SRE

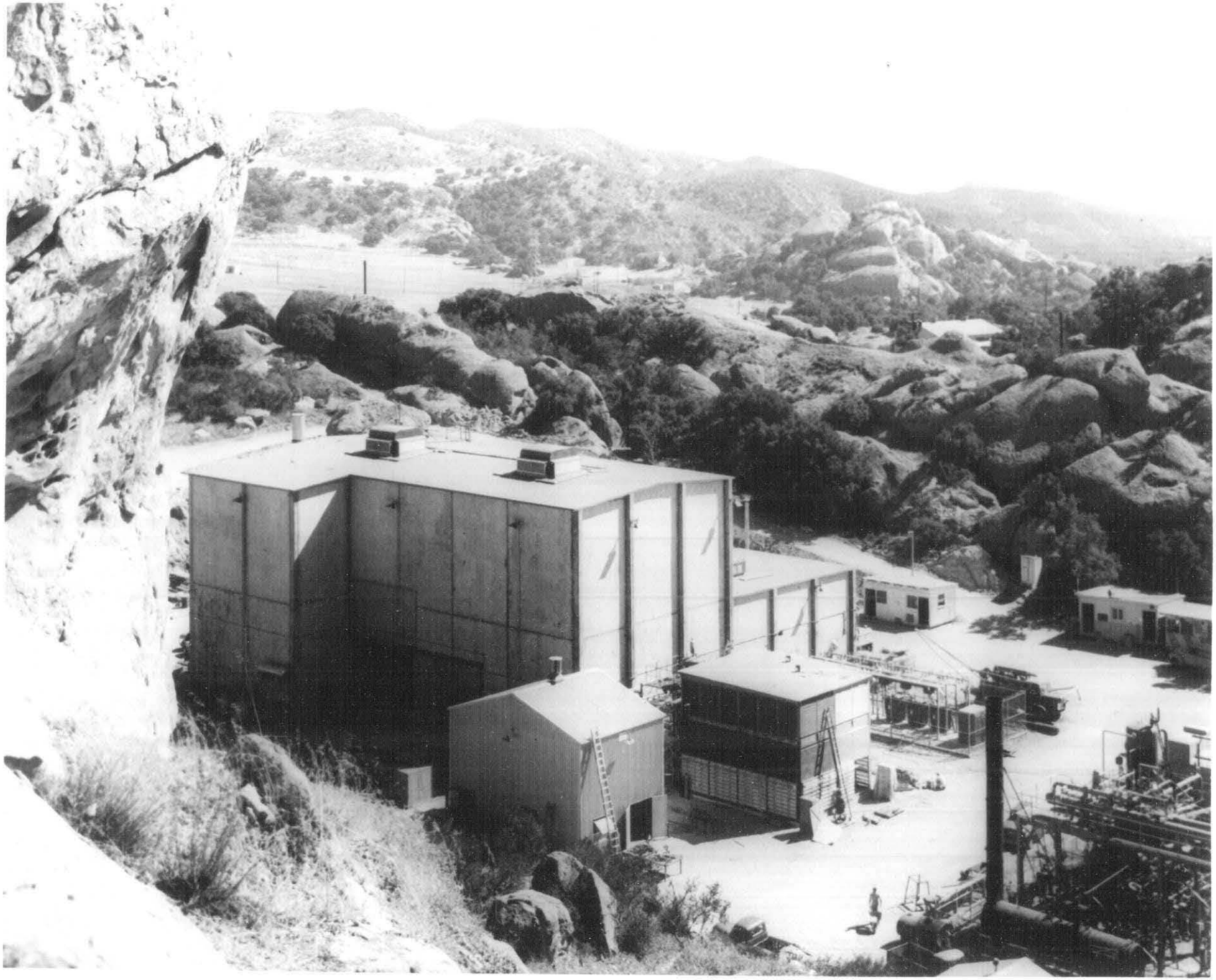
Site Survey

Plan

+

Results

R. J. Tuttle February 19??



SRE Photo printed Reverse

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SUPPORTING DOCUMENT

NUMBER	REV LTR/CHG NO.
N704ACR990027	SEE SUMMARY OF CHG

PROGRAM TITLE
Decontamination and Disposition of Facilities Program

DOCUMENT TYPE
Activity Requirements

KEY NOUNS
Final Closeout of SRE Facility

DOCUMENT TITLE
SRE Activity Requirement No. 29, Final Closeout of the SRE Facility

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07704	40100	REL. DATE 10-21-77 BU

PREPARED BY/DATE	DEPT	MAIL ADDR
B. F. Ureda	713	NB02

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APPROVALS

	DATE		DATE
WD Kittinger	10-12-77	ME Remley	10-14-77
JW Carroll	10-14-77	EG Johnson	10-19-77
BF Ureda			

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*	WR McCurnin	T020
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*	BF Ureda	NB02
*	JH Walter	T009

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ABSTRACT

The final closeout activity will complete the SRE D&D project. This activity will essentially consist of performing a total radiological survey of the SRE area, delineating areas where decontamination is incomplete, and resurveying after completion of decontamination. A final survey report will be prepared.

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FIGURES

TABLES

1.0 OBJECTIVE

The final closeout activity will complete the SRE D&D. The SRE D&D will be ready for closeout upon completion of all excavations, decontamination, backfilling, and repair to the site. The final closeout activity will essentially consist of making a comprehensive radiological survey of the entire SRE site to verify that the radioactivity remaining is at least below the prescribed limits for future unrestricted facility use. In making such a survey, particularly in the SRE high bay, finding of contamination levels above the limits is anticipated. When such areas are discovered, decontamination or removal will be required.

2.0 APPLICABLE DOCUMENTS

2.1	FDP-704-990-003	SRE Dismantling Plan, Revision A
2.2	SRR-704-990-001	Operational Safety Plan, Revision B
2.3	PP-704-990-001	Quality Assurance Plan, Revision D
2.4	PP-704-990-002	D&D Program Plan, Revision A/1
2.5	N704-CS-990-001	D&D of Facilities Document Status Report (Configuration Summary), Revision D
2.6	N704-TP-990-008	Radiological Survey Plan, Support of D&D Program Operations at T143
2.7	HSRS Records	Radiation Surveys During D&D Operations

3.0 WORK SCOPE

The final closeout activity will essentially consist of making a comprehensive radiological survey of the entire SRE site. The SRE site is shown in Figure 1. The survey will include all the area inside the dotted lines shown in Figure 1, but will be most intensive in the immediate vicinity of Building 143.

After removal of activated and contaminated materials, equipment, and structures from the interior of Building 143, a radiological survey of the high bay interior walls, ceiling, recesses, and remaining equipment (air conditioning, electrical distribution, cranes, lights, etc.) will be conducted to detect removable and total contamination. Wherever contamination is found at a level exceeding the acceptable limits, as shown on Table 1, decontamination or physical removal will be effected using techniques such as: vacuum-foaming, wiping with special solvents, scrubbing, or other suitable means.

The exterior surfaces of Building 143 will be similarly surveyed and decontaminated as necessary.

The area outside of the SRE building will be systematically checked using portable instrumentation. Included in this outside survey will be all areas previously checked during D&D of the outlining facilities. Selected soil samples, water samples, rock samples, and vegetation samples will be taken, analyzed, and reported. Should any radioactivity above the prescribed limits be detected, decontamination will proceed until the level is decreased below the prescribed limits. A final survey report will be prepared.

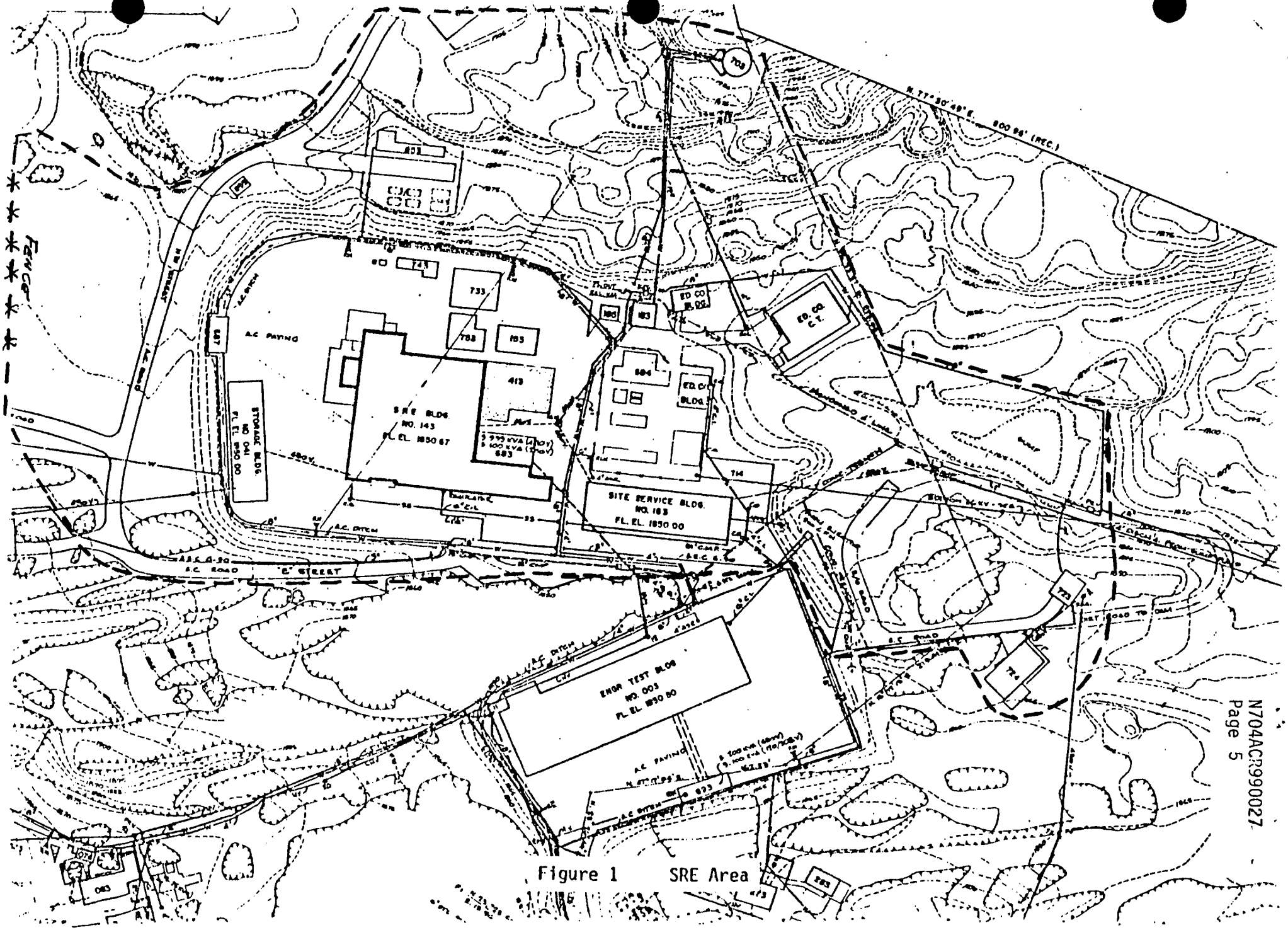

Figure 1 SRE Area

TABLE 1

Surface Contamination Limits for Decontamination and Disposition at the SRE

Beta Gamma Emitters	0.1 mrad/hr at 1 Cm with 7 mg/Cm^2 absorber	100 dpm/100 Cm^2
Alpha Emitters	100 dpm/100 Cm^2	20 dpm/100^2

Acceptable decontamination levels for soil is a specific activity of 100 pCi/gm and for water MPCw.

4.0 PROCEDURES

Detailed Working Procedures (DWP's) will be prepared delineating the final radiological survey. The procedures describe where smear, soil, and water samples will be taken, the frequency of sampling, and where radiation instrument measurements will be taken.

The procedures will also define the need for scaffolding, man-lifts, or means to gain access to ceilings, walls, etc.

The DWP's will contain the following statement: "A single designated working copy of the DWP may be changed in red ink (red lined) by the authorized Development and Test representative as procedural changes dictate. A Health and Safety representative must approve and sign those changes affecting health or safety; the Program Office Project Manager must approve and sign those changes affecting the scope of task, i.e., cost or schedule; and Quality Assurance must approve and sign those changes affecting quality. At the

completion of the task covered by the DWP, the marked-up working copy will be incorporated into the DWP an an appendix, reviewed by Quality Assurance, and released through Engineering Data."

5.0 OPERATIONS

5.1 Organization

The work will be directed and performed by the Health Safety and Radiation Services, Department 778. Support will be provided by the Remote Technology Unit, Department 731-540, Facilities and Industrial Engineering, and Maintenance. The D&D Program Office will monitor progress, arrange for photography, interface with Purchasing and F&IE, and assist in resolution of problems.

5.2 Records

HSRS will keep a daily log of the operations. A work copy of the procedure is to be available at the site, and upon completion of blocks of work the procedure is to be dated and initialed. A final survey report will be prepared.

5.3 Waste Handling

Radioactive waste will be transferred to the RMDF as soon as boxes are filled. Boxes and other containers will be provided in advance of need.

6.0 SCHEDULE

The final survey will be completed and the report issued before October 1, 1978.

SRE Survey Plan

APR 0 7 1978

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SUPPORTING DOCUMENT

NUMBER	REV LTR/CHG NO.
N704DWP990063	SEE SUMMARY OF CHG

PROGRAM TITLE
Decontamination and Disposition of Facilities

DOCUMENT TYPE
Detailed Working Procedure

KEY NOUNS
SRE, Site Survey, Unrestricted Use

DOCUMENT TITLE
SRE Site Survey Plan for Release to Unrestricted Use

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R. J. Tuttle 3/9/78	779	NB13

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APPROVALS

	DATE		DATE
D. F. Kelly	3/23/78	W. R. McCurnin	3/29/78
J. W. Carroll	3/24/78	M. E. Remley	3/27/78
W. D. Kittinger	3/24/78	B. F. Ureda	3-15-78

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*	R. J. Tuttle	NB13
*	B. F. Ureda	NB02
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*	D. F. Kelly	KB45

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ABSTRACT

The approach and methods to be used to demonstrate that all areas of the SRE facility are acceptable for release to unrestricted use, from radiological considerations, are described. This Detailed Working Procedure satisfies the requirement of N704ACR990027, "SRE Activity Requirement No. 29, Final Closeout of the SRE Facility."

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FORM 734-C REV. 11-77

CONTENTS

1.0 INTRODUCTION

The SRE facility consists of a major reactor building composed of a high bay, ground floor and mezzanine offices, and various rooms housing support equipment; a surrounding paved area; several out-buildings; and natural ground with drainage paths and a retention pond. During the operation of this facility, various portions became radioactively contaminated by neutron activation and from work with fission products and activation products. The goal of the D&D Program at this facility is to rehabilitate the major building to the point of being structurally sound and free of radioactivity to the extent that will permit release for unrestricted use. Radioactivity in all remaining portions of the facility will be reduced (by decontamination or by disposal) to levels that are as low as practicable and that do not exceed the limits stated in Table I.

TABLE I

SURFACE CONTAMINATION LIMITS FOR DECONTAMINATION AND DISPOSITION AT THE SRE

	Total	Removable
Beta-gamma emitters	0.1 mrad/hr at 1 cm thru 7 mg/cm^2 absorber	100 dpm/100 cm^2
Alpha emitters	100 dpm/100 cm^2	20 dpm/100 cm^2

Remaining activated or contaminated soil and concrete will generally be below 100 pCi/g, with exceptions determined for specific conditions. Water, in the retention ponds, and any pits or sumps, will be below MPC for Sr-90, the most restrictive radionuclide with which this water could be contaminated. This concentration limit is 3×10^{-7} $\mu Ci/cm^3$.

2.0 FACILITY REGIONS

The facility may be divided into several regions on the basis of past use, contamination history, and D&D operations. These regions are shown marked on a map of the facility, in Figure 1, and will be treated as geographical units in releasing the facility.

Region I

This area contained the Hot Oil-Sodium Cleaning Facility, Building 724, and related structures, roadways, and drainage paths. Building 724 has been relocated to Region IV, and is now identified as Building 133. This building has been released for unrestricted use (IL, R. J. Tuttle to R. A. Johnson, "Release of Building T724," January 23, 1978, and IL, F. E. Begley to R. J. Tuttle, "Unconditional Release of Building T724 for Unrestricted Use," January 18, 1978). Survey data for this building will be included in the report for Region IV.

Region II

This area contains the east end of Building 163 (this end being the Box Shop) and the surrounding paved surfaces.

Region III

This area adjoins the contaminated work area of Building 163 and comprises the entrance approaches to the SRE and the Region IV.

Region IV

This area consists of the roadway to the SRE West Parking Lot and the slope to the west of the SRE and includes the building moved from

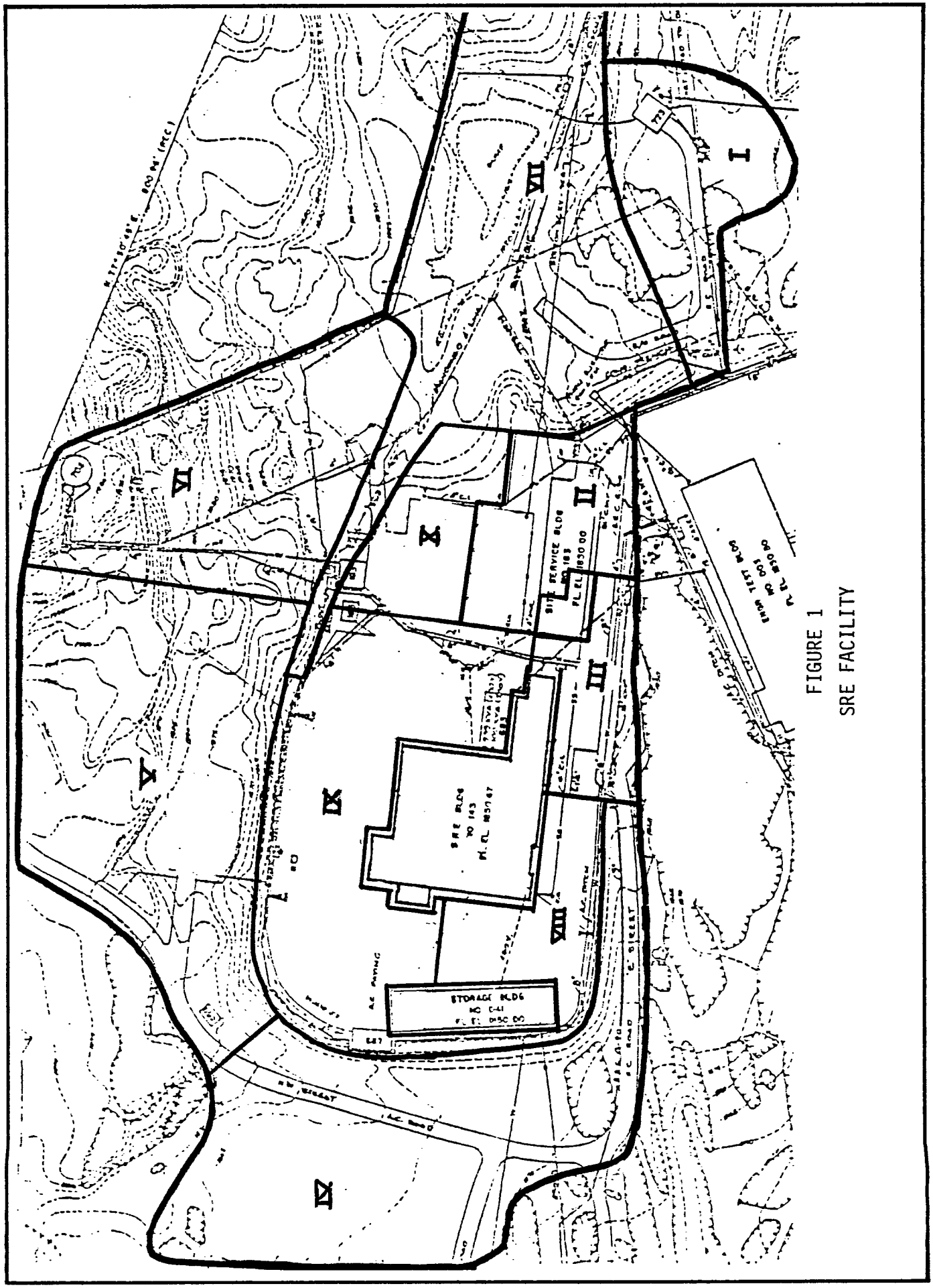

FIGURE 1
SRE FACILITY

Region I. It does not include the fenced yard used for storage of casks by the RMDF. This yard is assigned to the RMDF. Since surface drainage from this yard runs into Region IV, part of this region will need to be resurveyed following cleanup of the yard.

Region V

This area contained the Gas Storage Vault (Building 653) and the Temporary R/A Waste Storage Area. Both these structures have been demolished.

Region VI

This area contained the water supply storage tank and some Southern California Edison Company structures.

Region VII

This area contains the retention pond, the old leach field, the sanitary sewer pumping system, and the SRE drainage channel back to the fence line. It includes the retention pond overflow channel downstream for a distance of about 200 feet.

Region VIII

This area consists of the paving to the south and west of Building 143 to approximately the enclosure for the T1/T2 and T3 pits. It includes the drainage channel along the southwest to south edge of the paved area. It does not include Building 041.

Region IX

This area consists of the balance of the paved area around Building 143 and includes the drainage path along the north side to the fence

line at the northeast corner. Certain areas of the paving and the subsurface soil are known to be contaminated and will be removed prior to the final site survey.

Region X

This area is now in use as a parking lot and includes the natural ground to the east of the parking lot.

Building 163

This area is the contaminated work area of the building and includes the change room and the concrete ramp at the west entrance.

Building 143

This is the major reactor building and consists of nonradioactive areas and areas with surface and/or distributed contamination. Portions of the structure and subsurface soil will be removed. The ground level and certain below-grade rooms are shown in Figure 2. The mezzanine is shown in Figure 3. It is assumed that the majority of the floor and below-grade structures in the high bay will be removed.

Building 041

The north portion of this building is now being used for interim storage of radioactive waste prior to shipment for disposal. The south portion is used by LMEC for storage of controlled items.

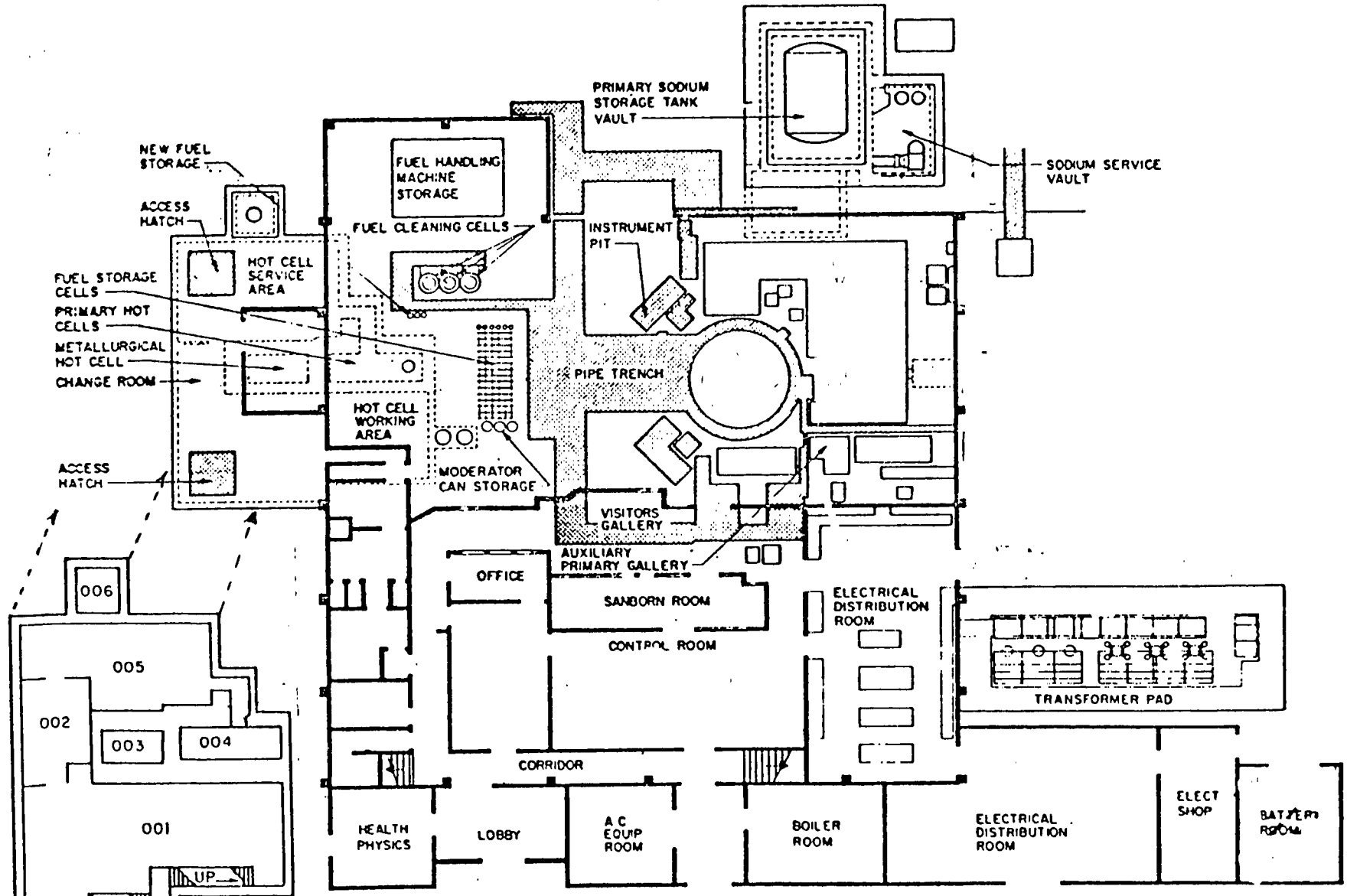

FIGURE 2

BUILDING 143 - GROUND LEVEL AND BELOW-GRADE STRUCTURES

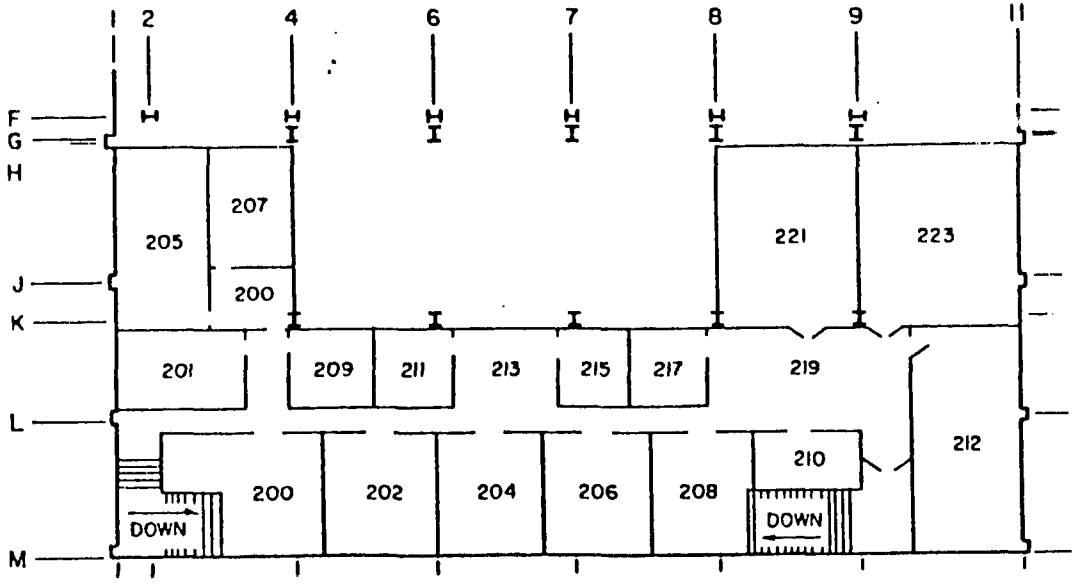

FIGURE 3

BUILDING 143 - MEZZANINE.

3.0 SURVEY PROCEDURES

All areas with significant known contamination are surveyed during the process of decontamination or disposal. Data obtained during this work will provide the major record demonstrating that an area is below the limits for release to unrestricted use. Sampling and supplemental surveys will be performed to verify that levels of radioactivity are acceptable and that recontamination has not taken place.

Surveys will rely primarily on the following methods:

1) Search for contamination by use of a pancake-probe G-M instrument or other high-sensitivity survey meter.
2) Smear checks for removable contamination to show compliance with Table I. Smears will cover 100 cm^2 each, taken at approximately 1-m intervals.
3) Measurement of radiation exposure rate with the special CP-6M (CP-7) to show compliance with Table I.
4) Counting of soil, concrete, and water samples to show compliance with a limit of 100 pCi/g for solids and 3×10^{-7} $\mu Ci/cm^3$ for water.

Any areas found to be above the applicable limits will be reworked by decontamination or disposal until the levels of radioactivity are reduced below those limits.

Since no significant contamination by highly active alpha emitters occurred, the above methods are adequate and the beta-gamma limits will be applied. Some areas, judged to have the greatest probability of being contaminated by fuel material, will be tested for alpha emitters, also. The hot cells or the wash cell valve pit may be appropriate locations.

The requirements for survey measurements in each region are shown in Table 2:

TABLE 2

SURVEY MEASUREMENT REQUIREMENTS

Region	Removable Contamination	Surface Radiation	Soil Samples	Concrete Samples	Water Samples
I	X	X	X	X	X
II	X	X	X		
III		X			
IV	X	X	X		
V		X	X	X	
VI		X	X		
VII		X	X		X
VIII		X			
IX	X	X	X		
X	X	X			
041	X	X			
163	X	X			
143 Offices	X	X			
143 High Bay	X	X	X	X	X

Measurements of removable contamination are omitted from those areas that consist solely of soil or asphalt-paved surfaces.

4.0 REPORTS

A technical information (TI) report will be prepared for each region and building identified in Section 2.0 as they are certified for preliminary and final release to unrestricted use. These reports have been pre-assigned document numbers as follows:

Region I

Radiological Survey Results - Release to Unrestricted Use, SRE Region I (Building 724 Area).
N704TI990027

Region II

Radiological Survey Results - Release to Unrestricted Use, SRE Region II (Building 163, Box Shop).
N704TI990028

Region III

Radiological Survey Results - Release to Unrestricted Use, SRE Region III (SRE Entrance).
N704TI990029

Region IV

Radiological Survey Results - Release to Unrestricted Use, SRE Region IV (West Parking Lot).
N704TI990030

Region V

Radiological Survey Results - Release to Unrestricted Use, SRE Region V (Gas Storage Vault).
N704TI990031

Region VI

Radiological Survey Results - Release to Unrestricted Use, SRE Region VI (Water Tank Area).
N704TI990032

Region VII

Radiological Survey Results - Release to Unrestricted Use, SRE Region VII (Retention Pond).
N704TI990033

Region VIII

Radiological Survey Results - Release to Unrestricted Use, SRE Region VIII (SRE Front Lot).
N704TI990034

Region IX

Radiological Survey Results - Release to Unrestricted Use, SRE Region IX (SRE Back Lot).
N704TI990035

Region X

Radiological Survey Results - Release to Unrestricted Use, SRE Region X (SRE Parking Lot).
N704TI990036

Building 041

Radiological Survey Results - Release to Unrestricted Use, SRE Building 041.
N704TI990037

Building 143

Radiological Survey Results - Release to Unrestricted Use, SRE Building 143.
N704TI990038

Building 163

Radiological Survey Results - Release to Unrestricted Use, SRE Building 163.
N704TI990039

In certain cases, a report will be made for preliminary release of an area subject to removal of certain remaining localized areas of contamination or radioactivity. After such an area is prepared and surveyed for final release, the report will be revised and reissued.

The format and content of each of these reports shall be consistent and will include:

I. INTRODUCTION

This section will give a brief statement of the operations conducted in the region or building during the life of the facility (during both the operating phase and the D&D Program) that might have led to activation or contamination. It will include a copy of Figure 1 of this DWP, and if applicable, Figure 2 and/or Figure 3, to provide a definite identification of areas.

The major operations performed under the D&D Program to prepare the area for unrestricted use will also be described.

The types of contamination or activation that existed in the area will be discussed.

II. SURVEYS AND RESULTS

This section will describe survey methods and results. Much of this work is performed in conjunction with the actual D&D work and should be specifically identified as such. Results of final surveys should also be separately identified. If a specific type of survey is not required, the subsection should be included with an explanation as to why this type was omitted.

a. Removable Contamination

Describe the smear technique used and the type of instrument used to count the smear. State the type of radiation detected, the minimum detection level (MDL) used, and the counter background and efficiency factor.

Summarize the results in terms of the approximate number of smears taken as the work progressed towards completion. (Do not include smear surveys performed in continuing support of contamination control during the work--just those taken as the area is finally cleaned up.) Indicate the highest values of surface contamination found and the locations. State which limit in Table I is applied and indicate that the survey shows that this limit is not exceeded. (Or, if a preliminary, provisional release is to be given, what further actions need to be performed before a final survey for release can be done.)

b. Surface Radiation

Describe the instrument survey technique used. State the type of radiation detected, the minimum detection level (MDL) used, and the counter background and calibration.

Summarize the results in terms of the approximate number of radiation levels recorded. Indicate the highest values of surface radiation found and the locations. State which limit in Table I is applied and indicate that the survey shows that this limit is not exceeded. (Or, if a preliminary, provisional release is to be given, what further actions need to be performed before a final survey for release can be done.)

c. Soil Samples

Describe the sampling technique and sample preparation used and the type of instrument used to count the sample. State the type of radiation detected, the minimum detection level (MDL) used, and the counter background and efficiency factor.

Summarize the results in terms of the approximate number of samples taken as the work progressed towards completion. (Do not include sampling performed in continuing support of contamination control during the work--just those taken as the area is finally cleaned up.) Indicate the highest values of soil activity found and the general natural activity. State that soil sampling is performed to assure that no significant radioactivity is distributed in the remaining soil and indicate that the survey shows that this is true. (Or, if a preliminary, provisional release is to be given, what further actions need to be performed before a final survey for release can be done.)

d. Concrete Samples

Describe the sampling technique and sample preparation used and the type of instrument used to count the sample. State the type of radiation detected, the minimum detection level (MDL) used, and the counter background and efficiency factor.

Summarize the results in terms of the approximate number of samples taken as the work progressed towards completion. (Do not include sampling performed in continuing support of contamination control during the work--just those taken as the area is finally cleaned up.) Indicate the highest values of concrete activity found and the general natural activity in the concrete. State that concrete sampling is performed to assure that no significant radioactivity is distributed in the remaining concrete, and indicate that the survey shows that this is true. (Or, if a preliminary, provisional release is to be given, what further actions need to be performed before a final survey for release can be done.)

e. Water Samples

Describe the sampling technique and sample preparation used and the type of instrument used to count the sample. State the type of radiation detected, the minimum detection level (MDL) used, and the counter background and efficiency factor.

Summarize the results in terms of the approximate number of samples taken as the work progressed towards completion. (Do not include sampling performed in continuing support of contamination control during the work--just those taken as the area is finally cleaned up.) Indicate the highest values of water activity found and the locations. State that the most restrictive limit for radionuclides that might be found (Sr-90) is applied and indicate that the survey shows that this limit is not exceeded. (Or, if a preliminary, provisional release is to be given, what further actions need to be performed before a final survey for release can be done.)

III. CONCLUSIONS

Summarize the conclusions of each subsection from the Surveys and Results, stating that:

> All appropriate surveys indicate that currently existing radioactivity in this area is below the applicable limits for release to unrestricted use. (If this area has a conditional release, repeat the conditions here.)

The TI shall have the same or equivalent distribution and approvals as this DWP, with the addition of the Manager, Radiation and Nuclear Safety, for approval.

5.0 EXPLORATORY SURVEYS

Some areas of the Facility are suspected or known to be contaminated at indeterminate levels. In order to plan work, it is necessary to evaluate these areas early. The most significant of these are:

1) High-bay interior walls, structure, and crane. A smear survey on approximate 1-m grid to a height of 2m will be performed on walls and columns. Chip samples of concrete and paint will be taken from the floor within 1 ft of the walls and from the walls at 1-ft and 1-m height. These samples will be taken at 1-m intervals. If significant contamination is found, the survey will be extended to greater elevations in 1-m increments until no contamination is found at two successive elevations. For elevations above 10 ft, some scaffold or man-lift will be required. An instrument survey will be conducted as soon as practical, following elimination of radiation sources in the high-bay that currently prevent such a survey.

2) Drainage channel and retention pond. Soil samples have been taken and analyzed. These indicate some minor areas exceeding 100 pCi/g in the pond. Since considerable sedimentation has occurred in the drainage channel along the north side of the back lot, additional soil samples, to a depth of about 2 ft, will be taken. Monthly water samples will be taken from the pond to detect any significant recontamination. An instrument survey of the drainage channel will be performed as soon as the ambient radiation level is reduced sufficiently low to permit this.

6.0 DEVIATIONS

A single designated working copy of the DWP may be changed in red ink (red lined) by the authorized Development and Test representative as procedural changes dictate. A Health and Safety representative must approve and sign those changes affecting health or safety; the Program Office project manager must approve those changes affecting the scope of task, i.e., cost or schedule; and Quality Assurance must approve and sign those changes affecting quality. At the completion of the task covered by the DWP, the marked-up working copy will be incorporated into the DWP as an appendix, reviewed by Quality Assurance, and released through Engineering Data.

7.0 SCHEDULE

The approximate order in which the regions will be surveyed for preliminary release has been estimated on the basis of completed and planned work schedules. This order is:

Region I - Building 724 area
Region IV - SRE West Parking Lot
Region V - Building 653 area
Region II - Box Shop
Region VI - Water Tank area
Building 143 - Offices
Region X - Parking Lot
Building 163 - Contamination area
Region III - SRE Entrance
Building 041 - Storage Building
Region VIII - Front Lot
Region IX - Back Lot
Building 143 - High Bay
Region VII - Drainage Channel and Retention Pond

Progress of the survey is dependent upon completion of decontamination and disposal efforts and will be paced by this work. The requested completion date of October 1, 1978, does not appear to be achievable.

R. J. Puttle

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SUPPORTING DOCUMENT

NUMBER	REV LTR/CHG NO.
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PROGRAM TITLE
Decontamination and Disposition of Facilities

DOCUMENT TYPE
Test Plan

KEY NOUNS
D&D Radiological Safety, SRE

DOCUMENT TITLE
Radiological Survey Plan, Support of D&D Program Operations at T-143 (SRE)

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PREPARED BY/DATE	DEPT	MAIL ADDR
R. K. Owen	779-210	T-143

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APPROVALS

		DATE
R. J. Tuttle	A. W. Graves	
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W. F. Heine	J. H. Walter	2/17/76
B. F. Ureda		

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*	J. H. Walter	T009
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*	J. C. Blake (2)	KB45

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ABSTRACT

Requirements for radiological survey data in support of the decontamination and disposition of the SRE facility (T-143) are described.

REV	SUMMARY OF CHANGE	APPROVALS AND DATE
A	Expanded Table 1, page 4, to include upper limits for soil and concrete contamination. New distribution list.	C. C. Conners B. F. Ureda J. H. Walter R. Aquilera REL DATE: 9-15-810

A. Objective

The objective of this plan is to assist D&D program personnel in the decontamination and dismantling of T-143 (SRE) and SRE support facilities for unrestricted use. The SRE support facilities that must be considered as radiologically hazardous are, the west end of T-163 (C.E.R.F.), the sodium service vault, the primary sodium fill/drain tank vault, and the R/A liquid/gaseous waste handling and storage systems located in the hill north of T-143 and adjacent to the west side of T-143.

B. Facility Operating Resume

The operations history of T-143(SRE) may be obtained from Facilities Dismantling Plan - FDP-704-990-003, June 6, 1975, by W. F. Heine and B. F. Ureda.

C. Facilities Contamination History

1. T-143: This facility experienced two primary R/A contamination incidents during the operating history, both of which involved fuel used in Core 1 operations. One was the result of a water/sodium reaction in fuel wash cell "B" during the cleaning operations of a Core 1 fuel element. However, the primary R/A contamination of T-143 High Bay (Reactor Room) occurred during the Core 1 Fuel Recovery program from mid-year 1959 through mid-year 1960.

2. T-163: This facility known as the Contaminated Equipment Repair Facility (C.E.R.F.) became R/A contaminated during the repair of such items as the primary sodium pumps and valves.

3. Sodium Service Vault (T-695) This facility, which is located below grade, is between the primary fill/drain tank vault and the sodium service building (T-153) that housed the new (clean) sodium melt stations and fill tank. The sodium service vault (T-695) contained such items of the primary sodium system as the "cold" trap and two "hot" traps. During the course of reactor operations, several primary sodium leaks and fires occurred within the vault.

4. Primary Sodium Fill/Drain Tank Vault There has been no significant contamination incident involving the sodium fill/drain tank. The primary hazard is high radiation levels. However, some R/A contamination occurred when the man-way cover was separated from the tank after draining primary sodium from the tank into 55 gallon drums.

NOTE: All smear swipe surveys, performed as part of the deactivated SRE facilities surveillance program, have indicated no removable R/A contamination in excess of 5 dpm/100 cm^2 alpha or 50 dpm/100 cm^2 beta. The smear swipes were obtained only of the facilities accessible floor areas. However, instrument surveys indicated fixed levels of contamination.

D. Radiological Surveys

All facilities and items within those facilities listed below shall be smeared/instrument surveyed for R/A contamination and/or radiation levels prior to and during dismantling/decontamination operations. All items and facility areas shall not exceed radiation and surface R/A contamination limits stated in Table 1 following completion of the D&D operation.

T-143
Passivation of Residual Primary Sodium in Reactor Core Vessel

1. Vent gas line shall be monitored continuously during passivation operations by in-line sampling procedures. Filter samples shall

be removed and analyzed for R/A concentrations at a frequency of each two hours of operations.

All items and facility areas that exceed those limits stated in Table 1, shall be decontaminated or disposed of as radioactive waste, whichever is more expeditious, economically feasible, and compatible with the D&D program objectives of returning all facilities to unrestricted use.

TABLE 1

UPPER CONTAMINATION LIMITS FOR DECONTAMINATION AND DISPOSITION AT THE SRE

A.	Surfaces	
	Beta Gamma Emitters:	Total = 0.1 mrad/h at 1 cm, with 7 mg/cm^2 absorber Removal = 100 dpm/100 cm^2
	Alpha Emitters:	Total = 100 dpm/100 cm^2 Removable = 20 dpm/100 cm^2
B.	Soil	
	Near Surface:	100 pCi/g gross detectable beta activity
	Below 3 m (average):	1000 pCi/g gross detectable beta activity
	*(maximum):	3000 pCi/g Gross detectable beta activity
C.	Concrete (rubble)	100 pCi/g Gross detectable beta activity

*The maximum value may be average over a volume of 1 m^3 to meet the limit for the average value.

The radioactivity levels of the facility at completion of the D&D work shall be as low as practicable but shall not exceed limits of Table 1 above. A radiological survey shall be performed upon completion of D&D work to verify this.

The following areas have been identified specifically as requiring radiological surveys prior to work.

1. T-143 (SRE)

   a. Main and auxiliary primary sodium handling systems vault.
   b. Floor/walls of high bay (reactor room)
   c. Pipe trenches - high bay
   d. Fuel storage cells - west end of high bay
   e. Fuel wash cells (3) - northwest end of high bay
   f. Fuel handling machine storage area (Pit)
   g. Fuel handling machines (Mark-I and Mark II)
   h. Overhead bridge cranes - (65 ton and 5 ton)
   i. Moderator can storage cells
   j. All R/A liquid/gaseous waste handling systems located underground, hillside north of T-143 and west side of T-143
   k. Primary sodium pump pit ("Durand's Pit") located between T-143 and fill/drain vault
   l. Moderator can handling machine
   m. Safety and control rod drive motors and storage rack
   n. R/A exhaust system and "hot" cells
   o. Demountable maintenance shield assembly (DMSA). (The well liner was removed during facility deactivation.)

2. T-163 (C.E.R.F.)

   a. Insulation material covering walls and ceiling
   b. 1 ton overhead bridge crane
   c. Floor area of facility (fixed contamination)

3. Primary Sodium Service Vault

   a. Vault walls and floor areas upon removal of sodium handling components, "hot" traps, "cold" trap, etc.

4. Primary Sodium Fill/Drain Tank Vault

   a. Vault walls and floor areas upon removal of primary sodium fill/drain tank.

E. Equipment - (Tools, etc.)

All tools and equipment shall be smear surveyed periodically during operations. No equipment or tools shall be removed from operations area until approved to do so by the Health and Safety representative.

All contractor-owned equipment and tools shall be surveyed prior to end of each work shift or as deemed necessary by the Health and Safety representative. Contractor's work schedule shall be such that the H&S representative will have a minimum of 30 minutes to perform survey and obtain results before contractor personnel leave facility at end of each work day.

F. Forms and Document

1. All radiation/smear surveys shall be recorded on Form 732-A Rev. 8-73; Health and Safety Analysis Report. All liquid, soil, concrete, and air samples shall also be recorded on Form 732-A. Copies of the above report shall be sent to R&NS manager, D&D Program Manager, Operations Manager and on-site H&S files.

2. A Restricted Access Area Entry Permit, Form 719L, Rev. 8-70, shall be issued prior to beginning of operations. One permit may be issued for duration of operation. However, a new permit must be issued if there is a significant change in the operations. Portions of the entry permit shall be filled in by the manager of the group authorizing or performing the work prior to being submitted to the Health and Safety representative.

3. Health Physics Data Request Form is to be filled in by operations personnel to request Health Physics Data for a specific item and/or area.

4. Radiation/Smear Survey Completion Data Form shall be completed by the H&S representative with disposition of item or area to be indicated by operations personnel.

5. Cumulative air sample data form may be used by H&S representative to record results of daily air samples. However, air sample results shall be recorded on Form 732-A as mentioned above.

6. Monthly Dosimeter Record Form shall be used by the H&S representative to record daily radiation exposure levels of personnel to preclude any accidental overexposure.

7. Respirator issuance record form shall be filled in by the H&S representative only, and only in accordance with operating procedure OP-001-870-001, "Control and Use of Respirators."

8. Applicable documents that may be referred to are listed below:

   a. Operational Safety document - G-27- "Control of Asbestos Operations," E. L. Roddy and W. F. Heine.

   b. Operating Procedure, OP-001-870-001, "Control and Use of Respirators," J. D. Moore.

   c. Operational Safety Plan for the AI Decontamination and Disposition of Facilities Program, SRR-704-990-001, Rev. B by J. D. Moore and E. L. Roddy.

   d. Facilities Dismantling Plan for SRE, FDP-704-990-003 by B. F. Ureda and W. F. Heine, June 24, 1975.

VII

Appended Forms

Figure 1 - Form 732-A Health and Safety Analysis Report

Figure 2 - Form 719-L Restricted Access Area Entry Permit

Figure 3 - Form No Number Health Physics Data Request

Figure 4 - Form No Number Radiation/Smear Survey Completion Data

Figure 5 - Cumulative Air Sample Data

Figure 6 - Monthly Dosimeter Record

Figure 7 - Respirator Issuance Record

ANALYZED BY _____

DATE ANALYZED _____

FILM NO. _____ (DO NOT WRITE IN THIS BOX)

Atomics International Division
Rockwell International

HEALTH AND SAFETY ANALYSIS REPORT

SUBMITTED BY _____

DATE SAMPLED _____

BLDG. AND ROOM NO. _____

SAMPLE NUMBER	DESCRIPTION AND LOCATION	RESULTS			

COMMENTS:

TYPE OF SAMPL

SMEAR ___ ___ (

TYPE OF ANALY

RADIOMETRIC ___

OTHER ___ ___

LEDGER ACCOUNT _____ CONTRACT OR ORDER _____ S[illegible] ACCOUNT _____ WORK RELEASE _____

LOG BOOK NO. _____ PAGE _____

N704TP990008
Page 9

FORM 732-A REV. 8-73

RESTRICTED ACCESS AREA ENTRY PERMIT

Nº 17700

GROUP AUTHORIZING OR PERFORMING WORK

REQUESTED BY: _____ DEPT: _____

JOB LOCATION _____

JOB DESCRIPTION _____

BEFORE STARTING WORK, OPERATIONAL SAFETY SUPERVISION OF GROUP AUTHORIZING OR PERFORMING WORK, AND SUPERVISION OF WORK AREA **MUST BE NOTIFIED.**

REFERENCE PROCEDURE, WORK REQUEST, JOB ORDER, ETC. _____

DATE OF REQUEST _____ WORK TO

N704TP990008

Page 10

OPERATIONAL SAFETY AND ORIGINATOR

NAME AND IDENTIFICATION OF PERSONS COVER

NAME	NR SERIAL	NON—NR AFFILIATION	I	IAL

OPERATIONAL SAFETY

PROTECTIVE EQUIPMENT REQUIRED

HANDS

- ☐ CANVAS GLOVES
- ☐ NEOPRENE GLOVES
- ☐ PVC GLOVES
- ☐ SURGEON'S GLOVES
- ☐ LEATHER GLOVES
- ☐ GAUNTLET TYPE
- ☐

BODY

- ☐ COVERALLS
- ☐ LAB COAT
- ☐ SURGEON'S CAP

- ☐ HOOD
- ☐ ACID APRON
- ☐ GONAD SHIELD
- ☐ HARD HAT
  - ☐ PHENOLIC
  - ☐ FACE SHIELD
- ☐ EYE PROTECTION
  - ☐ SAFETY GLASSES
  - ☐ JONES GOGGLES
- ☐ EAR PROTECTION
  - ☐ EAR PLUGS
  - ☐ EAR MUFFS
- ☐ SAFETY HARNESS
- ☐ SAFETY BELT

FEET

- ☐ TOE GUARDS
- ☐ CANVAS COVERS
- ☐ PLASTIC COVERS
- ☐ BOOTS
- ☐ LEGGINGS
- ☐

RESPIRATORY PROTECTION

- ☐ SCBA
- ☐ AIR SUPPLIED RESPIRATOR

- ☐ FILTER TYPE RESPIRATOR
- ☐ FULL FACE
- ☐ COMFO
- ☐ ULTRA FILTER
- ☐ DUST FILTER
- ☐ ORGANIC VAPOR
- ☐ ACID GASES
- ☐

PERSONNEL MONITORING EQUIPMENT —

- ☐ BETA-GAMMA FILM BADGE
- ☐ NEUTRON FILM BADGE
- ☐ BETA-GAMMA DOSIMETER
- ☐ NEUTRON DOSIMETER
- ☐ EXTREMITY MONITORING
- ☐ LAPEL AIR SAMPLER

SPECIAL REQUIREMENTS —

- ☐ PERSONAL SURVEY
- ☐ TOOL SURVEY
- ☐ WELDING PERMIT
- ☐ CONFINED SPACE PROCEDURES
- ☐ OXY. DEFICIENCY TEST _____ % O_2
- ☐ COMBUSTIBLE ATMOSPHERE _____ % LEL
- ☐ TOXIC ATMOSPHERE TEST _____ % TLV
- ☐ STANDBY REQUIRED
- ☐ FIRE PROTECTION

RADIATION MEASUREMENTS

BETA _____ mrem/hr

GAMMA _____ mrem/hr

NEUTRON _____ mrem/hr

TOTAL _____ mrem/hr

SURFACE CONTAMINATION LEVEL

_____

AIRBORNE CONTAMINATION LEVEL

_____

SPECIAL INSTRUCTIONS _____

APPROVALS

APPROVALS FOR PERFORMING WORK

SUPERVISOR OF AREA WHERE WORK WILL BE PERFORMED _____ DATE _____

SUPERVISOR OF GROUP AUTHORIZING OR PERFORMING WORK _____ DATE _____

OPERATIONAL SAFETY _____ DATE _____ PERMIT EXPIRES _____

ALL PERSONS COVERED BY THIS PERMIT MUST INITIAL AFTER SAFETY INSTRUCTIONS HAVE BEEN GIVEN

FORM 719-L REV. 6-70

ORIGINATOR

HEALTH PHYSICS DATA REQUEST

FACILITY

DATE	REQUESTOR	REQUIREMENT	RESULT	DATE

Radiation/Smear Survey Completion Data

Item/Area	Date	Results of Survey	Disposition R/A Waste	Decontaminate	Remarks

Figure 4

ATOMICS INTERNATIONAL CUMULATIVE AIR SAMPLE DATA

Date	Air Sample Location	Immediate Count D.P.M.	Delay Count D.P.M.	$D.P.M./Ft^3$	Accumulated Exposure $D.P.M.\text{-}Hr/Ft^3$	REMARKS

MONTH OF ____________

Atomics International Division
Rockwell International

BLDG ________

MONTHLY DOSIMETER RECORD

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

Health Physicist
Radiation and Nuclear Safety

RESPIRATOR ISSUANCE RECORD

		Phone	Respirator			Issue	Due	Return
Name	Dept.	Ext.	Type	#	Filter	Date	Date	Date

MAY 0 8 1978

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Atomics International Division

SUPPORTING DOCUMENT

NUMBER: N704TI990027
REV LTR/CHG NO.: SEE SUMMARY OF CHG

PROGRAM TITLE: Decontamination and Disposition of Facilities

DOCUMENT TYPE: Technical Information

KEY NOUNS: Decontamination

DOCUMENT TITLE: Radiological Survey Results - Release to Unrestricted Use, SRE Region I (Building 724 Area)

ORIGINAL ISSUE DATE:

GO NO.	S/A NO.	PAGE 1 OF TOTAL PAGES 11
07704	40300	REL. DATE 5-4-78 JH

PREPARED BY/DATE	DEPT	MAIL ADDR
D. E. Owens D E Owens 3/23/78	779	T055

IR&D PROGRAM? YES ☐ NO ☒ IF YES, ENTER TPA NO. _____

APPROVALS

	DATE		DATE
D. F. Kelly D F Kelly	4/25/78	R. J. Tuttle R J Tuttle	4/26/78
J. W. Carroll J W Carroll	4/26/78	W. R. McCurnin W R McCurnin	4/26/78
W. D. Kittinger W D Kittinger	4/28/78	M. E. Remley M E Remley	4/26/78
		B. F. Ureda B F Ureda	4-26-78

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*	W. R. McCurnin	T020
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*	J. H. Wallace	T034
*	D. F. Kelly	KB45
*	Authorization File	NB13

779-A.54/jjs/add

* COMPLETE DOCUMENT
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ABSTRACT

The results of the radiological survey for Region I (Building 724 Area) of the SRE are described. All survey results are below the applicable limits, indicating that this area may be released to unrestricted use.

RESERVED FOR PROPRIETARY/LEGAL NOTICES

FORM 734-C REV. 11-77

CONTENTS

I. INTRODUCTION

This report covers SRE Region I, located east of the main reactor complex (see Figure 1). The area is made up mainly of large sandstone formations covered with wild plant growth. Several facilities were located in the region and are identified as T723/T724. An asphalt road leads to this location. T723 is a 20-ft x 20-ft concrete pad used for sand blasting items and equipment that were known to be free of radioactivity.

Building T724 was the Hot Oil Sodium Cleaning facility. It was designed to be used for cleaning large pipes and assemblies from the secondary loop of the reactor. There was, however, a buildup of contamination from mixed fission products (MFP) over the lifetime of the facility. Readings of a few mR/hr could be detected in several places along the floor. Most of this activity was located inside a small trench along the west wall. The metal diamond-plate floor was cut free in an attempt to remove this contamination. Contamination could be detected in the underlying concrete at that time.

It was planned that the upper portion of the building would be used in support of another program. To achieve this, the walls and ceilings were decontaminated and when certified clean, were cut free from the bottom metal floor. Final survey results of the building, now located in Region IV and identified as T133, will also be reported in the document for that region. All that remained after the building had been removed was some contaminated metal flooring and concrete.

A jack-hammer was brought in to break the metal free and remove the concrete in large sections. It was felt that removing large pieces would help in contamination control. After the operation began, a network of rebar, not identified on the prints, prevented use of this

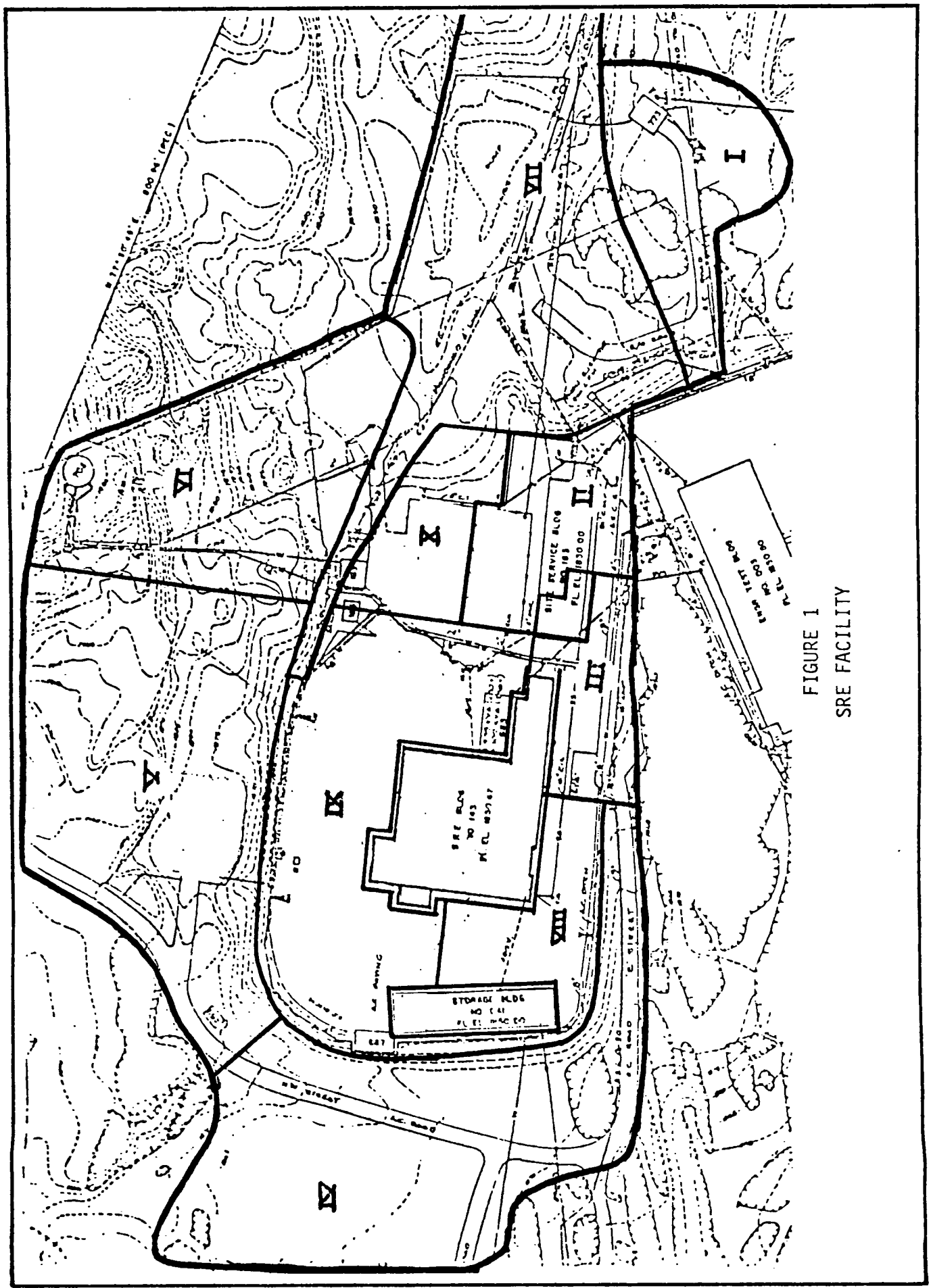

FIGURE 1
SRE FACILITY

method for removing the concrete. It became apparent at this time that the concrete would have to be removed by chipping away the upper layer. Only the concrete identified with yellow paint as contaminated was broken free and placed in 34-cubic foot waste containers. The remaining rubble was monitored with a thin window pancake G-M detector. Each location that had been contaminated was tested for residual activity by collecting loose powder and dust from the concrete.

II. SURVEYS AND RESULTS

A. REMOVABLE CONTAMINATION

The principal areas of concern were the two large concrete surfaces in the area. Both pads had been exposed to the weather. Routine surveys over the past few years had indicated pipes and heating equipment for the Hot Oil Sodium Cleaning facility were free of detectable activity. Twenty-five Whatman 2.5 cm filter papers were swiped around locations most likely to be contaminated on T724 before final D&D effort began. Each location for this test was outside the floor area that was known to be contaminated. Since a large area was to be covered, each location was divided into squares approximately 1 meter on a side. Within each square, random locations were swiped until approximately 100 cm^2 had been covered.

A smear survey of T724 showed six areas on the walls, out of 106 smears, with removable contamination greater than 100 dpm/100cm^2 beta. The walls were decontaminated to bring these areas below 50 dpm/100 cm^2 beta. A final survey, of 180 smears, showed all inside and outside surfaces of the building, including the ductwork, to be less than 50 dpm/100 cm^2 beta.

The building was then cut away from its foundation and moved to a temporary location near the Box Shop (T163) to permit measurement of surface radiation levels.

After all of the contaminated concrete had been removed, 45 smear swipes were taken in the area to justify final release. The highest level recorded at this time was 48 dpm/100 cm^2 at one location on the remaining concrete pad. All activity detected is assumed to be MFP older than 10 years.

All smears for this report were counted on an automatic counting system equipped with a thin window gas proportional detector. This system has a counting efficiency of about 36% for Bi-210 activity. A normal background count is approximately 20 counts per minute. Since the system is used in the beta-gamma mode above the alpha plateau, any alpha emitters present would also be detected. The normal efficiency for alpha activity is between 20 and 25%.

This area was not subject to contamination by alpha-emitting radionuclides. Therefore, the applicable limit for removable contamination is 100 dpm/100 cm^2 for beta-gamma emitters. All smears were below this limit.

B. SURFACE RADIATION

Two instruments were used for this portion of the survey; a Technical Associates Model CP-7 ion chamber detector and a PUG-1/P-11A probe (a thin window pancake G-M detector). This latter instrument was needed for its faster response and audible output to locate any contaminated areas. The CP-7 is an ion chamber measuring absorbed dose and has both the range and the absorber thickness required by the specifications for this test.

These instruments were used for a complete walk-through examination of all accessible parts of this region. Particular attention was paid to natural water courses and depressions where activity could be concentrated by runoff from surrounding areas. No area could be located within this region that exceeded twice the random background counts of about 100 cpm indicated on the PUG-1 GM detector. The probe on this instrument was held about 2-1/2 ft above the ground for this test. To provide complete coverage for this area, the main drainage channel was surveyed for about 1/8 to 1/4 mile beyond the site boundary.

The maximum dose rate indicated by the CP-7 was 0.04 mrad/hr. Natural background is approximately 0.04 mrad/hr, ± 0.05 mrad/hr for an uncertainty of ± 10% of full scale (0.5 mrad/hr) on this range.

An instrument survey of T724 after it was removed from Region I showed some areas above 0.1 mrad/hr. These areas were cut away. All subsequent readings with the CP-7 were less than 0.1 mrad/hr.

C. SOIL SAMPLES

The technique used to determine soil contamination consisted of removing samples from undisturbed top soil. Numbered salve-cans were used for this purpose. A grid network of wooden stakes was spread throughout the region. Each sample spot was modified from the basic plan to account for slope and terrain of the local landscape. Using the can lid as a scoop, soil from various spots located around each sample station was added to the can until it was nearly full. The contents were then mixed thoroughly by shaking. After all samples were collected, each sample can was opened and placed on a hot plate to drive off any moisture present. When dry, a small portion was taken from the can to be sieved through a Coor's sieve (Gooch crucible). From this, a one-gram portion was transferred onto an aluminum planchette. Alcohol was added and the sample tapped to settle it across the flat surface of the planchette. The sample was then heated to dryness. No chemical binders were added to hold the sample together for counting.

A thin window gas proportional detector operating in the preset count mode was used to count each sample.

A one-gram prepared KCl standard source (831 dpm) was counted with each group of soil samples. Using the mass-specific activity to calculate detector efficiency accounts for errors associated with self-

absorption, backscatter, and the difference between a 2π counter and a 4π source. Thus, based upon the statistical counting error of a single observation, the minimum detection level is approximately 9 pCi at the 95% confidence level.

The total of 27 soil samples showed a range of 16 pCi/gm to 45 pCi/g. The activity of natural uncontaminated soil ranges from about 20 pCi/g to 30 pCi/g.

D. CONCRETE SAMPLES

Five concrete samples representing each identified location within T724 were taken. Loose powder and dust were used for this purpose. All samples were placed on a hot plate to drive off water used in dust control. One-gram samples were prepared by passing material through a Coor's sieve (Gooch crucible), weighing the samples and wetting with alcohol. All samples were counted with a thin window, gas propotional counter having a background of approximately 20 cpm. A one-gram KCl standard was used to determine counter efficiency. Results indicated that four of the five samples were less than 100 pCi/g. The fifth sample read 140 pCi/g before a second layer of concrete was removed at that location (West Trench). All loose material of the second layer was removed and the trench was swept clean. No source of activity could be detected within the trench. The results from this survey indicate that no remaining activity was distributed in the concrete rubble. There was no evidence that the perimeter concrete outside this building had ever been contaminated.

E. WATER SAMPLES

There is only one location within this region where water could be trapped or retained. That is a concrete pit approximately 3-ft deep

outside of Building T724. After all of the contaminated concrete had been removed, two water samples were taken in this location. The second sample was taken immediately after heavy rainfall had covered this area with some runoff into the pit. From each sample, a measured 500 ml portion was reduced in volume to about 10 ml on a hot plate. Using a rubber policeman, undissolved solids and remaining liquid were transferred to a counting planchette and heated to dryness. A thin window gas proportional detector having a background of about 20 cpm was used to count the samples.

The limit for water is 3×10^{-7} μCi/cm^3 (Sr-90). The water sampled from this source had an activity of 2.3×10^{-8} μCi/cm^3, which is below the limit.

III. CONCLUSIONS

In each type of test performed, all samples indicated levels less than those limits prescribed by the Decontamination and Disposition of Facilities Program for release to unrestricted use.

All appropriate surveys indicate that current existing radioactivity in the area is below the applicable limits for release to unrestricted use.

MAY 0 8 1978

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Atomics International Division

SUPPORTING DOCUMENT

NUMBER	REV LTR/CHG NO.
N704TI990028	SEE SUMMARY OF CHG

PROGRAM TITLE
Decontamination & Disposition of Facilities

DOCUMENT TYPE
Technical Information

KEY NOUNS
Decontamination

DOCUMENT TITLE
Radiological Survey Results - Release to Unrestricted Use, SRE Region II (Building 163, Box Shop)

ORIGINAL ISSUE DATE

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07704	40300	7

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PREPARED BY/DATE	DEPT	MAIL ADDR
D. E. Owens D E Owens 3/28/78	779	T055

IR&D PROGRAM? YES ☐ NO ☒ IF YES, ENTER TPA NO. _____

APPROVALS

	DATE		DATE
D. F. Kelly D F Kelly	4/4/78	W. R. McCurnin W R McCurnin	4/19/78
J. W. Carroll J W Carroll	4/24/78	M. E. Remley M E Remley	4/20/78
W. D. Kittinger W D Kittinger	5-1-78	B. F. Ureda B F Ureda	4/25/78
R. J. Tuttle R J Tuttle	3/28/78		

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*	D. E. Owens	T055
*	J. H. Wallace	T034
*	D. F. Kelley	KB45
*	Authorization File	NB13

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ABSTRACT

The results of the radiological survey for Region II (Building 163, Box Shop) of the SRE are described. All survey results are below the applicable limits, indicating that this area may be released to unrestricted use.

CONTENTS

I. INTRODUCTION

This report covers SRE Region II located along the main entrance way to the reactor complex (Figure 1). Building 163 is located in this area and will be divided between two reports. The west end of the building is used as a contaminated equipment work area. Final release of this part of the building is forecast near the end of the D&D Program at the SRE. The remaining half of the building (east end) is currently used to make wooden shipping containers. Throughout the history of this part of the building, it has been used for nonnuclear support work such as a pipe shop and a machine shop. Routine surveys performed as part of the reactor operations program have never indicated any significant contamination of this part.

If a decision is made to remove the present wall between the two parts of the building, this report must be considered a conditional release, due to the hazard of cross contamination by such an operation.

II. SURVEYS AND RESULTS

A. REMOVABLE CONTAMINATION

One hundred smear swipes using Whatman 540 papers were taken throughout the east end of Building 163. Particular attention was made for any place where contamination might have migrated from the contaminated side of the building. Each swipe covered an area of 100 cm^2. Results for all smears were reported as less than 30 disintegrations per minute. However, no activity was detected that exceeded the normal statistical deviation above background.

All smears for this report were counted on an automatic counting system equipped with a thin window gas proportional detector. This system has a counting efficiency of about 36% for Bi-210 activity. A normal background count is approximately 20 counts per minute. Since the system is used in the beta-gamma mode above the alpha plateau, any alpha emitters present would also be detected. The normal efficiency for alpha activity is between 20 and 25%.

This area was not subject to contamination by alpha-emitting radionuclides. Therefore, the applicable limit for removable contamination is 100 dpm/100 cm^2 for beta-gamma emitters. All smears were below this limit.

B. SURFACE RADIATION

Two survey instruments were used for this part of the survey; a Technical Associates Model CP-7 ion chamber detector and a PUG-1/P-11A probe thin window pancake G-M detector. This latter instrument was needed for its faster response and audible output indication.

Using both instruments held about 2-1/2 ft above ground level, a complete walk-through inspection was made of all accessible areas. An average reading of 0.06 mrad/hr (±0.05) was recorded outside Building 163 with the Model CP-7. Some of this reading may be attributed to higher than normal background caused by surrounding nuclear facilities. All readings with the CP-7 were below the limit of 0.1 mrad/hr.

C. SOIL SAMPLES

All of the area in this region outside Building 163 is covered with asphalt paving. Soil samples are not applicable for this region.

D. CONCRETE SAMPLES

There are several concrete abutments around manhole accesses and curbs. They are located well away from any source of contamination or activation and are not to be removed. Concrete samples are not applicable for this region.

E. WATER SAMPLES

There are no natural or man-made catch basins or reservoirs for water in this region. Water samples are not applicable for this region.

III. CONCLUSIONS

In each type of test performed, all samples indicated levels less than those limits prescribed by the Decontamination and Disposition of Facilities Program for release to unrestricted use.

All appropriate surveys indicate that current existing radioactivity in the area is below the applicable limits for release to unrestricted use.

III

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SUPPORTING DOCUMENT

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ABSTRACT

The results of the radiological survey for Region III of the SRE facility are described. All survey results are below the applicable limits, indicating that this area may be released for unrestricted use.

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CONTENTS

TABLES

FIGURES

1.0 INTRODUCTION

This document covers Region III of the SRE facility (Figure 1). The area adjoins Building 163 (CERF) and comprises the entrance approach to the SRE complex.

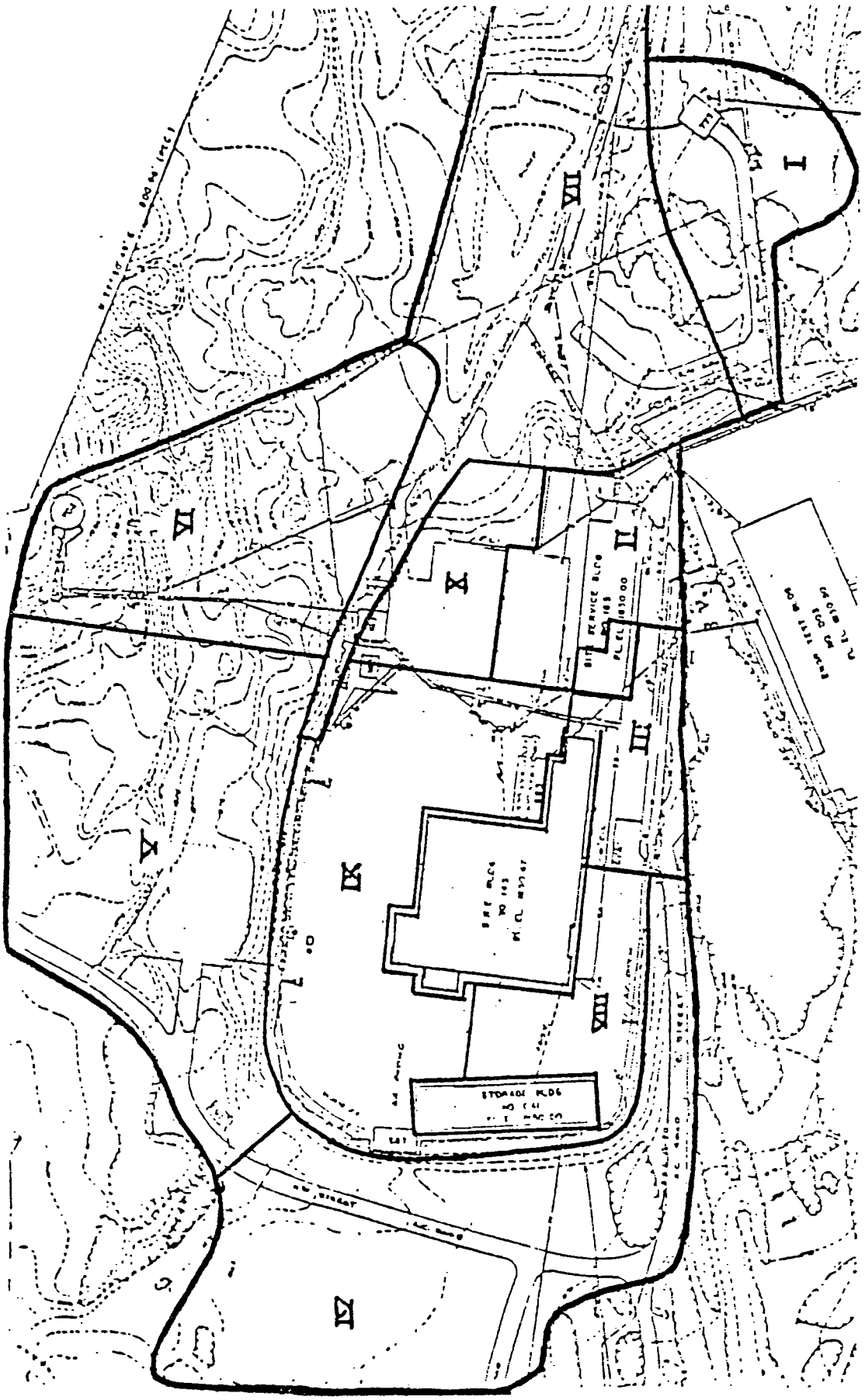

FIGURE 1
SRE FACILITY

The contamination/radiation limits for unrestricted use that were applied in decontaminating this area are shown in Table 1, and the requirements for survey measurements in each region are shown in Table 2.

TABLE 1
RESIDUAL RADIOACTIVITY LIMITS
FOR RELEASE FOR UNRESTRICTED USE

	Total	Removal
Surfaces		
Alpha	100 dpm/100 cm^2	20 dpm/100 cm^2
Beta	0.1 mrad/hr at 1 cm through 7 mg/cm^2 absorber	100 dpm/100 cm^2
Soil	100 pCi/g gross detectable beta	

TABLE 2

SURVEY MEASUREMENT REQUIREMENTS

Region	Removal Contamination	Surface Radiation	Soil Samples	Concrete Samples	Water Samples
I	X	X	X	X	X
II	X	X	X		
III		X			
IV	X	X	X		
V		X	X	X	
VI		X	X		
VII		X	X		X
VIII		X			
IX	X	X	X		
X	X	X	X		
041	X	X			
063	X	X			
143 Offices	X	X			
143 High Bay	X	X	X	X	X

Measurements of removable contamination are omitted from those areas that consist solely of soil or asphalt-paved surfaces

2.0 SURVEYS AND RESULTS

A. SURFACE RADIATION

At the conclusion of the D&D effort, a survey was conducted using three survey instruments, a Technical Associates Model CP-7 ion chamber, a Ludlum Model 12 with a thin-window pancake GM detector, and an Eberline Model PRM-5-3 low-energy gamma detector. The Ludlum GM detector and Eberline low-energy detector were used for their faster response and audible output. The CP-7 showed an average reading of 0.04 mrad/h for Region III which is a typical reading in all uncontaminated areas at Santa Susana. All readings with the CP-7 were below the Table 1 limit of 0.1 mrad/h. Surveys were performed as specified in N704TP99008, "Radiological Survey Plan, Support of D/D Program Operation at T143, SRE," R. K. Owens. Copies of survey results and data sheets are retained by Radiation and Nuclear Safety.

3.0 CONCLUSIONS

In each type of test performed, all samples indicated levels less than those limits prescribed by the Decontamination and Disposition of Facilities Program for release for unrestricted use.

All appropriate surveys indicate that current existing radioactivity in the area is below the applicable limits for release for unrestricted use.

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ABSTRACT

The results of the radiological survey for Region IV (West Parking Lot) of the SRE are described. For Building 133 and its adjacent area, all survey results are below the applicable limits, indicating that this area may be released to unrestricted use. The area adjacent to the storage yard (T654) is conditionally released subject to a final soil sample survey. The area adjacent to T041 is conditionally released subject to a final radiation survey.

CONTENTS

I. INTRODUCTION

This report covers SRE Region IV, located on a rise, west of the main reactor building (Figure 1). Originally, the area was used as an auxiliary parking lot. During the recovery phase after the Core I fuel cladding incident, additional storage area was needed to store radioactive material removed as part of that program. A fenced-in asphalt pad (T654) located on the south edge of the parking area was designated for this purpose. It was meant to be used as a temporary storage area only. Some fissile material had been stored in this location in several different casks. Currently, the area is used for storage of waste material assigned to the RMDF. Its continuing use requires exclusion from this report.

Several spills of contaminated material have occurred in this storage area, and that section of this region was not surveyed for this report. Soil samples outside the area do not indicate any major contamination at the present time. However, since surface drainage from this yard runs into Region IV, some additional surveys will be needed for a final release. Only a conditional release may be made at this time.

The remaining part of this area is under new construction for a Sodium Disposal facility. This building is designated Building 133, and is the upper structure of T724 removed from Region I. Final survey results for this building are included in this report.

It should be noted that construction of this new facility required lowering the overall grade of the parking lot approximately 1 ft. Surveys made at that time did not indicate the presence of any significant contamination. Further, since new soil was exposed, soil samples taken here were designed more to detect run off into the area, rather than old activity. Each location selected was picked for the highest probability based on past activities throughout this region.

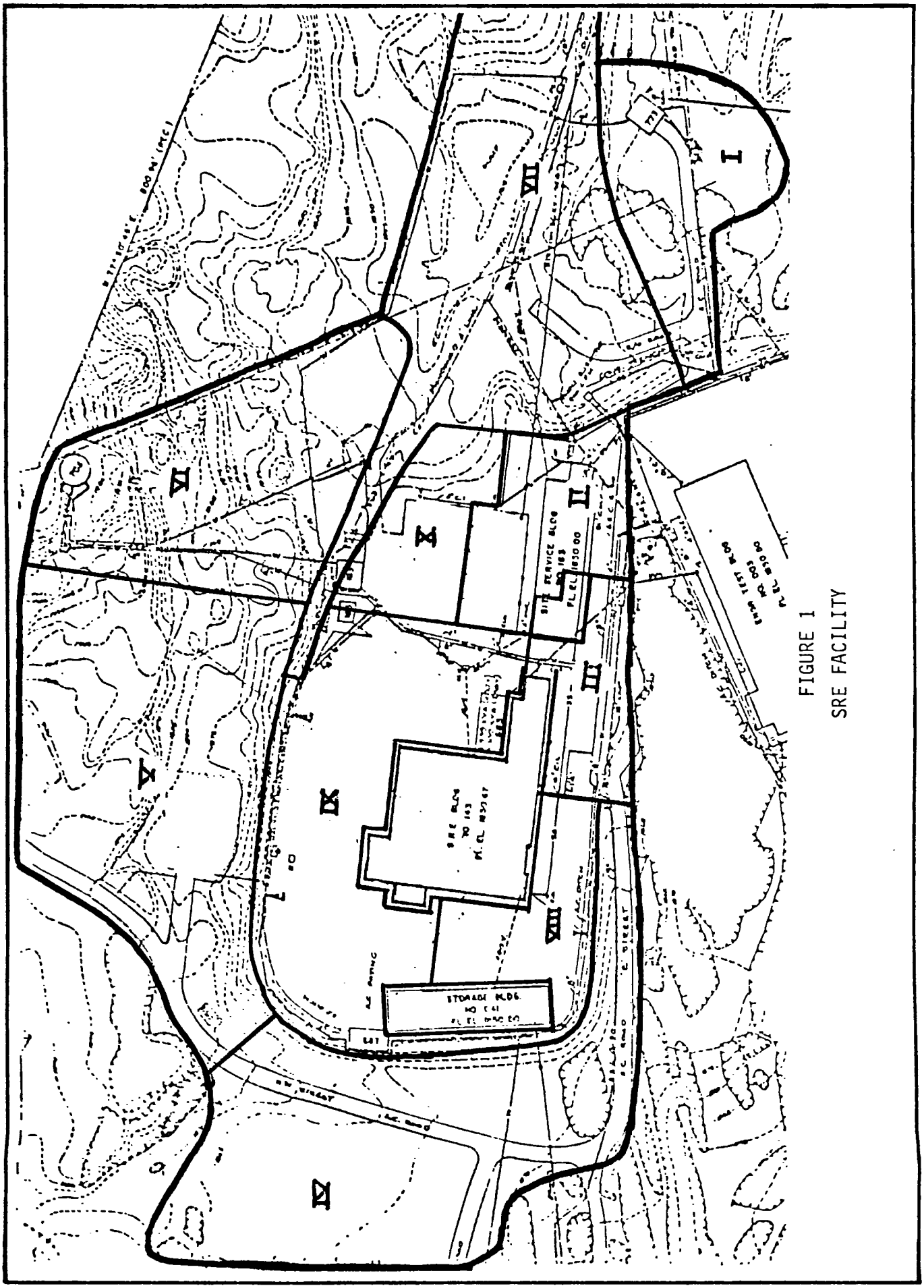

FIGURE 1

SRE FACILITY

II. SURVEY AND RESULTS

A. REMOVABLE CONTAMINATION

Extensive smear tests were made for Building 133 for unrestricted release of the structure from Region I. This building was a part of the Hot Oil Sodium Cleaning facility identified as T724 (see N704TI990027). Additional smears were taken for this report which confirmed the absence of any removable contamination. Whatman filter papers were used for this test and each smear covered approximately 100 cm^2. Locations selected to be smeared were places most likely to have remained contaminated.

All smears for this report were counted on an automatic counting system equipped with a thin window gas proportional detector. This system has a counting efficiency of about 36 percent for Bi-210 activity. A normal background count is approximately 20 counts per minute. Since the system is used in the beta-gamma mode above the alpha plateau, any alpha emitters present would also be detected. The normal efficiency for alpha activity is between 20 and 25 percent.

This area was not subject to contamination by alpha-emitting radionuclides. Therefore, the applicable limit for removable contamination is 100 dpm/100 cm^2 for beta-gamma emitters. All smears were below this limit.

B. SURFACE RADIATION

Two instruments were used for this portion of the report; a Technical Associates Model CP-7 ion chamber detector and a PUG-1A/P-11 probe thin window pancake G-M detector. Several locations experienced "sky shine" from radioactivity outside this region, most significantly along the east edge near Building 041. This building is being used for storage of radioactive waste. Final assessment for surface radiation will be needed here after radiation from Building 041 has been reduced. The maximum reading indicated by the CP-7 ion chamber was 0.6 mrad/hr

along the fence near the building. Readings of 0.1 mrad/hr to 0.15 mrad/hr were recorded atop the hill on the same line with T041. The rest of Region IV indicated average readings of 0.05 mrad/hr. Normal background for this instrument, determined more than 1 mile from the Santa Susana Field Laboratory, was 0.04 mrad/hr.

C. SOIL SAMPLES

Thirty-four soil samples were taken in this region. Wooden stakes were located at points with apparent potential for contamination.

The technique used to determine soil contamination consisted of removing samples from undisturbed top soil. Numbered salve-cans were used for this purpose. A grid network of wooden stakes was spread throughout the region. Each sample spot was modified from the basic plan to account for slope and terrain of the local landscape. Using the can lid as a scoop, soil from various spots located around each sample station was added to the can until it was nearly full. The contents were then mixed thoroughly by shaking. After all samples were collected, each sample can was opened and placed on a hot plate to drive off any moisture present. When dry, a small portion was taken from the can to be sieved through a Coor's sieve (Gooch crucible). From this, a 1-gram portion was transferred onto an aluminum planchette. Alcohol was added and the sample tapped to settle it across the flat surface of the planchette. The sample was then heated to dryness. No chemical binders were added to hold the sample together for counting.

A thin window gas proportional detector operating in the preset count mode was used to count each sample.

A 1-gram prepared KCl standard source (831 dpm) was counted with each group of soil samples. Using the mass-specific activity to calculate detector efficiency accounts for errors associated with self-absorption, backscatter, and the difference between a 2π counter and a 4π source. Thus, based upon the statistical counting error of a single observation, the minimum detection level is approximately 9 pCi at the 95 percent confidence level.

Soil readings varied from 9.4 pCi (new soil) to 80 pCi (near T654) with an average activity concentration between 20-30 pCi.

D. CONCRETE SAMPLES

There are no structures made of concrete within this region. Concrete samples are not applicable for this report.

E. WATER SAMPLES

There are no natural or man-made catch basins to retain water within this region. SRE Surveillance Well 1 was covered during construction activity in this region. Water samples are not applicable for this report.

III. CONCLUSIONS

Building 133 and the immediately surrounding area may be released for unrestricted use on the following basis:

In each type of test performed, all samples indicated levels less than those limits prescribed by the Decontamination and Disposition of Facilities Program for release to unrestricted use.

All appropriate surveys indicate that current existing radioactivity in the area is below the applicable limits for release to unrestricted use.

The area surrounding the storage yard (T654) is conditionally released subject to a final soil sample survey after decontamination and release of T654 or at the termination of the SRE D&D Project.

The area adjacent to T041 is conditionally released subject to a final radiation survey following removal of sources of radiation in T041.

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ABSTRACT

The results of the Radiological Survey for Region V (Gas Storage Vault) of the SRE are described. All survey results are below the applicable limits, indicating that this area may be released to unrestricted use.

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CONTENTS

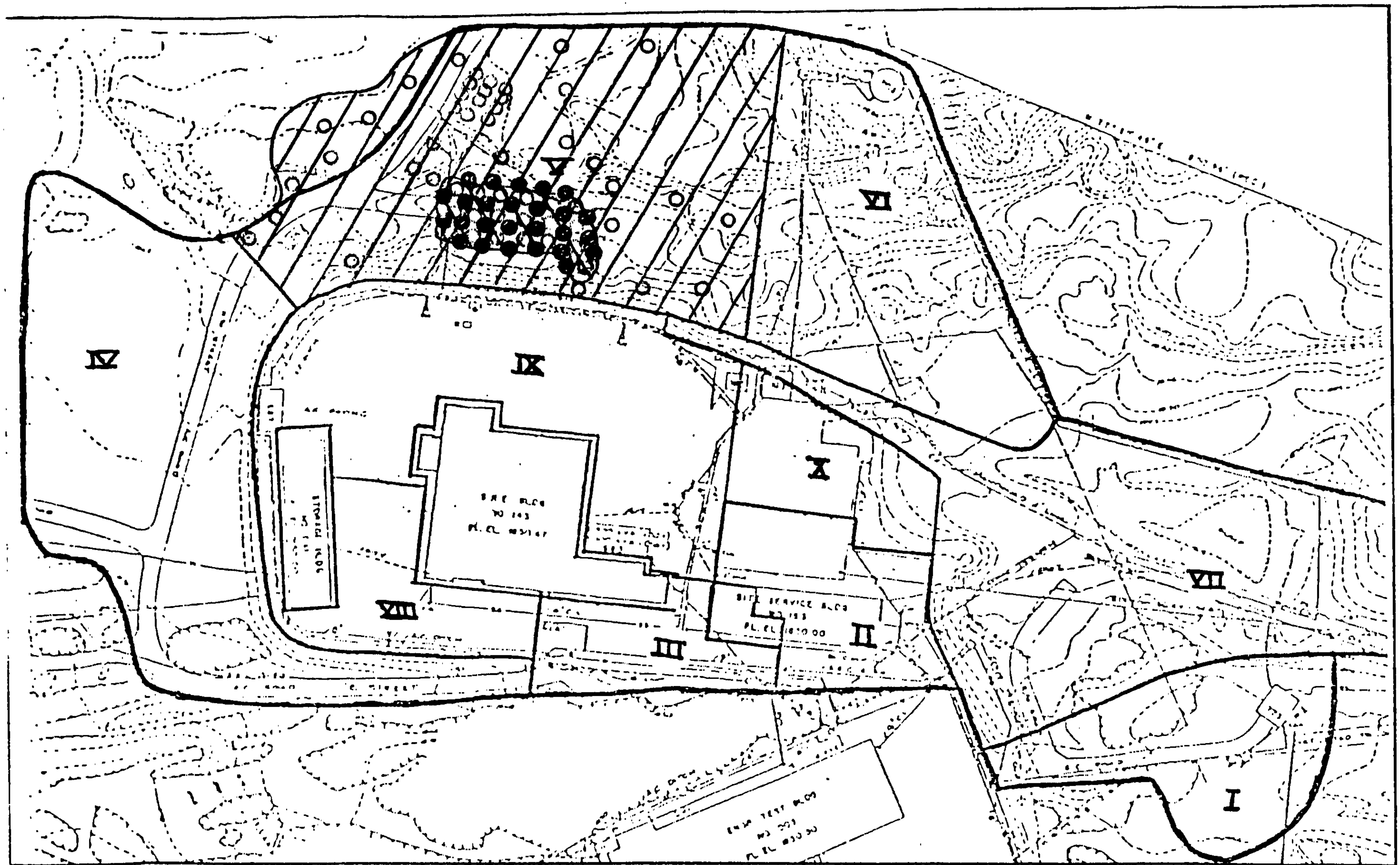
I. INTRODUCTION

This report covers SRE Region V, located north of the main reactor building (see Figure 1). Two facilities were located in this region as part of the reactor support system. They were identified as T686, the Hot Waste Storage area; and T653, Interim Radioactive Waste Vault. During the recovery phase of the reactor program (1961), additional storage space was needed to store irradiated core components, such as moderator cans and dummy fuel elements. A fenced-in asphalt area (T686) was designated for this purpose. During the lifetime of the facility no significant spread of contamination occurred. Principal radioactive material in this area was induced activity, although some mixed fission product (MFP) activity was present from fuel element failures. All material had been wrapped in plastic and placed in wooden boxes before moving to this storage area.

After Area T686 had been certified clean, it was removed by an outside contractor as one of the first facilities to be disposed of under the D&D Program at the SRE.

The second facility located in this region (T653) required extensive radiological support due to the nature of the facility. Four underground gas and two liquid holdup tanks were buried on the hillside. Along with these tanks were several concrete vaults that housed compressors and associated piping systems. Two auxiliary vaults held ten 50-gallon holdup tanks in addition to those tanks underground.

All liquid waste generated by the reactor program was eventually directed to one of the two tanks before final disposal. Principal sources of water were floor drains in the hot cell area, hot sinks in controlled areas, and the fuel element wash station located in the high bay area of the reactor room. The primary activity present in the water was due to MFP.



Surveys: Instrument ////// — Smear ×

FIGURE 1
SRE FACILITY

Excavation \\\\\\

Soil Samples: Surface ○ — Excavation ●

Two systems were used to collect radioactive gases at the SRE: a low volume system primarily from the core cover gas systems, and a larger volume system from all other areas. Gas was routed to one of the decay tanks where short-lived activity could decay. Activation products were the primary isotopes detected in the gas system.

Initial work began with removal of all buried tanks and associated pipes. A back hoe was used to gain access to each tank. Contaminated soil was detected between the liquid holdup tanks and a second location by one of the concrete vaults. This soil was boxed in 39-cubic-foot waste containers and shipped as radioactive waste along with the pipes, valves, and tanks from the building.

After all systems had been removed, further contamination was detected within the concrete walls and floor of one vault. To remove this activity, several inches of concrete had to be spalled away from the vault. This material was also packaged and shipped as waste.

A large number of soil and concrete samples were used to determine that no significant activity remained after all contaminated material had been removed. At this point, the concrete that was left was used as backfill to help stabilize the hillside.

II. SURVEYS AND RESULTS

A. REMOVABLE CONTAMINATION

All structures have been removed from this region. Smear surveys are not applicable for this part of the survey.

B. SURFACE RADIATION

Two survey instruments were used for this part of the report: a Technical Associates Model CP-7 ion chamber detector with an absorber thickness and range required by the specifications for this test, and a Technical Associates Model PUG1/P-11 probe thin window pancake G-M detector. This latter instrument was used to locate any unexpected source using its faster response and audible output.

A complete walk-through inspection was made in all accessible areas in this region. Each meter was held approximately 2-1/2 feet above the ground. Maximum reading recorded on the CP-7 meter was 0.08 (±0.05) mrad/hr along the south side of the region and in line with Building 041. This building, outside of Region V, is used as an interim radioactive waste storage area. Normal background for this instrument, measured more than 1 mile from the test site, is approximately 0.04 mrad/hr. There is an uncertainty of ±10% of full scale on the range used in this measurement.

C. SOIL SAMPLES

Twenty-two soil samples were taken thoughout that part of the region where Building T653 had been located. Forty-two other samples were taken in the remaining portion of the region which included that area where T686 had been located. Locations were selected for sampling by identifying areas most likely to collect and retain residual activity.

Wooden stakes were used to identify each sample point. Small salve cans, numbered to correspond to each sample location, were used to hold each soil sample. Undisturbed top soil from several locations around each station was collected, and when the can was almost full, the contents were shaken throughly to mix each sample.

All soil samples were then placed on a hot plate to drive off any moisture present. After the sample was dry, an aliquot from each sample was passed through a Gooch crucible. From this, a one-gram quantity was transferred to the counting planchette. Alcohol was added, and each sample tapped to uniform thickness. No chemical binders were added to the sample.

A thin window gas proportional counting system with an efficiency of approximately 36% for Bi-210 beta activity was used to count each sample. Normal background for this system is approximately 20 counts per minute. The efficiency of this system for alpha activity operating in the beta mode is 25%.

A one-gram prepared KCl standard was included with each group of samples counted. This sample was then used to determine a corrected efficiency factor. The maximum activity detected in any one sample was 49.3 pCi/g. All remaining samples ranged between 6.6 pCi/g to 40.2 pCi/g. Based upon errors associated with a single observation, the minimum detection level (MDL) is calculated to be approximately 10 pCi/g. The activity of natural uncontaminated soil ranges from about 20 pCi/g to 30 pCi/g.

D. CONCRETE SAMPLES

All structures have been removed from this area. Concrete samples were taken during demolition. All concrete with activity above 100 pCi/g was removed.

E. WATER SAMPLES

There are no locations within this region to entrap and hold water. Water samples are not applicable to this survey.

III. CONCLUSIONS

In each type of test performed, all samples indicated levels less than those limits prescribed by the Decontamination and Disposition of Facilities Program for release to unrestricted use.

All appropriate surveys indicate that current existing radioactivity in the area is below the applicable limits for release to unrestricted use.

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ABSTRACT

The results of the radiological survey for Region VI (Water Tank Area) of the SRE are described. All survey results are below the applicable limits, indicating that this area may be released to unrestricted use.

CONTENTS

Figures

I. INTRODUCTION

This report covers SRE Region VI (see Figure 1), which is made up mainly of sandstone formations, several hundred feet high, northeast of the main reactor complex. The only man-made structure in this region was a large wooden water tank and access stairway. Both of these structures were destroyed by a brush fire some years ago. The water tank stored emergency cooling water for the Edison Company steam generator portion of the Sodium Reactor program. Due to its inaccessibility, no other use was made of this region.

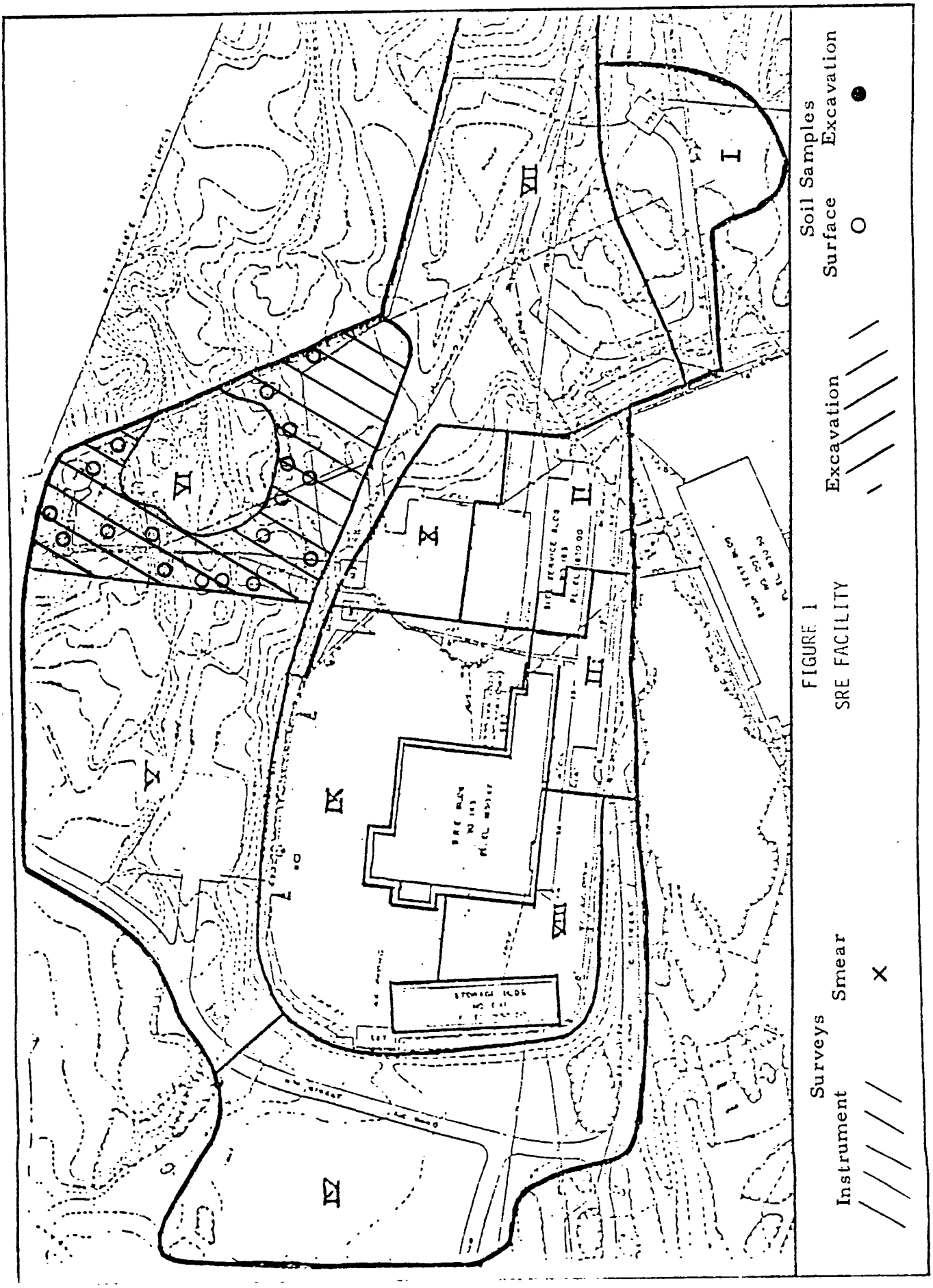

FIGURE 1

SRE FACILITY

II. SURVEYS AND RESULTS

A. REMOVABLE CONTAMINATION

The only structures in this region, a wooden water tank and access stairway, were destroyed by a brush fire after the reactor program was terminated. Smear surveys are not applicable for this part of the survey.

B. SURFACE RADIATION

Two radiation survey instruments were used for this portion of the report. They were a Technical Associates Model CP-7 ion chamber detector and a Technical Associates PUG1A/P-11A probe (a thin window G-M pancake detector). This latter instrument was needed for its faster response and audible output. The CP-7 detector measures absorbed dose and has the range and absorber thickness required by the specifications for this test. Each instrument was held above the natural ground cover brush, approximately 18 in. above the soil.

All accessible locations were checked with particular attention to weeds that might conceal an unexpected radiation source. No locations were found where either instrument indicated a level greater than 0.05 mrad/hr or 75 counts per minute. Such readings are essentially background for these instruments, as measured at a location more than one mile from the test site.

C. SOIL SAMPLES

The majority of this area, consisting of hard sandstone, does not lend itself to standard soil sampling techniques. Each location tested was designed to check for entrapment in depressions under the overhead cliff surfaces. Wooden stakes were not used to identify each location

since a representative pattern could not be established. The highest level detected was 31.6 pCi/g, while an average level of about 22 pCi/g was recorded for this region. A total of 18 samples were taken.

A small salve can was used to collect each sample. At each location to be tested, several small bits of dirt were added to the sample can until it was almost full. The can was then thoroughly shaken to mix the sample contents. All samples were then transferred to a hot plate, set for low temperature, to drive off any moisture present. When dry, a portion was passed through a Gooch crucible and a one-gram sample taken. After weighing, the soil was placed in an aluminum planchette, alcohol added, and the sample tapped until a flat, uniform sample was prepared. No chemical additives were included to bind the sample in place.

A thin window gas proportional automatic counting system was used to count these samples. This system has an efficiency of approximately 35% for a Bi-210 standard beta source. With each group of unknown samples, a prepared 1-gram KCl source was counted to determine the self absorption and counter efficiency factor. Normal background measured by a 10 minute test each day is approximately 22 counts per minute. Based upon the factors described and the uncertainties of a single observation, the minimum detection level is approximately 9 pCi/g at the 95% confidence level. The efficiency for alpha activity in the beta mode is 25%.

D. CONCRETE SAMPLES

The remaining concrete foundations in this area were not sampled since no spills of radioactive material occurred here, and there was no possibility of activation. Concrete samples are not applicable to this part of the survey.

E. WATER SAMPLES

There are no man-made or natural structures to entrap and hold water in this area. Water samples are not applicable to this survey.

III. CONCLUSIONS

In each type of test performed, all samples indicated levels less than those limits prescribed by the Decontamination and Disposition of Facilities Program for release to unrestricted use.

All appropriate surveys indicate that current existing radioactivity in the area is below the applicable limits for release to unrestricted uses.

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SUPPORTING DOCUMENT

GO NO.	S/A NO.	PAGE 1 OF	TOTAL PAGES	REV LTR/CHG NO SEE SUMMARY OF CHG	NUMBER
07704	44650	9	9	NC	N704TI990033

PROGRAM TITLE

Decontamination and Disposition of Facilities

DOCUMENT TITLE

Radiological Survey Results – Release to Unrestricted Use, SRE Region VII

DOCUMENT TYPE

Technical Information

KEY NOUNS

Decontamination

ORIGINAL ISSUE DATE

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5-13-83 HE

APPROVALS DATE

R. J. Tuttle R. J. Tuttle 4/27/83
B. F. Ureda B. F. Ureda 4/22/83
C. C. Conners C. C. Conners 4/25/83
J. M. Marzec
W. R. McCurnin W. R. McCurnin 5/3/83
M. E. Remley M. E. Remley 4 May 83

PREPARED BY/DATE

J. H. Wallace J. H. Wallace

DEPT 779

MAIL ADDR T034

IR&D PROGRAM? YES ☐ NO ☒
IF YES, ENTER TPA NO.

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*	M. E. Remley	NB13
*	R. J. Tuttle	NB13
*	B. F. Ureda	NB02
*	J. H. Wallace	T034

0056Y/reg

* COMPLETE DOCUMENT

NO ASTERISK, TITLE PAGE/SUMMARY OF CHANGE PAGE ONLY

ABSTRACT

The results of the radiological survey for Region VII of the SRE facility are described. All survey results are below the applicable limits, indicating that this area may be released for unrestricted use.

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CONTENTS

TABLES

FIGURES

1.0 INTRODUCTION

This document covers Region VII of the SRE facility (Figure 1). The area contains the retention pond, the old leach field, the sanitary sewer pumping system, and the SRE drainage back to the fence line. It includes the retention pond overflow channel downstream for a distance of about 200 feet.

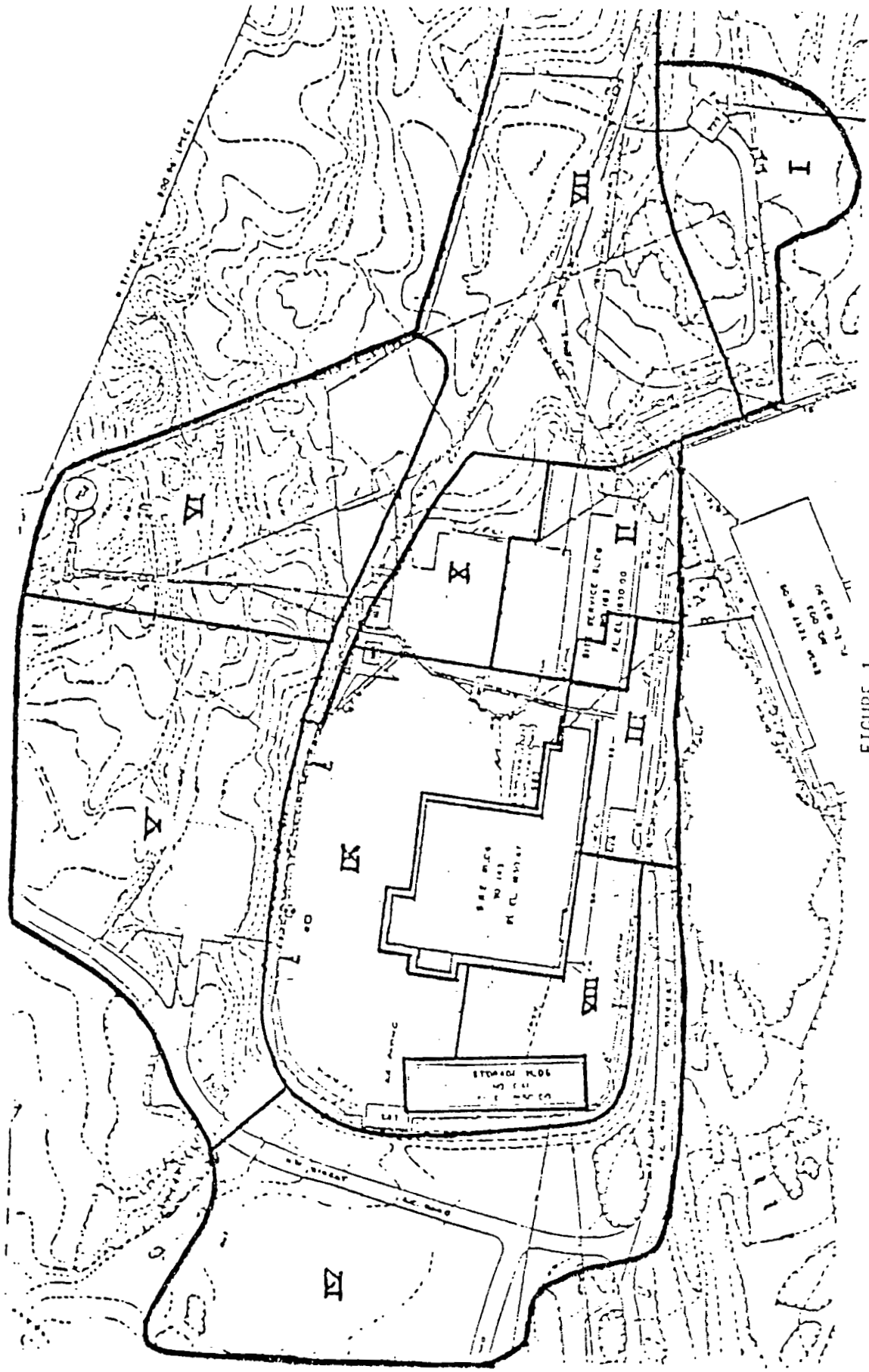

FIGURE 1
SRE FACILITY

The contamination/radiation limits for unrestricted use that were applied in decontaminating this area are shown in Table 1 and the requirements for survey measurements in each region are shown in Table 2.

TABLE 1
RESIDUAL RADIOACTIVITY LIMITS
FOR RELEASE FOR UNRESTRICTED USE

	Total	Removal
Surfaces		
Alpha	100 dpm/100 cm^2	20 dpm/100 cm^2
Beta	0.1 mrad/hr at 1 cm through 7 mg/cm^2 absorber	100 dpm/100 cm^2
Soil	100 pCi/g gross detectable beta	
Water	3 x 10^7 μCi/ml gross detectable beta	

TABLE 2

SURVEY MEASUREMENT REQUIREMENTS

Region	Removal Contamination	Surface Radiation	Soil Samples	Concrete Samples	Water Samples
I	X	X	X	X	X
II	X	X	X		
III		X			
IV	X	X	X		
V		X	X	X	
VI		X	X		
VII		X	X		X
VIII		X			
IX	X	X	X		
X	X	X	X		
041	X	X			
063	X	X			
143 Offices	X	X			
143 High Bay	X	X	X	X	X

Measurements of removable contamination are omitted from those areas that consist solely of soil or asphalt-paved surfaces

2.0 SURVEYS AND RESULTS

The pond was drained in 1979 and allowed to dry out. All areas of the pond bottom that read more than about 100 cpm above background with a pancake G-M probe, or that exceeded 100 pCi/g gross detectable beta activity, were removed and disposed of as radioactive waste. After this decontamination, soil samples were taken and the pond was returned to service.

The results of the pond soil sample analyses are shown in Figure 2, plotted as a log-normal distribution. This distribution is essentially that of natural soil, with a slight amount of residual contamination. No values are above the limit of 100 pCi/g. The mean is 29 pCi/g. The 90% point (indicated by the vertical line) at 1.28 standard deviation above the mean is below the limit, at about 50 pCi/g.

Surveys were performed as specified in N704TP990008, "Radiological Survey Plan, Support of D/D Program Operations at T143, SRE," R. K. Owens. Copies of the survey results and data sheets are retained by Radiation and Nuclear Safety.

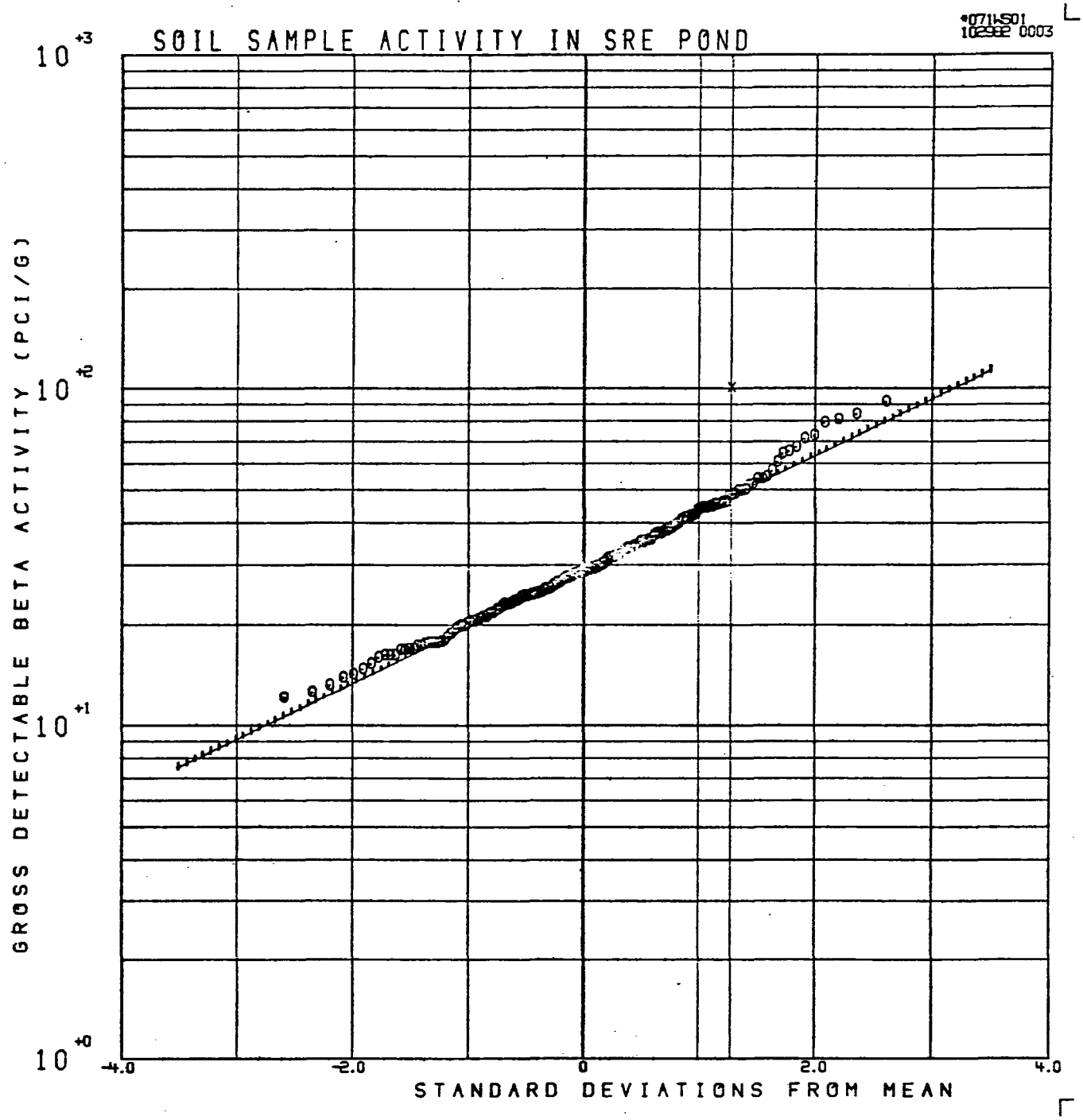

Figure 2. Log-normal distribution of gross detectable beta activity in sediment after cleanup of SRE pond.

3.0 CONCLUSIONS

In each type of test performed, all samples indicated levels less than those limits prescribed by the Decontamination and Disposition of Facilities Program for release for unrestricted use.

All appropriate surveys indicate that current existing radioactivity in the area is below the applicable limits for release for unrestricted use.

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SUPPORTING DOCUMENT

GO NO.	S/A NO.	PAGE 1 OF	TOTAL PAGES	REV LTR/CHG NO SEE SUMMARY OF CHG	NUMBER
07704	44650	8	8	NC	N704TI990034

PROGRAM TITLE

Decontamination and Disposition of Facilities

DOCUMENT TITLE

Radiological Survey Results — Release to Unrestricted Use, SRE Region VIII

DOCUMENT TYPE

Technical Information

KEY NOUNS

Decontamination

ORIGINAL ISSUE DATE

REL. DATE

5-13-83

PREPARED BY/DATE

J. H. Wallace

DEPT: 779

MAIL ADDR: T034

IR&D PROGRAM? YES ☐ NO ☒

IF YES, ENTER TPA NO.

APPROVALS

	DATE
R. J. Tuttle	4/27/83
B. F. Ureda	4/22/83
C. C. Conners	4/25/83
J. M. Marzec	
W. R. McCurnin	5/4/83
M. E. Remley	4 May 83

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*	R. J. Tuttle	NB13
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0057Y/reg

* COMPLETE DOCUMENT

NO ASTERISK, TITLE PAGE/SUMMARY OF CHANGE PAGE ONLY

ABSTRACT

The results of the radiological survey for Region VIII of the SRE facility are described. All survey results are below the applicable limits, indicating that this area may be released for unrestricted use.

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CONTENTS

TABLES

FIGURES

1.0 INTRODUCTION

This document covers Region VIII of the SRE facility (Figure 1). The area consists of the paving to the south and west of Building 143 to approximately the enclosure for T1/T2 and T3 pits. It includes the drainage channel along the southwest to south edge of the paved area.

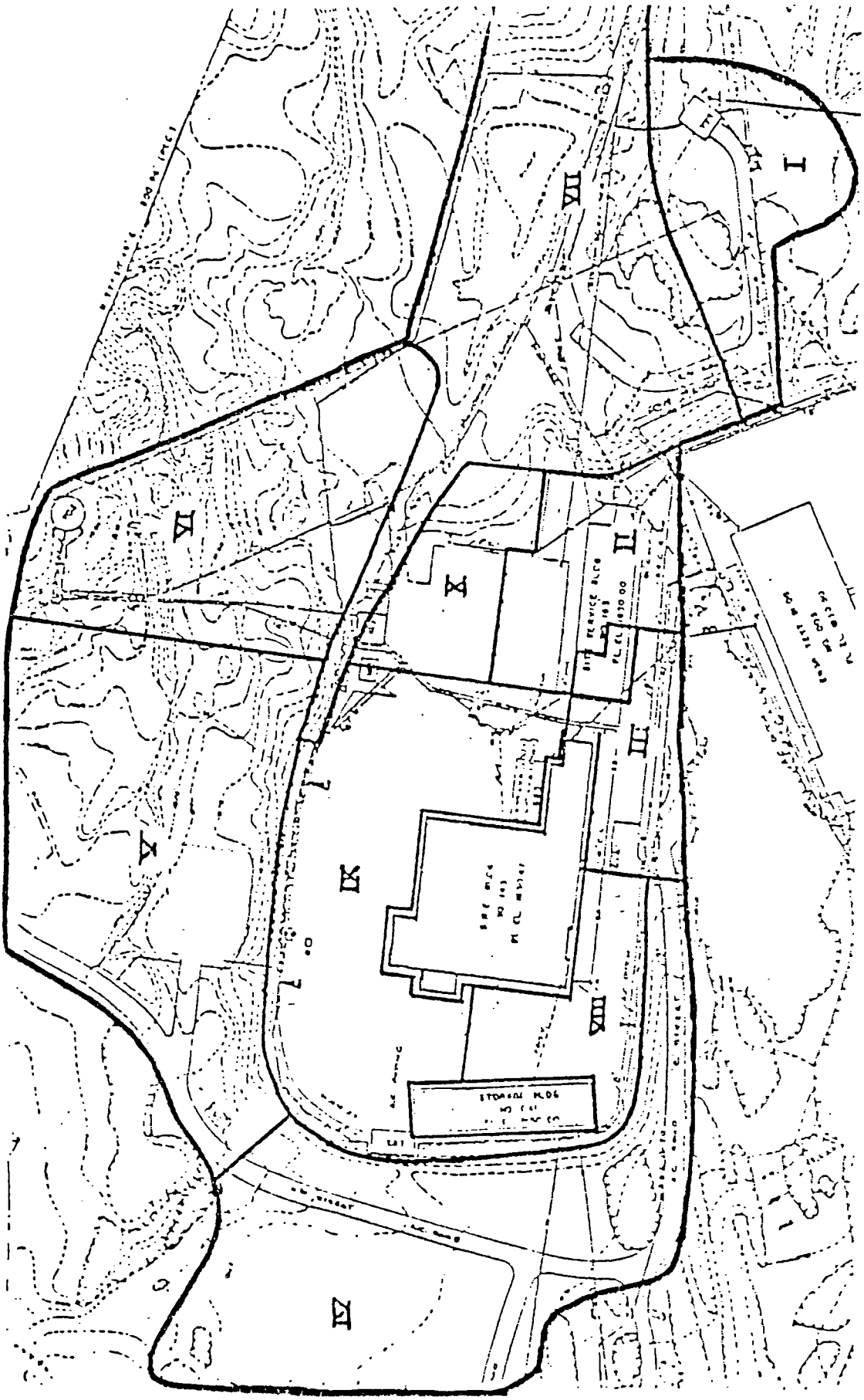

FIGURE 1
SRE FACILITY

The contamination/radiation limits for unrestricted use that were applied in decontaminating this area are shown in Table 1 and the requirements for survey measurements in each region are shown in Table 2.

TABLE 1
RESIDUAL RADIOACTIVITY LIMITS
FOR RELEASE FOR UNRESTRICTED USE

	Total	Removal
Surfaces		
Alpha	100 dpm/100 cm^2	20 dpm/100 cm^2
Beta	0.1 mrad/hr at 1 cm through 7 mg/cm^2 absorber	100 dpm/100 cm^2
Soil	100 pCi/g gross detectable beta	

TABLE 2

SURVEY MEASUREMENT REQUIREMENTS

Region	Removal Contamination	Surface Radiation	Soil Samples	Concrete Samples	Water Samples
I	X	X	X	X	X
II	X	X	X		
III		X			
IV	X	X	X		
V		X	X	X	
VI		X	X		
VII		X	X		X
VIII		X			
IX	X	X	X		
X	X	X	X		
041	X	X			
063	X	X			
143 Offices	X	X			
143 High Bay	X	X	X	X	X

Measurements of removable contamination are omitted from those areas that consist solely of soil or asphalt-paved surfaces

2.0 SURVEYS AND RESULTS

A. SURFACE RADIATION

At the conclusion of the D&D effort, a survey was conducted using three survey instruments, a Technical Associates Model CP-7 ion chamber, a Ludlum Model 12 with a thin-window pancake GM detector, and an Eberline Model PRM-5-3 low-energy gamma detector. The Ludlum GM detector and Eberline low-energy detector were used for their faster response and audible output. The CP-7 showed an average reading of 0.04 mrad/h for Region VIII which is a typical reading in all uncontaminated areas at Santa Susana. All readings with the CP-7 were below the Table 1 limit of 0.1 mrad/h. Surveys were performed as specified in N704TP99008, "Radiological Survey Plan, Support of D/D Program Operation at T143, SRE," R. K. Owens. Copies of survey results and data sheets are retained by Radiation and Nuclear Safety.

3.0 CONCLUSIONS

In each type of test performed, all samples indicated levels less than those limits prescribed by the Decontamination and Disposition of Facilities Program for release for unrestricted use.

All appropriate surveys indicate that current existing radioactivity in the area is below the applicable limits for release for unrestricted use.

XI

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SUPPORTING DOCUMENT

GO NO.	S/A NO.	PAGE 1 OF	TOTAL PAGES	REV LTR/CHG NO SEE SUMMARY OF CHG	NUMBER
07704	44650	8	8	NC	N704TI990035

PROGRAM TITLE

Decontamination and Disposition of Facilities

DOCUMENT TITLE

Radiological Survey Results – Release to Unrestricted Use, SRE Region IX

DOCUMENT TYPE

Technical Information

KEY NOUNS

Decontamination

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REL. DATE

5-3-83

APPROVALS DATE

R. J. Tuttle R J Tuttle 5/2/83
B. F. Ureda B F Ureda 5/4/83
C. C. Conners C. C. Conners 5/5/83
J. M. Marzec
W. R. McCurnin W R McCurnin 5/12/83 for WRM
M. E. Remley M E Remley 18 May 83

PREPARED BY/DATE — DEPT — MAIL ADDR

J. H. Wallace — J. H. Wallace — 779 — T034

IR&D PROGRAM? YES ☐ NO ☒
IF YES, ENTER TPA NO.

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*	J. H. Wallace	T034

0058Y/reg

* COMPLETE DOCUMENT

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ABSTRACT

The results of the radiological survey for Region IX of the SRE facility are described. All survey results are below the applicable limits, indicating that this area may be released for unrestricted use.

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CONTENTS

TABLES

FIGURES

1.0 INTRODUCTION

This document covers Region IX of the SRE facility (Figure 1). The area consists of the paved area surrounding the northern portion of Building 143 and includes the drainage path along the north side of the fence.

Radiological surveys were performed in conformance with N704TP990008, "Radiological Survey Plan Support of D/D Operations at T-143 (SRE)", R. K. Owens.

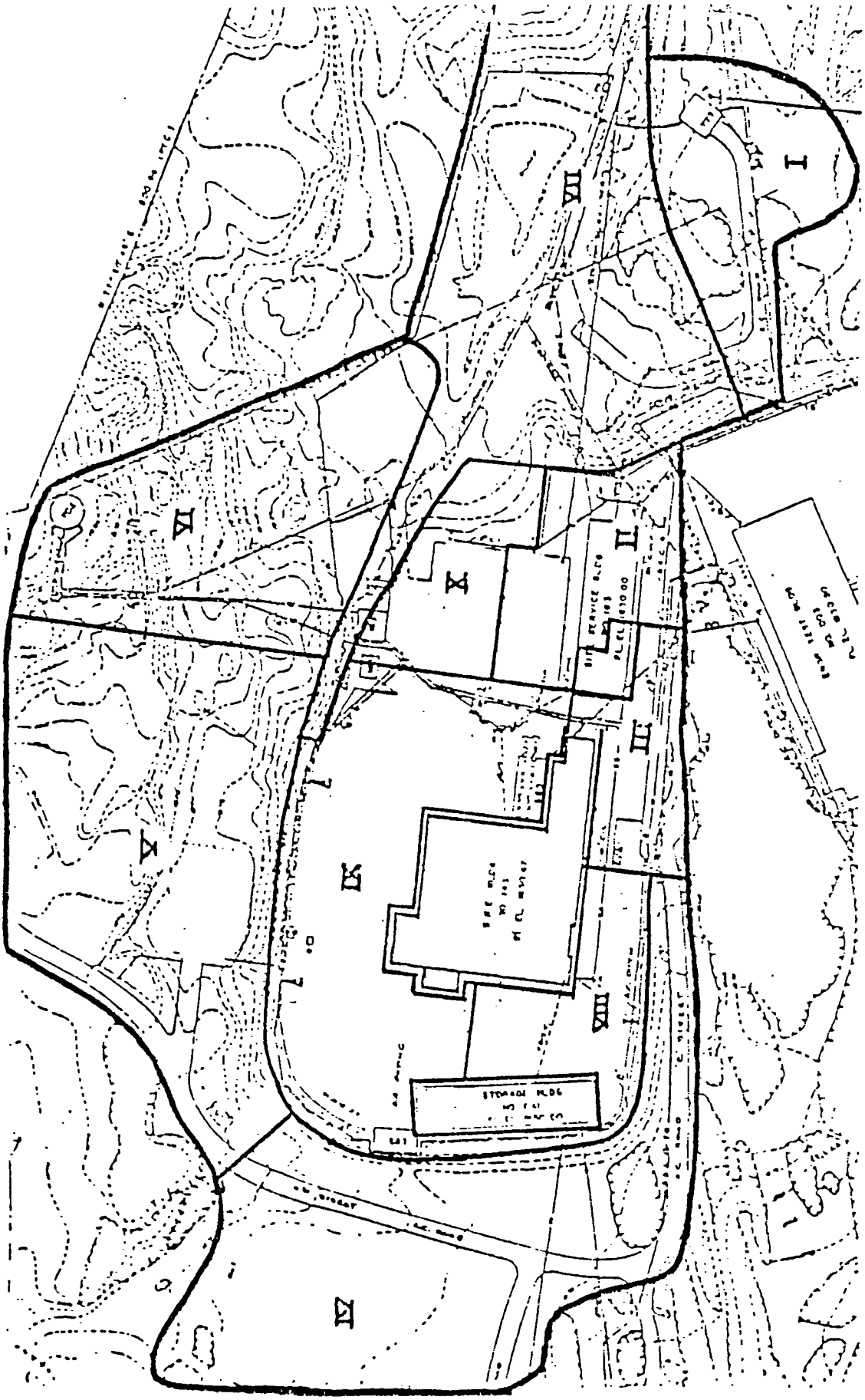

FIGURE 1
SRE FACILITY

The contamination/radiation limits for unrestricted use that were applied in decontaminating this area are shown in Table 1 and the requirements for survey measurements in each region are shown in Table 2.

TABLE 1
RESIDUAL RADIOACTIVITY LIMITS
FOR RELEASE FOR UNRESTRICTED USE

	Total	Removal
Surfaces		
Alpha	100 dpm/100 cm^2	20 dpm/100 cm^2
Beta	0.1 mrad/hr at 1 cm through 7 mg/cm^2 absorber	100 dpm/100 cm^2
Soil	100 pCi/g gross detectable beta	

TABLE 2

SURVEY MEASUREMENT REQUIREMENTS

Region	Removable Contamination	Surface Radiation	Soil Samples	Concrete Samples	Water Samples
I	X	X	X	X	X
II	X	X	X		
III		X			
IV	X	X	X		
V		X	X	X	
VI		X	X		
VII		X	X		X
VIII		X			
IX	X	X	X		
X	X	X	X		
041	X	X			
163	X	X			
143 Offices	X	X			
143 High Bay	X	X	X	X	X

Measurements of removable contamination are omitted from those areas that consist solely of soil or asphalt-paved surfaces.

2.0 SURVEYS AND RESULTS

A. REMOVABLE CONTAMINATION

At the conclusion of the D&D effort and after this region was surveyed for surface radiation plus soil sampling, it was decided that smear surveys were not applicable, because of the absence of suitable surfaces to smear.

B. SURFACE RADIATION

For this part of the survey three instruments were used, a Technical Associates Model CP-7 ion chamber, a Ludlum Model 12 with a thin-window pancake GM detector, and an Eberline Model PRM-5-3 low-energy gamma detector. The Ludlum GM detector and Eberline low-energy detector were used for their faster response and audible output. The CP-7 showed an average reading of 0.04 mrad/h for Region IX, which is a typical reading in all uncontaminated areas at Santa Susana. All readings with the CP-7 were below the Table 1 limit of 0.1 mrad/h.

C. SOIL SAMPLES

One hundred and eight soil samples were processed during the D&D effort for this region, including the drainage path. All soil samples were counted on a Nuclear Measurements Corporation automatic counting system with a KCl standard, with an average efficiency factor of 3.3 and an average background of 25-29 cpm.

The maximum soil activity remaining was 98 pCi/g, with an average of 33 pCi/g. The natural soil activity is approximately 28 pCi/g.

3.0 CONCLUSIONS

In each type of test performed, all samples indicated levels less than those limits prescribed by the Decontamination and Disposition of Facilities Program for release for unrestricted use.

All appropriate surveys indicate that current existing radioactivity in the area is below the applicable limits for release for unrestricted use.

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SUPPORTING DOCUMENT

GO NO.	S/A NO.	PAGE 1 OF	TOTAL PAGES	REV LTR/CHG NO SEE SUMMARY OF CHG	NUMBER
07704	44650	8	8	NC	N704TI990036

PROGRAM TITLE

Decontamination and Disposition of Facilities

DOCUMENT TITLE

Radiological Survey Results — Release to Unrestricted Use, SRE Region X

DOCUMENT TYPE	KEY NOUNS
Technical Information	Decontamination

ORIGINAL ISSUE DATE	REL. DATE
	5-31-83 RC

PREPARED BY/DATE — DEPT — MAIL ADDR

J. H. Wallace — 779 — T034

IR&D PROGRAM? YES ☐ NO ☒
IF YES, ENTER TPA NO.

APPROVALS — DATE

R. J. Tuttle — 1/27/83
B. F. Ureda — 5/4/83
C. C. Conners — 5/5/83
J. M. Marzec
W. R. McCurnin — 5/17/83 for WRMcC
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*	R. J. Tuttle	NB13
*	B. F. Ureda	NB02
*	J. H. Wallace	T034

0059Y/req

* COMPLETE DOCUMENT

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ABSTRACT

The results of the radiological survey for Region X of the SRE facility are described. All survey results are below the applicable limits, indicating that this area may be released for unrestricted use.

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CONTENTS

TABLES

FIGURES

1.0 INTRODUCTION

This document covers Region X of the SRE faicility (Figure 1). This area is now in use as a parking lot and/or storage area and includes the natural ground to the east of Building 143.

Radiological surveys were performed in conformance with N704TP990008, "Radiological Survey Plan Support of D/D Operations at T-143 (SRE)", R. K. Owens.

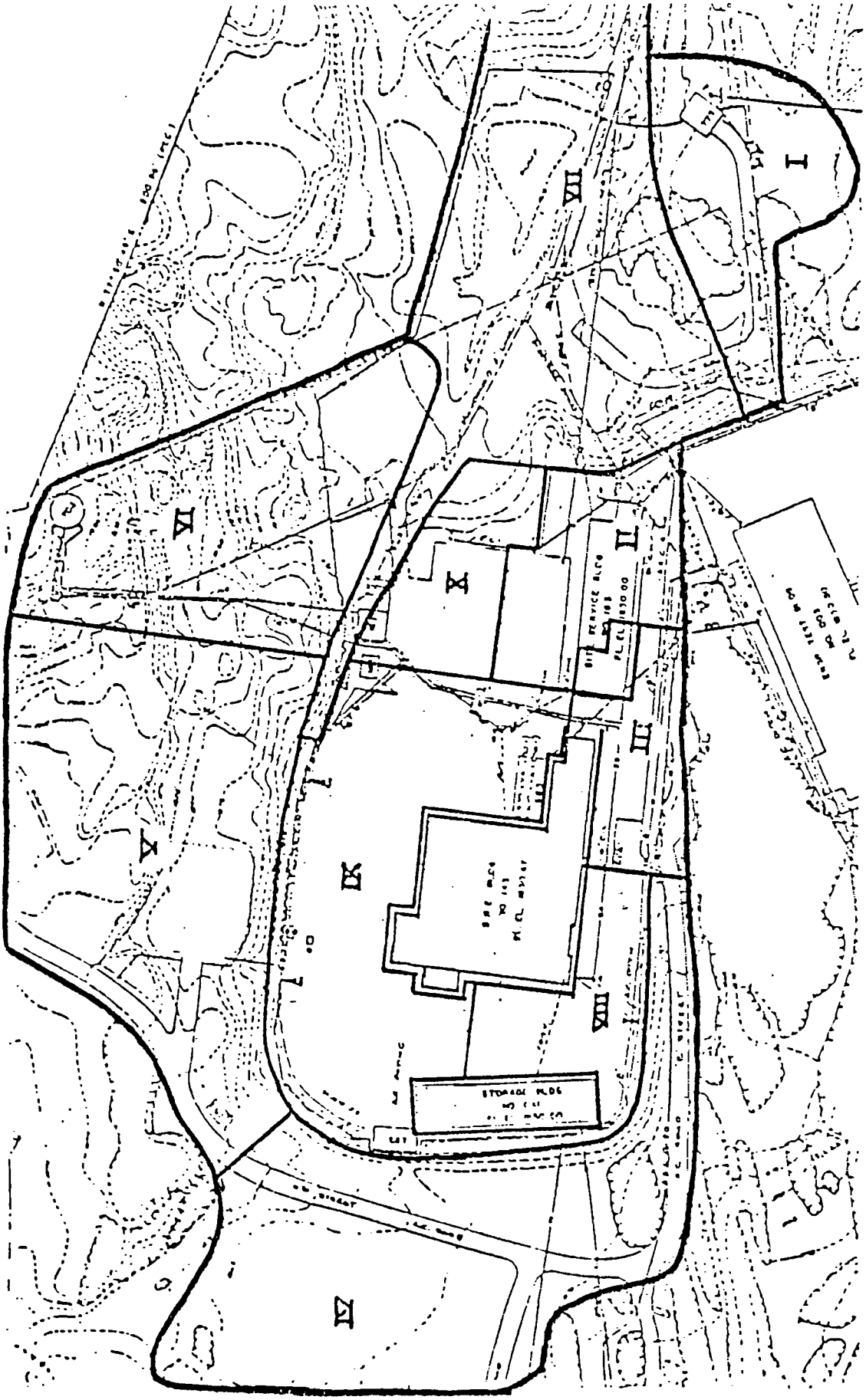

FIGURE 1
SRE FACILITY

The contamination/radiation limits for unrestricted use that were applied in decontaminating this area are shown in Table 1 and the requirements for survey measurements in each region are shown in Table 2.

TABLE 1
RESIDUAL RADIOACTIVITY LIMITS
FOR RELEASE FOR UNRESTRICTED USE

	Total	Removal
Surfaces		
Alpha	100 dpm/100 cm^2	20 dpm/100 cm^2
Beta	0.1 mrad/hr at 1 cm through 7 mg/cm^2 absorber	100 dpm/100 cm^2
Soil	100 pCi/g gross detectable beta	

TABLE 2

SURVEY MEASUREMENT REQUIREMENTS

Region	Removable Contamination	Surface Radiation	Soil Samples	Concrete Samples	Water Samples
I	X	X	X	X	X
II	X	X	X		
III		X			
IV	X	X	X		
V		X	X	X	
VI		X	X		
VII		X	X		X
VIII		X			
IX	X	X	X		
X	X	X	X		
041	X	X			
163	X	X			
143 Offices	X	X			
143 High Bay	X	X	X	X	X

Measurements of removable contamination are omitted from those areas that consist solely of soil or asphalt-paved surfaces.

2.0 SURVEYS AND RESULTS

A. REMOVABLE CONTAMINATION

Smear surveys for this region were not applicable and were replaced by soil sampling.

B. SURFACE RADIATION

For this part of the survey, a Ludlum Model 12S Micro-R meter was used. An average reading of 10 μR/h was recorded for this region. No readings differed significantly from background.

C. SOIL SAMPLES

Twenty-five soil samples were processed for this region, all below 30 pCi/g gross detectable beta. All soil samples were counted on a Nuclear Measurements Corporation automatic counting system with a KCl standard with an efficiency factor of 3.2 and a background of 25.6 cpm.

The maximum soil activity found was 28 pCi/g with an average of 25 pCi/g.

3.0 CONCLUSIONS

In each type of test performed, all samples indicated levels less than those limits prescribed by the Decontamination and Disposition of Facilities Program for release for unrestricted use.

All appropriate surveys indicate that current existing radioactivity in the area is below the applicable limits for release for unrestricted use.

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SUPPORTING DOCUMENT

GO NO.	S/A NO.	PAGE 1 OF	TOTAL PAGES	REV LTR/CHG NO SEE SUMMARY OF CHG	NUMBER
07704	44650	8	8	NC	N704TI990037

PROGRAM TITLE

Decontamination and Disposition of Facilities

DOCUMENT TITLE

Radiological Survey Results--Release to Unrestricted Use, SRE, Building 041

DOCUMENT TYPE	KEY NOUNS
Technical Information	Decontamination

ORIGINAL ISSUE DATE	REL. DATE
	11/9/82

PREPARED BY/DATE	DEPT	MAIL ADDR
J. H. Wallace	779	T-143

IR&D PROGRAM? YES ☐ NO ☒
IF YES, ENTER TPA NO.

APPROVALS	DATE
R. J. Tuttle	10/26/82
B. F. Ureda	10-29-82
C. C. Conners	10/29/82
J. M. Marzec	11/1/82
W. R. McCurnin	11/3/82
M. E. Remley	

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*	R. J. Tuttle	NB13
*	B. F. Ureda	NB02
*	J. H. Wallace	T034

779-C.46/paw

* COMPLETE DOCUMENT

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ABSTRACT

The results of the radiological survey for Building 041, the SRE Facility, are described. All survey results are below the applicable limits, indicating that this area may be released to unrestricted use.

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FORM 734-C REV. 12-79

CONTENTS

TABLE

FIGURES

I. INTRODUCTION

This document covers Building 041, SRE component storage, located west of the main building in the SRE complex. The building is a Butler building structure, approximately 138 ft x 28 ft.

Decontamination and disposition of Building 041 began in August 1982, and the building was available for release for unrestricted use on September 17, 1982. The only major operation performed was scabbling of the floor area.

All radioactive material was packaged for shipment to offsite land burial.

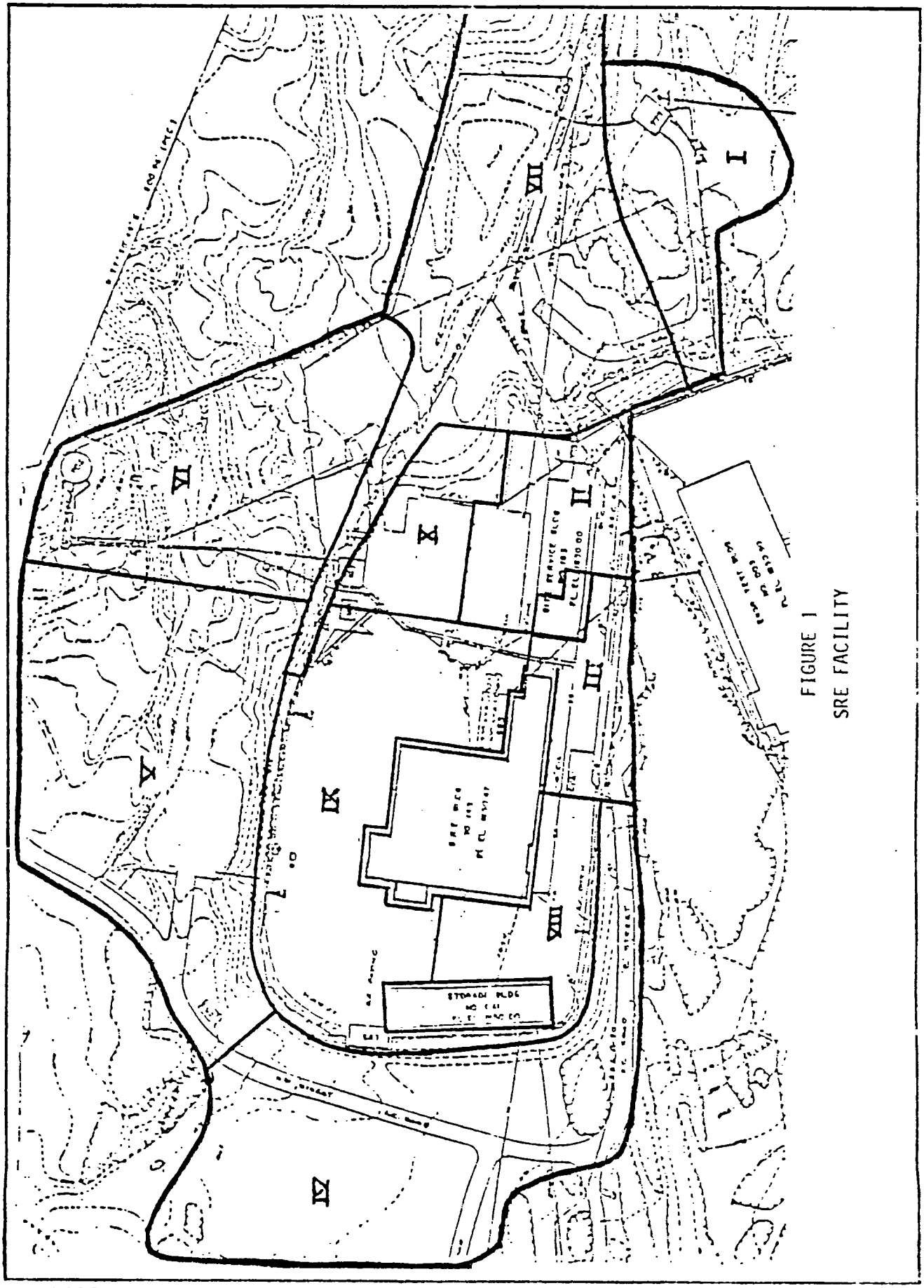
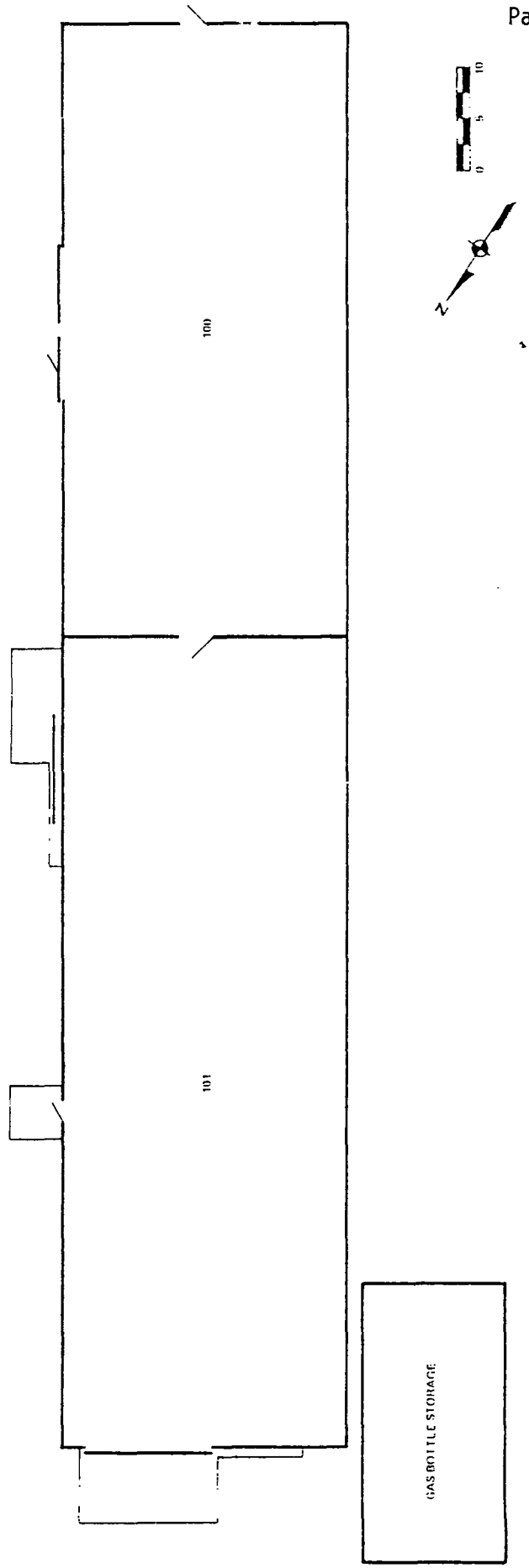


FIGURE 1
SRE FACILITY



SRL COMPONENT STORAGE
BUILDING 041

II. SURVEYS AND RESULTS

A. REMOVABLE CONTAMINATION

Two hundred smears were taken on surfaces throughout the interior of the building. Results of smear surveys were documented at less than 5 dpm alpha and less than 30 dpm beta-gamma.

All smears were counted for alpha and beta-gamma on a Nuclear Measurements Corporation automatic counting system. This system is checked daily with calibrated sources for efficiency. The background for alpha is 0-1 cpm with an average efficiency factor of 3.6. Background for beta is 25-29 cpm with an average efficiency factor of 3.8. Alpha contamination was not suspected for this area. However, had any occurred, it would have been detected with this counting system.

B. SURFACE RADIATION

At the conclusion of the D&D effort, a survey was conducted using three survey instruments: a Technical Associates Model CP-7 ion chamber detector, an Eberline Model PRM-5-3 low-energy gamma detector, and a Ludlum Model 12 with a thin window pancake GM detector. The low-energy gamma detector and Ludlum GM detector were used for the faster response and audible output. An average background reading of 0.03 mrad/hr was recorded inside the middle of Building 041, which is a typical reading with this instrument in uncontaminated areas. All readings with the CP-7 were below the Table 1 limit of 0.1 mrad/hr.

C. SOIL SAMPLES

The area outside Building 041 is covered with asphalt paving; therefore, soil samples were not required.

TABLE 1

CONTAMINATION/RADIATION LIMITS

Removable Contamination
20 dpm/100 cm^2 alpha
100 dpm/100 cm^2 beta
Total Contamination (Removable Plus Fixed)
100 dpm/100 cm^2 alpha
0.1 mrad/hr at 1 cm through a 7 mg/cm^2 absorber

D. CONCRETE SAMPLES

After the concrete floor had been scabbled and surveyed with the T/A CP-7, the low-energy gamma detector and the Ludlum GM detector, it was decided concrete samples were not required.

E. WATER SAMPLES

There are no natural or manmade catch basins for water in this area; therefore, water samples were not required.

III. CONCLUSIONS

In each type of test performed, all samples indicated levels less than those limits prescribed by the decontamination and disposition of facilities program for release for unrestricted use.

All appropriate surveys indicate that current existing radioactivity in the area is below the applicable limits for release for unrestricted use.

Rockwell International
Energy Systems Group

SUPPORTING DOCUMENT

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ABSTRACT

The results of the radiological survey for Building 143 of the SRE facility are described. All survey results are below the applicable limits, showing that this area may be released for unrestricted use.

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TABLES

FIGURES

I. INTRODUCTION

This document covers the final release survey of Building 143, the major reactor building of the SRE facility. This survey covers the following areas:

1) Below grade – Hot cell working area
2) High bay – Floor, walls, ceiling
3) Overhead bridge cranes (65 ton and 5 ton)
4) R/A exhaust systems
5) Mezzanine offices
6) Main floor offices
7) Main floor support areas.

The ground level layout of the operating facility is shown in Figure 1. The mezzanine, consisting solely of offices, and the basement, comprising the hot cell operating area, are shown in Figure 2.

Radiological surveys were performed in conformance with N704TP990008, "Radiological Survey Plan Support of D/D Operations at T-143 (SRE)", R. K. Owens.

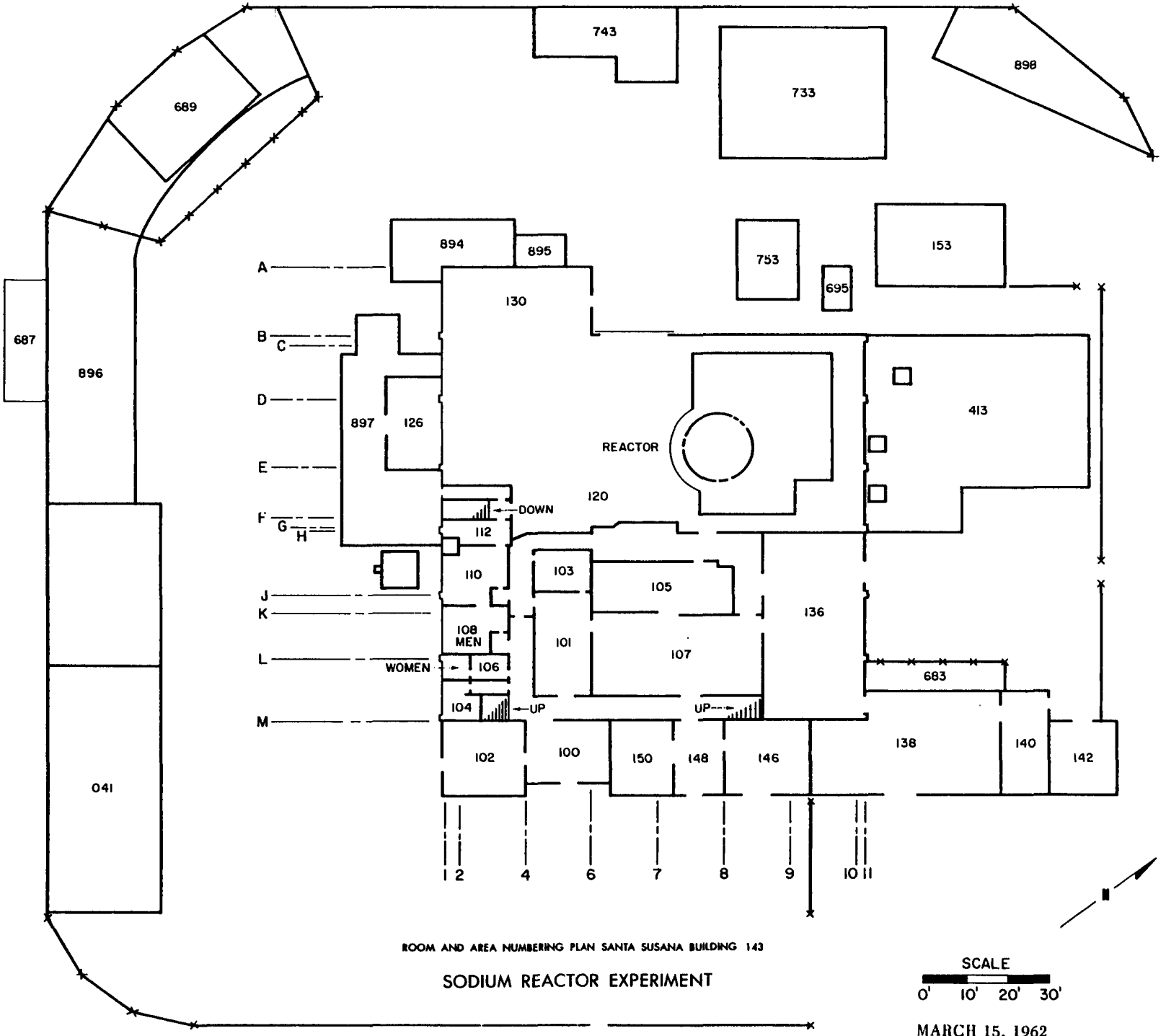

FIGURE 1. SRE Facilities, Ground Floor

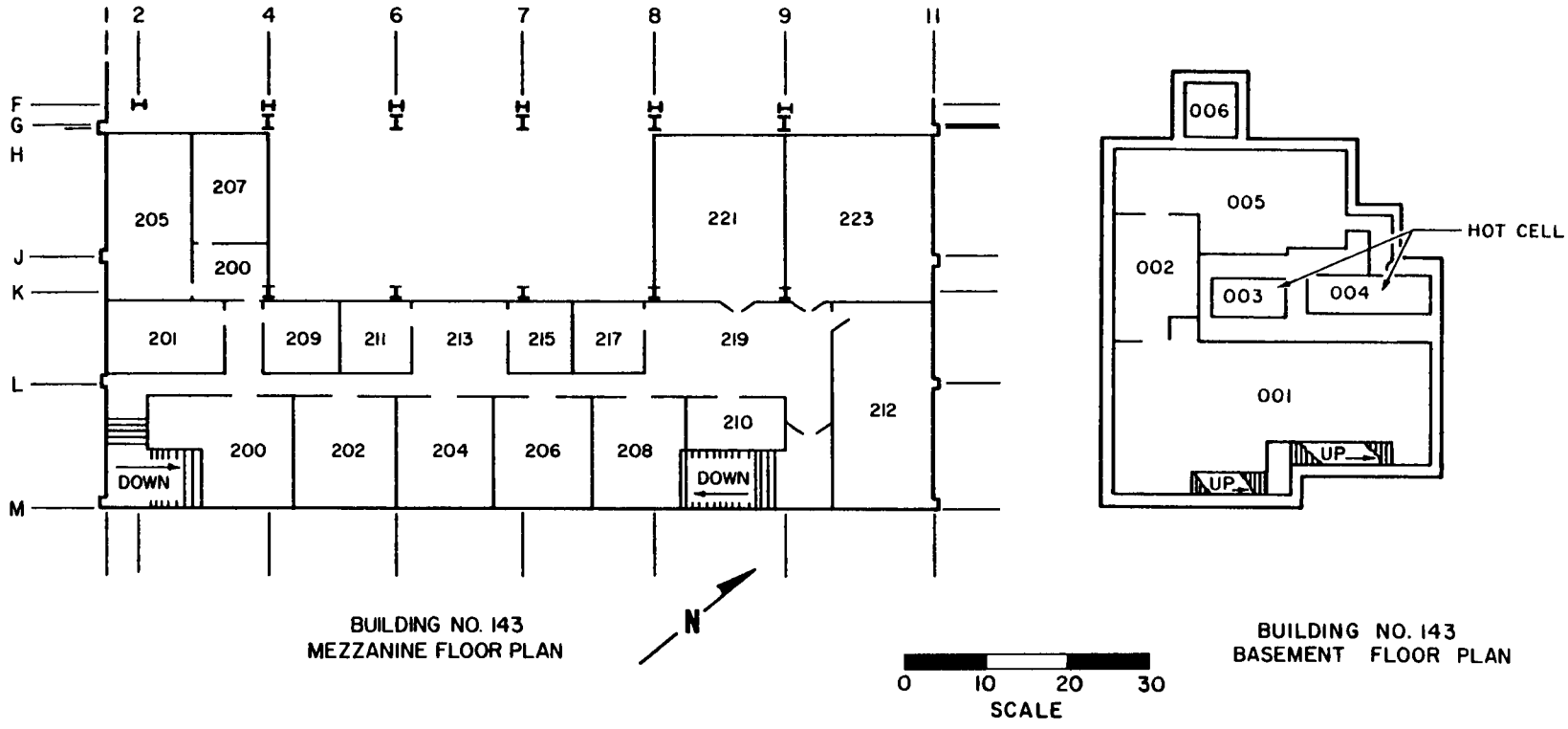

FIGURE 2. SRE Facility, Mezzanine and Basement

The contamination/radiation limits for unrestricted use that were applied in decontaminating this area are shown in Table 1 and the requirements for survey measurements in each region are shown in Table 2.

TABLE 1
RESIDUAL RADIOACTIVITY LIMITS
FOR RELEASE FOR UNRESTRICTED USE

	Total	Removal
Surfaces		
Alpha	100 dpm/100 cm^2	20 dpm/100 cm^2
Beta	0.1 mrad/hr at 1 cm through 7 mg/cm^2 absorber	100 dpm/100 cm^2
Soil	100 pCi/g gross detectable beta	
	1000 pCi/g gross detectable beta average below 3 m	
	3000 pCi/g gross detectable beta in isolated cracks below 3 m	

TABLE 2

SURVEY MEASUREMENT REQUIREMENTS

Region	Removal Contamination	Surface Radiation	Soil Samples	Concrete Samples	Water Samples
I	X	X	X	X	X
II	X	X	X		
III		X			
IV	X	X	X		
V		X	X	X	
VI		X	X		
VII		X	X		X
VIII		X			
IX	X	X	X		
X	X	X	X		
041	X	X			
063	X	X			
143 Offices	X	X			
143 High Bay	X	X	X	X	X

Measurements of removable contamination are omitted from those areas that consist solely of soil or asphalt-paved surfaces

II. SURVEYS AND RESULTS

A. SURFACE RADIATION – BELOW GRADE

Below Grade, Hot Cell Working Area. Radiation surveys were conducted using three survey instruments: A Technical Associates Model CP-7 ion chamber detector, a Technical Associates PUG-1 with a thin-window pancake GM detector for its faster response and audible output and a Ludlum Model-12 alpha scintillator detector. All surface radiation readings with the T/A CP-7 were below the Table 1 limit of 0.1 mrad/h with quality assurance verification.

B. SOIL SAMPLES

All below-grade soil samples were less than 100 pCi/g per the quality assurance verification sampling plan. All soil samples were counted in a Nuclear Measurements Corporation automatic counting system with a KCl standard, with an average background of 25-28 cpm. The maximum soil activity was 96 pCi/g with an average of 51 pCi/g.

C. SURFACE RADIATION – HIGH BAY

A total of 120, one-meter-square grids were selected for the final high bay survey. Survey instruments used for each individual grid were:

1) Ludlum Model 12S Micro-R-Meter with a NaI scintillator for gamma rays. A background reading was recorded at one meter away from each grid plus a grid surface reading. An average background reading for the high bay was 8 μR/h and an average of 10 μR/h for grid surfaces.
2) Technical Associates Model CP-7 ion chamber. An average background reading for the high bay was 0.04 mrad/h, and all selected grid surfaces were below the Table 1 limit of 0.1 mrad/h.

3) Technical Associates Model FS-8 automatic recycling scaler with a PAS-9 probe (alpha scintillator). This instrument was used on all selected grids for a 6-minute scan of the entire one-meter grid. An average 6-minute background count was also recorded.

D. REMOVABLE CONTAMINATION

A smear survey was performed on all selected grid surfaces throughout the high bay. Results of smear survey were documented at less than 10 dpm alpha and less than 70 dpm beta-gamma, all below the Table 1 limits.

All smears were counted for alpha and beta-gamma on a Nuclear Measurements Corporation automatic counting system. This system was checked daily with calibrated sources for efficiency. The background for alpha is 0-1 cpm with an average efficiency factor of 3.6. Background for beta is 25-29 cpm with an average efficiency factor of 3.8. Alpha contamination was not suspected at the SRE facility. However, had any occurred, it would have been detected with this counting system. In addition, a Technical Associates Model FS-8 automatic recycling scaler with a PAS-9 probe was used for a 20-minute survey on six selected grid surfaces for alpha contamination only with no detectable activity.

Smear and instrument surveys for the main floor office and support areas, mezzanine offices, and R/A exhaust systems were all below the Table 1 limits.

III. CONCLUSIONS

In each type of test performed, all samples indicated levels less than those limits prescribed by the decontamination and disposition of facilities program for release for unrestricted use.

All appropriate surveys indicate that current existing radioactivity in the area is below the applicable limits for release for unrestricted used.

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SUPPORTING DOCUMENT

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ABSTRACT

This document defines and discusses the activities which will be performed at the SRE to demonstrate compliance with the established cleanness criteria. It includes the monitoring techniques which will be employed, the data to be collected, and the analysis activities to be performed. Controls over the back filling operation are also discussed.

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TABLES

1.0 INTRODUCTION

The Energy Systems Group of Rockwell International has been in the process of decommissioning the Sodium Reactor Experiment (SRE) Building 143 at the Santa Susana Field Laboratory. With this effort nearing completion, it is necessary that a comprehensive radiological survey be conducted of the areas to be backfilled within and adjacent to this building. This is an important step in the release of the building for unrestricted use. It is necessary to provide reasonable assurance that residual radioactivity is below acceptable limits. These limits have been established and are presented in the cleanness criteria contained in Table 1 (see Section 3.0).

Quality Assurance has developed this document to describe the activities which will be performed at the SRE to provide an independent assessment of effectiveness of the decontamination operations which have been conducted. This effectiveness will be established by extensive meter surveys, smear sample examination, and a material sampling program conducted within the SRE for the purpose of defining the existing levels of the natural and induced radioactivity. These will be compared to the criteria established as necessary to release the site for unrestricted use.

Three specific approaches using radiation measuring instruments will be utilized. First, a complete sweep of the area will be made to identify any areas of "high" activity that are detectable with field survey instruments. Second, very thorough surveys of areas which the records show as having had high levels of contamination and were cleaned up will be performed concentrating on the boundaries with assumed clean areas. Third, a 1-meter square ($1\text{-}m^2$) grid will be developed on a drawing of the SRE and samples of material will be taken from the SRE surfaces for a preestablished number of both random and selected location samples. Specific analytical data on the average and maximum radiation levels will be determined and statistically evaluated. This data will be compared to the criteria to establish whether the backfilling can commence.

Three methods for obtaining material samples of soil and rock will be employed. Surface soil samples will be obtained in areas where there is sufficient loose material to make this approach more feasible. In hard-surfaced areas (sandstone or rock), material will be chipped away. Second, surface smears will be obtained from existing original concrete surfaces. Third, ground water samples will be obtained from points in and/or around the SRE for analysis. Each of these samples will be carefully identified and of sufficient quantity to provide for analysis and material archiving.

The material samples obtained for Quality Assurance will be submitted to Health, Safety and Radiation Services (HS&RS) for determination of the level of radioactivity and to an independent outside laboratory for analysis and determination of the radionuclides present. The results of both analysis activities will be accumulated into a final report of the survey prepared by Quality Assurance and Operations covering all activities at the SRE.

Comprehensive records of all activities supporting this plan will be maintained to provide a clear presentation of the survey and results. The data developed from the various examinations will be analyzed and a final report on the activities prepared.

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2.0 SCOPE OF ACTIVITIES

This program has been developed to evaluate that portion of the SRE building and immediately adjacent areas which have been excavated during the decontamination operations. It is specifically limited to those below-grade areas which are to be backfilled. In some areas, it was necessary to excavate extensively to remove various items of equipment and piping. These areas have already been backfilled for safety purposes. This plan will address the existing conditions in the SRE.

Since no releases of alpha-emitting radionuclides occurred at the SRE, the meter surveys and measurements made at the SRE will be specifically to detect beta-gamma and gamma radiation. Alpha measurements will be obtained from the material samples obtained and submitted for analysis.

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3.0 ACCEPTANCE CRITERIA

The criteria which have been established to release the SRE for unrestricted use are presented in Table 1 below.

TABLE 1
CONTAMINATION LIMITS FOR RELEASE TO UNRESTRICTED USE

A.	Surfaces:	
	Beta Gamma Emitters:	Total = 0.1 mrad/h at 1 cm, with 7 mg/cm^2 absorber
		Removable = 100 dpm/100 cm^2
	Alpha Emitters:	Total = 100 dpm/100 cm^2
		Removable = 20 dpm/100 cm^2
B.	Soil:	
	Near Surface:	100 pCi/g gross detectable beta activity
	Below 3 m (average):	1000 pCi/g gross detactable beta activity
	*(maximum):	3000 pCi/g gross detectable beta activity

*The maximum value may be average over a volume of 1 m^3 to meet the limit for the average value.

In order to be able to present the facility for unrestricted use, clearly all of these criteria must be met. A series of surveys and sample collection and analyses will be performed to fully establish the extent to which the criteria have been met. The evaluation of each of the criteria is dependent on the method utilized in its measurement.

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4.0 EXAMINATION METHODS

In this section the methods to be employed in the evaluation of each of the acceptance criteria will be discussed. At the outset, it is important to recognize that the evaluation is dependent on two major factors: appropriate, calibrated equipment, and the knowledge and skill of the person doing the survey.

4.1 SURFACE DOSE RATE

The first of the criteria from Table 1 is for beta-gamma emitters. Total radiation dose will be measured with a CP-7 (ion chamber) with a 7 mg/cm^2 window at 1 cm from the chamber front. The CP-7 is a large, high-sensitivity ion chamber for measuring true dose rate in air. Other measurements of beta activity are generally considered to be more sensitive contamination indicators and, therefore, the dose rate survey will be conducted in the manner of discovery. This means that the entire area will be surveyed in an attempt to locate and identify areas of increased radioactivity. As these are located, they will be evaluated against the acceptance criteria of 0.1 mrad/h. Any area which exceeds this limit will be identified for additional cleanup.

4.2 REMOVABLE BETA

The second of the acceptance criteria is the removable beta activity, which will be measured by a smear and reported in units of dpm/100 cm^2 with a limit of 100 dpm/100 cm^2. A 2.4-cm diameter Whatman No. 540 filter paper disc will be passed over a representative portion of a section of a surface using moderate pressure with the tip of the thumb. (The judgement of "moderate pressure" is a matter of experience.) Normally, the area of the portion smeared should approximate 100 cm^2. Since the pressure-bearing portion of the filter paper disc is approximateley 2 cm wide, the length of the smear should be about 50 cm (18 in.) long. This should be achieved by a Z or S pattern with legs that are each about 6 in. long. The original SRE concrete surfaces that are to be buried are to be sampled by this method. The smear paper will be protected against loss of activity prior to counting by use of a "smear book" composed of file cards. To prevent transfer of contamination, these books will not be reused. Approximately 10% of the 1-m^2 containing original concrete will be sampled with this technique.

4.3 ALPHA EMITTERS

Alpha emitters will be measured by the scanning scaler technique using an alpha detector, averaged over 1 m^2, and using the most sensitive range practical reported in dpm/100 cm^2. The acceptance criteria is 100 dpm/100 cm^2 maximum.

The scanning scaler method for alpha measurements uses the integrating function of a scaler in providing a direct measurement of the average surface activity. The measurement of surface radioactivity will use portable scalers (Ludlum Model 2200 or the Technical Associates Model FS-8) and alpha-sensitive detectors (Ludlum Model 43-5 alpha scintillator or the Technical Associates PAS-9 alpha scintillator). The detector probe will be slowly traversed across the surface to provide complete coverage during the counting time period set on the scaler. This time period will be 10 min for either of the alpha scintillator detectors. The average gross and net countrates will be calculated by dividing the gross count by the counting time and subtracting the background countrate. The net countrate will be converted to surface activity (dpm/100 cm^2) by correcting for detection efficiency and the area ratio (relative to 100 cm^2). The resulting value is the surface activity averaged over 1 square meter (the area scanned during the counting time period). If the area is scanned uniformly, this result is essentially independent of scan speed, so if the scan of the area is completed before completion of the count time, the probe should be moved in a random pattern over the area for the remainder of the counting time.

This method is not generally effective with soils, and so it will be limited to specific preselected areas which will be designated by Quality Assurance. The purpose will be to obtain a sufficient number of 1-m squares identified, documented, and measured so that positive conclusions can be made about the alpha activity at the SRE. Approximately 1% of the 1-m^2 grid will be sampled with this technique.

4.4 REMOVABLE ALPHA

The removable alpha will be determined from the beta smears and is limited to 20 dpm/100 cm^2. The only additional precaution to be observed is to avoid the excessive loading of the filter paper with surface dirt since this could cause incorrectly low measurements of the alpha activity.

The filter paper disc will be placed on a counting planchet flat in order to avoid source geometry errors. The activity for alpha and beta radioactivity will be recorded on the data sheet with any other related information.

4.5 SOIL CONTAMINATION LIMITS

The acceptance criteria for soils is based solely on beta activity and is established as 100 pCi/g at the surface, and 1000 pCi/g average at 3 m (10 ft) below the surface with a maximum of 3000 pCi/g. This criteria will be evaluated by three methods: instrument surveys, surface measurement, and laboratory analysis of soil samples.

Surveys for beta activity will be conducted by use of a Ludlum Model 12 or Technical Associates PUG-1 countrate meter and a thin-window, pancake G-M detector (Ludlum 44-9, Eberline HP-210, or Technical Associates P-11 or P-11A). The background countrate will be determined locally by placing a clean hand over the face of the probe or by placing the probe face against a known clean surface, preferrably with a low effective atomic number, such as a plastic slab, and estimating the mean meter indication, using the slow time response. During the survey, the probe may be in contact with the surface or up to 1/2 in. away. The survey traverse rate should not exceed 2 in./sec. The surveys will be conducted throughout the entire area in a manner of discovery, attempting to locate and identify areas of increased radioactivity. Surveys will be conducted with the audio on, the fast time response selected, and using the most sensitive range practical.

The surface soil samples will be obtained using a clean shovel to remove the soil and place it in a 2-quart waterpoof cardboard container. The shovel must be wiped clean after each sample is obtained. Each soil sample should be approximately 1 kg and should be free of rocks and debris. The identification for each sample will be clearly marked on both the cardboard container and lid. The lid will then be taped on in a manner that will not obscure the labeling nor result in damaging it when the tape and lid are removed.

Subsurface soil samples may also be required by Quality Assurance, and these will come from auger holes drilled in the surface. Core drilling will be used to obtain these samples, and care must be exercised to avoid cross contamination. In addition, it will be necessary to drill through a plastic sheet spread on the surface in the event radioactive material is picked up during the drilling. The material being removed from the hole will be continuously monitored for beta and gamma radiation as it is being withdrawn.

Samples of rock and concrete will also be obtained, identified, and submitted for analysis. These samples will be chipped from their surfaces and placed in the 2-quart waterproof cardboard containers, identified, and taped closed as discussed above.

4.6 SPECIAL EXAMINATIONS

The preceding section discussed the methods and activities necessary to demonstrate compliance to the established acceptance criteria. This section will describe certain additional tests and activities which will be performed to provide further confidence that the decontamination program has been effective and comprehensive.

4.6.1 Gamma Emitters

A comprehensive survey of the area will be conducted to locate and define any areas of increased gamma activity. While it should be recognized that there was a gamma component accounted for in the "surface dose rate," a specific evaluation of the gamma activity in the area has not been performed. A Ludlum Model 12S Micro R meter (which uses a 1-in. x 1-in. NaI (Tℓ) scintillator calibrated for Cs-137 gamma rays) will be used for the surveys of gamma radiation. The survey will be conducted with the audio on, and the fast (F) time response and most sensitive range selected. In performing the survey, the operator should move at a slow pace while monitoring the gamma radiation reading from approximately 1 m above the ground (waist level for most people). Areas of increased activity will be identified and defined and records maintained of the measurements

obtained. These will be cross correlated with the results of the examinations performed to demonstrate compliance to the acceptance criteria. No limit has been established for gamma radiation.

4.6.2 Migration Control Activities

A clear demonstration that there is no migration of residual radioactive contamination from the SRE to the surrounding environment is also necessary to assure a continuing acceptable condition. Two transport methods are available for the dispersion of the radioactive materials into the environment: water and air. Each of these will require monitoring to assure that the decommissioning task has been properly completed.

4.6.2.1 Water

Water samples will be obtained from the water sampling locations in and around the SRE on a weekly basis. Several wells exist in the area for this purpose, and there are low points in the SRE into which water seeps from time to time. If these prove to be insufficient, additional sampling locations within the SRE may be drilled for the purpose of water sampling.

Samples will be obtained in clean jars and properly identified with date and location. These will be submitted for a determination of the level of radioactivity which exists in each sample. Charts of the individual measurements and a ten measurement running average will be prepared for each location to identify significant changes in the levels identified.

4.6.2.2 Air Monitoring

The second transport method of radioactivity is through air movement, and the extent of contamination transfer from this method will be monitored. Air samples will be taken by passing air through filter paper by use of air sampling pumps (Gast 0211) with Type AE glass fiber filters, or high-volume air samplers (Hi-Q Filter Products CF-12B with 4-in. fiberglass Type E filters). The sampler used, its flow rate, and the sampling time will be noted on the data sheet. The

filter paper will be placed in an envelope with the serial number marked on the envelope. These air samples are generally ready for counting as received, however, the high-volume air samplers use a 4-in.-diameter filter paper from which a 1-in.-diameter sample must be cut for counting. In this case, only 1/16 of the surface gets counted, and the results must be adjusted accordingly. The airborne sample information will be reported and this data will be plotted on a chart with a ten measurement running average to identify any unusual conditions.

The air monitoring system will be operational during the shifts when soil is being disturbed in the SRE. A suitable representative location for the instrument will be identified, and comprehensive records of its operation and the resulting data will be maintained.

4.6.3 Alpha Emitters

Approximately five additional soil samples will be taken for the specific purpose of providing material for analysis for plutonium. These samples will consist of at least 2 quarts of soil and each will be well mixed and split into an archive sample and a sample to be sent to an outside laboratory for analysis. No limit has been established for plutonium.

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5.0 CALIBRATION AND QUALIFICATION

5.1 CALIBRATION

Maintenance and calibration of all battery-powered (field instrument) systems will be performed with 13-week service periods, and laboratory instruments (ac-powered) will be serviced and calibrated within 6-month service periods by QA Instrumentation and Technical Support at ESG/De Soto (or more frequently if required by the manufacturer). Prior to use of an instrument, the calibration label shall be checked to assure that the instrument is in current calibration. No instrument shall be used for a documented measurement or for radiation safety purposes if the calibration has expired.

Instrument calibration shall determine the correct operating parameters and will indicate both the background countrate and the efficiency factor. The efficiency factor is defined as:

$$E = \frac{A}{C - B} \text{ (dpm/cpm)}$$

where A is the total source activity rate (dpm) for the selected radiation corrected for backscatter, C is the gross countrate (cpm) with the source in place, and B is the background countrate (cpm) with the source removed. Calibration sources prepared as a thin deposit on a relatively high-Z metal backing, such as steel, copper, or nickel, may exhibit a strong back-scatter effect. This effect is negligible for smear and filter papers, and very small for soil and water samples in aluminum planchets. Therefore, when using calibration sources of this sort, the efficiency factor is defined as:

$$E = \frac{2\ (2\pi \text{ emission rate})}{C - B} \text{ (dpm/cpm)}$$

For the Tc-99 calibration sources, this effect will cause a difference of 25% in the efficiency factor. For the Th-230 alpha calibration sources, this is only 1.4%. Use of these efficiency factors will result in a small, but variable and uncertain, systematic error. This error will not be adjusted. For calibration sources and for samples near the acceptance levels, no correction is required for dead-time losses.

5.2 QUALIFICATION

In order to assure continued calibration of an instrument and detect malfunction or drift at an early time, repeated qualification measurements must be made and recorded. For each of the instruments described above, a measurement of the background (in a stable environment with low background) and the response to identified sources will be made and plotted on control charts prior to the first use of the instrument each day. For measurements with a small number of counts (alpha detector background), the action and limit lines will be established as closely as possible at the 68%, 95%, and 99% bounds as determined from the Poisson distribution (see Appendix A), while for measurements with 20 or more events, the Gaussian (normal) distribution will be assumed with the lines set at $\pm \sqrt{N}$, $\pm 1.960 \sqrt{N}$, and $\pm 2.576 \sqrt{N}$, where N is the number of counts recorded. The gross values are to be plotted; no corrections nor unjustified rejections are to be made. Redetermination of the average countrate and action and limit lines will be necessary following repair or servicing of an instrument.

Qualification data for each instrument shall be kept on instrument record sheets of the type shown in Appendix B. Sample control charts are also shown in this appendix. The records sheets and control charts are part of the permanent documentation to be developed in this program.

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6.0 GRID SURVEYS

The entire area to be surveyed at the SRE is approximately 140 ft long (east to west) and 65 ft wide (north to south) with the floor approximately 20 ft below grade. This represents about 18,500-ft^2 surface or 1700-m^2 area to be surveyed. Clearly, surveying each square foot or square meter of the area would represent an unreasonable task. Accordingly, alternative approachs of sampling the total population will be utilized.

The area to be surveyed will be defined on a drawing of the SRE. On this drawing will be overlayed 1-m^2 grid pattern covering the inside and outside below-grade areas including all of the walls, columns, and the post and plank retaining wall on the south edge of the excavation. Each of the resulting 1-m squares, representing the total population, will be given a number, and 54 of these numbers will be selected using a table of random numbers. These will form the unbiased or control sample.

A second independent group of 54 samples will be identified on the meter squares. These will be from specific locations selected because the history of operations or the previously run sweep surveys suggest that they are areas of higher activity. Every attempt will be made to make these 54 samples truly represent the worst case.

All 108 samples locations will be initially identified on the drawing or map of the SRE. Using the southwest corner, where the retaining wall meets the existing concrete wall, as the starting point, the sample locations on the SRE surfaces will be established. Material samples (soil, rock, or concrete from the original structure; there is nothing to be gained from chipping away the new column supports) will be obtained and identified, as discussed in Paragraph 4.5. In addition, the measurements used to establish the sample location will be recorded with the rest of the sample information. A 1-m^2 perimeter will be placed on the surface at the sample location. Material samples for the 54 unbiased samples will be obtained from any random location within the parameter. For 54

selected samples, however, it will be necessary to measure the surface gamma radiation within the perimeter and obtain the sample from the area showing the highest reading. This reading is to be recorded with the other sample data.

The samples will be carefully inventoried and submitted to HS&RS to establish the amount of radioactivity present in each sample, as discussed in the Sample Analysis section.

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7.0 SAMPLE ANALYSIS

The material obtained from the grid survey activity will be submitted to HS&RS for the determination of the amount of radioactivity present in the sample. This will be determined using standard, documented procedures and will yield a result in pCi/g. This information will be recorded and reported for each of the 108 samples submitted.

A second group of 27 samples will be drawn from the original 108 samples and submitted to HS&RS for a second determination of the amount of radioactivity present. These samples will be numbered only permitting tracibility to the original sample. The data from the reevaluated samples will permit an evaluation of the repeatability of the analysis system and provide for increased confidence in the resulting data.

A third group of samples will be drawn from the original 108 and submitted to an outside laboratory for a complete breakdown to provide an inventory of the natural and induced radionuclides present in the contribution each makes to the total radioactivity present in the sample. These samples will be selected from those with the highest measured radioactivity, original SRE material, or which in some manner seem to be unusual. The number of these samples cannot be predetermined, but it is expected that there will be more than ten.

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8.0 SAMPLE PLAN DESIGN

The grid sampling plan for the SRE has been designed to provide statistically supportable information about the radiological condition of the total below-grade area prior to backfilling. The approach taken is to establish an adequate, random, unbiased sample of the SRE surfaces and statistically compare it to an equal sample which the history of the building and surveys of the area indicate to be the worst condition. The sample size for the random sample has been established from accepted statistical tables and will represent the population of the entire area. This unbiased sample will represent the expected baseline or general condition of the total area. A second sample from the same population will be selected and will represent the worst case which can be defined for the area. The closer these two samples are, based on statistical tests, the more uniform will be the area and thus, the greater the assurance that the total area can be represented by the samples and be declared as acceptable.

In establishing the sample plan, MIL-STD-414 was consulted to determine the number of samples which would be required. This document indicated that 40 or 50 samples would be necessary for a total population of 1,700 where the variability is unknown and the standard deviation method is employed with a single specification limit.

In the case of the SRE, however, it is necessary to establish more than just a simple accept or reject condition. Certain statistical tests are necessary to adequately support the judgments made. Accordingly, the MIL-STD-414 sample sizes were used as a point of departure in establishing a more suitable sample size. In order to perform a single-sided "t" test of the mean where $\alpha = 0.025$ and β is selected at 0.05 and δ/σ is chosen as 0.5, then 54 samples would be required. This sample size offers a very satisfactory trade off between the cost of sampling and analysis versus the adequate and sufficient accumulation of data for statistical purposes. Therefore, a random sample of 54 will be drawn from the total population of approximately 1,700 m squares. A second sample of 54 will be drawn from the same population but at selected locations. These two samples will then be compared using a number of tests including the "difference of means" and others.

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9.0 BACKFILLING

The volume to be backfilled in and immediately adjacent to the SRE has been estimated at approximately 6,500 yd^3. This equates to approximately 1,300,5 yd^3 truckfulls of material, although the actual number will be higher since the loose material from the truck will have to be compacted when it is dumped in the SRE. Some of this material was removed from the SRE during the decontamination activities and has been determined to be safely below the cleanness limits for the SRE. Additional material will be required to complete the backfill operation, and this will be obtained from other areas at SSFL.

In order to be confident that the backfilling material which is used is substantially less than the cleanness criteria for soils established in Table 1, a monitoring program will be established. This program will required the radiolotical survey of the areas from which the material will be obtained, the sampling of soil which is used to establish the levels of radioactivity, the monitoring of water from the wells in the SRE area for changes in radioactivity levels, and the monitoring of the air. These are the controls necessary to assure that the materials and methods used in the backfilling operation do not result in creating a condition which exceeds the established criteria.

9.1 MATERIAL SITES

The meter surveys discussed in Paragraph 4.5 for beta and Paragraph 4.6.1 for gamma activity will be used at each site from which backfill material is drawn. These surveys will be performed approximately every other day while the material is being drawn from the site. The purpose of the survey will be to assure that the sites are essentially homogeneous with activity levels well below those established for soils. Records of each survey will be accumulated for incorporation into the final report.

9.2 SOIL SAMPLES

Samples of the backfill material will be obtained from approximately 10% of the truckloads each day. Material will be taken from several locations in the load (before or after it is dumped) and placed in a 2-quart waterproof cardboard container and identified as described in Paragraph 4.5. This material will be submitted to HS&RS for analysis to establish the activity in pCi/g. This data will be used to establish the "as left" condition of the SRE.

Obtaining samples from 10% of the truckloads is substantially more than would be required if a standard sampling program based on MIL-STD-414 were used. Had this standard been used, only 40 or 50 samples (approximately 3% to 5%) would have been required. The larger number of samples is justified when the cost of locating and removing material with excessive radioactivity is compared to the cost of sampling and the resulting data base which will be developed. A control chart will be used to provide substantiation that the backfill material is consistently within acceptable limits.

9.3 WATER SAMPLES

Water will be drawn from all available locations in and around the SRE each day and submitted to HS&RS for analysis. Water will be used in compacting the backfill material. By monitoring the well water, assurance can be gained that there is no migration of any residual high-level radioactivity from the SRE into the water table. Both the absolute levels of activity and the longer term trend will be tracked. This data will be accumulated, analyzed, and incorporated into the final report.

9.4 AIR SAMPLES

Air samples will be obtained and analyzed as described in Paragraph 9.4.

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APPENDIX A
THE POISSON DISTRIBUTION

Radioactive disintegration belongs to a class of phenomena that are represented by a statistical (or probability) distribution known as the binomial distribution. When the probability of a specific event (the radioactive transition of a specified nucleus) within the measurement time interval is small, the binomial distribution is well approximated by the Poisson distribution:

$$P(n) = \frac{m^n e^{-m}}{n!}$$

where P(n) is the probability of n events (counts, for example) occurring if the mean (or true) value is m. The standard deviation of this distribution is $\sqrt{m}$.

For values of m of 20 or more, the Poisson distribution is well represented by the discrete Gaussian distribution which, for the sake of generality, is represented by the continuous Gaussian distribution. The standard deviation (σ) is equal to $\sqrt{m}$.

Values of the percentage of occurrence of a specified number of counts (n) for distribution with true means (m) are shown in Table A-1.

The precise 95% bounds are shown for comparison below.

Mean Count	Lower Bound (-2.5%)	Upper Bound (+2.5%)
3	0.6	8.8
4	1.1	10.2
5	1.6	11.7
6	2.2	13.1
7	2.8	14.4
8	3.5	15.8
9	4.1	17.1
10	4.8	18.4
11	5.5	19.7
12	6.2	21.0
13	6.9	22.2
14	7.7	23.5
15	8.4	24.7
16	9.1	26.0
17	9.9	27.2
18	10.7	28.4
19	11.4	29.7
20	12.2	30.9

It may be noted that these differ somewhat from the bounds that would be selected from Table A-1. This may be due to representation of the discrete Poisson distribution in this calculation of bounds, as a continuous distribution.

TABLE A-1

PERCENTAGE OF MEASUREMENTS EXPECTED TO PRODUCE A CERTAIN NUMBER OF COUNTS FOR ACTIVITY WITH THE SPECIFIED MEAN COUNT (POISSON STATISTICS)

Number of Counts	Mean Count 0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	Number of Counts
0	90.48	81.87	74.08	67.03	60.65	54.88	49.66	44.93	40.66	0
1	9.05	16.37	22.22	26.81	30.33	32.93	34.76	35.95	36.59	1
2	0.45	1.64	3.33	5.36	7.58	9.88	12.17	14.38	16.47	2
3	0.02	0.11	0.33	0.72	1.26	1.98	2.84	3.83	4.94	3
4	-	0.01	0.03	0.07	0.16	0.30	0.50	0.77	1.11	4
5		-	-	0.01	0.02	0.04	0.07	0.12	0.20	5
6				-	-	-	0.01	0.02	0.03	6
7							-	-	-	7

Number of Counts	Mean Count 1	2	3	4	5	6	7	8	9	10	Number of Counts
0	36.79	13.53	4.98	1.83	0.67	0.25	0.09	0.03	0.01	-	0
1	36.79	27.07	14.94	7.33	3.37	1.49	0.64	0.27	0.11	0.05	1
2	18.39	27.07	22.40	14.65	8.42	4.46	2.23	1.07	0.50	0.23	2
3	6.13	18.04	22.40	19.54	14.04	8.92	5.21	2.86	1.50	0.76	3
4	1.53	9.02	16.80	19.54	17.55	13.39	9.12	5.73	3.37	1.89	4
5	0.31	3.61	10.08	15.63	17.55	16.06	12.77	9.16	6.07	3.78	5
6	0.05	1.20	5.04	10.42	14.62	16.06	14.90	12.21	9.11	6.31	6
7	0.01	0.34	2.16	5.95	10.44	13.77	14.90	13.96	11.71	9.01	7
8	-	0.09	0.81	2.98	6.53	10.33	13.04	13.96	13.18	11.26	8
9		0.02	0.27	1.32	3.63	6.88	10.14	12.41	13.18	12.51	9
10		-	0.08	0.53	1.81	4.13	7.10	9.93	11.86	12.51	10
11			0.02	0.19	0.82	2.25	4.52	7.22	9.70	11.37	11
12			0.01	0.06	0.34	1.13	2.63	4.81	7.28	9.48	12
13			-	0.02	0.13	0.52	1.42	2.96	5.04	7.29	13
14				0.01	0.05	0.22	0.71	1.69	3.24	5.21	14
15				-	0.02	0.09	0.33	0.90	1.94	3.47	15
16					-	0.03	0.14	0.45	1.09	2.17	16
17						0.01	0.06	0.21	0.58	1.28	17
18						-	0.02	0.09	0.29	0.71	18
19							0.01	0.04	0.14	0.37	19
20							-	0.02	0.06	0.19	20
21								0.01	0.03	0.09	21
22								-	0.01	0.04	22
23									-	0.02	23
24										0.01	24
25										-	25

PERCENTAGE OF MEASUREMENTS EXPECTED TO PRODUCE A CERTAIN NUMBER OF COUNTS FOR ACTIVITY WITH THE SPECIFIED MEAN COUNT (POISSON STATISTICS)

Number of Counts	Mean Count 11	12	13	14	15	16	17	18	19	Number of Counts
0	-	-								0
1	0.02	0.01	-	-						1
2	0.10	0.04	0.02	0.01	-	-				2
3	0.37	0.18	0.08	0.04	0.02	0.01	-	-		3
4	1.02	0.53	0.27	0.13	0.06	0.03	0.01	0.01	-	4
5	2.24	1.27	0.70	0.37	0.19	0.10	0.05	0.02	0.01	5
6	4.11	2.55	1.52	0.87	0.48	0.26	0.14	0.07	0.04	6
7	6.46	4.37	2.81	1.74	1.04	0.60	0.34	0.19	0.10	7
8	8.88	6.55	4.57	3.04	1.94	1.20	0.72	0.42	0.24	8
9	10.85	8.74	6.61	4.73	3.24	2.13	1.35	0.83	0.50	9
10	11.94	10.48	8.59	6.63	4.86	3.41	2.30	1.50	0.95	10
11	11.94	11.44	10.15	8.44	6.63	4.96	3.55	2.45	1.64	11
12	10.94	11.44	10.99	9.84	8.29	6.61	5.04	3.68	2.59	12
13	9.26	10.56	10.99	10.60	9.56	8.14	6.58	5.09	3.78	13
14	7.28	9.05	10.21	10.60	10.24	9.30	8.00	6.55	5.14	14
15	5.34	7.24	8.85	9.89	10.24	9.92	9.06	7.86	6.50	15
16	3.67	5.43	7.19	8.66	9.60	9.92	9.63	8.84	7.72	16
17	2.37	3.83	5.50	7.13	8.47	9.34	9.63	9.36	8.63	17
18	1.45	2.55	3.97	5.54	7.06	8.30	9.09	9.36	9.11	18
19	0.84	1.61	2.72	4.09	5.57	6.99	8.14	8.87	9.11	19
20	0.46	0.97	1.77	2.86	4.18	5.59	6.92	7.98	8.60	20
21	0.24	0.55	1.09	1.91	2.99	4.26	5.60	6.84	7.83	21
22	0.12	0.30	0.65	1.21	2.04	3.10	4.33	5.60	6.76	22
23	0.06	0.16	0.37	0.74	1.33	2.16	3.20	4.38	5.59	23
24	0.03	0.08	0.20	0.43	0.83	1.44	2.26	3.28	4.42	24
25	0.01	0.04	0.10	0.24	0.50	0.92	1.54	2.37	3.36	25
26	-	0.02	0.05	0.13	0.29	0.57	1.01	1.64	2.46	26
27		0.01	0.02	0.07	0.16	0.34	0.63	1.09	1.73	27
28		-	0.01	0.03	0.09	0.19	0.38	0.70	1.17	28
29			0.01	0.02	0.04	0.11	0.23	0.44	0.77	29
30			-	0.01	0.02	0.06	0.13	0.26	0.49	30
31				-	0.01	0.03	0.07	0.15	0.30	31
32					0.01	0.01	0.04	0.09	0.18	32
33					-	0.01	0.02	0.05	0.10	33
34						-	0.01	0.02	0.06	34
35							-	0.01	0.03	35
36								0.01	0.02	36
37								-	0.01	37

APPENDIX B
INSTRUMENT QUALIFICATION RECORD SHEETS AND CONTROL CHARTS

Each instrument (counting system, scaler and detector, or countrate meter and probe) used in the inspection surveys will be assigned a disinct code consisting of two alphanumeric characters to identify it and its results. As long as an instrument is in use, a Qualification Record Sheet will be maintained, documenting the calibration and quality control measurements. For instruments consisting of two components, such as the portable scaler and its detectors or countrate meters and probes, the first character will be assigned to the major component and the second to the minor. Each unit will have a label showing its identifying code.

Information on the Qualification Record Sheet will fully describe each instrument. A master sheet is included in this Appendix. These sheets provide for a dated record of response to background and to calibration sources. This record will also be shown on control charts to provide indication and early warning of deviation of the instrument from proper behavior.

The use of control charts is demonstrated by a fictitious example in Figures B-1 and B-2, for a scaler and alpha probe. The first figure shows the background count (not count rate) while the second shows the count (not count rate) for a standard alpha source. The first chart involves Poisson statistics, while the second involves Gaussian statistics. Normal background counts are shown initially, for a true count of 4. An abrupt change in April suggests a small light leak, while the slow upward drift in June could result from a drift in the discriminator. The control chart for the standard source shows normal behavior initially, then some erratic behavior in April, perhaps due to electrical supply noise. The slow decline in response after June could result from many causes: degradation of the scintillator screen, reduced amplification in the photomultiplier tube, declining high voltage. In any event, unacceptable

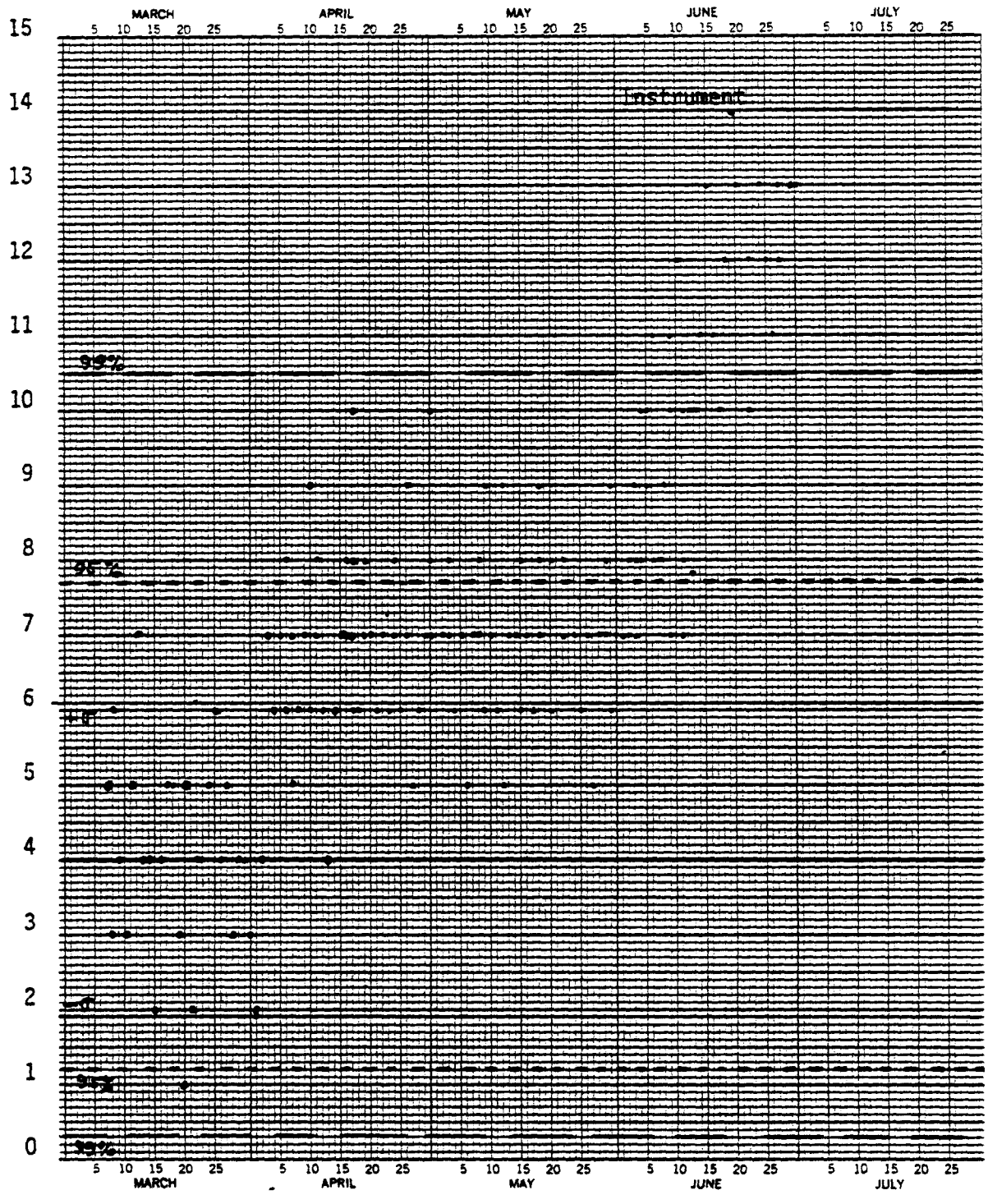

Figure B-1
Background Control Chart

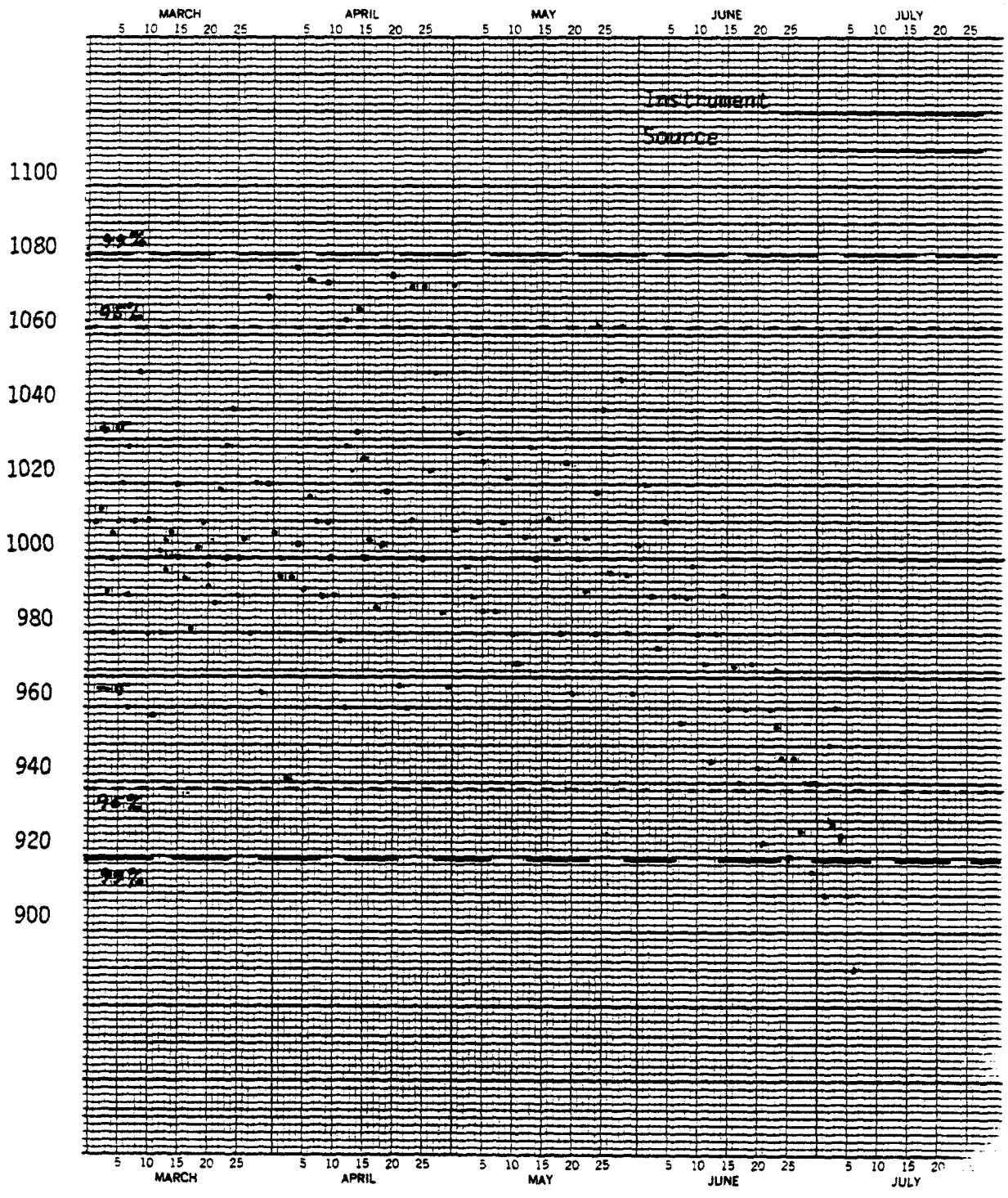

Figure B-2
Source Response Control Chart

performance is clearly forecast. (Note that indication of similar poor performance by several instruments checked with the same source suggests the need for checking the source itself.)

The scale and guidelines on a control chart should be selected and drawn with care. The scale should provide reasonable separation of the guidelines and good resolution for various count values, but should not spread them so widely that trends are hard to discern. For the Poisson distribution, the guidelines are chosen as symmetrically about the mean as possible to provide 68%, 95%, and 99% limits. For the Gaussian distribution, these correspond to $\pm 1\sigma$, $\pm 1.96\sigma$, and $\pm 2.576\sigma$. The standard deviation, σ, shall be taken as equal to $\sqrt{N}$ where N is the expected (true) number of counts in the counting interval, determined from a set of 100 counts (or alternatively, 100 times the counting time interval). This provides an uncertainty on the mean value of one-tenth the standard deviation of the data distribution for the basic counting interval, thus limiting the bias introduced by departure of this value from the true value. Mechanical and electronic adjustments to the instrument may affect both the background and source-response results, so these values must be redetermined after servicing of an instrument.

The Qualification Record Sheets and the Control Charts are part of the permanent documentation.

INSTRUMENT QUALIFICATION RECORD SHEET

Instrument Code _____ _____

Type: _____ _____

Mfr: _____ _____

Model: _____ _____

Serial: _____ _____

Prop. No.: _____ _____

Source Identification: _____

Date	Calib. Due Date	Background		Source Response			Efficiency Factor
		Count	Time	Rate	Count	Time	

March 2, 1982

J. M. Marzec
731, 071-T143

R. J. Tuttle
779, 071-NB13

4436

Review of Acceptance Survey for T163

I have reviewed the survey data for the west end of Building T163 and conclude that we have sufficient data (400 locations surveyed) and that the building meets the DOE D&D Program criteria for release for unrestricted use. Therefore, you may give up control over this area.

A final release survey document will be prepared (N704TI990039).

R. J. Tuttle, Manager
Radiation and Nuclear Safety

reg:2/1

cc: F. H. Badger
S. M. Bradbury
C. C. Conners
R. W. Hartzler
W. D. Kittinger
W. R. McCurnin
D. S. Ploszaj
B. F. Ureda
J. H. Walter
M. S. Wright

Rockwell International
Energy Systems Group

SUPPORTING DOCUMENT

GO NO.	S/A NO.	PAGE 1 OF	TOTAL PAGES	REV LTR/CHG NO SEE SUMMARY OF CHG	NUMBER
07704	44627	7	7	NC	N704TI990039

PROGRAM TITLE

Decontamination and Disposition of Facilities

DOCUMENT TITLE

Radiological Survey Results - Release to Unrestricted Use, SRE, Building 163

DOCUMENT TYPE

Technical Information

KEY NOUNS

Decontamination

ORIGINAL ISSUE DATE

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PREPARED BY/DATE

J. H. Wallace 3/5/82

DEPT 779

MAIL ADDR T143

APPROVALS DATE

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W. R. McCurnin 3/24/82
J. M. Marzec 3/24/82
M. E. Remley 30Mar82
R. J. Tuttle 3/23/82
B. F. Ureda 3/31/82

IR&D PROGRAM? YES ☐ NO ☒
IF YES, ENTER TPA NO.

DISTRIBUTION

*	NAME	MAIL ADDR
*	C. C. Conners	NB02
*	W. R. McCurnin	T020
*	J. M. Marzec	T143
*	M. E. Remley	NB13
*	R. J. Tuttle	~~NB13~~
*	B. F. Ureda	NB02
*	J. H. Wallace	T143
*	W. D. Kittinger (10)	NB02
*	L. A. Mountford	LB15
*	V. Keshishian	LB10
*	D. S. Ploszaj	T040
*	M. S. Wright	T030
*	J. W. Carroll	NB02

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* COMPLETE DOCUMENT

NO ASTERISK, TITLE PAGE/SUMMARY OF CHANGE PAGE ONLY

ABSTRACT

The results of the radiological survey for Building 163 of the SRE facility are described. All survey results are below the applicable limits, indicating that this area may be released to unrestricted use.

CONTENTS

TABLES

FIGURES

I. INTRODUCTION

This document covers Building 163, Component Equipment Repair Facility (CERF) located in the SRE complex approximately 50 ft northeast of the main building, T-143. The building is a Butler building structure, approximately 40 ft x 40 ft. A floor-to-ceiling Sheetrock wall separates the CERF from the remainder of Building 163 (box shop).

Decontamination and disposition of the CERF Building 163 began in October 1981 and the building was available for release for unrestricted use on March 2, 1982.

Major operations performed were the removal of the 5-ton overhead bridge crane, the radioactive exhaust system, all aluminum wainscot interior walls, and the scabbling of the floor area.

All radioactive-contaminated equipment was packaged for shipment to offsite land burial.

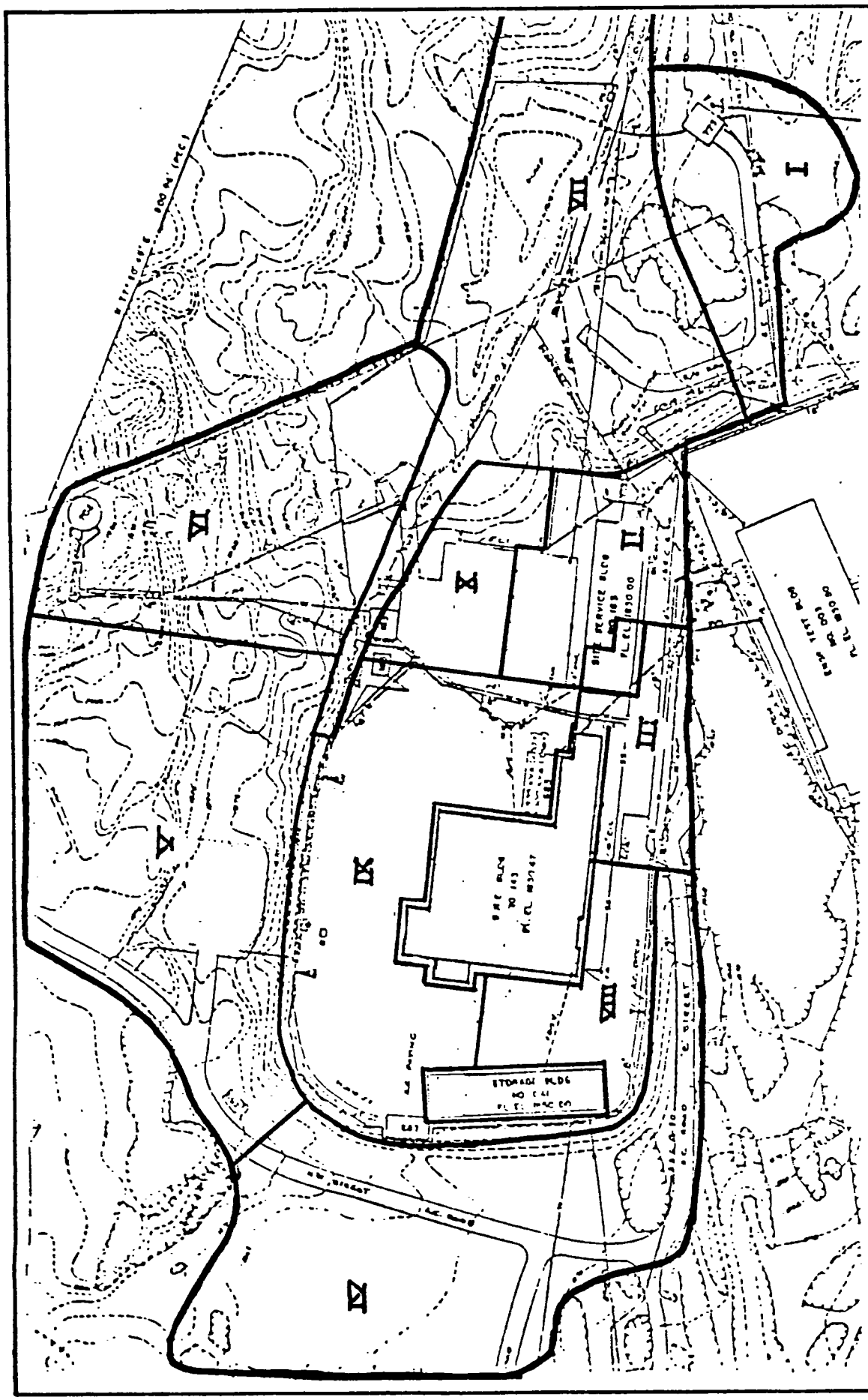

FIGURE 1
SRE FACILITY

TABLE 1

CONTAMINATION/RADIATION LIMITS

Removable Contamintion
20 dpm/100 cm^2 alpha
100 dpm/100 cm^2 beta
Total Contamination (Removable Plus Fixed)
100 dpm/100 cm^2 alpha
0.1 mrad/h at 1 cm through a
7 mg/cm^2 absorber.

II. SURVEYS AND RESULTS

A. REMOVABLE CONTAMINATION

Five hundred smears were taken on gridded surfaces throughout the interior of the building, and 60 smears were taken from exterior front and roof areas. Results of smear surveys were documented at less than 20 dpm alpha and less than 75 dpm beta-gamma.

All smears were counted for alpha and beta on a Nuclear Measurements Corporation automatic counting system. This system is checked daily with calibrated sources for efficiency. The background for alpha is 0-1 cpm with an average efficiency factor of 3.8; background for beta is 25-28 cpm with an average efficiency factor of 3.6. Alpha contamination was not suspected for this area. However, had any occurred, it would have been detected with this counting system.

B. SURFACE RADIATION

At the conclusion of the D&D effort, a survey was conducted using two survey instruments: a Technical Associates Model CP-7 ion chamber detector and a Technical Associates PUG-1 with a thin window pancake GM detector. The PUG-1 was used for its faster response and audible output. Both instruments were used for all accessible areas. An average background reading of 0.04 mrad/hr was recorded inside the middle of Building 163 with the T/A CP-7.* All readings with the CP-7 were below the Table 1 limit of 0.1 mrad/hr.

C. SOIL SAMPLES

The area outside Building 163 is covered with asphalt paving; therefore, soil samples were not taken. However, an SRE operations mockup pit was discovered in the east end of the box shop, which is in Building 163. It was uncertain if this pit was ever used for R/A work related to the CERF portion of the building.

---

*This is a typical reading with this instrument in all uncontaminated areas at Santa Susana.

A total of 22 soil samples were collected from the 5-1/2-ft-deep pit. All soil samples were less than 30 pCi/gram.

The samples were counted in a Nuclear Measurements Corporation automatic counting system with a KCl standard, with an average background of 25-28 cpm.

D. CONCRETE SAMPLES

After the concrete floor had been completely scabbled and surveyed with the T/A CP-7 and PUG-1, it was decided concrete samples were not required.

A total of 13 concrete wall and core samples were collected from the box shop mockup pit. All concrete samples were less than 25 pCi/gram.

The samples were counted with the same technique and counting system as soil samples.

E. WATER SAMPLES

There are no natural or man-made catch basins for water in this region. Water samples are not required for this region.

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III. CONCLUSIONS

In each type of test performed, all samples indicated levels less than those limits prescribed by the decontamination and disposition of facilities program for release for unrestricted use.

All appropriate surveys indicate that current existing radioactivity in the area is below the applicable limits for release for unrestricted use.

779-C.28/sjh