GENERAL ATOMICS

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VIA EXPRESS MAIL SERVICE

Ms. Mary Adams
Licensing Section 1/Licensing Branch
Division of Fuel Cycle Safety
and Safeguards, NMSS
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: **Docket No. 70-734; SNM-696: Request to Release Certain Portions of General Atomics' Facility to Unrestricted Use and Delete them from License: Namely, Areas 2 and 3 of Sorrento Valley West Land Area**

and

ATTN: Mr. David Wesley (in Duplicate)
State of California
Department of Health Services
Radiologic Health Branch Mail Stop 178
601 North 7th Street
Sacramento, CA 95814-0208

Subject: **Radioactive Materials License No. 0145-37: Request to Release Certain Portions of General Atomics' Facility to Unrestricted Use and Delete them from License: Namely, Areas 2 and 3 of Sorrento Valley West Land Area**

Dear Ms. Adams and Mr. Wesley:

As you are aware, General Atomics (GA) is continuing its efforts to decontaminate, as appropriate, and obtain the release to unrestricted use of selected facilities on its site. GA has recently completed the Final Radiological Survey of portions of its Sorrento Valley West (SVW) Land Area. These portions are referred to as "Area 2" and "Area 3" of the Sorrento Valley West land area. The total area of Areas 2 and 3 is about 43,700 ft^2. The Sorrento Valley West Land Area is located on GA's Sorrento Valley Site. (See attached figure).

The SVW Land Area is comprised of three (3) areas: Area 1, Area 2 and Area 3. The Final Radiological Survey of "Area 1" was completed in advance of the rest of the SVW Land Area because of GA's urgent need to begin construction of a trench needed for an important government project. GA's request to release and delete SVW "Area 1" from GA's special nuclear and radioactive materials licenses was submitted to both the U.S. Nuclear Regulatory Commission (NRC) and the State of California DOHS Radiologic Health Branch (State) by GA letter number 696/CAL-3311, dated January 10, 2001. That letter request included a copy of the Final Radiological Survey Report for SVW "Area 1").

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NMSS/Public

In response to GA's request, Mr. Emilio Garcia from NRC's Region IV office performed a radiological survey of the Sorrento Valley West Area 1 on January 10, 2001. A copy of the Final Radiological Survey Report for "Area 1" was provided to Mr. Emilio Garcia prior to his survey.

GA has now completed extensive and comprehensive radiological measurements in "Areas 2 and 3" of the SVW Land Area. Some areas of localized radiological contamination were identified in "Area 2." All such contamination was remediated. Subsequent radiological surveys verified that residual contamination levels are below the approved release criteria. These results are summarized in the enclosed report titled, "General Atomics' Final Radiological Survey Report for *Areas 2 and 3* of the Sorrento Valley West Land Area," dated February 2001. The results of these surveys demonstrate that Areas 2 and 3 of SVW meet the approved criteria for release to unrestricted use.

Accordingly, GA hereby requests that Areas 2 and 3 of its Sorrento Valley West Land Area, as described in the enclosed report, be released to unrestricted use and deleted from its NRC and State special nuclear and radioactive material licenses, respectively.

The history of use of Areas 2 and 3 involves both NRC and State licensed material. However, the radioactive contamination found during the radiologic surveys is attributable to the preparation for shipment of concrete slabs from GA's Hot Cell Decommissioning Project. Because the NRC was the agency with the lead regulatory oversight role for GA's Hot Cell decommissioning activities, it follows that it is appropriate for the NRC to take the lead in coordinating this release; including regulatory agency confirmatory surveys, as deemed appropriate.

If you should have any questions regarding this information, please contact Laura Q. Gonzales at (858) 455-2758, or me at (858) 455-2823. Your assistance in responding to our request is very much appreciated.

Very truly yours,

Keith E. Asmussen

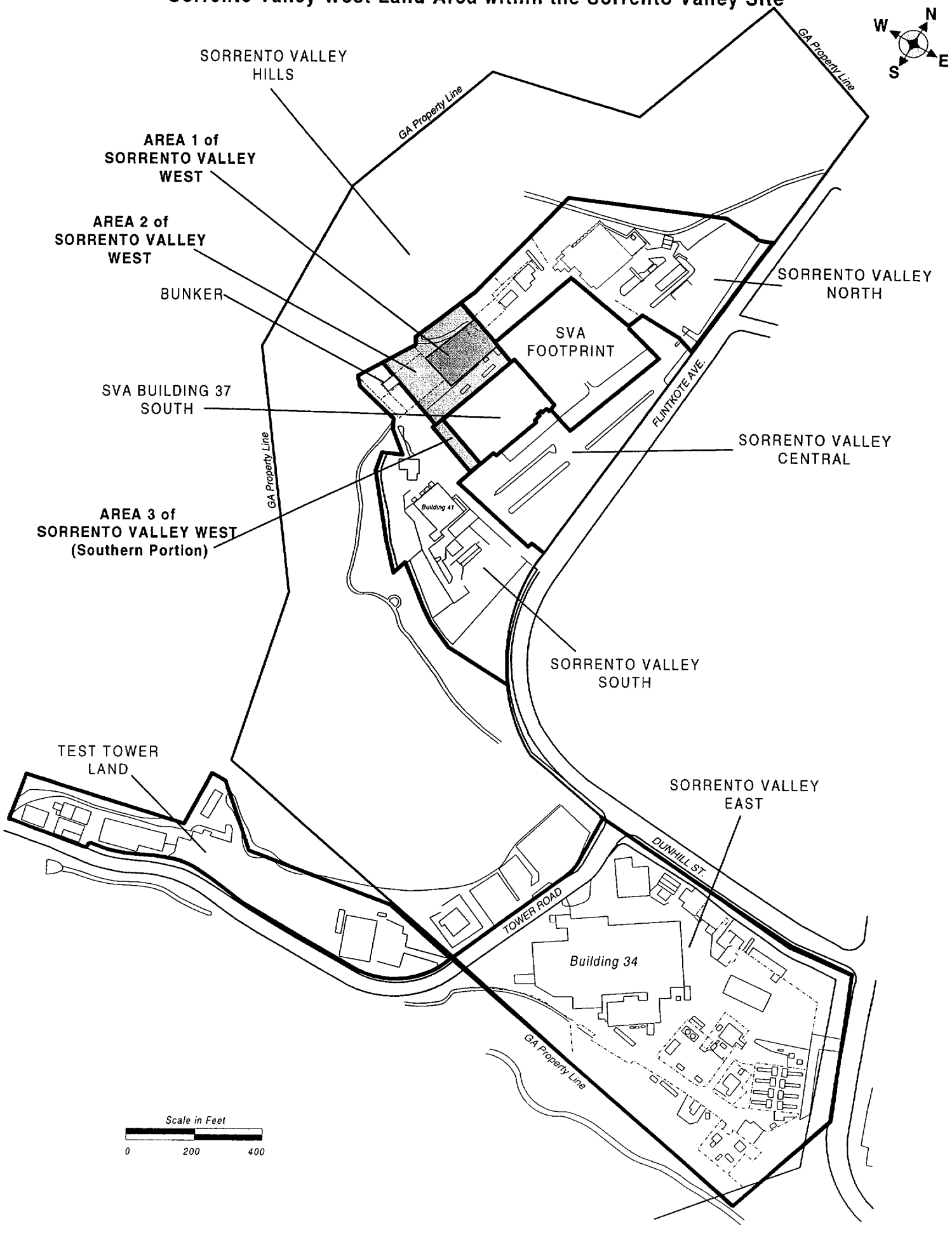
Keith E. Asmussen, Ph.D., Director
Licensing, Safety and Nuclear Compliance

Attached Figure: Sorrento Valley West Land Area showing the location of Areas 1, 2 and 3

Enclosure: Report titled: "General Atomics' Final Radiological Survey Report for *Areas 2 and 3* of The Sorrento Valley West Land Area," dated February 2001.

cc: Dr. D. Blair Spitzberg, Chief, NMSS Branch 3, Region IV
Mr. Wayne L. Britz, Fuel Cycle Inspector, NRC Region IV
Mr. Emilio Garcia, Fuel Cycle Inspector, NRC Region IV
Ms. Kathleen Henner, State of CA, Brea, CA
Dr. Ron Rogus, State of CA, Sacramento, CA

Sorrento Valley West Land Area within the Sorrento Valley Site



GENERAL ATOMICS

FINAL RADIOLOGICAL SURVEY REPORT FOR *AREAS 2 AND 3* OF THE SORRENTO VALLEY WEST LAND AREA

Prepared by: Cornelius Stanley, Richard Stowell, Laura Gonzales, Paul Maschka, Barbara Hunter, Joseph Sullivan, Jeff Vassett, Michael Dupray and Phil Poole

February 2001

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Introduction

General Atomics is continuing its efforts directed at decontaminating, as appropriate, and obtaining the release to unrestricted use of selected facilities and land areas at General Atomics. GA has recently completed the Final Radiological Survey of "Areas 2 and 3" of the Sorrento Valley West (SVW) land area. The Sorrento Valley West (SVW) Land Area is located in GA's Sorrento Valley Site (Figure 1), and is comprised of three (3) areas: Area 1, Area 2 and Area 3.

This report documents the results of extensive and comprehensive radiological measurements completed in Areas 2 and 3 of the SVW Land Area; the total of which is ~ 43,700 ft^2. The results of the surveys performed demonstrate that this area meets the approved criteria for release to unrestricted use. A summary of the results is provided in this report.

Note: The Final Radiological Survey of "Area 1" of the Sorrento Valley West (SVW) Land area was completed in advance of the rest of the SVW area due to GA's urgent need to begin construction of a trench needed for an important government project. The request to delete SVW "Area 1" from GA's radioactive materials licenses was made to the NRC and the State of CA on January 10, 2001 (letter 696/CAL-3311 which included the Final Radiological Survey Report for SVW "Area 1"). In response to GA's request, Mr. Emilio Garcia from NRC's Region IV office performed a radiological survey of the Sorrento Valley West Area 1 land area on January 10, 2001. A copy of GA's final survey ("Area 1") report was provided to Mr. Emilio Garcia prior to his surveying Area 1 of Sorrento Valley West land area.

Site Description

A plan view of the GA Site is shown in Figure 1. The Sorrento Valley West (SVW) Land Area is located on GA's Sorrento Valley Site. The location of the Sorrento Valley West Land Area in relation to other facilities and land areas on GA's Sorrento Valley Site is shown in Figure 2. The three Sorrento Valley West Land Areas (Area 1, Area 2 and Area 3) are shown in Figure 3. Area 1 occupies ~19,000 ft^2, Areas 2 and 3 occupy ~ 43,700 ft^2.

The only history of radioactive materials use on the SVW land area occurred in a former radioactive materials storage area located in a portion of Area 2. This fenced-in area occupies about 8,500 ft^2 and was used for the storage of packaged radioactive waste and for the preparation of concrete slabs and other materials for bulk shipment. Initially, the land area was classified as an unaffected area. However, radiological surveys determined that radioactive contamination above the release limits existed in the soil and asphalt of the previous radioactive waste storage area. Analysis of asphalt and soil demonstrated that the predominant contaminant was Cs-137, which GA believes was a result of preparation of Hot Cell concrete slabs for bulk shipment during decommissioning of its Hot Cell

Facility (Building 23). The fenced-in area (and surrounding area as shown in Figure 4) was reclassified as a suspect affected area. GA remediated the area and conducted additional surveys during the Final Radiological Survey.

Criteria for Release to Unrestricted Use

Facilities and Equipment

U.S. NRC's criteria for releasing facilities and equipment to unrestricted use is shown in Table 1. The State of California's guidelines, "DHS Criteria for Release of Facilities and Equipment to Unrestricted Use," also known as "DECON-1," is shown in Table 2.

Based on the gamma spectroscopy results of asphalt and soil which detected Cs-137 as the predominant contaminant (with trace quantities of Co-60), the approved guideline values for release to unrestricted use are provided below:

5,000 dpm/100 cm^2 (averaged over a 1 m^2 area)
15,000 dpm/100 cm^2 (maximum in a 100 cm^2 area if the average over 1 m^2 is met)
1000 dpm/100 cm^2 (removable activity)

Exposure Rate Guideline

The guideline value for exposure rates measured at 1 m above the surface, is 10 μR/hr above background levels.

Soil Release Criteria

The predominant radionuclides found in soil at GA and the soil release criteria (above background concentrations) in pCi/g for these radionuclides is provided below:

Cs-137	15 pCi/g
Co-60	8 pCi/g
Thorium (Th-228 + Th-232)	10 pCi/g
Enriched Uranium (U-234 + U-235)	30 pCi/g
Depleted Uranium	35 pCi/g

If more than one radionuclide exists, the sum of the fractions of the concentrations is calculated as follows:

$$\sum_{i=1}^{n} \frac{C_i}{L_i} < 1$$

Where C_i = The average concentration of radionuclides *i* in the soil above background levels.
L_i = The release criteria for radio nuclides *i*.

The sum of the fractions must be less than or equal to one in order for the soil to meet the release criteria.

Instrumentation

A list of instruments used during the radiological surveys is shown in Table 3. The table includes: (1) a description of the instrument, model number and its serial number, (2) a description of the detector (if applicable) and its serial number, (3) instrument ranges, (4) calibration due dates, (5) typical background readings and MDA's (minimum detectable activities), and (6) calibration efficiencies. All of the instruments used were calibrated semiannually and after repair except for exposure rate meters which were calibrated quarterly.

Background Measurements

Background Measurements for Instruments/Detectors

Asphalt backgrounds were obtained outside of Building 10 on GA's main site. This land area is unaffected.

For the fixed background measurements, shown in Table 3, the mean and standard deviation for each surface surveyed with the 100 cm^2 gas flow proportional detector were calculated using equations 8-11 and 8-12 from the draft version of NUREG/CR-5849[1] as shown below:

Equation (8-11) $$\bar{x} = \frac{1}{n_s} \sum_{i=1}^{n_s} x_i$$

Equation (8-12) $$s_x = \sqrt{\frac{\sum_{i=1}^{n} (\bar{x} - x_i)^2}{n-1}}$$

Minimum detectable activities (MDA's) for each type of surface (see Table 3), were calculated using equation (5-2) from the NUREG/CR-5849 as shown below:

[1] Manual for Conducting Radiological Surveys in Support of License Termination (Draft for Comment), NUREG/CR-5849, ORAU-92/C57, Oak Ridge Associated Universities, June 1992.

Equation (5-2)

$$MDA = \frac{2.71 + 4.65\sqrt{B_R \times t}}{t \times E \times \frac{A}{100}} (dpm/100cm^2)$$

Where:

B_R =background rate (cpm)
t = count time (min)
E = efficiency
A = area of the detector (cm^2)

Background Soil Concentrations

Typical background concentrations measured by gamma spectroscopy in soil near the GA site have been established (at the 95% confidence level) and are provided in Table 6. The soil samples were counted for 30 minutes each (same count time as the soil samples collected in Areas 2 and 3 of SVW).

Exposure Rate Background

Typical exposure rate background for this site is about 15 μR/hr measured at 1 m from the surface. This value can be measured south of Building 15 (an office building on the eastern portion of the GA site). Measurements taken offsite in 10 different locations over a period of a year also give an average of about 15 μR/hr (measured at 1 m from the surface). Normal background exposure rates increase to about 22 μR/hr at 1 m from the surface in small rooms with concrete floors and walls and up to 28 μR/hr inside concrete lined trenches or concrete lined pits (background measurements inside a concrete pit near Building 2 confirm this).

Previous Activities (History of Use)

The only history of radioactive materials use occurred in the south fenced area, within what is referred to as "Area 2" in this report. This fenced area was used for the storage of packaged radioactive waste and preparation of concrete slabs and other contaminated solid materials for bulk shipment. Initially, the land area was classified as an unaffected area. However, radiological surveys determined that radioactive contamination above the release limits existed in the soil and asphalt of the previous radioactive waste storage area. Analysis of asphalt and soil demonstrated that the predominant contaminant was Cs-137, which apparently was a result of preparation of Hot Cell concrete slabs for bulk shipment during decommissioning of its Hot Cell Facility (Building 23). The fenced-in area (and surrounding area as shown in Figure 4) was reclassified as a suspect affected area.

Decontamination Activities

During scanning of the area using a beta gas flow proportional detector (with a 434 cm^2 detector), elevated levels well above the alert levels were noted. These levels were verified using micro R meters and geiger counters. Contamination levels up to ~936,000 dpm/100 cm^2 (well above the average allowable release level of 5,000 dpm/100 cm^2 were noted. See Figure 4 for the results of the initial survey.

The contaminated asphalt and soil were removed and the area re-surveyed. This process was repeated until radiation levels met the approved release criteria. Approximately 69.5 ft^3 of asphalt/soil was removed during decontamination activities. This material will be disposed of as radioactive waste. Post decontamination surveys demonstrated that radiation levels had decreased to levels below the approved release criteria. This location was reclassified as a suspect affected area and additional surveys performed to demonstrate compliance with the release criteria.

Final Survey Plan

Objectives and Responsibilities

The objectives of the final survey plan were (1) to demonstrate that the average surface contamination levels for each survey unit were within the approved release criteria, (2) to show that the maximum residual activity ("hot spot" area) did not exceed three times the average value in an area up to 100 cm^2, (3) that a reasonable effort was made to clean removable contamination and fixed contamination (4) that the exposure rates are less than 10 μR/hr above background measured at 1 meter above the surface, and (5) that the soil concentrations were below the approved soil release criteria.

Surveys were taken only by qualified Health Physics Technicians having a minimum of three years Health Physics experience in accordance with approved Survey Plans. Samples were counted in GA's Health Physics Laboratory which maintains an effective QA program.

A copy of the Survey Plan is provided in Appendix A.

Classification of Areas

There was no history of radioactive materials use in this area other than storage of packaged radioactive waste in the south fenced area which had been posted with a "Caution, Radioactive Materials" sign. Therefore, the land area was originally classified as an unaffected area. However, radiological surveys determined that radioactive contamination above the release limits existed in an area previously used for radioactive waste storage and the preparation of contaminated soil materials for bulk shipment. Analysis of asphalt and soil demonstrated that the predominant contaminant was Cs-137.

This location was reclassified as a suspect affected area. The contaminated asphalt and soil were removed and the area re-surveyed. This process was repeated until radiation levels met the approved release criteria. Approximately 69.5 ft^3 of asphalt/soil was removed during decontamination activities. Additional surveys (as required for suspect affected areas) were performed in Area 2. In addition, a total of 61 soil samples, in a 5 m triangular grid pattern as shown in Figure 11, were collected.

Survey Summary

A summary of the number of fixed measurements, smears, exposure rate measurements (μR/hr), and samples taken is provided below:

SVW Areas 2 and 3 -- Survey Summary

Survey	# of Fixed Measurements	# of Smears	# of Exposure Rate Measurements (μR/hr)	# of Soil Samples
Final Survey Area 2	286	145	392 @ contact 392 @ 1 meter	61
Final Survey Area 3	95	33	67 @ contact 67 @ 1 meter	
Total	**381**	**178**	**918**	**61**

Soil Samples from Underneath the Asphalt

Soil Samples Collected

A total of 61 soil samples were collected underneath the asphalt; primarily in Area 2, where decontamination activities occurred. The approximate locations are shown in Figure 11.

Sample Preparation and Counting

Each of these samples were properly logged, labeled, packaged and tracked. Samples were dried, placed into a marinelli beaker, weighed and counted by gamma spectroscopy. All samples were analyzed in GA's Health Physics Laboratory with a Canberra Low Sensitivity Gamma Spectroscopy MCA System using a high purity Germanium Detector. The system is calibrated using NIST traceable standards and performance checked daily.

Samples were counted for a minimum of 30 minutes each. A 30 minute count is sufficient to detect the radionuclides of interest (Cs-137, Co-60, U-235, U-238 and thorium daughters) at levels well below GA's approved release criteria.

Results of the Final Surveys

Scanning

Scans with the 434 cm^2 gas-flow proportional detectors (floor monitors) were conducted in order to identify elevated areas of activity. Areas with elevated readings were further investigated with either the 100 cm^2 (β) gas-flow proportional detectors or hand held (α and β) instruments/detectors to determine if the levels were above the release criteria.

The results of these scans are provided in Table 4 and Figures 5 and 6 for Area 2, Figures 12 and 13 for Area 3 and Figures 18 and 19 for the loading dock located in Area 3. After remediation, scans showed radiation levels below the alert levels.

Fixed Measurements

A total of 381 fixed measurements were taken during the final survey. An appropriate background was determined for each type of surface and subtracted from the survey readings. The readings were converted from cpm to dpm/100 cm^2 using the appropriate count time, the efficiency of the detector and the geometry of the detector. The results are provided in Table 4 and the approximate locations (and results) are shown in Figure 9 for Area 2, Figure 14 for Area 3, and Figure 20 for the loading dock located in Area 3.

Of the 381 fixed measurements, 188 were alpha measurements and 193 were beta measurements. For the alpha measurements, fixed measurements (~6-10 seconds) were taken using a 50 cm^2 hand-held alpha detector. All results were <218 dpm/100 cm^2 after decontamination.

For the 193 beta measurements, one minute fixed measurements were taken using a beta gas-proportional counter having a 100 cm^2 detector. All results were <445 dpm/100 cm^2 after decontamination; well below the beta/gamma limit of 5,000 dpm/100 averaged over 1m.

Removable Contamination Surveys

Removable contamination measurements (smears) were performed on all asphalt an concrete surfaces. A total of 178 smears were taken during the final survey.

Smears consisted of using a Whatman Filter Paper (4.7 cm^2 diameter) and wiping an area of ~ 100 cm^2. The smears were counted in GA's Health Physics Laboratory using a Canberra 2400 low level alpha/beta counting system. The maximum smear result in dpm/100 cm^2 for both alpha and beta are provided in Table 4 and the approximate locations are shown in Figure 10 for Area 2 and Figure 15 for Area 3. The maximum smear results were 18 dpm/100 cm^2 α and 22 dpm/100 cm^2 β; well below the release criteria of 1000 dpm/100 cm^2.

Exposure Rate Measurements

The summary of exposure rate measurements is provided in Table 4. Surface scan results ranged from 15-24 μR/hr; see Figure 7 for Area 2 and Figure 17 for Area 3. Contact readings ranged from 12-25 μR/hr and fixed measurements taken 1 m readings ranged from 11-24 μR/hr; see Figure 8 for Area 2 and Figure 16 for Area 3.

Soil Samples

A total of 61 soil samples were collected underneath the asphalt; primarily in Area 2 where decontamination activities occurred. The approximate locations are shown in Figure 11.

The gamma spectroscopy results are provided in Table 5. The results show radioactivity levels at or near natural background levels (see Table 6); all levels were far below the approved soil release criteria.

GA Internal Confirmatory Survey

Purpose

GA conducted an Internal Confirmatory Survey to ensure that the results of the Final Survey are indeed below the State of California RHB and NRC approved release criteria. This survey was conducted in accordance with a written survey plan, by Health Physics Technicians not assigned to perform the Final Survey (i.e., an independent survey). A copy of the Confirmatory Survey Plan for the SVW area is provided in Appendix B.

Survey Description and Results of the Internal Confirmatory Survey

Beta Scans

Scans using the 434 cm^2 gas-flow proportional beta detectors were conducted on asphalt and concrete surfaces as shown in Figure CS 1. During these scans two small spots of contamination, <15 cm^2, were detected in the Suspect Affected Area at grid M,3. These two, 5,000 cpm and 8,000 cpm, spots were chipped up using a hammer and chisel and disposed of as radioactive waste. Subsequent scans of grid M,3 were 1700 to 2000 cpm. Overall scan results for all of Areas 2 & 3 range from 1200 to 2400 cpm on asphalt and 1600 to 2000 cpm on concrete. All were at or near background levels of 1900 to 2400 cpm for asphalt and 1400 to 2200 cpm for concrete.

Results: No contamination remains.

Gamma Scans

Scans using µR meters (2" X 2"NaI detectors) were also conducted on all surfaces as shown in Figure CS 2. During these scans one small spot of contamination, <15 cm^2, was detected in the Suspect Affected Area at grid M,2. This 34 µR/hr spot was chipped up using a hammer and chisel and

disposed of as radioactive waste. Subsequent scans of the grid M,2 were 19 to 23 μR/hr. Overall scan results for all of Areas 2 and 3 range from 14 to 18 μR/hr for concrete, 15 to 25 μR/hr for soil, and 14 to 25 μR/hr for asphalt. All were at or near background levels of 13 to 18 μR/hr for concrete, 12 to 19 μR/hr for soil and 17 to 21 μR/hr for asphalt.

Results: No contamination remains.

Soil Samples

Soil samples were collected inside the Suspect Affected Area of SVW Area 2 where the asphalt had been remediated and at one location where the bank had been remediated. A total of 14 surface soil samples, 0-6", were collected. The soil sample locations are shown in Figure CS 3 and the individual results are provided in Table CS 1.

Results: All 14 soil samples were below the release criteria.

Additional Survey:

Because contamination above the release criteria was found during GA's Internal Confirmatory Survey, an additional survey was performed by another technician who had limited duties during previous surveys.

Scans using both the 434 cm^2 gas-flow proportional beta detector and a microR meter (2"x2" NaI detector), were conducted in an area of ~85.5 m^2 just inside the eastern fence of the prior radioactive materials area. The survey results are provided in Figure CS 4. Beta scan results ranged from 1700-2300 cpm; levels at or near the background levels of 2175-2460 cpm for this instrument and that type of surface (asphalt). MicroR scan results ranged from 18-23 μR/hr (surface) compared to typical background of 17-20 microR/hr on the surface.

Conclusion

Final contamination and radiation surveys as well as soil sample results provided in this report for Areas 2 and 3 of the Sorrento Valley West Land Area, demonstrate that these areas meet the approved criteria for release to unrestricted use.

Table 1: USNRC'S ACCEPTABLE SURFACE CONTAMINATION LEVELS [1]			
Nuclides	**Average[b,c,f] (dpm/100cm²)**	**Maximum[b,d,f] (dpm/100 cm²)**	**Removable[b,e,f] (dpm/100cm²)**
U-nat, ^{235}U, ^{238}U, & associated decay products	5,000 α	15,000 α	1,000 α
Transuranics, ^{226}Ra, ^{228}Ra, ^{230}Th, ^{228}Th, ^{231}Pa, ^{227}Ac, ^{125}I, ^{129}I	100	300	20
Th-nat, ^{232}Th, ^{90}Sr, ^{223}Ra, ^{224}Ra, ^{232}U, ^{126}I, ^{133}I, ^{131}I	1,000	3,000	200
Beta/gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except ^{90}Sr and other noted above.	5,000	15,000	1,000

a Where surface contamination by both alpha- and beta/gamma-emitting nuclides exists, the limits established for alpha- and beta/gamma-emitting nuclides should apply independently.

b As used in this table dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, an geometric factors associated with the instrumentation.

c Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

d The maximum contamination level applies to an area of not more than 100 cm^2.

e The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, then pertinent levels should be reduced proportionally and the entire surface should be wiped.

f The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mRad/hr at 1 cm^2 and 1.0 mRad/hr at 1 cm^2, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

[1] **Guidelines For Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses For byproduct, Source, or Special Nuclear Material**, USNRC, July 1982, incorporated into GA's SNM 696 license.

Table 2: STATE OF CA ACCEPTABLE SURFACE CONTAMINATION LEVELS [1]

Nuclides[a]	Average[b,c,f] (dpm/100cm^2)	Maximum[b,d,f] (dpm/100cm^2)	Removable[b,e,f] (dpm/100cm^2)
U-nat, ^{235}U, ^{238}U, & associated decay products	5,000	15,000	1,000
Transuranics, ^{226}Ra, ^{228}Ra, ^{230}Th, ^{228}Th, ^{231}Pa, ^{227}Ac, ^{125}I, ^{129}I	100	300	20
Th-nat, ^{232}Th, ^{90}Sr, ^{223}Ra, ^{224}Ra, ^{232}U, ^{126}I, ^{133}I, ^{131}I	1,000	3,000	200
Beta/gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except ^{90}Sr and other noted above	5,000	15,000	1,000

a Where surface contamination by both alpha- and beta/gamma-emitting nuclides exists, the limits established for alpha- and beta/gamma-emitting nuclides should apply independently.

b As used in this table dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, an geometric factors associated with the instrumentation.

c Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

d The maximum contamination level applies to an area of not more than 100 cm ^{2}.

e The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, then pertinent levels should be reduced proportionally and the entire surface should be wiped.

f The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at 1 cm^2 and 1.0 mrad/hr at 1 cm^2, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

[1] Guidelines For Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses For byproduct, Source, or Special Nuclear Material, also known as "Decon-1" incorporated into GA's State of CA Radioactive Materials License.

Table 3: List of Instruments

Meter S/N	Detector	Detector S/N	Calibration Due Date	Efficiency	Range (cpm)	Background and MDA (minimum detectable activity)	Description
Ludlum Rate Meter Model 2221 S/N 97287	Ludlum Model 43-37 434 cm^2 Alpha	S/N 148926	02-26-01 07-20-01	21.25% 21.25%	Four Linear Ranges 0-500,000 & One Log 50-500,000	0-20 cpm (asphalt and concrete)	The instrument is a gas-flow proportional counter with an active probe area of 434 cm^2. The detector and rate meter are combined and mounted on a roll around cart. The instrument features a static-flow system, quick connects, a portable gas bottle and a means to adjust the height of the detector from the floor for optimum performance.
Ludlum Rate Meter Model 2221 S/N 97817	Ludlum Model 43-37 434 cm^2 Beta	S/N 94119	06-09-01 07-03-01 07-05-01 07-18-01	20.13% 20.42% 20.13% 20.03%	Four Linear Ranges 0-500,000 & One Log 50-500,000	(cpm) 1900-2400 (asphalt) 1400-2200 (concrete)	The instrument is a gas-flow proportional counter with an active probe area of 434 cm^2. The detector and rate meter are combined and mounted on a roll around cart. The instrument features a static-flow system, quick connects, a portable gas bottle and a means to adjust the height of the detector from the floor for optimum performance.
Ludlum Rate Meter Model 2221 S/N 154202	Ludlum Model 43-37 434 cm^2 Beta	S/N 149017	04-09-01 07-04-01	22.72% 22.64%	Four Linear Ranges 0-500,000 & One Log 50-500,000	(cpm) 2175-2460 (asphalt) 1600-1995 (concrete)	The instrument is a gas-flow proportional counter with an active probe area of 434 cm^2. The detector and rate meter are combined and mounted on a roll around cart. The instrument features a static-flow system, quick connects, a portable gas bottle and a means to adjust the height of the detector from the floor for optimum performance.
Ludlum Rate Meter Model 2221 S/N 86302	Ludlum Model 43-37 434 cm^2 Beta	S/N 092451	07-05-01 06-14-01 07-03-01 07-18-01	20.39% 20.45% 20.13% 20.31%	Four Linear Ranges 0-500,000 & One Log 50-500,000	(cpm) 1900-2300 (asphalt) 1400-2100 (concrete)	The instrument is a gas-flow proportional counter with an active probe area of 434 cm^2. The detector and rate meter are combined and mounted on a roll around cart. The instrument features a static-flow system, quick connects, a portable gas bottle and a means to adjust the height of the detector from the floor for optimum performance.

Table 3: List of Instruments

Meter S/N	Detector	Detector S/N	Calibration Due Date	Efficiency	Range (cpm)	Background and MDA (minimum detectable activity)	Description
Ludlum Rate Meter Model 2221 S/N 148436	Ludlum Model 43-68 100 cm^2 Beta	S/N 120477	06-06-01	27.11%	Four Linear Ranges 0-500,000 & One Log 50-500,000	644 ± 26 cpm MDA = 445 dpm/100 cm^2 (asphalt) 554 ± 28 cpm MDA = 414 dpm/100 cm^2 (Concrete)	The instrument is a gas-flow proportional counter with an active probe area of 100 cm^2.
Ludlum Model 3 S/N 138880	Ludlum Model 44-9 15 cm^2 Beta/Gamma	S/N 145963	02-20-01	21.35%	Four Ranges 0-100,000	(cpm) Concrete 80-140 Asphalt 80-100 MDA ~ 1,500 dpm/100 cm^2	The instrument is used for beta/gamma surveying. The detector has an active probe area of 15 cm^2.
Ludlum Model 12 S/N 91103	Ludlum Model 43-65 50 cm^2 Alpha	S/N 092192	03-26-01	21.58%	Four Ranges 0-500,000	0-20 cpm MDA ~ 218 dpm/100 cm^2	Alpha scintillator ZnS(Ag) with an active probe area of 50 cm^2.

Table 3: List of Instruments

Meter S/N	Detector	Detector S/N	Calibration Due Date	Efficiency	Range (cpm)	Background and MDA (minimum detectable activity)	Description
Ludlum Model 3 Ratemeter S/N 153590	Ratemeter coupled to a NaI Model 44-10 NaI detector	S/N 155190	03-08-01	N/A	Four Ranges 0-500 μR/hr	(In μR/hr) Soil 11-13 contact 11-13 @ 1m Asphalt 19-21 contact 18-20 @ 1 m Concrete 15-18 @ 1m	Used for measuring external dose rates on the surface and at one (1) meter from the surface (i.e., initial ground floor surveys). The scintillator [2" x 2" NaI (Tl)] contained in an external probe.
Ludlum Model 3 Ratemeter S/N 153551	Ratemeter coupled to a NaI Model 44-10 NaI detector	S/N 155109	04-04-01 03-20-01	N/A	Four Ranges 0-500 μR/hr	(In μR/hr) Soil 11-13 contact 11-13 @ 1m Asphalt 17-20 contact 17-19 @ 1 m Concrete 15-18 @ 1m	Used for measuring external dose rates on the surface and at one (1) meter from the surface (i.e., initial ground floor surveys). The scintillator [2" x 2" NaI (Tl)] contained in an external probe.

Table 3: List of Instruments

Meter S/N	Detector	Detector S/N	Calibration Due Date	Efficiency	Range (cpm)	Background and MDA (minimum detectable activity)	Description
Ludlum Model 3 Ratemeter S/N 151348	Ratemeter coupled to a NaI Model 44-10 NaI detector	S/N 154618	04-06-01 01-08-01	N/A	Four Ranges 0-500 μR/hr	(In μR/hr) Soil 13-19 contact 19-20 @ 1m Asphalt 20-21 contact 19-20 @ 1 m Concrete 19-20 @ 1m	Used for measuring external dose rates on the surface and at one (1) meter from the surface (i.e., initial ground floor surveys). The scintillator [2" x 2" NaI (Tl)] contained in an external probe.
Ludlum Model 3 Ratemeter S/N 147819	Ratemeter coupled to a NaI Model 44-10 NaI detector	S/N 153765	01-31-01	N/A	Four Ranges 0-500 μR/hr	(In μR/hr) Soil 12-17 contact 16-18 @ 1m Asphalt 18-19 contact 13-18 @ 1 m Concrete 16-18 @ 1m	Used for measuring external dose rates on the surface and at one (1) meter from the surface (i.e., initial ground floor surveys). The scintillator [2" x 2" NaI (Tl)] contained in an external probe.
Canberra Gamma Spectroscopy System	High Purity Germanium Detector	N/A	Calibrated as needed. Calibration checked daily with NIST traceable standard. Efficiency varies with sample.		Varies with Sample	Varies with Sample	Gamma Spectroscopy MCA system using a high purity Germanium detector.

Table 3: List of Instruments							
Meter S/N	**Detector**	**Detector S/N**	**Calibration Due Date**	**Efficiency**	**Range (cpm)**	**Background and MDA** (minimum detectable activity)	**Description**
Canberra Low Level α/β Counter	Gas Flow Proportional Detector	N/A	As needed	~ 26-30%	N/A	Varies with Sample	Canberra Model 2400 Low Level α/β gas proportional counting system used to count wipes for removable contamination. Results are usually reported as dpm/100 cm^2.

Table 4: Results of Final Surveys of Sorrento Valley West Areas 2 and 3

Figure #'s	Scan Results 434cm² (range in cpm)		# of Fixed Measurements		Maximum Results (dpm/100cm²) β (dpm/100cm²) α		# of Smears	Maximum Results (dpm/100cm²)		Exposure Rate Range (μR/hr)		
										Surface Scan (Range)	Contact Readings (Range)	@ 1 m Readings (Range)
Area 2												
	Alpha	Beta	Alpha	Beta	Alpha	Beta	Smears	Alpha	Beta	(μR/hr)	(μR/hr)	(μR/hr)
5-10	1-54	1300-2400	141	145	<218	<445	145	18	22	15-24	12-22	11-22
Area 3												
12-20	4-40	1500-2400	47	48	<218	<445	33	<10	<10	14-27	17-25	16-24

Table 5: Gamma Spectroscopy Results of Sorrento Valley West Area 2 Final Survey Soil Samples [1]								
Radionuclide Concentration (ρCi/gm) - Results ± 2σ - Backgrounds not Subtracted - Approximately 30 Minute Counts								
Sample ID	**Grid Coordinate**	**^{137}CS 661.6 keV peak**	**^{60}Co 1173 keV peak**	**^{228}Th 238 keV peak**	**^{232} Th 911 keV peak**	**Total Thorium ^{228}Th + ^{232}Th**	**^{238}U 63 keV peak (93 keV peak)**	**^{235}U 144 keV peak (186 keV peak)**
SVW-1	B,2	0.11 ± 0.07	ND	1.49 ± 0.13	2.00 ± 0.37	3.49	2.92 ± 0.87	(0.24 ± 0.12)
SVW-2	B,3	0.16 ± 0.09	ND	1.57 ± 0.12	2.02 ± 0.32	3.59	2.28 ± 1.28	(0.16 ± 0.09)
SVW-3	B,5	0.12 ± 0.08	ND	1.59 ± 0.13	2.30 ± 0.40	3.89	2.05 ± 1.40	(0.15 ± 0.09)
SVW-4	B,6	ND	ND	1.58 ± 0.12	2.03 ± 0.37	3.61	1.72 ± 1.03	(0.17 ± 0.09)
SVW-5	B,8	ND	ND	1.27 ± 0.11	1.55 ± 0.33	2.82	0.92 ± 0.90	(0.14 ± 0.08)
SVW-6	B,9	ND	ND	1.32 ± 0.10	1.48 ± 0.34	2.80	1.39 ± 0.97	(0.20 ± 0.07)
SVW-7	C,8	ND	ND	1.34 ± 0.12	1.98 ± 0.39	3.33	2.26 ± 1.28	(0.14 ± 0.08)
SVW-8	C,7	ND	ND	1.51 ± 0.12	1.79 ± 0.36	3.29	1.06 ± 1.16	(0.19 ± 0.09)
SVW-9	C,5	ND	ND	1.46 ± 0.12	1.92 ± 0.37	3.38	0.94 ± 1.14	(0.15 ± 0.08)
SVW-10	C,4	ND	ND	1.68 ± 0.11	1.64 ± 0.33	3.32	1.47 ± 0.98	(0.21 ± 0.08)
SVW-11	C,2	ND	ND	1.62 ± 0.13	2.23 ± 0.40	3.85	1.74 ± 1.20	(0.30 ± 0.13)
SVW-12	C,1	ND	ND	1.68 ± 0.12	2.37 ± 0.39	4.04	(1.77 ± 0.76)	(0.18 ± 0.12)
SVW-13	E,2	ND	ND	1.63 ± 0.12	2.04 ± 0.38	3.67	1.38 ± 1.01	(0.18 ± 0.09)
SVW-14	E,3	ND	ND	1.64 ± 0.11	1.79 ± 0.31	3.42	2.08 ± 1.26	(0.14 ± 0.08)
SVW-15	E,5	ND	ND	1.64 ± 0.18	1.84 ± 0.52	3.47	(2.16 ± 1.14)	(0.21 ± 0.11)
SVW-16	E,6	ND	ND	1.40 ± 0.12	1.62 ± 0.29	3.02	1.83 ± 0.95	(0.15 ± 0.06)
SVW-17	E,8	ND	ND	1.51 ± 0.12	1.85 ± 0.34	3.36	1.65 ± 1.11	(0.09 ± 0.09)

Table 5: Gamma Spectroscopy Results of Sorrento Valley West Area 2 Final Survey Soil Samples [1]								
Radionuclide Concentration (ρCi/gm) - Results ± 2σ - Backgrounds not Subtracted - Approximately 30 Minute Counts								
Sample ID	Grid Coordinate	^{137}CS 661.6 keV peak	^{60}Co 1173 keV peak	^{228}Th 238 keV peak	^{232} Th 911 keV peak	Total Thorium ^{228}Th + ^{232}Th	^{238}U 63 keV peak (93 keV peak)	^{235}U 144 keV peak (186 keV peak)
SVW-18	E,9	ND	ND	1.40 ± 0.09	1.69 ± 0.24	3.09	1.30 ± 1.01	(0.11± 0.06)
SVW-19	F,8	ND	ND	1.38 ± 0.19	2.18 ± 0.41	3.56	(2.25 ± 0.77)	(0.19 ± 0.10)
SVW-20	F,7	ND	ND	1.70 ± 0.11	1.85 ± 0.25	3.54	0.93 ± 0.92	(0.12 ± 0.06)
SVW-21	F,5	ND	ND	1.69 ± 0.13	2.42 ± 0.38	4.11	1.04 ± 1.21	(0.21 ± 0.13)
SVW-22	F,4	ND	ND	1.64 ± 0.11	1.64 ± 0.35	3.28	1.53 ± 0.94	(0.18 ± 0.07)
SVW-23	F,2	ND	ND	1.76 ± 0.14	2.24 ± 0.44	4.00	1.50 ± 1.24	(0.26 ± 0.10)
SVW-24	F,1	ND	ND	1.50 ± 0.11	1.81 ± 0.28	3.31	2.71 ± 1.02	(0.19 ± 0.07)
SVW-25	H,2	ND	ND	1.54 ± 0.13	2.13 ± 0.46	3.67	1.56 ± 1.10	(0.17 ± 0.10)
SVW-26	H,3	ND	ND	1.60 ± 0.11	1.80 ± 0.35	3.40	2.33 ± 1.56	(0.18 ± 0.07)
SVW-27	H,5	ND	ND	1.65 ± 0.13	2.33 ± 0.46	3.98	1.75 ± 1.33	(0.21 ± 0.10)
SVW-28	H,6	ND	ND	1.73 ± 0.11	1.88 ± 0.32	3.60	2.03 ± 1.44	(0.12 ± 0.07)
SVW-29	H,8	ND	ND	1.63 ± 0.12	1.89 ± 0.36	3.51	2.00 ± 1.26	(0.18 ± 0.12)
SVW-30	H,9	ND	ND	1.32 ± 0.10	1.42 ± 0.30	2.74	0.92 ± 0.89	0.25 ± 0.24
SVW-31	I,8	ND	ND	1.55 ± 0.12	1.94 ± 0.32	3.50	1.63 ± 1.15	(0.08 ± 0.09)
SVW-32	I,7	ND	ND	1.37 ± 0.11	1.80 ± 0.33	3.16	1.32 ± 0.87	(0.15 ± 0.06)
SVW-33	I,5	ND	ND	1.31 ± 0.12	1.82 ± 0.37	3.14	1.71 ± 1.28	(0.18 ± 0.09)
SVW-34	I,4	ND	ND	1.45 ± 0.11	1.87 ± 0.30	3.32	(2.40 ± 0.77)	(0.22 ± 0.08)

Table 5: Gamma Spectroscopy Results of Sorrento Valley West Area 2 Final Survey Soil Samples [1]								
Radionuclide Concentration (ρCi/gm) - Results ± 2σ - Backgrounds not Subtracted - Approximately 30 Minute Counts								
Sample ID	Grid Coordinate	^{137}CS 661.6 keV peak	^{60}Co 1173 keV peak	^{228}Th 238 keV peak	^{232}Th 911 keV peak	Total Thorium $^{228}Th + ^{232}Th$	^{238}U 63 keV peak (93 keV peak)	^{235}U 144 keV peak (186 keV peak)
SVW-35	I,2	ND	ND	1.47 ± 0.13	1.98 ± 0.37	3.45	1.40 ± 1.20	(0.16 ± 0.09)
SVW-36	I,1	ND	ND	1.59 ± 0.11	1.98 ± 0.38	3.57	1.36 ± 0.12	(0.20 ± 0.08)
SVW-37	K,2	ND	ND	1.72 ± 0.14	1.73 ± 0.29	3.45	1.88 ± 0.14	(0.14 ± 0.09)
SVW-38	K,3	ND	ND	1.55 ± 0.11	1.49 ± 0.22	3.04	1.79 ± 1.27	(0.18 ± 0.06)
SVW-39	K,5	ND	ND	1.45 ± 0.12	1.86 ± 0.34	3.31	1.45 ± 1.15	(0.10 ± 0.11)
SVW-40	K,6	ND	ND	1.31 ± 0.09	1.49 ± 0.27	2.80	1.32 ± 0.91	(0.16 ± 0.06)
SVW-41	K,8	ND	ND	1.68 ± 0.13	2.18 ± 0.42	3.86	1.01 ± 1.25	(0.24 ± 0.10)
SVW-42	K,9	ND	ND	1.35 ± 0.09	1.58 ± 0.24	2.93	1.45 ± 0.80	(0.10 ± 0.06)
SVW-43	L,8	ND	ND	1.48 ± 0.12	2.15 ± 0.38	3.63	1.13 ± 1.27	(0.16 ± 0.09)
SVW-44	L,7	ND	ND	1.46 ± 0.10	1.68 ± 0.31	3.14	2.70 ± 1.66	(0.17 ± 0.07)
SVW-45	L,5	ND	ND	1.48 ± 0.63	2.22 ± 0.39	3.70	1.09 ± 1.08	(0.21 ± 0.09)
SVW-46	L,4	ND	ND	1.61 ± 0.10	1.66 ± 0.31	3.27	1.31 ± 1.04	(0.20 ± 0.08)
SVW-47	L.2	ND	ND	1.67 ± 0.14	2.33 ± 0.39	4.00	2.37 ± 1.26	(0.27 ± 0.11)
SVW-48	L,1	ND	ND	1.50 ± 0.10	1.60 ± 0.28	3.09	2.05 ± 1.23	(0.23 ± 0.07)
SVW-49	N,2	ND	ND	1.63 ± 0.13	2.08 ± 0.43	3.70	0.94 ± 1.12	0.46 ± 0.40 (see re-count)
SVW-49 2.5 hr count	N,2	ND	ND	1.56 ± 0.06	1.94 ± 0.19	3.50	2.44 ± 0.71	(0.21 ± 0.05)

Table 5: Gamma Spectroscopy Results of Sorrento Valley West Area 2 Final Survey Soil Samples [1]								
Radionuclide Concentration (ρCi/gm) - Results ± 2σ - Backgrounds not Subtracted - Approximately 30 Minute Counts								
Sample ID	Grid Coordinate	^{137}CS 661.6 keV peak	^{60}Co 1173 keV peak	^{228}Th 238 keV peak	^{232}Th 911 keV peak	Total Thorium $^{228}Th + ^{232}Th$	^{238}U 63 keV peak (93 keV peak)	^{235}U 144 keV peak (186 keV peak)
SVW-50	N,3	ND	ND	1.56 ± 0.11	1.71 ± 0.28	3.26	1.12 ± 1.15	(0.21 ± 0.07)
SVW-51	N,5	ND	ND	1.57 ± 0.13	2.05 ± 0.43	3.61	0.94 ± 1.13	(0.12 ± 0.11)
SVW-52	N,6	ND	ND	1.60 ± 0.11	1.72 ± 0.32	3.32	(2.69 ± 0.85)	(0.12 ± 0.07)
SVW-53	N,8	ND	ND	1.48 ± 0.12	2.08 ± 0.39	3.56	(2.19 ± 0.83)	(0.18 ± 0.10)
SVW-54	N,9	ND	ND	1.52 ± 0.10	1.54 ± 0.26	3.06	(1.95 ± 1.08)	(0.14 ± 0.06)
SVW-55	P,2	ND	ND	1.45 ± 0.13	1.63 ± 0.50	3.08	1.32 ± 1.23	(0.21 ± 0.10)
SVW-58	F,14	ND	ND	0.88 ± 0.08	0.77 ± 0.25	1.65	0.94 ± 0.83	(0.10 ± 0.06)
SVW-60	Q,14	ND	ND	1.05 ± 0.10	1.58 ± 0.23	2.63	1.95 ± 0.95	(0.24 ± 0.07)
SVW-61	S,15	ND	ND	0.64 ± 0.11	1.34 ± 0.37	1.98	0.82 ± 0.89	0.28 ± 0.35
SVW-64	B,25	ND	ND	1.58 ± 0.11	1.61 ± 0.27	3.19	2.04 ± 1.12	(0.14 ± 0.07)
SVW-65	A,25	ND	ND	1.94 ± 0.15	2.45 ± 0.38	4.39	2.09 ± 1.43	(0.26 ± 0.12)
SVW-66	A,14	ND	ND	1.71 ± 0.10	1.57 ± 0.27	3.28	1.65 ± 0.98	(0.14 ± 0.06

(1) See Figure 11 for approximate locations of soil samples. Note: Soil samples SVW-56, SVW-57, SVW-59, SVW-62 and SVW-63 are located in Area 1 of SVW. The results of these soil samples are in the Area 1 Final Radiological Survey Report.

ND - means Not Detected

Cs-137 = < 0.1 pCi/g
Co-60 = < 0.1 pCi/g

Table 6: Gamma Spectroscopy Results of Background Soil (Surface) Samples

Radionuclide Concentrations (ρCi/gm) - Results ± 2σ - 30 Minute Counts

Sample ID	^{137}CS 661.6 keV peak	^{60}Co 1173 keV peak	^{228}Th 238 keV peak	^{232} Th 911 keV peak	Total Thorium ^{228}Th + ^{232}Th	^{238}U 63.3 (92.7) keV peak	^{235}U 144 (186) keV peak
X-1	ND	ND	0.71± 0.07	0.97 ± 0.25	1.69	1.17 ± 0.77	(0.13 ± 0.06)
X-2	ND	ND	0.90 ± 0.13	1.49 ± 0.31	1.49	1.91 ± 1.18	(0.13 ± 0.08)
X-3	0.06 ± 0.04	ND	1.49 ± 0.10	1.56 ± 0.25	3.05	1.45 ± 0.80	(0.23 ± 0.09)
X-4	ND	ND	1.52 ± 0.23	3.22 ± 0.61	4.74	3.74 ± 2.18	(0.28 ± 0.17)
X-5	ND	ND	1.92 ± 0.17	2.41 ± 0.53	4.33	(4.49 ± 1.64)	(0.32 ± 0.16)
X-6	ND	ND	1.02 ± 0.08	0.96 ± 0.23	1.99	1.31 ± 0.80	(0.14 ± 0.06)
X-7	0.13 ± 0.08	ND	1.59 ± 0.14	2.40 ± 0.38	3.98	2.16 ± 1.48	(0.18 ± 0.10)
X-8	ND	ND	1.44 ± 0.28	1.40 ± 0.28	2.84	2.30 ± 1.16	(0.14 ± 0.09)
X-9	0.09 ± 0.08	ND	0.89 ± 0.10	1.27 ± 0.31	2.15	1.59 ± 1.05	(0.10 ± 0.08)
X-10	ND	ND	1.29 ± 0.11	1.52 ± 0.36	2.80	1.10 ± 0.96	(0.16 ± 0.08)

Notes:

1. Soil samples were collected on 06/05/00 and 06/06/00 By Ed Rudgers off GA's site but close to GA.
2. Samples were counted 7/20/00 through 7/24/00 for 30 minutes (same count as the soil samples).
3. ND means: < 0.1 pCi/g for Cs-137
   < 0.1 pCi/g for Co-60

Table CS 1: Gamma Spectroscopy Results of SVW Area 2 Confirmatory Survey Soil Samples

Radionuclide Concentration (ρCi/gm) - Results ± 2σ - Backgrounds not Subtracted - Approximately 30 Minute Counts

Sample ID	Figure #	Grid Co-ord	^{137}CS 661.6 keV peak	^{60}Co 1173 keV peak	^{228}Th 238 keV peak	^{232}Th 911 keV peak	Total Thorium ^{228}Th + ^{232}Th	^{238}U 63.3(92.7) keV peak	^{235}U 144 (186) keV peak
SVW CS 1	CS 3	J,1	ND	ND	2.09 ± 0.17	2.86 ± 0.50	4.95	1.52 ± 1.30	(0.28 ± 0.13)
SVW CS 2	CS 3	J,1	ND	ND	1.38 ± 0.19	2.32 ± 0.40	3.70	1.47 ± 1.26	(0.21 ± 0.08)
SVW CS 3	CS 3	J,1	ND	ND	1.42 ± 0.11	2.18 ± 0.35	3.60	(1.60 ± 0.79)	(0.20 ± 0.08)
SVW CS 4	CS 3	J,1	ND	ND	1.76 ± 0.14	1.92 ± 0.35	3.68	1.67 ± 1.40	(0.15 ± 0.11)
SVW CS 5	CS 3	L,2	ND	ND	1.60 ± 0.13	2.06 ± 0.34	3.66	1.99 ± 1.45	(0.18 ± 0.10)
SVW CS 6	CS 3	L,2	0.18 ± 0.14	ND	1.48 ± 0.10	1.46 ± 0.26	2.95	2.06 ± 1.37	(0.16 ± 0.07)
SVW CS 7	CS 3	M,2	ND	ND	1.67 ± 0.13	2.00 ± 0.38	3.66	1.64 ± 1.33	(0.17 ± 0.09)
SVW CS 8	CS 3	M,2	3.47 ± 0.17	ND	1.61 ± 0.12	1.96 ± 0.29	3.57	2.38 ± 1.03	(0.20 ± 0.09)
SVW CS 9	CS 3	M,3	ND	ND	1.62 ± 0.14	0.96 ± 0.46	3.58	(2.41 ± 0.99)	(0.22 ± 0.11)
SVW CS 10	CS 3	M,4	ND	ND	1.42 ± 0.10	1.49 ± 0.32	2.91	1.97 ± 1.05	(0.18 ± 0.07)
SVW CS 11	CS 3	M,6	ND	ND	1.49 ± 0.12	1.76 ± 0.37	3.25	2.87 ± 1.19	0.44 ± 0.38
SVW CS 12	CS 3	M,7	ND	ND	1.45 ± 0.09	1.40 ± 0.29	2.85	0.88 ± 0.96	(0.13 ± 0.07)
SVW CS 13	CS 3	I,8	ND	ND	1.52 ± 0.12	2.21 ± 0.29	3.72	(2.17 ± 0.80)	(0.16 ± 0.09)
SVW CS 14	CS 3	D,9	ND	ND	1.07 ± 0.09	1.38 ± 0.25	2.45	1.44 ± 1.21	(0.14 ± 0.06)

ND - Not Detected -(<0.1 ρCi/gm ^{137}CS, <0.1 ρCi/gm ^{60}Co)

Figure 1: Main Site and Sorrento Valley Site

Building Numbers	Names
Building 1	Administration
Building 2	Science Laboratories A, B, C
Building 7	Cafeteria
Building 9	Experimental Building
Building 10	Maintenance Building
Building 13	Technical Office Building
Building 14	Technical Office East
Building 15	Technical Office East
Building 19	Swimming Pool Building
Building 21	TRIGA Building
Building 22	TRIGA Fuel Lab Building
Building 23	Hot Cell
Building 25	Waste Yard Building
Building 27	Experimental Area
Building 27-7	Experimental Area
Building 29	Experimental Area
Building 29-2	Emergency Vehicle Storage Building
Building 30	LINAC Complex
Building 31	TRIGA Storage Building
Building 31-1	Neutron Radiography Building
Building 31-2	ECF Critical Building
Building 31-3	Storage Building
Building 33	Fusion Building
Building 33-1	Fusion Lab Building
Building 33-5	Fusion Building Annex 5
Building 34	Fusion Doublet III Building
Building 34-1	Fusion Doublet III Capacitor Building
Building 34-2	Fusion Doublet III Lab Building
Building 34-3	Fusion Doublet III Storage Building
Building 35	Test Tower Building
Building 35-1	Facilities (Shipping & Receiving) Building
Building 36	Blower Assembly Building
Building 37	Sorrento Valley Building
Building 39	Sorrento Valley Building
Building 39-1	Storage Building
Building 41	Raw Stock Facility
Building 42	NDT Facility
Building 45	Helium Circulator Test Facility
Building 63	3550 Dunhill St.
Building 64	11030 Roselle St.
Building 65	11040 Roselle St.
Building 66	3520 Dunhill St.
Building 66	3510 Dunhill St.

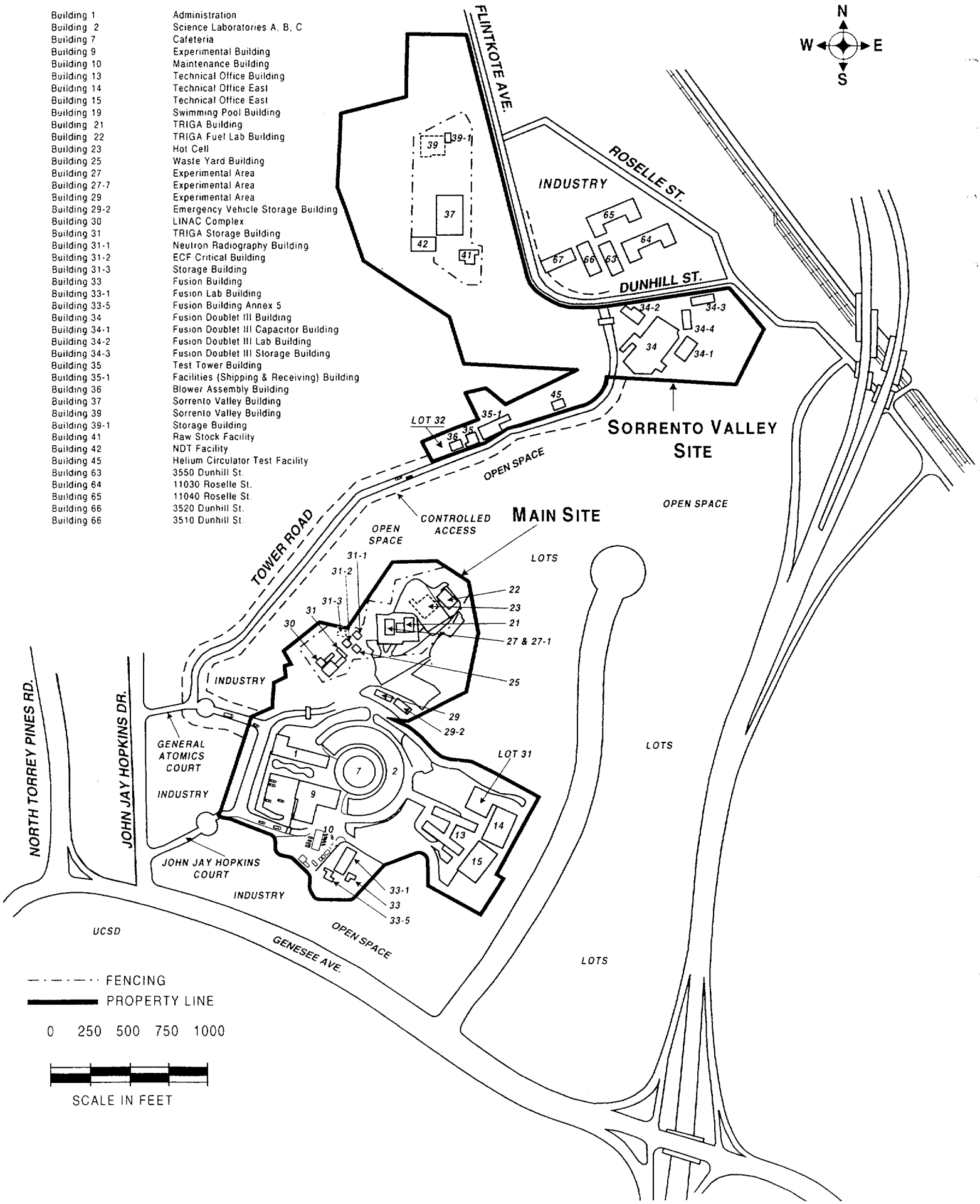
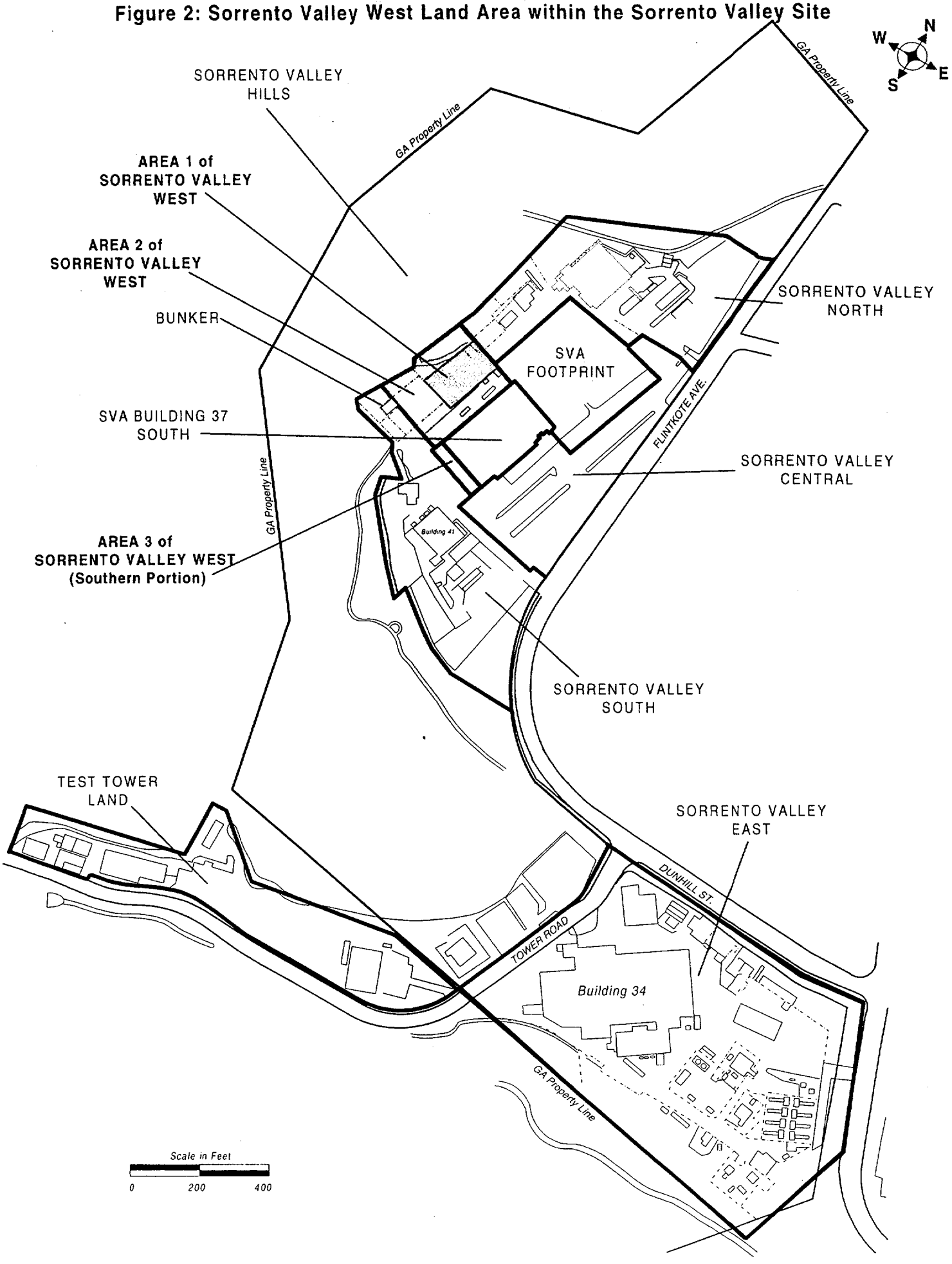


Figure 2: Sorrento Valley West Land Area within the Sorrento Valley Site



Sorrento Valley West

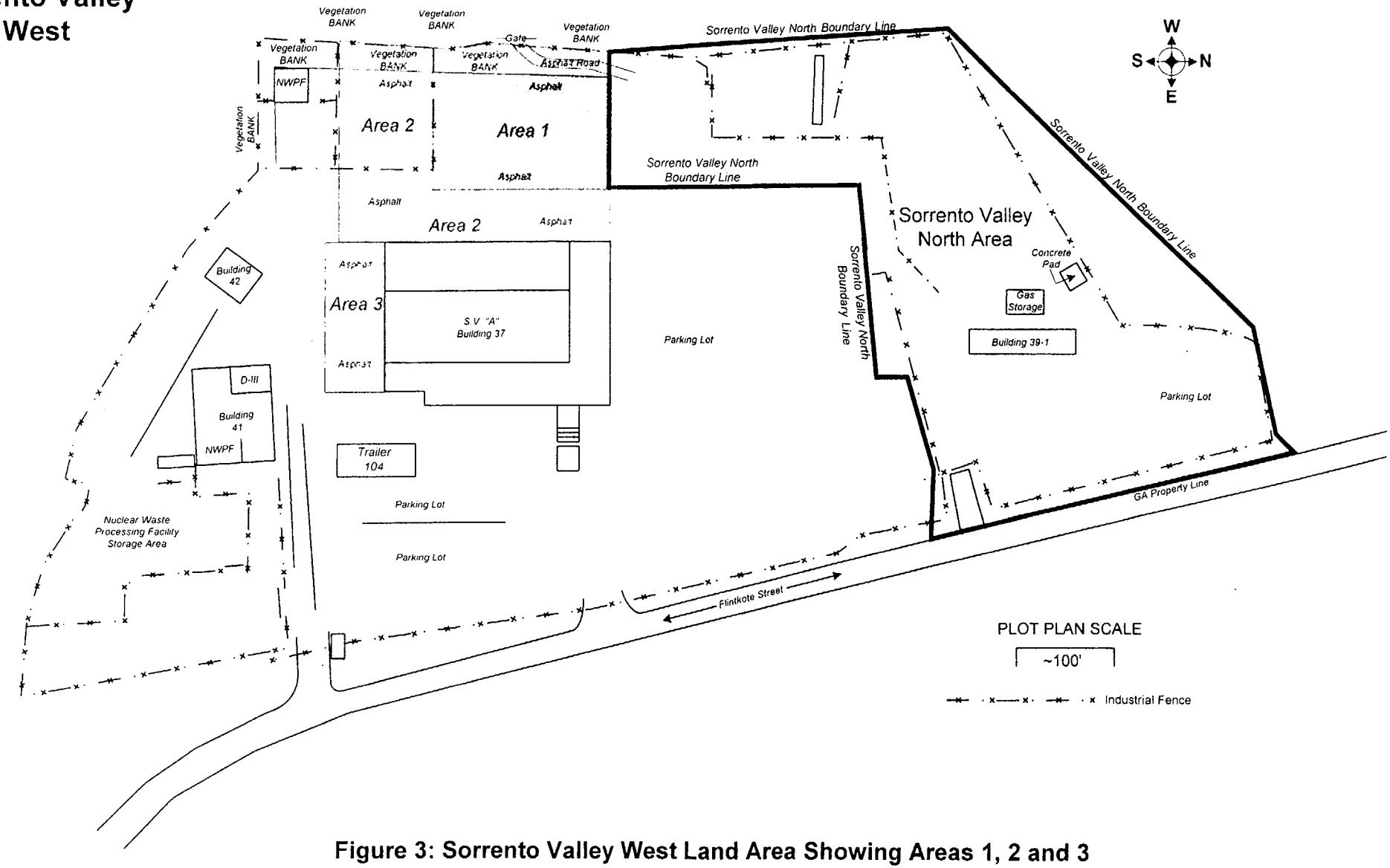
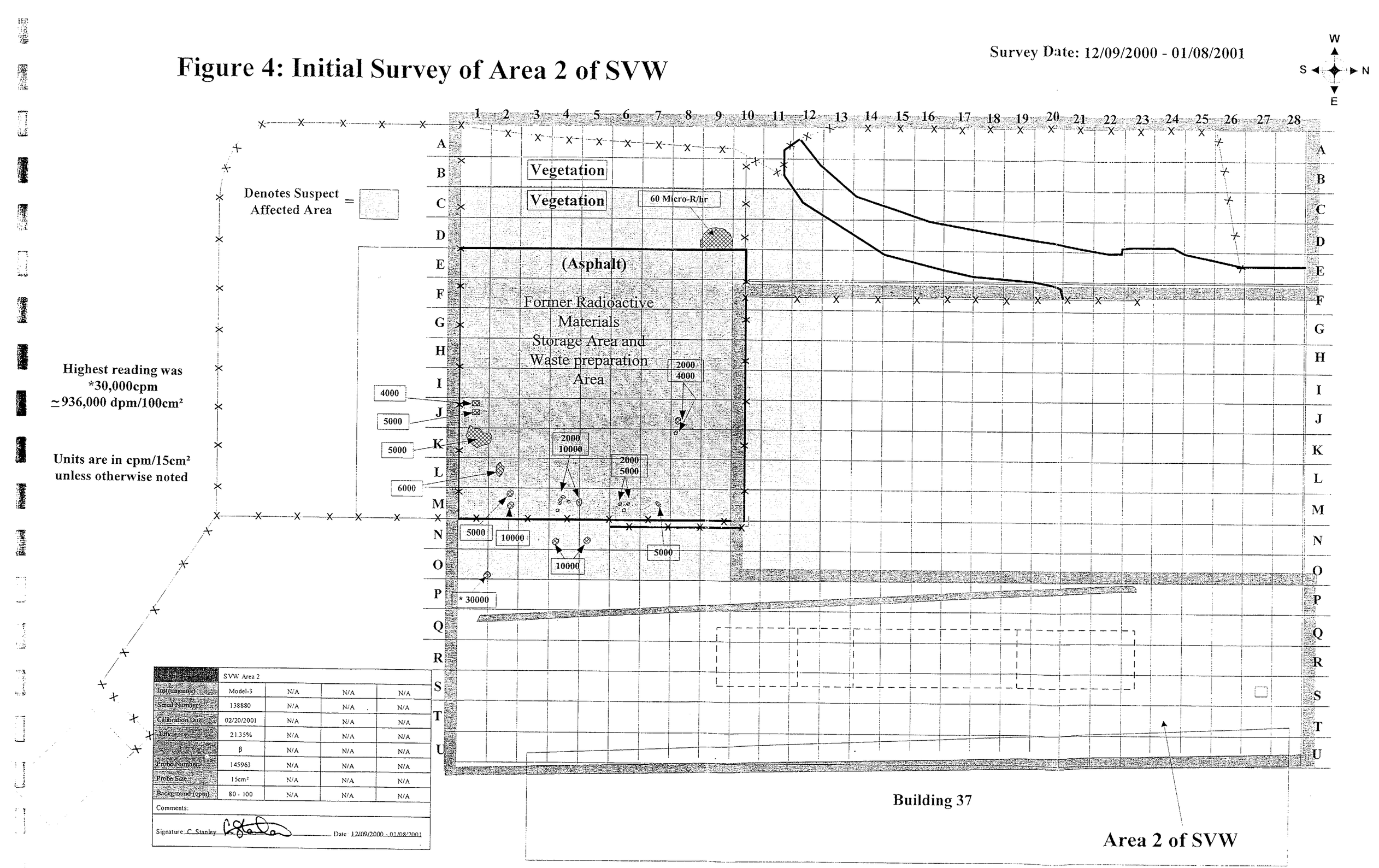


Figure 3: Sorrento Valley West Land Area Showing Areas 1, 2 and 3

Figure 4: Initial Survey of Area 2 of SVW

Survey Date: 12/09/2000 - 01/08/2001



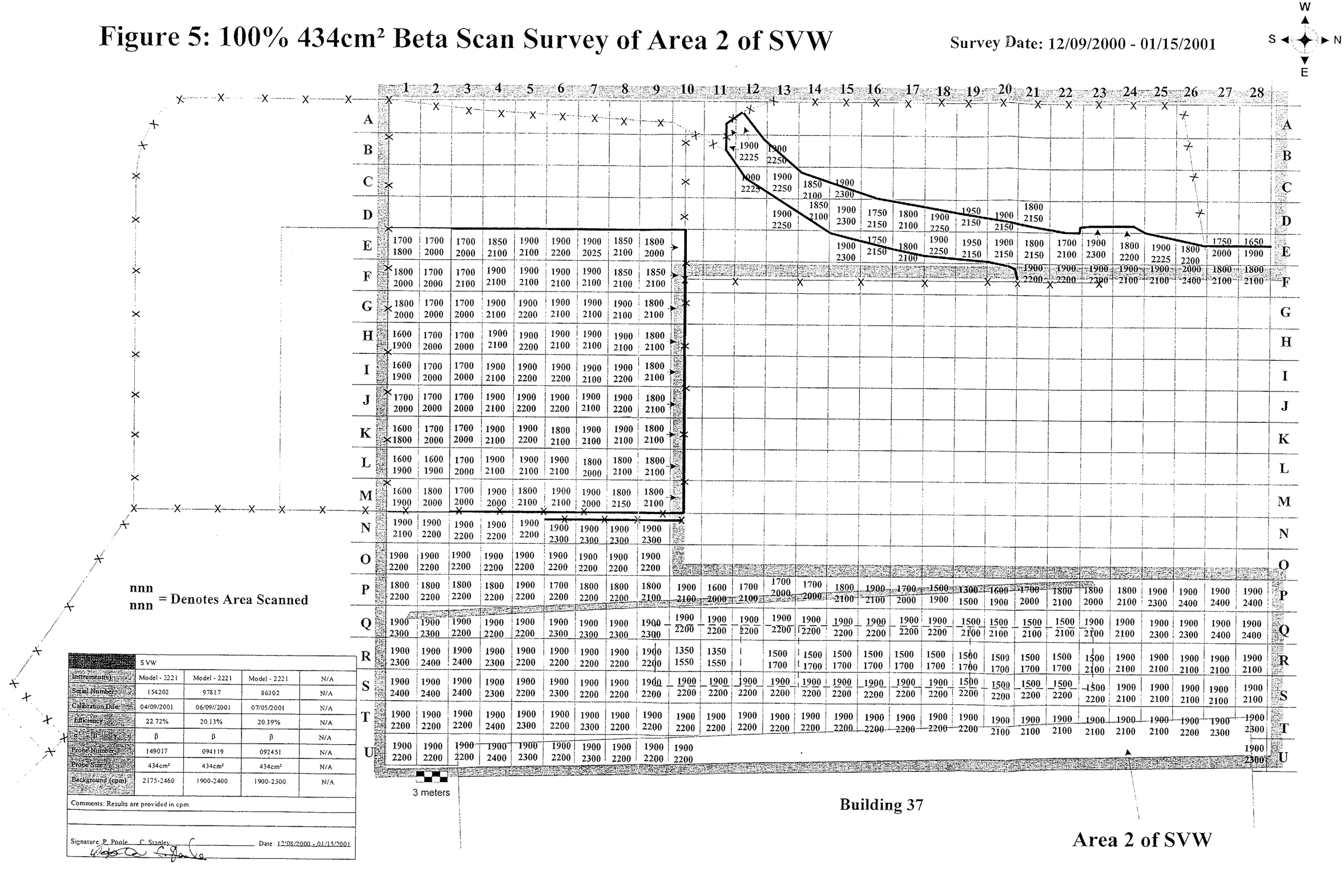
Highest reading was
*30,000cpm
≃936,000 dpm/100cm²

Units are in cpm/15cm²
unless otherwise noted

	SVW Area 2			
Instrument(s)	Model-3	N/A	N/A	N/A
Serial Number	138880	N/A	N/A	N/A
Calibration Date	02/20/2001	N/A	N/A	N/A
Efficiency	21.35%	N/A	N/A	N/A
α/β	β	N/A	N/A	N/A
Probe Number	145963	N/A	N/A	N/A
Probe Size	15cm²	N/A	N/A	N/A
Background (cpm)	80 - 100	N/A	N/A	N/A
Comments:				
Signature: C. Stanley			Date: 12/09/2000 - 01/08/2001	

Figure 5: 100% 434cm² Beta Scan Survey of Area 2 of SVW

Survey Date: 12/09/2000 - 01/15/2001



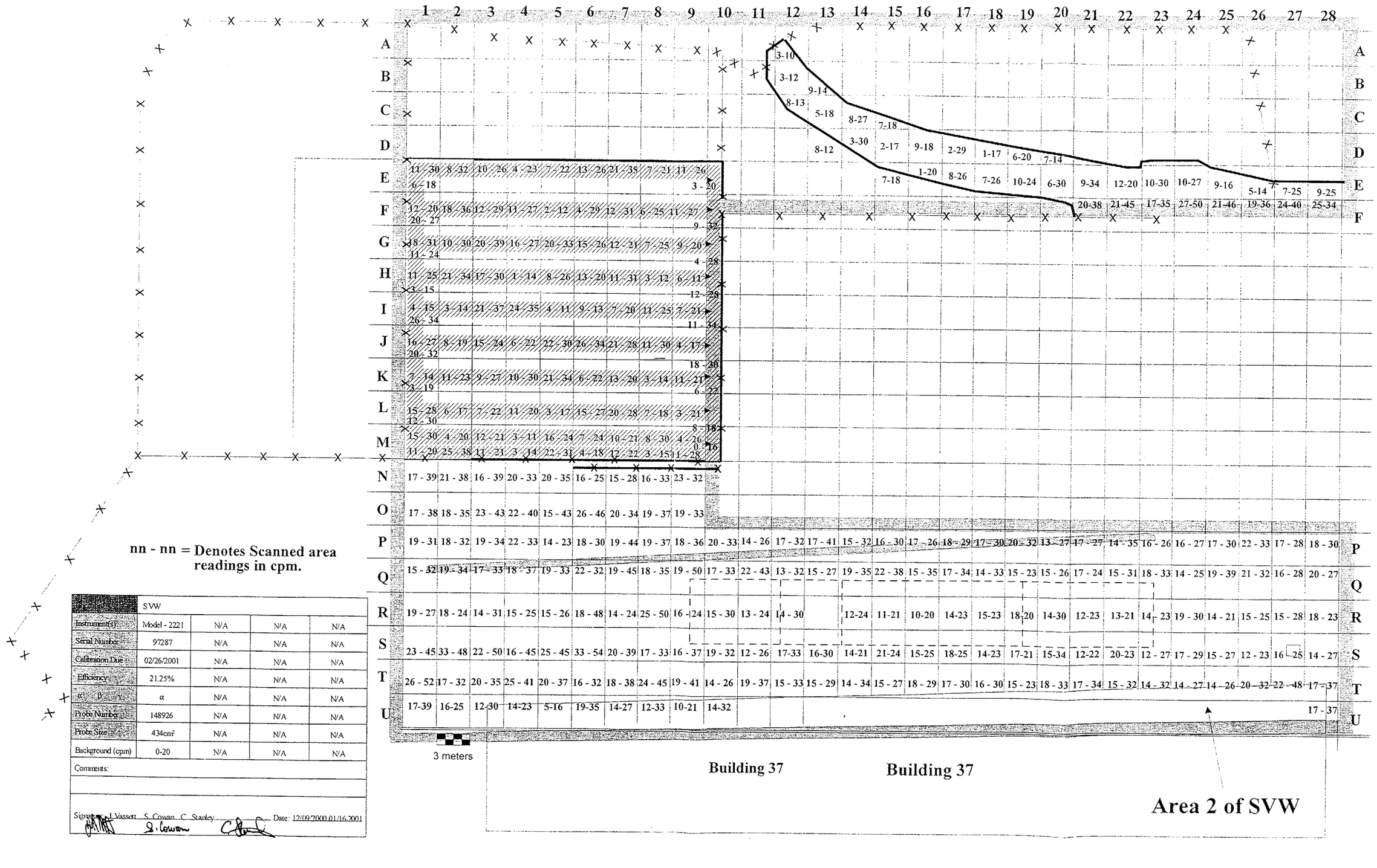
	SVW			
Instrument(s)	Model - 2221	Model - 2221	Model - 2221	N/A
Serial Number	154202	97817	86302	N/A
Calibration Date	04/09/2001	06/09//2001	07/05/2001	N/A
Efficiency	22.72%	20.13%	20.39%	N/A
α β γ	β	β	β	N/A
Probe Number	149017	094119	092451	N/A
Probe Size	434cm²	434cm²	434cm²	N/A
Background (cpm)	2175-2460	1900-2400	1900-2300	N/A

Comments: Results are provided in cpm.

Signature: P. Poole C. Stanley Date: 12/08/2000 - 01/15/2001

Figure 6: 10% 434cm² Alpha Scan Survey of Area 2 of SVW

Survey Date: 12/09/2000 - 01/16/2001

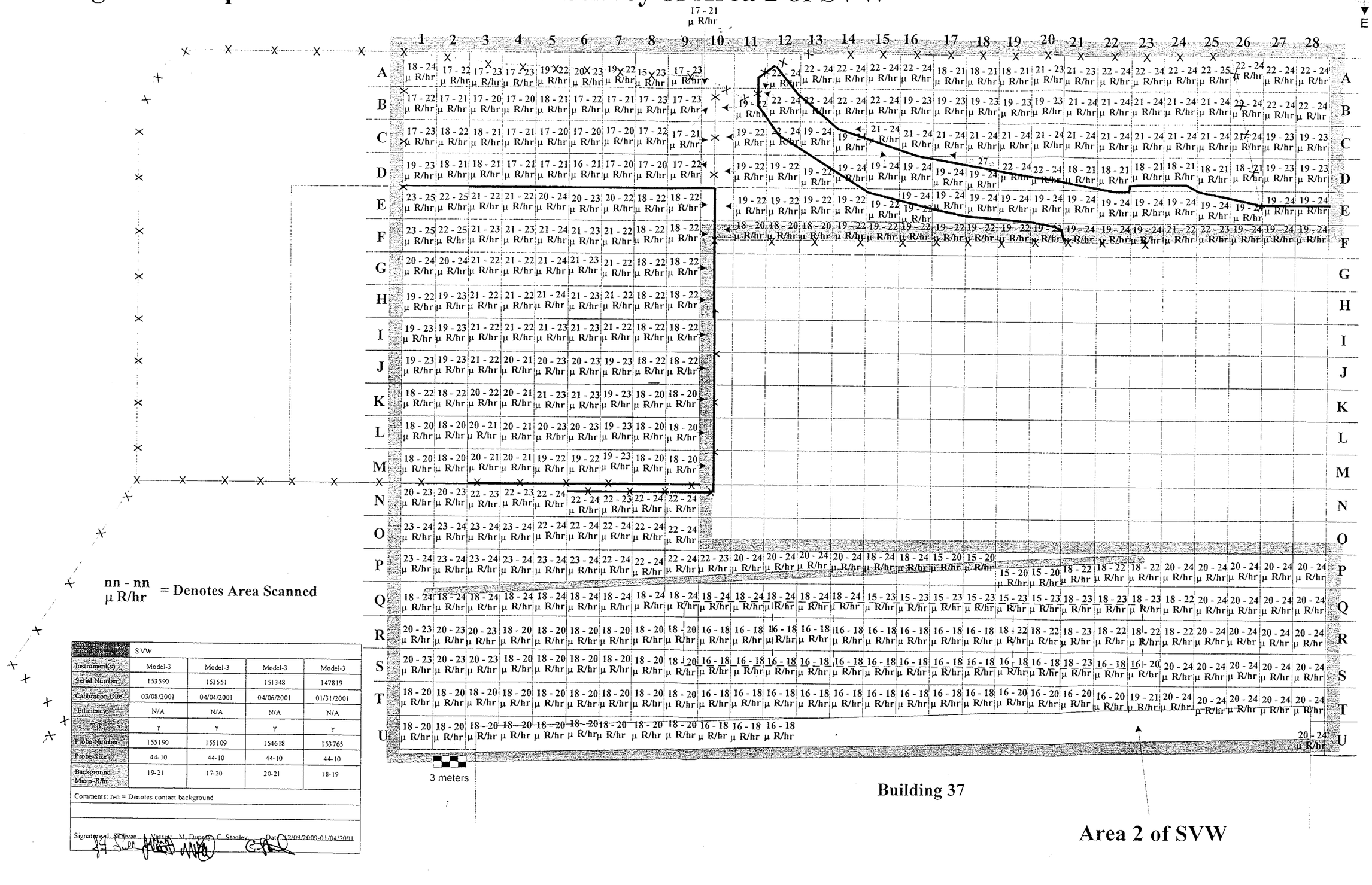


nn - nn = Denotes Scanned area readings in cpm.

	SVW			
Instrument(s)	Model - 2221	N/A	N/A	N/A
Serial Number	97287	N/A	N/A	N/A
Calibration Due	02/26/2001	N/A	N/A	N/A
Efficiency	21.25%	N/A	N/A	N/A
α β γ	α	N/A	N/A	N/A
Probe Number	148926	N/A	N/A	N/A
Probe Size	434cm²	N/A	N/A	N/A
Background (cpm)	0-20	N/A	N/A	N/A
Comments:				
Signature: J.Vasseur S.Cowan C.Stanley			Date: 12/09/2000 01/16/2001	

Figure 7: Exposure Rate Surface Scan Survey of Area 2 of SVW

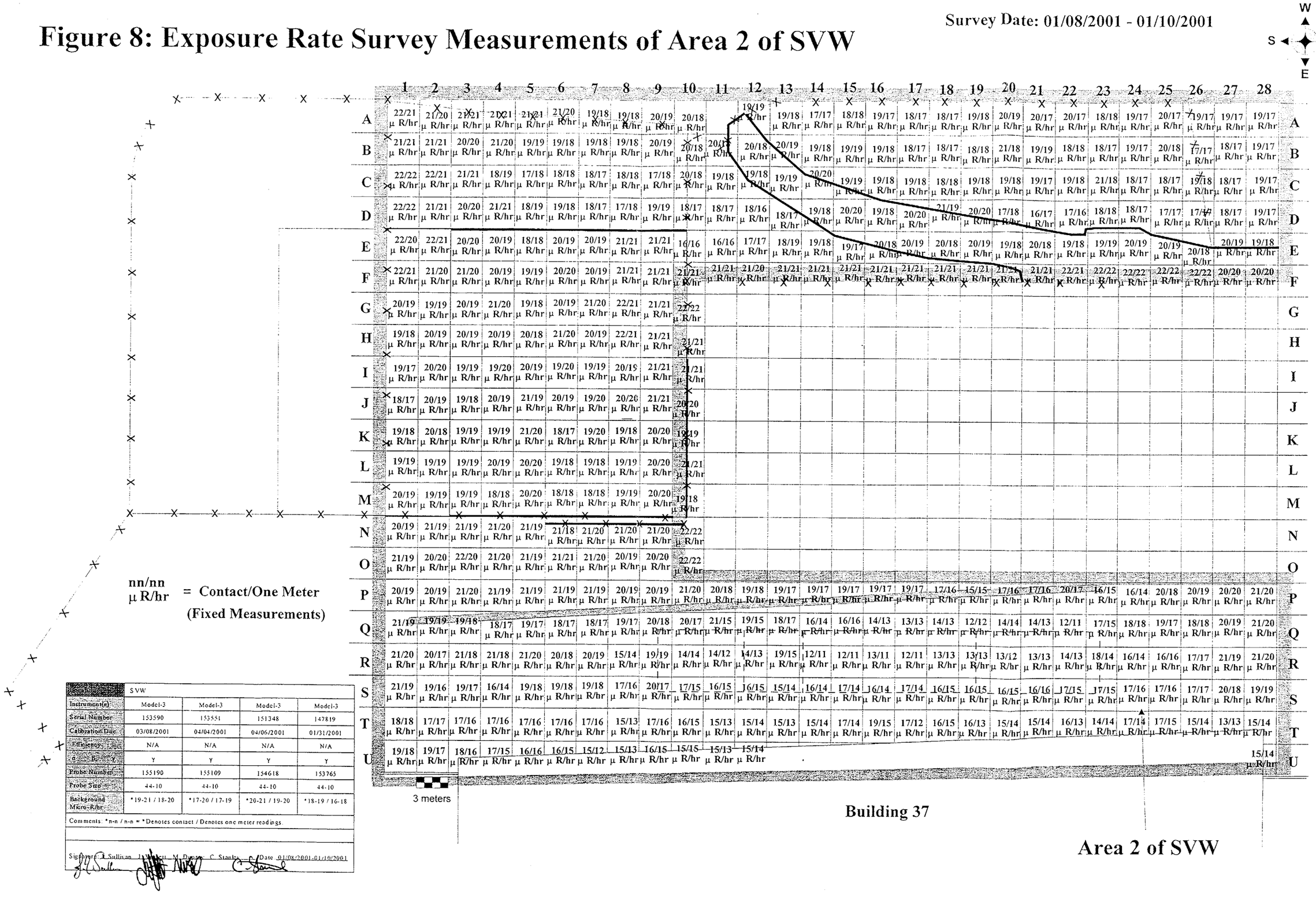
Survey Date: 12/09/2000 - 01/04/2001



	SVW			
Instrument(s)	Model-3	Model-3	Model-3	Model-3
Serial Number	153590	153551	151348	147819
Calibration Due	03/08/2001	04/04/2001	04/06/2001	01/31/2001
Efficiency	N/A	N/A	N/A	N/A
α, β, γ	Y	Y	Y	Y
Probe Number	155190	155109	154618	153765
Probe Size	44-10	44-10	44-10	44-10
Background Micro-R/hr	19-21	17-20	20-21	18-19
Comments: n-n = Denotes contact background				
Signature: J. Sullivan, L. Vasser, M. Dupree, C. Stanley Date: 12/09/2000-01/04/2001				

Figure 8: Exposure Rate Survey Measurements of Area 2 of SVW

Survey Date: 01/08/2001 - 01/10/2001



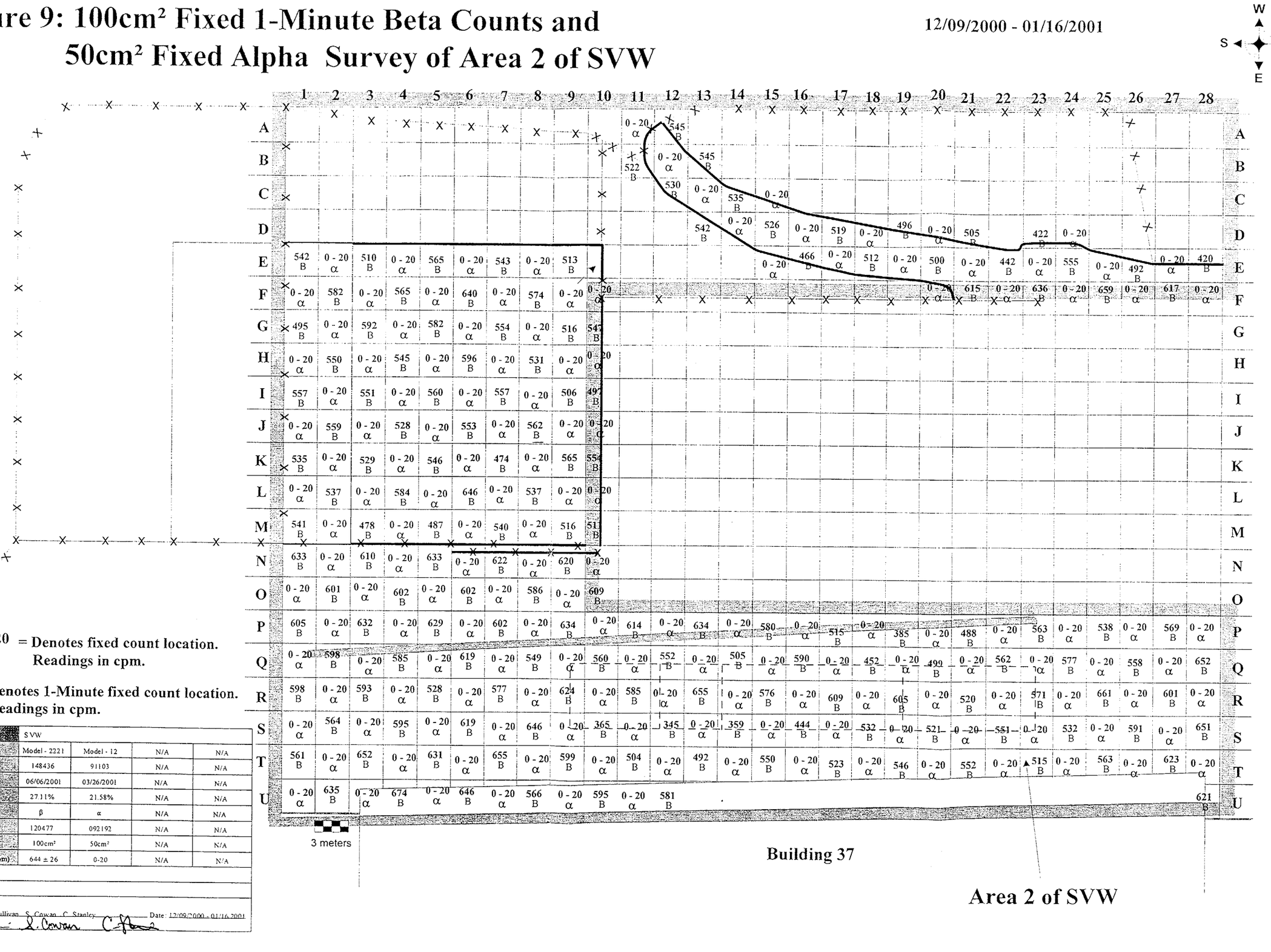
	SVW			
Instrument(s)	Model-3	Model-3	Model-3	Model-3
Serial Number	153590	153551	151348	147819
Calibration Due	03/08/2001	04/04/2001	04/06/2001	01/31/2001
Efficiency	N/A	N/A	N/A	N/A
[illegible]	Y	Y	Y	Y
Probe Number	155190	155109	154618	153765
Probe Size	44-10	44-10	44-10	44-10
Background Micro-R/hr	*19-21 / 18-20	*17-20 / 17-19	*20-21 / 19-20	*18-19 / 16-18

Comments: *n-n / n-n = *Denotes contact / Denotes one meter readings

Signature: J. Sullivan [illegible] M. Dupree C. Stanley Date: 01/08/2001-01/10/2001

Figure 9: 100cm² Fixed 1-Minute Beta Counts and 50cm² Fixed Alpha Survey of Area 2 of SVW

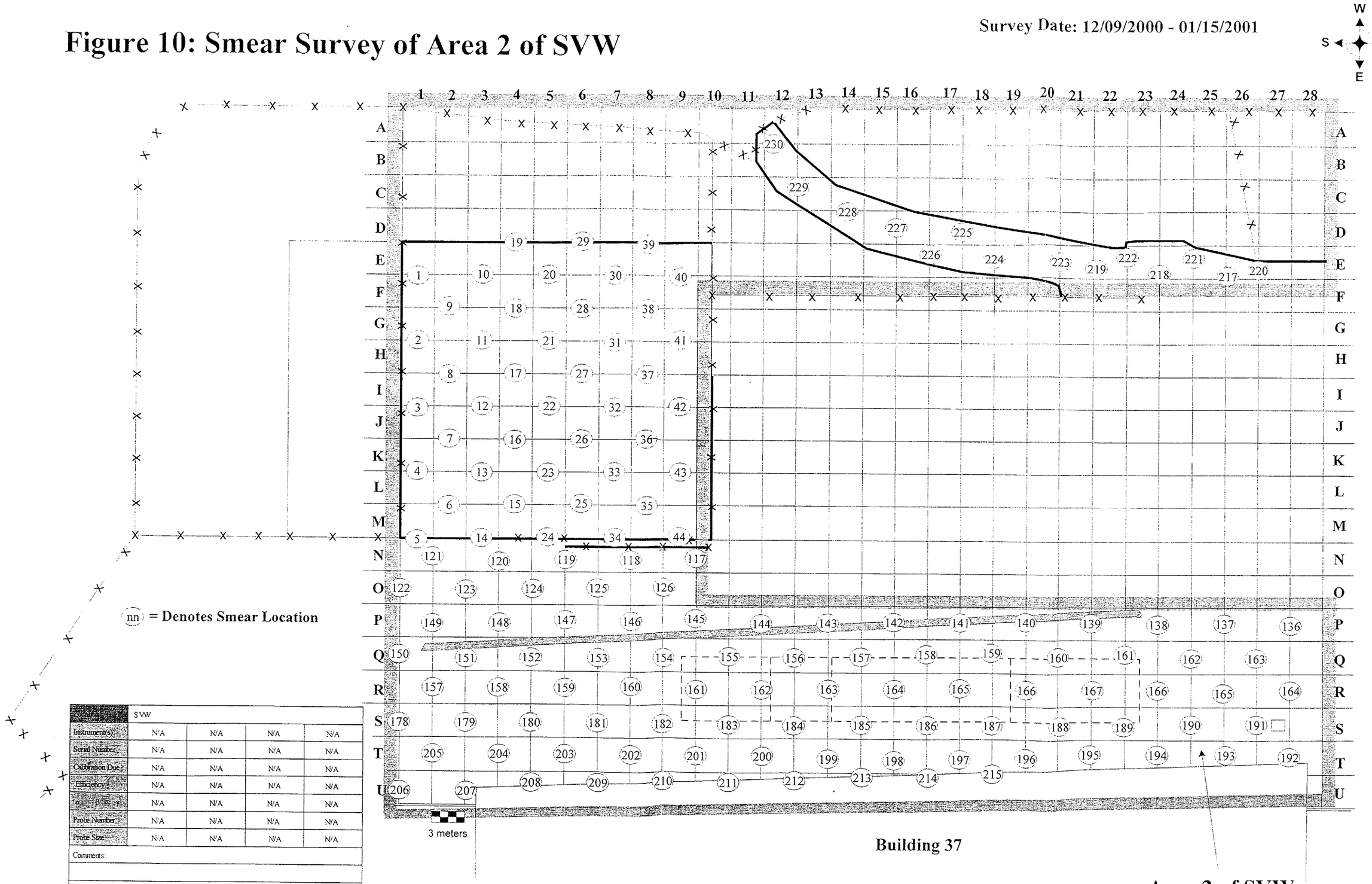
12/09/2000 - 01/16/2001



	SVW			
Instrument(s)	Model - 2221	Model - 12	N/A	N/A
Serial Number	148436	91103	N/A	N/A
Calibration Due	06/06/2001	03/26/2001	N/A	N/A
Efficiency	27.11%	21.58%	N/A	N/A
α , β , γ	β	α	N/A	N/A
Probe Number	120477	092192	N/A	N/A
Probe Size	100cm²	50cm²	N/A	N/A
Background (cpm)	644 ± 26	0-20	N/A	N/A
Comments:				
Signature: J. Sullivan S. Cowan C. Stanley			Date: 12/09/2000 - 01/16/2001	

Figure 10: Smear Survey of Area 2 of SVW

Survey Date: 12/09/2000 - 01/15/2001



	SVW			
Instrument(s)	N/A	N/A	N/A	N/A
Serial Number	N/A	N/A	N/A	N/A
Calibration Due	N/A	N/A	N/A	N/A
Efficiency	N/A	N/A	N/A	N/A
4π / 2π	N/A	N/A	N/A	N/A
Probe Number	N/A	N/A	N/A	N/A
Probe Size	N/A	N/A	N/A	N/A
Comments:				

Signature: J. Sullivan S. Cowan J. Vasdett Date: 12/09/2000 - 01/15/2001

Figure 11: Locations of Soil Samples Collected in Area 2 of SVW

Survey Date: 12/19/2000

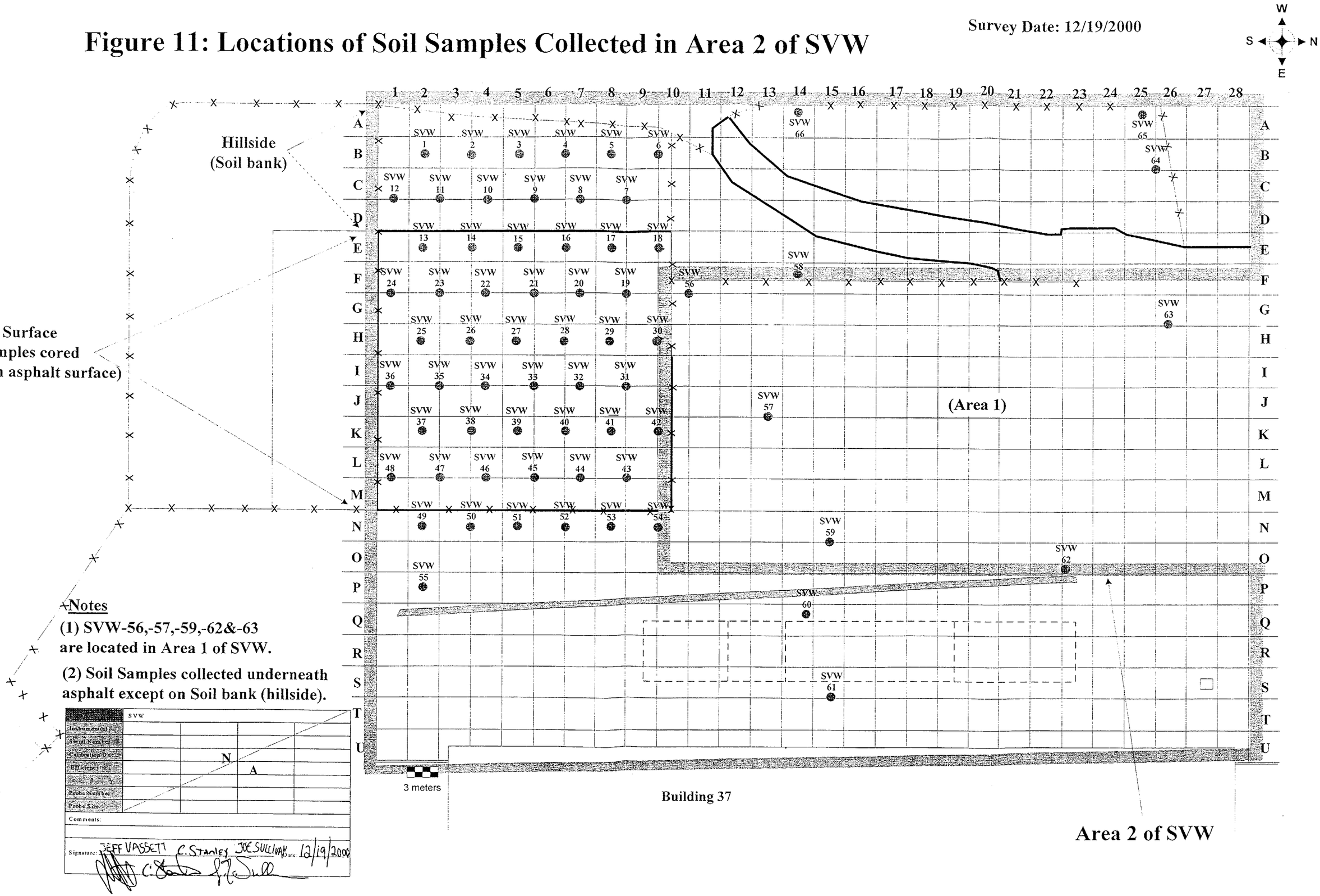
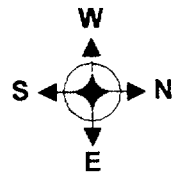


Figure 12: 100% 434cm² Beta Scan of Area 3 of SVW



01/19/2001

	A	B	C	D	E
1	1700 2100	1800 2300	1800 2100	1800 2100	
2	1700 2200	1800 2100	1800 2100	1800 2100	
3	1600 2100	1800 2000	1700 2000	1800 2100	
4	1700 2100	1700 2000	1800 2100	1800 2100	
5	1700 2100	1700 2000	1700 1900		
6	1700 2000	1800 2100	1800 2000	1700 1900	
7	1700 2000	1900 2200	1900 2100	1800 2100	
8	1900 2100	1900 2200	1900 2200	1900 2200	
9	1900 2100	1900 2200	1900 2300		
10	1900 2100	1900 2300	1900 2300	1900 2100	
11	1900 2100	1900 2300	1900 2300	1800 2100	
12	1900 2100	1900 2200	1900 2200	1700 2000	
13	1900 2100	1800 2100	1700 2000	1700 2000	
14	1800 2400	1900 2400	1700 2000	1700 1800	
15	2000 2300	1900 2400	1800 2300	1800 2000	
16	2000 2300	2000 2400	1800 2300	1800 2200	
17	2000 2400	2000 2300	1900 2300	1900 2200	

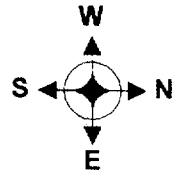
Building
37

3 meters

	SVW			
Instrument(s)	Model - 2221	N/A	N/A	N/A
Serial Number	154202	N/A	N/A	N/A
Calibration Due	07/04/2001	N/A	N/A	N/A
Efficiency	22.64%	N/A	N/A	N/A
α β γ	β	N/A	N/A	N/A
Probe Number	149017	N/A	N/A	N/A
Probe Size	434cm²	N/A	N/A	N/A
Background (cpm)	2175-2460	N/A	N/A	N/A
Comments:				
Signature: C. Stanley			Date: 01/19/2001	

nnn
nnn = Denotes Area Scanned

Figure 13: 10% 434cm² Alpha Scan of Area 3 of SVW



01/19/2001

	A	B	C	D	E
1	15-30	11-23	9-22	10-27	
2	18-26	9-23	11-23	9-21	
3	12-22	6-29	13-22	10-18	
4	17-28	8-16	9-35	11-22	
5	13-31	4-23	12-30		
6	17-34	6-28	10-19	17-22	
7	16-38	15-22	14-26	6-22	
8	7-40	11-30	11-23	6-11	
9	11-32	11-28	15-29		
10	11-23	13-24	11-25	15-18	
11	10-33	7-21	16-30	14-31	
12	11-25	10-18	15-24	16-23	
13	17-21	17-24	16-29	9-17	
14	11-20	13-25	9-28	13-23	
15	21-32	19-23	13-23	15-26	
16	15-25	20-37	15-25	16-23	
17	11-28	20-33	12-18	19-33	

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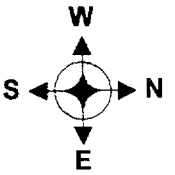
3 meters

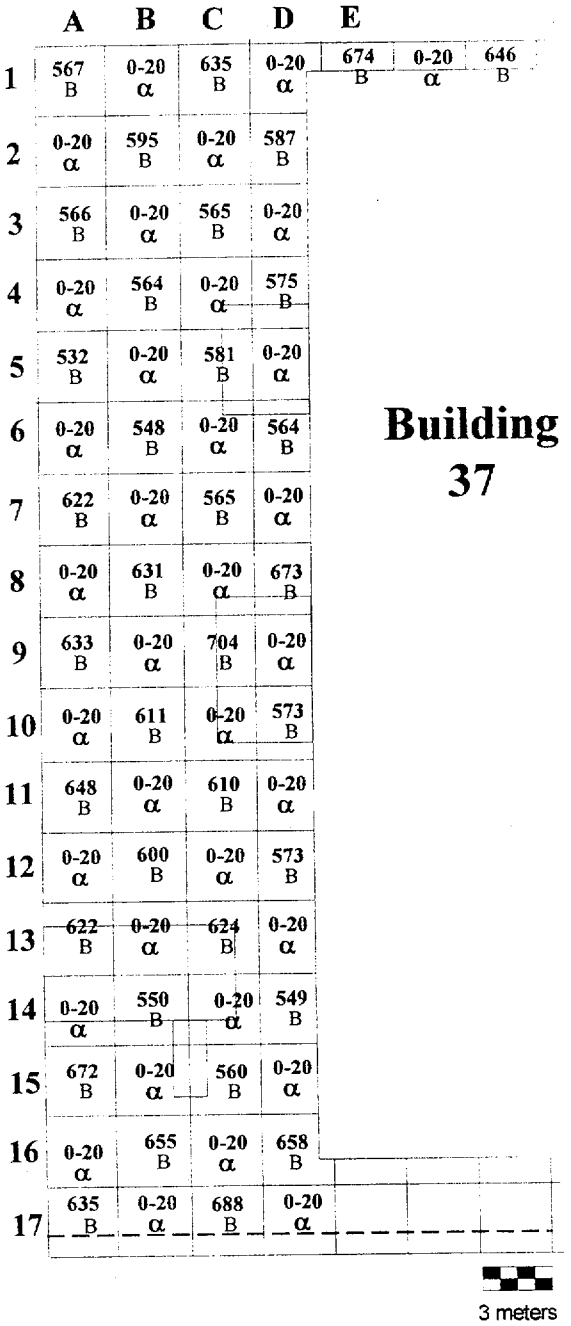
	SVW			
Instrument(s)	Model - 2221	N/A	N/A	N/A
Serial Number	97287	N/A	N/A	N/A
Calibration Due	07/20/2001	N/A	N/A	N/A
Efficiency	21.25%	N/A	N/A	N/A
α β γ	α	N/A	N/A	N/A
Probe Number	148926	N/A	N/A	N/A
Probe Size	434cm²	N/A	N/A	N/A
Background (cpm)	0-20	N/A	N/A	N/A
Comments:				
Signature: C. Stanley			Date: 01/19/2001	

nn-nn = Denotes Area Scanned

Figure 14: 100cm² Fixed 1-Minute and 50cm² Fixed Alpha Survey of Area 3 of SVW



01/19/2001



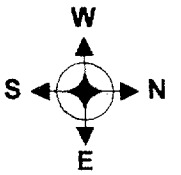
$\frac{nnn}{B}$ = Denotes 1-Minute fixed count location (in cpm).

$\frac{0\text{-}20}{\alpha}$ = Denotes fixed count location (in cpm).

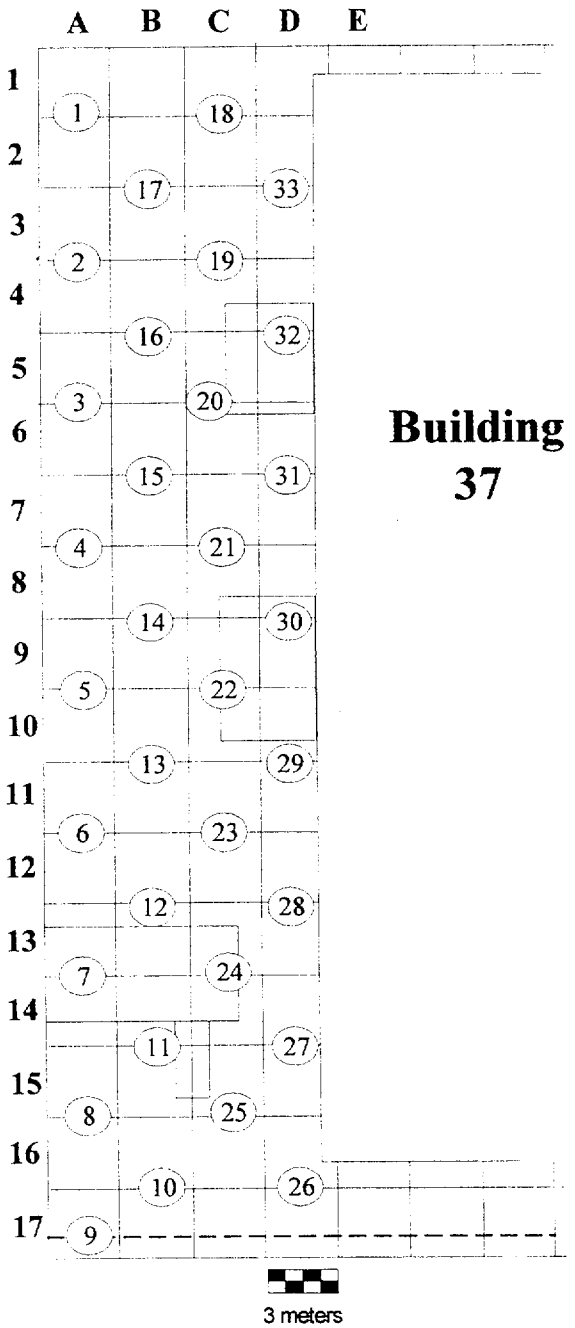
	SVW			
Instrument(s)	Model - 2221	Model - 12	N/A	N/A
Serial Number	148436	91103	N/A	N/A
Calibration Due	06/06/2001	03/26/2001	N/A	N/A
Efficiency	27.11%	21.58%	N/A	N/A
α β γ	β	α	N/A	N/A
Probe Number	120477	092192	N/A	N/A
Probe Size	100cm²	50cm²	N/A	N/A
Background (cpm)	644 ± 26	0-20	N/A	N/A
Comments:				

Signature: J. Sullivan Date: 01/19/2001

Figure 15: Smear Survey of Area 3 of SVW

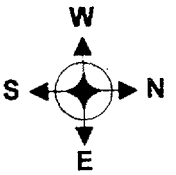


01/18/2001



	SVW			
Instrument(s)	N/A	N/A	N/A	N/A
Serial Number	N/A	N/A	N/A	N/A
Calibration Due	N/A	N/A	N/A	N/A
Efficiency	N/A	N/A	N/A	N/A
α β γ	N/A	N/A	N/A	N/A
Probe Number	N/A	N/A	N/A	N/A
Probe Size	N/A	N/A	N/A	N/A
Background	N/A	N/A	N/A	N/A
Comments:				
Signature: J. Vassett			Date: 01/18/2001	

Figure 16: Exposure Rate Measurements of Area 3 of SVW



01/19/2001

	A	B	C	D	E
1	21/21 µR/hr	20/20 µR/hr	20/20 µR/hr	20/19 µR/hr	
2	20/20 µR/hr	20/20 µR/hr	19/19 µR/hr	19/19 µR/hr	
3	21/20 µR/hr	20/20 µR/hr	20/20 µR/hr	20/19 µR/hr	
4	20/20 µR/hr	20/20 µR/hr	19/19 µR/hr	19/19 µR/hr	
5	20/20 µR/hr	20/20 µR/hr	19/19 µR/hr		
6	20/20 µR/hr	20/20 µR/hr	20/19 µR/hr	20/20 µR/hr	
7	20/20 µR/hr	20/20 µR/hr	21/20 µR/hr	21/20 µR/hr	
8	21/21 µR/hr	20/20 µR/hr	20/20 µR/hr	21/20 µR/hr	
9	21/21 µR/hr	21/21 µR/hr	21/21 µR/hr	19/18 µR/hr	
10	21/21 µR/hr	21/21 µR/hr	21/20 µR/hr	20/19 µR/hr	
11	21/20 µR/hr	20/20 µR/hr	18/18 µR/hr	18/17 µR/hr	
12	20/20 µR/hr	20/19 µR/hr	19/19 µR/hr	19/18 µR/hr	
13	24/23 µR/hr	24/24 µR/hr	25/24 µR/hr	17/16 µR/hr	
14	23/22 µR/hr	22/22 µR/hr	21/21 µR/hr	17/17 µR/hr	
15	19/19 µR/hr	19/19 µR/hr	19/18 µR/hr	18/18 µR/hr	
16	20/20 µR/hr	19/19 µR/hr	19/19 µR/hr	19/19 µR/hr	
17	19/19 µR/hr	19/19 µR/hr	19/19 µR/hr	19/18 µR/hr	

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nn/nn = Contact/One Meter
µ R/hr

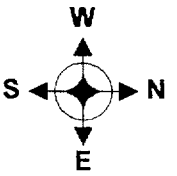
3 meters

	SVW			
Instrument(s)	Model-3	N/A	N/A	N/A
Serial Number	151348	N/A	N/A	N/A
Calibration Due	04/06/2001	N/A	N/A	N/A
Efficiency	N/A	N/A	N/A	N/A
α β γ	γ	N/A	N/A	N/A
Probe Number	154618	N/A	N/A	N/A
Probe Size	44-10	N/A	N/A	N/A
Background Micro-R/hr	*20-21 / 19-20	N/A	N/A	N/A

Comments: *n-n / n-n = *Denotes contact / Denotes one meter readings. Readings in Micro-R/hr.

Signature: C. Stanley Date: 01/19/2001

Figure 17: Exposure Rate Surface Scan Survey of Area 3 of SVW



01/19/2001

	A	B	C	D	E
1	19-22 µR/hr	18-21 µR/hr	18-20 µR/hr	18-21 µR/hr	
2	19-22 µR/hr	19-20 µR/hr	19-21 µR/hr	17-21 µR/hr	
3	18-21 µR/hr	18-20 µR/hr	18-21 µR/hr	17-20 µR/hr	
4	19-21 µR/hr	18-21 µR/hr	18-22 µR/hr	17-20 µR/hr	
5	18-20 µR/hr	18-20 µR/hr	17-20 µR/hr		
6	18-21 µR/hr	18-21 µR/hr	18-21 µR/hr	18-25 µR/hr	
7	18-21 µR/hr	19-21 µR/hr	18-21 µR/hr	16-23 µR/hr	
8	19-22 µR/hr	18-22 µR/hr	19-22 µR/hr	16-23 µR/hr	
9	20-22 µR/hr	20-22 µR/hr	20-22 µR/hr	18-22 µR/hr	
10	18-24 µR/hr	19-22 µR/hr	19-22 µR/hr	15-22 µR/hr	
11	18-21 µR/hr	19-21 µR/hr	17-21 µR/hr	14-20 µR/hr	
12	18-20 µR/hr	18-21 µR/hr	16-20 µR/hr	14-20 µR/hr	
13	18-23 µR/hr	16-26 µR/hr	16-27 µR/hr	15-18 µR/hr	
14	18-24 µR/hr	18-26 µR/hr	16-26 µR/hr	16-19 µR/hr	
15	18-21 µR/hr	19-26 µR/hr	17-25 µR/hr	18-22 µR/hr	
16	18-21 µR/hr	19-21 µR/hr	18-21 µR/hr	18-20 µR/hr	
17	17-21 µR/hr	19-21 µR/hr	16-20 µR/hr	17-21 µR/hr	

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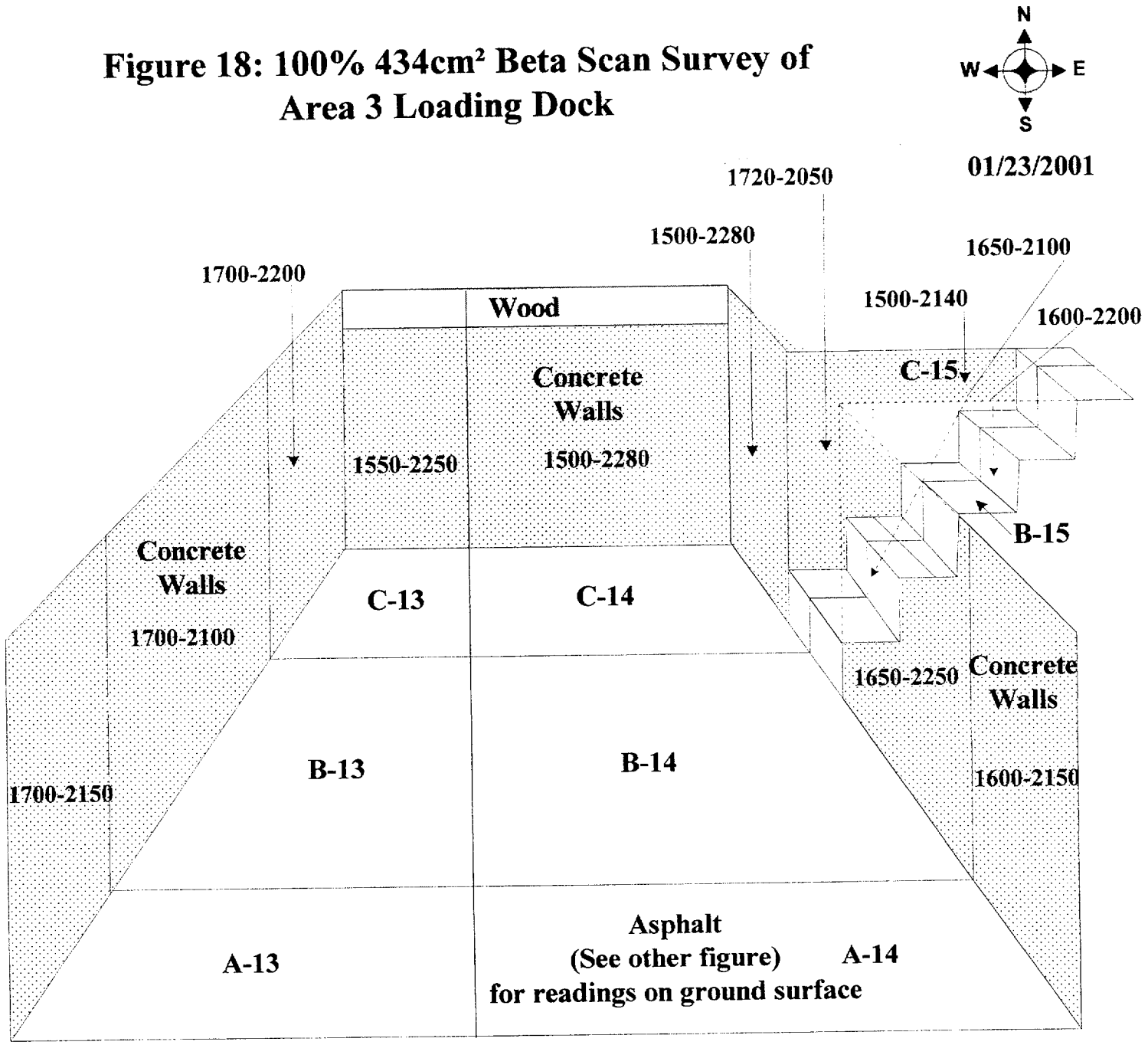
3 meters

	SVW			
Instrument(s)	Model-3	N/A	N/A	N/A
Serial Number	153551	N/A	N/A	N/A
Calibration Due	04/04/2001	N/A	N/A	N/A
Efficiency	N/A	N/A	N/A	N/A
α β γ	γ	N/A	N/A	N/A
Probe Number	155109	N/A	N/A	N/A
Probe Size	44-10	N/A	N/A	N/A
Background Micro-R/hr	17-20	N/A	N/A	N/A
Comments: n-n = Denotes contact background. Readings in Micro-R/hr				
Signature: J. Vassett			Date: 01/19/2001	

nn-nn µ R/hr = Denotes Area Surveyed

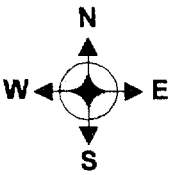
Figure 18: 100% 434cm² Beta Scan Survey of Area 3 Loading Dock



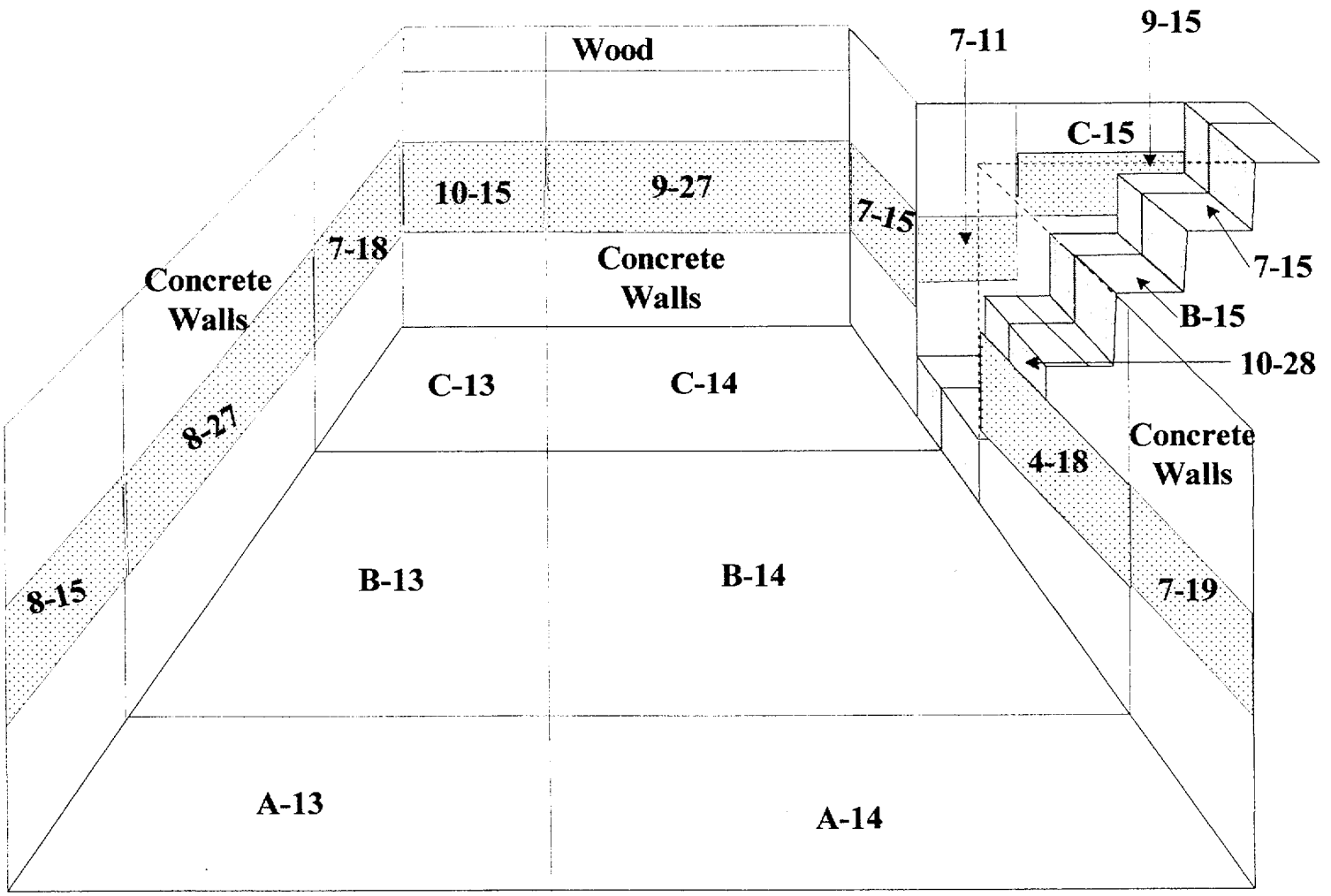
nnn-nnn = Denotes one minute Beta fixed count

	S VW			
Instrument(s)	Model - 2221	N/A	N/A	N/A
Serial Number	154202	N/A	N/A	N/A
Calibration Due	07/04/2001	N/A	N/A	N/A
Efficiency	22.64%	N/A	N/A	N/A
α β γ	β	N/A	N/A	N/A
Probe Number	149017	N/A	N/A	N/A
Probe Size	434cm²	N/A	N/A	N/A
Background (cpm)	1600-1995	N/A	N/A	N/A
Comments: Readings recorded in cpm.				
Signature: J. Vassett			Date: 01/23/2001	

Figure 19: 10% 434cm² Alpha Scan Survey of Area 3 Loading Dock



01/24/2001

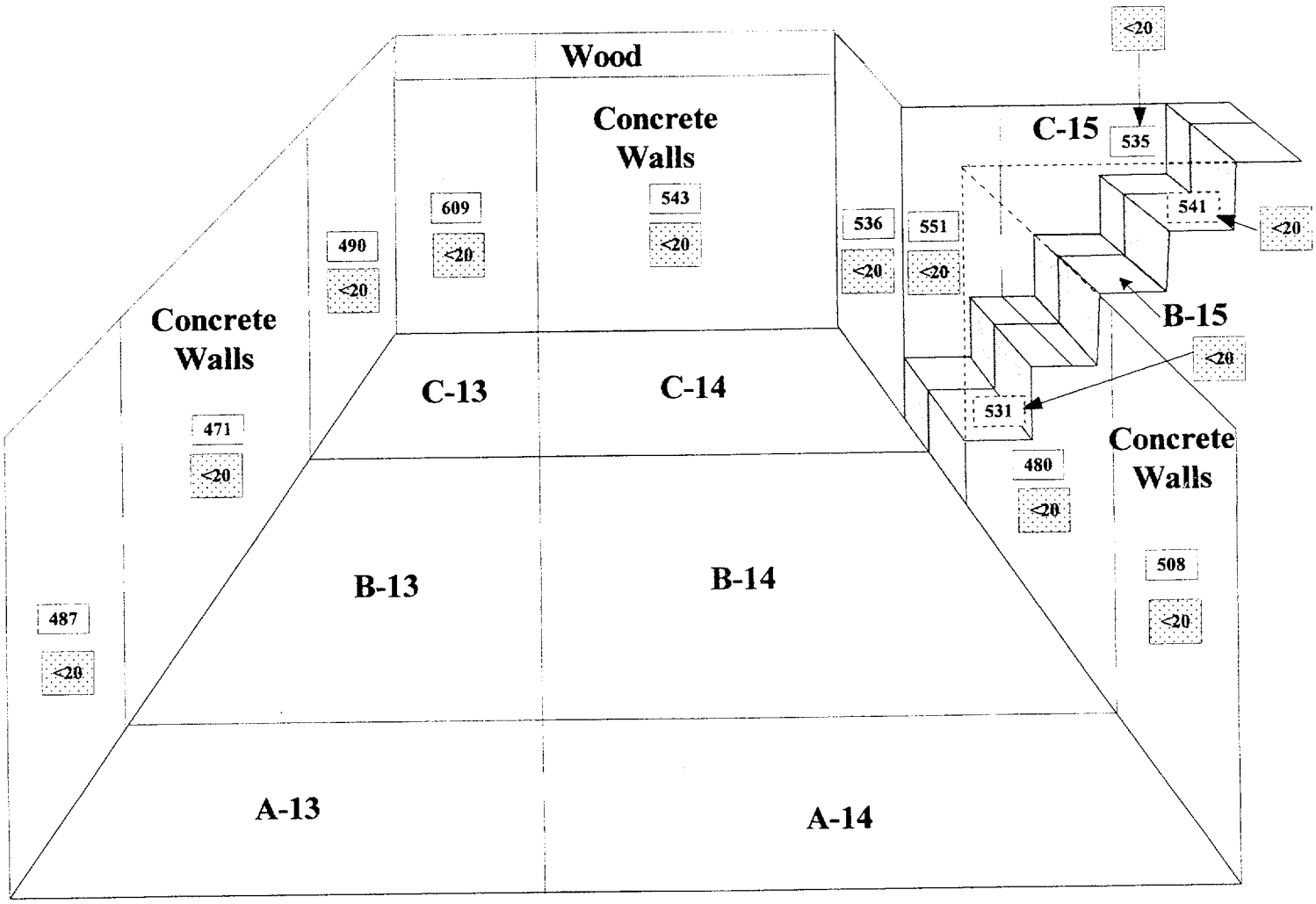


= Denotes Scanned area range in μR/hr.

	SVW			
Instrument(s)	Model - 2221	N/A	N/A	N/A
Serial Number	97287	N/A	N/A	N/A
Calibration Due	02/26/2001	N/A	N/A	N/A
Efficiency	21.25%	N/A	N/A	N/A
α β γ	α	N/A	N/A	N/A
Probe Number	148926	N/A	N/A	N/A
Probe Size	434cm²	N/A	N/A	N/A
Background (cpm)	0-20	N/A	N/A	N/A
Comments: Readings are in Micro-R/hr scan on surface.				
Signature: C. Stanley			Date: 01/24/2001	

Figure 20: 100cm² Fixed Beta 1-Minute and 50cm² Fixed Alpha Survey of Area 3 Loading Dock

01/23/2001-01/24/2001

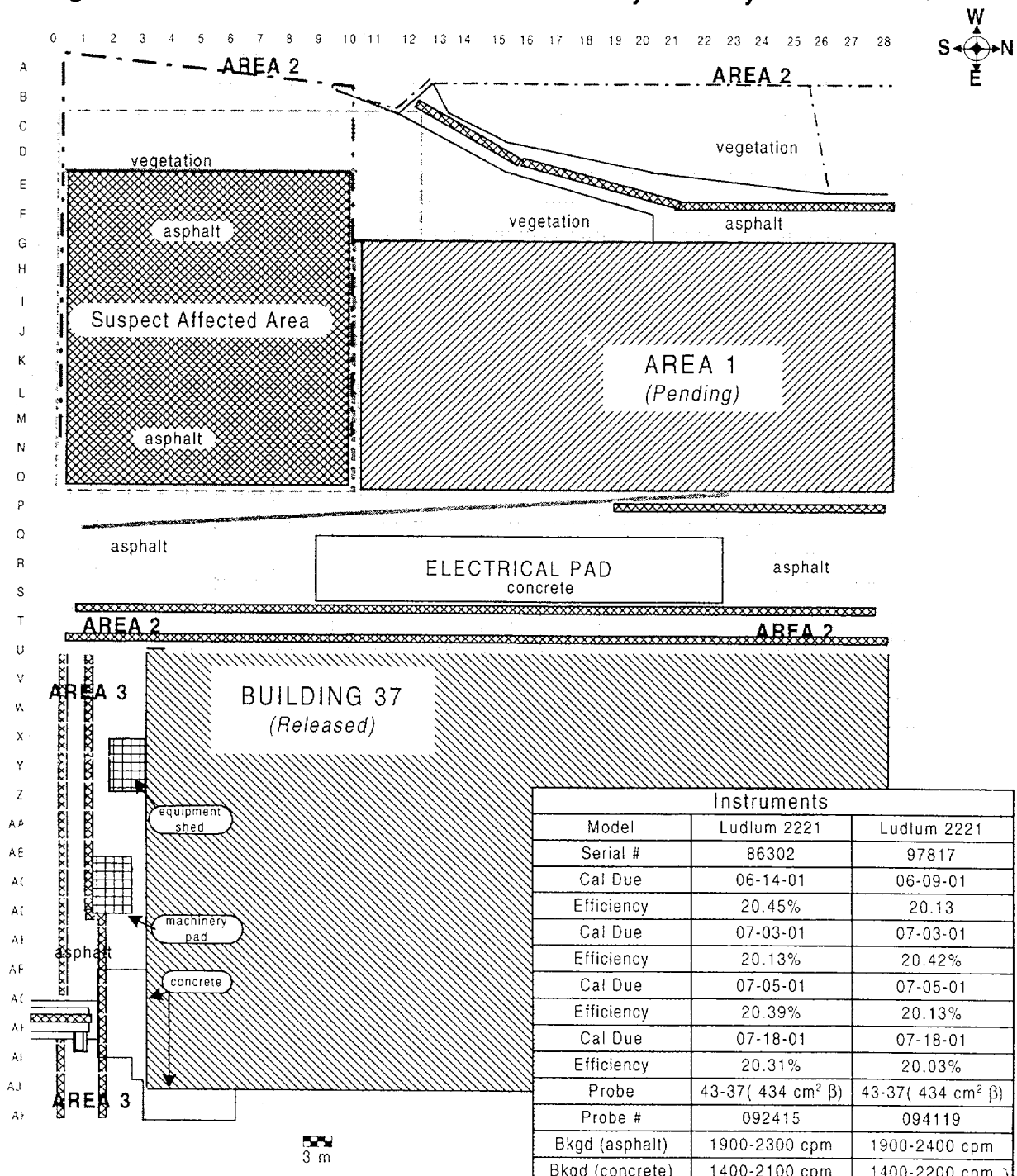


nnn = Denotes one minute Beta fixed count

nn = Denotes fixed Alpha count

	SVW			
Instrument(s)	Model - 2221	Model - 12	N/A	N/A
Serial Number	148436	91103	N/A	N/A
Calibration Due	06/06/2001	03/26/2001	N/A	N/A
Efficiency	27.11%	21.58%	N/A	N/A
α β γ	β	α	N/A	N/A
Probe Number	120477	092192	N/A	N/A
Probe Size	100cm²	50cm²	N/A	N/A
Background (cpm)	554 ± 28	0-20	N/A	N/A
Comments: Readings recorded in cpm.				
Signature: C. Stanley C. Stanley			Date: 01/23/2001-01/24/2001	

Figure CS 1: Areas 2 and 3 Confirmatory Survey Beta Scans



Instruments		
Model	Ludlum 2221	Ludlum 2221
Serial #	86302	97817
Cal Due	06-14-01	06-09-01
Efficiency	20.45%	20.13
Cal Due	07-03-01	07-03-01
Efficiency	20.13%	20.42%
Cal Due	07-05-01	07-05-01
Efficiency	20.39%	20.13%
Cal Due	07-18-01	07-18-01
Efficiency	20.31%	20.03%
Probe	43-37(434 cm^2 β)	43-37(434 cm^2 β)
Probe #	092415	094119
Bkgd (asphalt)	1900-2300 cpm	1900-2400 cpm
Bkgd (concrete)	1400-2100 cpm	1400-2200 cpm

Notes:

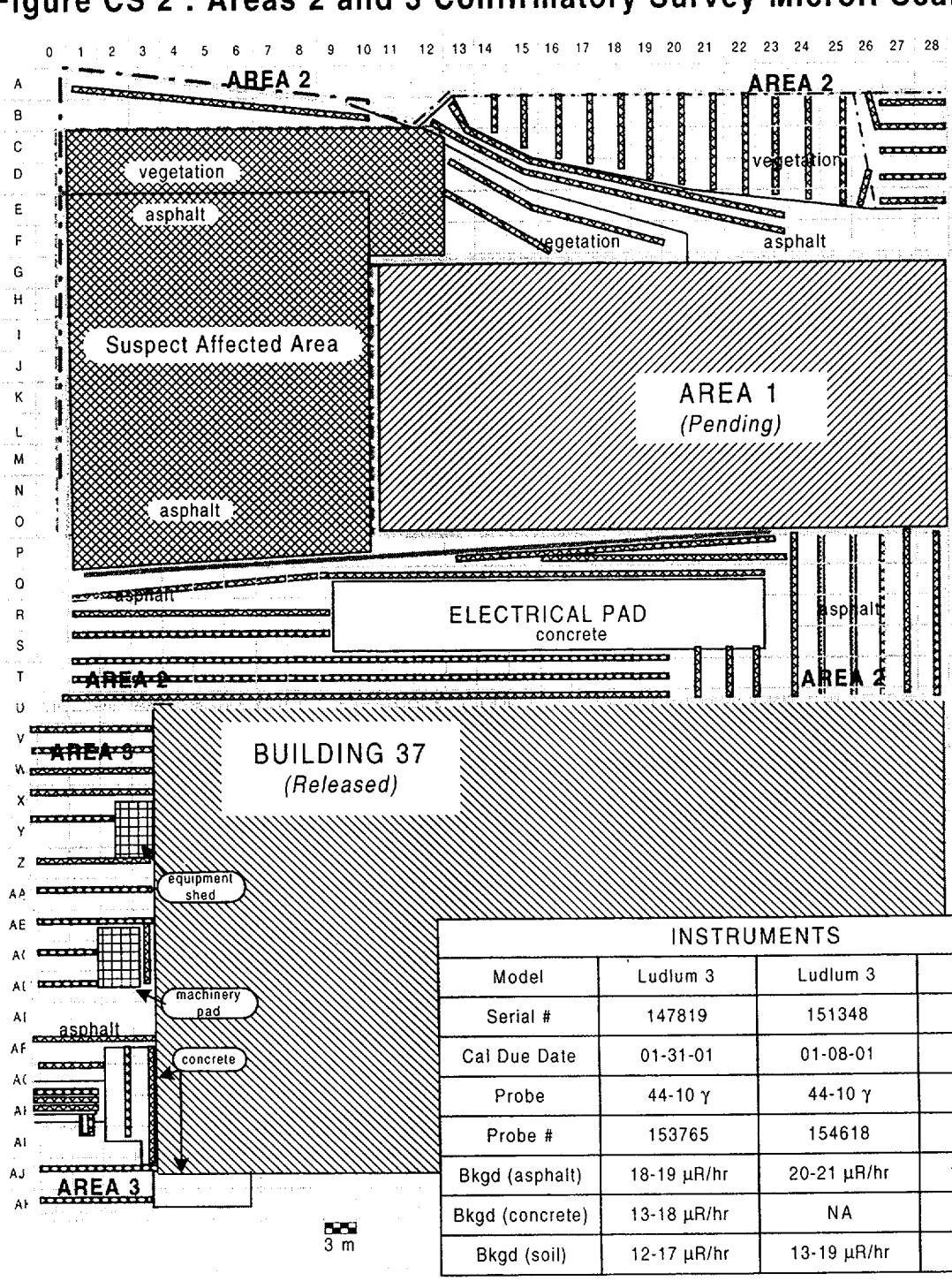
1. 100% scan of asphalt in Suspect Affected Area.
   10% scan of flat surfaces outside Suspect Affected Area.

Surveys Conducted By: R. Stowell
Dates: 01-02-01 to 01-19-01

2. Scan results range from 1200 to 2400 cpm β for asphalt and 1600 to 2000 β cpm for concrete.

3. ▨ Denotes location of scan .

Figure CS 2 : Areas 2 and 3 Confirmatory Survey MicroR Scans



INSTRUMENTS			
Model	Ludlum 3	Ludlum 3	Ludlum 3
Serial #	147819	151348	153551
Cal Due Date	01-31-01	01-08-01	03-20-01
Probe	44-10 γ	44-10 γ	44-10 γ
Probe #	153765	154618	155109
Bkgd (asphalt)	18-19 µR/hr	20-21 µR/hr	17-20 µR/hr
Bkgd (concrete)	13-18 µR/hr	NA	NA
Bkgd (soil)	12-17 µR/hr	13-19 µR/hr	NA

Notes:

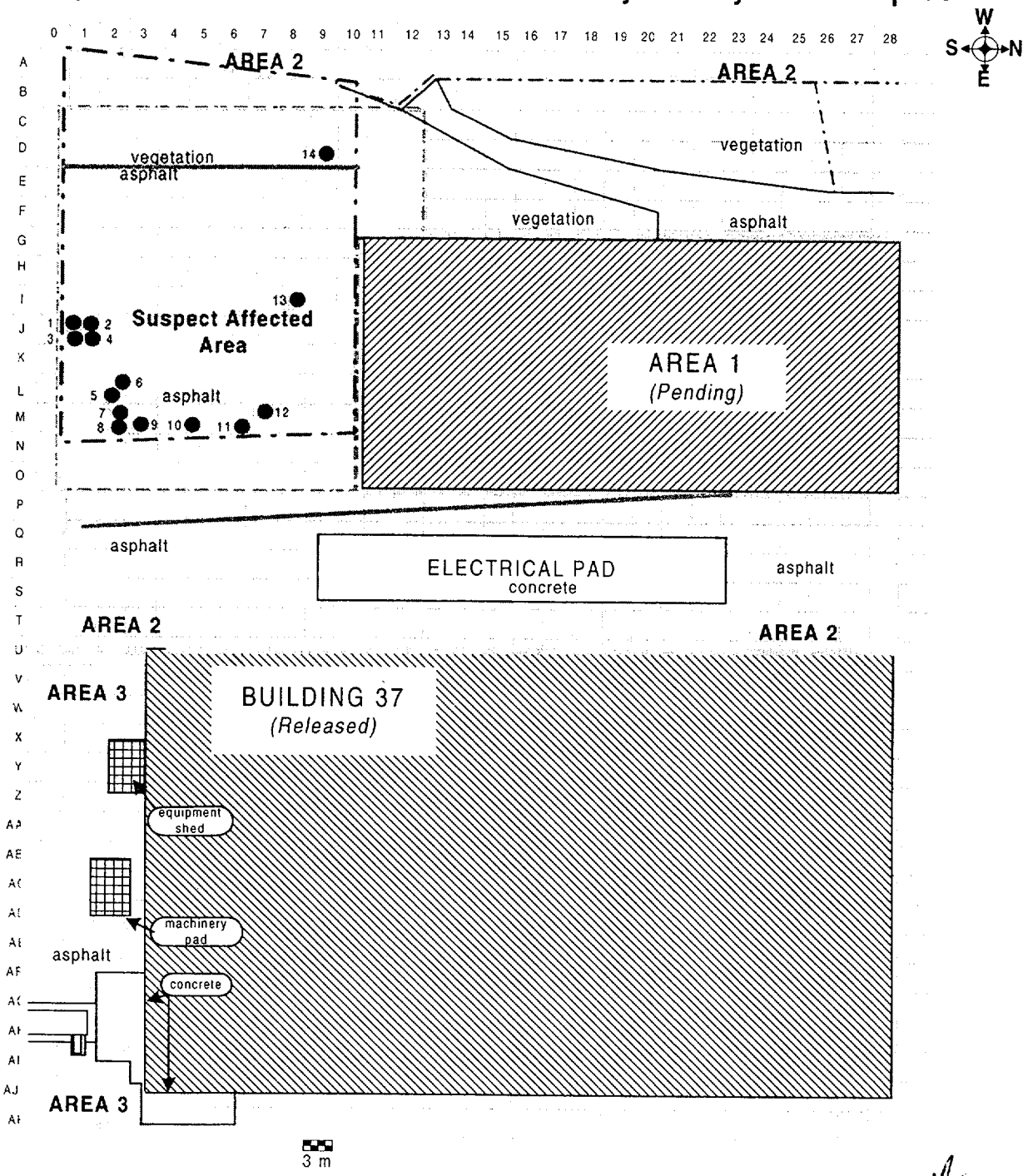
Surveys Conducted By: B. Hunter & R. Stowell
Dates: 12-20-00 to 01-22-01

1. !00 % of surface scanned inside the Suspect Affected Area.
   10% of surface scanned outside of the Suspect Affected Area.

2.. Scan results range from 14 to 25 µR/hr for asphalt, 14 to 18 µR/hr for concrete, and 15 to 25 µR/hr for soil.

3. Denotes location of scan.

Figure CS 3: Area 2 and 3 Confirmatory Survey Soil Samples

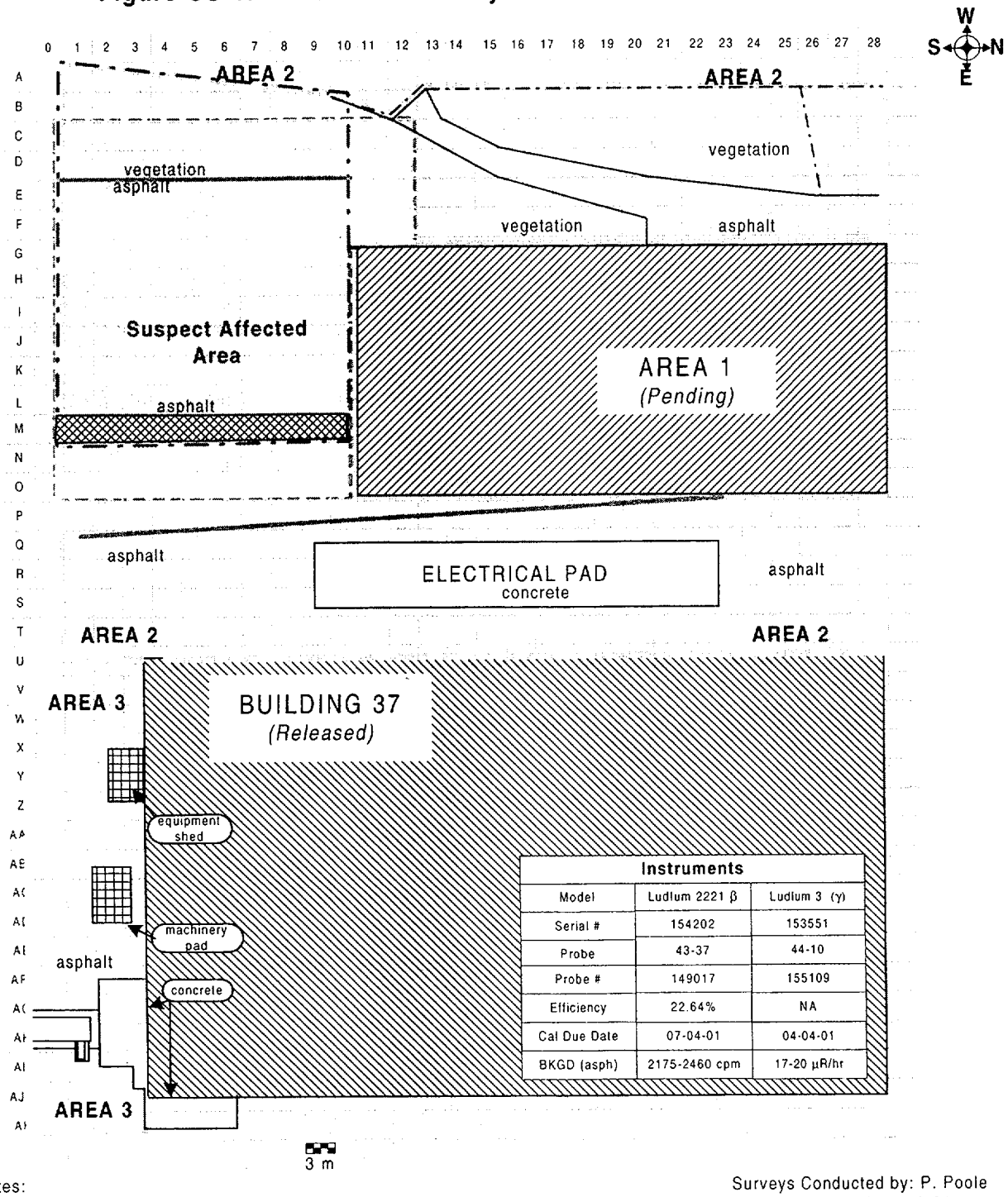


Samples Collected by : R. Stowell
Date: 01-19-01

Notes:

1. Soil sample results are provided in Table CS 1.
2. ● XX Denotes sample location
3. Sample ID's: SVW-SC-XX

Figure CS 4: Additional Survey of a Portion of Areas 2 and 3



Notes:

1. ~100% Beta and Gamma scans were repeated in the area where contamination was found and remediated during the Confirmatory Survey.
2. ▨ Denotes the area scanned.
3. Beta scans range from 1700 to 2300 cpm.
4. Gamma scans range from 18 to 23 µR/hr.

Surveys Conducted by: P. Poole
Dates: 02-09-01 & 02-12-01

APPENDIX A
TO THE FINAL RADIOLOGICAL SURVEY REPORT FOR AREAS 2 AND 3 OF SORRENTO VALLEY WEST LAND AREA

"FINAL SURVEY PLAN FOR THE SORRENTO VALLEY WEST LAND AREA" DATED NOVEMBER 20, 2000

Date: November 20, 2000
Prepared by: Michael Dupray 11-30-00
Approved by: Laura Gonzales 11/21/00 Paul R. Maddalena 11/21/00

Final Survey Plan for the Sorrento Valley West Land Area

SITE DESCRIPTION AND CLASSIFICATION

The "Building 37 West Land Area" is located in GA's Sorrento Valley Site as shown in Figure 1 and is classified as an **Unaffected Area.** There is no history of radioactive materials use in this area other than storage of packaged radioactive waste in the south fenced area marked RMA. Figure 2 shows the location of storm drains and fixed location equipment (storage areas, cooling tower, and associated piping). Figure 3 shows required soil sample locations. The total surface area is approximately 43,000 ft.^{2}.

CRITERIA FOR RELEASE TO UNRESTRICTED USE

Exposure Rate Guideline
The guideline value for exposure rates measured at 1 m above the surface, is 10 μR/hr above background levels. Normal background is 15 μR/hr measured at 1 meter up from the surface.

Acceptable Surface Contamination Levels
The potential contaminants of concern for this site are natural thorium and enriched uranium since these materials were used in nearby buildings.

Enriched Uranium:
The applicable guidelines for residual contamination on surfaces for enriched uranium are:

5,000 dpm/100 cm^2 (averaged over a 1m^2 area)
15,000 dpm/100 cm^2 (maximum in a 100 cm^2 area if the average over 1m^2 is met)
1000 dpm/100 cm^2 (removable activity)

Natural Thorium
The approved guideline values for residual contamination for release to unrestricted use for natural thorium are provided below:

1,000 dpm/100 cm^2 (averaged over a 1 m^2 area)
3,000 dpm/100 cm^2 (maximum in a 100 cm^2 area if the average over 1 m^2 is met)
200 dpm/100 cm^2 (removable activity)

As interpreted by the NRC, the average 1000 dpm/100cm^2 and the maximum 3000 dpm/100cm^2 should apply to both alpha and beta measurements, independently, for surface contamination involving natural thorium.[1] Alpha measurements will be performed to detect < 1000 α dpm/100 cm^2.

---

(1) "Interpretation of Thorium Surface Decontamination Limits," U.S. Nuclear Regulatory Commission, February 9, 1992.

Thorium emits alpha radiation to beta radiation in a 1:0.67 ratio; therefore, the corresponding average and maximum beta activity guidelines were adjusted to be 670 dpm/100cm² and 2000 dpm/100cm², respectively, for beta monitoring.

Beta Guideline Values (thorium)
The modified guideline values for residual contamination for release to unrestricted use for natural thorium are provided below:

670 dpm/100 cm² β (averaged over a 1 m² area)
2000 dpm/100 cm² β (maximum in a 100 cm² area if the average over 1 m² is met)
200 dpm/100 cm² β (removable activity)

If elevated levels are detected, GA will collect soil samples to determine the contaminants. For now, assuming a 50/50 mix is reasonable, therefore, GA will demonstrate that radiation levels are :

<2800 dpm/100cm² β (averaged over a 1m² area)
<8400 dpm/100cm² β (maximum in a 100cm² area if the average over 1 m² is met)
<600 dpm/100cm² β (removable activity)

Soil Release Criteria
The soil release criteria in pCi/g is provided below:

Thorium (Th-228 + Th-232)	10 pCi/g
Enriched Uranium (U-234 + U-235)	30 pCi/g (1 pCi/g U-235 and 29 pCi/g U-234)
Depleted Uranium	35 pCi/g

If more than one radio nuclide exists, the sum of the fractions of the concentrations is calculated as follows:

$$\sum_{i=1}^{n} \frac{C_i}{L_i}$$

C_i = The average concentration of radio nuclides I in the soil above background levels.
L_i = The release criteria for radio nuclides I.

The sum of the fractions must be less than or equal to one in order for the soil to meet the release criteria.

ALERT LEVELS

If the following "alert levels" are exceeded, notify HP Management so an evaluation can be performed to determine if increased survey coverage is required or to evaluate if decontamination is required.

Beta Alert Levels
>300 cpm beta above background using the large area (434 cm^2) probe
>150 cpm above background using the 100 cm^2 probe

Alpha Alert Levels
>150 cpm alpha using the large area (434 cm^2) probe
>75 cpm using a hand-held 50 cm^2 alpha probe (~ 750 dpm/100cm^2)

Survey Plan For The Sorrento Valley West Land Area

Type of Survey	Unaffected Area
Gridding	**Not Required** (The area will be gridded, 10' X 10', to facilitate location of soil samples and radiation measurements)
Direct **µR/hr** Readings	Take readings at 1m from surface and contact readings (at surface) every 3m
Scans α Using 434 cm^2 probe	10% of the concrete or asphalt-surfaces.
Scans β using 434 cm^2 probe or Using the dual probe unit	25% the concrete and/or asphalt-covered areas.
Radiation Measurements	One measurement every 7m (with a minimum of 30 measurements) **One every other grid block, on concrete or asphalt** alternate between: [a]1. Direct alpha fixed measurement, [b]2. Direct beta fixed measurement, [c]3. A 100 cm^2 smear.
Soil Samples	Collect 16 soil samples as shown on Figure 2

[a] For α measurements use the 50 cm^2 hand-held detector and count for 10 seconds. Record readings in cpm and mark locations on drawings.
[b] For β measurements use 100 cm^2 beta gas flow proportional counter. Count for 2 minutes. Record readings in cpm and mark locations on drawings.
[c] For removable measurements, take a 100 cm^2 wipe at each location and send to HP lab for counting

NOTE: If radiation readings are above alert levels, continue surveying area until the entire area of contamination is identified and outlined (i.e. marked with paint or chalk).

Quantify contamination levels in all elevated areas where the floor monitor readings are above the alert level using hand held instruments.

DOCUMENTATION

Radiation Surveys
Every survey conducted will be documented on a daily basis to a worksheet/drawing showing the approximate locations surveyed/sampled. The documentation must include the results of the measurements (including units), the technician's signature, date, instrument(s) used (including the model and serial number of both the rate meter and detector), calibration due date, % efficiency, background readings (if applicable) and any other pertinent information.

Soil Samples
Mark exact locations of the soil samples on a map or drawing and refer to the grid locations. Each soil sample must also be properly labeled and tracked.

The label should include:

The Date;
Sample ID number; (such as 37West-001, 37W-002, etc.);
Grid location;
HP Tech name.

APPENDIX B
TO THE FINAL RADIOLOGICAL SURVEY REPORT FOR AREAS 2 AND 3 OF SORRENTO VALLEY WEST LAND AREA

"GA INTERNAL CONFIRMATORY SURVEY PLAN FOR THE SORRENTO VALLEY WEST LAND AREA" DATED DECEMBER 19, 2000

Appendix B to Radiological Survey Report for Areas 2 and 3 the Sorrento Valley West Land Area

December 19, 2000

Prepared by: Richard Stowell

Approved by: Laura Gonzales

GA Confirmatory Radiological Survey Plan for Sorrento Valley West

This confirmatory survey covers "Building 37 West Land Area" located in GA's Sorrento Valley Site. This area consists of the land west of Building 37 to the GA boundary.

Background and Classification

The area inside the fenced Radioactive Material Area and a 6 meter buffer on the west, north and east sides was reclassified as a Suspect Affected Area following previous surveys. The remainder of the Sorrento Valley West area remains an Unaffected Area. Figure 1 shows these areas.

Survey Objectives and Responsibility

The purpose of performing an internal confirmatory survey is to double check that the radiological conditions in Sorrento Valley West satisfy the NRC and Stat of CA guidelines for release for unrestricted use.

Surveys will be taken only by qualified Health Physics Technicians having a minimum of three years Health Physics Technician experience not assigned to perform the Final Survey, i.e. an independent survey. The survey and final report documenting the survey will be performed by GA's Health Physics Group.

Release Criteria (per GA Decommissioning Plan)

As per "Final Survey Plan for the Sorrento Valeey West Land Area" approved: 11/21/00.

Alert Levels

If the following "alert levels" are exceeded notify HP Management so an evaluation can be performed to determine if increased survey coverage is required or to evaluate if decontamination is required.

Beta Monitoring
>300 cpm above the appropriate background using the 434 cm^2 probe.
>200 cpm above the appropriate background using the 100 cm^2 probe.
>150 cpm above the appropriate background using the 15 cm^2 probe.

Exposure Rate Measurements
>25 μR/hr at surface
>20 μR/hr at 1m

Appendix B to Radiological Survey Report for Areas 2 and 3
the Sorrento Valley West Land Area

Confirmatory Survey Plan for The Sorrento Valley West Land Area

Type of Survey	Suspect Affected Area (inside fenced RMA and 6 meters north and east outside the fence and 6 meters west of the blacktop inside the RMA)
Direct µR/hr Readings	100% surface scan of the area using 2" x 2" NaI probe.
Beta Scans Using 434 probe	100% of accessible flat surface areas (asphalt).
Soil Samples	Collect under asphalt where contamination was found on previous survey.
Type of Survey	**Unaffected Area (remaining area outside Suspect Affected)**
Direct µR/hr Readings	10% surface scan to include all depressions and low-lying areas.
Beta Scans Using 434 probe	10% of accessible flat surface areas (asphalt).
Soil Samples	None

Documentation

Radiation Surveys

Every survey conducted will be documented on a daily basis to a worksheet/drawing showing the approximate locations surveyed/sampled. The documentation must include the results of the measurements (including units), the technician's signature, date, instrument(s) used (including the model and serial number of both the rate meter and detector), calibration due date, % efficiency, background readings (if applicable) and any other pertinent information.

Soil Samples

Mark exact locations of the soil samples on a map or drawing and refer to the grid locations. Each soil sample must also be properly labeled and tracked.

The label should include:

Date; Sample ID, Tare Weight (gms); Net Weight (gms); HP Technician's Name.

Sorrento Valley West

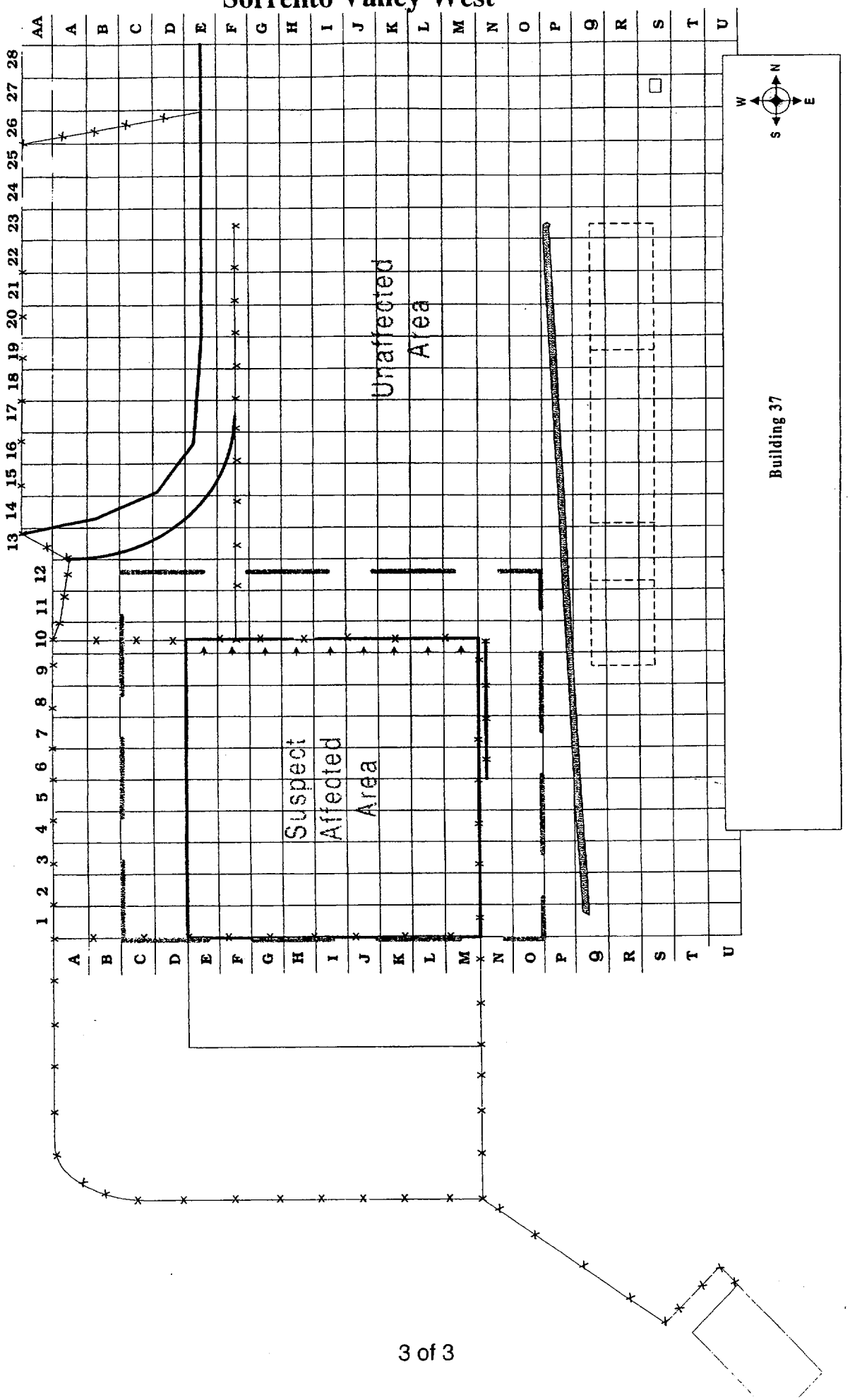


Figure 1
Sorrento Valley West Land Area

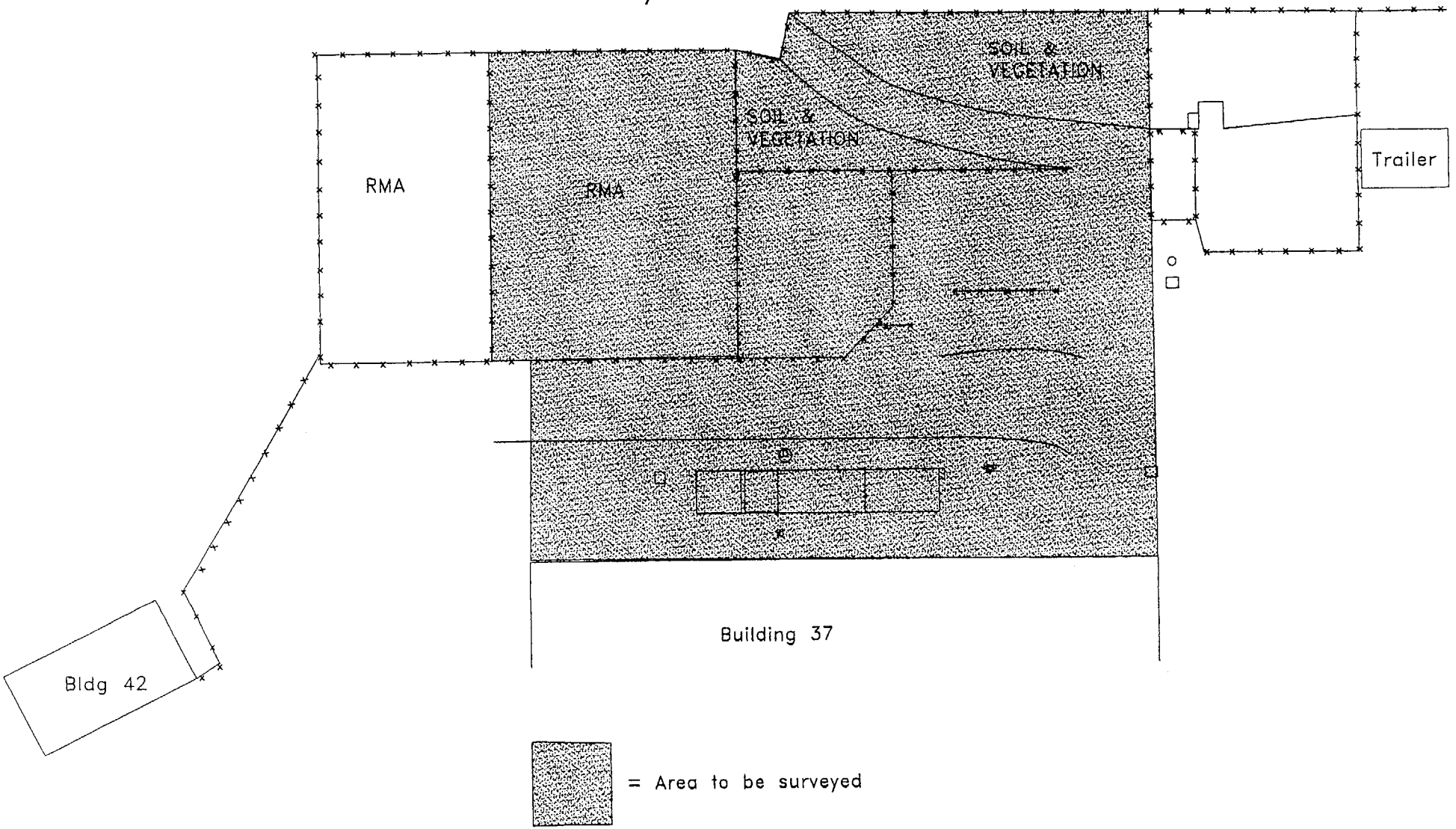
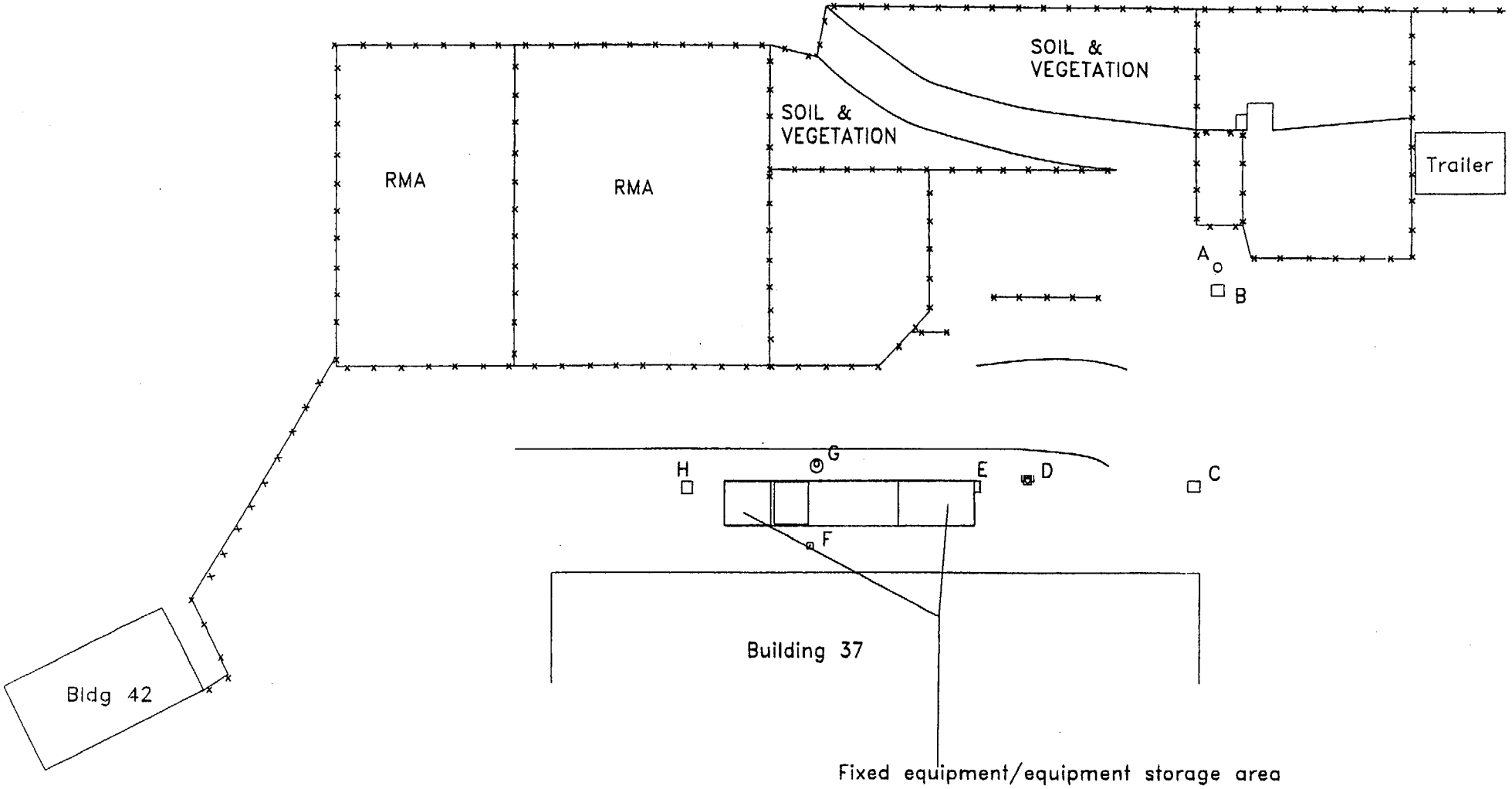


Figure 2
Sorrento Valley West Land Area



A Storm Drain
B Unknown
C Storm Drain
D Electrical
E Storm Drain
F Monitoring Well
G Main storm drain access
H Storm Drain

RMA = Radioactive Materials Area

= Fence lines

Figure 3
Sorrento Valley West Land Area
Soil Sample Locations