ORIGINAL

FirstEnergy

SNEC CALCULATION COVER SHEET

CALCULATION DESCRIPTION

Calculation Number	Revision Number	Effective Date	Page Number
E900-04-009	0	6-14-04	1 of 12

Subject

CV Yard Survey Design – South Side of CV

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 ☐

Question 3 - Does the calculation have the potential to affect an SSC as described in the USAR? 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. If a "YES" answer is obtained for Question 3, SNEC Management approval is required to implement the calculation. Calculations that do not have the potential to affect SSC's may be implemented by the TR.

DESCRIPTION OF REVISION

APPROVAL SIGNATURES

Calculation Originator	B. Brosey/ B. Brosey	Date	6-14-04
Technical Reviewer	P. Donnachie/ P. Donnachie	Date	6-14-04
Additional Review	A. Paynter/ [signature]	Date	17 Jun 04
Additional Review		Date	
SNEC Management Approval		Date	

1.0 PURPOSE

1.1 The purpose of this calculation is to develop a survey design for one (1) CV Yard open land area survey unit, and an exposed steel surface on the south side of the SNEC CV (located in the same area). In addition, several residual concrete structures in this area are to be surveyed. These are below grade Class 1 survey units. These areas and objects will be surveyed IAW **Reference 3.1** and **3.2.**

2.0 SUMMARY OF RESULTS

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

2.1 The open land area begins about 10' below the ~804' El (the cut-off elevation of the CV shell), and extends to about grade level at ~811' El. This survey unit is bounded on the western side by the southern edge of an old concrete transformer support structure, and on the eastern side by a wing wall extension from the CV support structure. These landmarks are shown in **Attachment 1-1**. This survey area is located in site area OL1 and the open land survey unit portion is designated ***OL1-3***. This survey unit includes all concrete block in the area to the base of the DSB foundation (the DSB foundation will be surveyed using a different survey design). The total exposed surface soil area including concrete block wall sections is ***~395 square meters***.

2.2 Exposed solid concrete structures such as old foundation segments and pillars of the Control, DSF and CV Tunnel, are collectively designated ***MA8-2*** (see **Attachment 1-2 to 1-8**). These exposed building segments are approximately ***13 square meters*** in area.

2.3 The CV Yard steel surface is an external section of the CV steel shell that extends about 77 feet along the south side of the circumference of the CV. This exposed steel surface is divided into a Class 1 area and a Class 2 area, with a non-impacted area below the Class 2 area. The actual surface area for these three exposed sections of CV shell are shown below. This does not include the wing wall steel which was radiologically clean materials added by SNEC personnel during dismantlement.

2.3.1 Class 1 (***CV4-2***) - ***7.4 m^2*** (100% scan coverage).

2.3.2 Class 2 (***CV5-1***) – ***16.2 m^2*** (upper 31" to be surveyed (12.6 m^2)) @ 100% scan coverage.

2.3.3 Non–impacted area of ~12.3 m^2 (not surveyed)

The Class 2 area is prepared for survey work down to about the 800' elevation. (see **Attachment 1-9**). Thus only the ***top 48"*** (from the cut-off down) of the external steel shell will be scanned (100% coverage). The top 48" includes both the Class 1 and Class 2 areas. Remnants of the CV support steel structure are visible at both ends of this area. These clean add-on steel materials (including the "wing walls") were welded to areas previously surveyed. Accessible areas of all add-on structural steel should be scanned.

2.4 Concrete structures found in the open land area are in poor overall condition. Much of this material is concrete block that is cracked and/or crumbling. Concrete block may be scanned as though it were soil since its density is similar to soil (~1.7 g/cc area Vs ~1.5 g/cc for soil).

2.5 Remaining solid concrete structures in this area should be scanned using a NaI detector, using a slower scanning rate. In addition, a GFPC beta radiation detection system will be used to survey these structures. Scanning parameters for these items are listed in the Table below.

SUMMARY OF SCANNING PARAMETERS

Area or Structure	Instrument Type Used	Scan Speed	Surface to Detector Face	Calculated MDCscan Values
OL1-3 (soil & block)	NaI (2" by 2" Cs-137 Window)	9.8" per sec (25 cm/sec)	4" (10.2 cm)	2.2 to 4.4 pCi/g (100 – 400 cpm bkgnd)
MA8-2 (solid concrete sections)	NaI (2" by 2" Cs-137 Window)	1.2" per sec (3.1 cm/sec)	2" (5.1 cm)	4.1 pCi/g or 4,425 dpm/100 cm^2 (@~200 cpm bkgnd)
MA8-2 (solid concrete sections)	GFPC (beta)	0.9" per sec (2.2 cm/sec)	Contact	2,204 dpm/100 cm^2
CV4-2 & CV5-1 (CV steel shell)	GFPC (beta)	0.9" per sec (2.2 cm/sec)	Contact	784 dpm/100 cm^2

2.6 Generic NaI Scanning Criteria

2.6.1 A ***2" D by 2" L NaI detector*** with a Cs-137 window setting shall be used. The window will straddle the Cs-137 662 keV full energy peak width.

2.6.2 The NaI instrument conversion factor/efficiency shall not be less than ***208 cpm/uR/h*** which was used for planning purposes. See **Attachment 2-1** for typical site listing of instrument efficiency factors (Cs-137).

2.6.3 Scan in a serpentine pattern that is ~0.5 meters wide (soil, fill materials and concrete block). Scan width for solid concrete foundations and pillars should be IAW the objects narrowest dimension.

2.7 The effective DCGLw values for the CV Yard area are listed below. The US NRC has reviewed and concurred with the derivation logic for applicable DCGL determination. See **Attachment 3-1** to **3-5**.

DCGLw Table

Volumetric DCGLw (pCi/g – Cs-137)	Surface Gross Activity DCGLw (dpm/100 cm^2)
5.73 (4.3 A.L.)	44,434 (33,325 A.L.)

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

2.8 GFPC Scanning of Concrete Pillars, Foundations (not for concrete block) and Steel Surfaces

A Gas Flow Proportional Counter (GFPC) shall be used to scan steel and selected concrete structures. The following parameters were used to develop this survey design.

2.9 For rough surfaces, a GFPC efficiency factor is based on estimating the gap between the probe face plate and the surface being measured. This information is collected IAW **Reference 3.3**. The rough surface factor is then determined from **Reference 3.4** and used to estimate the efficiency loss. See **Attachment 4-1** to **4-7** for the inspection report summary for this area. From **Attachment 5-1**, the correction factor used is a "worst case" estimate based on the objects shown in **Attachments 1-2** to **1-8**. No efficiency correction factor is applied for steel surfaces.

GFPC Detection Efficiency Results Used for Planning

Material Type	ε_i*	ε_s	ε_t (as %)	% Cs-137	Efficiency Factor	Resulting counts/disintegration
Concrete	0.478	0.5	23.9%	0.5952	0.45	0.0640
Steel	0.478	0.5	23.9%	0.5952	1.0	0.1423

*See **Attachment 2-1** as an example of typical detector efficiency factors used at the SNEC site (as of 6/1/04).

NOTE: Total efficiency should not be less than ε_t value for any instrument used during this survey effort.

2.10 Alarm Set-Points

Based on the expected detection efficiency, the following are the alarm set-points for these objects and areas.

Alarm Set-Points

Area or Structure	Instrument Type Used	Alarm Set (gross cpm)	DCGL (in ncpm)
OL1-3 (soil & block)	NaI (2" by 2" Cs-137 Window)*	300	~200
MA8-2 (solid concrete sections)	NaI (2" by 2" Cs-137 Window)*	300	~300 (surface limit), ~70 (volumetric limit)
MA8-2 (solid concrete sections)	GFPC (beta)	1,200	2,519
CV4-2 & CV5-1 (CV steel shell)	GFPC (beta)	2,500	5,879

* See **Attachment 6-1 to 6-12** for the actual calculations used to determine these factors.

> **NOTE**
>
> NaI Background has been measured in this area and ranges from about 100 to 400 cpm (from **Reference 3.5**).

2.10.1 All survey personnel shall be trained to identify count rates at or above the alarm set-points previously identified.

2.10.2 If an alarm set point is reached during any 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 tools.

2.11 Sample elevated areas(s) IAW SNEC procedure E900-IMP-4520.04 (**Reference 3-2**) and the following.

2.11.1 Clearly mark, identify and document all sample locations

2.11.2 Sample any location that is above the action level cited is Section 2.10 above.

2.11.3 For concrete, a 4" long core bore sample is preferred so that the depth of penetration can be identified. However, when a core bore cannot be taken because of the lack of volume, quality of concrete, or because of limited access in the area, sampling should remove the first 1" of material and yield a volume of at least 200 cc to ensure an adequate counting MDA for Cs-137 (a 4" diameter area by 1" deep = ~200 cc).

2.12 The minimum number of sampling points indicated for these survey units by the Compass (**Reference 3.6**) are listed in the following Table. See **Attachments 7-1** to **7-13** for Compass results and **Attachment 8-1** to **8-4** for diagrams of measurement and sampling points.

Minimum Number of Samples or Fixed Points per Area

Survey Unit No.	Classification	No. of Points
OL1-3 (soil & block)	Class 1	14
MA8-2 (solid concrete remnants)	Class 1	8
CV4-2 (CV steel shell)	Class 1	8
CV5-1 (CV steel shell)	Class 2	8

See Attachments 7-1 to 7-13 for Compass output and Attachment 8-1 to 8-4 for locations of measurement or sampling points.

2.13 VSP (**Reference 3.7**) is used to plot all sampling and measurement points on the included diagrams. In some cases, the actual number of random start systematically spaced sample/measurement points may be greater than that required by the Compass computer code because of:

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

2.13.1 The starting points for physically locating sites in the excavation area (OL1-3) are based on measurements from the CV outer shell. All key measurement points are marked on **Attachments 8-1** and **8-2**. Once the key points are located in the survey unit, a triangular grid system of sample points must be laid out over the sloped survey area. ***Distances for soil sample points are measured over the contour of the survey unit.***

2.13.1.1 Some starting point locations 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.

2.13.2 When an obstruction is encountered that will not allow collection of a sample or placement of a measurement point, ***contact the cognizant SR coordinator for permission to delete or move the point***.

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

3.0 REFERENCES

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

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

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

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

3.5 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.

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

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

3.8 SNEC Calculation No. E900-03-022, Rev 0, "CV Yard Soil – Survey Design to EI 803'".

3.9 Plan SNEC Facility License Termination Plan.

3.10 Westinghouse Electric Corporation, Gilbert Associates, Inc., Drawing No. D-37798, Saxton Reactor Project, "Containment Vessel Penetration Access", 7/21/60.

3.11 GPU Nuclear, SNEC Facility, "Containment Vessel Survey", SNECRM-019, Rev 1, 1/18/02.

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

3.13 SNEC Facility Historical Site Assessment, Rev 0, March, 2000.

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

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

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

4.0 ASSUMPTIONS AND BASIC DATA

4.1 Soil, Fill Materials and Concrete Block Survey Parameters (NaI Detector)

4.1.1 The MDCscan for soil and concrete block (in pCi/g), is determined using a MicroShield model. MDCscan calculations for the open land portion of these survey units are shown in **Attachment 6-1 to 6-6**.

4.2 Solid Concrete Structures (Footers and Pillars) (NaI Detector)

4.2.1 The MDCscan value determined for a NaI detector and assuming a surface deposition (in dpm/100 cm^2), is determined using a MicroShield model. MDCscan calculations are shown on **Attachments 6-7 to 6-9**.

4.2.2 The MDCscan value, assuming a volumetric concentration (pCi/g) in solid concrete is determined using a MicroShield model. MDCscan calculations are shown on **Attachments 6-10 to 6-12**.

4.3 The Compass computer program is used to calculate the required number of random start systematic samples (or measurements) to be taken in each survey unit (**Reference 3.6**). The off-site soil background from **Reference 3.9** is used to estimate background as input to the Compass program (see **Attachments 7-1 to 7-13**).

4.4 Soil samples from this area are used as the initial estimate of variability for the OL1-3 area. These results are shown on **Attachment 9-1**.

4.5 Concrete variability of the areas structures was performed at the start of this work and are reported in **Attachment 10-1**. Background variability results are taken from the

Williamsburg survey work of non-impacted background material (see **Attachment 10-2**). No elevation correction is applied to the Williamsburg results.

4.6 Steel variability of the areas structures was performed at the start of this work and are reported in **Attachment 11-1**. Background variability results are taken from the Williamsburg survey work of non-impacted background material (see **Attachment 11-2**). No elevation correction is applied to the Williamsburg results.

4.7 The MARSSIM WRS Test criteria will be used for work in this area.

4.8 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 3.7**). VSP is used to plot random start systematically spaced sampling points. The dimensions of selected survey points are provided for each survey unit referenced to an existing survey area landmark (key point measurement location). These diagrams are shown in **Attachment 8-1 to 8-4**.

4.9 **Reference 3.8** and **3.9** were also used as guidance during the survey design development phase. The construction/assembly drawings used to determine the original physical extent of these areas are listed as **Reference 3.10** and **3.11**.

4.10 Remediation History

A review of survey request data pertaining to this open land area adjacent to the CV shell was conducted in support of this survey design. Analysis of soil samples taken after remediation of the area (from SR-107), shows that this area (below the 803' elevation), has been reduced to an average of 0.19 pCi/g (Cs-137) with a maximum value of 0.4 pCi/g. Other subsurface sample data collected in conjunction with installation of the anchor bolts, grout curtain, and various wells within this area were also reviewed. These data are compiled and summarized in SR-0029. Earlier remediation history in this area is reported in the SNEC facility Historical Site Assessment document (**Reference 3-13**) and the 1994 Soil Remediation Project Report.

4.11 This 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.

4.12 The sample data base used to determine the effective radionuclide mix for the CV Yard area has been drawn from previous samples that were assayed at off-site laboratories. This list is shown as **Attachment 3-1** and **3-5**, 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. The data shows Cs-137 and H-3 (99%) to be the predominant radioactive contaminants found in this area. Sr-90 and Co-60 on the other hand, were also positively identified, but constitute less than 1% of the mix.

Remediation has impacted radionuclide concentration levels in this survey unit. Remediation efforts have been shown to be effective in lowering the average concentration of Cs-137 in this survey unit. Therefore, the impact of remediation must be considered in determining the effective Cs-137 DCGLw surrogate value. Remediation of this survey unit was largely complete by about July of 2001. Samples collected prior to this date have been disqualified in the final listing which was decayed to September 20th, 2003. In all, about twenty three (23) sample results were used to determine the best representative mix for this survey unit.

The decayed sample results were input to the spreadsheet titled "Effective DCGL Calculator for Cs-137" (**Reference 3-14**) to determine the effective volumetric and surface DCGLw values for the OL1-3 area. The output of this spreadsheet is shown on **Attachment 3-4** and **3-5**.

4.13 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 208 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 ~400 cpm.

4.14 These survey units were inspected after remediation efforts were shown effective. A copy of portions of the SNEC facility post-remediation inspection report is included as **Attachment 4-1** to **4-7**.

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

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

4.17 Special measurements including gamma-ray spectroscopy are not included in this survey design.

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

4.19 The applicable SNEC site radionuclides and their individual DCGLw values are listed on **Exhibit 1** of this calculation.

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

4.21 Area factors are not applicable in subsurface soil volumes (below 1 meter). Therefore, the area factor input requirement for soil in the Compass computer program is 1 for both a 10,000 square meter area as well as for a 1 square meter area (see **Attachment 7-1**).

4.22 Area factors for structural surfaces are shown on **Attachment 7-5**. These values are for Co-60 which is a constituent of the mix. However, Cs-137 and Co-60 area factors are very similar and therefore there is little impact from using this more conservative area factor. The lower limit area factor for areas less than 1 square meter is 10.1. Area factors for values between the values listed in the following table, are interpolated from the data by Compass.

AREA (m^2)	AREA FACTOR
1	10.1
4	3.4
9	2
16	1.5
25	1.2
36	1

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** to **1-9**, are diagrams of survey unit OL1-3, MA8 –2, CV4-2 & CV5-1.

6.2 **Attachment 2-1**, is a listing of typical calibration data from both GFPC & NaI radiation detection instrumentation that may be used during this survey effort.

6.3 **Attachment 3-1** to **3-5** is the sample results from the OL1 area and the DCGL calculation sheets.

6.4 **Attachment 4-1** to **4-7**, is copies of the inspection reports from these survey units.

6.5 **Attachment 5-1**, is the efficiency correction factor employed for a GFPC instrument as a result of the survey unit inspections.

6.6 **Attachment 6**

6.6.1 **Attachment 6-1**, is the MicroShield model of a soil volume used to determine the exposure rate from a 1 pCi/g Cs-137 source term in the OL1-3 area.

6.6.2 **Attachment 6-2** to **6-6**, are calculations of MDCscan values for soil in the OL1-3 area for backgrounds ranging from 100 cpm to 400 cpm.

6.6.3 **Attachment 6-7**, is the MicroShield output for a 12" surface source term used to model a surface deposition in a small area.

6.6.4 **Attachment 6-8** & **6-9**, are calculations of MDCscan values for a surface deposition in the MA8-2 survey unit.

6.6.5 **Attachment 6-10**, is the MicroShield output for a 12" volumetric source term used to model a concentration in concrete materials.

6.6.6 **Attachment 6-11** & **6-12**, are calculations of MDCscan values for a volumetric concentrations in concrete.

6.7 **Attachment 7-1** to **7-13**, is the Compass output for these four survey units.

6.8 **Attachment 8**

6.8.1 **Attachment 8-1**, is key sample point location coordinates from the CV shell (points 1 & 6), for sampling soil materials around the CV.

6.8.2 **Attachment 8-2**, is the complete layout of sample points for the OL1-3 area.

6.8.3 **Attachment 8-3**, is the layout of survey points along the south side of the SNEC CV steel shell for both the CV4-2 & CV5-1 survey units.

6.8.4 **Attachment 8-4**, is the layout of survey points for the MA8-2 miscellaneous concrete sections in the OL1-3 area.

6.9 **Attachment 9-1**, is the soil variability results for soil samples from the OL1-3 area collected under SR-107.

6.10 **Attachment 10-1** to **10-2**, is the concrete surface variability measurements from MA8-2 (FSS-636) and the Williamsburg concrete background measurement results (FSS-001).

6.11 **Attachment 11-1** to **11-2**, is the steel surface variability measurements from CV4-2 and CV5-1 and the Williamsburg steel background measurement results (FSS-004).

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).

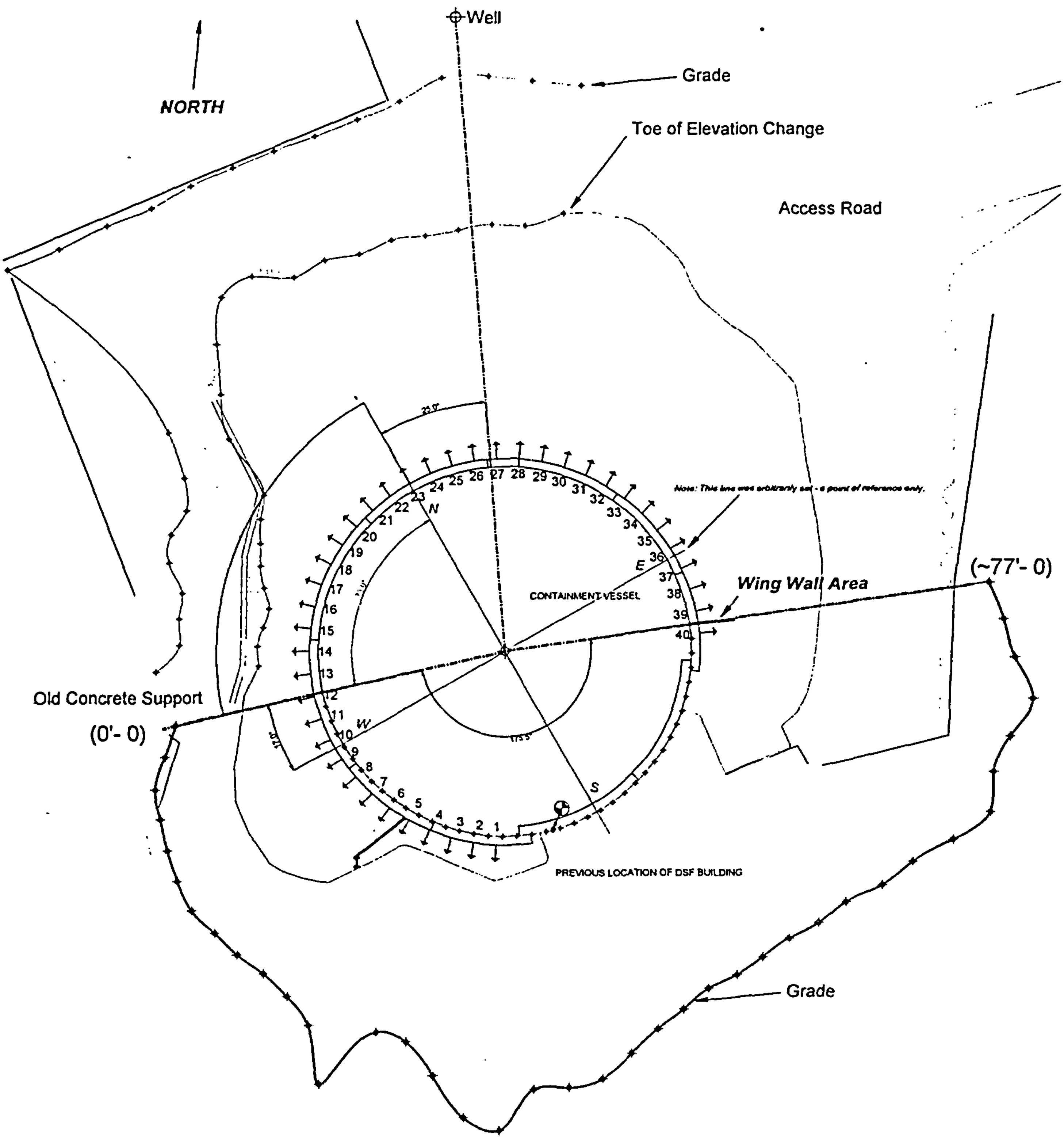
Exhibit 2

Survey Design Checklist

Calculation No. E900-04-009	Location Codes OL1-3, MA8-2, CV4-2 & CV5-1		
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	6/14/04
2	Are drawings/diagrams adequate for the subject area (drawings should have compass headings)?	Yes	6/14/04
3	Are boundaries properly identified and is the survey area classification clearly indicated?	Yes	6/14/04
4	Has the survey area(s) been properly divided into survey units IAW EXHIBIT 10	Yes	6/14/04
5	Are physical characteristics of the area/location or system documented?	Yes	6/14/04
6	Is a remediation effectiveness discussion included?	Yes	6/14/04
7	Have characterization survey and/or sampling results been converted to units that are comparable to applicable DCGL values?	Yes	6/14/04
8	Is survey and/or sampling data that was used for determining survey unit variance included?	Yes	6/14/04
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	6/14/04
10	Are applicable survey and/or sampling data that was used to determine variability included?	Yes	6/14/04
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?	N/A	6/14/04
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?	N/A	6/14/04
13	Are all necessary supporting calculations and/or site procedures referenced or included?	Yes	6/14/04
14	Has an effective DCGLw been identified for the survey unit(s)?	Yes	6/14/04
15	Was the appropriate $DCGL_{EMC}$ included in the survey design calculation?	Yes	6/14/04
16	Has the statistical tests that will be used to evaluate the data been identified?	Yes	6/14/04
17	Has an elevated measurement comparison been performed (Class 1 Area)?	Yes	6/14/04
18	Has the decision error levels been identified and are the necessary justifications provided?	Yes	6/14/04
19	Has scan instrumentation been identified along with the assigned scanning methodology?	Yes	6/14/04
20	Has the scan rate been identified, and is the MDCscan adequate for the survey design?	Yes	6/14/04
21	Are special measurements e.g., in-situ gamma-ray spectroscopy required under this design, and is the survey methodology, and evaluation methods described?	N/A	6/14/04
22	Is survey instrumentation calibration data included and are detection sensitivities adequate?	Yes	6/14/04
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	6/14/04
24	Are investigation levels and administrative limits adequate, and are any associated actions clearly indicated?	Yes	6/14/04
25	For sample analysis, have the required MDA values been determined.?	N/A	6/14/04
26	Has any special sampling methodology been identified other than provided in Reference 6.3?	N/A	6/14/04

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

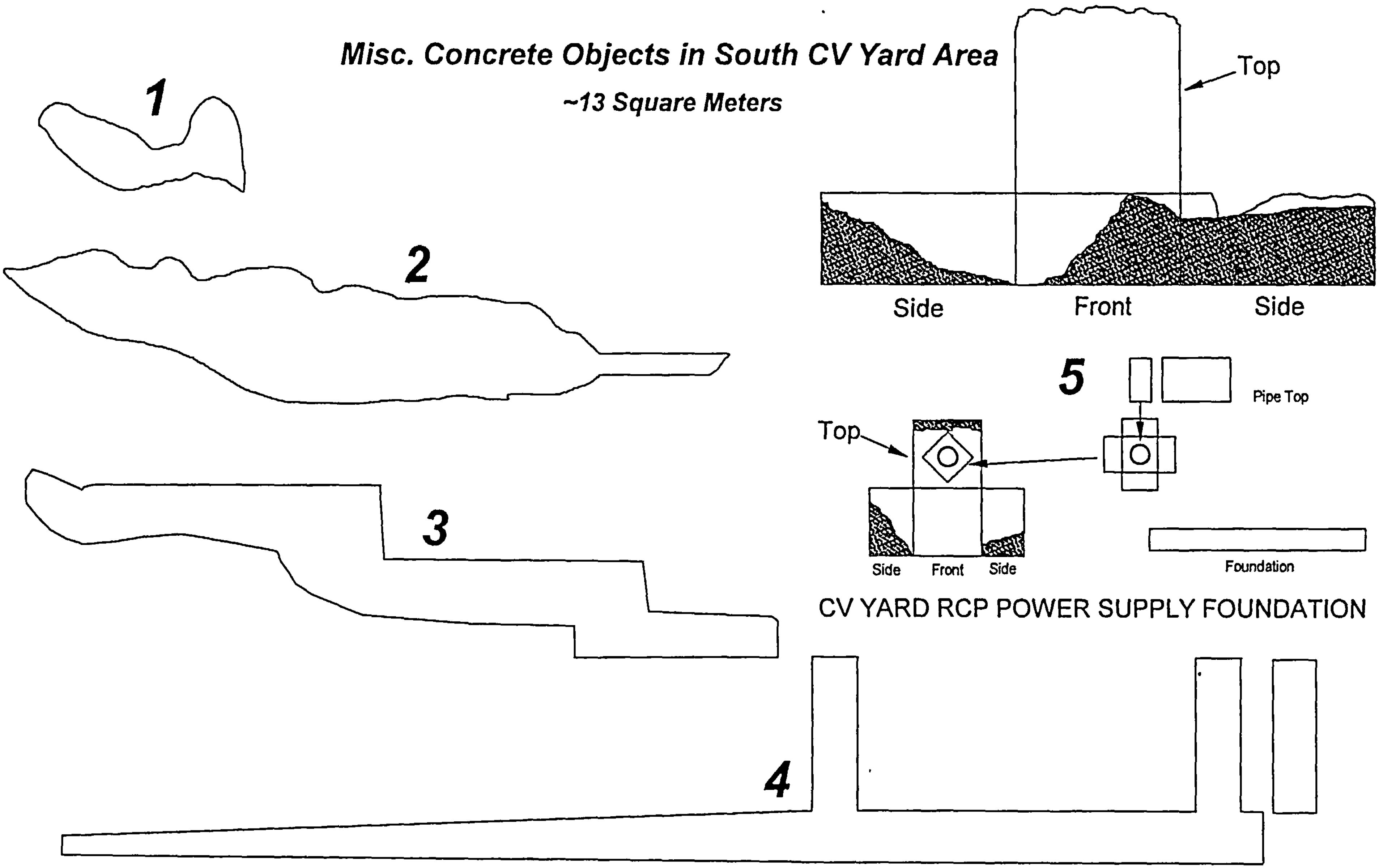
SOUTH CV YARD AREA EXCAVATION



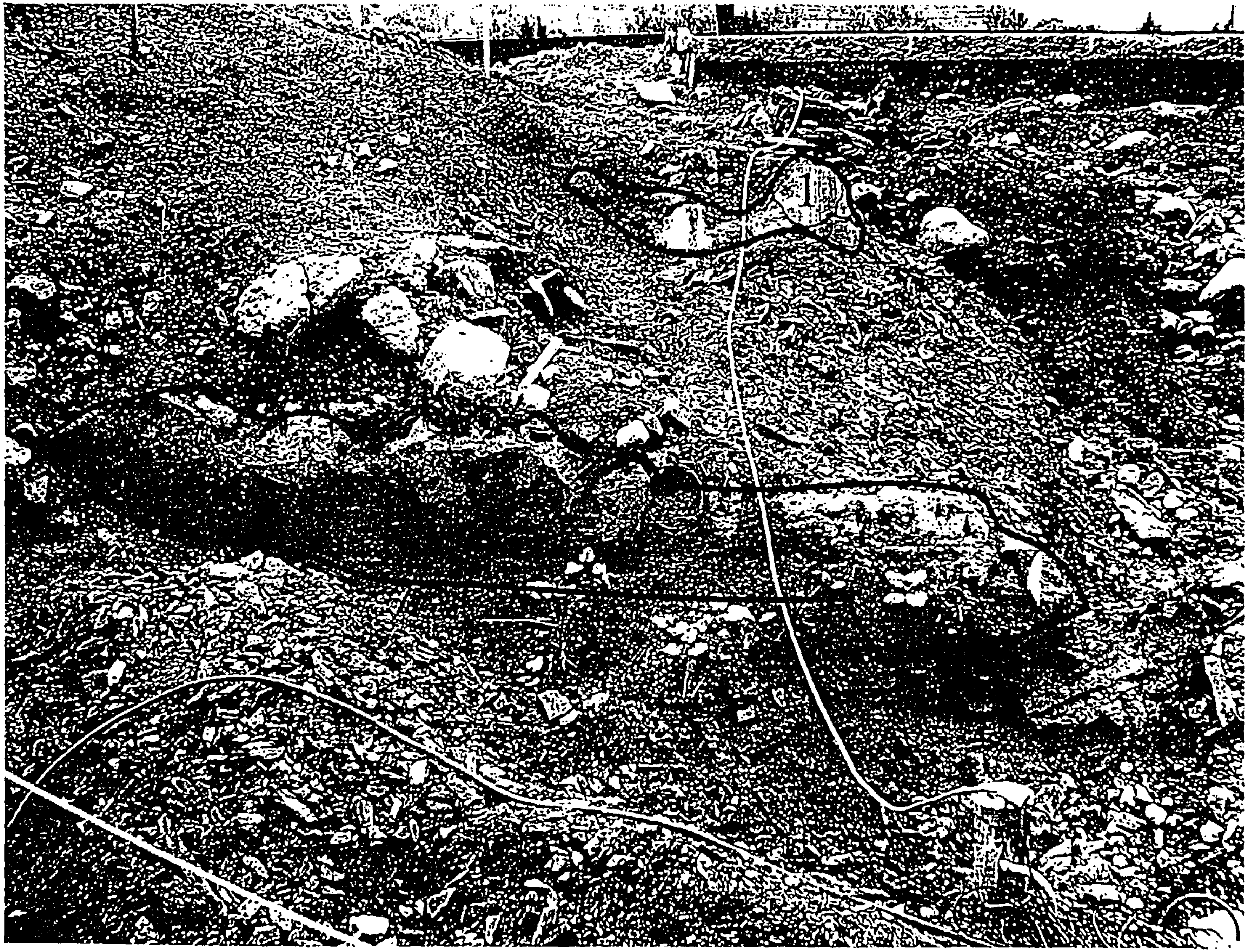
ATTACHMENT 1 . 1

Misc. Concrete Objects in South CV Yard Area

~13 Square Meters

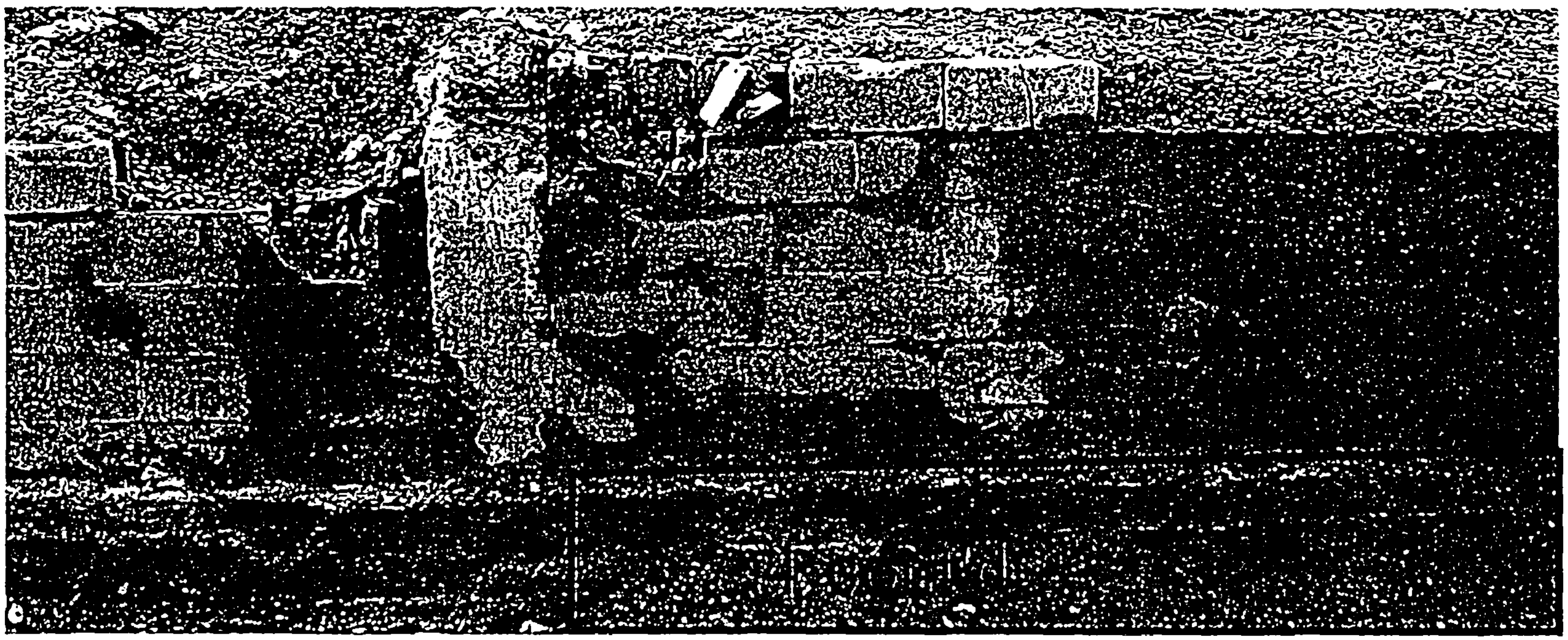


ATTACHMENT 1 . 2

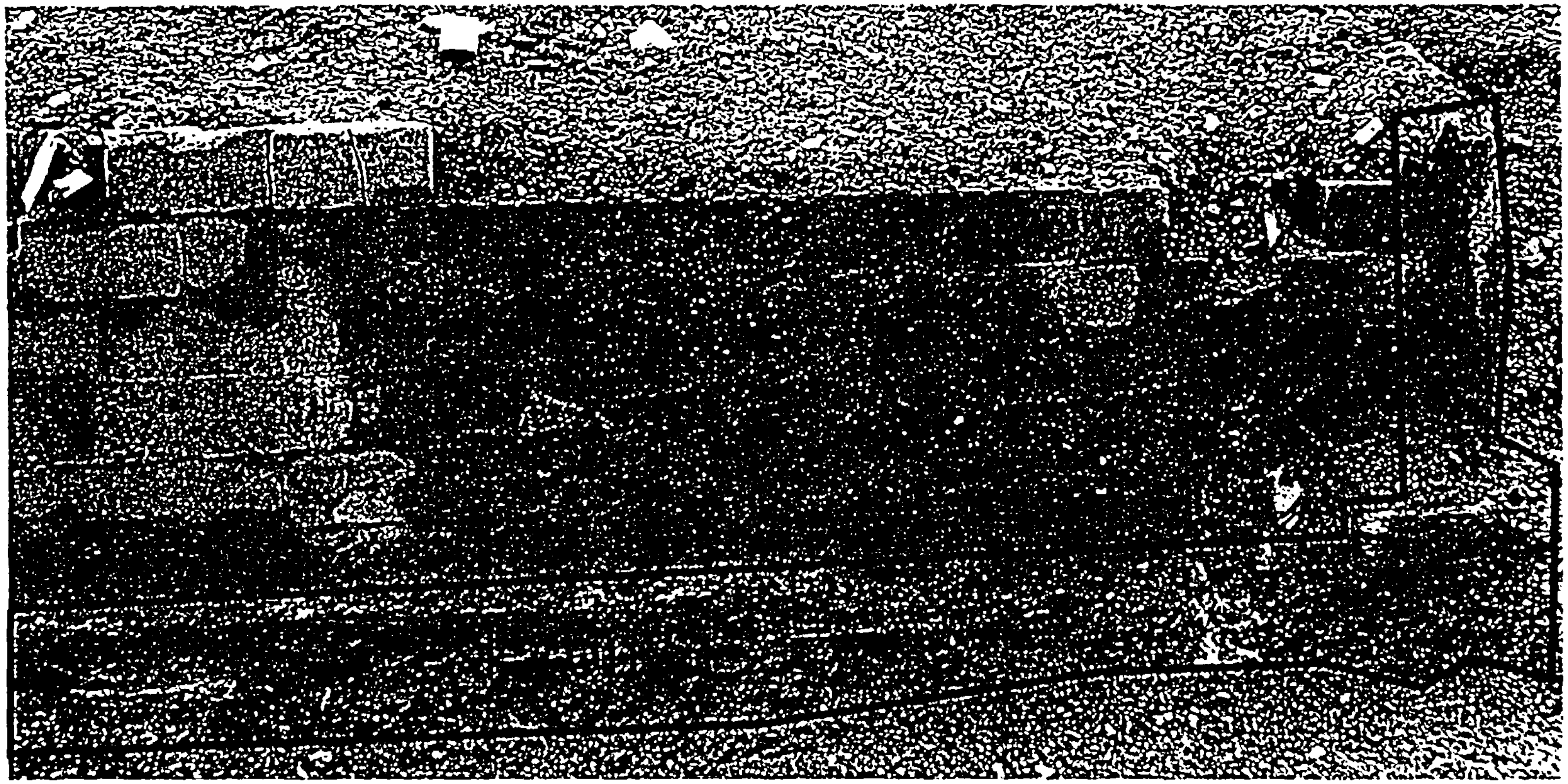


ATTACHMENT 1 . 3

ATTACHMENT 1 - 4



ATTACHMENT 1.5



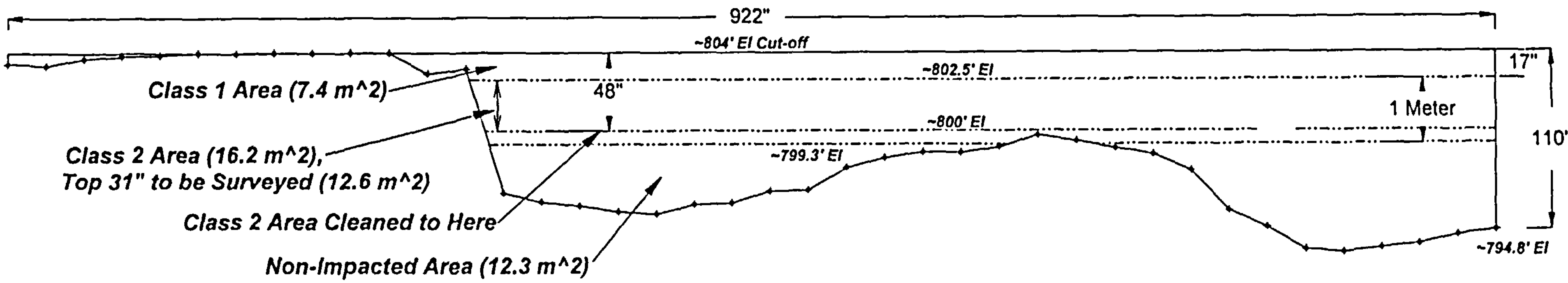
ATTACHMENT 1 - 6

ATTACHMENT 1.7

ATTACHMENT 1 . 8

South Wall of CV Steel External Shell

~36 Square Meters



ATTACHMENT 1.9

2350 INSTRUMENT AND PROBE EFFICIENCY CHART
6/1/04 **TYPICAL GFPC EFFICIENCY FACTORS**

INST #	INST C/D	43-68 PROBE #	PROBE C/D	44-10 PROBE #	PROBE C/D	BETA EFF	ALPHA EFF
126179	1/27/05	094819	1/27/05			25.1%	N/A
126188	1/27/05	099186	1/27/05			28.2%	N/A
126218	01/08/05	095080	01/09/05			27.9%	N/A

TYPICAL 2"X 2" NAI EFFICIENCY FACTORS (Cs-137)

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
129429	11/3/04	W&Y		206283 Pk	10/31/04	~~177185~~ Do not use B&B 6/10/04
126183	11/19/04	R&B		206280 Pk	12/12/04	~~190,907~~
126198	11/03/04	R&W		196021Pk	5/25/05	209,194
Inst not in use		~~(6L)~~		~~210938 Pk~~	~~4/14/05~~	~~205,603~~ RR 6-1-04

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

ATTACHMENT 2.1

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

ATTACHMENT 3-1

KEY	
	Yellow Shaded Background = Positive Result
	Gray Shaded Background = MDA

C01

	SNEC Sample No	Location/Description	H-3	Sr-90	Co-60	Cs-137	Total pCi/g
TABLE 3 - Decayed Listing of Positive Nuclides & MDAs Removed (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

	SNEC Sample No	LAB No.	Location/Description	H-3	Sr-90	Co-60	Cs-137	Total
TABLE 4 - % OF TOTAL CALCULATION								
1	CV Tunnel	BWXT, 0102059-01	CV Tunnel Sediment Composite, OL1		0.76%	0.07%	99.16%	100.0%
2	SX9SL99219	111074	Subsuface Sample #29 (0-5'), AY-128, OL1				100.00%	100.0%
3	SXSL1063	Teledyne-80018; L19184-1	North CV Yard Soil BA-127, 812' El, Sample # 5, OL2	83.07%			16.93%	100.0%
4	SXSL1089	Teledyne-80019; L19184-2	North CV Yard Soil AY-127, 810' El, Sample # 3, OL1	69.04%			30.96%	100.0%
5	SXSL1115	Teledyne-80020; L19184-3	North CV Yard Soil AY-128, 804' El, Sample # 2, OL1	72.02%			27.98%	100.0%
6	SXSL1122	Teledyne-80021; L19184-4	North CV Yard Soil AY-129, 798' El, Sample # 2, OL1	40.65%			59.35%	100.0%
7	SXSL1130	Teledyne-80022; L19184-5	North CV Yard Soil AX-129, 803' El, Sample # 4, OL1	17.32%		0.09%	82.59%	100.0%
8	SXSL1132	Teledyne-80023; L19184-6	North CV Yard Soil AZ-130, Sample # 5, OL1	52.22%			47.78%	100.0%
9	SXSL1270	BWXT, 0108055-02	AX-129, 3-3, Soil, CV SE Side 5' From CV, 800' El., OL1				100.00%	100.0%
10	SXSL1281	BWXT, 0108055-01	AX-128, 3-1, Soil, CV Tunnel East 5' From CV, 800' El, OL1				100.00%	100.0%
11	SXSL2649	Teledyne-73220; L18077-2	Anulus Well, A-2, 5 to 10' Depth, OL1				100.00%	100.0%
13	SXSL2871	Teledyne-71949; L17838-11	CV Area - East Yard Dirt Pile - Middle, 1/2 Way Up, OL1				100.00%	100.0%
14	SXSL2872	Teledyne-71948; L17838-10	CV Area - East Yard Dirt Pile - Bottom (also top center), OL1				100.00%	100.0%
15	SXSL3140	BWXT,1030-003-10-01	East CV Yard, Soil Pile @ 6' on West Side (6" Depth), OL1				100.00%	100.0%
16	SXSL3142	Teledyne; L20326-3	Soil Pile, CV Yard, Three Feet on East Side, SR-37, OL1				100.00%	100.0%
17	SXSL3145	BWXT,1030-003-10-01	East CV Yard, Soil Pile @ 3' on East Side (6" Depth), OL1				100.00%	100.0%
18	SXSL3149	Teledyne; L20326-4	Soil Pile, CV Yard, Six Feet on East Side, SR-37, OL1				100.00%	100.0%
19	SXSL3153	BWXT,1030-003-10-01	East CV Yard, Soil Pile @ Top (6" Depth), OL1				100.00%	100.0%
21	SXSL4142	Teledyne; L22187-2	CV Yard Soil - West Side, AP1-7, OL1				100.00%	100.0%
22	SXSL4143	Teledyne; L22187-3	CV Yard Soil - West Side, AP1-7, OL1				100.00%	100.0%
23	SXSL4149	Teledyne; L22187-4	CV Yard Soil - West Side, AP1-7, OL1			1.71%	98.29%	100.0%
			Mean⇒	0.557207	0.007643	0.00625	0.839541	1.41
			Sigma⇒	0.241		0.009	0.284	
			Mean % of Total⇒	39.50%	0.54%	0.44%	59.51%	100.00%

ATTACHMENT 3-2

C02

TABLE 5 - RATIO TO Cs-137

	SNEC Sample No	LAB No.	Location/Description	H-3	Sr-90	Co-60	Cs-137	Total
1	CV Tunnel	**BWXT, 0102059-01**	CV Tunnel Sediment Composite, OL1		7.71E-03	7.35E-04	1.00E+00	1.01
2	SX9SL99219	111074	Subsuface Sample #29 (0-5'), AY-128, OL1				1.00E+00	1.00
3	SXSL1063	**Teledyne-80018; L19184-1**	North CV Yard Soil BA-127, 812' El, Sample # 5, OL2	4.91E+00			1.00E+00	5.91
4	SXSL1089	**Teledyne-80019; L19184-2**	North CV Yard Soil AY-127, 810' El, Sample # 3, OL1	2.23E+00			1.00E+00	3.23
5	SXSL1115	**Teledyne-80020; L19184-3**	North CV Yard Soil AY-128, 804' El, Sample # 2, OL1	2.57E+00			1.00E+00	3.57
6	SXSL1122	**Teledyne-80021; L19184-4**	North CV Yard Soil AY-129, 798' El, Sample # 2, OL1	6.85E-01			1.00E+00	1.68
7	SXSL1130	**Teledyne-80022; L19184-5**	North CV Yard Soil AX-129, 803' El, Sample # 4, OL1	2.10E-01		1.12E-03	1.00E+00	1.21
8	SXSL1132	**Teledyne-80023; L19184-6**	North CV Yard Soil AZ-130, Sample # 5, OL1	1.09E+00			1.00E+00	2.09
9	SXSL1270	**BWXT, 0108055-02**	AX-129, 3-3, Soil, CV SE Side 5' From CV, 800' El., OL1				1.00E+00	1.00
10	SXSL1281	**BWXT, 0108055-01**	AX-128, 3-1, Soil, CV Tunnel East 5' From CV, 800' El, OL1				1.00E+00	1.00
11	SXSL2649	**Teledyne-73220; L18077-2**	Anulus Well, A-2, 5 to 10' Depth, OL1				1.00E+00	1.00
13	SXSL2871	**Teledyne-71949; L17838-11**	CV Area - East Yard Dirt Pile - Middle, 1/2 Way Up, OL1				1.00E+00	1.00
14	SXSL2872	**Teledyne-71948; L17838-10**	CV Area - East Yard Dirt Pile - Bottom (also top center), OL1				1.00E+00	1.00
15	SXSL3140	**BWXT,1030-003-10-01**	East CV Yard, Soil Pile @ 6' on West Side (6" Depth), OL1				1.00E+00	1.00
16	SXSL3142	**Teledyne; L20326-3**	Soil Pile, CV Yard, Three Feet on East Side, SR-37, OL1				1.00E+00	1.00
17	SXSL3145	**BWXT,1030-003-10-01**	East CV Yard, Soil Pile @ 3' on East Side (6" Depth), OL1				1.00E+00	1.00
18	SXSL3149	**Teledyne; L20326-4**	Soil Pile, CV Yard, Six Feet on East Side, SR-37, OL1				1.00E+00	1.00
19	SXSL3153	**BWXT,1030-003-10-01**	East CV Yard, Soil Pile @ Top (6" Depth), OL1				1.00E+00	1.00
21	SXSL4142	**Teledyne; L22187-2**	CV Yard Soil - West Side, AP1-7, OL1				1.00E+00	1.00
22	SXSL4143	**Teledyne; L22187-3**	CV Yard Soil - West Side, AP1-7, OL1				1.00E+00	1.00
23	SXSL4149	**Teledyne; L22187-4**	CV Yard Soil - West Side, AP1-7, OL1			1.74E-02	1.00E+00	1.02
			Mean⇒	1.949929	0.007708	0.006416	1	2.96
			Sigma⇒	1.708		0.010	0.000	
			Mean % of Total⇒	65.79%	0.26%	0.22%	33.74%	100.00%

ATTACHMENT 3-3

C03

Table 7

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

SNEC AL	75%
Total Activity Limit DCGLw	16.98 pCi/g
Administrative Limit	12.74 pCi/g
Cs-137 Limit	5.73 pCi/g
Cs-137 Administrative Limit	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 3-4

C04

Table 6

Effective DCGL Calculator for Cs-137 (dpm/100 cm^2)

Gross Activity DCGLw		Gross Activity Administrative Limit	
44434	dpm/100 cm^2	33325	dpm/100 cm^2

25.0 mrem/y TEDE Limit

Cs-137 Limit		Cs-137 Administrative Limit	
26445	dpm/100 cm^2	19834	dpm/100 cm^2

SAMPLE NO(s)⇒ CV Yard Soil & Boulder Samples - Decay 1-15-04

SNEC AL	75%

	Isotope	Sample Input (pCi/g, uCi, etc.)	% of Total	Individual Limits (dpm/100 cm^2)	Allowed dpm/100 cm^2	mrem/y TEDE	Beta dpm/100 cm^2	Alpha dpm/100 cm^2	
1	Am-241		0.000%	27	0.00	0.00	N/A	0.00	Am-241
2	C-14		0.000%	3,700,000	0.00	0.00	0.00	N/A	C-14
3	Co-60	6.25E-03	0.443%	7,100	196.87	0.69	196.87	N/A	Co-60
4	Cs-137	8.40E-01	59.515%	28,000	26444.70	23.61	26444.7	N/A	Cs-137
5	Eu-152		0.000%	13,000	0.00	0.00	0.00	N/A	Eu-152
6	H-3	5.57E-01	39.500%	120,000,000	17551.46	0.00	Not Detectable	N/A	H-3
7	Ni-63		0.000%	1,800,000	0.00	0.00	Not Detectable	N/A	Ni-63
8	Pu-238		0.000%	30	0.00	0.00	N/A	0.00	Pu-238
9	Pu-239		0.000%	28	0.00	0.00	N/A	0.00	Pu-239
10	Pu-241		0.000%	880	0.00	0.00	Not Detectable	N/A	Pu-241
11	Sr-90	7.64E-03	0.542%	8,700	240.75	0.69	240.75	N/A	Sr-90
			100.000%		44434	25.0	26882	0	
					Maximum Permissible dpm/100 cm^2				

ATTACHMENT 3-5

C05

Exhibit 1
Survey Unit Inspection Check Sheet

SECTION 1 - SURVEY UNIT INSPECTION DESCRIPTION			
Survey Unit #	OL1-3, MA8-2, CV4-2, CV5-2	Survey Unit Location	CV - Southside of CV – Steel Liner, solid concrete structures, concrete block wall, open land areas

Date	5/10/04	Time	1100	Inspection Team Members	D. Sarge/D. Black

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:

Response to Question 4 – miscellaneous wood (barricading), extension cords, buckets need to be removed/repositioned prior to establishing PRI controls.

Response to Question 5 – Caked-on mud/sediment on sections of cinderblock wall must be removed prior to FSS. Additionally, sediment needs to be removed from the structural bracing welded on the shell on the far east SIDE prior to FSS.

Response to Question 10– Personnel access to some areas of these survey units will require assistance. Safety systems, i.e. full body harnessing/lanyards may need to be worn when traversing some areas. Another option could be the utilization of a High Reach to gain access.

Response to Question 12 – There are numerous regions throughout these survey units which pose fall/slip hazards to personnel while performing required surveys. As stated in response to question 10 (above), the utilization of a High Reach is an option that would minimize these hazards.

Survey Unit Inspector (print/sign)	David Sarge / [signature]	Date	6/1/04
Survey Designer (print/sign)	B. Brosey / B. Brosey	Date	6/2/04

ATTACHMENT 4-1

EXHIBIT 3

Surface Measurement Test Area (SMTA) Data Sheet

SECTION 1 - DESCRIPTION

SMTA Number	SMTA-MA8-2-1	Survey Unit Number	MA8-2
SMTA Location	CV Shell - Southwest corner (approx. 795' el)		

Survey Unit Inspector	D. Sarge /	Date	6/1/04	Time	1115

SECTION 2 - CALIPER INFORMATION & PERSONNEL INVOLVED

Caliper Manufacturer	Mitotoyo	Caliper Model Number	CD-6" CS
Caliper Serial Number	783893	Calibration Due Date (as applicable)	N/A

Rad Con Technician	D. Sarge / DJS	Date	6/1/04	Time	1115
Survey Unit Inspector Approval	D. Sarge / DJS	Date	6/1/04		

SECTION 3 - MEASUREMENT RESULTS

SMTA Grid Map & Measurement Results in Units of mm (Insert Results In White Blocks Below)

1 18.3	7 19.1	13 20.6	19 19.9	25 19.6	31 22.1
2 0.0	8 0.0	14 0.0	20 0.0	26 0.0	32 0.0
3 0.0	9 0.0	15 0.0	21 0.0	27 0.0	33 0.0
4 0.0	10 0.0	16 20.7	22 0.0	28 0.0	34 0.0
5 20.3	11 19.5	17 20.3	23 21.2	29 21.2	35 20.2
6 3.3	12 3.5	18 22.7	24 3.0	30 4.7	36 4.1

Average Measurement – 8.45 mm

Comments

- SMTA readings were taken on steel plate welded to steel liner.
- A gap exists between two plates within this SMTA. The measurements obtained for this gap (20.7, 20.3 and 22.7 mm) is similar to another gap located above this gap.

Additional Measurements Required

ATTACHMENT 4.2

SECTION 1 - DESCRIPTION			KH
SMTA Number	MA8-2 Structure #1	Survey Unit Number	MA8-12
SMTA Location	CV – Southside of CV – Solid Concrete Structure #1		

Survey Unit Inspector	D. Sarge	Date	6/8/04	Time	1100

SECTION 2 - CALIPER INFORMATION & PERSONNEL INVOLVED			
Caliper Manufacturer		Caliper Model Number	
Caliper Serial Number		Calibration Due Date (as applicable)	N/A

Rad Con Technician	D. Sarge	Date	06/08/04	Time	1100
Survey Unit Inspector Approval	D. Sarge /	Date	6/08/04		

SECTION 3 - MEASUREMENT RESULTS

SMTA Grid Map & Measurement Results in Units of mm
(Insert Results in White Blocks Below)

1	7	13	19	25	31
2	8	14	20	26	32
3	9	15	21	27	33
4	10	16	22	28	34
5	11	17	23	29	35
6	12	18	24	30	36

Average Measurement – mm

Comments

Using a tape measure, eight depth measurements were obtained with the aid of a Ludlum 43-68 detector to simulate actual measurement depth.

The readings were obtained throughout the surface of the concrete structure in areas demonstrating surface roughness/recesses.

The average of these readings was calculated to be 1.0 ".

Additional Measurements Required

ATTACHMENT 4 . 3

SECTION 1 - DESCRIPTION			
SMTA Number	MA8-2 Structure #2	Survey Unit Number	MA8-12
SMTA Location	CV – Southside of CV – Solid Concrete Structure #2		

Survey Unit Inspector	D. Sarge	Date	6/8/04	Time	1100

SECTION 2 - CALIPER INFORMATION & PERSONNEL INVOLVED			
Caliper Manufacturer		Caliper Model Number	
Caliper Serial Number		Calibration Due Date (as applicable)	N/A

Rad Con Technician	D. Sarge	Date	08/08/04	Time	1110
Survey Unit Inspector Approval	D. Sarge /	Date	6/08/04		

SECTION 3 - MEASUREMENT RESULTS

SMTA Grid Map & Measurement Results in Units of mm
(Insert Results in White Blocks Below)

1	7	13	19	25	31
2	8	14	20	26	32
3	9	15	21	27	33
4	10	16	22	28	34
5	11	17	23	29	35
6	12	18	24	30	36

Average Measurement – mm

Comments

Using a tape measure, ten depth measurements were obtained with the aid of a Ludlum 43-68 detector to simulate actual measurement depth.

The readings were obtained throughout the surface of the concrete structure in areas demonstrating surface roughness/recesses.

The average of these readings was calculated to be 1.2 ".

Additional Measurements Required

ATTACHMENT 4-4

SECTION 1 - DESCRIPTION			
SMTA Number	MA8-2 Structure #3	Survey Unit Number	MA8-12
SMTA Location	CV – Southside of CV – Solid Concrete Structure #3		

Survey Unit Inspector	D. Sarge	Date	6/8/04	Time	1100

SECTION 2 - CALIPER INFORMATION & PERSONNEL INVOLVED			
Caliper Manufacturer		Caliper Model Number	
Caliper Serial Number		Calibration Due Date (as applicable)	N/A

Rad Con Technician	D. Sarge	Date	06/08/04	Time	1115
Survey Unit Inspector Approval	D. Sarge /	Date	6/08/04		

SECTION 3 - MEASUREMENT RESULTS

SMTA Grid Map & Measurement Results in Units of mm
(Insert Results in White Blocks Below)

1	7	13	19	25	31
2	8	14	20	26	32
3	9	15	21	27	33
4	10	16	22	28	34
5	11	17	23	29	35
6	12	18	24	30	36

Average Measurement – mm

Comments

Using a tape measure, eight depth measurements were obtained with the aid of a Ludlum 43-68 detector to simulate actual measurement depth.

The readings were obtained throughout the surface of the concrete structure in areas demonstrating surface roughness/recesses.

The average of these readings was calculated to be 1.2 ".

Additional Measurements Required

ATTACHMENT 4 . 5

EXHIBIT 3
Surface Measurement Test Area (SMTA) Data Sheet

SECTION 1 - DESCRIPTION					
SMTA Number	MA8-2 Structure #4	Survey Unit Number	MA8-~~1~~2		
SMTA Location	CV – Southside of CV – Solid Concrete Structure #4				
Survey Unit Inspector	D. Sarge	Date	6/8/04	Time	1100

SECTION 2 - CALIPER INFORMATION & PERSONNEL INVOLVED					
Caliper Manufacturer		Caliper Model Number			
Caliper Serial Number		Calibration Due Date (as applicable)	N/A		
Rad Con Technician	D. Sarge	Date	06/08/04	Time	1120
Survey Unit Inspector Approval	D Sarge /	Date	6/08/04		

SECTION 3 - MEASUREMENT RESULTS

SMTA Grid Map & Measurement Results in Units of mm
(Insert Results in White Blocks Below)

1	7	13	19	25	31
2	8	14	20	26	32
3	9	15	21	27	33
4	10	16	22	28	34
5	11	17	23	29	35
6	12	18	24	30	36

Average Measurement – mm

Comments

Using a tape measure, eight depth measurements were obtained with the aid of a Ludlum 43-68 detector to simulate actual measurement depth.

The readings were obtained throughout the surface of the concrete structure in areas demonstrating surface roughness/recesses.

The average of these readings was calculated to be 1.4 ".

Additional Measurements Required

ATTACHMENT 4 . 6

SECTION 1 - DESCRIPTION			
SMTA Number	MA8-2 Structure #5	Survey Unit Number	MA8-2
SMTA Location	CV – Southside of CV – Solid Concrete Structure #5		

Survey Unit Inspector	D. Sarge	Date	6/8/04	Time	1100

SECTION 2 - CALIPER INFORMATION & PERSONNEL INVOLVED			
Caliper Manufacturer		Caliper Model Number	
Caliper Serial Number		Calibration Due Date (as applicable)	N/A

Rad Con Technician	D. Sarge	Date	06/08/04	Time	1130
Survey Unit Inspector Approval	D. Sarge /	Date	6/08/04		

SECTION 3 - MEASUREMENT RESULTS

SMTA Grid Map & Measurement Results in Units of mm
(Insert Results In White Blocks Below)

1	7	13	19	25	31
2	8	14	20	26	32
3	9	15	21	27	33
4	10	16	22	28	34
5	11	17	23	29	35
6	12	18	24	30	36

Average Measurement – mm

Comments

Using a tape measure, six depth measurements were obtained with the aid of a Ludlum 43-68 detector to simulate actual measurement depth.

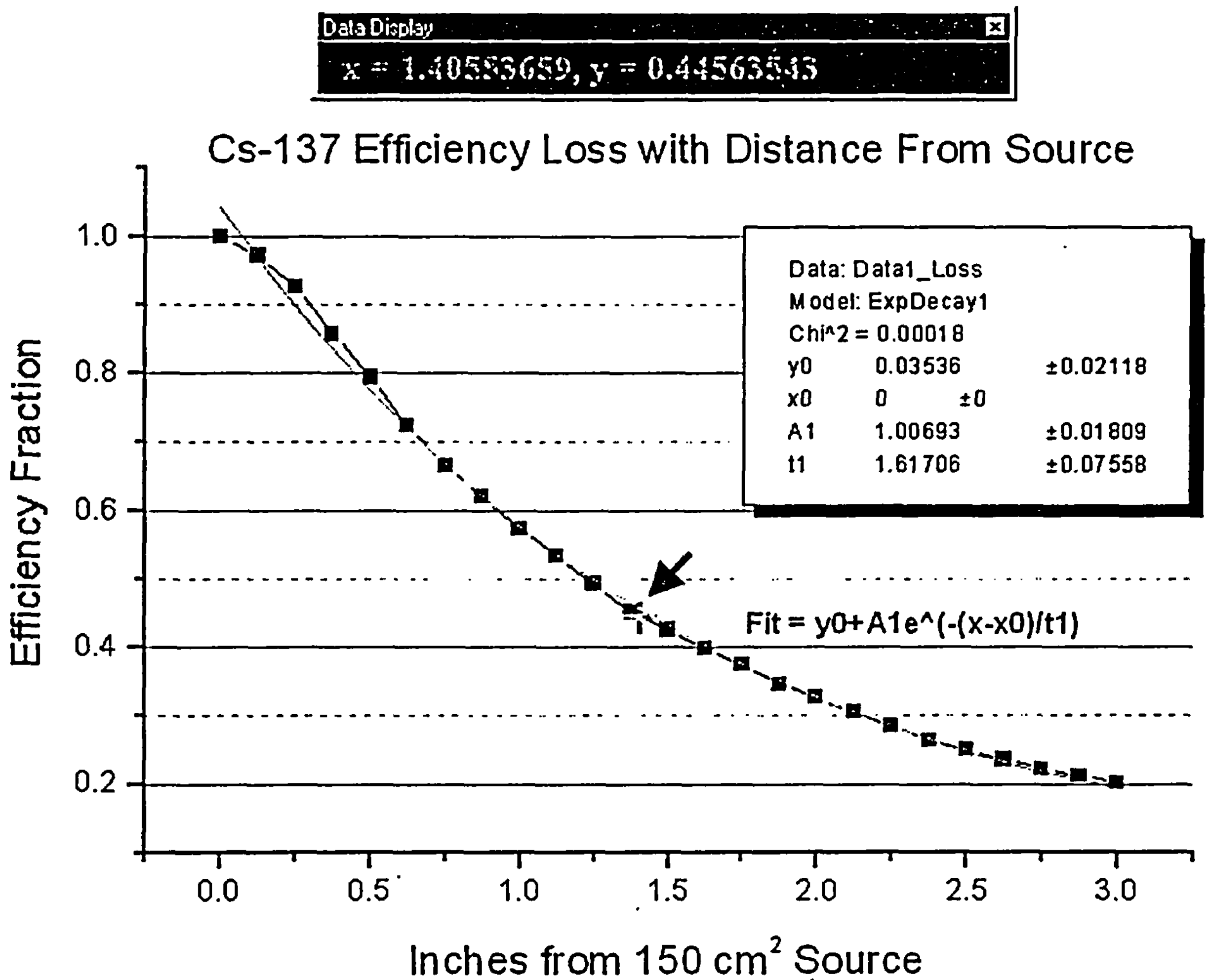
The readings were obtained throughout the surface of the concrete structure in areas demonstrating surface roughness/recesses.

The average of these readings was calculated to be 1.3 ".

Additional Measurements Required

ATTACHMENT 4 - 7

1



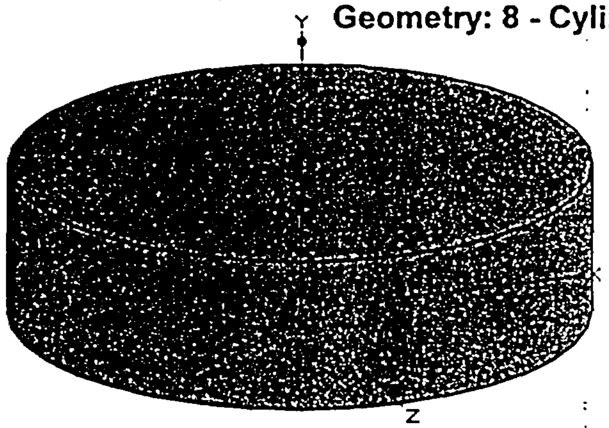
ATTACHMENT 5 . 1

MicroShield v5.05 (5.05-00121)
GPU Nuclear

Page : 1
DOS File : SOILC.MS5
Run Date: May 25, 2004
Run Time: 9:28:26 AM
Duration : 00:00:01

File Ref: ____________
Date: ____________
By: ____________
Checked: ____________

Case Title: Soil
Description: Soil Density 1.7 g/cc, 6" Cylinder @ 5" from Surface
Geometry: 8 - Cylinder Volume - End Shields



Source Dimensions

Height	15.24 cm	6.0 in
Radius	28.21 cm	11.1 in

Dose Points

	X	Y	Z
# 1	0 cm	27.94 cm	0 cm
	0.0 in	11.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	3.81e+04 cm³	Concrete	1.7
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	6.1275e-008	2.2672e+003	1.6082e-006	5.9503e-002
Cs-137	6.4772e-008	2.3966e+003	1.7000e-006	6.2900e-002

Buildup
The material reference is : Source

Integration Parameters

Radial	40
Circumferential	40
Y Direction (axial)	40

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	4.694e+01	6.799e-06	8.229e-06	5.663e-08	6.854e-08
0.0322	8.660e+01	1.307e-05	1.592e-05	1.052e-07	1.281e-07
0.0364	3.151e+01	7.243e-06	9.460e-06	4.115e-08	5.375e-08
0.6616	2.040e+03	6.302e-02	1.133e-01	1.222e-04	2.197e-04
TOTALS:	2.205e+03	6.305e-02	1.133e-01	1.224e-04	2.199e-04

ATTACHMENT 6.1

NaI Scan MDC Calculation

$b := 100 \qquad p := 0.5 \qquad HS_d := 56.42 \qquad SR := 25 \qquad d := 1.38$

$Conv := 208.705 \qquad MS_{output} := 2.197 \cdot 10^{-4}$

$\frac{HS_d}{SR} = 2.257$ *Observation Interval (seconds)*

$O_i := \frac{HS_d}{SR}$ *Observation Interval (seconds)*

$$b_i := \frac{(b \cdot O_i)}{60}$$

$$MDCR_i := \left(d \cdot \sqrt{b_i}\right) \cdot \frac{60}{O_i}$$

$MDCR_i = 71.155$ <u>*net counts per minute*</u>

$$MDCR_{surveyor} := \frac{MDCR_i}{\sqrt{p}}$$

$MDCR_{surveyor} = 100.629$ <u>*net counts per minute*</u>

$$MDER := \frac{MDCR_{surveyor}}{Conv}$$

$MDER = 0.482$ μR/h

$$MDC_{scan} := \frac{MDER}{MS_{output} \cdot 1 \cdot 10^3}$$

$MDC_{scan} = 2.195$ pCi/g

NaI Scan MDC Calculation

$b := 200 \qquad p := 0.5 \qquad HS_d := 56.42 \qquad SR := 25 \qquad d := 1.38$

$Conv := 208.705 \qquad MS_{output} := 2.197 \cdot 10^{-4}$

$\frac{HS_d}{SR} = 2.257$ *Observation Interval (seconds)*

$O_i := \frac{HS_d}{SR}$ *Observation Interval (seconds)*

$$b_i := \frac{(b \cdot O_i)}{60}$$

$$MDCR_i := \left(d \cdot \sqrt{b_i}\right) \cdot \frac{60}{O_i}$$

$MDCR_i = 100.629$ *net counts per minute*

$$MDCR_{surveyor} := \frac{MDCR_i}{\sqrt{p}}$$

$MDCR_{surveyor} = 142.311$ *net counts per minute*

$$MDER := \frac{MDCR_{surveyor}}{Conv}$$

$MDER = 0.682$ μR/h

$$MDC_{scan} := \frac{MDER}{MS_{output} \cdot 1 \cdot 10^3}$$

$MDC_{scan} = 3.104$ pCi/g

NaI Scan MDC Calculation

$b := 300 \qquad p := 0.5 \qquad HS_d := 56.42 \qquad SR := 25 \qquad d := 1.38$

$Conv := 208.705 \qquad MS_{output} := 2.197 \cdot 10^{-4}$

$\frac{HS_d}{SR} = 2.257$ *Observation Interval (seconds)*

$O_i := \frac{HS_d}{SR}$ *Observation Interval (seconds)*

$$b_i := \frac{(b \cdot O_i)}{60}$$

$$MDCR_i := \left(d \cdot \sqrt{b_i}\right) \cdot \frac{60}{O_i}$$

$MDCR_i = 123.245$ *net counts per minute*

$$MDCR_{surveyor} := \frac{MDCR_i}{\sqrt{p}}$$

$MDCR_{surveyor} = 174.295$ *net counts per minute*

$$MDER := \frac{MDCR_{surveyor}}{Conv}$$

$MDER = 0.835$ μR/h

$$MDC_{scan} := \frac{MDER}{MS_{output} \cdot 1 \cdot 10^3}$$

$MDC_{scan} = 3.801$ pCi/g

NaI Scan MDC Calculation

$b := 400 \qquad p := 0.5 \qquad HS_d := 56.42 \qquad SR := 25 \qquad d := 1.38$

$Conv := 208.705 \qquad MS_{output} := 2.197 \cdot 10^{-4}$

$\frac{HS_d}{SR} = 2.257$ *Observation Interval (seconds)*

$O_i := \frac{HS_d}{SR}$ *Observation Interval (seconds)*

$$b_i := \frac{(b \cdot O_i)}{60}$$

$$MDCR_i := \left(d \cdot \sqrt{b_i}\right) \cdot \frac{60}{O_i}$$

$MDCR_i = 142.311$ *net counts per minute*

$$MDCR_{surveyor} := \frac{MDCR_i}{\sqrt{p}}$$

$MDCR_{surveyor} = 201.258$ *net counts per minute*

$$MDER := \frac{MDCR_{surveyor}}{Conv}$$

$MDER = 0.964$ μR/h

$$MDC_{scan} := \frac{MDER}{MS_{output} \cdot 1 \cdot 10^3}$$

$MDC_{scan} = 4.389$ pCi/g

where:

b = background in counts per minute

b_i = background counts in observation interval

Conv = NaI manufacturers reported response to energy of contaminant (cpm/uR/h)

d = index of sensitivity (Table 6.5 MARSSIM), 1.38 = 95% of correct detection's, 60% false positives

HS_d = hot spot diameter (in centimeters)

MDC_{scan} = Minimum Detectable Concentration for scanning (pCi/g)

$MDCR_i$ = Minimum Detectable Count Rate (ncpm)

$MDCR_{surveyor}$ = $MDCR_i$ corrected by human performance factor (ncpm)

MDER = Minimum Detectable Exposure Rate (uR/h)

MS_{output} = MicroShield output exposure rate for 1 pCi/g of contaminant (mR/h)

O_i = obervation Interval (seconds)

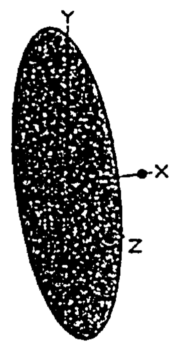
p = human performance factor

SR = scan rate in centimeters per second

MicroShield v5.05 (5.05-00121)
GPU Nuclear

Page : 1	File Ref: ___________
DOS File : SURFC.MS5	Date: ___________
Run Date: May 25, 2004	By: ___________
Run Time: 5:58:36 PM	Checked: ___________
Duration : 00:00:00	

Case Title: Concrete Surface
Description: 12" Diameter Model
Geometry: 3 - Disk



Source Dimensions

Radius	15.24 cm	6.0 in

Dose Points

	X	Y	Z
# 1	7.62 cm	0 cm	0 cm
	3.0 in	0.0 in	0.0 in

Shields

Shield Name	Material	Density
Air Gap	Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm²	Bq/cm²
Ba-137m	6.9026e-010	2.5540e+001	9.4600e-007	3.5002e-002
Cs-137	7.2966e-010	2.6997e+001	1.0000e-006	3.7000e-002

Buildup
The material reference is : Air Gap

Integration Parameters

Radial	40
Circumferential	40

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	5.287e-01	9.237e-06	9.286e-06	7.694e-08	7.735e-08
0.0322	9.755e-01	1.725e-05	1.734e-05	1.388e-07	1.395e-07
0.0364	3.550e-01	7.100e-06	7.137e-06	4.034e-08	4.055e-08
0.6616	2.298e+01	8.375e-03	8.383e-03	1.624e-05	1.625e-05
TOTALS:	2.484e+01	8.409e-03	8.417e-03	1.649e-05	1.651e-05

ATTACHMENT 6 - 7

NaI Scan MDC Calculation - Surface Deposition

$b := 200 \quad p := 0.5 \quad HS_d := 30.48 \quad SR := 3.048 \quad d := 1.38$

$Conv := 208.705 \quad MS_{output} := 1.625 \cdot 10^{-5} \quad O_i := \frac{HS_d}{SR}$

$O_i = 10$ *Observation Interval (seconds)*

$$b_i := \frac{(b \cdot O_i)}{60}$$

$$MDCR_i := \left(d \cdot \sqrt{b_i}\right) \cdot \frac{60}{O_i}$$

$MDCR_i = 47.805$ *net counts per minute*

$$MDCR_{surveyor} := \frac{MDCR_i}{\sqrt{p}}$$

$MDCR_{surveyor} = 67.606$ *net counts per minute*

$$MDER := \frac{MDCR_{surveyor}}{Conv}$$

$MDER = 0.324$ μR/h

$$MDC_{scan} := \frac{MDER}{MS_{output} \cdot 1 \cdot 10^3}$$

$MDC_{scan} = 19.934$ pCi/cm^2

$MDC_{scan} \cdot 222 = 4425.389$ *dpm/100 cm^2*

where:

b = background in counts per minute

b_i = background counts in observation interval

Conv = NaI manufacturers or calibration information reported response to energy of contaminant (cpm/uR/h)

d = index of sensitivity (Table 6.5 MARSSIM), 1.38 = 95% of correct detection's, 60% false positives

HS_d = hot spot diameter (in centimeters)

MDC_{scan} = Minimum Detectable Concentration for scanning (pCi/cm^2)

$MDCR_i$ = Minimum Detectable Count Rate (ncpm)

$MDCR_{surveyor}$ = $MDCR_i$ corrected by human performance factor (ncpm)

MDER = Minimum Detectable Exposure Rate (uR/h)

MS_{output} = MicroShield output exposure rate for 1 pCi/cm^2 of contaminant (mR/h)

O_i = obervation Interval (seconds)

p = human performance factor

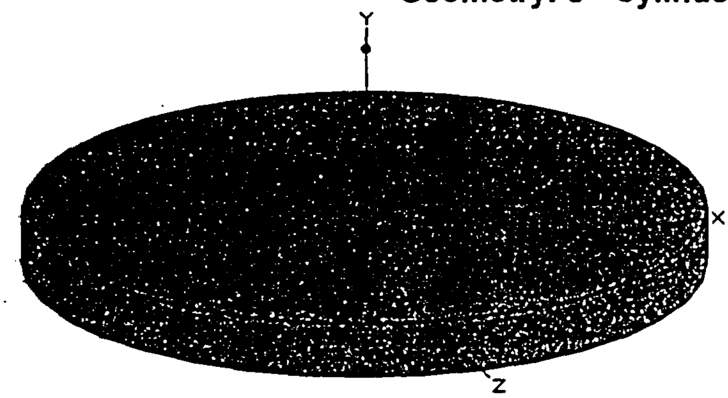
SR = scan rate in centimeters per second

MicroShield v5.05 (5.05-00121)
GPU Nuclear

Page : 1
DOS File : SLABD.MS5
Run Date: May 25, 2004
Run Time: 6:03:50 PM
Duration : 00:00:02

File Ref: ____________
Date: ____________
By: ____________
Checked: ____________

Case Title: Concrete Slab
Description: 12" Diameter by 1" Deep - Cs-137 @ 1 pCi/g
Geometry: 8 - Cylinder Volume - End Shields



Source Dimensions

Height	2.54 cm	1.0 in
Radius	15.24 cm	6.0 in

Dose Points

	X	Y	Z
# 1	0 cm	10.16 cm	0 cm
	0.0 in	4.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	113.097 in³	Concrete	2.35
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
Ba-137m	4.1201e-009	1.5245e+002	2.2231e-006	8.2255e-002
Cs-137	4.3553e-009	1.6115e+002	2.3500e-006	8.6950e-002

Buildup
The material reference is : Source

Integration Parameters

Radial	60
Circumferential	60
Y Direction (axial)	60

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	3.156e+00	6.355e-06	7.682e-06	5.293e-08	6.399e-08
0.0322	5.823e+00	1.222e-05	1.486e-05	9.832e-08	1.196e-07
0.0364	2.119e+00	6.726e-06	8.749e-06	3.821e-08	4.971e-08
0.6616	1.372e+02	3.200e-02	4.053e-02	6.204e-05	7.858e-05
TOTALS:	1.483e+02	3.203e-02	4.057e-02	6.223e-05	7.881e-05

ATTACHMENT 6 . 10

NaI Scan MDC Calculation - Concrete Volume

$b := 200 \quad p := 0.5 \quad HS_d := 30.48 \quad SR := 3.048 \quad d := 1.38$

$Conv := 208.705 \quad MS_{output} := 7.858\ 10^{-5}$

$\frac{HS_d}{SR} = 10$ *Observation Interval (seconds)*

$O_i := \frac{HS_d}{SR}$ *Observation Interval (seconds)*

$b_i := \frac{(b \cdot O_i)}{60}$

$MDCR_i := \left(d \cdot \sqrt{b_i}\right) \cdot \frac{60}{O_i}$

$MDCR_i = 47.805$ <u>*net counts per minute*</u>

$MDCR_{surveyor} := \frac{MDCR_i}{\sqrt{p}}$

$MDCR_{surveyor} = 67.606$ <u>*net counts per minute*</u>

$MDER := \frac{MDCR_{surveyor}}{Conv}$

$MDER = 0.324$ μR/h

$MDC_{scan} := \frac{MDER}{MS_{output} \cdot 1 \cdot 10^3}$

$MDC_{scan} = 4.122$ pCi/g

where:

b = *background in counts per minute*

b_i = *background counts in observation interval*

Conv = NaI manufacturers reported response to energy of contaminant (cpm/uR/h)

d = *index of sensitivity (Table 6.5 MARSSIM), 1.38 = 95% of correct detection's, 60% false positives*

HS_d = *hot spot diameter (in centimeters)*

MDC_{scan} = *Minimum Detectable Concentration for scanning (pCi/g)*

$MDCR_i$ = *Minimum Detectable Count Rate (ncpm)*

$MDCR_{surveyor}$ = $MDCR_i$ *corrected by human performance factor (ncpm)*

MDER = Minimum Detectable Exposure Rate (uR/h)

MS_{output} = *MicroShield output exposure rate for 1 pCi/g of contaminant (mR/h)*

O_i = *obervation Interval (seconds)*

p = *human performance factor*

SR = scan rate in centimeters per second

Site Report

Site Summary

Site Name: SOUTH CV SOIL AREA

Planner(s): BHB

Contaminant Summary

NOTE: Surface soil DCGLw units are pCi/g.
Building surface DCGLw units are dpm/100 cm^2.

Contaminant	Type	DCGLw	Screening Value Used?	Area (m^2)	Area Factor
Cs-137	Surface Soil	4.30	No	10,000	1
				1	1

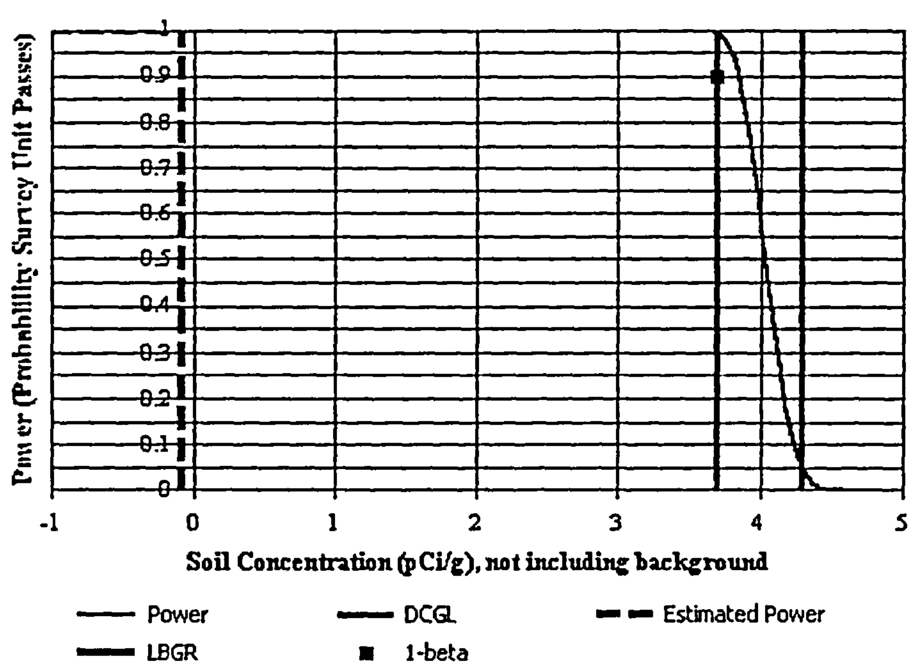
ATTACHMENT 7 - 1

Surface Soil Survey Plan

Survey Plan Summary

Site:	SOUTH CV SOIL AREA		
Planner(s):	BHB		
Survey Unit Name:	South CV Yard Area		
Comments:			
Area (m^2):	395	Classification:	1
Selected Test:	WRS	Estimated Sigma (pCi/g):	0.39
DCGL (pCi/g):	4.30	Sample Size (N/2):	14
LBGR (pCi/g):	3.7	Estimated Conc. (pCi/g):	-0.1
Alpha:	0.050	Estimated Power:	1
Beta:	0.100	EMC Sample Size (N):	14
Scanning Instrumentation:	2" x 2" NaI W Detector		

Prospective Power Curve



ATTACHMENT 7-2

Surface Soil Survey Plan

Contaminant Summary

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	4.1

Contaminant	Survey Unit Estimate (Mean ± 1-Sigma) (pCi/g)	Reference Area Estimate (Mean ± 1-Sigma) (pCi/g)
Cs-137	0.193 ± 0.108	0.28 ± 0.39

ATTACHMENT 7.3

COMPASS - DQO Wizard for Surface Soil Assessment

Elevated Measurement Comparison (EMC)

Enter in a description for the scanning instrumentation used. Then enter a scan MDC for each measured contaminant. Click the CALCULATE button to view the integrated survey design results. All entered and calculated scan MDC and DCGL units are in pCi/g.

Scanning Instrumentation Description: 2" x 2" NaI W Detector

Contaminant	Scan MDC
Cs-137	4.1

Enter Scan MDC

Scan MDC:

SAVE

NUREG-1507

CALCULATE

Statistical Design

N/2:	14
Bounded Area (m²):	28.2
Area Factor:	1
DCGLw:	4.30
Scan MDC Required:	N/A

Hot Spot Design

Actual Scan MDC:	4.1
Area Factor:	N/A
Bounded Area (m²):	N/A
Post-EMC N/2:	14

COMPASS

No additional samples are required because the actual scan MDC is less than the DCGLw.

OK

Enable Training

v1.0.0

ATTACHMENT 7 - 4

COMPASS Site Report

Site Summary

Site Name: South CV Yard Concrete & Steel A

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
Gross Activity	Building Surface	33,325	No	36	1
				25	1.2
				16	1.5
				9	2
				4	3.4
				1	10.1
				0.25	10.1

BHB
6/10/04

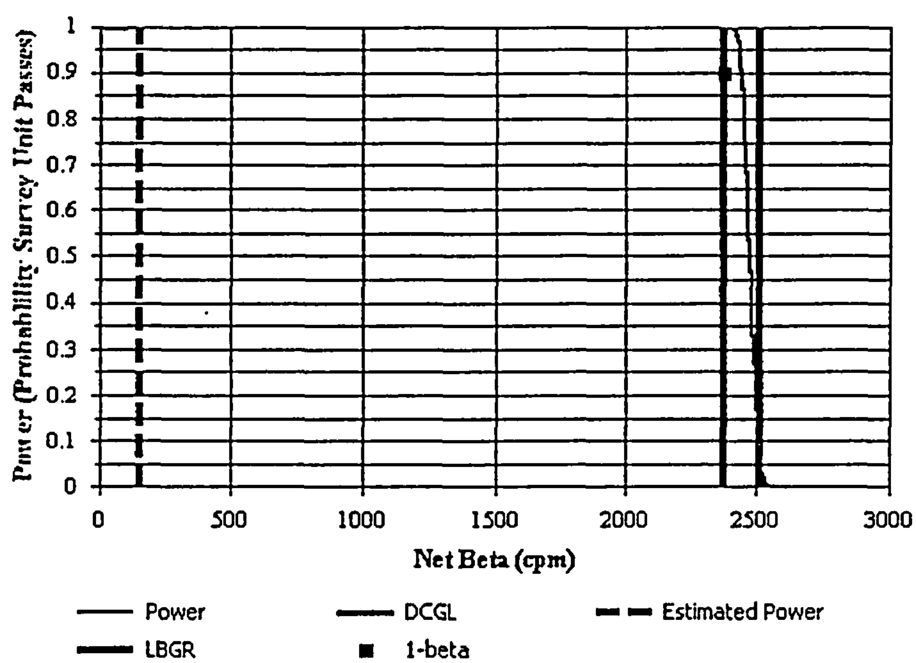
ATTACHMENT 7.5

Building Surface Survey Plan

Survey Plan Summary

Site:	South CV Yard Concrete & Steel A		
Planner(s):	BHB		
Survey Unit Name:	South CV Yard Misc. Concrete		
Comments:	Concrete Foundation Remnants		
Area (m²):	13	Classification:	1
Selected Test:	WRS	Estimated Sigma (cpm):	50.9
DCGL (cpm):	2,519	Sample Size (N/2):	8
LBGR (cpm):	2,375	Estimated Conc. (cpm):	157
Alpha:	0.050	Estimated Power:	1.00
Beta:	0.100	EMC Sample Size (N):	8

Prospective Power Curve



ATTACHMENT 7 - 6

Building Surface Survey Plan

Contaminant Summary

Contaminant	DCGLw (dpm/100 cm²)
Gross Activity	33,325

Beta Instrumentation Summary

Gross Beta DCGLw (dpm/100 cm²): 33,325
Total Efficiency: 0.06
Gross Beta DCGLw (cpm): 2,519

ID	Type	Mode	Area (cm²)
20	GFPC	Beta	126

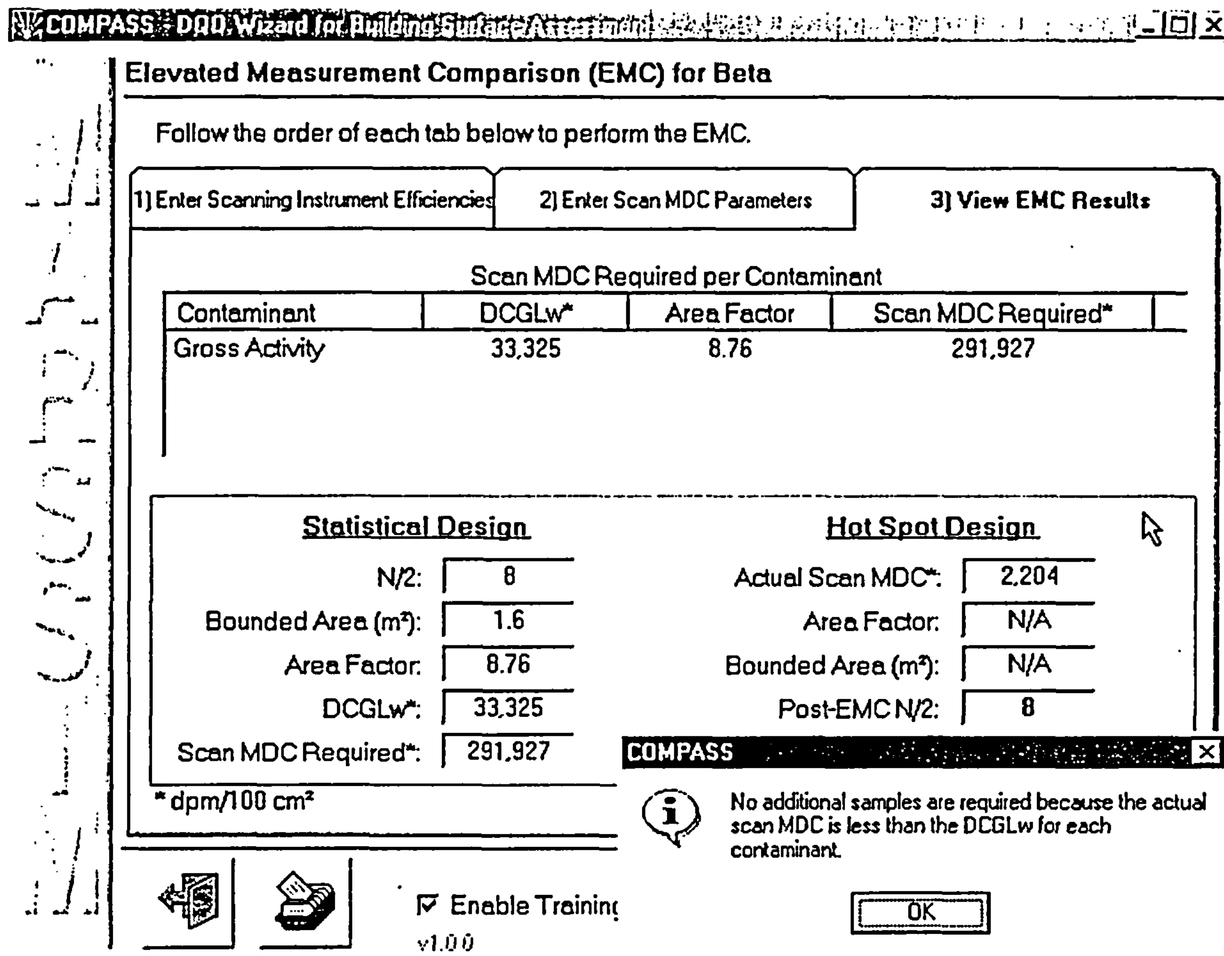
Contaminant	Energy[1]	Fraction[2]	Inst. Eff.	Surf. Eff.	Total Eff.
Gross Activity	187.87	1.0000	0.48	0.13	0.0624

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

Gross Survey Unit Mean (cpm): 463 ± 51 (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	1,116

ATTACHMENT 7 - 7



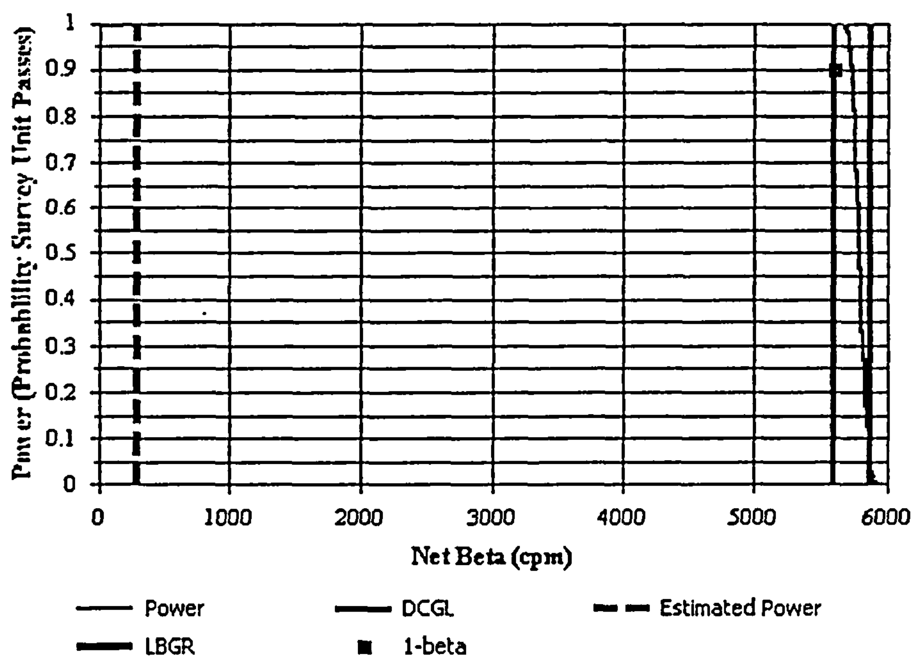
ATTACHMENT 7.8

Building Surface Survey Plan

Survey Plan Summary

Site:	South CV Yard Concrete & Steel A		
Planner(s):	BHB		
Survey Unit Name:	External CV Steel on South Side		
Comments:			
Area (m²):	7	Classification:	1
Selected Test:	WRS	Estimated Sigma (cpm):	93.9
DCGL (cpm):	5,879	Sample Size (N/2):	8
LBGR (cpm):	5,600	Estimated Conc. (cpm):	290
Alpha:	0.050	Estimated Power:	1.00
Beta:	0.100	EMC Sample Size (N):	8

Prospective Power Curve



ATTACHMENT 7-9

Building Surface Survey Plan

Contaminant Summary

Contaminant	DCGLw (dpm/100 cm²)
Gross Activity	33,325

Beta Instrumentation Summary

Gross Beta DCGLw (dpm/100 cm²): 33,325
Total Efficiency: 0.14
Gross Beta DCGLw (cpm): 5,879

ID	Type	Mode	Area (cm²)
20	GFPC	Beta	126

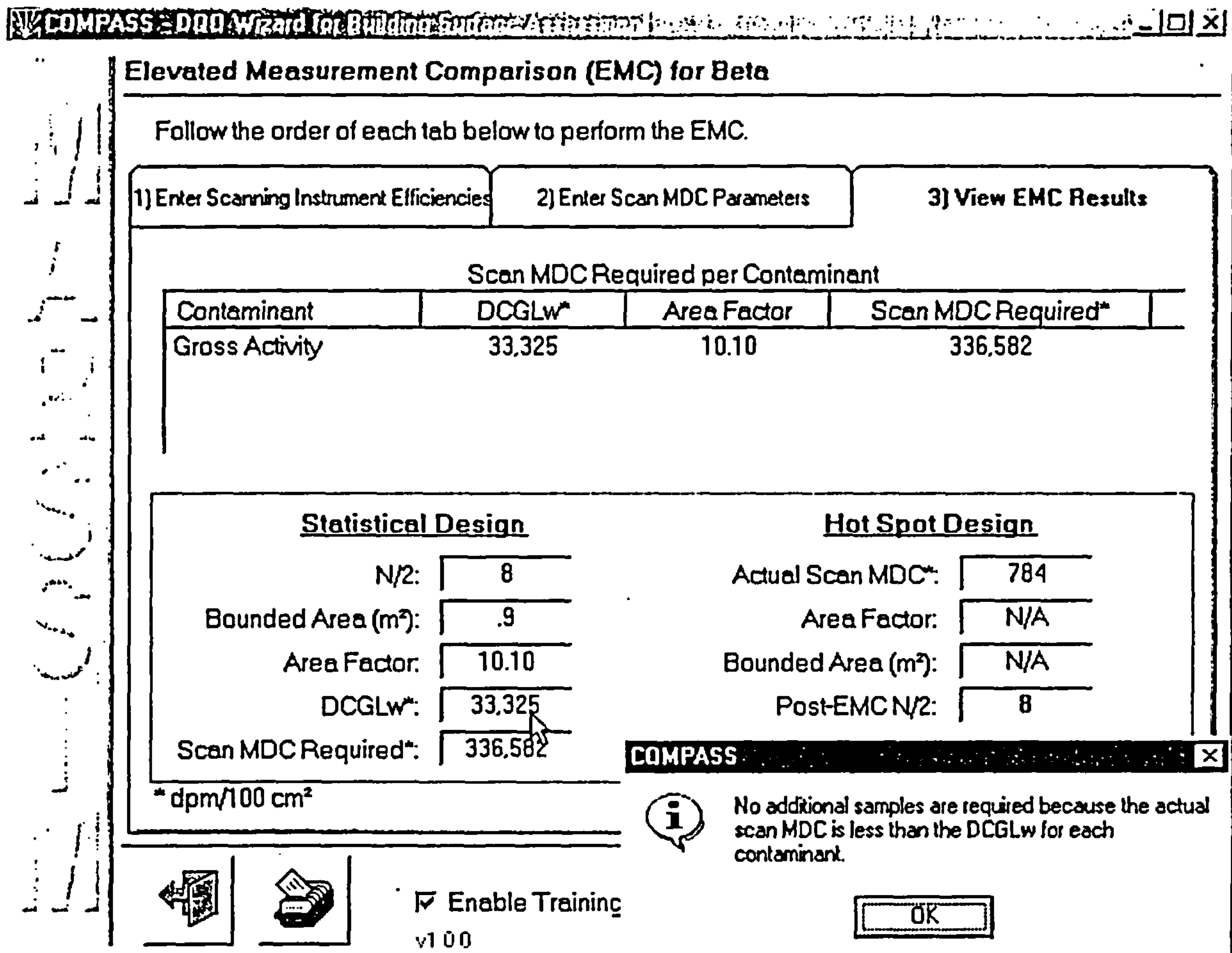
Contaminant	Energy[1]	Fraction[2]	Inst. Eff.	Surf. Eff.	Total Eff.
Gross Activity	187.87	1.0000	0.48	0.30	0.1423

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

Gross Survey Unit Mean (cpm): 501 ± 94 (1-sigma)
Count Time (min): 1

Material	Number of BKG Counts	Average (cpm)	Standard Deviation (cpm)	MDC (dpm/100 cm²)
Steel	37	210.9	17.7	400

ATTACHMENT 7.10



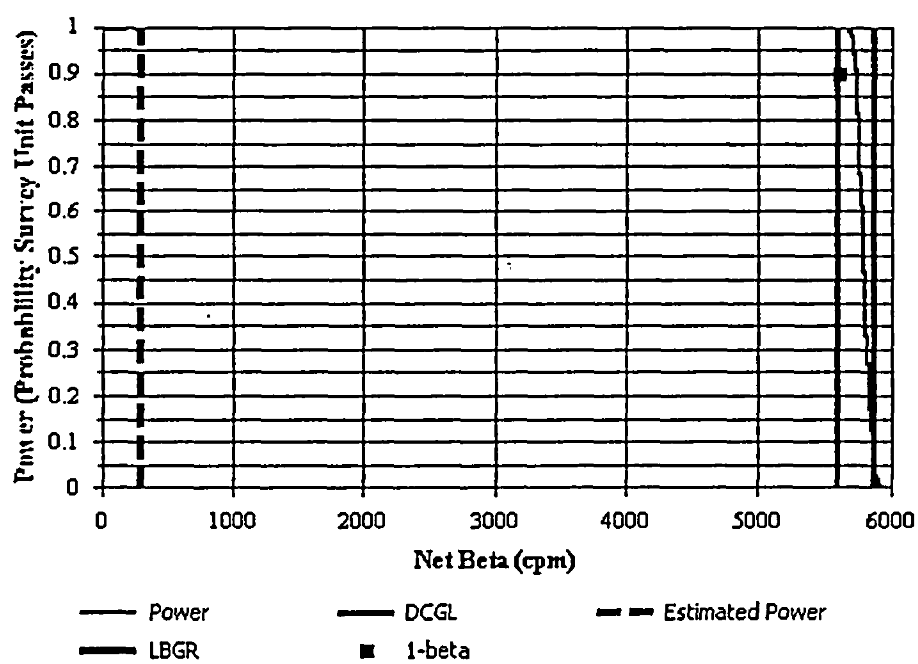
ATTACHMENT 7 - 11

Building Surface Survey Plan

Survey Plan Summary

Site:	South CV Yard Concrete & Steel A		
Planner(s):	BHB		
Survey Unit Name:	External CV Steel on South Side - Class 2		
Comments:	Upper 12.6 m^2ȿ to be Surveyed @ 100% Coverage		
Area (m²):	16	Classification:	2
Selected Test:	WRS	Estimated Sigma (cpm):	93.9
DCGL (cpm):	5,879	Sample Size (N/2):	8
LBGR (cpm):	5,600	Estimated Conc. (cpm):	290
Alpha:	0.050	Estimated Power:	1.00
Beta:	0.100		

Prospective Power Curve



ATTACHMENT 7-12

Building Surface Survey Plan

Contaminant Summary

Contaminant	DCGLw (dpm/100 cm²)
Gross Activity	33,325

Beta Instrumentation Summary

Gross Beta DCGLw (dpm/100 cm²): 33,325
Total Efficiency: *0.14*
Gross Beta DCGLw (cpm): 5,879

ID	Type	Mode	Area (cm²)
20	GFPC	Beta	126

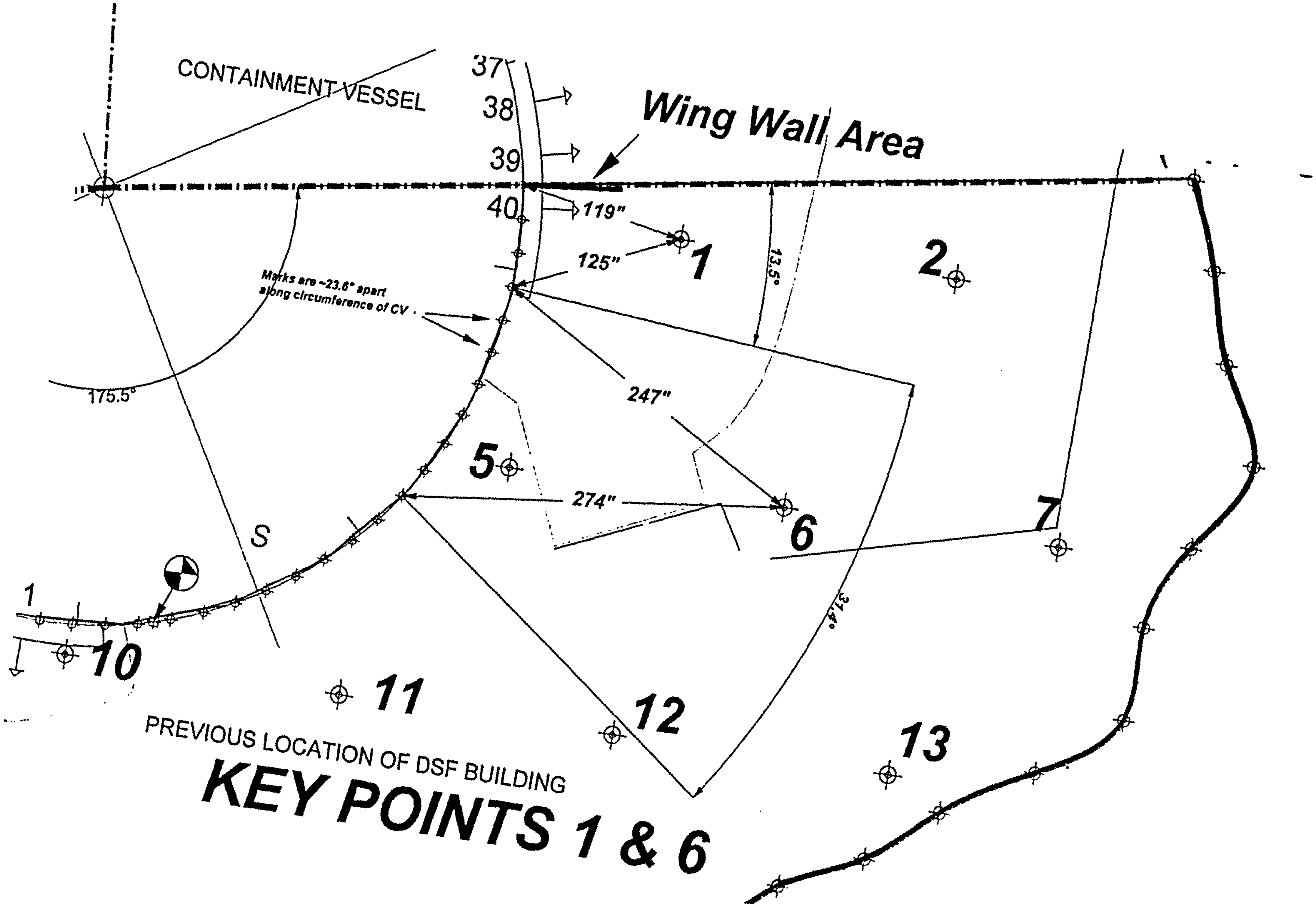
Contaminant	Energy[1]	Fraction[2]	Inst. Eff.	Surf. Eff.	Total Eff.
Gross Activity	187.87	1.0000	0.48	0.30	0.1423

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

Gross Survey Unit Mean (cpm): 501 ± 94 (1-sigma)
Count Time (min): 1

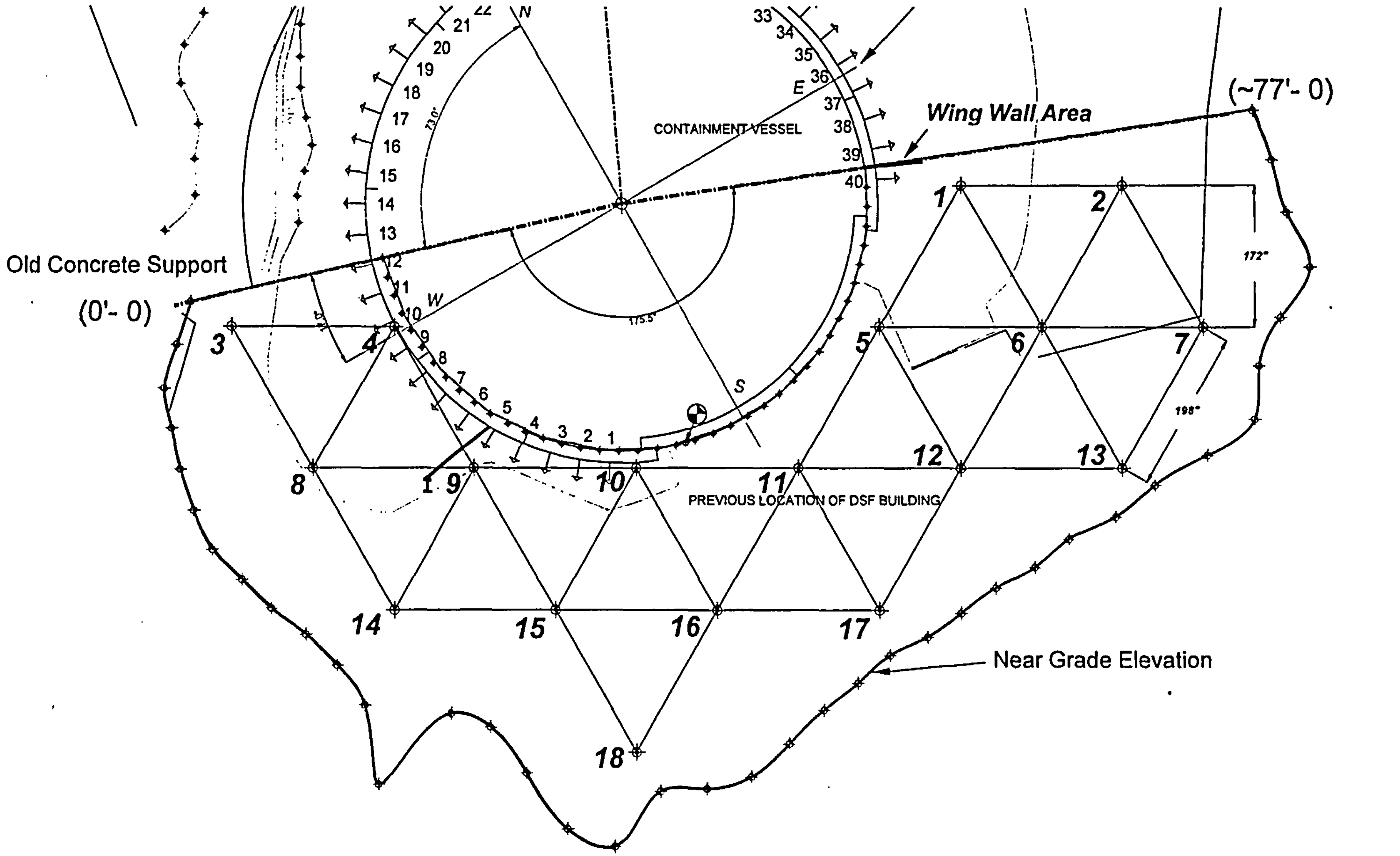
Material	Number of BKG Counts	Average (cpm)	Standard Deviation (cpm)	MDC (dpm/100 cm²)
Steel	37	210.9	17.7	400

ATTACHMENT 7-13



KEY POINTS 1 & 6

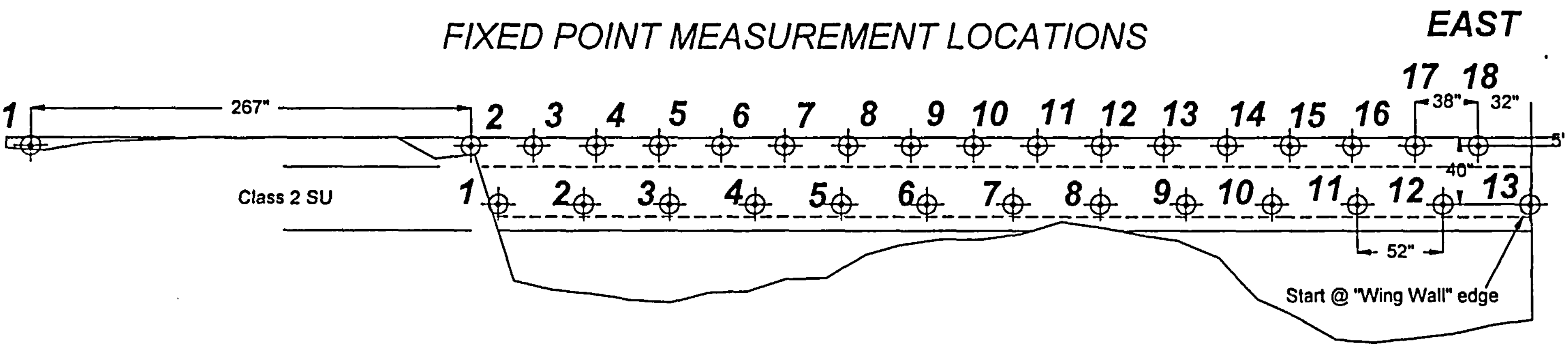
ATTACHMENT 8.1



ATTACHMENT 8 . 2

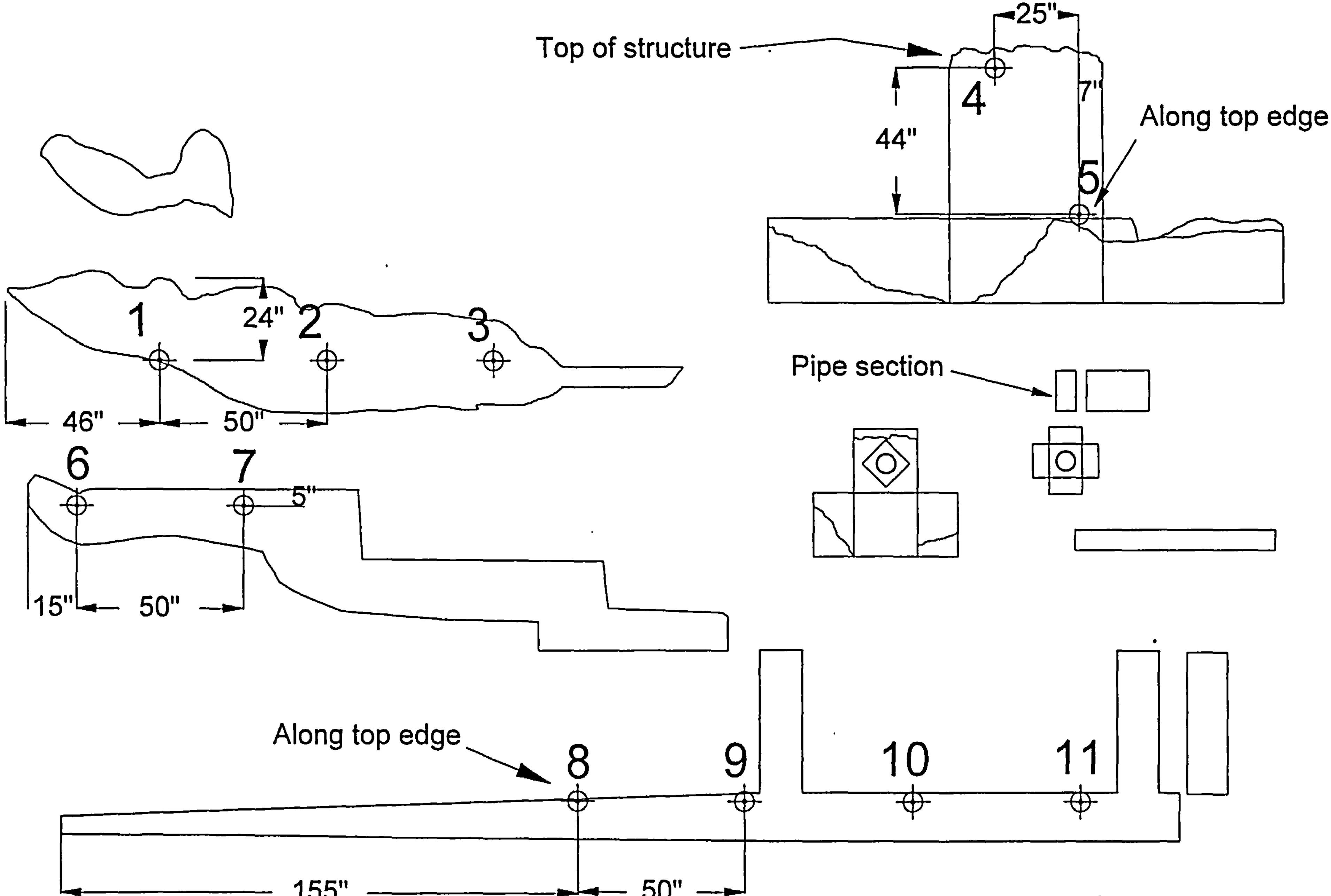
CV STEEL SHELL-SOUTH

FIXED POINT MEASUREMENT LOCATIONS



ATTACHMENT 8 . 3

MISC. CV YARD CONCRETE - SOUTH



ATTACHMENT 8 . 4

[illegible] SOIL SAMPLES		
Cs-137 Sample Results		
Sample No.	pCi/g	Grid
SXSL4778	0.3	AX-130
SXSL4779	0.13	AX-130
SXSL4780	0.15	AX-130
SXSL4781	0.3	AX-130
SXSL4782	0.1	AX-130
SXSL4813	0.08	AX-128
SXSL4814	0.2	AX-128
SXOT4815	0.08	AX-128
SXSL4816	0.17	AX-128
SXSL4827	0.1	AX-128
SXSL4828	0.4	AX-129
SXSL4829	0.08	AX-129
SXSL4830	0.1	AX-129
SXSL4838	0.35	AX-129
SXOT4890	0.3	AX-128
SXOT4891	0.25	AX-128
Min ⇒	***0.08***	
Max ⇒	***0.4***	
Mean ⇒	***0.193***	
Sigma ⇒	***0.108***	
Median ⇒	***0.16***	

ATTACHMENT 9 . 1

SOUTH SIDE OF CV - CONCRETE

MA8-2		126179 B. Horton									FSS-636	BHB
No.	Location	Date	Time	Detector	Counts	Count Time (sec)	Mode	Designator			Shielded	Unshielded
36	CVCON FP1S	6/7/2004	15:17	1	299	60	SCL	Shielded	β			439
12	CVCON FP1U	6/7/2004	13:15	1	439	60	SCL	Unshielded	β		299	
35	CVCON FP2S	6/7/2004	15:15	1	294	60	SCL	Shielded	β			425
14	CVCON FP2U	6/7/2004	13:18	1	425	60	SCL	Unshielded	β		294	
34	CVCON FP3S	6/7/2004	15:14	1	311	60	SCL	Shielded	β			475
15	CVCON FP3U	6/7/2004	13:28	1	475	60	SCL	Unshielded	β		311	
33	CVCON FP4S	6/7/2004	15:12	1	348	60	SCL	Shielded	β			539
16	CVCON FP4U	6/7/2004	13:33	1	539	60	SCL	Unshielded	β		348	
32	CVCON FP5S	6/7/2004	15:11	1	301	60	SCL	Shielded	β			479
17	CVCON FP5U	6/7/2004	13:37	1	479	60	SCL	Unshielded	β		301	
31	CVCON FP6S	6/7/2004	15:09	1	308	60	SCL	Shielded	β			383
18	CVCON FP6U	6/7/2004	13:40	1	383	60	SCL	Unshielded	β		308	
30	CVCON FP7S	6/7/2004	15:06	1	306	60	SCL	Shielded	β			415
19	CVCON FP7U	6/7/2004	13:55	1	415	60	SCL	Unshielded	β		306	
29	CVCON FP8S	6/7/2004	15:05	1	332	60	SCL	Shielded	β			450
20	CVCON FP8U	6/7/2004	13:57	1	450	60	SCL	Unshielded	β		332	
28	CVCON FP9S	6/7/2004	15:03	1	469	60	SCL	Shielded	β			569
21	CVCON FP9U	6/7/2004	14:00	1	569	60	SCL	Unshielded	β		469	
27	CVCON FP10S	6/7/2004	15:02	1	414	60	SCL	Shielded	β			462
22	CVCON FP10U	6/7/2004	14:04	1	462	60	SCL	Unshielded	β		414	
24	CVCON FP11S	6/7/2004	14:21	1	383	60	SCL	Shielded	β			467
23	CVCON FP11U	6/7/2004	14:17	1	467	60	SCL	Unshielded	β		383	
25	CVCON FP12S	6/7/2004	14:26	1	351	60	SCL	Shielded	β			451
26	CVCON FP12U	6/7/2004	14:27	1	451	60	SCL	Unshielded	β		351	
										Minimum ⇒	2.94E+02	3.83E+02
										Maximum ⇒	4.69E+02	5.69E+02
										Median ⇒	3.22E+02	4.57E+02
										Mean ⇒	3.43E+02	4.63E+02
										Sigma ⇒	5.43E+01	5.09E+01

ATTACHMENT 10.1

Williamsburg Concrete Background Measurements

37122N21	Instrument 95348	RLM6220	Time	Detector	Counts	Count Time (sec)	Mode	Designator			FSS-001	BHB
0	BKGND	1/4/2002	8:52	1	7.26E+03	1800	SCL	Inital Background	β			
1	Source Check	1/4/2002	9:07	1	1.79E+05	60	SCL	Source	β			
2	BKGND	1/4/2002	10:05	2	4.40E+01	1800	SCL	Inital Background	α	*Concrete CF(cpm) ⇒*		0
14	Source Check	1/4/2002	10:39	2	1.51E+05	60	SCL	Source	α		Shielded	Unshielded
15	CON A1S	1/4/2002	13:00	1	2.78E+02	60	SCL	Shielded	β		2.78E+02	
16	CON A1U	1/4/2002	13:02	1	3.88E+02	60	SCL	Unshielded	β			3.88E+02
17	CON A2S	1/4/2002	13:20	1	2.39E+02	60	SCL	Shielded	β		2.39E+02	
18	CON A2U	1/4/2002	13:21	1	2.22E+02	60	SCL	Unshielded	β			2.22E+02
19	CON A3S	1/4/2002	13:28	1	2.39E+02	60	SCL	Shielded	β		2.39E+02	
20	CON A3U	1/4/2002	13:30	1	2.62E+02	60	SCL	Unshielded	β			2.62E+02
21	CON A4S	1/4/2002	13:36	1	2.45E+02	60	SCL	Shielded	β		2.45E+02	
22	CON A4U	1/4/2002	13:38	1	2.71E+02	60	SCL	Unshielded	β			2.71E+02
23	CON A5S	1/4/2002	13:58	1	2.00E+02	60	SCL	Shielded	β		2.00E+02	
24	CON A5U	1/4/2002	14:00	1	2.82E+02	60	SCL	Unshielded	β			2.82E+02
25	CON A6S	1/4/2002	14:03	1	1.84E+02	60	SCL	Shielded	β		1.84E+02	
26	CON A6U	1/4/2002	14:05	1	3.10E+02	60	SCL	Unshielded	β			3.10E+02
27	CON A7S	1/4/2002	14:09	1	1.98E+02	60	SCL	Shielded	β		1.98E+02	
28	CON A7U	1/4/2002	14:10	1	3.15E+02	60	SCL	Unshielded	β			3.15E+02
29	CON A8S	1/4/2002	14:19	1	2.34E+02	60	SCL	Shielded	β		2.34E+02	
30	CON A8S	1/4/2002	14:22	1	2.31E+02	60	SCL	Shielded	β		2.31E+02	
31	CON A8U	1/4/2002	14:24	1	2.88E+02	60	SCL	Unshielded	β			2.88E+02
32	CON A9S	1/4/2002	14:31	1	2.65E+02	60	SCL	Shielded	β		2.65E+02	
33	CON A9U	1/4/2002	14:33	1	2.89E+02	60	SCL	Unshielded	β			2.89E+02
34	CON A10S	1/4/2002	14:42	1	2.46E+02	60	SCL	Shielded	β		2.46E+02	
35	CON A10U	1/4/2002	14:43	1	3.16E+02	60	SCL	Unshielded	β			3.16E+02
36	CON A11S	1/4/2002	15:10	1	1.95E+02	60	SCL	Shielded	β		1.95E+02	
37	CON A11U	1/4/2002	15:12	1	2.94E+02	60	SCL	Unshielded	β			2.94E+02
38	CON A12S	1/4/2002	15:13	1	2.21E+02	60	SCL	Shielded	β		2.21E+02	
39	CON A12U	1/4/2002	15:14	1	2.84E+02	60	SCL	Unshielded	β			2.84E+02
40	CON A13S	1/4/2002	15:23	1	1.74E+02	60	SCL	Shielded	β		1.74E+02	
41	CON A13U	1/4/2002	15:24	1	2.94E+02	60	SCL	Unshielded	β			2.94E+02
42	CON A14S	1/4/2002	15:25	1	1.96E+02	60	SCL	Shielded	β		1.96E+02	
43	CON A14U	1/4/2002	15:26	1	3.33E+02	60	SCL	Unshielded	β			3.33E+02
44	CON A15S	1/4/2002	15:28	1	2.16E+02	60	SCL	Shielded	β		2.16E+02	
45	CON A15U	1/4/2002	15:29	1	3.45E+02	60	SCL	Unshielded	β			3.45E+02
46	CON A16S	1/4/2002	15:30	1	1.83E+02	60	SCL	Shielded	β		1.83E+02	
47	CON A16U	1/4/2002	15:31	1	3.13E+02	60	SCL	Unshielded	β			3.13E+02
48	CON A17S	1/4/2002	15:33	1	1.82E+02	60	SCL	Shielded	β		1.82E+02	
49	CON A17U	1/4/2002	15:34	1	3.22E+02	60	SCL	Unshielded	β			3.22E+02
50	CON A18S	1/4/2002	15:35	1	1.84E+02	60	SCL	Shielded	β		1.84E+02	
51	CON A18U	1/4/2002	15:36	1	3.24E+02	60	SCL	Unshielded	β			3.24E+02
52	CON A19S	1/4/2002	15:37	1	1.91E+02	60	SCL	Shielded	β		1.91E+02	
53	CON A19U	1/4/2002	15:39	1	3.07E+02	60	SCL	Unshielded	β			3.07E+02
54	CON A20S	1/4/2002	15:40	1	1.94E+02	60	SCL	Shielded	β		1.94E+02	
55	CON A20U	1/4/2002	15:41	1	3.33E+02	60	SCL	Unshielded	β			3.33E+02
56	CON A21S	1/4/2002	15:57	1	2.23E+02	60	SCL	Shielded	β		2.23E+02	
57	CON A21U	1/4/2002	15:58	1	2.92E+02	60	SCL	Unshielded	β			2.92E+02
58	CON A22S	1/4/2002	15:59	1	1.72E+02	60	SCL	Shielded	β		1.72E+02	
59	CON A22U	1/4/2002	16:00	1	2.80E+02	60	SCL	Unshielded	β			2.80E+02
60	CON A23S	1/4/2002	16:01	1	1.94E+02	60	SCL	Shielded	β		1.94E+02	
61	CON A23U	1/4/2002	16:02	1	3.29E+02	60	SCL	Unshielded	β			3.29E+02
62	CON A24S	1/4/2002	16:04	1	1.87E+02	60	SCL	Shielded	β		1.87E+02	
63	CON A24U	1/4/2002	16:05	1	3.48E+02	60	SCL	Unshielded	β			3.48E+02
64	CON A25S	1/4/2002	16:06	1	2.07E+02	60	SCL	Shielded	β		2.07E+02	
65	CON A25U	1/4/2002	16:07	1	3.72E+02	60	SCL	Unshielded	β			3.72E+02
66	CON A26S	1/4/2002	16:09	1	2.09E+02	60	SCL	Shielded	β		2.09E+02	
67	CON A26U	1/4/2002	16:10	1	3.26E+02	60	SCL	Unshielded	β			3.26E+02
68	CON A27S	1/4/2002	16:11	1	2.07E+02	60	SCL	Shielded	β		2.07E+02	
69	CON A27U	1/4/2002	16:12	1	3.30E+02	60	SCL	Unshielded	β			3.30E+02
70	CON A28S	1/4/2002	16:14	1	2.30E+02	60	SCL	Shielded	β		2.30E+02	
71	CON A28U	1/4/2002	16:15	1	3.06E+02	60	SCL	Unshielded	β			3.06E+02
72	CON A29S	1/4/2002	16:20	1	2.13E+02	60	SCL	Shielded	β		2.13E+02	
73	CON A29U	1/4/2002	16:21	1	2.58E+02	60	SCL	Unshielded	β			2.58E+02
74	CON A30S	1/4/2002	16:24	1	2.33E+02	60	SCL	Shielded	β		2.33E+02	
75	CON A30U	1/4/2002	16:25	1	2.89E+02	60	SCL	Unshielded	β			2.89E+02
76	CON A31S	1/4/2002	16:28	1	1.84E+02	60	SCL	Shielded	β		1.84E+02	
77	CON A31U	1/4/2002	16:29	1	2.63E+02	60	SCL	Unshielded	β			2.63E+02
—	Source Check	1/4/2002	17:27	1	1.70E+05	60	SCL	—	β			

	Shielded	Unshielded
Minimum ⇒	1.72E+02	2.22E+02
Maximum ⇒	2.78E+02	3.88E+02
Mean ⇒	2.11E+02	3.06E+02
Sigma ⇒	2.69E+01	3.45E+01

ATTACHMENT 10.2

SOUTH SIDE OF CV - STEEL

37122N21	126218 BH4008										BHB
No.	Location	Date	Time	Detector	Counts	Count Time (sec)	Mode	Designator		Shielded	Unshielded
6	CVSH FP1S	6/8/2004	10:50	1	397	60	SCL	Shielded	β		443
7	CVSH FP1U	6/8/2004	10:51	1	443	60	SCL	Unshielded	β	397	
8	CVSH FP2S	6/8/2004	10:53	1	357	60	SCL	Shielded	β		344
9	CVSH FP2U	6/8/2004	10:54	1	344	60	SCL	Unshielded	β	357	
10	CVSH FP3S	6/8/2004	10:55	1	433	60	SCL	Shielded	β		437
11	CVSH FP3U	6/8/2004	10:57	1	437	60	SCL	Unshielded	β	433	
12	CVSH FP4S	6/8/2004	10:58	1	403	60	SCL	Shielded	β		432
13	CVSH FP4U	6/8/2004	11:00	1	432	60	SCL	Unshielded	β	403	
14	CVSH FP5S	6/8/2004	11:01	1	459	60	SCL	Shielded	β		418
15	CVSH FP5U	6/8/2004	11:02	1	418	60	SCL	Unshielded	β	459	
16	CVSH FP6S	6/8/2004	11:17	1	474	60	SCL	Shielded	β		447
17	CVSH FP6U	6/8/2004	11:18	1	447	60	SCL	Unshielded	β	474	
18	CVSH FP7S	6/8/2004	11:20	1	511	60	SCL	Shielded	β		566
19	CVSH FP7U	6/8/2004	11:21	1	566	60	SCL	Unshielded	β	511	
20	CVSH FP8S	6/8/2004	11:23	1	487	60	SCL	Shielded	β		505
21	CVSH FP8U	6/8/2004	11:24	1	505	60	SCL	Unshielded	β	487	
22	CVSH FP9S	6/8/2004	11:26	1	491	60	SCL	Shielded	β		578
23	CVSH FP9U	6/8/2004	11:27	1	578	60	SCL	Unshielded	β	491	
26	CVSHFP10S	6/8/2004	12:54	1	565	60	SCL	Shielded	β		630
27	CVSHFP10U	6/8/2004	12:55	1	630	60	SCL	Unshielded	β	565	
28	CVSHFP11S	6/8/2004	12:57	1	579	60	SCL	Shielded	β		622
29	CVSHFP11U	6/8/2004	12:58	1	622	60	SCL	Unshielded	β	579	
30	CVSHFP12S	6/8/2004	13:00	1	564	60	SCL	Shielded	β		595
31	CVSHFP12U	6/8/2004	13:02	1	595	60	SCL	Unshielded	β	564	
									Minimum ⇒	3.57E+02	3.44E+02
									Maximum ⇒	5.79E+02	6.30E+02
									Median ⇒	4.81E+02	4.76E+02
									Mean ⇒	4.77E+02	5.01E+02
									Sigma ⇒	7.12E+01	9.39E+01

ATTACHMENT 11 - 1

Williamsburg Steel Background Measurements SR-48

37122N21	Instrument 95348	RJR9291	Time	Detector	Counts	Count Time (sec)	Mode	Designator		FSS-004	BHB
0	BKGND	11/14/2002	6:47	1	6.54E+03	1800	SCL	Inital Background	β	Steel CF(cpm) ⇒	0
1	Source Check	11/14/2002	9:54	1	1.70E+05	60	SCL	Source	β	Shielded	Unshielded
2	STEELA1S	11/14/2002	10:32	1	2.13E+02	60	SCL	Shielded	β	2.13E+02	
3	STEELA1U	11/14/2002	10:33	1	2.04E+02	60	SCL	Unshielded	β		2.04E+02
4	STEELA2S	11/14/2002	10:37	1	2.03E+02	60	SCL	Shielded	β	2.03E+02	
5	STEELA2U	11/14/2002	10:38	1	2.25E+02	60	SCL	Unshielded	β		2.25E+02
6	STEELA3S	11/14/2002	10:39	1	1.85E+02	60	SCL	Shielded	β	1.85E+02	
7	STEELA3U	11/14/2002	10:40	1	2.09E+02	60	SCL	Unshielded	β		2.09E+02
8	STEELA4S	11/14/2002	10:42	1	2.03E+02	60	SCL	Shielded	β	2.03E+02	
9	STEELA4U	11/14/2002	10:43	1	1.67E+02	60	SCL	Unshielded	β		1.67E+02
10	STEELA5S	11/14/2002	10:44	1	1.55E+02	60	SCL	Shielded	β	1.55E+02	
11	STEELA5U	11/14/2002	10:45	1	2.26E+02	60	SCL	Unshielded	β		2.26E+02
12	STEELA6S	11/14/2002	10:46	1	1.92E+02	60	SCL	Shielded	β	1.92E+02	
13	STEELA6U	11/14/2002	10:47	1	1.95E+02	60	SCL	Unshielded	β		1.95E+02
14	STEELA7S	11/14/2002	10:48	1	1.96E+02	60	SCL	Shielded	β	1.96E+02	
15	STEELA7U	11/14/2002	10:50	1	2.01E+02	60	SCL	Unshielded	β		2.01E+02
16	STEELA8S	11/14/2002	10:51	1	2.15E+02	60	SCL	Shielded	β	2.15E+02	
17	STEELA8U	11/14/2002	10:52	1	2.38E+02	60	SCL	Unshielded	β		2.38E+02
18	STEELA9S	11/14/2002	10:53	1	2.00E+02	60	SCL	Shielded	β	2.00E+02	
19	STEELA9U	11/14/2002	10:54	1	1.92E+02	60	SCL	Unshielded	β		1.92E+02
20	STEELA10S	11/14/2002	10:56	1	1.83E+02	60	SCL	Shielded	β	1.83E+02	
21	STEELA10U	11/14/2002	10:57	1	2.25E+02	60	SCL	Unshielded	β		2.25E+02
22	STEELA11S	11/14/2002	10:58	1	1.95E+02	60	SCL	Shielded	β	1.95E+02	
23	STEELA11U	11/14/2002	10:59	1	2.15E+02	60	SCL	Unshielded	β		2.15E+02
24	STEELA12S	11/14/2002	11:00	1	1.77E+02	60	SCL	Shielded	β	1.77E+02	
25	STEELA12U	11/14/2002	11:01	1	2.34E+02	60	SCL	Unshielded	β		2.34E+02
26	STEELA13S	11/14/2002	11:03	1	2.02E+02	60	SCL	Shielded	β	2.02E+02	
27	STEELA13U	11/14/2002	11:05	1	2.18E+02	60	SCL	Unshielded	β		2.18E+02
28	STEELA14S	11/14/2002	11:06	1	1.89E+02	60	SCL	Shielded	β	1.89E+02	
29	STEELA14U	11/14/2002	11:07	1	1.99E+02	60	SCL	Unshielded	β		1.99E+02
30	STEELA15S	11/14/2002	11:08	1	2.16E+02	60	SCL	Shielded	β	2.16E+02	
31	STEELA15U	11/14/2002	11:09	1	2.15E+02	60	SCL	Unshielded	β		2.15E+02
32	STEELA16S	11/14/2002	11:10	1	1.88E+02	60	SCL	Shielded	β	1.88E+02	
33	STEELA16U	11/14/2002	11:11	1	2.05E+02	60	SCL	Unshielded	β		2.05E+02
34	STEELA17S	11/14/2002	11:13	1	2.12E+02	60	SCL	Shielded	β	2.12E+02	
35	STEELA17U	11/14/2002	11:14	1	2.11E+02	60	SCL	Unshielded	β		2.11E+02
36	STEELA18S	11/14/2002	11:15	1	2.00E+02	60	SCL	Shielded	β	2.00E+02	
37	STEELA18U	11/14/2002	11:16	1	1.93E+02	60	SCL	Unshielded	β		1.93E+02
38	STEELA19S	11/14/2002	11:17	1	1.84E+02	60	SCL	Shielded	β	1.84E+02	
39	STEELA19U	11/14/2002	11:18	1	2.09E+02	60	SCL	Unshielded	β		2.09E+02
40	STEELA20S	11/14/2002	11:19	1	1.94E+02	60	SCL	Shielded	β	1.94E+02	
41	STEELA20U	11/14/2002	11:20	1	2.30E+02	60	SCL	Unshielded	β		2.30E+02
42	STEELA21S	11/14/2002	11:22	1	2.10E+02	60	SCL	Shielded	β	2.10E+02	
43	STEELA21U	11/14/2002	11:23	1	1.93E+02	60	SCL	Unshielded	β		1.93E+02
44	STEELA22S	11/14/2002	11:24	1	2.05E+02	60	SCL	Shielded	β	2.05E+02	
45	STEELA22U	11/14/2002	11:25	1	1.91E+02	60	SCL	Unshielded	β		1.91E+02
46	STEELA23S	11/14/2002	11:26	1	1.77E+02	60	SCL	Shielded	β	1.77E+02	
47	STEELA23U	11/14/2002	11:27	1	1.98E+02	60	SCL	Unshielded	β		1.98E+02
48	STEELA24S	11/14/2002	11:28	1	1.88E+02	60	SCL	Shielded	β	1.88E+02	
49	STEELA24U	11/14/2002	11:30	1	2.44E+02	60	SCL	Unshielded	β		2.44E+02
50	STEELQC11S	11/14/2002	11:33	1	2.13E+02	60	SCL	Shielded	β	2.13E+02	
51	STEELQC11U	11/14/2002	11:34	1	2.10E+02	60	SCL	Unshielded	β		2.10E+02
52	STEELQC19S	11/14/2002	11:36	1	1.80E+02	60	SCL	Shielded	β	1.80E+02	
53	STEELQC19U	11/14/2002	11:37	1	1.99E+02	60	SCL	Unshielded	β		1.99E+02
58	STEELB1S	11/14/2002	13:09	1	2.25E+02	60	SCL	Shielded	β	2.25E+02	
59	STEELB1U	11/14/2002	13:10	1	1.94E+02	60	SCL	Unshielded	β		1.94E+02
60	STEELB2S	11/14/2002	13:12	1	1.78E+02	60	SCL	Shielded	β	1.78E+02	
61	STEELB2U	11/14/2002	13:13	1	2.50E+02	60	SCL	Unshielded	β		2.50E+02
62	STEELB3S	11/14/2002	13:14	1	2.03E+02	60	SCL	Shielded	β	2.03E+02	
63	STEELB3U	11/14/2002	13:15	1	2.11E+02	60	SCL	Unshielded	β		2.11E+02
64	STEELB4S	11/14/2002	13:17	1	2.03E+02	60	SCL	Shielded	β	2.03E+02	
65	STEELB4U	11/14/2002	13:18	1	1.78E+02	60	SCL	Unshielded	β		1.78E+02
66	STEELB5S	11/14/2002	13:19	1	2.32E+02	60	SCL	Shielded	β	2.32E+02	
67	STEELB5U	11/14/2002	13:20	1	2.08E+02	60	SCL	Unshielded	β		2.08E+02
68	STEELB6S	11/14/2002	13:22	1	2.22E+02	60	SCL	Shielded	β	2.22E+02	
69	STEELB6U	11/14/2002	13:23	1	2.22E+02	60	SCL	Unshielded	β		2.22E+02
70	STEELB7S	11/14/2002	13:24	1	2.21E+02	60	SCL	Shielded	β	2.21E+02	
71	STEELB7U	11/14/2002	13:25	1	2.18E+02	60	SCL	Unshielded	β		2.18E+02
72	STEELB8S	11/14/2002	13:26	1	2.18E+02	60	SCL	Shielded	β	2.18E+02	
73	STEELB8U	11/14/2002	13:28	1	2.15E+02	60	SCL	Unshielded	β		2.15E+02
74	STEELB9S	11/14/2002	13:29	1	1.90E+02	60	SCL	Shielded	β	1.90E+02	
75	STEELB9U	11/14/2002	13:30	1	2.17E+02	60	SCL	Unshielded	β		2.17E+02
76	STEELB10S	11/14/2002	13:41	1	2.45E+02	60	SCL	Shielded	β	2.45E+02	
77	STEELB10U	11/14/2002	13:42	1	2.32E+02	60	SCL	Unshielded	β		2.32E+02
78	STEELQCB5S	11/14/2002	13:44	1	1.81E+02	60	SCL	Shielded	β	1.81E+02	
79	STEELQCB5U	11/14/2002	13:45	1	2.13E+02	60	SCL	Unshielded	β		2.13E+02
									Minimum ⇒	1.55E+02	1.67E+02
									Maximum ⇒	2.45E+02	2.50E+02
									Mean ⇒	2.00E+02	2.11E+02
									Sigma ⇒	1.81E+01	1.77E+01

ATTACHMENT 11 - 2