Appendix B

Surfaces Survey Design
Revision 1

ORIGINAL

FirstEnergy

SNEC CALCULATION COVER SHEET

CALCULATION DESCRIPTION

Calculation Number	Revision Number	Effective Date	Page Number
E900-05-015	1	5/19/05	1 of 13

Subject

OL1 Paved and Miscellaneous concrete surfaces MA8, PF1, DB5, DB1, SS12, SS24 - Survey Design

Question 1 - Is this calculation defined as "In QA Scope"? Refer to definition 3.5. Yes ☒ No ☐

Question 2 - Is this calculation defined as a "Design Calculation"? Refer to definitions 3.2 and 3.3. Yes ☒ No ☐

NOTES: If a "Yes" answer is obtained for Question 1, the calculation must meet the requirements of the SNEC Facility Decommissioning Quality Assurance Plan. If a "Yes" answer is obtained for Question 2, the Calculation Originator's immediate supervisor should not review the calculation as the Technical Reviewer.

DESCRIPTION OF REVISION

1 - Revision 1 adds the use of the 43-37 extra large probe to the design. Numerous additions are made to provide setpoints, mdcr, useage protocols, etc. and attachments. The complete text of pages 1 through 13 is provided here, but only the added attachments are included. This revision also adds the survey units and layout for the concrete in the SSGS area OL1-8.

APPROVAL SIGNATURES

Calculation Originator	W. J. Cooper CHP/ [signature]	Date	5/19/05
Technical Reviewer	T. Tritch/ [signature]	Date	5/19/05
Additional Review	A. Paynter/ [signature]	Date	19 May 2005
Additional Review		Date	

1.0 PURPOSE

1.1 The purpose of this calculation is to develop a survey design for the residual concrete surfaces in the Saxton Nuclear Experimental Corporation SNEC and SSGS site areas. The total area (OL1) including the soil and solid surface portions is approximately ***11600 square meters***. Portions of the solid surface (concrete, macadam, brick) are Class1, Class 2, and Class 3 survey areas. Because the survey area exceeds the size limitations in the SNEC LTP **(Reference 3.5)** Table 5-5 for maximum Class 1 survey unit area and it includes survey units of all three classifications, this survey area is subdivided into multiple survey units: OL1-7 is an existing excavation in the SNEC site area, that will be backfilled after survey. OL1-8 through OL1-13 are subdivisions of the large open land area and comprise the majority of the total surface area. These open land areas and the excavation are covered by other design calculations. Several additional areas comprise the residual exposed concrete and macadam surfaces:

1.1.1 PF1 is a pre-existing Class 1 survey unit for the Personnel Access Facility (PAF) floor and includes the north edge of the PF1 portion of the slab with approximately **37 m^2**

1.1.2 DB1 is a pre-existing Class 1 survey area for the Decommissioning Support Building (DSB) floor pad and door ramp. This area is further divided into two survey units due to LTP survey unit area limitations. DB1-1(85 m^2) and DB1-2 (109 m^2) with **194 m^2** total. DB1-1 includes the full width of the north edge of the DSB portion of the pad.

1.1.3 DB5 is a pre-existing Class 1 survey unit for the DSB carport floor of approximately **54 m^2**

1.1.4 SS12 is a pre-existing survey area for the SSGS boiler pad. This concrete, although it is in a Class 1 soil area, is classified as Class 3 in the LTP Table 5-2. Some minor details of residual concrete hidden by soil may be present. This will not affect the survey since it is class 3 and only 10% scan is needed. Since SS12 is Class3, the entire pad is a single survey unit of approximately **658 m^2**.

1.1.5 SS24-1 is a Class 3 survey unit defined for the miscellaneous SSGS pads north of the turbine hall. There is likely to be a buried portion of this slab west of this area which is separately defined as SS24-2. Since SS24 is Class 3, the entire exposed pad is a single survey unit. Design scan area is 105 m^2. The west edge of the exposed concrete is uneven and the area is approximately **249 m^2**.

1.1.6 SS24-2 is a Class 3 survey unit defined for the miscellaneous SSGS pads north of the turbine hall. This is a buried portion of this slab west of the area defined as SS24-1. This area must first be surveyed as open land per E900-05-014, then cleared of soil and the residual concrete surveyed per this design. Since SS24 is Class 3, the entire buried portion of the pad is a single survey unit. Design scan area is 118 m^2. The area is approximately **321 m^2**.

1.1.7 MA8-6 through 13, 16, and 17: Ten survey units of the old parking lot and driveway macadam. Because of the 100 m^2 survey unit limitation for Class 1 surfaces, the surface was subdivided into ten approximately 100 m^2 (or less) survey units. The pavement occupies all of, or a large portion of, grids AT131, AU127, AU128, AU129, AU130, AU131, AV130, AV131, AW131, AX131, AY131. These are all class 1 survey units due to verbal reports of minor remediation and due to their proximity to the C&A building, the barrel bunker, and containment. Total area is about **772 m^2**. General arrangement of these units is shown in the drawing **Attachment 6-17.**

1.1.8 MA8-16 and MA8-17 have about 4 to 6 inches of soil on top of the pavement. This soil is to be surveyed per E900-05-014 and then removed and placed in a PRI pile to allow the pavement survey per this design.

1.1.9 MA8-14 – the Line Shack concrete including garage door ramps and sidewalks. This area is not specifically classified in the SNEC LTP (**Reference 3.5**) but is selected to be class 2 consistent with the class 3 classification of the line shack exterior and the class 1 assigned to the surrounding soil. This is a Class 2 survey unit with about **33 m^2** total area.

1.1.10 MA8-15 is additional concrete surfaces around the CV. There is some SSGS concrete and additional small monoliths in OL1-9 NW of the CV. This small concrete area is not specifically addressed in the SNEC LTP but is assumed to be Class 1 due to proximity to the CV and is about **37 m^2**.

1.1.11 A summary list of survey unit areas is included as **Attachment 5-1.**

1.2 This survey design applies only to the residual concrete, macadam, and other paved surfaces in the survey area. The design for the open land areas, fences, the east yard excavation, and the portion of OL1 covering the SSGS will be provided in separate calculations. The general layout of this survey unit is shown on **Attachment 1-1.**

1.3 If additional areas of concrete not identified here are found under soil, this design may to be revised to include the additional area.

2.0 SUMMARY OF RESULTS

The following information should be used to develop a survey request for this survey unit. The effective DCGLw value is listed below. This value is derived from previously approved derived values for "CV Yard Soil and Boulders", Attachment 2 in SNEC calculation E900-04-005 (**Reference 3.15**). The US NRC has reviewed and concurred with the methodology used to derive these values. See **Attachment 2-1** and **Reference 3.9.**

Table 1, DCGLw Values

Gross Activity DCGLw (dpm/100 cm^2)
26445 (19834 A.L.)

NOTE: A.L. is the site Administrative Limit (75% of effective DCGLw)

2.1 Survey Design

2.1.1 Scanning of concrete and macadam surfaces shall be performed using a L2350 with 43-68B gas flow proportional counter or a 43-37 'extra large' probe calibrated to Cs-137 (see typical calibration information on **Attachments 3-1 and 3-2**). Generic approval for use of the 43-37 is included in **Reference 3.10.**

2.1.2 The instrument conversion factor/efficiency (Et) shall not be less than that assumed on **Attachment 4-1** as ***23.9% – Cs-137*** for the 43-68B nor less than ***20.0%-Cs137*** for the 43-37 in its lowest efficiency region as assumed on **Attachment 4-3.**

2.1.3 Other instruments of the types specified in Section 2.1.1 above may be used during the final status survey (FSS), but must demonstrate detection efficiencies at or above the values listed in Section 2.1.2 above.

2.1.4 An efficiency correction factor (ECF) is applied to compensate for efficiency loss when surveying rough surfaces based on **Reference 3.1** and **Attachment 2-2.**

2.1.5 The fraction of detectable beta emitting activity affects the efficiency and is determined by the nuclide mix. The mix detectable beta fraction is determined to be 60% based on **Reference 3.15**. Because the adjusted DCGLw used is based only on the modified Cs-137 DCGLw, the mix percentage is not applied to the adjusted surrogate DCGLw. The gross activity DCGLw, which would include all the low energy activity and would require mix percentage adjustment is considerable higher, at 44434 dpm 100cm^2. The Cs-137 adjusted surrogate activity already accounts for the detectable beta yield of the mix.

2.1.6 The ECF is derived from **Attachment 2-2** and **Reference 3.1** based on a surface irregularity of 3 inches or less FOR THE 43-68B DETECTOR. This is conservative, as actual observed irregularity is typically less than one inch. Also, the loss of efficiency is based on moving the detector away from a 150 cm^2 source. If the area of the residual activity is larger, than the efficiency loss would be smaller due to the increase in 'field-of-view' of the detector.

2.1.7 The ECFs developed for the 43-68B probe per reference 3.1 are assumed to apply to the 43-37. The ECF for the 43-37 are based on the ASSUMPTION that the detector face will not be more than about 1 inch farther from the surface than from the source in the test jig (0.5 inches apart) and that the surface will be fairly smooth, typical of poured concrete or macadam.

2.1.8 Because the alarm point and MDCscan are based on the highly conservative surface irregularity assumptions (intended to bound all cases to simplify design and performance of the survey), where surfaces are much smoother (e.g. 1 inch irregularity or less per probe area for the 43-68B) than the assumed 3 inch variability, short (e.g. ½ to 1 inch) standoff support pegs may be attached to the 43-68B in order to reduce the possibility of mylar damage. These standoffs must only be used when the surface smoothness is well within the assumed 3 inch variability. Because the high surface irregularity is assumed and used for the efficiency of the instrument for the entire design, this standoff will not affect the assumed efficiency if limited as discussed above.

Table 2, GFPC Detection Efficiency Results Used for Planning

Detector	Material Type	EI	Es	Et(as %)	ECF	Adjusted efficiency
43-68B	Concrete or asphalt	.478	.5	23.9	.2	4.8%
43-37	Concrete or asphalt	.4	.5	20.0	.5	10.0%

Table 3, Surface Scanning Parameters for Solid Misc. Concrete & Pavement Sections

Detector	MDCscan (dpm/100cm^2)*	Scan Speed (cm/sec)	Maximum Distance from Surface	DCGLw Action Level	% Coverage
43-68B	4634	10	3" (gap between detector face & surface or 3 inch irregularity)	> 1450 cpm	Up to 100%
43-37	7311	30.5	1.5" (gap between detector face & surface)	>2900 cpm	Up to 100%

See Attachment 2-1, 2-2, 4-1, and 4-3 for calculations*

2.1.9 The 43-68B MDCscan (shown in **Attachment 4-1**) is based on a 300 cpm background. Typical backgrounds are similar to this value assumed, as shown in the variability data shown as "CW" (closed window or shielded detector) in **Attachment 8-2.** Unaffected material backgrounds were determined at the Williamsburg station, which resulted in a mean background value of 306 cpm +/- 34.5. On 3/7/05, measurements were collected on three different surfaces in OL1: the DSB pad, the old parking lot, and the SSGS boiler pad.

2.1.10 The 43-37 MDCscan (shown in **Attachment 4-2**) is based on a 1020 cpm background. On 5/12/05, measurements were collected on three different surfaces in OL1: the DSB pad, the asphalt, and the SSGS boiler pad. These are shown in **Attachment 8-7** and **Attachment 8-8.**

2.1.11 The 43-37 detector is to be used as a screening process.

2.1.11.1 Since the efficiency is determined with the same source as used for the 43-68B, the effective area of the detector is assumed to be 100 cm^2 for determining the MDCscan. This will underestimate the response of the detector to larger sources but produce similar efficiencies and MDCs as for the 43-68B.

2.1.11.2 Scanning using the 43-37 will be done only on flat surfaces with surface irregularities typical of poured concrete or rolled macadam pavement. Uneven surfaces, edges, etc. will be scanned with the 43-68B.

2.1.11.3 Because the 43-37 has a much larger effective surface area than the 43-68B, and the MDC and action level are based only on a 100 cm^2 elevated spot, the 43-37 may provide action level count rates on larger diffuse source areas that actually are less than the DCGL. Therefore, the 43-37 will be used to screen surfaces and will be considered to be the 'official' results only if no action levels are observed.

2.1.11.4 Any action levels observed with the 43-37 will be rescanned with the 43-68B. If no AP is observed with the 43-68B, there is no AP. APs observed in follow-up rescans with the 43-68B will be handled and documented in the SR per section 2.1.16 below.

2.1.11.5 Fraction scanned with the 43-37 and results should be separately reported in the SR for each survey unit / grid/ etc. in a similar manner as used for the

43-68B. E.G. '90% scanned with 43-37, one alarm rescanned with 43-68B no 43-68B AP'.

2.1.12 The 3/7/05 survey data shown as "OW" (open window or unshielded) is used for the variability assessment for the COMPASS determination of sample requirements and is shown in **Attachment 8-2**.

2.1.13 A background of 1300 cpm for the 43-68B would still result in MDCscan less than about 50% of the DCGLw (**Attachment 4-2**). Since the Action level cited in Table 3, above, is total counts per minute including background, if local backgrounds significantly exceed the background count rate assumed for the MDCscan (about 300cpm for the 43-68B see - **Attachment 4-1** or 1020 cpm for the 43-37 – see **Attachment 4-3**) ***contact the cognizant SR coordinator*** to determine need for additional background count rate adjustments.

2.1.14 The scan DCGLw Action Level for the 43-68B listed in Table 3 includes 1200 cpm DCGL equivalent count rate from **Attachment 4-1** and an estimated 260 cpm background . The DCGLw action level is based on fixed measurement and does not include 'human performance factors' or 'index of sensitivity' factors (see **Reference 3.12**).

2.1.15 The scan DCGLw Action Level for the 43-37 listed in Table 3 includes 1950 cpm DCGL equivalent count rate from **Attachment 4-3** and an estimated 950 cpm background. Although the 43-37 is assumed to be geometrically and functionally equivalent to the 43-68B for MDC and action level determination (a conservative assumption), the ECFs and probe areas are different and therefore result in a higher net count rate for the action level for the 43-37. The DCGLw action level is based on fixed measurement and does not include 'human performance factors' or 'index of sensitivity' factors (see **Reference 3.12**).

2.1.16 If a total count rate greater than the "DCGLw action level" of Table 3 is encountered during the scanning process with a 43-68B, the surveyor should stop and locate the boundary of the elevated area, and then perform a "second phase" fixed point count of at least 30 seconds duration. If the second phase result equals or exceeds the "DCGLw action" level noted in table 3, the surveyor should then mark the elevated area with appropriate marking methods and document the count rate observed and an estimate of the affected area. Subsequent investigation may take the actual surface irregularity into account for the efficiency.

2.1.16.1 ***Class 1*** concrete should be scanned to include 100% surface coverage at a scan rate of about 10 cm per second for the 43-68B or 30.5 cm per second for the 43-37. All accessible surfaces are required to be scanned. Areas that cannot be accessed should be clearly noted along with the reason for not completing the scan in that area.

2.1.16.2 ***Class 2*** concrete would normally be scanned to include 10% to 100% surface coverage. Only the concrete around the line shack is class 2. Due to the small size of the unit and the distribution of small areas, the unit (MA8-14) will be 100% scanned at a scan rate of about 10 cm per second for the 43-68B or 30.5 cm per second for the 43-37. Areas that cannot be accessed should be clearly noted along with the reason for not completing the scan in that area.

2.1.16.3 ***Class 3*** concrete would normally be scanned to include up to 10% surface coverage. The concrete and pavement in and around the SSGS is class 3 and will be approximately 10% scanned at a scan rate of about 10 cm per second for the 43-68B or 30.5 cm per second for the 43-37. Three 25 square meter scan areas are shown on **Attachment 6-34** for SS12, two regions totaling 105 square meters are shown on **Attachment 6-36** for SS24-1, and two regions totaling 118 square meters are shown on **Attachment 6-38** for SS24-2. Areas that cannot be accessed should be clearly noted along with the reason for not completing the scan in that area.

2.1.16.4 See **Attachment 1-1** for grid layout for the survey units.

2.1.16.5 The surfaces of the concrete or other pavement materials should be clear of debris to ensure detection parameters are not affected.

2.1.17 The minimum number of fixed measurement sampling points indicated by the COMPASS computer program (**Reference 3.3**) is ***11*** for each survey unit (see COMPASS output on **Attachment 7-1** to **7-5**). Fixed point measurements should be done only with the 43-68B IAW Section 2.2. The MDCscan (concrete) is below the effective administrative $DCGLw_{Cs-137}$ (4634 DPM/100cm^2 MDCscan @300cpm bkg < 19834 DPM/100cm^2 AL for the 43-68B and 7311 DPM/100cm^2 MDCscan @1020cpm bkg < 19834 DPM/100cm^2 AL for the 43-37).

2.1.18 The minimum number of fixed point samples is increased to 13 (18% increase) for survey unit DB1-2 due to the slightly oversized (109 m^2, 9% over LTP guideline) area of the unit. This oversize is due to the selection of a grid line as the separation point between DB1-1 and DB1-2. Survey Unit DB1-1 is only 85 m^2. Since both units are class 1, the DSB pad will be 100% scanned regardless of the survey unit separation. Relocation of the arbitrary separation line could make these both equal and <100m^2 but is not considered to be useful since: separation on a grid line simplifies survey layout, the two units combined are <200 m^2, and the two units combined have more than the required number of fixed points (26 total vs. 22 required per MARSSIM).

2.1.19 One Biased direct measurement point is placed in DB1-1 on the face of the exposed slab. This point should be taken centered vertically on the vertical face at the 128 grid line.

2.1.20 The minimum number of sample points for SS24-2 is increased to 18 to account for the unknown extent of the concrete below the soil layer to provide sufficient samples if some areas are not concrete.

2.1.21 VSP (**Reference 3.4**) is used to plot all sampling points on the included diagrams. The actual number of random start systematically spaced measurement points may be greater than that required by the COMPASS computer code because of any or all of the following:

- placement of the initial random starting point (edge effects),
- odd shaped diagrams, and/or
- coverage concerns

(see **Attachment 6-1** to **6-39** for VSP sampling point locations)

2.1.22 Because this design is a conglomerate of multiple slab surfaces into multiple survey units, the sample point locations are not derived from a single starting point. Measurement location details for the sample points are provided in the diagrams in **Attachment 6.**

2.1.23 Some sampling points may need to be adjusted to accommodate obstructions within the survey area. Contact the SR coordinator to report any difficulties encountered when laying out systematic grid sampling points.

2.1.24 Because of the unusual arrangement of this survey area, with multiple disjointed slabs that do not correspond directly to single grids, the drawings in **Attachment 6** are intended to be as close as practicable to as-left conditions. However, if actual layout is different from that shown, review with the cognizant SR coordinator, finish the survey if practicable, and mark up the drawings to indicate actual layout.

2.1.25 When an obstruction is encountered that will not allow collection of a sample, ***contact the cognizant SR coordinator*** for permission to delete the sampling point.

NOTE
If remediation actions are taken as a result of this survey, this survey design must be revised or re-written entirely.

2.2 Measure concrete fixed point and elevated areas(s) IAW SNEC procedure E900-IMP-4520.04 sec 4.3.3 (**Reference 3.2**) and the following.

2.2.1 Use only the 43-68B to confirm and 'finalize' elevated area measurements or to collect fixed point measurements.

2.2.2 Clearly mark, identify and document all sample locations.

2.3.1 Second phase scan any location that is above the action level cited in Table 3.

2.3.2 Investigation of APs may require surface and sub-surface samples per the LTP section 5.5.3.4.5 (**Reference 3.5**).

3.0 REFERENCES

3.1 SNEC Calculation number 6900-02-028, "GFPC Instrument Efficiency Loss Study"

3.2 SNEC Procedure E900-IMP-4520.04, "Survey Methodology to Support SNEC License Termination".

3.3 COMPASS Computer Program, Version 1.0.0, Oak Ridge Institute for Science and Education.

3.4 Visual Sample Plan, Version 3.0, Copyright 2004, Battelle Memorial Institute.

3.5 SNEC Facility License Termination Plan.

3.6 SNEC Procedure E900-IMP-4500.59, "Final Site Survey Planning and DQA".

3.7 SNEC survey 43-68B GFPC measurements in OL1 dated 3/7/05

3.8 GPU Nuclear, SNEC Facility, "Site Area Grid Map", SNECRM-020, Sheet 1, Rev 4, 1/18/05.

3.9 SNEC Calculation No. E900-03-012, Effective DCGL Worksheet Verification.

3.10 SNEC calculation E900–05-031 "Use of the 43-37 Detector and Ludlum 239 Floor Monitor for FSS Surveys"

3.11 SNEC Procedure E900-IMP-4520.06, "Survey Unit Inspection in Support of FSS Design".

3.12 NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual", August, 2000.

3.13 Microsoft Excel 97, Microsoft Corporation Inc., SR-1 and SR-2, 1985-1997.

3.14 Left intentionally blank

3.15 SNEC Calculation E900-04-005 "CV Yard Survey Design – North West Side of CV"

3.16 SNEC survey 43-37 GFPC measurements in OL1 dated 5/12/05

4.0 ASSUMPTIONS AND BASIC DATA

4.1 The COMPASS computer program is used to calculate the required number of random start systematic samples to be taken in the survey unit (**Reference 3.3**).

4.2 Reference background data from offsite at the Williamsburg station were used as the initial estimate of variability. These results are shown on **Attachment 8-1** and in **Reference 3.15.** Additional variance data that is used to assess sampling requirements is derived from the survey, **Reference 3.7.** Background data for the 43-37 is not used for variability assessment, since the fixed point data is only collected with the 43-68B

4.3 The MARSSIM Sign Test (**Reference 3.12**) will be applicable for this survey design. No background subtraction will be performed under this criteria during the DQA phase.

4.4 The required points chosen by COMPASS are located on the survey map for the survey unit by the Visual Sample Plan (VSP) computer code (**Reference 3.4**).

4.5 **Reference 3.5** and **3.6** were used as guidance during the survey design development phase.

4.6 Background for the 43-68B detector has been measured in the area, and ranges from about 250 to 300 cpm with averages of slightly less than 300 cpm (**Reference 3.7**). These recent survey result averages are used as the basis for the MDCscan. Background for the 43-37 detector has been measured in the area, and ranges from about 875 to 1100 cpm with averages of about 950 cpm to 1020 cpm (**Reference 3.16** and **Attachment 8-7**). These recent survey result averages are used as the basis for the MDCscan.

4.7 The determination of the physical extent of this area is based on the drawing **Reference 3.8** and a thorough walkdown / measurement of the survey unit.

4.8 Remediation History:

4.8.1 OL1 is an open land area. Portions contained the original SNEC site facility and the Saxton Steam Generating Station. Extensive remediation has occurred in the survey area. The SNEC Radwaste building (RWDF), Control and Auxiliary (C&A) building, Containment Vessel (CV), the SSGS, various buried pipe tunnels and underground tanks were all removed to grade or below. The residual portions of the buildings have been previously surveyed and the release surveys have been accepted.

4.8.2 The SSGS was backfilled when it was permanently shut down. Subsequently, residual licensed activity was found using core bores. The SSGS backfill was removed and surveyed through an automated conveyor system. Additional concrete surfaces in the SSGS basement were remediated and then the scanned backfill was replaced following survey.

4.8.3 The underground tank excavation was backfilled after the tanks were removed early in the project. This backfill was removed and scanned using a automated conveyor scanning system and is currently stored for re-use.

4.8.4 The barrel bunker was removed as part of the remediation process.

4.8.5 Underground drainage, sewerage systems and surface soils have been removed.

4.8.6 Some pavement was remediated during the building removal phase.

4.9 This survey design uses Cs-137 as a surrogate for all SNEC facility related radionuclides in the survey unit. The effective DCGLw is the Cs-137 DCGLw from the SNEC LTP (28000 dpm/100cm^2) adjusted (lowered) to compensate for the presence (or potential presence) of other SNEC related radionuclides (**Reference 3.9**). In addition, an administrative limit (75%) has been set that further lowers the permissible Cs-137 concentration to an effective surrogate DCGLw for this survey area.

The sample database used to determine the effective radionuclide mix for the OL1 area has been drawn from samples that were assayed at off-site laboratories. This nuclide mix is copied from **Reference 3.15**.

The GFPC detector scan MDC calculation is determined based on a 10 cm/sec scan rate, a 1.38 index of sensitivity (95% correct detection probability and 60% false positive) and a detector sensitivity (Et) of 23.9% cpm/dpm for Cs-137 for the 43-68B and 20% for the 43-37. The expected range of background values varies from about 250 cpm to about 300 cpm for the 43-68B detector and about 875 cpm to about 1100 for the 43-37.

4.10 The survey unit described in this survey design was inspected after remediation efforts were shown effective. A copy of the specific portion of the SNEC facility post-remediation inspection report (**Reference 3.11**) applicable to this design is included as **Attachment 9-1**.

4.11 No special area characteristics including any additional residual radioactivity (not previously noted during characterization) have been identified in this survey area.

4.12 The decision error for this survey design is 0.05 for the α value and 0.1 for the β value.

4.13 "Special measurements" (as described in the SNEC LTP, **Reference 3.5**) are included in this survey design. Section 5.5.3.4.5 discusses pavement surveys. This survey design is consistent with the LTP. Use of the 43-37 detector as a screening device may be considered a 'special measurement'. Use is explained and authorized in a SNEC calculation (**Reference 3.10**).

4.14 No additional sampling will be performed IAW this survey design beyond that described herein.

4.15 SNEC site radionuclides and their individual DCGLw values are listed on **Exhibit 1** of this calculation based on Table 5-1 in **Reference 3.5**.

4.16 The survey design checklist is listed in **Exhibit 2**.

4.17 Area factors are shown as part of COMPASS output (see **Attachment 7-1**) and are based on the Cs-137 area factors from the SNEC LTP.

5.0 CALCULATIONS

5.1 All calculations are performed internal to applicable computer codes or within an Excel (**Reference 3.13**) spreadsheet.

6.0 APPENDICES

6.1 **Attachment 1-1** is the general layout diagram of the survey units.

6.2 **Attachment 2-1** and **2-2** are the DCGLw calculation logic for the survey unit from **Reference 3.15** and the estimate of effect on efficiency of the irregular surface.

6.3 **Attachment 3-1**, is a copy of the calibration data from typical 43-68B GFPC radiation detection instrumentation that will be used in this survey area. **Attachment 3-2**, is a copy of the calibration data for a typical 43-37 GFPC radiation detection instrumentation that will be used in this survey area.

6.4 **Attachment 4-1**, is the 43-68B MDCscan calculation sheet for concrete (and macadam) surfaces in dpm/100cm^2. **Attachment 4-2** shows the effect of elevated background on the 43-68B MDCscan. **Attachment 4-3** is the 43-37 MDCscan calculation sheet for concrete (and macadam) surfaces in dpm/100cm^2.

6.5 **Attachment 5-1**, is a summary list of survey units included in this design, with the estimated area of each.

6.6 **Attachment 6-1** through **6-39**, show the randomly picked scan locations (from VSP) and reference coordinates for the survey unit areas.

6.7 **Attachment 7-1** through **7-5**, are COMPASS output for the survey unit showing the number of sampling points in the survey unit, area factors, and prospective power.

6.8 **Attachment 8-1**, is the surface variability results for concrete surface measurements from the Williamsburg station (**Reference 3.15**). **Attachment 8-2** is the summary of 43-68B backgrounds and surface measurements taken in the survey unit. **Attachments 8-3** through **8-6** are copies of the survey used for variability. **Attachment 8-7** is the summary of 43-37 backgrounds and surface measurements taken in the survey unit which are shown in **Attachment 8-8**.

6.9 **Attachment 9-1**, is the results of the inspection report for the residual surface portion of the OL1 area. **Attachments 9-2** through **9-5** are the surface test measurement data.

Exhibit 1

SNEC Facility Individual Radionuclide DCGL Values [(a)]

Radionuclide	25 mrem/y Limit Surface Area (dpm/100cm^2)	25 mrem/y Limit (All Pathways) Open Land Areas (Surface & Subsurface) (pCi/g)	4 mrem/y Goal (Drinking Water) Open Land Areas [(b)] (Surface & Subsurface) (pCi/g)
Am-241	2.7E+01	9.9	2.3
C-14	3.7E+06	2	5.4
Co-60	7.1E+03	3.5	67
Cs-137	2.8E+04	6.6	397
Eu-152	1.3E+04	10.1	1440
H-3	1.2E+08	132	31.1
Ni-63	1.8E+06	747	1.9E+04
Pu-238	3.0E+01	1.8	0.41
Pu-239	2.8E+01	1.6	0.37
Pu-241	8.8E+02	86	19.8
Sr-90	8.7E+03	1.2	0.61

NOTES:

(a) While drinking water DCGLs will be used by SNEC to meet the drinking water 4 mrem/y goal, only the DCGL values that constitute the 25 mrem/y regulatory limit will be controlled under this LTP and the NRC's approving license amendment.

(b) Listed values are from the subsurface model. These values are the most conservative values between the two models (i.e., surface & subsurface).

Exhibit 2

Survey Design Checklist

Calculation No. E900-05-015 rev 1	Location Codes SNEC plant areas : OL1 Paved and Miscellaneous *concrete surfaces MA8, PF1, DB5, DB1, SS12, SS24*		
ITEM	**REVIEW FOCUS**	**Status (Circle One)**	**Reviewer Initials & Date**
1	Has a survey design calculation number been assigned and is a survey design summary description provided?	Yes, N/A	
2	Are drawings/diagrams adequate for the subject area (drawings should have compass headings)?	Yes, N/A	
3	Are boundaries properly identified and is the survey area classification clearly indicated?	Yes, N/A	
4	Has the survey area(s) been properly divided into survey units IAW **EXHIBIT 10**	Yes, N/A	
5	Are physical characteristics of the area/location or system documented?	Yes, N/A	
6	Is a remediation effectiveness discussion included?	Yes, N/A	
7	Have characterization survey and/or sampling results been converted to units that are comparable to applicable DCGL values?	Yes, N/A	
8	Is survey and/or sampling data that was used for determining survey unit variance included?	Yes, N/A	
9	Is a description of the background reference areas (or materials) and their survey and/or sampling results included along with a justification for their selection?	Yes, N/A	
10	Are applicable survey and/or sampling data that was used to determine variability included?	Yes, N/A	
11	Will the condition of the survey area have an impact on the survey design, and has the probable impact been considered in the design?	Yes, N/A	
12	Has any special area characteristic including any additional residual radioactivity (not previously noted during characterization) been identified along with its impact on survey design?	Yes, N/A	
13	Are all necessary supporting calculations and/or site procedures referenced or included?	Yes, N/A	
14	Has an effective DCGLw been identified for the survey unit(s)?	Yes, N/A	
15	Was the appropriate $DCGL_{EMC}$ included in the survey design calculation?	Yes, N/A	
16	Has the statistical tests that will be used to evaluate the data been identified?	Yes, N/A	
17	Has an elevated measurement comparison been performed (Class 1 Area)?	Yes, N/A	
18	Has the decision error levels been identified and are the necessary justifications provided?	Yes, N/A	
19	Has scan instrumentation been identified along with the assigned scanning methodology?	Yes, N/A	
20	Has the scan rate been identified, and is the MDCscan adequate for the survey design?	Yes, N/A	
21	Are special measurements e.g., in-situ gamma-ray spectroscopy required under this design, and is the survey methodology, and evaluation methods described?	Yes, N/A	
22	Is survey instrumentation calibration data included and are detection sensitivities adequate?	Yes, N/A	
23	Have the assigned sample and/or measurement locations been clearly identified on a diagram or CAD drawing of the survey area(s) along with their coordinates?	Yes, N/A	
24	Are investigation levels and administrative limits adequate, and are any associated actions clearly indicated?	Yes, N/A	
25	For sample analysis, have the required MDA values been determined.?	Yes, N/A	
26	Has any special sampling methodology been identified other than provided in **Reference 6.3**?	Yes, N/A	

NOTE: a copy of this completed form or equivalent, shall be included within the survey design calculation.

ORIGINAL

GFPC Radiation Measurement Instrument Calibration Worksheet

Performed By:	Thomas Madden	Date:	4/29/04
Instrument S/N:	95348	Probe S/N:	92501 (A)
Instrument Vendor Cal. Date:	5/3/06	Cal. Due Date:	5/3/06

Source No.	ISO 7503-1 Values "εs"	Reference Date	Ao in µCi (± 6%)	2π β or α Emission Rate (sec-1) (± 3%)	
Am-241 (GO 535) S-023	0.25	4/8/99 12:00 GMT	4.24E-01	7.43E+03	☐ Am-241
Cs-137 (GO 536) S-024	0.50	4/8/99 12:00 GMT	3.11E-01	6.89E+03	☑ Cs-137

Source Radionuclide	Decay Date
Cs-137	5/16/05

Decay Factor⇒	8.687E-01
Elapsed Time (days)⇒	2230
Activity (µCi)⇒	2.700E-01
Source dpm⇒	5.994E+05
Source dpm/in Probe Area (cm^2)⇒	5.035E+05
2π Emission Rate (sec-1)⇒	5.986E+03
2π Emission Rate (min-1)⇒	3.591E+05
2π Emission Rate in Probe Area (min-1)⇒	3.017E+05

Probe Area (cm^2): 126

☑ Check if using ISO 7503-1 Value

Record of 1 Minute Source & Background Counting Results

No.	OW Source Gross CPM	OW Background CPM	OW Source Net CPM
1	1.32E+05	972	1.309E+05
2	1.32E+05	938	1.309E+05
3	1.32E+05	947	1.309E+05
4	1.31E+05	964	1.305E+05
5	1.33E+05	951	1.318E+05
6	1.32E+05	975	1.308E+05
7	1.32E+05	997	1.308E+05
8	1.32E+05	946	1.309E+05
9	1.32E+05	942	1.309E+05
10	1.33E+05	1005	1.318E+05
	Mean⇒	963.7	1.310E+05

RESULTS
Counts/Emission (εi)
43.4%
2π Emission/Disintigration (εs)
50.0%
Counts/Disintigration (εt)
21.7%

Approved: [signature]

Date: 5/17/05

Calibration Calculation Sheet Verification Date⇒	December-02
B. Brosey/P. Donnachie⇒	December-02

Attachment 3-2
EG00-05-0015

Attachment 1-1 SOP-05-0112

43-37 GFPC Scan MDC Calculation

MDCscan =	7311	dpm/100cm2

b = background in counts per minute
bi = background counts in observation interval
Ei = GFPC Detector / meter calibrated response in cpm/dpm
Es = Source efficiency emissions / disintegration
Et = Net detector efficiency
d = Index of sensitivity from MARSSIM Table 6.5 based on 95% detection, 60% false positive
p = human performance adjustment factor - unitless
SR = Scanning movement rate in centimeters per second
MDCscan = MinimumDetectable Concentration for scanning in dpm/100cm2
C= Constant to convert MDCR to MDC
Wd = Detector width in cm
A= area of probe in cm2
Oi = Observation interval in seconds
DCGLeq = Net count rate equivalent to the Adjusted DCGL
ECF = Efficiency correction factors (surface roughness)
AL = Action level, DCGLeq adjusted for d and p

b =	1020	cpm	p =	0.5		Wd =	13.3	cm
SR =	30.5	cm/sec	d =	1.38		DCGL =	19834	dpm/100 cm2
Ei=	0.4	cpm/dpm	Es=	0.500		A=	100	cm 2
ECF=	0.5							

Es*Ei= 0.2 = Et

$\frac{Wd}{SR}$ = 0.43607 = Oi (sec) $\frac{b*Oi}{60 (sec/min)}$ = 7.4 = bi (counts)

$\frac{1}{Ei*Es*ECF*A/100*sqrt(p)}$ = 14.14 =C

$\frac{d*sqrt(bi)*60}{Oi}$ = 517 =MDCRi (net cpm)   MDCRi+b= 1537 = gross cpm at MDCRi

MDCRi * C = 7311 = MDCscan in dpm/100cm2

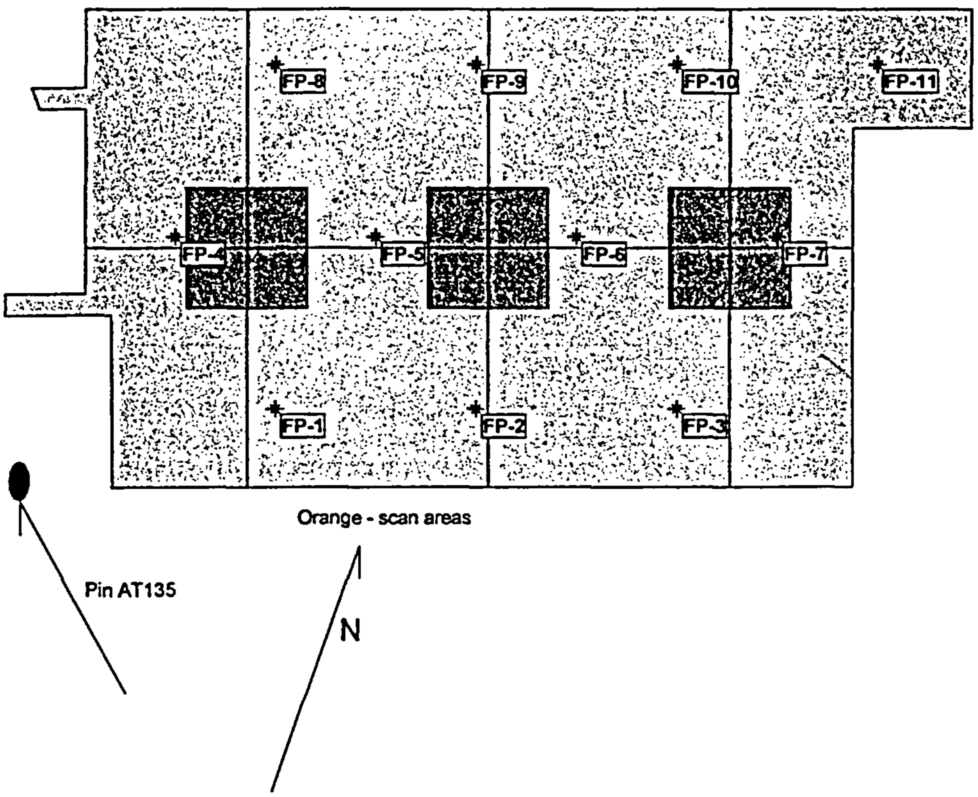
$\frac{DCGL*Ei*Es*ECF*A}{100}$ = 1983 = DCGLeq cpm

Attachment 4-3
E900-05-015

OL1 Concrete and Pavement Surfaces Survey Units

Unit	Area m^2	Description
MA8-6	76	Macadam - old SNEC parking lot, grid AU127
MA8-7	76	Macadam - old SNEC parking lot, grid AU128
MA8-8	76	Macadam - old SNEC parking lot, grid AU129
MA8-9	76	Macadam - old SNEC parking lot, grid AU130
MA8-10	102	Macadam - old SNEC parking lot, primarily grid AT131
MA8-11	42	Macadam - old SNEC parking lot, primarily grid AU131
MA8-12	73	Macadam - old SNEC parking lot, V shaped on N and E sides of AV131
MA8-13	100	Macadam - old SNEC parking lot, primarily grid AV131
MA8-14	33	Pavements around line shack
MA8-15	37	Concrete slabs and blocks NW of CV
MA8-16	93	Macadam - old SSGS driveway, grid AX131
MA8-17	58	Macadam - old SSGS driveway, grid AY131
PF1	37	Concrete - PAF floor slab
DB5	54	Concrete - DSB Carport slab
DB1-1	85	Concrete - DSB floor slab, west portion
DB1-2	109	Concrete - DSB floor slab, east portion
SS12	658	Concrete - SSGS Boiler Pad
SS24-1	249	Concrete - SSGS on grade concrete North of the turbine hall
SS24-2	321	Concrete - SSGS on grade concrete North of the turbine hall-under soil

SS12 SSGS Boiler Pad Concrete



Attachment 6-34
E900-05-015

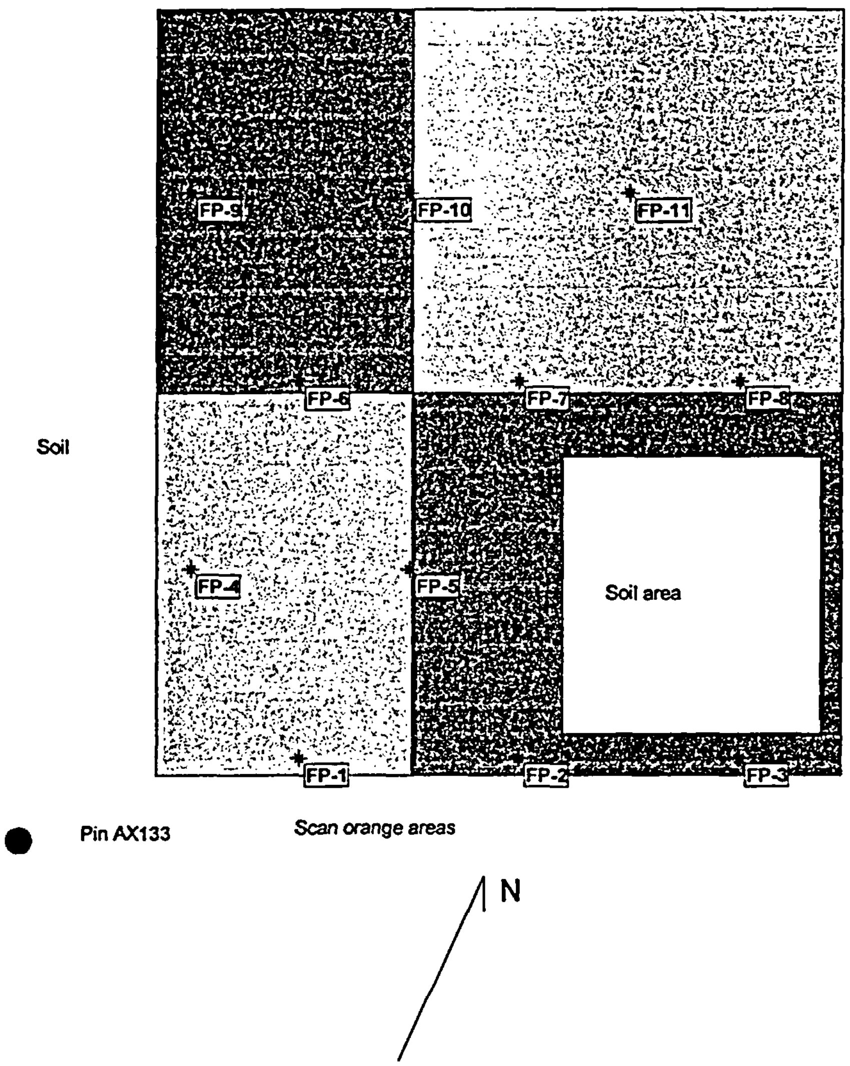
SS12 SSGS Boiler Pad Floor Slab
Measurements in FEET
658 sq meters

X Coord	Y Coord	Label	Value	Type
36.7	10.7	FP-1	0	Systematic
64.0	10.7	FP-2	0	Systematic
91.2	10.7	FP-3	0	Systematic
23.1	34.3	FP-4	0	Systematic
50.3	34.3	FP-5	0	Systematic
77.6	34.3	FP-6	0	Systematic
104.9	34.3	FP-7	0	Systematic
36.7	57.9	FP-8	0	Systematic
64.0	57.9	FP-9	0	Systematic
91.2	57.9	FP-10	0	Systematic
118.5	57.9	FP-11	0	Systematic

measured from pin AT135

Attachment 6-35
E900-05-015

SS24-1 SSGS north pad



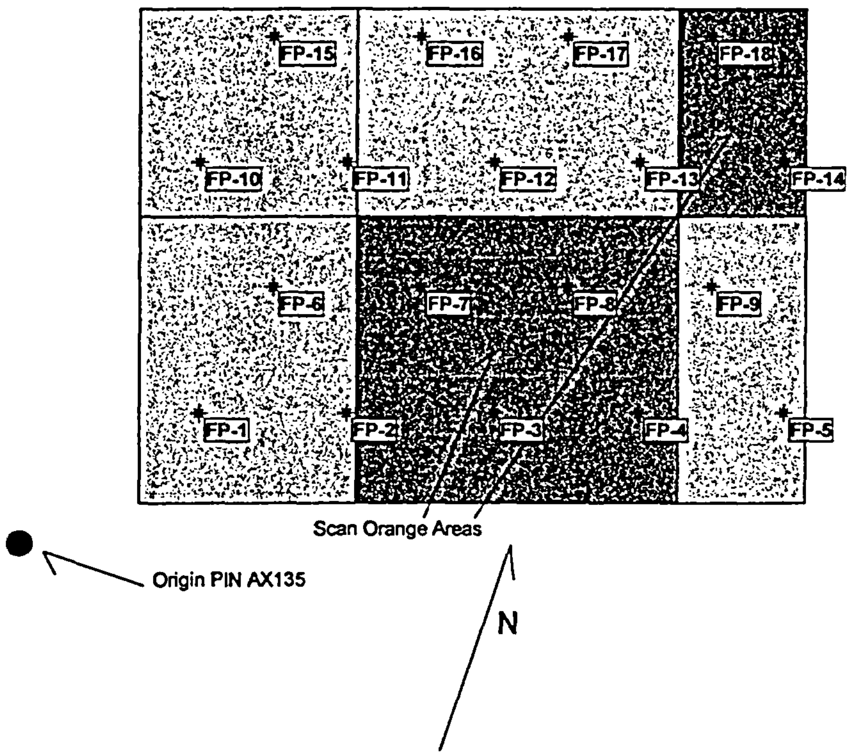
Attachment 6-36
E900-05-015

SS24-1 SSGS North Pad
Measurements in FEET
249 sq meters

X Coord	Y Coord	Label	Type
24.2	4.6	FP-1	Systematic
41.0	4.6	FP-2	Systematic
57.7	4.6	FP-3	Systematic
15.8	19.1	FP-4	Systematic
32.6	19.1	FP-5	Systematic
24.2	33.7	FP-6	Systematic
41.0	33.7	FP-7	Systematic
57.7	33.7	FP-8	Systematic
15.8	48.2	FP-9	Systematic
32.6	48.2	FP-10	Systematic
49.4	48.2	FP-11	Systematic

measured from pin AX133

SS24-2 North SSGS pad under soil



Attachment 6-38
E900-05-015

SS24- SSGS North Pad under soil
Measurements in FEET
231 sq meters

X Coord	Y Coord	Label	Type
16.9	12.6	FP-1	Systematic
31.8	12.6	FP-2	Systematic
46.7	12.6	FP-3	Systematic
61.6	12.6	FP-4	Systematic
76.5	12.6	FP-5	Systematic
24.4	25.5	FP-6	Systematic
39.3	25.5	FP-7	Systematic
54.2	25.5	FP-8	Systematic
69.1	25.5	FP-9	Systematic
16.9	38.4	FP-10	Systematic
31.8	38.4	FP-11	Systematic
46.7	38.4	FP-12	Systematic
61.6	38.4	FP-13	Systematic
76.5	38.4	FP-14	Systematic
24.4	51.3	FP-15	Systematic
39.3	51.3	FP-16	Systematic
54.2	51.3	FP-17	Systematic
69.1	51.3	FP-18	Systematic

Measured from pin AX135

OL1 43-37 Backgrounds

	DSB	Asph	Boiler Pad
	974	1025	971
	953	941	1115
	947	967	1000
	999	974	985
	873	911	1020
		~~926~~ 928	
		902	
		953	
		978	
		949	
mean	949.2	952.~~6~~8	1018.2
std dev	47.2	~~36.1~~ 35.0	57.1

[illegible] 5/19/05

Attachment 8-7
E900-05-015

Information Only

37122N21	95348						
0	DSBBKG1	5/12/05	14:09	5	974	60	SCL
1	DSBBKG2	5/12/05	14:11	5	953	60	SCL
2	DSBBKG3	5/12/05	14:12	5	947	60	SCL
3	DSBBKG4	5/12/05	14:14	5	999	60	SCL
4	DSBBKG5	5/12/05	14:15	5	873	60	SCL
5	ASPHBKG1	5/12/05	14:18	5	1025	60	SCL
6	ASPHBKG2	5/12/05	14:20	5	941	60	SCL
7	ASPHBKG3	5/12/05	14:21	5	967	60	SCL
8	ASPHBKG4	5/12/05	14:23	5	974	60	SCL
9	ASPHBKG5	5/12/05	14:25	5	911	60	SCL
10	BPADBKG1	5/12/05	14:30	5	971	60	SCL
11	BPADBKG2	5/12/05	14:32	5	1115	60	SCL
12	BPADBKG3	5/12/05	14:34	5	1000	60	SCL
13	BPADBKG4	5/12/05	14:36	5	985	60	SCL
14	BPADBKG5	5/12/05	14:38	5	1020	60	SCL
15	ASP2BKG1	5/12/05	14:41	5	928	60	SCL
16	ASP2BKG2	5/12/05	14:42	5	902	60	SCL
17	ASP2BKG3	5/12/05	14:44	5	953	60	SCL
18	ASP2BKG4	5/12/05	14:45	5	978	60	SCL
19	ASP2BKG5	5/12/05	14:47	5	949	60	SCL
LOGGED DATA DUMP COMPLETED.							

LPM

43-37 concrete + asphalt backgrounds

Attachment 8-8
E900-05-015

Appendix C

Surfaces Survey Design
Revision 2

ORIGINAL

FirstEnergy GPU

SNEC CALCULATION COVER SHEET

CALCULATION DESCRIPTION

Calculation Number	Revision Number	Effective Date	Page Number
E900-05-015	2	6/16/05	1 of 14

Subject

OL1 Paved and Miscellaneous concrete surfaces MA8, PF1, DB5, DB1, SS12, SS24 - Survey Design

Question 1 - Is this calculation defined as "In QA Scope"? Refer to definition 3.5. Yes ☒ No ☐

Question 2 - Is this calculation defined as a "Design Calculation"? Refer to definitions 3.2 and 3.3. Yes ☒ No ☐

NOTES: If a "Yes" answer is obtained for Question 1, the calculation must meet the requirements of the SNEC Facility Decommissioning Quality Assurance Plan. If a "Yes" answer is obtained for Question 2, the Calculation Originator's immediate supervisor should not review the calculation as the Technical Reviewer.

DESCRIPTION OF REVISION

1 - Revision 1 adds the use of the 43-37 extra large probe to the design. Numerous additions are made to provide setpoints, mdcr, useage protocols, etc. and attachments. The complete text of pages 1 through 13 is provided here, but only the added attachments are included. This revision also adds the survey units and layout for the concrete in the SSGS area OL1-8.

2- Revision 2 adds edge and sub-slab soil samples to the DSB pad area. Eleven samples are defined. The complete text of the revision is provided here, but only the two additional attachments (6-40 and 6-41 are included.

APPROVAL SIGNATURES

Calculation Originator	W. J. Cooper CHP/ [signature]	Date	6/16/05
Technical Reviewer	B. Brosey/ [signature]	Date	6/16/05
Additional Review	A. Paynter/ [signature]	Date	16 June 2005
Additional Review		Date	

1.0 PURPOSE

1.1 The purpose of this calculation is to develop a survey design for the residual concrete surfaces in the Saxton Nuclear Experimental Corporation SNEC and SSGS site areas. The total area (OL1) including the soil and solid surface portions is approximately ***11600 square meters*** . Portions of the solid surface (concrete, macadam, brick) are Class1, Class 2, and Class 3 survey areas. Because the survey area exceeds the size limitations in the SNEC LTP (**Reference 3.5**) Table 5-5 for maximum Class 1 survey unit area and it includes survey units of all three classifications, this survey area is subdivided into multiple survey units: OL1-7 is an existing excavation in the SNEC site area, that will be backfilled after survey. OL1-8 through OL1-13 are subdivisions of the large open land area and comprise the majority of the total surface area. These open land areas and the excavation are covered by other design calculations. Several additional areas comprise the residual exposed concrete and macadam surfaces:

1.1.1 PF1 is a pre-existing Class 1 survey unit for the Personnel Access Facility (PAF) floor and includes the north edge of the PF1 portion of the slab with approximately **37 m^2**

1.1.2 DB1 is a pre-existing Class 1 survey area for the Decommissioning Support Building (DSB) floor pad and door ramp. This area is further divided into two survey units due to LTP survey unit area limitations. DB1-1(85 m^2) and DB1-2 (109 m^2) with **194 m^2** total. DB1-1 includes the full width of the north edge of the DSB portion of the pad.

1.1.3 DB5 is a pre-existing Class 1 survey unit for the DSB carport floor of approximately **54 m^2**

1.1.4 SS12 is a pre-existing survey area for the SSGS boiler pad. This concrete, although it is in a Class 1 soil area, is classified as Class 3 in the LTP Table 5-2. Some minor details of residual concrete hidden by soil may be present. This will not affect the survey since it is class 3 and only 10% scan is needed. Since SS12 is Class3, the entire pad is a single survey unit of approximately **658 m^2** .

1.1.5 SS24-1 is a Class 3 survey unit defined for the miscellaneous SSGS pads north of the turbine hall. There is likely to be a buried portion of this slab west of this area which is separately defined as SS24-2. Since SS24 is Class 3, the entire exposed pad is a single survey unit. Design scan area is 105 m^2. The west edge of the exposed concrete is uneven and the area is approximately **249 m^2**.

1.1.6 SS24-2 is a Class 3 survey unit defined for the miscellaneous SSGS pads north of the turbine hall. This is a buried portion of this slab west of the area defined as SS24-1. This area must first be surveyed as open land per E900-05-014, then cleared of soil and the residual concrete surveyed per this design. Since SS24 is Class 3, the entire buried portion of the pad is a single survey unit. Design scan area is 118 m^2. The area is approximately **321 m^2**.

1.1.7 MA8-6 through 13, 16, and 17: Ten survey units of the old parking lot and driveway macadam. Because of the 100 m^2 survey unit limitation for Class 1 surfaces, the surface was subdivided into ten approximately 100 m^2 (or less) survey units. The pavement occupies all of, or a large portion of, grids AT131, AU127, AU128, AU129, AU130, AU131, AV130, AV131, AW131, AX131, AY131. These are all class 1 survey units due to verbal reports of minor remediation and due to their proximity to the C&A building, the barrel bunker, and containment. Total area is about **772 m²**. General arrangement of these units is shown in the drawing **Attachment 6-17.**

1.1.8 MA8-16 and MA8-17 have about 4 to 6 inches of soil on top of the pavement. This soil is to be surveyed per E900-05-014 and then removed and placed in a PRI pile to allow the pavement survey per this design.

1.1.9 MA8-14 – the Line Shack concrete including garage door ramps and sidewalks. This area is not specifically classified in the SNEC LTP (**Reference 3.5**) but is selected to be class 2 consistent with the class 3 classification of the line shack exterior and the class 1 assigned to the surrounding soil. This is a Class 2 survey unit with about **33 m²** total area.

1.1.10 MA8-15 is additional concrete surfaces around the CV. There is some SSGS concrete and additional small monoliths in OL1-9 NW of the CV. This small concrete area is not specifically addressed in the SNEC LTP but is assumed to be Class 1 due to proximity to the CV and is about **37 m²**.

1.1.11 A summary list of survey unit areas is included as **Attachment 5-1**.

1.1.12 Eleven biased (but arbitrarily located) soil samples are defined in and around the DSB/PAF/Carport slabs. Although arbitrarily located (pseudo-random), eleven samples are selected to represent a typical MARSSIM fixed point sample number. 2

1.2 This survey design applies only to the residual concrete, macadam, and other paved surfaces in the survey area. The design for the open land areas, fences, the east yard excavation, and the portion of OL1 covering the SSGS will be provided in separate calculations. The general layout of this survey unit is shown on **Attachment 1-1**.

1.3 If additional areas of concrete not identified here are found under soil, this design may to be revised to include the additional area.

2.0 SUMMARY OF RESULTS

The following information should be used to develop a survey request for this survey unit. The effective DCGLw value is listed below. This value is derived from previously approved derived values for "CV Yard Soil and Boulders", Attachment 2 in SNEC calculation E900-04-005 (**Reference 3.15**). The US NRC has reviewed and concurred with the methodology used to derive these values. See **Attachment 2-1** and **Reference 3.9.**

Table 1, DCGLw Values

Gross Activity DCGLw (dpm/100 cm²)
26445 (19834 A.L.)

NOTE: A.L. is the site Administrative Limit (75% of effective DCGLw)

2.1 Survey Design

2.1.1 Scanning of concrete and macadam surfaces shall be performed using a L2350 with 43-68B gas flow proportional counter or a 43-37 'extra large' probe calibrated to Cs-137 (see typical calibration information on **Attachments 3-1 and 3-2**). Generic approval for use of the 43-37 is included in **Reference 3.10**.

2.1.2 The instrument conversion factor/efficiency (Et) shall not be less than that assumed on **Attachment 4-1** as ***23.9% – Cs-137*** for the 43-68B nor less than ***20.0%-Cs137*** for the 43-37 in its lowest efficiency region as assumed on **Attachment 4-3.**

2.1.3 Other instruments of the types specified in Section 2.1.1 above may be used during the final status survey (FSS), but must demonstrate detection efficiencies at or above the values listed in Section 2.1.2 above.

2.1.4 An efficiency correction factor (ECF) is applied to compensate for efficiency loss when surveying rough surfaces based on **Reference 3.1** and **Attachment 2-2.**

2.1.5 The fraction of detectable beta emitting activity affects the efficiency and is determined by the nuclide mix. The mix detectable beta fraction is determined to be 60% based on **Reference 3.15**. Because the adjusted DCGLw used is based only on the modified Cs-137 DCGLw, the mix percentage is not applied to the adjusted surrogate DCGLw. The gross activity DCGLw, which would include all the low energy activity and would require mix percentage adjustment is considerable higher, at 44434 dpm 100cm^2. The Cs-137 adjusted surrogate activity already accounts for the detectable beta yield of the mix.

2.1.6 The ECF is derived from **Attachment 2-2** and **Reference 3.1** based on a surface irregularity of 3 inches or less FOR THE 43-68B DETECTOR. This is conservative, as actual observed irregularity is typically less than one inch. Also, the loss of efficiency is based on moving the detector away from a 150 cm^2 source. If the area of the residual activity is larger, than the efficiency loss would be smaller due to the increase in 'field-of-view' of the detector.

2.1.7 The ECFs developed for the 43-68B probe per reference 3.1 are assumed to apply to the 43-37. The ECF for the 43-37 are based on the ASSUMPTION that the detector face will not be more than about 1 inch farther from the surface than from the source in the test jig (0.5 inches apart) and that the surface will be fairly smooth, typical of poured concrete or macadam.

2.1.8 Because the alarm point and MDCscan are based on the highly conservative surface irregularity assumptions (intended to bound all cases to simplify design and performance of the survey), where surfaces are much smoother (e.g. 1 inch irregularity or less per probe area for the 43-68B) than the assumed 3 inch variability, short (e.g. ½ to 1 inch) standoff support pegs may be attached to the 43-68B in order to reduce the possibility of mylar damage. These standoffs must only be used when the surface smoothness is well within the assumed 3 inch variability. Because the high surface irregularity is assumed and used for the efficiency of the instrument for the entire design, this standoff will not affect the assumed efficiency if limited as discussed above.

Table 2, GFPC Detection Efficiency Results Used for Planning

Detector	Material Type	Ei	Es	Et(as %)	ECF	Adjusted efficiency
43-68B	Concrete or asphalt	.478	.5	23.9	.2	4.8%
43-37	Concrete or asphalt	.4	.5	20.0	.5	10.0%

Table 3, Surface Scanning Parameters for Solid Misc. Concrete & Pavement Sections

Detector	MDCscan (dpm/100cm²)*	Scan Speed (cm/sec)	Maximum Distance from Surface	DCGLw Action Level	% Coverage
43-68B	4634	10	3" (gap between detector face & surface or 3 inch irregularity)	> 1450 cpm	Up to 100%
43-37	7311	30.5	1.5" (gap between detector face & surface)	>2900 cpm	Up to 100%

See Attachment 2-1, 2-2, 4-1, and 4-3 for calculations*

2.1.9 The 43-68B MDCscan (shown in **Attachment 4-1**) is based on a 300 cpm background. Typical backgrounds are similar to this value assumed, as shown in the variability data shown as "CW" (closed window or shielded detector) in **Attachment 8-2**. Unaffected material backgrounds were determined at the Williamsburg station, which resulted in a mean background value of 306 cpm +/- 34.5. On 3/7/05, measurements were collected on three different surfaces in OL1: the DSB pad, the old parking lot, and the SSGS boiler pad.

2.1.10 The 43-37 MDCscan (shown in **Attachment 4-2**) is based on a 1020 cpm background. On 5/12/05, measurements were collected on three different surfaces in OL1: the DSB pad, the asphalt, and the SSGS boiler pad. These are shown in **Attachment 8-7** and **Attachment 8-8**.

2.1.11 The 43-37 detector is to be used as a screening process.

2.1.11.1 Since the efficiency is determined with the same source as used for the 43-68B, the effective area of the detector is assumed to be 100 cm^2 for determining the MDCscan. This will underestimate the response of the detector to larger sources but produce similar efficiencies and MDCs as for the 43-68B.

2.1.11.2 Scanning using the 43-37 will be done only on flat surfaces with surface irregularities typical of poured concrete or rolled macadam pavement. Uneven surfaces, edges, etc. will be scanned with the 43-68B.

2.1.11.3 Because the 43-37 has a much larger effective surface area than the 43-68B, and the MDC and action level are based only on a 100 cm^2 elevated spot, the 43-37 may provide action level count rates on larger diffuse source areas that actually are less than the DCGL. Therefore, the 43-37 will be used to screen surfaces and will be considered to be the 'official' results only if no action levels are observed.

2.1.11.4 Any action levels observed with the 43-37 will be rescanned with the 43-68B. If no AP is observed with the 43-68B, there is no AP. APs observed in follow-up rescans with the 43-68B will be handled and documented in the SR per section 2.1.16 below.

2.1.11.5 Fraction scanned with the 43-37 and results should be separately reported in the SR for each survey unit / grid/ etc. in a similar manner as used for the 43-68B. E.G. '90% scanned with 43-37, one alarm rescanned with 43-68B no 43-68B AP'.

2.1.12 The 3/7/05 survey data shown as "OW" (open window or unshielded) is used for the variability assessment for the COMPASS determination of sample requirements and is shown in **Attachment 8-2**.

2.1.13 A background of 1300 cpm for the 43-68B would still result in MDCscan less than about 50% of the DCGLw (**Attachment 4-2**). Since the Action level cited in Table 3, above, is total counts per minute including background, if local backgrounds significantly exceed the background count rate assumed for the MDCscan (about 300cpm for the 43-68B see - **Attachment 4-1** or 1020 cpm for the 43-37 – see **Attachment 4-3**) ***contact the cognizant SR coordinator*** to determine need for additional background count rate adjustments.

2.1.14 The scan DCGLw Action Level for the 43-68B listed in Table 3 includes 1200 cpm DCGL equivalent count rate from **Attachment 4-1** and an estimated 260 cpm background . The DCGLw action level is based on fixed measurement and does not include 'human performance factors' or 'index of sensitivity' factors (see **Reference 3.12**).

2.1.15 The scan DCGLw Action Level for the 43-37 listed in Table 3 includes 1950 cpm DCGL equivalent count rate from **Attachment 4-3** and an estimated 950 cpm background. Although the 43-37 is assumed to be geometrically and functionally equivalent to the 43-68B for MDC and action level determination (a conservative assumption), the ECFs and probe areas are different and therefore result in a higher net count rate for the action level for the 43-37. The DCGLw action level is based on fixed measurement and does not include 'human performance factors' or 'index of sensitivity' factors (see **Reference 3.12**).

2.1.16 If a total count rate greater than the "DCGLw action level" of Table 3 is encountered during the scanning process with a 43-68B, the surveyor should stop and locate the boundary of the elevated area, and then perform a "second phase" fixed point count of at least 30 seconds duration. If the second phase result equals or exceeds the "DCGLw action" level noted in table 3, the surveyor should then mark the elevated area with appropriate marking methods and document the count rate observed and an estimate of the affected area. Subsequent investigation may take the actual surface irregularity into account for the efficiency.

2.1.16.1 ***Class 1*** concrete should be scanned to include 100% surface coverage at a scan rate of about 10 cm per second for the 43-68B or 30.5 cm per second for the 43-37. All accessible surfaces are required to be scanned. Areas that cannot be accessed should be clearly noted along with the reason for not completing the scan in that area.

2.1.16.2 *Class 2* concrete would normally be scanned to include 10% to 100% surface coverage. Only the concrete around the line shack is class 2. Due to the small size of the unit and the distribution of small areas, the unit (MA8-14) will be 100% scanned at a scan rate of about 10 cm per second for the 43-68B or 30.5 cm per second for the 43-37. Areas that cannot be accessed should be clearly noted along with the reason for not completing the scan in that area.

2.1.16.3 *Class 3* concrete would normally be scanned to include up to 10% surface coverage. The concrete and pavement in and around the SSGS is class 3 and will be approximately 10% scanned at a scan rate of about 10 cm per second for the 43-68B or 30.5 cm per second for the 43-37. Three 25 square meter scan areas are shown on **Attachment 6-34** for SS12, two regions totaling 105 square meters are shown on **Attachment 6-36** for SS24-1, and two regions totaling 118 square meters are shown on **Attachment 6-38** for SS24-2. Areas that cannot be accessed should be clearly noted along with the reason for not completing the scan in that area.

2.1.16.4 See **Attachment 1-1** for grid layout for the survey units.

2.1.16.5 The surfaces of the concrete or other pavement materials should be clear of debris to ensure detection parameters are not affected.

2.1.17 The minimum number of fixed measurement sampling points indicated by the COMPASS computer program (**Reference 3.3**) is ***11*** for each survey unit (see COMPASS output on **Attachment 7-1** to **7-5**). Fixed point measurements should be done only with the 43-68B IAW Section 2.2. The MDCscan (concrete) is below the effective administrative $DCGLw_{Cs\text{-}137}$ (4634 DPM/100cm^2 MDCscan @300cpm bkg < 19834 DPM/100cm^2 AL for the 43-68B and 7311 DPM/100cm^2 MDCscan @1020cpm bkg < 19834 DPM/100cm^2 AL for the 43-37).

2.1.18 The minimum number of fixed point samples is increased to 13 (18% increase) for survey unit DB1-2 due to the slightly oversized (109 m^2, 9% over LTP guideline) area of the unit. This oversize is due to the selection of a grid line as the separation point between DB1-1 and DB1-2. Survey Unit DB1-1 is only 85 m^2. Since both units are class 1, the DSB pad will be 100% scanned regardless of the survey unit separation. Relocation of the arbitrary separation line could make these both equal and <100m^2 but is not considered to be useful since: separation on a grid line simplifies survey layout, the two units combined are <200 m^2, and the two units combined have more than the required number of fixed points (26 total vs. 22 required per MARSSIM).

2.1.19 One Biased direct measurement point is placed in DB1-1 on the face of the exposed slab. This point should be taken centered vertically on the vertical face at the 128 grid line.

2.1.20 The minimum number of sample points for SS24-2 is increased to 18 to account for the unknown extent of the concrete below the soil layer to provide sufficient samples if some areas are not concrete.

2.1.21 VSP (**Reference 3.4**) is used to plot all sampling points on the included diagrams. The actual number of random start systematically spaced measurement points may be greater than that required by the COMPASS computer code because of any or all of the following:

- placement of the initial random starting point (edge effects),
- odd shaped diagrams, and/or
- coverage concerns

(see **Attachment 6-1** to **6-39** for VSP sampling point locations)

2.1.22 Because this design is a conglomerate of multiple slab surfaces into multiple survey units, the sample point locations are not derived from a single starting point. Measurement location details for the sample points are provided in the diagrams in **Attachment 6**.

2.1.23 Some sampling points may need to be adjusted to accommodate obstructions within the survey area. Contact the SR coordinator to report any difficulties encountered when laying out systematic grid sampling points.

2.1.24 Because of the unusual arrangement of this survey area, with multiple disjointed slabs that do not correspond directly to single grids, the drawings in **Attachment 6** are intended to be as close as practicable to as-left conditions. However, if actual layout is different from that shown, review with the cognizant SR coordinator, finish the survey if practicable, and mark up the drawings to indicate actual layout.

2.1.25 When an obstruction is encountered that will not allow collection of a sample, ***contact the cognizant SR coordinator*** for permission to delete the sampling point.

2.1.26 DSB slab area soil samples are to be 1 meter thick surface samples. Edge samples shall be as close as practicable to the slab. Sub-slab samples will be 1 meter thick after removal of the concrete. Any engineered fill will be included in the sample. Use OL1 soil (E900-05-014) DCGLs (**Reference 3.17**). 2

NOTE
If remediation actions are taken as a result of this survey, this survey design must be revised or re-written entirely.

2.2 Measure concrete fixed point and elevated areas(s) IAW SNEC procedure E900-IMP-4520.04 sec 4.3.3 (**Reference 3.2**) and the following.

2.2.1 Use only the 43-68B to confirm and 'finalize' elevated area measurements or to collect fixed point measurements.

2.2.2 Clearly mark, identify and document all sample locations.

2.3.1 Second phase scan any location that is above the action level cited in Table 3.

2.3.2 Investigation of APs may require surface and sub-surface samples per the LTP section 5.5.3.4.5 (**Reference 3.5**).

3.0 REFERENCES

3.1 SNEC Calculation number 6900-02-028, "GFPC Instrument Efficiency Loss Study"

3.2 SNEC Procedure E900-IMP-4520.04, "Survey Methodology to Support SNEC License Termination".

3.3 COMPASS Computer Program, Version 1.0.0, Oak Ridge Institute for Science and Education.

3.4 Visual Sample Plan, Version 3.0, Copyright 2004, Battelle Memorial Institute.

3.5 SNEC Facility License Termination Plan.

3.6 SNEC Procedure E900-IMP-4500.59, "Final Site Survey Planning and DQA".

3.7 SNEC survey 43-68B GFPC measurements in OL1 dated 3/7/05

3.8 GPU Nuclear, SNEC Facility, "Site Area Grid Map", SNECRM-020, Sheet 1, Rev 4, 1/18/05.

3.9 SNEC Calculation No. E900-03-012, Effective DCGL Worksheet Verification.

3.10 SNEC calculation E900–05-031 "Use of the 43-37 Detector and Ludlum 239 Floor Monitor for FSS Surveys"

3.11 SNEC Procedure E900-IMP-4520.06, "Survey Unit Inspection in Support of FSS Design".

3.12 NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual", August, 2000.

3.13 Microsoft Excel 97, Microsoft Corporation Inc., SR-1 and SR-2, 1985-1997.

3.14 Left intentionally blank

3.15 SNEC Calculation E900-04-005 "CV Yard Survey Design – North West Side of CV"

3.16 SNEC survey 43-37 GFPC measurements in OL1 dated 5/12/05

3.17 SNEC Calculation No. E900-05-014 "SNEC Plant Area Open Land – OL1 – Survey Design" 2

4.0 ASSUMPTIONS AND BASIC DATA

4.1 The COMPASS computer program is used to calculate the required number of random start systematic samples to be taken in the survey unit (**Reference 3.3**).

4.2 Reference background data from offsite at the Williamsburg station were used as the initial estimate of variability. These results are shown on **Attachment 8-1** and in **Reference 3.15**. Additional variance data that is used to assess sampling requirements is derived from the survey, **Reference 3.7**. Background data for the 43-37 is not used for variability assessment, since the fixed point data is only collected with the 43-68B

4.3 The MARSSIM Sign Test (**Reference 3.12**) will be applicable for this survey design. No background subtraction will be performed under this criteria during the DQA phase.

4.4 The required points chosen by COMPASS are located on the survey map for the survey unit by the Visual Sample Plan (VSP) computer code (**Reference 3.4**).

4.5 **Reference 3.5** and **3.6** were used as guidance during the survey design development phase.

4.6 Background for the 43-68B detector has been measured in the area, and ranges from about 250 to 300 cpm with averages of slightly less than 300 cpm (**Reference 3.7**). These recent survey result averages are used as the basis for the MDCscan. Background for the 43-37 detector has been measured in the area, and ranges from about 875 to 1100 cpm with averages of about 950 cpm to 1020 cpm (**Reference 3.16** and **Attachment 8-7**). These recent survey result averages are used as the basis for the MDCscan.

4.7 The determination of the physical extent of this area is based on the drawing **Reference 3.8** and a thorough walkdown / measurement of the survey unit.

4.8 Remediation History:

4.8.1 OL1 is an open land area. Portions contained the original SNEC site facility and the Saxton Steam Generating Station. Extensive remediation has occurred in the survey area. The SNEC Radwaste building (RWDF), Control and Auxiliary (C&A) building, Containment Vessel (CV), the SSGS, various buried pipe tunnels and underground tanks were all removed to grade or below. The residual portions of the buildings have been previously surveyed and the release surveys have been accepted.

4.8.2 The SSGS was backfilled when it was permanently shut down. Subsequently, residual licensed activity was found using core bores. The SSGS backfill was removed and surveyed through an automated conveyor system. Additional concrete surfaces in the SSGS basement were remediated and then the scanned backfill was replaced following survey.

4.8.3 The underground tank excavation was backfilled after the tanks were removed early in the project. This backfill was removed and scanned using a automated conveyor scanning system and is currently stored for re-use.

4.8.4 The barrel bunker was removed as part of the remediation process.

4.8.5 Underground drainage, sewerage systems and surface soils have been removed.

4.8.6 Some pavement was remediated during the building removal phase.

4.9 This survey design uses Cs-137 as a surrogate for all SNEC facility related radionuclides in the survey unit. The effective DCGLw is the Cs-137 DCGLw from the SNEC LTP (28000 dpm/100cm^2) adjusted (lowered) to compensate for the presence (or potential presence) of other SNEC related radionuclides (**Reference 3.9**). In addition, an administrative limit (75%) has been set that further lowers the permissible Cs-137 concentration to an effective surrogate DCGLw for this survey area.

The sample database used to determine the effective radionuclide mix for the OL1 area has been drawn from samples that were assayed at off-site laboratories. This nuclide mix is copied from **Reference 3.15**.

The GFPC detector scan MDC calculation is determined based on a 10 cm/sec scan rate, a 1.38 index of sensitivity (95% correct detection probability and 60% false positive) and a detector sensitivity (Et) of 23.9% cpm/dpm for Cs-137 for the 43-68B and 20% for the 43-37. The expected range of background values varies from about 250 cpm to about 300 cpm for the 43-68B detector and about 875 cpm to about 1100 for the 43-37.

4.10 The survey unit described in this survey design was inspected after remediation efforts were shown effective. A copy of the specific portion of the SNEC facility post-remediation inspection report (**Reference 3.11**) applicable to this design is included as **Attachment 9-1**.

4.11 No special area characteristics including any additional residual radioactivity (not previously noted during characterization) have been identified in this survey area.

4.12 The decision error for this survey design is 0.05 for the α value and 0.1 for the β value.

4.13 "Special measurements" (as described in the SNEC LTP, **Reference 3.5**) are included in this survey design. Section 5.5.3.4.5 discusses pavement surveys. This survey design is consistent with the LTP. Use of the 43-37 detector as a screening device may be considered a 'special measurement'. Use is explained and authorized in a SNEC calculation (**Reference 3.10**).

4.14 Special measurements and sampling processes have been specified for revision 2 sub-slab sampling of the DSB pad area. The sample design is a limited biased sample regime to provide updated information on the sub-slab radiological status (SNEC LTP section 5.5.3.4.7). The soils at the edge of the slab are assumed to represent the sub-slab soils, and several samples are collected through core-bore holes in the slab.

4.15 No additional sampling will be performed IAW this survey design beyond that described herein.

4.16 SNEC site radionuclides and their individual DCGLw values are listed on **Exhibit 1** of this calculation based on Table 5-1 in **Reference 3.5**.

4.17 The survey design checklist is listed in **Exhibit 2**.

4.18 Area factors are shown as part of COMPASS output (see **Attachment 7-1**) and are based on the Cs-137 area factors from the SNEC LTP.

2

5.0 CALCULATIONS

5.1 All calculations are performed internal to applicable computer codes or within an Excel (**Reference 3.13**) spreadsheet.

6.0 APPENDICES

6.1 **Attachment 1-1** is the general layout diagram of the survey units.

6.2 **Attachment 2-1** and **2-2** are the DCGLw calculation logic for the survey unit from **Reference 3.15** and the estimate of effect on efficiency of the irregular surface.

6.3 **Attachment 3-1**, is a copy of the calibration data from typical 43-68B GFPC radiation detection instrumentation that will be used in this survey area. **Attachment 3-2**, is a copy of the calibration data for a typical 43-37 GFPC radiation detection instrumentation that will be used in this survey area.

6.4 **Attachment 4-1**, is the 43-68B MDCscan calculation sheet for concrete (and macadam) surfaces in dpm/100cm^2. **Attachment 4-2** shows the effect of elevated background on the 43-68B MDCscan. **Attachment 4-3** is the 43-37 MDCscan calculation sheet for concrete (and macadam) surfaces in dpm/100cm^2.

6.5 **Attachment 5-1**, is a summary list of survey units included in this design, with the estimated area of each.

6.6 **Attachment 6-1** through **6-39**, show the randomly picked scan locations (from VSP) and reference coordinates for the survey unit areas. **Attachments 6-40** and **6-41** show the biased sub-slab soil sample points for the DSB pad area. 2

6.7 **Attachment 7-1** through **7-5**, are COMPASS output for the survey unit showing the number of sampling points in the survey unit, area factors, and prospective power.

6.8 **Attachment 8-1**, is the surface variability results for concrete surface measurements from the Williamsburg station (**Reference 3.15**). **Attachment 8-2** is the summary of 43-68B backgrounds and surface measurements taken in the survey unit. **Attachments 8-3** through **8-6** are copies of the survey used for variability. **Attachment 8-7** is the summary of 43-37 backgrounds and surface measurements taken in the survey unit which are shown in **Attachment 8-8**.

6.9 **Attachment 9-1**, is the results of the inspection report for the residual surface portion of the OL1 area. **Attachments 9-2** through **9-5** are the surface test measurement data.

Exhibit 1

SNEC Facility Individual Radionuclide DCGL Values [(a)]

Radionuclide	25 mrem/y Limit Surface Area (dpm/100cm^2)	25 mrem/y Limit (All Pathways) Open Land Areas (Surface & Subsurface) (pCi/g)	4 mrem/y Goal (Drinking Water) Open Land Areas [(b)] (Surface & Subsurface) (pCi/g)
Am-241	2.7E+01	9.9	2.3
C-14	3.7E+06	2	5.4
Co-60	7.1E+03	3.5	67
Cs-137	2.8E+04	6.6	397
Eu-152	1.3E+04	10.1	1440
H-3	1.2E+08	132	31.1
Ni-63	1.8E+06	747	1.9E+04
Pu-238	3.0E+01	1.8	0.41
Pu-239	2.8E+01	1.6	0.37
Pu-241	8.8E+02	86	19.8
Sr-90	8.7E+03	1.2	0.61

NOTES:

(a) While drinking water DCGLs will be used by SNEC to meet the drinking water 4 mrem/y goal, only the DCGL values that constitute the 25 mrem/y regulatory limit will be controlled under this LTP and the NRC's approving license amendment.

(b) Listed values are from the subsurface model. These values are the most conservative values between the two models (i.e., surface & subsurface).

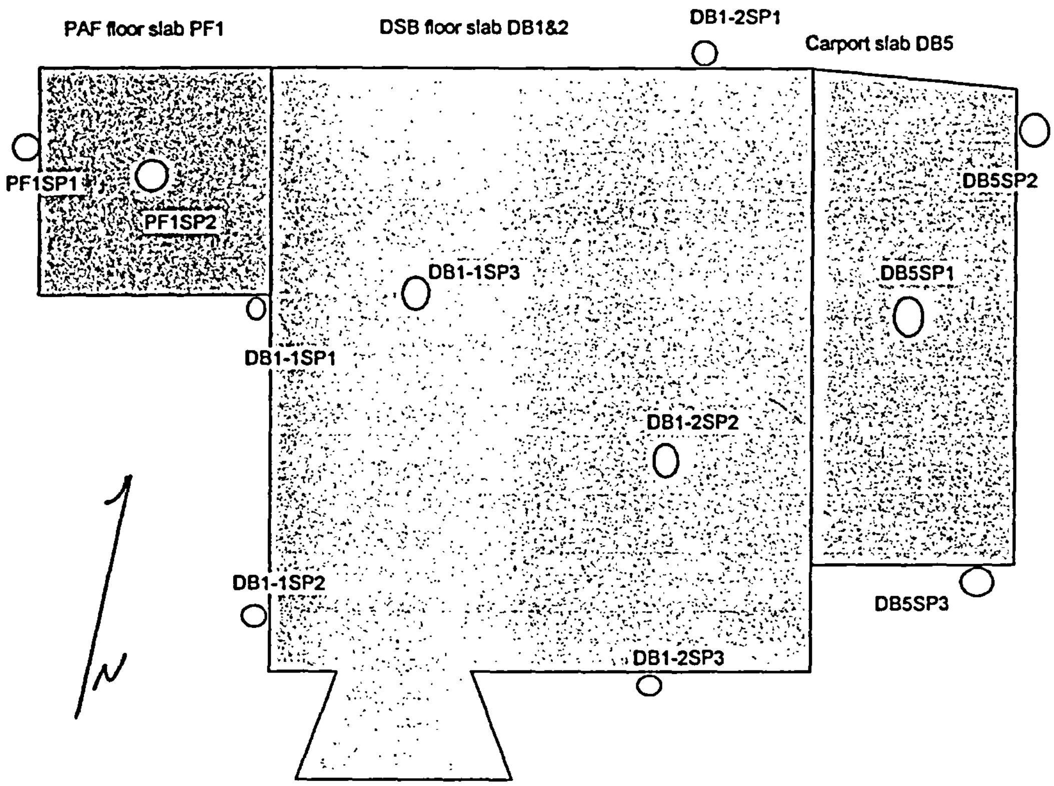
Exhibit 2

Survey Design Checklist

Calculation No. E900-05-015 rev 1	Location Codes SNEC plant areas : OL1 Paved and Miscellaneous concrete surfaces MA8, PF1, DB5, DB1, SS12, SS24		
ITEM	REVIEW FOCUS	Status (Circle One)	Reviewer Initials & Date
1	Has a survey design calculation number been assigned and is a survey design summary description provided?	(Yes), N/A	BNB 6/16/05
2	Are drawings/diagrams adequate for the subject area (drawings should have compass headings)?	(Yes), N/A	BNB 6/16/05
3	Are boundaries properly identified and is the survey area classification clearly indicated?	(Yes) N/A	BNB 6/16/05
4	Has the survey area(s) been properly divided into survey units IAW EXHIBIT 10	(Yes), N/A	BNB 6/16/05
5	Are physical characteristics of the area/location or system documented?	(Yes), N/A	BNB 6/16/05
6	Is a remediation effectiveness discussion included?	(Yes) N/A	BNB 6/16/05
7	Have characterization survey and/or sampling results been converted to units that are comparable to applicable DCGL values?	(Yes), N/A	BNB 6/16/05
8	Is survey and/or sampling data that was used for determining survey unit variance included?	(Yes), N/A	BNB 6/16/05
9	Is a description of the background reference areas (or materials) and their survey and/or sampling results included along with a justification for their selection?	Yes, (N/A)	BNB 6/16/05
10	Are applicable survey and/or sampling data that was used to determine variability included?	(Yes) N/A	BNB 6/16/05
11	Will the condition of the survey area have an impact on the survey design, and has the probable impact been considered in the design?	Yes, (N/A)	BNB 6/16/05
12	Has any special area characteristic including any additional residual radioactivity (not previously noted during characterization) been identified along with its impact on survey design?	Yes, (N/A)	BNB 6/16/05
13	Are all necessary supporting calculations and/or site procedures referenced or included?	(Yes) N/A	BNB 6/16/05
14	Has an effective DCGLw been identified for the survey unit(s)?	(Yes), N/A	BNB 6/16/05
15	Was the appropriate $DCGL_{EMC}$ included in the survey design calculation?	Yes, (N/A)	BNB 6/16/05
16	Has the statistical tests that will be used to evaluate the data been identified?	(Yes) N/A	BNB 6/16/05
17	Has an elevated measurement comparison been performed (Class 1 Area)?	Yes, (N/A)	BNB 6/16/05
18	Has the decision error levels been identified and are the necessary justifications provided?	(Yes) N/A	BNB 6/16/05
19	Has scan instrumentation been identified along with the assigned scanning methodology?	(Yes) N/A	BNB 6/16/05
20	Has the scan rate been identified, and is the MDCscan adequate for the survey design?	(Yes) N/A	BNB 6/16/05
21	Are special measurements e.g., in-situ gamma-ray spectroscopy required under this design, and is the survey methodology, and evaluation methods described?	(Yes), N/A	BNB 6/16/05
22	Is survey instrumentation calibration data included and are detection sensitivities adequate?	(Yes), N/A	BNB 6/16/05
23	Have the assigned sample and/or measurement locations been clearly identified on a diagram or CAD drawing of the survey area(s) along with their coordinates?	(Yes), N/A	BNB 6/16/05
24	Are investigation levels and administrative limits adequate, and are any associated actions clearly indicated?	(Yes), N/A	BNB 6/16/05
25	For sample analysis, have the required MDA values been determined.?	Yes, (N/A)	BNB 6/16/05
26	Has any special sampling methodology been identified other than provided in Reference 6.3?	Yes, (N/A)	BNB 6/16/05

NOTE: a copy of this completed form or equivalent, shall be included within the survey design calculation.

DSB Sub-Slab Sample Layout



Attachment 6-40

E900-05-015 R2

DSB Pad Sub-Surface soil sample layout

Sample	Location
PF1SP1	West edge of PAF slab, 13 feet N of SW corner of PAF slab
PF1SP2	Center of PAF slab, 11.5 feet N and 8.5 feet E of SW corner of PAF
DB1-1SP1	PAF/DSB pad inside corner
DB1-1SP2	West edge of DSB pad, 5 feet N of SW corner of DSB pad
DB1-1SP3	DSB Pad 22 feet N and 10 feet E of SW corner of DSB
DB1-2SP1	North edge DSB pad, 50 feet E of NW corner of PAF pad
DB1-2SP2	DSB pad 12 feet north and 32 feet E of SW corner of DSB
DB1-2SP3	South edge DSB pad, 30 feet E of SW corner of DSB
DB5SP1	Carport slab 20 feet N and 45 feet E of Sw corner of DSB pad
DB5SP2	East edge carport slab, 30 feet north of SE corner of carport
DB5SP3	South edge carport slab, 2 feet W of SE corner of carport slab

Samples at outside edges to be in contact with slab edge

Attachment 6-41
E900-05-015 R2

Appendix D

Soil Survey Design

ORIGINAL

FirstEnergy

SNEC CALCULATION COVER SHEET

CALCULATION DESCRIPTION

Calculation Number	Revision Number	Effective Date	Page Number
E900-05-014	0	5/10/05	1 of 11

Subject

SNEC Plant Area Open Land – OL1 - Survey Design

Question 1 - Is this calculation defined as "In QA Scope"? Refer to definition 3.5. Yes ☒ No ☐

Question 2 - Is this calculation defined as a "Design Calculation"? Refer to definitions 3.2 and 3.3. Yes ☒ No ☐

NOTES: If a "Yes" answer is obtained for Question 1, the calculation must meet the requirements of the SNEC Facility Decommissioning Quality Assurance Plan. If a "Yes" answer is obtained for Question 2, the Calculation Originator's immediate supervisor should not review the calculation as the Technical Reviewer.

DESCRIPTION OF REVISION

APPROVAL SIGNATURES

Calculation Originator	W. J. Cooper CHP/ [signature]	Date	4/21/05
Technical Reviewer	R. Holmes/ [signature]	Date	5/10/05
Additional Review	A. Paynter/ [signature]	Date	20 May 2005
Additional Review		Date	

1.0 PURPOSE

1.1 The purpose of this calculation is to develop a survey design for the Saxton Nuclear Experimental Corporation "OL1 SNEC and SSGS open land" areas that are located in the original SNEC facility site and the site of the Saxton Steam Generating Station (SSGS). The area (OL1) is approximately ***11600 square meters***, including the 1018 square meters in the existing east yard tank excavation. The area is a Class 1 survey area. Because the survey area exceeds the 2000 square meter limitation in Table 5-5 of the SNEC LTP (**Reference 3.5**) for maximum class 1 open land survey unit area, this survey area is subdivided into multiple survey units.

1.2 Multiple survey units of exposed concrete or macadam: MA8, DB1, PF1, and DB5 will be covered in a separate survey design (E900-05-015). This includes small concrete pads and monoliths, macadam driveways and parking areas, and the remaining pad footprint from the DSF building.

1.3 The OL1-8 area, which consists of the northern portion of the SSGS area is also **not** included in this design and will be covered by design E900-05-025. About one-third of OL1-8 is covered with a 'PRI pile'. This area is expected to contain both soil/rubble backfill and some residual concrete surfaces. Since layout of this area cannot be completed until the PRI pile is removed, a separate design will be used for the SSGS portion of OL1.

1.4 The Yard Storage Tank Excavation OL1-7 is covered in a separate design (E900-05-012).

1.5 This survey design includes five survey units:

1.5.1 OL1-9, consisting of the 1290 square meter area around and including the CV footprint between the SSGS footprint and the east yard excavation (**Attachment 1-3**).

1.5.1.1 This area has some exposed concrete NW of the CV.

1.5.1.2 A driveway/parking area west of the CV (145 m^2) has a thin (about 4 to 6 inches) soil cover. The soil will be surveyed under this design, then removed to expose the pavement, which will then be separately surveyed under design E900-05-015.

1.5.1.3 A portion of OL1 in this vicinity is inside the switchyard (e.g. grid AZ131 and portions of others) and will be surveyed with the switchyard under another design.

1.5.1.4 There is a large 'PRI pile' in the CV area that must be removed prior to survey, so that the as-left soil surface at the CV area can be surveyed as part of OL1-9.

1.5.2 OL1-10 which consists of about 1200 square meters of the SNEC yard (RWST, RWDF, east yard excavation). This area must be surveyed after the east yard excavation is backfilled (**Attachment 1-4**) so that the as-left soil surface is surveyed.

1.5.3 OL1-11 the barrel bunker area about 1200 square meters (**Attachment 1-5**).

1.5.4 OL1-12, the line shack surrounding area of about 1575 square meters (**Attachment 1-6**) not including the line shack itself, which was previously surveyed.

1.5.4.1 Portions of this survey unit are gravel road.

1.5.4.2 There are a number of small concrete or macadam ramps and sidewalks around the line shack. These paved surfaces will be separately surveyed under design E900-05-015.

1.5.5 OL1-13, an odd shaped perimeter of soil of approximately 1480 square meters around the barrel bunker area and the DSB slab and pavement (**Attachment 1-7**).

1.6 The general layout of these survey units is shown in **Attachment 1-1**.

1.7 Fences in and/or bordering the area will be surveyed using a separate design E900-05-023.

2.0 SUMMARY OF RESULTS

The following information should be used to develop a survey request for this survey unit. The effective DCGLw value is listed below. The US NRC has reviewed and concurred with the methodology used to derive these values. See **Attachment 2-1** to **2-4**. These are copied from **Reference 3.10** which was previously approved.

Table 1, DCGLw Values

Volumetric DCGLw (pCi/g – Cs-137)
5.73 (4.3 A.L.)

NOTE: A.L. is the site Administrative Limit (75% of effective DCGLw)

2.1 Survey Design

2.1.1 Scanning of soil (and fill materials) shall be performed using a ***2" D by 2" L NaI detector*** with a Cs-137 window setting (**Reference 3.1**). The window will straddle the Cs-137 662 keV full energy peak width (see typical calibration information on **Attachment 3-1**).

2.1.2 The instrument conversion factor/efficiency shall not be less than that assumed on **Attachment 4-1** as ***205.6 cpm/uR/h – Cs-137***.

2.1.3 Other instruments of the type specified in Section 2.1.1 above may be used during the final status survey (FSS), but must demonstrate detection efficiencies at or above the value listed in Section 2.1.2 above.

Table 2, Soil Scanning Parameters

MDCscan (pCi/g) – Cs-137*	Scan Speed (cm/sec)	Maximum Distance from Surface	Action Level	% Coverage
6.2	25	4" (gap between detector face & soil surface)	> 175 ncpm	100%

See Attachment 4-1 *

2.1.4 The action level specified is based on the MDCscan at a 300 cpm background. This is adequate since the MDCscan is expected to be less than the DCGLw times the area factor. Typical observed backgrounds are about 100 to 200 cpm (**Attachment 8-3**).

2.1.5 If a net count rate greater than the action level of Table 2 is encountered during the scanning process, the surveyor should stop and locate the boundary of the elevated area. The surveyor should then mark the elevated area with stakes or other appropriate marking methods. Continue the scan survey. ***Sample the elevated areas(s)*** IAW SNEC procedure E900-IMP-4520.04 **(Reference 3.2)**, and Section 2.2 of this document following evaluation and investigation survey planning.

2.1.5.1 ***Class 1*** soil should be scanned using a serpentine pattern that is ~0.5 meters wide.

2.1.5.2 This is a class 1 survey area. All accessible surfaces are required to be 100% scanned.

2.1.5.3 There is a large pile of 'PRI' soil in the south-central portion of OL1-9 on the CV cap. This pile should be removed prior to completion of the survey, so that the soils under the pile are subjected to the survey requirements of this design. No residual concrete surfaces are expected to be exposed by removal of this PRI pile.

2.1.5.4 The CV soil pile is an established PRI area, and was previously 100% scan surveyed and sampled during an automated conveyor measurement campaign in the summer of 2003 as SR186 and 190 **(References 3.15 and 3.16)**. The results of this survey indicate that the soil pile meets LTP residual activity release requirements and the thoroughness of the survey is adequate to meet FSS measurement needs. One hundred and fifty-seven composite samples were collected of the scanned soil, all of which are less than 25 percent of the AL in this design. Additionally, the automated scanning (see **Reference 3.17** for data on a previous scanning campaign) typically achieved an alarm setpoint less than 70% of the AL and detection limits substantially below the alarm setpoints. This soil pile is expected to be used as backfill elsewhere around the plant.

2.1.5.5 Areas that cannot be accessed should be clearly noted along with the reason for not completing the scan in that area.

2.1.6 The minimum number of soil sampling points indicated by the COMPASS computer program **(Reference 3.3)** is ***11*** for each of the survey units (see COMPASS output on **Attachment 7-4** to **7-8**). However, the number of samples is increased to 16 in OL1-13 to provide a more widely distributed layout of sample points in the unusual shape.

2.1.6.1 Sampling depth should be IAW Section 2.2.

2.1.6.2 The MDCscan (soil) exceeds the effective administrative DCGLw for Cs137 (6.2 pCi/g MDCscan @300cpm bkg > 4.3 pCi/g AL) but given the area factor for the assumed 1 meter squared elevated area (AF 28.7) and for the effective sample area (AF > 3), the scan MDC meets MARSSIM requirements.

2.1.7 VSP **(Reference 3.4)** is used to plot all sampling points on the included diagrams. The actual number of random start systematically spaced measurement points may be greater than that required by the Compass computer code because of any or all of the following:

- placement of the initial random starting point (edge effects),
- odd shaped diagrams, and/or
- coverage concerns

(see **Attachment 6-3** to **6-12** for VSP sampling point locations)

2.1.8 The starting points for physically locating sample sites in the survey unit are based on measurements from site grid pins or other evident markers (see diagrams on **Attachment 6-3, 6-5, 6-7, 6-9,** and **6-11**). Soil sampling points are positioned using coordinates developed from these markers and listed on **Attachments 6-4, 6-6, 6-8, 6-10,** and **6-12.**

2.1.9 Because of the proximity to the RWDF and drum bunker, a biased sample location (BP-01) is placed in OL1-12 west of the line shack between the line shack wall and the fence.

2.1.10 Because of the potential for residual activity transfer through vehicle movement and post-shutdown topfill on the gravel, two biased samples locations (BP-02 and BP-03) are defined in the gravel areas north and south of the line shack in OL1-12. See note below for sampling process for gravel areas.

2.1.11 A portion of the area of OL1-9 has a layer of old pavement underneath of a thin (4-6 inch) layer of soils. This area is indicated by the darker color on Attachment 6-3. The soil sample in this area should only be collected from the soils on top of the pavement. Cutting down through the pavement to obtain a deeper sample is not required. The soil will be removed after FSS of the soil so that the pavement can be separately surveyed under design E900-05-015.

2.1.12 Some sampling points may need to be adjusted to accommodate obstructions within the survey area. Contact the SR coordinator to report any difficulties encountered when laying out systematic grid sampling points.

2.1.13 When an obstruction is encountered that will not allow collection of a sample, ***contact the cognizant SR coordinator*** for permission to delete the sampling point.

> **NOTE**
> If remediation actions are taken as a result of this survey, this survey design must be revised or re-written entirely.

2.2 Sample the biased and random fixed points and any elevated areas(s) IAW SNEC procedure E900-IMP-4520.04 (**Reference 3.2**) and the following.

> **NOTE**
>
> Since the site surface dose model is 1 meter in depth, samples representative of the entire one meter thick dose model layer must be collected to satisfy the sampling requirements of Section 2.1.5 (of this document). This should be done by obtaining a well mixed sample of an entire 1 meter deep core. Section 4.2.3, 4.2.6 or 4.2.7 of site procedure E900-IMP-4520.04 are applicable when satisfying Section 2.1.5. Sampling due to an instrument alarm condition should also be of the entire 1 meter of soil/material.
>
> The gravel samples in OL1-12 (including the two biased samples BP-02 and BP-03) should be sampled by collecting two well mixed samples of the layers, one of the gravel overburden layer, and a second of the underlying soil down to a total of 1 meter in depth. This same process should be used whenever a random point lies on a gravel road or gravel parking area.
>
> For the fixed point soil sample in OL1-9 over the pavement (FP-11), only the soil layer on top of the pavement is to be sampled under this design.

2.2.1 Clearly mark, identify and document all sample locations.

2.2.2 Sample any location that is above the action level cited ~~is~~ in Table 2 based on specific investigation plan.

2.2.3 Maintain chain-of custody requirements on all design fixed point and action level samples (**Reference 3.14**).

3.0 REFERENCES

3.1 SNEC Calculation No. E900-03-018, "Optimize Window and Threshold Settings for the Detection of Cs-137 Using the Ludlum 2350-1 and a 44/10 NaI Detector", 8/7/03.

3.2 SNEC Procedure E900-IMP-4520.04, "Survey Methodology to Support SNEC License Termination".

3.3 COMPASS Computer Program, Version 1.0.0, Oak Ridge Institute for Science and Education.

3.4 Visual Sample Plan, Version 3.0, Copyright 2004, Battelle Memorial Institute.

3.5 SNEC Facility License Termination Plan.

3.6 SNEC Procedure E900-IMP-4500.59, "Final Site Survey Planning and DQA".

3.7 SNEC survey NaI measurements in OL1 & OL2 3/8/05

3.8 GPU Nuclear, SNEC Facility, "Site Area Grid Map", SNECRM-020, Sheet 1, Rev 4, 1/18/05.

3.9 SNEC Calculation No. E900-03-012, Effective DCGL Worksheet Verification.

3.10 SNEC Calculation No. E900-04-005 "CV Yard Survey Design – North West Side of CV"

3.11 SNEC Procedure E900-IMP-4520.06, "Survey Unit Inspection in Support of FSS Design".

3.12 NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual", August, 2000.

3.13 Microsoft Excel 97, Microsoft Corporation Inc., SR-1 and SR-2, 1985-1997.

3.14 SNEC Procedure E900-ADM-4500.39 "Chain of Custody for Samples"

3.15 SNEC survey SR0186

3.16 SNEC survey SR0190

3.17 "Final Report for Survey of Debris Pile", Revision 3 1/4/05 Shonka Research Associates

4.0 ASSUMPTIONS AND BASIC DATA

4.1 The COMPASS computer program is used to calculate the required number of random start systematic samples to be taken in the survey unit (**Reference 3.3**).

4.2 Scoping and post-remediation soil samples from this area are used as the initial estimate of variability. These results are shown on **Attachment 8-1** and **8-2**. The grid locations where these samples were taken are shown on **Attachment 1-1**.

4.3 The MARSSIM Sign Test (**Reference 3.12**) will be applicable for this survey design. No background subtraction will be performed under this criteria during the DQA phase. Normal environmental background of Cs137 will (conservatively) not be subtracted.

4.4 The required number of fixed survey points as determined by COMPASS are then located on the survey map for the survey unit by the Visual Sample Plan (VSP) computer code (**Reference 3.4**).

4.5 **Reference 3.5** and **3.6** were used as guidance during the survey design development phase.

4.6 Background has been measured in the area, and ranges from about 100 cpm to about 200 cpm (**Reference 3.7**). See **Attachment 8-3**.

4.7 The determination of the physical extent of this area is based on the drawing **Reference 3.8** and numerous walkdowns and measurements.

4.8 Remediation History: OL1 is an open land area. Portions contained the original SNEC site facility and the Saxton Steam Generating Station. Extensive remediation has occurred in the survey area.

4.8.1 The SNEC Radwaste building (RWDF), Control and Auxiliary (C&A) building, Containment Vessel (CV), the SSGS, various buried pipe tunnels and underground tanks were all extensively remediated by removal, various decon methods and extensive concrete removal. The buildings were then demolished to grade or below. The residual building portions have been previously surveyed and the release surveys have been accepted.

4.8.2 Extensive soil remediation (removal) was performed.

4.8.3 The SSGS was backfilled when it was permanently shut down. Subsequently, activity was found using core bores. The SSGS backfill was removed and surveyed through an automated conveyor system. Additional concrete surfaces in the SSGS basement were remediated and then the scanned backfill was replaced.

4.8.4 The underground tank excavation was backfilled after the tanks were removed early in the project. This backfill was removed. Portions were disposed of as radioactive waste, while the remainder was scanned using a automated conveyor scanning system and is currently stored for re-use.

4.8.5 The barrel bunker was removed to below grade.

4.8.6 Underground drainage and sewerage systems have been removed.

4.9 This survey design uses Cs-137 as a surrogate for all SNEC facility related radionuclides in the survey unit. The effective DCGLw is the Cs-137 DCGLw from the SNEC LTP (6.6 pCi/g) adjusted (lowered) to compensate for the presence (or potential presence) of other SNEC related radionuclides. In addition, an administrative limit (75%) has been set that further lowers the permissible Cs-137 concentration to an effective surrogate DCGLw for this survey area.

4.10 The sample database used to determine the effective radionuclide mix for the OL1 area has been drawn from samples that were assayed at off-site laboratories. This list is shown on **Attachment 2-1** through **2-3**, and includes twenty-one analysis results. Review of the data shows several radionuclides were not positively identified at any significant concentration. These radionuclides have been removed from the data set and are not considered further as any minor contribution is accounted for by the administrative reduction of the surrogate DCGLw to 75% of the surrogate DCGLw based on the identified nuclide ratios. Radionuclides remaining include H-3, Co-60, Sr-90, and Cs-137. Additionally, the data shows Cs-137 to be the predominant radioactive contaminant (based on activity) found in the area.

4.11 The decayed set of sample results were input to the spreadsheet titled "Effective DCGL Calculator for Cs-137" (**Reference 3.9**) to determine the effective volumetric DCGLw values for the OL1 area. The output of this spreadsheet is shown on **Attachment 2-4**. This data is copied from **Reference 3.10**.

4.12 The NaI detector scan MDC calculation is determined based on a 25 cm/sec scan rate, a 1.38 index of sensitivity (95% correct detection probability and 60% false positive) and a detector sensitivity of 205.6 cpm/uR/h for Cs-137. Additionally, the detection system incorporates a Cs-137 window that lowers sensitivity to background in the survey unit. The resulting range of background values varies from about 100 to 200 cpm (**Attachment 8-3**).

4.13 The survey unit described in this survey design was inspected after remediation efforts were shown effective. A copy of the OL1 specific portion of the SNEC facility post-remediation inspection report (**Reference 3.11**) is included as **Attachment 9-1**.

4.14 No special area characteristics including any additional residual radioactivity (not previously noted during characterization) have been identified in this survey area.

4.15 The decision error for this survey design is 0.05 for the α value and 0.1 for the β value.

4.16 "Special measurements" (as described in the SNEC LTP sec 5.5.3.4) are included in this survey design. Section 5.5.3.4.4 discusses re-fill materials. Portions of this survey will include areas that consist of crushed structural materials and backfill. These will be treated as soil for scanning and sampling.

4.17 No additional sampling will be performed IAW this survey design beyond that described herein.

4.18 SNEC site radionuclides and their individual DCGLw values are listed on **Exhibit 1** of this calculation based on Table 5-1 of **Reference 3.5**.

4.19 The survey design checklist is listed in **Exhibit 2**.

4.20 Area factors are shown as part of COMPASS output (see **Attachment 7-1**) and are based on the Cs-137 area factors from the SNEC LTP.

5.0 CALCULATIONS

5.1 All calculations are performed internal to applicable computer codes or within an Excel (**Reference 3.13**) spreadsheet.

6.0 APPENDICES

6.1 **Attachment 1-1**, is a diagram of survey unit OL1. **Attachment 1-3** through **1-7** are the grid layouts for the five OL1 open land survey units included in this design.

6.2 **Attachment 2-1** to **2-4** is the DCGLw calculation logic and sample results from the OL1 and OL2 areas in addition to the DCGL calculation sheets (decayed to January 15, 2004).

6.3 **Attachment 3-1**, is a copy of the calibration data from typical NaI radiation detection instrumentation that will be used in this survey area.

6.4 **Attachment 4-1**, is the MDCscan calculation sheet for volumetric materials in pCi/g.

6.5 **Attachment 5-1**, is the MicroShield dose rate calculation results for 6" thick soil used to determine the exposure rate from a 1 pCi/cm^3 Cs-137 source term in a end-cylinder geometry.

6.6 **Attachment 6-3** to **6-12**, show the randomly picked scan locations (from VSP) and reference coordinates for the five OL1 open land survey units included in this design.

6.7 **Attachment 7-1** is a COMPASS output showing the area factors used. **Attachment 7-2** shows the variability used for all five survey units. **Attachments 7-4** through **7-8**, are the COMPASS output for the five OL1 open land survey units included in this design, showing the number of sampling points in the survey unit, area factors, and prospective power.

6.8 **Attachment 8-1** and **8-2**, is the soil variability results from selected recent soil samples from the OL1 area. **Attachment 8-3** is the general area NaI detector backgrounds measured on 3/8/05.

6.9 **Attachment 9-1**, is the results of the inspection report for the OL1 area.

NOTE
Attachments 1-2, 6-1, 6-2, and 7-3 are left intentionally blank due to transfer of OL1-8 to a separate design

Exhibit 1

SNEC Facility Individual Radionuclide DCGL Values [(a)]

Radionuclide	25 mrem/y Limit Surface Area (dpm/100cm^2)	25 mrem/y Limit (All Pathways) Open Land Areas (Surface & Subsurface) (pCi/g)	4 mrem/y Goal (Drinking Water) Open Land Areas [(b)] (Surface & Subsurface) (pCi/g)
Am-241	2.7E+01	9.9	2.3
C-14	3.7E+06	2	5.4
Co-60	7.1E+03	3.5	67
Cs-137	2.8E+04	6.6	397
Eu-152	1.3E+04	10.1	1440
H-3	1.2E+08	132	31.1
Ni-63	1.8E+06	747	1.9E+04
Pu-238	3.0E+01	1.8	0.41
Pu-239	2.8E+01	1.6	0.37
Pu-241	8.8E+02	86	19.8
Sr-90	8.7E+03	1.2	0.61

NOTES:

(a) While drinking water DCGLs will be used by SNEC to meet the drinking water 4 mrem/y goal, only the DCGL values that constitute the 25 mrem/y regulatory limit will be controlled under this LTP and the NRC's approving license amendment.

(b) Listed values are from the subsurface model. These values are the most conservative values between the two models (i.e., surface & subsurface).

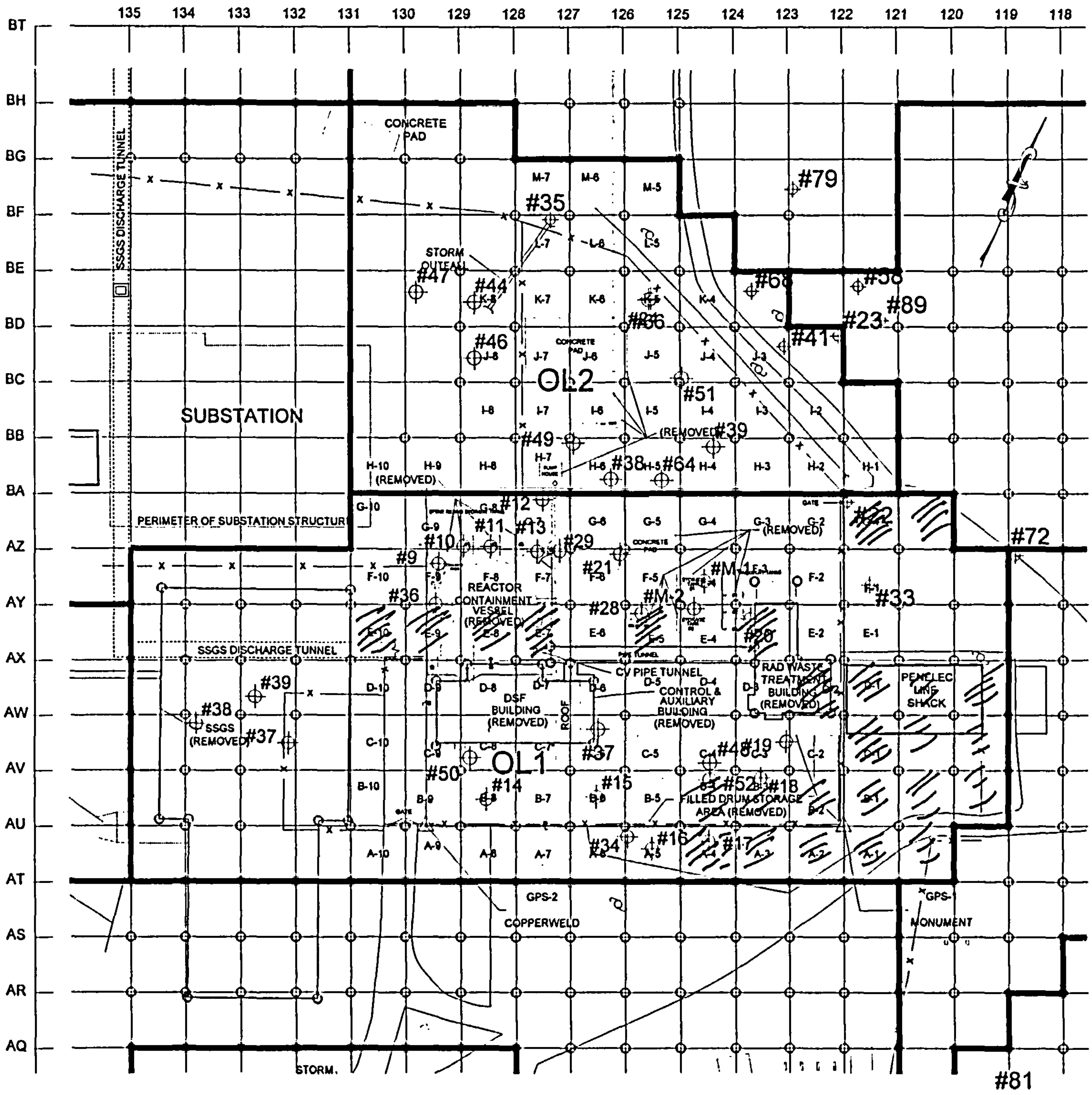
Exhibit 2

Survey Design Checklist

Calculation No. E900-05-014	Location Codes SNEC plant area open land – OL1 - Survey Design		
ITEM	**REVIEW FOCUS**	**Status (Circle One)**	**Reviewer Initials & Date**
1	Has a survey design calculation number been assigned and is a survey design summary description provided?	(Yes) N/A	[initials] 5/10/05
2	Are drawings/diagrams adequate for the subject area (drawings should have compass headings)?	(Yes) N/A	[initials] 5/10/05
3	Are boundaries properly identified and is the survey area classification clearly indicated?	(Yes) N/A	[initials] 5/10/05
4	Has the survey area(s) been properly divided into survey units IAW EXHIBIT 10	(Yes) N/A	[initials] 5/10/05
5	Are physical characteristics of the area/location or system documented?	(Yes) N/A	[initials] 5/10/05
6	Is a remediation effectiveness discussion included?	(Yes) N/A	[initials] 5/10/05
7	Have characterization survey and/or sampling results been converted to units that are comparable to applicable DCGL values?	(Yes) N/A	[initials] 5/10/05
8	Is survey and/or sampling data that was used for determining survey unit variance included?	(Yes) N/A	[initials] 5/10/05
9	Is a description of the background reference areas (or materials) and their survey and/or sampling results included along with a justification for their selection?	Yes, (N/A)	[initials] 5/10/05
10	Are applicable survey and/or sampling data that was used to determine variability included?	(Yes) N/A	[initials] 5/10/05
11	Will the condition of the survey area have an impact on the survey design, and has the probable impact been considered in the design?	Yes, (N/A)	[initials] 5/10/05
12	Has any special area characteristic including any additional residual radioactivity (not previously noted during characterization) been identified along with its impact on survey design?	Yes (N/A)	[initials] 5/10/05
13	Are all necessary supporting calculations and/or site procedures referenced or included?	(Yes) N/A	[initials] 5/10/05
14	Has an effective DCGLw been identified for the survey unit(s)?	(Yes) N/A	[initials] 5/10/05
15	Was the appropriate $DCGL_{EMC}$ included in the survey design calculation?	Yes, (N/A)	[initials] 5/10/05
16	Has the statistical tests that will be used to evaluate the data been identified?	(Yes) N/A	[initials] 5/10/05
17	Has an elevated measurement comparison been performed (Class 1 Area)?	Yes, (N/A)	[initials] 5/10/05
18	Has the decision error levels been identified and are the necessary justifications provided?	(Yes) N/A	[initials] 5/10/05
19	Has scan instrumentation been identified along with the assigned scanning methodology?	(Yes) N/A	[initials] 5/10/05
20	Has the scan rate been identified, and is the MDCscan adequate for the survey design?	(Yes) N/A	[initials] 5/10/05
21	Are special measurements e.g., in-situ gamma-ray spectroscopy required under this design, and is the survey methodology, and evaluation methods described?	(Yes,) N/A	[initials] 5/10/05
22	Is survey instrumentation calibration data included and are detection sensitivities adequate?	(Yes) N/A	[initials] 5/10/05
23	Have the assigned sample and/or measurement locations been clearly identified on a diagram or CAD drawing of the survey area(s) along with their coordinates?	(Yes) N/A	[initials] 5/10/05
24	Are investigation levels and administrative limits adequate, and are any associated actions clearly indicated?	(Yes) N/A	[initials] 5/10/05
25	For sample analysis, have the required MDA values been determined.?	Yes, (N/A)	[initials] 5/10/05
26	Has any special sampling methodology been identified other than provided in Reference 6.3?	Yes, (N/A)	[initials] 5/10/05

NOTE: a copy of this completed form or equivalent, shall be included within the survey design calculation.

Attachment 1-1 E900-05-014



||| — Grids with recent sample results

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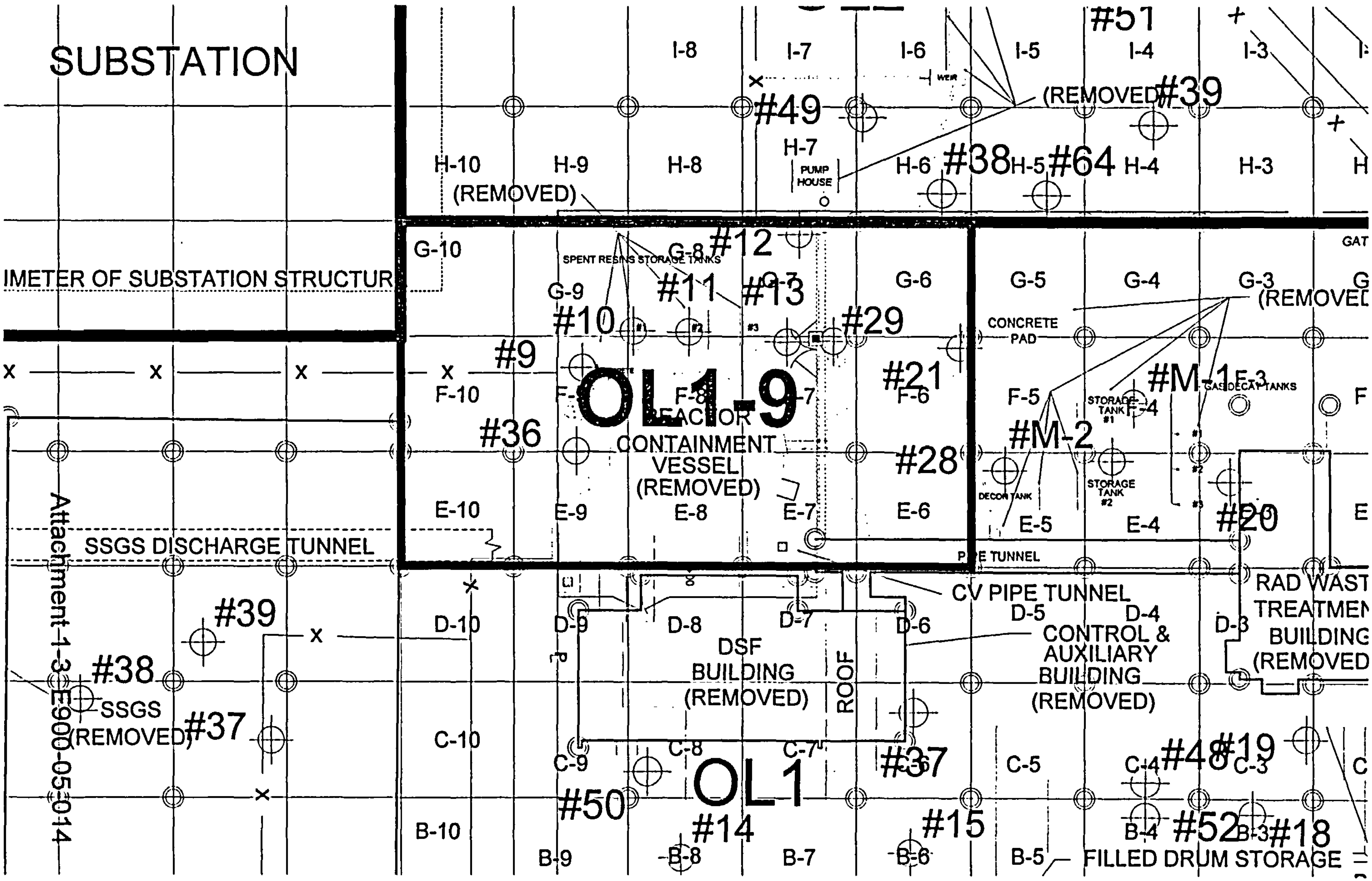

SUBSTATION
IMETER OF SUBSTATION STRUCTUR
OL1-9
OL1
REACTOR
CONTAINMENT
VESSEL
(REMOVED)
SPENT RESINS STORAGE TANKS
PUMP HOUSE
WEIR
(REMOVED)
CONCRETE PAD
GAS DECAY TANKS
STORAGE TANK #1
STORAGE TANK #2
DECON TANK
PIPE TUNNEL
CV PIPE TUNNEL
SSGS DISCHARGE TUNNEL
SSGS
(REMOVED)
DSF
BUILDING
(REMOVED)
ROOF
CONTROL &
AUXILIARY
BUILDING
(REMOVED)
RAD WAST
TREATMEN
BUILDING
(REMOVED
FILLED DRUM STORAGE
#9
#10
#11
#12
#13
#14
#15
#18
#19
#20
#21
#28
#29
#36
#37
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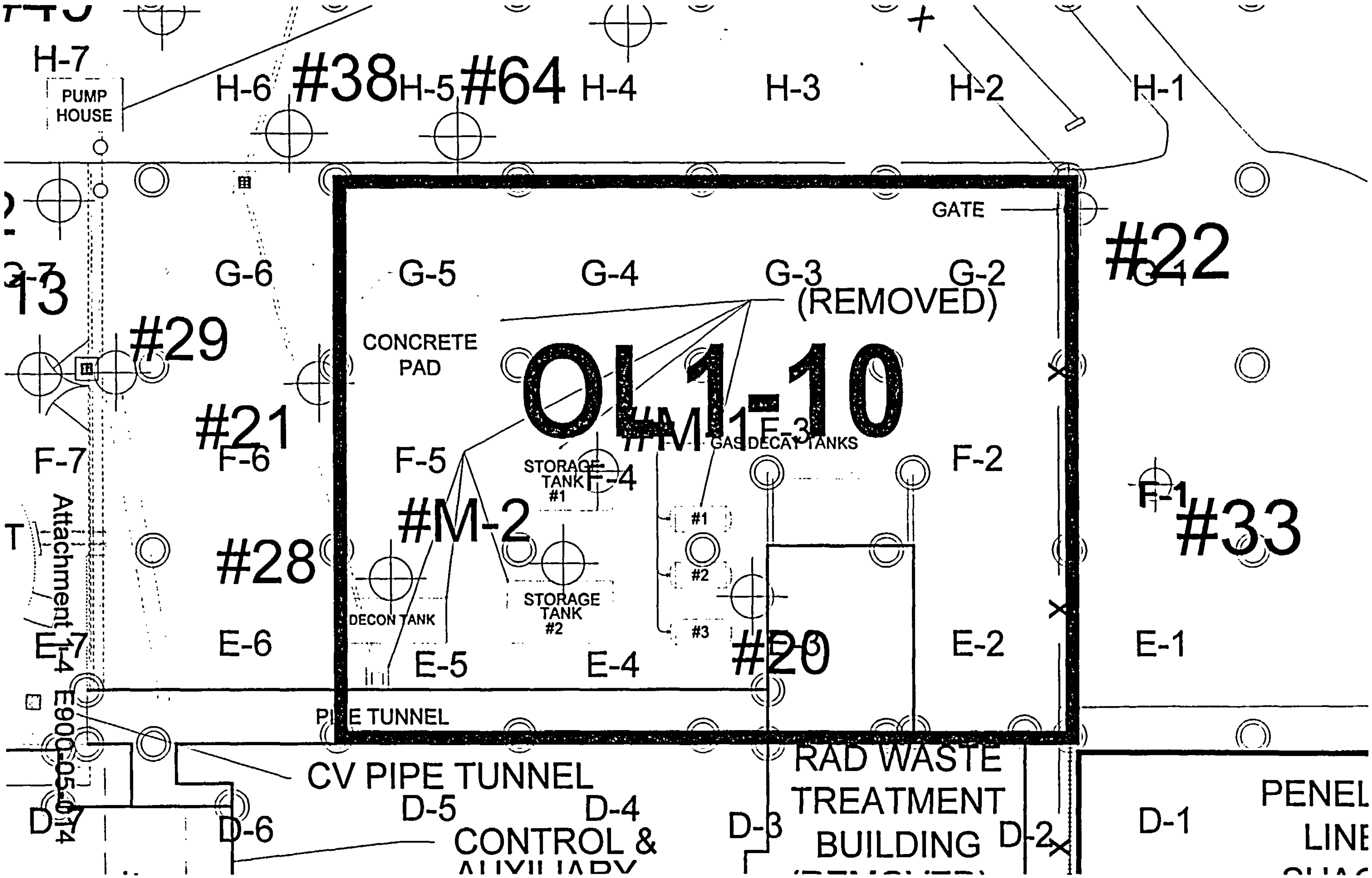
#39
#48
#49
#50
#51
#52
#64
#M-1
#M-2
Attachment 1-3 E900-05-014



PUMP HOUSE
H-7
H-6
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H-5
#64
H-4
H-3
H-2
H-1
GATE
#22
G-6
G-5
G-4
G-3
G-2
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(REMOVED)
#29
CONCRETE PAD
OL1-10
#M-1
GAS DECAY TANKS
#21
F-7
F-6
F-5
STORAGE TANK #1
F-4
F-2
F-1
#33
#M-2
#1
#2
#3
#28
DECON TANK
STORAGE TANK #2
E-6
E-5
E-4
#20
E-2
E-1
PIPE TUNNEL
CV PIPE TUNNEL
RAD WASTE TREATMENT BUILDING
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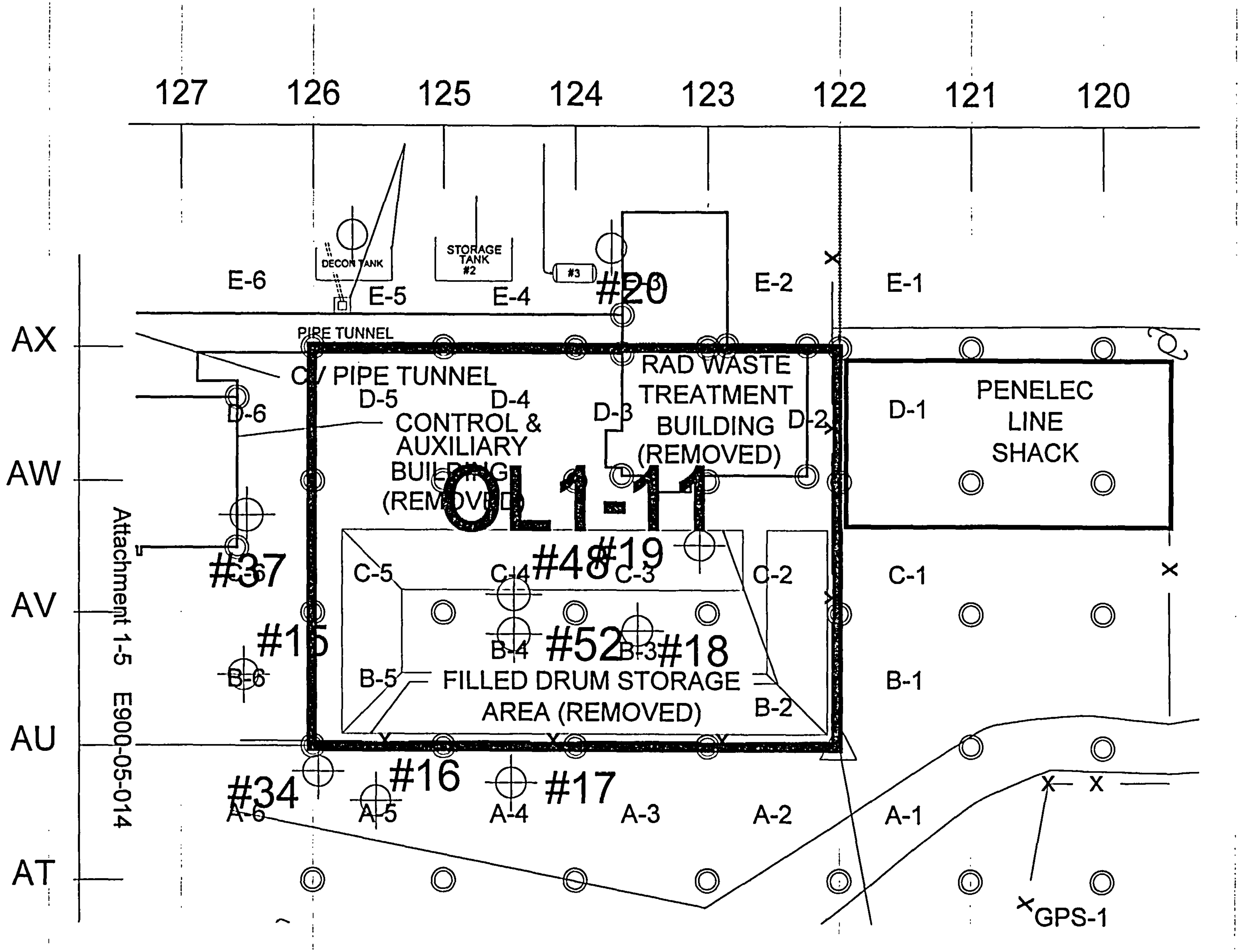
D-4
D-3
D-2
D-1
D-6
CONTROL &
Attachment 1-4 E900-05-014



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120
AX
AW
AV
AU
AT
DECON TANK
STORAGE TANK #2
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E-6
E-5
E-4
#20
E-2
E-1
PIPE TUNNEL
C/V PIPE TUNNEL
RAD WASTE TREATMENT BUILDING (REMOVED)
PENELEC LINE SHACK
D-6
D-5
D-4
D-3
D-2
D-1
CONTROL & AUXILIARY BUILDING (REMOVED)
OL1-11
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#48
#19
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C-4
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C-2
C-1
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FILLED DRUM STORAGE AREA (REMOVED)
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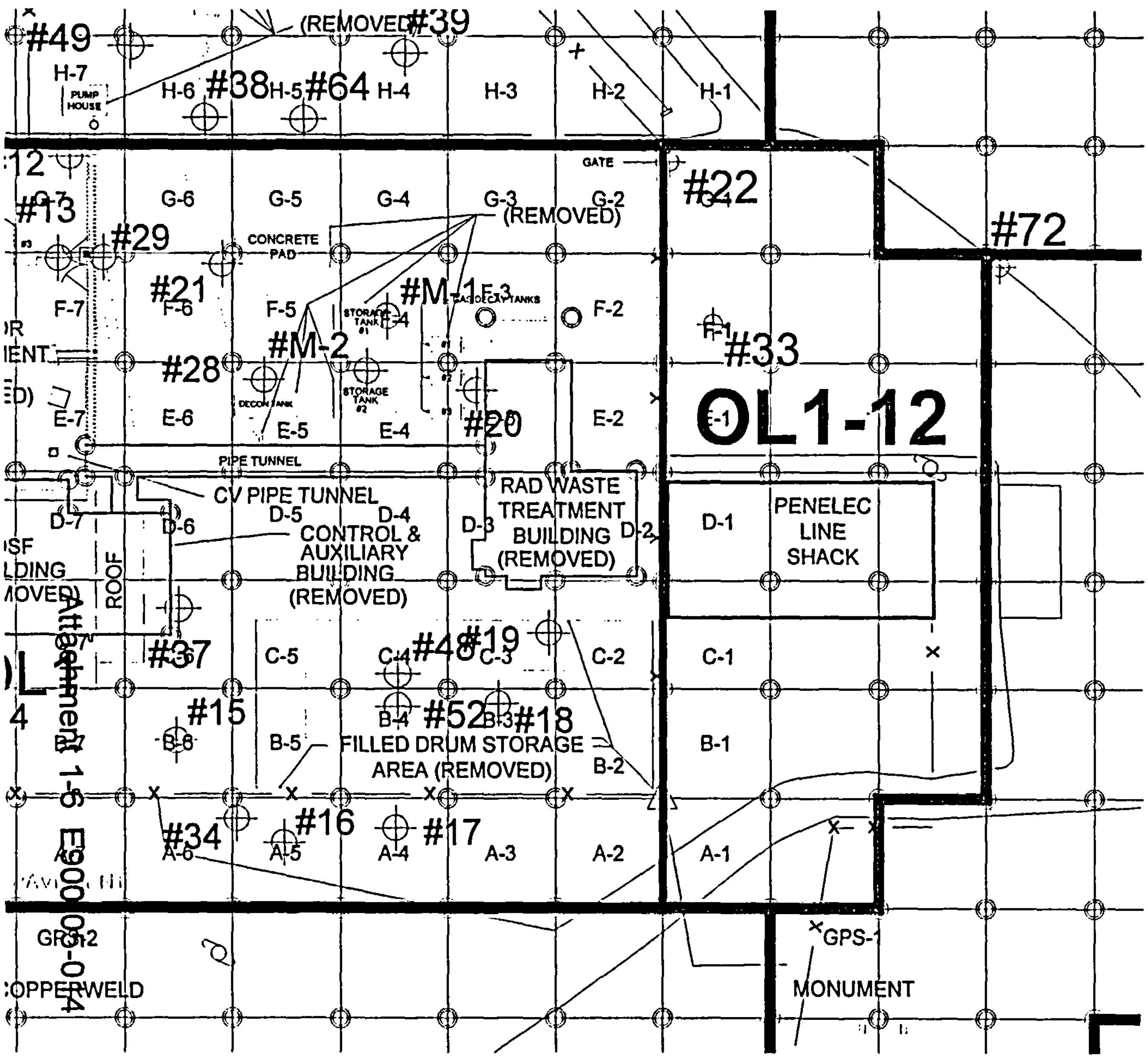

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PUMP HOUSE
(REMOVED)
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H-6
#38
H-5
#64
H-4
H-3
H-2
H-1
GATE
#22
G-6
G-5
G-4
G-3
G-2
(REMOVED)
#13
#29
CONCRETE PAD
#72
#21
#M-1
F-3
DECAY TANKS
F-7
F-6
F-5
STORAGE TANK #1
F-4
F-2
F-1
#33
#28
#M-2
DECON TANK
STORAGE TANK #2
E-7
E-6
E-5
E-4
#20
E-2
E-1
OL1-12
PIPE TUNNEL
CV PIPE TUNNEL
RAD WASTE TREATMENT BUILDING (REMOVED)
D-7
D-6
D-5
D-4
D-3
D-2
D-1
PENELEC LINE SHACK
CONTROL & AUXILIARY BUILDING (REMOVED)
ROOF
#37
C-5
C-4
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#19
C-3
C-2
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#15
B-6
B-5
B-4
#52
B-3
#18
FILLED DRUM STORAGE AREA (REMOVED)
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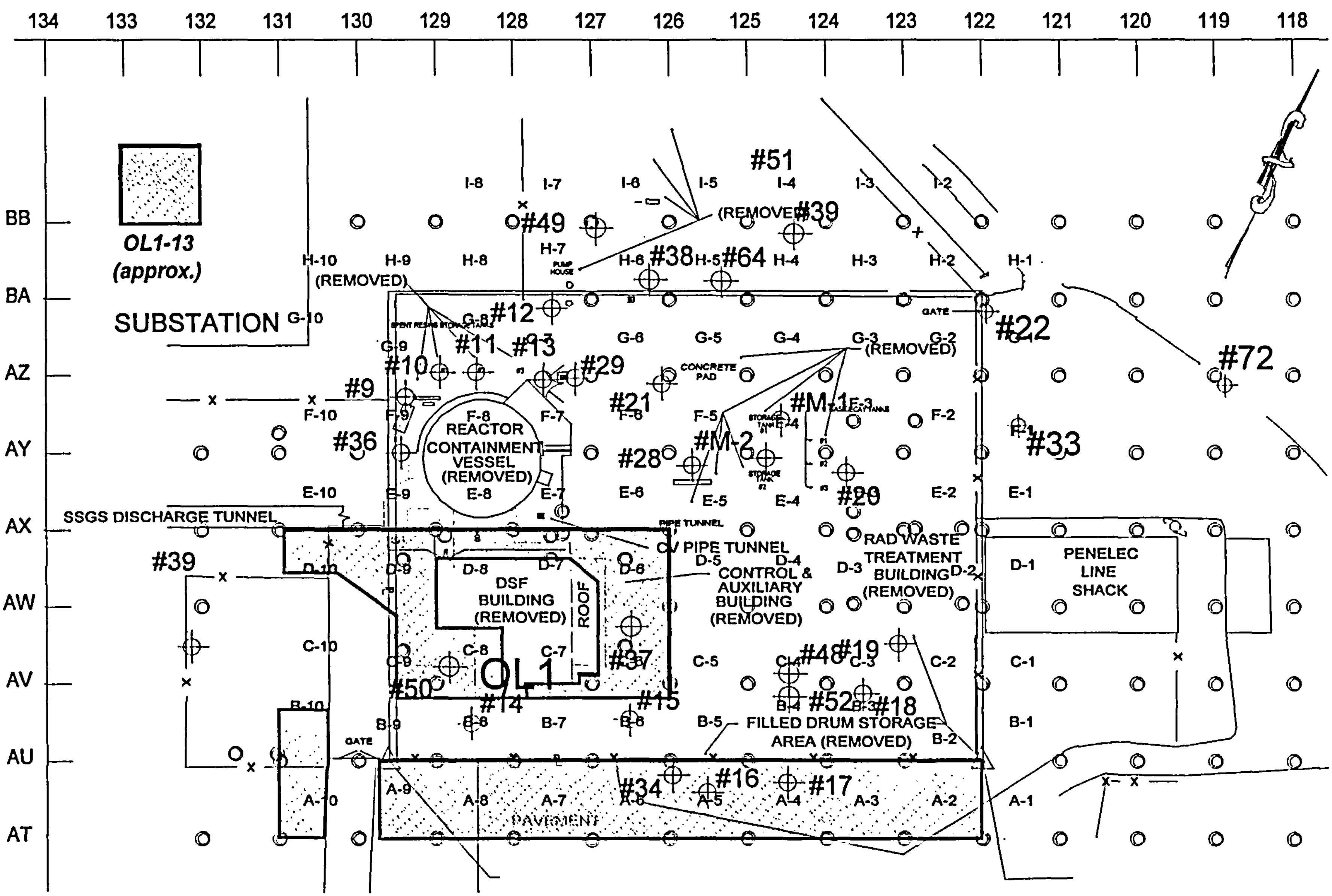
MONUMENT
COPPERWELD
Attachment 1-6 E900-04-04



ATTACHMENT 1-7, E900-05-014

DCGL Calculation Logic-CV Yard Soil & Boulders

I. **Survey Unit:** SNEC Containment Vessel (CV) Yard Soil and Boulders

II. **Description:** The purpose of this calculation is to determine a representative isotopic mix for the CV Yard Soil and associated Boulders from available sample analyses. The effective volumetric $DCGL_w$s are then determined from the mean percent of applicable samples.

III. **Data Selection Logic Tables:** The radionuclide selection logic and subsequent DCGL calculations are provided in six (6) tables. These tables were developed using Microsoft Excel. Table explanation is as follows.

Table 1: Data Listing – This table, which has been extracted from a larger database, provides a list of the most representative sample analyses. Results are from scoping, characterization, and pre/post remediation surveys. The samples consist of soil media that was taken in support of the aforementioned surveys. As applicable, a sample number, sample location/description, radionuclide concentration, analysis date are provided for each sample. Positive nuclide concentrations are noted with yellow/shaded background fields while MDA values are noted in the gray shaded fields.

Table 2: Decayed Listing – This table decays the data from Table 1. Half-life values (days) are listed above each respective nuclide column. Samples are decayed from the respective analysis date to January 15, 2004. Positive results are denoted in a yellow background field while MDA values are noted in the gray shaded fields.

Table 3: Decayed Listing of Positive Nuclides & MDAs Removed – This table provides the best overall representation of the data. Non-positive nuclide columns have been removed as well as all the MDA values. Therefore, 11 nuclides have been reduced to four (4).

Table 4: Ratio to Cs-137 for Positive Nuclides – This table provides the calculation methodology for determining the surrogate ratio to Cs-137 for each radionuclide. From this information the mean, sigma, and mean % of total are calculated. The mean % of total values is used to calculate the volumetric $DCGL_w$ per MARSSIM equation I-14. See Table 5. Note that the mean percent values were averaged using only the positive sample results in each column. In some cases only a single nuclide value (e.g. Sr-90) had a positive result. This value is listed as the value in the mean result field. This results in higher "mean percent of total" values in the mix, which are conservative.

Note: From Table 4 only the "mean % of total" values are used as input to the "Effective DCGL Calculation Spreadsheet" as illustrated in Table 5.

Table 5: Effective DCGL Calculator for Cs-137 (in pCi/g) – This table provides the surrogate volumetric modified Cs-137 $DCGL_w$ calculation results from data derived from Table 4.

IV. **Summary** – Since the CV Yard and Boulders are volumes of soil or rock material, existing in place or in a pile, the release limit is primarily based on the volumetric $DCGL_w$. Using the above data selection logic tables the calculated Cs-137 volumetric $DCGL_w$ is 5.73 pCi/g. This value will be reduced by 25% as part of SNEC's requirement to apply an administrative limit as discussed in the License Termination Plan (LTP).

TABLE 1 - Data Listing (pCi/g)

	SNEC Sample No	Location/Description	H-3	Sr-90	Co-60	Cs-137	Am-241	Pu-238	Pu-239	Pu-241	C-14	Ni-63	Eu-152
1	CV Tunnel	CV Tunnel Sediment Composite, OL1	9.40E+00	9.67E+00	1.26E+00	1.25E+03	1.80E-01	5.50E-01	2.20E-01	4.47E+01	9.34E+00	4.02E+00	1.30E-01
2	SX9SL99219	Subsuface Sample #29 (0-5'), AY-128, OL1			7.00E-02	5.90E-01							
3	SXSL1063	North CV Yard Soil BA-127, 812' El, Sample # 5, OL2	4.58E+00	5.31E-02	1.92E-02	8.86E-01	9.61E-02	4.68E-02	3.27E-02	3.77E+00	2.10E-01	1.09E+01	5.25E-02
4	SXSL1089	North CV Yard Soil AY-127, 810' El, Sample # 3, OL1	3.03E+00	6.95E-02	3.32E-02	1.29E+00	9.93E-02	1.28E-01	5.00E-02	4.97E+00	2.10E-01	7.54E+00	8.28E-02
5	SXSL1115	North CV Yard Soil AY-128, 804' El, Sample # 2, OL1	4.88E+00	5.36E-02	2.43E-02	1.80E+00	2.40E-01	1.38E-01	4.07E-02	4.21E+00	2.10E-01	7.60E+00	5.71E-02
6	SXSL1122	North CV Yard Soil AY-129, 798' El, Sample # 2, OL1	3.44E+00	5.29E-02	2.79E-02	4.77E+00	1.83E-01	8.94E-02	4.00E-02	3.68E+00	2.06E-01	8.75E+00	8.62E-02
7	SXSL1130	North CV Yard Soil AX-129, 803' El, Sample # 4, OL1	4.99E+00	6.48E-02	2.98E-02	2.26E+01	1.49E-01	8.56E-02	1.21E-02	3.55E+00	2.31E-01	1.34E+01	9.89E-02
8	SXSL1132	North CV Yard Soil AZ-130, Sample # 5, OL1	2.98E+00	7.15E-02	3.50E-02	2.59E+00	1.64E-01	7.46E-02	6.46E-02	5.27E+00	2.15E-01	1.26E+01	7.34E-02
9	SXSL1270	AX-129, 3-3, Soil, CV SE Side 5' From CV, 800' El., OL1	1.13E+01	2.00E-02	1.00E-02	2.31E+01	3.70E-02	7.00E-03	7.00E-03	2.10E+00	3.93E+00	8.68E+00	7.00E-02
10	SXSL1281	AX-128, 3-1, Soil, CV Tunnel East 5' From CV, 800' El, OL1	1.15E+01	3.00E-02	1.00E-02	4.38E+00	3.10E-02	1.60E-02	7.00E-03	1.91E+00	4.00E+00	7.78E+00	4.00E-02
11	SXSL2649	Anulus Well, A-2, 5 to 10' Depth, OL1	2.00E+00	3.14E-02	1.00E-01	6.00E-01	9.78E-03	1.33E-02	1.10E-02	1.87E+00	1.83E-01	1.75E+00	
13	SXSL2871	CV Area - East Yard Dirt Pile - Middle, 1/2 Way Up, OL1		3.00E-02	7.00E-02	5.60E-01							
14	SXSL2872	CV Area - East Yard Dirt Pile - Bottom (also top center), OL1		3.00E-02	6.00E-02	1.00E-01							
15	SXSL3140	East CV Yard, Soil Pile @ 6' on West Side (6" Depth), OL1	1.89E+00	1.20E-02	1.40E-02	8.25E-01	7.00E-03	5.00E-03	5.00E-03	3.69E-01	8.60E-02	3.41E+00	3.00E-02
16	SXSL3142	Soil Pile, CV Yard, Three Feet on East Side, SR-37, OL1		2.95E-02	7.00E-02	6.00E-01							
17	SXSL3145	East CV Yard, Soil Pile @ 3' on East Side (6" Depth), OL1	1.90E+00	1.70E-02	1.30E-02	1.26E+00	4.00E-03	5.00E-03	5.00E-03	3.76E-01	8.30E-02	3.69E+00	3.80E-02
18	SXSL3149	Soil Pile, CV Yard, Six Feet on East Side, SR-37, OL1		2.97E-02	8.00E-02	3.00E-01							
19	SXSL3153	East CV Yard, Soil Pile @ Top (6" Depth), OL1	1.94E+00	4.30E-02	2.30E-02	3.00E-01	3.00E-03	5.00E-03	5.00E-03	3.43E-01	8.70E-02	4.18E+00	5.10E-02
21	SXSL4142	CV Yard Soil - West Side, AP1-7, OL1	2.22E+00	3.25E-02	5.00E-02	9.00E-01	1.76E-02	6.71E-02	2.02E-02				
22	SXSL4143	CV Yard Soil - West Side, AP1-7, OL1	2.23E+00	3.16E-02	5.00E-02	5.00E-01	2.21E-02	6.31E-02	3.64E-02				
23	SXSL4149	CV Yard Soil - West Side, AP1-7, OL1	2.24E+00	2.77E-02	7.00E-02	3.90E+00	2.77E-02	4.30E-02	3.04E-02				

TABLE 2 - Decayed Listing (pCi/g)

			T 1/2	T 1/2	T 1/2	T 1/2	T 1/2	T 1/2	T 1/2	T 1/2	T 1/2	T 1/2	T 1/2	Decay Date	
			4485.27	10446.15	1925.23275	11019.5925	157861.05	32050.6875	8813847.75	5259.6	2092882.5	36561.525	4967.4	January 15, 2004	
	SNEC Sample No	Location/Description	H-3	Sr-90	Co-60	Cs-137	Am-241	Pu-238	Pu-239	Pu-241	C-14	Ni-63	Eu-152	Analysis Date	ET (d)
1	CV Tunnel	CV Tunnel Sediment Composite, OL1	7.97E+00	9.01E+00	8.59E-01	1.17E+03	1.79E-01	5.37E-01	2.20E-01	3.88E+01	9.34E+00	3.94E+00	1.12E-01	February 14, 2001	1065
2	SX9SL99219	Subsuface Sample #29 (0-5'), AY-128, OL1			4.05E-02	5.36E-01								November 17, 1999	1520
3	SXSL1063	North CV Yard Soil BA-127, 812' El, Sample # 5, OL2	4.20E+00	5.11E-02	1.57E-02	8.55E-01	9.59E-02	4.62E-02	3.27E-02	3.50E+00	2.10E-01	1.08E+01	4.85E-02	June 27, 2002	567
4	SXSL1089	North CV Yard Soil AY-127, 810' El, Sample # 3, OL1	2.78E+00	6.69E-02	2.71E-02	1.24E+00	9.91E-02	1.26E-01	5.00E-02	4.61E+00	2.10E-01	7.46E+00	7.65E-02	June 28, 2002	566
5	SXSL1115	North CV Yard Soil AY-128, 804' El, Sample # 2, OL1	4.47E+00	5.16E-02	1.98E-02	1.74E+00	2.39E-01	1.36E-01	4.07E-02	3.91E+00	2.10E-01	7.52E+00	5.28E-02	June 29, 2002	565
6	SXSL1122	North CV Yard Soil AY-129, 798' El, Sample # 2, OL1	3.15E+00	5.10E-02	2.28E-02	4.60E+00	1.83E-01	8.83E-02	4.00E-02	3.42E+00	2.06E-01	8.66E+00	7.97E-02	June 29, 2002	565
7	SXSL1130	North CV Yard Soil AX-129, 803' El, Sample # 4, OL1	4.58E+00	6.24E-02	2.44E-02	2.18E+01	1.49E-01	8.46E-02	1.21E-02	3.30E+00	2.31E-01	1.33E+01	9.15E-02	July 3, 2002	561
8	SXSL1132	North CV Yard Soil AZ-130, Sample # 5, OL1	2.73E+00	6.89E-02	2.86E-02	2.50E+00	1.64E-01	7.37E-02	6.46E-02	4.89E+00	2.15E-01	1.25E+01	6.79E-02	July 3, 2002	561
9	SXSL1270	AX-129, 3-3, Soil, CV SE Side 5' From CV, 800' El., OL1	9.84E+00	1.88E-02	7.22E-03	2.18E+01	3.69E-02	6.86E-03	7.00E-03	1.87E+00	3.93E+00	8.53E+00	6.17E-02	July 26, 2001	903
10	SXSL1281	AX-128, 3-1, Soil, CV Tunnel East 5' From CV, 800' El, OL1	1.00E+01	2.83E-02	7.22E-03	4.14E+00	3.09E-02	1.57E-02	7.00E-03	1.69E+00	4.00E+00	7.65E+00	3.53E-02	July 26, 2001	903
11	SXSL2649	Anulus Well, A-2, 5 to 10' Depth, OL1	1.79E+00	3.00E-02	7.77E-02	5.74E-01	9.75E-03	1.31E-02	1.10E-02	1.71E+00	1.83E-01	1.73E+00		February 13, 2002	701
13	SXSL2871	CV Area - East Yard Dirt Pile - Middle, 1/2 Way Up, OL1		2.87E-02	5.48E-02	5.37E-01								March 6, 2002	680
14	SXSL2872	CV Area - East Yard Dirt Pile - Bottom (also top center), OL1		2.87E-02	4.70E-02	9.58E-02								March 6, 2002	680
15	SXSL3140	East CV Yard, Soil Pile @ 6' on West Side (6" Depth), OL1	1.75E+00	1.16E-02	1.17E-02	7.99E-01	6.98E-03	4.95E-03	5.00E-03	3.45E-01	8.60E-02	3.37E+00	2.80E-02	August 30, 2002	503
16	SXSL3142	Soil Pile, CV Yard, Three Feet on East Side, SR-37, OL1		2.85E-02	5.81E-02	5.81E-01								August 13, 2002	520
17	SXSL3145	East CV Yard, Soil Pile @ 3' on East Side (6" Depth), OL1	1.76E+00	1.64E-02	1.08E-02	1.22E+00	3.99E-03	4.95E-03	5.00E-03	3.52E-01	8.30E-02	3.65E+00	3.54E-02	August 30, 2002	503
18	SXSL3149	Soil Pile, CV Yard, Six Feet on East Side, SR-37, OL1		2.87E-02	6.63E-02	2.90E-01								August 13, 2002	520
19	SXSL3153	East CV Yard, Soil Pile @ Top (6" Depth), OL1	1.79E+00	4.16E-02	1.92E-02	2.91E-01	2.99E-03	4.95E-03	5.00E-03	3.21E-01	8.70E-02	4.14E+00	4.75E-02	August 30, 2002	503
21	SXSL4142	CV Yard Soil - West Side, AP1-7, OL1	2.18E+00	3.23E-02	4.81E-02	8.94E-01	1.76E-02	6.69E-02	2.02E-02					October 2, 2003	105
22	SXSL4143	CV Yard Soil - West Side, AP1-7, OL1	2.19E+00	3.14E-02	4.81E-02	4.97E-01	2.21E-02	6.30E-02	3.64E-02					October 2, 2003	105
23	SXSL4149	CV Yard Soil - West Side, AP1-7, OL1	2.20E+00	2.75E-02	6.74E-02	3.87E+00	2.77E-02	4.29E-02	3.04E-02					October 2, 2003	105

KEY	
(yellow)	Yellow Shaded Background = Positive Result
(gray)	Gray Shaded Background = MDA

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TABLE 3 - Decayed Listing of Positive Nuclides & MDAs Removed (pCi/g)							
	SNEC Sample No	Location/Description	H-3	Sr-90	Co-60	Cs-137	Total pCi/g
1	CV Tunnel	CV Tunnel Sediment Composite, OL1		9.01E+00	8.59E-01	1.17E+03	1178.89
2	SX9SL99219	Subsuface Sample #29 (0-5'), AY-128, OL1				5.36E-01	0.54
3	SXSL1063	North CV Yard Soil BA-127, 812' El, Sample # 5, OL2	4.20E+00			8.55E-01	5.05
4	SXSL1089	North CV Yard Soil AY-127, 810' El, Sample # 3, OL1	2.78E+00			1.24E+00	4.02
5	SXSL1115	North CV Yard Soil AY-128, 804' El, Sample # 2, OL1	4.47E+00			1.74E+00	6.21
6	SXSL1122	North CV Yard Soil AY-129, 798' El, Sample # 2, OL1	3.15E+00			4.60E+00	7.76
7	SXSL1130	North CV Yard Soil AX-129, 803' El, Sample # 4, OL1	4.58E+00		2.44E-02	2.18E+01	26.42
8	SXSL1132	North CV Yard Soil AZ-130, Sample # 5, OL1	2.73E+00			2.50E+00	5.23
9	SXSL1270	AX-129, 3-3, Soil, CV SE Side 5' From CV, 800' El., OL1				2.18E+01	21.82
10	SXSL1281	AX-128, 3-1, Soil, CV Tunnel East 5' From CV, 800' El, OL1				4.14E+00	4.14
11	SXSL2649	Anulus Well, A-2, 5 to 10' Depth, OL1				5.74E-01	0.57
13	SXSL2871	CV Area - East Yard Dirt Pile - Middle, 1/2 Way Up, OL1				5.37E-01	0.54
14	SXSL2872	CV Area - East Yard Dirt Pile - Bottom (also top center), OL1				9.58E-02	0.10
15	SXSL3140	East CV Yard, Soil Pile @ 6' on West Side (6" Depth), OL1				7.99E-01	0.80
16	SXSL3142	Soil Pile, CV Yard, Three Feet on East Side, SR-37, OL1				5.81E-01	0.58
17	SXSL3145	East CV Yard, Soil Pile @ 3' on East Side (6" Depth), OL1				1.22E+00	1.22
18	SXSL3149	Soil Pile, CV Yard, Six Feet on East Side, SR-37, OL1				2.90E-01	0.29
19	SXSL3153	East CV Yard, Soil Pile @ Top (6" Depth), OL1				2.91E-01	0.29
21	SXSL4142	CV Yard Soil - West Side, AP1-7, OL1				8.94E-01	0.89
22	SXSL4143	CV Yard Soil - West Side, AP1-7, OL1				4.97E-01	0.50
23	SXSL4149	CV Yard Soil - West Side, AP1-7, OL1			6.74E-02	3.87E+00	3.94

TABLE 4 - Ratio To Cs-137 for Positive Nuclides							
	SNEC Sample No	Location/Description	H-3	Sr-90	Co-60	Cs-137	Total
1	CV Tunnel	CV Tunnel Sediment Composite, OL1		7.71E-03	7.35E-04	1.00E+00	1.01
2	SX9SL99219	Subsuface Sample #29 (0-5'), AY-128, OL1				1.00E+00	1.00
3	SXSL1063	North CV Yard Soil BA-127, 812' El, Sample # 5, OL2	4.91E+00			1.00E+00	5.91
4	SXSL1089	North CV Yard Soil AY-127, 810' El, Sample # 3, OL1	2.23E+00			1.00E+00	3.23
5	SXSL1115	North CV Yard Soil AY-128, 804' El, Sample # 2, OL1	2.57E+00			1.00E+00	3.57
6	SXSL1122	North CV Yard Soil AY-129, 798' El, Sample # 2, OL1	6.85E-01			1.00E+00	1.68
7	SXSL1130	North CV Yard Soil AX-129, 803' El, Sample # 4, OL1	2.10E-01		1.12E-03	1.00E+00	1.21
8	SXSL1132	North CV Yard Soil AZ-130, Sample # 5, OL1	1.09E+00			1.00E+00	2.09
9	SXSL1270	AX-129, 3-3, Soil, CV SE Side 5' From CV, 800' El., OL1				1.00E+00	1.00
10	SXSL1281	AX-128, 3-1, Soil, CV Tunnel East 5' From CV, 800' El, OL1				1.00E+00	1.00
11	SXSL2649	Anulus Well, A-2, 5 to 10' Depth, OL1				1.00E+00	1.00
13	SXSL2871	CV Area - East Yard Dirt Pile - Middle, 1/2 Way Up, OL1				1.00E+00	1.00
14	SXSL2872	CV Area - East Yard Dirt Pile - Bottom (also top center), OL1				1.00E+00	1.00
15	SXSL3140	East CV Yard, Soil Pile @ 6' on West Side (6" Depth), OL1				1.00E+00	1.00
16	SXSL3142	Soil Pile, CV Yard, Three Feet on East Side, SR-37, OL1				1.00E+00	1.00
17	SXSL3145	East CV Yard, Soil Pile @ 3' on East Side (6" Depth), OL1				1.00E+00	1.00
18	SXSL3149	Soil Pile, CV Yard, Six Feet on East Side, SR-37, OL1				1.00E+00	1.00
19	SXSL3153	East CV Yard, Soil Pile @ Top (6" Depth), OL1				1.00E+00	1.00
21	SXSL4142	CV Yard Soil - West Side, AP1-7, OL1				1.00E+00	1.00
22	SXSL4143	CV Yard Soil - West Side, AP1-7, OL1				1.00E+00	1.00
23	SXSL4149	CV Yard Soil - West Side, AP1-7, OL1			1.74E-02	1.00E+00	1.02
		Mean⇒	1.95E+00	7.71E-03	6.42E-03	1	2.96
		Sigma⇒	1.708		0.010	0.000	
		Mean % of Total⇒	65.79%	0.26%	0.22%	33.74%	100.00%

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Table 5

Effective DCGL Calculator for Cs-137 (in pCi/g)

SHEC AL:	75%	Total Activity Limit DCGLw		Administrative Limit	
		16.98	pCi/g	12.74	pCi/g
		Cs-137 Limit		Cs-137 Administrative Limit	
		5.73	pCi/g	4.30	pCi/g

SAMPLE NUMBER(s)⇒ CV YARD SOIL & BOULDER SAMPLES

17.45%	25.0	mrem/y TEDE Limit
7.79%	4.0	mrem/y Drinking Water (DW) Limit

☑ Check for 25 mrem/y

	Isotope	Sample Input (pCi/g, uCi, % of Total, etc.)	% of Total	25 mrem/y TEDE Limits (pCi/g)	4 mrem/y DW Limits (pCi/g)	A - Allowed pCi/g for 25 mrem/y TEDE	B - Allowed pCi/g for 4 mrem/y DW	Value Checked from Column A or B	This Sample mrem/y TEDE	This Sample mrem/y DW	
1	Am-241		0.000%	9.9	2.3	0.00	0.00	0.00	0.00	0.00	Am-241
2	C-14		0.000%	2.0	5.4	0.00	0.00	0.00	0.00	0.00	C-14
3	Co-60	0.0064	0.216%	3.5	67.0	0.04	0.08	0.04	0.05	0.00	Co-60
4	Cs-137	1.0000	33.738%	6.6	397	5.73	12.83	5.73	3.79	0.01	Cs-137
5	Eu-152		0.000%	10.1	1440	0.00	0.00	0.00	0.00	0.00	Eu-152
6	H-3	1.9499	65.786%	132	31.1	11.17	25.02	11.17	0.37	0.25	H-3
7	Ni-63		0.000%	747	19000	0.00	0.00	0.00	0.00	0.00	Ni-63
8	Pu-238		0.000%	1.8	0.41	0.00	0.00	0.00	0.00	0.00	Pu-238
9	Pu-239		0.000%	1.6	0.37	0.00	0.00	0.00	0.00	0.00	Pu-239
10	Pu-241		0.000%	86	19.8	0.00	0.00	0.00	0.00	0.00	Pu-241
11	Sr-90	0.0077	0.260%	1.2	0.61	0.04	0.10	0.04	0.16	0.05	Sr-90
		2.96E+00	100.000%			16.98	38.03	16.98	4.364	0.312	
						Maximum Permissible pCi/g (25 mrem/y)	Maximum Permissible pCi/g (4 mrem/y)		To Use This Information, Sample Input Units Must Be in pCi/g *not % of Total.*		

Attachment 2-4 E900-05-014

2350 INSTRUMENT AND PROBE EFFICIENCY CHART

7/01/04 (Typical 2" by 2" NaI (Cs-137 W) Conversion Factors)

Inst.#	Cal Due	AP #		Probe #	Cal Due	cpm/mR/h
98625	5/18/05	R & Y		211680 Pk	5/18/05	214.882
98647	5/18/05	G &Y		211667 Pk	5/18/05	218.807
129423	5/18/05	P &Y.		211687 Pk	5/18/05	213.539
117573	5/18/05	O &Y		211674 Pk	5/18/05	212.173
117566	4/9/05	G&R		185852 Pk	4/13/05	209.862
126183	11/19/04	B&R		206280 Pk	12/12/04	190,907
129429	11/3/04	Y&W		206283 Pk	10/31/04	177185
126198	11/03/04	R&W		196021Pk	5/25/05	209.194
126172	6/07/05	G&W		196022	6/07/05	208.302
129440	4/09/05	O&W		210938 Pk	4/14/05	205.603
120588	6/08/05	B&W		185844 Pk	6/09/05	216.654
95361	6.25/05	P&W		025686	6/28/05	211.799

Attachment 3-1
E900-05-014

NaI Scan MDC Calculation

MDCscan =	6.2	pCi / g

b = background in counts per minute
bi = background counts in observation interval
Conv = NaI Detector / meter calibrated response in cpm/uR/hr
d = Index of sensitivity from MARSSIM Table 6.5 based on 95% detection, 60% false positive
HSd = Elevated measurement spot diameter in centimeters
MDCscan = MinimumDetectable Concentration for scanning in pCi/g
MDCRi = Minimum Detectable Count Rate in net counts per minute
MDCRsurv = MDCRi adjusted for the human performance factor p - in net counts per minute
MDER = Minimum Detectable Exposure Rate in uR / hr
MSoutput = MicroShield derived exposure rate for 1 pCi/g contaminant in mR/hr
Oi = Observation interval in seconds
p = human performance adjustment factor - unitless
SR = Scanning movement rate in centimeters per second
DCGLeq = Net count rate equivalent to the Adjusted DCGL

b =	300	cpm	p =	0.5		HSd =	56	cm
SR =	25	cm	d =	1.38		Conv =	205.6	cpm/uR/hr
Msoutput =	1.37E-04	mR/hr / pCi/g	DCGL =	4.3	pCi/g			

HSd / SR = 2.24 = Oi (sec)

b*Oi / 60 (sec/min) = 11.2 = bi (counts)

d*sqrt(bi)*60 / Oi = 123.7 = MDCRi (net counts per minute)

MDCRi / sqrt(p) = 174.9 = MDCRsurv (net counts per minute)

MDCRsurveyor / Conv = 0.851 = MDER (uR/hr)

MDER / MSoutput*1000(uR/mR) = **6.21** = MDCscan pCi/g

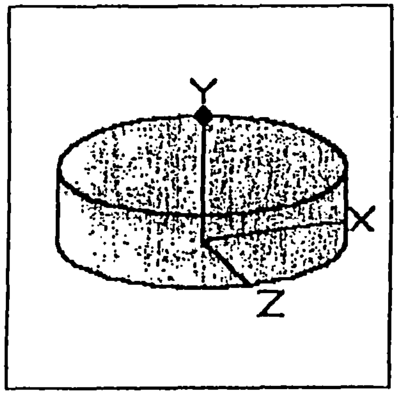
MDCsurv*DCGL / MDCscan = 121 = AL net cpm

Attachment 4-1
E900-05-014

Page	: 1
DOS File	: MODEL.MS5
Run Date	: September 23, 2003
Run Time	: 2:43:26 PM
Duration	: 00:00:02

File Ref: ________
Date: ________
By: ________
Checked: ________

Case Title: Cs-137 Soil
Description: Model for Scanning
Geometry: 8 - Cylinder Volume - End Shields



Source Dimensions

Height	15.24 cm	6.0 in
Radius	28.0 cm	11.0 in

Dose Points

A	X	Y	Z
# 1	0 cm	25.4 cm	0 cm
	0.0 in	10.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	3.75e+04 cm³	Concrete	1.6
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ba-137m	5.6815e-008	2.1022e+003	1.5136e-006	5.6003e-002
Cs-137	6.0058e-008	2.2221e+003	1.6000e-006	5.9200e-002

Buildup
The material reference is : Source

Integration Parameters

Radial	50
Circumferential	50
Y Direction (axial)	50

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	4.352e+01	7.617e-06	9.220e-06	6.345e-08	7.680e-08
0.0322	8.030e+01	1.465e-05	1.784e-05	1.179e-07	1.436e-07
0.0364	2.922e+01	8.118e-06	1.060e-05	4.613e-08	6.024e-08
0.6616	1.892e+03	7.060e-02	1.260e-01	1.369e-04	2.443e-04
TOTALS:	2.045e+03	7.063e-02	1.261e-01	1.371e-04	2.446e-04

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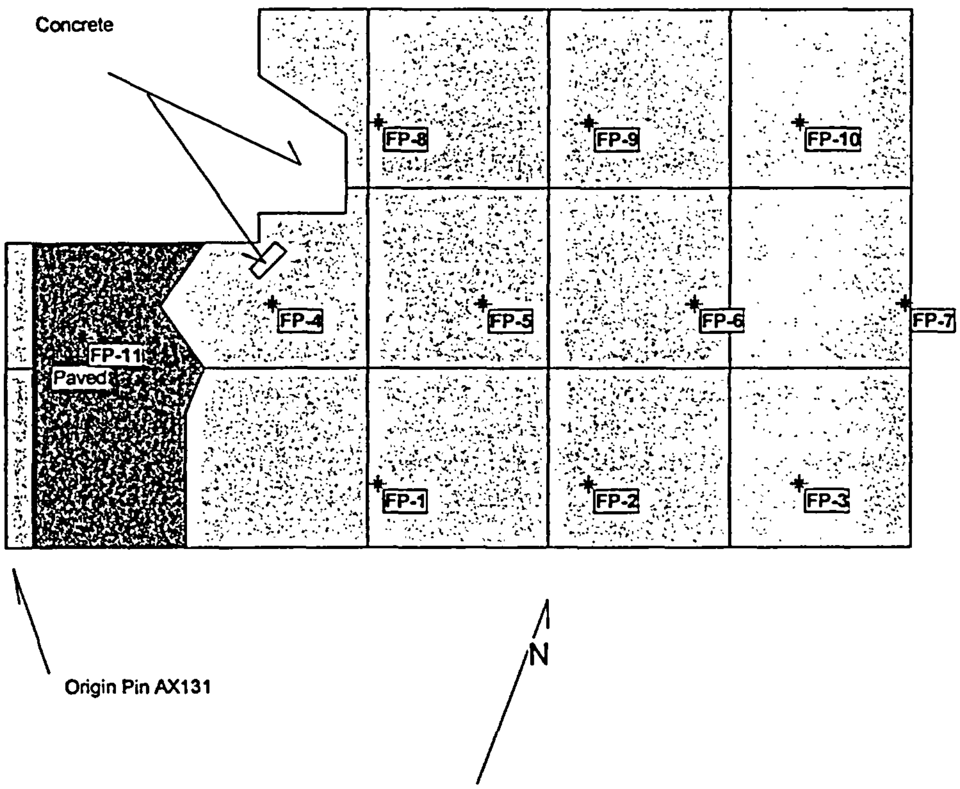
OL1-9 Open Land CV Area



Attachment 6-3
E900-05-014

OL1-9 Fixed point Dimensions in METERS

X Coord	Y Coord	Label	Grid	Type	East	North
20.63	3.52	FP-1	AX129	Systematic	0.6	3.5
32.27	3.52	FP-2	AX128	Systematic	2.3	3.5
43.91	3.52	FP-3	AX127	Systematic	3.9	3.5
14.81	13.60	FP-4	AY130	Systematic	4.8	3.6
26.45	13.60	FP-5	AY129	Systematic	6.5	3.6
38.09	13.60	FP-6	AY128	Systematic	8.1	3.6
49.73	13.60	FP-7	AY127	Systematic	9.7	3.6
20.63	23.68	FP-8	AZ129	Systematic	0.6	3.7
32.27	23.68	FP-9	AZ128	Systematic	2.3	3.7
43.91	23.68	FP-10	AZ127	Systematic	3.9	3.7
4.27	11.72	FP-11	AY131	Systematic	4.3	1.7

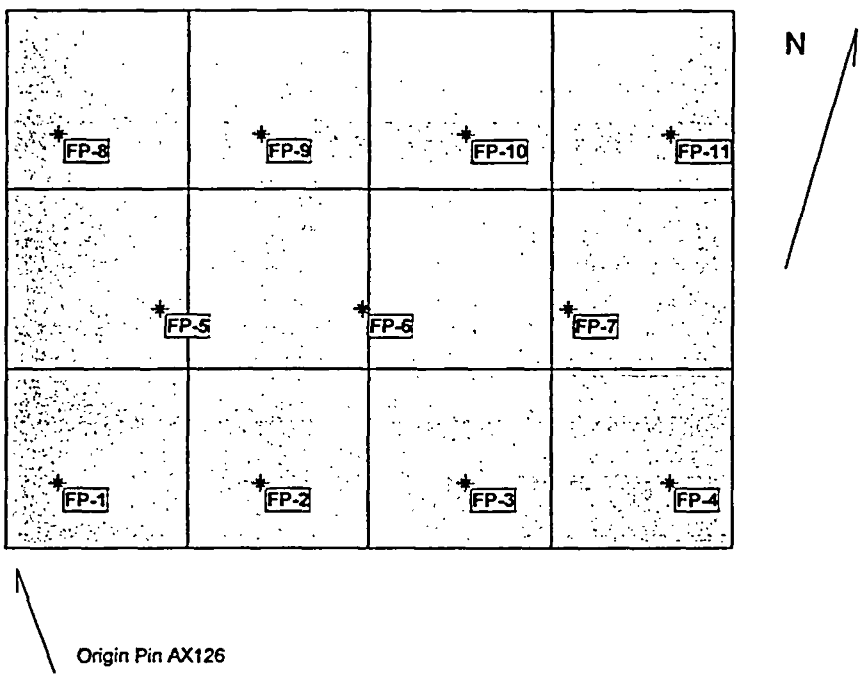
OL1-9 Fixed point Dimensions in FEET

X Coord	Y Coord	Label	Grid	Type	East	North
67.67	11.55	FP-1	AX129	Systematic	2.1	11.5
105.85	11.55	FP-2	AX128	Systematic	7.5	11.5
144.03	11.55	FP-3	AX127	Systematic	12.8	11.5
48.59	44.61	FP-4	AY130	Systematic	15.8	11.8
86.76	44.61	FP-5	AY129	Systematic	21.2	11.8
124.94	44.61	FP-6	AY128	Systematic	26.5	11.8
163.11	44.61	FP-7	AY127	Systematic	31.9	11.8
67.67	77.67	FP-8	AZ129	Systematic	2.1	12.1
105.85	77.67	FP-9	AZ128	Systematic	7.5	12.1
144.03	77.67	FP-10	AZ127	Systematic	12.8	12.1
14.00	38.44	FP-11	AY131	Systematic	14.0	5.6

Xcoord and Ycoord values are from the origin pin AX131
East and North are from each grid ID pin

Attachment 6-4
E900-05-014

OL1-10 SNEC Yard after backill



Attachment 6-5
E900-05-014

OL1-10 Fixed point Dimensions in METERS

X Coord	Y Coord	Label	GRID	Type	East	North
2.87	3.64	FP-1	AX126	Systematic	2.87	3.64
14.09	3.64	FP-2	Ax125	Systematic	4.09	3.64
25.32	3.64	FP-3	Ax124	Systematic	5.32	3.64
36.54	3.64	FP-4	Ax123	Systematic	6.54	3.64
8.48	13.36	FP-5	AY126	Systematic	8.48	3.36
19.70	13.36	FP-6	AY125	Systematic	9.70	3.36
30.93	13.36	FP-7	AY123	Systematic	0.93	3.36
2.87	23.08	FP-8	AZ126	Systematic	2.87	3.08
14.09	23.08	FP-9	AZ125	Systematic	4.09	3.08
25.32	23.08	FP-10	AZ124	Systematic	5.32	3.08
36.54	23.08	FP-11	AZ123	Systematic	6.54	3.08

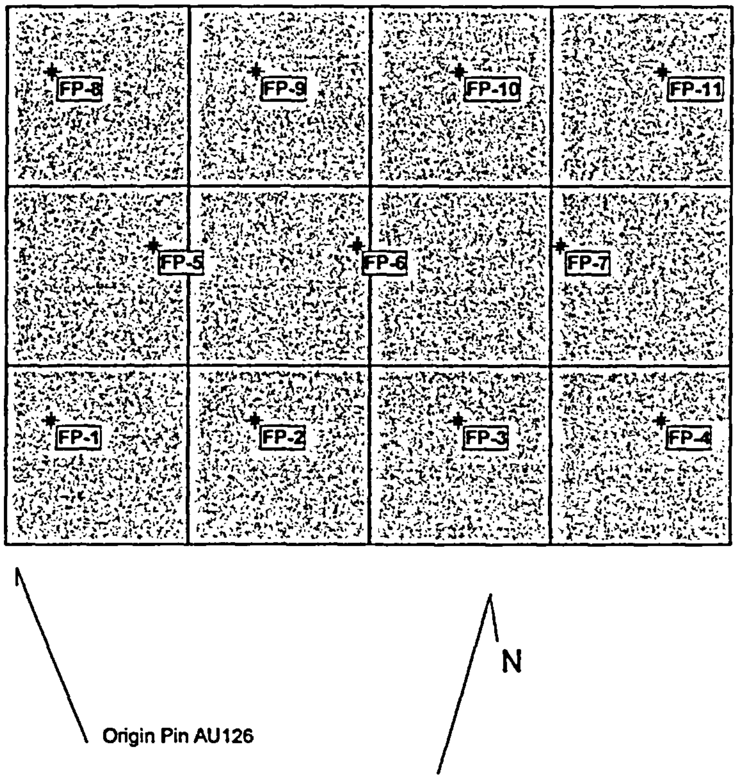
OL1-10 Fixed point Dimensions in FEET

X Coord	Y Coord	Label	GRID	Type	East	North
9.41	11.95	FP-01	AX126	Systematic	9.4	12.0
46.22	11.95	FP-02	Ax125	Systematic	13.4	12.0
83.04	11.95	FP-03	Ax124	Systematic	17.4	12.0
119.85	11.95	FP-04	Ax123	Systematic	21.4	12.0
27.82	43.83	FP-05	AY126	Systematic	27.8	11.0
64.63	43.83	FP-06	AY125	Systematic	31.8	11.0
101.44	43.83	FP-07	AY123	Systematic	3.0	11.0
9.41	75.71	FP-08	AZ126	Systematic	9.4	10.1
46.22	75.71	FP-09	AZ125	Systematic	13.4	10.1
83.04	75.71	FP-10	AZ124	Systematic	17.4	10.1
119.85	75.71	FP-11	AZ123	Systematic	21.4	10.1

Xcoord and Ycoord values are from the origin pin AX126
East and North are from each grid ID pin

Attachment 6-6
E900-05-014

OL1-11 Barrel Bunker Area



Attachment 6-7
E900-05-014

OL1-11 sample dimensions in METERS

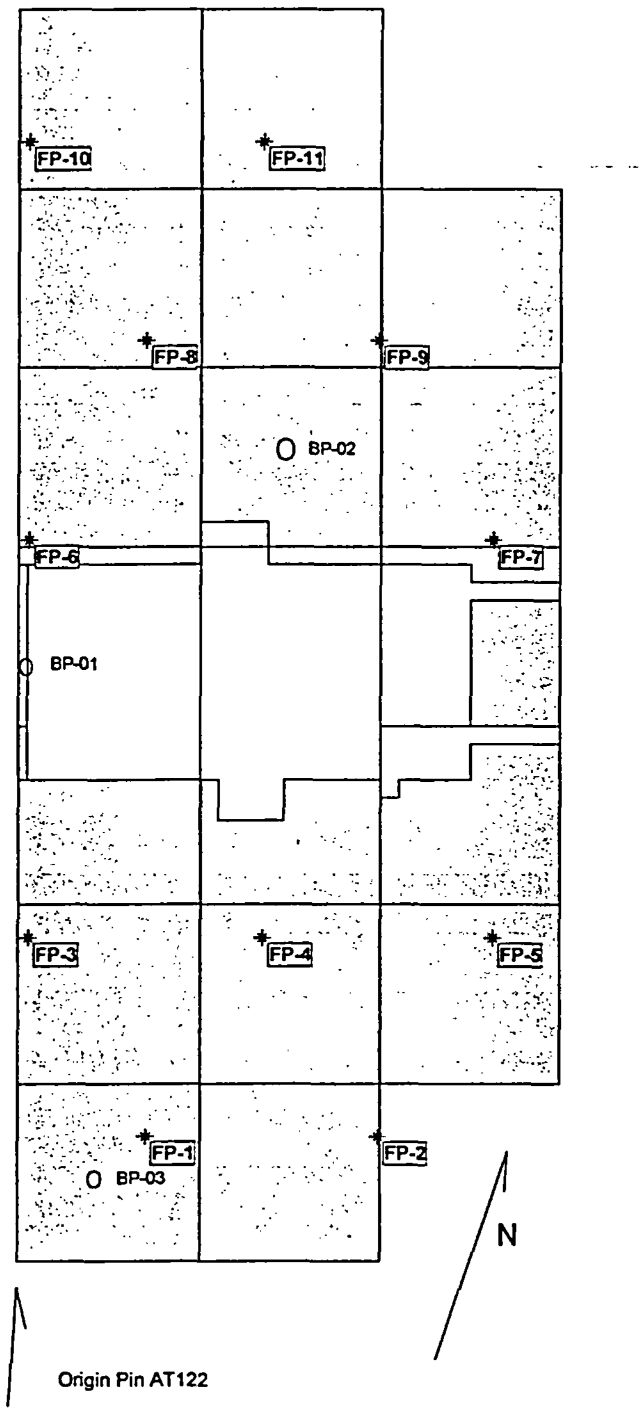
X Coord	Y Coord	Label	Grid	Type	East	North
2.50	6.95	FP-1	AU126	Systematic	2.5	7.0
13.72	6.95	FP-2	AU125	Systematic	3.7	7.0
24.95	6.95	FP-3	AU124	Systematic	4.9	7.0
36.17	6.95	FP-4	AU123	Systematic	6.2	7.0
8.11	16.67	FP-5	AV126	Systematic	8.1	6.7
19.33	16.67	FP-6	AV125	Systematic	9.3	6.7
30.56	16.67	FP-7	AV123	Systematic	0.6	6.7
2.50	26.39	FP-8	AW126	Systematic	2.5	6.4
13.72	26.39	FP-9	AW125	Systematic	3.7	6.4
24.95	26.39	FP-10	AW124	Systematic	4.9	6.4
36.17	26.39	FP-11	AW123	Systematic	6.2	6.4

OL1-11 Fixed point Dimensions in FEET

X Coord	Y Coord	Label	Grid	Type	East	North
8.20	22.80	FP-1	AU126	Systematic	8.2	22.8
45.01	22.80	FP-2	AU125	Systematic	12.2	22.8
81.82	22.80	FP-3	AU124	Systematic	16.2	22.8
118.64	22.80	FP-4	AU123	Systematic	20.2	22.8
26.60	54.68	FP-5	AV126	Systematic	26.6	21.9
63.42	54.68	FP-6	AV125	Systematic	30.6	21.9
100.23	54.68	FP-7	AV123	Systematic	1.8	21.9
8.20	86.56	FP-8	AW126	Systematic	8.2	21.0
45.01	86.56	FP-9	AW125	Systematic	12.2	21.0
81.82	86.56	FP-10	AW124	Systematic	16.2	21.0
118.64	86.56	FP-11	AW123	Systematic	20.2	21.0

Xcoord and Ycoord values are from the origin pin AU126
East and North are from each grid ID pin

OL1-12 Line Shack Surrounding Area



Attachment 6-9
E900-05-014

OL1-12 Fixed point Dimensions in METERS

X Coord	Y Coord	Label	Grid	Type	East	North
7.03	7.00	FP-1	AT122	Systematic	7.0	7.0
19.87	7.00	FP-2	AT121	Systematic	9.9	7.0
0.60	18.12	FP-3	AU122	Systematic	0.6	8.1
13.45	18.12	FP-4	AU121	Systematic	3.4	8.1
26.29	18.12	FP-5	AU120	Systematic	6.3	8.1
0.60	40.37	FP-6	AX122	Systematic	0.6	0.4
26.29	40.37	FP-7	AX120	Systematic	6.3	0.4
7.03	51.50	FP-8	AY122	Systematic	7.0	1.5
19.87	51.50	FP-9	AY121	Systematic	9.9	1.5
0.60	62.62	FP-10	AZ122	Systematic	0.6	2.6
13.45	62.62	FP-11	AZ121	Systematic	3.4	2.6
0.40	34.00	BP-01	AW122	Biased	0.4	4
15.00	45.00	BP-02	AX121	Biased	5	5
5.00	5.00	BP-03	AT122	Biased	5	5

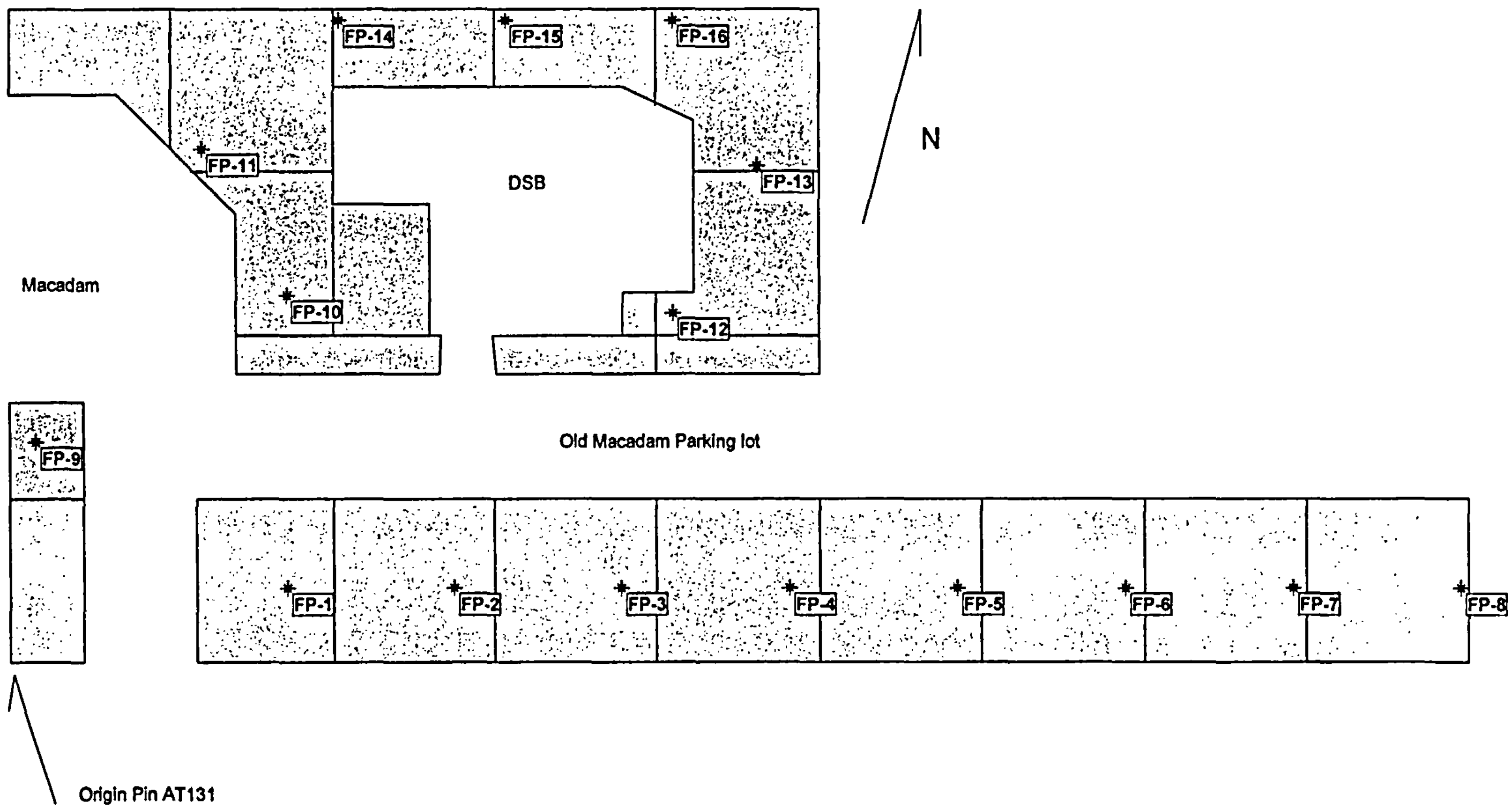
OL1-12 Fixed point Dimensions in FEET

X Coord	Y Coord	Label	Grid	Type	East	North
23.05	22.96	FP-1	AT122	Systematic	23.0	23.0
65.18	22.96	FP-2	AT121	Systematic	32.4	23.0
1.98	59.45	FP-3	AU122	Systematic	2.0	26.6
44.11	59.45	FP-4	AU121	Systematic	11.3	26.6
86.25	59.45	FP-5	AU120	Systematic	20.6	26.6
1.98	132.42	FP-6	AX122	Systematic	2.0	1.2
86.25	132.42	FP-7	AX120	Systematic	20.6	1.2
23.05	168.91	FP-8	AY122	Systematic	23.0	4.9
65.18	168.91	FP-9	AY121	Systematic	32.4	4.9
1.98	205.40	FP-10	AZ122	Systematic	2.0	8.6
44.11	205.40	FP-11	AZ121	Systematic	11.3	8.6
1.31	111.52	BP-01	AW122	Biased	1.3	13.1
49.20	147.60	BP-02	AX121	Biased	16.4	16.4
16.40	16.40	BP-03	AT122	Biased	16.4	16.4

Xcoord and Ycoord values are from the origin pin AT122
East and North are from each grid ID pin

Attachment 6-11E900-05-014

OL1-13 South and West SNEC Yard Perimeter



OL1-13 Fixed point Dimensions in METERS

X Coord	Y Coord	Label	Grid	Type	East	North
17.10	4.53	FP-1	AT130	Systematic	7.1	4.5
27.44	4.53	FP-2	AT129	Systematic	7.4	4.5
37.78	4.53	FP-3	AT128	Systematic	7.8	4.5
48.12	4.53	FP-4	AT127	Systematic	8.1	4.5
58.46	4.53	FP-5	AT126	Systematic	8.5	4.5
68.80	4.53	FP-6	AT125	Systematic	8.8	4.5
79.14	4.53	FP-7	AT124	Systematic	9.1	4.5
89.48	4.53	FP-8	AT123	Systematic	9.5	4.5
1.59	13.48	FP-9	AU131	Systematic	1.6	3.5
17.10	22.43	FP-10	AV130	Systematic	7.1	2.4
11.93	31.39	FP-11	AW130	Systematic	1.9	1.4
41.04	21.37	FP-12	AV127	Systematic	1.0	1.4
46.21	30.32	FP-13	AW127	Systematic	6.2	0.3
20.36	39.28	FP-14	AW129	Systematic	0.4	9.3
30.70	39.28	FP-15	AW128	Systematic	0.7	9.3
41.04	39.28	FP-16	AW127	Systematic	1.0	9.3

OL1-13 Fixed point Dimensions in FEET

X Coord	Y Coord	Label	Grid	Type	East	North
56.09	14.84	FP-1	AT130	Systematic	23.3	14.8
90.00	14.84	FP-2	AT129	Systematic	24.4	14.8
123.92	14.84	FP-3	AT128	Systematic	25.5	14.8
157.83	14.84	FP-4	AT127	Systematic	26.6	14.8
191.75	14.84	FP-5	AT126	Systematic	27.7	14.8
225.66	14.84	FP-6	AT125	Systematic	28.9	14.8
259.58	14.84	FP-7	AT124	Systematic	30.0	14.8
293.49	14.84	FP-8	AT123	Systematic	31.1	14.8
5.21	44.22	FP-9	AU131	Systematic	5.2	11.4
56.09	73.59	FP-10	AV130	Systematic	23.3	8.0
39.13	102.96	FP-11	AW130	Systematic	6.3	4.6
134.60	70.09	FP-12	AV127	Systematic	3.4	4.5
151.56	99.46	FP-13	AW127	Systematic	20.4	1.1
66.77	128.83	FP-14	AW129	Systematic	1.2	30.4
100.68	128.83	FP-15	AW128	Systematic	2.3	30.4
134.60	128.83	FP-16	AW127	Systematic	3.4	30.4

Xcoord and Ycoord values are from the origin pin AT131
East and North are from each grid ID pin

Site Report

Site Summary

Site Name: SSGS and SNEC Open land

Planner(s): WJCooper

Contaminant Summary

NOTE: Surface soil DCGLw units are pCi/g.
Building surface DCGLw units are dpm/100 cm².

Contaminant	Type	DCGLw	Screening Value Used?	Area (m²)	Area Factor
Cs-137	Surface Soil	4.30	No	400	3
				100	3.6
				25	4.7
				1	28.7

Attachment 7-1 E900-05-014

Surface Soil Survey Plan

Contaminant Summary — SSGS and SNEC Open Land OL1

Contaminant	DCGLw (pCi/g)	Inferred Contaminant	Ratio	Modified DCGLw (pCi/g)	Scan MDC (pCi/g)
Cs-137	4.30	N/A	N/A	N/A	6.2

Contaminant	Survey Unit Estimate (Mean ± 1-Sigma) (pCi/g)	Reference Area Estimate (Mean ± 1-Sigma) (pCi/g)
Cs-137	0.32 ± 0.3	N/A

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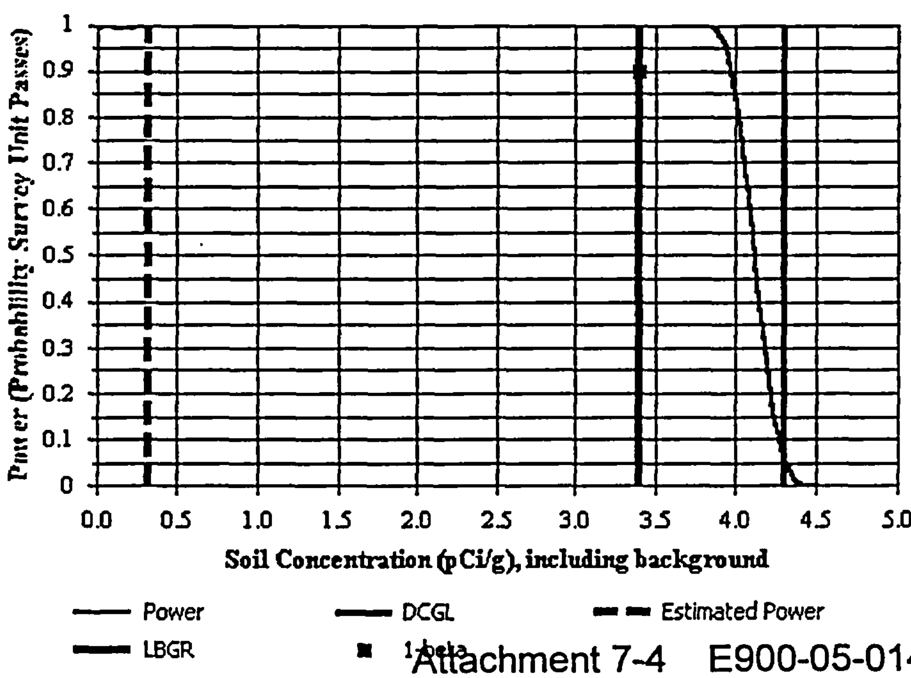
Surface Soil Survey Plan

Survey Plan Summary

Site:	SSGS and SNEC Open land		
Planner(s):	WJCooper		
Survey Unit Name:	Open Land ARea CV OL1-9		
Comments:			
Area (m²):	~~1,500~~ 1290 4/13/05	Classification:	1
Selected Test:	Sign	Estimated Sigma (pCi/g):	0.3
DCGL (pCi/g):	4.30	Sample Size (N):	11
LBGR (pCi/g):	3.4	Estimated Conc. (pCi/g):	0.3
Alpha:	0.050	Estimated Power:	1
Beta:	0.100	EMC Sample Size (N):	11
Scanning Instrumentation:	NaI		

Prospective Power Curve



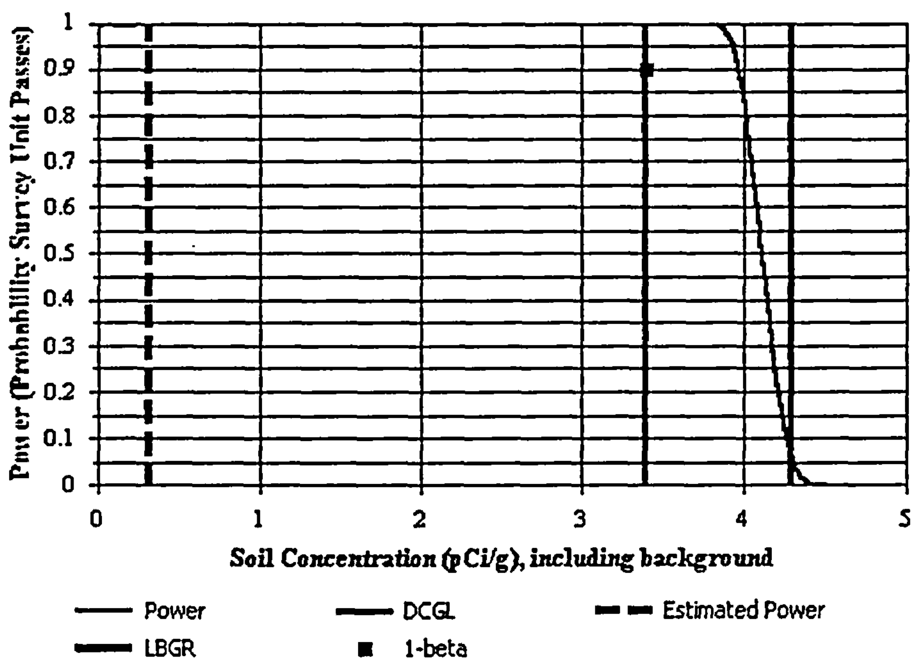
Attachment 7-4 E900-05-014

Surface Soil Survey Plan

Survey Plan Summary

Site:	SSGS and SNEC Open land		
Planner(s):	WJCooper		
Survey Unit Name:	SNEC Yard Excavation After Backfill OL1-10		
Comments:			
Area (m^2):	1,200	Classification:	1
Selected Test:	Sign	Estimated Sigma (pCi/g):	0.3
DCGL (pCi/g):	4.30	Sample Size (N):	11
LBGR (pCi/g):	3.4	Estimated Conc. (pCi/g):	0.3
Alpha:	0.050	Estimated Power:	1
Beta:	0.100	EMC Sample Size (N):	11
Scanning Instrumentation:	NaI		

Prospective Power Curve



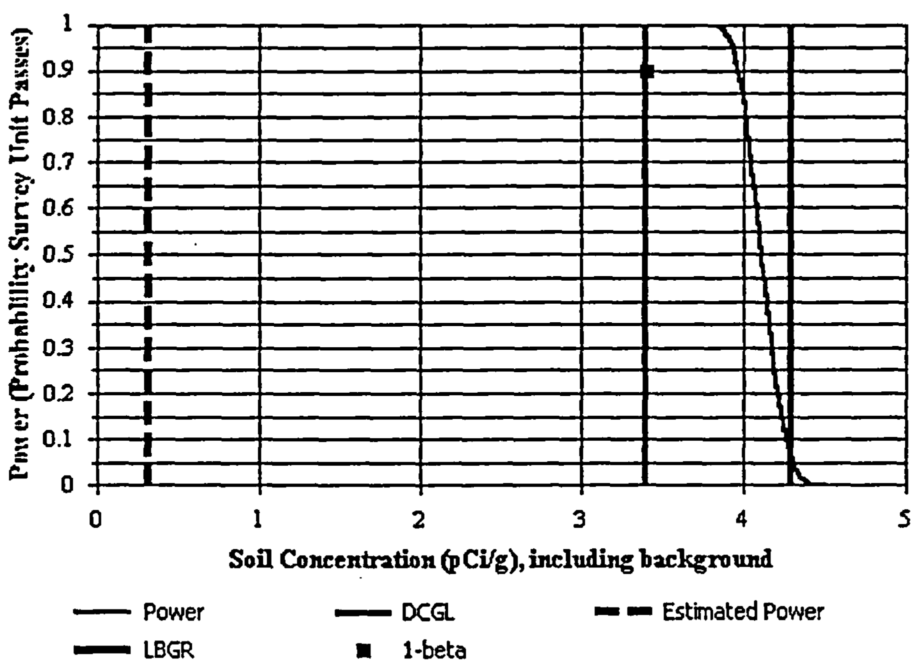
Attachment 7-5 E900-05-014

Surface Soil Survey Plan

Survey Plan Summary

Site:	SSGS and SNEC Open land		
Planner(s):	WJCooper		
Survey Unit Name:	Barrrel Bunker Area OL1-11		
Comments:			
Area (m²):	~~1,500~~ 1200 WJC 4/11/05	Classification:	1
Selected Test:	Sign	Estimated Sigma (pCi/g):	0.3
DCGL (pCi/g):	4.30	Sample Size (N):	11
LBGR (pCi/g):	3.4	Estimated Conc. (pCi/g):	0.3
Alpha:	0.050	Estimated Power:	1
Beta:	0.100	EMC Sample Size (N):	11
Scanning Instrumentation:	NaI		

Prospective Power Curve



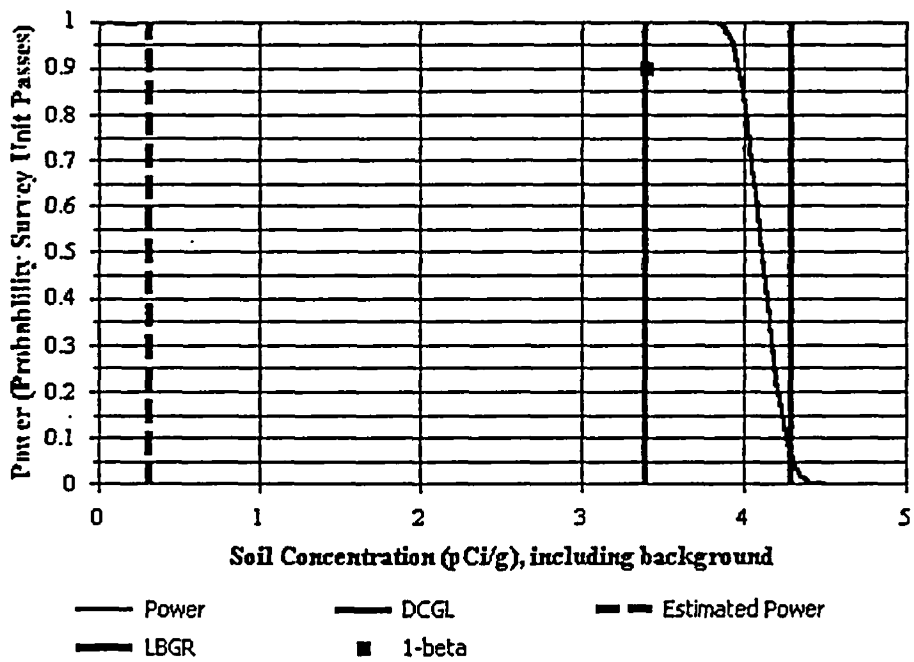
Attachment 7-6 E900-05-014

Surface Soil Survey Plan

Survey Plan Summary

Site:	SSGS and SNEC Open land		
Planner(s):	WJCooper		
Survey Unit Name:	Line Shack Surrounding Area OL1-12		
Comments:	Not including line shack and ramp		
Area (m²):	~~4,550~~ 1575 (handwritten initials, 4/11/05)	Classification:	1
Selected Test:	Sign	Estimated Sigma (pCi/g):	0.3
DCGL (pCi/g):	4.30	Sample Size (N):	11
LBGR (pCi/g):	3.4	Estimated Conc. (pCi/g):	0.3
Alpha:	0.050	Estimated Power:	1
Beta:	0.100	EMC Sample Size (N):	11
Scanning Instrumentation:	NaI		

Prospective Power Curve



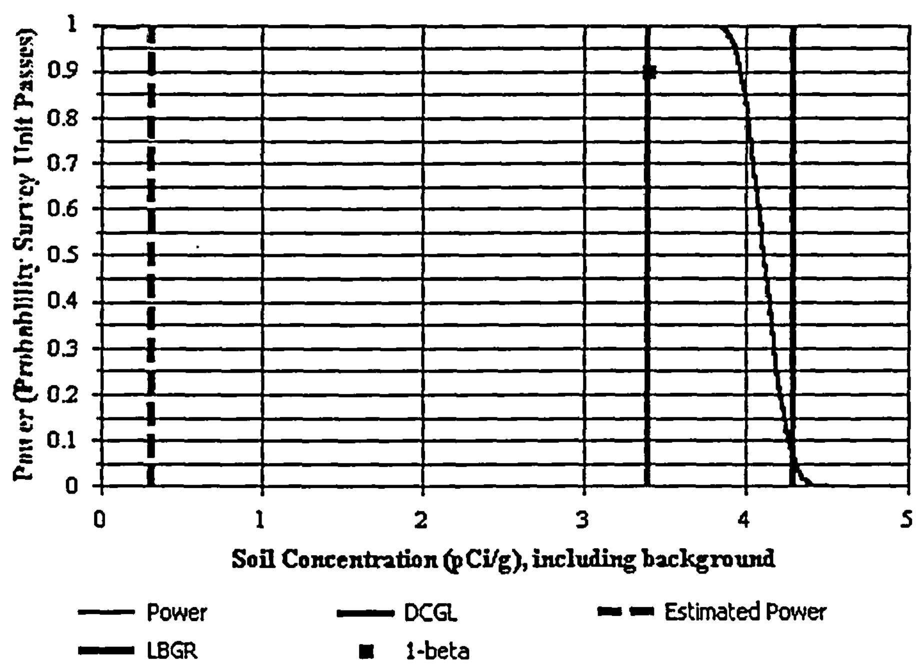
Attachment 7-7 E900-05-014

Surface Soil Survey Plan

Survey Plan Summary

Site:	SSGS and SNEC Open land		
Planner(s):	WJCooper		
Survey Unit Name:	South and West SNEC Yard Perimeter OL1-13		
Comments:			
Area (m²):	~~1,300~~ 1480 7/4/11/05	Classification:	1
Selected Test:	Sign	Estimated Sigma (pCi/g):	0.3
DCGL (pCi/g):	4.30	Sample Size (N):	11
LBGR (pCi/g):	3.4	Estimated Conc. (pCi/g):	0.3
Alpha:	0.050	Estimated Power:	1
Beta:	0.100	EMC Sample Size (N):	11
Scanning Instrumentation:	NaI		

Prospective Power Curve



Attachment 7-8 E900-05-014

Recent OL1 Soil Sample Results

Grid	Cs137 pCi/gm	Date
Mean	0.32	2/14/05
Std Dev	0.30	
AT125	0.13	12/14/2004
AT125	0.27	12/14/2004
AT124	0.3	12/13/2004
AT124	0.42	12/13/2004
AT123	0.82	12/13/2004
AT123	0.8	12/13/2004
AT122	0.07	12/14/2004
AT122	0.1	12/14/2004
AU125	0.13	12/14/2004
AU125	0.14	12/14/2004
AU124	0.4	12/14/2004
AU124	0.4	12/14/2004
AU123	0.3	12/14/2004
AU123	0.5	12/14/2004
AU122	0.34	12/14/2004
AU122	0.84	12/14/2004
AV122	0.55	12/13/2004
AV122	0.16	12/13/2004
AW123	0.13	12/14/2004
AW123	0.16	12/14/2004
AW123	0.13	12/14/2004
AW122	0.9	12/13/2004
AW120	0.33	1/26/2005
AX131	0.15	9/21/2004
AX131	0.13	9/21/2004
AX130	0.3	4/22/2004
AX130	0.13	4/22/2004
AX130	0.15	4/22/2004
AX130	0.3	4/22/2004
AX130	0.1	4/22/2004
AX129	0.4	4/22/2004
AX129	0.08	4/27/2004
AX129	0.1	4/27/2004
AX129	0.35	4/27/2004
AX128	0.08	4/26/2004
AX128	0.2	4/26/2004
AX128	0.08	4/26/2004
AX128	0.17	4/26/2004
Ax126	0.56	1/5/2005
Ax126	0.09	1/5/2005
AX124	0.06	1/4/2005
AX124	0.06	1/4/2005
AZ122	0.22	10/20/2004
AZ122	0.2	10/20/2004
AZ122	0.36	1/12/2005

Attachment 8-1
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Grid	^{137}Cs pCi/gm	Date 5/14/05	
AZ122	0.24	1/12/2005	Recent OL1 soil results (con't)
AZ122	0.13	1/12/2005	
AZ122	0.34	1/12/2005	
AZ122	0.2	1/12/2005	
AZ121	0.5	10/20/2004	
AZ121	0.15	10/20/2004	
AZ121	0.28	1/12/2005	
AZ121	0.1	1/12/2005	
AZ121	0.08	1/12/2005	
AZ121	0.08	1/12/2005	
AZ121	0.09	1/12/2005	
AU121	0.15	1/26/2005	
AU121	0.6	1/26/2005	
AT121	0.24	1/26/2005	
AT121	0.15	1/26/2005	
AU120	0.4	1/26/2005	
AU120	0.23	1/26/2005	
AV121	0.66	1/26/2005	
AV121	1.8	1/26/2005	
AV120	0.66	1/26/2005	
AV120	0.3	1/26/2005	
AW121	1	1/26/2005	
AW121	0.9	1/26/2005	
AW120	0.14	1/26/2005	

Attachment 8-2
E900-05-014

Location	Date	time		cpm	count time 5/4/05
7 EYENORTH	3/8/05	14:31	4	123	60 SCL
8 EYEWEST	3/8/05	14:33	4	176	60 SCL
9 EYESOUTH	3/8/05	14:35	4	179	60 SCL
10 EYEEAST	3/8/05	14:37	4	141	60 SCL
11 FENCEEAST	3/8/05	14:38	4	144	60 SCL
12 FENCENORTH	3/8/05	14:41	4	150	60 SCL
13 LSHAKSOUTH	3/8/05	14:49	4	100	60 SCL
14 LSHAKEAST	3/8/05	14:52	4	110	60 SCL
15 LSHAKNORTH	3/8/05	14:53	4	90	60 SCL
16 LSHAK[illegible] WEST	3/8/05	14:55	4	135	60 SCL
17 SSGSNORTH	3/8/05	15:04	4	154	60 SCL
18 SSGSWEST	3/8/05	15:07	4	207	60 SCL
19 SSGSSOUTH	3/8/05	15:09	4	137	60 SCL
20 SSGSEAST	3/8/05	15:10	4	174	60 SCL

ORIGINAL

Exhibit 1
Survey Unit Inspection Check Sheet

SECTION 1 - SURVEY UNIT INSPECTION DESCRIPTION

Survey Unit #	OL-1 (Land)	Survey Unit Location	CV & SSGS Footprints / CV Yard
Date 4-18-05	Time 1500	Inspection Team Members	R. Shepherd

SECTION 2 - SURVEY UNIT INSPECTION SCOPE

Inspection Requirements (Check the appropriate Yes/No answer.)	Yes	No	N/A
1. Have sufficient surveys (i.e., post remediation, characterization, etc.) been obtained for the survey unit?	X		
2. Do the surveys (from Question 1) demonstrate that the survey unit will most likely pass the FSS?	X		
3. Is the physical work (i.e., remediation & housekeeping) in or around the survey unit complete?		X	
4. Have all tools, non-permanent equipment, and material not needed to perform the FSS been removed?		X	
5. Are the survey surfaces relatively free of loose debris (i.e., dirt, concrete dust, metal filings, etc.)?			X
6. Are the survey surfaces relatively free of liquids (i.e., water, moisture, oil, etc.)?	X		
7. Are the survey surfaces free of all paint, which has the potential to shield radiation?			X
8. Have the Surface Measurement Test Areas (SMTA) been established? (Refer to Exhibit 2 for instructions.)			X
9. Have the Surface Measurement Test Areas (SMTA) data been collected? (Refer to Exhibit 2 for instructions.)			X
10. Are the survey surfaces easily accessible? (No scaffolding, high reach, etc. is needed to perform the FSS)	X		
11. Is lighting adequate to perform the FSS?			X
12. Is the area industrially safe to perform the FSS? (Evaluate potential fall & trip hazards, confined spaces, etc.)	X		
13. Have photographs been taken showing the overall condition of the area?	X		
14. Have all unsatisfactory conditions been resolved?		X	

NOTE: If a "No" answer is obtained above, the inspector should immediately correct the problem or initiate corrective actions through the responsible site department, as applicable. Document actions taken and/or justifications in the "Comments" section below. Attach additional sheets as necessary.

Comments:

Items # 3 and 4 - Shonka surveyed dirt piles cover the majority of the CV and SSGS footprint areas; also there are materials, tools and equipment stored within the survey unit south of the SSGS and line building that will require relocation. Lou Shamenek notified.

Item # 12 - Several grids and grid portions are located inside the switchyard fence presenting potential electrical hazard.

Item # 13 - Photographs of the survey unit were taken to show present existing conditions.

Attachment 9-1
E900-05-014

Survey Unit Inspector (print/sign)	R. Shepherd [signature]	Date	4/19/05
Survey Designer (print/sign)	W. Cooper [signature]	Date	4/20/05