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ROCKETDYNE DIVISION
ANNUAL SITE
ENVIRONMENTAL REPORT
SANTA SUSANA FIELD LABORATORY
AND DESOTO SITES
1995

Rockwell Aerospace

Rocketdyne

Site Environmental Report Reader Survey

To Our Readers:

The Annual Site Environmental Report publishes the results of environmental monitoring in support of DOE-sponsored programs at Rocketdyne's Santa Susana Field Laboratory and DeSoto sites, and documents our compliance with federal, state, and local environmental regulations. In providing this information, our goal is to give our readership - regulators, scientists, and the public - a clear understanding of our environmental activities, the methods we use, how we can be sure our results are accurate, the status of our programs, and significant issues affecting our programs.

It is important that the information we provide is easily understood, of interest, and communicates Rocketdyne's efforts to protect human health and minimize our impact on the environment. We would like to know from you whether we are successful in achieving these goals. Your comments are appreciated and will help us to improve our communications.

1. Is the writing ❑ too concise? ❑ too wordy? ❑ uneven? ❑ just right?
2. Is the technical content ❑ too concise? ❑ too wordy? ❑ uneven? ❑ just right?
3. Is the text easy to understand? ❑ yes ❑ no

   If you selected "no," is it: ❑ too technical ❑ too detailed ❑ other: _____

	Yes	No
4. Is the report comprehensive? (please identify issues you believe are missing in the comments section)	❑	❑
5. Do the illustrations help you understand the text better?	❑	❑
Are the figures understandable?	❑	❑
Are there enough?	❑	❑
Too few?	❑	❑
Too many?	❑	❑
6. Are the data tables of interest?	❑	❑
Would you prefer short summaries of data trends instead?	❑	❑
7. Is the background information sufficient?	❑	❑
Are the methodologies described reasonably understandable?	❑	❑
8. Are the glossaries and appendices useful?	❑	❑

Other comments:

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Please return this survey to Environmental Remediation - M/S T100, Rocketdyne Division, 6633 Canoga Avenue, Canoga Park, CA 91309.

OPTIONAL INFORMATION

Name: _____ Occupation: _____

Address: _____

ROCKETDYNE DIVISION ANNUAL SITE ENVIRONMENTAL REPORT SANTA SUSANA FIELD LABORATORY AND DESOTO SITES 1995

Prepared by the Staff of Environmental Remediation

July 30, 1996

Rockwell Aerospace
Rocketdyne

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1. EXECUTIVE SUMMARY

Rocketdyne currently operates several facilities in the San Fernando Valley/Simi Valley area, for manufacturing, testing, and research and development (R&D). These operations include manufacturing liquid-fueled rocket engines, such as the Space Shuttle Main Engine (SSME); testing rocket engines, lasers, and heat-transfer systems; and R&D in a wide range of high-technology fields, such as the electrical power system for the Space Station. Previously, this work included development, fabrication, and disassembly of nuclear reactors, reactor fuel, and other radioactive materials, but this work was terminated in 1987. Subsequently, all radiological work has been directed toward decontamination and decommissioning (D&D) of the previously used nuclear facilities and associated site areas.

The 1995 results of the radiological monitoring program indicate that there are no significant releases of artificial radioactive material from Rocketdyne sites. The atmospheric discharge of radioactive materials and direct radiation exposure are the only potential exposure pathways to the general public from Rocketdyne's radiological cleanup and waste packaging operations. All radioactive wastes are processed for subsequent disposal at Department of Energy (DOE) disposal sites. Liquid radioactive wastes are not released into the environment and do not constitute an exposure pathway. Groundwater and surface water are sampled and analyzed to assure detection of any artificial radioactivity. With the exception of low concentrations of tritium, well below Federal and State drinking water standards, only naturally occurring radioactivity has been found in this water.

Radioactivity in the facility ventilation exhaust effluents, and in the environment, is analyzed to assess any impact of the remaining radiological-related operations on the public and the environment. Little radioactivity is dispersed by these operations and very little is released to the environment, due to highly efficient filtration systems. Only small amounts of artificial radioactivity are found in the exhaust effluents. With the exception of localized areas of facility and soil contamination, only naturally occurring radioactivity can be detected in soil and vegetation samples.

Calculated radiation doses to the public, due to airborne releases and direct radiation, are a factor of thousands to millions of times lower than the applicable limits as well as natural background levels.

The nonradiological monitoring program has increased in recent years, with more extensive sampling of the groundwater at the Santa Susana Field Laboratory (SSFL). Nine new wells were installed in 1993 and 1994 to characterize the hydrogeology and water quality of known groundwater contamination horizontally and vertically, and in relation to the potential source areas. Three new wells were installed in Area IV in 1994 for extraction and treatment of degraded groundwater. No new wells were drilled in 1995.

In 1995, there were 216 onsite and 16 offsite wells sampled under the program. Surface discharges of water, after use in rocket-engine testing and other industrial purposes, are analyzed

at least monthly for 84 analytes and quarterly for 169 analytes per discharge location. Three existing trichloroethylene occurrences in the groundwater in the northwest part of Area IV were monitored in 1995. No new off-site plume of degraded groundwater was detected from these wells.

Twenty-one agency inspections were conducted during 1995. No Notices of Violations (NOVs) were issued.

In summary, Rocketdyne is committed to sound environmental management of all programs at our facilities and to correcting existing environmental problems before they pose a threat to our employees or the public. We have a long-standing record of our commitment to protecting the environment and will continue to strengthen that commitment in the future.

2. INTRODUCTION

This annual report discusses environmental monitoring at two manufacturing and test operations sites operated in the Los Angeles area by the Rocketdyne Division of Rockwell International Corporation (Rocketdyne). These are identified as the Santa Susana Field Laboratory (SSFL) and the DeSoto site. The sites have been used for manufacturing, R&D, engineering, and testing in a broad range of technical fields, primarily rocket engine propulsion and nuclear reactor technology. The DeSoto site essentially comprises office space and light industry with no remaining radiological operations, and has little potential impact on the environment. The SSFL site, because of its large size (2,668 acres), warrants comprehensive monitoring to assure protection of the environment.

SSFL consists of four administrative areas used for research, development, and test operations as well as a buffer zone. The arrangement of these areas is shown in Figure 2-1.

A portion of Area I and all of Area II are owned by the U.S. Government and assigned to the National Aeronautics and Space Administration (NASA). A portion of Area IV is under option for purchase by the Department of Energy (DOE).

The purpose of this report is to present information on environmental and effluent monitoring of DOE-sponsored activities to the regulatory agencies, i.e., the U.S. DOE, the Nuclear Regulatory Commission (NRC), and the California State Department of Health Services (DHS) Radiologic Health Branch (RHB). For that reason, information concentrates on Area IV at SSFL, which is the only area where DOE nuclear related activities have been performed. While the major focus of attention is radiological, this report also includes a discussion of nonradiological monitoring at SSFL.

Areas I, II, and III have been used for developing and testing rocket engines and propellants, lasers, and other energy technologies since 1949. No operations with nuclear fuel or nuclear reactors were conducted in those areas. Since 1956, Area IV has been used for work with nuclear materials, including fabricating nuclear reactor fuels, testing nuclear reactors, and disassembling used fuel elements. This work ended in 1989 and subsequent efforts have been directed toward Decommissioning & Decontamination (D&D) of the former nuclear facilities.

Work in nuclear energy R&D in what has become the Rocketdyne Division of Rockwell International Corporation began under North American Aviation, Inc. in 1946. During the evolution of these operations, small test and demonstration reactors and critical assemblies were built and operated, reactor fuel elements were fabricated, and used reactor fuel elements were disassembled and declad. These projects have been completed and terminated over the past 30 years. Most of this work was performed at SSFL and is described in detail in "Nuclear Operations at Rockwell's Santa Susana Field Laboratory—A Factual Perspective" (Ref. 1). No work with nuclear materials has been conducted since 1987, and the only work related to these operations during 1995 was the ongoing cleanup and decontamination of the remaining inactive nuclear facilities.

The nuclear operations have been conducted under State and Federal licenses and under contract to DOE and its predecessors. In April 1990, in response to a corporate decision to discontinue work with radioactive materials at SSFL, the NRC Special Nuclear Materials License was amended to permit only decommissioning operations.

The location of these sites in relation to nearby communities is shown in Figure 2-2 and Figure 2-3. Undeveloped land surrounds most of the SSFL site. There is occasional cattle grazing on the southern portion, and the Santa Monica Mountains Conservancy's Sage Ranch Park is at the northeastern boundary. No significant agricultural land use exists within 30 km (19 miles) of the SSFL site. While the land immediately surrounding SSFL is undeveloped, at greater distances there are suburban residential areas. For example, 2.7 km (1.7 miles) toward the northwest from Area IV is the closest residential portion of Simi Valley. The community of Santa Susana Knolls lies 4.8 km (3.0 miles) to the northeast, and a small truck farm exists approximately 7 km (4.4 miles) to the northeast. The Bell Canyon area begins approximately 2.3 km (1.4 miles) to the southeast, and the Brandeis-Bardin Institute is adjacent to the north. A sand and gravel quarry was operated approximately 2.4 km (1.5 miles) to the west but is now abandoned.

The Los Angeles basin is a semiarid region whose climate is controlled primarily by the semipermanent Pacific high-pressure cell that extends from Hawaii to the Southern California coast. The seasonal changes in the position of this cell greatly influence the weather conditions in this area. During the summer months, the high-pressure cell is displaced to the north. This results in mostly clear skies with little precipitation. During the winter, the cell moves sufficiently southward to allow some Pacific lows with their associated frontal systems to move into the area. This produces light to moderate precipitation with northerly and northwesterly winds.

During the summer, a shallow inversion layer generally exists in the Los Angeles area. The base and top of this inversion layer usually lie below the elevation of the SSFL site. Thus, any atmospheric release from the SSFL site during the summer would likely result in considerable atmospheric dispersion above the inversion layer prior to any diffusion through the inversion layer into the Simi or San Fernando Valleys. In the winter season, surface airflow is dominated by frontal activity moving easterly through the area. Storms passing through the area during winter are generally accompanied by rainfall. Airborne mixing varies depending on the location of the weather front relative to the site. Generally, a light to moderate southwesterly wind precedes these storms, introducing a strong onshore flow of marine air and producing slightly unstable air. Wind speeds increase as the frontal systems approach, enhancing mixing and dispersion. Locally, average wind speeds range from 0 to about 4.4 m/s, mostly from the north and northwest.

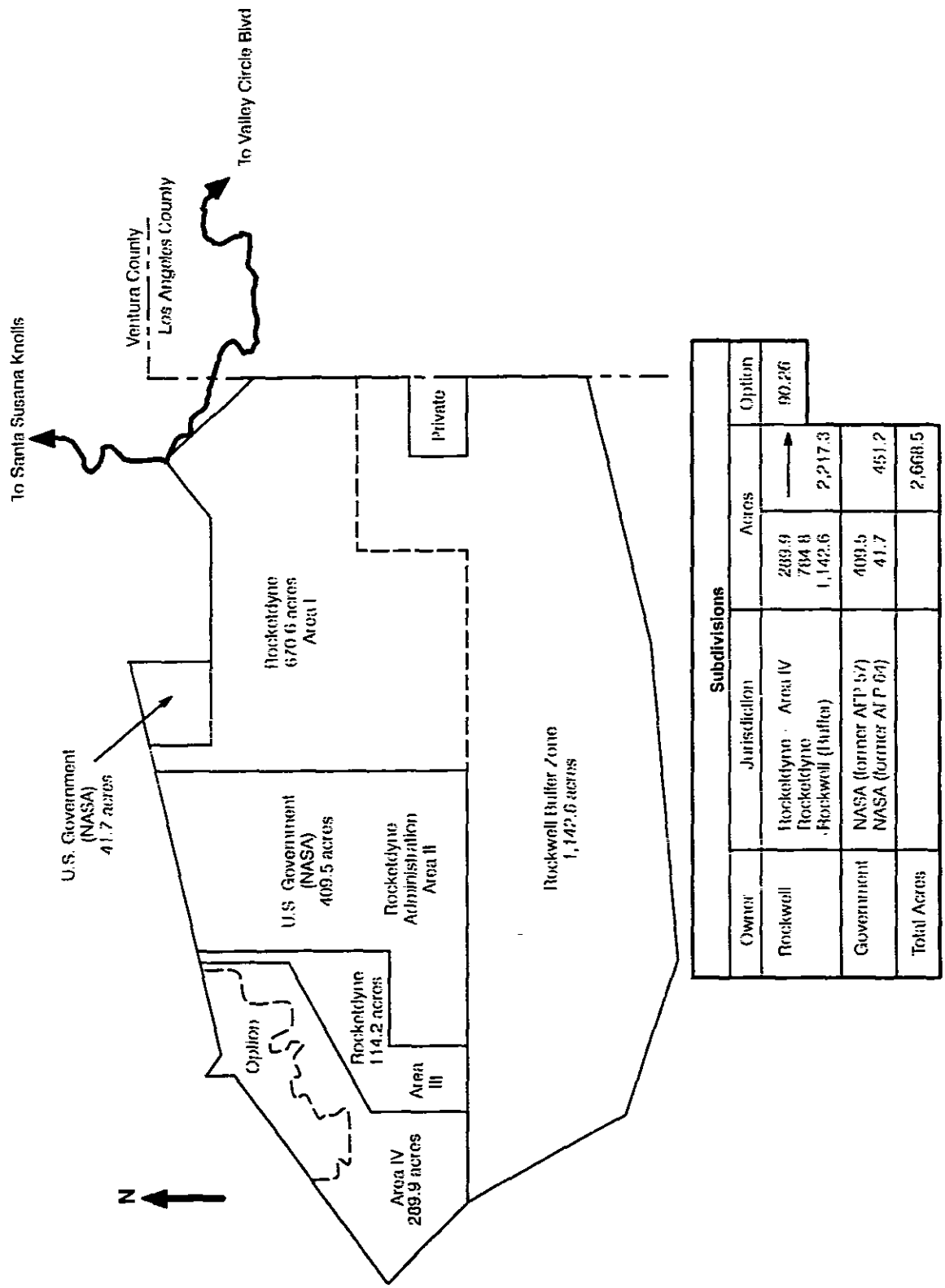

Figure 2-1. Santa Susana Field Laboratory Site Arrangement

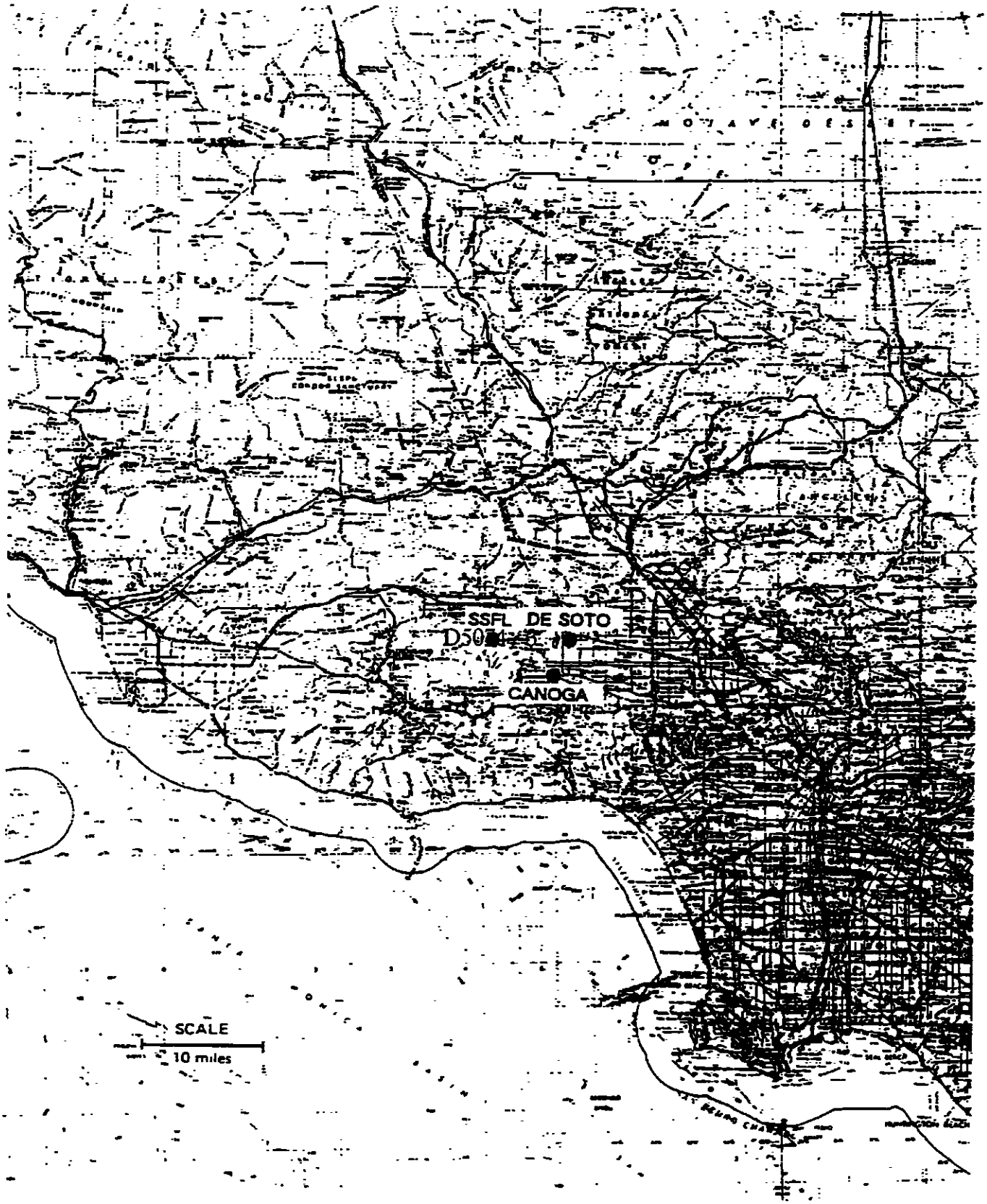

Figure 2-2. Map of General Los Angeles Area Showing Locations of Major Rocketdyne Facilities

Figure 2-3. Area Surrounding SSFL (Canoga Site is Southeast of SSFL)

Surrounding the DeSoto complex is light manufacturing, other commercial establishments, apartment buildings, and single-family houses. With the exception of the Pacific Ocean approximately 20 km (12 miles) south, no recreational body of water of noteworthy size is located in the surrounding area. Four major reservoirs providing domestic water to the greater Los Angeles area are located within 50 km (30 miles) of SSFL. However, the closest reservoir to SSFL (Bard Reservoir) is more than 10 km (6 miles) from Area IV. The nearest groundwater well that is used for a municipal water supply is more than 16 km (10 miles) from Area IV, north of Moorpark.

The SSFL site occupies 2,668 acres located in the Simi Hills of Ventura County, approximately 48 km (30 miles) northwest of downtown Los Angeles. The SSFL site is situated on rugged terrain which typifies mountain areas of recent geological age. Elevations of the site vary from 500 to 700 m (1,650 to 2,250 ft) above sea level (ASL). Rockwell International- and DOE-owned facilities (Figure 2-4 and Figure 2-5) share the Area IV portion of this site.

Within Area IV of the SSFL site is a 90-acre government-optioned area where DOE contract activities are conducted. All of the work is now performed by the Energy Technology Engineering Center (ETEC). The major operational nuclear installation within the DOE-optioned area is the Radioactive Materials Handling Facility (RMHF)[1]. This facility has been used for storage of sealed irradiated fuel and for packaging radioactive wastes resulting from nuclear facility decommissioning operations. No nuclear fuel has been present at the RMHF since May of 1989 when the last packages of disassembled Fermi-reactor fuel were shipped to another DOE site. Radioactively contaminated water from the decontamination operations is evaporated and the sludge is dried and disposed as packaged dry waste together with other dry wastes at a DOE disposal site.

The SSFL site also contains facilities in which operations with nuclear materials licensed by the NRC and radioactive materials licensed by the State of California were conducted. The principal licensed facilities are the Rockwell International Hot Laboratory (RIHL) (T020) and the Radiation Instrument Calibration Laboratory (RICL).

Licensed programs conducted during 1995 were directed toward D&D of the RIHL, which was last used for nuclear reactor fuel disassembly in 1987.

Some research licensed by the State of California using radioactive materials was conducted at the DeSoto site (Figure 2-6) in the Building 104 Applied Nuclear Technology laboratories. Irradiation operations in the Gamma Irradiation Facility, also located at Building 104, were terminated in 1994 and the radiation sources were shipped off-site. Operations at the Helium Analysis Laboratory were terminated in May 1995, in preparation for relocation of the laboratory to Battelle - Pacific Northwest National Laboratories (PNNL) in Richland, Washington. This transfer terminates all work (other than D&D) with radioactive materials at

[1] Formerly the Radioactive Materials Disposal Facility (RMDF).

the DeSoto site. The DeSoto location is at an altitude of 267 m (875 ft) ASL on generally flat terrain.

2.1 FACILITY DESCRIPTIONS

2.1.1 Santa Susana Field Laboratory Site

2.1.1.1 RIHL - NRC and California State-Licensed Activities

Operations at T020 that may have generated radioactive effluents in the past consisted of hot cell examination and decladding of irradiated nuclear fuels and examination of reactor components. Only filtered atmospheric effluents are released from the building during D&D activities. Since T020 was shut down in 1987, only decontamination of the facility was performed in 1995. No radioactive liquids are released from the facility. Prior radioactive material handled in unencapsulated form in this facility included the following radionuclides that are present in minor amounts as facility contamination: U, Pu, as constituents in the various fuel materials; Cs-137 and Sr-90 as mixed fission products; and Co-60.

2.1.1.2 DOE Contract Activities

RMHF

Operations at T021 and T022 that may generate radioactive effluents consist of the processing, packaging, and temporary storage of liquid and dry radioactive waste material for disposal. Only filtered atmospheric effluents are released from the building to uncontrolled areas. No radioactive liquids are released from the facility. Contamination from nuclear fuel and decontamination operations contains uranium and plutonium plus Cs-137 and Sr-90 as mixed fission products, and Co-60 and Eu-152 activation products.

Building T059

Operations at T059 that may generate radioactive effluents consist of removal of activated steel and concrete as part of the D&D of this former Systems for Nuclear Auxiliary Power (SNAP) reactor ground test facility. Only filtered atmospheric effluents are released from the building to uncontrolled areas during operations. No radioactive liquid waste is released from the facility. Activation products consist primarily of Fe-55, Eu-152, and Co-60, and minimal amounts of H-3.

In January 1995, the decontamination of the Large Leak Test Rig (LLTR) reaction products tank was completed by replacement of the support legs. The facility was then shut down and placed under the orphan facilities radiological surveillance plan. In October 1995, the facility was re-opened to begin planning for the tear down of equipment in the High Bay and the Vault area, including disassembly of the LLTR valve silo. In 1996, LLTR dismantling activities are expected to be initiated, starting in the High Bay and working down to the Vault area.

Because of the limited non-radiological activity in the building in 1995, no effluent monitoring was performed.

Buildings T005, T023, and T064

Buildings T005, T023, and T064 completed D&D activities in 1993. The Oak Ridge Institute for Science and Education (ORISE) performed verification surveys at T005, T023, and T064. The results confirmed ETEC survey results showing that these buildings met DOE guidelines for removal of the radioactive material management area (RMMA) designation. RMMA designation was removed by DOE in October 1994. T005 was released for unrestricted use by the California Department of Health Services (DHS) Radiologic Health Branch (RHB) on March 22, 1995. Release dockets for T023 and T064 are currently in preparation.

Buildings T012 and T363

Buildings T012 and T363 completed D&D activities in 1995. A Final radiological survey on T363 was conducted by Rocketdyne in 1995. A final Rocketdyne radiological survey for T012, and confirmatory radiological surveys by ORISE for both buildings, are planned for 1996.

2.1.2 DeSoto Site

2.1.2.1 Building 104 - California State-Licensed Activities

Operations at Building 104 that could have generated radioactive effluents consisted of research studies in applied physics and physical chemistry. Only minimal quantities of filtered atmospheric effluents are released from the building to uncontrolled areas. No liquid effluents are released. The mass spectrometer laboratory continued to analyze low-level activated test samples for universities and national laboratories until May 1995, at which time, operations in the laboratory were terminated. The laboratory was relocated to Battelle - Pacific Northwest National Laboratories (PNNL) in early 1996. Archive low-level radioactive materials from the operation of the laboratory remain stored in Building 104, awaiting final disposal or shipment to PNNL.

2.1.3 Canoga Site

Insufficient quantities of radioactive materials are used at the Canoga facility to warrant environmental monitoring. Radioactive materials at the Canoga facility are exempt quantities of C-14, Sr-90, and Ru-106. The C-14 is embedded in solid ceramic insulator tubes used in the Peacekeeper Stage IV ordnance firing unit switches. The strontium and ruthenium are encapsulated as sealed sources for a beta-backscatter analysis instrument for measuring material plating thickness.

Figure 2-4. Rocketdyne Division - Santa Susana Field Laboratory Site, Area IV

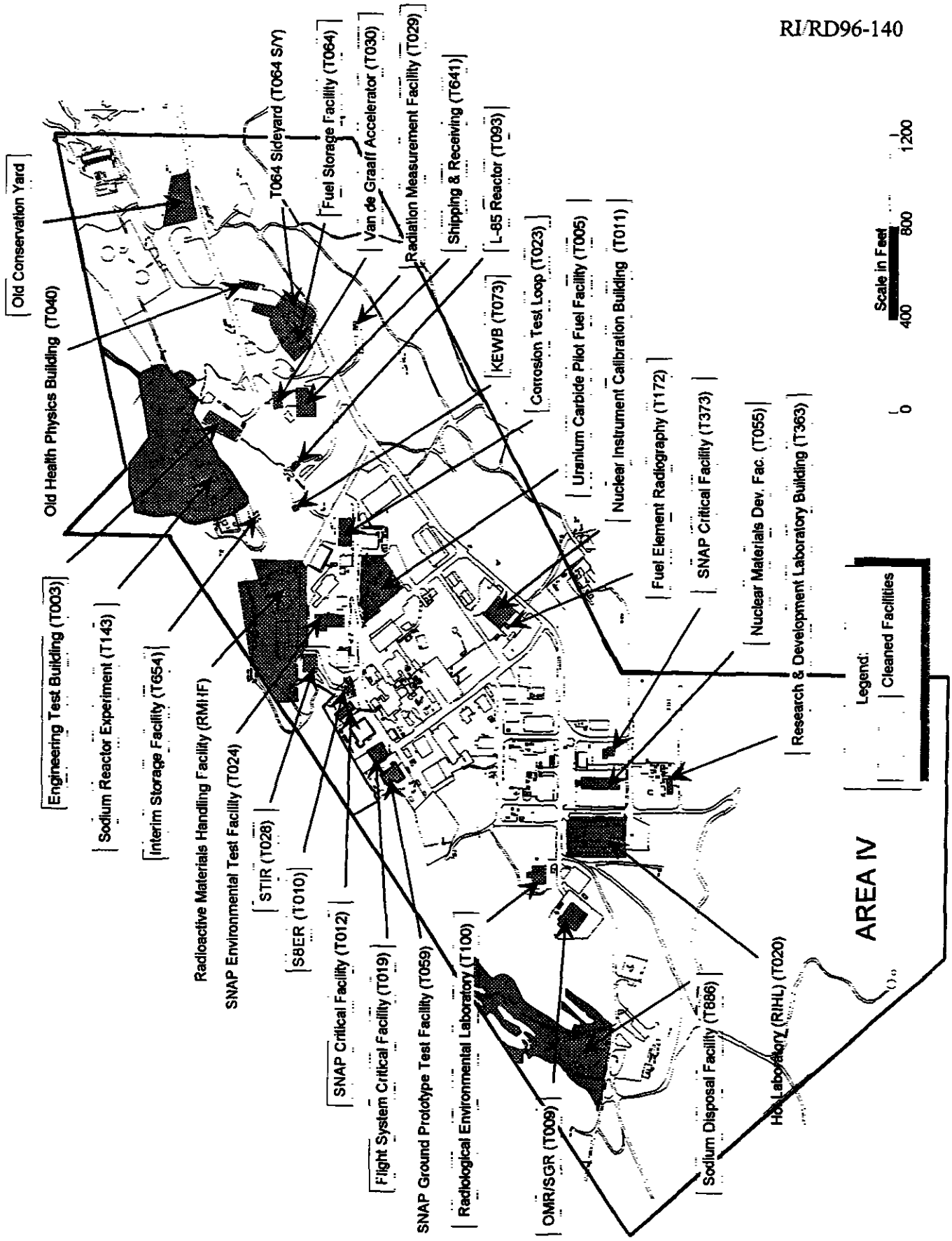

Figure 2-5. Map of Santa Susana Field Laboratory Area IV Facilities DeSoto Site

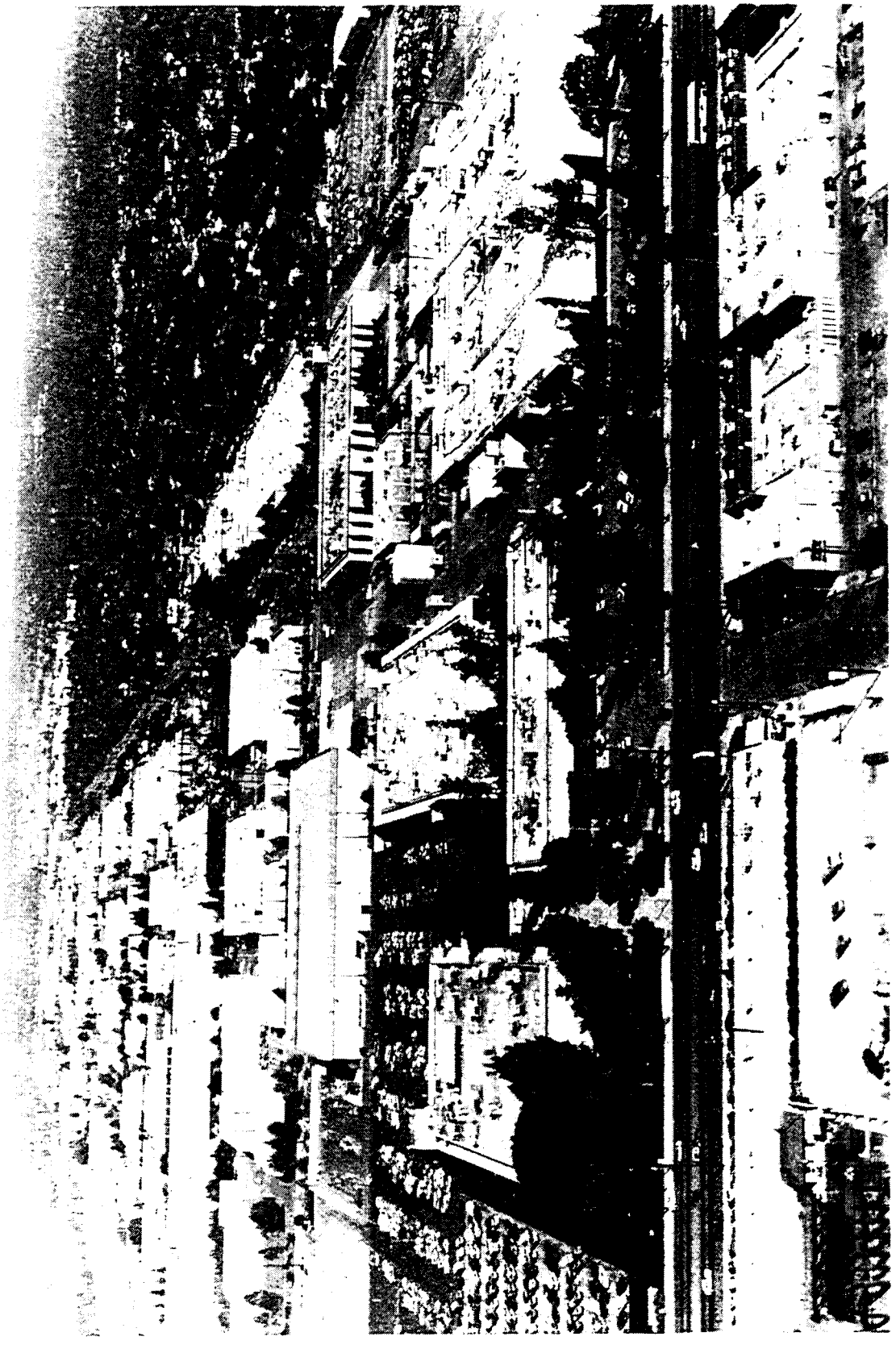

Figure 2-6. Rocketdyne Division - DeSoto Site

3. COMPLIANCE SUMMARY

This section summarizes ETEC's compliance with federal, state, and local environmental regulations. Two main categories are discussed; Section 3.1 discusses compliance status, and Section 3.2 discusses current issues and actions.

3.1 COMPLIANCE STATUS

3.1.1 Comprehensive Environmental Response, Compensation, and Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) regulates reporting and emergency response for hazardous substances released into the environment and for the cleanup of abandoned hazardous waste sites or other historical hazardous waste releases. Under the historical release authority of CERCLA, a Preliminary Assessment/Site Investigation (PA/SI) review of SSFL Area IV was conducted by the EPA Site Evaluation Section. A report of findings, dated 11 August 1989, was transmitted to ETEC in April 1990.

Prior to ranking the facilities, the EPA had requested additional air monitoring be provided for SSFL. Rocketdyne submitted the last quarterly status report in June 1992. The EPA contracted an outside contractor, PRC Inc., to assist in the ranking of the facilities. The facility ranked below the criteria for being included on the National Priority Listing. There was no further activity on this in 1995. However, discussions with both the DOE and NASA customers have resulted in agreement to incorporate CERCLA-type protocols per DOE policy into the cleanup activities at SSFL. CERCLA-type protocols were initiated early in the process, but because of the State having RCRA authority instead of the EPA, cleanup activities will be conducted under RCRA corrective action.

The Superfund Amendments and Reauthorization Act (SARA) extended the regulatory provisions of CERCLA. SARA Title III requires extensive hazardous material reporting, community right-to-know and emergency response planning provisions. ETEC has met the SARA reporting requirements. The SSFL Hazardous Materials Release Response Business Plan and Inventory was issued to Ventura County Environmental Health Department on April 12, 1996, addressing the following SARA Title III provisions:

1. Planning, Emergency Response
2. Reporting, Leaks and Spills
3. Reporting, Chemical Inventories
4. HAZMAT Training Program
5. Facility Maps and Diagrams.

SARA Title III also addresses reporting toxic chemical (EPA Form R) usage. Rocketdyne annually submits an EPA Form R report to the Environmental Protection Agency (EPA) for toxic

chemicals handled at ETEC facilities exceeding the reporting threshold quantity of 10,000 lb. In 1994, ETEC used ammonia and sulfuric acid exceeding the threshold quantity. Preliminary data for the toxic release inventory was submitted to the DOE. A final report was provided to the DOE by June 1995. The DOE submitted the final report to the EPA by July 1, 1995. For 1995, ETEC will report only ammonia, since sulfuric acid was delisted by the EPA.

3.1.2 Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) gives the EPA broad authority to regulate the handling, treatment, storage, and disposal of hazardous wastes. DOE owns and ETEC operates two RCRA-permitted Treatment, Storage, and Disposal Facilities. Permit numbers are listed in Section 3.2.5.

The Radioactive Materials Handling Facility (RMHF) is operating as a Part A California Interim Status Facility. This facility is used primarily for the handling and packaging of radioactive waste. The Part A permit is required for the treatment and storage of small amounts of mixed waste resulting from decontamination and decommissioning activities at ETEC. Final disposition of the mixed waste is being addressed under the Federal Facilities Compliance Act, Section 3.1.3.

The Hazardous Waste Management Facility (HWMF) includes a storage area (T029) and a treatment facility (T133) for reactive metal waste. The RCRA Part B permit for the facility was renewed by the California Department of Toxic Substances Control (DTSC) in 1993. In February 1994 DTSC inspected the facility for compliance with the permit. No violations were noted. ETEC is in compliance with permit requirements.

RCRA also has governing authority of underground tanks which contain hazardous materials. Area IV has 14 underground storage tanks (USTs), 3 radioactive water and 11 sodium tanks. The radioactive water storage tanks are exempt from permitting by the Ventura County Environmental Health Division (VCEHD) per Article 2. Section 2621.a.11, Exemptions, California Underground Storage Tank Regulations. The California Department of Health Services and the Department of Energy are the lead agencies for tanks containing radioactive material. In 1994 one UST for radioactive water was removed as part of the D & D of the RIHL and stored at the RMHF. The other two tanks are in operation at RMHF.

The 11 sodium tanks are no longer permitted by VCEHD. They are now exempt from UST requirements pursuant to a VCEHD correspondence to Rocketdyne dated September 8, 1995.

3.1.3 Federal Facilities Compliance Act

ETEC is participating with the DOE Oakland Operations Office (DOE-OAK) and the State of California in the Site Treatment Plans in accordance with the Federal Facilities Compliance Act (FFCA). A draft Site Treatment Plan was submitted on schedule. All known mixed wastes have been identified with a treatment plan and a storage location within the DOE complex. A

small amount of waste requires additional characterization prior to determining the best repository/treatment options. The FFCA Site Treatment Plan was finalized in October 1995.

3.1.4 National Environmental Policy Act

The National Environmental Policy Act (NEPA) establishes a national policy to ensure that consideration is given to environmental values and factors in federal planning and decision-making. For those projects or actions that are expected to either affect the quality of the human environment or create controversy on environmental grounds, DOE assures that appropriate NEPA actions (Categorical Exclusion [CX], Environmental Assessment [EA], Finding of No Significant Impact [FONSI], or Notice of Intent [NOI], draft Environmental Impact Statement [EIS], final EIS, Record of Decision [ROD]) have been incorporated into project planning documents. DOE has implemented NEPA as defined in Federal Register Volume 57, Number 80, pages 15122 through 15199.

ETEC subjectively assesses the environmental impact of each project planned for implementation. Based on the assessments, DOE is requested to issue determinations of compliance to the NEPA. ETEC submitted 13 requests for NEPA determinations in calendar year 1994, and 7 requests in calendar year 1995 (see Appendix A). Nineteen requests were issued as categorical exclusions and approved by DOE, two in July 1995, and seventeen in December 1995.

3.1.5 Clean Air Act

The Clean Air Act (CAA) resulted in federal regulations that set air quality standards and require state implementation plans, National Emissions Standards for Hazardous Air Pollutants (NESHAPs), New Source Performance Standards, and monitoring programs in an effort to achieve air quality levels beneficial to the public health and welfare. The SSFL is mainly regulated by the Ventura County Air Pollution Control District (VCAPCD) and must comply with VCAPCD Rules and Regulations. The EPA can enforce VCAPCD rules and also regulates pollutants such as Ozone Depleting Substances (ODS's) under 40 CFR 82. The DeSoto facility is under the jurisdiction of South Coast Air Quality Management District (SCAQMD). VCAPCD and SCAQMD Rules and Regulations incorporate, by reference, NESHAPs regulations as codified under the CAA.

3.1.5.1 Radiological

The results of radiological environmental monitoring indicate that there are no significant releases of artificial radioactive material from the SSFL or DeSoto sites. Atmospheric transport of radioactive materials and direct exposure during ETEC's environmental remediation and waste management operations are the only credible pathways to the general public. A small seepage of water containing low levels of tritium occurs in an area that is very isolated, and thus no exposure is likely.

Small amounts of radioactive materials may be released in ventilation exhaust from facilities at SSFL and DeSoto, along with naturally occurring airborne radioactivity. These releases are minimized by the use of high-efficiency particulate air (HEPA) filters, and are continuously monitored by sampling the workplace air and the exhaust effluent. Radionuclide-specific analyses determine the radioactive composition of these effluents, and maximum off-site doses at the nearest residence from this source are estimated by use of the EPA computer program CAP88-PC (Ref. 2).

Considering airborne releases from both the RMHF exhaust stack and a single diffuse area source, the maximum individual annual exposure was estimated to be 1.3×10^{-5} mrem/yr for DOE operations at ETEC. Similarly, licensed operations at the RIHL and the DeSoto site were estimated to have resulted in 2.5×10^{-6} mrem/yr and 5.4×10^{-5} mrem/yr, respectively. All effective dose equivalents for the maximally exposed individual are far below the EPA NESHAPs limit of 10 mrem/yr, and below the action level of 1% of the limit (0.1 mrem/yr) as specified in 40 CFR 61, Subpart H (DOE facilities) and Subpart I (licensed facilities). Additional calculations are done for the licensed facilities (RIHL and DeSoto) using the DOE computer program COMPLY (Ref. 3) to demonstrate compliance under Subpart I of the NESHAPs regulations.

3.1.5.2 Nonradiological

The requested SCTI H-1, H-2 and H-101 Pilot Burner data was submitted to VCAPCD in February 1995 for renewal of our Permit to Operate No. 0271.

On February 9, 1995, a burst diaphragm on an ammonia tank released 10-12 gal. of 60% NH_3. This was not a reportable incident, and had no known offsite consequences.

On March 24, 1995, VCAPCD contacted Rocketdyne stating there may be NOx exceedence violations during the last quarter H-1 and H-2 were running. Rocketdyne met with VCAPCD and discussed the issue explaining the reason for the high NOx reading. On April 4, 1995, the enforcement section of VCAPCD contacted Rocketdyne and said there would be no further actions taken and no citation issued.

The SCTI had a Continuous Emissions Monitoring (CEM) malfunction on May 25, 1995. On August 15, 1995, VCAPCD issued an NOV for this malfunction. Rocketdyne met with the VCAPCD enforcement section and was able to show that there was no negligence or exceedances during the malfunction. On August 30, 1995, the VCAPCD rescinded the NOV.

The current VCAPCD permit, No. 0271, was issued in July 1995 and renewed for January 1995 through December 1995.

VCAPCD Rule 74.15, sets limits for oxides of nitrogen (NOx) and carbon monoxide (CO) emissions on boilers, steam generators, and process heaters. The Sodium Component Test Installation (SCTI) completed installation of the new low-NOx burners in 1991 as well as the carbon monoxide CEM system. An extended variance to the rule was applied for and granted,

running through December 1992 to allow for source testing and adjusting of the H-1 and H-2 sodium heaters and the H-101 boiler to bring them into compliance. Further extensions of the variance were granted through November 1994. ETEC operated under Variance 392-3 until the amended Rule 74.15 was adopted on November 8, 1994. VCAPCD is in the process of revising permit No. 0271. VCAPCD is allowing ETEC to operate the unit pending permit approval.

On September 27, September 28, and October 2, 1995, SCTI had the H-1, H-2 sodium heaters and the H-101 boiler source tested for NOx and CO emission to comply with VCAPCD rule 741.5. Test data will be used to calculate the permitted emissions for the 0271 permit to operate renewal. On October 10, 1995, Rocketdyne submitted a VCAPCD Authority to Construct Application to modify permit 0271 to allow for installation of a natural gas turbine and duct burner in the Kalina Facility to replace the H-1 sodium heater as a heat source.

Rocketdyne initiated efforts in December to release or extend the NOx leased credits for the Saber Facility Boiler in the Bowl Area for another two years.

Title V of the Clean Air Act requires issuance of a federal permit for the ETEC operations. VCAPCD met its initial responsibility by issuance of Rule 33, Part 70 Permits. The U. S. EPA has granted interim approval for Rule 33. A Title V permit application will be filed with the VCAPCD following final approval of the rule.

Although ETEC has traditionally had little or no ODS's, Rocketdyne has for years maintained a Hazardous Materials Elimination Team to eliminate ODS's at Rocketdyne. This multifunctional team has the responsibility to identify suitable alternatives for various toxic chemicals and has been instrumental in eliminating CFC-113 from all of Rocketdyne's Southern California manufacturing operations. ETEC will provide DOE with a complete inventory of Class I and Class II ODS's by October 31, 1996.

The permit application submitted to VCAPCD for an ethanol cleaning operation located at the Sodium Pump Test Facility (T463) was completed with the inclusion of adequate reactive organic compound (ROC) offsets. The current permit reflects the new ethanol cleaning operation.

3.1.6 Clean Water Act

The Clean Water Act (CWA) is the primary authority for water pollution control programs, including the National Pollutant Discharge Elimination System (NPDES) permit program. The NPDES program regulates point source discharges of surface water to drainage channels (i.e., to locations other than sewage systems), the preparation of Spill Prevention Control and Countermeasure (SPCC) plans, and the discharge of storm water runoff associated with industrial activities.

As part of the SSFL, ETEC surface water discharges are regulated under the California Water Code (Division 7) as administered by the California Regional Water Quality Control Board (CRWQCB). The existing SSFL NPDES Permit (CA0001309, Ref. 4), which was revised

and became effective December 17, 1992, is expected to remain in force through November 10, 1997.

During periods of rainfall which create adequate runoff for sampling, grab samples of surface water runoff are collected at the discharge points for the Perimeter Pond, R2A Pond, and the five storm water catch basins along the northwest slope of ETEC. When rainfall occurs more than once a week or continuously, samples are taken weekly. During non-rain event discharges from the Perimeter Pond and R2A Pond discharge locations, samples are collected during each discharge event. When discharges occur on a continual basis in excess of a month, samples are collected monthly. The sampling performed at the five northwest slope locations includes quarterly monitoring for a list of analytes referred to as "priority pollutants." There were no exceedences of permit limits, and no violations of the NPDES permit resulting from these analytical results in 1995. The turbidity problems experienced at the sewage treatment plants in previous years have been virtually eliminated through numerous changes in managerial, operational, and maintenance procedures.

The CRWQCB, in negotiation with the Rocketdyne staff, has eliminated existing Waste Discharge Requirements stemming from a 1959 permit for septic tanks and leach fields. Use of all septic tanks and leachfields has been discontinued at the SSFL.

Inland surface water quality objectives are established for effluent standards for off-site discharge of storm and industrial waste water via the SSFL water reclamation system. The revised NPDES Permit incorporated federal storm water regulations by requiring development and implementation of a site-wide Storm Water Pollution Prevention Plan (SWPPP) by February 7, 1993. This document is revised as needed and includes by reference many existing pollution prevention plans, policies, and procedures implemented at the SSFL site. Several key elements of the plan, including maps, are in the process of being updated. The maps will be updated pending the completion of the new baseline facility topographic maps. Another key element, also in the process of being updated, is the development and implementation of Environmental Control Manual Procedure EC03.50, "SSFL Storm Water Pollution Prevention Requirements."

A program of groundwater and surface water sampling for the study of the ratios of stable isotopes of hydrogen and oxygen in Area IV and off-site northwest of Area IV commenced in October 1994. The study is intended to identify fractionated water sources that might be used for future tracer tests. Data obtained may provide information concerning isotopic variation with time, groundwater isotopic responses with time or rainfall events, and communication routes between surface and ground waters.

3.1.6.1 Radiological

All liquid radioactive wastes are processed by either solidification or evaporation prior to subsequent disposal at DOE disposal sites. Liquid radioactive wastes are not released into the

environment and do not constitute an exposure pathway. Groundwater and surface water are sampled and analyzed to assure detection of any artificial radioactivity.

At SSFL, a large number of groundwater monitoring wells are sampled and analyzed periodically and no indication of artificial radioactivity has been found, with the exception of low levels of tritium in a localized area (maximum of 3,200 ± 440 pCi/l in 1995, see Ref. 5), considerably below the Federal and State standards for drinking water suppliers of 20,000 pCi/l. This limit has been imposed on groundwater as part of the State of California groundwater goals. Occasional results for gross alpha and gross beta radioactivity that exceeded the Maximum Contamination Level (MCL) are attributed to naturally occurring uranium (Ref. 4).

Extracted groundwater from the French drain at T059 is sampled and analyzed by gamma spectroscopy prior to treatment and disposal. T059 was previously used for SNAP program reactor testing. These samples are tested by gamma spectroscopy for any transfer of gamma-emitting activation products from the underground reactor test vault containment into the surrounding soil. Expected radionuclides include Co-60 and Eu-152, both of which are easily detected, and none have been found to date.

Surface water from two NPDES discharge points and five storm water runoff catch basins are also monitored. The Rocketdyne NPDES permit requires radiological measurements of gross alpha, gross beta, tritium, strontium-90, radium-226, and radium-228. No NPDES samples exceeded drinking water supplier limits.

3.1.6.2 Nonradiological

Throughout Calendar Year 1995, discharges associated with the SSFL NPDES permit were in compliance with permitted discharge standards. No exceedances were noted as a result of 1,624 analyses from 59 sampling events. No NOVs were issued nor penalties assessed for 1995 relative to NPDES discharge requirements.

Characterization of the groundwater at the site continues. The most recent phase of the groundwater site characterization program approved by DTSC was completed in June 1994. The plan included nine new wells located in Area IV and off-site northwest of Area IV. In 1993, five of these nine wells were installed. In 1994, the four remaining monitoring wells were constructed 300 to 1,250 feet off-site and northwest of Area IV. TCE continued to be detected at concentrations ranging from 1.4 to 19 µg/l in groundwater approximately 75 to 250 feet off-site and northwest of Area IV. TCE and other VOCs were also detected in three on-site areas along the northwestern property border.

3.1.7 Miscellaneous

3.1.7.1 Building T886 Former Sodium Disposal Facility Closure Order

The T886 Former Sodium Disposal Facility was used for removing sodium and sodium-potassium alloys from metal components. The site formerly consisted of a cleaning facility and

an Upper Pond and a Lower Pond. A Clean-up and Abatement Order was issued by the Los Angeles Regional Water Quality Control Board for Closure of the Lower Pond. To comply with the Order, roughly 7,000 cubic yards of soil were removed from the Lower Pond in 1992, and the site was removed from the State Toxic Pits Cleanup Act (TPCA) list. Further excavation of the Upper Pond and portions of the western area was conducted in 1993.

The entire site, including both the Upper and Lower Ponds, is identified as a Solid Waste Management Unit (SWMU) with Cal-EPA DTSC. In May and June 1993, samples were taken from the area for chemical and radiological analysis. The chemical analyses indicated the presence of residual contaminants in the excavated region. The contaminants of concern were PCBs and mercury. The results from the radiological analysis showed no constituents above background levels.

A systematic soil sampling of the Former Sodium Disposal Facility and surrounding area was completed in July 1995 (Ref. 6). Analysis of soil samples for radioactivity indicated no statistical difference from background activity. Analysis of soil samples for chemical constituents indicated the presence of low levels of PCBs and dioxins. As a result, interim measures have been implemented after consultation with the Department of Toxic Substances Control, including establishment of sediment weirs downslope of the Facility. A health based risk assessment will be performed. Further excavation at the facility will occur if the risk assessment determines that the residual chemical contamination poses a risk to human health or the environment.

All excavated waste that contained both artificial radioactivity and hazardous waste, was shipped to an offsite management facility in 1994. The low level radioactive waste was shipped to an offsite management facility in 1995.

3.1.7.2 Public Participation

In mid-1995, Rocketdyne launched its Santa Susana Field Laboratory (SSFL) Community Involvement Plan with a mass mailing to 25,000 residents within a three-plus mile radius of the SSFL site. Prior to its release, the draft plan was provided to legislators, regulators and the public for comment. Community meetings were held to introduce the plan and present information about ongoing environmental activities at the site. The plan, which details Rocketdyne's commitment to effective two-way communication with the public on all SSFL site-wide environmental issues, provides the public with a comprehensive document that outlines the methods through which community outreach will occur. The comments received were included in the final plan. Since the initiation of the Community Involvement Plan, two fact sheets, discussing environmental activities at the field lab, were distributed to the community mailing list.

During 1995, Rocketdyne participated in meetings of the EPA-chaired SSFL Work Group. The SSFL Work Group, made up of community and regulatory agency representatives, was created in 1990 to facilitate exchange of information relating to environmental activities at the

SSFL. Rocketdyne supported the two meetings of the SSFL Work Group by providing information about current environmental and remediation activities at the site.

ETEC continued to support the efforts of the Los Angeles Community Reuse Organization (CRO), an independent community group established by the Department of Energy to explore and promote alternative uses of the ETEC facility and its resources. During 1995, ETEC hosted 8 community seminars as part of the CRO's efforts to create awareness about the facility. For local business, 2 company workshops also were held to assist area industry through information sharing.

Rocketdyne continues to work with local colleges and universities, providing field studies in environmental technology to give students an opportunity for hands-on experience in various areas of this field. Additionally, through a national program called Discover "E" (or Discover "Engineering"), Rocketdyne engineers visit the schools to demonstrate practical applications of math, science and engineering. Through this and other educational partnership programs, Rocketdyne experts continue to actively work with students in elementary, junior high, and high school.

3.1.7.3 Site Boundary Exposures

The external radiation exposure estimates at the maximum exposed boundary location and at the nearest residence are based on results from site ambient radiation dosimeters and several facility workplace radiation dosimeters. The external exposure from direct radiation at the maximum exposed boundary location for ETEC and the SSFL was estimated from the 1995 measurements to correspond to an average annual dose of approximately 23 mrem above natural background. A similarly calculated value of 0.00034 mrem/yr was found for the nearest residence. These values are considerably below the DOE long-term limit of 100 mrem/yr.

At the DeSoto facility, the external exposure from direct radiation at the maximum exposed boundary location was estimated to be approximately 0.053 mrem above natural background. A similarly calculated value of approximately 0.035 mrem/yr was found for the nearest residence. These values are considerably below the State of California limit of 100 mrem/yr.

3.1.7.4 1995 Agency Inspections/Audits

A list of all inspections and audits by the various agencies overseeing the SSFL and DeSoto sites is given in Table 3-1. There were no Notices of Violations in any of these inspections or audits. An NOV issued by the VCAPCD on August 15, 1995, was rescinded on August 30, 1995 when it was determined that no violation had occurred.

Table 3-1. 1995 Agency Inspections/Visits Related to Environmental Remediation

Date	Agency	Subject Area	Results[a]
January	DTSC	Haz. Waste SSFL	No NOVs
January	DHS	Survey of Bldg. 009	No NOVs
January	Cal OSHA	Asbestos	No NOVs
January	VCEHD	Landfill Inspections	No NOVs
April	VCEHD	Landfill Inspections	No NOVs
April	DHS	Soil sampling as part of Area IV survey	No NOVs
May	VCAPCD	Permit 0271	No NOVs
May	DHS	Soil sampling as part of Area IV survey	No NOVs
June	RWQCB	Above ground tanks at Canoga, DS. SSFL	No NOVs
June	Hanford LLRW Disposal Site	Waste Disposal Operations	No NOVs
June	DHS	Soil sampling as part of Area IV survey	No NOVs
July	VCEHD	Landfill Inspections	No NOVs
July	DTSC	Oversight of soil sampling at Sodium Disposal Facility (T886)	No NOVs
August	American Nuclear Insurers	Records management. radiation safety	No NOVs
September	VCAPCD	CEM System	No NOVs
September	VCEH	Haz. Waste SSFL & Business Plan SSFL T462	No NOVs
September	DTSC	T462 sodium fire	No NOVs
October	Nevada Test Site	Waste Disposal Operations	No NOVs
October	VCEHD	Landfill Inspections	No NOVs
December	DHS	Radiation Safety, State License 0015-70	No NOVs
December	DTSC	Permitted Facilities T133 and T029	No NOVs

[a]NOV = Notice of Violations

3.2 CURRENT ISSUES AND ACTIONS

3.2.1 Environmental Monitoring and Site Characterization

In response to various internal and external assessments, a comprehensive environmental monitoring plan was developed by Rocketdyne and approved by DOE in March 1994. Implementation of the plan has been delayed pending issuance of the final version of 10 CFR

834 (Ref. 7) . It is anticipated that 10 CFR 834 will be published as a final rule by the end of CY 1996. Several meetings have been held with DOE-OAK to discuss implementation of the rule. After publishing of the final rule there will be one year in which an Environmental Radiological Protection Plan (ERPP) will be prepared, and funding requirements and sources identified, followed by a six month approval period and full implementation.

Eighteen months of field work for the Area IV radiological characterization survey was completed in September 1995. The final report was sent to DOE-OAK for review in April 1996 and approved for release in July 1996 (Ref. 8). Over 10,000 ambient gamma measurements and 149 scheduled soil samples were taken over the 290 acres of Area IV. Three small localized areas were identified as requiring remediation. One was a natural uranium mineral deposit - remediation of this has been completed. The second was elevated Cs-137 soil contamination in a prior remediated sideyard of T064. The third was elevated Cs-137 soil contamination in an area within 100 ft of the T064 sideyard. Both of these areas are currently undergoing remediation and resampling. Statistical comparisons with the rest of Area IV confirmed that, with the exception of the Cs-137, Area IV was statistically similar to local background. Even though the Area IV Cs-137 was statistically different from local background, it was comparable to U. S. background and well below risk-based derived cleanup limits for Cs-137.

3.2.2 Epidemiological Study

The California Public Health Foundation has been awarded DOE grant funds to perform and epidemiological study of workers at the site. In February 1993, an advisory panel selected the University of California, Los Angeles (UCLA) to perform the study. The study covers radiological and nonradiological health effects on workers. UCLA researchers began the study in January 1994 and are currently expected to publish the results of their analysis in the summer of 1996.

3.2.3 Resource Conservation and Recovery Act

Under the Hazardous and Solid Waste Amendments of 1984, RCRA facilities can be brought into the corrective action process when an agency is considering any RCRA permit action for the facility. The SSFL was initially subject to the corrective action process in 1989 by EPA, Region IX. The EPA has performed the Preliminary Assessment Report (i.e., record search) and the Visual Site Inspection portions of the RCRA Facility Assessment (RFA) process.

Pursuant to Health and Safety Code, Section 25187, Cal-EPA, Region 3, DTSC issued on 2 December 1992 a Stipulated Enforcement Order to Rockwell International Corporation regarding SSFL, including ETEC. The Order was issued by the State Attorney General's office and requires Rockwell to comply with specific terms and conditions, i.e., a Corrective Action.

The State of California DTSC has RCRA authorization and has become the lead agency in implementing the corrective action process for the SSFL. ETEC has performed soil sampling at various SWMUs and Areas of Concern (AOCs) that were identified in the RFA report. This has

enabled ETEC to determine if further action and/or interim measures will be necessary for SWMUs to be incorporated into the RCRA Facility Investigation (RFI).

The current conditions report and a draft of the RCRA Facility Investigation Work Plan for the Area IV SWMUs were submitted to the DTSC in October 1993. One SWMU, the T056 Landfill, was proposed for the RFI. In 1994, DTSC issued a letter to Rocketdyne conditionally approving the draft RFI work plan, subject to satisfactory resolution of their comments. A RFI workplace addendum was submitted to DTSC in March 1995 which responded to the DTSC comments. In December 1995, DTSC forwarded draft comments to Rocketdyne on the Area IV SWMUs AOCs. Activities are underway to respond to the DTSC comments and will continue into 1996.

The Waste Minimization Program at ETEC operations consists primarily of recycling and reusing sodium hydroxide that is generated from treatment of sodium at the HWMF. Waste minimization opportunities are currently being investigated for the SCTI operations. Waste minimization is also an integral part of planning and implementing any environmental restoration project or D&D activity.

3.2.4 Clean Water Act

Water quality objectives set forth by the current NPDES permit are being met on a consistent basis. As a result of video surveying of the sewer lines, large sections of sewage line were replaced during 1995. Replacement of the lines prevents impacts to groundwater from leaky sewage pipes.

The Spill Prevention Control and Countermeasure (SPCC) plan serves to identify specific procedures for handling oil and hazardous substances to prevent uncontrolled discharge into or upon the navigable waters of the State of California or the United States. The SPCC plan for ETEC was last updated on April 1, 1995 and submitted to all local emergency response agencies.

3.2.5 Permits and Licenses (Area IV)

Listed below are the permits and licenses applicable to activities in Area IV[2].

Permit	Facility	Valid
Air (VCAPCD)		
0271	Combined permit renewal	1/1/95-12/31/95
Treatment Storage (EPA)		
CAD000629972 (93-3-TS-002)	Hazardous Waste Management Facility (T133 and T029)	11/30/93-11/30/03
CA3890090001	Radioactive Materials Handling Facility (RMHF)	Part A interim status updated 4/93
NPDES (CRWQCB)		
CA0001309	Santa Susana Field Laboratory	12/7/92-11/10/97
Nuclear Regulatory Agency		
SNM-21	Rockwell International Hot Laboratory (T020)	Amendment 8 issued 4/20/92 Request for termination filed 2/96
State of California		
Radioactive Materials License (0015-70)	All Rocketdyne facilities	Amendment 92 issued 1/24/96 ongoing
Well Permits (VCPWA)		
1573, 1808, 2138, 2322, 2328, 2331, 2342, 2916, 3359, and 3455	Santa Susana Field Laboratory - Area IV and off-site monitor wells	Latest (No. 3455) issued 7/1/93

There were 14 underground storage tanks permitted in Area IV during 1995. A list of these tanks can be found in Table 3-2.

[2]The waste discharge requirements for the sewage treatment plant in Area III that receives the Area IV sewage are included in the NPDES permit.

Table 3-2. SSFL Current Underground Storage Tanks

UST	Location	Capacity (gallons)	Tank Type	Contents
UT-7	Bldg. T022	3,000	Stainless Steel Vaulted	RA water[a]
UT-15	Bldg. T022	8,000	Stainless Steel Vaulted	RA water
UT-16	Bldg. T021	200	Stainless Steel Vaulted	RA water
UT-20	Bldg. T826	12,000	Stainless Steel Vaulted	Sodium[b]
UT-21	Bldg. T826	10,000	Stainless Steel Vaulted	Sodium
UT-23	Bldg. T032	5,500	Stainless Steel Vaulted	Sodium
UT-24	Bldg. T059	12,000	Stainless Steel Vaulted	Sodium
UT-29	Bldg. T356	13,000	Stainless Steel Vaulted	Sodium
UT-30	Bldg. T356	10,000	Stainless Steel Vaulted	Sodium
UT-31	Bldg. T356	10,000	Stainless Steel Vaulted	Sodium
UT-32	Bldg. T356	10,000	Stainless Steel Vaulted	Sodium
UT-33	Bldg. T356	12,000	Stainless Steel Vaulted	Sodium
UT-34	Bldg. T462	36,000	Stainless Steel Vaulted	Sodium
UT-35	Bldg. T462	34,000	Stainless Steel Vaulted	Sodium

[a]Regulated by U. S. Department of Energy (DOE). RA - Radioactive
[b]Sodium tanks are exempt from UST permitting per Ventura County regulations

4. ENVIRONMENTAL PROGRAM INFORMATION

ETEC's Environmental Management (EM) Department is responsible for Environmental Restoration and Waste Management Operations at SSFL Area IV. The Department's mission is to "Perform remediation of the ETEC facilities with full regulatory compliance, total regard for personnel safety and protection of the environment, within agreed to budgets and schedules". Supporting the EM department in matrix capacity are ETEC's General Support & QA Department and Rocketdyne's Environment, Health & Safety, Transportation, Quality Assurance, Procurement, and Technical Skills Development Departments.

Environmental restoration activities at ETEC include decontamination and decommissioning (D&D) of radioactively contaminated facilities, assessment and remediation of soil and groundwater, surveillance and maintenance of work areas, and environmental monitoring. Waste Management activities include waste characterization and certification, storage, treatment, and offsite disposal. Waste management activities are performed at two key permitted facilities; the Radioactive Materials Handling Facility (RMHF) for radioactive and mixed waste, and the Hazardous Waste Management Facility (HWMF) for alkali metal waste.

4.1 Rocketdyne Environmental Protection and Remediation

Environmental protection at Rocketdyne is managed under the Environment, Health & Safety Department, and this department provides matrixed support to ETEC for environmental management and restoration. The stated policy of the department is "To support the Corporation's commitment to the well-being of its employees, community and environment. It is Rocketdyne's policy to maintain facilities and conduct operations in accordance with all federal, state and local requirements and contractual agreements. Rocketdyne employees are responsible for implementing and complying with this policy". Responsibilities for environmental protection at Rocketdyne fall under two sub-departments; Environmental Protection and Environmental Remediation. The responsibilities for each are listed below.

Environmental Protection (EP) is responsible for developing and implementing cost effective and efficient programs designed to ensure achievement of the policy objectives related to environmental protection. EP's responsibilities include:

- Ensuring compliance with applicable federal, state, and local rules and regulations, including maintaining a working knowledge of applicable environmental laws, performing compliance audits, reviewing new and modified facility projects, coordinating solid and hazardous waste disposal, maintaining required records, preparing and submitting required regulatory reports, applying for and maintaining permits and assuring compliance with permit conditions, performing sampling and analysis.

- Responding to uncontrolled releases, and reporting releases as required by law and contractual requirements.

- Suspending operations determined to be in violation of environmental regulations.
- Participating in rule and regulatory development, including evaluating impacts on Rocketdyne programs, coordinating with other Rocketdyne and Rockwell functions, as appropriate, and informing management and staff of new or revised requirements.
- Providing a program, in conjunction with Technical Skills & Development, for motivating, informing and training employees about their duties to comply with environmental regulations and protect the environment.
- Recognizing and responding to the community's concerns regarding the environmental impact of Rocketdyne operations including escorting and cooperating with regulatory officials interested in environmental matters and responding to requests for information referred to Communications.
- Working with Rocketdyne customers and suppliers to minimize the use of materials and processes which impact the environment while maintaining product quality and competitive pricing.
- Making environmental concerns, energy and raw material conservation a priority when evaluating new and existing operations and products or when making decisions regarding land use, process changes, materials purchases, and business acquisitions.

Environmental Remediation (ER) is responsible for remedial actions to clean up historic chemical contamination and for providing radiological support for the D&D of radiological contamination at all Rocketdyne facilities. ER's responsibilities include:

- Compliance with all federal, state and local regulations pertaining to environmental remediation.
- Remediation of historical chemically and radiologically contaminated Rocketdyne sites to achieve closure.
- Compliance with all federal, state and local regulations pertaining to occupational and environmental (ionizing) radiation protection.
- Provision of health physics oversight of D&D and radioactive waste management activities.
- Performance of final surveys of D&D'd buildings and facilities to demonstrate acceptability for release for unrestricted use.
- Response to employee and public concerns regarding environmental remediation activities and the impact of these activities on the health & safety of the community.

4.2 Environmental Monitoring Program

The purpose of the environmental monitoring program is to detect and measure releases of hazardous materials and identify other undesirable impacts on the environment. It includes remediation efforts to correct or improve impacted conditions at the site and prevent off-site effects. For this purpose, the environment is sampled and monitored, and effluents are analyzed. A goal of this program is to demonstrate compliance with applicable regulations. Environmental restoration activities at the SSFL include a thorough review of past programs and historical practices to identify, characterize, and correct all areas of potential concern. The key regulations governing the monitoring program are DOE Orders 5400.1 and 5400.5 (Refs. 10 and 11).

The basic policy for control of radiological and chemical materials requires that adequate containment of such materials be provided through engineering controls, that facility effluent releases be controlled to federal and state standards, and that external radiation levels be reduced to as low as reasonably achievable (ALARA) through rigid operational controls. The environmental monitoring program provides a measure of the effectiveness of these operational procedures and of the engineering safeguards incorporated into facility designs.

4.2.1 Radiological Monitoring

Facility atmospheric effluent sample filters and ambient air sample filters for 1995 were composited from each sampler for radiochemistry analysis by DataChem Laboratories. Gamma-spectrometry analyses of samples such as soil, water, and ambient air sample filters confirm that the major radionuclides present are normally those of the naturally occurring thorium and uranium decay chains, plus other natural radionuclides such as the primordial K-40, and Be-7 produced by cosmic ray interactions in the atmosphere.

In addition to environmental monitoring, workplace air and atmospheric effluents are continuously monitored or sampled, as appropriate. This directly measures the effectiveness of engineering controls and allows remedial action to be taken before a significant release of radioactivity could occur.

4.2.2 Non-Radiological Monitoring

Extensive monitoring programs for chemical contaminants in air, soil, surface water, and groundwater are in effect to assure that the existing environmental conditions do not pose a threat to the public welfare or environment. Petroleum hydrocarbon impacted soils are remediated whenever underground tanks are removed. Extensive soil sampling is performed under the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) and other site-specific remedial programs. Groundwater is extensively monitored for chemical contaminants through sampling at 232 on-site and off-site wells. Groundwater analyses are conducted by GRC following approved EPA methods. An extensive groundwater remediation program has the capacity to remove solvents from contaminated groundwater at a throughput of one million gallons per day.

All surface water discharges are monitored as specified in the existing NDPES permit. In addition, all sources of emissions are monitored and regulated by the Ventura County Air Pollution Control District (VCAPCD). Asbestos control is conducted under the requirements of Titles 29, 40, and 49 of the Code of Federal Regulations (CFR), in addition to any state or local regulations that apply to any asbestos abatement program.

In addition to this environmental monitoring and restoration program, current operational procedures reflect Rocketdyne's commitment to a clean and safe environment. For example, solvents and oils are collected and recycled. A comprehensive training and employee awareness program is in place. All employees working with hazardous materials are required to attend a course on hazardous materials waste management. Environmental bulletins are printed in the internal Rocketdyne newspaper to promote environmental awareness among all employees.

4.3 Environmental Training

Rocketdyne conducts training and development programs as an investment in human resources to meet both organizational and individual goals. These programs are aimed toward improving employee performance, assuring employee proficiency, preventing obsolescence in employee capability, and preparing employees for changing technology requirements and for possible advancement.

The Vice President, Human Resources & Communications, is responsible for the development and administration of formal training and development programs. Line managers are responsible for individual employee development through formal training, work assignments, coaching, counseling, and performance evaluation. Line managers and employees are jointly responsible for defining and implementing individual training development goals and plans, including On the Job Training.

The Rocketdyne training department currently maintains a listing of approximately 700 courses available for Rocketdyne personnel. Of these, approximately 90 relate to environment, health, and safety, with approximately 40 of these relating to environmental protection and remediation. Specialized training programs are provided, as needed, about new technological developments and changes in regulations. Also, informal discussions about waste minimization and management occur at hazardous waste coordinators meetings. Additional offsite course are also encouraged.

4.4 Waste Minimization and Pollution Prevention

4.4.1 Program Planning and Development

ETEC has currently in place a Waste Minimization and Pollution Prevention Awareness Plan (Ref. 9) in accordance with DOE Order 5400.1 (Ref. 10). This plan serves as a guidance document for all waste generators at ETEC. The plan emphasizes ETEC's proactive policy of waste minimization and poliution prevention, and outlines goals, processes, and waste minimization techniques to be considered for all waste streams generated at ETEC.

The majority of waste currently generated at ETEC is attributable to environmental management activities related to environmental restoration of surplus facilities and clean up of contaminated sites from previous programs. Small amounts of hazardous waste are also generated as a result of ongoing test operations. The key components of waste generated at ETEC are:

- Low-level radioactive waste (LLW), mixed, hazardous, and nonhazardous wastes from decontamination and decommissioning (D&D) operations.
- Sodium hydroxide and scrap metals resulting from the treatment of sodium contaminated metal components at a RCRA permitted facility. The sodium contaminated components are from D&D operations and ongoing test operations at ETEC.
- Motor/turbine oils from ongoing test operations.
- Demineralizer regeneration effluent water.
- High salinity cooling tower basin water.
- Solvents and paints.

In general, the measures used to promote waste minimization at ETEC are:

- Using comprehensive segregation and screening procedures to minimize mixed wastes by separating LLW and hazardous wastes.
- Sampling, analyzing, and filtering oils to extend their useful life and reduce oil consumption.
- Reusing containers.
- Linking of a chemical/material exchange system with the purchasing system to reduce purchases of hazardous materials.
- Reducing non-hazardous waste disposal through process changes and recycling.

Waste minimization is accomplished by first assessing the waste, identifying waste minimization options, and finally conducting technical and economic evaluations to determine the best approach.

The following ETEC Procedures supplement the Waste Minimization Plan.

- ETEC Procedure 1-20, Environmental Protection Program
- ETEC Procedure 2-11, Construction Management
- ETEC Procedure 2-28, Non-Department of Energy Funded Work

- ETEC Procedure 2-30, Management of Real Property Maintenance Program
- ETEC Procedure 2-44, ETEC Self-Assessment Program

4.4.2 Training and Awareness Programs

The ETEC Waste Minimization and Pollution Prevention Awareness Program includes: 1) orientation programs and refreshers, 2) specialized training, and 3) incentive awards and recognition. New ETEC employees attend an orientation program that describes waste generation, treatment, disposal, minimization, and pollution prevention. Orientation presentations are designed to increase pollution prevention and waste minimization awareness and to motivate employees. Also, employees attend periodic refresher training.

Employees are reminded about pollution prevention and waste minimization awareness. Posters are placed in work areas to notify employees about environmental issues or practices. Memoranda are circulated about changes in waste management policy, ETEC and Rockwell policies or procedures, and technical data relevant to an employee's job assignment. Presentations using visual aids are provided, as needed, to review major changes in environmental issues.

4.4.3 Waste Minimization and Pollution Prevention Activities

The following are some of the significant activities related to waste minimization and pollution prevention.

- A treatability study was completed which verified the operational capability of an outside contractor to decontaminate lead for free release. Removal of approximately 250,000 lb. of lead from the RMHF was accomplished and decontamination completed using ice blasting and chelation processes.
- Purchased and installed computer hardware and software at the RMHF in preparation to track LLW and mixed low level waste through a computerized database management system.
- Perform sampling, analysis, and filtering of motor/turbine oils prior to servicing. These procedures have greatly extended the life of these oils and saved money particularly when synthetic oils are involved.
- Developed a comprehensive segregation and screening procedure of RA materials resulting in the salvage of usable non-RA materials (i.e., scrap metal).
- A chemical/material exchange system is currently linked to the purchasing system and prevents the unnecessary purchase of hazardous materials.
- All hazardous waste containers in acceptable condition are reused. Similar hazardous wastes are combined during pickup runs.

- Completed water usage minimization study for the HWMF, and recommended use of spray nozzles for rinsing operations.
- Empty product drums returned to the vendor for reuse when practical.
- Approximately 80% of the white paper (6 mt) and aluminum cans (1.4 mt) are recycled as a result of increased environmental awareness.
- Use of self-cleaning cartridge prefilters resulting in a significant reduction of low level radioactive D&D waste was demonstrated (a 99% volume reduction is achieved by replacing the conventional prefilters with the self-cleaning prefilters). This results in a waste reduction of more than 1,000 cubic feet in a typical year of D&D operation. The corresponding savings are approximately $180,000 per year.

4.4.4 Tracking and Reporting System

ETEC and Rocketdyne track various categories of materials from procurement to waste disposal. Wastes are tracked by various Rocketdyne and ETEC departments. Radioactive and mixed waste are characterized by the generator, shipped to the Radioactive Materials Handling Facility (RMHF), and logged and temporarily stored at the RMHF. Documents that accompany the wastes are verified for accuracy and completeness, and filed at the RMHF by Environmental Management personnel. Hazardous waste tracking and verification procedures (from generator to final off-site disposal) are followed by the Rocketdyne Environmental Protection Department. Rocketdyne is responsible for all non-hazardous and sanitary waste operations at the SSFL.

Relevant reports include:

- EPA's Biennial Hazardous Waste Report
- DOE's Annual Waste Minimization Report
- DOE's Affirmative Procurement Report
- "Source Reduction Evaluation Review and Plan" and "Hazardous Waste Management Performance Report" both of which are required by the "Source Reduction and Hazardous Waste Management Review Act (SB14)"

5. ENVIRONMENTAL RADIOLOGICAL PROGRAM INFORMATION

The selection of monitoring locations was based on several site-specific parameters such as topography, meteorology, hydrology, and the location of nuclear facilities. The prevailing wind direction for the SSFL site is generally from the north and northwest, with some seasonal diurnal shifting to the southeast quadrant. Most rainfall runoff at the SSFL site flows through several natural watercourses and drainage channels and is collected in two large-capacity retention ponds. This water may be discharged off-site into Bell Canyon to the south or it may be reused for industrial purposes.

Gross alpha and beta measurements of air filter samples are used for screening purposes and to permit a long-term historical record of radioactivity in the environment. For water, these measurements also permit direct comparison with the screening limits established by EPA for suppliers of drinking water. Ventilation exhaust and ambient air samples are counted for gross alpha and beta radioactivity and are also analyzed for specific radionuclides. Detailed analyses of these samples permit more accurate estimates of dose for the air pathway. The following discussion presents a brief summary of pathway dose analysis results for SSFL and DeSoto for 1995. Ambient and exhaust gross alpha beta measurements are also presented graphically in Section 5.2.1 (Figure 5-4).

Direct radiation is monitored by the use of a large number of thermoluminescent dosimeters (TLDs) mounted on facility fencelines and along the site boundary. These are complemented by TLDs installed by the State of California Department of Health Services Radiologic Health Branch for independent confirmation.

DOE Facilities at SSFL (Area IV)

The RMHF and T059 have continuous effluent monitoring capability. In 1995, effluent was monitored only for the RMHF; there was no activity in T059 during the year. Buildings T005, T023, and T064 have been decontaminated and the RMMA designation was removed by DOE in October 1994. Buildings T012 and T024 are inactive with no effluent, and thus no effluent monitoring. Airborne releases from the RMHF are detailed in Table 5-1, sheet 1, and are shown to be below the derived concentration guides (DCGs) of DOE Order 5400.5 (Ref. 11). Airborne and direct radiation doses from the RMHF are detailed in Table 5-14 and are shown to be below the dose limits of DOE Order 5400.5 and EPA NESHAPs limits of 40 CFR 61, Subpart H. Key results are discussed below.

At the site boundary line location nearest to the RMHF, the external annual exposure from direct radiation is estimated to correspond to an average annual dose of approximately 23 mrem above natural background. An annual dose of 0.00034 mrem is similarly calculated for the nearest residence. These values are below the DOE long-term limit of 100 mrem/yr as specified in DOE Order 5400.5 "Radiation Protection of the Public and the Environment" (2/8/90).

The above values were determined by extrapolating observed annual doses from various area dosimeters in place around the facility. Details on these calculations are given in Section 5.3. The boundary-line exposure is a conservative estimate of potential dose, in that the rugged terrain at the site boundary nearest the RMHF precludes anything more than the possible rare and temporary presence of any person at that location. For the nearest residence, radiation attenuation by the air reduces direct radiation to levels indistinguishable from normal background. In addition, intervening irregular rock formations and hills completely shield off-site locations from the radiation sources. Essentially only natural background radiation inherent to the residence location would be present.

Dose calculations were performed to demonstrate compliance with the NESHAPs standard. At the location of the Maximally Exposed Individual, the Effective Dose Equivalent for DOE operations during 1995 was 2.1×10^{-6} mrem. The EPA limit for a DOE site is 10 mrem/yr, as specified in 40 CFR 61, Subpart H. Potential releases from these facilities are so low that, even assuming absence of HEPA filters, estimated doses would be below the level requiring continuous monitoring. However, continuous monitoring is still being performed as a best management practice.

In addition to the above point sources, analyses were performed to determine the maximum estimated individual dose due to potential releases from "area" sources. The only area source considered for 1995 is the T064 sideyard and adjacent areas. The RMHF pond, considered in prior years, contained water throughout 1995 and so was not subject to resuspension of sediment by the wind. The RMHF northslope is fully covered by native vegetation, and thus no windborne resuspension of radioactively contaminated soil can occur.

The maximum estimated individual dose due to potential releases from area sources is 1.1×10^{-5} mrem for 1995. Since releases from the area source was too small and diffuse to permit accurate measurements, potential releases were estimated using the same method used in the RESRAD computer program (ANL/ES-160), for calculation of airborne radioactivity due to resuspension of soil by the wind. These estimated releases were used as input in the CAP88-PC program to perform the area source dose assessments. Releases from these sources have not been detected by on-site continuous ambient air sampling.

NRC Licensed Facility at SSFL (Area IV)—RIHL

Airborne releases from the Rockwell International Hot Laboratory (RIHL) are detailed in Table 5-1, sheet 2, and are shown to be below the maximum permissible concentrations (MPCs) of 10 CFR 20.1301 (Ref. 13) and State of California, CCR Title 17, Section 30269 (Ref. 14). Airborne and direct radiation doses at the site boundary are detailed in Table 5-15 and are shown to be less than the dose limits of 10 CFR 20.105 and State of California, CCR Title 17, Section 30253.

Direct radiation dose at the nearest site boundary is 0.037 mrem/yr and approximately 3×10^{-6} mrem/yr at the nearest residence, compared to annual NRC and State of California limits of

100 mrem/yr. Airborne effluent is a factor of 10^6 less than the isotopic MPCs of the NRC and State of California. Nearest receptor dose from airborne effluent from RIHL is 2.5×10^{-6} mrem/yr, and, though not applicable to NRC licensed facilities, this compares well with the EPA NESHAPs limit of 10 mrem/yr from 40 CFR 61, Subpart H. Even in the absence of HEPA filters the dose from RIHL would still be below the level requiring continuous monitoring; however, continuous monitoring is still being performed as a best management practice. Compliance with 40 CRF 61, Subpart I, applicable to licensed facilities, was demonstrated by use of the COMPLY code at the simplest level.

State of California Licensed Facility at DeSoto—Building 104

Airborne releases from Building 104 at the DeSoto facility are detailed in Table 5-1, sheet 3, and are shown to be below the MPCs of State of California, CCR Title 17, Section 30253. Airborne and direct radiation doses at the site boundary are detailed in Table 5-16 and are shown to be less than the dose limits of State of California, CCR Title 17, Section 30253.

Direct radiation dose at the nearest site boundary is approximately 0.053 mrem/yr and approximately 0.035 mrem/yr at the nearest residence, compared to annual NRC and State of California limits of 100 mrem/yr. Analysis of the DeSoto facility dosimetry resulted in an average value of 183 mrem/yr with a maximum of 187 mrem/yr. Off-site dosimetry used to estimate a background level showed the background to be 181 mrem/yr. Airborne effluent from Building 104 was a factor of 10^5 less than the isotopic MPCs for the State of California. Nearest receptor dose from airborne effluent was 5.4×10^{-5} mrem/yr, which is less than the EPA NESHAPs limit of 10 mrem/yr from 40 CFR 61, Subpart H. Compliance with 40 CFR 61, Subpart I, applicable to licensed facilities, was demonstrated by the use of the COMPLY code at the simplest level.

5.1 EFFLUENT MONITORING

Workplace ventilation is provided in all areas where unencapsulated or unpackaged radioactive material is handled, such as in the RIHL decontamination project (in the hot cells) and in the decontamination and packaging rooms at RMHF (where equipment is decontaminated and radioactive waste is repackaged). This assures protection of the workers from inhalation of airborne radioactive material and prevents the spread of radioactive contamination into the adjacent clean areas. The ventilation exhaust is passed through HEPA filters before being discharged to the atmosphere, to prevent the release of airborne radioactivity. The filtered air generally contains lower levels of long-lived radioactivity than does ambient air from naturally occurring radionuclides in the atmosphere. Essentially all short-lived radioactivity in the air is caused by the naturally present radon daughters, which dominate the airborne activity.

The ventilation exhaust is sampled at several facilities to measure the effluent radioactivity. Data from this sampling is used to demonstrate compliance with NRC, State RHB, DOE, and EPA standards. The U.S. EPA regulates airborne releases of radioactivity from DOE facilities

under 40 CFR 61, Subpart H (NESHAPs) and from licensed facilities under 40 CFR 61, Subpart I.

Effluents that may contain radioactive material are released at the Rocketdyne Division facilities as the result of operations performed under contract to DOE, under NRC Special Nuclear Materials License SNM-21, and under the State of California Radioactive Material License 0015-70. The specific facilities are identified as the RMHF, T059, and the RIHL at SSFL, and Building 104 at the DeSoto complex.

The only potential release of effluent radioactivity to uncontrolled areas is by way of filtered discharge from the RMHF, the RIHL, T059, and Building 104, and occasional diffuse area sources. No contaminated liquids are discharged to uncontrolled areas. No activities involving radioactive materials were conducted in T059 during 1995. The only diffuse area source considered significant for 1995 is the slightly contaminated soil to the east of Building T064. Brush has been cleared from this area to permit further survey work.

The level of radioactivity contained in all atmospheric effluents is reduced to the lowest practical value by passing the effluents through certified HEPA filters. The effluents are sampled for particulate radioactive materials by means of continuously operating stack exhaust samplers at the point of release. In addition, stack monitors installed at the RIHL and the RMHF provide automatic alarm capability in the event of the release of particulate activity. The HEPA filters used for filtering atmospheric effluents are at least 99.97% efficient for particles 0.3 μm in diameter.

In the tables that follow, the data are generally presented in an uncensored manner. That is, analytical results that were less than the procedure background value are shown as negative values and results that did not indicate the presence of a radionuclide that could have been detected by the analytical method are shown as "not detected." In showing comparative data, the negative values are included to permit a complete and balanced view of the results. Omission of the negative values would significantly bias the presentation. Censoring of the results by substituting zero for negative values would produce a misleading impression of environmental conditions, and an incorrect estimate of the average values.

The average concentration and total radioactivity in atmospheric effluents to uncontrolled areas from the RMHF, the RIHL, and DeSoto 104 are shown in Table 5-1. The total shows that no significant quantities of radioactivity were released in 1995. Detected levels of Pu-241 in the RIHL and DeSoto effluents are suspect due to possible counting interference, and are currently under investigation by the reporting laboratory.

The isotopic composition of the radioactivity deposited on the nuclear facility exhaust air sampling filters, composited for the year, is also presented in Table 5-1. Gamma-emitting radionuclides were measured by using a high-resolution gamma spectrometer. All others were measured by using specific chemical separations followed by alpha or beta counting. Radionuclides that were reported as less than the method detection level are shown as "not

detected" (ND). The Po-210 that is collected on the RIHL filter is due to the use of unfiltered bypass (ambient) air taken into the main exhaust system from the outside which contains naturally occurring elements in the U-238 decay chain in the environment. The K-40 is due to the presence of this radionuclide in the airborne dust in the ambient air. Materials used in operations conducted at the SSFL and DeSoto sites are responsible for the fission activation product radioactivity.

For each radionuclide detected, the laboratory calculates a lower limit of detection (LLD). This is the lowest activity that would be identified as "radioactive" with 95% confidence. "Radioactive" is specified as above 95% of the distribution of background results. This LLD refers to the specific sample form analyzed, in this case a composite of filters. For the purpose of comparing effluent releases, the laboratory LLD for the composited filters was converted to an equivalent annual release and is shown in the table as the release LLD.

The reactivity results are also shown in Table 5-2, for comparison with ambient air. For convenience in presenting and viewing this data, the results are given in units of femtocuries per cubic meter [fCi/m^3], which is 10^{-15} µCi/ml. The effectiveness of the air cleaning systems is evident from the fact that the atmospheric effluents are less radioactive than is the ambient air with respect to the ambient air radionuclides Be-7, K-40, and Po-210.

Exhaust samples are counted for gross alpha and beta activity after allowing decay of the short-lived airborne radioactivity, on a weekly basis. Composited samples are analyzed in detail at the end of the year to determine the individual radionuclide concentrations. The results of these latter analyses for the RMHF, the RIHL, and DeSoto are also shown in Table 5-2.

The effluent at the exhaust stack for each facility is compared with an appropriate limit for exposure of the public. The isotopic limits for DOE facilities are Derived Concentration Guides (DCGs) for exposure of the public for the most restrictive form of the radionuclide as specified in DOE Order 5400.5. Isotopic effluent limits for facilities with State of California- and NRC-licensed activities are Maximum Permissible Concentrations (MPCs) for release to an unrestricted area for the most restrictive form of the radionuclide as specified in 10 CFR 20, Appendix B.

The most restrictive MPC or DCG for each radionuclide (from CCR 17) is shown in Column 2 in Table 5-2. (The natural radionuclide K-40 is so uniformly present, and so rarely present in an enriched form, that no MPC or DCG has been developed for it.) These values refer to the permissible concentrations allowed by the State of California (and the NRC) and the DOE for continuous exposure of the public. Note that, in all cases, for the exhaust air, the observed concentrations are far below the MPC and DCG. Many of the results are so low (close to zero) that the measurements are dominated by analytical and background variations, with the result that negative and inconsistent values are frequently produced. Furthermore, dilution and dispersion would occur before the material reaches an unrestricted area.

Table 5-1. Atmospheric Effluents to Uncontrolled Areas
(Sheet 1 of 3)

SSFL/RMHF - 1995	
Effluent volume (m^3)	123,457,275
Lower limit of detection, LLD	
Gross alpha (µCi/ml)	3×10^{-16}
Gross beta (µCi/ml)	1×10^{-5}
Air volume sampled (m^3)	25,128
Annual average concentration in effluent	
Gross alpha (µCi/ml)	1.74×10^{-16}
Gross beta (µCi/ml)	2.03×10^{-4}
Maximum observed concentration	
Gross alpha (µCi/ml)	1.07×10^{-15}
Gross beta (µCi/ml)	1.62×10^{-3}
Activity released (µCi)	
Gross alpha	0.021
Gross beta	2.51

Radionuclide - Specific Data

Radionuclide	Half-Life (yr)	Activity Detected (pCi)	Annual Release (µCi)	Analysis LLD (pCi)	Release LLD (µCi)	Average Exhaust Concentration (µCi/ml)	DCG (µCi/ml)
H-3	12.34	ND	20	200	4.2	1.626E-12	1.0E-7
Be-7	0.146	17.4	0.085	101	0.496	6.925E-16	natural
K-40	1,260,000,000	7.00	0.034	119	0.585	2.786E-16	natural
Co-60	5.26	70.85	0.348	9.70	0.048	2.819E-15	8.0E-11
Sr-90	27.7	24.2	0.119	8.90	0.044	9.631E-16	9.0E-12
Cs-137	30	219.4	1.078	9.70	0.048	8.731E-15	4.0E-10
Po-210	0.38	3.719	0.018	0.828	0.004	1.480E-16	natural
Th-228	1.9131	0.214	0.001	0.874	0.004	8.516E-18	natural
Th-230	80,000	0.296	0.001	0.521	0.003	1.178E-17	4.0E-14
Th-232	14,100,000,000	0.461	0.002	0.400	0.002	1.835E-17	natural
U-234	247,000	2.062	0.010	0.652	0.003	8.205E-17	9.0E-14
U-235	710,000,000	0.088	0.000432	0.549	0.003	3.502E-18	1.0E-13
U-238	4,510,000,000	0.235	0.001	0.609	0.003	9.355E-18	1.0E-13
Pu-238	86.4	0.190	0.001	0.516	0.003	7.546E-18	3.0E-14
Pu-239/240	24,390/6,580	0.884	0.004	0.602	0.003	3.519E-17	2.0E-14
Pu-241	15.16	ND	ND	124.3	0.611	ND	1.0E-12
Am-241	433	0.028	0.000137	0.481	0.002	1.112E-18	2.0E-14

H-3 release is estimated from H-3 content of water and evaporation rate.

Naturally occurring radionuclides are included for information. These activities have not been used in dose estimates.

Derived concentrations guides (DCGs) for exposure of the public, for the most restrictive form of radionuclide as specified in DOE Order 5400.5 (2/8/90).

ND = Not Detected

Table 5-1. Atmospheric Effluents to Uncontrolled Areas
(Sheet 2 of 3)

SSFL/RIHL - 1995	
Effluent volume (m^3)	503,399,086
Lower limit of detection, LLD	
Gross alpha (µCi/ml)	3×10^{-16}
Gross beta (µCi/ml)	1×10^{-13}
Air volume sampled (m^3)	32,796
Annual average concentration in effluent	
Gross alpha (µCi/ml)	3.08×10^{-15}
Gross beta (µCi/ml)	3.44×10^{-14}
Maximum observed concentration	
Gross alpha (µCi/ml)	1.32×10^{-14}
Gross beta (µCi/ml)	1.37×10^{-13}
Activity released (µCi)	
Gross alpha	1.55
Gross beta	17.3

Radionuclide - Specific Data

Radionuclide	Half-Life (yr)	Activity Detected (pCi)	Annual Release (µCi)	Analysis LLD (pCi)	Release LLD (µCi)	Average Exhaust Concentration (µCi/ml)	MPC (µCi/ml)
Be-7	0.146	13.20	0.203	96.0	1.474	4.025E-16	natural
K-40	1,250,000,000	98.14	1.506	99.0	1.520	2.992E-15	natural
Co-60	5.26	ND	ND	10.6	0.163	ND	5.0E-11
Sr-90	27.7	2.790	0.043	9.30	0.143	8.507E-17	6.0E-12
Cs-137	30	4.312	0.066	11.1	0.170	1.315E-16	2.0E-10
Po-210	0.38	16.35	0.251	0.925	0.014	4.984E-16	natural
Th-228	1.9131	1.044	0.016	0.680	0.010	3.184E-17	2.0E-14
Th-230	80,000	0.048	0.001	0.590	0.009	1.462E-18	2.0E-14
Th-232	14,100,000,000	0.885	0.014	0.693	0.011	2.698E-17	4.0E-15
U-234	247,000	0.100	0.001	0.698	0.011	3.052E-18	5.0E-14
U-235	710,000,000	ND	ND	0.549	0.008	ND	6.0E-14
U-238	4,510,000,000	0.125	0.002	0.606	0.009	3.824E-18	6.0E-14
Pu-238	86.4	0.092	0.001	0.470	0.007	2.802E-18	2.0E-14
Pu-239/240	24,390/6,580	0.159	0.002	0.422	0.006	4.845E-18	2.0E-14
Pu-241	15.16	ND	ND	103.3	1.586	ND	8.0E-13
Am-241	433	0.421	0.006	0.377	0.006	1.282E-17	2.0E-14

Naturally occurring radionuclides are included for information. These activities have not been used in dose estimates.

Maximum permissible concentrations (MPC's) for release to unrestricted areas, for the most restrictive form of the radionuclide as specified in 10 CFR 20, Appendix B and CCR 17, Appendix A.

ND = Not Detected

Table 5-1. Atmospheric Effluents to Uncontrolled Areas
(Sheet 3 of 3)

DeSoto 104 - 1995	
Effluent volume (m^3)	95,446,836
Lower limit of detection, LLD	
Gross alpha (µCi/ml)	3×10^{-16}
Gross beta (µCi/ml)	1×10^{-15}
Air volume sampled (m^3)	16,082
Annual average concentration in effluent	
Gross alpha (µCi/ml)	1.19×10^{-16}
Gross beta (µCi/ml)	1.53×10^{-15}
Maximum observed concentration	
Gross alpha (µCi/ml)	1.50×10^{-15}
Gross beta (µCi/ml)	6.20×10^{-15}
Activity released (µCi)	
Gross alpha	0.011
Gross beta	0.15

Radionuclide - Specific Data

Radionuclide	Half-Life (yr)	Activity Detected (pCi)	Annual Release (µCi)	Analysis LLD (pCi)	Release LLD (µCi)	Average Exhaust Concentration (µCi/ml)	MPC (µCi/ml)
Be-7	0.146	14.0	0.0831	92.0	0.546	8.705E-16	natural
K-40	1,260,000,000	1.76	0.0105	81.0	0.481	1.094E-16	natural
Co-60	5.26	0.340	0.00202	9.60	0.057	2.114E-17	5.0E-11
Sr-90	27.7	6.340	0.0376	9.60	0.057	3.942E-16	6.0E-12
Cs-137	30	0.550	0.00326	9.00	0.053	3.420E-17	2.0E-10
Po-210	0.38	4.53	0.0269	0.637	0.004	2.814E-16	natural
Th-228	1.9131	0.790	0.00469	0.821	0.005	4.909E-17	2.0E-14
Th-230	80,000	0.250	0.00149	1.242	0.007	1.557E-17	2.0E-14
Th-232	14,100,000,000	0.430	0.00255	0.559	0.003	2.674E-17	4.0E-15
U-234	247,000	1.40	0.00832	0.729	0.004	8.713E-17	5.0E-14
U-235	710,000,000	0.202	0.00120	0.507	0.003	1.259E-17	6.0E-14
U-238	4,510,000,000	0.456	0.00271	0.555	0.003	2.838E-17	6.0E-14
Pu-238	86.4	0.077	0.000458	0.788	0.005	4.797E-18	2.0E-14
Pu-239/240	24,390/6,580	0.022	0.000128	0.465	0.003	1.338E-18	2.0E-14
Pu-241	15.16	119.0	0.706	66.1	0.392	7.400E-15	8.0E-13
Am-241	433	0.452	0.00268	0.430	0.003	2.812E-17	2.0E-14

Naturally occurring radionuclides are included for information. These activities have not been used in dose estimates.

Maximum permissible concentrations (MPC's) for release to unrestricted areas, for the most restrictive form of the radionuclide as specified in 10 CFR 20, Appendix B and CCR 17, Appendix A.

ND = Not Detected

Table 5-2. Filtered and Ambient Air Radioactivity Concentrations - 1995

		Activity Concentration (femtocuries per cubic meter)[a]											
		Exhaust				Ambient						Averages	
Radionuclide	Maximum Permissible Concentration	RMHF	RIHL	DS 104	T059[b]	RMHF	RMHF Pond	RIHL	T100 (7 day)	T886	DS 104	Exhaust	Ambient
Be-7	natural	0.549	0.402	0.692	NM	8.630	13.25	14.88	17.45	19.64	14.97	0.52	14.8
K-40	natural	1.824	2.992	0.279	NM	ND	ND	ND	2.623	ND	ND	2.01	2.6
Co-60	50,000	1.347	0.000	2.819	NM	0.039	ND	0.083	0.110	ND	0.160	1.07	0.098
Sr-90	6,000	0.655	0.085	0.963	NM	0.321	0.208	0.268	0.085	ND	0.519	0.47	0.28
Cs-137	200,000	4.858	0.131	8.731	NM	0.191	ND	0.119	0.220	0.258	ND	3.6	0.20
Po 210	natural	0.158	0.498	0.148	NM	6.149	9.794	7.552	7.729	7.988	7.229	0.31	7.8
Th 228	20	0.032	0.032	0.009	NM	0.067	ND	ND	0.015	0.096	0.054	0.027	0.057
Th-230	20	0.012	0.001	0.012	NM	ND	ND	ND	0.057	ND	ND	0.007	0.057
Th-232	4	0.027	0.027	0.018	NM	0.039	ND	ND	0.013	0.031	ND	0.025	0.028
U 234	50	0.036	0.003	0.082	NM	ND	ND	ND	ND	ND	ND	0.032	ND
U-235	60	0.000	0.000	0.004	NM	ND	ND	ND	0.001	ND	ND	0.001	0.001
U-238	60	0.013	0.004	0.009	NM	ND	ND	ND	0.004	ND	ND	0.008	0.004
Pu-238	20	0.005	0.003	0.008	NM	0.011	0.003	ND	0.007	ND	0.002	0.005	0.006
Pu-239/240	20	0.035	0.005	0.035	NM	ND	ND	ND	0.099	ND	ND	0.022	0.099
Pu-241	800	ND	ND	7.4	NM	ND	ND	ND	ND	ND	1.487	7.4	1.5
Am-241	20	0.013	0.013	0.001	NM	ND	0.022	ND	0.019	ND	ND	0.010	0.020
Gross Alpha	20	0.17	3.1	0.12	NM	3.2	3.8	3.3	1.9	3.5	3.6	1.1	3.2
Gross Beta	10,000	20.3	34.4	1.5	NM	24.4	28.8	27.5	24.2	28.0	26.3	14.7	26.5

[a]The averages are calculated from reported values only, without consideration of ND samples, and values are weighted by effluent volume (ND = Not Detected).
[b]No data were collected for T059 as there was no activity in the building during the calendar year.

The downwind concentration of radioactive material emissions to the atmosphere during 1995 from the two SSFL exhaust stacks has been calculated with the CAP88-PC computer code using representative input data including wind speed, directional frequency, and stability (using meteorological data developed for the SSFL site by the NRC and Argonne National Laboratory [ANL]) plus facility-specific data such as stack heights and exhaust air velocity.

The radioactivity concentrations at the site boundary location nearest to each release point and at the nearest residence for each nuclear facility are shown in Table 5-3. Table 5-3 shows the artificial radioactivity concentrations at the nearest boundary and residence locations. These concentrations were estimated by use of CAP88-PC and specific radionuclide releases for each facility.

Table 5-3. Annual Average Radioactivity Concentrations of Atmospheric Effluents - 1995

Facility	Annual Release (µCi)	Distance (m) and Direction to		Downwind Concentration (10^{-18} µCi/ml)	
		Boundary	Residence	Boundary	Residence
DS 104	3.26	187 E	315 S	0.68	0.40
RIHL	2.12	302 NW	1,900 SE	0.026	0.0022
RMHF	21.6	118 NW	2,300 SE	2.3	0.24

5.2 ENVIRONMENTAL SAMPLING

5.2.1 Air

Ambient air sampling is performed continuously at DeSoto and SSFL with air samplers operating on 24-hour sampling cycles. Monitoring locations currently in use are shown in Figure 5-1 and Figure 5-2, and listed in Table 5-4. Airborne particulate radioactivity is collected on glass fiber (Type A/E) filters that are automatically changed daily at the end of each sampling period (midnight). The samples are counted for gross alpha and beta radiation following a minimum 120-hour decay period to allow for decay of short-lived radionuclides. The volume of a typical daily ambient air sample is approximately 28 m^3.

Daily ambient air samples are counted for gross alpha and beta radiation with a low-background thin-window gas-flow proportional-counting system. The system is capable of simultaneously counting both alpha and beta radiation. The sample-detector configuration provides a nearly hemispherical (2π) geometry. The thin-window detector is continually purged with argon/methane counting gas. A preset time mode of operation is used for counting all samples.

Counting system efficiencies are determined routinely with Tc-99 and Th-230 standard sources. The activities of the standard sources are traceable to the National Institute of Standards and Technology (NIST).

Filter media for each sampling location are composited annually and analyzed for isotopic-specific activity. The results of the sample analyses are shown in Table 5-2 with the effluent results for comparison. As is the case with effluent air samples, the observed ambient air radionuclide concentrations were far below the MPC. The measurements were dominated by analytical and background variations, with the result that negative and inconsistent values were produced.

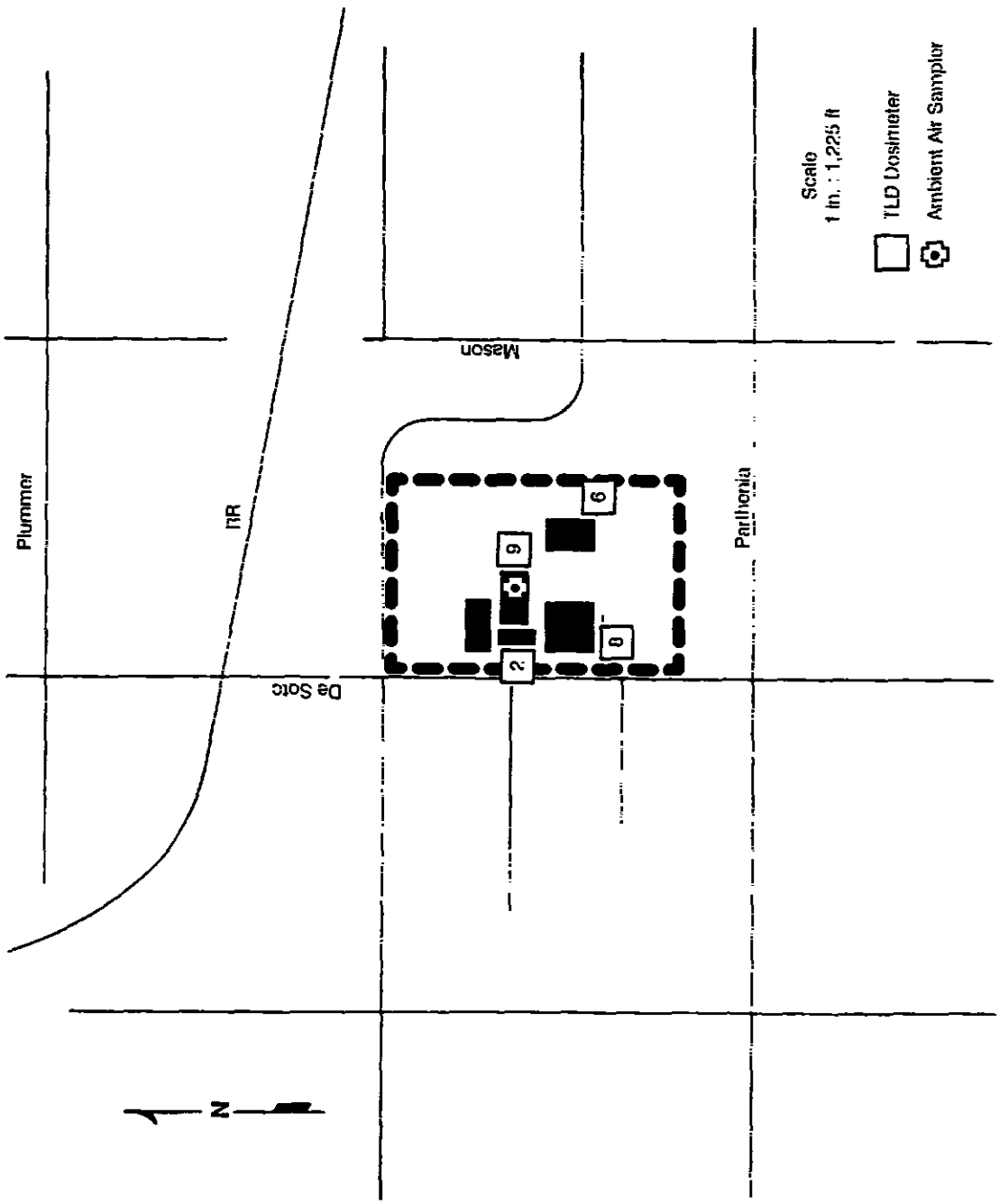

Figure 5-1. Map of DeSoto Site Monitoring Stations

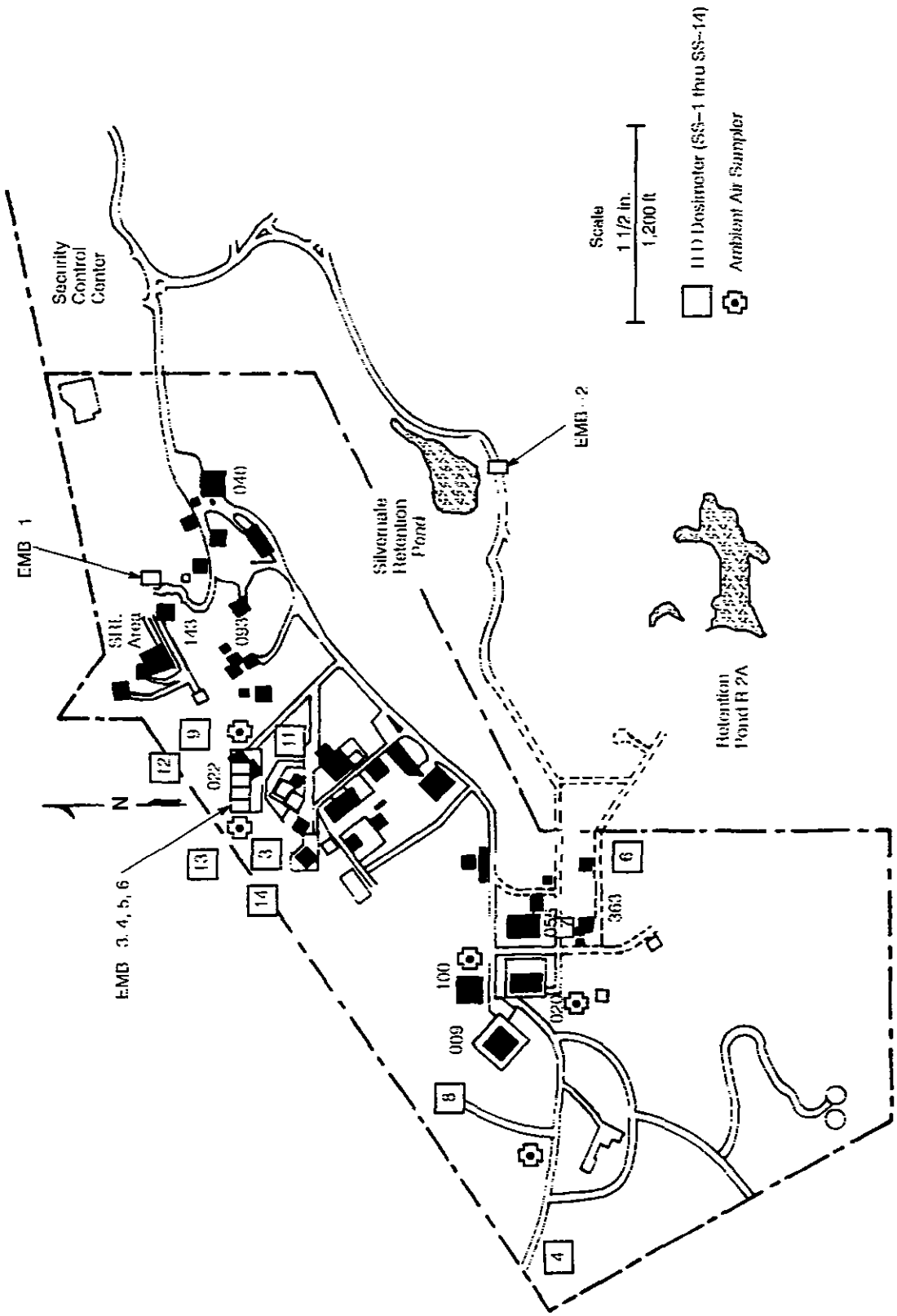

Figure 5-2. Map of Santa Susana Field Laboratory Site Sampling Stations

Table 5-4. Sampling Location Description

Station	Location	Frequency of Sampling
Ambient Air Sampler Locations		
A-1	DeSoto Site, Building 104 roof	(D)
A-2	SSFL Site, T020, southwest side	(D)
A-3	SSFL Site, T034, at main gate	(D)
A-4	SSFL Site, T886, Former Sodium Disposal Facility	(D)
A-5	SSFL Site, RMHF Pond, north side	(D)
A-6	SSFL Site, T100, east side - 7-day sampler	(W)
On-Site - Soto - Ambient Radiation Dosimeter Locations		
DS-2	DeSoto Site, northwest corner of Building 101	(Q)
DS-6	DeSoto Site, east boundary, southeast corner of Building 105	(Q)
DS-8	DeSoto Site, Guard Post 4, southwest corner of Building 101	(Q)
DS-9	DeSoto Site, southeast of Building 104	(Q)
On-Site - L - Ambient Radiation Dosimeter Locations		
SS-3 (CA)	SSFL Site, Electric Substation 719 on boundary fence	(Q)
SS-4 (CA)	SSFL Site, west boundary on H Street	(Q)
SS-6 (CA)	SSFL Site, northeast corner of T353	(Q)
SS-7 (CA)	SSFL Site, T363, north side	(Q)
SS-8 (CA)	SSFL Site, Former Sodium Disposal Facility north boundary	(Q)
SS-9 (CA)	SSFL Site, RMHF northeast boundary at T133	(Q)
SS-11 (CA)	SSFL Site, T036, east side	(Q)
SS-12 (CA)	SSFL Site, RMHF northwest property line boundary	(Q)
SS-13 (CA)	SSFL Site, RMHF northwest property line boundary	(Q)
SS-14 (CA)	SSFL Site, RMHF northwest property line boundary	(Q)
EMB-1 (CA)	SSFL Site, SRE area north of T003	(Q)
EMB-2 (CA)	SSFL Site, south of Silvernale retention pond, off Test Area Road	(Q)
EMB-3(CA)	SSFL Site, northeast fence of RMHF	(Q)
EMB-4(CA)	SSFL Site, RMHF north central fenceline	(Q)
EMB-5 (CA)	SSFL Site, RMHF northwest fenceline	(Q)
EMB-6 (CA)	SSFL Site, RMHF T075 north fenceline	(Q)
Off-Site Ambient Radiation Dosimeter Locations		
OS-1 (CA)	Off-site, Chatsworth	(Q)
OS-5	Off-site, Simi Valley	(Q)
BKG-11	Background Location, West Hills	(Q)
BKG-12	Background Location, Somis	(Q)
BKG-13	Background Location, N. Hollywood	(Q)
BKG-14	Background Location, Northridge	(Q)
BKG-15	Background Location, Simi Valley	(Q)
BKG-16	Background Location, Moorpark	(Q)
BKG-17	Background Location, Simi Valley	(Q)
BKG-19	Background Location, Burbank	(Q)
BKG-20	Background Location, Lancaster	(Q)
BKG-21	Background Location, Quartz Hill	(Q)
BKG-22	Background Location, Saugus	(Q)
BKG-23	Background Location, Calabasas	(Q)

Codes:		Locations:	
A	Air Sampler Station	DS	DeSoto
D	Daily Sample	SS	SSFL
W	Weekly Sample	OS	Off-Site
Q	Quarterly Sample	BKG	Background
CA	State Confirmatory Location		

It should be emphasized that these measurements determine only the long-lived particulate radioactivity in the air and therefore do not show radon (Rn-222) and most of its daughter radionuclides. Polonium-210 is a long-lived daughter and is detected by these analyses. It is assumed to be in equilibrium with its parent, Pb-210, whose relatively long half-life (22.3 years) provides an essentially constant level of Po-210 in the samples. Because of these effects, the ambient air, the air that is being breathed, is actually about four times as radioactive as implied in this table. Since most of the short-lived particulate radioactivity is removed from the exhaust air by the HEPA filters, these effects are not significant in the filtered effluent.

Because the alpha and beta activity are counted relatively soon after collection, most of the natural Be-7 is detected, elevating the beta activity. The naturally occurring radionuclides, Po-210 and Ra-226 and -228, also contribute to the activity detected on the stack exhaust filter samples, particularly at the RIHL, where some unfiltered outside air is brought into the exhaust system after the HEPA filters. A more complete list of the results from the gross alpha and gross beta counting of the ambient air samples is shown in Table 5-5.

The appropriate guide value for SSFL site ambient air alpha activity is 6×10^{-14} µCi/ml (Pu-239) due to contamination remaining from work with unencapsulated plutonium (the DOE value is 2×10^{-14} µCi/ml). The appropriate value for beta activity is 3×10^{-11} µCi/ml (Sr-90) due to the presence of Sr-90 in fission product contamination from previous work with irradiated nuclear fuel at the SSFL site (the DOE value is 9×10^{-12} µCi/ml). The appropriate guide value for DeSoto ambient air alpha activity is 5×10^{-14} µCi/ml (U-234) due to prior (licensed) work with unencapsulated depleted uranium. The appropriate guide value for beta activity is for Co-60, since it is 3×10^{-10} µCi/ml (Co-60) the most restrictive limit for any beta-emitting radionuclide currently in use at DeSoto.

Figure 5-3 is a graph of the weekly averaged long-lived alpha and beta ambient air radioactivity concentrations for DeSoto and SSFL during 1995 as indicated by the gross alpha and gross beta counting. Generally, the ambient airborne radioactivity was relatively constant during 1995, and showed no significant disturbances.

Table 5-5. Ambient Air Radioactivity Data - 1995

Area	Activity	Number of Samples	Gross Radioactivity Concentrations (µCi/ml)		
			Annual Average Value and Dispersion	Maximum Value[a] and Date Observed	Average Percent of Guide[b]
DeSoto Building 104	Alpha	344	(3.6 ± 2.8) E-15	13.7E-15 (11/02)	0.12
	Beta		(26.3 ± 18.5) E-15	88.0E-15 (11/02)	0.01
SSFL Area IV RIHL	Alpha	344	(3.3 ± 3.0) E-15	15.2E-15 (11/02)	5.5
	Beta		(27.5 ± 17.3) E-15	85.1 E-15 (11/18)	0.09
SSFL Area IV RMHF	Alpha	344	(3.2 ± 3.1) E-15	18.1E-15 (11/01)	16
	Beta		(24.4 ± 14.6) E-15	72.0E-15 (10/21)	0.27
SSFL Area IV T886	Alpha	344	(3.5 ± 3.2) E-15	17.1E-15 (10/31)	5.8
	Beta		(28.0 ± 20.3) E-15	92.3E-15 (11/17)	0.09
SSFL Area IV RMHF Pond	Alpha	344	(3.8 ± 3.1) E-15	13.2E-15 (11/26)	19
	Beta		(28.8 ± 19.4) E-15	106.3E-15 (10/30)	0.32

[a] *Maximum value observed for single sample.*

[b] Guide DeSoto Site: 3E-12 µCi/ml alpha, 3E-10 µCi/ml beta; 10 CFR 20 Appendix B, CCR 17. SSFL site: 6E-14 µCi/ml alpha, 3E-11 µCi/ml beta; 10 CFR 20 Appendix B, CCR 17, and 2E-14 µCi/ml alpha, 9E-12 µCi/ml beta, DOE Order 5400.5 (02/08/90).

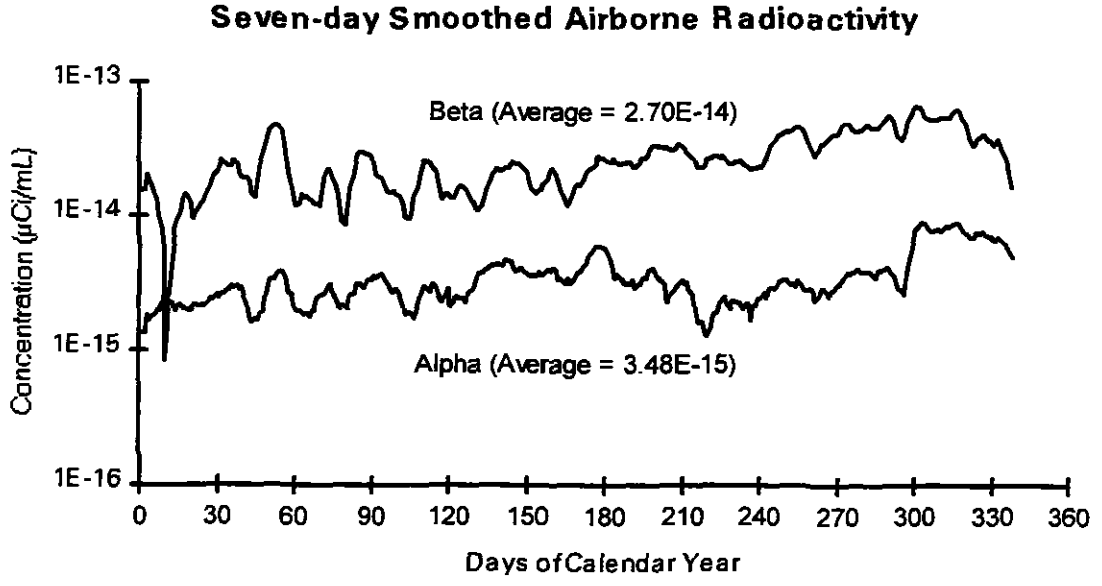

Figure 5-3. Seven-Day Smoothed and Annual Average Airborne Radioactivity at the DeSoto and Santa Susana Field Laboratory Sites - 1995

The daily data were mathematically smoothed in a moving weekly average for the year. The activity detected in ambient air is attributed to naturally occurring radioactive materials.

Radionuclides detected by gross alpha and beta analysis of air samples collected during 1995 include K-40 plus several naturally occurring radionuclides from the uranium and thorium series.

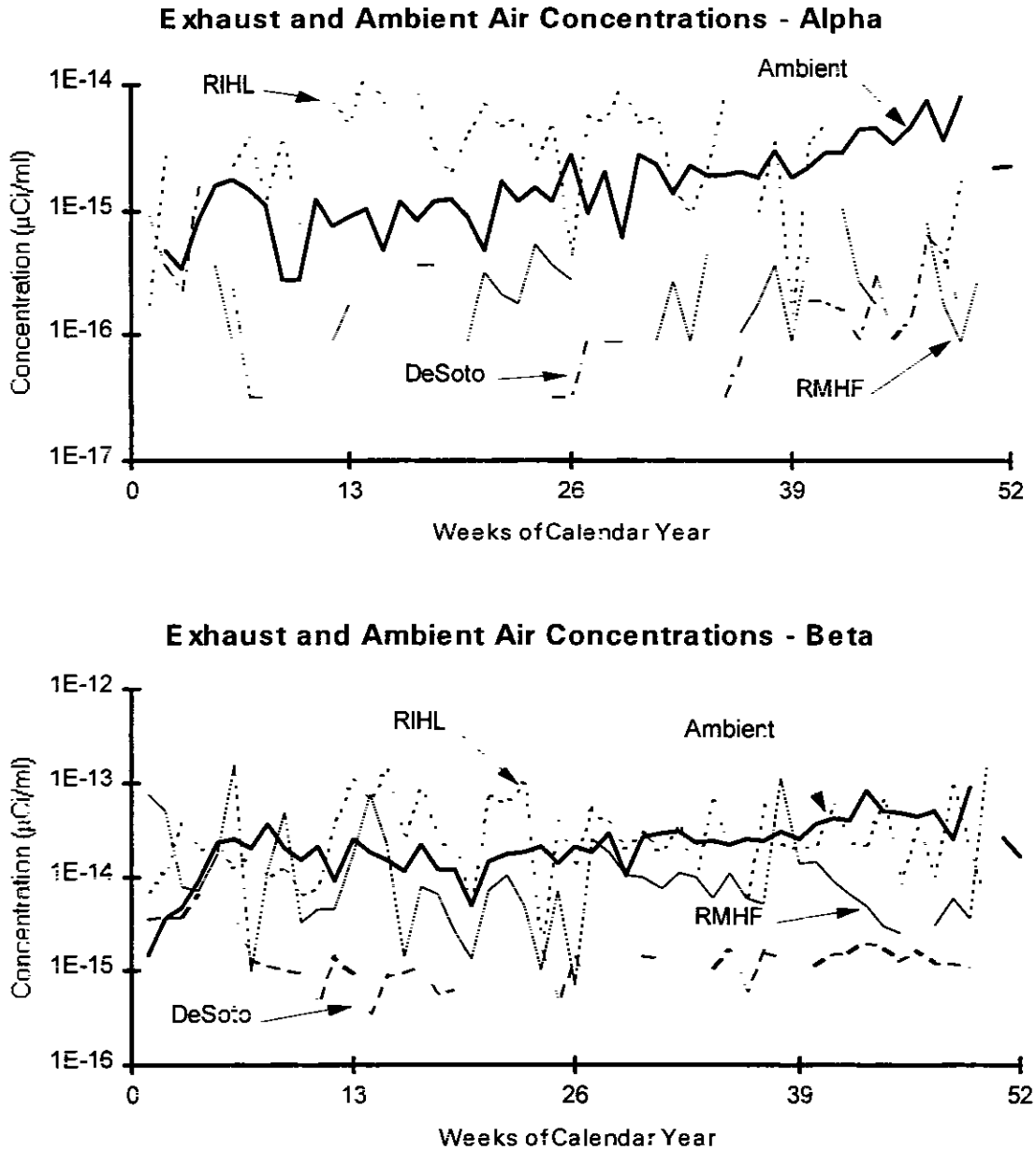

Figure 5-4. Filtered Exhaust and Ambient Air Radioactivity Concentration

A further comparison of ambient air and facility exhaust radioactivity is presented in Figure 5-4. The gross alpha and the gross beta concentrations for the ambient weekly samples are compared with the stack sample results for the RIHL, the RMHF, and Building 104 at DeSoto.

which are also on a weekly cycle. Gaps in the plots are due to negative values resulting from air samples showing less activity than instrument background.

5.2.2 Water

Many wells in and around the site are used to monitor the condition of the groundwater in the unconsolidated surface alluvium and the underlying Chatsworth Formation. The locations of these wells are shown in Figure 6-2. Water samples from these wells are periodically analyzed for radioactivity. The summary results for 1995 are shown in Table 5-6. The regulatory limits for radioactivity in water from drinking water suppliers have been assigned to groundwater by the State of California as a water-quality goal, and are applied here. Numerical limits for radionuclides not specifically listed by the State were derived from the EPA generic dose limit of 4 mrem/year by use of Dose Conversion Factors from RESRAD version 5.61. Except for one instance for uranium (31 pCi/l), and several instances for gross alpha (15 to 25 pCi/l), the groundwater satisfies the goal. The uranium and gross alpha limit exceedences were because of the presence of higher levels of naturally occurring uranium.

Groundwater is extracted from a French drain around a basement area of Building T059 to prevent any inflow or outflow of groundwater into a part of the building currently undergoing remediation. During 1995, this water was taken offsite for disposal by a commercial service. Samples were analyzed by gamma spectrometry, and in three cases for tritium. The results of these analyses are shown in Table 5-7, along with appropriate limits for those artificial radionuclides that might be in this water from accidental intrusion and subsequent outflow from T059. The radionuclide limits used for the release of the water are the drinking water standard for tritium of 20,000 pCi/l, and no detectable activity (NDA) for the remaining activation nuclides possible from T059. In no sample was any activity detected that indicated the possibility of contamination of this water.

Tritium was detected in 12 groundwater monitoring wells, with values ranging from 7.1 to 3,200 pCi/l, far below the EPA and California limits for drinking water suppliers of 20,000 pCi/l. Tritium was undetected (negative value, or value less than the stated uncertainty) in 36 wells. The maximum tritium levels were observed in Well RD-34A, with values of 3,200 ± 440 pCi/l on 2/7/95, and 2,080 ± 380 pCi/l on 8/9/95, and Well RD-28, with values of 380 ± 230 pCi/l on 2/9/95 and 680 ± 280 pCi/l on 8/18/95. Well RD-34A is located off-site near the RMHF in Area IV. Well RD-28 is located near T059. Other wells indicating some detectable level of tritium were RD-6, RD-13, RD-23, RD-24, RD-34B, RD-48A, RD-48C, RD-59A, RD-63, and OS-5A. The average detected tritium in the 12 wells was 561 pCi/l.

Radioactivity concentration guide values used for comparisons for licensed operations are those concentration limits adopted by the NRC and the State of California as MPC values for uncontrolled areas. These values are established in 10 CFR 20 and California Code of Regulations Title 17. Where noted, limits for drinking water suppliers are also used (tritium, gross alpha, gross beta).

Table 5-6. Radioactivity in Groundwater at SSFL - 1995

	Activity (pCi/l)[c]									
	H-3	Cs-137	Th-228	Th-230	Th-232	U-234	U-235	U-238	Gross Alpha	Gross Beta
Maximum Permissible Concentration[b]	20,000[a]	110	5.8	10	2.0	20 - Total Uranium			15[a]	50[a]
Maximum	3,200	5.4	ND	0.24	ND	15.0	0.78	15.2	25.1	34.6
Mean	100	-0.1	ND	0.11	ND	9.8	0.57	9.1	6.6	7.8
Minimum	ND	ND	ND	ND	ND	7.0	0.43	6.4	ND	ND
Number of analyses[c]	12 (60)	(42)	(2)	1 (1)	(2)	4	4	4	25 (31)	45 (11)

[a]From 40 CFR 141 and EPA limit of 4 mrem/yr (see text).
[b]Above natural background
[c]Numbers in parentheses represent the number of analyses reported as less than the detectable limit. The mean has been calculated from detectable values only. ND = not detected.

Table 5-7. T059 Water Radioactivity Data - 1995

	Activity (pCi/l)			
	H-3	Co-60	Cs-137	Eu-152
Maximum Permissible Concentration[a]	20,000	NDA	NDA	NDA
Maximum	680	ND	ND	ND
Mean	235	ND	ND	ND
Minimum	-100	ND	ND	ND
Number of analyses[b]	3 (3)	(24)	(24)	(24)

[a]Maximum concentration limit above natural background for release for commercial disposal.
[b]Numbers in parentheses represent the number of analyses reported as less than the detectable limit. The mean has been calculated from detectable values only. NDA = no detectable activity. ND = not detected.

Most of Area IV slopes toward the southeast and rainfall runoff is collected by a series of drainage channels and accumulates in pond R-2A, and is eventually released to Bell Creek under the NPDES permit. Water from pond R-2A is also used for cooling the rocket engine test stand flame buckets. Some of Area IV slopes to the northwest and a small amount of rainfall drains

toward the northwest ravines, which lead into Meier Canyon. To permit sampling this runoff, five catch basins were installed near the site boundary to accumulate runoff.

Average radioactivity concentrations in these catch basin samples are summarized in Table 5-8. Actual analysis data are given in Table 6-1 through Table 6-7. For radioactivity, the limits applicable to suppliers of drinking water (Title 22, Chapter 15, Article 5, Section 64443, of the California Code of Regulations) are imposed on releases from the two southern controlled discharge points (Outfalls 001 and 002) and the five northwest slope runoff channels (Outfalls 003, 004, 005, 006, and 007). Although not required if gross alpha does not exceed 5 pCi/l, the specific analyses for Ra-226 + Ra-228 were generally performed.

As shown in the table, the maximum observed Sr-90 concentration was 8 pCi/l. This particular analysis, however, had an uncertainty of ± 11 pCi/l, which is significantly higher than the usual range of ± 1 to ± 2 pCi/l. The mean Sr-90 concentration was 1.4 pCi/l, well below the NPDES limit of 8 pCi/l.

Table 5-8. NPDES Discharge Radioactivity Data - 1995

	Activity (pCi/l)				
	H-3	Sr-90	Ra-226+ R-228	Gross Alpha	Gross Beta
Drinking Water Standards/ NPDES Limits	20,000	8	5	15	50
Maximum	460	8.0	3.6	10.0	19.0
Mean	104	1.4	1.1	1.7	5.7
Minimum	0	0.0	0.0	0.0	1.1
Number of Analyses[a]	9 (50)	14 (45)	5 (54)	18 (41)	55 (4)

[a]Numbers in parentheses represent the number of analyses reported as less than the detectable limit.

Domestic water in this area is supplied by a variety of municipal and regional organizations, including the Los Angeles Department of Water and Power, the Metropolitan Water District of Southern California, several Ventura County Waterworks Districts, and the Oxnard Public Works Department. Most of the water is imported from distant sources, such as Owens Valley, the Feather River, and the Colorado River; some water, for Oxnard and Moorpark, comes from local groundwater wells. The local water is blended with imported water and treated to assure purity and safety. Water is transported in open aqueducts and enclosed pipelines and is stored in open reservoirs and underground settling basins. The State of California requires that these suppliers routinely monitor their water for many potentially hazardous materials (and less significant quality factors, as well) and report the results of this monitoring to their customers on an annual basis. Tests for radioactivity are relatively limited, and are

performed over an extended period of time, so not all parameters are reported in any one year. The results reported by local water suppliers during 1995 are shown in Table 5-9.

Comparison of the radioactivity concentrations in water from Table 5-8 with that of the supply water (Table 5-9) shows no significant differences in either the alpha or beta activity. The values reported in Table 5-9 represent the averages of results of analysis of water supplied from the Metropolitan Water District (MWD), and the Ventura County Waterworks (Districts 1 and 8). The data are for calendar year 1994, which is the most recent period currently available. The MWD is by far the largest contingent of locally consumed potable water.

Table 5-9. Domestic Water Supplies Radioactivity Data

	Activity (pCi/l)						
	H-3	Sr-90	Ra-226	Ra-228	Uranium	Gross Alpha	Gross Beta
State Maximum Contamination Level	20,000	8	5 combined		20	15	50
Maximum	832	-	2.2 combined		4	5.1	19
Mean	832	ND	2.2 combined		1.4	2.3	4.8
Minimum	ND	-	ND		ND	ND	ND

ND = not detected

5.2.3 Rock and Soil

The radioactivity in native rock and soil serves as an indicator of any spread of contamination outside the operating facilities and other known areas of radioactive contamination. Soil radioactivity is due to various naturally occurring radionuclides present in the environment and to radioactive fallout of dispersed nuclear weapons materials. Naturally occurring radionuclides include K-40 and the uranium and thorium series (including radon and daughters). The radionuclide composition of local area surface soil has been determined to be predominantly K-40, natural thorium, and natural uranium, both in secular equilibrium with daughter nuclides. Radioactivity in nuclear weapons test fallout consists primarily of the fission-produced Sr-90 and Cs-137, as well as Pu-239.

Results of soil sampling at the SSFL during 1995 are shown in Table 5-10 through Table 5-12. These include sampling during the Area IV characterization (Table 5-10), routine soil sampling (Table 5-11), and sampling at the former Sodium Disposal Facility (T886) as part of the independent verification process for release of this area (Table 5-12). Sampling locations for the Area IV survey are shown in Figure 5-5. Sampling locations for the routine and T886 samples are shown in Figure 5-6. Soil analyses for the Area IV and T886 surveys were performed by TMA/Richmond in Richmond, California. The data in Table 5-10 are for areas

that were not identified for remediation. Three locations were identified as requiring remediation - one, with natural U-238 up to 255 pCi/g, has been remediated, and the other two, with Cs-137 up to 271 and 138 pCi/g, are in the process of being remediated. The Area IV and T886 soil sampling results are discussed extensively in References 12 and 13.

Analysis of the data in Table 5-10 indicates that H-3, Sr-90, U-238 (and its decay products U-234 and Th-230) are all statistically indistinguishable from local background. Statistical comparisons of Th-232, Th-228, and U-235 were inconclusive. Only Cs-137 appeared to be statistically distinguishable from local background (Area IV is 0.15 ± 0.51 pCi/g compared to local background of 0.09 ± 0.12 pCi/g). However, Area IV Cs-137 was well within the U.S. average of 0.8 ± 1.0 pCi/g. A small number of individual soil samples did show elevated Cs-137 activity levels above local background but still within the range of U.S. background and at levels well below a requested cleanup standard for the site of 9.2 pCi/g. The soil and rock results shown in Table 5-11 and Table 5-12 are indistinguishable from natural background.

5.2.4 Vegetation

No vegetation data was collected in 1995.

5.2.5 Wildlife

No animal data was collected in 1995.

5.2.6 Ambient Radiation

Standard commercial thermoluminescent dosimeters (TLDs) using lithium fluoride (LiF) are placed at locations near the site boundaries at SSFL and DeSoto, and at fourteen off-site locations. The locations are indicated in Table 5-4. On a quarterly calendar basis, the TLDs are processed by a contractor laboratory and the results are reported to Rocketdyne. Where more than one TLD is located, the results are averaged. Generally, the dosimetry vendor reports a background corrected value for quarterly dose (i.e., the contribution from natural background is accounted for and subtracted from the readings reported for the TLDs). For environmental comparisons, however, the natural background was determined using a series of fourteen controls dosimeters (see below). The results for the non-background locations have been adjusted to reflect the natural background. These corrected results are shown in Table 5-13.

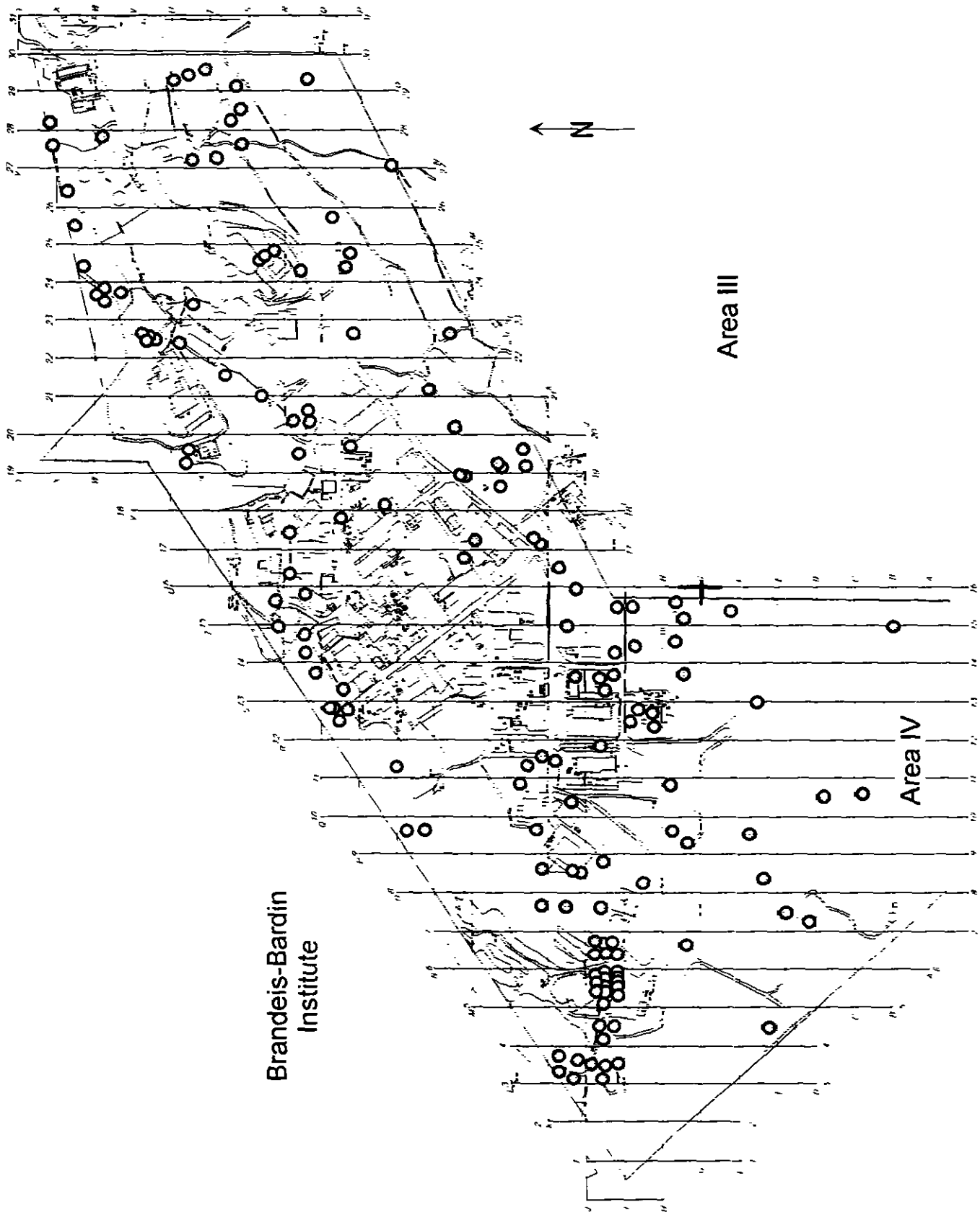

Figure 5-5. Soil Sample Locations for Area IV Survey

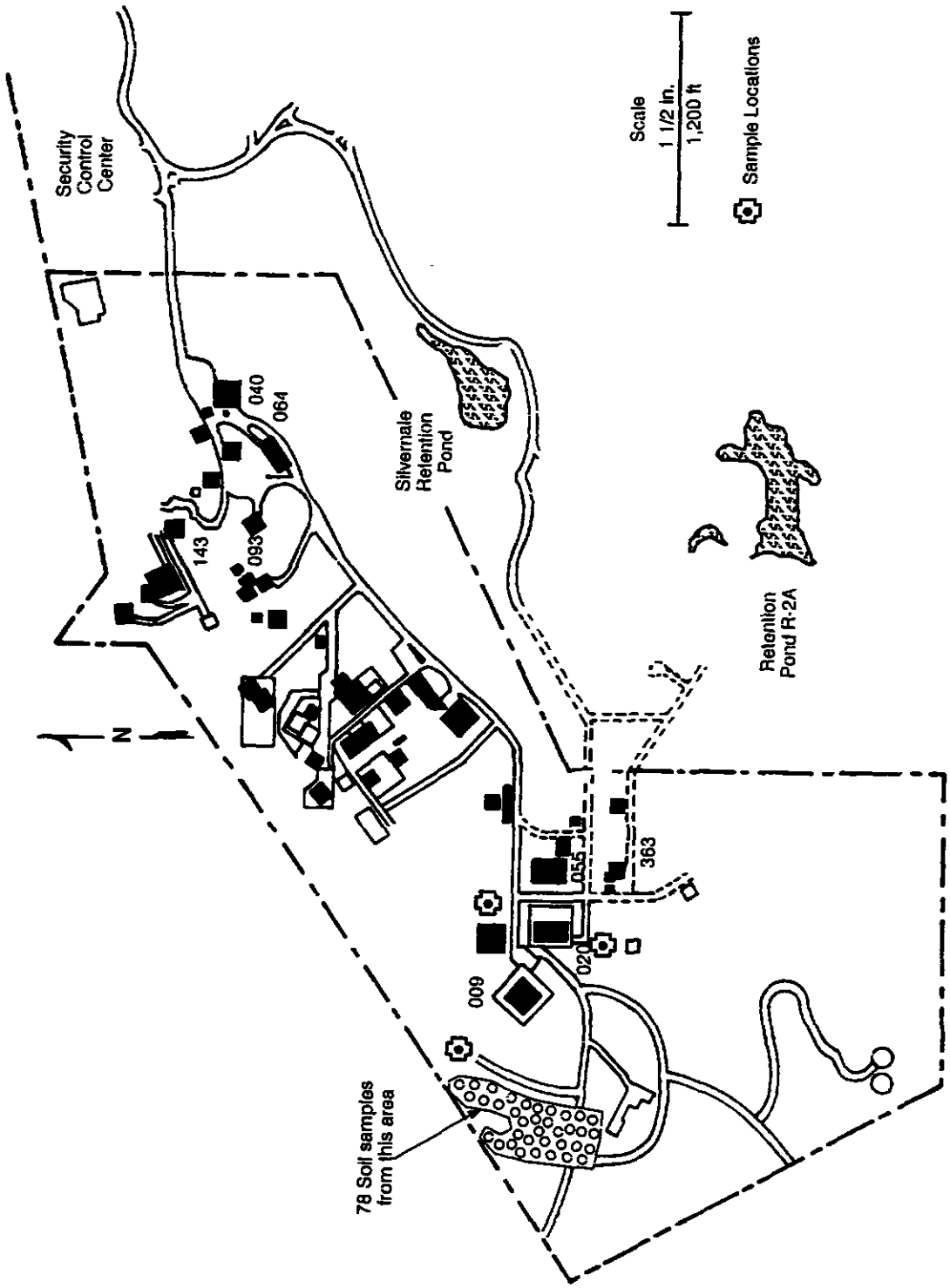

Figure 5-6. Soil Sample Locations for Routine and T886 SSFL Soil Samples

Table 5-10. Soil Radioactivity Data from Area IV Survey

	Activity (pCi/g)[a]											
	H-3[a]	Be-7	K-40	Sr-90	Cs-137	Tl-208	Pb-210	Pb-212	Bi-212	Pb-214	Bi-214	Ra-224
Maximum	8.500	0.50	24	0.22	2.40	NM	NM	NM	NM	NM	NM	NM
Mean	19	0.47	19	0.04	0.15	NM	NM	NM	NM	NM	NM	NM
Minimum	-1.500	0.44	9	-0.06	0.01	NM	NM	NM	NM	NM	NM	NM
Number of analyses[b]	1 (148)	2	149	31 (118)	104 (45)	NM	NM	NM	NM	NM	NM	NM

	Activity (pCi/g)[a]											
	Ra-226	Ac-228	Th-227	Th-228	Th-230	Th-232	Th-234	U-234	U-235	U-238	Pu-238	Pu-239
Maximum	1.60	NM	NM	2.50	2.30	2.10	NM	2.10	0.10	2.00	0.009	0.029
Mean	0.81	NM	NM	1.01	0.82	0.99	NM	0.78	0.04	0.79	ND	0.004
Minimum	0.40	NM	NM	0.39	0.37	0.36	NM	0.36	0.02	0.38	-0.009	-0.003
Number of analyses[b]	149	NM	NM	129	149	149	NM	149	149	149	(149)	39 (110)

[a]Tritium values are in pCi/l in water extracted from soil samples. Next highest value below 8,500 pCi/l was 590 pCi/l. ND = not detected. NM = Not Measured.
[b]Numbers in parentheses represent the number of analyses reported as less than the detectable limit.

Table 5-11. SSFL Rock and Soil Radioactivity Data - 1995

	Activity (pCi/g)[a]											
	H-3	Be-7	K-40	Sr-90	Cs-137	Tl-208	Pb-210	Pb-212	Bi-212	Pb-214	Bi-214	Ra-224
Maximum	NM	0.27	19	NM	0.19	0.35	1.15	1.25	0.71	0.89	0.81	1.56
Mean	NM	0.27	16	NM	0.12	0.31	0.84	1.05	0.71	0.66	0.64	1.24
Minimum	NM	0.27	14	NM	0.04	0.28	0.56	0.93	0.71	0.54	0.54	0.92
Number of analyses[b]	NM	1 (2)	3	NM	3	3	3	3	1 (2)	3	3	3

	Activity (pCi/g)[a]											
	Ra-226	Ac-228	Th-227	Th-228	Th-230	Th-232	Th-234	U-234	U-235	U-238	Pu-238	Pu-239
Maximum	1.86	1.11	0.12	NM	NM	NM	1.34	NM	0.11	NM	NM	NM
Mean	1.64	0.90	0.10	NM	NM	NM	1.14	NM	0.09	NM	NM	NM
Minimum	1.41	0.78	0.08	NM	NM	NM	0.93	NM	0.08	NM	NM	NM
Number of analyses[b]	3	3	3	NM	NM	NM	3	NM	3	NM	NM	NM

[a]NM = Not Measured.
[b]Numbers in parentheses represent the number of analyses reported as less than the detectable limit.

Table 5-12. Soil and Rock Radioactivity Data from the Former Sodium Disposal Facility

	Activity (pCi/g)[a]											
	H-3	Be-7	K-40	Sr-90	Cs-137	Tl-208	Pb-210	Pb-212	Bi-212	Pb-214	Bi-214	Ra-224
Maximum	-	-	26.2	78	0.57	NM	NM	2.4	NM	1.8	1.8	NM
Mean	-	-	21.8	15	0.05	NM	NM	1.4	NM	1.0	1.0	NM
Minimum	-	-	17.9	ND	ND	NM	NM	0.8	NM	0.4	0.5	NM
Number of analyses[b]	-	-	78	15 (63)	41 (37)	-	-	78	-	78	78	-
	Activity (pCi/g)[a]											
	Ra-226	Ac-228	Th-227	Th-228	Th-230	Th-232	Th-234	U-234	U-235	U-238	Pu-238	Pu-239
Maximum	NM	2.2	NM	1.8	1.4	1.7	2.4	1.3	0.07	1.3	0.06	0.05
Mean	NM	1.4	NM	1.5	1.2	1.3	1.1	0.9	0.04	0.9	0.02	0.01
Minimum	NM	0.8	NM	ND	ND	0.7	ND	0.4	ND	ND	ND	ND
Number of analyses[b]	-	78	-	77 (1)	77 (1)	78	77 (1)	78	75 (3)	77 (1)	27 (51)	8 (70)

[a]NM = Not Measured.
[b]Numbers in parentheses represent the number of analyses reported as less than the detectable limit.

In addition to the TLDs discussed above, Rocketdyne has begun deploying environmental TLDs that utilize an aluminum oxide base. These TLDs are capable of determining doses in increments of 0.1 mrem (vs. 10 mrem for LiF based badges). In addition, the aluminum oxide badge reporting is much more detailed, providing both gross and corrected readings for the locations. Test badges were positioned starting in the second and third quarters of 1995. In the fourth quarter of 1995, aluminum oxide TLDs were co-located at all perimeter locations indicated in Table 5-13. Where both types of dosimeters were deployed, the data in Table 5-13 represent an average of the data from both types of dosimeters. A background exposure value of 46.2 mrem was used to adjust the background-corrected quarterly LiF TLD data as supplied by the vendor. This value was obtained from an average of the fourth quarter exposure values from the twelve aluminum oxide dosimeters labeled BKG-11 through BKG-23 in the table. These dosimeters were all located off-site. The background value has been assumed to be approximately constant throughout the year.

With the exception of dosimeter locations SS-9, -11, -12, and -13, Table 5-13 shows that radiation exposures and equivalent annual exposure rates monitored on-site are nearly identical to levels monitored at the off-site locations. These data reflect natural background radiation from cosmic radiation, radionuclides in the soil, and radon and thoron in the atmosphere. Radiation doses measured at locations SS-9, -11, -12, and -13, are slightly higher, and are reflective of normal operations at the RIHL which involve handling and shipment of radioactive material.

The natural background radiation level as measured by the off-site dosimeters is approximately 181 mrem/yr. At the SSFL the local background is approximately 189 mrem/yr, based on the data from dosimeters SS-3, -4, -6, -7, -8, -11, EMB-1, and EMB -2, shown in Table

5-13. At Desoto, the local background is approximately 183 mrem/yr. The small variability observed in these values is attributed to differences in elevation and geologic conditions at the various sites. The altitude range for the dosimeter locations is from approximately 260 m (850 ft) above sea level (ASL) at the DeSoto facility and the off-site locations to a maximum of approximately 580 m (1,900 ft) ASL at SSFL.

The State RHB also provides packages containing calcium sulfate ($CaSO_4$) dosimeters for independent monitoring of radiation levels at SSFL and in the surrounding area. These dosimeters are placed at specific locations along with the Rocketdyne TLDs. The State dosimeters are returned to the Radiologic Health Branch (RHB) for evaluation. Data for these TLDs, which were placed at various Rocketdyne dosimeter locations both on-site and off-site, are also shown in Table 5-13. Historical differences have been noted between exposure rates determined by Rocketdyne and the State, with Rocketdyne generally reporting higher exposure rates. This is particularly true for the 1995 data, as a result of the initial use at Rocketdyne of aluminum-oxide based TLD's in place of the previous LiF-based TLD's. The current differences in reported exposure rates are attributed largely to differences in gamma-radiation energy response for the different dosimeter materials used by Rocketdyne and the State. In various intercomparisons, aluminum-oxide based dosimeters have been shown to be among the most accurate in measuring environmental exposure rates.

Analysis of the results demonstrates that compliance was achieved with the annual limits of the NRC, the State of California Department of Health Services (DHS), and the U.S. Department of Energy (DOE); the limit being 100 mrem/yr for total dose, above natural background, to the maximally exposed individual.

5.3 ESTIMATION OF PUBLIC RADIATION DOSE

Because so little radioactive material is released from the Rocketdyne facilities, and the radiation exposure is so small, it is not possible to directly measure radiation dose to the public. Hypothetical doses were estimated based on direct measurements at the facilities, extrapolated to occupied areas off-site. The external dose calculations assume that differences in observed TLD readings represent true differences in local exposure. These TLD measurements, which are assumed to represent points sources at the RIHL and RMDF, are extrapolated to the boundary and nearest residence using an inverse square distance relation, and accounting for air attenuation of the radiation. The external exposures, above background, are then obtained by subtracting from these extrapolated values an average background exposure obtained from off-site measurements.

For 1995, the estimated dose at the property line boundary nearest the RMHF was calculated to be 23 mrem/yr above local background. Similarly, for the nearest residence, the annual dose estimate for 1995 was calculated to be 0.00034 mrem. For these calculations, the external dose estimate at the boundary was obtained by extrapolation of data from three environmental monitoring TLDs (SS-12, -13, and -14 in Table 5-13) located at the RMHF. For

the nearest residence dose, data from fourteen separate TLDs (not listed in Table 5-4 or Table 5-13) was used for extrapolation. The average annual background used in both calculations was obtained from the fourteen off-site dosimeters, and was 181 mrem (see Table 5-13). Boundary dose estimates assume 100% occupancy, whereas the actual presence of persons at the boundary is rare or nonexistent. The estimated doses are far below the applicable limits of DOE, NRC, and the State of California.

Table 5-13. DeSoto and SSFL Ambient Radiation Dosimetry Data - 1995

TLD-Locations		RI Quarterly Exposure (mrem)				Annual Exposure (mrem)	Annual Average Exposure Rate(μR/h)	
		Q-1	Q-2	Q-3	Q-4		Rocketdyne	State DHS
DeSoto	DS-2	46.2	46.2	41.1	48.3	181.7	20.7	–
	DS-6	46.2	46.2	41.3	45.3	178.9	20.4	–
	DS-8	46.2	46.2	43.3	48.1	183.7	21.0	–
	DS-9	46.2	46.2	45.4	48.9	186.6	21.3	–
Mean values		**46.2**	**46.2**	**42.8**	**47.7**	**182.7**	**20.8**	–
SSFL	SS-3	46.2	46.2	40.5	45.5	178.3	20.3	10.2
	SS-4	46.2	46.2	44.0	63.4	199.7	22.8	12.7
	SS-6	46.2	46.2	41.3	55.2	188.8	21.5	12.9
	SS-7	46.2	46.2	44.4	50.2	186.9	21.3	11.7
	SS-8	46.2	46.2	44.4	52.6	189.3	21.6	13.3
	SS-9	56.5	46.2	46.6	56.3	205.6	23.4	13.9
	SS-11	46.2	46.2	44.9	54.4	191.6	21.9	13.0
	SS-12	51.0	46.3	57.8	79.5	234.6	26.8	17.3
	SS-13	47.7	41.7	54.9	60.8	205.1	23.4	14.5
	SS-14	46.2	46.2	41.9	61.7	195.9	22.3	13.5
	EMB-1	46.2	46.2	46.2	46.2	184.6	21.1	12.6
	EMB-2	46.2	46.2	46.2	46.2	184.6	21.1	12.9
Mean values		**47.5**	**45.8**	**46.1**	**56.0**	**195.4**	**22.3**	**13.2**
Off-site	OS-1	41.1	39.8	42.6	48.2	171.7	19.6	11.5
	OS-5	37.8	34.2	38.1	47.7	157.8	18.0	–
	BKG-11	N/A	N/A	N/A	47.6	190.4	21.7	–
	BKG-12	N/A	N/A	N/A	46.0	184.0	21.0	–
	BKG-13	N/A	N/A	N/A	40.3	161.2	18.4	–
	BKG-14	N/A	N/A	N/A	45.7	182.8	20.9	–
	BKG-15	N/A	N/A	N/A	42.9	171.6	19.6	–
	BKG-16	N/A	N/A	N/A	44.2	176.8	20.2	–
	BKG-17	N/A	N/A	N/A	49.4	197.6	22.5	–
	BKG-19	N/A	N/A	N/A	44.9	179.6	20.5	–
	BKG-20	N/A	N/A	N/A	45.0	180.0	20.5	–
	BKG-21	N/A	N/A	N/A	42.0	168.0	19.2	–
	BKG-22	N/A	N/A	N/A	52.6	210.4	24.0	–
	BKG-23	N/A	N/A	N/A	49.6	198.4	22.6	–
Mean values		**N/A**	**N/A**	**N/A**	**46.2**	**180.7**	**20.6**	**11.5**

Note: Includes natural background radiation of approximately 181 mrem per year (see text).

Except for the nearest boundary line exposure for the RMHF, the estimated off-site doses are extremely low compared to the maximum permissible exposures recommended for the

general population in the vicinity of DOE facilities. The effective dose equivalent for any member of the public, for all pathways (combining internal and external dose), shall not exceed 100 mrem/yr (above background) for DOE facilities or for NRC and State of California licensed facilities. As discussed above, the RMHF boundary to the north of the facility received an estimated average "property line" exposure of approximately 23 mrem/yr above the local background. However, this does not constitute a dose to the general public since it lies within an isolated area without direct public access.

Estimates of the internal dose assume a constant unsheltered exposure throughout the year, adjusted for wind direction frequency, and therefore considerably overestimate the actual annual averaged doses near the site. Estimated internal radiation doses due to atmospheric emission of radioactive materials from DeSoto and the SSFL nuclear facilities are several orders of magnitude below the radiation standards and are far below doses from internal exposure resulting from natural radioactivity in air. For the air pathway only, for DOE operations, the standard is 10 mrem/yr for committed effective dose equivalent, as established by EPA.

Public exposure to radiation and radioactivity is shown in Table 5-14 through Table 5-15. These tables present the estimated exposures in comparison to the regulatory standards and that received due to natural radioactivity in the environment. Dose values in the tables represent both internal and external exposures.

The general population (person-rem) dose estimates were calculated using CAP88-PC code. This code uses release rate, wind speed, wind direction and frequency, stability fractions, and stack height parameters as input data. Population dose estimates are 1.6×10^{-3} person-rem for the SSFL site and 8.4×10^{-4} person-rem for the DeSoto site. The collective effective dose equivalent estimated for potential area sources in 1995 is 7.2×10^{-4} person-rem. Inhalation is the only potential exposure pathway likely to exist. In addition to the doses reported for the SSFL facilities, an additional estimated air pathway dose of 1.0×10^{-5} mrem/yr is calculated for the diffuse area source of T064.

Figure 5-7 shows the arrangement of the census tract boundaries from the 1990 census. Figure 5-8 through Figure 5-10 show local population distribution estimates that were determined from the 1990 Federal census by Urban Decision Systems, Inc., and modified by direct observation of nearby residential areas around the SSFL site, and the occupational population at SSFL.

Table 5-14. Public Exposure to Radiation and Radioactivity from DOE Operations at SSFL - 1995

Radioactive Materials Handling Facility (RMHF)
Department of Energy (DOE, Exempt from Licensing)

1.	All pathways	
	a. Maximum estimated external dose to an individual	3.4×10^{-4} mrem/yr
	b. Maximum estimated internal dose to an individual[a]	1.4×10^{-6} mrem/yr
	Total	3.4×10^{-4} mrem/yr
	Limit	100 mrem/yr
	("Radiation Protection of the Public and the Environment" DOE Order 5400.5, 2/8/90)	
2.	Air pathway (reported in NESHAPs report)	2.1×10^{-6} mrem/yr
	Limit (40 CFR 61, Subpart H)	10 mrem/yr

[a]Inhalation and ingestion exposure from CAP88-PC calculation of air pathway; NESHAPs report contains only total air pathway exposure.

Table 5-15. Public Exposure to Radiation and Radioactivity from Rocketdyne Operations at SSFL - 1995

Rockwell International Hot Laboratory (RIHL)
U.S. Nuclear Regulatory Commission
Special Nuclear Material License No. SNM-21
State of California
Radioactive Material License No. 0015-70

1.	Direct radiation at boundary	3.7×10^{-2} mrem/yr
	Limits (10 CFR 20.1301, CCR 17 Section 30253)	100 mrem in 1 yr
2.	Airborne (nonnatural radioactivity) effluent at boundary[a]	4.7×10^{-19} µCi/ml
	Limits (10 CFR 20.1302, CCR 17 Section 30253)	2×10^{-14} µCi/ml

[a]Use of the EPA computer program, COMPLY, to determine the air pathway dose from the measured radionuclide concentrations for the ventilation exhaust from the RIHL at SSFL showed this facility to be in compliance with 40 CFR 61, Subpart I, at Level 1, the simplest, most conservative screening level.

Table 5-16. Public Exposure to Radiation and Radioactivity from Rocketdyne Operations at DeSoto - 1995

Applied Nuclear Technology Laboratory (DS104)
State of California
Radioactive Materials License No. 0015-70

1.	Direct radiation at boundary	5.3×10^{-2} mrem/yr
	Limits (CCR 17 Section 30253)	100 mrem in 1 yr
2.	Airborne (nonnatural radioactivity) effluent at boundary[a]	2.9×10^{-8} µCi/ml
	Limit (CCR 17 Section 30253)	2×10^{-4} µCi/ml

[a]Use of the EPA computer program, COMPLY, to determine the air pathway dose from the measured radionuclide concentrations for the ventilation exhaust from the Applied Nuclear Technology Laboratories at DeSoto showed this facility to be in compliance with 40 CFR 61, Subpart I, at Level 1, the simplest, most conservative screening level.

In spite of the large number of people in the surrounding population, the population dose estimated for Rocketdyne operations is extremely small. For comparison, the dose received by the same population from naturally occurring radiation is approximately 3 million person-rem, approximately 2 billion times greater than that estimated for SSFL operations.

To account for population increases, analytical results using the 1990 census data were multiplied by 1.03. This factor was based on population increases in Los Angeles and Ventura counties since 1990.

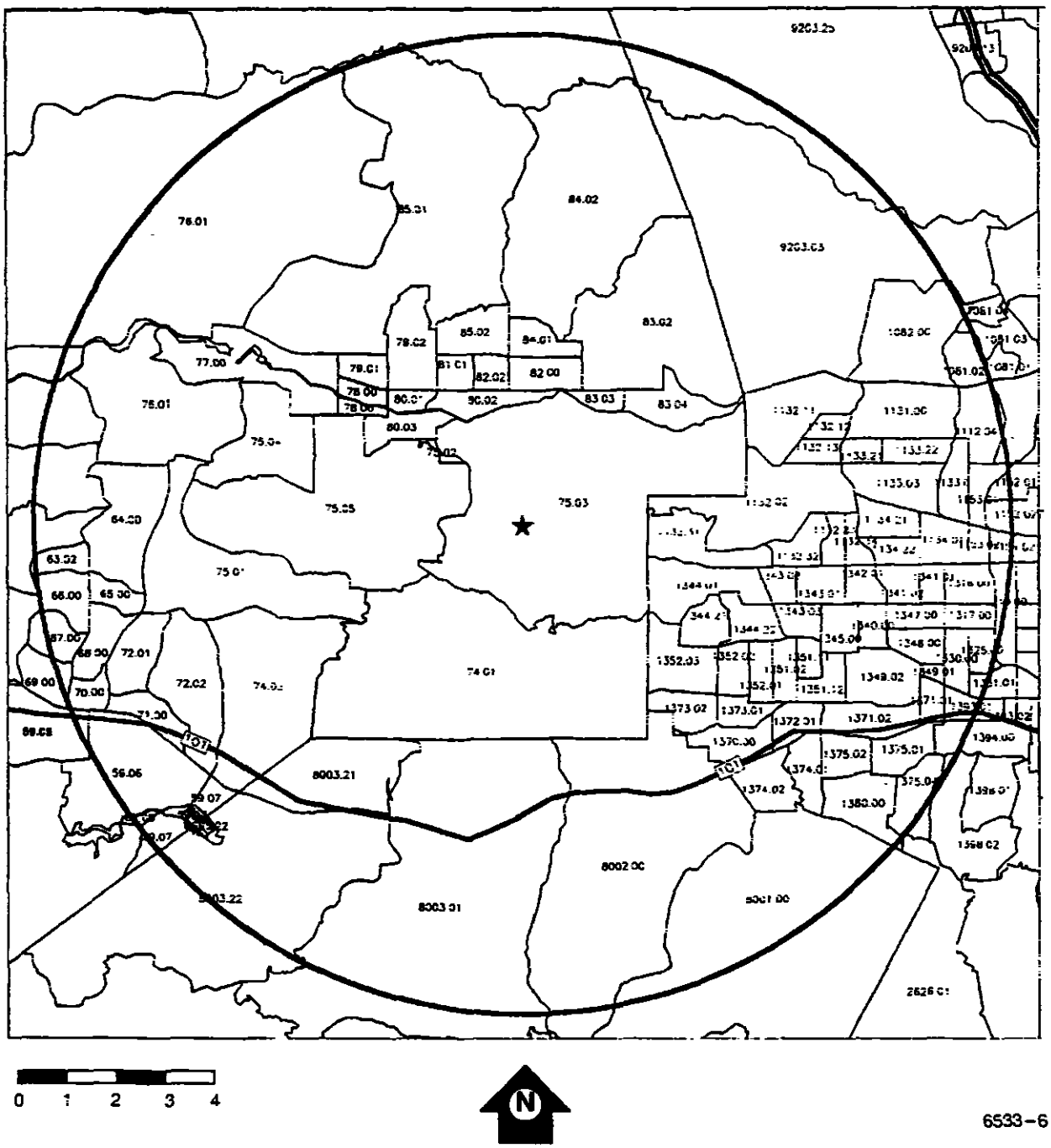

Figure 5-7. Census Tract Boundaries (1990) within 10 miles of SSFL (individual tracts are identified by number)

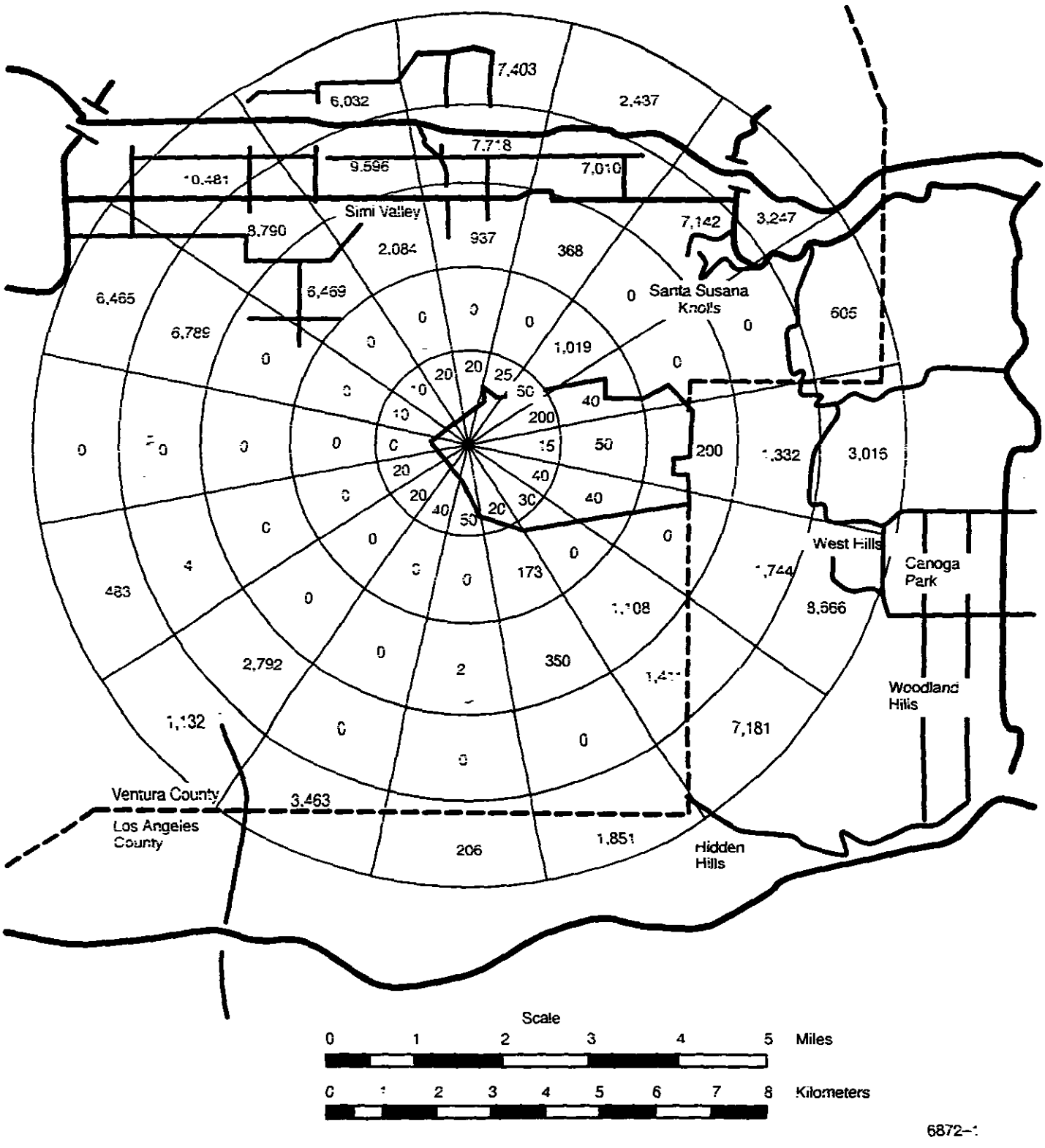

Figure 5-8. SSFL Site-Centered Demography to 8 km (1990), Showing Number of Persons Living in Each Grid (daytime employment for SSFL)

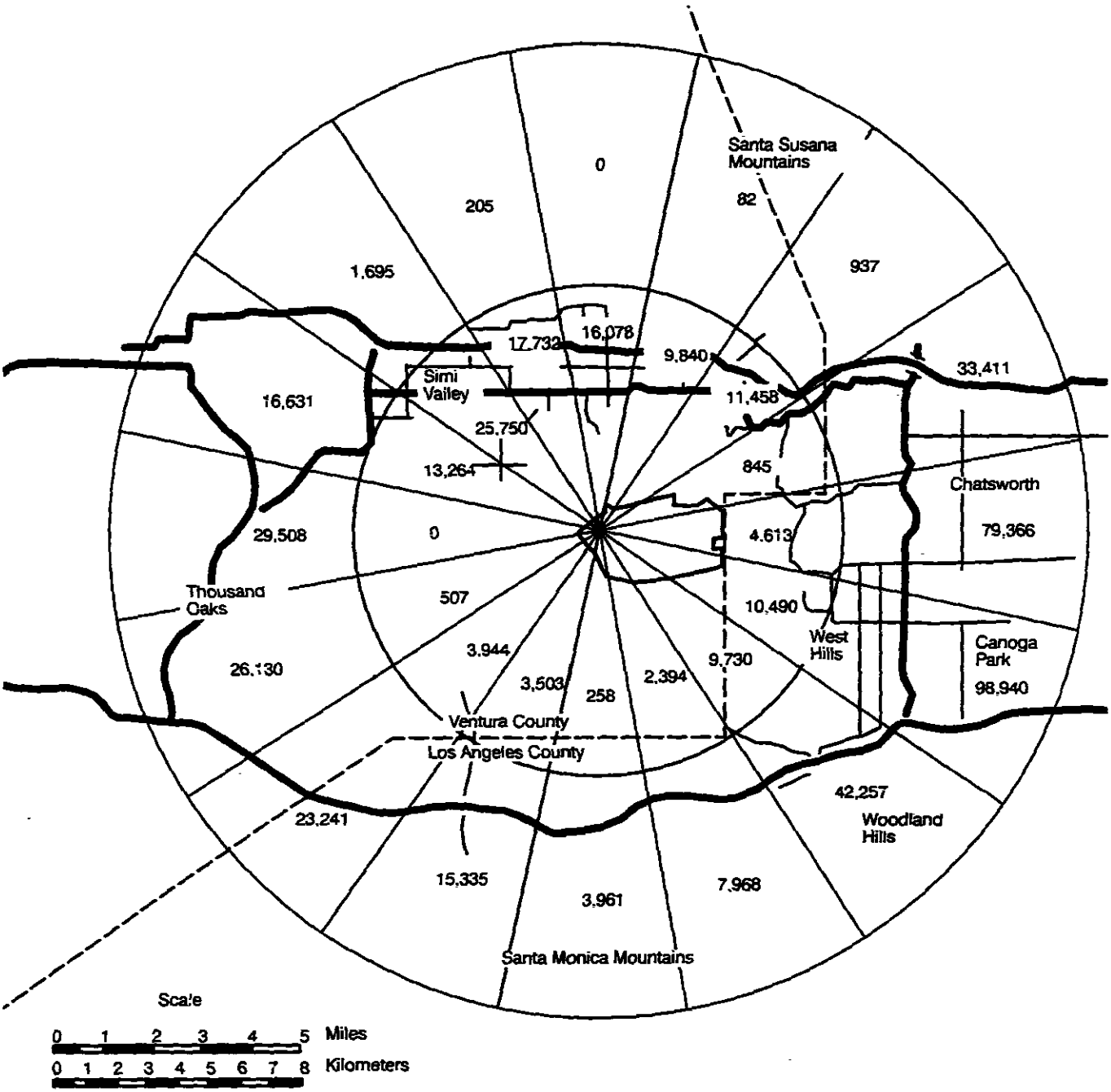

Figure 5-9. SSFL Site-Centered Demography to 16 km (1990), Showing Number of Persons Living in Each Grid

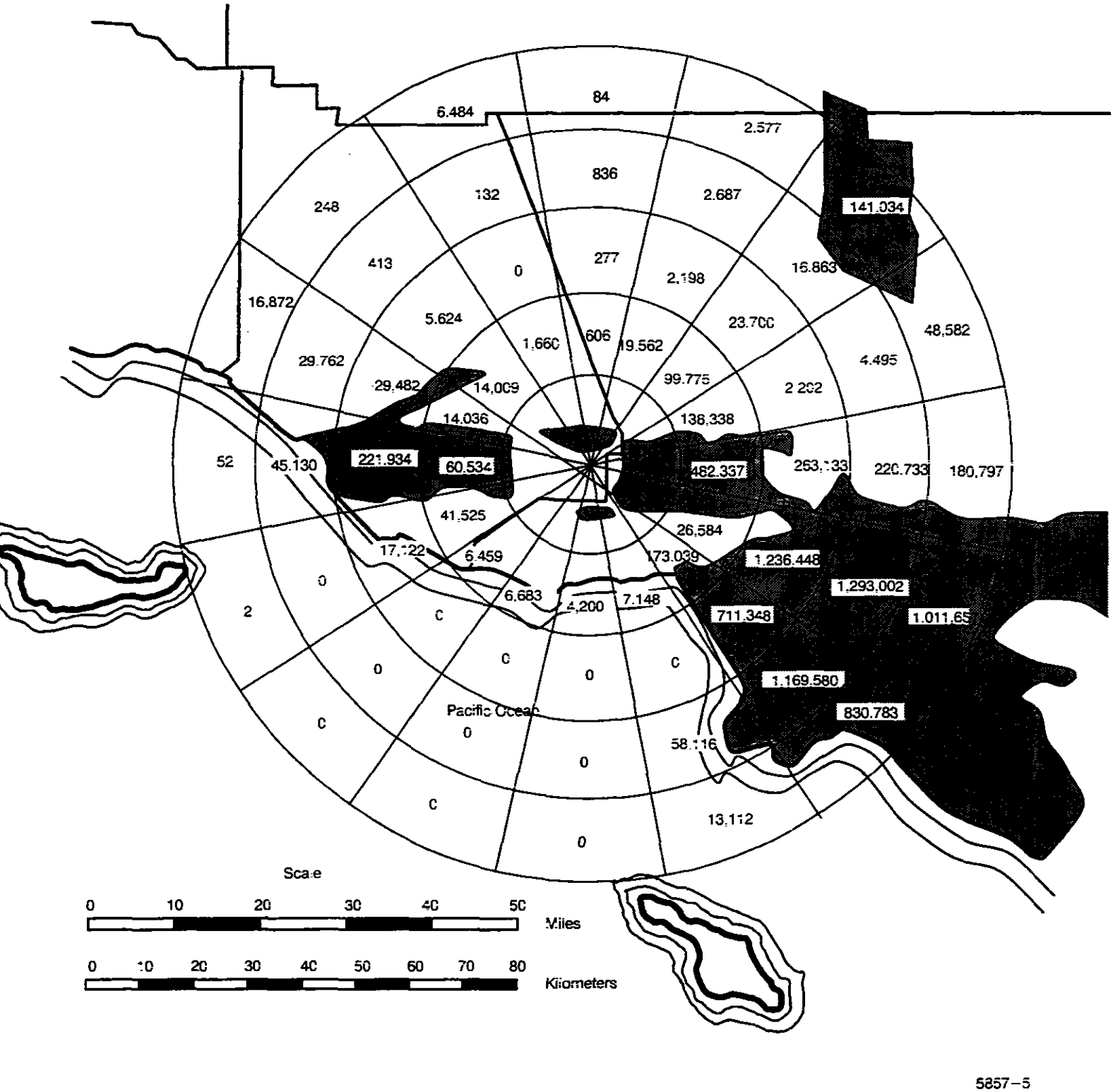

Figure 5-10. SSFL Site-Centered Demography to 80 km (1990), Showing Number of Persons Living in Each Grid (heavily populated areas are shown by shading)

6. ENVIRONMENTAL NON-RADIOLOGICAL PROGRAM INFORMATION

Rocketdyne maintains a comprehensive environmental program to ensure compliance with all applicable regulations, to prevent adverse environmental impact, and to restore the quality of the environment from past operations. Petroleum hydrocarbon impacted soils resulting from underground storage tanks (USTs) have been remediated as tanks are removed. The majority of the storage tanks have been removed. The few remaining USTs contain either sodium or radioactive water and are located within concrete vaults and equipped with automatic leak detection systems. As stated previously, these tanks are exempt from the UST regulations. After an extensive review of past UST closures, it appeared that two tanks, UT-3 and UT-55, non-DOE tanks located in Area IV, warranted further investigation. This determination is based on inconclusive closure documentation following remedial activities in February and March 1986. Rocketdyne is working with the VCEHD on this matter.

An extensive groundwater remediation program has the capacity for removing solvent contamination from approximately one million gallons of groundwater per day at SSFL. The major groundwater contaminant in Area IV is trichloroethylene and its degradation products. Two pilot groundwater extraction system wells have been installed in Area IV and evaluation of their performance is in progress.

The discharge of surface water at SSFL is rain water or due to the nonutilization of treated groundwater and is regulated by the California Regional Water Quality Control Board through an NPDES permit. The majority of surface water runoff drains to the south and is collected in the water reclamation/pond system. Discharges from this system are subject to effluent limitations and monitoring requirements as specified in the existing NPDES permit. A small portion of the site within Area IV generates rainfall runoff to five northwest boundary runoff channels where monitoring locations (see Figure 6-1) have been established and sampling is conducted in accordance with the northwest slope monitoring program. All discharges are periodically monitored for volatile organics, heavy metals, and applicable radionuclides, in addition to other parameters necessary to assess water quality.

All sources of air emissions at SSFL are subject to the provisions of the Clean Air Act (CAA) as administered through the California Air Resources Board and the Ventura County Air Pollution Control District (VCAPCD). The VCAPCD regulates sources of air emissions and issues permits that contain limits on pollutant levels and conditions of operation.

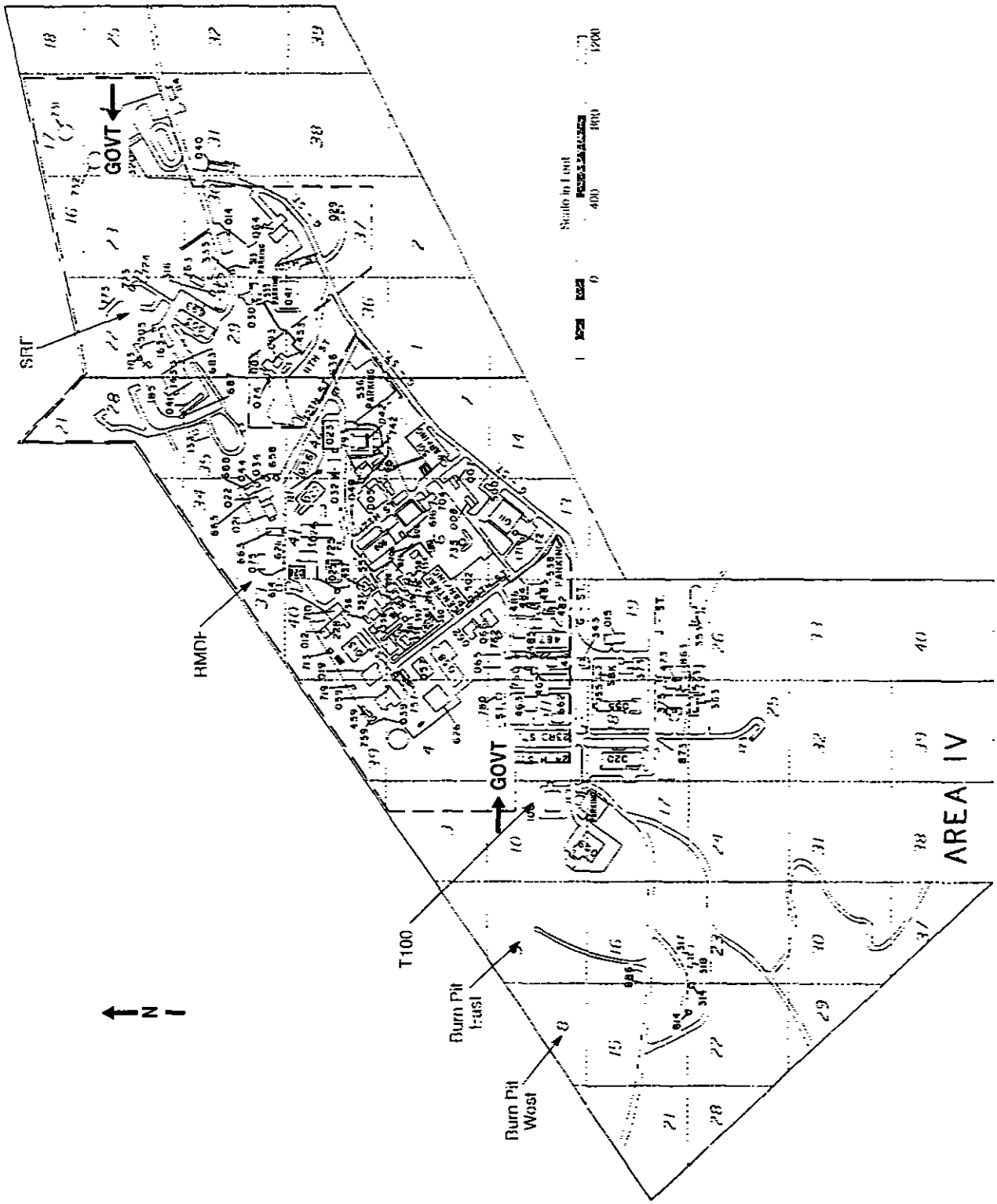

Figure 6-1. Locations of Surface Water Runoff Collectors Along Northwest Boundary of SSFL, Area IV

Soil analyses have been and are currently site specific according to the activities generating the analyses and potential disposition of the soil. A wide variety of analyses are conducted to determine the extent of any potential chemical contamination. All analyses conducted in Area IV at the present time are conducted per appropriate regulations.

The 1994 SARA Title III Form R (Toxic Release Inventory) submission was sent to both the state and federal agencies by the July 1, 1995 deadline. The forms include questions regarding off-site waste shipments and air emission calculations. At ETEC only two chemicals met the threshold requirements for CY 1994: ammonia and sulfuric acid.

The overall annual groundwater monitoring program at SSFL addresses collection and analysis of groundwater samples and measurement of the water levels for the 216 Rocketdyne installed wells on-site and 16 off-site private wells. The locations of these wells within and around DOE areas in Area IV are shown on the map of SSFL in Figure 6-2. Groundwater quality parameters and sampling frequency have been determined based on historical water quality data, location of known or potential sources of groundwater contamination, operational requirements of groundwater extraction and treatment systems and regulatory direction. The groundwater monitoring program includes the following parameters, all analyzed using the appropriate EPA methods: volatile organic constituents, base/neutral and acid extractable organic compounds, petroleum hydrocarbons, and trace metals and common ion constituents. Radiological analyses are performed on groundwater samples from DOE areas in Area IV and offsite.

A revised Spill Prevention Control and Countermeasure (SPCC) plan was submitted as a part of the revised Spill Prevention and Response Plan to the local Administering Agency on April 1, 1995. The U.S. EPA requires the preparation of an SPCC plan by those facilities which, because of their location, could reasonably be expected to discharge oil in harmful quantities into or upon navigable waters. Additionally, an updated hazardous materials inventory was submitted to the VCEHD as an update of the business plan on the same date as the SPCC. The hazardous materials disclosure fee was also submitted.

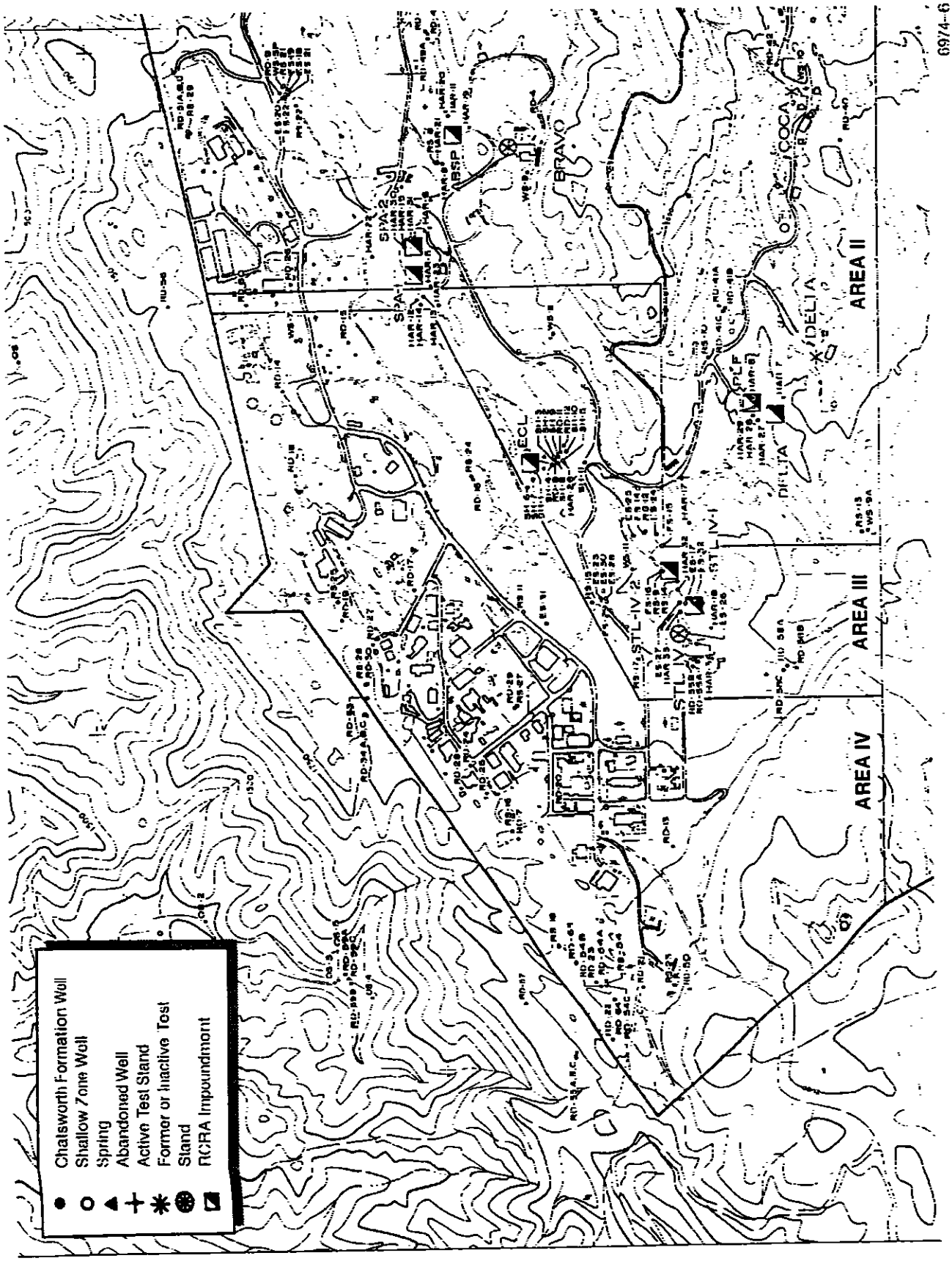

Figure 6-2. Location of Wells Used in Groundwater Management Program

Several steps in asbestos program management have been incorporated into facility renovation and demolition. These generally include assessment or identification of asbestos-containing materials (ACMs), abatement activities such as worker protection and surveillance, and clearance requirements such as cleanup and disposal. Within Area IV, approximately 100% of the buildings have been surveyed, and materials in question have been analyzed for asbestos. Where required, asbestos abatement will occur when renovation or demolition projects are identified.

There were no draft or final environmental impact statements or reports, site assessments, or remedial action reports produced during 1995. Additionally, there were no actions taken by local authorities relative to CERCLA/SARA activities or Notices of Violation for the DOE Area.

6.1 SURFACE WATER

Rocketdyne has filed a Report of Waste Discharge with the California Regional Water Quality Control Board (RWQCB) and has been granted a discharge permit pursuant to the National Pollutant Discharge Elimination System (NPDES) and Section 402 of the federal Water Pollution Control Act. The permit to discharge, NPDES No. CA0001309, initially became effective September 27, 1976. The permit was renewed with minor changes effective September 17, 1984 and has since undergone significant modifications subsequent to reissuance on December 7, 1992. The current permit is in effect through November 10, 1997.

The permit allows the discharge of reclaimed wastewater and storm water runoff from water retention ponds into Bell Creek, a tributary to the Los Angeles River, in addition to the discharge of storm water runoff from the northwest slope (Area IV) locations. Discharge along the northwest slope generally occurs only during and after periods of heavy rainfall (Outfalls 003 through 007). Excess reclaimed water is now discharged on a continuous basis through the R-2A outfall location (Outfall 002).

There is no sanitary sewer discharge from SSFL. Domestic sewage is treated, disinfected, and discharged to the retention ponds. Permit conditions are placed on the operation of the two treatment plants. Area IV sewage is discharged directly to the Area III Sewage Treatment Plant (STP III).

Of the two retention ponds at SSFL that discharge via the NPDES permit, only one receives influent from Area IV, and is referred to as Pond R-2A. Influent to the ponds includes tertiary treated domestic sewage, cooling water from various testing operations, and storm water runoff. During periods of discharge from the ponds, grab-type samples are collected for analysis by a California State certified testing laboratory. Analyses include chemical constituents such as heavy metals, volatile organics, base/neutral and acid extractable, and general chemistry in addition to specified radionuclides. Toxicity testing is also conducted in the form of acute and chronic toxicity bioassays.

In November 1989, a storm water runoff program was developed and implemented in Area IV for runoff from the northwest portion of the site. Five monitoring locations were selected that include: the Radioactive Materials Handling Facility watershed (Outfall 003), Sodium Reactor Experiment watershed (Outfall 004), the Former Sodium Disposal Facility (Outfalls 005 and 006), and behind T100 (Outfall 007). Runoff monitoring is currently conducted as set forth by the NPDES permit referenced above. Furthermore, all surface water program activities for the SSFL, including Area IV, have been addressed and incorporated into the current NPDES permit. The SWPPP and the NPDES permits were both prepared in accordance with the current federal and state regulations.

The permit goes far beyond the requirements of the drinking water supplier regulations in requiring much more frequent sampling and analysis. For Outfalls 001 and 002, during periods of discharge, and whenever rainfall is greater than 0.1 inch, no more than one sample per week needs to be obtained. During dry weather flow, minimum sampling frequency for these two outfalls shall be once per month. For discharges from Outfalls 003, 004, 005, 006, and 007, no more than one sample per week need be obtained.

Analytical results from 1995 surface water discharge events and storm water runoff, are shown in Table 6-1 through Table 6-7. In the tables, NA signifies "not analyzed", ND signifies "not detected", and NC signifies "not calculated". No data is shown for Outfalls 1, 3, 4, 5, 6, and 7 for summer and fall as discharges from these outfalls occur only during periods of rain. In general, applicable release limits are shown in the third column of each table. Exceptions include the limit for settleable solids, where the limit does not apply for discharges occurring during rainfall events (e.g., Outfalls, 1, 3, 4, 5, 6, and 7), and the limits for the metals cadmium, copper, lead, mercury, nickel, silver, and zinc, which are based on a calculation that is dependent on the water hardness for each particular sampling event. These latter limits thus change with every sampling event. The limits shown in Table 6-1 through Table 6-7, for these metals, represent the lowest calculated limit from all the sampling events. The asterisk next to several of the data for Outfall 002 for December 23, indicate that the analysis was conducted outside of the required hold time period.

Table 6-1. 1995 Analytical Results for NPDES Water Releases from Outfall 001 (Perimeter Pond) (Sheet 1 of 3)

CONSTITUENT	UNITS	LIMITS	9-Jan	24-Jan	6-Mar	11-Mar	21-Mar	24-Apr
RAINFALL	INCHES	Not Applicable	0.73	2.45	0	1.16	0.4	0
VOLUME DISCHARGED	MG	160 MGD	3.0	11.4	Motor Error	4.3	0.1	0.09
pH	pH UNITS	6.0 TO 9.0	7.3	7.19	7.3	7	7.6	6.8
TEMPERATURE	DEG. F	NTE 100F	55.6	53.8	57.2	57.0	67.0	64.0
TURBIDITY	TU	Not Stated	1.5	30.4	5.0	178	32	7.0
TOTAL SUSPENDED SOLIDS	mg/l	-	7	72	40	81	7	< 5
SETTLEABLE SOLIDS	mg/l	0.1	<0.1	0.1	13	17	< 0.1	< 0.1
TOTAL DISSOLVED SOLIDS	mg/l	960	206	188	168	150	210	482
TOTAL ORGANIC CARBON	ug/l	Not Stated	13	9.5	11	22	9.8	53
CONDUCTIVITY @ 25 C	umhos/cm	Not Stated	346	214	185	191	255	768
BOD 5-DAY A@ 20 C	mg/l	30	<5	<5	< 5	< 5	< 5	< 5
OIL AND GREASE	mg/l	15	<5	<5	< 5	< 5	< 5	< 5
CHLORIDE	mg/l	180	18	7.2	7.3	6	15.0	35
FLUORIDE	mg/l	1	0.70	0.14	0.41	0.36	0.50	0.49
NITRATE AND NITRITE (AS NITROGEN)	mg/l	8	0.97	1.85	1.87	1.00	0.34	0.08
SULFATE	mg/l	300	36	36	14	11	25	129
SURFACTANTS (AS MBAs)	mg/l	0.5	<0.05	<0.05	< 0.05	< 0.05	< 0.05	< 0.05
RESIDUAL CHLORINE	mg/l	0.1	ND	ND	ND	ND	ND	ND
ARSENIC	ug/l	5	<1.0	1.0	< 1.0	< 1.0	< 1.0	< 1.0
BARIUM	ug/l	1,000	<5.0	70	< 5.0	< 5.0	< 5.0	< 5.0
BORON	mg/l	1	0.15	0.11	0.07	0.09	0.10	0.2
TOTAL HARDNESS (CaCO3)	mg/l	NA	102	96	63	240	101	290
RADIOACTIVITY								
GROSS ALPHA	pCi/l	15	0.2 +/- 1.4	1.7 +/- 1.4	0.9 +/- 1.3	1.7 +/- 1.1	0.0 +/- 1.3	1.3 +/- 2.7
GROSS BETA	pCi/l	50	4.0 +/- 1.9	3.5 +/- 1.6	2.5 +/- 1.7	1.9 +/- 1.6	1.1 +/- 2.2	3.4 +/- 2.6
TOTAL COMBINED RADIUM-226 & RADIUM 228	pCi/l	5	1.1 +/- 1.2	1.3 +/- 2.1	0.8 +/- 1.2	0.5 +/- 1.0	0.7 +/- 2.0	2.8 +/- 2.2
TRITIUM	pCi/l	20,000	0 +/- 215	160 +/- 227	0 +/- 192	160 +/- 224	33 +/- 215	273 +/- 269
STRONTIUM-90	pCi/l	8	6.7 +/- 5.6	1.6 +/- 1.4	2.1 +/- 1.4	1.4 +/- 1.5	0.4 +/- 0.9	0.8 +/- 1.0
METALS								
CADMIUM	ug/l	10	<5	<5	<5.0	<5.0	<5.0	<5.0 ug/l
CHROMIUM	ug/l	50	<1	<1	<1.0	<1.0	<1.0	<1.0 ug/l
COPPER	ug/l	1000	<20	<20	<20	20	20	<20 ug/l
LEAD	ug/l	50	40	<5	<5.0	<5.0	<5.0	<5.0 ug/l
MERCURY	ug/l	12	<1	<1	<1.0	<1.0	<1.0	<1.0 ug/l
NICKEL	ug/l	600	30	<20	40	<20	<20	<20 ug/l
SELENIUM	ug/l	10	<1	<1	<1.0	<1.0	<1.0	<1.0 ug/l
SILVER	ug/l	50	<20	<20	<20	<20	<20	<20 ug/l
ZINC	ug/l	5000	20	40	130	80	40	40 ug/l

Table 6-1. 1995 Analytical Results for NPDES Water Releases from Outfall 001 (Perimeter Pond) (Sheet 2 of 3)

CONSTITUENT	UNITS	LIMITS	9-Jan	24-Jan	6-Mar	11-Mar	21-Mar	24-Apr
PESTICIDES								
ALDRIN	pg/l	130	<0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug
CHLORDANE (BASED ON CA INLAND SURFACE WATERS PLAN)	ng/l	0.08	<1.0 ug	<1.0 ug	<1.0 ug	<1.0 ug	<1.0 ug	<1.0 ug
DDT (BASED ON THE CA INLAND SURFACE WATERS PLAN)	ng/l	0.59	<0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug
DIELDRIN	ng/l	0.14	<0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug
ENDOSULFAN (BASED ON THE CA INLAND SURFACE WATERS PLAN)	ng/l	56	<0.1 ug	<0.1 ug	<0.1 ug	<0.1 ug	<0.1 ug	<0.1 ug
ENDRIN	ng/l	2.3	<0.05 ug/l	<0.05 ug/l	<0.05 ug/l	<0.05 ug/l	<0.05 ug/l	<0.05 ug/l
HEPTACHLOR	pg/l	160	<0.01 ug/l	<0.01 ug/l	<0.01 ug/l	<0.01 ug/l	<0.01 ug/l	<0.01 ug/l
HEPTACHLOR EPOXIDE	pg/l	70	<0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug
HEXACHLOROCYCLOHEXANE-ALPHA	ng/l	3.9	<0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug
HEXACHLOROCYCLOHEXANE-BETA	ng/l	14	<0.03 ug	<0.03 ug	<0.03 ug	<0.03 ug	<0.03 ug	<0.03 ug
HEXACHLOROCYCLOHEXANE-DELTA	ng/l	19	<0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug
LINDANE	ug/l	Not Stated	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
METHOXYCHLOR	ug/l	100	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-D	ug/l	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
2,4,5-TP-SILVEX	ug/l	10	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
TOXAPHENE	pg/l	670	<1.0 ug	<1.0 ug	<1.0 ug	<1.0 ug	<1.0 ug	<1.0 ug
VOLATILE ORGANICS								
DICHLOROMETHANE	ug/l	4.6	<2	<2	<2	<2	<0.4	<1
1,1-DICHLOROETHYLENE	ug/l	6	<1	<1	<0.5	<0.5	<0.4	<1
TRANS-1,2-DICHLOROETHYLENE	ug/l	10	<1	<1	<0.5	<0.5	<0.4	<1
TRICHLOROETHYLENE	ug/l	5	<1	<1	<2	<2	<0.4	<1
1,1,2,2-TETRACHLOROETHANE	ug/l	1	<1	<1	<0.5	<0.5	<0.4	<1
TETRACHLOROETHYLENE	ug/l	5	<1	<1	<2	<2	<0.4	<1
VINYL CHLORIDE	ug/l	5	<2	<2	<2	<2	<2	<1
CARBON TETRACHLORIDE	ug/l	0.5	<1	<1	<0.2	<0.2	<0.4	<1
1,2-DICHLOROETHANE	ug/l	0.5	<1	<1	<0.5	<0.5	<0.4	<1
1,1-DICHLOROETHANE	ug/l	5	<1	<1	<0.5	<0.5	<0.4	<1
ETHYLBENZENE	ug/l	680	<1	<1	<2	<2	<1	<1
1,1,1-TRICHLOROETHANE	ug/l	200	<1	<1	<0.5	<0.5	<0.4	<1
1,1,2-TRICHLOROETHANE	ug/l	32	<1	<1	<0.5	<0.5	<0.4	<1
BENZENE	ug/l	0.34	<1	<1	<0.2	<0.2	<1	<1
CHLOROFORM	ug/l	100	<1	<1	<2	<2	<0.4	<1
BROMOFORM	ug/l	100	<1	<1	<2	<2	<2	<1
TOLUENE	ug/l	10	<1	<1	<2	<2	<1	<1
SEMI-VOLITILES								
FLUORANTHENE	ug/l	42	<2	<2	<2	<2	<2	<2

Table 6-1. 1995 Analytical Results for NPDES Water Releases from Outfall 001 (Perimeter Pond) (Sheet 3 of 3)

CONSTITUENT	UNITS	LIMITS	9-Jan	24-Jan	6-Mar	11-Mar	21-Mar	24-Apr
BASE/NEUTRAL/ACID EXTRACTIBLES								
1,2-DICHLOROBENZENE	ug/l	-/-/2.7	<1	<1	<3	<3	<3	<3
1,3-DICHLOROBENZENE	ug/l	-/-/400	<1	<1	<3	<3	<3	<3
1,4-DICHLOROBENZENE	ug/l	-/-/15.9	<1	<1	<3	<3	<3	<3
HEXACHLOROBENZENE	pg/l	-/-/660	<3 ug/l	<3 ug/l	<3 ug/l	<3 ug/l	<3 ug/l	<3 ug/l
N-NITROSODIMETHYLAMINE	ug/l	0.02/-/-	<2	<2	<2	<2	<2	<2
PENTACHLOROPHENOL	ug/l	NC/NC/0.28	<1	<1	<20	<20	<20	<20
PHENOL	ug/l	-/-/300	<5	<5	<5	<5	<5	<5
2,4,6-TRICHLOROPHENOL	ug/l	-/-/0.24	<1	<1	<10	<10	<10	<10
2-4 DICHLOROPHENOL	ug/l	-/-/0.30	<1	<1	<10	<10	<10	<10
4-CHLORO-3-METHYLPHENOL	ug/l	-/-/3000	<1	<1	<10	<10	<10	<10
MISCELLANEOUS								
CYANIDE	ug/l	22/-/-	ND	ND	ND	ND	ND	ND
PCB's (BASED ON THE CA INLAND SURFACE WATERS PLAN)	pg/l	-/14000/70	ND	ND	ND	ND	ND	ND
PAH's (BASED ON THE CA INLAND SURFACE WATERS PLAN)	ng/l	-/-/2.8	ND	ND	ND	ND	ND	ND
HALOMETHANES (BASED ON THE CA INLAND SURFACE WATERS PLAN)	ug/l	-/-/100	ND	ND	ND	ND	ND	ND
TOXICITY - BIOASSAYS								
ACUTE	% SURVIVAL	70% MINIMUM	100%	100%	100%	95%	100%	100%
CHRONIC	TUC	-/-/1	1	NA	NA	NA	NA	1.00
PRIORITY POLLUTANTS (IN EXCESS OF ROUTINE)								
PERFORMED QUARTERLY	ug/l	NOT STATED	ND	NA	NA	NA	NA	ND

Table 6-2. 1995 Analytical Results for NPDES Water Releases from Outfall 002 (R2A Flume) (Sheet 1 of 6)

CONSTITUENT	UNITS	LIMITS	3-Jan	10-Jan	24-Jan	14-Feb	10-Mar	21-Mar	6-Apr	19-Apr	10-May	16-May
RAINFALL	INCHES	Not Applicable	0.78	0.73	2.45	0.74	3.13	0.4	0	0	0	1.00
VOLUME DISCHARGED	MG	160 MGD	0.62	8.11	31.03	2.05	19.86	1.39	0.72	1.03	0.67	1.1
pH	pH UNITS	6.0 TO 9.0	7.89	7.2	7.45	7.7	6.4	7.4	7.0	7.4	8.2	8.3
TEMPERATURE	DEG. F	NTE 100F	49.2	55.4	55.0	66.4	58	65	65	56	63.5	56.5
TURBIDITY	TU	Not Stated	130	117	6.8	NA	17	25	8	32	0.8	24
TOTAL SUSPENDED SOLIDS	mg/l	15	12	276	56	61	7	20	10	76	ND	10
SETTLEABLE SOLIDS	mg/l	0.1	< 0.1	266	0.2	30	< 0.1	< 0.1	< 0.1	5	< 0.1	0.5
TOTAL DISSOLVED SOLIDS	mg/l	-	588	180	198	298	472	278	512	268	650	330
TOTAL ORGANIC CARBON	ug/l	Not Stated	7.4	11	11	35	47	7.2	8.7	8.1	2.6	6.5
CONDUCTIVITY @ 25 C	umhos/cm	Not Stated	891	248	255	553	553	367	255	410	1000	560
BOD 5-DAY A@ 20 C	mg/l	30	< 5	<5	<5	< 5	< 5	< 5	< 5	6	< 2	8
OIL AND GREASE	mg/l	15	< 5	<5	<5	< 5	< 5	< 5	< 5	< 5	< 3	< 3
CHLORIDE	mg/l	150	74	16	14	25	31	20	36	24	50	30
FLUORIDE	mg/l	1	0.50	0.37	0.38	0.44	0.53	0.43	0.6	0.46	0.7	0.3
NITRATE AND NITRITE (AS NITROGEN)	mg/l	8	1.76	1.08	1.85	1.02	1.01	0.71	1.18	ND	ND	0.9
SULFATE	mg/l	300	182	32	21	36	1.35	47	85	31	200	79
SURFACTANTS (AS MBAs)	mg/l	0.5	< 0.05	<0.05	0.16	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
RESIDUAL CHLORINE	mg/l	0.1	ND	ND	ND	ND	0.05	ND	< 0.05	< 0.05	< 0.1	< 0.1
ARSENIC	ug/l	5	< 1	<1	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
BARIUM	ug/l	1,000	< 5	<5	<5	< 10	10	< 5.0	< 5.0	< 5.0	50	52
BORON	mg/l	1	< 0.05	0.11	0.07	0.18	< 0.05	0.07	0.10	0.10	0.10	< 0.1
TOTAL HARDNESS (CaCO3)	mg/l	Not Applicable	297	74	92	141	54	146	250	120	400	280
RADIOACTIVITY												
GROSS ALPHA	pCi/l	15	3.1 +/- 3.2	0.5 +/- 1.3	0.9 +/- 1.1	2.6 +/- 2.0	0.6 +/- 2.0	1.3 +/- 2.0	3.2 +/- 3.4	0.5 +/- 1.5	2 +/- 2	0.7 +/- 1
GROSS BETA	pCi/l	50	15 +/- 3	1.4 +/- 1.8	2.4 +/- 1.5	15 +/- 2	4.4 +/- 2.0	3.5 +/- 2.4	5.3 +/- 3.0	4.2 +/- 2.4	4 +/- 3	3 +/- 2
TOTAL RADIUM 226 & RADIUM 228	pCi/l	5	0.7 +/- 1.9	0.6 +/- 1.1	2.0 +/- 2.0	1.9 +/- 2.5	1.9 +/- 1.7	2.2 +/- 2.0	1.8 +/- 1.9	0.7 +/- 2.0	0.2 +/- 1	0.3 +/- 1
TRITIUM	pCi/l	20,000	0 +/- 238	61 +/- 217	74 +/- 224	7 +/- 213	197 +/- 228	223 +/- 228	0 +/- 109	125 +/- 260	70 +/- 300	0 +/- 300
STRONTIUM-90	pCi/l	8	0.7 +/- 1.3	1.5 +/- 4.9	0.0 +/- 1.3	0.8 +/- 1.3	0.3 +/- 1.3	0.0 +/- 0.8	0.0 +/- 1.0	0.3 +/- 1.2	0.3 +/- 1	0.0 +/- 1
METALS												
CADMIUM	ug/l	10	<5	<5	<5	< 5.0	<5.0	<5.0	<5.0	<5.0	< 2	< 2
CHROMIUM	ug/l	11	<1	<1	<1	< 1.0	<1.0	<1.0	<1.0	<1.0	< 10	< 10
COPPER	ug/l	1000	<20	<20	<20	< 20	<20	20	<20	40	< 20	< 20
LEAD	ug/l	50	<5	<5	<5	< 5.0	<5.0	<5.0	<5.0	<5.0	< 2	5
MERCURY	ug/l	12	<1	<1	<1	< 1.0	<1.0	<1.0	<1.0	<1.0	0.3	< .2
NICKEL	ug/l	600	<20	20	<20	< 20	<20	20	<20	30	< 10	< 10
SELENIUM	ug/l	5	<1	<1	<1	< 1.0	<1.0	<1.0	<1.0	<1.0	< 2	< 2
SILVER	ug/l	50	<20	<20	<20	< 20	<20	<20	<20	<20	< 10	< 10
ZINC	ug/l	351	30	<20	40	40	50	90	70	100	< 20	70

Table 6-2. 1995 Analytical Results for NPDES Water Releases from Outfall 002 (R2A Flume) (Sheet 2 of 6)

CONSTITUENT	UNITS	LIMITS	7-Jun	16-Jun	11-Jul	17-Aug	13-Sep	26-Oct	28-Nov	14-Dec	23-Dec
RAINFALL	INCHES	Not Applicable	0	0.41	0	0	0	0	0	0	0.83
VOLUME DISCHARGED	MG	180 MGD	0.46	0.77	0.21	0.4	0.036	0.07	0.2	0.2	0.6
pH	pH UNITS	6.0 TO 9.0	8.3	8.33	8.2	8.1	8.2	8.3	8.3	8.0	8.1
TEMPERATURE	DEG. F	NTE 100F	62.1	58.0	72.7	63.9	66.1	56.5	52.1	54.2	48.9
TURBIDITY	TU	Not Stated	0.4	1.9	0.9	3	4.7	1.6	1.9	8.1	39 *
TOTAL SUSPENDED SOLIDS	mg/l	15	ND	10	ND	10	15	< 10	< 10	< 10	10
SETTLEABLE SOLIDS	mg/l	0.1	ND	ND	ND	ND	ND	< 0.1	< 0.1	< 0.1	< 0.1 *
TOTAL DISSOLVED SOLIDS	mg/l	-	610	600	600	500	630	610	620	600	630
TOTAL ORGANIC CARBON	ug/l	Not Stated	1.6	3.9	3.6	5.1	2.7	2.8	2.8	3.6	3.5
CONDUCTIVITY @ 25 C	umhos/cm	Not Stated	910	910	880	830	890	950	950	930	1000
BOD 5-DAY @ 20 C	mg/l	30	< 2	6	< 2	3	10	3	3	2	< 2 *
OIL AND GREASE	mg/l	15	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3
CHLORIDE	mg/l	150	56	57	61	63	62	62	69	65	63
FLUORIDE	mg/l	1	0.4	0.4	0.5	0.4	0.4	0.4	0.3	0.3	0.3
NITRATE AND NITRITE (AS NITROGEN)	mg/l	8	ND	1.1	2.0	1.1	0.2	< 0.1	< 0.1	1.1	1.2 *
SULFATE	mg/l	300	160	150	150	130	130	140	160	160	130
SURFACTANTS (AS MBAs)	mg/l	0.5	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
RESIDUAL CHLORINE	mg/l	0.1	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04 *
ARSENIC	ug/l	5	2	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
BARIUM	ug/l	1,000	45	54	49	46	58	45	0.05	50	60
BORON	mg/l	1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1
TOTAL HARDNESS (CaCO3)	mg/l	Not Applicable	250	300	270	260	280	290	320	300	240
RADIOACTIVITY											
GROSS ALPHA	pCi/l	15	3 +/- 2	2 +/- 2	2 +/- 2	3 +/- 2	3 +/- 2	1.0 +/- 2	0.0 +/- 1	3 +/- 2	2 +/- 2
GROSS BETA	pCi/l	50	3 +/- 3	9 +/- 3	5 +/- 3	9 +/- 2	5 +/- 2	5 +/- 3	6 +/- 3	6 +/- 3	7 +/- 3
TOTAL RADIUM-226 & RADIUM 228	pCi/l	5	0.2 +/- 1	1.0 +/- 1	0.0 +/- 1	0.6 +/- 1	0.0 +/- 1	0.4 +/- 1	0.6 +/- 1	0.0 +/- 1	0.0 +/- 1
TRITIUM	pCi/l	20,000	0 +/- 200	300 +/- 300	0 +/- 300	130 +/- 200	0 +/- 200	0 +/- 300	20 +/- 200	0 +/- 200	20 +/- 200
STRONTIUM-90	pCi/l	8	0.3 +/- 1	0.0 +/- 1	0.0 +/- 1	0.0 +/- 1	0.5 +/- 1	0.0 +/- 1	0.0 +/- 1	0.0 +/- 2	0.5 +/- 1
METALS											
CADMIUM	ug/l	10	< 2 ug/l	< 2 ug/l	< 2 ug/l	< 2 ug/l	< 2 ug/l	< 2 ug/l	< 2 ug/l	< 2 ug/l	< 2 ug/l
CHROMIUM	ug/l	11	< 10 ug/l	< 10 ug/l	< 10 ug/l	< 10 ug/l	< 10 ug/l	< 10 ug/l	< 10 ug/l	< 10 ug/l	< 10 ug/l
COPPER	ug/l	1000	< 10 ug/l	< 10 ug/l	< 10 ug/l	< 10 ug/l	< 10 ug/l	< 10 ug/l	< 10 ug/l	< 10 ug/l	20 ug/l
LEAD	ug/l	12	< 2 ug/l	< 2 ug/l	< 2 ug/l	< 2 ug/l	2 ug/l	< 2 ug/l	< 2 ug/l	< 5 ug/l	< 5 ug/l
MERCURY	ug/l	12	< 0.2 ug/l	< 0.2 ug/l	< 0.2 ug/l	< 0.2 ug/l	< 0.2 ug/l	< 0.2 ug/l	< 0.2 ug/l	< 0.2 ug/l	< 0.2 ug/l
NICKEL	ug/l	600	< 10 ug/l	< 10 ug/l	< 10 ug/l	< 10 ug/l	< 10 ug/l	< 10 ug/l	< 10 ug/l	< 50 ug/l	< 10 ug/l
SELENIUM	ug/l	5	< 5 ug/l	< 5 ug/l	< 5 ug/l	< 5 ug/l	< 5 ug/l	< 5 ug/l	< 5 ug/l	< 10 ug/l	< 10 ug/l
SILVER	ug/l	50	< 5 ug/l	< 2 ug/l	< 2 ug/l	< 2 ug/l	< 2 ug/l	< 2 ug/l	< 2 ug/l	< 2 ug/l	10 ug/l
ZINC	ug/l	351	< 20 ug/l	40 ug/l	< 30 ug/l	< 30 ug/l	< 30 ug/l	< 30 ug/l	< 30 ug/l	< 30 ug/l	50 ug/l

Table 6-2. 1995 Analytical Results for NPDES Water Releases from Outfall 002 (R2A Flume) (Sheet 3 of 6)

CONSTITUENT	UNITS	LIMITS	3-Jan	10-Jan	24-Jan	14-Feb	10-Mar	21-Mar	6-Apr	19-Apr	10-May	15-May
PESTICIDES												
ALDRIN	pg/l	130	<0.01 ug	<0.01 ug	<0.01 ug	< 0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug	<0.05 ug	<0.05 ug
CHLORDANE	ng/l	0.08	<1.0 ug	<1.0 ug	<1.0 ug	< 1.0 ug	<1.0 ug	<1.0 ug	<1.0 ug	<1.0 ug	<0.02 ug	<0.02 ug
DDT	ng/l	0.59	<0.01 ug	<0.01 ug	<0.01 ug	< 0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug	<0.2 ug	<0.2 ug
DIELDRIN	ng/l	0.14	<0.1 ug	<0.1 ug	<0.1 ug	< 0.1 ug	<0.1 ug	<0.1 ug	<0.1 ug	<0.1 ug	<0.09 ug	<0.09 ug
ENDOSULFAN	ng/l	56	<0.1 ug	<0.1 ug	<0.1 ug	< 0.1 ug	<0.1 ug	<0.1 ug	<0.1 ug	<0.1 ug	<0.1 ug	<0.1 ug
ENDRIN	ng/l	2.3	0.05 ug/l	0.05 ug/l	0.05 ug/l	< 0.05 ug/l	<0.05 ug/l	<0.05 ug/l	<0.05 ug/l	<0.05 ug/l	<0.11 ug/l	<0.11 ug/l
HEPTACHLOR	pg/l	160	0.01 ug/l	0.01 ug/l	0.01 ug/l	< 0.01 ug/l	<0.01 ug/l	<0.01 ug/l	<0.01 ug/l	<0.01 ug/l	<0.07 ug/l	<0.07 ug/l
HEPTACHLOR EPOXIDE	pg/l	70	<0.01 ug	<0.01 ug	<0.01 ug	< 0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug	<0.08 ug	<0.08 ug
HEXACHLOROCYCLOHEXANE-ALPHA	ng/l	3.9	<0.01 ug	<0.01 ug	<0.01 ug	< 0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug	<0.08 ug	<0.08 ug
HEXACHLOROCYCLOHEXANE-BETA	ng/l	14	<0.03 ug	<0.03 ug	<0.03 ug	< 0.03 ug	<0.03 ug	<0.03 ug	<0.03 ug	<0.03 ug	<0.04 ug	<0.04 ug
HEXACHLOROCYCLOHEXANE-DELTA	ng/l	19	<0.01 ug	<0.01 ug	<0.01 ug	< 0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug	<0.01 ug	<0.06 ug	<0.06 ug
LINDANE	ug/l	Not Stated	<0.01	<0.01	<0.01	< 0.01	<0.01	<0.01	<0.01	<0.01	<0.06	<0.06
METHOXYCHLOR	ug/l	100	<0.5	<0.5	<0.5	< 0.5	<0.5	<0.5	<0.5	<0.5	<0.14	<0.14
2,4-D	ug/l	0.1	<0.05	<0.05	<0.05	< 0.05	<0.05	<0.05	<0.05	<0.05	<0.14	<0.14
2,4,5-TP-SILVEX	ug/l	10	<0.05	<0.05	<0.05	< 0.05	<0.05	<0.05	<0.05	<0.05	<10	<5
TOXAPHENE	pg/l	670	<1 ug	<1 ug	<1 ug	< 1 ug	<1 ug	<1 ug	<1 ug	<1 ug	<0.5 ug	<0.5 ug
VOLITILE ORGANICS												
DICHLOROMETHANE	ug/l	4.6	<2	<2	<2	< 2	<2	<0.4	<0.4	<1	<0.5	<0.5
1,1-DICHLOROETHYLENE	ug/l	6	<1	<1	<1	< 1	<1	<0.4	<0.4	<1	<1	<1
TRANS-1,2-DICHLOROETHYLENE	ug/l	10	<1	<1	<1	< 1	<1	<0.4	<0.4	<1	<1	<1
TRICHLOROETHYLENE	ug/l	5	<1	<1	<1	< 1	<1	<0.4	4.3	<1	<1	<1
1,1,2,2-TETRACHLOROETHANE	ug/l	1	<1	<1	<1	< 1	<1	<0.4	<0.4	<1	<0.3	<0.3
TETRACHLOROETHYLENE	ug/l	5	<1	<1	<1	< 1	<1	<0.4	<0.4	<1	<0.5	<0.5
VINYL CHLORIDE	ug/l	5	<2	<2	<2	< 2	<2	<2	<2	<1	<0.5	<0.5
CARBON TETRACHLORIDE	ug/l	0.5	<1	<1	<1	< 1	<1	<0.4	<0.4	<1	<0.3	<0.3
1,2-DICHLOROETHANE	ug/l	0.5	<1	<1	<1	< 1	<1	<0.4	<0.4	<1	<0.4	<0.4
1,1-DICHLOROETHANE	ug/l	5	<1	<1	<1	< 1	<1	<0.4	<0.4	<1	<1	<1
ETHYLBENZENE	ug/l	680	<1	<1	<1	< 1	<1	<1	<1	<1	<0.5	<0.5
1,1,1-TRICHLOROETHANE	ug/l	200	<1	<1	<1	< 1	<1	<0.4	<0.4	<1	<0.5	<0.5
1,1,2-TRICHLOROETHANE	ug/l	32	<1	<1	<1	< 1	<1	<0.4	<0.4	<1	<1	<0.5
BENZENE	ug/l	0.34	<1	<1	<1	< 1	<1	<1	<0.2	<1	<0.3	<0.3
CHLOROFORM	ug/l	100	<1	<1	<1	< 1	<1	<0.4	<0.4	<1	<0.5	1.6
BROMOFORM	ug/l	100	<1	<1	<1	< 1	<1	<2	<2	<1	<1	<1
TOLUENE	ug/l	10	<1	<1	<1	< 1	<1	<1	<1	<1	<0.5	<0.5
SEMI-VOLITILES												
FLUORANTHENE	ug/l	42	<2	<2	<2	< 2	<2	<2	<2	<2	<5	<5

Table 6-2. 1995 Analytical Results for NPDES Water Releases from Outfall 002 (R2A Flume) (Sheet 4 of 6)

CONSTITUENT	UNITS	LIMITS	7-Jun	16-Jun	11-Jul	17-Aug	13-Sep	26-Oct	28-Nov	14-Dec	23-Dec
PESTICIDES											
ALDRIN	pg/l	130	<0.05 ug	<0.05 ug	<0.05 ug	<0.05 ug	<0.05 ug	<0.05 ug	<0.05 ug	<0.05 ug	<0.05 ug
CHLORDANE	ng/l	0.08	<0.02 ug	<0.02 ug	<0.02 ug	<0.02 ug	<0.02 ug	<0.02 ug	<0.02 ug	<0.02 ug	<0.02 ug
DDT	ng/l	0.59	<0.2 ug	<0.2 ug	<0.2 ug	<0.2 ug	<0.2 ug	<0.2 ug	<0.2 ug	<0.2 ug	<0.2 ug
DIELDRIN	ng/l	0.14	<0.09 ug	<0.09 ug	<0.09 ug	<0.09 ug	<0.09 ug	<0.05 ug	<0.05 ug	<0.05 ug	<0.05 ug
ENDOSULFAN	ng/l	56	<0.1 ug	<0.1 ug	<0.1 ug	<0.1 ug	<0.1 ug	<0.05 ug	<0.05 ug	<0.05 ug	<0.05 ug
ENDRIN	ng/l	2.3	<0.11 ug/l	<0.11 ug/l	<0.11 ug/l	<0.11 ug/l	<0.11 ug/l	<0.05 ug	<0.05 ug	<0.05 ug	<0.05 ug
HEPTACHLOR	pg/l	160	<0.07 ug/l	<0.07 ug/l	<0.07 ug/l	<0.07 ug/l	<0.07 ug/l	<0.05 ug	<0.05 ug	<0.05 ug	<0.05 ug
HEPTACHLOR EPOXIDE	pg/l	70	<0.08 ug	<0.08 ug	<0.08 ug	<0.08 ug	<0.08 ug	<0.05 ug	<0.05 ug	<0.05 ug	<0.05 ug
HEXACHLOROCYCLOHEXANE-ALPHA	ng/l	3.9	<0.08 ug	<0.08 ug	<0.08 ug	<0.08 ug	<0.08 ug	<0.05 ug	<0.05 ug	<0.05 ug	<0.05 ug
HEXACHLOROCYCLOHEXANE-BETA	ng/l	14	<0.04 ug	<0.04 ug	<0.04 ug	<0.04 ug	<0.04 ug	<0.04 ug	<0.04 ug	<0.04 ug	<0.04 ug
HEXACHLOROCYCLOHEXANE-DELTA	ng/l	19	<0.06 ug	<0.06 ug	<0.06 ug	<0.06 ug	<0.06 ug	<0.05 ug	<0.05 ug	<0.05 ug	<0.05 ug
LINDANE	ug/l	Not Stated	<0.06	<0.06	<0.06	<0.06	<0.06	<0.05 ug	<0.05 ug	<0.05 ug	<0.05 ug
METHOXYCHLOR	ug/l	100	<0.14	<0.14	<0.14	<0.14	<0.14	<0.11	<0.11	<0.11	<0.11
2,4-D	ug/l	0.1	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14	<0.14
2,4,5-TP-SILVEX	ug/l	10	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	< 2
TOXAPHENE	pg/l	670	<0.5 ug	<0.5 ug	<0.5 ug	<0.5 ug	<0.5 ug	<0.5 ug	<0.5 ug	<0.5 ug	<0.5 ug
VOLITILE ORGANICS											
DICHLOROMETHANE	ug/l	4.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-DICHLOROETHYLENE	ug/l	6	<1	<1	<1	<1	<1	<1	<1	<1	<1
TRANS-1,2-DICHLOROETHYLENE	ug/l	10	<1	<1	<1	<1	<1	<1	<1	<1	<1
TRICHLOROETHYLENE	ug/l	5	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,1,2,2-TETRACHLOROETHANE	ug/l	1	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
TETRACHLOROETHYLENE	ug/l	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
VINYL CHLORIDE	ug/l	2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
CARBON TETRACHLORIDE	ug/l	0.5	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
1,2-DICHLOROETHANE	ug/l	0.5	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
1,1-DICHLOROETHANE	ug/l	5	<1	<1	<1	<1	<1	<1	<1	<1	<1
ETHYLBENZENE	ug/l	680	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,1-TRICHLOROETHANE	ug/l	200	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2-TRICHLOROETHANE	ug/l	32	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
BENZENE	ug/l	0.34	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
CHLOROFORM	ug/l	100	<0.5	1.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.7
BROMOFORM	ug/l	100	<1	<1	<1	<1	<1	<1	<1	<1	<1
TOLUENE	ug/l	10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
SEMI-VOLITILES											
FLUORANTHENE	ug/l	42	<5	<2	<2	<2	<2	<2	<2	<2	<2

Table 6-2. 1995 Analytical Results for NPDES Water Releases from Outfall 002 (R2A Flume) (Sheet 5 of 6)

CONSTITUENT	UNITS	LIMITS	3-Jan	10-Jan	24-Jan	14-Feb	10-Mar	21-Mar	6-Apr	19-Apr	10-May	15-May
BASE/NEUTRAL/ACID EXTRACTIBLES												
1,2-DICHLOROBENZENE	ug/l	-/-/2.7	<1	<1	<1	< 1	<3	<3	<0.4	<3	<6	<1
1,3-DICHLOROBENZENE	ug/l	-/-/400	<1	<1	<1	< 1	<3	<3	<1	<3	<6	<1
1,4-DICHLOROBENZENE	ug/l	-/-/9.9	<1	<1	<1	< 1	<3	<3	<1	<3	<6	<1
HEXACHLOROBENZENE	pg/l	-/-/880	<3 ug/l	<3 ug/l	<3 ug/l	< 3 ug/l	<3 ug/l	<3 ug/l	<3 ug/l	<3 ug/l	<4 ug/l	<3 ug/l
N-NITROSODIMETHYLAMINE	ug/l	0.02/-/-	<2	<2	<2	< 2	<2	<2	<2	<2	<3	<2
PENTACHLOROPHENOL	ug/l	NC/ NC /0.28	<1	<1	<1	< 1	<20	<20	<20	<20	<5	<20
PHENOL	ug/l	-/-/300	<5	<5	<5	< 5	<5	<5	<5	<5	<2	<5
2,4,6-TRICHLOROPHENOL	ug/l	-/-/0.34	<1	<1	<1	< 1	<10	<10	<10	<10	<5	<10
2-4 DICHLOROPHENOL	ug/l	-/-/0.30	<1	<1	<1	< 1	<10	<10	<10	<10	<4	<10
4-CHLORO-3-METHYLPHENOL	ug/l	-/-/3000	<1	<1	<1	< 1	<10	<10	<10	<10	<5	<10
MISCELLANEOUS												
CYANIDE	ug/l	22/-/-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB's (CA INLAND SURFACE WATERS PLAN)	pg/l	-/14000/70	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH's (CA INLAND SURFACE WATERS PLAN)	ng/l	-/-/2.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
HALOMETHANES (CA INLAND SURF. WATERS PLAN)	ug/l	-/-/100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOXICITY - BIOASSAYS												
ACUTE	% SURVIVAL	70% MINIMUM		100%	100%	100%	95%	100%	100%	100%	100%	100%
CHRONIC	TUC	-/-/1	1	NA	NA	NA	NA	NA	1.00	NA	NA	NA
PRIORITY POLLUTANTS (IN EXCESS OF ROUTINE)												
PERFORMED QUARTERLY	ug/l	NOT STATED	ND	NA	NA	NA	NA	NA	ND	NA	NA	NA

Table 6-2. 1995 Analytical Results for NPDES Water Releases from Outfall 002 (R2A Flume) (Sheet 6 of 6)

CONSTITUENT	UNITS	LIMITS	7-Jun	16-Jun	11-Jul	17-Aug	13-Sep	25-Oct	28-Nov	14-Dec	23-Dec
BASE/NEUTRAL/ACID EXTRACTIBLES											
1,2-DICHLOROBENZENE	ug/l	-/-/2.7	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,3-DICHLOROBENZENE	ug/l	-/-/400	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,4-DICHLOROBENZENE	ug/l	-/-/5.5	<1	<1	<1	<1	<1	<1	<1	<1	<1
HEXACHLOROBENZENE	pg/l	-/-/660	<4 ug/l	<2 ug/l	<2 ug/l	<2 ug/l	<2 ug/l	<2 ug/l	<2 ug/l	<2 ug/l	<2 ug/l
N-NITROSODIMETHYLAMINE	ug/l	0.02/-/-	<3	<2	<2	<2	<2	<2	<2	<2	<2
PENTACHLOROPHENOL	ug/l	NC/ NC/0.28	<5	<3	<3	<3	<3	<3	<3	<3	<3
PHENOL	ug/l	-/-/1300	<2	<2	<2	<2	<2	<2	<2	<2	<2
2,4,6-TRICHLOROPHENOL	ug/l	-/-/0.34	<5	<2	<2	<2	<2	<2	<2	<2	<2
2-4 DICHLOROPHENOL	ug/l	-/-/0.30	<4	<2	<2	<2	<2	<2	<2	<2	<2
4-CHLORO-3-METHYLPHENOL	ug/l	-/-/3000	<5	<2	<2	<2	<2	<2	<2	<2	<2
MISCELLANEOUS											
CYANIDE	ug/l	22/-/-	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB's (CA INLAND SURFACE WATERS PLAN)	pg/l	-/14000/170	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAH's (CA INLAND SURFACE WATERS PLAN)	ng/l	-/-/2.8	ND	ND	ND	ND	ND	ND	ND	ND	ND
HALOMETHANES (CA INLAND SURF. WATERS PLAN)	ug/l	-/-/100	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOXICITY - BIOASSAYS											
ACUTE	% SURVIVAL	70% MINIMUM	100%	100%	95%	100%	100%	100%	100%	100%	100%
CHRONIC	TUC	-/-/1	NA	NA	1.00	NA	NA	1.00	NA	NA	NA
PRIORITY POLLUTANTS (IN EXCESS OF ROUTINE)											
PERFORMED QUARTERLY	ug/l	NOT STATED	NA	NA	ND	NA	NA	ND	NA	NA	NA

Table 6-3. 1995 Analytical Results for NPDES Water Releases from Outfall 003 (RMHF)

CONSTITUENT	UNITS	LIMITS	4-Jan	10-Jan	24-Jan	14-Feb	11-Mar	21-Mar	16-May
RAINFALL	INCHES	Not Applicable	3.42	4.96	2.45	0.74	1.16	0.4	1.00
VOLUME DISCHARGED	MG	160 MGD	0.96	1.39	0.69	0.21	0.33	0.11	0.28
pH	pH UNITS	6.0 TO 9.0	7.57	7.1	7.3	7.7	7.0	8.2	8.0
TEMPERATURE	DEG. F	NTE > 100	46.8	53.4	54.0	54.8	59.8	61.9	57.4
TOTAL DISSOLVED SOLIDS	mg/l	850	530	119	161	260	156	414	610
OIL AND GREASE	mg/l	15	< 5	1.2	0.3	1.4	1.5	1.5	< 3
CHLORIDE	mg/l	150	3.9	6.6	9.1	13.7	4.9	16	71
FLUORIDE	mg/l	1.0	0.30	<0.1	<0.1	0.4	0.38	0.58	0.5
NITRATE AND NITRITE (AS NITROGEN)	mg/l	10	0.72	1.2	1.44	0.84	1.11	< 0.05	0.2
SULFATE	mg/l	250	11.3	16	22	47.0	14	76	200
RESIDUAL CHLORINE	mg/l	0.1	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
BORON	mg/l	1.0	0.11	0.25	0.3	0.27	< 0.05	0.23	0.1
RADIOACTIVITY									
GROSS ALPHA	pCi/l	15	0.5 +/- 0.8	0.8 +/- 1.1	0.7 +/- 1.2	1.9 +/- 1.7	0.3 +/- 1.0	8.5 +/- 4.2	8 +/- 2
GROSS BETA	pCi/l	50	19 +/- 2	4.7 +/- 1.9	6.3 +/- 1.7	6.0 +/- 1.8	8.0 +/- 1.9	17 +/- 4	18 +/- 3
TOTAL RADIUM-226 & RADIUM 228	pCi/l	5	0.6 +/- 1.7	0.9 +/- 1.2	0.4 +/- 1.8	2.1 +/- 2.6	1.5 +/- 1.8	1.7 +/- 2.0	0.8 +/- 1
TRITIUM	pCi/l	20,000	0 +/- 238	159 +/- 224	0 +/- 219	73 +/- 215	233 +/- 230	460 +/- 244	110 +/- 300
STRONTIUM-90	pCi/l	8	8 +/- 11	5.1 +/- 5.7	3.2 +/- 1.2	2.0 +/- 1.3	5.4 +/- 1.9	4.8 +/- 1.8	3 +/- 2
TOXICITY - BIOASSAYS									
ACUTE	% SURVIVAL	70% MINIMUM	95%	100%	100%	100%	95%	100%	95%
CHRONIC	TUC	1	1.00	NA	NA	NA	NA	NA	1.00
PRIORITY POLLUTANTS									
BERYLLIUM	ug/l	Not Stated	ND	NA	NA	NA	NA	NA	3
CHROMIUM	ug/l	Not Stated	8.7	NA	NA	NA	NA	NA	90
COPPER	ug/l	Not Stated	60	NA	NA	NA	NA	NA	40
LEAD	ug/l	Not Stated	ND	NA	NA	NA	NA	NA	45
NICKEL	ug/l	Not Stated	30	NA	NA	NA	NA	NA	60
ZINC	ug/l	Not Stated	180	NA	NA	NA	NA	NA	270
ALL OTHERS	ug/l	Not Stated	ND	NA	NA	NA	NA	NA	ND

Table 6-4. 1995 Analytical Results for NPDES Water Releases from Outfall 004 (SRE)

CONSTITUENT	UNITS	LIMITS	3-Jan	10-Jan	24-Jan	14-Feb	11-Mar	21-Mar	15-May
RAINFALL	INCHES	Not Applicable	0.78	4.96	2.45	0.74	1.16	0.4	1.00
VOLUME DISCHARGED	MG	160 MGD	0.31	1.96	0.97	0.29	0.46	0.16	0.40
pH	pH UNITS	6.0 TO 9.0	6.44	6.9	7.23	7.3	7.6	7.9	6.9
TEMPERATURE	DEG. F	NTE > 100	51.8	54.8	52	54.2	59.8	60.8	54.2
TOTAL DISSOLVED SOLIDS	mg/l	850	64	61.0	103	76.0	233	242	200
OIL AND GREASE	mg/l	15	< 5	0.87	1.3	1.1	0.8	1.9	< 3
CHLORIDE	mg/l	150	2.9	2.5	4.5	2.7	7.4	9	7
FLUORIDE	mg/l	1.0	0.27	<0.1	<0.1	0.2	0.38	0.46	0.1
NITRATE AND NITRITE (AS NITROGEN)	mg/l	10	1.24	0.90	1.94	< 0.05	1.62	0.18	0.9
SULFATE	mg/l	250	6.2	4.5	11	10.4	28	43	21
RESIDUAL CHLORINE	mg/l	0.1	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
BORON	mg/l	1.0	0.06	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
RADIOACTIVITY									
GROSS ALPHA	pCi/l	15	0.5 +/- 1.1	0 +/- 0.8	0.4 +/- 0.9	0.2 +/- 0.8	1.8 +/- 1.5	4.8 +/- 2.5	0.7 +/- 1
GROSS BETA	pCi/l	50	6.3 +/- 1.7	2.6 +/- 1.8	4.3 +/- 1.6	3.6 +/- 1.5	9.4 +/- 2.1	7.0 +/- 2.6	3 +/- 2
TOTAL RADIUM-226 & RADIUM 228	pCi/l	5	1.5 +/- 2.0	0.9 +/- 1.1	1.0 +/- 1.7	3.6 +/- 2.8	1.7 +/- 1.1	3.4 +/- 3.8	0.1 +/- 1
TRITIUM	pCi/l	20,000	68 +/- 243	82 +/- 220	0 +/- 219	73 +/- 215	287 +/- 232	382 +/- 239	0 +/- 300
STRONTIUM-90	pCi/l	8	0.8 +/- 1.6	2.5 +/- 5.7	1.9 +/- 1.4	1.0 +/- 1.4	4.3 +/- 1.9	1.6 +/- 1.0	0.0 +/- 1
TOXICITY - BIOASSAYS									
ACUTE	% SURVIVAL	70% MINIMUM	100%	100%	100%	100%	90%	100%	100%
CHRONIC	TUC	1	1.00	NA	NA	NA	NA	NA	1.00
PRIORITY POLLUTANTS									
ANTIMONY	ug/l	Not Stated	ND	NA	NA	NA	NA	NA	5
CHROMIUM	ug/l	Not Stated	ND	NA	NA	NA	NA	NA	40
COPPER	ug/l	Not Stated	50	NA	NA	NA	NA	NA	ND
LEAD	ug/l	Not Stated	ND	NA	NA	NA	NA	NA	4
ZINC	ug/l	Not Stated	240	NA	NA	NA	NA	NA	110
ALL OTHERS			ND	NA	NA	NA	NA	NA	ND

Table 6-5. 1995 Analytical Results for NPDES Water Releases from Outfall 005 (SBP-1)

CONSTITUENT	UNITS	LIMITS	3-Jan	4-Jan	10-Jan	12-Jan	24-Jan	14-Feb	11-Mar	23-Mar	15-May
RAINFALL	INCHES	Not Applicable	0.78	NA	4.96	NA	2.45	0.74	1.16	1.00	1.00
VOLUME DISCHARGED	MG	160 MGD	0.32	NA	2.03	NA	1.00	0.30	0.47	0.41	0.41
pH	pH UNITS	6.0 TO 9.0	7.06	NA	7.6	NA	7.5	7 6	7.7	7.1	7.9
TEMPERATURE	DEG. F	NTE > 100	48.4	NA	53.2	NA	51.8	55.6	60.8	55	57.6
TOTAL DISSOLVED SOLIDS	mg/l	850	140	NA	104	NA	150	343	85	196	< 40
OIL AND GREASE	mg/l	15	6.0	NA	1.0	NA	0.0	0.7	2.1	1 2	< 3
CHLORIDE	mg/l	150	2.1	NA	2.2	NA	4.2	20.3	4.5	4.0	3
FLUORIDE	mg/l	1.0	0.80	NA	<0.1	NA	<0.1	0.3	0.38	0.39	0.2
NITRATE AND NITRITE (AS NITROGEN)	mg/l	10	1.83	NA	2.1	NA	4.94	0.90	1.02	3.02	0.5
SULFATE	mg/l	250	9.1	NA	2.7	NA	7.3	40.4	11	12	4
RESIDUAL CHLORINE	mg/l	0.1	< 0.04	NA	< 0.04	NA	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
BORON	mg/l	1.0	0.10	NA	0.27	NA	< 0.05	0.40	< 0.05	0.25	< 0.05
RADIOACTIVITY											
GROSS ALPHA	pCi/l	15	0.4 +/- 0.7	NA	0.7 +/- 1.0	NA	0.3 +/- 1.1	10 +/- 3	2.8 +/- 1.6	2.2 +/- 1.7	8 +/- 2
GROSS BETA	pCi/l	50	4.8 +/- 1.7	NA	2.7 +/- 1.8	NA	2 3 +/- 1.5	4.9 +/- 1.8	2.6 +/- 1.7	3.7 +/- 2.4	18 +/- 3
TOTAL RADIUM 226 & RADIUM 228	pCi/l	5	1.1 +/- 1.9	NA	0.9 +/-1.1	NA	1.9 +/- 2.1	1.4 +/- 2.5	1.1 +/- 1.5	1.5 +/- 2.0	0.8 +/- 1
TRITIUM	pCi/l	20,000	199 +/- 225	NA	0 +/- 215	NA	0 +/- 219	247 +/- 226	259 +/- 229	180 +/- 224	170 +/- 300
STRONTIUM 90	pCi/l	8	1.1 +/- 1.7	NA	0.5 +/- 5.0	NA	0.7 +/- 1.2	1.1 +/- 1.2	1.7 +/- 1.4	0.6 +/- 1.2	3 +/- 2
TOXICITY - BIOASSAYS											
ACUTE	% SURVIVAL	70% MINIMUM	100%	NA	100%	NA	100%	100%	95%	100%	100%
CHRONIC	TUC	1	1	NA	NA	NA	NA	NA	NA	NA	1.00
PRIORITY POLLUTANTS											
CHROMIUM	ug/l	Not Stated	ND	NA	ND	NA	NA	NA	NA	NA	50
COPPER	ug/l	Not Stated	50	NA	NA	NA	NA	NA	NA	NA	120
LEAD	ug/l	Not Stated	ND	NA	NA	NA	NA	NA	NA	NA	16
MERCURY	ug/l	Not Stated	ND	NA	NA	NA	NA	NA	NA	NA	0.4
NICKEL	ug/l	Not Stated	ND	NA	NA	NA	NA	NA	NA	NA	30
ZINC	ug/l	Not Stated	70	NA	NA	NA	NA	NA	NA	NA	120
PCB 1254	ug/l	Not Stated	ND	ND	NA	ND	NA	NA	NA	NA	ND
BENZENE	ug/l	Not Stated	ND	NA	NA	NA	NA	NA	NA	NA	5.6
ETHYL BENZENE	ug/l	Not Stated	ND	NA	NA	NA	NA	NA	NA	NA	1.2
TOLUENE	ug/l	Not Stated	ND	NA	NA	NA	NA	NA	NA	NA	16
XYLENE	ug/l	Not Stated	ND	NA	NA	NA	NA	NA	NA	NA	8
ALL OTHERS	ug/l	Not Stated	ND	NA	NA	NA	NA	NA	NA	NA	ND

Table 6-6. 1995 Analytical Results for NPDES Water Releases from Outfall 006 (SBP-2)

CONSTITUENT	UNITS	LIMITS	3-Jan	4-Jan	10-Jan	12-Jan	24-Jan	14-Feb	11-Mar	23-Mar	15-May
RAINFALL	INCHES	Not Applicable	0.78	NA	4.96	NA	2.45	0.74	1.16	1.00	1.00
VOLUME DISCHARGED	MG	180 MGD	0.24	NA	1.50	NA	0.74	0.22	0.35	0.30	0.30
pH	pH UNITS	6.0 TO 9.0	7.8	NA	6.6	NA	6.5	6.7	6.5	7.4	8.0
TEMPERATURE	DEG. F	NTE > 100	50	NA	53.4	NA	52.8	56.4	57	56	54.8
TOTAL DISSOLVED SOLIDS	mg/l	550	172	NA	109	NA	102	137	110	116	490
OIL AND GREASE	mg/l	15	< 5	NA	1.0	NA	< 0.2	1.3	1.9	0.9	< 0.2
CHLORIDE	mg/l	150	8.7	NA	3.5	NA	4.3	10.4	5.7	9.0	18
FLUORIDE	mg/l	1.0	0.28	NA	<0.1	NA	<0.1	0.2	0.38	0.35	0.3
NITRATE AND NITRITE (AS NITROGEN)	mg/l	10	2.51	NA	2.7	NA	2.78	0.86	1.02	0.89	3.4
SULFATE	mg/l	250	3.5	NA	3.5	NA	5.3	13.0	12.0	10.0	22
RESIDUAL CHLORINE	mg/l	0.1	< 0.04	NA	< 0.04	NA	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
BORON	mg/l	1.0	< 0.05	NA	0.30	NA	< 0.05	< 0.05	< 0.05	0.21	< 0.05
RADIOACTIVITY											
GROSS ALPHA	Pci/l	15	1.0 +/- 1.0	NA	0.6 +/- 1.0	NA	1.2 +/- 1.0	0.0 +/- 1.0	0.8 +/- 1.0	0.0 +/- 1.0	2 +/- 1
GROSS BETA	Pci/l	50	14 +/- 2	NA	2.5 +/- 1.7	NA	2.3 +/- 1.5	3.5 +/- 1.6	2.5 +/- 1.6	1.9 +/- 2.2	4 +/- 3
TOTAL RADIUM-226 & RADIUM 228	Pci/l	5	1.6 +/- 2.0	NA	0.4 +/- 1.1	NA	1.2 +/- 1.8	1.4 +/- 2.5	1.3 +/- 1.4	1.6 +/- 2.0	0.3 +/- 1
TRITIUM	Pci/l	20,000	0 +/- 238	NA	0 +/- 215	NA	0 +/- 219	99 +/- 216	283 +/- 233	419 +/- 242	160 +/- 300
STRONTIUM-90	Pci/l	8	0.3 +/-1.5	NA	1.2 +/- 5.5	NA	0.0 +/- 1.4	0.7 +/-1.4	0.6 +/-1.4	1.4 +/-1.5	0.0 +/-1
TOXICITY - BIOASSAYS											
ACUTE	% SURVIVAL	70% MINIMUM	100%	NA	100%	NA	100%	100%	100%	100%	100%
CHRONIC	TUC	1	1.00	NA	NA	NA	NA	NA	NA	NA	1.00
PRIORITY POLLUTANTS											
BERYLLIUM	ug/l	Not Stated	ND	NA	NA	NA	NA	NA	NA	NA	8
CADMIUM	ug/l	Not Stated	ND	NA	NA	NA	NA	NA	NA	NA	4
CHROMIUM	ug/l	Not Stated	7.2	NA	NA	NA	NA	NA	NA	NA	240
COPPER	ug/l	Not Stated	100	NA	NA	NA	NA	NA	NA	NA	130
LEAD	ug/l	Not Stated	30	NA	NA	NA	NA	NA	NA	NA	75
MERCURY	ug/l	Not Stated	ND	NA	NA	NA	NA	NA	NA	NA	2
NICKEL	ug/l	Not Stated	40	NA	NA	NA	NA	NA	NA	NA	170
THALLIUM	ug/l	Not Stated	ND	NA	NA	NA	NA	NA	NA	NA	2
ZINC	ug/l	Not Stated	210	NA	NA	NA	NA	NA	NA	NA	640
BIS- (2-ETHYLHEXYL) PHTHALATE	ug/l	Not Stated	3.4	NA	NA	NA	NA	NA	NA	NA	ND
PCB 1254	ug/l	Not Stated	ND	ND	NA	ND	NA	NA	NA	NA	NA
ALL OTHERS			ND	NA	NA	NA	NA	NA	NA	NA	ND

Table 6-7. 1995 Analytical Results for NPDES Water Releases from Outfall 007 (T100)

CONSTITUENT	UNITS	LIMITS	4-Jan	10-Jan	24-Jan	14-Feb	10-Mar	21-Mar
RAINFALL	INCHES	Not Applicable	3.42	4.96	2.45	0.74	3.13	0.40
VOLUME DISCHARGED	MG	160 MGD	0.94	1.37	0.68	0.20	0.86	0.11
pH	pH UNITS	6.0 TO 9.0	6.26	6.5	6.74	6.9	7.37	7.7
TEMPERATURE	DEG. F	NTE > 100	48.7	55.4	58.3	53.4	52.1	62.4
TOTAL DISSOLVED SOLIDS	mg/l	850	122	63.0	100	132	159	164
OIL AND GREASE	mg/l	15	< 5	1.0	1.7	1.8	0.8	1.6
CHLORIDE	mg/l	150	6.9	1.2	1.7	12.6	3.6	5
FLUORIDE	mg/l	1.0	0.30	<0.1	<0.1	0.2	0.38	0.39
NITRATE AND NITRITE (AS NITROGEN)	mg/l	10	7.29	0.95	2.03	1.38	< 0.05	0.19
SULFATE	mg/l	250	8.5	2.1	3.3	2.6	3.5	4
RESIDUAL CHLORINE	mg/l	0.1	*< 0.04*	*< 0.04*	< 0.04	< 0.04	< 0.04	< 0.04
BORON	mg/l	1.0	0.13	< 0.05	< 0.05	0.26	< 0.05	< 0.05
RADIOACTIVITY								
GROSS ALPHA	Pci/l	15	*0.4 +/- 1.2*	*0 +/- 0.8*	*0.3 +/- 0.9*	0.0 +/- 1.0	0.9 +/- 1.2	1.1 +/- 1.7
GROSS BETA	Pci/l	50	9.0 +/- 2.0	2.6 +/- 1.8	3.4 +/- 1.5	2.8 +/- 1.6	2.7 +/- 1.7	3.7 +/- 2.4
TOTAL RADIUM-226 & RADIUM 228	Pci/l	5	1.1 +/- 1.8	1.3 +/- 2.1	1.2 +/- 2.1	0.7 +/- 2.4	0.3 +/- 1.2	0.9 +/- 2.1
TRITIUM	Pci/l	20,000	0 +/- 238	76 +/- 218	0 +/- 219	99 +/- 216	48 +/- 217	126 +/- 220
STRONTIUM-90	Pci/l	8	*0.7 +/-1.6*	*3.4 +/- 5.8*	*0.0 +/- 1.3*	*1.6 +/-1.4*	0.8 +/-1.5	0.7 +/-0.9
TOXICITY - BIOASSAYS								
ACUTE	% SURVIVAL	70% MINIMUM	100%	100%	100%	100%	100%	100%
CHRONIC	TUC	1	1	NA	NA	NA	NA	NA
PRIORITY POLLUTANTS								
COPPER	ug/l	Not Stated	20	NA	NA	NA	NA	NA
ZINC	ug/l	Not Stated	40	NA	NA	NA	NA	NA
ALL OTHERS			ND	NA	NA	NA	NA	NA

6.2 AIR

Atmospheric pollutant discharge limitations are imposed by VCAPCD Permit 0271 on natural gas personnel comfort space heaters, boilers in various buildings in Area IV, several natural gas/oil-fired sodium heaters operated by ETEC for component testing, and the Kalina facility. The permit for 1995 was issued July 7, 1995. The permit for 1996 was renewed on June 13, 1996.

VCAPCD Rule 74.15, as adopted in March 1989 and revised in December 1991, sets limits for oxides of nitrogen (NOx) and carbon monoxide (CO) emissions on boilers, steam generators, and process heaters. The Sodium Component Test Installation (SCTI) finished installing the new low-NOx burners in 1991 as well as the carbon monoxide continuous emissions monitoring system. An extended variance to the rule was applied for and granted, running through December 31, 1992 to allow for source testing and adjusting of the H-1 and H-2 sodium heaters and the H-101 boiler to bring them into compliance. Further extensions of the variance were granted to November 30, 1994. ETEC operated under Variance 392-3 until the amended Rule 74.15 was adopted on November 8, 1994. VCAPCD is in the process of revising permit No. 0271. ETEC has been assured by VCAPCD that ETEC is not in violation as long as VCAPCD is processing the permit renewal.

A permit modification application was submitted to VCAPCD on June 3, 1994 to update the permit for language changes, revisions to existing conditions and proposed operations. Included were changes to the Kalina Plant operations that raised the permitted ammonia emissions from 9.3 tons per year and 2.12 lb per hour to 51 and 80, respectively. The current permit reflects these changes.

6.3 GROUNDWATER

A groundwater monitoring program has been in place at the SSFL site since 1984. This has been accomplished largely under the direction and guidance of the regulatory agencies, RWQCB, Los Angeles (responsible during the period 1984 through July 1989) and Cal-EPA DTSC (since August 1989). During the investigation, 232 on-site and off-site wells have been installed and monitored. Ten off-site wells are near the northwest boundary. Ninety-three of these wells are in the Shallow Zone, and 139 (including private off-site wells) have been drilled into the Chatsworth Formation, the indurated sandstone that constitutes the dominant aquifer underlying the facility. In Area IV, the lower pond at the Former Sodium Disposal Facility (T886) was identified as a potentially chemically impacted area, and subsurface soil samples were taken at numerous locations. Chemically and radiologically impacted soils were removed from the T886 site.

Routine quarterly chemical and radiological monitoring of the wells is conducted according to the monitoring plan submitted to the lead agency for the groundwater program.

Quarterly reports are submitted to the regulatory agencies at the end of the first three quarters. An annual report is submitted after the monitoring for the fourth quarter is completed.

Hydrogeologic studies at SSFL describe two groundwater systems at the site: a shallow, unconfined system in the alluvium (surface mantle soils) of the Burro Flats area and along the major drainage channels, and a deeper fracture controlled groundwater system in the Chatsworth Formation sandstone (bedrock). The alluvium is composed of a heterogeneous mixture of gravel, sand, silt, and clay, which are known to have hydraulic conductivities ranging from 0.1 to 100 gal·day·ft^{-2}. Water levels in the alluvium respond to recharge resulting from precipitation and runoff, and may vary considerably between wet and dry periods.

The Chatsworth Formation is composed of well-consolidated, massively bedded sandstones with interbedded layers of siltstone and claystone. The formation may be as thick as 6,000 ft at the SSFL site. The regional direction of groundwater flow in the formation is probably radially off-site toward the surrounding lowlands. The permeability of the Chatsworth Formation is very low except along open fractures. Groundwater within fractures occurs mostly under confined conditions.

The hydrogeologic environment at the SSFL site is a dynamic system. The groundwater system is recharged by precipitation migration through fractures and from unlined ponds and drainage channels. Because of the meager rainfall in the area and the relatively large variability in annual precipitation, groundwater recharge is low and may vary greatly from year to year. Specific pathways of possible transport of contaminant-bearing groundwater along fracture zones are difficult to predict on the basis of the well data. Fracture zones vary widely in frequency and geometry. Water transmitting characteristics also vary from one location to the other as well as from one specific depth to another. Not all fractures are water-bearing. Recharge over the area may also vary over both space and time.

The solvents found in the groundwater include trichloroethylene (TCE) and its family of degradation products. The results of the analyses of the Area IV wells have been documented in the "Area IV (Phase III) Groundwater Investigation Report" prepared for Rocketdyne by Groundwater Resources Consultants, Inc., in December 1992, as well as in their 1995 Annual Report.

The bulk of the Area IV shallow groundwater is seasonal and dependent upon rain/natural drainage patterns. The surface water sampling occurs rarely because it is rain-prompted. Documentation of these rainfall events since November 1989 has been submitted to the California RWQCB (Los Angeles area).

Three existing TCE occurrences in the northwest part of Area IV were monitored in 1995. The TCE occurrences are shown in Figure 6-3. As indicated in the figure, two of the three occurrences (north and south) have spread slightly off-site to the northwest. The remaining occurrence may also extend offsite, however, no data are available because this area is located in

inaccessible terrain. The installation of nine new monitor wells in 1993-1994 detected no new off-site plume of degraded groundwater near Area IV.

The shallow zone well RS-28, one of the two on-site wells within the TCE occurrence (No. 1, fig. 6-3), recorded 59 µg/l TCE in August 1995. The other well, a Chatsworth Formation well (RD-30) showed 18 to 29 µg/l TCE in 1995. Both wells were installed in 1989. RD-34A, an off-site Chatsworth Formation well (shallowest well of a three-well cluster constructed in 1991), within the same occurrence also recorded a decrease in the range of the TCE concentration. It showed less than 0.4 to 19 µg/l TCE in 1995, compared to 16 to 39 µg/l in 1994. RD-63, an extraction well installed in 1994 for the pilot extraction test in the area, recorded 7.5 to 11 µg/l TCE in 1995.

The Chatsworth Formation well (RD-7), the only well within the occurrence (No. 2, Figure 6-3) southwest of T059, also recorded a TCE concentration of 47 to 53 µg/l in 1995 compared to 37 to 38 µg/l in 1994. Since its construction in 1986, RD-7 generally maintained the TCE concentration in the 16 to 35 µg/l range with peaks ranging up to 130 µg/l.

RD-25, located southwest of T059, continued to exhibit perchloroethene (PCE). In 1995, the well recorded 32 to 42 µg/l PCE, compared to 29 to 32 µg/l PCE in 1994. From 1989 to 1993, the well showed less than 1 to 39 µg/l PCE.

Three wells, a Chatsworth Formation well (RD-54A, shallowest of the three bedrock well cluster constructed in 1993) and two shallow zone wells (RS-18 and RS-54) of the occurrence (No. 3, Figure 6-3) near T886, recorded a significant increasing trend in TCE concentration during 1993 to 1994. TCE in RS-54 decreased from a 1994 range of 2300 to 4500 µg/l to the 1995 range of 1700 to 2800 µg/l. RD-54A, constructed in 1989, showed 200 to 390 µg/l TCE in 1995 compared to 190 to 320 µg/l in 1994. RS-18, mostly dry since its construction in 1985 to 1991, recorded an increase in TCE from 2,700 µg/l in 1993 to 3,200 µg/l in 1994. RD-21 and RD-23, two Chatsworth Formation wells installed in 1989 recorded an increase in TCE from 88 to 1,600 µg/l in 1994 to 350 to 2200 µg/l in 1995. RD-33A, an off-site Chatsworth Formation well (shallowest well of a three-well cluster constructed in 1991) of the occurrence, showed 3.0 to 6.3 µg/l TCE in 1995, compared to 2.4 to 9.5 µg/l TCE in 1994.

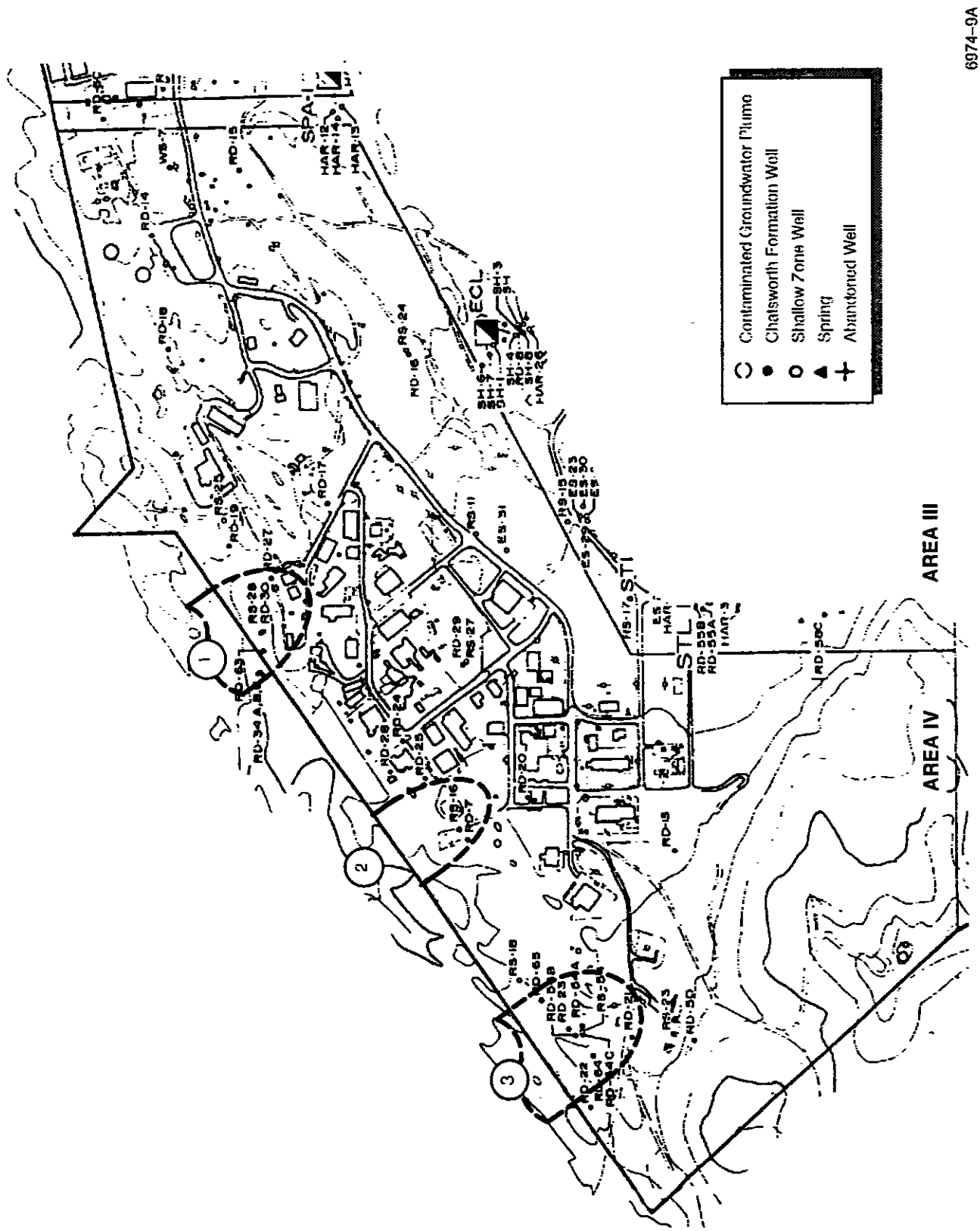

Figure 6-3. TCE Occurrences in Groundwater at SSFL, Area IV

The Interim Well Construction Plan for the most recent phase of monitor well installation and testing at SSFL started in 1993 and was completed in 1994. The Interim Well Construction Plan was approved by Cal-EPA DTSC in November 1992. Eight new Chatsworth Formation wells were constructed in Area IV and off-site northwest of Area IV with DOE funding. Six of these wells were drilled as two well clusters, each with three wells. One of these two clusters was drilled in the T886 area as required by the T886 closure. The other cluster was located off-site, down gradient and west of the RMHF area. An off-site well was also drilled down gradient of T886. The eighth well was drilled south of T886 near the Burro Flats Fault. In addition to the eight Chatsworth Formation wells, one shallow zone well (RS-54) was also completed in the T886 area. The new wells are designed to characterize the hydrogeology and water quality of known groundwater contamination, horizontally and vertically and in relation to the potential source areas. The drilling for the DOE-funded wells started in May 1993 and was completed in June 1994.

A proposed plan for the construction and testing of two pilot groundwater extraction systems in Area IV was submitted to DTSC in August 1993. Following the approval by DTSC, one well was installed for an extraction test at RMHF in May 1994 and two wells were installed at T886 in May and August 1994. All three wells were located within the Area IV boundary. The goal of the project was to develop a full-scale, long-term system needed to contain, extract, and treat degraded groundwater at Area IV. Both tests were completed in 1995.

The test at RMHF included installation of an extraction well, and treatment of the extracted water in a portable carbon adsorption treatment unit. Results indicate the effectiveness of groundwater extraction in the test well at RMHF in creating a capture zone for degraded groundwater. The capture zone extended up to 200 ft downgradient of the extraction well. Two new wells were installed for the test at T886. Cyclic pumping of one to three wells was conducted in the test at T886, an area characterized by low yield of groundwater. The evaluation of the results is in progress.

Additional remediation treatment options for Area IV degraded groundwater are under consideration. These include conventional methods such as an air-stripping tower unit or a portable carbon adsorption unit or newly emerging enhanced remediation technology.

In 1995, geophysical and hydrogeologic testing was conducted at RD-7 well and vicinity. The average depth of bedrock at the site was determined to be at approximately 15 feet by the seismic survey. Hydrologic, geologic, and geophysical testing showed the presence of vertical sections in the well with hydraulic conductivity ranging from 0.029 to 0.73 feet per day.

7. ENVIRONMENTAL MONITORING PROGRAM QUALITY CONTROL

This section describes the quality assurance (QA) elements that are incorporated into the Rocketdyne radiological analysis program to ensure that data produced are as meaningful as possible.

The following elements of quality control are used for the Rocketdyne program:

1. Reagent Quality - Certified grade counting gas used.
2. Laboratory Ventilation - Room air supply is controlled to minimize temperature variance and dust incursion.
3. Laboratory Contamination - Periodic laboratory contamination surveys for fixed and removable surface contamination are performed. Areas are cleaned routinely and decontaminated when necessary.
4. Control Charts - Background and reference source control charts for counting equipment are maintained to evaluate stability and response characteristics.
5. Laboratory Intercomparisons - Rocketdyne participates in the DOE EML-QAP.
6. Calibration Standards - Counting standard radioactivity values are traceable to the NIST primary standards.

7.1 PROCEDURES

Procedures followed include those for sample selection; sample collection; packaging, shipping, and handling of samples for off-site analysis; sample preparation and analysis; the use of radioactive reference standards; calibration methods and instrument QA; and data evaluation and reporting.

7.2 RECORDS

Records generally cover the following processes: field sample collection and laboratory identification coding; sample preparation method; radioactivity measurements (counting) of samples, instrument backgrounds, and analytical blanks; and data reduction and verification.

Quality control records for laboratory counting systems include the results of measurements of radioactive check sources, calibration sources, backgrounds, and blanks, as well as a complete record of all maintenance and service.

Records relating to overall laboratory performance include the results of analysis of interlaboratory cross-check samples and other quality control analyses; use of standard (radioactive) reference sources; and calibration of analytical balances.

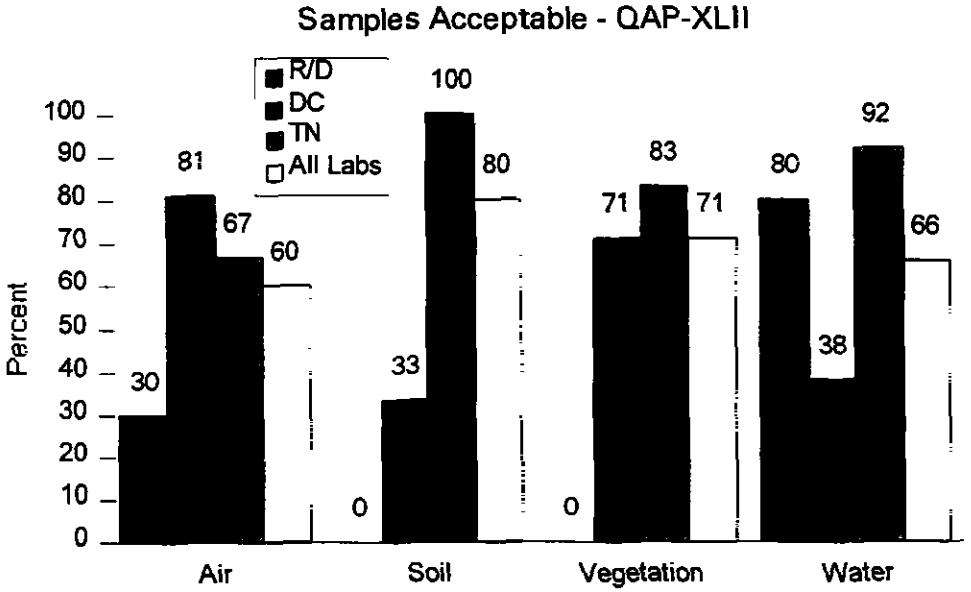

Figure 7-1. Quality Assessment Program Results for QAP-XLII

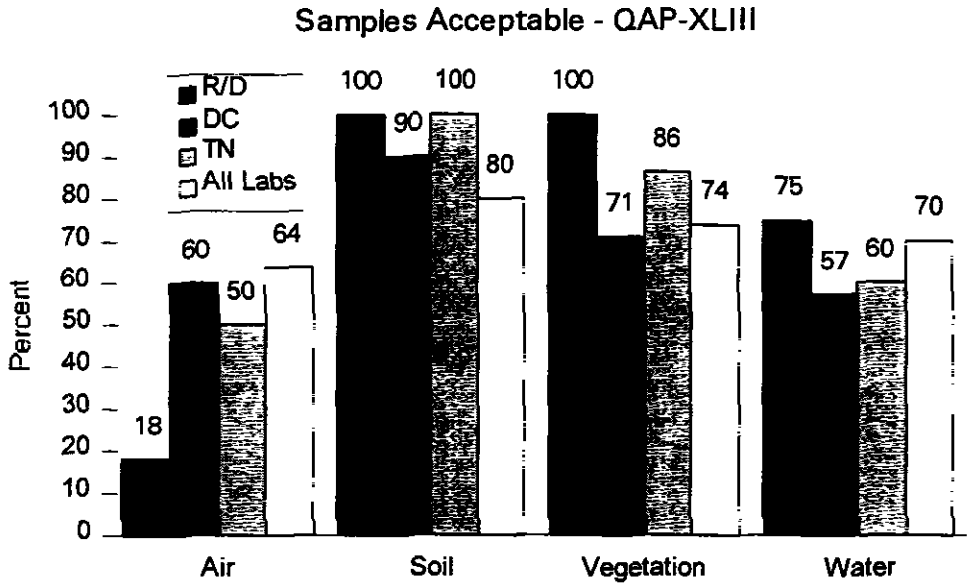

Figure 7-2. Quality Assessment Program Results for QAP-XLIII

7.3 QUALITY ASSURANCE

Rocketdyne participates in the DOE Quality Assessment Program (QAP) operated by the Environmental Measurements Laboratory (EML) in New York for radiological analyses. During 1995, two sets of samples were distributed: QAP-XLII and QAP-XLIII (Refs. 15 and 16). In 1994, EML analyzed the QAP historical data for air filter, soil, vegetation, and water samples from 1982 through 1992 to generate representative control limits for the performance evaluation

of analytical services. The individual data values reported by the participating laboratories were normalized to the EML reference value, and the normalized values were grouped into percentiles. The middle 70% of all historical reported values (from the 15th to 85th percentile) was established as *acceptable* and the next 10% on both sides of the 70%--the 5th to 15th and 85th to 95th percentiles--as *acceptable with warning*. Results outside this 90% band were considered *not acceptable*.

Results of Rocketdyne (RD), DataChem (DC), and TMA/Norcal analyses, and the average for all laboratories, are shown in Figure 7-1 and Figure 7-2 for QAP-XLII and QAP-XLIII, respectively. Although these comparisons involve sample types, geometries, and analyses that are not part of the routine procedures at the Rocketdyne laboratory, historical review of the Rocketdyne results and those of the other laboratories has generally shown a similar level of quality. This remains the case for the present results for water samples for QAP-XLII and QAP-XLIII, and for soil and vegetation samples for QAP-XLIII. Differences with the other laboratories are noted, however, in the air samples for both QAP-XLII (30% acceptance) and -XLIII (18% acceptance), and in the soil and vegetation samples for QAP-XLII where all Rocketdyne results were outside the acceptable and acceptable-with-warning boundaries.

In 1994, Rocketdyne performed several calibrations on the analysis equipment, which resulted is some improvement in the percent acceptance for air samples (22% for QAP-XLI). The level of agreement for QAP-XLII and QAP-XLIII are consistent with this level of acceptance. Additional investigation may be conducted to attempt to further improve the agreement in the air filter analyses, including the use of a newly purchased radiation standard. It is noted, however, that no quantitative air filter analyses are conducted by Rocketdyne for environmental use. All quantitative environmental air samples for the site are analyzed by outside laboratories. For the present report, environmental sample data reported in Table 5-1 and Table 5-2 were performed by DataChem Laboratories (Salt Lake City, Utah). The DataChem air filter results for QAP-XLII and QAP-XLIII were 81% and 60% acceptable, respectively. These values are close to or above the averages for all laboratories.

The QAP soil and vegetation samples (200 g and 100 g, respectively) are significantly smaller than the typical 600 g sample size used at Rocketdyne for similar analyses. By adding inert filler material and adjusting the sample geometries, the percentage acceptable was increased from 0% in QAP-XLII to 100% in QAP-XLIII for these two analyses, well above the rate for all laboratories. Quantitative soil analyses for the Area IV (Table 5-10) and T886 (Table 5-12) surveys were conducted by TMA/Norcal (Richmond, CA). The TMA/Norcal soil results were 100% acceptable for both intercomparisons, also well above the average rate for all laboratories.

8. REFERENCES

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14. *California Radiation Control Regulations*, California Code of Regulations, Title 17, Public Health.
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16. EML-576, "Semi-Annual Report of the Department of Energy, Office of Environmental Management, Quality Assessment Program", February 1996.

APPENDIX A.

STATUS OF NEPA COMPLIANCE ACTIVITIES - FY 1995
(Sheet 1 of 2)

Item	Level/ DOE No.	NEPA Determination for	Remarks/Action
1	CX ET-NE-94-08	Test a Prototype Natural Gas Fired Regenerative Radiant Burner (MKE)	95ETEC-DRF-1014, 12/11/95 Approved
2	CX ET NE-94-09	System & Component Testing for Clean Alternative Fuel-Based (H_2) Transportation	95ETEC-DRF-1014, 12/11/95 Approved
3	CX ET-NE-94-10	System & Component Testing of Dark Gas Solar Collectors	95ETEC-DRF-1014, 12/11/95 Approved
4	CX ET-NE-94-11	Design/Fabrication & Test of Remote D&D Handling Equipment	95ETEC-DRF-1014, 12/11/95 Approved
5	CX ET-NE-94-12	Commercial Development of High Temperature Composite Metal Purifier of Hydrogen Reformate Gas Streams	95ETEC-DRF-0669, 07/20/95 Approved
6	CX ET-NE-94-13	*Design/Installation/Test & Evaluate Test Apparatus Containing Glass* Microspheres	95ETEC-DRF-1014, 12/11/95 Approved
7	CX ET-NE-94-14	Test 15 kWe Green Car Fuel Cell/Battery Hybrid Vehicle	95ETEC-DRF-1014, 12/11/95 Approved
8	CX ET-NE-94-15	Test a Lynch Engine for Several Different Hythane Mixtures	95ETEC-DRF-1014, 12/11/95 Approved
9	CX ET-NE-94-16	Test of Solar II Receiver Components	95ETEC-DRF-1014,12/11/95 Approved
10	CX ET-NE-94-17	*Design/Installation/Test & Evaluate Process for Manufacturing High Energy* Density, High Storage Capacity Electric Capacitors	95ETEC-DRF-1014, 12/11/95 Approved
11	CX ET-NE-94-18	Test of the Kalina Cycle Demonstration Plant	95ETEC-DRF-1014, 12/11/95 Approved
12	CX ET-EE-94-19	Test of a Natural Gas Fueled, 24 kWe Turbogenerator	95ETEC-DRF-1014, 12/11/95 Approved
13	CX ET-EE-94-20	Test High Speed Technique - Continued Manufacturing of Bimetallic Strip Stock Using Laser Weld Process	95ETEC-DRF-1014, 12/11/95 Approved

CX - Categorical Exclusion, EA - Environmental Assessment

STATUS OF NEPA COMPLIANCE ACTIVITIES - FY 1995
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14	CX ET-EM-95-21	Test of a Solar Turbine Incorporated Centaur 40 Gas Turbine	95ETEC-DRF-1014, 12/11/95 Approved
15	CX ET-EM-95-22	Acquisition & Evaluation Testing of a Remote Mechanical System for Decontaminating Concrete Walls	95ETEC-DRF-1014, 12/11/95 Approved
16	CX ET-EM-95-23	Feasibility Investigation of Remote Laser Processing of R/A Components	95ETEC-DRF-1014, 12/11/95 Approved
17	CX ET-EE-95-24	Seismic Isolator Bearing Test	95ETEC-DRF-1014, 12/11/95 Approved
18	CX ET-EE-95-25	Assessing Capabilities of a Fluorescent Lamp Disposal Machine	95ETEC-DRF-1014, 12/11/95 Approved
19	CX ET-EE-95-26	Design/Installation & Test of a Kollitz Wind Turbine	95ETEC-DRF-0670, 07/20/95 Approved
20	EA No Number Assigned	Water Vapor Nitrogen Process for Removal of Sodium	DOE Canceled 12/95
CX - Categorical Exclusion, EA - Environmental Assessment			

APPENDIX B.

ACRONYMS

ACM	asbestos-containing materials
ALARA	As Low As Reasonably Achievable
ANL	Argonne National Laboratory
AOC	Areas of Concern
ASL	above sea level
ATIR	Air Toxics Inventory Report
CAA	Clean Air Act
CARB	California Air Resources Board
CCR	California Code of Regulations
CEM	Continuous Emission Monitoring
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CO	carbon monoxide
CRO	Community Reuse Organization
CRWQCB	California Regional Water Quality Control Board
CTC	Clemson Technical Center
CWA	Clean Water Act
CX	Categorical Exclusion
D&D	decontamination and decommissioning
DAS	Data Acquisition System
DCG	Derived Concentration Guide
DHS	Department of Health Services
DL	detectable limit
DOE	Department of Energy
DOE-OAK	Department of Energy - Oakland Office
DOE-SF	Department of Energy-San Francisco Office
DTSC	Cal-EPA Department of Toxic Substances Control
EA	Environmental Assessment
EIS	Environmental Impact Statement
EP	Environmental Protection
EML	Environmental Measurements Laboratory
EPA	Environmental Protection Agency

ER	Environmental Remediation
ERPP	Environmental Radiological Protection Plan
ETEC	Energy Technology Engineering Center
FFCA	Federal Facilities Compliance Act
FGR	Flue Gas Recirculation
FONSI	Finding of No Significant Impact
GWRC	Groundwater Resources Consultants, Inc. (Tucson, AZ)
HAR	Hydrogeological Assessment Report
HEPA	high-efficiency particulate air
HMET	Hazardous Materials Elimination Team
HRS	Hazard Ranking System
HSWA	Hazardous and Solid Waste Amendments of 1984
HWMF	Hazardous Waste Management Facility
ICP	Inductively Coupled Plasma
LLD	lower limit of detection
LLTR	Large Leak Test Rig (T059)
MBAS	methylene blue active substances
MCL	Maximum Contamination Level
MGD	million gallons per day
MPC	maximum permissible concentration, air, or water
MSOP	Molten Salt Operation Program
MSTF	Molten Salt Test Facility
MWD	Metropolitan Water District
NA	not analyzed
NASA	National Aeronautics and Space Administration
ND	not detected
NEPA	National Environmental Policy Act
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NIST	National Institute of Standards and Technology
NOD	Notice of Deficiency
NOI	Notice of Intent
NOV	Notice of Violation
NOx	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
NS	not specified
NSPS	New Source Performance Standards

ODS	Ozone Depleting Substance
ORISE	Oak Ridge Institute for Science and Education
PAH	polynucleararomatic hydrocarbon
PA/SI	Preliminary Assessment/Site Investigation
PCB	polychlorinated biphenyl
PCE	perchloroethene
QA	quality assurance
QAP	Quality Assessment Program
QC	quality control
QUAP	Quality Assessment Plan
R/D	Rocketdyne
R&D	research and development
RCP	Radiological Characterization Plan
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RHB	Radiologic Health Branch
RIHL	Rockwell International Hot Laboratory
RMHF	Radioactive Materials Handling Facility
RMMA	Radioactive Materials Management Areas
ROC	reactive organic compound
ROD	Record of Decision
ROV	Report of Violation
RWQCB	Regional Water Quality Control Board
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
SBP1	Sodium Disposal Facility Burn Pit 1
SBP2	Sodium Disposal Facility Burn Pit 2
SCP	Site Characterization Plan
SCTI	Sodium Component Test Installation
SNAP	Systems for Nuclear Auxiliary Power
SNM	Special Nuclear Materials
SPCC	Spill Prevention Control and Countermeasure
SPTF	Sodium Pump Test Facility
SRE	Sodium Reactor Experiment
SRI	Stanford Research Institute
SSFL	Santa Susana Field Laboratory

SSME	Space Shuttle Main Engine
SWPPP	Storm Water Pollution Prevention Plan
STL-IV	Systems Test Laboratory, Area IV
STP	Sewage Treatment Plant
SVOC	semi-volatile organic compound
SWMU	Solid Waste Management Unit
TBE	Teledyne Brown Engineering
TCE	trichloroethylene
TLD	thermoluminescent dosimeter
TPCA	Toxic Pits Cleanup Act
TSDF	Treatment, Storage, and Disposal Facility
UCLA	University of California, Los Angeles
USEPA	United States Environmental Protection Agency
UST	underground storage tank
UV	ultraviolet
VCAPCD	Ventura County Air Pollution Control District
VCEHD	Ventura County Environmental Health Division
VCPWA	Ventura County Public Works Agency
VOC	volatile organic compound
WDR	Waste Discharge Requirement

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