OAKLAND OPERATIONS OFFICE

University of California
Lawrence Livermore
National Laboratory

ENVIRONMENTAL RESTORATION DIVISION

April 1, 1998

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Reference: Building 854 Operable Unit Characterization Summary
Lawrence Livermore National Laboratory Site 300

Dear Mr. Piros, Ms. Setian, and Ms. Timm:

This letter report summarizes the preliminary results of environmental investigations at the Building 854 OU at Lawrence Livermore National Laboratory (LLNL) Site 300, and is organized into nine major sections:

- Introduction.
- Investigations to Date.
- Physical Setting.
- Hydrogeology.
- Nature and Extent of Subsurface Contamination.
- Soil Vapor Flux and Ambient Air Measurements.
- Future Work.
- Schedule.

- References.

Attachments to this letter are:

A. Data Tables

B. Results and Protocol for Air Sampling and Modeling Within the Building 854 OU

According to our current Federal Facility Agreement (FFA) schedule, revised in October 1997, all field work at the Building 854 Operable Unit (OU) shall be completed by October 15, 1999. A final report of the results of this investigation will be transmitted to the regulatory agencies sometime after that date.

Introduction

Site 300 is a U.S. Department of Energy (DOE) experimental test facility operated by the University of California, and is located in the Altamont Hills approximately 15 miles west of Tracy, California (Fig. 1). LLNL Site 300 was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) National Priorities List in 1990. Environmental investigations have been carried out under the joint oversight of the U.S. Environmental Protection Agency (Region IX), the California Regional Water Quality Control Board(Central Valley Region), and the California Department of Toxic Substances Control (Northern California Coastal Cleanup Operations Branch). The Building 854 OU is included in the Site 300 Federal Facility Agreement (FFA), and this summary is a required secondary document in the FFA.

The Building 854 OU is located in the west-central portion of Site 300 (Fig. 2). It consists of twelve buildings built between 1959 and 1970. The OU contains the Building 854 and Building 855 Complexes and Buildings 856 and 857 (Fig. 3). Facilities in the OU were used to test the stability of weapons and weapons components under various environmental conditions and mechanical and thermal stresses. Chemicals, primarily the volatile organic compound (VOC) trichloroethylene (TCE), were released to the subsurface as a result of these activities. The likely source of the TCE is a brine system (Fig. 4). This system consisted of a network of pipes that delivered TCE to several buildings within the Building 854 Complex and was centered near Building 854D. The TCE was used as a heat transfer fluid. During the life of this system several leaks of varying size were noted or suspected due to high consumption rates. Significant TCE brine system leaks are thought to have occurred between 1967 and 1984 near Buildings 854D, 854E, 854F, and 854H (Carpenter et al., 1983 and 1986; Webster-Scholten [Ed.], 1994). Other smaller releases may have occurred within the complex, but these four leaks are likely to be the most extensive. In 1982, as a preliminary cleanup action, TCE-contaminated soil was excavated and removed from the Building 854F and 854H areas (Carpenter et al., 1983).

Investigations to date have identified TCE in the vadose zone and ground water. Several other contaminants, including high explosives (HE), petroleum hydrocarbons, and other solvents, have recently been identified sporadically in soil. Nitrate, natural uranium, and gross alpha radioactivity have been detected above their respective Maximum Contaminant Levels (MCLs) in ground water. Although other potential contaminants may have been used or stored within the complex (Webster-

Scholten, 1994), such as insulating oil, depleted uranium, thorium, beryllium, HE, acetone, and methyl ethyl ketone (MEK), there is no indication that these materials have been released to the environment (Webster-Scholten, 1994).

This Characterization Summary presents an overview of the physical characteristics, hydrogeology, contaminant releases, and the nature and extent of environmental contamination in the OU. A proposed schedule for future work is also included.

This report summarizes work in progress. Additional work is required to complete the characterization and evaluate the potential risks to human health and the environment from contaminants in the Building 854 OU. DOE/LLNL anticipate presenting the results of additional investigation in the year 2000. This additional work is outlined in the Future Work section of this report.

Investigations to Date

Environmental investigations in the Building 854 OU began in 1982, and are ongoing. Investigations intensified in the area in 1996 when the OU was first placed on the FFA schedule. The work performed thus far includes records searches and interviews with former employees; soil excavation and disposal; well abandonment; borehole drilling and sampling; analysis of soil, rock, and soil vapor; measurement of VOC flux to air and ambient air concentrations; calculation of risks from air concentrations; well installation and ground water sampling; and preliminary hydrogeologic interpretation. Twelve monitor wells have been installed in the OU. Table 1 summarizes field work and cleanup operations performed in the Building 854 OU to date. Well completion data are summarized in Table 2.

Physical Setting

Topography, cultural features, and monitor well and borehole locations in the Building 854 OU are shown on Figure 3. The Building 854 Complex occupies a topographic high on a thick and extensive landslide deposit. There is a prominent hillside southwest of the paved area housing the buildings. The land surface slopes downward from the paved area of the Building 854 Complex, the Building 855 Complex and Buildings 856 and 857, to the east and southeast. South of these areas, a deep ravine trends southwest-northeast and contains Springs 10 and 11. A deeply incised channel trends southeast just west of Building 857, and empties into this deep ravine. Due to the rugged terrain, safe drilling locations are generally limited to paved areas near buildings and roads. Figure 4 shows the buildings in the OU, and the former locations of TCE storage tanks and aboveground piping, and other release sites.

The Site 300 climate is classified as semi-arid. Rainfall typically averages 10-11 inches per year, most of which falls during winter storms. Surface water flows in local channels after rainfall events, but quickly infiltrates into the ground after traveling short distances. Rainfall intensity, water level, and chemical data suggest that episodic rainfall and associated surface water flow and ground water recharge result in the most significant mobilization of contaminants (Webster-Scholten, 1994).

Hydrogeology

The Building 854 OU is located on the southern limb of the west-southeast trending Patterson Anticline. Fracturing is common throughout the bedrock in this area. There are also many small faults in the area, but none disturb the Pleistocene and Holocene alluvium, and they are considered inactive (Carpenter et al., 1986).

Much of the OU is immediately underlain by a Quaternary landslide deposit (Qls) (Fig. 5) that is locally in excess of 70-ft thick. This landslide appears to be unsaturated throughout the OU. Immediately beneath the landslide deposit, in descending order, are the Tertiary-age Neroly Formation Lower Blue Sandstone unit ($Tnbs_1$) and the underlying Cierbo Formation (Tmss). Neroly strata exposed northwest of the buildings indicate strikes of about N80-85W and dips of 10-13 degrees southwest. Strata south of the building complex (Fig. 5) and near Springs 10 and 11, indicate dips averaging 7-13 degrees southwest. There are no structural attitude data for strata beneath the landslide deposit. However, based on water elevation and borehole logs, strata east and southeast of the buildings appear to dip south-southeast.

At least two water-bearing zones have been identified during drilling and surface reconnaissance. Figure 6 is a hydrogeological cross-section showing the location of the first water-bearing zone. The first water-bearing zone extends throughout the Building 854 OU area, north of monitor well W-854-05 south to Springs 10 and 11, and contains the Building 854 ground water TCE plume. This zone occurs in Neroly Lower Blue Sandstone ($Tnbs_1$) and underlying upper Cierbo Formation (Tmss) materials. This water-bearing zone is generally unconfined and occurs in permeable sandstone and fractured claystone. This zone appears to be perched as there is unsaturated permeable material below the confining layer. The confining layer for this zone is a low permeability siltstone or an expansive clay, depending on the location. Although the first water-bearing zone is laterally continuous throughout the OU, it also appears to be offset vertically within different portions of a stratigraphic unit depending on the extent of fracturing and faulting. The first water-bearing zone is approximately 10 to 20 ft thick. Depth to the top of the zone varies from 0 ft (at the springs) to 180 ft on the slopes west of the building complex. This water-bearing zone appears to discharge locally at Springs 10 and 11.

Flow in the first water-bearing zone appears to be generally to the southeast, with a more easterly flow direction near the core of the complex (Fig. 7). This flow pattern roughly parallels the topographic relief in the area, although ground water flow is also influenced by stratigraphic dip. The horizontal hydraulic gradient in the first water-bearing zone is approximately 0.15 ft/ft near the core of the complex, and 0.077 ft/ft further downgradient. We plan to conduct hydraulic tests and colloidal borescope surveys in the future to determine hydraulic conductivity and seepage velocities.

At least one deeper water-bearing zone has been encountered below the first. This deeper water-bearing zone is found at a minimum of 50 ft below the first water-bearing zone. Deeper ground water appears to be free of TCE (see Nature and Extent of Subsurface Contamination section). Only three wells have been completed in deeper strata: two wells (W-854-01 and W-854-06) are completed in finer Tmss rocks, and one well (W-854-04) is completed in a permeable Tmss sandstone. Confined conditions exist at all three of these deeper wells.

Currently, their relationships to one another and to the first water-bearing zone are not well understood.

Ground water elevation data are tabulated in Table A-1.

Nature and Extent of Subsurface Contamination

Building 854 facility operations relevant to contaminant releases, and the nature and extent of subsurface chemical contamination, are summarized below. Source investigations in the OU were conducted in 1982-83, 1985-86, and 1996-97 and focused on facility buildings where chemicals were known to have been used, stored, or spilled. Building 854 investigation activities are summarized in Table 1. Detailed facility use and preliminary source investigation information are discussed in Carpenter et al. (1983 and 1986) and Chapter 11-4 of the Final Site-Wide Remedial Investigation (SWRI) report (Webster-Scholten [Ed.], 1994).

History of Chemical Use

Chemical use and release information for the various building areas is summarized in the following sections.

Building 854 Complex

The Building 854 Dynamic Test Complex consists of 10 buildings used for vibration, thermal, and shock (acceleration) testing of electrical, mechanical, and experimental devices containing inert or hazardous materials. Material used or authorized for use at Building 854 included TCE, HE, natural and depleted uranium, thorium, and beryllium. In 1967, a TCE brine system was installed that connected Buildings 854B through 854H. The brine system was consistently used until 1986, infrequently used after 1986, and removed in 1989. The outdoor piping system between these buildings was constructed aboveground on stanchions, and through earthen berms via a corrugated metal culvert. During testing prior to 1989, the outdoor TCE brine system occasionally leaked; however, most leaks occurred at the outdoor valve stations and at pumps inside the buildings. Most spills are believed to have occurred between 1967 and 1984. Leaks have been documented, or are suspected to have occurred, at the following locations (Fig. 4):

- TCE storage tanks 20 ft north of Building 854B.
- Southwest corner of Building 854C (TCE valve system station).
- TCE piping leak southwest of Building 854D.
- Southeast corner of Building 854E (outdoor TCE valve station).
- Building 854F (TCE valve system leaks).
- Building 854G (concrete pad-six TCE brine system tanks and drum rack).
- Building 854H (valve station discharges to a sump on the east side of the building).

Facility upgrades were installed in the mid-1980s to reduce the potential for TCE spillage. A drainage pit on the northeast corner of Building 854C was used to allow rainwater to drain from an underground utility vault and thus is not a likely contaminant release site.

The Building 854 Complex has rarely been used since 1989.

Building 855 Complex

The Building 855 Complex was used for the remote assembly and disassembly of test devices containing inert or hazardous materials. Construction of Buildings 855A and 855B was completed in 1960, and Building 855C was completed in 1971. Hydraulic oil lines are located along the western side of the Building 855 Complex, but there is no evidence that they have leaked. A septic system drain field is located about 100 ft east of Building 855A that received sanitary waste and wash water from floor drains in the Building 855A equipment room.

The Building 855 Complex was used from 1960 until 1973. Some test devices were filled with various oils; during disassembly, test devices were sometimes washed with solvents. HE particulates were also produced during some disassembly operations. A disposal lagoon is located about 70 ft southeast of Building 855C and was used for the disposal of liquids generated at Building 855B (Fig. 4). When Building 855B was in use, the disposal lagoon probably received various oils, solvents (such as acetone, MEK, and perhaps TCE) and possibly HE particulates. The presence of two HE settling ponds between Building 855B and the lagoons suggests that HE particulates were collected and disposed at the HE Process Area, as specified in Site 300 procedures.

Buildings 856 and 857

Building 856 was constructed in 1960 and is used for storing test apparatus and non-hazardous materials. A dry well is located about 10 ft west of the building and collects water from floor drains. It is not known if this dry well was removed or simply paved over.

Building 857 was constructed in 1960 for the long-term storage of HE materials at controlled temperatures. No spills are known to have occurred at this location.

No evidence of other disposal lagoons, underground storage tanks, or dry wells have been found in the Building 854 OU during former and present employee interviews, site reconnaissance, or records searches.

Extent of Contamination

The current knowledge of the distribution of contaminants in the Building 854 OU is described below.

Volatile Organic Compounds

Chemical data from soil, rock, soil vapor, and ground water indicate that TCE was released from past activities at the Building 854 OU. TCE has been reported at maximum concentrations of 2,900 µg/L in ground water, 0.042 mg/kg in soil, and 18 $\text{ppm}_{v/v}$ in soil vapor. The only other

VOC detected, tetrachloroethene (PCE), has been reported only in passive PETREX soil vapor survey (SVS) samples. Because PCE has not been identified in soil, rock, active vacuum-induced (AVI) soil vapor, or ground water, its presence is suspect. Chemical analysis of soil, rock, and soil vapor samples indicated no chemical release from the Building 855B lagoon or the Building 856 dry well area. Passive SVS ion counts indicative of VOCs were found in samples located at several potential release sites and at other areas. However, VOCs were not detected in AVI-SVS and soil and rock samples from the same locations, except for Buildings 854E and 854F and the hillslope to the immediate southwest.

Volatile Organic Compounds in Soil Vapor

Both passive (PETREX) (Fig. 8) and AVI-SVS (Fig. 9) data indicate that VOCs were released near Buildings 854E and 854F. The 101 PETREX points indicate that low VOC concentrations (ion counts) in soil vapor are widespread throughout the Building 854 OU (Fig. 8 and Table A-4). The maximum ion count for TCE was 941,640 ppm$_{vv}$ (parts per million on a volume per volume basis) at SVX-854-011. The maximum TCE ion counts were generally found near Building 854F and the area uphill and west of it. TCE was also detected near Buildings 854E, 854B, 854D and immediately south of the paved portions of the Building 854 area. The maximum PCE ion count was 151,307 ppm$_{vv}$ at SVX-854-041 (Fig. 8). The area of highest PCE ion counts was generally along the road west of the Building 854 Complex.

Thirty-five boreholes were drilled and sampled at multiple depths by AVI-SVS (Fig. 9 and Table A-5). Fifteen of these boreholes yielded detectable TCE in soil vapor. No PCE was detected in any AVI-SVS sample collected in the OU at a detection limit of 0.2 ppm$_{v/v}$). Borehole SVV-854-29 yielded the maximum TCE concentration in soil vapor, 18 ppm$_{v/v}$ at a depth of 41.5 feet. This borehole is located adjacent to Building 854F (Fig. 9), where TCE in soil vapor was most widespread (boreholes SVV-854-29, -29A, -32, -34, -34A, and -41A). TCE was also found in concentrations of tenths-to-tens of ppm$_{v/v}$ in AVI-SVS samples collected from the road on the hillslope immediately west of Building 854E and 854F (SVV-854-24, -35, -33, -33A, -36, and -42). TCE was detected at only one depth (0.9 ppm$_{v/v}$ at 5.5 ft) in one borehole adjacent to Building 854E (SVV-854-21), but not in several other boreholes in that area (SVV-854-21, -25, -14, and -38). Adjacent to Building 854C, TCE was only detected in soil vapor from borehole SVV-854-017 (14 ppm$_{v/v}$) at a depth of 29.5 ft. No VOCs in soil vapor were detected to the total depths of all boreholes in the vicinity of potential or actual release sites north of Building 854B(854-18), southwest of Building 854D (SVV-854-15, -22, and -16), Building 854G (SVV-854-19,-20, -30, -31, and -40), and Building 854H (SVV-854-40). No VOCs were detected in soil vapor collected from the Building 855B lagoon (SVV-854-27 and -27A). In summary, the AVI-SVS principally detected TCE in the 854F vicinity and the hillslope to the west; no PCE was detected. Sporadic concentrations of TCE in soil vapor were reported from the Building 854C and 854E areas. TCE and PCE ion counts were reported from PETREX points throughout the OU.

Volatile Organic Compounds in Surface Soil

Thirty surface soil samples were collected and analyzed for VOCs (Fig. 10, Table A-3). TCE was detected only at location 3SS-854-09 at 0.0016 mg/kg.

Volatile Organic Compounds in Subsurface Soil and Rock

Two hundred and ninety subsurface soil and rock samples were collected in the OU and analyzed for VOCs. The maximum TCE concentration, 0.042 mg/kg at a depth of 156.5 feet, was reported from the borehole completed as well W-854-02. This borehole is located directly south of Building 854F (Fig. 11). TCE was detected in soil or rock samples from boreholes B-854-01, 02, -03, -04, -10, -11, and SVV-854-24, -29, -29A, -32, -34A, -35, and -36, which are located in the vicinity of Buildings 854F and 854E and the road to the west, and south of Building 855 (Figs. 3 and 9, Table A-3). TCE was the only VOC detected, except for one report of Freon-11 (0.00061 mg/kg at 6 ft depth in SVV-854-21) and many methylene chloride detections. However, methylene chloride is an ubiquitous reagent and common contaminant in the laboratory. The subsurface soil and rock VOC data indicate the presence of TCE near Buildings 854E and 854F and the hill to the west, with lesser concentrations south of Building 855.

Volatile Organic Compounds in Ground Water

TCE in ground water exceeding the State and Federal MCL of 5 µg/L extends at least 2,000 ft from Buildings 854E and 854F to the south and southeast (Fig. 11). TCE was released from leaks and spills in the brine system at the buildings and migrated downward through unsaturated landslide debris and rock to the ground water. Ground water from twelve wells and two springs in the Building 854 OU has been sampled and analyzed for VOCs since June 1996 (Table A-2). TCE has been detected in the first water-bearing zone at a maximum concentration of 2,900 µg/L (Well W-854-02, May 1997). The distribution of TCE concentrations suggests a significant release in the vicinity of Buildings 854F and 854E. This ground water TCE concentration distribution generally correlates with the TCE concentration distribution in soil vapor from AVI-SVS. TCE has not been detected in ground water samples from wells completed in lower water-bearing zones, except for a single report of 0.62 µg/L in the ground water sample from well W-854-04 collected on December 13, 1996 (Table A-2). Previous and subsequent analyses reported < 0.5 µg/L TCE in ground water samples from this well. Water samples from Springs 10 and 11, located southwest and downgradient of the Building 854 Complex, have occasionally yielded sporadic low (<1.0 µg/L) concentrations of TCE. Well 13, sealed in 1996, has consistently yielded ground water TCE concentrations at or below the 5 µg/L TCE MCL.

Fuel Hydrocarbons

The distribution and occurrence of fuel hydrocarbons in the OU are sporadic. A maximum of 0.6 $\text{ppm}_{v/v}$ total xylenes was detected in an AVI-SVS sample from borehole SVV-854-27 (Fig. 9). Concentrations of toluene and total xylenes, just above their respective detection limits, were detected in several soil samples. A maximum of 30 µg/L of total xylenes was detected in a ground water sample from well W-854-02 collected on May 12, 1997. This sample also contained 14 µg/L of toluene. A maximum of 3,800 mg/kg of hydrocarbons reported as oil and grease were found in the surface soil sample 3SS-854-030 (Fig. 10). All fuel hydrocarbon data are summarized in Tables A-20 and A-21. These data indicate no significant releases of fuel hydrocarbons in the OU.

Nitrate

Nitrate (as NO_3) has been detected in concentrations in excess of the 45 mg/L MCL in ground water samples from wells W-854-05 and W-845-08 (Fig. 3). The maximum reported concentration was 180 mg/L in a water sample collected from well W-845-08 on September 10, 1996. Analytical data for nitrogenous compounds are tabulated in Table A-16.

High Explosive Compounds

The high explosives compound HMX was detected at a maximum concentration of 150 mg/kg in a surface soil sample from location 3SS-854-21 (Fig. 10). No other detections of high explosives compounds were found in samples of any environmental media. Analytical data for high explosives compounds are tabulated in Tables A-6 and A-7.

Uranium and Gross Alpha and Beta Radioactivity

Total uranium exceeded the State MCL of 20 pCi/L in a ground water sample from well W-854-10 (42.01 pCi/L) collected on February 6, 1997. Total uranium also exceeded the State MCL in the four water samples collected from Spring 11 annually from 1993 to 1996. The highest total uranium activity detected in Spring 11 water was 45.7 pCi/L in a sample collected on October 13, 1995. All of these samples contained uranium isotopic ratios indicative of natural uranium ($\text{mass}_{235_{U}}/\text{mass}_{238_{U}} \cong 0.0072$). Tables A-12, A-13, and A-14 contain uranium analytical data.

Gross alpha radioactivity was detected above the State MCL (15 pCi/L) in water samples from 3 wells (W-854-03, W-854-10, W-854-11) and Springs 10 and 11; the maximum activity was 50.2 pCi/L in a sample collected from Spring 11 on October 13, 1995. As expected, the samples with elevated alpha radioactivity generally correlate with samples containing elevated activities of natural uranium.

Gross beta radioactivity was not detected above the State MCL (50 pCi/L) in any water samples from the OU. The maximum gross beta radioactivity was 35.5 pCi/L in a sample collected from well W-854-06 on September 10, 1996.

Gross alpha and beta radioactivity analytical data are contained in Tables A-10 and A-11.

Polychlorinated Biphenyl Compounds

The polychlorinated biphenyl compounds (PCBs) Aroclor 1242, 1248, and 1254 were reported in surface soil samples at maximum concentrations of 34, 52, and 0.16 mg/kg, at sample locations 3SS-854-21, 3SS-854-21, and 3SS-854-22, respectively (Fig. 10). PCBs were not detected in any ground water samples collected from the OU. Analytical data for PCBs are summarized in Table A-24.

Other Analytes

Analyses were also performed for a number of other analytes. None of these data indicate releases of contaminants. Other analytical data in Attachment A include:

- Tritium (Tables A-8 and A-9).
- Thorium isotopes (Table A-15).
- Total metals (Tables A-17 and A-19).
- Dissolved metals (Table A-18).
- Anions, TDS, specific conductivity and pH (Table A-21).
- Cations (Table A-23).

Soil Vapor Flux and Ambient Air Measurements

To estimate cancer risks, measurements of VOCs were made in the Building 854 OU by collecting samples of soil vapor flux and ambient air. Soil vapor flux samples were collected with Emission Isolation Flux Chambers (EIFCs). Ambient air samples were collected from several outdoor locations and from the interior of Buildings 854A and 854F. Both types of air samples were collected in SUMMA™ canisters. Where exposure point concentrations exceeded U.S. EPA Region IX Preliminary Remediation Goals (PRGs), excess cancer risk was calculated. Methodology, data tables, and results are presented in Attachment B. Figure 12 and Table B-4 (Attachment B) show sampling points and soil vapor flux rates, respectively.

Excess Cancer Risk Calculations

For soil vapor, exposure-point concentrations were calculated using the maximum measured flux rate. Cancer risks were only estimated in cases where exposure-point concentrations exceeded the PRGs. Generally, flux chamber sampling points were located over the areas of highest subsurface VOC concentrations. Excess cancer risks are summarized below.

Emission Isolation Flux Chambers Sample Results

The PRGs for vinyl chloride, 1,1-DCE, chloroform, and 1,2-DCA are lower than the analytical method detection limit typically available for the EIFC sampling. Although these constituents were not detected in the EIFC effluent, we used the maximum detection limits for these compounds to calculate the exposure point concentrations. The resulting calculated cancer risks for the maximum detection limits are 1.6×10^{-7} to 2.1×10^{-6} (Attachment B).

Outdoor Air Sample Results

Chloroform was detected in the Building 854 OU outdoor air. The corresponding calculated excess cancer risk is 9.2×10^{-6}. The detection limits for vinyl chloride, 1,1-DCE, 1,2-DCA, 1,2-Dichloropropane (1,2-DCPa), and 1,1,2-TCA are greater than the PRGs. The cancer risks that were calculated based on the analytical detection limits are at or below 1×10^{-6}. The chloroform cancer risk is the highest calculated for the exposure assessment. Chloroform does not appear to be volatilizing from the subsurface, as it was not detected in EIFC, soil, rock, or ground water samples. The source of the chloroform is unknown. However, chloroform is widely distributed in the atmosphere and water including municipal drinking water, primarily as a consequence of chlorination (Sittig, 1991).

Indoor Air Sample Results

Chloroform and TCE were detected above their PRGs inside Building 854F, and methylene chloride was detected above its PRGs inside Building 854A. The calculated excess cancer risks are 4.7×10^{-6}, 3.4×10^{-5}, and 1.0×10^{-6}, for chloroform, TCE, and methylene chloride, respectively. The detection limits for vinyl chloride, 1,1-DCE, chloroform (Building 854A only), 1,2-DCA, 1,2-DCPa, and 1,1,2-TCA are greater then the PRGs. The excess cancer risks that were calculated based on their detection limits are all at or below 1×10^{-6} (Attachment B).

Future Work

The following activities are planned to complete the Building 854 OU assessment and determine the potential risks to human health and the environment:

- Install several additional wells to determine the extent of TCE in ground water, and if the contaminant flow path is toward potential water-supply wells.
- Hydraulic testing and colloidal borescope surveys to determine hydraulic conductivity and seepage velocity distribution and ground water flow direction in individual wells.
- To determine potential receptor point concentrations needed for a limited risk assessment, LLNL will model the fate and transport of VOCs in ground water in the Building 854 OU.

Upon completion of this planned future work, anticipated in the year 2000, the results will be transmitted to the regulatory agencies and an appropriate remedy will be developed and agreed upon by DOE, LLNL, and the regulatory agencies.

Schedule

Three Building 854 OU milestones are specified in the current FFA schedule for Site 300. The Building 854 CERCLA Pathway is scheduled to be agreed upon by June 1, 1998, and a Compliance Monitoring Plan for the OU will be put in place by October 15, 1999. The FFA schedule states that all characterization field work in the OU will be completed by Summer 1999. Additional milestones and dates will be developed and agreed upon by DOE, LLNL, and the regulatory agencies.

References

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Carpenter, D. W., R. Elwood, and L. G. Gross (1986), *Assessment of the Extent of Trichloroethylene in Soil and Water at Lawrence Livermore National Laboratory Site 300*, Lawrence Livermore National Laboratory, Livermore Calif. (UCID-20774).

Sittig, M. (1991), Handbook of Toxic and Hazardous Chemicals and Carcinogens, 3rd ed., Vol. 1, Park Ridge, Noyes Publications.

Webster-Scholten, C. P. (Ed.) (1994), *Final Site-Wide Remedial Investigation Report for Lawrence Livermore National Laboratory Site 300*, Lawrence Livermore National Laboratory, Livermore, Calif. (UCRL-AR-108131).

Should you have any questions concerning this report, please contact John Ziagos at (510) 422-5479 or Elisabeth Reber-Cox at (510) 423-6718.

Sincerely,

John P. Ziagos
Site 300 Project Leader
Environmental Restoration Division
UC/LLNL

for

Elisabeth Reber-Cox
Site 300 Remedial Project Manager
Environmental Restoration Division
U.S. Department of Energy
DOE/OAK

JPZ:ER:MJT:rtd
Attachments

cc: K. Angleberger, DOE/HQ
L. Cleland (w/o att)
H. Galles (w/o att)
A. Lamarre (w/o att)

Certification

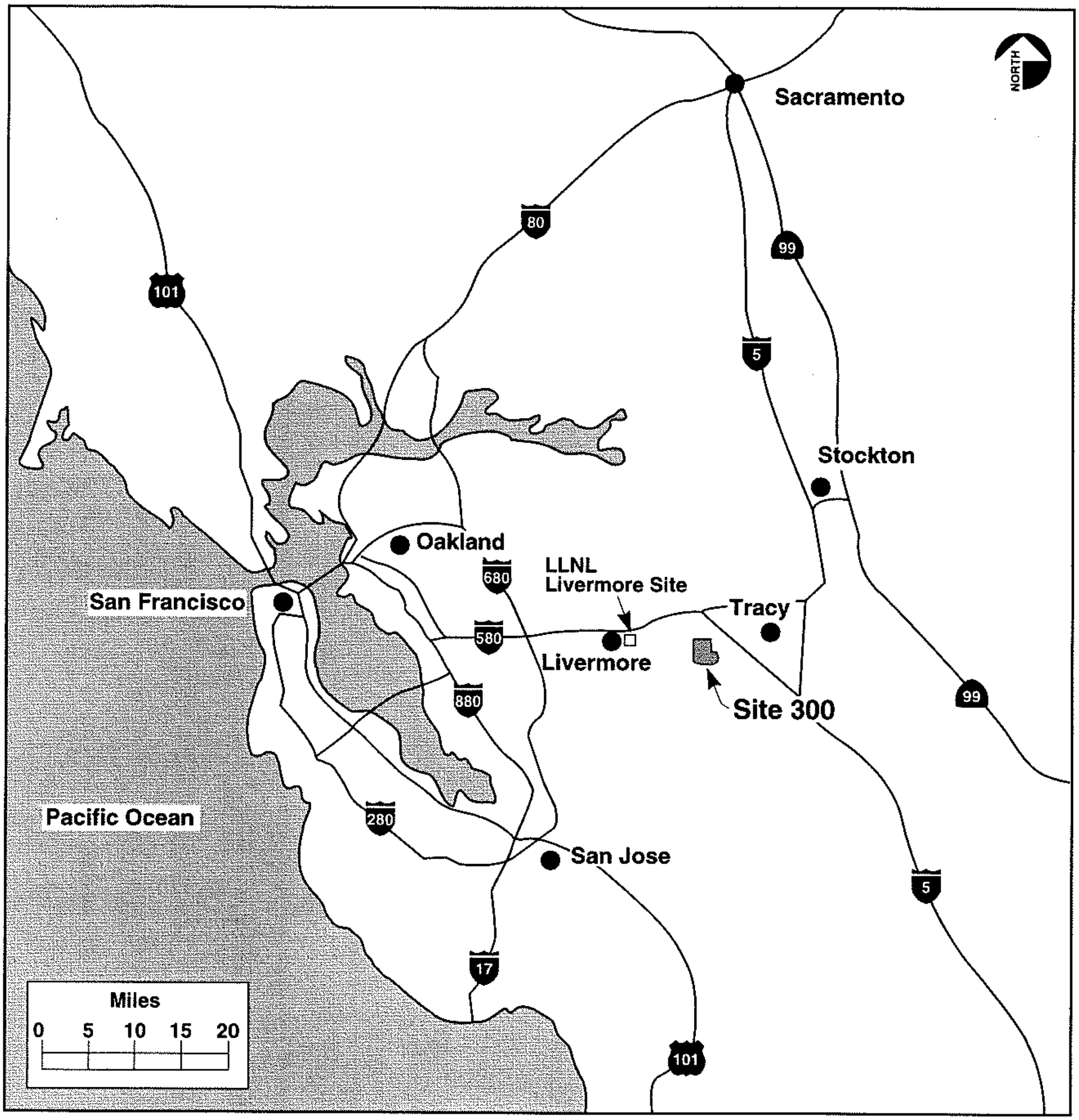
I certify that the work presented in this report was performed under my supervision. To the best of my knowledge, the data contained herein are true and accurate, and the work was performed in accordance with professional standards.

MICHAEL JEFFREY TAFFET
No. 5616

3-30-98

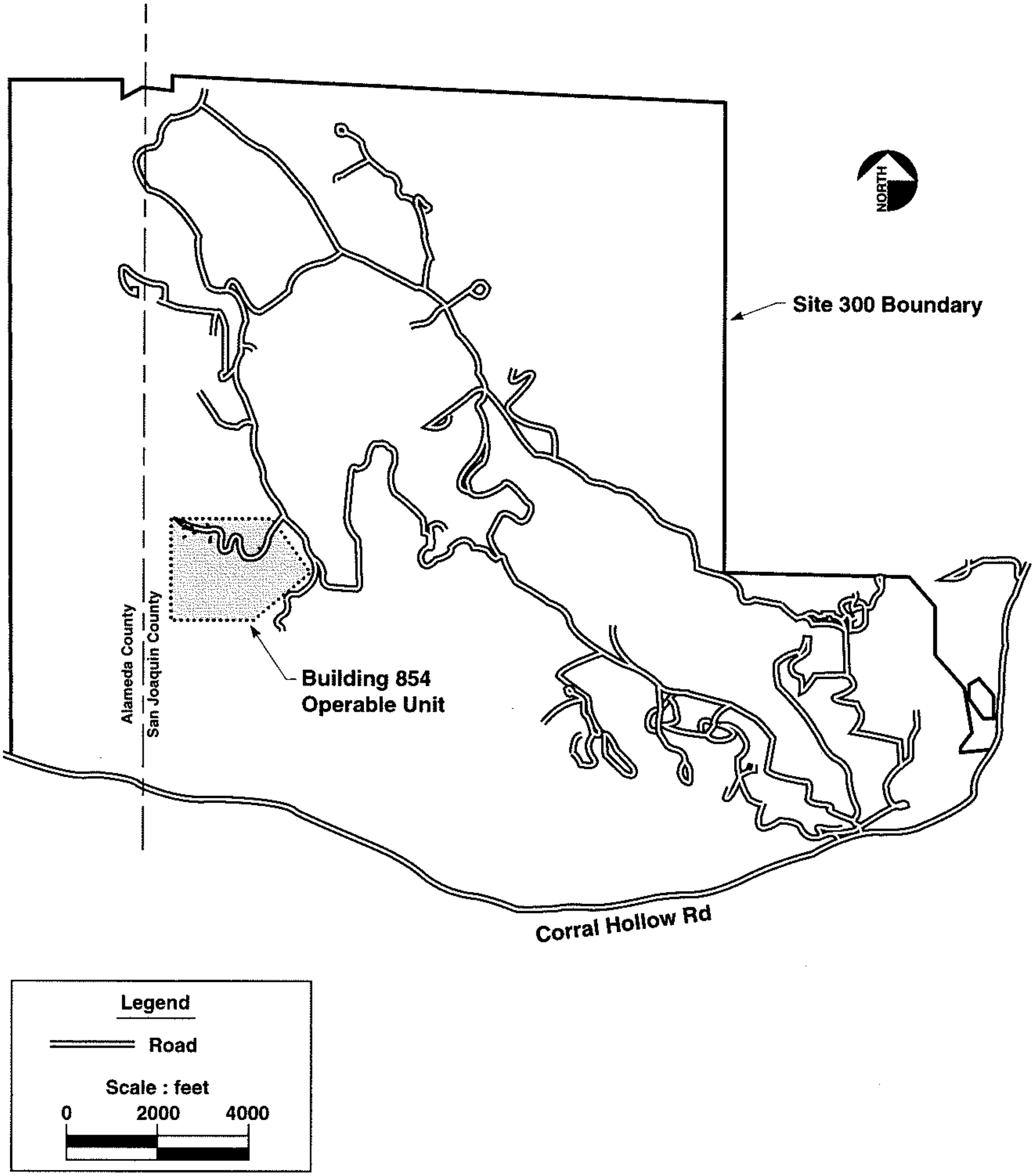
Michael J. Taffet Date
California Registered Geologist
No. 5616
License expires: May 31, 1999
California Certified Hydrogeologist
No. 129
License expires: May 31, 1999

Figures



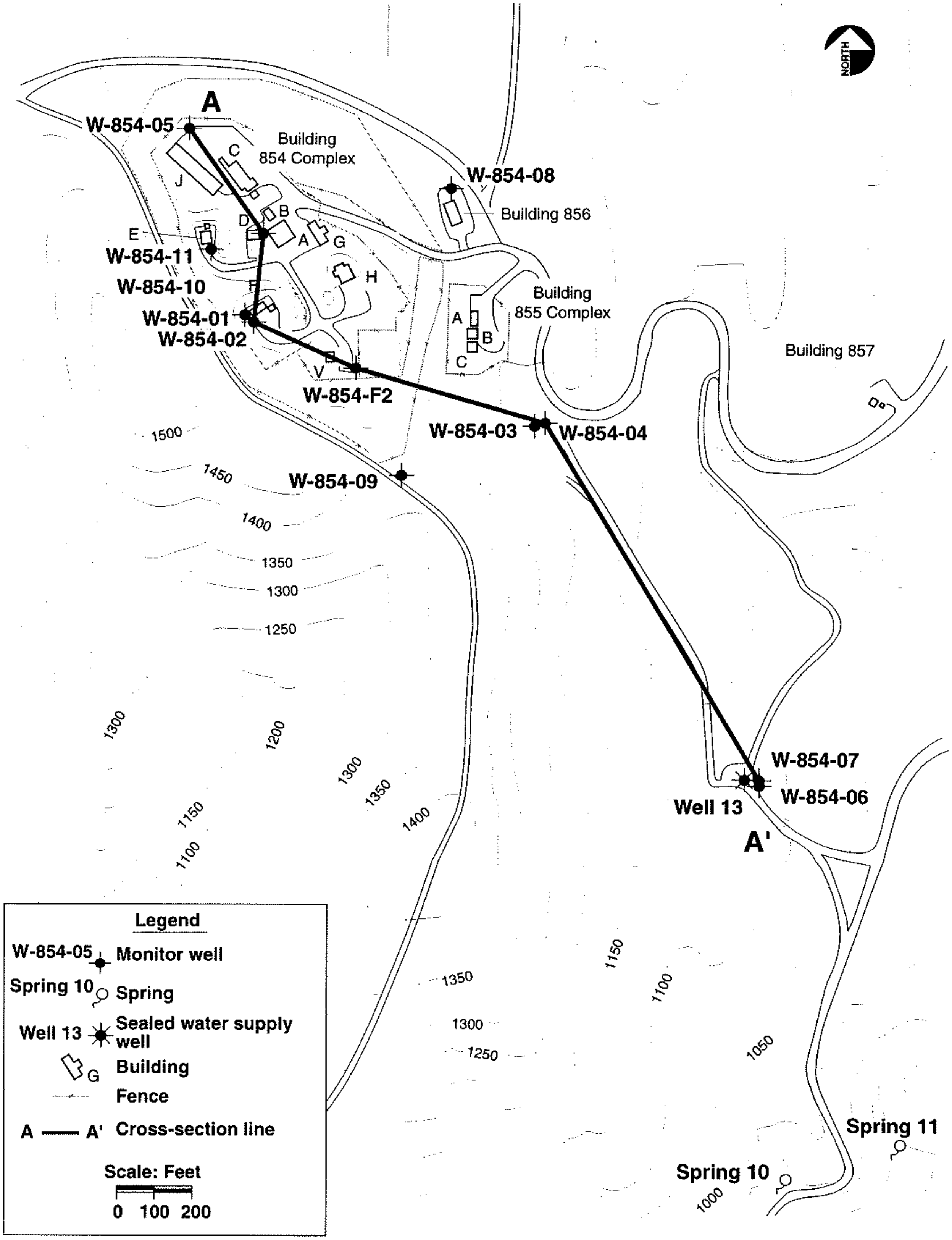
ERD-S3R-98-0007

Figure 1. Location of LLNL Site 300.



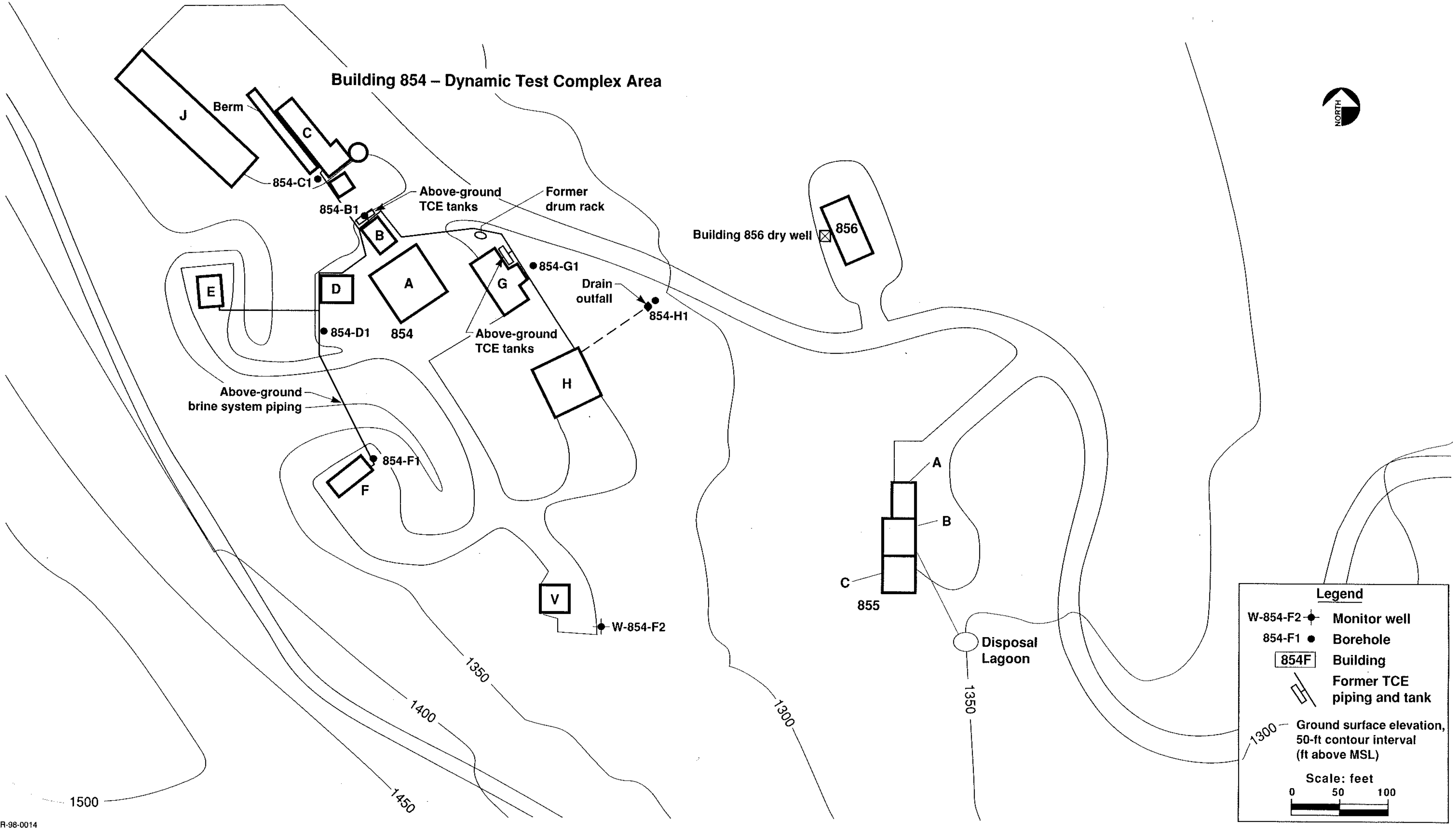
ERD-S3R-98-0008

Figure 2. Location of the Building 854 Operable Unit at Site 300.



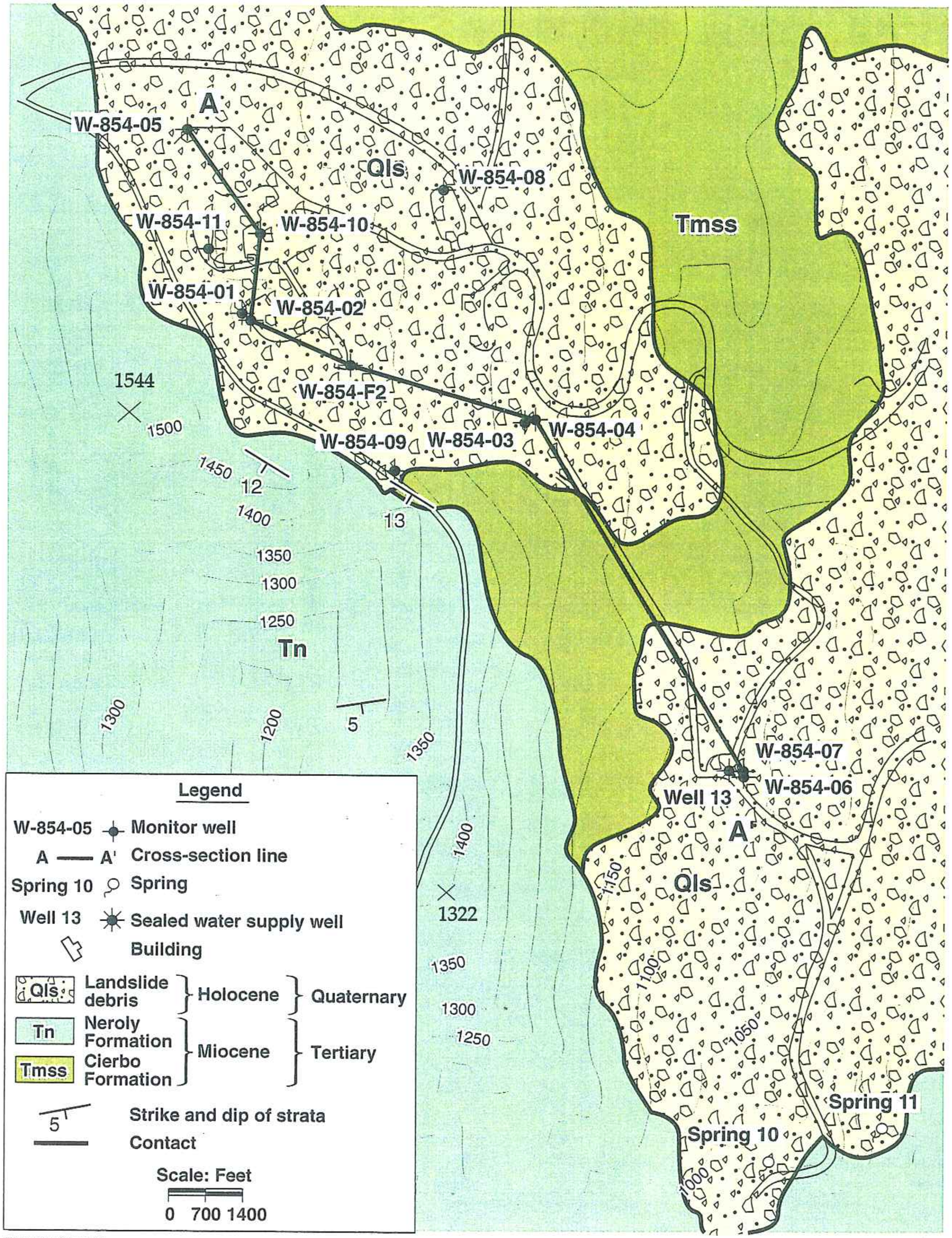
ERD-S3R-98-0012

Figure 3. Locations of hydrogeologic cross-section A-A', monitor wells and springs, Building 854 OU.



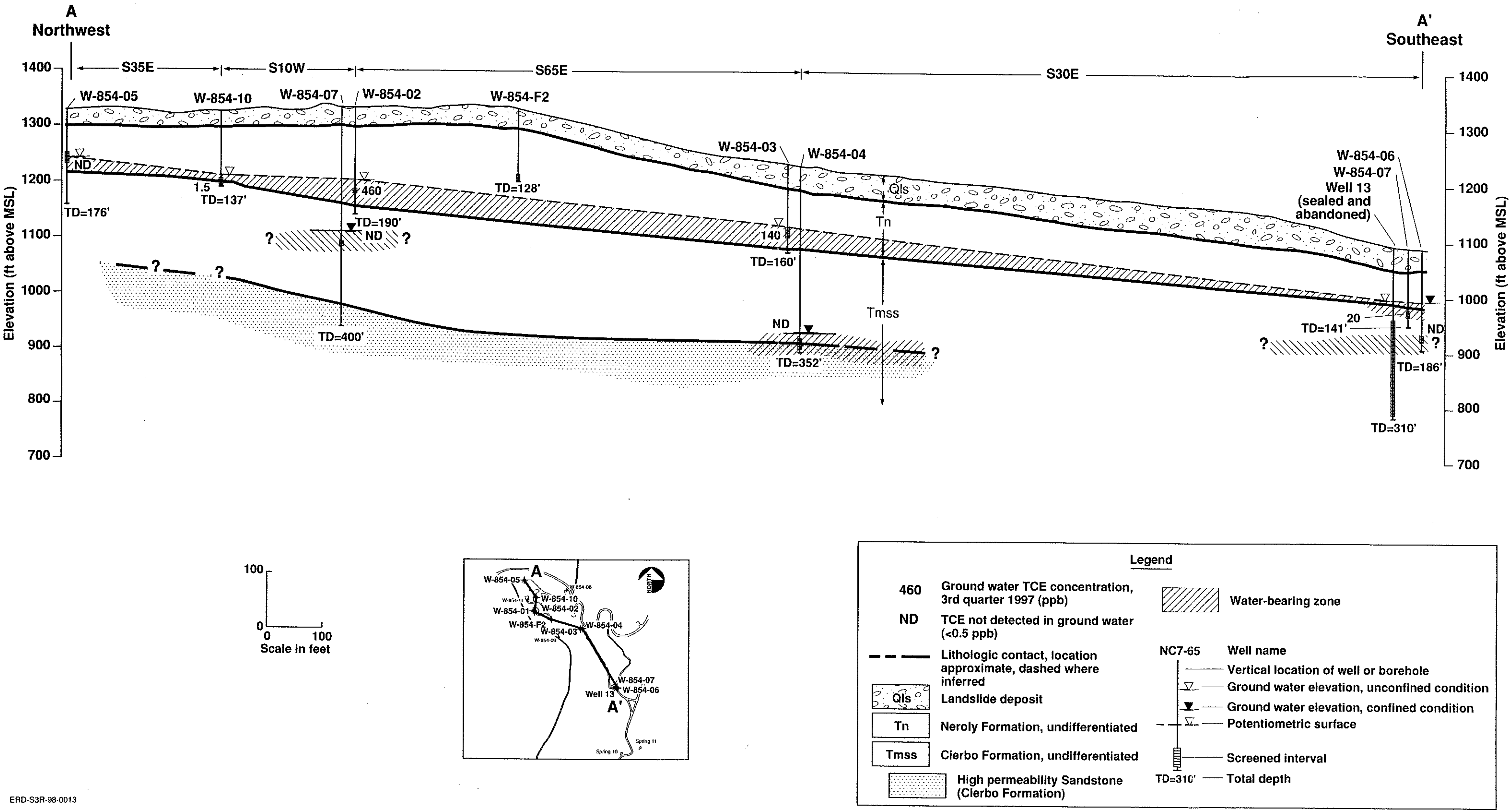
ERD-S3R-98-0014

Figure 4. Building 854-Dynamic Test Complex showing TCE brine system piping and tanks and the Building 854H drain outfall.



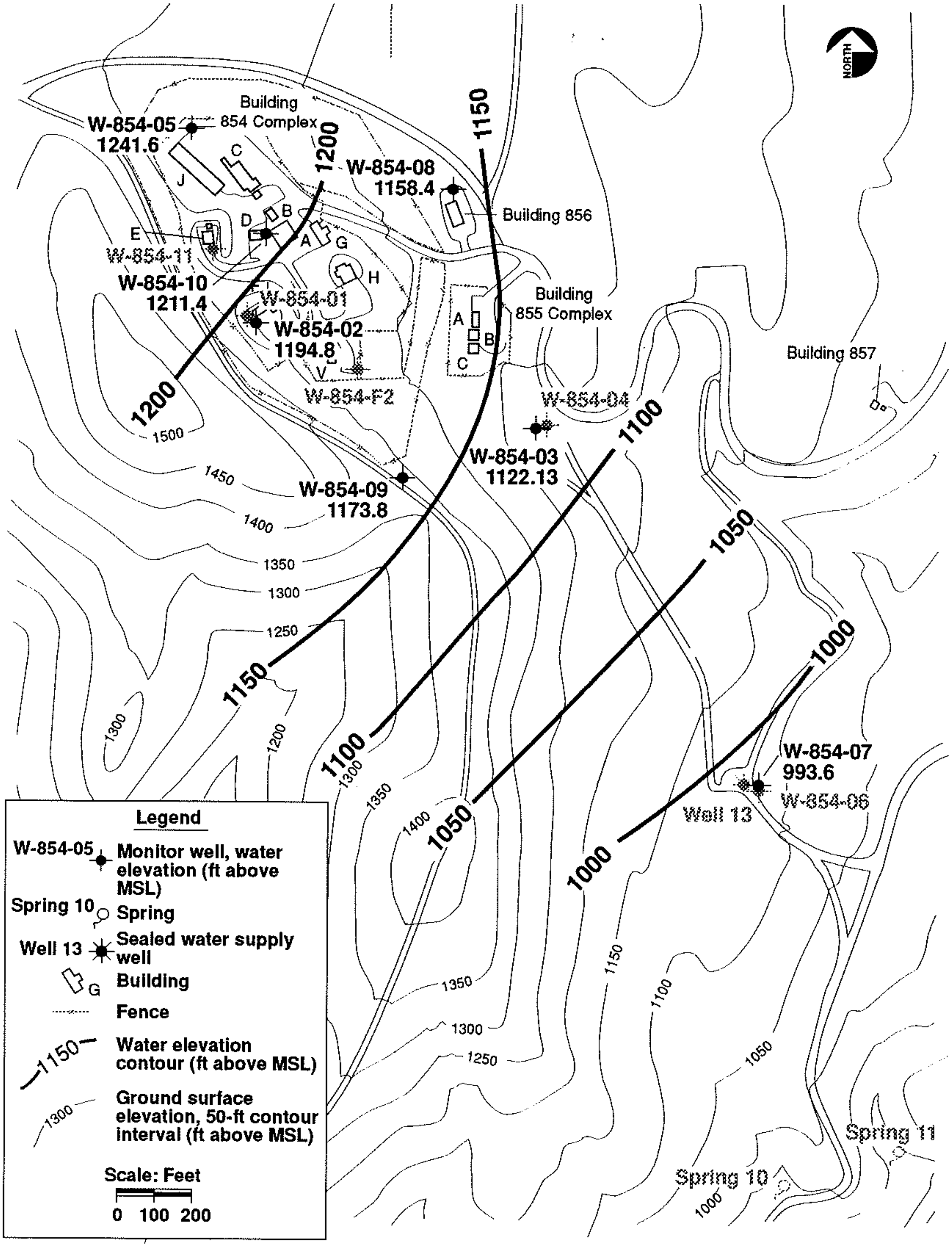
ERD-S3R-98-0015

Figure 5. Geologic map of the Building 854 OU.



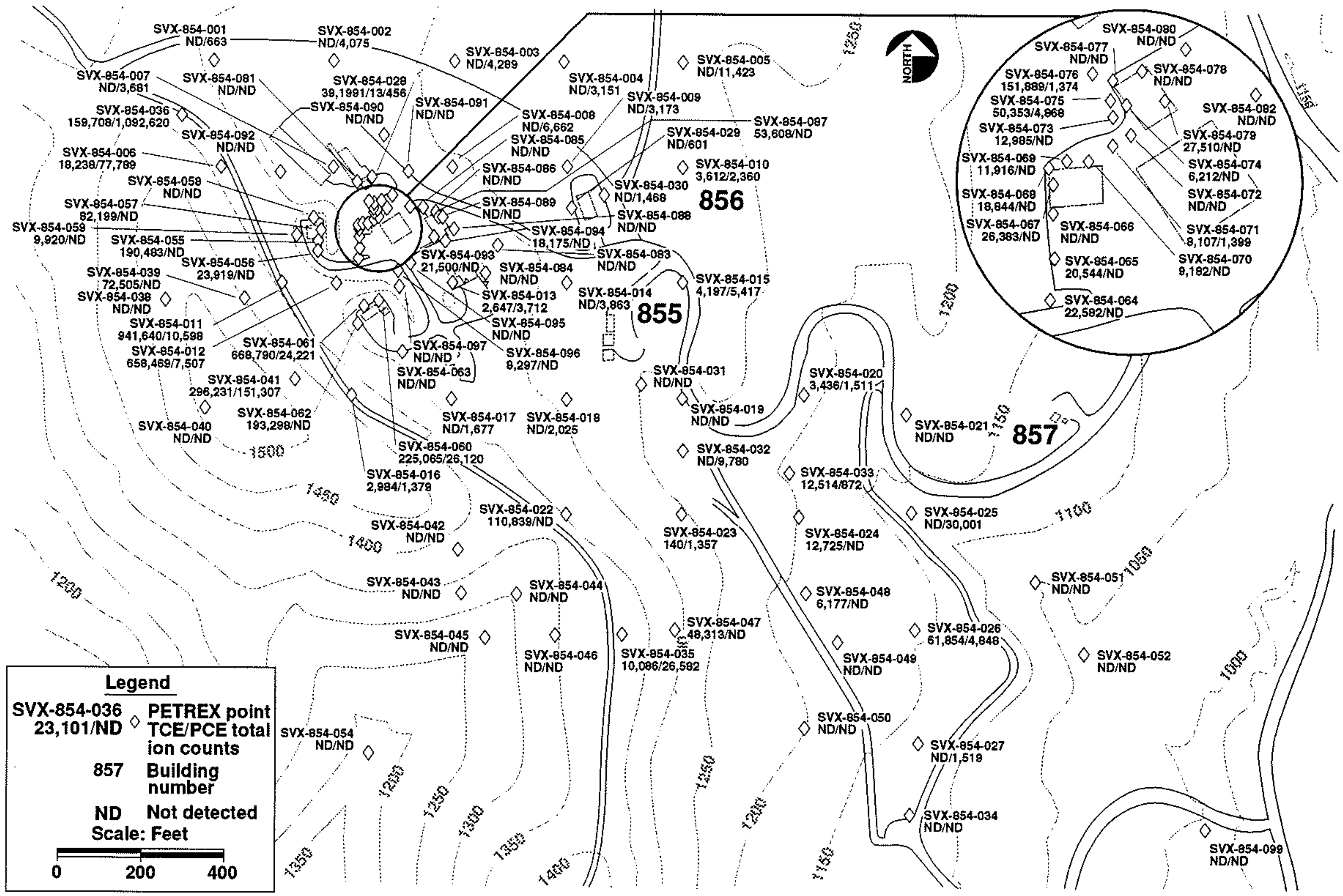
ERD-S3R-98-0013

Figure 6. Hydrogeologic cross section A-A', Building 854 OU.



ERD-S3R-98-0010

Figure 7. Building 854 OU ground water elevation contours, first water-bearing zone, 3rd quarter 1997.



ERD-S3R-98-0020

Figure 8. Locations of PETREX passive soil vapor sampling points in the Building 854 OU, showing total ion counts for TCE and PCE.

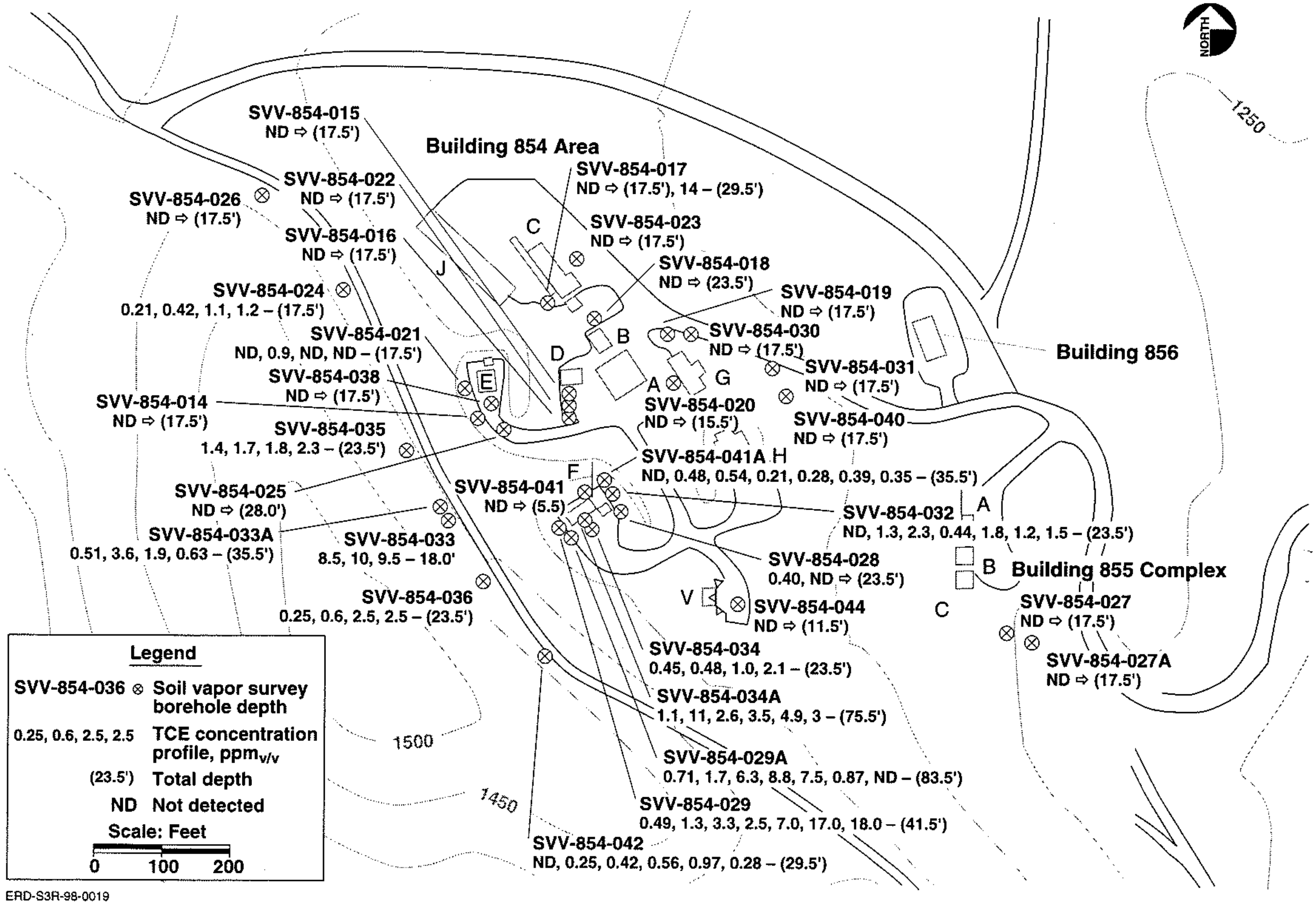
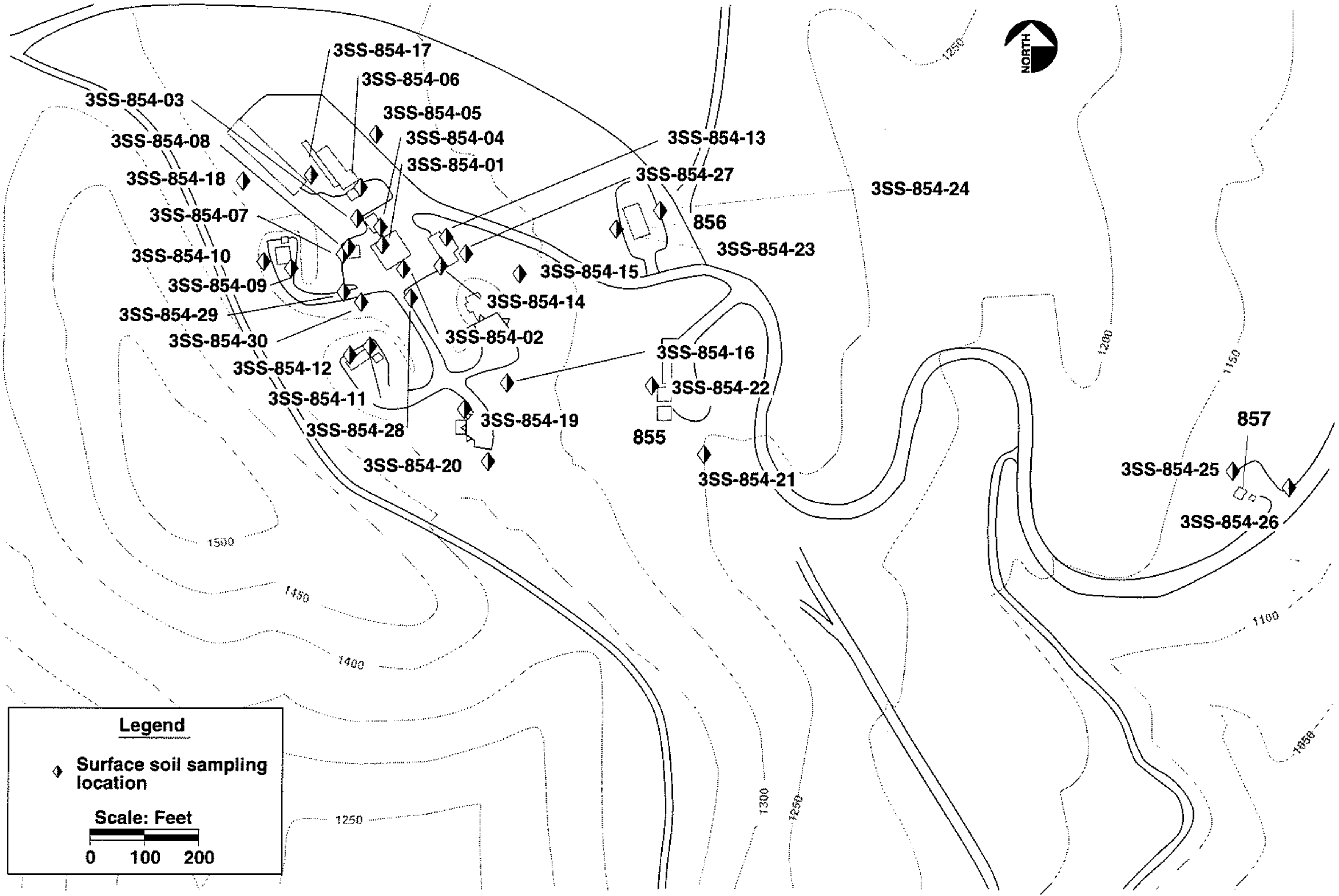
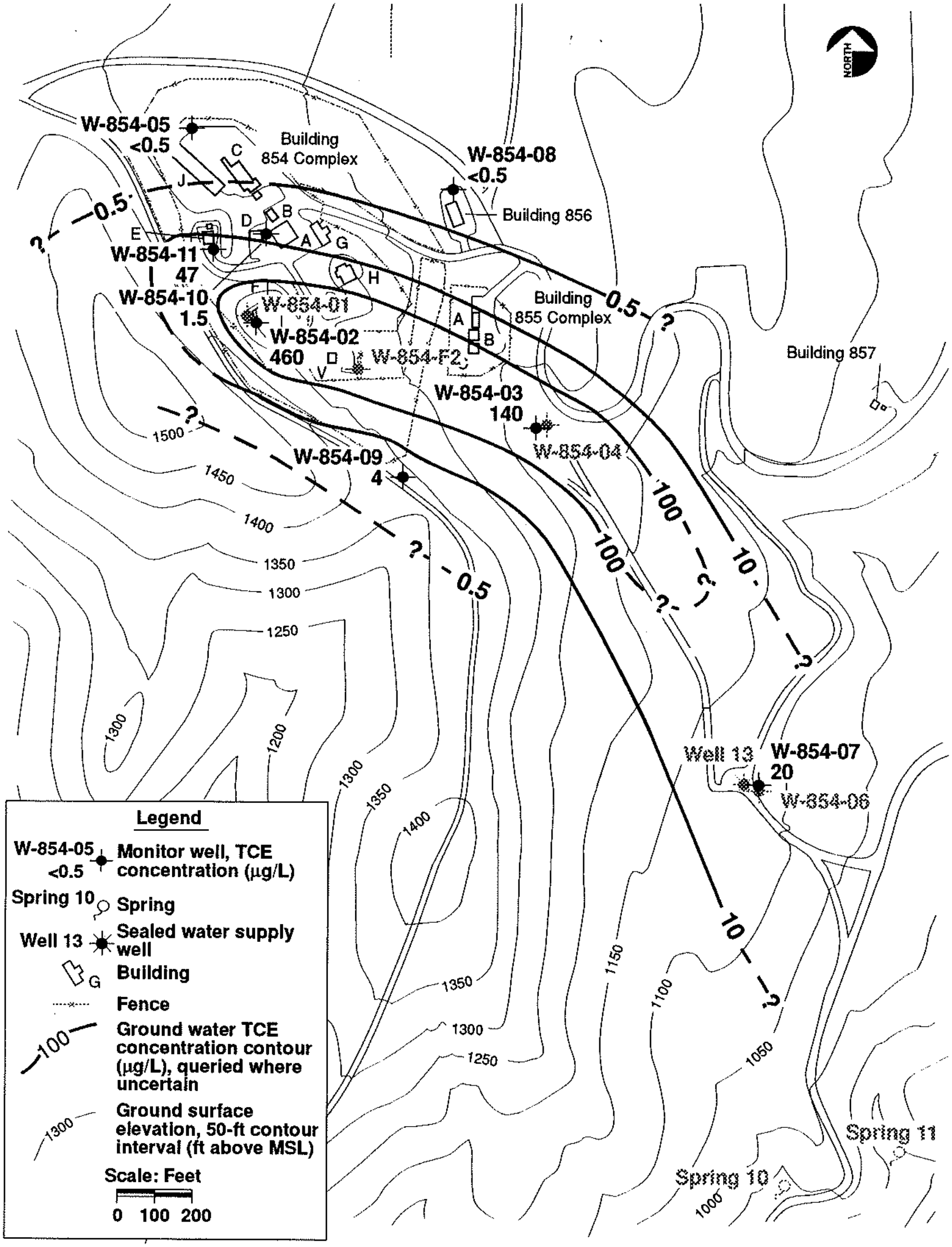


Figure 9. Locations of AVI-SVS sampled boreholes in the Building 854 OU (showing TCE vapor concentration profiles, $ppm_{v/v}$).



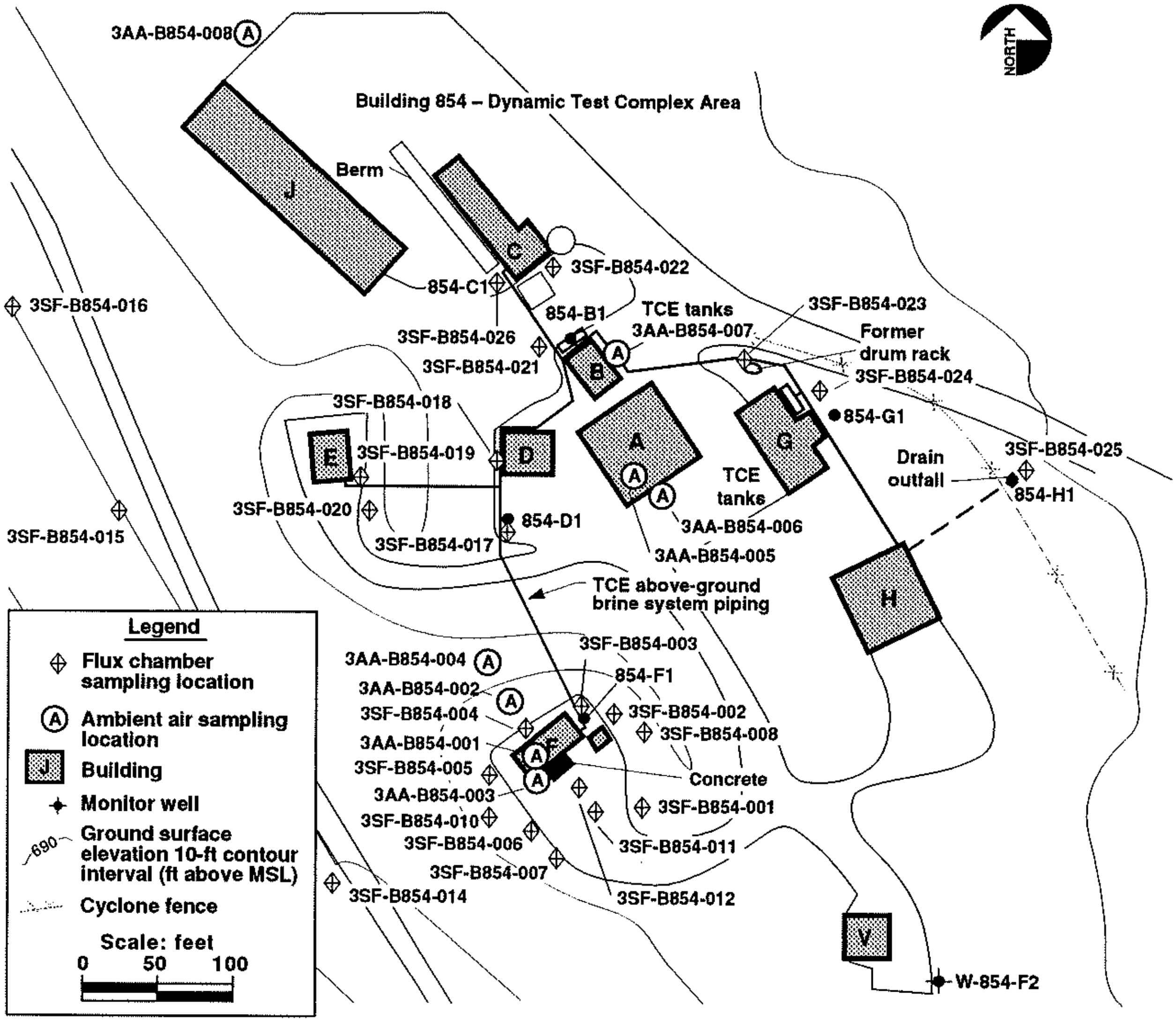
ERD-S3R-98-0021

Figure 10. Surface soil sampling locations in the Building 854 OU.



ERD-S3R-98-0011

Figure 11. TCE concentrations in the first water-bearing zone, Building 854 OU, 3rd quarter 1997.



ERD-S3R-98-0018

Figure 12. Building 854 OU ambient air and flux chamber sampling locations.

Tables

Table 1. Field activities at the Building 854 OU.

Date	Activity
1982-1983	LLNL drilled and sampled six exploratory boreholes within the Building 854 Complex and conducted geologic mapping.
1983	TCE-contaminated surface soil adjacent to Building 854F was excavated and removed. There were no detections of TCE in samples from the remaining soil at the excavation site.
1983	TCE-contaminated soil at the Building 854H drainage outfall area was excavated to a depth of 5.5 feet and removed. There were no detections of TCE in samples from the remaining soil at the excavation site.
1985	W-854-F2 was drilled. No ground water was encountered but a well was installed to monitor for potential future saturation.
1983-Present	Water from Springs 10 and 11 and Well 13, hydraulically downgradient of the complex, was sampled and analyzed for VOCs.
1996-Present	Eleven monitor wells, W-854-01 through W-854-11, were installed. Surface and subsurface soil and rock samples were collected from each of these wells during drilling, and analyzed for VOCs and other potential contaminants. These wells are sampled quarterly to bi-annually.
1995	A Petrex passive soil vapor survey was conducted. A total of 101 points were installed and analyzed in two phases.
1996	Well 13, a potential vertical conduit for ground water contamination, was sealed and abandoned.
1996	An active vacuum induced soil vapor study for VOCs in the Building 854 OU was conducted. Thirty-five boreholes for dual soil and soil vapor sampling were drilled and backfilled, with sampling depths ranging from 0.5 feet to 85 feet (Fig. 10).
1996	Surface soil was sampled to evaluate potential release locations and the presence of contaminants in the top six inches of soil. Twenty nine samples were collected and analyzed for VOCs and other contaminants (Fig. 11).
1996	Twenty-six emission isolation flux chamber (EIFC) samples were collected to measure and identify VOCs of potential concern that may be emitted to ambient air (Fig. 12).

Table 2. Well completion data for the Building 854 Study Area.

Well	Formation of completion	Point of measurement elevation (ft above MSL)	Depth of screened interval (ft bgs)	Approximate well yield (gpm)	Well inside diameter (in.)
W-854-F2	Tn	1336.07	113–123	Dry	4.5
W-854-01	Tmss	1334.44	239–249	1.2	4.5
W-854-02	Tn	1334.27	144–154	1.5	4.5
W-854-03	Tn	1238.83	125–135	0.4	4.5
W-854-04	Tmss	1238.38	320–332	1.2[a]	4.5
W-854-05	Tn	1330.34	83–98	7.0	5.0
W-854-06	Tn	1108.45	156–166	0.28	5.0
W-854-07	Tmss	1108.86	114–124	0.34	5.0
W-854-08	Tn	1274.20	108–123	1.2	5.0
W-854-09	Tn	1359.21	180–190	–[b]	5.0
W-854-10	Tn	1326.38	120–130	1.5	5.0
W-854-11	Tn	1342.18	142–152	–[c]	5.0
Well 13	Tn-Tmss	1111.76	150–232, 238–306	NA[d]	10.0–8.00

Notes:

MSL = Mean sea level.
ft = Feet.
bgs = Below ground surface.
gpm = Gallons per minute.
in. = Inch.
Tn = Neroly Formation.
Tmss = Cierbo Formation.

[a] W-854-04 dries out after pumping at 1.2 gpm for 10 min.

[b] W-854-09 is sampled with a bailer due to minimal water in casing.

[c] W-854-11 does not have an operational pump installed.

[d] Well 13 was sealed and abandoned in 1996.

Attachment A

Data Tables

```
BUILDING 854 AREA GWELEV.RPT
Current Date:  6-feb-1998
Current Time:  14:17:30
```

Table A-1. Ground water elevations, Building 854 area. Results reported by February 6, 1998.

Location	Date of Measurement	Depth to Water (ft)	Water Elevation (ft/MSL)	Notes
W-854-01				
	07/11/96	218.70	1115.74	
	08/08/96	218.33	1116.11	
	09/04/96	218.69	1115.75	
	10/09/96	218.11	1116.33	
	11/08/96	217.94	1116.50	NOM
	12/09/96	217.35	1117.09	
	01/13/97	217.81	1116.63	
	02/06/97	218.66	1115.78	
	03/05/97	218.13	1116.31	
	04/10/97	217.51	1116.93	
	05/10/97	217.38	1117.06	
	06/03/97	217.79	1116.65	
	07/08/97	217.42	1117.02	
	08/06/97	217.27	1117.17	
	09/03/97	217.95	1116.49	
	10/07/97	217.43	1117.01	
	11/04/97	217.56	1116.88	
	12/02/97	217.20	1117.24	
	01/15/98	216.95	1117.49	
W-854-02				
	07/11/96	139.77	1194.50	
	08/08/96	139.76	1194.51	
	09/04/96	139.74	1194.53	
	10/09/96	139.77	1194.50	
	11/08/96	139.77	1194.50	
	12/09/96	139.79	1194.48	
	01/13/97	139.81	1194.46	
	02/06/97	139.77	1194.50	
	03/05/97	139.70	1194.57	
	04/10/97	139.53	1194.74	
	05/10/97	139.58	1194.69	
	06/03/97	139.55	1194.72	
	07/08/97	139.49	1194.78	
	08/06/97	139.44	1194.83	
	09/03/97	139.41	1194.86	
	10/07/97	139.42	1194.85	
	11/04/97	139.41	1194.86	
	12/02/97	139.42	1194.85	
	01/15/98	139.43	1194.84	
W-854-03				
	07/11/96	116.31	1122.52	
	08/08/96	117.19	1121.64	
	09/04/96	117.05	1121.78	
	10/09/96	117.07	1121.76	
	11/08/96	117.04	1121.79	
	12/09/96	117.04	1121.79	
	01/13/97	117.12	1121.71	
	02/06/97	117.17	1121.66	
	03/05/97	117.02	1121.81	
	04/17/97	116.82	1122.01	
	05/17/97	116.85	1121.98	
	06/03/97	116.72	1122.11	
	07/07/97	116.63	1122.20	
	08/06/97	116.64	1122.19	
	09/04/97	116.68	1122.15	
	10/07/97	116.70	1122.13	
	11/04/97	116.83	1122.00	
	12/02/97	116.90	1121.93	
	01/15/98	116.98	1121.85	
W-854-04				
	07/11/96	306.37	932.01	
	08/08/96	307.63	930.75	
	09/04/96	307.49	930.89	
	10/09/96	307.52	930.86	
	11/08/96	307.84	930.54	
	12/09/96	307.36	931.02	
	01/13/97	307.22	931.16	
	02/06/97	307.51	930.87	
	03/06/97	307.61	930.77	
	04/17/97	307.14	931.24	
	05/17/97	307.08	931.30	
	06/03/97	307.10	931.28	
	07/07/97	307.09	931.29	
	08/06/97	307.13	931.25	
	09/04/97	307.12	931.26	
	10/07/97	306.93	931.45	
	11/04/97	306.68	931.70	
	12/02/97	306.88	931.50	
	01/15/98	306.86	931.52	
W-854-05				
	07/11/96	88.45	1241.89	
	08/08/96	89.14	1241.20	
	09/04/96	89.13	1241.21	
	10/09/96	89.11	1241.23	
	11/08/96	89.09	1241.25	
	12/09/96	89.05	1241.29	
	01/13/97	89.06	1241.28	
	02/06/97	89.05	1241.29	
	03/05/97	88.94	1241.40	
	04/10/97	88.82	1241.52	
	05/10/97	88.92	1241.42	
	06/03/97	88.89	1241.45	
	07/07/97	88.85	1241.49	
	08/06/97	88.82	1241.52	
	09/03/97	88.80	1241.54	
	10/07/97	88.78	1241.56	
	11/04/97	88.77	1241.57	
	12/02/97	88.76	1241.58	
	01/15/98	88.70	1241.64	
W-854-06				
	08/08/96	120.08	988.37	
	09/04/96	119.49	988.96	
	10/17/96	117.02	991.43	
	11/08/96	118.66	989.79	
	12/09/96	117.95	990.50	
	01/13/97	117.53	990.92	
	02/06/97	117.58	990.87	
	03/05/97	117.41	991.04	
	04/03/97	116.84	991.61	
	05/03/97	116.83	991.62	
	06/03/97	116.52	991.93	
	07/08/97	116.35	992.10	
	08/06/97	116.27	992.18	
	09/04/97	116.17	992.28	
	10/07/97	116.05	992.40	
	11/04/97	116.12	992.33	
	12/02/97	116.00	992.45	
	01/15/98	116.02	992.43	
W-854-07				
	08/08/96	119.00	989.86	

Table A-1. Ground water elevations, Building 854 area. Results reported by February 6, 1998.

Location	Date of Measurement	Depth to Water (ft)	Water Elevation (ft/MSL)	Notes
W-854-07 (continued)				
	09/04/96	118.50	990.36	
	10/17/96	117.95	991.36	
	11/08/96	117.69	991.17	
	12/09/96	117.11	991.75	
	01/13/97	116.88	991.98	
	02/06/97	116.75	992.11	
	03/05/97	116.57	992.29	
	04/03/97	116.12	992.74	
	05/03/97	116.02	992.84	
	06/03/97	115.77	993.09	
	07/08/97	115.57	993.29	
	08/06/97	115.46	993.40	
	09/04/97	115.35	993.51	
	10/07/97	115.28	993.58	
	11/04/97	115.39	993.47	
	12/02/97	115.25	993.61	
	01/15/98	115.17	993.69	
W-854-08				
	08/08/96	115.67	1158.53	
	10/09/96	115.43	1158.77	
	11/08/96	115.59	1158.61	
	12/09/96	115.68	1158.52	
	01/13/97	115.44	1158.76	
	02/06/97	114.59	1159.61	
	03/05/97	113.80	1160.40	
	04/10/97	114.22	1159.98	
	05/10/97	114.64	1159.56	
	06/03/97	115.16	1159.04	
	07/07/97	115.50	1158.70	
	08/06/97	115.66	1158.54	
	09/03/97	115.74	1158.46	
	10/07/97	115.84	1158.36	
	11/04/97	115.98	1158.22	
	12/02/97	116.20	1158.00	
	01/15/98	116.38	1157.82	
W-854-09				
	10/09/96	190.66	1168.55	
	11/08/96	191.38	1167.83	
	12/09/96	192.02	1167.19	
	01/13/97	191.21	1168.00	
	02/06/97	190.94	1168.27	
	03/05/97	189.62	1169.59	
	04/10/97	187.46	1171.75	
	05/10/97	186.98	1172.23	
	06/03/97	186.83	1172.38	
	07/08/97	185.71	1173.50	
	08/06/97	185.37	1173.84	
	09/04/97	185.44	1173.77	
	10/10/97	185.49	1173.72	
	11/04/97	185.46	1173.75	
	12/02/97	185.32	1173.89	
	01/15/98	184.98	1174.23	
W-854-10				
	10/09/96	117.58	1208.80	
	11/22/96	117.45	1208.93	
	12/09/96	114.72	1211.66	
	01/13/97	113.49	1212.89	
	02/06/97	113.30	1213.08	
	03/05/97	113.18	1213.20	
	04/10/97	113.49	1212.89	
W-854-10 (continued)				
	05/10/97	113.83	1212.55	
	06/03/97	114.15	1212.23	
	07/08/97	114.42	1211.96	
	08/06/97	114.65	1211.73	
	09/03/97	114.85	1211.53	
	10/07/97	115.03	1211.35	
	11/04/97	115.05	1211.33	
	12/02/97	114.88	1211.50	
	01/15/98	113.86	1212.52	
W-854-11				
	10/09/96	151.93	1190.25	
	11/22/96	148.73	1193.45	
	12/09/96	148.85	1193.33	
	01/13/97	148.88	1193.30	
	02/06/97	148.89	1193.29	
	03/05/97	148.77	1193.41	
	04/10/97	148.49	1193.69	
	05/10/97	148.65	1193.53	
	06/03/97	148.62	1193.56	
	07/08/97	148.57	1193.61	
	08/06/97	148.51	1193.67	
	09/03/97	148.52	1193.66	
	10/07/97	148.49	1193.69	
	11/04/97	148.53	1193.65	
	12/02/97	148.50	1193.68	
	01/15/98	148.51	1193.67	
W-854-F2				
	01/21/93			DRY
	02/25/93			DRY
	03/16/93			DRY
	05/10/93			DRY
	06/16/93			DRY
	07/13/93			DRY
	08/12/93			DRY
	10/18/93			DRY
	11/16/93			DRY
	12/02/93			DRY
	01/11/94			DRY
	02/02/94			DRY
	04/06/94			DRY
	07/07/94			DRY
	10/19/94			DRY
	01/11/95			DRY
	01/12/95			DRY
	04/06/95			DRY
	10/05/95			DRY
	01/12/96			DRY
	04/05/96			DRY
	07/11/96			DRY
	10/09/96			DRY
	01/13/97			DRY
	04/10/97			DRY
	07/07/97			DRY
	10/07/97			DRY
	01/15/98			DRY
WELL13				
	04/21/59	135.00	976.82	
	11/23/81	208.00	903.82	
	12/01/81	208.80	903.02	
	12/29/81	208.50	903.32	

Table A-1. Ground water elevations, Building 854 area. Results reported by February 6, 1998.

Location Date of Measurement	Depth to Water (ft)	Water Elevation (ft/MSL)	Notes	Location Date of Measurement	Depth to Water (ft)	Water Elevation (ft/MSL)	Notes
WELL13 (continued)							
02/02/82	208.10	903.72					
02/23/82	209.00	902.82					
04/08/82	178.10	933.72					
05/02/82	207.00	904.82					
07/07/82	182.50	929.32					
08/21/82	180.20	931.62					
10/06/82	173.50	938.32					
07/01/90	197.21	914.61					
11/24/92	199.31	912.21					
07/13/93	198.61	912.91					
10/18/93	198.41	913.11					
01/11/94	198.23	913.29					
04/11/94	198.07	913.45					
07/07/94	197.65	913.87					
10/19/94	197.70	913.82					
01/18/95	197.73	913.79					
04/06/95	197.09	914.43					
05/23/95	197.08	914.44	PS				
07/12/95	197.16	914.36					
10/06/95	196.66	914.86					
01/12/96			NA				
04/05/96			ABD				

Notes:

ABD	Abandoned well.
AD	Drilling of adjacent new wells disturbed water level.
BS	Water detected below bottom of screened interval.
DRY	Well dry at time of time of measurement.
ME	Measuring error suspected.
NM	Not measured.
PD	Predevelopment measurement.
PS	Measurement taken just before sampling.
PT	Pump test interfered with measurement.
WE	Well equilibrium suspect.
WR	Well recovery.

Table A-2. Volatile organic compounds in ground water and surface water (ug/L) collected from the Building 854 area. Results recorded by February 6, 1998.

VOCs in Ground Water, Site 300
February 6, 1998
epdbs::epddata

s300voc_854L.
s300voc_854R.

Table A-2. Volatile organic compounds in ground water and surface water (ug/L)

Location Date	Lab	Note	Val.	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	Total 1,2-DCE	TCE	PCE	1,1-DCA
W-854-01										
27-jun-96	CS	a	V	<1 U	-	-	<1 U	<0.5 U	<1 U	<1 U
15-aug-96	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
26-dec-96	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
23-jan-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
07-may-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
12-aug-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
28-oct-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
W-854-02										
27-jun-96	CS	a	V	<1 U	-	-	<1 U	460 D	<1 U	<1 U
15-aug-96	CS	a	V	<2.5 DU	<2.5 DU	<2.5 DU	-	530 D	<2.5 DU	<2.5 DU
26-dec-96	CS	ah	V	<5 DU	<5 DU	<5 DU	-	650 D	<5 DU	<5 DU
26-dec-96	CS	aeh	V	<5 DU	<5 DU	<5 DU	-	570 D	<5 DU	<5 DU
24-jan-97	CS	a	V	<5 DU	<5 DU	<5 DU	-	590 D	<5 DU	<5 DU
12-may-97	CS	a	V	<5 DU	<5 DU	<5 DU	-	2900 D	<5 DU	<5 DU
30-jul-97	CS	ah	V	<5 DU	<5 DU	<5 DU	-	400 D	<5 DU	<5 DU
30-jul-97	CS	aeh	V	<2.5 DU	<2.5 DU	<2.5 DU	-	460 D	<2.5 DU	<2.5 DU
29-oct-97	CS	a	V	<2.5 DU	<2.5 DU	<2.5 DU	-	470 D	<2.5 DU	<2.5 DU
W-854-03										
17-sep-96	CS	a	V	<1 U	-	-	<1 U	150 D	<1 U	<1 U
13-dec-96	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	180 D	<0.5 U	<0.5 U
24-jan-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	170 D	<0.5 U	<0.5 U
07-may-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	140 D	<0.5 U	<0.5 U
12-aug-97	CS	af	V	<0.5 U	<0.5 U	<0.5 U	-	140 D	<0.5 U	<0.5 U
29-oct-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	170 D	<0.5 U	<0.5 U
W-854-04										
16-aug-96	CS	a	V	<1 U	-	-	<1 U	<0.5 U	<1 U	<1 U
13-dec-96	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	0.62	<0.5 U	<0.5 U
24-jan-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
07-may-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
12-aug-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
28-oct-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
W-854-05										
16-aug-96	CS	a	V	<1 U	-	-	<1 U	<0.5 U	<1 U	<1 U
12-dec-96	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
23-jan-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
07-may-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
12-aug-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
28-oct-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
W-854-06										
30-may-96	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
10-sep-96	CS	a	V	<1 U	-	-	<1 U	<0.5 U	<1 U	<1 U
26-dec-96	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
27-jan-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
09-may-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
06-aug-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
28-oct-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
W-854-07										
17-jun-96	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	1.5	<0.5 U	<0.5 U
10-sep-96	CS	a	V	<1 U	-	-	<1 U	6.7	<1 U	<1 U
26-dec-96	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	18	<0.5 U	<0.5 U
27-jan-97	CS	aeh	V	<0.5 U	<0.5 U	<0.5 U	-	19	<0.5 U	<0.5 U
27-jan-97	CS	ah	V	<0.5 U	<0.5 U	<0.5 U	-	19	<0.5 U	<0.5 U
09-may-97	CS	aeh	V	<0.5 U	<0.5 U	<0.5 U	-	20	<0.5 U	<0.5 U
09-may-97	CS	ah	V	<0.5 U	<0.5 U	<0.5 U	-	19	<0.5 U	<0.5 U
06-aug-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	17	<0.5 U	<0.5 U
29-oct-97	BB	ag	V	<0.5 U	<0.5 U	<0.5 U	<1 U	20	<0.5 U	<0.5 U
29-oct-97	CS	ag	V	<0.5 U	<0.5 U	<0.5 U	-	18	<0.5 U	<0.5 U
W-854-08										
24-jun-96	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	2.3	<0.5 U	<0.5 U
10-sep-96	CS	a	V	<1 U	-	-	<1 U	<0.5 U	<1 U	<1 U

collected from the Building 854 area. Results recorded by February 6, 1998.

1,2-DCA	1,1,1-TCA	Chloroform	Freon 11	Freon 113	Methylene chloride	Location Date
						W-854-01
<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	27-jun-96
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	15-aug-96
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	26-dec-96
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	23-jan-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	07-may-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	12-aug-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	28-oct-97
						W-854-02
<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	27-jun-96
<2.5 DU	<2.5 DU	<2.5 DU	<2.5 DU	<2.5 DU	<2.5 DU	15-aug-96
<5 DU	<5 DU	<5 DU	<5 DU	<5 DU	<5 DU	26-dec-96
<5 DU	<5 DU	<5 DU	<5 DU	<5 DU	<5 DU	26-dec-96
<5 DU	<5 DU	<5 DU	<5 DU	<5 DU	<5 DU	24-jan-97
<5 DU	<5 DU	<5 DU	<5 DU	<5 DU	<5 DU	12-may-97
<5 DU	<5 DU	<5 DU	<5 DU	<5 DU	<5 DU	30-jul-97
<2.5 DU	<2.5 DU	<2.5 DU	<2.5 DU	<2.5 DU	<2.5 DU	30-jul-97
<2.5 DU	<2.5 DU	<2.5 DU	<2.5 DU	<2.5 DU	<2.5 DU	29-oct-97
						W-854-03
<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	17-sep-96
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	13-dec-96
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	24-jan-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	07-may-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	12-aug-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	29-oct-97
						W-854-04
<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	16-aug-96
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	13-dec-96
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	24-jan-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	07-may-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	12-aug-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	28-oct-97
						W-854-05
<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	16-aug-96
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	12-dec-96
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	23-jan-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	07-may-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	12-aug-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	28-oct-97
						W-854-06
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	30-may-96
<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	10-sep-96
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	26-dec-96
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	27-jan-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	09-may-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	06-aug-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	28-oct-97
						W-854-07
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	17-jun-96
<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	10-sep-96
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	26-dec-96
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	27-jan-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	27-jan-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	09-may-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	09-may-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	06-aug-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<1 U	29-oct-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	29-oct-97
						W-854-08
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	24-jun-96
<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	10-sep-96

Table A-2. Volatile organic compounds in ground water and surface water (ug/L)

Location Date	Lab	Note	Val.	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	Total 1,2-DCE	TCE	PCE	1,1-DCA
W-854-08 (continued)										
13-dec-96	CS	a	V	<1 UO	-	-	<1 U	<0.5 U	<1 U	<1 U
23-jan-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
12-may-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
30-jul-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
28-oct-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
W-854-09										
11-jul-96	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
06-feb-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
07-may-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	1.3	<0.5 U	<0.5 U
06-aug-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	3.5	<0.5 U	<0.5 U
29-oct-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	4	<0.5 U	<0.5 U
W-854-10										
06-feb-97	CS	a	V	<1 U	-	-	<1 U	<0.5 U	<1 U	<1 U
06-jun-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	6.9	<0.5 U	<0.5 U
16-sep-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	1.5	<0.5 U	<0.5 U
28-oct-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	12	<0.5 U	<0.5 U
W-854-11										
19-feb-97	CS	a	V	<1 U	-	-	<1 U	48 D	<1 U	<1 U
16-sep-97	CS	af	V	<0.5 U	<0.5 U	<0.5 U	-	47 D	<0.5 U	<0.5 U
SPRING10										
16-dec-82	BC	a	U	-	-	-	-	<0.5 P	-	-
04-may-83	BC	a	U	-	-	-	-	0.6 P	-	-
03-aug-83	BC	a	U	-	-	-	-	<0.5 P	-	-
10-feb-86	BC	a	U	<0.5 P	-	-	<0.5 P	<0.5 P	<0.5 P	<0.5 P
19-nov-91	BC	a	U	<0.5 P	<0.5 P	<0.5 P	<0.5 P	<0.5 P	<0.5 P	<0.5 P
22-sep-93	CS	a	V	<0.5 U	-	-	<0.5 U	<0.5 U	<0.5 U	<0.5 U
28-apr-94	CS	a	V	<0.5 U	-	-	<0.5 U	<0.5 U	<0.5 U	<0.5 U
13-oct-95	CS	a	V	<0.5 U	-	-	<0.5 U	0.7 LO	<0.5 U	<0.5 U
01-dec-95	CS	a	V	<0.5 U	-	-	<0.5 U	<0.5 U	<0.5 U	<0.5 U
17-jun-96	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
SPRING11										
16-dec-82	BC	a	U	-	-	-	-	<0.5 P	-	-
04-may-83	BC	a	U	-	-	-	-	<0.5 P	-	-
10-feb-86	BC	a	U	<0.5 P	-	-	<0.5 P	<0.5 P	<0.5 P	<0.5 P
14-nov-91	BC	a	U	<0.5 P	<0.5 P	<0.5 P	<0.5 P	<0.5 P	<0.5 P	<0.5 P
22-sep-93	CS	a	V	<0.5 U	-	-	<0.5 U	<0.5 U	<0.5 U	<0.5 U
28-apr-94	CS	a	V	<0.5 U	-	-	<0.5 U	<0.5 U	<0.5 U	<0.5 U
13-oct-95	CS	a	V	<0.5 U	-	-	<0.5 U	0.75 LO	<0.5 U	<0.5 U
01-dec-95	CS	a	V	<0.5 U	-	-	<0.5 U	<0.5 U	<0.5 U	<0.5 U
17-jun-96	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	1	<0.5 U	<0.5 U
28-jun-96	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U
08-may-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	-	<0.5 U	<0.5 U	<0.5 U

collected from the Building 854 area. Results recorded by February 6, 1998.

1,2-DCA	1,1,1-TCA	Chloroform	Freon 11	Freon 113	Methylene chloride	Location Date
						(continued) W-854-08
<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	13-dec-96
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	23-jan-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	12-may-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	30-jul-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	28-oct-97
						W-854-09
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	11-jul-96
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	06-feb-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	07-may-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	06-aug-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	29-oct-97
						W-854-10
<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	06-feb-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	06-jun-97
<0.5 U	<0.5 U	0.5	<0.5 U	<0.5 U	<0.5 U	16-sep-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	28-oct-97
						W-854-11
<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	19-feb-97
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	16-sep-97
						SPRING10
-	-	-	-	-	-	16-dec-82
-	-	-	-	-	-	04-may-83
-	-	-	-	-	-	03-aug-83
<0.5 P	<0.5 P	<0.5 P	<0.5 P	<0.5 P	<0.5 P	10-feb-86
<0.5 P	<0.5 P	<0.5 P	<0.5 P	<0.5 P	<2 P	19-nov-91
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	22-sep-93
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	28-apr-94
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	13-oct-95
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	01-dec-95
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	17-jun-96
						SPRING11
-	-	-	-	-	-	16-dec-82
-	-	-	-	-	-	04-may-83
<0.5 P	<0.5 P	<0.5 P	<0.5 P	<0.5 P	<0.5 P	10-feb-86
<0.5 P	<0.5 P	<0.5 P	<0.5 P	<0.5 P	<2 P	14-nov-91
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	22-sep-93
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	28-apr-94
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	13-oct-95
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	01-dec-95
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	17-jun-96
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	28-jun-96
<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	08-may-97

See following page for notes

Table A-2. Volatile organic compounds in ground water and surface water (ug/L) collected from the Building 854 area. Results recorded by February 6, 1998.

Notes:

- Indicates no analysis performed for this compound

Val. = Validation code

Footnotes:

a	ERD data
b	ORAD WGMG data
c	Analytical results for this sample are suspect
d	Sample collected during hydraulic testing
e	Blind sample, sent to lab without well identity
f	Sample dilution necessary for analysis; detection limits increased
g	Interlaboratory collocated sample
h	Intralaboratory collocated sample
i	Sample collected as part of pilot study
j	Note field may contain important information regarding this sample
k	Pre-development sample
l	Norm month, norm quarter or norm year inconsistent with sample date
m	Confirmation sample
n	Sample analyzed after standard holding time
o	Sample comprised of partial composite
p	Alpha spectroscopy analysis of uranium isotopes
q	Gamma spectroscopy analysis of uranium isotopes

Lab Codes:

BB	BC Laboratories, Inc., Bakersfield, CA
BC	Brown and Caldwell, Emeryville, CA
CS	California Laboratory Services, Rancho Cordova, CA

Validation Codes:

V	Validated
N	Not validated (default value)
U	Undeclared
H	Historical comparison only

CLP flags: (follow result)

B	Analyte found in method blank
D	Analysis performed at a secondary dilution or concentration (i.e., vapor samples)
E	The analyte was detected below the LLNL reporting limit, but above the analytical laboratory minimum detection limit.
F	Analyte found in field blank, trip blank, or equipment blank
G	Quantitated using fuel calibration, but does not match typical fuel fingerprint (fuel maybe gasoline, diesel, motor oil etc.).
H	Sample analyzed outside of holding time, sample results should be evaluated
J	Analyte was postively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
L	Spike accuracy not within control limits
O	Duplicate spike or sample precision not within control limits
P	Indicates that the absence of a data qualifier flag does not mean that the data does not need qualification, but that the implementation of electronic data qualifier flags was not yet established
R	Sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified
S	Analytical results for this sample are suspect
T	Analyte is tentatively identified compound; result is approximate
U	Compound was analyzed for, but not detected above detection limit

Table A-3. Volatile organic compounds in soil and rock (mg/kg) collected from the Building 854 area. Results recorded by February 10, 1998.

VOCs in Soil
February 11, 1998
gemini1

s3vocSO_854L.11feb98
s3vocSO_854R.11feb98

Table A-3. Volatile organic compounds in soil and rock (mg/kg) collected from the

Location Date	Lab	Note	Val.	Depth (ft)	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	Total 1,2-DCE	TCE	PCE	1,1-DCA
854-14											
03-sep-96	CS	a	V	1.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
03-sep-96	CS	a	V	6.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
04-sep-96	BB	ag	V	12.0	<0.0004 U	<0.0005 U	<0.0005 U	-	<0.00037 U	<0.0009 U	<0.0006 U
04-sep-96	CS	a	V	12.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
04-sep-96	CS	a	V	18.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
854-15											
14-aug-96	CS	a	V	1.5	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
14-aug-96	CS	a	V	6.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
14-aug-96	CS	a	V	12.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
14-aug-96	CS	a	V	18.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
854-16											
13-aug-96	CS	a	V	1.5	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
13-aug-96	CS	a	V	6.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
13-aug-96	CS	a	V	12.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
13-aug-96	CS	a	V	18.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
854-17											
26-aug-96	CS	a	V	1.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
26-aug-96	CS	a	V	6.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
26-aug-96	CS	a	V	12.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
26-aug-96	CS	a	V	18.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
854-18											
28-aug-96	BB	ag	V	1.0	<0.0004 U	<0.0005 U	<0.0005 U	-	<0.00037 U	<0.0009 U	<0.0006 U
28-aug-96	CS	ag	V	1.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
28-aug-96	BB	ag	V	6.0	<0.0004 U	<0.0005 U	<0.0005 U	-	<0.00037 U	<0.0009 U	<0.0006 U
28-aug-96	CS	ag	V	6.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
30-aug-96	CS	a	V	12.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
30-aug-96	CS	a	V	18.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
854-19											
15-aug-96	BB	ag	V	1.5	<0.0004 U	<0.0005 U	<0.0005 U	-	<0.00037 U	<0.0009 U	<0.0006 U
15-aug-96	CS	ag	V	1.5	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 UO	<0.0005 U	<0.0005 U
15-aug-96	CS	a	V	6.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 UO	<0.0005 U	<0.0005 U
15-aug-96	CS	a	V	12.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 UO	<0.0005 U	<0.0005 U
15-aug-96	CS	a	V	18.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 UO	<0.0005 U	<0.0005 U
854-20											
14-aug-96	CS	a	V	1.5	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
14-aug-96	CS	a	V	6.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
14-aug-96	CS	a	V	12.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
15-aug-96	CS	a	V	16.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 UO	<0.0005 U	<0.0005 U
854-21											
03-sep-96	CS	a	V	1.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
03-sep-96	CS	a	V	6.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
03-sep-96	CS	a	V	12.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
03-sep-96	CS	a	V	18.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
854-22											
14-aug-96	CS	a	V	1.5	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
14-aug-96	CS	a	V	6.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
14-aug-96	CS	a	V	12.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
14-aug-96	CS	a	V	18.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
854-23											
03-sep-96	CS	a	V	1.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
03-sep-96	CS	a	V	6.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
03-sep-96	CS	a	V	12.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
03-sep-96	CS	a	V	18.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
854-24											
19-aug-96	CS	a	V	1.5	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
19-aug-96	CS	a	V	6.0	<0.0005 U	<0.0005 U	<0.0005 U	-	0.00079	<0.0005 U	<0.0005 U
19-aug-96	CS	a	V	12.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U

Building 854 area. Results recorded by February 10, 1998.

1,2-DCA	1,1,1-TCA	Chloroform	Freon 11	Freon 113	Methylene chloride	Location Date
						854-14
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00097 B	03-sep-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0013 B	03-sep-96
<0.0005 U	<0.0006 U	<0.0007 U	<0.0005 U	<0.0005 U	0.0011 B	04-sep-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00068 B	04-sep-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00092 B	04-sep-96
						854-15
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0021 B	14-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0025 B	14-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0025 B	14-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0027 B	14-aug-96
						854-16
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0026 B	13-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0038 B	13-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0035 B	13-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0028 B	13-aug-96
						854-17
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0033 B	26-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0017 B	26-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0031 B	26-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0025 B	26-aug-96
						854-18
<0.0005 U	<0.0006 U	<0.0007 U	<0.0005 U	<0.0005 U	0.0021 B	28-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0016 B	28-aug-96
<0.0005 U	<0.0006 U	<0.0007 U	<0.0005 U	<0.0005 U	0.0018 B	28-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0017 B	28-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0011 B	30-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00073 B	30-aug-96
						854-19
<0.0005 U	<0.0006 U	<0.0007 U	<0.0005 U	<0.0005 U	0.0011 B	15-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0042 B	15-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0038 B	15-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.003 B	15-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0035 B	15-aug-96
						854-20
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0021 B	14-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0015 B	14-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0018 B	14-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0031 B	15-aug-96
						854-21
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0031 B	03-sep-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00061	0.0021 B	03-sep-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0016 B	03-sep-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0018 B	03-sep-96
						854-22
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0026 B	14-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0022 B	14-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0023 B	14-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0016 B	14-aug-96
						854-23
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0022 B	03-sep-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0034 B	03-sep-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.002 B	03-sep-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0018 B	03-sep-96
						854-24
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	19-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	19-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	19-aug-96

Table A-3. Volatile organic compounds in soil and rock (mg/kg) collected from the

Location Date	Lab	Note	Val.	Depth (ft)	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	Total 1,2-DCE	TCE	PCE	1,1-DCA
854-24 (continued)											
19-aug-96	CS	a	V	18.0	<0.0005 U	<0.0005 U	<0.0005 U	-	0.00058	<0.0005 U	<0.0005 U
854-25											
28-aug-96	CS	a	V	1.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
28-aug-96	CS	a	V	6.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
28-aug-96	CS	a	V	12.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
28-aug-96	CS	a	V	18.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
28-aug-96	CS	a	V	20.5	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
28-aug-96	CS	a	V	26.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
854-26											
16-aug-96	CS	a	V	1.5	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
16-aug-96	CS	a	V	6.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
16-aug-96	CS	a	V	12.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
16-aug-96	CS	a	V	18.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
854-27											
27-aug-96	CS	a	V	1.0	<0.005 U	-	-	<0.005 U	<0.005 U	<0.005 U	<0.005 U
27-aug-96	CS	a	V	6.0	<0.005 U	-	-	<0.005 U	<0.005 U	<0.005 U	<0.005 U
27-aug-96	CS	a	V	12.0	<0.005 U	-	-	<0.005 U	<0.005 U	<0.005 U	<0.005 U
27-aug-96	CS	a	V	18.0	<0.005 U	-	-	<0.005 U	<0.005 U	<0.005 U	<0.005 U
854-27A											
27-aug-96	CS	a	V	1.0	<0.005 U	-	-	<0.005 U	<0.005 U	<0.005 U	<0.005 U
27-aug-96	CS	a	V	6.0	<0.005 U	-	-	<0.005 U	<0.005 U	<0.005 U	<0.005 U
28-aug-96	CS	a	V	12.0	<0.005 U	-	-	<0.005 U	<0.005 U	<0.005 U	<0.005 U
28-aug-96	CS	a	V	18.0	<0.005 U	-	-	<0.005 U	<0.005 U	<0.005 U	<0.005 U
854-28											
21-aug-96	CS	a	V	1.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
21-aug-96	CS	a	V	3.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
21-aug-96	CS	a	V	6.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
21-aug-96	CS	a	V	12.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
21-aug-96	CS	a	V	18.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
21-aug-96	CS	a	V	24.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
854-29											
22-aug-96	CS	a	V	1.0	<0.0005 IUJ	<0.0005 IUJ	<0.0005 IUJ	-	0.00089 IJ	<0.0005 IUJ	<0.0005 IUJ
22-aug-96	BB	ag	V	6.0	<0.0004 U	<0.0005 U	<0.0005 U	-	<0.00037 U	<0.0009 U	<0.0006 U
22-aug-96	CS	ag	V	6.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
22-aug-96	CS	a	V	12.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
22-aug-96	CS	a	V	18.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
23-aug-96	CS	a	V	24.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
26-aug-96	CS	a	V	30.0	<0.0005 U	<0.0005 U	<0.0005 U	-	0.00072	<0.0005 U	<0.0005 U
26-aug-96	CS	a	V	36.0	<0.0005 U	<0.0005 U	<0.0005 U	-	0.0015	<0.0005 U	<0.0005 U
26-aug-96	CS	a	V	42.0	<0.0005 U	<0.0005 U	<0.0005 U	-	0.0059	<0.0005 U	<0.0005 U
854-29A											
05-nov-96	CS	a	V	44.0	<0.0005 U	<0.0005 U	<0.0005 U	-	0.023 LO	<0.0005 U	<0.0005 U
05-nov-96	CS	agh	V	54.0	<0.0005 U	<0.0005 U	<0.0005 U	-	0.035 LO	<0.0005 U	<0.0005 U
05-nov-96	EC	agh	N	54.0	<0.004 U	<0.004 U	-	-	<0.004 U	<0.004 U	-
05-nov-96	CS	a	V	64.0	<0.0005 U	<0.0005 U	<0.0005 U	-	0.0087	<0.0005 U	<0.0005 U
854-30											
15-aug-96	CS	a	V	1.5	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 UO	<0.0005 U	<0.0005 U
15-aug-96	BB	ag	V	6.0	<0.0004 U	<0.0005 U	<0.0005 U	-	<0.00037 U	<0.0009 U	<0.0006 U
15-aug-96	CS	ag	V	6.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 UO	<0.0005 U	<0.0005 U
15-aug-96	CS	a	V	12.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 UO	<0.0005 U	<0.0005 U
15-aug-96	CS	a	V	18.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 UO	<0.0005 U	<0.0005 U
854-31											
30-aug-96	CS	a	V	1.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
30-aug-96	CS	a	V	6.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
30-aug-96	CS	a	V	12.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
30-aug-96	CS	a	V	18.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U

Building 854 area. Results recorded by February 10, 1998.

1,2-DCA	1,1,1-TCA	Chloroform	Freon 11	Freon 113	Methylene chloride	Location Date
						(continued) 854-24
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	19-aug-96
						854-25
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0024 B	28-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0016 B	28-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0014 B	28-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0016 B	28-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0017 B	28-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0015 B	28-aug-96
						854-26
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0046 B	16-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0047 B	16-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0039 B	16-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0034 B	16-aug-96
						854-27
<0.005 U	<0.005 U	<0.005 U	<0.005 U	<0.005 U	<0.005 U	27-aug-96
<0.005 U	<0.005 U	<0.005 U	<0.005 U	<0.005 U	0.0061 S	27-aug-96
<0.005 U	<0.005 U	<0.005 U	<0.005 U	<0.005 U	0.0055 S	27-aug-96
<0.005 U	<0.005 U	<0.005 U	<0.005 U	<0.005 U	<0.005 U	27-aug-96
						854-27A
<0.005 U	<0.005 U	<0.005 U	<0.005 U	<0.005 U	0.0056 S	27-aug-96
<0.005 U	<0.005 U	<0.005 U	<0.005 U	<0.005 U	<0.005 U	27-aug-96
<0.005 U	<0.005 U	<0.005 U	<0.005 U	<0.005 U	<0.005 U	28-aug-96
<0.005 U	<0.005 U	<0.005 U	<0.005 U	<0.005 U	0.0059 S	28-aug-96
						854-28
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0029	21-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0025 S	21-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0019 S	21-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0017 S	21-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0015 S	21-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0019 S	21-aug-96
						854-29
<0.0005 IUJ	<0.0005 IUJ	<0.0005 IUJ	<0.0005 IUJ	<0.0005 IUJ	0.0047 BIJ	22-aug-96
<0.0005 U	<0.0006 U	<0.0007 U	<0.0005 U	<0.0005 U	0.0023 B	22-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0025 B	22-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0028 B	22-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0038 B	22-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0029 S	23-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0022 B	26-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0022 B	26-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.002 B	26-aug-96
						854-29A
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	05-nov-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	05-nov-96
<0.004 U	<0.004 U	<0.004 U	<0.004 U	-	-	05-nov-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	05-nov-96
						854-30
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0035 B	15-aug-96
<0.0005 U	<0.0006 U	<0.0007 U	<0.0005 U	<0.0005 U	0.0009 B	15-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0036 B	15-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0036 B	15-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.003 B	15-aug-96
						854-31
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0008 B	30-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00064 B	30-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.001 B	30-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00092 B	30-aug-96

Table A-3. Volatile organic compounds in soil and rock (mg/kg) collected from the

Location Date	Lab	Note	Val.	Depth (ft)	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	Total 1,2-DCE	TCE	PCE	1,1-DCA
854-32											
20-aug-96	CS	a	V	1.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
20-aug-96	CS	a	V	3.0	<0.0005 U	<0.0005 U	<0.0005 U	-	0.00065	<0.0005 U	<0.0005 U
20-aug-96	CS	a	V	6.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
20-aug-96	CS	a	V	12.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
21-aug-96	CS	a	V	18.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
21-aug-96	CS	a	V	24.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
854-33											
28-aug-96	CS	a	V	6.0	<0.0005 U	<0.0005 U	<0.0005 U	-	0.0016	<0.0005 U	<0.0005 U
28-aug-96	CS	a	V	11.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
854-34											
22-aug-96	CS	a	V	1.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
22-aug-96	CS	a	V	6.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
22-aug-96	CS	a	V	12.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
22-aug-96	BB	ag	V	18.0	<0.0004 U	<0.0005 U	<0.0005 U	-	<0.00037 U	<0.0009 U	<0.0006 U
22-aug-96	CS	ag	V	18.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
22-aug-96	CS	a	V	24.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
854-34A											
07-nov-96	CS	a	V	56.0	<0.0005 U	<0.0005 U	<0.0005 U	-	0.0048	<0.0005 U	<0.0005 U
07-nov-96	CS	a	V	66.0	<0.0005 U	<0.0005 U	<0.0005 U	-	0.033	<0.0005 U	<0.0005 U
07-nov-96	CS	a	V	76.0	<0.0005 U	<0.0005 U	<0.0005 U	-	0.018	<0.0005 U	<0.0005 U
854-35											
19-aug-96	CS	a	V	6.0	<0.0005 U	<0.0005 U	<0.0005 U	-	0.0016	<0.0005 U	<0.0005 U
19-aug-96	CS	a	V	12.0	<0.0005 U	<0.0005 U	<0.0005 U	-	0.0016	<0.0005 U	<0.0005 U
19-aug-96	CS	a	V	18.0	<0.0005 U	<0.0005 U	<0.0005 U	-	0.00096	<0.0005 U	<0.0005 U
20-aug-96	BB	ag	V	24.0	<0.0004 U	<0.0005 U	<0.0005 U	-	<0.00037 U	<0.0009 U	<0.0006 U
20-aug-96	CS	ag	V	24.0	<0.0005 U	<0.0005 U	<0.0005 U	-	0.0029	<0.0005 U	<0.0005 U
854-36											
20-aug-96	CS	a	V	6.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
20-aug-96	BB	ag	V	12.0	<0.0004 U	<0.0005 U	<0.0005 U	-	<0.00037 U	<0.0009 U	<0.0006 U
20-aug-96	CS	ag	V	12.0	<0.0005 U	<0.0005 U	<0.0005 U	-	0.00056	<0.0005 U	<0.0005 U
20-aug-96	CS	a	V	18.0	<0.0005 U	<0.0005 U	<0.0005 U	-	0.0022	<0.0005 U	<0.0005 U
20-aug-96	CS	a	V	24.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
854-38											
06-sep-96	CS	a	V	1.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
06-sep-96	CS	a	V	6.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
06-sep-96	CS	a	V	12.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
06-sep-96	CS	a	V	18.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
854-40											
04-sep-96	CS	a	V	1.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
04-sep-96	BB	ag	V	6.0	<0.0004 U	<0.0005 U	<0.0005 U	-	<0.00037 U	<0.0009 U	<0.0006 U
04-sep-96	CS	ag	V	6.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
04-sep-96	CS	a	V	12.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
04-sep-96	CS	a	V	18.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
854-41											
06-sep-96	CS	a	V	1.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
16-sep-96	EC	a	N	7.0	<0.0004 U	<0.0004 U	-	-	<0.0004 U	<0.0004 U	-
16-sep-96	CS	ag	V	12.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
16-sep-96	EC	ag	N	12.0	<0.0004 U	<0.0004 U	-	-	<0.0004 U	<0.0004 U	-
16-sep-96	EC	a	N	18.0	<0.0004 U	<0.0004 U	-	-	<0.0004 U	<0.0004 U	-
16-sep-96	CS	ag	V	24.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
16-sep-96	EC	ag	N	24.0	<0.0004 U	<0.0004 U	-	-	<0.0004 U	<0.0004 U	-
16-sep-96	EC	a	N	30.0	<0.0004 U	<0.0004 U	-	-	<0.0004 U	<0.0004 U	-
854-42											
12-sep-96	EC	a	N	1.0	<0.0004 U	<0.0004 U	-	-	<0.0004 U	<0.0004 U	-
12-sep-96	EC	a	N	6.0	<0.0004 U	<0.0004 U	-	-	<0.0004 U	<0.0004 U	-
12-sep-96	EC	a	N	12.0	<0.0004 U	<0.0004 U	-	-	<0.0004 U	<0.0004 U	-
12-sep-96	EC	a	N	18.0	<0.0004 U	<0.0004 U	-	-	<0.0004 U	<0.0004 U	-
12-sep-96	EC	a	N	24.0	<0.0004 U	<0.0004 U	-	-	<0.0004 U	<0.0004 U	-
12-sep-96	EC	a	N	30.0	<0.0004 U	<0.0004 U	-	-	<0.0004 U	<0.0004 U	-

1,2-DCA	1,1,1-TCA	Chloroform	Freon 11	Freon 113	Methylene chloride	Location Date
						854-32
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00067 S	20-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00065 S	20-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00068 S	20-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0006 S	20-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.001 S	21-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0017 S	21-aug-96
						854-33
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0016 B	28-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0015 B	28-aug-96
						854-34
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0027 B	22-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0028 B	22-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0026 B	22-aug-96
<0.0005 U	<0.0006 U	<0.0007 U	<0.0005 U	<0.0005 U	0.0017 B	22-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0021 B	22-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0026 B	22-aug-96
						854-34A
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	07-nov-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	07-nov-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	07-nov-96
						854-35
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	19-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	19-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	19-aug-96
<0.0005 U	<0.0006 U	<0.0007 U	<0.0005 U	<0.0005 U	0.0008 B	20-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00068 S	20-aug-96
						854-36
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00059 S	20-aug-96
<0.0005 U	<0.0006 U	<0.0007 U	<0.0005 U	<0.0005 U	0.0009 B	20-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00064 S	20-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00062 S	20-aug-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00065 S	20-aug-96
						854-38
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.009 B	06-sep-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0062 B	06-sep-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0062 B	06-sep-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0052 B	06-sep-96
						854-40
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00063 B	04-sep-96
<0.0005 U	<0.0006 U	<0.0007 U	<0.0005 U	<0.0005 U	0.0008 B	04-sep-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	04-sep-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00078 B	04-sep-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00074 B	04-sep-96
						854-41
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.008 B	06-sep-96
<0.0004 U	<0.0004 U	<0.0004 U	-	<0.0004 U	-	16-sep-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	16-sep-96
<0.0004 U	<0.0004 U	<0.0004 U	-	<0.0004 U	-	16-sep-96
<0.0004 U	<0.0004 U	<0.0004 U	-	<0.0004 U	-	16-sep-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	16-sep-96
<0.0004 U	<0.0004 U	<0.0004 U	-	<0.0004 U	-	16-sep-96
<0.0004 U	<0.0004 U	<0.0004 U	-	<0.0004 U	-	16-sep-96
						854-42
<0.0004 U	<0.0004 U	<0.0004 U	-	<0.0004 U	-	12-sep-96
<0.0004 U	<0.0004 U	<0.0004 U	-	<0.0004 U	-	12-sep-96
<0.0004 U	<0.0004 U	<0.0004 U	-	<0.0004 U	-	12-sep-96
<0.0004 U	<0.0004 U	<0.0004 U	-	<0.0004 U	-	12-sep-96
<0.0004 U	<0.0004 U	<0.0004 U	-	<0.0004 U	-	12-sep-96
<0.0004 U	<0.0004 U	<0.0004 U	-	<0.0004 U	-	12-sep-96

Table A-3. Volatile organic compounds in soil and rock (mg/kg) collected from the

Location Date	Lab	Val. Note	Depth (ft)	1,1- DCE	cis- 1,2- DCE	trans- 1,2- DCE	Total 1,2- DCE	TCE	PCE	1,1- DCA
854-44										
29-oct-96	CS a	V	1.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
29-oct-96	CS a	V	6.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
29-oct-96	CS a	V	12.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
W-854-01										
21-nov-95	CS a	V	0.5	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
21-nov-95	CS ag	V	5.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
21-nov-95	CS ag	V	10.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
21-nov-95	CS a	V	20.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
21-nov-95	CS a	V	22.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
21-nov-95	CS a	V	25.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
21-nov-95	CS a	V	40.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
22-nov-95	CS a	V	60.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
22-nov-95	CS ag	V	80.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
22-nov-95	FS ag	V	80.0	<0.005 U	<0.005 U	<0.005 U	-	<0.005 U	<0.005 U	<0.005 U
27-nov-95	CS a	V	100.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
27-nov-95	CS a	V	121.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
13-dec-95	CS a	V	141.0	<0.0005 U	-	-	<0.0005 U	0.0017	<0.0005 U	<0.0005 U
04-jan-96	CS a	V	193.3	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
04-jan-96	CS a	V	223.1	<0.0005 U	-	-	<0.0005 U	0.0008	<0.0005 U	<0.0005 U
04-jan-96	CS a	V	236.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
05-jan-96	CS a	V	246.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
05-jan-96	CS a	V	256.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
05-jan-96	CS a	V	264.0	<0.0005 IUJ	-	-	<0.0005 IUJ	<0.0005 IUJ	<0.0005 IUJ	<0.0005 IUJ
08-jan-96	CS a	V	301.1	<0.0005 IUJ	-	-	<0.0005 IUJ	<0.0005 IUJ	<0.0005 IUJ	<0.0005 IUJ
09-jan-96	CS a	V	350.8	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
09-jan-96	CS ag	V	391.0	<0.0005 IUJ	-	-	<0.0005 IUJ	<0.0005 IUJ	<0.0005 IUJ	<0.0005 IUJ
09-jan-96	FS ag	V	391.0	<0.005 U	<0.005 LOU	<0.005 U	-	<0.005 U	<0.005 OU	<0.005 LOU
W-854-02										
22-jan-96	CS a	V	0.5	<0.0005 UO	-	-	<0.0005 U	0.0044	<0.0005 U	<0.0005 U
22-jan-96	CS a	V	5.0	<0.0005 UO	-	-	<0.0005 U	0.00081	<0.0005 U	<0.0005 U
22-jan-96	CS a	V	10.0	<0.0005 UO	-	-	<0.0005 U	0.0015	<0.0005 U	<0.0005 U
23-jan-96	CS a	V	20.1	<0.0005 UO	-	-	<0.0005 U	0.001	<0.0005 U	<0.0005 U
23-jan-96	CS a	V	33.0	<0.0005 UO	-	-	<0.0005 U	0.0085	<0.0005 U	<0.0005 U
24-jan-96	CS a	V	42.0	<0.0005 U	-	-	<0.0005 U	0.007	<0.0005 U	<0.0005 U
24-jan-96	CS a	V	52.5	<0.0005 U	-	-	<0.0005 U	0.0053	<0.0005 U	<0.0005 U
24-jan-96	CS a	V	62.0	<0.0005 U	-	-	<0.0005 U	0.0087	<0.0005 U	<0.0005 U
24-jan-96	CS a	V	73.0	<0.0005 U	-	-	<0.0005 U	0.0072	<0.0005 U	<0.0005 U
25-jan-96	CS a	V	93.0	<0.0005 U	-	-	<0.0005 U	0.0091	<0.0005 U	<0.0005 U
25-jan-96	CS a	V	106.0	<0.0005 U	-	-	<0.0005 U	0.00094	<0.0005 U	<0.0005 U
25-jan-96	CS a	V	116.0	<0.0005 U	-	-	<0.0005 U	0.0029	<0.0005 U	<0.0005 U
25-jan-96	CS a	V	124.1	<0.0005 U	-	-	<0.0005 U	0.017	<0.0005 U	<0.0005 U
30-jan-96	CS a	V	132.0	<0.0005 U	-	-	<0.0005 U	0.0056	<0.0005 U	<0.0005 U
30-jan-96	CS a	V	139.1	<0.0005 U	-	-	<0.0005 U	0.019	<0.0005 U	<0.0005 U
01-feb-96	CS a	V	147.7	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
01-feb-96	CS a	V	156.5	<0.0005 U	-	-	<0.0005 U	0.042	<0.0005 U	<0.0005 U
01-feb-96	CS a	V	162.0	<0.0005 U	-	-	<0.0005 U	0.0093	<0.0005 U	<0.0005 U
01-feb-96	CS a	V	167.0	<0.0005 U	-	-	<0.0005 U	0.0015	<0.0005 U	<0.0005 U
01-feb-96	CS a	V	170.6	<0.0005 U	-	-	<0.0005 U	0.00073	<0.0005 U	<0.0005 U
01-feb-96	CS a	V	176.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
01-feb-96	CS a	V	181.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
01-feb-96	CS a	V	186.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
01-feb-96	CS a	V	190.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
W-854-03										
14-feb-96	CS ag	V	0.5	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
14-feb-96	CS ag	V	0.5	<0.005 U	-	-	<0.005 U	<0.005 U	<0.005 U	<0.005 U
14-feb-96	CS ag	V	5.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
14-feb-96	CS ag	V	5.0	<0.005 U	-	-	<0.005 U	<0.005 U	<0.005 U	<0.005 U
14-feb-96	CS a	V	10.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
14-feb-96	CS a	V	20.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
14-feb-96	CS ag	V	30.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
14-feb-96	FS ag	V	30.0	<0.005 U	<0.005 U	<0.005 U	-	<0.005 U	<0.005 U	<0.005 U
15-feb-96	CS a	V	41.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
15-feb-96	CS a	V	54.0	<0.0005 U	-	-	<0.0005 U	0.0011	<0.0005 U	<0.0005 U
15-feb-96	CS a	V	61.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
15-feb-96	CS a	V	76.0	<0.0005 U	-	-	<0.0005 U	0.00094	<0.0005 U	<0.0005 U

Building 854 area. Results recorded by February 10, 1998.

1,2-DCA	1,1,1-TCA	Chloroform	Freon 11	Freon 113	Methylene chloride	Location Date
						854-44
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	29-oct-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	29-oct-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	29-oct-96
						W-854-01
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	21-nov-95
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	21-nov-95
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00055	21-nov-95
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	21-nov-95
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	21-nov-95
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	21-nov-95
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	21-nov-95
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00066	22-nov-95
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	22-nov-95
<0.005 U	<0.005 U	<0.005 U	<0.005 U	<0.005 U	<0.005 U	22-nov-95
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0035	27-nov-95
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.003	27-nov-95
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0014 B	13-dec-95
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	04-jan-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	04-jan-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	04-jan-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	05-jan-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	05-jan-96
<0.0005 IUJ	<0.0005 IUJ	<0.0005 IUJ	<0.0005 IUJ	<0.0005 IUJ	<0.0005 IUJ	05-jan-96
<0.0005 IUJ	<0.0005 IUJ	<0.0005 IUJ	<0.0005 IUJ	<0.0005 IUJ	<0.0005 IUJ	08-jan-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	09-jan-96
<0.0005 IUJ	<0.0005 IUJ	<0.0005 IUJ	<0.0005 IUJ	<0.0005 IUJ	<0.0005 IUJ	09-jan-96
<0.005 U	<0.005 UL	<0.005 OU	<0.005 U	<0.005 U	<0.005 LOU	09-jan-96
						W-854-02
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00053 B	22-jan-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	22-jan-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	22-jan-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	23-jan-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00053 B	23-jan-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00064 B	24-jan-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00054 B	24-jan-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	24-jan-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	24-jan-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00069 S	25-jan-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00072 S	25-jan-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00088 S	25-jan-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00061 S	25-jan-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	30-jan-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	30-jan-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00063 B	01-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00064 B	01-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0007 B	01-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00061 B	01-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0009 B	01-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00083 B	01-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0011 B	01-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0012 B	01-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0012 B	01-feb-96
						W-854-03
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0011 B	14-feb-96
<0.005 U	<0.005 U	<0.005 U	<0.005 U	<0.005 U	<0.005 U	14-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00075 B	14-feb-96
<0.005 U	<0.005 U	<0.005 U	<0.005 U	<0.005 U	<0.005 U	14-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00094 B	14-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00081 B	14-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0012 B	14-feb-96
<0.005 U	<0.005 U	<0.005 U	<0.005 U	<0.005 U	<0.005 U	14-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	15-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	15-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	15-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	15-feb-96

Table A-3. Volatile organic compounds in soil and rock (mg/kg) collected from the

Location Date	Lab	Note	Val.	Depth (ft)	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	Total 1,2-DCE	TCE	PCE	1,1-DCA
W-854-03 (continued)											
15-feb-96	CS	ag	V	87.0	<0.0005 U	-	-	<0.0005 U	0.0017	<0.0005 U	<0.0005 U
15-feb-96	FS	ag	V	87.0	<0.005 U	<0.005 U	<0.005 U	-	<0.005 U	<0.005 U	<0.005 U
15-feb-96	CS	a	V	94.0	<0.0005 U	-	-	<0.0005 U	0.00084	<0.0005 U	<0.0005 U
20-feb-96	CS	a	V	105.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
20-feb-96	CS	a	V	115.0	<0.0005 U	-	-	<0.0005 U	0.00075	<0.0005 U	<0.0005 U
20-feb-96	CS	a	V	121.0	<0.0005 U	-	-	<0.0005 U	0.009	<0.0005 U	<0.0005 U
20-feb-96	CS	a	V	125.0	<0.0005 U	-	-	<0.0005 U	0.0049	<0.0005 U	<0.0005 U
21-feb-96	CS	a	V	133.0	<0.0005 U	-	-	<0.0005 U	0.0024	<0.0005 U	<0.0005 U
21-feb-96	CS	a	V	152.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
21-feb-96	CS	a	V	157.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
21-feb-96	CS	a	V	162.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
W-854-04											
28-feb-96	CS	a	V	0.5	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
28-feb-96	CS	a	V	0.5	<0.005 U	-	-	<0.005 U	<0.005 U	<0.005 U	<0.005 U
29-feb-96	CS	a	V	51.0	<0.0005 U	-	-	<0.0005 U	0.0011	<0.0005 U	<0.0005 U
29-feb-96	CS	a	V	61.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
29-feb-96	CS	a	V	78.0	<0.0005 U	-	-	<0.0005 U	0.0017	<0.0005 U	<0.0005 U
29-feb-96	CS	a	V	91.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
04-mar-96	CS	a	V	121.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
04-mar-96	CS	a	V	135.0	<0.0005 U	-	-	<0.0005 U	0.0022	<0.0005 U	<0.0005 U
05-mar-96	CS	a	V	157.0	<0.0005 U	-	-	<0.0005 U	<0.0005 ULO	<0.0005 U	<0.0005 U
05-mar-96	CS	a	V	162.0	<0.0005 U	-	-	<0.0005 U	<0.0005 ULO	<0.0005 U	<0.0005 U
18-mar-96	CS	a	V	183.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
19-mar-96	CS	a	V	219.0	<0.0005 UO	-	-	<0.0005 U	<0.0005 UO	<0.0005 U	<0.0005 U
19-mar-96	CS	a	V	235.0	<0.0005 UO	-	-	<0.0005 U	<0.0005 UO	<0.0005 U	<0.0005 U
20-mar-96	CS	a	V	267.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
20-mar-96	CS	a	V	277.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
21-mar-96	CS	a	V	315.0	<0.0005 U	-	-	<0.0005 U	<0.0005 ULO	<0.0005 U	<0.0005 U
25-mar-96	CS	a	V	336.0	<0.0005 UO	-	-	<0.0005 U	<0.0005 UO	<0.0005 U	<0.0005 U
W-854-05											
04-apr-96	CS	a	V	0.5	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
04-apr-96	CS	a	V	5.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
04-apr-96	CS	a	V	20.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
10-apr-96	CS	a	V	30.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
10-apr-96	CS	a	V	40.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
10-apr-96	CS	a	V	60.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
11-apr-96	CS	a	V	80.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
W-854-06											
29-apr-96	CS	a	V	60.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
29-apr-96	CS	a	V	80.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
29-apr-96	CS	a	V	100.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
30-apr-96	CS	a	V	120.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
30-apr-96	CS	a	V	133.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
16-may-96	BB	a	V	136.0	<0.0004 U	<0.0005 U	<0.0005 U	-	<0.00037 LOU	<0.0009 U	<0.0006 U
30-apr-96	CS	a	V	140.0	<0.0005 U	-	-	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U
16-may-96	CS	a	V	163.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
20-may-96	CS	a	V	173.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
20-may-96	CS	a	V	183.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
W-854-07											
07-jun-96	CS	a	V	115.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
07-jun-96	CS	a	V	121.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
07-jun-96	CS	a	V	124.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
07-jun-96	CS	a	V	129.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
07-jun-96	CS	a	V	134.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
07-jun-96	CS	a	V	140.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U
W-854-08											
19-jun-96	CS	a	V	0.5	<0.0005 UO	<0.0005 U	<0.0005 U	-	<0.0005 UO	<0.0005 U	<0.0005 U
19-jun-96	CS	a	V	6.5	<0.0005 UO	<0.0005 U	<0.0005 U	-	<0.0005 UO	<0.0005 U	<0.0005 U
19-jun-96	CS	a	V	11.0	<0.0005 UO	<0.0005 U	<0.0005 U	-	<0.0005 UO	<0.0005 U	<0.0005 U
19-jun-96	CS	a	V	21.0	<0.0005 UO	<0.0005 U	<0.0005 U	-	<0.0005 UO	<0.0005 U	<0.0005 U
19-jun-96	CS	a	V	41.0	<0.0005 UO	<0.0005 U	<0.0005 U	-	<0.0005 UO	<0.0005 U	<0.0005 U
19-jun-96	CS	a	V	50.0	<0.0005 UO	<0.0005 U	<0.0005 U	-	<0.0005 UO	<0.0005 U	<0.0005 U
20-jun-96	CS	a	V	70.0	<0.0005 U	<0.0005 U	<0.0005 U	-	<0.0005 U	<0.0005 U	<0.0005 U

Building 854 area. Results recorded by February 10, 1998.

1,2- DCA	1,1,1- TCA	Chloro- form	Freon 11	Freon 113	Methylene chloride	Location Date
						(continued) W-854-03
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	15-feb-96
<0.005 U	<0.005 U	<0.005 U	<0.005 U	<0.005 U	<0.005 U	15-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	15-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0028 B	20-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.002 B	20-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0021 B	20-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0033 B	20-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00081 S	21-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0015 S	21-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0012 S	21-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0009 S	21-feb-96
						W-854-04
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0014 B	28-feb-96
<0.005 U	<0.005 U	<0.005 U	<0.005 U	<0.005 U	<0.005 U	28-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00061 B	29-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00071 B	29-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00078 B	29-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00067 B	29-feb-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00089 B	04-mar-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00093 B	04-mar-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00054 S	05-mar-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	05-mar-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00058 S	18-mar-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00092 B	19-mar-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0013 B	19-mar-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0035 B	20-mar-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.003 B	20-mar-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.002 B	21-mar-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	25-mar-96
						W-854-05
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	04-apr-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	04-apr-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	04-apr-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	10-apr-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	10-apr-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	10-apr-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.001 B	11-apr-96
						W-854-06
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	29-apr-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	29-apr-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	29-apr-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0029 S	30-apr-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0034 S	30-apr-96
<0.0005 U	<0.0006 U	<0.0007 U	<0.0005 U	<0.0005 U	0.0007 B	16-may-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0036 S	30-apr-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0022 S	16-may-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	20-may-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	20-may-96
						W-854-07
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.00099 B	07-jun-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0013 B	07-jun-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0017 B	07-jun-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.002 B	07-jun-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0023 B	07-jun-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0017 B	07-jun-96
						W-854-08
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0018 B	19-jun-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0017 B	19-jun-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.003 B	19-jun-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0029 B	19-jun-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0026 B	19-jun-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0017 B	19-jun-96
<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	<0.0005 U	0.0012 S	20-jun-96

Table A-5. Volatile organic compounds in soil vapor (active vapor induced) (ppm v/v),

Location Date	Lab	Note	Val.	Depth (ft)	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	Total 1,2-DCE	TCE	PCE	1,1-DCA
854-34											
22-aug-96	MO	a	V	5.5	<0.2 U	-	<0.3 U	-	0.45	<0.2 U	<0.2 U
22-aug-96	MO	a	V	11.5	<0.2 U	-	<0.3 U	-	0.48	<0.2 U	<0.2 U
22-aug-96	MO	a	V	17.5	<0.2 U	-	<0.3 U	-	1	<0.2 U	<0.2 U
22-aug-96	MO	a	V	23.5	<0.2 U	-	<0.3 U	-	2.1	<0.2 U	<0.2 U
854-35											
19-aug-96	MO	a	V	5.5	<0.2 U	-	<0.3 U	-	1.4	<0.2 U	<0.2 U
19-aug-96	MO	a	V	11.5	<0.2 U	-	<0.3 U	-	1.7	<0.2 U	<0.2 U
19-aug-96	MO	a	V	17.5	<0.2 U	-	<0.3 U	-	1.8	<0.2 U	<0.2 U
20-aug-96	MO	ag	V	23.5	<0.2 U	-	<0.3 U	-	2.3	<0.2 U	<0.2 U
854-36											
20-aug-96	MO	a	V	5.5	<0.2 U	-	<0.3 U	-	0.25	<0.2 U	<0.2 U
20-aug-96	MO	ag	V	11.5	<0.2 U	-	<0.3 U	-	0.6	<0.2 U	<0.2 U
20-aug-96	MO	a	V	17.5	<0.2 U	-	<0.3 U	-	2.5	<0.2 U	<0.2 U
20-aug-96	MO	a	V	23.5	<0.2 U	-	<0.3 U	-	2.5	<0.2 U	<0.2 U
854-38											
06-sep-96	MO	a	V	0.5	<0.2 U	-	<0.3 U	-	<0.2 U	<0.2 U	<0.2 U
06-sep-96	MO	a	V	5.5	<0.2 U	-	<0.3 U	-	<0.2 U	<0.2 U	<0.2 U
06-sep-96	MO	a	V	11.5	<0.2 U	-	<0.3 U	-	<0.2 U	<0.2 U	<0.2 U
06-sep-96	MO	a	V	17.5	<0.2 U	-	<0.3 U	-	<0.2 U	<0.2 U	<0.2 U
854-40											
04-sep-96	MO	a	V	0.5	<0.2 U	-	<0.3 U	-	<0.2 U	<0.2 U	<0.2 U
04-sep-96	MO	a	V	5.5	<0.2 U	-	<0.3 U	-	<0.2 U	<0.2 U	<0.2 U
04-sep-96	MO	ag	V	11.5	<0.2 U	-	<0.3 U	-	<0.2 U	<0.2 U	<0.2 U
04-sep-96	MO	a	V	17.5	<0.2 U	-	<0.3 U	-	<0.2 U	<0.2 U	<0.2 U
854-41											
06-sep-96	MO	a	V	0.5	<0.2 U	-	<0.3 U	-	<0.2 U	<0.2 U	<0.2 U
854-41A											
13-sep-96	MO	a	V	0.5	<0.2 U	-	<0.3 U	-	<0.2 U	<0.2 U	<0.2 U
13-sep-96	MO	a	V	5.5	<0.2 U	-	<0.3 U	-	0.48	<0.2 U	<0.2 U
16-sep-96	MO	ag	V	11.5	<0.2 U	-	<0.3 U	-	0.54	<0.2 U	<0.2 U
16-sep-96	MO	a	V	17.5	<0.2 U	-	<0.3 U	-	0.21	<0.2 U	<0.2 U
16-sep-96	MO	a	V	23.5	<0.2 U	-	<0.3 U	-	0.28	<0.2 U	<0.2 U
16-sep-96	MO	a	V	29.5	<0.2 U	-	<0.3 U	-	0.39	<0.2 U	<0.2 U
16-sep-96	MO	ag	V	35.5	<0.2 U	-	<0.3 U	-	0.35	<0.2 U	<0.2 U
854-42											
12-sep-96	MO	a	V	0.5	<0.2 U	-	<0.3 U	-	<0.2 U	<0.2 U	<0.2 U
12-sep-96	MO	a	V	5.5	<0.2 U	-	<0.3 U	-	0.25	<0.2 U	<0.2 U
12-sep-96	MO	a	V	11.5	<0.2 U	-	<0.3 U	-	0.42	<0.2 U	<0.2 U
12-sep-96	MO	a	V	17.5	<0.2 U	-	<0.3 U	-	0.56	<0.2 U	<0.2 U
12-sep-96	MO	a	V	23.5	<0.2 U	-	<0.3 U	-	0.97	<0.2 U	<0.2 U
12-sep-96	MO	a	V	29.5	<0.2 U	-	<0.3 U	-	0.28	<0.2 U	<0.2 U
SVV-854-029A											
05-nov-96	MO	a	V	43.5	<0.2 U	-	<0.3 U	-	0.71	<0.2 U	<0.2 U
05-nov-96	MO	ah	V	53.5	<0.2 U	-	<0.3 U	-	1.7	<0.2 U	<0.2 U
05-nov-96	EC	ah	N	53.5	-	-	-	-	6.3	<1 U	-
05-nov-96	MO	ah	V	63.5	<0.2 U	-	<0.3 U	-	8.8	<0.2 U	<0.2 U
05-nov-96	EC	ah	N	63.5	-	-	-	-	7.5	<1 U	-
06-nov-96	MO	a	V	73.5	<0.2 U	-	<0.3 U	-	0.87	<0.2 U	<0.2 U
06-nov-96	MO	a	V	83.5	<0.2 U	-	<0.3 U	-	<0.2 U	<0.2 U	<0.2 U
SVV-854-033A											
28-oct-96	MO	a	V	25.0	1.9	-	<0.3 U	-	0.51	<0.2 U	<0.2 U
28-oct-96	MO	a	V	35.0	<0.2 U	-	<0.3 U	-	3.6	<0.2 U	<0.2 U
04-nov-96	MO	a	V	45.5	<0.2 U	-	<0.3 U	-	1.9	<0.2 U	<0.2 U
04-nov-96	MO	a	V	55.5	<0.2 U	-	<0.3 U	-	0.63	<0.2 U	<0.2 U
SVV-854-034A											
07-nov-96	MO	a	V	35.5	<0.2 U	-	<0.3 U	-	1.1	<0.2 U	<0.2 U
07-nov-96	MO	a	V	45.5	<0.2 U	-	<0.3 U	-	11	<0.2 U	<0.2 U
07-nov-96	MO	a	V	55.5	<0.2 U	-	<0.3 U	-	2.6	<0.2 U	<0.2 U

collected from the Building 854 area. Results recorded by February 5, 1998.

1,2-DCA	1,1,1-TCA	Chloroform	Freon 11	Freon 113	Methylene chloride	Location Date
						854-34
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	22-aug-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	22-aug-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	22-aug-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	22-aug-96
						854-35
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	19-aug-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	19-aug-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	19-aug-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	20-aug-96
						854-36
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	20-aug-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	20-aug-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	20-aug-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	20-aug-96
						854-38
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	06-sep-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	06-sep-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	06-sep-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	06-sep-96
						854-40
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	04-sep-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	04-sep-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	04-sep-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	04-sep-96
						854-41
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	06-sep-96
						854-41A
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	13-sep-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	13-sep-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	16-sep-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	16-sep-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	16-sep-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	16-sep-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	16-sep-96
						854-42
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	12-sep-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	12-sep-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	12-sep-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	12-sep-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	12-sep-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	12-sep-96
						SVV-854-029A
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	05-nov-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	05-nov-96
-	-	-	-	-	-	05-nov-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	05-nov-96
-	-	-	-	-	-	05-nov-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	06-nov-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	06-nov-96
						SVV-854-033A
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	28-oct-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	28-oct-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	04-nov-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	04-nov-96
						SVV-854-034A
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	07-nov-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	07-nov-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	-	<0.4 U	07-nov-96

Table A-5. Volatile organic compounds in soil vapor (active vapor induced) (ppm v/v),

Location Date	Lab	Note	Val.	Depth (ft)	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	Total 1,2-DCE	TCE	PCE	1,1-DCA
SVV-854-034A (continued)											
07-nov-96	EC	a	N	55.5	-	-	-	-	3.5	<1 U	-
07-nov-96	MO	a	V	65.5	<0.2 U	-	<0.3 U	-	4.9	<0.2 U	<0.2 U
07-nov-96	MO	a	V	75.5	<0.2 U	-	<0.3 U	-	3	<0.2 U	<0.2 U
SVV-854-044											
29-oct-96	MO	a	V	0.5	<0.2 U	-	<0.3 U	-	<0.2 U	<0.2 U	<0.2 U
29-oct-96	MO	a	V	5.5	<0.2 U	-	<0.3 U	-	<0.2 U	<0.2 U	<0.2 U
29-oct-96	MO	a	V	11.5	<0.2 U	-	<0.3 U	-	<0.2 U	<0.2 U	<0.2 U

collected from the Building 854 area. Results recorded by February 5, 1998.

1,2-DCA	1,1,1-TCA	Chloroform	Freon 11	Freon 113	Methylene chloride	Location Date
					(continued)	SVV-854-034A
–	–	–	–	–	–	07-nov-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	–	<0.4 U	07-nov-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	–	<0.4 U	07-nov-96
						SVV-854-044
<0.3 U	<0.2 U	<0.2 U	<0.2 U	–	<0.4 U	29-oct-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	–	<0.4 U	29-oct-96
<0.3 U	<0.2 U	<0.2 U	<0.2 U	–	<0.4 U	29-oct-96

See following page for notes

Table A-5. Volatile organic compounds in soil vapor (active vapor induced) (ppm v/v), collected from the Building 854 area. Results recorded by February 5, 1998.

Notes:

\- Indicates no analysis performed for this compound

Val. = Validation code

Footnotes:

a	ERD data
b	ORAD WGMG data
c	Analytical results for this sample are suspect
d	Sample collected during hydraulic testing
e	Blind sample, sent to lab without well identity
f	Sample dilution necessary for analysis; detection limits increased
g	Interlaboratory collocated sample
h	Intralaboratory collocated sample
i	Sample collected as part of pilot study
j	Note field may contain important information regarding this sample
k	Pre-development sample
l	Norm month, norm quarter or norm year inconsistent with sample date
m	Confirmation sample
n	Sample analyzed after standard holding time
o	Sample comprised of partial composite
p	Alpha spectroscopy analysis of uranium isotopes
q	Gamma spectroscopy analysis of uranium isotopes

Lab Codes:

EC	LLNL Environmental Chemistry Lab

Validation Codes:

V	Validated
N	Not validated (default value)
U	Undeclared
H	Historical comparison only

CLP flags: (follow result)

B	Analyte found in method blank
D	Analysis performed at a secondary dilution or concentration (i.e., vapor samples)
E	The analyte was detected below the LLNL reporting limit, but above the analytical laboratory minimum detection limit.
F	Analyte found in field blank, trip blank, or equipment blank
G	Quantitated using fuel calibration, but does not match typical fuel fingerprint (fuel maybe gasoline, diesel, motor oil etc.).
H	Sample analyzed outside of holding time, sample results should be evaluated
J	Analyte was postively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
L	Spike accuracy not within control limits
O	Duplicate spike or sample precision not within control limits
P	Indicates that the absence of a data qualifier flag does not mean that the data does not need qualification, but that the implementation of electronic data qualifier flags was not yet established
R	Sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified
S	Analytical results for this sample are suspect
T	Analyte is tentatively identified compound; result is approximate
U	Compound was analyzed for, but not detected above detection limit

Table A-6. High explosives compounds in ground water and surface water (ug/L) collected from the Building 854 area. Results recorded by February 5, 1998.

HE Compounds in Water, Site 300
February 10, 1998
gemini2

s3hmx.10feb98

Table A-6. High explosives compounds in ground water and surface water (ug/L) collected from the Building 854 area. Results recorded by February 5, 1998.

Location Date	Lab	Note	Val.	HMX	RDX	TNT
WELL13						
21-oct-91	MS	a	U	<20 P	<30 P	<30 P
15-oct-92	MS	a	U	<20 P	<30 P	<30 P
SPRING10						
14-nov-91	MS	a	U	<20 P	<30 P	<30 P
22-sep-93	MS	a	N	<20 U	<30 U	<30 U
28-apr-94	CS	a	V	<10 U	<10 U	<5 U
20-oct-95	CS	a	V	<5 U	<5 U	-
18-jun-96	CS	a	V	<5 U	<5 U	-
SPRING11						
14-nov-91	MS	a	U	<20 P	<30 P	<30 P
22-sep-93	MS	a	N	<20 U	<30 U	<30 U
28-apr-94	CS	a	V	<10 U	<10 U	<5 U
20-oct-95	CS	a	V	<5 U	<5 U	-
17-jun-96	CS	a	V	<5 U	<5 U	-

See following page for notes

Table A-6. High explosives compounds in ground water and surface water (ug/L) collected from the Building 854 area. Results recorded by February 5, 1998.

Notes:

- Indicates no analysis performed for this compound

Val. = Validation code

Footnotes:

a	ERD data
b	ORAD WGMG data
c	Analytical results for this sample are suspect
d	Sample collected during hydraulic testing
e	Blind sample, sent to lab without well identity
f	Sample dilution necessary for analysis; detection limits increased
g	Interlaboratory collocated sample
h	Intralaboratory collocated sample
i	Sample collected as part of pilot study
j	Note field may contain important information regarding this sample
k	Pre-development sample
l	Norm month, norm quarter or norm year inconsistent with sample date
m	Confirmation sample
n	Sample analyzed after standard holding time
o	Sample comprised of partial composite
p	Alpha spectroscopy analysis of uranium isotopes
q	Gamma spectroscopy analysis of uranium isotopes

Lab Codes:

CS	California Laboratory Services, Rancho Cordova, CA
MS	C & MS-Gas Chromatography, LLNL, Livermore, CA

Validation Codes:

V	Validated
N	Not validated (default value)
U	Undeclared
H	Historical comparison only

CLP flags: (follow result)

B	Analyte found in method blank
D	Analysis performed at a secondary dilution or concentration (i.e., vapor samples)
E	The analyte was detected below the LLNL reporting limit, but above the analytical laboratory minimum detection limit.
F	Analyte found in field blank, trip blank, or equipment blank
G	Quantitated using fuel calibration, but does not match typical fuel fingerprint (fuel maybe gasoline, diesel, motor oil etc.).
H	Sample analyzed outside of holding time, sample results should be evaluated
J	Analyte was postively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
L	Spike accuracy not within control limits
O	Duplicate spike or sample precision not within control limits
P	Indicates that the absence of a data qualifier flag does not mean that the data does not need qualification, but that the implementation of electronic data qualifier flags was not yet established
R	Sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified
S	Analytical results for this sample are suspect
T	Analyte is tentatively identified compound; result is approximate
U	Compound was analyzed for, but not detected above detection limit

Table A-7. High explosives compounds in soil and rock (mg/kg) collected from the Building 854 area. Results recorded by February 10, 1998.

Site 300 HMX Compounds in Soil
February 11, 1998
gemini1

s3hmxso.11feb98

Table A-7. High explosives compounds in soil and rock (mg/kg) collected from the Building 854 area. Results recorded by February 10, 1998.

Location Date	Lab	Note	Val.	Depth (ft)	HMX	RDX	TNT
854-27							
27-aug-96	CS	a	V	1.0	<0.2 U	<0.15 U	-
27-aug-96	CS	a	V	6.0	<0.2 U	<0.15 U	-
27-aug-96	CS	a	V	12.0	<0.2 U	<0.15 U	-
27-aug-96	CS	a	V	18.0	0.37	<0.15 U	-
854-27A							
27-aug-96	CS	a	V	1.0	<0.2 U	<0.15 U	-
27-aug-96	CS	a	V	6.0	<0.2 U	<0.15 U	-
28-aug-96	CS	a	V	12.0	<0.2 U	<0.15 U	-
28-aug-96	CS	a	V	18.0	<0.2 U	<0.15 U	-
W-854-01							
21-nov-95	CS	a	V	0.5	<0.1 U	<0.1 U	<0.1 U
21-nov-95	CS	ag	V	5.0	<0.1 U	<0.1 U	<0.1 U
21-nov-95	CS	ag	V	10.0	<0.1 U	<0.1 U	<0.1 U
21-nov-95	FS	ag	V	10.0	<0.26 U	<0.26 U	-
W-854-03							
14-feb-96	CS	ag	V	0.5	<0.2 U	<0.15 U	-
14-feb-96	CS	ag	V	5.0	<0.2 U	<0.15 U	-
14-feb-96	CS	a	V	20.0	<0.2 U	<0.15 U	-
14-feb-96	FS	a	V	20.0	<0.1 U	<0.1 U	-
15-feb-96	CS	a	V	41.0	<0.2 U	<0.15 U	-
15-feb-96	CS	a	V	61.0	<0.2 U	<0.15 U	-
15-feb-96	CS	a	V	76.0	<0.2 U	<0.15 U	-
15-feb-96	CS	ag	V	87.0	<0.2 U	<0.15 U	-
15-feb-96	CS	a	V	94.0	<0.2 U	<0.15 U	-
20-feb-96	CS	a	V	115.0	<0.2 U	<0.15 U	-
20-feb-96	CS	a	V	121.0	<0.2 U	<0.15 U	-
20-feb-96	CS	a	V	125.0	<0.2 U	<0.15 U	-
21-feb-96	CS	a	V	133.0	<0.2 U	<0.15 U	-
21-feb-96	CS	a	V	152.0	<0.2 U	<0.15 U	-
21-feb-96	CS	a	V	157.0	<0.2 U	<0.15 U	-
21-feb-96	CS	a	V	162.0	<0.2 U	<0.15 U	-
W-854-04							
28-feb-96	CS	a	V	0.5	<0.2 U	<0.15 U	-
W-854-05							
04-apr-96	CS	a	V	5.0	<0.2 U	<0.15 ULO	-
W-854-08							
19-jun-96	CS	a	V	11.0	<0.2 U	<0.15 U	-
3SS-854-019							
22-nov-95	CS	a	V	0.0	<0.1 U	<0.1 U	<0.1 U
3SS-854-020							
22-nov-95	CS	a	V	0.0	<0.1 U	<0.1 U	<0.1 U
3SS-854-021							
29-nov-95	CS	a	V	0.0	150 DHLO	<1.5 DHULO	-
29-nov-95	FS	a	V	0.0	<0.26 U	<0.26 U	-
3SS-854-022							
22-nov-95	CS	a	V	0.0	<0.1 U	<0.1 U	<0.1 U
3SS-854-025							
22-nov-95	CS	a	V	0.0	<0.1 U	<0.1 U	<0.1 U
3SS-854-026							
22-nov-95	CS	a	V	0.0	<0.1 U	<0.1 U	<0.1 U
3SS-854-027							
29-nov-95	CS	a	V	0.0	<2 DHU	<1.5 DHU	-

Table A-7. High explosives compounds in soil and rock (mg/kg) collected from the Building 854 area. Results recorded by February 10, 1998.

Location Date	Lab	Note	Val.	Depth (ft)	HMX	RDX	TNT
3SS-854-028							
29-nov-95	CS	a	V	0.0	<2 DHU	<1.5 DHU	-
3SS-854-029							
29-nov-95	CS	a	V	0.0	<2 DHU	<1.5 DHU	-
3SS-854-030							
29-nov-95	CS	a	V	0.0	<2 DHU	<1.5 DHU	-

See following page for notes

Table A-7. High explosives compounds in soil and rock (mg/kg) collected from the Building 854 area. Results recorded by February 10, 1998.

Notes:

\- Indicates no analysis performed for this compound

Val. = Validation code

Footnotes:

a ERD data
b ORAD WGMG data
c Analytical results for this sample are suspect
d Sample collected during hydraulic testing
e Blind sample, sent to lab without well identity
f Sample dilution necessary for analysis; detection limits increased
g Interlaboratory collocated sample
h Intralaboratory collocated sample
i Sample collected as part of pilot study
j Note field may contain important information regarding this sample
k Pre-development sample
l Norm month, norm quarter or norm year inconsistent with sample date
m Confirmation sample
n Sample analyzed after standard holding time
o Sample comprised of partial composite
p Alpha spectroscopy analysis of uranium isotopes
q Gamma spectroscopy analysis of uranium isotopes

Lab Codes:

CS California Laboratory Services, Rancho Cordova, CA

Validation Codes:

V Validated
N Not validated (default value)
U Undeclared
H Historical comparison only

CLP flags: (follow result)

B Analyte found in method blank
D Analysis performed at a secondary dilution or concentration (i.e., vapor samples)
E The analyte was detected below the LLNL reporting limit, but above the analytical laboratory minimum detection limit.
F Analyte found in field blank, trip blank, or equipment blank
G Quantitated using fuel calibration, but does not match typical fuel fingerprint (fuel maybe gasoline, diesel, motor oil etc.).
H Sample analyzed outside of holding time, sample results should be evaluated
J Analyte was postively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
L Spike accuracy not within control limits
O Duplicate spike or sample precision not within control limits
P Indicates that the absence of a data qualifier flag does not mean that the data does not need qualification, but that the implementation of electronic data qualifier flags was not yet established
R Sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified
S Analytical results for this sample are suspect
T Analyte is tentatively identified compound; result is approximate
U Compound was analyzed for, but not detected above detection limit

Table A-8. Tritium in ground water and surface water (pCi/L) collected from the Building 854 area. Results recorded by February 5, 1998.

Tritium in Ground Water, Site 300
February 10, 1998
gemini2

s3trit.10feb98

Table A-8. Tritium in ground water and surface water (pCi/L) collected from the Building 854 area. Results recorded by February 5, 1998.

Location Date	Lab	Note	Val.	Tritium Activity
W-854-01				
27-jun-96	LH	a	V	100 +/- 49 J
15-aug-96	LH	a	V	410 +/- 86 O
26-dec-96	LH	a	V	<94 +/- 58U O
W-854-02				
15-aug-96	LH	a	V	<110 +/- 57 UO
26-dec-96	LH	aeh	V	<93 +/- 54 UO
26-dec-96	LH	ah	V	<93 +/- 56 UO
W-854-03				
17-sep-96	LH	a	V	<100 +/- 58 UO
13-dec-96	LH	a	V	<97 +/- 55 U
W-854-04				
16-aug-96	LH	a	V	<100 +/- 55 UO
13-dec-96	LH	a	V	<96 +/- 57 U
W-854-05				
16-aug-96	LH	a	V	<100 +/- 57 UO
12-dec-96	LH	a	V	<95 +/- 54 U
W-854-06				
10-sep-96	LH	a	V	<100 +/- 60 ULO
26-dec-96	LH	a	V	<94 +/- 52 UO
W-854-07				
10-sep-96	LH	a	V	<100 +/- 62 OUL
26-dec-96	LH	a	V	<91 +/- 52 UO
W-854-08				
10-sep-96	LH	a	V	<100 +/- 56 OUL
13-dec-96	LH	a	V	<93 +/- 54 U
W-854-10				
06-feb-97	LH	a	V	108 +/- 64
W-854-11				
19-feb-97	LH	a	V	<90 +/- 54 UB
WELL13				
09-aug-90	TM	a	U	<270 P
25-nov-92	NW	ag	U	418 +/- 383 P
25-nov-92	TM	ag	V	<188 +/- 188 P
27-apr-93	IT	a	U	<170 +/- 50 U
13-jul-93	IT	ah	U	<89 +/- 27 U
13-jul-93	IT	ah	U	<93 +/- 28 U
09-feb-94	IT	a	V	<95.9 +/- 29.8 U
24-feb-95	IT	a	V	<90.7 +/- 26.8 U
29-feb-96	IT	a	V	123 +/- 25

Table A-8. Tritium in ground water and surface water (pCi/L) collected from the Building 854 area. Results recorded by February 5, 1998.

Location Date	Lab	Note	Val.	Tritium Activity
SPRING10				
19-nov-91	TM	ap	U	<200 +/- 200 P
22-sep-93	IT	a	V	130 +/- 31
28-apr-94	IT	ap	V	<83 +/- 25.3 U
13-oct-95	IT	a	V	<77.4 +/- 23.3 U
17-jun-96	LH	a	V	<80 +/- 45 ULO
SPRING11				
14-nov-91	TM	ap	U	<200 +/- 200 P
22-sep-93	IT	a	V	<93.7 +/- 28.2 U
28-apr-94	IT	ap	V	163 +/- 28 B
13-oct-95	IT	a	V	<82.9 +/- 25.3 U
17-jun-96	LH	a	V	<78 +/- 47 ULO

See following notes

Notes:

\- Indicates no analysis performed for this compound

Val. = Validation code

Footnotes:

a ERD data
b ORAD WGMG data
c Analytical results for this sample are suspect
d Sample collected during hydraulic testing
e Blind sample, sent to lab without well identity
f Sample dilution necessary for analysis; detection limits increased
g Interlaboratory collocated sample
h Intralaboratory collocated sample
i Sample collected as part of pilot study
j Note field may contain important information regarding this sample
k Pre-development sample
l Norm month, norm quarter or norm year inconsistent with sample date
m Confirmation sample
n Sample analyzed after standard holding time
o Sample comprised of partial composite
p Alpha spectroscopy analysis of uranium isotopes
q Gamma spectroscopy analysis of uranium isotopes

Lab Codes:

IT	International Technology Corp.
LH	Lockheed Analytical Services, Las Vegas, NV
NW	New World Tech Analytical and Consulting Services
TM	Thermo Analytical Inc., Richmond, CA

Table A-8. Tritium in ground water and surface water (pCi/L) collected from the Building 854 area. Results recorded by February 5, 1998.

Validation Codes:

V	Validated
N	Not validated (default value)
U	Undeclared
H	Historical comparison only

CLP flags: (follow result)

B	Analyte found in method blank
D	Analysis performed at a secondary dilution or concentration (i.e., vapor samples)
E	The analyte was detected below the LLNL reporting limit, but above the analytical laboratory minimum detection limit.
F	Analyte found in field blank, trip blank, or equipment blank
G	Quantitated using fuel calibration, but does not match typical fuel fingerprint (fuel may be gasoline, diesel, motor oil etc.).
H	Sample analyzed outside of holding time, sample results should be evaluated
J	Analyte was postively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
L	Spike accuracy not within control limits
O	Duplicate spike or sample precision not within control limits
P	Indicates that the absence of a data qualifier flag does not mean that the data does not need qualification, but that the implementation of electronic data qualifier flags was not yet established
R	Sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified
S	Analytical results for this sample are suspect
T	Analyte is tentatively identified compound; result is approximate
U	Compound was analyzed for, but not detected above detection limit

Table A-9. Tritium in soil and rock moisture (pCi/Lsm) collected from the Building 854 area. Results recorded by February 10, 1998.

Tritium in Soil, Site 300
February 11, 1998
gemini1

s3tritso.11feb98

Table A-9. Tritium in soil and rock moisture (pCi/Lsm) collected from the Building 854 area. Results recorded by February 10, 1998.

Location Date	Lab	Note	Val.	Depth (ft)	Tritium (pCi/L)	Moisture by Weight (percent)
W-854-01						
21-nov-95	IT	a	V	0.5	<129 +/- 39 U	10
21-nov-95	IT	a	V	5.0	<124 +/- 37 U	17
21-nov-95	IT	ag	V	10.0	<168 +/- 49 U	17
21-nov-95	IT	a	V	20.0	<129 +/- 39 U	11
21-nov-95	IT	a	V	25.0	<120 +/- 36 U	10
27-nov-95	IT	a	V	100.0	<129 +/- 39 U	15
27-nov-95	IT	a	V	121.0	<193 +/- 59 U	8
04-jan-96	IT	a	V	193.3	<126 +/- 38 U	19.9
04-jan-96	IT	a	V	223.1	<121 +/- 37 U	19
04-jan-96	IT	a	V	236.0	<121 +/- 37 U	15.9
05-jan-96	IT	a	V	246.0	<117 +/- 36 U	15.5
05-jan-96	IT	a	V	256.0	<117 +/- 36 U	14.9
05-jan-96	IT	a	V	264.0	<117 +/- 35 U	10
08-jan-96	IT	a	V	301.1	<117 +/- 35 U	24
09-jan-96	IT	a	V	350.8	<117 +/- 36 U	11.4
09-jan-96	IT	a	V	391.0	<121 +/- 37 U	15.5
09-jan-96	LH	a	V	391.0	<180 +/- 130 U	18
W-854-03						
14-feb-96	IT	ag	V	0.5	317 +/- 49	19
14-feb-96	IT	ag	V	5.0	<158 +/- 48 U	10.5
14-feb-96	IT	a	V	10.0	<152 +/- 47 U	15
14-feb-96	LH	a	V	10.0	<180 +/- 130 U	16
3SS-854-021						
29-nov-95	IT	a	V	0.0	<200 +/- 62 U	4
3SS-854-022						
22-nov-95	IT	a	V	0.0	<160 +/- 49 U	5
3SS-854-025						
22-nov-95	IT	a	V	0.0	<91.5 +/- 27.2 U	12
3SS-854-026						
22-nov-95	IT	a	V	0.0	<203 +/- 62 U	4
3SS-854-027						
29-nov-95	IT	a	V	0.0	<152 +/- 46 U	5
3SS-854-028						
29-nov-95	IT	a	V	0.0	<129 +/- 39 U	12
3SS-854-029						
29-nov-95	IT	a	V	0.0	<133 +/- 41 U	9
3SS-854-030						
29-nov-95	IT	a	V	0.0	211 +/- 54	4

See following page for notes

Table A-9. Tritium in soil and rock moisture (pCi/Lsm) collected from the Building 854 area. Results recorded by February 10, 1998.

Notes:

- Indicates no analysis performed for this compound

Val. = Validation code

Footnotes:

a	ERD data
b	ORAD WGMG data
c	Analytical results for this sample are suspect
d	Sample collected during hydraulic testing
e	Blind sample, sent to lab without well identity
f	Sample dilution necessary for analysis; detection limits increased
g	Interlaboratory collocated sample
h	Intralaboratory collocated sample
i	Sample collected as part of pilot study
j	Note field may contain important information regarding this sample
k	Pre-development sample
l	Norm month, norm quarter or norm year inconsistent with sample date
m	Confirmation sample
n	Sample analyzed after standard holding time
o	Sample comprised of partial composite
p	Alpha spectroscopy analysis of uranium isotopes
q	Gamma spectroscopy analysis of uranium isotopes

Lab Codes:

IT	International Technology Corp.
LH	Lockheed Analytical Services, Las Vegas, NV

Validation Codes:

V	Validated
N	Not validated (default value)
U	Undeclared
H	Historical comparison only

CLP flags: (follow result)

B	Analyte found in method blank
D	Analysis performed at a secondary dilution or concentration (i.e., vapor samples)
E	The analyte was detected below the LLNL reporting limit, but above the analytical laboratory minimum detection limit.
F	Analyte found in field blank, trip blank, or equipment blank
G	Quantitated using fuel calibration, but does not match typical fuel fingerprint (fuel maybe gasoline, diesel, motor oil etc.).
H	Sample analyzed outside of holding time, sample results should be evaluated
J	Analyte was postively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
L	Spike accuracy not within control limits
O	Duplicate spike or sample precision not within control limits
P	Indicates that the absence of a data qualifier flag does not mean that the data does not need qualification, but that the implementation of electronic data qualifier flags was not yet established
R	Sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified
S	Analytical results for this sample are suspect
T	Analyte is tentatively identified compound; result is approximate
U	Compound was analyzed for, but not detected above detection limit

Table A-10. Gross alpha and beta radioactivity (pCi/L) in ground water and surface water collected from the Building 854 area. Results recorded by February 5, 1998.

Gross Alpha and Gross Beta, Site 300
February 10, 1998
gemini2

s3rads.10feb98

Table A-10. Gross alpha and beta radioactivity (pCi/L) in ground water and surface water collected from the Building 854 area. Results recorded by February 5, 1998.

Location Date	Lab	Note	Val.	Gross Alpha	Gross Beta
W-854-01					
27-jun-96	LH	a	V	<5.1 +/- 2.6 UO	11.3 +/- 3.4
15-aug-96	LH	a	V	<6.7 +/- 2.8 UOL	14.6 +/- 4.3
26-dec-96	LH	a	V	<2.6 +/- 1.6 U	6.7 +/- 1.8 B
W-854-02					
27-jun-96	LH	a	V	7.5 +/- 3.8 O	8.5 +/- 3.1
15-aug-96	LH	a	V	9.8 +/- 5 OL	10.1 +/- 3.6
26-dec-96	LH	a	V	11.1 +/- 2.5	8 +/- 1.8 B
W-854-03					
17-sep-96	LH	a	V	21.2 +/- 4.4 O	10.9 +/- 2.4
13-dec-96	LH	a	V	19 +/- 4.5	14.5 +/- 2.9
W-854-04					
16-aug-96	LH	a	V	<9.2 +/- 4.1 UOL	9.9 +/- 5.1
13-dec-96	LH	a	V	<6 +/- 3.2 U	10.9 +/- 4.1
W-854-05					
16-aug-96	LH	a	V	<5.4 +/- 3.2 UOL	7.8 +/- 2.6
12-dec-96	LH	a	V	5.8 +/- 2.2	7 +/- 1.7
W-854-06					
10-sep-96	LH	a	V	<4.3 +/- 2.1 OU	35.5 +/- 3.8
26-dec-96	LH	a	V	<2.2 +/- 1.2 U	25.3 +/- 2.4 B
W-854-07					
10-sep-96	LH	a	V	<2.7 +/- 1.5 OU	7.6 +/- 1.7
26-dec-96	LH	a	V	6 +/- 1.8	7.7 +/- 1.5 B
W-854-08					
10-sep-96	LH	a	V	6.5 +/- 2.9 O	11.1 +/- 2.2
13-dec-96	LH	a	V	8.7 +/- 3.4	8.9 +/- 2.5
W-854-10					
06-feb-97	LH	a	V	23.7 +/- 3.4	10.8 +/- 1.7
W-854-11					
19-feb-97	LH	a	V	16 +/- 4.7	7.8 +/- 3.1 L
WELL13					
21-oct-91	TM	ap	U	3 +/- 7 P	7 +/- 6 P
29-feb-96	LH	a	V	<15 +/- 10 U	17.4 +/- 9.1
SPRING10					
19-nov-91	TM	ap	U	3 +/- 3 P	7 +/- 3 P
28-apr-94	IT	ap	V	14.7 +/- 0.7	14.2 +/- 0.7
13-oct-95	IT	a	V	19.7 +/- 0.8	6.51 +/- 0.4
18-jun-96	LH	a	V	12.1 +/- 5.9 LO	<6.3 +/- 4 ULO
SPRING11					
14-nov-91	TM	ap	U	2 +/- 6 P	6 +/- 4 P
22-sep-93	IT	ap	V	18.4 +/- 1.7	10.1 +/- 0.8
28-apr-94	IT	ap	V	20.9 +/- 1.2	18.9 +/- 1.1
13-oct-95	IT	a	V	50.2 +/- 2	12.3 +/- 0.8
17-jun-96	LH	a	V	37 +/- 15 LO	<14 +/- 8.9 ULO

See following page for notes

Table A-10. Gross alpha and beta radioactivity (pCi/L) in ground water and surface water collected from the Building 854 area. Results recorded by February 5, 1998.

Notes:

- Indicates no analysis performed for this compound

Val. = Validation code

Footnotes:

a	ERD data
b	ORAD WGMG data
c	Analytical results for this sample are suspect
d	Sample collected during hydraulic testing
e	Blind sample, sent to lab without well identity
f	Sample dilution necessary for analysis; detection limits increased
g	Interlaboratory collocated sample
h	Intralaboratory collocated sample
i	Sample collected as part of pilot study
j	Note field may contain important information regarding this sample
k	Pre-development sample
l	Norm month, norm quarter or norm year inconsistent with sample date
m	Confirmation sample
n	Sample analyzed after standard holding time
o	Sample comprised of partial composite
p	Alpha spectroscopy analysis of uranium isotopes
q	Gamma spectroscopy analysis of uranium isotopes

Lab Codes:

IT	International Technology Corp.
LH	Lockheed Analytical Services, Las Vegas, NV
TM	Thermo Analytical Inc., Richmond, CA

Validation Codes:

V	Validated
N	Not validated (default value)
U	Undeclared
H	Historical comparison only

CLP flags: (follow result)

B	Analyte found in method blank
D	Analysis performed at a secondary dilution or concentration (i.e., vapor samples)
E	The analyte was detected below the LLNL reporting limit, but above the analytical laboratory minimum detection limit.
F	Analyte found in field blank, trip blank, or equipment blank
G	Quantitated using fuel calibration, but does not match typical fuel fingerprint (fuel maybe gasoline, diesel, motor oil etc.).
H	Sample analyzed outside of holding time, sample results should be evaluated
J	Analyte was postively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
L	Spike accuracy not within control limits
O	Duplicate spike or sample precision not within control limits
P	Indicates that the absence of a data qualifier flag does not mean that the data does not need qualification, but that the implementation of electronic data qualifier flags was not yet established
R	Sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified
S	Analytical results for this sample are suspect
T	Analyte is tentatively identified compound; result is approximate
U	Compound was analyzed for, but not detected above detection limit

Table A-11. Gross alpha and beta radioactivity in soil and rock (pCi/g) collected from the Building 854 area. Results recorded by February 10, 1998.

Rads in soil, Site 300
February 11, 1998
gemini1

s3-stdrads-SO.11feb98

Table A-11. Gross alpha and beta radioactivity in soil and rock (pCi/g) collected from the Building 854 area. Results recorded by February 10, 1998.

Location Date	Lab	Note	Val.	Depth (ft)	Gross Alpha	Gross Beta
W-854-01						
21-nov-95	IT	a	V	0.5	12.3 +/- 0.9	15.9 +/- 0.6
21-nov-95	IT	a	V	5.0	10.8 +/- 0.9	15.8 +/- 0.7
21-nov-95	IT	ag	V	10.0	9.57 +/- 0.9	15.5 +/- 0.6
21-nov-95	IT	a	V	20.0	6.81 +/- 0.86	19.1 +/- 0.6
21-nov-95	IT	a	V	25.0	<2.07 +/- 0.7 U	19.4 +/- 0.7
27-nov-95	IT	a	V	100.0	9.49 +/- 0.87	19.3 +/- 0.6
27-nov-95	IT	a	V	121.0	39.4 +/- 1.4	27.2 +/- 0.8
W-854-03						
14-feb-96	IT	ag	V	0.5	11.3 +/- 1.3	17.8 +/- 0.9
14-feb-96	IT	ag	V	5.0	6.31 +/- 1.16	15.7 +/- 0.9
14-feb-96	IT	a	V	10.0	7.06 +/- 1.15	17.1 +/- 0.9
14-feb-96	LH	a	V	10.0	13.9 +/- 6.1 L	22.1 +/- 4.5
3SS-854-021						
29-nov-95	IT	a	V	0.0	8.36 +/- 0.98	17.7 +/- 0.7
3SS-854-022						
22-nov-95	IT	a	V	0.0	7.09 +/- 0.84	18.1 +/- 0.6
3SS-854-025						
22-nov-95	IT	a	V	0.0	7.7 +/- 0.96	14.3 +/- 0.6
3SS-854-026						
22-nov-95	IT	a	V	0.0	5.16 +/- 0.82	16.6 +/- 0.6
3SS-854-027						
29-nov-95	IT	a	V	0.0	10.4 +/- 1	15.6 +/- 0.6
3SS-854-028						
29-nov-95	IT	a	V	0.0	10.2 +/- 0.9	16.3 +/- 0.6
3SS-854-029						
29-nov-95	IT	a	V	0.0	11.4 +/- 1	16.3 +/- 0.6
3SS-854-030						
29-nov-95	IT	a	V	0.0	7.51 +/- 0.88	17.7 +/- 0.7

See following page for notes

Table A-11. Gross alpha and beta radioactivity in soil and rock (pCi/g) collected from the Building 854 area. Results recorded by February 10, 1998.

Notes:

- Indicates no analysis performed for this compound

Val. = Validation code

Footnotes:

a	ERD data
b	ORAD WGMG data
c	Analytical results for this sample are suspect
d	Sample collected during hydraulic testing
e	Blind sample, sent to lab without well identity
f	Sample dilution necessary for analysis; detection limits increased
g	Interlaboratory collocated sample
h	Intralaboratory collocated sample
i	Sample collected as part of pilot study
j	Note field may contain important information regarding this sample
k	Pre-development sample
l	Norm month, norm quarter or norm year inconsistent with sample date
m	Confirmation sample
n	Sample analyzed after standard holding time
o	Sample comprised of partial composite
p	Alpha spectroscopy analysis of uranium isotopes
q	Gamma spectroscopy analysis of uranium isotopes

Lab Codes:

IT	International Technology Corp.
LH	Lockheed Analytical Services, Las Vegas, NV

Validation Codes:

V	Validated
N	Not validated (default value)
U	Undeclared
H	Historical comparison only

CLP flags: (follow result)

B	Analyte found in method blank
D	Analysis performed at a secondary dilution or concentration (i.e., vapor samples)
E	The analyte was detected below the LLNL reporting limit, but above the analytical laboratory minimum detection limit.
F	Analyte found in field blank, trip blank, or equipment blank
G	Quantitated using fuel calibration, but does not match typical fuel fingerprint (fuel maybe gasoline, diesel, motor oil etc.).
H	Sample analyzed outside of holding time, sample results should be evaluated
J	Analyte was postively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
L	Spike accuracy not within control limits
O	Duplicate spike or sample precision not within control limits
P	Indicates that the absence of a data qualifier flag does not mean that the data does not need qualification, but that the implementation of electronic data qualifier flags was not yet established
R	Sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified
S	Analytical results for this sample are suspect
T	Analyte is tentatively identified compound; result is approximate
U	Compound was analyzed for, but not detected above detection limit

Table A-12. Uranium isotopes in ground water and surface water (pCi/L) collected from the Building 854 area. Results recorded by February 10, 1998.

Uranium Isotopes in Ground Water, Site 300
February 10, 1998
gemini1

s3uraniumL.11feb98
s3uraniumR.11feb98

Table A-12. Uranium isotopes in ground water and surface water (pCi/L) collected from

Location Date	Lab	Note	Val.	Uranium 233+234	Uranium 235+236	Uranium 238	Uranium 233 by mass measurement
W-854-01							
27-jun-96	IC	a	V	-	-	-	-
15-aug-96	LH	a	V	0.45 +/- 0.15 B	0.11 +/- 0.073 B	0.3 +/- 0.11 B	-
W-854-02							
27-jun-96	IC	a	V	-	-	-	-
15-aug-96	LH	a	V	6.11 +/- 0.56 B	0.4 +/- 0.13 B	4.48 +/- 0.47 B	-
W-854-03							
17-sep-96	LH	a	V	-	-	-	<9600 U
W-854-04							
16-aug-96	IC	a	V	-	-	-	-
W-854-05							
16-aug-96	IC	a	V	-	-	-	-
W-854-06							
10-sep-96	LH	a	V	-	-	-	<9600 U
W-854-07							
10-sep-96	LH	a	V	-	-	-	<9600 U
W-854-08							
10-sep-96	LH	a	V	-	-	-	<9600 U
13-dec-96	IC	a	V	-	-	-	-
W-854-10							
06-feb-97	IC	a	V	-	-	-	-
W-854-11							
19-feb-97	IC	a	V	-	-	-	-
WELL13							
21-oct-91	TM	ap	U	0.9 +/- 0.2 P	<0.1 +/- 0.1 P	0.9 +/- 0.2 P	-
20-jun-94	IC	a	V	-	-	-	-
19-dec-94	IT	ap	V	1.29 +/- 0.21 BJ	0.13 +/- 0.04 BJ	0.8 +/- 0.14 BJ	-
24-feb-95	IT	ap	V	1.25 +/- 0.43	<0.117 +/- 0.069 U	1.26 +/- 0.43	-
SPRING10							
19-nov-91	TM	ap	U	3.7 +/- 0.5 P	<0.2 +/- 0.2 P	2.3 +/- 0.4 P	-
28-apr-94	IT	ap	V	6.55 +/- 0.23	0.46 +/- 0.07	4.33 +/- 0.19	-
13-oct-95	IT	a	V	9.42 +/- 3.15 B	1.62 +/- 0.78	6 +/- 2.1	-
18-jun-96	LH	a	V	4.2 +/- 0.35 BLO	0.245 +/-0.072 LO	3.27 +/- 0.3 BLO	-
SPRING11							
14-nov-91	TM	ap	U	1.2 +/- 0.2 P	<0.1 +/- 0.1 P	1 +/- 0.2 P	-
22-sep-93	IT	ap	V	13.3 +/- 0.4	0.61 +/- 0.09	11.8 +/- 0.4	-
28-apr-94	IT	ap	V	16.7 +/- 0.4	2.41 +/- 0.15	15 +/- 0.4	-
13-oct-95	IT	a	V	19.9 +/- 7.3 B	7.6 +/- 3.05	18.2 +/- 6.7	-
17-jun-96	LH	a	V	17.5 +/- 1 BLO	0.82 +/- 0.13 LO	14.97 +/- 0.91 BLO	-

the Building 854 area. Results recorded by February 10, 1998.

Uranium 234 by mass measurement	Uranium 235 by mass measurement	Uranium 236 by mass measurement	Uranium 238 by mass measurement	Location Date
				W-854-01
0.29 +/- 0.04	0.00599 +/- 7e-05	<0.0007 U	0.1288 +/- 0.0006	27-jun-96
-	-	-	-	15-aug-96
				W-854-02
5.3 +/- 0.3	0.182 +/- 0.004	<0.0007 U	3.78 +/- 0.04	27-jun-96
-	-	-	-	15-aug-96
				W-854-03
<6200 U	0.34	<65 U	8	17-sep-96
				W-854-04
0.103 +/- 0.21	0.014 +/- 0.001	<0.0007 U	0.261 +/- 0.006	16-aug-96
				W-854-05
3.41 +/- 0.38	0.116 +/- 0.001	<0.0007 U	2.58 +/- 0.02	16-aug-96
				W-854-06
<6200 U	<0.22 U	<65 U	<0.34 U	10-sep-96
				W-854-07
<6200 U	<0.22 U	<65 U	1.1	10-sep-96
				W-854-08
<6200 U	<0.22 U	<65 U	4.7	10-sep-96
6.61 +/- 0.66	0.189 +/- 0.004	<0.0007 U	3.89 +/- 0.06	13-dec-96
				W-854-10
31.9 +/- 3.1	0.501 +/- 0.014	<0.0007 U	10.6 +/- 0.3	06-feb-97
				W-854-11
5.2 +/- 0.3	0.16 +/- 0.002	<0.0007 U	3.43 +/- 0.04	19-feb-97
				WELL13
-	-	-	-	21-oct-91
0.68 +/- 0.33	0.035 +/- 0.001	-	0.74 +/- 0.01	20-jun-94
-	-	-	-	19-dec-94
-	-	-	-	24-feb-95
				SPRING10
-	-	-	-	19-nov-91
-	-	-	-	28-apr-94
-	-	-	-	13-oct-95
-	-	-	-	18-jun-96
				SPRING11
-	-	-	-	14-nov-91
-	-	-	-	22-sep-93
-	-	-	-	28-apr-94
-	-	-	-	13-oct-95
-	-	-	-	17-jun-96

See following page for notes

Table A-12. Uranium isotopes in ground water and surface water (pCi/L) collected from the Building 854 area. Results recorded by February 10, 1998.

Notes:

- Indicates no analysis performed for this compound

Val. = Validation code

Footnotes:

a	ERD data
b	ORAD WGMG data
c	Analytical results for this sample are suspect
d	Sample collected during hydraulic testing
e	Blind sample, sent to lab without well identity
f	Sample dilution necessary for analysis; detection limits increased
g	Interlaboratory collocated sample
h	Intralaboratory collocated sample
i	Sample collected as part of pilot study
j	Note field may contain important information regarding this sample
k	Pre-development sample
l	Norm month, norm quarter or norm year inconsistent with sample date
m	Confirmation sample
n	Sample analyzed after standard holding time
o	Sample comprised of partial composite
p	Alpha spectroscopy analysis of uranium isotopes
q	Gamma spectroscopy analysis of uranium isotopes

Lab Codes:

IC	ICP MS Facility, LLNL, Livermore, CA
IT	International Technology Corp.
LH	Lockheed Analytical Services, Las Vegas, NV
TM	Thermo Analytical Inc., Richmond, CA

Validation Codes:

V	Validated
N	Not validated (default value)
U	Undeclared
H	Historical comparison only

CLP flags: (follow result)

B	Analyte found in method blank
D	Analysis performed at a secondary dilution or concentration (i.e., vapor samples)
E	The analyte was detected below the LLNL reporting limit, but above the analytical laboratory minimum detection limit.
F	Analyte found in field blank, trip blank, or equipment blank
G	Quantitated using fuel calibration, but does not match typical fuel fingerprint (fuel maybe gasoline, diesel, motor oil etc.).
H	Sample analyzed outside of holding time, sample results should be evaluated
J	Analyte was postively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
L	Spike accuracy not within control limits
O	Duplicate spike or sample precision not within control limits
P	Indicates that the absence of a data qualifier flag does not mean that the data does not need qualification, but that the implementation of electronic data qualifier flags was not yet established
R	Sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified
S	Analytical results for this sample are suspect
T	Analyte is tentatively identified compound; result is approximate
U	Compound was analyzed for, but not detected above detection limit

Table A-13. Uranium isotope mass ratios in ground water and surface water collected from the Building 854 area. Results recorded by February 10, 1998.

Mass Ratios of Uranium Isotopes in Ground Water
February 11, 1998
gemini1

s3uratios.11feb98

Table A-13. Uranium isotope mass ratios in ground water and surface water collected from the Building 854 area. Results recorded by February 10, 1998.

Location Date	Lab	Note	Val.	Uranium 234/238	Uranium 235/238	Uranium 236/238
W-854-01 27-jun-96	IC	a	V	0.00012 +/- 2e-05	0.00723 +/- 8e-05	-
W-854-02 27-jun-96	IC	a	V	7.5e-05 +/- 4e-06	0.0075 +/- 0.00012	-
W-854-04 16-aug-96	IC	a	V	0.000212 +/- 4.3e-05	0.00816 +/- 0.00039	-
W-854-05 16-aug-96	IC	a	V	7.1e-05 +/- 8e-06	0.00698 +/- 6e-05	-
W-854-08 13-dec-96	IC	a	V	9.2e-05 +/- 9e-06	0.00755 +/- 8e-05	-
W-854-10 06-feb-97	IC	a	V	0.000162 +/- 1.5e-05	0.00735 +/- 7e-05	-
W-854-11 19-feb-97	IC	a	V	8.1e-05 +/- 4e-06	0.00728 +/- 7e-05	-
WELL13 20-jun-94	IC	a	V	5e-05 +/- 2.4e-05	0.00733 +/- 0.00012	<1e-05 U

See following page for notes

Table A-13. Uranium isotope mass ratios in ground water and surface water collected from the Building 854 area. Results recorded by February 10, 1998.

Notes:

- Indicates no analysis performed for this compound

Val. = Validation code

Footnotes:

a ERD data
b ORAD WGMG data
c Analytical results for this sample are suspect
d Sample collected during hydraulic testing
e Blind sample, sent to lab without well identity
f Sample dilution necessary for analysis; detection limits increased
g Interlaboratory collocated sample
h Intralaboratory collocated sample
i Sample collected as part of pilot study
j Note field may contain important information regarding this sample
k Pre-development sample
l Norm month, norm quarter or norm year inconsistent with sample date
m Confirmation sample
n Sample analyzed after standard holding time
o Sample comprised of partial composite
p Alpha spectroscopy analysis of uranium isotopes
q Gamma spectroscopy analysis of uranium isotopes

Lab Codes:

IC ICP MS Facility, LLNL, Livermore, CA

Validation Codes:

V Validated
N Not validated (default value)
U Undeclared
H Historical comparison only

CLP flags: (follow result)

B Analyte found in method blank
D Analysis performed at a secondary dilution or concentration (i.e., vapor samples)
E The analyte was detected below the LLNL reporting limit, but above the analytical laboratory minimum detection limit.
F Analyte found in field blank, trip blank, or equipment blank
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R Sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified
S Analytical results for this sample are suspect
T Analyte is tentatively identified compound; result is approximate
U Compound was analyzed for, but not detected above detection limit

Table A-14. Uranium isotopes in soil and rock (pCi/g) collected from the Building 854 area. Results recorded by February 10, 1998.

Uranium Isotopes in Soil, Site 300
February 11, 1998
gemini1

s3uraniumsoL.11feb98
s3uraniumsoR.11feb98

Table A-14. Uranium isotopes in soil and rock (pCi/g) collected from the Building 854

Location Date	Lab	Note	Val.	Depth (ft)	Uranium 233+234	Uranium 235+236	Uranium 238	Uranium 233 by mass measurement
W-854-01								
21-nov-95	IC	a	V	0.5	-	-	-	-
21-nov-95	IC	a	V	5.0	-	-	-	-
21-nov-95	IC	ag	V	10.0	-	-	-	-
21-nov-95	IC	a	V	20.0	-	-	-	-
W-854-03								
14-feb-96	IT	ag	V	0.5	1.01 +/- 0.19 B	0.28 +/- 0.08 B	1.08 +/- 0.2 B	-
14-feb-96	IT	ag	V	5.0	1.15 +/- 0.21 B	0.34 +/- 0.09 B	1.06 +/- 0.2 B	-
14-feb-96	IT	a	V	10.0	1.24 +/- 0.22 B	0.42 +/- 0.12 B	1.25 +/- 0.23 B	-
14-feb-96	LH	a	V	10.0	1.52 +/- 0.29	0.23 +/- 0.11	1.8 +/- 0.32 O	-
3SS-854-021								
29-nov-95	IC	a	V	0.0	-	-	-	-
3SS-854-022								
22-nov-95	IC	a	V	0.0	-	-	-	-
3SS-854-025								
22-nov-95	IC	a	V	0.0	-	-	-	-
3SS-854-026								
22-nov-95	IC	a	V	0.0	-	-	-	-
3SS-854-027								
29-nov-95	IC	a	V	0.0	-	-	-	-
3SS-854-028								
29-nov-95	IC	a	V	0.0	-	-	-	-
3SS-854-029								
29-nov-95	IC	a	V	0.0	-	-	-	-
29-nov-95	IC	a	V	0.0	-	-	-	-
3SS-854-030								
29-nov-95	IC	a	V	0.0	-	-	-	-
29-nov-95	IC	a	V	0.0	-	-	-	-
29-nov-95	IC	a	V	0.0	-	-	-	-
29-nov-95	IC	a	V	0.0	-	-	-	-

area. Results recorded by February 10, 1998.

Uranium 234 by mass measurement	Uranium 235 by mass measurement	Uranium 236 by mass measurement	Uranium 238 by mass measurement	Location Date
				W-854-01
-	0.009 H	-	0.24 +/- 0.01 H	21-nov-95
-	0.01 H	-	0.21 +/- 0.01 H	21-nov-95
-	0.007 H	-	0.16 +/- 0.003 H	21-nov-95
-	0.01 H	-	0.21 +/- 0.004 H	21-nov-95
				W-854-03
-	-	-	-	14-feb-96
-	-	-	-	14-feb-96
-	-	-	-	14-feb-96
-	-	-	-	14-feb-96
				3SS-854-021
-	0.024 H	-	0.93 +/- 0.01 H	29-nov-95
				3SS-854-022
-	0.016 H	-	0.34 +/- 0.01 H	22-nov-95
				3SS-854-025
-	0.014 H	-	0.39 +/- 0.01 H	22-nov-95
				3SS-854-026
-	0.014 H	-	0.32 +/- 0.01 H	22-nov-95
				3SS-854-027
-	0.015 H	-	0.43 +/- 0.01 H	29-nov-95
				3SS-854-028
-	0.012 H	-	0.31 +/- 0.01 H	29-nov-95
				3SS-854-029
-	0.009 H	-	0.27 +/- 0.01 H	29-nov-95
-	0.009 H	-	0.22 +/- 0.01 H	29-nov-95
				3SS-854-030
-	0.009 H	-	0.31 +/- 0.01 H	29-nov-95
-	0.008 H	-	0.23 +/- 0.01 H	29-nov-95
-	0.008 H	-	0.23 +/- 0.01 H	29-nov-95
-	0.011 H	-	0.43 +/- 0.01 H	29-nov-95

See following page for notes

Table A-14. Uranium isotopes in soil and rock (pCi/g) collected from the Building 854 area. Results recorded by February 10, 1998.

Notes:

- Indicates no analysis performed for this compound

Val. = Validation code

Footnotes:

a ERD data
b ORAD WGMG data
c Analytical results for this sample are suspect
d Sample collected during hydraulic testing
e Blind sample, sent to lab without well identity
f Sample dilution necessary for analysis; detection limits increased
g Interlaboratory collocated sample
h Intralaboratory collocated sample
i Sample collected as part of pilot study
j Note field may contain important information regarding this sample
k Pre-development sample
l Norm month, norm quarter or norm year inconsistent with sample date
m Confirmation sample
n Sample analyzed after standard holding time
o Sample comprised of partial composite
p Alpha spectroscopy analysis of uranium isotopes
q Gamma spectroscopy analysis of uranium isotopes

Lab Codes:

IC ICP MS Facility, LLNL, Livermore, CA
IT International Technology Corp.
LH Lockheed Analytical Services, Las Vegas, NV

Validation Codes:

V Validated
N Not validated (default value)
U Undeclared
H Historical comparison only

CLP flags: (follow result)

B Analyte found in method blank
D Analysis performed at a secondary dilution or concentration (i.e., vapor samples)
E The analyte was detected below the LLNL reporting limit, but above the analytical laboratory minimum detection limit.
F Analyte found in field blank, trip blank, or equipment blank
G Quantitated using fuel calibration, but does not match typical fuel fingerprint (fuel maybe gasoline, diesel, motor oil etc.).
H Sample analyzed outside of holding time, sample results should be evaluated
J Analyte was postively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
L Spike accuracy not within control limits
O Duplicate spike or sample precision not within control limits
P Indicates that the absence of a data qualifier flag does not mean that the data does not need qualification, but that the implementation of electronic data qualifier flags was not yet established
R Sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified
S Analytical results for this sample are suspect
T Analyte is tentatively identified compound; result is approximate
U Compound was analyzed for, but not detected above detection limit

Table A-15. Thorium isotopes in ground water and surface water (pCi/L) collected from the Building 854 area. Results recorded by February 10, 1998.

Thorium Isotopes in Ground Water, Site 300
February 11, 1998
gemini1

s3thorium.11feb98

Table A-15. Thorium isotopes in ground water and surface water (pCi/L) collected from the Building 854 area. Results recorded by February 10, 1998.

Location Date	Lab	Note	Val.	Thorium 228 by mass measurement	Thorium 230 by mass measurement	Thorium 232 by mass measurement
W-854-01						
27-jun-96	IC	a	V	-	-	12.5 +/- 0.2 F
W-854-02						
27-jun-96	IC	a	V	-	-	59 +/- 2 UF
W-854-04						
16-aug-96	IC	a	V	-	-	0.0714 +/- 0.005
W-854-05						
16-aug-96	IC	a	V	-	-	0.00853 +/- 0.00027
W-854-08						
13-dec-96	IC	a	V	-	-	<0.0001 +/- 3.1e-05 U
W-854-10						
06-feb-97	IC	a	V	-	-	<5e-06 U
W-854-11						
19-feb-97	IC	a	V	-	-	0.00281 +/- 0.00014

See following page for notes

Table A-15. Thorium isotopes in ground water and surface water (pCi/L) collected from the Building 854 area. Results recorded by February 10, 1998.

Notes:

\- Indicates no analysis performed for this compound

Val. = Validation code

Footnotes:

a	ERD data
b	ORAD WGMG data
c	Analytical results for this sample are suspect
d	Sample collected during hydraulic testing
e	Blind sample, sent to lab without well identity
f	Sample dilution necessary for analysis; detection limits increased
g	Interlaboratory collocated sample
h	Intralaboratory collocated sample
i	Sample collected as part of pilot study
j	Note field may contain important information regarding this sample
k	Pre-development sample
l	Norm month, norm quarter or norm year inconsistent with sample date
m	Confirmation sample
n	Sample analyzed after standard holding time
o	Sample comprised of partial composite
p	Alpha spectroscopy analysis of uranium isotopes
q	Gamma spectroscopy analysis of uranium isotopes

Lab Codes:

IC	ICP MS Facility, LLNL, Livermore, CA

Validation Codes:

V	Validated
N	Not validated (default value)
U	Undeclared
H	Historical comparison only

CLP flags: (follow result)

B	Analyte found in method blank
D	Analysis performed at a secondary dilution or concentration (i.e., vapor samples)
E	The analyte was detected below the LLNL reporting limit, but above the analytical laboratory minimum detection limit.
F	Analyte found in field blank, trip blank, or equipment blank
G	Quantitated using fuel calibration, but does not match typical fuel fingerprint (fuel maybe gasoline, diesel, motor oil etc.).
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J	Analyte was postively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
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O	Duplicate spike or sample precision not within control limits
P	Indicates that the absence of a data qualifier flag does not mean that the data does not need qualification, but that the implementation of electronic data qualifier flags was not yet established
R	Sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified
S	Analytical results for this sample are suspect
T	Analyte is tentatively identified compound; result is approximate
U	Compound was analyzed for, but not detected above detection limit

Table A-16. Nitrogenous compounds in ground water and surface water samples (mg/L) collected from Building 854 area. Results recorded by February 10, 1998.

Nitrates, Nitrites, and Nitrogen in Ground Water,
February 11, 1998
gemini1

s3NL.11feb98
s3NR.11feb98

Table A-16. Nitrogenous compounds in ground water and surface water samples (mg/L) collected

Location Date	Lab	Note	Val.	Ammonia Nitrogen as N	Nitrate and Nitrite as N	Nitrate and Nitrite as NO3	Nitrate as N
W-854-01							
27-jun-96	CS	a	V	-	-	-	<0.5 U
W-854-02							
27-jun-96	CS	a	V	-	-	-	9.8
W-854-03							
17-sep-96	CS	a	V	-	-	-	<30 UD
W-854-04							
16-aug-96	CS	a	V	-	-	-	<0.5 U
W-854-05							
16-aug-96	CS	a	V	-	-	-	12 D
W-854-06							
10-sep-96	CS	a	V	-	-	-	<0.5 U
W-854-07							
10-sep-96	CS	a	V	-	-	-	7.5
W-854-08							
10-sep-96	CS	a	V	-	-	-	41 D
13-dec-96	CS	a	V	-	-	-	<25 DU
W-854-10							
06-feb-97	CS	a	V	-	-	-	0.79
W-854-11							
19-feb-97	CS	a	V	-	-	-	9.9 D
WELL13							
09-aug-90	BC	a	U	-	3.6 P	16 P	-
21-oct-91	BC	ag	U	-	1 P	4.4 P	-
29-feb-96	CS	a	V	-	-	-	-
SPRING10							
19-nov-91	BC	a	U	-	5.8 P	26 P	-
28-apr-94	CS	a	V	-	-	-	<5 DU
SPRING11							
14-nov-91	BC	a	U	-	<0.1 P	<0.4 P	-
22-sep-93	CS	a	V	-	-	-	0.54
28-apr-94	CS	a	V	-	-	-	<5 DU

from Building 854 area. Results recorded by February 10, 1998.

Nitrite as N	Nitrite as NO2	Nitrate as NO3	Total Kjeldahl Nitrogen	Location Date
				W-854-01
<0.5 ULO	-	<0.5 U	-	27-jun-96
				W-854-02
<5 DULO	-	43	-	27-jun-96
				W-854-03
<5 DULO	-	<30 DLOU	-	17-sep-96
				W-854-04
<5 DUL	-	<0.5 U	-	16-aug-96
				W-854-05
<5 DUL	-	54 D	-	16-aug-96
				W-854-06
<2.5 DLOU	-	<0.5 LOU	-	10-sep-96
				W-854-07
<5 DLOU	-	33 LO	-	10-sep-96
				W-854-08
<5 DLOU	-	180 DLO	-	10-sep-96
<0.5 U	-	62 D	-	13-dec-96
				W-854-10
<0.5 U	-	3.5	-	06-feb-97
				W-854-11
<0.5 U	-	44 L	-	19-feb-97
				WELL13
-	-	-	-	09-aug-90
-	-	-	-	21-oct-91
-	-	5.3	-	29-feb-96
				SPRING10
-	-	-	-	19-nov-91
-	-	<22.15 DU	-	28-apr-94
				SPRING11
-	-	-	-	14-nov-91
-	-	2.3922	-	22-sep-93
-	-	<22.15 DU	-	28-apr-94

See following page for notes

Table A-16. Nitrogenous compounds in ground water and surface water samples (mg/L) collected from Building 854 area. Results recorded by February 10, 1998.

Notes:

-	Indicates no analysis performed for this compound

Val. = Validation code

Footnotes:

a	ERD data
b	ORAD WGMG data
c	Analytical results for this sample are suspect
d	Sample collected during hydraulic testing
e	Blind sample, sent to lab without well identity
f	Sample dilution necessary for analysis; detection limits increased
g	Interlaboratory collocated sample
h	Intralaboratory collocated sample
i	Sample collected as part of pilot study
j	Note field may contain important information regarding this sample
k	Pre-development sample
l	Norm month, norm quarter or norm year inconsistent with sample date
m	Confirmation sample
n	Sample analyzed after standard holding time
o	Sample comprised of partial composite
p	Alpha spectroscopy analysis of uranium isotopes
q	Gamma spectroscopy analysis of uranium isotopes

Lab Codes:

BC	Brown and Caldwell, Emeryville, CA
CS	California Laboratory Services, Rancho Cordova, CA

Validation Codes:

V	Validated
N	Not validated (default value)
U	Undeclared
H	Historical comparison only

CLP flags: (follow result)

B	Analyte found in method blank
D	Analysis performed at a secondary dilution or concentration (i.e., vapor samples)
E	The analyte was detected below the LLNL reporting limit, but above the analytical laboratory minimum detection limit.
F	Analyte found in field blank, trip blank, or equipment blank
G	Quantitated using fuel calibration, but does not match typical fuel fingerprint (fuel maybe gasoline, diesel, motor oil etc.).
H	Sample analyzed outside of holding time, sample results should be evaluated
J	Analyte was postively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
L	Spike accuracy not within control limits
O	Duplicate spike or sample precision not within control limits
P	Indicates that the absence of a data qualifier flag does not mean that the data does not need qualification, but that the implementation of electronic data qualifier flags was not yet established
R	Sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified
S	Analytical results for this sample are suspect
T	Analyte is tentatively identified compound; result is approximate
U	Compound was analyzed for, but not detected above detection limit

Table A-17. Metals in ground water and surface water (mg/L) collected from the Building 854 area. Results recorded by February 10, 1998.

Site 300 Metals Report
February 11, 1998
gemini1

s3metsplusL.11feb98
s3metsplusR.11feb98

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from the Building 854

soil

Table A-20. Fuel hydrocarbons in soil and rock (ug/L) collected from the Building 854 area. Results recorded by February 10, 1998.

O&G, Gas Fingerprint, TPH-Diesel in soil
February 11, 1998
gemini1

gas-oil-dsl_SO.11feb98

Table A-17. Metals in ground water and surface water (mg/L) collected from the Building 854 area. Results recorded by February 10, 1998.

Site 300 Metals Report
February 11, 1998
gemini1

s3metsplusL.11feb98
s3metsplusR.11feb98

Table A-17. Metals in ground water and surface water (mg/L) collected from the Building

Location Date	Lab	Note	Val.	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt
W-854-01										
27-jun-96	CS	a	V	–	0.0049	0.027	–	<0.0005 U	0.0019 L	–
27-jun-96	CS	a	V	–	–	–	–	–	–	–
W-854-02										
27-jun-96	CS	a	V	–	0.029	0.04	–	<0.0005 U	0.003 L	–
27-jun-96	CS	a	V	–	–	–	–	–	–	–
W-854-03										
17-sep-96	CS	a	V	–	0.053	<0.025 U	–	<0.0005 U	<0.001 U	–
17-sep-96	CS	a	V	–	–	–	–	–	–	–
W-854-04										
16-aug-96	CS	a	V	–	0.04	<0.025 U	–	<0.0005 U	<0.001 U	–
16-aug-96	CS	a	V	–	–	–	–	–	–	–
W-854-05										
16-aug-96	CS	a	V	–	0.041	0.04	–	<0.0005 U	0.0011	–
16-aug-96	CS	a	V	–	–	–	–	–	–	–
W-854-06										
10-sep-96	CS	a	V	–	<0.002 U	<0.025 U	–	<0.0005 U	<0.001 U	–
10-sep-96	CS	a	V	–	–	–	–	–	–	–
W-854-07										
10-sep-96	CS	a	V	–	0.042	<0.025 U	–	<0.0005 U	0.0025	–
10-sep-96	CS	a	V	–	–	–	–	–	–	–
W-854-08										
10-sep-96	CS	a	V	–	0.032	<0.025 U	–	<0.0005 U	<0.001 U	–
10-sep-96	CS	a	V	–	–	–	–	–	–	–
13-dec-96	CS	a	V	–	0.026	0.038	0.092	<0.0005 U	0.0023	–
13-dec-96	CS	a	V	–	–	–	–	–	–	–
W-854-10										
06-feb-97	CS	a	V	–	0.043	0.043	–	<0.0005 U	<0.001 U	–
06-feb-97	CS	a	V	–	–	–	–	–	–	–
W-854-11										
19-feb-97	CS	a	V	–	0.026	0.097	–	<0.0005 U	0.0016	–
19-feb-97	CS	a	V	–	–	–	–	–	–	–
WELL13										
09-aug-90	BC	a	U	–	–	–	–	–	–	–
21-oct-91	BC	ag	U	–	<0.002 P	<0.05 P	–	<0.0005 P	<0.005 P	–
21-oct-91	BC	ag	U	–	–	–	<0.0005 P	–	–	–
21-oct-91	BC	ag	U	–	–	–	–	–	–	–
15-oct-92	BC	a	U	–	0.012 P	<0.05 P	–	<0.0005 P	<0.005 P	–
25-aug-93	CS	a	V	–	0.027	<0.05 U	–	<0.001 U	<0.01 DU	–
25-aug-93	CS	a	V	–	–	–	<0.0005 U	–	–	–
09-feb-94	CS	a	V	–	–	–	0.0008	–	–	–
20-jun-94	IC	a	V	–	0.001	0.0251	<0.0001 U	<0.0001 U	0.00037	0.00095
24-feb-95	CS	a	V	–	–	–	<0.0005 U	–	–	–
25-jul-95	CS	a	V	–	0.0051	<0.025 U	–	<0.0005 U	<0.01 U	–
25-jul-95	CS	a	V	–	–	–	<0.0005 U	–	–	–
29-feb-96	CS	a	V	–	<0.002 U	0.037	<0.0005 U	<0.0005 U	<0.01 U	–
29-feb-96	CS	a	V	–	–	–	–	–	–	–

854 area. Results recorded by February 10, 1998.

Copper	Iron	Lead	Mercury	Nickel	Selenium	Silver	Zinc	Location Date
								W-854-01
-	-	<0.002 U	<0.0002 U	-	<0.002 UL	<0.001 U	-	27-jun-96
0.53	1.1	-	-	<0.1 U	-	-	<0.05 U	27-jun-96
								W-854-02
-	-	<0.002 U	<0.0002 U	-	0.009 L	<0.001 U	-	27-jun-96
<0.05 U	0.14	-	-	<0.1 U	-	-	<0.05 U	27-jun-96
								W-854-03
-	-	0.0058	0.0004	-	0.0054	<0.001 U	-	17-sep-96
<0.05 U	<0.1 U	-	-	<0.1 U	-	-	<0.05 U	17-sep-96
								W-854-04
-	-	<0.002 U	<0.0002 U	-	<0.002 LU	<0.001 U	-	16-aug-96
<0.05 U	0.14	-	-	<0.1 U	-	-	<0.05 U	16-aug-96
								W-854-05
-	-	<0.002 U	<0.0002 U	-	0.0024 L	<0.001 U	-	16-aug-96
<0.05 U	<0.1 U	-	-	<0.1 U	-	-	<0.05 U	16-aug-96
								W-854-06
-	-	<0.002 U	<0.0002 U	-	0.003	<0.001 U	-	10-sep-96
<0.05 U	<0.1 U	-	-	<0.1 U	-	-	<0.05 U	10-sep-96
								W-854-07
-	-	<0.002 U	<0.0002 U	-	0.012	<0.001 U	-	10-sep-96
<0.05 U	<0.1 U	-	-	<0.1 U	-	-	<0.05 U	10-sep-96
								W-854-08
-	-	<0.002 U	<0.0002 U	-	0.0077	<0.001 U	-	10-sep-96
<0.05 U	<0.1 U	-	-	<0.1 U	-	-	<0.05 U	10-sep-96
-	-	0.003	<0.0002 U	-	0.0081	<0.001 U	-	13-dec-96
<0.05 U	<0.1 U	-	-	<0.1 U	-	-	<0.05 U	13-dec-96
								W-854-10
-	-	<0.002 U	<0.0002 U	-	<0.002 LU	<0.001 U	-	06-feb-97
<0.05 U	<0.1 U	-	-	<0.1 U	-	-	<0.05 U	06-feb-97
								W-854-11
-	-	<0.002 U	<0.0002 U	-	0.012	<0.001 LU	-	19-feb-97
<0.05 U	0.16	-	-	<0.1 U	-	-	0.13	19-feb-97
								WELL13
<0.05 P	<0.1 P	-	-	-	-	-	<0.05 P	09-aug-90
-	-	<0.002 P	<0.0005 P	-	<0.002 P	<0.05 P	-	21-oct-91
-	-	-	-	-	-	-	-	21-oct-91
<0.05 P	<0.1 P	-	-	-	-	-	<0.05 P	21-oct-91
-	-	0.005 P	<0.0002 P	-	0.004 P	<0.05 P	-	15-oct-92
-	-	<0.005 U	<0.0005 U	-	0.0083	<0.001 U	-	25-aug-93
-	-	-	-	-	-	-	-	25-aug-93
-	-	-	-	-	-	-	-	09-feb-94
0.0064	-	0.00041	-	-	-	-	0.0066	20-jun-94
-	-	-	-	-	-	-	-	24-feb-95
-	-	<0.002 U	<0.0002 U	-	<0.002 U	<0.001 U	-	25-jul-95
-	-	-	-	-	-	-	-	25-jul-95
-	-	<0.002 U	0.00032	-	<0.002 U	<0.001 U	-	29-feb-96
<0.05 U	0.23	-	-	<0.1 U	-	-	<0.05 U	29-feb-96

Table A-17. Metals in ground water and surface water (mg/L) collected from the Building

Location Date	Lab	Note	Val.	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt
SPRING10										
19-nov-91	BC	a	U	–	0.059 P	<0.05 P	–	<0.0005 P	<0.005 P	–
19-nov-91	BC	a	U	–	–	–	–	–	–	–
28-apr-94	CS	a	V	–	0.063	0.13	–	0.0011	0.018	–
28-apr-94	CS	a	V	–	–	–	0.00055	–	–	–
28-apr-94	CS	a	V	–	–	–	–	–	–	–
13-oct-95	CS	a	V	–	0.048	0.051	<0.0005 U	<0.0005 U	<0.01 U	–
18-jun-96	CS	a	V	–	0.06 L	0.042	–	<0.0005 U	<0.001 U	–
18-jun-96	CS	a	V	–	–	–	<0.0005 U	–	–	–
SPRING11										
14-nov-91	BC	a	U	–	0.004 P	0.06 P	–	<0.0005 P	<0.005 P	–
14-nov-91	BC	a	U	–	–	–	–	–	–	–
22-sep-93	CS	a	V	–	0.011	0.16	<0.001 U	<0.001 U	<0.01 U	–
22-sep-93	CS	a	V	–	–	–	–	–	–	–
28-apr-94	CS	a	V	–	0.0071	0.094	–	<0.0005 U	<0.01 U	–
28-apr-94	CS	a	V	–	–	–	<0.0005 U	–	–	–
28-apr-94	CS	a	V	–	–	–	–	–	–	–
13-oct-95	CS	a	V	–	0.0049	0.084	<0.0005 U	<0.0005 U	<0.01 U	–
17-jun-96	CS	a	V	–	0.0032	0.072	–	0.001	<0.001 U	–
17-jun-96	CS	a	V	–	–	–	<0.0005 U	–	–	–

854 area. Results recorded by February 10, 1998.

Copper	Iron	Lead	Mercury	Nickel	Selenium	Silver	Zinc	Location Date
								SPRING10
-	-	<0.002 P	<0.0005 P	-	0.014 P	<0.05 P	-	19-nov-91
<0.05 P	<0.1 P	-	-	-	-	-	<0.05 P	19-nov-91
-	-	0.022	<0.0002 U	-	<0.002 U	<0.001 U	-	28-apr-94
-	-	-	-	-	-	-	-	28-apr-94
<0.05 U	<0.1 U	-	-	<0.1 U	-	-	<0.05 U	28-apr-94
-	-	<0.002 U	<0.0002 U	-	<0.002 U	<0.001 U	-	13-oct-95
-	-	<0.002 U	<0.0002 U	-	0.013	<0.001 UL	-	18-jun-96
-	-	-	-	-	-	-	-	18-jun-96
								SPRING11
-	-	<0.002 P	<0.0005 P	-	<0.002 P	<0.05 P	-	14-nov-91
<0.05 P	<0.1 P	-	-	-	-	-	<0.05 P	14-nov-91
-	-	<0.005 U	<0.0005 U	-	<0.005 U	<0.001 U	-	22-sep-93
<0.05 U	<0.1 U	-	-	<0.1 U	-	-	<0.05 U	22-sep-93
-	-	0.023	<0.0002 U	-	<0.002 U	<0.001 U	-	28-apr-94
-	-	-	-	-	-	-	-	28-apr-94
<0.05 U	<0.1 U	-	-	<0.1 U	-	-	<0.05 U	28-apr-94
-	-	<0.002 U	<0.0002 U	-	<0.002 U	<0.001 U	-	13-oct-95
-	-	<0.002 U	<0.0002 U	-	<0.002 UL	<0.001 U	-	17-jun-96
-	-	-	-	-	-	-	-	17-jun-96

See following page for notes

Table A-17. Metals in ground water and surface water (mg/L) collected from the Building 854 area. Results recorded by February 10, 1998.

Notes:

-	Indicates no analysis performed for this compound

Val. = Validation code

Footnotes:

a	ERD data
b	ORAD WGMG data
c	Analytical results for this sample are suspect
d	Sample collected during hydraulic testing
e	Blind sample, sent to lab without well identity
f	Sample dilution necessary for analysis; detection limits increased
g	Interlaboratory collocated sample
h	Intralaboratory collocated sample
i	Sample collected as part of pilot study
j	Note field may contain important information regarding this sample
k	Pre-development sample
l	Norm month, norm quarter or norm year inconsistent with sample date
m	Confirmation sample
n	Sample analyzed after standard holding time
o	Sample comprised of partial composite
p	Alpha spectroscopy analysis of uranium isotopes
q	Gamma spectroscopy analysis of uranium isotopes

Lab Codes:

BC	Brown and Caldwell, Emeryville, CA
CS	California Laboratory Services, Rancho Cordova, CA
IC	ICP MS Facility, LLNL, Livermore, CA

Validation Codes:

V	Validated
N	Not validated (default value)
U	Undeclared
H	Historical comparison only

CLP flags: (follow result)

B	Analyte found in method blank
D	Analysis performed at a secondary dilution or concentration (i.e., vapor samples)
E	The analyte was detected below the LLNL reporting limit, but above the analytical laboratory minimum detection limit.
F	Analyte found in field blank, trip blank, or equipment blank
G	Quantitated using fuel calibration, but does not match typical fuel fingerprint (fuel maybe gasoline, diesel, motor oil etc.).
H	Sample analyzed outside of holding time, sample results should be evaluated
J	Analyte was postively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
L	Spike accuracy not within control limits
O	Duplicate spike or sample precision not within control limits
P	Indicates that the absence of a data qualifier flag does not mean that the data does not need qualification, but that the implementation of electronic data qualifier flags was not yet established
R	Sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified
S	Analytical results for this sample are suspect
T	Analyte is tentatively identified compound; result is approximate
U	Compound was analyzed for, but not detected above detection limit

Table A-18. Dissolved metals in soil and rock (mg/kg) collected from the Building 854 area. Results recorded by February 10, 1998.

Dissolved Metals in Soil, Site 300
February 12, 1998
gemini1

s3metstlc.soL.12feb98
s3metstlc.soR.12feb98

Table A-18. Dissolved metals in soil and rock (mg/kg) collected from the Building 854 area. Results recorded by February 10, 1998.

Notes:

- Indicates no analysis performed for this compound

Val. = Validation code

Footnotes:

a	ERD data
b	ORAD WGMG data
c	Analytical results for this sample are suspect
d	Sample collected during hydraulic testing
e	Blind sample, sent to lab without well identity
f	Sample dilution necessary for analysis; detection limits increased
g	Interlaboratory collocated sample
h	Intralaboratory collocated sample
i	Sample collected as part of pilot study
j	Note field may contain important information regarding this sample
k	Pre-development sample
l	Norm month, norm quarter or norm year inconsistent with sample date
m	Confirmation sample
n	Sample analyzed after standard holding time
o	Sample comprised of partial composite
p	Alpha spectroscopy analysis of uranium isotopes
q	Gamma spectroscopy analysis of uranium isotopes

Lab Codes:

CS	California Laboratory Services, Rancho Cordova, CA

Validation Codes:

V	Validated
N	Not validated (default value)
U	Undeclared
H	Historical comparison only

CLP flags: (follow result)

B	Analyte found in method blank
D	Analysis performed at a secondary dilution or concentration (i.e., vapor samples)
E	The analyte was detected below the LLNL reporting limit, but above the analytical laboratory minimum detection limit.
F	Analyte found in field blank, trip blank, or equipment blank
G	Quantitated using fuel calibration, but does not match typical fuel fingerprint (fuel maybe gasoline, diesel, motor oil etc.).
H	Sample analyzed outside of holding time, sample results should be evaluated
J	Analyte was postively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
L	Spike accuracy not within control limits
O	Duplicate spike or sample precision not within control limits
P	Indicates that the absence of a data qualifier flag does not mean that the data does not need qualification, but that the implementation of electronic data qualifier flags was not yet established
R	Sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified
S	Analytical results for this sample are suspect
T	Analyte is tentatively identified compound; result is approximate
U	Compound was analyzed for, but not detected above detection limit

Table A-19. Total metals in soil and rock (mg/kg) collected from Building 854 area. Results recorded by February 10, 1998.

Metals in Surface Soil, Site 300
February 12, 1998
gemini1

s3metttlc.soL.12feb98
s3metttlc.soR.12feb98

Table A-19. Total metals in soil and rock (mg/kg) collected from Building 854 area.

Location Date	Lab	Val. Note	Depth (ft)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper
W-854-01											
21-nov-95	CS a	V	0.5	<1 U	0.6	93	0.69	<1 U	9.8	8	16
21-nov-95	CS ag	V	5.0	<1 U	0.8	72	0.76	<1 U	13	6.1	25
21-nov-95	CS ag	V	5.0	<1 U	1.6	72	0.57	<1 U	12	5.6	22
21-nov-95	CS a	V	40.0	<1 U	1.4	52	0.89	<1 U	14	15	20
22-nov-95	CS a	V	60.0	<1 U	0.72	40	0.56	<1 U	13	6	11
22-nov-95	CS ag	V	80.0	<1 LOU	0.73 LO	49	0.73	<1 U	12 LO	8.7	11
W-854-03											
14-feb-96	CS ag	V	0.5	<1 LOU	2 LO	97	<0.5 U	<1 LOU	17	9	7.9
W-854-04											
28-feb-96	CS a	V	0.5	<1 ULO	1.4	160	0.78	<1 U	24	11	14
3SS-854-001											
29-nov-95	CS a	V	0.0	<1 LOU	2	110	<0.5 U	0.13	22	6.3	17
3SS-854-002											
29-nov-95	CS a	V	0.0	<1 U	2.9	120	<0.5 U	<0.1 U	24	7.3	23
3SS-854-003											
21-nov-95	CS a	V	0.0	<1 U	1.4	110	<0.5 U	0.12	18	7.8	25
3SS-854-004											
21-nov-95	CS a	V	0.0	<1 U	2.6	130	0.59	0.2	23	10	15
3SS-854-005											
21-nov-95	CS a	V	0.0	<1 U	3.8	120	0.66	0.11	21	11	14
3SS-854-006											
21-nov-95	CS a	V	0.0	<1 LOU	1.1 LO	120	<0.5 U	0.93 LO	22	8.9	15
3SS-854-007											
21-nov-95	CS a	V	0.0	<1 U	1.1	110	0.62	0.29	27	10	19
3SS-854-008											
21-nov-95	CS a	V	0.0	<1 U	1.2	100	<0.5 U	1.4	19	8.5	17
3SS-854-009											
21-nov-95	CS a	V	0.0	<1 U	1.2	98	<0.5 U	4	16	6.8	60
3SS-854-010											
21-nov-95	CS a	V	0.0	<1 U	1.2	110	0.64	0.18	22	8.8	14
21-nov-95	FS a	V	0.0	<3 LOU	<3 U	91	<0.5 U	<1 U	<3 U	<3 LOU	17
3SS-854-011											
22-nov-95	CS a	V	0.0	<1 U	2.3	120	<0.5 U	2.4	30	9.2	22
3SS-854-012											
22-nov-95	CS a	V	0.0	<1 U	1.8	100	0.6	0.25	20	9.3	16
3SS-854-013											
22-nov-95	CS a	V	0.0	<1 U	2	88	<0.5 U	1.2	24	7.5	230
3SS-854-014											
22-nov-95	CS a	V	0.0	<1 U	1.2	120	<0.5 U	0.1	22	9	11
22-nov-95	CS a	V	0.0	<1 U	2.5	110	<0.5 U	0.1	24	6.8	11
3SS-854-015											
22-nov-95	CS a	V	0.0	<1 U	<0.5 U	58	0.55	<1 U	6.4	<5 U	11
3SS-854-016											
22-nov-95	CS a	V	0.0	<1 U	1.5	95	<0.5 U	0.23	15	6.2	15
3SS-854-017											
22-nov-95	CS a	V	0.0	<1 U	0.65	130	0.75	<1 U	21	11	17

Results recorded by February 10, 1998.

Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Location Date
									W-854-01
<10 U	<0.05 U	<5 U	14	<0.5 U	<2.5 U	<1 U	30	37	21-nov-95
<10 U	<0.05 U	<5 U	10	<0.5 U	<2.5 U	<1 U	68	34	21-nov-95
<10 U	<0.05 HU	<5 U	10	0.81	<2.5 U	<1 U	64	33	21-nov-95
<10 U	<0.05 U	<5 U	13	<0.5 U	<2.5 U	<1 U	51	33	21-nov-95
<10 U	<0.05 U	<5 U	<10 U	<0.5 U	<2.5 U	<1 U	69	31	22-nov-95
<10 U	<0.05 U	<5 U	11	<0.5 LOU	<2.5 U	<1 U	100 LO	36 LO	22-nov-95
									W-854-03
10	<0.05 U	<5 U	13	<0.5 LOU	<2.5 U	<1 U	75	38	14-feb-96
									W-854-04
<10 U	<0.05 U	<5 U	16	<0.5 ULO	<2.5 U	<1 U	82	50	28-feb-96
									3SS-854-001
<10 U	<0.05 HU	<5 U	32	<0.5 LOU	<2.5 U	<1 U	35	36	29-nov-95
									3SS-854-002
<10 U	<0.05 HU	<5 U	28	<0.5 U	<2.5 U	<1 U	37	42	29-nov-95
									3SS-854-003
<10 U	<0.05 HU	<5 U	14	<0.5 U	<2.5 U	<1 U	75	46	21-nov-95
									3SS-854-004
<10 U	<0.05 HU	<5 U	17	<0.5 U	<2.5 U	<1 U	82	63	21-nov-95
									3SS-854-005
17	<0.05 HU	<5 U	17	<0.5 U	<2.5 U	<1 U	88	50	21-nov-95
									3SS-854-006
10	<0.05 HU	<5 U	20	<0.5 LOU	<2.5 U	<1 U	60	110	21-nov-95
									3SS-854-007
23	<0.05 HU	<5 U	24	<0.5 U	<2.5 U	<1 U	74	87	21-nov-95
									3SS-854-008
<10 U	<0.05 HU	<5 U	15	<0.5 U	<2.5 U	<1 U	69	160	21-nov-95
									3SS-854-009
98	0.29 H	<5 U	14	<0.5 U	<2.5 U	<1 U	41	180	21-nov-95
									3SS-854-010
10	<0.05 HU	<5 U	16	<0.5 U	<2.5 U	<1 U	75	60	21-nov-95
15	0.04 DU	<3 U	12	<3 U	42 LO	<3 LOU	36 U	40	21-nov-95
									3SS-854-011
15	<0.05 HU	<5 U	21	<0.5 U	<2.5 U	<1 U	65	130	22-nov-95
									3SS-854-012
<10 U	<0.05 HU	<5 U	16	<0.5 U	<2.5 U	<1 U	79	49	22-nov-95
									3SS-854-013
<10 U	<0.05 HU	<5 U	19	<0.5 U	<2.5 U	<1 U	63	140	22-nov-95
									3SS-854-014
<10 U	<0.05 HU	<5 U	22	<0.5 U	<2.5 U	<1 U	43	36	22-nov-95
<10 U	<0.05 HU	<5 U	24	<0.5 U	<2.5 U	<1 U	49	40	22-nov-95
									3SS-854-015
<10 U	<0.05 U	<5 U	<10 U	<0.5 U	<2.5 U	<1 U	36	26	22-nov-95
									3SS-854-016
<10 U	<0.05 HU	<5 U	11	<0.5 U	<2.5 U	<1 U	56	140	22-nov-95
									3SS-854-017
<10 U	<0.05 U	<5 U	22	<0.5 U	<2.5 U	<1 U	71	45	22-nov-95

Table A-19. Total metals in soil and rock (mg/kg) collected from Building 854 area.

Location Date	Lab	Note	Val.	Depth (ft)	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper
3SS-854-018 22-nov-95	CS	a	V	0.0	<1 U	0.91	100	0.71	<1 U	12	8.8	15
3SS-854-019 22-nov-95	CS	a	V	0.0	<1 U	<0.5 U	79	0.67	<1 U	15	8.1	14
3SS-854-020 22-nov-95	CS	a	V	0.0	<1 U	0.64	100	0.93	<1 U	18	10	18
22-nov-95	FS	a	V	0.0	<3 LOU	<3 U	64 U	0.6	<1 U	8	10 LO	16
3SS-854-021 29-nov-95	CS	a	V	0.0	<1 U	1.1	390	0.69	1.1	17	9.9	28
3SS-854-022 22-nov-95	CS	a	V	0.0	<1 U	3	110	0.51	0.53	22	9.6	11
3SS-854-023 22-nov-95	CS	a	V	0.0	<1 U	<0.5 U	130	0.67	<1 U	11	8.5	13
3SS-854-024 22-nov-95	CS	a	V	0.0	<1 U	<0.5 U	150	0.88	<1 U	16	9.7	15
3SS-854-025 22-nov-95	CS	a	V	0.0	<1 U	0.84	100	<0.5 U	<1 U	10	6.8	12
3SS-854-026 22-nov-95	CS	a	V	0.0	<1 U	0.8	74	<0.5 U	<1 U	22	5.9	36
3SS-854-027 29-nov-95	CS	a	V	0.0	<1 U	<0.5 U	100	0.64	0.71	15	8.8	18
3SS-854-028 29-nov-95	CS	a	V	0.0	<1 U	0.7	110	0.66	0.47	18	8.9	19
3SS-854-029 29-nov-95	CS	a	V	0.0	<1 U	1.2	96	0.73	0.72	18	8.8	30
3SS-854-030 29-nov-95	CS	a	V	0.0	<1 U	2.4	100	<0.5 U	0.29	17	7.5	15

Results recorded by February 10, 1998.

Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc	Location Date
<10 U	<0.05 U	<5 U	13	<0.5 U	<2.5 U	<1 U	54	35	3SS-854-018 22-nov-95
<10 U	<0.05 U	<5 U	13	<0.5 U	<2.5 U	<1 U	51	70	3SS-854-019 22-nov-95
<10 U	<0.05 U	<5 U	15	<0.5 U	<2.5 U	<1 U	74	41	3SS-854-020 22-nov-95
7	0.02 DU	<3 U	12	<3 U	<3 LOU	<3 LOU	33	26	22-nov-95
17	<0.05 HU	<5 U	18	<0.5 U	<2.5 U	<1 U	63	140	3SS-854-021 29-nov-95
<10 U	<0.05 HU	<5 U	15	<0.5 U	<2.5 U	<1 U	95	55	3SS-854-022 22-nov-95
<10 U	<0.05 U	<5 U	15	<0.5 U	<2.5 U	<1 U	41	33	3SS-854-023 22-nov-95
<10 U	<0.05 U	<5 U	16	<0.5 U	<2.5 U	<1 U	55	46	3SS-854-024 22-nov-95
<10 U	<0.05 U	<5 U	16	<0.5 U	<2.5 U	<1 U	27	25	3SS-854-025 22-nov-95
62	<0.05 U	<5 U	16	<0.5 U	<2.5 U	<1 U	52	1400	3SS-854-026 22-nov-95
21	<0.05 HU	<5 U	15	<0.5 U	<2.5 U	<1 U	50	510	3SS-854-027 29-nov-95
15	<0.05 HU	<5 U	20	<0.5 U	<2.5 U	<1 U	58	330	3SS-854-028 29-nov-95
10	<0.05 HU	<5 U	18	<0.5 U	<2.5 U	<1 U	67	180	3SS-854-029 29-nov-95
<10 U	<0.05 HU	<5 U	18	<0.5 U	<2.5 U	<1 U	49	140	3SS-854-030 29-nov-95

See following page for notes

Table A-19. Total metals in soil and rock (mg/kg) collected from Building 854 area. Results recorded by February 10, 1998.

Notes:

-	Indicates no analysis performed for this compound

Val. = Validation code

Footnotes:

a	ERD data
b	ORAD WGMG data
c	Analytical results for this sample are suspect
d	Sample collected during hydraulic testing
e	Blind sample, sent to lab without well identity
f	Sample dilution necessary for analysis; detection limits increased
g	Interlaboratory collocated sample
h	Intralaboratory collocated sample
i	Sample collected as part of pilot study
j	Note field may contain important information regarding this sample
k	Pre-development sample
l	Norm month, norm quarter or norm year inconsistent with sample date
m	Confirmation sample
n	Sample analyzed after standard holding time
o	Sample comprised of partial composite
p	Alpha spectroscopy analysis of uranium isotopes
q	Gamma spectroscopy analysis of uranium isotopes

Lab Codes:

CS	California Laboratory Services, Rancho Cordova, CA

Validation Codes:

V	Validated
N	Not validated (default value)
U	Undeclared
H	Historical comparison only

CLP flags: (follow result)

B	Analyte found in method blank
D	Analysis performed at a secondary dilution or concentration (i.e., vapor samples)
E	The analyte was detected below the LLNL reporting limit, but above the analytical laboratory minimum detection limit.
F	Analyte found in field blank, trip blank, or equipment blank
G	Quantitated using fuel calibration, but does not match typical fuel fingerprint (fuel maybe gasoline, diesel, motor oil etc.).
H	Sample analyzed outside of holding time, sample results should be evaluated
J	Analyte was postively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
L	Spike accuracy not within control limits
O	Duplicate spike or sample precision not within control limits
P	Indicates that the absence of a data qualifier flag does not mean that the data does not need qualification, but that the implementation of electronic data qualifier flags was not yet established
R	Sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified
S	Analytical results for this sample are suspect
T	Analyte is tentatively identified compound; result is approximate
U	Compound was analyzed for, but not detected above detection limit

Table A-20. Fuel hydrocarbons in soil and rock (ug/L) collected from the Building 854 area. Results recorded by February 10, 1998.

O&G, Gas Fingerprint, TPH-Diesel in soil
February 11, 1998
gemini1

gas-oil-dsl_SO.11feb98

Table A-20. Fuel hydrocarbons in soil and rock (ug/L) collected from the Building 854 area. Results recorded by February 10, 1998.

Location Date	Lab	Note	Val.	Depth (ft)	Oil and Grease	TPH as Diesel	Tetra (2-ethylbutoxy) silane
W-854-01							
21-nov-95	CS	a	V	0.5	120	-	-
21-nov-95	CS	a	V	0.5	-	-	<2 U
21-nov-95	CS	ag	V	5.0	56	-	-
21-nov-95	CS	ag	V	5.0	-	-	<2 U
21-nov-95	CS	ag	V	10.0	62	-	-
21-nov-95	CS	ag	V	10.0	-	-	<2 U
21-nov-95	CS	a	V	20.0	98	-	-
21-nov-95	CS	a	V	20.0	-	-	<2 U
21-nov-95	CS	a	V	22.0	100	-	-
21-nov-95	CS	a	V	22.0	-	-	<2 U
21-nov-95	CS	a	V	25.0	78	-	-
21-nov-95	CS	a	V	25.0	-	-	<2 U
21-nov-95	CS	a	V	40.0	58 LO	-	-
21-nov-95	CS	a	V	40.0	-	-	<2 U
21-nov-95	CS	a	V	40.0	-	-	<2 HULO
W-854-02							
22-jan-96	CS	a	V	0.5	-	-	<2 ULO
22-jan-96	CS	a	V	5.0	-	-	<2 ULO
22-jan-96	CS	a	V	10.0	-	-	<2 ULO
23-jan-96	CS	a	V	20.1	-	-	<2 LOU
23-jan-96	CS	a	V	33.0	-	-	<2 ULO
24-jan-96	CS	a	V	42.0	-	-	<2 ULO
24-jan-96	CS	a	V	52.5	-	-	<2 ULO
24-jan-96	CS	a	V	62.0	-	-	<2 ULO
30-jan-96	CS	a	V	132.0	-	-	<2 U
W-854-03							
14-feb-96	CS	ag	V	0.5	-	<1 LOU	-
14-feb-96	CS	ag	V	5.0	-	<1 ULO	-
14-feb-96	CS	a	V	10.0	-	<1 ULO	-
W-854-04							
28-feb-96	CS	a	V	0.5	-	<1 U	-
W-854-08							
19-jun-96	CS	a	V	11.0	-	<1 U	-
3SS-854-003							
21-nov-95	CS	a	V	0.0	-	-	<2 U
3SS-854-004							
21-nov-95	CS	a	V	0.0	-	-	<2 U
3SS-854-005							
21-nov-95	CS	a	V	0.0	-	-	<2 U
3SS-854-006							
21-nov-95	CS	a	V	0.0	-	-	<2 U
3SS-854-007							
21-nov-95	CS	a	V	0.0	-	-	<2 U
3SS-854-008							
21-nov-95	CS	a	V	0.0	-	-	<2 U
3SS-854-009							
21-nov-95	CS	a	V	0.0	-	-	<2 U
3SS-854-010							
21-nov-95	CS	a	V	0.0	-	-	<2 U
21-nov-95	CS	a	V	0.0	-	-	<2 HU
3SS-854-011							
22-nov-95	CS	a	V	0.0	-	-	<20 DU

Table A-20. Fuel hydrocarbons in soil and rock (ug/L) collected from the Building 854 area. Results recorded by February 10, 1998.

Location Date	Lab	Note	Val.	Depth (ft)	Oil and Grease	TPH as Diesel	Tetra (2-ethylbutoxy) silane
3SS-854-012							
22-nov-95	CS	a	V	0.0	-	-	<2 U
3SS-854-013							
22-nov-95	CS	a	V	0.0	360	-	-
22-nov-95	CS	a	V	0.0	-	-	<20 DU
3SS-854-014							
22-nov-95	CS	a	V	0.0	340	-	-
22-nov-95	CS	a	V	0.0	640	-	-
22-nov-95	CS	a	V	0.0	1800	-	-
22-nov-95	CS	a	V	0.0	-	-	<20 DU
3SS-854-015							
22-nov-95	CS	a	V	0.0	-	-	<2 U
3SS-854-016							
22-nov-95	CS	a	V	0.0	-	-	<2 U
3SS-854-017							
22-nov-95	CS	a	V	0.0	120	-	-
3SS-854-018							
22-nov-95	CS	a	V	0.0	58	-	-
3SS-854-020							
21-nov-95	CS	a	V	0.0	-	-	<2 HU
3SS-854-021							
29-nov-95	CS	a	V	0.0	1000	-	-
3SS-854-022							
22-nov-95	CS	a	V	0.0	110	-	-
3SS-854-023							
22-nov-95	CS	a	V	0.0	-	-	<2 U
3SS-854-024							
22-nov-95	CS	a	V	0.0	-	-	<2 U
3SS-854-027							
29-nov-95	CS	a	V	0.0	1200	-	-
29-nov-95	CS	a	V	0.0	-	-	<200 DU
3SS-854-028							
29-nov-95	CS	a	V	0.0	1200	-	-
29-nov-95	CS	a	V	0.0	-	-	<200 DU
3SS-854-029							
29-nov-95	CS	a	V	0.0	86	-	-
29-nov-95	CS	a	V	0.0	-	-	<20 DU
29-nov-95	CS	a	V	0.0	-	-	<20 DU
3SS-854-030							
29-nov-95	CS	a	V	0.0	2100	-	-
29-nov-95	CS	a	V	0.0	-	-	<200 DU
29-nov-95	CS	a	V	0.0	-	-	<200 DU

See following page for notes

Table A-20. Fuel hydrocarbons in soil and rock (ug/L) collected from the Building 854 area. Results recorded by February 10, 1998.

Notes:

\- Indicates no analysis performed for this compound

Val. = Validation code

Footnotes:

a	ERD data
b	ORAD WGMG data
c	Analytical results for this sample are suspect
d	Sample collected during hydraulic testing
e	Blind sample, sent to lab without well identity
f	Sample dilution necessary for analysis; detection limits increased
g	Interlaboratory collocated sample
h	Intralaboratory collocated sample
i	Sample collected as part of pilot study
j	Note field may contain important information regarding this sample
k	Pre-development sample
l	Norm month, norm quarter or norm year inconsistent with sample date
m	Confirmation sample
n	Sample analyzed after standard holding time
o	Sample comprised of partial composite
p	Alpha spectroscopy analysis of uranium isotopes
q	Gamma spectroscopy analysis of uranium isotopes

Lab Codes:

CS	California Laboratory Services, Rancho Cordova, CA

Validation Codes:

V	Validated
N	Not validated (default value)
U	Undeclared
H	Historical comparison only

CLP flags: (follow result)

B	Analyte found in method blank
D	Analysis performed at a secondary dilution or concentration (i.e., vapor samples)
E	The analyte was detected below the LLNL reporting limit, but above the analytical laboratory minimum detection limit.
F	Analyte found in field blank, trip blank, or equipment blank
G	Quantitated using fuel calibration, but does not match typical fuel fingerprint (fuel maybe gasoline, diesel, motor oil etc.).
H	Sample analyzed outside of holding time, sample results should be evaluated
J	Analyte was postively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
L	Spike accuracy not within control limits
O	Duplicate spike or sample precision not within control limits
P	Indicates that the absence of a data qualifier flag does not mean that the data does not need qualification, but that the implementation of electronic data qualifier flags was not yet established
R	Sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified
S	Analytical results for this sample are suspect
T	Analyte is tentatively identified compound; result is approximate
U	Compound was analyzed for, but not detected above detection limit

Table A-21. Anions, TDS, specific conductivity, and pH in ground water and surface water collected from the Building 854 area. Results recorded by February 10, 1998.

Anions in Ground Water, Site 300
February 12, 1998
gemini1

s3anionsL.12feb98
s3anionsR.12feb98

Table A-21. Anions, TDS, specific conductivity, and pH in ground water and surface

Location Date	Lab	Note	Val.	Fluoride (mg/L)	Silica (mg/L)	Nitrate as (NO3) (mg/L)	Chloride (mg/L)	Sulfate (mg/L)
W-854-01								
27-jun-96	CS	a	V	-	15	-	-	-
27-jun-96	CS	a	V	73 L	-	<0.5 U	120 D	240 D
W-854-02								
27-jun-96	CS	a	V	-	26	-	-	-
27-jun-96	CS	a	V	0.49 L	-	43	170 D	88 D
W-854-03								
17-sep-96	CS	a	V	-	57	-	-	-
17-sep-96	CS	a	V	0.48 L	-	<30 DLOU	230 LO	20 LO
W-854-04								
16-aug-96	CS	a	V	-	82	-	-	-
16-aug-96	CS	a	V	0.72	-	<0.5 U	120 D	370 D
W-854-05								
16-aug-96	CS	a	V	-	50	-	-	-
16-aug-96	CS	a	V	0.38	-	54 D	100 D	29
W-854-06								
10-sep-96	CS	a	V	-	30	-	-	-
10-sep-96	CS	a	V	0.6	-	<0.5 LOU	120 DLO	110 D
W-854-07								
10-sep-96	CS	a	V	-	31	-	-	-
10-sep-96	CS	a	V	0.33	-	33 LO	190 DLO	90 D
W-854-08								
10-sep-96	CS	a	V	-	55	-	-	-
10-sep-96	CS	a	V	0.41	-	180 DLO	490 DLO	23
13-dec-96	CS	a	V	-	57	-	-	-
13-dec-96	CS	a	V	0.38	-	62 D	160 DLO	25 LO
W-854-10								
06-feb-97	CS	a	V	-	73 D	-	-	-
06-feb-97	CS	a	V	0.29	-	3.5	100 D	220 D
W-854-11								
19-feb-97	CS	a	V	-	24	-	-	-
19-feb-97	CS	a	V	0.51	-	44 L	160 DLO	42 D
WELL13								
09-aug-90	BC	a	U	-	-	-	140 P	250 P
21-oct-91	BC	ag	U	-	-	-	130 P	1100 P
21-oct-91	BC	ag	U	-	34 P	-	-	-
29-feb-96	CS	a	V	0.25	-	5.3	150 LO	950 D
SPRING10								
19-nov-91	BC	a	U	-	-	-	140 P	110 P
28-apr-94	CS	a	V	0.7	-	<22.15 DU	140 D	110 D
SPRING11								
14-nov-91	BC	a	U	-	-	-	280 P	290 P
22-sep-93	CS	a	V	0.81	-	2.3922	330	330
22-sep-93	CS	a	V	-	54	-	-	-
28-apr-94	CS	a	V	0.74	-	<22.15 DU	390 D	300 D

water collected from the Building 854 area. Results recorded by February 10, 1998.

Carbonate (mg/L)	Bicarbonate** (mg/L)	TDS (mg/L)	Spec Cond (umhos/cm)	pH	Location Date
					W-854-01
-	-	-	-	-	27-jun-96
33	110	740	960	8.5	27-jun-96
					W-854-02
-	-	-	-	-	27-jun-96
<1 U	150	630	830	8.2	27-jun-96
					W-854-03
-	-	-	-	-	17-sep-96
<1 U	240	750	820	7.6	17-sep-96
					W-854-04
-	-	-	-	-	16-aug-96
<1 U	140	1000	1400	11	16-aug-96
					W-854-05
-	-	-	-	-	16-aug-96
<1 U	140	470	700	7.6	16-aug-96
					W-854-06
-	-	-	-	-	10-sep-96
<1 U	360	750	1800	11	10-sep-96
					W-854-07
-	-	-	-	-	10-sep-96
<1 U	130	560	680	7.7	10-sep-96
					W-854-08
-	-	-	-	-	10-sep-96
<1 U	200	690	880	7.6	10-sep-96
-	-	-	-	-	13-dec-96
<1 U	180	660	1100	7.6	13-dec-96
					W-854-10
-	-	-	-	-	06-feb-97
<1 U	260	760	1200	7.8	06-feb-97
					W-854-11
-	-	-	-	-	19-feb-97
<1 U	160	600	970	7.9	19-feb-97
					WELL13
<1 P	88 P	670 P	890 P	7.4 P	09-aug-90
<1 P	250 P	1900 P	2450 P	7.2 P	21-oct-91
-	-	-	-	-	21-oct-91
<1 U	240	1800	2100	6.8	29-feb-96
					SPRING10
<1 P	140 P	580 P	800 P	8.3 P	19-nov-91
<1 U	160	570	840	7.8	28-apr-94
					SPRING11
<1 P	260 P	1200 P	1770 P	8.1 P	14-nov-91
<1 U	530	1500	2100	8.1	22-sep-93
-	-	-	-	-	22-sep-93
<1 U	370	1400	2000	8	28-apr-94

See following page for notes

Table A-21. Anions, TDS, specific conductivity, and pH in ground water and surface water collected from the Building 854 area. Results recorded by February 10, 1998.

Notes:

\- Indicates no analysis performed for this compound

Val. = Validation code

Footnotes:

a	ERD data
b	ORAD WGMG data
c	Analytical results for this sample are suspect
d	Sample collected during hydraulic testing
e	Blind sample, sent to lab without well identity
f	Sample dilution necessary for analysis; detection limits increased
g	Interlaboratory collocated sample
h	Intralaboratory collocated sample
i	Sample collected as part of pilot study
j	Note field may contain important information regarding this sample
k	Pre-development sample
l	Norm month, norm quarter or norm year inconsistent with sample date
m	Confirmation sample
n	Sample analyzed after standard holding time
o	Sample comprised of partial composite
p	Alpha spectroscopy analysis of uranium isotopes
q	Gamma spectroscopy analysis of uranium isotopes

Lab Codes:

BC	Brown and Caldwell, Emeryville, CA
CS	California Laboratory Services, Rancho Cordova, CA

Validation Codes:

V	Validated
N	Not validated (default value)
U	Undeclared
H	Historical comparison only

CLP flags: (follow result)

B	Analyte found in method blank
D	Analysis performed at a secondary dilution or concentration (i.e., vapor samples)
E	The analyte was detected below the LLNL reporting limit, but above the analytical laboratory minimum detection limit.
F	Analyte found in field blank, trip blank, or equipment blank
G	Quantitated using fuel calibration, but does not match typical fuel fingerprint (fuel maybe gasoline, diesel, motor oil etc.).
H	Sample analyzed outside of holding time, sample results should be evaluated
J	Analyte was postively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
L	Spike accuracy not within control limits
O	Duplicate spike or sample precision not within control limits
P	Indicates that the absence of a data qualifier flag does not mean that the data does not need qualification, but that the implementation of electronic data qualifier flags was not yet established
R	Sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified
S	Analytical results for this sample are suspect
T	Analyte is tentatively identified compound; result is approximate
U	Compound was analyzed for, but not detected above detection limit

Table A-22. Cations in ground water and surface water (mg/L) collected from the Building 854 area. Results recorded by February 10, 1998.

Site 300 Cations Report
February 12, 1998
gemini1

s3cationL.12feb98
s3cationR.12feb98

Table A-22. Cations in ground water and surface water (mg/L) collected from the Building

Location Date	Lab	Note	Val.	Sodium	Potassium	Calcium	Magnesium	Iron
W-854-01								
27-jun-96	CS	a	V	230	13	27	<0.5 U	1.1
W-854-02								
27-jun-96	CS	a	V	140	7.6	40	21	0.14
W-854-03								
17-sep-96	CS	a	V	180 L	7.8	45 D	26	<0.1 U
W-854-04								
16-aug-96	CS	a	V	320 L	15	24	<0.5 U	0.14
W-854-05								
16-aug-96	CS	a	V	87 L	6.8	43	19	<0.1 U
W-854-06								
10-sep-96	CS	a	V	230 LO	44	9.2	<0.5 U	<0.1 U
W-854-07								
10-sep-96	CS	a	V	85 LO	8.4	54	35	<0.1 U
W-854-08								
10-sep-96	CS	a	V	180 LO	6.9	33	22	<0.1 U
13-dec-96	CS	a	V	–	6	25	18	<0.1 U
W-854-10								
06-feb-97	CS	a	V	140 LO	8.8	51 LO	46	<0.1 U
W-854-11								
19-feb-97	CS	a	V	130 LO	7.5	33	21 O	0.16
WELL13								
09-aug-90	BC	a	U	120 P	7 P	47 P	19 P	<0.1 P
21-oct-91	BC	ag	U	250 P	12 P	280 P	75 P	<0.1 P
20-jun-94	IC	a	V	–	–	–	–	–
29-feb-96	CS	a	V	230	9.2	220	65	0.23
SPRING10								
19-nov-91	BC	a	U	110 P	6 P	30 P	22 P	<0.1 P
28-apr-94	CS	a	V	130	6.6	35	22	<0.1 U
SPRING11								
14-nov-91	BC	a	U	280 P	8 P	100 P	25 P	<0.1 P
22-sep-93	CS	a	V	380	7.1	120	34	<0.1 U
28-apr-94	CS	a	V	340	7.3	110	37	<0.1 U

854 area. Results recorded by February 10, 1998.

Manganese	Copper	Zinc	Boron	Strontium	Aluminum	Location Date
<0.03 U	0.53	<0.05 U	-	-	<0.2 U	W-854-01 27-jun-96
<0.03 U	<0.05 U	<0.05 U	-	-	0.38	W-854-02 27-jun-96
<0.03 U	<0.05 U	<0.05 U	-	-	<0.2 U	W-854-03 17-sep-96
<0.03 U	<0.05 U	<0.05 U	-	-	0.21	W-854-04 16-aug-96
<0.03 U	<0.05 U	<0.05 U	-	-	<0.2 U	W-854-05 16-aug-96
<0.03 U	<0.05 U	<0.05 U	-	-	0.51	W-854-06 10-sep-96
<0.03 U	<0.05 U	<0.05 U	-	-	<0.2 U	W-854-07 10-sep-96
<0.03 U	<0.05 U	<0.05 U	-	-	<0.2 U	W-854-08 10-sep-96
<0.03 U	<0.05 U	<0.05 U	-	-	<0.2 U	13-dec-96
<0.03 U	<0.05 U	<0.05 U	-	-	<0.2 U	W-854-10 06-feb-97
<0.03 U	<0.05 U	0.13	-	-	0.23	W-854-11 19-feb-97
<0.04 P	<0.05 P	<0.05 P	-	-	-	WELL13 09-aug-90
0.87 P	<0.05 P	<0.05 P	-	-	-	21-oct-91
-	0.0064	0.0066	-	-	-	20-jun-94
0.61	<0.05 U	<0.05 U	-	-	<0.2 U	29-feb-96
<0.05 P	<0.05 P	<0.05 P	-	-	-	SPRING10 19-nov-91
<0.03 U	<0.05 U	<0.05 U	-	-	<0.2 U	28-apr-94
<0.05 P	<0.05 P	<0.05 P	-	-	-	SPRING11 14-nov-91
<0.03 U	<0.05 U	<0.05 U	-	-	<0.2 U	22-sep-93
<0.03 U	<0.05 U	<0.05 U	-	-	<0.2 U	28-apr-94

See following page for notes

Table A-22. Cations in ground water and surface water (mg/L) collected from the Building 854 area. Results recorded by February 10, 1998.

Notes:

- Indicates no analysis performed for this compound

Val. = Validation

Footnotes:

a ERD data
b ORAD WGMG data
c Analytical results for this sample are suspect
d Sample collected during hydraulic testing
e Blind sample, sent to lab without well identity
f Sample dilution necessary for analysis; detection limits increased
g Interlaboratory collocated sample
h Intralaboratory collocated sample
i Sample collected as part of pilot study
j Note field may contain important information regarding this sample
k Pre-development sample
l Norm month, norm quarter or norm year inconsistent with sample date
m Confirmation sample
n Sample analyzed after standard holding time
o Sample comprised of partial composite
p Alpha spectroscopy analysis of uranium isotopes
q Gamma spectroscopy analysis of uranium isotopes

Lab Codes:

BC	Brown and Caldwell, Emeryville, CA
CS	California Laboratory Services, Rancho Cordova, CA
IC	ICP MS Facility, LLNL, Livermore, CA

Validation Codes:

V	Validated
N	Not validated (default value)
U	Undeclared
H	Historical comparison only

CLP flags: (follow result)

B	Analyte found in method blank
D	Analysis performed at a secondary dilution or concentration (i.e., vapor samples)
E	The analyte was detected below the LLNL reporting limit, but above the analytical laboratory minimum detection limit.
F	Analyte found in field blank, trip blank, or equipment blank
G	Quantitated using fuel calibration, but does not match typical fuel fingerprint (fuel maybe gasoline, diesel, motor oil etc.).
H	Sample analyzed outside of holding time, sample results should be evaluated
J	Analyte was postively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
L	Spike accuracy not within control limits
O	Duplicate spike or sample precision not within control limits
P	Indicates that the absence of a data qualifier flag does not mean that the data does not need qualification, but that the implementation of electronic data qualifier flags was not yet established
R	Sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified
S	Analytical results for this sample are suspect
T	Analyte is tentatively identified compound; result is approximate
U	Compound was analyzed for, but not detected above detection limit

Table A-23. PCBs in ground water and surface water (ug/L) collected from the Building 854 area. Results recorded by February 10, 1998.

PCBs in Ground Water, Site 300
February 10, 1998
gemini1

s3pcbL.12feb98
s3pcbR.12feb98

Table A-23. PCBs in ground water and surface water (ug/L) collected from the Building

Location Date	Lab	Note	Val.	PCB 1016	PCB 1221	PCB 1232	PCB 1242	PCB 1248
W-854-01								
27-jun-96	CS	a	V	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
W-854-02								
27-jun-96	CS	a	V	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
W-854-03								
13-dec-96	CS	a	V	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
W-854-04								
16-aug-96	CS	a	V	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
W-854-05								
16-aug-96	CS	a	V	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
W-854-06								
10-sep-96	CS	a	V	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
W-854-07								
10-sep-96	CS	a	V	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
W-854-08								
10-sep-96	CS	a	V	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
13-dec-96	CS	a	V	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
W-854-10								
06-feb-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
W-854-11								
19-feb-97	CS	a	V	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U

854 area. Results recorded by February 10, 1998.

PCB 1254	PCB 1260	PCB 1262	PCB 1268	Total PCBs	Location Date
<0.5 U	<0.5 U	-	-	-	W-854-01 27-jun-96
<0.5 U	<0.5 U	-	-	-	W-854-02 27-jun-96
<0.5 U	<0.5 U	-	-	-	W-854-03 13-dec-96
<0.5 U	<0.5 UO	-	-	-	W-854-04 16-aug-96
<0.5 U	<0.5 UO	-	-	-	W-854-05 16-aug-96
<0.5 U	<0.5 U	-	-	-	W-854-06 10-sep-96
<0.5 U	<0.5 U	-	-	-	W-854-07 10-sep-96
<0.5 U	<0.5 U	-	-	-	W-854-08 10-sep-96
<0.5 U	<0.5 U	-	-	-	13-dec-96
<0.5 LOU	<0.5 U	-	-	-	W-854-10 06-feb-97
<0.5 U	<0.5 U	-	-	-	W-854-11 19-feb-97

See following page for notes

Table A-23. PCBs in ground water and surface water (ug/L) collected from the Building 854 area. Results recorded by February 10, 1998.

Notes:

- Indicates no analysis performed for this compound

Val. = Validation code

Footnotes:

a	ERD data
b	ORAD WGMG data
c	Analytical results for this sample are suspect
d	Sample collected during hydraulic testing
e	Blind sample, sent to lab without well identity
f	Sample dilution necessary for analysis; detection limits increased
g	Interlaboratory collocated sample
h	Intralaboratory collocated sample
i	Sample collected as part of pilot study
j	Note field may contain important information regarding this sample
k	Pre-development sample
l	Norm month, norm quarter or norm year inconsistent with sample date
m	Confirmation sample
n	Sample analyzed after standard holding time
o	Sample comprised of partial composite
p	Alpha spectroscopy analysis of uranium isotopes
q	Gamma spectroscopy analysis of uranium isotopes

Lab Codes:

CS	California Laboratory Services, Rancho Cordova, CA

Validation Codes:

V	Validated
N	Not validated (default value)
U	Undeclared
H	Historical comparison only

CLP flags: (follow result)

B	Analyte found in method blank
D	Analysis performed at a secondary dilution or concentration (i.e., vapor samples)
E	The analyte was detected below the LLNL reporting limit, but above the analytical laboratory minimum detection limit.
F	Analyte found in field blank, trip blank, or equipment blank
G	Quantitated using fuel calibration, but does not match typical fuel fingerprint (fuel maybe gasoline, diesel, motor oil etc.).
H	Sample analyzed outside of holding time, sample results should be evaluated
J	Analyte was postively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
L	Spike accuracy not within control limits
O	Duplicate spike or sample precision not within control limits
P	Indicates that the absence of a data qualifier flag does not mean that the data does not need qualification, but that the implementation of electronic data qualifier flags was not yet established
R	Sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified
S	Analytical results for this sample are suspect
T	Analyte is tentatively identified compound; result is approximate
U	Compound was analyzed for, but not detected above detection limit

Table A-24. PCBs in soil and rock (mg/kg) collected from the Building 854 area. Results recorded by February 10, 1998.

PCBs in Soil, Site 300
February 11, 1998
gemini1

s3pcbsoL.11feb98
s3pcbsoR.11feb98

Table A-24. PCBs in soil and rock (mg/kg) collected from the Building 854 area.

Location Date	Lab	Note	Val.	Depth (ft)	PCB 1016	PCB 1221	PCB 1232	PCB 1242	PCB 1248
W-854-01									
21-nov-95	CS	a	V	0.5	<1 U	<1 U	<1 U	<1 U	<1 U
21-nov-95	CS	a	V	5.0	<1 U	<1 U	<1 U	<1 U	<1 U
21-nov-95	CS	ag	V	10.0	<1 U	<1 U	<1 U	<1 U	<1 U
21-nov-95	FS	ag	V	10.0	<0.05 HU	<0.05 HU	<0.05 HU	<0.05 HU	<0.05 HU
W-854-02									
22-jan-96	CS	a	V	0.5	<0.02 U	<0.02 U	<0.02 U	<0.02 U	<0.02 U
22-jan-96	CS	a	V	5.0	<0.02 U	<0.02 U	<0.02 U	<0.02 U	<0.02 U
22-jan-96	CS	a	V	10.0	<0.02 U	<0.02 U	<0.02 U	<0.02 U	<0.02 U
23-jan-96	CS	a	V	20.1	<0.02 U	<0.02 U	<0.02 U	<0.02 U	<0.02 U
23-jan-96	CS	a	V	33.0	<0.02 U	<0.02 U	<0.02 U	<0.02 U	<0.02 U
24-jan-96	CS	a	V	42.0	<0.02 U	<0.02 U	<0.02 U	<0.02 U	<0.02 U
24-jan-96	CS	a	V	52.5	<0.02 U	<0.02 U	<0.02 U	<0.02 U	<0.02 U
24-jan-96	CS	a	V	62.0	<0.02 U	<0.02 U	<0.02 U	<0.02 U	<0.02 U
W-854-03									
14-feb-96	CS	a	V	0.5	<0.02 ULO	<0.02 ULO	<0.02 ULO	<0.02 ULO	<0.02 ULO
14-feb-96	CS	a	V	5.0	<0.02 U	<0.02 U	<0.02 U	<0.02 U	<0.02 U
W-854-04									
28-feb-96	CS	a	V	0.5	<0.02 U	<0.02 U	<0.02 U	<0.02 U	<0.02 U
W-854-05									
04-apr-96	CS	a	V	0.5	<0.02 U	<0.02 U	<0.02 U	<0.02 U	<0.02 U
3SS-854-021									
29-nov-95	CS	a	V	0.0	<10 DU	<10 DU	<10 DU	34 D	<10 DU
29-nov-95	FS	a	V	0.0	<0.05 U	<0.05 U	<0.05 U	<0.05 U	52 D
3SS-854-022									
22-nov-95	CS	a	V	0.0	<0.02 U	<0.02 U	<0.02 U	<0.02 U	<0.02 U

Results recorded by February 10, 1998.

PCB 1254	PCB 1260	PCB 1262	PCB 1268	Total PCBs	Location Date
					W-854-01
<1 U	<1 U	–	–	–	21-nov-95
<1 U	<1 U	–	–	–	21-nov-95
<1 U	<1 U	–	–	–	21-nov-95
<0.05 HU	<0.05 HU	–	–	–	21-nov-95
					W-854-02
<0.02 U	<0.02 U	–	–	–	22-jan-96
<0.02 U	<0.02 U	–	–	–	22-jan-96
<0.02 U	<0.02 U	–	–	–	22-jan-96
<0.02 U	<0.02 U	–	–	–	23-jan-96
<0.02 U	<0.02 U	–	–	–	23-jan-96
<0.02 U	<0.02 U	–	–	–	24-jan-96
<0.02 U	<0.02 U	–	–	–	24-jan-96
<0.02 U	<0.02 U	–	–	–	24-jan-96
					W-854-03
<0.02 ULO	<0.02 ULO	–	–	–	14-feb-96
<0.02 U	<0.02 LOU	–	–	–	14-feb-96
					W-854-04
<0.02 U	<0.02 U	–	–	–	28-feb-96
					W-854-05
<0.02 U	<0.02 U	–	–	–	04-apr-96
					3SS-854-021
<10 DU	–	–	–	–	29-nov-95
<0.05 U	<0.05 U	–	–	–	29-nov-95
					3SS-854-022
0.16	<0.02 LOU	–	–	–	22-nov-95

See following page for notes

Table A-24. PCBs in soil and rock (mg/kg) collected from the Building 854 area. Results recorded by February 10, 1998.

Notes:

- Indicates no analysis performed for this compound

Val. = Validation code

Footnotes:

a	ERD data
b	ORAD WGMG data
c	Analytical results for this sample are suspect
d	Sample collected during hydraulic testing
e	Blind sample, sent to lab without well identity
f	Sample dilution necessary for analysis; detection limits increased
g	Interlaboratory collocated sample
h	Intralaboratory collocated sample
i	Sample collected as part of pilot study
j	Note field may contain important information regarding this sample
k	Pre-development sample
l	Norm month, norm quarter or norm year inconsistent with sample date
m	Confirmation sample
n	Sample analyzed after standard holding time
o	Sample comprised of partial composite
p	Alpha spectroscopy analysis of uranium isotopes
q	Gamma spectroscopy analysis of uranium isotopes

Lab Codes:

CS	California Laboratory Services, Rancho Cordova, CA

Validation Codes:

V	Validated
N	Not validated (default value)
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CLP flags: (follow result)

B	Analyte found in method blank
D	Analysis performed at a secondary dilution or concentration (i.e., vapor samples)
E	The analyte was detected below the LLNL reporting limit, but above the analytical laboratory minimum detection limit.
F	Analyte found in field blank, trip blank, or equipment blank
G	Quantitated using fuel calibration, but does not match typical fuel fingerprint (fuel maybe gasoline, diesel, motor oil etc.).
H	Sample analyzed outside of holding time, sample results should be evaluated
J	Analyte was postively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
L	Spike accuracy not within control limits
O	Duplicate spike or sample precision not within control limits
P	Indicates that the absence of a data qualifier flag does not mean that the data does not need qualification, but that the implementation of electronic data qualifier flags was not yet established
R	Sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified
S	Analytical results for this sample are suspect
T	Analyte is tentatively identified compound; result is approximate
U	Compound was analyzed for, but not detected above detection limit

Attachment B

Air Sampling and Modeling Protocol and Results for the Building 854 Operable Unit

Attachment B

Air Sampling and Modeling for the Building 854 Operable Unit

Emission isolation flux chambers (EIFCs) were used in the Building 854 Operable Unit (OU) to make VOC soil vapor flux measurements during July and August of 1996 using the LLNL EIFC methodology (Dibley and Depue, Eds., 1997). The primary goal of the flux chamber sampling was to collect adequate data to determine the volatile organic compound (VOC) soil vapor flux rates for use in subsequent risk assessments for the Building 854 OU.

The source of the contamination in the Building 854 area is thought to be a result of leaks in the TCE brine distribution system, which was removed in 1989. Borehole data indicate that TCE is present in both shallow and deep soil and rock. The air sampling plan for the Building 854 area incorporated source area hot-spot sampling and diffuse source area sampling to address the potential VOC sources. In addition to the EIFC sampling, ambient air samples were also collected. The sampling approaches used at the Building 854 OU are described below.

B-1. Building 854 Area Emission Isolation Flux Chamber Sampling Activities

The minimum total number of soil vapor flux samples collected from each potential source area was determined based upon the area of the sampling zone using the following equation (U.S. EPA, 1989a):

$$\text{Number of samples} = 6 + 0.15 \bullet [\text{sampling zone area } (m^2)]^{0.5} \qquad \text{(B-1)}$$

This equation determines the number of samples necessary to provide an estimated average surface soil flux emission rate within 20% of the true mean with 95% confidence as recommended in the Air/Superfund Technical Guidance Series, Volume II (U.S. EPA, 1990).

A total of twenty-six flux chamber samples were collected in the Building 854 complex area. Figure B-1 shows the Building 854 EIFC sampling locations. Nine EIFC samples were collected to characterize emissions from suspected areas of high VOC concentration and areas surrounding Building 854F (3SF-B854-001 to 007, 011, and 012). Three of the EIFC sampling locations were collocated with PETREX survey points SVX-854-060 (3SF-B854-003), SVX-854-061 (3SF-B854-004), and SVX-854-062 (3SF-B854-005), where higher VOC concentrations were indicated. Several of these EIFC samples were collected at regular intervals along an unpaved strip surrounding a flat area (3SF-B854-001-007), and two were located within a paved area where significant cracking is observed (3SF-B854-011 and 012).

Based upon PETREX data, the hillside immediately west of the Building 854 complex may be a source of TCE soil vapor flux. The reasons for this are currently not well understood, but may be due to preferential vadose zone transport from the Building 854 area. Soil vapor flux sampling on the hillsides and berm in the vicinity of Building 854F was limited to six EIFC sampling points. One EIFC sample was collocated with PETREX survey point SVX-854-011 (3SF-B854-015), which indicated a potential high concentration. Three EIFC sampling points were located at regular intervals along the berms surrounding the flat area (3SF-B854-008-010). One sample was collected on top of the berm above the former brine system piping conduit (3SF-B854-013), and another was collected on the fire road along the hillside to the west of Building 854F (3SF-B854-014). Additional EIFC samples were collected in the vicinity of the TCE brine system valve stations, piping and storage tanks near Building 854D area (3SF-B854-017 and 018), the former Building 854G drum storage rack (3SF-B854-023 and 024), and the Building 854H drain outfall (3SF-B854-025). EIFC samples were also collected in areas of potential brine system leakage. These include samples collected near Building 854E (3SF-B854-019 and 020), Building 854C (3SF-B854-022 and 026), and behind Building 854B (3SF-B854-021). One additional sample was collected near PETREX survey point SVX-854-006, located on the fire road west of Building 854J (3SF-B854-016), because of relatively high PETREX VOC values.

B-2. Building 854 Area Ambient Air Sampling Activities

Indoor and outdoor ambient air samples were collected in the Building 854 complex concurrent with the EIFC sampling to provide additional exposure-point information. Ambient air samples were collected using SUMMA™ canisters over an approximate 8-hour time period (8-hr integrated air sample).

A temporary meteorological tower was erected during sampling activities to record temperature, wind speed and wind direction data. Site-specific meteorological data were correlated with data from the LLNL Site 300 meteorological tower to address seasonal meteorological variations and assure that final exposure-point calculations are representative of average conditions. The ambient air field data including wind speed, temperature, and sampling time are presented in Table B-1. Figures B-2 and B-3 show the wind roses for each day of sampling.

Eight integrated air samples were collected during EIFC sampling on 7/31/96 and 8/1/96 in the vicinity of Building 854F area and other potential areas of VOC contamination. Figure B-1 shows the Building 854 ambient air sampling locations. One sample was collected near the doorway to Building 854F to represent the most likely outdoor exposure point (3AA-B854-003). Another sample was collected at the base of the berm directly north of Building 854F (3AA-B854-002). A third sample was taken on top of the berm directly northwest of Building 854F (3AA-B854-004) to a measure background concentrations in the vicinity of Building 854F. A fourth sample was collected at breathing height (about 5 ft) at the fence north of the Building 854 complex (3AA-B854-008) to provide a background sample up-wind of the B854 area. A fifth sample was taken in front of Building 854A on a ladder by the dock (3AA-B854-006) representing a common outdoor exposure location. The sixth sample was taken near the phone located outside Building 854B (3AA-B854-007), which is used frequently by field personnel. The remaining two integrated indoor air samples were collected within Building 854F and Building 854B (3AA-B854-001 and 3AA-B854-005, respectively).

B-3. Emission Isolation Flux Chamber Sampling Methodology

The EIFC LLNL methodology used by LLNL is based on U.S. EPA guidance (U.S. EPA, 1986) and follows the Environmental Restoration Division (ERD) Standard Operating Procedure, SOP 1.11, "Soil Surface Flux Monitoring of Gaseous Emissions" (Dibley and Depue, Eds., 1997). The EIFC system is composed of three parts: the chamber, the sweep air controller and data logger, and the sampling system. The flux chamber contains a fan to circulate air and a thermistor to measure the chamber temperature. Three EIFCs have been constructed by LLNL (Martins, 1993). Each chamber encloses a surface area of approximately 0.122 m^2 and a total volume of about 27 L (0.027 m^3).

The sweep air controller and data logger contains a metering pump, two rotometers used to measure air flow in and out of the chamber, a battery, and the associated electronics required for chamber control and data acquisition. The metering pump and two rotometers are used to control air flow in and out of the chamber to maintain a negligible pressure differential across the chamber. The chamber controller is connected to an external data logger that acquires temperature and pressure data.

When the flux chamber operates, ultra-pure "zero-air" is metered into the chamber using a pressure regulator and the first rotometer. At approximately the same rate, air is pulled from the chamber through the second rotometer using the pump in the chamber controller. Both rotometers are adjusted to achieve a net pressure drop of zero (±0.1 in. H_2O) between the inside and the outside of the chamber. An air flow rate of about 3 L/min is used to achieve a chamber air residence time of approximately 10 min. A minimum of 30 min is required for the sweep air to reach a steady-state concentration with the VOC soil flux emissions. At that time, the effluent sweep air pump is turned off and an evacuated SUMMA™ canister is used to withdraw a vapor sample at approximately the same air flow rate (3 L/min).

To collect a sample, the EIFC is placed on the ground surface, and VOC soil flux emissions enter the open bottom of the chamber. Clean, dry sweep air is added into the chamber at a metered rate. Within the chamber a fan mixes the sweep air with emitted VOC vapors. When the concentration of the VOC soil flux emissions and the sweep air reaches equilibrium, a sample is collected in a SUMMA™ canister for analysis. VOC flux (emission/area-time) from the soil surface is then calculated from the VOC vapor concentration.

B-3.1. Equipment Calibration

All flux chambers and associated equipment were calibrated between November 19 and December 9, 1996. These calibrations include all Dwyer rotometers on each flux-chamber control-box (FCCB) as well as the measurement of flux chamber recovery rates.

All rotometers were calibrated under field conditions. Zero-air was used to calibrate units that control zero-air flow. Units used to control return-air flow were calibrated with air from the FCCB's internal air pump.

The displacement method was used for these calibrations. A 1-liter graduated cylinder was filled with water, covered and inverted in a water bath. Once under water, the cover was removed from the cylinder. The desired air flow rate for the test was set on the rotometer undergoing the test and flow was started. A 1/4-in. plastic tube connected to the rotometer was placed in the cylinder at the same time a timer was started. After about 15 to 20 seconds, the tube was removed from the cylinder and the elapsed time was noted. The volume of displaced water was then recorded and the observed flow rate was calculated by dividing this volume by the elapsed time. At least five observations were made for each rotometer. When all data were collected, linear regression analysis was performed with data pairs composed of the observed flow rate and the flow-rate set point. These results are shown in Table B-2. The constant (b) and the X coefficient (m) listed in Table B-2 were used to correct flow rates listed on the field log sheets using the formula:

$$y = mx + b \tag{B-2}$$

where

x = recorded flow rate.

m = X coefficient.

b = Constant.

y = Corrected flow rate.

Each flux chamber was then set up on stainless steel sheet. In order to eliminate rotometer flow-rate calibration as a variable, only FCCB 3 was used in these tests. A tank of stock gas containing 48 $\mathrm{ppm}_{v/v}$ of 1,1,1-trichloroethane (1,1,1-TCA) was obtained for this test. This gas was metered into each flux chamber with a mass-flow meter rated at 0 to 10 cm^3/min (at standard temperature and pressure). The mass-flow meter was controlled by an Octagon SBS2300 single board computer.

The mass-flow meter was calibrated during the flux measurements using the displacement method. The observed flow rate was calculated by dividing the volume of water displaced from a 100 mL graduated cylinder by the elapsed time. Linear regression analysis was performed with data pairs composed of the observed flow-rate and the flow-rate set point in digital to analog (D/A) units. The D/A units represent the voltage of a signal that is used by the mass flow controller to control gas flow rates.

Flux measurements were made using methods detailed in ERD SOP 1.11 (Dibley and Depue, Eds., 1997). A theoretical flux rate was calculated under each condition by multiplying the standard-gas flow rate-in m^3/min by the concentration of the standard gas in mg/m^3 and dividing by the base area of the flux chamber. The observed flux-rate was calculated using the method detailed in SOP 1.11. The percent recovery was then calculated by dividing the observed flux-rate by the theoretical flux-rate. These data are listed in Table B-3. At one point in these tests, the return-air pump was inadvertently left on during sampling. In this case, the sweep-air rate was adjusted with a time-weighted average of the initial sweep-rate and the final sweep-rate plus the sample flow-rate.

B-3.2. Field Quality Assurance/Quality Control

The VOC soil flux measurement protocol developed for the Building 854 surveys meets or exceeds all the data quality objectives recommended by the U.S. EPA (1986).

Field blank samples (chamber blanks) were collected at a frequency of one per chamber per day whenever possible to measure possible contamination from the equipment. Field blanks were not always collected for all chambers on each day of sampling due to time constraints. Field blanks were not collected from Chambers 2 and 3 on July 29, 1996 in the Building 854 area. When field blank data do not exist for a chamber on a particular sampling day, the data are qualified using the previous days' chamber blank results. Collection of field blank samples for EIFCs consisted of placing the chamber over a known clean surface and running a test using ultra-pure sweep air under routine operating conditions.

One collocated sample (field duplicate) was collected per day. The collocated samples were collected immediately after one another in two separate SUMMA™ canisters using the same flux chamber to measure analytical and sampling precision. Collocated samples were not collected on July 29, 1996 in the Building 854 area due to time constraints. The locations of duplicate samples were randomly selected in the field.

One control point location was sampled at two different times during the diurnal cycle to measure the effects of temperature variations. These times were chosen near the maximum and minimum diurnal temperatures. The control point samples were also collected from those locations where the highest VOC soil vapor flux was expected.

A SUMMA™ canister of the zero-air was collected and analyzed with the introduction of each new gas cylinder. An unused SUMMA™ canister was used as a trip blank and sent to the laboratory for analysis.

A field sample log sheet was completed for each sample. All relevant parameters were recorded on the sample log sheet: sample location and number, chamber number, sweep flow rate, ambient and chamber air temperature, and sample start and stop time. A daily field log was also completed, noting field conditions of interest, such as weather conditions. EIFC field data from sample log sheets are presented in Table B-4.

Each sample was labeled using indelible ink. Sample ID, sampler initials, and date were recorded on the sample label. Formal chain-of-custody procedures, as described in our SOPs (Dibley and Depue, Eds., 1997), were followed by all field personnel. SUMMA™ canister samples were delivered to a certified analytical laboratory within 48 hours of collection, and were analyzed for VOCs using EPA Method TO-14.

B-4. Laboratory Quality Assurance/Quality Control and Validation

The laboratory reported full QA/QC results, including results from method blanks, method spikes, and duplicate analyses with each analytical batch. The results were validated according to ERD SOP 4.6 (Dibley and Depue, Eds., 1997). The analytical laboratory and field QA/QC samples were reviewed against acceptance criteria and the sample results were flagged with data qualifier flags when necessary. Based on review of laboratory QA/QC, the data are believed valid and of a high quality with the exception of the analytes detected in the field and laboratory blanks. EIFC effluent and ambient air SUMMA™ canister analytical results were flagged with an 'F' when the VOC was detected in a chamber blank sample. When a specific VOC was detected in the laboratory method blank, the affected ambient air samples were flagged with a "B". Those analytes flagged with an "F" or "B" should not be used in risk assessment if the results are less than ten times the blank result as described above. The qualifier flags applied to the EIFC and ambient air analytical results are shown in Tables B-5 and B-6, respectively.

B-5. Analytical Results from Building 854 Operable Unit Sampling

Compounds of concern were identified based on past investigation data and historical accounts. The analytical laboratory analyzed the SUMMA™ canisters by EPA Method TO14 for the following compounds of potential concern: vinyl chloride; 1,1-dichloroethene (1,1-DCE); Freon 113; methylene chloride, cis-1,2-dichloroethene (cis-1,1-DCE); chloroform, 1,2-dichloroethane (1,2-DCA); TCE; 1, 2-dichloropropane (1,2-DCPa); 1,1,2-trichloroethane (1,1,2-TCA); PCE; and trans-1,2-dichloroethene (trans-1,2-DCE).

B-5.1. Analytical Results from the Analyses of Emission Isolation Flux Chambers Effluent Samples

The analytical results for the EIFC samples are presented in Table B-5. Almost all the EIFC samples contained methylene chloride. However, no methylene chloride was detected in the analytical laboratory method blanks analyzed with the EIFC samples, indicating that the methylene chloride contamination is not being contributed by the laboratory, even though methylene chloride is a common analytical laboratory contaminant (U.S. EPA, 1989). The methylene chloride is believed to be volatilizing from the materials used to construct the EIFC based on the chamber blank results. The methylene chloride concentrations detected in the samples and chamber blanks increase with higher ambient temperature during sampling, indicating that the summer heat drove methylene chloride out of the EIFC system. Field blank samples (chamber blanks) were collected to provide a measure of such contamination. U.S. EPA guidance (1989b) states that if blanks contain detectable levels of common contaminants (methylene chloride, acetone, 2-butanone, toluene, and phthalate esters), then the analytical results should be considered positive only if the concentrations in the sample exceed ten times the maximum concentration detected in any blank. If the concentration of a common contaminant is less than ten times the blank concentration, then it can be concluded that the chemical was not detected in the associated sample(s). This guidance prevents the inclusion of non-site-related contaminants in a risk assessment. All Building 854 EIFC samples had a methylene chloride concentration less than ten times the maximum concentration detected in the chamber blanks. As discussed above, EPA guidance recommends that these data be treated as non-detections in the calculation of cancer risk. However, we carried the methylene chloride results through the flux rate and exposure-point calculations for informational purposes.

TCE was detected in seven Building 854 OU EIFC samples and PCE was detected once. EIFC sample 3SF-B854-015 had the highest TCE concentration (7.9 $\text{ppb}_{\text{V/V}}$) in the area. This sample was collected at a potential release site. All other analytes with the exception of methylene chloride were below detection limits.

B-5.2. Analytical Results from the Analyses of Ambient Air Samples

The ambient air samples were analyzed for the same constituents as the EIFC samples using modified EPA TO-14 with Selective Ion Monitoring (SIM) to achieve lower detection limits. We selected SIM in an attempt to reduce the ambient air detection limit below the EPA Region IX

Preliminary Remediation Goals (PRGs). Unfortunately, the 8-hour integrated air sample methodology requires a continuous vacuum on the canister, requiring the analytical laboratory to dilute the sample to bring it to ambient pressure for analysis. This caused the detection limit to be above the PRG for vinyl chloride; 1,1-DCE; methylene chloride, 1,2-DCA; 1,2-DCPa; and 1,1,2-TCA. However, for the two primary analytes of concern, TCE and PCE, the PRG exceeds the detection limit. The analytical results of the ambient air samples are presented in Table B-6. The ambient air sample detection limits are compared against the EPA Region IX PRGs in Table B-7.

All the ambient air samples contained methylene chloride. The source of the methylene chloride is presumed to be the analytical laboratory since it was detected in the analytical laboratory method blanks analyzed with the ambient air samples. All ambient air samples, with the exception of one location at Building 854 (3AA-B854-005), had methylene chloride concentrations less than ten times the maximum concentration detected in the laboratory method blanks. Normally, these data would be excluded from the risk assessment based on EPA guidance. However, the methylene chloride results were compared to the PRG for informational purposes.

The ambient air analyses may have detected VOCs from sources other than the subsurface. Distinguishing between what was contributed from the subsurface or other sources is difficult using ambient air samples. Nevertheless, the ambient air sample results that are greater than the PRGs were carried through the cancer risk calculations.

Freon 113, methylene chloride (laboratory contamination), chloroform, and PCE were detected in Building 854 area outdoor air. Freon 113, methylene chloride (laboratory contamination), chloroform, TCE, and PCE were detected in Building 854F indoor air samples. Freon 113, methylene chloride (greater then 10 times the method blank concentration), and PCE were detected in Building 854A indoor air samples. The elevated concentrations of this methylene chloride may be from an as yet unidentified indoor source.

B-6. Estimating Flux Rates and Exposure-Point Concentrations

The VOC flux rates from subsurface soil were calculated and used in an air dispersion model to estimate VOC exposure-point concentrations in ambient air. The flux rates were calculated using the validated analytic results obtained from the EIFC sampling and analysis. A simple air dispersion box model was used to calculate VOC exposure-point concentrations.

The VOC soil flux rate from each sampled location was first calculated using (1) validated analytical data from the analyses of the SUMMA™ canisters which were used to collect the air flowing from the EIFC, (2) flow rate of air into the chambers, and (3) the surface area enclosed by the chamber. The VOC exposure-point concentrations were then calculated using (1) calculated VOC soil flux rate from the sampled location, (2) downwind length of the emission source, (3) average wind speed within the mixing zone, and (4) ambient air mixing zone height.

B-6.1. VOC Flux Rates

VOC soil vapor flux was calculated using the following equation:

$$E_i = Y_i Q/A \qquad \text{(B-3)}$$

where

E_i = VOC soil flux, µg/(m^2 • sec).

Y_i = VOC vapor concentration in SUMMA™ canister sample. This is the sample specific VOC SUMMA™ canister vapor concentration as measured by the analytical laboratory from Table 5, converted to units of µg/m^3.

Q = Sweep flow rate. This is the sample-specific, corrected sweep flow rate from Table 4, converted to units of m^3/sec.

A = Surface area enclosed by the chamber, equal to 0.122 m^2.

The flux rates were calculated using the maximum VOC concentration detected in the EIFC samples. When an analyte was not detected in the EIFC samples, the maximum detection limit was used to calculate the flux rate. This is indicated by a less than sign (<) before the flux rate. The only exception was for Freon 113 which had a detection limit greater than the single detection; therefore, the highest detection limit was used to determine the flux rate. The calculated VOC soil vapor flux rates for each sample location are presented in Table 8.

B-6.2. Exposure-Point Concentrations

To estimate outdoor exposure-point concentrations of VOCs in air, an exposure model was applied that utilizes the measured VOC soil flux. To estimate maximum plausible ambient outdoor air concentrations in the vicinity of the Building 854 complex, a calculated maximum VOC soil vapor flux from each sampling zone was used as model input. To be conservative, where there were no detections, the emission rate was assumed to be at the detection limit.

A simple box model was applied to estimate local exposure-point concentrations. This approach is applicable to the prediction of local short- and long-term exposure-point concentrations resulting from any area source. Because estimated exposure-point concentrations in outdoor air are intended only for receptors in the immediate vicinity of Building 854 complex, standard air dispersion modeling methods cannot be used because these methods are intended to estimate exposure concentrations at larger distances from the source.

The ASTM box model used to estimate VOC exposure-point concentrations in outdoor air was used previously by LLNL for the General Services Area Feasibility Study (Rueth and Berry, 1995) is:

$$c_{outdoor} = (E_i \cdot L)/(U_w \cdot H_m) \qquad \text{(B-4)}$$

where

$c_{outdoor}$ = VOC concentration resulting from the area vapor source (µg/m^3).

E_i = Emission rate of VOC soil flux from the area source (µg/m^2 • s).

L = Downwind length of the emission source (site specific).

U_w = Average wind speed within the mixing zone (ASTM default value).

H_m = Ambient air mixing zone height (ASTM default value).

Although the ASTM box model is simple to apply, it is also very conservative. As a result, it is used for screening purposes only. Actual air concentrations corresponding to measured VOC soil vapor flux emissions are expected to be lower than those estimated by application of this model. The maximum plausible downwind length of the vapor emission source was estimated based upon the estimated source area boundaries. The downwind length of the vapor emission sources was estimated to be 40 m for Building 854F, 25 m for Building 854E, 45 m for Building 854A, 45 m for Building 854B, and 45 m for Building 854D. To be conservative, a downwind length of 200 m was used for Building 854. In addition, the conservative ASTM default parameters for wind speed (2.25 m/sec) and mixing height (2 m) were used in the model. The annual average wind speed reported for Site 300 in the *LLNL Environmental Report for 1995,* is approximately 5.5 m/sec (Lentzner et al., 1996). This wind speed would result in even lower ambient air concentrations.

The maximum measured flux rates from Table B-8, modeled exposure-point concentrations, and the U.S. EPA Region IX PRGs are presented in Table B-9. Calculated exposure-point concentrations for vinyl chloride, 1,1-DCE, chloroform, and 1,2-DCA were just above the PRGs. The flux rate was calculated based on the detection limit. However, these analytes were not detected in the flux chamber samples or during the SVS. Only methylene chloride, TCE (3SF-854-001, 002, 004, 014, 015), and PCE (3SF-854-001) were detected in flux chamber samples. The resultant exposure-point concentrations are below the PRGs.

The VOC concentrations detected in the ambient air samples are directly measured inhalation exposure-point concentrations. Table B-10 presents the maximum outdoor ambient air sample VOC concentrations compared to the applicable PRGs. Table B-11 presents the building indoor ambient air VOCs concentrations compared to the applicable PRGs. When an analyte was not detected, the maximum detection limit was compared to the PRG.

Only methylene chloride (indoor Building 854A), TCE (indoor Building 854F) and chloroform (indoor Building 854F and outdoor) were above the PRGs. When an analyte was not detected, the maximum detection limit was compared to the PRGs. Several analytes including vinyl chloride, 1,1-DCE, chloroform (indoor 854A), 1,2-DCA, 1,2-DCPa, and 1,1,2-TCA had detection limits greater than the PRGs. The VOC inhalation risk was calculated for those analytes that had a maximum detection or detection limit greater than the PRGs.

When an exposure-point concentration in air is below the PRG, it does not represent a potential health risk. Therefore, we did not calculate the associated cancer risk. We calculated cancer risk for analytes detected at a concentration greater than the PRG or when the detection limit was greater than the PRG.

B-7. Risk to Adult Onsite Workers Attributable to the Inhalation of VOCs from Subsurface Soil

The adult onsite worker average daily intake of VOCs attributable to inhalation from the Building 854 OU subsurface soil was calculated using the equations and parameters used in the Final Site-Wide Remedial Investigation Report (SWRI) (Webster-Scholten, 1994) with the exception of the exposure duration. The SWRI (Webster-Scholten, 1994) conservatively used an exposure duration of 250 days/year for (50 weeks/year, 5 days/week). For this study, we used the more realistic exposure duration of 83.33 days/year (corresponds to 8 hours of a 24-hour day, 5 days/week for 50 weeks).

The inhalation cancer risks calculated for indoor and outdoor air where VOCs were detected or where detection limits were greater than the PRGs are shown in Table B-12. To be conservative, when there were multiple detections, the maximum concentration was used to calculate risk. The cancer risk calculation results are summarized below.

B-7.1. Building 854 Cancer Risk Based on the EIFC Sample Results

The exposure-point concentrations for vinyl chloride, 1,1-DCE, chloroform, and 1,2-DCA as determined by EIFC sampling were above the PRGs. These constituents were not detected in the EIFC effluent but cancer risks were calculated based on the detection limit. The calculated cancer risks are 1.6×10^{-7} to 2.1×10^{-6}, at or below the EPA 10^{-4} to 10^{-6} excess cancer risk range.

B-7.2. Building 854 Cancer Risk Based on the Outdoor Air Sample Results

Chloroform was detected in the Building 854 complex outdoor air, and the associated calculated cancer risk was 9.2×10^{-6}. The detection limits for vinyl chloride, 1,1-DCE, 1,2-DCA, 1,2-DCPa, and 1,1,2-TCA were greater than the PRGs. The calculated cancer risks for these constituents based on the detection limits were at or below 1×10^{-6}. The chloroform cancer risk was the highest cancer risk calculated for the exposure assessment. The source of the chloroform is unknown, but it does not appear to be volatilizing from the subsurface because it was not detected in subsurface soil, rock, or soil vapor samples from the same locations. Chloroform is widely distributed in the atmosphere and water, including municipal drinking water, primarily as a consequence of chlorination (Sittig, 1991).

B-7.3. Building 854 Cancer Risk Based on the Indoor Air Sample Results

Chloroform and TCE were detected above the PRGs inside Building 854F, and methylene chloride was detected above the PRGs inside Building 854A. The calculated cancer risks were 4.7×10^{-6}, 3.4×10^{-7}, and 1.0×10^{-6}, for chloroform, TCE, and methylene chloride, respectively. The detection limits for vinyl chloride, 1,1-DCE, chloroform (Building 854A only), 1,2-DCA, 1,2-DCPa, and 1,1,2-TCA were greater than the PRGs. The cancer risks that were calculated based on the detection limits were all at or below 1×10^{-6}.

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Table B-1. Wind speed and temperature data collected during ambient air sampling in the Building 854 OU.

Location	Date sampled	Sample time (hr)	Average wind speed[a] (m/sec)	Average ambient temperature[b] (°C)
3AA-B854-001	07/31/96	6.47	2.9	22.0
3AA-B854-001	08/01/96	6.66	4.4	25.2
3AA-B854-002	07/31/96	6.90	2.9	36.3
3AA-B854-002	08/01/96	6.65	4.4	29.5
3AA-B854-003	07/31/96	7.02	2.9	36.3
3AA-B854-003	08/01/96	6.61	4.4	29.5
3AA-B854-004	07/31/96	6.58	2.9	36.3
3AA-B854-004	08/01/96	6.64	4.4	29.5
3AA-B854-005	08/01/96	6.59	4.4	29.5
3AA-B854-006	08/01/96	6.01	4.4	29.5
3AA-B854-007	08/01/96	5.83	4.4	29.5
3AA-B854-008	08/01/96	5.72	4.4	29.5

Notes:

hr = Hour(s).

m/s = Meters per second.

[a] Wind speed data and averages are from onsite meteorological station data.

[b] Temperature data are from field data sheets where available, or from onsite meteorological station data.

Table B-2. Flux chamber control box rotometer calibration results.

Parameter	Rotometer Zero air	 Return air
Control box 1		
Constant (b)	0.5475	-1
X Coefficient (m)	0.904167	1.266667
R^2	0.787257	0.996549
N	5	5
Control box 2		
Constant (b)	-0.9	-0.3875
X Coefficient (m)	1.366667	1.0625
R^2	0.915577	0.982993
N	5	5
Control box 3		
Constant (b)	0.143529	-0.86
X Coefficient (m)	1.039216	1.233333
R^2	0.861075	0.975071
N	5	5

Notes:

R^2 = Fraction of variance.

N = Number of data pairs observed.

Attachment B

Air Sampling and Modeling Protocol and Results for the Building 854 Operable Unit

Attachment B

Air Sampling and Modeling for the Building 854 Operable Unit

Emission isolation flux chambers (EIFCs) were used in the Building 854 Operable Unit (OU) to make VOC soil vapor flux measurements during July and August of 1996 using the LLNL EIFC methodology (Dibley and Depue, Eds., 1997). The primary goal of the flux chamber sampling was to collect adequate data to determine the volatile organic compound (VOC) soil vapor flux rates for use in subsequent risk assessments for the Building 854 OU.

The source of the contamination in the Building 854 area is thought to be a result of leaks in the TCE brine distribution system, which was removed in 1989. Borehole data indicate that TCE is present in both shallow and deep soil and rock. The air sampling plan for the Building 854 area incorporated source area hot-spot sampling and diffuse source area sampling to address the potential VOC sources. In addition to the EIFC sampling, ambient air samples were also collected. The sampling approaches used at the Building 854 OU are described below.

B-1. Building 854 Area Emission Isolation Flux Chamber Sampling Activities

The minimum total number of soil vapor flux samples collected from each potential source area was determined based upon the area of the sampling zone using the following equation (U.S. EPA, 1989a):

$$\text{Number of samples} = 6 + 0.15 \bullet [\text{sampling zone area } (\text{m}^2)]^{0.5} \qquad \text{(B-1)}$$

This equation determines the number of samples necessary to provide an estimated average surface soil flux emission rate within 20% of the true mean with 95% confidence as recommended in the Air/Superfund Technical Guidance Series, Volume II (U.S. EPA, 1990).

A total of twenty-six flux chamber samples were collected in the Building 854 complex area. Figure B-1 shows the Building 854 EIFC sampling locations. Nine EIFC samples were collected to characterize emissions from suspected areas of high VOC concentration and areas surrounding Building 854F (3SF-B854-001 to 007, 011, and 012). Three of the EIFC sampling locations were collocated with PETREX survey points SVX-854-060 (3SF-B854-003), SVX-854-061 (3SF-B854-004), and SVX-854-062 (3SF-B854-005), where higher VOC concentrations were indicated. Several of these EIFC samples were collected at regular intervals along an unpaved strip surrounding a flat area (3SF-B854-001-007), and two were located within a paved area where significant cracking is observed (3SF-B854-011 and 012).

Based upon PETREX data, the hillside immediately west of the Building 854 complex may be a source of TCE soil vapor flux. The reasons for this are currently not well understood, but may be due to preferential vadose zone transport from the Building 854 area. Soil vapor flux sampling on the hillsides and berm in the vicinity of Building 854F was limited to six EIFC sampling points. One EIFC sample was collocated with PETREX survey point SVX-854-011 (3SF-B854-015), which indicated a potential high concentration. Three EIFC sampling points were located at regular intervals along the berms surrounding the flat area (3SF-B854-008-010). One sample was collected on top of the berm above the former brine system piping conduit (3SF-B854-013), and another was collected on the fire road along the hillside to the west of Building 854F (3SF-B854-014). Additional EIFC samples were collected in the vicinity of the TCE brine system valve stations, piping and storage tanks near Building 854D area (3SF-B854-017 and 018), the former Building 854G drum storage rack (3SF-B854-023 and 024), and the Building 854H drain outfall (3SF-B854-025). EIFC samples were also collected in areas of potential brine system leakage. These include samples collected near Building 854E (3SF-B854-019 and 020), Building 854C (3SF-B854-022 and 026), and behind Building 854B (3SF-B854-021). One additional sample was collected near PETREX survey point SVX-854-006, located on the fire road west of Building 854J (3SF-B854-016), because of relatively high PETREX VOC values.

B-2. Building 854 Area Ambient Air Sampling Activities

Indoor and outdoor ambient air samples were collected in the Building 854 complex concurrent with the EIFC sampling to provide additional exposure-point information. Ambient air samples were collected using SUMMA™ canisters over an approximate 8-hour time period (8-hr integrated air sample).

A temporary meteorological tower was erected during sampling activities to record temperature, wind speed and wind direction data. Site-specific meteorological data were correlated with data from the LLNL Site 300 meteorological tower to address seasonal meteorological variations and assure that final exposure-point calculations are representative of average conditions. The ambient air field data including wind speed, temperature, and sampling time are presented in Table B-1. Figures B-2 and B-3 show the wind roses for each day of sampling.

Eight integrated air samples were collected during EIFC sampling on 7/31/96 and 8/1/96 in the vicinity of Building 854F area and other potential areas of VOC contamination. Figure B-1 shows the Building 854 ambient air sampling locations. One sample was collected near the doorway to Building 854F to represent the most likely outdoor exposure point (3AA-B854-003). Another sample was collected at the base of the berm directly north of Building 854F (3AA-B854-002). A third sample was taken on top of the berm directly northwest of Building 854F (3AA-B854-004) to a measure background concentrations in the vicinity of Building 854F. A fourth sample was collected at breathing height (about 5 ft) at the fence north of the Building 854 complex (3AA-B854-008) to provide a background sample up-wind of the B854 area. A fifth sample was taken in front of Building 854A on a ladder by the dock (3AA-B854-006) representing a common outdoor exposure location. The sixth sample was taken near the phone located outside Building 854B (3AA-B854-007), which is used frequently by field personnel. The remaining two integrated indoor air samples were collected within Building 854F and Building 854B (3AA-B854-001 and 3AA-B854-005, respectively).

B-3. Emission Isolation Flux Chamber Sampling Methodology

The EIFC LLNL methodology used by LLNL is based on U.S. EPA guidance (U.S. EPA, 1986) and follows the Environmental Restoration Division (ERD) Standard Operating Procedure, SOP 1.11, "Soil Surface Flux Monitoring of Gaseous Emissions" (Dibley and Depue, Eds., 1997). The EIFC system is composed of three parts: the chamber, the sweep air controller and data logger, and the sampling system. The flux chamber contains a fan to circulate air and a thermistor to measure the chamber temperature. Three EIFCs have been constructed by LLNL (Martins, 1993). Each chamber encloses a surface area of approximately 0.122 m^2 and a total volume of about 27 L (0.027 m^3).

The sweep air controller and data logger contains a metering pump, two rotometers used to measure air flow in and out of the chamber, a battery, and the associated electronics required for chamber control and data acquisition. The metering pump and two rotometers are used to control air flow in and out of the chamber to maintain a negligible pressure differential across the chamber. The chamber controller is connected to an external data logger that acquires temperature and pressure data.

When the flux chamber operates, ultra-pure "zero-air" is metered into the chamber using a pressure regulator and the first rotometer. At approximately the same rate, air is pulled from the chamber through the second rotometer using the pump in the chamber controller. Both rotometers are adjusted to achieve a net pressure drop of zero (±0.1 in. H_2O) between the inside and the outside of the chamber. An air flow rate of about 3 L/min is used to achieve a chamber air residence time of approximately 10 min. A minimum of 30 min is required for the sweep air to reach a steady-state concentration with the VOC soil flux emissions. At that time, the effluent sweep air pump is turned off and an evacuated SUMMA™ canister is used to withdraw a vapor sample at approximately the same air flow rate (3 L/min).

To collect a sample, the EIFC is placed on the ground surface, and VOC soil flux emissions enter the open bottom of the chamber. Clean, dry sweep air is added into the chamber at a metered rate. Within the chamber a fan mixes the sweep air with emitted VOC vapors. When the concentration of the VOC soil flux emissions and the sweep air reaches equilibrium, a sample is collected in a SUMMA™ canister for analysis. VOC flux (emission/area-time) from the soil surface is then calculated from the VOC vapor concentration.

B-3.1. Equipment Calibration

All flux chambers and associated equipment were calibrated between November 19 and December 9, 1996. These calibrations include all Dwyer rotometers on each flux-chamber control-box (FCCB) as well as the measurement of flux chamber recovery rates.

All rotometers were calibrated under field conditions. Zero-air was used to calibrate units that control zero-air flow. Units used to control return-air flow were calibrated with air from the FCCB's internal air pump.

The displacement method was used for these calibrations. A 1-liter graduated cylinder was filled with water, covered and inverted in a water bath. Once under water, the cover was removed from the cylinder. The desired air flow rate for the test was set on the rotometer undergoing the test and flow was started. A 1/4-in. plastic tube connected to the rotometer was placed in the cylinder at the same time a timer was started. After about 15 to 20 seconds, the tube was removed from the cylinder and the elapsed time was noted. The volume of displaced water was then recorded and the observed flow rate was calculated by dividing this volume by the elapsed time. At least five observations were made for each rotometer. When all data were collected, linear regression analysis was performed with data pairs composed of the observed flow rate and the flow-rate set point. These results are shown in Table B-2. The constant (b) and the X coefficient (m) listed in Table B-2 were used to correct flow rates listed on the field log sheets using the formula:

$$y = mx + b \tag{B-2}$$

where

x = recorded flow rate.

m = X coefficient.

b = Constant.

y = Corrected flow rate.

Each flux chamber was then set up on stainless steel sheet. In order to eliminate rotometer flow-rate calibration as a variable, only FCCB 3 was used in these tests. A tank of stock gas containing 48 $\mathrm{ppm}_{v/v}$ of 1,1,1-trichloroethane (1,1,1-TCA) was obtained for this test. This gas was metered into each flux chamber with a mass-flow meter rated at 0 to 10 cm^3/min (at standard temperature and pressure). The mass-flow meter was controlled by an Octagon SBS2300 single board computer.

The mass-flow meter was calibrated during the flux measurements using the displacement method. The observed flow rate was calculated by dividing the volume of water displaced from a 100 mL graduated cylinder by the elapsed time. Linear regression analysis was performed with data pairs composed of the observed flow-rate and the flow-rate set point in digital to analog (D/A) units. The D/A units represent the voltage of a signal that is used by the mass flow controller to control gas flow rates.

Flux measurements were made using methods detailed in ERD SOP 1.11 (Dibley and Depue, Eds., 1997). A theoretical flux rate was calculated under each condition by multiplying the standard-gas flow rate-in m^3/min by the concentration of the standard gas in $\mathrm{mg/m}^3$ and dividing by the base area of the flux chamber. The observed flux-rate was calculated using the method detailed in SOP 1.11. The percent recovery was then calculated by dividing the observed flux-rate by the theoretical flux-rate. These data are listed in Table B-3. At one point in these tests, the return-air pump was inadvertently left on during sampling. In this case, the sweep-air rate was adjusted with a time-weighted average of the initial sweep-rate and the final sweep-rate plus the sample flow-rate.

B-3.2. Field Quality Assurance/Quality Control

The VOC soil flux measurement protocol developed for the Building 854 surveys meets or exceeds all the data quality objectives recommended by the U.S. EPA (1986).

Field blank samples (chamber blanks) were collected at a frequency of one per chamber per day whenever possible to measure possible contamination from the equipment. Field blanks were not always collected for all chambers on each day of sampling due to time constraints. Field blanks were not collected from Chambers 2 and 3 on July 29, 1996 in the Building 854 area. When field blank data do not exist for a chamber on a particular sampling day, the data are qualified using the previous days' chamber blank results. Collection of field blank samples for EIFCs consisted of placing the chamber over a known clean surface and running a test using ultra-pure sweep air under routine operating conditions.

One collocated sample (field duplicate) was collected per day. The collocated samples were collected immediately after one another in two separate SUMMA™ canisters using the same flux chamber to measure analytical and sampling precision. Collocated samples were not collected on July 29, 1996 in the Building 854 area due to time constraints. The locations of duplicate samples were randomly selected in the field.

One control point location was sampled at two different times during the diurnal cycle to measure the effects of temperature variations. These times were chosen near the maximum and minimum diurnal temperatures. The control point samples were also collected from those locations where the highest VOC soil vapor flux was expected.

A SUMMA™ canister of the zero-air was collected and analyzed with the introduction of each new gas cylinder. An unused SUMMA™ canister was used as a trip blank and sent to the laboratory for analysis.

A field sample log sheet was completed for each sample. All relevant parameters were recorded on the sample log sheet: sample location and number, chamber number, sweep flow rate, ambient and chamber air temperature, and sample start and stop time. A daily field log was also completed, noting field conditions of interest, such as weather conditions. EIFC field data from sample log sheets are presented in Table B-4.

Each sample was labeled using indelible ink. Sample ID, sampler initials, and date were recorded on the sample label. Formal chain-of-custody procedures, as described in our SOPs (Dibley and Depue, Eds., 1997), were followed by all field personnel. SUMMA™ canister samples were delivered to a certified analytical laboratory within 48 hours of collection, and were analyzed for VOCs using EPA Method TO-14.

B-4. Laboratory Quality Assurance/Quality Control and Validation

The laboratory reported full QA/QC results, including results from method blanks, method spikes, and duplicate analyses with each analytical batch. The results were validated according to ERD SOP 4.6 (Dibley and Depue, Eds., 1997). The analytical laboratory and field QA/QC samples were reviewed against acceptance criteria and the sample results were flagged with data qualifier flags when necessary. Based on review of laboratory QA/QC, the data are believed valid and of a high quality with the exception of the analytes detected in the field and laboratory blanks. EIFC effluent and ambient air SUMMA™ canister analytical results were flagged with an 'F' when the VOC was detected in a chamber blank sample. When a specific VOC was detected in the laboratory method blank, the affected ambient air samples were flagged with a "B". Those analytes flagged with an "F" or "B" should not be used in risk assessment if the results are less than ten times the blank result as described above. The qualifier flags applied to the EIFC and ambient air analytical results are shown in Tables B-5 and B-6, respectively.

B-5. Analytical Results from Building 854 Operable Unit Sampling

Compounds of concern were identified based on past investigation data and historical accounts. The analytical laboratory analyzed the SUMMA™ canisters by EPA Method TO14 for the following compounds of potential concern: vinyl chloride; 1,1-dichloroethene (1,1-DCE); Freon 113; methylene chloride, cis-1,2-dichloroethene (cis-1,1-DCE); chloroform, 1,2-dichloroethane (1,2-DCA); TCE; 1, 2-dichloropropane (1,2-DCPa); 1,1,2-trichloroethane (1,1,2-TCA); PCE; and trans-1,2-dichloroethene (trans-1,2-DCE).

B-5.1. Analytical Results from the Analyses of Emission Isolation Flux Chambers Effluent Samples

The analytical results for the EIFC samples are presented in Table B-5. Almost all the EIFC samples contained methylene chloride. However, no methylene chloride was detected in the analytical laboratory method blanks analyzed with the EIFC samples, indicating that the methylene chloride contamination is not being contributed by the laboratory, even though methylene chloride is a common analytical laboratory contaminant (U.S. EPA, 1989). The methylene chloride is believed to be volatilizing from the materials used to construct the EIFC based on the chamber blank results. The methylene chloride concentrations detected in the samples and chamber blanks increase with higher ambient temperature during sampling, indicating that the summer heat drove methylene chloride out of the EIFC system. Field blank samples (chamber blanks) were collected to provide a measure of such contamination. U.S. EPA guidance (1989b) states that if blanks contain detectable levels of common contaminants (methylene chloride, acetone, 2-butanone, toluene, and phthalate esters), then the analytical results should be considered positive only if the concentrations in the sample exceed ten times the maximum concentration detected in any blank. If the concentration of a common contaminant is less than ten times the blank concentration, then it can be concluded that the chemical was not detected in the associated sample(s). This guidance prevents the inclusion of non-site-related contaminants in a risk assessment. All Building 854 EIFC samples had a methylene chloride concentration less than ten times the maximum concentration detected in the chamber blanks. As discussed above, EPA guidance recommends that these data be treated as non-detections in the calculation of cancer risk. However, we carried the methylene chloride results through the flux rate and exposure-point calculations for informational purposes.

TCE was detected in seven Building 854 OU EIFC samples and PCE was detected once. EIFC sample 3SF-B854-015 had the highest TCE concentration (7.9 $ppb_{V/V}$) in the area. This sample was collected at a potential release site. All other analytes with the exception of methylene chloride were below detection limits.

B-5.2. Analytical Results from the Analyses of Ambient Air Samples

The ambient air samples were analyzed for the same constituents as the EIFC samples using modified EPA TO-14 with Selective Ion Monitoring (SIM) to achieve lower detection limits. We selected SIM in an attempt to reduce the ambient air detection limit below the EPA Region IX

Preliminary Remediation Goals (PRGs). Unfortunately, the 8-hour integrated air sample methodology requires a continuous vacuum on the canister, requiring the analytical laboratory to dilute the sample to bring it to ambient pressure for analysis. This caused the detection limit to be above the PRG for vinyl chloride; 1,1-DCE; methylene chloride, 1,2-DCA; 1,2-DCPa; and 1,1,2-TCA. However, for the two primary analytes of concern, TCE and PCE, the PRG exceeds the detection limit. The analytical results of the ambient air samples are presented in Table B-6. The ambient air sample detection limits are compared against the EPA Region IX PRGs in Table B-7.

All the ambient air samples contained methylene chloride. The source of the methylene chloride is presumed to be the analytical laboratory since it was detected in the analytical laboratory method blanks analyzed with the ambient air samples. All ambient air samples, with the exception of one location at Building 854 (3AA-B854-005), had methylene chloride concentrations less than ten times the maximum concentration detected in the laboratory method blanks. Normally, these data would be excluded from the risk assessment based on EPA guidance. However, the methylene chloride results were compared to the PRG for informational purposes.

The ambient air analyses may have detected VOCs from sources other than the subsurface. Distinguishing between what was contributed from the subsurface or other sources is difficult using ambient air samples. Nevertheless, the ambient air sample results that are greater than the PRGs were carried through the cancer risk calculations.

Freon 113, methylene chloride (laboratory contamination), chloroform, and PCE were detected in Building 854 area outdoor air. Freon 113, methylene chloride (laboratory contamination), chloroform, TCE, and PCE were detected in Building 854F indoor air samples. Freon 113, methylene chloride (greater then 10 times the method blank concentration), and PCE were detected in Building 854A indoor air samples. The elevated concentrations of this methylene chloride may be from an as yet unidentified indoor source.

B-6. Estimating Flux Rates and Exposure-Point Concentrations

The VOC flux rates from subsurface soil were calculated and used in an air dispersion model to estimate VOC exposure-point concentrations in ambient air. The flux rates were calculated using the validated analytic results obtained from the EIFC sampling and analysis. A simple air dispersion box model was used to calculate VOC exposure-point concentrations.

The VOC soil flux rate from each sampled location was first calculated using (1) validated analytical data from the analyses of the SUMMA™ canisters which were used to collect the air flowing from the EIFC, (2) flow rate of air into the chambers, and (3) the surface area enclosed by the chamber. The VOC exposure-point concentrations were then calculated using (1) calculated VOC soil flux rate from the sampled location, (2) downwind length of the emission source, (3) average wind speed within the mixing zone, and (4) ambient air mixing zone height.

B-6.1. VOC Flux Rates

VOC soil vapor flux was calculated using the following equation:

$$E_i = Y_i Q/A \qquad \text{(B-3)}$$

where

E_i = VOC soil flux, $\mu g/(m^2 \bullet sec)$.

Y_i = VOC vapor concentration in SUMMA™ canister sample. This is the sample specific VOC SUMMA™ canister vapor concentration as measured by the analytical laboratory from Table 5, converted to units of $\mu g/m^3$.

Q = Sweep flow rate. This is the sample-specific, corrected sweep flow rate from Table 4, converted to units of m^3/sec.

A = Surface area enclosed by the chamber, equal to 0.122 m^2.

The flux rates were calculated using the maximum VOC concentration detected in the EIFC samples. When an analyte was not detected in the EIFC samples, the maximum detection limit was used to calculate the flux rate. This is indicated by a less than sign (<) before the flux rate. The only exception was for Freon 113 which had a detection limit greater than the single detection; therefore, the highest detection limit was used to determine the flux rate. The calculated VOC soil vapor flux rates for each sample location are presented in Table 8.

B-6.2. Exposure-Point Concentrations

To estimate outdoor exposure-point concentrations of VOCs in air, an exposure model was applied that utilizes the measured VOC soil flux. To estimate maximum plausible ambient outdoor air concentrations in the vicinity of the Building 854 complex, a calculated maximum VOC soil vapor flux from each sampling zone was used as model input. To be conservative, where there were no detections, the emission rate was assumed to be at the detection limit.

A simple box model was applied to estimate local exposure-point concentrations. This approach is applicable to the prediction of local short- and long-term exposure-point concentrations resulting from any area source. Because estimated exposure-point concentrations in outdoor air are intended only for receptors in the immediate vicinity of Building 854 complex, standard air dispersion modeling methods cannot be used because these methods are intended to estimate exposure concentrations at larger distances from the source.

The ASTM box model used to estimate VOC exposure-point concentrations in outdoor air was used previously by LLNL for the General Services Area Feasibility Study (Rueth and Berry, 1995) is:

$$c_{outdoor} = (E_i \bullet L)/(U_w \bullet H_m) \tag{B-4}$$

where

$c_{outdoor}$ = VOC concentration resulting from the area vapor source ($\mu g/m^3$).

E_i = Emission rate of VOC soil flux from the area source ($\mu g/m^2 \bullet s$).

L = Downwind length of the emission source (site specific).

U_w = Average wind speed within the mixing zone (ASTM default value).

H_m = Ambient air mixing zone height (ASTM default value).

Although the ASTM box model is simple to apply, it is also very conservative. As a result, it is used for screening purposes only. Actual air concentrations corresponding to measured VOC soil vapor flux emissions are expected to be lower than those estimated by application of this model. The maximum plausible downwind length of the vapor emission source was estimated based upon the estimated source area boundaries. The downwind length of the vapor emission sources was estimated to be 40 m for Building 854F, 25 m for Building 854E, 45 m for Building 854A, 45 m for Building 854B, and 45 m for Building 854D. To be conservative, a downwind length of 200 m was used for Building 854. In addition, the conservative ASTM default parameters for wind speed (2.25 m/sec) and mixing height (2 m) were used in the model. The annual average wind speed reported for Site 300 in the *LLNL Environmental Report for 1995,* is approximately 5.5 m/sec (Lentzner et al., 1996). This wind speed would result in even lower ambient air concentrations.

The maximum measured flux rates from Table B-8, modeled exposure-point concentrations, and the U.S. EPA Region IX PRGs are presented in Table B-9. Calculated exposure-point concentrations for vinyl chloride, 1,1-DCE, chloroform, and 1,2-DCA were just above the PRGs. The flux rate was calculated based on the detection limit. However, these analytes were not detected in the flux chamber samples or during the SVS. Only methylene chloride, TCE (3SF-854-001, 002, 004, 014, 015), and PCE (3SF-854-001) were detected in flux chamber samples. The resultant exposure-point concentrations are below the PRGs.

The VOC concentrations detected in the ambient air samples are directly measured inhalation exposure-point concentrations. Table B-10 presents the maximum outdoor ambient air sample VOC concentrations compared to the applicable PRGs. Table B-11 presents the building indoor ambient air VOCs concentrations compared to the applicable PRGs. When an analyte was not detected, the maximum detection limit was compared to the PRG.

Only methylene chloride (indoor Building 854A), TCE (indoor Building 854F) and chloroform (indoor Building 854F and outdoor) were above the PRGs. When an analyte was not detected, the maximum detection limit was compared to the PRGs. Several analytes including vinyl chloride, 1,1-DCE, chloroform (indoor 854A), 1,2-DCA, 1,2-DCPa, and 1,1,2-TCA had detection limits greater than the PRGs. The VOC inhalation risk was calculated for those analytes that had a maximum detection or detection limit greater than the PRGs.

When an exposure-point concentration in air is below the PRG, it does not represent a potential health risk. Therefore, we did not calculate the associated cancer risk. We calculated cancer risk for analytes detected at a concentration greater than the PRG or when the detection limit was greater than the PRG.

B-7. Risk to Adult Onsite Workers Attributable to the Inhalation of VOCs from Subsurface Soil

The adult onsite worker average daily intake of VOCs attributable to inhalation from the Building 854 OU subsurface soil was calculated using the equations and parameters used in the Final Site-Wide Remedial Investigation Report (SWRI) (Webster-Scholten, 1994) with the exception of the exposure duration. The SWRI (Webster-Scholten, 1994) conservatively used an exposure duration of 250 days/year for (50 weeks/year, 5 days/week). For this study, we used the more realistic exposure duration of 83.33 days/year (corresponds to 8 hours of a 24-hour day, 5 days/week for 50 weeks).

The inhalation cancer risks calculated for indoor and outdoor air where VOCs were detected or where detection limits were greater than the PRGs are shown in Table B-12. To be conservative, when there were multiple detections, the maximum concentration was used to calculate risk. The cancer risk calculation results are summarized below.

B-7.1. Building 854 Cancer Risk Based on the EIFC Sample Results

The exposure-point concentrations for vinyl chloride, 1,1-DCE, chloroform, and 1,2-DCA as determined by EIFC sampling were above the PRGs. These constituents were not detected in the EIFC effluent but cancer risks were calculated based on the detection limit. The calculated cancer risks are 1.6×10^{-7} to 2.1×10^{-6}, at or below the EPA 10^{-4} to 10^{-6} excess cancer risk range.

B-7.2. Building 854 Cancer Risk Based on the Outdoor Air Sample Results

Chloroform was detected in the Building 854 complex outdoor air, and the associated calculated cancer risk was 9.2×10^{-6}. The detection limits for vinyl chloride, 1,1-DCE, 1,2-DCA, 1,2-DCPa, and 1,1,2-TCA were greater than the PRGs. The calculated cancer risks for these constituents based on the detection limits were at or below 1×10^{-6}. The chloroform cancer risk was the highest cancer risk calculated for the exposure assessment. The source of the chloroform is unknown, but it does not appear to be volatilizing from the subsurface because it was not detected in subsurface soil, rock, or soil vapor samples from the same locations. Chloroform is widely distributed in the atmosphere and water, including municipal drinking water, primarily as a consequence of chlorination (Sittig, 1991).

B-7.3. Building 854 Cancer Risk Based on the Indoor Air Sample Results

Chloroform and TCE were detected above the PRGs inside Building 854F, and methylene chloride was detected above the PRGs inside Building 854A. The calculated cancer risks were 4.7×10^{-6}, 3.4×10^{-7}, and 1.0×10^{-6}, for chloroform, TCE, and methylene chloride, respectively. The detection limits for vinyl chloride, 1,1-DCE, chloroform (Building 854A only), 1,2-DCA, 1,2-DCPa, and 1,1,2-TCA were greater than the PRGs. The cancer risks that were calculated based on the detection limits were all at or below 1×10^{-6}.

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Table B-1. Wind speed and temperature data collected during ambient air sampling in the Building 854 OU.

Location	Date sampled	Sample time (hr)	Average wind speed[a] (m/sec)	Average ambient temperature[b] (°C)
3AA-B854-001	07/31/96	6.47	2.9	22.0
3AA-B854-001	08/01/96	6.66	4.4	25.2
3AA-B854-002	07/31/96	6.90	2.9	36.3
3AA-B854-002	08/01/96	6.65	4.4	29.5
3AA-B854-003	07/31/96	7.02	2.9	36.3
3AA-B854-003	08/01/96	6.61	4.4	29.5
3AA-B854-004	07/31/96	6.58	2.9	36.3
3AA-B854-004	08/01/96	6.64	4.4	29.5
3AA-B854-005	08/01/96	6.59	4.4	29.5
3AA-B854-006	08/01/96	6.01	4.4	29.5
3AA-B854-007	08/01/96	5.83	4.4	29.5
3AA-B854-008	08/01/96	5.72	4.4	29.5

Notes:

hr = Hour(s).

m/s = Meters per second.

[a] Wind speed data and averages are from onsite meteorological station data.

[b] Temperature data are from field data sheets where available, or from onsite meteorological station data.

Table B-2. Flux chamber control box rotometer calibration results.

Parameter	Rotometer	
	Zero air	Return air
Control box 1		
Constant (b)	0.5475	-1
X Coefficient (m)	0.904167	1.266667
R^2	0.787257	0.996549
N	5	5
Control box 2		
Constant (b)	-0.9	-0.3875
X Coefficient (m)	1.366667	1.0625
R^2	0.915577	0.982993
N	5	5
Control box 3		
Constant (b)	0.143529	-0.86
X Coefficient (m)	1.039216	1.233333
R^2	0.861075	0.975071
N	5	5

Notes:

R^2 = Fraction of variance.

N = Number of data pairs observed.

Table B-3. Flux chamber calibration recovery rates.

Chamber	Date	Requested analysis	Observed flux ($\mu g/m^2/min$)	Theoretical flux ($\mu g/m^2/min$)	Percent (%) recovery
1	12/09/96	TO-14	13.72	13.66	100
	12/09/96	TO-14	5.58	6.49	86
				Average	93
2	12/09/96[a]	TO-14	13.70	13.66	100
	12/09/96[b]	TO-14	5.61	6.49	86
				Average	93
3	12/09/96	TO-14	13.09	13.66	96
	11/19/96	TO-14	6.85	6.50	105
				Average	101

Notes:

$\mu g/m^2$ = Micrograms per cubic meter.

min = Minute(s).

TO-14 = EPA air method.

[a] Thirty minutes of purge time instead of the forty minutes called for in SOP 1.11.

[b] Return pump left on, flow rate adjusted.

Table B-4. Sampling intervals, temperature, and flow rates during emission isolation flux chamber measurements at the Building 854 OU.

							Temperature (°C)				Rotometer setting		Corrected flow rates	
Location	Chamber number[a]	Sample date	Purge time (min)	Sample start time	Sample stop time	Sample time (min)	Ambient	Start chamber	End chamber	Rotometer number	Sweep in (L/min)	Sweep out (L/min)	Sweep in (L/min)	Sweep out (L/min)
3SF-B854-001	2	7/29/96	43.25	11:57:15	12:00:15	3.00	50	51	45	1	3.00	2.90	3.26	2.67
3SF-B854-002	2	7/29/96	33.48	13:41:29	13:43:00	1.52	36	40	39	1	3.00	2.40	3.26	2.04
3SF-B854-002[b]	2	7/29/96	33.48	13:41:29	13:43:00	1.52	36	40	39	2	3.00	2.40	3.20	2.16
3SF-B854-003	3	7/29/96	30.00	13:36:00	13:38:00	2.00	38	40	40	3	3.00	2.40	3.26	2.10
3SF-B854-003[c]	3	7/29/96	43.10	13:49:06	13:52:40	3.57	38	40	40	3	3.00	2.40	3.26	2.10
3SF-B854-003[d]	3	7/30/96	48.00	10:12:00	10:15:30	3.50	35	32	31.8	3	3.00	2.40	3.26	2.10
3SF-B854-003[d]	3	7/31/96	44.67	9:19:40	9:23:00	3.33	35.6	35	35	3	3.00	2.40	3.26	2.10
3SF-B854-004	3	7/30/96	54.25	11:58:15	12:01:05	2.83	36.9	43	36	3	2.90	2.30	3.16	1.98
3SF-B854-004[c]	3	7/30/96	59.00	12:03:00	12:06:40	3.67	36.9	43	36	3	2.90	2.30	3.16	1.98
3SF-B854-005	3	7/30/96	41.75	13:02:45	13:05:45	3.00	34	40	35	3	3.00	2.20	3.26	1.85
3SF-B854-006	2	7/30/96	47.33	13:22:20	13:25:15	2.92	37	42	40	1	3.00	2.40	3.26	2.04
3SF-B854-006[b]	2	7/30/96	47.33	13:22:20	13:25:15	2.92	34	42	40	2	3.00	2.40	3.20	2.16
3SF-B854-007	3	7/30/96	40.00	14:00:00	14:02:45	2.75	33	37	40	3	3.00	2.40	3.26	2.10
3SF-B854-008	2	7/30/96	54.00	10:37:00	10:39:40	2.67	38	34	29.3	2	3.10	2.40	3.34	2.16
3SF-B854-009	3	7/30/96	41.00	11:00:00	11:02:25	2.42	40	41	40	1	3.06	2.60	3.31	2.29
3SF-B854-009[b]	3	7/30/96	41.00	11:00:00	11:02:25	2.42	41	41	40	3	3.00	2.40	3.26	2.10
3SF-B854-010	2	7/30/96	44.00	12:30:00	12:33:00	3.00	37	44.7	34	1	3.00	2.40	3.26	2.04
3SF-B854-011	2	7/30/96	53.50	11:36:30	11:40:30	4.00	35.1	37	36	1	3.00	2.40	3.26	2.04
3SF-B854-012	2	7/30/96	44.50	14:14:30	14:17:30	3.00	34	41	38	1	3.00	2.40	3.26	2.04
3SF-B854-013	2	7/31/96	46.00	10:00:00	10:03:00	3.00	e	39.5	38	1	3.00	2.40	3.26	2.04
3SF-B854-014	1	7/31/96	42.00	11:19:00	11:22:00	3.00	e	e	e	2	2.70	2.40	2.79	2.16
3SF-B854-015	1	7/31/96	114.00	13:43:00	13:46:00	3.00	41	e	e	2	2.60	2.40	2.65	2.16
3SF-B854-016	3	7/31/96	62.00	15:27:00	15:30:00	3.00	38	e	e	3	2.60	2.40	2.85	2.10
3SF-B854-017	3	7/31/96	42.00	11:45:00	11:48:20	3.33	39.8	43	42	3	3.00	2.40	3.26	2.10
3SF-B854-017[c]	3	7/31/96	48.00	11:51:00	11:54:35	3.58	39.8	43	42	3	3.00	2.40	3.26	2.10
3SF-B854-018	2	7/31/96	51.00	12:02:00	12:05:00	3.00	41	39	51	1	3.00	2.40	3.26	2.04
3SF-B854-019	3	7/31/96	47.17	13:17:10	13:19:30	2.33	40.7	49	e	3	3.00	2.40	3.26	2.10
3SF-B854-019[b]	3	7/31/96	47.17	13:17:10	13:19:30	2.33	40.7	49	e	3	3.00	2.40	3.26	2.10
3SF-B854-020	2	7/31/96	45.00	13:55:00	13:57:15	2.25	45.7	45	45	1	3.00	2.40	3.26	2.04
3SF-B854-021	3	8/1/96	43.08	9:28:05	9:30:55	2.83	40.7	32	37	3	3.00	2.40	3.26	2.10
3SF-B854-021[c]	3	8/1/96	48.50	9:33:30	9:36:00	2.50	40.7	32	37	3	3.00	2.40	3.26	2.10
3SF-B854-021[d]	1	8/1/96	50.50	13:15:30	13:18:15	2.75	33	37	33	1	3.00	2.40	3.26	2.04
3SF-B854-022	2	8/1/96	45.17	9:47:10	9:51:40	4.50	27	25	32	2	3.40	2.40	3.75	2.16

Table B-4. (Continued)

							Temperature (°C)				Rotometer setting		Corrected flow rates	
Location	Chamber number[a]	Sample date	Purge time (min)	Sample start time	Sample stop time	Sample time (min)	Ambient	Start chamber	End chamber	Rotometer number	Sweep in (L/min)	Sweep out (L/min)	Sweep in (L/min)	Sweep out (L/min)
3SF-B854-023	2	8/1/96	51.50	11:07:30	11:10:25	2.92	30.7	35	35	2	3.10	2.20	3.34	1.95
3SF-B854-024	3	8/1/96	58.00	11:22:00	11:25:20	3.33	32.5	37	37	3	3.00	2.40	3.26	2.10
3SF-B854-025	1	8/1/96	61.00	12:07:00	12:10:00	3.00	31.3	e	39	1	3.00	2.40	3.26	2.04
3SF-B854-026	1	8/1/96	41.50	10:36:30	10:39:20	2.83	27	26	36.5	1	2.90	2.40	3.17	2.04
3SF-B854-CB-01[f]	2	7/30/96	40.00	9:36:00	9:39:20	3.33	32	37	34	1	3.00	2.40	3.26	2.04
3SF-B854-CB-02[f]	3	7/30/96	40.83	14:45:50	14:48:29	2.65	34	40	40	3	3.00	2.40	3.26	2.10
3SF-B854-CB-03[f]	3	7/31/96	42.00	10:32:00	10:35:00	3.00	36.3	37	37	3	3.00	2.40	3.26	2.10
3SF-B854-CB-04[f]	2	7/30/96	96.50	12:51:30	12:54:17	2.78	37.8	42	42	1	3.00	2.40	3.26	2.04
3SF-B854-CB-05[f]	1	7/31/96	46.00	14:38:00	14:40:30	2.50	39.9	42	40	2	3.00	2.20	3.20	1.95
3SF-B854-CB-06[f]	3	8/1/96	54.25	12:34:15	12:37:15	3.00	28.7	29	25	3	3.00	2.40	3.26	2.10
3SF-B854-CB-07[f]	2	8/1/96	44.75	13:24:45	13:27:50	3.08	320.2	25	25	2	3.00	2.40	3.20	2.16
3SF-B854-CB-07[b,f]	2	8/1/96	44.75	13:24:45	13:27:50	3.08	320.2	25	25	2	3.00	2.40	3.20	2.16
3SF-B854-CB-08[f]	1	8/1/96	48.25	14:17:15	14:20:00	2.75	31.9	26	28	1	3.00	2.40	3.26	2.04

[a] Chamber number (one through three) signifies the chamber from which the sample was collected.

[b] Laboratory duplicate.

[c] Collocated sample.

[d] Control point sample.

[e] Measurement not recorded.

[f] Chamber blank.

Table B-5. Emission isolation flux chamber effluent VOC concentrations measured in the Building 854 OU.

			Analyte concentration detected in the SUMMA™ canister (ppb$_{v/v}$)											
Location	Chamber number[a]	Sample date	Vinyl chloride	1,1-DCE	Freon 113	Methylene Chloride	cis-1,2-DCE	Chloroform	1,2-DCA	TCE	1,2-DCPa	1,1,2-TCA	PCE	trans-1,2-DCE
3SF-B854-001	2	7/29/96	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	16^{F}	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	3.6	$<0.73^{U}$	$<0.73^{U}$	1.1	$<2.9^{U}$
3SF-B854-002	2	7/29/96	$<0.72^{U}$	$<0.72^{U}$	$<0.7^{U}$	6.7^{F}	$<0.72^{U}$	$<0.72^{U}$	$<0.72^{U}$	1.3	$<0.72^{U}$	$<0.72^{U}$	$<0.72^{U}$	$<2.9^{U}$
3SF-B854-002[b]	2	7/29/96	$<0.85^{U}$	$<0.85^{U}$	$<0.85^{U}$	7.4^{F}	$<0.85^{U}$	$<0.85^{U}$	$<0.85^{U}$	0.73^{J}	$<0.85^{U}$	$<0.85^{U}$	$<0.85^{U}$	$<3.4^{U}$
3SF-B854-003	3	7/29/96	$<0.76^{U}$	$<0.76^{U}$	$<0.76^{U}$	5.3^{F}	$<0.76^{U}$	$<0.76^{U}$	$<0.76^{U}$	$<0.76^{U}$	$<0.76^{U}$	$<0.76^{U}$	$<0.76^{U}$	$<3.0^{U}$
3SF-B854-003[c]	3	7/29/96	$<0.72^{U}$	$<0.72^{U}$	$<0.72^{U}$	5.2^{F}	$<0.72^{U}$	$<0.72^{U}$	$<0.72^{U}$	$<0.72^{U}$	$<0.72^{U}$	$<0.72^{U}$	$<0.72^{U}$	$<2.9^{U}$
3SF-B854-003[d]	3	7/30/96	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	4.3^{F}	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<3.0^{U}$
3SF-B854-003[d]	3	7/31/96	$<0.72^{U}$	$<0.72^{U}$	$<0.72^{U}$	1.9^{F}	$<0.72^{U}$	$<0.72^{U}$	$<0.72^{U}$	$<0.72^{U}$	$<0.72^{U}$	$<0.72^{U}$	$<0.72^{U}$	$<2.9^{U}$
3SF-B854-004	3	7/30/96	$<0.78^{U}$	$<0.78^{U}$	$<0.78^{U}$	0.84^{F}	$<0.78^{U}$	$<0.78^{U}$	$<0.78^{U}$	1.1	$<0.78^{U}$	$<0.78^{U}$	$<0.78^{U}$	$<3.1^{U}$
3SF-B854-004[c]	3	7/30/96	$<0.79^{U}$	$<0.79^{U}$	$<0.79^{U}$	$<0.7^{U}$	$<0.79^{U}$	$<0.79^{U}$	$<0.79^{U}$	1.7	$<0.79^{U}$	$<0.79^{U}$	$<0.79^{U}$	$<3.2^{U}$
3SF-B854-005	3	7/30/96	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	0.9^{F}	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<3.0^{U}$
3SF-B854-006	2	7/30/96	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	1.2^{F}	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	$<2.9^{U}$
3SF-B854-006[b]	2	7/30/96	$<0.91^{U}$	$<0.91^{U}$	$<0.91^{U}$	1.2^{F}	$<0.91^{U}$	$<0.91^{U}$	$<0.91^{U}$	$<0.91^{U}$	$<0.91^{U}$	$<0.91^{U}$	$<0.91^{U}$	$<3.6^{U}$
3SF-B854-007	3	7/30/96	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	1^{F}	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	$<2.9^{U}$
3SF-B854-008	2	7/30/96	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	2^{F}	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<3.0^{U}$
3SF-B854-009	3	7/30/96	$<0.78^{U}$	$<0.78^{U}$	$<0.78^{U}$	0.93^{F}	$<0.78^{U}$	$<0.78^{U}$	$<0.78^{U}$	$<0.78^{U}$	$<0.78^{U}$	$<0.78^{U}$	$<0.78^{U}$	$<3.1^{U}$
3SF-B854-009[b]	3	7/30/96	$<0.92^{U}$	$<0.92^{U}$	$<0.92^{U}$	0.82^{FJ}	$<0.92^{U}$	$<0.92^{U}$	$<0.92^{U}$	$<0.92^{U}$	$<0.92^{U}$	$<0.92^{U}$	$<0.92^{U}$	$<3.7^{U}$
3SF-B854-010	2	7/30/96	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	13^{F}	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<3.0^{U}$
3SF-B854-011	2	7/30/96	$<0.78^{U}$	$<0.78^{U}$	$<0.78^{U}$	$<0.78^{U}$	$<0.78^{U}$	$<0.78^{U}$	$<0.78^{U}$	$<0.78^{U}$	$<0.78^{U}$	$<0.78^{U}$	$<0.78^{U}$	$<3.1^{U}$
3SF-B854-012	2	7/30/96	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	1.2^{F}	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	$<2.9^{U}$
3SF-B854-013	2	7/31/96	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	2.3^{F}	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	$<2.9^{U}$
3SF-B854-014	1	7/31/96	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	9.4^{F}	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	0.95	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<3.0^{U}$
3SF-B854-015	1	7/31/96	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	7.2^{F}	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	7.9	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<3.0^{U}$
3SF-B854-016	3	7/31/96	$<0.76^{U}$	$<0.76^{U}$	$<0.76^{U}$	2.4^{F}	$<0.76^{U}$	$<0.76^{U}$	$<0.76^{U}$	$<0.76^{U}$	$<0.76^{U}$	$<0.76^{U}$	$<0.76^{U}$	$<3.0^{U}$
3SF-B854-017	2	7/31/96	$<0.76^{U}$	$<0.76^{U}$	$<0.76^{U}$	1.3^{F}	$<0.76^{U}$	$<0.76^{U}$	$<0.76^{U}$	$<0.76^{U}$	$<0.76^{U}$	$<0.76^{U}$	$<0.76^{U}$	$<3.0^{U}$
3SF-B854-017[c]	3	7/31/96	$<0.76^{U}$	$<0.76^{U}$	$<0.76^{U}$	1.5^{F}	$<0.76^{U}$	$<0.76^{U}$	$<0.76^{U}$	$<0.76^{U}$	$<0.76^{U}$	$<0.76^{U}$	$<0.76^{U}$	$<3.0^{U}$
3SF-B854-018	2	7/31/96	$<0.79^{U}$	$<0.79^{U}$	$<0.79^{U}$	8.5^{F}	$<0.79^{U}$	$<0.79^{U}$	$<0.79^{U}$	$<0.79^{U}$	$<0.79^{U}$	$<0.79^{U}$	$<0.79^{U}$	$<3.2^{U}$
3SF-B854-019	3	7/31/96	$<0.78^{U}$	$<0.78^{U}$	$<0.78^{U}$	1.3^{F}	$<0.78^{U}$	$<0.78^{U}$	$<0.78^{U}$	$<0.78^{U}$	$<0.78^{U}$	$<0.78^{U}$	$<0.78^{U}$	$<3.1^{U}$
3SF-B854-019[b]	3	7/31/96	$<0.92^{U}$	$<0.92^{U}$	$<0.92^{U}$	1.6^{F}	$<0.92^{U}$	$<0.92^{U}$	$<0.92^{U}$	$<0.92^{U}$	$<0.92^{U}$	$<0.92^{U}$	$<0.92^{U}$	$<3.7^{U}$
3SF-B854-020	2	7/31/96	$<0.79^{U}$	$<0.79^{U}$	$<0.79^{U}$	2.6	$<0.79^{U}$	$<0.79^{U}$	$<0.79^{U}$	$<0.79^{U}$	$<0.79^{U}$	$<0.79^{U}$	$<0.79^{U}$	$<3.2^{U}$
3SF-B854-021	3	8/1/96	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	2.2^{F}	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	$<0.73^{U}$	$<2.9^{U}$
3SF-B854-021[c]	3	8/1/96	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	2^{F}	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<3.0^{U}$
3SF-B854-021[d]	1	8/1/96	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	2^{F}	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<3.0^{U}$
3SF-B854-022	2	8/1/96	$<0.72^{U}$	$<0.72^{U}$	$<0.72^{U}$	4^{F}	$<0.72^{U}$	$<0.72^{U}$	$<0.72^{U}$	$<0.72^{U}$	$<0.72^{U}$	$<0.72^{U}$	$<0.72^{U}$	$<2.9^{U}$
3SF-B854-023	2	8/1/96	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<3.0^{U}$
3SF-B854-024	3	8/1/96	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	2.3^{F}	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<0.75^{U}$	$<3.0^{U}$

Table B-5. (Continued)

			Analyte concentration detected in the SUMMA™ canister ($ppb_{v/v}$)											
Location	Chamber number[a]	Sample date	Vinyl chloride	1,1-DCE	Freon 113	Methylene Chloride	cis-1,2-DCE	Chloroform	1,2-DCA	TCE	1,2-DCPa	1,1,2-TCA	PCE	trans-1,2-DCE
3SF-B854-025	1	8/1/96	<0.75^{U}	<0.75^{U}	<0.75^{U}	1.2^{F}	<0.75^{U}	<0.75^{U}	<0.75^{U}	<0.75^{U}	<0.75^{U}	<0.75^{U}	<0.75^{U}	<3.0^{U}
3SF-B854-026	1	8/1/96	<0.73^{U}	<0.73^{U}	<0.73^{U}	3^{F}	<0.73^{U}	<0.73^{U}	<0.73^{U}	<0.73^{U}	<0.73^{U}	<0.73^{U}	<0.73^{U}	<2.9^{U}
3SF-B854-CB-01[e]	2	7/30/96	<0.73^{U}	<0.73^{U}	<0.73^{U}	5.8	<0.73^{U}	<0.73^{U}	<0.73^{U}	<0.73^{U}	<0.73^{U}	<0.73^{U}	<0.73^{U}	<2.9^{U}
3SF-B854-CB-02[e]	3	7/30/96	<0.73^{U}	<0.73^{U}	<0.73^{U}	3.2	<0.73^{U}	<0.73^{U}	<0.73^{U}	<0.73^{U}	<0.73^{U}	<0.73^{U}	<0.73^{U}	<2.9^{U}
3SF-B854-CB-03[e]	3	7/31/96	<0.7^{U}	<0.73^{U}	<0.73^{U}	1.9	<0.73^{U}	<0.73^{U}	<0.73^{U}	<0.73^{U}	<0.73^{U}	<0.73^{U}	<0.73^{U}	<2.9^{U}
3SF-B854-CB-04[e]	2	7/31/96	<0.75^{U}	<0.75^{U}	<0.75^{U}	11	<0.75^{U}	<0.75^{U}	<0.75^{U}	<0.75^{U}	<0.75^{U}	<0.75^{U}	<0.75^{U}	<3.0^{U}
3SF-B854-CB-05[e]	1	7/31/96	<0.75^{U}	<0.75^{U}	<0.75^{U}	12	<0.75^{U}	<0.75^{U}	<0.75^{U}	<0.75^{U}	<0.75^{U}	<0.75^{U}	<0.75^{U}	<3.0^{U}
3SF-B854-CB-06[e]	3	8/1/96	<0.72^{U}	<0.72^{U}	<0.72^{U}	1	<0.72^{U}	<0.72^{U}	<0.72^{U}	<0.72^{U}	<0.72^{U}	<0.72^{U}	<0.72^{U}	<2.9^{U}
3SF-B854-CB-07[e]	2	8/1/96	<0.72^{U}	<0.72^{U}	<0.72^{U}	1.6	<0.72^{U}	<0.72^{U}	<0.72^{U}	<0.72^{U}	<0.72^{U}	<0.72^{U}	<0.72^{U}	<2.9^{U}
3SF-B854-CB-07[b,e]	2	8/1/96	<0.85^{U}	<0.85^{U}	<0.85^{U}	1.5	<0.85^{U}	<0.85^{U}	<0.85^{U}	<0.85^{U}	<0.85^{U}	<0.85^{U}	<0.85^{U}	<3.4^{U}
3SF-B854-CB-08[e]	1	8/1/96	<0.75^{U}	<0.75^{U}	<0.75^{U}	1.5	<0.75^{U}	<0.75^{U}	<0.75^{U}	<0.75^{U}	<0.75^{U}	<0.75^{U}	<0.75^{U}	<3.0^{U}

Notes:

U = Compound not detected above the detection limit.

F = Analyte found in field blank, trip blank, or equipment blank.

J = Analyte concentration estimated because it was detected below the reported detection limit.

[a] Chamber number (one through three) signifies the chamber from which the sample was collected.

[b] Laboratory duplicate.

[c] Collocated sample.

[d] Control point sample.

[e] Chamber blank.

Table B-6. Measured ambient air VOCs concentrations in the Building 854 OU.

		Analyte concentration detected in the SUMMA™ canister ($\text{ppb}_{v/v}$)											
Location	Sample date	Vinyl chloride	1,1-DCE	Freon 113	Methylene Chloride	cis-1,2-DCE	Chloroform	1,2-DCA	TCE	1,2-DCPa	1,1,2-TCA	PCE	trans-1,2-DCE
3AA-B854-001[a]	7/31/96	<0.045[U]	<0.045[U]	0.15	0.24[B]	<0.045[U]	<0.045[U]	<0.11[U]	0.45	<0.11[U]	<0.045[U]	<0.045[U]	<0.045[U]
3AA-B854-001[a]	8/1/96	<0.033[U]	<0.033[U]	0.14	0.19[B]	<0.033[U]	0.51	<0.082[U]	0.37	<0.082[U]	<0.033[U]	0.05	<0.033[U]
3AA-B854-002	7/31/96	<0.046[U]	<0.046[U]	0.12	0.32[B]	<0.046[U]	1	<0.12[U]	<0.046[U]	<0.12[U]	<0.046[U]	0.065	<0.046[U]
3AA-B854-002	8/1/96	<0.043[U]	<0.043[U]	0.11	0.23[B]	<0.043[U]	<0.043[U]	<0.11[U]	<0.043[U]	<0.11[U]	<0.043[U]	0.4	<0.043[U]
3AA-B854-003	7/31/96	<0.046[U]	<0.046[U]	0.13	0.24[B]	<0.046[U]	0.67	<0.12[U]	<0.046[U]	<0.12[U]	<0.046[U]	0.055	<0.046[U]
3AA-B854-003	8/1/96	<0.045[U]	<0.045[U]	0.12	0.23[B]	<0.045[U]	<0.045[U]	<0.11[U]	<0.045[U]	<0.11[U]	<0.045[U]	<0.045[U]	<0.045[U]
3AA-B854-004	7/31/96	<0.047[U]	<0.047[U]	0.11	0.32[B]	<0.047[U]	<0.047[U]	<0.12[U]	<0.047[U]	<0.12[U]	<0.047[U]	<0.047[U]	<0.047[U]
3AA-B854-004	8/1/96	<0.046[U]	<0.046[U]	0.12	0.25[B]	<0.046[U]	<0.046[U]	<0.12[U]	<0.046[U]	<0.12[U]	<0.046[U]	0.23	<0.046[U]
3AA-B854-005[b]	8/1/96	<0.046[U]	<0.046[U]	2	7.6[B]	<0.046[U]	<0.046[U]	<0.12[U]	<0.046[U]	<0.12[U]	<0.046[U]	0.046	<0.046[U]
3AA-B854-005[b,c]	8/1/96	<0.055[U]	<0.055[U]	2	7.7[B]	<0.055[U]	<0.055[U]	<0.14[U]	<0.055[U]	<0.14[U]	<0.055[U]	0.043[J]	<0.055[U]
3AA-B854-006	8/1/96	<0.050[U]	<0.050[U]	0.12	0.3[B]	<0.050[U]	<0.050[U]	<0.13[U]	<0.050[U]	<0.13[U]	<0.050[U]	<0.050[U]	<0.050[U]
3AA-B854-007	8/1/96	<0.050[U]	<0.050[U]	0.12	0.27[B]	<0.050[U]	<0.050[U]	<0.13[U]	<0.050[U]	<0.13[U]	<0.050[U]	<0.050[U]	<0.050[U]
3AA-B854-008	8/1/96	<0.049[U]	<0.049[U]	0.12	0.28[B]	<0.049[U]	<0.049[U]	<0.12[U]	<0.049[U]	<0.12[U]	<0.049[U]	<0.049[U]	<0.049[U]
Trip blank	7/31/96	<0.02[U]	<0.02[U]	<0.02[U]	0.16[B]	<0.02[U]	<0.02[U]	<0.05[U]	<0.02[U]	<0.05[U]	<0.02[U]	<0.02[U]	<0.02[U]
Trip blank	8/1/96	<0.02[U]	<0.02[U]	<0.02[U]	0.16[B]	<0.02[U]	<0.02[U]	<0.05[U]	<0.02[U]	<0.05[U]	<0.02[U]	<0.02[U]	<0.02[U]

Notes:

U = Compound not detected above the detection limit.

B = Analyte found in method blank.

J =Analyte estimated because it was detected below the detection limit.

[a] Indoor air sample collected in Building 854F.

[b] Indoor air sample collected in Building 854A.

[c] Laboratory duplicate.

Table B-7. Comparison of detection limit range and preliminary remediation goals (PRGs) for ambient air samples ($ppb_{v/v}$).

Analyte	Detection limit range	EPA Region IX PRG
Vinyl chloride	0.033 - 0.055[a]	0.009
1,1-Dichloroethene (1,1-DCE)	0.033 - 0.055[a]	0.010
Freon 113	0.033 - 0.055	4036
Methylene chloride ($MeCl_2$)	0.033 - 0.055	1.178
cis-1,2-Dichloroethene (cis-1,2-DCE)	0.033 - 0.055	9.312
Chloroform ($CHCl_3$)	0.033 - 0.055[a]	0.017
1,2-Dichloroethane (1,2-DCA)	0.082 - 0.14[a]	0.018
Trichloroethene (TCE)	0.033 - 0.055	0.204
1,2-Dichloropropane (1,2-DCPa)	0.082 - 0.14[a]	0.021
1,1,2-Trichloroethane (1,1,2-TCA)	0.033 - 0.055[a]	0.022
Tetrachloroethene (PCE)	0.033 - 0.055	0.485
trans-1,2-Dichloroethene (trans-1,2-DCE)	0.033 - 0.055	18.372

[a] Detection limit is greater then the PRG.

Table B-8. Soil vapor flux rates calculated from the Building 854 OU emission isolation flux chamber samples.

		Flux Rate in μg/(m^2•sec)											
Location	**Sample date**	**Vinyl chloride**	**1,1-DCE**	**Freon 113**	**Methylene Chloride**	**cis-1, 2-DCE**	**Chloroform**	**1, 2-DCA**	**TCE**	**1, 2-DCPa**	**1, 1, 2-TCA**	**PCE**	**trans-1, 2-DCE**
3SF-B854-001	7/29/96	<0.0008	<0.0013	<0.0025	0.0252	<0.0013	<0.0016	<0.0013	0.0088	<0.0015	<0.0018	0.0034	<0.0053
3SF-B854-002	7/29/96	<0.0008	<0.0013	<0.0025	0.0105	<0.0013	<0.0016	<0.0013	0.0032	<0.0015	<0.0018	<0.0022	<0.0053
3SF-B854-002[a]	7/29/96	<0.001	<0.0015	0.0029	0.0114	<0.0015	<0.0018	<0.0015	0.0017	<0.0017	<0.0021	<0.0026	<0.0061
3SF-B854-003	7/29/96	<0.0009	<0.0014	<0.0026	0.0083	<0.0014	<0.0017	<0.0014	<0.0019	<0.0016	<0.0019	<0.0023	<0.0055
3SF-B854-003[b]	7/29/96	<0.0008	<0.0013	<0.0025	0.0082	<0.0013	<0.0016	<0.0013	<0.0018	<0.0015	<0.0018	<0.0022	<0.0053
3SF-B854-003[c]	7/30/96	<0.0009	<0.0013	<0.0026	0.0068	<0.0013	<0.0017	<0.0014	<0.0018	<0.0016	<0.0019	<0.0023	<0.0055
3SF-B854-003[c]	7/31/96	<0.0009	<0.0013	<0.0026	0.0068	<0.0013	<0.0017	<0.0014	<0.0018	<0.0016	<0.0019	<0.0023	<0.0055
3SF-B854-004	7/30/96	<0.0009	<0.0014	<0.0026	0.0013	<0.0014	<0.0017	<0.0014	0.0026	<0.0016	<0.0019	<0.0023	<0.0055
3SF-B854-004[b]	7/30/96	<0.0009	<0.0014	<0.0027	<0.0012	<0.0014	<0.0017	<0.0014	0.004	<0.0016	<0.0019	<0.0024	<0.0057
3SF-B854-005	7/30/96	<0.0009	<0.0013	<0.0026	0.0014	<0.0013	<0.0017	<0.0014	<0.0018	<0.0016	<0.0019	<0.0023	<0.0055
3SF-B854-006	7/30/96	<0.0008	<0.0013	<0.0025	0.0019	<0.0013	<0.0016	<0.0013	<0.0018	<0.0015	<0.0018	<0.0022	<0.0053
3SF-B854-006[a]	7/30/96	<0.001	<0.0016	<0.0031	0.0019	<0.0016	<0.002	<0.0016	<0.0022	<0.0019	<0.0022	<0.0027	<0.0065
3SF-B854-007	7/30/96	<0.0008	<0.0013	<0.0025	0.0016	<0.0013	<0.0016	<0.0013	<0.0018	<0.0015	<0.0018	<0.0022	<0.0053
3SF-B854-008	7/30/96	<0.0009	<0.0014	<0.0027	0.0032	<0.0014	<0.0017	<0.0014	<0.0019	<0.0016	<0.0019	<0.0024	<0.0056
3SF-B854-009	7/30/96	<0.0009	<0.0014	<0.0028	0.0015	<0.0014	<0.0018	<0.0015	<0.0019	<0.0017	<0.002	<0.0024	<0.0058
3SF-B854-009[a]	7/30/96	<0.0011	<0.0017	<0.0032	0.0013	<0.0017	<0.002	<0.0017	<0.0022	<0.0019	<0.0023	<0.0028	<0.0068
3SF-B854-010	7/30/96	<0.0009	<0.0013	<0.0026	0.0205	<0.0013	<0.0017	<0.0014	<0.0018	<0.0016	<0.0019	<0.0023	<0.0055
3SF-B854-011	7/30/96	<0.0009	<0.0014	<0.0027	<0.0012	<0.0014	<0.0017	<0.0014	<0.0019	<0.0016	<0.0019	<0.0024	<0.0057
3SF-B854-012	7/30/96	<0.0008	<0.0013	<0.0025	0.0019	<0.0013	<0.0016	<0.0013	<0.0018	<0.0015	<0.0018	<0.0022	<0.0053
3SF-B854-013	7/31/96	<0.0008	<0.0013	<0.0025	0.0036	<0.0013	<0.0016	<0.0013	<0.0018	<0.0015	<0.0018	<0.0022	<0.0053
3SF-B854-014	7/31/96	<0.0007	<0.0012	<0.0022	0.0127	<0.0012	<0.0014	<0.0012	0.002	<0.0013	<0.0016	<0.002	<0.0047
3SF-B854-015	7/31/96	<0.0007	<0.0011	<0.0021	0.0092	<0.0011	<0.0014	<0.0011	0.0157	<0.0013	<0.0015	<0.0019	<0.0045
3SF-B854-016	7/31/96	<0.0008	<0.0012	<0.0023	0.0033	<0.0012	<0.0015	<0.0012	<0.0016	<0.0014	<0.0016	<0.002	<0.0048
3SF-B854-017	7/31/96	<0.0009	<0.0014	<0.0026	0.002	<0.0014	<0.0017	<0.0014	<0.0019	<0.0016	<0.0019	<0.0023	<0.0055
3SF-B854-017[b]	7/31/96	<0.0009	<0.0014	<0.0026	0.0024	<0.0014	<0.0017	<0.0014	<0.0019	<0.0016	<0.0019	<0.0023	<0.0055
3SF-B854-018	7/31/96	<0.0009	<0.0014	<0.0027	0.0134	<0.0014	<0.0017	<0.0014	<0.0019	<0.0017	<0.002	<0.0024	<0.0059
3SF-B854-019	7/31/96	<0.0009	<0.0014	<0.0027	0.002	<0.0014	<0.0017	<0.0014	<0.0019	<0.0016	<0.0019	<0.0024	<0.0057
3SF-B854-019[a]	7/31/96	<0.0011	<0.0017	<0.0032	0.0025	<0.0017	<0.002	<0.0017	<0.0022	<0.0019	<0.0023	<0.0028	<0.0068
3SF-B854-020	7/31/96	<0.0009	<0.0014	<0.0027	0.0041	<0.0014	<0.0017	<0.0014	<0.0019	<0.0017	<0.002	<0.0024	<0.0059
3SF-B854-021	8/1/96	<0.0008	<0.0013	<0.0025	0.0035	<0.0013	<0.0016	<0.0013	<0.0018	<0.0015	<0.0018	<0.0022	<0.0053
3SF-B854-021[b]	8/1/96	<0.0009	<0.0013	<0.0026	0.0031	<0.0013	<0.0017	<0.0014	<0.0018	<0.0016	<0.0019	<0.0023	<0.0055
3SF-B854-021[c]	8/1/96	<0.0009	<0.0013	<0.0026	0.0031	<0.0013	<0.0017	<0.0014	<0.0018	<0.0016	<0.0019	<0.0023	<0.0055
3SF-B854-022	8/1/96	<0.001	<0.0015	<0.0029	0.0072	<0.0015	<0.0018	<0.0015	<0.002	<0.0017	<0.002	<0.0025	<0.0061
3SF-B854-023	8/1/96	<0.0009	<0.0014	<0.0027	<0.0012	<0.0014	<0.0017	<0.0014	<0.0019	<0.0016	<0.0019	<0.0024	<0.0056
3SF-B854-024	8/1/96	<0.0009	<0.0013	<0.0026	0.0036	<0.0013	<0.0017	<0.0014	<0.0018	<0.0016	<0.0019	<0.0023	<0.0055

Table B-8. (Continued)

		Flux Rate in µg/(m^2•sec)											
Location	**Sample date**	**Vinyl chloride**	**1,1-DCE**	**Freon 113**	**Methylene Chloride**	**cis-1, 2-DCE**	**Chloroform**	**1, 2-DCA**	**TCE**	**1, 2-DCPa**	**1, 1, 2-TCA**	**PCE**	**trans-1, 2-DCE**
3SF-B854-025	8/1/96	<0.0009	<0.0013	<0.0026	0.0019	<0.0013	<0.0017	<0.0014	<0.0018	<0.0016	<0.0019	<0.0023	<0.0055
3SF-B854-026	8/1/96	<0.0008	<0.0013	<0.0025	0.0046	<0.0013	<0.0016	<0.0013	<0.0017	<0.0015	<0.0018	<0.0022	<0.0052

Note:

The < sign indicates that the flux rate was calculated based on the upper analyte detection limit.

[a] Laboratory duplicate.

[b] Collocated sample.

[c] Control point sample.

Table B-9. Building 854 VOC exposure-point concentrations for outdoor air calculated using the maximum soil flux rate.

Analyte	Maximum measured flux [µg/(m^2•sec)][a]	Calculated outdoor air concentration ($ppb_{v/v}$)	EPA Region IX PRGs ($ppb_{v/v}$)
Vinyl chloride	<0.0011	0.0123[c]	0.009
1,1-Dichloroethene	<0.0017	0.0190[c]	0.010
Freon 113	<0.0032	0.0185	4036
Methylene chloride	0.0252[b]	0.322	1.178
cis-1,2-Dichloroethene	<0.0017	0.0190	9.312
Chloroform	<0.0020	0.0182[c]	0.017
1,2-Dichloroethane	<0.0017	0.0186[c]	0.018
Trichloroethene	0.0157	0.130	0.204
1,2-Dichloropropane	<0.0019	0.0182	0.021
1,1,2-Trichloroethane	<0.0023	0.0187	0.022
Tetrachloroethene	0.0034	0.0222	0.485
trans-1,2-Dichloroethane	<0.0068	0.0745	18.372

[a] Maximum calculated VOC flux rate or detection limit (indicated by <), whichever was greater.

[b] Compound detected in chamber blanks.

[c] Concentration greater than PRG.

Table B-10. Maximum VOC concentrations in Building 854 outdoor ambient air samples compared to the PRGs.

Analyte	Maximum measured outdoor air concentration ($ppb_{v/v}$)[a]	EPA Region IX PRG ($ppb_{v/v}$)
Vinyl chloride	<0.050[b]	0.009
1,1-Dichloroethene	<0.050[b]	0.010
Freon 113	0.13	4036
Methylene chloride	0.32[c]	1.178
cis-1,2-Dichloroethene	<0.050	9.312
Chloroform	1[b]	0.017
1,2-Dichloroethane	<0.13[b]	0.018
Trichloroethene	<0.050	0.204
1,2-Dichloropropane	<0.13[b]	0.021
1,1,2-Trichloroethane	<0.050[b]	0.022
Tetrachloroethene	0.4	0.485
trans-1,2-Dichloroethane	<0.050	18.372

[a] Maximum measured VOC concentration or detection limit (indicated by <), whichever was greater.

[b] Concentration or detection limit greater than PRG.

[c] Compound detected in the analytical laboratory method blank.

Table B-11. Directly measured VOC concentrations in Building 854 indoor ambient air samples compared to the PRGs.

Analyte	Maximum measured indoor air concentration ($ppb_{v/v}$)[a]	EPA Region IX PRGs ($ppb_{v/v}$)
Building 854F		
Vinyl chloride	<0.045[b]	0.009
1,1-Dichloroethene	<0.045[b]	0.010
Freon 113	0.15	4036
Methylene chloride	0.24[c]	1.178
cis-1,2-Dichloroethene	<0.045	9.312
Chloroform	0.51[b]	0.017
1,2-Dichloroethane	<0.11[b]	0.018
Trichloroethene	0.45[b]	0.204
1,2-Dichloropropane	<0.11[b]	0.021
1,1,2-Trichloroethane	<0.045[b]	0.022
Tetrachloroethene	0.05	0.485
trans-1,2-Dichloroethane	<0.045	18.372
Building 854A		
Vinyl chloride	<0.055[b]	0.009
1,1-Dichloroethene	<0.055[b]	0.010
Freon 113	2	4036
Methylene Chloride	7.7[bc]	1.178
cis-1,2-Dichloroethene	<0.055	9.312
Chloroform	<0.055[b]	0.017
1,2-Dichloroethane	<0.14[b]	0.018
Trichloroethene	<0.055	0.204
1,2-Dichloropropane	<0.14[b]	0.021
1,1,2-Trichloroethane	<0.055[b]	0.022
Tetrachloroethene	0.046	0.485
trans-1,2-Dichloroethane	<0.055	18.372

[a] Maximum measured VOC concentration or detection limit (indicated by <), whichever was greater.

[b] Concentration or detection limit greater than PRG.

[c] Compound detected in the analytical laboratory method blank.

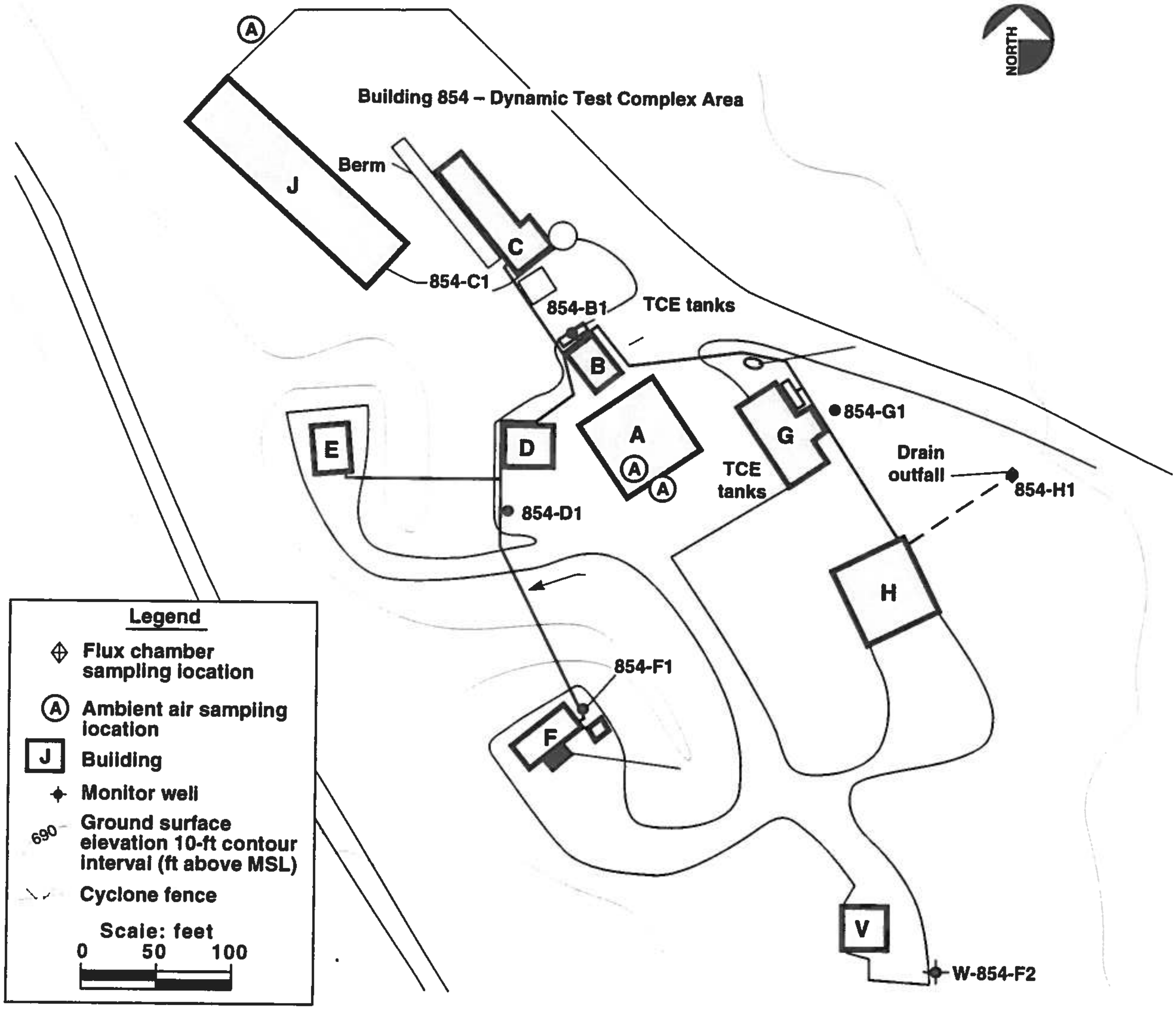

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Figure B-1. Building 854 OU ambient air and flux chamber sampling locations.

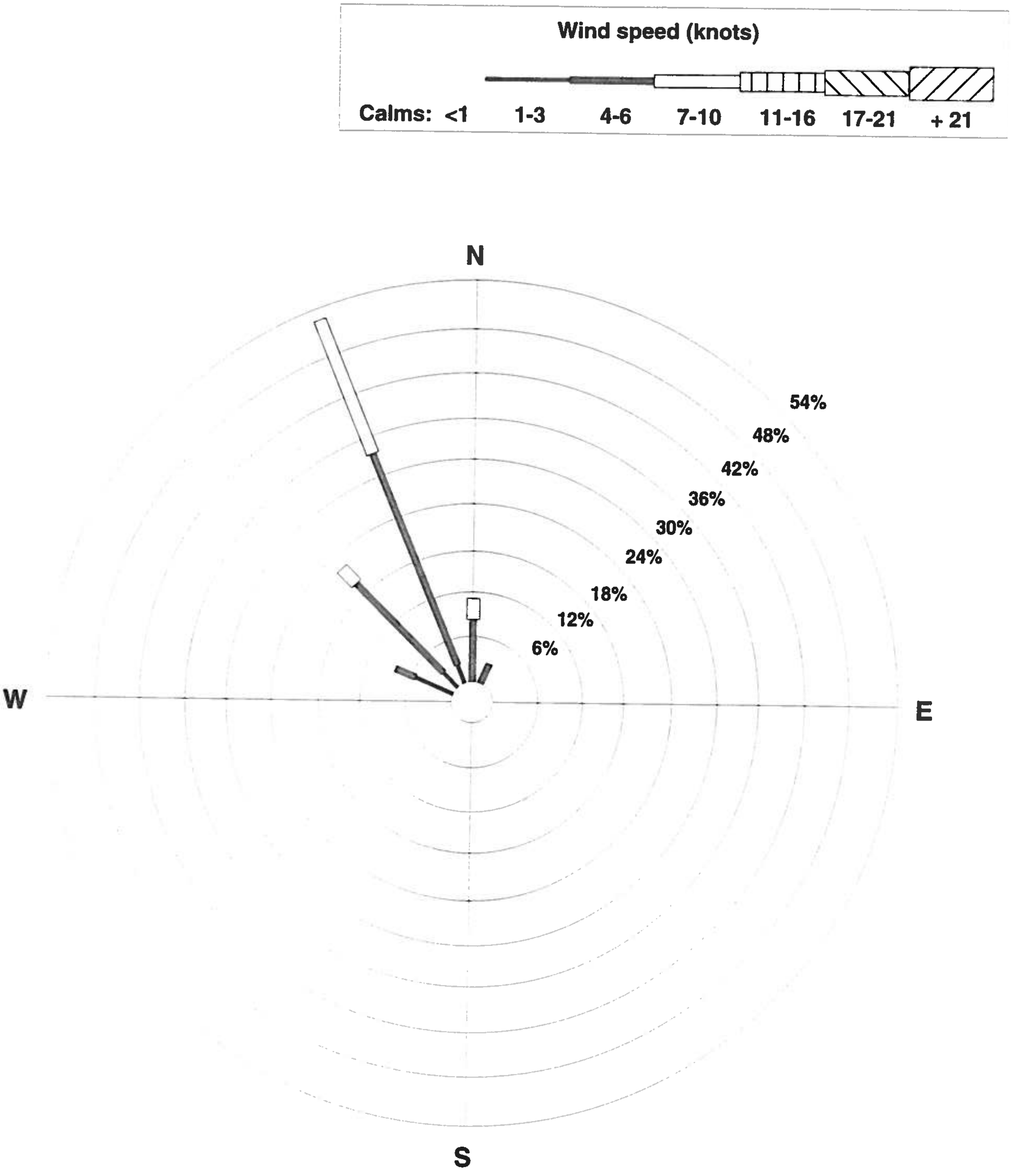

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Figure B-2. Building 854 OU wind rose for July 31, 1996 8 AM through 4 PM.

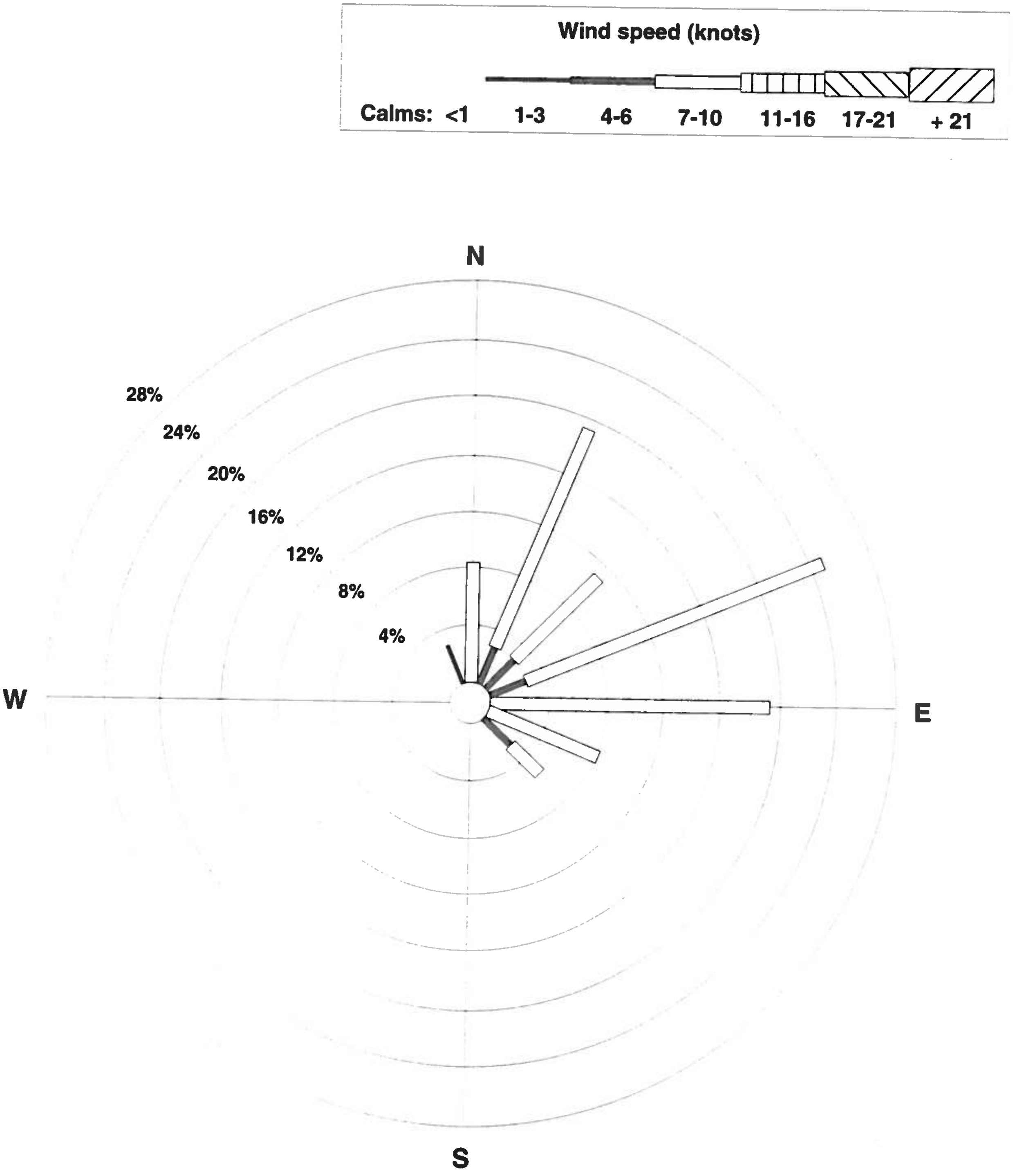

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Figure B-3. Building 854 OU wind rose for August 1, 1996 8 AM through 4 PM.