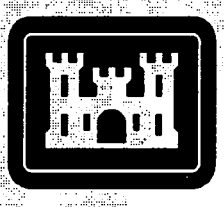
Draft Final

Initial Field Investigation Report for the Former Building 354 at Main Post Fort Riley, Kansas

12 March 1998

Prepared for



U.S. Army Corps of Engineers
Kansas City District

Prepared by

Burns
&
McDonnell

Contract Number: DACA41-96-D-8010
Project Number: 96-806-4-004

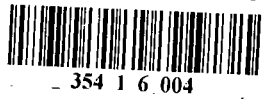


TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

µg/kg	Micrograms per Kilogram
µg/L	Micrograms per Liter
1,2 - DCA	1,2-dichloroethane
1,1-DCE	1,1-Dichloroethene
1,1,1-TCA	1,1,1-Trichloroethane
bgs	Below Ground Surface
BMcD	Burns & McDonnell Engineering Company, Inc.
BTEX	Benzene, Toluene, Ethylbenzene, and Total Xylenes
cis-1,2-DCE	cis-1,2-Dichloroethene
DES	Fort Riley Directorate of Environment and Safety
DNAPL	Dense Non-Aqueous Phase Liquids
DPW	Department of Public Works
EPS	Environmental Priority Service
GC	Gas Chromatograph
IDW	Investigation-Derived Waste
IFI	Initial Field Investigation
IRG	Interim Remedial Guidelines
ITS	Intertek Testing Services
KDHE	Kansas Department of Health and Environment
LCS/LCSD	Laboratory Control Sample/Laboratory Control Sample Duplicate
LNAPL	Light Non-Aqueous Phase Liquids
LUST	Leaking Underground Storage Tank
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MSL	Mean Sea Level
NFGI	National Functional Guidelines for Inorganic Data Review
NFGO	National Functional Guidelines for Organic Data Review
NTU	Nephelometric Turbidity Units
PARCC	Precision, accuracy, representativeness, completeness, and comparability
PCE	Tetrachloroethene
PID	Photoionization Detector
PQL	Practical Quantitation Limit
PVC	Polyvinyl Chloride
QA	Quality Assurance
QC	Quality Control
REC	Percent Recovery
RPD	Relative Percent Difference
SAS	Sampling and Analysis Plan for the Initial Field Investigation of Former Building 354
Site	Former Building 354
SVOCs	Semi-volatile Organic Compounds
SW-846	Test Methods for Evaluating Solid Waste

TAL	Target Analyte List
TCE	Trichloroethene
TPH	Total Petroleum Hydrocarbons
TVOCs	Total Volatile Organic Compounds
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOCs	Volatile Organic Compounds

*****

EXECUTIVE SUMMARY

Burns & McDonnell Engineering Company, Inc. (BMcD), under contract with the United States Army Corps of Engineers, Kansas City District, conducted an initial field investigation (IFI) at former Building 354 on the Main Post of Fort Riley, Kansas. The IFI efforts were designed to attempt to identify the sources of the chlorinated solvents and obtain information to interpret the site hydrogeology.

Previous investigations had encountered contamination attributed to gasoline, diesel, and chlorinated solvents previously stored at the former underground storage tank (UST) facility at Building 354. Chlorinated solvents were also encountered upgradient of the former UST facility in Monitoring Well MW95-06.

BMcD conducted the following activities as part of the IFI.

- installed 6 temporary piezometers and 12 temporary monitoring wells for groundwater sample collection and water-level measurements
- conducted a soil-gas survey at 71 locations for on-site analyses
- collected 16 subsurface soil samples at 14 locations for on-site analyses
- collected groundwater samples from one probehole, 5 temporary piezometers, 9 temporary monitoring wells, 4 permanent piezometers for on-site analyses
- submitted confirmation soil and groundwater samples to an off-site laboratory for chemical analyses
- collected groundwater samples from 12 existing monitoring wells near former Building 354, the former Main Post Landfill, and the former Pesticide Storage Facility for off-site analysis.

Results of on-site screening activities indicated that benzene contamination in the soil, soil gas (sampled just above groundwater) and groundwater is limited to the area downgradient of the former UST facility at

Building 354 and also near the former fuel unloading facility located adjacent to the Union Pacific Railroad tracks near Marshall Avenue.

Results of the on-site analyses of groundwater indicated the presence of 1,2-dichloroethane (1,2-DCA) in all of the 18 groundwater samples analyzed on-site. Concentrations of 1,2-DCA were greater than 5 µg/L in 9 of the 18 samples. 1,2-DCA was not detected above the detection limit of 5µg/L in the two confirmation samples collected and analyzed by the off-site laboratory. In addition, 1,2-DCA was not detected in the off-site laboratory analyses of groundwater samples collected from three monitoring wells (TS0292-01, TS0292-02, and MW95-06) located within the extent of the on-site detections of 1,2-DCA.

Results of the on-site screening activities indicated the presence of tetrachloroethene (PCE) in the soil gas (sampled just above groundwater) and in the groundwater across much of the area investigated. Trichloroethene (TCE) was encountered in small, isolated areas within the larger PCE plume. The extent of PCE contamination appears to be defined except for the area north of Building 330 and 300, west of Building 300, and south of Probehole B-83. The probable sources for this contamination are the UST facility at former Building 354, activities near Building 332, and unknown sources north of Buildings 330 and 300. Results of on-site analyses of groundwater also indicated the presence of PCE at Piezometer PZ-C and Piezometer PZ-D (above the U.S. Environmental Protection Agency (USEPA) Maximum Contaminant Levels (MCLs)). The source and extent of this contamination have not been determined.

Groundwater samples were collected from monitoring wells at the former Main Post Landfill site and former Pesticide Storage Facility Site, and analyzed by an offsite laboratory. No volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) or metals were detected above USEPA MCLs. Groundwater samples collected from wells associated with the former Building 354 Site were also collected and analyzed by an off-site laboratory. The samples from Monitoring Well TS0292-02 contained arsenic and benzene above USEPA MCLs. Monitoring Wells TS0292-01 and MW 95-06 showed PCE above the USEPA MCL.

* * * * *

1.0 BACKGROUND SUMMARY

1.1 INTRODUCTION

Burns & McDonnell Engineering Company, Inc. (BMcD), under contract with the United States Army Corps of Engineers (USACE), Kansas City District, conducted an initial field investigation (IFI) of former Building 354 (site) on the Main Post of Fort Riley, Kansas between 19 August and 25 September 1997. The objective was to gain an increased understanding of the nature and extent of contamination near former Building 354. The IFI efforts were designed to attempt to identify the source of the chlorinated solvents. An additional objective was to obtain groundwater elevation data to allow better interpretation of the site hydrogeology.

1.2 SITE IDENTIFICATION AND LOCATION

The Fort Riley Military Reservation is in north-central Kansas. It occupies approximately 83,500 acres in southern Riley County and 9,000 acres in northern Geary County (refer to Figure 1-1). Figure 1-2 shows the general location of former Building 354 at Fort Riley. The site is located approximately 100 feet south of Building 332. The IFI study area encompasses a larger area, extending north to Dickman Avenue (including most of the Public Works compound, northwest of Dickman Avenue at Marshall Drive, southwest across Marshall Avenue to the vicinity of the Union Pacific Railroad station, and south approximately 300 feet from the Union Pacific Railroad track. The extent of the IFI study area is shown on Figure 1-3.

The Kansas Department of Health and Environment (KDHE) Bureau of Environmental Remediation assigned project code from the Leaking Underground Storage Tank (LUST) Database is 05031603. The KDHE facility and owner identification number is 23650.

1.3 SITE HISTORY

Refer to the *Building 354 Site Investigation: POL UST Investigations/Remedial Action Plans* (Dames & Moore, 1995) for the history of Fort Riley.

The site was constructed in 1935 as a gasoline service station. In addition to gasoline and diesel fuel, it may have been subsequently used as a storage site for solvents and road oil. Two 10,000-gallon steel underground storage tanks (USTs), one 12,800-gallon steel UST, and one 8,500-gallon steel USTs were installed at the site in either 1933 (Dames & Moore, 1995) or 1935 (USACE, 1995), and were used for

gasoline and diesel storage. Two 10,000-gallon steel USTs were installed at the site in 1980 and were used for diesel storage (Dames & Moore, 1995). USACE indicated that the USTs at this site were also used to store road oil, and may have been used to store solvents (USACE, 1996). Former USTs (including solvent tank) were 20 feet south of the former Building 354 site and approximately 60 feet northwest of the site (see Figure 1-3).

A drawing dated June 1982, obtained from Fort Riley Department of Public Works (DPW), indicated plans to replace the pump on a solvent tank located approximately 15 feet southeast of former Building 354. The drawing does not indicate if the tank was a UST or an above-ground tank.

Five of the six USTs, shown on historical drawings of the site, were removed in 1990 and 1991. The 8,500-gallon steel UST, reportedly used for diesel storage, was not found (Dames & Moore, 1995). Real Property records of the DPW indicate that five USTs were located at this site, which corresponds to the number removed in 1990 and 1991.

Most of the IFI study area, previously described in Section 1.2, is used by Public Works for parking, vehicle maintenance and motor pool activities. Much of the study area is covered with either concrete or asphalt in the vicinity of the Public Works compound. Numerous buried utilities are also present at the site including water, sewer, electricity, gas, telephone, and fiber-optic cable (see Figure 1-4).

Table 1-1 provides a chronological summary of investigative and corrective action work which was performed prior to August 1997. Refer to Figure 1-5 and Figure 1-6 for the locations of soil and groundwater sampling points from previous investigations and to Appendix A for tables of the analytical results from previous investigations. Previous investigative activities conducted at the site are described below.

1.3.1 Previous Soil-Gas Survey

In December 1992, a 28-point soil-gas survey was performed in the area south and east of the site (see Figure 1-7; note that these sample points do not have location numbers). Benzene, toluene, ethylbenzene, total xylene (BTEX) and total petroleum hydrocarbons (TPH) were detected in two of the soil-gas samples. These samples were collected approximately 10 and 90 feet east of the former location of the USTs at the site. 1,2-Dichloroethane (1,2-DCA) was also detected in the sample collected approximately 90 feet east of the former

UST locations. Visibly contaminated soil was noted on the soil-gas probe rods at a sample point near the base of the slope, approximately 140 feet southeast of the former tank pit, but the soil-gas sample analyzed was below detection limits (Dames & Moore, 1995). Analytical results are included in Appendix A, Table A-1.

1.3.2 Previous Subsurface Soil Investigations

Between October and December 1994, 10 soil borings were drilled and sampled (354SB-01 through 354SB-10; see Figure 1-5). Soil sample headspace was screened for volatile organic compounds (VOCs) with a photoionization detector (PID). Soil samples were tested for TPH by immunoassay. VOCs and TPH were detected in various soil samples. Two duplicate samples were collected and submitted for laboratory analyses for comparison of TPH values. Analytical results are included in Appendix A, Table A-2.

A total of eight confirmation samples from four soil borings were collected in February 1995 (from Soil Borings 354SB-11 through 354SB-14; see Figure 1-5). Soil samples were submitted for off-site laboratory analyses of VOCs, semi-volatile organic compounds (SVOCs), and TPH to confirm the headspace and immunoassay analyses. Ethylbenzene, total xylene, and TPH were detected in samples collected from Soil Boring 354SB-12 which was located in the immediate area of the former locations of the USTs. Analytical results are included in Appendix A, Table A-2.

1.3.3 Previous Groundwater Investigations

Two monitoring wells (TS0292-01 and -02; see Figure 1-6) were installed at locations selected based on the soil-gas sampling results (Dames & Moore, 1995). The data available are contradictory concerning the time of well development and do not indicate that these two wells were sampled prior to November 1993.

Tetrachloroethene (PCE), benzene, ethylbenzene, and toluene were detected in the sample collected from Monitoring Well TS0292-01 in November 1993 (Dames & Moore, 1995). Water levels and free-product thickness were monitored 35 times, between 26 November 1994 and 9 September 1995, in Monitoring Well TS0292-01. Free product was encountered on two occasions and was measured as 0.01 feet on both occasions. This was the smallest thickness measurable with the available interface probe (Dames & Moore, 1995). The Dames & Moore Report does not indicate whether the free product was light non-aqueous phase liquid (LNAPL) or dense non-aqueous phase liquid (DNAPL).

In September 1994, two piezometers were installed at the site; Piezometers PZ-A and PZ-B. Piezometer PZ-A was sampled and analyzed for BTEX on-site with a gas chromatograph (GC), but Piezometer PZ-B was dry. Piezometers PZ-C and PZ-D were installed and sampled in January 1995. In addition, five in-situ groundwater samples were collected in January 1995. Dames and Moore attempted to collect in-situ groundwater samples at 9 other locations, but the locations yielded no groundwater. All of these samples were analyzed on-site with a GC for BTEX, 1,2-DCA, total volatile organic compounds (TVOCs), 1,1-dichloroethene (1,1-DCE), 1,1,1-trichloroethane (1,1,1-TCA), trichloroethene (TCE), and PCE. Although PCE and TCE were detected in some of these samples collected south and east of Former Building 354, all detections were below United States Environmental Protection Agency (USEPA) maximum contaminant levels (MCLs). BTEX compounds were also detected in some of the samples (Dames & Moore, 1995). Sample locations are illustrated on Figure 1-8 and analytical results are included in Appendix A, Table A-3.

Groundwater samples were collected from Monitoring Wells TS0292-01 and TS0292-02 in September 1994 and submitted to an off-site laboratory for analyses of VOCs and TPH. PCE was detected in TS0292-01 (Dames & Moore, 1995). Analytical results are included in Appendix A, Table A-3.

In February 1995, three new monitoring wells were installed by Dames & Moore (MW95-03, -04, and -05). MW95-05 was damaged during development and replaced with MW95-06. These three monitoring wells and the two existing monitoring wells, TS0292-01 and -02, were sampled and analyzed for VOCs and TPH in March 1995. PCE was detected in three wells, TS0292-01, MW95-04, and MW95-06 (Dames & Moore, 1995).

In December 1995, water levels were measured and samples were collected from all five former Building 354 monitoring wells. The results were reported in the *Data Summary Report for Confirmation Groundwater Sampling: Main Post Solvent Detection Site* by Louis Berger & Associates (LBA, 1996a). In December 1995, water levels were measured and samples were collected from all three Main Post Landfill monitoring wells. The results were reported in the *Data Summary Report for Confirmation Groundwater Sampling: Main Post Landfill* (LBA, 1996b). Also in December 1995, water levels were measured and samples were collected from all five Pesticide Storage Facility monitoring wells. The results were reported in the *Data Summary Report for Confirmation Groundwater Sampling: Pesticide Storage Facility* (LBA, 1996c). The results of the water level measurements and groundwater sampling from all three areas are summarized in the

Data Summary Report for Confirmation Groundwater Sampling: Building 354 Solvent Detection Area (Main Post Landfill, Pesticide Storage Facility, and Main Post Solvent Detection Site) (LBA, 1996d). This report lists the results of each round of sampling from these monitoring wells. Refer to Appendix A, Tables A-3 through A-5, for analytical results. PCE was not detected in any of the Main Post Landfill monitoring wells, but degradation products, TCE and 1,2-DCE, were detected at levels below MCLs (LBA, 1996b). TCE was detected in one Pesticide Storage Facility monitoring well, PSF92-05, at a concentration below the USEPA MCL, in July 1992, but was not detected in groundwater from this well in subsequent sampling events. No other chlorinated solvents were reported as detected in the Pesticide Storage Facility monitoring wells (LBA, 1996c). PCE was detected in three monitoring wells at the IFI study area, TS0292-01, MW95-04, and MW95-06 (LBA, 1996a).

During the Phase II site investigation, conducted between 9 September 1994 and 24 March 1995, chlorinated solvents, particularly PCE, were detected in groundwater both upgradient and downgradient of the site (USACE, 1996). Dames & Moore (1995) assumed the PCE was most likely from an off-site source located north-northeast of the site. This was partially based on increasing concentrations of PCE in several of the monitoring wells, in comparison to corresponding decreases in BTEX concentrations. However, results of the last round of groundwater sampling, conducted in December 1995, indicated that PCE concentrations had decreased compared to the previous two sampling rounds (see Appendix A, Tables A-4 through A-6, for analytical results).

1.4 REGIONAL GEOLOGY/HYDROGEOLOGY

1.4.1 Regional Geology

Fort Riley lies in the Osage Plains section of the Central Lowlands physiographic province and within the Flint Hills physiographic province of Kansas. The bedrock in the area has been dissected in the upland areas by intermittent and perennial streams, and in the lowlands by the Smoky Hill, Republican, and Kansas Rivers. Numerous tributaries also drain the area. The resultant topography is composed of upland bluff areas adjacent to alluvial plains and associated terraces (see Figure 1-9).

The geology of the area consists of Pennsylvanian and Permian Age sedimentary rock overlain by eolian and fluvial deposits of Pleistocene and Recent Age (Jewett, 1941). The Nemaha Anticline is the prominent structural feature in the area and Fort Riley is situated on the western limb of this fold (Merriam, 1963).

Bedrock in the vicinity of Fort Riley dips gently to the west-northwest and consists of alternating limestones and shales of the Permian-age Chase and Council Grove Groups. The Barnestone Formation of the Chase Group (composed of the Fort Riley Limestone, Oketo Shale, and Florence Limestone Members) is the uppermost bedrock in the upland areas.

Loess covers portions of the upland areas. In the alluvial plains, sand, silt and gravel deposits reach a combined thickness of approximately 100 feet near the rivers, and decrease in thickness towards the river bluffs. Eudora soils are commonly found on terraces above the Republican and Kansas River flood plains, such as the location of the site. Eudora soils are well drained, have a moderate permeability, and normally form in deep alluvium which rarely receives flooding (Jantz et al., 1975).

1.4.2 Regional Hydrogeology

Generally, three hydrogeologic environments are present beneath Fort Riley; the river valley consisting of alluvial sediments including clay, silt, sand, and gravel; the upland terrace areas consisting of a thin, unconsolidated overburden; and the transition zones along the river valley margins where colluvial deposits from the upland terraces overlie and intermingle with alluvial river deposits. The former Building 354 site is located in the transition zone along the valley margin. The unconsolidated material is underlain by bedrock, which in the Fort Riley area consists of alternating limestone and shale beds as described in Subsection 1.4.1. Drinking water in the area is primarily obtained from the alluvial aquifer in the Kansas and Republican River valleys.

Historical groundwater elevation data from monitoring wells installed in the overburden at the former Building 354, Pesticide Storage, and Main Post Landfill sites, allow estimation of the general groundwater flow direction in the area. These data, used in conjunction with the river stage elevations measured at the Kansas River at Fort Riley (Henry Drive Bridge), indicate that groundwater flow in the saturated overburden is generally south toward the river. Seasonal variations in the river stage and groundwater elevations result in either gaining or losing stream conditions in the area.

1.5 WATER USAGE AND SENSITIVE ENVIRONMENTS

Drinking water in the area is primarily obtained from the alluvial aquifer in the Kansas and Republican River valleys. Fort Riley and Junction City obtain drinking water from wells completed in the sand and gravel

alluvium of the Republican River Valley. Fort Riley obtains potable water from wells located in Camp Forsyth. The nearest groundwater production well is approximately 1.5 miles west and upgradient of the former Building 354 site.

A review of the Junction City, Kansas National Wetlands Inventory Map, which includes the former Building 354 site, indicated no identified wetlands within a 1000-foot radius of the site (Dames & Moore, 1995).

*****

2.0 INVESTIGATION ACTIVITIES

BMcD conducted the following field activities between 18 August 1997 and 24 September 1997, to define groundwater gradient at the IFI study area and to attempt to determine the source, nature, and extent of chlorinated solvent contamination.

- installed six temporary piezometers
- conducted a soil-gas survey at 71 locations for on-site GC analyses
- collected 16 subsurface soil samples at 14 locations for on-site GC analyses
- installed temporary monitoring wells at 12 locations
- collected groundwater samples from one probehole, four permanent piezometers, five temporary piezometers, and 9 temporary monitoring wells for on-site GC analyses
- collected groundwater samples from 12 existing monitoring wells near former Building 354, Main Post Landfill, and Pesticide Storage Facility for off-site chemical analyses
- submitted confirmation soil and groundwater samples to off-site laboratories for chemical analyses
- measured groundwater levels in temporary piezometers, temporary monitoring wells, existing monitoring wells, and existing piezometers

All direct-push activities and on-site GC analyses were performed by Environmental Priority Service (EPS). The following sections describe the details of each field activity conducted at the IFI study area.

2.1 TEMPORARY PIEZOMETER INSTALLATION

Six temporary piezometers were installed at the IFI study area on 19 and 20 August 1997. The temporary piezometers were installed at or near the locations proposed in the *Final Sampling and Analyses Plan for the*

Initial Field Investigation of former Building 354 at Fort Riley, Kansas (SAP) (BMcD 1997). Sampling locations are illustrated on Figure 1-3.

Temporary piezometers were installed using truck- and van-mounted, direct-push sampling equipment. The probeholes were continuously sampled using a Macrocore (four-feet by two-inch) sampler. Probehole logs are included in Appendix B. Probeholes were advanced to refusal on bedrock. Minor amounts of limestone or shale were recovered at five of the six locations.

The sampling procedure produced a nominal two-inch probehole in which the temporary piezometer was installed. A one-inch schedule 40 polyvinyl chloride (PVC) riser pipe with a five-foot section of machine slotted screen (0.01-inch slots) was installed in each probehole. The temporary piezometers were screened in natural sand and granular bentonite was placed in the annulus as a surface seal. Temporary Piezometers P-3, P-4, P-5, and P-6 were completed with an above-ground stickup of two to three feet while Temporary Piezometers P-1 and P-2 were completed flush with the ground surface and covered with an eight-inch steel vault. Slip caps were locked on each temporary piezometer.

On 22 August 1997, Anderson Survey Company surveyed the horizontal locations, ground surface elevation, and top of pipe elevation for each temporary piezometer (survey data are included in Appendix C). Water level measurements were recorded daily during the week of 18 August 1997 and intermittently during the remainder of the investigation.

2.2 SOIL-GAS SURVEY

Soil-gas samples were collected from 71 locations from the unsaturated interval just above bedrock or groundwater. The survey was conducted between 20 and 27 August 1997, using truck- or van-mounted direct-push sampling equipment. One groundwater sample was also collected from Probehole B-62 and analyzed. Probeholes were advanced to refusal on bedrock based on results of the temporary piezometer installations. Each soil-gas sample, and the one groundwater sample, was analyzed for PCE, TCE, 1,2-DCA, and benzene using an on-site GC. Each probehole was abandoned by backfilling with granular bentonite. Soil-gas survey locations are shown on Figure 1-3.

A 62-point sampling grid was designed, using ELIPGRID PC software, as a guide to soil-gas sampling and to provide a known level of confidence in determining the source or sources within the grid. The initial soil-gas samples were collected near known areas of contamination near the former UST pit. Subsequent sample locations were selected by successively stepping out one grid node point in an attempt to determine the extent of contamination. Results of the soil-gas survey indicated that the area covered by the proposed grid was not adequate to determine sources or the extent of the chlorinated solvent contamination. In addition, several points within the initial 62 point sampling grid were not required (B-28, 33, 34, 37, 41, 43, 44, 45, 46, 49, 51, 53, 56, 58, and 60). The investigation was therefore expanded to include 27 additional points located 150 to 250 feet outside of the initial grid (locations designated B-63 through B-88). Soil-gas samples were obtained only from the outermost locations, resulting in five of the additional locations (B-63, B-65, B-67, B-69, and B-87) being excluded.

On 28 August 1997, Anderson Survey Company surveyed the horizontal locations and ground elevation for each soil-gas survey location. Survey data are included in Appendix C.

2.3 TEMPORARY MONITORING WELL INSTALLATION AND SAMPLING

Temporary monitoring well locations were selected based on soil-gas survey results and groundwater flow direction at the IFI study area. The locations were selected to obtain soil and groundwater analytical results that would satisfy one or more of the following objectives:

- characterize contamination within the plume
- define extent of the plume
- identify possible sources

On 11 and 12 September 1997, 16 soil samples were collected from 14 probeholes for on-site GC analyses of PCE, TCE, DCA, and benzene. Soil samples for analyses were selected based on the results of field screening of soil samples with a PID. Soil samples with the highest PID reading were selected for on-site GC analyses. The probeholes were continuously sampled using a Macrocore (four-feet by two-inch) sampler. Probehole logs are included in Appendix B. Probeholes were advanced to refusal on bedrock.

Two confirmation soil samples collected at Location T-05 and T-10 were submitted to Intertek Testing Services (ITS) for off-site laboratory analyses of VOCs, SVOCs, and target analyte list (TAL) metals.

Twelve of the 14 probeholes were completed as temporary monitoring wells. The sampling procedure produced a nominal two-inch probehole in which each temporary monitoring well was installed. A one-inch schedule 40 PVC riser pipe with a five-foot section of machine slotted screen (0.01 inch slots) was installed in each probehole. The temporary monitoring wells were screened in natural sand and granular bentonite was placed in the annulus as a surface seal. Temporary monitoring wells were completed with an above- ground stick up of two to three feet except Temporary Monitoring Wells T-2, T-4, and T-5, which were completed flush with the ground surface and covered with an eight-inch steel vault. Slip caps were locked on each temporary monitoring well.

On 22 September 1997, groundwater screening samples were collected from 9 temporary monitoring wells, five temporary piezometers, and four existing piezometers. The wells and piezometers were not purged before sampling. The decision not to purge was based on the fact that these were to be screening samples, which were to be analyzed in the field. In addition, the wells and piezometers were very slow to recharge and it was thought that they would not provide adequate recharge for purging. Each groundwater screening sample was collected using a disposable polyethylene mini-bailer and analyzed within 30 minutes of collection on-site with a portable gas chromatograph. Eighteen groundwater samples and one duplicate, were analyzed on-site for benzene, DCA, PCE, and TCE.

Groundwater samples were collected from Temporary Monitoring Well T-21 and Temporary Piezometer P-3 on 23 September 1997, and submitted to ITS for confirmation analyses of VOCs and SVOCs.

Temporary Monitoring Wells T-3, T-14, and T-15, Temporary Piezometers P-4 and P-6, and Piezometer PZ-B were not sampled on 22 September 1997 because groundwater was not present. However, the water table had risen in Temporary Piezometer P-4 and Piezometer PZ-B by 24 September 1997, apparently due to heavy rain in the area. Samples were collected from Temporary Piezometer P-4 and Piezometer PZ-B, packed on ice, and transported to the EPS office in Salina, Kansas for analyses within four hours. Each sample was analyzed for benzene, DCA, PCE, and TCE using the same methodologies as were used at the site on 22 September 1997 except for the holding time.

On 22 to 24 September 1997, Anderson Survey Company surveyed the horizontal locations and ground elevation for each temporary monitoring well (survey data are included in Appendix C). Water level measurements were recorded intermittently during the remainder of the investigation.

Upon completion of the investigation, BMcD abandoned the temporary piezometers and temporary monitoring wells in accordance with the SAP. Each probehole was abandoned by pulling the PVC pipe and backfilling with granular bentonite.

2.4 GROUNDWATER SAMPLING ACTIVITIES

Groundwater samples were collected from 12 existing monitoring wells near the former Building 354 site, the Pesticide Storage Facility, and the Main Post Landfill from 15 to 17 September 1997. The groundwater samples were analyzed at ITS for VOCs, SVOCs, and TAL metals. Before sampling, the monitoring wells were purged using a portable bladder pump or dedicated bladder pumps until pH, specific conductance, and temperature stabilized and turbidity was less than 30 nephelometric turbidity units (NTU).

One quality assurance (QA) sample was submitted to the USACE Chemistry and Materials Quality Assurance Laboratory. One quality control (QC) sample and a matrix spike/matrix spike duplicate (MS/MSD) were submitted to ITS for analyses. A rinsate sample was collected prior to using the portable bladder pump and after sampling Monitoring Well MW95-06. Additionally, trip blanks accompanied each cooler with VOC samples and a temperature blank accompanied all coolers.

2.5 INVESTIGATION DERIVED WASTE MANAGEMENT

Investigation derived waste (IDW) for this investigation included soil, water, and other disposable material such as nitrile gloves and acetate sampling liners. During the investigation, soil was stored on-site at the Public Works compound in Department of Transportation approved 55-gallon drums. The soil drums were subsequently removed to the recycling center at Camp Funston for temporary storage while awaiting a determination for proper disposal. Water used for decontaminating sampling equipment was also stored in a DOT-approved 55-gallon drum on-site. This IDW, plus purge water generated during the sampling of monitoring wells at the site, was subsequently placed in a holding tank for temporary storage at the pilot

study building at the Former Fire Training Area-Marshall Army Airfield (FFTA-MAAF). A sample of the IDW water was collected and subsequent analyses indicated that VOCs were not present in the liquid IDW. Based on the analytical results, the liquid IDW was emptied onto the ground surface west of the pilot study building at FFTA-MAAF on 25 November 1997. Solid waste generated during the investigation, including nitrile gloves, acetate core liners, and other material, was bagged daily and placed in a dumpster at Camp Funston for disposal.

* * * * *

3.0 INVESTIGATION RESULTS

3.1 SITE GEOLOGY

Information obtained during the IFI indicates that the soils are primarily alluvial sediments. These soils exhibit the classic upward-fining sequence typical of alluvial sediments, with coarse-grained sands at depth, grading upward into fine- to medium-grained sands, then fine-grained silts and clays near the surface. The general nature of the soil overburden was similar both in the Kansas floodplain borings and in those advanced in the higher terrace, to the northwest of the railroad grade. Most of the materials encountered are natural deposits; however, there was evidence that possible fill material was present in some locations, especially in the area to the west of Building 332. Temporary Piezometer P-03 had a significant iron-oxide-stained zone at a depth of approximately 29 feet below ground surface (bgs). This staining was possibly a result of the complete oxidation of buried iron debris. In Probehole T-11, a nail was recovered from the sampler shoe at a depth of approximately 20 feet bgs. This evidence suggested that an undetermined amount of fill, likely from a local source, was present in the area.

Sediments were deposited on calcareous shale or limestone bedrock. Bedrock elevations and depth to bedrock for the site are summarized in Table 3-1. Probeholes were advanced to refusal using a direct push method, with refusal assumed to be the top of bedrock. This was confirmed in logged boreholes based on the recovery of minimal amounts of limestone or shale at depth. The depth to bedrock ranged from 7.9 feet bgs in Probehole B-47 to 43.6 feet bgs in Temporary Monitoring Well T-1. Bedrock elevations ranged from 1022.3 feet above mean sea level (MSL) in Probehole B-80 to 1059.1 feet above MSL in Probehole B-35. The bedrock surface consisted of a relatively flat planar surface between an elevation of approximately 1055 to 1059 feet MSL, which underlies the area northwest of the Union Pacific Railroad grade. Southeast of the railroad grade, the bedrock surface dropped off steeply (approximately 25 to 35 feet) into the Kansas River floodplain. Figure 3-1 is a bedrock elevation map. A cross section of the site is included as Figure 3-2. The line of the cross-section is shown on Figure 3-1.

The bedrock at the IFI study area does not serve as an aquitard. The alluvium immediately adjacent to the IFI study area exerts the primary control on groundwater flow and thus, contaminant dispersion.

3.2 SITE HYDROGEOLOGY

The overburden aquifer at the site is a relatively thin, unconfined saturated zone above limestone and shale bedrock. Groundwater flows generally to the south, away from the bedrock high and toward the Kansas River floodplain.

On 23 September 1997, groundwater was encountered at depths ranging from 9.21 feet bgs in Piezometer P-04 to 38.23 feet bgs in Temporary Monitoring Well T-1. Groundwater elevations on 23 September 1997, ranged from 1067.29 feet above MSL in Piezometer PZ-A to 1039.25 feet above MSL in Monitoring Well HS97-1. In general, the water table conforms with the slope of the bedrock and ground surface with groundwater flowing to the south based on water levels measured during the investigation. Figure 3-3 shows the groundwater elevation map for 23 September 1997, and presents groundwater contours that are representative of the data collected during the investigation. Groundwater-level data are summarized in Table 3-2.

3.3 ANALYTICAL RESULTS

3.3.1 Soil-Gas Analytical Results

In August 1997, 71 soil-gas samples were collected just above groundwater or bedrock and analyzed for benzene, 1,2-DCA, TCE, and PCE using a mobile GC. Figures 3-4 through 3-7 illustrate the soil-gas sampling locations and results for each of the four analytes. Soil-gas analytical results are summarized in Table 3-3.

Benzene was detected in eight of 71 soil-gas samples at concentrations ranging from 5.7 micrograms per liter (µg/L) in Probehole B-38 to 203 µg/L in Probehole B-36a. 1,2-DCA was detected in 15 of 71 samples at concentrations ranging from 0.7 µg/L in Probehole B-70 to 78.2 µg/L in Probehole B-36a. TCE was detected in 11 of 71 samples at concentrations ranging from 1.0 µg/L in Probehole B-86 to 4.2 µg/L in Probehole B-21. PCE was detected in 53 of 71 samples at concentrations ranging from 0.2 µg/L in Probehole B-03 to 76.8 µg/L in Probehole B-11. Soil-gas survey results are included in Appendix D.

3.3.2 On-Site Analytical Results for Soil

In September 1997, 16 soil samples were collected at the site during installation of the temporary piezometers and analyzed for benzene, 1,2-DCA, TCE, and PCE using a mobile GC. Soil samples for analyses were

selected based on the results of field screening of soil samples with a PID. Soil samples with the highest PID reading were selected for on-site GC analyses. As exceptions, two soil samples each were collected from Probehole T-10 and from Probehole T-7 and analyzed with the on-site GC. Figure 3-8 and 3-9 illustrate the soil sample locations and analytical results. On-site soil analytical results are summarized in Table 3-4.

Benzene was detected in three of 16 samples at concentrations ranging from 7.0 micrograms per kilogram (µg/kg) in Probehole T-07 (sample depth 23 feet) to 2,899 µg/kg in Probehole T-05 (sample depth 24 feet). 1,2-DCA was detected in seven of 16 samples at concentrations ranging from 1.9 µg/kg in Probehole T-07 (sample depth 23 feet) to 35.9 µg/kg in Probehole T-05 (sample depth 24 feet). TCE was detected in two of 16 samples at concentrations ranging from 7.8 µg/kg in Probehole T-05 (sample depth 24 feet) to 11.3 µg/kg in Probehole T-09 (sample depth 19 feet). PCE was detected in five of 16 samples at concentrations ranging from 2.2 µg/kg in Probehole T-01 (sample depth 39 feet) to 42.8 µg/kg in Probehole T-15 (sample depth 17 feet). The one detection of 2,899 µg/kg of benzene slightly exceeded the KDHE Non-Residential Interim Remedial Guidelines (IRGs) of 2,000 µg/kg. No other samples exceeded Non-Residential IRGs for any other compounds. On-site soil results are included in Appendix D.

3.3.3 On-Site Analytical Results for Groundwater

In September 1997, 19 groundwater samples were collected from 14 temporary piezometers, four permanent piezometers, and one probehole. Samples were analyzed for benzene, 1,2-DCA, TCE, and PCE using a mobile GC. Refer to Section 4.2 and Appendix B of the Sampling and Analysis Plan for sample collection and analysis procedures (BMcD 1997). Figures 3-10, 3-11, and 3-12 illustrate the groundwater sample locations and analytical results. On-site groundwater analytical results are summarized in Table 3-5.

Benzene was detected in five of 19 groundwater samples at concentrations ranging from 2.4 µg/L in Piezometer PZ-A to 135 µg/L in Probehole B-62. Four groundwater samples were above the USEPA MCL for benzene of 5 µg/L. DCA was detected in 18 of 19 samples at concentrations ranging from 0.2 µg/L in Piezometer PZ-D to 52 µg/L in Probehole B-62. 1, 2-DCA levels in 10 of the samples equaled or exceeded the MCL of 5 µg/L. TCE was detected in 12 of 19 samples at concentrations ranging from 0.8 µg/L in Temporary Monitoring Well T-08 to 7.9 µg/L in Temporary Piezometer P-03. TCE levels in three of the samples exceeded the MCL of 5 µg/L. PCE was detected in 14 of 19 samples at concentrations ranging from 0.8 µg/L in Temporary Monitoring Well T-05 to 200 µg/L in Temporary Piezometer P-03. PCE levels in 9

of the samples exceeded the MCL of 5 µg/L. On-site analytical results for groundwater are included in Appendix D.

3.3.4 Off-Site Laboratory Confirmation Analytical Results for Soil and Groundwater

In September 1997, two soil samples were collected at the locations of Temporary Monitoring Wells T-05 (sample depth 18 to 19 feet) and T-10 (sample depth two to four feet). The soil samples were analyzed for VOCs, SVOCs, and TAL metals by an off-site laboratory to confirm the analytical results from the on-site GC analyses. Off-site analysis of soil from Temporary Monitoring Well T-05 indicated the presence of several VOCs, including xylene, ethylbenzene, and toluene; however, benzene was not detected. This does not compare to the level of benzene (2,899 µg/kg) detected in the on-site GC analyses. EPS re-examined the digital chromatogram for on-site soil analyses for Temporary Monitoring well T-05 and confirmed that the analyte detected at 2,899 µg/kg was benzene as reported. In addition, the chain-of-custody forms and laboratory data sheets were checked and it was confirmed that the sample was not mislabeled. This information, along with routine QC checks on the field GC, indicates that the benzene detection in the on-site soil sample is valid. On-site analyses of soil from Temporary Monitoring Well T-10 indicated only the presence of 8.3 µg/kg of 1,2-DCA (no PCE, TCE, or benzene). This compares favorably (except for 1, 2-DCA) to the laboratory analyses which did not detect the presence of any VOCs. Off-site laboratory soil analytical results (positive detections) are summarized in Table 3-6. None of the positive detections from off-site analyses exceeded the KDHE Non-Residential IRGs for soil, except for xylene in Temporary Monitoring Well T-05.

Two groundwater samples were collected from Temporary Piezometer P-03 and Temporary Monitoring Well T-21 during September 1997 for off-site laboratory analysis of VOCs and SVOCs. The purpose of the samples was to confirm analytical results from the on-site GC analyses. Results of the off-site analyses of groundwater collected at Temporary Piezometer P-03 indicated a PCE level of 172 µg/L and no detections of any other VOCs. This compares favorably to the on-site analytical result for that sample point of 200 µg/L of PCE and low levels of TCE and benzene (7.9µg/L and 6.6 µg/L, respectively). Off-site laboratory results for groundwater collected from Temporary Monitoring Well T-21 indicated the presence of 13.8 µg/L of cis-1,2-dichloroethene (cis-1,2-DCE) and no detections of any other VOCs. This compares favorably to the on-site analytical results of only low levels of VOCs (7.0 µg/L for 1,2-DCA; 2.0 µg/L for TCE; and 2.3 µg/L for

PCE). Positive detections from the off-site laboratory groundwater analytical results are summarized in Table 3-7. Only the concentration of PCE at Temporary Piezometer P-03 exceeded the USEPA MCL. Off-site analytical results are presented in Attachment 1.

3.3.5 Off-Site Laboratory Analytical Results for Groundwater

In September 1997, groundwater samples were collected from 12 existing monitoring wells. Each groundwater sample was analyzed for VOCs, SVOCs, and TAL metals by an off-site laboratory. Figure 3-13 illustrates the water sample locations and VOC results. Positive detections are summarized in Table 3-8.

Arsenic was detected at a concentration of 0.0645 mg/L in Monitoring Well TS02092-02 which exceeds the USEPA MCL for arsenic. All other positive metal detections in groundwater were below the USEPA MCLs.

Benzene was detected in Monitoring Well TS02092-02 at a concentration of 25.1 µg/L which exceeds the USEPA MCL for benzene (5 µg/L). PCE was detected in Monitoring Wells TS02092-01 (53.8 µg/L) and MW95-06 (47.4 µg/L) at concentrations exceeding the USEPA MCL (5 µg/L for PCE). No other VOCs or SVOCs were detected above MCLs. Off-site analytical results are presented in Attachment 1.

3.3.6 On-Site Laboratory Analytical Results Quality

During the investigation a field GC was used to analyze soil-gas, soil, and groundwater screening samples on-site. The GC was calibrated on a daily basis at minimum. Duplicates and field blanks were collected to insure quality of results. Additional evidence of no cross contamination of the GC between samples is the fact that non detects or estimated values below the reporting limits were detected throughout the investigation. Results of the duplicates and field blanks results indicate that the on-site analytical results are usable as screening samples. Duplicate and field blank results are presented in Tables 3-3, 3-4, and 3-5, and in Appendix D.

* * * * *

4.0 DATA QUALITY EVALUATION

This section presents the results of the QC evaluation performed on the data and the associated field QC results. Data with QC results that do not meet QC criteria are discussed in the following subsections. The reporting of analytical results is based on the practical quantitation limit (PQL); however, positive results above the method detection limit (MDL) but below the PQL were reported as estimated (J) by the laboratory.

Performance of calibration, tuning, and maintenance of laboratory equipment was the responsibility of Intertek Testing Services, Inc. (ITS). ITS was also responsible for ensuring that backup systems and equipment were available, as required by the United States Environmental Protection Agency (USEPA) under *Test Methods for Evaluating Solid Waste* (SW-846 (USEPA, 1986)) protocol. The laboratory did not report any problems in these areas.

Data obtained from on-site analyses were not reviewed as part of the QC evaluation.

4.1 ANALYTICAL METHODS

Table 4-1 presents the analytical methods which were used for the samples collected at the site. All samples were analyzed by the methods requested.

4.2 DATA EVALUATION

The analytical data were evaluated using any SW-846 method-specific QA/QC criteria in conjunction with USACE Kansas City District's CEMRK-EP-ES Data Quality Evaluation Guidance (March 26, 1997). When SW-846 method-specific QA/QC criteria or USACE guidance were unavailable, data validation was performed following the guidelines presented in the *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review* (NFGO (USEPA, 1993)) and the *USEPA Contract Laboratory National Functional Guidelines for Inorganic Data Review* (NFGI (USEPA, 1994)). The data quality parameters examined as part of the QC evaluation were precision, accuracy, representativeness, completeness, and comparability (PARCC). Each of the PARCC parameters is discussed in the following subsections.

4.2.1 Precision

Precision is a measure of the reproducibility of measurements made under a set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared with their average value. This relative percent difference (RPD) is calculated as follows:

$$RPD = \frac{|(D_1 - D_2)|}{(D_1 + D_2)/2} \times 100\%$$

Where: RPD = Relative percent difference
D_1 = First duplicate value
D_2 = Second duplicate value

Precision is assessed through matrix spike/ matrix spike duplicate (MS/MSD), laboratory control sample/ laboratory control sample duplicate (LCS/LCSD), and inorganic duplicate analyses.

4.2.1.1 LCS/LCSD Analyses

For the LCS/LCSD analyses, compounds of interest are spiked into two portions of a sample of clean matrix. The LCS/LCSD samples are then prepared and analyzed by the same method as the field samples. Precision is measured by the RPD between the results for the spike and its duplicate. LCS/LCSD samples are performed at a frequency of at least once per analytical batch, up to a maximum of 20 samples.

All LCS/LCSD RPDs were within QC limits.

4.2.1.2 Inorganic Laboratory Duplicate Analyses

For inorganic laboratory duplicates, a field sample is split into two portions and analyzed. The results of these two analyses are compared against each other for reproducibility using the RPD equation.

The inorganic laboratory duplicate RPD for barium (26.8 percent) in QC batch AC201-02 exceeded the 25 percent maximum RPD established by ITS. As such, the barium result for the associated sample 354T5/S02 was qualified as estimated (J*).

The inorganic laboratory duplicate RPD for lead (25.7 percent) in QC batch AC202-36F exceeded the 25 percent maximum RPD established by ITS. As such, the lead results for associated samples 354T10/S01 and 354T10/S04 were qualified as estimated (J*).

All other inorganic Duplicate RPDs were within QC limits.

4.2.1.3 MS/MSD Analyses

For the MS/MSD analyses, compounds of interest are spiked into two portions of a field sample. The MS/MSD samples are then prepared and analyzed by the same methods as the field samples. Precision is measured as the RPD between the results for the spike and its duplicate. MS/MSD samples are performed at a frequency of at least one per analytical batch, up to a maximum of 20 samples. Table 4-2 presents the MS/MSD results which did not meet QC limits and any data qualification which was required.

For the MS/MSD performed on QC batch AC201-56, the magnesium and silver RPDs (25.6 and 23 percent, respectively) exceeded the 20 percent RPD maximum. As such, the magnesium and silver results for associated samples 354R/W01 and TS020292-02/W01 were qualified as estimated (J*).

4.2.2 Accuracy

Accuracy is a measure of the deviation of a measurement from its true value. Laboratory analytical accuracy is assessed by two approaches; recovery studies (MS/MSD, LCS/LCSD, and surrogate results) and method blank analyses. Sampling accuracy is assessed by examining the results of submitted field QC samples, including rinsate blanks. Possible sources of error include inconsistent sampling or analytical procedures and laboratory or field contamination.

4.2.2.1 Method Blank Analyses

Method blanks are expected to have no positive detections. As specified in NFGI and NFGO, any laboratory method blanks with positive detections are used to qualify the data for the associated field samples. The field samples results are qualified as undetected (U*) if the value in the sample is less than five times the value in the associated laboratory method blank. For the common laboratory contaminants of acetone, 2-butanone, methylene chloride, and common phthalate esters, the results are qualified as undetected (U*) if the field sample value is less than 10 times the concentration in the associated laboratory blank.

Butyl benzyl phthalate (0.183 J mg/Kg) was detected in the SVOC method blank associated with QC batch AC195-27. Since the butyl benzyl phthalate result was undetected for associated sample 354T05/S02, no qualification was necessary. Sample 354T05/S02 was the only sample associated with this method blank.

Zinc (1.77 J mg/Kg) was detected in the method blank associated with the QC batch AC201-43. Since the zinc result for associated sample 354T05/S02 (12.1 mg/Kg) was greater than five times the zinc result in the method blank, qualification was not necessary. Sample 354T05/S02 was the only sample associated with this method blank.

4.2.2.2 Rinsate Blanks

Rinsate blanks are collected to identify any carry over of contaminants due to insufficient decontamination techniques. In accordance with the recommendations of USACE guidelines, field samples which contained less than five times the concentration contained in the rinsate blank were qualified as undetected (U*). For common laboratory contaminants (acetone, methylene chloride, 2-butanone, phthalate esters), field samples which contained less than 10 times the concentration in the rinsate blank were qualified as undetected (U*). Field samples which contained detections which were greater than five times (or 10 times for common laboratory contaminants) the rinsate blank concentrations were indicated by adding a qualifier (F).

Two rinsate blanks, sample 354R/W01 and MW95-06/W01R were collected. The positive results and associated samples for these rinsate blanks are presented in Table 4-3.

Silver and calcium (0.0022 J mg/L and 0.50 mg/L, respectively) were detected in rinsate blank MW95-06/W01R. The calcium results were greater than five times the rinsate blank. Thus, the following associated samples were "F" qualified for calcium: MW95-06/W02, MPL94-01/W01, MW95-06/W01, and TS02092-02/W01. The silver results were all undetected, thus no qualification was necessary.

Arsenic and sodium (0.0016 mg/L and 0.90 mg/L, respectively) were detected in rinsate blank 354R/W01. Since the arsenic results were less than five times the method blank, the following associated samples were qualified as undetected (U*) for arsenic: MPL94-02/W01, PSF92-05/W01, MW95-04/W01, and PSF92-03/W01. The sodium results were greater than five times the rinsate blank. Thus, the following associated

samples were "F" qualified for sodium: MPL94-02/W01, PSF92-05/W01, MW95-04/W01, PSF92-03/W01, PSF92-02/W01, and PSF92-04/W01.

4.2.2.3 Trip Blanks

Trip blanks are analyzed for VOCs to determine if any volatiles diffused through the container septum due to site, shipping, or laboratory conditions. The laboratory prepares trip blanks as high-performance liquid chromatography water samples and sends them to the field along with the containers for sample collection. One trip blank is included in each cooler which contains samples for VOC analyses. In accordance with the recommendations of USACE guidelines, field samples which contained less than five times the concentration contained in the trip blank were qualified as undetected (U*). For common laboratory contaminants (acetone, methylene chloride, 2-butanone, phthalate esters), field samples which contained less than 10 times the concentration in the trip blank were qualified as undetected (U*). Field samples which contained detections which were greater than five times (or 10 times for common laboratory contaminants) the rinsate blank concentrations were indicated by adding a qualifier (T).

Bromoform (1.60 J µg/L) was detected in trip blank TB091597/TB1. This trip blank was associated with samples MW95-03/W01 and MPL94-03/W01. Since the bromoform results from the associated samples were undetected, qualification was not necessary.

4.2.2.4 LCS Analyses

Accuracy of the analytical methodologies is also assessed by examining the percent recovery (REC) of the spiking compounds. The LCS contains a matrix similar to that of the sample which has been spiked with known concentrations of target analytes. As a measure of accuracy, the results of the LCS are compared against the known concentrations in the spike to determine REC. The purpose of the LCS analysis is to determine the performance of the laboratory, independent of field sample matrix interferences. REC limits are determined by the laboratory in accordance with procedures outlined in the analytical method.

All LCS and LCSD RECs were within QC limits.

4.2.2.5 Surrogates

Surrogates are added for organic analyses. Surrogate analysis of organic compounds gives a measure of the laboratory performance on individual samples. Surrogates are compounds not normally found in the environment which are added (spiked) into the samples and analyzed for REC. REC limits are determined by the laboratory in accordance with procedures outlined in the analytical method.

The dibromofluoromethane surrogate REC (125 percent) for sample MPL94-03/W01 exceeded the 120 percent QC maximum. In accordance with USACE guidance, the VOC results for sample MWPL94-03/W01 were qualified as rejected (R).

The dibromofluoromethane surrogate REC (124 percent) for sample MW95-03/W01MS exceeded the 120 percent QC maximum REC. This sample was the matrix spike for VOC QC batch 970918001A. Since all MS/MSD criteria was met, no qualification was necessary.

All other SVOC and VOC surrogate RECs were within QC limits.

4.2.2.6 MS/MSD Analyses

Matrix spike analyses are run to examine the accuracy of an analytical method for a particular matrix. Accuracy of the spiked sample is assessed by determining RECs as previously discussed. Perfect accuracy would give a REC of 100 percent. REC limits are determined by the laboratory in accordance with procedures outlined in the analytical method. USACE guidelines suggest corrective action be taken when MS/MSD results fall outside of QC limits. ITS was contracted prior to the implementation of the USACE corrective action guidelines. As such, ITS was only required to follow guidelines presented in the appropriate SW-846 method. However, when a USACE recommended corrective action was not conducted, the associated sample results were qualified as rejected (R). Table 4-2 presents the MS/MSD results which did not meet QC limits and any data qualification which was required. A discussion of MS/MSD results falling outside of QC limits follows.

The aluminum MS/MSD performed on QC batches AC202-98, AC202-17, and AC201-02 had spike levels which were less than one-fourth of the sample value. Thus, no conclusion can be made regarding the

accuracy of these MS/MSD analyses. Samples 354T10/S01 and 354T10S04 were associated with these QC batches.

The antimony MS and MSD RECs for QC batches AC202-17F and AC202-98F fell below the 60 percent QC minimum. Since no corrective measures were conducted, the antimony results for associated samples 354T10/S04 and 354T10/S01 were qualified as rejected (R).

The antimony MS and MSD RECs for QC batch AC201-51F fell below the 60 percent QC minimum established by ITS. Since the MSD REC (29.6 percent) fell below the NFGI QC minimum of 30 percent, the undetected antimony result for sample 354T05/S02 was qualified as rejected (R).

The arsenic MS and MSD RECs (68.5 and 70.3 percent, respectively) for the MS/MSD performed on QC batch AC210-93F fell below the 80 percent QC minimum. Since no corrective measures were conducted, all arsenic results for the following associated samples were qualified as rejected (R): MW95-06/W02, MW95-06/W01R, MPL94-01/W01, and MW95-06/W01.

The arsenic MS and MSD RECs (24 and 27.4 percent, respectively) for the MS/MSD performed on QC batch AC202-36F fell below the 75 percent QC minimum. In accordance with the recommendations of the NFGI, all associated sample arsenic results were qualified as rejected (R). Associated samples 354T10/S01 and 354T10/S04 were qualified as rejected (R).

The calcium MS/MSD performed on QC batches AC202-25, AC201-56, and AC202-17 had spike levels which were less than one-fourth the sample value. As such, no conclusion can be made regarding the accuracy of these MS/MSD analyses. The following samples were associated with these QC batches: MW95-03/W01, 354R/W01, 354T10/S01, and TS02092-02/W01.

The iron MS/MSD performed on the following QC batches had spike levels which were less than one-fourth the sample concentration: AC202-98, AC202-17, AC201-56, and AC201-02. As such, no conclusion can be made regarding the accuracy of these MS/MSD analyses. The following samples were associated with these QC batches: 354T10/S01, 354T10/S04, 354R/W01, TS02092-02/W01, and 354T05/S02.

The lead MS and MSD RECs (49.8 and 47.7 percent, respectively) for the MS/MSD performed on QC batch AC210-93F fell below the QC minimum of 80 percent. Since no corrective measures were conducted, all lead results for the following associated samples were qualified as rejected (R): MW95-06/W02, MW95-06/W01R, MPL94-01/W01, and MW95-06/W01.

The lead MS and MSD RECs (167 and 202 percent, respectively) performed on QC batch AC202-36F exceeded the QC maximum limit of 125 percent. The corrective action prescribed by USACE guidelines was not conducted. In accordance with USACE guidance, the lead results for samples 354T10/S01 and 354T10/S04 were qualified as rejected (R).

The spike level for the lead MS/MSD performed on QC batch AC201-60F was less than one-fourth the sample concentration. Thus, no conclusion can be made concerning the accuracy of this MS/MSD analysis. Sample 354T05/S02 was the only sample associated with this QC batch.

The spike level for the magnesium MS/MSD performed on QC batch AC202-25 and AC202-17 was less than one-fourth the sample value. As such, no conclusion can be made regarding the accuracy of this MS/MSD analysis. Samples MW95-03/W01 and 354T10/W01 were associated with these QC batches.

Both the MS and MSD RECs were 67 percent for the potassium MS/MSD analysis performed on QC batch AC202-17 which fell below the 75 percent QC minimum. The corrective action prescribed by the USACE guidelines was not conducted. In accordance with USACE guidance, the associated potassium result for sample 354T10/S04 was qualified as rejected (R).

The MS and MSD RECs (76 and 79 percent, respectively) performed on selenium QC batch AC201-75F fell below the QC minimum REC of 80 percent. The corrective action prescribed by the USACE guidelines was not conducted. In accordance with USACE guidance, the following associated sample results were qualified as rejected (R): MW95-03/W01, MPL94-03/W01, 354R/W01, TS02092-02/W01, MPL94-02/W01, PSF92-05/W01, MW95-04/W01, PSF92-02/W01, PSF92-03/W01, PSF92-04/W01, and TS02092-01/W01.

The silver MS and MSD RECs (42.1 and 53 percent, respectively) performed on QC batch AC201-56 fell below the QC minimum REC of 70 percent. The corrective action prescribed by the USACE guidelines was

not conducted. In accordance with USACE guidance, the silver results for samples 354R/W01 and TS02092/W01 were qualified as rejected (R).

The spike level for the sodium MS/MSD performed on QC batch AC202-25 was less than one-fourth the sample value. Thus, no conclusion can be made regarding the accuracy of this MS/MSD analysis. Sample MW95-03/W01 was the only sample associated with this QC batch.

The MS and MSD RECs (64 and 64.8 percent, respectively) for the thallium MS/MSD performed on QC batch AC210-93F fell below the QC minimum REC of 80 percent. The corrective action prescribed by the USACE guidelines was not conducted. In accordance with USACE guidance, the thallium results for following associated samples were qualified as rejected (R): MW95-06/W02, MW95-06/W01R, MPL94-01/W01, and MW95-06/W01.

The MS and MSD RECs (71.3 and 70.3 percent, respectively) for the thallium MS/MSD performed on QC batch AC201-75F fell below the 80 percent QC minimum. The corrective action prescribed by the USACE guidelines was not conducted. In accordance with USACE guidance, the thallium results for the following associated samples were qualified as rejected (R): MW95-03/W01, MPL94-03/W01, 354R/W01, TS02092-02/W01, MPL94-02/W01, PSF92-05/W01, MW95-04/W01, PSF92-02/W01, PSF92-03/W01, PSF92-04/W01, and TS02092-01/W01.

The MS REC (73.3 percent) for the thallium MS/MSD performed on QC batch AC201-60F fell below the QC minimum REC of 75 percent. The corrective action prescribed by the USACE guidelines was not conducted. Since the MS REC fell slightly below the QC limit, the thallium result for associated sample 354T05/S02 was qualified as estimated (J*).

The pyrene MS and MSD RECs (139 and 123 percent, respectively) for the VOC MS/MSD performed on QC batch AC195-27 exceeded the QC maximum of 115 percent. In accordance with USACE guidance, the pyrene results for sample 354T-5/S02 was qualified as rejected (R).

4.2.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent the nature and extent of contamination at a site. Data qualified as rejected (R) are considered nonrepresentative. Representativeness is addressed by explaining the rationale used to select sampling locations and analytical parameters. The rationale for the selection of sampling locations was presented in the work plan.

The antimony result for Sample 354T05/S02 was qualified as rejected (R) based on NFGI guidance. The arsenic results for sample 354T10/S01 and 354T10/S04 were qualified as rejected (R) based on NFGI guidance. In addition, there were 101 analytes which were qualified as rejected (R) based on USACE guidance. Therefore, these results are non-representative of site conditions.

Representativeness is further assessed through evaluation of field duplicate samples. Field duplicate results provide information on the ability to reproduce field results and account for error introduced from handling, shipping, storage, preparation, and analysis of field samples. In accordance with USACE Guidance, the following guidelines have been applied to field duplicates:

- Was the compound detected in both samples?

- Was the difference between sample results and its duplicate results for inorganic analyses less than a factor of two? If not, did the difference fall between a factor of two and three (minor discrepancy)? Or was the difference greater than a factor of three (major discrepancy)?

- Was the difference between sample results and its duplicate results for organic soil analyses less than a factor of four? If not, was the difference between a factor of four and five (minor discrepancy)? Or was the difference greater than a factor of five (major discrepancy)?

- Was the difference between sample results and its duplicate results for organic groundwater analyses less than a factor of two? If not, did the difference fall between a factor of two and three (minor discrepancy)? Or was the difference greater than a factor of three (major discrepancy)?

Tables 4-4 and 4-5 present the soil and groundwater field duplicate results, respectively. Field duplicate samples were collected for soil sample 354T10/S01 and groundwater sample MW95-06/W01. All results met USACE field duplicate criteria. Therefore, adequate replication was noted for both field duplicate pairs.

4.2.4 Completeness

Completeness defines the percentage of performed measurements which are judged to be valid measurements. Overall completeness is assessed by comparing the number of samples yielding valid data to the number of samples planned for collection.

All samples were collected as planned. The antimony results for sample 354T05/S02 and the arsenic results for samples 354T10/S01 and 354T10/S04 were qualified as rejected (R) based on the recommendations of the NFGI. In addition, there were 101 analytes which were qualified as rejected (R) based on USACE guidance. The overall completeness is presented in Table 4-6. The overall completeness for the sampling activities at the site was 96.5 percent.

4.2.5 Comparability

Comparability expresses the confidence with which one set of data may be compared with another. To address comparability, the standard techniques used to collect and analyze representative samples are evaluated. ITS used standard analytical procedures for samples taken from the site; thus, the data are comparable to past and future investigations using the same procedures.

4.3 DATA USABILITY SUMMARY

The data generated during this investigation were evaluated with respect to precision, accuracy, representativeness, completeness, and comparability. There were 104 analytes which were qualified as rejected (R) during the data review. With these exceptions, the data collected during are useable (as qualified) for the objectives of the investigation. The effects and significance of qualified data are discussed in section 4.2.

*****

5.0 CONCLUSIONS

Results of the IFI at former Building 354 are presented in this section. The following conclusions are based on the results of the on-site analyses, off-site laboratory analyses, and observations made during the field investigation.

5.1 Benzene and 1,2-DCA

Soil

The results of the soil-gas survey indicated the presence of benzene and 1,2-DCA in an area approximately 100 feet by 150 feet near the former Building 354 (see Figure 3-4 and 3-5). The highest soil-gas results for benzene and 1,2-DCA were detected at Probehole B-36a (203 µg/L and 78.2 µg/L, respectively), immediately downgradient of the former UST facility at former Building 354. Results of the on-site soil sample analyses confirmed the presence of contamination in an area similar to the area defined by soil-gas results (see Figure 3-8). The on-site detection of 2,899 µg/kg of benzene in soil at Temporary Monitoring Well T-05 slightly exceeded the KDHE Non-Residential IRGs for soil of 2,000 µg/kg; however, benzene was not detected in the off-site laboratory analyses of this sample.

On-site analyses of soil samples collected during the installation of temporary monitoring wells showed the presence of 1,2-DCA. However, confirmation soil samples submitted for off-site analyses did not detect 1,2-DCA above the detection limits. Xylene was detected above the KDHE Non-Residential IRG.

The probable source of this contamination is the former UST facility at former Building 354. An additional source may be the former fuel unloading facility at the northeast corner of Marshall Avenue and the Union Pacific Railroad (see Figure 1-3). Results of the analyses of all soil-gas and soil samples indicated the presence of benzene and 1,2-DCA in an area approximately 100 feet by 150 feet near former Building 354 (see Figure 3-4 and 3-5).

Water

Results of on-site analyses of groundwater indicated the presence of benzene above the USEPA MCL (5.0 µg/L) in the area immediately downgradient of the previous UST facility at former Building 354. Benzene was detected in 5 of the 18 samples. The highest concentration of benzene in groundwater was detected at

Probehole B-62 (135 µg/L). Benzene was not detected in the two confirmation samples collected for off-site analyses. Results of the off-site laboratory analyses showed 25.1 µg/L benzene in a groundwater sample collected from existing Monitoring Well TS0292-02 (see Figure 3-10). Benzene was not detected in any other monitoring wells.

On-site analyses of groundwater also indicated the presence of 1,2-DCA above the USEPA MCL (5.0 µg/L) in the areas indicated on Figure 3-10. 1,2-DCA was detected in all of the 18 groundwater samples analyzed on-site. Concentrations of 1,2-DCA were less than 5 µg/L in 9 of the 18 samples. 1,2-DCA was not detected above the detection limit of 5µg/L in the two confirmation samples collected and analyzed by the off-site laboratory. In addition, 1,2-DCA was not detected in the off-site laboratory analyses of groundwater samples collected from three monitoring wells (TS0292-01, TS0292-02, and MW95-06) located within the extent of the on-site detections of 1,2-DCA (see Figure 3-10).

Results of the groundwater analyses indicated the presence of benzene and 1,2-DCA in an area approximately 100 feet by 150 feet downgradient of the former UST facility at former Building 354 (see Figure 3-10). The probable source for this contamination was the former UST facility at former Building 354. Additionally, a former fuel unloading facility at the northeast corner of Marshall Avenue and the Union Pacific Railroad may have been a source.

5.2 PCE and TCE

Soil

The soil-gas survey indicated the presence of TCE and PCE in an area illustrated on Figure 3-6 and 3-7. The highest soil-gas results for PCE and TCE were detected at Locations B-11 (76.8 µg/L PCE and 3.2 µg/L TCE) and B-21 (73.9 µg/L PCE and 4.2 µg/L TCE). On-site analyses detected PCE in soil samples collected during the installation of Temporary Monitoring Wells T-01, T-05, T-09, T-12, and T-15. In addition, TCE was detected in soil samples collected from Temporary Monitoring Wells T-05 and T-09. PCE and TCE concentrations in soil are illustrated on Figure 3-9.

The extent of the PCE soil gas detections near former Building 354 appears to be partially defined. The areas north of Probeholes B-74 and B-86, north of Building 300, and south of Probehole B-83 have insufficient data to determine the extent. TCE detections in groundwater appear in small isolated areas within the larger

area of PCE detections. The probable source for the PCE and TCE contamination encountered during this investigation was the solvent storage tank located near former Building 354, waste management activities near Building 332, and unknown sources north of Buildings 330 and 300.

Water

On-site groundwater analyses detected TCE and PCE above the USEPA MCL (both 5.0 µg/L) in the areas identified on Figures 3-11 and 3-12 . The highest concentrations were detected at Temporary Piezometer P-03 (200 µg/L PCE and 7.9 µg/L TCE). This temporary piezometer is near Probeholes B-11 and B-21 where the highest levels of PCE and TCE were detected during the soil-gas survey. (Probeholes B-11 and B-21 are located approximately 105 feet east and southeast, respectively, of Temporary Piezometer P-03).

Off-site laboratory analyses were conducted on groundwater samples collected from Temporary Piezometer P-03 and Temporary Monitoring Well T-21. Results showed PCE at a similar but lower concentration of 172 µg/L (on-site analytical result for PCE was 200 µg/L). Cis-1,2-DCE , a common degradation product of PCE and TCE, was detected below the USEPA MCL (70 µg/L) in the sample from Temporary Monitoring Well T-21.

On-site analyses also indicated PCE above the USEPA MCL in Piezometer PZ-C and PZ-D. In addition, TCE was detected at Temporary Monitoring Well T-08, however, the detection was below the USEPA MCL.

The extent of the PCE groundwater detections near former Building 354 appears to be partially defined. There is insufficient data to determine the extent of PCE in the areas north of Building 300 and 330 and south of Temporary Piezometer P-05. TCE detections in groundwater appear in small isolated areas within the larger area of PCE detections. The extent of TCE and PCE detections in groundwater encountered covers an area similar to the extent of the soil-gas detections. The probable source for the PCE and TCE contamination encountered during this investigation was the solvent storage tank located near former Building 354, waste management activities near Building 332, and unknown sources north of Buildings 330 and 300.

The southeastern extent of PCE detections above the USEPA MCL is somewhat defined (see Figure 3-12); however results of on-site analyses of groundwater also indicated the presence of PCE at levels above the USEPA MCL at Piezometer PZ-C and PZ-D. Piezometers PZ-C and PZ-D are located south of several non

detects and detections below the USEPA MCL for PCE (see Figure 3-12) and the source of these detections may or may not be associated with former Building 354.

5.3 Monitoring Well Sampling Results for Main Post Landfill and Pesticide Storage Facility

Results of the off-site laboratory analyses of groundwater collected from Monitoring Wells associated with the Main Post Landfill and Pesticide Storage Facility indicated the following:

- VOCs, SVOCs, and metals were not detected above USEPA MCLs in the monitoring wells sampled at the Main Post Landfill, and the Pesticide Storage Facility.
- Results indicated the presence of several contaminants above USEPA MCLs in monitoring wells associated with former Building 354. Arsenic was detected at a concentration of 0.0645 mg/L in Monitoring Well TS02092-02. This exceeds the USEPA MCL (0.05 mg/L) for arsenic. All other positive metal detections in groundwater were below USEPA MCLs. Benzene was detected in sample TS02092-02 at a concentration of 25.1 µg/L, which exceeds the USEPA MCL (5.0 µg/L). As discussed previously, PCE was detected in Monitoring Wells TS02092-01 (53.8 µg/L) and MW95-06 (46 µg/L) at concentrations in excess of the USEPA MCLs. Cis-1,2-DCE was detected below the USEPA MCL in Monitoring Well TS02092-02.

* * * * *

6.0 REFERENCES

Burns & McDonnell Engineering Company, Inc. (BMcD), 1997, *Final Sampling and Analysis Plan for the Initial Field Investigation of Former Building 354 at Fort Riley, Kansas*

Dames & Moore, 1995, *Building 354 Site Investigation: POL UST Investigations/Remedial Action Plans, Fort Riley, Kansas*, 4 August 1995.

Jantz, D.R., R.F. Harmer, H.T. Rowland, and D.A. Gier, 1975, *Soil Survey of Riley County and Part of Geary County, Kansas*, United States Department of Agriculture, Soil Conservation Service.

Jewett, John M., 1941, *The Geology of Geary and Riley Counties, KS.* University of Kansas Publications, Bulletin 39. December.

Louis Berger & Associates, Inc (LBA), 1996a, *Data Summary Report for Confirmation Groundwater Sampling: Main Post Solvent Detection Site, Fort Riley, Kansas*, 21 June 1996.

Louis Berger & Associates, Inc (LBA), 1996b, *Data Summary Report for Confirmation Groundwater Sampling: Main Post Landfill, Fort Riley, Kansas*, 21 June 1996.

Louis Berger & Associates, Inc (LBA), 1996c, *Data Summary Report for Confirmation Groundwater Sampling: Pesticide Storage Facility, Fort Riley, Kansas*, 21 June 1996.

Louis Berger & Associates, Inc (LBA), 1996d, *Data Summary Report for Confirmation Groundwater Sampling: Building 354 Solvent Detection Area (Main Post Landfill, Pesticide Storage Facility, and Main Post Solvent Detection Site), Fort Riley, Kansas*, 21 June 1996.

Louis Berger & Associates, Inc (LBA), 1992, *Draft Final Installation Wide Site Assessment for Fort Riley, Kansas*, 7 December 1992.

Merriam, Daniel F., 1963, *The Geologic History of Kansas*, State Geological Survey of Kansas, Bulletin 162. December.

United States Army Corps of Engineers (USACE), 1995, *Preliminary Evaluation of Data: Building 354 Solvent Detections, Fort Riley, Kansas*, 30 June 1995.

United States Army Corps of Engineers (USACE), 1996, *Scope of Work: Limited Site Investigation, Former Building 354, Contract DACA 41-96-D-8010, Task Order No. 0003, Fort Riley, Kansas*, 26 August 1996, Revised: 26 September 1996.

United States Environmental Protection Agency (USEPA), 1986, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, 3rd edition (SW-846).*

United States Environmental Protection Agency (USEPA), 1993, *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (NFGO).*

United States Environmental Protection Agency (USEPA), 1994, *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (NFGI).*

* * * * *

TABLES

Table 1-1
Chronological Description of Previous Investigative and Corrective Action Work
Former Building 354

DATE	INVESTIGATION/CORRECTIVE ACTION	Source
16 August 1990	Three USTs removed. Tanks sold as scrap metal by Fort Riley DRMO. Petroleum contaminated soil disposed of in contractors' approved disposal location above Camp Whitside. One UST not found.	Dames & Moore, 1995
19 November and 5 December 1991	Two USTs removed. Tanks sold as scrap metal by Fort Riley DRMO. No petroleum contaminated soil above 50 parts per million detected.	Dames & Moore, 1995.
15 December 1992	Conducted a 28-point soil-gas survey to assess the horizontal extent of petroleum contaminated soil. Soil-gas samples analyzed by on-site gas chromatograph (GC) for BTEX, 1,2-DCA, and total volatile hydrocarbons.	Dames & Moore, 1995
16 and 21 December 1992	Installed two monitoring wells, TS0292-01 and TS0292-02.	Dames & Moore, 1995
2 December 1993 - 28 September 1994	Thirty-five depth to groundwater / free product measurements taken in TS0292-01	Dames & Moore, 1995
3 and 4 September 1993	Sampled two existing monitoring wells (TS0292-01 and TS0292-02). Benzene and tetrachloroethene detected above KDHE action levels in TS0292-01. No contaminants above KDHE action levels in TS0292-02.	Dames & Moore, 1995
9 through 15 September 1994	Installed two piezometers (PZ-A and PZ-B). Sampled PZ-A and analyzed with on-site GC for BTEX	Dames & Moore, 1995
17 October through 7 December 1994	Advanced and sampled ten soil borings to confirm the findings of the soil-gas survey. Soil samples analyzed on-site for TPH using an immunoassay test kit.	Dames & Moore, 1995
10 and 11 January 1995	Collected five in-situ groundwater samples. Samples analyzed by on-site GC for BTEX, 1,2-DCA, total VOCs, 1,1-DCE, 1,1,1-TCA, TCE, and PCE. Attempted to collect 16 other samples, but locations were dry.	Dames & Moore, 1995
11 January 1995	Installed two piezometers (PZ-C & PZ-D). Sampled three piezometers. Samples analyzed by on-site GC for BTEX, 1,2-DCA, total VOCs, 1,1-DCE, 1,2-DCE, 1,1,1-TCA, TCE, and PCE.	Dames & Moore, 1995
7 and 8 February 1995	Advanced and sampled four soil borings to confirm the findings of the soil-gas survey and immunoassay results. Soil samples analyzed by off-site laboratory for VOCs and TPH. Soil contamination in 354SB-12 detected above KDHE action levels.	Dames & Moore, 1995
10 February through 6 March 1995	Installed four monitoring wells (MW95-03, MW95-04, MW95-05, and MW95-06). One monitoring well (MW95-05) was abandoned because it was damaged.	Dames & Moore, 1995
24 March 1995	Developed and sampled five existing monitoring wells (TS0292-01, TS0292-02, MW95-03, MW95-04, and MW95-06). Benzene, PCE, and lead detected above KDHE action levels in groundwater.	Dames & Moore, 1995
15 to 18 December 1995	Performed groundwater level measurements and sampled groundwater from the three Main Post Landfill wells, the five pesticide storage facility wells, and the five Main Post solvent detection site (Building 354) wells.	Louis Berger & Associates, 1996d

Notes:
BTEX - benzene, toluene, ethylbenzene, and total xylenes
DRMO - Defense Reutilization Marketing Office
KDHE - Kansas Department of Health & Environment
VOCs - volatile organic compounds
1,1-DCE - 1,1-dichloroethene
1,2-DCE - 1,1-dichloroethene
1,1,1-TCA - 1,1,1-trichloroethane
TPH - total petroleum hydrocarbons
TCE - trichloroethene
PCE - tetrachloroethene
1,2-DCA - 1,2-dichloroethane

Table 3-1
Bedrock Elevations
Former Building 354
Fort Riley, Kansas

Sample Points	Ground Surface Elevation[1] (feet)	Depth to Bedrock[2] (feet)	Bedrock Elevation[1] (feet)
B-01	1095.18	39.0	1056.2
B-02	1095.43	37.7	1057.7
B-03	1095.63	39.4	1056.2
B-04	1096.10	40.6	1055.5
B-05	1096.28	39.2	1057.1
B-06	1093.05	36.5	1056.6
B-07	1095.17	38.8	1056.4
B-08	1095.79	39.0	1056.8
B-09	1095.69	39.0	1056.7
B-10	1094.67	37.4	1057.3
B-10A	1088.67	30.0	1058.7
B-11	1093.82	36.9	1056.9
B-12	1093.58	36.6	1057.0
B-13	1092.00	35.0	1057.0
B-14	1093.56	36.7	1056.9
B-15	1092.10	35.0	1057.1
B-16	1091.11	34.6	1056.5
B-17	1091.55	35.0	1056.6
B-18	1091.04	34.3	1056.7
B-19	1090.39	33.5	1056.9
B-20	1085.50	30.0	1055.5
B-21	1089.49	33.0	1056.5
B-22	1090.10	33.6	1056.5
B-23	1088.60	32.0	1056.6
B-24	1088.04	30.4	1057.6
B-25	1087.49	30.8	1056.7
B-26	1081.86	25.3	1056.6
B-27	1077.65	21.4	1056.3
B-29	1086.73	30.3	1056.4
B-30	1088.09	31.5	1056.6
B-31	1087.00	30.4	1056.6
B-32	1082.69	29.0	1053.7
B-35	1072.41	13.3	1059.1
B-36	1078.77	22.0	1056.8
B-36A	1083.06	26.5	1056.6
B-38	1081.82	24.3	1057.5
B-39	1080.38	22.4	1058.0
B-40	1070.18	14.5	1055.7
B-42	1068.97	13.5	1055.5
B-47	1064.98	7.9	1057.1
B-48	1071.93	15.2	1056.7
B-50	1068.89	12.5	1056.4
B-52	1070.21	13.5	1056.7
B-54	1065.05	8.3	1056.8
B-55	1073.72	17.5	1056.2

Table 3-1
Bedrock Elevations
Former Building 354
Fort Riley, Kansas

Sample Points	Ground Surface Elevation[1] (feet)	Depth to Bedrock[2] (feet)	Bedrock Elevation[1] (feet)
B-57	1069.42	12.6	1056.8
B-59	1067.41	18.9	1048.5
B-61	1065.63	9.6	1056.0
B-62	1064.76	24.8	1040.0
B-64	1063.43	23.1	1040.3
B-66	1063.11	22.6	1040.5
B-68	1083.43	27.3	1056.1
B-70	1073.98	18.0	1056.0
B-71	1076.83	21.0	1055.8
B-72	1076.41	19.0	1057.4
B-73	1076.42	21.0	1055.4
B-74	1092.97	36.2	1056.8
B-75	1098.80	42.4	1056.4
B-76	1083.33	25.6	1057.7
B-77	1078.56	21.0	1057.6
B-78	1065.58	8.6	1057.0
B-79	1062.59	22.4	1040.2
B-80	1062.85	40.6	1022.3
B-81	1063.79	39.0	1024.8
B-82	1063.77	32.6	1031.2
B-83	1079.29	20.6	1058.7
B-84	1092.43	37.9	1054.5
B-85	1080.10	23.0	1057.1
B-86	1097.49	40.7	1056.8
B-88	1085.22	28.4	1056.8
P-1	1089.41	33.0	1056.4
P-2*	1086.71	30.0	1056.7
P-3*	1089.7	34.0	1055.7
P-4*	1065.7	10.0	1055.7
P-5*	1073.0	16.8	1056.2
P-6*	1069.9	13.5	1056.4
T-1	1100.0	43.6	1056.4
T-2*	1099.0	42.5	1056.5
T-3	1094.2	35.0	1059.2
T-4	1093.2	36.0	1057.2
T-5	1087.4	31.0	1056.4
T-7	1063.1	24.0	1039.1
T-8	1062.7	23.0	1039.7
T-9*	1075.7	19.5	1056.2
T-10*	1072.6	16.3	1056.3
T-11	1091.9	36.0	1055.9
T-12	1089.6	31.5	1058.1
T-14	1086.5	28.0	1058.5
T-15*	1074.9	19.0	1055.9
T-21*	1072.4	16.0	1056.4

Table 3-1
Bedrock Elevations
Former Building 354
Fort Riley, Kansas

Sample Points	Ground Surface Elevation[1] (feet)	Depth to Bedrock[2] (feet)	Bedrock Elevation[1] (feet)
MPL94-01	1061.1	NA	NA
MPL94-02	1060.2	NA	NA
MPL94-03	1060.0	NA	NA
PSF92-02	1077.8	NA	NA
PSF92-03	1077.5	NA	NA
PSF92-04	1078.6	NA	NA
PSF92-05	1062.0	NA	NA
TSO292-01	1083.1	26.0	1057.1
TSO292-02	1065.3	9.2	1056.1
MW95-03	1065.2	NA	NA
MW95-04	1082.5	NA	NA
MW95-06	1090.0	33.7	1056.3
PZ A	1067.8	NA	NA
PZ B	1065.6	NA	NA
PZ C	1063.6	NA	NA
PZ D	1062.0	NA	NA

Notes:

[1]Elevations are feet above mean sea level

[2]Depth to bedrock in probeholes (B-#) estimated from depth of probe refusal.

*Bedrock recovered during temporary piezometer/well installation

NA = Not Available

Table 3-2
Groundwater Elevations
August/September, 1997
Former Building 354
Fort Riley, Kansas

Sample Points	TOC Elevation	Groundwater Elevation									Total Depth (feet)
		8/20/97	8/21/97	8/22/97	8/27/97	9/12/97	9/15/97	9/19/97	9/23/97	9/24/97	
P-01	1089.43	1058.33	1058.39	1058.39	1058.42	1058.39	1058.27	1058.27	1058.25	NM	32.72
P-02	1086.61	1058.76	1058.82	1058.82	1058.78	1058.73	1058.71	1058.71	1058.71	NM	29.52
P-03	1090.51	1059.19	1059.21	1059.22	1059.21	NM	1059.24	1059.23	1059.25	NM	34.42
P-04	1067.19	1057.55	1057.23	1057.14	1056.78	1056.01	1055.92	1055.83	1056.49	1058.35	11.42
P-05	1076.55	1057.35	1057.36	1057.36	1057.3	1057.24	dry	1057.21	1057.29	NM	20.09
P-06	1071.30	dry	dry	dry	dry	dry	dry	dry	dry	NM	14.71
T-1	1102.61	NA	NA	NA	NA	1061.76	1061.78	1061.82	1061.77	NM	29.91
T-2	1099.06	NA	NA	NA	NA	1061.52	1061.55	1061.54	1061.55	NM	40.04
T-3	1096.60	NA	NA	NA	NA	dry	dry	dry	dry	NM	34.42
T-4	1093.21	NA	NA	NA	NA	dry	1058.86	1058.91	1058.88	NM	25.01
T-5	1087.38	NA	NA	NA	NA	1058.66	NM	NM	1058.83	NM	29.51
T-7	1065.38	NA	NA	NA	NA	1041.46	1041.39	1041.23	1041.05	NM	24.51
T-8	1064.83	NA	NA	NA	NA	1041.77	1041.52	1041.31	1041.12	NM	24.17
T-9	1076.51	NA	NA	NA	NA	1057.67	1057.64	1057.59	1057.75	NM	19.69
T-10	1074.17	NA	NA	NA	NA	dry	dry	dry	dry	NM	17.73
T-14	1088.73	NA	NA	NA	NA	dry	dry	dry	dry	NM	29.49
T-15	1077.50	NA	NA	NA	NA	dry	dry	dry	dry	NM	19.72
T-21	1073.55	NA	NA	NA	NA	1057.74	1057.75	1057.65	1057.73	NM	16.58
MPL94-01	1063.14	NM	NM	NM	NM	NM	1039.01	1038.88	NM	NM	NM
MPL94-02	1062.57	NM	NM	NM	NM	NM	1039.22	1039.08	NM	NM	NM
MPL94-03	1062.34	NM	NM	NM	NM	NM	1038.75	1038.61	NM	NM	NM
MW95-03	1065.03	NM	NM	NM	NM	NM	1039.77	1039.63	1039.5	NM	35.50
MW95-04	1062.20	NM	NM	NM	NM	NM	1039.91	1039.8	1039.67	NM	33.60
MW95-06	1089.81	NM	NM	NM	NM	1059.13	1059.12	1059.09	1059.08	NM	34.63
PSF92-02	1079.64	NM	NM	NM	NM	NM	1055.38	NM	NM	NM	28.00
PSF92-03	1079.35	NM	NM	NM	NM	NM	1055	1054.9	NM	NM	28.00
PSF92-04	1079.82	NM	NM	NM	NM	NM	1055.54	1056.05	NM	NM	29.50
PSF92-05	1063.76	NM	NM	NM	NM	NM	1042.38	1042.32	NM	NM	28.00

Table 3-2
Groundwater Elevations
August/September, 1997
Former Building 354
Fort Riley, Kansas

Sample Points	TOC Elevation	Groundwater Elevation									Total Depth (feet)
		8/20/97	8/21/97	8/22/97	8/27/97	9/12/97	9/15/97	9/19/97	9/23/97	9/24/97	
TSO292-01	1082.82	NM	NM	NM	NM	1058.42	1058.4	1058.36	1058.33	NM	29.91
TSO292-02	1065.22	NM	NM	NM	NM	1050.81	1050.65	1050.54	1050.39	NM	17.37
PZ-A	1067.82	NM	NM	NM	NM	NM	NM	NM	1057.22	NM	11.90
PZ-B	1065.59	NM	NM	NM	NM	NM	NM	NM	dry	1057.48	8.57
PZ-C	1063.58	NM	NM	NM	NM	NM	NM	NM	1038.85	NM	29.99
PZ-D	1062.00	NM	NM	NM	NM	NM	NM	NM	1039.44	NM	29.86

Notes:
Elevations are feet above mean sea level
NM - not measured
NA - not available; sample point had not been installed on this date.

Table 3-3
Soil-Gas Analytical Results
August, 1997
Former Building 354
Fort Riley, Kansas

Sample Point	Sample Depth[1] (feet)	Benzene (ug/L)	1,2-DCA (ug/L)	TCE (ug/L)	PCE (ug/L)
B-01	33	ND	ND	ND	7.1
B-02	33	ND	ND	ND	4.8
B-03	33	ND	ND	ND	0.2
B-04	36	ND	ND	ND	2.0
B-05	33	ND	ND	ND	13.1
B-06	30.5	ND	ND	ND	5.3
B-07	33	ND	ND	ND	ND
B-08	35	ND	ND	ND	1.1
B-09	35	ND	ND	ND	3.1
B-10	33	ND	ND	ND	17.0
B-10a	24	ND	ND	ND	19.1
B-11	32	ND	ND	3.2	76.8
B-12	32.6	ND	3.2	2.2	30.5
B-13	30	ND	ND	ND	14.6
B-14	33	ND	ND	ND	43.8
B-15	31	ND	ND	ND	21.5
B-15D	31	ND	ND	ND	16.1
B-16	28	ND	ND	ND	4.6
B-17	29	ND	ND	ND	9.3
B-18	28	ND	ND	2.6	33.0
B-19	28	ND	1.2	1.3	18.0
B-19D	28	ND	1.7	1.2	16.7
B-20	24	ND	ND	ND	17.3
B-21	29	ND	ND	4.2	73.9
B-22	29.6	ND	2.6	ND	31.3
B-23	26	ND	1.0	ND	ND
B-24	24	10.4	6.5	ND	ND
B-25	26	ND	ND	ND	ND
B-26	21	ND	ND	1.8	33.8
B-27	17	ND	ND	ND	0.3J
B-29	26	ND	3.2	ND	0.5J
B-30	27	11.0	7.2	1.0	3.4
B-31	26	14.2	9.0	ND	0.3J
B-32	25	ND	1.0	ND	ND
B-33	9	ND	ND	ND	1.1
B-35	12	ND	ND	ND	3.8
B-35D	12	ND	ND	ND	0.3J
B-36	18	ND	ND	ND	4.7
B-36a	24	203	78.2	2.5	1.2
B-38	20	5.7	5.5	ND	ND
B-39	18	ND	ND	ND	ND

Table 3-3 (continued)
Soil-Gas Analytical Results
August, 1997
Former Building 354
Fort Riley, Kansas

Sample Point	Sample Depth (feet)	Benzene (ug/L)	1,2-DCA (ug/L)	TCE (ug/L)	PCE (ug/L)
B-40	9	ND	ND	ND	1.0
B-42	9	ND	ND	ND	2.9
B-42D	9	ND	ND	ND	2.4
B-47	4.9	ND	ND	ND	ND
B-48	11.2	ND	ND	ND	0.3J
B-50	8.6	ND	ND	ND	12.7
B-52	9.5	ND	ND	ND	0.3J
B-54	5.3	ND	ND	ND	ND
B-55	14.5	ND	ND	ND	ND
B-57	9	ND	ND	ND	0.4J
B-59	12	9.4	ND	0.9J	0.6J
B-59D	12	9.0	ND	0.9J	0.7J
B-61	6	ND	ND	ND	ND
B-62	21	72.0	10.6	ND	ND
B-64	20.6	120	17.1	ND	ND
B-66	18	ND	ND	ND	ND
B-68	24	ND	2.0	ND	8.1
B-70	12	ND	O.7J	ND	4.4
B-71	18	ND	ND	ND	7.7
B-72	15	ND	ND	ND	29.2
B-73	16	ND	ND	ND	24.4
B-74	30	ND	ND	ND	11.4
B-75	33	ND	ND	ND	0.5J
B-75D	33	ND	ND	ND	0.6J
B-76	21	ND	ND	ND	ND
B-77	18	ND	ND	ND	0.3J
B-78	6	ND	ND	ND	ND
B-79	18	ND	ND	ND	0.5J
B-80	21	ND	ND	ND	2.8
B-81	20	ND	ND	ND	ND
B-82	27	ND	ND	ND	ND
B-83	16	ND	ND	ND	4.2
B-84	33	ND	ND	ND	25.3
B-85	19	ND	ND	ND	12.9
B-85D	19	ND	ND	ND	1.3
B-86	34	ND	ND	1.0	41.8
B-88	24	ND	ND	2.8	3.3
Field Blank	NA	ND	ND	ND	ND
Field Blank	NA	ND	ND	ND	ND
Field Blank	NA	ND	ND	ND	ND
Field Blank	NA	ND	ND	ND	ND
Field Blank	NA	ND	ND	ND	ND
Field Blank	NA	ND	ND	ND	ND

Table 3-3 (continued)
Soil-Gas Analytical Results
August, 1997
Former Building 354
Fort Riley, Kansas

Notes:

[1] Feet below ground surface
ug/L - micrograms per liter
1,2-DCA - 1,2-Dichloroethane
PCE - Tetrachloroethene
NA - Not Applicable
TCE - Trichloroethene
J - estimated value below reporting limit
D - duplicate sample analyzed
ND - Not Detected (<0.1 ug/L)

See Appendix D for additional QC data, including chronological sequencing of field blanks.

Table 3-4
On-Site Analytical Results (Soil)
September, 1997
Former Building 354
Fort Riley, Kansas

Sample Point	Sample Depth[1] (feet)	Benzene (ug/kg)	1,2-DCA (ug/kg)	TCE (ug/kg)	PCE (ug/kg)
T-1	39.0	ND	ND	ND	2.2
T-2	38.0	ND	ND	ND	ND
T-3	29.0	ND	ND	ND	ND
T-4	34.0	ND	ND	ND	ND
T-5	24.0	2899	35.9	7.8	27.7
T-7	14.0	ND	5.3	ND	ND
T-7	23.0	7.0	1.9	ND	ND
T-8	22.0	ND	17.2	ND	ND
T-9	19.0	336	4.6	11.3	26.5
T-10	1.0	ND	8.3	ND	ND
T-10	10.0	ND	11.9	ND	ND
T-10D	10.0	ND	6.5	ND	ND
T-11	4.0	ND	ND	ND	ND
T-12	27.0	ND	ND	ND	1.4
T-14	23.0	ND	ND	ND	ND
T-15	17.0	ND	ND	ND	42.8
T-21	12.0	ND	ND	ND	ND
Field Blank	NA	ND	ND	ND	ND
Field Blank	NA	ND	ND	ND	ND
Field Blank	NA	ND	ND	ND	ND

Notes:

[1] Feet below ground surface

ug/kg - micrograms per kilogram

1,2-DCA - 1,2-Dichloroethane

PCE - Tetrachloroethene

TCE - Trichloroethene

T-# - Temporary monitoring well location

J - estimated value below reporting limit

D - duplicate sample analyzed

ND - Not Detected (<0.1 ug/kg)

NA - Not Applicable

See Appendix D for additional QC data, including chronological sequencing of field blanks.

Table 3-5
On-Site Analytical Results (Groundwater)
September, 1997
Former Building 354
Fort Riley, Kansas

Sample Point	Benzene (ug/L)	1,2-DCA (ug/L)	TCE (ug/L)	PCE (ug/L)
P-1	ND	6.1	2.6	18.5
P-2	ND	9.4	5.5	1.1
P-2D	ND	8.0	6.1	1.4
P-3	ND	6.6	7.9	200
P-4	ND	0.4J	ND	ND
P-5	ND	7.7	0.9J	40.0
PZ-A	2.4	1.2	5.8	ND
PZ-B	ND	4.7	ND	2.7
PZ-C	ND	0.5J	ND	7.9
PZ-D	ND	0.2J	1.9	6.6
T-1	ND	6.9	ND	40.8
T-2	ND	5.0	4.2	58.0
T-4	ND	11.2	1.6	32.9
T-5	10.2	0.5J	1.0	0.8J
T-7	34.6	4.9	ND	ND
T-8	ND	1.3	0.8J	1.2
T-9	53.4	17.5	3.3	11.2
T-21	ND	7.0	2.0	2.3
B-62	135	52.0	ND	ND
Field Blank	ND	ND	ND	ND

Notes:
ug/L - micrograms per liter
1,2-DCA - 1,2-Dichloroethane
PCE - Tetrachloroethene
TCE - Trichloroethene
T-# - Temporary monitoring well location
P-# - Temporary piezometer location
PZ - previously installed piezometer location
B-# - probehole location
J - estimated value below reporting limit
D - duplicate sample analyzed
ND - Not Detected (<0.1 ug/L)

See Appendix D for additional QC data, including chronological sequencing of field blanks.

Table 3-6
Off-Site Confirmation Analytical Results
(Positive Detections)
Former Building 354
Fort Riley, Kansas

		Sample Point:		354T05/S02		354T10/SO1#		Kansas/IRG
		Date Sampled:		9/12/97		9/22/97		9/23/97
		Sample Matrix:		SOLID		SOLID		SOLID
		Laboratory Number:		D97-11198-1		D97-11522-1		VALUES
Metals, Total	UNITS							
Aluminum, Total	mg/Kg		***5,860***		***6,160***		NA	
Arsenic, Total	mg/Kg		***0.65***	***DJ***	***2.57***	***DR***	***100***	
Barium, Total	mg/Kg		***40.6***	***J****	***87.3***		***24,000***	
Beryllium, Total	mg/Kg		***0.26***	***J***	***0.38***		***0.67***	
Cadmium, Total	mg/Kg		0.56	U	***0.27***	***J***	***170***	
Calcium, Total	mg/Kg		***901***		***2,500***		NA	
Chromium, Total	mg/Kg		***4.66***		***7.6***		***1,700***	
Cobalt, Total	mg/Kg		***1.09***	***J***	***2.9***		NA	
Copper, Total	mg/Kg		***3.12***		***4.32***		***12,500***	
Iron, Total	mg/Kg		***4,880***		***6,710***		NA	
Lead, Total	mg/Kg		***12.4***	***D***	***6.78***	***DR***	***1,000***	
Magnesium, Total	mg/Kg		***760***		***1,340***		NA	
Manganese, Total	mg/Kg		***33.1***		***133***		***1,700***	
Nickel, Total	mg/Kg		***3.88***		***6.64***		***6,800***	
Potassium, Total	mg/Kg		***682***		***1,330***		NA	
Sodium, Total	mg/Kg		***66.6***	***J***	***189***		NA	
Thallium, Total	mg/Kg		0.135	UJ*	***0.224***		NA	
Vanadium, Total	mg/Kg		***11.1***		***14.2***		***2,400***	
Zinc, Total	mg/Kg		***12.1***		***19.2***		***100,000***	
Volatiles	UNITS							
1,2,4-Trimethylbenzene	ug/Kg		***68,500***	***D***	5.27	U	NA	
1,3,5-Trimethylbenzene	ug/Kg		***91,100***	***D***	5.27	U	NA	
2-Butanone	ug/Kg		***532***	***DJ***	105	U	NA	
Ethylbenzene	ug/Kg		***312***	***D***	5.27	U	***1,980***	
m,p-Xylene	ug/Kg		***5,910***	***D***	5.27	U	***630***	
o-Xylene	ug/Kg		***3,670***	***D***	5.27	U	***630***	
Toluene	ug/Kg		***389***	***D***	5.27	U	***1,500***	
Semivolatiles	UNITS							
2-Methylnaphthalene	mg/Kg		***10.4***	***D***	0.348	U	NA	
Diethyl phthalate	mg/Kg		0.372	U	***0.212***	***J***	***270,000***	
Naphthalene	mg/Kg		***3.85***		0.348	U	***500***	

Footnote: Kansas IRG - Interim Remedial Guidelines (Non-Residential)

LEGEND: B - Detected in the associated laboratory method blank
R - Qualified as unusable in the QC evaluation
NA - Not Analyzed
F - Detected in the associated equipment rinsate blank
T - Detected in associated trip blank
ND - Not Detected
J - Qualified as estimated by the laboratory
U - Qualified as undetected by the laboratory
D - Diluted
J* - Qualified as estimated in the QC evaluation
U* - Qualified as undetected in the QC evaluation

Table 3-7
Off-Site Groundwater Confirmation Analytical Results
(Positive Detections)
Former Building 354
Fort Riley, Kansas

		Sample Point:	354P3/W01	354T21/W01	MCL//
		Date Sampled:	9/23/97	9/23/97	9/23/97
		Sample Matrix:	LIQUID	LIQUID	LIQUID
		Laboratory Number:	D97-11567-1	D97-11567-2	VALUES
Volatiles	UNITS				
cis-1,2-Dichloroethene	ug/L		5 U	***13.8***	***0.07***
Tetrachloroethene	ug/L		***172***	5 U	***0.005***

LEGEND: B - Detected in the associated laboratory method blank
R - Qualified as unusable in the QC evaluation
NA - Not Analyzed
F - Detected in the associated equipment rinsate blank
T - Detected in associated trip blank
ND - Not Detected
J - Qualified as estimated by the laboratory
U - Qualified as undetected by the laboratory
MCL - Maximum Contaminant Level
J* - Qualified as estimated in the QC evaluation
U* - Qualified as undetected in the QC evaluation

Table 3-8
Off-Site Groundwater Analytical Results
(Positive Detections)
Former Building 354
Fort Riley, Kansas

Sample Point:		MPL94-02/W01	MW95-04/W01	TS02092-02/WO1#	MPL94-01/W01	MPL94-01/W01#	MW95-O6/W01R	MW95-06/W01#
Date Sampled:		9/16/97	9/16/97	9/17/97	9/17/97	9/17/97	9/17/97	9/17/97
Sample Matrix:		LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID
Laboratory Number:		D97-11277-1	D97-11277-3	D97-11420-2	D97-11373-1	D97-11420-3	D97-11372-2	D97-11420-4
Metals, Total	UNITS							
Aluminum, Total	mg/L	0.1 U	***0.255***	0.1 U	0.1 U	NA	0.1 U	NA
Arsenic, Total	mg/L	0.0046 JU*	0.0059 U*	***0.0645 D***	***0.004 JR***	NA	0.01 UR	NA
Barium, Total	mg/L	***0.169***	***0.238***	***1.07***	***0.177***	NA	0.01 U	NA
Calcium, Total	mg/L	***243 D***	***146 D***	***181 F***	***233 DF***	NA	***0.5***	NA
Chromium, Total	mg/L	0.005 U	***0.0024 J***	0.005 U	0.005 U	NA	0.005 U	NA
Iron, Total	mg/L	***6.08***	***0.218***	***19.4***	***9.77***	NA	0.1 U	NA
Lead, Total	mg/L	***0.0017 J***	***0.0021***	0.002 U	0.002 UR	NA	0.002 UR	NA
Magnesium, Total	mg/L	***35.7***	***16.4***	***35.8 J****	***39.8***	NA	0.5 U	NA
Manganese, Total	mg/L	***0.4***	***0.0047 J***	***0.591***	***0.716***	NA	0.01 U	NA
Mercury, Total	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	NA	0.0002 U	NA
Nickel, Total	mg/L	***0.0082***	***0.0039 J***	0.005 U	***0.0038 J***	NA	0.005 U	NA
Potassium, Total	mg/L	***22***	***6.4***	***8.32***	***24.8***	NA	1 U	NA
Silver, Total	mg/L	0.005 U	0.005 U	0.005 UR	0.005 U	NA	***0.0022 J***	NA
Sodium, Total	mg/L	***61.3 DF***	***26.4 F***	***35.9***	***60.3 D***	NA	1 U	NA
Vanadium, Total	mg/L	0.01 U	***0.0139***	0.01 U	0.01 U	NA	0.01 U	NA
Volatiles	UNITS							
Benzene	ug/L	5 U	5 U	***25.1***	NA	5 U	NA	5 U
cis-1,2-Dichloroethene	ug/L	5 U	5 U	***21.8***	NA	5 U	NA	5 U
Tetrachloroethene	ug/L	5 U	5 U	5 U	NA	5 U	NA	***46***
Semivolatiles	UNITS							
Diethyl phthalate	ug/L	10 U	10 U	10 U	***7.3 J***	NA	10 U	NA

LEGEND: B - Detected in the associated laboratory method blank
F - Detected in the associated equipment rinsate blank
J - Qualified as estimated by the laboratory
J* - Qualified as estimated in the QC evaluation
R - Qualified as unusable in the QC evaluation
T - Detected in associated trip blank
U - Qualified as undetected by the laboratory
U* - Qualified as undetected in the QC evaluation
NA - Not Analyzed
ND - Not Detected
D - Diluted
MCL - Maximum Contaminant Level

Table 3-8
Off-Site Groundwater Analytical Results
(Positive Detections)
Former Building 354
Fort Riley, Kansas

Sample Point: / Date Sampled: / Sample Matrix: / Laboratory Number:		MW95-06/W01 9/17/97 LIQUID D97-11373-2	MW95-06/W02 9/17/97 LIQUID D97-11372-1	MW95-06/W02# 9/17/97 LIQUID D97-11420-5	MCL// 9/23/97 LIQUID VALUES
Metals, Total	UNITS				
Aluminum, Total	mg/L	0.1 U	0.1 U	NA	NA
Arsenic, Total	mg/L	0.01 UR	0.01 UR	NA	***0.05***
Barium, Total	mg/L	***0.179***	***0.18***	NA	***2***
Calcium, Total	mg/L	***176 DF***	***177 DF***	NA	NA
Chromium, Total	mg/L	***0.0021 J***	***0.0023 J***	NA	***0.1***
Iron, Total	mg/L	0.1 U	0.1 U	NA	NA
Lead, Total	mg/L	0.002 UR	0.002 UR	NA	***0.015***
Magnesium, Total	mg/L	***24.8***	***25***	NA	NA
Manganese, Total	mg/L	0.01 U	0.01 U	NA	NA
Mercury, Total	mg/L	***0.0001 J***	0.0002 U	NA	NA
Nickel, Total	mg/L	0.005 U	0.005 U	NA	***0.1***
Potassium, Total	mg/L	***3.94***	***3.97***	NA	NA
Silver, Total	mg/L	0.005 U	0.005 U	NA	NA
Sodium, Total	mg/L	***45.6 D***	***45.2 D***	NA	NA
Vanadium, Total	mg/L	***0.0035 J***	***0.0027 J***	NA	NA
Volatiles	UNITS				
Benzene	ug/L	NA	NA	5 U	***0.005***
cis-1,2-Dichloroethene	ug/L	NA	NA	5 U	***0.07***
Tetrachloroethene	ug/L	NA	NA	***47.4***	***0.005***
Semivolatiles	UNITS				
Diethyl phthalate	ug/L	***4.3 J***	10.5 U	NA	NA

LEGEND: B - Detected in the associated laboratory method blank; F - Detected in the associated equipment rinsate blank; J - Qualified as estimated by the laboratory; J* - Qualified as estimated in the QC evaluation
R - Qualified as unusable in the QC evaluation; T - Detected in associated trip blank; U - Qualified as undetected by the laboratory; U* - Qualified as undetected in the QC evaluation
NA - Not Analyzed; ND - Not Detected; D - Diluted; MCL - Maximum Contaminant Level

Table 4-1
Analytical Methods
Former Building 354

Parameter	Method*				Holding Time			
	Soil		Water		Soil		Water	
	Preparatory	Analytical	Preparatory	Analytical	Extraction	Analysis	Extraction	Analysis
Organic Compounds								
Semivolatile Organic Compounds (SVOCs)	3550B	8270C	3520B	8270C	14 days	40 days	7 days	40 days
Volatile Organic Compounds (VOCs)	- -	8260B	- -	8260B	- -	14 days	- -	14 days
Metals								
Aluminum	3050A	6010A	3010A	6010A	- -	180 days	- -	180 days
Barium	3050A	6010A	3010A	6010A	- -	180 days	- -	180 days
Beryllium	3050A	6010A	3010A	6010A	- -	180 days	- -	180 days
Cadmium	3050A	6010A	3010A	6010A	- -	180 days	- -	180 days
Calcium	3050A	6010A	3010A	6010A	- -	180 days	- -	180 days
Chromium	3050A	6010A	3010A	6010A	- -	180 days	- -	180 days
Cobalt	3050A	6010A	3010A	6010A	- -	180 days	- -	180 days
Copper	3050A	6010A	3010A	6010A	- -	180 days	- -	180 days
Iron	3050A	6010A	3010A	6010A	- -	180 days	- -	180 days
Magnesium	3050A	6010A	3010A	6010A	- -	180 days	- -	180 days
Mangenes	3050A	6010A	3010A	6010A	- -	180 days	- -	180 days
nickel	3050A	6010A	3010A	6010A	- -	180 days	- -	180 days
Potassium	3050A	6010A	3010A	6010A	- -	180 days	- -	180 days
Silver	3050A	6010A	3010A	6010A	- -	180 days	- -	180 days
Sodium	3050A	6010A	3010A	6010A	- -	180 days	- -	180 days
Vanadium	3050A	6010A	3010A	6010A	- -	180 days	- -	180 days
Zinc	3050A	6010A	3010A	6010A	- -	180 days	- -	180 days
Arsenic	3050	7060A	3020A	7060A	- -	180 days	- -	180 days
Lead	3050	7421	3020A	7421	- -	180 days	- -	180 days
Mercury	7471A	7470A	7470	7470A	- -	28 days	- -	28 days
Selenium	3050	7740	3020A	7740	- -	180 days	- -	180 days
Thallium	3050	7841	3020A	7841	- -	180 days	- -	180 days

* - The methods listed are from SW-846

Table 4-2
MS/MSD Results not Within QC Limits
Former Building 354

Parameter	QC Batch Number	MS REC	MSD REC	REC Limits	RPD	RPD Limits	Associated Samples	Qualifier Appended
Metals								
Aluminum	AC202-98	NC	NC	60-140	NC	30	354T10/S01	None
	AC202-17	NC	NC	60-140	NC	30	354T10/S04	None
	AC201-02	NC	NC	60-140	NC	30	354T05/S02	None
Antimony	AC202-17F	**33**	**34**	60-140	1.2	30	354T10/S04	J*
	AC202-98F	**45**	**54**	60-140	18.2	30	354T10/S01	J*
	AC201-51F	**33.4**	**29.6**	60-140	11.9	30	354T05/S02	R
Arsenic	AC210-93F	**68.5**	**70.3**	80-120	2.52	20	MW95-06/W02	J*
							MW95-06/W01R	J*
							MPL94-01/w01	J*
							MW95-06/W01	J*
	AC202-36F	**24**	**27.4**	75-125	13.3	25	354T10/S01	J*
							354T10/S04	J*
Calcium	AC202-25	NC	NC	80-120	NC	20	MW95-03/W01	None
	AC201-56	NC	NC	80-120	NC	20	354R/W01	None
							TS02092-02/W01	None
	AC202-17	NC	NC	75-125	NC	25	354T10/S01	None
Iron	AC202-98	NC	NC	60-140	NC	30	354T10/S01	None
	AC202-17	NC	NC	60-140	NC	30	354T10/S04	None
	AC201-56	NC	NC	80-120	NC	20	354R/W01	None
							TS02092-02/W01	None
	AC201-02	NC	NC	60-140	NC	30	354T05/S02	None
Lead	AC210-93F	**49.8**	**47.7**	80-120	4.41	20	MW95-06/W02	J*
							MW95-06/W01R	J*
							MPL94-01/w01	J*
							MW95-06/W01	J*
	AC202-36F	**167**	**202**	75-125	18.7	25	354T10/S04	J*
							354T10/S01	J*
	AC201-60F	NC	NC	75-125	NC	25	354T05/S02	None
Magnesium	AC202-25	NC	NC	80-120	NC	20	MW95-03/W01	None
	AC201-56	119	92	80-120	**25.6**	20	354R/W01	J*
							TS02092-02/W01	J*
	AC202-17	NC	NC	75-125	NC	25	354T10/S01	None
Potassium	AC202-17	**67**	**67**	75-125	0	25	354T10/S04	J*
Selenium	AC201-75F	**76**	**79**	80-120	3.87	20	MW95-03/W01	J*
							MPL94-03/W01	J*
							354R/W01	J*
							TS02092-02/W01	J*
							MPL94-02/W01	J*
							PSF92-05/W01	J*
							MW95-04/W01	J*
							PSF92-02/W01	J*
							PSF92-03/W01	J*
							PSF92-04/W01	J*
							TS02092-01/W01	J*
Silver	AC201-56	**42.1**	**53**	70-130	**23**	20	354R/W01	J*
							TS02092-02/W01	J*
Sodium	AC202-25	NC	NC	80-120	NC	20	MW95-03/W01	None

Table 4-2
MS/MSD Results not Within QC Limits
Former Building 354

Parameter	QC Batch Number	MS REC	MSD REC	REC Limits	RPD	RPD Limits	Associated Samples	Qualifier Appended
Metals								
Thallium	AC210-93F	**64**	**64.8**	80-120	1.17	20	MW95-06/W02	J*
							MW95-06/W01R	J*
							MPL94-01/W01	J*
							MW95-06/W01	J*
	AC201-75F	**71.3**	**70.3**	80-120	1.41	20	MW95-03/W01	J*
							MPL94-03/W01	J*
							354R/W01	J*
							TS02092-02/W01	J*
							MPL94-02/W01	J*
							PSF92-05/W01	J*
							MW95-04/W01	J*
							PSF92-02/W01	J*
							PSF92-03/W01	J*
							PSF92-04/W01	J*
							TS02092-01/W01	J*
	AC201-60F	**73.3**	77.5	75-125	5.64	25	354T5/S02	J*
Semivolatile Organic Compounds								
Pyrene	AC195-27	**139**	**123**	52-115	12.2	25	354T5/S02	None

Notes:

J*- Qualified as estimated.
MS- Matrix Spike
MSD- Matrix Spike Duplicate
NC- The spike level was less than one-fourth the sample concentration; therefore no conclusion can be made regarding the accuracy or precision of this MS/MSD.
QC- Quality Control
RPD- Relative Percent Difference

Table 4-3
Rinsate Blank Detections
Former Building 354

Parameter	Rinsate Sample	Rinsate Result	Units	Associated Samples	Qualifier Added
Metals					
Silver	MW95-06/W01R	0.0022 J	mg/L	MPL94-01/W01	None
				MW95-06/W01	None
				MW95-06/W02	None
				TS0292-02/W01	None
Calcium	MW95-06/W01R	0.5	mg/L	MPL94-01/W01	F
				MW95-06/W01	F
				MW95-06/W02	F
				MW95-04/W01	F
				TS0292-02/W01	F
Arsenic	354R/W01	0.0016	mg/L	MPL94-02/W01	U*
				PSF92-05/W01	U*
				PSF92-04/W01	U*
				PSF92-02/W01	None
				PSF92-03/W01	U*
Sodium	354R/W01	0.9	mg/L	MPL94-02/W01	F
				PSF92-05/W01	F
				PSF92-04/W01	F
				PSF92-02/W01	F
				PSF92-03/W01	F

F = Compound detected in Rinsate Blank.
mg/L = Micrograms per Liter
U* = Qualified as undetected during data review.

Table 4-4
Soil Field Duplicate Results
Former Building 354

	Sample Point:	354T10/S01	354T10/S04	Meets QC
	Date Sampled:	9/22/97	9/22/97	Criteria?
	Laboratory Number:	D97-11522-1	D97-11522-2	Yes/No
	Sample Delivery Group:	D97-11522	D97-11522	
Metals	**Units**			
Aluminum, Total	mg/Kg	6160	8060	Yes
Antimony, Total	mg/Kg	0.685 UR	0.729 UR	Yes
Arsenic, Total	mg/Kg	2.57 DR	2.31 DR	Yes
Barium, Total	mg/Kg	87.3	123	Yes
Beryllium, Total	mg/Kg	0.38	0.54	Yes
Cadmium, Total	mg/Kg	0.27 J	0.54 J	Yes
Calcium, Total	mg/Kg	2500	3210	Yes
Chromium, Total	mg/Kg	7.6	8.68	Yes
Cobalt, Total	mg/Kg	2.9	3.95	Yes
Copper, Total	mg/Kg	4.32	6.23	Yes
Iron, Total	mg/Kg	6710	8610	Yes
Lead, Total	mg/Kg	6.78 DR	7.55 DR	Yes
Magnesium, Total	mg/Kg	1340	1680	Yes
Manganese, Total	mg/Kg	133	195	Yes
Mercury, Total	mg/Kg	0.126 U	0.135 U	Yes
Nickel, Total	mg/Kg	6.64	8.77	Yes
Potassium, Total	mg/Kg	1330	1410 R	Yes
Selenium, Total	mg/Kg	1.05 U	1.12 U	Yes
Silver, Total	mg/Kg	0.53 U	0.56 U	Yes
Sodium, Total	mg/Kg	189	220	Yes
Thallium, Total	mg/Kg	0.224	0.206	Yes
Vanadium, Total	mg/Kg	14.2	19.7	Yes
Zinc, Total	mg/Kg	19.2	23.9	Yes
SVOCs	**Units**			
1,2,4-Trichlorobenzene	µg/Kg	0.348 U	0.367 U	Yes
1,2-Dichlorobenzene	µg/Kg	0.348 U	0.367 U	Yes
1,3-Dichlorobenzene	µg/Kg	0.348 U	0.367 U	Yes
1,4-Dichlorobenzene	µg/Kg	0.348 U	0.367 U	Yes
2,4,5-Trichlorophenol	µg/Kg	1.74 U	1.83 U	Yes
2,4,6-Trichlorophenol	µg/Kg	0.348 U	0.367 U	Yes
2,4-Dichlorophenol	µg/Kg	0.348 U	0.367 U	Yes
2,4-Dimethylphenol	µg/Kg	0.348 U	0.367 U	Yes
2,4-Dinitrophenol	µg/Kg	1.74 U	1.83 U	Yes
2,4-Dinitrotoluene	µg/Kg	0.348 U	0.367 U	Yes
2,6-Dinitrotoluene	µg/Kg	0.348 U	0.367 U	Yes
2-Chloronaphthalene	µg/Kg	0.348 U	0.367 U	Yes
2-Chlorophenol	µg/Kg	0.348 U	0.367 U	Yes
2-Methylnaphthalene	µg/Kg	0.348 U	0.367 U	Yes
2-Methylphenol	µg/Kg	0.348 U	0.367 U	Yes
2-Nitroaniline	µg/Kg	1.74 U	1.83 U	Yes

Table 4-4
Soil Field Duplicate Results
Former Building 354

	Sample Point:	354T10/S01	354T10/S04	Meets QC
	Date Sampled:	9/22/97	9/22/97	Criteria?
	Laboratory Number:	D97-11522-1	D97-11522-2	Yes/No
	Sample Delivery Group:	D97-11522	D97-11522	
SVOCs (Cont.)	Units			
2-Nitrophenol	µg/Kg	0.348 U	0.367 U	Yes
3,3'-Dichlorobenzidine	µg/Kg	0.348 U	0.367 U	Yes
3-Nitroaniline	µg/Kg	1.74 U	1.83 U	Yes
4,6-Dinitro-2-methylphenol	µg/Kg	1.74 U	1.83 U	Yes
4-Bromophenyl-phenyl ether	µg/Kg	0.348 U	0.367 U	Yes
4-Chloro-3-methylphenol	µg/Kg	0.685 U	0.722 U	Yes
4-Chloroaniline	µg/Kg	0.348 U	0.367 U	Yes
4-Chlorophenyl-phenyl ether	µg/Kg	0.348 U	0.367 U	Yes
4-Methylphenol	µg/Kg	0.348 U	0.367 U	Yes
4-Nitroaniline	µg/Kg	1.74 U	1.83 U	Yes
4-Nitrophenol	µg/Kg	0.843 U	0.888 U	Yes
Acenaphthene	µg/Kg	0.348 U	0.367 U	Yes
Acenaphthylene	µg/Kg	0.348 U	0.367 U	Yes
Anthracene	µg/Kg	0.348 U	0.367 U	Yes
Benzo(a)anthracene	µg/Kg	0.348 U	0.367 U	Yes
Benzo(a)pyrene	µg/Kg	0.348 U	0.367 U	Yes
Benzo(b)fluoranthene	µg/Kg	0.348 U	0.367 U	Yes
Benzo(g,h,i)perylene	µg/Kg	0.348 U	0.367 U	Yes
Benzo(k)fluoranthene	µg/Kg	0.348 U	0.367 U	Yes
Benzoic acid	µg/Kg	0.843 U	0.888 U	Yes
Benzyl alcohol	µg/Kg	0.685 U	0.722 U	Yes
Bis(2-chloroethoxy)methane	µg/Kg	0.348 U	0.367 U	Yes
Bis(2-chloroethyl)ether	µg/Kg	0.348 U	0.367 U	Yes
Bis(2-chloroisopropyl)ether	µg/Kg	0.348 U	0.367 U	Yes
Bis(2-ethylhexyl)phthalate	µg/Kg	0.348 U	0.367 U	Yes
Butylbenzylphthalate	µg/Kg	0.348 U	0.367 U	Yes
Carbazole	µg/Kg	0.348 U	0.367 U	Yes
Chrysene	µg/Kg	0.348 U	0.367 U	Yes
Di-n-butylphthalate	µg/Kg	0.348 U	0.367 U	Yes
Di-n-octylphthalate	µg/Kg	0.348 U	0.367 U	Yes
Dibenzo(a,h)anthracene	µg/Kg	0.348 U	0.367 U	Yes
Dibenzofuran	µg/Kg	0.348 U	0.367 U	Yes
Diethyl phthalate	µg/Kg	0.212 U	0.367 U	Yes
Dimethyl phthalate	µg/Kg	0.348 U	0.367 U	Yes
Fluoranthene	µg/Kg	0.348 U	0.367 U	Yes
Fluorene	µg/Kg	0.348 U	0.367 U	Yes
Hexachlorobenzene	µg/Kg	0.348 U	0.367 U	Yes
Hexachlorobutadiene	µg/Kg	0.348 U	0.367 U	Yes
Hexachlorocyclopentadiene	µg/Kg	0.348 U	0.367 U	Yes
Hexachloroethane	µg/Kg	0.348 U	0.367 U	Yes

Table 4-4
Soil Field Duplicate Results
Former Building 354

	Sample Point:	354T10/S01	354T10/S04	Meets QC
	Date Sampled:	9/22/97	9/22/97	Criteria?
	Laboratory Number:	D97-11522-1	D97-11522-2	Yes/No
	Sample Delivery Group:	D97-11522	D97-11522	
SVOCs (Cont.)	**Units**			
Indeno(1,2,3-cd)pyrene	µg/Kg	0.348 U	0.367 U	Yes
Isophorone	µg/Kg	0.348 U	0.367 U	Yes
N-Nitroso-di-n-propylamine	µg/Kg	0.348 U	0.367 U	Yes
N-Nitrosodiphenylamine	µg/Kg	0.348 U	0.367 U	Yes
Naphthalene	µg/Kg	0.348 U	0.367 U	Yes
Nitrobenzene	µg/Kg	0.348 U	0.367 U	Yes
Pentachlorophenol	µg/Kg	1.74 U	1.83 U	Yes
Phenanthrene	µg/Kg	0.348 U	0.367 U	Yes
Phenol	µg/Kg	0.348 U	0.367 U	Yes
Pyrene	µg/Kg	0.348 U	0.367 U	Yes
VOCs	**Units**			
1,1,1,2-Tetrachloroethane	µg/Kg	5.27 U	5.61 U	Yes
1,1,1-Trichloroethane	µg/Kg	5.27 U	5.61 U	Yes
1,1,2,2-Tetrachloroethane	µg/Kg	5.27 U	5.61 U	Yes
1,1,2-Trichloroethane	µg/Kg	5.27 U	5.61 U	Yes
1,1-Dichloroethane	µg/Kg	5.27 U	5.61 U	Yes
1,1-Dichloroethene	µg/Kg	5.27 U	5.61 U	Yes
1,1-Dichloropropene	µg/Kg	5.27 U	5.61 U	Yes
1,2,3-Trichlorobenzene	µg/Kg	5.27 U	5.61 U	Yes
1,2,3-Trichloropropane	µg/Kg	5.27 U	5.61 U	Yes
1,2,4-Trichlorobenzene	µg/Kg	5.27U	5.61 U	Yes
1,2,4-Trimethylbenzene	µg/Kg	5.27 U	5.61 U	Yes
1,2-Dibromo-3-chloropropane	µg/Kg	26.3 U	28 U	Yes
1,2-Dibromoethane	µg/Kg	5.27 U	5.61 U	Yes
1,2-Dichlorobenzene	µg/Kg	5.27 U	5.61 U	Yes
1,2-Dichloroethane	µg/Kg	5.27 U	5.61 U	Yes
1,2-Dichloropropane	µg/Kg	5.27 U	5.61 U	Yes
1,3,5-Trimethylbenzene	µg/Kg	5.27 U	5.61 U	Yes
1,3-Dichlorobenzene	µg/Kg	5.27 U	5.61 U	Yes
1,3-Dichloropropane	µg/Kg	5.27 U	5.61 U	Yes
1,4-Dichlorobenzene	µg/Kg	5.27 U	5.61 U	Yes
2,2-Dichloropropane	µg/Kg	5.27 U	5.61 U	Yes
2-Butanone	µg/Kg	105 U	112 U	Yes
2-Chloroethylvinyl ether	µg/Kg	10.5 U	11.2 U	Yes
2-Chlorotoluene	µg/Kg	5.27 U	5.61 U	Yes
2-Hexanone	µg/Kg	52.7 U	56.1 U	Yes
4-Chlorotoluene	µg/Kg	5.27 U	5.61 U	Yes
4-Methyl-2-pentanone	µg/Kg	105 U	112 U	Yes
Acetone	µg/Kg	105 U	112 U	Yes
Acrylonitrile	µg/Kg	5.27 U	5.61 U	Yes

Table 4-4
Soil Field Duplicate Results
Former Building 354

	Sample Point:	354T10/S01	354T10/S04	Meets QC
	Date Sampled:	9/22/97	9/22/97	Criteria?
	Laboratory Number:	D97-11522-1	D97-11522-2	Yes/No
	Sample Delivery Group:	D97-11522	D97-11522	
VOCs (cont)	Units			
Benzene	µg/Kg	5.27 U	5.61 U	Yes
Bromobenzene	µg/Kg	5.27 U	5.61 U	Yes
Bromochloromethane	µg/Kg	5.27 U	5.61 U	Yes
Bromodichloromethane	µg/Kg	5.27 U	5.61 U	Yes
Bromoform	µg/Kg	5.27 U	5.61 U	Yes
Bromomethane	µg/Kg	5.27 U	5.61 U	Yes
Carbon disulfide	µg/Kg	5.27 U	5.61 U	Yes
Carbon tetrachloride	µg/Kg	5.27 U	5.61 U	Yes
Chlorobenzene	µg/Kg	5.27 U	5.61 U	Yes
Chloroethane	µg/Kg	5.27 U	5.61 U	Yes
Chloroform	µg/Kg	5.27 U	5.61 U	Yes
cis-1,2-Dichloroethene	µg/Kg	5.27U	5.61 U	Yes
cis-1,3-Dichloropropene	µg/Kg	5.27 U	5.61 U	Yes
Dibromochloromethane	µg/Kg	5.27 U	5.61 U	Yes
Dibromomethane	µg/Kg	5.27 U	5.61 U	Yes
Ethylbenzene	µg/Kg	5.27 U	5.61 U	Yes
Iodomethane	µg/Kg	5.27 U	5.61 U	Yes
m,p-Xylene	µg/Kg	5.27 U	5.61 U	Yes
Methyl chloride	µg/Kg	5.27 U	5.61 U	Yes
Methylene chloride	µg/Kg	5.27 U	5.61 U	Yes
o-Xylene	µg/Kg	5.27 U	5.61 U	Yes
Styrene	µg/Kg	5.27 U	5.61 U	Yes
Tetrachloroethene	µg/Kg	5.27 U	5.61 U	Yes
Toluene	µg/Kg	5.27 U	5.61 U	Yes
trans-1,2-Dichloroethene	µg/Kg	5.27 U	5.61 U	Yes
trans-1,3-Dichloropropene	µg/Kg	5.27 U	5.61 U	Yes
trans-1,4-Dichloro-2-butene	µg/Kg	105 U	112	Yes
Trichloroethene	µg/Kg	5.27 U	5.61 U	Yes
Trichlorofluoromethane	µg/Kg	5.27 U	5.61 U	Yes
Vinyl acetate	µg/Kg	52.7 U	56.1 U	Yes
Vinyl chloride	µg/Kg	5.27 U	5.61 U	Yes

Notes:

mg/Kg = milligrams per Kilogram

µg/Kg= microgram per Kilogram

U = undetected

J = Qualified as estimated by the laboratory.

R = Qualified as unusable during data review.

SVOCs = Semivolatile Organic Compounds

VOCs = Volatile Organic Compounds

Table 4-5
Groundwater Field Duplicate Results
Former Building 354

	Sample Point:	MW95-06/W01	MW95-06/W02	Meets QC
	Date Sampled:	9/17/97	9/17/97	Criteria?
	Laboratory Number:	D97-11373-2	D97-11372-1	Yes/No
	Sample Delivery Group:	D97-11373	D97-11373	
Metals	**Units**			
Aluminum, Total	mg/L	0.1 U	0.1 U	Yes
Antimony, Total	mg/L	0.006 U	0.006 U	Yes
Arsenic, Total	mg/L	0.01 UR	0.01 UR	Yes
Barium, Total	mg/L	0.179	0.18	Yes
Beryllium, Total	mg/L	0.003 U	0.003 U	Yes
Cadmium, Total	mg/L	0.005 U	0.005 U	Yes
Calcium, Total	mg/L	176 DF	177 DF	Yes
Chromium, Total	mg/L	0.0021 J	0.0023 J	Yes
Cobalt, Total	mg/L	0.01 U	0.01 U	Yes
Copper, Total	mg/L	0.01 U	0.01 U	Yes
Iron, Total	mg/L	0.1 U	0.1 U	Yes
Lead, Total	mg/L	0.002 UR	0.002 UR	Yes
Magnesium, Total	mg/L	24.8	25	Yes
Manganese, Total	mg/L	0.01 U	0.01 U	Yes
Mercury, Total	mg/L	0.0001 J	0.0002 U	Yes
Nickel, Total	mg/L	0.005 U	0.005 U	Yes
Potassium, Total	mg/L	3.94	3.97	Yes
Selenium, Total	mg/L	0.01 U	0.01 U	Yes
Silver, Total	mg/L	0.005 U	0.005 U	Yes
Sodium, Total	mg/L	45.6 D	45.2 D	Yes
Thallium, Total	mg/L	0.005 UR	0.005 UR	Yes
Vanadium, Total	mg/L	0.0035 J	0.0027 J	Yes
Zinc, Total	mg/L	0.02 U	0.02 U	Yes
SVOCs	**Units**			
1,2,4-Trichlorobenzene	µg/L	10 U	10.5 U	Yes
1,2-Dichlorobenzene	µg/L	10 U	10.5 U	Yes
1,3-Dichlorobenzene	µg/L	10 U	10.5 U	Yes
1,4-Dichlorobenzene	µg/L	10 U	10.5 U	Yes
2,4,5-Trichlorophenol	µg/L	10 U	10.5 U	Yes
2,4,6-Trichlorophenol	µg/L	10 U	10.5 U	Yes
2,4-Dichlorophenol	µg/L	10 U	10.5 U	Yes
2,4-Dimethylphenol	µg/L	10 U	10.5 U	Yes
2,4-Dinitrophenol	µg/L	50 U	52.5 U	Yes
2,4-Dinitrotoluene	µg/L	10 U	10.5 U	Yes
2,6-Dinitrotoluene	µg/L	10 U	10.5 U	Yes
2-Chloronaphthalene	µg/L	10 U	10.5 U	Yes
2-Chlorophenol	µg/L	10 U	10.5 U	Yes
2-Methylnaphthalene	µg/L	10 U	10.5 U	Yes
2-Methylphenol	µg/L	10 U	10.5 U	Yes

Table 4-5
Groundwater Field Duplicate Results
Former Building 354

Sample Point:		MW95-06/W01	MW95-06/W02	Meets QC
Date Sampled:		9/17/97	9/17/97	Criteria?
Laboratory Number:		D97-11373-2	D97-11372-1	Yes/No
Sample Delivery Group:		D97-11373	D97-11373	
SVOCs (Cont.)	**Units**			
2-Nitroaniline	µg/L	50 U	52.5 U	Yes
2-Nitrophenol	µg/L	10 U	10.5 U	Yes
3,3'-Dichlorobenzidine	µg/L	20 U	21 U	Yes
3-Nitroaniline	µg/L	50 U	52.5 U	Yes
4,6-Dinitro-2-methylphenol	µg/L	50 U	52.5 U	Yes
4-Bromophenyl-phenyl ether	µg/L	10 U	10.5 U	Yes
4-Chloro-3-methylphenol	µg/L	20 U	21 U	Yes
4-Chloroaniline	µg/L	20 U	21 U	Yes
4-Chlorophenyl-phenyl ether	µg/L	10 U	10.5 U	Yes
4-Methylphenol	µg/L	10 U	10.5 U	Yes
4-Nitroaniline	µg/L	50 U	52.5 U	Yes
4-Nitrophenol	µg/L	50 U	52.5 U	Yes
Acenaphthene	µg/L	10 U	10.5 U	Yes
Acenaphthylene	µg/L	10 U	10.5 U	Yes
Anthracene	µg/L	10 U	10.5 U	Yes
Benzo(a)anthracene	µg/L	10 U	10.5 U	Yes
Benzo(a)pyrene	µg/L	10 U	10.5 U	Yes
Benzo(b)fluoranthene	µg/L	10 U	10.5 U	Yes
Benzo(g,h,i)perylene	µg/L	10 U	10.5 U	Yes
Benzo(k)fluoranthene	µg/L	10 U	10.5 U	Yes
Benzoic acid	µg/L	50 U	52.5 U	Yes
Benzyl alcohol	µg/L	20 U	21 U	Yes
Bis(2-chloroethoxy)methane	µg/L	10 U	10.5 U	Yes
Bis(2-chloroethyl)ether	µg/L	10 U	10.5 U	Yes
Bis(2-chloroisopropyl)ether	µg/L	10 U	10.5 U	Yes
Bis(2-ethylhexyl)phthalate	µg/L	10 U	10.5 U	Yes
Butylbenzylphthalate	µg/L	10 U	10.5 U	Yes
Carbazole	µg/L	10 U	10.5 U	Yes
Chrysene	µg/L	10 U	10.5 U	Yes
Di-n-butylphthalate	µg/L	10 U	10.5 U	Yes
Di-n-octylphthalate	µg/L	10 U	10.5 U	Yes
Dibenzo(a,h)anthracene	µg/L	10 U	10.5 U	Yes
Dibenzofuran	µg/L	10 U	10.5 U	Yes
Diethyl phthalate	µg/L	4.3 J	10.5 U	Yes
Dimethyl phthalate	µg/L	10 U	10.5 U	Yes
Fluoranthene	µg/L	10 U	10.5 U	Yes
Fluorene	µg/L	10 U	10.5 U	Yes

Table 4-5
Groundwater Field Duplicate Results
Former Building 354

	Sample Point:	MW95-06/W01	MW95-06/W02	Meets QC
	Date Sampled:	9/17/97	9/17/97	Criteria?
	Laboratory Number:	D97-11373-2	D97-11372-1	Yes/No
	Sample Delivery Group:	D97-11373	D97-11373	
SVOCs (Cont.)	Units			
Hexachlorobenzene	µg/L	10 U	10.5 U	Yes
Hexachlorobutadiene	µg/L	10 U	10.5 U	Yes
Hexachlorocyclopentadiene	µg/L	10 U	10.5 U	Yes
Hexachloroethane	µg/L	10 U	10.5 U	Yes
Indeno(1,2,3-cd)pyrene	µg/L	10 U	10.5 U	Yes
Isophorone	µg/L	10 U	10.5 U	Yes
N-Nitroso-di-n-propylamine	µg/L	10 U	10.5 U	Yes
N-Nitrosodiphenylamine	µg/L	10 U	10.5 U	Yes
Naphthalene	µg/L	10 U	10.5 U	Yes
Nitrobenzene	µg/L	10 U	10.5 U	Yes
Pentachlorophenol	µg/L	50 U	52.5 U	Yes
Phenanthrene	µg/L	10 U	10.5 U	Yes
Phenol	µg/L	10 U	10.5 U	Yes
Pyrene	µg/L	10 U	10.5 U	Yes

Notes:

mg/L = milligrams per Liter

µg/L = microgram per Liter

U = undetected

J = Qualified as estimated by the laboratory.

R = Qualified as unusable during data review.

SVOCs = Semivolatile Organic Compounds

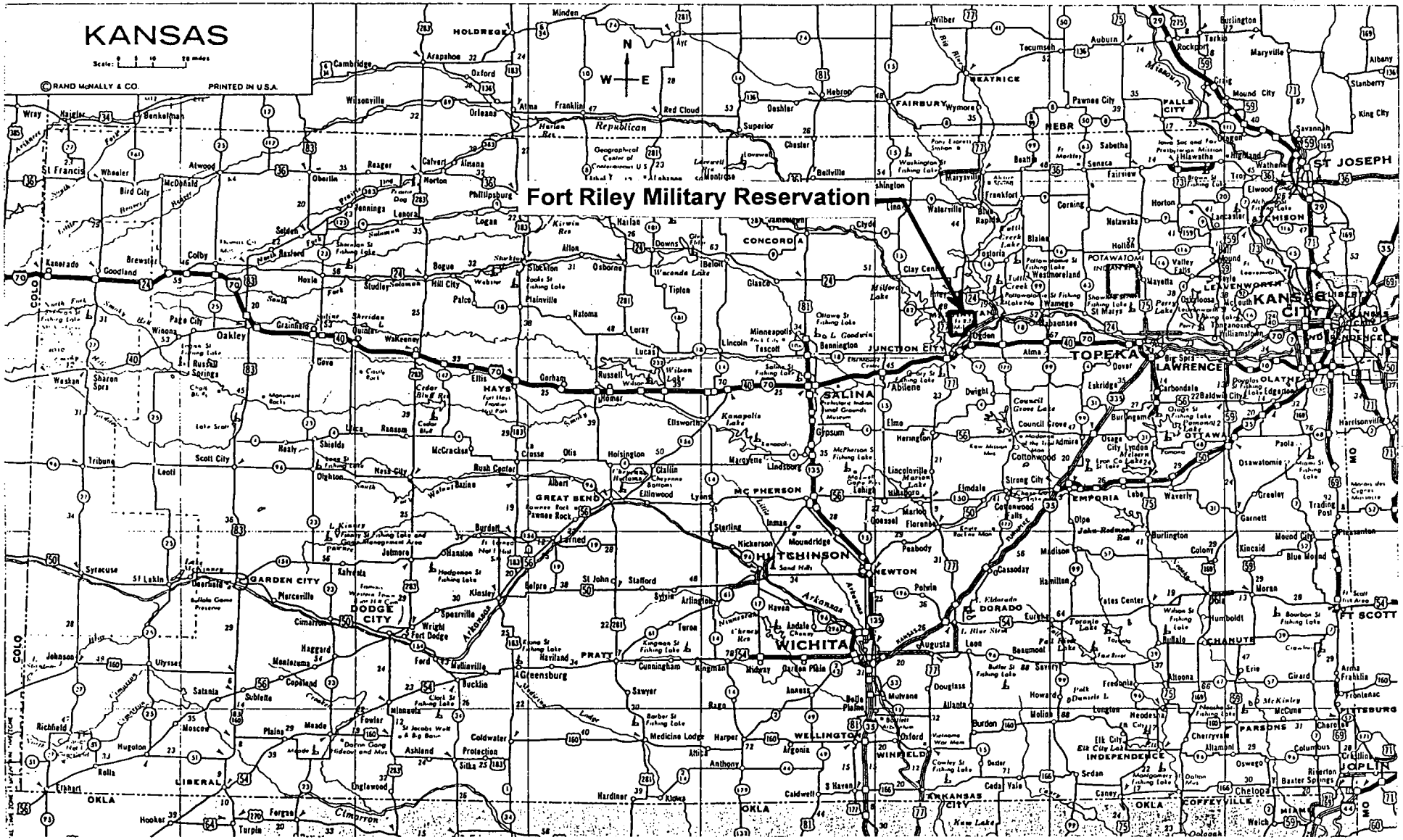
VOCs = Volatile Organic Compounds

Table 4-6
Analytical Completeness
Former Building 354

Parameter	Requested Number of Samples	Number of Analytes per Analysis	Total Number of Analytes	Number of Usable Analytes	Laboratory Completeness (%)
SVOCs	20	66	1320	1319	99.9
TAL Metals	18	23	414	371	89.6
VOCs	20	60	1200	1140	95.0
Overall Completeness			2934	2830	96.5

* = Included groundwater, surface water, subsurface soil, and sediment matrices. Number includes all field samples, field duplicates, and rinsates.
TAL = Target Analyte List
SVOCs = Semivolatile Organic Compounds
VOCs = Volatile Organic Compounds

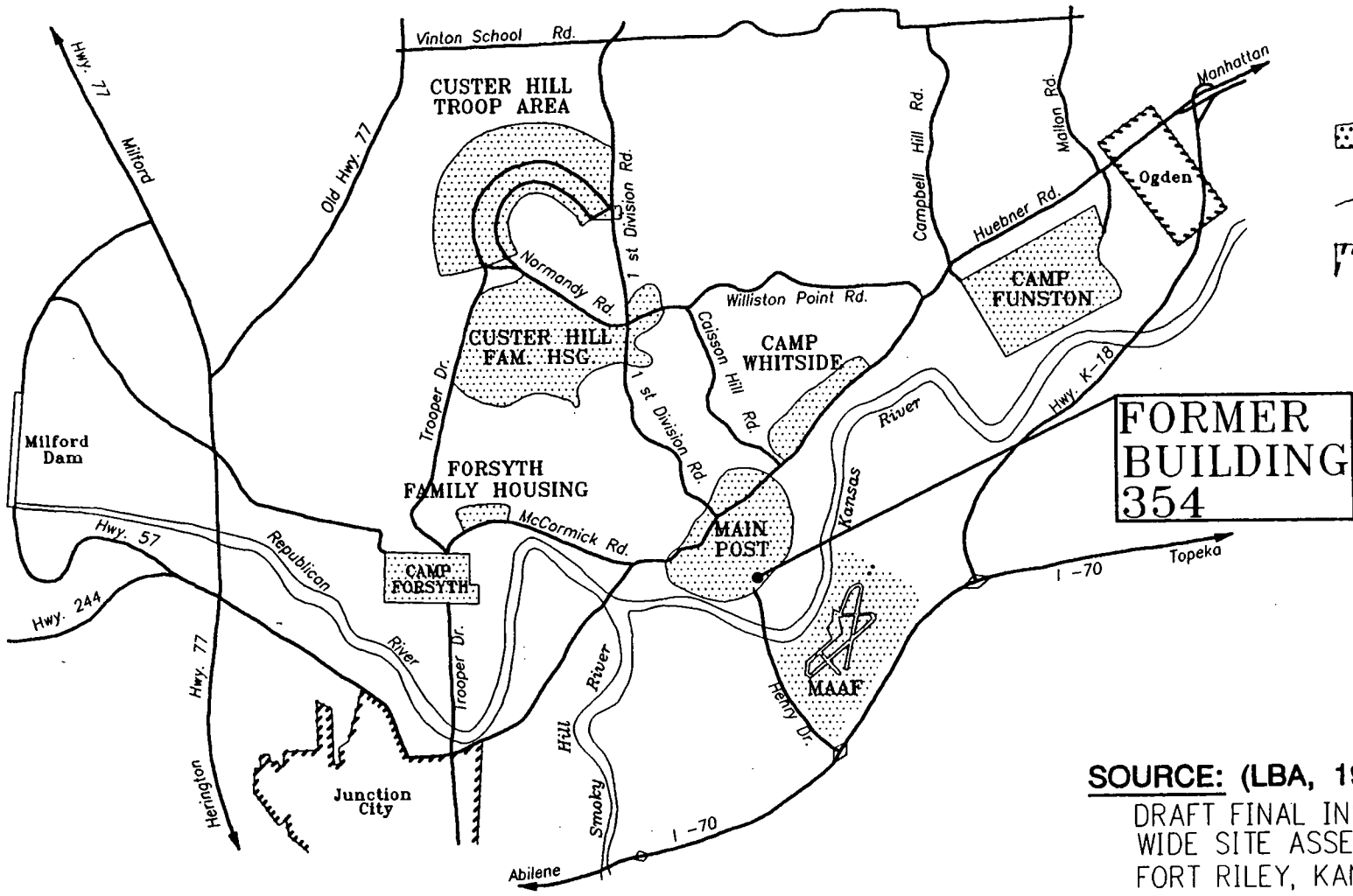
FIGURES



Burns & McDonnell

Figure 1-1

Fort Riley Location Map
Former Building 354
Fort Riley, Kansas

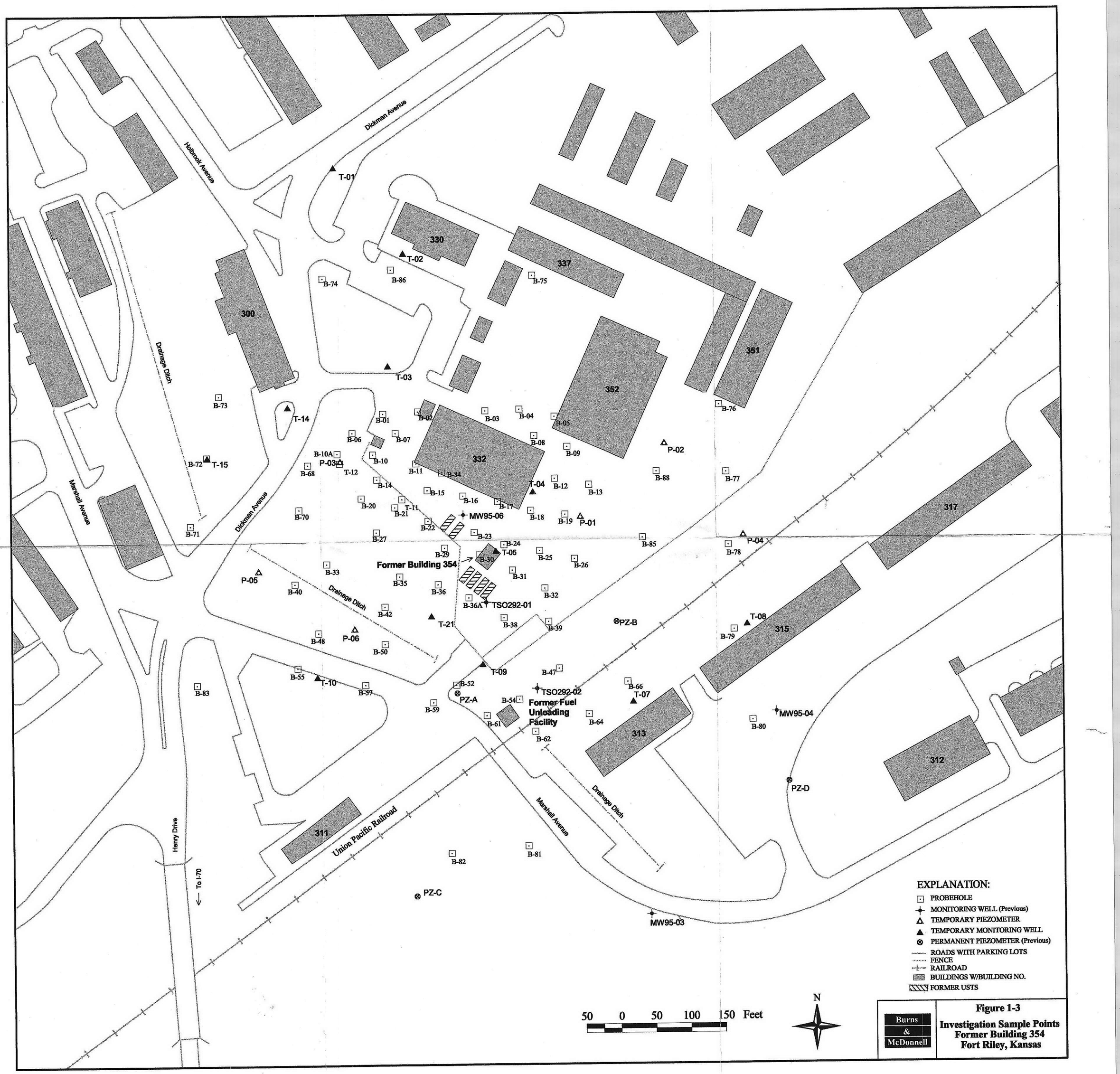


Burns & McDonnell

Figure 1-2

Project Location
Former Building 354
Fort Riley, Kansas

USFR354.DWG 01-03-1997 13:58 SSS


Dickman Avenue
Holbrook Avenue
Drainage Ditch
Marshall Avenue
Dickman Avenue
Drainage Ditch
Former Building 354
Drainage Ditch
Former Fuel Unloading Facility
Union Pacific Railroad
Marshall Avenue
Drainage Ditch
Henry Drive
To I-70
330
337
300
351
352
332
317
315
313
312
311
T-01
T-02
T-03
T-14
T-15
T-04
T-05
T-21
T-09
T-10
T-11
T-12
T-08
T-07
P-01
P-02
P-03
P-04
P-05
P-06
MW95-06
TSO292-01
TSO292-02
MW95-04
MW95-03
PZ-A
PZ-B
PZ-C
PZ-D
B-01
B-02
B-03
B-04
B-05
B-06
B-07
B-08
B-09
B-10
B-10A
B-11
B-12
B-13
B-14
B-15
B-16
B-17
B-18
B-19
B-20
B-21
B-22
B-23
B-24
B-25
B-26
B-27
B-29
B-30
B-31
B-32
B-33
B-35
B-36
B-36A
B-38
B-39
B-40
B-42
B-47
B-48
B-50
B-52
B-54
B-55
B-57
B-59
B-61
B-62
B-64
B-66
B-68
B-70
B-71
B-72
B-73
B-74
B-75
B-76
B-77
B-78
B-79
B-80
B-81
B-82
B-83
B-84
B-85
B-86
B-88
50 0 50 100 150 Feet
N
EXPLANATION:
PROBEHOLE
MONITORING WELL (Previous)
TEMPORARY PIEZOMETER
TEMPORARY MONITORING WELL
PERMANENT PIEZOMETER (Previous)
ROADS WITH PARKING LOTS
FENCE
RAILROAD
BUILDINGS W/BUILDING NO.
FORMER USTS
Burns & McDonnell
Figure 1-3
Investigation Sample Points
Former Building 354
Fort Riley, Kansas

Dickman Avenue
Holbrook Avenue
330
337
300
351
352
Drainage Ditch
332
Marshall Avenue
Dickman Avenue
Drainage Ditch (Buried)
Former Building 354
317
Transatlantic Fiberoptic (AT&T)
Drainage Ditch
315
Former Fuel Unloading Facility
313
312
Henry Drive
311
Union Pacific Railroad
Marshall Avenue
Drainage Ditch
To I-70

EXPLANATION:

- GAS LINE
- ELECTRIC LINE
- TELEPHONE OR FIBER OPTIC CABLE
- SANITARY SEWER LINE
- WATER LINE
- ROADS WITH PARKING LOTS
- FENCE
- RAILROAD
- BUILDINGS W/BUILDING NO.
- FORMER USTS

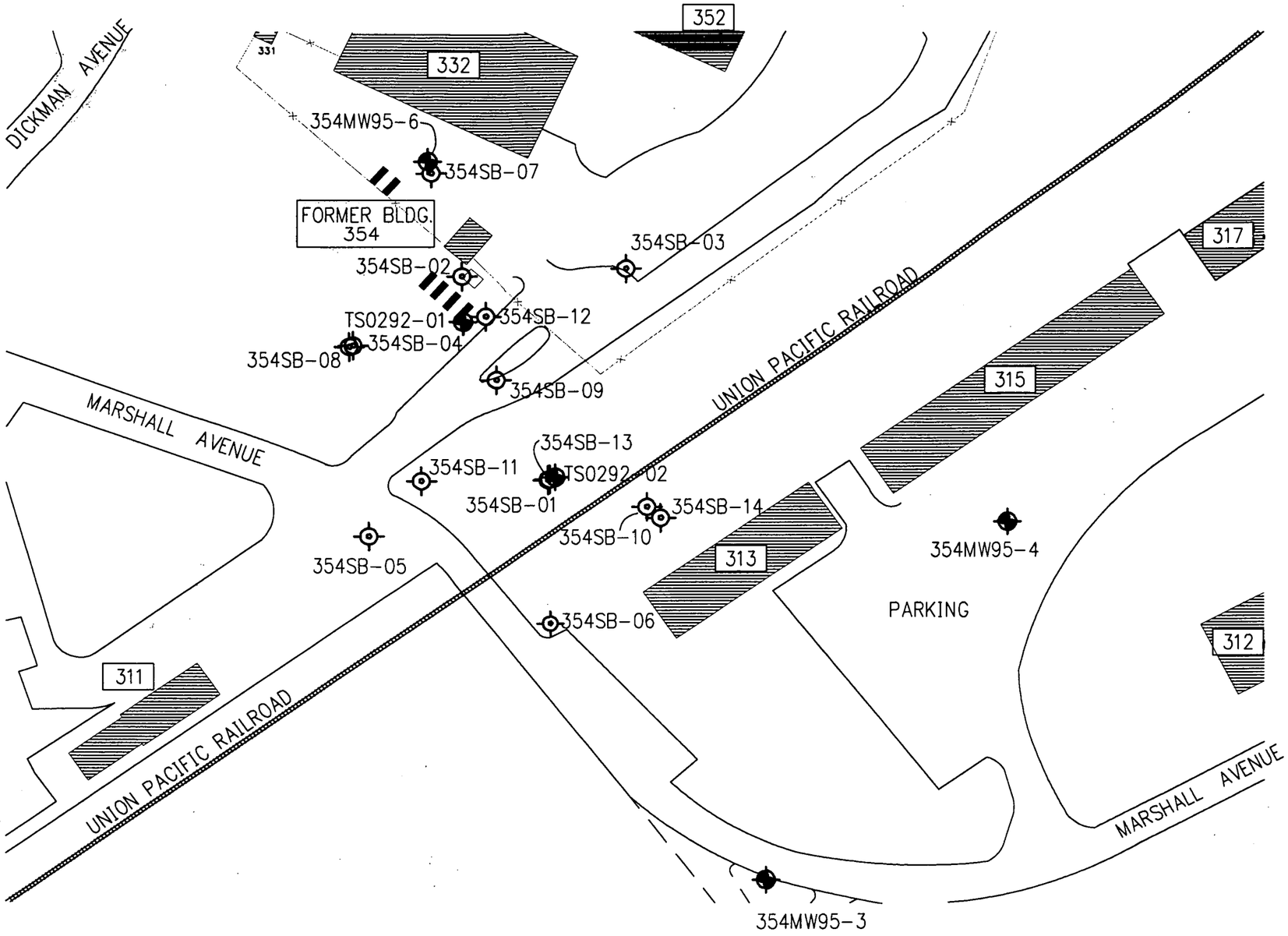
50 0 50 100 150 Feet

N

NOTES:
1.) Locations of all utilitity lines are approximate.

Burns & McDonnell

Figure 1-4
Buried Utility Locations
Former Building 354
Fort Riley, Kansas



354FG23A.DWG 11-06-1997 13:34 CCJ

Burns & McDonnell

Figure 1-5
Previous Soil Boring Locations
Former Building 354
Fort Riley, Kansas

DICKMAN AVENUE

331

352

332

MW95-06

WS-11

WS-10

FORMER BLDG. 354

WS-9

317

TS0292-01

PZ-B

UNION PACIFIC RAILROAD

315

WS-13

MARSHALL AVENUE

PZ-A (WS-A)

WS-14

TS0292-02

313

MW95-04

PARKING

WS-1

311

WS-5

PZ-D (WS-16)

312

UNION PACIFIC RAILROAD

WS-2

WS-3

WS-4

MARSHALL AVENUE

PZ-C (WS-15)

WS-18

MW95-03

WS-17

100 0 100 200

SCALE IN FEET

NORTH

LEGEND

= EXISTING MONITOR WELL LOCATION

= EXISTING PIEZOMETER LOCATION

= WELL-POINT SAMPLING LOCATION

= LOCATION OF FORMER USTs

= FENCE LINE

= EXISTING RAIL LINE

311 = BUILDING NUMBER

? = SAMPLE NUMBER NOT AVAILABLE

Burns & McDonnell

Figure 1-6
Previous Groundwater Sample Locations
Former Building 354
Fort Riley, Kansas

354FG24A.DWG 11-06-1997 13:39 CCJ

354FG2[illegible] DWG 11-06-1997 13:42 CCJ

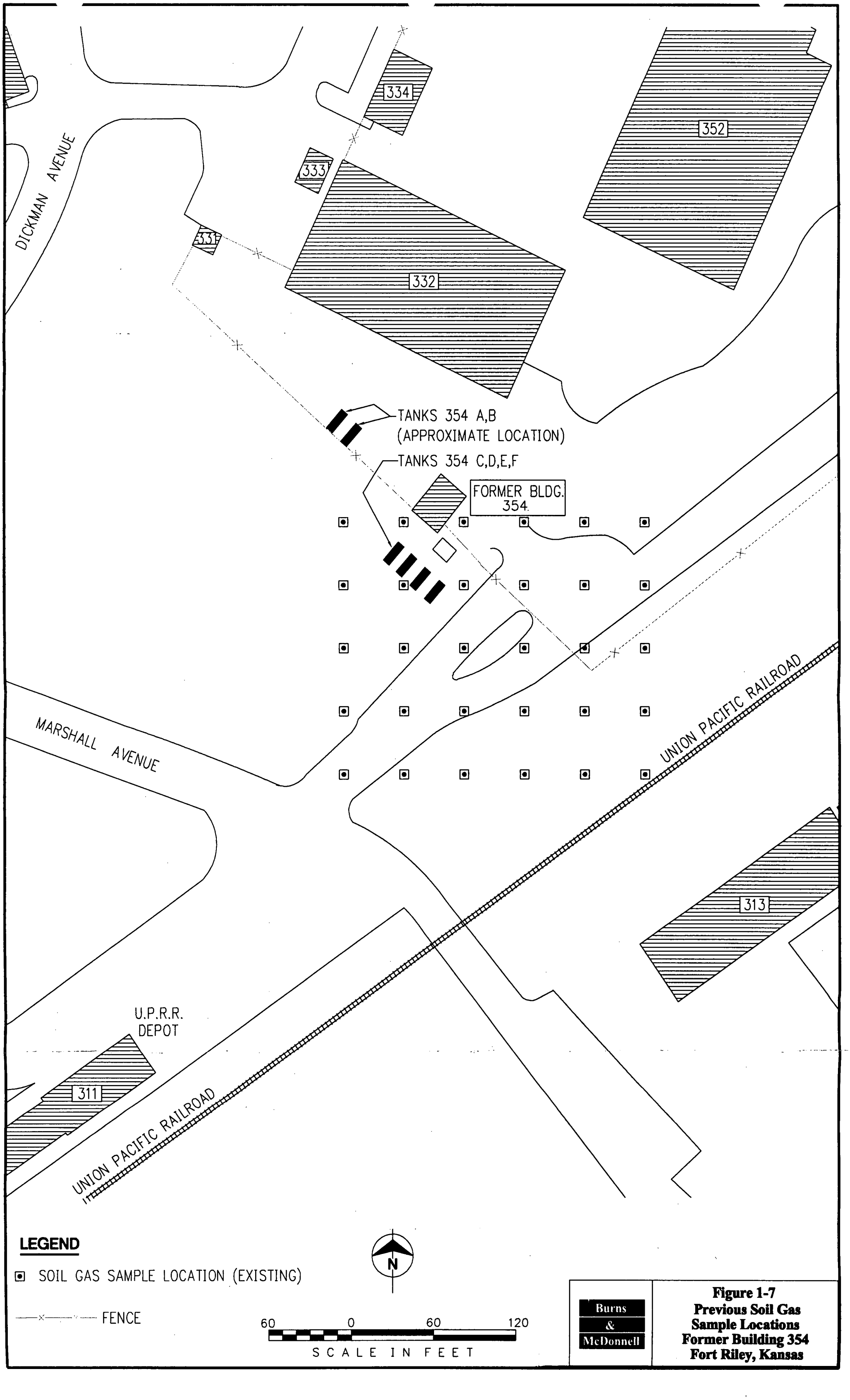


Figure 1-7
Previous Soil Gas Sample Locations
Former Building 354
Fort Riley, Kansas

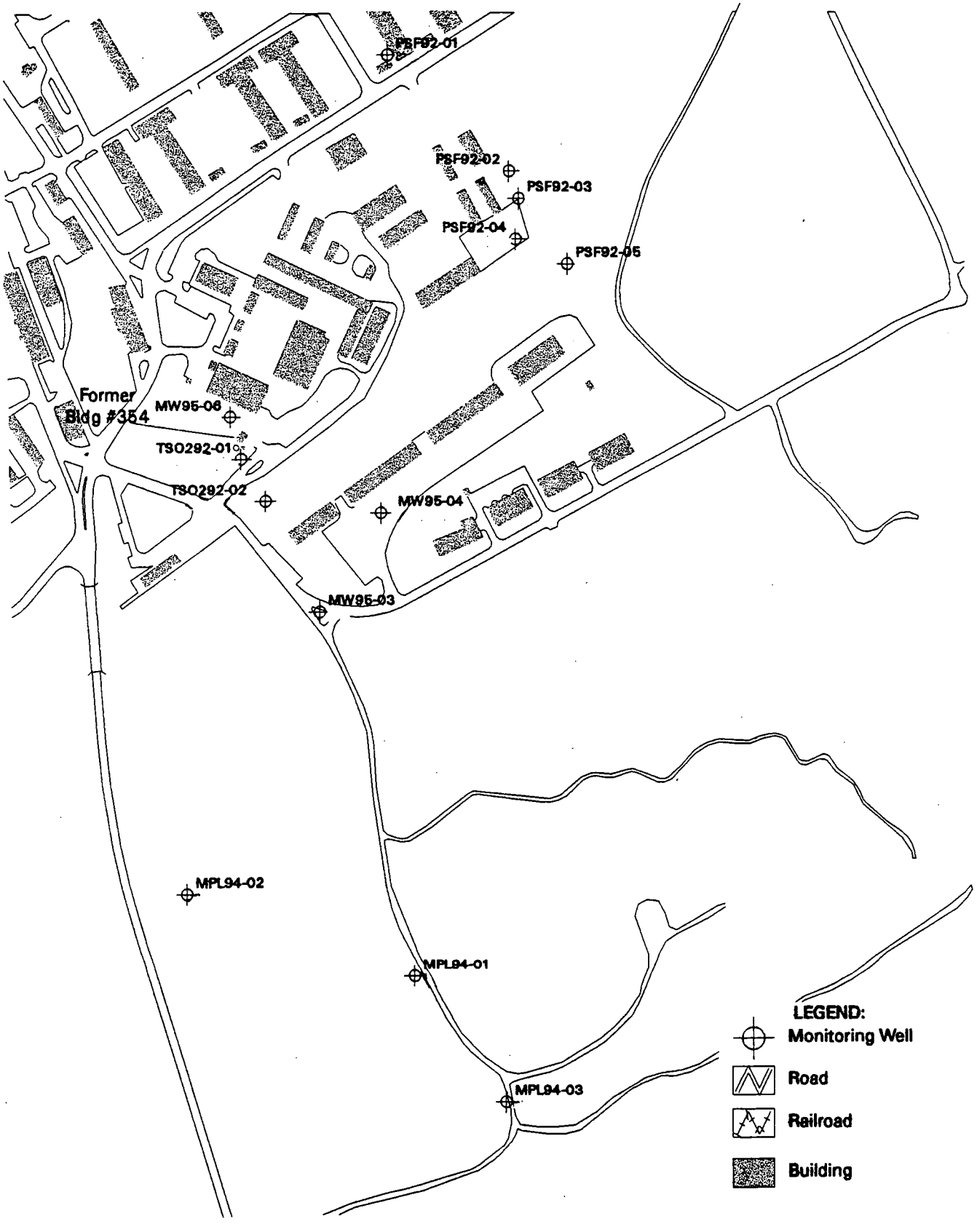
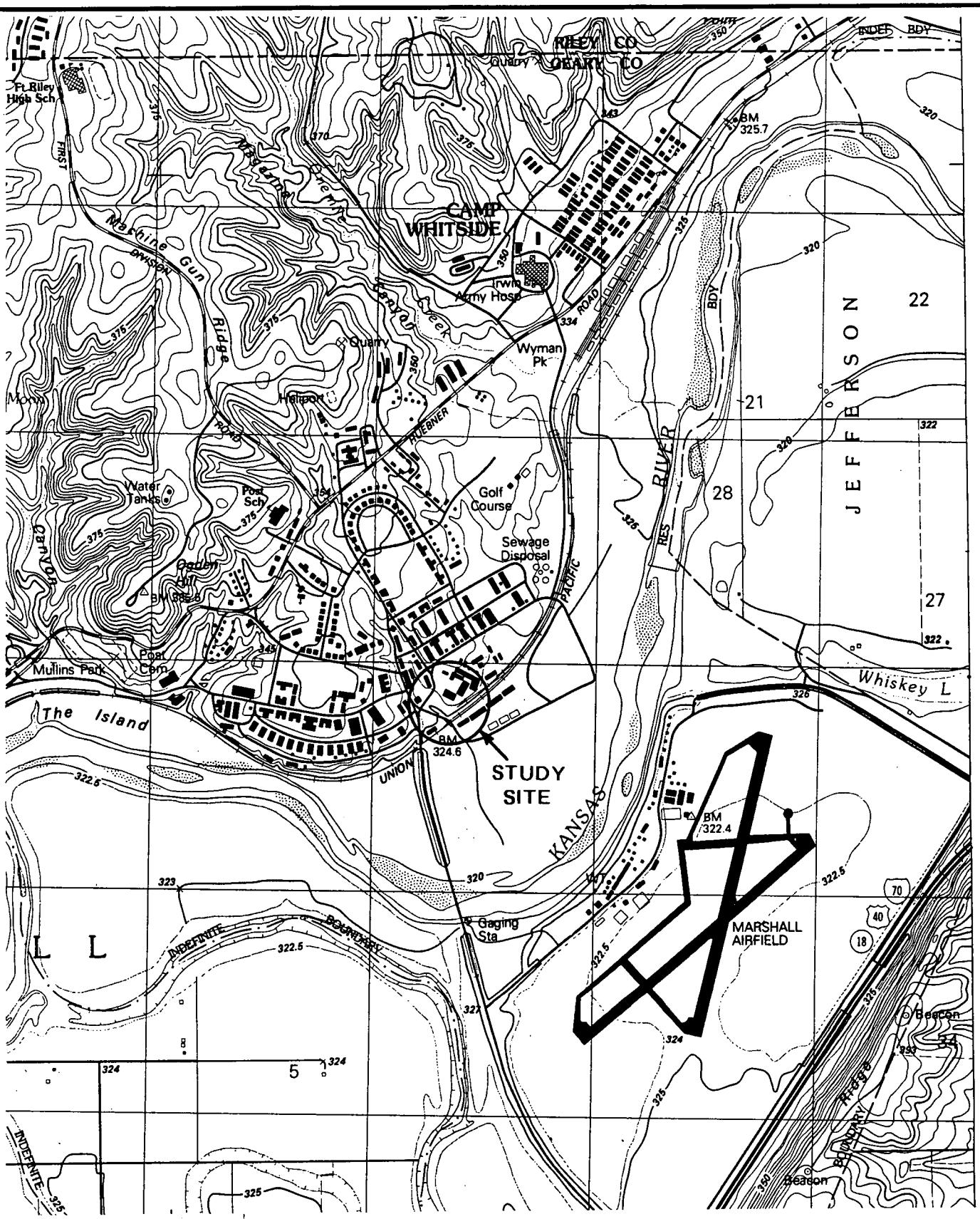


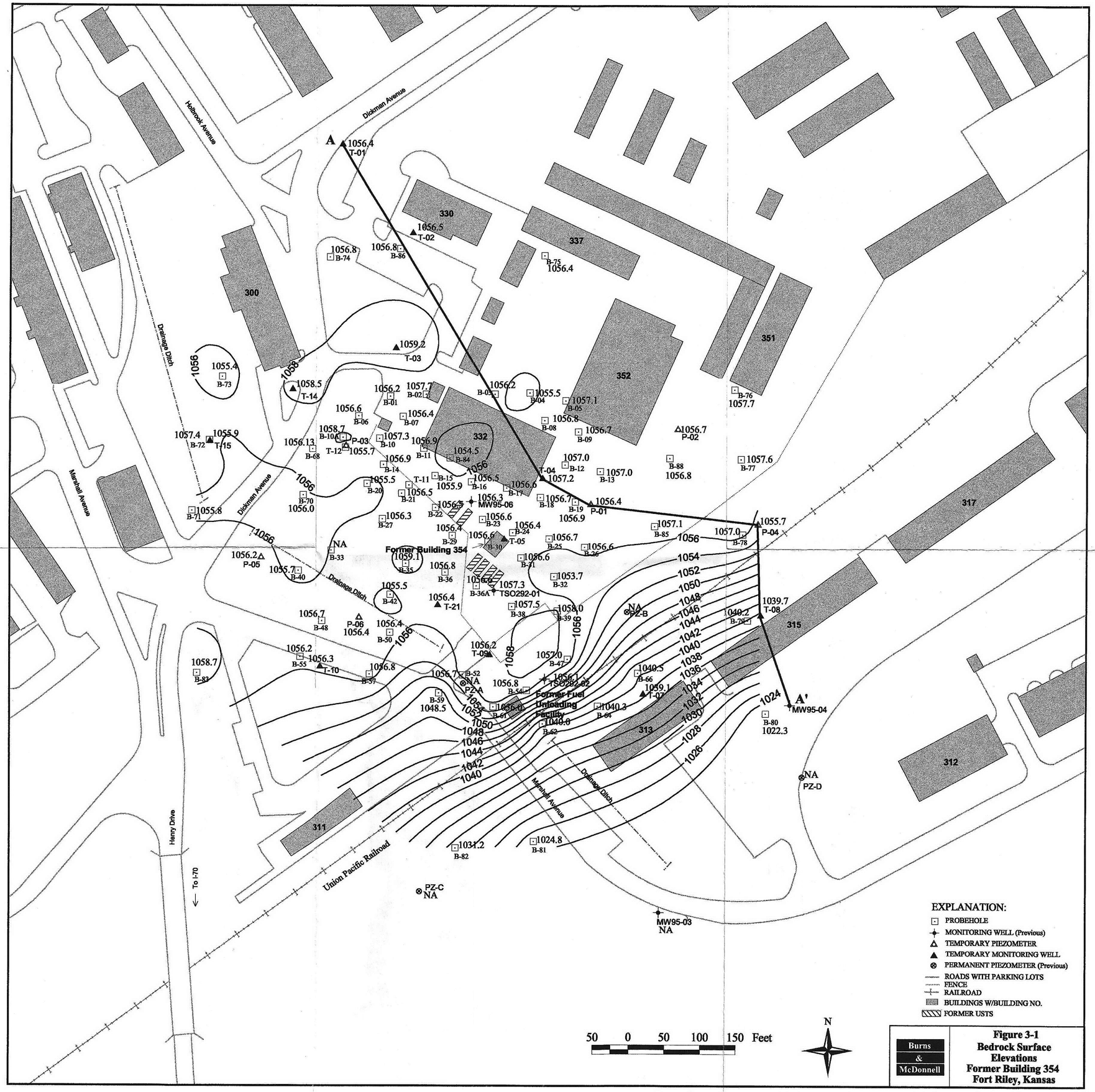
Figure 1-8
Previous Monitoring Well Sample Locations
Former Building 354
Fort Riley, Kansas

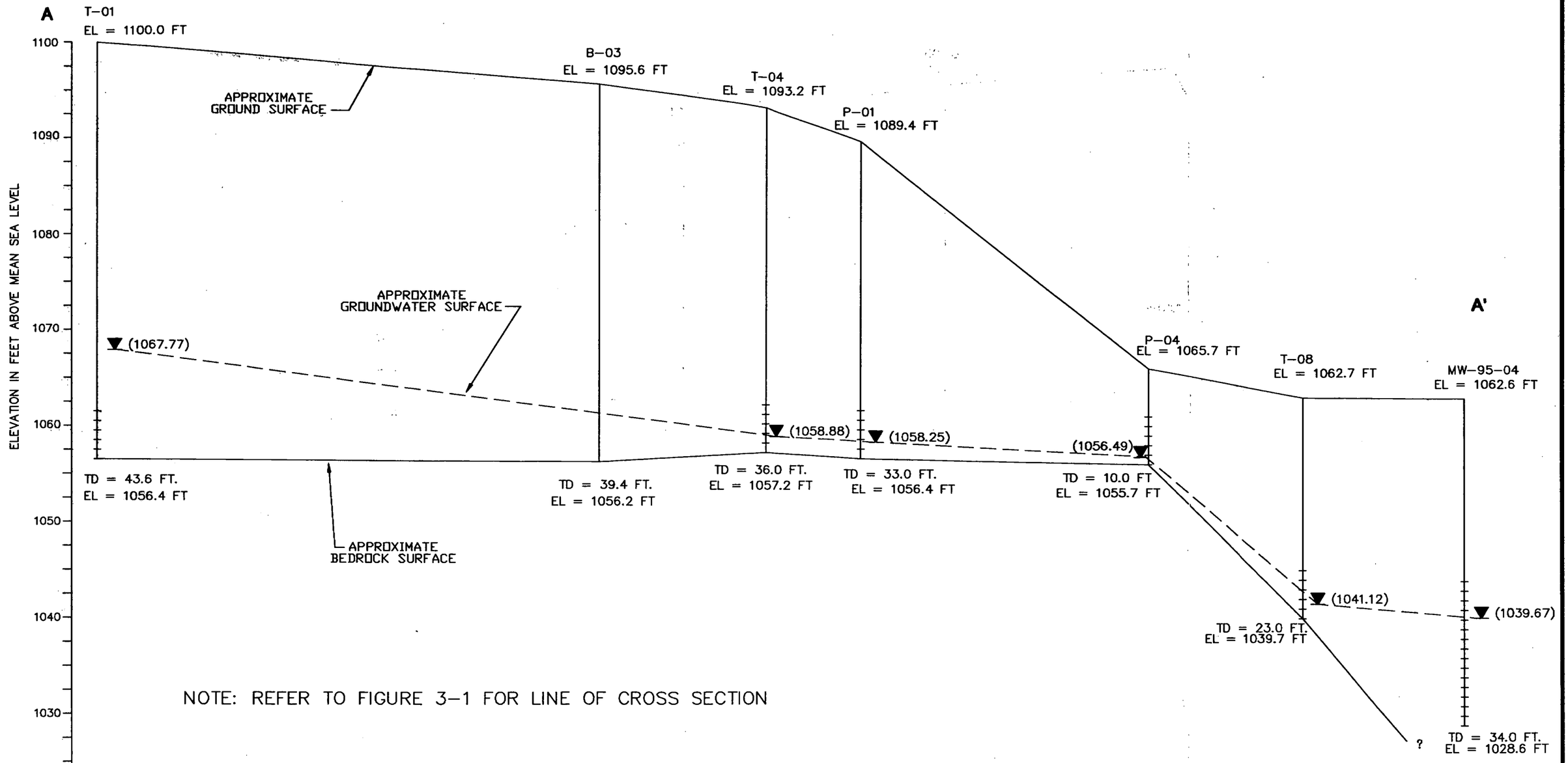


Burns & McDonnell

Figure 1-9
Topographic Map
Main Post Area
Former Building 354
Fort Riley, Kansas

K:\USFR354\WC1\MISC\TOPOBDR.DWG 11-7-97


Holbrook Avenue
Dickman Avenue
Drainage Ditch
Marshall Avenue
Dickman Avenue
Drainage Ditch
Former Building 354
Former Fuel Unloading Facility
Marshall Avenue
Drainage Ditch
Henry Drive
To I-70
Union Pacific Railroad
330
337
300
351
352
332
317
315
313
312
311
A
A'
T-01
T-02
T-03
T-14
T-15
T-12
T-11
T-04
T-05
T-21
T-09
T-10
T-07
T-08
P-01
P-02
P-03
P-04
P-05
P-06
MW95-06
MW95-04
MW95-03
TSO292-01
TSO292-02
PZ-A
PZ-B
PZ-C
PZ-D
1056
1058
1054
1052
1050
1048
1046
1044
1042
1040
1038
1036
1034
1032
1030
1028
1026
1024
EXPLANATION:
PROBEHOLE
MONITORING WELL (Previous)
TEMPORARY PIEZOMETER
TEMPORARY MONITORING WELL
PERMANENT PIEZOMETER (Previous)
ROADS WITH PARKING LOTS
FENCE
RAILROAD
BUILDINGS W/BUILDING NO.
FORMER USTS
50 0 50 100 150 Feet
N
Burns & McDonnell
Figure 3-1
Bedrock Surface Elevations
Former Building 354
Fort Riley, Kansas



NOTE: REFER TO FIGURE 3-1 FOR LINE OF CROSS SECTION

LEGEND

TD	TOTAL DEPTH IN FEET
	SCREENED INTERVAL
(1058.25) ▼	GROUNDWATER LEVEL ELEVATION ON 9/23/97

VERTICAL SCALE

10 0 10 20

SCALE IN FEET

HORIZONTAL SCALE

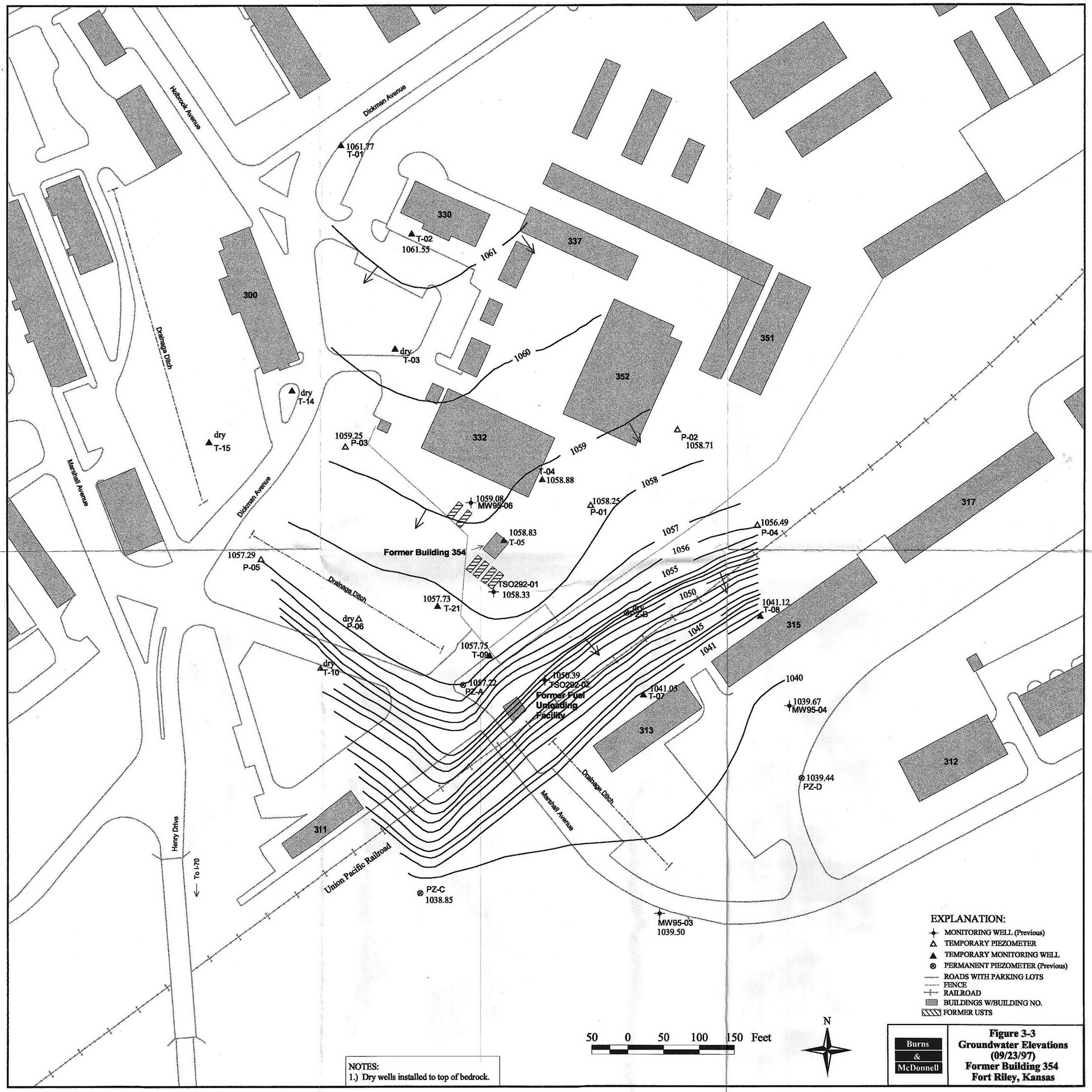
80 0 80 160

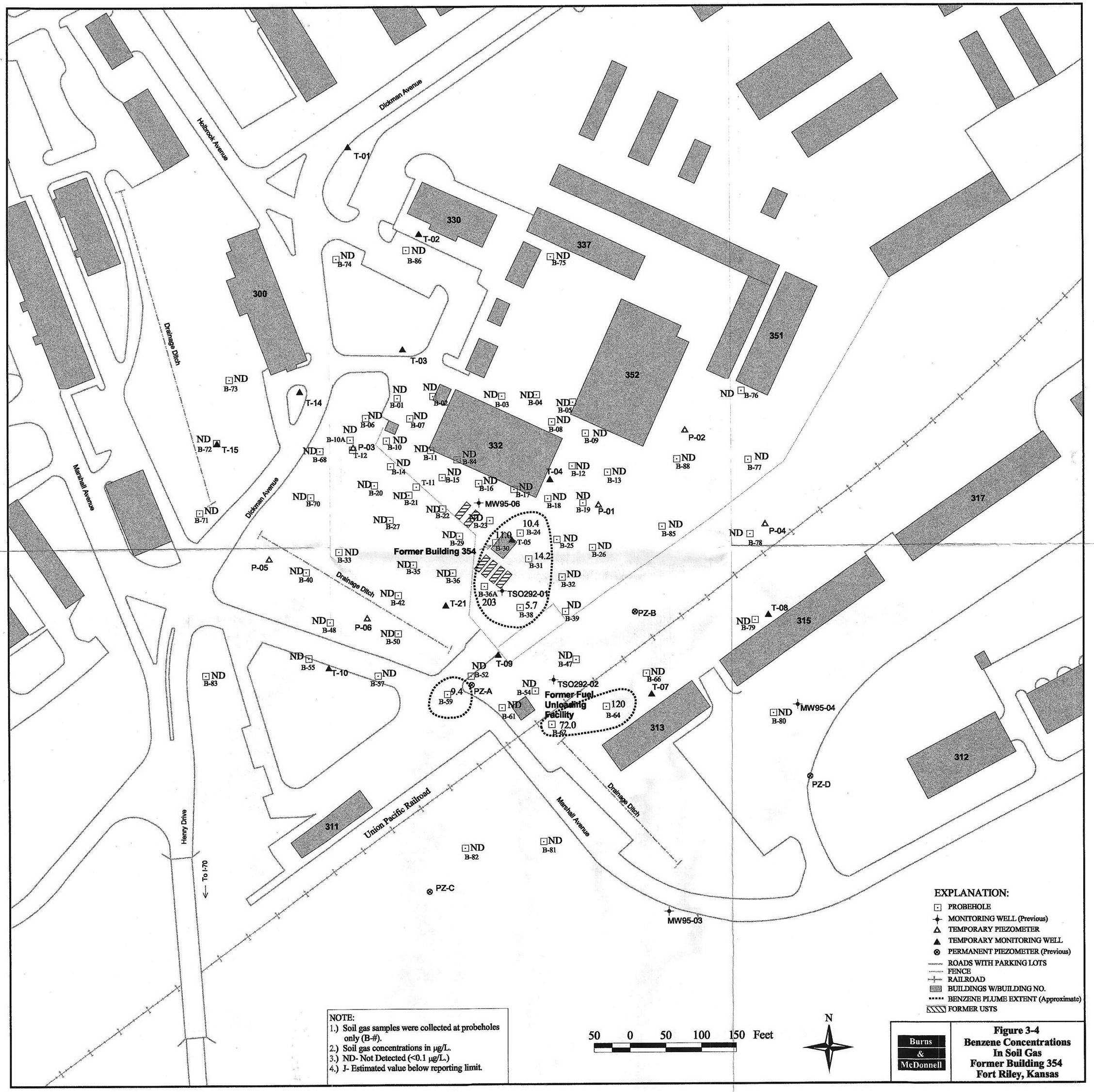
SCALE IN FEET

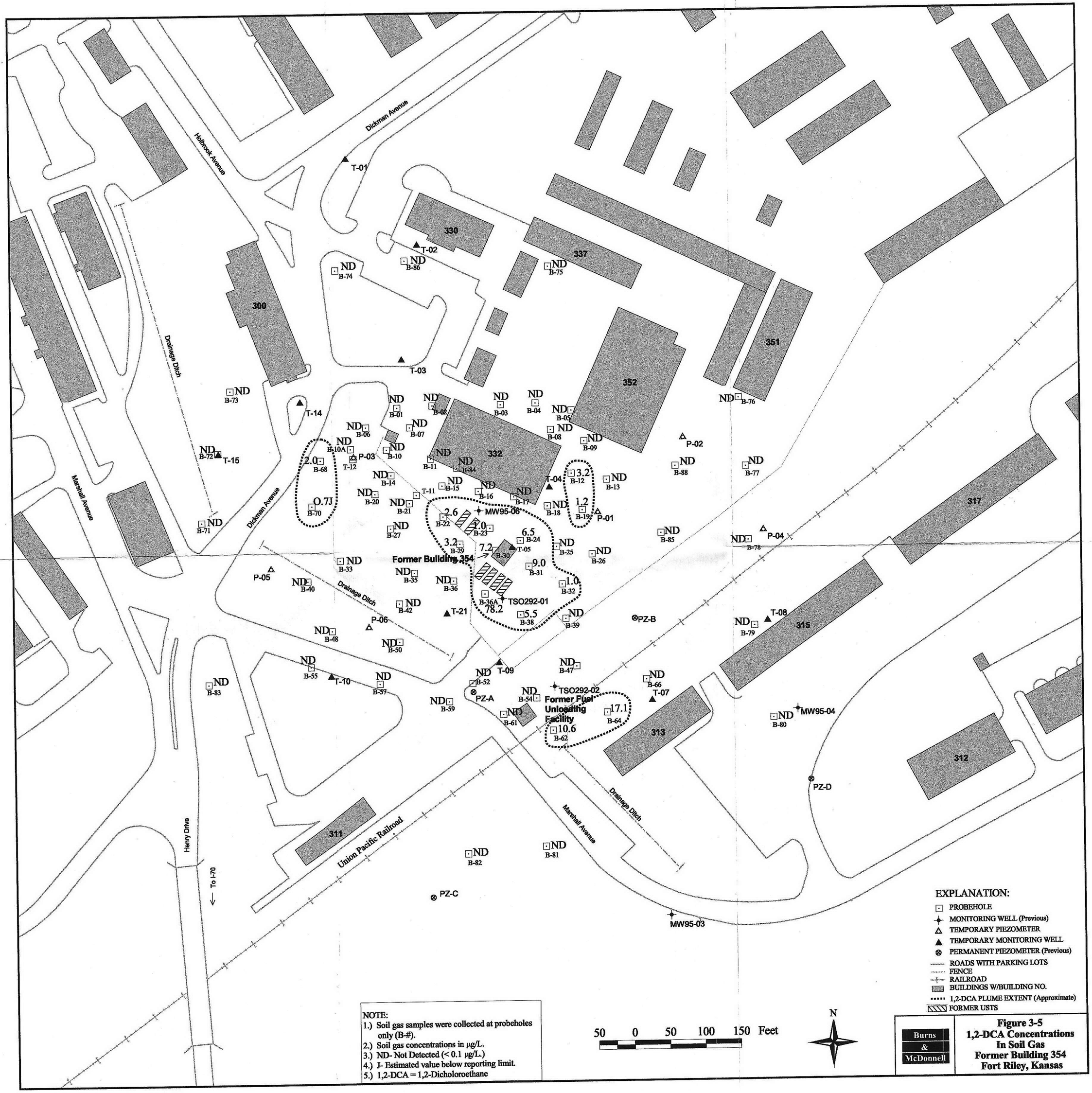
Burns & McDonnell

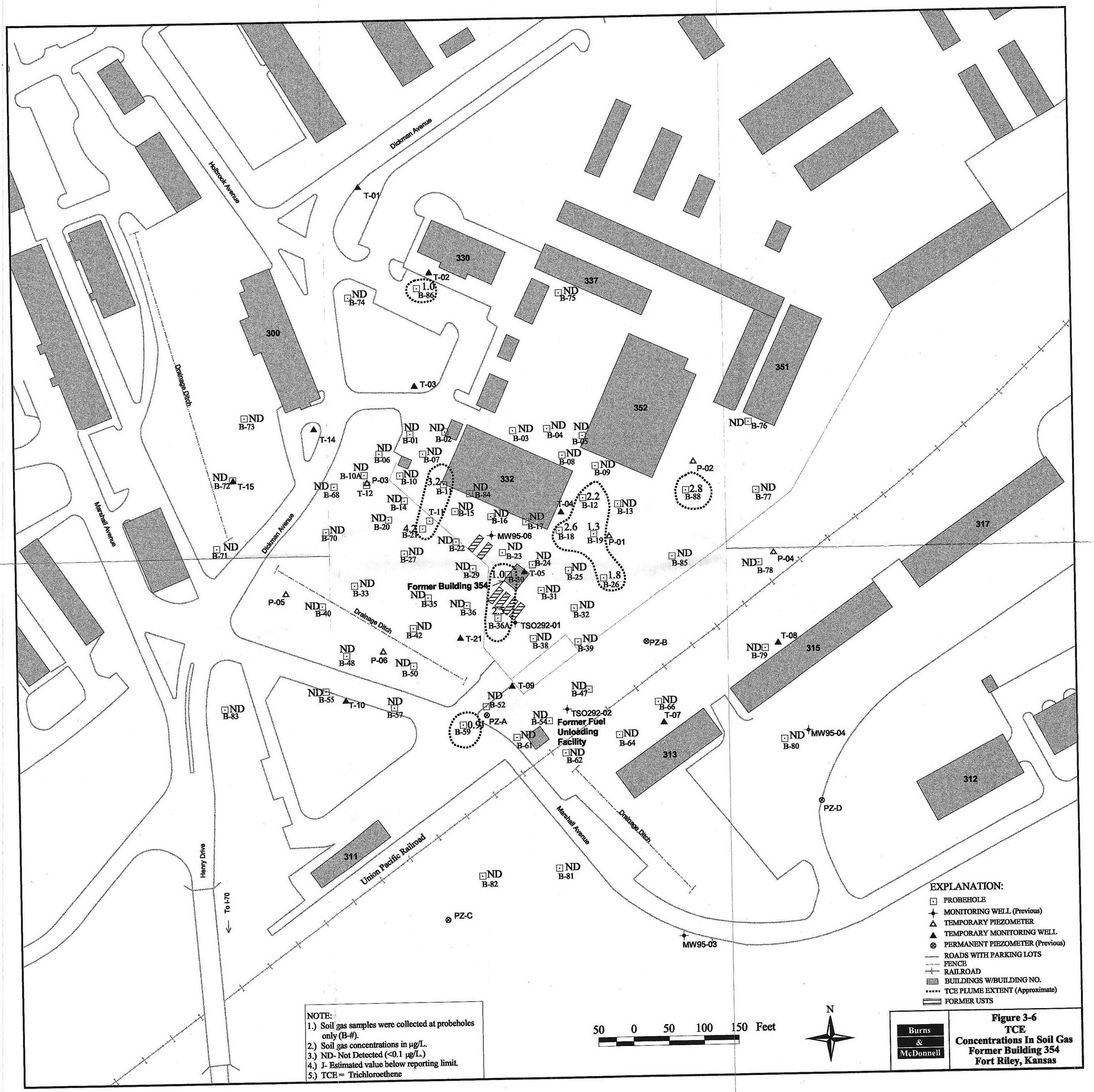
Figure 3-2
Geologic Cross Section A-A'
Former Building 354
Fort Riley, Kansas

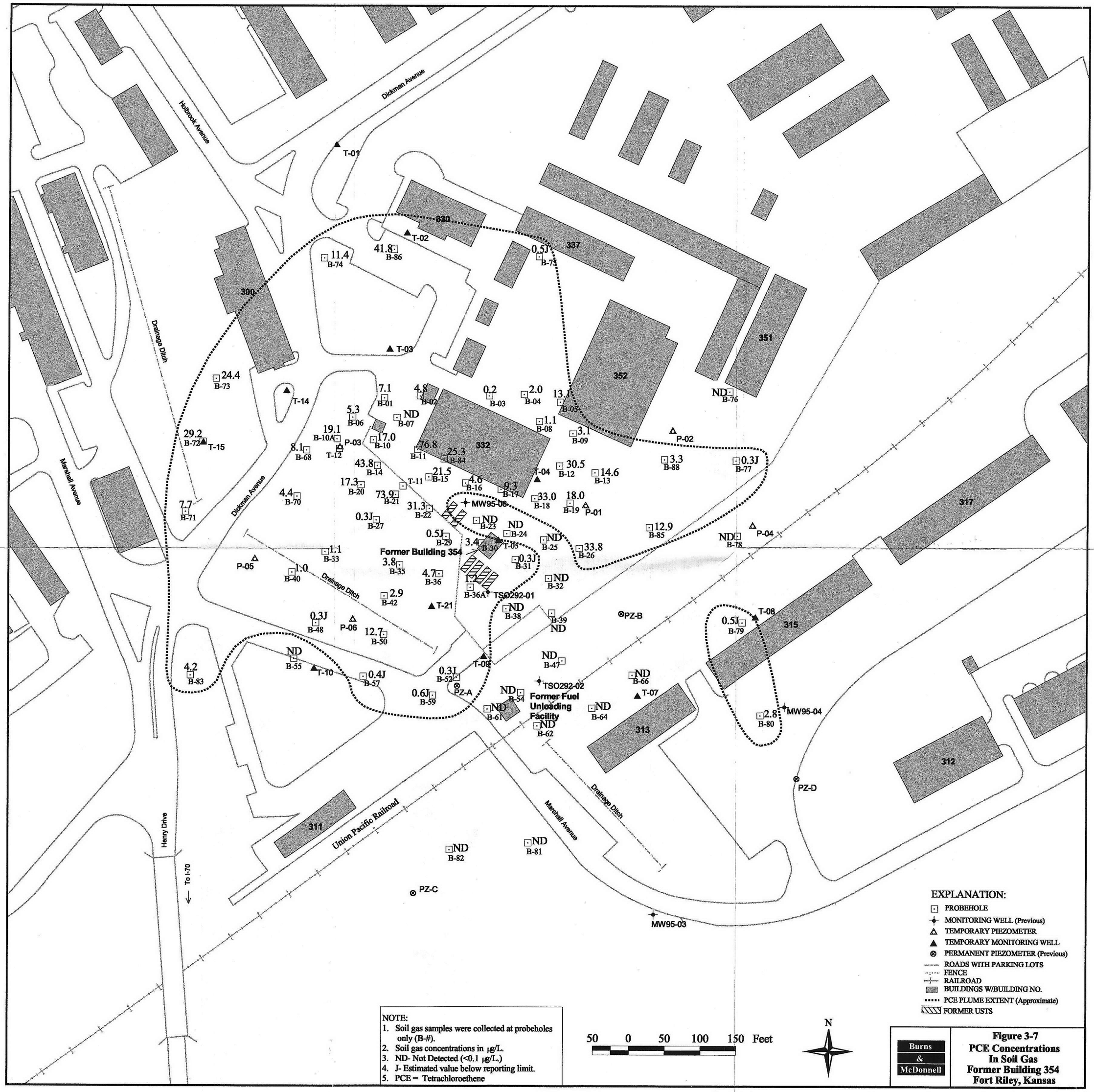
K:\USFR354 MISC\XSEC.DWG 11-11-97


Holbrook Avenue
Dickman Avenue
1061.77
T-01
330
T-02
1061.55
337
1061
300
Drainage Ditch
dry
T-03
1060
351
352
dry
T-14
dry
T-15
1059.25
P-03
332
1059
P-02
1058.71
Marshall Avenue
Dickman Avenue
T-04
1058.88
1059.08
MW95-06
1058
1058.25
P-01
317
1058.83
T-05
Former Building 354
1056.49
P-04
1057.29
P-05
1057
1056
1055
Drainage Ditch
TSO292-01
1058.33
1057.73
T-21
1050
dry
PZ-B
1041.12
T-08
315
dry
P-06
1045
1057.75
T-09
1041
dry
T-10
1040
1056.39
TSO292-02
1057.22
PZ-A
Former Fuel
Unloading
Facility
1041.05
T-07
1039.67
MW95-04
313
312
1039.44
PZ-D
Drainage Ditch
Marshall Avenue
Henry Drive
311
To I-70
Union Pacific Railroad
PZ-C
1038.85
MW95-03
1039.50
EXPLANATION:
MONITORING WELL (Previous)
TEMPORARY PIEZOMETER
TEMPORARY MONITORING WELL
PERMANENT PIEZOMETER (Previous)
ROADS WITH PARKING LOTS
FENCE
RAILROAD
BUILDINGS W/BUILDING NO.
FORMER USTS
50 0 50 100 150 Feet
N
NOTES:
1.) Dry wells installed to top of bedrock.
Burns & McDonnell
Figure 3-3
Groundwater Elevations
(09/23/97)
Former Building 354
Fort Riley, Kansas


Dickman Avenue
Holbrook Avenue
Drainage Ditch
Marshall Avenue
Dickman Avenue
Drainage Ditch
Union Pacific Railroad
Marshall Avenue
Drainage Ditch
Henry Drive
To I-70
330
337
300
351
352
332
317
315
313
312
311
T-01
T-02
T-03
T-14
T-15
T-04
T-11
T-12
T-21
T-09
T-10
T-08
T-07
P-01
P-02
P-03
P-04
P-05
P-06
MW95-06
MW95-04
MW95-03
PZ-A
PZ-B
PZ-C
PZ-D
TSO292-01
TSO292-02
Former Building 354
Former Fuel Unloading Facility
ND
10.4
11.0
14.2
9.4
203
5.7
120
72.0
EXPLANATION:
PROBEHOLE
MONITORING WELL (Previous)
TEMPORARY PIEZOMETER
TEMPORARY MONITORING WELL
PERMANENT PIEZOMETER (Previous)
ROADS WITH PARKING LOTS
FENCE
RAILROAD
BUILDINGS W/BUILDING NO.
BENZENE PLUME EXTENT (Approximate)
FORMER USTS
NOTE:
1.) Soil gas samples were collected at probeholes only (B-#).
2.) Soil gas concentrations in µg/L.
3.) ND- Not Detected (<0.1 µg/L.)
4.) J- Estimated value below reporting limit.
50 0 50 100 150 Feet
N
Burns & McDonnell
Figure 3-4
Benzene Concentrations In Soil Gas
Former Building 354
Fort Riley, Kansas


Holbrook Avenue
Dickman Avenue
Drainage Ditch
Marshall Avenue
Dickman Avenue
Drainage Ditch
Drainage Ditch
Henry Drive
To I-70
Union Pacific Railroad
Marshall Avenue
Former Building 354
Former Fuel Unloading Facility
330
337
300
351
352
332
317
315
313
312
311
T-01
T-02
T-03
T-14
T-15
T-12
T-11
T-04
T-05
T-21
T-10
T-09
T-08
T-07
P-01
P-02
P-03
P-04
P-05
P-06
MW95-06
TSO292-01
TSO292-02
MW95-04
MW95-03
PZ-A
PZ-B
PZ-C
PZ-D
ND B-01
ND B-02
ND B-03
ND B-04
ND B-05
ND B-06
ND B-07
ND B-08
ND B-09
ND B-10
ND B-10A
ND B-11
ND B-12
ND B-13
ND B-14
ND B-15
ND B-16
ND B-17
ND B-18
ND B-20
ND B-21
ND B-22
ND B-23
ND B-24
ND B-25
ND B-26
ND B-27
ND B-29
ND B-30
ND B-31
ND B-32
ND B-33
ND B-35
ND B-36
ND B-36A
ND B-38
ND B-39
ND B-40
ND B-42
ND B-47
ND B-48
ND B-50
ND B-52
ND B-54
ND B-55
ND B-57
ND B-59
ND B-61
ND B-66
ND B-68
ND B-70
ND B-71
ND B-72
ND B-73
ND B-74
ND B-75
ND B-76
ND B-77
ND B-78
ND B-79
ND B-80
ND B-81
ND B-82
ND B-83
ND B-84
ND B-85
ND B-86
ND B-88
2.0 B-68
0.7J B-70
3.2 B-12
1.2 B-19
2.6 B-22
2.0 B-23
6.5 B-24
3.2 B-29
7.2 B-30
9.0 B-31
1.0 B-32
78.2 B-36A
5.5 B-38
17.1 B-64
10.6 B-62
EXPLANATION:
PROBEHOLE
MONITORING WELL (Previous)
TEMPORARY PIEZOMETER
TEMPORARY MONITORING WELL
PERMANENT PIEZOMETER (Previous)
ROADS WITH PARKING LOTS
FENCE
RAILROAD
BUILDINGS W/BUILDING NO.
1,2-DCA PLUME EXTENT (Approximate)
FORMER USTS
NOTE:
1.) Soil gas samples were collected at probeholes only (B-#).
2.) Soil gas concentrations in µg/L.
3.) ND- Not Detected (< 0.1 µg/L.)
4.) J- Estimated value below reporting limit.
5.) 1,2-DCA = 1,2-Dicholoroethane
50 0 50 100 150 Feet
N
Burns & McDonnell
Figure 3-5
1,2-DCA Concentrations In Soil Gas
Former Building 354
Fort Riley, Kansas


Dickman Avenue
Holbrook Avenue
Drainage Ditch
Marshall Avenue
Dickman Avenue
Former Building 354
Drainage Ditch
Former Fuel Unloading Facility
Marshall Avenue
Drainage Ditch
Union Pacific Railroad
Henry Drive
To I-70
330
337
300
351
352
332
317
315
313
312
311
T-01
T-02
T-03
T-04
T-05
T-07
T-08
T-09
T-10
T-12
T-14
T-15
T-17
T-21
P-01
P-02
P-03
P-04
P-05
P-06
MW95-06
TSO292-01
TSO292-02
PZ-A
PZ-B
PZ-C
PZ-D
MW95-03
MW95-04
NOTE:
1.) Soil gas samples were collected at probeholes only (B-#).
2.) Soil gas concentrations in µg/L.
3.) ND- Not Detected (<0.1 µg/L.)
4.) J- Estimated value below reporting limit.
5.) TCE = Trichloroethene
50 0 50 100 150 Feet
N
EXPLANATION:
PROBEHOLE
MONITORING WELL (Previous)
TEMPORARY PIEZOMETER
TEMPORARY MONITORING WELL
PERMANENT PIEZOMETER (Previous)
ROADS WITH PARKING LOTS
FENCE
RAILROAD
BUILDINGS W/BUILDING NO.
TCE PLUME EXTENT (Approximate)
FORMER USTS
Burns & McDonnell
Figure 3-6
TCE
Concentrations In Soil Gas
Former Building 354
Fort Riley, Kansas


Holbrook Avenue
Dickman Avenue
Drainage Ditch
Marshall Avenue
Dickman Avenue
Drainage Ditch
Drainage Ditch
Union Pacific Railroad
Marshall Avenue
Henry Drive
To I-70
330
337
300
351
352
332
317
315
313
312
311
Former Building 354
Former Fuel Unloading Facility
T-01
T-02
T-03
T-04
T-05
T-07
T-08
T-09
T-10
T-11
T-12
T-14
T-15
T-21
P-01
P-02
P-03
P-04
P-05
P-06
MW95-06
TSO292-01
TSO292-02
PZ-A
PZ-B
PZ-C
PZ-D
MW95-04
MW95-03
B-01 7.1
B-02 4.8
B-03 0.2
B-04 2.0
B-05 13.1
B-06 5.3
B-07 ND
B-08 1.1
B-09 3.1
B-10 17.0
B-10A 19.1
B-11 76.8
B-12 30.5
B-13 14.6
B-14 43.8
B-15 21.5
B-16 4.6
B-17 9.3
B-18 33.0
B-19 18.0
B-20 17.3
B-21 73.9
B-22 31.3
B-23 ND
B-24 ND
B-25 ND
B-26 33.8
B-27 0.3J
B-29 0.5J
B-30 3.4
B-31 0.3J
B-32 ND
B-33 1.1
B-35 3.8
B-36 4.7
B-36A ND
B-38 ND
B-39 ND
B-40 1.0
B-42 2.9
B-47 ND
B-48 0.3J
B-50 12.7
B-52 0.3J
B-54 ND
B-55 ND
B-57 0.4J
B-59 0.6J
B-61 ND
B-62 ND
B-64 ND
B-66 ND
B-68 8.1
B-70 4.4
B-71 7.7
B-72 29.2
B-73 24.4
B-74 11.4
B-75 0.5J
B-76 ND
B-77 0.3J
B-78 ND
B-79 0.5J
B-80 2.8
B-81 ND
B-82 ND
B-83 4.2
B-84 25.3
B-85 12.9
B-86 41.8
B-88 3.3
EXPLANATION:
PROBEHOLE
MONITORING WELL (Previous)
TEMPORARY PIEZOMETER
TEMPORARY MONITORING WELL
PERMANENT PIEZOMETER (Previous)
ROADS WITH PARKING LOTS
FENCE
RAILROAD
BUILDINGS W/BUILDING NO.
PCE PLUME EXTENT (Approximate)
FORMER USTS
NOTE:
1. Soil gas samples were collected at probeholes only (B-#).
2. Soil gas concentrations in µg/L.
3. ND- Not Detected (<0.1 µg/L.)
4. J- Estimated value below reporting limit.
5. PCE = Tetrachloroethene
50 0 50 100 150 Feet
N
Burns & McDonnell
Figure 3-7
PCE Concentrations In Soil Gas
Former Building 354
Fort Riley, Kansas

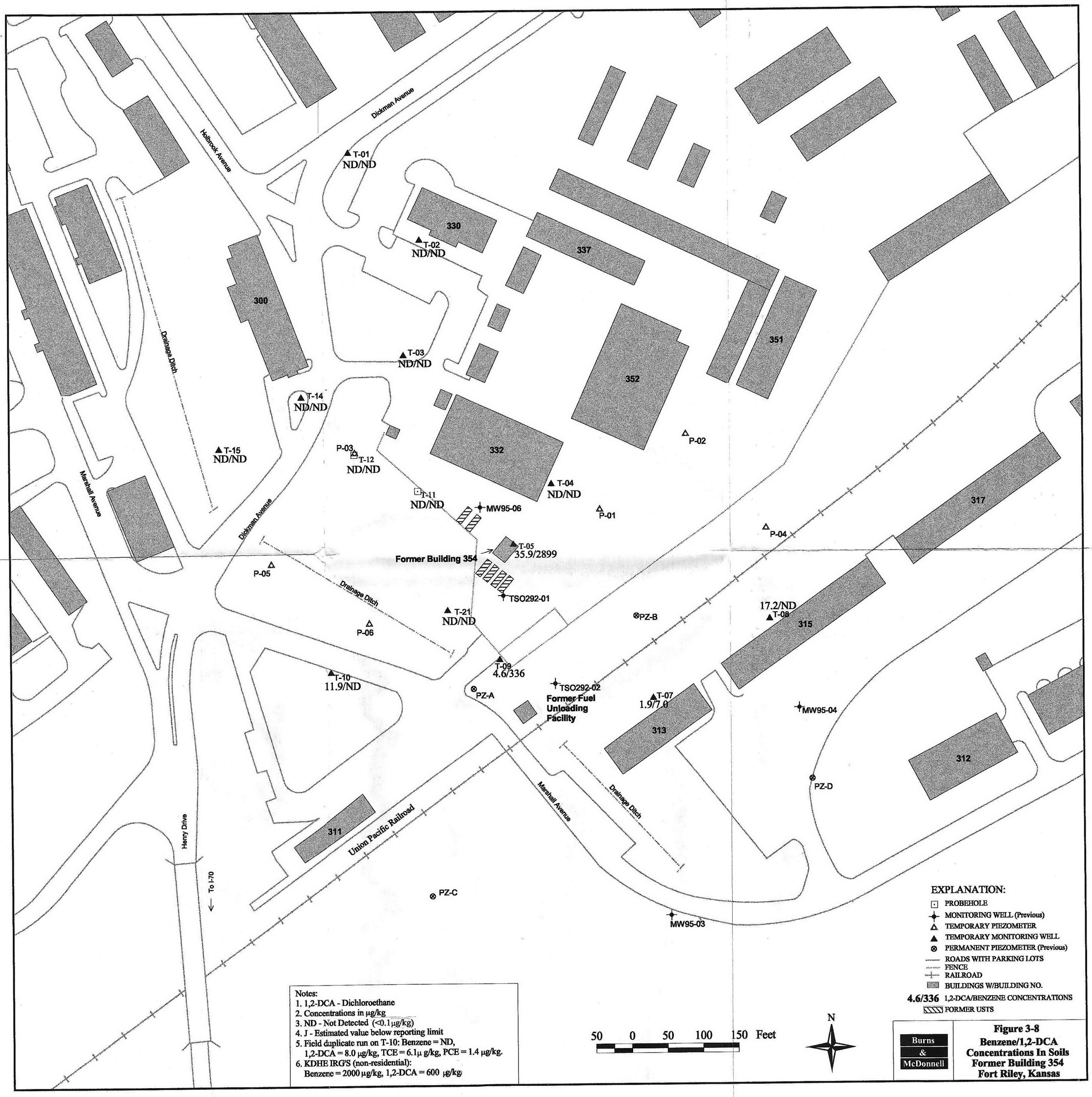
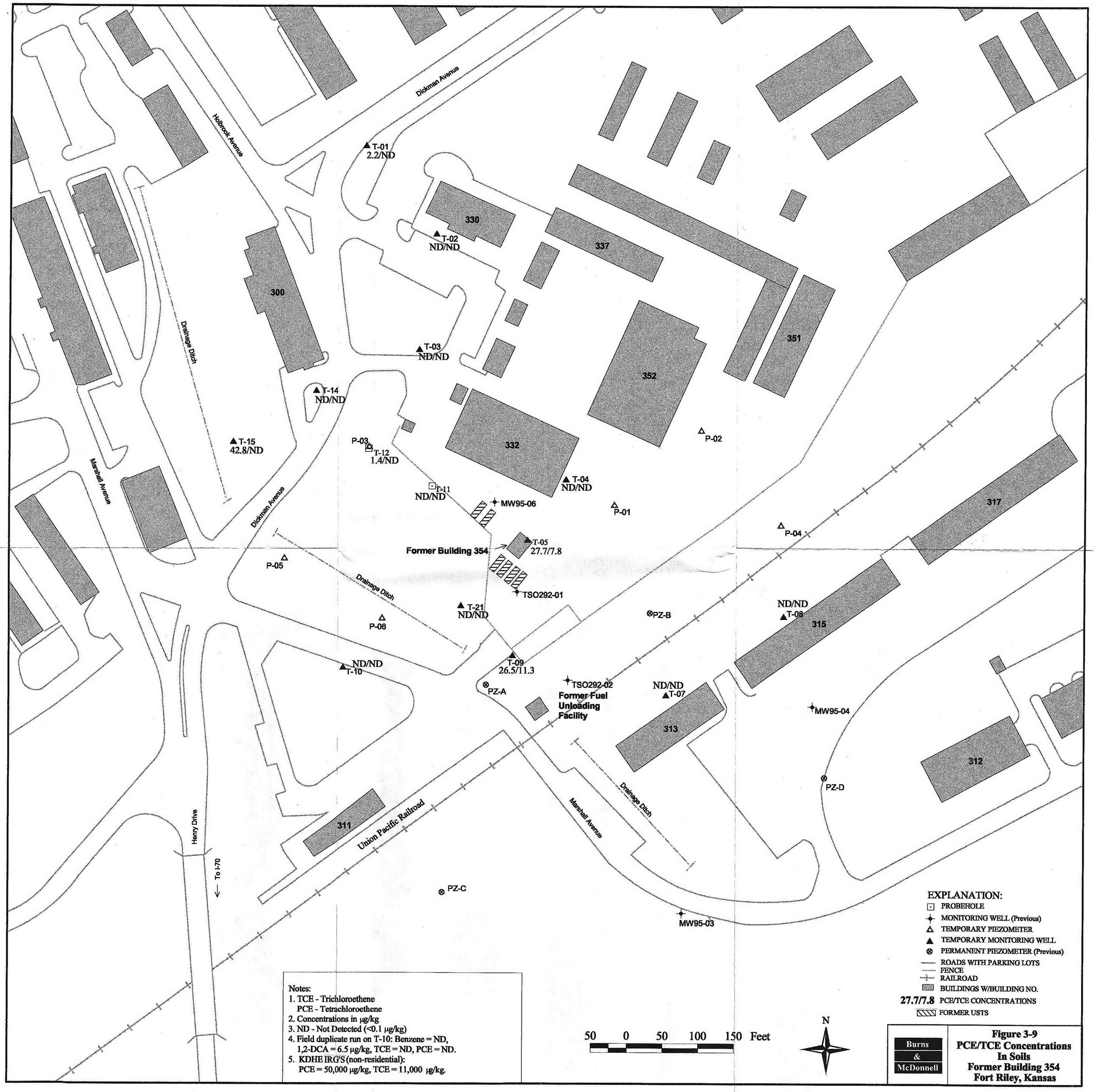


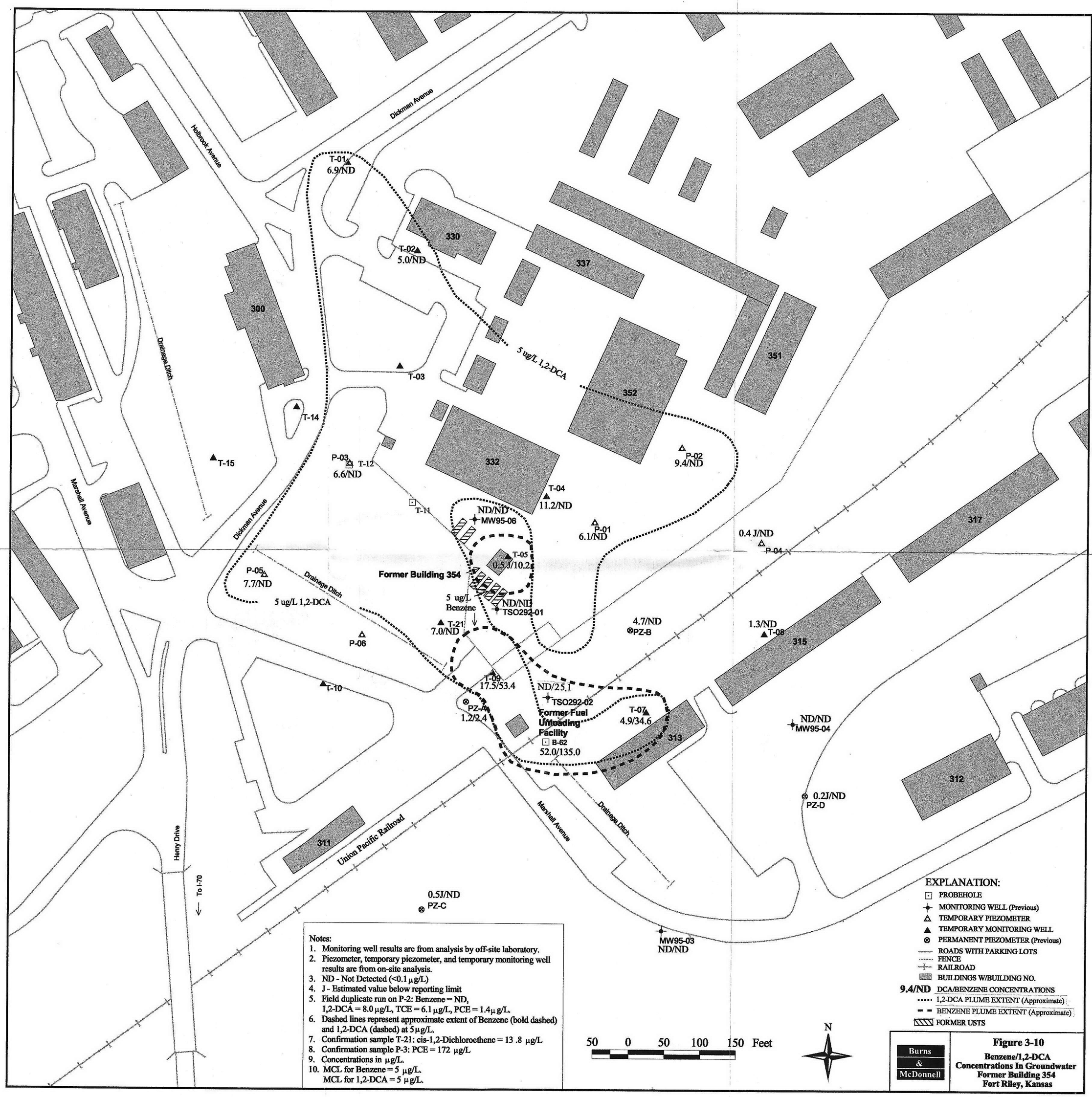
Figure 3-8
Benzene/1,2-DCA Concentrations In Soils Former Building 354 Fort Riley, Kansas



Notes:
1. TCE - Trichloroethene
   PCE - Tetrachloroethene
2. Concentrations in µg/kg
3. ND - Not Detected (<0.1 µg/kg)
4. Field duplicate run on T-10: Benzene = ND, 1,2-DCA = 6.5 µg/kg, TCE = ND, PCE = ND.
5. KDHE IRG'S (non-residential): PCE = 50,000 µg/kg, TCE = 11,000 µg/kg.

Burns & McDonnell

Figure 3-9
PCE/TCE Concentrations In Soils
Former Building 354
Fort Riley, Kansas



Notes:
1. Monitoring well results are from analysis by off-site laboratory.
2. Piezometer, temporary piezometer, and temporary monitoring well results are from on-site analysis.
3. ND - Not Detected (<0.1 µg/L)
4. J - Estimated value below reporting limit
5. Field duplicate run on P-2: Benzene = ND, 1,2-DCA = 8.0 µg/L, TCE = 6.1 µg/L, PCE = 1.4 µg/L.
6. Dashed lines represent approximate extent of Benzene (bold dashed) and 1,2-DCA (dashed) at 5 µg/L.
7. Confirmation sample T-21: cis-1,2-Dichloroethene = 13 .8 µg/L
8. Confirmation sample P-3: PCE = 172 µg/L
9. Concentrations in µg/L.
10. MCL for Benzene = 5 µg/L.
    MCL for 1,2-DCA = 5 µg/L.

Burns & McDonnell

Figure 3-10
Benzene/1,2-DCA Concentrations In Groundwater Former Building 354 Fort Riley, Kansas

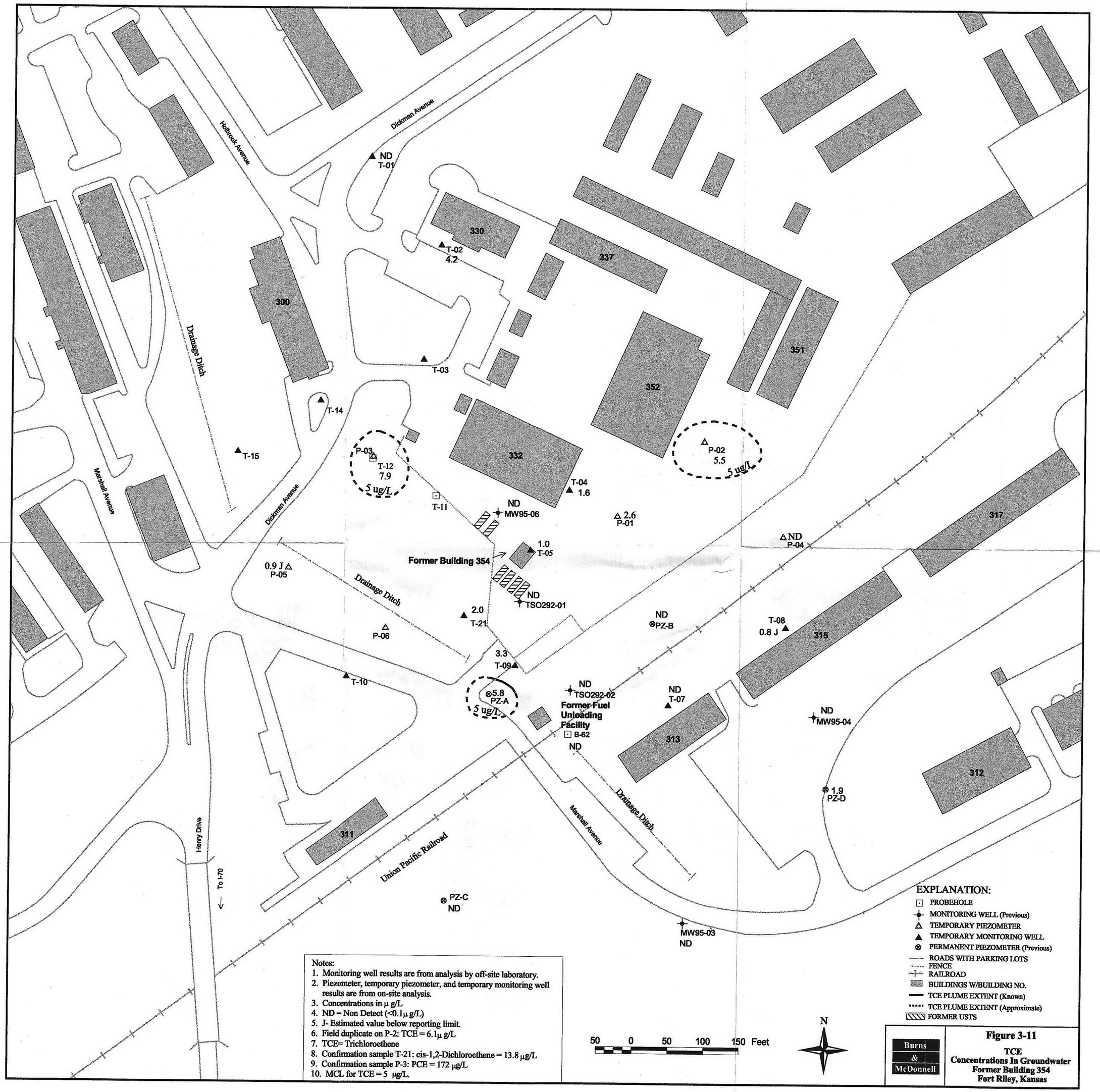
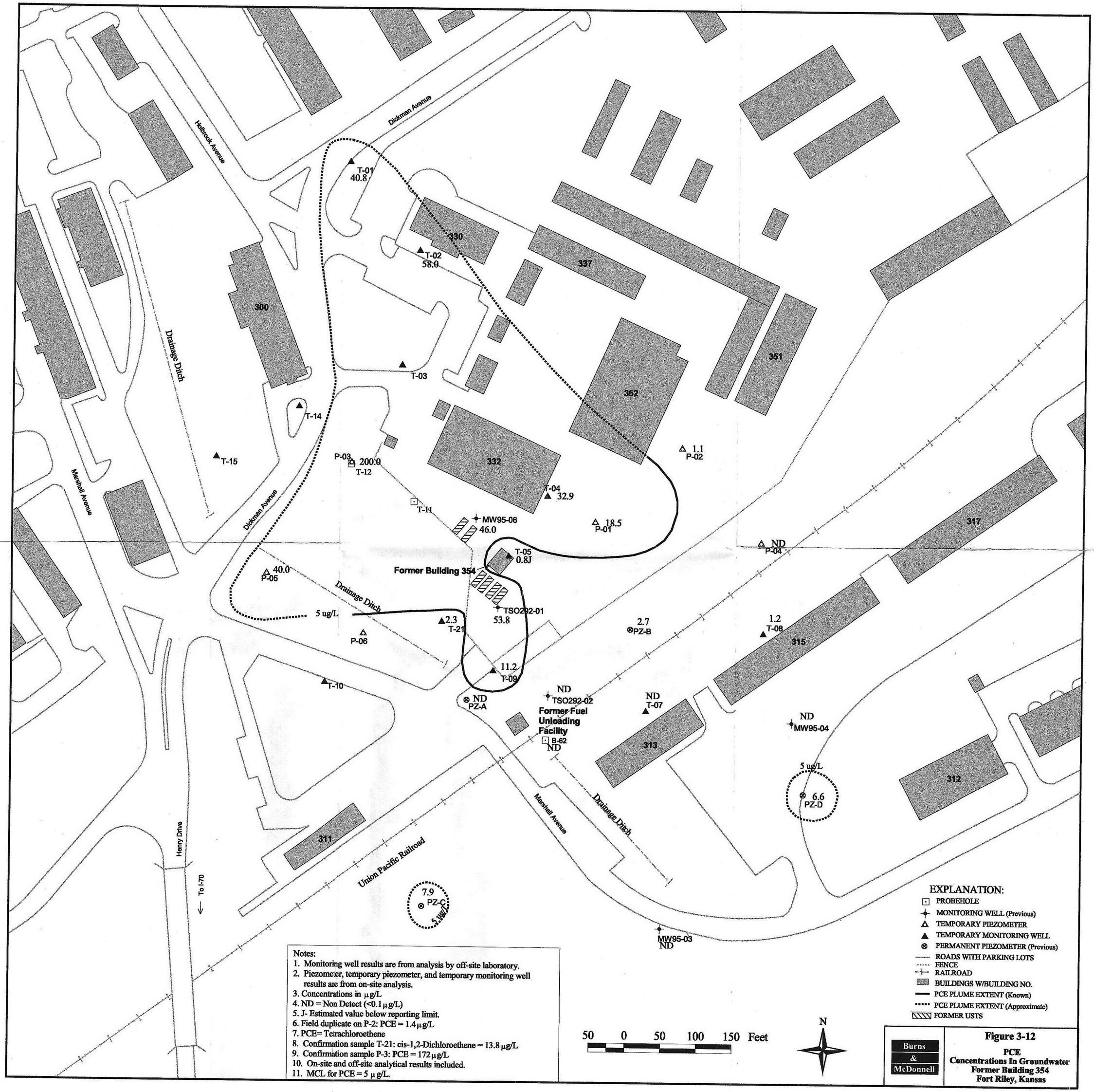


Figure 3-11

TCE
Concentrations In Groundwater
Former Building 354
Fort Riley, Kansas



Notes:
1. Monitoring well results are from analysis by off-site laboratory.
2. Piezometer, temporary piezometer, and temporary monitoring well results are from on-site analysis.
3. Concentrations in µg/L
4. ND = Non Detect (<0.1 µg/L)
5. J- Estimated value below reporting limit.
6. Field duplicate on P-2: PCE = 1.4 µg/L
7. PCE= Tetrachloroethene
8. Confirmation sample T-21: cis-1,2-Dichloroethene = 13.8 µg/L
9. Confirmation sample P-3: PCE = 172 µg/L
10. On-site and off-site analytical results included.
11. MCL for PCE = 5 µg/L.

50 0 50 100 150 Feet

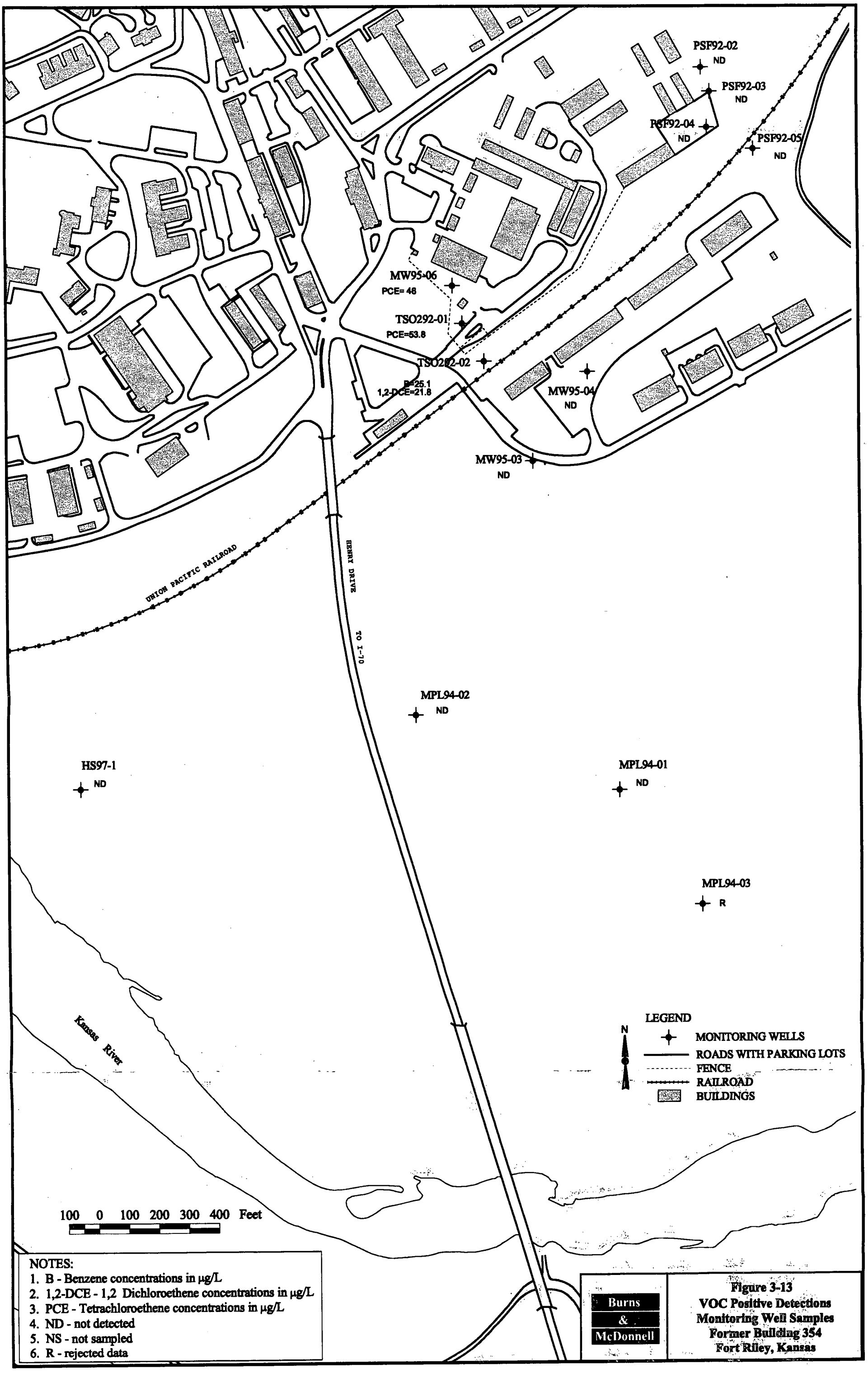
N

EXPLANATION:
- PROBEHOLE
- MONITORING WELL (Previous)
- TEMPORARY PIEZOMETER
- TEMPORARY MONITORING WELL
- PERMANENT PIEZOMETER (Previous)
- ROADS WITH PARKING LOTS
- FENCE
- RAILROAD
- BUILDINGS W/BUILDING NO.
- PCE PLUME EXTENT (Known)
- PCE PLUME EXTENT (Approximate)
- FORMER USTS

Burns & McDonnell

Figure 3-12

PCE
Concentrations In Groundwater
Former Building 354
Fort Riley, Kansas


PSF92-02
ND
PSF92-03
ND
PSF92-04
ND
PSF92-05
ND
MW95-06
PCE= 46
TSO292-01
PCE=53.8
TSO292-02
B=25.1
1,2-DCE=21.8
MW95-04
ND
MW95-03
ND
UNION PACIFIC RAILROAD
HENRY DRIVE
TO I-70
MPL94-02
ND
HS97-1
ND
MPL94-01
ND
MPL94-03
R
Kansas River
LEGEND
N
MONITORING WELLS
ROADS WITH PARKING LOTS
FENCE
RAILROAD
BUILDINGS
100 0 100 200 300 400 Feet
NOTES:
1. B - Benzene concentrations in µg/L
2. 1,2-DCE - 1,2 Dichloroethene concentrations in µg/L
3. PCE - Tetrachloroethene concentrations in µg/L
4. ND - not detected
5. NS - not sampled
6. R - rejected data
Burns
&
McDonnell
Figure 3-13
VOC Positive Detections
Monitoring Well Samples
Former Building 354
Fort Riley, Kansas

APPENDIX A
PREVIOUS INVESTIGATION RESULTS

Table A-1
Previous Soil Gas Sample Results [1]
Former Building 354

Soil Gas Sample Number	BTEX (ppb)	1,2-DCA (ppb)	TVH (ppb)	Comments
01	ND	ND	ND	
02	ND	ND	ND	
03	ND	ND	ND	
04	ND	ND	ND	
05	ND	ND	ND	
06	ND	ND	ND	
07	ND	ND	ND	(Vacuumed water failed depth 10 feet)
07A	ND	ND	ND	
08	ND	ND	ND	
09	ND	ND	ND	
10	ND	ND	ND	
11	414	ND	9,170	
12	ND	ND	ND	
13	ND	ND	ND	
14	ND	ND	ND	
15	ND	ND	ND	
16	ND	ND	ND	
17	ND	ND	ND	
18	ND	ND	ND	
19	ND	ND	ND	
20	ND	ND	ND	
21	ND	ND	ND	
22	ND	ND	ND	
23	182	51	3,632	
24	ND	ND	ND	
25	ND	ND	ND	
26	ND	ND	ND	
27	ND	ND	ND	
28	ND	ND	ND	

Notes: [1] (Dames & Moore, 1995)
BTEX - total benzene, toluene, ethylbenzene, and total xylenes
1,2-DCA - 1,2-dichloroethane
TVH - total volatile petroleum hydrocarbons
ppb - parts per billion
ND - not detected

All soil gas samples collected on December 15, 1992 by PSA Environmental, Inc., at a depth of 10 feet.

TABLE A-2
PREVIOUS SOIL SAMPLE ON-SITE AND OFF-SITE ANALYTICAL RESULTS *
FORMER BUILDING 354

SOIL IDENTIFICATION	354SB-01			354SB-02			354SB-03			354SB-04			KDHE ACTION LEVEL
	[4-6']	[6-8']	[8-9.3']	A [11-13']	B [19-21']	[27-29']	[3-5']	[13-15']	[23-25']	[4-6']	[10-12']	[12-14']	
ANALYSES	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
ON-SITE SOIL HEADSPACE ANALYSIS (ppm)	0	1	250	20	350	350	25	22	18	4	4	5	N/A
ON-SITE IMMUNOASSAY ANALYSIS	>100	>100	>100	<100	>100	>100	<100	<100	<100	<100	<100	<100	N/A
BENZENE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.4
TOLUENE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ETHYLBENZENE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
XYLENES	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1,2-DCA	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8
TPH by OA-1	N/A	N/A	N/A	0.26	11,000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100
TPH by OA-2	N/A	N/A	N/A	29	ND(50)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100
ACETONE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2-METHYL NAPTHALENE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NAPHTHALENE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

N/A: Not Analyzed
ND: Not detected above method detection limit
( ): Method Detection Limit
* (Dames & Moore, 1995)

TABLE A-2 (CONTINUED)
PREVIOUS SOIL SAMPLE ON-SITE AND OFF-SITE ANALYTICAL RESULTS *
FORMER BUILDING 354

SOIL IDENTIFICATION	354SB-05			354SB-06			354SB-07			354SB-08			KDHE ACTION LEVEL
	[3-5']	[7-9']	[9-11']	[8-10']	[18-20']	[24-26']	[8-10']	[26-28']	[32-34']	[6-8']	[10-12']	[20-22']	
ANALYSES	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
ON-SITE SOIL HEADSPACE ANALYSIS (ppm)	3	3	3	3	6	350	1	1	1	2	3	0	N/A
ON-SITE IMMUNOASSAY ANALYSIS	<100	<100	<100	<100	<100	>100	<100	<100	<100	<100	<100	<100	N/A
BENZENE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.4
TOLUENE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ETHYLBENZENE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
XYLENES	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1,2-DCA	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8
TPH by OA-1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100
TPH by OA-2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100
ACETONE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2-METHYL NAPTHALENE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NAPHTHALENE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

N/A: Not Analyzed
ND: Not detected above method detection limit
( ): Method Detection Limit
* (Dames & Moore, 1995)

TABLE A-2 (CONTINUED)
PREVIOUS SOIL SAMPLE ON-SITE AND OFF-SITE ANALYTICAL RESULTS *
FORMER BUILDING 354

SOIL IDENTIFICATION	354SB-09			354SB-10			354SB-11		354SB-12	KDHE ACTION LEVEL
	[10-12']	[16-18']	[20-22']	[12-14']	[16-18']	[20-22']	D [6-8']	F [10-12']	H [14-16']	
ANALYSES	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
ON-SITE SOIL HEADSPACE ANALYSIS (ppm)	0	0	35	5	65	450	5	300	450	N/A
ON-SITE IMMUNOASSAY ANALYSIS	<100	<100	>100	<100	<100	>100	N/A	N/A	N/A	N/A
BENZENE	N/A	N/A	N/A	N/A	N/A	N/A	ND(.005)	ND(.005)	ND(.024)	1.4
TOLUENE	N/A	N/A	N/A	N/A	N/A	N/A	ND(.005)	ND(.005)	ND(.024)	N/A
ETHYLBENZENE	N/A	N/A	N/A	N/A	N/A	N/A	ND(.005)	ND(.005)	59	N/A
XYLENES	N/A	N/A	N/A	N/A	N/A	N/A	ND(.005)	ND(.005)	440	N/A
1,2-DCA	N/A	N/A	N/A	N/A	N/A	N/A	ND(.005)	ND(.005)	ND(.024)	8
TPH by OA-1	N/A	N/A	N/A	N/A	N/A	N/A	ND(.1)	ND(.1)	110	100
TPH by OA-2	N/A	N/A	N/A	N/A	N/A	N/A	ND(5.0)	ND(5.0)	13[1]	100
ACETONE	N/A	N/A	N/A	N/A	N/A	N/A	0.24	N/A	N/A	N/A
2-METHYL NAPTHALENE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NAPHTHALENE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

1: Calculated from motor oil standard
N/A: Not Analyzed
ND: Not detected above method detection limit
( ): Method Detection Limit
* (Dames & Moore, 1995)

TABLE A-2 (CONTINUED)
PREVIOUS SOIL SAMPLE ON-SITE AND OFF-SITE ANALYTICAL RESULTS *
FORMER BUILDING 354

SOIL IDENTIFICATION	354SB-12				354SB-13		354SB-14		KDHE ACTION LEVEL
	N [26-28'] (initial)	N [26-28']	O duplicate of [26-28']	O duplicate of [26-28']	D [6-8']	E [8-10']	L [20-22']	M [22-24']	
ANALYSES	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
ON-SITE SOIL HEADSPACE ANALYSIS (ppm)	500	500	500	500	5	2	500	425	N/A
ON-SITE IMMUNOASSAY ANALYSIS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BENZENE	ND(0.05)	ND(2.5)	ND(0.05)	ND(2.5)	ND(.005)	ND(.005)	ND(01)	ND(.005)	1.4
TOLUENE	0.22	ND(2.5)	0.099	ND(2.5)	ND(.005)	ND(.005)	ND(.01)	ND(.005)	N/A
ETHYLBENZENE	*	6.5	1.9	ND(2.5)	ND(.005)	ND(.005)	ND(.01)	ND(.005)	N/A
XYLENES	*	39	*	10	ND(.005)	ND(.005)	ND(.01)	ND(.005)	N/A
1,2-DCA	ND(0.05)	ND(2.5)	ND(0.05)	ND(2.5)	ND(.005)	ND(.005)	ND(.01)	ND(.005)	8
TPH by OA-1	N/A	2500	N/A	3100	ND(.1)	ND(.1)	81	42	100
TPH by OA-2	N/A	ND(5.0)	N/A	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	100
ACETONE	ND(1.0)	N/A	ND(1.0)	N/A	N/A	N/A	N/A	N/A	N/A
2-METHYL NAPTHALENE	N/A	1.8	N/A	1.9	N/A	N/A	N/A	0.6	N/A
NAPHTHALENE	N/A	2.2	N/A	2.2	N/A	N/A	N/A	N/A	N/A

N/A: Not Analyzed
ND: Not detected above method detection limit
( ): Method Detection Limit
* Reading exceeded calibration instrument range

Table A-3
Previous On-Site Analysis of Groundwater [1]
Former Building 354

Piezometer Number:	NA	NA	NA	PZ-C	PZ-D	NA	NA	PZ-A
Sample Number:	WS-3	WS-4	WS-5	WS-15	WS-16	WS-17	WS-18	A
Sample Depth (feet):	25.3	25.7	24.2	26.4	25.3	24.2	24.6	24.6
Units:	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)
Parameters								
1,2-Dichloroethane	ND	ND	4	ND	ND	ND	ND	ND
Benzene	ND	3	6	ND	ND	ND	ND	372
Toluene	10	10	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	5	ND	ND	ND	ND	ND	109
Total Xylenes	ND	8	ND	ND	ND	ND	ND	44
Total BTEX	10	26	6	ND	ND	ND	ND	525
Total VOCs	10	130	42	ND	ND	ND	ND	4,800
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	NA
1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	NA
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	NA
Trichloroetthene	1	ND	0.4	ND	0.9	ND	0.9	NA
Tetrachloroethene	2	ND	0.3	1.3	1.6	0.6	1.6	NA

Notes: [1] (Dames & Moore, 1995)
ppb - parts per billion
ND - not detected
BTEX - benzene, toluene, ethylbenzene, and total xylenes
VOCs - volatile organic compounds
NA - not applicable

All groundwater samples, except for PZ-A, were collected on January 10-11, 1995 by PSA Environmental, Inc.
PZ-A was collected on September 12, 1994 by PSA Environmental, Inc.

TABLE A-4
MAIN POST SOLVENT DETECTION SITE GROUNDWATER SAMPLING POSITIVE DETECTIONS[1]
FORMER BUILDING 354

Well ID	TS0292-01					TS0292-02				MW95-03				MW95-04						MW95-06				Regulatory Standards
Sample ID	From Draft SI Report*				TS0292-01	From Draft SI Report*			TS0292-02	From Draft SI Report*			MW95-03	From Draft SI Report*				MW95-04	DUP95-0007**	From Draft SI Report*			MW95-06	MCL
Date of Sample	Nov-93	Nov-93**	Sep-94	Mar-95	Dec-95	Nov-93	Sep-94	Mar-95	Dec-95	Nov-93	Sep-94	Mar-95	Dec-95	Nov-93	Sep-94	Mar-95	Mar-95**	Dec-95	Dec-95	Nov-93	Sep-94	Mar-95	Dec-95	
Nitrate mg/L	NA	NA	NA	NA	**8.1**	NA	NA	NA	<0.1	NS	NS	NA	<0.1	NS	NS	NA	NA	**14.3**	**14.2**	NS	NS	NA	**15.2**	10
TPH-GRO µg/L	NA	NA	NA	NA	<100	NA	NA	NA	**3600**	NS	NS	NA	**710**	NS	NS	NA	NA	<0.1	<100	NS	NS	NA	<100	NAv
TPH-DRO µg/L	NA	NA	NA	**160**	<100	NA	NA	**320**	**850**	NS	NS	<100	<100	NS	NS	<100	<100	<100	<100	NS	NS	<100	<100	NAv
Volatiles - results in µg/L																								
Benzene	**37**	**39**	**5.4**	**8.6**	**1**	<5.0	**59**	<5.0	**3**	NS	NS	<5.0	<0.4	NS	NS	<5.0	<5.0	<0.4	<0.4	NS	NS	<5.0	<0.4	5
1,2-DCE (Total)	<5.0	<5.0	ND	<5.0	<0.5	<5.0	**6.6**	**5.6**	**1.3**	NS	NS	<5.0	<0.5	NS	NS	<5.0	<5.0	<0.5	<0.5	NS	NS	<5.0	<0.5	70(c)
Ethylbenzene	**30**	**28**	**2.2**	<5.0	<0.7	**9**	**34**	<5.0	**1.3**	NS	NS	<5.0	<0.7	NS	NS	<5.0	<5.0	<0.7	<0.7	NS	NS	<5.0	<0.7	700
m &/or P-xylenes	**90(d)**	**85(d)**	**7.8(d)**	**23(d)**	<0.6	**5.2(d)**	**23(d)**	<5.0(d)	0.7	NS	NS	<5.0(d)	**1.7**	NS	NS	<5.0(d)	<5.0(d)	<0.6	<0.6	NS	NS	<5.0(d)	<0.6	10000
Tetrachloroethylene	**13**	**12**	**130**	**170**	**62**	<5.0	ND	<5.0	<1.1	NS	NS	<5.0	<1.1	NS	NS	**7.1**	**10**	**1.3**	**1.3**	NS	NS	**150**	**44**	5
Tetrachloromethane	<5.0	<5.0	**1.1(e)**	<5.0	**1**	<5.0	**1.1(e)**	<5.0	<0.7	NS	NS	<5.0	<0.7	NS	NS	<5.0	<5.0	<0.7	<0.7	NS	NS	<5.0	**5.1**	5
Toluene	**91**	**89**	**3.8**	<5.0	**0.8**	<5.0	**6.2**	<5.0	<0.4	NS	NS	<5.0	**1**	NS	NS	<5.0	<5.0	<0.4	<0.4	NS	NS	<5.0	<0.4	1000
Trichloroethylene	<5.0	<5.0	NAv	**6.4**	**3.6**	<5.0	NAv	<5.0	<0.6	NS	NS	<5.0	<0.6	NS	NS	<5.0	<5.0	<0.6	<0.6	NS	NS	<5.0	**1.9**	5
Trichloromethane	<5.0	<5.0	**2.1**	<5.0	**1.9**	<5.0	ND	<5.0	<0.5	NS	NS	<5.0	<0.5	NS	NS	<5.0	<5.0	<0.5	<0.5	NS	NS	<5.0	**1.9**	80
Metals - results in mg/L																								
Arsenic, Total	NA	NA	NA	NA	<0.005	NA	NA	NA	**0.049**	NS	NS	NA	0.017	NS	NS	NA	NA	<0.005	<0.005	NS	NS	NA	<0.005	0.05
Chromium, Total	NA	NA	NA	NA	**0.007**	NA	NA	NA	**0.004**	NS	NS	NA	<0.002	NS	NS	NA	NA	**0.004**	<0.002	NS	NS	NA	<0.002	0.1(a)
Copper, Total	NA	NA	NA	NA	<0.010	NA	NA	NA	**0.014**	NS	NS	NA	<0.010	NS	NS	NA	NA	<0.010	<0.010	NS	NS	NA	<0.010	1.3(b)
Lead, Total	**0.011**	**0.02**	ND	<.003	<.003	**0.009**	ND	<.003	<.003	NS	NS	**0.021**	<.003	NS	NS	**0.056**	**0.14**	<.003	<.003	NS	NS	**0.003**	<.003	.015(b)
Selenium, Total	NA	NA	NA	NA	<0.005	NA	NA	NA	<0.005	NS	NS	NA	<0.005	NS	NS	NA	NA	**0.007**	**0.006**	NS	NS	NA	<0.005	0.05
Zinc, Total	NA	NA	NA	NA	<0.010	NA	NA	NA	**0.017**	NS	NS	NA	<0.010	NS	NS	NA	NA	<0.010	<0.010	NS	NS	NA	**0.015**	NAv
Zinc, Dissolved	NA	NA	NA	NA	<0.010	NA	NA	NA	<0.010	NS	NS	NA	<0.010	NS	NS	NA	NA	<0.010	<0.010	NS	NS	NA	<0.010	NAv

Bolded values represent positive detections

MCL: Federal Maximum Contaminant Level. From Drinking Water Regulations and Health Advisories, Office of Water, US Environmental Protection Agency, May 1995.

* Data from Draft Building 354 Site Investigation Report, POL UST Investigations/Remedial Action Plans, August 4, 1995. For a full summary of positive detections from these sampling events, please refer to this document.

** Duplicate sample

NA - Not Analyzed

NAv - Not Available

ND - Not Detected (no detection limit specified)

NS - Not Sampled

(a) The MCL represents values for both hexavalent and trivalent chromium.

(b) MCLs have not been established for lead or copper. Instead, the Safe Drinking Water Act has established Treatment Thresholds (TT), above which treatment is required.

(c) The value represents the MCL for cis-1,2-dichloroethylene; the MCL for trans-1,2-dichloroethylene is 100 µg/L.

(d) This value represents total xylenes.

(e) Estimated value based on QC data

[1] (LBA, 1996d)

TABLE A-5
PESTICIDE STORAGE FACILITY GROUNDWATER SAMPLING POSITIVE DETECTIONS[1]
FORMER BUILDING 354

Well ID	PSF92-01				PSF92-02				PSF92-03				PSF92-04				PSF92-05				Regulatory Standards
Sample ID	From RI/FS Report, July 1993*			PSF92-01	From RI/FS Report, July 1993*			PSF92-01	From RI/FS Report, July 1993*			PSF92-03	From RI/FS Report, July 1993*			PSF92-04	From RI/FS Report, July 1993*			PSF92-05	MCL
Date of Sample	Jul-92	Nov-92	Feb-93	Dec-95	Jul-92	Nov-92	Feb-93	Dec-95	Jul-92	Nov-92	Feb-93	Dec-95	Nov-93	Sep-94	Mar-95	Dec-95	Jul-92	Nov-92	Feb-93	Dec-95	
Nitrate (mg/L)	**4.5**	**3.8**	**6.4**	**4.2**	**32.6**	**20.3**	**165**	**9**	**11.6**	**11.1**	**50.6**	**15.1**	**ND**	**13.8**	**65.6**	**11.9**	**18.4**	**10.7**	**45.9**	**5.6**	**10**
Volatiles - results in µg/L																					
Trichloroethylene	ND	ND	ND	<0.6	ND	ND	ND	<0.6	ND	ND	ND	<0.6	ND	ND	ND	<0.6	**3**	ND	ND	<0.6	5
Metals - results in mg/L																					
Chromium, total	**0.01**	ND	ND	<0.002	ND	ND	ND	<0.002	ND	ND	ND	**0.005**	ND	ND	ND	<0.002	ND	ND	ND	<0.002	0.1(a)
Lead, total	ND(M2)	ND(M2)	ND	<0.003	ND(M2)	ND(M2)	ND	<0.003	ND(M2)	ND(M2)	ND	**0.004**	ND(M2)	ND(M2)	ND	<0.003	ND(M2)	ND(M2)	ND	<0.003	0.015(b)
Zinc, total	**0.012(B1)**	**0.023**	**0.007**	**0.011**	**0.096**	**0.016**	**0.007**	<0.010	**0.018(B1)**	**0.021**	**0.014**	**0.015**	**0.0078(B1)**	**0.015**	ND	<0.010	**0.0097(B1)**	**0.013**	**0.004**	**0.013**	Nav
Zinc, dissolved	**0.013(B1)**	**0.013**	**0.012**	<0.010	**0.016(B1)**	**0.01**	**0.005**	<0.010	**0.011(B1)**	**0.01**	**0.008**	**0.013**	**0.011(B1)**	**0.008**	**0.008**	<0.010	**0.015(B1)**	**0.01**	**0.006**	<0.010	NAv

Bolded values represent positive detections

MCL: Federal Maximum Contaminant Level. From Drinking Water Regulations and Health Advisories, Office of Water, US Environmental Protection Agency, May 1995.

NAv - Not Available

ND - Not Detected (no detection limit specified)

(a) The MCL represents values for both hexavalent and trivalent chromium.

(b) MCLs have not been established for lead or copper. Instead, the Safe Drinking Water Act has established Treatment Thresholds (TT), above which treatment is required.

* Data is from the Draft Final Remedial Investigation for Remedial Investigation/Feasibility Study Pesticide Storage Facility, July 1993. For a full summary of positive detections from these sampling events, please refer to this document.

(M2) Matrix spike recovery is low due to sample matrix effect. Sample result is estimated.

(B1) Sample results are less than 5 times the amount detected in the method blank. Result is estimated.

[1] (LBA, 1996d)

TABLE A-6
MAIN POST LANDFILL GROUNDWATER SAMPLING POSITIVE DETECTIONS[1]
FORMER BUILDING 354

Well ID	**MPL94-01**			**MPL94-02**			**MPL94-03**		**Regulatory Standards**
Sample ID	MPL-94-01-01	**MPL94-01**	**DUP95-006***	MPL-94-02-01	MPL-94-04-01*	**MPL94-02**	MPL-94-03-01	**MPL94-03**	MCL
Date of Sample	Jul-94	**Dec-95**	**Dec-95**	Jul-94	Jul-94	**Dec-95**	Jul-94	**Dec-95**	
Nitrate (mg/L)	NA	**0.9**	**0.8**	NA	NA	<0.1	NA	**11.5**	10
Volatiles - results in µg/L									
1,2 Dichloroethylene (Total)	**2.3**	**0.07**	<0.5	**2.6**	**1.9**	**5.0**	<0.5	<0.5	70(c)
Trichloroethylene	<0.6	<0.6	<0.6	**1.5**	**1.5**	**3.0**	<0.6	<0.6	5
Dichloromethane	**1.2**	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	5
Metals - results in mg/L									
Chromium, total	<0.01	**0.006**	<0.002	<0.01	<0.01	**0.002**	<0.01	<0.002	0.1(a)
Lead, total	<0.003	<0.003	<0.003	<0.003	0.006	<0.003	<0.003	<0.003	.015(b)
Selenium, total	<0.005	**0.007**	**0.008**	<0.005	<0.005	<0.005	<0.005	**0.007**	0.05

Bolded values represent positive detections

MCL: Federal Maximum Contaminant Level. From Drinking Water Regulations and Health Advisories, Office of Water, US Environmental Protection Agency, May 1995.

*Duplicate sample

NA - Not Analyzed

NAv - Not Available

(a) The MCL represents values for both hexavalent and trivalent chromium.

(b) MCLs have not been established for lead or copper. Instead, the Safe Drinking Water Act has established Treatment Thresholds (TT), above which treatment is required.

(c) The value represents the MCL for cis-1,2-dichloroethylene; the MCL for trans-1,2-dichloroethylene is 100 µg/L.

[1] (LBA, 1996d)

APPENDIX B
DRILLING LOGS

HTW DRILLING LOG LEGEND

- Depths indicated in column b are in feet below ground surface.
- Soils and rock are described in column c. Soils are described according to the Unified Soil Classification System (see back of this sheet). Soil color is described using the Munsell Soil Color Chart (i.e. dark brown is 10YR 3/3). Rock color is described using the Geological Society of America rock color chart.
- Field screening results (column d) document photoionization detector readings for the breathing zone (BZ), bore hole (BH), and sample screening (S). In addition, oxygen and lower explosive limits (LEL) readings for the breathing zone, as measured with a combustible gas meter, are listed.
- Recovery, which represents the total length of soil recovered over the amount of soil penetrated, is listed in column 7 (i.e. 3.0/4.0).
- Depth water was first encountered during drilling is noted in Remarks (column 8).
- Commonly used acronyms and abbreviations include the following:

bent	bentonite
BGS	Below Ground Surface
BH	Bore Hole (air quality measurement)
BTOC	Below Top Of Casing
BZ	Breathing Zone (air quality measurement)
DIA	Diameter
FT	Feet
GC	Gas Chromatograph
LEL	Lower Explosive Limit
NA	Not Applicable
N/D	Not Detected
ppb	Parts Per Billion
ppm	Parts Per Million
PVC	Polyvinyl Chloride
S	Sample (soil screening measurement)
temp	temporary
TOC	Top Of Casing
WL	Water Level

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions			Graph symbol	Letter symbol	Typical descriptions
Coarse-grained soils	Gravel and gravelly soil	Clean gravels (little or no fines)		GW	Well-graded gravel-sand mixtures, little or no fines
				GP	Poorly graded gravels, gravel-sand mixtures, little or no fines
	More than 50% of coarse fraction **retained** on a no. 4 sieve	Gravels with fines (appreciable amount of fines)		GM	Silty gravels, gravel-sand-silt mixtures
				GC	Clayey gravels, gravel-sand-clay mixtures
More than 50% of material is larger than no. 200 sieve size	Sand and sandy soils	Clean sand (little or no fines)		SW	Well-graded sands, gravelly sands, little or no fines
				SP	Poorly graded sands, gravelly sands, little or no fines
	More than 50% of coarse fraction **passing** a no. 4 sieve	Sands with fines (appreciable amount of fines)		SM	Silty sands, sand-silt mixtures
				SC	Clayey sands, sand-clay mixtures
Fine-grained soils	Silts and clays	Liquid limit **less** than 50%		ML	Inorganic silts and very fine sands, rock flour silty or clayey fine sands or clayey silts with slight plasticity
				CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
				OL	Organic silts and organic silty clays or low plasticity
More than 50% of material is smaller than no. 200 sieve size	Silts and clays	Liquid limit **greater** than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sand or silty soils
				CH	Inorganic clays or high plasticity, fat clays
				OH	Organic clays of medium to high plasticity, organic silts
Highly organic soils				PT	Peat, humus, swamp soils with high organic contents

HTW DRILLING LOG

HOLE NO. P-1

1. COMPANY NAME: Purnell McDonnell	2. DRILLING SUBCONTRACTOR: RS	SHEET 1 OF 5 SHEETS
3. PROJECT: USFRC354 96-806-4-004	4. LOCATION: Ft Riley	
5. NAME OF DRILLER: Doug Roy	6. MANUFACTURER'S DESIGNATION OF DRILL: GEOPROBE 4200	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" DIAMETER MACRO CORE SAMPLER w/ 4' LONG ACETATE LINERS	8. HOLE LOCATION	
	9. SURFACE ELEVATION	
	10. DATE STARTED: 9/19/97	11. DATE COMPLETED: 9/19/97
12. OVERBURDEN THICKNESS: 33.0 FT	15. DEPTH GROUNDWATER ENCOUNTERED: 31.5' BGS	
13. DEPTH DRILLED INTO ROCK: 0.0 FT	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 1006 31.19' BGS	
14. TOTAL DEPTH OF HOLE: 33.0 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): 31.16' TOC (9/15/97); 31.16' TOC (9/19/97)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	NA	NA	NA	NA	NA	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
TEMPORARY PIEZOMETER	9/24/97 BENT. GRANULES		TEMP PIEZOMETER	

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	0	SILT, some clay (30%), trace gravel (10%), dark brown (7.5YR3/2), damp, ~~moist~~, trace plasticity, 6" asphalt at top of hole (ML) (SOIL)	BZ=0 ppm BH=0 ppm S=0 ppm O_2=20.9% LEL=0% S=0 ppm S=0 ppm S=0 ppm	NA	NA	0/4.0	BEGIN DRIVING SAMPLER
	1						
	2					20/4.0	
	3						
	4					0/4.0	
	5		BZ=0 ppm BH=0 ppm	NA	NA	0/4.0 35/4.0	

HTW DRILLING LOG

HOLE NO. P-1

PROJECT USFR354 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 2 OF 2 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	5	SILT, some clay (30%), trace gravel (10%), dark brown (7.5YR 3/2), damp, trace plasticity, 6" asphalt top of hole	S=0 ppm O_2=20.9%	NA	NA		
	6	SILT, some clay (20%), trace vf sand (5%), brown (7.5YR 5/2), damp, soft consistency, trace plasticity (ML) (Alluvium)	LEL=0.0% S=0 ppm			3.5/4.0	
	7		S=0 ppm				
	8					0850	
		SAND (vf-med grained), some silt (20%), trace clay (10%), yellowish brown (10YR 5/6) damp, loose, trace plastic, trace iron staining, (SM) (Alluvium)	BZ=0.0 ppm BH=0.0 ppm	NA	NA	0851	
	9		S=0.0 ppm O_2=20.9%			3.5/4.0	
	10		LEL=0.0%				
			S=0.0 ppm				
	11		S=0.0 ppm				
	12					0900	
			BZ=0.0 ppm BH=0.0 ppm	NA	NA	0902	
	13		S=0.0 ppm O_2=21.0%			3.0/4.0	
			LEL=0.0%				
	14						

HTW DRILLING LOG

HOLE NO. P-1

PROJECT USFR 354 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 3 OF 5 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	14	SAND (med-coarse grained, coarsening downward), trace silt (5%), yellowish brown (10YR 5/6), damp, loose, trace iron staining (SM) (Alluvium)	NA	NA			
			S=0.0 ppm			3.0/4.0	
	15		S=0.0 ppm				
	16	SAND (fine-med grained) 10% clay/silt (10YR 6/4), damp with increasing moisture, loose, increasing clay to bottom, trace iron stain (SM) (Alluvium)	BZ=0.0 ppm	NA	NA	0911	
			BH=0.0 ppm			0912	
	17		S=0.0 ppm			3.5/4.0	
			O_2=21.0%				
	18		LEL=0.0%				
			S=0.0 ppm				
	19		S=0.0 ppm				
	20		BZ=0.0 ppm	NA	NA	0920	
			BH=0.0 ppm			0921	
	21		S=0.0 ppm			3.0/4.0	
			O_2=21.1%				
	22		LEL=0.0%				
		CLAY with trace silt (10%) and trace sand (10%), pale brown, damp, stiff (CL) (Alluvium)	S=0.0 ppm				
			S=0.0 ppm				
	23						

HTW DRILLING LOG

HOLE NO. P-1

PROJECT USFK3524 96-F06-4-004 | INSPECTOR E D LINDGREN | SHEET 4 OF 5 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	23	SAND (coarse grained), brown yellow ( ) damp (SW) (Alluvium)		NA	NA	3.0/4.0	
						0927	
	24	SAND (fine–med. grained) yellowish red (5YR 5/6) damp, slightly cohesive (SW) (Alluvium)	TBZ=0.0 ppm	NA	NA	0928	
			TBH=0.0 ppm				
	25		S=0.0 ppm			7.0/4.0	
			O_2=21.1%				
	26		LEL=0.0%				
			S=0.0 ppm				
	27		S=0.0 ppm				
						0934	
	28			NA	NA	0935	
			TBZ=0.0 ppm				
			TBH=0.0 ppm				
	29		S=0.0 ppm			3.0/4.0	
			O_2=21.0%				
	30		LEL=0.0%				
			S=0.0 ppm				
	31		S=0.0 ppm				
		SAND (coarse grained), brown yellow (10YR 6/6), wet (SW) (Alluvium)				0938	
	32						

HTW DRILLING LOG

HOLE NO. P-1

PROJECT USFR354 96-F06-4-004 | INSPECTOR E D LINDGREN | SHEET 5 OF 5 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	32	SAND (coarse gravel), brown yellow (10YR 6/6), wet (SW) (Alluvium)	BZ = 0.0 ppm BH = 0.0 ppm S = 0.0 ppm O_2 = 21.0% LEL = 0.0%	NA	NA	0934 1.0/1.0 0941	
	33	BOTTOM OF HOLE = 33.0 FT					0945 SET TEMP. PIEZOMETER WITH 5' SCREEN AND 26' RISER ~~(2' STICK UP)~~ SDL 1006 GL = 71.19' BGS

HTW DRILLING LOG

HOLE NO. P-2

1. COMPANY NAME: Dames & McDonnell	2. DRILLING SUBCONTRACTOR: EPS
PROJECT: USFRL554 96-F06-4-004	4. LOCATION: Ft Riley
5. NAME OF DRILLER: Doug Roy	6. MANUFACTURER'S DESIGNATION OF DRILL: GEOPROBE 4200
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" DIAMETER MACROCORE SAMPLER; 4' LONG ACETATE LINERS	8. HOLE LOCATION
	9. SURFACE ELEVATION
	10. DATE STARTED: 9/19/97 — 11. DATE COMPLETED: 9/19/97
12. OVERBURDEN THICKNESS: 30.0 FT	15. DEPTH GROUNDWATER ENCOUNTERED: 29.0' BGS
13. DEPTH DRILLED INTO ROCK: 0.0 FT	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 1220 27.90' BGS
14. TOTAL DEPTH OF HOLE: 30.0 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): 27.90' TOC (9/15/97); 27.90' TOC (9/19/97)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	NA	NA	NA	NA	NA	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
TEMPORARY PIEZOMETER	9/24/97 BENT. GRANULES		TEMP. PIEZOMETER	

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
		MOIST TOPSOIL	BZ-0 ppm	NA	NA	1113	Began drilling Sampler
	1	GRAVEL, some sand (10%) and silt (10%), prob. FILL (GM) (FILL)	BH-0 ppm S-0.0 ppm				
	2	SILT, some clay (20%) dark grayish brown (10YR 4/2), damp, soft, trace plasticity, (ML) ~~(ALL~~ (ALLUVIUM)	O_2-21.0% LEL-0.0% S-0.0 ppm			20/4.0	
	3		S-0.0 ppm				
	4					1121	
			BZ-0.0 ppm BH-0.0 ppm	NA	NA	1122 3.0/4.0	
	5		S-0.0 ppm				

HTW DRILLING LOG

HOLE NO. P-2

PROJECT USFR554 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 2 OF 4 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	5	SILT, some clay (20%), dark gray brown (10YR 4/2), damp, soft, trace plasticity (ML) (Alluvium)	O_2=21.0%	NA	NA		
	6		LEL=0.0%			3.0/4.0	
		SILT, some clay (20%), dark brown (10YR 3/3), damp, soft medium plastic (ML) (Alluvium)	S=0.0 ppm				
	7		S=0.0 ppm				
	8					1125	
			BZ=0.0 ppm	NA	NA	1126	
			TH=0.0 ppm				
	9		O_2=21.2%			3.5/4.0	
			LEL=0.0%				
	10						
		SAND (fine-med grained), trace silt (10%) and trace clay (10%) light yellow brown (10YR 6/4), damp, soft, trace iron staining (SM) (Alluvium)	S=0.0 ppm				
	11		S=0.0 ppm				
			S=0.0 ppm				
	12					1131	
			BZ=0.0 ppm	NA	NA	1132	
	13		TH=0.0 ppm			3.5/4.0	
			O_2=21.0%				
	14		S=0.0 ppm				

HTW DRILLING LOG

HOLE NO. P-2

PROJECT USFRL354 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 3 OF 4 SHEETS

ELEV. a	DEPTH	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	14	SAND (fine-med grained, coarser at bottom), trace silt (5%), yellow brown (10YR 5/6), damp, soft, nonplastic, trace mica shining. Small zones of fine-grained sediment (clay/silt); less than 0.1 ft. (SM) (Alluvium)	LEL=0.0% S=0.0 ppm S=0.0 ppm	NA	NA	3.5/4.0	
	16					1137	
			BZ: 0.0 ppm BH: 0.0 ppm O_2=21.1% S=0.0 ppm LEL=0.0% S: 0.0 ppm S=0.0 ppm	NA	NA	1138 3.5/4.0	
	20					1144	
			BZ: 0.0 ppm BH: 0.0 ppm O_2=21.1% LEL=0.0% S=0 ppm	NA	NA	1145 3.0/4.0	
	22	SILT, some fine sand (15%) & clay (15%), moist, medium consistency, medium plastic, yellow brown (10YR 5/6), trace fine sand (5%) (Alluvium)					

HTW DRILLING LOG

HOLE NO. P-2

PROJECT USFR 354 96-F06-4-004 | INSPECTOR E D LINDGREN | SHEET 4 OF 4 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	23	SILT, some fine sand (15%) and clay (15%), yellow brown (10YR 5/6), moist (moist - v. wet at ~23 ft), medium consistency, medium plasticity, trace iron staining. (ML) (Alluvium)	S = 0.0 ppm S = 0.0 ppm	N/A	N/A	3.0/4.0	
	24					1152	
			BZ = 0.0 ppm BH = 0.0 ppm O_2 = 21.7% S = 0.0 ppm LEL = 6.0	N/A	N/A	1154 3.5/4.0	
	25						
	26	SAND, fine-med, some silt (30%) brown-yellow (10YR 6/6), damp, salt, nonplastic (SM) (Alluvium)	S = 0.0 ppm S = 0.0 ppm				
	27	SAND, coarse-very coarse grained, brown-yellow (10YR 6/6), damp, nonplastic, iron staining. Sand saturated from 29-30 ft (SW) (Alluvium)				1202	
	28		BZ = 0.0 ppm BH = 0.0 ppm O_2 = 21.7% S = 0.0 ppm LEL = 0.0% S = 0.0 ppm S = 0.0 ppm	N/A	N/A	~~1202~~ 1205 SDT 1.5/2.0	
	29	LIMESTONE, fine-grained, gray brown (2.5Y 5/2) at 30 feet					
	30	Bottom of hole = 30.0 ft.					1210 Installed temp. piezometer 5' screened 25' riser - flush. 1220 GWL = 27.90' BGS
	31						
	32						

HTW DRILLING LOG

HOLE NO. P-3

1. COMPANY NAME: Ticus E McDonnell	2. DRILLING SUBCONTRACTOR: EPS
3. PROJECT: USAR 354 96-F06-4-604	4. LOCATION: FT RILEY
5. NAME OF DRILLER: Doug Roy	6. MANUFACTURER'S DESIGNATION OF DRILL: GEOPROBE 4200
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" DIAMETER MACHINE SAMPLER WITH 4' LONG ACETATE LINERS	8. HOLE LOCATION
	9. SURFACE ELEVATION
	10. DATE STARTED: 9/19/97 — 11. DATE COMPLETED: 9/19/97
12. OVERBURDEN THICKNESS: 34.0 FT	15. DEPTH GROUNDWATER ENCOUNTERED: 31.5
13. DEPTH DRILLED INTO ROCK: 0.0 FT	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 1552 31.30' TOC
14. TOTAL DEPTH OF HOLE: 34.0 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): 31.27' TOC (9/15/97); 31.28' TOC (9/19/97)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	NA	NA	NA	NA	NA	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
TEMPORARY PIEZOMETER	9/24/97 BENT. GRANULES		TEMPORARY PIEZOMETER	

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	0	SILT, some clay (20%) dark grey brown (10YR 4/2) damp, medium consistency, medium plastic, ~~brown~~ (10Y (ML) (SOIL) 20-	PID=0.0 ppm FID=0.0 ppm S=0.0 ppm LEL=0.0% O_2=21.2%	NA	NA	1471 4.0/4.0	
	2	SILT, some clay (10%), fine sand (5%), dry, soft, non plastic brown (10YR 5/3) (ML)	S=0.0 ppm S=0.0 ppm			HSJ	
	4		PID=0.0 ppm BH=0.0 ppm	NA	NA	1434 3.5/4.0	

HTW DRILLING LOG

HOLE NO. P-J

PROJECT USFK 554 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 2 OF 5 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	5	SILT, some clay (10%), fine sand (5%), dry, soft, non-plastic brown (10YR 5/3) (ML)	S = 0.0 ppm O_2 = 21.2% LEL = 0.0% S = 0.0 ppm S = 0.0 ppm	NA	NA	3.5/4.0	
	8					1436	
	9		BZ = 0.0 ppm BH = 0.0 ppm S = 0.0 ppm O_2 = 21.2% LEL = 0.0% S = 0.0 ppm S = 0.0 ppm	NA	NA	1437 3.5/4.0	
	10	SILT, vf-fine sand (20%), very dark gray brown (10YR 3/2), damp, soft, non-plastic (ML)					
	11					1441	
	12	SAND, medium-fine grained, trace silt (10%), trace clay (10%), yellowish brown (10YR 5/4), damp, soft, root traces, (SM)	BZ = 0.0 ppm BH = 0.0 ppm S = 0.0 ppm O_2 = 21.2%	NA	NA	1442 3.5/4.0	
	13						
	14						

HTW DRILLING LOG

HOLE NO. P-7

PROJECT USFR 354 96-D06-4-004 | INSPECTOR E D LINDGREN | SHEET 1 OF 5 SHEETS

ELEV. a	DEPTH ft	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	14	SAND, medium to fine grained, trace silt (5%), trace clay (10%) yellowish brown (10YR 5/4), damp, soft, root traces (SM)	LEL=0.0%	NA	NA		
			S=0.0 ppm			7.5/4.0	
	15		S=0.0 ppm				
	16					1446	
			B7=0.0 ppm	NA	NA	1447	
			BH=0.0 ppm				
	17		S=0.0 ppm			7.5/4.0	
			O_2=21.2%				
	18		LEL=0.0%				
			S=0.0 ppm				
	19	SILT with some fine-med grained sand (30%) & clay (10%), yellowish brown (10YR 5/4), damp, medium consistency, trace plasticity, (ML)	S=0.0 ppm				
	20					1451	
			B7=0.0 ppm	NA	NA	1452	
			BH=0.0 ppm				
			S=0.0 ppm			7.5/4.0	
	21		O_2=21.2%				
		SAND, fine to med grained, some silt (20%) & trace clay (5%) dark yellowish brown (10YR 4/4)	LEL=0.0%				
	22	damp, medium consistency, non plastic (SM)	S=0.0 ppm				
			S=0.0 ppm				
	23						

HTW DRILLING LOG

HOLE NO. P-3

PROJECT USFR354 96-806-4-004

INSPECTOR E D LINDGREN

SHEET 4 OF 5 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	23	SAND, fine to med. grained, some silt (20%) and trace clay (5%), dark yellow brown (10YR 4/4), damp (SM)		NA	NA	3.5/4.0	
	24	SILT, some fine-med sand (15%), some clay (15%), yellowish brown (10YR 5/6), damp, soft, trace plasticity, (ML)				1458	
			BZ = 0.0 ppm BH = 0.0 ppm S = 0.0 ppm O_2 = 21.2% LEL = 0.0% S = 0.0 ppm S = 0.0 ppm	NA	NA	1459 4.0/4.0	
	25						
	26						
	27						
	28					1506	
		SAND, coarse grained, well sorted, brownish yellow (10YR 6/6), moist to saturated (from 31.5-72.0 ft). Significant zone of reddish-brown iron staining from 28.2-~29.0 ft. (SW)	BZ = 0.0 ppm BH = 0.0 ppm S = 0.0 ppm O_2 = 21.2% LEL = 0.0% S = 0.0 ppm S = 0.0 ppm	NA	NA	1507 3.0/4.0	
	29						
	30						
	31						
	32					1517	

HTW DRILLING LOG

HOLE NO. P-3

PROJECT USFR 354 96-806-4-004

INSPECTOR E D LINDGREN

SHEET 5 OF 5 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	32	SAND, coarse to very coarse grained, trace fine gravel (5%), brownish yellow (10YR 6/6), moist to saturated (SW)	BZ = 0.0 ppm BH = 0.0 ppm S = 0.0 ppm O_2 = 21.2% LEL = 0.0% S = 0.0 ppm S = 0.0 ppm	NA	NA	2.0/2.0	
	33						
	34	LIMESTONE, gray at refusal				1530	
		Bottom of hole = 32 BGS					1542 Installed temp. piezometer 5' screen at 30' riser 1552 GL = 31.70' TOC

HTW DRILLING LOG

HOLE NO. P-4

1. COMPANY NAME: BURNS & McDONNELL	2. DRILLING SUBCONTRACTOR: EPS
3. PROJECT: USFR354 96-806-4-004	4. LOCATION: FT RILEY
5. NAME OF DRILLER: DOUG ROY	6. MANUFACTURER'S DESIGNATION OF DRILL: GEOPROBE 4200
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" DIAMETER MACROCORE SAMPLER WITH 4' LONG ACETATE LINERS	8. HOLE LOCATION
	9. SURFACE ELEVATION
	10. DATE STARTED: 9/19/97 — 11. DATE COMPLETED: 9/19/97
12. OVERBURDEN THICKNESS: 10.0 FT	15. DEPTH GROUNDWATER ENCOUNTERED
13. DEPTH DRILLED INTO ROCK: 0.0 FT	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 1415 GL = 10.70' BTOC
14. TOTAL DEPTH OF HOLE: 10.0 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): 11.27' TOC (9/15/97); 11.36' TOC (9/19/97)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	NA	NA	NA	NA	NA	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
TEMPORARY PIEZOMETER	9/24/97 TENT. GRAVELS		TEMPORARY PIEZOMETER	

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	0	SILT, some PEA ballast (7%) very dark grey brown (10YR 3/2) damp, soft, trace plasticity, (ML) (SOIL)	BZ = 0.0 ppm BH = 0.0 ppm S = 0.0 ppm O_2 = 21.2% LEL = 0.0% S = 0.0 ppm S = 0.0 ppm	NA	NA	1742 3.5/4.0 1744	
	4	SILT, some clay (20%) dark brown (10YR 3/3), damp, soft, medium plastic (ML) (Alluvium)	BZ = 0.0 ppm BH = 0.0 ppm	NA	NA	1745 3.0/4.0	
	10						

HTW DRILLING LOG

HOLE NO. P-4

PROJECT USFR354 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 2 OF 2 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	5	SILT, some clay (20%), dark brown (10YR 3/3), damp, soft, medium plastic (ML) (Alluvium)	S = 0.0 ppm O_2 = 20.9% LEL = 0.0%	NA	NA		
	6	SILT with some clay (30%), dark gray brown (10YR 4/2), moist to wet, medium plastic, trace iron staining (ML) (Alluvium)	S = 0.0 ppm S = 0.0 ppm			3.0/4.0	
	7						
	8					1347	
			BZ = 0.0 ppm TH = 0.0 ppm S = 0.0 ppm O_2 = 21.2% LEL = 0.0% S = 0.0 ppm S = 0.0 ppm	NA	NA	1349	
	9	SILT with some clay (20%), light yellow brown (10YR 6/4), moist, soft, medium plastic, trace CaCO3 nodules (ML) (Alluvium)				1.5/2.0	
	10	SHALE, calcareous, light olive gray (5Y 6/2), last 0.2 ft hard rock				1352	
		BOTTOM OF HOLE = 10.0 FT					1405 Set temp. piezometer with 5' slot & 5' riser. 1415 WL = 10.70' BTOC

HTW DRILLING LOG

HOLE NO. P-5

1. COMPANY NAME: BURNS & McDONNELL	2. DRILLING SUBCONTRACTOR: EPS
SHEET 1 OF 3 SHEETS	
3. PROJECT: USFK 354 96-806-4-004	4. LOCATION: FT RILEY
5. NAME OF DRILLER: DOUG ROY	6. MANUFACTURER'S DESIGNATION OF DRILL: GEOPROBE 4200
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" DIAMETER MACROCORE SAMPLER WITH 4' LONG ACETATE LINERS	8. HOLE LOCATION
	9. SURFACE ELEVATION
	10. DATE STARTED: 9/19/97 — 11. DATE COMPLETED: 9/19/97
12. OVERBURDEN THICKNESS: 16.5 FT	15. DEPTH GROUNDWATER ENCOUNTERED
13. DEPTH DRILLED INTO ROCK: 0.0 FT	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 1645 19.25' BTOC
14. TOTAL DEPTH OF HOLE: 16.5 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): DRY (9/15/97); 19.34' TOC (9/19/97)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	NA	NA	NA	NA	NA	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
TEMPORARY PIEZOMETER	9/24/97 BENT. GRANULES		TEMPORARY PIEZOMETER	

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	0	SILT, some v fine-fine sand (15%), some clay (10%), damp, soft, non-plastic, very dark grayish brown (10YR 3/2), topsoil (ML) (SM)	BH = 0.0 ppm BZ = 0.0 ppm S = 0.0 ppm O_2 21.3% LEL = 0.0% S = 0.0 ppm S = 0.0 ppm	NA	NA	1601 3.0/4.0	
	1	SILT, some clay (15%), grayish brown (10YR 5/2), damp, soft, non-plastic (ML) (Alluvium)					
	2						
	3						
	4					1602	
			BH = 0.0 ppm BZ = 0.0 ppm	NA	NA	1603 3.5/4.0	

HTW DRILLING LOG

HOLE NO. P-5

PROJECT USFR354 96-806-4-004

INSPECTOR E D LINDGREN

SHEET 2 OF 3 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	6	SILT, some clay (25%), zone of med to coarse sand, very dark brown (10YR 2/2), damp, soft, trace plasticity (ML) (Allwan)	S=0.0 ppm O_2=21.2% LEL=0.0% S=0.0 ppm S=0.0 ppm	NA	NA	3.5/4.0	
	8					1607	
	9	SILT with some v. fine to fine sand (20%) and trace clay (10%) dark grayish brown (10YR 4/2), damp, soft, trace plasticity (ML) (Allwan)	BH=0.0 ppm BZ=0.0 ppm S=0.0 ppm O_2=21.2% LEL=0.0% S=0.0 ppm S=0.0 ppm	NA	NA	1608 3.5/4.0	
	12					1612	
	13		BH=0.0 ppm BZ=0.0 ppm S=0.0 ppm O_2=21.1% LEL=0.0%	NA	NA	1613 2.5/4.0	
	14						

HTW DRILLING LOG

HOLE NO. P-5

PROJECT USFR354 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 3 OF 3 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	14	SMD, medium to coarse grained trace fine gravel at bottom (~16 ft - 16.8 ft), yellowish brown (10YR 5/4), moist to saturated (SW) (Alluvium)	S=0.0 ppm S=0.0 ppm	NA	NA	2.5/4.0	
	15						
	16					1620	
		SILTSTONE, calcareous, light olive gray (5Y 6/2)	BH=0.0 ppm BZ=0.0 ppm S=0.0 ppm O_2=21.3% LEL=0.0%	NA	NA	0.8/0.8	
	17	BOTTOM OF HOLE 16.8'				1626	1627 Tunnel temp. present 5' screen w/ 15' riser 1645 GWL= 19.25' TOC
	18						

HTW DRILLING LOG

HOLE NO. P-6

1. COMPANY NAME: BURNS & McDONNELL	2. DRILLING SUBCONTRACTOR: EPS	SHEET 1 OF 2 SHEETS
PROJECT: USFR754 96-206-4-004	4. LOCATION: FT RILEY	
5. NAME OF DRILLER: PAT MARTIN	6. MANUFACTURER'S DESIGNATION OF DRILL: GEOPROBE 4200	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" DIAMETER MACHINE DRIVE SAMPLER 4' LONG WITH METAL LINERS	8. HOLE LOCATION	
	9. SURFACE ELEVATION	
	10. DATE STARTED: 9/20/97	11. DATE COMPLETED: 9/20/97
12. OVERBURDEN THICKNESS: 13.5 FT	15. DEPTH GROUNDWATER ENCOUNTERED	
13. DEPTH DRILLED INTO ROCK: 0.0 FT	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 0730 DRY	
14. TOTAL DEPTH OF HOLE: 13.5 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): DRY (9/15/97); DRY (9/19/97)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	NA	NA	NA	NA	NA	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
TEMPORARY PIEZOMETER			TEMPORARY PIEZOMETER	

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	0	SILT, some clay (20%), dark brown (10YR 3/3), damp, soft trace plasticity (ML) (~~Alluvium~~ EOL) (Soil)	BZ = 0.0 ppm TH = 0.0 ppm S = 0.0 ppm O_2 = 21.0% LEL = 0.0 % S = 0.0 ppm S = 0.0 ppm	NA	NA	0703 4.0/4.0 0705	
	4		BZ = 0.0 ppm TH = 0.0 ppm	NA	NA	0706 2.0/4.0	
	5						

HTW DRILLING LOG

PROJECT USFK 554 96-806-4-004 | INSPECTOR E D LINDGREN | HOLE NO. P-6 | SHEET 2 OF 2 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	5	SILT, some fine sand (10%) & some clay (15%), damp, soft, yellowish brown (10YR 5/4) trace plasticity. (ML) (Alluvium)	S = 0.0 ppm O_2 = 21.0% LEL = 0.0% S = 0.0 ppm S = 0.0 ppm	NA	NA	2.0/4.0 0708	
	8	SAND, med to coarse grained brownish yellow (10YR 6/6), clean, moist to saturated (above bedrock), loose. (SW) (Alluvium)	BH = 0.0 ppm BZ = 0.0 ppm S = 0.0 ppm O_2 = 21.0% LEL = 0.0% S = 0.0 ppm S = 0.0 ppm	NA	NA	0709 3.5/4.0 0712	
	12		BH = 0.0 ppm BZ = 0.0 ppm S = 0.0 ppm O_2 = 21.0% LEL = 0.0% S = 0.0 ppm S = 0.0 ppm	NA	NA	0713 1.5/1.5 0716	
	13	SHALE (bedrock), calcareous, light gray (5Y 7/1)					
		BOTTOM OF HOLE = 13.5 FT					0720 INSTALL TEMP. PIEZOMETER 2/5' SCREEN / 10' RISER 0730 WL = DRY

HTW DRILLING LOG

HOLE NO: T-1

1. COMPANY NAME: Tetra Tech McDONNELL	2. DRILLING SUBCONTRACTOR: EPS
SHEET 1 OF 6 SHEETS	
3. PROJECT: USFR354 96-806-4-004	4. LOCATION: FT RILEY
5. NAME OF DRILLER: DOUG ROY	6. MANUFACTURER'S DESIGNATION OF DRILL: GEOPROBE 4200
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" DIAMETER MACROCORE SAMPLER w/4' LONG ACETATE LINERS	8. HOLE LOCATION
	9. SURFACE ELEVATION
	10. DATE STARTED: 9/11/97 — 11. DATE COMPLETED: 9/11/97
12. OVERBURDEN THICKNESS: 43.5 FT	15. DEPTH GROUNDWATER ENCOUNTERED: ~42-43 FT BGS (SEE REMARKS)
13. DEPTH DRILLED INTO ROCK: 0.0 FT	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 40.85' TOC (~30 hrs)
14. TOTAL DEPTH OF HOLE: 43.5	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): 40.83' TOC (9/15/97); 40.79' TOC (9/19/97)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	NA	NA	NA	NA	NA	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
TEMPORARY MONITORING WELL	9/24/97 BENT. GRANULES	5' SCREEN / 40' RISER		

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	1	CLAY, with silt (40%) trace gravel (5%), very dark grayish brown (10YR 3/2), damp, medium consistency, non-plastic (CL) (~~Alluvium~~) SOIL (SOIL)	BZ=0.0 ppm BH=0.0 ppm S=0.0 ppm O_2=21.3% LEL=0.0%	NA	NA	0723 3.0/4.0	BEGIN DRIVING SAMPLER
	2	SILT, some clay (20%) brown (10YR 4/3), damp, soft, non-plastic (ML) (Alluvium)	S=0.0 ppm S=0.0 ppm			0725	
	4		BZ=0.0 ppm BH=0.0 ppm	NA	NA	0726 3.5/4.0	
	5						

HTW DRILLING LOG

HOLE NO. T-1

PROJECT USFR7354 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 2 OF 6 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	5	SILT, some clay (20%), brown (10YR 4/3), damp, soft, non-plastic (ML) (Alluvium)	S=0.0 ppm O_2=21.4% LEL=0.0% S=0.0 ppm S=0.0 ppm	NA	NA	3,5/4.0	
	6						
	7	SILT, some clay (70%), grayish brown (10YR 5/2), damp, soft, trace plasticity (ML) (Alluvium)				0728	
	8		BZ=0.0 ppm BH=0.0 ppm S=0.0 ppm O_2=21.6% LEL=0.0% S=0.0 ppm S=0.0 ppm	NA	NA	0729 4.0/4.0 0731	
	9	SILT, some fine sand (10%), some clay (10%), light brownish gray (10YR 6/2), damp, ~~firm~~ soft, medium plasticity (ML) (Alluvium)					
	10						
	11						
	12		BZ=0.0 ppm BH=0.0 ppm S=0.0 ppm	NA	NA	0732 7.5/4.0	
	13	SILT, some fine-med. sand (20%), some clay (10%), yellowish brown (10YR 4/4), damp, ~~firm~~ stiff, med plastic (ML) (Alluvium)					
	EOB						
	14						

HTW DRILLING LOG

HOLE NO. T-1

PROJECT USFR354 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 3 OF 6 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	14	SILT, some fine-medium sand (20%), some clay (10%), yellowish brown (10YR 4/4), damp, ~~firm~~ stiff, med. plasticity (ML) (Alluvium)	O_2=21.7%	NA	NA	3.5/4.0	
			LEL=0.0 ppm				
	15		S=0.0 ppm				
			S=0.0 ppm				
	16					0736	
			TBZ=0.0 ppm	NA	NA	0737	
			TBH=0.0 ppm				
	17		S=0.0 ppm			3.0/4.0	
			O_2=21.7%				
	18	SILT, some med-coarse sand (20-30%) with zones (1-2") of more sandy composition, trace clay (10%), yellowish brown (10YR 4/4), damp, soft → ~~firm~~ stiff, trace plastic → non plastic (ML-SM) (Alluvium)	LEL=0.0%				
			S=0.0 ppm				
	19		S=0.0 ppm				
	20					0742	
			TBZ=0.0 ppm	NA	NA	0743	
			TBH=0.0 ppm			3.0/4.0	
	21		S=0.0 ppm				
			O_2=22.0%				
	22	CLAY, some silt (30%) brown (10YR 5/3), moist, soft, medium plastic (CL) (Alluvium)	LEL=0.0%				
	23						

HTW DRILLING LOG

HOLE NO. T-1

PROJECT USFRC354 96-F06-4-004 | INSPECTOR E D LINDGREN | SHEET 4 OF 6 SHEETS

ELEV. a	DEPTH	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	23	CLAY, some silt (30%), brown (10YR 5/3), moist, soft, medium plasticity (CL) (Alluvium)	S = 0.0 ppm S = 6.0 ppm	NA	NA	3.0/4.0 0752	
	24		BZ = 0.0 ppm BH = 0.0 ppm S = 0.0 ppm O_2 = 22.0% LEL = 0.0%	NA	NA	0753 3.0/4.0	
	25						
	26						
	27	SILT, some fine sand (15%) trace clay (5%), damp → moist, soft, trace plasticity brown (10YR 5/3) (ML) (Alluvium)	S = 0.0 ppm S = 0.0 ppm			0800	
	28		BZ = 0.0 ppm BH = 0.0 ppm S = 0.0 ppm O_2 = 21.8% LEL = 0.0%	NA	NA	0801 3.0/4.0	
	29						
	30						
	31	very fine SAND, fine-~~to~~ grained, some silt (20%), pale brown (10YR 6/3), damp ~~soft, non-plastic~~ loose, subangular grains, moderately poorly ~~sorted~~ graded, quartzitic (SM) (Alluvium)	S = 0.0 ppm S = 0.0 ppm			0810	
	32						

HTW DRILLING LOG

HOLE NO. T-1

PROJECT USFR354 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 5 OF 6 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	32	SAND, ~~reddish~~ very fine grained, some silt (20%), pale brown, (10YR 6/3), damp, ~~soft~~, SDL	BZ = 0.0 ppm	NA	NA	08 11	
		~~non plastic~~ loose, subangular grains, moderately ~~poor~~ sorting, grading quartz sand (SM) (Alluvium)	BH = 0.0 ppm				
	33		S = 0.0 ppm				
			O_2 = 21.9%			4.0 / 4.0	
	34	~~- - - - - - - - - -~~	LEL = 0.0%				
		SAND, medium ~~coarse~~ coarse grained, trace silt (5%), very pale brown (10YR 7/4), damp,	S = 0.0 ppm				
	35	~~soft, non plastic~~, loose, subangular to subrounded grains, moderately ~~poor~~ well SDL sorting grading, quartz sand (SW) (Alluvium)	S = 0.0 ppm				
						08 20	
	36		BZ = 0.0 ppm	NA	NA	0F 21	
			BH = 0.0 ppm				
	37		S = 0.0 ppm				
			O_2 = 21.9%			1.5 / 4.0	SAMPLE WET AT 37 FT
	38	~~- - - - - - - - - -~~	LEL = 0.0%				
		SAND, medium ~~coarse~~ coarse grained, clean, brownish yellow (10YR 6/6), moist to wet, ~~soft, non plastic~~, SDL	S = 0.0 ppm				
	39		S = 0.0 ppm				SOIL SAMPLED FOR FIELD GC SCREEN AT 39-40'
		trace iron staining, loose, subrounded, ~~poorly~~ well SDL graded, quartz					
	40	sand (SW) (Alluvium)				0F 32	
			BZ = 0.0 ppm	NA	NA	0F 33	CORE STUCK IN SAMPLER 40-44'
			BH = 0.0 ppm			2 / 4.0	
	41					SEE ~~SDL~~ LOG REMARKS	

HTW DRILLING LOG

HOLE NO. T-1

PROJECT USFBL354 96-806-4-004

INSPECTOR E D LINDGREN

SHEET 6 OF 6 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	41	SAND, ~~medium~~ → coarse grained, clean, brownish yellow (10YR 6/6), moist to wet, ~~soft~~, ~~non-plastic~~, trace iron staining, loose, subrounded, ~~poorly~~ good grading, quartz sand (SW) (Alluvium)	S = 0.0 ppm O_2 = 21.9% LEL = 0.0% S = 0.0 ppm S = 0.0 ppm	NA	NA	2/4.0 SEE REMARKS	CORE STUCK IN SAMPLER 41'-44' WET SAND ~~SATURATED~~ DEPTH UNKNOWN DUE TO SAMPLE STUCK IN CORE BARREL
	42						
	43					0845	
		BOTTOM OF HOLE 43.5 FT					0845 INSTALLED 5' SCREEN / 40' RISER FOR TEMP. MONIT. WELL (1" DIA PVC) FIELD SCREEN RESULTS BENZENE = N/D DCA = N/D TCE = N/D PCE = 2.2 ppb

HTW DRILLING LOG

HOLE NO. T-2

1. COMPANY NAME: BURNS & McDONNELL	2. DRILLING SUBCONTRACTOR: EPS
SHEET 1 OF 6 SHEETS	
3. PROJECT: USFR354 96-806-4-004	4. LOCATION: FT RILEY
5. NAME OF DRILLER: DOUG ROY	6. MANUFACTURER'S DESIGNATION OF DRILL: GEOPROBE 4200
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2¼ DIAMETER MACROCORE SAMPLER W/ 4' LONG ACETATE LINERS	8. HOLE LOCATION
	9. SURFACE ELEVATION
	10. DATE STARTED: 9/11/97 — 11. DATE COMPLETED: 9/11/97
12. OVERBURDEN THICKNESS: 42.5 FT	15. DEPTH GROUNDWATER ENCOUNTERED: 38.5 FT BGS
13. DEPTH DRILLED INTO ROCK: 0.0 FT	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 37.54' TOC (~30 hrs)
14. TOTAL DEPTH OF HOLE: 42.5 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): 37.51' TOC (9/15/97); 37.52' TOC (9/19/97)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
NA	NA	NA	NA	NA	NA	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
TEMPORARY MONITORING WELL	9/24/97 BENT. GRANULES	5' SCREEN / 37.5' RISER		ED

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	1	SILT, some clay (30%), brown (10YR 4/3), damp, soft, nonplastic (ML) (~~Alluvium~~) [TOPSOIL] ED	PID = 0.0 ppm FID = 0.0 ppm S = 0.0 ppm O_2 = 20.8% LEL = 0.0%	NA	NA	0918 3.0/4.0	BEGIN DRIVING SAMPLER
	2	SILT, some clay (20%) dark brown (10YR 3/3), damp, soft, nonplastic (ML) (Alluvium)	S = 0.0 ppm				
	3		S = 0.0 ppm				
	4					0920	
			PID = 0.0 ppm FID = 0.0 ppm	NA	NA	0421 3.5/4.0	
	5						

HTW DRILLING LOG

HOLE NO. T-2

PROJECT USFR354 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 2 OF 6 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	5	SILT, some clay (20%), dark brown (10YR 3/3), damp, soft, nonplastic (ML) (Alluvium)	S = 0.0 ppm O_2 = 20.8% LEL = 0.0%	NA	NA	3.5/4.0	
	6	SILT, some fine → medium sand (20%), some clay (20%), damp, soft → medium stiff consistency, EOT trace plasticity, trace $CaCO_3$ nodules, dark yellowish brown (10YR 4/4) (ML) (Alluvium)	S = 0.0 ppm				
	7		S = 0.0 ppm			0925	
	8		BZ = 0.0 ppm BH = 0.0 ppm	NA	NA	0926	
	9	SAND, fine → medium grained, some silt (20%), yellowish brown (10YR 5/4), damp, soft, EOT trace plasticity, trace	S = 0.0 ppm O_2 = 20.8% LEL = 0.0%			4.0/4.0	
	10						
	11	loose, subangular to subrounded grains, moderately poorly sorting → grading, quartz sand with trace (5%) feldspar (SM) (Alluvium)	S = 0.0 ppm				
	12		S = 0.0 ppm			0930	
	13		BZ = 0.0 ppm BH = 0.0 ppm S = 0.0 ppm	NA	NA	0971 4.0/4.0	
	14						

HTW DRILLING LOG

HOLE NO. T-2

PROJECT USFR 354 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 3 OF 6 SHEETS

ELEV. a	DEPTH	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	14	SAND, fine → medium grained, some silt (20%), yellowish brown (10YR 5/4), damp, loose, dense, subangular to subrounded grains, moderately poor sorting, SOK quartz sand with trace (5%) of feldspar, trace iron staining at 10-12' BGS (SM) (Alluvium).	O_2=20.7% LEL=0.0% S=0.0 ppm S=0.2 ppm	NA	NA	4.0/4.0 0933	
	16		BZ=0.0 ppm BH=0.0 ppm S=0.0 ppm O_2=20.7%	NA	NA	0934 4.0/4.0	
	18	SAND, medium → coarse grained, SOK, brownish yellow (10YR 6/6), damp to moist, ~~soft, non plastic, trace iron staining.~~ SOK loose, subrounded grains, well graded, quartz sand, trace iron staining (SW) (Alluvium)	LEL=0.0% S=0.0 ppm S=0.0 ppm			0939	
	20		BZ=0.0 ppm BH=0.0 ppm S=0.0 ppm O_2=20.5%	NA	NA	0940 3.5/4.0	
	22	SAND, very fine → medium grained, some silt (15%), pale brown (10YR 6/3), damp, ~~soft,~~ SOK ~~trace plasticity~~, loose, subangular to subrounded grains, moderately sorting, quartz sand (SM) (Alluvium)	LEL=0.0%				
	23						

HTW DRILLING LOG

HOLE NO. T-2

PROJECT USFR754 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 4 OF 6 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	23	SM/SP, very fine → medium grained, some silt (15%), pale brown (10YR 6/3), damp, ~~soft, trace~~ slight plasticity, loose, subangular grains, moderately poor grading, quartz sand (SM) (Alluvium)	S = 0.0 ppm	NA	NA	7.5/4.0	
			S = 0.0 ppm			0948	
	24		BZ = 0.0 ppm	NA	NA	0949	
			BH = 0.0 ppm				
			S = 0.0 ppm				
	25					3.5/4.0	
			O_2 = 20.4%				
			LEL = 0.0%				
	26		S = 0.0 ppm				
	27		S = 0.0 ppm				
						0954	
	28		BZ = 0.0 ppm	NA	NA	0955	
			BH = 0.0 ppm				
	29		S = 0.0 ppm				
						4.0/4.0	
			O_2 = 20.4%				
	30		LEL = 0.0%				
	31		S = 0.0 ppm				
			S = 0.0 ppm				
	32					1001	

HTW DRILLING LOG

HOLE NO. T-2

PROJECT USFRJ54 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 5 OF 6 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	32	SAND, very fine-medium grained, some silt (15%), pale brown (10YR 6/3), damp, loose, subangular grains, moderately poor grading, quartz sand (SW) (Alluvium)	BZ=20.0 ppm BH=0.0 ppm S=0.0 ppm O_2=20.3% LEL=0.0%	NA	NA	1002	
	33	SAND, medium grained, clean, yellowish brown (10YR 6/6), damp to moist (localized saturated zone at 1/4-1/2") soft, non-plastic, trace iron staining loose, subrounded grains, poorly graded, quartz sand (SW) (Alluvium)	S=0.0 ppm S=0.0 ppm			3.5/4.0	
	34						
	35						
	36			NA	NA	1015	
	37		BZ=0.0 ppm BH=0.0 ppm S=0.0 ppm O_2=20.3% LEL=0.0%			3.0/4.0	TAKE SEDIMENT SAMPLE FOR FIELD GC ANALYSIS AT ~37' WET SEDIMENT AT 37.5'
	38						
	39	SAND, coarsed grained, wet yellow (10YR 7/6), saturated at 38.5', soft, loose, poorly graded clean, some iron staining loose, subrounded, quartz sand (SW) (Alluvium)	S=0.0 ppm S=0.0 ppm			1022	
	40		BZ=0.0 ppm BH=0.0 ppm S=0.0 ppm	NA	NA	1024 25/25	

HTW DRILLING LOG

HOLE NO. T-2

PROJECT USFR354 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 6 OF 6 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	41	SAND, course grained, yellow (10YR 7/6), ~~saturated~~ wet 20% at 38.5 ft, loose subrounded, ~~well~~ poorly graded and clean, quartz sand, some iron staining, (SW) (Alluvium)	O_2 = 20.5%	NA	NA	25/25	
			LEL = 0.0%				
	42	FOSSILIFEROUS LIMESTONE AT ~~??~~ 42.5 FT	S = 0.0 ppm				
			S = 0.0 ppm			1035	
		BOTTOM OF HOLE 42.5'					1035 INSTALLED 5' SCREEN / 37.5' RISER FOR TEMP. MNT. WELL (1" DIA PVC)
							FIELD SCREEN RESULTS
							BENZENE = N/D
							PCA = N/D
							TCE = N/D
							PCE = N/D

HTW DRILLING LOG

HOLE NO. 1-3

1. COMPANY NAME: BURNS & McDONNELL	2. DRILLING SUBCONTRACTOR: EPS	SHEET 1 OF 5 SHEETS
3. PROJECT: USAFR 354 96-806-4-004	4. LOCATION: FT RILEY	
5. NAME OF DRILLER: DOUG ROY	6. MANUFACTURER'S DESIGNATION OF DRILL: GEOPROBE 4200	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" DIAMETER MACROCORE SAMPLER 4'/4' LONG ACETATE LINERS	8. HOLE LOCATION	
	9. SURFACE ELEVATION	
	10. DATE STARTED: 9/11/97	11. DATE COMPLETED: 9/11/97
12. OVERBURDEN THICKNESS: 35.0 FT	15. DEPTH GROUNDWATER ENCOUNTERED: 31.0 FT BGS	
13. DEPTH DRILLED INTO ROCK: 0.0 FT	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: DRY (~30 hrs)	
14. TOTAL DEPTH OF HOLE: 35.0 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): DRY (9/15/97); DRY (9/19/97)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	NA	NA	NA	NA	NA	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
TEMPORARY MONITORING WELL	9/24/97 Bent. Granules	5' SCREEN/ 35' RISER		

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	0	SILT, some clay (15%) dark grey (10YR 4/1) damp, soft, non-plastic (ML) (~~Alluvium~~) (Topsoil)	BZ=0.0 ppm BH=0.0 ppm S=0.0 ppm O_2=20.7% LEL=0.0% S=0.0 ppm S=0.0 ppm	NA	NA	1100 3.5/4.0 1106	BEGIN DRIVING SAMPLER
	4	SILT, some very fine - fine sand, trace clay (10%), brown (10YR 4/3), dry to damp, soft, non-plastic (ML) (Alluvium)	BZ=0.0 ppm BH=0.0 ppm	NA	NA	1107 4.0/4.0	

HTW DRILLING LOG

HOLE NO. T-7

PROJECT USFR354 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 2 OF 5 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	5	SILT, some very fine-fine sand, trace clay (10%), brown (10YR 4/3), dry to damp, silt, non-plastic (ML) (Alluvium)	S=0.0 ppm O_2=20.8% LEL=0.0% S=0.0 ppm S=0.0 ppm	NA	NA	4.0/4.0 1109	
	8		BZ=0.0 ppm BH=0.0 ppm S=0.0 ppm O_2=20.8% LEL=0.0% S=0.0 ppm S=0.0 ppm	NA	NA	1110 4.0/4.0 1114	
	12		BZ=0.0 ppm BH=0.0 ppm S=0.0 ppm	NA	NA	1115 3.0/4.0	
	14						

~~SAND, very fine to medium grained, some silt (20%), yellowish brown (10YR 5/4), damp, soft to medium consistency, SM~~ non-plastic loose, subangular to subrounded, moderately poorly graded, fine to coarse sand with trace (TR) feldspar (SM) (Alluvium)

HTW DRILLING LOG

HOLE NO. T-3

PROJECT USFR 754 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 3 OF 5 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	14	SAND, very fine to medium grained, some silt (20%), yellowish brown (10YR 5/4), damp, loose, subangular to subrounded grains, moderately poor grading, quartz sand with a trace (5%) of feldspar (SM) (Alluvium)	O_2 = ~~0.0~~ EQL	NA	NA	7.0/4.0	
			LEL = 0.0%				
	15		S = 0.0 ppm				
			S = 0.0 ppm			1119	
	16		BZ = 0.0 ppm	NA	NA	1120	
			BH = 0.0 ppm				
	17		S = 0.0 ppm			3.0/4.0	
			O_2 = 20.2%				
	18	~~medium~~ SAND, ~~med~~ fine to coarse grained, ~~clean~~ SDL very pale brown (10YR 7/4), ~~dry~~ SDL, damp, loose, subangular, well graded, quartz sand (SW) (Alluvium)	LEL = 0.0%				
	19		S = 0.0 ppm				
		SAND, fine-medium grained, some silt (10%), yellowish brown (10YR 5/4), damp, ~~medium dense~~ SDL, ~~fine gravel~~ (change at 20') (SM) (Alluvium)	S = 0.0 ppm			1125	
	20	SAND, fine-~~medium~~ grained, some silt (20%), brownish yellow (10YR 6/6), damp	BZ = 0.0 ppm	NA	NA	1126	
			BH = 0.0 ppm				
	21	~~SDL soft, non-plastic~~, loose, subangular to subrounded, moderately poor grading, quartz sand (SM) (Alluvium)	S = 0.0 ppm			4.0/4.0	
			O_2 = 20.6%				
	22		LEL = 0.0%				
	23						

HTW DRILLING LOG

HOLE NO. T-J

PROJECT USFR354 96-806-4-004

INSPECTOR E D LINDGREN

SHEET 4 OF 5 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	23	SM/O, fine-medium grained, some silt (20%), brownish yellow (10YR 6/6), damp, soft loose, subangular to subrounded, moderately poor grading, quartz sand (SM) (Alluvium)	S=0.0 ppm S=0.0 ppm	NA	NA	4.0/4.0 1174	
	24		BZ=0.0 ppm BH=0.0 ppm S=0.0 ppm O_2=20.8% LEL=0.0%	NA	NA	1175 3.5/4.0	
	25						
	26	SM/OS MOIST AT ABOUT 26'					
	27		S=0.0 ppm S=0.0 ppm				
	28		BZ=0.0 ppm BH=0.0 ppm S=0.0 ppm O_2=20.9% LEL=0.0%	NA	NA	1178 1140 3.0/4.0	
	29	SM/O, v. fine to medium grained, some silt (10%), yellowish brown (10YR 5/4) subrounded, medium density, moderately well grading, mega quartz, moist to wet at 31' BGS (SW) (Alluvium) EOB					TAKE SOIL SAMPLE FOR FIELD GC ANALYSIS ~29' BGS
	30						
	31		S=0.0 ppm S=0.0 ppm				WET AT 31' BGS
	32					1148	

HTW DRILLING LOG

HOLE NO. T-7

PROJECT USFR354 96-F06-4-004 | INSPECTOR E D LINDGREN | SHEET 5 OF 5 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	72	SAND, very fine to medium grained, some silt (10%), yellowish brown (10YR 5/4), moist to ~~saturated~~ not at 74 bgs, subrounded grains, medium density, moderately well ~~sorted~~ poorly graded, quartz grains with trace (5%) feldspar (SW) (Alluvium)	BZ = 0.0 ppm Bkt = 0.0 ppm S = 0.0 ppm O_2 = 21.0% LEL = 0.0%	NA	NA	1150 3.0/7.0	
	74	SAND, coarse grained, yellow (10YR 7/6), loose, subrounded to well graded, saturated, quartz sand (SW) (Alluvium)	S = 0.6 ppm S = 0.0 ppm			1200	
	75	BOTTOM OF HOLE = 75' (SP) EOL					12W INSTALLED 5' SCREEN / 35' RISER FOR TEMP. MONIT. WELL
	76						FIELD SCREEN RESULTS BTEX/TPH = N/D DCA = N/D TCE = N/D PCE = N/D

HTW DRILLING LOG

HOLE NO. T-4

1. COMPANY NAME: Burns & McDonnell	2. DRILLING SUBCONTRACTOR: BPS	SHEET 1 OF 5 SHEETS
3. PROJECT: USFR354 96-806-4-004	4. LOCATION: FT RILEY	
5. NAME OF DRILLER: DOUG ROY	6. MANUFACTURER'S DESIGNATION OF DRILL: GEOPROBE 4200	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" DIAMETER MACROCORE SAMPLER W/4' LONG ACETATE LINERS	8. HOLE LOCATION	
	9. SURFACE ELEVATION	
	10. DATE STARTED: 9/11/97	11. DATE COMPLETED: 9/11/97
12. OVERBURDEN THICKNESS: 36.0 FT	15. DEPTH GROUNDWATER ENCOUNTERED: NOT OBSERVED	
13. DEPTH DRILLED INTO ROCK: 0.0 FT	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: DRY (~24 hrs)	
14. TOTAL DEPTH OF HOLE: 36.0 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): 34.35' TOC (9/15/97); 34.30' TOC (9/19/97)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
NA	NA	NA	NA	NA	NA	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
TEMPORARY MONITORING WELL	9/24/97 BENT. GRANULES	5' SCREEN/ 31' RISER		

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	0	CONCRETE	BZ = 0.0 ppm BH = 0.0 ppm S = 0.0 ppm O_2 = 21.1% LEL = 0.0% S = 0.0 ppm S = 0.0 ppm	NA	NA	1338	~~BEGIN DRIVING~~ SAMPLER CONCRETE HAMMERING
	1					2.0/ 1346 1347 4.0	BEGIN DRIVING SAMPLER
	2	SAND, fine to medium grained, some silt (15%), dark yellowish brown (10YR 3/4), loose, saturated, moderately ~~poor~~ well ~~sorting~~ graded, damp (SM) (Alluvium)					
	3						
	4					1349	
			BZ = 0.0 ppm BH = 0.0 ppm	NA	NA	1350 3.0/ 4.0	
	5						

HTW DRILLING LOG

HOLE NO. T-4

PROJECT USFR 754 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 2 OF 5 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	5	SAND, fine to medium grained, some silt (15%), dark yellowish brown (10YR 3/4), loose, rounded moderately, [illegible], damp (SM) (Alluvium) well graded	S=0.1 ppm O_2=21.2% LEL=0.0% S=0.1 ppm S=0.1 ppm	NA	NA	3.0/4.0 1755 J	
	6						
	7	SAND, very fine to medium grained, yellowish brown (10YR 5/4), damp, loose, subangular moderately poor grading, silty sand (SM) (Alluvium)					
	8		BZ=0.0 ppm BH=0.0 ppm	NA	NA	1354	
	9						
	10	SAND, medium to coarse grained, brown (10YR 5/3), damp, loose to medium dense soil consistency, subangular, moderately well sorted graded, trace non staining (SW) (Alluvium)	S=0.1 ppm O_2=21.2% LEL=0.0% S=0.2 ppm S=0.1 ppm			3.5/4.0 1757	
	11						
	12		BZ=0.0 ppm BH=0.0 ppm S=0.1 ppm	NA	NA	1758 4.0/4.0	
	13						
	14						

HTW DRILLING LOG

HOLE NO. T-4

PROJECT USFR 354 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 3 OF 5 SHEETS

ELEV. a	DEPTH	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	14	SAND, medium to coarse grained, brown (10YR 5/3), damp, loose to medium density, subangular, moderately well graded, trace iron staining (SW)(Alluvium)	O_2=21.2% LEL=0.0% S=0.1 ppm S>0.2 ppm	NA	NA	4.0/4.0 1407	
	16	SAND, fine to medium grained, brownish yellow (10YR 6/6), damp, loose to medium density, subrounded, moderately poor grading, trace iron staining, separate sand with trace (SM) fieldpea, Some more gray mottling at 17-18' TGJ (SP)(Alluvium)	BZ=0.0 ppm BH=0.0 ppm S=0.1 ppm O_2=21.2% LEL=0.0% ppm SOL S=0.1 ppm S=0.1 ppm	NA	NA	1404 SOL 3.5/4.0 1417	
	20		BZ=0.0 ppm BH=0.0 ppm S=0.0 ppm O_2=21.7% LEL=0.0%	NA	NA	1418 3.5/4.0	
	23						

HTW DRILLING LOG

HOLE NO. T-4

PROJECT USFR354 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 4 OF 5 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	23	SAND, fine to medium grained, brownish yellow (10YR 6/6) damp, loose to medium density subrounded, moderately poor grading, trace iron staining. Cut Quartz major gsm type. (SP) (Alluvium)	S = 0.1 ppm S = 0.1 ppm	NA	NA	3.5/4.0 1424	
	24		BZ = 0.0 ppm BH = 0.0 ppm	NA	NA	1426	
	25		S = 0.0 ppm O_2 = 21.3%			3.0/4.0	
	26		LEL = 0.0%				
		SAND, medium grained, some silt (15%) lenses EDL, very pale brown (10YR 7/4), damp to moist, loose to medium density, subrounded, moderately ~~poorly graded~~ poorly graded, some iron staining (15%). Quartz major gsm type, trace ~~fill~~ spar ~~(Sha)~~ (Alluvium) (SP-SM) EDL	S = 0.0 ppm				
	27		S = 0.0 ppm				
	28					1436	
	29		BZ = 0.0 ppm BH = 0.0 ppm	NA	NA	1438	
	30		S = 0.0 ppm O_2 = 21.3%			3.0/4.0	
	31	SAND, medium grained, light gray (10YR 7/2) damp to locally ~~saturated~~ wet EDL, loose, subrounded, ~~well graded~~ poorly graded EDL, some iron staining. ~~Coarse grained at 32' (Sand)~~ (Alluvium)	LEL = 0.0% S = 0.0 ppm S = 0.0 ppm				
	32					1448	

HTW DRILLING LOG

HOLE NO. T-4

PROJECT USFR354 96-P06-4-004 | INSPECTOR E D LINDGREN | SHEET 5 OF 5 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	32	SAND, EDL ~~medium to~~ coarse grained, trace (5%) gravel, brownish yellow (10YR 6/6) moist, well rounded, ~~good~~ poor EDL grading, quartz grains. Some iron staining. (SW)(Alluvium)	BZ = 0.0	NA	NA	1449	
	33		BH = 0.0			3.0/4.0	
			S = 0.0				
			O_2 = 21.3%				
	34		LEL = 0.0				Took soil sample at 34' for field GC analysis
			S = 1.6 ppm				
	35		S = 1.4 ppm				
	36					1458	
		BOTTOM OF HOLE 36.0'					Set temp. monitoring well. 5' screen / 30' riser (1' cavity on hole) 1" PVC
							Field analytical results: Benzene = N/D; DCA = N/D; TCE = N/D; PCE = N/D

HTW DRILLING LOG

HOLE NO. T-5

1. COMPANY NAME Burns & McDonnell	2. DRILLING SUBCONTRACTOR EPS	SHEET 1 OF 4 SHEETS
3. PROJECT USFR2354 96-806-4-004	4. LOCATION FT RILEY	
5. NAME OF DRILLER Doug Roy	6. MANUFACTURER'S DESIGNATION OF DRILL GEOPROBE 4200	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" DIAMETER MACROCORE SAMPLER W/4' LONG ACETATE LINERS	8. HOLE LOCATION	
	9. SURFACE ELEVATION	
	10. DATE STARTED 9/12/97	11. DATE COMPLETED 9/12/97
12. OVERBURDEN THICKNESS 31.0 FT	15. DEPTH GROUNDWATER ENCOUNTERED 29.5 FT BGS	
13. DEPTH DRILLED INTO ROCK 0.0 FT	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED 28.72 TOC (~8 hrs)	
14. TOTAL DEPTH OF HOLE 31.0 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) 28.55 TOC (9/23/97)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
NA	NA	NA	NA	NA	NA	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
TEMPORARY MONITORING WELL	9-24-97 BENT. GRANULES	5' SCREEN / 20' RISER		

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	1	GRAVEL, fill, some broken red brick (Fill)	BZ=0.0 ppm BH=0.0 ppm S=0.0 ppm O_2=20.7% LEL=0.0% S=3.4 ppm	NA	NA	0714 15/4.0	BEGIN DRIVING SAMPLER 1140 TO PUSH THROUGH FIRST 2' W/O CORING
	2						
	3	SILT, some clay (15%), some fine sand (15%), damp, soft, trace plasticity, dark greyish brown (10YR 4/2) FOR possible fill (ML) (Possible Fill)	S=12.2 ppm				
	4	SAND, medium to coarse grained, yellowish brown (10YR 5/4), loose, subrounded moderately well graded, damp (SW) (Alluvium)	BZ=0.0 BH=0.0	NA	NA	0724 0725 3.0/4.0	
	5						

HTW DRILLING LOG

HOLE NO. T-5

PROJECT USFR754 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 2 OF 4 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	5	SAND, medium to coarse grained, yellowish brown (10YR 5/4), loose, subrounded, moderately well graded, damp, quartz grains with feldspar, some to trace iron staining (5-15%) some mottled zones. (SW) (Alluvium)	S=0.6 ppm	NA	NA	7.0/4.0	
			O_2=20.7%				
	6		LEL=0.0%				
			S=0.0 ppm				
	7		S=0.0 ppm				
						0727	
	8		BZ=0.0 ppm	NA	NA	0728	
			BH=0.0 ppm			7.5/4.0	
	9		S=8.2 ppm				
			O_2=20.7%				
	10		LEL=0.0%				
			S=15.6 ppm				
	11		S=78.2 ppm				
						0733	
	12		BZ=0.0 ppm	NA	NA	0734	
			BH=0.0 ppm			7.5/4.0	
	13		S=63.4 ppm				
	14						

HTW DRILLING LOG

HOLE NO. T-5

PROJECT USFR7354 96-F06-4-004 | INSPECTOR E D LINDGREN | SHEET 3 OF 4 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	14	SAND, medium to coarse grained, yellowish brown (10YR 5/4), loose, subrounded, moderately well graded, damp, quartz grains with feldspar, trace to little staining, some (20%) mottled zones (SW)(Alluvium)	O_2=20.7% LEL=0.0% S=47.0 ppm S=~~784~~ 784 ppm ~~69.0~~	NA	NA	3.5/4.0 0736	
	16		TSZ=0.0 ppm TSH=2.6 ppm S=126 ppm O_2=20.7%	NA	NA	0737 3.0/4.0	
	17	~~fine to medium grained~~ SAND, with clay (~~75~~5%) some silt (15%), yellowish brown (10YR 5/6), damp to moist, loose to medium, subangular to subrounded, very poorly graded (SM-SC) (Alluvium)					
	18		LEL=0.0%		354T05 SOC VOC SVOC TAL Metals		COLLECTED SAMPLE AT 0745 18-19 ft.
	19		S=~~784~~ 1371 ppm				
	20		S=326 ppm			0742	
	21		TSZ=0.0 ppm TSH=8.2 ppm S=223 ppm	NA	NA	0743 3.0/4.0	
	22	SAND, ~~moist~~ 20% to coarse grained, brownish yellow (10YR 6/6), damp, loose, subrounded, moderately well graded, quartz sand, ~~strong HC odor~~ (SW)(Alluvium)	O_2=20.7% LEL=0.0%				Strong organic odor
	23						

HTW DRILLING LOG

HOLE NO. T-5

PROJECT USFR354 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 4 OF 4 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	23	SAND, very fine-medium grained, some silt (15%) and some clay (15%), damp, loose to medium density, subangular to subrounded, very poorly graded, ~~H.C. stain~~ EOY gray (2.5Y 5/1) (SM-SC) (Alluvium)	S=286 ppm S=1400 ppm	NA	NA	3.0/4.0 0800	Stained by organic substance
	24		BZ=0.0 ppm BH=7.2 ppm S=504 ppm O_2=20.7% LEL=0.0% S=885 ppm S=1035 ppm	NA	NA	0802 7.0 ~~8.1~~ EOY/4.0 0816	EOY ~~SAMPLE SLEEVE JAMMED IN CORE BARREL, VIRTUALLY NO RECOVERY~~ Collected soil screening sample at 24' BGS Benzene=2899 ppb DCA=35.9 ppb TCE=7.8 ppb PCE=27.7 ppb Strong organic chemical odor
	25						
	26	SAND, medium to coarse grained, olive yellow (5Y 6/6), damp, loose, subrounded, moderately well graded, quartz sand with trace (5%) feldspar. ~~strong solvent odor~~ (SW) (Alluvium) EOY					
	27						
	28		BZ=0.0 ppm BH=27.0 ppm S=356 ppm O_2=20.7% LEL=0.0% S=800 ppm S=1200 ppm	NA	NA	0817 3.0/3.0 0830	▽ SAND WET AT ~29.5' BGS Heavily stained
	29	SAND, coarse to very coarse grained, some gravel (20%), gray (5Y 5/1), ± saturated, loose, angular to subangular, ~~poorly~~ well graded ~~sorted, heavily stained~~ EOY (SP) (Alluvium) quartz EOY sand					
	30						
	31	BOTTOM OF HOLE 31.0'				~~0830~~	0831. Set temp mw well with 5' screen 20' riser, flush
	32						

MRK FORM JUN 89 55-2 | PROJECT USFR354 96-806-4-004 | HOLE NO. T-5

HTW DRILLING LOG

HOLE NO. T-7

1. COMPANY NAME: BURNS & McDONNELL	2. DRILLING SUBCONTRACTOR: EPS	SHEET 1 OF 4 SHEETS
PROJECT: USFR354 96-806-4-004	4. LOCATION: FT RILEY	
5. NAME OF DRILLER: DOUG ROY	6. MANUFACTURER'S DESIGNATION OF DRILL: GEOPROBE 4200	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" DIAMETER MACROCORE SAMPLER W/4' LONG ACETATE LINERS	8. HOLE LOCATION	
	9. SURFACE ELEVATION	
	10. DATE STARTED: 9/11/97	11. DATE COMPLETED: 9/11/97
12. OVERBURDEN THICKNESS: 24.0 FT	15. DEPTH GROUNDWATER ENCOUNTERED: ~23.5 FT TOS	
13. DEPTH DRILLED INTO ROCK: 0.0 FT	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 23.92' TOC (~24 hrs)	
14. TOTAL DEPTH OF HOLE: 24.0 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): 24.15' TOC (9/19/97); 24.35' TOC (9/27/97)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	NA	NA	NA	NA	NA	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
TEMPORARY MONITORING WELL	9-24-97 BENT. CHIPS	5' SCREEN / 2" RISER		

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	1	SILT, some clay (20%), very dark gray (10YR 3/1); damp, soft to medium consistency, trace plasticity (CL) (TOPSOIL)	BZ=0.0 ppm BH=0.0 ppm S=0.0 ppm O_2=20.7% LEL=0.0%	NA	NA	1518 3.0/4.0	BEGIN DRIVING SAMPLER
	2						
	3						
	4	SAND, very fine to fine grained, some silt (10%), light brownish gray (10YR 6/2), loose, saturated, moderately poor grading (SM) (Alluvium)	S=0.0 ppm			1520	
	5		BZ=0.0 ppm BH=0.0 ppm	NA	NA	1521 4.0/4.0	

Quaternary

HTW DRILLING LOG

HOLE NO. T-7

PROJECT USFRJ54 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 2 OF 4 SHEETS

ELEV. a.	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	5	SAND, very fine to fine grained, some silt (10%), light brown gray (10YR 6/2), loose to medium density, subrounded moderately poor grading, (SM) (Alluvium) quartz sand with trace (5%) feldspar	S=0.0 ppm O_2=20.8% LEL=0.0% S=0.0 ppm S=0.0 ppm	NA	NA	4.0/4.0 1524	
	8		BZ=0.0 ppm BH=0.0 ppm S=0.8 ppm O_2=20.8% LEL=0.0% S=0.2 ppm S=1.2 ppm	NA	NA	1525 4.0/4.0 1528	
	12	SAND, medium to coarse grained, very pale brown (10YR 7/4), damp to wet (at ~16' BGS), loose subangular to subrounded grains, well graded, quartz grains, (SW) (Alluvium)	BZ=0.0 ppm BH=0.0 ppm S=1.1 ppm	NA	NA	1529 4.0/4.0	
	14						

HTW DRILLING LOG

HOLE NO. T-7

PROJECT USFR354 96-F06-4-004 | INSPECTOR E D LINDGREN | SHEET 3 OF 4 SHEETS

ELEV. a	DEPTH	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	14	SAND, medium to coarse grained, very pale brown (10YR 7/4), damp, loose, subangular to subrounded grains, well graded, quartz grains, trace fine staining (Sw) (Alluvium)	O_2 = 20.9% LEL = 0.0% S = 0.5 ppm S = 0.7 ppm	NA	NA	4.0/4.0 1571	Took soil sample for field GC analysis at 14' TGS
	16		TBZ = 0.0 ppm TBH = 0.0 ppm S = 1.0 ppm O_2 = 21.0% LEL = 0.0% S = 0.6 ppm S = 0.7 ppm	NA	NA	1535 4.0/4.0 1574	
	20	SAND, v. fine to fine grained, trace silt (5%), pale brown (10YR 6/3), moist to wet, ~~FOX~~ loose, subrounded, moderately well graded, qtz quartz grains. (Sw) (Alluvium)	TBZ = 0.0 ppm TBH = 0.0 ppm S = 24.0 ppm O_2 = 21.0% LEL = 0.0%	NA	NA	1540 3.5/4.0	
	23						

HTW DRILLING LOG

HOLE NO. T-7

PROJECT USFR 354 96-806-4-004

INSPECTOR E D LINDGREN

SHEET 4 OF 4 SHEETS

ELEV. a	DEPTH	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	27						Soil
		SAND, coarse grained, gray (N5/), wet, loose, subrounded well graded, heavily stained by hydrocarbon, ~~strong odor (slw)~~ (slw) (1 hour)	S=64.0 ppm S=722.0 ppm	NA	NA	3.5/4.0	Took sample for field GC analysis at 27.0'
	24					1546	Screen casing and cover
		BOTTOM OF HOLE 24.0'					1546 Set temp. monitoring well with 5' screen / 20' riser. (1" PVC)
							SOIL SCREENING RESULTS
							14.0 FT BENZENE = N/D DCA = 5.3 ppb TCE = N/D PCE = N/D
							23.0 FT BENZENE = 7.0 ppb DCA = 1.9 ppb TCE = N/D PCE = N/D

HTW DRILLING LOG

HOLE NO. T-8

1. COMPANY NAME: BURNS & McDONNELL	2. DRILLING SUBCONTRACTOR: EJ
SHEET 1 OF 4 SHEETS	
3. PROJECT: USFR354 96-806-4-004	4. LOCATION: FT RILEY
5. NAME OF DRILLER	6. MANUFACTURER'S DESIGNATION OF DRILL: GEOPROBE 4200
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" DIAMETER MACROCORE W/ 4' LONG ACETATE LINERS	8. HOLE LOCATION
	9. SURFACE ELEVATION
	10. DATE STARTED: 9/11/97 — 11. DATE COMPLETED: 9/11/97
12. OVERBURDEN THICKNESS: 23.0 FT	15. DEPTH GROUNDWATER ENCOUNTERED: NOT OBSERVED
13. DEPTH DRILLED INTO ROCK: 0.0 FT	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 23.06' TOC (~24 hrs.)
14. TOTAL DEPTH OF HOLE: 23.0 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): 23.52' TOC (9/19/97); 23.71' TOC (9/23/97)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
N/A	N/A	N/A	N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
NA	NA	NA	NA	NA	NA	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
TEMPORARY MONITORING WELL	9/24/97 BENT. GRANULES/	5' SCREEN / 2" RISER		

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	0	SILT, some fine sand (15%), trace clay (10%), very dark gray brown (10YR 3/2), dry to damp, moderate to stiff, nonplastic (ML) (SOIL) (TOPSOIL)	BZ = 0.0 ppm BH = 0.0 ppm S = 0.4 ppm O_2 = 21.2% LEL = 0.0% S = 0.5 ppm S = 0.0 ppm	NA	NA	1606 2.5/4.0	BEGIN DRIVING SAMPLER
	4	SAND, fine grained, some silt (15%), light yellowish brown (10YR 6/4), loose, damp → moist, moderately poorly graded, subangular to subrounded, quartz grains, (SM) (Alluvium)	BZ = 0.0 ppm BH = 0.0 ppm	NA	NA	1608 1609 3.0/4.0	
	5						

HTW DRILLING LOG

HOLE NO. T-8

PROJECT USFRJ54 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 2 OF 4 SHEETS

ELEV. a	DEPTH	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	5	SAND, fine grained, some silt (15%), light yellowish brown (10YR 6/4), loose, damp to moist, moderately poorly graded, quartz grains, (SM) (Alluvium) subangular	S=0.4 ppm O_2=21.2% LEL=0.0% S=0.1 ppm S=0.0 ppm	NA	NA	7.0/4.0 1611	
	8	SILT, some clay (20%), trace fine sand (10%), moist, soft, medium plasticity (ML) (Alluvium) Pale brown (10YR 7/3)					
	9	SAND, medium to coarse grained, very pale brown (10YR 7/4), loose, subrounded, moderately poorly graded, quartz with minor feldspar, damp to moist (SW) (Alluvium)	BZ=0.0 ppm BH=0.0 ppm S=0.2 ppm O_2=21.2% LEL=0.0% S=0.1 ppm S=0.0 ppm	NA	NA	1612 3.5/4.0 1613	
	12		BZ=0.0 ppm BH=0.0 ppm S=0.1 ppm	NA	NA	1614 3.0/4.0	
	14						

HTW DRILLING LOG

HOLE NO. T-8

PROJECT USFR 354 96-806-4-004 | INSPECTOR E. D LINDGREN | SHEET 3 OF 4 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	14	SAND, medium to coarse grained, very pale brown (10YR 7/4), loose, subrounded moderately well graded, quartz with min feldspar, damp to moist (SW)(Alluvium)	O_2=21.1%	NA	NA	3.0/4.0	
	15		LEL=0.0%				
			S=0.0 ppm				
			S=0.0 ppm			1618	
	16		BZ=0.0 ppm	NA	NA	1619	
			BH=0.0 ppm			3.0/4.0	
	17		S=0.4 ppm				
			O_2=21.2%				
	18		LEL=0.0%				
			S=0.0 ppm				
	19		S=0.0 ppm				
						1625	
	20		BZ=0.0 ppm	NA	NA	1626	
			BH=0.0 ppm			20/3.0	
	21		S=0.7 ppm				
			O_2=21.2%				
	22	SAND, very coarse grained, some gravel (20%), grayish brown (10YR 5/2), loose, subangular, (descriptions continued below)	LEL=0.0%				Took sediment sample for field GC analysis at 22' BGS
			S=1.7 ppm				
			S=0.0 ppm			1631	
	23						

HTW DRILLING LOG

HOLE NO. T-8

PROJECT USFL354 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 4 OF 4 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	25	BOTTOM OF HOLE 27.0' descriptn continued - poorly graded. Gravel fragments EDR consist of fragments of limestone (SP) (Alluvium) moist					1672 Set Exp. monitoring well with 5' slotted screen 20' riser C1" PVC) Result of field GC analysis Benzene = ND DCA = 17.2 ppb TCE = ND PCE = ND

HTW DRILLING LOG

HOLE NO. T-9

1. COMPANY NAME: BURNS & MCDONNELL	2. DRILLING SUBCONTRACTOR: EPS
3. PROJECT: USFRJ54 96-806-4-004	4. LOCATION: FT RILEY
5. NAME OF DRILLER: DOUG ROY	6. MANUFACTURER'S DESIGNATION OF DRILL: GEOPROBE 4200
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" DIAMETER MACROCORE SAMPLER W/4' LONG ACETATE LINERS	8. HOLE LOCATION
	9. SURFACE ELEVATION
	10. DATE STARTED: 9/12/97 — 11. DATE COMPLETED: 9/12/97
12. OVERBURDEN THICKNESS: 19.5 FT	15. DEPTH GROUNDWATER ENCOUNTERED: ~19.0 FT
13. DEPTH DRILLED INTO ROCK: 0.0 FT	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 18.84' TOC (~6 hrs)
14. TOTAL DEPTH OF HOLE: 19.5 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): 18.92' TOC (9/19/97); 18.76' TOC (9/23/97)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	NA	NA	NA	NA	NA	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
TEMPORARY MONITORING WELL	9/24/97 BENT. GRANULES	5' SCREEN / 14.5' RISER		

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	0	SAND and GRAVEL (FILL)	BZ = 0.0 ppm	NA	NA	0900	BEGIN DRIVING SAMPLER
			BH = 0.0 ppm			3.0/4.0	
	1	SILT, some clay (15%), little fine sand (5%), dark grayish brown (10YR 4/2), damp, soft, non plastic (ML) (TOPSOIL) EOL	S = 0.0 ppm				
	2		O_2 = 20.2%				
			LEL = 0.0%				
			S = 0.5 ppm				
	3	SAND, very fine to fine grained, trace silt (10%), brown (10YR 5/3), damp, loose, subangular to subrounded, moderately well graded quartz sand (SM) (Alluvium) EOL	S = 0.3 ppm			0901	
	4		BZ = 0.0 ppm	NA	NA	0902 3.0/4.0	
			BH = 0.0 ppm				
	5						

HTW DRILLING LOG

HOLE NO. T-9

PROJECT USFR 354 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 2 OF 3 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	5	SAND, very fine to fine grained, trace silt (10%), brown (10YR 5/3), damp, loose, subangular to subrounded, moderately poor graded, (SP) (Alluvium)	S=0.0 ppm O_2=20.1% LEL=0.0% S=0.0 ppm S=0.0 ppm	NA	NA	3.0/4.0 0904	
	6	SAND, fine to medium grained, dark yellowish brown (10YR 4/4), damp, loose, subangular to subrounded, moderately poor grading, quartz sand (SP) (Alluvium)					
	7						
	8		BZ=0.0 ppm BH=0.0 ppm S=0.0 ppm O_2=19.9% LEL=0.0% S=0.0 ppm S=0.0 ppm	NA	NA	0905 2.0/4.0 0909	
	9						
	10						
	11	SAND; medium to coarse grained; brownish yellow (10YR 6/6); damp to moist; loose, subrounded, moderately poorly sorted graded, quartz sand (SW) (Alluvium)					
	12		BZ=0.0 ppm BH=0.0 ppm S=0.0 ppm	NA	NA	0910 3.0/4.0	
	13						
	14						

HTW DRILLING LOG

HOLE NO. T-9

PROJECT USFL354 96-806-4-004

INSPECTOR E D LINDGREN

SHEET 3 OF 3 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	14	SAND, medium to coarse gravel, brown yellow (10YR 5/6), damp to moist, loose, subrounded, moderately well graded, quartz sand (SW) (Alluvium)	O_2 = 19.8%	NA	NA	3.0/4.0	
			LEL = 0.0%				
	15		S = 0.0 ppm				
			S = 0.0 ppm				
						0915	
	16		TPZ = 0.0 ppm	NA	NA	2.0/3.5	
			TPH = 0.0 ppm				
	17		S = 0.0 ppm				
			O_2 = 19.8%				Soil sample V Took grab sample for field GC analysis
	18		LEL = 0.0%				
			S = 1.6 ppm				Stained with thick black organic substance
	19	SAND, coarse to very coarse gravel, black (2.5/N), wet, loose, subrounded, well graded (SW) (Alluvium) SHEEN at retrieval	S = 175 ppm			0922	
	20	BOTTOM OF HOLE 19.5'					0924 Installed temp. monitoring well w/ 5' screen and riser
							Analytical Results: BENZENE = 336 ppb DCA = 4.6 ppb TCE = 11.3 ppb PCE = 26.5 ppb

HTW DRILLING LOG

HOLE NO. T-10

1. COMPANY NAME Florida McDONNELL	2. DRILLING SUBCONTRACTOR EPS
3. PROJECT USFR354 96-806-4-004	4. LOCATION FT RILEY
5. NAME OF DRILLER DOUG ROY	6. MANUFACTURER'S DESIGNATION OF DRILL GEOPROBE 4200
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" DIAMETER MACROCORE SAMPLER W/4' LONG ACETATE LINERS	8. HOLE LOCATION
	9. SURFACE ELEVATION
	10. DATE STARTED 9/12/97 — 11. DATE COMPLETED 9/12/97
12. OVERBURDEN THICKNESS 16.3 FT	15. DEPTH GROUNDWATER ENCOUNTERED ~~~16.0 FT BGS~~ 15.8 FT BGS
13. DEPTH DRILLED INTO ROCK 0.0 FT	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED DRY (~6 hrs)
14. TOTAL DEPTH OF HOLE 16.3 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) DRY (9/19/97); DRY (9/23/97)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
~~SDL~~ NA 1	X ~~NA SDL~~	X ~~NA SDL~~	SVOC ~~NA SDL~~	NA	NA	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
TEMPORARY MONITORING WELL	9/24/97 BENT. GRANULES	5' SCREEN / 15' RISER		

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	1	SILT, some clay (20%), brown (10YR 5/3), dry to damp, soft, non plastic (ML) ~~(SDL)~~ (TOPSOIL) SDL	BZ-0.0 ppm BH=0.0 ppm S=2.2 ppm O_2=19.7%	NA	NA	0938 3.0/4.0	BEGIN DRIVING SAMPLER Collected grab sample for field GC analysis at ~1' BGS
	2	SILT, some clay (15%), trace fine sand (5%), dark grayish brown (10YR 4/2), damp, slight cavitary, non plastic (ML) (Alluvium)	LEL=0.0% S=0.0 ppm		TAL TIO SOL VOC SVOC TAL METALS SOL QA/QC MS/MSD		COLLECTED SAMPLE AT 0940 2-4' BGS VOCs collected 2-3 ft
	3		S=0.0 ppm			0939	
	4		BZ=0.0 ppm BH=0.0 ppm	NA	NA	0940 3.5/4.0	
	5						

HTW DRILLING LOG

HOLE NO. T-10

PROJECT USFWS54 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 2 OF 3 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	5	SILT, some clay (15%), trace fine sand (5%), dark grayish brown (10YR 4/2), damp, soft, cuttings non-plastic (ML) (Alluvium)	S=47 ppm O_2=19.7%	NA	NA	3.5/4.0	
	6	SAND, very fine to fine grained, some silt (20%), yellowish brown (10YR 5/4), damp, loose to medium density, subangular, well poorly graded (SM) (Alluvium) SDL	LEL=0.0% S=45 ppm S=28 ppm				
	7						
	8					0944	
			TSZ=0.0 ppm TSH=0.0 ppm	NA	NA	0945 3.0/4.0	
	9	SILT, some clay (15%) pale brown (10YR 6/3) damp, soft, non-plastic (ML) (Alluvium)	S=0.0 ppm O_2=19.6%				COLLECTED GRAB SOIL SAMPLE FOR FIELD GC ANALYSIS AT ~10'
	10		LEL=0.0%				
	11		S=0.0 ppm S=0.0 ppm				
	12	SAND, medium to coarse grained, trace fine gravel (SW) yellowish brown (10YR 5/4), damp to wet (at 15.8'), loose, subangular to subrounded, moderately well graded, granite grains with trace (5%) feldspar) (SW) (Alluvium)	TSZ=0.0 ppm TSH=0.0 ppm S=0.0 ppm	NA	NA	0946 0947 3.0/4.0	
	13						
	14						

HTW DRILLING LOG

HOLE NO. T-10

PROJECT USFRL354 96-F06-4-004 | INSPECTOR E D LINDGREN | SHEET 3 OF 3 SHEETS

ELEV. a	DEPTH	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	14						
		SAND, medium to coarse grained, trace gravel (5%), yellow brown (10YR 5/4), damp, loose, subangular to subrounded, moderately well graded, quartz with trace (5%) feldspar (SW)(Alluvium)	O_2 = 20.9%	NA	NA	3.0/4.0	
	15		LEL = 0.0%				
			S = 0.0 ppm				
			S = 0.0 ppm				
	16	SAND, medium to coarse grained, trace gravel (5%), yellow brown (10YR 5/4), wet, loose, subangular to subrounded, moderately well graded, quartz with trace (5%) feldspar (SW)(Alluvium)				0951	0952 Installed temporary monitoring well with 5' screen and 15' riser
	17	SHALE, light gray (5Y 7/2), weak, moderately weathered, calcareous					Result of soil GC screen
		BOTTOM OF HOLE 16.5' BGS					1st BGS Sample
							Benzene = N/D
							DCA = 5.3 ppb
							TCE = N/D
							PCE = N/D
							10' BGS Sample (Clay)
							Benzene = ND/ND
							DCA = 11.9 ppb/6.5 ppb
							TCE = ND/ND
							PCE = ND/ND

HTW DRILLING LOG

HOLE NO. T-11

1. COMPANY NAME BURNS & MCDONNELL	2. DRILLING SUBCONTRACTOR EPS
SHEET 1 OF 4 SHEETS	
3. PROJECT USAFR354 96-806-4-004	4. LOCATION FT RILEY
5. NAME OF DRILLER DOUG ROY	6. MANUFACTURER'S DESIGNATION OF DRILL GEOPROBE 4200
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" DIAMETER MACROCORE SAMPLER W/4' LONG ACETATE LINERS	8. HOLE LOCATION
	9. SURFACE ELEVATION
	10. DATE STARTED 9/12/97 — 11. DATE COMPLETED 9/12/97
12. OVERBURDEN THICKNESS 56.0 FT	15. DEPTH GROUNDWATER ENCOUNTERED NOT OBSERVED
13. DEPTH DRILLED INTO ROCK 0.0 FT	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED HOLE PLUGGED
14. TOTAL DEPTH OF HOLE 56.0 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY) HOLE PLUGGED

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	NA	NA	NA	NA	NA	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
PLUGGED	PLUGGED WITH BENSEM 9/12/97			

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	0	FILL, SAND, very fine to coarse grained, some gravel and concrete (30%), varied colors (SP) (Fill)	BZ = 0.0 ppm BH = 0.0 ppm S = 0.0 ppm O_2 = 20.9% LEL = 0.0% S = 0.0 ppm	NA	NA	1106 3.0/4.0	BEGIN DRIVING SAMPLER
	1						
	2						
	3	Concrete rubble 3'–6'	S = 0.4 ppm				TAKE GRAB SOIL SAMPLE FOR GC ANALYSIS AT ~ 4' BGS
	4					1108	
			BZ = 0.0 ppm BH = 0.0 ppm	NA	NA	1109 7.0/4.0	
	5						

HTW DRILLING LOG

HOLE NO. T-11

PROJECT USFR 354 96-806 4-004 | INSPECTOR E D LINDGREN | SHEET 2 OF 4 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	5	FILL, SAND, very fine to coarse grained, some gravel and concrete (70%), varied colors (SP) (Fill)	S=0.0 ppm O_2=20.8% LEL=0.0% S=0.0 ppm S=0.0 ppm	NA	NA	3.0/4.0 1113	Field screen results Benzene = N/D DCA = N/D TCE = N/D PCE = N/D
	6						
	7	Some silt (15%) SAND, fine grained, brown (10YR 5/3), dry to damp, loose, subangular to subrounded, moderately poor grading (SP) (Fill) quartz sand with trace (5%) feldspar					
	8		BZ=0.0 ppm BH=0.0 ppm S=0.0 ppm	NA	NA	1114 2.5/4.0	
	9						
	10	SAND, very fine to medium grained, some silt (15%), yellowish brown (10YR 5/6), damp, loose to medium density, subangular, moderately poor grading, quartz sand (SM) (Alluvium)	O_2=20.9% LEL=0.0% S=0.0 ppm S=0.0 ppm			1115	
	11						
	12		BZ=0.0 ppm BH=0.0 ppm S=0.0 ppm	NA	NA	1116 2.0/4.0	
	13						
	14						

HTW DRILLING LOG

HOLE NO. T-11

PROJECT USFTL354 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 3 OF 4 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	14	SAND, very fine to medium grained, some silt (15%), yellowish brown (10YR 5/6), damp, loose to medium density, subangular, moderately poor grading, quartz sand (SM) (Alluvium)	O_2=20.8%	NA	NA	20/4.0	
	15		LEL=0.0%				
			S=0.0 ppm				
			S=0.0 ppm			1120 Start	
	16		BTZ=0.0 ppm	NA	NA	1130	No recovery, sleeve jammed in core barrel.
			BSH=0.0 ppm			00/4.0	
	17		S=N/A				
			O_2=20.9%				
	18		LEL=0.0%				
			S=N/A				
	19		S=N/A				
						1142	Nail recovered from shoe at ~20'
	20		BTZ=0.0 ppm	NA	NA	1144	
			BSH=0.0 ppm			1.0/4.0	
	21		S=0.0 ppm				
			O_2=20.9%				
	22		LEL=0.0%				
	23						

HTW DRILLING LOG

HOLE NO. 1-11

PROJECT USTR754 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 4 OF 4 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	23	NO DESCRIPTION BELOW 27'	NA	NA	NA		Int refusal for casing at ~27'. Will attempt to drive point to bedrock and set mnit. well
						1155	
	24		NA	NA	NA		
	25						Intend. of limestone gravel and sand suggest fill and/or sluff into borehole
	76'	BOTTOM OF HOLE 76.0'					1215 Abandoned borehole, could not push PVC riser/screen past ~5-6' BGS. Offset ~2' to drive point and set temp monitoring well 1232 Could not push past ~4' with screen at offset hole. Abandoned existing plugged hole with bentonite.

HTW DRILLING LOG

HOLE NO. T-12 SOIL ONLY

1. COMPANY NAME: BURNS & MCDONNELL	2. DRILLING SUBCONTRACTOR: EPS	SHEET 1 OF 4 SHEETS
3. PROJECT: USFR354 96-806-4-004	4. LOCATION: FT RILEY	
5. NAME OF DRILLER: DOUG ROY	6. MANUFACTURER'S DESIGNATION OF DRILL: GEOPROBE 4200	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" DIAMETER MACRO CORE SAMPLER W/4' LONG ACETATE LINERS	8. HOLE LOCATION	
	9. SURFACE ELEVATION	
	10. DATE STARTED: 9/12/97	11. DATE COMPLETED: 9/12/97
12. OVERBURDEN THICKNESS: 31.5 FT	15. DEPTH GROUNDWATER ENCOUNTERED: 30.5 FT BGS	
13. DEPTH DRILLED INTO ROCK: 0.0 FT	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: HOLE PLUGGED	
14. TOTAL DEPTH OF HOLE: 31.5 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): HOLE PLUGGED	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
NA	NA	NA	NA	NA	NA	

22. DISPOSITION OF HOLE				23. SIGNATURE OF INSPECTOR
PLUGGED/ABANDONED	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	
	PLUGGED WITH BENSEAL 9/12/97			

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	1	SILT, some clay (15%) trace v fine sand (5%), dark grayish brown (10YR 4/2), damp, soft, trace plasticity (ML) (Soil) (Topsoil) EDL	PID=0.0 ppm FID=0.0 ppm S=0.0 ppm O_2=20.8%	NA	NA	1345 7.5/4.0	BEGIN DRIVING SAMPLER
	2		LEL=0.0%				
	3	SILT, some clay (15%), yellow brown (10YR 5/4) dry to damp, soft to stiff consistency, non plastic (ML) (Alluvium)	S=0.0 ppm S=0.0 ppm				
	4		PID=0.0 ppm FID=6.0 ppm	NA	NA	1345 1346 4.0/4.0	
	5						

HTW DRILLING LOG

HOLE NO. T-12

PROJECT USFRJ54 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 2 OF 4 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	5	SILT, some clay (15%), yellow brown (10YR 5/4), dry to damp, soft to stiff consistency, non-plastic (ML) (Alluvium)	S=0.0 ppm O_2=20.8% LEL=0.0% S=0.0 ppm S=0.0 ppm	NA	NA	4.0/4.0 1349	
	6						
	7	SILT, some very fine to fine sand, very dark grayish brown to brown (10YR 3/2 – 10YR 4/3), damp, soft to stiff consistency, non plastic to trace plasticity (ML) (Alluvium)					
	8						
	9		BZ=0.0 ppm BH=0.0 ppm S=0.0 ppm O_2=20.7% LEL=0.0% S=0.0 ppm S=0.0 ppm	NA	NA	1350 4.0/4.0 1352	
	10						
	11						
	12	SAND, fine to medium grained, brown (10YR 5/3), damp, loose, subangular to subrounded, moderately poor grading, quartz sand (SP) (Alluvium)	BZ=0.0 ppm BH=0.0 ppm S=0.0 ppm	NA	NA	1353 3.0/4.0	
	13						
	14						

HTW DRILLING LOG

HOLE NO. T-12

PROJECT USFR354 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 3 OF 4 SHEETS

ELEV. a	DEPTH ft	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	15	SAND, fine to medium grained, brown (10YR 5/3), damp, loose, subangular to subrounded, moderately poor grading, quartz sand (SP) (Alluvium)	O_2=20.7% LEL=0.0% S=0.0 ppm S=0.0 ppm	NA	NA	9.6/4.0 1357	
	16		BZ=0.0 ppm TH=0.0 ppm S=0.0 ppm O_2=20.9%	NA	NA	1358 7.5/4.0	
	18	SILT, some clay (15%), some fine to medium sand (15%), brown (10YR 5/3) damp, soft to medium consistency, trace to medium plasticity (ML) (Alluvium)	LEL=0.0% S=0.0 ppm S=0.0 ppm			1402	
	20		BZ=0.0 ppm TH=0.0 ppm S=0.0 ppm O_2=20.8% LEL=0.0%	NA	NA	1405 4.0/4.0	
	23						

HTW DRILLING LOG

HOLE NO. T-12

PROJECT USFR 354 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 4 OF 4 SHEETS

ELEV. a	DEPTH	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	23	SILT, some clay (15%), some fine to medium sand (15%), brown (10YR 5/3), damp, soft to medium consistency, trace to medium plasticity (ML) (Alluvium)	S = 0.0 ppm S = 0.0 ppm	NA	NA	4.0/4.0 PID 9	
	24		BZ = 0.0 ppm TH = 0.0 ppm S = 0.0 ppm O_2 = 20.9% LEL = 0.0% S = 0.0 ppm S = 0.0 ppm	NA	NA	7.5/4.0	
	25						
	26						
	27	CLAY, some silt (15%) trace sand (5%), pale brown (10YR 6/3), damp to moist, soft, medium plasticity, (CL) (Alluvium)				14 16	TOOK SOIL GRAB SAMPLE FOR FIELD GC ANALYSIS @ ~27' BTEX/MTBE = N/D DCA = N/D TCE = N/D PCE = 1.4 ppb
	28		BZ = 0.0 ppm TH = 0.0 ppm	NA	NA		
	29		S = 0.0 ppm O_2 = 20.8% LEL = 0.0 %			3.0/7.5	
	30	SAND, medium to coarse grained, very pale brown (10YR 7/4), loose, moist to wet, poorly graded, quartz grains, trace to some iron staining (15%) (SW) (Alluvium)	S = 0.0 ppm S = 0.0 ppm				SAND WET AT ~30.5 FT BGS
	31					14 31	
		BOTTOM OF HOLE 31.5' BGS					14 32 HOLE PLUGGED W/ BENTONITE

MRK FORM JUN 89 55-2 | PROJECT USFR 354 96-806-4-004 | HOLE NO. T-12

HTW DRILLING LOG

HOLE NO. T-14

1. COMPANY NAME: Burns & McDonnell	2. DRILLING SUBCONTRACTOR: EPS	SHEET 1 OF 4 SHEETS
3. PROJECT: USFR 334 96-806-4-004	4. LOCATION: FT RILEY	
5. NAME OF DRILLER: Doug Roy	6. MANUFACTURER'S DESIGNATION OF DRILL: GEOPROBE 4200	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" DIAMETER MACROCORE SAMPLER W/4' LONG ACETATE LINERS	8. HOLE LOCATION	
	9. SURFACE ELEVATION	
	10. DATE STARTED: 9/12/97	11. DATE COMPLETED: 9/12/97
12. OVERBURDEN THICKNESS: 28.0 FT	15. DEPTH GROUNDWATER ENCOUNTERED: ~26.0 FT BGS	
13. DEPTH DRILLED INTO ROCK: 0.0 FT	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: DRY (~2 hrs)	
14. TOTAL DEPTH OF HOLE: 28.0 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): DRY (9/19/97); DRY (9/23/97)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	NA	NA	NA	NA	NA	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
TEMPORARY MONITORING WELL	9/24/97 BENT. GRANULES	5' SCREEN 25' RISER		

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	0	SILT, some clay (15%) dark gray brown (10YR 4/2) dry, medium-stiff consistency, nonplastic (ML)(Soil)	Bkgd = 0.0 ppm	NA	NA	1452	BEGIN DRIVING SAMPLER
	1		Bz = 0.0 ppm				
			S = 0.0 ppm			3.0/4.0	
			O_2 = 20.8%				
	2		LEL = 0.0%				
		SILT, some very f. fine to fine sand (20%), brown (10YR 5/3), dry, stiff consistency, nonplastic (CL)(Alluvium)	S = 0.0 ppm				
	3		S = 0.0 ppm				
						1457	
	4		Bz = 0.0 ppm	NA	NA	1454	
			Bkgd = 0.0 ppm			3.5/4.0	
	5						

HTW DRILLING LOG

HOLE NO. T-14

PROJECT USFR754 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 2 OF 4 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	5	SILT, some very fine to fine sand (20%), brown (10YR 5/3), dry, stiff consistency, nonplastic (CL)(Alluvium) (ML) SOIL	S=0.0 ppm O_2=20.8% LEL=0.0% S=0.0 ppm S=0.0 ppm	NA	NA	3.5/4.0	
	8					1457	
	9	SAND, fine to medium grained (zones of coarse gravel), some silt (15%) yellowish brown (10YR 5/4), damp, loose to medium density, moderately poor grading, subangular to subrounded grains, quartz grains with trace (5%) feldspar (SM)(Alluvium)	BZ=0.0 ppm BH=0.0 ppm S=0.0 ppm O_2=20.9% LEL=0.0% S=0.0 ppm S=0.0 ppm	NA	NA	1458 3.0/4.0	
	12					1504	
	13		BZ=0.0 ppm BH=0.0 ppm S=0.0 ppm	NA	NA	1505 3.5/4.0	
	14						

HTW DRILLING LOG

HOLE NO. T-14

PROJECT USFR354 96-806-4-004

INSPECTOR E D LINDGREN

SHEET 3 OF 4 SHEETS

ELEV. a	DEPTH	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	14	SAND, fine to medium grained (zones of coarse grained), some silt (15%), yellowish brown (10YR 5/4), damp, loose to medium density, moderately poor grading, subangular to subrounded grains, quartz with trace (5%) Feldspar (SM) (Alluvium)	O_2=20.7%	NA	NA	3.5/4.0	
	15		LEL=0.0%				
			S=0.0 ppm				
			S=0.0 ppm			1504	
	16		BZ=0.0 ppm	NA	NA	1510	
		SILT, some clay (20%), some very fine to fine sand (15%), yellowish brown (10YR 5/4) damp, soft, medium plasticity (ML) (Alluvium)	BH=0.0 ppm				
	17		S=0.0 ppm			9.5/4.0	
			O_2=20.8%				
	18		LEL=0.0%				
			S=0.0 ppm				
	19		S=0.0 ppm				
						1515	
	20		TBZ=0.0 ppm	NA	NA	1516	
			BH=0.0 ppm			3.0/4.0	
	21		S=0.0 ppm				
			O_2=20.8%				
	22		LEL=0.0%				GRAB SAMPLE OF SOIL FOR FIELD GC ANALYSIS, 21-23' BGS 20Z 23-24'
						1527	
	23						

HTW DRILLING LOG

HOLE NO. T-14

PROJECT USFRJ54 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 4 OF 4 SHEETS

ELEV. a	DEPTH	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	23	SILT, some clay (20%) some very fine to fine sand (15%) yellowish brown (10YR 5/4) damp, ~~slightly~~	S = 0.0 ppm	NA	NA		
		SAND, fine to coarse grained,	S = 0.0 ppm				
	24	some silt (15%) yellowish				1527	
		brown (10YR 5/8), moist	S = Soil	NA	NA	1528	
		to wet, subangular, mediumly	BZ = 0.0 ppm				
	25	poor graded, quartz grains.	BH = 0.0 ppm				
		(SM) (Alluvium) EDR	S = 0.0 ppm				
			O_2 = 20.8 %				▽
	26						SAND WET AT ~26.0' BGS
			LEL = 0.0 %				
	27		S = 0.0 ppm				
			S = 0.0 ppm				
	28					1575	
		BOTTOM OF HOLE 28.0'					1575 Install temp. monit. well 5' screen at 25' riser.
							Analytical results on soil
							BENZENE = N/D
							DCA = N/D
							TCE = N/D
							PCE = N/D

HTW DRILLING LOG

HOLE NO. T-15

1. COMPANY NAME: Burns & McDonnell	2. DRILLING SUBCONTRACTOR: EPS
3. PROJECT: USFR354 96-806-4-004	4. LOCATION: FT RILEY
5. NAME OF DRILLER: Doug Roy	6. MANUFACTURER'S DESIGNATION OF DRILL: GEOPROBE 4200
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" DIAMETER MACROCORE SAMPLER w/4' LONG ACETATE LINERS	8. HOLE LOCATION
	9. SURFACE ELEVATION
	10. DATE STARTED: 9/12/97 — 11. DATE COMPLETED: 9/12/97
12. OVERBURDEN THICKNESS: 19.0 FT	15. DEPTH GROUNDWATER ENCOUNTERED: 18.0 BGS
13. DEPTH DRILLED INTO ROCK: 0.0 FT	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: DRY (~1 hr)
14. TOTAL DEPTH OF HOLE: 19.0 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): DRY (9/19/97); DRY (9/23/97)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	NA	NA	NA	NA	NA	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
TEMPORARY MONITORING WELL	9/24/97 BENT. GRANULES	5' SCREEN 15' RISER		

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	0	FILL, sandy silt with limestone gravel and red brick (Fill)	BZ=0.0 ppm BH=0.0 ppm	NA	NA	1545	BEGIN DRIVING SAMPLER
	1	SILT, some very fine to fine sand (20%), dark brown (10YR 3/3), dry to damp, soft, non plastic (ML) (~~Sand~~) FOX (TOPSOIL)	S=0.0 ppm O_2=20.8%			3.0/4.0	
	2		LEL=0.0%				
	3		S=0.0 ppm S=0.0 ppm				
	4	SAND, very fine to ~~fine~~ medium, trace silt (5%), brownish yellow (10 YR 6/6), dry to damp, loose, subangular, well graded; ~~poorly~~ (TM) (Alluvial)				1547	
			BZ=0.0 ppm BH=0.0 ppm	NA	NA	1548 2.0/4.0	
	5						

HTW DRILLING LOG

HOLE NO. T-15

PROJECT USFRL354 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 2 OF 3 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	5	~~poor sorting, grading, quartz sand (SM) (Alluvium)~~ DC	S = 0.0 ppm	NA	NA		
		SAND, very fine to medium grained,	O_2 = 20.8%				
	6	trace silt (5%), brownish yellow				2.0/4.0	
		(10YR 6/6), dry to damp, loose,	LEL = 0.0%				
		subangular, moderately poor grading,	S = 0.0 ppm				
	7	quartz sand (SM) (Alluvium)	S = 0.0 ppm				
						1551	
	8			NA	NA	1552	
			BZ = 0.0 ppm				
	9	— — — — — — —	BH = 0.0 ppm				
		SAND, medium to coarse	S = 0.0 ppm			3.5/4.0	
		grained, brownish yellow	O_2 = 20.7%				
	10	(10YR 6/6), damp,					
		loose, subangular to subrounded,	LEL = 0.0%				
		moderately ~~poor~~ good to ~~good~~ poor DC					
		grading, quartz. Zones of	S = 0.0 ppm				
	11	iron stains. Trace chat	S = 0.0 ppm				
		gravel (5%) (SW) (Alluvium)					
		fine					
	12	Heavy iron staining at 12'				1554	
				NA	NA	1555	
			BZ = 0.0 ppm				
	17		BH = 0.0 ppm			4.0/4.0	
			S = 0.0 ppm				
	14						

HTW DRILLING LOG

HOLE NO. T-15

PROJECT USFRJ54 96-806-4-004

INSPECTOR E D LINDGREN

SHEET 3 OF 3 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	14	SAND, medium to coarse grained, brownish yellow (10YR 6/6), damp, loose, subangular to subrounded, moderately poor grading, quartz sand (SW) (Alluvium)	O_2=20.8% LEL=0.0% J=0.0 ppm S=0.0 ppm	NA	NA	4.0/4.0	
	15	CLAY, with silt (40%), trace fine sand (5%), light gray (10YR 7/1), damp to moist, soft to medium consistency, medium plasticity (CL) (Alluvium)					
	16		BZ=0.0 ppm BH=0.0 ppm	NA	NA	1557 1558	
	17	SAND, medium to coarse grained, very pale brown (10YR 7/4), moist, loose, subrounded, poorly graded, quartz grains, heavily iron stained throughout (SW) (Alluvium)	S=0.0 ppm O_2=20.8% LEL=0.0%				Grab soil sample for GC analysis from 17' BGS
	18	SAND, medium to coarse grained, very pale brown (10YR 7/4), wet, loose, subrounded, poorly graded, quartz grains, iron stained (SW) (Alluvium)	S=0.0 ppm S=0.0 ppm				
	19	LIMESTONE, yellow (10YR 7/6), moderately strong, moderately weathered Bottom of Hole 19.0' BGS				1602	1603 Installed temporary monitoring well with 5' screen and 15' riser Soil Analytical results Benzene = N/D DCA = N/D TCE = N/D PCE = 42.8 ppb

HTW DRILLING LOG

HOLE NO. T-21

1. COMPANY NAME: Burns & McDonnell	2. DRILLING SUBCONTRACTOR: EPS	SHEET 1 OF 3 SHEETS
3. PROJECT: USFR754 96-806-4-004	4. LOCATION: FT RILEY	
5. NAME OF DRILLER: Doug Roy	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 4200	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" Diameter Macrocore Sampler w/ 4' Long Acetate Liners	8. HOLE LOCATION	
	9. SURFACE ELEVATION	
	10. DATE STARTED: 9/12/97	11. DATE COMPLETED: 9/12/97
12. OVERBURDEN THICKNESS: 16.0 FT	15. DEPTH GROUNDWATER ENCOUNTERED: 14.5 FT BGS	
13. DEPTH DRILLED INTO ROCK: 0.0 FT	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 15.81' TOC (~6 hrs)	
14. TOTAL DEPTH OF HOLE: 16.0 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): 15.90' TOC (9/19/97); 15.82' TOC (9/23/97)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
NA	NA	NA	NA	NA	NA	NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
TEMPORARY MONITORING WELL	9/24/97 BENT. GRANULES	5 FT SCREEN / 11.5 FT RISER		

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	0	SILT, some clay (15%), dark grayish brown (10YR 4/2), dry to damp, soft to stiff consistency, non-plastic (ML) (SOIL) (TOPSOIL) SDL	BZ=0.0 ppm BH=0.0 ppm S=0.0 ppm O_2=20.9% LEL=0.0% S=0.0 ppm S=0.0 ppm	NA	NA	1018 3.5/4.0	BEGIN DRIVING SAMPLER
	4	SAND, fine to fine grained, trace silt (10%), light brown gray (10YR 6/2), damp, soft) with subangular poorly graded quartz sand (SM) (ALLUVIUM)	BZ=0.0 ppm BH=0.0 ppm	NA	NA	1019 1021 3.5/4.0	

HTW DRILLING LOG

HOLE NO. T-21

PROJECT USFRTS4 96-806-4-004 | INSPECTOR E D LINDGREN | SHEET 2 OF 3 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	5	SAND, very fine to fine grained, trace silt (10%), light brown-gray (10YR 6/2), damp, soft, subangular, well graded (SM) (Alluvial)	S=0.0 ppm O_2=20.9%	NA	NA	3.5/4.0	
	6	SAND, very fine to fine grained, dark brown (10YR 3/3), damp, loose soft subangular, moderately well grading (SM) (Alluvial)	LEL=0.0% S=0.0 ppm				
	7		S=0.0 ppm				
	8					1023	
			BZ=0.0 ppm	NA	NA	1024	
			BH=0.0 ppm			4.0/4.0	
	9		S=0.0 ppm				
			O_2=20.9%				
	10		LEL=0.0%				
		SAND, fine to medium grained, brownish yellow (10YR 6/6), damp, soft loose subangular to subrounded, moderately well graded, quartz sand (SW) (Alluvial)	S=0.0 ppm				
	11		S=0.0 ppm				TRIP BLANK SENT WITH SAMPLES FOR FIELD GC ANALYSIS AT 11.5' BGS
						1027	
	12		BE=0.0 ppm	NA	NA	1029	BENZENE = N/D
			BH=0.0 ppm			25/4.0	DCA = N/D
	13	SAND grain size increasing to medium to coarse	S=0.0 ppm				TCE = N/D
							PCE = N/D
	14						

HTW DRILLING LOG

HOLE NO. T-21

PROJECT USFR354 96-806-4-004

INSPECTOR E D LINDGREN

SHEET 3 OF 3 SHEETS

ELEV. a	DEPTH b	DESCRIPTION OF MATERIALS c	FIELD SCREENING RESULTS d	GEOTECH SAMPLE OR CORE BOX NO. e	ANALYTICAL SAMPLE NO. f	BLOW COUNTS g	REMARKS h
	14	SAND, fine to medium grained, brownish yellow (10YR 6/6) damp, loose, sub-angular to subrounded, moderately well graded, quartz sand (SW) (Alluvial	O_2=21.0% LEL=0.0% S=0.0 ppm S=0.0 ppm	NA	NA	2.5/4.0	▽
	15	SAND, ~~fine~~ medium to coarse, brownish yellow (10YR 6/6), wet, loose, subrounded, poorly graded, quartz sand (SW) (Alluvial)					
	16	SHALE, light gray (5Y7/2), weak, moderately weathered, calcareous.				1030	1031 Installed temporary monitoring well with 5' screen at 11.5' riser (1" PVC)
		BOTTOM OF HOLE 16.0 bgs					

APPENDIX C
SURVEY DATA

ANDERSON
SURVEY COMPANY
203 N.W. EXECUTIVE WAY
P.O. BOX 637
LEE'S SUMMIT, MO 64063
(816) 246-5050
FAX: (816) 246-0502

LAND SURVEYORS
INDUSTRIAL MEASUREMENT SPECIALISTS

FOUNDER: JAMES P. ANDERSON 1887 — 1948

August 27, 1997

Burns & McDonnell, Engineers, Architects, Consultants
9400 Ward Parkway
Kansas City, Missouri 64114

Atention: Mr. Tracy Cooley

RE: Piezometer Well Locations at Ft. Filey, Kansas

Dear Mr. Cooley:

Listed below are the coordinates and elevations of the 6 piezometers near Building No. 354 at Fort Riley, Kansas on August 22, 1997.

PIEZOMETER NUMBER	STATE PLANE COORDINATE		*TOP OF PIPE ELEVATION	**G. OR A. ELEVATION
	NORTH	EAST		
P-1	267,827.39	2,347,422.85	1089.43'	1089.41 A
P-2	267,929.50	2,347,544.50	1086.61'	1086.71 A
P-3	267,911.80	2,347,082.20	1090.51'	1089.7 G
P-4	267,797.38	2,347.654.84	1067.19'	1065.7 G
P-5	267,757.62	2,346,962.55	1076.55'	1073.0 G
P-6	267,673.22	2,347,098.57	1071.30'	1069.9 G

* TOP OF PIPE = TOP OF 1" PVC PIPE
** G = GROUND A = ASPHALT

The Kansas State Plane Coordinates, are on North Zone NAD 27 Datum.

The elevations are on NAVD 29 Datum.

The top of the rock outcropping on the west side of Buildings 181 and 180 (the Old Dry Cleaners) is at elevation 1073.05'

If you have any questions, please call me at 246-5050.

Sincerely,

AUG 28 1997

Dana G. Kinsley, RLS
ANDERSON SURVEY COMPANY, INC.

DGK:jg

The quiet of our estates, in a great measure, depends upon the faithfulness, understanding, and care of our surveyors.
Virginia Statutes, 1705

ANDERSON
SURVEY COMPANY
203 N.W. EXECUTIVE WAY
P.O. BOX 637
LEE'S SUMMIT, MO 64063
(816) 246-5050
FAX: (816) 246-0502

LAND SURVEYORS
INDUSTRIAL MEASUREMENT SPECIALISTS

FOUNDER: JAMES P. ANDERSON 1887 — 1948

September 2, 1997

Burns & McDonnell,
Engineers, Architects, Consultants
9400 Ward Parkway
Kansas City, MO 64114

Attention: Mr. Tracy Cooley

RE: Sample Point Locations
Ft. Riley, Kansas

Dear Mr. Cooley:

Attached are the coordinate and elevation listings on the sample points near Building 354 at Ft. Riley, Kansas.

The coordinates are on the Kansas State Plane North Zone System and on NAD 27 Datum. The elevations are on NAVD 29 Datum.

Also enclosed is a drawing and a diskette of the buildings, fences, and drives in the area. The diskette includes an ASCII file of the sample points.

If you have any questions, please call me at 246-5050.

Sincerely,

Dana G. Kinsley

Dana G. Kinsley, RLS
ANDERSON SURVEY COMPANY, INC.

DGK:jg

Enclosure

SAMPLE POINT NUMBER	STATE PLANE COORDINATES		ELEVATION
	NORTH	EAST	
B-1	267,978.88'	2,347,144.70'	1095.18'
B-2	267,981.14'	2,347,194.33'	1095.43'
B-3	267,980.18'	2,347,290.19'	1095.63'
B-4	267,981.58'	2,347,338.76'	1096.10'
B-5	267,970.55'	2,347,388.83'	1096.28'
B-6	267,952.60'	2,347,100.21'	1093.05'
B-7	267,951.03'	2,347,161.81'	1095.17'
B-8	267,943.83'	2,347,359.36'	1095.79'
B-9	267,927.23'	2,347,405.95'	1095.69'
B-10	267,920.92'	2,347,128.89'	1094.67'
B-10A	267,923.15'	2,347,078.24'	1088.67'
B-11	267,906.78'	2,347,190.26'	1093.82'
B-12	267,882.31'	2,347,387.11'	1093.58'
B-13	267,872.53'	2,347,436.09'	1092.00'
B-14	267,885.07'	2,347,134.14'	1093.56'
B-15	267,868.67'	2,347,205.57	1092.10'
B-16	267,859.81'	2,347,256.34'	1091.11'
B-17	267,851.03'	2,347,305.47'	1091.55'
B-18	267,837.63'	2,347,352.40'	1091.04'
B-19	267,830.88'	2,347,401.16'	1090.39'
B-20	267,859.01'	2,347,111.16'	1085.50'
B-21	267,844.94'	2,347,159.10'	1089.49'
B-22	267,825.00'	2,347,205.92'	1090.10'
B-23	267,807.94'	2,347,271.30'	1088.60'

ANDERSON
SURVEY COMPANY

SAMPLE POINT NUMBER	STATE PLANE COORDINATES		ELEVATION
	NORTH	EAST	
B-24	267,789.57'	2,347,313.31'	1088.04'
B-25	267,780.21'	2,347,364.14'	1087.49'
B-26	267,767.88'	2,347,413.47'	1081.86'
B-27	267,809.98'	2,347,132.03'	1077.65'
B-28	267,798.91'	2,347,179.72'	1082.69'
B-29	267,786.31'	2,347,228.80'	1086.73'
B-30	267,776.62'	2,347,278.75'	1088.09'
B-31	267,753.21'	2,347,324.57'	1087.00'
B-32	267,726.85'	2,347,370.57'	1082.69'
B-33	267,766.49'	2,347,060.42'	1070.06'
B-34	267,756.56'	2,347,115.45'	1072.23'
B-35	267,746.78'	2,347,164.04'	1072.41'
B-36	267,734.46'	2,347,218.74'	1078.77'
B-36A	267,715.39'	2,347,262.15'	1083.06'
B-38	267,685.74'	2,347,311.50'	1081.82'
B-39	267,679.22'	2,347,374.84'	1080.38'
B-40	267,738.54'	2,347,013.87'	1070.18'
B-41	267,721.76'	2,347,088.84'	1069.35'
B-42	267,704.27'	2,347,142.13'	1068.97'
B-43	267,686.28'	2,347,196.46'	1070.01'
B-44	267,675.08'	2,347,250.58'	1078.03'
B-45	267,649.66'	2,347,302.66'	1078.99'
B-46	267,621.93'	2,347,340.34'	1074.91'
B-47	267,612.35	2,347,388.55'	1064.98'

ANDERSON SURVEY COMPANY

SAMPLE POINT NUMBER	STATE PLANE COORDINATES		
	NORTH	EAST	ELEVATION
B-48	267,668.69'	2,347,046.63'	1071.93'
B-49	267,653.35'	2,347,091.72'	1070.80'
B-50	267,651.38'	2,347,141.29'	1068.89'
B-51	267,628.17'	2,347,186.73'	1068.33'
B-52	267,591.72'	2,347,242.12'	1070.21'
B-53	267,579.38'	2,347,290.19'	1067.93'
B-54	267,569.55'	2,347,331.12'	1065.05'
B-55	267,619.34'	2,347,015.63'	1073.72'
B-56	267,607.31'	2,347,064.30'	1071.27'
B-57	267,593.90'	2,347,112.33'	1069.42'
B-58	267,577.20'	2,347,157.65'	1068.10'
B-59	267,566.94'	2,347,208.75'	1067.41'
B-60	267,553.02'	2,347,258.35'	1066.34'
B-61	267,547.10'	2,347,284.33'	1065.63'
B-62	267,523.26'	2,347,353.29'	1064.76'
B-63	267,553.89'	2,347,392.63'	1064.38'
B-64	267,546.64'	2,347,429.85'	1063.43'
B-66	267,591.83'	2,347,485.92'	1063.11'
B-67	267,897.12'	2,347,085.30'	1088.71'
B-68	267,907.89'	2,347,035.44'	1083.43'
B-69	267,821.99'	2,347,083.44'	1073.78'
B-70	267,844.24'	2,347,021.75'	1073.98'
B-71	267,824.23'	2,346,866.53'	1076.83'
B-72	276,921.09'	2,346,891.61'	1076.41'

ANDERSON
SURVEY COMPANY

SAMPLE POINT NUMBER	STATE PLANE COORDINATES		ELEVATION
	NORTH	EAST	
B-73	268,007.96'	2,346,910.47'	1076.42'
B-74	268,173.11'	2,347,062.04'	1092.97'
B-75	268,172.26'	2,347,360.84'	1098.80'
B-76	267,983.00'	2,347,623.93'	1083.33'
B-77	267,886.96'	2,347,632.02'	1078.56'
B-78	267,783.58'	2,347,633.34'	1065.58'
B-79	267,662.97'	2,347,639.35'	1062.59'
B-80	267,534.00'	2,347,663.44'	1062.85'
B-81	267,360.77'	2,347,339.71'	1063.79'
B-82	267,352.59'	2,347,230.34'	1063.77'
B-83	267,598.06'	2,346,871.48'	1079.29'
B-84	267,893.19'	2,347,226.76'	1092.43'
B-85	267,796.16'	2,347,510.76'	1080.10'
B-86	268,183.75'	2,347,159.81'	1097.49'
B-88	267,889.50'	2,347,532.59'	1085.22'

ANDERSON
SURVEY COMPANY

ANDERSON
SURVEY COMPANY
203 N.W. EXECUTIVE WAY
P.O. BOX 637
LEE'S SUMMIT, MO 64063
(816) 246-5050
FAX: (816) 246-0502

LAND SURVEYORS
INDUSTRIAL MEASUREMENT SPECIALISTS

FOUNDER: JAMES P. ANDERSON 1887 — 1948

September 25, 1997

Burns & McDonnell Waste Consultants, Inc.
9400 Ward Parkway
Kansas City, MO 64114

Attention: Mr. Tracy Cooley

RE: Location of 14 Piezometer Wells and 2 soil sample points at Ft. Riley, Kansas

Dear Mr. Cooley:

Listed below are the coordinates and elevations of the 14 piezometer wells and 2 soil sample points.

PIEZOMETER NUMBER	STATE PLANE COORDINATE		TOP OF PIPE ELEVATION	GROUND ELEVATION
	NORTH	EAST		
T-1	268,331.16'	2,347,080.80'	1102.61'	1100.0'
T-2	268,206.47'	2,347,178.00'	1099.06'	1099.0'
T-3	268,046.90'	2,347,153.07'	1096.60'	1094.2'
T-4	267,864.44'	2,347,356.05'	1093.21'	1093.2'
T-5	267,780.91'	2,347,301.76'	1087.38'	1087.4'
T-7	267,563.48'	2,347,493.38'	1065.38'	1063.1'
T-8	267,670.62'	2,347,658.12'	1064.83'	1062.7'
T-9	267,620.42'	2,347,280.12'	1076.51'	1075.7'
T-10	267,606.39'	2,347,043.90'	1074.17'	1072.6'
*T-11	267,856.25'	2,347,169.36'	-	1091.9'
*T-12	267,909.24'	2,347,081.35'	-	1089.6'
T-14	267,990.87'	2,347,008.68'	1088.73'	1086.5'
T-15	267,920.84'	2,346,892.46'	1077.50'	1074.9'
T-21	267,690.00'	2,347,208.48'	1073.55'	1072.4'
HS 97-1	266,223.87'	2,345,996.79'	1065.23'	1062.7'
72797-1	264,957.09'	2,350,256.47'	1063.54'	1061.0'

*Soil sample points

The quiet of our estates, in a great measure, depends upon the faithfulness, understanding, and care of our surveyors.
Virginia Statutes, 1705

The Kansas State Plane Coordinates North Zone, are on NAD 27 Datum.

The elevations are on NAVD 39 Datum.

If you have any questions, please call me at 246-5050.

Sincerely,

Dana G. Kinsley, RLS
ANDERSON SURVEY COMPANY, INC.

DGK:jg

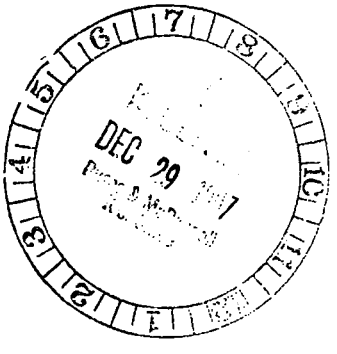
ANDERSON SURVEY COMPANY

APPENDIX D
ON-SITE ANALYTICAL DATA

DATE: August 20, 1997
PROJECT: Ft. Riley Building 354, Ft. Riley, Kansas
PROJECT #: 970827

Spl. ID #	Sample Depth	Recovery Time	Benz	DCA	TCE	PCE	Bedrock Depth	H2O Depth
Fld. Blk		NA	ND	ND	ND	ND	NA	NA
B-36a	24.0'	instant	203	78.2	2.5	1.2	26.5'	NA
B-30	27.0'	instant	11.0	7.2	1.0	3.4	31.5'	NA
B-23	26.0'	instant	ND	1.0	ND	ND	32.0'	NA
B-24	24.0'	instant	10.4	6.5	ND	ND	30.4'	NA
B-17	29.0'	instant	ND	ND	ND	9.3	35.0'	NA
B-18	28.0'	instant	ND	ND	2.6	33.0	34.3'	NA
B-16	28.0'	instant	ND	ND	ND	4.6	34.6'	NA
B-36	18.0'	instant	ND	ND	ND	4.7	22.0'	NA
B-29	26.0'	instant	ND	3.2	ND	0.5 J	30.3'	NA
B-22	29.6'	instant	ND	2.6	ND	31.3	33.6'	NA
B-12	32.6'	instant	ND	3.2	2.2	30.5	36.6'	NA
B-09	35.0'	instant	ND	ND	ND	3.1	39.0'	NA
B-08	35.0'	instant	ND	ND	ND	1.1	39.0'	NA
B-03	33.0'	10 sec.	ND	ND	ND	0.2	39.4'	35'

B = Soil Gas testhole number
Results are given in ug/l (ppb)
Recovery time is determined by the amount of time it takes for sampling string to return to atmospheric pressure.
ND = Not Detected
NA = Not Available
J = estimated value below reporting limit



DATE: August 21, 1997
PROJECT: Ft. Riley Building 354, Ft. Riley, Kansas
PROJECT #: 970827

Spl. ID #	Sample Depth	Recovery Time	Benz	DCA	TCE	PCE	Bedrock Depth	H2O Depth
Fld. Blk		NA	ND	ND	ND	ND	NA	NA
B-01	33.0'	instant	ND	ND	ND	7.1	39.0'	35'
B-02	33.0'	instant	ND	ND	ND	4.8	37.7'	NA
B-11	32.0'	instant	ND	ND	3.2	76.8	36.9'	NA
B-15	31.0'	instant	ND	ND	ND	21.5	35.0'	NA
B-15*	31.0'	instant	ND	ND	ND	16.1	35.0'	NA
B-04	36.0'	instant	ND	ND	ND	2.0	40.6'	NA
B-05	33.0'	instant	ND	ND	ND	13.1	39.2'	NA
B-13	30.0'	instant	ND	ND	ND	14.6	35.0'	NA
B-19	28.0'	instant	ND	1.2	1.3	18.0	33.5'	NA
B-19*	28.0'	instant	ND	1.7	1.2	16.7	33.5'	NA
B-25	26.0'	instant	ND	ND	ND	ND	30.8'	NA
B-31	26.0'	instant	14.2	9.0	ND	0.3 J	30.4'	NA
B-32	25.0'	instant	ND	1.0	ND	ND	29.0'	NA
B-26	21.0'	instant	ND	ND	1.8	33.8	25.3'	NA
B-06	30.5'	instant	ND	ND	ND	5.3	36.5'	32'
B-10a	24.0'	instant	ND	ND	ND	19.1	30.0'	26'
B-27	17.0'	instant	ND	ND	ND	0.3 J	21.4'	NA

B = Soil Gas testhole number
Results are given in ug/l (ppb)
Recovery time is determined by the amount of time it takes for sampling string to return to atmospheric pressure.
ND = Not Detected
NA = Not Available
J = estimated value below reporting limit
* = duplicate samples analyzed

DATE: August 22, 1997
PROJECT: Ft. Riley Building 354, Ft. Riley, Kansas
PROJECT #: 970827

Spl. ID #	Sample Depth	Recovery Time	Benz	DCA	TCE	PCE	Bedrock Depth	H2O Depth
B-33	9.0'	instant	ND	ND	ND	1.1	13.3'	NA
Fld. Blk		NA	ND	ND	ND	ND	NA	NA
B-35	12.0'	instant	ND	ND	ND	3.8	16.8'	NA
B-35*	12.0'	instant	ND	ND	ND	0.3 J	16.8'	NA
B-48	11.2'	instant	ND	ND	ND	0.3 J	15.2'	NA
B-50	8.6'	instant	ND	ND	ND	12.7	12.5'	NA
B-52	9.5'	instant	ND	ND	ND	0.3 J	13.5'	NA
B-54	5.3'	instant	ND	ND	ND	ND	8.3'	NA
B-47	4.9'	instant	ND	ND	ND	ND	7.9'	6'
B-62	21.0'	instant	72.0	10.6	ND	ND	24.8'	24'
B-62	24.0'	water	135	52.0	ND	ND	24.8'	24'
B-64	20.6'	instant	120	17.1	ND	ND	23.1'	NA
B-66	18.0'	instant	ND	ND	ND	ND	22.6'	21'
B-61	6.0'	instant	ND	ND	ND	ND	9.6'	NA
B-59	12.0'	instant	9.4	ND	0.9 J	0.6 J	18.9'	15'
B-59*	12.0'	instant	9.0	ND	0.9 J	0.7 J	18.9'	15'
B-57	9.0'	instant	ND	ND	ND	0.4 J	12.6'	NA
B-55	14.5'	instant	ND	ND	ND	ND	17.5'	NA
B-68	24.0'	instant	ND	2.0	ND	8.1	27.3'	NA
B-70	12.0'	instant	ND	O.7 J	ND	4.4	18.0'	15'

B = Soil Gas testhole number
Results are given in ug/l (ppb)
Recovery time is determined by the amount of time it takes for sampling string to return to atmospheric pressure.
ND = Not Detected
NA = Not Available
J = estimated value below reporting limit
* = duplicate samples analyzed

DATE: August 26, 1997
PROJECT: Ft. Riley Building 354, Ft. Riley, Kansas
PROJECT #: 970827

Spl. ID #	Sample Depth	Recovery Time	Benz	DCA	TCE	PCE	Bedrock Depth	H2O Depth
Fld. Blk		NA	ND	ND	ND	ND	NA	NA
B-79	18.0'	instant	ND	ND	ND	0.5 J	22.4'	NA
B-80	21.0'	instant	ND	ND	ND	2.8	40.6'	23'
B-77	18.0'	instant	ND	ND	ND	0.3 J	21.0'	NA
B-76	21.0'	instant	ND	ND	ND	ND	25.6'	NA
B-75	33.0'	instant	ND	ND	ND	0.5 J	42.4'	36'
B-75*	33.0'	instant	ND	ND	ND	0.6 J	42.4'	36'
B-07	33.0'	instant	ND	ND	ND	ND	38.8'	NA
B-84	33.0'	instant	ND	ND	ND	25.3	37.9'	NA
B-10	33.0'	instant	ND	ND	ND	17.0	37.4'	NA
B-14	33.0'	instant	ND	ND	ND	43.8	36.7'	NA
B-21	29.0'	instant	ND	ND	4.2	73.9	33.0'	NA
Fld. Blk		NA	ND	ND	ND	ND	NA	NA
B-20	24.0'	instant	ND	ND	ND	17.3	30.0'	26'

B = Soil Gas testhole number
Results are given in ug/l (ppb)
Recovery time is determined by the amount of time it takes for sampling string to return to atmospheric pressure.
ND = Not Detected
NA = Not Available
J = estimated value below reporting limit
* = duplicate samples analyzed

DATE: August 27, 1997
PROJECT: Ft. Riley Building 354, Ft. Riley, Kansas
PROJECT #: 970827

Spl. ID #	Sample Depth	Recovery Time	Benz	DCA	TCE	PCE	Bedrock Depth	H2O Depth
B-82	27.0'	instant	ND	ND	ND	ND	32.6'	NA
B-81	20.0'	instant	ND	ND	ND	ND	39.0'	23.6'
B-83	16.0'	instant	ND	ND	ND	4.2	20.6'	NA
B-74	30.0'	instant	ND	ND	ND	11.4	36.2'	32'
B-73	16.0'	instant	ND	ND	ND	24.4	21.0'	NA
B-72	15.0'	instant	ND	ND	ND	29.2'	19.0'	NA
B-71	18.0'	instant	ND	ND	ND	7.7	21.0'	NA
B-78	6.0'	instant	ND	ND	ND	ND	8.6'	NA
B-85	19.0'	instant	ND	ND	ND	12.9	23.0'	NA
B-85*	19.0'	instant	ND	ND	ND	1.3	23.0'	NA
B-86	34.0'	instant	ND	ND	1.0	41.8	40.7'	36'
B-88	24.0'	instant	ND	ND	2.8	3.3	28.4'	NA
B-39	18.0'	instant	ND	ND	ND	ND	22.4'	NA
B-38	20.0'	instant	5.7	5.5	ND	ND	24.3'	NA
B-40	9.0'	instant	ND	ND	ND	1.0	14.5'	NA
B-42	9.0'	instant	ND	ND	ND	2.9	13.5'	NA
B-42*	9.0'	instant	ND	ND	ND	2.4	13.5'	NA
Fld. Blk		NA	ND	ND	ND	ND	NA	NA

B = Soil Gas testhole number
Results are given in ug/l (ppb)
Recovery time is determined by the amount of time it takes for sampling string to return to atmospheric pressure.
ND = Not Detected
NA = Not Available
J = estimated value below reporting limit
* = duplicate samples analyzed

DATE: September 11, 1997
PROJECT: Ft. Riley Building 354, Ft. Riley, Kansas
PROJECT #: 970912

Spl. ID #	Sample Depth	Benz	DCA	TCE	PCE	Bedrock Depth	Comments
Fld. Blk	NA	ND	ND	ND	ND	NA	NA
T-1	39.0'	ND	ND	ND	2.2	43.6'	set temp. piezo.
T-2	38.0'	ND	ND	ND	ND	42.5'	set temp. piezo.
Fld. Blk	NA	ND	ND	ND	ND	NA	NA
T-3	29.0'	ND	ND	ND	ND	35.0'	set temp. piezo.
T-4	34.0'	ND	ND	ND	ND	36.0'	set temp. piezo.
T-7	14.0'	ND	5.3	ND	ND	24.0'	set temp. piezo.
T-7	23.0'	7.0	1.9	ND	ND	24.0'	NA
T-8	22.0'	ND	17.2	ND	ND	23.0'	set temp. piezo.

T = Testhole number (temporary piezometer location)
Results are given in ug/kg (ppb)
ND = Not Detected
NA = Not Available

DATE: September 12, 1997
PROJECT: Ft. Riley Building 354, Ft. Riley, Kansas
PROJECT #: 970912

Spl. ID #	Sample Depth	Benz	DCA	TCE	PCE	Bedrock Depth	Comments
Fld. Blk	NA	ND	ND	ND	ND	NA	NA
T-5	24.0'	2899	35.9	7.8	27.7	31.0'	set temp. piezo.
T-9	19.0'	336	4.6	11.3	26.5	19.5'	set temp. piezo.
T-10	1.0'	ND	8.3	ND	ND	16.3'	set temp. piezo.
T-10	10.0'	ND	11.9	ND	ND	16.3'	NA
T-10*	10.0'	ND	6.5	ND	ND	16.3'	NA
T-21	12.0'	ND	ND	ND	ND	16.0'	set temp. piezo.
T-11	4.0'	ND	ND	ND	ND	36.0'	no piezo., cave-in @ 5'
T-12	27.0'	ND	ND	ND	1.4	31.5'	profile only, no piezo.
T-14	23.0'	ND	ND	ND	ND	28.0'	set temp. piezo.
T-15	17.0'	ND	ND	ND	42.8	19.0'	set temp. piezo.

T = Testhole number (temporary piezometer location)
Results are given in ug/kg (ppb)

DATE: September 22 & 24, 1997
PROJECT: Ft. Riley Building 354, Ft. Riley, Kansas
PROJECT #: 970922

Spl. ID #	Sample Depth	Spl. Type	Benz	DCA	TCE	PCE
Fld. Blk		NA	ND	ND	ND	ND
T-10	2.0'	soil	ND	ND	ND	ND
P-5	NA	H2O	ND	7.7	0.9 J	40.0
T-21	NA	H2O	ND	7.0	2.0	2.3
T-9	NA	H2O	53.4	17.5	3.3	11.2
PZ-A	NA	H2O	2.4	1.2	5.8	ND
PZ-C	NA	H2O	ND	0.5 J	ND	7.9
PZ-D	NA	H2O	ND	0.2 J	1.9	6.6
T-7	NA	H2O	34.6	4.9	ND	ND
T-8	NA	H2O	ND	1.3	0.8 J	1.2
T-5	NA	H2O	10.2	0.5 J	1.0	0.8 J
T-4	NA	H2O	ND	11.2	1.6	32.9
P-1	NA	H2O	ND	6.1	2.6	18.5
P-2	NA	H2O	ND	9.4	5.5	1.1
P-2*	NA	H2O	ND	8.0	6.1	1.4
P-3	NA	H2O	ND	6.6	7.9	200
T-2	NA	H2O	ND	5.0	4.2	58.0
T-1	NA	H2O	ND	6.9	ND	40.8
P-4	NA	H2O	ND	0.4 J	ND	ND
PZ-B	NA	H2O	ND	4.7	ND	2.7

T = Temporary piezometer location)
PZ = Previously installed piezometer location
* = Duplicate sample analyzed
Results are given in ug/l (ppb)
ND = Not Detected
NA = Not Available