ZONE III
EPA REGION 9

RCRA ENFORCEMENT, PERMITTING, AND ASSISTANCE CONTRACT

FINAL OVERSIGHT VERIFICATION AND CONFIRMATION RADIOLOGICAL SURVEY REPORT FOR BUILDINGS T-012, T-029, AND T-363

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Prepared for:

U.S. Environmental Protection Agency
Office of Compliance
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CONTENTS

CONTENTS (Continued)

FIGURES

TABLES

ABBREVIATIONS AND ACRONYMS

α	alpha
Β	beta
Γ	gamma
<	Less than
>	Greater than
±	Plus or minus
Ac	Actinium
ACP	Activation and corrosion products
cm	Centimeter
cm^2	Square centimeter
COC	Contaminant of concern
cpm	Counts per minute
DOE	U.S. Department of Energy
dpm/100 cm^2	Disintegrations per minute per 100 square centimeters
EPA	U.S. Environmental Protection Agency
ESSAP	Environmental Site Survey and Assessment Program
ETEC	Energy Technology and Engineering Center
I	Iodine
L_C	Critical level
L_D	Detection limit
Ludlum	Ludlum Measurements, Inc.
m	Meter
m^2	Square meter
µR/hr	MicroRems per hour
µR/hr per cpm	MicroRems per hour per count per minute
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDA	Minimum detectable activity
MFP	Mixed fission products
NA	Not applicable
NIST	National Institute of Standards and Technology
NRC	U.S. Nuclear Regulatory Commission
ORISE	Oak Ridge Institute for Science and Education
OV	Oversight verification
Pa	Protactinium
Paragon	Paragon Analytics, Inc.
pCi/g	Picocuries per gram

ABBREVIATIONS AND ACRONYMS (Continued)

QC	Quality control
Ra	Radium
Rocketdyne	Boeing-Rocketdyne
RPD	Relative percent difference
SOP	Standard operating procedure
Sr	Strontium
SSFL	Santa Susana Field Laboratory
Tetra Tech	Tetra Tech EM Inc.
Th	Thorium
Th-nat	Natural thorium
U	Uranium
U-nat.	Natural uranium

EXECUTIVE SUMMARY

On January 15, 1999, Tetra Tech EM Inc. (Tetra Tech) received Work Assignment No. R09805 from U.S. Environmental Protection Agency (EPA) Region 9, under Contract No. 68-W-99-008, Resource Conservation and Recovery Act Enforcement, Permitting, and Assistance, Zone III. Under this work assignment, Tetra Tech provides oversight, sampling, and technical review of documents pertaining to the U.S. Department of Energy's (DOE) Energy Technology and Engineering Center (ETEC), which is presently operated by the Rocketdyne Division of Boeing Corporation (Rocketdyne) (formerly Rockwell Corporation) and is located at the Santa Susana Field Laboratory (SSFL). The work assignment includes review of decontamination and decommissioning reports, development of survey and sampling work plans, oversight of radiation surveys, and collection of split groundwater samples for analysis. As of April 1, 2002, this work assignment expired and incomplete tasks have been continued under Work Assignment No. R09107, under Contract No. 68-W-02-021.

This document presents the results of oversight verification (OV) radiological survey tasks conducted by Tetra Tech at the DOE ETEC, located in Area IV of the SSFL, from January 10 through 12, 2000. The general objectives of the OV surveys under this task were to perform: (1) independent measurements of areas not previously surveyed, (2) measurements of areas previously surveyed to establish comparability of survey methods and results, and (3) biased sampling of surfaces and areas that may retain radioactivity. As such, the OV survey covers approximately 20 percent of the building surfaces.

Tetra Tech performed radiation surveys for alpha and beta-gamma radiation in three ETEC buildings: T-012, T-029, and T-363. During the surveys, Tetra Tech scanned a total of 78 survey grids and performed 113 fixed-point measurements. Fifty-five swipes were collected to assess removable contamination in the survey areas. Four concrete and two dust samples also were collected to assess subsurface and loose surface contamination, respectively. All field measurements were performed in accordance with a quality assurance program developed for this survey. All laboratory analyses were performed by Paragon Analytics, Inc., a State of California-certified laboratory, and the laboratory data were independently validated.

No field measurements made by Tetra Tech indicated the presence of contamination at concentrations greater than the criteria contained in U.S. Nuclear Regulatory Commission (NRC) Regulatory Guide 1.86 (1974). None of the 113 fixed-point measurements, exceeded the most restrictive, allowable, average surface contamination limits. Additionally, none of the removable contamination samples (swipes) contained concentrations of radioactivity greater than the criteria contained in NRC Regulatory Guide 1.86 (1974). Of the six solid samples, one sample contained measurable cesium-137 activity just above

minimum detectable activity (MDA), but did not exceed the release limit. The gamma dose rates in the same area were below average background levels. No action is required for this isolated instance. All other solid sample results were below the MDA.

Tetra Tech's field measurements were compared to previous radiological close-out surveys conducted by Rocketdyne and DOE's contractor, Oak Ridge Institute for Science and Education (ORISE) Environmental Site Survey and Assessment Program. Tetra Tech measured alpha and beta radioactivity in 71 locations previously surveyed by Rocketdyne or ORISE. Because field measurement techniques and data reporting methods differed, it was only possible to directly compare one alpha and one beta measurement with previous surveys. Those two indicated acceptable agreement (a relative percent difference of plus or minus 50 percent) between Tetra Tech and the earlier surveys.

For the remaining 70 alpha survey locations, none of the Rocketdyne, ORISE, or Tetra Tech measurements exceeded 10 percent of the surface activity limit. Similarly, for the remaining 70 beta survey locations, only one ORISE measurement exceeded 33 percent of the beta surface activity limit. It can be seen that the results of the Rocketdyne, ORISE, and Tetra Tech surveys are very similar. The California Department of Health Services, Radiologic Health Branch, has performed confirmation surveys and has concurred with the release of Buildings T-012, T-029, and T-363 for use without radiological restriction.

Tetra Tech also performed a background radiation investigation to assess the variability of background radiation exposure rates throughout the SSFL Site, outside of Area IV. The survey was designed to provide a basis for comparing ambient gamma radiation dose rates within survey areas to the sitewide release criteria (Rocketdyne 1996). The investigation assessed background dose rates inside of buildings constructed of materials similar to those of the buildings included in the OV surveys, as well as outside areas.

The independent data collected by Tetra Tech during the OV survey are of sufficient quality and quantity to: (1) assess the radiological status of the buildings, (2) supplement and confirm other documentation of facility conditions, and (3) be used by EPA to develop recommendations and conclusions. The data show that: (1) good agreement was established with prior surveys, (2) surfaces monitored by Tetra Tech are within NRC-established radiological limits, and (3) exposure rates measured by Tetra Tech do not exceed NRC-established radiological limits. Based on this assessment, Tetra Tech recommends that EPA accept the resurvey data as consistent with and supporting the conclusions reached by prior Rocketdyne and ORISE survey reports regarding the status of these facilities.

1.0 INTRODUCTION

On January 15, 1999, Tetra Tech EM Inc. (Tetra Tech), formerly known as PRC Environmental Management, Inc., received Work Assignment No. R09805 from the U.S. Environmental Protection Agency (EPA) Region 9, under Contract No. 68-W-99-008, Resource Conservation and Recovery Act Enforcement, Permitting, and Assistance, Zone III. Under this work assignment, Tetra Tech provides oversight, sampling, and technical review of documents pertaining to the U.S. Department of Energy's (DOE) Energy Technology and Engineering Center (ETEC), which is presently operated by the Rocketdyne Division of Boeing Corporation (Rocketdyne) (formerly Rockwell Corporation) and is located at the Santa Susana Field Laboratory (SSFL). The work assignment includes review of decontamination and decommissioning reports, development of oversight verification (OV) survey and sampling work plans, oversight of radiation surveys, and collection of split groundwater samples for analysis. As of April 1, 2002, this work assignment expired and incomplete tasks have been continued under Work Assignment No. R09107, under Contract No. 68-W-02-021.

This document presents the results of OV radiological survey tasks conducted by Tetra Tech in Buildings T-012, T-029, and T-363 at the DOE ETEC, located in Area IV of the SSFL, from January 10 through 12, 2000.

1.1 PURPOSE

The purpose of this report is to describe the results of the OV surveys conducted by Tetra Tech. This report also compares the OV survey data to data from previous radiological close-out surveys conducted by Rocketdyne and to confirmation surveys performed by DOE's contractor, Oak Ridge Institute for Science and Education (ORISE) Environmental Site Survey and Assessment Program (ESSAP).

The OV surveys conducted by Tetra Tech were developed to supplement and confirm other data used to document the final radiological status of the buildings. The OV surveys included sampling of areas surveyed previously by other parties, as well as areas not previously surveyed in Buildings T-012, T-029, and T-363.

The project scope and detailed technical procedures are described in the OV and Confirmation Radiological Survey Work Plan (Revision 1) (Tetra Tech 1999). Detailed standard operating procedures (SOP) for performing indoor and outdoor radiological surveys, instrument calibrations, and the quality assurance (QA) project plan also are included in the work plan.

1.2 GENERAL SURVEY OBJECTIVES

General survey objectives under this task were to perform: (1) independent measurement of areas not previously surveyed, (2) measurements of areas previously surveyed to establish comparability of survey results, and (3) limited sampling of surfaces and areas that could retain radioactivity. Surveys were performed to a quality level equal to that of a final status survey, as defined by the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) (Revision 1) (EPA 2000); however, because an OV survey does not require the same level of detail as a final status survey, the extent of OV surveys and sampling and selection of sampling locations intentionally were reduced in scope from that of a MARSSIM final status survey.

2.0 PROJECT SCOPE

The OV survey work plan covered accessible building surfaces that could be surveyed for the purpose of establishing total and removable surface radioactivity, in accordance with standard guidance provided by the State of California, DOE, and the U.S. Nuclear Regulatory Commission (NRC). Standard release criteria are reproduced from the NRC Regulatory Guide 1.86 (1974) in Table 1. These are substantially the same criteria approved for this facility by DOE (Rocketdyne 1996). The buildings identified in Table 2 were scoped for evaluation of floors and walls in accordance with the OV survey work plan (Tetra Tech 1999).

The approved work plan included five buildings at the SSFL, as listed in Table 2. At the direction of the EPA work assignment manager, only Buildings T-012, T-029, and T-363 were surveyed. Buildings T-023 and T-028 already had been demolished, and the building materials had been disposed of off site.

3.0 SITE BACKGROUND AND HISTORY

Site background information, contaminants of concern (COC), and general and specific site histories for the buildings included in the OV survey are discussed briefly in the following subsections.

TABLE 1

ACCEPTABLE SURFACE CONTAMINATION LEVELS
ROCKETDYNE
SANTA SUSANA FIELD LABORATORY

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

Source: U.S. Nuclear Regulatory Commission. 1974. Regulatory Guide 1.86.

Notes:

a Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently. As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

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

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

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

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

Ac	Actinium
α	alpha
β	beta
cm^2	Centimeters squared
dpm/100 cm^2	Disintegrations per minute per 100 centimeters squared
γ	gamma
I	Iodine
Pa	Protactinium
Ra	Radium
Sr	Strontium
Th	Thorium
Th-nat	Natural thorium
U	Uranium
U-nat	Natural uranium

TABLE 2

**SCOPE OF RADIOLOGICAL SURVEYS
ROCKETDYNE
SANTA SUSANA FIELD LABORATORY**

Building	Description	Facility Status	Contaminants of Concern [a]	Target Areas
T-012	Systems for Nuclear and Auxiliary Power Critical Assemblies, Fast Neutron Spectrum Reactor Experiments, Fuel Storage in Irradiated and Unirradiated Forms, and Nuclear Radiography Sources	Not in use; released for unrestricted use	MFP, U, and ACP	Floors and walls
T-029	Calibration Facility	Closed; released for unrestricted use; currently a permitted hazardous waste storage area	Radium-226	Floors and walls
T-363	Sodium Reactor Experiment Support Facility	Not in use; partially dismantled; released for unrestricted use	MFP and U	Floors and walls
T-023	Sodium Test Loop and Chemistry Lab	Closed; released for unrestricted use; demolished	MFP and U	NA
T-028	Shield Test Reactor and Shield Test and Irradiation Reactor	Closed; released for unrestricted use; demolished	MFP, U, and ACP	NA

Notes:

a Contaminants of concern are discussed in Sections 3.2. and 3.4.

ACP Activation and corrosion activation products
MFP Mixed fission product
NA Not applicable; buildings have been demolished
U Uranium

3.1 SITE BACKGROUND

In 1946, Rocketdyne established the SSFL, located in Ventura County, California, as a rocket engine test site. Rocketdyne divided the 2,700-acre site into four administrative areas (Areas I, II, III, and IV) and a buffer zone. During the 1950s, Rocketdyne expanded site operations to include nuclear energy research and nuclear reactor development for DOE. Nuclear operations were conducted in Area IV and included fabrication of nuclear fuels, testing of nuclear reactors, and disassembly and analysis of used fuel elements. No nuclear research has been conducted at the site since 1988.

Location of the SSFL and Area IV are shown in Figure 1. About 25 buildings within Area IV used radioactive material. The OV surveys addressed three of these buildings. Area IV and the three buildings surveyed are shown in Figure 2.

A detailed operational history of the facility is found in the document entitled, Nuclear Operations at Rockwell's Santa Susana Field Laboratory – A Factual Perspective (Rocketdyne 1989). The Radiological Survey Plan for Santa Susan Field Laboratory (Rocketdyne 1985) presents a concise summary of radiological issues at the site and a discussion of the environmental setting of SSFL.

3.2 CONTAMINANTS OF CONCERN

The history of the facility indicates the potential for contamination by tritium, mixed fission products (MFP), activation products, radium, uranium, and transuranic compounds. The alpha and beta-gamma radiation characteristics of these contaminants are described and the applicability of the NRC Regulatory Guide 1.86 limits to each contaminant is identified in the following sections.

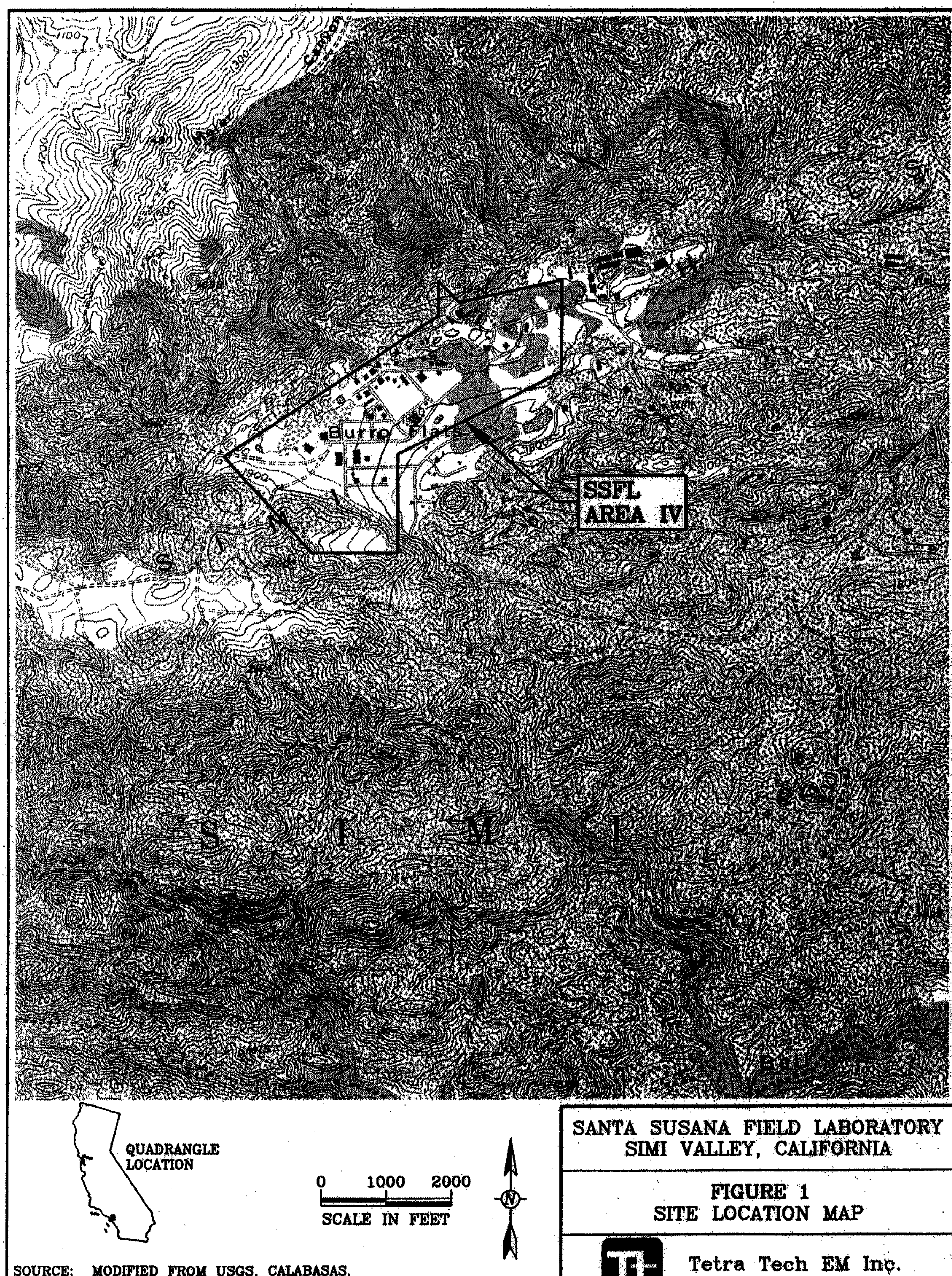
3.2.1 Tritium

Although tritium is a COC for the ETEC, based on past practices in these buildings, tritium is not considered to be a COC for the buildings included in the OV surveys (Rocketdyne 1991). As noted by Rocketdyne, the maximum potential release of tritium to the environment from Building T-028 operations was estimated to be negligible. Buildings T-012 and T-363 were not potential sources of tritium. Therefore, OV surveys were not designed for detection of tritium, and no surface samples were collected for the purpose of assessing possible tritium contamination.

3.2.2 Mixed Fission Products

OV survey methods and alpha and beta-gamma survey instruments were used to detect MFP total surface contamination. Swipe samples were collected to determine the presence of removable gross beta-gamma activity. Concrete samples were collected in Building T-363 to identify any photon-emitting MFPs through gamma spectrum analysis.

The MFP activity limits of Table 1 (for beta-gamma emitters) (nuclides with decay modes other than alpha emission or spontaneous fission) are appropriate and were used for evaluating beta-gamma surface activity measurements for the three buildings surveyed in this project.

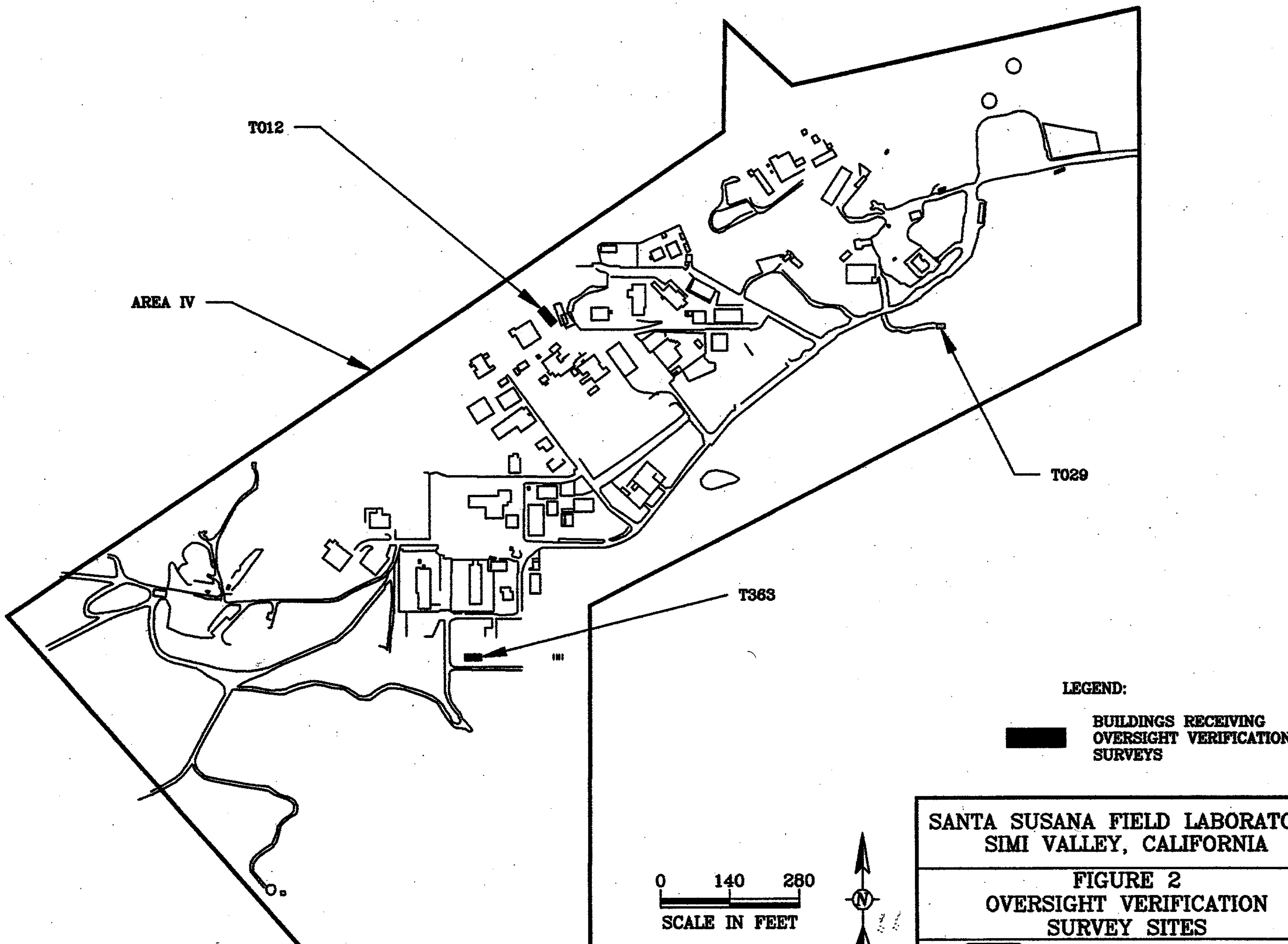


SOURCE: MODIFIED FROM USGS, CALABASAS, CALIFORNIA, 1952, PHOTOREVISED, 1967.

SANTA SUSANA FIELD LABORATORY
SIMI VALLEY, CALIFORNIA

FIGURE 1
SITE LOCATION MAP

Tetra Tech EM Inc.



SANTA SUSANA FIELD LABORATORY
SIMI VALLEY, CALIFORNIA

FIGURE 2
OVERSIGHT VERIFICATION SURVEY SITES

Tetra Tech EM Inc.

SOURCE: BOEING-ROCKETDYNE, 3-23-99

3.2.3 Activation Products

The potential for presence of activation products resulting in volumetric contamination was assessed using survey methods and survey instruments to measure total surface contamination and by measuring external gamma dose rates. OV surface survey methods would be capable of detecting activation products resulting in surface or near-surface beta-gamma contamination. Swipe samples were collected to determine the presence of removable gross beta-gamma activity.

The activity limits for beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) in Table 1 are appropriate and were used for evaluating activation product surface activity measurements for the three buildings surveyed in this project.

DOE limits for external gamma radiation for a site to be released without restrictions are no more than 20 microRem per hour (μR/hr) above background (DOE 1990). Rocketdyne further reduced the acceptable external gamma dose rate to no more than 5 μR/hr above background. Dose rates measured by Tetra Tech were assessed against the Rocketdyne established gamma dose-rate criteria.

3.2.4 Radium

OV survey methods and survey instruments capable of detecting total alpha surface activity were used to determine potential contamination resulting from radium. However, the surveys were not designed to distinguish specific radionuclides. Swipe samples were collected to determine the presence of removable gross alpha activity.

The radium activity limits (for transuranics and radium-226) in Table 1 are appropriate and were used for evaluating alpha surface activity for the three buildings surveyed in this project.

3.2.5 Uranium

As noted in Section 3.4, uranium is a potential COC for Buildings T-012 and T-363. The half-lives of the various uranium isotopes range from days to millions of years. All uranium isotopes with half-lives greater than 30 days emit alpha radiation. OV survey methods and survey instruments capable of detecting total alpha surface activity were used to determine potential contamination resulting from uranium. However, the surveys were not designed to distinguish specific isotopes or radionuclides. Swipe samples were collected to determine the presence of removable gross alpha activity.

The uranium limits (for U-nat, U-235, U-238, and associated decay products) in Table 1 are appropriate and were used for evaluating alpha surface activity for the three buildings surveyed in this project.

3.2.6 Transuranic Compounds

Plutonium could potentially be present wherever irradiated fuel was handled and in the vicinity of nuclear reactors. Plutonium has a half-life on the order of 24,000 years. However, based on the history of the buildings surveyed, application of the transuranic free-release limit was not appropriate, because none of the facility history suggested that plutonium was handled or that irradiated fuel was opened or examined in the facility.

3.3 BACKGROUND RADIATION IN SOILS AND CONSTRUCTION MATERIALS

Naturally occurring radiation is present in soils and common building materials. Naturally occurring isotopes include, but are not limited to, uranium and thorium, as well as their progeny, and potassium-40. Soils at the SSFL Site are discussed in the Radiological Survey Plan for Santa Susana Field Laboratory (Rocketdyne 1985). Arkosic sandstone, with interbeds of marine siltstone, claystone, and shale, underlie much of the site. Arkosic sand is the predominant source of naturally occurring radioactive isotopes in these soils. Arkose is a type of sandstone that contains feldspars. The feldspar fraction is a natural source of gamma-emitting potassium-40. The arkosic sand fraction also may contain some granitic rock.

Granitic rock contains small amounts of natural uranium that decays in a natural series into other radioisotopes, including radium-226 and radon-222. Granitic rock often is integrated into common masonry and ceramic building materials. All numerical criteria for surface radioactivity are intended to be applied above the background concentration. The exact relationship between background concentrations of naturally occurring radioactive material and field measurement of surface alpha activity may be complicated to assess. Therefore, as an initial conservative approach, the contribution from natural activity is assumed to be zero.

Other important sources of background radiation in soils are anthropogenic (produced as a result of the activities of humans). As the result of atmospheric testing of nuclear weapons, the fission products cesium-137 and strontium-90 are two anthropogenic radioisotopes that are ubiquitous in the environment. These materials are deposited from the atmosphere as fallout. The quantities of fallout material in soils depend on the extent of surface soil erosion or tilling since deposition; therefore, they can vary widely from site to site. The variability of fallout may factor into background measurements.

Because naturally occurring radioactive materials are present in some construction materials originating from rock or soil, in varying concentrations, the level of background radiation also will be variable within buildings at the SSFL Site. As part of this project, background radioactivity was assessed in soils and construction materials by gamma dose rate measurements to document the contribution of background materials to the variability of field radiological measurements. Various beta background measurements also were noted in buildings of different construction material.

3.4 OPERATIONAL HISTORY AND BASIS FOR SURVEY

The following sections describe the operational history of the buildings where OV surveys were performed and provide descriptions of the buildings and the technical basis for conducting the surveys. The site survey grid maps are included in Appendix A.

3.4.1 Building T-012

Building T-012 was used for experiments using the Systems for Nuclear and Auxiliary Power critical assemblies. Other operations included fast neutron spectrum reactor experiments, fuel storage in irradiated and un-irradiated forms, and radiography using radioactive sources. This building reportedly stored highly enriched uranium. COCs for this building are MFPs, activation and corrosion products, and uranium.

The building consists of three rooms: Room 109, the fuel storage room, and the critical cell. Room 109 is the main room in the building. The room has thick concrete walls, a concrete slab floor, and a concrete ceiling about 5 meters (m) high. Room 109 has about 30 square meters (m^2) of floor space and a total surface area (floor, ceiling, and walls) of about 150 m^2. The fuel storage room is adjacent to Room 109. Uranium fuel rods formerly were stored in this room in tubes within the thick concrete walls. The fuel storage room has concrete walls, a concrete slab floor (about 10 m^2), and a corrugated steel ceiling (approximately 2.5 m high). The area above the fuel storage room is referred to as the attic. The critical cell is a steel-lined room (about 36 m^2 of floor space), with a ceiling height of about 3 m. A small hallway (airlock) joins the critical cell and Room 109. A large, steel door (about 1 foot thick) at the critical cell end of the airlock is still in place. The door at the Room 109 end of the airlock has been removed.

The final status survey for this facility was completed by Rocketdyne in 1996 (ETEC 1996a). Rocketdyne reported performing fixed-point measurements, 100 percent scans of the floor and lower wall areas, and swipe measurements for removable activity for alpha, beta, and gamma activity. ORISE also performed radiological surveys in July 1996. ORISE made fixed-point measurements and collected swipe samples to assess levels of removable contamination. Tetra Tech performed scan surveys for alpha and beta in 39 grid locations and performed fixed-point measurements for alpha and beta in 68 grid locations. These surveys included 22 grids previously surveyed by ORISE and 49 grids previously surveyed by Rocketdyne. In addition, Tetra Tech collected 29 swipe samples for laboratory analysis for removable contamination.

3.4.2 Building T-029

Building T-029 was used for radiological calibrations. According to the facility history, a 24.8-millicurie radium-226 source encapsulated in plastic was dropped inside of the source storage well, resulting in internal contamination of the source storage well and source holder. Minor contamination also occurred in the immediate vicinity of the source holder. The area outside of the source holder was promptly decontaminated and surveyed. The damaged source was removed and sealed to prevent further leakage. No further contamination incidents were reported for this facility. The source storage well and source holder subsequently were removed for disposal. Other portions of the facility also were removed during the course of decommissioning. The building currently is permitted as a hazardous waste storage facility. The COC for this building is radium.

Building T-029 is a 20- by 40-foot storage building, with metal walls, ceiling, and roof and a concrete slab floor. The interior walls have insulation tiles (4 by 4 feet) covering the upper walls. The sloped ceiling is about 15 feet high at the centerline.

No additional surveys were recommended for this facility in the work plan (Tetra Tech 1999), because the facility handled only sealed sources, previous surveys performed were deemed to be adequate, and the one source incident involving contamination that occurred at this facility was minor and adequately characterized. However, two of the buildings (T-023 and T-028) originally identified in the work plan to be included in the OV survey had been demolished: consequently, EPA directed that Building T-029 should be surveyed instead. The final status survey for this facility was completed by Rocketdyne in 1988. ORISE performed scans of the floor of Building T-029 in the vicinity of the previously installed source holder. Tetra Tech performed scan surveys for alpha and beta in 10 grid locations and performed fixed-point measurements for alpha and beta in 22 grids. Six swipe samples were collected, and dust samples were collected from two ventilation ducts. Swipe samples were analyzed for removable contamination, and dust samples were analyzed for the presence of radium daughter products.

3.4.3 Building T-363

Building T-363 was used as a support facility for sodium-cooled reactors. COCs are MFPs and uranium. The building, made up of four storage bays (Bays 1 through 4) and a support area (Rooms 100 through 103), has been partially dismantled. The northern and southern walls of each bay and the support area (excluding doors and doorframes), the eastern wall of the support area (Room 100), all of the roofs, and the interior walls in the support area have been removed. The building has a concrete slab floor and a concrete loading dock on the northern and southern sides of the building. Each storage bay has an area of about 24 m^2, and the support area has a total area of about 36 m^2.

In 1996, Rocketdyne conducted a 100 percent survey of Bay 4 and a 10 percent survey in the other bays and rooms (ETEC 1996c). ORISE performed fixed-point measurements and collected swipe samples in July 1996. Tetra Tech performed scan surveys for alpha and beta in 29 grid locations and performed fixed-point measurements for alpha and beta in 23 grid locations. These surveys included 11 grids previously surveyed by ORISE and 11 grids previously surveyed by Rocketdyne. In addition, Tetra Tech collected 20 swipe samples for laboratory analysis for removable contamination. Four concrete samples were collected from the floor of Bay 4 for isotopic analysis.

4.0 RADIOLOGICAL SURVEY METHODS

This section describes the overall approach used to perform OV surveys for this project, including radiation detection methods used, survey design, statistical considerations, and quality control (QC) for the survey. Subsequent sections describe detailed measurement methods, instrument performance characteristics, and instrument operation parameters as well as detailed survey tasks.

4.1 INITIAL INSPECTION AND SURVEY GRIDS

Tetra Tech performed a walk-through inspection of the buildings to be surveyed with Rocketdyne staff. Tetra Tech also performed an on-site review of the original survey data, locations surveyed, and the coverage frequency. Based on the results of previous surveys, the survey team then identified specific locations to be included in the OV survey.

The survey team also determined some survey locations using professional judgment. Emphasis was placed on locations with a potential to trap residual radioactivity such as wall penetrations, ventilation ducts, and low points. Several pipes, ducts, cracks, and vents identified were surveyed and swiped for assessment of removable activity. Measurements also were taken at random locations.

Tetra Tech followed the established grid when it could be identified or established a new grid to cover required areas.

4.2 RADIATION DETECTION METHODS

Several radiation detection methods and field activities were used during radiological surveys, including: (1) gamma dose rate measurements, (2) gamma detector response rate measurements (which are correlated to dose rates), (3) fixed and removable beta-gamma activity measurements, (4) fixed and removable alpha activity measurements, and (5) collection of concrete and dust samples for off-site laboratory analysis. Surveys and data evaluation were performed in accordance with the work plan (Tetra Tech 1999). This work plan was designed such that field survey methodology, techniques, and terminology were in general accordance with two federal guidance documents: the Manual for Conducting Radiological Surveys in Support of License Termination (NRC 1993) and MARSSIM[1] (EPA 2000).

For measurements of alpha surface radioactivity and beta-gamma surface activity, background radiation levels were measured at appropriate, unaffected locations identified within the same survey area.[2] For gamma radiation surveys, background measurements were taken at locations with similar construction material that are unlikely to contain any radioactive materials at activities above background levels. Background radiation levels for surface activity measurements were established by assuming that surface contribution of background is zero (which is conservative and health-protective). Contributions to the alpha and beta-gamma surface activity background are therefore assumed to be from cosmic, terrestrial, or other natural sources or detector noise (a result of detector electronics).

4.3 SYSTEMATIC SAMPLING PLAN

OV survey locations were selected based on previous survey data, professional judgment, or random methods in order to: (1) establish comparability with previous surveys, (2) provide coverage of data gaps in the original survey, and (3) provide additional data for areas previously surveyed. Rooms that had received 100 percent area scans by ESSAP were not completely resurveyed; however, small areas within each room were rescanned to establish comparability of data. Survey coverage consisted of surface area scans, together with fixed-point surveys of areas selected by Tetra Tech, as well as fixed-point and scan surveys of areas randomly selected or selected by the community. Because each

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[1] MARSSIM was jointly developed by EPA, NRC, the U.S. Department of Defense, and DOE.

[2] Background radiation levels were assessed only as necessary to verify compliance with surface activity criteria and comparability with Rocketdyne and ESSAP data.

independent measurement process has an associated uncertainty consisting of systematic and random uncertainty, on comparison, results do differ. The initial criterion established in the work plan for evaluation of data comparability is a relative percent difference (RPD) of plus or minus (±) 50 percent.[3] If comparability cannot be established within this value, reasons for discrepancies are discussed.

4.4 FIELD MEASUREMENT IDENTIFICATION

All field measurements are clearly traceable to a detector calibration record. Field measurements are coded for use with a computer database/spreadsheet designed specifically for collecting data, performing necessary calculations, and presenting field measurement data several ways in order to aid analysis.

Data typically were recorded directly on figures or sketches of survey areas or on survey forms. For scanning measurements, the average and maximum alpha and beta-gamma count rates (in counts per minute [cpm]) were recorded on the figure within the survey grid. Fixed-point and node measurements were made for 2 minutes, and gross alpha and gross beta-gamma counts were recorded on a survey form or a figure. Detectors used and detector-specific backgrounds also were noted in the figures or survey forms. Raw field data were transferred to the database for conversion to activity units (disintegrations per minute per 100 square centimeters [dpm/100 cm^2]), uncertainty calculations, and reportable concentrations. Data tables from the database for the scan and fixed-point field measurements are presented as Table B-1 in Appendix B. Swipe sample data are presented in Table B-2. Results of gamma spectroscopy of concrete and dust samples are presented in Table B-3. Count rate to dose rate correlation data and background survey results are presented in Tables B-4 and B-5, respectively.

5.0 MEASUREMENT METHODS

The methods used by Tetra Tech to set up, calibrate, and operate radiation detectors, as well as record data and perform measurement QC, are described in the SOPs appended to the survey work plan (Tetra Tech 1999). The following sections describe measurement methods used to collect the data presented in this report.

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[3] The RPD criterion is applied if the surface activity is at least one-half of the release limit.

The radiological OV surveys were divided into the following tasks:

- Measure gamma dose rates in areas of concern (Section 5.1).
- Establish grid systems, as needed (Section 5.2.1).
- Perform scan surveys of specified and random areas (Section 5.2.3).
- Perform fixed-point surveys of specified and random areas (Section 5.3).
- Sample areas for removable contamination (Section 5.4).
- Determine the detection efficiency of surface radiation detectors (Section 5.5).
- Collect samples of construction materials or debris in buildings, as needed (Section 6.4).
- Assess background dose rates at areas in and around Area IV of SSFL (Section 6.5).

The following sections provide additional description on how each of these tasks was performed.

5.1 MEASUREMENTS OF GAMMA DOSE RATE

Gamma dose rates were determined using a gamma scintillation detector correlated to a tissue-equivalent dose rate chamber calibrated for radium-226 at several locations within each building surveyed. This method is described by EPA SOPs (1988).

For dose rate evaluations, all measurements were taken at 1 m from the floor surface at approximate locations of exposure rate measurements made during the previous surveys.

5.2 SCANNING SURVEYS

Tetra Tech selected areas to be scanned for surface activity to: (1) replicate previous survey data, (2) assess an area that would have a higher likelihood of containing residual contamination, or (3) assess random locations. Scanning surveys included floors and walls in Buildings T-012, T-029, and T-363. Detectors used during the scanning surveys are described in Section 5.2.2, and scanning methods are described in Section 5.2.3.

5.2.1 Establish Site-specific Grids

In Building T-012, Tetra Tech used the existing grid system that was marked on the walls and floors in Room 109, the fuel storage room, and the critical cell. These 1-m^2 grids were numbered sequentially, beginning with “1” in each of the three rooms. A new 4- by 4-foot grid system, resulting in 50 equally sized floor grids, was established in Building T-029. The floor grid was used to reference survey areas on the walls. Existing ORISE survey maps were used as a reference to establish a grid system for Building T-363. However, because ORISE maps used in the field did not number the grids, Tetra Tech established a sequential numbering system for grid identification. Survey maps provided in Appendix A show each of the grid systems used for the surveys.

5.2.2 Detectors Sensitive to Multiple Radiation Types

Large-area phoswich[4] dual alpha and beta-gamma detectors (Ludlum Measurements, Inc. [Ludlum], Model 43-89), coupled to a rate/scalar meter (Ludlum Model 2260 or Model 2224), were used for surface scans. Large-area detectors (100 square centimeters [cm^2]) provide a proportionate increase in sensitivity over pancake-style Geiger-Mueller detectors. Actual detector efficiencies were determined by the survey team during calibration using methods described in the survey work plan (Tetra Tech 1999). Field efficiency determinations reflect that for the applicable source energy, an appropriate detector and detector standoff distance was used. These factors can account for significant effects on measurement results. Detectors selected were suitable for the conditions.

5.2.3 Scanning Methods

Floor and wall surfaces were scanned with the 100-cm^2 phoswich detectors, sensitive to both alpha and beta-gamma activity. The detector probe was held no more than 1 centimeter (cm) from the surface being scanned, and the scan rate was no more than 1 probe width (10 cm) per 4 seconds. The phoswich detector is unique in that it produces two different tones (clicks) for alpha and beta-gamma detections and therefore allows an experienced surveyor to scan for both alpha and beta-gamma radiation at the same time. The vast majority of the surfaces were clean, flat, and relatively smooth. Surface conditions, in general, are not considered to have affected detector sensitivity. Some areas, however, where holes or cracks existed in a wall or floor surfaces, were not considered to be appropriate for alpha activity measurements because of the alpha particles' limited range in air.

For optimum detection sensitivity, changes in instrument response were monitored by visual and audible outputs. Average and maximum alpha and beta-gamma count rates, as discernable from the analog output display on the rate meters, were recorded for each grid scanned. To further assess areas identified by scan surveys as above background, these areas were marked, mapped, and remeasured using a fixed measurement.

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[4] A phoswich detector contains one alpha- and one beta-sensitive layer; therefore, alpha and beta emissions may be counted simultaneously.

The scan minimum detectable concentration was calculated prior to the survey using the method described in MARSSIM (EPA 2000). Detection sensitivity for this type of detection system, calibrated to a moderate energy beta source (technicium-99), ranged from 250 to 820 dpm/100 cm^2 for scanning measurements for this project. Detection sensitivity for this type of detector system, calibrated to a moderate energy alpha source (thorium-230), ranged from 11 to 62 dpm/100 cm^2 for scanning measurements.

5.3 FIXED-POINT ACTIVITY MEASUREMENTS

Tetra Tech selected locations for fixed-point measurements to: (1) replicate previous survey data, (2) assess an area identified as above background, or (3) assess random locations. Fixed-point activity measurements were taken on floors, walls, vents, pipes, and doors in Buildings T-012, T-029, and T-363. Measurement methods for beta-gamma and alpha activity are described in Sections 5.3.1 and 5.3.2, respectively.

5.3.1 Fixed Measurements of Beta-gamma Activity

Tetra Tech measured beta-gamma activity by using 100-cm^2 phoswich probes (Ludlum Model 43-89), coupled to a rate/scalar meter (Ludlum Model 2260). Detection sensitivity calculated for this type of detection system, calibrated to a moderate-energy beta source (technicium-99), ranged from 276 to 804 dpm/100 cm^2 for static, 2-minute counts for this project. A counting time of 2 minutes was chosen to meet detection limit requirements of one-half of the maximum allowable average beta-gamma surface activity provided in Table 1.

For the purpose of these measurements, the beta-gamma activity expressed in disintegrations per minute per 100 centimeters squared was calculated using the equations given in Appendix C.

5.3.2 Fixed Measurements of Alpha Activity

Tetra Tech measured alpha activity on the interior surfaces of the rooms simultaneously while measuring beta-gamma activity. A 100-cm^2 phoswich probe (Ludlum Model 43-89), coupled to a rate/scalar meter (Ludlum Model 2260), was used for these measurements. Detection sensitivity calculated for this type of detector system, calibrated to a moderate-energy source (thorium-230), ranged from 9 to 46 dpm/100 cm^2 for static, 2-minute counts for this project. A counting time of 2 minutes was chosen to meet detection limit requirements of one-half of the maximum allowable average alpha surface activity provided in Table 1.

5.4 REMOVABLE CONTAMINATION ASSESSMENT

Removable contamination measurements were made by taking surface swipes at locations of elevated total alpha activity, in areas that are likely to have trapped or pooled contaminated liquids, such as cracks and floor-wall joints. In addition, areas were selected randomly for collection of surface swipes. Swipes for assessment of removable surface activity were collected by using a dry filter paper to wipe an area of approximately 100 cm^2, while applying moderate pressure. Swipes also were collected on the insides of pipes (including fuel storage pipes), under doors, and in other inaccessible areas by attaching the swipe to a wooden dowel and inserting the dowel and swipe into the area.

On January 27, 2000, all of the swipes (55) were sent to Paragon Analytics, Inc. (Paragon), in Fort Collins, Colorado, for gross alpha and gross beta analysis. Four concrete samples from existing floor cracks and two dust samples also were sent to Paragon for gamma spectroscopy analysis.

5.5 CALIBRATION AND EFFICIENCY DETERMINATION

Survey instruments were rented for OV surveys. Instrument suppliers calibrated the detectors before shipment. Prior to using the detectors, the survey team determined the efficiency of each detector (probe and rate meter pair) using National Institute of Standards and Technology (NIST)-traceable sources, in accordance with procedures provided in the survey work plan (Tetra Tech 1999). Efficiencies were calculated in order to convert detector counts in cpm to alpha or beta-gamma activity in disintegrations per minute. Efficiencies also were used to determine scan rates and counting times that would provide sufficient detection limits to ensure that residual contamination less than one-half of the release criteria is detectable with a 95 percent confidence level. Equations used to calculate the detector efficiency are provided in Appendix C. A response check was performed each day to verify that the instruments properly responded to a known source of radioactivity. A background measurement was performed each day.

5.6 DETECTION LIMITS

Detection limits reported as "L_D" specify the capability of a measurement system to detect a signal in the presence of a background/noise signal. Because all low-level radioactivity measurements are associated with a physical error characteristic of the measurement process, statistical analysis is required for all measurements. Detection limits must be calculated at the field location where the survey is performed to account for background and to attain sufficient data quality of the intended purpose. Detection limits are based on counting statistics using the 95 percent confidence level for both Type I and Type II errors. MARSSIM defines a Type I error as "a decision error that occurs when the *null hypothesis* is rejected when it is true", and a Type II error as "a decision error that occurs when the *null hypothesis* is accepted when it is false." Adjustments of counting times allow required or specific detection limits to be met.

5.6.1 Critical Level

Detection limits are reported in terms of the critical level (L_C), the a posteriori statement of detection that protects from the false positive or Type I error. The L_C activity is the level at which there is a statistical probability of incorrectly identifying a background value as greater than background. All activity measurements less than L_C are reported as less-than values. The L_C is a statistical function of sample and background counting times and the background count rate. Equations for calculating L_C and the reported less-than value are provided in Appendix C.

5.6.2 Detection Limit

The detection limit is the a priori limit that protects from the false negative or Type II error and represents measurement system sensitivity. That is, a measurement with a true activity equal to L_D will be identified correctly as different from background a predetermined percentage of the time. For OV surveys, the L_D was calculated to represent a 95 percent confidence level. Activities determined to be greater than L_D are reported with a ± error. The L_D is a statistical function of sample and background counting times and the background count rate. Equations for calculating L_D and the reportable activity error are provided in Appendix C.

The minimum detectable activity (MDA) is an a priori measure of the smallest quantity of activity that could be present and still be detected with a specified level of confidence. The MDA is equal to the L_D converted from raw data units (cpm) to activity units (disintegrations per minute).

5.7 LABORATORY QUALITY CONTROL/QUALITY ASSURANCE AND DATA VALIDATION

Solid and swipe samples were shipped to Paragon Analytics Inc. under chain-of-custody control. Trained laboratory personnel received and verified the inventory of the samples and entered them into the laboratory control system. The samples were analyzed using instruments calibrated against NIST-traceable standards, in accordance with verified procedures. Laboratory control sample (LCS) analysis, method blank analysis, and duplicate sample analysis, as applicable, were used to verify the accuracy of sample analyses. No discrepancies requiring action were reported. All laboratory data were reviewed for completeness and correctness.

6.0 SURVEY RESULTS

The following sections discuss data reporting requirements, as outlined in the survey work plan (Tetra Tech 1999); discuss the results of OV surveys; present summaries of survey data; and present comparisons of survey data to data from previous surveys. All of the survey data are presented in Appendix B.

6.1 REPORTING REQUIREMENTS

When reporting field survey results, levels of radioactivity will be reported as "less than L_D" if the value (in disintegrations per minute per 100 cm^2) is less than the L_D. If the value (in disintegrations per minute per 100 cm^2) is greater than the calculated activity L_D, it is assigned an uncertainty estimate. The L_D is the smallest quantity of radioactivity that can be reliably distinguished from background 95 percent of the time, based on counting statistics (for a laboratory detection system, the L_D is equal to the laboratory MDA when the units are converted from counts to activity). The L_C is the level at which there is a 5 percent chance of calling a background sample value "greater than background" (that is, the probability of a false positive). For the purpose of reporting individual measurement results, any response above the instrument L_C will be considered above background (or a net positive result). For a detailed explanation of how L_C, L_D, and MDA limits are determined, see Appendix A of the survey work plan (Tetra Tech 1999) and MARSSIM (EPA 2000).

6.2 SUMMARY OF SURVEY RESULTS

This section provides the summary statistics for OV surveys. Table 3 presents the number of grids scanned, the number of fixed-point measurement grids, and the number of swipe samples for each building surveyed. The number of grids previously surveyed by Rocketdyne or ORISE and also surveyed by Tetra Tech for comparison purposes also is shown.

TABLE 3

SUMMARY OF MEASUREMENT LOCATIONS
ROCKETDYNE
SANTA SUSANA FIELD LABORATORY

Building	Number of Scanned Grids	Number of Fixed-point Measurement Grids	Number of Swipes	Number of Comparison Grids from Prior Surveys
T-012	39	68	29	49
T-029	10	22	6	0
T-363	29	23	20	22
TOTAL	**78**	**113**	**55**	**71**

Figures 3 and 4 are histogram plots showing the distribution of alpha and beta-gamma activities (in disintegrations per minute per 100 cm^2), respectively, for all fixed-point measurements. The alpha and beta-gamma activities are the calculated net activities after subtracting the background counts. The alpha backgrounds vary from 0.4 to 1.6 cpm. The beta-gamma backgrounds vary from 286 to 509 cpm. The background variations are the result of surveying three different building locations using five different survey instruments. The plots also show LC and LD values and indicate the applicable maximum allowable surface contamination limit. As the figures show, most of the alpha and beta-gamma measurements are reported as less than the LD. No measurement was greater than the applicable maximum alpha activity of 300 dpm/100cm2 (for radium), and no measurement was greater than the applicable maximum beta-gamma activity of 15,000 dpm/100cm2, as provided in Table 1. Limits selected are applicable and allowable, based on the history of the Rocketdyne buildings.

Table 4 provides information on the highest fixed-point alpha and beta-gamma measurements observed. Because these are the highest measurement results obtained, they are discussed further below, even though these measurement results are less than the appropriate release limits. No remedial action was required for any of the eight listed measurements.

Fixed-point measurements of Building T-363 identified one alpha and one beta-gamma elevated reading. The alpha reading was identified during a random surface scan of Grid 4 in Bay 4. The beta-gamma reading was a confirmation measurement of a previously identified anomaly of the ORISE survey. The beta-gamma reading, located in Grid 49, is on the inside surface of the lower half of the northern door.

FIGURE 3

ALPHA ACTIVITY FIXED-POINT MEASUREMENTS
BUILDINGS T-012, T-029, AND T-363

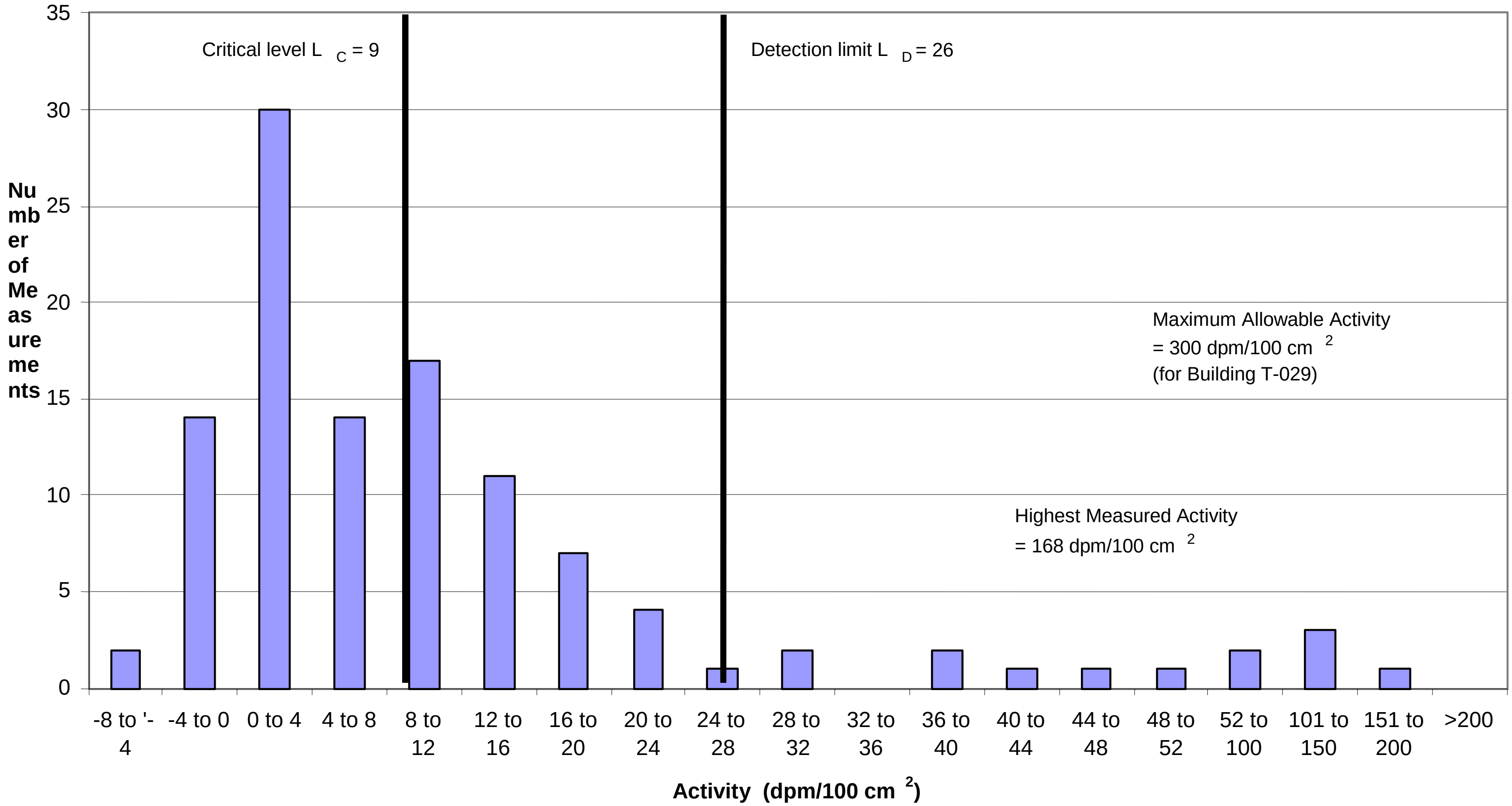

FIGURE 4

BETA-GAMMA ACTIVITY FIXED-POINT MEASUREMENTS
BUILDINGS T-012, T-029, AND T-363

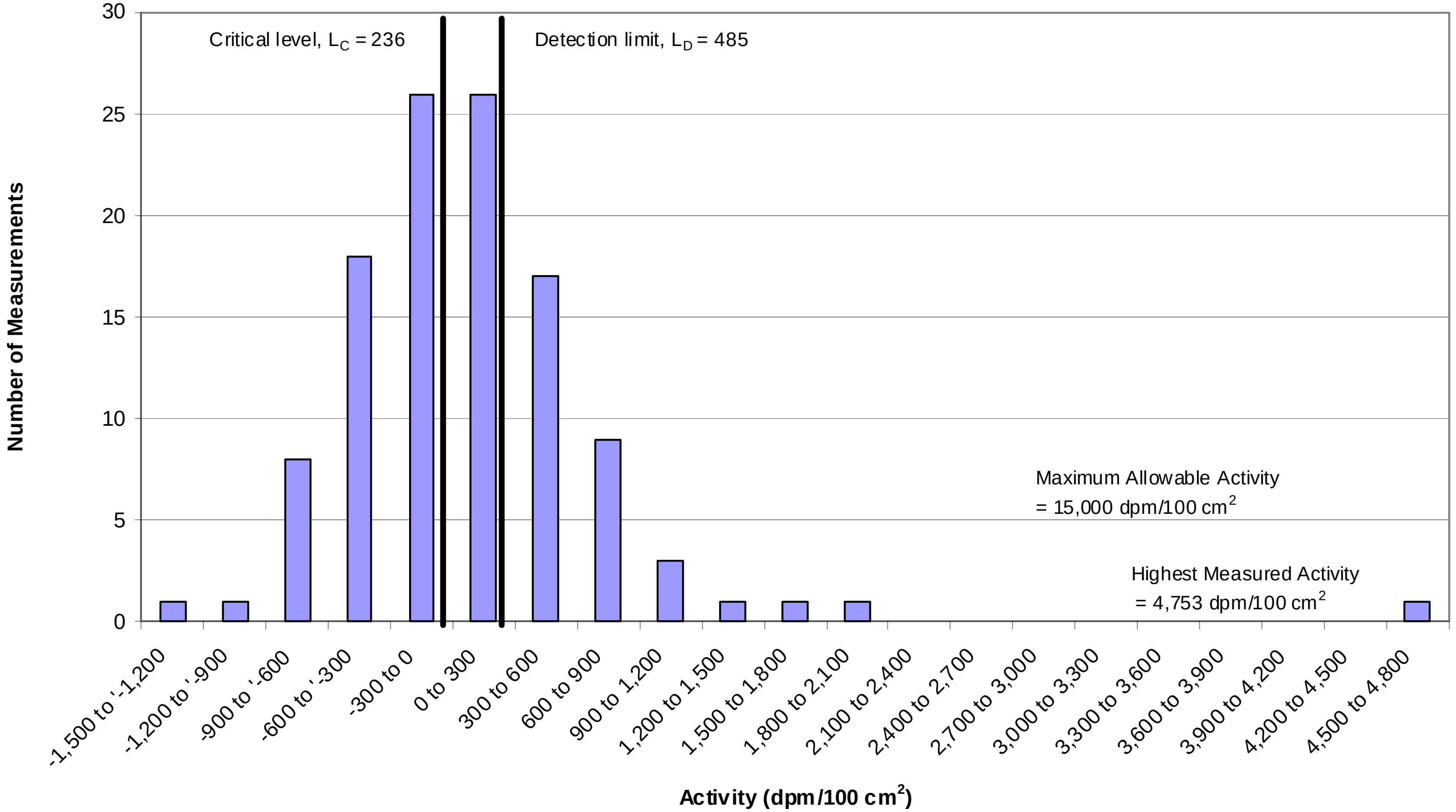

TABLE 4

MAXIMUM ACTIVITY MEASUREMENTS
ROCKETDYNE
SANTA SUSANA FIELD LABORATORY

Building	Room	Tetra Tech EM Inc. Grid Number	Activity (dpm/100 cm^2)
alpha Measurements			
T-363	Bay 4	4	49.8 ± 38
T-012	Critical Cell	63	78.1 ± 46
T-012	Critical Cell	146 Hinge of removed airlock door	87.6 ± 48
T-029	NA	Southern wall vent filter	114 ± 53
T-029	NA	Northern wall vent filter	120 ± 55
T-012	109	70	135 ± 59
T-012	Critical Cell	156 On top of the airlock door	168 ± 65
beta-gamma Measurements			
T-363	Bay 4	49 On the interior door surface	4,753 ± 565

Notes:

±　Plus or minus
dpm/100 cm^2　Disintegrations per minute per 100 square centimeters
NA　Not applicable; the building is only one room

Four elevated alpha readings were identified in Building T-012, three of which were identified in the critical cell. One critical cell alpha reading was detected in Grid 63, using a fixed-point measurement, at a location on the wall marked during a previous survey with "DA α." The alpha reading identified in Grid 146 of the critical cell was on the hinge of the previously removed airlock door and also was marked with "DA α." The alpha reading in Grid 156 was identified during a fixed-point measurement of the area because of the potential for radionuclides to concentrate on top of the door. The alpha reading in Room 109, Grid 70, was identified during a random surface scan of the area.

The two highest reading alpha measurements identified in Building T-029 were on the air vent filters located in the northwestern and southwestern corners of the building, about 10 feet above the floor surface. The filters were surveyed because of the potential for airborne radionuclides to concentrate on filter media. The activities provided in Table 4 represent maximum detected activities for each filter surface.

6.3 MEASUREMENT COMPARABILITY

As shown in Table 3, Tetra Tech made survey measurements in the same grid locations as those made by Rocketdyne and ORISE. Tetra Tech compared alpha and beta-gamma fixed-point measurements to measurements made in the same location by ORISE in July 1996. The survey work plan (Tetra Tech 1999) establishes an initial criterion for evaluation of data comparability. Specifically, for areas in which the surface activity is at least one-half of the release limit, the criterion is an RPD of ± 50 percent. Of 22 alpha and 22 beta-gamma measurements listed in Table 5, only 1 measurement (Building T-363, Bay 4, Grid 49 [door]), beta-gamma activity, exceeds one-half of the surface activity release limit. The RPD between the Tetra Tech and ORISE measurements is 4.4 percent. The highest Tetra Tech and ORISE alpha measurements, Building T-012, Hinge 146, are each less than 5 percent of the surface activity limit of 5,000 dpm α/100 cm^2. Even though these two measurements do not meet the criterion for comparison, the RPD was calculated to be 49 percent. Therefore, the two readings show acceptable comparability. Table 7 shows the comparison of these two highest reading fixed-point measurements. Of the other 21 alpha measurements taken at the same location by Tetra Tech and ORISE, only 1 ORISE measurement was greater than the MDA. Therefore, RPD values cannot be calculated. Aside from the RPD calculations, it is important to note that all of the Table 5 alpha measurements taken by Tetra Tech and ORISE were less than 5 percent of the average surface activity limit. Of the other 21 beta-gamma measurements taken in the same location by Tetra Tech and ORISE, only six grid points could potentially be compared. In 15 grid locations, either the Tetra Tech or the ORISE data were less than the MDA. In six grid locations, the highest Tetra Tech beta-gamma measurement (1,587 dpm/100 cm^2) was only 32 percent of the average surface activity limit. The highest ORISE beta-gamma measurement was in the same location (6,229 dpm/ 100 cm^2). ORISE determined the 1-m^2 average in that grid to be 1,300 dpm/100 cm^2. Although Table 5 beta-gamma measurements are not high enough to meet the criterion for calculation of RPDs, all measurements are much lower than the average surface activity limit.

Tetra Tech and Rocketdyne alpha scan and beta-gamma scan survey data for 49 grids are compared in Table 6. Tetra Tech measurements were recorded as maximum count rates (in cpm). Rocketdyne used a method of collecting gross counts in 5 minutes while scanning an entire grid, resulting in an average count rate (in cpm). RPDs for Rocketdyne and Tetra Tech scan measurements were not calculated because of the differences in data reporting methods. However, in 33 of the 49 grids, either Tetra Tech or Rocketdyne alpha measurements were less than the MDA or negative. The highest value from the remaining 16 grids was less than 2 percent of the average alpha surface activity limit. Similarly, in 33 of

TABLE 5

FIXED-POINT MEASUREMENT COMPARISONS
ROCKETDYNE
SANTA SUSANA FIELD LABORATORY

Building	Room	ORISE	Tetra Tech	ORISE		Tetra Tech	
		Point Number	Grid Number	Alpha (dpm/ 100 cm^2)	Beta (dpm/ 100 cm^2)	Alpha (dpm/ 100 cm^2)	Beta (dpm/ 100 cm^2)
T-363	Bay 2	8	21	< 34	< 230	15.1	< 251.2
T-363	Bay 3	15	10	< 34	255	18.3	< 251.2
T-363	Bay 3	17	23	< 34	228	21.4	< 251.2
T-363	Bay 4	27	49 (door)	< 34	4,553	12.0	4,753 ± 565
T-363	Bay 4	28	41	< 34	3,699	< 17.5	< 251.2
T-363	Bay 4	39	50 (outside)	51	6,229	37 ± 34	1,587 ± 454
T-363	100	33	6	< 34	< 230	31 ± 32	< 251.2
T-363	101	35	1	< 34	265	12.0	< 251.2
T-363	102	36	5	< 34	467	< 22.3	< 251.2
T-363	103	31	2	< 34	< 230	40.4	< 251.2
T-363	103	32	9	< 34	375	12.0	< 251.2
T-012	109	70	99	< 34	303	< 27.9	466
T-012	109	72	105	< 34	346	< 27.9	475
T-012	109	73	124	< 34	305	15.9	710 ± 400
T-012	109	76	120	< 34	332	22.2	< 515.7
T-012	109	78	90	< 34	< 230	12.7	< 498
T-012	109	80	55	< 34	269	15.9	385
T-012	Fuel Storage	82	33	< 34	382	< 8.4	747 ± 419
T-012	Critical Cell	68	Hinge 146	173	< 230	87.6 ± 48	<192.0
T-012	Critical Cell	51	101	<34	<230	<11.5	<276.2
T-012	Critical Cell	65	113	<34	<230	<16.9	<334.7
T-012	Critical Cell	67	55	<34	<230	45 ±35	<200.5

Notes:

±	Plus or minus
<	Less than
dpm/100cm^2	Disintegrations per minute per 100 square centimeters
ORISE	Oak Ridge Institute for Science and Education
Tetra Tech	Tetra Tech EM Inc.

TABLE 6

SCAN SURVEY MEASUREMENT COMPARISONS
ROCKETDYNE
SANTA SUSANA FIELD LABORATORY

Building	Room	Grid Number		Rocketdyne		Tetra Tech	
		Tetra Tech	Rocketdyne	Alpha (dpm/ 100 cm^2)	Beta (dpm/ 100 cm^2)	Alpha (dpm/ 100 cm^2)	Beta (dpm/ 100 cm^2)
T-363	Bay 4	4	4	7.82	-737.8	< 36.3	< 263.4
T-363	Bay 4	5	5	2.06	-182.28	< 23.7	< 263.4
T-363	Bay 4	9	9	4.12	-946.12	< 13.0	925 ± 444
T-363	Bay 4	13	13	4.94	-729.12	< 36.3	462
T-363	Bay 4	19	19	9.88	654.81	< 13.0	462
T-363	Bay 4	31	EW-15	-6.26	-57.28	< 13.0	462
T-363	Bay 4	34	EW-11	-0.42	-171.84	< 13.0	< 532.7
T-363	Bay 4	40	WW-17	3.74	83.38	< 13.0	< 263.4
T-363	Bay 4	41	WW-16	6.24	98.54	< 13.0	2,773 ± 512
T-363	Bay 4	42	WW-10	3.74	-545.76	< 23.7	925 ± 444
T-363	103	7	19	0	-393.64	< 36.3	<263.4
T-012	109	3	3	4	348	13.3	< 419.6
T-012	109	14	14	18	458	21.6	< 249.9
T-012	109	21	21	12	-101	13.3	< 249.9
T-012	109	30	30	4	43	22.2	967 ± 411
T-012	109	33	33	-1	51	29.9	< 419.6
T-012	109	48	48	0	174	38.2	< 419.6
T-012	109	54	54	15	342	< 24.5	< 249.9
T-012	109	59	59	11	207	< 18.1	1,138 ± 418
T-012	109	62	62	5	-207	< 24.5	< 249.9
T-012	109	70	70	18	426	71.5 ± 51.6	< 249.9
T-012	109	71	71	5	135	< 20.5	868 ± 424
T-012	109	78	78	17	-84	< 24.5	< 419.6
T-012	109	86	86	5	-25	< 8.4	589 ± 412
T-012	109	98	98	26	593	13.3	< 249.9
T-012	109	101	101	7	120	13.3	< 249.9
T-012	109	112	112	5	524	< 8.4	961 ± 428
T-012	109	117	117	3	266	13.3	< 249.9
T-012	109	125	125	10	399	38 ± 40	277
T-012	Fuel Storage	2	2	7	-163	< 8.4	496
T-012	Fuel Storage	14	14	2	-83	< 24.5	277
T-012	Fuel Storage	22	22	26	-134	13.3	< 249.6
T-012	Fuel Storage	36	36	14	243	13.3	462

TABLE 6 (Continued)

SCAN SURVEY MEASUREMENT COMPARISONS
ROCKETDYNE
SANTA SUSANA FIELD LABORATORY

Building	Room	Grid Number		Rocketdyne		Tetra Tech	
		Tetra Tech	Rocketdyne	Alpha (dpm/ 100 cm^2)	Beta (dpm/ 100 cm^2)	Alpha (dpm/ 100 cm^2)	Beta (dpm/ 100 cm^2)
T-012	Critical Cell	16	16	1	-132	< 21.8	871 ± 355
T-012	Critical Cell	22	22	4	-225	< 26.2	< 249.9
T-012	Critical Cell	26	26	3	-63	< 20	942 ± 344
T-012	Critical Cell	30	30	1	-41	< 20	857 ± 340
T-012	Critical Cell	49	49	7	-287	57 ± 39	< 344.5
T-012	Critical Cell	66	66	-1	-18	39 ± 33	< 393.2
T-012	Critical Cell	73	73	4	164	< 26.2	462 ± 314
T-012	Critical Cell	75	75	8	76	< 26.2	555 ± 319
T-012	Critical Cell	86	86	8	215	< 26.2	924 ± 339
T-012	Critical Cell	90	90	0	208	31.6	462 ± 314
T-012	Critical Cell	95	95	6	265	39 ± 33	267
T-012	Critical Cell	98	98	2	115	39 ± 33	406
T-012	Critical Cell	100	100	1	50	< 26.2	647 ± 324
T-012	Critical Cell	102	102	6	193	< 21.8	1,057 ± 365
T-012	Critical Cell	146	146	0	-32	< 26.2	< 338.4
T-012	Critical Cell	156	156	18	-148	< 11.2	< 200.5

Notes:

<	Less than
±	Plus or minus
dpm/100cm^2	Disintegrations per minute per 100 square centimeters
Rocketdyne	Boeing-Rocketdyne
Tetra Tech	Tetra Tech EM Inc.

TABLE 7

RELATIVE PERCENT DIFFERENCE COMPARISONS
ROCKETDYNE
SANTA SUSANA FIELD LABORATORY

Building	Room	ORISE Point Number	Tetra Tech Grid Number	Measurement Activity		Relative Percent Difference
				ORISE (dpm/100 cm^2)	Tetra Tech[a] (dpm/100 cm^2)	
T-363	Bay 4	27	49 (door)	4,553 beta	4,753 beta	4.4
T-012	Airlock	68	146	173 alpha	88 alpha	49.0

Notes:

a Activity without associated plus or minus error
dpm/100cm^2 Disintegrations per minute per 100 square centimeters
ORISE Oak Ridge Institute for Science and Education
Tetra Tech Tetra Tech EM Inc.

the 49 grids, either the Tetra Tech or the Rocketdyne beta-gamma activity was less than the MDA or negative. The highest beta-gamma activity reported by Tetra Tech (2,773 dpm/100 cm^2) was in Building T-363, Bay 4, Grid 41 and is 55 percent of the average beta-gamma surface activity limit. The Rocketdyne activity for the same grid is 99 dpm/100 cm^2. Again, the Tetra Tech and Rocketdyne calculated beta-gamma surface activities are well below the average surface activity limit.

No data are available to make direct comparisons to surveys previously performed in Building T-029. A 1988 survey performed in and around this building concluded that gamma exposure measurements showed no residual contamination existed on the inspected areas of the building floor and its surroundings (ETEC 1996b). The only indication of residual activity at that time was the alpha activity detected in the removed radium-226 source storage well.

6.4 REMOVABLE CONTAMINATION AND OTHER SAMPLING RESULTS

Fifty-five removable contamination samples (swipes) were collected throughout the three buildings included in the OV survey. Table B-2, in Appendix B, provides the locations where swipe samples were collected. The swipe samples were shipped to Paragon on January 27, 2000, for gross alpha and gross beta analysis.

The analytical data for swipe samples are presented in Table B-2, Appendix B. The most restrictive criterion for removable alpha activity is 20 dpm/100 cm^2 for transuranic and radium alpha activity (applicable to Building T-029). Based on documented past activities associated with Building T-012, which primarily involved the use of enriched uranium (enriched uranium contains a higher percentage of uranium-235 than is found in natural uranium), it is more appropriate to compare removable contamination sample results to release limits for natural uranium, uranium-235, and uranium-238 and associated decay products. As shown in Table 1, the appropriate limit for evaluation of removable activity data for Buildings T-012 and T-363 is 1,000 dpm/100 cm^2. This limit was not exceeded. Table 8 provides analytical results for the two highest gross alpha and gross beta sample results. No swipe samples exceeded applicable release criteria limits for removable alpha or beta-gamma contamination.

TABLE 8

HIGHEST SWIPE SAMPLE RESULTS
ROCKETDYNE
SANTA SUSANA FIELD LABORATORY

Sample Identification	Sampling Location	Gross alpha (dpm/100 cm^2)	Validated Qualifier	Minimum Detectable Activity (dpm/100 cm^2)
R09805-001	Building T-012, Room 109, Grid 70	23.5 ± 6.2	J	3.1
R09805-013	Building T-012, Fuel Storage Room, Tube 42	16.4 ± 4.9	J	2.7
		Gross beta (dpm/100 cm^2)		
R09805-045	Building T-363, Bay 4, Grid 2	14.87 ± 4.44	J	4.88
R09805-050	Building T-363, Bay 3, Grid 23	11.10 ± 4.22	J	5.11

Notes:

± Plus or minus
dpm/100 cm^2 Disintegrations per minute per 100 square centimeters
J The reported quantity is an estimated value

Full validation was performed on 5 of the 59 swipe samples. Cursory validation was performed on the remaining 54 swipe samples. The validation was based on satisfactory review of analysis of laboratory calibration standards, analysis of laboratory blanks, and review of instrument calibration data. All gross alpha and gross beta results were qualified as estimated. No swipe sample results were rejected by the validation process.

Six solid samples, including four concrete samples and two dust samples, were sent to Paragon for gamma spectroscopy analysis. Concrete samples were concrete chips chiseled from the floor surface in Bay 4 of Building T-363. Dust samples came from the two air vent filters in Building T-029, where alpha radiation anomalies were measured. Tetra Tech collected the dust samples by applying a piece of duct tape (about 100 cm^2) to the air vent filter and then removing it. The tape pieces were then sent to the laboratory for analysis. Concrete and dust samples were analyzed using gamma spectroscopy for photon-emitting isotopes. The analysis did not indicate the presence of any suspect radionuclides at elevated concentrations. Results are summarized in Table B-3 of Appendix B. One concrete sample, R09895-037, exceeded the method detection limit for one isotope, cesium-137. The cesium-137 concentration was reported as 1.88 picoCuries per gram (pCi/g). There are no recognized national standards for concentrations of isotopes in concrete. The closest appropriate standard is the standard for isotope concentrations in soil. The approved standard for cesium-137 in soil is 9.2 pCi/g, which is equivalent to an excess cancer risk of approximately 3 E 10^{-4} (Rocketdyne 1999). The measured cesium-137 concentration is less than the soil concentration value. None of the beta-gamma scans or fixed-point measurements of the floor of Bay 4 exceeded the average contamination limit of 5,000 dpm/100 cm^2. Therefore, no action is required regarding this isolated spot of residual activity.

Full validation was performed on two concrete samples. Cursory validation was performed on the remaining two concrete samples and two dust samples. The validation was based on satisfactory review of analysis of laboratory calibration standards, analysis of laboratory blanks, performance of duplicate analyses, and review of instrument calibration data. Analysis of a LCS for gamma spectroscopy was satisfactory. No solid sample results were rejected by the validation process.

6.5 BACKGROUND INVESTIGATION RESULTS

Tetra Tech performed an assessment of background radiation dose rates at several locations at the Rocketdyne facility outside of Area IV. Surveys were performed initially with a tissue-equivalent ionization chamber (Health Physics Instruments Model 1010) and a 2- by 2-inch sodium iodide gamma scintillation detector (Ludlum Model 44-10), coupled to a Ludlum rate meter (Ludlum Model 2221). The instruments were used concurrently in order to establish a correlation between the background gamma radiation count rate (provided by the scintillation detector in cpm) and the dose rate (provided by the ionization chamber in microRems per hour). Based on the initial seven measurements (provided in Table B-4 of Appendix B), an average conversion factor of 0.001149 microRems per hour per count per minute (μR/hr per cpm) was determined. Because of the time necessary to obtain an adequate measurement using the ionization chamber, all subsequent background measurements were made with the scintillation detector and resulting count rates then were converted to dose rates. Even though only a few data points were used to calculate the conversion factor, the purpose of the calculation is to compare survey site data to background data collected with the same instrument. As such, it is adequate for the intended purpose.

Natural background radiation varies throughout the Rocketdyne facility. Background survey data are provided in Table B-5 of Appendix B. Summary statistics for the background measurements are provided in Table 9. All measurements were taken at 1 m above the ground or floor surface.

TABLE 9

INDOOR AND OUTDOOR BACKGROUND SURVEY RESULTS
ROCKETDYNE
SANTA SUSANA FIELD LABORATORY

Number of Measurements	11[a]
Maximum Background Dose Rate Measurement (outdoor)	19.7
Minimum Background Dose Rate Measurement (outdoor)	11.9
Mean Background Dose Rate (outdoor)	15.6
Range Background Dose Rate (outdoor)	7.8
Maximum Background Dose Rate Measurement (indoor)	18.7
Minimum Background Dose Rate Measurement (indoor)	16.8
Mean Background Dose Rate (indoor)	17.7
Range Background Dose Rate (indoor)	1.9
Standard Deviation of All Background Measurements	2.6

Note: a All values are in microRems per hour.

6.6 DOSE RATE SURVEY RESULTS

Dose rate measurements were collected in OV survey areas using scintillation detector reading in cpm. The count rates were multiplied by the conversion factor (0.001149 μR/hr per cpm) described in Section 6.5. Dose rate survey results are provided in Table 10. All measurements were taken at 1 m above the floor surface. Rocketdyne had established a limit of 5 μR/hr above background as the project criterion for remediation. All of the 10 indoor dose rate measurements were less than the Rocketdyne limit. Similarly, the three outdoor dose rate measurements were all less than the Rocketdyne limit.

TABLE 10

INDOOR AND OUTDOOR DOSE RATE SURVEY RESULTS
ROCKETDYNE
SANTA SUSANA FIELD LABORATORY

Location	Indoor or Outdoor	Count Rate (cpm)	Dose Rate (μR/hr)	Mean Background (μR/hr)	Rocketdyne Limit (μR/hr)
Building T-012, Critical Cell	Indoor	9,600	11.03	17.7	22.7
Building T-012, Critical Cell	Indoor	9,630	11.06	17.7	22.7
Building T-012, Room 109	Indoor	9,701	11.14	17.7	22.7
Building T-012, Room 109	Indoor	17,336	19.91	17.7	22.7
Building T-363, Bay 4	Indoor	11,939	13.72	17.7	22.7
Building T-363, Bay 1	Indoor	9,918	11.39	17.7	22.7
Building T-029	Indoor	12,600	14.47	17.7	22.7
Building T-029	Indoor	12,500	14.36	17.7	22.7
Building T-029	Indoor	12,450	14.30	17.7	22.7
Building T-029	Indoor	14,000	16.08	17.7	22.7
Mean Indoor Value	Indoor	NA	13.7	17.7	22.7
Range Indoor Value	Indoor	NA	8.88	NA	NA
Building T-363, Loading Pad	Outdoor	12,427	14.28	15.6	20.6
Building T-363, Loading Pad	Outdoor	12,406	14.25	15.6	20.6
Building T-363, Loading Pad	Outdoor	10,600	12.18	15.6	20.6
Mean Outdoor Value	Outdoor	NA	13.5	15.6	20.6
Range Outdoor Value	Outdoor	NA	2.1	NA	NA

Notes:

cpm	Counts per minute
μR/hr	MicroRem per hour
NA	Not applicable
Rocketdyne	Boeing-Rocketdyne

The highest dose rate was recorded in the fuel storage room of Building T-012. This is a small room with thick concrete walls (increasing the impact from naturally occurring radioactive material in concrete). The lowest dose rates were recorded in the critical cell of Building T-012. The concrete walls of the critical cell walls, ceiling, and floor are lined with steel (lowering the impact from naturally occurring radioactive material in concrete).

7.0 SUMMARY AND CONCLUSIONS

Tetra Tech performed radiation surveys for alpha and beta-gamma radiation in three Rocketdyne Buildings: T-012, T-029, and T-363. During the surveys, Tetra Tech scanned a total of 78 survey grids and performed 113 fixed-point measurements. Fifty-five swipes were collected in the survey areas and sent off site for analysis of gross alpha and beta contamination. Tetra Tech also collected four concrete samples and two dust samples for off-site gamma spectroscopy analysis. All field measurements were performed in accordance with a QA program developed for this survey. All laboratory analyses were performed by Paragon Analytics, Inc., a State of California-certified laboratory, and the laboratory data were independently validated.

Tetra Tech also performed a background radiation investigation to assess the variability of background throughout the SSFL site and within Area IV. The survey was designed to provide a basis for determining ambient gamma radiation dose rates within survey areas. The investigation assessed the background dose rates inside of buildings consisting of construction materials similar to those of the buildings included in the OV surveys as well as outside areas.

Field measurements conducted by Tetra Tech did not indicate the presence of surface contamination at levels greater than maximum free-release criteria established in the NRC Regulatory Guide 1.86 (1974) (see Table 1 or Rocketdyne criteria in the Proposed Sitewide Release Criteria [Rocketdyne 1996]). Of the 113 fixed-point measurements made by Tetra Tech, 1 beta-gamma measurement (Building T-363, Bay 4, Grid 49) approached the Table 1 average surface activity limit. A similar surface activity value was observed by ORISE at the same grid. Two fixed-point alpha surface activity measurements in Building T-029 wall vents exceeded the average alpha surface activity level of Table 1, but neither exceed the maximum alpha surface activity level. No remediation action is warranted. Tetra Tech's field measurements were compared to previous radiological close-out surveys conducted in 1996 by Rocketdyne and verification surveys conducted by ORISE. Although field measurement and data reporting methods used by the parties differed, the surveys performed by Tetra Tech confirm the results of the Rocketdyne and ORISE surveys.

The surveys provide an independent assessment of radiological conditions for Buildings T-012, T-029, and T-363 within Area IV of the SSFL. Within the limitations of the sampling and assessment methodology, Tetra Tech did not identify any locations that exceeded the Proposed Sitewide Release Criteria established by Rocketdyne for surface activity. Tetra Tech did not identify any locations inside of the buildings that exceeded background dose rates by the 5-µR/hr above background limit established by Rocketdyne.

In summary, the OV survey data developed by Tetra Tech is comparable and consistent with Rocketdyne and ORISE data. The independent data developed by Tetra Tech show that: (1) good agreement was established with prior surveys, (2) surfaces monitored by Tetra Tech are within NRC-established radiological limits, and (3) exposure rates measured by Tetra Tech do not exceed NRC-established radiological limits. Based on this assessment, Tetra Tech recommends that EPA accept the resurvey data as consistent with and supporting the conclusions reached by prior Rocketdyne and ORISE survey reports regarding the status of Buildings T-012, T-029, and T-363.

8.0 REFERENCES

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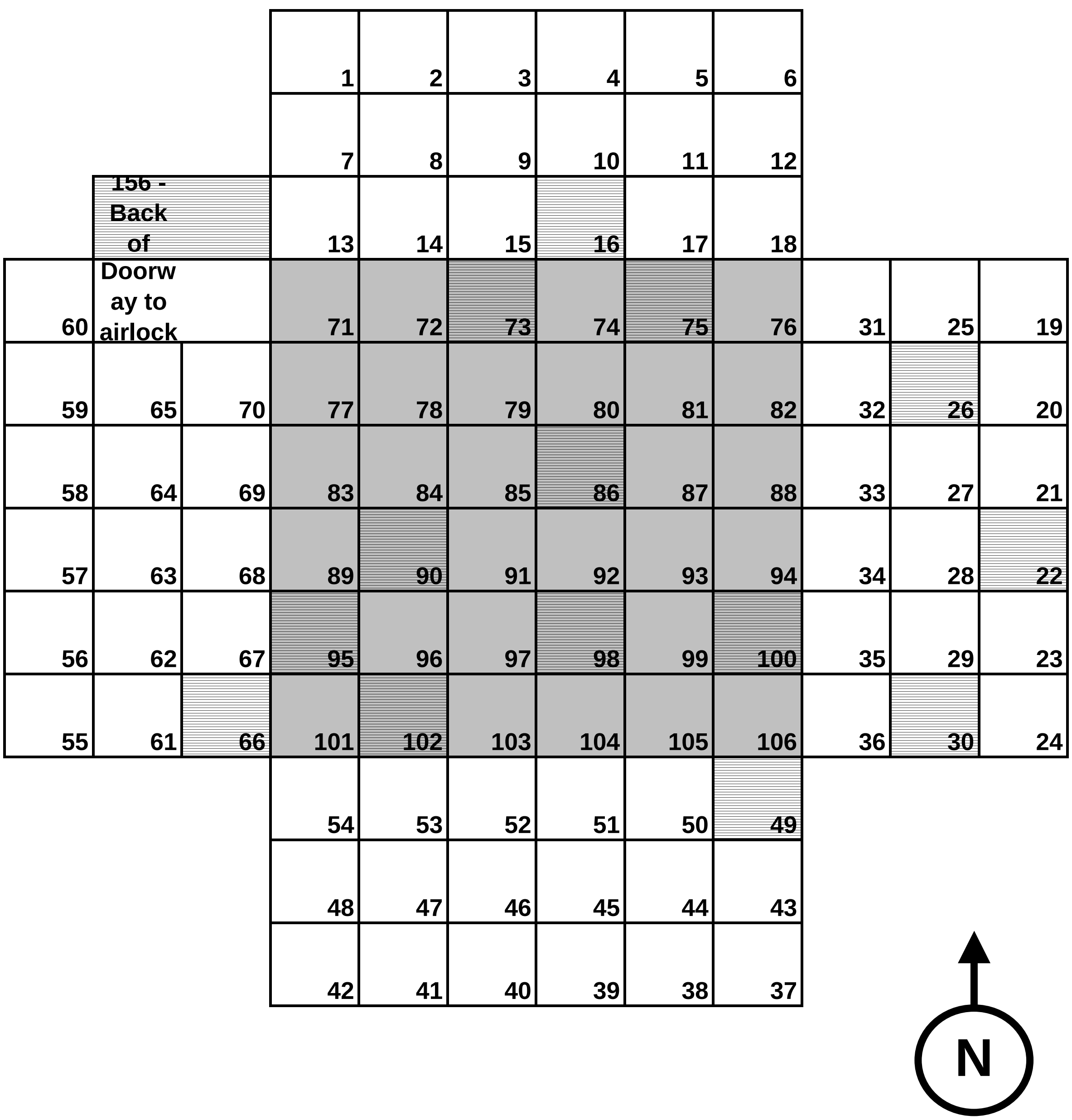
APPENDIX A

SITE SURVEY GRID MAPS

(12 Pages)



LEGEND

OV Survey Grid	OV Fixed Count
Floor Grid	
Wall Grid	ORISE Fixed Count

OVERSIGHT VERIFICATION SURVEY GRID

SANTA SUSANA FIELD LABORATORY

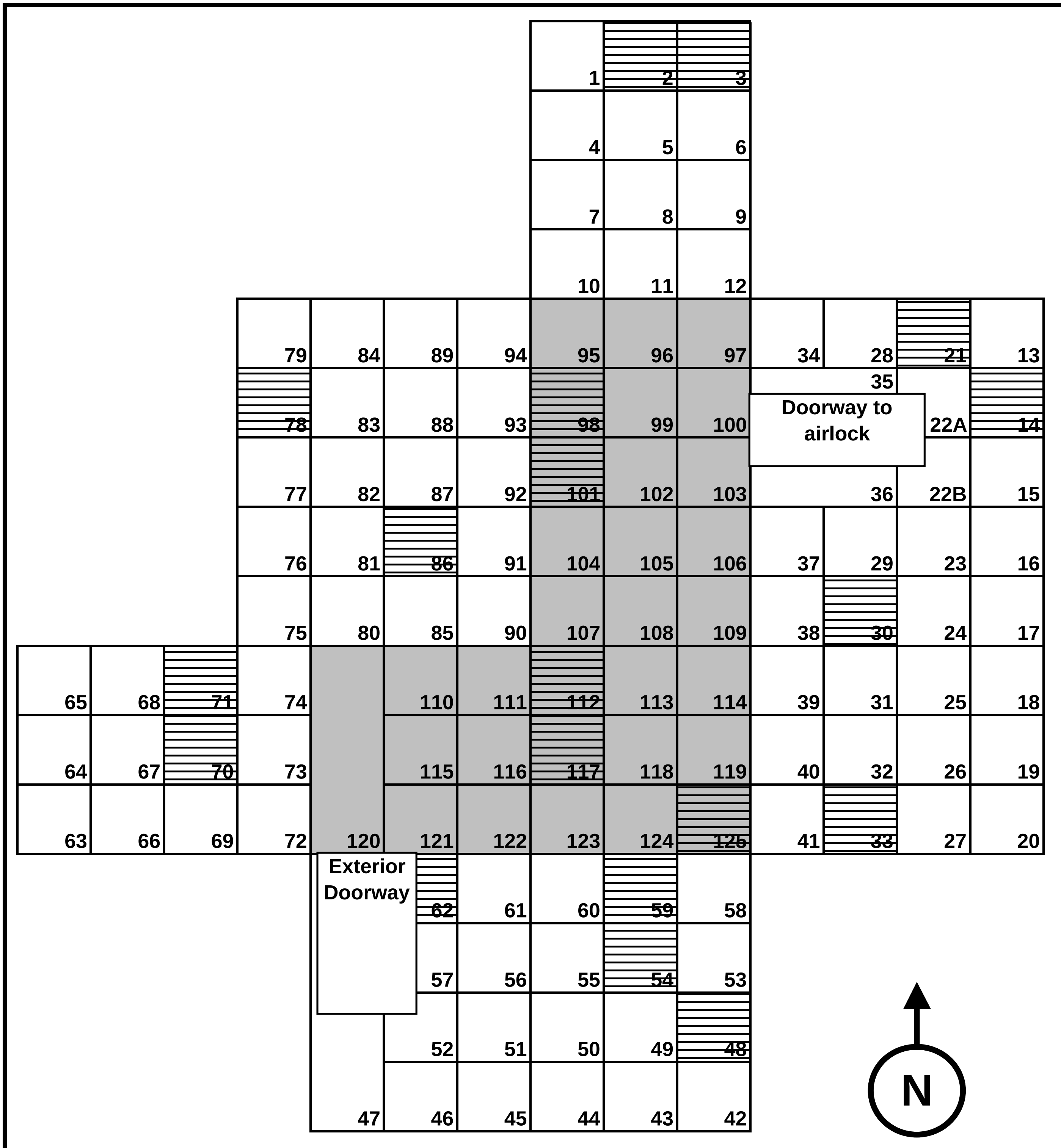
BUILDING T-012

CRITICAL CELL

Tetra Tech EM Inc.

EPA Region 9
Oversight Verification (OV) Surveys

EPA Survey Dates:
January 10 - 11, 2000



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- OV Survey Grid
- Floor Grid
- Wall Grid
- OV Fixed Count
- ORISE Fixed Count

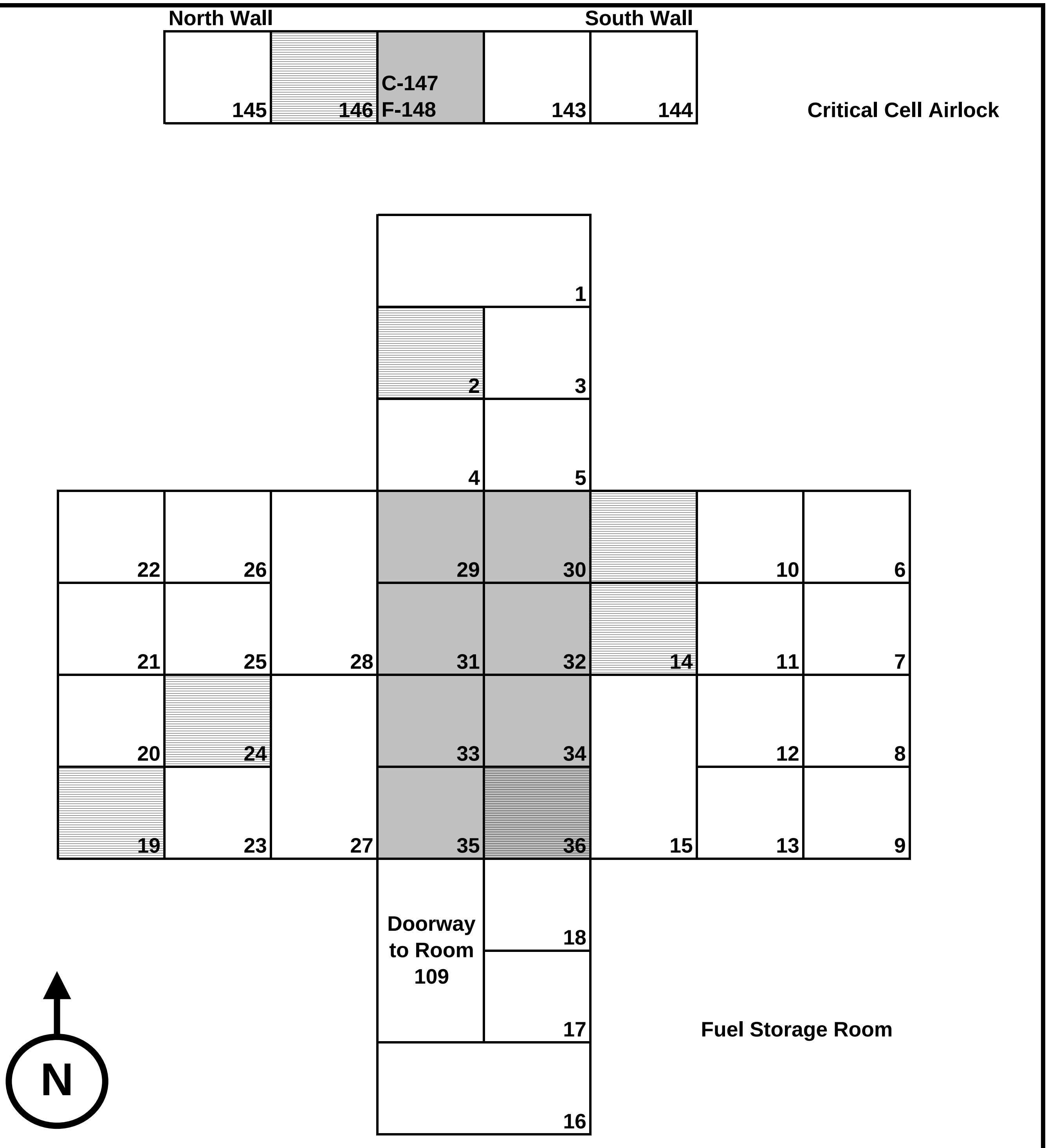
OVERSIGHT VERIFICATION SURVEY GRID

SANTA SUSANA FIELD LABORATORY

BUILDING T-012

ROOM 109

Tetra Tech EM Inc.



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OV Survey Grid

Floor Grid

Wall Grid

OV Fixed Count

ORISE Fixed Count

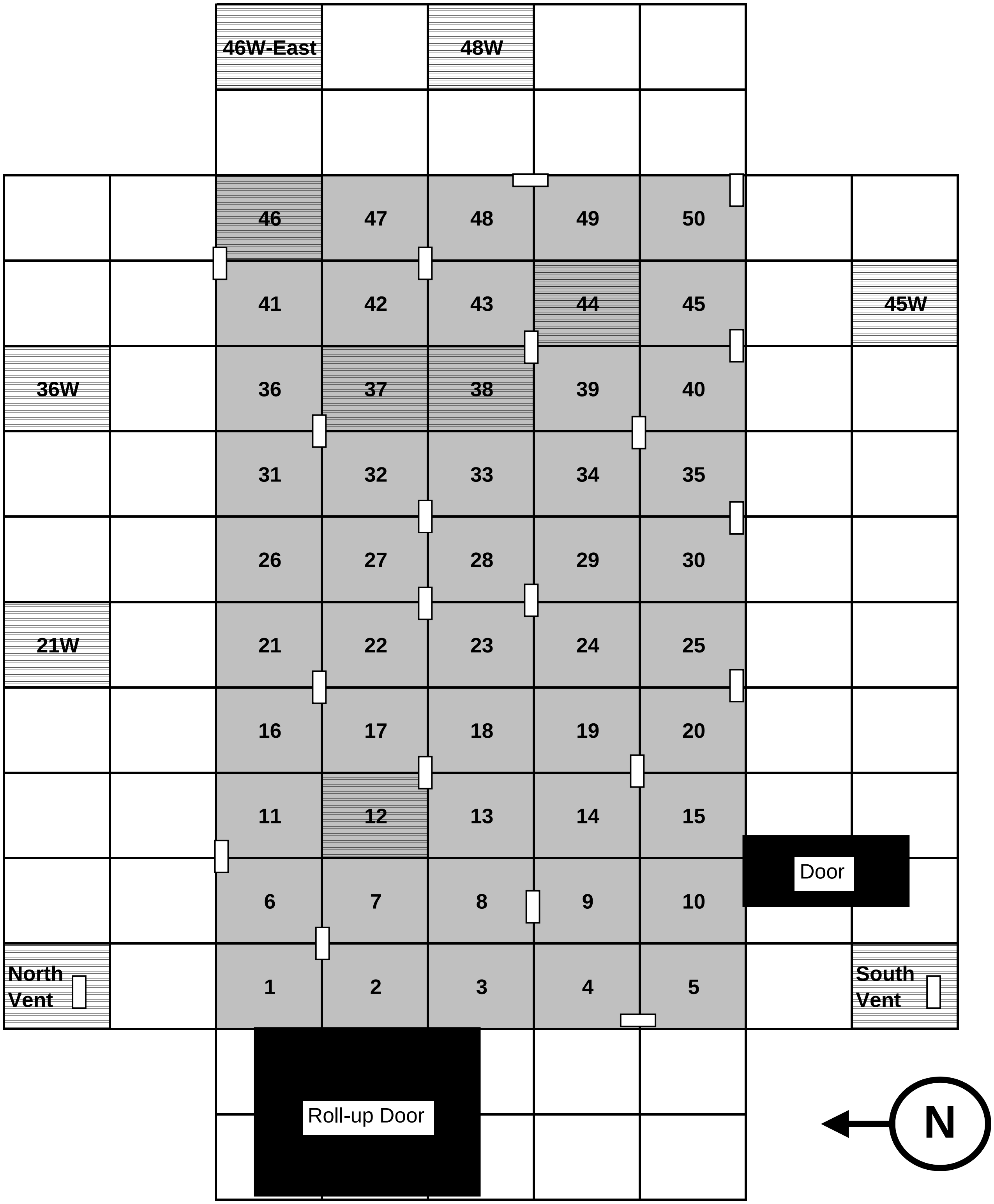
OVERSIGHT VERIFICATION SURVEY GRID

SANTA SUSANA FIELD LABORATORY

BUILDING T-012

FUEL STORAGE ROOM AND AIRLOCK

Tetra Tech EM Inc.



LEGEND

OV Survey Grid

Floor Grid

Wall Grid

OV Fixed Count

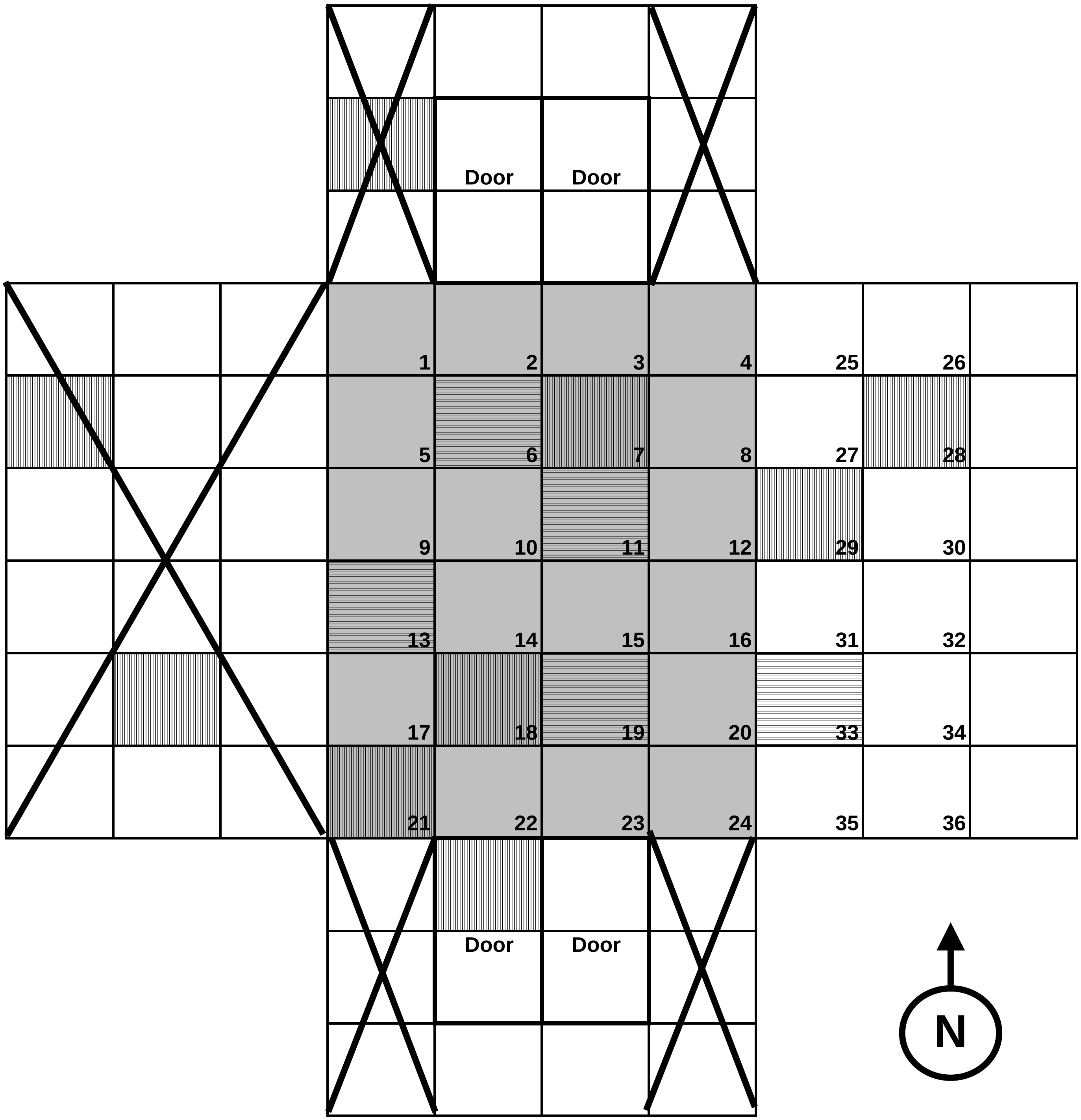
OVERSIGHT VERIFICATION SURVEY GRID

SANTA SUSANA FIELD LABORATORY

BUILDING T-029

Tetra Tech EM Inc.

EPA Survey Date:
January 12, 2000



LEGEND

ESSAP Survey Grid

OV Survey Grid

Floor Grid

Wall Grid

OV Fixed Count

ORISE Fixed Count

Wall Section Removed Prior to OV Survey

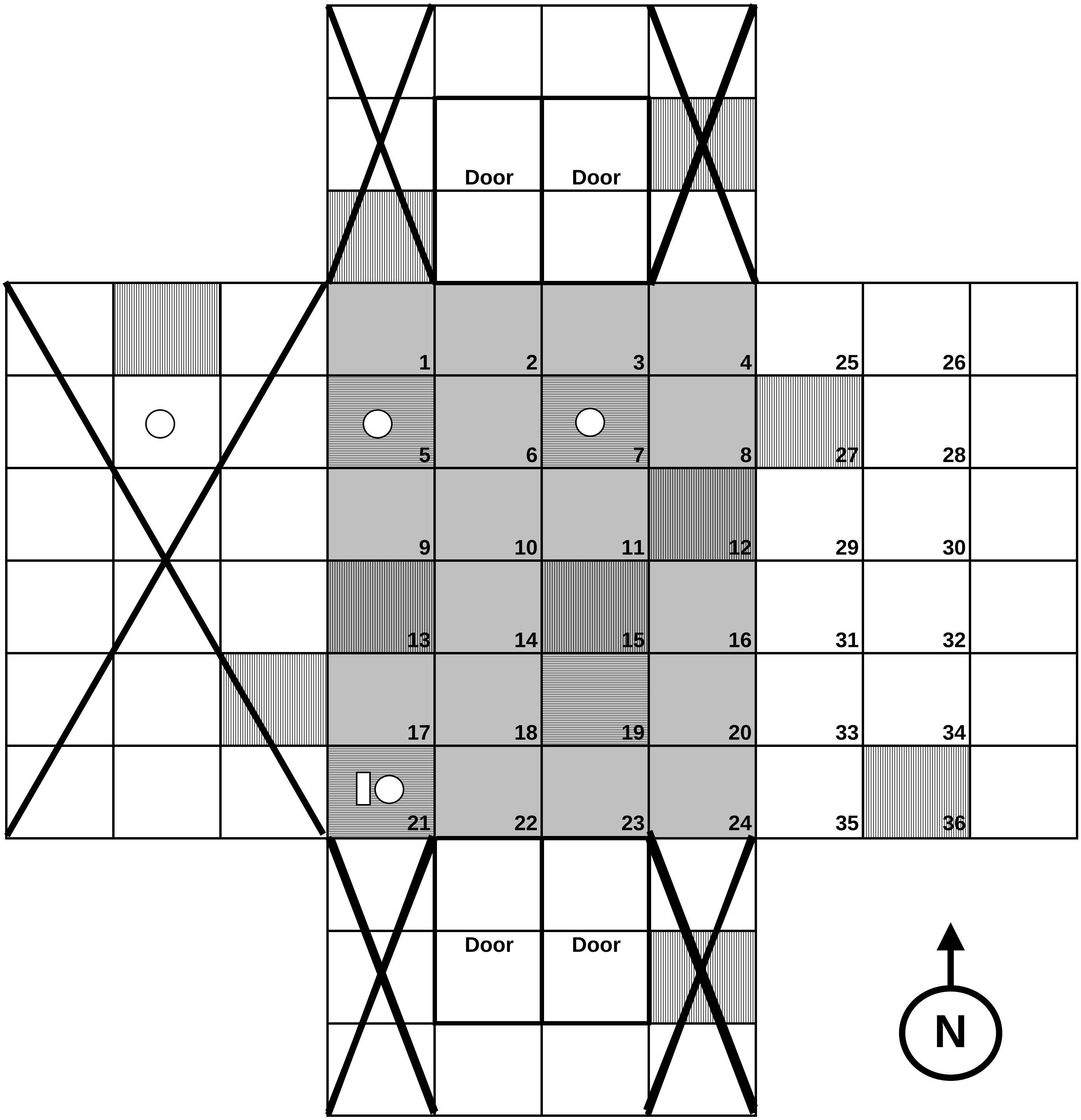
OVERSIGHT VERIFICATION SURVEY GRID

SANTA SUSANA FIELD LABORATORY

BUILDING T-363

BAY 1

Tetra Tech EM Inc.



LEGEND

- ESSAP Survey Grid
- OV Survey Grid
- Floor Grid
- Wall Grid
- OV Fixed Count
- ORISE Fixed Count
- Wall Section Removed Prior to OV Survey

OVERSIGHT VERIFICATION SURVEY GRID

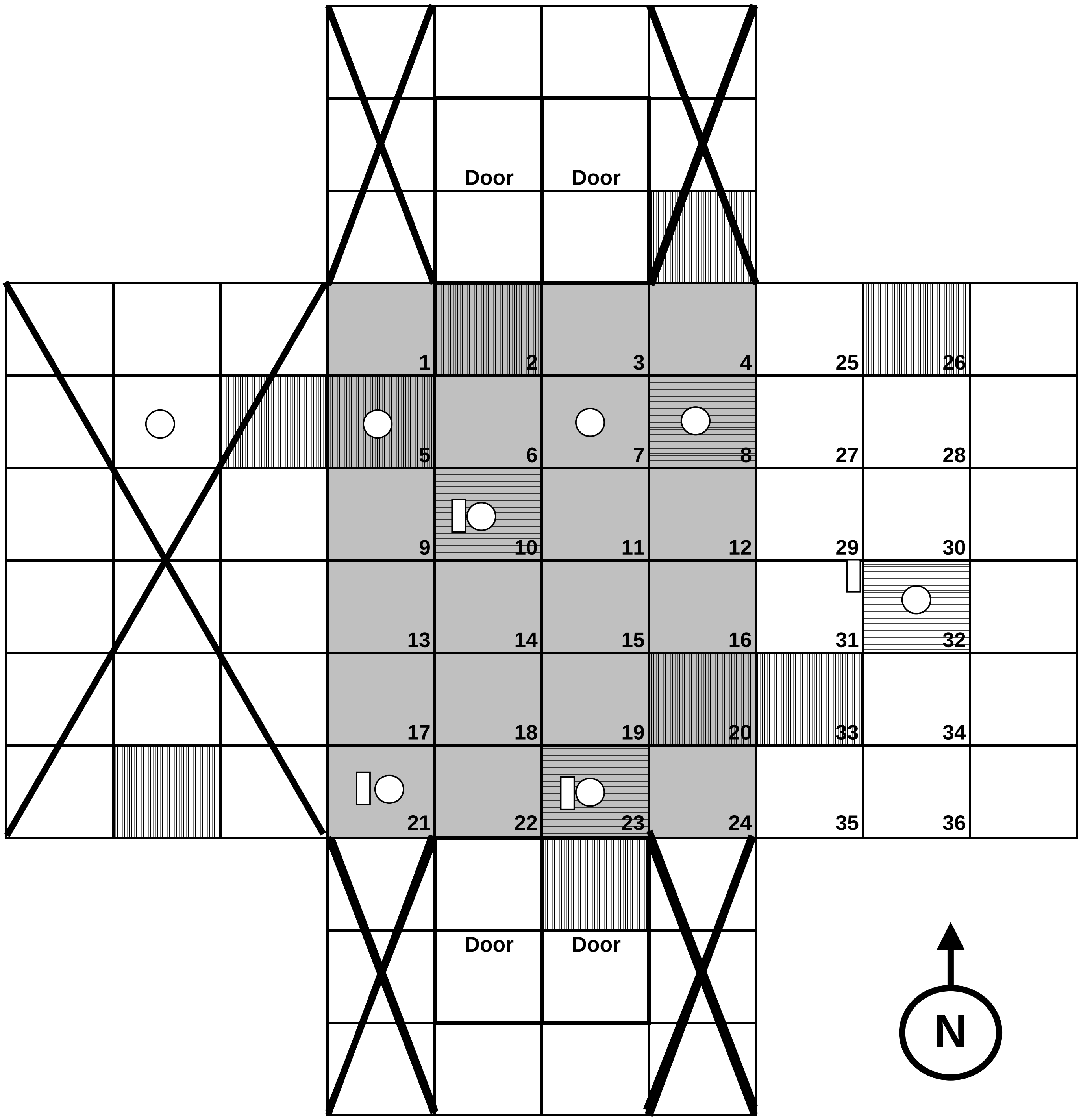
SANTA SUSANA FIELD LABORATORY

BUILDING T-363

BAY 2

Tetra Tech EM Inc.

EPA Survey Date:
January 12, 2000



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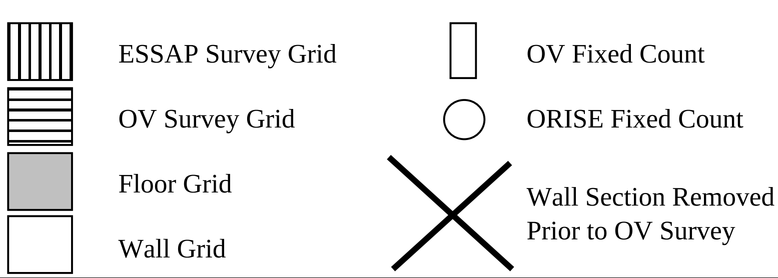


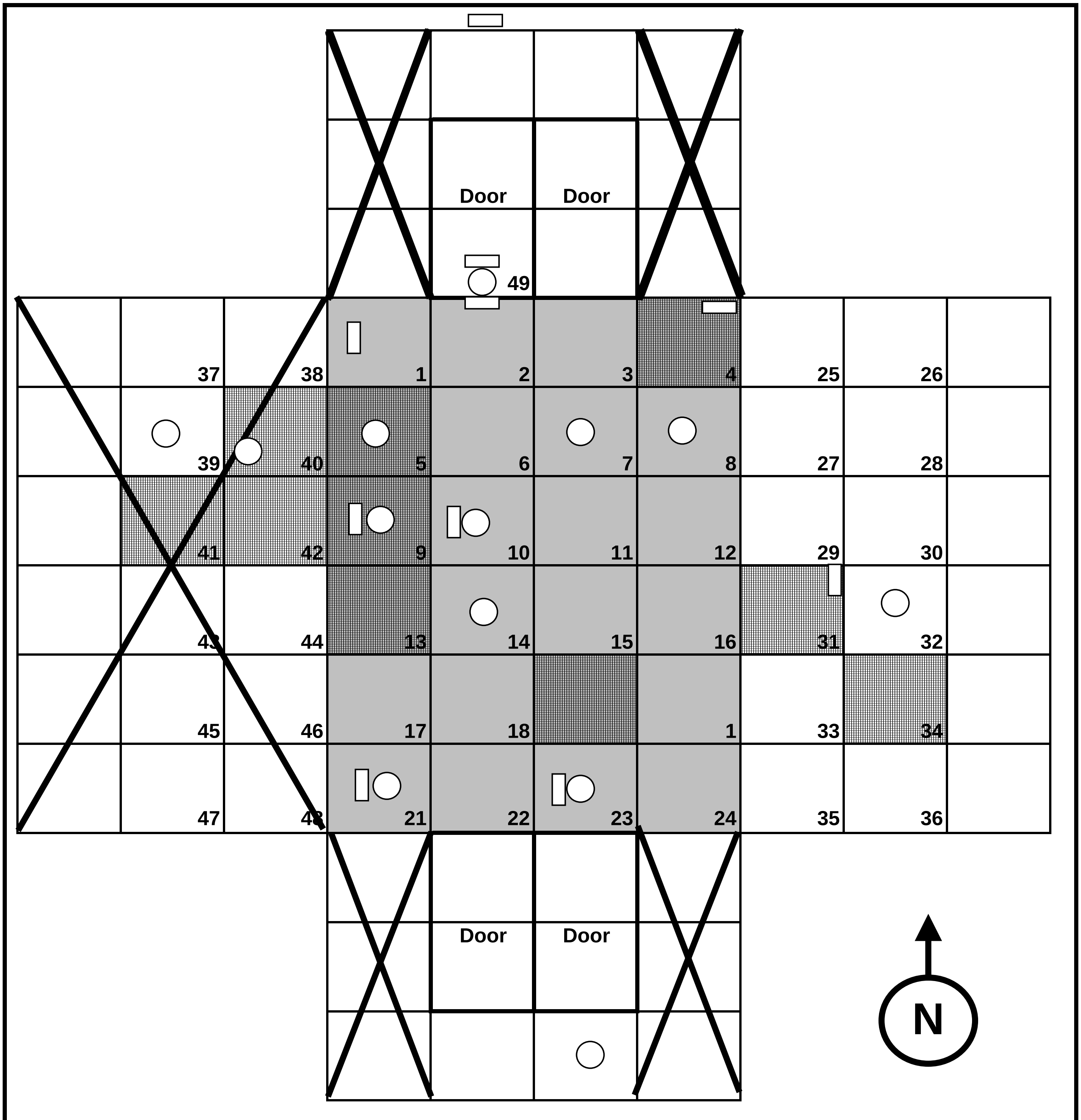
OVERSIGHT VERIFICATION SURVEY GRID

SANTA SUSANA FIELD LABORATORY

BUILDING T-363

BAY 3

Tetra Tech EM Inc.



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	ESSAP Survey Grid		OV Fixed Count
	ESSAP & OV Survey Grid		ORISE Fixed Count
	Floor Grid		Wall Section Removed Prior to OV Survey
	Wall Grid		

OVERSIGHT VERIFICATION SURVEY GRID

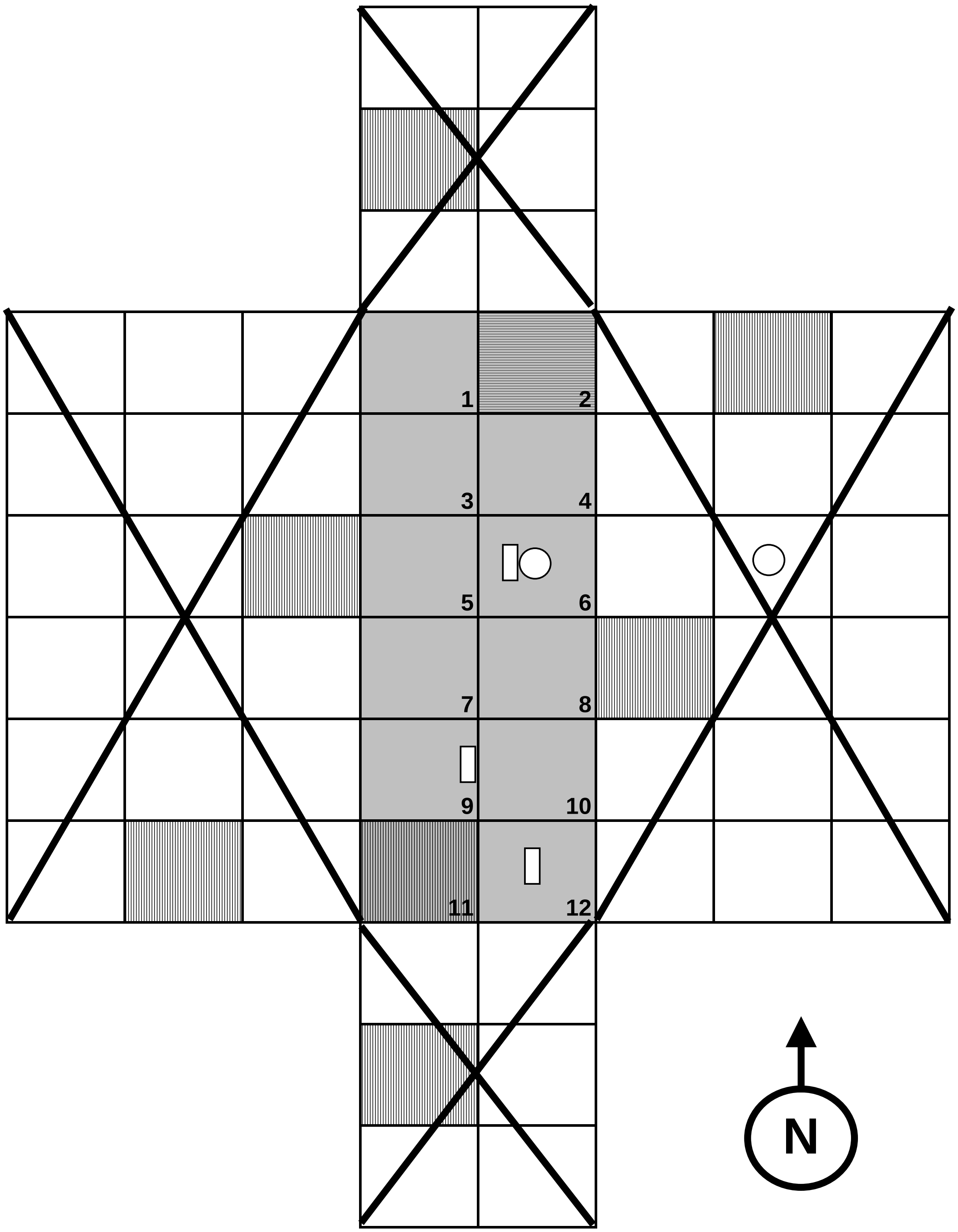
SANTA SUSANA FIELD LABORATORY

BUILDING T-363

BAY 4

Tetra Tech EM Inc.

EPA Survey Date:
January 12, 2000



LEGEND

ESSAP Survey Grid	OV Fixed Count
OV Survey Grid	ORISE Fixed Count
Floor Grid	Wall Section Removed Prior to OV Survey
Wall Grid	

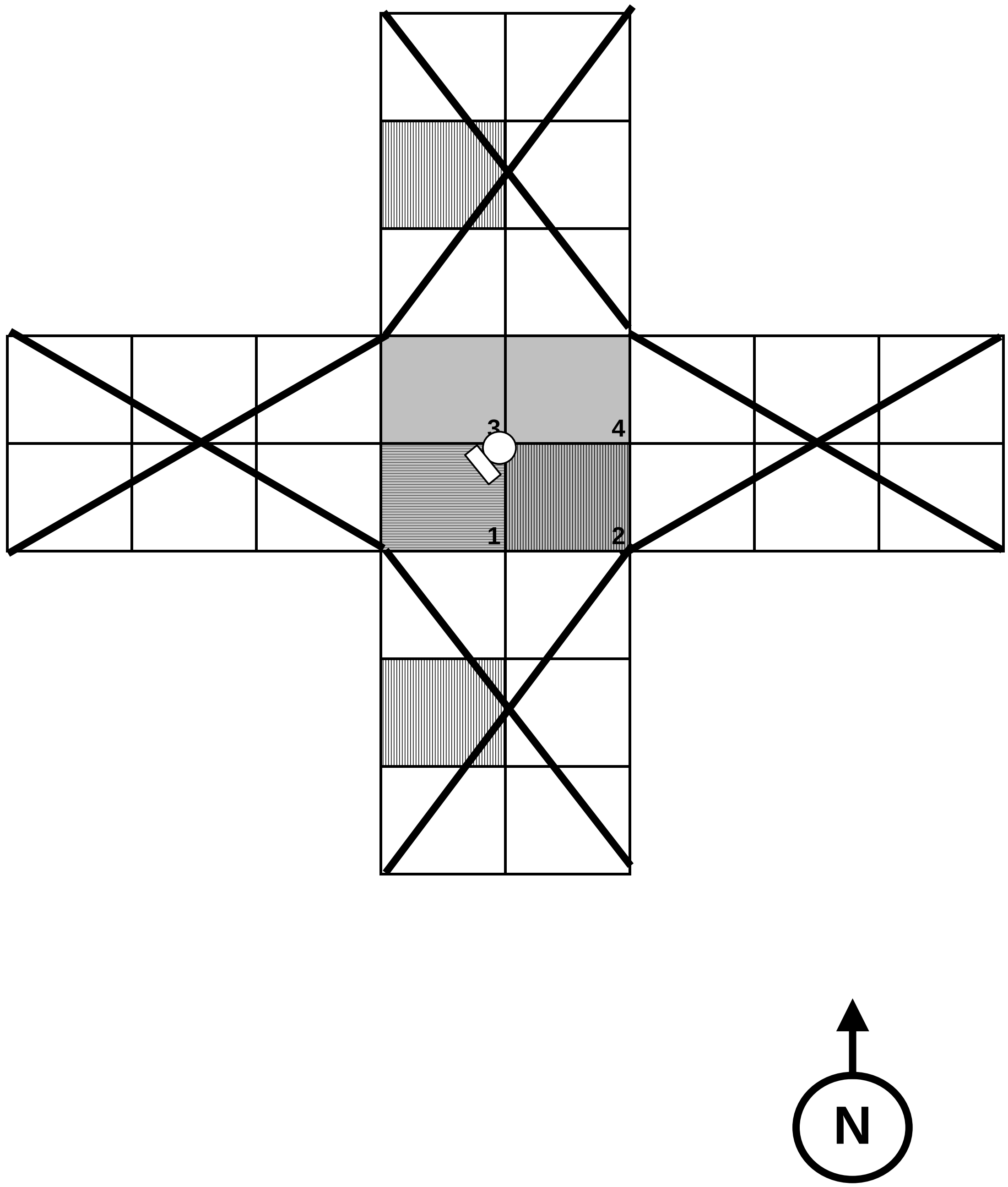
OVERSIGHT VERIFICATION SURVEY GRID

SANTA SUSANA FIELD LABORATORY

BUILDING T-363

ROOM 100

Tetra Tech EM Inc.



LEGEND

ESSAP Survey Grid

OV Survey Grid

Floor Grid

Wall Grid

OV Fixed Count

ORISE Fixed Count

Wall Section Removed Prior to OV Survey

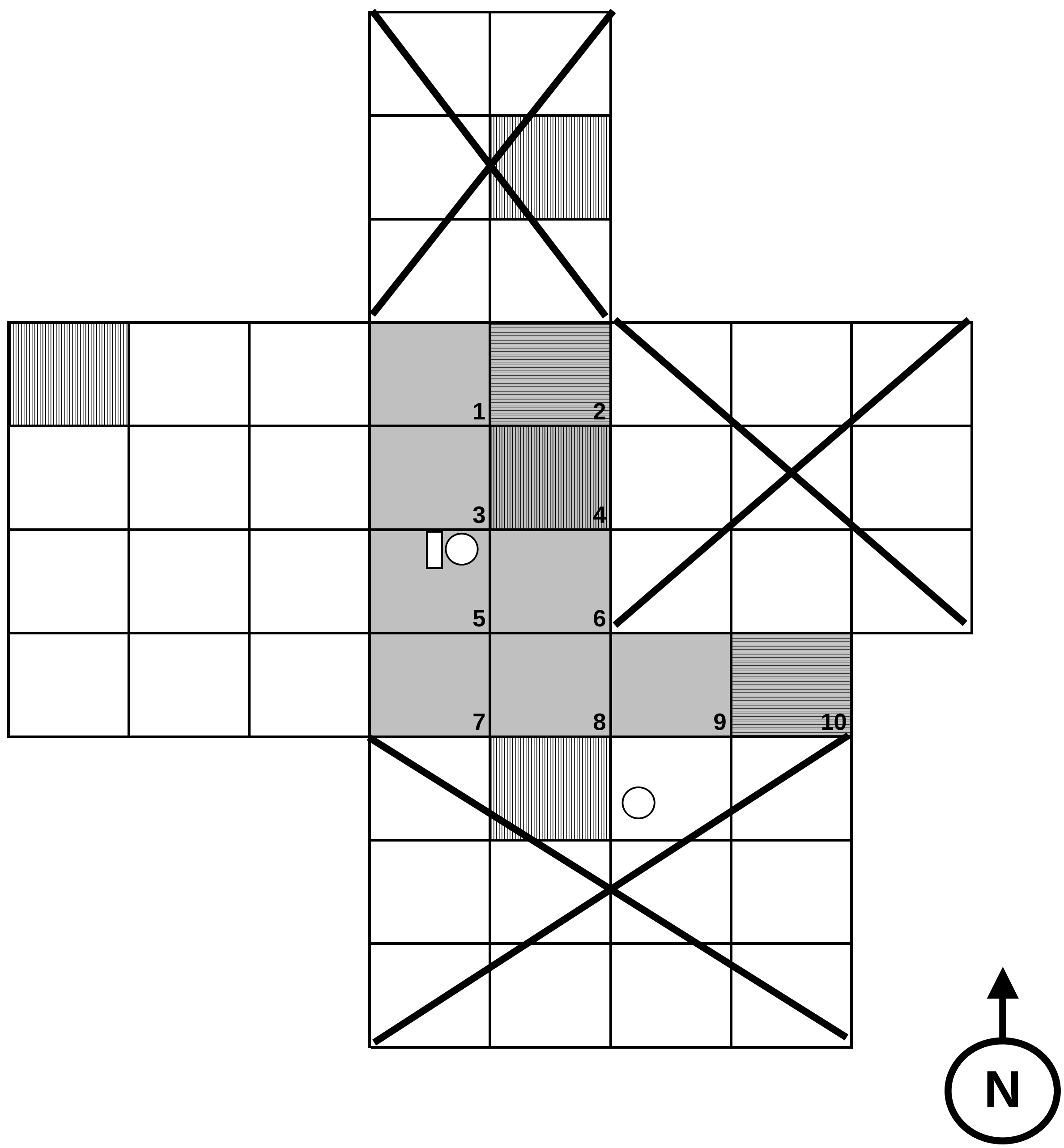
OVERSIGHT VERIFICATION SURVEY GRID

SANTA SUSANA FIELD LABORATORY

BUILDING T-363

ROOM 101

Tetra Tech EM Inc.



LEGEND

ESSAP Survey Grid
OV Survey Grid
Floor Grid
Wall Grid
OV Fixed Count
ORISE Fixed Count
Wall Section Removed Prior to OV Survey

OVERSIGHT VERIFICATION SURVEY GRID

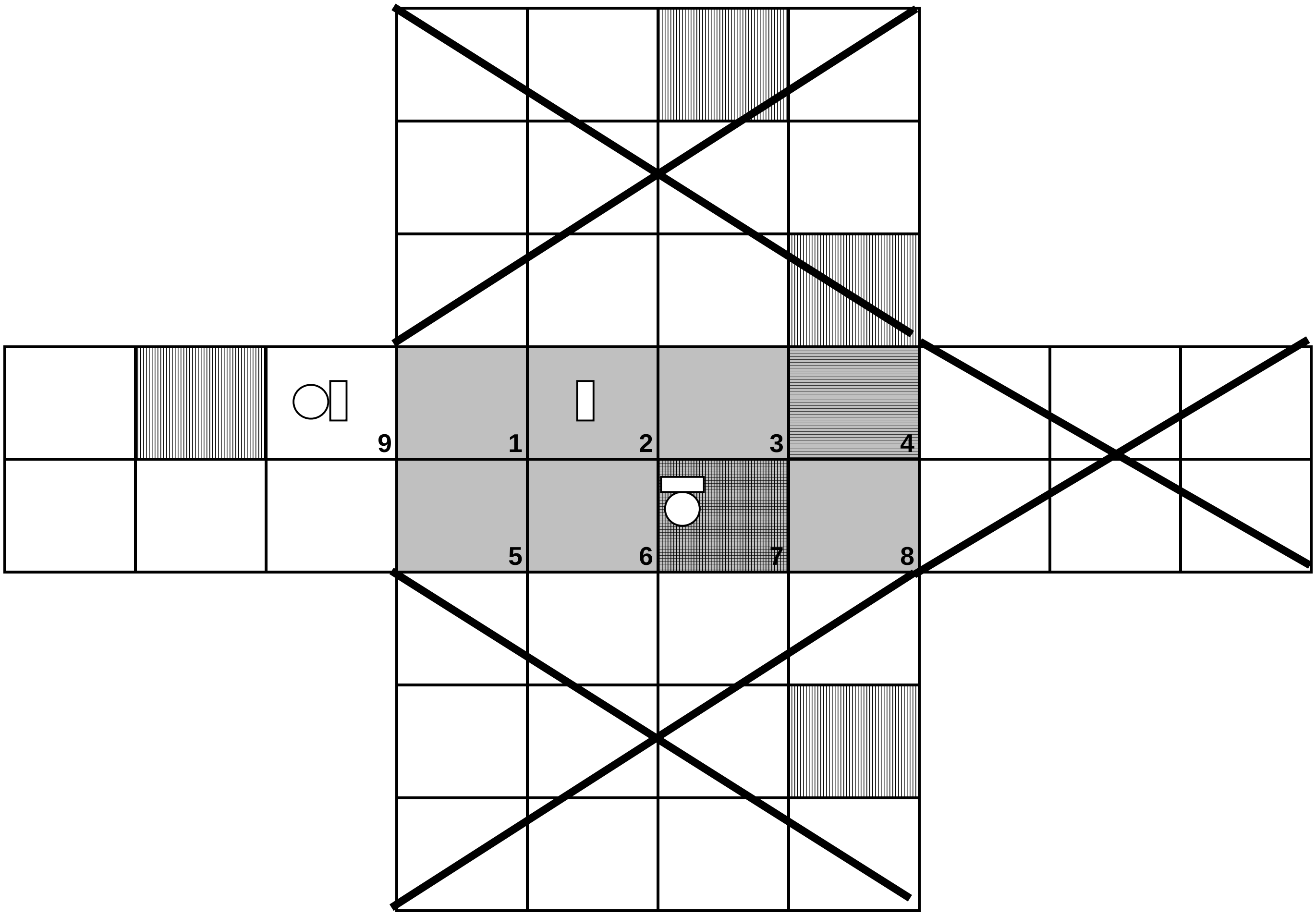
SANTA SUSANA FIELD LABORATORY

BUILDING T-363

ROOM 102

Tetra Tech EM Inc.

EPA Survey Date:
January 12, 2000



LEGEND

ESSAP Survey Grid
OV Survey Grid
Floor Grid
Wall Grid
OV Fixed Count
ORISE Fixed Count
Wall Section Removed Prior to OV Survey

OVERSIGHT VERIFICATION SURVEY GRID

SANTA SUSANA FIELD LABORATORY

BUILDING T-363

ROOM 103

Tetra Tech EM Inc.

APPENDIX B

SURVEY DATA

(16 Pages)

TABLE B-1
OVERSIGHT VERIFICATION SURVEY DATABASE

Alpha or Beta-gamma	Date	Building Number	Room	Fix or Scan	Tetra Tech Grid Number/ Location	Gross Counts	Gross Count Rate (cpm)	Bkg Rate (cpm)	Net Count Rate (cpm)	Activity	ACF	L_C (dpm)	L_D (dpm)	Reportable Activity (dpm /100 cm^2)	Note	Percent Error	flag
FIXED-POINT MEASUREMENTS																	
a	1/11/2000	12	109	f	70	45	22.50	1.10	21.40	134.92	6.30	8.43	25.38	134.92 +/- 58.7	percent error =	43.5%	pass
a	1/11/2000	12	109	f	85	2	1.00	1.10	-0.10	-0.63	6.30	8.43	25.38	< -0.6	less than LD		pass
a	1/11/2000	12	109	f	14/22A	1	0.50	1.10	-0.60	-3.78	6.30	8.43	25.38	< -3.8	less than LD		pass
a	1/11/2000	12	109	f	30	4	2.00	1.10	0.90	5.67	6.30	8.43	25.38	< 5.7	less than LD		pass
a	1/11/2000	12	109	f	58	14	7.00	1.10	5.90	37.20	6.30	8.43	25.38	37.20 +/- 32.9	percent error =	88.4%	pass
a	1/11/2000	12	109	f	48	3	1.50	1.10	0.40	2.52	6.30	8.43	25.38	< 2.5	less than LD		pass
a	1/11/2000	12	109	f	7	3	1.50	1.10	0.40	2.52	6.30	8.43	25.38	< 2.5	less than LD		pass
a	1/11/2000	12	109	f	97	3	1.50	1.10	0.40	2.52	6.30	8.43	25.38	< 2.5	less than LD		pass
a	1/11/2000	12	109	f	123	7	3.50	1.10	2.40	15.13	6.30	8.43	25.38	< 15.1	less than LD		pass
a	1/11/2000	12	109	f	40/41	5	2.50	1.50	1.00	6.35	6.35	9.91	28.40	< 6.3	less than LD		pass
a	1/11/2000	12	109	f	31/39	2	1.00	1.50	-0.50	-3.17	6.35	9.91	28.40	< -3.2	less than LD		pass
a	1/11/2000	12	109	f	100	9	4.50	1.50	3.00	19.04	6.35	9.91	28.40	< 19.0	less than LD		pass
a	1/11/2000	12	109	f	61	10	5.00	1.50	3.50	22.22	6.35	9.91	28.40	< 22.2	less than LD		pass
a	1/11/2000	12	109	f	109	3	1.50	1.50	0.00	0.00	6.35	9.91	28.40	< 0.0	less than LD		pass
a	1/11/2000	12	109	f	99	6	3.00	1.50	1.50	9.52	6.35	9.91	28.40	< 9.5	less than LD		pass
a	1/11/2000	12	109	f	89/94	6	3.00	1.50	1.50	9.52	6.35	9.91	28.40	< 9.5	less than LD		pass
a	1/11/2000	12	109	f	95	3	1.50	1.50	0.00	0.00	6.35	9.91	28.40	< 0.0	less than LD		pass
a	1/11/2000	12	109	f	91/92	4	2.00	1.50	0.50	3.17	6.35	9.91	28.40	< 3.2	less than LD		pass
a	1/11/2000	12	109	f	90	7	3.50	1.50	2.00	12.69	6.35	9.91	28.40	< 12.7	less than LD		pass
a	1/11/2000	12	109	f	124	8	4.00	1.50	2.50	15.87	6.35	9.91	28.40	< 15.9	less than LD		pass
a	1/11/2000	12	109	f	107	5	2.50	1.50	1.00	6.35	6.35	9.91	28.40	< 6.3	less than LD		pass
a	1/11/2000	12	109	f	107	8	4.00	1.50	2.50	15.87	6.35	9.91	28.40	< 15.9	less than LD		pass
a	1/11/2000	12	109	f	120	10	5.00	1.50	3.50	22.22	6.35	9.91	28.40	< 22.2	less than LD		pass
a	1/11/2000	12	109	f	55	8	4.00	1.50	2.50	15.87	6.35	9.91	28.40	< 15.9	less than LD		pass
a	1/11/2000	12	109	f	32	5	2.50	1.50	1.00	6.35	6.35	9.91	28.40	< 6.3	less than LD		pass
a	1/11/2000	12	109	f	30	2	1.00	1.50	-0.50	-3.17	6.35	9.91	28.40	< -3.2	less than LD		pass
a	1/11/2000	12	109	f	91/92	3	1.50	1.50	0.00	0.00	6.35	9.91	28.40	< 0.0	less than LD		pass
a	1/11/2000	12	109	f	8	3	1.50	1.50	0.00	0.00	6.35	9.91	28.40	< 0.0	less than LD		pass
a	1/11/2000	12	109	f	105	6	3.00	1.50	1.50	9.52	6.35	9.91	28.40	< 9.5	less than LD		pass
a	1/11/2000	12	attic	f	12	1	0.50	1.10	-0.60	-3.78	6.30	8.43	25.38	< -3.8	less than LD		pass
a	1/11/2000	12	attic	f	27	5	2.50	1.10	1.40	8.83	6.30	8.43	25.38	< 8.8	less than LD		pass
a	1/11/2000	12	Crit Cell	f	65/65	2	1.00	0.90	0.10	0.63	6.30	7.62	23.77	< 0.6	less than LD		pass
a	1/11/2000	12	Crit Cell	f	46/47	2	1.00	0.90	0.10	0.63	6.30	7.62	23.77	< 0.6	less than LD		pass
a	1/11/2000	12	Crit Cell	f	106	1	0.50	0.90	-0.40	-2.52	6.30	7.62	23.77	< -2.5	less than LD		pass
a	1/11/2000	12	Crit Cell	f	76	6	3.00	0.90	2.10	13.24	6.30	7.62	23.77	< 13.2	less than LD		pass
a	1/11/2000	12	Crit Cell	f	55	16	8.00	0.90	7.10	44.76	6.30	7.62	23.77	44.76 +/- 35.1	percent error =	78.5%	pass
a	1/11/2000	12	Crit Cell	f	42	3	1.50	0.90	0.60	3.78	6.30	7.62	23.77	< 3.8	less than LD		pass
a	1/11/2000	12	Crit Cell	f	56	2	1.00	0.90	0.10	0.63	6.30	7.62	23.77	< 0.6	less than LD		pass
a	1/11/2000	12	Crit Cell	f	156	55	27.50	0.90	26.60	167.71	6.30	7.62	23.77	167.71 +/- 64.9	percent error =	38.7%	pass
a	1/11/2000	12	Crit Cell	f	101	2	1.00	0.90	0.10	0.63	6.30	7.62	23.77	< 0.6	less than LD		pass
a	1/11/2000	12	Crit Cell	f	24	2	1.00	0.90	0.10	0.63	6.30	7.62	23.77	< 0.6	less than LD		pass
a	1/11/2000	12	Crit Cell	f	44	3	1.50	0.90	0.60	3.78	6.30	7.62	23.77	< 3.8	less than LD		pass
a	1/11/2000	12	Crit Cell	f	120	4	2.00	0.90	1.10	6.94	6.30	7.62	23.77	< 6.9	less than LD		pass
a	1/11/2000	12	Crit Cell	f	60	6	3.00	0.90	2.10	13.24	6.30	7.62	23.77	< 13.2	less than LD		pass
a	1/11/2000	12	Crit Cell	f	113	3	1.50	0.90	0.60	3.78	6.30	7.62	23.77	< 3.8	less than LD		pass
a	1/11/2000	12	Crit Cell	f	19	1	0.50	0.90	-0.40	-2.52	6.30	7.62	23.77	< -2.5	less than LD		pass

TABLE B-1
OVERSIGHT VERIFICATION SURVEY DATABASE

Alpha or Beta-gamma	Date	Building Number	Room	Fix or Scan	Tetra Tech Grid Number/ Location	Gross Counts	Gross Count Rate (cpm)	Bkg Rate (cpm)	Net Count Rate (cpm)	Activity	ACF	L_C (dpm)	L_D (dpm)	Reportable Activity (dpm /100 cm^2)	Note	Percent Error	flag
FIXED-POINT MEASUREMENTS (Continued)																	
a	1/11/2000	12	Crit Cell	f	door	2	1.00	1.20	-0.20	-1.27	6.35	8.86	26.31	< -1.3	less than LD		pass
a	1/11/2000	12	Crit Cell	f	63/57	7	3.50	1.20	2.30	14.60	6.35	8.86	26.31	< 14.6	less than LD		pass
a	1/11/2000	12	Crit Cell	f	63	27	13.50	1.20	12.30	78.07	6.35	8.86	26.31	78.07 +/- 45.8	percent error =	58.7%	pass
a	1/11/2000	12	Crit Cell	f	146	6	3.00	1.20	1.80	11.43	6.35	8.86	26.31	< 11.4	less than LD		pass
a	1/11/2000	12	Crit Cell	f	57/58	0	0.00	1.20	-1.20	-7.62	6.35	8.86	26.31	< -7.6	less than LD		pass
a	1/11/2000	12	Crit Cell	f		3	1.50	1.20	0.30	1.90	6.35	8.86	26.31	< 1.9	less than LD		pass
a	1/11/2000	12	Crit Cell	f	63/64	3	1.50	1.20	0.30	1.90	6.35	8.86	26.31	< 1.9	less than LD		pass
a	1/11/2000	12	Crit Cell	f	146	30	15.00	1.20	13.80	87.59	6.35	8.86	26.31	87.59 +/- 48.3	percent error =	55.1%	pass
a	1/11/2000	12	Crit Cell	f	99	11	5.50	1.20	4.30	27.29	6.35	8.86	26.31	27.29 +/- 29.4	percent error =	107.6%	pass
a	1/11/2000	12	Crit Cell	f	74	2	1.00	1.20	-0.20	-1.27	6.35	8.86	26.31	< -1.3	less than LD		pass
a	1/11/2000	12	Crit Cell	f	91	3	1.50	1.20	0.30	1.90	6.35	8.86	26.31	< 1.9	less than LD		pass
a	1/11/2000	12	Crit Cell	f	54	2	1.00	1.20	-0.20	-1.27	6.35	8.86	26.31	< -1.3	less than LD		pass
a	1/11/2000	12	Crit Cell	f	12	1	0.50	1.20	-0.70	-4.44	6.35	8.86	26.31	< -4.4	less than LD		pass
a	1/11/2000	12	Crit Cell	f	153	4	2.00	1.20	0.80	5.08	6.35	8.86	26.31	< 5.1	less than LD		pass
a	1/11/2000	12	Crit Cell	f	33	2	1.00	1.20	-0.20	-1.27	6.35	8.86	26.31	< -1.3	less than LD		pass
a	1/11/2000	12	Fuel Stg	f	6	6	3.00	1.10	1.90	11.98	6.30	8.43	25.38	< 12.0	less than LD		pass
a	1/11/2000	12	Fuel Stg	f	29	5	2.50	1.10	1.40	8.83	6.30	8.43	25.38	< 8.8	less than LD		pass
a	1/11/2000	12	Fuel Stg	f	33	1	0.50	1.10	-0.60	-3.78	6.30	8.43	25.38	< -3.8	less than LD		pass
a	1/11/2000	12	Fuel Stg	f	1	4	2.00	1.10	0.90	5.67	6.30	8.43	25.38	< 5.7	less than LD		pass
a	1/11/2000	12	Fuel Stg	f	24	5	2.50	1.10	1.40	8.83	6.30	8.43	25.38	< 8.8	less than LD		pass
a	1/11/2000	12	Fuel Stg	f	9	3	1.50	1.10	0.40	2.52	6.30	8.43	25.38	< 2.5	less than LD		pass
a	1/11/2000	12	Fuel Stg	f	32	3	1.50	1.10	0.40	2.52	6.30	8.43	25.38	< 2.5	less than LD		pass
a	1/11/2000	29	NA	f	5	4	2.00	0.40	1.60	10.09	6.30	5.08	18.69	< 10.1	less than LD		pass
a	1/11/2000	29	NA	f	8	3	1.50	0.40	1.10	6.94	6.30	5.08	18.69	< 6.9	less than LD		pass
a	1/11/2000	29	NA	f	13	5	2.50	0.40	2.10	13.24	6.30	5.08	18.69	< 13.2	less than LD		pass
a	1/11/2000	29	NA	f	16	2	1.00	0.40	0.60	3.78	6.30	5.08	18.69	< 3.8	less than LD		pass
a	1/11/2000	29	NA	f	21	2	1.00	0.40	0.60	3.78	6.30	5.08	18.69	< 3.8	less than LD		pass
a	1/11/2000	29	NA	f	23	4	2.00	0.40	1.60	10.09	6.30	5.08	18.69	< 10.1	less than LD		pass
a	1/11/2000	29	NA	f	26	0	0.00	0.40	-0.40	-2.52	6.30	5.08	18.69	< -2.5	less than LD		pass
a	1/11/2000	29	NA	f	30	3	1.50	0.40	1.10	6.94	6.30	5.08	18.69	< 6.9	less than LD		pass
a	1/11/2000	29	NA	f	33	1	0.50	0.40	0.10	0.63	6.30	5.08	18.69	< 0.6	less than LD		pass
a	1/11/2000	29	NA	f	34	6	3.00	0.40	2.60	16.39	6.30	5.08	18.69	< 16.4	less than LD		pass
a	1/11/2000	29	NA	f	N. Vent	39	19.50	0.40	19.10	120.42	6.30	5.08	18.69	120.42 +/- 54.7	percent error =	45.4%	pass
a	1/11/2000	29	NA	f	S. Vent	37	18.50	0.40	18.10	114.12	6.30	5.08	18.69	114.12 +/- 53.3	percent error =	46.7%	pass
a	1/11/2000	29	NA	f	39	5	2.50	1.30	1.20	7.62	6.35	9.22	27.03	< 7.6	less than LD		pass
a	1/11/2000	29	NA	f	42	3	1.50	1.30	0.20	1.27	6.35	9.22	27.03	< 1.3	less than LD		pass
a	1/11/2000	29	NA	f	44	8	4.00	1.30	2.70	17.14	6.35	9.22	27.03	< 17.1	less than LD		pass
a	1/11/2000	29	NA	f	47	3	1.50	1.30	0.20	1.27	6.35	9.22	27.03	< 1.3	less than LD		pass
a	1/11/2000	29	NA	f	52	3	1.50	1.30	0.20	1.27	6.35	9.22	27.03	< 1.3	less than LD		pass
a	1/11/2000	29	NA	f	54	8	4.00	1.30	2.70	17.14	6.35	9.22	27.03	< 17.1	less than LD		pass
a	1/11/2000	29	NA	f	55	3	1.50	1.30	0.20	1.27	6.35	9.22	27.03	< 1.3	less than LD		pass
a	1/11/2000	29	NA	f	57	4	2.00	1.30	0.70	4.44	6.35	9.22	27.03	< 4.4	less than LD		pass
a	1/11/2000	29	NA	f	64	2	1.00	1.30	-0.30	-1.90	6.35	9.22	27.03	< -1.9	less than LD		pass
a	1/11/2000	29	NA	f	66	3	1.50	1.30	0.20	1.27	6.35	9.22	27.03	< 1.3	less than LD		pass
a	1/12/2000	363	100	f	6	13	6.50	1.60	4.90	30.89	6.30	10.16	28.85	30.89 +/- 31.7	percent error =	102.5%	pass

TABLE B-1
OVERSIGHT VERIFICATION SURVEY DATABASE

Alpha or Beta-gamma	Date	Building Number	Room	Fix or Scan	Tetra Tech Grid Number/ Location	Gross Counts	Gross Count Rate (cpm)	Bkg Rate (cpm)	Net Count Rate (cpm)	Activity	ACF	L_C (dpm)	L_D (dpm)	Reportable Activity (dpm /100 cm^2)	Note	Percent Error	flag
FIXED-POINT MEASUREMENTS (Continued)																	
a	1/12/2000	363	100	f	9	5	2.50	1.60	0.90	5.67	6.30	10.16	28.85	< 5.7	less than LD		pass
a	1/12/2000	363	100	f	12	13	6.50	1.60	4.90	30.89	6.30	10.16	28.85	30.89 +/- 31.7	percent error =	102.5%	pass
a	1/12/2000	363	101	f	1	7	3.50	1.60	1.90	11.98	6.30	10.16	28.85	< 12.0	less than LD		pass
a	1/12/2000	363	102	f	5	5	2.50	1.60	0.90	5.67	6.30	10.16	28.85	< 5.7	less than LD		pass
a	1/12/2000	363	103	f	2	16	8.00	1.60	6.40	40.35	6.30	10.16	28.85	40.35 +/- 35.1	percent error =	87.0%	pass
a	1/12/2000	363	103	f	7	10	5.00	1.60	3.40	21.44	6.30	10.16	28.85	< 21.4	less than LD		pass
a	1/12/2000	363	103	f	9	7	3.50	1.60	1.90	11.98	6.30	10.16	28.85	< 12.0	less than LD		pass
a	1/12/2000	363	Bay 2	f	19	9	4.50	1.60	2.90	18.28	6.30	10.16	28.85	< 18.3	less than LD		pass
a	1/12/2000	363	Bay 2	f	21	8	4.00	1.60	2.40	15.13	6.30	10.16	28.85	< 15.1	less than LD		pass
a	1/12/2000	363	Bay 2	f	36	6	3.00	1.60	1.40	8.83	6.30	10.16	28.85	< 8.8	less than LD		pass
a	1/12/2000	363	Bay 2	f	37	9	4.50	1.60	2.90	18.28	6.30	10.16	28.85	< 18.3	less than LD		pass
a	1/12/2000	363	Bay 3	f	10	9	4.50	1.60	2.90	18.28	6.30	10.16	28.85	< 18.3	less than LD		pass
a	1/12/2000	363	Bay 3	f	23	10	5.00	1.60	3.40	21.44	6.30	10.16	28.85	< 21.4	less than LD		pass
a	1/12/2000	363	Bay 3	f	31	6	3.00	1.60	1.40	8.83	6.30	10.16	28.85	< 8.8	less than LD		pass
a	1/12/2000	363	Bay 3	f	36	5	2.50	1.60	0.90	5.67	6.30	10.16	28.85	< 5.7	less than LD		pass
a	1/12/2000	363	Bay 3	f	37	6	3.00	1.60	1.40	8.83	6.30	10.16	28.85	< 8.8	less than LD		pass
a	1/12/2000	363	Bay 4	f	2	6	3.00	1.60	1.40	8.83	6.30	10.16	28.85	< 8.8	less than LD		pass
a	1/12/2000	363	Bay 4	f	4	19	9.50	1.60	7.90	49.81	6.30	10.16	28.85	49.81 +/- 38.2	percent error =	76.7%	pass
a	1/12/2000	363	Bay 4	f	9	8	4.00	1.60	2.40	15.13	6.30	10.16	28.85	< 15.1	less than LD		pass
a	1/12/2000	363	Bay 4	f	41	4	2.00	1.60	0.40	2.52	6.30	10.16	28.85	< 2.5	less than LD		pass
a	1/12/2000	363	Bay 4	f	49/door	7	3.50	1.60	1.90	11.98	6.30	10.16	28.85	< 12.0	less than LD		pass
a	1/12/2000	363	Bay 4	f	outside door	15	7.50	1.60	5.90	37.20	6.30	10.16	28.85	37.20 +/- 34.0	percent error =	91.4%	pass
b-g	1/11/2000	12	109	f	70	1005	502.50	446.70	55.80	518.96	9.30	250.47	513.51	518.96 +/- 408.6	percent error =	78.7%	pass
b-g	1/11/2000	12	109	f	85	764	382.00	446.70	-64.70	-601.73	9.30	250.47	513.51	< -601.7	less than LD		pass
b-g	1/11/2000	12	109	f	14/22A	940	470.00	446.70	23.30	216.70	9.30	250.47	513.51	< 216.7	less than LD		pass
b-g	1/11/2000	12	109	f	30	981	490.50	446.70	43.80	407.35	9.30	250.47	513.51	< 407.4	less than LD		pass
b-g	1/11/2000	12	109	f	58	950	475.00	446.70	28.30	263.20	9.30	250.47	513.51	< 263.2	less than LD		pass
b-g	1/11/2000	12	109	f	48	969	484.50	446.70	37.80	351.55	9.30	250.47	513.51	< 351.6	less than LD		pass
b-g	1/11/2000	12	109	f	12	906	453.00	446.70	6.30	58.59	9.30	250.47	513.51	< 58.6	less than LD		pass
b-g	1/11/2000	12	109	f	27	927	463.50	446.70	16.80	156.25	9.30	250.47	513.51	< 156.2	less than LD		pass
b-g	1/11/2000	12	109	f	7	889	444.50	446.70	-2.20	-20.46	9.30	250.47	513.51	< -20.5	less than LD		pass
b-g	1/11/2000	12	109	f	97	1050	525.00	446.70	78.30	728.22	9.30	250.47	513.51	728.22 +/- 417.7	percent error =	57.4%	pass
b-g	1/11/2000	12	109	f	123	1061	530.50	446.70	83.80	779.37	9.30	250.47	513.51	779.37 +/- 419.9	percent error =	53.9%	pass
b-g	1/11/2000	12	109	f	40/41	1047	523.50	487.00	36.50	312.37	8.56	240.65	492.87	< 312.4	less than LD		pass
b-g	1/11/2000	12	109	f	31/39	1072	536.00	487.00	49.00	419.34	8.56	240.65	492.87	< 419.3	less than LD		pass
b-g	1/11/2000	12	109	f	100	1009	504.50	487.00	17.50	149.76	8.56	240.65	492.87	< 149.8	less than LD		pass
b-g	1/11/2000	12	109	f	61	984	492.00	487.00	5.00	42.79	8.56	240.65	492.87	< 42.8	less than LD		pass
b-g	1/11/2000	12	109	f	109	1092	546.00	487.00	59.00	504.92	8.56	240.65	492.87	504.92 +/- 391.9	percent error =	77.6%	pass
b-g	1/11/2000	12	109	f	99	1083	541.50	487.00	54.50	466.41	8.56	240.65	492.87	< 466.4	less than LD		pass
b-g	1/11/2000	12	109	f	89/94	999	499.50	487.00	12.50	106.97	8.56	240.65	492.87	< 107.0	less than LD		pass
b-g	1/11/2000	12	109	f	95	1105	552.50	487.00	65.50	560.55	8.56	240.65	492.87	560.55 +/- 394.3	percent error =	70.3%	pass
b-g	1/11/2000	12	109	f	91/92	871	435.50	487.00	-51.50	-440.74	8.56	240.65	492.87	< -440.7	less than LD		pass
b-g	1/11/2000	12	109	f	90	1016	508.00	487.00	21.00	179.72	8.56	240.65	492.87	< 179.7	less than LD		pass
b-g	1/11/2000	12	109	f	124	1140	570.00	487.00	83.00	710.31	8.56	240.65	492.87	710.31 +/- 400.5	percent error =	56.4%	pass
b-g	1/11/2000	12	109	f	107	1111	555.50	487.00	68.50	586.22	8.56	240.65	492.87	586.22 +/- 395.3	percent error =	67.4%	pass
b-g	1/11/2000	12	109	f	107	1111	555.50	487.00	68.50	586.22	8.56	240.65	492.87	586.22 +/- 395.3	percent error =	67.4%	pass

TABLE B-1
OVERSIGHT VERIFICATION SURVEY DATABASE

Alpha or Beta-gamma	Date	Building Number	Room	Fix or Scan	Tetra Tech Grid Number/ Location	Gross Counts	Gross Count Rate (cpm)	Bkg Rate (cpm)	Net Count Rate (cpm)	Activity	ACF	L_C (dpm)	L_D (dpm)	Reportable Activity (dpm /100 cm^2)	Note	Percent Error	flag
FIXED-POINT MEASUREMENTS (Continued)																	
b-g	1/11/2000	12	109	f	120	1020	510.00	487.00	23.00	196.83	8.56	240.65	492.87	< 196.8	less than LD		pass
b-g	1/11/2000	12	109	f	55	1064	532.00	487.00	45.00	385.11	8.56	240.65	492.87	< 385.1	less than LD		pass
b-g	1/11/2000	12	109	f	32	964	482.00	487.00	-5.00	-42.79	8.56	240.65	492.87	< -42.8	less than LD		pass
b-g	1/11/2000	12	109	f	30	992	496.00	487.00	9.00	77.02	8.56	240.65	492.87	< 77.0	less than LD		pass
b-g	1/11/2000	12	109	f	91/92	848	424.00	487.00	-63.00	-539.15	8.56	240.65	492.87	< -539.2	less than LD		pass
b-g	1/11/2000	12	109	f	8	947	473.50	487.00	-13.50	-115.53	8.56	240.65	492.87	< -115.5	less than LD		pass
b-g	1/11/2000	12	109	f	105	1085	542.50	487.00	55.50	474.97	8.56	240.65	492.87	< 475.0	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	65/65	521	260.50	286.30	-25.80	-239.95	9.30	200.52	413.62	< -239.9	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	46/47	502	251.00	286.30	-35.30	-328.30	9.30	200.52	413.62	< -328.3	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	106	627	313.50	286.30	27.20	252.97	9.30	200.52	413.62	< 253.0	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	76	602	301.00	286.30	14.70	136.71	9.30	200.52	413.62	< 136.7	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	55	546	273.00	286.30	-13.30	-123.69	9.30	200.52	413.62	< -123.7	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	42	518	259.00	286.30	-27.30	-253.90	9.30	200.52	413.62	< -253.9	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	56	554	277.00	286.30	-9.30	-86.49	9.30	200.52	413.62	< -86.5	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	156	445	222.50	286.30	-63.80	-593.36	9.30	200.52	413.62	< -593.4	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	101	576	288.00	286.30	1.70	15.81	9.30	200.52	413.62	< 15.8	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	24	594	297.00	286.30	10.70	99.51	9.30	200.52	413.62	< 99.5	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	44	569	284.50	286.30	-1.80	-16.74	9.30	200.52	413.62	< -16.7	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	120	603	301.50	286.30	15.20	141.37	9.30	200.52	413.62	< 141.4	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	60	497	248.50	286.30	-37.80	-351.55	9.30	200.52	413.62	< -351.6	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	113	588	294.00	286.30	7.70	71.61	9.30	200.52	413.62	< 71.6	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	19	560	280.00	286.30	-6.30	-58.59	9.30	200.52	413.62	< -58.6	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	door	410	205.00	309.90	-104.90	-897.73	8.56	191.97	395.51	< -897.7	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	63/57	560	280.00	309.90	-29.90	-255.88	8.56	191.97	395.51	< -255.9	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	63	319	159.50	309.90	-150.40	-1287.12	8.56	191.97	395.51	< -1287.1	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	146	664	332.00	309.90	22.10	189.13	8.56	191.97	395.51	< 189.1	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	57/58	513	256.50	309.90	-53.40	-457.00	8.56	191.97	395.51	< -457.0	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f		571	285.50	309.90	-24.40	-208.82	8.56	191.97	395.51	< -208.8	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	63/64	520	260.00	309.90	-49.90	-427.04	8.56	191.97	395.51	< -427.0	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	146	590	295.00	309.90	-14.90	-127.51	8.56	191.97	395.51	< -127.5	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	99	689	344.50	309.90	34.60	296.11	8.56	191.97	395.51	< 296.1	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	74	599	299.50	309.90	-10.40	-89.00	8.56	191.97	395.51	< -89.0	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	91	705	352.50	309.90	42.60	364.57	8.56	191.97	395.51	< 364.6	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	54	533	266.50	309.90	-43.40	-371.42	8.56	191.97	395.51	< -371.4	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	12	584	292.00	309.90	-17.90	-153.19	8.56	191.97	395.51	< -153.2	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	153	420	210.00	309.90	-99.90	-854.94	8.56	191.97	395.51	< -854.9	less than LD		pass
b-g	1/11/2000	12	Crit Cell	f	33	492	246.00	309.90	-63.90	-546.86	8.56	191.97	395.51	< -546.9	less than LD		pass
b-g	1/11/2000	12	Fuel Stg	f	6	892	446.00	446.70	-0.70	-6.51	9.30	250.47	513.51	< -6.5	less than LD		pass
b-g	1/11/2000	12	Fuel Stg	f	29	1069	534.50	446.70	87.80	816.57	9.30	250.47	513.51	816.57 +/- 421.4	percent error =	51.6%	pass
b-g	1/11/2000	12	Fuel Stg	f	33	1054	527.00	446.70	80.30	746.82	9.30	250.47	513.51	746.82 +/- 418.5	percent error =	56.0%	pass
b-g	1/11/2000	12	Fuel Stg	f	1	1117	558.50	446.70	111.80	1039.78	9.30	250.47	513.51	1039.78 +/- 430.8	percent error =	41.4%	pass
b-g	1/11/2000	12	Fuel Stg	f	24	975	487.50	446.70	40.80	379.45	9.30	250.47	513.51	< 379.5	less than LD		pass
b-g	1/11/2000	12	Fuel Stg	f	9	934	467.00	446.70	20.30	188.80	9.30	250.47	513.51	< 188.8	less than LD		pass
b-g	1/11/2000	12	Fuel Stg	f	32	1136	568.00	446.70	121.30	1128.13	9.30	250.47	513.51	1128.13 +/- 434.4	percent error =	38.5%	pass
b-g	1/11/2000	29	NA	f	5	850	425.00	397.60	27.40	254.83	9.30	236.30	485.18	< 254.8	less than LD		pass

TABLE B-1
OVERSIGHT VERIFICATION SURVEY DATABASE

Alpha or Beta-gamma	Date	Building Number	Room	Fix or Scan	Tetra Tech Grid Number/ Location	Gross Counts	Gross Count Rate (cpm)	Bkg Rate (cpm)	Net Count Rate (cpm)	Activity	ACF	L_C (dpm)	L_D (dpm)	Reportable Activity (dpm /100 cm^2)	Note	Percent Error	flag
FIXED-POINT MEASUREMENTS (Continued)																	
b-g	1/11/2000	29	NA	f	8	957	478.50	397.60	80.90	752.40	9.30	236.30	485.18	752.40 +/- 398.7	percent error =	53.0%	pass
b-g	1/11/2000	29	NA	f	13	788	394.00	397.60	-3.60	-33.48	9.30	236.30	485.18	< -33.5	less than LD		pass
b-g	1/11/2000	29	NA	f	16	984	492.00	397.60	94.40	877.95	9.30	236.30	485.18	877.95 +/- 404.3	percent error =	46.1%	pass
b-g	1/11/2000	29	NA	f	21	906	453.00	397.60	55.40	515.24	9.30	236.30	485.18	515.24 +/- 388.0	percent error =	75.3%	pass
b-g	1/11/2000	29	NA	f	23	932	466.00	397.60	68.40	636.14	9.30	236.30	485.18	636.14 +/- 393.5	percent error =	61.9%	pass
b-g	1/11/2000	29	NA	f	26	858	429.00	397.60	31.40	292.03	9.30	236.30	485.18	< 292.0	less than LD		pass
b-g	1/11/2000	29	NA	f	30	848	424.00	397.60	26.40	245.53	9.30	236.30	485.18	< 245.5	less than LD		pass
b-g	1/11/2000	29	NA	f	33	889	444.50	397.60	46.90	436.19	9.30	236.30	485.18	< 436.2	less than LD		pass
b-g	1/11/2000	29	NA	f	34	850	425.00	397.60	27.40	254.83	9.30	236.30	485.18	< 254.8	less than LD		pass
b-g	1/11/2000	29	NA	f	N. Vent	1015	507.50	397.60	109.90	1022.11	9.30	236.30	485.18	1022.11 +/- 410.7	percent error =	40.2%	pass
b-g	1/11/2000	29	NA	f	S. Vent	853	426.50	397.60	28.90	268.78	9.30	236.30	485.18	< 268.8	less than LD		pass
b-g	1/11/2000	29	NA	f	39	948	474.00	509.10	-35.10	-300.39	8.56	246.05	503.67	< -300.4	less than LD		pass
b-g	1/11/2000	29	NA	f	42	857	428.50	509.10	-80.60	-689.77	8.56	246.05	503.67	< -689.8	less than LD		pass
b-g	1/11/2000	29	NA	f	44	894	447.00	509.10	-62.10	-531.45	8.56	246.05	503.67	< -531.5	less than LD		pass
b-g	1/11/2000	29	NA	f	47	901	450.50	509.10	-58.60	-501.50	8.56	246.05	503.67	< -501.5	less than LD		pass
b-g	1/11/2000	29	NA	f	52	901	450.50	509.10	-58.60	-501.50	8.56	246.05	503.67	< -501.5	less than LD		pass
b-g	1/11/2000	29	NA	f	54	803	401.50	509.10	-107.60	-920.84	8.56	246.05	503.67	< -920.8	less than LD		pass
b-g	1/11/2000	29	NA	f	55	959	479.50	509.10	-29.60	-253.32	8.56	246.05	503.67	< -253.3	less than LD		pass
b-g	1/11/2000	29	NA	f	57	940	470.00	509.10	-39.10	-334.62	8.56	246.05	503.67	< -334.6	less than LD		pass
b-g	1/11/2000	29	NA	f	64	882	441.00	509.10	-68.10	-582.80	8.56	246.05	503.67	< -582.8	less than LD		pass
b-g	1/11/2000	29	NA	f	66	809	404.50	509.10	-104.60	-895.17	8.56	246.05	503.67	< -895.2	less than LD		pass
b-g	1/12/2000	363	100	f	6	715	357.50	449.40	-91.90	-854.70	9.30	251.22	515.03	< -854.7	less than LD		pass
b-g	1/12/2000	363	100	f	9	936	468.00	449.40	18.60	172.99	9.30	251.22	515.03	< 173.0	less than LD		pass
b-g	1/12/2000	363	100	f	12	994	497.00	449.40	47.60	442.70	9.30	251.22	515.03	< 442.7	less than LD		pass
b-g	1/12/2000	363	101	f	1	890	445.00	449.40	-4.40	-40.92	9.30	251.22	515.03	< -40.9	less than LD		pass
b-g	1/12/2000	363	102	f	5	748	374.00	449.40	-75.40	-701.25	9.30	251.22	515.03	< -701.2	less than LD		pass
b-g	1/12/2000	363	103	f	2	856	428.00	449.40	-21.40	-199.03	9.30	251.22	515.03	< -199.0	less than LD		pass
b-g	1/12/2000	363	103	f	7	877	438.50	449.40	-10.90	-101.37	9.30	251.22	515.03	< -101.4	less than LD		pass
b-g	1/12/2000	363	103	f	9	781	390.50	449.40	-58.90	-547.79	9.30	251.22	515.03	< -547.8	less than LD		pass
b-g	1/12/2000	363	Bay 2	f	19	881	440.50	449.40	-8.90	-82.77	9.30	251.22	515.03	< -82.8	less than LD		pass
b-g	1/12/2000	363	Bay 2	f	21	848	424.00	449.40	-25.40	-236.23	9.30	251.22	515.03	< -236.2	less than LD		pass
b-g	1/12/2000	363	Bay 2	f	36	881	440.50	449.40	-8.90	-82.77	9.30	251.22	515.03	< -82.8	less than LD		pass
b-g	1/12/2000	363	Bay 2	f	37	852	426.00	449.40	-23.40	-217.63	9.30	251.22	515.03	< -217.6	less than LD		pass
b-g	1/12/2000	363	Bay 3	f	10	767	383.50	449.40	-65.90	-612.89	9.30	251.22	515.03	< -612.9	less than LD		pass
b-g	1/12/2000	363	Bay 3	f	23	832	416.00	449.40	-33.40	-310.63	9.30	251.22	515.03	< -310.6	less than LD		pass
b-g	1/12/2000	363	Bay 3	f	31	941	470.50	449.40	21.10	196.24	9.30	251.22	515.03	< 196.2	less than LD		pass
b-g	1/12/2000	363	Bay 3	f	36	821	410.50	449.40	-38.90	-361.78	9.30	251.22	515.03	< -361.8	less than LD		pass
b-g	1/12/2000	363	Bay 3	f	37	843	421.50	449.40	-27.90	-259.48	9.30	251.22	515.03	< -259.5	less than LD		pass
b-g	1/12/2000	363	Bay 4	f	2	1189	594.50	449.40	145.10	1349.48	9.30	251.22	515.03	1349.48 +/- 444.5	percent error =	32.9%	pass
b-g	1/12/2000	363	Bay 4	f	4	866	433.00	449.40	-16.40	-152.53	9.30	251.22	515.03	< -152.5	less than LD		pass
b-g	1/12/2000	363	Bay 4	f	9	1030	515.00	449.40	65.60	610.10	9.30	251.22	515.03	610.10 +/- 413.7	percent error =	67.8%	pass
b-g	1/12/2000	363	Bay 4	f	41	783	391.50	449.40	-57.90	-538.49	9.30	251.22	515.03	< -538.5	less than LD		pass
b-g	1/12/2000	363	Bay 4	f	49/door	1921	960.50	449.40	511.10	4753.40	9.30	251.22	515.03	4753.40 +/- 564.9	percent error =	11.9%	pass
b-g	1/12/2000	363	Bay 4	f	outside door	1240	620.00	449.40	170.60	1586.64	9.30	251.22	515.03	1586.64 +/- 453.9	percent error =	28.6%	pass

TABLE B-1
OVERSIGHT VERIFICATION SURVEY DATABASE

Alpha or Beta-gamma	Date	Building Number	Room	Fix or Scan	Tetra Tech Grid Number/ Location	Gross Counts	Gross Count Rate (cpm)	Bkg Rate (cpm)	Net Count Rate (cpm)	Activity	ACF	L_C (dpm)	L_D (dpm)	Reportable Activity (dpm /100 cm^2)	Note	Percent Error	flag
SCAN SURVEY MEASUREMENTS																	
a	1/10/2000	12	109	s	54	2	2.00	1.40	0.60	4.99	8.31	12.53	36.30	< 5.0	less than LD		pass
a	1/10/2000	12	109	s	62	2	2.00	1.40	0.60	4.99	8.31	12.53	36.30	< 5.0	less than LD		pass
a	1/10/2000	12	109	s	70	10	10.00	1.40	8.60	71.47	8.31	12.53	36.30	71.47 +/- 51.6	percent error =	72.2%	pass
a	1/10/2000	12	109	s	98	3	3.00	1.40	1.60	13.30	8.31	12.53	36.30	< 13.3	less than LD		pass
a	1/10/2000	12	109	s	101	3	3.00	1.40	1.60	13.30	8.31	12.53	36.30	< 13.3	less than LD		pass
a	1/10/2000	12	109	s	21	3	3.00	1.40	1.60	13.30	8.31	12.53	36.30	< 13.3	less than LD		pass
a	1/10/2000	12	109	s	14	4	4.00	1.40	2.60	21.61	8.31	12.53	36.30	< 21.6	less than LD		pass
a	1/10/2000	12	109	s	78	2	2.00	1.40	0.60	4.99	8.31	12.53	36.30	< 5.0	less than LD		pass
a	1/10/2000	12	109	s	125	6	6.00	1.40	4.60	38.23	8.31	12.53	36.30	38.23 +/- 40.0	percent error =	104.6%	pass
a	1/10/2000	12	109	s	117	3	3.00	1.40	1.60	13.30	8.31	12.53	36.30	< 13.3	less than LD		pass
a	1/10/2000	12	109	s	33	5	5.00	1.40	3.60	29.92	8.31	12.53	36.30	< 29.9	less than LD		pass
a	1/10/2000	12	109	s	48	6	6.00	1.40	4.60	38.23	8.31	12.53	36.30	38.23 +/- 40.0	percent error =	104.6%	pass
a	1/10/2000	12	109	s	3	3	3.00	1.40	1.60	13.30	8.31	12.53	36.30	< 13.3	less than LD		pass
a	1/11/2000	12	109	s	71	2	2.00	1.10	0.90	5.67	6.30	8.43	25.38	< 5.7	less than LD		pass
a	1/11/2000	12	109	s	86	1	1.00	1.10	-0.10	-0.63	6.30	8.43	25.38	< -0.6	less than LD		pass
a	1/11/2000	12	109	s	112	1	1.00	1.10	-0.10	-0.63	6.30	8.43	25.38	< -0.6	less than LD		pass
a	1/11/2000	12	109	s	30	5	5.00	1.50	3.50	22.22	6.35	9.91	28.40	< 22.2	less than LD		pass
a	1/11/2000	12	109	s	59	2	2.00	1.50	0.50	3.17	6.35	9.91	28.40	< 3.2	less than LD		pass
a	1/11/2000	12	109	s	17	4	4.00	1.50	2.50	15.87	6.35	9.91	28.40	< 15.9	less than LD		pass
a	1/10/2000	12	Crit Cell	s	22	2	2.00	1.20	0.80	6.65	8.31	11.60	34.44	< 6.6	less than LD		pass
a	1/10/2000	12	Crit Cell	s	146	2	2.00	1.20	0.80	6.65	8.31	11.60	34.44	< 6.6	less than LD		pass
a	1/10/2000	12	Crit Cell	s	100	2	2.00	1.20	0.80	6.65	8.31	11.60	34.44	< 6.6	less than LD		pass
a	1/10/2000	12	Crit Cell	s	75	2	2.00	1.20	0.80	6.65	8.31	11.60	34.44	< 6.6	less than LD		pass
a	1/10/2000	12	Crit Cell	s	73	2	2.00	1.20	0.80	6.65	8.31	11.60	34.44	< 6.6	less than LD		pass
a	1/10/2000	12	Crit Cell	s	86	2	2.00	1.20	0.80	6.65	8.31	11.60	34.44	< 6.6	less than LD		pass
a	1/10/2000	12	Crit Cell	s	90	5	5.00	1.20	3.80	31.58	8.31	11.60	34.44	< 31.6	less than LD		pass
a	1/11/2000	12	Crit Cell	s	156	1	1.00	0.90	0.10	0.63	6.30	7.62	23.77	< 0.6	less than LD		pass
a	1/11/2000	12	Crit Cell	s	66	7	7.00	0.90	6.10	38.46	6.30	7.62	23.77	38.46 +/- 32.8	percent error =	85.3%	pass
a	1/11/2000	12	Crit Cell	s	98	7	7.00	0.90	6.10	38.46	6.30	7.62	23.77	38.46 +/- 32.8	percent error =	85.3%	pass
a	1/11/2000	12	Crit Cell	s	49	10	10.00	0.90	9.10	57.37	6.30	7.62	23.77	57.37 +/- 39.2	percent error =	68.3%	pass
a	1/11/2000	12	Crit Cell	s	95	7	7.00	0.90	6.10	38.46	6.30	7.62	23.77	38.46 +/- 32.8	percent error =	85.3%	pass
a	1/11/2000	12	Crit Cell	s	102	2	2.00	0.90	1.10	6.94	6.30	7.62	23.77	< 6.9	less than LD		pass
a	1/11/2000	12	Crit Cell	s	16	2	2.00	0.90	1.10	6.94	6.30	7.62	23.77	< 6.9	less than LD		pass
a	1/11/2000	12	Crit Cell	s	26	2	2.00	1.20	0.80	5.08	6.35	8.86	26.31	< 5.1	less than LD		pass
a	1/11/2000	12	Crit Cell	s	30	2	2.00	1.20	0.80	5.08	6.35	8.86	26.31	< 5.1	less than LD		pass
a	1/10/2000	12	Fuel Stg	s	22	3	3.00	1.40	1.60	13.30	8.31	12.53	36.30	< 13.3	less than LD		pass
a	1/10/2000	12	Fuel Stg	s	36	3	3.00	1.40	1.60	13.30	8.31	12.53	36.30	< 13.3	less than LD		pass
a	1/10/2000	12	Fuel Stg	s	14	2	2.00	1.40	0.60	4.99	8.31	12.53	36.30	< 5.0	less than LD		pass
a	1/11/2000	12	Fuel Stg	s	2	1	1.00	1.10	-0.10	-0.63	6.30	8.43	25.38	< -0.6	less than LD		pass
a	1/11/2000	29		s	38	1	1.00	0.40	0.60	3.78	6.30	5.08	18.69	< 3.8	less than LD		pass
a	1/11/2000	29		s	12	1	1.00	0.40	0.60	3.78	6.30	5.08	18.69	< 3.8	less than LD		pass
a	1/11/2000	29		s	44	2	2.00	0.40	1.60	10.09	6.30	5.08	18.69	< 10.1	less than LD		pass
a	1/11/2000	29		s	46W-East	1	1.00	0.40	0.60	3.78	6.30	5.08	18.69	< 3.8	less than LD		pass
a	1/11/2000	29		s	36W	1	1.00	0.40	0.60	3.78	6.30	5.08	18.69	< 3.8	less than LD		pass
a	1/11/2000	29		s	46	0	0.00	1.30	-1.30	-8.25	6.35	9.22	27.03	< -8.3	less than LD		pass
a	1/11/2000	29		s	37	2	2.00	1.30	0.70	4.44	6.35	9.22	27.03	< 4.4	less than LD		pass

TABLE B-1
OVERSIGHT VERIFICATION SURVEY DATABASE

Alpha or Beta-gamma	Date	Building Number	Room	Fix or Scan	Tetra Tech Grid Number/ Location	Gross Counts	Gross Count Rate (cpm)	Bkg Rate (cpm)	Net Count Rate (cpm)	Activity	ACF	L_C (dpm)	L_D (dpm)	Reportable Activity (dpm /100 cm^2)	Note	Percent Error	flag
SCAN SURVEY MEASUREMENTS (Continued)																	
a	1/11/2000	29		s	45W	6	6.00	1.30	4.70	29.83	6.35	9.22	27.03	29.83 +/- 30.6	percent error =	102.5%	pass
a	1/11/2000	29		s	21W	4	4.00	1.30	2.70	17.14	6.35	9.22	27.03	< 17.1	less than LD		pass
a	1/11/2000	29		s	48	2	2.00	1.30	0.70	4.44	6.35	9.22	27.03	< 4.4	less than LD		pass
a	1/12/2000	363	100	s	2	0	0.00	1.50	-1.50	-12.47	8.31	12.97	37.18	< -12.5	less than LD		pass
a	1/12/2000	363	101	s	1	3	3.00	1.50	1.50	12.47	8.31	12.97	37.18	< 12.5	less than LD		pass
a	1/12/2000	363	102	s	2	1	1.00	1.50	-0.50	-4.16	8.31	12.97	37.18	< -4.2	less than LD		pass
a	1/12/2000	363	102	s	10	2	2.00	1.50	0.50	4.16	8.31	12.97	37.18	< 4.2	less than LD		pass
a	1/12/2000	363	103	s	4	1	1.00	1.50	-0.50	-4.16	8.31	12.97	37.18	< -4.2	less than LD		pass
a	1/12/2000	363	103	s	7	3	3.00	1.50	1.50	12.47	8.31	12.97	37.18	< 12.5	less than LD		pass
a	1/12/2000	363	Bay 1	s	6	5	5.00	1.50	3.50	29.09	8.31	12.97	37.18	< 29.1	less than LD		pass
a	1/12/2000	363	Bay 1	s	11	4	4.00	1.50	2.50	20.78	8.31	12.97	37.18	< 20.8	less than LD		pass
a	1/12/2000	363	Bay 1	s	13	3	3.00	1.50	1.50	12.47	8.31	12.97	37.18	< 12.5	less than LD		pass
a	1/12/2000	363	Bay 1	s	19	3	3.00	1.50	1.50	12.47	8.31	12.97	37.18	< 12.5	less than LD		pass
a	1/12/2000	363	Bay 1	s	32	2	2.00	1.50	0.50	4.16	8.31	12.97	37.18	< 4.2	less than LD		pass
a	1/12/2000	363	Bay 2	s	5	2	2.00	1.50	0.50	4.16	8.31	12.97	37.18	< 4.2	less than LD		pass
a	1/12/2000	363	Bay 2	s	7	1	1.00	1.50	-0.50	-4.16	8.31	12.97	37.18	< -4.2	less than LD		pass
a	1/12/2000	363	Bay 2	s	19	2	2.00	1.50	0.50	4.16	8.31	12.97	37.18	< 4.2	less than LD		pass
a	1/12/2000	363	Bay 2	s	21	5	5.00	1.50	3.50	29.09	8.31	12.97	37.18	< 29.1	less than LD		pass
a	1/12/2000	363	Bay 3	s	8	1	1.00	1.50	-0.50	-4.16	8.31	12.97	37.18	< -4.2	less than LD		pass
a	1/12/2000	363	Bay 3	s	10	4	4.00	1.50	2.50	20.78	8.31	12.97	37.18	< 20.8	less than LD		pass
a	1/12/2000	363	Bay 3	s	23	3	3.00	1.50	1.50	12.47	8.31	12.97	37.18	< 12.5	less than LD		pass
a	1/12/2000	363	Bay 3	s	32	2	2.00	1.50	0.50	4.16	8.31	12.97	37.18	< 4.2	less than LD		pass
a	1/12/2000	363	Bay 4	s	4	3	3.00	1.50	1.50	12.47	8.31	12.97	37.18	< 12.5	less than LD		pass
a	1/12/2000	363	Bay 4	s	5	2	2.00	1.50	0.50	4.16	8.31	12.97	37.18	< 4.2	less than LD		pass
a	1/12/2000	363	Bay 4	s	9	1	1.00	1.50	-0.50	-4.16	8.31	12.97	37.18	< -4.2	less than LD		pass
a	1/12/2000	363	Bay 4	s	13	3	3.00	1.50	1.50	12.47	8.31	12.97	37.18	< 12.5	less than LD		pass
a	1/12/2000	363	Bay 4	s	19	1	1.00	1.50	-0.50	-4.16	8.31	12.97	37.18	< -4.2	less than LD		pass
a	1/12/2000	363	Bay 4	s	31	1	1.00	1.50	-0.50	-4.16	8.31	12.97	37.18	< -4.2	less than LD		pass
a	1/12/2000	363	Bay 4	s	34	1	1.00	1.50	-0.50	-4.16	8.31	12.97	37.18	< -4.2	less than LD		pass
a	1/12/2000	363	Bay 4	s	40	1	1.00	1.50	-0.50	-4.16	8.31	12.97	37.18	< -4.2	less than LD		pass
a	1/12/2000	363	Bay 4	s	41	1	1.00	1.50	-0.50	-4.16	8.31	12.97	37.18	< -4.2	less than LD		pass
a	1/12/2000	363	Bay 4	s	42	2	2.00	1.50	0.50	4.16	8.31	12.97	37.18	< 4.2	less than LD		pass
b-g	1/10/2000	12	109	s	54	450	450.00	450.00	0.00	0.00	9.24	249.88	512.27	< 0.0	less than LD		pass
b-g	1/10/2000	12	109	s	62	400	400.00	450.00	-50.00	-462.23	9.24	249.88	512.27	< -462.2	less than LD		pass
b-g	1/10/2000	12	109	s	70	425	425.00	450.00	-25.00	-231.11	9.24	249.88	512.27	< -231.1	less than LD		pass
b-g	1/10/2000	12	109	s	98	450	450.00	450.00	0.00	0.00	9.24	249.88	512.27	< 0.0	less than LD		pass
b-g	1/10/2000	12	109	s	101	450	450.00	450.00	0.00	0.00	9.24	249.88	512.27	< 0.0	less than LD		pass
b-g	1/10/2000	12	109	s	21	450	450.00	450.00	0.00	0.00	9.24	249.88	512.27	< 0.0	less than LD		pass
b-g	1/10/2000	12	109	s	14	450	450.00	450.00	0.00	0.00	9.24	249.88	512.27	< 0.0	less than LD		pass
b-g	1/10/2000	12	109	s	78	460	460.00	450.00	10.00	92.45	9.24	249.88	512.27	< 92.4	less than LD		pass
b-g	1/10/2000	12	109	s	125	480	480.00	450.00	30.00	277.34	9.24	249.88	512.27	< 277.3	less than LD		pass
b-g	1/10/2000	12	109	s	117	440	440.00	450.00	-10.00	-92.45	9.24	249.88	512.27	< -92.4	less than LD		pass
b-g	1/10/2000	12	109	s	33	460	460.00	450.00	10.00	92.45	9.24	249.88	512.27	< 92.4	less than LD		pass
b-g	1/10/2000	12	109	s	48	460	460.00	450.00	10.00	92.45	9.24	249.88	512.27	< 92.4	less than LD		pass
b-g	1/10/2000	12	109	s	3	460	460.00	450.00	10.00	92.45	9.24	249.88	512.27	< 92.4	less than LD		pass
b-g	1/11/2000	12	109	s	71	540	540.00	446.70	93.30	867.72	9.30	250.47	513.51	867.72 +/- 423.6	percent error =	48.8%	pass

TABLE B-1
OVERSIGHT VERIFICATION SURVEY DATABASE

Alpha or Beta-gamma	Date	Building Number	Room	Fix or Scan	Tetra Tech Grid Number/ Location	Gross Counts	Gross Count Rate (cpm)	Bkg Rate (cpm)	Net Count Rate (cpm)	Activity	ACF	L_C (dpm)	L_D (dpm)	Reportable Activity (dpm /100 cm^2)	Note	Percent Error	flag
SCAN SURVEY MEASUREMENTS (Continued)																	
b-g	1/11/2000	12	109	s	86	510	510.00	446.70	63.30	588.71	9.30	250.47	513.51	588.71 +/- 411.7	percent error =	69.9%	pass
b-g	1/11/2000	12	109	s	112	550	550.00	446.70	103.30	960.73	9.30	250.47	513.51	960.73 +/- 427.5	percent error =	44.5%	pass
b-g	1/11/2000	12	109	s	30	600	600.00	487.00	113.00	967.05	8.56	240.65	492.87	967.05 +/- 410.9	percent error =	42.5%	pass
b-g	1/11/2000	12	109	s	59	620	620.00	487.00	133.00	1138.21	8.56	240.65	492.87	1138.21 +/- 417.7	percent error =	36.7%	pass
b-g	1/11/2000	12	109	s	17	600	600.00	487.00	113.00	967.05	8.56	240.65	492.87	967.05 +/- 410.9	percent error =	42.5%	pass
b-g	1/10/2000	12	Crit Cell	s	22	260	260.00	250.00	10.00	92.45	9.24	186.25	385.01	< 92.4	less than LD		pass
b-g	1/10/2000	12	Crit Cell	s	146	260	260.00	250.00	10.00	92.45	9.24	186.25	385.01	< 92.4	less than LD		pass
b-g	1/10/2000	12	Crit Cell	s	100	320	320.00	250.00	70.00	647.12	9.24	186.25	385.01	647.12 +/- 324.1	percent error =	50.1%	pass
b-g	1/10/2000	12	Crit Cell	s	75	310	310.00	250.00	60.00	554.67	9.24	186.25	385.01	554.67 +/- 319.0	percent error =	57.5%	pass
b-g	1/10/2000	12	Crit Cell	s	73	300	300.00	250.00	50.00	462.23	9.24	186.25	385.01	462.23 +/- 313.8	percent error =	67.9%	pass
b-g	1/10/2000	12	Crit Cell	s	86	350	350.00	250.00	100.00	924.45	9.24	186.25	385.01	924.45 +/- 339.0	percent error =	36.7%	pass
b-g	1/10/2000	12	Crit Cell	s	90	300	300.00	250.00	50.00	462.23	9.24	186.25	385.01	462.23 +/- 313.8	percent error =	67.9%	pass
b-g	1/11/2000	12	Crit Cell	s	156	220	220.00	286.30	-66.30	-616.61	9.30	200.52	413.62	< -616.6	less than LD		pass
b-g	1/11/2000	12	Crit Cell	s	66	300	300.00	286.30	13.70	127.41	9.30	200.52	413.62	< 127.4	less than LD		pass
b-g	1/11/2000	12	Crit Cell	s	98	330	330.00	286.30	43.70	406.42	9.30	200.52	413.62	< 406.4	less than LD		pass
b-g	1/11/2000	12	Crit Cell	s	49	295	295.00	286.30	8.70	80.91	9.30	200.52	413.62	< 80.9	less than LD		pass
b-g	1/11/2000	12	Crit Cell	s	95	315	315.00	286.30	28.70	266.92	9.30	200.52	413.62	< 266.9	less than LD		pass
b-g	1/11/2000	12	Crit Cell	s	102	400	400.00	286.30	113.70	1057.45	9.30	200.52	413.62	1057.45 +/- 364.6	percent error =	34.5%	pass
b-g	1/11/2000	12	Crit Cell	s	16	380	380.00	286.30	93.70	871.44	9.30	200.52	413.62	871.44 +/- 355.3	percent error =	40.8%	pass
b-g	1/11/2000	12	Crit Cell	s	26	420	420.00	309.90	110.10	942.24	8.56	191.97	395.51	942.24 +/- 343.8	percent error =	36.5%	pass
b-g	1/11/2000	12	Crit Cell	s	30	410	410.00	309.90	100.10	856.66	8.56	191.97	395.51	856.66 +/- 339.6	percent error =	39.6%	pass
b-g	1/10/2000	12	Fuel Stg	s	22	450	450.00	450.00	0.00	0.00	9.24	249.88	512.27	< 0.0	less than LD		pass
b-g	1/10/2000	12	Fuel Stg	s	36	500	500.00	450.00	50.00	462.23	9.24	249.88	512.27	< 462.2	less than LD		pass
b-g	1/10/2000	12	Fuel Stg	s	14	480	480.00	450.00	30.00	277.34	9.24	249.88	512.27	< 277.3	less than LD		pass
b-g	1/11/2000	12	Fuel Stg	s	2	500	500.00	446.70	53.30	495.71	9.30	250.47	513.51	< 495.7	less than LD		pass
b-g	1/11/2000	29		s	38	520	520.00	397.60	122.40	1138.36	9.30	236.30	485.18	1138.36 +/- 415.7	percent error =	36.5%	pass
b-g	1/11/2000	29		s	12	480	480.00	397.60	82.40	766.35	9.30	236.30	485.18	766.35 +/- 399.4	percent error =	52.1%	pass
b-g	1/11/2000	29		s	44	500	500.00	397.60	102.40	952.35	9.30	236.30	485.18	952.35 +/- 407.6	percent error =	42.8%	pass
b-g	1/11/2000	29		s	46W-East	380	380.00	397.60	-17.60	-163.69	9.30	236.30	485.18	< -163.7	less than LD		pass
b-g	1/11/2000	29		s	36W	400	400.00	397.60	2.40	22.32	9.30	236.30	485.18	< 22.3	less than LD		pass
b-g	1/11/2000	29		s	46	600	600.00	509.10	90.90	777.92	8.56	246.05	503.67	777.92 +/- 410.9	percent error =	52.8%	pass
b-g	1/11/2000	29		s	37	600	600.00	509.10	90.90	777.92	8.56	246.05	503.67	777.92 +/- 410.9	percent error =	52.8%	pass
b-g	1/11/2000	29		s	45W	500	500.00	509.10	-9.10	-77.88	8.56	246.05	503.67	< -77.9	less than LD		pass
b-g	1/11/2000	29		s	21W	420	420.00	509.10	-89.10	-762.52	8.56	246.05	503.67	< -762.5	less than LD		pass
b-g	1/11/2000	29		s	48	600	600.00	509.10	90.90	777.92	8.56	246.05	503.67	777.92 +/- 410.9	percent error =	52.8%	pass
b-g	1/12/2000	363	100	s	2	550	550.00	500.00	50.00	462.23	9.24	263.40	539.30	< 462.2	less than LD		pass
b-g	1/12/2000	363	101	s	1	550	550.00	500.00	50.00	462.23	9.24	263.40	539.30	< 462.2	less than LD		pass
b-g	1/12/2000	363	102	s	2	550	550.00	500.00	50.00	462.23	9.24	263.40	539.30	< 462.2	less than LD		pass
b-g	1/12/2000	363	102	s	10	510	510.00	500.00	10.00	92.45	9.24	263.40	539.30	< 92.4	less than LD		pass
b-g	1/12/2000	363	103	s	4	540	540.00	500.00	40.00	369.78	9.24	263.40	539.30	< 369.8	less than LD		pass
b-g	1/12/2000	363	103	s	7	480	480.00	500.00	-20.00	-184.89	9.24	263.40	539.30	< -184.9	less than LD		pass
b-g	1/12/2000	363	Bay 1	s	6	500	500.00	500.00	0.00	0.00	9.24	263.40	539.30	< 0.0	less than LD		pass
b-g	1/12/2000	363	Bay 1	s	11	520	520.00	500.00	20.00	184.89	9.24	263.40	539.30	< 184.9	less than LD		pass
b-g	1/12/2000	363	Bay 1	s	13	500	500.00	500.00	0.00	0.00	9.24	263.40	539.30	< 0.0	less than LD		pass
b-g	1/12/2000	363	Bay 1	s	19	520	520.00	500.00	20.00	184.89	9.24	263.40	539.30	< 184.9	less than LD		pass
b-g	1/12/2000	363	Bay 1	s	32	600	600.00	500.00	100.00	924.45	9.24	263.40	539.30	924.45 +/- 443.8	percent error =	48.0%	pass

TABLE B-1
OVERSIGHT VERIFICATION SURVEY DATABASE

Alpha or Beta-gamma	Date	Building Number	Room	Fix or Scan	Tetra Tech Grid Number/ Location	Gross Counts	Gross Count Rate (cpm)	Bkg Rate (cpm)	Net Count Rate (cpm)	Activity	ACF	L_C (dpm)	L_D (dpm)	Reportable Activity (dpm /100 cm^2)	Note	Percent Error	flag
SCAN SURVEY MEASUREMENTS (Continued)																	
b-g	1/12/2000	363	Bay 2	s	5	500	500.00	500.00	0.00	0.00	9.24	263.40	539.30	< 0.0	less than LD		pass
b-g	1/12/2000	363	Bay 2	s	7	500	500.00	500.00	0.00	0.00	9.24	263.40	539.30	< 0.0	less than LD		pass
b-g	1/12/2000	363	Bay 2	s	19	550	550.00	500.00	50.00	462.23	9.24	263.40	539.30	< 462.2	less than LD		pass
b-g	1/12/2000	363	Bay 2	s	21	500	500.00	500.00	0.00	0.00	9.24	263.40	539.30	< 0.0	less than LD		pass
b-g	1/12/2000	363	Bay 3	s	8	480	480.00	500.00	-20.00	-184.89	9.24	263.40	539.30	< -184.9	less than LD		pass
b-g	1/12/2000	363	Bay 3	s	10	500	500.00	500.00	0.00	0.00	9.24	263.40	539.30	< 0.0	less than LD		pass
b-g	1/12/2000	363	Bay 3	s	23	480	480.00	500.00	-20.00	-184.89	9.24	263.40	539.30	< -184.9	less than LD		pass
b-g	1/12/2000	363	Bay 3	s	32	500	500.00	500.00	0.00	0.00	9.24	263.40	539.30	< 0.0	less than LD		pass
b-g	1/12/2000	363	Bay 4	s	4	500	500.00	500.00	0.00	0.00	9.24	263.40	539.30	< 0.0	less than LD		pass
b-g	1/12/2000	363	Bay 4	s	5	500	500.00	500.00	0.00	0.00	9.24	263.40	539.30	< 0.0	less than LD		pass
b-g	1/12/2000	363	Bay 4	s	9	600	600.00	500.00	100.00	924.45	9.24	263.40	539.30	924.45 +/- 443.8	percent error =	48.0%	pass
b-g	1/12/2000	363	Bay 4	s	13	550	550.00	500.00	50.00	462.23	9.24	263.40	539.30	< 462.2	less than LD		pass
b-g	1/12/2000	363	Bay 4	s	19	550	550.00	500.00	50.00	462.23	9.24	263.40	539.30	< 462.2	less than LD		pass
b-g	1/12/2000	363	Bay 4	s	31	550	550.00	500.00	50.00	462.23	9.24	263.40	539.30	< 462.2	less than LD		pass
b-g	1/12/2000	363	Bay 4	s	34	520	520.00	500.00	20.00	184.89	9.24	263.40	539.30	< 184.9	less than LD		pass
b-g	1/12/2000	363	Bay 4	s	40	500	500.00	500.00	0.00	0.00	9.24	263.40	539.30	< 0.0	less than LD		pass
b-g	1/12/2000	363	Bay 4	s	41	800	800.00	500.00	300.00	2773.36	9.24	263.40	539.30	2773.36 +/- 512.5	percent error =	18.5%	pass
b-g	1/12/2000	363	Bay 4	s	42	600	600.00	500.00	100.00	924.45	9.24	263.40	539.30	924.45 +/- 443.8	percent error =	48.0%	pass

Notes:	
ACF	Area correction factor (unitless)
Bkg	Background
cpm	Counts per minute
dpm	Disintigrations per minute
L_C	Critical level
L_D	Detection limit

TABLE B-2

SWIPE SAMPLE DATA
ROCKETDYNE
SANTA SUSANA FIELD LABORATORY

Sample Identification	Building Number and Sampling Location (Collected 01/12/00)	Gross Alpha (dpm/100 cm^2)	MDA Alpha (dpm/100 cm^2)	Validated Qualifier	Gross Beta (dpm/100 cm^2)	MDA Beta (dpm/100 cm^2)	Validated Qualifier
R09805-001	12, Room 190, Grid 70	23.53 ± 6.22	3.11	J	1.91 ± 3.77	6.44	UJ
R09805-002	12, Airlock, Grid 146, Middle Hinge	0.91 ± 1.53	2.89	UJ	1.69 ± 2.89	5.11	UJ
R09805-003	12, Critical Cell, Grid 55, Pipe	1.58 ± 1.73	2.66	UJ	2.66 ± 2.89	4.88	UJ
R09805-004	12, Critical Cell, Grid 156, Back of Door	0.89 ± 1.40	2.44	UJ	2.22 ± 2.89	5.11	UJ
R09805-005	12, Critical Cell, Grid 156, Top of Door	1.18 ± 1.55	2.66	UJ	3.55 ± 3.11	4.88	UJ
R09805-006	12, Airlock, Grid 146, Bottom Hinge	11.10 ± 3.77	2.44	J	0.87 ± 3.11	5.77	UJ
R09805-007	12, Fuel Storage Room, Tube #56	4.88 ± 2.66	2.89	J	3.11 ± 3.11	5.11	UJ
R09805-008	12, Fuel Storage Room, Tube #52	3.55 ± 2.22	2.66	J	4.88 ± 3.55	5.33	UJ
R09805-009	12, Fuel Storage Room, Tube #47	1.82 ± 2.00	3.11	UJ	0.13 ± 2.44	4.66	UJ
R09805-010	12, Fuel Storage Room, Tube #46	4.44 ± 2.66	2.89	J	0.00 ± 3.11	5.77	UJ
R09805-011	12, Fuel Storage Room, Tube #90	1.02 ± 1.67	3.11	UJ	4.00 ± 3.33	5.33	UJ
R09805-012	12, Fuel Storage Room, Tube #66	1.71 ± 1.80	2.89	UJ	2.22 ± 3.11	5.11	UJ
R09805-013	12, Fuel Storage Room, Tube #42	16.43 ± 4.88	2.66	J	0.22 ± 3.33	5.99	UJ
R09805-014	12, Fuel Storage Room, Tube #82	2.53 ± 1.95	2.44	J	1.42 ± 2.89	5.11	UJ
R09805-015	12, Fuel Storage Room, Tube #9	5.11 ± 2.66	2.66	J	2.66 ± 3.11	5.33	UJ
R09805-016	12, Fuel Storage Room, Tube #71	5.33 ± 2.66	2.44	J	0.67 ± 2.89	5.33	UJ
R09805-017	12, Fuel Storage Room, Tube #1	5.99 ± 2.89	2.89	J	-0.18 ± 2.66	5.11	UJ
R09805-018	12, Critical Cell, Grid 55, Pipe	0.22 ± 1.22	2.66	UJ	-0.44 ± 2.66	5.11	UJ
R09805-019	12, Room 109, Grid 40, Small Pipe	0.36 ± 1.51	3.11	UJ	6.44 ± 3.46	4.44	J
R09805-020	12, Critical Cell, Grid 38/39, Medium Pipe	0.60 ± 1.49	2.89	UJ	3.11 ± 3.33	5.55	UJ
R09805-021	12, Critical Cell, Grid 67/68, Medium Pipe	< 3.11 ± 2.89	2.66	UJ	3.11 ± 2.89	4.88	UJ
R09805-022	12, Critical Cell, Grid 64, Medium Pipe	0.51 ± 1.35	2.66	UJ	-0.18 ± 2.44	4.66	UJ
R09805-023	12, Room 109, 10 Inch Vent Inside of Elbow Pipe	0.82 ± 1.40	2.66	UJ	3.11 ± 3.11	5.11	UJ

TABLE B-2

SWIPE SAMPLE DATA
ROCKETDYNE
SANTA SUSANA FIELD LABORATORY

Sample Identification	Building Number and Sampling Location (Collected 01/12/00)	Gross Alpha (dpm/100 cm^2)	MDA Alpha (dpm/100 cm^2)	Validated Qualifier	Gross Beta (dpm/100 cm^2)	MDA Beta (dpm/100 cm^2)	Validated Qualifier
R09805-024	12, Room 109, Upper Hinge of Main Door	9.32 ± 3.55	2.89	J	1.44 ± 3.11	5.33	UJ
R09805-025	12, Critical Cell, Grid 156, Under Door	1.02 ± 1.53	2.66	UJ	5.99 ± 3.33	4.88	J
R09805-026	12, Critical Cell, Grid 156, Upper Hinge	1.31 ± 1.64	2.66	UJ	6.44 ± 3.55	5.11	J
R09805-027	12, Critical Cell, Grid 156, Lower Hinge	4.00 ± 2.22	2.44	J	0.07 ± 2.66	5.11	UJ
R09805-028	12, Critical Cell, Grid 156, Under Door	1.31 ± 1.51	2.44	UJ	3.55 ± 2.89	4.44	UJ
R09805-029	12, Critical Cell, Grid 20	< 1.73 ± 2.66	3.11	UJ	1.73 ± 2.66	4.44	UJ
R09805-031	363, Bay 1, Grid 19	0.95 ± 1.71	3.11	UJ	5.55 ± 3.11	4.66	J
R09805-032	363, Bay 1, Grid 33	2.24 ± 1.95	2.89	UJ	2.44 ± 3.11	5.33	UJ
R09805-033	363, Bay 1, Grid 11	1.02 ± 1.55	2.66	UJ	5.33 ± 3.33	4.88	J
R09805-034	363, Bay 1, Grid 11	1.91 ± 1.84	2.66	UJ	7.10 ± 3.55	4.88	J
R09805-038	363, Bay 2, Grid 21	0.56 ± 1.29	2.44	UJ	1.35 ± 2.89	5.11	UJ
R09805-039	363, Bay 2, Grid 19	0.33 ± 1.35	2.89	UJ	2.89 ± 2.89	4.66	UJ
R09805-040	363, Bay 4, Grid 49, Above North Door	0.75 ± 1.44	2.66	UJ	1.20 ± 2.89	4.88	UJ
R09805-041	363, Bay 4, Grid 14	< 0.31 ± 2.66	2.66	UJ	0.31 ± 2.66	5.11	UJ
R09805-042	363, Bay 4, Grid 9	< 2.22 ± 2.89	2.44	UJ	2.22 ± 2.89	4.88	UJ
R09805-043	363, Bay 4, Grid 5	< 0.64 ± 2.44	2.44	UJ	0.64 ± 2.44	4.22	UJ
R09805-044	363, Bay 4, Grid 40	0.95 ± 1.71	3.11	UJ	1.71 ± 2.66	4.66	UJ
R09805-045	363, Bay 4, Grid 2	0.47 ± 1.35	2.66	UJ	14.87 ± 4.44	4.88	J
R09805-046	363, Bay 4, Grid 32	< 4.22 ± 3.11	2.66	UJ	4.22 ± 3.11	4.66	UJ
R09805-048	29, Grid 19	0.33 ± 1.35	2.89	UJ	5.33 ± 3.33	4.66	J

TABLE B-2

SWIPE SAMPLE DATA
ROCKETDYNE
SANTA SUSANA FIELD LABORATORY

Sample Identification	Building Number and Sampling Location (Collected 01/12/00)	Gross Alpha (dpm/100 cm^2)	MDA Alpha (dpm/100 cm^2)	Validated Qualifier	Gross Beta (dpm/100 cm^2)	MDA Beta (dpm/100 cm^2)	Validated Qualifier
R09805-049	363, Bay 3, Grid 10	0.75 ± 1.44	2.66	UJ	3.33 ± 3.11	4.88	UJ
R09805-050	363, Bay 3, Grid 23	0.49 ± 1.33	2.66	UJ	11.10 ± 4.22	5.11	J
R09805-051	29, Grid 28	< 1.98 ± 2.89	2.44	UJ	1.98 ± 2.89	4.88	UJ
R09805-052	363, Bay 4, Grid 49, north door	1.07 ± 1.42	2.44	UJ	10.66 ± 3.77	4.44	J
R09805-053	363, Bay 4, floor	2.78 ± 2.11	2.89	UJ	5.11 ± 3.55	5.33	UJ
R09805-054	363, Bay 4	2.11 ± 1.91	2.66	UJ	2.89 ± 3.11	4.88	UJ
R09805-055	363, Bay 4, crack on floor	< 1.31 ± 2.66	2.66	UJ	1.31 ± 2.66	4.66	UJ
R09805-056	363, Bay 4, under north door	0.27 ± 1.18	2.66	UJ	4.22 ± 3.11	5.11	UJ
R09805-057	29, Grid 39	0.09 ± 1.24	2.89	UJ	1.38 ± 2.66	4.66	UJ
R09805-065	29, Grid 49W	0.49 ± 1.33	2.66	UJ	2.22 ± 2.89	4.88	UJ
R09805-066	29, Grid 20W	< 4.88 ± 3.33	2.66	UJ	4.88 ± 3.33	5.11	UJ
R09805-067	29, Grid 21W	< 3.33 ± 2.89	2.66	UJ	3.33 ± 2.89	4.88	UJ

Notes:

± Plus or minus
dpm/100 cm^2 Disintegrations per minute per 100 square centimeters
J The reported quantity is an estimated value.
MDA Minimum detectable activity
UJ The reported quantity is an estimated value less than the MDA.

TABLE B-3

CONCRETE AND DUST SAMPLES
ROCKETDYNE
SANTA SUSANA FIELD LABORATORY

Sample R09805-059: Building T363, Bay 4, Concrete							
	Bismuth-212	Bismuth-214	Cobalt-60	Cesium-137	Thorium-227	Thorium-234	Uranium-235
Result (pCi/g)	12 ± 15	1.5 ± 1.1	0.19 ± 0.26	0.62 ± 0.65	0.2 ± 2.8	3.2 ± 2.0	0.6 ± 0.10
MDC (pCi/g)	12	2.1	1.5	1.1	4.8	14	5.5
Qualifier	U	U	U	U	U	U	U

Sample R09805-060: Building T363, Bay 4, Concrete							
	Bismuth-212	Bismuth-214	Cobalt -60	Cesium-137	Thorium-227	Thorium-234	Uranium-235
Result (pCi/g)	3.0 ± 12	1.2 ± 1.2	0.21 ± 0.38	0.37 ± 0.71	1.6 ± 4.0	1.60 ± 4.0	1.10 ± 2.7
MDC (pCi/g)	14	3.1	1.8	1.2	6.8	21	6.3
Qualifier	U	U	U	U	U	U	U

Sample R09805-037: Building T363, Bay 4, Concrete							
	Bismuth-212	Bismuth-214	Cobalt -60	Cesium-137	Thorium-227	Thorium-234	Uranium-235
Result (pCi/g)	2.6 ± 5.2	0.71 ± 0.87	0.14 ± .24	1.88 ± .51	0.60 ± 1.8	1.6 ± 5.4	0.60 ± 1.4
MDC (pCi/g)	4.8	1.6	0.66	0.59	3.0	18	2.9
Qualifier	U	U	U		U	U	U

Sample R09805-030: Building T363, Bay 4, Concrete							
	Bismuth-212	Bismuth-214	Cobalt -60	Cesium-137	Thorium-227	Thorium-234	Uranium-235
Result (pCi/g)	-6.0 ± 35	0.31 ± 0.73	-0.05 ± 0.11	0.26 ± 0.54	0.065 ± 0.011	-1.76 ± 0.29	0.5 ± 1.4
MDC (pCi/g)	11	2.1	1.2	0.92	4.2	14	4.3
Qualifier	U	U	U	U	U	U	U

Sample R09805-061: Building T029, Dust from Air Vent							
	Bismuth-212	Bismuth-214	Cobalt -60	Cesium-137	Thorium-227	Thorium-234	Uranium-235
Result (pCi/g)	-0.80 ± 8.6	-0.013 ± 0.08	0.17 ± 0.23	0.13 ± 0.27	0.3 ± 1.9	11.2 ± 4.5	0.31 ± 0.53
MDC (pCi/g)	5.1	1.1	0.61	0.45	3.2	29	3.0
Qualifier	U	U	U	U	U	U	U

TABLE B-3

CONCRETE AND DUST SAMPLES
ROCKETDYNE
SANTA SUSANA FIELD LABORATORY

Sample R09805-064: Building T029, Dust from Air Vent							
	Bismuth-212	Bismuth-214	Cobalt -60	Cesium-137	Thorium-227	Thorium-234	Uranium-235
Result (pCi/g)	9.0 ± 26	3.0 ± 4.4	5.4 ± 3.2	0.40 ± 2.1	1.0 ± 11	8.0 ± 35	-6.0 ± 20
MDC (pCi/g)	35	9.7	4.2	3.7	19	72	18
Qualifier	U	U	U	U	U	U	U

Notes:

± Plus or minus

MDC Minimum detectable concentration

pCi/g Picocuries per gram

U The quantity reported is less than the sample-specific minimum detectable concentration.

TABLE B-4

COUNT RATE TO DOSE RATE CORRELATION MEASUREMENTS
ROCKETDYNE
SANTA SUSANA FIELD LABORATORY

Location	Measurement Time (hours)	Count Rate (cpm)	Dose Rate (μR/hr)	Conversion (μR/hr per cpm)
Building 220, Control Center	0.311	15,728	14.81	0.000942
Main Office Building (Area IV)	0.153	17,786	17.02	0.000957
Building T012, Room 109	0.033	9,701	12.00	0.001237
Building T012, Fuel Storage Room	0.336	12,805	13.71	0.001071
Building T012, Room 109	0.178	17,336	24.75	0.001428
Building T363	0.239	12,763	16.74	0.001312
Test Instrument Room	0.181	17,188	18.83	0.001096
			Mean:	**0.001149**

Notes:

cpm Counts per minute

μR/hr MicroRem per hour

TABLE B-5

BACKGROUND SURVEY RESULTS
ROCKETDYNE
SANTA SUSANA FIELD LABORATORY

(OUTDOOR)

Location	Indoor	Count Rate (cpm)	Dose Rate (μR/hr)
Building 220, COCA Control Center	No	10,362	11.90
Building 220, COCA Control Center	No	10,921	12.55
COCA T Room	No	11,809	13.57
COCA T Room	No	13,377	15.37
COCA T Room	No	13,700	15.74
Building 219, COCA Test Instrument Room	No	15,200	17.46
Building 219, COCA Test Instrument Room	No	17,188	19.74
Building 219, Lower Level	No	16,000	18.38
		Mean	**15.6**

(INDOOR)

Location	Indoor	Count Rate (cpm)	Dose Rate (μR/hr)
Building 216, Inside Room	Yes	14,620	16.79
Building 216, Inside Room	Yes	15,450	17.75
Building 216, Inside Room	Yes	16,282	18.70
		Mean	**17.7**

Notes:

COCA Acronym for a Rocketdyne rocket engine test area
cpm Counts per minute
μR/hr MicroRem per hour

APPENDIX C
FORMULAS AND EQUATIONS
(Two Pages)

Critical Level (L_C)

$$L_C = \frac{K_a}{t_s} \times \sqrt{t_s r_b \left(1 + \frac{t_s}{t_b}\right)}$$

Detection Limit (L_D)

$$L_D = \frac{K_a^2}{t_s}\left[2 \times \frac{K_a}{t_s} \times \sqrt{t_s r_b \left(1 + \frac{t_s}{t_b}\right)}\right]$$

Activity in dpm/100cm^2 (A)

$$A(dpm/100cm^2) = \left(\frac{n_s}{t_s} - \frac{n_b}{t_b}\right) \times A_{CF} \pm \left(A_{CF} \times K_b\right) \times \sqrt{\frac{r_s}{t_s} - \frac{r_b}{t_b}}$$

Less Than Value for Reportable Activity (LTV)

$$\text{LTV (for } r_s - r_b \leq L_C\text{)} = \left(\frac{n_s}{t_s} - \frac{n_b}{t_b}\right) \times A_{CF} + \left(A_{CF} \times K_a\right) \times \sqrt{\frac{r_s}{t_s} - \frac{r_b}{t_b}}$$

Activity Conversion Factor (A_{CF})

$$A_{CF} = \frac{1}{\varepsilon} \times \frac{100cm^2}{area_d}$$

Efficiency (ε)

$$\varepsilon = \frac{A_{source}}{\left(\frac{n_{cal}}{t_{cal}} - \frac{n_{b-cal}}{t_{b-cal}}\right)} \times f_1 \times f_2 \times f_3 \bullet\bullet\bullet$$

TERMS AND DEFINITIONS

A	=	Activity (disintegrations per minute per 100 square centimeters)
A_{CF}	=	Activity conversion factor
A_{source}	=	Activity of the standard calibration source (disintegrations per minute)
$area_d$	=	Detector surface area (square centimeters)
cm^2	=	square centimeters
cpm	=	Counts per minute
dpm	=	Disintegrations per minute
ε	=	Efficiency
f_i	=	Other conversion factors
K_a	=	1.645 (one-sided 95 percent standard deviation)
K_b	=	1.96 (two-sided 95 percent standard deviation)
L_C	=	Critical level (disintegrations per minute per 100 square centimeters)
L_D	=	detection limit (disintegrations per minute per 100 square centimeters)
n_b	=	Total background counts
n_{cal}	=	Total calibration source counts
$n_{b\text{-}cal}$	=	Total background counts at calibration location
n_s	=	Total sample counts
t_s	=	Sample count time (minutes)
t_{cal}	=	Calibration count time (minutes)
$t_{b\text{-}cal}$	=	Background count time at calibration location (minutes)
t_b	=	Background count time (minutes)
r_b	=	Background count rate (counts per minute) = n_b/t_b
r_s	=	Sample count rate (counts per minute) = n_s/t_s