HDP-PR-FSS-701, Final Status Survey Plan Development (Revision 8)
APPENDIX P-3
FSS PLAN

Survey Area: BSA 02 **Description:** Building Survey Area (Building 230)
Survey Unit: 27 **Description:** U-Shaped Area, Northwest – Floors, Lower Walls, Stairs, and Interior Walls

Overview: The Survey Unit (SU) identified as BSA 02-27 has been prepared for Final Status Survey (FSS) by the Hematite Decommissioning Project (HDP). This appendix provides an overview of the proposed FSS implementation as well as general and specific instructions for the technicians responsible for performing the FSS.

- **Data Quality Objectives**

1. Personnel performing FSS duties meet the qualifications listed in HDP-PR-HP-102 *Health Physics Technician Training* and have received training and instruction commensurate with their duties. The RSO has approved all FSS personnel to perform work associated with their individual roles and responsibilities. Training records are documented in accordance with HDP-PR-GM-020, *Training Material Development and Documentation of Training*.
2. All HDP FSS procedures ("700 series") have been reviewed, revised, and validated in order to ensure performance of actual FSS work activities reflect the requirements detailed in the individual FSS Procedures and the HDP Decommissioning Plan.
3. All FSS instrumentation has undergone a receipt inspection by HDP QA personnel, is within current calibration, and is determined to be functioning within acceptable ranges based on initial set-up and daily source checks in accordance with HDP-PR-HP-411, *Radiological Instrumentation*. HP technicians will confirm that environmental conditions (e.g. operating temperature range, no wet surfaces) are acceptable for use of field instrumentation.

- **Location**

BSA 02-27 is designated **Class 2** and is comprised of the floor, lower walls, and stair surfaces in the northwest portion of the U-Shaped Area in Building 230. Also included are building support columns (< 2 meters) and the interior walls of the FSS and Operations (Ops) offices. The total area of BSA 02-27 is 903.6 m^2. This SU was not outlined in the DP, however several Building 230 SUs were re-designed in June and July 2015 in order to conform to the maximum SU areas suggested in MARSSIM, e.g., 1,000 m^2 for a Class 2 structural SU; HDP practice has been to use the MARSSIM limit + 10% as an upper design bound for new FSS SUs.

- **Background**

This SU ("U-Shaped Area – Northwest Floor, Lower Walls, Stairs, and Interior Walls") is designated Class 2 due to its location adjacent to the Class 1 fuel rod assembly operations area under the Building 230 mezzanine. Previous characterization surveys indicate the potential exists for residual radioactivity to represent a fraction of the Structures, Systems, and Components (SSC) DCGL of 18,925 dpm/100 cm^2, but little to no potential of actually exceeding the DCGL.

HDP Satellite Site View: See Building 230 in Red Crosshatching

Building 230, constructed in 1992, is a split level mezzanine building that housed the fuel assembly fabrication equipment for

commercial operations. Radioactive material was used in this building during site operations. Fuel pellets were brought into Building 230 in stainless steel transfer boxes via the Cushman Room, and sent into both the Gad Room and the Rod Assembly Room via a conveyor system.

Significant portions of the Building 230 ground floor areas are designated Class 1 - primarily those associated with pellet handling and fuel rod assembly operations. BSA 02-27 is classified as a MARSSIM Class 2 survey unit due to its location adjacent to Class 1 Rod Load Assembly area and the potential of encountering elevated activity at a significant fraction of the DCGL.

BSA 02-27 underwent final remedial action support surveys (RASS) during May and June, 2015, including a partial (between 10% and 50%) scan of accessible surfaces and 36 total surface contamination (TSC) measurements taken over the entire floor. Finally, swipe samples were collected at each TSC measurement location.

All direct measurement activities were well below the applicable SSC DCGL (with a maximum measurement at 2.7% of the DCGL) and removable activity was less than 10% of the measured total activity results at all locations. These data support the initial DP Classification of Class 2 for BSA 02-27.

Due to the high traffic, heavy use situation in BSA 02-27, typical Isolation and Control (I & C) postings (green/white rope with I & C signage) will not be installed in the U-Shaped Area before FSS begins in BSA 02-27. However, verification that cross-contamination is not occurring within the SU after FSS will be verified through ongoing radiological surveillance as long as the building is occupied. The U-Shaped Area includes Class 2 floors and lower walls (BSA 02-13, 02-14, 02-21 and 02-27) and Class 3 upper walls and ceiling (BSA 02-17).

- **Criteria**

All FSS analytical results for samples collected within BSA 02-27 will be evaluated against the HDP SSC Gross Activity DCGL of 18,925 dpm /100 cm^2.

Radionuclide	Structural Surfaces (dpm / 100 cm^2)
Total Gross Activity	**18,925**

Table adapted from HDP FSS Procedure HDP-PR-FSS-701, *Final Status Survey Plan Development*, Revision 8, August, 2015.

- **Implementation**

As a Class 2 SU, BSA 02-27 will undergo a minimum 10% scan of all accessible surfaces (floor, lower walls, stairs, interior walls) using a handheld Ludlum 43-93 alpha-beta dual channel scintillation detector and a Ludlum 43-37 gas proportional floor monitor. The floor monitor will scan the majority of the floor area, while the handheld probe will be used to scan the lower walls, stairs, and "tight" sections of the floor where the larger detector can't reach. One particular section within the SU, a small pit within the Ops office, will require scanning judgmentally targeted to the surfaces most likely to contain residual contamination (e.g., the lowest horizontal surface, cracks, holes, etc.).

Perform biased measurements on floor seams, cracks, or penetrations, and at floor/wall interfaces. Consult FSS supervision for guidance on the amount and specific locations of biased measurements. At locations where measurements exceed the survey instrument static minimum detectable activity (MDA), adjustments to instrument efficiency or volumetric sampling may be

necessary – consult FSS supervision for guidance.

Based on a statistical evaluation of the RASS dataset, a minimum of eleven (11) measurement locations were calculated for BSA 02-27 and eleven (11) were designed. As this BSA is a Class 2 survey unit, the 11 measurement locations were selected based on a random-start point systematic triangular grid. Six of the eleven measurements fall on the floor surface. Direct measurement locations are given in X-Y coordinates in feet as measured from the southwest corner of the floor surface in BSA 02-27 (X0, Y0), except in the case of Locations 7 through 11, which are based on the lower left corners of each appropriate wall in the U-Shaped Area.

After each static measurement, within the same area as the static measurement, cloth smears will be swiped with moderate pressure over an area of 100 cm^2 (a 4" by 4" square) in an S-shaped pattern in order to assess removable activity.

Per HDP-PR-FSS-703, QC replicate survey requirements for structural survey units require that 5% of all Class 1, Class 2, and Class 3 SSC Survey Units are randomly selected to undergo a replicate survey of the entire SU area. The replicate survey is to be performed by an HP technician other than the one who performed the initial survey using similar instrumentation. BSA 02-27 is not one of the randomly selected SSC Survey Units for which a replicate survey has been required.

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FSS IMPLEMENTATION SUMMARY TABLE

Portable Instrument Scanning:	
Scan Coverage	Minimum 10% of BSA 02-27 total area (crane pit scan is mandatory)
Scan MDC	2,351 dpm / 100 cm^2 (Ludlum 43-93) 1,193 dpm / 100 cm^2 (Ludlum 43-37)
Investigation Action Level (IAL)	2,351 dpm / 100 cm^2 (Ludlum 43-93) 1,193 dpm / 100 cm^2 (Ludlum 43-37)

Total Surface Contamination (TSC) Measurements:		
Surface	Minimum Number of Measurements	Comments
Building 230: U-Shaped Area – Northwest (floor, lower walls, stairs, and interior walls)	11	A total of **11** TSC measurements locations have been systematically designed from a random start point.
TSC Investigation Action Level	18,925 dpm / 100cm^2 (Adjusted Gross DCGL)	

Removable Activity Locations:
After each TSC measurement, at the same point as the TSC measurement, using moderate pressure swipe a cloth smear over the surface (e.g. exterior wall, roof, window, etc.) in an S-shaped pattern within an approximately 4" by 4" box.

Biased Measurement Locations:
Perform biased measurements on floor seams, cracks, or penetrations, and at floor/wall interfaces. Consult FSS supervision for guidance on the amount and specific locations of biased measurements. At locations where measurements exceed the instrument static MDA, adjustments to instrument efficiency or volumetric sampling may be necessary – consult FSS supervision for guidance.

Instrumentation:	
Ludlum 2360 with 43-93 scintillation detector;	Used for scanning lower walls, stairs, interior walls and to obtain static (TSC) measurements; used to investigate elevated areas found with the floor monitor.
Ludlum 2360 with 43-37 gas proportional detector	Used for scanning floors.
Ludlum 2929 with 43-10-1 scintillation detector	Used for counting of swipe (smear) samples.

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General Instructions:

1. Summarize daily work activities on the log sheets provided in Appendix P-6 (from procedure HDP-PR-FSS-701, *Final Status Survey Plan Development*). Provide a description of work area conditions, measurements collected (including swipes for removable activity) and the status of instrument scan surveys for every shift that involves work in this survey unit. Document the surveyor name and instrumentation used for each structural surface survey on Appendix A-1 (from procedure HDP-PR-FSS-712, *Final Status Surveys of Structures, Systems, and Components*) and on Appendix P-6 for reporting traceability. In the event that a situation arises where the survey instructions cannot be followed as written, stop work and contact the FSS Supervisor for resolution. All changes to the survey instructions shall be approved by the RSO before continuing work and be documented in the FSS Field Log.
2. In accordance with HDP-PR-FSS-701, *(Sec. 8.4.2),* documentation of activities performed, equipment used, and potential safety hazards that may be encountered during the performance of characterization activities (along with associated controls) will be documented using the FSS Daily Task Briefing log sheet.
3. Due to the high traffic, heavy use situation in BSA 02-27, typical Isolation and Control (I & C) postings (green/white rope with I & C signage) will not be installed in the U-Shaped Area before FSS begins in BSA 02-27. However, verification that cross-contamination is not occurring within the SU after FSS will be verified through ongoing radiological surveillance as long as the building is occupied.
4. In accordance with HDP-PR-HP-411, *Radiological Instrumentation*, confirm that FSS instrumentation is within the current calibration period, has been daily source checked, and environmental conditions are acceptable for field use as per the manufacturer's recommended operating parameters. As required by HDP-PR-HP-415, *Operation of the Ludlum 2360 for Final Status Survey*, calculation of weighted efficiencies for each survey detector used during FSS of BSA 02-27 will be performed prior to field use.
5. Structural FSS are to be performed in accordance with HDP-PR-FSS-712, *Final Status Surveys of Structures, Systems, and Components*, using instrumentation that has been documented and prepared per the requirements of HDP-PR-HP-411 and HDP-PR-HP-415. BSA 02-27 is a Class 2 Survey Unit. A total of 11 systematic TSC measurements will be taken across the entire survey unit. At least 10% of the total survey unit area will be scanned by a combination of the floor monitor and handheld survey probe.
6. A scanning survey of the floor will be performed using a Ludlum 43-37 gas proportional floor monitor. Move the floor monitor systematically across the surface at a speed between 1 and 2 inches per second. Ensure the probe set screws maintain a close, even distance (nominally ¼", but not to exceed ½") to the floor surface. A scanning survey of any tight, or cramped, floor areas the floor monitor can't reach will be performed using a Ludlum 43-93 alpha-beta scintillation detector. Move the handheld survey probe systematically across the wall surface at a speed between 1 and 2 inches per second while holding the probe as close (nominally ¼", but not to exceed ½") to the surface as conditions allow. The scanning surveys will cover the percentage (≥ 10%) of the accessible surface areas within the area of interest as indicated in the table above. A certain amount of judgmental scanning will be required in the crane mount pit within the Ops office focusing on the pit features (lowest ledge, holes, cracks, etc.) most likely to contain residual contamination. Notify the FSS Supervisor of any areas, conditions or constraints where surveying (or subsequent sampling) may not be possible. Document the conditions and any resolutions in the FSS Field Log.
7. Perform biased measurements on floor seams, cracks, or penetrations, and at floor/wall interfaces. Consult FSS supervision for guidance on the amount and specific locations of biased measurements. At locations where remediation has taken place or where measurements exceed the static MDA, adjustments to instrument efficiency or volumetric sampling may be necessary – consult FSS supervision for guidance.

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8. Static TSC measurements made with the scaler-ratemeter (Ludlum 2360) coupled to the handheld detector will be manually recorded onto a field survey diagram. Results of the structural survey will be documented on form Appendix A-1 from HDP-PR-FSS-712.
9. A map or diagram of the structural survey area will be attached to the survey instruction. Direct measurement locations are given in X, Y coordinates as measured in feet from the origin point (0, 0) of each structural surface (e.g., floor, east wall) within the survey unit.
10. Swipe samples will be collected at each TSC measurement location after the static count is completed. All swipe samples will be analyzed in the onsite FSS office using the Ludlum 2929 swipe counters for gross alpha/gross beta activity.
11. No volumetric sampling is planned as part of the FSS effort for BSA 02-27 (see also **General Instruction** #7).

Specific Instructions:

NOTE: Unless otherwise indicated, the performance of these specific instructions is the responsibility of the HP Technician.

Before Beginning Work

1. **Rad. Engineer/HP Technician:** Perform a daily task-specific briefing; documenting the attendants, planned work activities, anticipated hazards, and controls on the FSS Daily Task Briefing log sheet.
2. **Rad. Engineer/HP Technician:** Verify that survey instrumentation is within the current calibration period by checking the calibration due date for each piece of instrumentation used for FSS. Perform daily pre- and post-survey daily source checks for handheld survey instrumentation in accordance with HDP-PR-HP-411. Confirm that environmental conditions in which the survey will be performed are within the manufacturer's recommended operating range (e.g. temperature between -4° F to 122° F).
3. **Rad Engineer/HP Technician:** Prior to survey, collect three background measurements in (alpha + beta) scaler mode at waist level per Step 8.4.1 of HDP-PR-FSS-712. Use the average of the three readings as the daily field background. The purpose of these measurements is to determine the ambient background count rate and identify a previously undetected source term within or near the survey area.
4. **Rad. Engineer/HP Technician:** Prior to survey, inspect the work area to ensure that the surface is clean and dry.

Structural Surveys (Scanning, Total Surface Contamination Direct Measurements, Swipes)

1. It is not necessary to establish a "material background" for the surface being surveyed, since all measurements will be compared to the gross activity SSC DCGL of 18,925 dpm / 100 cm^2.
2. Perform a scan of the structural surface holding the probe as close to the surface as conditions allow (nominally 1/4", but not to exceed 1/2") moving the probe at a rate between 1 and 2 inches per second, in accordance with HDP-PR-FSS-712 and HDP-PR-HP-415. Ensure that the crane mount pit within the Ops office undergoes a prudent amount of judgmental scanning to include those features (lowest level, cracks, holes, etc.) most likely to contain residual contamination.
    a. Look and/or listen for elevated count rates and then pause to determine locations that exhibit anomalous readings (e.g., count rates that exceed the IAL for this unit). In particular, focus on the floor/wall interface, joints, cracks, or penetrations. Any small areas of elevated (>IAL) activity encountered during the floor monitor scan will be further investigated with the Ludlum 43-93 handheld detector for more precise delineation. Note the IAL for these special features is the Scan MDC of the survey probe.
    b. Mark the location(s) exhibiting anomalous readings to facilitate possible future investigations. Contact FSS Supervision for guidance as to the selection of potential biased

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measurements.

3. At each location where anomalous readings occur, perform a more detailed point survey of the area using the handheld probe (Ludlum 43-93). Pause and place the survey probe as close as possible to the surface to define and record the total count rate associated with the area of interest on the Field Log. If residual radioactivity exceeding the static MDA is detected in a floor seam, crack, penetration, or on any painted surface, contact FSS supervision for guidance. Adjustments in instrument efficiency or volumetric sampling may be necessary.
4. Collect static count measurements at the 11 systematically designed locations on contact with the structural surface for a period of 1 minute.
5. At each TSC measurement location, after the alpha+beta static count has been completed, swipe a cloth smear over the surface (e.g. interior wall, ceiling, etc.) with moderate pressure in an S-shaped pattern within an approximately 4" by 4" box (100 cm^2).
6. Record all scan, direct measurements, and swipe data on Form Appendix A-1 and submit to the FSS Supervisor for review.

Volumetric Sampling

1. No volumetric sampling is planned as part of the FSS of BSA 02-27 (see also **General Instruction** #7).

Prepared by:	Brian A. Miller	Brian A. Miller	9/10/15
	(Print Name)	(Signature)	(Date)
Peer Reviewed by:	Ellen C. Jakub	Ellen C. Jakub	9/10/15
	(Print Name)	(Signature)	(Date)
Approved by (RSO):	W. Clark Evers	W. Clark Evers	9/10/15
	(Print Name)	(Signature)	(Date)

APPENDIX P-2
FINAL STATUS SURVEY SAMPLING PLAN DEVELOPMENT CHECKLIST FOR STRUCTURE SURVEY UNITS

Survey Area BSA 02 **Description:** Building 230

Survey Unit 27 **Description:** U-Shaped Area (Northwest) – Lower Walls, Floor, Stairs, and Interior Walls

1. Survey Unit Isolation & Control

Has the Survey Unit been properly isolated and/or controlled (indicated by outlining the area with green rope and posting the appropriate signage) as required by HDP-PR-HP-602, *Data Package Development and Isolation and Control Measures to Support Final Status Survey*?

Note: I&C will be verified through ongoing routine surveillance while the building is occupied. Yes ☒ No ☐

(If "No", then discontinue survey design until area turnover requirements have been met).

2. Assessment of Characterization/Remedial Action Support Surveys (RASS)

a. Derive & List the Basic Statistical Data for the TSC measurements in the characterization/RASS Survey Population.

# of Measurements Taken: 36

	TSC Measurements (dpm/100cm^2)
Minimum	0 (< BKG)
Maximum	519
Mean	141
Median	60
Standard Deviation	157.8

b. Is the characterization/RASS Survey Data sufficient to support FSS Design? Yes ☒ No ☐

(If "No", then terminate survey design and perform additional characterization or remediation and repeat the planning process.

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3. Survey Unit Classification

Write a short description of the survey unit based on historical use and remedial activities:

BSA 02-27 is a MARSSIM Class 2 survey unit that includes the lower walls, floor and stairs of the northwestern U-Shaped Area in Building 230, including the interior walls of the FSS and Operations (Ops) offices. Building 230 was constructed in 1992 and used for uranium fuel rod bundling. Fuel pellets were brought into the building in stainless steel transfer boxes via the Cushman Room and sent into both the Gadolinium Room and Rod Assembly Room via a conveyor system. The lower walls, floor and stairs, including interior walls, have a surface area of 903.6 m^2.

Initial Classification per DP Ch 14: 2 Survey Unit Area: 903.6 m^2

a. Has the Survey Unit Classification changed from the Initial Classification for the Survey Unit as described in DP Ch. 14?

Yes ☐ No ☒

(If "Yes", then include a copy of Appendix P-5, *Survey Unit Classification Change Form* with the FSSP).

b. Is the Survey Unit area less than the maximum size for the Classification? Yes ☒ No ☐

(If "No", then terminate survey design and evaluate dividing the survey unit into multiple survey units).

4. Area Remediation

Select the appropriate remediation status for the Survey Unit.

☒ No Remediation ☒ System Removal

☐ Structural or System Decontamination ☐ Structural Removal

5. Types of Samples and Measurements for FSS

Select the appropriate types of samples and measurements for FSS for this Survey Unit.

Statistical Sample Population

☒ Total Surface Contamination (TSC) measurements

☐ Volumetric Material Samples

☒ Swipe Samples for Loose Surface Contamination

☐ Other

Scan Measurements

☐ 100% Scan Coverage of Exposed Surfaces

☒ 10-100% Judgmental Scan Coverage of Exposed Surfaces

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6. Derived Concentration Guideline Levels (DCGL)

The Adjusted Gross DCGL for structural surfaces at HDP is 18,925 dpm/100cm^2 per Table 14-7 of DP Ch. 14. This Table has been reproduced as Appendix C of HDP-PR-FSS-701.

7. Determine the Number of Samples in the Statistical Survey Population

a. Set the Lower Bound of the Grey Region (LBGR) at the mean activity for the characterization/RASS survey data set from Step 2.

$Activity_{Mean}$ = 141 dpm/100cm^2 = Lower Bound of the Grey Region (LBGR)

b. Standard Deviation for the characterization/RASS survey data set from Step 2.

σ = 157.8

c. Define the Decision Errors.

Type I Error = 0.05 Type II Error = 0.10

Note: The Type II Error is set at 0.10 initially but it may be adjusted with RSO concurrence.

d. Determine the Relative Shift using the equation from Step 8.3.4c of HDP-PR-FSS-701.

Relative Shift = 119

e. Is the Relative Shift between 1 and 3? Yes ☐ No ☒

(If "Yes", then continue to Step 7f, if "No", then proceed to the next step).

If the variability in the data set is acceptable, then adjust the LBGR as necessary in order to achieve a Relative Shift between 1 and 3. In order to accomplish this, the LBGR may be set as low as the MDC of the instrument that will be used for the measurements.

Adjusted LBGR = 18,452

Adjusted Relative Shift = 3.0

f. Determine the Number of Samples (N) required corresponding to the Type I error, Type II Error and the Relative Shift from Appendix E of HDP-PR-FSS-701.

Number of Samples (N) = 11

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8. Determine the Scan MDC

a. Identify the Radiological Instrument that will be used for scanning.

☐ Ludlum 43-89 Scintillation Detector ☒ Other Ludlum 43-93 Scintillation Detector

Ludlum 43-37 Gas Proportional Floor Monitor

b. Determine the Scan MDC for the selected instrument using the equation from Step 8.3.5b of HDP-PR-FSS-701.

MDC_{scan} = 2,351 dpm/100cm^2 43-93

MDC_{scan} = 1,193 dpm/100cm^2 43-37

9. Adjust the Statistical Sample Population Size (N) for Scan MDC

a. Is the MDC_{scan} for the selected instrument less than the Adjusted Gross DCGL? Yes ☒ No ☐

b. If the answer to the question in Step 9a is "Yes" or the survey unit is either Class 2 or Class 3, then proceed to Step 10. If the answer to the question in Step 9a is "No" and the survey unit is Class 1, then proceed to the next step.

c. Divide the total area of the survey unit by the Number of Samples (N) calculated in Step 7f to calculate the area bounded by the statistical sample population (A_{SU}).

Area Bounded by the statistical sample population (A_{SU}) = NA m^2

d. Select an Area Factor (AF) from Appendix I of HDP-PR-FSS-701 that corresponds to the area bounded by the statistical sample population (A_{SU}).

AF for the Bounded Area (A_{SU}) = NA

e. Multiply the Adjusted Gross DCGL Area Factor (AF) to derive an Adjusted Gross $DCGL_{EMC}$.

Adjusted Gross $DCGL_{EMC}$ = NA dpm/100cm^2

f. Is the MDC_{scan} for the selected instrument less than the Adjusted Gross $DCGL_{EMC}$?

Yes ☐ No ☐ NA ☒

g. If the answer to the question above is "Yes", then continue to Step 10. If the answer to the question above is "No", then proceed to the next step.

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h. Determine a new AF (AF_{EMC}) corresponding to the MDC_{scan} for the selected instrument by dividing the MDC_{scan} by the Adjusted Gross $DCGL_W$.

AF_{EMC} corresponding to MDC_{scan} = NA

i. Find the Area (A') that corresponds to the Area Factor (AF_{EMC}).

A' corresponding to AF_{EMC} = NA

Note: The Area Factors for structures are found in Appendix I of HDP-PR-FSS-701.

j. Determine an Adjusted Number of Samples (N_{EMC}) for the statistical sample population size that corresponds to the bounded A_{EMC} using the equation from Step 8.3.6h of HDP-PR-FSS-701.

N_{EMC} corresponding to A' = NA

N calculated in Step 7f = NA

k. Is N_{EMC} > the value of N determined in Step 7f? Yes ☐ No ☐ NA ☒

(If "Yes", then use the larger N_{EMC} value as the statistical sample population size. If no, then use the value of N that was calculated in Step 7f as the statistical sample population size).

10. Determine the Grid Spacing

a. Is the Survey Unit a Class 3 Survey Unit? Yes ☐ No ☒

(If "Yes", then continue to Step 11, if "No", then proceed to the next step).

b. Determine Grid Spacing (L) using the equation from Step 8.3.7b of HDP-PR-FSS-701.

Grid Spacing (L) for Survey Unit = 9.7 m

11. Generate a Survey Map

a. Assign a unique identification number to each measurement in the statistical sample population using the guidance and direction provided in Appendix M of HDP-PR-FSS-701.

b. Generate a graphic representation of the Survey Unit with dimensions and boundaries corresponding to an established reference coordinate system in accordance with Step 8.3.8 of HDP-PR-FSS-701.

c. Using the reference coordinate system, ascertain coordinates for each sample location.

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d. Designate measurement locations, and location coordinates on Appendix P-4, *FSS Sample & Measurement Locations & Coordinates* and attach a copy of that form to the FSSP.

e. Attach a copy of the developed Survey Map with sample locations to the FSSP.

12. Biased Measurements

a. Designate if any biased measurements will be taken at the discretion of the HP Staff designing the survey and the basis for taking them. Necessary biased samples will be explained on Appendix P-3, *FSS Sampling Plan.*

Note: Biased measurements are not included as part of the statistical sample population. Rather, they are treated as pre-emptive investigation measurements.

b. Using the reference coordinate system, ascertain coordinates for each biased measurement location.

c. Designate biased measurement locations, and location coordinates on attached Appendix P-4, *FSS Sample & Measurement Locations & Coordinates*.

13. Scan Coverage

a. The Survey Unit is: ☐ Class 1 ☒ Class 2 ☐ Class 3

b. Based on the Survey Unit Classification, the scan coverage in this Survey Unit is;

☐ 100% Scan Coverage of Exposed Surfaces ☒ 10-100% Judgmental Scan Coverage of Exposed Surfaces

14. Investigation Levels

a. The Survey Unit is: ☐ Class 3

1) Scan Investigation Levels are set at the most limiting between the Adjusted Gross $DCGL_W$ = 18,925 dpm/100cm^2 or the MDC_{scan} for the instrument used.

NA dpm/100cm^2

2) TSC Measurement Investigation Levels are set at 50% of the Adjusted Gross $DCGL_W$ = 9,462 dpm/100cm^2.

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b. The Survey Unit is: ☒ Class 2

1) Scan Investigation Levels are set at the most limiting between the Adjusted Gross $DCGL_W$ = 18,925 dpm/100cm^2 or the MDC_{scan} for the instrument used.

2,351 dpm/100cm^2 Ludlum 43-93

1,193 dpm/100cm^2 Ludlum 43-37

2) TSC Measurement Investigation Levels are set at the Adjusted Gross $DCGL_W$ = 18,925 dpm/100cm^2.

c. The Survey Unit is: ☐ Class 1

1) Scan Investigation Levels (general area) are set at 50% of the Adjusted Gross $DCGL_W$ = NA dpm/100cm^2

Scan Investigation Levels (expansion joints, stress cracks, floor/wall interface, penetrations) are set at the most limiting MDC_{scan} for the instrument used = NA dpm/100cm^2 Ludlum 43-93; NA dpm/100cm^2 Ludlum 43-37

2) TSC Measurement Investigation Levels are set at the Adjusted Gross $DCGL_W$ = 18,925 dpm/100cm^2.

15. FSSP Development Checklist Approval

Prepared by:	Ellen C. Jakub	(Print Name)	(Signature)	9/10/15 (Date)
Peer Reviewed by:	Brian A. Miller	(Print Name)	(Signature)	9/10/15 (Date)
Approved by (RSO):	W. Clark Evers	(Print Name)	(Signature)	9/10/15 (Date)

APPENDIX P-4
FSS SAMPLE & MEASUREMENT LOCATIONS & COORDINATES

Survey Area: BSA 02 **Description:** Building Survey Area (Building 230)

Survey Unit: 27 **Description:** U-Shaped Area (Northwest) – Lower Walls, Floor, Stairs, and Interior Walls

Survey Type: FSS **Classification:** Class 2

Measurement or Sample ID	Surface or CSM	Type	Start * Elevation	End * Elevation	Northing (feet) (Y Axis) **	Easting (feet) (X Axis) **	Remarks / Notes
B02-27-01-S-F-S-00	F	S	NA	NA	65.0	5.2	Floor
B02-27-02-S-F-S-00	F	S	NA	NA	65.0	35.0	Floor
B02-27-03-S-F-S-00	F	S	NA	NA	37.4	20.0	Floor
B02-27-04-S-F-S-00	F	S	NA	NA	37.4	51.9	Floor
B02-27-05-S-F-S-00	F	S	NA	NA	9.9	5.2	Floor
B02-27-06-S-F-S-00	F	S	NA	NA	9.9	35.0	Floor
B02-27-07-S-F-S-00	W	S	NA	NA	2.8	37.0	Rod Load West Wall
B02-27-08-S-F-S-00	W	S	NA	NA	1.4	16.9	FSS Office E Wall Outer
B02-27-09-S-F-S-00	W	S	NA	NA	1.3	8.6	Ops Offices E Wall Inner
B02-27-10-S-F-S-00	W	S	NA	NA	3.6	14.9	Ops Offices S Wall Inner
B02-21-11-S-W-S-00	W	S	NA	NA	2.1	11.5	Ops Pit North Wall
B02-27-XX-S-X-B-00	TBD	B	NA	NA	TBD	TBD	TBD

*Elevations are in feet above mean sea level.

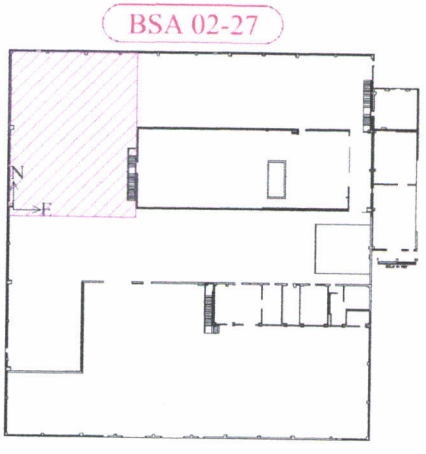
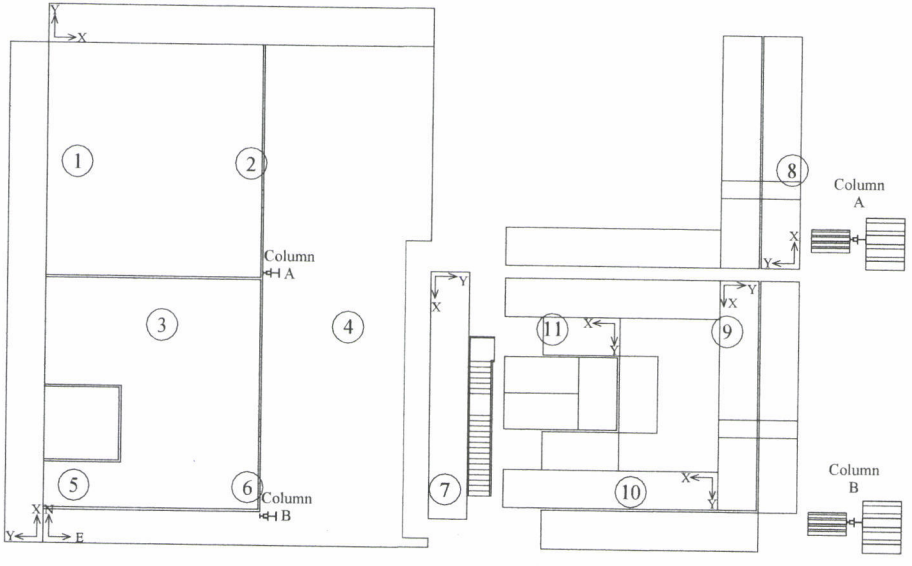
** Missouri - East State Plane Coordinates [North American Datum (NAD) 1983] (Open Land Area) OR
Distance in feet from lower left corner of the surface (Structures); each surface has it's own (X,Y) = (0,0); OR
For piping the distance from the beginning of the survey unit.

Surface: Floor = F; Wall = W; Ceiling = C; Roof = R

CSM: Three-Layer (Surface-Root-Deep) or Uniform

Type: Systematic = S, Biased = B; QC =Q; Investigation = I

BSA 02-27
Floor and Lower Walls of the NW Section of the U Shaped Area



Sample Location	Surface	X Coordinates (feet)	Y Coordinates (feet)
1	Floor	5.2	65.0
2	Floor	35.0	65.0
3	Floor	20.0	37.4
4	Floor	51.9	37.4
5	Floor	5.2	9.9
6	Floor	35.0	9.9
7	Rod Load W Wall	37.0	2.8
8	FSS Office E Wall (outer)	16.9	1.4
9	Ops Office E Wall (inner)	8.6	1.3
10	Ops Office S Wall (inner)	14.9	3.6
11	Ops Pit N Wall (outer)	11.5	2.1