Appendix C-1 (pages 1-10)

FirstEnergy GPU

SNEC CALCULATION COVER SHEET

CALCULATION DESCRIPTION

Calculation Number	Revision Number	Effective Date	Page Number
E900-05-003	0	3/14/05	1 of 10

Subject

PENELEC Switch Yard, Class 2 Area – 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	B. Brosey/ B. Brosey	Date	2/9/05
Technical Reviewer	R. Holmes/ R.O. Holmes	Date	3/10/05
Additional Review	A. Paynter/	Date	11 March 2005
Additional Review		Date	

1.0 PURPOSE

1.1 The purpose of this calculation is to develop a survey design for the PENELEC Switch Yard area located between site grid pin marker No. 131 and No. 137 on the SNEC site area grid map. This section of the Switch Yard is shown on **Attachment 1-1,** and is composed of a Class 2 open land area, Class 3 unpainted concrete structures, hazardous equipment and other metallic support structures that will not be surveyed. The following designations apply:

1.1.1 PS3b-1 – (Class 3) Unpainted Concrete Structures = ~ 414 m^2 (does not include all concrete equipment supports, vertical sides of concrete pedestals, or other concrete structures north of the cut-off line shown on **Attachment 1-1**). It does however, include the side walk located in grids BB-136 to BD-136.

1.1.2 PS4-2 – (Class 2) Open Land Area = < 3,600 m^2

1.2 The PENELEC Switch Yard is an operational electrical distribution facility. The western portion of the Switch Yard (west of grid line 131), lies mainly in site area ***OL8***. Transformers, switching devices and cabling carry extremely dangerous levels of electricity up to ***~115,000 volts***. Therefore, SNEC management has designated only select items/areas to be the subject of a Final Status Survey. A detailed justification and basic safety considerations for a limited survey approach is provided in **Attachment 2-1**. Accordingly, the following items/areas ***will not*** be surveyed under this survey design:

1.2.1 Steel support structures, light poles or any other metallic structure or component,

1.2.2 Soil sampling, and scanning will not be performed in areas near equipment designated by SNEC management as a "HAZARD AREA" (see **Attachment 2-1**).

1.2.3 Soil sampling below the yard grounding mat will not be performed. The grounding mat is at a depth of approximately 16".

2.0 SUMMARY OF RESULTS

The following information should be used to develop a survey request for these survey units.

2.1 The effective DCGLw values are listed below. The US NRC has reviewed and concurred with the methodology used to derive these values. See **Reference 3.1**.

Table 1, DCGLw Values

Gross Activity DCGLw (dpm/100 cm^2)	Volumetric DCGLw (pCi/g – Cs-137)
44,317 (33,238 A.L.)	5.75 (4.31 A.L.)

NOTE 1: A.L. is the site Administrative Limit (75% of effective DCGLw)

NOTE 2: Decay date is December 15, 2004

2.2 Soil Survey Design – PS4-2

2.2.1 Scanning of soil (and gravel materials) shall be performed using a ***2" D by 2" L NaI detector*** with a Cs-137 window setting. The window will straddle the Cs-137 662 keV full energy peak width. The instrument conversion factor shall not be less than the lowest value reported on **Attachment 3-1** (***209 cpm/uR/h – Cs-137***).

2.2.2 The MDCscan is determined using the MicroShield model **Reference 3.1**. Initial MDCscan calculations for soil are also shown in **Reference 3.1**.

Table 2, Soil Scanning Parameters

MDCscan (pCi/g) – Cs-137	Scan Speed (cm/sec)	Maximum Distance from Surface	% Coverage*
3.2	25	4" (gap between detector face & soil surface)	100%

NOTE: See Reference 3.1 for calculation of MDCscan value for soils in the Switch Yard area.

*Except in "Hazard Area" designations (see Attachment 2-1).

2.2.3 Soil should be scanned using a serpentine pattern that is ~0.5 meters wide.

2.2.4 Background has been measured in the Switch Yard area and ranges from about 100 cpm to 200 cpm (see **Reference 3.2**). If a ***count rate*** of greater than ***300 gross cpm*** 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. ***Sample the elevated areas(s)*** IAW SNEC procedure E900-IMP-4520.04 (**Reference 3.3**).

2.2.5 Sampling points are to be ***clearly marked, identified*** and ***documented***.

2.2.6 All survey personnel shall be trained to identify ***300 gross cpm*** based on the audible instrument response.

2.2.7 Other instruments of the type specified in Section 2.2.1 above may be used during the FSS, but they must demonstrate a detection efficiency at or above the value listed in Section 2.2.2.

2.2.8 The minimum number of sampling points indicated by the Compass computer program for this survey unit (**Reference 3.4**) is ***14*** (see Compass output - **Attachment 4-1** to **4-3**). Sampling depth should not be more than the top ~16 inches (40 cm) of soil in most areas, and not be deeper than the grounding mat. When sampling in an area where more recent crushed stone has been applied, collect two (2) samples per location whenever possible. One (1) from the new upper layer and one (1) from the older lower materials.

2.2.9 VSP (**Reference 3.5**) 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

2.2.10 The starting points for physically locating sampling sites are based on measurements from a local landmark (as noted on **Attachment 1-5**). Some sampling points may need to be adjusted to accommodate obstructions/hazards within the survey area. Contact the SR coordinator to report any difficulties encountered when laying out systematic grid sampling points (see also Section 1.2).

2.2.11 When an obstruction/hazard 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.

2.3 Unpainted Concrete Surfaces – PS3b-1

2.3.1 There are numerous Class 3 structures in the western Switch Yard area. These are shown on **Attachment 1-1**. Static measurement point locations (from Compass – **Reference 3.4**) are shown on **Attachment 1-3**. In addition, there are numerous other unpainted concrete structures in the Switch Yard.

2.3.2 All concrete surfaces shall be scanned with a GFPC survey instrument. The detection efficiency for Cs-137 beta radiation shall be no less than 23.9% (ε_t).

2.3.3 The fraction of Cs-137 in this sample mix is presented on below in Table 3 as 0.599. A mean efficiency loss factor for weathered concrete is determined from **Reference 3.1** to be approximately 0.285 (based on area inspection results shown in **Reference 3.1**. This value will be used for unpainted concrete surfaces, and yields the following detection efficiency factors.

Table 3, GFPC Detection Efficiency Data

ε_i	ε_s	% Cs-137	Efficiency Loss Factor	counts/disintegration
0.478	0.5	59.9	0.285	0.041

Data from Reference 3.1.

2.3.4 The calculated MDCscan results are shown below for both unpainted concrete materials.

Table 4, GFPC MDCscan Data

Material Type	MDCscan (dpm/100 cm²)*	Minimum No. of Static Points	Action Level Assigned During Phase 1 Scanning
Unpainted Concrete	3,306	11*	1000 gross cpm (Class 3)

*As calculated by the Compass computer program (Reference 3.4). See Reference 3.1.

2.3.5 Class 3 coverage is typically judgmental up to 10% IAW **Reference 3.6**. However, since personnel safety issues in this area are of paramount importance, there is a significant amount of surface area in the Switch Yard that will not be surveyed. Therefore, at a minimum, the horizontal concrete surface area (the highlighted regions shown on **Attachment 1-2**) should be surveyed at 100% coverage.

NOTE

If the action level for the Class 3 area (unpainted concrete) is exceeded, the survey unit should be re-classified and re-surveyed IAW **Reference 3.6**, Table 5-7. To ensure that an elevated count rate is the result of Cs-137 contamination, sample any concrete surface location above the action level and gamma scan the sampled materials.

2.3.6 Sampling Concrete Surfaces

2.3.7.1 Sample any location that is above the action level cited is Section 2.3.4 above. Remove the first 1" of concrete to yield a volume of at least 200 cc to ensure an adequate counting MDA for Cs-137.

3.0 REFERENCES

3.1 SNEC Calculation No. E900-05-002, PENELEC Switch Yard, Class 1 Area – Survey Design.

3.2 SR-1233, PENELEC Switch Yard, Trench & Sumps & Yard Soil Survey Results, 12/22/04.

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

3.4 Compass Computer Program, Version 1.0.0, Oak Ridge Institute for Science and Education.

3.5 Visual Sample Plan, Version 2.0 (or greater), Copyright 2002, Battelle Memorial Institute.

3.6 SNEC Facility License Termination Plan.

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

3.8 GPU Nuclear, SNEC Facility, "Site Area Grid Map", SNECRM-020, Sheet 1, Rev 2, 1/29/03.

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

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

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

3.12 Microsoft Excel 97, Microsoft Corporation Inc., SR-2, 1985-1997.

3.13 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.

3.14 SNEC Calculation No. 6900-02-028, GFPC Instrument Efficiency Loss Study.

3.15 ISO 7503-1, Evaluation of Surface Contamination, Part 1: Beta-emitters (maximum beta energy greater than 0.15 MeV) and alpha-emitters, 1988.

4.0 ASSUMPTIONS AND BASIC DATA

4.1 The Compass computer program is used to calculate the required number of random start systematic samples/measurements to be taken in these survey units (**Reference 3.4**).

4.2 Soil and sediment samples from the Switch Yard area are used as the initial estimate of variability for the area. These results are shown in **Reference 3.1**.

4.3 Using the GFPC values shown in Table 3, the estimated MDCscan values for concrete are shown in Table 4. Both of these calculated values depend on backgrounds for like materials as shown in **Reference 3.1**.

4.4 Switch Yard concrete variability measurements are shown in **Reference 3.1**.

4.5 The MARSSIM Sign Test will be applicable for the soil survey design. No background subtraction will be performed under this criteria during the DQA phase. Concrete surface area survey design requires the WRS testing criteria.

4.6 Compass output for unpainted concrete base structures is shown on **Attachment 5-1** to **5-3**.

4.7 The number of points chosen by Compass are located on the survey map for the survey unit by the Visual Sample Plan (VSP) computer code (**Reference 3.5**).

4.8 **Reference 3.6** was used as guidance during the survey design development phase.

4.9 The site area drawing used to determine the physical extent of this area is listed as **Reference 3.7**.

4.10 Remediation History

No remediation has been performed in these survey areas.

4.11 The soil survey design uses Cs-137 as a surrogate to bound the average concentration for all SNEC facility related radionuclides in the survey unit. The effective DCGLw is just the permitted Cs-137 concentration (6.6 pCi/g) 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 DCGLw for this radionuclide.

The western portion of the PENELEC Switch Yard is adjacent to the OL2 area, but resides mainly in the OL8 site area. The sample mix is assumed to be the same as that currently assigned to the OL1 and OL2 area (CV yard). The sample list was decayed to December 15th, 2004. In all, twenty three (23) sample results were used to determine the best representative mix.

4.12 The sample database used to determine the effective radionuclide mix has been drawn from previous samples that were assayed at off-site laboratories. This list is shown in **Reference 3.1**, and includes (23) analysis results. Review of the data shows several radionuclides have not been positively identified at any significant concentration. These radionuclides have been removed from the data set and will not be considered further. Radionuclides removed include Am-241, C-14, Eu-152, Ni-63, Pu-238, Pu-239 and Pu-41. Additionally, the data shows Cs-137 to be the predominant radioactive contaminant found in the area. Sr-90 on the other hand, was positively identified in only one (1) sample. H-3 was

identified as a positive contaminant in six (6) samples, and Co-60 was identified in three (3) samples.

The decayed sample results were input to the spreadsheet titled "Effective DCGL Calculator for Cs-137" (**Reference 3-9**) to determine both the effective volumetric DCGLw and gross activity DCGLw values for this area. The output of this spreadsheet is shown in **Reference 3.1**.

The NaI 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 209 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 cpm to ~200 cpm. The resulting MDCscan is ~3.2 pCi/g (see **Reference 3.1**).

4.13 The survey units described in this survey design were inspected by SNEC personnel. A copy of portions of the SNEC facility inspection report (**Reference 3.10**), is included in **Reference 3.1**.

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) are not included in this survey design.

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.

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

4.20 Area factors applicable in the soil survey unit are provided on **Attachment 4-1**. Area factors are not applicable in Class 3 areas.

5.0 CALCULATIONS

5.1 All calculations are performed internal to applicable computer codes or within an Excel spreadsheet.

6.0 APPENDICES

6.1 **Attachment 1-1**, is a diagram of the western portion of the PENELEC Switch yard area.

6.2 **Attachment 1-2**, is the VSP diagram of the Class 3 concrete survey areas.

6.3 **Attachment 1-3**, is the VSP diagram of the Class 2 soil survey area.

6.4 **Attachment 1-4**, is a drawing of the Class 3 concrete survey area showing the VSP placed static measurement points with dimensions from a local landmark.

6.5 **Attachment 1-5**, is a drawing of the Class 2 soil survey area with the static sampling points placed by VSP with dimensions from a local landmark.

6.6 **Attachment 2-1**, is the justification for a limited survey of the Switch Yard and some basic safety concerns for this area.

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

6.8 **Attachment 4-1** to **4-3**, is the Compass output for the soil within the Class 2 area of the Switch Yard.

6.9 **Attachment 5-1** to **5-2**, is the Compass output for Class 3 concrete within the survey area.

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).

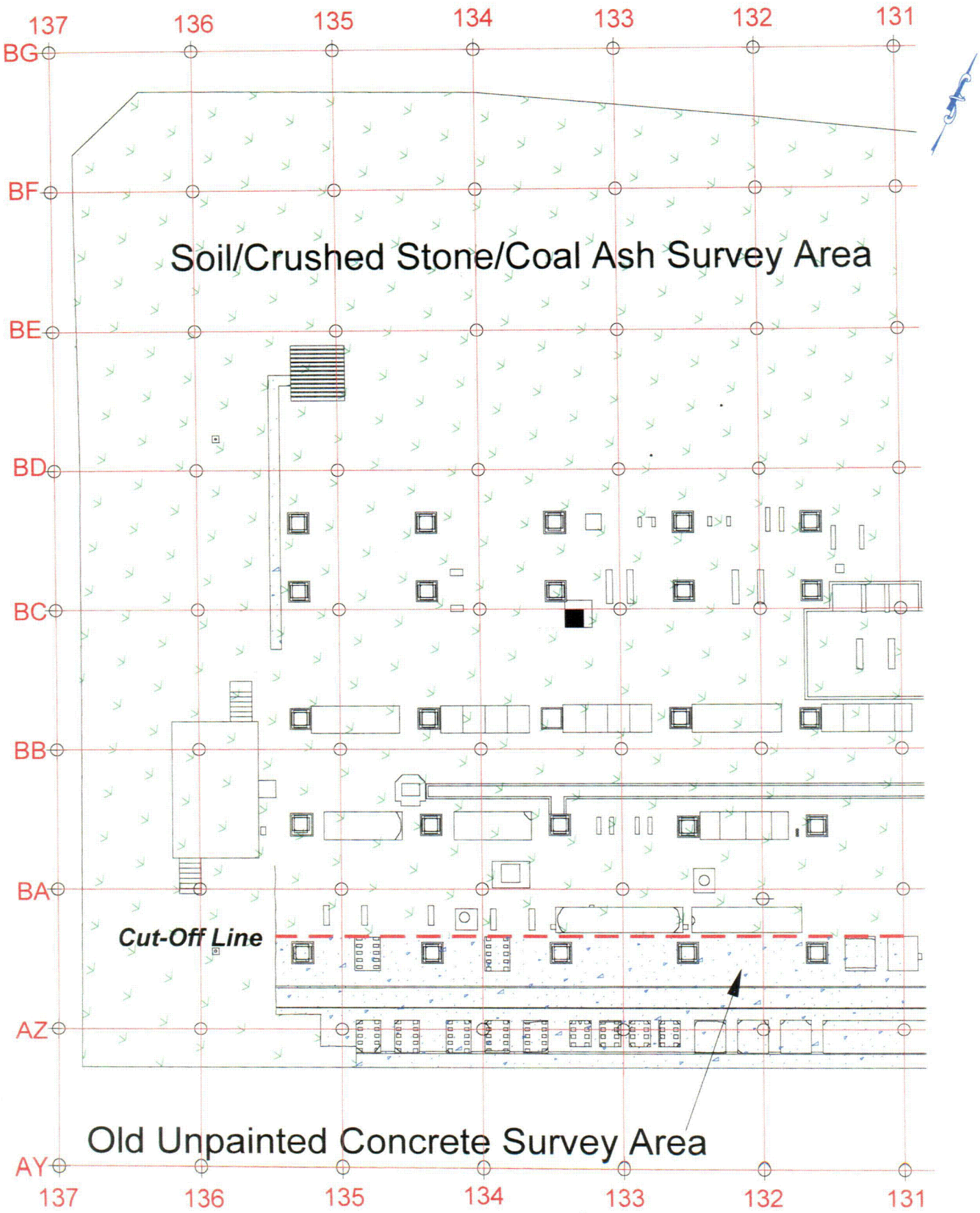
Exhibit 2
Survey Design Checklist

Calculation No. E900-05-002	Location Codes PS3-1, PS3-2, PS4-1 (PENLEC Switch Yard)		
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	3/10/05
2	Are drawings/diagrams adequate for the subject area (drawings should have compass headings)?	(Yes) N/A	3/10/05
3	Are boundaries properly identified and is the survey area classification clearly indicated?	(Yes) N/A	3/10/05
4	Has the survey area(s) been properly divided into survey units IAW EXHIBIT 10	(Yes) N/A	3/10/05
5	Are physical characteristics of the area/location or system documented?	(Yes) N/A	3/10/05
6	Is a remediation effectiveness discussion included?	Yes, (N/A)	3/10/05
7	Have characterization survey and/or sampling results been converted to units that are comparable to applicable DCGL values?	(Yes) N/A	3/10/05
8	Is survey and/or sampling data that was used for determining survey unit variance included?	(Yes) N/A	3/10/05
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	3/10/05
10	Are applicable survey and/or sampling data that was used to determine variability included?	(Yes) N/A	3/10/05
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	3/10/05
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)	3/10/05
13	Are all necessary supporting calculations and/or site procedures referenced or included?	(Yes) N/A	3/10/05
14	Has an effective DCGLw been identified for the survey unit(s)?	(Yes) N/A	3/10/05
15	Was the appropriate $DCGL_{EMC}$ included in the survey design calculation?	(Yes) N/A	3/10/05
16	Has the statistical tests that will be used to evaluate the data been identified?	(Yes) N/A	3/10/05
17	Has an elevated measurement comparison been performed (Class 1 Area)?	Yes, (N/A)	3/10/05
18	Has the decision error levels been identified and are the necessary justifications provided?	(Yes) N/A	3/10/05
19	Has scan instrumentation been identified along with the assigned scanning methodology?	(Yes) N/A	3/10/05
20	Has the scan rate been identified, and is the MDCscan adequate for the survey design?	(Yes) N/A	3/10/05
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)	3/10/05
22	Is survey instrumentation calibration data included and are detection sensitivities adequate?	(Yes) N/A	3/10/05
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	3/10/05
24	Are investigation levels and administrative limits adequate, and are any associated actions clearly indicated?	(Yes) N/A	3/10/05
25	For sample analysis, have the required MDA values been determined.?	Yes, (N/A)	3/10/05
26	Has any special sampling methodology been identified other than provided in Reference 6.3?	Yes, (N/A)	3/10/05

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

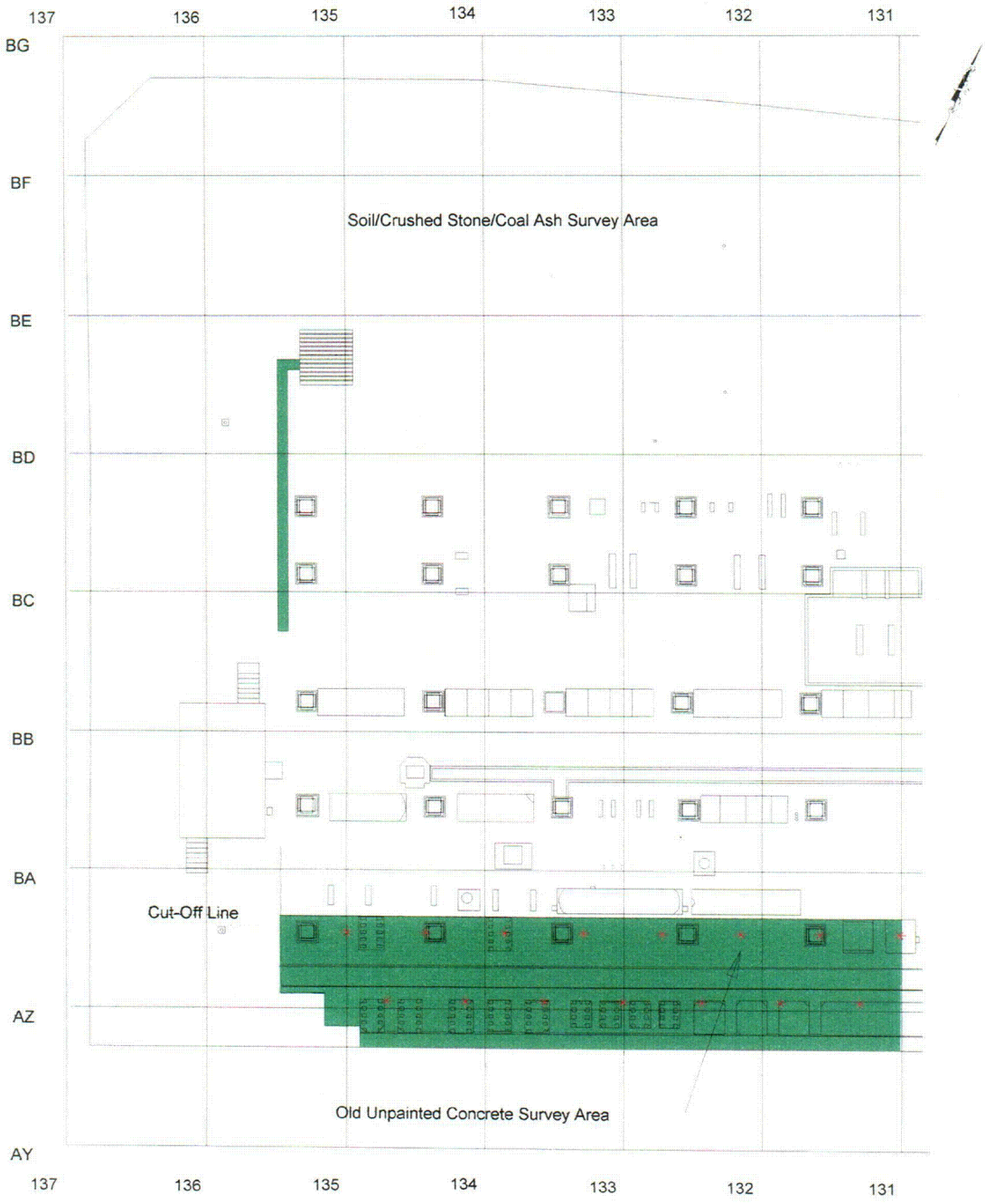
Appendix C-1 (attachment 1-1 to 2-1)

PENELEC Switch Yard Class 2 Area - In OL8 Area



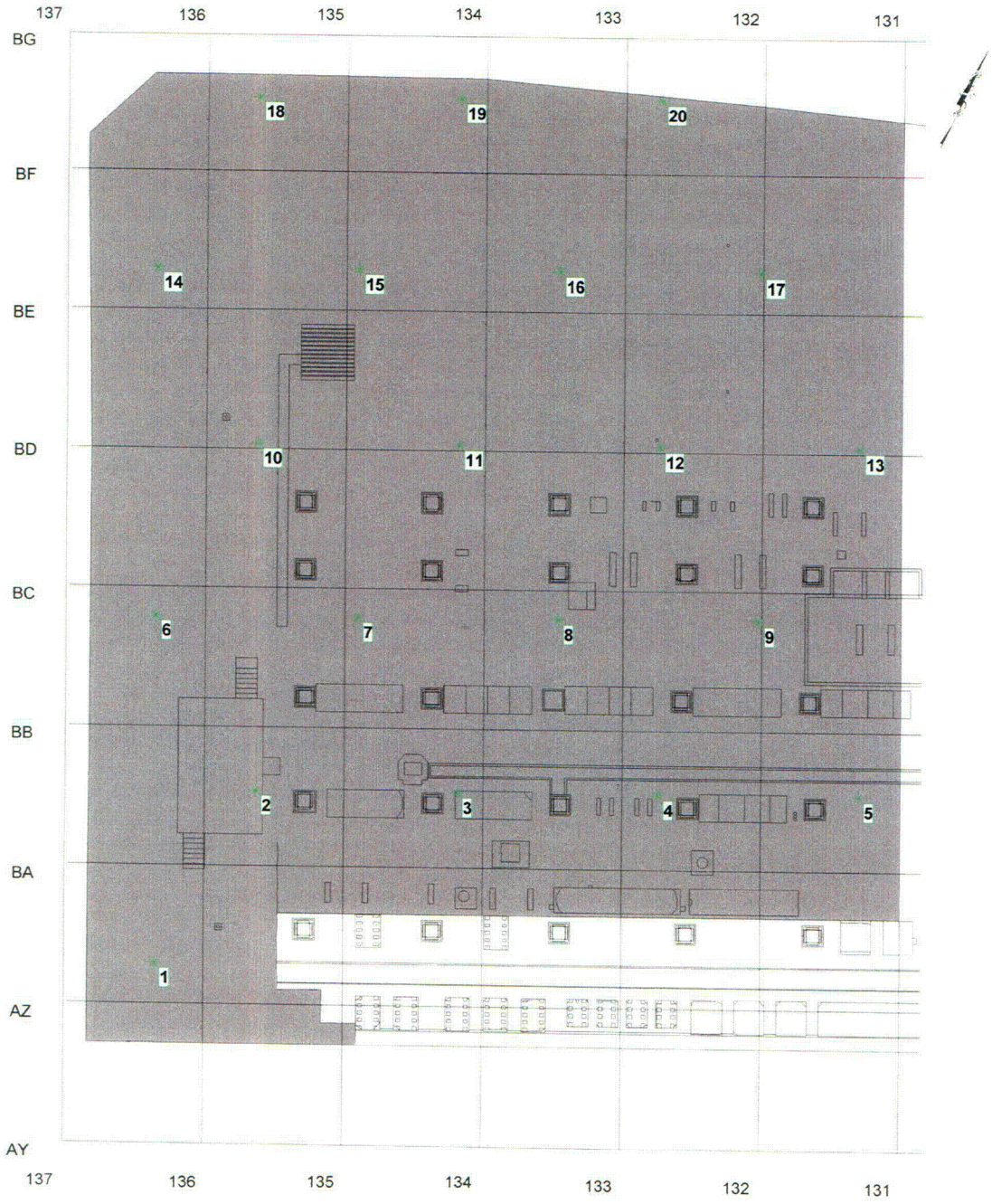
ATTACHMENT 1 - 1

C01



ATTACHMENT 1 . 2

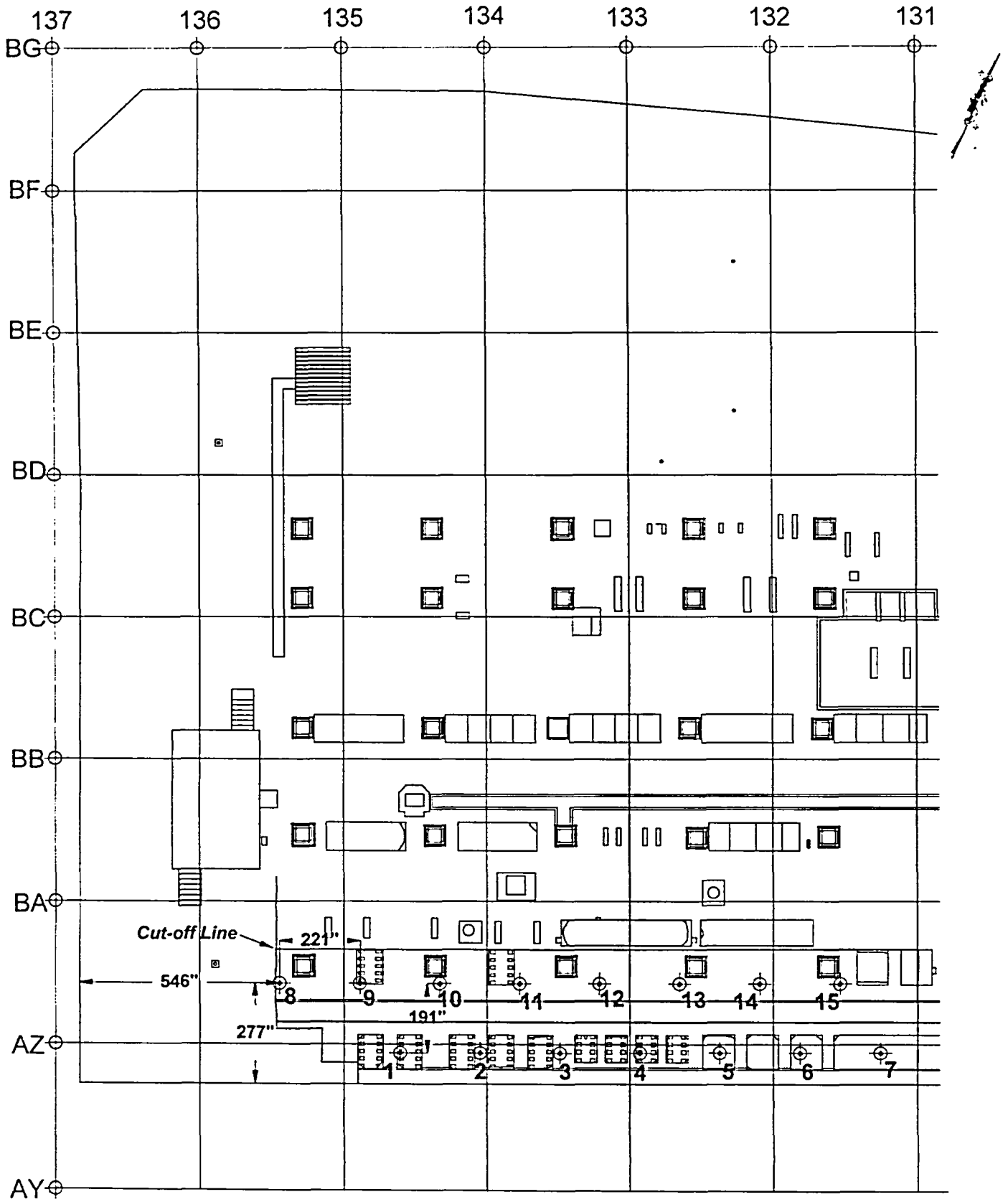
C02



ATTACHMENT 1 . 3

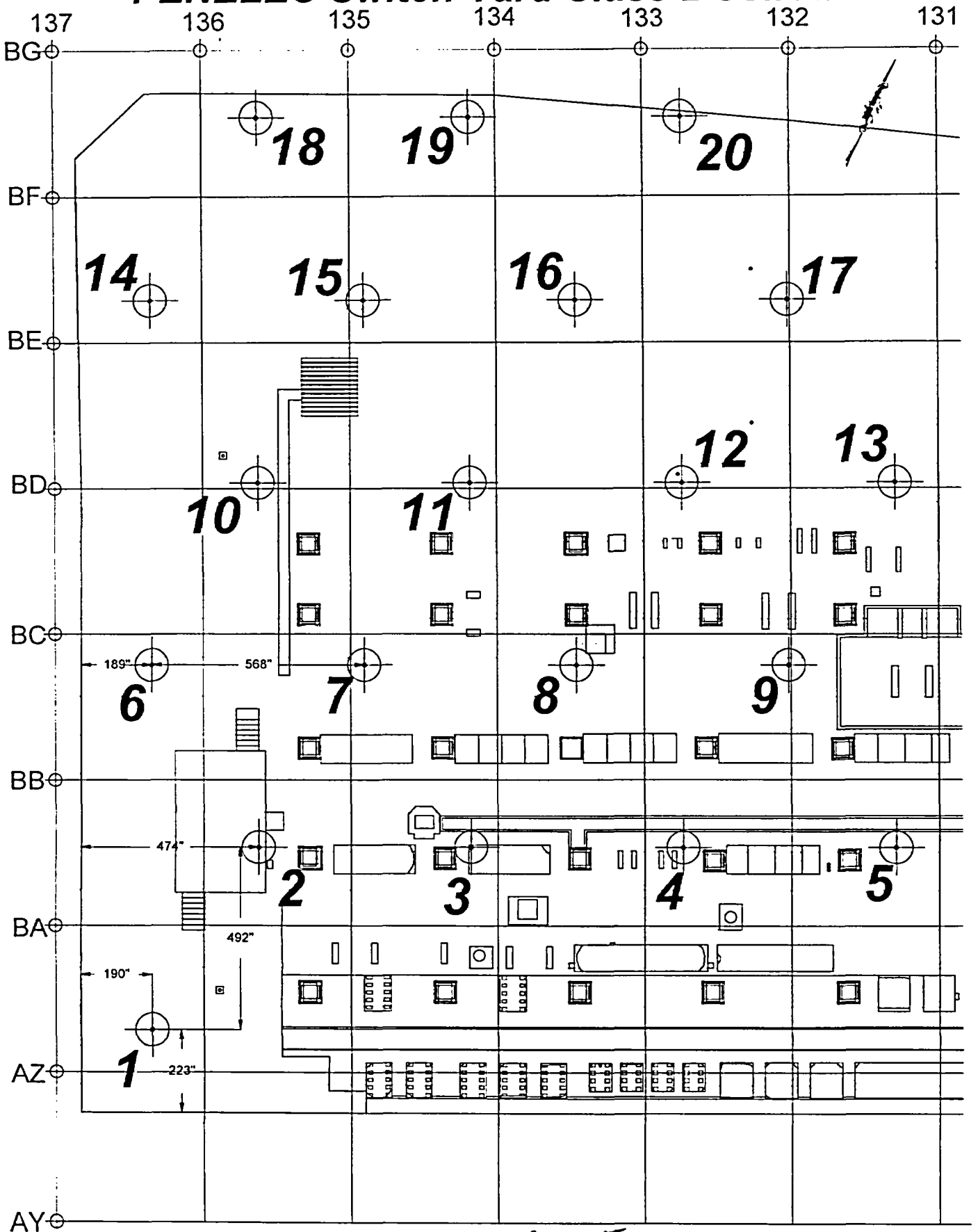
C03

PENELEC Switch Yard Class 3 Unpainted Concrete



ATTACHMENT 1 - 4

PENELEC Switch Yard Class 2 Soil Area



ATTACHMENT 1.5

The following are the FirstEnergy specific requirements applicable to entry and work in substations. Please note that other routine safety requirements such as use of PPE, switching & tagging, confined space, etc., are not covered here

From subsection 411 "Substations" of section 400 "Electrical Safety" of the FirstEnergy "Energy Delivery Accident Prevention Handbook" the following precautions are to be observed when working in or near Company substations that may be applicable to your question:

411.1 Employees assigned to work in substations or perform switching must be:

(a) Properly qualified through training or work experience.
(b) Familiar with the equipment being operated and knowledgeable of the "Manual of Operations".

411.5 When handling material and equipment, care must be taken to maintain minimum approach distances. (*Approach distances are covered in section 412*)

411.6 before driving into a substation, radio antennas on vehicles must be lowered and secured in place.

411.8 A qualified person must escort all unqualified personnel when entering a substation. (*Qualified persons are defined in OSHA 29 CFR 1910.269*)

412 Minimum Safe Working Distances from Energized Conductors or Equipment

412.1 Unless properly protected, qualified personnel must maintain minimum working distances and clear hot-stick distances from uninsulated and energized equipment as outlined in the following:

A table follows showing the minimum clearances. The shortest applicable is 2'-1" from 1.1 kV to 3'-2" for 115 kV. *Please note however that these distances only apply to "Qualified Personnel".*

412.3 Employees/contracted personnel ***not*** electrically qualified per the requirements of 29 CFR 1910.269 must maintain a minimum approach of at least 10 feet from energized conductors and equipment.

Note that except for some Company specific terminology, these requirements come from OSHA 29 CFR 1910.

For Final Status Survey (FSS) work in the Saxton Penelec Substation, Radiological Controls technicians who are not electrically qualified per the requirements of 29 CFR 1910.269 must maintain a minimum approach of at least 10 feet from energized conductors and equipment. Much of the lattice support structure and almost all of the components in the substation are inaccessible to personnel not so qualified. In addition, the ground surface within 10 feet of un-insulated energized equipment would be inaccessible for FSS.

Appendix C-1 (attachment 3-1 to 5-2)

2350 INSTRUMENT AND PROBE EFFICIENCY CHART

1/03/05 Remove 126198 & 117566 Add 129407

Inst.#	Cal Due	AP #		Probe #	Cal Due	
95361	6/25/05	P & W		25686 Pk	6/28/05	211,799
~~98620~~	~~12/01/05~~	~~G&W~~		~~196022 Pk~~	~~12/01/05~~	~~204,609~~
For remediation only			For remediation only			For remediation only
98625	5/18/05	R & Y		211680 Pk	5/18/05	214,882
98642	9/28/05	B&W		185844 Pk	9/28/05	209,771
98647	11/02/05	G & Y		211667 Pk	11/02/05	213,180
117573	5/18/05	O & Y		211674 Pk	5/18/05	212,173
129407	12/17/05	White		206280	12/17/05	222,724
129423	5/18/05	P & Y		211687 Pk	5/18/05	213,539
~~129440~~	~~11/01/05~~	~~O&W~~		~~210938 Pk~~	~~11/01/05~~	~~196,636~~
For remediation only			For remediation only			For remediation only

Different Instrument/Probe Cal. Due | Cesium only instruments (10mV to 100)

BMB 1/25/05

BMB 1/25/05

ATTACHMENT 3 . 1

COC

Site Report

Site Summary

Site Name: Western Portion of SY

Planner(s): BHB

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	4.31	No	1	12.4
				25	2
				100	1.6
				400	1.4
				2,500	1.3
				10,000	1

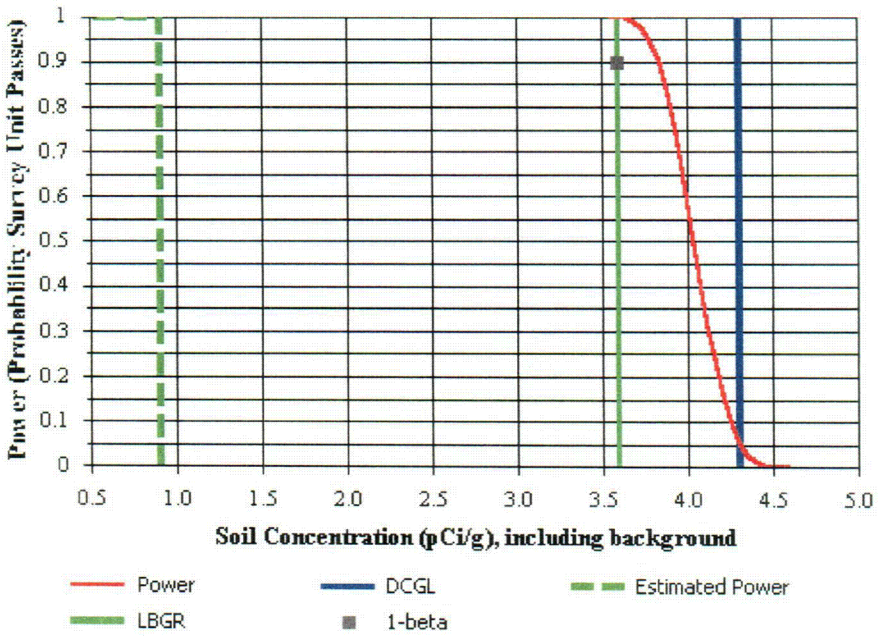
ATTACHMENT 4.1

Surface Soil Survey Plan

Survey Plan Summary

Site:	Western Portion of SY		
Planner(s):	BHB		
Survey Unit Name:	Switch Yard - Survey Unit PS4-2		
Comments:	Western Portion of Switch Yard		
Area (m²):	3,600	Classification:	2
Selected Test:	Sign	Estimated Sigma (pCi/g):	0.47
DCGL (pCi/g):	4.31	Sample Size (N):	14
LBGR (pCi/g):	3.6	Estimated Conc. (pCi/g):	0.9
Alpha:	0.050	Estimated Power:	1
Beta:	0.100		

Prospective Power Curve



ATTACHMENT 4 - 2

C05

Surface Soil Survey Plan

Contaminant Summary

Contaminant	DCGLw (pCi/g)	Inferred Contaminant	Ratio	Modified DCGLw (pCi/g)	Scan MDC (pCi/g)
Cs-137	4.31	N/A	N/A	N/A	N/A

Contaminant	Survey Unit Estimate (Mean ± 1-Sigma) (pCi/g)	Reference Area Estimate (Mean ± 1-Sigma) (pCi/g)
Cs-137	0.91 ± 0.47	0.28 ± 0.39

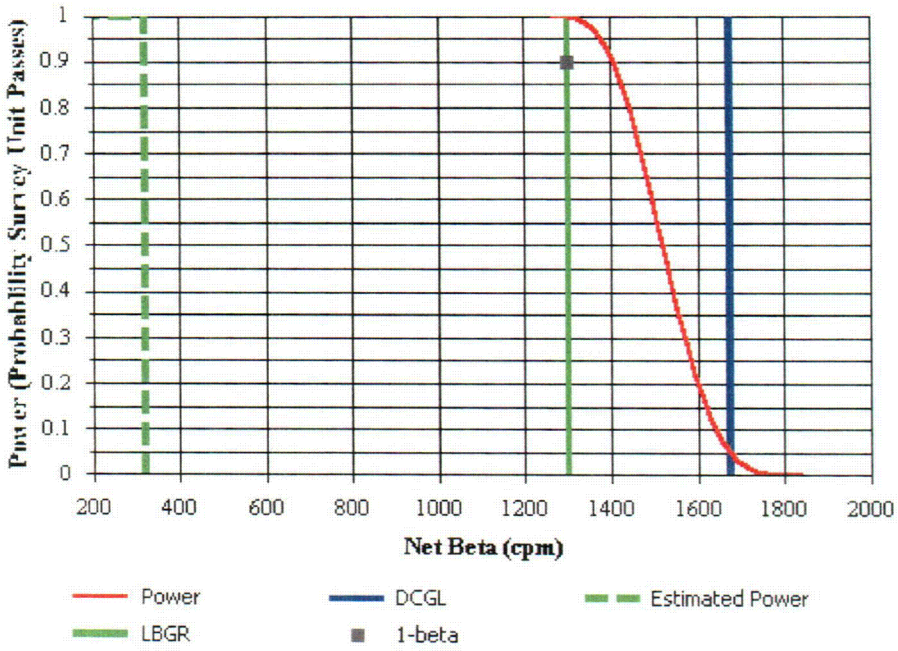
ATTACHMENT 4.3

Building Surface Survey Plan

Survey Plan Summary

Site:	Switch Yard Concrete		
Planner(s):	BHB		
Survey Unit Name:	PENELEC Switch Yard Unpainted Concrete -W		
Comments:	Class 3 Structures - Horizontal Surface		
Area (m²):	414	Classification:	3
Selected Test:	WRS	Estimated Sigma (cpm):	205
DCGL (cpm):	1,675	Sample Size (N/2):	11
LBGR (cpm):	1,300	Estimated Conc. (cpm):	322
Alpha:	0.050	Estimated Power:	1.00
Beta:	0.100		

Prospective Power Curve



ATTACHMENT 5 . 1

C06

Building Surface Survey Plan

Contaminant Summary

Contaminant	DCGLw (dpm/100 cm²)
Gross Activity	33,238

Beta Instrumentation Summary

Gross Beta DCGLw (dpm/100 cm²): 33,238
Total Efficiency: 0.04
Gross Beta DCGLw (cpm): 1,675

ID	Type	Mode	Area (cm²)
30	GFPC	Beta	126

Contaminant	Energy[1]	Fraction[2]	Inst. Eff.	Surf. Eff.	Total Eff.
Gross Activity	187.87	1.0000	0.48	0.09	0.0432

[1] Average beta energy (keV) [N/A indicates alpha emission]
[2] Activity fraction

Gross Survey Unit Mean (cpm): 628 ± 205 (1-sigma)
Count Time (min): 1

Material	Number of BKG Counts	Average (cpm)	Standard Deviation (cpm)	MDC (dpm/100 cm²)
Concrete	31	306	34.5	1,673

ATTACHMENT 5.2

Appendix C-2

SURVEY REQUEST CONTINUATION SHEET			
SR NUMBER	0194	AREA/LOCATION	PS3b-1/PS4-2
SPECIFIC SAMPLING/SURVEY INSTRUCTIONS OR COMMENTS			

RESULTS SUMMARY FOR SR-0194

SR-0194 was issued to obtain radiological survey and sampling data to ensure Final Site Survey activities are complete. The survey units covered under this SR are PS3b-1 and PS4-2 (grids are listed in the SR). The SR required the following radiological measurements.

- Surface soil scan measurements used a 2" x 2" NaI detector (set to identify Cs-137). Concrete scan surveys used a GFPC. Survey techniques will be IAW the SR.
- A total of 20 Site Surface Dose Model (SSDM) sample points were provided for samples to be taken for analysis. SNEC Calculation Sheet using "COMPASS" program required 14 samples to be taken. **(See Section 5).**
- Site Surface Samples: Obtain samples as directed in the SR. Using the auger, obtain a sample no greater than 40 cm. in depth. **(See Section 4)**
- QC Repeat Measurements: A minimum of 5% of all surface scan measurements and sampling were re-performed using identical methodology. SSDM sampling was performed by taking a second sample from the same drill hole.
- QC Repeat Analysis: A minimum of 1 sample per SR or 5%, whichever is greater, of all SSDM samples were analyzed using identical methodology.
- Additional sampling/surveys were performed at the request of the SR coordinator.

1. Summary of Results

A. Surface Scan Measurements (2" x 2" NaI Detector)

A 100% surface scan was required of all accessible areas of certain grids, IAW the SR. A total of 76.18% of this Class 2 area (PS4-2) was surveyed, which is well within design basis. Total surface area obtained through use of survey data.

Results: **Except as indicated in Section 4,** No areas indicated activity above the action level of >300 GCPM (gross counts per minute).

B. Surface Scan Measurements (Gas Flow Proportional Detector)

A 100% surface scan was required of all accessible areas of certain grids, IAW the SR. A total of 87.34% of this Class 3 area (PS3b-1) was surveyed, which is well within design basis

Results: **Except as indicated in Section 4,** No areas indicated activity above the action level of >1000 GCPM (gross counts per minute). Total surface area obtained through survey data.estimations and area walk downs.

Appendix C-2

C. Surface Static Measurements

A total of 15 points were provided in area PS3b-1 for static measurements. The "COMPASS" program required a minimum of 11 static measurements in this area.

Results: Fifteen (15) static measurements were taken in PS3b-1. No areas indicated activity greater than the allowed action point of > 1000 GCPM

D. Site Surface Sampling

Thirty three (33) Site Surface soil samples were obtained. Two (2) Site Surface soil QC samples were taken. These samples were statistically spaced based on a random starting point due to the lack of noticeable elevated activity during final post remediation scan/static surveys. **(See Section 4)**

Results: Sixteen (16) Site Surface soil samples taken for this SR were less than MDA. MDA activity range is from 0.03 pCi/g to 0.23 pCi/g (for the surrogate isotope, Cs-137). For the seventeen (17) samples, not including QC samples, that did contain Cs-137activity greater than the sample MDA, activities ranged from 0.25 pCi/g to 2.00 pCi/g. No other licensed isotopes identified for this particular SR.

2. Quality Control (QC) Measurements and Comparisons

- **Repeat Scan measurements and SSDM samples** were performed and met the applicable acceptance criteria established in Section 4.6 of E900-IMP-4520.04.
  - QC scan measurements were repeated for 7.79% of the area scanned in Unit PS3b-1.
  - QC static measurements were repeated for 13.33% of the area scanned in Unit PS3b-1.
  - QC scan measurements were repeated for 5.82% of the area scanned in Unit PS4-2.
  - Site Surface soil sample QC measurements were repeated for 6.06% of Site Surface soil samples.

3. Quality Control Sample Recounts

- **Repeat QC replicate recount** – SNEC has determined that, at a minimum, one SSDM sample, or five per cent (5%) of SSDM samples from each SR will have replicate gamma spectroscopy counts performed on them. In the case of this SR, 4 Soil/Concrete sample had a replicate count performed; sample #5-23434, #1-24219, #2-23418 and #5-23417 satisfying this requirement. **(See section #5)**

SURVEY REQUEST CONTINUATION SHEET			
SR NUMBER	0194	AREA/LOCATION	PS3b-1/PS4-2
SPECIFIC SAMPLING/SURVEY INSTRUCTIONS OR COMMENTS			

4. Exceptions and Discrepancies

- Refer to the individual survey maps for locations and reasons each listed grid was not given a 100% scan survey.
- SSDM samples were not taken for this SR. Due to the location of the Pennelec electric substation, a grounding grid is in place approximately 16 inches below the surface of the topsoil. To prevent damage to this grounding grid the majority of samples were taken from the surface to a maximum of 6" depth.
- In the case of a fresh cover of crushed rock, the surface of the rock was sampled, and then the area under the rock was sampled, which provided the large number of soil samples for this SR.

- For unit PS3b-1 the AP level was exceeded in seven (7) locations; Labeled AP-1 through AP-7.
  - AP-1 1028 gcpm
  - AP-2 1053 gcpm
  - AP-3 1030 gcpm
  - AP-4 1122 gcpm
  - AP-5 1089 gcpm
  - AP-6 1011 gcpm
  - AP-7 1004 gcpm

- A QC static point reading at AP-3 was 1135 gcpm

- For unit PS4-2 the AP level was exceeded in seven (7) locations in grid BE-137; Labeled AP-1 through AP-7.
  - AP-1 305 gcpm
  - AP-2 306 gcpm
  - AP-3 303 gcpm
  - AP-4 359 gcpm
  - AP-5 325 gcpm
  - AP-6 302 gcpm
  - AP-7 353 gcpm

- For unit PS4-2 the AP level was exceeded in grid BE-135, labeled as AP-1 with 301 gcpm

- For unit PS4-2 the AP level was exceeded in grid BF-137 twice, labeled as AP-1 with 301 gcpm and AP-2 with 316 gcpm

- For unit PS4-2 the AP level was exceeded in grid BD-136, labeled as AP-1 with 340 gcpm

- A QC static point reading at AP-1 in grid BE-135 was 334 gcpm

SURVEY REQUEST CONTINUATION SHEET			
SR NUMBER	0194	AREA/LOCATION	PS3b-1/PS4-2
SPECIFIC SAMPLING/SURVEY INSTRUCTIONS OR COMMENTS			

5. Special Note(s)

- This SR covers a Class 2 area (PS4-2) and also a class 3 area (PS3b-1), scan coverage of approximately < 10%-50% will suffice to show due diligence in survey technique for release of the site for unrestricted use for these classifications. As both units received greater than a 75% minimum scan, Design Criteria has been met to a very high confidence for release of this area for unrestricted use.

- For the Alarm Points in unit PS4-2 the following action was taken
  - Seven of the APs were sampled. Two of these samples were less than MDA for Cs-137. All others showed positive Cs-137 activity.
  - Four bounding samples were obtained. One of theses samples was less than MDA for Cs-137. All others showed positive Cs-137 activity.
  - MDA for samples with no positive Cs-137 activity ranged from 0.09 pCi/g to 0.21 pCi/g
  - Samples with positive Cs-137 activity ranged from 0.34 pCi/g to 3.10 pCi/g.
  - Two QC samples were obtained
  - Two of the samples obtained were shale.

- For the Alarm Points in unit PS3b-1 the following action was taken
  - Four of the APs were sampled. One of these samples was less than MDA for Cs-137. All others showed positive Cs-137 activity.
  - MDA for the sample with no positive Cs-137 activity was 0.10 pCi/g.
  - Samples with positive Cs-137 activity ranged from 0.11 pCi/g to 0.27 pCi/g.
  - One QC sample was obtained

- Guidance was provided on SR Continuation Sheets for the AP resolutions for both areas.

- SSDM samples were substituted with soil surface samples due to the Pennelec electrical grounding grid. In areas where the acronym SSDM is still in place, this acronym refers directly to the type of soil/concrete/stone sample taken for this SR.

Chris A. Marshall

Print/Signature

6/28/05

Date