GENERAL ATOMICS

October 9, 2002
696/CAL-3525

VIA EXPRESS DELIVERY 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 "TRIGA® Reactor Facility Electrical Pad" to Unrestricted Use and Delete it from GA's License**

and

Ms. Sudana Kwok (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 for State to Acknowledge NRC's Sole Jurisdiction Over GA's TRIGA® Reactor Related Release Requests**

Dear Ms. Adams and Ms. Kwok:

As you are aware, General Atomics (GA) is continuing its efforts to decommission and decontaminate, as appropriate, selected facilities and land areas on its site in support of obtaining their release to unrestricted use. GA recently completed its final radiological surveys of an area referred to as the "TRIGA® Reactor Facility Electrical Pad." The electrical pad is a small fenced-in area (~948 ft^2 (~88 m^2)) paved with concrete on which is located electrical transformers, substations and breakers that provide power to GA's Building 21 (the TRIGA® Reactors Facility).

Although this electrical pad has no history of radioactive material storage or use (i.e, a "non-impacted" area), GA performed radiological surveys to demonstrate that no radioactive contamination was present. Enclosed is GA's report titled "General Atomics' Final Radiological Survey Report For "TRIGA® Reactor Facility Electrical Pad," dated

October 2002. This report documents the results of GA's radiological survey measurements which demonstrate that no radioactivity above natural background levels were observed, and therefore, that the area meets the criteria for release to unrestricted use.

The "TRIGA® Reactor Facility Electrical Pad" was/is used to support TRIGA® reactor operations/decommissioning which were/are authorized by the NRC. During the GA/NRC/State decommissioning coordination meeting held in May 14, 2002, it was agreed that the NRC has sole jurisdiction over all TRIGA® reactors related release requests. Therefore, it is GA's understanding that the NRC is the sole agency responsible for coordinating this release request, including conducting regulatory agency confirmatory surveys, if deemed appropriate; the results of which will be made available to the State.

GA hereby requests the U.S. Nuclear Regulatory Commission (NRC) to release the "TRIGA® Reactor Facility Electrical Pad," as described in the enclosed final survey report, to unrestricted use and to delete it from GA's NRC special nuclear materials license.

GA hereby requests the California DOHS Radiologic Health Branch (State) to acknowledge that it does not wish to claim any regulatory jurisdiction over this, or future, TRIGA® reactors related release requests.

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

Very truly yours,

Keith E. Asmussen

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

Enclosure: GA report titled: "General Atomics' Final Radiological Survey Report For TRIGA® Reactor Facility Electrical Pad," dated October 2002.

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

GENERAL ATOMICS'

FINAL RADIOLOGICAL SURVEY REPORT

For

TRIGA® Reactor Facility Electrical Pad

Prepared By: William LaBonte, Joseph Sullivan and Laura Gonzales

Survey Technicians: Scott Cowan, Barbara Hunter, Barbara Lyon, and Joseph Sullivan

October 2002

GENERAL ATOMICS

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GENERAL ATOMICS Final Radiological Survey Report For TRIGA® Reactor Facility Electrical Pad

Introduction

General Atomics (GA) 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 the TRIGA® Reactor Facility Electrical Pad. As expected, no radiological contamination was found on the concrete pad.

This report documents the results of GA's radiological measurements completed on the TRIGA® Reactor Facility Electrical Pad. The results of these surveys demonstrate that this electrical pad meets the NRC- and State- approved criteria for release to unrestricted use.

Site Description

The TRIGA® Reactor Facility Electrical Pad is located on General Atomics' Main Site (see Figure 1). The location of the TRIGA® Reactor Facility Electrical Pad in relation to other facilities on GA's Main Site is shown in Figure 2. The total surface area of this electrical pad is approximately 948 ft^2 (~88 m^2).

The TRIGA® Reactor Facility Electrical Pad is a small fenced in area which contains electrical transformers, substations and breakers which provide power to the TRIGA® Mark I and TRIGA® Mark F Cooling and Auxiliary systems. This electrical pad is located within the TRIGA® Reactor Facility site and east of Building 27. The electricity was shut off during the performance of the survey for safety reasons.

History of Use

The Electrical Pad contains electrical transformers, substations and breakers which provide power to TRIGA® Mark I and TRIGA® Mark F Cooling and Auxiliary systems. This pad has no history of radioactive material storage or use.

Classification

This electrical pad is classified as a **Non-Impacted Area** for final survey purposes. The GA Site Decommissioning Plan does not require radiological surveys in Non-Impacted Areas, however, a final survey was performed because it is surrounded by sites in which radioactive material was used and/or stored. The predominate isotopes associated with the facilities adjacent to this electrical pad are: mixed fission and mixed activation products (i.e. beta/gamma emitters).

Criteria for Release to Unrestricted Use

As Low As Reasonably Achievable (ALARA)

During decommissioning efforts, GA always attempts to decontaminate to levels as close to "background" as possible and as far below the approved Soil Release Criteria as reasonably achievable.

Facilities and Equipment (and Asphalt or Concrete Surfaces)

The U.S. NRC's and the State of California's criteria for releasing facilities and equipment to unrestricted use are shown in Tables 1 and 2, respectively. The applicable guidelines for beta/gamma emitters including Cs-137 and Co-60 are as follows:

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
1,000 dpm/100 cm^2, removable activity

Exposure Rate Guideline

Exposure rates measured at 1 m above the surface are not to exceed 10 μR/hr above natural background levels.

Instrumentation and Background Measurements

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 (6) calibration efficiencies (if applicable). All of the instruments used were calibrated semiannually and after repair, except for exposure rate meters which were calibrated quarterly.

Background Measurements for Instruments/Detectors

Building 13 on GA's main site was used for conducting background measurements with instruments used for the final survey because: (1) there is no history involving the use or storage of radioactive materials in Building 13, and (2) the various surfaces and construction materials found at the TRIGA® Reactor Facility Electrical Pad could also be found within and outside of Building 13. Background information, where appropriate, is included in Table 3.

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

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)

Exposure Rate Background

Typical exposure rate background for GA's site using a Ludlum Model 19 micro R meter is 12-18 μR/hr measured at 1 m from the surface of soil. This range of exposure rates 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 (9 offsite and 1 onsite at a non-impacted area near Building 15) over a period of 15 months also averaged ~ 15 μR/hr (measured at 1 m from the surface). The range of 12-18 μR/hr is typical at the GA site for the external dose rates measured at 1 meter from the surface. Background measurements @ 1 m above an asphalt surface are generally higher due to the higher concentrations of naturally occurring radioactive material (NORM). This background fluctuates depending upon the asphalt batch used and the date applied. This background, (measured at 1 m from the surface) ranges from 22-30 μR/hr.

Final Surveys Performed

Objectives and Responsibilities

The objectives of the final survey plans were: (1) to demonstrate that the average surface contamination levels for each survey unit were below the approved release criteria, (2) to show that the maximum residual activity did not exceed three times the approved release criteria for average surface contamination value in an area up to 100 cm^2, and, (3) that the exposure rate

measurements taken in these areas, measured at 1 meter above the surface, were less than 10 μR/hr above background.

Survey Plans

A Final Survey Plan was developed based on the previous history of the TRIGA® Reactor Facility Electrical Pad and the facilities it supported, the history of use for the TRIGA® Reactor Facility Electrical Pad, the radionuclides of concern for this area, the potential for contamination, the various types of surfaces encountered and the classification of the various areas. See Appendix A for the Final Survey Plan for the TRIGA® Reactor Facility Electrical Pad.

Surveys were taken in accordance with an approved survey plan(s) by qualified Health Physics Technicians having a minimum of three years health physics experience.

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

Survey Summary

Comparisons of the Site Decommissioning Plan requirements with the Final Surveys performed in relation to the percentage of surface area scanned, number of measurements (i.e., number of fixed radiation measurements), exposure rate measurements (μR/hr) and soil samples taken are provided as follows:

Comparisons of Site Decommissioning Plan Requirements with Final Surveys Performed on the TRIGA® Reactor Facility Electrical Pad

Survey Area**	Gridding Required ?	# of Direct Measurements Fixed α, β, or Wipes on concrete or asphalt	# of Exposure Rate Measurements (μR/hr)	Surface Scans on asphalt or concrete
D-Plan* Non-Impacted Area →	No	None	None	None
Final Surveys Non-Impacted Area (performed) →	No	11 fixed α measurements, 8 fixed β measurements, and 11 wipe samples analyzed for α and β activity, for a total of 30 measurements. Plus fixed α and β measurements taken on the external surface of each electrical cabinet.	13 fixed measurements at 1 m from the concrete pad surface, 13 fixed measurements at contact with the concrete surface. Fixed measurements at contact with 12 electrical cabinets, and 10% scan of the concrete pad surface 100% of the accessible external surfaces of the electrical panels were taken with a 2" x 2" NaI(Tl) detector held within 1" of the surface.	10% of concrete pad surface and all accessible surfaces of the electrical cabinets were scanned for α and β activity. The pad surface was scanned with 434 cm^2 proportional detectors and the cabinets were scanned with small hand held detectors.

* D-Plan = GA Site Decommissioning Plan

** The total surface area to be released is approximately 88 m^2.

Results of the Final Surveys

The results for the TRIGA® Reactor Facility Electrical Pad Final Surveys are provided in figures and tables as noted below:

Scanning

10% of the surface was scanned for α and β activity with large area (434 cm^2) gas flow proportional detectors held within approximately 1" of the concrete surface. The highest α activity measured (0 - 20 cpm) was less than the background range of 3 to 21 cpm for the instrument used. See Figure 3 for locations and results. The range of β activity measured was 2400 to 2600 cpm. The background for this instrument was 1858 to 2036 cpm. Although the

concrete β scans results were higher than background measurements taken with the same instrument, the higher results are due to fluctuations in natural radioactivity concentrations in the concrete; not radioactive material contamination of this pad. The readings are consistent across the entire pad, fixed measurements were all less than the MDA, there was no removable activity, and the exposure rate measurements were background. See Figure 3 for locations and results. The surface scans of the electrical cabinets detected no α or β activity above natural background. See Figure 3 for locations and results.

Fixed Measurements (α and β)

Eleven (11) fixed α and eight (8) fixed β measurements were taken. The highest α activity measured was <20 cpm. The highest β activity measured was less than the minimum detectable activity (MDA) for the instrument used (<313 dpm/100cm^2). All of these measurements are not discernable from natural background activity levels. See Figure 4 for survey locations and results.

Removable Activity

Eleven (11) wipe samples were taken. All samples were analyzed for α and β activity. The highest α activity measured was <20 dpm/100 cm^2, and the highest β activity measured was <20 dpm/100 cm^2. These results are far below the approved release criteria and indistinguishable from natural background levels. See Figure 5 for locations and Table 4 for results.

Fixed Exposure Rate Measurements

A total of thirteen (13) fixed measurements were taken at 1m from the pad surface. The highest exposure rate measured was 16 μR/hr at 1m from the surface. These measurements are at or below the natural background range of 15-18 μR/hr at GA when the detector is held at 1 m from the surface.

In addition, thirteen (13) fixed measurements were taken at contact (within 1") with the external surface of electrical cabinets and thirteen (13) fixed measurements were taken on contact with the pad surface. The highest measurement on the electrical cabinets was 15 μR/hr. The highest measurement in contact with the pad surface was 18 μR/hr. See Figure 6 for locations and results.

Exposure Rate Scans

10% of the electrical pad and 100% of the accessible electrical cabinet external surfaces were scanned with a NaI(Tl) detector held approximately 1" from the surfaces. The exposure rate

ranged from 15 to 20 μR/hr on the electrical pad and were background (6 to 15 μR/hr) on the electrical cabinets. See Figure 6 for locations and results.

Confirmatory Survey

No activity distinguishable from natural background was detected during the Final survey. This factor, combined with the fact that this land area is very small, and it is classified as a Non-Impacted Area, lead to the decision that an internal confirmatory survey was not needed.

Conclusion

Final contamination and radiation surveys, as documented in this report, demonstrate that the TRIGA® Reactor Facility Electrical Pad meets the approved criteria for release to unrestricted use. No activity distinguishable from natural background was detected during the Final survey.

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.

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

Instrument	Detector	Range (cpm, µR/hr or mr/hr)	Calibration Due Date	Efficiency	Background MDA (100cm² β & 50cm² α detectors only)	Description
Ludlum Model 2221 S/N 148425	Ludlum Model 43-37 gas (434cm²) proportional **Alpha detector** S/N 086236	Four Linear Ranges 0-500,000 & one Log 50-500,000 (CPM)	06/02/02	21 29%	3 - 21cpm (concrete)	Active Probe Area = 434 cm². 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 Model 2221 S/N 84459	Ludlum Model 43-37 gas (434cm²) proportional **Beta detector** S/N 086215	Four Linear Ranges 0-500,000 & one Log 50-500,000 (CPM)	09/27/02	31 08%	1858 -2036cpm (concrete)	Active Probe Area = 434 cm² 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 Model 2221 S/N 84423	Ludlum Model 43-68 100 cm² proportional **Beta detector** S/N 119444	Four Linear Ranges 0-500,000 & one Log 50-500,000 (CPM)	01/08/02	24 43%	1042 ± 90cp2m (concrete) MDA= 313 dpm /100cm²	100 cm² gas flow proportional counter
Ludlum Model 3 S/N 151348	Ludlum Model 44-10 NaI (Tl) Scintillator **Gamma Detector** S/N 154618	Four Ranges 0-500 µR/hr	02/05/02	NA	10 - 18 µ/hr	2 inch x 2 inch NaI (Tl) scintillator. Used for measuring external dose rates on the surface and at one meter.
Ludlum Model 3 S/N 153551	Ludlum Model 44-10 NaI (Tl) Scintillator **Gamma Detector** S/N 155109	Four Ranges 0-500 µR/hr	01/08/02	NA	10 - 18 µ/hr	2 inch x 2 inch NaI (Tl) scintillator Used for measuring external dose rates on the surface and at one meter.
Ludlum Model 3 S/N 143349	Ludlum Model 44-9 15cm² beta/gamma probe S/N 145967	Four Ranges 0-500,000 cpm	01/17/02	20 26%	80 - 120cpm	Active Probe Area = 15cm² Used for beta/gamma surveying
Ludlum Model 12 S/N 138738	Ludlum Model 43-64 Alpha Scintilator ZnS (Ag) S/N 148346	Four Ranges 0-500,000cpm	01/10/02	21.58%	1 - 20cpm (concrete) MDA=297dpm/100cm²	Active Probe Area =50cm² Used for Alpha surveying
CanberraLow Level α/β Counter Model 2404	Gas Flow Proportional Detector	N/A	As needed	~26-30%	Varies with Sample	Canberra Model 2404 Low Level / gas proportional counting system used to count wipes for removable contamination Results are usually reported as dpm/100cm².
Canberra Gamma Spectroscopy System	High Purity Germanium Detector	N/A	As needed	Varies with Sample	Varies with Sample	Gamma Spectroscopy MCA system using a high purity Germanium detector.

Table 4:TRIGA® Reactor Facility Electrical Pad Wipe Survey Results		
Sample Number	α Activity in dpm/100cm^2	β Activity in dpm/100cm^2
1	<20	<20
2	<20	<20
3	<20	<20
4	<20	<20
5	<20	<20
6	<20	<20
7	<20	<20
8	<20	<20
9	<20	<20
10	<20	<20
11	<20	<20

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

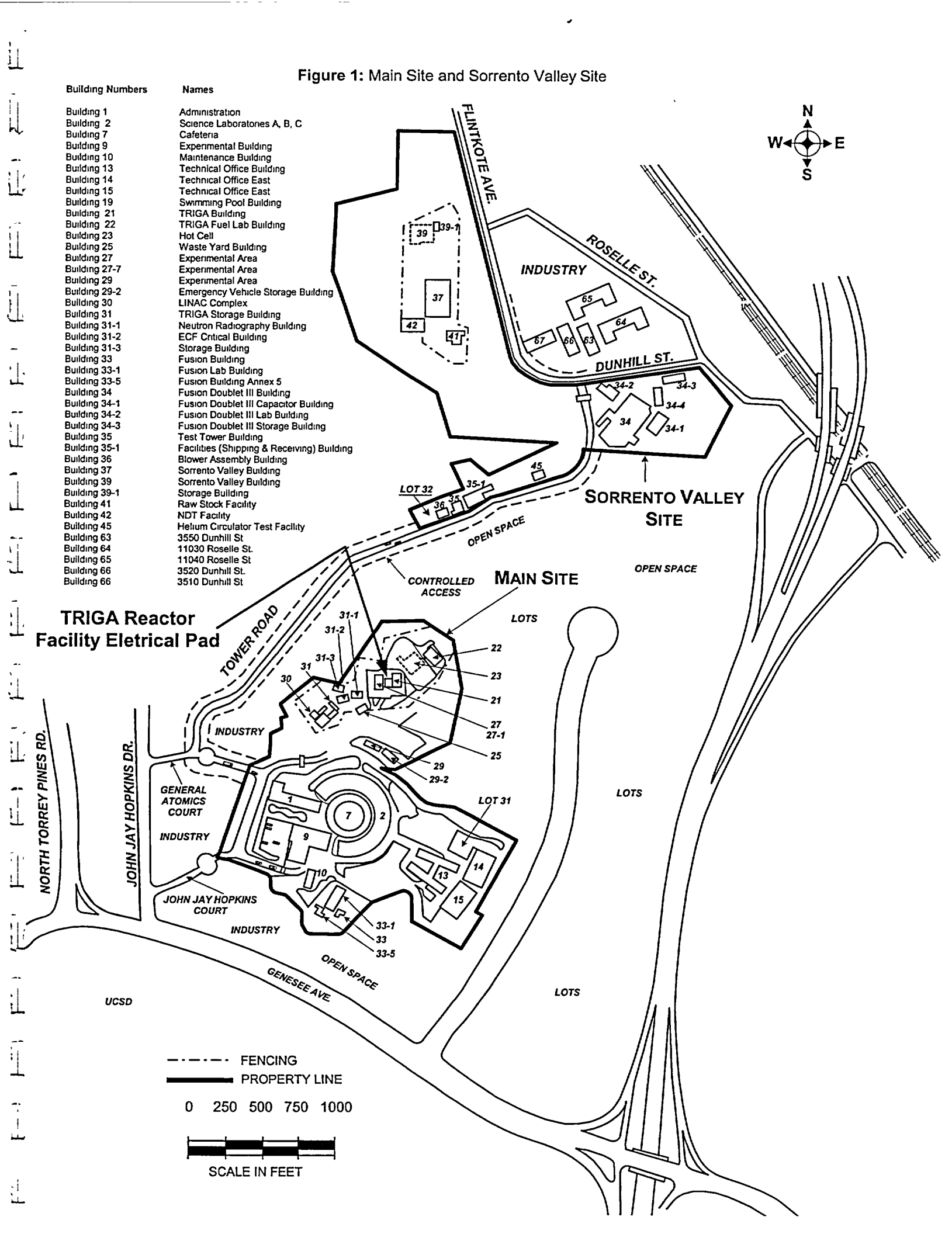


Figure 2 : TRIGA Reactor Facility Eletrical Pad Area in Relationship to Surrounding Areas

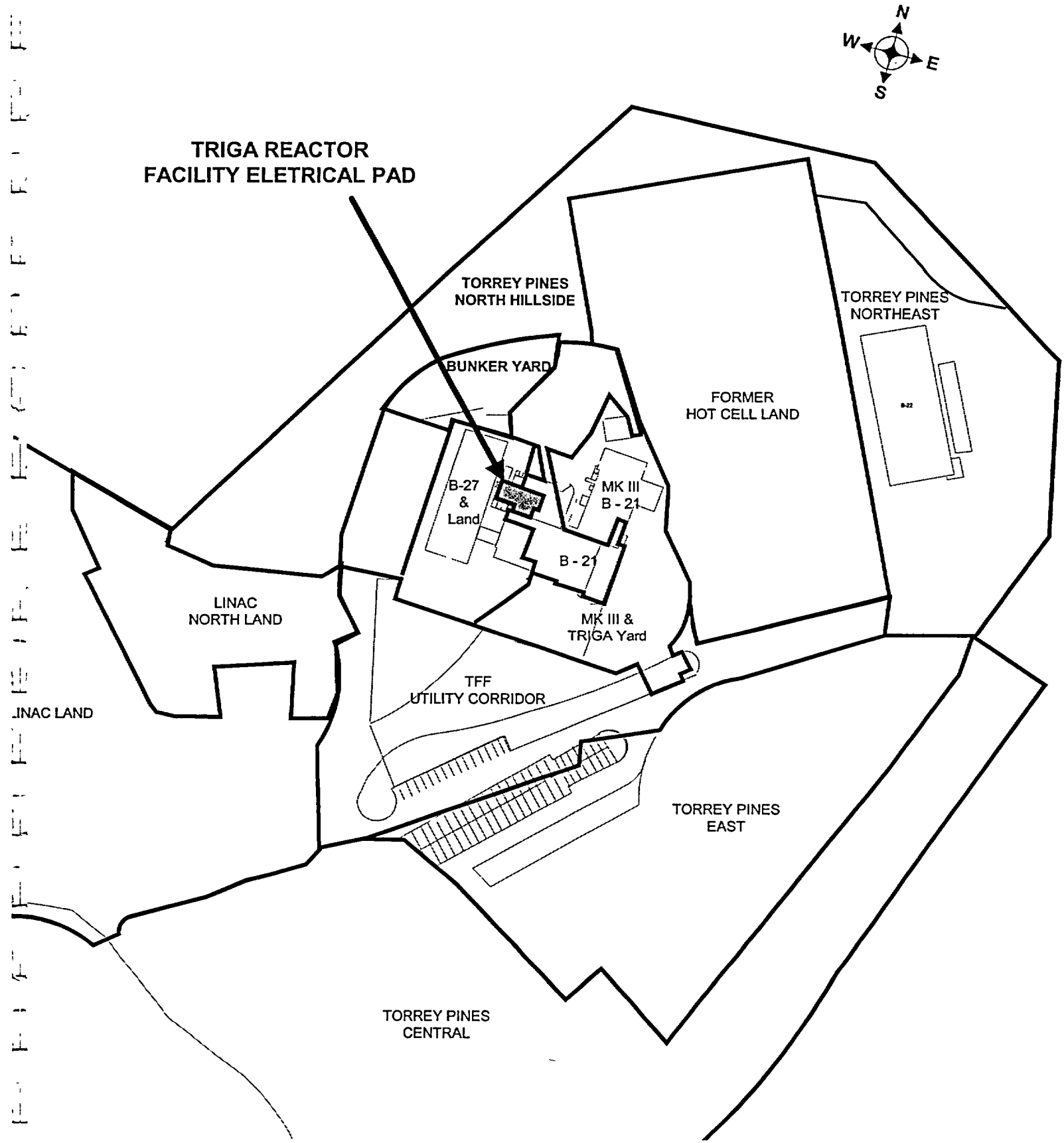
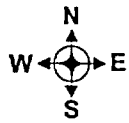


Figure 3: Building 21 (TRIGA) Backyard Electrical Pad
Alpha and Beta scans



Date : Dec. 09,2001

Technician : B.Hunter, B.Lyon, S.Cowan, J.Sullivan

COMMENTS:

Alpha and Beta scans of equipment cabinets with handheld instruments showed only background levels. All readings are in cpm.

Meter Information.

Model ..... . Ludlum 2221 434cm² β
SN 84459
PN 086215
EFF..... ...31 08%
Cal Due. ..... Sept 27, 2002
BKGD . ..... Concrete .. . 1858-2036

Meter Information.

Model..... .Ludlum 2221 434cm² α
SN 148425
PN 086236
EFF: 21.29%
Cal Due..... Jun 2, 2002
BKGD . ..... Concrete ...3-21

Meter Information.

Model .... ..LUDLUM 12 50cm² α
SN... ..... .138738
PN:... 148346
EFF.... ..... 21.58%
Cal Due..... Jan 10, 2002
MDA..... .....Concrete 297 dpm/100cm²
BKGD 20 cpm/50cm²

Meter Information.

Model:..... ..LUDLUM 3 15cm² β
SN 143349
PN .. .. .145967
EFF:..... .....20.26%
Cal Due ..... Jan. 17, 2002
BKGD 80-120 cpm/15cm²

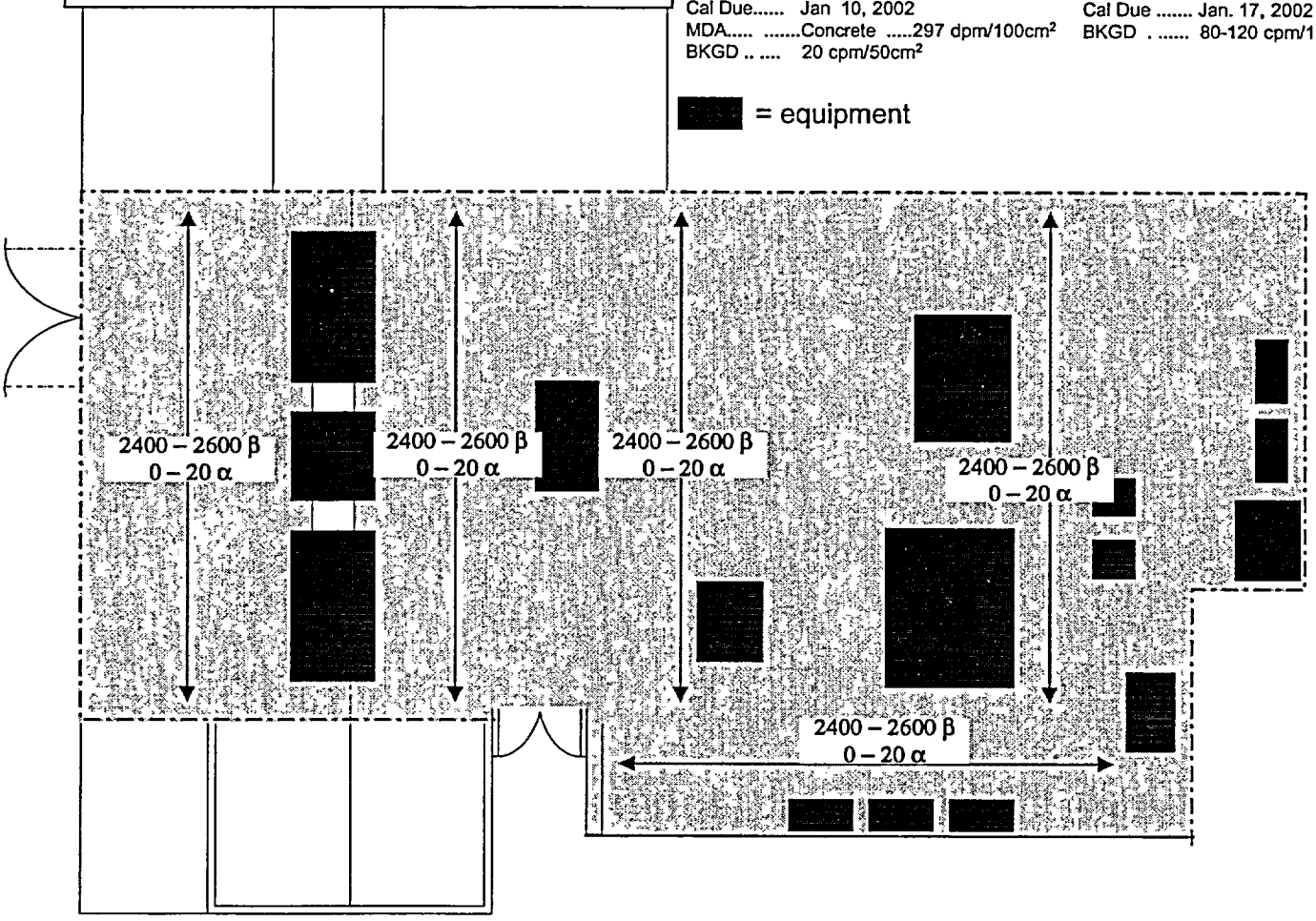
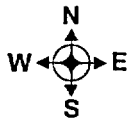


Figure 4: Building 21 (TRIGA) Backyard Electrical Pad
Alpha and Beta Fixed



= equipment

Date : Dec. 09,2001

Technician : B.Hunter, B.Lyon, S.Cowan, J.Sullivan

COMMENTS:

Alpha and Beta measurements of equipment cabinets with handheld instruments showed only background levels.

Meter Information.

Model .. . .LUDLUM 100cm² β
SN 84423
PN 119444
EFF:. 24.43%
Cal Due .... Jan 08, 2002
MDA: .... Concrete 313 dpm/100cm²
BKND ... ... Concrete . ..1042 cpm/100cm²

Meter Information.

Model . .. .LUDLUM 12 50cm² α
SN.. 138738
PN .... .148346
EFF:. 21 58%
Cal Due ... .Jan 10, 2002
MDA·. ... .Concrete... ...297 dpm/100cm²
BKGD... ..... 20 cpm/50cm²

= Beta Reading in dpm/100cm²

= Alpha Reading in dpm/100cm²

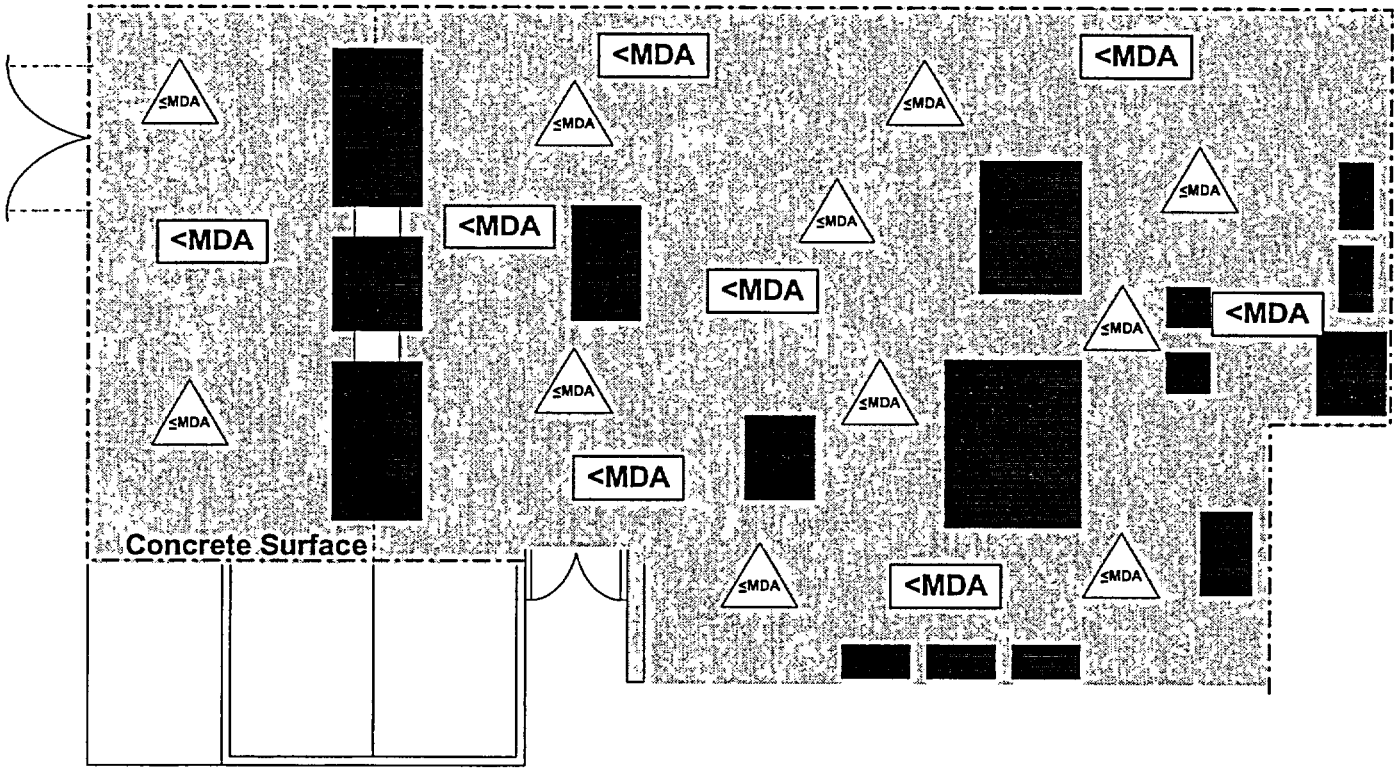


Figure 5: Building 21 (TRIGA) Backyard Electrical Pad
Wipe Survey

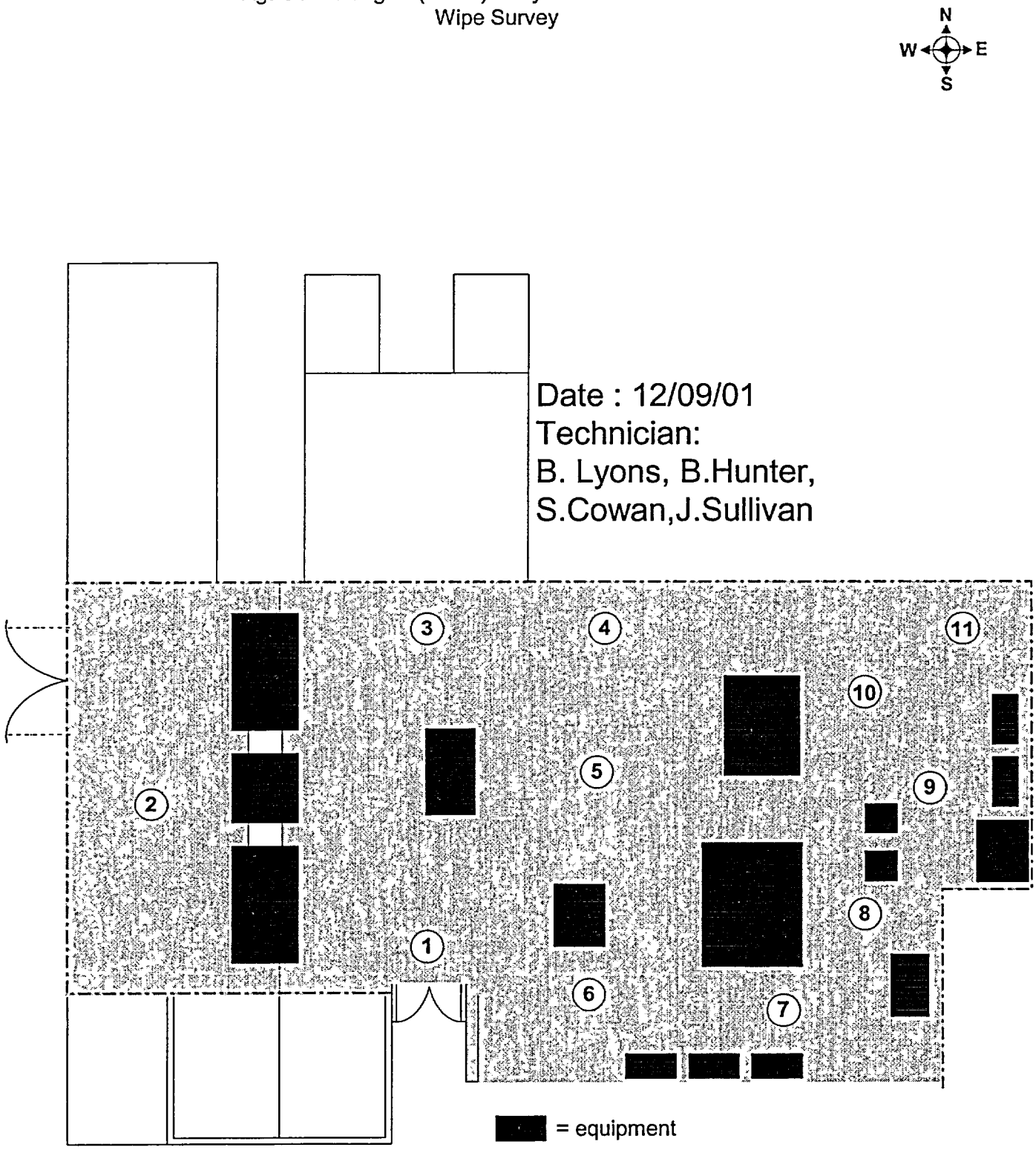
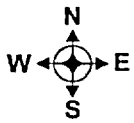


Figure 6: Building 21 (TRIGA) Backyard Electrical Pad
Exposure Rate scans and Fixed Readings



Date : Dec. 09,2001

Technician : B.Hunter, B.Lyon, S.Cowan, J.Sullivan

COMMENTS:

Scans of equipment cabinets with handheld instruments showed only background levels. All readings are in µR/Hr

Meter Information:

Model ....LUDLUM 3, 2"x2" µ R
SN 151348
PN ... .154618
EFF:..... n/a
Cal.Due .... .Feb 05, 2002
BKGD . ... ..15-18 µR/Hr

Meter Information.

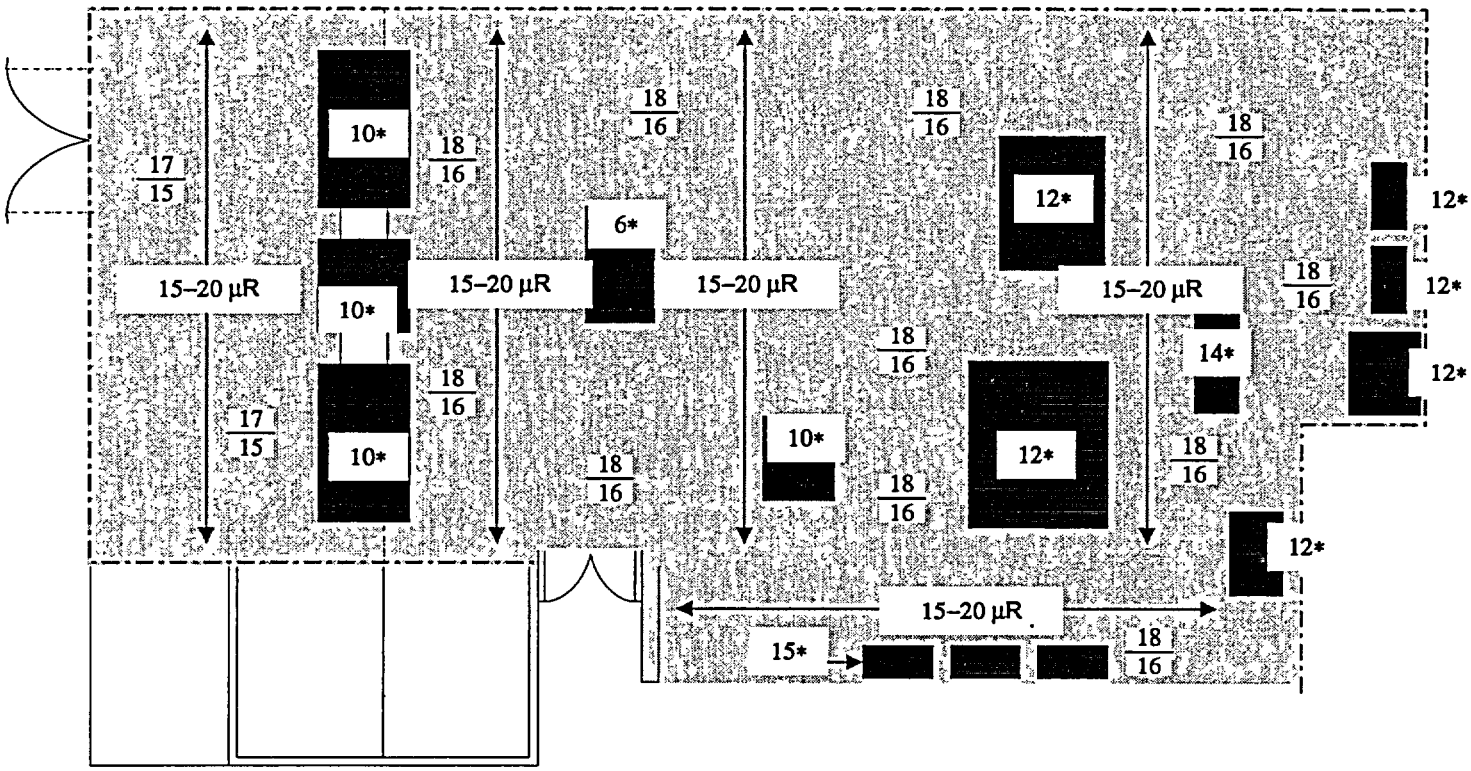
Model . . .... LUDLUM 3, 2"x2" µ R
SN .... .153551
PN .... .155109
EFF: ... .. n/a
Cal Due ..... Jan. 08, 2002
BKGD . . .. 15-18 µR/Hr

← 15–20 µR → = Scan Measurement

■ = equipment

18/16 = Measurement @ Contact
18/16 = Measurement @ 1 Meter

12* = Measurement @ Contact



General Atomics'

Final Radiological Survey Report

For

TRIGA® Reactor Facility Electrical Pad

Appendix A

Final Survey Plan

Prepared By: William L. LaBonte Date: 12/6/01

Approved By: Laura Gonzales Date: 12/6/01
L. Q. Gonzales

Final Survey Plan for TRIGA® Reactor Facility Electrical Pads

This survey plan is for the release of the TRIGA® Reactor Facility Electrical Pad located behind Building 21 at the Northwest corner of the building. This Electrical Pad will be surveyed to show compliance with the GA Site Decommissioning Plan criteria. This survey does not include the open land areas associated with TRIGA® Mark-I or Mark-F. Figure-1 shows the area to be released relative to the remainder of GA's Main Site (Torrey Pines Site). Figure-2 shows the area to be included in this survey.

Classification

This Electrical Pad contains electrical transformers, substations and breakers that provides power to TRIGA® Mark I and Mark F Cooling and Auxiliary systems. This pad has no history of radioactive material storage or use. This electrical pad is classified as a Non-Impacted Area for final survey purposes. The GA Site Decommissioning Plan does not require radiological surveys in Non-Impacted Areas, however, the minimum surveys identified in this plan will be performed. If any measurement is above 75% of the release limits presented below, the area will be re-classified and survey requirements will be expanded.

Survey Objectives and responsibility

The purpose of performing a final survey is to demonstrate that the radiological conditions satisfy the NRC and State of California guidelines for release to unrestricted use contained in the GA Site Decommissioning Plan as reproduced below for applicable measurements.

Samples will be taken by qualified Health Physics technicians having a minimum of 3 years Health Physics Technician experience following approved Health Physics procedures and this plan.

Release criteria (per GA Site Decommissioning Plan)

1. Contamination limits

   The applicable release criteria for the surfaces of the asphalt/concrete pads, based on Beta/Gamma emitters , is:

   5,000 dpm/100 cm^2, averaged over 1 m^2 area
   15,000 dpm/100 cm^2, maximum in a 100 cm^2 area
   1,000 dpm/100 cm^2, removable activity

2. Exposure Rate Measurements

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

Alert Levels

Note: The Alert levels provided below are based on the background cpm plus the meter cpm value taking into account the instrument efficiency and probe surface area.

1. Alpha Monitoring

>100 cpm alpha using the large area (434 cm^2) probe. If >100 cpm, check with a hand held alpha meter.
>60 cpm using a hand held alpha probe, notify Health Physics Management.

2. Beta Scanning using 434 cm^2 probe

> ~1900 cpm beta using the large area (434 cm^2) probe (#84459)
> ~2300 cpm beta using the large area (434 cm^2) probe (#73701)
> ~300 cpm above background using any other 434 cm^2 probe

3. Beta Measurement Using the 100 cm^2 probe

> ~200 cpm (400 counts in 2 minutes) above background for a beta 100 cm^2 gas flow proportional counter.

4. Beta Measurement Using the Pancake GM probe

> 150 cpm

Decontamination Required- when (1) Pancake GM measurement > 150 cpm **or** (2) values greater than those provided above using the 100 cm^2 probe.

5. Exposure Rate Measurement

Exposure rate measurements at 1 m above the surface: 5 μR/hr above background or any reading > 20 μR/hr at 1 m, which ever is less. The alert level for surface scans is 25 μR/hr.

Final Survey Requirements

The minimum survey requirements are identified in Table-1 as follows:

Table-1: TRIGA® Electrical Pad Minimal Final Survey Requirements				
Area	**Dose Rate Measurements**	**α and β Scan Measurements**	**Fixed Measurements**	**Soil Samples**
Non-Impacted Areas	Scan 10% of concrete surface at contact (meter/probe held within 1" of the surface) with a 2" x 2" NaI (Tl) detector. Take 10 equally spaced dose rate measurements at 1m from the concrete surface. Take 1 dose rate measurement at contact with each electrical panel.	Scan 10% of concrete surface with a 434 cm^2 Beta detector and 10% of the surface with a 434 cm^2 Alpha detector. Scan the external surfaces of each electrical panel with a 15 cm^2 Beta detector and with a 50 cm^2 Alpha detector.	Take a Fixed measurement every 7m. Alternate Fixed Alpha, and Fixed Beta measurements, and, Swipe samples (analyzed for α,β).	Not Applicable

Documentation

Every survey conducted must be documented on a **daily basis** on a drawing showing the approximate locations surveyed. Include the results (including units), the technician signature, date, instrument(s) used, efficiency, background readings (if applicable) and any other applicable information.

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

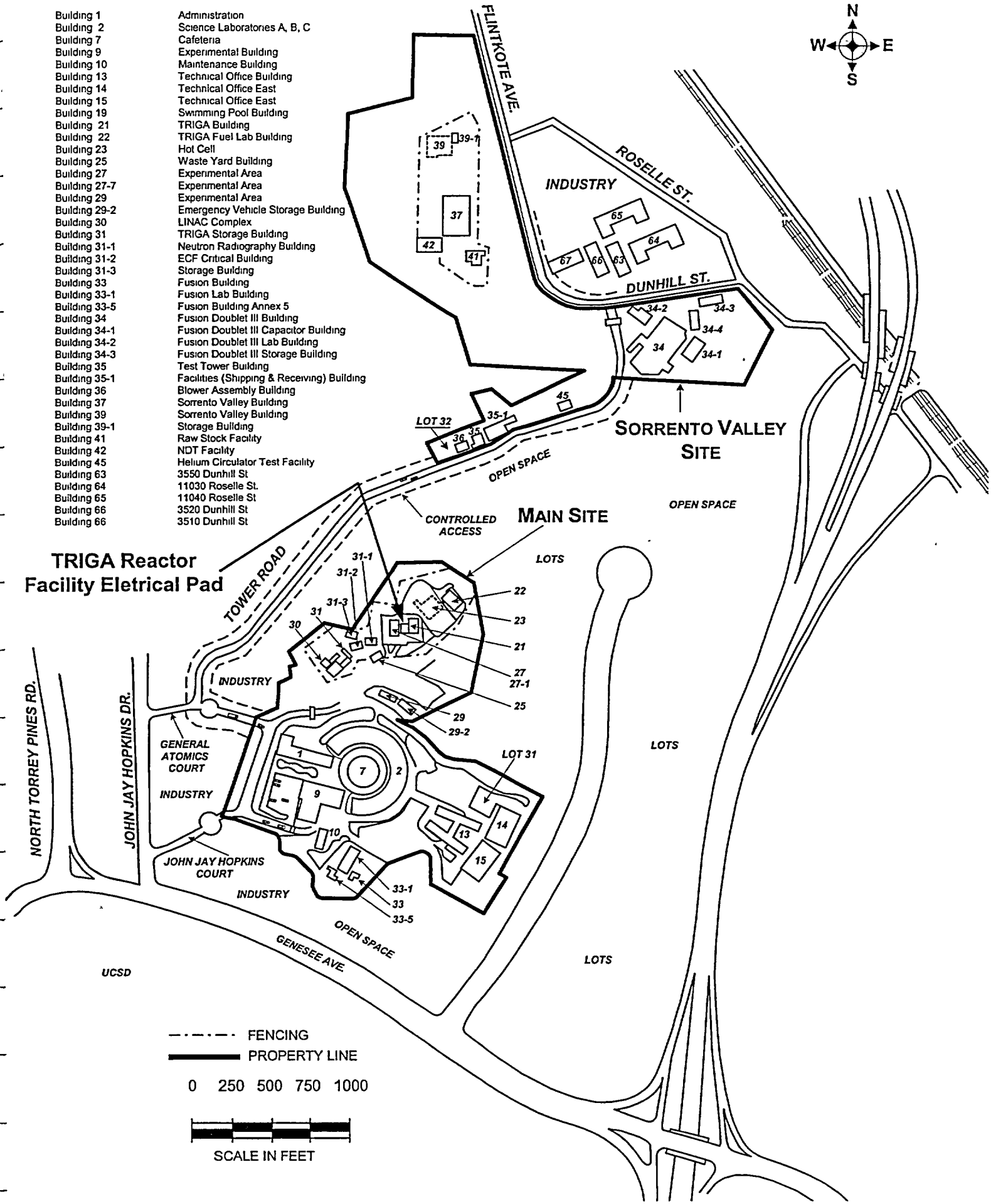


Figure 2 : TRIGA Reactor Facility Eletrical Pad Area in Relationship to Surrounding Areas