FINAL
RCRA FACILITY INVESTIGATION REPORT
LANDFILL 4 (FTC-008/SWMU 4)
FORT CARSON, COLORADO

Prepared for
U.S. Army Corps of Engineers
Omaha District
Contract No. DACW45-94-D0001

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October 2003

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L	Slug Test Analyses

LIST OF ABBREVIATIONS AND ACRONYMS

Aguirre	Aguirre Engineers
ASTM	American Society for Testing and Materials
BEHP	bis(2-ethylhexyl)phthalate
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
°C	degrees Celsius
CAF	Corrective Action Form
CCR	Code of Colorado Regulations
CDPHE	Colorado Department of Public Health and Environment
CGWS	Colorado Ground Water Standards
COC	chain of custody
DOT	Department of Transportation
DQCR	Daily Quality Control Report
DQO	data quality objective
DRMO	Defense Reutilization and Marketing Office
Earth Tech	Earth Tech Environment & Infrastructure, Inc.
EPA	Environmental Protection Agency
FLPM	Field and Laboratory Procedures Manual
Fort Carson	Fort Carson Military Reservation
ft/day	feet per day
GPS	Global Positioning System
HydroLogic	HydroLogic Laboratories, Inc.
ID	inside diameter
IDW	investigation-derived waste
Leigh Whitehead	Leigh Whitehead & Associates, Inc.
LEL	lower explosive limit
MCL	maximum contaminant level
MDL	method detection limit
MEK	methyl ethyl ketone
mg/kg	milligram per kilogram
µg/kg	microgram per kilogram
mg/L	milligram per liter
µg/L	microgram per liter
OD	outside diameter
Paragon	Paragon Analytical Laboratory, Inc.
Part B Permit	RCRA Hazardous Waste Part B Permit No. CO-95-09-29-03
PCB	polychlorinated biphenyl
PID	photoionization detector
POL	petroleum, oil, and lubricants
ppb	parts per billion
ppm	parts per million
PQL	practical quantitation limit

LIST OF ABBREVIATIONS AND ACRONYMS
(Continued)

PVC	polyvinyl chloride
QC	quality control
QCSR	Quality Control Summary Report
QGMP	Quarterly Groundwater Monitoring Program
RCRA	Resource Conservation and Recovery Act
RFI	RCRA facility investigation
RFI Work Plan	Draft Final RFI Work Plan for Landfill 4
Rust	Rust Environment & Infrastructure
SAP	Sampling and Analysis Plan
Site Services	Site Services, Inc.
SOS	Scope of Services
Spectrum	Spectrum Exploration, Inc.
SPLP	synthetic precipitation leaching procedure
STL	Severn Trent Laboratories
SVOC	semivolatile organic compounds
SWMU	Solid Waste Management Unit
TAL	target analyte list
TDS	total dissolved solids
TOC	total organic carbon
USACE	U.S. Army Corps of Engineers
USACHPPM	U.S. Army Center for Health Promotion & Preventive Medicine (Provisional)
USAEHA	U.S. Army Environmental Hygiene Agency
USCS	Unified Soil Classification System
UTL	upper tolerance limit
VOC	volatile organic compound

EXECUTIVE SUMMARY

Earth Tech Environment & Infrastructure, Inc. (Earth Tech) conducted a Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) for the Department of the Army, Omaha District Corps of Engineers to evaluate the potential presence of contamination associated with Landfill 4 (FTC-008, Solid Waste Management Unit 4) at the Fort Carson Military Reservation. The investigation was initiated voluntarily. During the course of the investigation, Fort Carson's RCRA Hazardous Waste Part B Permit No. CO-95-09-29-03 (Part B Permit) became effective (Colorado Department of Public Health and Environment [CDPHE] 1995). The RFI was completed in accordance with Part B Permit requirements. The objective of this project was to assess the nature and extent of contamination present in the soils and groundwater resulting from historical activities dating to 1957 at Landfill 4. The landfill is not currently in use.

The investigation program included sampling and analysis of soil, soil gas, groundwater, surface water, and sediment at locations where releases of chemical contaminants may have occurred during site activities. Subsurface soil conditions were characterized using trench excavations, soil borings, headspace screening analyses, and chemical analyses. Groundwater samples were collected from new and existing monitoring wells as part of the Fort Carson Quarterly Groundwater Monitoring Program, and these data are included in this report. Surface water and sediment samples were collected from three locations in a storm water drainage ditch (B Ditch) that is adjacent to the site. Soil and sediment analytical results were compared to interim background soil screening values (upper tolerance limits), and groundwater and surface water analytical results were compared to Colorado and federal groundwater and surface water regulatory criteria, as appropriate.

Trenches were excavated around the presumed landfill perimeter and in the southwest quadrant of the site to define the landfill boundary. The excavations encountered construction debris as well as a black organic layer in several locations, which was presumed to be an old soil horizon. Additional trenching and soil gas investigations were conducted to determine whether the black organic material represented the remains of sewage and petroleum, oil, and lubricant sludge believed to have been disposed at the landfill when it was operated in 1957. Soil samples of the material were obtained, but chemical analyses did not indicate a sewage or sludge origin.

Soil gas samples taken near trenches where the black organic layer was observed did not indicate the presence of landfill gases at these locations. No volatile organic compounds were detected during headspace vapor screening of soil samples taken during soil boring and monitoring well installation activities. Furthermore, only five low-concentration detections of methane were observed in the 22 soil gas samples taken to assess the black organic material encountered during trenching activities and to look for signs of waste decomposition. Of the five methane detections, only two were subsequently confirmed by off-site laboratory analysis.

Three semivolatile organic compounds (2,6-dinitrotoluene, 4-chlorophenyl phenyl ether, and di-n-butyl phthalate) were detected at concentrations exceeding their practical quantitation limits in two soil samples from one soil boring. However, neither of these compounds was detected in soil at comparable depths from LF4MW4, which was installed about 11 feet away. In addition, none of these compounds was detected in any of the Landfill 4 groundwater samples, except for one

detection of di-n-butyl phthalate in LF4MW02 (below the practical quantitation limit). Toluene was detected in almost every soil sample collected for analysis in January 2001, but not above its reporting limit in corresponding groundwater samples. Although it was not detected in any laboratory method blanks, the relative consistency of the concentrations, together with its nearly uniform spatial distribution, strongly suggests it is a sampling or laboratory artifact. Metals in soil exceeding interim upper tolerance limits include cadmium, calcium, iron, lead, magnesium, mercury, sodium, and vanadium. Of these metals, only cadmium and mercury appear in soil samples within the presumed landfill perimeter.

Vinyl chloride was detected in groundwater samples from PZ4 and its replacement well LF4MW6. In addition, vinyl chloride was detected in one of three samples from adjacent well LF4MW5. Results from casing samples from PZ4 and the present screen material suggest that the vinyl chloride in groundwater samples is from the deterioration of the former PZ4 well screen that was installed in 1974. Groundwater samples collected after PZ4 was replaced with LF4MW6 suggest that residual vinyl chloride is still in the aquifer. Other organic constituents were anomalously detected in groundwater samples at low concentrations. Only bis(2-ethylhexyl)phthalate, a common laboratory contaminant, was detected at concentrations above its assessment criteria. Metals exceeding groundwater assessment criteria were also detected. It is likely that these concentrations represent naturally occurring conditions that will be further evaluated in a risk assessment. Some inorganic concentrations of chloride, sulfate, and total dissolved solids also exceeded criteria in wells PZ4, LF4MW5, and LF4MW7. The source of these elevated inorganics is not known. The presence of these organic and inorganic analytes is likely not due to site activities because these sample locations, except for LF4MW7, are located upgradient of the landfill.

Surface water and sediment data may indicate impacts from site activities based on their distribution relative to the landfill, but they may result from other areas as well. The only organic compounds detected were benzene, toluene, ethylbenzene and xylenes at concentrations below their reporting limits. Metals exceeding surface water criteria were aluminum, copper, iron, lead, and zinc. The following metals exceeded alluvial soil upper tolerance limits in sediment samples: copper, iron, magnesium, nickel, potassium, sodium, selenium, vanadium, and zinc. The sediment in B Ditch was excavated in January and February 2001 and transported to Landfill 1 as part of drainage improvements. No waste materials were visible in the bank of B Ditch or were encountered during the excavation process.

Recommendations

The results of this RFI indicate that no significant impacts to the surrounding environment have resulted from the presence of Landfill 4. Landfill 4 is currently covered by an asphalt parking/storage area and several storage buildings, which function as a landfill cap to prevent percolation of precipitation into the landfill. Repairs will be made to the asphalt pavement as needed. The ability of the existing asphalt layer to function as a cap will be evaluated through quarterly inspections and continued groundwater monitoring. Detected constituents will be addressed through a risk assessment.

1.0 INTRODUCTION

This report presents the results of the Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) conducted at Landfill 4 (FTC-008, Solid Waste Management Unit [SWMU] 4) at the Fort Carson Military Reservation (Fort Carson), Colorado. This report summarizes and presents the collected data, interprets the results, and provides recommendations for additional investigation, if necessary. The RFI was conducted by Earth Tech Environment & Infrastructure, Inc. (Earth Tech) for the Department of the Army, Omaha District Corps of Engineers, under Contract No. DACW45-94-D001.

In January 1995, the U.S. Army Corps of Engineers (USACE) initiated a voluntary site investigation of Landfill 4. During the investigation, the RCRA Hazardous Waste Part B Permit No. CO-95-09-29-03 (Part B Permit) for Fort Carson was issued and became effective (Colorado Department of Public Health and Environment [CDPHE] 1995). This RFI report is intended to comply with the Part B Permit requirements for an RFI at Landfill 4.

This RFI report follows six documents previously submitted by Rust Environment & Infrastructure (Rust) and Earth Tech regarding Landfill 4 (some documents are for the Group A sites of which Landfill 4 was one of the four Group A sites). These six documents are summarized below.

- The Group A Final Sampling and Analysis Plan (SAP) (Rust 1994), which was submitted prior to the start of field investigation activities, discusses sampling methods to be used and sampling locations. The SAP was prepared to the specifications of the project Scope of Services (SOS), which is included in Appendix A of the SAP.

- The Final Analytical Data Package for Site Investigations at Group A Sites (Rust 1995a) was submitted after all analytical data were received for sampling conducted through May 1995. It includes laboratory summary sheets, quality control sheets, chain-of-custody (COC) documentation, and HydroLogic Laboratories, Inc. (HydroLogic) and Severn Trent Laboratories (STL) (formerly Quanterra Environmental Services) analytical results.

- The Final Quality Control Summary Report (QCSR) for Site Investigations at Group A Sites (Rust 1995b) evaluates data usability for data collected through May 1995. In general, the QCSR concluded that the data generated are suitable for addressing the overall objective of this investigation. In addition, the QCSR found that none of the quality issues addressed in the

report impact the data quality objectives (DQOs) or data usability. Responses to CDPHE comments on the Group A QCSR are presented in Appendix A of this report.

- The Draft Final RFI Report for Group A Sites (Rust 1999a) discusses investigation results collected through 1998. Responses to CDPHE comments on the Draft Final RFI Report are presented in Appendix A of this report.

- The Draft Final RFI Work Plan for Landfill 4 (RFI Work Plan) (Earth Tech 2000b) discusses sampling methods and locations for follow-on field work that was conducted between January and March 2001. Responses to CDPHE comments on the Draft Final RFI Work Plan are presented in Appendix A of this report.

- The Letter Work Plan for Additional Field Activities at Landfill 4 (Earth Tech 2001a) discusses additional investigation activities to be conducted to determine the source of the vinyl chloride detections in PZ4, as well as the resampling of the temporary monitoring wells at Landfill 4.

Section 2.0 of this report discusses the project objectives, site and facility characteristics, and DQOs and summarizes previous Army investigations. Section 3.0 describes the operations and procedures followed by Earth Tech and its subcontractors: HydroLogic of Brighton, Colorado; STL of Arvada, Colorado; GEO Environmental of Golden, Colorado; Site Services, Inc. (Site Services) of Golden, Colorado; Spectrum Exploration, Inc. (Spectrum) of Colorado Springs, Colorado; Paragon Analytical Laboratory, Inc. (Paragon) of Fort Collins, Colorado; Aguirre Engineers (Aguirre) of Englewood, Colorado; and Leigh Whitehead & Associates, Inc. (Leigh Whitehead) of Colorado Springs, Colorado. Investigation results, including assessment criteria for screening the results, are presented in Section 4.0. Conclusions and recommendations are presented in Section 5.0.

2.0 BACKGROUND

The following sections discuss the site location and description, site history, project objectives, DQOs and data quality levels, facility characteristics, and previous site investigations and their results.

2.1 SITE LOCATION AND DESCRIPTION

Fort Carson occupies approximately 220 square miles in central Colorado, adjacent to the eastern flank of the Rocky Mountain Front Range. The northern edge of the post is located about 8 miles south of Colorado Springs in El Paso County (Figure 2-1). The post is bounded on the northeast by Interstate 25, on the north by Colorado State Highway 83 (Academy Boulevard), and on the west by Colorado State Highway 115. The southern boundary is approximately 10 miles north of and parallel to U.S. Highway 50 in Pueblo County. A small area in the southwestern portion of the post is located in Fremont County.

Fort Carson is an active military training post for both weapons qualification and field training. The primary mission of Fort Carson is the training and preparation of all assigned and attached troops to ensure combat readiness. Principal industrial operations at Fort Carson include vehicle and aircraft repair and maintenance.

As shown on Figure 2-2, Landfill 4 is located in the northeast section of the Cantonment Area, which is in the northern part of the military post. A site map is included on Figure 2-3. Landfill 4 is located within the NW 1/4 of Section 8, Township 15 South, Range 66 West (Figure 2-3A). The site is bordered by B Ditch to the west and south and Specker Avenue to the east. The stretch of B Ditch that borders Landfill 4 is an artificial drainage that was constructed to route surface water around the rail yard. Currently, Buildings 320, 326, 327, 340, E341, 342, and E343 are located on the abandoned landfill. As a result, most of the landfill surface is covered with asphalt for parking and storage.

A review of aerial photographs (Figures 2-4 through 2-9) suggests that fill material was added to the edge of the drainage ditch (B Ditch), which flows in a generally southeast direction. Therefore,

sampling conducted for this investigation primarily addressed the area east of B Ditch, as specified in the SAP (Rust 1994). However, as discussed in Section 4.0, additional field work was conducted in 2001 in the area west of B Ditch to investigate whether landfill activities may have occurred in that area as well.

2.2 SITE HISTORY

According to historical records, Landfill 4 covered approximately 14 acres (U.S. Army Environmental Hygiene Agency [USAEHA] 1988a). The landfill was excavated into the Piney Creek alluvium and operated for about 6 months in 1957 to receive sanitary wastes and possibly small amounts of sludge and waste petroleum, oil, and lubricants (POL). A shallow groundwater table forced the landfill to be abandoned. The Defense Reutilization and Marketing Office (DRMO) storage yard (FTC-024, SWMU 50) was subsequently built over the former landfill.

Aerial photographs of Landfill 4 were reviewed. Available photographs include July 1947 (Figure 2-4), June 1953 (Figure 2-5), September 1957 (Figure 2-6), June 1967 (Figure 2-7), April 1970 (Figure 2-8), and June 1984 (Figure 2-9). The 1947 photograph shows the future site of Landfill 4 bordered on the west and south by B Ditch and a road that pre-dates Specker Avenue bordering the east side of the site. There appears to be some ground disturbance between B Ditch and the road, but there is no evidence of landfill activities. There may also be some ground disturbance west of the ditch that is close to, and appears associated with, the former Prisoner of War Camp area in the northwest corner of the Cantonment Area. The 1953 photograph shows slightly more disturbed conditions than seen in the 1947 photo. At this time, the present day Specker Avenue has been or is being constructed. All the vegetation in the area of the future Landfill 4 site (east of B Ditch) appears to have been scraped off and the ground surface is a light color. Although there may be some surface debris, there is no evidence of landfill activities. The area west of the ditch appears unchanged since the 1947 photograph, except for a dirt path to a minimally disturbed area. The 1957 photograph shows further ground disturbance in the Landfill 4 area (east of B Ditch). There appears to be a darker area in the southwest portion of the site. In addition, the dirt path noted in the 1953 photograph (located west of the ditch) now turns to the east and cuts across the ditch, through the southwest portion of Landfill 4 (through the middle of the darker area on the photo), and intersects with Specker Avenue. As seen in

stereo viewing for a majority of the site, there does not appear to be any debris or surface disposal activities at this site. The 1967 photograph shows similar conditions; however, there appear to be several items staged in the Landfill 4 area. The 1970 photograph shows the presence of six structures on the Landfill 4 site. There is no evidence of ground disturbance to the west, and the dirt road noted in the previous two photos has been mostly covered with vegetation. The 1984 photograph shows conditions similar to the present, with buildings and other structures located on the site.

2.3 PROJECT OBJECTIVES

Investigation activities were performed to assess the nature and extent of contamination present in the soils and groundwater at Landfill 4. The results of this investigation will be used to design and implement an interim or corrective action plan, if necessary. The investigation followed the methods described in the SAP (Rust 1994), the RFI Work Plan (Earth Tech 2000b), the Letter Work Plan for Additional Field Activities at Landfill 4 (Earth Tech 2001a), and the Field and Laboratory Procedures Manual (FLPM) (Rust 1997 and 1998). Investigation methods were designed and implemented in accordance with CDPHE regulations, Colorado Water Resources Division Regulations, and additional guidance documents as discussed in the SAP. The RFI was completed in accordance with Section IV.G.1.d of the Part B Permit and Colorado Hazardous Waste Regulations. Specifically, the objectives of the field and laboratory investigations described in this report were to:

- Delineate the landfill boundary,
- Determine whether landfill gas is being generated and migrating away from the site,
- Determine whether shallow groundwater at the site has been adversely affected by past landfill activities, and
- Determine whether adjacent surface water and sediments have been adversely affected by past landfill activities.

2.4 DATA QUALITY OBJECTIVES

DQOs for Landfill 4 RFI activities were developed using the seven-step format provided by the U.S. Environmental Protection Agency (EPA) (1994). DQOs define sampling program objectives and

specify underlying hypotheses so that appropriate data are collected and defensible conclusions can be drawn from the data. The seven DQO elements are summarized in the following sections.

Step 1: State the Problem

As discussed in Subsection 2.2, wastes consisting of sanitary waste and possibly POL sludge were disposed at Landfill 4. The extent to which these waste materials may have adversely affected underlying groundwater was unknown. In addition, the boundaries of the landfill were unknown. Specific objectives for this RFI are listed in Subsection 2.3. To meet the objectives of this RFI, the scope of work outlined in the SAP (Rust 1994), the RFI Work Plan (Earth Tech 2000b), and the Letter Work Plan for Additional Field Activities (Earth Tech 2001a) was performed.

Step 2: Identify the Decisions

The following decision criteria were established to identify whether objectives of the RFI were met.

1. Has the extent of the landfilled materials present at Landfill 4 been identified?
2. Has groundwater underlying Landfill 4 been affected by landfill activities?
3. Have surface water and sediments been affected by landfill activities?
4. Are landfill gases migrating away from the landfill?
5. Do the impacts to groundwater and other environmental media, if any, pose an unacceptable risk to human health or the environment?

Step 3: Identify Inputs to the Decision

The required inputs for the first through the fourth decisions specified above are objective scientific data that are presented in this RFI report. These data include results from soil gas sampling, trench excavation, borehole logging, water level measurements, laboratory analyses of groundwater, surface water, sediment, and soil samples; and surveying. The input for the fifth decision specified above includes background and risk-based evaluations and engineering design.

Step 4: Define the Study Boundaries

The study boundary, at its maximum extent, comprised the area between Chiles Road on the west, Specker Avenue on the east, the northern boundary of the landfill, and the southernmost extent of B Ditch. However, the primary investigation area comprises the area located west of Specker Avenue, east and north of B Ditch, and south of and overlapping with Building 320. Review of historical records, historical aerial photographs, and field indications, such as changes in topography, were used to identify the estimated boundaries of the landfill.

Step 5: Develop a Decision Rule

Decisions 1 through 4 were addressed during the RFI activities based on data obtained from field surveys and from the USACE-approved laboratories. Laboratory contaminants and artifacts of sampling, shipping, or analysis were removed from consideration. Comparisons of inorganic detections in solid material (soil and sediment samples) were made to interim background upper tolerance limits (UTLs) for 23 inorganic analytes for the alluvium and bedrock data sets (Rust 1999b). Comparisons of organic detections in solid material to assessment criteria were not made because risk-based concentrations will be developed as part of the risk-based screening.

Groundwater data were compared to regulatory criteria (Colorado Ground Water Standards [CGWS], Colorado Drinking Water Regulations, and EPA Maximum Contaminant Levels [MCLs]) to define elevated groundwater results (Code of Colorado Regulations [CCR] 1995; CCR 1997; and EPA 1993, respectively). The most conservative standards were used to identify potential impacts to groundwater. For analytes with no regulatory criteria, risk-based concentrations will be developed as assessment criteria during the forthcoming risk-based screening effort.

Results exceeding the assessment criteria discussed above, as well as Decision 5, will be addressed in the risk-based screening effort.

Step 6: Specify Limits on Decision Errors

The FLPM (Rust 1997 and 1998) was prepared for all Fort Carson investigation activities to ensure sampling was conducted in a manner to meet DQOs. The FLPM is based on USACE's General

Geology SOS (USACE 1992) and General Chemistry Supplement to the SOS for Studies (USACE 1996). The FLPM specifies methods for field investigations and laboratory procedures to ensure that samples are collected and analyzed uniformly. The laboratory control limits and limits specified in the FLPM for method accuracy and precision were the basis for evaluating laboratory errors for the RFI.

Step 7: Optimize the Design for Obtaining Data

To allow the necessary flexibility for the phased approach utilized for the Landfill 4 RFI, separate phase-specific SAPs provide the sampling program details, as discussed in Section 1.0 of this RFI Report. Sample collection for this project was based on a judgmental sampling design. Biased sampling locations included groundwater and soil sampling locations to identify the most contaminated locations. Uniform sampling locations included soil gas survey locations to provide complete site coverage.

2.5 DATA QUALITY LEVELS

The field investigation included soil, soil gas, groundwater, surface water, and sediment sampling. The analytical data quality levels presented in the FLPM were used to evaluate field data. The data quality levels were defined for remedial investigation projects with the primary purpose of determining the nature and extent of site-related chemicals. The data quality levels specify the precision, accuracy, representiveness, comparability, and completeness requirements for the data. In addition, the following project-specific data levels were established.

- Soil Gas Sampling (Screening Level Data): Soil gas samples were collected from shallow soil or below asphalt pavement to assess if landfill gas is migrating away from the site. Soil gas samples were analyzed for organic vapor, methane, hydrogen sulfide, carbon dioxide, oxygen, lower explosive limit (LEL), and pressure using portable field instruments. Samples with significant methane and carbon dioxide detections were analyzed at an off-site analytical laboratory for methane, carbon dioxide, nitrogen, and oxygen using EPA Method 3C.

- Groundwater Sampling (Screening Level Data): Groundwater samples were collected from temporary monitoring wells installed in six soil borings to further characterize the groundwater in the Landfill 4 area. Groundwater samples from the temporary wells were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals in accordance with the Part B Permit requirements in Section IV.G.1.i. The

results were used to distinguish the nature and extent of contamination and characterize investigation-derived waste (IDW) for disposal. The groundwater samples were analyzed using EPA-approved methods and the method reporting limits provided in the FLPM. The samples were analyzed at an off-site, fixed-base laboratory. The methods provide reporting limits that are generally sufficient to characterize groundwater based on CGWS and Federal MCLs and to compare with RCRA characteristic waste criteria to evaluate IDW disposal options.

- Groundwater Sampling (Definitive Level Data): New monitoring wells were installed and sampled to investigate potential impacts from site activities to groundwater. In addition, existing monitoring wells were sampled. Groundwater samples from the new and existing monitoring wells were analyzed for VOCs, SVOCs, and metals in accordance with the Part B Permit requirements in Section IV.G.1.i. The results were used to characterize the nature and extent of contamination and characterize IDW for disposal. The groundwater samples were analyzed using EPA-approved methods and the method reporting limits provided in the FLPM. The samples were analyzed at an off-site, fixed-base laboratory. The methods provide detection limits that are generally sufficient to characterize groundwater based on CGWS and federal MCLs and to compare with RCRA characteristic waste criteria to evaluate IDW disposal options.

- Soil Sampling (Definitive Level Data): Soil samples from each monitoring well and soil boring were analyzed for VOCs, SVOCs, and metals using EPA-approved methods and the method reporting limits provided in the FLPM. The methods selected provide adequate detection limits to compare the results with RCRA characteristic waste criteria. The samples were analyzed at an off-site, fixed-base laboratory. The results provide definitive level data for waste characterization and identification of the organic layer.

2.6 FACILITY CHARACTERISTICS

General Fort Carson facility characteristics, including physiography and topography, geology, hydrogeology, and climate are discussed in detail in Section 2.3 of the Final RFI Report, Grit/Oil Pit (Earth Tech 2000a). Site-specific geologic and hydrogeologic characteristics are discussed below.

The soils immediately surrounding Landfill 4 consist of alluvial deposits belonging to the Piney Creek Alluvium. Waste materials are present within the landfill boundaries, mixed with soil fill consisting of silty to gravelly sand. Beneath the fill material, the native alluvial materials are generally clayey units. The maximum thickness of alluvium encountered during the investigation was 13.5 feet. These soils overlie the variably weathered claystones and siltstones of the Pierre

Shale. At this location, the claystone exhibits a blocky fracture pattern. Materials filling the fractures are commonly iron oxide stained (orange or black) clays or white precipitates and crystals.

Shallow groundwater in the vicinity of Landfill 4 is encountered within the Quaternary deposits in some areas and within the Pierre Shale in other areas. Depth to groundwater at Landfill 4 ranges from less than 1 foot to approximately 14 feet below ground surface (bgs), based on borehole and monitoring well results.

2.7 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

Limited environmental investigations have been conducted at Landfill 4 prior to the RFI. In 1988, the USAEHA assisted Fort Carson in identifying SWMUs that would require environmental sampling to confirm the existence or absence of a release (USAEHA 1988a). Landfill 4 was included in this study.

Following recommendations in the 1988 study, the USAEHA installed monitoring wells W4-1, W4-2, and W4-3 at Landfill 4 as part of a groundwater study (USAEHA 1988b). No groundwater contamination was detected in the initial sampling event. The USAEHA sampled these three wells again in 1992. Analytical data from these groundwater samples showed concentrations of chromium and silver up to 3.75 and 0.302 milligrams per liter (mg/L) (equivalent to parts per million [ppm]), respectively. Total dissolved solids (TDS) were detected at concentrations up to 16,000 mg/L. Also detected in well W4-3 were low levels of toluene and styrene at concentrations of 0.2 and 0.4 microgram per liter (µg/L) (equivalent to parts per billion [ppb]), respectively. Another monitoring well (a 1.5-inch-diameter piezometer designated PZ4) was installed in the southwest quadrant of the presumed Landfill 4 site by the U.S. Geological Survey in 1976 (U.S. Army Center for Health Promotion & Preventive Medicine [USACHPPM] 1995). PZ4 was included in subsequent groundwater sampling for the Landfill 4 RFI.

3.0 INVESTIGATION ACTIVITIES

This section describes the field and analytical methods used to complete the RFI for Landfill 4. Discussions include equipment used and procedures followed to assure quality during sample collection activities. Laboratory analytical methods are summarized in Tables 3-1, 3-2, 3-3, and 3-4 for groundwater samples, soil samples, miscellaneous, and source water samples, respectively. Additional information on field procedures and analytical quality assurance programs is provided in the SAP (Rust 1994), the RFI Work Plan (Earth Tech 2000b), the QCSR (Rust 1995b), and the QCSR Addendum (Earth Tech 2001b). DQOs and a discussion of the data quality levels generated during this investigation are presented in Sections 2.4 and 2.5.

Several RFIs were conducted at the Landfill 4 site between 1995 and 2001. Activities included soil boring and sampling, soil gas monitoring, monitoring well installation, groundwater sampling, trenching, and surface water and sediment sampling. Details of these activities are discussed in the following subsections.

3.1 SITE CLEARANCE

Prior to site mobilization to begin subsurface investigations, the investigation areas were cleared for underground utilities and structures. Utility clearances were conducted by Fort Carson personnel and other clearance companies in the Colorado Springs area. The following organizations were notified at least two weeks prior to scheduled subsurface activities so that subsurface utilities beneath the pavement, concrete, or ground surface near the investigation sites could be located: Fort Carson personnel (Pacific Architects & Engineers); Utility Notification Center of Colorado; City of Fountain; Fountain Valley Fry-Ark Line; and Stratmoor Hills Water District. As-built site plans provided by the USACE were also checked by Earth Tech for utility locations. Actual drilling locations were adjusted as required in the field to avoid overhead and underground utilities or obstructions.

3.2 EXISTING MONITORING WELLS

Four existing groundwater monitoring wells (W4-1, W4-2, W4-3, and PZ4) are located in the immediate vicinity of Landfill 4. Information regarding PZ4 indicates that this 1.5-inch-diameter monitoring well was actually installed as a piezometer (USACHPPM 1995). This piezometer has also been referred to by the site identification W4-4. However, in this report it will be identified as PZ4. A new permanent monitoring well, LF4MW6, was installed to replace well PZ4 due to the presence of vinyl chloride detected in samples from this well. The presence of vinyl chloride was postulated to be the result of deterioration of the PZ4 well casing material. Well PZ4 was overdrilled and LF4MW6 was placed at the former location of PZ4. Well locations are shown on Figure 3-1.

3.2.1 Well Inspection

Each well was inspected for usability in future groundwater sampling activities. Well construction details were also collected from the USACHPPM well inventory for the Phase II Geohydrologic Study at Fort Carson (USACHPPM 1995). Construction details for existing and new wells are summarized in Table 3-5.

Screened intervals were assessed during field activities by brushing the inside of the monitoring well with plastic "feelers" or ties. The plastic ties were attached to a 100-foot steel measuring tape weighted by a steel rod. A small round disc was also attached to the measuring tape to brush the inside of the well casing. The tape was lowered to the bottom of each well, and then it was slowly raised until a distinction was made between the rough well screen and the smooth blank well casing. The distinction was made both by feel and by the sound of the plastic ties brushing the inside of the well casing. Measurements were recorded from the top of the inner casing. Survey coordinates and elevations for these wells (presented in Appendix B) were measured as part of the field program described in Section 3.15. The existing wells were not developed as part of this investigation because it was assumed they had been developed following their installation.

3.2.2 Purging and Sampling

The existing monitoring wells were sampled in April and May 1995. PZ4 was sampled in November 2001 and W4-1 was sampled in December 2001. In addition, W4-1, W4-2, and W4-3 were sampled

on an annual basis in 1999, 2000, and 2001 for the Quarterly Groundwater Monitoring Program (QGMP). Groundwater monitoring analyses for each well and each event are shown in Table 3-1. Each well was purged before sampling to ensure that samples were representative of natural groundwater. Before purging, the groundwater elevation and total well depth were measured with an electrical water level meter. The elevation was measured from the top of the well riser pipe and was determined to within an accuracy of ±0.01 foot. The purge method (bailing or pumping) was determined after considering several factors, including the accessibility of each well location, the volume of water to be purged, and the recharge rate of the groundwater in the well. Analytical samples were collected after three to five well volumes were purged from each well, when possible, and field parameters (pH, temperature, specific conductance, and turbidity) stabilized to 0.2 pH unit or a 10 percent variation around the mean of four successive specific conductance, temperature, and turbidity measurements. Field parameters were measured at the start of purging and twice per casing volume removed, when possible. Purging ceased when a well was pumped or bailed dry three times. Purging was accomplished using a clean, disposable polyvinyl chloride (PVC) bailer attached to a new, clean nylon rope, or by using the piston pump. The pump was decontaminated prior to purging and sampling each well.

Sampling was typically conducted immediately after purging and no later than three hours following purging, unless well recharge required a longer recovery time. Well PZ4 required two to three days to collect an adequate sample volume for a full suite because of the very low recharge rate in the well. The USACHPPM Study (1995) reported that the screened interval of PZ4 was only 2 feet long, which was confirmed when the well casing was pulled out of the ground as described in Section 3.3.1. Collecting groundwater samples from this well required several days because the well capacity is small and the recharge rate is slow. Samples requiring chemical preservatives were placed in pre-preserved sample containers. Samples were collected using a new PVC, polyethylene disposable bailer, or the piston pump. Samples for metals analyses were filtered using a disposable 0.45-micron inline filter. Dedicated nylon rope was used to lower and retrieve the bailer from the well. The rope was not allowed to contact the ground during the purging or sampling procedures and was discarded after use at each well.

3.2.3 PZ4 Removal and Testing

As discussed above, well LF4MW6 was installed to replace PZ4. Prior to the removal of well PZ4, the well was sampled in accordance with the Letter Work Plan for Additional Field Activities at Landfill 4 (Earth Tech 2001a). These sampling activities included deployment of a passive diffusion bag sampler in well PZ4 prior to its replacement with LF4MW6. The purpose of the diffusion sampler was to provide additional information on the vinyl chloride detections in water samples from PZ4, which were believed to be the result of leaching from the PVC well material. This hypothesis was supported by an EPA paper on the potential for vinyl chloride detections in water samples collected from water distribution systems constructed of PVC piping manufactured prior to 1977. According to the USGS well construction information, well PZ4 was installed in 1976. The EPA paper is included as Attachment A to the Letter Work Plan for Additional Field Activities at Landfill 4.

The passive diffusion bag sampler was constructed of low-density polyethylene tubing filled with deionized water and sealed with a heat sealer. The sampler was 24 inches long and 1.25 inches in diameter. The inner casing diameter for well PZ4 was 1.5 inches, and the well screen was 2 feet in length. The total depth of PZ4 was about 12 feet from top of casing. Depth to water in PZ4 at the time of sampling was 2.6 feet below top of casing. The diffusion sampler was deployed in PZ4 so that the location of the 2-foot sampler coincided with the 2-foot screen near the bottom of the well.

The diffusion sampler was retrieved from the well about 2 weeks after deployment (November 8, 2001, labeled PZ4) to allow time for equilibration between the diffusion sampler and the surrounding groundwater. The diffusion sampler was pulled gently out of the well and the top cut off so that the sample containers could be filled immediately with its contents. One sample for VOC analysis was collected from the diffusion sampler. There was not an adequate sample volume for collection of a field duplicate sample. An equipment blank sample (LF4EB02) was also collected at the same time as the field sample. The equipment blank sample was collected from a clean, unused diffusion sampler to confirm that the deionized water present within the diffusion sampler did not contain any contaminants. Both the PZ4 diffusion sample and the equipment blank sample were submitted for VOC analysis.

Following collection of the diffusion sample from PZ4, the well was purged and sampled using traditional sampling methods. The well was purged dry on November 8, 2001, and allowed to recharge over night before collection of a groundwater sample for VOC analysis. The groundwater sample was collected from PZ4 on the following day (November 9, 2001). The results of the diffusion and traditional groundwater samples from PZ4 are discussed in Section 4.2.3.1.2.

Immediately prior to replacing PZ4, the existing well screen and casing were pulled out of the ground on November 13, 2001, using the drill rig. The casing and screen were removed whole from the ground and photographed. The photographs are included in Appendix C. The bottom 2 feet of the well screen was cut into pieces, placed into sample jars (labeled PZ4, with a medium type of PVC), and submitted to the laboratory for analysis in an attempt to determine if vinyl chloride appeared to be leaching from the screen material. The pieces of PVC were subjected to two types of testing. The first type of testing consisted of placing some of the sample in deionized water for 24 hours with minimal headspace. The resulting leachate/extract was then analyzed by Method 8260B. The second type of testing consisted of using the synthetic precipitation leaching procedure (SPLP) defined as Method 1312. In this procedure, the screen sample is placed in a container of deionized water with a pH maintained utilizing nitric and sulfuric acids to simulate leaching through a soil with acid rain. The mixture is subjected to an 18-hour rotary extraction. This leachate/extract was also analyzed by Method 8260B. The pH and temperature values for the samples were as follows: CAS-1 - final pH of 8.83, with a starting temperature of 22 degrees Celsius (°C) and ending temperature of 21 °C; PZ-4 - final pH of 7.14, with a starting and ending temperature of 21 °C.

In addition to analyzing the pieces of well screen from PZ4 after it was removed from the ground, a sample of current-day well screen was also analyzed in the same manner (CAS-1, also with a medium type of PVC) for comparison purposes. The casing sample was collected on December 12, 2001, and the pieces of PVC were submitted to the same laboratory and subjected to the same two types of testing as the casing sample from PZ4.

3.3 NEW MONITORING WELLS

The following sections describe drilling, installation, development, purging, and sampling procedures for the seven new monitoring wells installed at Landfill 4. The new monitoring well locations are shown on Figure 3-1.

3.3.1 Drilling and Installation

Three monitoring wells (LF4MW1, LF4MW2, and LF4MW3) were installed in March 1995, two monitoring wells (LF4MW4 and LF4MW5) were installed in January 2001, and two additional monitoring wells (FL4MW6 and LF4MW7) were installed in November 2001. Monitoring well LF4MW6 replaces well PZ4; PZ4 was overdrilled and LF4MW6 was placed at the former location of PZ4. Monitoring well locations were approved by the USACE Technical Manager prior to well installation, and drilling permits were obtained from the State of Colorado and Fort Carson before installation. Site Services, using a conventional truck-mounted drilling rig (CME-75) fully equipped for hollow stem auger drilling, performed drilling and well installation in 1995. Spectrum, using similar equipment, installed the monitoring wells in January and November 2001. An Earth Tech field geologist continuously supervised, observed, and recorded drilling and well construction operations. The work area of the drill rig, augers, drilling tools, and all downhole equipment were steam cleaned prior to use at the site, between borings, and prior to demobilization. Fort Carson provided a potable water supply for equipment decontamination. Decontamination procedures are described in Section 3.12.

Boreholes for the 2-inch inside diameter (ID) groundwater monitoring wells installed in 1995 were drilled using 3.25-inch-ID, 6.25-inch outside diameter (OD) hollow stem augers; boreholes for the 2-inch wells installed in 2001 were drilled using 4.25-inch-ID hollow stem augers. The boreholes allowed sufficient annular space for proper well construction. The same geologic logging techniques used for soil borings were followed as discussed in Section 3.8. Two geotechnical soil samples were collected from each of the three monitoring wells installed in 1995, one from above the water table and one from within the projected well screen interval, and submitted for physical testing of moisture content, grain size, and Atterberg limits. Geotechnical analysis results are provided in Appendix D. Geotechnical samples were not collected from the four wells installed in 2001. Two analytical soil

samples were collected from each of the five wells installed in 1995 and January 2001 (LF4MW1 through LF4MW5) and submitted for chemical analysis. One analytical soil sample was collected in November 2001 from the borehole for monitoring well LF4MW7. No soil sample was collected from well LF4MW6 because installation of this well involved overdrilling existing well PZ4. Geologic logging of this borehole was also not possible.

Monitoring well construction details are summarized in Table 3-5. Monitoring well screens consisted of new, threaded, flush joint, 2-inch-ID, continuous wire-wrapped, Schedule 40 PVC with a 0.010-inch slot width. Well screens were 10 feet in length (except for LF4MW6, which has a 5-foot screen) and were installed to intersect the water table. The riser pipe consisted of new threaded, flush joint, 2-inch-ID Schedule 40 PVC. Clean, new, disposable, nitrile gloves were worn when handling well screens and casings. All well casings and screens were transported and stored in plastic wrap, and personnel handling these items were not permitted to handle tools or drilling equipment while installing the well. All well materials were steam-cleaned immediately before installation.

The lengths of all screen and riser sections, bottom caps, etc., were measured and recorded on the Well Completion Detail Form (Appendix E). The desired sections of well screen and riser pipe were assembled and lowered through the augers to the bottom of the borehole. Wells were constructed inside the augers with approximately 5 feet of screen below and 5 feet of screen above the apparent water table wherever possible, so that any potential light non-aqueous phase liquids floating on the water surface could be sampled and analyzed. Clean 10-20 grade silica filter sand was poured through the augers while the augers were pulled back incrementally to construct a continuous filter pack within the borehole annulus. The depth to the sand pack was measured repeatedly using a decontaminated stainless steel tag bar attached to a fiberglass measuring tape to monitor the sand level inside the augers as the filter pack was constructed. The filter pack extended to only about 1 foot above the top of the screen in LF4MW1, LF4MW2, LF4MW3, LF4MW5, and LF4MW6 due to shallow water tables and limited completion zones. This deviation from the SAP, which is documented in a Corrective Action Form (CAF) found in Appendix F, should not affect the quality of the water sampled from these wells.

A 2-foot-thick bentonite seal was constructed by pouring commercially manufactured sodium bentonite chips (crumbles) and pellets through the augers. The bentonite seal was installed in two 1-foot lifts, with each lift hydrated with potable water before proceeding with the next lift. The bottom lift was composed of sodium bentonite chips, and the top lift was composed of the sodium bentonite pellets. After placing the final lift, the bentonite seal was allowed to hydrate for a minimum of 2 hours prior to grouting. The SAP required that the bentonite seal be installed in four 6-inch lifts. This deviation from the SAP, which is documented in a CAF found in Appendix F, will not affect the quality of the monitoring well construction or quality of the groundwater sampled.

The remaining annular space was tremie grouted from the top of the bentonite seal to near surface grade with cement/bentonite grout. Grout consisted of not more than 6 gallons of clean potable water per 94-pound bag (1 cubic foot) of Portland Type I Cement (American Society for Testing and Materials [ASTM] C150). Approximately 3 percent (by weight) bentonite powder was added to reduce shrinkage and the heat of hydration. Well plumbness was checked in each well by running a 10-foot-long section of 1-inch-OD PVC pipe through the entire length of the well to check its alignment. The results of the plumbness tests are documented on the corresponding Daily Quality Control Report (DQCR) found in Appendix A of the QCSR, and showed that all wells were constructed straight. Monitoring well completion details are included on the soil boring logs presented in Appendix G of this report and on the Well Completion Detail Forms in Appendix E.

All wells, except LF4MW4 and LF4MW7, were completed above ground. Monitoring well LF4MW4 was completed as a flush-mount well because it is located in a trafficked area of asphalt. Monitoring well LF4MW7 was also completed as a flush-mount well because it is located immediately adjacent to Specker Avenue. For the above-ground wells, a protective steel casing was set and cemented below the ground surface and extended 2 to 3 feet above the ground surface such that it will not hinder the collection of groundwater samples from the well. The casing contains a locking key cap and brass lock, keyed alike to other wells installed as part of Fort Carson projects. All protective casings were installed with a weep hole to facilitate drainage of water that could collect in the annular space between the well riser and protective casing. The outside of each protective casing was painted white as specified by the Directorate of Environmental Compliance

and Management representative. In addition, an identification tag containing the well number, total depth, date of installation, adjusted top of casing elevation, and "U.S. Army Corps of Engineers, Omaha District" was attached to each new monitoring well after completion of investigation activities. Square concrete pads, a minimum of 3 feet on each side, 6 inches thick, and sloping away from the well were constructed after completion of well installation activities. Four approximately 3-inch-diameter concrete-filled steel posts, equally spaced around the well, were cemented firmly into the ground around the concrete pad to protect the well.

3.3.2 Development

Development of the newly installed wells began a minimum of 48 hours after well completion. Development was accomplished by mechanical surging and bailing with a stainless steel or disposable PVC bailer for a period of 2 hours, followed by continuous pumping using a pump, if the wells were able to produce a sufficient amount of water. Groundwater temperature, pH, specific conductance, and turbidity were monitored as indicator parameters during pumping. Parameter measurement frequency ranged from about one measurement per each casing volume removed (wells with low yields) to one measurement every 15 minutes (wells with higher yields). These parameters were recorded on Well Development Records. Development continued until the indicator parameters stabilized at less than 0.2 pH unit or less than a 10 percent deviation from the average of four successive specific conductance and temperature measurements, in accordance with the SAP and USACE General Geology SOS (USACE 1992). In addition, well development continued until most suspended solids were removed to obtain samples that were not highly turbid.

When the well yields were too low to permit continuous pumping or bailing, development was performed in cycles of bailing the well dry for a total of 2 hours or until continuous pumping was achieved. After final development, water was collected from the well in a clear glass jar, and the water sample was labeled and photographed. Copies of these photographs are included in Appendix C. Well development information was recorded on the Well Development Record (Appendix H). All well development fluids were collected in Department of Transportation (DOT)-approved 55-gallon drums in preparation for disposal.

3.3.3 Purging and Sampling

Several rounds of groundwater samples were collected from the new monitoring wells. Wells LF4MW1, LF4MW2, and LF4MW3 were sampled in April 1995 after they were installed and again in February 2001 as part of the RFI. Wells LF4MW4 and LF4MW5 were also sampled in February and August 2001 following their installation. Monitoring wells LF4MW6 and LF4MW7 were sampled in January and April 2002. In addition, LF4MW1, LF4MW2 and LF4MW3 were included in Fort Carson's QGMP in 1996, 1997, 1998, 1999, 2000, 2001, and 2002. Groundwater monitoring parameters for each well and each sampling event are shown in Table 3-1.

Samples were collected from the new monitoring wells no sooner than 2 weeks following well development. All equipment used for water level measurement, well purging, and groundwater sampling was decontaminated prior to use in accordance with the procedures described in Section 3.12. Groundwater sampling data for all wells monitored, including a description of the sampling locations, names of sampling personnel, ambient weather conditions, environmental conditions that may affect sample representativeness, indicator parameter measurements, equipment used, and well purging information, were recorded on the Groundwater Sample Collection Log (Appendix I). The visible monitoring well construction materials and the apparent integrity of each well were also evaluated and noted.

Each well was purged before sampling to ensure that samples were representative of natural groundwater. Before purging, the groundwater elevation and total well depth were measured with an electrical water level meter. The elevation was measured from the top of the well riser pipe and was determined to within an accuracy of ±0.01 foot. The purge method (bailing or pumping) was determined after considering several factors, including the accessibility of each well location, the volume of water to be purged, and the recharge rate of the groundwater in the well. Analytical samples were collected after three to five well volumes were purged from each well, when possible, and field parameters (pH, temperature, specific conductance, and turbidity) stabilized to 0.2 pH unit or a 10 percent variation around the mean of four successive specific conductance, temperature, and turbidity measurements. Field parameters were measured at the start of purging and twice per casing volume removed, when possible. Purging ceased when a well was pumped or bailed dry three times.

Purging was accomplished using a clean, disposable PVC bailer attached to a new, clean nylon rope, or by using the piston pump. The pump was decontaminated prior to purging and sampling each well.

Sampling was typically conducted immediately after purging and no later than 3 hours following purging, unless well recharge required a longer recovery time. Samples requiring chemical preservatives were placed in pre-preserved sample containers. Samples were collected using a new PVC or polyethylene disposable bailer or the piston pump. Samples for metals analyses were field filtered using a disposable 0.45-micron inline filter. Dedicated nylon rope was used to lower and retrieve the bailer from the well. The rope was not allowed to contact the ground during the purging or sampling procedures and was discarded after use at each well.

3.4 TRENCHES

Nineteen trenches (LF4TP01 through LF4TP19) were excavated in August 1998 and four trenches (LF4TP20 through LF4TP23) were excavated in January 2001. Trench locations are shown on Figure 3-2. The objective of the trench excavation activity was to assess the landfill boundaries and determine whether waste materials are present west of B Ditch.

Trenches were excavated by removing soil in 6-inch to 1-foot lifts. Each backhoe bucket of removed material was visually assessed for the presence of landfill materials. The trenches were backfilled immediately if waste materials were encountered. All excavated materials were placed on plastic sheeting and were used to backfill the excavation. Trench excavation progress was logged on a Test Pit Report Form, which documented subsurface conditions, length, width, depth, the orientation of each trench and all materials encountered (Appendix J). Excavation depths ranged from 4.5 feet bgs (LF4TP15) to 20 feet bgs (LF4TP18). The lithology of most of the trenches can be described as fill material overlying a silt layer. Both weathered Pierre Shale and groundwater were encountered in most trenches throughout the area investigated.

A black organic layer with a slight humic odor was noted in nine of the trenches excavated in 1998, most of them west of B Ditch. The 6-inch to 1-foot layer of black organic matter, described as

containing decaying roots, grass, and other vegetation, was usually encountered at 4 to 10 feet bgs. Trenches where the black organic layer or landfill material was observed are indicated on Figure 3-3. The black organic layer was not sampled in the 1998 trenching investigation because it was thought to represent a former soil horizon. Subsequently, there was a concern that the black organic layer could be an indication of the presence of the sewage and POL sludge that were reportedly disposed at the landfill in 1957. Therefore, four trenches were excavated in January 2001 to evaluate the extent of the black organic layer west of B Ditch in the southwest area of the site and collect samples of any black organic material encountered. An olive-black material presumed to be similar to the black organic material was observed in trenches LF4TP22 and LF4TP23. Two samples (LF4EX22 and LF4EX23) were collected for laboratory analysis of VOCs, SVOCs, metals, and total organic carbon (TOC).

The landfill boundary, as shown on Figure 3-3, was delineated based on locations where landfill debris was encountered. Significant amounts of landfill debris, consisting primarily of concrete, metal, bricks, wood, and nails were encountered in LF4TP09 and LF4TP15. The debris thickness in LF4TP09 increased as trenching continued north to the asphalt. Debris was encountered again north of the asphalt in LF4TP15. No debris was found east or west of the asphalt. Thus, the trenches containing debris place the footprint of the landfill directly under the asphalt between LF4TP09 and LF4TP15. Trenching activities ceased once debris was identified.

During the construction of Building 320 north of the outlined landfill area in November 1999, additional landfill material was encountered and excavated. This suggests the boundary extends north under Building 320, as shown on Figure 3-3.

Although traces of road base and construction concrete debris were observed in LF4TP03, LF4TP04, LF4TP18, and LF4TP19, these materials were generally characterized as fill material. The presence of this debris does not indicate that landfill activities occurred as far west as these trenches.

3.5 SURFACE WATER AND SEDIMENT SAMPLING

Three co-located surface water and sediment samples were collected from B Ditch in June 1999 for characterization (Figure 3-4) following sampling methods described in the FLPM (Rust 1997 and 1998). Surface water and sediment samples were analyzed for metals, VOCs, aromatic hydrocarbons, and SVOCs.

B Ditch was dredged and channelized in November 2000 as part of planned surface water control improvements. During this activity, no trash was observed along the channel sideslopes. The material that was observed along the sideslopes consisted of reworked weathered Pierre Shale as fill material.

3.6 SOIL GAS SAMPLING

Twenty-two soil gas sampling points were installed in February 2001 to assess the presence of pressure and gases generated from waste decomposition and to screen for potential organic contaminants in the wastes (Figure 3-5). Ten points were installed within the landfill boundary, and 12 points were installed outside the boundary, including nine points on the west side of B Ditch. Of the 12 points installed outside the boundary, four points were installed at former trench locations (LF4TP04 [LF4SG20], LF4TP09 [LF4SG9], LF4TP18 [LF4SG21], and LF4TP19 [LF4SG19]) where the black organic layer was previously identified.

To obtain samples both inside and outside of the landfill, the post driver method was used to penetrate the ground surface. Temporary gas sampling rods were installed in the vadose zone in accordance with 40 Code of Federal Regulations (2000). Each probe consisted of a pre-cleaned 5.25-foot-long by 0.38-inch-OD steel sampling rod. The RFI Work Plan called for sampling rods to be pushed to a depth not less than 3 feet, then lifted no more than 0.5 feet to create a void space. Due to the presence of shallow groundwater at sampling location LF4SG08, the probe rod was pushed to a depth of only 2 feet bgs. At all other sampling locations, the probe rods were pushed to a depth of 4 to 6 feet bgs.

Each sample rod was sealed at the ground surface with hydrated bentonite to ensure a good seal between the soil and the sample rods. After the sample rods were sealed in place, a Teflon® cover was placed on top of the rods to prevent ambient air from entering the rods or subsurface vapors from escaping. The sample rods were left undisturbed for 24 hours to ensure the bentonite had fully hydrated and that the subsurface vapors exposed to the sample rod had equilibrated between the sample rod and the soil. A pressure meter was used to evaluate the pressure within the sampling probe prior to collection of soil gas samples. A multigas meter was used to analyze soil gas samples for methane, LEL, hydrogen sulfide, oxygen, and carbon dioxide. A photoionization detector (PID) was used to screen the soil gas samples for VOC vapors.

No VOC vapors were detected in any of the probes. However, five samples (LF4SG02, LF4SG06, LF4SG18, LF4SG20, and LF4SG21) had measurable levels of methane (Table 4-6). Gas samples were collected from each of these probes and submitted to an off-site laboratory for analysis of oxygen, nitrogen, methane, and carbon dioxide by EPA Method 3C. Method T014 was not performed on the samples because no VOCs were detected in the field screening samples. The laboratory samples were collected by first evacuating the void space within the sample rod four or more times using a personal pump. After the rod void volume was purged, a SUMMA™ canister provided by the analytical laboratory was attached to each sample rod. SUMMA™ canisters are small stainless steel sample vessels under 30 inches of mercury vacuum. A soil gas sample was collected by opening the regulator/valve on the SUMMA™ canister and allowing the gas to fill the evacuated canister.

One additional soil gas sample was collected from monitoring well PZ4 at the request of CDPHE. It was noted by the field personnel that the water level in the well at the time of sampling was above the screened interval of the well. The sample was collected by sealing off the end of the monitoring well casing using a rubber end cap. The well was left capped for 24 hours before field screening was conducted. There were no detections of methane, hydrogen sulfide, carbon dioxide, or VOCs in this sample.

3.7 DIRECT PUSH SOIL BORINGS AND INSTALLATION OF TEMPORARY GROUNDWATER MONITORING WELLS

Six direct push soil borings were completed in January 2001 (LF4DP1, LF4DP2, LF4DP3, LF4DP4, LF4DP5, and LF4DP6), as shown on Figure 3-6. All direct push borings were completed as temporary monitoring wells to obtain grab samples for groundwater analysis. In addition, soil samples were collected from each boring to evaluate the black organic layer noted in test pits and monitoring well installations.

3.7.1 Direct Push Soil Borings

The six soil borings were drilled using a truck-mounted direct push drilling rig. The drilling was conducted using 1.5-inch OD direct push drilling rods to allow for the installation of temporary monitoring wells. Soil samples were collected continuously for lithologic description during drilling. Additional samples were collected at each sample interval (typically 4 feet) for headspace screening and potential laboratory analysis. The borehole was advanced until groundwater was encountered (anticipated depth of 5 to 10 feet) or refusal.

3.7.2 Soil Analysis

Soil samples were collected for laboratory analysis from the black organic material interval or from the interval that displayed the highest field headspace results. If there was no black organic layer or if headspace-screening results indicated no VOCs, the sample was collected from immediately above the water table interface. In addition, a soil sample was collected from the bottom of each boring. Soil samples from all six soil borings were analyzed for VOCs, SVOCs, and metals. Any samples of the black organic material were also analyzed for TOC.

LF4DP06 was installed on the west side of B Ditch, within about 11 feet of LF4MW1, in an attempt to collect a sample of black-stained soil that was encountered at 7.5 feet during the installation of the well. Although no black organic material was observed in the direct push sample, a soil sample was collected for analysis from the 7.5- to 8.5-foot interval.

3.7.3 Temporary Groundwater Wells

Temporary monitoring wells were constructed in all of the direct push borings. The screens were placed to bracket the water table interface. The monitoring well screens were constructed of 1-inch ID, flush-threaded Schedule 40 PVC. The screens were machine-slotted with a screen slot opening of 0.010 inch, and the maximum length of each screen was 10 feet. The well casing consisted of flush-threaded Schedule 40 PVC. All PVC well screen and riser sections were rinsed with clean water prior to being placed in the ground unless they arrived at the site factory wrapped. Clean 10-20 grade silica filter sand was used as a sand pack around the well screen and extended 1 to 2 feet above the top of the well screen. A 1- to 4-foot-thick bentonite seal was placed above the sand pack and consisted of sodium bentonite chips (crumbles) and pellets hydrated with one gallon of source water (i.e., water from Fort Carson's potable water supply). This amount of hydration water is greater than that typically used for hydration of bentonite seals. The monitoring wells were constructed as temporary aboveground installations.

The direct push rods, drilling tools, and all downhole equipment were decontaminated between uses at each soil boring location in accordance with the procedures identified in Section 2.15 of the FLPM (Rust 1998). The decontamination fluids and drill cuttings were placed in new DOT-approved 55-gallon drums and handled as discussed in Section 5.5 of the RFI Work Plan (Earth Tech 2000b).

3.7.4 Groundwater Analysis

Groundwater samples were collected in January 2001 using 0.75-inch-OD disposable bailers immediately following completion of the temporary wells. The temporary monitoring wells were not developed because of the small size of the wells and their temporary nature. Purging was not conducted prior to collection of the groundwater samples because the groundwater samples were collected on the same day the wells were installed. Groundwater quality parameters were not collected. Only the required volume for analysis was collected. Groundwater samples were analyzed for VOCs, SVOCs, and metals using the methods identified in Table 3-1. In addition, a preserved VOC sample was collected and submitted for analyses by Method 8021 to evaluate the potential presence of aromatic hydrocarbons. Groundwater samples collected for dissolved metals analysis were field-filtered using a disposable 0.45-micron filter.

3.7.5 Resampling of Temporary Monitoring Wells

The analytical data from the temporary well groundwater samples collected in January 2001 included detections of trihalomethane compounds (chloroform, bromodichloromethane, and dibromochloromethane), as discussed in Section 4.2.3. The concentrations of trihalomethane compounds in these samples were within the range of the concentrations of trihalomethanes detected in historical source water samples and slightly below the concentrations in the most recent source water samples. These results indicated that the temporary well groundwater samples were not representative of the aquifer at these locations, but rather consisted in part of source water introduced into the well during well construction activities (bentonite seal hydration). Because the temporary wells were not purged prior to sampling, any source water introduced into the well would have remained in the well with the subsequent potential for sampling this water. Results of these samples are not further evaluated in the text or shown on figures.

Resampling the temporary monitoring wells was therefore conducted to provide accurate groundwater quality information for the aquifer at each of the temporary well locations. The temporary wells were purged prior to sampling to ensure that all source water was removed from the wells and that the samples were representative of natural groundwater. Before purging, the groundwater elevation and total well depth were measured and recorded on the Groundwater Sample Collection Log (see Appendix I). The wells were purged a minimum of three casing volumes by pumping. Field parameters (temperature, pH, specific conductance, and turbidity) were recorded during purging. Samples for laboratory analyses were collected after the minimum number of casing volumes was purged from the well and the field parameters stabilized to 0.2 pH unit or a 10 percent variation around the mean of four successive specific conductance, temperature, and turbidity measurements. In the case of low yield wells, the well was pumped dry three times.

Groundwater samples were collected using new disposable bailers. Samples requiring chemical preservatives were collected in pre-preserved sample containers. Samples for metals analyses were field-filtered using disposable 0.45-micron inline filters. Dedicated nylon rope was used to lower and retrieve the bailer from the well. The groundwater samples were analyzed for VOC, SVOCs, benzene, toluene, ethylbenzene, and xylenes (BTEX), and target analyte list (TAL) metals using the methods listed in Table 3-1. If inadequate water was present in a temporary well, the samples for

analyses were collected in the following order of priority, from highest to lowest: VOCs, BTEX, SVOCs, and TAL metals.

3.8 SOIL BORINGS

Four soil borings (LF4SB1, LF4SB2, LF4SB3, and LF4SB4) were installed at the landfill and around the buildings in January 1995 (Figure 3-7). Soil boring locations were approved by the USACE Technical Manager prior to drilling. Borehole drilling was performed by Site Services using a conventional truck-mounted CME-75 drilling rig equipped for hollow stem auger drilling. A field geologist continuously supervised and observed drilling operations. After sampling, the boreholes were abandoned as described in Section 3.10.

Soil borings were drilled using 3.25-inch-ID and 6.25-inch-OD hollow stem augers. Drilling and sampling continued until auger refusal (bedrock) or groundwater was encountered. Water levels noted during drilling were approximately 10 to 15 feet bgs. As the augers were advanced into the borehole, soil samples were collected continuously using a stainless steel, 5-foot-long, 3-inch-OD continuous core barrel. The continuous core sampler was used instead of the 2-inch split spoon sampler to obtain sufficient sample volume for duplicate and split sample aliquots. Because the core barrel was driven continuously, no blow counts were obtained. Soil encountered in each boring was described and logged by the field geologist using the visual/manual techniques described in ASTM D-2488-90 (ASTM 1994) and in accordance with the Unified Soil Classification System (USCS). Observations made while drilling and the results of field headspace screening were recorded on soil boring logs. Boring logs and headspace screening results are presented in Appendices G and K, respectively.

Soil samples were collected for geologic logging, headspace screening, and chemical analysis. Four soil samples for potential chemical analysis were collected from each boring from the 0 to 1-foot, 4 to 5-foot, 9 to 10-foot, and 14 to 15-foot intervals. However, only two sample intervals from each boring were submitted for laboratory analysis based on headspace analysis. The headspace analysis procedure is described in Section 3.9. The sample from the interval that exhibited the highest headspace reading and the first “clean” sample after the deepest observed contamination were

submitted for laboratory analysis for metals, polychlorinated biphenyls (PCBs), VOCs, and SVOCs. If the headspace readings were all non-detect, the samples from the 5- and 15-foot intervals were submitted for laboratory analysis. Samples for metals, PCBs, and SVOCs were generated by compositing the required amount of soil in a stainless steel bowl. Subsamples for VOC analyses were immediately transferred into clean, labeled, laboratory-supplied sample jars. The analytical samples were stored in ice-filled coolers and chilled to 4 °C pending the results of field headspace analysis.

3.9 FIELD HEADSPACE SCREENING

Field headspace screening was conducted on aliquots of all soil samples collected during soil boring and monitoring well construction to assess the potential presence of VOC contamination and as an aid in analytical sample selection. VOC field screening was performed using a calibrated Thermo Environmental Instruments Model 580B PID. PID calibration is discussed in Section 3.18. Screening results are contained in Appendix K.

Soil was collected in a clean, new plastic bag lining the inside of a clean 16-ounce jar, so that the jar was about half filled. The jar was sealed with a continuous sheet of aluminum foil and secured with the jar lid. There were no holes in the foil cap, and the foil was tight against the mouth of the jar. The sample jars were agitated vigorously for 15 seconds, and then the sample was allowed to volatilize for a minimum of 10 minutes. During cold weather, the samples were warmed in the vehicles to near room temperature. Following the 10-minute volatilization period, the jar was agitated again and the lid was removed. The headspace was sampled with the PID by piercing the aluminum foil cap and inserting the PID probe into the headspace. The peak volatile concentration detected was recorded directly from the PID display screen.

PID measurements from headspace soil samples were recorded on Jar Headspace Testing Logs (Appendix K). A background PID reading and an estimated temperature measurement were also collected simultaneously with the headspace readings, however, headspace readings were not adjusted to compensate for background readings. Field headspace measurements were also recorded on the soil boring logs (Appendix G), which also included ambient air background PID readings and

field breathing zone measurements. In addition to field headspace screening, the PID was used for health and safety purposes, and these measurements were recorded on the Direct Reading Instrument Logs.

3.10 BOREHOLE ABANDONMENT

All boreholes created by either the direct push method or by auger drilling were abandoned by backfilling with cement grout in accordance with State of Colorado Water Resources Division and USACE requirements. The grout consisted of a mixture of Portland cement and water in the proportion of approximately 6 gallons of approved water per 94-pound bag of cement. In addition, approximately 3 percent by weight sodium bentonite powder was added to the mixture. After the grout had set, the concrete or asphalt surface, if present, was repaired by plugging with similar materials of comparable thickness. A survey stake, pin flag, or other marker was inserted in the center of each borehole so that the area could be relocated and surveyed.

3.11 SOURCE WATER SAMPLING

Several potable water samples were collected at Fort Carson to ensure the water used for decontamination and other investigation activities did not contain constituents that could adversely affect the results of this study. Fort Carson personnel identified water taps at Building 1399, near the Equalization Basin, at Building 1304, near the intersection of Wetzel Avenue and Ellis Street, and Building 9246 as the collection points for Fort Carson's potable water source that the field program would use for steam-cleaning, well drilling, borehole grouting, and other field activities. In addition, the Earth Tech field trailer was also utilized as a location to obtain source water for these activities. Analytical results of all four taps are discussed because source water was obtained from all four sources during the RFI and QGMP activities that resulted in data for this RFI. These taps access the City of Colorado Springs water supply. The samples were analyzed by the methods shown in Table 3-4.

Multiple samples were collected from the tap at Building 1399 and analyzed as part of the QGMP and other RFI activities. These source water samples were collected directly from a hose connected to the source water discharge point. Some metals samples were filtered with a pressurized

disposable bailer and a 0.45-micron filter. The water tap at Building 1399 was destroyed during recent construction at the Equalization Basin and is no longer used.

Samples have been collected from the tap at Building 1304 and analyzed as part of the QGMP since May 1996. This source consists of a high-flow overhead hose typically used for filling large tanks. The source water samples collected during the QGMP were obtained by collecting a volume of water in a new, rinsed 5-gallon bucket, transferring the water in a new pressurized disposable bailer, and filling the sample containers from the bailer. Some metals samples were filtered with a pressurized disposable bailer and a 0.45-micron filter.

Samples were collected from the tap at Building 9246 and analyzed as part of the QGMP and other RFI activities, beginning in January 1999. This source is similar to Building 1304 in that it also consists of a high-flow overhead hose. Samples were collected by collecting a volume of water in a clean container, transferring the water in a new pressurized disposable bailer, and filling the sample containers from the bailer.

Since June 2000, samples have been collected from the Earth Tech field trailer tap and analyzed as part of the QGMP and other activities. These source water samples were collected directly from a hose connected to the source water discharge point.

3.12 DECONTAMINATION PROCEDURES

Augers and downhole tools used for drilling were decontaminated between boring and well locations using pressurized hot water from a steam cleaner. In addition, soil samplers were decontaminated between sampling intervals with a steam cleaner. Potable water supplied by Fort Carson was used as the water source. Decontamination was conducted using a mobile decontamination rig that included a steam cleaner and a trough that collected the decontamination water, which was then transferred into new 55-gallon drums located at each site.

Smaller equipment, such as stainless steel bowls, water level probes, bailers, down-hole pumps, shovels, hand augers, and post-hole diggers, were decontaminated between each sample with a

non-phosphate laboratory detergent and potable water wash with a brush, followed by a potable water rinse and deionized water rinse. When possible, smaller equipment was steam cleaned rather than the detergent wash and rinse. If any soil or contamination was visible after decontamination, the equipment was re-steam cleaned or washed and rinsed until clean. Following decontamination procedures, all sampling equipment was wrapped in aluminum foil or stored on a clean surface to prevent possible re-contamination.

The piston pump used for well development and sampling was decontaminated prior to sampling and after collecting each groundwater sample. The outside of the pump and tubing that came in contact with groundwater was washed with a mixture of potable water and Alconox and rinsed with deionized water. The inside of the pump and tubing was decontaminated by pumping 5 gallons of a mixture of potable water and Alconox followed by 2 gallons of deionized water.

3.13 SAMPLE LABELING

Each soil and groundwater sample was labeled with a unique identification number consisting of a site identifier, sample type identifier and sample location number.

- Site Identifier:
  LF4 - Landfill 4

- Sample Type Identifier:
  SB - Soil Boring
  MW - Monitoring Well
  DP - Direct Push (soil and groundwater)
  EX - Soil sample from test pit
  SC - Source Water
  SW Surface Water
  SG - Soil Gas
  SD - Sediment

- Sample Location Number:
  A unique sequential number identifies each sampling location. The depth at which the sample was collected, the aliquot type (field sample, field duplicate, etc.) and the medium type are all recorded and included in the analytical database.

The following are examples of sample designations used for the samples collected.

Soil Gas Sample	Direct Push Sample	Soil Boring Sample	Monitoring Well Groundwater Sample	Surface Water Sample	Sediment Sample
LF4SG01	LF4DP1	LF4SB1	LF4MW2	LF4SW1	LF4SD1

For groundwater samples collected from existing wells, the well name was used (e.g., W4-1). A predetermined number of split samples were sent to the Environmental Chemistry Branch Laboratory with the Information Management Systems Project Identification Number of 2604. This identification number was also indicated on the COC form.

3.14 SAMPLE HANDLING AND SHIPPING

Samples were shipped daily in coordination with the analytical laboratory to enable analysis within holding times. Upon receipt in the laboratory, the Sample Receiving Supervisor opened the shipping containers, compared the contents with the COC record, ensured that document control information was accurate and complete, and dated the form. A sample receipt form was also used by the laboratory to log sample receipt and document sample integrity upon arrival. These forms are provided in the Analytical Data Package submitted as part of the QCSR.

3.15 SURVEYING

Surveying of new and existing monitoring wells, soil borings, and trenches excavated in 1998 was accomplished by Leigh Whitehead & Associates, a Registered Land Surveyor licensed in the State of Colorado, using total station surveying methods. Montgomery-Phillips, Inc., performed surveying in 2001. All monitoring wells were resurveyed in 2001. A Global Positioning System (GPS) was utilized to determine the horizontal coordinates of the soil gas points and the corners of Buildings 320 and 330. The four new trenches excavated in 2001 were not surveyed and their location on figures of the site are approximate. The coordinates and ground surface elevations, as well as the elevation of the top of the PVC monitoring well casing, were determined to the closest 0.01 foot vertically and 1 foot horizontally (Appendix B). The surveyed coordinates were referenced to the North American Datum of 1983 and the Colorado State Plane Coordinate System, and the elevations

were referenced to the North American Vertical Datum of 1988. The reference point was permanently marked with an indelible marker on the PVC riser pipe of each monitoring well for groundwater level measurements. Survey data were recorded on each final boring log, well completion detail log, and also in the Monitoring Well Log Book, filled in by Earth Tech personnel upon survey completion.

3.16 FIELD WORK DOCUMENTATION

All field activities were thoroughly documented in indelible ink using the following forms, which are presented in Appendix E of the SAP:

- Daily Report,
- DQCR,
- Drilling Log,
- Jar Headspace Testing for Volatiles,
- Well Completion Details,
- Well Development Record,
- Water Level Data Summary,
- Groundwater Sample Collection Log,
- COC Record,
- Corrective Action Form,
- Instrument Reading Log, and
- Vehicle Inspection Form.

A Daily Report, or activity log, was maintained throughout each day, and DQCRs were also completed each day. The DQCRs are included in Appendix A of the QCSR. Copies of these two forms, with attached health and safety forms, updated site maps, boring logs, analytical data, and COC forms, were sent daily to the Earth Tech Project Manager. The original signed forms were delivered weekly to the Project Manager. The DQCRs and Daily Reports were sent to the USACE Technical Manager for review and comment. A package of DQCRs, records of communication, and boring logs/well completion diagrams for the preceding week was submitted to USACE weekly.

COC documentation was initiated by Earth Tech as samples were collected for laboratory analysis. Sample custody was maintained by Earth Tech project personnel until samples were relinquished for

shipment to the analytical laboratory. Custody documentation was confirmed at the subcontract laboratory upon sample receipt.

3.17 MANAGEMENT OF INVESTIGATION-DERIVED WASTE

Soil cuttings and discarded soil samples were placed in reconditioned DOT-approved (17H) 55-gallon drums. Wastewater, including decontamination, well development, and purge water, was containerized in new or dedicated 55-gallon drums. The drums were sealed, labeled, and collected in one central location at each site for the duration of the field activities. At the conclusion of the field program, the contents of these drums were disposed based on the analytical results of their respective soil and groundwater samples.

3.18 FIELD EQUIPMENT CALIBRATION

Calibration and maintenance of the PID, dust dosimeter, pH meter, conductivity meter, turbidity meter, water level measuring device, and LEL/oxygen/hydrogen sulfide meter used for this project were accomplished daily. Calibration and maintenance of the field equipment were conducted in accordance with the manufacturer's instructions and procedures outlined in the FLPM (Rust 1997 and 1998). Prior to using the equipment, it was checked to see that it had been maintained and was in working condition.

4.0 DATA EVALUATION

The following sections discuss field observations and analytical results for Landfill 4. Procedures for the sampling and analyses of the media investigated were described in Section 3.0. Supporting field investigation documentation is included in the appendices of this report and in the QCSR.

4.1 FIELD OBSERVATIONS

Soil and groundwater data were collected during soil boring, trenching and monitoring well installation, and sampling to investigate the potential impact of Landfill 4 on the subsurface environment. Sampling locations are shown on Figure 4-1. This section discusses the geologic units encountered, groundwater conditions, and VOC headspace measurements in soil samples collected during soil boring and monitoring well installation.

4.1.1 Soil and Bedrock Conditions

Four soil borings, six direct push sampling points, seven monitoring wells, and 23 trenches were installed to investigate the horizontal and vertical extent of soil contamination, if any, present in the vicinity of Landfill 4 (Figure 4-1). The soil borings were located in areas believed to have the highest potential levels of soil contamination based on visual assessment and historical data.

The soils encountered above bedrock in the northern portion of the landfill varied slightly from the soils encountered in the southern portion of Landfill 4. The soils in the northern part of Landfill 4 consisted of very soft to medium stiff, olive gray, damp to moist clay with little silt and trace fine-grained sand (USCS classification of CL). It was difficult to discern by field testing methods if the fine-grained soils encountered were clays or silts. According to the geotechnical analysis of soil samples collected from the monitoring well soil borings (Appendix D), the soils consisted primarily of medium plastic, inorganic clays. Calcium carbonate caliche and iron oxide staining were also present in trace amounts from the samples from the northern portion of Landfill 4. This soil was observed to extend to a maximum depth of 7.5 feet bgs where the soil/bedrock interface was encountered (Appendix G).

In the southern portion of Landfill 4, approximately 1.5 to 2 feet of fill material, which included 0.5 feet of asphalt, 1 foot of silty sand, and 0.5 feet of silty gravel, was encountered at the surface. Below the fill material, the soils encountered consisted mainly of a very soft to medium stiff, mottled olive brown and gray, moist to wet clay with varying amounts of silt, sand, and gravel (USCS classifications of CL and SC). The thickness of this soil in the southern area above bedrock is approximately 13 feet.

Weathered bedrock was encountered at this site ranging from a depth of 1.25 feet (soil-bedrock interface) at LF4SB2 to 16 feet bgs at LF4DP4. A contour map of the weathered bedrock surface (Figure 4-2) reveals a bedrock high in the area of HWSSB2 (i.e., the northern portion of Landfill 4). This bedrock high is expressed as a topographic high on both sides of B Ditch. The bedrock was soft at the soil-bedrock interface and was increasingly hard with depth. The material consisted of olive gray or olive brown, moist to wet, severely to moderately weathered claystone and/or siltstone with a blocky texture. Long horizontal fractures approximately 0.25 inch wide that cut across the soil core were encountered throughout the core sample, with iron oxide and black staining present in the fractures. At a depth of approximately 20 to 23 feet bgs, a hard, dark gray, dry, competent bedrock more massive than the overlying weathered bedrock was encountered. According to Trimble and Machette (1979), this weathered and fresh bedrock is the Upper Cretaceous Pierre Shale as described in Section 2.4. The deepest boring logged with a continuous core at Landfill 4 (LF4SB1) extended to 24 feet bgs and was drilled through 21 feet of weathered bedrock and 0.5 foot of competent bedrock before auger refusal was reached.

Cross sections illustrating the subsurface geology at this site are presented on Figures 4-3 and 4-4. One cross-sectional line trends south to north, and another line trends west to east. Three soil borings (HWSSB1, HWSSB2, and HWSSB3) from the investigation of the former DRMO hazardous waste storage site have been used in addition to borings from the Landfill 4 investigation in constructing the cross-sections and the bedrock surface map. Soil boring logs for these borings are included in Appendix G.

Based on the bedrock topography and cross-sections, a bedrock channel is evident in the southern portion of the site. The exact trend of this channel is difficult to precisely define due to the limited information presented in the boring logs for wells W4-1, W4-2, and W4-3. These logs were developed from cuttings and the weathered Pierre Shale was not consistently evaluated.

4.1.2 Groundwater Evaluation

Groundwater was encountered in three of the four soil borings installed at Landfill 4. Based on the soil boring geologic logs, it appears that groundwater is present within the silty clay and sandy clay with gravel, as well as the upper section of the weathered Pierre Shale bedrock. Four existing Landfill 4 monitoring wells were inspected and sampled as part of this RFI (Table 3-5). Three existing monitoring wells (W4-1, W4-2, and PZ4 [now replaced by LF4MW6]) border the site on the south to southwest, straddling B Ditch (Figure 4-1). The depth to water in these southwestern wells was shallow, ranging from 6 inches to 4 feet bgs. The fourth well, W4-3, is located east of the site on the east side of Specker Avenue. The depth to water in this well ranges from 13 to 17 feet bgs.

To better characterize the hydrogeologic conditions at Landfill 4, seven new groundwater monitoring wells were installed (LF4MW1, LF4MW2, LF4MW3, LF4MW4, LF4MW5, LF4MW6 and LF4MW7) and six direct push sampling points were installed as temporary wells (LF4DP1, LF4DP2, LF4DP3, LF4DP4, LF4DP5, and LF4DP6). Two of these monitoring wells, LF4MW1 and LF4MW2, were installed to evaluate both Landfill 4 and the former DRMO Hazardous Waste Storage Area, which overlaps the Landfill 4 boundary. LF4MW3 and LF4MW4 were installed upgradient of the landfill to collect data on groundwater occurrence, flow direction, and chemical quality. LF4MW5 was installed approximately 4 feet north of PZ4. PZ4 was a 1.5-inch-diameter piezometer with a 2-foot screen. The groundwater elevation in PZ4 was 0.44 foot higher than in LF4MW5, which may be related to the way in which PZ4 was constructed. LF4MW6 was installed to replace PZ4, and LF4MW7 was installed to provide additional downgradient water quality information. The depth to groundwater measured in the direct push temporary wells and the new monitoring wells ranged from 3.5 to 14.6 feet bgs.

Based on water level measurements from permanently installed wells collected June 26, 2001, the groundwater flow direction is toward the east at a gradient of approximately 0.01 foot/foot (Figure 4-5). It appears the direction of groundwater flow follows the local topography as well as the bedrock high shown on Figure 4-2. Historical water level data for the site are summarized in Table 4-1. Groundwater was encountered in the alluvial soils in the southern part of the site and in the weathered Pierre Shale to the north. It appears that the water table may not be located in the weathered Pierre Shale in the area of the weathered Pierre Shale topographic high based on drilling logs and water level measurements in well LF4MW1.

Aquifer testing, in the form of slug tests, was performed on monitoring wells LF4MW2, LF4MW4, and LF4MW5 on July 10, 2001, to determine hydraulic conductivity values for the aquifers. Rising head and falling head permeability aquifer tests were conducted in accordance with the procedures specified in Section 2.6 of the FLPM (Rust 1998). Four tests were conducted on each well: two rising head and two falling head tests each.

The tests were performed using a solid acrylic 3-foot slug inside the well being tested. Falling head tests were performed by completely submerging a solid slug below the water table and recording the water level fluctuations during the instantaneous rise and gradual fall after submersion of the slug. Rising head tests were performed when the water level had equilibrated after completely submerging the slug below the water table. Then, the slug was instantaneously removed and water fluctuations were recorded during the instantaneous fall and gradual rise after removal of the slug.

Static water levels in the wells were measured with electronic sounding equipment prior to performing either rising head or falling head tests. A pressure transducer was lowered into the well to just above the bottom of the well, and a data logger was programmed to a reference level based on the pressure measurements of the transducer (in pounds per square inch) exerted by the column of water into depth-to-water in feet as the water level recovers. Water level measurements were recorded to the nearest 0.01 foot, and the water level data were referenced to the North American Vertical Datum of 1988. At a minimum, manual water level measurements were also taken at the

beginning and end of each test using the electronic sounding equipment to check the accuracy of the pressure transducer measurements collected by the data logger.

The recovery measurements were analyzed using AQTESOLV for Windows, and the hydrologic conductivity was determined utilizing the Bouwer-Rice solution for a slug test in an unconfined aquifer (Bouwer and Rice 1976) for the test results from monitoring wells LF4MW2 and LF4MW4. Result summary sheets for the best test from each well are found in Appendix L. These results indicate that the hydraulic conductivity of the aquifer beneath Landfill 4 ranges from 0.164 feet per day (ft/day) to 0.379 ft/day.

4.1.3 Headspace Screening Results

Field screening for headspace vapor was conducted for all soil sampling intervals at each soil boring, monitoring well location, and direct push sampling point to monitor for potential VOC contamination. No elevated PID readings were observed in any of the headspace samples collected from the soil borings at Landfill 4. However, monitoring well LF4MW1 had elevated headspace readings from the 0 to 1-foot and 4 to 5-foot intervals (19.5 and 43.0 ppm, respectively [Appendices G and K]). Soil samples were collected from the three monitoring wells installed in 1995 for headspace analysis only and were not submitted to the analytical laboratory for analysis, so the source of the elevated headspace readings was not identified. However, direct push point LF4DP6, which was installed in January 2001 on the west side of B Ditch about 11 feet southwest of LF4MW1 specifically to investigate the dark soil staining and elevated headspace reading encountered in LF4MW1, also had a slightly elevated headspace reading (2.2 ppm). Except for toluene, which is a suspected sampling or laboratory artifact as discussed in Section 4.2.2.2, no VOCs were detected in the soil sample from LF4DP6. Also, no VOCs were detected in soil samples from soil boring LF4SB2, located approximately 57 feet north of monitoring well LF4MW1. Furthermore, no elevated soil gas readings were detected in probes LF4SG04 and LF4SG05, which were located within an approximately 80-foot radius of LF4MW1. Thus, the elevated headspace readings observed in LF4MW1 cannot be confirmed as being related to VOC contamination.

4.2 ANALYTICAL RESULTS

Groundwater, surface water, sediment, and soil samples collected from Landfill 4 were analyzed by off-site laboratories using the methods shown in Tables 3-1 through 3-3. Detected analytes in these samples are compared to data assessment criteria as discussed in the following sections. To further define the data usability, a discussion of "J" and "B" flags, as applied by the laboratory and from data validation, follows.

The analytical laboratory qualifies detections of organic analytes falling between the method detection limit (MDL) and the practical quantitation limit (PQL) with a "J" flag, and it qualifies inorganic analytes detected between the MDL and PQL with a "B" flag. The MDL is defined by the laboratory during an MDL study, and the PQL is defined by multiplying the MDL by a factor of 3 to 5. These "J" and "B" qualified values are conservative estimates of the concentration of an analyte and are an indication that the analyte is present at an unverifiable concentration. The laboratory also uses a "B" flag for organic analytes; however, in this case it means the organic analyte was detected in an associated method or field blank and is an indication that the detection may be due to sampling or laboratory contamination. As a consequence, "B"-flagged organic analytes should be used with care because they may be a false positive detection.

Daily method calibrations performed for each analytical method confirm instrument linearity between the PQL and an upper concentration limit. The reported "J" or "B" value assumes there is also linearity between the MDL and the PQL. However, results flagged with the "J" or "B" qualifiers have an unknown level of confidence in the concentration. Although confidence in these qualified concentrations is decreased below the 95 percent level, "J" and "B" qualified values are usable for investigative, risk assessment, and remediation tasks, but should be considered only as qualitative values.

"J" flags may also be applied to results during data validation, which occurs after the data are received from the laboratory. Data validation involves thoroughly reviewing each result against accepted quality control (QC) criteria to evaluate its usability. "J" validation flags are an indication that one or more QC criteria have not been met with regard to a particular value. As with results that

receive laboratory "J" flags, confidence in these qualified concentrations is decreased below the 95 percent level. Although "J" qualified values are usable for investigative, risk assessment, and remediation tasks, they should be considered a semi-quantitative value. "B" flags are not used during data validation.

4.2.1 Quality Control Summary

QCSRs have been prepared and submitted separately as companion documents to this RFI Report (Rust 1995b; Earth Tech 2003). The QCSR provides a rigorous evaluation of the data quality and analyzes the usability of data collected. In addition, the QCSR discusses any deviations from the Work Plan or FLPM that may have occurred during field activities. A brief summary of field variances and data evaluation is presented below.

4.2.1.1 Deviations From the Work Plans/FLPM

The following sections discuss deviations from the work plans and the FLPM for field activities. The deviations discussed below do not adversely affect the quality of data obtained during the RFI.

The RFI Work Plan (Earth Tech 2000b) states that the soil gas sampling rods will be pushed to a depth not less than 3 feet, then lifted no more than 0.5 feet to create a void space. Due to the presence of shallow groundwater at sampling location LF4SG08, the probe rods were extended to a depth of only 2 feet bgs. At all of the other sampling locations, the probe rods were pushed to a depth of 4 to 6 feet bgs.

The results of the field screening of the soil gas samples indicated that no volatile organic vapors were present. Detections of methane and significant levels of carbon dioxide were present in five of the soil gas samples. Samples were then collected in the SUMMA canisters from these five sampling locations and submitted to the off-site analytical laboratory. These five samples were analyzed using Method 3C. Method T014 was not conducted on the samples due to the lack of detections of volatile organic vapors in the field. One additional soil gas sample was collected from monitoring well PZ-4 at the request of CDPHE. It was noted by the field personnel that the water level in the well at the time of sampling was above the screened interval of the well. The sample was

collected by sealing off the end of the monitoring well casing using a rubber end cap. The well was left capped for 24 hours before field screening was conducted. There were no detections of methane, hydrogen sulfide, carbon dioxide, or volatile organic vapors in this sample.

Two new monitoring wells (LF4MW4 and LF4MW5) were installed as part of the field activities. The Work Plan states that the wells will be completed above ground. Monitoring well LF4MW5 was completed above ground; however, well LF4MW4 is located within a fenced, paved area, and due to the traffic in this area, was completed as a flush-mount well.

The work plans stated that newly-installed monitoring wells were to be installed with a sand pack placed 2 feet above the screened interval. The filter packs for monitoring wells LF4MW1, LF4MW2, LF4MW3, and LF4MW5 only extended to 1 foot above the top of the screen due to the shallow depth to groundwater at this location. In addition, new monitoring wells LF4MW1, LF4MW2, and LF4MW3 were constructed by placing the bentonite seal in with two 1-foot lifts. The work plans and the FLPM state that these wells should be installed in four 6-inch lifts.

The existing monitoring wells (LF4MW1, LF4MW2, LF4MW3, W4-1, W4-2, and W4-3) were to be sampled for VOCs, SVOCs, TAL metals, and aromatic hydrocarbons (Method 8021) in February 2001. The first quarter 2001 QGMP sampling was conducted in January 2001 at a similar time as the Landfill 4 RFI field activities. Because these six existing Landfill 4 monitoring wells were scheduled to be sampled for VOCs, SVOCs, and TAL metals as part of the QGMP, only samples for analysis by Method 8021 were collected as part of the Landfill 4 RFI field activities.

Four trenches were excavated at Landfill 4 as part of the RFI field activities to investigate the organic layer and presence of waste materials. Soil samples were collected of the black organic layer in two of the four trenches (LF4EX22 and LF4EX23) and submitted for laboratory analysis. The black organic layer was not identified in the other two trenches (LF4EX20 and LF4EX21).

The newly installed permanent and temporary monitoring wells were surveyed by a registered surveyor in the State of Colorado using total station surveying techniques. The soil gas sampling

locations and the corners of Buildings 320 and 330 were surveyed using GPS methods. The four trenches were not surveyed, and their locations on site figures are approximate.

4.2.1.2 Data Evaluation

QCSRs were prepared to evaluate the information generated during the Landfill 4 RFI. This assessment evaluated if program objectives and data quality goals were met. The assessment reviewed data planning, data sources, reporting limits, and data quality with regard to the data quality indicators (precision, accuracy, representativeness, completeness, and comparability). The following conclusions were drawn based on this assessment of the analytical data.

- Project planning and subsequent documentation helped to ensure that the samples were representative of the environmental medium in which they were collected.
- Analytical data precision is acceptable, based on field and laboratory QC sample results.
- Sample result accuracy was affected by method blank contamination and matrix spike/matrix spike duplicate (MS/MSD) for a small number of analytical results. Duplicate control sample results were within laboratory control limits, and the overall accuracy of the analytical results is acceptable.
- Data representativeness is acceptable based on successful project planning and documentation and analytical result accuracy.
- Data completeness is acceptable because the analytical results were found to be fully usable as qualified with no results rejected.
- Data comparability is acceptable based on the analytical and reporting methods used.
- Based on the evaluation of the LCS/LCSD recoveries, matrix spike/matrix spike duplicate recoveries, duplicate sample analyses, and surrogate compound recoveries, the analytical methods were appropriate for the analyses of the sample matrices encountered. The analytical results are usable as qualified.
- The analytical reporting limits for several analytes exceeded their respective FLPM-suggested PQLs. However, the reported concentrations of these analytes were predominately less than the corresponding risk-based concentrations. Data usability of non-detects for risk assessment may be affected by the elevated PQLs for these analytes in water samples.

Based on this review, the analytical data generated under the Landfill 4 RFI are adequate to fulfill program objectives and may be used to define the nature and extent of contamination and the selection and implementation of any appropriate corrective measure.

4.2.2 Data Assessment Criteria

The analytical data collected for Landfill 4 are compared to various assessment criteria to evaluate whether groundwater, surface water, sediment or soil samples have been affected by site activities. Metals detected in soil and sediment were evaluated using statistically derived background screening values. Groundwater and surface water data were compared to CGWS and EPA standards. These assessment criteria are discussed below.

4.2.2.1 Soil and Sediment Assessment Criteria

Regulatory levels are not available to evaluate the organic and inorganic constituents detected in the soil and sediment samples from Landfill 4. Therefore the screening criterion used for organics is any detection above the PQL. The screening criteria for metals are the background concentrations of metals in Fort Carson soils. The Draft Final Risk-Based Procedures Evaluation Manual, Module 1, Sitewide Background Data Set for Soils (Rust 1999b) has been submitted to CDPHE for approval and is currently being revised based on CDPHE's comments. The draft final report is designed as a stand-alone document that identifies how the background levels were established as well as how the levels should be used. The background data set for soils consists of 39 discrete soil samples collected during landfill cap design activities and through the installation of five borings for background soil data collection. Since Fort Carson is underlain predominantly by Quaternary alluvium and Pierre Shale, samples from these two units were included in the background soil data set and evaluated by unit. The report includes UTLs for 23 inorganic constituents for both the Alluvium and Pierre Shale data sets, as shown in Table 4-2. Alluvium soil UTLs were applied to the sediment data. In the absence of an approved background data set, these interim background UTLs have been used and are presented with the analytical results.

4.2.2.2 Groundwater Assessment Criteria

Groundwater data were compared to CGWS (CCR 1997); Colorado Drinking Water Standards (CCR 1995); and EPA MCLs (EPA 1993) to define elevated groundwater results. The CGWS consist of primary standards, including Organic Chemical and Human Health Standards (CGWS-P), Secondary Drinking Water Standards (CGWS-S), and Agricultural Standards (CGWS-A). The most conservative standard was used to identify groundwater samples with potential impacts from site activities. For compounds with no regulatory criteria, risk-based screening level assessment criteria will be developed during the risk-based screening for Landfill 4.

4.2.2.3 Surface Water Assessment Criteria

Surface water data were compared to the Colorado Surface Water Standards (CCR 2001). The surface water values were compared to the Aquatic Life Based - Chronic values for organic and inorganic parameters.

4.2.3 Sampling Results

Results of the investigative activities performed at Landfill 4 are discussed in the following sections. Sample locations are shown on Figure 4-1.

4.2.3.1 Groundwater Sampling Results

Groundwater samples were collected from temporary monitoring wells constructed from the direct push soil boring points and from permanent monitoring wells (existing and new). Samples were analyzed for VOCs, SVOCs, pesticides/PCBs, metals, cyanide, major anions, and various other water quality parameters (Table 3-1). Detected analytes are shown in Table 4-3; exceedances of assessment criteria are shaded. Figure 4-6 shows historical exceedances at each monitoring point. If an analyte exceeded the criteria more than once in the historical sampling period, the concentration range is shown and the number of exceedances is listed in brackets next to the concentration range. Assessment criterion exceedances are summarized by sample group.

4.2.3.1.1 Direct Push Temporary Monitoring Wells

January 2001 Samples – Several organic analytes were detected in the groundwater samples collected in January 2001. These organic analytes primarily consisted of trihalomethanes that are normally associated with the chlorination of water. Their presence in shallow groundwater is unusual and unexpected. The concentrations of trihalomethane compounds in these samples were within the range of concentrations of trihalomethanes detected in historical source water samples and slightly below the concentrations detected in the most recent (January 2001) source water samples. This correlation as well as a review of the temporary well construction procedures indicates that source water contaminated the direct push groundwater samples during the construction of the monitoring points. As discussed in Section 3.7.5, these results are not compared to groundwater assessment criteria and are not discussed further.

November 2001/January 2002 Samples - Based on the results of the January 2001 samples and the conclusion that the samples probably contained source water from well installation procedures, the temporary monitoring wells were purged and resampled in November 2001 (organics) and January 2002 (inorganics). These results are usable for the RFI report. Low volume yields from these temporary wells resulted in the time delay between collection of organic and inorganic samples.

The following organic analytes were detected in groundwater samples: acetone (three detections), chloroform (one detection), carbon disulfide (one detection), and 2-butanone (methyl ethyl ketone [MEK], one detection). Acetone is considered a common laboratory contaminant. A total of six detections occurred in all of the direct push wells except LF4DP1. The groundwater concentrations were all below their respective PQLs, except for the acetone concentration in LF4DP6, which was detected at 13 µg/L. Chloroform, the only detected constituent with an assessment criterion (6 µg/L), was detected below its assessment criteria at 0.19 µg/L.

Several metals were also detected in these groundwater samples; however, only manganese and thallium were detected at concentrations exceeding their assessment criteria. Manganese was detected in four samples at concentrations above the assessment criterion of 0.05 mg/L, with a

maximum concentration of 1.8 mg/L. Thallium was detected in two samples at concentrations above the assessment criterion of 0.0025 mg/L, with a maximum concentration of 0.0035 mg/L.

4.2.3.1.2 Permanent Monitoring Wells

Groundwater samples were collected on numerous occasions from existing monitoring wells (W4-1, W4-2, W4-3, and PZ4) and from wells installed for the RFI (LF4MW1 through LF4MW7), as discussed in previous sections. Analytical results of these samples showed the presence of both organic and inorganic constituents, some at concentrations above the assessment criteria.

The following organic compounds were detected in groundwater samples from the permanent monitoring wells: acetone (two detections), benzene (one detection), bromomethane (three detections), carbon disulfide (two detections), chloromethane (six detections), MEK (one detection), toluene (three detections), vinyl chloride (six detections), benzoic acid (two detections), bis(2-ethylhexyl)phthalate (BEHP) (three detections), and di-n-butyl phthalate (one detection). Acetone and BEHP are considered common laboratory contaminants. The majority of the organic detections occurred in monitoring wells located upgradient of the landfill. However, organics were detected in on-site well LF4MW2 (bromomethane and benzoic acid) and downgradient monitoring wells LF4MW7 (bromomethane and chloromethane) and W4-3 (toluene). Of all these detections, vinyl chloride and BEHP were the only constituents with concentrations above their assessment criteria. Vinyl chloride was detected at concentrations above its assessment criterion of 2 µg/L in four samples (all from PZ4) with a maximum concentration of 18 µg/L (from the passive diffusion sampler). The other detections of vinyl chloride were from groundwater samples from LF4MW05 (one of three samples at 0.15 µg/L) and LF4MW06 (the only sample at 0.61 µg/L). All three of the monitoring wells where vinyl chloride was detected are located west and upgradient of Landfill 4. BEHP was detected at concentrations above its assessment criterion of 2.5 µg/L in three samples (LF4MW03 and LF4MW05), with the maximum concentration of 18 µg/L from LF4MW03. Both the monitoring wells where BEHP was detected are located west and upgradient of Landfill 4.

A total of four samples were obtained from PZ4 during the RFI program and analyzed for VOCs by EPA Method 8260; three samples were obtained with a bailer, and one sample was obtained by a

passive diffusion sampler. A comparison of the PZ4 sample results for the passive diffusion sampler and the bailed samples show that vinyl chloride was detected in both types of samples. The three samples obtained with a bailer contained vinyl chloride at concentrations ranging from 3.8 µg/L to 7.5 µg/L. The concentration in the sample obtained from the passive diffusion sampler was 18 µg/L. These results suggest that the vinyl chloride is in solution in the groundwater and that the passive diffusion sampler results are similar to the bailed sample results.

Several inorganic constituents were detected in the groundwater samples from the permanent monitoring wells. A total of nine constituents had concentrations exceeding their assessment criteria. Cadmium was detected above its assessment criterion (0.005 mg/L) in one sample from LF4MW02 at a concentration of 0.0066 mg/L. Chloride was detected above its assessment criterion (250 mg/L) in 13 samples with a maximum concentration of 2,900 mg/L in LF5MW05. In addition, all of the maximum concentrations (approximately one order of magnitude greater than the other concentrations) were detected in LF4MW05, LF4MW07, and PZ4. Fluoride was detected above its assessment criterion (2 mg/L) in two samples with a maximum concentration of 2.8 mg/L from LF4MW03. Iron was detected above its assessment criterion (0.3 mg/L) in three samples with a maximum concentration of 0.49 mg/L from W4-1. Manganese was detected above its assessment criterion (0.05 mg/L) in 45 samples with a maximum concentration of 3.9 mg/L from W4-1. In addition, all of the maximum concentrations were from W4-1 and W4-2 samples, suggesting these elevated results may be related to the well construction. Nitrate was detected above its assessment criterion (10 mg/L) in one sample with a maximum concentration of 1,160 mg/L from LF4MW02. However, this sample result has not been repeated suggesting a laboratory error. Sulfate was detected above its assessment criterion (250 mg/L) in 53 samples with a maximum concentration of 85,000 mg/L LF4MW07. In addition, all of the maximum concentrations (approximately one order of magnitude greater than the other concentrations) were from LF5MW05, LF5MW07, and PZ4. Thallium was detected above its assessment criterion (0.002 mg/L) in 16 samples with a maximum concentration of 0.039 mg/L from LF4MW05. TDS, where analyzed, were also relatively high and exceeded the assessment criterion of 10,000 mg/L in 11 samples. The highest concentrations were in samples from LF4MW05 and LF4MW07, which correlate to the high concentrations of chloride and sulfate. The reason for these elevated concentrations is unclear at this time as there are no significant

organic detections at these locations. However, it was noted that bromomethane and chloromethane were detected in groundwater samples from LF4MW05 and LF4MW07. These two constituents are associated with source water and may be derived from nearby water or wastewater utility lines.

4.2.3.1.3 Summary of Groundwater Analytical Results

In summary, the spatial distribution of organic analytes and inorganic analytes exceeding assessment criteria in groundwater relative to Landfill 4 show that the majority of elevated constituent concentrations in groundwater are located upgradient of Landfill 4. Vinyl chloride was only detected in a small area around PZ4/LF4MW06 and the adjacent monitoring well LF4MW05 and does not appear to be related to Landfill 4. Vinyl chloride was only detected in one of three samples from LF4MW05. The source of the vinyl chloride in the groundwater cannot be explained at this point other than to say it may be a result of the breakdown of old PVC casing in PZ4. Other organic constituents were anomalously detected and do not present a pattern suggesting groundwater impacts from Landfill 4. The majority of inorganic detections are likely representative of naturally occurring background conditions that will be formally evaluated in a risk assessment. However, some concentrations of chloride, sulfate, and TDS are anomalously high. Those concentrations, in conjunction with the presence of source water constituents, suggests that source water possibly associated with wastewater has impacted the subsurface.

4.2.3.2 Casing Sample Results

Samples of the casing material from PZ4 and from a current piece of well screen material (CAS-1) were collected and submitted to the laboratory for analytical testing to evaluate the potential of the casing material to leach vinyl chloride to the groundwater, as discussed in Section 3.2.3. The results of these casing sample analyses are also shown in Table 4-4. One portion of each casing sample was extracted using a modified SPLP procedure (identified with a SPLP extraction date in the table) and analyzed for VOCs. The second sample was analyzed for VOCs after tumbling the casing pieces with deionized water. Vinyl chloride was detected in both of the PZ4 samples at concentrations of 31 µg/L and 26 µg/L for the standard and SPLP analyses, respectively. The results of the current day sample show that vinyl chloride was only detected in the sample that underwent the SPLP process at a much lower concentration than the PZ4 sample (0.13 µg/L). Vinyl chloride was not detected in the

other CAS-1 sample. These results provide strong support for the theory suggesting that the vinyl chloride detections in PZ4 groundwater samples are a result of leaching from the PVC well casing at PZ4.

Based on these data, the vinyl chloride in groundwater samples from PZ4/LF4MW06 and LF4MW05 do not appear to be related to contamination from Landfill 4. It is probable that the vinyl chloride is in the groundwater around LF4MW5 and LF4MW6 as a result of the deterioration of the former PZ4 PVC well casing that was installed in 1976.

4.2.3.3 Soil Boring, Monitoring Well Installation, and Trench Soil Sampling Results

Soil samples were collected from soil borings, direct push borings, monitoring well installation borings, and trench excavations. The samples were analyzed by the methods shown in Table 3-2. Detected analytes in each sample at each sampling interval are shown in Table 4-5; detections exceeding assessment criteria (for inorganics) are shaded. Figure 4-7 shows exceedances at each sampling point and each sample.

The only organic compounds detected in soil above their PQLs were toluene, di-n-butylphthalate, 2,6-dinitrotoluene, 4-chlorophenyl phenyl ether, and methylene chloride. Phthalates are common plasticizers frequently found as laboratory contaminants; detections of these compounds are highly suspect as false positives. Toluene was detected in almost every soil sample submitted for analysis in January 2001 (but not in corresponding groundwater samples above its PQL). The concentrations detected ranged from 6.7 to 72 micrograms per kilogram (µg/kg). Toluene was not detected in any of the soil boring samples collected during the 1995 field activities, and there are no apparent trends in the detected toluene concentrations with depth or with spatial location of the sampling points. The fact that toluene was not detected in associated method blanks, together with the lack of spatial trends and relative consistency of concentrations, strongly suggests it is a sampling artifact; however, the exact source of the toluene detections is unknown. The remaining two organic analytes, 2,6-dinitrotoluene (1,400 µg/kg) and 4-chlorophenyl phenyl ether (3,000 µg/kg), were both detected in the 9 to10-foot interval sample of LF4SB2 at concentrations of more than three times their estimated PQLs. However, neither compound was detected in subsequent sampling at LF4MW4.

One or more metals exceeded the UTL assessment criteria in most of the soil samples collected at Landfill 4. The results are summarized by sample group in the following paragraphs.

Direct Push Soil Boring Samples: With the exception of LF4DP6, soil was collected from two depth intervals from each of the six direct push soil borings installed in January 2001. The following metals concentrations exceeded assessment criteria in the direct push soil samples: calcium (one exceedance), magnesium (six exceedances), mercury (three exceedances), and sodium (five exceedances). Calcium had a maximum concentration of 51,000 milligrams per kilogram (mg/kg); however, this concentration did not exceed its assessment criterion (UTL-P) of 55,400 mg/kg. The only calcium exceedance occurred in LF4DP2 (0 to 2.5 feet bgs) where the detected concentration of 35,000 mg/kg exceeded the assessment criterion (UTL-A) of 27,800 mg/kg. Magnesium had a maximum concentration of 8,500 mg/kg in LF4DP1 (7.5 to 8 feet bgs) and LF4DP5 (6 to 7 feet bgs). Five of the six exceedances were above the UTL-A assessment criteria of 7,000 mg/kg, and one of the six exceedances was above the UTL-P assessment criteria of 8,000 mg/kg. Mercury had a maximum concentration of 0.039 mg/kg in LF4DP6 (7.5 to 8.5 feet bgs), and the three exceedances were above the UTL-A of 0.034 mg/kg. Sodium had a maximum concentration of 6,700 mg/kg in LF4DP5 (3 to 4 feet bgs). Two of the five exceedances were above the UTL-A assessment criteria of 3,820 mg/kg and three of the five exceedances was above the UTL-P assessment criteria of 2,580 mg/kg.

Monitoring Well Installation Soil Samples: Soil samples were collected from two depth intervals during the January 2001 installation of LF4MW4 and LF4MW5 and one depth interval during the November 2001 installation of LF4MW7. Soil from LF4MW5 and LF5MW7 had metals exceeding assessment criteria. Sodium exceeded the alluvium UTL of 3,820 mg/kg at the 4 to 5-foot interval (6,900 mg/kg) and the Pierre Shale UTL of 2,580 mg/kg at the 12 to 13-foot interval (6,300 mg/kg), both located at LF4MW5. Magnesium exceeded the Pierre Shale UTL of 8,000 mg/kg at the 12 to 13-foot interval (8,200 mg/kg) of LF4MW5. Iron (37,000 mg/kg), mercury (0.039 mg/kg), and vanadium (41 mg/kg) exceeded the alluvial UTLs of 28,900 mg/kg, 0.0340 mg/kg, and 37 mg/kg, respectively, in the 8 to 9-foot sample from LF4MW7.

Soil Boring Samples: Soil samples from two depth intervals were chemically analyzed in each of the four soil borings installed in April 1995. The analytes exceeding UTLs include cadmium (LF4SB3, 0.86 mg/kg, 4 to 5 feet, and LF4SB4, 0.41 mg/kg, 4 to 5 feet), lead (LF4SB2, 28.1 mg/kg, 9 to 10 feet), and mercury (LF4SB4, 0.035 mg/kg, 0 to 1 foot, and 0.047 mg/kg, 4 to 5 feet). The detected concentrations of these metals only slightly exceeded the UTLs.

Trench Excavation Samples: During trenching activities in January 2001, a sample of olive-black material exhibiting a slight humic organic odor, presumed to be the organic layer described during the August 1998 trenching activities, was collected at 2.5 feet bgs from trenches 22 and 23. The trench samples, LF4EX22 and LF4EX23, respectively, were analyzed for VOCs, SVOCs, TOC, and metals (Table 3-2).

The only organic compound detected in either trench sample was toluene. As explained above, toluene is suspected of being a field sampling artifact. Thus, there is no evidence of organic contamination from sewage or POL sludge, such as that believed to have been disposed in the landfill in 1957.

The only metals exceeding assessment criteria were detected in the sample from LF4EX23; magnesium (7,200 mg/kg) and sodium (8,200 mg/kg) exceeded their criteria of 7,000 mg/kg and 3,820 mg/kg, respectively.

In summary, eight metals (cadmium, calcium, iron, lead, magnesium, mercury, sodium, and vanadium) exceeded assessment criteria in soil. The spatial distribution and concentrations of magnesium, mercury, and sodium relative to Landfill 4 do not indicate impacts from the site. Locations where magnesium (7,200 to 8,500 mg/kg) and sodium (4,700 to 8,200 mg/kg) exceeded their criteria are generally evenly distributed in the area west of B Ditch. Likewise, mercury (0.035 to 0.047 mg/kg) exceeded its criteria in five locations, of which only LF4SB4 and LF4MW7 are east of B Ditch. Calcium exceeded its criteria in only one location, LF4DP2, which is west of B Ditch. Lead exceeded criteria in LF4SB2, which is north of the landfill footprint, and cadmium exceeded its criteria in two locations, both of which are within the landfill footprint. Iron and vanadium exceeded

their criteria in LF4MW7, which is located across Specker Avenue from Landfill 4. Three organic compounds were detected above their PQLs: toluene, 2,6-dinitrotoluene and 4-chlorophenyl phenyl ether. As explained above, toluene is believed to be a sampling artifact. The other organic compounds were anomalously detected in LF4SB2, which is north of the landfill footprint.

4.2.3.4 Soil Gas Results

Twenty-two soil gas sampling probes were installed in and around the landfill to assess the presence of gases generated from organic matter decomposition. The soil gas samples were analyzed in the field using a PID to detect VOCs and a multigas meter to analyze for methane, hydrogen sulfide, oxygen, carbon dioxide, and LEL. Field results are summarized in Table 4-6 and laboratory results are summarized in Table 4-7. Figure 4-8 shows field and laboratory results for methane.

Field results indicated that no VOCs were present in the soil gas and only five probes (LF4SG02, LF4SG06, LF4SG18, LF4SG20, and LF4SG21) had measurable concentrations of methane. In accordance with the work plan, because no VOCs were detected, samples were submitted for laboratory analysis from these five sampling points for only the fixed gases by Method 3C (Table 4-7). As shown on Figure 4-8, methane concentrations were generally low and laboratory analysis confirmed the presence of methane in only two of the five samples (LF4SG02 and LF4SG20). The highest concentration of methane was detected in LF4SG20 (4.5 percent).

Based on the fact that only two soil gas samples had confirmed detections of methane, there does not appear to be a strong correlation between methane concentrations and the presence of the black organic material observed during trenching activities. Furthermore, three of the soil gas probes (LF4SG09, LF4SG19, and LF4SG21) purposely located near trenches where the black organic material was observed (LF4TP09, LF4TP18, and LF4TP19) did not detect measurable methane. The fact that soil gas probe LF4SG20, which had the highest methane concentration, was located near several trenches where black organic material was observed is notable. However, the lack of correlation between the other probe and trench pairs tends to indicate that its source may be from something other than the black organic material. Thus, the soil gas results do not support the hypothesis that the black organic material is of sewage or POL sludge origin.

4.2.3.5 Surface Water and Sediment Results

Three sets of collocated surface water and sediment samples were collected from B Ditch in June 1999. Detections are summarized in Table 4-8 and are illustrated on Figure 4-9.

No organic analytes above PQLs were detected in any of the surface water or sediment samples. However, sediment sample LF4SD1 had a detection of acetone below the PQL. Sediment sample LF4SD2 contained 1,4-dichlorobenzene and BTEX (total) at concentrations below PQLs. Total xylenes were also detected below the PQL in sediment sample LF4SD3.

Aluminum and iron exceeded their criteria in all surface water samples. In addition, the downstream sample, LF4SW3, contained levels of copper, lead, and zinc slightly greater than their criteria. Sediment samples for the three sites contained numerous metals above the alluvium UTL criteria. Cobalt, copper, iron, magnesium, vanadium, and zinc exceeded their criteria in LF4SD1. LF4SD2 contained copper, iron, magnesium, nickel, potassium, selenium, vanadium, and zinc at concentrations above the assessment criteria. Only magnesium, sodium, and zinc exceeded their criteria in sample LF4SD3.

The spatial distribution of metals in surface water relative to stream flow shows that the highest concentrations occur in downstream sample LF4SW3. This trend is most evident for aluminum and iron, which were about an order of magnitude higher in LF4SW3 than in either upstream sample.

The sediment samples, on the other hand, did not show a strong correlation with stream flow direction. The concentrations of metals in all three sediment samples were generally consistent from sample to sample.

The sediment in B Ditch was excavated in January and February 2001 and transported to Landfill 1 as part of surface water improvements. No waste materials were visible in the bank of B Ditch or were encountered during the excavation process.

4.2.3.6 Source Water Results

Source water samples were collected and analyzed as part of site investigations and the QGMP. The results of these analyses are summarized in Table 4-9.

Organic compounds detected in source water samples include bromodichloromethane, bromomethane, chloroform, dibromochloromethane, methylene chloride, carbon disulfide, methyl ethyl ketone, and acetone. Bromodichloromethane, bromomethane, chloroform, and dibromochloromethane are trihalomethane compounds commonly associated with potable water treated by chlorination. Methylene chloride is a common laboratory contaminant. These samples also contained several metals at concentrations below drinking water standards. Additional inorganic results were also obtained for the source water samples, including: TOC, alkalinity, anions, nitrate, and TDS. Detectable nitrate concentrations ranged from 0.12 mg/L to 0.19 mg/L, well below the drinking water standard of 10.0 mg/L. TDS concentrations in these samples ranged from 42.0 mg/L to 107.0 mg/L.

Source water results indicate that groundwater samples collected from the direct push temporary wells in January 2001 may have been adversely affected by the trihalomethanes present in the source water supply. Source water was used to develop the direct push wells. As discussed in Section 4.2.3.1, trihalomethanes were present in concentrations less than that detected in the raw source water, but exceeding assessment criteria in five of the six direct push groundwater samples.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

The purpose of the RFI conducted at Landfill 4 was to define the nature and extent of contamination present in soil and groundwater. The conclusions of the RFI are summarized below. The objectives of the RFI listed in Section 2.1 were achieved, as discussed below.

The landfill footprint, as shown on Figure 4-1, was delineated based on several factors, including an examination of aerial photographs and topography, and analysis of field and analytical data from trench excavations, soil, soil gas, groundwater, surface water and sediment samples. The aerial photographs show a progression of uses that have occurred on the presumed landfill site. However, the presence of the road to the east (predecessor to Specker Avenue) and the drainage ditch (B Ditch) to the west of the site dating from 1953 indicates that landfill activities were probably confined to the area between those two landmarks and did not extend further east or west of those features. The RFI field data confirms that landfilling activities did not occur outside of these boundaries.

Nineteen trenches were excavated in August 1998 to define the landfill boundary. Two trenches (LF4TP09 and LF4TP15) unearthed typical landfill construction debris (e.g., concrete, bricks, wood, and nails) at the southern and northern perimeter of the site, respectively. In November 1999, during construction of Building 320, additional landfill debris was encountered approximately 175 feet northeast of LF4TP15. Nine trenches around the perimeter and west of B Ditch also encountered a black organic layer, generally described as decaying grass, roots, and vegetation. In some places, the black material was up to about 1 foot thick (e.g., LF4TP08). The material was not sampled because it was believed to be an old surface horizon and field screening with a PID did not detect any volatile organic vapors. However, due to subsequent concern that it may represent the sewage and POL sludge believed to have been disposed in the landfill, four additional trenches were excavated in January 2001. The new trenches were located west of B Ditch and in the southwest quadrant of the area to investigate the extent of the black organic layer and confirm the proposed landfill boundaries. Two of the new trenches (LF4TP22 and LF4TP23) encountered moist, olive-black lean clay with a slight humic odor at 2.5 feet bgs that was believed to be similar to the black organic material

encountered in 1998. However, analytical data from the samples did not indicate the presence of any organic compounds that would indicate a sewage/POL sludge origin.

Only two soil gas samples had confirmed detections of methane (LF4SG02 and LF4SG20). LF4SG02, which is in the northeast quadrant of the landfill, had a low methane detection in an area where there was no reported observance of the black organic horizon. LF4SG20, which is located about 275 feet west of the landfill boundary, had a measurable methane detection in an area where the black organic material was observed, but probes located even closer to trenches where the black material was observed did not reveal any detections. Thus, the soil gas results do not indicate that sewage or POL sludge decomposition gases or VOCs are being generated in the vicinity of the landfill.

Soil data (Figure 4-6) indicated only two organic compounds (2,6-dinitrotoluene and 4-chlorophenyl phenyl ether) present in one soil boring at concentrations exceeding their PQLs and that were not likely due to laboratory or field contamination. However, neither compound was detected in soil samples taken during the installation of monitoring well LF4MW4, which was installed about 11 feet away. Metals exceeding UTLs included cadmium, calcium, cobalt, iron, lead, magnesium, mercury, sodium, and vanadium. One or more of these metals exceeded their criteria in every soil sample except soil from LF4SB1, LF4MW4, and LF4EX22. All of these metals are present in background soil, and it does not appear that any single soil sample contained more metals or metals at significantly higher concentrations than any other sample. However, it does appear that the majority of toxic metals (cadmium, lead, and mercury) and organic compounds detected in soil samples are within the presumed landfill perimeter. Thus, the soil data support the placement of the landfill as shown.

Groundwater samples were collected from new and existing monitoring wells in addition to temporary wells. Both organic and inorganic analytes were detected in the groundwater samples collected from Landfill 4. Vinyl chloride was detected above the assessment criteria in monitoring well PZ4, adjacent well LF4MW05 in one of three samples, and in replacement well for PZ4 (LF4MW06), all of which are upgradient of the landfill. Based on the results of the casing sampling,

the vinyl chloride is presumed to be the result of the deterioration of the PVC well casing materials in the U.S. Geological Survey well installed in 1976. However, some residual amount of vinyl chloride still exists in the groundwater around the PZ4 area. A few anomalous detections of other organic compounds were encountered, however these were all at low concentrations and do not suggest groundwater impacts from Landfill 4. Several inorganics (metals and anions) were detected above assessment criteria in most of the groundwater samples. A majority of these detections are likely representative of naturally occurring conditions. However, some concentrations of chloride, sulfate, and TDS in wells PZ4, LF4MW05, and LF4MW07 were an order of magnitude above the other concentrations, suggesting some groundwater impacts. There were no significant organic detections from these wells. Based on their location, these elevated concentrations do not appear to be associated with Landfill 4.

Surface water and sediment results show only minimal impacts that may be attributed to current site activities. Although the downstream surface water sample (LF4SW3) showed elevated levels of some metals, there is no indication that metals have accumulated in downstream sediments (LF4SD3). The sediment in B Ditch was excavated in January and February 2001 and transported to Landfill 1 as part of surface water improvements. No waste materials were visible in the bank of B Ditch or were encountered during the excavation process.

5.2 RECOMMENDATIONS

The results of this RFI indicate that no significant impacts to the surrounding environment have resulted from the presence of Landfill 4. Landfill 4 is currently covered by an asphalt parking and storage area and several storage buildings, which function as a landfill cap to prevent percolation of precipitation into the landfill. Repairs will be made to the asphalt pavement as needed. The ability of the existing asphalt layer to function as a cap will be evaluated through quarterly inspections and continued groundwater monitoring. Groundwater monitoring is recommended at LF4MW05 and LF4MW06 to monitor the residual vinyl chloride and elevated inorganic detections, and at LF4MW07 to monitor the elevated inorganic concentrations.

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TABLES

TABLE 3-1
SUMMARY OF GROUNDWATER SAMPLE ANALYSES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Analytical Laboratory
LF4DP1	1/30/01	8021	VOC Halogens and BTEX	PA
		8260	VOCs	PA
		8270	SVOCs	PA
	2/6/01	6010/7000	Metals[1]	PA
	11/14/01	8260	VOCs	PA
		8021	VOC Halogens and BTEX	PA
		8270	SVOCs	PA
	1/17/02	6010/7000	Metals[1]	PA
LF4DP2	1/30/01	8260	VOCs	PA
	11/14/01	8260	VOCs	PA
		8021	VOC Halogens and BTEX	PA
	1/21/02	6010/7000	Metals[1]	PA
LF4DP3	1/30/01	6010/7000	Metals[1]	PA
		8021	VOC Halogens and BTEX	PA
		8260	VOCs	PA
		8270	SVOCs	PA
	11/14/01	8260	VOCs	PA
		8021	VOC Halogens and BTEX	PA
		8270	SVOCs	PA
	1/17/02	6010/7000	Metals[1]	PA
LF4DP4	1/30/01	6010/7000	Metals[1]	PA
		8021	VOC Halogens and BTEX	PA
		8260	VOCs	PA
		8270	SVOCs	PA
	11/14/01	8260	VOCs	PA
		8021	VOC Halogens and BTEX	PA
		8270	SVOCs	PA
	1/17/02	6010/7000	Metals[1]	PA
LF4DP5	1/30/01	8021	VOC Halogens and BTEX	PA
		8260	VOCs	PA
	11/14/01	8260	VOCs	PA
		8021	VOC Halogens and BTEX	PA
	1/17/02	6010/7000	Metals[1]	PA
LF4DP6	1/30/01	8021	VOC Halogens and BTEX	PA
		8260	VOCs	PA
	11/14/01	8260	VOCs	PA
		8021	VOC Halogens and BTEX	PA
	1/21/02	6010/7000	Metals[1]	PA

TABLE 3-1
SUMMARY OF GROUNDWATER SAMPLE ANALYSES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Analytical Laboratory
LF4MW1	4/25/95	6010/7000	Metals[1]	HY
		8080	Pesticides/PCBs	HY
		8260	VOCs	HY
		8270	SVOCs	HY
	1/18/01	160.1	Total Dissolved Solids	PA
		160.2	Total Suspended Solids	PA
		300.0	Major Anions[2]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		405.1	Biochemical Oxygen Demand	PA
		410.4	Chemical Oxygen Demand	PA
		415.1	Total Organic Carbon	PA
		6010/7000	Metals[1]	PA
		8260	VOCs	PA
		8270	SVOCs	PA
		9010	Cyanide	PA
	2/13/01	8021	VOC Halogens and BTEX	PA
	8/2/01	160.1	Total Dissolved Solids	PA
		300.0	Major Anions[3]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		6010/7000	Metals[1]	PA
		8260	VOCs	PA
	10/18/01	160.1	Total Dissolved Solids	PA
		160.2	Total Suspended Solids	PA
		300.0	Major Anions[2]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		415.1	Total Organic Carbon	PA
		6010/7000	Metals[1]	PA
		8260	VOCs	PA
		8270	SVOCs	PA
	12/4/01	160.1	Total Dissolved Solids	PA
		160.2	Total Suspended Solids	PA
		300.0	Major Anions[2]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		415.1	Total Organic Carbon	PA
		6010/7000	Metals[1]	PA
LF4MW2	4/25/95	6010/7000	Metals[1]	HY
		8080	Pesticides/PCBs	HY
		8260	VOCs	HY
		8270	SVOCs	HY

TABLE 3-1
SUMMARY OF GROUNDWATER SAMPLE ANALYSES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Analytical Laboratory
LF4MW2	1/31/96	160.1	Total Dissolved Solids	STL
		160.2	Total Suspended Solids	STL
		300.0	Major Anions[4]	STL
		310.1	Alkalinity	STL
		353.2	Nitrate-Nitrite	STL
		405.1	Biochemical Oxygen Demand	STL
		410.4	Chemical Oxygen Demand	STL
		415.1	Total Organic Carbon	STL
		8080	Pesticides/PCBs	STL
		8150	Herbicides	STL
		8260	VOCs	STL
		8270	SVOCs	STL
		9012	Cyanide	STL
	2/1/96	6010/7000	Metals[1]	STL
	4/25/96	6010/7000	Metals[1]	STL
		8260	VOCs	STL
		8270	SVOCs	STL
	4/26/96	160.1	Total Dissolved Solids	STL
		160.2	Total Suspended Solids	STL
		300.0	Major Anions[4]	STL
		310.1	Alkalinity	STL
		353.2	Nitrate-Nitrite	STL
		405.1	Biochemical Oxygen Demand	STL
		410.4	Chemical Oxygen Demand	STL
		415.1	Total Organic Carbon	STL
		8080	Pesticides/PCBs	STL
		8150	Herbicides	STL
		9012	Cyanide	STL
	7/23/96	160.1	Total Dissolved Solids	STL
		160.2	Total Suspended Solids	STL
		300.0	Major Anions[4]	STL
		310.1	Alkalinity	STL
		353.2	Nitrate-Nitrite	STL
		405.1	Biochemical Oxygen Demand	STL
		410.4	Chemical Oxygen Demand	STL
		415.1	Total Organic Carbon	STL
		6010/7000	Metals[1]	STL
		8080	Pesticides/PCBs	STL
		8150	Herbicides	STL
		8260	VOCs	STL
		8270	SVOCs	STL
		9012	Cyanide	STL
	11/5/96	160.1	Total Dissolved Solids	STL
		160.2	Total Suspended Solids	STL
		300.0	Major Anions[4]	STL

TABLE 3-1
SUMMARY OF GROUNDWATER SAMPLE ANALYSES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Analytical Laboratory
LF4MW2	11/5/96	310.1	Alkalinity	STL
(cont.)		353.2	Nitrate-Nitrite	STL
		405.1	Biochemical Oxygen Demand	STL
		410.4	Chemical Oxygen Demand	STL
		415.1	Total Organic Carbon	STL
		6010/7000	Metals[1]	STL
		8080	Pesticides/PCBs	STL
		8150	Herbicides	STL
		8260	VOCs	STL
		8270	SVOCs	STL
		9012	Cyanide	STL
	1/23/97	300.0	Major Anions[4]	STL
		6010/7000	Metals[1]	STL
		8260	VOCs	STL
		8270	SVOCs	STL
	1/24/97	160.1	Total Dissolved Solids	STL
		160.2	Total Suspended Solids	STL
		300.0	Major Anions[4]	STL
		310.1	Alkalinity	STL
		405.1	Biochemical Oxygen Demand	STL
	4/15/97	353.2	Nitrate-Nitrite	STL
		410.4	Chemical Oxygen Demand	STL
		415.1	Total Organic Carbon	STL
		6010/7000	Metals[1]	STL
		8260	VOCs	STL
		8270	SVOCs	STL
		9012	Cyanide	STL
	4/16/97	160.1	Total Dissolved Solids	STL
		160.2	Total Suspended Solids	STL
		300.0	Major Anions[4]	STL
		310.1	Alkalinity	STL
		405.1	Biochemical Oxygen Demand	STL
		8080	Pesticides/PCBs	STL
		8150	Herbicides	STL
	7/28/97	160.1	Total Dissolved Solids	STL
		300.0	Major Anions[4]	STL
		310.1	Alkalinity	STL
		353.2	Nitrate-Nitrite	STL
		6010/7000	Metals[1]	STL
		8260	VOCs	STL
	10/28/97	160.1	Total Dissolved Solids	STL
		300.0	Major Anions[4]	STL
		310.1	Alkalinity	STL

TABLE 3-1
SUMMARY OF GROUNDWATER SAMPLE ANALYSES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Analytical Laboratory
LF4MW2	10/28/97	6010/7000	Metals[1]	STL
(cont.)		8260	VOCs	STL
	10/29/97	353.2	Nitrate-Nitrite	STL
	1/21/98	160.1	Total Dissolved Solids	PA
		300.0	Major Anions[5]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		6010/7000	Metals[1]	PA
		8260	VOCs	PA
	7/30/98	160.1	Total Dissolved Solids	PA
		160.2	Total Suspended Solids	PA
		300.0	Major Anions[2]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		6010/7000	Metals[1]	PA
		8270	SVOCs	PA
	7/31/98	405.1	Biochemical Oxygen Demand	PA
		410.4	Chemical Oxygen Demand	PA
		415.1	Total Organic Carbon	PA
		8080	Pesticides/PCBs	PA
		8150	Herbicides	PA
	8/10/98	8260	VOCs	PA
	4/21/99	300.0	Major Anions[6]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		353.3	Nitrate-Nitrite	PA
		354.1	Nitrite	PA
		6010/7000	Metals[1]	PA
		8260	VOCs	PA
		8270	SVOCs	PA
	4/22/99	160.1	Total Dissolved Solids	PA
		160.2	Total Suspended Solids	PA
		405.1	Biochemical Oxygen Demand	PA
		410.4	Chemical Oxygen Demand	PA
		415.1	Total Organic Carbon	PA
		8081	Organochlorine Pesticides	PA
		8150	Herbicides	PA
		9010	Cyanide	PA
	5/3/00	6010/7000	Metals[1]	PA
		8260	VOCs	PA
		8270	SVOCs	PA
	5/4/00	160.1	Total Dissolved Solids	PA
		160.2	Total Suspended Solids	PA
		300.0	Major Anions[2]	PA

TABLE 3-1
SUMMARY OF GROUNDWATER SAMPLE ANALYSES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Analytical Laboratory
LF4MW2	5/4/00	340.2	Fluoride	PA
(cont.)		405.1	Biochemical Oxygen Demand	PA
		410.4	Chemical Oxygen Demand	PA
		415.1	Total Organic Carbon	PA
		8080	Pesticides/PCBs	PA
		8150	Herbicides	PA
		9010	Cyanide	PA
	1/16/01	8260	VOCs	PA
		8270	SVOCs	PA
	1/17/01	160.1	Total Dissolved Solids	PA
		160.2	Total Suspended Solids	PA
		300.0	Major Anions[2]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		405.1	Biochemical Oxygen Demand	PA
		410.4	Chemical Oxygen Demand	PA
		415.1	Total Organic Carbon	PA
		6010/7000	Metals[1]	PA
		9010	Cyanide	PA
	2/13/01	8021	VOC Halogens and BTEX	PA
	8/3/01	160.1	Total Dissolved Solids	PA
		300.0	Major Anions[3]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		6010/7000	Metals[1]	PA
		8260	VOCs	PA
LF4MW3	4/21/95	160.1	Total Dissolved Solids	HY
		160.2	Total Suspended Solids	HY
		206.2	Arsenic	HY
		300.0	Major Anions[3]	HY
		310.1	Alkalinity	HY
		410.4	Chemical Oxygen Demand	HY
		6010/7000	Metals[1]	HY
		8080	Pesticides/PCBs	HY
		8260	VOCs	HY
		405.1	Biochemical Oxygen Demand	HY
	1/31/96	160.1	Total Dissolved Solids	STL
		160.2	Total Suspended Solids	STL
		300.0	Major Anions[4]	STL
		310.1	Alkalinity	STL
		353.2	Nitrate-Nitrite	STL
		405.1	Biochemical Oxygen Demand	STL
		410.4	Chemical Oxygen Demand	STL
		415.1	Total Organic Carbon	STL

TABLE 3-1
SUMMARY OF GROUNDWATER SAMPLE ANALYSES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Analytical Laboratory
LF4MW3	1/31/96	6010/7000	Metals[1]	STL
(cont.)		8080	Pesticides/PCBs	STL
		8150	Herbicides	STL
		8260	VOCs	STL
		8270	SVOCs	STL
		9012	Cyanide	STL
	4/25/96	160.1	Total Dissolved Solids	STL
		160.2	Total Suspended Solids	STL
		300.0	Major Anions[4]	STL
		310.1	Alkalinity	STL
		353.2	Nitrate-Nitrite	STL
		405.1	Biochemical Oxygen Demand	STL
		410.4	Chemical Oxygen Demand	STL
		415.1	Total Organic Carbon	STL
		6010/7000	Metals[1]	STL
		8080	Pesticides/PCBs	STL
		8150	Herbicides	STL
		8260	VOCs	STL
		8270	SVOCs	STL
		9012	Cyanide	STL
	7/23/96	160.1	Total Dissolved Solids	STL
		160.2	Total Suspended Solids	STL
		300.0	Major Anions[4]	STL
		310.1	Alkalinity	STL
		353.2	Nitrate-Nitrite	STL
		405.1	Biochemical Oxygen Demand	STL
		410.4	Chemical Oxygen Demand	STL
		415.1	Total Organic Carbon	STL
		6010/7000	Metals[1]	STL
		8080	Pesticides/PCBs	STL
		8150	Herbicides	STL
		8260	VOCs	STL
		8270	SVOCs	STL
		9012	Cyanide	STL
	11/1/96	160.1	Total Dissolved Solids	STL
		160.2	Total Suspended Solids	STL
		300.0	Major Anions[4]	STL
		310.1	Alkalinity	STL
		353.2	Nitrate-Nitrite	STL
		405.1	Biochemical Oxygen Demand	STL
		410.4	Chemical Oxygen Demand	STL
		415.1	Total Organic Carbon	STL
		6010/7000	Metals[1]	STL
		8080	Pesticides/PCBs	STL
		8150	Herbicides	STL

TABLE 3-1
SUMMARY OF GROUNDWATER SAMPLE ANALYSES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Analytical Laboratory
LF4MW3	11/1/96	8260	VOCs	STL
(cont.)		8270	SVOCs	STL
		9012	Cyanide	STL
	1/15/97	160.1	Total Dissolved Solids	STL
		160.2	Total Suspended Solids	STL
		300.0	Major Anions[4]	STL
		310.1	Alkalinity	STL
		353.2	Nitrate-Nitrite	STL
		405.1	Biochemical Oxygen Demand	STL
		410.4	Chemical Oxygen Demand	STL
		415.1	Total Organic Carbon	STL
		6010/7000	Metals[1]	STL
		8260	VOCs	STL
		8270	SVOCs	STL
	4/15/97	160.1	Total Dissolved Solids	STL
		160.2	Total Suspended Solids	STL
		300.0	Major Anions[4]	STL
		310.1	Alkalinity	STL
		353.2	Nitrate-Nitrite	STL
		405.1	Biochemical Oxygen Demand	STL
		410.4	Chemical Oxygen Demand	STL
		415.1	Total Organic Carbon	STL
		6010/7000	Metals[1]	STL
		8080	Pesticides/PCBs	STL
		8150	Herbicides	STL
		8260	VOCs	STL
		8270	SVOCs	STL
		9012	Cyanide	STL
	7/21/97	160.1	Total Dissolved Solids	STL
		300.0	Major Anions[4]	STL
		310.1	Alkalinity	STL
		353.2	Nitrate-Nitrite	STL
		6010/7000	Metals[1]	STL
		8260	VOCs	STL
	10/27/97	160.1	Total Dissolved Solids	STL
		300.0	Major Anions[4]	STL
		310.1	Alkalinity	STL
	10/27/97	353.2	Nitrate-Nitrite	STL
		6010/7000	Metals[1]	STL
		8260	VOCs	STL
	1/16/98	160.1	Total Dissolved Solids	PA
		300.0	Major Anions[5]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA

TABLE 3-1
SUMMARY OF GROUNDWATER SAMPLE ANALYSES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Analytical Laboratory
LF4MW3	1/16/98	6010/7000	Metals[1]	PA
(cont.)		8260	VOCs	PA
	4/29/98	160.1	Total Dissolved Solids	PA
		160.2	Total Suspended Solids	PA
		300.0	Major Anions[2]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		405.1	Biochemical Oxygen Demand	PA
		410.4	Chemical Oxygen Demand	PA
		415.1	Total Organic Carbon	PA
		6010/7000	Metals[1]	PA
		8080	Pesticides/PCBs	PA
		8150	Herbicides	PA
		8260	VOCs	PA
		8270	SVOCs	PA
		9010	Cyanide	PA
	1/17/01	160.1	Total Dissolved Solids	PA
		160.2	Total Suspended Solids	PA
		300.0	Major Anions[2]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		405.1	Biochemical Oxygen Demand	PA
		410.4	Chemical Oxygen Demand	PA
		415.1	Total Organic Carbon	PA
		6010/7000	Metals[1]	PA
		8260	VOCs	PA
		8270	SVOCs	PA
		9010	Cyanide	PA
	2/14/01	8021	VOC Halogens and BTEX	PA
	8/2/01	160.1	Total Dissolved Solids	PA
		300.0	Major Anions[3]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		6010/7000	Metals[1]	PA
		8260	VOCs	PA
	10/15/01	160.1	Total Dissolved Solids	PA
		160.2	Total Suspended Solids	PA
		300.0	Major Anions[2]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		415.1	Total Organic Carbon	PA
		6010/7000	Metals[1]	PA
		8260	VOCs	PA
		8270	SVOCs	PA

TABLE 3-1
SUMMARY OF GROUNDWATER SAMPLE ANALYSES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Analytical Laboratory
LF4MW3	12/4/01	160.1	Total Dissolved Solids	PA
		160.2	Total Suspended Solids	PA
		300.0	Major Anions[2]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		415.1	Total Organic Carbon	PA
		6010/7000	Metals[1]	PA
	4/17/02	300.0	Major Anions[2]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		353.2	Nitrate/Nitrite as N	PA
		6010/7000	Metals[1]	PA
		8260	VOCs	PA
LF4MW4	2/13/01	6010/7000	Metals[1]	PA
		8021	VOC Halogens and BTEX	PA
		8260	VOCs	PA
		8270	SVOCs	PA
	8/6/01	160.1	Total Dissolved Solids	PA
		300.0	Major Anions[3]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		6010/7000	Metals[1]	PA
		8260	VOCs	PA
	4/17/02	300.0	Major Anions[2]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		353.2	Nitrate/Nitrite as N	PA
		6010/7000	Metals[1]	PA
		8260	VOCs	PA
LF4MW5	2/13/01	6010/7000	Metals[1]	PA
		8021	VOC Halogens and BTEX	PA
		8260	VOCs	PA
		8270	SVOCs	PA
	8/2/01	160.1	Total Dissolved Solids	PA
		300.0	Major Anions[3]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		6010/7000	Metals[1]	PA
		8260	VOCs	PA
	4/18/02	300.0	Major Anions[2]	PA
		310.1	Alkalinity	PA

TABLE 3-1
SUMMARY OF GROUNDWATER SAMPLE ANALYSES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Analytical Laboratory
LF4MW5	4/18/02	340.2	Fluoride	PA
(cont.)		353.2	Nitrate/Nitrite as N	PA
		6010/7000	Metals[1]	PA
		8260	VOCs	PA
LF4MW6	1/8/02	8260	VOCs	PA
		8021	VOC Halogens and BTEX	PA
		8270	SVOCs	PA
		6010/7000	Metals[1]	PA
LF4MW7	1/8/02	8260	VOCs	PA
		8021	VOC Halogens and BTEX	PA
		8270	SVOCs	PA
	1/10/02	6010/7000	Metals[1]	PA
	1/8/02	8021	VOC Halogens and BTEX	PA
		8260	VOCs	PA
		8270	SVOCs	PA
	4/17/02	300.0	Major Anions[2]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		353.2	Nitrate/Nitrite as N	PA
		6010/7000	Metals[1]	PA
		8260	VOCs	PA
PZ4	5/5/95	6010/7000	Metals[1]	HY
	5/9/95	8270	SVOCs	HY
	5/10/95	8080	Pesticides/PCBs	HY
		9012	Cyanide	HY
	8/10/00	8260	VOCs	PA
	1/25/01	405.1	Biochemical Oxygen Demand	PA
		6010/7000	Metals[1]	PA
		8260	VOCs	PA
		8270	SVOCs	PA
	1/26/01	300.0	Major Anions[2]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		410.4	Chemical Oxygen Demand	PA
		415.1	Total Organic Carbon	PA
		9010	Cyanide	PA
	2/14/01	8021	VOC Halogens and BTEX	PA
	11/8/01	8260	VOCs (passive diffusion sample)	PA
	11/9/01	8260	VOCs	PA

TABLE 3-1
SUMMARY OF GROUNDWATER SAMPLE ANALYSES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Analytical Laboratory
W4-1	4/27/95	6010/7000	Metals[1]	HY
		8080	Pesticides/PCBs	HY
		8260	VOCs	HY
		8270	SVOCs	HY
		9012	Cyanide	HY
	1/18/01	160.1	Total Dissolved Solids	PA
		160.2	Total Suspended Solids	PA
		300.0	Major Anions[2]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		405.1	Biochemical Oxygen Demand	PA
		410.4	Chemical Oxygen Demand	PA
		415.1	Total Organic Carbon	PA
		6010/7000	Metals[1]	PA
		8260	VOCs	PA
		8270	SVOCs	PA
		9010	Cyanide	PA
	2/14/01	8021	VOC Halogens and BTEX	PA
	8/2/01	160.1	Total Dissolved Solids	PA
		300.0	Major Anions[3]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		6010/7000	Metals[1]	PA
		8260	VOCs	PA
	10/18/01	160.1	Total Dissolved Solids	PA
		160.2	Total Suspended Solids	PA
		300.0	Major Anions[2]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		415.1	Total Organic Carbon	PA
		6010/7000	Metals[1]	PA
		8260	VOCs	PA
		8270	SVOCs	PA
	12/4/01	160.1	Total Dissolved Solids	PA
		160.2	Total Suspended Solids	PA
		300.0	Major Anions[2]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		415.1	Total Organic Carbon	PA
		6010/7000	Metals[1]	PA
W4-2	4/24/95	6010/7000	Metals[1]	HY
		8080	Pesticides/PCBs	HY

TABLE 3-1
SUMMARY OF GROUNDWATER SAMPLE ANALYSES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Analytical Laboratory
W4-2	4/24/95	8260	VOCs	HY
(cont.)		8270	SVOCs	HY
	1/16/01	160.1	Total Dissolved Solids	PA
		160.2	Total Suspended Solids	PA
		300.0	Major Anions[2]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		405.1	Biochemical Oxygen Demand	PA
		410.4	Chemical Oxygen Demand	PA
		415.1	Total Organic Carbon	PA
		6010/7000	Metals[1]	PA
		8260	VOCs	PA
		8270	SVOCs	PA
		9010	Cyanide	PA
	2/14/01	8021	VOC Halogens and BTEX	PA
	8/3/01	160.1	Total Dissolved Solids	PA
		300.0	Major Anions[3]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		6010/7000	Metals[1]	PA
		8260	VOCs	PA
W4-3	7/27/99	160.1	Total Dissolved Solids	PA
		160.2	Total Suspended Solids	PA
		300.0	Major Anions[2]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		405.1	Biochemical Oxygen Demand	PA
		410.4	Chemical Oxygen Demand	PA
		415.1	Total Organic Carbon	PA
		6010/7000	Metals[1]	PA
		8080	Pesticides/PCBs	PA
		8150	Herbicides	PA
		8260	VOCs	PA
		8270	SVOCs	PA
		9010	Cyanide	PA
	8/4/00	160.1	Total Dissolved Solids	PA
		300.0	Major Anions[3]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		365.2	Phosphorus, all forms	PA
		6010/7000	Metals[1]	PA
		8260	VOCs	PA
	1/17/01	160.1	Total Dissolved Solids	PA
		160.2	Total Suspended Solids	PA

TABLE 3-1
SUMMARY OF GROUNDWATER SAMPLE ANALYSES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Analytical Laboratory
W4-3	1/17/01	300.0	Major Anions[2]	PA
(cont.)		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		405.1	Biochemical Oxygen Demand	PA
		410.4	Chemical Oxygen Demand	PA
		415.1	Total Organic Carbon	PA
		6010/7000	Metals[1]	PA
		8260	VOCs	PA
		8270	SVOCs	PA
		9010	Cyanide	PA
	8/2/01	160.1	Total Dissolved Solids	PA
		300.0	Major Anions[3]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		6010/7000	Metals[1]	PA
		8260	VOCs	PA
	4/18/02	300.0	Major Anions[2]	PA
		310.1	Alkalinity	PA
		340.2	Fluoride	PA
		353.2	Nitrate/Nitrite as N	PA
		6010/7000	Metals[1]	PA
		8260	VOCs	PA

Notes:

BTEX	benzene, toluene, ethylbenzene, and xylenes
HY	HydroLogic Laboratories, Inc., Brighton, Colorado
N	nitrogen
PA	Paragon Analytics, Inc., Fort Collins, Colorado
PCB	polychlorinated biphenyl
STL	Severn Trent Laboratories, Arvada, Colorado (formerly known as Quanterra Incorporated)
SVOC	semivolatile organic compound
VOC	volatile organic compound
1	6010/7000 Metals: aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc
2	Major Anions: chloride, nitrate, nitrite, orthophosphate, and sulfate
3	Major Anions: chloride, nitrate, nitrite, and sulfate
4	Major Anions: chloride, fluoride, nitrate, orthophosphate, and sulfate
5	Major Anions: chloride, fluoride, nitrate, nitrate + nitrite as N, and sulfate
6	Major Anions: chloride and sulfate

TABLE 3-2
SUMMARY OF SOIL SAMPLE ANALYSES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Depth Interval (feet)	Sample Date	Method Number	Analyte	Analytical Laboratory
LF4DP01	7.5 - 8.0	1/18/01	6010/7000	Metals[1]	PA
	9 - 11		8260	VOCs	PA
			8270	SVOCs	PA
LF4DP02	0 - 2.5	1/19/01	6010/7000	Metals[1]	PA
	4 - 5		8260	VOCs	PA
			8270	SVOCs	PA
LF4DP03	6 - 7	1/18/01	6010/7000	Metals[1]	PA
	9 - 10		8260	VOCs	PA
			8270	SVOCs	PA
LF4DP04	9 - 10	1/18/01	6010/7000	Metals[1]	PA
	13 - 15		8260	VOCs	PA
			8270	SVOCs	PA
LF4DP05	3 - 4	1/19/01	6010/7000	Metals[1]	PA
	6 - 7		8260	VOCs	PA
			8270	SVOCs	PA
LF4DP06	7.5 - 8.5	1/19/01	6010/7000	Metals[1]	PA
			8260	VOCs	PA
			8270	SVOCs	PA
			9060	TOC	PA
LF4EX22	2.5	1/29/01	6010/7000	Metals[1]	PA
			8260	VOCs	PA
			8270	SVOCs	PA
			9060	TOC	PA
LF4EX23	2.5	1/29/01	6010/7000	Metals[1]	PA
			8260	VOCs	PA
			8270	SVOCs	PA
			9060	TOC	PA
LF4MW4	13 - 14	1/17/01	6010/7000	Metals[1]	PA
	18 - 19		8260	VOCs	PA
			8270	SVOCs	PA
LF4MW5	4 - 5	1/17/01	6010/7000	Metals[1]	PA
	12 -13		8260	VOCs	PA
			8270	SVOCs	PA
LF4MW6	No soil sample collected; overdrill of PZ4.				

TABLE 3-2
SUMMARY OF SOIL SAMPLE ANALYSES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Depth Interval (feet)	Sample Date	Method Number	Analyte	Analytical Laboratory
LF4MW7	8-9	11/12/01	8260	VOCs	PA
			8270	SVOCs	PA
			6010/7000	Metals[1]	PA
LF4SB1	4 - 5	1/25/95	6010/7000	Metals[2]	HY
	9 - 10		8260	VOCs	HY
			8270	SVOCs	HY
			8080	PCBs	HY
LF4SB2	4 - 5	1/25/95	6010/7000	Metals[2]	HY
	9 - 10		8260	VOCs	HY
			8270	SVOCs	HY
			8080	PCBs	HY
LF4SB3	0 - 1	1/25/95	6010/7000	Metals[2]	HY
	4 - 5		8260	VOCs	HY
			8270	SVOCs	HY
			8080	PCBs	HY
LF4SB4	0 - 1	1/26/95	6010/7000	Metals[2]	HY
	4 - 5		8260	VOCs	HY
			8270	SVOCs	HY
			8080	PCBs	HY

Notes:

HY	HydroLogic Laboratories, Inc., Brighton, Colorado
PA	Paragon Analytical Laboratory, Inc., Fort Collins, Colorado
PCBs	polychlorinated biphenyls
SVOCs	semivolatile organic compounds
TOC	total organic carbon
VOCs	volatile organic compounds
1	6010/7000 Metals: aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc.
2	6010/7000 Metals: arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver.

TABLE 3-3
SUMMARY OF MISCELLANEOUS SAMPLE ANALYSES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Matrix	Sample Date	Method Number	Method Name	Laboratory
PZ4	Pieces of PVC well screen pulled from PZ4 prior to overdrilling	11/13/01	8260 8260	VOCs SPLP VOCs	PA
CAS-1	Pieces of PVC well screen typically used in current well screen construction at Fort Carson	12/10/01	8260 8260	VOCs SPLP VOCs	PA
LF4AB01	Deionized water poured into standard sample container at sample collection area using the standard sample collection procedures	11/20/01	8260	VOCs	PA
LF4EB01	Deionized water poured through unused disposable bailer at site using standard sample collection procedures	11/20/01	8260 8270 8021	VOCs SVOCs VOC Halogens & BTEX	PA
LF4EB02	Deionized water from unused (not placed in well) passive diffusion bag sampler	11/8/01	8260	VOCs	PA
LF4SD1	Sediment sample	6/28/99	8260 8270 8021 6010/7000	VOCs SVOCs VOC Halogens & BTEX Metals	PA
LF4SD2	Sediment sample	6/28/99	8260 8270 8021 6010/7000	VOCs SVOCs VOC Halogens & BTEX Metals	PA
LF4SD3	Sediment sample	6/28/99	8260 8270 8021 6010/7000	VOCs SVOCs VOC Halogens & BTEX Metals	PA

TABLE 3-3
SUMMARY OF MISCELLANEOUS SAMPLE ANALYSES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Matrix	Sample Date	Method Number	Method Name	Laboratory
LF4SW1	Surface water sample	6/28/99	8260	VOCs	PA
			8270	SVOCs	
			8021	VOC Halogens & BTEX	
			6010/7000	Metals	
LF4SW2	Surface water sample	6/28/99	8260	VOCs	PA
			8270	SVOCs	
			8021	VOC Halogens & BTEX	
			6010/7000	Metals	
LF4SW3	Surface water sample	6/28/99	8260	VOCs	PA
			8270	SVOCs	
			8021	VOC Halogens & BTEX	
			6010/7000	Metals	

Notes:

BTEX	benzene, toluene, ethylbenzene, and xylenes
PA	Paragon Analytical Laboratory Inc., Fort Collins, Colorado
PVC	polyvinyl chloride
SPLP	Synthetic Precipitate Leaching Procedure
SVOCs	semivolatile organic compounds
VOCs	volatile organic compounds

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TABLE 3-4
SUMMARY OF SOURCE WATER SAMPLE ANALYSES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Analytical Laboratory
1304SC	5/16/96	6010	Metals [1]	STL
		7041	Antimony	STL
		7060	Arsenic	STL
		7196A	Chromium (VI)	STL
		7421	Lead	STL
		7470	Mercury	STL
		7740	Selenium	STL
		7841	Thallium	STL
		8260	Volatile Organic Compounds	STL
		8270	Semivolatile Organic Compounds	STL
	8/7/96	160.1	Total Dissolved Solids	STL
		160.2	Total Suspended Solids	STL
		300.0	Major Anions [2]	STL
		310.1	Alkalinity	STL
		353.2	Nitrate plus Nitrite as N	STL
		405.1	Biochemical Oxygen Demand	STL
		410.4	Chemical Oxygen Demand	STL
		415.1	Total Organic Carbon	STL
		6010	Metals [1]	STL
		7041	Antimony	STL
		7060	Arsenic	STL
		7421	Lead	STL
		7470	Mercury	STL
		7740	Selenium	STL
		7841	Thallium	STL
		8260	Volatile Organic Compounds	STL
		8270	Semivolatile Organic Compounds	STL
		9012	Cyanide	STL
	11/8/96	160.1	Total Dissolved Solids	STL
		160.2	Total Suspended Solids	STL
		300.0	Major Anions [2]	STL
		310.1	Alkalinity	STL
		353.2	Nitrate plus Nitrite as N	STL
		405.1	Biochemical Oxygen Demand	STL
		410.4	Chemical Oxygen Demand	STL
		415.1	Total Organic Carbon	STL
		6010	Metals [1]	STL
		7041	Antimony	STL
		7060	Arsenic	STL
		7421	Lead	STL
		7470	Mercury	STL
		7740	Selenium	STL
		7841	Thallium	STL
		8260	Volatile Organic Compounds	STL
		8270	Semivolatile Organic Compounds	STL
		9012	Cyanide	STL

TABLE 3-4
SUMMARY OF SOURCE WATER SAMPLE ANALYSES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Analytical Laboratory
1304SC	1/28/97	160.1	Total Dissolved Solids	STL
		160.2	Total Suspended Solids	STL
		300.0	Major Anions [2]	STL
		310.1	Alkalinity	STL
		353.2	Nitrate plus Nitrite as N	STL
		405.1	Biochemical Oxygen Demand	STL
		410.4	Chemical Oxygen Demand	STL
		415.1	Total Organic Carbon	STL
		6010	Metals [1]	STL
		7041	Antimony	STL
		7060	Arsenic	STL
		7421	Lead	STL
		7470	Mercury	STL
		7740	Selenium	STL
		7841	Thallium	STL
		8260	Volatile Organic Compounds	STL
		8270	Semivolatile Organic Compounds	STL
	4/17/97	160.1	Total Dissolved Solids	STL
		160.2	Total Suspended Solids	STL
		300.0	Major Anions [2]	STL
		310.1	Alkalinity	STL
		353.2	Nitrate plus Nitrite as N	STL
		405.1	Biochemical Oxygen Demand	STL
		410.4	Chemical Oxygen Demand	STL
		415.1	Total Organic Carbon	STL
		6010	Metals [1]	STL
		7041	Antimony	STL
		7060	Arsenic	STL
		7421	Lead	STL
		7470	Mercury	STL
		7740	Selenium	STL
		7841	Thallium	STL
		8260	Volatile Organic Compounds	STL
		8270	Semivolatile Organic Compounds	STL
		9012	Cyanide	STL
	7/31/97	6010	Metals [1]	STL
		7041	Antimony	STL
		7060	Arsenic	STL
		7421	Lead	STL
		7470	Mercury	STL
		7740	Selenium	STL
		7841	Thallium	STL
		8260	Volatile Organic Compounds	STL
		8270	Semivolatile Organic Compounds	STL
	11/5/97	6010	Metals [1]	STL
		7041	Antimony	STL
		7060A	Arsenic	STL

TABLE 3-4
SUMMARY OF SOURCE WATER SAMPLE ANALYSES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Analytical Laboratory
1304SC	11/5/97	7421	Lead	STL
(cont.)		7470	Mercury	STL
		7740	Selenium	STL
		7841	Thallium	STL
		8260	Volatile Organic Compounds	STL
		8270	Semivolatile Organic Compounds	STL
	2/5/98	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	4/24/98	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	7/31/98	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	10/23/98	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	1/29/99	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	4/27/99	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	11/5/99	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	4/21/00	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	8/7/00	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	10/26/00	6010B	Metals [1]	STL
		7470A	Mercury	STL
		8260B	Volatile Organic Compounds	STL
		8270C	Semivolatile Organic Compounds	STL

TABLE 3-4
SUMMARY OF SOURCE WATER SAMPLE ANALYSES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Analytical Laboratory
1304SC	1/10/01	6010	Metals [1]	PA
(cont.)		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	5/4/01	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	7/23/01	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	11/12/01	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	4/19/02	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	7/2/02	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
1399SC	5/16/96	6010	Metals [1]	STL
		7041	Antimony	STL
		7060	Arsenic	STL
		7196A	Chromium (VI)	STL
		7421	Lead	STL
		7470	Mercury	STL
		7740	Selenium	STL
		7841	Thallium	STL
		8260	Volatile Organic Compounds	STL
		8270	Semivolatile Organic Compounds	STL
	8/7/96	160.1	Total Dissolved Solids	STL
		160.2	Total Suspended Solids	STL
		300.0	Major Anions [2]	STL
		310.1	Alkalinity	STL
		353.2	Nitrate plus Nitrite as N	STL
		405.1	Biochemical Oxygen Demand	STL
		410.4	Chemical Oxygen Demand	STL
		415.1	Total Organic Carbon	STL
		6010	Metals [1]	STL
		7041	Antimony	STL
		7060	Arsenic	STL

TABLE 3-4
SUMMARY OF SOURCE WATER SAMPLE ANALYSES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Analytical Laboratory
1399SC	8/7/96	7421	Lead	STL
(cont.)		7470	Mercury	STL
		7740	Selenium	STL
		7841	Thallium	STL
		8260	Volatile Organic Compounds	STL
		8270	Semivolatile Organic Compounds	STL
		9012	Cyanide	STL
	11/8/96	160.1	Total Dissolved Solids	STL
		160.2	Total Suspended Solids	STL
		300.0	Major Anions [2]	STL
		310.1	Alkalinity	STL
		353.2	Nitrate plus Nitrite as N	STL
		405.1	Biochemical Oxygen Demand	STL
		410.4	Chemical Oxygen Demand	STL
		415.1	Total Organic Carbon	STL
		6010	Metals [1]	STL
		7041	Antimony	STL
		7060	Arsenic	STL
		7421	Lead	STL
		7470	Mercury	STL
		7740	Selenium	STL
		7841	Thallium	STL
		8260	Volatile Organic Compounds	STL
		8270	Semivolatile Organic Compounds	STL
		9012	Cyanide	STL
	1/30/97	160.1	Total Dissolved Solids	STL
		160.2	Total Suspended Solids	STL
		300.0	Major Anions [2]	STL
		310.1	Alkalinity	STL
		353.2	Nitrate plus Nitrite as N	STL
		405.1	Biochemical Oxygen Demand	STL
		410.4	Chemical Oxygen Demand	STL
		415.1	Total Organic Carbon	STL
		6010	Metals [1]	STL
		7041	Antimony	STL
		7060	Arsenic	STL
		7421	Lead	STL
		7470	Mercury	STL
		7740	Selenium	STL
		7841	Thallium	STL
		8260	Volatile Organic Compounds	STL
		8270	Semivolatile Organic Compounds	STL
	4/17/97	160.1	Total Dissolved Solids	STL
		160.2	Total Suspended Solids	STL
		300.0	Major Anions [2]	STL
		310.1	Alkalinity	STL
		353.2	Nitrate plus Nitrite as N	STL

TABLE 3-4
SUMMARY OF SOURCE WATER SAMPLE ANALYSES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Analytical Laboratory
1399SC	4/17/97	405.1	Biochemical Oxygen Demand	STL
(cont.)		410.4	Chemical Oxygen Demand	STL
		415.1	Total Organic Carbon	STL
		6010	Metals [1]	STL
		7041	Antimony	STL
		7060	Arsenic	STL
		7421	Lead	STL
		7470	Mercury	STL
		7740	Selenium	STL
		7841	Thallium	STL
		8260	Volatile Organic Compounds	STL
		8270	Semivolatile Organic Compounds	STL
		9012	Cyanide	STL
	11/5/97	6010	Metals [1]	STL
		7041	Antimony	STL
		7060A	Arsenic	STL
		7421	Lead	STL
		7470	Mercury	STL
		7740	Selenium	STL
		7841	Thallium	STL
		8260	Volatile Organic Compounds	STL
		8270	Semivolatile Organic Compounds	STL
	2/5/98	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	4/24/98	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	7/31/98	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	10/23/98	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
9246SC	1/29/99	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	4/27/99	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA

TABLE 3-4
SUMMARY OF SOURCE WATER SAMPLE ANALYSES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Analytical Laboratory
9246SC	10/29/99	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	4/21/00	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	8/7/00	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	10/26/00	6010B	Metals [1]	STL
		7470A	Mercury	STL
		8260B	Volatile Organic Compounds	STL
		8270C	Semivolatile Organic Compounds	STL
	1/10/01	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	5/4/01	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	7/23/01	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	11/12/01	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	4/19/02	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	7/2/02	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
ETTSC	6/6/00	6010	Metals [1]	PA
		7470	Mercury	PA
		8021	BTEX	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA

TABLE 3-4
SUMMARY OF SOURCE WATER SAMPLE ANALYSES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Analytical Laboratory
ETTSC	8/7/00	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	10/26/00	6010B	Metals [1]	STL
		7470A	Mercury	STL
		8260B	Volatile Organic Compounds	STL
		8270C	Semivolatile Organic Compounds	STL
	1/10/01	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8260	Semivolatile Organic Compounds	PA
	5/4/01	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	7/23/01	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	11/12/01	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	4/19/02	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA
	7/2/02	6010	Metals [1]	PA
		7470	Mercury	PA
		8260	Volatile Organic Compounds	PA
		8270	Semivolatile Organic Compounds	PA

Notes:

N	nitrogen
PA	Paragon Analytical Laboratory Inc.
STL	Severn Trent Laboratories
[1]	6010 Metals: aluminum, barium, beryllium, cadmium, chromium, calcium, cobalt, copper, iron, magnesium, manganese, nickel, potassium, selenium, silver, sodium, vanadium, and zinc.
[2]	Major Anions: chloride, fluoride, nitrate as N, orthophosphate, and sulfate

TABLE 3-5
BEDROCK AND WELL COMPLETION INFORMATION
LANDFILL 4
FORT CARSON, COLORADO

	Measurements from Ground Surface (feet)						Measurements from Top of Casing (feet)			
Well ID	**Ground Surface Elevation[1]**	**Depth to Weathered Pierre Shale**	**Weathered Pierre Shale Elevation**	**Inner Riser Stick Up Height (feet)**	**Screen Length[2]**	**Well Casing Inside Diameter (inches)[2]**	**TOC Elevation[1]**	**Total Depth[2,3]**	**Depth to Screen[2]**	**Comments**
New Wells:										
LF4MW1	5877.85	7.50	5870.35	2.43	10	2	5878.18	17.62	7.43	
LF4MW2	5876.73	3.00	5873.73	2.55	10	2	5879.70	17.89	7.55	
LF4MW3	5872.55	7.50	5865.05	2.16	10	2	5874.94	17.56	7.16	
LF4MW4	5877.80	4.00	5873.80	flush mount	10	2	5877.58	19.0	7.0	
LF4MW5	5872.63	10.50	5862.13	2.0	10	2	5874.75	13.4	2.5	
LF4MW6	5872.00	UK	NA	2.6	5	2	5875.03	14.0	8.45	Overdrill of PZ4, no log generated.
LF4MW7	5875.70	21.00	5854.70	flush mount	15	2	5875.43	24.0	8.7	
Existing Wells:[4]										
W4-1	5874.71	UK	NA	2.7	10	2	5877.43	18.18	7.75	Log based on drill cuttings and not core samples.
W4-2	5872.54	UK	NA	2.6	10	2	5875.17	20.13	10.27	Log based on drill cuttings and not core samples.
W4-3	5878.95	UK	NA	2.4	20	2	5881.32	32.81	12.0	Log based on drill cuttings and not core samples.
PZ4[5]	5872.05	UK	NA	0.55	2	1.5	5872.58	11.98	10.25	Log based on drill cuttings and not core samples.
Soil Borings:										
LF4SB1	5875.30	2.50	5872.80							
LF4SB2	5875.90	1.50	5874.40							
LF4SB3	5875.10	12.50	5862.60							
LF4SB4	5873.50	13.50	5860.00							
Direct Push Borings:										
LF4DP1	5874.14	11.00	5863.14							
LF4DP2	5873.55	4.00	5869.55							
LF4DP3	5871.63	12.00	5859.63							
LF4DP4	5881.66	15.00	5866.66							
LF4DP5	5874.63	9.00	5865.63							
LF4DP6	5874.72	UK	NA							No definitive contact with bedrock.

TABLE 3-5
BEDROCK AND WELL COMPLETION INFORMATION
LANDFILL 4
FORT CARSON, COLORADO

	Measurements from Ground Surface (feet)						Measurements from Top of Casing (feet)			
Well ID	**Ground Surface Elevation[1]**	**Depth to Weathered Pierre Shale**	**Weathered Pierre Shale Elevation**	**Inner Riser Stick Up Height (feet)**	**Screen Length[2]**	**Well Casing Inside Diameter (inches)[2]**	**TOC Elevation[1]**	**Total Depth[2,3]**	**Depth to Screen[2]**	**Comments**
Other Borings:										
HWSSB1	5876.10	4.00	5872.10							
HWSSB2	5877.20	1.50	5875.70							
HWSSB3	5876.90	2.00	5874.90							

Notes:

NA	Not available
TOC	Top of Casing
UK	Unknown

1 Based on survey data; top of inner casing listed for wells with protective casing above grade.
2 From Well Completion Detail Log (Appendix E)
3 Total depth measured prior to sampling (Ground Water Sample Collection Log, Appendix I)
4 USACHPPM 1995
5 Well overdrilled on 11/13/01 and replaced by well LF4MW6.

TABLE 4-1
SUMMARY OF WATER LEVEL INFORMATION
LANDFILL 4
FORT CARSON, COLORADO

Well ID	Measurement Date	TOC Elevation	Depth to Water (feet)	Water Elevation
LF4MW1	4/10/95	5878.18	4.68	5873.50
	1/24/96	5878.18	6.30	5871.88
	4/15/96	5878.18	6.91	5871.27
	7/17/96	5878.18	6.79	5871.39
	10/21/96	5878.18	6.63	5871.55
	1/7/97	5878.18	6.58	5871.60
	3/31/97	5878.18	6.82	5871.36
	7/10/97	5878.18	6.46	5871.72
	10/22/97	5878.18	6.48	5871.70
	1/14/98	5878.18	6.33	5871.85
	6/26/01	5878.18	Dry[1]	--
	7/16/01	5878.18	9.72	5868.46
	3/25/02	5878.18	9.66	5868.52
LF4MW2	4/10/95	5879.70	4.25	5875.45
	1/24/96	5879.70	12.02	5867.68
	4/15/96	5879.70	6.95	5872.75
	7/17/96	5879.70	10.75	5868.95
	10/21/96	5879.70	11.15	5868.55
	1/7/97	5879.70	11.68	5868.02
	3/31/97	5879.70	12.83	5866.87
	7/10/97	5879.70	9.64	5870.06
	10/22/97	5879.70	11.00	5868.70
	1/14/98	5879.70	10.71	5868.99
	4/23/98	5879.70	9.31	5870.39
	7/28/98	5879.70	11.27	5868.43
	10/20/98	5879.70	11.45	5868.25
	4/15/99	5879.70	11.33	5868.37
	7/21/99	5879.70	10.25	5869.45
	4/13/00	5879.70	11.20	5868.50
	7/11/00	5879.70	10.88	5868.82
	6/26/01	5879.70	12.29	5867.41
	7/16/01	5879.70	12.44	5867.26
	3/25/02	5879.70	14.29	5865.41
LF4MW3	4/9/95	5874.94	5.21	5869.73
	1/24/96	5874.94	7.66	5867.28
	4/15/96	5874.94	7.71	5867.23
	7/17/96	5874.94	6.83	5868.11
	10/21/96	5874.94	6.98	5867.96
	1/7/97	5874.94	7.31	5867.63
	3/31/97	5874.94	7.65	5867.29
	7/10/97	5874.94	5.69	5869.25
	10/22/97	5874.94	6.72	5868.22
	1/13/98	5874.94	7.29	5867.65

TABLE 4-1
SUMMARY OF WATER LEVEL INFORMATION
LANDFILL 4
FORT CARSON, COLORADO

Well ID	Measurement Date	TOC Elevation	Depth to Water (feet)	Water Elevation
LF4MW3	4/23/98	5874.94	5.15	5869.79
(cont.)	7/28/98	5874.94	7.14	5867.80
	10/20/98	5874.94	7.17	5867.77
	1/22/99	5874.94	8.05	5866.89
	4/15/99	5874.94	7.15	5867.79
	7/21/99	5874.94	6.20	5868.74
	4/13/00	5874.94	6.50	5868.44
	7/11/00	5874.94	6.74	5868.20
	6/26/01	5874.94	8.19	5866.75
	7/16/01	5874.94	8.27	5866.67
	10/23/01	5874.94	9.03	5865.91
	3/25/02	5874.94	9.97	5864.97
LF4MW4	1/23/01	5877.58	11.23	5866.35
	6/26/01	5877.58	8.96	5868.62
	7/16/01	5877.58	9.23	5868.35
	10/23/01	5877.58	9.08	5868.50
	3/25/02	5877.58	9.19	5868.39
LF4MW5	1/23/01	5874.75	5.87	5868.88
	6/26/01	5874.75	3.57	5871.18
	7/16/01	5874.75	3.27	5871.48
	10/23/01	5874.75	3.86	5870.89
	3/25/02	5874.75	5.10	5869.65
LF4MW6	3/25/02	5875.03	5.34	5869.69
LF4MW7	3/25/02	5875.43	9.71	5865.72
PZ4	1/24/96	5872.58	2.10	5870.48
	4/15/96	5872.58	1.71	5870.87
	7/17/96	5872.58	0.99	5871.59
	10/21/96	5872.58	5.04	5867.54
	3/31/97	5872.58	1.29	5871.29
	1/13/98	5872.58	1.07	5871.51
	4/23/98	5872.58	0.50	5872.08
	7/28/98	5872.58	0.33	5872.25
	10/20/98	5872.58	1.11	5871.47
	1/22/99	5872.58	2.36	5870.22
	4/15/99	5872.58	1.60	5870.98
	7/21/99	5872.58	0.15	5872.43
	4/13/00	5872.58	0.80	5871.78
	7/11/00	5872.58	0.60	5871.98
	6/26/01	5872.58	0.96	5871.62
	7/16/01	5872.58	0.91	5871.67

TABLE 4-1
SUMMARY OF WATER LEVEL INFORMATION
LANDFILL 4
FORT CARSON, COLORADO

Well ID	Measurement Date	TOC Elevation	Depth to Water (feet)	Water Elevation
W4-1	6/26/01	5877.43	8.39	5869.04
	7/16/01	5877.43	8.19	5869.24
	3/25/02	5877.43	9.31	5868.12
W4-2	6/26/01	5875.17	7.35	5867.82
	7/16/01	5875.17	7.14	5868.03
	3/25/02	5875.17	7.70	5867.47
W4-3	7/11/00	5881.32	13.67	5867.65
	6/26/01	5881.32	14.67	5866.65
	7/16/01	5881.32	14.86	5866.46
	10/23/01	5881.32	15.64	5865.68
	3/25/02	5881.32	16.91	5864.41

Notes:

TOC — Top of casing; top of inner casing listed for wells with protective casing above grade.

[1] Although LF4MW1 was reported dry on 6/26/01, depth to water measured on 7/16/01 was 9.72 feet below TOC. The corresponding groundwater elevation is 5868.46.

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TABLE 4-2
INTERIM UPPER TOLERANCE LIMITS FOR BACKGROUND SOIL DATA SETS*
ALLUVIUM AND PIERRE SHALE
FORT CARSON, COLORADO

Analyte	Alluvium UTL (mg/kg)	Pierre Shale UTL (mg/kg)
Aluminum	17,000	13,248
Antimony	3.4	3
Arsenic	15	11.3
Barium	282	573
Beryllium	1.3	1.37
Cadmium	0.315	0.64
Calcium	27,800	55,400
Chromium (Total)	22.1	21.8
Cobalt	11	28.9
Copper	22.3	35
Iron	28,900	34,064
Lead	32.9	27.8
Magnesium	7,000	8,000
Manganese	1,100	2,448
Mercury	0.034	0.0772
Nickel	25.7	60.5
Potassium	2,910	2,195
Selenium	3.03	5.5
Silver	0.73	2.8
Sodium	3,820	2,580
Thallium	30	27
Vanadium	37	37
Zinc	87	130

Notes:
* Rust 1999b. Draft Final Risk-Based Procedures Evaluation Manual, Module I, Sitewide Background Data Set for Soils. Fort Carson, Colorado. October.

mg/kg milligram per kilogram
UTL upper tolerance limit

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TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
Direct Push Temporary Monitoring Wells - Initial Samples Impacted by Source Water - Data Not Evaluated in RFI Report												
LF4DP01	1/30/01	8260		No	Bromodichloromethane	1.1	µg/L					
		8260		No	Chloroform	2.9	µg/L					
		8260		No	Dibromochloromethane	0.47	µg/L	J				
		8260	TIC	No	Oxygenated Hydrocarbon	1.7	µg/L	J				
		8270			bis(2-Ethylhexyl)phthalate	3.4	µg/L	J	J7			
		8270	TIC		Saturated Hydrocarbon	11	µg/L	J				
		8270	TIC		Unknown	41	µg/L	J				
		8270	TIC		Unknown #2	6.7	µg/L	J				
		8270	TIC		Unknown #3	17	µg/L	J				
		8270	TIC		Unsaturated hydrocarbon	18	µg/L	J				
		6010			Barium	0.023	mg/L	B				
		6010			Calcium	370	mg/L					
		6010			Copper	0.0061	mg/L	B				
		6010			Magnesium	190	mg/L					
		6010			Manganese	0.056	mg/L					
		6010			Potassium	24	mg/L					
		6010			Selenium	0.055	mg/L					
		6010			Sodium	1400	mg/L					
		6010			Vanadium	0.00082	mg/L	B				
LF4DP02	1/30/01	8260		No	Acetone	6.3	µg/L	J	J9			
		8260		No	Bromodichloromethane	1.6	µg/L					
		8260		No	Chloroform	6.3	µg/L					
		8260		No	Dibromochloromethane	0.43	µg/L	J				
		8260		No	Toluene	0.24	µg/L	J				
		8260		No	Xylene-m,p	0.58	µg/L					
		8260		No	Xylene-o	0.27	µg/L	J				
		8260	TIC	No	1,2,4-Trimethylbenzene	1.2	µg/L	J				
		8260	TIC	No	Oxygenated Hydrocarbon2	4.1	µg/L	J				
		8260	TIC	No	Substituted benzene	1.3	µg/L	J				
LF4DP03	1/30/01	6010			Arsenic	0.0026	mg/L	B				
		6010			Barium	0.021	mg/L	B				
		6010			Calcium	280	mg/L					
		6010			Cobalt	0.018	mg/L					
		6010			Copper	0.017	mg/L					
		6010			Magnesium	1700	mg/L					
		6010			Manganese	4.8	mg/L					
		6010			Nickel	0.02	mg/L					

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
LF4DP03	1/30/01	6010			Potassium	48	mg/L					
(cont.)		6010			Selenium	0.0053	mg/L					
		6010			Sodium	9200	mg/L					
		6010			Vanadium	0.00049	mg/L	B				
		8021		Yes	Toluene	0.29	µg/L	J	J11			
		8260		No	Acetone	12	µg/L		J9			
		8260		No	Bromodichloromethane	0.25	µg/L	J				
		8260		No	Chloroform	2.7	µg/L					
		8260		No	Ethylbenzene	0.2	µg/L	J				
		8260		No	Toluene	0.49	µg/L	J				
		8260		No	Xylene-m,p	0.76	µg/L					
		8260		No	Xylene-o	0.37	µg/L	J				
		8270	TIC		2,6-bis(1,1-Dimethylethyl)-4-(1-oxyprop	6.1	µg/L	J				
		8270	TIC		Carboxylic Acid	9.1	µg/L	J				
		8270	TIC		Saturated Hydrocarbon	4.8	µg/L	J				
		8270	TIC		Saturated Hydrocarbon2	11	µg/L	J				
		8270	TIC		Saturated Hydrocarbon3	8.6	µg/L	J				
		8270	TIC		Unknown	46	µg/L	J				
		8270	TIC		Unsaturated hydrocarbon	22	µg/L	J				
		8270	TIC		Unsaturated hydrocarbon2	20	µg/L	J				
LF4DP04	1/30/01	6010			Arsenic	0.0038	mg/L	B				
		6010			Barium	0.027	mg/L	B	J13			
		6010			Calcium	340	mg/L		J13			
		6010			Copper	0.035	mg/L					
		6010			Magnesium	720	mg/L					
		6010			Manganese	1.2	mg/L		J13			
		6010			Nickel	0.0093	mg/L	B				
		6010			Potassium	19	mg/L		J2			
		6010			Selenium	0.0049	mg/L	B				
		6010			Sodium	3700	mg/L					
		6010			Vanadium	0.0015	mg/L	B				
		8021		Yes	Toluene	0.2	µg/L	J	J11			
		8260		No	Acetone	4.8	µg/L	J	J9			
		8260		No	Bromodichloromethane	2.7	µg/L					
		8260		No	Chloroform	5.8	µg/L					
		8260		No	Dibromochloromethane	0.97	µg/L	J				
		8260		No	Toluene	0.2	µg/L	J				
		8260		No	Xylene-o	0.22	µg/L	J				

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
LF4DP04	1/30/01	8260	TIC	No	Oxygenated Hydrocarbon	1	µg/L	J				
(cont.)		8270	TIC		Oxygenated Hydrocarbon	28	µg/L	J				
		8270	TIC		Oxygenated Hydrocarbon2	12	µg/L	J				
		8270	TIC		Saturated Hydrocarbon	6.9	µg/L	J				
		8270	TIC		Saturated Hydrocarbon2	5.7	µg/L	J				
		8270	TIC		Unknown alcohol	7.7	µg/L	J				
LF4DP05	1/30/01	8260		No	Acetone	3.3	µg/L	J	J9			
		8260		No	Bromodichloromethane	1.9	µg/L					
		8260		No	Chloroform	6.1	µg/L					
		8260		No	Dibromochloromethane	0.64	µg/L	J				
		8260		No	Xylene-o	0.27	µg/L	J				
		8260	TIC	No	Oxygenated Hydrocarbon	1.5	µg/L	J				
LF4DP06	1/30/01	8021		Yes	Toluene	0.17	µg/L	J	J11			
		8260		No	Acetone	10	µg/L		J9			
		8260		No	Bromodichloromethane	0.78	µg/L	J				
		8260		No	Chloroform	6	µg/L					
		8260		No	Dibromochloromethane	0.26	µg/L	J				
		8260		No	Ethylbenzene	0.21	µg/L	J				
		8260		No	Toluene	0.37	µg/L	J				
		8260		No	Xylene-m,p	0.88	µg/L					
		8260		No	Xylene-o	0.39	µg/L	J				
		8260	TIC	No	1,2,4-Trimethylbenzene	2	µg/L	J				
		8260	TIC	No	Oxygenated Hydrocarbon	4.6	µg/L	J				
		8260	TIC	No	Substituted benzene	1.9	µg/L	J				
		8260	TIC	No	Substituted Benzene2	1	µg/L	J				
Direct-Push Temporary Monitoring Wells - Resampled - Data Evaluated in RFI Report												
LF4DP01	1/17/02	6010			Barium	0.01	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	340	mg/L					
		6010			Cobalt	0.00086	mg/L	B		0.05	mg/L	CGWS-A
		6010			Copper	0.0015	mg/L	B	J11	0.2	mg/L	CGWS-A
		6010			Magnesium	220	mg/L					
		6010			Manganese	0.01	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.0024	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	21	mg/L					
		6010			Sodium	1700	mg/L					
		6010			Thallium	0.0035	mg/L	B		0.002	mg/L	CGWS-P
LF4DP02	11/14/01	8260		No	Acetone	3.8	µg/L	J	J9			

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
LF4DP02	1/17/02	6010			Arsenic	0.0026	mg/L	B		0.05	mg/L	CGWS-P
		6010			Barium	0.015	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	350	mg/L					
		6010			Cobalt	0.0039	mg/L	B		0.05	mg/L	CGWS-A
		6010			Copper	0.0018	mg/L	B	J11	0.2	mg/L	CGWS-A
		6010			Magnesium	310	mg/L					
		6010			Manganese	0.12	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.0076	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	11	mg/L					
		6010			Sodium	830	mg/L					
		6010			Thallium	0.002	mg/L	B		0.002	mg/L	CGWS-P
		6010			Zinc	0.012	mg/L	B		2	mg/L	CGWS-A
LF4DP03	11/14/01	8260		No	Acetone	7.1	µg/L	J	J9			
LF4DP03	1/17/02	6010			Arsenic	0.0047	mg/L	B		0.05	mg/L	CGWS-P
		6010			Barium	0.0071	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	230	mg/L					
		6010			Cobalt	0.0061	mg/L	B		0.05	mg/L	CGWS-A
		6010			Copper	0.025	mg/L			0.2	mg/L	CGWS-A
		6010			Magnesium	3100	mg/L					
		6010			Manganese	1.8	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.018	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	47	mg/L					
		6010			Sodium	12000	mg/L					
		6010			Thallium	0.0017	mg/L	B		0.002	mg/L	CGWS-P
		7470			Mercury	0.000035	mg/L	B	J11	0.002	mg/L	CGWS-P
LF4DP04	11/14/01	8260		No	Chloroform	0.19	µg/L	J		6	µg/L	CGWS-P
LF4DP04	1/17/02	6010			Arsenic	0.0052	mg/L	B		0.05	mg/L	CGWS-P
		6010			Barium	0.0077	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	240	mg/L					
		6010			Chromium	0.00076	mg/L	B	J11	0.1	mg/L	CGWS-P
		6010			Cobalt	0.0014	mg/L	B		0.05	mg/L	CGWS-A
		6010			Copper	0.016	mg/L			0.2	mg/L	CGWS-A
		6010			Magnesium	2700	mg/L					
		6010			Manganese	0.018	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.011	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	31	mg/L					
		6010			Sodium	11000	mg/L					
		6010			Vanadium	0.00058	mg/L	B	J11	0.1	mg/L	CGWS-A
LF4DP05	11/14/01	8260		No	Carbon disulfide	0.25	µg/L	J				

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
LF4DP05	1/17/02	6010			Arsenic	0.0036	mg/L	B		0.05	mg/L	CGWS-P
		6010			Barium	0.011	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	260	mg/L					
		6010			Cobalt	0.0065	mg/L	B		0.05	mg/L	CGWS-A
		6010			Copper	0.00071	mg/L	B	J11	0.2	mg/L	CGWS-A
		6010			Iron	0.26	mg/L			0.3	mg/L	CGWS-S
		6010			Magnesium	620	mg/L					
		6010			Manganese	0.33	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.0091	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	30	mg/L					
		6010			Sodium	4300	mg/L					
		6010			Thallium	0.0029	mg/L	B		0.002	mg/L	CGWS-P
		6010			Vanadium	0.0023	mg/L	B		0.1	mg/L	CGWS-A
LF4DP06	11/14/01	8260		No	2-Butanone (MEK)	4.7	µg/L	J				
		8260		No	Acetone	13	µg/L		J9			
LF4DP06	1/17/02	6010			Barium	0.025	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	140	mg/L					
		6010			Cobalt	0.001	mg/L	B		0.05	mg/L	CGWS-A
		6010			Magnesium	54	mg/L					
		6010			Manganese	0.41	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.0039	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	6	mg/L					
		6010			Sodium	180	mg/L					
		6010			Zinc	0.0094	mg/L	B		2	mg/L	CGWS-A
Permanent Monitoring Wells												
LF4MW01	4/25/95	6010			Barium	0.0236	mg/L			2	mg/L	CGWS-P
		6010			Calcium	509	mg/L					
		6010			Magnesium	104	mg/L					
		6010			Potassium	16	mg/L					
		6010			Silver	0.0039	mg/L	J	J	0.05	mg/L	CGWS-P
		6010			Sodium	867	mg/L					
LF4MW01	1/18/01	160.1			Total Dissolved Solids	5500	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	44	mg/L					
		300.0			Chloride	110	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	3500	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	580	mg/L					

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
LF4MW01	1/18/01	310.1			Alkalinity, Total as CaCO3 at pH 4.5	580	mg/L					
(cont.)		340.2			Fluoride	0.89	mg/L			2	mg/L	CGWS-A
		410.4			Chemical Oxygen Demand (Regular)	15	mg/L					
		415.1			Total Organic Carbon	6.4	mg/L					
		6010			Antimony	0.0019	mg/L	B		0.006	mg/L	CGWS-P
		6010			Arsenic	0.0043	mg/L	B		0.05	mg/L	CGWS-P
		6010			Barium	0.013	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	470	mg/L					
		6010			Chromium	0.0011	mg/L	B		0.1	mg/L	CGWS-P
		6010			Copper	0.0014	mg/L	B	J11	0.2	mg/L	CGWS-A
		6010			Magnesium	100	mg/L					
		6010			Manganese	0.54	mg/L			0.05	mg/L	CGWS-S
		6010			Potassium	20	mg/L					
		6010			Sodium	850	mg/L					
		6010			Thallium	0.0078	mg/L			0.002	mg/L	CGWS-P
		6010			Vanadium	0.0021	mg/L	B		0.1	mg/L	CGWS-A
LF4MW01	8/2/01	160.1			Total Dissolved Solids	5100	mg/L			10000	mg/L	EPA
		300.0			Chloride	82	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	2900	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	600	mg/L					
		340.2			Fluoride	0.86	mg/L			2	mg/L	CGWS-A
		6010			Barium	0.011	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	420	mg/L					
		6010			Cobalt	0.0018	mg/L	B		0.05	mg/L	CGWS-A
		6010			Magnesium	110	mg/L					
		6010			Manganese	0.48	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.0054	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	19	mg/L					
		6010			Sodium	860	mg/L					
		6010			Thallium	0.005	mg/L	B		0.002	mg/L	CGWS-P
		6010			Zinc	0.0031	mg/L	B	J11	2	mg/L	CGWS-A
LF4MW01	10/18/01	160.1			Total Dissolved Solids	5300	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	200	mg/L					
		300.0			Chloride	89	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	3100	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	580	mg/L					
		340.2			Fluoride	0.84	mg/L			2	mg/L	CGWS-A
		415.1			Total Organic Carbon	5.6	mg/L					

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
LF4MW01	10/18/01	6010			Antimony	0.0017	mg/L	B		0.006	mg/L	CGWS-P
(cont.)		6010			Barium	0.014	mg/L	B		2	mg/L	CGWS-P
		6010			Beryllium	0.00024	mg/L	B	J11	0.004	mg/L	CGWS-P
		6010			Calcium	470	mg/L					
		6010			Cobalt	0.0013	mg/L	B		0.05	mg/L	CGWS-A
		6010			Magnesium	100	mg/L					
		6010			Manganese	0.35	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.0055	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	22	mg/L					
		6010			Sodium	1000	mg/L					
		6010			Zinc	0.0035	mg/L	B	J11	2	mg/L	CGWS-A
		8270	TIC		Unsaturated hydrocarbon	4.9	µg/L	J,A				
		8270	TIC		Unsaturated hydrocarbon2	4.2	µg/L	J,A				
LF4MW01	12/4/01	160.1			Total Dissolved Solids	5500	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	110	mg/L					
		300.0			Chloride	97	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	3400	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	550	mg/L					
		340.2			Fluoride	0.93	mg/L			2	mg/L	CGWS-A
		415.1			Total Organic Carbon	5.8	mg/L					
		6010			Barium	0.012	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	480	mg/L					
		6010			Cobalt	0.0031	mg/L	B		0.05	mg/L	CGWS-A
		6010			Magnesium	90	mg/L					
		6010			Manganese	0.3	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.0045	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	18	mg/L					
		6010			Sodium	1100	mg/L					
		6010			Zinc	0.0029	mg/L	B		2	mg/L	CGWS-A
LF4MW02	4/25/95	6010			Barium	0.0249	mg/L			2	mg/L	CGWS-P
		6010			Calcium	492	mg/L					
		6010			Magnesium	134	mg/L					
		6010			Potassium	24.1	mg/L					
		6010			Silver	0.0035	mg/L	J	J	0.05	mg/L	CGWS-P
		6010			Sodium	496	mg/L					
LF4MW02	1/31/96	160.1			Total Dissolved Solids	4340	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	648	mg/L					
		300.0			Chloride	92.1	mg/L			250	mg/L	CGWS-S

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
LF4MW02	1/31/96	300.0			Nitrate as N	0.55	mg/L			10	mg/L	CGWS-P
(cont.)		300.0			Sulfate	2550	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	367	mg/L					
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	367	mg/L					
		353.2			Nitrate plus Nitrite as N	1.3	mg/L			10	mg/L	CGWS-P
		415.1			Total Organic Carbon	4	mg/L					
LF4MW02	2/1/96	6010			Barium	0.017	mg/L			2	mg/L	CGWS-P
		6010			Calcium	491	mg/L					
		6010			Magnesium	151	mg/L					
		6010			Manganese	0.5	mg/L			0.05	mg/L	CGWS-S
		6010			Potassium	17.8	mg/L					
		6010			Silica as SiO2	15.1	mg/L					
		6010			Sodium	505	mg/L					
		7041			Antimony	0.0032	mg/L	J		0.006	mg/L	CGWS-P
LF4MW02	4/25/96	6010			Barium	0.017	mg/L			2	mg/L	CGWS-P
		6010			Calcium	483	mg/L					
		6010			Magnesium	158	mg/L					
		6010			Manganese	0.2	mg/L			0.05	mg/L	CGWS-S
		6010			Potassium	17.2	mg/L					
		6010			Silica as SiO2	14.6	mg/L					
		6010			Sodium	500	mg/L					
		7060			Arsenic	0.0028	mg/L	J		0.05	mg/L	CGWS-P
		8270	TIC		Caprolactam	7.3	µg/L	2				
		8270	TIC		Oxygenated Hydrocarbon	4	µg/L	0				
		8270	TIC		Oxygenated Hydrocarbon	4.7	µg/L	0				
LF4MW02	4/26/96	160.1			Total Dissolved Solids	4320	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	734	mg/L					
		300.0			Chloride	98.4	mg/L			250	mg/L	CGWS-S
		300.0			Nitrate as N	0.52	mg/L			10	mg/L	CGWS-P
		300.0			Sulfate	2470	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	364	mg/L					
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	364	mg/L					
		353.2			Nitrate plus Nitrite as N	1.1	mg/L			10	mg/L	CGWS-P
		415.1			Total Organic Carbon	3.4	mg/L					
LF4MW02	7/23/96	160.1			Total Dissolved Solids	4530	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	431	mg/L					
		300.0			Chloride	89.6	mg/L			250	mg/L	CGWS-S
		300.0			Nitrate as N	1.2	mg/L			10	mg/L	CGWS-P

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
LF4MW02	7/23/96	300.0			Sulfate	2660	mg/L			250	mg/L	CGWS-S
(cont.)		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	359	mg/L					
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	359	mg/L					
		353.2			Nitrate plus Nitrite as N	1.4	mg/L			10	mg/L	CGWS-P
		415.1			Total Organic Carbon	4.4	mg/L					
		6010			Barium	0.022	mg/L			2	mg/L	CGWS-P
		6010			Calcium	447	mg/L					
		6010			Magnesium	139	mg/L					
		6010			Manganese	0.052	mg/L			0.05	mg/L	CGWS-S
		6010			Potassium	14.6	mg/L					
		6010			Silica as SiO2	14.1	mg/L					
		6010			Sodium	472	mg/L					
		8270			Benzoic acid	3.4	µg/L	J				
		8270			Di-n-butyl phthalate	1.5	µg/L	J		700	µg/L	CGWS-P
		8270	TIC		2-Butoxyethanol	13	µg/L	2				
		8270	TIC		Caprolactam	36	µg/L	2				
		8270	TIC		Ethanol, 2-(2-methoxyethoxy)-	5.8	µg/L	2				
		8270	TIC		Nitrogen Compound	5.9	µg/L	0				
		8270	TIC		Oxygenated Hydrocarbon	6.8	µg/L	0				
		8270	TIC		Oxygenated Hydrocarbon	5.7	µg/L	0				
LF4MW02	11/5/96	160.1			Total Dissolved Solids	4200	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	227	mg/L					
		300.0			Chloride	99.6	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	2560	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	376	mg/L					
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	376	mg/L					
		353.2			Nitrate plus Nitrite as N	0.47	mg/L			10	mg/L	CGWS-P
		415.1			Total Organic Carbon	3.9	mg/L					
		6010			Barium	0.021	mg/L			2	mg/L	CGWS-P
		6010			Calcium	535	mg/L					
		6010			Magnesium	156	mg/L					
		6010			Manganese	0.17	mg/L			0.05	mg/L	CGWS-S
		6010			Potassium	19	mg/L					
		6010			Silica as SiO2	15.9	mg/L					
		6010			Sodium	569	mg/L					
		8260		Yes	Bromomethane	3.6	µg/L	J				
		8260		Yes	Chloromethane	1.3	µg/L	J				
		8260	TIC	Yes	Siloxane	5.2	µg/L	0				

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
LF4MW02	11/5/96	8270	TIC		Siloxane	17	µg/L	0				
(cont.)		8270	TIC		Siloxane	15	µg/L	0				
		8270	TIC		Siloxane	7.3	µg/L	0				
		8270	TIC		Siloxane	7.8	µg/L	0				
		8270	TIC		Siloxane	16	µg/L	0				
		8270	TIC		Siloxane	4.8	µg/L	0				
		8270	TIC		Siloxane	4.5	µg/L	0				
		8270	TIC		Siloxane	4.3	µg/L	0				
LF4MW02	1/23/97	300.0			Chloride	90	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	2620	mg/L			250	mg/L	CGWS-S
		6010			Barium	0.017	mg/L			2	mg/L	CGWS-P
		6010			Calcium	517	mg/L					
		6010			Magnesium	172	mg/L					
		6010			Manganese	0.04	mg/L			0.05	mg/L	CGWS-S
		6010			Potassium	17.2	mg/L					
		6010			Sodium	564	mg/L					
		8260	TIC	Yes	Siloxane	1	µg/L	0				
		8270	TIC		1,3-Dioxolane, 2-ethyl-4-methyl-	4.1	µg/L	1				
LF4MW02	1/24/97	160.1			Total Dissolved Solids	4280	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	96	mg/L					
		300.0			Chloride	101	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	2580	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	364	mg/L					
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	364	mg/L					
LF4MW02	4/15/97	353.2			Nitrate plus Nitrite as N	0.73	mg/L			10	mg/L	CGWS-P
		415.1			Total Organic Carbon	3.7	mg/L					
		6010			Barium	0.016	mg/L			2	mg/L	CGWS-P
		6010			Calcium	537	mg/L					
		6010			Magnesium	179	mg/L					
		6010			Potassium	16.7	mg/L					
		6010			Silica as SiO2	15.2	mg/L					
		6010			Sodium	615	mg/L					
LF4MW02	4/16/97	160.1			Total Dissolved Solids	4240	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	106	mg/L					
		300.0			Chloride	100	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	2550	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	352	mg/L					
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	352	mg/L					

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
LF4MW02	7/28/97	160.1			Total Dissolved Solids	4350	mg/L			10000	mg/L	EPA
		300.0			Chloride	89.6	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	2630	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	360	mg/L					
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	360	mg/L					
		353.2			Nitrate plus Nitrite as N	1.1	mg/L			10	mg/L	CGWS-P
		6010			Barium	0.017	mg/L			2	mg/L	CGWS-P
		6010			Calcium	508	mg/L					
		6010			Magnesium	166	mg/L					
		6010			Potassium	14.9	mg/L					
		6010			Silica as SiO2	15.4	mg/L					
		6010			Sodium	549	mg/L					
LF4MW02	10/28/97	160.1			Total Dissolved Solids	4630	mg/L			10000	mg/L	EPA
		300.0			Chloride	40	mg/L			250	mg/L	CGWS-S
		300.0			Nitrate as N	1160	mg/L			10	mg/L	CGWS-P
		300.0			Orthophosphate as P	8.6	mg/L					
		300.0			Sulfate	249	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	364	mg/L					
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	364	mg/L					
		6010			Barium	0.015	mg/L			2	mg/L	CGWS-P
		6010			Cadmium	0.0066	mg/L			0.005	mg/L	CGWS-P
		6010			Calcium	477	mg/L					
		6010			Magnesium	154	mg/L					
		6010			Potassium	15	mg/L					
		6010			Silica as SiO2	15.6	mg/L					
		6010			Sodium	522	mg/L					
LF4MW02	10/29/97	353.2			Nitrate plus Nitrite as N	1.1	mg/L			10	mg/L	CGWS-P
LF4MW02	1/21/98	160.1			Total Dissolved Solids	4100	mg/L			10000	mg/L	EPA
		300.0			Chloride	89	mg/L			250	mg/L	CGWS-S
		300.0			Fluoride	1.7	mg/L			2	mg/L	CGWS-A
		300.0			Sulfate	2600	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	370	mg/L					
		6010			Calcium	500	mg/L					
		6010			Magnesium	160	mg/L					
		6010			Potassium	18	mg/L					
		6010			Sodium	550	mg/L					
		6010			Thallium	0.0063	mg/L			0.002	mg/L	CGWS-P

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
LF4MW02	7/30/98	160.1			Total Dissolved Solids	4400	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	1100	mg/L					
		300.0			Chloride	85	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	2600	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	340	mg/L					
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	340	mg/L					
		6010			Calcium	500	mg/L					
		6010			Magnesium	160	mg/L					
		6010			Potassium	23	mg/L					
		6010			Sodium	500	mg/L					
LF4MW02	7/31/98	410.4			Chemical Oxygen Demand (Regular)	32	mg/L					
		415.1			Total Organic Carbon	7	mg/L					
		8080	TIC		Decachlorobiphenyl	0.144	µg/L					
		8150	TIC		DCAA	2	µg/L			60	µg/L	MCL
LF4MW02	4/21/99	300.0			Chloride	93	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	2700	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	380	mg/L					
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	380	mg/L					
		353.3			Nitrate as N	0.68	mg/L			10	mg/L	CGWS-P
		6010			Calcium	450	mg/L					
		6010			Magnesium	160	mg/L					
		6010			Potassium	21	mg/L					
		6010			Sodium	550	mg/L					
		8270	TIC		Oxygenated Hydrocarbon2	4.3	µg/L	J				
		8270	TIC		Oxygenated Hydrocarbon3	6.6	µg/L	J				
		8270	TIC		Oxygenated Hydrocarbon4	4.3	µg/L	J				
		8270	TIC		Unknown	7.4	µg/L	J				
LF4MW02	4/22/99	160.1			Total Dissolved Solids	4400	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	86	mg/L					
		410.4			Chemical Oxygen Demand (Regular)	20	mg/L					
		415.1			Total Organic Carbon	8.8	mg/L	N				
LF4MW02	5/3/00	6010			Calcium	460	mg/L					
		6010			Iron	0.16	mg/L			0.3	mg/L	CGWS-S
		6010			Magnesium	160	mg/L					
		6010			Potassium	19	mg/L					
		6010			Sodium	530	mg/L					
LF4MW02	5/4/00	160.1			Total Dissolved Solids	4300	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	88	mg/L					

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
LF4MW02	5/4/00	300.0			Chloride	80	mg/L			250	mg/L	CGWS-S
(cont.)		300.0			Nitrate as N	0.68	mg/L			10	mg/L	CGWS-P
		300.0			Sulfate	2600	mg/L			250	mg/L	CGWS-S
		410.4			Chemical Oxygen Demand (Regular)	15	mg/L					
		415.1			Total Organic Carbon	2.7	mg/L					
LF4MW02	1/17/01	160.1			Total Dissolved Solids	4500	mg/L			10000	mg/L	EPA
		300.0			Chloride	100	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	2800	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	380	mg/L					
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	380	mg/L					
		410.4			Chemical Oxygen Demand (Regular)	10	mg/L					
		415.1			Total Organic Carbon	6.8	mg/L					
		6010			Arsenic	0.0025	mg/L	B		0.05	mg/L	CGWS-P
		6010			Barium	0.013	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	460	mg/L					
		6010			Magnesium	160	mg/L					
		6010			Manganese	0.0019	mg/L	B		0.05	mg/L	CGWS-S
		6010			Nickel	0.0037	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	22	mg/L					
		6010			Silver	0.0021	mg/L	B		0.05	mg/L	CGWS-P
		6010			Sodium	540	mg/L					
		6010			Thallium	0.0054	mg/L			0.002	mg/L	CGWS-P
		6010			Zinc	0.007	mg/L	B		2	mg/L	CGWS-A
LF4MW02	8/3/01	160.1			Total Dissolved Solids	4600	mg/L			10000	mg/L	EPA
		300.0			Chloride	94	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	2700	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	370	mg/L					
		6010			Barium	0.012	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	470	mg/L					
		6010			Chromium	0.0012	mg/L	B	J11	0.1	mg/L	CGWS-P
		6010			Cobalt	0.00037	mg/L	B	J11	0.05	mg/L	CGWS-A
		6010			Magnesium	130	mg/L					
		6010			Nickel	0.00072	mg/L	B	J11	0.1	mg/L	CGWS-P
		6010			Potassium	23	mg/L					
		6010			Sodium	590	mg/L					
LF4MW03	4/21/95	6010			Barium	0.011	mg/L	J		2	mg/L	CGWS-P
		6010			Calcium	212	mg/L					
		6010			Magnesium	103	mg/L					

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
LF4MW03	4/21/95	6010			Potassium	5.23	mg/L					
(cont.)		6010			Sodium	352	mg/L					
		160.1			Total Dissolved Solids	2180	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	652	mg/L					
		300.0			Chloride	29.5	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	1150	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	376	mg/L					
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	376	mg/L					
		410.4			Chemical Oxygen Demand (Regular)	8.7	mg/L					
LF4MW03	4/27/95	300.0			Nitrate as N	5.93	mg/L			10	mg/L	CGWS-P
		405.1			Biochemical Oxygen Demand	1.3	mg/L					
LF4MW03	1/31/96	160.1			Total Dissolved Solids	5280	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	1480	mg/L					
		300.0			Chloride	59.8	mg/L			250	mg/L	CGWS-S
		300.0			Nitrate as N	0.25	mg/L			10	mg/L	CGWS-P
		300.0			Sulfate	2980	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	636	mg/L					
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	636	mg/L					
		353.2			Nitrate plus Nitrite as N	0.22	mg/L			10	mg/L	CGWS-P
		415.1			Total Organic Carbon	5.5	mg/L					
		6010			Barium	0.033	mg/L			2	mg/L	CGWS-P
		6010			Calcium	455	mg/L					
		6010			Magnesium	235	mg/L					
		6010			Manganese	0.28	mg/L			0.05	mg/L	CGWS-S
		6010			Potassium	9.3	mg/L					
		6010			Silica as SiO2	12.6	mg/L					
		6010			Sodium	717	mg/L					
		7041			Antimony	0.002	mg/L	J		0.006	mg/L	CGWS-P
		7060			Arsenic	0.004	mg/L	J		0.05	mg/L	CGWS-P
		8270			bis(2-Ethylhexyl)phthalate	18	µg/L			2.5	µg/L	CGWS-P
LF4MW03	4/25/96	160.1			Total Dissolved Solids	5280	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	718	mg/L					
		300.0			Chloride	70.8	mg/L			250	mg/L	CGWS-S
		300.0			Nitrate as N	0.2	mg/L			10	mg/L	CGWS-P
		300.0			Sulfate	3030	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	676	mg/L					
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	676	mg/L					
		415.1			Total Organic Carbon	5.4	mg/L					

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
LF4MW03	4/25/96	6010			Barium	0.022	mg/L			2	mg/L	CGWS-P
(cont.)		6010			Calcium	450	mg/L					
		6010			Magnesium	243	mg/L					
		6010			Manganese	0.21	mg/L			0.05	mg/L	CGWS-S
		6010			Potassium	9.6	mg/L					
		6010			Silica as SiO2	11.7	mg/L					
		6010			Sodium	747	mg/L					
		7060			Arsenic	0.007	mg/L	J		0.05	mg/L	CGWS-P
		8270	TIC		Caprolactam	17	µg/L	2				
		8270	TIC		Unknown	3.9	µg/L	0				
LF4MW03	7/23/96	160.1			Total Dissolved Solids	3900	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	201	mg/L					
		300.0			Chloride	40.8	mg/L			250	mg/L	CGWS-S
		300.0			Fluoride	2.6	mg/L			2	mg/L	CGWS-A
		300.0			Nitrate as N	2.2	mg/L			10	mg/L	CGWS-P
		300.0			Sulfate	2020	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	614	mg/L					
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	614	mg/L					
		353.2			Nitrate plus Nitrite as N	2.4	mg/L			10	mg/L	CGWS-P
		410.4			Chemical Oxygen Demand (Regular)	21.1	mg/L					
		415.1			Total Organic Carbon	5.6	mg/L					
		6010			Barium	0.022	mg/L			2	mg/L	CGWS-P
		6010			Calcium	326	mg/L					
		6010			Magnesium	161	mg/L					
		6010			Manganese	0.22	mg/L			0.05	mg/L	CGWS-S
		6010			Potassium	7.5	mg/L					
		6010			Silica as SiO2	12.4	mg/L					
		6010			Sodium	518	mg/L					
		7041			Antimony	0.0045	mg/L	J		0.006	mg/L	CGWS-P
		8270			Benzoic acid	2.4	µg/L	J				
		8270	TIC		2-Butoxyethanol	6.1	µg/L	2				
		8270	TIC		Caprolactam	34	µg/L	2				
		8270	TIC		Nitrogen Compound	4.7	µg/L	0				
		8270	TIC		Siloxane	4.6	µg/L	0				
LF4MW03	11/1/96	160.1			Total Dissolved Solids	4360	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	258	mg/L					
		300.0			Chloride	53.3	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	2610	mg/L			250	mg/L	CGWS-S

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
LF4MW03	11/1/96	310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	640	mg/L					
(cont.)		310.1			Alkalinity, Total as CaCO3 at pH 4.5	640	mg/L					
		353.2			Nitrate plus Nitrite as N	0.13	mg/L			10	mg/L	CGWS-P
		415.1			Total Organic Carbon	5.7	mg/L					
		6010			Barium	0.018	mg/L			2	mg/L	CGWS-P
		6010			Calcium	404	mg/L					
		6010			Magnesium	215	mg/L					
		6010			Manganese	0.22	mg/L			0.05	mg/L	CGWS-S
		6010			Potassium	10.5	mg/L					
		6010			Silica as SiO2	13.3	mg/L					
		6010			Sodium	694	mg/L					
		7041			Antimony	0.0029	mg/L	J		0.006	mg/L	CGWS-P
		8270	TIC		Caprolactam	11	µg/L	2				
		8270	TIC		Ethane, isothiocyanato-	4.5	µg/L	1				
LF4MW03	1/15/97	160.1			Total Dissolved Solids	5260	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	79.6	mg/L					
		300.0			Chloride	60.2	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	3120	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	649	mg/L					
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	649	mg/L					
		410.4			Chemical Oxygen Demand (Regular)	22.2	mg/L					
		415.1			Total Organic Carbon	6.6	mg/L					
		6010			Barium	0.02	mg/L			2	mg/L	CGWS-P
		6010			Calcium	394	mg/L					
		6010			Cobalt	0.0052	mg/L	J		0.05	mg/L	CGWS-A
		6010			Magnesium	211	mg/L					
		6010			Manganese	0.17	mg/L			0.05	mg/L	CGWS-S
		6010			Potassium	9.3	mg/L					
		6010			Sodium	681	mg/L					
		7421			Lead	0.0021	mg/L	J		0.015	mg/L	MCL
		8270	TIC		Siloxane	4.7	µg/L	0				
		8270	TIC		Siloxane	5.1	µg/L	0				
		8270	TIC		Siloxane	5.5	µg/L	0				
LF4MW03	4/15/97	160.1			Total Dissolved Solids	5460	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	61.2	mg/L					
		300.0			Chloride	64.6	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	3230	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	653	mg/L					

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
LF4MW03	4/15/97	310.1			Alkalinity, Total as CaCO3 at pH 4.5	653	mg/L					
(cont.)		415.1			Total Organic Carbon	5.7	mg/L					
		6010			Barium	0.017	mg/L			2	mg/L	CGWS-P
		6010			Calcium	462	mg/L					
		6010			Magnesium	274	mg/L					
		6010			Manganese	0.22	mg/L			0.05	mg/L	CGWS-S
		6010			Potassium	10.8	mg/L					
		6010			Silica as SiO2	12.7	mg/L					
		6010			Sodium	834	mg/L					
		8260	TIC	Yes	Siloxane	1.3	µg/L	0				
		8270	TIC		TID Cmpd 2		µg/L	0				
LF4MW03	7/21/97	160.1			Total Dissolved Solids	4740	mg/L			10000	mg/L	EPA
		300.0			Chloride	54.6	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	2770	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	621	mg/L					
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	621	mg/L					
		353.2			Nitrate plus Nitrite as N	0.74	mg/L			10	mg/L	CGWS-P
		6010			Barium	0.024	mg/L			2	mg/L	CGWS-P
		6010			Calcium	445	mg/L					
		6010			Magnesium	232	mg/L					
		6010			Manganese	0.14	mg/L			0.05	mg/L	CGWS-S
		6010			Potassium	9.7	mg/L					
		6010			Silica as SiO2	14.2	mg/L					
		6010			Sodium	685	mg/L					
LF4MW03	10/27/97	160.1			Total Dissolved Solids	4830	mg/L			10000	mg/L	EPA
		300.0			Chloride	52.1	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	2690	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	623	mg/L					
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	623	mg/L					
		353.2			Nitrate plus Nitrite as N	0.12	mg/L			10	mg/L	CGWS-P
		6010			Barium	0.027	mg/L			2	mg/L	CGWS-P
		6010			Calcium	397	mg/L					
		6010			Magnesium	216	mg/L					
		6010			Manganese	0.17	mg/L			0.05	mg/L	CGWS-S
		6010			Potassium	9.4	mg/L					
		6010			Silica as SiO2	14	mg/L					
		6010			Sodium	690	mg/L					

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
LF4MW03	1/16/98	160.1			Total Dissolved Solids	5100	mg/L			10000	mg/L	EPA
		300.0			Chloride	60	mg/L			250	mg/L	CGWS-S
		300.0			Fluoride	2.8	mg/L			2	mg/L	CGWS-A
		300.0			Sulfate	3200	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	640	mg/L					
		340.2			Fluoride	0.7	mg/L			2	mg/L	CGWS-A
		6010			Calcium	430	mg/L					
		6010			Magnesium	250	mg/L					
		6010			Manganese	0.21	mg/L			0.05	mg/L	CGWS-S
		6010			Potassium	13	mg/L					
		6010			Sodium	750	mg/L					
		6010			Thallium	0.0066	mg/L			0.002	mg/L	CGWS-P
LF4MW03	4/29/98	160.1			Total Dissolved Solids	3000	mg/L			10000	mg/L	EPA
		300.0			Chloride	29	mg/L			250	mg/L	CGWS-S
		300.0			Nitrate as N	2.9	mg/L			10	mg/L	CGWS-P
		300.0			Nitrate plus Nitrite as N	2.9	mg/L			10	mg/L	CGWS-P
		300.0			Sulfate	1600	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	540	mg/L					
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	540	mg/L					
		340.2			Fluoride	0.9	mg/L			2	mg/L	CGWS-A
		410.4			Chemical Oxygen Demand (Regular)	17	mg/L					
		415.1			Total Organic Carbon	9	mg/L					
		6010			Calcium	310	mg/L					
		6010			Magnesium	150	mg/L					
		6010			Manganese	0.094	mg/L			0.05	mg/L	CGWS-S
		6010			Potassium	7.9	mg/L					
		6010			Sodium	490	mg/L					
		8270			bis(2-Ethylhexyl)phthalate	2.6	µg/L	J		2.5	µg/L	CGWS-P
LF4MW03	1/17/01	160.1			Total Dissolved Solids	4900	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	310	mg/L					
		300.0			Chloride	60	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	3100	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	670	mg/L					
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	670	mg/L					
		340.2			Fluoride	0.89	mg/L			2	mg/L	CGWS-A
		410.4			Chemical Oxygen Demand (Regular)	15	mg/L					
		415.1			Total Organic Carbon	8.9	mg/L					
		6010			Barium	0.017	mg/L	B		2	mg/L	CGWS-P

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
LF4MW03	1/17/01	6010			Calcium	410	mg/L					
(cont.)		6010			Magnesium	260	mg/L					
		6010			Manganese	0.25	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.0062	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	18	mg/L		J13			
		6010			Silver	0.00047	mg/L	B		0.05	mg/L	CGWS-P
		6010			Sodium	660	mg/L					
		6010			Thallium	0.0038	mg/L	B		0.002	mg/L	CGWS-P
		8270	TIC		Unknown alcohol	11	µg/L	J				
		8270	TIC		Unknown alcohol2	13	µg/L	J				
LF4MW03	8/2/01	160.1			Total Dissolved Solids	4600	mg/L			10000	mg/L	EPA
		300.0			Chloride	44	mg/L			250	mg/L	CGWS-S
		300.0			Nitrate as N	1.2	mg/L			10	mg/L	CGWS-P
		300.0			Sulfate	2400	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	650	mg/L					
		340.2			Fluoride	1.1	mg/L			2	mg/L	CGWS-A
		6010			Barium	0.016	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	390	mg/L					
		6010			Chromium	0.00066	mg/L	B	J11	0.1	mg/L	CGWS-P
		6010			Cobalt	0.0011	mg/L	B		0.05	mg/L	CGWS-A
		6010			Magnesium	270	mg/L					
		6010			Manganese	0.41	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.0061	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	14	mg/L					
		6010			Sodium	590	mg/L					
		6010			Thallium	0.004	mg/L	B		0.002	mg/L	CGWS-P
LF4MW03	10/15/01	160.1			Total Dissolved Solids	5600	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	130	mg/L					
		300.0			Chloride	58	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	3100	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	690	mg/L					
		340.2			Fluoride	0.83	mg/L			2	mg/L	CGWS-A
		415.1			Total Organic Carbon	7.7	mg/L					
		6010			Barium	0.015	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	470	mg/L					
		6010			Cobalt	0.00029	mg/L	B	J11	0.05	mg/L	CGWS-A
		6010			Magnesium	240	mg/L					
		6010			Manganese	0.2	mg/L			0.05	mg/L	CGWS-S

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
LF4MW03	10/15/01	6010			Nickel	0.0055	mg/L	B		0.1	mg/L	CGWS-P
(cont.)		6010			Potassium	20	mg/L					
		6010			Silver	0.00092	mg/L	B		0.05	mg/L	CGWS-P
		6010			Sodium	730	mg/L					
		6010			Thallium	0.003	mg/L	B		0.002	mg/L	CGWS-P
LF4MW03	12/4/01	160.1			Total Dissolved Solids	5500	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	110	mg/L					
		300.0			Chloride	63	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	3300	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	670	mg/L					
		340.2			Fluoride	0.9	mg/L			2	mg/L	CGWS-A
		415.1			Total Organic Carbon	6.9	mg/L					
		6010			Antimony	0.0041	mg/L	B		0.006	mg/L	CGWS-P
		6010			Barium	0.013	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	490	mg/L					
		6010			Cobalt	0.00079	mg/L	B		0.05	mg/L	CGWS-A
		6010			Magnesium	250	mg/L					
		6010			Manganese	0.2	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.0064	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	17	mg/L					
		6010			Silver	0.0018	mg/L	B		0.05	mg/L	CGWS-P
		6010			Sodium	790	mg/L					
		6010			Thallium	0.0028	mg/L	B		0.002	mg/L	CGWS-P
		6010			Zinc	0.0019	mg/L	B		2	mg/L	CGWS-A
LF4MW03	4/17/02	160.1			Total Dissolved Solids	5600	mg/L			10000	mg/L	EPA
		300.0			Chloride	58	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	3300	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	670	mg/L					
		340.2			Fluoride	1	mg/L			2	mg/L	CGWS-A
		353.2			Nitrate plus Nitrite as N	0.61	mg/L			10	mg/L	CGWS-P
		6010			Barium	0.012	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	490	mg/L					
		6010			Magnesium	260	mg/L					
		6010			Manganese	0.27	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.0058	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	19	mg/L					
		6010			Selenium	0.0032	mg/L	B		0.02	mg/L	CGWS-A
		6010			Sodium	720	mg/L					

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
LF4MW03	4/17/02	160.1			Total Dissolved Solids	5500	mg/L			10000	mg/L	EPA
Duplicate		300.0			Chloride	58	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	3200	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	670	mg/L					
		340.2			Fluoride	0.88	mg/L			2	mg/L	CGWS-A
		353.2			Nitrate plus Nitrite as N	0.6	mg/L			10	mg/L	CGWS-P
		6010			Barium	0.011	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	490	mg/L					
		6010			Magnesium	260	mg/L					
		6010			Manganese	0.2	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.0062	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	20	mg/L					
		6010			Silver	0.00083	mg/L	B	J11	0.05	mg/L	CGWS-P
		6010			Sodium	740	mg/L					
		6010			Vanadium	0.00042	mg/L	B	J11	0.1	mg/L	CGWS-A
		6010			Zinc	0.0019	mg/L	B	J11	2	mg/L	CGWS-A
LF4MW04	2/13/01	6010			Barium	0.053	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	210	mg/L					
		6010			Cobalt	0.0063	mg/L	B		0.05	mg/L	CGWS-A
		6010			Magnesium	100	mg/L					
		6010			Manganese	2.1	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.015	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	16	mg/L					
		6010			Sodium	200	mg/L					
		6010			Vanadium	0.0015	mg/L	B		0.1	mg/L	CGWS-A
		6010			Zinc	0.0097	mg/L	B	J11	2	mg/L	CGWS-A
		8260		No	Carbon disulfide	0.24	µg/L	J				
LF4MW04	2/13/01	6010			Antimony	0.0016	mg/L	B		0.006	mg/L	CGWS-P
Duplicate		6010			Barium	0.051	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	210	mg/L					
		6010			Cobalt	0.0064	mg/L	B		0.05	mg/L	CGWS-A
		6010			Magnesium	96	mg/L					
		6010			Manganese	2	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.014	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	17	mg/L					
		6010			Silver	0.00039	mg/L	B		0.05	mg/L	CGWS-P
		6010			Sodium	200	mg/L					
		6010			Zinc	0.01	mg/L	B	J11	2	mg/L	CGWS-A

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
LF4MW04	8/6/01	160.1			Total Dissolved Solids	1800	mg/L			10000	mg/L	EPA
		300.0			Chloride	87	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	810	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	530	mg/L					
		340.2			Fluoride	0.73	mg/L			2	mg/L	CGWS-A
		6010			Barium	0.037	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	240	mg/L					
		6010			Cobalt	0.0024	mg/L	B		0.05	mg/L	CGWS-A
		6010			Magnesium	100	mg/L					
		6010			Manganese	1.9	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.011	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	15	mg/L					
		6010			Sodium	260	mg/L					
		6010			Zinc	0.011	mg/L	B		2	mg/L	CGWS-A
		8260		No	Chloromethane	0.37	µg/L	J				
LF4MW04	4/17/02	160.1			Total Dissolved Solids	1800	mg/L			10000	mg/L	EPA
		300.0			Chloride	82	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	880	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	390	mg/L					
		340.2			Fluoride	0.94	mg/L			2	mg/L	CGWS-A
		353.2			Nitrate plus Nitrite as N	0.051	mg/L			10	mg/L	CGWS-P
		6010			Barium	0.027	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	220	mg/L					
		6010			Cobalt	0.0028	mg/L	B		0.05	mg/L	CGWS-A
		6010			Iron	0.053	mg/L	B		0.3	mg/L	CGWS-S
		6010			Magnesium	92	mg/L					
		6010			Manganese	1.7	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.0088	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	13	mg/L					
		6010			Sodium	210	mg/L					
		6010			Vanadium	0.00067	mg/L	B	J11	0.1	mg/L	CGWS-A
		6010			Zinc	0.0079	mg/L	B	J11	2	mg/L	CGWS-A
		8260		No	2-Butanone (MEK)	3.9	µg/L	J				
LF4MW05	2/13/01	6010			Arsenic	0.0036	mg/L	B		0.05	mg/L	CGWS-P
		6010			Barium	0.023	mg/L	B	J2	2	mg/L	CGWS-P
		6010			Cadmium	0.00025	mg/L	B	J2	0.005	mg/L	CGWS-P
		6010			Calcium	270	mg/L		J13			
		6010			Chromium	0.00065	mg/L	B	J11	0.1	mg/L	CGWS-P

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
LF4MW05	2/13/01	6010			Cobalt	0.0044	mg/L	B	J2	0.05	mg/L	CGWS-A
(cont.)		6010			Copper	0.014	mg/L			0.2	mg/L	CGWS-A
		6010			Magnesium	4300	mg/L					
		6010			Manganese	0.67	mg/L		J2	0.05	mg/L	CGWS-S
		6010			Nickel	0.019	mg/L	B	J2	0.1	mg/L	CGWS-P
		6010			Potassium	120	mg/L		J2			
		6010			Selenium	0.0023	mg/L	B	J11	0.02	mg/L	CGWS-A
		6010			Silver	0.0011	mg/L	B		0.05	mg/L	CGWS-P
		6010			Sodium	17000	mg/L					
		6010			Zinc	0.023	mg/L		J11	2	mg/L	CGWS-A
		8260		No	Benzene	0.33	µg/L	J	J1	5	µg/L	CGWS-P
		8260		No	Toluene	0.63	µg/L	J	J1	1000	µg/L	CGWS-P
		8270			bis(2-Ethylhexyl)phthalate	8.1	µg/L	J		2.5	µg/L	CGWS-P
LF4MW05	8/2/01	160.1			Total Dissolved Solids	100000	mg/L			10000	mg/L	EPA
		300.0			Chloride	2400	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	73000	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	780	mg/L					
		340.2			Fluoride	1.1	mg/L			2	mg/L	CGWS-A
		6010			Arsenic	0.0044	mg/L	B	J11	0.05	mg/L	CGWS-P
		6010			Barium	0.014	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	260	mg/L					
		6010			Cobalt	0.0017	mg/L	B		0.05	mg/L	CGWS-A
		6010			Copper	0.01	mg/L			0.2	mg/L	CGWS-A
		6010			Magnesium	4700	mg/L					
		6010			Nickel	0.015	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	53	mg/L					
		6010			Sodium	23000	mg/L					
		6010			Thallium	0.0038	mg/L	B		0.002	mg/L	CGWS-P
		6010			Vanadium	0.001	mg/L	B		0.1	mg/L	CGWS-A
		6010			Zinc	0.0043	mg/L	B	J11	2	mg/L	CGWS-A
		7470			Mercury	0.000036	mg/L	B	J11	0.002	mg/L	CGWS-P
		8260		No	Acetone	3.2	µg/L	J	J9			
		8260		No	Bromomethane	0.19	µg/L	J				
		8260		No	Chloromethane	0.41	µg/L	J				
		8260		No	Vinyl chloride	0.15	µg/L	J		2	µg/L	CGWS-P
LF4MW05	4/18/02	160.1			Total Dissolved Solids	80000	mg/L			10000	mg/L	EPA
		300.0			Chloride	2900	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	65000	mg/L			250	mg/L	CGWS-S

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
LF4MW05	4/18/02	310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	830	mg/L					
(cont.)		340.2			Fluoride	1.4	mg/L			2	mg/L	CGWS-A
		353.2			Nitrate plus Nitrite as N	0.054	mg/L			10	mg/L	CGWS-P
		6010			Barium	0.0078	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	360	mg/L					
		6010			Magnesium	4500	mg/L					
		6010			Nickel	0.025	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	80	mg/L					
		6010			Sodium	18000	mg/L					
		6010			Thallium	0.039	mg/L	B		0.002	mg/L	CGWS-P
		7470			Mercury	0.00012	mg/L	B	J11	0.002	mg/L	CGWS-P
		8260		No	Chloromethane	0.39	µg/L	J				
LF4MW06	1/8/02	6010			Barium	0.019	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	240	mg/L					
		6010			Cobalt	0.0032	mg/L	B		0.05	mg/L	CGWS-A
		6010			Copper	0.012	mg/L			0.2	mg/L	CGWS-A
		6010			Magnesium	4700	mg/L					
		6010			Manganese	0.25	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.017	mg/L	B	J11	0.1	mg/L	CGWS-P
		6010			Potassium	86	mg/L					
		6010			Selenium	0.0061	mg/L			0.02	mg/L	CGWS-A
		6010			Sodium	17000	mg/L					
		6010			Zinc	0.007	mg/L	B	J11	2	mg/L	CGWS-A
		7470			Mercury	0.00005	mg/L	B	J11	0.002	mg/L	CGWS-P
		8260		No	Vinyl chloride	0.61	µg/L	J		2	µg/L	CGWS-P
LF4MW07	1/8/02	8260		No	Bromomethane	0.15	µg/L	J	J1			
		8260		No	Chloromethane	0.32	µg/L	J	J1			
LF4MW07	1/10/02	6010			Barium	0.018	mg/L	B	J2	2	mg/L	CGWS-P
		6010			Calcium	240	mg/L		J13			
		6010			Chromium	0.0013	mg/L	B	J11	0.1	mg/L	CGWS-P
		6010			Cobalt	0.0044	mg/L	B	J2	0.05	mg/L	CGWS-A
		6010			Copper	0.019	mg/L		J2	0.2	mg/L	CGWS-A
		6010			Magnesium	4900	mg/L					
		6010			Manganese	0.71	mg/L		J2	0.05	mg/L	CGWS-S
		6010			Nickel	0.023	mg/L		J11	0.1	mg/L	CGWS-P
		6010			Potassium	100	mg/L		J2			
		6010			Selenium	0.0024	mg/L	B		0.02	mg/L	CGWS-A
		6010			Sodium	18000	mg/L					

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
LF4MW07	1/10/02	6010			Zinc	0.011	mg/L	B	J11	2	mg/L	CGWS-A
(cont.)		7470			Mercury	0.000013	mg/L	B	J11	0.002	mg/L	CGWS-P
LF4MW07	4/17/02	160.1			Total Dissolved Solids	89000	mg/L			10000	mg/L	EPA
		300.0			Chloride	1600	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	85000	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	1100	mg/L					
		340.2			Fluoride	1.1	mg/L			2	mg/L	CGWS-A
		353.2			Nitrate plus Nitrite as N	0.056	mg/L			10	mg/L	CGWS-P
		6010			Barium	0.017	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	440	mg/L					
		6010			Cobalt	0.0046	mg/L	B		0.05	mg/L	CGWS-A
		6010			Copper	0.0053	mg/L	B	J11	0.2	mg/L	CGWS-A
		6010			Magnesium	11000	mg/L					
		6010			Manganese	0.37	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.038	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	120	mg/L					
		6010			Sodium	41000	mg/L					
		7470			Mercury	0.00013	mg/L	B		0.002	mg/L	CGWS-P
		8260		No	Chloromethane	0.72	µg/L	J				
PZ4	5/5/95	6010			Aluminum	0.095	mg/L	J		5	mg/L	CGWS-A
		6010			Barium	0.0266	mg/L		J	2	mg/L	CGWS-P
		6010			Beryllium	0.0004	mg/L	J		0.004	mg/L	CGWS-P
		6010			Calcium	447	mg/L					
		6010			Iron	0.456	mg/L			0.3	mg/L	CGWS-S
		6010			Magnesium	1.21	mg/L					
		6010			Nickel	0.0461	mg/L			0.1	mg/L	CGWS-P
		6010			Potassium	69.6	mg/L					
		6010			Silver	0.0032	mg/L	J	J	0.05	mg/L	CGWS-P
		7041			Aluminum	0.088	mg/L	J		5	mg/L	CGWS-A
PZ4	8/10/00	8260		No	Carbon disulfide	0.45	µg/L	J				
		8260		No	Vinyl chloride	4.7	µg/L			2	µg/L	CGWS-P
		8260	TIC	No	Oxygenated Hydrocarbon	5.6	µg/L	J				
PZ4	1/25/01	405.1			Biochemical Oxygen Demand	332	mg/L					
		6010			Antimony	0.0017	mg/L	B		0.006	mg/L	CGWS-P
		6010			Arsenic	0.0048	mg/L	B		0.05	mg/L	CGWS-P
		6010			Barium	0.016	mg/L	B		2	mg/L	CGWS-P
		6010			Beryllium	0.0033	mg/L	B		0.004	mg/L	CGWS-P
		6010			Calcium	270	mg/L					

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
PZ4	1/25/01	6010			Cobalt	0.0042	mg/L	B		0.05	mg/L	CGWS-A
(cont.)		6010			Iron	0.3	mg/L			0.3	mg/L	CGWS-S
		6010			Magnesium	4800	mg/L					
		6010			Manganese	0.78	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.023	mg/L			0.1	mg/L	CGWS-P
		6010			Potassium	81	mg/L					
		6010			Sodium	17000	mg/L					
		6010			Thallium	0.0073	mg/L			0.002	mg/L	CGWS-P
		6010			Zinc	0.0012	mg/L	B		2	mg/L	CGWS-A
		8260		No	Acetone	6.2	µg/L	J	J9			
		8260		No	Vinyl chloride	3.8	µg/L		J1	2	µg/L	CGWS-P
		8260	TIC	No	Tetrahydrofuran	3.2	µg/L	J				
		8270	TIC		Caprolactam	15	µg/L	J				
		8270	TIC		Substituted benzoic acid	56	µg/L	J				
PZ4	1/26/01	300.0			Chloride	2600	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	65000	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	820	mg/L					
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	950	mg/L					
		340.2			Fluoride	1.5	mg/L			2	mg/L	CGWS-A
		410.4			Chemical Oxygen Demand (Regular)	210	mg/L					
		415.1			Total Organic Carbon	64	mg/L					
PZ4-PDS	11/8/01	8260		No	Toluene	0.16	µg/L	J		1000	µg/L	CGWS-P
		8260		No	Vinyl chloride	18	µg/L			2	µg/L	CGWS-P
PZ4	11/9/01	8260		No	Vinyl chloride	7.5	µg/L			2	µg/L	CGWS-P
W4-1	4/27/95	6010			Barium	0.012	mg/L	J	J	2	mg/L	CGWS-P
		6010			Calcium	476	mg/L					
		6010			Magnesium	313	mg/L					
		6010			Potassium	2.87	mg/L					
		6010			Silver	0.0033	mg/L	J	J	0.05	mg/L	CGWS-P
		6010			Sodium	1420	mg/L					
W4-1	1/18/01	160.1			Total Dissolved Solids	8500	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	21	mg/L					
		300.0			Chloride	310	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	5200	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	860	mg/L					
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	860	mg/L					
		340.2			Fluoride	0.65	mg/L			2	mg/L	CGWS-A
		410.4			Chemical Oxygen Demand (Regular)	30	mg/L					

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
W4-1	1/18/01	415.1			Total Organic Carbon	10	mg/L					
(cont.)		6010			Barium	0.0093	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	420	mg/L					
		6010			Cobalt	0.0087	mg/L	B		0.05	mg/L	CGWS-A
		6010			Iron	0.49	mg/L			0.3	mg/L	CGWS-S
		6010			Magnesium	320	mg/L					
		6010			Manganese	3.9	mg/L			0.05	mg/L	CGWS-S
		6010			Potassium	7.4	mg/L					
		6010			Sodium	1300	mg/L					
		6010			Thallium	0.0032	mg/L	B		0.002	mg/L	CGWS-P
W4-1	8/2/01	160.1			Total Dissolved Solids	8000	mg/L			10000	mg/L	EPA
		300.0			Chloride	290	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	4800	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	870	mg/L					
		6010			Barium	0.0095	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	480	mg/L					
		6010			Cobalt	0.0075	mg/L	B		0.05	mg/L	CGWS-A
		6010			Iron	0.37	mg/L			0.3	mg/L	CGWS-S
		6010			Magnesium	310	mg/L					
		6010			Manganese	3.6	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.0063	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	8.2	mg/L					
		6010			Sodium	1500	mg/L					
		6010			Zinc	0.0042	mg/L	B	J11	2	mg/L	CGWS-A
W4-1	10/18/01	160.1			Total Dissolved Solids	8900	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	310	mg/L					
		300.0			Chloride	290	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	4800	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	870	mg/L					
		340.2			Fluoride	0.64	mg/L			2	mg/L	CGWS-A
		415.1			Total Organic Carbon	7.6	mg/L					
		6010			Arsenic	0.0032	mg/L	B		0.05	mg/L	CGWS-P
		6010			Barium	0.011	mg/L	B		2	mg/L	CGWS-P
		6010			Beryllium	0.00033	mg/L	B	J11	0.004	mg/L	CGWS-P
		6010			Calcium	460	mg/L					
		6010			Cobalt	0.0077	mg/L	B		0.05	mg/L	CGWS-A
		6010			Copper	0.0043	mg/L	B	J11	0.2	mg/L	CGWS-A
		6010			Magnesium	340	mg/L					

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
W4-1	10/18/01	6010			Manganese	3.5	mg/L			0.05	mg/L	CGWS-S
(cont.)		6010			Nickel	0.012	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	9.5	mg/L					
		6010			Silver	0.00077	mg/L	B		0.05	mg/L	CGWS-P
		6010			Sodium	1700	mg/L					
		6010			Zinc	0.0075	mg/L	B		2	mg/L	CGWS-A
		8270	TIC		Unsaturated hydrocarbon	4	µg/L	J,A				
W4-1	12/4/01	160.1			Total Dissolved Solids	8300	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	210	mg/L					
		300.0			Chloride	290	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	5300	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	820	mg/L					
		340.2			Fluoride	0.72	mg/L			2	mg/L	CGWS-A
		415.1			Total Organic Carbon	8.7	mg/L					
		6010			Antimony	0.0045	mg/L	B		0.006	mg/L	CGWS-P
		6010			Barium	0.0092	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	470	mg/L					
		6010			Cobalt	0.01	mg/L			0.05	mg/L	CGWS-A
		6010			Iron	0.2	mg/L			0.3	mg/L	CGWS-S
		6010			Magnesium	330	mg/L					
		6010			Manganese	3.7	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.0088	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	7.2	mg/L					
		6010			Silver	0.00053	mg/L	B		0.05	mg/L	CGWS-P
		6010			Sodium	1700	mg/L					
		6010			Zinc	0.0056	mg/L	B		2	mg/L	CGWS-A
W4-2	4/24/95	6010			Barium	0.011	mg/L	J		2	mg/L	CGWS-P
		6010			Calcium	355	mg/L					
		6010			Magnesium	314	mg/L					
		6010			Potassium	21.1	mg/L					
		6010			Sodium	4100	mg/L					
W4-2	1/16/01	160.1			Total Dissolved Solids	17000	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	34	mg/L					
		300.0			Chloride	600	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	11000	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	760	mg/L					
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	760	mg/L					
		340.2			Fluoride	0.51	mg/L			2	mg/L	CGWS-A

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
W4-2	1/16/01	410.4			Chemical Oxygen Demand (Regular)	30	mg/L					
(cont.)		415.1			Total Organic Carbon	2.7	mg/L					
		6010			Barium	0.0079	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	380	mg/L					
		6010			Cobalt	0.0056	mg/L	B		0.05	mg/L	CGWS-A
		6010			Magnesium	340	mg/L					
		6010			Manganese	3.2	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.0087	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	34	mg/L					
		6010			Silver	0.00058	mg/L	B		0.05	mg/L	CGWS-P
		6010			Sodium	3600	mg/L					
		6010			Thallium	0.0062	mg/L			0.002	mg/L	CGWS-P
W4-2	8/3/01	160.1			Total Dissolved Solids	17000	mg/L			10000	mg/L	EPA
		300.0			Chloride	600	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	11000	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	740	mg/L					
		6010			Barium	0.0082	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	330	mg/L					
		6010			Cobalt	0.0026	mg/L	B		0.05	mg/L	CGWS-A
		6010			Magnesium	330	mg/L					
		6010			Manganese	2.6	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.006	mg/L	B	J11	0.1	mg/L	CGWS-P
		6010			Potassium	39	mg/L					
		6010			Sodium	3700	mg/L					
W4-3	7/27/99	160.1			Total Dissolved Solids	11000	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	57	mg/L					
		300.0			Chloride	270	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	6600	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	590	mg/L					
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	590	mg/L					
		410.4			Chemical Oxygen Demand (Regular)	20	mg/L					
		415.1			Total Organic Carbon	16	mg/L					
		6010			Calcium	380	mg/L					
		6010			Magnesium	250	mg/L					
		6010			Manganese	0.57	mg/L			0.05	mg/L	CGWS-S
		6010			Potassium	34	mg/L					
		6010			Sodium	2400	mg/L					
		8270	TIC		Caprolactam	9.2	µg/L	J				

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
W4-3	8/4/00	160.1			Total Dissolved Solids	13000	mg/L			10000	mg/L	EPA
		300.0			Chloride	530	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	8400	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	570	mg/L					
		340.2			Fluoride	0.62	mg/L			2	mg/L	CGWS-A
		6010			Calcium	390	mg/L					
		6010			Magnesium	330	mg/L					
		6010			Manganese	0.13	mg/L			0.05	mg/L	CGWS-S
		6010			Potassium	35	mg/L					
		6010			Sodium	2300	mg/L					
		8260		No	Toluene	0.22	µg/L	J		1000	µg/L	CGWS-P
W4-3	1/17/01	160.1			Total Dissolved Solids	11000	mg/L			10000	mg/L	EPA
		160.2			Total Suspended Solids	21	mg/L					
		300.0			Chloride	190	mg/L			250	mg/L	CGWS-S
		300.0			Nitrate as N	2.1	mg/L			10	mg/L	CGWS-P
		300.0			Sulfate	7300	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	580	mg/L					
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	580	mg/L					
		340.2			Fluoride	0.69	mg/L			2	mg/L	CGWS-A
		410.4			Chemical Oxygen Demand (Regular)	15	mg/L					
		415.1			Total Organic Carbon	11	mg/L					
		6010			Arsenic	0.0039	mg/L	B		0.05	mg/L	CGWS-P
		6010			Barium	0.0082	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	410	mg/L					
		6010			Magnesium	310	mg/L					
		6010			Manganese	0.22	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.0066	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	36	mg/L					
		6010			Sodium	2200	mg/L					
		6010			Thallium	0.0057	mg/L			0.002	mg/L	CGWS-P
		6010			Zinc	0.0075	mg/L	B		2	mg/L	CGWS-A
		8270	TIC		Nitrogen Compound	4.6	µg/L	J				
		8270	TIC		Oxygenated Hydrocarbon	9.8	µg/L	J				
		8270	TIC		Unknown	10	µg/L	J				
		8270	TIC		Unknown alcohol	11	µg/L	J				
W4-3	1/17/01	160.1			Total Dissolved Solids	11000	mg/L			10000	mg/L	EPA
Duplicate		160.2			Total Suspended Solids	21	mg/L					
		300.0			Chloride	180	mg/L			250	mg/L	CGWS-S

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
W4-3	1/17/01	300.0			Nitrate as N	2.2	mg/L			10	mg/L	CGWS-P
Duplicate (cont.)		300.0			Sulfate	7200	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	580	mg/L					
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	580	mg/L					
		410.4			Chemical Oxygen Demand (Regular)	15	mg/L					
		415.1			Total Organic Carbon	11	mg/L					
		6010			Barium	0.0081	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	390	mg/L					
		6010			Magnesium	270	mg/L					
		6010			Manganese	0.37	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.0069	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	38	mg/L					
		6010			Sodium	2300	mg/L					
		8270	TIC		Chloroiodomethane	5.7	µg/L	J				
		8270	TIC		Unknown	14	µg/L	J				
		8270	TIC		Unknown alcohol	6.9	µg/L	J				
		8270	TIC		Unknown alcohol2	7.8	µg/L	J				
W4-3	8/2/01	160.1			Total Dissolved Solids	12000	mg/L			10000	mg/L	EPA
		300.0			Chloride	310	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	7400	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Total as CaCO3 at pH 4.5	540	mg/L					
		6010			Barium	0.0085	mg/L	B		2	mg/L	CGWS-P
		6010			Calcium	340	mg/L					
		6010			Cobalt	0.0019	mg/L	B		0.05	mg/L	CGWS-A
		6010			Magnesium	190	mg/L					
		6010			Manganese	0.58	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.0042	mg/L	B	J11	0.1	mg/L	CGWS-P
		6010			Potassium	27	mg/L					
		6010			Sodium	3600	mg/L					
		6010			Thallium	0.0029	mg/L	B		0.002	mg/L	CGWS-P
W4-3	4/18/02	160.1			Total Dissolved Solids	11000	mg/L			10000	mg/L	EPA
		300.0			Chloride	200	mg/L			250	mg/L	CGWS-S
		300.0			Sulfate	7000	mg/L			250	mg/L	CGWS-S
		310.1			Alkalinity, Bicarb. as CaCO3 at pH 4.5	560	mg/L					
		353.2			Nitrate plus Nitrite as N	1.67	mg/L			10	mg/L	CGWS-P
		6010			Barium	0.0073	mg/L	B	J11	2	mg/L	CGWS-P
		6010			Beryllium	0.0001	mg/L	B	J11	0.004	mg/L	CGWS-P
		6010			Calcium	350	mg/L					

TABLE 4-3
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	TIC	VOC Preserved?	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Criterion Units	Criterion Source
W4-3	4/18/02	6010			Magnesium	300	mg/L					
(cont.)		6010			Manganese	0.096	mg/L			0.05	mg/L	CGWS-S
		6010			Nickel	0.0045	mg/L	B		0.1	mg/L	CGWS-P
		6010			Potassium	38	mg/L					
		6010			Sodium	2000	mg/L					
		6010			Zinc	0.012	mg/L	B	J11	2	mg/L	CGWS-A

Notes: Shaded concentrations exceed assessment criteria
All metals samples were field filtered and results are reported as dissolved.
mg/L milligrams per liter
µg/L micrograms per liter
PDS Passive diffusion sampler was used to obtain sample from PZ4 on 11/8/01.
QGMP Quarterly Groundwater Monitoring Program
TIC tentatively identified compound

Lab Flags:
0, 1, and 2 Indicates degree of confidence in identifying a TIC with 0 being the lowest degree of confidence.
A Indicates the presence of an aldol condensation product.
B Inorganic Analytes - Result is detected below the practical quantitation limit and above the detection limit.
J Organic Analytes - Result is detected below the practical quantitation limit and above the detection limit.
J Inorganic Analytes - Analyte was also detected below the practical quantitation limit for older samples (1997 and earlier).
N Spiked sample recovery not within control limits.

Validation Flags:
J Estimated detect from older validation.
J1 Estimated detect due to surrogate recovery outside control limits.
J2 Estimated detect due to MS/MSD recoveries outside control limits.
J7 Estimated detect due to internal standard area count outside control limits.
J9 Estimated detect due to initial or continuing calibration outside control limits.
J11 Estimated detect due to professional judgment.
J13 Estimated detect due to out of control ICP Serial Dilution.

Criteria Source:
CGWS-A Colorado Groundwater Standard (Agricultural Standard)
CGWS-P Colorado Groundwater Standard (Primary Standard - Organic Chemical and Human Health Standard)
CGWS-S Colorado Groundwater Standard (Secondary Drinking Water Standard)
EPA Environmental Protection Agency standard for TDS
MCL EPA Maximum Contaminant Level

TABLE 4-4
ANALYTES DETECTED IN MISCELLANEOUS SAMPLES
FORT CARSON, COLORADO

Site ID	Matrix	Sample Date	SPLP Extraction Date	Method Number	Analyte	Result	Units	Lab Flag	Validation Flag
PZ4	Pieces of PVC well screen pulled from PZ4 prior to overdrilling	11/13/01	11/19/01	8260	Toluene	0.23	µg/L	J	
				8260	2-Butanone (MEK)	4.5	µg/L	J	
				8260	1,1,1-Trichloroethane	0.34	µg/L	J	
				8260	Vinyl chloride	26	µg/L		
PZ4	Pieces of PVC well screen pulled from PZ4 prior to overdrilling	11/13/01		8260	Acetone	9.1	µg/L	J	J9
				8260	Methylene chloride	3.7	µg/L		
				8260	2-Butanone (MEK)	3.7	µg/L	J	
				8260	Vinyl chloride	31	µg/L		
CAS-1	Pieces of typical PVC well screen used at Fort Carson	12/10/01	12/19/01	8260	Acetone	3.2	µg/L	J	J9
				8260	Chloromethane	0.29	µg/L	J	
				8260	Vinyl Chloride	0.13	µg/L	J	
CAS-1	Pieces of typical PVC well screen used at Fort Carson	12/10/01		8260	All non-detect				
LF4AB01	Deionized water poured into standard sample container at sample collection area using the standard sample collection procedures	11/20/01		8260	Chloroform	0.95	µg/L	J	
LF4EB01	Deionized water poured through unused disposable bailer at site using standard sample collection procedures	11/20/01		8260	All non-detect				
				8270	All non-detect				
				8021	All non-detect				
LF4EB02	Deionized water from unused (not placed in well) passive diffusion bag sampler	11/8/01		8260	All non-detect				

Notes:

µg/L	micrograms per liter
J	Result is detected below the reporting limit and above the detection limit.
J9	Estimated detect due to initial or continuing calibration outside control limits.
SPLP	synthetic precipitate leaching procedure

TABLE 4-5
ANALYTES DETECTED IN SOIL SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Sample Interval (feet)	TIC	Method Number	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Assessment Criterion Units	Assessment Criterion Source
LF4DP1	1/18/01	7.5 - 8.0		6010	Aluminum	9100	mg/kg			17000	mg/kg	UTL-A
				6010	Antimony	0.33	mg/kg	B		3.4	mg/kg	UTL-A
				6010	Arsenic	5.3	mg/kg			15	mg/kg	UTL-A
				6010	Beryllium	0.6	mg/kg	B		1.3	mg/kg	UTL-A
				6010	Barium	98	mg/kg			282	mg/kg	UTL-A
				6010	Calcium	15000	mg/kg			27800	mg/kg	UTL-A
				6010	Chromium	11	mg/kg			22.1	mg/kg	UTL-A
				6010	Cobalt	8.5	mg/kg			11	mg/kg	UTL-A
				6010	Copper	16	mg/kg			22.3	mg/kg	UTL-A
				6010	Iron	22000	mg/kg			28900	mg/kg	UTL-A
				6010	Lead	16	mg/kg			32.9	mg/kg	UTL-A
				6010	Magnesium	8500	mg/kg			7000	mg/kg	UTL-A
				6010	Manganese	250	mg/kg			1100	mg/kg	UTL-A
				6010	Nickel	17	mg/kg			25.7	mg/kg	UTL-A
				6010	Potassium	1600	mg/kg			2910	mg/kg	UTL-A
				6010	Selenium	1	mg/kg			3.03	mg/kg	UTL-A
				6010	Sodium	2100	mg/kg			3820	mg/kg	UTL-A
				6010	Vanadium	22	mg/kg			37	mg/kg	UTL-A
				6010	Zinc	66	mg/kg			87	mg/kg	UTL-A
				8260	Toluene	20	µg/kg					
LF4DP1	1/18/01	7.5 - 8.0		6010	Aluminum	8600	mg/kg			17000	mg/kg	UTL-A
Field Duplicate				6010	Antimony	0.53	mg/kg	B		3.4	mg/kg	UTL-A
				6010	Arsenic	4.9	mg/kg			15	mg/kg	UTL-A
				6010	Barium	110	mg/kg			282	mg/kg	UTL-A
				6010	Beryllium	0.6	mg/kg	B		1.3	mg/kg	UTL-A
				6010	Calcium	14000	mg/kg			27800	mg/kg	UTL-A
				6010	Chromium	10	mg/kg			22.1	mg/kg	UTL-A
				6010	Cobalt	6.9	mg/kg			11	mg/kg	UTL-A
				6010	Copper	15	mg/kg			22.3	mg/kg	UTL-A
				6010	Iron	20000	mg/kg			28900	mg/kg	UTL-A
				6010	Lead	15	mg/kg			32.9	mg/kg	UTL-A
				6010	Magnesium	7200	mg/kg			7000	mg/kg	UTL-A
				6010	Manganese	220	mg/kg			1100	mg/kg	UTL-A

TABLE 4-5
ANALYTES DETECTED IN SOIL SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Sample Interval (feet)	TIC	Method Number	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Assessment Criterion Units	Assessment Criterion Source
LF4DP1	1/18/01	7.5 - 8.0		6010	Nickel	14	mg/kg			17	mg/kg	UTL-A
Field Duplicate				6010	Potassium	1500	mg/kg			2910	mg/kg	UTL-A
(cont.)				6010	Selenium	0.68	mg/kg			3.03	mg/kg	UTL-A
				6010	Sodium	2100	mg/kg			3820	mg/kg	UTL-A
				6010	Vanadium	21	mg/kg			37	mg/kg	UTL-A
				6010	Zinc	60	mg/kg			87	mg/kg	UTL-A
				8260	Toluene	4.3	µg/kg	J				
		9 - 11		6010	Aluminum	8100	mg/kg			13248	mg/kg	UTL-P
				6010	Antimony	0.36	mg/kg	B		3	mg/kg	UTL-P
				6010	Arsenic	5.8	mg/kg			11.3	mg/kg	UTL-P
				6010	Barium	120	mg/kg			573	mg/kg	UTL-P
				6010	Beryllium	0.54	mg/kg	B		1.37	mg/kg	UTL-P
				6010	Calcium	15000	mg/kg			55400	mg/kg	UTL-P
				6010	Chromium	10	mg/kg			21.8	mg/kg	UTL-P
				6010	Cobalt	5.2	mg/kg			28.9	mg/kg	UTL-P
				6010	Copper	15	mg/kg			35	mg/kg	UTL-P
				6010	Iron	22000	mg/kg			34064	mg/kg	UTL-P
				6010	Lead	15	mg/kg			27.8	mg/kg	UTL-P
				6010	Magnesium	7300	mg/kg			8000	mg/kg	UTL-P
				6010	Manganese	140	mg/kg			2448	mg/kg	UTL-P
				6010	Nickel	13	mg/kg			60.5	mg/kg	UTL-P
				6010	Potassium	1600	mg/kg			2195	mg/kg	UTL-P
				6010	Selenium	1.2	mg/kg			5.5	mg/kg	UTL-P
				6010	Sodium	1600	mg/kg			2580	mg/kg	UTL-P
				6010	Vanadium	20	mg/kg			37	mg/kg	UTL-P
				6010	Zinc	64	mg/kg			130	mg/kg	UTL-P
				7471	Mercury	0.037	mg/kg			0.0772	mg/kg	UTL-P
				8260	Toluene	18	µg/kg					
			TIC	8260	Ethyl Acetate	20	µg/kg	J				
LF4DP2	1/19/01	0 - 2.5		6010	Aluminum	9000	mg/kg			17000	mg/kg	UTL-A
				6010	Antimony	0.58	mg/kg	B		3.4	mg/kg	UTL-A
				6010	Arsenic	4.7	mg/kg			15	mg/kg	UTL-A

TABLE 4-5
ANALYTES DETECTED IN SOIL SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Sample Interval (feet)	TIC	Method Number	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Assessment Criterion Units	Assessment Criterion Source
LF4DP2	1/19/01	0 - 2.5		6010	Barium	170	mg/kg			282	mg/kg	UTL-A
(cont.)				6010	Beryllium	0.55	mg/kg	B		1.3	mg/kg	UTL-A
				6010	Calcium	35000	mg/kg			27800	mg/kg	UTL-A
				6010	Chromium	9.5	mg/kg			22.1	mg/kg	UTL-A
				6010	Cobalt	5.9	mg/kg			11	mg/kg	UTL-A
				6010	Copper	13	mg/kg			22.3	mg/kg	UTL-A
				6010	Iron	19000	mg/kg			28900	mg/kg	UTL-A
				6010	Lead	14	mg/kg			32.9	mg/kg	UTL-A
				6010	Magnesium	7300	mg/kg			7000	mg/kg	UTL-A
				6010	Manganese	110	mg/kg			1100	mg/kg	UTL-A
				6010	Nickel	12	mg/kg			25.7	mg/kg	UTL-A
				6010	Potassium	1400	mg/kg			2910	mg/kg	UTL-A
				6010	Selenium	0.5	mg/kg	B		3.03	mg/kg	UTL-A
				6010	Sodium	2400	mg/kg			3820	mg/kg	UTL-A
				6010	Vanadium	20	mg/kg			37	mg/kg	UTL-A
				6010	Zinc	57	mg/kg			87	mg/kg	UTL-A
				7471	Mercury	0.035	mg/kg	B		0.034	mg/kg	UTL-A
				8260	Toluene	72	µg/kg				µg/kg	UTL-A
		4 - 5		6010	Aluminum	7800	mg/kg			13248	mg/kg	UTL-P
				6010	Arsenic	5.3	mg/kg			11.3	mg/kg	UTL-P
				6010	Barium	420	mg/kg			573	mg/kg	UTL-P
				6010	Beryllium	0.49	mg/kg	B		1.37	mg/kg	UTL-P
				6010	Calcium	30000	mg/kg			55400	mg/kg	UTL-P
				6010	Chromium	9.6	mg/kg			21.8	mg/kg	UTL-P
				6010	Cobalt	6.1	mg/kg			28.9	mg/kg	UTL-P
				6010	Copper	14	mg/kg			35	mg/kg	UTL-P
				6010	Iron	19000	mg/kg			34064	mg/kg	UTL-P
				6010	Lead	14	mg/kg			27.8	mg/kg	UTL-P
				6010	Magnesium	7200	mg/kg			8000	mg/kg	UTL-P
				6010	Manganese	110	mg/kg			2448	mg/kg	UTL-P
				6010	Nickel	14	mg/kg			60.5	mg/kg	UTL-P
				6010	Potassium	1300	mg/kg			2195	mg/kg	UTL-P
				6010	Selenium	1.2	mg/kg			5.5	mg/kg	UTL-P

TABLE 4-5
ANALYTES DETECTED IN SOIL SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Sample Interval (feet)	TIC	Method Number	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Assessment Criterion Units	Assessment Criterion Source
LF4DP2	1/19/01	4 - 5		6010	Sodium	1400	mg/kg			2580	mg/kg	UTL-P
(cont.)				6010	Vanadium	18	mg/kg			37	mg/kg	UTL-P
				6010	Zinc	60	mg/kg			130	mg/kg	UTL-P
				8260	Toluene	38	µg/kg					
			TIC	8260	Ethyl Acetate	40	µg/kg	J				
			TIC	8270	Substituted Hexanedioic Acid1	780	µg/kg	J				
LF4DP3	1/18/01	6 - 7		6010	Aluminum	11000	mg/kg			17000	mg/kg	UTL-A
				6010	Antimony	0.55	mg/kg	B		3.4	mg/kg	UTL-A
				6010	Arsenic	6.3	mg/kg			15	mg/kg	UTL-A
				6010	Barium	110	mg/kg			282	mg/kg	UTL-A
				6010	Beryllium	0.81	mg/kg			1.3	mg/kg	UTL-A
				6010	Calcium	13000	mg/kg			27800	mg/kg	UTL-A
				6010	Chromium	13	mg/kg			22.1	mg/kg	UTL-A
				6010	Cobalt	9	mg/kg			11	mg/kg	UTL-A
				6010	Copper	18	mg/kg			22.3	mg/kg	UTL-A
				6010	Iron	25000	mg/kg			28900	mg/kg	UTL-A
				6010	Lead	19	mg/kg			32.9	mg/kg	UTL-A
				6010	Magnesium	5800	mg/kg			7000	mg/kg	UTL-A
				6010	Manganese	510	mg/kg			1100	mg/kg	UTL-A
				6010	Nickel	18	mg/kg			25.7	mg/kg	UTL-A
				6010	Potassium	2000	mg/kg			2910	mg/kg	UTL-A
				6010	Selenium	2.2	mg/kg			3.03	mg/kg	UTL-A
				6010	Sodium	5600	mg/kg			3820	mg/kg	UTL-A
				6010	Vanadium	29	mg/kg			37	mg/kg	UTL-A
				6010	Zinc	69	mg/kg			87	mg/kg	UTL-A
				8260	Toluene	8.1	µg/kg					
		9 - 10		6010	Aluminum	9000	mg/kg			13248	mg/kg	UTL-P
				6010	Antimony	0.39	mg/kg	B		3	mg/kg	UTL-P
				6010	Arsenic	5.8	mg/kg			11.3	mg/kg	UTL-P
				6010	Barium	210	mg/kg			573	mg/kg	UTL-P
				6010	Beryllium	0.61	mg/kg	B		1.37	mg/kg	UTL-P
				6010	Calcium	44000	mg/kg			55400	mg/kg	UTL-P

TABLE 4-5
ANALYTES DETECTED IN SOIL SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Sample Interval (feet)	TIC	Method Number	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Assessment Criterion Units	Assessment Criterion Source
LF4DP3	1/18/01	9 - 10		6010	Chromium	11	mg/kg			21.8	mg/kg	UTL-P
(cont.)				6010	Cobalt	5.1	mg/kg			28.9	mg/kg	UTL-P
				6010	Copper	14	mg/kg			35	mg/kg	UTL-P
				6010	Iron	22000	mg/kg			34064	mg/kg	UTL-P
				6010	Lead	13	mg/kg			27.8	mg/kg	UTL-P
				6010	Magnesium	7700	mg/kg			8000	mg/kg	UTL-P
				6010	Manganese	190	mg/kg			2448	mg/kg	UTL-P
				6010	Nickel	13	mg/kg			60.5	mg/kg	UTL-P
				6010	Potassium	1700	mg/kg			2195	mg/kg	UTL-P
				6010	Selenium	0.35	mg/kg	B		5.5	mg/kg	UTL-P
				6010	Sodium	5400	mg/kg			2580	mg/kg	UTL-P
				6010	Vanadium	24	mg/kg			37	mg/kg	UTL-P
				6010	Zinc	56	mg/kg			130	mg/kg	UTL-P
				8260	Toluene	6.7	µg/kg					
			TIC	8260	Ethyl Acetate	22	µg/kg	J				
			TIC	8270	Unsaturated Hydrocarbon1	390	µg/kg	J				
LF4DP4	1/18/01	9 - 10		6010	Aluminum	13000	mg/kg			17000	mg/kg	UTL-A
				6010	Arsenic	6.2	mg/kg			15	mg/kg	UTL-A
				6010	Barium	120	mg/kg			282	mg/kg	UTL-A
				6010	Beryllium	0.87	mg/kg			1.3	mg/kg	UTL-A
				6010	Calcium	3800	mg/kg			27800	mg/kg	UTL-A
				6010	Chromium	15	mg/kg			22.1	mg/kg	UTL-A
				6010	Cobalt	8.4	mg/kg			11	mg/kg	UTL-A
				6010	Copper	20	mg/kg			22.3	mg/kg	UTL-A
				6010	Iron	25000	mg/kg			28900	mg/kg	UTL-A
				6010	Lead	18	mg/kg			32.9	mg/kg	UTL-A
				6010	Magnesium	6800	mg/kg			7000	mg/kg	UTL-A
				6010	Manganese	310	mg/kg			1100	mg/kg	UTL-A
				6010	Nickel	20	mg/kg			25.7	mg/kg	UTL-A
				6010	Potassium	2000	mg/kg			2910	mg/kg	UTL-A
				6010	Selenium	0.93	mg/kg	B		3.03	mg/kg	UTL-A
				6010	Sodium	3200	mg/kg			3820	mg/kg	UTL-A

TABLE 4-5
ANALYTES DETECTED IN SOIL SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Sample Interval (feet)	TIC	Method Number	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Assessment Criterion Units	Assessment Criterion Source
LF4DP4	1/18/01	9 - 10		6010	Vanadium	29	mg/kg			37	mg/kg	UTL-A
(cont.)				6010	Zinc	75	mg/kg			87	mg/kg	UTL-A
				8260	Toluene	39	µg/kg					
		13 - 15		6010	Aluminum	7900	mg/kg			13248	mg/kg	UTL-P
				6010	Antimony	0.54	mg/kg	B	J2	3	mg/kg	UTL-P
				6010	Arsenic	6	mg/kg			11.3	mg/kg	UTL-P
				6010	Barium	180	mg/kg			573	mg/kg	UTL-P
				6010	Beryllium	0.57	mg/kg	B		1.37	mg/kg	UTL-P
				6010	Calcium	51000	mg/kg			55400	mg/kg	UTL-P
				6010	Chromium	12	mg/kg			21.8	mg/kg	UTL-P
				6010	Cobalt	4.4	mg/kg			28.9	mg/kg	UTL-P
				6010	Copper	16	mg/kg			35	mg/kg	UTL-P
				6010	Iron	25000	mg/kg			34064	mg/kg	UTL-P
				6010	Lead	14	mg/kg			27.8	mg/kg	UTL-P
				6010	Magnesium	7600	mg/kg			8000	mg/kg	UTL-P
				6010	Manganese	380	mg/kg			2448	mg/kg	UTL-P
				6010	Nickel	12	mg/kg			60.5	mg/kg	UTL-P
				6010	Potassium	1500	mg/kg			2195	mg/kg	UTL-P
				6010	Sodium	5700	mg/kg			2580	mg/kg	UTL-P
				6010	Vanadium	24	mg/kg			37	mg/kg	UTL-P
				6010	Zinc	58	mg/kg			130	mg/kg	UTL-P
				8260	Toluene	6	µg/kg	J				
LF4DP5	1/19/01	3 - 4		6010	Aluminum	11000	mg/kg			17000	mg/kg	UTL-A
				6010	Antimony	0.62	mg/kg	B		3.4	mg/kg	UTL-A
				6010	Arsenic	6.4	mg/kg			15	mg/kg	UTL-A
				6010	Barium	130	mg/kg			282	mg/kg	UTL-A
				6010	Beryllium	0.66	mg/kg			1.3	mg/kg	UTL-A
				6010	Calcium	19000	mg/kg			27800	mg/kg	UTL-A
				6010	Chromium	12	mg/kg			22.1	mg/kg	UTL-A
				6010	Cobalt	6.3	mg/kg			11	mg/kg	UTL-A
				6010	Copper	16	mg/kg			22.3	mg/kg	UTL-A
				6010	Iron	23000	mg/kg			28900	mg/kg	UTL-A

TABLE 4-5
ANALYTES DETECTED IN SOIL SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Sample Interval (feet)	TIC	Method Number	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Assessment Criterion Units	Assessment Criterion Source
LF4DP5	1/19/01	3 - 4		6010	Lead	16	mg/kg			32.9	mg/kg	UTL-A
(cont.)				6010	Magnesium	7300	mg/kg			7000	mg/kg	UTL-A
				6010	Manganese	190	mg/kg			1100	mg/kg	UTL-A
				6010	Nickel	15	mg/kg			25.7	mg/kg	UTL-A
				6010	Potassium	1900	mg/kg			2910	mg/kg	UTL-A
				6010	Selenium	1.9	mg/kg			3.03	mg/kg	UTL-A
				6010	Sodium	6700	mg/kg			3820	mg/kg	UTL-A
				6010	Vanadium	28	mg/kg			37	mg/kg	UTL-A
				6010	Zinc	62	mg/kg			87	mg/kg	UTL-A
				7471	Mercury	0.036	mg/kg	B		0.034	mg/kg	UTL-A
				8260	Toluene	38	µg/kg					
		6 - 7		6010	Aluminum	11000	mg/kg			13248	mg/kg	UTL-P
				6010	Antimony	0.58	mg/kg	B		3	mg/kg	UTL-P
				6010	Arsenic	6.7	mg/kg			11.3	mg/kg	UTL-P
				6010	Barium	150	mg/kg			573	mg/kg	UTL-P
				6010	Beryllium	0.68	mg/kg			1.37	mg/kg	UTL-P
				6010	Calcium	32000	mg/kg			55400	mg/kg	UTL-P
				6010	Chromium	12	mg/kg			21.8	mg/kg	UTL-P
				6010	Cobalt	7	mg/kg			28.9	mg/kg	UTL-P
				6010	Copper	17	mg/kg			35	mg/kg	UTL-P
				6010	Iron	24000	mg/kg			34064	mg/kg	UTL-P
				6010	Lead	17	mg/kg			27.8	mg/kg	UTL-P
				6010	Magnesium	8500	mg/kg			8000	mg/kg	UTL-P
				6010	Manganese	210	mg/kg			2448	mg/kg	UTL-P
				6010	Nickel	16	mg/kg			60.5	mg/kg	UTL-P
				6010	Potassium	1700	mg/kg			2195	mg/kg	UTL-P
				6010	Selenium	1.4	mg/kg			5.5	mg/kg	UTL-P
				6010	Sodium	4700	mg/kg			2580	mg/kg	UTL-P
				6010	Vanadium	29	mg/kg			37	mg/kg	UTL-P
				6010	Zinc	65	mg/kg			130	mg/kg	UTL-P
				8260	Toluene	17	µg/kg					

TABLE 4-5
ANALYTES DETECTED IN SOIL SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Sample Interval (feet)	TIC	Method Number	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Assessment Criterion Units	Assessment Criterion Source
LF4DP6	1/19/01	7.5 - 8.5		6010	Aluminum	9300	mg/kg			17000	mg/kg	UTL-A
				6010	Antimony	0.79	mg/kg	B		3.4	mg/kg	UTL-A
				6010	Arsenic	9.7	mg/kg			15	mg/kg	UTL-A
				6010	Barium	130	mg/kg			282	mg/kg	UTL-A
				6010	Beryllium	0.63	mg/kg	B		1.3	mg/kg	UTL-A
				6010	Calcium	16000	mg/kg			27800	mg/kg	UTL-A
				6010	Chromium	11	mg/kg			22.1	mg/kg	UTL-A
				6010	Cobalt	8.7	mg/kg			11	mg/kg	UTL-A
				6010	Copper	18	mg/kg			22.3	mg/kg	UTL-A
				6010	Iron	25000	mg/kg			28900	mg/kg	UTL-A
				6010	Lead	18	mg/kg			32.9	mg/kg	UTL-A
				6010	Magnesium	7200	mg/kg			7000	mg/kg	UTL-A
				6010	Manganese	320	mg/kg			1100	mg/kg	UTL-A
				6010	Nickel	20	mg/kg			25.7	mg/kg	UTL-A
				6010	Potassium	1500	mg/kg			2910	mg/kg	UTL-A
				6010	Selenium	1.4	mg/kg			3.03	mg/kg	UTL-A
				6010	Sodium	540	mg/kg			3820	mg/kg	UTL-A
				6010	Vanadium	22	mg/kg			37	mg/kg	UTL-A
				6010	Zinc	78	mg/kg			87	mg/kg	UTL-A
				7471	Mercury	0.039	mg/kg			0.034	mg/kg	UTL-A
				9060	Total Organic Carbon	3570	mg/kg				mg/kg	UTL-A
				8260	Toluene	37	µg/kg					
LF4EX22	1/29/01	2.5		6010	Aluminum	10000	mg/kg			17000	mg/kg	UTL-A
				6010	Arsenic	5.6	mg/kg			15	mg/kg	UTL-A
				6010	Barium	140	mg/kg			282	mg/kg	UTL-A
				6010	Beryllium	0.73	mg/kg			1.3	mg/kg	UTL-A
				6010	Calcium	3800	mg/kg			27800	mg/kg	UTL-A
				6010	Chromium	12	mg/kg			22.1	mg/kg	UTL-A
				6010	Cobalt	11	mg/kg			11	mg/kg	UTL-A
				6010	Copper	17	mg/kg			22.3	mg/kg	UTL-A
				6010	Iron	24000	mg/kg			28900	mg/kg	UTL-A
				6010	Lead	16	mg/kg			32.9	mg/kg	UTL-A

TABLE 4-5
ANALYTES DETECTED IN SOIL SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Sample Interval (feet)	TIC	Method Number	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Assessment Criterion Units	Assessment Criterion Source
LF4EX22	1/29/01	2.5		6010	Magnesium	4100	mg/kg			7000	mg/kg	UTL-A
(cont.)				6010	Manganese	560	mg/kg			1100	mg/kg	UTL-A
				6010	Mercury	0.0072	mg/kg	B	J11	0.034	mg/kg	UTL-A
				6010	Nickel	17	mg/kg			25.7	mg/kg	UTL-A
				6010	Potassium	2100	mg/kg			2910	mg/kg	UTL-A
				6010	Selenium	1.4	mg/kg			3.03	mg/kg	UTL-A
				6010	Sodium	1400	mg/kg			3820	mg/kg	UTL-A
				6010	Vanadium	30	mg/kg			37	mg/kg	UTL-A
				6010	Zinc	62	mg/kg			87	mg/kg	UTL-A
				9060	Total Organic Carbon	5760	mg/kg					
				8260	Toluene	5.8	mg/kg	J				
			TIC	8270	Saturated Hydrocarbon1	160	µg/kg	J				
LF4EX22	1/29/01			6010	Aluminum	8800	mg/kg			17000	mg/kg	
Field Duplicate				6010	Arsenic	5.2	mg/kg			15	mg/kg	
				6010	Barium	120	mg/kg			282	mg/kg	
				6010	Beryllium	0.65	mg/kg			1.3	mg/kg	
				6010	Calcium	4300	mg/kg			27800	mg/kg	
				6010	Chromium	11	mg/kg			22.1	mg/kg	
				6010	Cobalt	9.4	mg/kg			11	mg/kg	
				6010	Copper	15	mg/kg			22.3	mg/kg	
				6010	Iron	21000	mg/kg			28900	mg/kg	
				6010	Lead	15	mg/kg			32.9	mg/kg	
				6010	Magnesium	3800	mg/kg			7000	mg/kg	
				6010	Manganese	410	mg/kg			1100	mg/kg	
				6010	Nickel	15	mg/kg			25.7	mg/kg	
				6010	Potassium	1900	mg/kg			2910	mg/kg	
				6010	Selenium	1.3	mg/kg			3.03	mg/kg	
				6010	Sodium	1300	mg/kg			3820	mg/kg	
				6010	Vanadium	24	mg/kg			37	mg/kg	
				6010	Zinc	58	mg/kg			87	mg/kg	
				7471	Mercury	0.0036	mg/kg	B	J11	0.034		
				8260	Toluene	6.3	µg/kg					

TABLE 4-5
ANALYTES DETECTED IN SOIL SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Sample Interval (feet)	TIC	Method Number	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Assessment Criterion Units	Assessment Criterion Source
LF4EX23	1/29/01	2.5		6010	Aluminum	10000	mg/kg			17000	mg/kg	UTL-A
				6010	Arsenic	5.6	mg/kg			15	mg/kg	UTL-A
				6010	Barium	150	mg/kg			282	mg/kg	UTL-A
				6010	Beryllium	0.72	mg/kg			1.3	mg/kg	UTL-A
				6010	Calcium	4300	mg/kg			27800	mg/kg	UTL-A
				6010	Chromium	13	mg/kg			22.1	mg/kg	UTL-A
				6010	Cobalt	9.4	mg/kg			11	mg/kg	UTL-A
				6010	Copper	17	mg/kg			22.3	mg/kg	UTL-A
				6010	Iron	21000	mg/kg			28900	mg/kg	UTL-A
				6010	Lead	16	mg/kg			32.9	mg/kg	UTL-A
				6010	Magnesium	7200	mg/kg			7000	mg/kg	UTL-A
				6010	Manganese	390	mg/kg			1100	mg/kg	UTL-A
				7471	Mercury	0.003	mg/kg	B	J11	0.034	mg/kg	UTL-A
				6010	Nickel	17	mg/kg			25.7	mg/kg	UTL-A
				6010	Potassium	2200	mg/kg			2910	mg/kg	UTL-A
				6010	Selenium	1.1	mg/kg			3.03	mg/kg	UTL-A
				6010	Sodium	8200	mg/kg			3820	mg/kg	UTL-A
				6010	Vanadium	32	mg/kg			37	mg/kg	UTL-A
				6010	Zinc	61	mg/kg			87	mg/kg	UTL-A
				9060	Total Organic Carbon	8020	mg/kg					
				8260	Toluene	20	µg/kg					
LF4MW4	1/17/01	13 - 14		6010	Aluminum	7700	mg/kg			13248	mg/kg	UTL-P
				6010	Antimony	0.52	mg/kg	B		3	mg/kg	UTL-P
				6010	Arsenic	5.9	mg/kg			11.3	mg/kg	UTL-P
				6010	Barium	100	mg/kg			573	mg/kg	UTL-P
				6010	Beryllium	0.51	mg/kg	B		1.37	mg/kg	UTL-P
				6010	Calcium	10000	mg/kg			55400	mg/kg	UTL-P
				6010	Chromium	10	mg/kg			21.8	mg/kg	UTL-P
				6010	Cobalt	8.1	mg/kg			28.9	mg/kg	UTL-P
				6010	Copper	17	mg/kg			35	mg/kg	UTL-P
				6010	Iron	22000	mg/kg			34064	mg/kg	UTL-P
				6010	Lead	19	mg/kg			27.8	mg/kg	UTL-P

TABLE 4-5
ANALYTES DETECTED IN SOIL SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Sample Interval (feet)	TIC	Method Number	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Assessment Criterion Units	Assessment Criterion Source
LF4MW4	1/17/01	13 - 14		6010	Magnesium	7900	mg/kg			8000	mg/kg	UTL-P
(cont.)				6010	Manganese	200	mg/kg			2448	mg/kg	UTL-P
				7471	Mercury	0.04	mg/kg			0.0772	mg/kg	UTL-P
				6010	Nickel	18	mg/kg			60.5	mg/kg	UTL-P
				6010	Potassium	1400	mg/kg			2195	mg/kg	UTL-P
				6010	Selenium	1	mg/kg			5.5	mg/kg	UTL-P
				6010	Sodium	350	mg/kg			2580	mg/kg	UTL-P
				6010	Vanadium	17	mg/kg			37	mg/kg	UTL-P
				6010	Zinc	76	mg/kg			130	mg/kg	UTL-P
				8260	Toluene	45	µg/kg					
			TIC	8260	Acetaldehyde	6.1	µg/kg	J				
			TIC	8260	Ethyl Acetate	16	µg/kg	J				
		18 - 19		6010	Aluminum	7600	mg/kg			13248	mg/kg	UTL-P
				6010	Antimony	0.58	mg/kg	B		3	mg/kg	UTL-P
				6010	Arsenic	5.7	mg/kg			11.3	mg/kg	UTL-P
				6010	Barium	42	mg/kg			573	mg/kg	UTL-P
				6010	Beryllium	0.47	mg/kg	B		1.37	mg/kg	UTL-P
				6010	Calcium	8500	mg/kg			55400	mg/kg	UTL-P
				6010	Chromium	9.7	mg/kg			21.8	mg/kg	UTL-P
				6010	Cobalt	6.1	mg/kg			28.9	mg/kg	UTL-P
				6010	Copper	19	mg/kg			35	mg/kg	UTL-P
				6010	Iron	20000	mg/kg			34064	mg/kg	UTL-P
				6010	Lead	18	mg/kg			27.8	mg/kg	UTL-P
				6010	Magnesium	6500	mg/kg			8000	mg/kg	UTL-P
				6010	Manganese	140	mg/kg			2448	mg/kg	UTL-P
				6010	Mercury	0.029	mg/kg	B	J11	0.0772	mg/kg	UTL-P
				6010	Nickel	16	mg/kg			60.5	mg/kg	UTL-P
				6010	Potassium	1400	mg/kg			2195	mg/kg	UTL-P
				6010	Selenium	1.1	mg/kg			5.5	mg/kg	UTL-P
				6010	Sodium	430	mg/kg			2580	mg/kg	UTL-P
				6010	Vanadium	16	mg/kg			37	mg/kg	UTL-P
				6010	Zinc	68	mg/kg			130	mg/kg	UTL-P
				8260	Toluene	58	µg/kg					

TABLE 4-5
ANALYTES DETECTED IN SOIL SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Sample Interval (feet)	TIC	Method Number	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Assessment Criterion Units	Assessment Criterion Source
LF4MW4	1/17/01	18 - 19	TIC	8270	bis(2-Ethylhexyl)phthalate	69	µg/kg	J				
(cont.)			TIC	8260	Ethyl Acetate	75	µg/kg	J				
LF4MW5	1/17/01	4 - 5		6010	Aluminum	11000	mg/kg			17000	mg/kg	UTL-A
				6010	Antimony	0.77	mg/kg	B		3.4	mg/kg	UTL-A
				6010	Arsenic	6.8	mg/kg			15	mg/kg	UTL-A
				6010	Barium	160	mg/kg			282	mg/kg	UTL-A
				6010	Beryllium	0.76	mg/kg			1.3	mg/kg	UTL-A
				6010	Calcium	6100	mg/kg			27800	mg/kg	UTL-A
				6010	Chromium	13	mg/kg			22.1	mg/kg	UTL-A
				6010	Cobalt	8.2	mg/kg			11	mg/kg	UTL-A
				6010	Copper	16	mg/kg			22.3	mg/kg	UTL-A
				6010	Iron	25000	mg/kg			28900	mg/kg	UTL-A
				6010	Lead	17	mg/kg			32.9	mg/kg	UTL-A
				6010	Magnesium	5500	mg/kg			7000	mg/kg	UTL-A
				6010	Manganese	250	mg/kg			1100	mg/kg	UTL-A
				6010	Nickel	16	mg/kg			25.7	mg/kg	UTL-A
				6010	Potassium	2000	mg/kg			2910	mg/kg	UTL-A
				6010	Selenium	1.2	mg/kg	B		3.03	mg/kg	UTL-A
				6010	Sodium	6900	mg/kg			3820	mg/kg	UTL-A
				6010	Vanadium	33	mg/kg			37	mg/kg	UTL-A
				6010	Zinc	66	mg/kg			87	mg/kg	UTL-A
				8260	Toluene	20	µg/kg					
		12 - 13		6010	Aluminum	8800	mg/kg			13248	mg/kg	UTL-P
				6010	Antimony	0.41	mg/kg	B		3	mg/kg	UTL-P
				6010	Arsenic	3.4	mg/kg			11.3	mg/kg	UTL-P
				6010	Barium	93	mg/kg			573	mg/kg	UTL-P
				6010	Beryllium	0.6	mg/kg	B		1.37	mg/kg	UTL-P
				6010	Calcium	6900	mg/kg			55400	mg/kg	UTL-P
				6010	Chromium	11	mg/kg			21.8	mg/kg	UTL-P
				6010	Cobalt	7.8	mg/kg			28.9	mg/kg	UTL-P
				6010	Copper	17	mg/kg			35	mg/kg	UTL-P
				6010	Iron	19000	mg/kg			34064	mg/kg	UTL-P

TABLE 4-5
ANALYTES DETECTED IN SOIL SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Sample Interval (feet)	TIC	Method Number	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Assessment Criterion Units	Assessment Criterion Source
LF4MW5	1/17/01	12 - 13		6010	Lead	17	mg/kg			27.8	mg/kg	UTL-P
(cont.)				6010	Magnesium	8200	mg/kg			8000	mg/kg	UTL-P
				6010	Manganese	180	mg/kg			2448	mg/kg	UTL-P
				7471	Mercury	0.042	mg/kg			0.0772	mg/kg	UTL-P
				6010	Nickel	18	mg/kg			60.5	mg/kg	UTL-P
				6010	Potassium	1800	mg/kg			2195	mg/kg	UTL-P
				6010	Selenium	2.3	mg/kg			5.5	mg/kg	UTL-P
				6010	Sodium	6300	mg/kg			2580	mg/kg	UTL-P
				6010	Vanadium	19	mg/kg			37	mg/kg	UTL-P
				6010	Zinc	74	mg/kg			130	mg/kg	UTL-P
				8260	Toluene	16	µg/kg					
			TIC	8260	Ethyl Acetate	240	µg/kg	J				
LF4MW7	11/12/01	8-9		6010	Aluminum	8000	mg/kg			17000	mg/kg	UTL-A
				6010	Iron	37000	mg/kg			28900	mg/kg	UTL-A
				6010	Lead	13	mg/kg			32.9	mg/kg	UTL-A
				6010	Magnesium	5500	mg/kg			7000	mg/kg	UTL-A
				6010	Manganese	330	mg/kg			1100	mg/kg	UTL-A
				7471	Mercury	0.039	mg/kg			0.034	mg/kg	UTL-A
				6010	Nickel	16	mg/kg			25.7	mg/kg	UTL-A
				6010	Potassium	1600	mg/kg			2910	mg/kg	UTL-A
				6010	Sodium	1100	mg/kg			3820	mg/kg	UTL-A
				6010	Arsenic	6	mg/kg			15	mg/kg	UTL-A
				6010	Barium	200	mg/kg			282	mg/kg	UTL-A
				6010	Beryllium	0.46	mg/kg	B		1.3	mg/kg	UTL-A
				6010	Chromium	17	mg/kg			22.1	mg/kg	UTL-A
				6010	Cobalt	8.5	mg/kg			11	mg/kg	UTL-A
				6010	Copper	16	mg/kg			22.3	mg/kg	UTL-A
				6010	Vanadium	41	mg/kg			37	mg/kg	UTL-A
				6010	Zinc	66	mg/kg			87	mg/kg	UTL-A
				6010	Calcium	14000	mg/kg		J2	27800	mg/kg	UTL-A
				8260	Methylene chloride	6.4	µg/kg		J9			

TABLE 4-5
ANALYTES DETECTED IN SOIL SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Sample Interval (feet)	TIC	Method Number	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Assessment Criterion Units	Assessment Criterion Source
LF4SB1	1/25/95	4 - 5		6010R	Barium	94.7	mg/kg			573	mg/kg	UTL-P
				6010R	Cadmium	0.47	mg/kg	J		0.64	mg/kg	UTL-P
				6010R	Chromium	10.6	mg/kg			21.8	mg/kg	UTL-P
				7060	Arsenic	5.8	mg/kg			11.3	mg/kg	UTL-P
				7421	Lead	14.7	mg/kg			27.8	mg/kg	UTL-P
				7471	Mercury	0.034	mg/kg	J		0.772	mg/kg	UTL-P
		9 - 10		6010R	Barium	189	mg/kg			573	mg/kg	UTL-P
				6010R	Cadmium	0.47	mg/kg	J		0.64	mg/kg	UTL-P
				6010R	Chromium	12.5	mg/kg			21.8	mg/kg	UTL-P
				6010R	Silver	0.45	mg/kg	J		2.8	mg/kg	UTL-P
				7060	Arsenic	5.2	mg/kg			11.3	mg/kg	UTL-P
				7421	Lead	18.9	mg/kg			27.8	mg/kg	UTL-P
LF4SB1DUP	1/25/95	9 - 10		6010R	Barium	178	mg/kg			573	mg/kg	UTL-P
				6010R	Cadmium	0.32	mg/kg	J		0.64	mg/kg	UTL-P
				6010R	Chromium	9.6	mg/kg			21.8	mg/kg	UTL-P
				6010R	Silver	0.41	mg/kg	J		2.8	mg/kg	UTL-P
				7060	Arsenic	4.8	mg/kg			11.3	mg/kg	UTL-P
				7421	Lead	17.9	mg/kg			27.8	mg/kg	UTL-P
				7471	Mercury	0.046	mg/kg	J		0.0772	mg/kg	UTL-P
				8270	Di-n-butylphthalate	340	µg/kg					
LF4SB2	1/25/95	4 - 5		6010R	Barium	80.1	mg/kg			573	mg/kg	UTL-P
				6010R	Cadmium	0.51	mg/kg			0.64	mg/kg	UTL-P
				6010R	Chromium	11.1	mg/kg			21.8	mg/kg	UTL-P
				7060	Arsenic	8.9	mg/kg			11.3	mg/kg	UTL-P
				7421	Lead	21.5	mg/kg			27.8	mg/kg	UTL-P
				7471	Mercury	0.056	mg/kg	J		0.0772	mg/kg	UTL-P
				7740	Selenium	0.51	mg/kg			5.5	mg/kg	UTL-P
		9 - 10		6010R	Barium	74.8	mg/kg		J	573	mg/kg	UTL-P
				6010R	Cadmium	0.37	mg/kg	J	J	0.64	mg/kg	UTL-P
				6010R	Chromium	10.5	mg/kg		J	21.8	mg/kg	UTL-P
				6010R	Silver	0.27	mg/kg	J		2.8	mg/kg	UTL-P

TABLE 4-5
ANALYTES DETECTED IN SOIL SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Sample Interval (feet)	TIC	Method Number	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Assessment Criterion Units	Assessment Criterion Source
LF4SB2	1/25/95	9 - 10		7060	Arsenic	4	mg/kg		J	11.3	mg/kg	UTL-P
(cont.)				7421	Lead	28.1	mg/kg		J	27.8	mg/kg	UTL-P
				7471	Mercury	0.072	mg/kg	J		0.0772	mg/kg	UTL-P
				8270A	2,6-Dinitrotoluene	1400	µg/kg					
				8270A	4-Chlorophenyl phenyl ether	3000	µg/kg					
				8270A	Bis(2-ethylhexyl)phthalate	150	µg/kg	J				
LF4SB3	1/25/95	0 - 1		6010R	Barium	44.5	mg/kg			282	mg/kg	UTL-A
				6010R	Chromium	5.3	mg/kg			22.1	mg/kg	UTL-A
				6010R	Silver	0.22	mg/kg	J		0.73	mg/kg	UTL-A
				7060	Arsenic	3.1	mg/kg			15	mg/kg	UTL-A
				7421	Lead	11.5	mg/kg			32.9	mg/kg	UTL-A
		4 - 5		6010R	Barium	132	mg/kg			282	mg/kg	UTL-A
				6010R	Cadmium	0.86	mg/kg			0.315	mg/kg	UTL-A
				6010R	Chromium	12.9	mg/kg			22.1	mg/kg	UTL-A
				7060	Arsenic	5.7	mg/kg			15	mg/kg	UTL-A
				7421	Lead	17.2	mg/kg			32.9	mg/kg	UTL-A
LF4SB4	1/26/95	0 - 1		6010R	Barium	89.9	mg/kg			282	mg/kg	UTL-A
				6010R	Chromium	8.8	mg/kg			22.1	mg/kg	UTL-A
				6010R	Silver	0.4	mg/kg	J		0.73	mg/kg	UTL-A
				7060	Arsenic	4.1	mg/kg			15	mg/kg	UTL-A
				7421	Lead	13.9	mg/kg			32.9	mg/kg	UTL-A
				7471	Mercury	0.035	mg/kg	J		0.034	mg/kg	UTL-A
				7740	Selenium	0.38	mg/kg	J		3.03	mg/kg	UTL-A
		4 - 5		6010R	Barium	69.9	mg/kg			282	mg/kg	UTL-A
				6010R	Cadmium	0.41	mg/kg			0.315	mg/kg	UTL-A
				6010R	Chromium	14.7	mg/kg			22.1	mg/kg	UTL-A
				7060	Arsenic	4.2	mg/kg			15	mg/kg	UTL-A
				7421	Lead	14.5	mg/kg			32.9	mg/kg	UTL-A
				7471	Mercury	0.047	mg/kg	J		0.034	mg/kg	UTL-A
				8270A	Di-n-butylphthalate	190	µg/kg	J				

TABLE 4-5
ANALYTES DETECTED IN SOIL SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Sample Interval (feet)	TIC	Method Number	Analyte	Value	Units	Lab Flag	Validation Flag	Assessment Criterion	Assessment Criterion Units	Assessment Criterion Source

Notes: Shaded concentrations exceed assessment criteria.
mg/kg milligrams per kilogram
µg/kg micrograms per kilogram

Lab Flags
B Inorganic Analytes - Result is detected below the reporting limit and above the detection limit.
B Organic Analytes - Analyte also detected in associated method blank.
J Organic Analytes - Result is detected below the practical quantitation limit and above the detection limit.

Validation Flags
J Estimated detect
J2 Estimated detect due to MS/MSD recoveries outside control limits.
J9 Estimated detect due to initial or continuing calibration outside control limits.
J11 Professional judgment

Criteria Source
UTL-A Upper Tolerance Limit-Alluvium
UTL-P Upper Tolerance Limit-Pierre Shale

Sample Types
LF4DP# Direct push soil boring samples
LF4SB# Soil boring samples
LF4MW# Monitoring well soil samples
LF4EX# Trench soil samples

TABLE 4-6
FIELD SOIL GAS DATA
LANDFILL 4
FORT CARSON, COLORADO

Probe	Probe Depth (feet)	Probe Pressure (inches H_2O)	CH_4 (%)	LEL (%)	H_2S (ppm)	O_2 (%)	CO_2 (%)	PID (ppm)
LF4SG1	5	3.61	0	0	0	21.2	0	0
LF4SG2	6	0.01	0.2	5	0	2.2	19.5	0
LF4SG3	6	0.00	0	1	0	19.6	0.8	0
LF4SG4	4.5	0.01	0	0	0	15.9	0.8	0
LF4SG5	5	-2.04	0	0	0	20.9	0	0
LF4SG6	6	-0.01	0.1	2	0	15.6	4.9	0
LF4SG7	6	0.01	0	1	0	18.7	0.4	0
LF4SG8	2	0.03	0	0	0	17.7	0.6	0
LF4SG9	6	0.00	0	0	0	20.7	0.2	0
LF4SG10	6	0.00	0	0	0	20.6	0.2	0
LF4SG11	6	0.01	0	0	0	20.8	0	0
LF4SG12	6	19.62	0	0	0	20.9	0	0
LF4SG13	6	-0.21	0	0	0	20.9	0	0
LF4SG14	4	-4.60	0	0	0	21.0	0	0
LF4SG15	6	-4.30	0	0	0	20.9	0	0
LF4SG16	6	-0.15	0	0	0	20.9	0.1	0
LF4SG17	6	-0.02	0	0	0	20.9	0	0
LF4SG18	6	-0.04	0.1	2	0	11.4	0.4	0
LF4SG19	6	0.00	0	0	0	20.9	0	0
LF4SG20	6	0.04	2.8	82	0	15.3	10.8	0
LF4SG21	6	0.00	0.1	2	0	16.6	2.0	0
LF4SG22	6	0.01	0	0	0	20.9	0	0

Notes:

CH_4	methane
CO_2	carbon dioxide
H_2O	water
H_2S	hydrogen sulfide
LEL	lower explosive limit
O_2	oxygen
PID	photoionization detector
ppm	parts per million
%	percent

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TABLE 4-7
LABORATORY ANALYSIS OF SOIL GAS SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Result (%)	Lab Flag	Validation Flag
LF4SG2	3/1/01	3C	Oxygen	3.0		
		3C	Nitrogen	82		
		3C	Methane	0.25		
		3C	Carbon Dioxide	20		
LF4SG6	3/1/01	3C	Oxygen	17		
		3C	Nitrogen	80		
		3C	Carbon Dioxide	5.9		
LF4SG18	3/1/01	3C	Oxygen	13		
		3C	Nitrogen	90		
		3C	Carbon Dioxide	0.91		
LF4SG20	3/1/01	3C	Oxygen	16		
		3C	Nitrogen	73		
		3C	Methane	4.5		
		3C	Carbon Dioxide	12		
LF4SG21	3/1/01	3C	Oxygen	18		
		3C	Nitrogen	82		
		3C	Carbon Dioxide	2.7		

Note:
% percent

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TABLE 4-8
ANALYTES DETECTED IN SURFACE WATER AND SEDIMENT SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Result	Units	Lab Flag	Validation Flag	Assessment Criterion Value	Assessment Criterion Units	Assessment Criterion Source
LF4SW1	6/28/99	6010	Aluminum	3.1	mg/L			0.087	mg/L	CDPHE
		6010	Calcium	92	mg/L					
		6010	Iron	4.1	mg/L			1.0	mg/L	CDPHE
		6010	Magnesium	26	mg/L					
		6010	Manganese	0.3	mg/L			2.44[a]	mg/L	CDPHE
		6010	Potassium	4.3	mg/L					
		6010	Sodium	59	mg/L					
		6010	Zinc	0.03	mg/L			0.319[a]	mg/L	CDPHE
LF4SD1	6/28/99	8260	Acetone	27	µg/kg	J	J9			
		6010	Aluminum	15000	mg/kg			17,000	mg/kg	UTL-A
		6010	Barium	180	mg/kg			282	mg/kg	UTL-A
		6010	Beryllium	1.2	mg/kg			1.3	mg/kg	UTL-A
		6010	Calcium	10000	mg/kg			27800	mg/kg	UTL-A
		6010	Chromium	18.0	mg/kg			22.1[a]	mg/kg	UTL-A
		6010	Cobalt	11	mg/kg			11	mg/kg	UTL-A
		6010	Copper	28.0	mg/kg			22.3	mg/kg	UTL-A
		6010	Iron	29000	mg/kg			28900	mg/kg	UTL-A
		6010	Lead	23.0	mg/kg			32.9	mg/kg	UTL-A
		6010	Magnesium	8100	mg/kg			7000	mg/kg	UTL-A
		6010	Manganese	360	mg/kg			1100	mg/kg	UTL-A
		6010	Nickel	24.0	mg/kg			25.7	mg/kg	UTL-A
		6010	Potassium	2900	mg/kg		J13	2910	mg/kg	UTL-A
		6010	Sodium	460	mg/kg			3820	mg/kg	UTL-A
		6010	Vanadium	40	mg/kg			37	mg/kg	UTL-A
		6010	Zinc	110	mg/kg			87	mg/kg	UTL-A
LF4SW2	6/28/99	6010	Aluminum	7.9	mg/L			0.087	mg/L	CDPHE
		6010	Barium	0.17	mg/L					
		6010	Calcium	130	mg/L					
		6010	Iron	11	mg/L			1.0	mg/L	CDPHE

TABLE 4-8
ANALYTES DETECTED IN SURFACE WATER AND SEDIMENT SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Result	Units	Lab Flag	Validation Flag	Assessment Criterion Value	Assessment Criterion Units	Assessment Criterion Source
LF4SW2	6/28/99	6010	Magnesium	40	mg/L					
(cont.)		6010	Manganese	0.61	mg/L			2.44[a]	mg/L	CDPHE
		6010	Potassium	7.2	mg/L					
		6010	Sodium	95	mg/L					
		6010	Zinc	0.055	mg/L			0.319[a]	mg/L	CDPHE
LF4SD2	6/28/99	8021	1,4-Dichlorobenzene	0.97	µg/kg	J	J2			
		8021	Benzene	0.62	µg/kg	J				
		8021	Ethylbenzene	0.76	µg/kg	J				
		8021	Toluene	0.51	µg/kg	J				
		8021	Xylenes (total)	2	µg/kg	J				
		6010	Aluminum	16000	mg/kg			17,000	mg/kg	UTL-A
		6010	Barium	230	mg/kg			282	mg/kg	UTL-A
		6010	Beryllium	1.3	mg/kg			1.3	mg/kg	UTL-A
		6010	Calcium	14000	mg/kg			27800	mg/kg	UTL-A
		6010	Chromium	20.0	mg/kg			22.1	mg/kg	UTL-A
		6010	Cobalt	11	mg/kg			11	mg/kg	UTL-A
		6010	Copper	31.0	mg/kg			22.3	mg/kg	UTL-A
		6010	Iron	31000	mg/kg			28900	mg/kg	UTL-A
		6010	Lead	28.0	mg/kg			32.9	mg/kg	UTL-A
		6010	Magnesium	9900	mg/kg			7000	mg/kg	UTL-A
		6010	Manganese	450	mg/kg			1100	mg/kg	UTL-A
		6010	Nickel	27.0	mg/kg			25.7	mg/kg	UTL-A
		6010	Potassium	3200	mg/kg			2910	mg/kg	UTL-A
		6010	Selenium	3.5	mg/kg			3.03	mg/kg	UTL-A
		6010	Sodium	900	mg/kg			3820	mg/kg	UTL-A
		6010	Vanadium	47	mg/kg			37	mg/kg	UTL-A
		6010	Zinc	140	mg/kg			87	mg/kg	UTL-A
LF4SW3	6/28/99	6010	Aluminum	62	mg/L			0.087	mg/L	CDPHE
		6010	Barium	0.91	mg/L					
		6010	Beryllium	0.0056	mg/L					

TABLE 4-8
ANALYTES DETECTED IN SURFACE WATER AND SEDIMENT SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Result	Units	Lab Flag	Validation Flag	Assessment Criterion Value	Assessment Criterion Units	Assessment Criterion Source
LF4SW3	6/28/99	6010	Calcium	250	mg/L					
(cont.)		6010	Chromium	0.074	mg/L			0.193[a]	mg/L	CDPHE
		7470	Copper	0.095	mg/L			0.024[a]	mg/L	CDPHE
		6010	Iron	120	mg/L			1.0	mg/L	CDPHE
		6010	Lead	0.11	mg/L			0.0088[a]	mg/L	CDPHE
		6010	Magnesium	91	mg/L					
		6010	Manganese	1.9	mg/L			2.44[a]	mg/L	CDPHE
		6010	Mercury	0.00032	mg/L			0.77	mg/L	CDPHE
		6010	Nickel	0.11	mg/L			0.14[a]	mg/L	CDPHE
		6010	Potassium	18	mg/L					
		6010	Sodium	160	mg/L					
		6010	Vanadium	0.17	mg/L					
		6010	Zinc	0.5	mg/L			0.319[a]	mg/L	CDPHE
LF4SD3	6/28/99	8021	Xylenes (total)	0.9	µg/kg	J				
		6010	Aluminum	13000	mg/kg			17,000	mg/kg	UTL-A
		6010	Barium	170	mg/kg			282	mg/kg	UTL-A
		6010	Beryllium	1.0	mg/kg			1.3	mg/kg	UTL-A
		6010	Calcium	20000	mg/kg			27800	mg/kg	UTL-A
		6010	Chromium	16.0	mg/kg			22.1	mg/kg	UTL-A
		6010	Copper	21.0	mg/kg			22.3	mg/kg	UTL-A
		6010	Iron	24000	mg/kg			28900	mg/kg	UTL-A
		6010	Lead	21.0	mg/kg			32.9	mg/kg	UTL-A
		6010	Magnesium	8300	mg/kg			7000	mg/kg	UTL-A
		6010	Manganese	230	mg/kg			1100	mg/kg	UTL-A
		6010	Nickel	21.0	mg/kg			25.7	mg/kg	UTL-A
		6010	Potassium	2700	mg/kg			2910	mg/kg	UTL-A
		6010	Sodium	3900	mg/kg			3820	mg/kg	UTL-A
		6010	Vanadium	35	mg/kg			37	mg/kg	UTL-A
		6010	Zinc	91	mg/kg			87	mg/kg	UTL-A

TABLE 4-8
ANALYTES DETECTED IN SURFACE WATER AND SEDIMENT SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Result	Units	Lab Flag	Validation Flag	Assessment Criterion Value	Assessment Criterion Units	Assessment Criterion Source

Notes: Shaded rows indicate exceedance of assessment criteria value
µg/kg microgram per kilogram
mg/L milligram per liter
mg/kg milligram per kilogram
[a] Surface water assessment criteria are calculated based on water hardness
(alkalinity, total as CaCO3, value obtained from sample taken in B Ditch near Landfill 5)

Lab Flag
J Result is detected below the reporting limit and above the detection limit.

Validation Flags
J2 Estimated detect due to MS/MSD recoveries outside control limits.
J9 Estimated detect due to initial or continuing calibration outside control limits.
J13 Estimated detect due to out of control ICP Serial Dilution.

Criteria Source
UTL-A Upper Tolerance Limit-Alluvium
CDPHE Colorado Department of Public Health and Environment Water Quality Control Division; Regulation No. 31

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TABLE 4-9
ANALYTES DETECTED IN SOURCE WATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Value	Units	Metals Type	Lab Flag	Validation Flag
1304SC	5/16/96	6010	Silica as SiO2	7.6	mg/L	DIS		
		6010	Magnesium	15.5	mg/L	DIS		
		6010	Sodium	22.7	mg/L	DIS		
		6010	Potassium	2.5	mg/L	DIS	J	
		6010	Calcium	55.2	mg/L	DIS		
		6010	Barium	0.056	mg/L	DIS		
		7041	Antimony	0.0025	mg/L	DIS	J	
		7740	Selenium	0.0028	mg/L	DIS	J	
		8260	Dibromochloromethane	3.8	µg/L		J	
		8260	Chloroform	18	µg/L			
		8260	Bromodichloromethane	11	µg/L			
	8/7/96	160.1	Total Dissolved Solids	66	mg/L			
		300.0	Chloride	3.4	mg/L			
		300.0	Sulfate	10.8	mg/L			
		300.0	Fluoride	0.8	mg/L			
		300.0	Nitrate as N	0.18	mg/L			
		310.1	Alkalinity, Total as CaCO3 at pH 4.5	34.6	mg/L			
		310.1	Alkalinity, Bicarb. as CaCO3 at pH 4.5	34.6	mg/L			
		415.1	Total Organic Carbon	1.3	mg/L			
		6010	Aluminum	0.069	mg/L	DIS	J	
		6010	Magnesium	1.6	mg/L	DIS		
		6010	Manganese	0.0072	mg/L	DIS	J	
		6010	Potassium	0.99	mg/L	DIS	J	
		6010	Barium	0.018	mg/L	DIS		
		6010	Calcium	10.3	mg/L	DIS		
		6010	Sodium	10.6	mg/L	DIS		
		6010	Nickel	0.017	mg/L	DIS	J	
		7421	Lead	0.0024	mg/L	DIS	J	
		8260	Bromodichloromethane	4.4	µg/L		J	
		8260	Chloroform	30	µg/L			
	11/8/96	160.1	Total Dissolved Solids	42	mg/L			
		300.0	Sulfate	14	mg/L			
		310.1	Alkalinity, Total as CaCO3 at pH 4.5	25.6	mg/L			
		310.1	Alkalinity, Bicarb. as CaCO3 at pH 4.5	25.6	mg/L			

TABLE 4-9
ANALYTES DETECTED IN SOURCE WATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Value	Units	Metals Type	Lab Flag	Validation Flag
1304SC	11/8/96	415.1	Total Organic Carbon	1.3	mg/L			
(cont.)		6010	Magnesium	1.6	mg/L	DIS		
		6010	Zinc	0.014	mg/L	DIS	J	
		6010	Calcium	9.6	mg/L	DIS		
		6010	Barium	0.017	mg/L	DIS		
		6010	Sodium	7.1	mg/L	DIS		
		7041	Antimony	0.0065	mg/L	DIS	J	
	1/28/97	160.1	Total Dissolved Solids	72	mg/L			
		300.0	Sulfate	18	mg/L			
		310.1	Alkalinity, Bicarb. as CaCO3 at pH 4.5	34	mg/L			
		310.1	Alkalinity, Total as CaCO3 at pH 4.5	34	mg/L			
		6010	Barium	0.018	mg/L	DIS		
		6010	Calcium	11.7	mg/L	DIS		
		6010	Magnesium	2.4	mg/L	DIS		
		6010	Manganese	0.017	mg/L	DIS		
		6010	Sodium	8.5	mg/L	DIS		
		6010	Zinc	0.0068	mg/L	DIS	J	
		8260	Bromodichloromethane	2.7	µg/L			
		8260	Chloroform	26	µg/L			
		8260	Dibromochloromethane	0.4	µg/L		J	
	4/17/97	160.1	Total Dissolved Solids	71	mg/L			
		300.0	Chloride	3.1	mg/L			
		300.0	Sulfate	18.4	mg/L			
		310.1	Alkalinity, Bicarb. as CaCO3 at pH 4.5	32.9	mg/L			
		310.1	Alkalinity, Total as CaCO3 at pH 4.5	32.9	mg/L			
		353.2	Nitrate plus Nitrite as N	0.19	mg/L			
		415.1	Total Organic Carbon	1.2	mg/L			
		6010	Barium	0.021	mg/L	DIS		
		6010	Calcium	13.1	mg/L	DIS		
		6010	Magnesium	2.4	mg/L	DIS		
		6010	Sodium	8.2	mg/L	DIS		
		8260	Bromodichloromethane	3.8	µg/L			
		8260	Chloroform	24	µg/L			
		8260	Dibromochloromethane	0.65	µg/L		J	

TABLE 4-9
ANALYTES DETECTED IN SOURCE WATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Value	Units	Metals Type	Lab Flag	Validation Flag
1304SC	7/31/97	6010	Barium	0.024	mg/L	DIS		
		6010	Calcium	25.3	mg/L	DIS		
		6010	Magnesium	5.5	mg/L	DIS		
		6010	Manganese	0.028	mg/L	DIS		
		6010	Silica as SiO2	8	mg/L	DIS		
		6010	Sodium	18	mg/L	DIS		
		8260	Bromodichloromethane	6	µg/L			
		8260	Chloroform	39	µg/L			
		8260	Dibromochloromethane	0.76	µg/L		J	
	11/5/97	6010	Barium	0.016	mg/L	DIS		
		6010	Calcium	11.9	mg/L	DIS		
		6010	Magnesium	2.3	mg/L	DIS		
		6010	Silica as SiO2	5.4	mg/L	DIS		
		6010	Sodium	7.4	mg/L	DIS		
		8260	Bromodichloromethane	3.7	µg/L			
		8260	Chloroform	26	µg/L			
		8260	Dibromochloromethane	0.5	µg/L		J	
	2/5/98	6010	Barium	0.027	mg/L	TOT		
		6010	Calcium	25	mg/L	TOT		
		6010	Magnesium	6.2	mg/L	TOT		
		6010	Sodium	11	mg/L	TOT		
		8260	Bromodichloromethane	6.5	µg/L			
		8260	Chloroform	24	µg/L			
		8260	Dibromochloromethane	1.4	µg/L			
	4/24/98	6010	Barium	0.023	mg/L	DIS		
		6010	Calcium	21	mg/L	DIS		
		6010	Magnesium	4.2	mg/L	DIS		
		6010	Manganese	0.018	mg/L	DIS		
		6010	Sodium	1.1	mg/L	DIS		
		6010	Zinc	0.031	mg/L	DIS		
		8260	Bromodichloromethane	7.6	µg/L			
		8260	Chloroform	90	µg/L			
	7/31/98	6010	Calcium	11	mg/L	DIS		
		6010	Magnesium	1.7	mg/L	DIS		

TABLE 4-9
ANALYTES DETECTED IN SOURCE WATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Value	Units	Metals Type	Lab Flag	Validation Flag
1304SC	7/31/98	6010	Sodium	8.2	mg/L	DIS		
(cont.)		8260	Acetone	4	µg/L		J	
		8260	Bromodichloromethane	4.3	µg/L			
		8260	Chloroform	33	µg/L			
	10/23/98	6010	Calcium	8.2	mg/L	DIS		
		6010	Magnesium	1.3	mg/L	DIS		
		6010	Manganese	0.014	mg/L	DIS		
		6010	Sodium	5.7	mg/L	DIS		
		6010	Zinc	0.022	mg/L	DIS		
		8260	Bromodichloromethane	3.8	µg/L			
		8260	Chloroform	32	µg/L			
	1/29/99	6010	Calcium	14	mg/L	DIS		
		6010	Magnesium	3.1	mg/L	DIS		
		6010	Sodium	8.3	mg/L	DIS		
		8260	Bromodichloromethane	4.8	µg/L			
		8260	Chloroform	24	µg/L			
	4/27/99	6010	Calcium	8.4	mg/L	TOT		
		6010	Magnesium	1.4	mg/L	TOT		
		6010	Sodium	5.4	mg/L	TOT		
		8260	Bromodichloromethane	5.3	µg/L			
		8260	Chloroform	27	µg/L			
	11/5/99	6010	Calcium	8.5	mg/L	DIS		
		6010	Magnesium	1.3	mg/L	DIS		
		6010	Sodium	6.2	mg/L	DIS		
		8260	Chloroform	32	µg/L			J9
		8260	Dibromochloromethane	0.48	µg/L		J	
		8260	Toluene	0.19	µg/L		J	
	4/21/00	6010	Aluminum	0.14	mg/L	DIS		
		6010	Calcium	10	mg/L	DIS		
		6010	Magnesium	1.7	mg/L	DIS		
		6010	Sodium	9.6	mg/L	DIS		
		8260	Bromodichloromethane	6.7	µg/L			
		8260	Chloroform	34	µg/L			J9
		8260	Dibromochloromethane	1.2	µg/L			

TABLE 4-9
ANALYTES DETECTED IN SOURCE WATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Value	Units	Metals Type	Lab Flag	Validation Flag
1304SC	8/7/00	6010	Calcium	8	mg/L	TOT		
		6010	Magnesium	1.3	mg/L	TOT		
		6010	Sodium	5.8	mg/L	TOT		
		6010	Zinc	0.024	mg/L	TOT		
		8260	Bromodichloromethane	2.2	µg/L			J9
		8260	Chloroform	26	µg/L			
	10/26/00	6010B	Zinc	0.0035	mg/L	TOT	B	
		6010B	Copper	0.003	mg/L	TOT	B	
		6010B	Barium	0.069	mg/L	TOT		
		6010B	Sodium	19.9	mg/L	TOT		
		6010B	Potassium	2.2	mg/L	TOT	B	
		6010B	Calcium	50	mg/L	TOT		
		6010B	Iron	0.016	mg/L	TOT	B	
		6010B	Magnesium	13.8	mg/L	TOT		
		8260B	Bromodichloromethane	12	µg/L			
		8260B	Chloroform	24	µg/L			
		8260B	Chlorodibromomethane	4.3	µg/L			
	1/10/01	6010	Barium	0.042	mg/L	TOT	B	
		6010	Calcium	33	mg/L	TOT		
		6010	Cobalt	0.00045	mg/L	TOT	B	
		6010	Copper	0.0064	mg/L	TOT	B	
		6010	Magnesium	8.7	mg/L	TOT		
		6010	Manganese	0.0069	mg/L	TOT	B	
		6010	Potassium	1.6	mg/L	TOT		
		6010	Sodium	13	mg/L	TOT		
		6010	Zinc	0.013	mg/L	TOT	B	
		8260	Bromodichloromethane	6.3	µg/L			
		8260	Dibromochloromethane	1.8	µg/L			
	5/4/01	6010	Barium	0.032	mg/L	TOT	B	
		6010	Calcium	26	mg/L	TOT		
		6010	Copper	0.0095	mg/L	TOT	B	
		6010	Magnesium	6.3	mg/L	TOT		
		6010	Manganese	0.0046	mg/L	TOT	B	
		6010	Nickel	0.0011	mg/L	TOT	B	

TABLE 4-9
ANALYTES DETECTED IN SOURCE WATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Value	Units	Metals Type	Lab Flag	Validation Flag
1304SC	5/4/01	6010	Potassium	1.9	mg/L	TOT		
(cont.)		6010	Sodium	13	mg/L	TOT		
		6010	Zinc	0.011	mg/L	TOT	B	
		8260	Bromodichloromethane	9.3	µg/L			
		8260	Chloroform	25	µg/L			
		8260	Dibromochloromethane	2.9	µg/L			
	7/23/01	6010	Barium	0.013	mg/L	TOT	B	
		6010	Calcium	8.5	mg/L	TOT		
		6010	Copper	0.02	mg/L	TOT		
		6010	Lead	0.057	mg/L	TOT		
		6010	Magnesium	1.6	mg/L	TOT		
		6010	Manganese	0.0083	mg/L	TOT	B	
		6010	Sodium	5.5	mg/L	TOT		
		6010	Zinc	0.16	mg/L	TOT		
		8260	Bromodichloromethane	3.5	µg/L			
		8260	Chloroform	28	µg/L			
		8270	Di-n-butyl phthalate	7.7	µg/L		J	
	11/12/01	6010	Antimony	0.0016	mg/L	TOT	B	
		6010	Barium	0.016	mg/L	TOT	B	
		6010	Calcium	11	mg/L	TOT		
		6010	Copper	0.002	mg/L	TOT	B	J11
		6010	Iron	0.38	mg/L	TOT		
		6010	Magnesium	2.2	mg/L	TOT		
		6010	Manganese	0.0021	mg/L	TOT	B	
		6010	Sodium	7.1	mg/L	TOT		
		6010	Thallium	0.0036	mg/L	TOT	B	
		8260	Bromodichloromethane	4.3	µg/L			
		8260	Chloroform	28	µg/L			
		8260	Dibromochloromethane	0.83	µg/L		J	
	4/19/02	6010	Barium	0.058	mg/L	TOT	B	
		6010	Calcium	61	mg/L	TOT		
		6010	Copper	0.013	mg/L	TOT		

TABLE 4-9
ANALYTES DETECTED IN SOURCE WATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Value	Units	Metals Type	Lab Flag	Validation Flag
1304SC	4/19/02	6010	Lead	0.0012	mg/L	TOT	B	
(cont.)		6010	Magnesium	18	mg/L	TOT		
		6010	Manganese	0.00066	mg/L	TOT	B	J11
		6010	Nickel	0.0013	mg/L	TOT	B	
		6010	Potassium	3.1	mg/L	TOT		
		6010	Selenium	0.0029	mg/L	TOT	B	
		6010	Sodium	23	mg/L	TOT		
		6010	Vanadium	0.00042	mg/L	TOT	B	J11
		8260	Bromodichloromethane	11	µg/L			
		8260	Chloroform	14	µg/L			
		8260	Dibromochloromethane	4.9	µg/L			
	7/2/02	6010	Aluminum	0.04	mg/L	TOT	B	J11
		6010	Barium	0.063	mg/L	TOT	B	
		6010	Calcium	66	mg/L	TOT		
		6010	Copper	0.0049	mg/L	TOT	B	
		6010	Iron	0.13	mg/L	TOT		
		6010	Magnesium	19	mg/L	TOT		J11
		6010	Nickel	0.0023	mg/L	TOT	B	
		6010	Potassium	3.3	mg/L	TOT		
		6010	Selenium	0.0035	mg/L	TOT	B	
		6010	Sodium	29	mg/L	TOT		
		6010	Zinc	0.0024	mg/L	TOT	B	J11
		8260	Bromodichloromethane	12	µg/L			
		8260	Bromoform	0.64	µg/L		J	
		8260	Chloroform	16	µg/L			
		8260	Dibromochloromethane	6.4	µg/L			
1399SC	5/16/96	6010	Silica as SiO2	4.2	mg/L	DIS		
		6010	Magnesium	2.6	mg/L	DIS		
		6010	Potassium	0.86	mg/L	DIS	J	
		6010	Sodium	10.8	mg/L	DIS		
		6010	Barium	0.023	mg/L	DIS		
		6010	Calcium	13.3	mg/L	DIS		

TABLE 4-9
ANALYTES DETECTED IN SOURCE WATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Value	Units	Metals Type	Lab Flag	Validation Flag
1399SC	5/16/96	7041	Antimony	0.0035	mg/L	DIS	J	
(cont.)		7740	Selenium	0.0029	mg/L	DIS	J	
		8260	Chloroform	35	µg/L			
		8260	Bromodichloromethane	4.7	µg/L		J	
	8/7/96	160.1	Total Dissolved Solids	56	mg/L			
		300.0	Nitrate as N	0.12	mg/L			
		300.0	Sulfate	12.7	mg/L			
		310.1	Alkalinity, Total as CaCO3 at pH 4.5	30.8	mg/L			
		310.1	Alkalinity, Bicarb. as CaCO3 at pH 4.5	30.8	mg/L			
		415.1	Total Organic Carbon	1.3	mg/L			
		6010	Aluminum	0.067	mg/L	DIS	J	
		6010	Magnesium	1.5	mg/L	DIS		
		6010	Manganese	0.0054	mg/L	DIS	J	
		6010	Nickel	0.017	mg/L	DIS	J	
		6010	Sodium	9.8	mg/L	DIS		
		6010	Barium	0.023	mg/L	DIS		
		6010	Zinc	0.0071	mg/L	DIS	J	
		6010	Calcium	9.8	mg/L	DIS		
		8260	Chloroform	51	µg/L			
		8260	Bromodichloromethane	3.7	µg/L		J	
	11/8/96	160.1	Total Dissolved Solids	74	mg/L			
		300.0	Sulfate	23.3	mg/L			
		310.1	Alkalinity, Total as CaCO3 at pH 4.5	31.8	mg/L			
		310.1	Alkalinity, Bicarb. as CaCO3 at pH 4.5	31.8	mg/L			
		415.1	Total Organic Carbon	1.1	mg/L			
		6010	Magnesium	2.4	mg/L	DIS		
		6010	Manganese	0.006	mg/L	DIS	J	
		6010	Sodium	7.6	mg/L	DIS		
		6010	Barium	0.022	mg/L	DIS		
		6010	Copper	0.0051	mg/L	DIS	J	
		6010	Zinc	0.014	mg/L	DIS	J	
		6010	Calcium	14	mg/L	DIS		
		7041	Antimony	0.0048	mg/L	DIS	J	
		8260	Carbon disulfide	1.4	µg/L		J	

TABLE 4-9
ANALYTES DETECTED IN SOURCE WATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Value	Units	Metals Type	Lab Flag	Validation Flag
1399SC	1/30/97	160.1	Total Dissolved Solids	62	mg/L			
		300.0	Sulfate	13	mg/L			
		310.1	Alkalinity, Bicarb. as CaCO3 at pH 4.5	29.3	mg/L			
		310.1	Alkalinity, Total as CaCO3 at pH 4.5	29.3	mg/L			
		415.1	Total Organic Carbon	1.3	mg/L			
		6010	Barium	0.018	mg/L	DIS		
		6010	Calcium	10.1	mg/L	DIS		
		6010	Iron	0.023	mg/L	DIS	J	
		6010	Magnesium	1.7	mg/L	DIS		
		6010	Manganese	0.0088	mg/L	DIS	J	
		6010	Sodium	7.6	mg/L	DIS		
		6010	Zinc	0.0064	mg/L	DIS	J	
		8260	Bromodichloromethane	3.2	µg/L			
		8260	Carbon disulfide	0.44	µg/L		J	
		8260	Chloroform	31	µg/L			
		8260	Dibromochloromethane	0.26	µg/L		J	
1399SC Duplicate	1/30/97	160.1	Total Dissolved Solids	60	mg/L			
		300.0	Sulfate	13	mg/L			
		310.1	Alkalinity, Bicarb. as CaCO3 at pH 4.5	29.2	mg/L			
		310.1	Alkalinity, Total as CaCO3 at pH 4.5	29.2	mg/L			
		415.1	Total Organic Carbon	1.2	mg/L			
		6010	Barium	0.017	mg/L	DIS		
		6010	Calcium	10.1	mg/L	DIS		
		6010	Iron	0.035	mg/L	DIS	J	
		6010	Magnesium	1.7	mg/L	DIS		
		6010	Sodium	7.7	mg/L	DIS		
		8260	Bromodichloromethane	3.3	µg/L			
		8260	Carbon disulfide	0.48	µg/L		J	
		8260	Chloroform	33	µg/L			
		8260	Dibromochloromethane	0.27	µg/L		J	
1399SC	4/17/97	160.1	Total Dissolved Solids	107	mg/L			
		300.0	Chloride	3.4	mg/L			

TABLE 4-9
ANALYTES DETECTED IN SOURCE WATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Value	Units	Metals Type	Lab Flag	Validation Flag
1399SC	4/17/97	300.0	Sulfate	37.9	mg/L			
(cont.)		310.1	Alkalinity, Bicarb. as CaCO3 at pH 4.5	42.6	mg/L			
		310.1	Alkalinity, Total as CaCO3 at pH 4.5	42.6	mg/L			
		415.1	Total Organic Carbon	1.1	mg/L			
		6010	Barium	0.031	mg/L	DIS		
		6010	Calcium	21.8	mg/L	DIS		
		6010	Magnesium	4.5	mg/L	DIS		
		6010	Sodium	10.4	mg/L	DIS		
		8260	Bromodichloromethane	5.9	µg/L			
		8260	Chloroform	33	µg/L			
		8260	Dibromochloromethane	1.2	µg/L			
	11/5/97	6010	Barium	0.035	mg/L	DIS		
		6010	Calcium	20.3	mg/L	DIS		
		6010	Magnesium	3	mg/L	DIS		
		6010	Manganese	0.012	mg/L	DIS		
		6010	Silica as SiO2	6.5	mg/L	DIS		
		6010	Sodium	8.8	mg/L	DIS		
		6010	Zinc	0.067	mg/L	DIS		
		8260	2-Butanone (MEK)	260	µg/L			
		8260	Acetone	590	µg/L			
		8260	Bromodichloromethane	6.7	µg/L		J	
		8260	Chloroform	42	µg/L			
	2/5/98	6010	Calcium	14	mg/L	TOT		
		6010	Copper	0.018	mg/L	TOT		
		6010	Iron	0.12	mg/L	TOT		
		6010	Magnesium	2	mg/L	TOT		
		6010	Sodium	8.3	mg/L	TOT		
		6010	Zinc	0.12	mg/L	TOT		
		8260	2-Butanone (MEK)	42	µg/L			
		8260	Acetone	120	µg/L			
		8260	Bromodichloromethane	4.4	µg/L			
		8260	Chloroform	47	µg/L			
	4/24/98	6010	Barium	0.032	mg/L	DIS		
		6010	Calcium	26	mg/L	DIS		

TABLE 4-9
ANALYTES DETECTED IN SOURCE WATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Value	Units	Metals Type	Lab Flag	Validation Flag
1399SC	4/24/98	6010	Magnesium	5.9	mg/L	DIS		
(cont.)		6010	Potassium	1.3	mg/L	DIS	J	
		6010	Sodium	1.1	mg/L	DIS		
		8260	2-Butanone (MEK)	110	µg/L			
		8260	Acetone	120	µg/L		B	
		8260	Bromodichloromethane	11	µg/L			
		8260	Chloroform	55	µg/L			
		8270	Cyclohexanone	400	µg/L		J	
	7/31/98	6010	Calcium	9.2	mg/L	DIS		
		6010	Magnesium	1.2	mg/L	DIS		
		6010	Sodium	7.6	mg/L	DIS		
		8260	2-Butanone (MEK)	3.9	µg/L		J	
		8260	Acetone	9.4	µg/L		J	
		8260	Bromodichloromethane	4	µg/L			
		8260	Chloroform	36	µg/L			
		8270	bis(2-Ethylhexyl)phthalate	3.1	µg/L		J	
	10/23/98	6010	Calcium	8.1	mg/L	DIS		
		6010	Magnesium	1.4	mg/L	DIS		
		6010	Manganese	0.012	mg/L	DIS		
		6010	Sodium	6.6	mg/L	DIS		
		6010	Zinc	0.022	mg/L	DIS		
		8260	Bromodichloromethane	5.8	µg/L			J1
		8260	Chloroform	47	µg/L			J1
		8260	Methylene chloride	1.7	µg/L		J	J1
9246SC	1/29/99	6010	Calcium	24	mg/L	DIS		
		6010	Magnesium	6.3	mg/L	DIS		
		6010	Sodium	12	mg/L	DIS		
		8260	Acetone	4.1	µg/L		J	
		8260	Bromodichloromethane	8.9	µg/L			
		8260	Chloroform	23	µg/L			
		8260	Dibromochloromethane	2.6	µg/L			
		8260	Tetrachloroethene	0.25	µg/L		J	

TABLE 4-9
ANALYTES DETECTED IN SOURCE WATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Value	Units	Metals Type	Lab Flag	Validation Flag
9246SC	4/27/99	6010	Calcium	15	mg/L	TOT		
		6010	Magnesium	3.5	mg/L	TOT		
		6010	Sodium	7.8	mg/L	TOT		
		8260	2-Butanone (MEK)	2.3	µg/L		J	
		8260	Acetone	3.3	µg/L		J	
		8260	Bromodichloromethane	7.6	µg/L			
		8260	Chloroform	31	µg/L			
	10/29/99	6010	Aluminum	0.17	mg/L	DIS		
		6010	Calcium	10	mg/L	DIS		
		6010	Magnesium	1.9	mg/L	DIS		
		6010	Sodium	11	mg/L	DIS		
		8260	Bromodichloromethane	5.7	µg/L			
		8260	Chloroform	23	µg/L			
		8260	Dibromochloromethane	1.2	µg/L			
	4/21/00	6010	Aluminum	0.17	mg/L	DIS		
		6010	Calcium	11	mg/L	DIS		
		6010	Magnesium	1.9	mg/L	DIS		
		6010	Sodium	11	mg/L	DIS		
		8260	Bromodichloromethane	8	µg/L			
		8260	Carbon tetrachloride	0.59	µg/L		J	
		8260	Chloroform	35	µg/L			J9
		8260	Dibromochloromethane	1.4	µg/L			
	8/7/00	6010	Calcium	11	mg/L	TOT		
		6010	Magnesium	2	mg/L	TOT		
		6010	Potassium	1.4	mg/L	TOT		
		6010	Sodium	9.2	mg/L	TOT		
		8260	Bromodichloromethane	7.1	µg/L			J9
		8260	Chloroform	30	µg/L			
		8260	Dibromochloromethane	1.3	µg/L			
	10/26/00	6010B	Iron	0.014	mg/L	TOT	B	
		6010B	Magnesium	14.1	mg/L	TOT		
		6010B	Potassium	2.2	mg/L	TOT	B	
		6010B	Sodium	20.5	mg/L	TOT		
		6010B	Barium	0.067	mg/L	TOT		

TABLE 4-9
ANALYTES DETECTED IN SOURCE WATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Value	Units	Metals Type	Lab Flag	Validation Flag
9246SC	10/26/00	6010B	Zinc	0.0075	mg/L	TOT	B	
(cont.)		6010B	Calcium	51.9	mg/L	TOT		
		8260B	Chloroform	25	µg/L			
		8260B	Bromodichloromethane	13	µg/L			
		8260B	Chlorodibromomethane	4.7	µg/L			
	1/10/01	6010	Barium	0.066	mg/L	TOT	B	
		6010	Calcium	60	mg/L	TOT		
		6010	Copper	0.0028	mg/L	TOT	B	
		6010	Magnesium	17	mg/L	TOT		
		6010	Potassium	2.8	mg/L	TOT		
		6010	Sodium	21	mg/L	TOT		
		6010	Zinc	0.01	mg/L	TOT	B	
		8260	Bromodichloromethane	11	µg/L			
		8260	Chloroform	19	µg/L			
		8260	Dibromochloromethane	4.1	µg/L			
	5/4/01	6010	Barium	0.017	mg/L	TOT	B	
		6010	Calcium	14	mg/L	TOT		
		6010	Copper	0.0017	mg/L	TOT	B	
		6010	Magnesium	2.9	mg/L	TOT		
		6010	Manganese	0.00025	mg/L	TOT	B	J11
		6010	Sodium	11	mg/L	TOT		
		6010	Zinc	0.016	mg/L	TOT	B	
		8260	Bromodichloromethane	8.9	µg/L			
		8260	Chloroform	20	µg/L			
		8260	Dibromochloromethane	2.1	µg/L			
	7/23/01	6010	Barium	0.051	mg/L	TOT	B	
		6010	Calcium	44	mg/L	TOT		
		6010	Copper	0.0054	mg/L	TOT	B	
		6010	Magnesium	10	mg/L	TOT		
		6010	Manganese	0.0012	mg/L	TOT	B	J11
		6010	Potassium	2.5	mg/L	TOT		
		6010	Sodium	12	mg/L	TOT		
		6010	Vanadium	0.00067	mg/L	TOT	B	

TABLE 4-9
ANALYTES DETECTED IN SOURCE WATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Value	Units	Metals Type	Lab Flag	Validation Flag
9246SC	7/23/01	6010	Zinc	0.039	mg/L	TOT		
(cont.)		8260	Bromodichloromethane	8.9	µg/L			
		8260	Chloroform	26	µg/L			
		8260	Dibromochloromethane	1.9	µg/L			
	11/12/01	6010	Antimony	0.0024	mg/L	TOT	B	
		6010	Barium	0.062	mg/L	TOT	B	
		6010	Calcium	52	mg/L	TOT		
		6010	Copper	0.0011	mg/L	TOT	B	J11
		6010	Magnesium	13	mg/L	TOT		
		6010	Potassium	3.1	mg/L	TOT		
		6010	Sodium	19	mg/L	TOT		
		6010	Vanadium	0.00072	mg/L	TOT	B	
		8260	4-Methyl-2-pentanone (MIBK)	1.8	µg/L		J	
		8260	Bromodichloromethane	12	µg/L			
		8260	Chloroform	26	µg/L			
		8260	Dibromochloromethane	5	µg/L			
	4/19/02	6010	Barium	0.057	mg/L	TOT	B	
		6010	Calcium	61	mg/L	TOT		
		6010	Copper	0.0026	mg/L	TOT	B	J11
		6010	Magnesium	18	mg/L	TOT		
		6010	Manganese	0.00076	mg/L	TOT	B	J11
		6010	Nickel	0.0017	mg/L	TOT	B	
		6010	Potassium	3.1	mg/L	TOT		
		6010	Selenium	0.0043	mg/L	TOT	B	
		6010	Sodium	24	mg/L	TOT		
		6010	Vanadium	0.001	mg/L	TOT	B	J11
		6010	Zinc	0.06	mg/L	TOT		
		8260	Bromodichloromethane	10	µg/L			
		8260	Chloroform	14	µg/L			
		8260	Dibromochloromethane	4.9	µg/L			
	7/2/02	6010	Aluminum	0.042	mg/L	TOT	B	J11
		6010	Barium	0.062	mg/L	TOT	B	

TABLE 4-9
ANALYTES DETECTED IN SOURCE WATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Value	Units	Metals Type	Lab Flag	Validation Flag
9246SC	7/2/02	6010	Calcium	66	mg/L	TOT		
(cont.)		6010	Cobalt	0.00059	mg/L	TOT	B	
		6010	Copper	0.002	mg/L	TOT	B	
		6010	Iron	0.04	mg/L	TOT	B	
		6010	Magnesium	19	mg/L	TOT		
		6010	Manganese	0.0015	mg/L	TOT	B	
		6010	Potassium	3.3	mg/L	TOT		
		6010	Selenium	0.0032	mg/L	TOT	B	
		6010	Sodium	29	mg/L	TOT		
		6010	Zinc	0.018	mg/L	TOT	B	
		8260	Bromodichloromethane	12	µg/L			
		8260	Bromoform	0.57	µg/L		J	
		8260	Chloroform	16	µg/L			
		8260	Dibromochloromethane	6.5	µg/L			
ETTSC	6/6/00	6010	Calcium	7.2	mg/L	DIS		
		6010	Aluminum	0.14	mg/L	DIS		
		6010	Magnesium	1	mg/L	DIS		
		6010	Sodium	7.3	mg/L	DIS		
		8260	Xylenes (total)	0.24	µg/L		J	
		8260	2-Butanone (MEK)	8.5	µg/L			
		8260	Bromodichloromethane	4	µg/L			
		8260	Acetone	3.1	µg/L		J	J9
		8260	Xylene-o	0.24	µg/L		J	J9
		8260	Dibromochloromethane	0.34	µg/L		J	
		8260	Chloroform	34	µg/L			
		8270	2,4,6-Trichlorophenol	2.3	µg/L		J	
		8270	bis(2-Ethylhexyl)phthalate	2.7	µg/L		J	
		8270	Butyl benzyl phthalate	1.3	µg/L		J	
	8/7/00	6010	Sodium	7.8	mg/L	TOT		
		6010	Calcium	9.6	mg/L	TOT		
		6010	Potassium	1.1	mg/L	TOT		
		6010	Magnesium	1.7	mg/L	TOT		

TABLE 4-9
ANALYTES DETECTED IN SOURCE WATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Value	Units	Metals Type	Lab Flag	Validation Flag
ETTSC	8/7/00	6010	Lead	0.0066	mg/L	TOT		
(cont.)		8260	Bromodichloromethane	7.2	µg/L			J9
		8260	Xylene-o	0.2	µg/L		J	
		8260	2-Butanone (MEK)	5.9	µg/L			
		8260	Toluene	0.25	µg/L		J	
		8260	Dibromochloromethane	0.91	µg/L		J	
		8260	m+p-Xylene	0.54	µg/L			
		8260	Acetone	6.2	µg/L		J	J9
		8260	Chloroform	35	µg/L			
	10/26/00	6010B	Sodium	19.6	mg/L	TOT		
		6010B	Iron	0.015	mg/L	TOT	B	
		6010B	Calcium	49.6	mg/L	TOT		
		6010B	Zinc	0.036	mg/L	TOT		
		6010B	Manganese	0.0012	mg/L	TOT	B	
		6010B	Barium	0.065	mg/L	TOT		
		6010B	Lead	0.0023	mg/L	TOT	B	
		6010B	Potassium	2	mg/L	TOT	B	
		6010B	Magnesium	13.7	mg/L	TOT		
		6010B	Copper	0.06	mg/L	TOT		
		8260B	Bromodichloromethane	10	µg/L			
		8260B	2-Butanone (MEK)	11	µg/L			
		8260B	Chlorodibromomethane	3.4	µg/L			
		8260B	Chloroform	24	µg/L			
	1/10/01	6010	Barium	0.064	mg/L	TOT	B	
		6010	Calcium	59	mg/L	TOT		
		6010	Chromium	0.00055	mg/L	TOT	B	
		6010	Cobalt	0.00053	mg/L	TOT	B	
		6010	Copper	0.022	mg/L	TOT		
		6010	Magnesium	17	mg/L	TOT		
		6010	Manganese	0.0014	mg/L	TOT	B	
		6010	Potassium	3	mg/L	TOT		
		6010	Silver	0.00041	mg/L	TOT	B	
		6010	Sodium	20	mg/L	TOT		
		6010	Zinc	0.018	mg/L	TOT	B	

TABLE 4-9
ANALYTES DETECTED IN SOURCE WATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Value	Units	Metals Type	Lab Flag	Validation Flag
ETTSC	1/10/01	8260	2-Butanone (MEK)	21	µg/L			
(cont.)		8260	Bromodichloromethane	11	µg/L			
		8260	Chloroform	19	µg/L			
		8260	Dibromochloromethane	4.1	µg/L			
	5/4/01	6010	Barium	0.058	mg/L	TOT	B	
		6010	Calcium	60	mg/L	TOT		
		6010	Copper	0.012	mg/L	TOT		
		6010	Magnesium	17	mg/L	TOT		
		6010	Manganese	0.0038	mg/L	TOT	B	
		6010	Nickel	0.00087	mg/L	TOT	B	
		6010	Potassium	2.9	mg/L	TOT		
		6010	Selenium	0.0033	mg/L	TOT	B	
		6010	Sodium	23	mg/L	TOT		
		6010	Zinc	0.019	mg/L	TOT	B	
		8260	Acetone	6.1	µg/L		J	
		8260	Bromodichloromethane	3.9	µg/L			
		8260	Chloroform	7.9	µg/L			
		8260	Dibromochloromethane	1.4	µg/L			
	7/23/01	6010	Barium	0.049	mg/L	TOT	B	
		6010	Calcium	45	mg/L	TOT		
		6010	Copper	0.034	mg/L	TOT		
		6010	Magnesium	10	mg/L	TOT		
		6010	Manganese	0.0038	mg/L	TOT	B	
		6010	Potassium	2.5	mg/L	TOT		
		6010	Selenium	0.0026	mg/L	TOT	B	
		6010	Sodium	11	mg/L	TOT		
		6010	Zinc	0.017	mg/L	TOT	B	J11
		8260	Bromodichloromethane	7.5	µg/L			
		8260	Chloroform	23	µg/L			
		8260	Dibromochloromethane	1.4	µg/L			
	11/12/01	6010	Barium	0.072	mg/L	TOT	B	
		6010	Calcium	57	mg/L	TOT		

TABLE 4-9
ANALYTES DETECTED IN SOURCE WATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Value	Units	Metals Type	Lab Flag	Validation Flag
ETTSC	11/12/01	6010	Copper	0.014	mg/L	TOT		
(cont.)		6010	Magnesium	15	mg/L	TOT		
		6010	Manganese	0.00015	mg/L	TOT	B	J11
		6010	Potassium	3	mg/L	TOT		
		6010	Selenium	0.0033	mg/L	TOT	B	
		6010	Sodium	21	mg/L	TOT		
		6010	Thallium	0.0032	mg/L	TOT	B	
		6010	Vanadium	0.00052	mg/L	TOT	B	
		6010	Zinc	0.026	mg/L	TOT		
		8260	Bromodichloromethane	15	µg/L			
		8260	Chloroform	31	µg/L			
		8260	Dibromochloromethane	5.3	µg/L			
	4/19/02	6010	Barium	0.056	mg/L	TOT	B	
		6010	Calcium	61	mg/L	TOT		
		6010	Copper	0.0074	mg/L	TOT	B	J11
		6010	Magnesium	18	mg/L	TOT		
		6010	Manganese	0.00072	mg/L	TOT	B	J11
		6010	Nickel	0.0013	mg/L	TOT	B	
		6010	Potassium	3.1	mg/L	TOT		
		6010	Selenium	0.0029	mg/L	TOT	B	
		6010	Sodium	23	mg/L	TOT		
		6010	Vanadium	0.00034	mg/L	TOT	B	J11
		6010	Zinc	0.015	mg/L	TOT	B	
		7470	Mercury	0.0000034	mg/L	TOT	B	J11
		8260	Bromodichloromethane	11	µg/L			
		8260	Chloroform	14	µg/L			
		8260	Dibromochloromethane	4.8	µg/L			
	7/2/02	6010	Aluminum	0.035	mg/L	TOT	B	J11
		6010	Barium	0.061	mg/L	TOT	B	
		6010	Calcium	67	mg/L	TOT		
		6010	Copper	0.0081	mg/L	TOT	B	
		6010	Magnesium	19	mg/L	TOT		J11

TABLE 4-9
ANALYTES DETECTED IN SOURCE WATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Value	Units	Metals Type	Lab Flag	Validation Flag
ETTSC	7/2/02	6010	Nickel	0.002	mg/L	TOT	B	
(cont.)		6010	Potassium	3.1	mg/L	TOT		
		6010	Selenium	0.0043	mg/L	TOT	B	
		6010	Sodium	29	mg/L	TOT		
		6010	Zinc	0.022	mg/L	TOT		
		8260	Bromodichloromethane	11	µg/L			
		8260	Bromoform	0.57	µg/L		J	
		8260	Chloroform	16	µg/L			
		8260	Dibromochloromethane	6	µg/L			

Notes:

mg/L	milligrams per liter
µg/L	micrograms per liter
DIS	dissolved
TOT	total

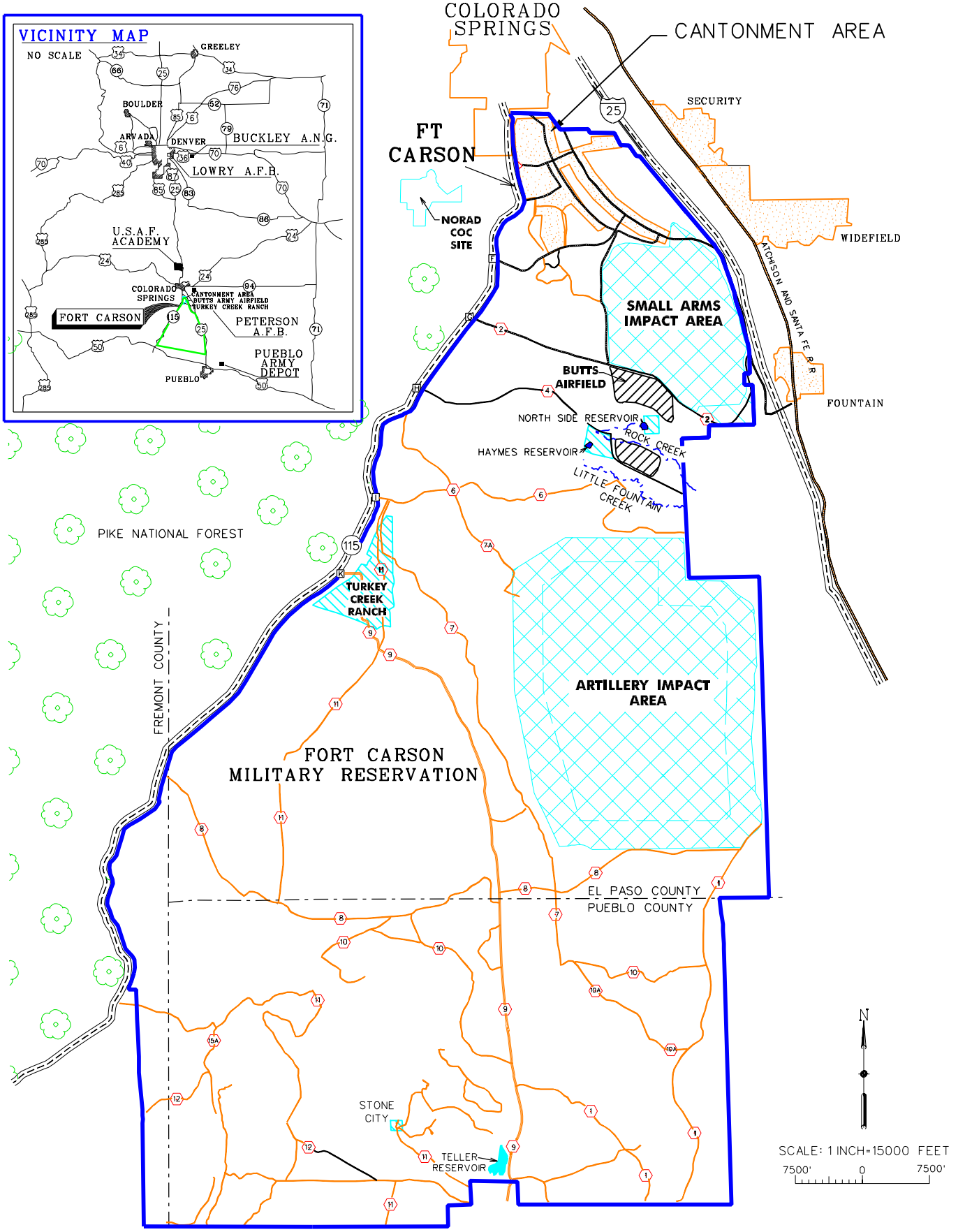
Lab Flags

B	Organic Analytes: analyte was also detected in associated blank sample.
B	Inorganic Analytes: result is below the reporting limit and above the detection limit.
J	Result is detected below the reporting limit and above the detection limit.

Validation Flags

J1	Estimated detect due to surrogate recovery outside control limits.
J9	Estimated detect due to initial or continuing calibration outside control limits.
J11	Estimated detect due to professional judgment.

FIGURES



DATE: 6/21/00

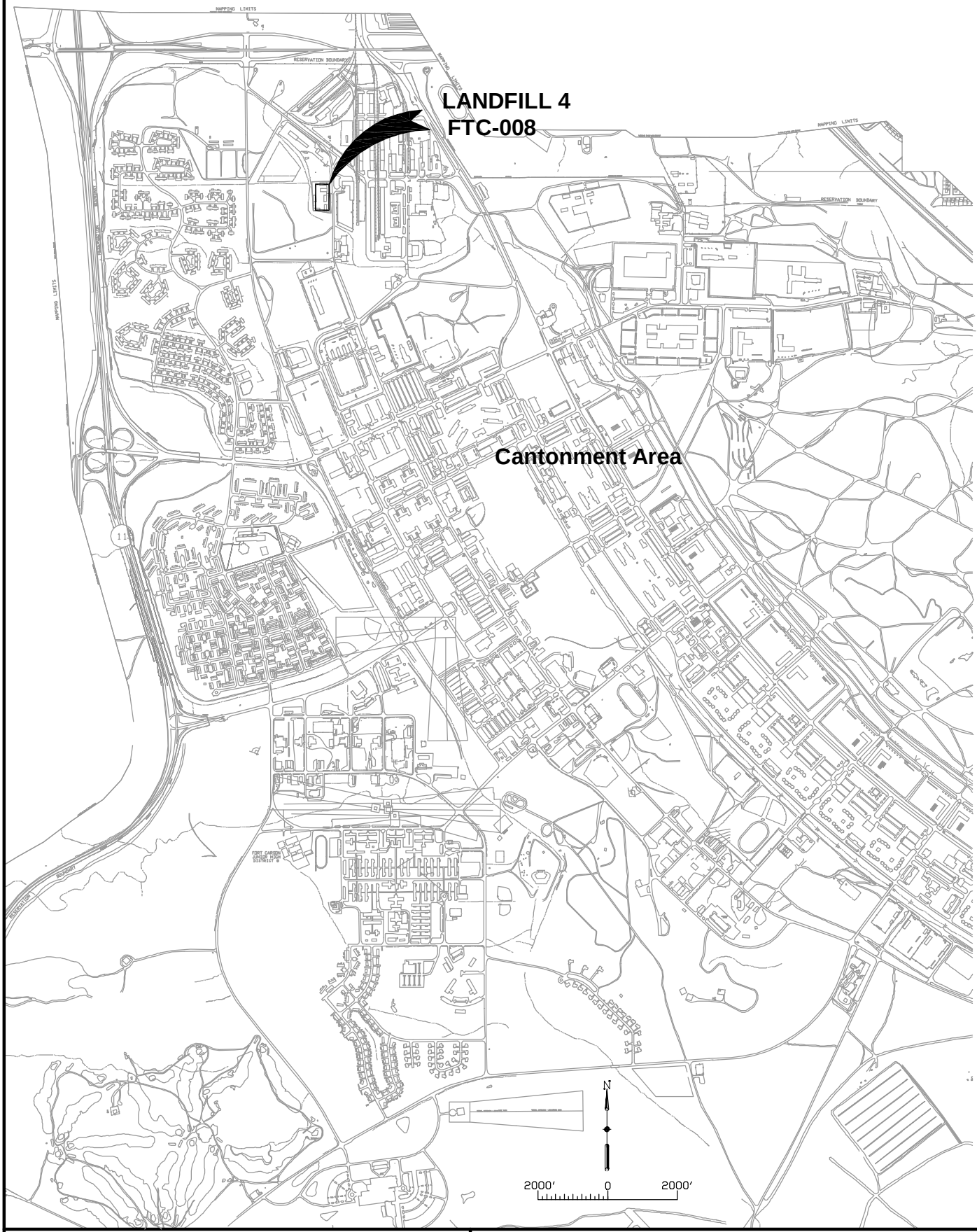
CAD FILE: WORK\29188\CAD\FTCARSON\FTCARFG.DGN

EARTH TECH

FIGURE 2-1

FORT CARSON AREA MAP

LANDFILL 4
FORT CARSON, COLORADO



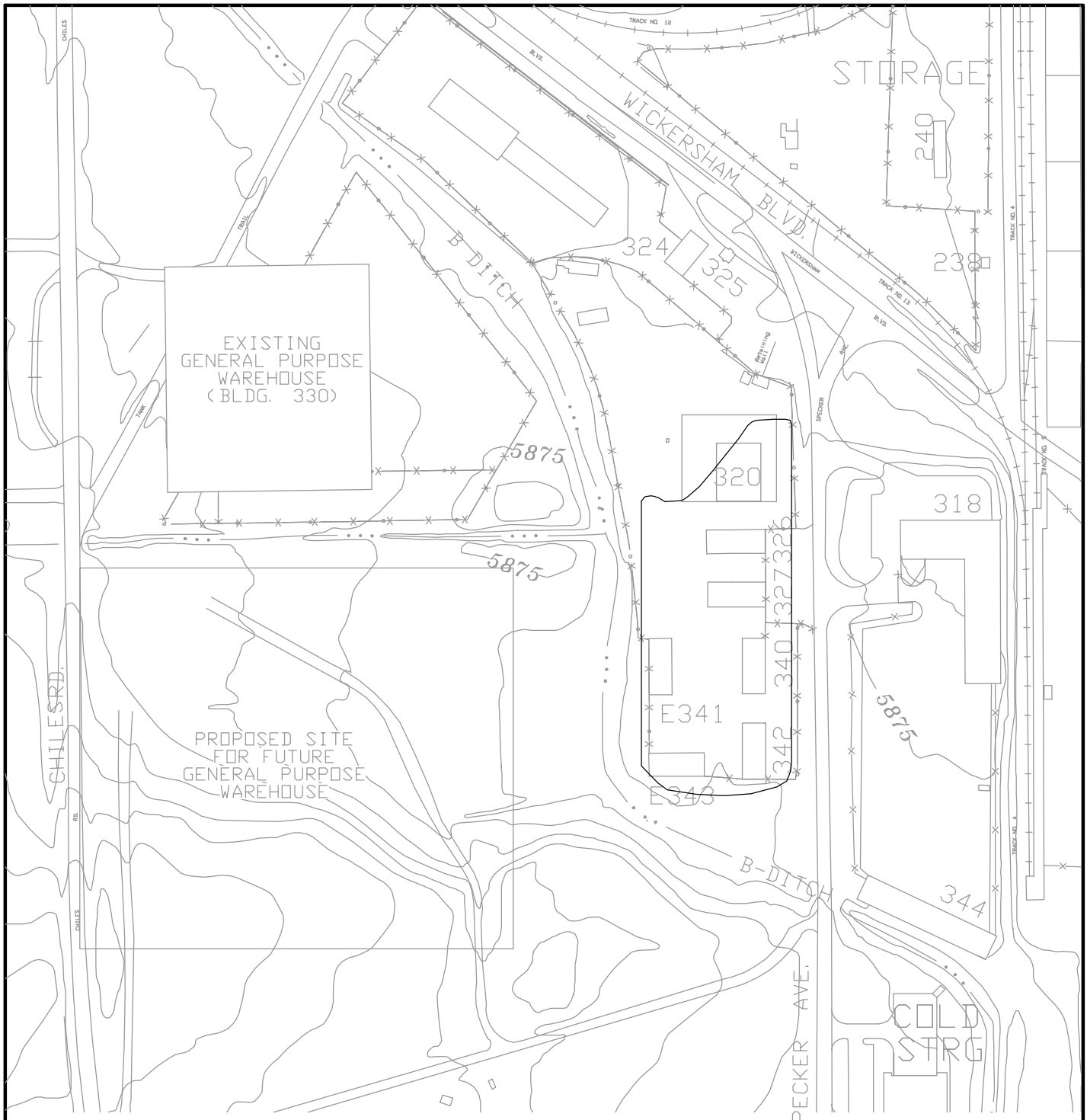
EARTH TECH

FIGURE 2-2

SITE LOCATION MAP

LANDFILL 4
FORT CARSON, COLORADO

L:\WORK\56737\CAD\53724001.DWG



LEGEND

APPROXIMATE LANDFILL BOUNDARY

WIRE FENCE

125 0 125 250 FEET

EARTH TECH

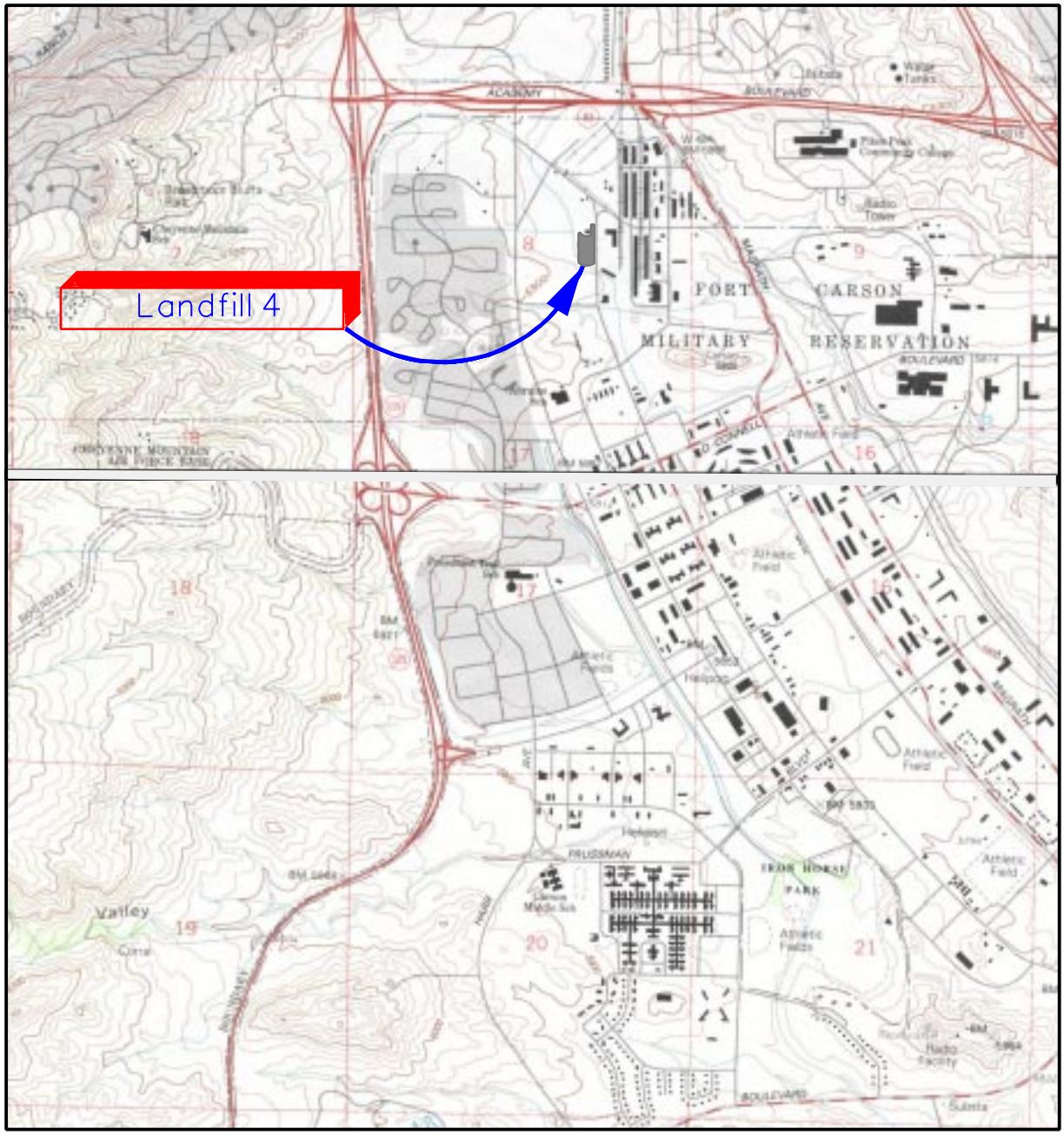
FIGURE 2-3

SITE MAP

LANDFILL 4
FORT CARSON, COLORADO

L:\WORK\56737\CAD\53724010.DWG

COLORADO SPRINGS QUADRANGLE
COLORADO-EL PASO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



ROAD CLASSIFICATION

Primary highway, hard surface
Light duty road, hard or improved surface
Secondary highway, hard surface
Unimproved road
Interstate Route
U. S. Route
State Route

QUADRANGLE LOCATION

SCALE 1:24 000
1"=2000'
CONTOUR INTERVAL 20 FEET

EARTH TECH

FIGURE 2-3A

COLORADO SPRINGS / CHEYENNE MOUNTAIN USGS QUADRANGLE

LANDFILL 4
FORT CARSON, COLORADO

DATE:12/3/2002

CAD FILE: GROUP\CAD\FTC\QUADS\COLO_SPGS\landfill4.DGN

N

250' 0 250' 500 FEET

EARTH TECH

FIGURE 2-4
LANDFILL 4 AERIAL PHOTOGRAPH
JULY 1947

FORT CARSON
COLORADO SPRINGS, COLORADO

L:\WORK\56737\CAD\53427011.DWG [LAYOUT 1947]

N

250' 0 250' 500 FEET

EARTH TECH

FIGURE 2-5
LANDFILL 4 AERIAL PHOTOGRAPH
JUNE 1953

FORT CARSON
COLORADO SPRINGS, COLORADO

L:\WORK\56737\CAD\53427011.DWG [LAYOUT 1953]

N

250' 0 250' 500 FEET

EARTH TECH

FIGURE 2-6
LANDFILL 4 AERIAL PHOTOGRAPH
SEPTEMBER 1957

FORT CARSON
COLORADO SPRINGS, COLORADO

L:\WORK\56737\CAD\53427011.DWG [LAYOUT 1957]

N

250' 0 250' 500 FEET

EARTH TECH

FIGURE 2-7
LANDFILL 4 AERIAL PHOTOGRAPH
JUNE 1967

FORT CARSON
COLORADO SPRINGS, COLORADO

L:\WORK\56737\CAD\53427011.DWG [LAYOUT 1967]

N

250' 0 250' 500 FEET

EARTH TECH

FIGURE 2-8
LANDFILL 4 AERIAL PHOTOGRAPH
APRIL 1970

FORT CARSON
COLORADO SPRINGS, COLORADO

L:\WORK\56737\CAD\53427011.DWG [LAYOUT 1970]

N

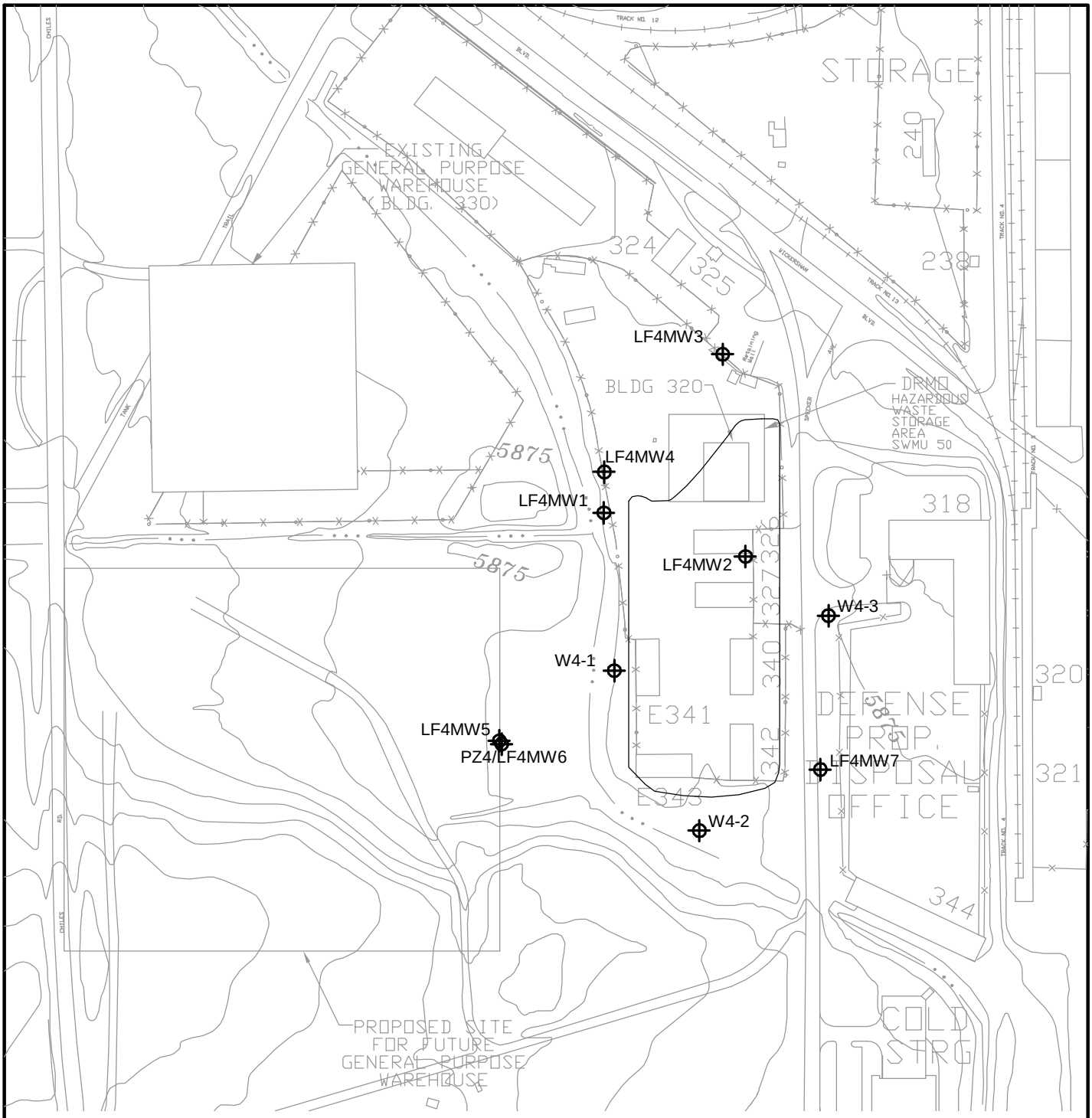
250' 0 250' 500 FEET

EARTH TECH

FIGURE 2-9
LANDFILL 4 AERIAL PHOTOGRAPH
JUNE 1984

FORT CARSON
COLORADO SPRINGS, COLORADO

L:\WORK\56737\CAD\53427011.DWG [LAYOUT 1984]



LEGEND

MONITORING WELL

APPROXIMATE LANDFILL BOUNDARY

NOTE: WELL PZ4 WAS REPLACED WITH WELL LF4MW6 ON NOV. 13, 2001.

N

125 0 125 250 FEET

EARTH TECH

FIGURE 3-1
NEW AND EXISTING MONITORING WELLS

LANDFILL 4
FORT CARSON, COLORADO

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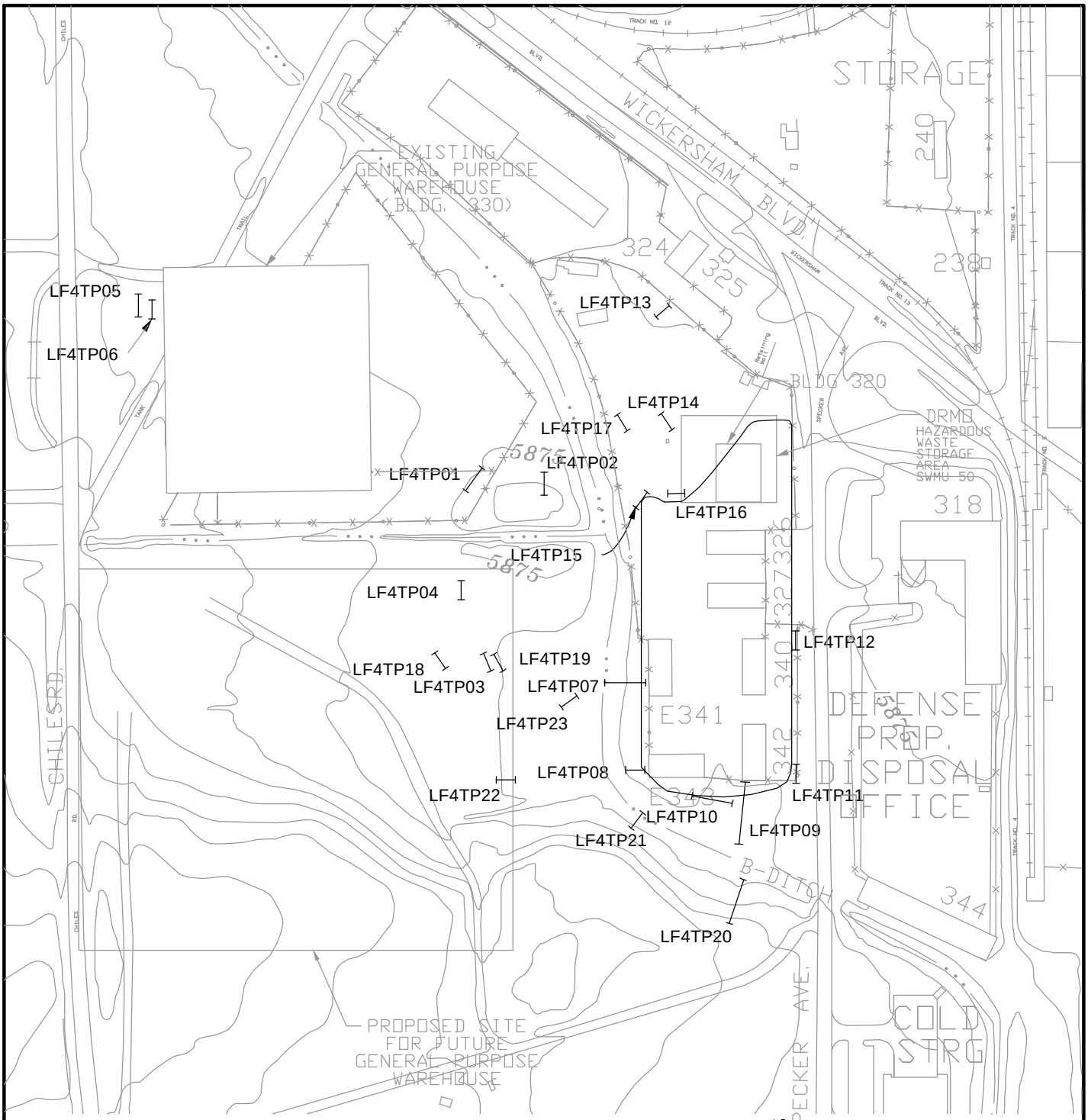

LEGEND

TRENCH LOCATION

APPROXIMATE LANDFILL BOUNDARY

Note: LF4TP20-23 locations are approximate

EARTH TECH

FIGURE 3-2

TRENCH LOCATIONS

LANDFILL 4
FORT CARSON, COLORADO

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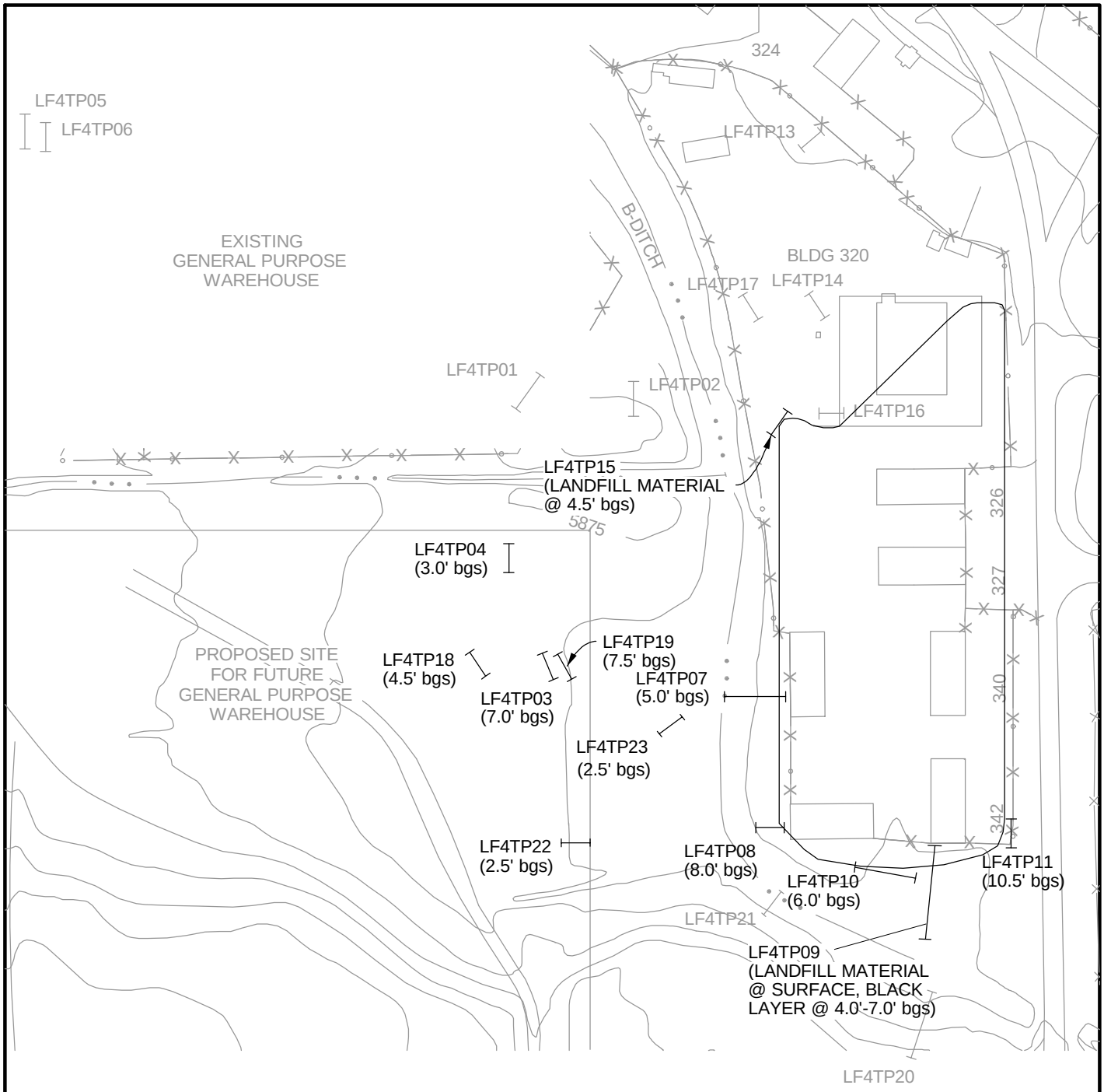


LEGEND

TRENCH LOCATION WITH LANDFILL MATERIAL OR BLACK ORGANIC LAYER

TRENCH WITHOUT LANDFILL MATERIAL OR BLACK ORGANIC LAYER

(7.0' bgs) DEPTH OF BLACK ORGANIC LAYER BELOW GROUND SURFACE (bgs)

APPROXIMATE LANDFILL BOUNDARY

N

85 0 85 170 FEET

Note: LF4TP22-23 locations are approximate.

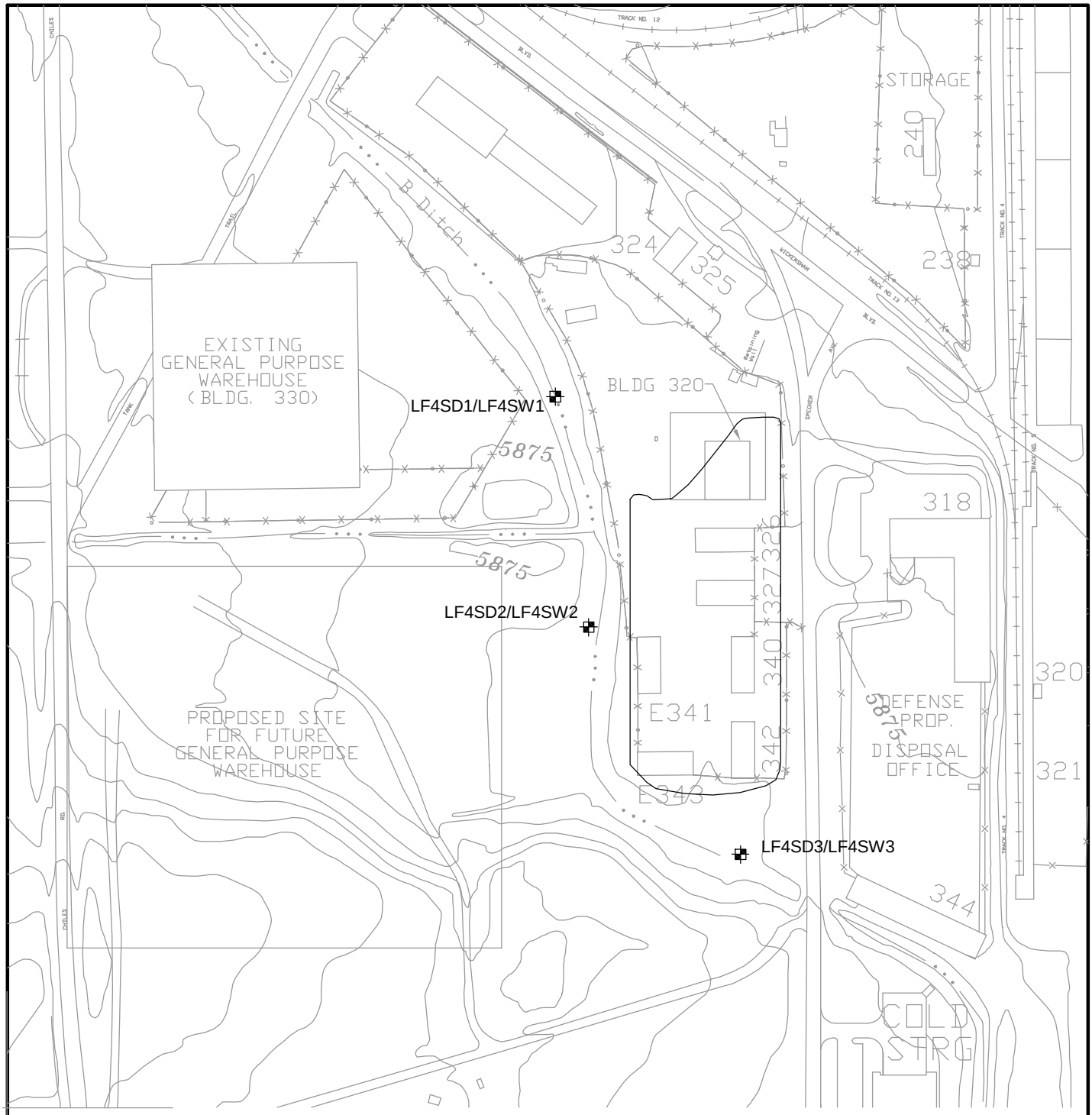
EARTH TECH

FIGURE 3-3

LANDFILL MATERIAL AND
BLACK ORGANIC LAYER LOCATIONS

LANDFILL 4
FORT CARSON, COLORADO

L:\WORK\56737\CAD\53724013.DWG



N

LEGEND

SURFACE WATER AND SEDIMENT SAMPLING LOCATION

APPROXIMATE LANDFILL BOUNDARY

125 0 125 250 FEET

EARTH TECH

FIGURE 3-4

SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS

LANDFILL 4
FORT CARSON, COLORADO

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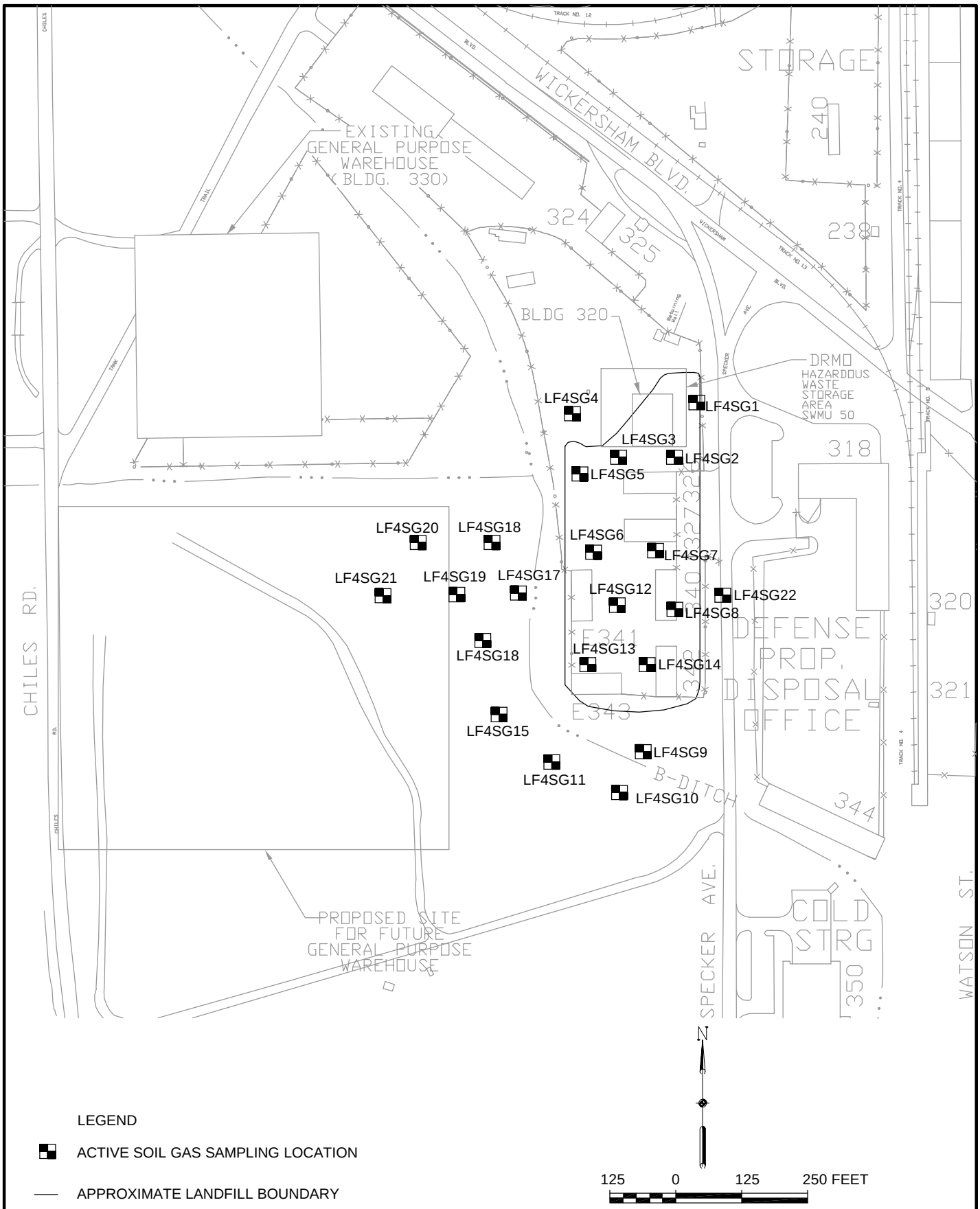

LEGEND

ACTIVE SOIL GAS SAMPLING LOCATION

APPROXIMATE LANDFILL BOUNDARY

EARTH TECH

FIGURE 3-5

ACTIVE SOIL GAS SAMPLING LOCATIONS

LANDFILL 4
FORT CARSON, COLORADO

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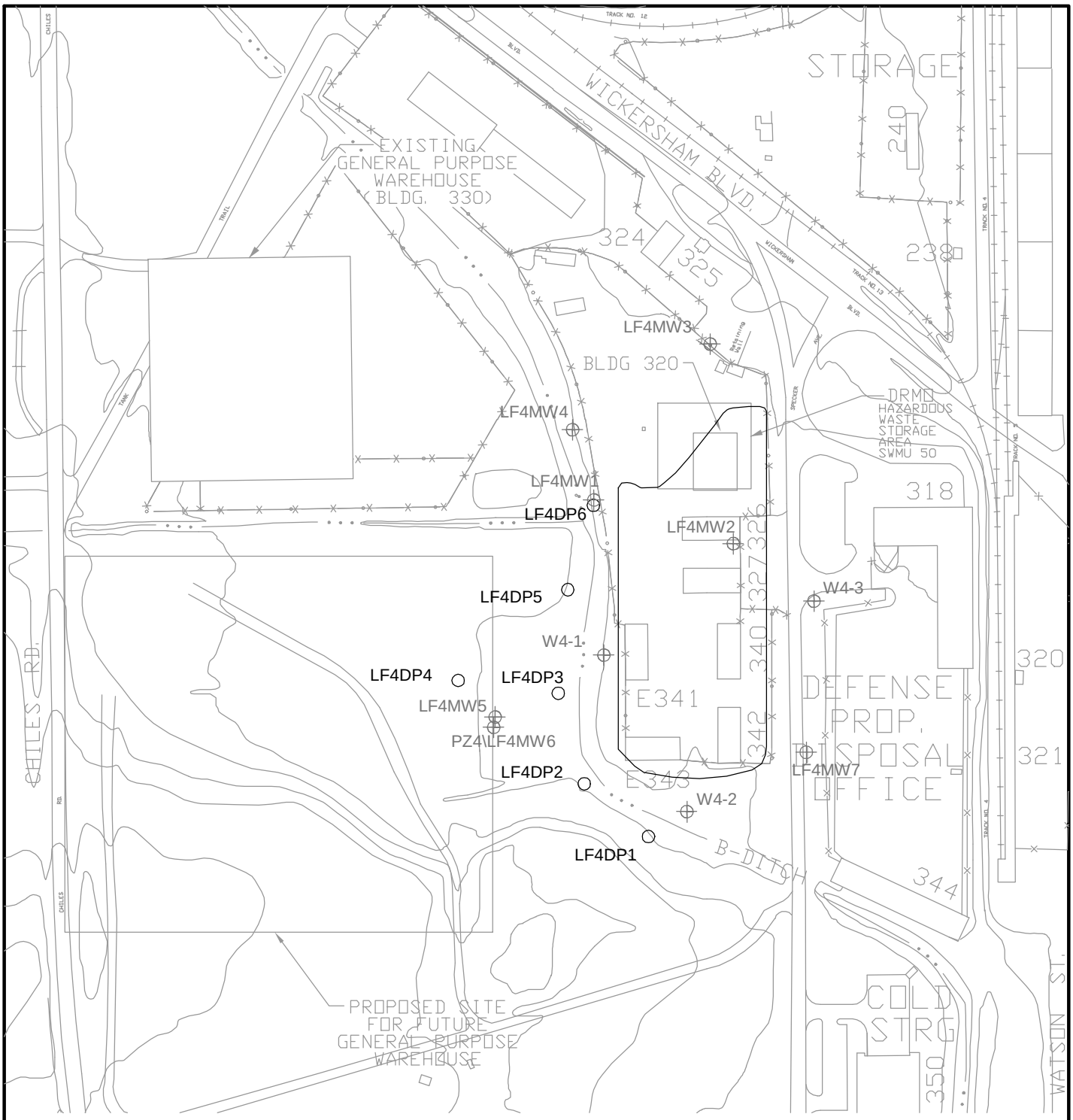


LEGEND

MONITORING WELL

DIRECT PUSH SOIL BORING/TEMPORARY MONITORING WELL LOCATION

APPROXIMATE LANDFILL BOUNDARY

NOTE: WELL PZ4 WAS REPLACED WITH WELL LF4MW6 ON NOV. 13, 2001.

N

125 0 125 250 FEET

56737/Graphics/53724005 06/28/01 plc

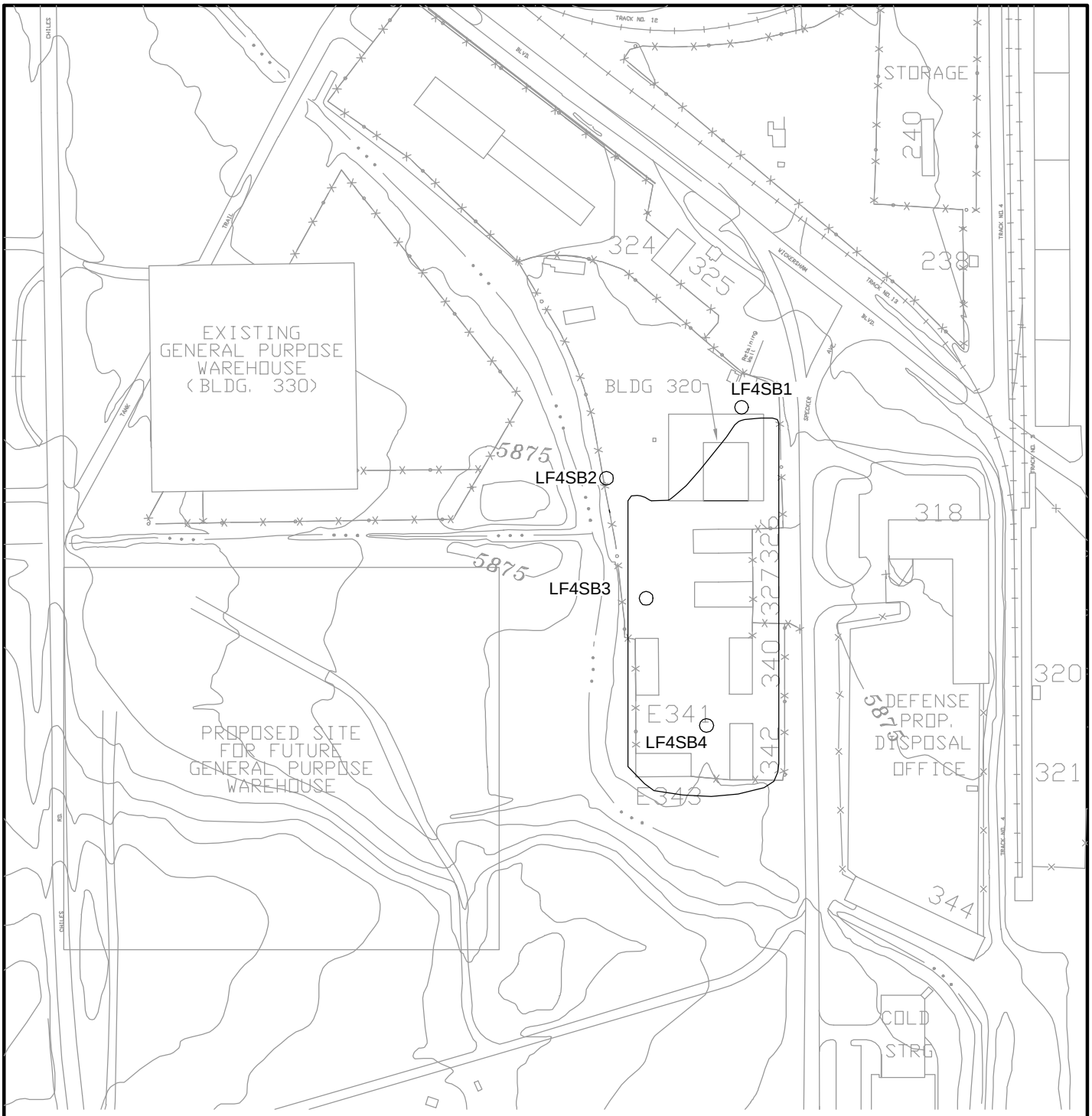
EARTH TECH

FIGURE 3-6

DIRECT PUSH TEMPORARY WELL AND PERMANENT MONITORING WELL LOCATIONS

LANDFILL 4

FORT CARSON, COLORADO



N

LEGEND

○ SOIL BORING

—— APPROXIMATE LANDFILL BOUNDARY

125 0 125 250 FEET

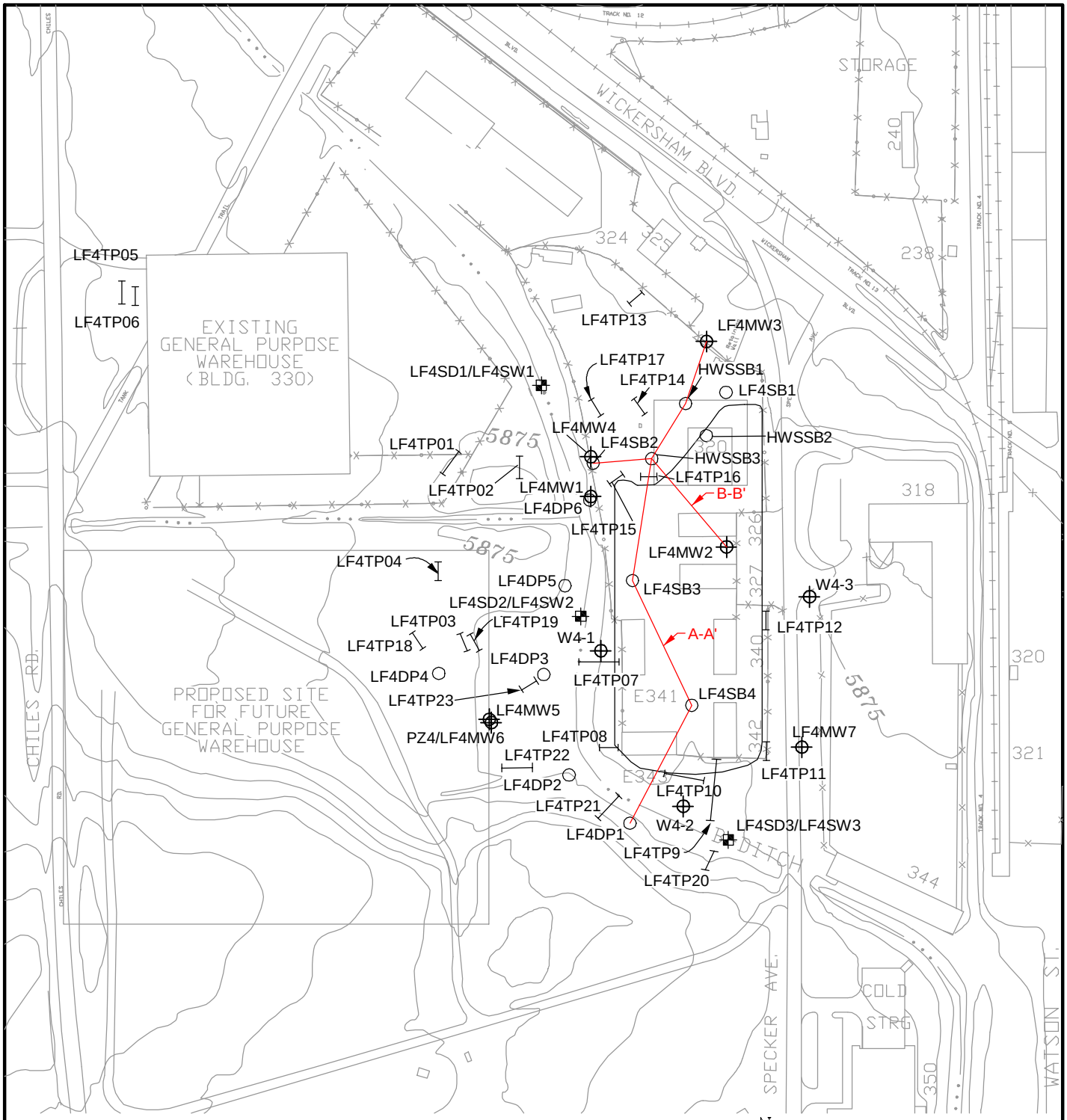
EARTH TECH

FIGURE 3-7

SOIL BORING LOCATIONS

LANDFILL 4
FORT CARSON, COLORADO

L:\WORK\56737\CAD\53724006.DWG



LEGEND

- SURFACE WATER AND SEDIMENT SAMPLING LOCATION
- DIRECT PUSH AND SOIL BORING LOCATION
- MONITORING WELL LOCATION
- TRENCH LOCATION
- APPROXIMATE LANDFILL BOUNDARY

NOTE: LF4TP20-23 LOCATIONS ARE APPROXIMATE. WELL PZ4 WAS REPLACED WITH WELL LF4MW6 ON NOV. 13, 2001.

N

125 0 125 250 FEET

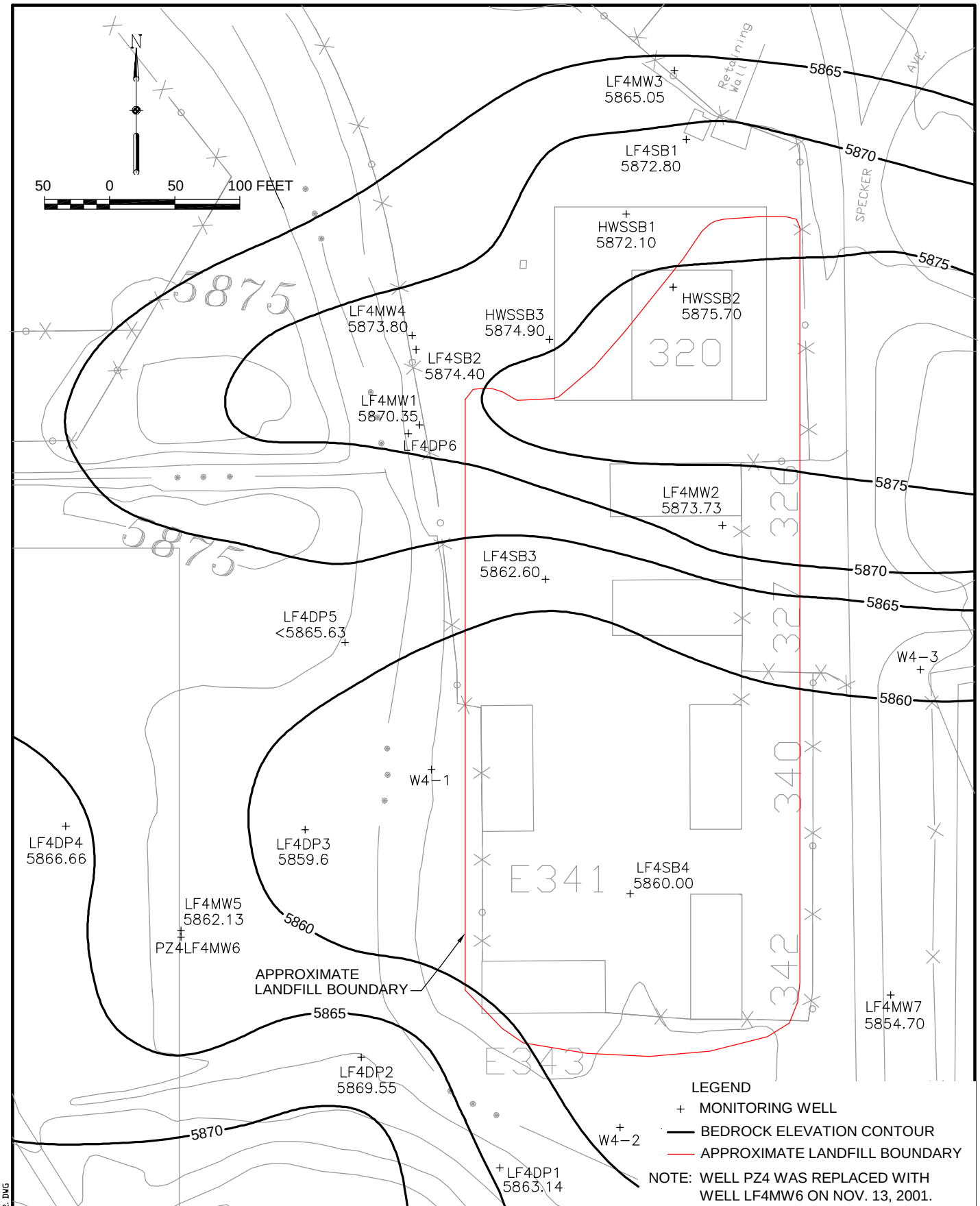
EARTH TECH

FIGURE 4-1

SAMPLE LOCATION MAP

LANDFILL 4
FORT CARSON, COLORADO

56737/CAD/53724014.DWG 07/18/01 PLC



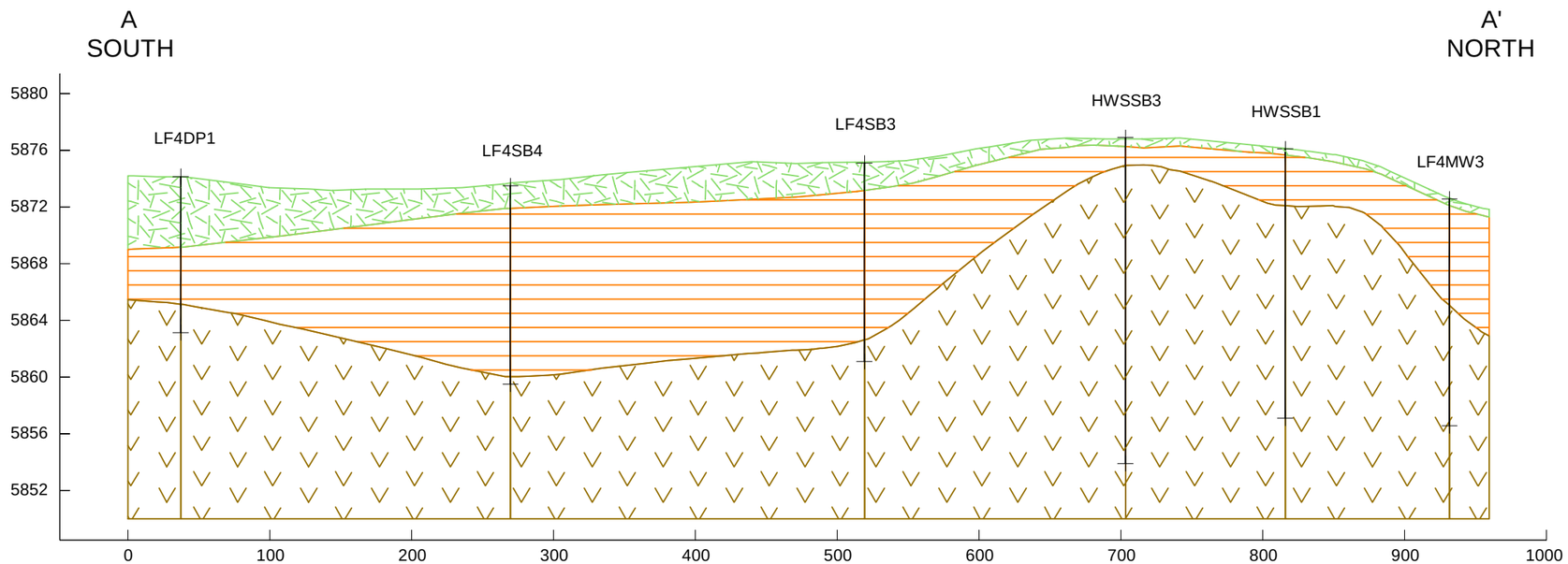
EARTH TECH

FIGURE 4-2

WEATHERED BEDROCK TOPOGRAPHY

LANDFILL 4
FORT CARSON, COLORADO

L:\WORK\56737\CAD\53724032.DWG



COMMENTS

1. CROSS SECTION LOCATION IS INDICATED ON FIGURE 4-1.
2. ELEVATIONS ARE IN FEET IN ACCORDANCE WITH THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988.
3. IT WAS DIFFICULT TO DISCERN FINE-GRAINED SEDIMENTS USING FIELD METHODS. AS A RESULT, GEOTECHNICAL ANALYSES WERE PERFORMED TO DISTINGUISH BETWEEN SILT AND CLAY. GEOTECHNICAL RESULTS INDICATE THAT THE FINE-GRAINED SEDIMENTS WERE CLAY AS SHOWN HERE.

LEGEND

FILL MATERIAL/GRAVEL

CLAY

WEATHERED PIERRE SHALE

HORIZONTAL SCALE: 1 INCH = 100 FEET
VERTICAL SCALE: 1 INCH = 10 FEET

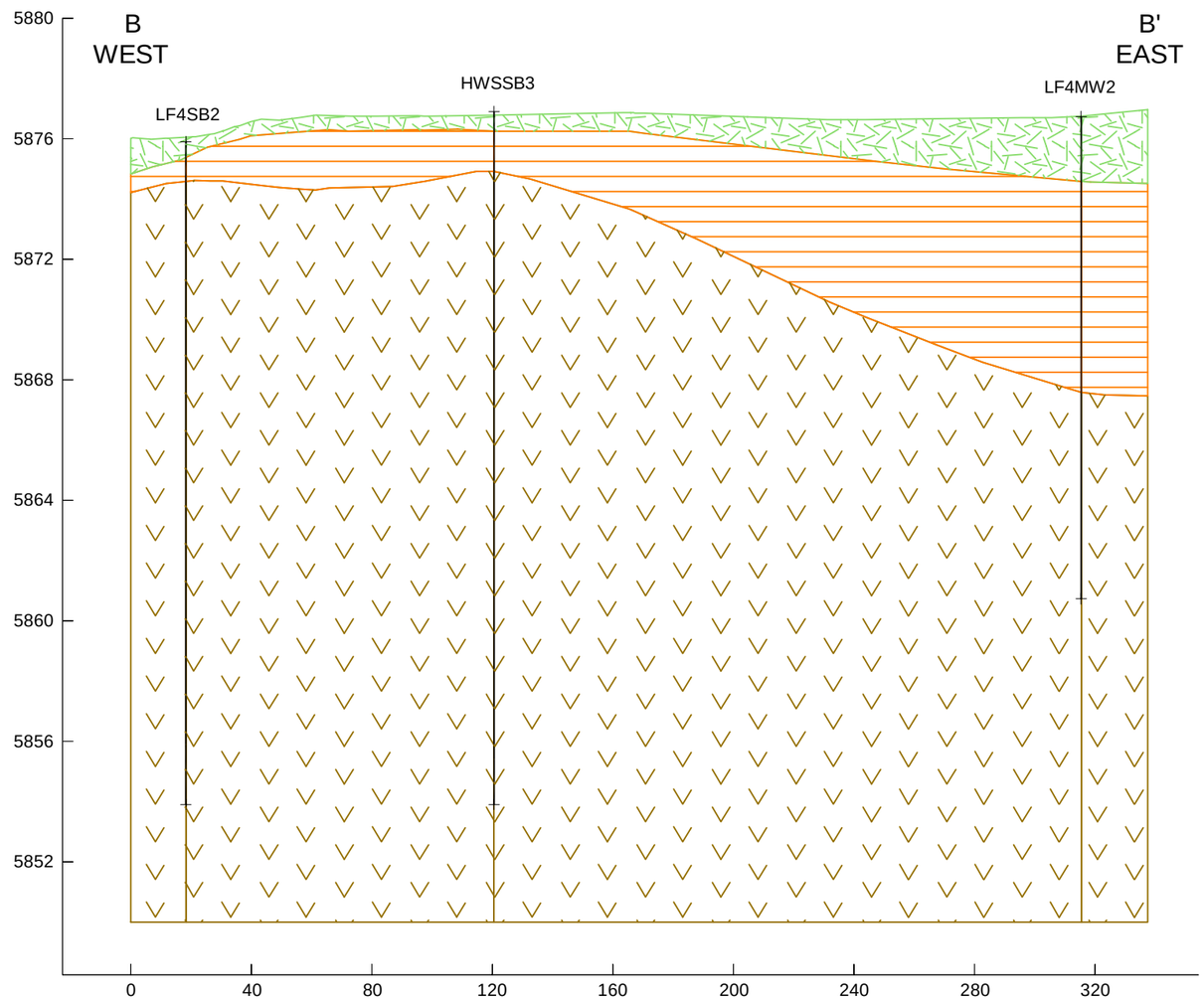
EARTH TECH

FIGURE 4-3

CROSS SECTION A-A'

LANDFILL 4
FORT CARSON, COLORADO

L:\WORK\56737\CAD\53724030.DWG



LEGEND

- FILL MATERIAL/GRAVEL
- CLAY
- WEATHERED PIERRE SHALE

HORIZONTAL SCALE: 1 INCH = 50 FEET
VERTICAL SCALE: 1 INCH = 5 FEET

COMMENTS

1. CROSS SECTION LOCATION IS INDICATED ON FIGURE 4-1.
2. ELEVATIONS ARE IN FEET IN ACCORDANCE WITH THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988.
3. IT WAS DIFFICULT TO DISCERN FINE-GRAINED SEDIMENTS USING FIELD METHODS. AS A RESULT, GEOTECHNICAL ANALYSES WERE PERFORMED TO DISTINGUISH BETWEEN SILT AND CLAY. GEOTECHNICAL RESULTS INDICATE THAT THE FINE-GRAINED SEDIMENTS WERE CLAY AS SHOWN HERE.

EARTH TECH

FIGURE 4-4
CROSS SECTION B-B'

LANDFILL 4
FORT CARSON, COLORADO

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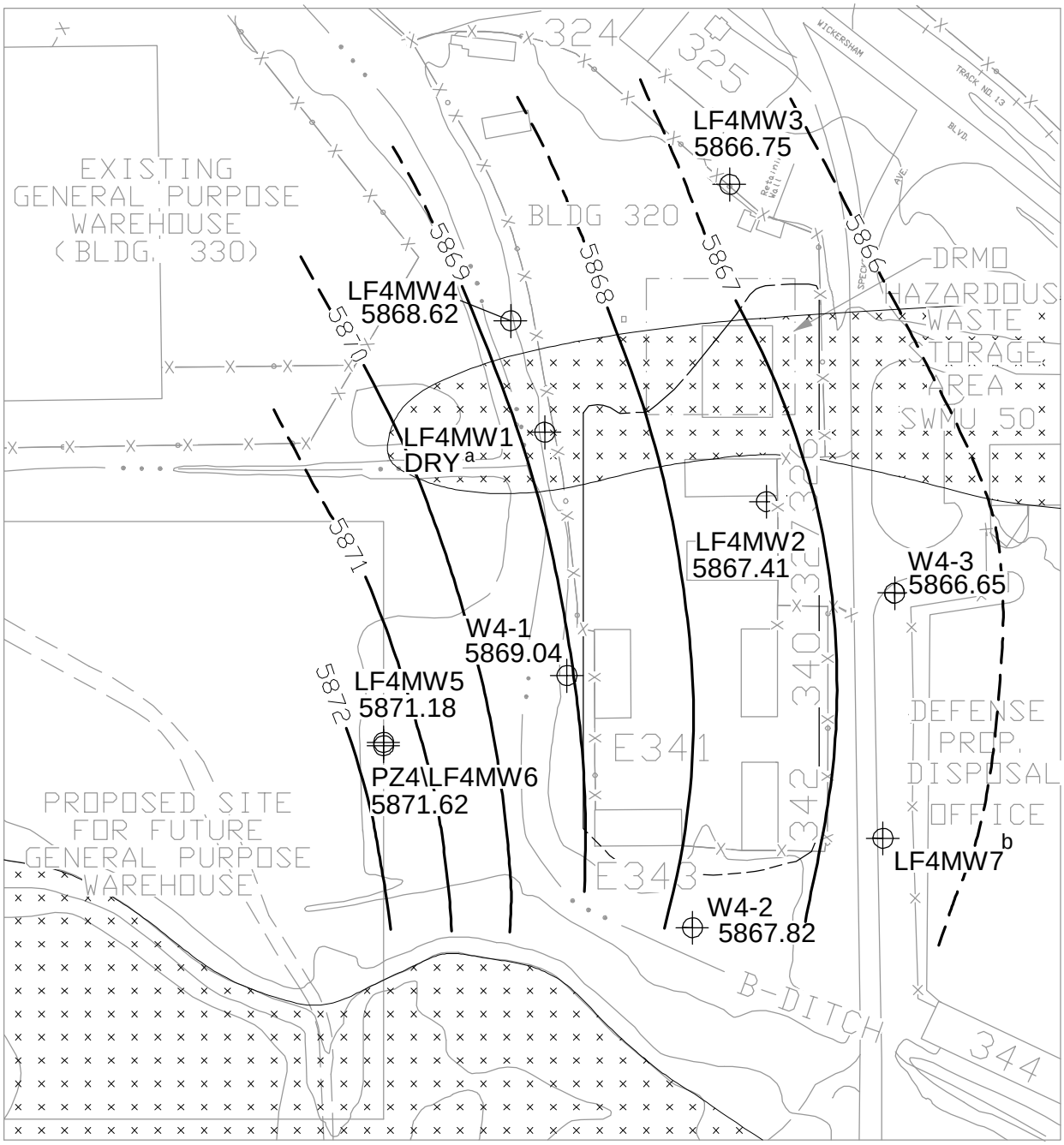

LEGEND

⊕ MONITORING WELL

— APPROXIMATE LANDFILL BOUNDARY

—5871— LINE OF EQUAL GROUNDWATER ELEVATION

WATER LEVEL MEASUREMENTS COLLECTED JUNE 26, 2001

NOTE: WELL PZ4 WAS REPLACED WITH WELL LF4MW6 ON NOV. 13, 2001.

a - ALTHOUGH LF4MW1 WAS REPORTED DRY ON 6/26/01, DEPTH TO WATER MEASURED ON 7/16/01 WAS 9.72 FEET BELOW TOC. THE CORRESPONDING GROUNDWATER ELEVATION IS 5868.46.

b - WATER LEVEL NOT TAKEN.

ALLUVIUM AND WEATHERED PIERRE SHALE ARE DRY BASED ON WATER LEVELS AND GEOLOGIC INFORMATION.

N

EARTH TECH

FIGURE 4-5

GROUNDWATER PIEZOMETRIC SURFACE MAP

LANDFILL 4
FORT CARSON, COLORADO

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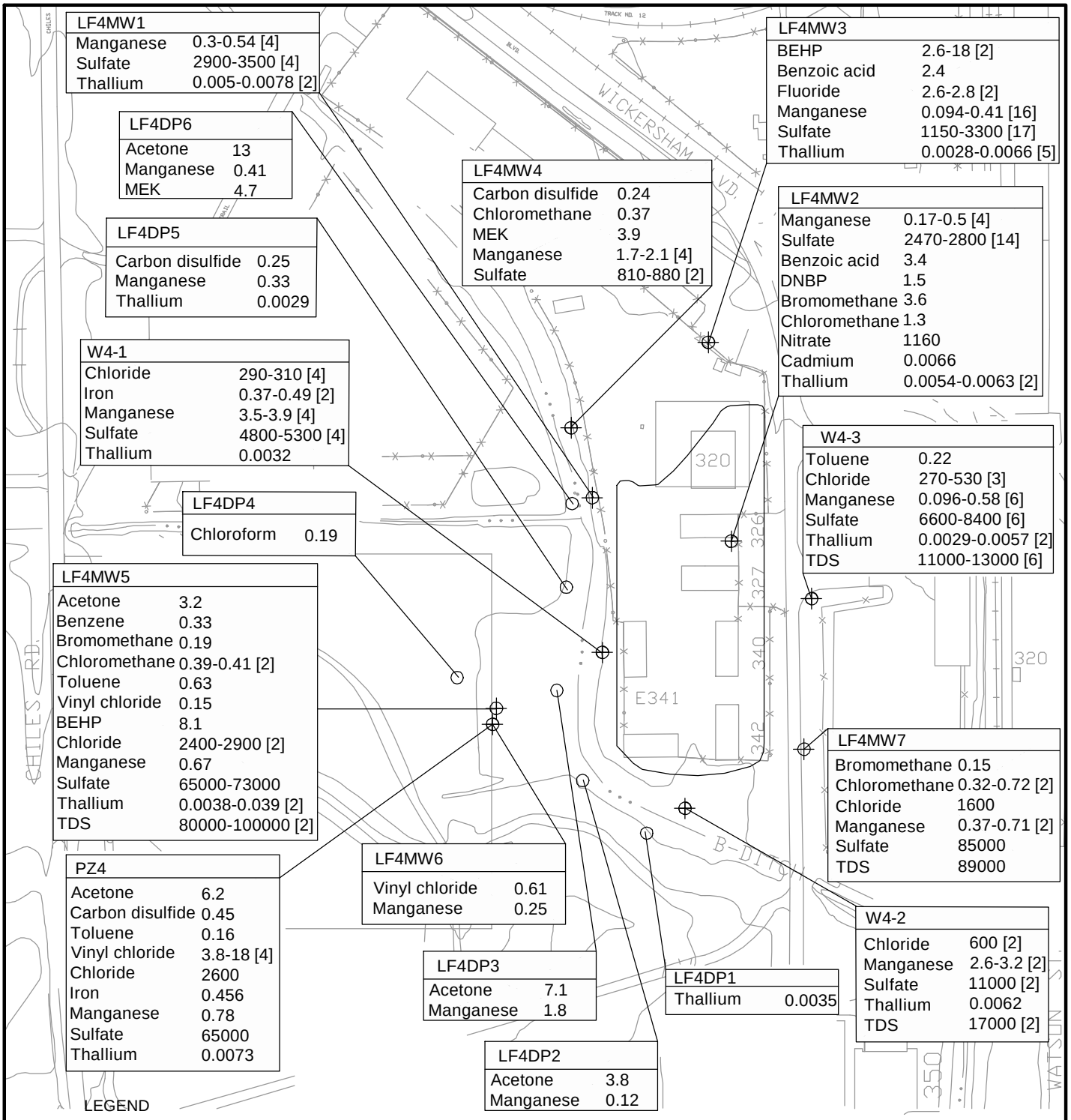

LEGEND

⊕	MONITORING WELL
○	DIRECT PUSH SOIL BORING/ TEMPORARY MONITORING WELL LOCATION
—	APPROXIMATE LANDFILL BOUNDARY
BEHP	BIS(2-ETHYLHEXYL)PHTHALATE
DNBP	DI-N-BUTYL PHTHALATE
MEK	2-BUTANONE
TDS	TOTAL DISSOLVED SOLIDS
[#]	NUMBER OF EXCEEDANCES OF ASSESSMENT CRITERION

Note: Organic compound concentrations in ug/L and metals concentrations in mg/L.

EARTH TECH

FIGURE 4-6

ANALYTES DETECTED IN GROUNDWATER ABOVE ASSESSMENT CRITERIA

LANDFILL 4
FORT CARSON, COLORADO

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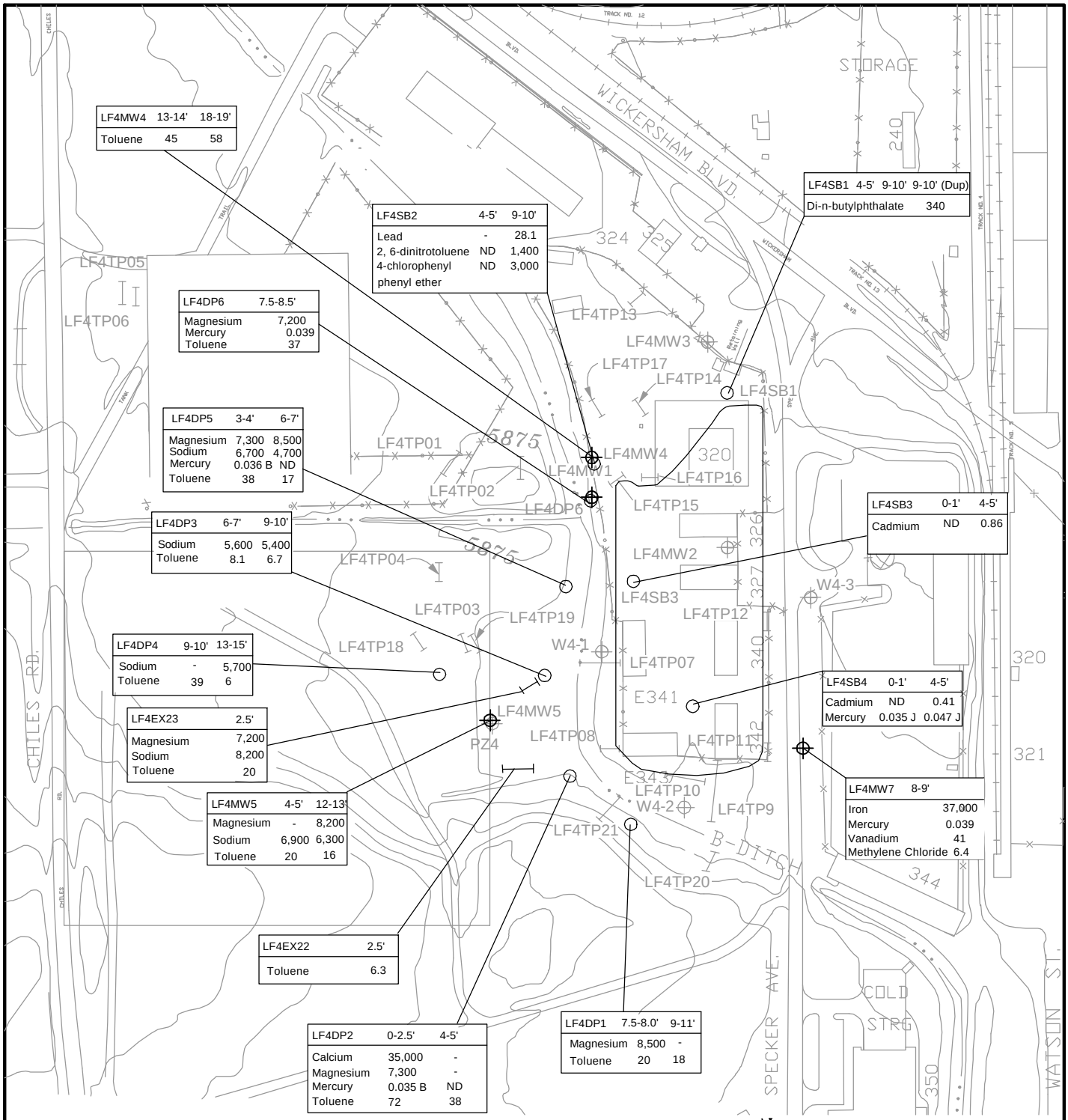


LEGEND

- ○ DIRECT PUSH AND SOIL BORING LOCATION
- ⊕ MONITORING WELL LOCATION
- ⊢⊣ TRENCH LOCATION
- — APPROXIMATE LANDFILL BOUNDARY
- ND NONE DETECTED
- \- ASSESSMENT CRITERION NOT EXCEEDED

Notes: All organic analytes detected above PQLs are shown. Only metals exceeding background UTLs are shown.

Organic compound concentrations in ug/kg and metals concentrations in mg/kg.

Well PZ4 was replaced with well LF4MW6 on NOV. 13, 2001.

LF4TP22-23 locations are approximate.

N

125 0 125 250 FEET

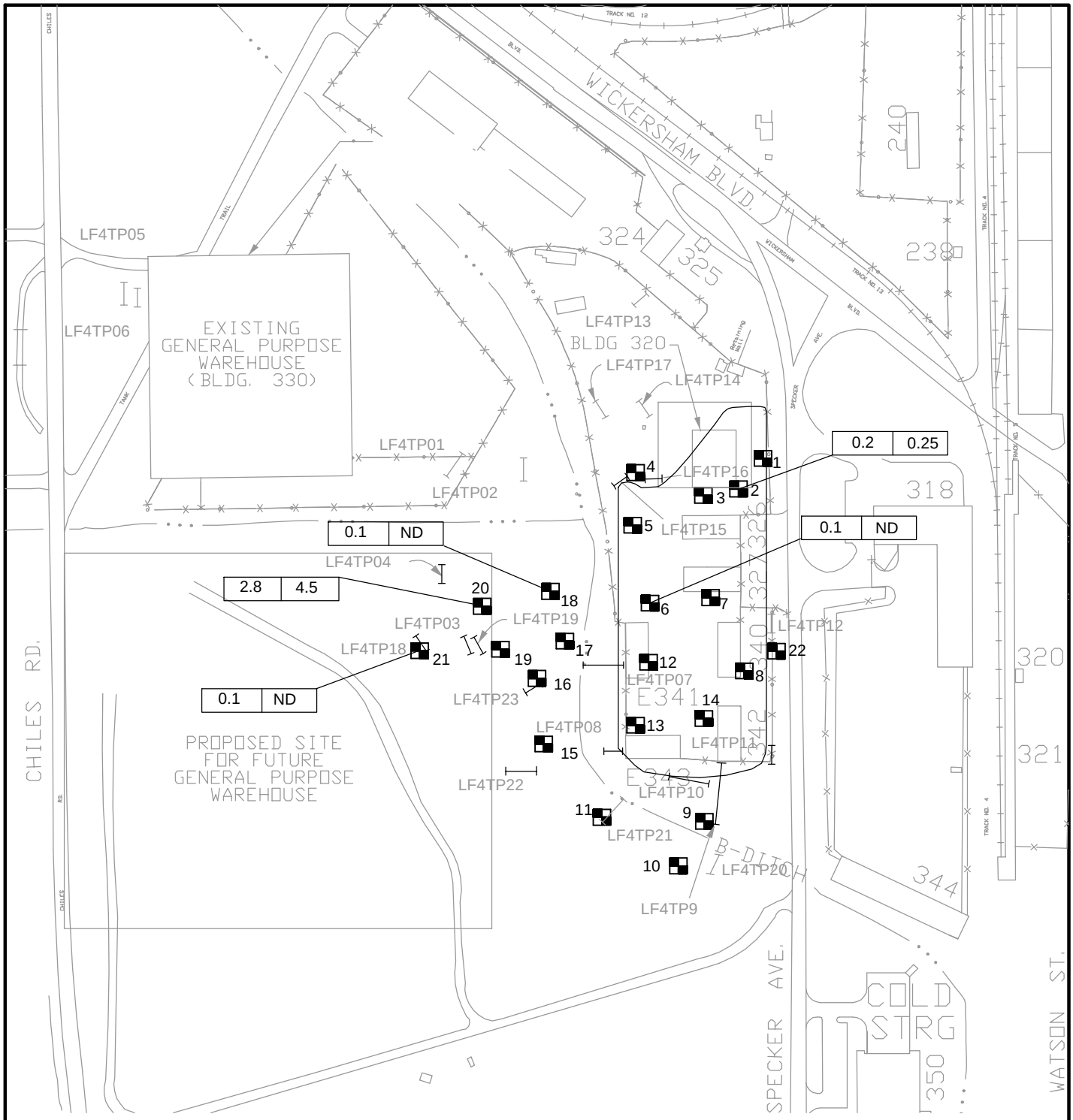
EARTH TECH

FIGURE 4-7

ANALYTES DETECTED IN SOIL ABOVE ASSESSMENT CRITERIA

LANDFILL 4
FORT CARSON, COLORADO

L:\WORK\56737\CAD\53724020.DWG



LEGEND

Field	Lab
0.1	ND

Methane concentration (%)

Active soil gas sampling location (LF4SG_)

Trench location without black organic layer

Trench location with black organic layer

Approximate landfill boundary

N

125 0 125 250 FEET

EARTH TECH

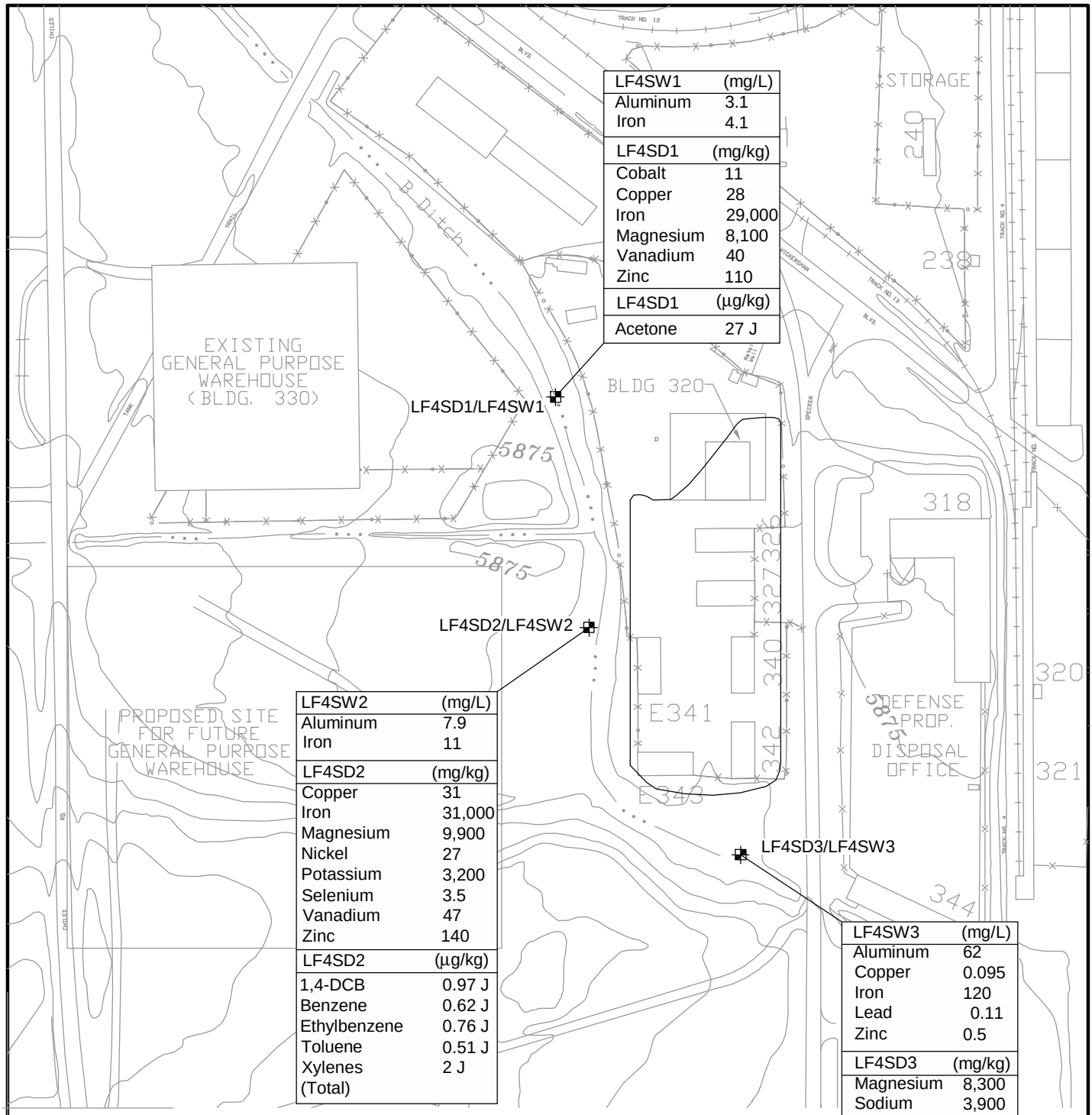
FIGURE 4-8

SOIL GAS FIELD AND LABORATORY RESULTS - METHANE DETECTIONS

LANDFILL 4

FORT CARSON, COLORADO

L:\WORK\56737\CAD\53724016.DWG



LF4SW1	(mg/L)
Aluminum	3.1
Iron	4.1
LF4SD1	**(mg/kg)**
Cobalt	11
Copper	28
Iron	29,000
Magnesium	8,100
Vanadium	40
Zinc	110
LF4SD1	**(µg/kg)**
Acetone	27 J

LF4SW2	(mg/L)
Aluminum	7.9
Iron	11
LF4SD2	**(mg/kg)**
Copper	31
Iron	31,000
Magnesium	9,900
Nickel	27
Potassium	3,200
Selenium	3.5
Vanadium	47
Zinc	140
LF4SD2	**(µg/kg)**
1,4-DCB	0.97 J
Benzene	0.62 J
Ethylbenzene	0.76 J
Toluene	0.51 J
Xylenes (Total)	2 J

LF4SW3	(mg/L)
Aluminum	62
Copper	0.095
Iron	120
Lead	0.11
Zinc	0.5
LF4SD3	**(mg/kg)**
Magnesium	8,300
Sodium	3,900
Zinc	91
LF4SD3	**(µg/kg)**
Xylenes (Total)	0.9 J

N

125 0 125 250 FEET

LEGEND

SURFACE WATER AND SEDIMENT SAMPLING LOCATION

APPROXIMATE LANDFILL BOUNDARY

DCB DICHLOROBENZENE

NOTE: ALL ORGANIC DETECTIONS ARE SHOWN. ONLY THOSE INORGANIC DETECTIONS WHICH EXCEEDED ASSESSMENT CRITERIA ARE SHOWN.

EARTH TECH

FIGURE 4-9
ANALYTES DETECTED IN SURFACE WATER AND SEDIMENT

LANDFILL 4
FORT CARSON, COLORADO

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APPENDIX A

RESPONSE TO COMMENTS ON DRAFT FINAL RCRA FACILITY INVESTIGATION REPORT FOR THE GROUP A SITES, QUALITY CONTROL SUMMARY REPORT FOR THE GROUP A SITES, AND DRAFT FINAL RCRA FACILITY INVESTIGATION WORK PLAN FOR LANDFILL 4

FORT CARSON ARMY INSTALLATION
RCRA FACILITY INVESTIGATION REPORT
GROUP A SITES
FORT CARSON, COLORADO
CDPHE COMMENTS DATED OCTOBER 2000

GENERAL RESPONSE: A revised Draft Final RCRA Facility Investigation Report for the Group A sites will not be submitted. Rather, site specific RFI reports will be submitted based on responses to comments discussed below. A work plan is currently in preparation for Landfill 4 and will be submitted by December 18, 2000. A revised RFI report will be issued after the field work has been completed and evaluated. A work plan to evaluate the issues at the Vehicle Wash Rack Ditches will be included as part of the 11- and/or 33-Site Former Used/Waste Oil USTs. Revised Draft Final RFI reports will be issued for the DRMO Hazardous Waste Storage Area, the Vehicle Wash Racks Ditches, and the Building 301 Drainage Ditch after approval of these responses.

Specific Comments:

1. Executive Summary, Landfill 4: p. ES-2, 2nd para., 3rd sent - COMMENT: An exceedance of vinyl chloride (above CGWS) was reported as not confirmed by subsequent Quarterly Groundwater Monitoring Program (QGMP) sampling. Did the QGMP sampling include the well with the vinyl chloride exceedance? Please confirm its inclusion or discuss the limitations of the QGMP as a basis for the assertion. That is, if the well with the vinyl chloride exceedance was not included in the QGMP then the weight of evidence may not be overly significant.

   RESPONSE: Well PZ4 has not traditionally been sampled as part of the QGMP sampling. It has not been included since the well has a 1.5-inch inside diameter, is set with a two-foot screen in a clay unit, and purges dry very quickly. Additional information indicates that the well was installed in 1976. However, this well was resampled in the August 2000 QGMP to further assess the vinyl chloride detection. A permanent monitoring well is scheduled for construction adjacent to this well during the Landfill 4 additional RFI investigation. In addition, new sampling techniques will be tried to determine if the vinyl chloride detections represent groundwater conditions or represent deterioration of the PVC casing.

2. Building 301 Drainage Ditch: p. ES-3, 2nd para., 1st sent. - COMMENT: Consideration must be given to the location of the well where the two VOCs were detected. That is, would the well where VOCs were detected represent the highest potential VOC concentration? What is known about the origin, transport and fate of VOCs at the site? Were investigation wells placed at optimum potential impact locations?

   RESPONSE: This monitoring well was put in an optimum location to evaluate groundwater conditions surrounding the Building 301 drainage ditch. Surface water discharge from Building 301 is in the east-west drainage located adjacent to monitoring well DRDMW1.

Source area for the detected VOCs is unknown, but there are other investigated SWMUs in the area.

3. p. ES-3, 2nd para., 3rd Sent. - COMMENT: Please consider antimony in the context of Comment 1.

RESPONSE: As shown in Tables 3-2 and 4-8, antimony has been sampled for but only intermittently detected in QGMP samples from DRDMW1. All subsequent detections have been at concentrations below the assessment criteria.

4. Introduction: p. 1-1, 2nd para., 2nd sent. - COMMENT: Please note the permit was dated September 29, 1995 and became effective October 29, 1995. Please revise the text.

RESPONSE: The text will be revised as requested.

5. Section 2.2.2: p. 2-2, 2nd para., 2nd sent. - COMMENT: The operation of the DRMO Hazardous Waste Storage Area, until 1983, specifically subjects the unit to RCRA Closure requirements.

RESPONSE: Comment noted. This section provides background information for the site. A Closure Plan will ultimately be prepared for the DRMO Hazardous Waste Storage Area in accordance with RCRA regulation.

6. Section 2.2.3: p. 2-3, 1st para. - COMMENT: The use of the wash racks up to 1981 and the reported disposal of solvents into the ditches (storm drains) even after the completion and use of the IWTP indicates that the unit is subject to RCRA Closure requirements. Please so indicate or provide a basis for an exclusion from the specific requirements to conduct a RCRA Closure.

RESPONSE: Comment noted. This section provides background information for the site. A Closure Plan will ultimately be prepared for the Building 301 Drainage Ditch in accordance with RCRA regulation.

7. Section 2.2.4: p. 2-3, 2nd para. - COMMENT: Please see and apply comment No. 6 as appropriate.

RESPONSE: Comment noted. This section provides background information for the site. A Closure Plan will ultimately be prepared in accordance with RCRA regulation.

8. Section 3.14: p. 3-16, 2nd para. 5th sent. - COMMENT: The approach used in making Investigation-Derived Waste determinations was not fully consistent with the Division=s *Interim Final Policy and Guidance on Management of Investigation Derived (IDW) at RCRA Facilities,* undated, as incorporated by reference in the Field and Laboratory Procedures Manual, April 1997 (or the unapproved September 1998 version). The method used was to collect an aliquot of soil from each drum of soil cuttings to create a composite sample. Section 3.3 of the IDW policy states in the next to last sentence on page 6 of 13 that, AThis [hazardous waste determination] must be made for each

container (or pile, etc.) of IDW.@ Please ensure that future IDW determinations are made in accordance with the policy.

> RESPONSE: All IDW sampling at Fort Carson is in compliance with IDW policies. This includes the practice of taking discrete samples from every boring at the interval that displays the highest headspace or impact. Disposal is based on the analytical results.

9. Section 4.1.1: p. 4-2, 2nd para. - COMMENT: Other than road base and asphalt, there is no discussion of landfill wastes. Please do so, and include the results from the trenches dug in August 1998. (It is unclear why this data was not included previously since the trenches predate the RFI Report.) In so doing, note that Section 2.2.1 indicates that Landfill 4 was operated Ato receive sanitary wastes and possibly small amounts of sludge and waste petroleum, oil and lubricants.@ There is no mention of construction debris being disposed; however, such material was used to terminate trenching performed during August 1998. Many of the trench descriptions contain reference to Black Decaying Organic Material [including grass and vegetation] at an Old Surface Horizon. As a result, the Division is concerned that the principle landfill material, sludge and POL, as encountered in the trenches dug in August 1998, has neither been given proper significance and attention in defining the outer limit of Landfill 4 nor sampled to determine or refute the presence of hazardous wastes or waste constituents. The sludge, Adewatered@ as a result of burial, may represent a small increment of the Astratigraphic@ section, but may represent a potentially significant source of contaminants, particularly organic compounds.

> RESPONSE: As part of the Landfill 4 Final Work Plan, more trenches and soil borings will be utilized to sample and characterize the black organic layer. Soil gas samples will be taken at the interval where the blank organic layer is most commonly seen, 4 to 10 feet below ground surface. This section will be revised to include all data to date in the next version of the RFI report.

10. Section 4.1.3: p. 4-3, 3RD para. - COMMENT: Please discuss the physical description of the soil samples taken from LF4MW1 that exhibited elevated headspace readings relative to any potential correlation of visual and instrument results. Staining was noted below 7.5 feet in the boring for LF4-MW1 (Appendix C), yet the notation Ablack staining also found in fractures@, is not discussed in conjunction with the elevated head space readings for the surface and 4/5 intervals. Thus, the statement that no VOCS were detected in LFSB2, which is upgradient of LF4MW-1, is unacceptable. The conditions in the vicinity of LF4SB2 are not indicative of conditions in the vicinity LF4MW-1. (Per the scale of Figure 4-3, LFSB2 is approximately 120 feet north-northwest, not 25 feet, north of LF4MW1. Please check the data.)

> RESPONSE: The text will be revised in the forthcoming Landfill 4 RFI report to include more information on samples with elevated headspace readings. A discussion of analytical results is found in Section 4.2.2, and referenced to analytical data in this section will be removed. Figure 4-3 will be checked to confirm the accuracy of the well and boring locations. Additional sampling will be performed at LF4MW1 to evaluate the black organic layer.

11. Section 4.1.4: p. 4-4, 2nd para. - COMMENT: Similar to Landfill 4, the discussion is limited to geologic descriptions. Please review the data further and report any occurrences of potential contamination.

RESPONSE: This section is only intended to discuss what was observed during drilling activities. Analytical results are presented in Section 4.2.3.

12. Section 4.1.7: p. 4-5, 3rd para. - COMMENT: Please indicate why sediment samples were not collected from the Wash Rack Drainage Ditches as were collected from the Building 301 Drainage Ditch. If site conditions were such that it was more appropriate to term the samples Asoil samples@, rather than Asediment samples@ and use soil sampling protocols, please so state.

RESPONSE: As discussed in section 2.2.3, water was not present in the ditches during site activities. These ditches appear to carry storm water runoff only. Therefore, all solid samples were referred to as Asoil@ samples.

13. p. 4-5, 4th para. - COMMENT: Please see and apply comment No. 10 as appropriate.

RESPONSE: This section is only intended to discuss what was observed during drilling activities. Headspace results are presented in Section 4.1.9, and analytical results are presented in Section 4.2.4. The text will be revised to include more information on previously discussed information to help evaluate the site.

14. Section 4.1.9 p. 4-7, 1st para., 2nd sent. - COMMENT: The head space reading of 226 ppm, Appendix D, was actually from VWRMW1-4/5 not VWRMW2-4/5 which was 85 ppm. The borehole log, Appendix C, noted Ablack staining present in fracture (very defined)@ in the VWRMW1-4/5 interval. As a result, the subsequent statement, 3rd sent., that the high readings may be moisture interference with the instrument is not accepted. As discussed in Comment 15, laboratory analyses of unrelated samples with low head space readings are not sufficient to negate both instrument readings and visual observations.

RESPONSE: A work plan will be prepared to collect soil samples adjacent to VWRMW1 and VWRMW2, both at the 4 to 5-foot interval, to further evaluate the headspace readings during drilling of these monitoring wells. The samples will be analyzed for VOCs, SVOCs, and TAL metals. This sampling will be performed as part of the SWMU 72 (former used/waste oil UST) investigation since VWRMW1 is downgradient of SWMU 72.

15. p. 4-7, 1st para., 2nd full sent. - COMMENT: The absence of VOCs from the borings samples, based on both head space data and laboratory data, cannot be used to negate the Aanomalous@ head space readings from the monitoring well soil samples. One may, but should not expect to find VOCS in the laboratory samples if not detected by instrument readings. Therefore, it is inappropriate to assume that the laboratory would not have detected VOCs on samples with high head space readings had such analyses been requested. Consequently, boring and sampling in the immediate vicinity of VWRMW1 and VWRMW2 must be proposed to the Division. (Please note

that the contamination in VWRMW1 is at the contact with the Pierre Shale. In VWRMW2 elevated readings occur at the 4/5 interval and near the contact with the Pierre Shale, 21 feet deep.)

RESPONSE: See response to Comment No. 14 regarding soil sampling at wells VWRMW1 and VWRMW2.

16. Section 4.1.10: p. 4-7, 3rd para. - COMMENT: Please see and apply comment No. 11 as appropriate.

RESPONSE: This section is only intended to discuss what was observed during drilling activities. Analytical results are presented in Section 4.2.4.

17. Section 4.1.10: p. 4-7, 4th para. - COMMENT: Unless the soil background boring provides specific information on the Building 301 Drainage Ditch, please delete the discussion or indicate the significance of the bore hole data.

RESPONSE: Information regarding background boring GPABB1 was included in this report to provide geologic information due to it-s close proximity to the Building 301 drainage ditch and the absence of other geologic data in the area.

18. Section 4.1.12: p. 4-8, 3rd para. - COMMENT: Section 4.1.10 describes field screening for all soil sampling intervals Aat each sample location@. There was, per Appendix D, only one soil sample location associated with monitoring well DRD-MW1. Please clarify that head space readings were made at three depth intervals. As written, the Division first believed that head space reading had been made at the three sediment sampling sites. The use of Asoil sample@ in Section 4.1.7, see Comment 12, increased the level of confusion.

RESPONSE: The text will be edited to indicate that headspace readings were obtained from three intervals at DRDMW1.

19. Section 4.2 p. 4-8, 6th para. - COMMENT: Only RLs are discussed; however only PQLs are used in Section 4.2.2 and subsequent sections. Please assure the correct terminology is being used and consistently applied.

RESPONSE: All references to PQLs will be changed to RLs.

20. Section 4.2.1.1: p. 4-9, 3rd para. - COMMENT: Please correctly state the status of the Draft Background Data Set for Soils based on the Division-s earlier comments.

RESPONSE: The text will be revised to indicate the background data set is currently being revised based on CDPHE comments. However, interim background levels will continue to be utilized in the absence of an approved background data set.

21. Section 4.2.2: p. 4-10, 3rd para. - COMMENT: The presence of vinyl chloride above the 2 ug/L state ground water standard is noted, and of concern. In addition to impacts to ground water,

vinyl chloride can be a significant air hazard, particularly in closed-in spaces. (Based on work by the Division, concentrations of volatile organic compounds, even below ground water standards under certain conditions, are emerging as sources of unacceptable levels in indoor air.) The northernmost General Purpose Warehouse (GPW) building was recently constucted over the Landfill 4 SWMU, prior to any consideration of the possible need for cleanup of the site. Monitoring well W4-4 showed vinyl chloride at a concentration of 4.6 ug/L. This well abuts the proposed location for the proposed southernmost GPW. (Please refer to Figure 2-1 in the Draft Final RCRA Facility Investigation Work Plan [the Work Plan], Landfill 4, dated December 1999 for the comparative locations.) Therefore, an investigation of the potential impact to the indoor air of warehouse workers, in the northermost building, is warranted since the extent and severity of VOC contamination in the landfill is unknown.

> RESPONSE: Vinyl chloride has only been detected in well PZ4 (previously known as W4-4). This well, however, has a 1.5-inch inside diameter, a two-foot screen, and there is no construction information. A new monitoring well is proposed in the revised Landfill 4 Work Plan to replace this well and provide further information on the anomalous vinyl chloride presence at the Landfill 4 site. In addition, groundwater samples will be collected from temporary monitoring well located west of B-ditch to provide additional groundwater quality information in that area.

22. p. 4-10, 3rd para. - COMMENT: Additionally, the mere presence of vinyl chloride portends the need to more fully establish the immediate source of the vinyl chloride parent chlorinated compound, and given the location of W4-4 at the general down gradient edge of Landfill 4, the potential for a release of parent/daughter products off site. Of significance to this issue is the historical information which indicated the potential disposal of sanitary sludge and possibly small amounts of POL waste. This information, along with reports of an organic layer at the old surface horizon in a number of trenches, e.g. LF4TP03 and 04, etc.(see Comment 9), warrants reconsideration of the aerial extent of landfilled materials. As a result, the Landfill 4 boundary depicted in Figure 2-3 of the December 1999 RFI Work Plan is suspect. Therefore, Ft. Carson should expand the investigation of Landfill 4. Guidance to that end will be included in the comments on the December 1999 RFI Work Plan.

> RESPONSE: The revised Landfill 4 Final Work Plan includes more trenching and sampling on the west side of B-Ditch to confirm the proposed landfill boundary. This includes sampling to specifically characterize the black organic layer noted in several of the test pits.

23. p. 4-13, 3rd para. - COMMENT: Please clarify that the samples of surficial material collected from the wash rack drainage ditches were collected and identified as soil versus sediment samples.

> RESPONSE: See response to comment No. 12. Text has been added to this section to indicate the drainage ditches were dry at the time of sampling.

24. p. 4-13, 3rd para. - COMMENT: Please clarify the significance of being unable to confirm petroleum hydrocarbons as the source of the oil and grease. Does the absence of PAHs suggest

other sources? If so, please identify other potential sources and any investigation or analytical techniques that may establish the origin of the oil and grease.

> RESPONSE: The range of hydrocarbons analyzed under the oil and grease method (EPA Method 413.2) encompasses heavy end petroleum hydrocarbons such as motor oils, as well as, heavy end hydrocarbons such as waxes. The absence of PAH compounds indicates that the oil and grease detections are not indicative of used/waste oil, but are probably related to heavy end hydrocarbons such as waxes. Additional investigations are not warranted since the target SVOC compounds were not detected.

25. p. 4-14, 2nd para. - COMMENT: Antimony was collected from four wells above background. Well VWRMW3 was subsequently added to the QGMP. In Section 5.1 **Vehicle Wash Rack Drainage Ditches,** page 5-3, 1st paragraph, the conclusion is drawn that the QGMP results, based solely on Well VWRMW3, confirm the absence of Aorganic and inorganic contamination of the ground water. The Division does not consider this to be adequate confirmation but will await further risk evaluations before considering any additional investigative requirements.

> RESPONSE: Comment noted. The RFI for the Vehicle Wash Rack Ditches will include data collected from former used/waste oil tanks (11-Site and 33-Site) to evaluate the groundwater on a large scale at this site.

26. p. 4-14, 3rd para. - COMMENT: The occurrence of chlorinated compounds in five quarterly samples from a single well, VWRMW3, although PQLs and available assessment criteria were not exceeded, is of concern. The well is located, per Figure 3-3, approximately 50-60 feet from the center of the wash rack drainage ditch and, perhaps coincidentally, about 45-50 feet from Clover Ditch. The ground water may have been contaminated from compounds in either or both of these streams. However, the well may not be situated to detect chlorinated species of higher concentrations migrating along the low point of the incised drainage as may be expected of DNAPLs. The need for a direct-push temporary well(s) to collect a sample(s) of water at the center of the wash rack drainage ditch is indicated. It may also be appropriate, if possible, to place a temporary well in the center of Clover Ditch.

> RESPONSE: A work plan will be prepared to install a direct push temporary groundwater monitoring well in the ditch on the east side of the gravel road. This ditch is a continuation of the Vehicle Wash Rack drainage ditches after is has gone under the dirt road. This work will be performed as part of the SWMU 75 used/waste oil UST RFI since SWMU 75 is located southwest and upgradient of VWRMW3.

27. Section 4.2.5: p. 4-16, 1st para. - COMMENT: Well DRDMW1 reported chlorinated compounds below the CGWS thresholds. Although the well is within approximately 10 feet of the center of the ditch, per Figure 3-4, a question remains on whether the peripheral location of the well is adequate to detect DNAPL constituents at higher concentrations. As suggested in Comment 26, one or more direct-push temporary wells are appropriate to ensure that constituents are at safe levels.

RESPONSE: As discussed in response to Comment No. 2, this monitoring well was put in an optimum location to evaluate groundwater conditions surrounding the Building 301 drainage ditch.

28. p. 4-16, 1st para. - COMMENT: Antimony is reported to have been above background (unapproved) but in Section 5.1 **Building 301 Drainage Ditch,** page 5-4, 1st paragraph, is indicated to be above assessment criteria. Table 4-8. page 1 of 3 shows a single occurrence of antimony as BR(ARC)- background, above regulatory criteria. Please coordinate the two sections.

RESPONSE: The background value is the assessment criteria as discussed in Section 4.2.1.2. This interim background value is also above the regulatory criteria.

29. Section 4.2.5: p. 4-16, 2nd para. - COMMENT: The inclusion of well DRDMW1 in the Quarterly Ground Water Program, and subsequent repetitious occurrences of chlorinated compounds, notwithstanding the comparative low levels, support the need for sampling at the most optimum location, i.e. in, not adjacent, to the drainage ditch.

RESPONSE: As discussed in responses to Comments No. 2 and 27, monitoring well DRDMW1 was put in an optimum location to evaluate groundwater conditions surrounding the Building 301 drainage ditch.

30. Section 5.1: Landfill 4, p. 5-1, 2nd para. - COMMENT: The conclusion that organic compound contamination is not present at Landfill 4 is not accepted. Chlorinated compounds are evidenced at Landfill 4 by the occurrence of vinyl chloride in monitoring well W4-4. As noted on page 4-11, 3rd paragraph, vinyl chloride is a degradation product of chlorinated solvents. The assertion that head space readings confirmed the absence of organic compounds is inconclusive. Section 2.4.2 of the Work Plan indicates that a PID and multigas meter were used to evaluate conditions in the trenches dug in August 1998. However, these were field screenings and Appendix B of the Work Plan provides no information on where, or at what horizon, the screenings were made. Although Appendix B clearly shows the presence of an Aorganic@ layer at the Aoriginal horizon@ and the principal use of Landfill 4 was for the disposal of sanitary waste (Comment 9), potentially contaminated with POL wastes as opposed to Adebris@, there is no indication reading were made of the material and there are no reports of head space readings of organic layer samples. Clearly, an opportunity has been missed to focus attention on the waste reported to have been placed in Landfill 4. Additional investigations now must be conducted.

RESPONSE: This section addresses soil results. The text has been modified to further clarify its soil focus. Additionally, see response to Comment No. 9 regarding additional soil sampling.

31. p. 5-1, 3rd para. - COMMENT: Note must also be made that the vinyl chloride occurrence in W4-4 has neither been confirmed or refuted by additional sampling. The statement is made that initial and subsequent QGMP sampling in other wells did not confirm the vinyl chloride; however, W4-4 was neither added to the QGMP nor re-sampled. Moreover, per page 4-3 1st paragraph, the gradient is to the southeast and therefore more side-gradient than down-gradient of W4-4. Likewise,

the three new wells described on page 4-3, 2nd paragraph, are either within or north of the DRMO site and thus clearly upgradient of W4-4. Thus, the statement in that 2nd paragraph that three new wells were added to better characterize Landfill 4 should be revised to avoid any inference that the vinyl chloride occurrence has been fully evaluated.

> RESPONSE: As noted in previous responses, additional sampling at Landfill 4 is proposed in the revised Landfill 4 RFI work plan. This work plan includes replacing PZ4 (formerly known as W4-4) and performing up- and down-gradient (of PZ4) groundwater sampling. A revised RFI report will be based on existing results and proposed sampling results.

32. Vehicle Wash Rack Drainage Ditches, p. 5-2, 1st para., 1st sent. - COMMENT: The referenced statement conflicts with the discussion on page 4-14, 3rd paragraph, which indicates monitoring well VWRMW3, subsequently added to the QGMP, contained chlorinated solvents in five sampling events. Although the occurrences could not be reliably quantified, being below the PQL, five detections were reported (see Table 4-6, page 4 of 4.) Please make changes to the referenced sentence to reflect the content of Comment 26. (Note: The discussion of the Building 301 Drainage Ditch, 3rd paragraph, page 5-3, correctly reports detections, i.e. PAHs, including those below PQLs.)

> RESPONSE: This text will be revised to discuss the presence of organic constituents in groundwater samples at concentrations above and below the RL.

33. p. 5-2, 3rd para. - COMMENT: Table 4-6 show the persistent re-occurrence of nitrates in Well VWRMW3 above state ground water standards (CWGS), the most down gradient monitoring well, which are discussed in Section 4.2.4, page 4-14. However, the nitrate occurrences are not discussed in the **Conclusions**. Please do so, as the Division believes the occurrences may be significant to warrant remediation as levels are generally two-three times the CGWS of 10 mg/L.

> RESPONSE: A discussion of nitrate detections will be added to this section in the forthcoming RFI Report for the Vehicle Wash Rack Ditches.

Figures:

34. Figure 4-6 - COMMENT: The locations depicted for LF4SB1 thru LFSB4 are inconsistent with the locations shown on Figure 3-2 and 4-3. Which figures are correct? The failure to internally validate the locations prior to interpreting the data seriously impairs the reliability of the entire report. (It is noteworthy that two preparers and two reviewers, plus a presumed review by the Army Corp of Engineers, failed to detect the discrepancies. Reviewers must provide meaningful oversight of the documents.)

> RESPONSE: All figures will be updated based on a re-survey proposed in the revised Landfill 4 RFI work plan.

35. Figure 4-7 - COMMENT: The locations depicted for wells W4-2 and W4-4 are inconsistent with those shown on Figures 3-1, 4-3 and applicable figures of the December 1999 Work Plan. This

is particularly significant since on Figure 2-1 of the Work Plan the location of W4-4 is shown to abut the proposed warehouse location with the potential for accumulation of vinyl chloride in indoor air. Please determine the correct location from the survey data presented in Appendix B.

RESPONSE: See response to Comment No. 34.

FORT CARSON ARMY INSTALLATION
QUALITY CONTROL SUMMARY REPORT
RCRA FACILITY INVESTIGATION AND HEALTH BASED RISK ASSESSMENT
GROUP A SITES
FORT CARSON, COLORADO
CDPHE COMMENTS DATED OCTOBER 2000

Specific Comments:

1. Section 2.5: p. 2-9, last para. - COMMENT: The purpose and value of analyzing the general water quality at the Defense Reutilization and Marketing Office (DRMO) site and ascribing the results to the Group A sites is questionable. On page 2-10, 1st para., the statement is made that the analyses allow for the detection of contaminants potentially due to Group A site activities and impacted ground water. It goes on to say the data will be used in a risk assessment. Please explain how the investigations of these four different and non-contiguous sites benefit from such data.

   RESPONSE: The text will be modified to show that the groundwater sample from LF4MW3 was also analyzed for general water quality parameters and these results are only applicable for the Landfill 4/DRMO Hazardous Waste Storage Area.

2. p. 2-11, 2nd para., 2nd to last sent. - COMMENT: The sentence states, "HydroLogic reported data for background soil samples as discussed previously for the surface soils." Page 2-6, 1st para., 1st sent., pertaining to surface and sediment samples, states that HydroLogic used a reporting limit equal to the "most recent MDL study." In contrast, p. 2-11, 2nd para., last sent., states that Quanterra reported non-detects "with a reporting limit equal to the laboratory-derived PQL." These also were relative to background samples. The discussion of MDL, LOQ and PQLs on page 3-24 of the Final Field and Laboratory Procedures Manual (FLPM), April 1997, indicates that non-detects from the two laboratories are not based on equivalent procedures, since PQLs, as RLs, are typically 3 to 5 times the MDL. Therefore, to what extent have background non-detects been treated in the statistical evaluation reported in the Risk-Based Procedures Evaluation Manual, Module I, Sitewide Background Data Set For Soils, Volumes I and II, March 1999. Please assess and determine the impact to the sitewide background study of using one-half detection limits in the statistical evaluation. (Please note, the manner in which the reporting limits were discussed gives the appearance of not disclosing pertinent information. The contrasting approaches should have been clearly noted and discussed in the same section.)

   RESPONSE: The background soil samples were initially included as part of the Group A investigations. However, the background soil data set has been revised since this document was issued. A revised QCSR will not include a discussion of the background soil sampling. In addition, the samples analyzed by HydroLogic were not included in the background data set. Moreover, the revised QCSR will have more clarification of reporting limits A discussion of using background non-detects is discussed in the Background Soil document.

3. Section 4.0 - COMMENT: MDLs and PQLs are listed as criteria used to measure whether the data met DQOs. However, no such discussion of MDL and PQL limits is delivered in Section 4.0.

RESPONSE: As noted in response to Comment 2, the revised QCSRs will include more text on MDLs, PQLs, RLs, and DQOs.

4. Tables, General Comment - COMMENT: It does not appear that all data tables necessary to support the evaluation of QC/QA are included in the QCSR. No apparent table has been provided which shows the MS/MSD results for ground water samples. Tables 4-2 and 4-3 are limited to reporting the MS/MSD results for surface soils and soil borings. Likewise, no table(s) were found that report the LCS/LCSD results. (LCS control limits are reported in Table 3-3.). As a result, the Division is unable to verify whether limits were met (or when not met per Table 4-2) or the severity of the problem. Please add the appropriate tables to the report.

RESPONSE: As noted in response to Comment 2, the revised QCSRs will include more text and tables for QC data.

5. Table 2-2; p. 2 of 5 - COMMENT: For the constituent 2,4-Dinitrophenol, an MDL 220 and PQL 160 ug/KG are reported. This is inconsistent with norm of PQLs being 3-5 times MDLs. Please verify the data, since PQLs cannot be lower than MDLs.

RESPONSE: According to the Quality Assurance Program Plan for HydroLogic (QAPP, Appendix C of the Group A RFI Work Plan), the PQLs for 2,4-Dimethylphenol and 2,4-Dinitrophenol were switched. The QCSR will be updated to show that the PQL for 2,4-Dimethylphenol was 160 ug/kg and for 2,4-Dinitrophenol was 820 ug/kg at the time the samples were collected.

6. p.3 of 5 - COMMENT: Benzoic Acid is reported as: MDL 2000 and PQL 820, while Dibenz(a,j)acridine is 170, 160 respectively. Please verify the data.

RESPONSE: Table 2-2 was based on the Quality Assurance Program Plan which listed PQLs. The PQLs in Table 2-2 were listed incorrectly for Benzoic Acid and Dibenz(a,j)acridine. Actual PQLs for these parameters are 3200 and 8000 µg/kg, respectively, based on the analytical data packages. Table 2-2 will be revised in the revised Quality Control Summary Report.

7. p. 4 & 5 of 5 - COMMENT: The PQLs for (m+p)-Xylene, o-Xylene, cis-1,2-Dichlorethene and trans-1,2- Dichlorethene, for soils, are reported as 5 ug/Kg. However, the RL in Table 2-2, page 2 & 3 of 14, of the FLPM is 2.5 ug/Kg. Please evaluate the potential significance of this departure from the reporting levels subsequently incorporated into the FLPM.

RESPONSE: The first version of the FLPM was developed after generation and submittal of the data for the Group A RFI report and QCSR. The PQLs in the more recent versions of the FLPM are based on existing laboratory PQLs (Revision 2) and method specific PQLs (Revision 3). The next version of the FLPM (Revision 4) will have PQLs that are appropriate for Fort Carson where they will be ideal for regulatory and risk limits.

8. Table 2-3; p. 5 & 6 of 6 - COMMENT: The PQLs for (m+p)-Xylene, o-Xylene, cis-1,2-Dichlorethene and trans-1,2- Dichlorethene, for water, are reported as 1 ug/L. However, the RL in Table 2-2, page 2 & 3 of 14, of the FLPM is 0.5 ug/L. Please evaluate the potential significance of this departure from the reporting levels subsequently incorporated into the FLPM.

RESPONSE: See Response to Comment No. 7.

9. Table 3-1 - COMMENT: Per footnote "g" to the "Sample Type" column, field duplicates for both soil and ground water samples were "inadvertently" omitted. Please ascertain the extent to which these omissions have been acknowledged and discussed in the Group A RFI Report. Please specifically discuss the impact to the reliability of the investigations relative to the DRMO site thus impacted. Please also consider the QC/QA effort relative to the Building 301 site. It also appears to be missing similar data.

RESPONSE: The omission of the duplicate groundwater sample at the DRMO area, which is part of the Landfill 4 area, was not discussed in the Group A RFI report. However, investigation activities for Landfill 4 are continuing, and a groundwater duplicate sample will be collected from a new or existing monitoring wells and will be addressed in the revised QCSR. Only one monitoring well was proposed in the work plan at the Building 301 site, and a duplicate sample was consequently not proposed and not sampled.

10. Table 3-2 - COMMENT: The samples for VOC analysis were preserved with hydrochloric acid and may not be fully indicative of site conditions. To the extent that additional sampling is justified through comments on the RFI Report supported by this QCSR, future samples should include preservation by chilling to 4° centigrade.

RESPONSE: These groundwater samples were collected in 1995 in accordance with regulatory guidelines at that time. However, Fort Carson groundwater samples collected for VOC analysis by 8260 have not been preserved since 1998.

11. Table 4-1: p. 3 of 8 - COMMENT: Regarding Lab Batch L1284, Issue c - What is the basis for no action where LCS/LCSD recoveries for Silver were below the lower control limit? That is, was the occurrence of Silver potentially under reported? Note on page 5 of 8, that Silver results from samples in Lab Batch L1411, Issue c, were qualified "U" and "UJ" because both the LCS/LCSD and MS/MSD pairs showed results below the control limits. Is this the distinction? If so, please provide the rationale.

RESPONSE: The Ag LCS/LCSD percent recovery was reported below the control limits; however, the Ag MS/MSD percent recovery was reported within the control limits. Because the Ag MS/MSD percent recoveries (%Rs) were within the control limits and the Ag results would not be considered to be under reported, no qualification was necessary.

12. p. 5 of 8 - COMMENT: Regarding Lab Batch L1411, Issue b - What is the basis for no action where the RPD for the MS/MSD samples was outside the control limits for benzene and toluene? Please state the RPD value, and associated RPD limit, as it does not appear that a table(s) has been provided to report the MS/MSD results relative to ground water samples. Table 4-2 merely reports the MS/MSD results for surface soils and soil borings.

RESPONSE: The following table presents the requested information:

Analyte	MS/MSD %R Control Limit	MS/MSD %RPD Control Limit	MS %R	MSD %R	MSD RPD
Benzene	76-127	13	100	85	16
Toluene	76-125	13	97	84	14

Because benzene and toluene MS/MSD percent recovery, the LCS/LCSD percent recovery, and LCS RPD were within control limits, no qualification was necessary.

13. p. 6 of 8 - COMMENT: Regarding Lab Batch L1415, Issue b, and L1416, Issue c - What was the basis for no action?

RESPONSE: The LCS/LCSD included with this SDG were acquired on a separate day for a separate SDG. According to USEPA Contract Laboratory Program National Functional Guidelines, the LCS/LCSD must be analyzed once per SDG and concurrently with the samples in the SDG. Therefore, the LCS/LCSD are not applicable to this SDG and all detects should be qualified "J3" and all non-detects should be qualified "UJ3." MS/MSD are required every twenty samples per matrix type. The MS/MSD reported for this SDG are the same as addressed in Comment 12. Because the data is already qualified for LCS/LSCD and as indicated in the response to Comment 12, no qualifications are necessary for the MS/MSD for Issues b and c.

14. p. 7 of 8 - COMMENT: Regarding Lab Batch L1442, Issues d and e, - What was the basis for no action?

RESPONSE: The LCS/LCSD included with this SDG were acquired on a separate day for a separate SDG. According to USEPA Contract Laboratory Program National Functional Guidelines, the LCS/LCSD must be analyzed once per SDG and concurrently with the samples in the SDG. Therefore, the LCS/LCSD are not applicable to this SDG and all detects should be qualified "J3" and all non-detects should be qualified "UJ3." MS/MSD are required every twenty samples per matrix type. The MS/MSD reported for this SDG are the same as addressed in Comment 12. Because the data is already qualified for LCS/LSCD

as indicated in the response to Comment 12, no qualifications are necessary for the MS/MSD for Issue e.

Table 4-1, Page 7 of 8, Issue d incorrectly stated that 4-chloro-3-methylphenol LCS percent recovery of 97 percent was below the control limit of 23 percent. Issue d will be deleted from Table 4-1.

15. Table 4-4: p. 18 of 20 - COMMENT: The results of the trip blanks reported by Lab ID 0412530005TB (Quanterra) show constituent concentrations, other than Metheylene Chloride, as Non-Detect, at 5 or 10 ug/L. These are high detection limits compared to the other laboratory and do not compare favorably with the RLs shown in Table 2-2 of the FLPM. As a result, these Trip Blanks would not be able to confirm any potential contamination of the investigative samples with which they were shipped. Again, no Chain of Custody Forms have been provided. Of more concern, however, is whether the high RLs from Quanterra, despite the MDLs and PQLs reported in Table 2-2 and 2-3 affected the reliability of any data generated by Quanterra. Please research the issue and discuss in the Response to Comments document. (Note the Decontamination Water Samples, reported in Table 4-6, reflect the high RLs.)

RESPONSE: As noted in response to Comment No. 7, this work was performed prior to submittal of the FLPM. Chain of Custody forms are found in the Analytical Data Package for the Group A sites. The tables are, however, misleading in that Quanterra and HydroLogic reported their data differently and prior to when specific database deliverable requirements were established. If an analyte was not detected, the "result" represents a method detection limit by Quanterra, and a practical quantitation limit by HydroLogic. Quanterra's and HydroLogic's PQLs were similar during this sampling period.

5575 DTC Parkway, Suite 200, Englewood, Colorado 80111-3016

April 10, 2001

Serial No. CDPHE-0178

Colorado Department of Public Health and Environment
Attn: Mr. Harlen Ainscough
HMWMD-SWIM-B2
4300 Cherry Creek Drive South
Denver, Colorado 80222-1530

Re: Response to Comments on Draft Final RCRA Facility Investigation Work Plan for Landfill 4 (FTC 008/SWMU 4), Fort Carson, Colorado
Project No. 29188/WBS 090204

Dear Mr. Ainscough:

Telephone
303.694.6660
Facsimile
303.694.4410

Earth Tech Environment & Infrastructure, Inc. is pleased to submit two copies of the responses to the Colorado Department of Public Health and Environment comments on the Draft Final RCRA Facility Investigation Work Plan for Landfill 4 (FTC-008/ SWMU 4) at Fort Carson, Colorado, dated March 19, 2001. Also attached are revised copies of the figures from the Work Plan and available historical aerial photographs for the site to clarify the discussions in the responses to comments.

Please do not hesitate to call Sara Handy or me at (303) 694-6660 if you have any questions regarding this report.

Very truly yours,

Earth Tech Environment & Infrastructure, Inc.

Sara A. Handy for
John A. England, P.E.
Chief Project Manager

Enclosures

cc: Linda White, USACE
Jim Henderson, DECAM
Sara Handy, Earth Tech
File

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FORT CARSON ARMY INSTALLATION
DRAFT FINAL RCRA FACILITY INVESTIGATION WORK PLAN
LANDFILL 4 (FTC-008/SWMU 4), REVISION 2
FORT CARSON, COLORADO
CDPHE COMMENTS

Specific Comments:

Section 2.3:

1. p. 2-2, 4th para., 3rd sent. - COMMENT: From the 1947 photograph, please depict as accurately as possible, on an appropriate figure, the ditch that defined the west and south boundary of the landfill and the pre-Specker Avenue road that defined the east side of the landfill site. If reasonably legible, please provide copies of all available photographs in Appendix C.

   RESPONSE: B Ditch defines the west and south boundary of Landfill 4 in the 1947 aerial photograph. The ditch and pre-Specker Avenue road are visible in the attached 1947 aerial photograph. All available aerial photographs of the site (dated 1947, 1953, 1957, 1967, 1970, and 1984) have been included with these responses.

2. 5th sent. – COMMENT: The association between Landfill 4 and the Northern POW area does not appear to be plausible. The POW site is located approximately one-half mile west of Landfill 4. Please address.

   RESPONSE: In the 1947 aerial photograph, there are a few dirt paths to the west of B Ditch. It appears that the dirt paths originate from a road to the west. Since the Northern Prisoner of War (POW) area is the only developed sector north and west of the B Ditch, it was suggested that the disturbances to the west of the ditch are associated with activities at the Northern POW area; however, the actual purpose of these paths are unknown.

3. p2-3, 1st para., 2nd sent. – COMMENT: From the 1957 photograph, please depict on an appropriate figure, the darker area within the southwestern portion of Landfill 4. Is this darker area perhaps reflecting the black organic layer? (Please note that the test pits where the black organic layer was most common was in the southern and western portion of the larger landfill area depicted on Figure 2-3.)

   RESPONSE: In the attached 1957 aerial photograph, the darker areas in the middle and southern portions of Landfill 4 are visible. It is unclear from the photograph whether these darker areas are vegetation not present in the other aerial photographs of the site from different time periods or if these areas represent surface disposal. It is unlikely that these darker areas are related to the black organic layer encountered at a depth of several feet in the soil borings and trenches. The black organic layer has been determined to be a naturally-occurring humic layer. No petroleum hydrocarbon odors were noted during drilling and preliminary analytical results for the black organic material confirm the absence of organic contaminants in this layer.

4. 1st para. – COMMENT: Collectively the old photographs do not account for the wood debris in the northwest portion of the site where landfill waste was encountered during the construction of Building 320. Does this suggest a post 1970 activity date or is the activity not apparent from the older photos? Either way, it appears that the extent of that waste eastward needs to be better delineated since it may not be contiguous with wastes in other portions of Landfill 4. The landfill boundary shown on Figure 2-2 is very questionable.

RESPONSE: It is unknown when the wood debris encountered during construction of Building 320 was disposed. This area is within the areas of visible surficial disturbance on the historical aerial photographs (attached). Due to the presence of buildings in this area of the site in the 1970 and 1984 aerial photographs, it is assumed that the wood debris was disposed prior to 1970.

Section 2.4.2:

5. p. 2-5, 4th para., 1st sent. – COMMENT: Building 320 is not simply "north of the outlined landfill area" The building, and land filled material found during construction, is north and west of the outlined area, thereby showing that the outlined area is incorrect. Please address.

RESPONSE: As shown on the revised figures included here, Building 320 is located directly north of the previously assumed area of Landfill 4, and wood debris was encountered on the east side of Building 320. Landfill waste was encountered in trenches LF4TP15, but was not encountered in trenches LF4TP14, LF4TP16, and LF4TP17. Soil boring LF4SB2 also did not encounter landfill waste. These results indicate that landfill wastes are not present between B Ditch and the west side of Building 320. No landfill waste has been encountered west of B Ditch, including in the area of the recently-constructed General Purpose Warehouse (Building 330). Additional trenching between the east side of Building 320 and Specker Avenue is not possible due to the presence of gas and water mains running parallel to Specker Avenue in this location. The historical aerial photographs indicate that the landfill activities did not extend to the east of Specker Avenue. The landfill boundary as shown on the revised figures has been dashed in the area of Building 320 to indicate that the exact location of the landfill boundary in this area is unknown.

6. 2nd sent. – COMMENT: Given that Building 320 is located north and west of the landfill, the landfill boundary would appear to extend further north and west not north and east.

RESPONSE: Please see response to comment 5.

Section 4.1:

7. p. 4-1, bullets. – COMMENT: Please add additional trenching between B-Ditch and the eastern wall of Building 320 to delineate the eastern edge of the waste in that portion of the landfill. Trenches LF4TP01 and LF4TP02 did not encounter waste although the caption on the top photo of Appendix C indicates that waste was found along the east column footing of the building.

RESPONSE: Wood debris was encountered to the east of Building 320 which is located immediately north of the previously assumed area of Landfill 4. No landfill waste was encountered during construction of the General Purpose Warehouse (Building ___), which is located northwest of Landfill 4 on the west side of B Ditch. Because no landfill waste was encountered in trenches LF4TP01 and LF4TP02 located west of B Ditch, no further trenching in this area is warranted.

Section 4.2:

8. p. 4-2, 3rd and 4th para. – COMMENT: The specific reference for Part B Permit requirements is IV.G.1.d. Permit Condition IV.G.1.i is specific to Landfill 11. Please note that each SWMU has generally similar, but distinct, analytical requirements defined in the Part B Permit.

RESPONSE: Comment noted. Future Work Plans will be revised accordingly.

Section 4.5:

9. p. 4-5, mid para. – COMMENT: As proposed, please install a new well in the vicinity of, **but do not abandon**, PZ-4. Instead use PZ-4 as a soil gas sampling point. Make any necessary adjustments but follow the basic approach proposed in Section 4.4.

RESPONSE: A new well, LF4MW05, has been installed adjacent to monitoring well PZ-4. Well PZ-4 will not be abandoned. Well installation and trenching activities conducted west of B Ditch has occurred and no landfill waste was encountered west of the ditch. In addition, the soil gas survey as proposed in the Draft Final Work Plan has been conducted. Four soil gas points were installed and monitored in the vicinity of PZ-4. Methane, carbon dioxide, and hydrogen sulfide were not detected in two of these sampling points. One sampling point contained a very low level (0.1 percent) of carbon dioxide. The fourth sampling point contained low levels of carbon dioxide (2.0 percent) and methane (0.1 percent). A soil gas sample was collected from this sampling point and submitted to the analytical laboratory for analysis using EPA Methods T014 and 3C. If significant concentrations of hazardous constituents are detected in this soil gas sample, additional soil gas probes will be installed in the vicinity of this point and PZ4.

Section 5.1:

10. p. 5-1, 1st para. 2nd to last sent. – COMMENT: Source water from three locations, Bldg 1304, Bldg 9246 and the Earth Tech trailer, are available for use. Please revise.

RESPONSE: Comment noted. Future Work Plans will be revised accordingly.

Table 4-1:

11. COMMENT: Please change Footnote 2 to indicate that samples will be preserved by chilling to +/- 4 degrees C.

RESPONSE: Comment noted. Future Work Plans will be revised accordingly.

Figure 2-1:

12. COMMENT: Based on historical information and data gathered to date, please show the potential full extent of landfill activities. The solid outline is identical to the disputed landfill boundary shown on Figure 2-2, i.e. the "estimated landfill boundary" and the definitively characterized "landfill boundary" shown on Figure 2-4. The dashed line on Figure 2-1 appears to better represent all available data, including the occurrence of wood waste along the southeast footing of Building 320. The intent of the work plan is to fully delineate the boundary of the landfill as opposed to presenting a boundary, which has already been shown to be incorrect in respect to Building 320.

RESPONSE: Figure 2-1 as well as the other RFI Work Plan figures have been revised and are attached. As discussed above, no landfill waste has been encountered on the west side of B Ditch either in previous investigations or during conduct of the field investigations proposed in the Draft Final RFI Work Plan for Landfill 4 (December 2000). The estimated landfill boundary to the east of B Ditch has been revised and clarified on these figures.

Figure 2-2:

13. COMMENT: Please show the location and view direction of the Appendix C photos on the figure.

RESPONSE: The locations of the photographs included in Appendix C of the Draft Final RFI Work Plan for Landfill 4 are indicated on revised Figure 2-2 attached to these responses. The view direction of these photographs is unknown.

Figure 4-1:

14. COMMENT: Please add seven additional gas-sampling locations at the approximate locations depicted on the attached copy of Figure 4-1.

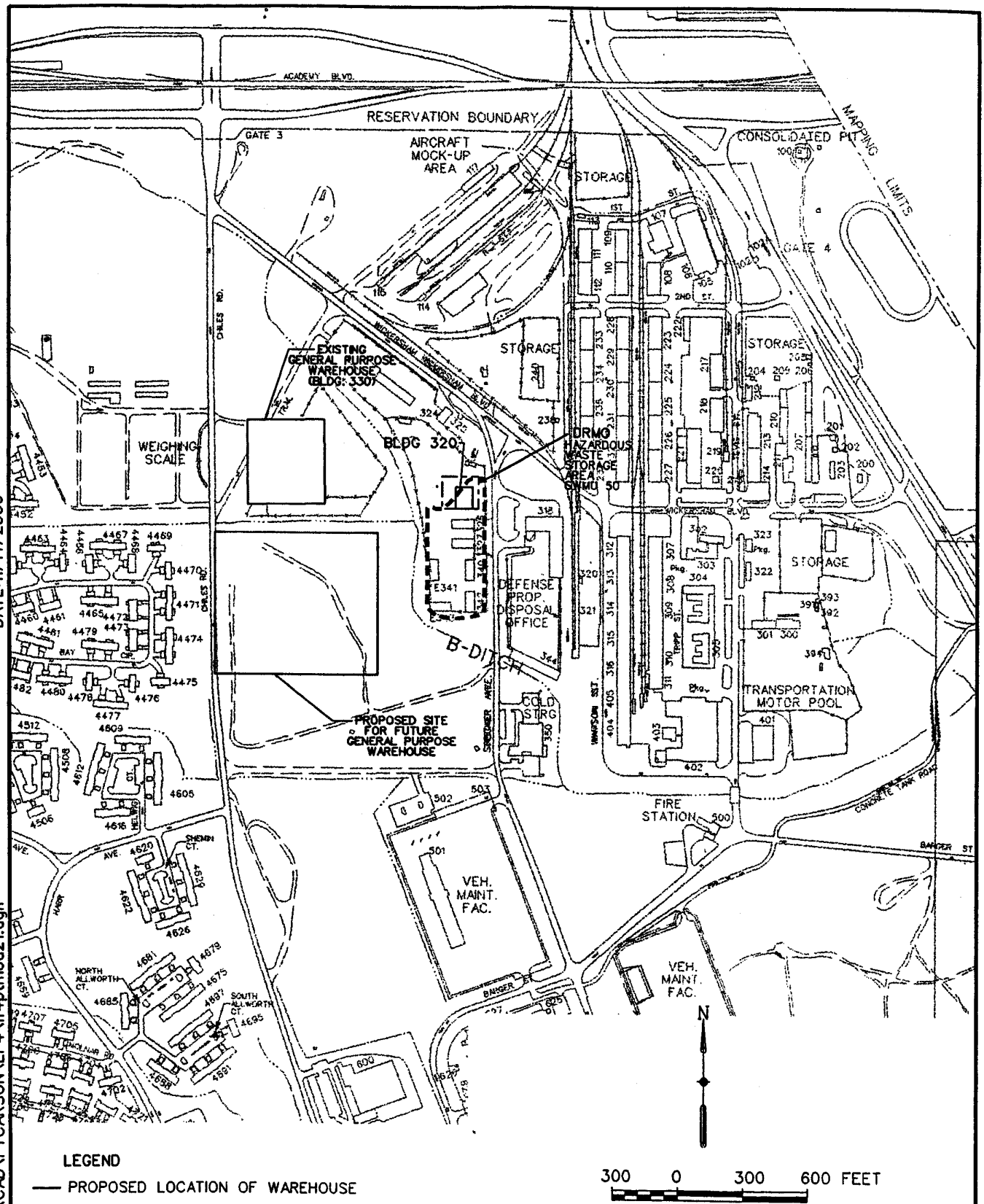
RESPONSE: The soil gas sampling program as proposed in the Draft Final RFI Work Plan for Landfill 4 was conducted prior to the receipt of these comments. Results of the field monitoring of the soil gas sampling points for landfill gases indicated that hydrogen sulfide was not detected at any of the sampling points. Methane was detected at five of the sampling points at low levels (0.1 to 2.8 percent). Carbon dioxide was detected in 12 of the sampling points at concentrations ranging from 0.1 to 19.5 percent. Samples were collected from the five soil gas sampling points where methane was detected and submitted to the analytical laboratory for analysis using EPA Methods T014 and 3C.

Based on the low levels and general absence of landfill gases as determined during the soil gas survey at Landfill 4 and the fact that no landfill waste has been encountered on the west side of B Ditch, the additional soil gas points as recommended in this comment are not warranted. However, if the analytical results for the soil gas samples discussed above indicate the presence of hazardous constituents in soil gas, additional soil gas sampling will be conducted in the vicinity of the detections to fully define the extent of any soil gas contamination.

Figure 4-2:

15. COMMENT: Please add three additional direct push points at the approximate locations as depicted on the attached copy of Figure 4-2.

RESPONSE: The proposed additional direct push sampling points are located northwest of Landfill 4. No landfill waste has been encountered west of B Ditch or north of trench LF4TP15, therefore, these additional direct push sampling points are not warranted. One additional direct push point (LF4DP6) has been installed near the northwest corner of the landfill and an upgradient monitoring well (LF4MW04) has been installed northwest of the landfill. Preliminary analytical data for the soil and groundwater samples from these two locations indicate that hazardous constituents are not present at significant concentrations at either of these two locations.



DATE:11/14/2000

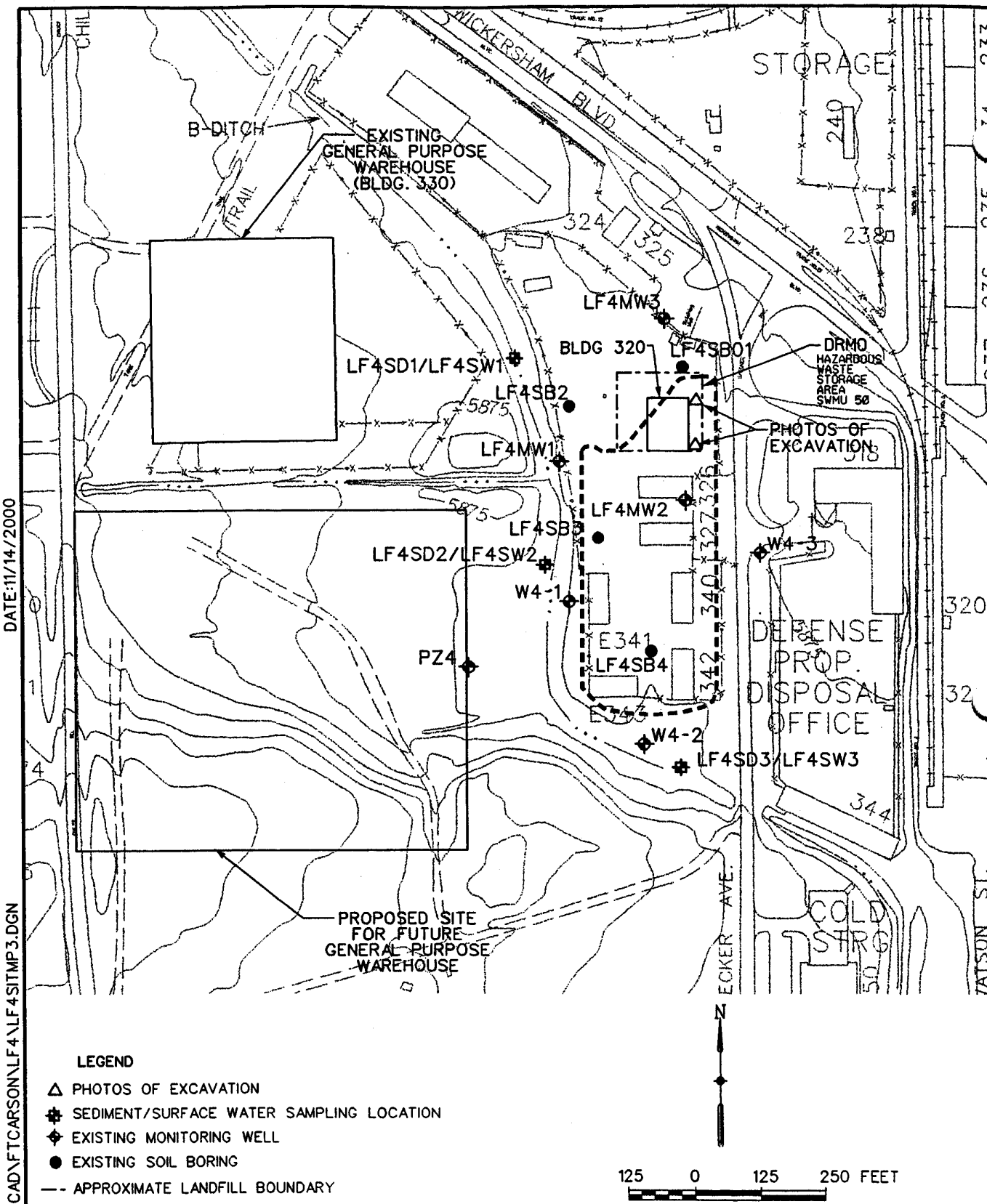
CAD FILE: 29188\CAD\FTCARSON\LF4\lf4ptmod21.dgn

EARTH TECH

FIGURE 2-1

SITE LOCATION

LANDFILL 4
FORT CARSON, COLORADO



DATE:11/14/2000

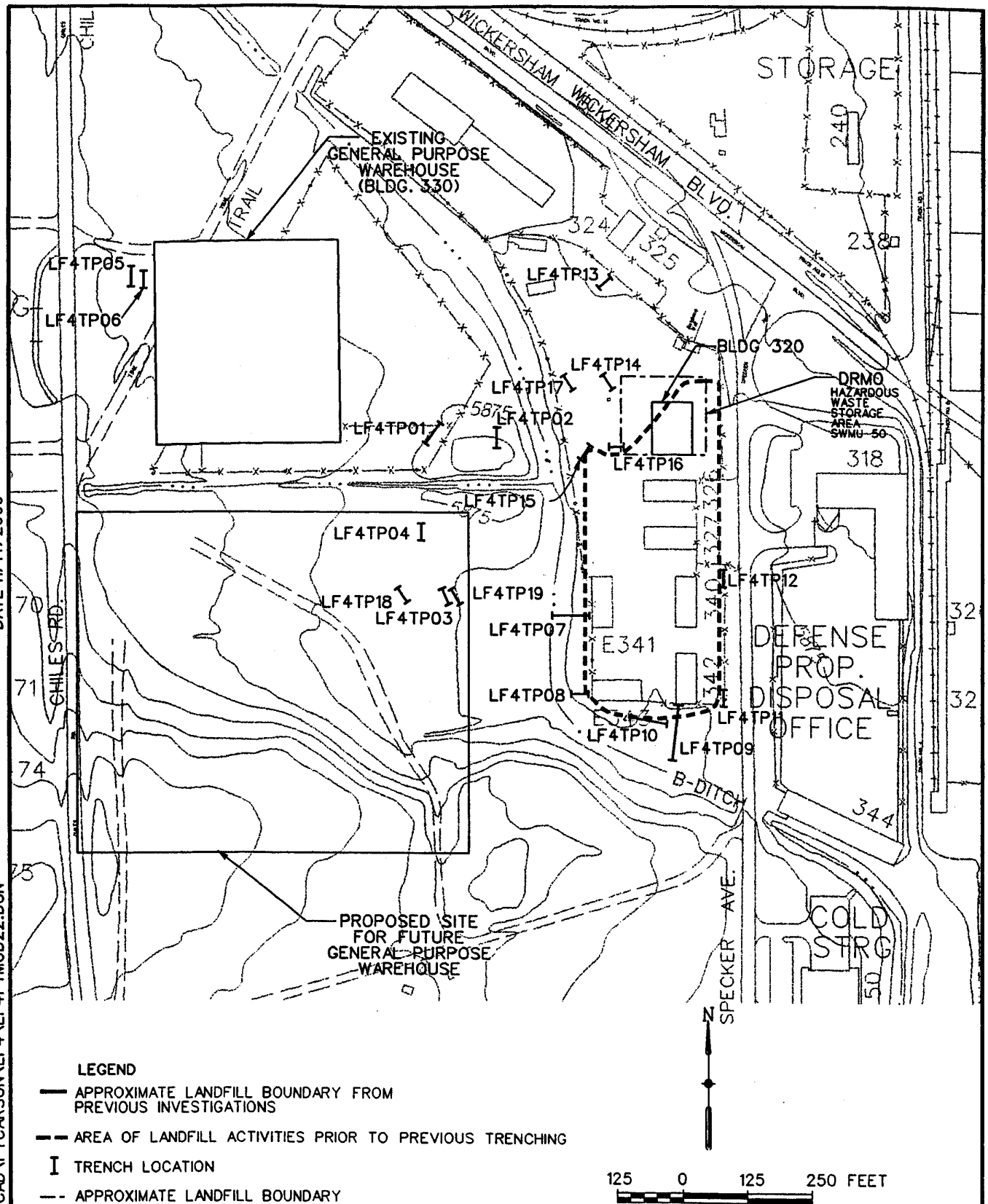
CAD FILE: 29188\CAD\FTCARSON\LF4\LF4SITMP3.DGN

EARTH TECH

FIGURE 2-2

PREVIOUS SAMPLE LOCATIONS

LANDFILL 4
FORT CARSON, COLORADO



DATE:11/14/2000

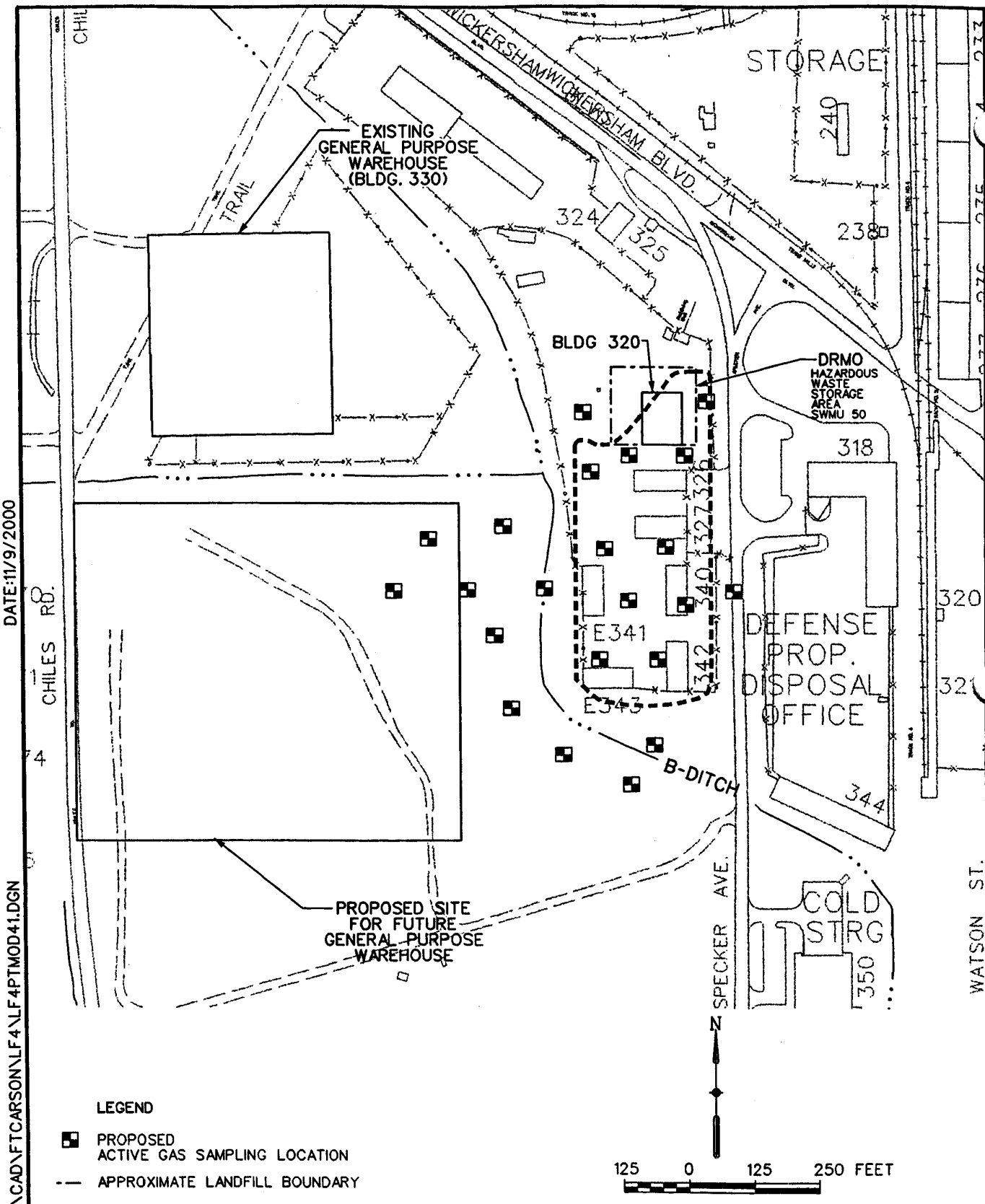
CAD FILE: 29188\CAD\FTCARSON\LF4\LF4PTMOD22.DGN

EARTH TECH

FIGURE 2-3

PREVIOUS TRENCH LOCATIONS

LANDFILL 4
FORT CARSON, COLORADO



DATE:11/9/2000

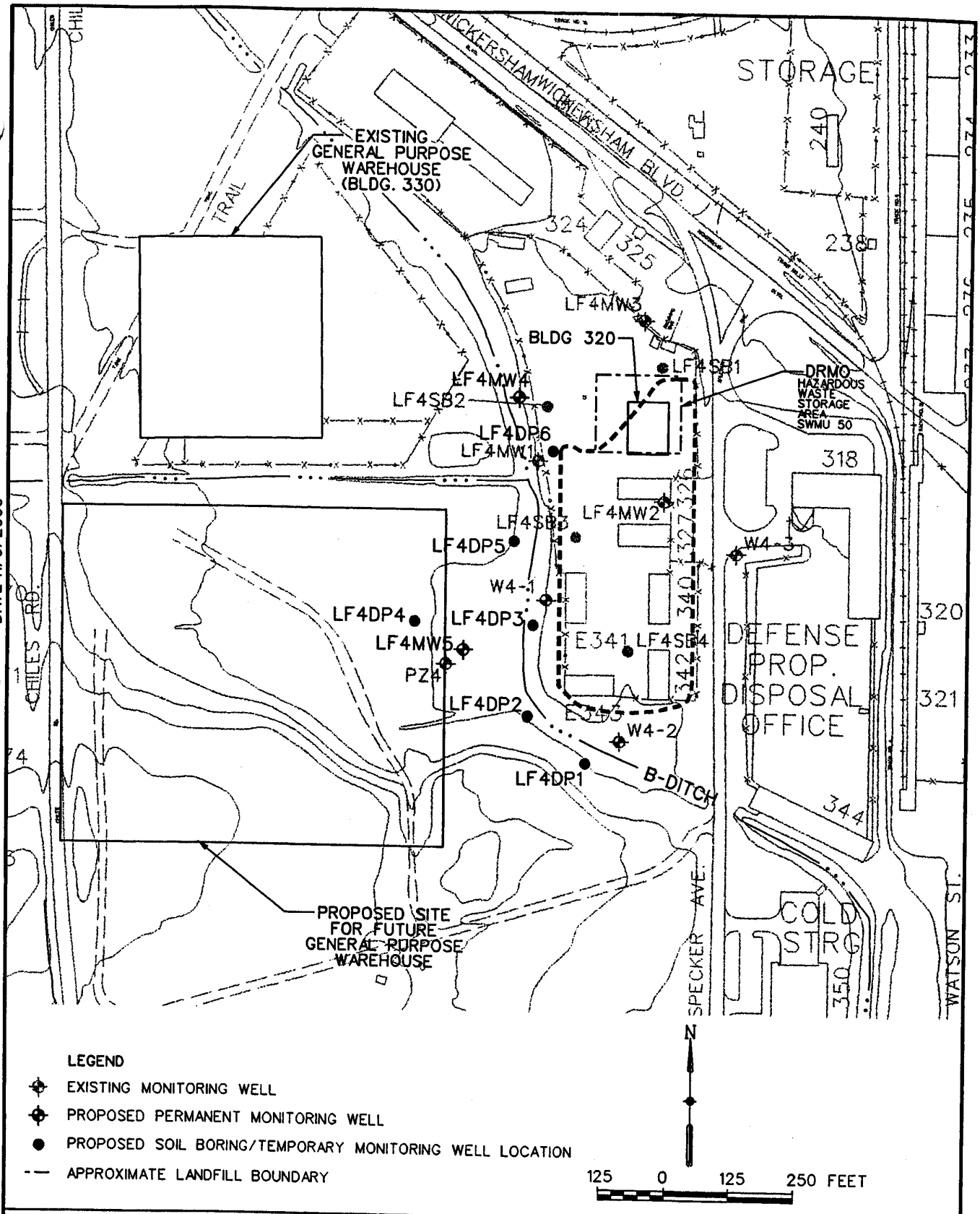
CAD FILE: 29188\CAD\FTCARSON\LF4\LF4PTMOD41.DGN

EARTH TECH

FIGURE 4-1

ACTIVE GAS SAMPLING LOCATIONS

LANDFILL 4
FORT CARSON, COLORADO



LEGEND

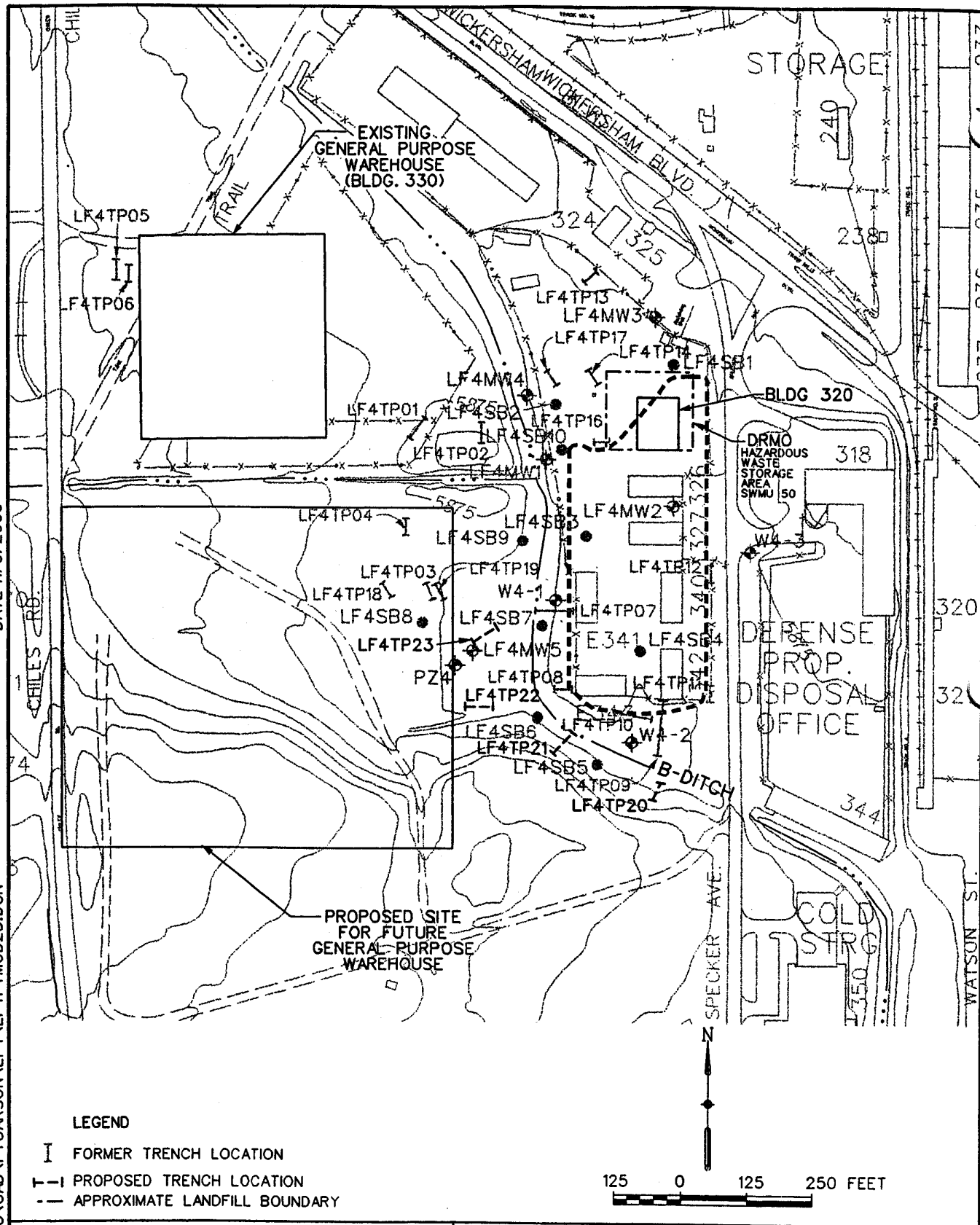
- EXISTING MONITORING WELL
- PROPOSED PERMANENT MONITORING WELL
- PROPOSED SOIL BORING/TEMPORARY MONITORING WELL LOCATION
- APPROXIMATE LANDFILL BOUNDARY

DATE:11/9/2000

CAD FILE: 2..8\CAD\FTCARSON\LF4\LF4PTMOD42.DGN

EARTH TECH

FIGURE 4-2
DIRECT PUSH AND PERMANENT MONITORING WELL LOCATIONS
LANDFILL 4
FORT CARSON, COLORADO



DATE:11/9/2000

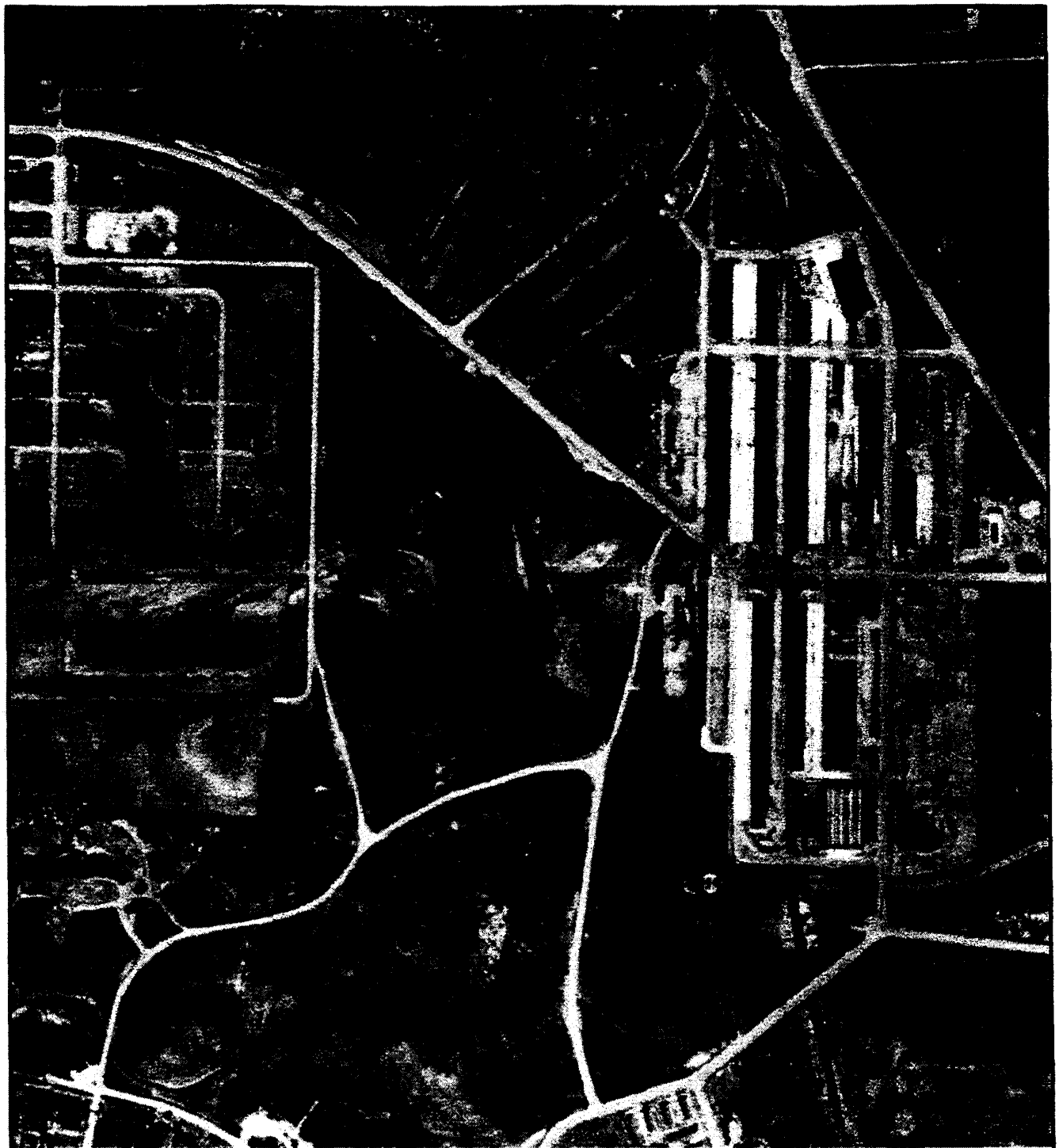
CAD FILE: 29188\CAD\FTCARSON\LF4\LF4PTMOD23.DGN

EARTH TECH

FIGURE 4-3

TRENCH LOCATIONS

LANDFILL 4
FORT CARSON, COLORADO



EARTH TECH

LANDFILL 4 AERIAL PHOTOGRAPH
1947
FORT CARSON
COLORADO SPRINGS, COLORADO

3/23/01

29188.090204

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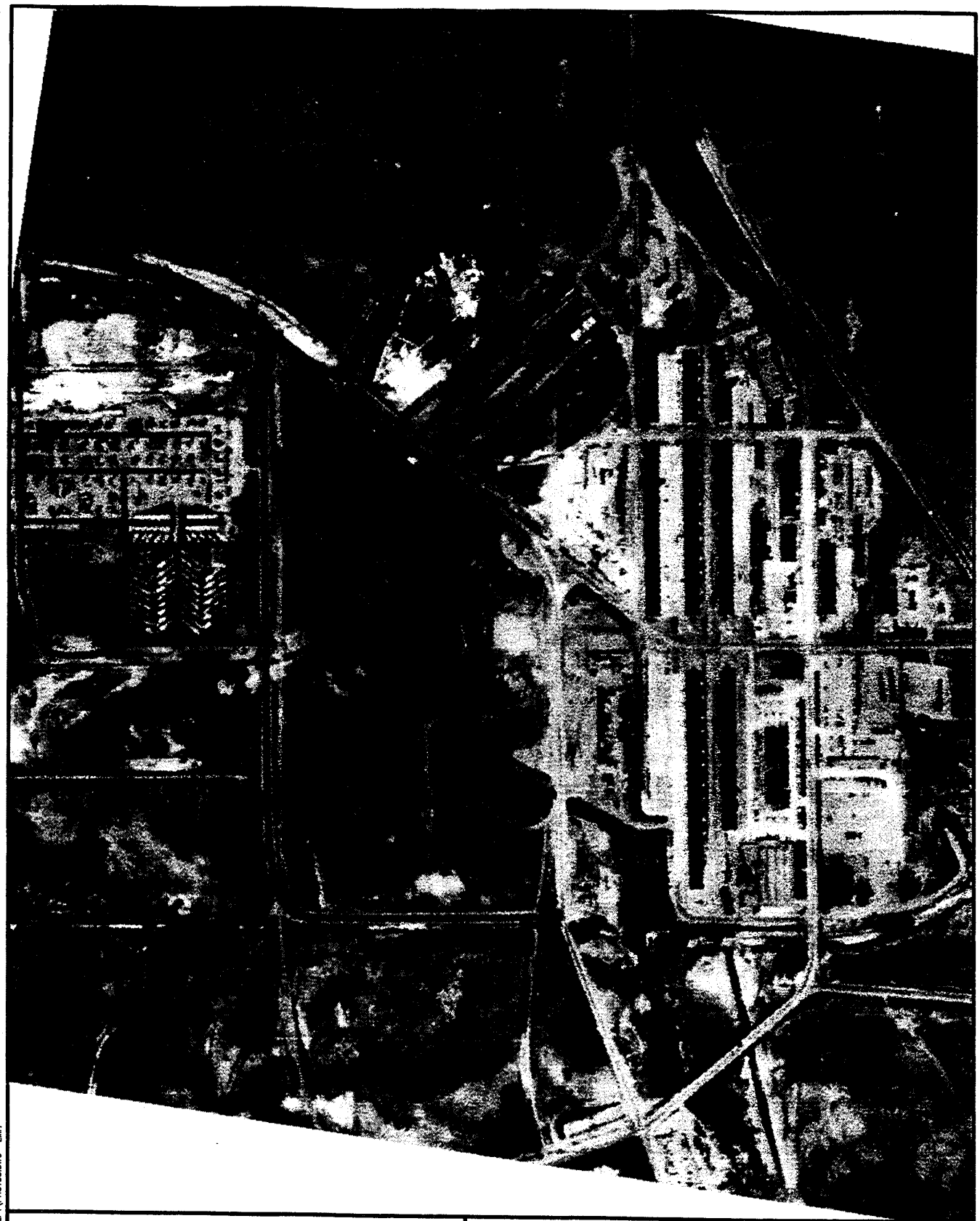
EARTH TECH

LANDFILL 4 AERIAL PHOTOGRAPH
1953
FORT CARSON
COLORADO SPRINGS, COLORADO

3/23/01

29188.090204



EARTH TECH

LANDFILL 4 AERIAL PHOTOGRAPH
1957
FORT CARSON
COLORADO SPRINGS, COLORADO

3/23/01

29188.090204

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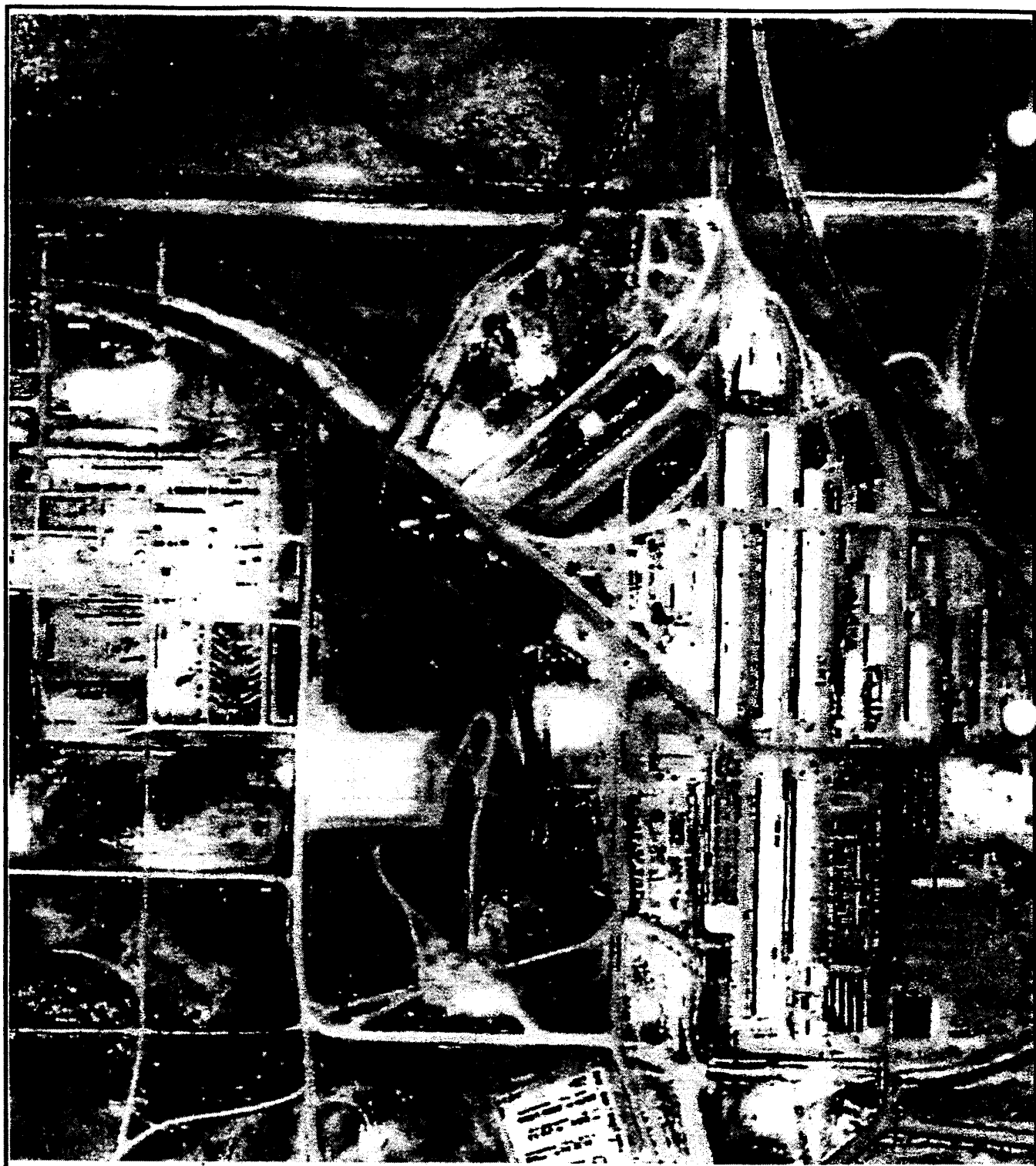

EARTH TECH

LANDFILL 4 AERIAL PHOTOGRAPH
1967
FORT CARSON
COLORADO SPRINGS, COLORADO

3/23/01

29188.090204

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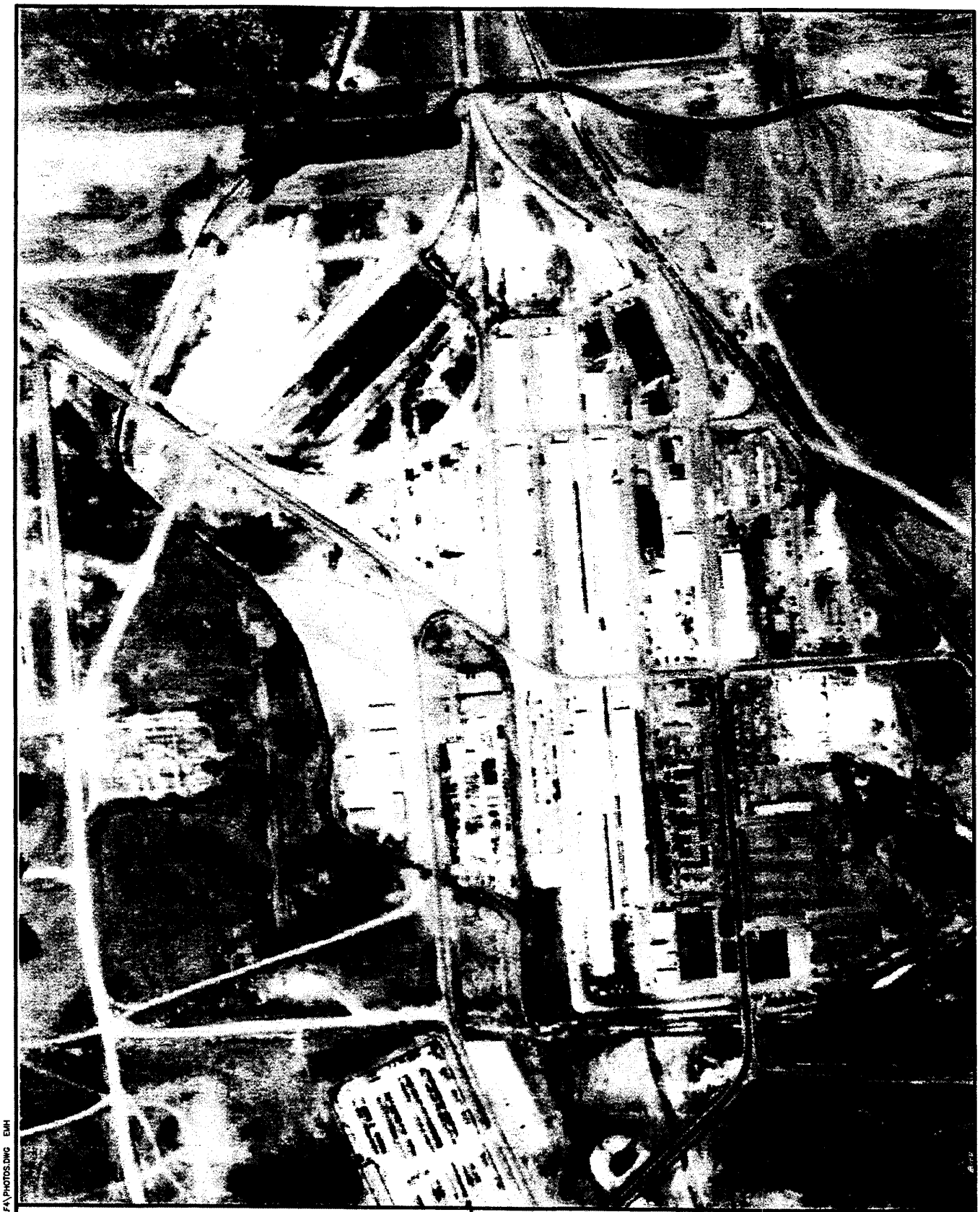

EARTH TECH

LANDFILL 4 AERIAL PHOTOGRAPH
1970
FORT CARSON
COLORADO SPRINGS, COLORADO

3/23/01

29188.090204

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EARTH TECH

LANDFILL 4 AERIAL PHOTOGRAPH
1984
FORT CARSON
COLORADO SPRINGS, COLORADO

3/23/01

29188.090204

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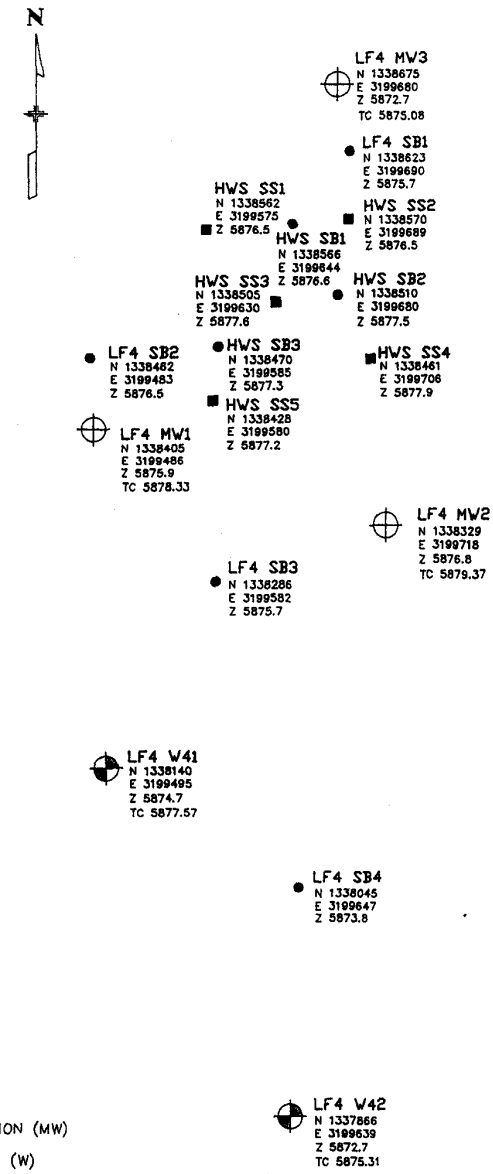
APPENDIX B

SOIL BORING AND MONITORING WELL LOCATION SURVEY DATA

Appendix B

FT. CARSON LANDFILL
EARTH TECH PROJECT
DATE PREPARED: MARCH 22, 2001
MPI JOB NO. 915.302
LAND FILL #4 RCRA FACILITY INVESTIGATION
PROJ. # 29188 WBS 090102

SITE I.D.	NORTHING	EASTING	CONC. PAD ELEV.	GROUND ELEV.	T.I.C. ELEV.	T.O.C. ELEV.	DATUM	UNITS
DP5	3199428.69	1338237.58				5877.98	NAVD 88	FEET
DP5	3199428.59	1338237.63		5874.63			NAVD 88	FEET
DP4	3199214.76	1338096.65				5884.12	NAVD 88	FEET
DP4	3199214.58	1338096.90		5881.66			NAVD 88	FEET
DP3	3199397.80	1338094.10				5873.97	NAVD 88	FEET
DP3	3199397.92	1338094.26		5871.63			NAVD 88	FEET
DP2	3199441.10	1337919.50				5876.35	NAVD 88	FEET
DP2	3199441.08	1337919.67		5873.55			NAVD 88	FEET
DP1	3199547.31	1337834.95				5876.88	NAVD 88	FEET
DP1	3199547.32	1337835.03		5874.14			NAVD 88	FEET
DP6	3199477.43	1338398.07				5877.26	NAVD 88	FEET
DP6	3199477.39	1338398.30		5874.72			NAVD 88	FEET
W4-1	3199494.62	1338140.04				5877.43	NAVD 88	FEET
W4-1	3199494.66	1338140.14		5874.71			NAVD 88	FEET
PZ4	3199303.06	1338011.08			5872.58	5872.74	NAVD 88	FEET
PZ4	3199302.87	1338011.70		5872.05			NAVD 88	FEET
W4-2	3199639.02	1337865.77				5875.17	NAVD 88	FEET
W4-2	3199639.34	1337865.94		5872.54			NAVD 88	FEET
W4-3	3199869.52	1338216.74				5881.32	NAVD 88	FEET
W4-3	3199869.51	1338216.89		5878.95			NAVD 88	FEET
MW5	3199303.14	1338014.49			5874.75	5875.29	NAVD 88	FEET
MW5	3199302.79	1338016.74	5872.63	5872.63			NAVD 88	FEET
MW4	3199479.68	1338472.71			5877.58		NAVD 88	FEET
MW4	3199479.82	1338473.05		5877.80			NAVD 88	FEET
MW1	3199485.60	1338404.15			5878.18	5878.98	NAVD 88	FEET
MW1	3199485.53	1338404.45		5877.85			NAVD 88	FEET
MW3	3199679.81	1338674.88			5874.94	5875.49	NAVD 88	FEET
MW3	3199681.00	1338675.80	5873.05	5872.55			NAVD 88	FEET
MW2	3199717.79	1338327.92			5879.70	5879.24	NAVD 88	FEET
MW2	3199717.87	1338327.26	5876.87	5876.73			NAVD 88	FEET



● SOIL BORING LOCATION (SB)

⊕ RUST E&I MONITORING WELL LOCATION (MW)

◐ OTHER MONITORING WELL LOCATION (W)

■ SURFACE SOIL LOCATION (SS)

TC TOP OF PVC CASING

ELEVATIONS SHOWN ARE GROUND

COORDINATES SHOWN REPRESENT NAD-83 LAMBERT PROJECTION, COLORADO CENTRAL ZONE , NAD-83 DATUM, U.S. SURVEY FEET.
VERTICAL DATUM IS NAVD 1988 DATUM.

CONTROL MONUMENTS
CARSON – N 1336376.20 – E 32021182.23 – Z 5908.10
R-1 – N 1337720.20 – E 3199767.16 – Z 5879.54

SURVEYOR'S STATEMENT

ON THE BASIS OF MY KNOWLEDGE, INFORMATION AND BELIEF, I HEREBY STATE AND DECLARE TO RUST ENVIROMENT AND INFRASTRUCTURE, EXCLUSIVELY, THAT AS A RESULT OF A SURVEY MADE ON THE GROUND ON SEPTEMBER 18, 1995 UNDER MY DIRECT SUPERVISION AND TO THE NORMAL STANDARD OF CARE OF PROFESSIONAL LAND SURVEYORS PRACTICING IN EL PASO COUNTY, COLORADO, I FIND THAT THE LOCATIONS OF THE ABOVE DEPICTED POINTS ARE AS SHOWN.

COLORADO REGISTERED PROFESSIONAL LAND SURVEYOR STEPHEN L. McANALLY 10/13/95 25955

THIS SURVEY NULL AND VOID WITHOUT SURVEYOR'S ORIGINAL SIGNATURE AND SEAL.

STEPHEN L. McANALLY
COLORADO PLS 25955
FOR AND ON BEHALF OF
LEIGH WHITEHEAD & ASSOCIATES, INC.

GRAPHIC SCALE

0 50 100 200

(IN FEET)
1 inch = 100 ft.

SHEET TITLE: **TEST POINT LOCATIONS LANDFILL #4 & DRMO**	DRAWING NO. SITE	PREPARED BY: Leigh Whitehead & Associates, Inc. Engineers, Surveyors & Planners
	SCALE 1"=100'	
	DATE 10\11\95	
PROJECT: **FORT CARSON COLORADO**	DRAWN BY KMO	806 South Tejon Street Colorado Springs, CO 80905 Phone (719) 636-6171 Fax (719) 636-6191
	CHECKED BY SLA\RCR	
	PROJECT NO. 95079	SHEET 1 OF 8

```
program vertcon
*****************************************************************************
*                              Release 2.0                                  *
* PURPOSE:     CALCULATE THE DATUM CONVERSION CORRECTION TO NGVD29          *
*              ORTHOMETRIC HEIGHT IN ORDER TO OBTAIN NAVD88 HEIGHT.         *
*              THE INPUT REQUIRES LATITUDE AND LONGITUDE VALUES.            *
*                                                                           *
*              [THE GEODETIC DATUM TO WHICH THE POSITION IS REFERENCED      *
*              (I.E., NAD27 OR NAD83) IS GENERALLY IRRELEVANT DUE TO        *
*              THE IMPRECISION OF SCALED NAD27 POSITIONS;  HOWEVER,         *
*              SINCE NUMEROUS BENCH MARKS ARE ALSO HORIZONTAL NETWORK       *
*              STATIONS, ALL POSITIONS WILL BE CONVERTED TO NAD83           *
*              POSITIONS IN THE NEXT RELEASE]                               *
*                                                                           *
*              THE COMPUTATION IS PERFORMED AS AN INTERPOLATION USING       *
*              A BILINEAR INTERPOLATOR AMONG FOUR GRID POINTS.              *
*                                                                           *
*              THE PROGRAM REQUIRES THAT THE USER SPECIFY:                  *
*              1)  THE NAME OF AN INPUT FILE (IF AVAILABLE).                *
*              2)  THE NAME OF AN OUTPUT FILE                               *
*                                                                           *
*              THIS PROGRAM ALLOWS FOR :                                    *
*                GENERIC FILE FORMATS -  SEE SUBROUTINE TYPE1 OR TYPE2      *
*                                   OR                                      *
*                NGS INTERNAL BENCH MARK FILE FORMAT - SEE TYPE3            *
*                                                                           *
*             [THE CODE CAN BE EASILY MODIFIED TO ACCOMMODATE CUSTOM        *
*              FILE SPECIFICATIONS (TYPE..) BY MODIFYING SUBROUTINES:       *
*              GETPT, IPARMS, WRTPT, AND (OPTIONALLY) FHELP.]               *
*                                                                           *
*                                                                           *
* VERSION CODE:  2.00   [illegible]                                         *
*                                                                           *
* INFORMATION CONCERNING THE VERTCON SYSTEM MAY BE OBTAINED FROM:           *
*                  RUDOLF J. FURY  NOAA/NOS/C&GS/NGS                        *
*                  SILVER SPRING, MARYLAND [illegible]                      *
*****************************************************************************
*                                                                           *
*                  DISCLAIMER                                               *
*                                                                           *
*   THIS PROGRAM AND SUPPORTING INFORMATION IS FURNISHED BY THE             *
* GOVERNMENT OF THE UNITED STATES OF AMERICA, AND IS ACCEPTED AND           *
* USED BY THE RECIPIENT WITH THE UNDERSTANDING THAT THE UNITED STATES       *
* GOVERNMENT MAKES NO WARRANTIES [illegible]                                *
* ACCURACY, COMPLETENESS, RELIABILITY, OR SUITABILITY OF THIS               *
* PROGRAM, OF ITS CONSTITUENT PARTS, OR OF ANY [illegible]                  *
*                                                                           *
*   THE GOVERNMENT OF THE UNITED STATES [illegible]                         *
* LIABILITY WHATSOEVER RESULTING FROM ANY USE OF THIS PROGRAM.  THIS        *
* PROGRAM SHOULD NOT BE [illegible]                                         *
* PROBLEM WHOSE INCORRECT SOLUTION COULD RESULT IN INJURY TO PERSON         *
* OR [illegible]                                                            *
*                                                                           *
*                                                                           *
* OF AMERICA [illegible], THE RECIPIENT FURTHER AGREES NOT TO [illegible]   *
*                                                                           *
* [illegible]                                                               *
```

VERTical CONversion (VERTCON) Transformation Program
Between NGVD 29 and NAVD 88
Version 2.0

Station Name: carson

Latitude	Longitude	NAVD 88 - NGVD 29 (meters)
38 45 17.21718	104 47 28.44227	1.027

Station Name: r1

Latitude	Longitude	NAVD 88 - NGVD 29 (meters)
38 45 30.68233	104 47 57.99041	1.030

Station Name: r2

Latitude	Longitude	NAVD 88 - NGVD 29 (meters)
38 40 30.52919	104 45 28.32520	.997

Station Name: r3

Latitude	Longitude	NAVD 88 - NGVD 29 (meters)
38 40 28.57673	104 45 24.31870	.996

Station Name: r4

Latitude	Longitude	NAVD 88 - NGVD 29 (meters)
38 32 56.40104	104 43 44.91664	.978

Station Name: r5

Latitude	Longitude	NAVD 88 - NGVD 29 (meters)
38 32 56.60714	104 43 37.26531	.978

Station Name: r6

Latitude	Longitude	NAVD 88 - NGVD 29 (meters)
38 26 35.74306	104 53 28.79497	.962

Station Name: r7

Latitude	Longitude	NAVD 88 - NGVD 29 (meters)
38 26 29.39698	104 53 30.60942	.961

Station Name: r8

Latitude	Longitude	NAVD 88 - NGVD 29 (meters)
38 35 54.30745	104 52 .41555	1.042

Station Name: [illegible]

Latitude	Longitude	NAVD 88 - NGVD 29 (meters)
38 35 57.66291	104 51 57.44750	1.043

Station Name: [illegible]

Latitude	Longitude	NAVD 88 - NGVD 29 (meters)
38 44 22.17211	104 46 13.34813	1.016

Station Name: [illegible]

Latitude	Longitude	NAVD 88 - NGVD 29 (meters)
38 43 40.49189	104 45 21.12794	1.014

Station Name: bj

Latitude	Longitude	NAVD 88	NGVD 29 (meters)
38 43 47.10300	104 46 5.97840	1.012	

Station Name: radar

Latitude	Longitude	NAVD 88	NGVD 29 (meters)
38 44 58.27994	104 46 45.29065	1.021	

Station Name: frank

Latitude	Longitude	NAVD 88	NGVD 29 (meters)
38 45 26.94827	104 47 31.81322	1.028	

Station Name: potter

Latitude	Longitude	NAVD 88	NGVD 29 (meters)
38 45 36.82884	104 47 58.16462	1.030	

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1,1338405,3199486,5875.9,LF4-MW1
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3,1338675,3199680,5872.7,LF4-MW3
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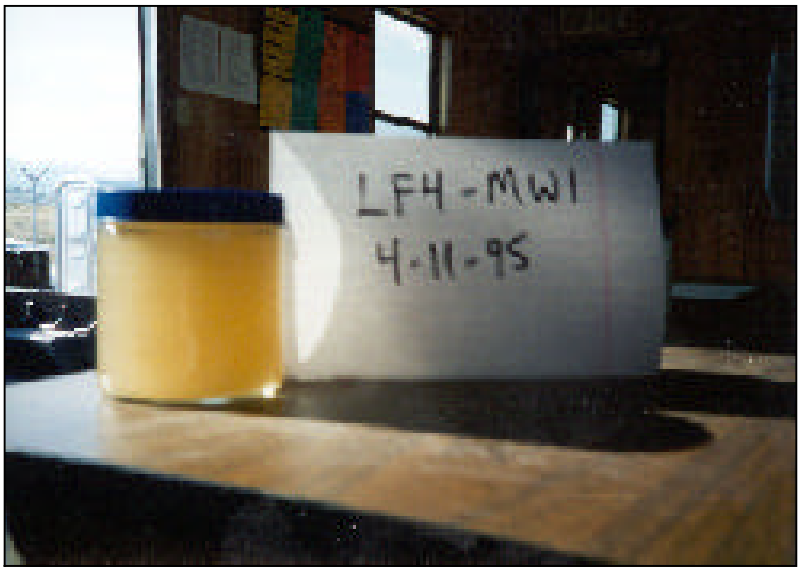
APPENDIX C

PHOTOGRAPHS OF PZ4 CASING AND WELL DEVELOPMENT WATER

Well Development Pictures

LF4MW1



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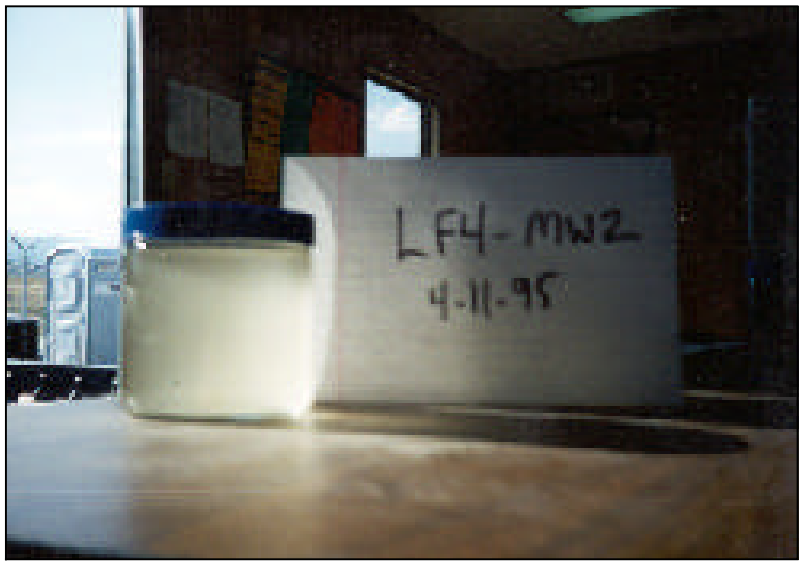
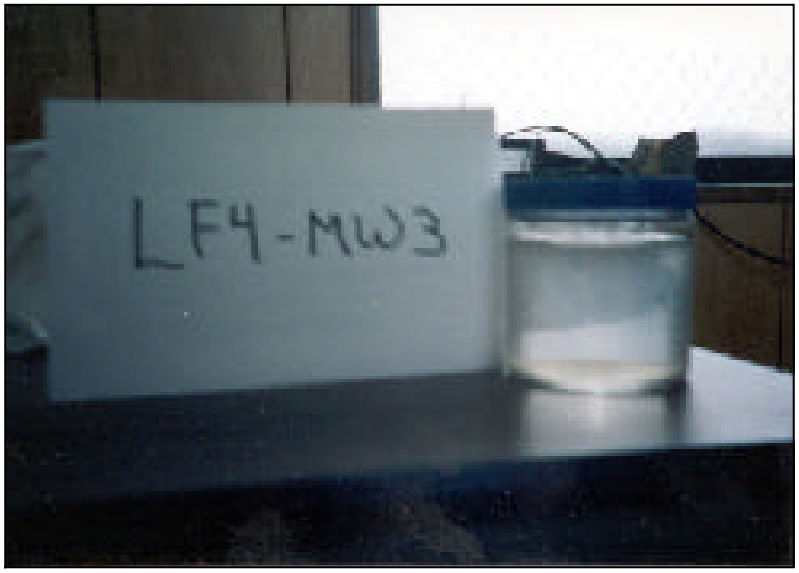


LF4MW3



Removal of PZ4

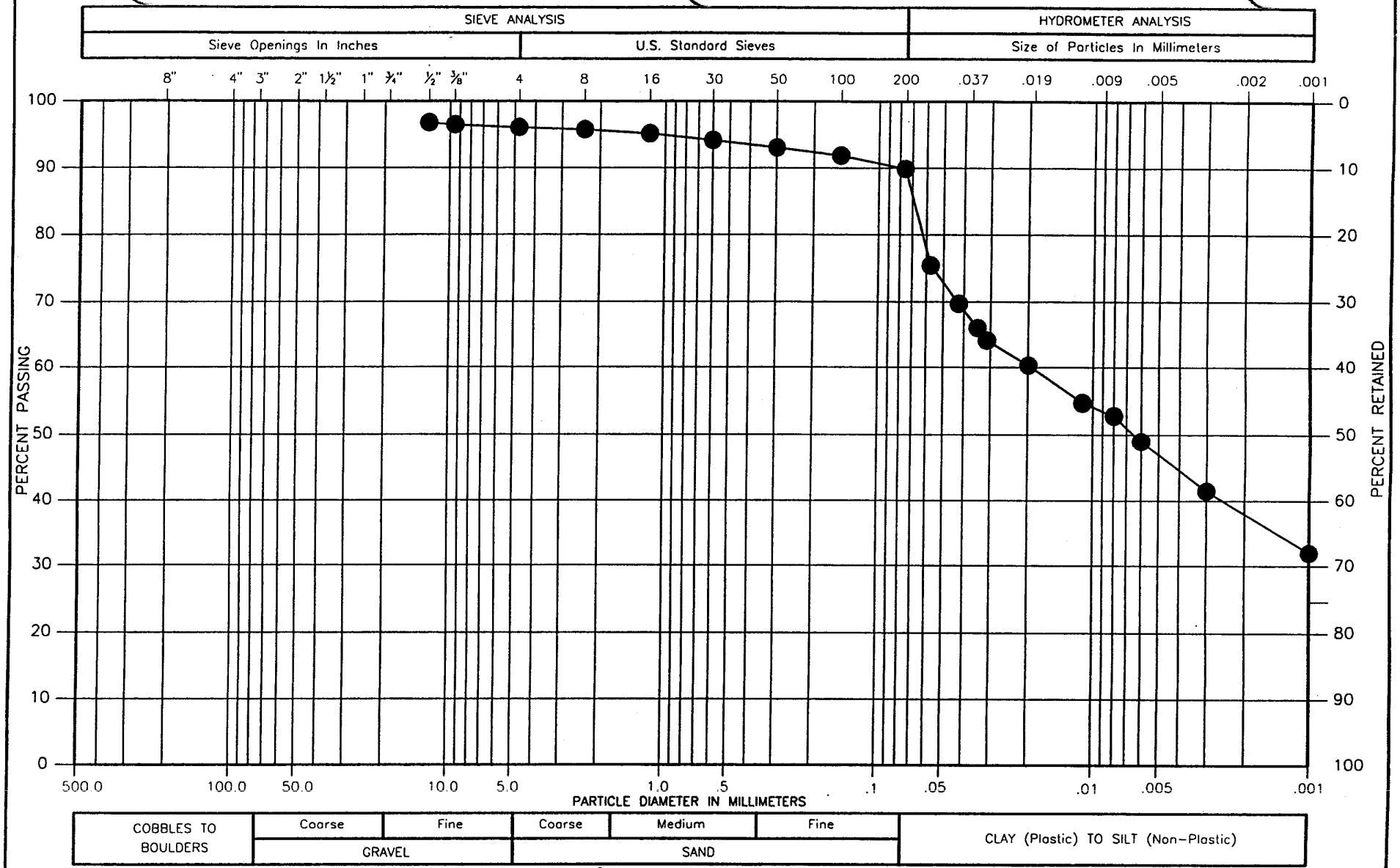
PZ4 Well Casing

PZ4 End Cap

PZ4 Casing Cut

APPENDIX D

GEOTECHNICAL DATA FOR MONITORING WELL SOIL BORINGS



BORING NO.	SAMPLE No.	DEPTH (FEET)	NATURAL DRY DENSITY (PCF)	MOISTURE CONTENT %	PL	PI	LL	SOIL DESCRIPTION
				22.4	17	30	47	LF4-MW1-3/4 CLAY, brown

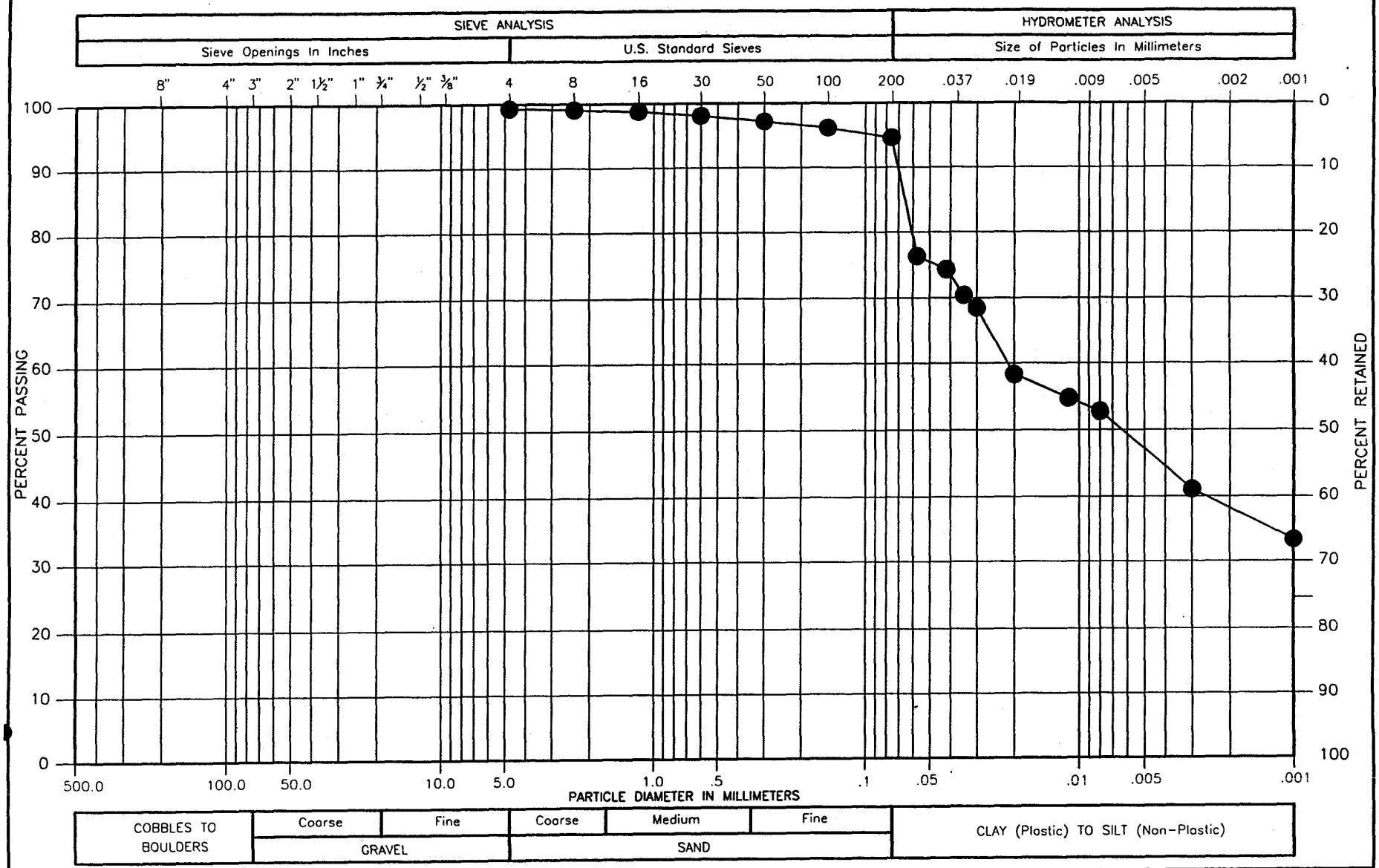
AGUIRRE ENGINEERS, INC.

GRADATION ANALYSIS

DRAWN BY: CLN
CHECKED BY: JWL
DATE: 4/17/95

JOB NO. 24,046-02

PLATE 16



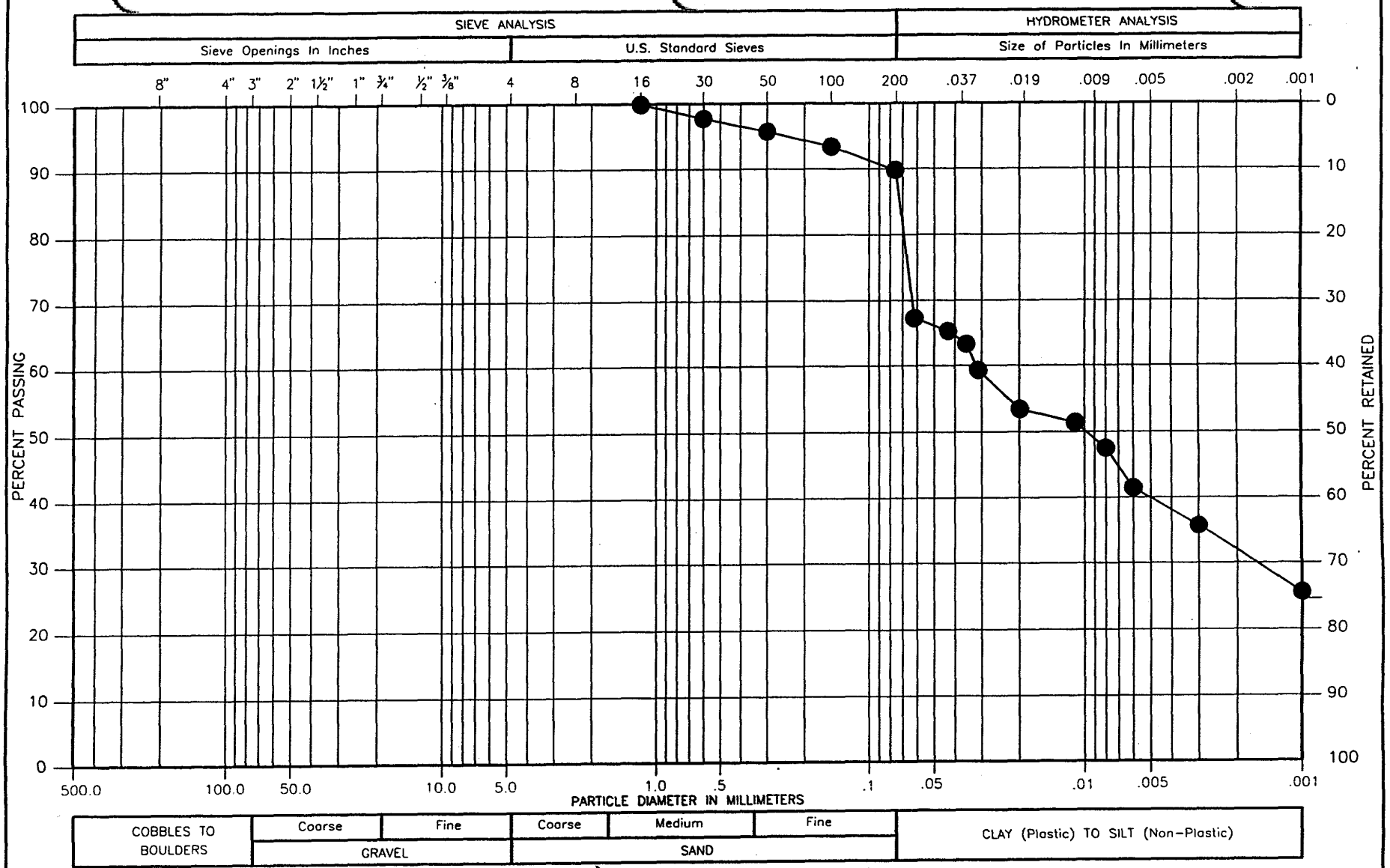
BORING NO.	SAMPLE No.	DEPTH (FEET)	NATURAL DRY DENSITY (PCF)	MOISTURE CONTENT %	PL	PI	LL	SOIL DESCRIPTION
				27.5	22	22	44	LF4-MW1-7/8 Y, light brown

AGUIRRE ENGINEERS, INC.

GRADATION ANALYSIS

DRAWN BY: CLN
CHECKED BY: JWL
DATE: 4/18/95

JOB NO. 24,046-02
PAGE 17



BORING NO.	SAMPLE No.	DEPTH (FEET)	NATURAL DRY DENSITY (PCF)	MOISTURE CONTENT %	PL	PI	LL	SOIL DESCRIPTION
				14.1	19	26	45	LF4-MW2-3/4 CLAY, light brown

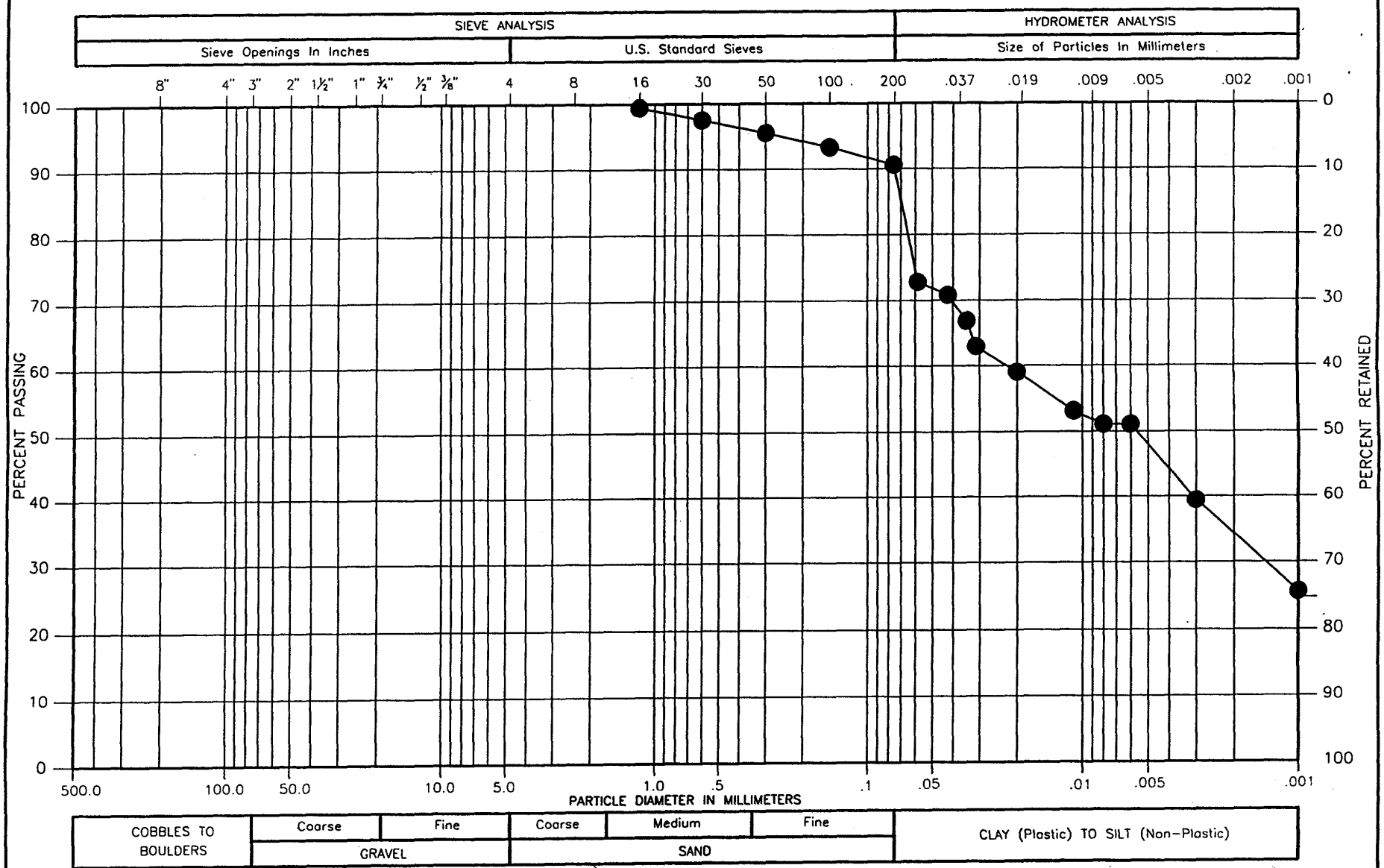
AGUIRRE ENGINEERS, INC.

GRADATION ANALYSIS

DRAWN BY: CLN
CHECKED BY: JWL
DATE: 4/18/95

JOB NO. 24,046-02

PLATE 18



BORING NO.	SAMPLE No.	DEPTH (FEET)	NATURAL DRY DENSITY (PCF)	MOISTURE CONTENT %	PL	PI	LL	SOIL DESCRIPTION
				14.5	22	24	46	LF4-MW2-9/10 AY, trace gravel, brown

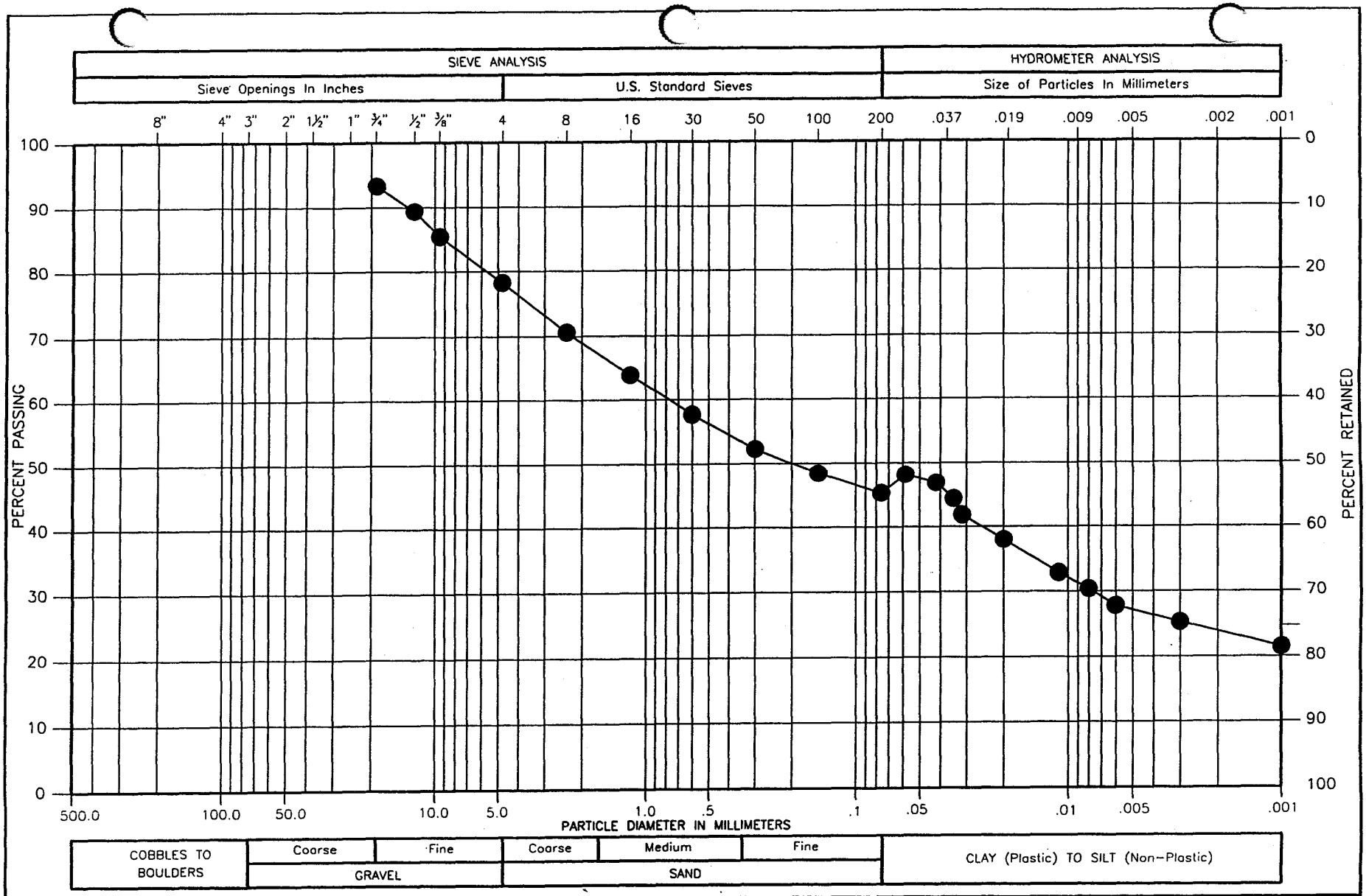
AGUIRRE ENGINEERS, INC.

GRADATION ANALYSIS

DRAWN BY: CLN
CHECKED BY: JWL
DATE: 4/18/95

JOB NO. 24,046-02

19



BORING NO.	SAMPLE No.	DEPTH (FEET)	NATURAL DRY DENSITY (PCF)	MOISTURE CONTENT %	PL	PI	LL	SOIL DESCRIPTION
				9.7	11	36	47	LF4-MW3-3/4 CLAY, some sand, brown

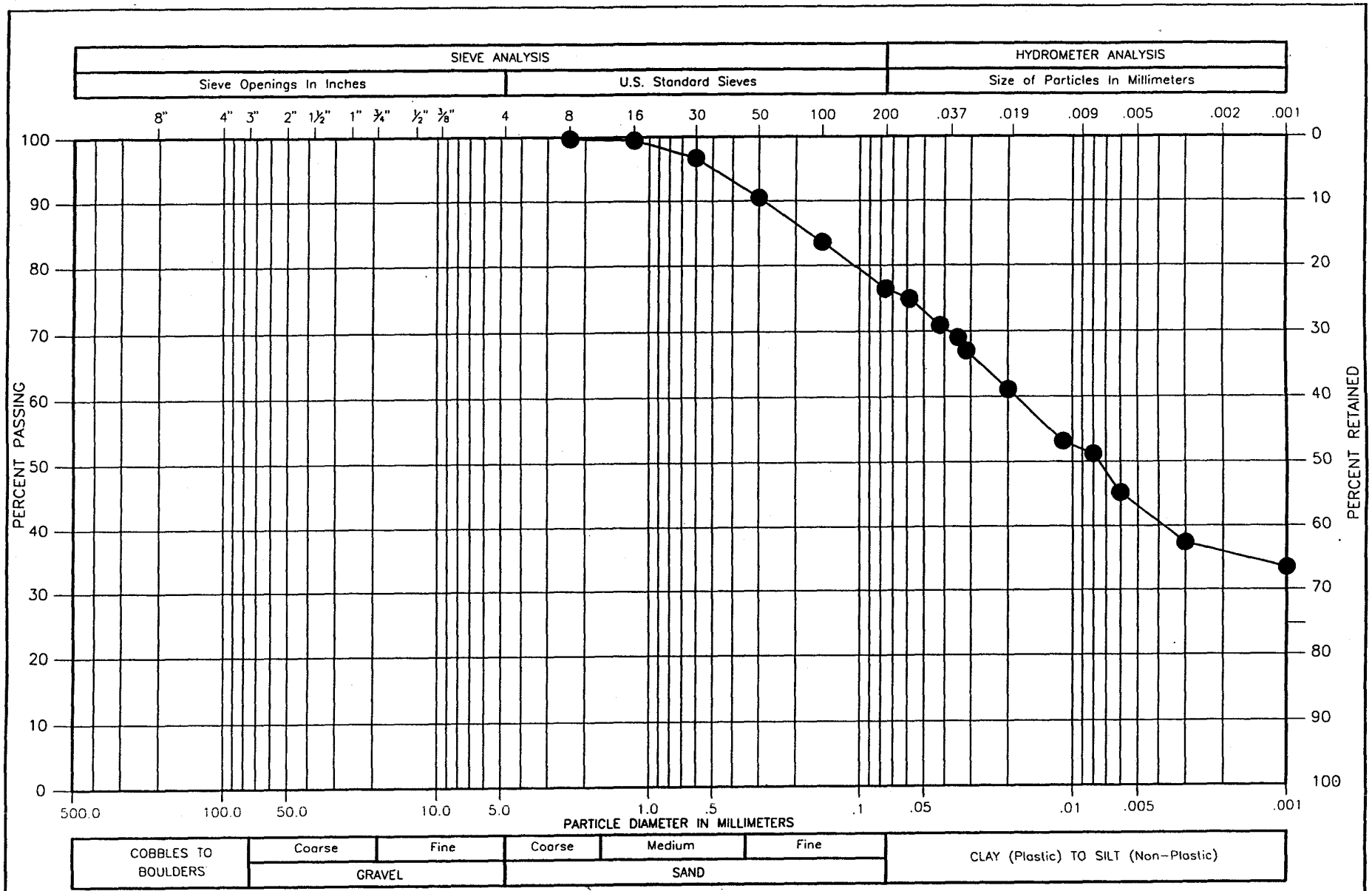
AGUIRRE ENGINEERS, INC.

GRADATION ANALYSIS

DRAWN BY: CLN
CHECKED BY: JWL
DATE: 4/18/95

JOB NO. 24,046-02

PLATE 20



BORING NO.	SAMPLE No.	DEPTH (FEET)	NATURAL DRY DENSITY (PCF)	MOISTURE CONTENT %	PL	PI	LL	SOIL DESCRIPTION
				21.1	23	19	42	LF4-MW3-9/10 AY, brown

AGUIRRE ENGINEERS, INC.

GRADATION ANALYSIS

DRAWN BY: CLN
CHECKED BY: JWL
DATE: 4/18/95

JOB 24,046-02
21

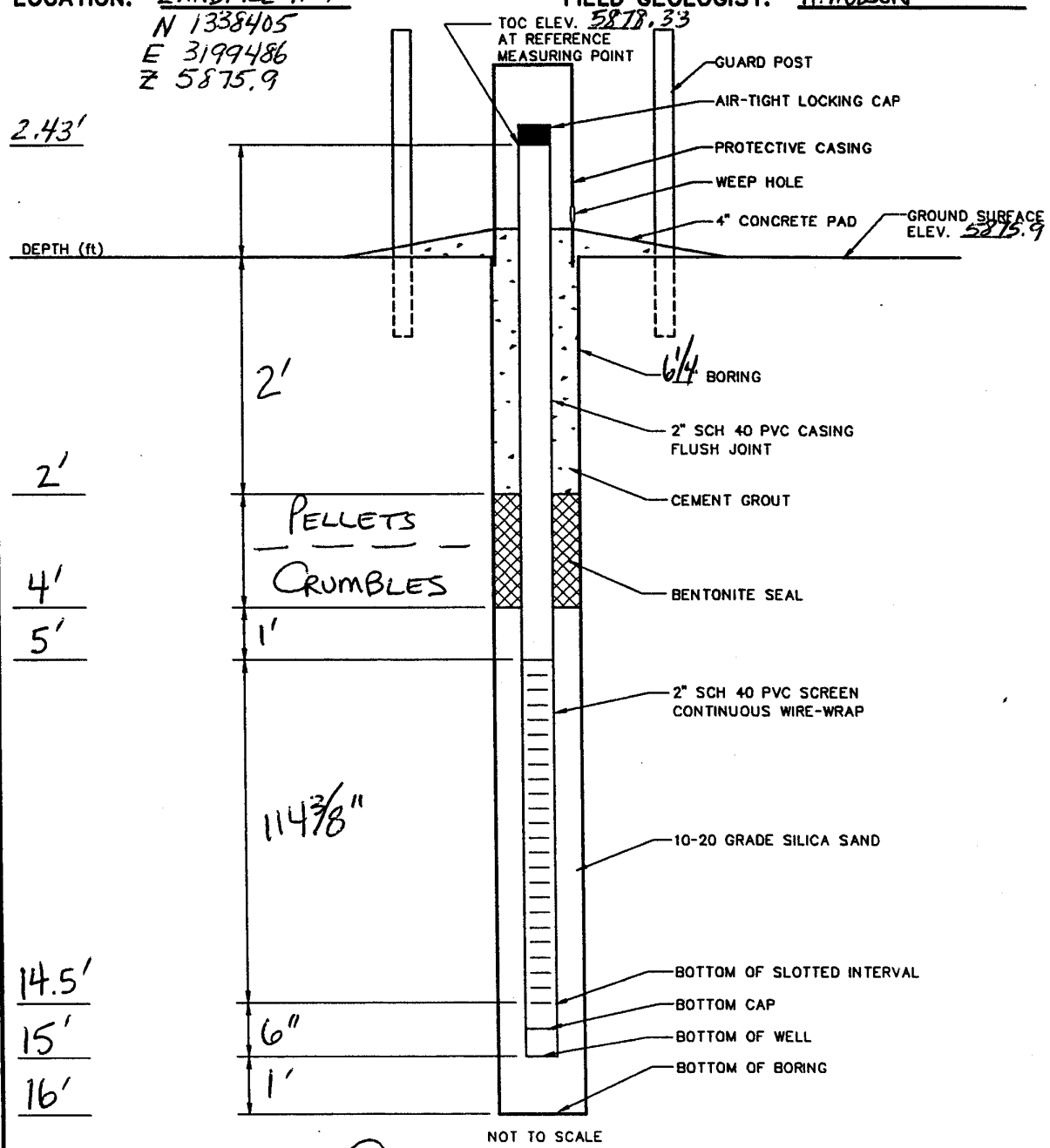
APPENDIX E

WELL COMPLETION DETAIL FORMS

WELL LF4-MW1
ABOVE GROUND WELL COMPLETION DETAILS

PROJECT: FT. CARSON - GRP A
DATE COMPLETED 3/22/95
LOCATION: LANDFILL #4
N 1338405
E 3199486
Z 5875.9

DRILLING METHOD: HOLLOW STEM AUGER 3.25" ID
DRILLING COMPANY: SITE SERVICES
FIELD GEOLOGIST: H. HODSON



NOT TO SCALE

REMARKS: PLUMBNESS CHECKED OK - YES OR NO IF NO, WELL REPAIRED OR ABANDONED ?

REFERENCE MEASURING POINT LOCATION/DESCRIPTION: Black mark on TOC

DEPTH TO WATER AFTER COMPLETION: 6.48 (TOC) 4-25-95

SIGNATURE OF PREPARER H. Hodson

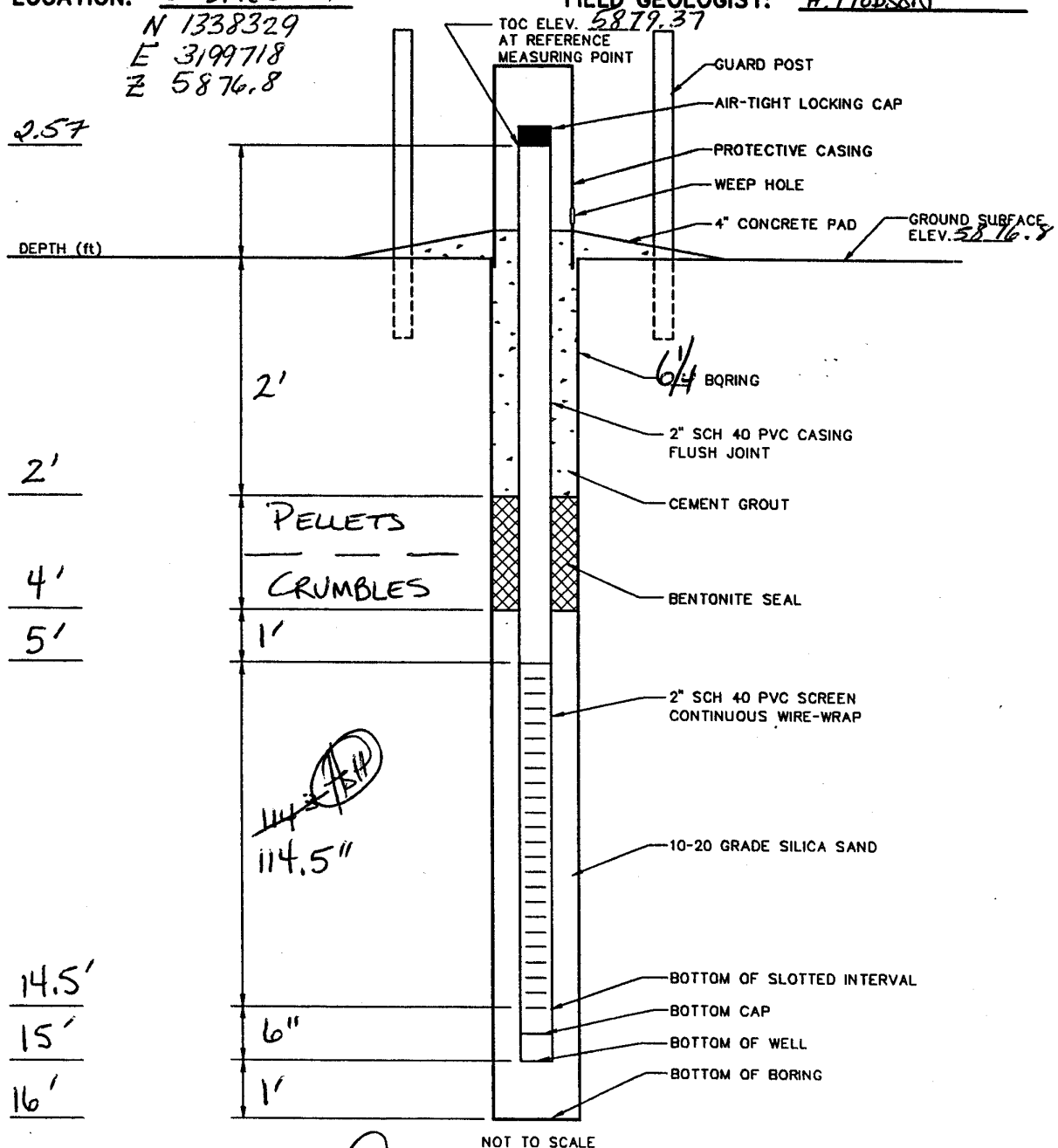
FORMS/WELLFORM.DWG 1/26/95 EMH

RUST ENVIRONMENT & INFRASTRUCTURE

WELL LF4-MW2
ABOVE GROUND WELL COMPLETION DETAILS

PROJECT: FORT CARSON - GROUP A
DATE COMPLETED 3/22/95
LOCATION: LANDFILL #4
N 1338329
E 3199718
Z 5876.8

DRILLING METHOD: HOLLOW STEM AUGER 3.25" ID
DRILLING COMPANY: SITE SERVICES
FIELD GEOLOGIST: H. HODSON



REMARKS: PLUMBNESS CHECKED OK - YES OR NO IF NO, WELL REPAIRED OR ABANDONED ?

REFERENCE MEASURING POINT LOCATION/DESCRIPTION: Black mark on TOC

DEPTH TO WATER AFTER COMPLETION: 9.54' TOC (4/25/95)

SIGNATURE OF PREPARER H S Hodson

FORMS/WELLFORM.DWG 1/26/95 EMH

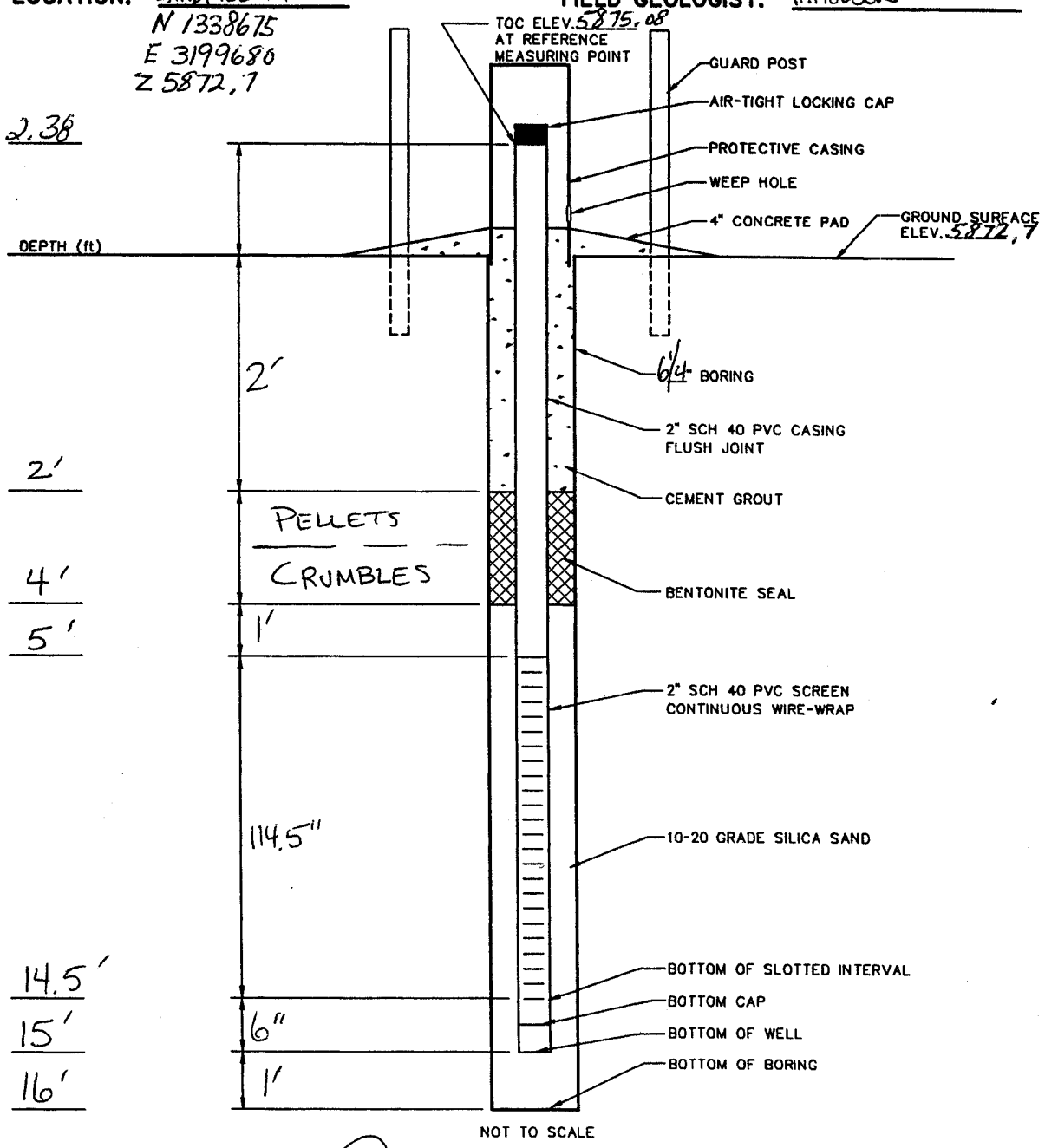
RUST ENVIRONMENT & INFRASTRUCTURE

WELL LF4-MW3

ABOVE GROUND WELL COMPLETION DETAILS

PROJECT: FT. CARSON/GROUPA
DATE COMPLETED 3/22/95
LOCATION: LANDFILL #4
N 1338675
E 3199680
Z 5872.7

DRILLING METHOD: HOLLOW STEM AUGER 3.25" ID
DRILLING COMPANY: SITE SERVICES
FIELD GEOLOGIST: H. HODSON



REMARKS: PLUMBNESS CHECKED OK (YES) OR NO IF NO, WELL REPAIRED OR ABANDONED ?

REFERENCE MEASURING POINT/LOCATION/DESCRIPTION: Black mark on TOC

DEPTH TO WATER AFTER COMPLETION: 10.5' / 5.51 4/21/95

SIGNATURE OF PREPARER H. Hodson

FORMS/WELLFORM.DWG 1/26/95 EMH

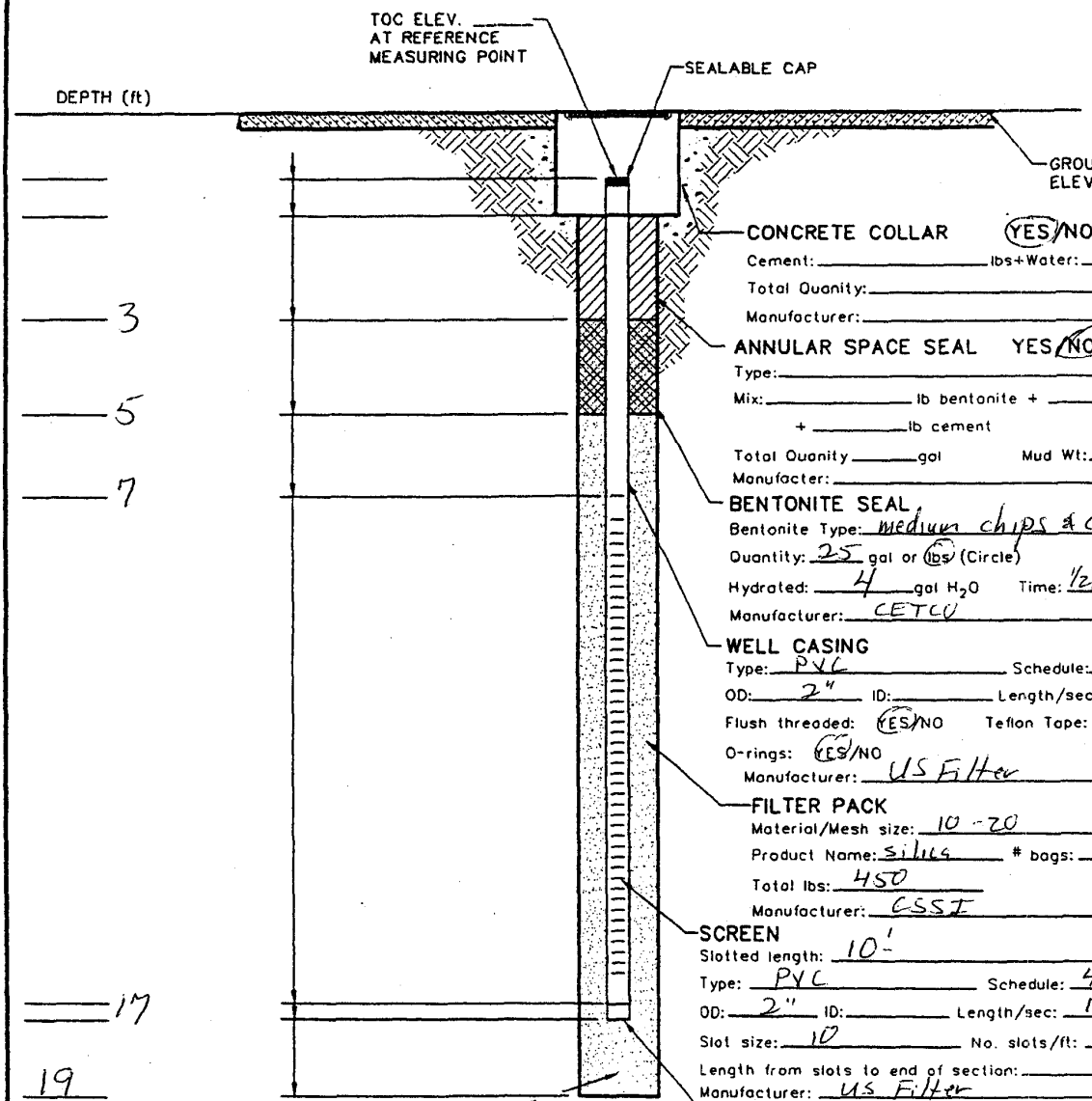
RUST ENVIRONMENT & INFRASTRUCTURE

WELL LF4MW41

BELOW GROUND WELL COMPLETION DETAILS

PROJECT: 29188
DATE COMPLETED 1/17/01
LOCATION: Ft Carson
PERMIT NO. D013-2013

DRILLING METHOD: HSA
DRILLING COMPANY: Spectrum
FIELD GEOLOGIST: K. Matthews
STATIC DEPTH TO WATER: _____



CONCRETE COLLAR (YES)/NO
Cement: _____ lbs+Water: _____ gal
Total Quanity: _____ gal
Manufacturer: _____

ANNULAR SPACE SEAL YES/(NO)
Type: _____
Mix: _____ lb bentonite + _____ gal H_2O
+ _____ lb cement
Total Quanity _____ gal Mud Wt: _____ lbs/gal
Manufacter: _____

BENTONITE SEAL
Bentonite Type: medium chips & crumbles
Quantity: 25 gal or (lbs) (Circle)
Hydrated: 4 gal H_2O Time: 1/2hr/6"
Manufacturer: CETCO

WELL CASING
Type: PVC Schedule: 40
OD: 2" ID: _____ Length/sec: 10
Flush threaded: (YES)/NO Teflon Tape: YES/(NO)
O-rings: (YES)/NO
Manufacturer: US Filter

FILTER PACK
Material/Mesh size: 10-20
Product Name: silica # bags: 50
Total lbs: 450
Manufacturer: CSSI

SCREEN
Slotted length: 10'
Type: PVC Schedule: 40
OD: 2" ID: _____ Length/sec: 10
Slot size: 10 No. slots/ft: _____
Length from slots to end of section: _____
Manufacturer: US Filter

BOTTOM CAP OR PLUG
Type: PVC Length: _____
Manufacturer: US Filter

REMARKS: PLUMBNESS CHECKED OK - YES OR NO IF NO, WELL REPAIRED OR ABANDONED ?

REFERENCE MEASURING POINT LOCATION/DESCRIPTION:

DEPTH TO WATER AFTER COMPLETION:

SIGNATURE OF PREPARER

NOT TO SCALE

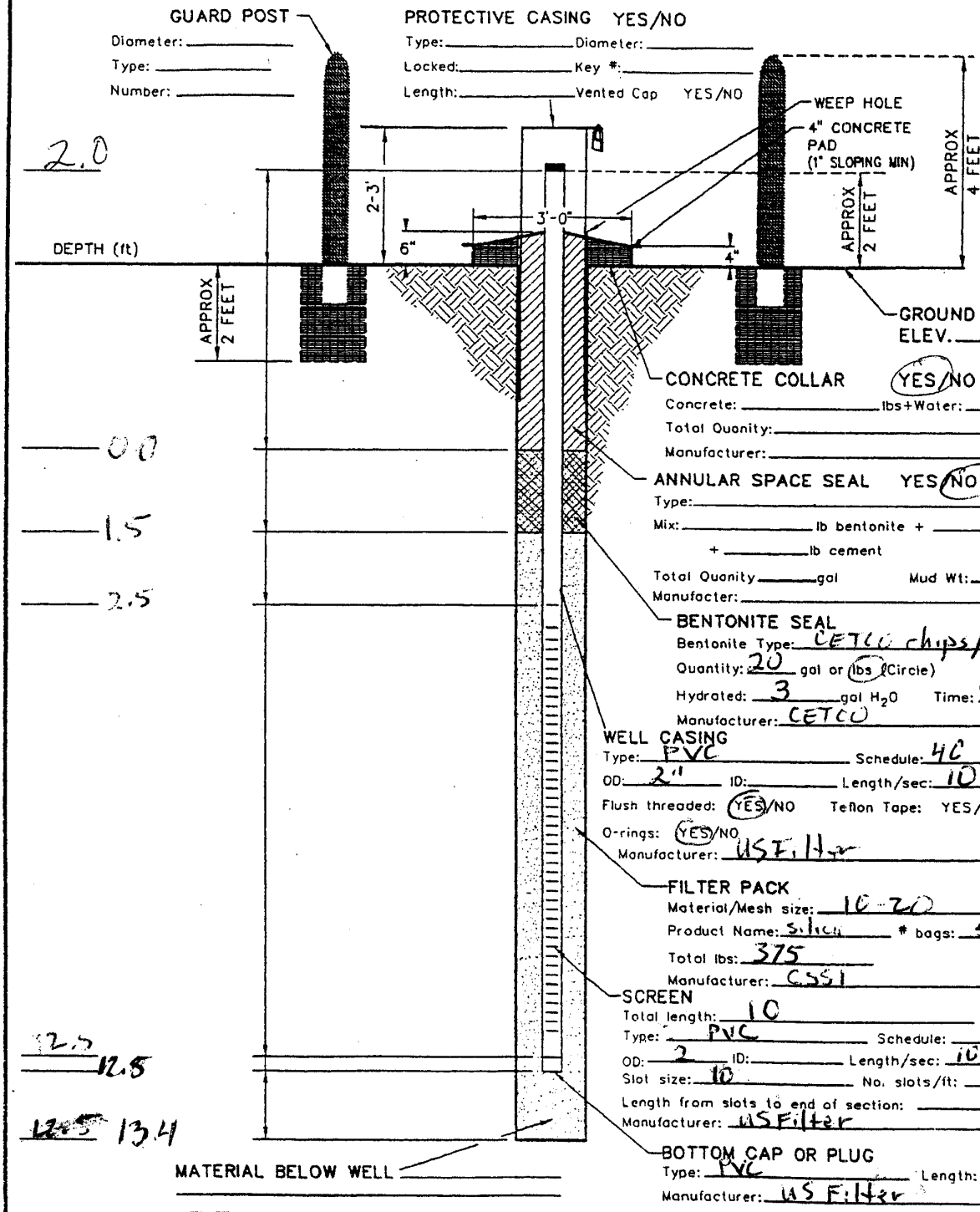
J:\CADFILES\FTCARSON\WELLS\AUTOCAD\WELLFM02.DWG 12/7/95 EJM

WELL LF4MW05

ABOVE GROUND WELL COMPLETION DETAILS

PROJECT: 21153
DATE COMPLETED 1/17/01
LOCATION: Ft Carson
PERMIT NO. D013-203

DRILLING METHOD: HSA
DRILLING COMPANY: Spectrum
FIELD GEOLOGIST: K. Mathews
STATIC DEPTH TO WATER:



CONCRETE COLLAR YES/NO
Concrete: lbs+Water: gal
Total Quanity: gal
Manufacturer:

ANNULAR SPACE SEAL YES/NO
Type:
Mix: lb bentonite + gal H_2O
+ lb cement
Total Quanity gal Mud Wt: lbs/gal
Manufacter:

BENTONITE SEAL
Bentonite Type: CETCO chips/crumbles
Quantity: 20 gal or lbs (Circle)
Hydrated: 3 gal H_2O Time: 1/2hr/6"
Manufacturer: CETCO

WELL CASING
Type: PVC Schedule: 40
OD: 2" ID: Length/sec: 10
Flush threaded: YES/NO Teflon Tape: YES/NO
O-rings: YES/NO
Manufacturer: US Filter

FILTER PACK
Material/Mesh size: 10-20
Product Name: Silica # bags: 50
Total lbs: 375
Manufacturer: CSSI

SCREEN
Total length: 10
Type: PVC Schedule: 40
OD: 2 ID: Length/sec: 10
Slot size: 10 No. slots/ft:
Length from slots to end of section:
Manufacturer: US Filter

BOTTOM CAP OR PLUG
Type: PVC Length: 0.3'
Manufacturer: US Filter

REMARKS: STRAIGHTNESS CHECKED OK - YES OR NO
REFERENCE MEASURING POINT LOCATION/DESCRIPTION:
DEPTH TO WATER AFTER COMPLETION:
SIGNATURE OF PREPARER

NOT TO SCALE

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WELL LF4DP1

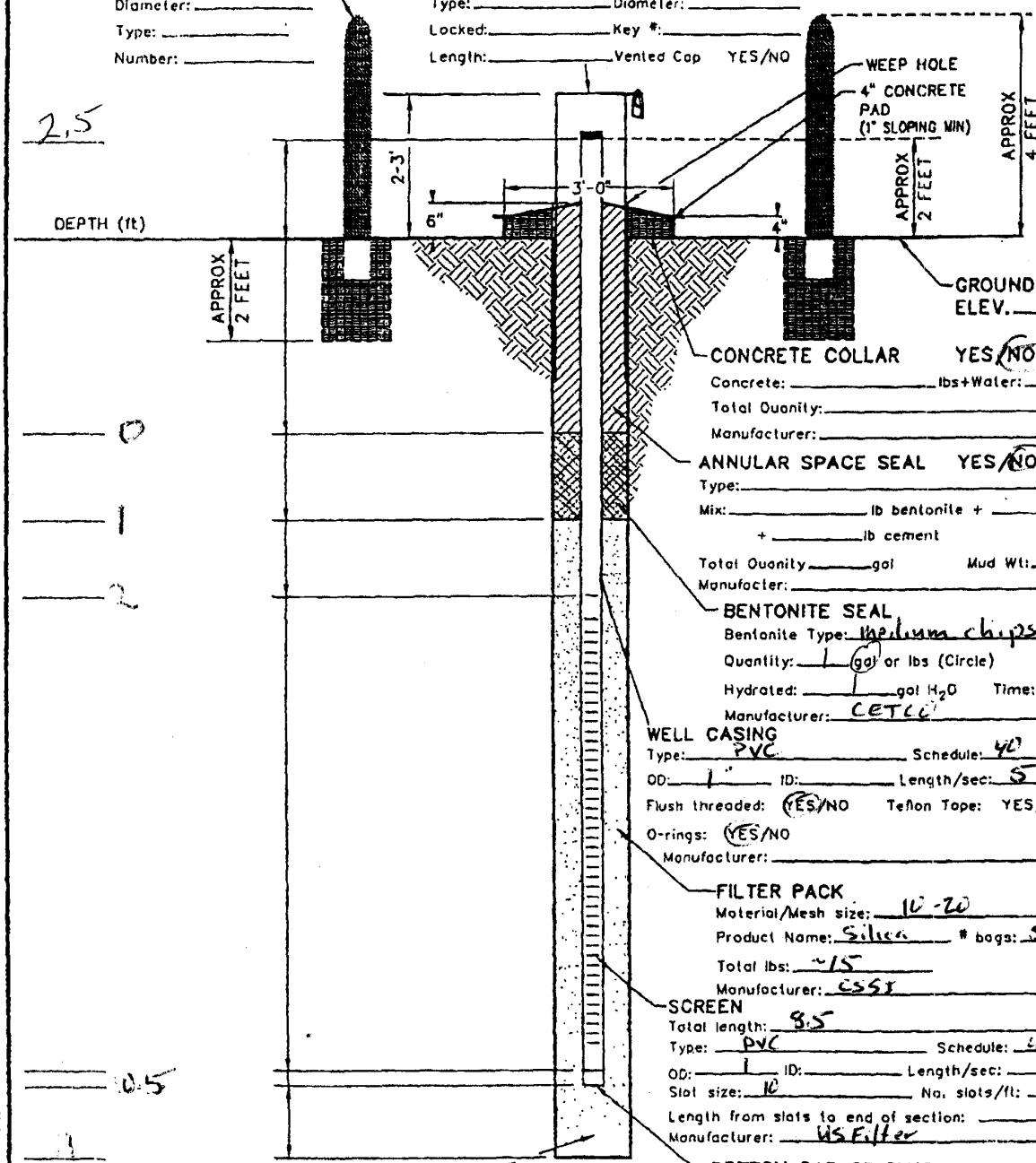
ABOVE GROUND WELL COMPLETION DETAILS

PROJECT: 29188
DATE COMPLETED 1/18/01
LOCATION: Landfill 4
PERMIT NO. D013-203

DRILLING METHOD: Direct Push
DRILLING COMPANY: Spectrum
FIELD GEOLOGIST: Kevin Mathews
STATIC DEPTH TO WATER:

GUARD POST
Diameter:
Type:
Number:

PROTECTIVE CASING YES/NO
Type: Diameter:
Locked: Key #:
Length: Vented Cap YES/NO



CONCRETE COLLAR YES/NO
Concrete: lbs+Water: gal
Total Quanity: gal
Manufacturer:

ANNULAR SPACE SEAL YES/NO
Type:
Mix: lb bentonite + gal H_2O
+ lb cement
Total Quanity gal Mud Wt: lbs/gal
Manufacter:

BENTONITE SEAL
Bentonite Type: medium chips
Quantity: 1 gal or lbs (Circle)
Hydrated: 1 gal H_2O Time:
Manufacturer: CETCO

WELL CASING
Type: PVC Schedule: 40
OD: 1" ID: Length/sec: 5
Flush threaded: YES/NO Teflon Tape: YES/NO
O-rings: YES/NO
Manufacturer:

FILTER PACK
Material/Mesh size: 10-20
Product Name: Silica # bags: 50
Total lbs: ~15
Manufacturer: CSSI

SCREEN
Total length: 8.5
Type: PVC Schedule: 40
OD: 1 ID: Length/sec: 10
Slot size: 10 No. slots/ft:
Length from slots to end of section:
Manufacturer: US Filter

BOTTOM CAP OR PLUG
Type: slip PVC Length:
Manufacturer: US Filter

REMARKS: STRAIGHTNESS CHECKED OK - YES OR NO
REFERENCE MEASURING POINT LOCATION/DESCRIPTION:
DEPTH TO WATER AFTER COMPLETION:
SIGNATURE OF PREPARER

NOT TO SCALE

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WELL LF4MW6

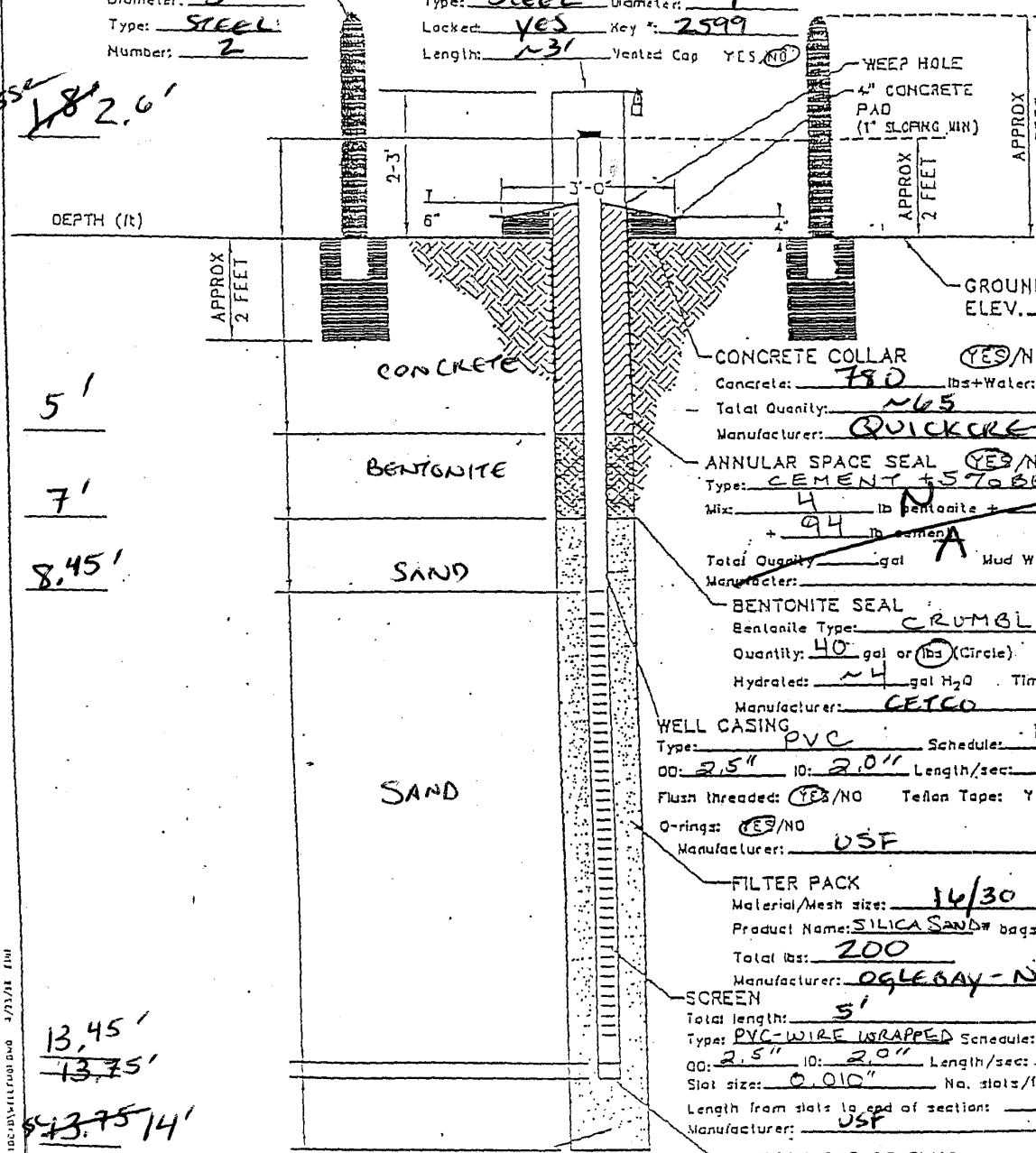
ABOVE GROUND WELL COMPLETION DETAILS

PROJECT: ~~11/13/01~~ LF4
DATE COMPLETED 11/13/01
LOCATION: SOUTH OF LF4MW5
PERMIT NO. _____

DRILLING METHOD: HSA
DRILLING COMPANY: SPECTRUM
FIELD GEOLOGIST: S. CARTER
STATIC DEPTH TO WATER: NA

GUARD POST
Diameter: 3"
Type: STEEL
Number: 2

PROTECTIVE CASING (YES)/NO
Type: STEEL Diameter: 4"
Locked: YES Key #: 2599
Length: ~3' Vented Cap YES/(NO)



SSE ~~1.8'~~ 2.6'
5'
7'
8.45'
13.45'
~~13.75'~~
SSE ~~13.75~~ 14'

GROUND SURFACE ELEV. NA

CONCRETE COLLAR (YES)/NO
Concrete: 780 lbs+Water: 6 1/2 gal
Total Quanity: ~65 gal
Manufacturer: QUICKCRETE

ANNULAR SPACE SEAL (YES)/NO
Type: CEMENT + 5% BENTONITE
Mix: 4 lb bentonite + ~~6~~ gal H_2O
+ 94 lb cement
Total Quanity ____ gal Mud Wt: — lbs/gal
Manufacter: _____

BENTONITE SEAL
Bentonite Type: CRUMBLES / CHIPS
Quantity: 40 gal or (lbs) (Circle)
Hydrated: ~4 gal H_2O Time: 1125
Manufacturer: CETCO

WELL CASING
Type: PVC Schedule: 40
OD: 2.5" ID: 2.0" Length/sec: 10'
Flush threaded: (YES)/NO Teflon Tape: YES/(NO)
O-rings: (YES)/NO
Manufacturer: USF

FILTER PACK
Material/Mesh size: 16/30
Product Name: SILICA SAND # bags: 4
Total lbs: 200
Manufacturer: OGLEBAY - NORTON

SCREEN
Total length: 5'
Type: PVC-WIRE WRAPPED Schedule: 40
OD: 2.5" ID: 2.0" Length/sec: 5'
Slot size: 0.010" No. slots/ft: 50/1
Length from slots to end of section: 0.5'
Manufacturer: USF

BOTTOM CAP OR PLUG
Type: THREADED PVC Length: 2"
Manufacturer: USF

MATERIAL BELOW WELL NATIVE ALLUVIUM

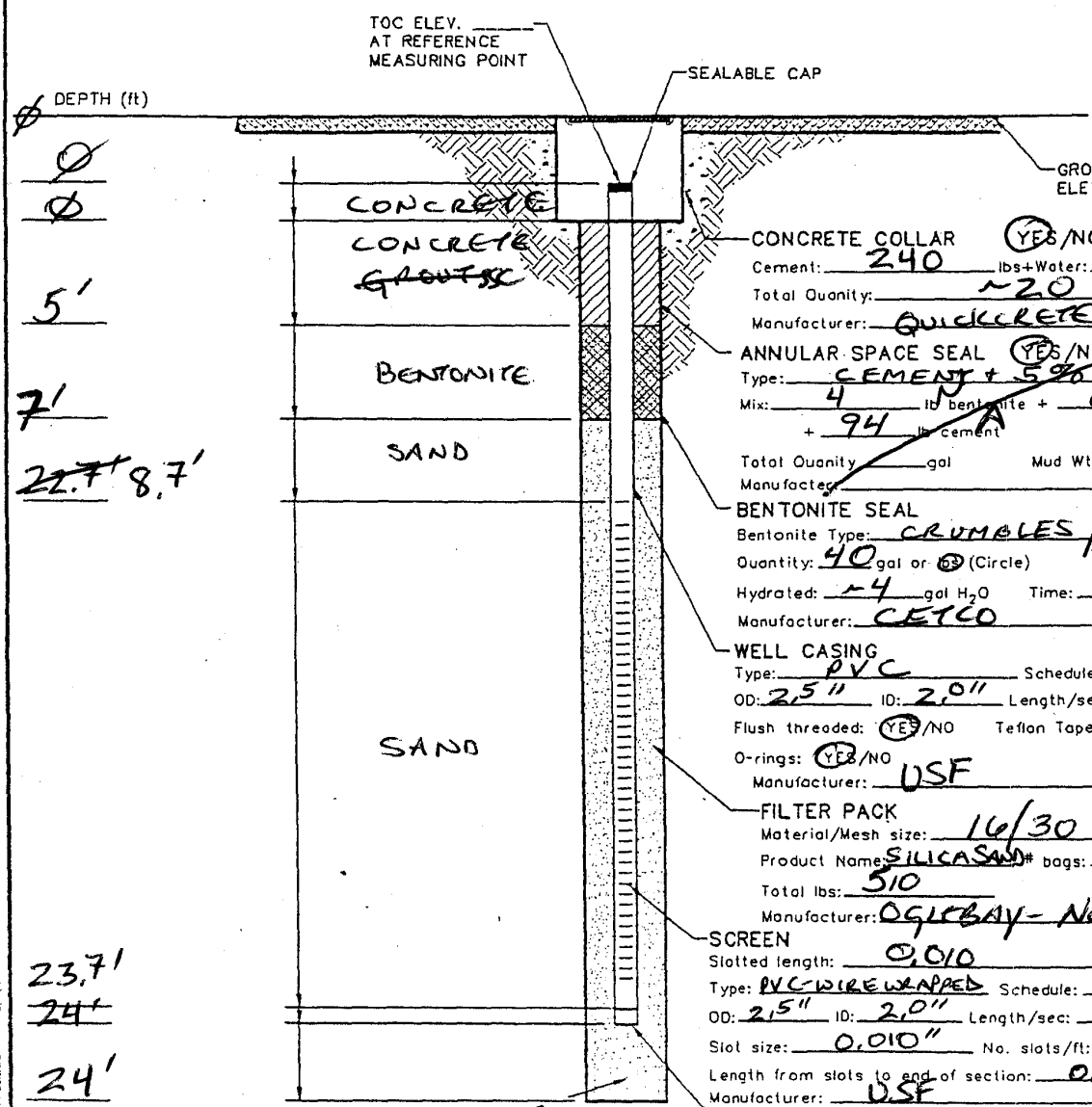
REMARKS: STRAIGHTNESS CHECKED OK - YES OR (NO) NOT CHECKED
REFERENCE MEASURING POINT LOCATION/DESCRIPTION: GROUND SURFACE
DEPTH TO WATER AFTER COMPLETION: NOT ENCOUNTERED ON 11/13/01 @ 0930
SIGNATURE OF PREPARER [signature] NOT TO SCALE

WELL LF4MW7

BELOW GROUND WELL COMPLETION DETAILS

PROJECT: LF4
DATE COMPLETED 11/12/01
LOCATION: E OF BLDG. #343 + SPECKER
PERMIT NO. _____

DRILLING METHOD: HSA
DRILLING COMPANY: SPECTRUM
FIELD GEOLOGIST: L. BARKAU
STATIC DEPTH TO WATER: N/A



CONCRETE COLLAR (YES)/NO
Cement: 240 lbs + Water: 2 gal
Total Quanity: ~20 gal
Manufacturer: QUICKCRETE

ANNULAR SPACE SEAL (YES)/NO
Type: CEMENT + 5% BENTONITE
Mix: 4 lb bentonite + 6 gal H_2O + 94 lb cement
Total Quanity _____ gal Mud Wt: _____ lbs/gal
Manufacturer: N/A

BENTONITE SEAL
Bentonite Type: CRUMBLES / CHIPS
Quantity: 40 gal or (bags) (Circle)
Hydrated: ~4 gal H_2O Time: 1330
Manufacturer: CETCO

WELL CASING
Type: PVC Schedule: 40
OD: 2.5" ID: 2.0" Length/sec: 10'
Flush threaded: (YES)/NO Teflon Tape: YES/(NO)
O-rings: (YES)/NO
Manufacturer: USF

FILTER PACK
Material/Mesh size: 16/30
Product Name: SILICA SAND # bags: 10 1/3
Total lbs: 510
Manufacturer: OGLEBAY-NORTON

SCREEN
Slotted length: 0.010
Type: PVC-WIRE WRAPPED Schedule: 40
OD: 2.5" ID: 2.0" Length/sec: 10' + 5'
Slot size: 0.010" No. slots/ft: 50/1
Length from slots to end of section: 0.5"
Manufacturer: USF

BOTTOM CAP OR PLUG
Type: THREADED PVC Length: 2"
Manufacturer: USF

MATERIAL BELOW WELL: NATIVE WEATHERED PIERRE SHALE

REMARKS: PLUMBNESS CHECKED OK - YES OR (NO) IF NO, WELL REPAIRED OR ABANDONED ? NOT CHECKED

REFERENCE MEASURING POINT LOCATION/DESCRIPTION: GROUND SURFACE

DEPTH TO WATER AFTER COMPLETION: NOT ENCOUNTERED ON 11/12/01 @ 1215

SIGNATURE OF PREPARER: Stephanie Cates

NOT TO SCALE

12/7/95 EHM

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WELL LF4DP2

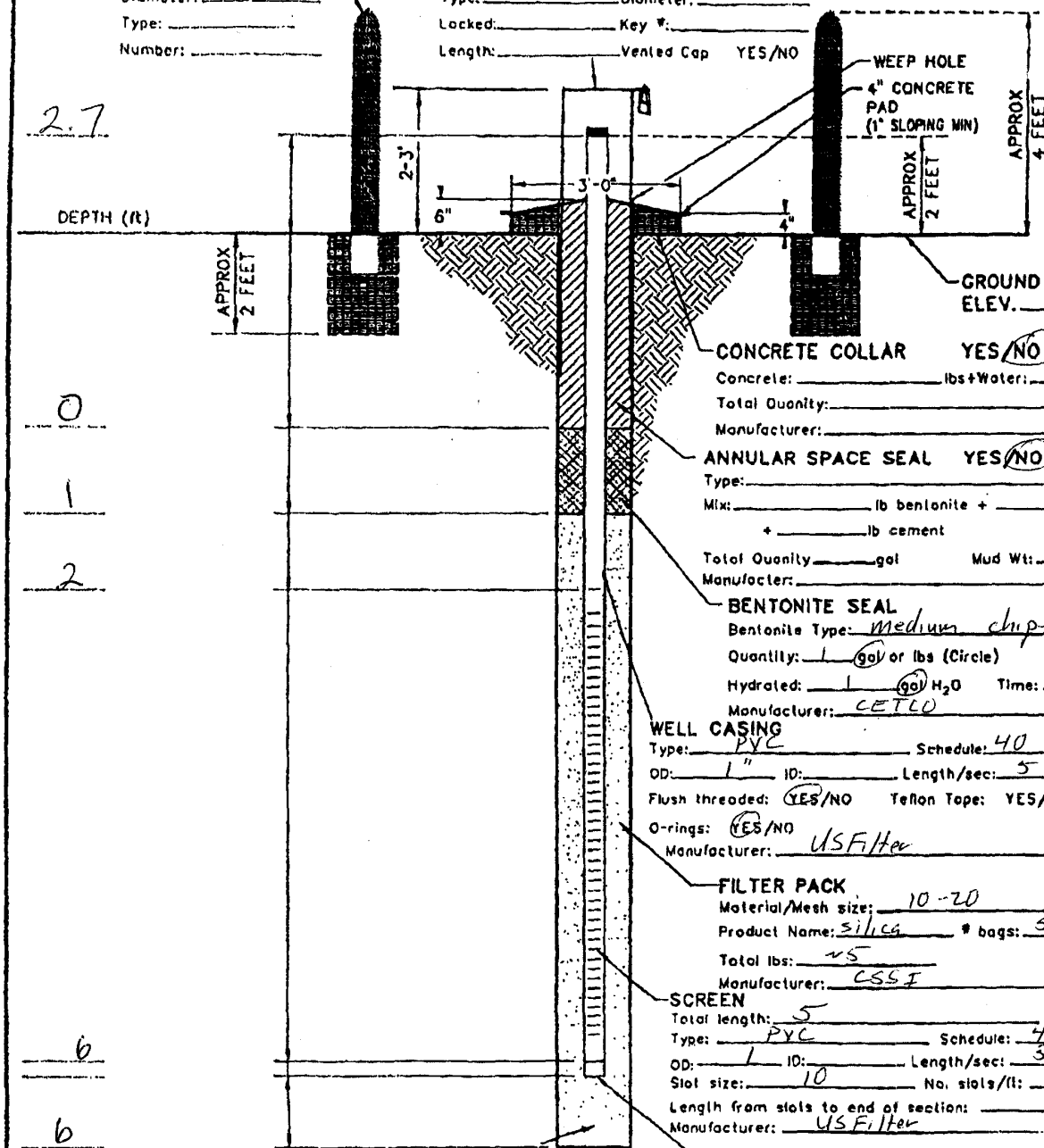
ABOVE GROUND WELL COMPLETION DETAILS

PROJECT: 29188
DATE COMPLETED 1/19/01
LOCATION: LANDFILL 4
PERMIT NO. P013-203

DRILLING METHOD: Direct Push
DRILLING COMPANY: Spectrum
FIELD GEOLOGIST: K. Mathews
STATIC DEPTH TO WATER:

GUARD POST
Diameter:
Type:
Number:

PROTECTIVE CASING YES/NO
Type: Diameter:
Locked: Key #:
Length: Vented Cap YES/NO



CONCRETE COLLAR YES/NO
Concrete: lbs+Water: gal
Total Quanity: gal
Manufacturer:

ANNULAR SPACE SEAL YES/NO
Type:
Mix: lb bentonite + gal H_2O
+ lb cement
Total Quanity gal Mud Wt: lbs/gal
Manufacter:

BENTONITE SEAL
Bentonite Type: medium chips
Quantity: 1 gal or lbs (Circle)
Hydrated: 1 gal H_2O Time:
Manufacturer: CETCO

WELL CASING
Type: PVC Schedule: 40
OD: 1" ID: Length/sec: 5
Flush threaded: YES/NO Teflon Tape: YES/NO
O-rings: YES/NO
Manufacturer: USFilter

FILTER PACK
Material/Mesh size: 10-20
Product Name: silica # bags: 50
Total lbs: ~5
Manufacturer: CSSI

SCREEN
Total length: 5
Type: PVC Schedule: 40
OD: 1 ID: Length/sec: 5
Slot size: 10 No. slots/ft:
Length from slots to end of section:
Manufacturer: USFilter

BOTTOM CAP OR PLUG
Type: PVC-slip Length:
Manufacturer: USFilter

MATERIAL BELOW WELL

REMARKS: STRAIGHTNESS CHECKED OK - YES OR NO
REFERENCE MEASURING POINT LOCATION/DESCRIPTION:
DEPTH TO WATER AFTER COMPLETION:
SIGNATURE OF PREPARER

NOT TO SCALE

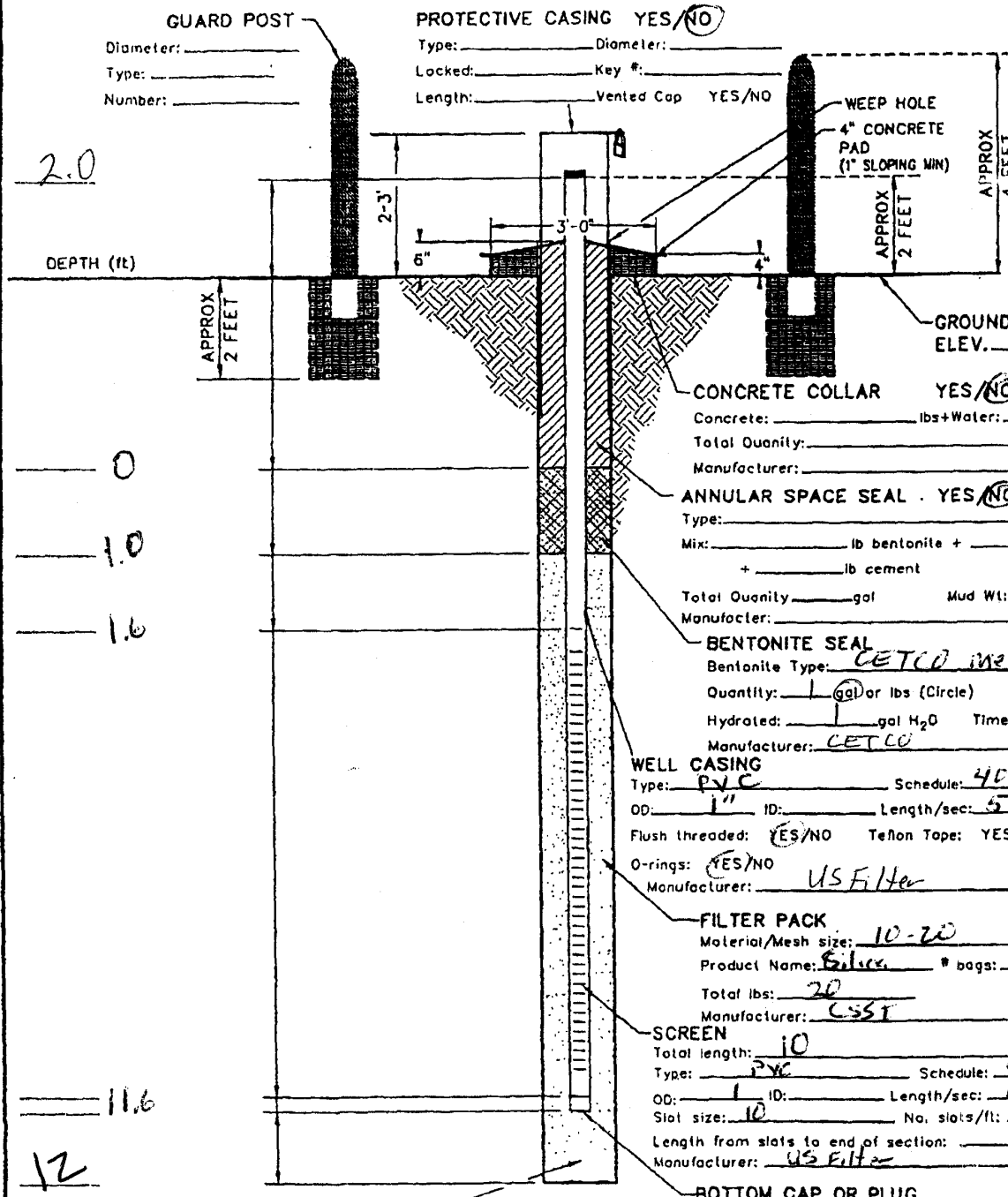
A:\SCHEMES\FCAPSON\WELLS\AUFSC\DWELL1.DWG 4/23/98 Sam

WELL LF4PP3

ABOVE GROUND WELL COMPLETION DETAILS

PROJECT: 29188
DATE COMPLETED 1/18/01
LOCATION: Landfill 4
PERMIT NO. D013-203

DRILLING METHOD: Direct Push
DRILLING COMPANY: Spectrum
FIELD GEOLOGIST: Kevin Mathews
STATIC DEPTH TO WATER: _____



CONCRETE COLLAR YES/NO
Concrete: _____ lbs+Water: _____ gal
Total Quanity: _____ gal
Manufacturer: _____

ANNULAR SPACE SEAL YES/NO
Type: _____
Mix: _____ lb bentonite + _____ gal H_2O
+ _____ lb cement
Total Quanity _____ gal Mud Wt: _____ lbs/gal
Manufacter: _____

BENTONITE SEAL
Bentonite Type: CETCO med chips
Quantity: 1 gal or lbs (Circle)
Hydrated: 1 gal H_2O Time: _____
Manufacturer: CETCO

WELL CASING
Type: PVC Schedule: 40
OD: 1" ID: _____ Length/sec: 5
Flush threaded: YES/NO Teflon Tape: YES/NO
O-rings: YES/NO
Manufacturer: US Filter

FILTER PACK
Material/Mesh size: 10-20
Product Name: Silica # bags: 50
Total lbs: 20
Manufacturer: CSST

SCREEN
Total length: 10
Type: PVC Schedule: 40
OD: 1 ID: _____ Length/sec: 10
Slot size: 10 No. slots/ft: _____
Length from slots to end of section: _____
Manufacturer: US Filter

BOTTOM CAP OR PLUG
Type: Slip PVC Length: _____
Manufacturer: US Filter

REMARKS: STRAIGHTNESS CHECKED OK - YES OR NO
REFERENCE MEASURING POINT LOCATION/DESCRIPTION:
DEPTH TO WATER AFTER COMPLETION:
SIGNATURE OF PREPARER

NOT TO SCALE

J:\CADFILES\FTCARSON\WELLS\AUTOCAD\WELLFMOD.DWG 4/23/96 EMH

WELL LE4DP4

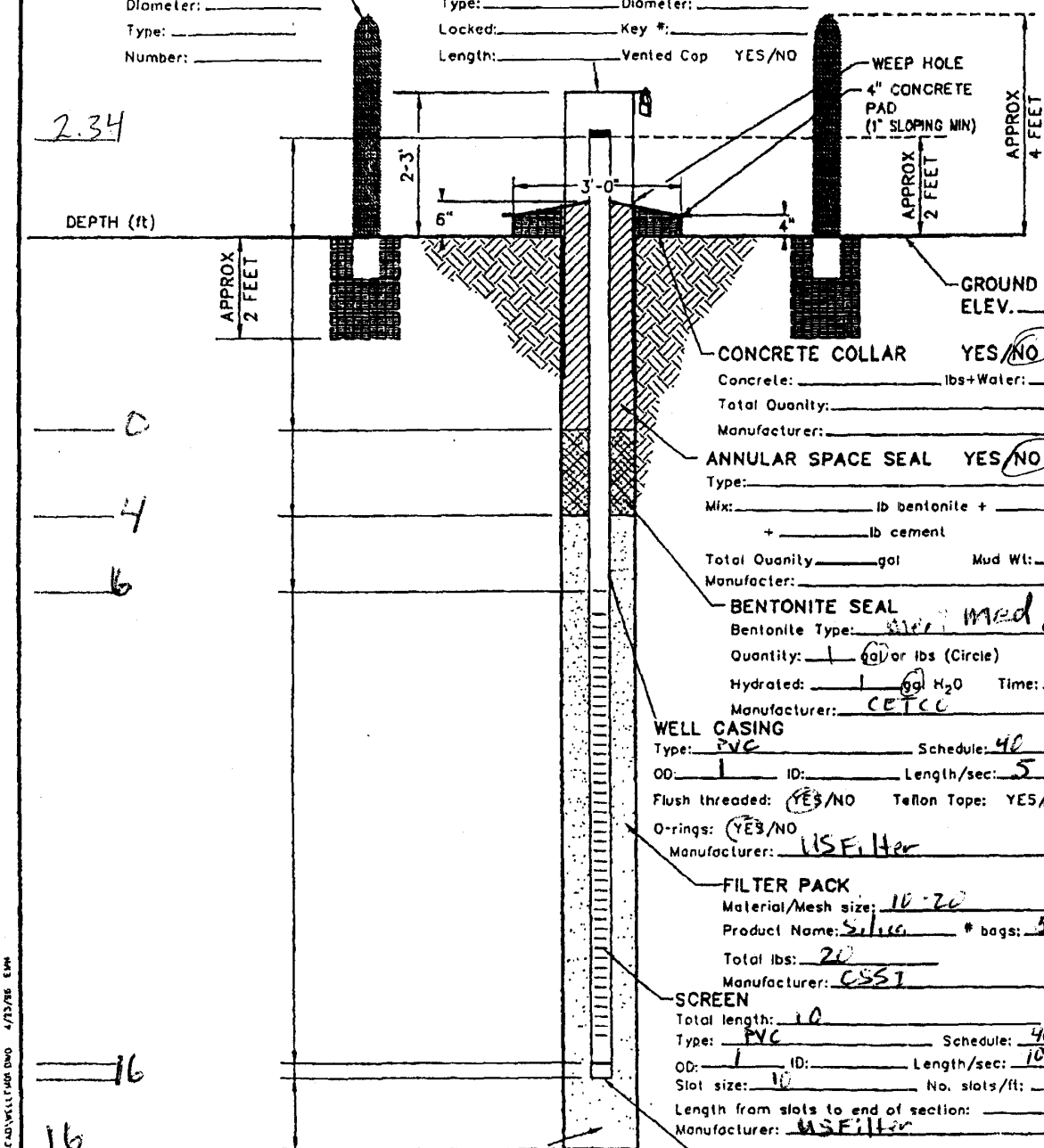
ABOVE GROUND WELL COMPLETION DETAILS

PROJECT: 29188
DATE COMPLETED 1/18/01
LOCATION: Landfill 4
PERMIT NO. _____

DRILLING METHOD: Direct Push
DRILLING COMPANY: Spectrum
FIELD GEOLOGIST: Kevin Mathews
STATIC DEPTH TO WATER: _____

GUARD POST
Diameter: _____
Type: _____
Number: _____

PROTECTIVE CASING YES/NO
Type: _____ Diameter: _____
Locked: _____ Key #: _____
Length: _____ Vented Cap YES/NO



CONCRETE COLLAR YES/NO
Concrete: _____ lbs+Water: _____ gal
Total Quanity: _____ gal
Manufacturer: _____

ANNULAR SPACE SEAL YES/NO
Type: _____
Mix: _____ lb bentonite + _____ gal H_2O
+ _____ lb cement
Total Quanity _____ gal Mud Wt: _____ lbs/gal
Manufacter: _____

BENTONITE SEAL
Bentonite Type: Med chips
Quantity: 1 gal or lbs (Circle)
Hydrated: 1 gal H_2O Time: _____
Manufacturer: CETCO

WELL CASING
Type: PVC Schedule: 40
OD: 1 ID: _____ Length/sec: 5
Flush threaded: YES/NO Teflon Tape: YES/NO
O-rings: YES/NO
Manufacturer: USFilter

FILTER PACK
Material/Mesh size: 10-20
Product Name: Silica # bags: 50
Total lbs: 20
Manufacturer: CSSI

SCREEN
Total length: 10
Type: PVC Schedule: 40
OD: 1 ID: _____ Length/sec: 10
Slot size: 10 No. slots/ft: _____
Length from slots to end of section: _____
Manufacturer: USFilter

BOTTOM CAP OR PLUG
Type: slip - PVC Length: _____
Manufacturer: USFilter

MATERIAL BELOW WELL _____

REMARKS: STRAIGHTNESS CHECKED OK - YES OR NO
REFERENCE MEASURING POINT LOCATION/DESCRIPTION:
DEPTH TO WATER AFTER COMPLETION:
SIGNATURE OF PREPARER

NOT TO SCALE

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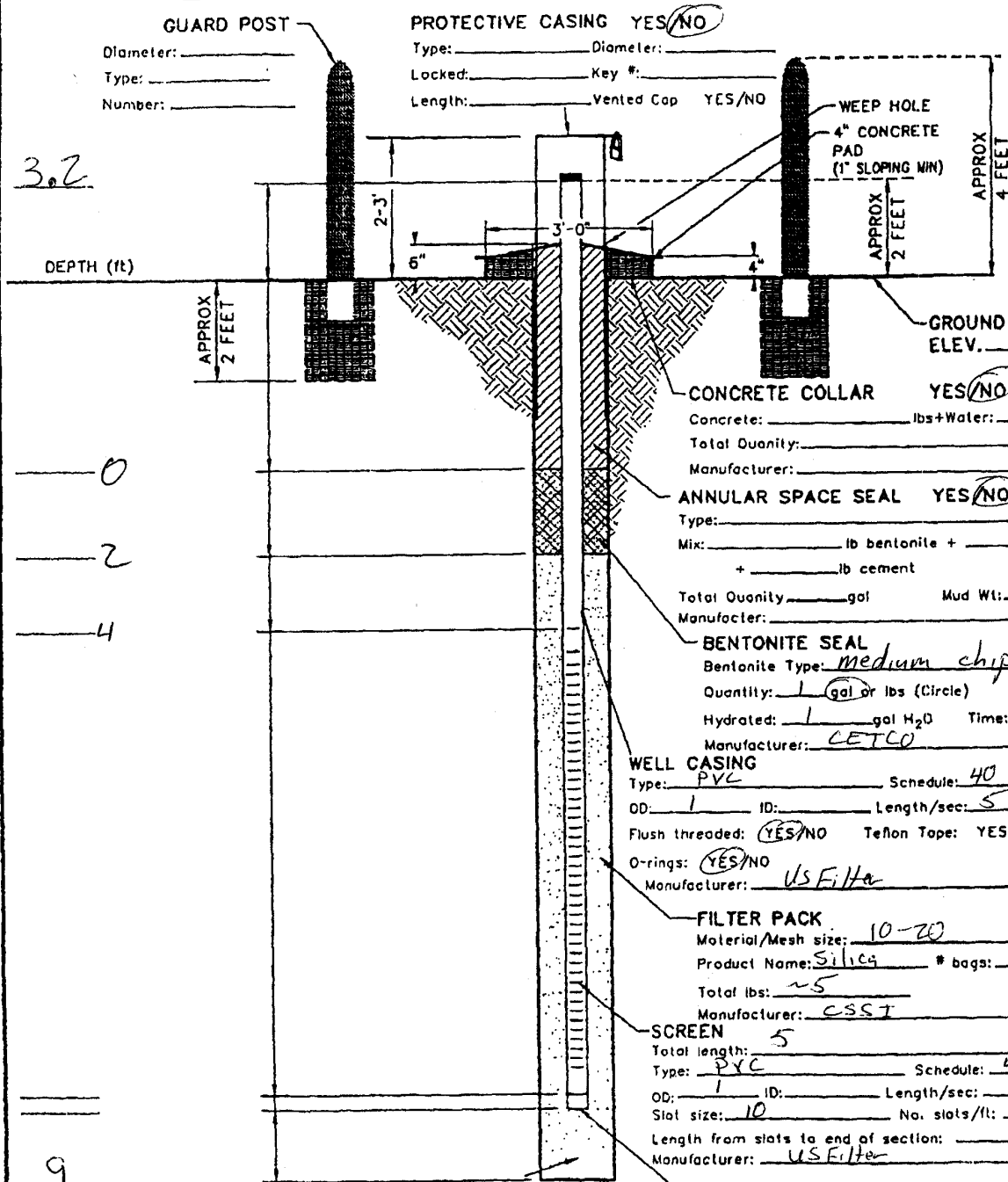
WELL LF4DP5

ABOVE GROUND WELL COMPLETION DETAILS

PROJECT: 29188
DATE COMPLETED 1/19/01
LOCATION: Ft Carson
PERMIT NO. DC13-203

DRILLING METHOD: Direct Push
DRILLING COMPANY: Spectrum
FIELD GEOLOGIST: K. Mathews
STATIC DEPTH TO WATER:



CONCRETE COLLAR YES/NO
Concrete: lbs+Water: gal
Total Quanity: gal
Manufacturer:

ANNULAR SPACE SEAL YES/NO
Type:
Mix: lb bentonite + gal H_2O
+ lb cement
Total Quanity gal Mud Wt: lbs/gal
Manufacter:

BENTONITE SEAL
Bentonite Type: medium chips
Quantity: 1 gal or lbs (Circle)
Hydrated: 1 gal H_2O Time:
Manufacturer: CETCO

WELL CASING
Type: PVC Schedule: 40
OD: 1 ID: Length/sec: 5
Flush threaded: YES/NO Teflon Tape: YES/NO
O-rings: YES/NO
Manufacturer: US Filter

FILTER PACK
Material/Mesh size: 10-20
Product Name: Silica # bags: 50
Total lbs: ~5
Manufacturer: CSST

SCREEN
Total length: 5
Type: PVC Schedule: 40
OD: 1 ID: Length/sec:
Slot size: 10 No. slots/ft:
Length from slots to end of section:
Manufacturer: US Filter

BOTTOM CAP OR PLUG
Type: PVC-slip Length:
Manufacturer: US Filter

MATERIAL BELOW WELL

REMARKS: STRAIGHTNESS CHECKED OK - YES OR NO
REFERENCE MEASURING POINT LOCATION/DESCRIPTION:
DEPTH TO WATER AFTER COMPLETION:
SIGNATURE OF PREPARER

NOT TO SCALE

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WELL LF4DP6

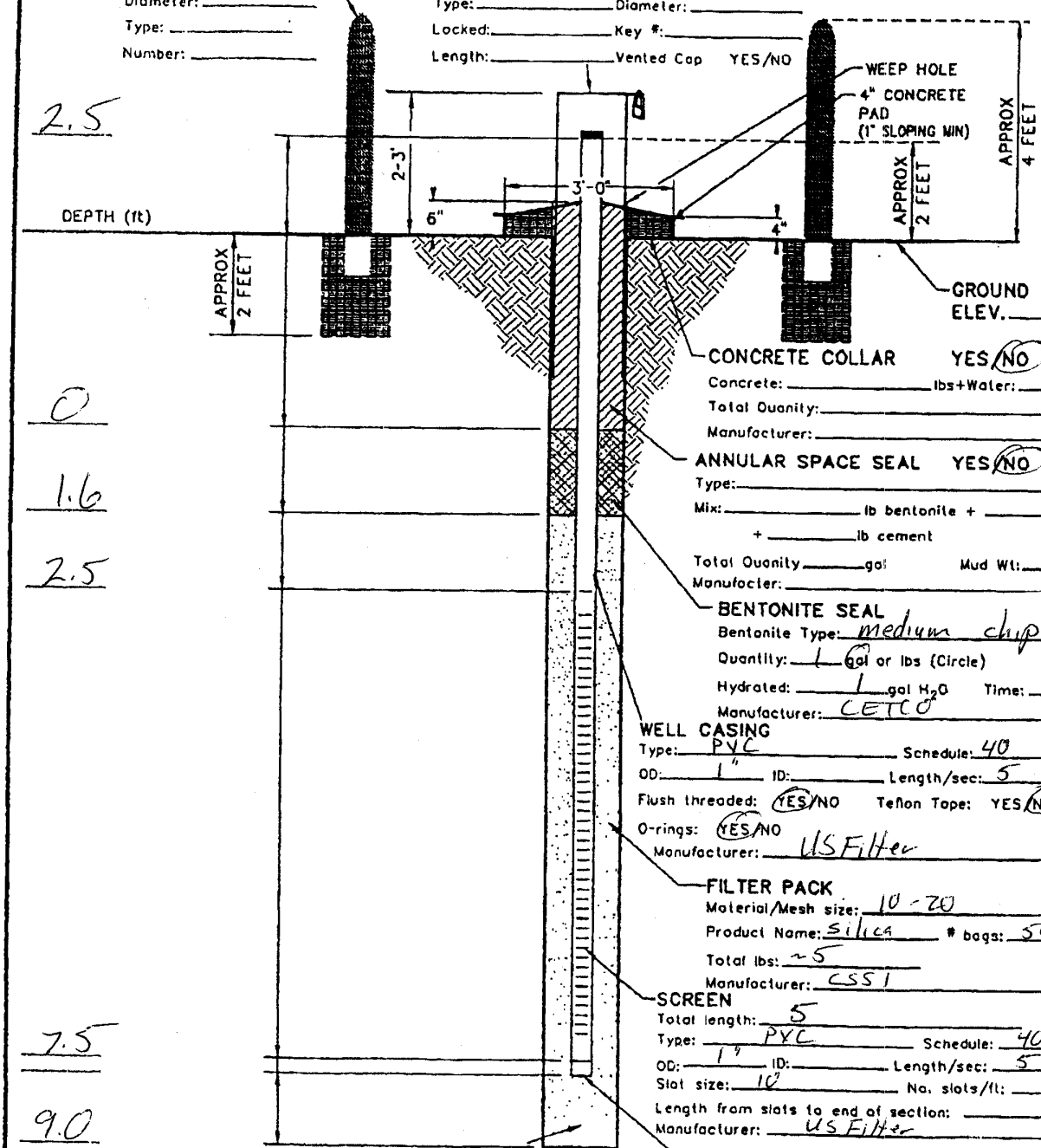
ABOVE GROUND WELL COMPLETION DETAILS

PROJECT: 29188
DATE COMPLETED 1/19/01
LOCATION: Landfill 4
PERMIT NO. D013-203

DRILLING METHOD: Direct Push
DRILLING COMPANY: Spectrum
FIELD GEOLOGIST: K. Mathews
STATIC DEPTH TO WATER: _____

GUARD POST
Diameter: _____
Type: _____
Number: _____

PROTECTIVE CASING YES/NO
Type: _____ Diameter: _____
Locked: _____ Key #: _____
Length: _____ Vented Cap YES/NO



CONCRETE COLLAR YES/NO
Concrete: _____ lbs+Water: _____ gal
Total Quanity: _____ gal
Manufacturer: _____

ANNULAR SPACE SEAL YES/NO
Type: _____
Mix: _____ lb bentonite + _____ gal H_2O
+ _____ lb cement
Total Quanity _____ gal Mud Wt: _____ lbs/gal
Manufacter: _____

BENTONITE SEAL
Bentonite Type: medium chips
Quantity: 1 gal or lbs (Circle)
Hydrated: 1 gal H_2O Time: _____
Manufacturer: CETCO

WELL CASING
Type: PVC Schedule: 40
OD: 1" ID: _____ Length/sec: 5
Flush threaded: YES/NO Teflon Tape: YES/NO
O-rings: YES/NO
Manufacturer: US Filter

FILTER PACK
Material/Mesh size: 10-20
Product Name: silica # bags: 50
Total lbs: ~5
Manufacturer: CSS1

SCREEN
Total length: 5
Type: PVC Schedule: 40
OD: 1" ID: _____ Length/sec: 5
Slot size: 10 No. slots/ft: _____
Length from slots to end of section: _____
Manufacturer: US Filter

BOTTOM CAP OR PLUG
Type: PVC-slip Length: _____
Manufacturer: US Filter

MATERIAL BELOW WELL _____

REMARKS: STRAIGHTNESS CHECKED OK - YES OR NO
REFERENCE MEASURING POINT LOCATION/DESCRIPTION:
DEPTH TO WATER AFTER COMPLETION:
SIGNATURE OF PREPARER

NOT TO SCALE

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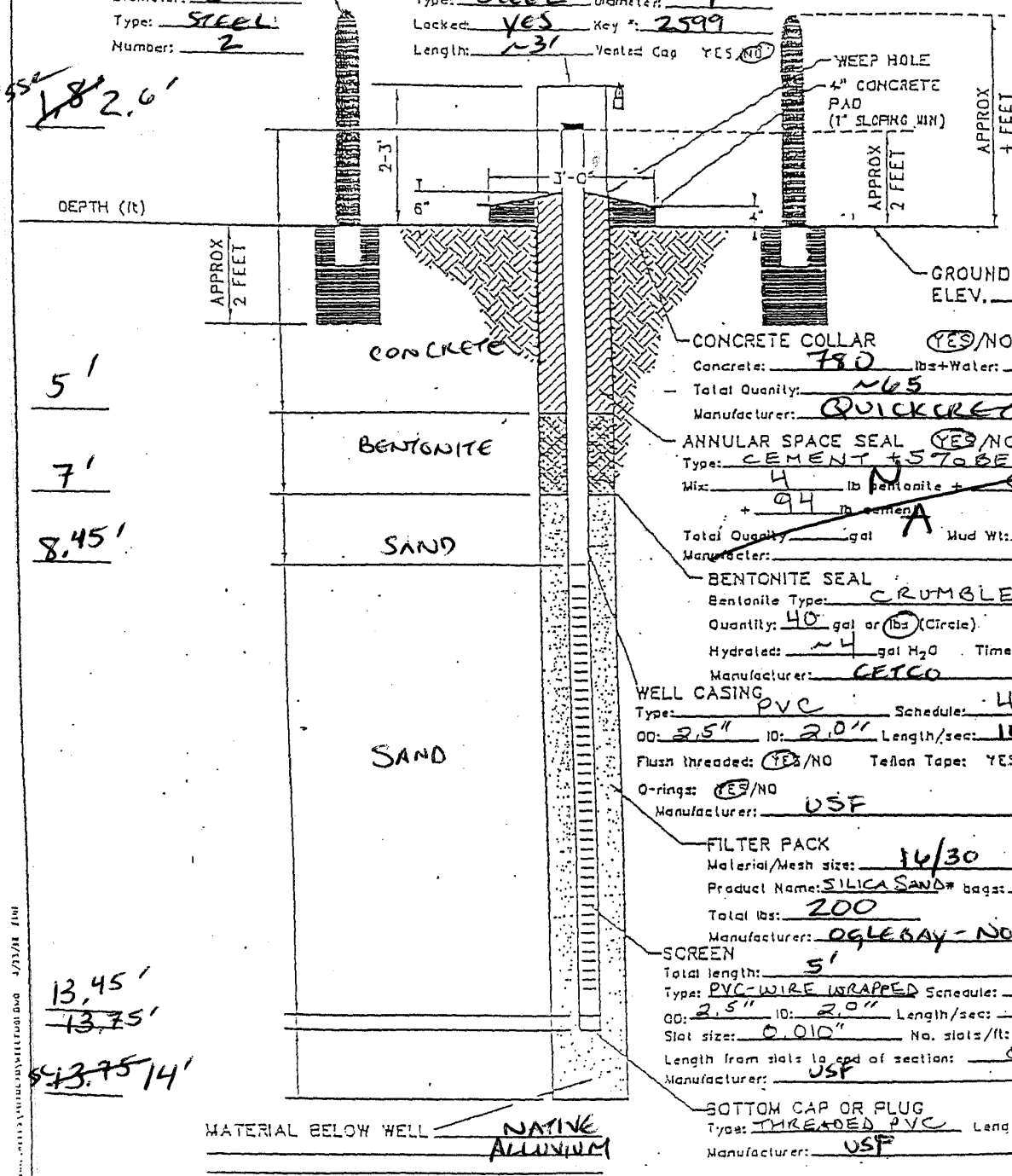
WELL LF4MW6

ABOVE GROUND WELL COMPLETION DETAILS

PROJECT: ~~11/13/01~~ LF4
DATE COMPLETED 11/13/01
LOCATION: SOUTH OF LF4MW5
PERMIT NO.

DRILLING METHOD: HSA
DRILLING COMPANY: SPECTRUM
FIELD GEOLOGIST: S. CARTER
STATIC DEPTH TO WATER: NA



CONCRETE COLLAR (YES)/NO
Concrete: 780 lbs+Water: 6 1/2 gal
Total Quanity: ~65 gal
Manufacturer: QUICKCRETE

ANNULAR SPACE SEAL (YES)/NO
Type: ~~CEMENT + 5% BENTONITE~~
Mix: ~~4 lb bentonite + 6 gal H_2O + 94 lb cement~~
Total Quanity ~~gal~~ Mud Wt: ~~lbs/gal~~
Manufacturer:

BENTONITE SEAL
Bentonite Type: CRUMBLES / CHIPS
Quantity: 40 gal or (lbs) (Circle)
Hydrated: ~4 gal H_2O Time: 1125
Manufacturer: CETCO

WELL CASING
Type: PVC Schedule: 40
OD: 2.5" ID: 2.0" Length/sec: 10'
Flush threaded: (YES)/NO Teflon Tape: YES/(NO)
O-rings: (YES)/NO
Manufacturer: USF

FILTER PACK
Material/Mesh size: 16/30
Product Name: SILICA SAND # bags: 4
Total lbs: 200
Manufacturer: OGLEBAY-NORTON

SCREEN
Total length: 5'
Type: PVC-WIRE WRAPPED Schedule: 40
OD: 2.5" ID: 2.0" Length/sec: 5'
Slot size: 0.010" No. slots/ft: 50/1
Length from slots to end of section: 0.5'
Manufacturer: USF

BOTTOM CAP OR PLUG
Type: THREADED PVC Length: 2"
Manufacturer: USF

MATERIAL BELOW WELL: NATIVE ALLUVIUM

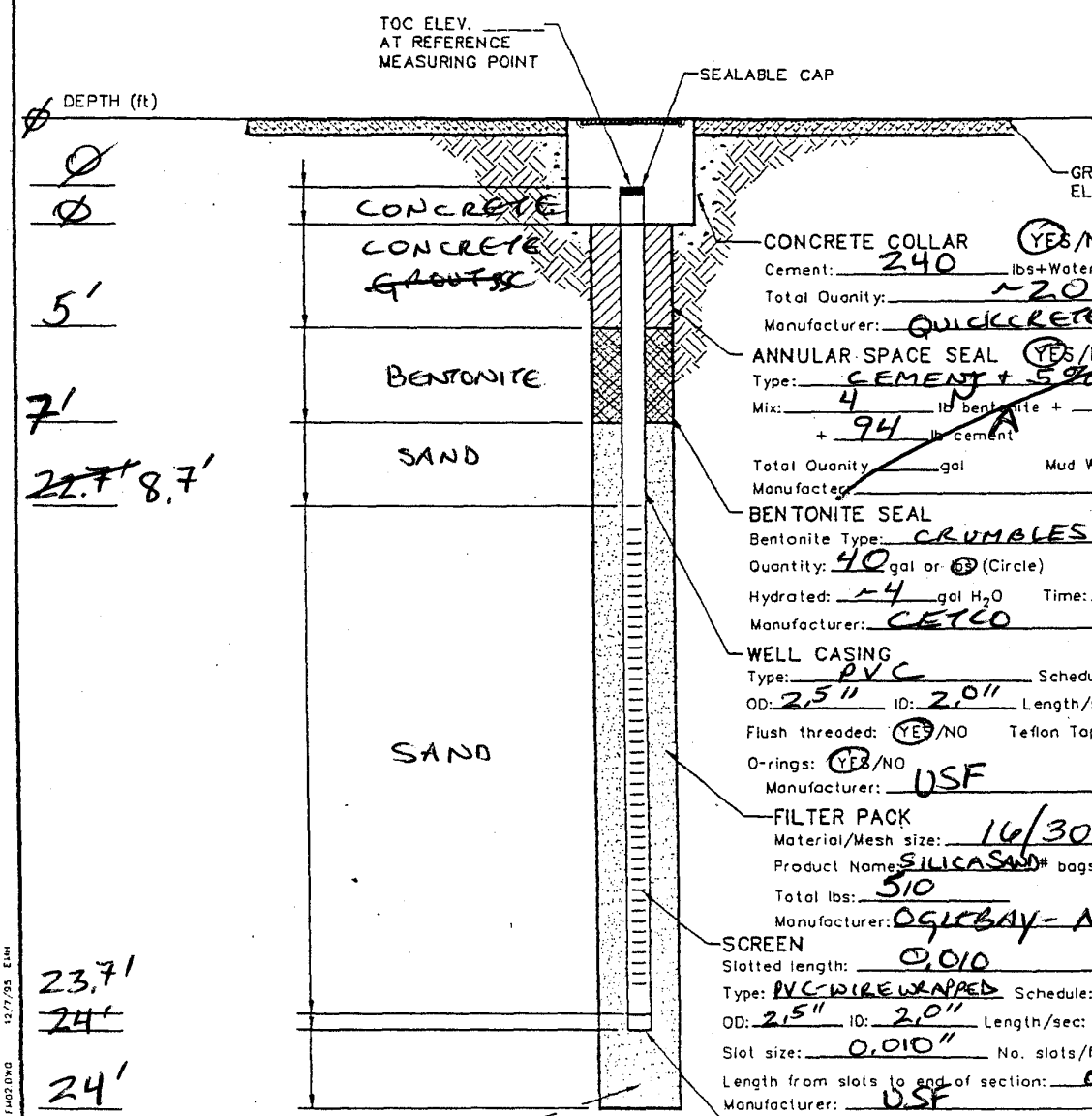
REMARKS: STRAIGHTNESS CHECKED OK - YES OR (NO) NOT CHECKED
REFERENCE MEASURING POINT LOCATION/DESCRIPTION: GROUND SURFACE
DEPTH TO WATER AFTER COMPLETION: NOT ENCOUNTERED ON 11/13/01 @ 0930
SIGNATURE OF PREPARER: [signature]

NOT TO SCALE

WELL LF4MW7
BELOW GROUND WELL COMPLETION DETAILS

PROJECT: LF4
DATE COMPLETED 11/12/01
LOCATION: E OF BLDG. #343 + SPECKER
PERMIT NO. _____

DRILLING METHOD: HSA
DRILLING COMPANY: SPECTRUM
FIELD GEOLOGIST: L. BARKAU
STATIC DEPTH TO WATER: N/A



CONCRETE COLLAR (YES)/NO
Cement: 240 lbs+Water: 2 gal
Total Quanity: ~20 gal
Manufacturer: QUICKCRETE

ANNULAR SPACE SEAL (YES)/NO
Type: CEMENT + 5% BENTONITE
Mix: 4 lb bentonite + 6 gal H_2O + 94 lb cement
Total Quanity _____ gal Mud Wt: _____ lbs/gal
Manufacter: _____

BENTONITE SEAL
Bentonite Type: CRUMBLES / CHIPS
Quantity: 40 gal or (lbs) (Circle)
Hydrated: ~4 gal H_2O Time: 1330
Manufacturer: CETCO

WELL CASING
Type: PVC Schedule: 40
OD: 2.5" ID: 2.0" Length/sec: 10'
Flush threaded: (YES)/NO Teflon Tape: YES/(NO)
O-rings: (YES)/NO
Manufacturer: USF

FILTER PACK
Material/Mesh size: 16/30
Product Name: SILICA SAND # bags: 10 1/3
Total lbs: 510
Manufacturer: OGLEBAY - NORTON

SCREEN
Slotted length: 0.010
Type: PVC-WIRE WRAPPED Schedule: 40
OD: 2.5" ID: 2.0" Length/sec: 10' + 5'
Slot size: 0.010" No. slots/ft: 50/1
Length from slots to end of section: 0.5"
Manufacturer: USF

BOTTOM CAP OR PLUG
Type: THREADED PVC Length: 2"
Manufacturer: USF

MATERIAL BELOW WELL NATIVE WEATHERED PIERRE SHALE

REMARKS: PLUMBNESS CHECKED OK - YES OR (NO) IF NO, WELL REPAIRED OR ABANDONED ? NOT CHECKED

REFERENCE MEASURING POINT LOCATION/DESCRIPTION: GROUND SURFACE

DEPTH TO WATER AFTER COMPLETION: NOT ENCOUNTERED ON 11/12/01 @ 1215

SIGNATURE OF PREPARER Stephanie Carter

NOT TO SCALE

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APPENDIX F

CORRECTIVE ACTION FORMS

CORRECTIVE ACTION FORM - FORT CARSON

RUST Environment and Infrastructure (RUST E&I) **Laboratory:** N/A
Task No. 89840.200
Date: 7/11/95

Initiated by: Field/Laboratory
Condition:
Monitoring well installation requires the placement of two feet of filter pack sand above the well screen. Four wells installed for the Group A RFI (LF4-MW1, LF4-MW2, LF4-MW3, and DRD-MW1) were installed at shallow depths due to a shallow water table. As a result only one foot of filter pack sand was installed above the well screen to allow the two foot bentonite seal to be added above the sand pac before reaching the ground surface. HSH 7/11/95.
Signature: [signature]

Review and Corrective Action: Field/Laboratory Coordinator
Due to unusual groundwater conditions, the well had to be installed close to the surface. All of the other wells at Fort Carson were installed according to the procedures outlined in the Final SAP (RUST, November 1994).

Signature: Carolin W. Whitsuler

Acceptance: Project Manager/Chemist

Signature: [signature]

File No.

CORRECTIVE ACTION - FORT CARSON

RUST Environment and Infrastructure (Rust) **Laboratory:** HydroLogic
Task No.: 89840.200
Date: 10/19/95

Initiated by: Field
Condition:

Rust originally requested that ground water from all Group A sites be analyzed for the following suite of metals by either EPA Method 6010 or the 7000 series:

Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc

This list of metals was not identified on the individual sample Chain-of-Custody forms, and as a result, all but one of the samples were analyzed for a short list of metals as follows:

Arsenic, Barium, Cadmium, Calcium, Chromium, Lead, Magnesium, Mercury, Potassium, Selenium, Silver, and Sodium

Signature: Holmistie Sarah Hodson

Review and Corrective Action: Field/Laboratory Coordinator

In the future, the laboratory will be sent a list of analytes to be sampled for in upcoming sampling efforts. The analytes will also be listed on the individual Chain-of-Custody forms by referring to a specific list of analytes (e.g. "Schedule A" will refer to a specific list of metals to be sampled for). This list will be submitted to the lab immediatly prior to sampling activities

** Corrective Action: Many of these metals were analyzed for by ICP (EPA Method 6010). The results were retrieved from the raw data packages for the following metals for all Group A wells: Al, Sb, Be, Cu, Co, Fe, Mn, Ni, Tl, V, Zn.

Signature: Terry A. Ridley

Acceptance: Project Manager/Chemist

Concur. DATA RETRIEVED FOR ALL ANALYTES, SOME DETECTION LIMITS HIGHER THAN PLANNED.

Signature: Terry A. Ridley Jane Hampel Stephens [signature]

File No. 89840.200 E

CORRECTIVE ACTION FORM - FORT CARSON

RUST Environment and Infrastructure (RUST E&I) **Laboratory:** Hydrologics

Task No. 89846-200

Date: 01/04/95

Initiated by: ~~Field/Laboratory~~ PROJECT CHEMIST

Condition:

Change Nitrate method from 9200 to E300.0 for waters and soils due to possible inconsistent analytical results from the 9200 colorimetric development process. Consulted with USACE Chemist, Janie Carrig, and she concurred. MDL studies from E300.0 should consistent accuracy and precision ≈ 99% ±2

Signature: Julie Hampel Stephens 01/04/95

Review and Corrective Action: Field/Laboratory Coordinator

Revised tables defining methods for Fort Carson will be generated.

Signature: Julie Hampel Stephens 01/04/95

Acceptance: Project Manager/Chemist

Signature: [illegible]

File No.

CORRECTIVE ACTION FORM - FORT CARSON

RUST Environment and Infrastructure (RUST E&I) **Laboratory:** Hydrologic Lab

Task No. Group A

Date: 01/31/95

Initiated by: Field/Laboratory (Project Chemist RUST)

Condition:

Thallium is not requested for Group A sites as written in the approved SAP. The laboratory was informed on 1/30/95 about eliminating Tl from the RUST reports and not to log in samples for Tl should it be listed on the Chain of Custody.

Signature: Janie Hampel Stephens

Review and Corrective Action: Field/Laboratory Coordinator

Signature:

Acceptance: Project Manager/Chemist

Signature:

File No.

APPENDIX G

SOIL BORING LOGS

HTW DRILLING LOG

HOLE NO.	LF4-MW1
SHEET 1 OF 2 SHEETS	

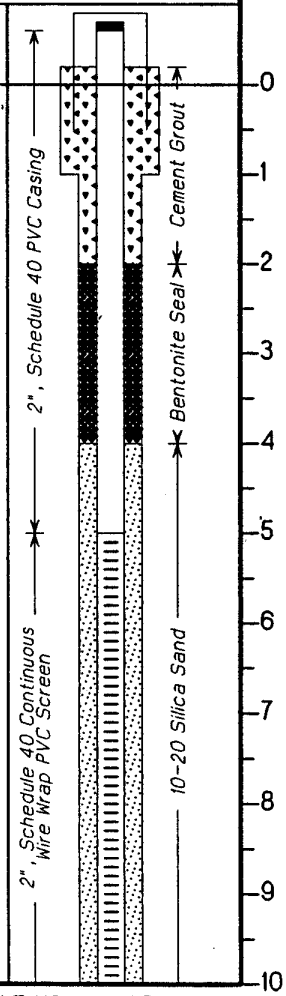
1. COMPANY NAME	RUST Environment & Infrastructure
2. DRILLING SUBCONTRACTOR	Site Services
3. PROJECT	Fort Carson
4. LOCATION	Landfill 4/Hazardous Waste Storage Area
5. NAME OF DRILLER	B. Dechante / J. Hegge
6. MANUFACTURERS DESIGNATION OF DRILL	CME 75
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	3.25" Inside Diameter, 6.25" Outside Diameter, Hollow Stem Auger, 3" Continuous Core Barrel
8. HOLE LOCATION	N: 1338405 E: 3199486
9. SURFACE ELEVATION	5875.9
10. DATE STARTED	3/22/95
11. DATE COMPLETED	3/22/95
12. OVERBURDEN THICKNESS	7.5 ft.
15. DEPTH GROUNDWATER ENCOUNTERED	6.5-7.5' very moist
13. DEPTH DRILLED INTO ROCK	8.5 ft.
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
14. TOTAL DEPTH OF HOLE	16 ft.
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	2 (see below)		NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OIL & GREASE	SVOC	PCB	21. TOTAL CORE REC.
NA	NA	NA	NA	NA	NA	NA%

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHERS (SPECIFY)	23. SIGNATURE OF INSPECTOR
	NA	Y	NA	Hollistir Sarah Hodson

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	REMARKS
		Pink top gravel				
1	ML	CLAYEY SILT (ML) Stiff, olive grey, damp, mostly silt, some clay, trace fine to medium grained sand.	Bkd. 0.0 Breath 0.6 Scrn 19.5		No Analytical Samples Collected	Recovery (Rec) 36" (0-4')
2		CLAYEY SILT (ML) Soft, olive grey (chunks of grey mudstone), damp, mostly silt, some clay, trace fine grained sand, caliche present.				
3		CLAY based on Geotechnical Analysis Cww For HSH 1/23/03		MW1-3/4 Geotech Samples		
4			Breath 0.6 Scrn 43.0			Rec 47" (4-9')
5						
6						
7	CL	SILTY CLAY (CL) Very soft, olive grey, moist, mostly clay, little silt, trace fine grained sand. CLAY based on Geotechnical Analysis Cww For HSH 1/23/03		MW1-7/8 Geotech Samples		
8		SILTSTONE/CLAYSTONE Soft, olive grey, orange brown zones where stained from iron oxide, dry, moderately to severely weathered, heavy iron oxide staining especially in fractures, black staining also found in fractures.				7.5' Bedroock
9						Rec 57" (9-14')
10						



HTW DRILLING LOG

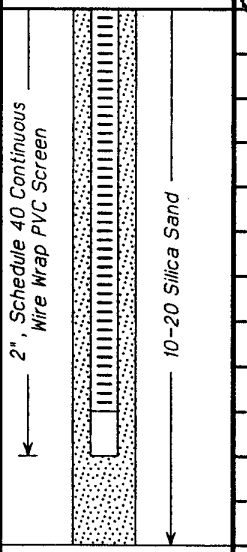
HOLE NO. LF4-MW1

1. COMPANY NAME: RUST Environment & Infrastructure

2. INSPECTOR: Hollistir Sarah Hodson

SHEET 2 OF 2 SHEETS

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	REMARKS
11		SILTSTONE/CLAYSTONE Soft, olive grey, orange brown zones where stained from iron oxide, dry, moderately to severely weathered, heavy iron oxide staining especially in fractures, black staining also found in fractures.				
12		SILTSTONE/CLAYSTONE Soft-medium stiff, olive grey, dry, moderately weathered, heavy iron oxide and black staining along fractures.			No Analytical Samples Collected	
13						
14		SILTSTONE/CLAYSTONE Soft-hard, olive grey, dry, medium fractures present, iron oxide and black staining in fractures (wet in some fractures).				Rec 36" (14-16')
15						
16		Bottom of exploration at 16' Monitoring well installed				
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						



MRK Form 55-2

PROJECT: 89840.200 Fort Carson

HOLE NO.: LF4-MW1

HTW DRILLING LOG

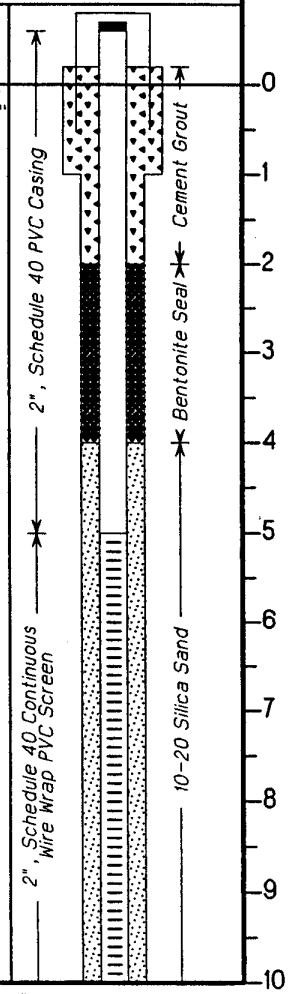
HOLE NO.	LF4-MW2
SHEET 1 OF 2 SHEETS	
1. COMPANY NAME	RUST Environment & Infrastructure
2. DRILLING SUBCONTRACTOR	Site Services
3. PROJECT	Fort Carson
4. LOCATION	Landfill 4/Hazardous Waste Storage Area
5. NAME OF DRILLER	B. Dechante / J. Hegge
6. MANUFACTURERS DESIGNATION OF DRILL	CME 75
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	3.25" Inside Diameter, 6.25" Outside Diameter; Hollow Stem Auger; 3" Continuous Core Barrel
8. HOLE LOCATION	N: 1338329 E: 3199718
9. SURFACE ELEVATION	5876.5
10. DATE STARTED	3/22/95
11. DATE COMPLETED	3/22/95
12. OVERBURDEN THICKNESS	3 ft.
15. DEPTH GROUNDWATER ENCOUNTERED	NA
13. DEPTH DRILLED INTO ROCK	13 ft.
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
14. TOTAL DEPTH OF HOLE	16 ft.
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
	2 (see below)		NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OIL & GREASE	SVOC	PCB	21. TOTAL CORE REC.
NA	NA	NA	NA	NA	NA	NA%

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHERS (SPECIFY)	23. SIGNATURE OF INSPECTOR
	NA	Y	NA	Hollistir Sarah Hodson

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	REMARKS
		Asphalt	Bkd. 0.0 Breath 0.1 Screen 2.5		No Analytical Samples Collected	Recovery (Rec) 30" (0-4')
1	SM	SILTY SAND WITH GRAVEL (SM) Very loose, reddish pink, moist, mostly sand, little silt/clay, few fine to coarse gravel.				
2	SW	WELL GRADED SAND WITH GRAVEL (SW) Very loose, reddish pink, moist, mostly well graded sand, few fine to coarse gravel.				
3		SILTSTONE/CLAYSTONE Medium stiff-soft, olive grey, dry, moderately to severely weathered, iron oxide staining present in fractures (few to trace), little caliche present.		MW2-3/4 Geotech Sample		
4		CLAY, ~~trace gravel~~ based on geotechnical analysis - CWW For HSH 1/23/03				Rec 58" (4-9')
5						
6						
7						
8						
9		CLAY, ~~some sand~~ trace gravel based on geotechnical analysis CWW For HSH 1/23/03		MW2-9/10 Geotech Sample		Rec 52" (9-14')
10						



MRK Form 55-2

PROJECT: 89840.200 Fort Carson

HOLE NO.: LF4-MW2

HTW DRILLING LOG

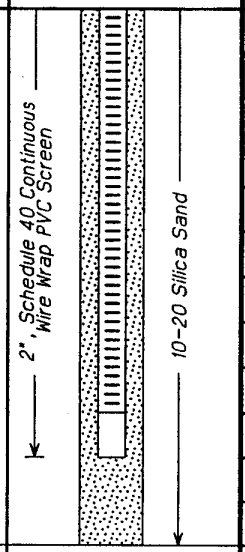
HOLE NO. LF4-MW2

1. COMPANY NAME: RUST Environment & Infrastructure

2. INSPECTOR: Hollistir Sarah Hodson

SHEET 2 OF 2 SHEETS

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	REMARKS
11		SILTSTONE/CLAYSTONE Medium stiff-soft, olive grey, dry, moderately to severely weathered, iron oxide staining present in fractures (few to trace), little caliche present.				
12		Same as above				
13					No Analytical Samples Collected	
14						Rec 40" (14-16')
15						
16		Bottom of exploration at 16' Monitoring well installed				
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						



MRK Form 55-2

PROJECT: 89840.200 Fort Carson

HOLE NO.: LF4-MW2

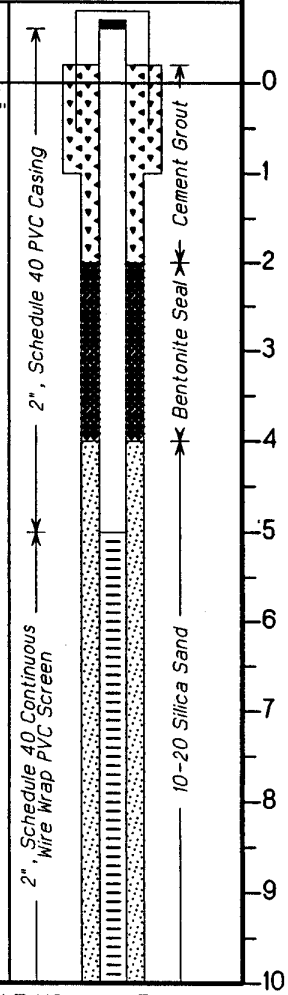
HTW DRILLING LOG

HOLE NO.	LF4-MW3
SHEET 1	OF 2 SHEETS
1. COMPANY NAME	RUST Environment & Infrastructure
2. DRILLING SUBCONTRACTOR	Site Services
3. PROJECT	Fort Carson
4. LOCATION	Landfill 4/Hazardous Waste Storage Area
5. NAME OF DRILLER	B. Dechante / J. Hegge
6. MANUFACTURERS DESIGNATION OF DRILL	CME 75
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	3.25" Inside Diameter, 6.25" Outside Diameter Hollow Stem Auger 3" Continuous Core Barrel
8. HOLE LOCATION	N: 1338675 E: 3199690
9. SURFACE ELEVATION	5872.9
10. DATE STARTED	3/22/95
11. DATE COMPLETED	3/22/95
12. OVERBURDEN THICKNESS	7.5 ft.
15. DEPTH GROUNDWATER ENCOUNTERED	11
13. DEPTH DRILLED INTO ROCK	8.5 ft.
6. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	14' 10min
14. TOTAL DEPTH OF HOLE	16 ft.
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	10.5' 20min
18. GEOTECHNICAL SAMPLES	DISTURBED: 2 (see below); UNDISTURBED:
19. TOTAL NUMBER OF CORE BOXES	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OIL & GREASE	SVOC	PCB	21. TOTAL CORE REC.
NA	NA	NA	NA	NA	NA	NA%

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHERS (SPECIFY)	23. SIGNATURE OF INSPECTOR
	NA	Y	NA	Hollistir Sarah Hodson

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	REMARKS
		Pink Gravel (road parking lot)	Bkd. 0.0 Breath 0.6 Screen 2.6			Recovery (Rec) 24" (0-4')
1	CL	SANDY CLAY WITH GRAVEL (CL) Soft, reddish brown, damp, mostly silty clay, little fine to coarse grained sand, few fine to coarse gravel.				
2						
3		CLAY, some sand based on Geotechnical analysis CWW For HSH 1/23/03				
4		SILTY CLAY (CL) Soft, olive green, damp, mostly clay, little silt, caliche present, trace fine grained sand, heavy iron oxide sraining present.	Breath 0.5 Screen 2.9	MW3-3/4 Geotech Sample	No Analytical Samples Collected	Rec 36" (4-9')
5						
6						
7						
8		SILTSTONE/CLAYSTONE Medium stiff, olive green, dry, severely weathered, highly fractured, iron oxide staining and caliche present.				
9		CLAY based on geotechnical analysis - CWW For HSH 1/23/03 SILTSTONE/CLAYSTONE Soft, olive green, moist-damp, severely weathered.	Breath 0.5 Screen 2.0	MW3-9/10 Geotech Sample		Rec 45" (9-14')
10						



MRK Form 55-2 | PROJECT: 89840.200 Fort Carson | HOLE NO.: LF4-MW3

HTW DRILLING LOG

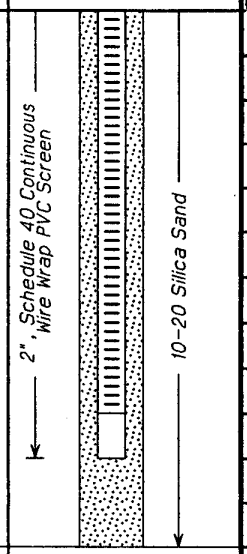
HOLE NO. LF4-MW3

1. COMPANY NAME: RUST Environment & Infrastructure

2. INSPECTOR: Hollistir Sarah Hodson

SHEET 2 OF 2 SHEETS

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	REMARKS
11		SILTSTONE/CLAYSTONE Soft, olive green, moist-damp, severely weathered. CLAYSTONE Soft, olive green, moist, very severely weathered, water found in between hard siltstone in fractures - weathered in fractures. SILTSTONE/CLAYSTONE Medium stiff, olive grey, trace orangish brown in fractures from iron staining, moderately weathered, calcium carbonate (caliche present in fractures).			No Analytical Samples Collected	Water at 11' Rec 45" (14-16')
16		Bottom of exploration at 16' Monitoring well installed				



MRK Form 55-2

PROJECT: 89840.200 Fort Carson

HOLE NO.: LF4-MW3

HTW DRILLING LOG

Hole No. LF4MW04

1. Company Name: Earth Tech	**2. Drilling Contractor:** Spectrum **Sheet** 1
3. Project: Landfill 4	**4. Location:** Fort Carson, Colorado
5. Name of Driller: S. Whitley	**6. Manufacturers Designation of Drill:** CME 75
7. Sizes and Types 8" OD HSA, **of Drilling** 4" continuous ss sampler **and Sampling Equipment**	**8. Hole Location Northing: Easting:**
	9. Surface Elevation:
	10. Started **10. Date:** 1/17/01 **10. Time:** 0930
	11. Completed **11. Date:** 1/17/01 **11. Time:** 1100
12. Overburden Thickness (ft): 4	**15. Depth GW First Encountered (BGS)** **15. Depth:** Not encountered **15. Date: 15. Time:**
13. Depth Drilled into Bedrock (ft): 15	**16. Depth to Water and Time Measured** **16. Depth: 16. Date: 16. Time:**
14. Total Depth of Hole (ft): 19	**17. Other Water Level Measurements:**
18. Sampled for Geotechnical Testing Undisturbed: Disturbed:	**19. Total Number of Core Boxes:** none
20. Samples for Chemical Analysis **VOCs:** 2 **SVOCs:** 2 **Metals:** 2 **Other (Specify)**	**21. Total core Rec %** na
22. Disposition of Hole Backfilled: Monitoring Well: 2" PVC	**Other (Specify Type)** **23. Inspector** Kevin Mathews

COMMENTS:

TW DRILLING LOG

Hole No. LF4MW04

1. Company Name: Earth Tech | 2. Inspector: Kevin Mathews | Sheet 2

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT - RECOVERY	REMARKS
		Asphalt					
1		**GM, SANDY GRAVEL,** moist, 5yr6/6 reddish yellow, non-plastic, massive, sharp gradation, subrounded gravel to 3/4" with 40% c, m, f sand; subgrade fill.					1
		No recovery					
2						1.5/4.0	2
3							3
4		**Pierre Shale** CL, Claystone bedrock, medium density, moist, 2.5Y4/2 Dark grayish brown, medium plasticity, blocky, Fe staining on fracture surfaces. Weathered bedrock.	HS=0.0				4
5							5
6						5/5	6
7							7
8			HS=0.0				8
9		**Pierre Shale** as above,					9
10							10

PROJECT: Landfill 4 | HOLE NO. LF4MW04

TW DRILLING LOG

Hole No. LF4MW04

1. Company Name: Earth Tech | 2. Inspector: Kevin Mathews | Sheet 2

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT - RECOVERY	REMARKS
11							11
12						5/5	12
							wet, soft - potential water-bearing zone.
13		13 -13.5 feet - color change to 2.5Y4/1 dark gray, stiff.					13
			HS=0.0		LF4MW04 (13-14)		
14		as above					14
15							15
16							16
						5/5	
17							17
18							18
			HS=0.0		LF4MW04 (18-19)		
19		End of Log					19
20							20

PROJECT: Landfill 4 | HOLE NO. LF4MW04

HTW DRILLING LOG

Hole No. LF4MW05

1. Company Name: Earth Tech	**2. Drilling Contractor:** Spectrum **Sheet** 1
3. Project: Landfill 4	**4. Location:** Fort Carson, Colorado
5. Name of Driller: S. Whitley	**6. Manufacturers Designation of Drill:** CME 75
7. Sizes and Types 8" OD HSA	**8. Hole Location Northing:** **Easting:**
of Drilling 4" continuous ss sampler	**9. Surface Elevation:**
and Sampling	**10. Started** / **11. Completed**
Equipment	**10. Date:** 1/17/01 **10. Time:** 1240 / **11. Date:** 1/17/01 **11. Time:** 1340
12. Overburden Thickness (ft): 10.5	**15. Depth GW First Encountered (BGS)** Not encountered
	15. Depth: **15. Date:** **15. Time:**
13. Depth Drilled into Bedrock (ft): 2	**16. Depth to Water and Time Measured**
	16. Depth: **16. Date:** **16. Time:**
14. Total Depth of Hole (ft): 12.5	**17. Other Water Level Measurements:**
18. Sampled for Geotechnical Testing Undisturbed: **Disturbed:**	**19. Total Number of Core Boxes:** na
20. Samples for Chemical Analysis **VOCs:** 2 **SVOCs:** 2	**21. Total core Rec %**
Metals: 2 **Other (Specify)**	
22. Disposition of Hole Backfilled: **Other (Specify Type)**	
Monitoring Well: 2" PVC	**23. Inspector** Kevin Mathews

COMMENTS:

TW DRILLING LOG

1. Company Name: **2. Inspector:** **Sheet**

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT - RECOVERY	REMARKS
		CL, SILTY CLAY Medium stiff, moist, 10YR4/2 dark grayish brown, high plasticity, massive, root zone.					
1		**CLAY w/SAND AND GVL** Medium stiff, saturated, 10YR3/2 very dark grayish brown.High plasticity.15% medium sand to fine gravel.	HS=0.0				1
2						4/4	2
3			HS=0.0				3
4		as above, minor black mottling and roots from 4.0 to 5.0'	HS=0.0		LF4MW05 (4-5)		4
5							5
6						5/5	6
7							7
8		**LAYEY GRAVEL w/SAND** Medium dense, moist, 10YR4/6 dark yellowish brown, low plasticity, subrounded gvl to 3/4" with 40% f, m, c sand.	HS=0.0				8
9		gradational change, increasing clay, decreasing sand and gravel, wet.					9
10							10

PROJECT: **HOLE NO.**

TW DRILLING LOG

Hole No.

1. Company Name: 2. Inspector: Sheet

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT - RECOVERY	REMARKS
11		**CL, SILTY CLAY** stiff, dry, 2.5Y4/4 olive brown, medium plasticity, blocky, weathered Pierre shale.				4.5/4.5	11
12					LF4MW05 (12-13)		12
13			HS=0.0				13
		End of Log					
14							14
15							15
16							16
17							17
18							18
19							19
20							20

PROJECT: HOLE NO.

HTW DRILLING LOG

HOLE NO.	LF4-SB1
SHEET 1 OF 2 SHEETS	

1. COMPANY NAME	RUST Environment & Infrastructure
2. DRILLING SUBCONTRACTOR	Site Services
3. PROJECT	Fort Carson
4. LOCATION	Landfill #4
5. NAME OF DRILLER	B. Dechante / J. Hegge
6. MANUFACTURERS DESIGNATION OF DRILL	CME 75
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	3.25" Inside Diameter, 6.25" Outside Diameter; Hollow Stem Auger; 3" Continuous Core Barrel
8. HOLE LOCATION	N: 1338623 E: 3199690
9. SURFACE ELEVATION	5875.3
10. DATE STARTED	1/25/95
11. DATE COMPLETED	1/25/95
12. OVERBURDEN THICKNESS	2.5 ft.
15. DEPTH GROUNDWATER ENCOUNTERED	~14.5', ~19'No Sat. Cuttings
13. DEPTH DRILLED INTO ROCK	21.5 ft.
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
14. TOTAL DEPTH OF HOLE	24 ft.
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA		0

20. SAMPLES SENT TO LAB FOR ANALYSIS	METALS	EXPLOSIVES	NITRATES	SVOC	VOC	PCB	OIL & GREASE
4/5, 9/10	1x125 ml	1x4 oz	0	1x16 oz	0	w/ svoc jar	0

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHERS (SPECIFY)	23. SIGNATURE OF INSPECTOR
	NA	NA	GROUTED	Hollistir Sarah Hodson

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNTS	REMARKS
		Pink road gravel.	Bkgd 0.0 Breath 0.0 Screen 0.0	NA	SB 1-0/1	NA Contin. Core Sampler	Recovery (Rec) (0-4 ft.) 3" Time 0910
1	CL	SANDY CLAY WITH GRAVEL (CL) Soft, reddish brown (orange), damp, mostly clay, some fine- to coarse-grained sand (granite, little fine to coarse gravel, weathered granite).					
2		CLAY (CL) Medium stiff, olive green, damp, mostly clay, few silt, iron oxide stringers present, calcium carbonate deposits also present.					
3		CLAYSTONE/SILTSTONE Medium stiff, olive gray/brown, damp, blocky, moderately to severely weathered, heavy iron staining and calcium carbonate deposits in fractures. Moist in fractures (weathered into clay).					
4			Breath 0.0 Screen 1.0		SB 1-4/5		Rec (4-9 ft.) 60" Time 0920
5							
6							
7							
8							
9		SILTSTONE/CLAYSTONE Medium stiff, olive gray, (brown from iron oxide), moderately to severely weathered, blocky, heavy calcium carbonate staining and deposits, crystals and layers.	Breath 0.0 Screen 2.0		SB 1-9/10		Rec (9-14 ft.) 60" Time 0940
10							

HTW DRILLING LOG

HOLE NO. LF4-SB1

1. COMPANY NAME: RUST Environment & Infrastructure

2. INSPECTOR: Hollistir Sarah Hodson

SHEET 2 OF 2 SHEETS

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNTS	REMARKS
11		SILTSTONE/CLAYSTONE Medium stiff, olive gray, (brown from iron oxide), moderately to severely weathered, blocky, heavy calcium carbonate staining and deposits, crystals and layers.		NA		NA Contin. Core Sampler	
12							
13							
14		SILTSTONE/CLAYSTONE Stiff, medium olivish brown, damp, moist in fractures (weathered into soft clay/silt ~1" thick only), blocky but more massive than above (harder), heavy calcium carbonate and iron staining.	Breath 0.0 Screen 2.0		SB 1-14/15		Rec (14-19 ft.) 60.5" Time 0950
15							
16							
17							
18				NA		NA	
19		SILTSTONE/CLAYSTONE Hard, olive gray, damp, moist to wet in one 19' fracture, moist in most fractures, weathered siltstone/claystone into soft clay, heavy calcium carbonate deposits in voids/fractures, crystals present, moderately to severely weathered.	Breath 0.0 Screen 1.2		SB 1-19/20		Rec (19-24 ft.) 56" Time 1000
20							
21							
22							
23							
24		PIERRE SHALE Hard, dark gray/black, dry, fresh.					Auger refusal at 24 ft.
25		TOTAL DEPTH = 24.0 FEET boring filled with cement/bentonite upon completion.					
26							
27							

MRF Form PDA-FTCb

PROJECT: 89840.200 Fort Carson

HOLE NO.: LF4-SB1

HTW DRILLING LOG

HOLE NO.	LF4-SB2
SHEET 1 OF 2 SHEETS	

1. COMPANY NAME	RUST Environment & Infrastructure
2. DRILLING SUBCONTRACTOR	Site Services
3. PROJECT	Fort Carson
4. LOCATION	Landfill #4
5. NAME OF DRILLER	B. Dechante / J. Hegge
6. MANUFACTURERS DESIGNATION OF DRILL	CME 75
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	3.25" Inside Diameter, 6.25" Outside Diameter; Hollow Stem Auger; 3" Continuous Core Barrel
8. HOLE LOCATION	N: 1338462 E: 3199483
9. SURFACE ELEVATION	5875.9
10. DATE STARTED	1/25/95
11. DATE COMPLETED	1/25/95
12. OVERBURDEN THICKNESS	1.5 ft.
15. DEPTH GROUNDWATER ENCOUNTERED	NA
13. DEPTH DRILLED INTO ROCK	20.5 ft.
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
14. TOTAL DEPTH OF HOLE	22 ft.
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA		0

20. SAMPLES SENT TO LAB FOR ANALYSIS	METALS	EXPLOSIVES	NITRATES	SVOC	VOC	PCB	OIL & GREASE
4/5, 9/10	1x125 ml	1x4 oz	0	1x16 oz	0	w/ svoc jar	0

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHERS (SPECIFY)	23. SIGNATURE OF INSPECTOR
	NA	NA	GROUTED	Hollistir Sarah Hodson

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNTS	REMARKS
		Dark pink road gravel.	Bkgd 0.0 Breath 0.0 Screen 0.6				
1	CL	CLAY Soft, olive grey, damp, mostly clay, little to some silt, trace calcium carbonate and iron oxide staining and black staining.			SB 2-0/1		Recovery (Rec) (0-4 ft.) 4" Time 1055
2		CLAYSTONE/SILTSTONE Soft, olive grey, brown, damp, mostly siltstone, moderately weathered, calcium carbonate present in fractures, some iron oxide staining, blocky.					
3							
4		SILTSTONE/CLAYSTONE Soft to medium stiff, olive grey, damp (moist along fractures), moderately to severely weathered, iron staining along fractures, calcium carbonate present in voids.	Breath 0.0 Screen 2.3		SB 2-4/5		Rec (4-9 ft.) 60" Time 1110
5				NA		NA Contin. Core Sampler	
6							
7							
8							
9		SILTSTONE/CLAYSTONE - Very soft, olive grey, brown, moist, very severely weathered, high calcium carbonate staining and heavy iron oxide staining.	Breath 0.0 Screen 2.6		SB 2-9/10		Rec (9-14 ft.) 58" Time 1125
10							

HTW DRILLING LOG

HOLE NO. LF4-SB2

1. COMPANY NAME: RUST Environment & Infrastructure

2. INSPECTOR: Hollistir Sarah Hodson

SHEET 2 OF 2 SHEETS

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNTS	REMARKS
11, 12, 13		SILTSTONE/CLAYSTONE Medium stiff, olive grey, damp, moderately weathered, blocky, some iron staining in fractures, trace calcium carbonate staining.		NA		NA Contin. Core Sampler	
14, 15, 16, 17, 18		SILTSTONE/CLAYSTONE Stiff (hard), grey/olive-grey, damp to dry, slightly weathered, massive, iron oxide staining found in trace amounts (speckled in fractures).	Breath 0.0 Screen 2.0	NA	SB 2-14/15	NA	Rec (14-19 ft.) 62" Time 1140 Soap used on threads of continuous core barrel from 14' to 19'.
19, 20		SILTSTONE Medium stiff-soft (hard in spots), brownish olive grey, damp, moist in 1-2 fractures, moderately to severely weathered, heavy iron staining.	Breath 0.0 Screen 1.5		SB 2-19/20		Rec (19-22 ft.) 34" Time 1150
21		PIERRE SHALE Hard, dark grey/brownish grey, dry, damp, slightly to moderately weathered, layers of iron staining present.					
22		TOTAL DEPTH = 22 FEET boring filled with cement/bentonite upon completion.					Auger refusal at 22 ft.
23, 24, 25, 26, 27							

HTW DRILLING LOG

HOLE NO.	LF4-SB3
SHEET 1 OF 2 SHEETS	
1. COMPANY NAME	RUST Environment & Infrastructure
2. DRILLING SUBCONTRACTOR	Site Services
3. PROJECT	Fort Carson
4. LOCATION	Landfill #4
5. NAME OF DRILLER	B. Dechante / J. Hegge
6. MANUFACTURERS DESIGNATION OF DRILL	CME 75
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	3.25" Inside Diameter, 6.25" Outside Diameter; Hollow Stem Auger; 3" Continuous Core Barrel
8. HOLE LOCATION	N: 1338286 E: 3199582
9. SURFACE ELEVATION	5875.1
10. DATE STARTED	1/25/95
11. DATE COMPLETED	1/25/95
12. OVERBURDEN THICKNESS	12.5 ft.
15. DEPTH GROUNDWATER ENCOUNTERED	10.5' and 11.25'
13. DEPTH DRILLED INTO ROCK	1.55 ft.
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
14. TOTAL DEPTH OF HOLE	14 ft.
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	X		1x16 oz

20. SAMPLES SENT TO LAB FOR ANALYSIS	METALS	EXPLOSIVES	NITRATES	SVOC	VOC	PCB	OIL & GREASE
0/1, 4/5	1x125 ml	1x4 oz	0	1x16 oz	0	w/ svoc jar	0

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHERS (SPECIFY)	23. SIGNATURE OF INSPECTOR
	NA	NA	GROUTED	Hollistir Sarah Hodson

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNTS	REMARKS
		Asphalt	Bkgd 0.0 Breath 0.0 Screen 2.0				
1	SM	SILTY SAND (SM) Loose, mottled, dark pink, moist, mostly well-graded sand, little silt. - Fill Material -			SB 3-0/1		Recovery (Rec) (0-4 ft.) 32" Time 1250
2	GM CL	SILTY GRAVEL (GM) Dense, dark pink, moist, mostly coarse gravel, some silt, few fine- to coarse-grained sand. SILTY CLAY (CL) Medium stiff, olive gray, moist, mostly clay, little silt, calcium carbonate stringers present, wood and piece of chalk found at top of clay, iron oxide staining also present.					
3							
4			Breath 0.0 Screen 2.0				Rec (4-9 ft.) 62" Time 1300
					SB 3-4/5		
5		CLAY (CL) Very soft, olive brown, moist, highly plastic, mostly clay, trace coarse-grained sand.		NA		NA Contin. Core Sampler	
6							
7							
8							
9			Breath 0.0 Screen 2.3				Rec (9-14 ft.) 49" Time 1310
					SB 3-9/10		
10							

MRF Form PDA-FTCb

PROJECT: 89840.200 Fort Carson

HOLE NO.: LF4-SB3

HTW DRILLING LOG

HOLE NO. LF4-SB3

1. COMPANY NAME: RUST Environment & Infrastructure

2. INSPECTOR: Hollistir Sarah Hodson

SHEET 2 OF 2 SHEETS

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNTS	REMARKS
	CL						
	SC	CLAYEY SAND (SC) - Very loose, olive grey, saturated, mostly fine- to coarse-grained sand, little fine gravel (angular sand grains), little to few clay.					Water encountered.
11	CL	CLAY as above.					
12		SANDY CLAY (CL) - Soft, olive grey, wet to moist, mostly clay, some fine- to coarse-grained sand, trace fine gravel.		NA		NA Contin. Core Sampler	
13		CLAY WITH SAND (CL) Medium stiff, olive green, moist, mostly clay with little fine- to coarse-grained sand, few fine gravel.					
14		CLAYSTONE Medium stiff, olive green mottled gray, damp, severely weathered, blocky.					
15		TOTAL DEPTH = 14.0 FEET boring filled with cement/bentonite upon completion.					
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							

HTW DRILLING LOG

HOLE NO.	LF4-SB4
SHEET 1 OF 2 SHEETS	

1. COMPANY NAME	RUST Environment & Infrastructure
2. DRILLING SUBCONTRACTOR	Site Services
3. PROJECT	Fort Carson
4. LOCATION	Landfill #4
5. NAME OF DRILLER	B. Dechante / J. Hegge
6. MANUFACTURERS DESIGNATION OF DRILL	CME 75
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	3.25" Inside Diameter, 6.25" Outside Diameter; Hollow Stem Auger; 3" Continuous Core Barrel
8. HOLE LOCATION	N: 1338045 E: 3199647
9. SURFACE ELEVATION	5873.5
10. DATE STARTED	1/25/95
11. DATE COMPLETED	1/25/95
12. OVERBURDEN THICKNESS	14 ft.
15. DEPTH GROUNDWATER ENCOUNTERED	~10-14 ft.
13. DEPTH DRILLED INTO ROCK	0 ft.
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
14. TOTAL DEPTH OF HOLE	14 ft.
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	X		0

20. SAMPLES SENT TO LAB FOR ANALYSIS	METALS	EXPLOSIVES	NITRATES	SVOC	VOC	PCB	OIL & GREASE
0/1, 4/5	1x125 ml	1x4 oz	1x16 oz	0	0	0	0

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHERS (SPECIFY)	23. SIGNATURE OF INSPECTOR
	NA	NA	GROUTED	Hollistir Sarah Hodson

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNTS	REMARKS
0		Asphalt					
0–1	SM	SILTY SAND (SM) Very loose, dark pink, damp, mostly well-graded, fine- to coarse grained sand, little to few silt. - Fill Material -	Bkgd 0.0 Breath 0.0 Screen 1.1		SB 4-0/1		Recovery (Rec) (0-4 ft.) 21" Time 0910
1–2	GM	SILTY GRAVEL (GM) Dense, dark pink, moist, mostly coarse gravel with some silt, few fine- to coarse-grained sand.					
2–3	CL	CLAY (CL) Very soft, olive brown mottled gray, moist, mostly clay, trace silt, calcium carbonate stringers, trace iron oxide staining.					
3–4		CLAY (CL) Medium stiff, olive gray, moist to damp, blocky, mostly clay, trace silt, calcium carbonate and iron oxide staining present.					
4–5		CLAY (CL) As above.	Breath 0.0 Screen 0.8	NA	SB 4-4/5	NA Contin. Core Sampler	Rec (4-9 ft.) 62" Time 0915
5–6							
6–7							
7–8		CLAY WITH GRAVEL (CL) Very soft, olive gray to gray mottled, moist to wet, mostly clay, little coarse-grained sand to fine gravel.					
8–9							
9–10			Breath 0.0 Screen 0.8				Rec (9-14 ft.) 62"

HTW DRILLING LOG

HOLE NO. LF4-SB4

1. COMPANY NAME: RUST Environment & Infrastructure

2. INSPECTOR: Hollistir Sarah Hodson

SHEET 2 OF 2 SHEETS

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNTS	REMARKS
	CL	CLAY (CL) Very soft, olive gray, moist to wet, mostly clay, trace silt. (Very severely weathered Pierre shale?)		NA		NA Contin. Core Sampler	Water Encountered.
11							
12				NA		NA	
13							
14		CLAYSTONE Medium stiff, orange, damp, very severely weathered, high calcium carbonate and iron oxide staining.					
		TOTAL DEPTH = 14.0 FEET boring filled with cement/bentonite upon completion.					
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							

HTW DRILLING LOG

Hole No. LF4DP1

1. Company Name: Earth Tech	**2. Drilling Contractor:** Spectrum Exploration **Sheet** 1
3. Project: Landfill 4	**4. Location:** Fort Carson
5. Name of Driller: Marc Haes	**6. Manufacturers Designation of Drill:** CME 55 w/ Direct Push mods
7. Sizes and Types of Drilling and Sampling Equipment	**8. Hole Location Northing:** **Easting:**
	9. Surface Elevation:
	10. Started **10. Date:** 1/18/01 **10. Time:** 0845
	11. Completed **11. Date:** 1/18/01 **11. Time:** 0930
12. Overburden Thickness (ft): 11	**15. Depth GW First Encountered (BGS)** **15. Depth:** **15. Date:** **15. Time:**
13. Depth Drilled into Bedrock (ft): 0	**16. Depth to Water and Time Measured** **16. Depth:** **16. Date:** **16. Time:**
14. Total Depth of Hole (ft):	**17. Other Water Level Measurements:**
18. Sampled for Geotechnical Testing Undisturbed: **Disturbed:**	**19. Total Number of Core Boxes:** na
20. Samples for Chemical Analysis **VOCs:** 3 **SVOCs:** 3 **Metals:** 3 **Other (Specify)**	**21. Total core Rec %**
22. Disposition of Hole Backfilled: **Monitoring Well:**	**Other (Specify Type)** temporary well **23. Inspector** Kevin Mathews

COMMENTS:

TW DRILLING LOG

Hole No. LF4DP1

1. Company Name: Earth Tech | 2. Inspector: Kevin Mathews | Sheet 2

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT - RECOVERY	REMARKS
		SW, GRAVELLY SAND medium dense, moist, 2.5YR5/3 light olive brown, low plasticity, interbedded, 20% gravel to 1/4" w/ f, m, c sand in a clay/silt matrix.					
1							1
2						4/4	2
3			HS=0.0				3
4							4
5		**w/minor gravel and sand** medium stiff, wet, 2.5YR5/4 light olive brown, high plasiticy, massive, clay with 10% imbedded gravel and coarse sand.					4' - 7' black organic layer not apparent in continuous sample 5
6						4/4	6
7			HS=0.0		LF4DP1 (7.5-8), LF4DP1 (7.5-8) Dup		7
8		as above, grading to weathered claystone.					8
9					LF4DP1 (9-11)	3/3	9
10			HS=0.0				10

PROJECT: Landfill 4 | HOLE NO. LF4DP1

TW DRILLING LOG

Hole No. LF4DP1

1. Company Name: Earth Tech | 2. Inspector: Kevin Mathews | Sheet 2

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT - RECOVERY	REMARKS
						3/3	Push rod refusal at 11'
11		End of Log					11
12							12
13							13
14							14
15							15
16							16
17							17
18							18
19							19
20							20

PROJECT: Landfill 4 | HOLE NO. LF4DP1

HTW DRILLING LOG

Hole No. LF4DP2

1. Company Name: Earth Tech	**2. Drilling Contractor:** Spectrum Exploration **Sheet** 1
3. Project: Landfill 4	**4. Location:** Fort Carson
5. Name of Driller: Marc Haes	**6. Manufacturers Designation of Drill:** CME 55 w/Direct Push mods
7. Sizes and Types of Drilling and Sampling Equipment	**8. Hole Location Northing:** **Easting:**
	9. Surface Elevation:
	10. Started **10. Date:** 1/19/01 **10. Time:** 0910 / **11. Completed** **11. Date:** 1/19/01 **11. Time:** 0940
12. Overburden Thickness (ft): 4	**15. Depth GW First Encountered (BGS)** **15. Depth:** **15. Date:** **15. Time:**
13. Depth Drilled into Bedrock (ft): 2	**16. Depth to Water and Time Measured** **16. Depth:** **16. Date:** **16. Time:**
14. Total Depth of Hole (ft): 6	**17. Other Water Level Measurements:**
18. Sampled for Geotechnical Testing Undisturbed: **Disturbed:**	**19. Total Number of Core Boxes:** na
20. Samples for Chemical Analysis **VOCs:** 2 **SVOCs:** 2 **Metals:** 2 **Other (Specify)**	**21. Total core Rec %** na
22. Disposition of Hole Backfilled: **Monitoring Well:**	**Other (Specify Type)** Temporary well **23. Inspector** Kevin Mathews

COMMENTS:

TW DRILLING LOG

Hole No. LF4DP2

1. Company Name: Earth Tech | 2. Inspector: Kevin Mathews | Sheet 2

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT - RECOVERY	REMARKS
1		**ML, SANDY SILTIMedium** Medium Density, moist, 10YR4/2 dark grayish brown, medium plasticity, 20% f, m sand. Numerous roots from 0 to 1'. Residual soil.	HS=0.0		LF4DP2 (0-2.5)	2.5/4	
2							
3		no recovery					
4		**CL, SILTY CLAY** Stiff, moist, 10YR4/4 dark yellowish brown, medium plsticity, blocky, minor Fe coatings on fracture surfaces. Weathered Pierre Shale.	HS=0.1		LF4DP2 (4-5)	1/2	
5							
		no recovery					
6		End of Log					
7							
8							
9							
10							

PROJECT: Landfill 4 | HOLE NO. LF4DP2

HTW DRILLING LOG

Hole No. LF4DP3

1. Company Name: Earth Tech	**2. Drilling Contractor:** Spectrum Exploration **Sheet** 1
3. Project: Fort Carson	**4. Location:** Landfill 4
5. Name of Driller: Marc Haes	**6. Manufacturers Designation of Drill:** CME55 w/Direct Push mods
7. Sizes and Types of Drilling and Sampling Equipment	**8. Hole Location Northing:** **Easting:**
	9. Surface Elevation:
	10. Started **11. Completed**
	10. Date: 1/18/01 **10. Time:** 1215 **11. Date:** 1/18/01 **11. Time:** 1330
12. Overburden Thickness (ft): 12+	**15. Depth GW First Encountered (BGS)**
	15. Depth: **15. Date:** **15. Time:**
13. Depth Drilled into Bedrock (ft): na	**16. Depth to Water and Time Measured**
	16. Depth: **16. Date:** **16. Time:**
14. Total Depth of Hole (ft): 12	**17. Other Water Level Measurements:**
18. Sampled for Geotechnical Testing Undisturbed: **Disturbed:**	**19. Total Number of Core Boxes:**
20. Samples for Chemical Analysis **VOCs:** 3 **SVOCs:** 3	**21. Total core Rec %**
Metals: 3 **Other (Specify)**	
22. Disposition of Hole Backfilled: **Other (Specify Type)** Temporary well	
Monitoring Well:	**23. Inspector** Kevin Mathews

COMMENTS:

TW DRILLING LOG

Hole No. LF4DP3

1. Company Name: Earth Tech | 2. Inspector: Kevin Mathews | Sheet 2

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT - RECOVERY	REMARKS
1		**CL, CLAY** medium density, moist, 2.5y4/3 olive brown, high plasticity. Minor root fragments. Occasional coarse sand. Reworked shale.	HS=0.0				
2		no recovery				2/4	
3							
4		as above, only wet.					
5							
6			HS=0.0		LF4DP3 (6-7)	3/4	
7		no recovery					
8		as above, only moist. With fragments of bright red shale - roadbase?. Reworked material.					
9			HS=0.0		LF4DP3 (9-10)		
10						2/4	

PROJECT: Landfill 4 | HOLE NO. LF4DP3

TW DRILLING LOG

Hole No. LF4DP3

1. Company Name: Earth Tech | 2. Inspector: Kevin Mathews | Sheet 2

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT - RECOVERY	REMARKS
		no recovery					
11						2/4	Direct push refusal at 12'. Bedrock not encountered.
12		End of Log					
13							
14							
15							
16							
17							
18							
19							
20							

PROJECT: Landfill 4 | HOLE NO. LF4DP3

HTW DRILLING LOG

Hole No. LF4DP4

1. Company Name: Earth Tech	**2. Drilling Contractor:** Spectrum Exploration **Sheet** 2
3. Project: Fort Carson	**4. Location:** Landfill 4
5. Name of Driller: Marc Haes	**6. Manufacturers Designation of Drill:** CME 55 w/ Direct Push mods
7. Sizes and Types of Drilling and Sampling Equipment	**8. Hole Location Northing:** **Easting:**
	9. Surface Elevation:
	10. Started **10. Date:** 1/18/01 **10. Time:** 1045 / **11. Completed** **11. Date:** 1/18/01 **11. Time:** 1200
12. Overburden Thickness (ft): 15	**15. Depth GW First Encountered (BGS)** **15. Depth:** **15. Date:** **15. Time:**
13. Depth Drilled into Bedrock (ft): 1	**16. Depth to Water and Time Measured** **16. Depth:** **16. Date:** **16. Time:**
14. Total Depth of Hole (ft): 16	**17. Other Water Level Measurements:**
18. Sampled for Geotechnical Testing Undisturbed: **Disturbed:**	**19. Total Number of Core Boxes:**
20. Samples for Chemical Analysis **VOCs:** 4 **SVOCs:** 4 **Metals:** 4 **Other (Specify)**	**21. Total core Rec %**
22. Disposition of Hole Backfilled: **Monitoring Well:**	**Other (Specify Type)** Temporary well / **23. Inspector** Kevin Mathews

COMMENTS:

TW DRILLING LOG

Hole No. LF4DP4

1. Company Name: Earth Tech | 2. Inspector: Kevin Mathews | Sheet 2

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT - RECOVERY	REMARKS
1		**SM, CLAYEY SAND** Medium dense, moist, 10YR4/3 brown, low plasticity, 50% f, m, c sand in a clay/silt matrix. Reworked material - Fill.	HS=0.0				1
2						3/4	2
3		no recovery	HS=0.0				3
4		**CL, SILTY CLAY** Stiff,moist, 10YR5/3 brown, medium plasticity,massive, mottled silty clay with minor sand. Reworked weathered bedrock - Fill					4
5							5
6		no recovery				2/4	6
7							7
8		blocky texture,					8
9		soft, wet.	HS=0.0		LF4DP4 (9-10)		9
10						2/4	10

PROJECT: Landfill 4 | HOLE NO. LF4DP4

TW DRILLING LOG

Hole No. LF4DP4

1. Company Name: Earth Tech | 2. Inspector: Kevin Mathews | Sheet 2

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT - RECOVERY	REMARKS
		no recovery					
11						2/4	11
12		as above, saturated					12
13					LF4DP4(13-15)		13
					LF4DP4(13-15)MS		
14			HS=0.0		LF4DP4(13-15)MSD	4/4	14
15		**CL, CLAY** Stiff, moist, mottled 10YR5/4 yellowish brown, medium plasticity, blocky. Highly weathered PierreShale. Sharp gradation.					15
16		End of Log					16
17							17
18							18
19							19
20							20

PROJECT: Landfill 4 | HOLE NO. LF4DP4

HTW DRILLING LOG

Hole No. LF4DP5

1. Company Name: Earth Tech	**2. Drilling Contractor:** Spectrum Exploration **Sheet** 1
3. Project: Landfill 4	**4. Location:** Fort Carson
5. Name of Driller: Marc Haes	**6. Manufacturers Designation of Drill:** CME 55 w/Direct Push mods
7. Sizes and Types of Drilling and Sampling Equipment	**8. Hole Location Northing:** **Easting:**
	9. Surface Elevation:
	10. Started **10. Date:** 1/19/01 **10. Time:** 0950 / **11. Completed** **11. Date:** 1/19/01 **11. Time:** 1100
12. Overburden Thickness (ft): 9	**15. Depth GW First Encountered (BGS)** **15. Depth:** **15. Date:** **15. Time:**
13. Depth Drilled into Bedrock (ft): 0	**16. Depth to Water and Time Measured** **16. Depth:** **16. Date:** **16. Time:**
14. Total Depth of Hole (ft): 9	**17. Other Water Level Measurements:**
18. Sampled for Geotechnical Testing Undisturbed: **Disturbed:**	**19. Total Number of Core Boxes:** na
20. Samples for Chemical Analysis **VOCs:** 2 **SVOCs:** 2 **Metals:** 2 **Other (Specify)**	**21. Total core Rec %** na
22. Disposition of Hole Backfilled: **Monitoring Well:**	**Other (Specify Type)** Temporary well **23. Inspector** Kevin Mathews

COMMENTS:

TW DRILLING LOG

Hole No. LF4DP5

1. Company Name: Earth Tech | 2. Inspector: Kevin Mathews | Sheet 2

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT - RECOVERY	REMARKS
1		**ML, SANDY SILT** Medium dense, moist, 10YR4/3 brown, low plasticity, 40% f, m, c sand and fine gvl in silt clay matrix. Numerous roots. Reworked material.	HS=0.0			3/3	
2							
3		**CL, SILTY CLAY** stiff, moist, 2.5YR4/3 olive brown, medium plasticity, no sand or larger. Residual material. Separated from overlying soils by a granitic cobble.	HS=0.1		LF4DP5 (3-4)		
4		no recovery					
5						1/4	
6		as above, white gypsum? xtals on fracture surfaces. Highly weathered shale or residual soil.	HS=0.0		LF4DP5 (6-7)		
7		no recovery					
8						0.5/2.0	push rod refusal at 9.0'
9		End of Log					
10							

PROJECT: Landfill 4 | HOLE NO. LF4DP5

HTW DRILLING LOG

Hole No. LF4DP6

1. Company Name: Earth Tech	**2. Drilling Contractor:** Spectrum Exploration **Sheet** 1
3. Project: Landfill 4	**4. Location:** Fort Carson
5. Name of Driller: Marc Haes	**6. Manufacturers Designation of Drill:** CME55 w/Direct Push mods
7. Sizes and Types of Drilling and Sampling Equipment	**8. Hole Location Northing:** **Easting:**
	9. Surface Elevation:
	10. Started **10. Date:** 1/19/01 **10. Time:** 1205 / **11. Completed** **11. Date:** 1/19/01 **11. Time:** 1300
12. Overburden Thickness (ft): 9	**15. Depth GW First Encountered (BGS)** **15. Depth:** **15. Date:** **15. Time:**
13. Depth Drilled into Bedrock (ft): 0	**16. Depth to Water and Time Measured** **16. Depth:** **16. Date:** **16. Time:**
14. Total Depth of Hole (ft): 9	**17. Other Water Level Measurements:**
18. Sampled for Geotechnical Testing Undisturbed: **Disturbed:**	**19. Total Number of Core Boxes:** na
20. Samples for Chemical Analysis **VOCs:** 2 **SVOCs:** 2 **Metals:** 2 **Other (Specify)** 1 TOC	**21. Total core Rec %**
22. Disposition of Hole Backfilled: **Monitoring Well:**	**Other (Specify Type)** Temporary well / **23. Inspector** Kevin Mathews

COMMENTS:

TW DRILLING LOG

Hole No. LF4DP6

1. Company Name: Earth Tech | 2. Inspector: Kevin Mathews | Sheet 2

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT - RECOVERY	REMARKS
1 2		**ML, CLAYEY SILT** medium density, moist, 2.5YR5/3 light olive brown,low plasticity, 20% f, m, c sand and roots in upper 1', decreasing with depth. Residual soil?	HS=0.1			3/4	
3		no recovery					
4 5 6 7		no recovery				0/3.5	
8		as above, no appreciable sand.	HS=2.2		LF4DP6 (7.5-8.5)	1/1.5	No apparent black organic material
9		no recovery					
10		End of Log					

PROJECT: Landfill 4 | HOLE NO. LF4DP6

HTW DRILLING LOG

HOLE NO.	HWS-SB1
1. COMPANY NAME	RUST Environment & Infrastructure
2. DRILLING SUBCONTRACTOR	Site Services
SHEET	1 OF 2 SHEETS
3. PROJECT	Fort Carson
4. LOCATION	DRMO Hazardous Waste Storage Area
5. NAME OF DRILLER	B. Dechante / J. Hegge
6. MANUFACTURERS DESIGNATION OF DRILL	CME 75
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	3.25" Inside Diameter, 6.25" Outside Diameter; Hollow Stem Auger; 3" Continuous Core Barrel
8. HOLE LOCATION	N: 1338566 E: 3199644
9. SURFACE ELEVATION	5876.1
10. DATE STARTED	1/24/95
11. DATE COMPLETED	1/24/95
12. OVERBURDEN THICKNESS	4 ft.
15. DEPTH GROUNDWATER ENCOUNTERED	14
13. DEPTH DRILLED INTO ROCK	15 ft.
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
14. TOTAL DEPTH OF HOLE	19 ft.
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA

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

20. SAMPLES SENT TO LAB FOR ANALYSIS	METALS	EXPLOSIVES	NITRATES	SVOC	VOC	PCB	OIL & GREASE
3/4, 8/9	1x125 ml	1x4 oz	0	1x8 ml	0	8/9 only	0

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHERS (SPECIFY)	23. SIGNATURE OF INSPECTOR
	NA	NA	GROUTED	Hollistir Sarah Hodson

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNTS	REMARKS
		Pink gravel cover.	Bkgd 0.0 Breath 0.0 Screen 2.0		SB1-0/1		Recovery (Rec) Time 0935 (0-3 ft.) 44"
1	CL	CLAY WITH SAND (CL) Medium stiff, olive brown, moist to damp, mostly clay, little fine- to coarse-grained sand, iron staining speckled throughout.					
2							
3			Breath 0.0 Screen 1.2		SB1-3/4		Rec (3-8 ft.) 60" Time 0945
4		CLAYSTONE Soft, medium stiff, olive brown, damp, heavy calcium carbonate stringers and deposits, blocky, severely weathered, heavy iron staining, zones with brown (gypsum ?) stained needle-like calcium crystals.		NA		NA Contin. Core Sampler	
5							
6							
7							
8			Breath 0.0 Screen 1.2		SB1-8/9		Rec (8-13 ft.) 62" Time 0955
9		CLAYSTONE as above.					
10							

HTW DRILLING LOG

HOLE NO. HWS-SB1

1. COMPANY NAME: RUST Environment & Infrastructure

2. INSPECTOR: Hollistir Sarah Hodson

SHEET 2 OF 2 SHEETS

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNTS	REMARKS
10–11		CLAYSTONE Medium stiff, mottled grayish brown to olive brown, damp, moist in some fractures, moderately to moderately-severely weathered, calcium carbonate deposits in fractures, iron staining.		NA		NA Contin. Core Sampler	
11–12							
12–13			Breath 0.0 Screen 1.2	NA	SB1-13/14	NA	Rec (13-18 ft.) 62" Time 1000
13–14		CLAYSTONE Stiff, mottled, tan to olive brown, saturated, moderately weathered, calcium carbonate present in fractures, water present in fractures, trace iron staining.					
14–15							
15–16							Saturated zone in fractures from 14' to 18'.
16–17							
17–18		Damp (not saturated)	Breath 0.0 Screen 4.0		SB1-18/19		Time 1005
18–19							
19–20		TOTAL DEPTH = 19.0 FEET boring filled with cement/bentonite upon completion.					Borehole grouted with cement/bentonite upon completion.
20–21							
21–22							
22–23							
23–24							
24–25							
25–26							
26–27							

MRF Form PDA-FTCb

PROJECT: 89840.200 Fort Carson

HOLE NO.: HWS-SB1

HTW DRILLING LOG

HOLE NO.	HWS-SB2
1. COMPANY NAME	RUST Environment & Infrastructure
2. DRILLING SUBCONTRACTOR	Site Services
SHEET 1	OF 2 SHEETS
3. PROJECT	Fort Carson
4. LOCATION	DRMO Hazardous Waste Storage Area
5. NAME OF DRILLER	B. Dechante / J. Hegge
6. MANUFACTURERS DESIGNATION OF DRILL	CME 75
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	3.25" Inside Diameter, 6.25" Outside Diameter; Hollow Stem Auger; 3" Continuous Core Barrel
8. HOLE LOCATION	N: 1338510 E: 3199680
9. SURFACE ELEVATION	5877.2
10. DATE STARTED	1/24/95
11. DATE COMPLETED	1/24/95
12. OVERBURDEN THICKNESS	1.5 ft.
15. DEPTH GROUNDWATER ENCOUNTERED	NA
13. DEPTH DRILLED INTO ROCK	22.5 ft.
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
14. TOTAL DEPTH OF HOLE	24 ft.
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA

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

20. SAMPLES SENT TO LAB FOR ANALYSIS	METALS	EXPLOSIVES	NITRATES	SVOC	VOC	PCB	OIL & GREASE
4/5, 9/10	1x125 ml	1x4 oz	0	1X16 oz	0	0	0

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHERS (SPECIFY)	23. SIGNATURE OF INSPECTOR
	NA	NA	GROUTED	Hollistir Sarah Hodson

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNTS	REMARKS
		Pink road gravel.	Bkgd 0.0 Breath 0.0 Screen 0.9				Recovery (Rec) (0-4 ft.) 43" Time 1120
1	CL	CLAY WITH SAND (CL) Soft, olive brown, damp, mostly clay, little to few fine- to coarse-grained sand.			SB2-0/1		
2		CLAYSTONE Medium stiff, olive brown, damp, moderately to severely weathered, heavy calcium carbonate deposits, stringers, heavy iron oxide staining in fractures, some mottled black staining.					
3							
4			Breath 0.0 Screen 0.9				Rec (4-9 ft.) 62" Time 1130
5				NA	SB 2-4/5	NA Contin. Core Sampler	
6							
7							
8							
9		CLAYSTONE as above.	Breath 0.0 Screen 1.6		SB 2-9/10		Rec (9-14 ft.) 62" Time 1135
10							

HTW DRILLING LOG

HOLE NO. HWS-SB2

1. COMPANY NAME: RUST Environment & Infrastructure

2. INSPECTOR: Hollistir Sarah Hodson

SHEET 2 OF 2 SHEETS

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNTS	REMARKS
10–24		CLAYSTONE Medium stiff, mottled olive brown, black brown, damp, moist in some fractures, moderately to severely weathered, heavy iron oxide staining and calcium carbonate (gypsum?) crystals in fractures, blocky, some zone of silty claystone.		NA		NA Contin. Core Sampler	
14–15		CLAYSTONE Medium stiff, mottled olive brown, tannish and black, damp, moist in fractures, more massive than upper samples, moderately weathered, heavy calcium carbonate and iron staining still present in fractures.	Breath 0.0 Screen 0.5		SB 2-14/15		Rec (14-19 ft.) 62" Time 1145
15–20				NA		NA	
19–20		CLAYSTONE - Hard, tannish brown, dry, damp to moist in one fracture, slightly to moderately weathered, iron staining still present, trace amounts of calcium carbonate visible.	Breath 0.0 Screen 1.0		SB 2-19/20		Rec (19-24 ft.) 62" Time 1205
20–24		PIERRE SHALE Hard, dark gray, dry, competent, bedrock, very slightly weathered, massive.					No sample collected at 24' due to hard bedrock.
24		TOTAL DEPTH = 24.0 FEET boring filled with cement/bentonite upon completion.					

MRF Form PDA-FTCb

PROJECT: 89840.200 Fort Carson

HOLE NO.: HWS-SB2

HTW DRILLING LOG

HOLE NO.	HWS-SB3
1. COMPANY NAME	RUST Environment & Infrastructure
2. DRILLING SUBCONTRACTOR	Site Services
SHEET 1	OF 2 SHEETS
3. PROJECT	Fort Carson
4. LOCATION	DRMO Hazardous Waste Storage Area
5. NAME OF DRILLER	B. Dechante / J. Hegge
6. MANUFACTURERS DESIGNATION OF DRILL	CME 75
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	3.25" Inside Diameter, 6.25" Outside Diameter; Hollow Stem Auger; 3" Continuous Core Barrel
8. HOLE LOCATION	N: 1338470 E: 3199484
9. SURFACE ELEVATION	5876.9
10. DATE STARTED	1/24/95
11. DATE COMPLETED	1/24/95
12. OVERBURDEN THICKNESS	2 ft.
15. DEPTH GROUNDWATER ENCOUNTERED	14
13. DEPTH DRILLED INTO ROCK	21 ft.
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	NA
14. TOTAL DEPTH OF HOLE	23 ft.
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	NA

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

20. SAMPLES SENT TO LAB FOR ANALYSIS	METALS	EXPLOSIVES	NITRATES	SVOC	VOC	PCB	OIL & GREASE
4/5, 9/10	1x125 ml	1x4 oz	0	1x16 oz	0	4/5 only	0

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHERS (SPECIFY)	23. SIGNATURE OF INSPECTOR
	NA	NA	GROUTED	Hollistir Sarah Hodson

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNTS	REMARKS
		Pink road gravel.	Bkgd 0.0 Breath 0.0 Screen 0.9		SB 3-0/1	NA Contin. Core Sampler	Time - 1330 Rec (0' - 4') = 48"
1	CL	CLAY WITH SAND (CL) Soft, olive brown, moist, mostly clay, little fine- to coarse-grained sand, few fine to coarse granite gravel.					
2		CLAYSTONE Soft, olive brown/gray brown mottled, damp, trace calcium carbonate staining, blocky, fractured.					
3							
4			Breath 0.0 Screen 0.5		SB 3-4/5		Recovery (Rec) (4-9 ft.) 61" Time 1345
5		SILTSTONE Medium hard, olive green, damp, moderately weathered, iron oxide staining and heavy calcium carbonate deposits in fractures.		NA			
6							
7		CLAYSTONE Soft, olive brown, gray brown, mottled, damp, heavy iron oxide and calcium carbonate staining.					
8							
9		CLAYSTONE Soft, mottled medium brown, grayish brown, moist, iron oxide staining present, no calcium carbonate staining.	Breath 0.0 Screen 0.5		SB 3-9/10		Rec (9-14 ft.) 59" Time 1350
10							

HTW DRILLING LOG

HOLE NO. HWS-SB3

1. COMPANY NAME: RUST Environment & Infrastructure

2. INSPECTOR: Hollistir Sarah Hodson

SHEET 2 OF 2 SHEETS

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNTS	REMARKS
10–14		CLAYSTONE Soft, mottled medium brown, grayish brown, moist, iron oxide staining present, no calcium carbonate staining.					
14–19		CLAYSTONE/SILTSTONE Medium stiff (soft along fractures where weathering and iron oxide is present), olive brown stained reddish brown along fractures, damp, moist along fractures (not all), less blocky, more massive, moderate to slightly weathered, some spots with black staining.	Breath 0.0 Screen 0.1	NA	SB 3-14/15	NA Contin. Core Sampler	Rec (14-19 ft.) 61" Time 1400 Water encountered in fractures
19–21			Breath 0.0 Screen 0.5		SB 3-19/20		Rec (19-23 ft.) 47" Time 1410
21		Severely weathered CLAYSTONE into clay.					
22		PIERRE SHALE Very hard, dark gray, dry, fresh, no staining or fracturing.					Borehole filled with bentonite/cement upon completion.
23		TOTAL DEPTH = 23.0 FEET boring filled with cement/bentonite upon completion.					

MRF Form PDA-FTCb

PROJECT: 89840.200 Fort Carson

HOLE NO.: HWS-SB3

LITHOLOGIC LOG AND WELL INSTALLATION SPECIFICATIONS
Fort Carson
WELL W4-1

DEPTH From	To	LITHOLOGY
0.0	4.0	Clayey silt, light brown, slightly moist, fill, easy drilling.
4.0	9.0	Clayey silt, dark gray, moist, very easy drilling.
9.0	16.0	Clayey silt, brown, with a little small gravel, very moist, very east drilling. Nearly saturated below 5 feet, and wet at 14 feet.
16.0	25.0	Clayey silt, brown, with a very few small gravels, moist, easy drilling. Not as moist or easy drilling as overlying interval.
25.0	30.0	Clayey silt, gravelly, brown.
30.0		Weathered shale, gray, dry, moderately hard drilling.
	34.0	Bottom of hole.

NOTES: Depth to water in borehole was 4.6 feet at 0830 hours 6 November 1988. Sides of borehole "squeezed in" from about 9 feet to 14 feet.

Drilling and Well Installation Specifications

Drilling and well installation were performed 5-6 November, except for cement grouting, which was accomplished later. Drilling was accomplished using hollow-stem auger making 6-inch diameter boreholes. Casing and screen is 2-inch ID Schedule 40 PVC with machined 0.010-inch slots and flush threaded joints.

Cement grout	0.0 to 2.5 ft
Bentonite seal	2.5 to 4.5 ft
Sand filter pack	4.5 to 16.0 ft
Fallback	16.0 to 34.0 ft
Screen	5.0 to 15.0 ft

NOTE: The sand placed into the annular space displaced the silt in the borehole.

Top of PVC casing elevation	96.07 ft
Stickup of PVC well casing	3.0 ft
Elevation of ground surface	93.1 ft

Static water level (from TOC): 7.46 ft on 9 Nov 88

LITHOLOGIC LOG AND WELL INSTALLATION SPECIFICATIONS
Fort Carson
WELL W4-2

DEPTH From	To	LITHOLOGY
0.0	2.0	Clayey silt, brown, slightly moist, with a little sand and gravel.
2.0	6.0	Sandy gravelly silt, black, very moist, very soft and easy drilling.
6.0	14.5	Clayey silt, brown, very moist, very soft, with a little sand and gravel.
14.5	26.5	Clayey silt, brown, moist, soft and easy drilling, with a little gravel.
26.5	28.0	Weathered shale.
28.0		Shale.
	29.0	Bottom of hole.

NOTES: Depth to water in borehole was 7.7 feet at 0830 hours 6 November 1988 and 6.6 feet at 1330 hours 6 November 1988.

Drilling and Well Installation Specifications

Drilling and well installation were performed 5-6 November 1988, except for cement grouting, which was accomplished later. Drilling was accomplished using hollow-stem auger making 6-inch diameter boreholes. Casing and screen is 2-inch ID Schedule 40 PVC with machined 0.010-inch slots and flush threaded joints.

Cement grout	0.0 to 2.5 ft
Bentonite seal	2.5 to 5.0 ft
Sand filter pack	5.0 to 29.0 ft
Screen	7.0 to 17.0 ft

Top of PVC casing elevation	93.88 ft
Stickup of PVC well casing	3.0 ft
Elevation of ground surface	90.9 ft

Static water level (from TOC): 6.66 ft on 9 Nov 88

LITHOLOGIC LOG AND WELL INSTALLATION SPECIFICATIONS
Fort Carson
WELL W4-3

DEPTH From	DEPTH To	LITHOLOGY
0.0	0.5	Stone, gravel, silt; parking lot surface.
0.5	30.0	Clayey silt, brown, moist, easy drilling, with a very small amount of small gravel. Packing around auger and binding below 10 feet; getting gradually worse with depth; shift to 1st at 18 feet. Stones at 10 feet; fill around utility line? Less moisture in lower portion of interval.
30.0		Shale, gray, dry or slightly moist.
	32.5	Bottom of hole.

NOTES: Borehole dry on completion.

Drilling and Well Installation Specifications

Drilling and well installation were performed 6-7 November 1988, except for cement grouting, which was accomplished later. Drilling was accomplished using hollow-stem auger making 6-inch diameter boreholes. Casing and screen is 2-inch ID Schedule 40 PVC with machined 0.010-inch slots and flush threaded joints.

Cement grout	0.0 to 6.0 ft
Bentonite seal	6.0 to 8.0 ft
Sand filter pack	8.0 to 32.5 ft
Screen	10.0 to 30.0 ft

Top of PVC casing elevation	100.00 ft
Stickup of PVC well casing	2.5 ft
Elevation of ground surface	97.5 ft

Static water level (from TOC): 14.95 ft on 9 Nov 88

HTW DRILLING LOG

Hole No. LF4MW7

1. Company Name: Earth Tech	**2. Drilling Contractor:** Spectrum **Sheet** 1
3. Project: 45484.07.05.01	**4. Location:** E. side of Specker
5. Name of Driller: Steve Jager & Todd McInroy	**6. Manufacturers Designation of Drill:** CME 75 HSA
7. Sizes and Types of Drilling 8.25" OD **and Sampling** Split Spoon **Equipment**	**8. Hole Location Northing:** NA **Easting:** NA **9. Surface Elevation:** NA **10. Started** **10. Date:**11/12/01 **10. Time:**0900 **11. Completed** **11. Date:**11/12/01 **11. Time:**1100
12. Overburden Thickness (ft): 21	**15. Depth GW First Encountered (BGS)** **15. Depth:** 14 **15. Date:** 11/12/01 **15. Time:** 1025
13. Depth Drilled into Bedrock (ft): 3	**16. Depth to Water and Time Measured** **16. Depth:** NA **16. Date:** NA **16. Time:** NA
14. Total Depth of Hole (ft): 24	**17. Other Water Level Measurements:** NA
18. Sampled for Geotechnical Testing Undisturbed: NA **Disturbed:** NA	**19. Total Number of Core Boxes:** NA
20. Samples for Chemical Analysis **VOCs:** 1 **SVOCs:** 1 **Metals:** 1 **Other (Specify)** NA	**21. Total core Rec %** 77
22. Disposition of Hole Backfilled: NA **Other (Specify Type)** NA **Monitoring Well:** 2" PVC	**23. Inspector** L. Barkau

COMMENTS:

HTW DRILLING LOG

Hole No. LF4MW7

1. Company Name: Earth Tech | 2. Inspector: L. Barkau | Sheet 2

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT - RECOVERY	REMARKS
1		**SILT (ML).** Medium, dry, very dark gray (2.5Y 3/1), few fine gravels, coarse sand lense at 3-feet, cohesive, slightly plastic, ALLUVIUM.					
2				NA		2.0/4.0	
3			HS=0.4				
4		**SANDY SILT-SILT (ML).** Medium, dry, yellowish brown (10YR 5/4), very fine sands, few fine gravels, over core sized cobble at 5-feet, large gravels at 8-feet, subrounded, cohesive, slightly plastic, ALLUVIUM.					
5							
6						1.5/5.0	
7							
8			HS=0.4		LF4MW7 (8'-9')		
9							
10							

PROJECT: 45484.07.05.01 HOLE NO. LF4MW7

HTW DRILLING LOG

Hole No. LF4MW7

1. Company Name: Earth Tech | 2. Inspector: L. Barkau | Sheet 3

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT - RECOVERY	REMARKS
11		**SILT (ML).** Medium to soft, slight moisture begins at 13-feet, dry remainder of interval, olive brown (2.5Y 4/4) with mottling at 13.5-feet of olive brown, dark bluish gray (GLEY 2 4/1) and black (GLEY 1 2.5/N), trace very fine sands, few coarse to fine gravels, cohesive, slightly plastic, ALLUVIUM.					11
12						5.0/5.0	12
13			HS=0				13
14		**ELASTIC SILT (MH).** Soft, wet, very dark gray (2.5Y 3/1), cohesive, high plasticity, wet throughout, ALLUVIUM.					14 Water noted.
15							15
16						5.0/5.0	16
17							17
18			HS=0.1				18
19		**SILT (ML).** Medium, moist, mottled dark yellowish brown (10YR 4/6) and dark bluish gray (GLEY 4/1), cohesive, medium plasticity, few bedrock fragments, ALLUVIUM.					19
20							20

HTW DRILLING LOG

Hole No. LF4MW7

1. Company Name: Earth Tech | 2. Inspector: L. Barkau | Sheet 4

DEPTH	USCS	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (ppm)	GEOTECH SAMPLE OR CORE BOX NO.	ANALYTICAL SAMPLE NO.	BLOW COUNT - RECOVERY	REMARKS
21		**SILTSTONE/CLAYSTONE.** Medium, moderate to moderately severe weathering, olive gray (5Y 3/2), blocky to fissle with depth, color change at 21.5-feet to dark yellowish orange (10YR 6/6) approximately 1-inch thick then back to olive gray, WEATHERED PIERRE SHALE.					21
22						5.0/5.0	22
23			HS=0				23
24		End of Log					24
25							25
26							26
27							27
28							28
29							29
30							30

APPENDIX H

WELL DEVELOPMENT RECORDS

WELL DEVELOPMENT RECORD

Well LF4-MW1 (Page 1 of 2)

PROJECT NAME Fort Carson

PROJECT NUMBER 89840.200

LOCATION Landfill #4

DEVELOPER Todd Murray, Jon Kaibel

WELL DEPTH 18.61 (ft)

STATIC WATER LEVEL DEPTH 9.88 (ft)

REFERENCE POINT FOR DEPTH MEASUREMENTS TWC

TPC - Top of Protective Cover

(TWC) Top of Well Casing

GS - Ground Surface

WATER COLUMN VOLUME CALCULATION

- Water Column Volume = Length of Water Column X Unit Casing Volume
- Unit Casing Volume (Gal./Lin. Ft) = ~~0.04~~ 0.17 | 0.65 | 1.5 |
  Casing I.D. (in) = 2.0 | 4.0 | 6.0
- Length of Water Column = Well Depth - Static Water Level Depth = 8.73 (ft)
- Water Column Volume = 1.5 (Gal.)

CYCLE NO.	DATE	SURGING		EVACUATION			WATER LEVEL RECOVERY		INDICATOR PARAMETERS			TURBIDITY (NTU's)	COMMENTS (odor, appearance, free-phase, etc.)
		Surge Time	Method	Starting Time	Method	Total Vol. Removed (gallons)	Time	Depth (feet)	Water Temp (°C)	pH	Specific Conductance (µmhos/cm)	• Clear • Slightly cloudy • Cloudy • Very Cloudy • Muddy	
1	3/28/95	1122	S.S. Bailer	1132	S.S. Bailer	0.3			7.3	7.78	3260	Muddy >200	No odor or sheen.
				1136	Air piston pump								
						6	1204	Dry					Well went dry
2	3/29/95	1153	SS Bailer	1205	SS Bailer	~~6.3~~ 15.4	1149	7.08					
						6.3	1207		7.9	7.56	2390	Muddy >200	
						11	1215		7.4	7.68	2380	Muddy >200	
						14	1224	DRY	7.8	7.74	2530	V. Cloudy >200	Well went dry
							1231	15.64					
3	3/30/95	0939	S.S. Bailer	0950	S.S. Bailer	14.3	0936	7.03	7.2	7.67	7270	Cloudy >200	
						19	1003		7.0	7.87	7000	Cloudy >200	
				1013	Air piston pump								
						20	1030		5.7	7.75	6850	Cloudy >200	
						23	1034	DRY					
						23.3	1044		7.5	7.73	7410	Cloudy 883	
							1135	14.25					

WELL DEVELOPMENT RECORD

Well LF4-MW1 (Page 2 of 2)

PROJECT NAME Fort Carson

PROJECT NUMBER 89840.200

LOCATION Landfill 4

DEVELOPER T. Murray, M. Witczak

WELL DEPTH 17.64 (ft)

STATIC WATER LEVEL DEPTH 7.05 (ft)

REFERENCE POINT FOR DEPTH MEASUREMENTS TWC

TPC - Top of Protective Cover

(TWC) Top of Well Casing

GS - Ground Surface

WATER COLUMN VOLUME CALCULATION

- Water Column Volume = Length of Water Column X Unit Casing Volume
- Unit Casing Volume (Gal./Lin. Ft) = ~~0.04~~ 0.17 | 0.65 | 1.5 |
  Casing I.D. (in) = 2.0 | 4.0 | 6.0 |
- Length of Water Column = Well Depth - Static Water Level Depth = 10.59 (ft)
- Water Column Volume = 1.8 (Gal.)

CYCLE NO.	DATE	SURGING		EVACUATION			WATER LEVEL RECOVERY		INDICATOR PARAMETERS			TURBIDITY (NTU's)	COMMENTS (odor, appearance, free-phase, etc.)
		Surge Time	Method	Starting Time	Method	Total Vol. Removed (gallons)	Time	Depth (feet)	Water Temp (°C)	pH	Specific Conductance (µmhos/cm)	• Clear • Slightly cloudy • Cloudy • Very Cloudy • Muddy	
1	4/11/95						0943	7.05					Surging with
				0955	Air Piston pump	2.0	1007		8.1	6.97	4980	82/CLEAR	pump intermitently.
							1010	DRY					Pump also turned on
						3.5	1024		7.2	7.86	4570	>1000/CLOUDY	and off intermitently.
						10	1059	Dry	4.0	8.02	4200	90.5/S.C.	
							1109	15.85					

WELL DEVELOPMENT RECORD

Well LF4-MW2 (page 1 of ~~2~~ 3)

PROJECT NAME Fort Carson
PROJECT NUMBER 89840.200
LOCATION Landfill #4
DEVELOPER Todd Murray, Jon Kaibel

WELL DEPTH 15.12' (ft)
STATIC WATER LEVEL DEPTH 8.84' (ft)
REFERENCE POINT FOR DEPTH MEASUREMENTS TWC
TPC - Top of Protective Cover
TWC - Top of Well Casing
GS - Ground Surface

WATER COLUMN VOLUME CALCULATION

- Water Column Volume = Length of Water Column X Unit Casing Volume
- Unit Casing Volume (Gal./Lin. Ft) = ~~0.04~~ .17 | 0.65 | 1.5 |
  Casing I.D. (in) = 2.0 | 4.0 | 6.0 |
- Length of Water Column = Well Depth - Static Water Level Depth = 6.28 (ft)
- Water Column Volume = 1.0 (Gal.)

CYCLE NO.	DATE	SURGING		EVACUATION			WATER LEVEL RECOVERY		INDICATOR PARAMETERS			TURBIDITY (NTU's)	COMMENTS (odor, appearance, free-phase, etc.)
		Surge Time	Method	Starting Time	Method	Total Vol. Removed (gallons)	Time	Depth (feet)	Water Temp (°C)	pH	Specific Conductance (µmhos/cm)	• Clear • Slightly cloudy • Cloudy • Very Cloudy • Muddy	
1	3/28/95	0955	S.S. Bailer	1005	S.S. Bailer	0.5			10.9	7.08	2760	Muddy >200	No odor or
							1012	15.44					Sheen. Well dry.
							1028	13.10					
						3	1030		11.0	7.56	3590	Muddy >200	
						3.5	1035	DRY					
						3.6	1052		9.8	7.85	3420	Muddy >200	
						3.6	1053	DRY			~~3420~~ Tm		Well went dry
2	3/29/95					~~3.9~~	1101	9.33					
		1110	SS Bailer	1120	SS. Bailer	3.9	1111		11.6	7.13	2240	Cloudy >200	
						4.2	1122		10.9	7.59	2050	Muddy >200	
						7	1132	DRY	10.6	7.60	1990	V. Cloudy >200.	Well went dry
							1137	14.30					
3	3/30/95	855	S.S. Bailer	0905	S.S. Bailer		0855	8.94					

WELL DEVELOPMENT RECORD (TBH)

Well LF4-MW2 (page 2 of 23)

PROJECT NAME _____

PROJECT NUMBER _____

LOCATION _____

DEVELOPER Todd Murray, Holly Hodson

WELL DEPTH _____ (ft)
STATIC WATER LEVEL DEPTH _____ (ft)
REFERENCE POINT FOR DEPTH MEASUREMENTS _____
TPC - Top of Protective Cover
TWC - Top of Well Casing
GS - Ground Surface

WATER COLUMN VOLUME CALCULATION

- Water Column Volume = Length of Water Column X Unit Casing Volume
- Unit Casing Volume (Gal./Lin. Ft) = 0.04 | 0.65 | 1.5 |
  Casing I.D. (in) = 2.0 | 4.0 | 6.0 |
- Length of Water Column = Well Depth - Static Water Level Depth = _____ (ft)
- Water Column Volume = _____ (Gal.)

CYCLE NO.	DATE	SURGING		EVACUATION			WATER LEVEL RECOVERY		INDICATOR PARAMETERS			TURBIDITY	COMMENTS (odor, appearance, free-phase, etc.)
		Surge Time	Method	Starting Time	Method	Total Vol. Removed (gallons)	Time	Depth (feet)	Water Temp (°C)	pH	Specific Conductance (µmhos/cm)	• Clear • Slightly cloudy • Cloudy • Very Cloudy • Muddy	
3	3/30/95					7.30	0906		11.0	7.51	3170	Muddy >200	
						11	0913		10.8	7.65	3490	V. Cloudy >200	
						11.5	0919	DRY	10.6	7.79	3460	V. Cloudy >200	Well dry, Finished
													Developing
							0925	14.13					

WELL DEVELOPMENT RECORD

Well LF4-MW2 (Page 3 of 3)

PROJECT NAME Fort Carson

PROJECT NUMBER 89840.200

LOCATION Landfill #4

DEVELOPER T. Murray, M.

WELL DEPTH 17.90 (ft)

STATIC WATER LEVEL DEPTH 11.37 (ft)

REFERENCE POINT FOR DEPTH MEASUREMENTS TWC

TPC - Top of Protective Cover

TWC - Top of Well Casing

GS - Ground Surface

WATER COLUMN VOLUME CALCULATION

- Water Column Volume = Length of Water Column X Unit Casing Volume
- Unit Casing Volume (Gal./Lin. Ft) = ~~0.04~~ 0.57 | 0.65 | 1.5 |
  Casing I.D. (in) = 2.0 | 4.0 | 6.0 |
- Length of Water Column = Well Depth - Static Water Level Depth = 6.53 (ft)
- Water Column Volume = 1.1 (Gal.)

CYCLE NO.	DATE	SURGING		EVACUATION			WATER LEVEL RECOVERY		INDICATOR PARAMETERS			TURBIDITY (NTU's)	COMMENTS (odor, appearance, free-phase, etc.)
		Surge Time	Method	Starting Time	Method	Total Vol. Removed (gallons)	Time	Depth (feet)	Water Temp (°C)	pH	Specific Conductance (µmhos/cm)	• Clear • Slightly cloudy • Cloudy • Very Cloudy • Muddy	
1	4/11/95						1135	11.37					Surging intermittently
	↓			1139	Air Piston pump	2	1144	DRY	9.0	7.29	3530	161.5 / S.C.	with pump as well
	↓						1158	17.33					would go dry &
													re-charge.

WELL DEVELOPMENT RECORD

Well LFH-MW3 (Page 1 of 1)

PROJECT NAME FORT CARSON

PROJECT NUMBER 89840.200

LOCATION

DEVELOPER Todd Murray, Jon Kaikel

WELL DEPTH 17.56 (ft)

STATIC WATER LEVEL DEPTH 7.29 (ft)

REFERENCE POINT FOR DEPTH MEASUREMENTS TWC

TPC - Top of Protective Cover

TWC - Top of Well Casing

GS - Ground Surface

WATER COLUMN VOLUME CALCULATION

- Water Column Volume = Length of Water Column X Unit Casing Volume
- Unit Casing Volume (Gal./Lin. Ft) = ~~0.04~~ .17 | 0.65 | 1.5 |
  Casing I.D. (in) = 2.0 | 4.0 | 6.0 |
- Length of Water Column = Well Depth - Static Water Level Depth = 10.27 (ft)
- Water Column Volume = 1.7 (Gal.)

CYCLE NO.	DATE	SURGING		EVACUATION			WATER LEVEL RECOVERY		INDICATOR PARAMETERS			TURBIDITY (NTU's)	COMMENTS (odor, appearance, free-phase, etc.)
		Surge Time	Method	Starting Time	Method	Total Vol. Removed (gallons)	Time	Depth (feet)	Water Temp (°C)	pH	Specific Conductance (µmhos/cm)	• Clear • Slightly cloudy • Cloudy • Very Cloudy • Muddy	
1	3/27/95	1434	S.S. Bailer	1445	S.S. Bailer	0.3			8.3	7.6	4520	Muddy >200	No odor or
				1454	Air piston pump	8	1454		6.7	7.59	5030	V.C. >200	sheen. Well
						10	1503		8.7	7.51	5300	V.C. >200	only sustains
						13	1513		8.2	7.57	5620	V.C. >200	approx. 0.5 gpm
						18	1522		9.5	7.78	5430	V.C. >200	
						21	1529		8.4	7.89	5560	V.C. >200	
						25	1545		9.3	7.51	5500	V.C. >200	
						28	1551		7.7	7.54	5650	V.C. >200	
						32	1602		7.5	7.59	5570	V.C. >200	
						36	1610		7.7	7.61	5590	S.C. >200	
						39	1615		7.9	7.64	5760	S.C. 186	
						42	1627		8.2	7.53	5750	S.C. >200	
						44	1630		7.7	7.54	5740	S.C. >200	
						50	1634		7.9	7.57	5740	Clear 78	
						55	1645		7.7	7.49	5780	Clear 31.6	
							1645	9.94					

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Rev. 10/27/93

WELL DEVELOPMENT RECORD

Well LF4MW04

PROJECT NAME LF4 Well Developed

PROJECT NUMBER 29188.090102

LOCATION ~~LF4 Behind~~ LF4

DEVELOPER J. Nelson, T. Hohman

WELL DEPTH 16.75 (ft)

STATIC WATER LEVEL DEPTH 10.88 (ft)

REFERENCE POINT FOR DEPTH MEASUREMENTS TOC

TPC - Top of Protective Cover

TWC - Top of Well Casing

GS - Ground Surface

WATER COLUMN VOLUME CALCULATION

- Water Column Volume = Length of Water Column X Unit Casing Volume
- Unit Casing Volume (Gal./Lin. Ft) = 0.04 | 0.65 | 1.5 |
- Casing I.D. (in) = 2.0 | 4.0 | 6.0 |
- Length of Water Column = Well Depth - Static Water Level Depth = 5.87 (ft)
- Water Column Volume = .235 (Gal.)

CYCLE NO.	DATE	SURGING		EVACUATION			WATER LEVEL RECOVERY		INDICATOR PARAMETERS			TURBIDITY	COMMENTS (odor, appearance, free-phase, etc.)	
		Surge Time	Method	Starting Time	Method	Total Vol. Removed (gallons)	Time	Depth (feet)	Water Temp (°C)	pH	Specific Conductance (µmhos/cm)	• Clear • Slightly cloudy • Cloudy • Very Cloudy • Muddy	-MV	D.O
1	1-24-01	—	Trash pump	1130	Trash pump	Initial	1130	10.88	8.20	7.50	23498	Slightly cloudy 236	-43.7	7.75
2	↓	10	↓	1140	↓	3	N/A	N/A	10.10	7.13	3370	Slightly cloudy 261	-24.3	8.48
3	↓	20	↓	1150	↓	5	↓	↓	10.66	7.20	2635	Slightly cloudy 330	-29.3	8.7
4	↓	30	↓	1200	↓	5.5	↓	↓	11.17	7.44	2569	slightly cloudy 286	-42.4	9.0
5	↓	40	surge block	WELL DRIED UP										
6	1-25-01	~~50~~	surge block	1355	—	—	1355	15.52						
7	↓	~~75~~ 75	"	1430	disp bailer	5.75	N/A	N/A	10.93	7.32	2502	Muddy >1000	-33.5	8.40
8	↓	80	Disp bailer	1435	"	7				well dried up				
9	1/29/01	~~120~~ 120	surge block	0915	disp bailer	10	—	—	8.37	7.08	2.94	Muddy >1000	-47	7.19
10	↓						0955	15.71						

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WELL DEVELOPMENT RECORD

1-23-01

Well LF4MW05

PROJECT NAME LF4 Well Development
PROJECT NUMBER 29188.090102
LOCATION LF4
DEVELOPER J. Nelson, J. Mascellino

WELL DEPTH 15.00 5.87 (ft)
STATIC WATER LEVEL DEPTH ~~6.54~~ (ft)
REFERENCE POINT FOR DEPTH MEASUREMENTS TOC
TPC - Top of Protective Cover
TWC - Top of Well Casing
GS - Ground Surface

WATER COLUMN VOLUME CALCULATION

- Water Column Volume = Length of Water Column X Unit Casing Volume
- Unit Casing Volume (Gal./Lin. Ft) = 0.04 | 0.65 | 1.5 | ; Casing I.D. (in) = 2.0 | 4.0 | 6.0
- Length of Water Column = Well Depth - Static Water Level Depth = 9.13 (ft)
- Water Column Volume = .365 (Gal.)

CYCLE NO.	DATE	SURGING		EVACUATION			WATER LEVEL RECOVERY		INDICATOR PARAMETERS			TURBIDITY	COMMENTS (odor, appearance, free-phase, etc.)	
		Surge Time	Method	Starting Time	Method	Total Vol. Removed (gallons)	Time	Depth (feet)	Water Temp (°C)	pH	Specific Conductance (µmhos/cm)	• Clear • Slightly cloudy • Cloudy • Very Cloudy • Muddy	-MV	D.O
1	1-23-01	—	Trash pump + Surge Block	1100	Trash pump + Surge Block	Initial			5.99	7.39	54117	284 Cloudy	-39.6 ~~-36~~	9.12
2		10				5 ~~10~~ gal.			8.47	7.45	54922	637 Cloudy	-43.1	8.38
3		20				7 gal.			9.34	7.59	54759	708 Cloudy	-49.5	8.44
4		30				8 gal			9.21	7.62	54825	668 Cloudy	-52.3	8.43
5		40				9 gal			5.68	7.70	55018	698 Cloudy	-56.4	9.07
6		50				10 gal			9.90	7.76	54871	550 Cloudy	-60.0	8.28
7		60				10.75 gal			8.84	7.82	54784	443 Cloudy	-62.8	8.54
8		70				11.5 gal			7.18	7.90	54717	382 Cloudy	-66.8	8.98
9		80				12.25 gal			6.75	7.91	54944	283 Slightly Cloudy	-67.7	8.96
10		90				13.00 gal			5.63	7.97	54784	263 Slightly Cloudy	-71.1	9.06
11		100				13.50 gal			8.97	8.09	54295	260 Slightly Cloudy	-78.1	8.33
12		110				14.25 gal			11.53	8.17	54750	227 Slightly Cloudy	-82.5	7.86
13		120		1300		15.0 gal	1305	14.94	8.29	8.14	54792	218 Slightly Cloudy	-81.3	9.14

Well ~~does not~~ has a very slow recharge Rate

WELL DEVELOPMENT RECORD

Well LF4 MW6

PROJECT NAME LF4 well Development

PROJECT NUMBER 45484.07.05.01

LOCATION LF4

DEVELOPER T. Hohmann, J. Fenton

WELL DEPTH 16.38 (ft)

STATIC WATER LEVEL DEPTH 11.70 (ft)

REFERENCE POINT FOR DEPTH MEASUREMENTS TWC

TPC - Top of Protective Cover

TWC - Top of Well Casing

GS - Ground Surface

WATER COLUMN VOLUME CALCULATION

- Water Column Volume = Length of Water Column X Unit Casing Volume
- Unit Casing Volume (Gal./Lin. Ft) = 0.04 (0.16) | 0.65 | 1.5 | 2.0 | 4.0 | 6.0
- Casing I.D. (in) =
- Length of Water Column = Well Depth - Static Water Level Depth = 4.68 (ft)
- Water Column Volume = 0.75 (Gal.)

CYCLE NO.	DATE	SURGING		EVACUATION			WATER LEVEL RECOVERY		INDICATOR PARAMETERS			TURBIDITY	COMMENTS (odor, appearance, free phase, etc.)	
		Surge Time (min)	Method	Starting Time	Method	Total Vol. Removed (gallons)	Time	Depth (feet)	Water Temp (°C)	pH	Specific Conductance (µmhos/cm)	• Clear • Slightly cloudy • Cloudy • Very Cloudy • Muddy	-MV	D.O
INITIAL	12-5-01	–	–	1040	2" disp. bailer	0.25	N/A	N/A	11.70	7.18	67.5	4.90 Yellow	237	4.37
1	"	20	2" disp. bailer	1100	"	0.50			11.74	7.30	67.5	677 cloudy brownish Yellow	228	6.09
2	"	45	"	1125	"	0.75			11.81	7.32	67.4	459 " "	228	4.33
3	"	65	"	1145	"	~~1.00~~ 1.25			11.83	7.36	67.6	306 "	226	4.23
4	"	80	"	1200	"	~~1.25~~ 1.50			11.66	7.40	67.6	296 "	225	3.93
5	"	–	"	1435	"	–	N/A	N/A						
6	"	90	"	1445	"	1.50	"	"	11.64	7.47	67.6	308 "	~~228~~ 163	4.95
7	12-6-01	–	"	0915	"	–	N/A	N/A	11.34	7.50	67.4	134 "	162	5.28
8	" "	120	"	0945	"	1.75	N/A	N/A	↓	↓	↓	↓ ↓	↓	↓
							0955	15.34						
												TH		

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WELL DEVELOPMENT RECORD

Well LF4 MW7

PROJECT NAME LF4 Well Development

PROJECT NUMBER 45484.07.05.01

LOCATION LF4

DEVELOPER T. Hohman, J. Fenton

WELL DEPTH 23.47 (ft)

STATIC WATER LEVEL DEPTH 17.20 (ft)

REFERENCE POINT FOR DEPTH MEASUREMENTS TWC

TPC - Top of Protective Cover

TWC - Top of Well Casing

GS - Ground Surface

WATER COLUMN VOLUME CALCULATION

- Water Column Volume = Length of Water Column X Unit Casing Volume
- Unit Casing Volume (Gal./Lin. Ft) = 0.16 ~~0.04~~ | ~~0.65~~ | 1.5 | 2.0 | 4.0 | 6.0
- Casing I.D. (in) =
- Length of Water Column = Well Depth - Static Water Level Depth = 6.27 (ft)
- Water Column Volume = 1.00 (Gal.)

CYCLE NO.	DATE	SURGING		EVACUATION			WATER LEVEL RECOVERY		INDICATOR PARAMETERS			TURBIDITY	COMMENTS (odor, appearance, free-phase, etc.)	
		Surge Time (min)	Method	Starting Time	Method	Total Vol. Removed (gallons)	Time	Depth (feet)	Water Temp (°C)	pH	Specific Conductance (µmhos/cm)	• Clear • Slightly cloudy • Cloudy • Very Cloudy • Muddy	-MV	D.O
INITIAL	12-5-01	—	—	1250	2" disp. bailer	0.25	N/A	N/A	13.74	7.26	71.1	11.8 Bright Yellow	175	3.67
1	"	15	2" disp. bailer	1305	"	1.50			12.97	7.26	71.5	715 "	179	4.57
2	"	30	"	1320	"	2.25			13.25	7.27	71.7	918 " "	184	4.03
3	"	50	"	1340	"	2.50			13.10	7.27	72.2	1155 " "	184	4.62
4	"	70	"	1400	"	3.00			13.00	7.26	72.0	1015 " "	186	4.45
5	"	85	"	1415	"	3.20			13.04	7.29	72.0	1013 "	186	3.93
							1417	DRY						
6	12-6-01	—	"	0815	"	3.30	N/A	N/A	13.60	7.22	72.2	44.7 "	219	4.07
7	"	120	"	0850	"	3.50	N/A	N/A	13.36	7.24	71.9	547 "	198	3.24
							0900	22.39						

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APPENDIX I

GROUNDWATER SAMPLE COLLECTION LOGS

GROUNDWATER SAMPLE COLLECTION LOG

Project Name: *Fort Carson Military Reservation*
Project No.: 29128.090102
Sample Collected By: J. Nelson, B. Kibaudo

COC Number: 7525
Site ID: LF4DP01
Date(s) of Collection: 1-30-01, 2-6-01

EQUIPMENT
Purging Method/Equipment: N/A
Sampling Equipment: 1" disposable bailer
Filtering Equipment: .45um
Equipment Decontamination: DI H_2O

Equipment Calibration		
Equipment Model	Serial No.	Date Calibrated
	N/A	

FIELD PARAMETERS - *Collected at the start of purging and twice per casing volume removed for a total of 7 readings.*

Ambient Air Temperature (°F): 20°-30°
Sampling Depth (ft): N/A
Weather Conditions: Partly Cloudy
Reference Point: TOC

Time	Vol. Purged	Temp (°C)	pH	Eh (mV)	D.O. (ppm)	Conductance(mS/µS)	Turb. (NTU)	Descrip.
	INITIAL							
PARAMETERS STABILIZED?		±10%	±0.2	±10%	±10%	±10%	<5NTUs	

No Parameters taken

Total Volume Purged: _____ gallons
Purged Dry (Y/N): _____

PURGE INFORMATION
Casing I.D. [a] N/A (in.) Unit Casing Volume [b] N/A (gal/lin ft) Depth to Water [c] 9.79 (ft)
Depth to Well Bottom [d] 13.24 (ft) Casing Volumes [e] N/A
Purge Volume = [d-c] x [b] x [e] = N/A (gal)

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE COLLECTION AND ORDER OF COLLECTION

Date(s)	Time(s)	Container(s) Type/Volume	Filtered (Y/N)	Preservatives	Parameters
1-30-01	0908	4x 40 ml VOA	N	N	8260 VOC's
↓	0910	3x 40 ml VOA	N	HCL	8021 BTEX
↓	0924	2x 1 L Amber	N	N	8270 SVOC's
2-6-01	0948	1x 500 ml poly	Y	HNO_3	6010, 7470 Metals

Effervesces?(Y/N) N
QC Sample Collected(Y/N) N
QC-COC No. N

COMMENTS:

GROUNDWATER SAMPLE COLLECTION LOG

Project Name: *Fort Carson Military Reservation*
Project No.: 29188.C90102
Sample Collected By: J. Nolson, R. Ribaudo

COC Number: 7526
Site ID: ~~LF4M~~ LF40PW2
Date(s) of Collection: 1-30-01

EQUIPMENT
Purging Method/Equipment: N/a
Sampling Equipment: 1" disposable bailer
Filtering Equipment: .45um
Equipment Decontamination: DIH2O

Equipment Calibration		
Equipment Model	Serial No.	Date Calibrated
	N/A	

FIELD PARAMETERS - *Collected at the start of purging and twice per casing volume removed for a total of 7 readings.*

Ambient Air Temperature (°F): 20°-30°
Sampling Depth (ft): N/A

Weather Conditions: Partly Cloudy
Reference Point: TOC

Time	Vol. Purged	Temp (°C)	pH	Eh (mV)	D.O. (ppm)	Conductance(mS/µS)	Turb. (NTU)	Descrip.
	INITIAL							
PARAMETERS STABILIZED?		±10%	±0.2	±10%	±10%	±10%	<5NTUs	

No Parameters taken

Total Volume Purged: N/A gallons
Purged Dry (Y/N): N/A

PURGE INFORMATION
Casing I.D. [a] N/a (in.) Unit Casing Volume [b] N/a (gal/lin ft) Depth to Water [c] 7.43 (ft)
Depth to Well Bottom [d] 8.70 (ft) Casing Volumes [e] N/a
Purge Volume = [d-c] x [b] x [e] = N/a (gal)

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE COLLECTION AND ORDER OF COLLECTION

Date(s)	Time(s)	Container(s) Type/Volume	Filtered (Y/N)	Preservatives	Parameters
1-30-01	1228	4 x 40 mL VOA	N	N	8260 VOC's
		3 x 40 mL VOA	N	HCL	8021 BTEX
		1 x 1 L Amber	N	N	8270 SVOC's
		1 x 500 mL poly	Y	HNO_3	6010, 7470 metals

Effervesces?(Y/N) N
QC Sample Collected(Y/N) N
QC-COC No. N

COMMENTS:

GROUNDWATER SAMPLE COLLECTION LOG

Project Name: *Fort Carson Military Reservation*
Project No.: 29188-090102
Sample Collected By: J. Nelson, B. Ribaude

COC Number: 7527
Site ID: ~~LF4MW~~ LF4DPW3
Date(s) of Collection: 1-30-01

EQUIPMENT
Purging Method/Equipment: disp. bailer / peristaltic pump
Sampling Equipment: same
Filtering Equipment: 0.45 micron filter
Equipment Decontamination: dedicated or DI Rinse

Equipment Calibration		
Equipment Model	Serial No.	Date Calibrated
	N/A	

FIELD PARAMETERS - *Collected at the start of purging and twice per casing volume removed for a total of 7 readings.*

Ambient Air Temperature (°F): 20°-30°
Sampling Depth (ft): N/A
Weather Conditions: Partly cloudy
Reference Point: TOC

Time	Vol. Purged	Temp (°C)	pH	Eh (mV)	D.O. (ppm)	Conductance(mS/µS)	Turb. (NTU)	Descrip.
	INITIAL							
PARAMETERS STABILIZED?		±10%	±0.2	±10%	±10%	±10%	<5NTUs	

no Parameters taken

Total Volume Purged: N/A gallons
Purged Dry (Y/N): N/A

PURGE INFORMATION
Casing I.D. [a] N/A (in.) Unit Casing Volume [b] N/A (gal/lin ft) Depth to Water [c] 8.57 (ft)
Depth to Well Bottom [d] 13.16 (ft) Casing Volumes [e] N/A
Purge Volume = [d-c] x [b] x [e] = N/A (gal)

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE COLLECTION AND ORDER OF COLLECTION

Date(s)	Time(s)	Container(s) Type/Volume	Filtered (Y/N)	Preservatives	Parameters
1-30-01	1005	4 x 40 mL VOA	N	N	M. 8260
	1007	3 x 40 mL VOA	N	HCl	M. 8021
	1010	1 x 1 L Amber	N	N	M. 8270
	1018	1 x 500 mL poly	~~Y~~ N	HNO_3	M. 6010, 7470

Effervesces?(Y/N) N
QC Sample Collected(Y/N) N
QC-COC No. N

COMMENTS:

GROUNDWATER SAMPLE COLLECTION LOG

Project Name: *Fort Carson Military Reservation*
Project No.: 24188.010102
Sample Collected By: J Nelson, K. Ribaudo

COC Number: 7528
Site ID: LF4 DPW4
Date(s) of Collection: 1-30-01

EQUIPMENT
Purging Method/Equipment: N/a
Sampling Equipment: 1" disposable bailer
Filtering Equipment: .45 um
Equipment Decontamination: DI H2O

Equipment Calibration		
Equipment Model	Serial No.	Date Calibrated
	N/a	

FIELD PARAMETERS - *Collected at the start of purging and twice per casing volume removed for a total of 7 readings.*

Ambient Air Temperature (°F): 20°- 30°
Sampling Depth (ft): N/a
Weather Conditions: Partly Cloudy
Reference Point: TOC

Time	Vol. Purged	Temp (°C)	pH	Eh (mV)	D.O. (ppm)	Conductance(mS/µS)	Turb. (NTU)	Descrip.
	INITIAL							
PARAMETERS STABILIZED?		±10%	±0.2	±10%	±10%	±10%	<5NTUs	

Total Volume Purged: N/a gallons
Purged Dry (Y/N): N/a

PURGE INFORMATION
Casing I.D. [a] N/A (in.) Unit Casing Volume [b] N/a (gal/lin ft) Depth to Water [c] 10.94 (ft)
Depth to Well Bottom [d] 17.83 (ft) Casing Volumes [e] N/a
Purge Volume = [d-c] x [b] x [e] = N/a (gal)

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE COLLECTION AND ORDER OF COLLECTION

Date(s)	Time(s)	Container(s) Type/Volume	Filtered (Y/N)	Preservatives	Parameters
1-30-01	1250	4 x 40 ml VOA	N	N	8260 VOCs
	1254	3 x 40 ml VOA	N	HCl	8021 BTEX
	1300	2 x 1 L Amber	N	N	8270 SVOCs
	1304	1 x 500 ml poly	Y	HNO_3	6010, 7470 metals

Effervesces?(Y/N) N
QC Sample Collected(Y/N) N
QC-COC No. N

COMMENTS:

GROUNDWATER SAMPLE COLLECTION LOG

Project Name: *Fort Carson Military Reservation*
Project No.: 29188.096102
Sample Collected By: J. Nelson, K. Ribaudo

COC Number: 7529
Site ID: LF4DP05
Date(s) of Collection: 1-30-01

EQUIPMENT
Purging Method/Equipment: N/A
Sampling Equipment: 1" disposable bailer and parastaltic pump
Filtering Equipment: .45 um
Equipment Decontamination: DI H_2O

Equipment Calibration		
Equipment Model	Serial No.	Date Calibrated
	N/A	

FIELD PARAMETERS - *Collected at the start of purging and twice per casing volume removed for a total of 7 readings.*

Ambient Air Temperature (°F): 20°-30°
Sampling Depth (ft): N/A

Weather Conditions: Partly cloudy
Reference Point: TOC

Time	Vol. Purged	Temp (°C)	pH	Eh (mV)	D.O. (ppm)	Conductance(mS/µS)	Turb. (NTU)	Descrip.
	INITIAL							
PARAMETERS STABILIZED?		±10%	±0.2	±10%	±10%	±10%	<5NTUs	

No Parameters taken

Total Volume Purged: N/A gallons
Purged Dry (Y/N): N/A

PURGE INFORMATION
Casing I.D. [a] N/A (in.) Unit Casing Volume [b] N/A (gal/lin ft) Depth to Water [c] 8.41 (ft)
Depth to Well Bottom [d] 12.55 (ft) Casing Volumes [e] N/A
Purge Volume = [d-c] x [b] x [e] = N/A (gal)

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE COLLECTION AND ORDER OF COLLECTION

Date(s)	Time(s)	Container(s) Type/Volume	Filtered (Y/N)	Preservatives	Parameters
1-30-01	1042	4 x 40 ml VOA	N	N	8260 VOC's
↓	1044	3 x 40 ml VOA	N	HCl	~~8270 SVOC's~~ 8
		1 x 1 L Amber	N	N	~~8270 SVOC's~~ B
		1 x 500 ml poly	Y	HNO_3	~~6010, 7470 metals~~

Effervesces?(Y/N) N
QC Sample Collected(Y/N) N
QC-COC No. N

COMMENTS:

GROUNDWATER SAMPLE COLLECTION LOG

Project Name: *Fort Carson Military Reservation*
Project No.: 29188.090102
Sample Collected By: J. Nelson, K. Ribaudo

COC Number: 7530
Site ID: ~~LF4PM~~ LF4DPW06
Date(s) of Collection: 1-30-01

EQUIPMENT
Purging Method/Equipment: 4" N/A
Sampling Equipment: 1" disposable bailer, parastaltic pump
Filtering Equipment: 45 um
Equipment Decontamination: DI H2O

Equipment Calibration		
Equipment Model	Serial No.	Date Calibrated
	N/A	

FIELD PARAMETERS - *Collected at the start of purging and twice per casing volume removed for a total of 7 readings.*

Ambient Air Temperature (°F): 20° - 30°
Sampling Depth (ft): N/A

Weather Conditions: Partly Cloudy
Reference Point: TOC

Time	Vol. Purged	Temp (°C)	pH	Eh (mV)	D.O. (ppm)	Conductance(mS/µS)	Turb. (NTU)	Descrip.
	INITIAL							
PARAMETERS STABILIZED?		±10%	±0.2	±10%	±10%	±10%	<5NTUs	

no Parameters taken

Total Volume Purged: _____ gallons Purged Dry (Y/N): _____

PURGE INFORMATION
Casing I.D. [a] N/A (in.) Unit Casing Volume [b] N/A (gal/lin ft) Depth to Water [c] 8.77 (ft)
Depth to Well Bottom [d] 9.98 (ft) Casing Volumes [e] N/A
Purge Volume = [d-c] x [b] x [e] = N/A (gal)

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE COLLECTION AND ORDER OF COLLECTION

Date(s)	Time(s)	Container(s) Type/Volume	Filtered (Y/N)	Preservatives	Parameters
1-30-01	0816	4x40mL VOA	N	N	8260 VOC'S
↓	0820	~~2x~~ 3x40mL VOA	N	HCl	8021 BTEX
		~~2x 1L Amber~~	~~N~~	~~N~~	~~8270 VOC'S~~
		~~1x 500mL poly~~	~~N~~ Y	~~HNO3~~	~~6010, 7470 metals~~

Effervesces?(Y/N) N QC Sample Collected(Y/N) N QC-COC No. N

COMMENTS:

GROUNDWATER SAMPLE COLLECTION LOG

Project Name: *Fort Carson Military Reservation*
Project No.: 29188.090102
Sample Collected By: J. Nelson, T. Hohmer

COC Number: 7534
Site ID: LP4MW1
Date(s) of Collection: 2-13-01

EQUIPMENT
Purging Method/Equipment: 2" disp. bailer
Sampling Equipment: 2" disp. bailer
Filtering Equipment: .45um
Equipment Decontamination: DI H_2O

Equipment Calibration		
Equipment Model	Serial No.	Date Calibrated
Purge Saver	185559R	2-13-01
Turbidity meter	DRT15CE	2-13-01
Heron dipper T	—	—

FIELD PARAMETERS - *Collected at the start of purging and twice per casing volume removed for a total of 7 readings.*

Ambient Air Temperature (°F): 40° - 50°
Sampling Depth (ft): N/A

Weather Conditions: Sunny, Strong wind
Reference Point: TOC

Time	Vol. Purged	Temp (°C)	pH	Eh (mV)	D.O. (ppm)	Conductance(mS/µS)	Turb. (NTU)	Descrip.
1436	INITIAL	8.83	7.14	-28.3	7.92	4388	7.02	Clear
1438	.50	9.39	7.12	-27.0	6.08	5056	6.76	Clear
1440	1.00	8.40	7.13	-24.3	7.06	3929	45.2	Slightly cloudy
1442	1.75	8.58	7.04	-23.1	6.98	4173	85.1	Slightly cloudy
1446	2.50	8.89	7.05	-23.7	6.69	4765	81.9	Slightly cloudy
1450	3.25	9.31	7.06	-24.4	6.09	5058	71.1	Slightly cloudy
1454	4.0	9.27	7.08	-25.2	6.13	5163	54.8	Slightly cloudy
PARAMETERS STABILIZED?		±10% ✓ .9	±0.2 ✓ .7	±10% ✓ 2.5	±10% ✓ .67	±10% ✓ 516	<5NTUs N 1.0	

Total Volume Purged: 4.0 gallons
Purged Dry (Y/N): N

PURGE INFORMATION
Casing I.D. [a] 2.0 (in.) Unit Casing Volume [b] .16 (gal/lin ft) Depth to Water [c] 9.76 (ft)
Depth to Well Bottom [d] 17.67 (ft) Casing Volumes [e] 3
Purge Volume = [d-c] x [b] x [e] = 3.79 (gal)

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE COLLECTION AND ORDER OF COLLECTION

Date(s)	Time(s)	Container(s) Type/Volume	Filtered (Y/N)	Preservatives	Parameters
2-13-01	1500	3x40 ml VOA	N	HCL	8021 BTEX

Effervesces?(Y/N) N
QC Sample Collected(Y/N) N
QC-COC No. N

COMMENTS:

GROUNDWATER SAMPLE COLLECTION LOG

Project Name: Fort Carson Military Reservation
Project No.: 29188.090102
Sample Collected By: J. Nelson, T. Hohman

COC Number: 7535
Site ID: LP4MW2
Date(s) of Collection: 2-13-01

EQUIPMENT
Purging Method/Equipment: 2" disp. bailer
Sampling Equipment: 2" disp. bailer
Filtering Equipment: .45 um
Equipment Decontamination: DI H_2O

Equipment Calibration		
Equipment Model	Serial No.	Date Calibrated
Purge Saver	185559R	2-13-01
Turbidity meter	DRT 15CE	2-13-01
Hera dipper J	—	—

FIELD PARAMETERS - *Collected at the start of purging and twice per casing volume removed for a total of 7 readings.*

Ambient Air Temperature (°F): 40° - 50°
Sampling Depth (ft): N/A
Weather Conditions: Sunny, Strong winds
Reference Point: TOC

Time	Vol. Purged	Temp (°C)	pH	Eh (mV)	D.O. (ppm)	Conductance(mS/µS)	Turb. (NTU)	Descrip.
1400	INITIAL	12.68	7.31	-37.6	8.46	5663	5.53	Clear
1402	.50	12.28	7.25	-34.0	8.48	4264	12.81	Clear
1404	.75	12.25	7.22	-32.9	8.61	4161	21.8	Clear
1407	1.00	12.04	7.19	-30.9	8.70	4165	52.6	Slightly cloudy
1409	1.50	12.07	7.17	-30.2	8.63	4133	46.1	Clear
1411	2.0	12.15	7.16	-29.5	8.46	4137	50.2	Clear
1414	2.50	12.34	7.16	-29.4	8.54	4158	36.2	Clear
PARAMETERS STABILIZED?		±10% ✓ 1.2	±0.2 ✓ .7	±10% ✓ 3.0	±10% ✓ .9	±10% ✓ 415	<5NTUs N/A	

Total Volume Purged: 2.50 gallons
Purged Dry (Y/N): N

PURGE INFORMATION
Casing I.D. [a] 2.0 (in.) Unit Casing Volume [b] .16 (gal/lin ft) Depth to Water [c] 13.09 (ft)
Depth to Well Bottom [d] 17.89 (ft) Casing Volumes [e] 3
Purge Volume = [d-c] x [b] x [e] = 2.30 (gal)

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE COLLECTION AND ORDER OF COLLECTION

Date(s)	Time(s)	Container(s) Type/Volume	Filtered (Y/N)	Preservatives	Parameters
2-13-01	1420	3x 40 mL VOA	N	HCL	8021 BTEX

Effervesces?(Y/N) N
QC Sample Collected(Y/N) N
QC-COC No. N

COMMENTS:

GROUNDWATER SAMPLE COLLECTION LOG

Project Name: Fort Carson Military Reservation
Project No.: 27188.090102
Sample Collected By: J. Nelson, T. Johnson

COC Number: 7536
Site ID: LF4NW3
Date(s) of Collection: 2-14-01

EQUIPMENT

Purging Method/Equipment: 2" disp. bailer
Sampling Equipment: 2" disp. bailer
Filtering Equipment: .45 mm
Equipment Decontamination: DI H2O

Equipment Calibration		
Equipment Model	Serial No.	Date Calibrated
Purge Saver	185553R	2-14-01
Turbidity meter	DRT 15CE	2-14-01

FIELD PARAMETERS - *Collected at the start of purging and twice per casing volume removed for a total of 7 readings.*

Ambient Air Temperature (°F): 20°-30°
Sampling Depth (ft): N/A

Weather Conditions: Cloudy, light snow
Reference Point: TOC

Time	Vol. Purged	Temp (°C)	pH	Eh (mV)	D.O. (ppm)	Conductance(mS/µS)	Turb. (NTU)	Descrip.
1245	INITIAL	6.93	7.09	-26.0	5.83	3220	21.8	Clear
1249	.50	7.78	7.02	-22.8	5.70	3513	41.3	Clear
1252	.75	8.21	6.97	-20.1	5.10	3662	77.1	Clear
1255	1.50	7.86	6.98	-20.4	5.52	3523	238	Slightly Cloudy
1258	2.25	8.13	6.96	-19.6	5.57	3755	289	Slightly Cloudy
1301	~~3.50~~ 3.50	8.32	6.94	-18.5	5.18	3920	318	Slightly Cloudy
1304	4.25	8.58	6.91	-17.6	4.94	4072	461	Cloudy
PARAMETERS STABILIZED?		±10% ✓.7	±0.2 ✓.7	±10% ✓ 2.8	±10% ✓ 2.4	±10% ✓ 407	<5NTUs N/A	

Total Volume Purged: 4.25 gallons
Purged Dry (Y/N): N

PURGE INFORMATION

Casing I.D. [a] 2.0 (in.) Unit Casing Volume [b] .16 (gal/lin ft) Depth to Water [c] 9.11 (ft)
Depth to Well Bottom [d] 17.23 (ft) Casing Volumes [e] 3
Purge Volume = [d-c] x [b] x [e] = 4.08 (gal)

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE COLLECTION AND ORDER OF COLLECTION

Date(s)	Time(s)	Container(s) Type/Volume	Filtered (Y/N)	Preservatives	Parameters
2-14-01	1308	3 x 40 ml VOA	N	HCL	8021 8TEX

QC Sample Collected(Y/N) N QC-COC No. N

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To Susan H	Date 6/27 # of pages ▶
Co./Dept.	From Todd M
Phone #	Co.
Fax #	Phone #
	Fax #

GROUNDWATER SAMPLE COLLECTION LOG

Project Name: Fort Carson Military Reservation
Project No.: 29188.090102
Sample Collected By: J. Nelson, T. Hohman

COC Number: 7523
Site ID: UFHMW04
Date(s) of Collection: 2-13-01

EQUIPMENT
Purging Method/Equipment: 2" disp. bailer
Sampling Equipment: 2" disp. bailer
Filtering Equipment: .45um
Equipment Decontamination: DI H_2O

Equipment Calibration		
Equipment Model	Serial No.	Date Calibrated
Purge Saver	185559R	2-13-01
Turbidity meter	DRT 15CE	2-13-01
Heron dipper T	—	—

FIELD PARAMETERS - *Collected at the start of purging and twice per casing volume removed for a total of 7 readings.*

Ambient Air Temperature (°F): 40°-50°
Sampling Depth (ft): N/A

Weather Conditions: Sunny, Strong winds
Reference Point: TOC

Time	Vol. Purged	Temp (°C)	pH	Eh (mV)	D.O. (ppm)	Conductance(mS/µS)	Turb. (NTU)	Descrip.
1109	INITIAL	9.42	6.66	-3.2	7.54	2251	37.5	Clear
1112	~~1.25~~ .50	9.07	6.62	-1.8	7.53	2135	109	Slightly cloudy
1115	~~2.75~~ .75	8.83	6.65	-3.2	7.52	2118	337	Cloudy
1119	~~2.25~~ 1.50	8.91	6.69	-5.5	7.00	2117	415	Cloudy
1121	2.25	8.93	6.71	-6.4	6.71	2115	318	Cloudy
1124	3.00	9.12	6.71	-6.3	6.12	2108	303	Cloudy
1126	3.75	9.11	6.72	-6.4	5.96	2112	424	Cloudy
PARAMETERS STABILIZED?		±10% ✓.7	±0.2 ✓.9	±10% ✓.6	±10% ✓.7	±10% ✓.24	<5NTUs N/A	

Total Volume Purged: 3.75 gallons
Purged Dry (Y/N): N

PURGE INFORMATION
Casing I.D. [a] 2.0 (in.) Unit Casing Volume [b] .16 (gal/lin ft) Depth to Water [c] 9.22 (ft)
Depth to Well Bottom [d] 16.75 (ft) Casing Volumes [e] 3
Purge Volume = [d-c] x [b] x [e] = 3.01 (gal)

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE COLLECTION AND ORDER OF COLLECTION

Date(s)	Time(s)	Container(s) Type/Volume	Filtered (Y/N)	Preservatives	Parameters
2-13-01	1130	4 x 40 mL VOA	N	N	8260 VOCS
	1133	3 x 40 mL VOA	N	HCL	BTEX 8021
	1137	2 x 1L Amber	N	N	8270 SVOC'S
	1140	1 x 500 mL poly	Y	HNO_3	6010, 7470 metals

Effervesces?(Y/N) N
QC Sample Collected(Y/N) Y
QC-COC No. 7531

COMMENTS:

GROUNDWATER SAMPLE COLLECTION LOG

Project Name: Fort Carson Military Reservation
Project No.: 29188.090102
Sample Collected By: J. Nelson, T. Hohmann

COC Number: 7524
Site ID: LP4MW05
Date(s) of Collection: 2-13-01

EQUIPMENT
Purging Method/Equipment: 2" disp. bailer
Sampling Equipment: 2" disp. bailer
Filtering Equipment: .45 um
Equipment Decontamination: DI H_2O

Equipment Calibration		
Equipment Model	Serial No.	Date Calibrated
Purge Saver	1X55598	2-13-01
Turbidity meter	DRT 15CE	2-13-01
Heron dipper T	—	—

FIELD PARAMETERS - *Collected at the start of purging and twice per casing volume removed for a total of 7 readings.*

Ambient Air Temperature (°F): 40° - 50°
Sampling Depth (ft): N/A

Weather Conditions: Sunny, Strong Winds
Reference Point: TOC

Time	Vol. Purged	Temp (°C)	pH	Eh (mV)	D.O. (ppm)	Conductance(mS/µS)	Turb. (NTU)	Descrip.
1526	INITIAL	7.40	9.252	-48.2	9.21	54355	8.54	clear/yellows
1528	.50	6.67	7.49	-45.8	9.59	54812	36.8	"
1531	1.00	6.56	7.42	-42.9	8.15	54840	53.7	"
1535	1.75	6.89	7.41	-42.1	8.30	54859	52.6	"
1538	2.50	7.14	7.40	-41.8	8.14	54844	67.2	"
1544	3.25	7.20	7.40	-41.4	8.03	54856	58.3	"
1549	4.00	7.33	7.39	-41.0	8.01	54860	47.2	"
PARAMETERS STABILIZED?		±10% ✓.73	±0.2 ✓.74	±10% ✓4.1	±10% ✓.8	±10% ✓549	<5NTUs N/A	

Total Volume Purged: 4.00 gallons
Purged Dry (Y/N): N

PURGE INFORMATION
Casing I.D. [a] 2.0 (in.) Unit Casing Volume [b] .16 (gal/lin ft) Depth to Water [c] 6.60 (ft)
Depth to Well Bottom [d] 15.02 (ft) Casing Volumes [e] 3
Purge Volume = [d-c] x [b] x [e] = 4.00 (gal)

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE COLLECTION AND ORDER OF COLLECTION

Date(s)	Time(s)	Container(s) Type/Volume	Filtered (Y/N)	Preservatives	Parameters
2-13-01	1547	4 x 40 ml VOA	N	N	8260 VOCS
	1550	3 x 40 ml VOA	N	HCL	8021 BTEX
	1552	2 x 1 L Amber	N	N	8270 SVOCS
	1555	1 x 500 ml poly	Y	HNO_3	6010, 7470 metals

Effervesces?(Y/N) N
QC Sample Collected(Y/N) Y
QC-COC No. 7532, 2533

COMMENTS:

GROUND WATER SAMPLE COLLECTION LOG

Project Name: Ft Carson
Project No.: 89840/200
Sample Collected By: JFA HSH

Sample Number: LF4-mw1
Sample Location: Landfill #4
Date & Time Collected: 4/25/95, 0916

EQUIPMENT

Purging Method/Equipment: Bennett Piston Pump
Sampling Equipment: Bennett Piston Pump
Filtering Equipment: Geotech 0.45 micron disposable filter

Equipment Calibration

Equipment Model	Serial No.	Date Calibrated
Turbidimeter	DRT - 15CE	4/25/95
Beckman (pH)	219791	4/25/95
HyDAC (Cond)	9311	4/25/95

	Standard Temp	Standard ~~Reading~~	~~Standard~~ Reading
pH Meter	14.3°C	7.0	7.13

Conductivity std	Temp	~~Standard~~ Reading
1000 / 10000	59.2°F	925 / 8990

Turb	Std: 10/100/1000	Read: 5.5/99.7/1006

Equipment Decontamination:

FIELD PARAMETERS

Air Temperature (°F): 40-50°
Sampling Depth (ft): NA
Initial Depth to Water (ft): 6.48
Reference Point: TOC

Volume Purged (gal)	Temp (°C)	Conductance µS/cm ( )	pH	Time	Turb NTU	Water Description
0	10.3	6.88	8.81	0900	0	clear
0.5	8.8	3990	7.08	0901	4.5	clear
1.5	8.3	4150	7.38	0903	14.8	clear
2.5	7.9	4200	7.42	0905	10.6	clear
3.5	8.2	4370	7.47	0907	1.13	clear
5.5	8.1	4420	7.49	0911	0	clear

Total Volume Purged: 5.5 Time: 0911 Purged Dry (Y/N): N (but did chase down)

PURGING INFORMATION

Casing I.D. [a] (in.) 2" Unit Casing Volume [b] 0.16 (gal/ft) Depth to Water [c] 6.48 (ft)
Depth to Well Bottom [d] 17.62 (ft) Casing Volumes [e] 3
Purge Volume = [d-c] x [b] x [e] = 5.3 gal (gal)

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE PACKAGING

Container(s) Type & Volume	Filtered (Y/N)	Preservatives	Parameters
40ml VOA x 4	N	HCl	VOC
1L plastic	Y	HNO_3	metals except Hg
500ml plastic	Y	HNO_3	Hg
1L amber glass x 4	N	none	SVOC + PCB + Pests
500 ml plastic	N	NaOH	Cyanide

Additional Remarks: MRD Split Collected

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GROUND WATER SAMPLE COLLECTION LOG

Project Name: Ft Carson
Project No.: 89840.200
Sample Collected By: JFA HSH

Sample Number: LF4-MW2
Sample Location: Landfill #4
Date & Time Collected: 4/25/95, 1035

EQUIPMENT

Purging Method/Equipment: Bennett Piston Pump
Sampling Equipment: Bennett Piston Pump
Filtering Equipment: Gelman 0.45 micron disposable filter

Equipment Calibration

Equipment Model	Serial No.	Date Calibrated
Turbidimeter	DRT - 15CE	4/25/95
Beckman (pH)	219791	4/25/95
HyDAC (cond)	9311	4/25/95

Equipment Decontamination:

	Standard Temp	Standard ~~Reading~~	~~Standard~~ Reading
pH Meter	14.3°C	7.0	7.13

Conductivity std	Temp	~~Standard~~ Reading
1000 / 10000	59.2°F	925 / 8990

Turb	Std: 10/100/1000	Read: 5.5/99.7/1006

FIELD PARAMETERS

Air Temperature (°F): 40-50°
Sampling Depth (ft): NA

Initial Depth to Water (ft): 9.54
Reference Point: TOC

Volume Purged (gal)	Temp (°C)	Conductance (uS/cm)	pH	Time	Turb NTU	Water Description
0	14.8	~~2020~~	7.60	1023	166	sl. cloudy
1	13.9	3930	7.52	1025	276	sl. cloudy
2.5	13.2	4000	7.47	1026	133	sl. cloudy
3.0	12.9	4010	7.45	1027	105	sl. cloudy
3.5	13.0	4000	7.47	1029	75.4	sl. cloudy
3.75 ~~4.0 PA~~	12.7	4020	7.48	1030	79.4	

Total Volume Purged: 3.75 Time: 1030 Purged Dry (Y/N): Y

PURGING INFORMATION

Casing I.D. [a] (in.) 2 Unit Casing Volume [b] 0.16 (gal/ft) Depth to Water [c] 9.54 (ft)
Depth to Well Bottom [d] 17.89 (ft) Casing Volumes [e] 3
Purge Volume = [d-c] x [b] x [e] = 4 (gal)

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE PACKAGING

Container(s) Type & Volume	Filtered (Y/N)	Preservatives	Parameters
40 ml VOA x 4	N	HCl	VOC
1L plastic	Y	HNO_3	metals except Hg
500 ml plastic	Y	HNO_3	Hg
1L amber glass x 4	N	none	SVOC + PCB + PEST
500 ml plastic	N	NaOH	Cyanide

Additional Remarks:

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GROUND WATER SAMPLE COLLECTION LOG

Project Name: Ft. Carson
Project No.: 89840.200
Sample Collected By: JEA, HSH

Sample Number: LF4-MW2
Sample Location: Group A
Date & Time Collected: 4/21/95 1330

EQUIPMENT

Purging Method/Equipment: Bennett Piston Pump
Sampling Equipment: Bennett Piston Pump
Filtering Equipment: Geotech 0.45 micron disposable filter

Equipment Calibration

	Equipment Model	Serial No.	Date Calibrated
Cond	HyDAC	9311	4/21/95
Turb	HF Scientific Inc	DRT-15CE	4/21/95
pH	Beckman	219791	4/21/95

Equipment Decontamination:

	Standard Temp	Standard Reading	Standard Reading
pH Meter	13.5°C	7.0	7.07

Conductivity	Temp	Standard Reading
1000 / 10000	56.6°F	870 / 8220

Turbidity	STD: 10/100/1000	READ: 5.4/106/995

FIELD PARAMETERS

Air Temperature (°F): 305
Sampling Depth (ft): NA

Initial Depth to Water (ft): 5.51
Reference Point: TOC

Volume Purged (gal)	Temp (°C)	Conductance µS/cm	pH	Time	NT	Water Description
0.1	3.1	790	7.84	1317	38.4	Clear
2.5	5.9	1530	7.53	1319	18.2	clear
3.5	6.0	1560	7.50	1320	48.5	slightly cloudy
4.5	6.4	1760	7.44	1321	97.4	slightly cloudy
5	6.8	1780	7.46	1323	73.9	slightly cloudy
6	6.9	1820	7.42	1325	95.9	slightly cloudy

Total Volume Purged: 6.5 gal Time: 15 min Purged Dry (Y/N): N

PURGING INFORMATION

Casing I.D. [a] (in.) 2 Unit Casing Volume [b] 0.16 (gal/lin ft) Depth to Water [c] 5.51 (ft)
Depth to Well Bottom [d] 17.56 (ft) Casing Volumes [e] 5
Purge Volume = [d-c] x [b] x [e] = 5.8 (gal)

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE PACKAGING

Container(s) Type & Volume	Filtered (Y/N)	Preservatives	Parameters
4x40ml VOA	N	HCl	VOC
2x1l amber	N	None	SVOC
1x 500ml plastic	N	NaOH	Cyanide
1x 500ml plastic	Y	HNO_3	Metals - Total Hg
1x1l plastic	Y	HNO_3	Metals

Additional Remarks:

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GROUNDWATER SAMPLE COLLECTION LOG

Project Name: *Fort Carson Military Reservation*

COC Number: 9846, 9847

Project No.: 45484.07.05.01

Site ID: LF4MW07

Sample Collected By: T. Hohman, d. Fenton

Date(s) of Collection: 1-8-02, 1-9-02, 1-10-02

Purging Method/Equipment: disposable bailer
Sampling Equipment: disposable bailer
Filtering Equipment: 0.45 micron disposable filter
Equipment Decontamination: NA

Equipment Calibration		
Equipment Model	Serial No.	Date Calibrated
purge saver	1013	1-7-02
turbidity meter	DRT 15CE	"
Heron Dipper T	ETB	—

FIELD PARAMETERS - *Collected at the start of purging and twice per casing volume removed for a total of 7 readings.*

Ambient Air Temperature (°F): 50°F

Weather Conditions: partly cloudy

Date Well Purged: 1-7-02

Reference Point: Top of casing

Time	Vol. Purged	Temp(°C)	pH	Eh (mV)	D.O.(ppm)	Conductance(mS/μS)	Turb.(NTU)	Descrip
1408	INITIAL	14.14	7.28	158	4.16	54.4	7.97	Yellow
1413	1.50	14.09	7.24	160	4.15	55.8	77.6	"
1416	2.25	14.04	7.24	162	3.57	58.7	59.6	"
1418	3.00	14.01	7.25	163	3.90	~~79.0~~ 63.8	71.4	"
1421	3.75	13.99	7.21	164	3.70	68.0	82.0	"
1428	4.50	13.74	7.20	163	3.62	69.4	190.0	"
~~5.25~~		DRY @	≈ 5.20 gallons purged					
Parameters Stabilized?		±10%	±0.2	±10%	±10%	±10%	<5NTUs	

Total Volume Purged: ≈ 5.20 gallons

Purged Dry (Y/N): Y

PURGE INFORMATION

Casing I.D. [a] 2 (in.) Unit Casing Volume [b] 0.16 (gal/lin ft) Depth to Water [c] 12.83' (ft)

Depth to Well Bottom [d] 23.44 (ft) Casing Volumes [e] 3

Purge Volume = [d-c] x [b] x [e] = 5.09 (gal)

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE COLLECTION AND ORDER OF COLLECTION – cross out unused bottles

Date(s)	Time(s)	Container(s) Type/Volume	Filtered (Y/N)	Preservatives	Parameters
1-8-02	1255	12 x 40ml VOA	N	None	8260 VOCs
↓	1307	4 x 40ml VOA	N	HCL	8021 BTEX
1-9-02	1316	6 x 1L amber	N	N	8270 SVOC's
1-10-02	1440	3 x 500 ml poly	Y	HNO3	6010 Metals

Effervesces?(Y/N) Y

QC Sample Collected(Y/N) Y

QC-COC No. 9850, 9851, 9851, 9852

COMMENTS:

GROUNDWATER SAMPLE COLLECTION LOG

Time	Vol. Purged (gal)	Temp (°C)	pH	Eh (mV)	D.O. (ppm)	Conductance(mS/μS)	Turb. (NTU)	Descrip.
PARAMETERS STABILIZED?		±10%	±0.2	±10%	±10%	±10%	<5NTUs	

TABLE 2-8
NUMBER OF WELL CASING VOLUMES TO PURGE
FORT CARSON, COLORADO

Well Casing Diameter (in.)	Borehole Diameter* (in.)								
	4	5	6	7	8	9	10	11	12
2	3	3	4	5	7	8	10	--	--
4	--	3	3	3	3	3	3	4	4
6	--	--	--	3	3	3	3	3	3

* Round borehole diameter to the next higher full inch.

The above table is based on the following equations:

$$V_B=[\pi(\frac{D_B}{2})^2-\pi(\frac{D_C}{2})^2]\cdot hn+V_C$$

$$V_C=\pi(\frac{D_C}{2})^2\cdot h$$

$$N=\frac{V_B}{V_C}$$ (If N<3, use N=3)

$$v=V_C\cdot A$$

$$V=N\cdot v$$

where:
A = conversion factor (7.48 = number of gallons per cubic foot of water)
D_B = Diameter of borehole (ft)
D_C = Diameter of well casing (ft)
h = height of standing water (ft)
n = porosity (estimated at 35 percent or 0.35)
N = Number of casing volumes to purge to equal one borehole volume
r = radius of well casing (ft) = $D_C/2$
v = volume of water in well casing (gallons)
V = 1 borehole volume of water (gallons)
V_B = Volume of water in borehole (ft^3)
V_C = Volume of water in well casing (ft^3)

To convert the volume from ft^3 to gallons, multiply V_B or V_C by 7.48 (gallons/ft^3)

GROUNDWATER SAMPLE COLLECTION LOG

Project Name: *Fort Carson Military Reservation* COC Number: 9843

Project No.: 45484.07.05.01 Site ID: LF4 MW06

Sample Collected By: T. Hohmann, J. Fenton Date(s) of Collection: 1-8-02

Purging Method/Equipment: disposable bailer
Sampling Equipment: disposable bailer
Filtering Equipment: 0.45 micron disposable filter
Equipment Decontamination: NA

Equipment Calibration		
Equipment Model	Serial No.	Date Calibrated
purge saver	1013	1-7-02
turbidity meter	DRT15CE	"
Heron Dipper-T	ETB	—

FIELD PARAMETERS - *Collected at the start of purging and twice per casing volume removed for a total of 7 readings.*

Ambient Air Temperature (°F): 45°F Weather Conditions: partly cloudy

Date Well Purged: 1-7-02 Reference Point: Top of casing

Time	Vol. Purged	Temp(°C)	pH	Eh (mV)	D.O.(ppm)	Conductance(mS/μS)	Turb.(NTU)	Descrip
1320	*INITIAL*	10.57	7.26	225	4.56	67.1	6.42	yellow
1327	1.50	10.88	7.25	210	4.32	66.8	19.0	"
1332	2.00	11.18	7.29	206	4.93	59.4	46.6	"
1340	2.50	DRY @ ≈ 2.45 gallons purged						
	3.00							
	3.50							
	4.00						TH	
Parameters Stabilized?		±10%	±0.2	±10%	±10%	±10%	<5NTUs	

Total Volume Purged: ≈ 2.45 gallons Purged Dry (Y/N): Y

PURGE INFORMATION
Casing I.D. [a] 2 (in.) Unit Casing Volume [b] 0.16 (gal/lin ft) Depth to Water [c] 8.32 (ft)
Depth to Well Bottom [d] 16.36 (ft) Casing Volumes [e] 3
Purge Volume = [d-c] x [b] x [e] = 3.86 (gal)

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE COLLECTION AND ORDER OF COLLECTION – cross out unused bottles

Date(s)	Time(s)	Container(s) Type/Volume	Filtered (Y/N)	Preservatives	Parameters
1-8-02	1200	4x40 mL VOA	N	None	8260 VOCs
	1211	3x40 mL VOA	N	HCL	8021 BTEX
	1220	2x1L Amber	N	None	8270 SVOCs
	1238	1x500mL Poly	Y	HNO3	6010 Metals
					TH

Effervesces?(Y/N) N QC Sample Collected(Y/N) N QC-COC No. N/A

COMMENTS:

GROUNDWATER SAMPLE COLLECTION LOG

Time	Vol. Purged (gal)	Temp (°C)	pH	Eh (mV)	D.O. (ppm)	Conductance(mS/μS)	Turb. (NTU)	Descrip.
							TH	
PARAMETERS STABILIZED?		±10%	±0.2	±10%	±10%	±10%	<5NTUs	

TABLE 2-8
NUMBER OF WELL CASING VOLUMES TO PURGE
FORT CARSON, COLORADO

Well Casing Diameter (in.)	Borehole Diameter* (in.)								
	4	5	6	7	8	9	10	11	12
2	3	3	4	5	7	8	10	--	--
4	--	3	3	3	3	3	3	4	4
6	--	--	--	3	3	3	3	3	3

* Round borehole diameter to the next higher full inch.

The above table is based on the following equations:

$$V_B=[\pi(\frac{D_B}{2})^2-\pi(\frac{D_C}{2})^2]\cdot hn+V_C$$

$$V_C=\pi(\frac{D_C}{2})^2\cdot h$$

$$N=\frac{V_B}{V_C}$$ (If N<3, use N=3)

$$v=V_C\cdot A$$

$$V=N\cdot v$$

where:
A = conversion factor (7.48 = number of gallons per cubic foot of water)
D_B = Diameter of borehole (ft)
D_C = Diameter of well casing (ft)
h = height of standing water (ft)
n = porosity (estimated at 35 percent or n = 0.35)
N = Number of casing volumes to purge to equal one borehole volume
r = radius of well casing (ft) = $D_C/2$
v = volume of water in well casing (gallons)
V = borehole volume of water (gallons)
V_B = Volume of water in borehole (ft^3)
V_C = Volume of water in well casing (ft^3)

To convert volume from ft^3 to gallons, multiply V_B or V_C by 7.48 (gallons/ft^3)

GROUNDWATER SAMPLE COLLECTION LOG

Project Name: *Fort Carson Military Reservation* COC Number: 9691, 9729

Project No.: 45484.07.05.01 Site ID: LFHOP01

Sample Collected By: J. Nelson, D. Butler, T. Hohman, J. Fenton Date(s) of Collection: 11-14-01, 11-15-01, 11-16-01, 11-19-01

Purging Method/Equipment: disposable bailer
Sampling Equipment: disposable bailer
Filtering Equipment: 0.45 micron disposable filter
Equipment Decontamination: NA

Equipment Calibration		
Equipment Model	Serial No.	Date Calibrated
	N/a	

FIELD PARAMETERS - *Collected at the start of purging and twice per casing volume removed for a total of 7 readings.*

Ambient Air Temperature (°F): 65° Weather Conditions: Sunny, Fair

Date Well Purged: 11-12-01 Reference Point: Top of casing

Time	Vol. Purged	Temp(°C)	pH	Eh (mV)	D.O.(ppm)	Conductance(mS/μS)	Turb (NTU)	Descrip
	INITIAL							
	0.11							
	0.20							
	0.29							
	0.38							
	0.47							
	0.56							
Parameters Stabilized?		±10%	±0.2	±10%	±10%	±10%	<5NTUs	

N/a

Total Volume Purged: 0.25 gallons Purged Dry (Y/N): YES

PURGE INFORMATION
Casing I.D. [a] 1.0 (in.) Unit Casing Volume [b] .04 (gal/lin ft) Depth to Water [c] 8.66 (ft)
Depth to Well Bottom [d] 13.25 (ft) Casing Volumes [e] 3
Purge Volume = [d-c] x [b] x [e] = N/a (gal)

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE COLLECTION AND ORDER OF COLLECTION – cross out unused bottles

Date(s)	Time(s)	Container(s) Type/Volume	Filtered (Y/N)	Preservatives	Parameters
11-14-01	0800	4 x 40 mL VOA	N	N	8260 VOCs's
"	0804	3 x 40 mL VOA	N	HCL	~~8270 SVOC's~~ 8021 BTEX
"	0808	~~2~~ 1 x 1 L Amber	N	~~8Z~~ N	~~6010 Metals~~ ~~8270 SVOC~~
TH		~~1 x 500 mL poly~~	~~Y~~	~~HNO_3~~	~~8270 SVOC's~~
					TH

Effervesces (Y/N) V QC Sample Collected(Y/N) N QC-COC No. N/A

COMMENTS:

GROUNDWATER SAMPLE COLLECTION LOG

Project Name: *Fort Carson Military Reservation* COC Number: 9692

Project No.: 45484.07.05.01 Site ID: LFHDP 02

Sample Collected By: J. Nelson, D. Butler, T. Hohman Date(s) of Collection: 11-14-01, 11-15-01

Purging Method/Equipment: disposable bailer
Sampling Equipment: disposable bailer
Filtering Equipment: 0.45 micron disposable filter
Equipment Decontamination: NA

Equipment Calibration		
Equipment Model	Serial No.	Date Calibrated
	N/a	

FIELD PARAMETERS - *Collected at the start of purging and twice per casing volume removed for a total of 7 readings.*

Ambient Air Temperature (°F): 65° Weather Conditions: SUNNY, FAIR

Date Well Purged: 11-12-01 Reference Point: Top of casing

Time	Vol. Purged	Temp(°C)	pH	Eh (mV)	D.O.(ppm)	Conductance(mS/μS)	Turb (NTU)	Descrip
	INITIAL							
Parameters Stabilized?		±10%	±0.2	±10%	±10%	±10%	<5NTUs	

N/a

Total Volume Purged: 0.05 gallons Purged Dry (Y/N): YES

PURGE INFORMATION
Casing I.D. [a] 1.0 (in.) Unit Casing Volume [b] .04 (gal/lin ft) Depth to Water [c] _____ (ft)
Depth to Well Bottom [d] _____ (ft) Casing Volumes [e] 3
Purge Volume = [d-c] x [b] x [e] = N/a (gal)

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE COLLECTION AND ORDER OF COLLECTION – cross out unused bottles

Date(s)	Time(s)	Container(s) Type/Volume	Filtered (Y/N)	Preservatives	Parameters
11-14-01	0810	4 x 40 ml VOA	N	N	8260 VOC's
11-15-01	0838	3 x 40 ml VOA	N	HCL	8270 SVOC's 8021B
TH		~~2 x 1 L Amber~~	~~N~~	~~82 N~~	~~6010 Metals~~
TH		~~1 x 500 ml poly~~	~~Y~~	~~HNO_3~~	~~8270 SVOC's~~

TH

COMMENTS: Effervesces (Y/N) N QC Sample Collected(Y/N) N QC-COC No. N/A

GROUNDWATER SAMPLE COLLECTION LOG

Project Name: *Fort Carson Military Reservation* COC Number: 9693, 9731

Project No.: 45484.07.05.01 Site ID: LFHDP 03

Sample Collected By: J. Nelson, D. Butler, T. Hohman, J. Fenton Date(s) of Collection: 11-14-01, 11-15-01, 11-16-01, 11-19-01

Purging Method/Equipment: disposable bailer
Sampling Equipment: disposable bailer
Filtering Equipment: 0.45 micron disposable filter
Equipment Decontamination: NA

Equipment Calibration		
Equipment Model	Serial No.	Date Calibrated
	N/a	

FIELD PARAMETERS - *Collected at the start of purging and twice per casing volume removed for a total of 7 readings.*

Ambient Air Temperature (°F): 65° Weather Conditions: Sunny, Fair

Date Well Purged: 11-12-01 Reference Point: Top of casing

Time	Vol. Purged	Temp(°C)	pH	Eh (mV)	D.O.(ppm)	Conductance(mS/μS)	Turb (NTU)	Descrip
	INITIAL							
	0.25							
	0.40							
	0.55							
	0.70							
	0.85		N/a					
	1.00							
Parameters Stabilized?		±10%	±0.2	±10%	±10%	±10%	<5NTUs	

Total Volume Purged: 0.50 gallons Purged Dry (Y/N): YES

PURGE INFORMATION
Casing I.D. [a] 1.0 (in.) Unit Casing Volume [b] .04 (gal/lin ft) Depth to Water [c] 5.23 (ft)
Depth to Well Bottom [d] 13.46 (ft) Casing Volumes [e] 3
Purge Volume = [d-c] x [b] x [e] = N/a (gal)

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE COLLECTION AND ORDER OF COLLECTION – cross out unused bottles

Date(s)	Time(s)	Container(s) Type/Volume	Filtered (Y/N)	Preservatives	Parameters
11-14-01	0822	4 x 40 mL VOA	N	N	8260 VOC's
11-15-01	0818	3 x 40 mL VOA	N	HCL	~~8270 SVOC's~~ 8021 BE
11-15-01	0825	2 x 1 L Amber	N	~~82~~ N	~~6010 Metals~~ 8270 SVOC
TH		~~1 x 500 mL poly~~	~~Y~~	~~HNO_3~~	~~8270 SVOC's~~

Effervesces (Y/N) N QC Sample Collected(Y/N) N QC-COC No. N/A

COMMENTS:

GROUNDWATER SAMPLE COLLECTION LOG

Project Name: *Fort Carson Military Reservation* COC Number: 9694, 9732

Project No.: 45484.07.05.01 Site ID: LFHDP 04

Sample Collected By: J. Nelson, D. Butler, T. Hohman, J. Fenton Date(s) of Collection: 11-14-01, 11-15-01, 11-19-01

Purging Method/Equipment: disposable bailer
Sampling Equipment: disposable bailer
Filtering Equipment: 0.45 micron disposable filter
Equipment Decontamination: NA

Equipment Calibration		
Equipment Model	Serial No.	Date Calibrated
	N/a	

FIELD PARAMETERS - *Collected at the start of purging and twice per casing volume removed for a total of 7 readings.*

Ambient Air Temperature (°F): 65° Weather Conditions: FAIR, SUNNY

Date Well Purged: 11-12-01 Reference Point: Top of casing

Time	Vol. Purged	Temp(°C)	pH	Eh (mV)	D.O.(ppm)	Conductance(mS/µS)	Turb (NTU)	Descrip
	INITIAL							
	0.25						MUDDY-BROWNISH-BLACK	
	0.35							
	0.45							
	0.55							
	0.65							
	0.75							
Parameters Stabilized?		±10%	±0.2	±10%	±10%	±10%	<5NTUs	

N/a

Total Volume Purged: 0.25 gallons Purged Dry (Y/N): YES

PURGE INFORMATION
Casing I.D. [a] 1.0 (in.) Unit Casing Volume [b] .04 (gal/lin ft) Depth to Water [c] 11.52 (ft)
Depth to Well Bottom [d] 17.8 (ft) Casing Volumes [e] 3
Purge Volume = [d-c] x [b] x [e] = N/a (gal)

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE COLLECTION AND ORDER OF COLLECTION – cross out unused bottles

Date(s)	Time(s)	Container(s) Type/Volume	Filtered (Y/N)	Preservatives	Parameters
11-14-01	0835	4 x 40 mL VOA	N	N	8260 VOC's
"	0846	3 x 40 mL VOA	N	HCL	~~8270 SVOC's~~ 8021B
"	0848	~~2 x~~ 1 L Amber	N	~~82~~ N	TH ~~6010 Metals~~ 8270 SVOC's
TH		~~1 x 500 mL poly~~	~~Y~~	~~HNO_3~~	
					TH

Effervesces (Y/N) N QC Sample Collected(Y/N) N QC-COC No. N/A

COMMENTS:

GROUNDWATER SAMPLE COLLECTION LOG

Project Name: *Fort Carson Military Reservation* COC Number: 9695

Project No.: 45484.09.05.01 Site ID: LFHOP 05

Sample Collected By: J. Nelson, D. Butler, T. Holman Date(s) of Collection: 11-14-01, 11-15-01

Purging Method/Equipment: disposable bailer
Sampling Equipment: disposable bailer
Filtering Equipment: 0.45 micron disposable filter
Equipment Decontamination: NA

Equipment Calibration		
Equipment Model	Serial No.	Date Calibrated
	N/A	

FIELD PARAMETERS - *Collected at the start of purging and twice per casing volume removed for a total of 7 readings.*

Ambient Air Temperature (°F): 65° Weather Conditions: Sunny, Fair

Date Well Purged: 11-12-01 Reference Point: Top of casing

Time	Vol. Purged	Temp(°C)	pH	Eh (mV)	D.O.(ppm)	Conductance(mS/μS)	Turb (NTU)	Descrip
	INITIAL							
	0.07						Black +	Nasty
	0.14							
	0.21							
	0.28		N/A					
	0.35							
	0.43							
Parameters Stabilized?		±10%	±0.2	±10%	±10%	±10%	<5NTUs	

Total Volume Purged: 0.10 gallons Purged Dry (Y/N): YES

PURGE INFORMATION
Casing I.D. [a] 1.0 (in.) Unit Casing Volume [b] .04 (gal/lin ft) Depth to Water [c] 8.98 (ft)
Depth to Well Bottom [d] 12.55 (ft) Casing Volumes [e] 3
Purge Volume = [d-c] x [b] x [e] = N/A (gal)

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE COLLECTION AND ORDER OF COLLECTION – cross out unused bottles

Date(s)	Time(s)	Container(s) Type/Volume	Filtered (Y/N)	Preservatives	Parameters
11-14-01	0904	4 x 40 mL VOA	N	N	8260 VOCs
11-15-01	0815	8 x 40 mL VOA	N	HCL	~~8270 SVOCs~~ 8021B
TH		~~2 x 1 L Amber~~	N	~~82~~ N	6010 Metals
TH		~~1 x 500 mL poly~~	Y	~~HNO_3~~	~~8270 SVOCs~~
				TH	

Effervesces (Y/N) N QC Sample Collected(Y/N) N QC-COC No. N/A

COMMENTS:

GROUNDWATER SAMPLE COLLECTION LOG

Project Name: *Fort Carson Military Reservation* COC Number: 9696

Project No.: 45484.07.05.01 Site ID: LFHAP 06

Sample Collected By: J. Nelson, D. Butler, T. Hohman Date(s) of Collection: 11-14-01, 11-15-01

Purging Method/Equipment: disposable bailer
Sampling Equipment: disposable bailer
Filtering Equipment: 0.45 micron disposable filter
Equipment Decontamination: NA

Equipment Calibration		
Equipment Model	Serial No.	Date Calibrated
	N/a	

FIELD PARAMETERS - *Collected at the start of purging and twice per casing volume removed for a total of 7 readings.*

Ambient Air Temperature (°F): 65° Weather Conditions: Sunny, Fair

Date Well Purged: 11-12-01 Reference Point: Top of casing

Time	Vol. Purged	Temp(°C)	pH	Eh (mV)	D.O.(ppm)	Conductance(mS/μS)	Turb (NTU)	Descrip
	INITIAL							
	0.04							
	0.06							
	0.08							
	0.10							
	0.12							
	0.14							
Parameters Stabilized?		±10%	±0.2	±10%	±10%	±10%	<5NTUs	

N/a

Total Volume Purged: 0.10 gallons Purged Dry (Y/N): YES

PURGE INFORMATION
Casing I.D. [a] 1.0 (in.) Unit Casing Volume [b] .04 (gal/lin ft) Depth to Water [c] 8.87 (ft)
Depth to Well Bottom [d] 10.03 (ft) Casing Volumes [e] 3
Purge Volume = [d-c] x [b] x [e] = N/a (gal)

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE COLLECTION AND ORDER OF COLLECTION – cross out unused bottles

Date(s)	Time(s)	Container(s) Type/Volume	Filtered (Y/N)	Preservatives	Parameters
11-14-01	0915	~~4~~ TH 3 x 40 ml VOA	N	N	8260 VOC's
11-15-01	0858	~~3~~ TH 3 x 40 ml VOA	N	HCL	~~8270 SVOC's~~ 8021B
TH		~~2 x 1 L Amber~~	~~N~~	~~82 N~~	~~6010 Metals~~
TH		~~1 x 500 ml poly~~	~~Y~~	~~HNO_3~~	~~8270 SVOC's~~
					TH

Effervesces (Y/N) N QC Sample Collected(Y/N) N QC-COC No. N/A

COMMENTS:

GROUND WATER SAMPLE COLLECTION LOG

Project Name: Ft Carson - Group A
Project No.: 89840.200
Sample Collected By: JFA HSH

Sample Number: W4-1
Sample Location: Landfill #4
Date & Time Collected: 4/27/95, 1400

EQUIPMENT

Purging Method/Equipment: disposable bailer
Sampling Equipment: metals - pressurized disposable bailer, other - disposable bailer
Filtering Equipment: GeoTech

Equipment Calibration

Equipment Model	Serial No.	Date Calibrated
Turbidimeter	DRT-15CE	4/27/95
HyDAC (Cond.)	9311	↓
Beckman (pH)	219791	↓

Equipment Decontamination:

	Standard Temp	Standard Reading	Standard Reading
pH Meter	14.5°C	7.0	7.07

Conductivity Std.	Temp	Standard Reading
1000 / 10,000	57.3	760 / 7070

Turb	Std: 10	100	1000	Read: 2.85	72.8	648

FIELD PARAMETERS

Air Temperature (°F): 30-40°
Sampling Depth (—): NA
Initial Depth to Water (ft): 6.09'
Reference Point: TOC

Volume Purged (gal)	Temp (°C)	Conductance (µS/cm)	pH	Time	Turb. NTU	Water Description
0.1	11.3	4670	7.35	1333	82.9	sl. cloudy
1	8.9	4910	7.19	1337	118.9	sl. cloudy
2.5	8.7	4820	7.21	1339	300	"
3.5	8.8	4760	7.20	1340	185	sl. cloudy
4.5	8.9	5080	7.22	1344	325	sl. cloudy
5.8	9.3	5040	7.22	1347	139	sl. cloudy

Total Volume Purged: gal. Time: 1347 (14min) Purged Dry (Y/N): N
chased down

PURGING INFORMATION

Casing I.D. [a] (in.) 2" Unit Casing Volume [b] 0.16 (gal/ft) Depth to Water [c] 6.09 (ft)
Depth to Well Bottom [d] 18.18 (ft.) Casing Volumes [e] 3
Purge Volume = [d-c] x [b] x [e] = 5.8 (gal)

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE PACKAGING

Container(s) Type & Volume	Filtered (Y/N)	Preservatives	Parameters
40ml VOA x4	N	HCl	VOCs
1L plastic	Y	HNO_3	metals except Hg
500ml plastic	Y	HNO_3	Hg
1L amber glass x4	N	none	SVOCs + PCBs + Pests
500ml plastic	N	NaOH	cyanide

Additional Remarks:

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GROUND WATER SAMPLE COLLECTION LOG

Project Name: Ft. Carson
Project No.: 89840.200
Sample Collected By: JFA HSH

Sample Number: W4-2
Sample Location: Landfill #4
Date & Time Collected: 4/24/95, 1246

EQUIPMENT

Purging Method/Equipment: Bennet Piston Pump
Sampling Equipment: Bennet Piston Pump
Filtering Equipment: Geotech 0.45 um disposable

Equipment Calibration

Equipment Model	Serial No.	Date Calibrated
Beckman (pH)	219791	4/24/95
Turbidimeter	DRT-15CE	↓
HYDAC (cond)	9311	↓

Equipment Decontamination:

	Standard Temp	Standard Reading	Standard Reading
pH Meter	18.8°C	7.0	7.12

(µS/cm) Conductivity std	Temp	Standard Reading
1000 / 10,000	61.5°F	968 / 9140

Turb. (NTU)	Std: 10/100/1000	Read: 5.25/98.3/987

FIELD PARAMETERS

Air Temperature (°F): 45-50
Initial Depth to Water (ft): 6.67
Sampling Depth (ft): NA Top of H_2O Column
Reference Point: TOC

Volume Purged (gal)	Temp (°C)	Conductance µS/cm	pH	Time	Water Description	NTU
0	13.7	11230	7.61	12 ~~13~~ 25	clear	5.28
1	11.8	13250	7.31	1228	clear	7.60
2	11.5	10990	7.37	1230	clear	6.60
3	11.7	13200	7.36	1233	clear	14.5
4	12.0	14390	7.30	1236	clear	5.86
5	12.3	14590	7.32	1239	clear	0

Total Volume Purged: 6.5 Time: 1244 Purged Dry (Y/N): N (closed valve)
→ 6.5 12.3 14750 7.32 1244 clear 0.28

PURGING INFORMATION

Casing I.D. [a] (in.) 2" Unit Casing Volume [b] 0.16 gal/ft Depth to Water [c] 6.67 (ft)
Depth to Well Bottom [d] 20.13 (ft) Casing Volumes [e] 3
Purge Volume = [d-c] x [b] x [e] = 6.5 (gal)

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE PACKAGING

Container(s) Type & Volume	Filtered (Y/N)	Preservatives	Parameters
40 ml VOA x 4	N	HCl	VOCs (8260)
1L plastic	Y	HNO_3	Metals (except Hg)
500 ml plastic	Y	HNO_3	Hg
Pest/PCB 1L amber x 2	N	–	Pest/PCB
SVOCs 1L glass amber x 2	N	–	SVOCs
Additional Remarks: Cyanide 500 ml plastic	N	NaOH	Cyanide

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RUST ENVIRONMENT & INFRASTRUCTURE

GROUND WATER SAMPLE COLLECTION LOG

Ft. Carson Group A Landfill 4

Project Name: ~~RD at LF's 2, 5 & 6 and VOC~~ (TSH)
Project Location: Fort Carson, Colorado
Project No.: ~~89868.200~~ 89840.200 (TSH)
Sample Collected By: C. GROSE / H. HODSON

Sample Number: LF4-WG4-4
Sample Location: LANDFILL 4 GROUP A
Date & Time Collected: 5/4/95 0930

TSH 5/4/95

EQUIPMENT

Purging Method/Equipment: ~~BERNETT PISTON PUMP~~ 1" PVC Bailer
Sampling Equipment: ~~BERNETT PISTON PUMP~~ 1" PVC Bailer
Filtering Equipment: GEOTECH 0.45 MICRON DISPOSABLE FILTER (through 2" disposable bailer
Equipment Decontamination: 5 GALLONS POTABLE H_2O WITH ALCONOX FOLLOWED BY 2 GALLONS DI H_2O

Equipment Calibration

Equipment Model (TSH)	Serial No.	Date Calibrated
HYDAC (pH/COND)	9311	5/4/95
BERMAN (pH, T)	00123132	5/4/95
HF SCIENTIFIC	DRT-15LE	5/4/95

	(°C) Standard Temp 4.0 10.0 7.0	4.0 Standard Reading	10.0 Standard Reading	7.0 Std Rd
pH Meter	14.5/15.0/14.8	4.0	10.12	7.1

Conductivity Std.	Temp	Standard Reading
1000 / 10000	14.8	9820 / 9910

(NTU) Turbidity 0.02 = -4.35; 10 = 5.30; 100 = 89.4; 1000 = 847

FIELD PARAMETERS

Air Temperature (°F): _____
Sampling Depth (—): TOP OF H_2O COLUMN
Initial Depth to Water (FT): 0.89'
Reference Point: TOC

Volume Purged (GAL)	Time	Temp (°C)	Conductance (µS/cm)	pH	NTU Turbidity	Water Description
0.0	0913	12.9	>20000	7.93	15.9	yellowish clear
1.0	0915	10.2	>20000	7.92	59.1	yellow/orange
1.5	0918	10.0	>20000	7.96	>200	dk gray w/debris & cloudy

Total Volume Purged: 2.0 gal Time: 5 minutes Purged Dry (Y/N): Y

PURGING INFORMATION

Casing I.D. [a] (in.) 2" Unit Casing Volume [b] 0.09 gal/lin.ft. Depth to Water [c] 0.89 (FT)
Depth to Well Bottom [d] 11.98 (FT) Casing Volumes [e] 3
Purge Volume = [d-c] x [b] x [e] = ~~0.45~~ 2.9 (GAL)

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.27	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE PACKAGING

Container(s) Type & Volume	Filtered (Y/N)	Preservatives	Parameters
4x40ml VOA	N	HCl	VOC
~~2x1l amber glass~~	~~N~~	~~None~~	~~SVOC~~
2x1l amber glass	N	None	PCB/PESTICIDE
1x1l plastic	N	None	Nitrite
1x1l plastic	Y	~~HNO_3~~	Metals
~~1x500ml plastic~~	N	~~H_2SO_4~~	~~NO_2 NO_3~~

Only VOC's collected 5/4/95

Additional Remarks:

Quality through teamwork

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GROUND WATER SAMPLE COLLECTION LOG

Project Name: Ft. Carson
Project No.: 89840
Sample Collected By: HSH/CTG

Sample Number: LF4W4-4
Sample Location: Landfill #4
Date & Time Collected: 5/8/95

EQUIPMENT

Purging Method/Equipment: PVC Bailer (1.04")
Sampling Equipment: PVC Bailer (1.04")
Filtering Equipment: Gootech 0.45 micron disposable filter

Equipment Calibration

Equipment Model	Serial No.	Date Calibrated
Hydac	9311	5/8
Beckman	219791	5/8
HF Scientific	DRT 15CE	5/8

	Standard Temp	4.0 Standard Reading	10.0 Standard Reading
pH Meter	19.8/19.5	4.00	10.07

Conductivity	Temp	Standard Reading
1000/10000	—	1083/9990

Equipment Decontamination:

0.02 NTU = -4.46; 10 NTU = 5.20; 1000 NTU = 94.3
1000 NTU 922

FIELD PARAMETERS

Air Temperature (°F): 40-50
Sampling Depth (—): Top of H_2O Column
Initial Depth to Water (ft): 5.90'
Reference Point: TOC

Volume Purged (gal)	Temp (°C)	Conductance µS/cm	pH	Time	Water Description
0.1	~~1438~~ 13.4	720,000	8.17	1438	318 muddy/cloudy
0.4	12.7	720,000	8.20	1441	176 cloudy w/f. sand
0.5	11.3	720,000	8.20	1443	60.6 cloudy

Total Volume Purged: 0.75 Time: 1444 (6 min) Purged Dry (Y/N): Y

PURGING INFORMATION

Casing I.D. [a] (in.) 1.5" Unit Casing Volume [b] 0.09 (gal/lin ft) Depth to Water [c] 5.90 (ft)
Depth to Well Bottom [d] 12.00 (ft) Casing Volumes [e] 3
Purge Volume = [d-c] x [b] x [e] = 1.6 (gal)
6.1

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE PACKAGING

Container(s) Type & Volume	Filtered (Y/N)	Preservatives	Parameters
already collected 4x40ml VOA	N	HCl	VOC
2x1L amber	N	—	SVOC
already collected 2x1L amber	N	—	PCB/Pest
1x1L plastic	Y	HNO_3	Metals + Hg
1x500ml plastic	N	H_2SO_4	Cyanide

Additional Remarks: 2nd purging.

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GROUNDWATER SAMPLE COLLECTION LOG

Project Name: *Fort Carson Military Reservation*
Project No.: 45484.07.05.01
Sample Collected By: D Butler + D Arason

COC Number: 9709
Site ID: PZ4
Date(s) of Collection: 11-08-01

EQUIPMENT
Purging Method/Equipment: 1" Decated Bailer
Sampling Equipment:
Filtering Equipment:
Equipment Decontamination: N/A

Equipment Calibration		
Equipment Model	Serial No.	Date Calibrated
Heron Dipper-T	ETB	N/A
- All sampling equipment being used - well will go		
Dry - so no parameters taken		

FIELD PARAMETERS - *Collected at the start of purging and twice per casing volume removed for a total of 7 readings.*

Ambient Air Temperature (°F): 35°
Sampling Depth (ft): N/A - purged on 11-08-01

Weather Conditions: Cloudy, Slt. Breezy
Reference Point: TOC

Time	Vol. Purged	Temp (°C)	pH	Eh (mV)	D.O. (ppm)	Conductance(mS/µS)	Turb. (NTU)	Descrip.
12:20	INITIAL							Slt. Yellow
1228	0.60		N/A					↓
1242	1.00							Black
	~~1.40~~ (DB)							
	~~1.80~~ (DB)							
	~~2.20~~ (DB)							
	~~2.60~~ (DB)							
PARAMETERS STABILIZED?		±10%	±0.2	±10%	±10%	±10%	<5NTUs	

Dry @ 1250

Total Volume Purged: 1.2 gallons
Purged Dry (Y/N): Y

PURGE INFORMATION
Casing I.D. [a] 1.5 (in.) Unit Casing Volume [b] 0.09 (gal/lin ft) Depth to Water [c] 2.60 (ft)
Depth to Well Bottom [d] 12.00 (ft) Casing Volumes [e] 3
Purge Volume = [d-c] x [b] x [e] = 2.54 (gal)

CASING VOLUME

Casing I.D. [a] (in.)	1.0	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
Unit Casing Volume [b] (Gal/Lin. Ft.)	0.04	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

SAMPLE COLLECTION AND ORDER OF COLLECTION

Date(s)	Time(s)	Container(s) Type/Volume	Filtered (Y/N)	Preservatives	Parameters
11-9-01	0721	4x 40ml VOA	N	N	8260 VOCs

Effervesces?(Y/N) N
QC Sample Collected(Y/N) ~~Y~~ N
QC-COC No N

COMMENTS:

APPENDIX J

TEST PIT REPORT FORMS

INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. LF TP-01

PROJECT: LF 4, 10, 11 INVESTIGATION	JOB NO: 55253.000
CLIENT: USACE	LOCATION: WBS 00912
CONTRACTOR: RUST E & I	ELEVATION:
EQUIPMENT USED: OVM, MULTIGAS, DUST (310D JOHN DEERE)	DATE START: 8/24/98
	DATE FINISH: 8/24/98
	LOGGED BY: S. GILLERY

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
2			SILT (ML) DRY, LIGHT BROWN (OLIVE 5Y 5/3) MOSTLY SILT, LITTLE TO FEW FINE SAND, NO ORANGE STAINING SOME WHITE DEPOSITS @ 2-3 FT	
4			RESIDUUM.	
6			CONTACT WEATHERED PIERRE SHALE SILT (ML) DRY TO MOIST, WEATHERED SILTSTONE OLIVE 5Y 5/3, HARD BLOCKY ORANGE STAINING ON FRACTURES	
8				
10				
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
N/E		

NOT ENCOUNTERED N/E * HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

20 FT (L) x 1.0 FT (W) x 7 FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. LF11-02

PROJECT: LF4, 10, 11 INVESTIGATION	JOB NO: 55253
CLIENT: USACE	LOCATION: LF4
CONTRACTOR: RUST	ELEVATION: —
EQUIPMENT USED: OVM, DUST MONITOR, MUTIGAS, 310D JOHN DEERE	DATE START: 8/24/98
	DATE FINISH: 8/24/98
	LOGGED BY: J GILLESPIE

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
			SILT (ML)	
2			FILL	
			CONTACT WEATHERED PIERRE SHALE	
4				▽ 4.8 FT
			B.O.E. @ 5.1 FT	
6				
8				
10				
12				

ASTM COMPONENT %	
MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/24/98	1325	4.8 FT

NOT ENCOUNTERED ☐ * HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

10 (L) x 1.0 (W) x 5.0 (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

RUST ENVIRONMENT & INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. LF4 TP03

PROJECT: LF4, 10, 11 INVESTIGATION
CLIENT: ~~USACE~~ USACE
CONTRACTOR: RUST E&I
EQUIPMENT USED: OVM, DUST MONITOR, MULTIGAS, 310D JOHN DEERE BACKHOE

JOB NO: 55253.000 00912
LOCATION: LF4
ELEVATION: –
DATE START: 8/24/98
DATE FINISH: 8/24/98
LOGGED BY: ~~J.G.~~ J.G. LUEBA

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
2			GRAVELLY CLAY (GC) MOIST, SLIGHTLY PLASTIC, MOSTLY CLAY, SOME RED GRAVEL (ROAD BASE) TRACE CONSTRUCTION CONCRETE	
4			FILL MATERIAL	
6				
8			GRASS BLACK DECAYED ORGANICS, OLD SURFACE HORIZON @ 7 FT CLAY (CL) SLIGHTLY MOIST, PLASTIC (OLIVE 5Y 5/3), MOSTLY CLAY, FEW FINE - MED SAND NO INDICATION OF FILL MATERIAL OR CONSTRUCTION DEBRIS	
10			B.O.E. @ 9.5 FT BGS. WEATHERED PIERRE NOT ENCOUNTERED	

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/24/98	1500	NE
NOT ENCOUNTERED		* HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

10 FT (L) x 1.0 FT (W) x 9.5 FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

ENVIRONMENT & INFRASTRUCTURE

TEST PIT REPORT

TEST PIT NO. LF4 TP.04

PROJECT: LF4, 10, 11 INVESTIGATION

CLIENT: USACE

CONTRACTOR: RUST E & I

EQUIPMENT USED: OVM, DUSTMONITOR, MULTIGAS, 310 D JOHN DEERE BACKHOE

JOB NO: 55253000 08917

LOCATION: LF4

ELEVATION: -

DATE START: 8/24/98

DATE FINISH: 8/24/98

LOGGED BY: [illegible]

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
			GRAVELLY CLAY (GC), MOIST PLASTIC, RED GRAVEL (ROAD BASE) CHUNKS OF CONCRETE - DEBRI IS LESS THAN 5%	
2			FILL MATERIAL	
			GRASS BLACK DECAYED ORGANICS OLD SURFACE HORIZON	
4			SILT (ML) OLIVE 5Y 5/3, MOIST, MOSTLY SILT LITTLE FINE SAND	
6				
			RESIDUUM	
8			CONTACT WEATHERED PIERRE, DRY-MOIST, BLOCKY OLIVE	
			WP	▼
			B.O.F. @ 9.0FT	
10				
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/24/98	1515	9.0 FT
NOT ENCOUNTERED		* HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

5FT (L) x 1.0FT (W) x 9.0FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

RUST ENVIRONMENT & INFRASTRUCTURE **TEST PIT REPORT**

TEST PIT NO. LF4TP05

PROJECT: LF4, 10, 11 INVESTIGATION

CLIENT: USAEE

CONTRACTOR: RUST E & I

EQUIPMENT USED: OVM, DUST MONITOR, MUTIGAS, 310 B JOHN DEERE

JOB NO: 55253.00912

LOCATION: LF4

ELEVATION: –

DATE START: 8/24/98

DATE FINISH: 8/24/98

LOGGED BY: JEGILLEN

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
			LOW LYING AREA.	
			SILT (ML) MOIST, (OLIVE MOTTLED GRAY, 5Y 5/3) MOSTLY SILT, SLIGHTLY PLASTIC	
2			Fill MATERIAL	
4				
			SAND SP SATURATED, LOOSE, MOSTLY COARSE SILICA SAND, BACKFILL FOR WATER MAIN?	▼ WL
6			B.O.E. @ 6.0 FT	
			NOTE: MOVE 15FT EAST & TRENCH LF4TP-06	
8				
10				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/24/98	1540	6.0 FT
NOT ENCOUNTERED		* HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

5.0 FT (L) x 1.0 FT (W) x 6.0 FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

KUSI ENVIRONMENT & INFRASTRUCTURE

TEST PIT REPORT

TEST PIT NO. LF4TP-06

PROJECT: LF 4, 10, 11 INVESTIGATION

CLIENT: USACE

CONTRACTOR: RUST E & I

EQUIPMENT USED: OVM, DUST MONITOR, MULTIGAS 310D BACKHOE JOHN DEERE

JOB NO: 55253.000 00912

LOCATION: KANSAS 4

ELEVATION: –

DATE START: 8/24/98

DATE FINISH: 8/24/98

LOGGED BY: [illegible]

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
			(N.) SILT (ML) MOIST, PLASTIC, BLACK ORGANICS GRASS (S.)	
			GRAVELLY SILT (GM) MOIST - DRY ORANGE MOTTLED GRAY, MOSTLY SILT, SOME FINE ANGULAR GRAVEL, TRACE - FEW FINE SAND	
2			SILT (ML) MOIST - DRY, ORANGE MOTTLED GRAY, BLOCKY TEXTURE, SEVERELY WEATHERED PIERRE SHALE.	
4				
6			8" PIPE UNMARKED UTILITY	
8			B.O.E. @ 8 FT	▼
10				
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/24/98	1600	8 FT.
NOT ENCOUNTERED		* HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

5.0 FT (L) x 1.0 FT (W) x 8.0 FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. LF4TP-07

PROJECT: LF4, 10, 11 LANDFILL INVESTIGATIONS
CLIENT: USACE
CONTRACTOR: ROST E&T
EQUIPMENT USED: O/M DUST MONITOR MULTI GAS, 310 D BACKHOE J. DEERE 18" BUCKET

JOB NO: 53253.00 US109912
LOCATION: DRMO STORAGE
ELEVATION: -
DATE START: 8/25/98
DATE FINISH: 8/25/98
LOGGED BY: EGLUSSER

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
		W	SILT (ML) MOIST - DRY, OLIVE 5Y 4/3 MOSTLY SILT SLIGHTLY PLASTIC, LITTLE TO FEW FINE SAND	E TRENCH FROM W - E TOWARD DRMO STORAGE BLDG FROM B-DITCH
2			NO CONSTRUCTION DEBRIS	
4			FILL	NOTE:
			BLACK DESCRIPTION ORGANICS (GRASS, VEGETATION W/ BOULDERS CLAYSTONE, GRANITE	- OLD HORIZON LINE DROPS TO 8 FT BGS NEXT TO E END OF BLDG. NO VISIBLE WATER IN E END DOES NOT APPEAR TO BE AS SATURATED AS W.
6				
			SILT (ML) MOIST - SATURATED 5Y 6/6 OLIVE YELLOW, PLASTIC, MOSTLY SILT, LITTLE FINE SAND, NO CONSTRUCTION DEBRIS	▼ WATER SATURATION POINT BETWEEN 8-9 FT
8				
10				
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/25/98	0945	8-9FT
NOT ENCOUNTERED		* HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

JEG 50 FT (L) x 18" (W) x 9.5 (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

RUST ENVIRONMENT & INFRASTRUCTURE

TEST PIT REPORT

TEST PIT NO. LF4TP-08

PROJECT: LANDFILL 4, 10, 11 INVESTIGATION

CLIENT: USACE

CONTRACTOR: RUST

EQUIPMENT USED: OVM, DUST MONITOR, MULTIGAS, 310 D BACKHOE, 18" BUCKET

JOB NO: 55253.000 UBS 00912

LOCATION: SW CORNER DRMO

ELEVATION: —

DATE START: 8/25/98

DATE FINISH: 8/25/98

LOGGED BY: [illegible]

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
			~~ML~~ SILT (ML) MOIST, SLIGHT PLASTICITY, 5Y 4/3 OLIVE, MOSTLY SILT, 2 10" BOULDERS, LITTLE FINE TO MEDIUM SAND	
2				
4				
			FILL	
6			BLACK DECAYING ORGANIC MATERIAL	≈ 1.0 FT THICK GRASS, VEGETATION
			SILT (ML) OLIVE YELLOW, 5Y 6/6, MOIST PLASTIC, MOSTLY SILT, LITTLE FINE SAND TRACE FINE GRAVEL	
8				
			RESIDUAL	▽ WATER ENTERING TRENCH
10			B.O.E. @ 10 FT	

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/25/98	11:00	10.0 FT
NOT ENCOUNTERED		* HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

10 FT (L) x 18" (W) x 10.0 FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

RUST ENVIRONMENT & INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. LF4TP-09a

PROJECT: LF4, 10, 11 INVESTIGATION
CLIENT: USACE
CONTRACTOR: RUST
EQUIPMENT USED: OVM, BATHMONITOR, MULTIGAS, 310 D BACKHOE 18" BUCKET

JOB NO: 55253.00 00912
LOCATION: SOF DRMO STORAGE
ELEVATION: –
DATE START: 8/25/98
DATE FINISH: 8/25/98
LOGGED BY: [illegible]

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
2			SILT (ML) MOIST, OLIVE (5Y 4/3), MOSTLY SILT, LITTLE - SOME FINE SAND, OCCASIONAL SAND LENSES ALLUVIAL CHANNELS. OCCASIONAL TRACE COBBLES NO EVIDENCE OF LANDFILL ACTIVITIES	
4			FILL	
			BLACK DECAYING ORGANIC MATERIALS 6 - 8" THICK	NOTE: OLD HORIZON LINE
6			SILT (ML) MOIST SLIGHTLY PLASTIC OLIVE YELLOW 5Y 6/6, MOSTLY SILT,	
8			CLOSE TO BEDROCK SEVERELY WEATHERED PIERRE AT 10 FT	
10			Bottom of Exploration @ 10 FT	
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/25/98	1130	NE

NOT ENCOUNTERED | * HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

8FT (L) x 18" (W) x 10FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

RUST ENVIRONMENT & INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. LF4TP09b @ 30 FT N.

PROJECT: LANDFILL 4, 10, 11 INVESTIGATION
CLIENT: USACE
CONTRACTOR: RUST
EQUIPMENT USED: OVM, DUSTMONITOR, MULTIGAS, 310D BACKHOE 18" BUCKET

JOB NO: 55253.000 WBS C0912
LOCATION: S OF DRMO STOR
ELEVATION: –
DATE START: 8/25/98
DATE FINISH: 8/25/98
LOGGED BY: JEG

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION (S. N)	REMARKS
			DRY, MOSTLY CLAY, BRICK, WOOD, NAILS (CLAY DK GRAY, LANDFILL DEBRI)	1.0 FT THICK PINCHING OUT S. MIC SMALL METAL PIECES — LANDFILL DEBRI
2			SILT (ML) BROWN, MOIST - ~~DRY~~, MOSTLY SILT, FEW - LITTLE FINE GRAVEL, TRACE - COBBLES FILL	
4			FILL	
			BLACK ORGANIC DECAYING GRASS, VEGETATION ROOTS	OLD SOIL HORIZON
6			SILT WITH SAND (ML) OLIVE (5Y 4/3), MOIST SLIGHTLY PLASTIC	
			BLACK ORGANIC ZONE	OLD SOIL HORIZON
8			SILT (ML) MOIST - SATURATED, OLIVE YELLOW (5Y 6/6) SLIGHTLY PLASTIC, MOSTLY SILT, LITTLE FINE SAND. RESIDUUM.	▼ VISIBLE WATER ENTERING PIT @ 9.0.
10			BOTTOM OF EXPLORATION @ 9.5 FT	
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/25/98	12:43	9.0 FT
NOT ENCOUNTERED		* HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

100 FT (L) x 18" (W) x 9 FT (D) = _____ CU. FT.

NOTE PART TWO OF THREE REPORTS

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

ENVIRONMENT & INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. LFATP-09C
80 FT N Along Trench

PROJECT: LANDFILL 4, 10, 11 INVESTIGATION
CLIENT: USACE
CONTRACTOR: RUST
EQUIPMENT USED: OVM, DOTMONITOR, MULTIGAS, 310 D BACKHOE 18" BUCKET

JOB NO: 55253.000 WBS 08912
LOCATION: 80 FT N OF 1 & 2
ELEVATION: —
DATE START: 8/25/98
DATE FINISH: 8/25/98
LOGGED BY: [illegible]

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
			CLAY (CL) STIFF, DRY, CRUMBLY, DK GRAY, MOSTLY CLAY WITH SOME FINE - COARSE SAND, BROKEN BRICKS, NAILS, WOOD ~~LITTLE~~ GRAVEL MISC. METAL CHUNKS.	
2			LANDFILL MAT.	
			SANDY SILT WITH GRAVEL (ML) OLIVE (5Y 4/3), MOIST SLIGHTLY PLASTIC, MOSTLY SILT, SOME FINE TO COARSE SAND, LITTLE FINE GRAVEL, TRACE BOULDERS, COBBLES	
4				
6				
			FILL	
8			BLACK ORGANIC LAYER DECAYING VEGETATION B.O.E. @ 8 FT	▼ VISIBLE WATER ENTERING PIT @ 8 FT
10			NOTE. SEE LFATP-09 1, 3, 2 LOCATIONS FOR DESCRIPTIONS OF MATERIAL BELOW BLACK ORGANICS	
12				

ASTM COMPONENT %	
MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/25/98	1300	8.0 FT
NOT ENCOUNTERED		* HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

100 FT (L) x 18" (W) x 9.0 FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

INFRASTRUCTURE **TEST PIT REPORT**

TEST PIT NO. LF47F-10

PROJECT: LANDFILL 4, 10, 11 INVESTIGATION

CLIENT: USACE

CONTRACTOR: RUST

EQUIPMENT USED: OVM, DUSTMONITOR, MULTIGAS, 18" BUCKET, BB10 D BACKHOE

JOB NO: 55253.000 WBS 00912

LOCATION: S OF DRMO STORAGE

ELEVATION: —

DATE START: 8/25/98

DATE FINISH: 8/25/98

LOGGED BY: [illegible]

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION (E.) (W.)	REMARKS
		≈GS	GS.	
			SILT (ML) MOIST, OLIVE (5Y4/3), MOSTLY SILT SOME FINE TO COARSE SAND, LITTLE FINE GRAVEL, ~~SOME~~ TRACE COBBLES, BOULDERS	DK GRAY CLAY WITH OLIVE YELLOW SILT
2				
4			FILL	
6			BLACK ORGANIC LAYER, GRASS & VEGETATION	OLD SOIL HORIZON
			B.O.E @ 6.5-7.0 FT @ BOT ~~TOP~~ OF BLACK ORGANIC SOIL PROFILE	
8				
10				
12				

ASTM COMPONENT %	
MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/25/98	1435	~~NE~~ JB
		NE
NOT ENCOUNTERED		* HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

55 FT (L) x 18" (W) x ≈ 7 FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

RUST ENVIRONMENT & INFRASTRUCTURE

TEST PIT REPORT

TEST PIT NO. LF4TP-11

PROJECT: LANDFILL 4, 10, 11 INVESTIGATION

CLIENT: USACE

CONTRACTOR: RUST E & I

EQUIPMENT USED: OVM, DUSTMONITOR, MULTIGAS 380 D BACKHOE 18" BUCKET

JOB NO: 55253.000WBS00917

LOCATION: SPECKER AVE

ELEVATION: --

DATE START: 8/25/98

DATE FINISH: 8/25/98

LOGGED BY: J.E. GILLEN

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION (N.) (S.)	REMARKS
			SILT (ML) OLIVE (5Y 4/3), MOIST, MOSTLY ~~SILT WITH SAND & JG~~ SILT, LITTLE ~~SOME~~ FINE TO COARSE SAND, FEW FINE GRAVEL TRACE BOULDERS (2) AND COBBLES	
2				
4			NOTE: NO EVIDENCE OF LANDFILL ACTIVITY	
6				
8			Fill	
10			BLACK ORGANIC LAYER	NOTE: LIMITS OF EQUIPMENT
			B.O.E. @ 11 FT BELOW GROUND SURFACE	
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/25/98	1528	NE

NOT ENCOUNTERED

* HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

10 FT (L) x 18" (W) x 11 FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. [illegible]

PROJECT: LF 4, 10, 11 INVESTIGATION
CLIENT: USACE
CONTRACTOR: RUST E & I
EQUIPMENT USED: OVM, DUST MONITOR, MULTIGAS, 380 - D BACKHOE, 18" BUCKET

JOB NO: 55253.000 WBS 00912
LOCATION: E of DRMO STORAGE
ELEVATION: —
DATE START: 8/25/98
DATE FINISH: 8/25/98
LOGGED BY: J. GILLESPIE

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
			TOP SOIL	
2			SILT (ML) BLOCKY, DRY, OLIVE (5Y 4/3), MOSTLY SILT, ORANGE STAINING @ 8 FT	
			WEATHERED PIERRE	
4				
6				
8				▽ VISIBLE WATER ENTERING BORING FROM FRACTURES
10			B.O.E @ 10 FT IN WEATHERED PIERRE SHALE	
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/25/98	1600	8.5 FT
NOT ENCOUNTERED		* HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

10 FT (L) x 18" (W) x 10 FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

ENVIRONMENTAL INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. LF4TP-13

PROJECT: LF4, 10, 11 INVESTIGATION
CLIENT: CLSACE
CONTRACTOR: RUST E&I
EQUIPMENT USED: OVM, DUST MONITOR, MINIRAE, 385D BACKHOE, 18" BUCKET

JOB NO: 55253.000 WBS 009.12
LOCATION: NORTH DEMO STOCK
ELEVATION: —
DATE START: 8/26/98
DATE FINISH: 8/26/98
LOGGED BY: J. GILLER

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
			ROAD BASE 1.5FT 1/2" GRAVEL	
2			BROWN W/ GRAVEL, BOULDERS, SAND, LOOSE, SATURATED, ALLUVIAL? FILL? VISIBLE WATER RUNNING ON FOUR SIDES	NOTE FAR NORTH EDGE OF DEMO FACE
4			NO INDICATION OF LANDFILL ACTIVITY	▼ VISIBLE WATER @ 3.0 FT
			CLAY (CL), SOFT, MOIST TO SATURATED, OLIVE (5Y 4/3), MOSTLY CLAY (ROLLS < 1/8") BLACK ORGANIC LAYER @ 5.0 THEN CLAY LAYER < 5 INCHES THICK RESIDUUM	
6				
			B.O.E. @ 7.0 FT DUE TO CAVE IN NO INDICATION OF LANDFILL ACTIVITIES	
8				
10				
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/26/98	0900	3.0 FT

NOT ENCOUNTERED ☐ * HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

10 FT (L) x 18" (W) x 7.0 FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

ENVIRONMENT & INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. LF9TP-14

PROJECT: LANDFILL 4/10/11 INVESTIGATION
CLIENT: USACE
CONTRACTOR: RUST E&I
EQUIPMENT USED: OVM, DUSTMONITOR, MULTIGAS 330D BACKHOE 18" BUCKET

JOB NO: 55253.000 WBS CD912
LOCATION: CENTER GRAVEL ROAD
ELEVATION: –
DATE START: 8/26/98
DATE FINISH: 8/26/98
LOGGED BY: JEGILLESPIE

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
			1/2" GRAVEL ROAD BASE TO 1.0 FT	
			3-4" STONE W/ CLAY BASE	
2			SILT (ML), ~~DENSE~~ MED. DENSE, OLIVE 5Y 3/3, DRY, MOSTLY SILT, LITTLE FINE SAND, BLOCKY FRACTURE, LAMINATED, WHITE PRECIPITATE ALONG FRACTURE	
4			BECOMING DENSE W/ DEPTH	
6			WEATHERED PIERRE SHALE	
			BOTTOM OF EXPLORATION @ 6.5 FT IN WEATHERED PIERRE SHALE	NOTE: DIFFICULT EXCAVATION @ 6.5 USING WEIGHT OF BACKHOE TO BREAK UP.
8				
10				
12				

ASTM COMPONENT %	
MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/26/98	0945	NE
NOT ENCOUNTERED		* HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

10 FT (L) x 18" (W) x 6.5 FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

RUST ENVIRONMENT & INFRASTRUCTURE

TEST PIT REPORT

TEST PIT NO. LF4TP-15

PROJECT: LF4, 10, 11 INVESTIGATION

CLIENT: USACE

CONTRACTOR: RUST E & I

EQUIPMENT USED: OVM, DUST MONITOR, MULTIGAS 380 D BACKHOE 18 INCH BUCKET

JOB NO: 55253000 WBS 00912

LOCATION: SW CORNER DRUM GRAVEL

ELEVATION: —

DATE START: 8/26/98

DATE FINISH: 8/26/98

LOGGED BY: E. GILLESPIE

DEPTH (FT)	SAMPLE NO/ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
			CRUSHER RUN ROAD BASE MATERIAL	
2			SILT W/SAND (SM) SOFT, OLIVE (5Y 4/3), MOSTLY SILT, LITTLE FINE TO COARSE SAND, ~~BROKEN~~ CHUNKS OF DK GRAY WEATHERED PIERRE SHALE	NE OF LF4-MW1 ≈ 50 FT
4			FILL MATERIAL	
			B.O.E. @ 4.5 FT IN WOOD DEBRI	
6				
8				
10				
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/26/98	10:30	NE
NOT ENCOUNTERED		* HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

15' (L) x 18" (W) x 4.5' (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

ENVIRONMENT & INFRASTRUCTURE

TEST PIT REPORT

TEST PIT NO. LF4TP-16

PROJECT: LF4, 10, 11 INVESTIGATION

CLIENT: USACE

CONTRACTOR: RUST E & I

EQUIPMENT USED: OVM, DUSTMONITOR, MULTIGAS 380 D BACKHOE 18 INCH BUCKET

JOB NO: 55253.000 WBS 00912

LOCATION:

ELEVATION:

DATE START: 8/26/98

DATE FINISH: 8/26/98

LOGGED BY: [illegible]

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
			1/2" GRAVEL ROAD BASE	
2			SILT (ML). DENSE, OLIVE (5Y 4/3), MOSTLY SILT, LITTLE FINE SAND, WHITE PRECIPITANT ON BLOCKY FRACTURE SURFACES, SLIGHTLY LAMINATED. NOTE: BECOMING DENSER W/ DEPTH	NO GROUNDWATER ENCOUNTERED
4			NO LANDFILL ACTIVITY ENCOUNTERED WEATHERED PIERRE SHALE	
6			B.O.E. @ 5.0 FT BGS IN DK GREENISH GRAY WEATHERED PIERRE SHALE	
8				
10				
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/26/98	1056	NE

NOT ENCOUNTERED

* HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

10 FT (L) x 18" (W) x 5.0 FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. LF4TP-17

PROJECT: LF4, 10, 11 INVESTIGATION
CLIENT: USACE
CONTRACTOR: RUST E & I
EQUIPMENT USED: OVM, DUSTMONITOR, MULTIGAS 380 D BACKHOE 18" BUCKET

JOB NO: 55253.000 WBS 009.12
LOCATION: E. BDRY FENCE
ELEVATION: —
DATE START: 8/26/98
DATE FINISH: 8/26/98
LOGGED BY: [illegible]

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
			1/2" ROAD BASE MATERIAL	
2			SILT (ML) MEDIUM - DENSE, DRY, OLIVE 5Y 4/3, WHITE PRECIPITATE ALONG FRACTURES SLIGHTLY LAMINATED, MOSTLY SILT, LITTLE FINE - MEDIUM SAND	
4			WEATHERED PIERRE SHALE	
			B.O.E. @ 5FT BECOMING DIFFICULT TO EXCAVATE NO INDICATION OF LAND FILL ACTIVITY	
6				
8				
10				
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/26/98	1133	NE

NOT ENCOUNTERED | * HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

10FT (L) x 18" (W) x 5FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. LF4TP-18

PROJECT: LANDFILL 4, 10, 11 INVESTIGATION
CLIENT: USACE
CONTRACTOR: PARKER EXCAVATION
EQUIPMENT USED: CAT 330 L TRACHOE OVM DUST MONITOR

JOB NO: 53253.000 00912
LOCATION: LF4TP-03
ELEVATION: —
DATE START: 8/31/98
DATE FINISH: 8/31/98
LOGGED BY: J. GILLEY

DEPTH (FT)	SAMPLE NO/ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
			SAND SILT (ML) MEDIUM, DRY BRAWNISH YELLOW 10YR 6/8 MOTTLED OLIVE GRAY 5Y 4/2, MOSTLY SILT, SOME FINE TO COARSE SAND, TRACE COBBLES BOULDERS, CONCRETE MANHOLE, MISC. WIRE —	
4			~~LANDFILL~~ FILL	
			SILT (ML) MOIST, MEDIUM, OLIVE 5Y 4/3, MOSTLY SILT LIKE FINE SAND	OLD HORIZON LINE
8				
			SEVERELY WEATHERED PIERRE	
12			SILT (ML) MEDIUM DENSE, MOIST, OLIVE 5Y 4/3 MOTTLED OLIVE GRAY. MOSTLY SILT, SOME FINE SAND, BLOCKY TEXTURE, IRON STAINING SLIGHTLY LAMINATED	▼ VISIBLE WATER ENTERING THE PIT @ 12 FT 12 FT CONTACT W/ WEATHERED PIERRE
16				
			WEATHERED PIERRE SHALE	
20			B.O.E @ 20 FT	
24				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/31/98	1520	12FT
NOT ENCOUNTERED		* HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

15FT (L) x 3FT (W) x 20FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

PROJECT: LANDFILL 4, 10, 11 INVESTIGATION
CLIENT: USACE
CONTRACTOR: PARKER EXCAVATING
EQUIPMENT USED: CAT 330 L TRACHOE OVM DUST MULTIGAS.

JOB NO: 55253.000 00912
LOCATION: LF4TP-04
ELEVATION: —
DATE START: 8/31/98
DATE FINISH: 8/31/98
LOGGED BY: [illegible]

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
4			SILT WITH SAND (ML) MEDIUM, MOIST-DRY, ORANGE RED MOTTLED OLIVE 5Y4/3, MOSTLY SILT WITH SOME SAND, LITTLE RED GRAVEL LENS - W/ SMALL AMOUNT OF CONCRETE FILL	
8			SILT (ML) MEDIUM, OLIVE, 5Y4/3, MOIST, MOSTLY SILT LITTLE FINE SAND RESIDUUM SEVERELY WEATHERED PIERRE	BLACK ORGANICS GRASS ROOTS FORMER HORIZON LINE
12			SILT (ML) MEDIUM DENSE, MOIST, OLIVE (5Y4/3), MOSTLY SILT, LITTLE FINE SAND, BLOCKY TEXTURE, SLIGHTLY LAMINATED ORANGE STAINING ON FRACTURE SURFACES WEATHERED PIERRE.	CONTACT WEATHERED PIERRE
16			B.O.E. @ 18 FT	
20				
24				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/31/98	1541	NE
NOT ENCOUNTERED		* HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

15 FT (L) x 3 FT (W) x 18 FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

EARTH TECH

TEST PIT REPORT

TEST PIT NO. LF4TP20

PROJECT: Landfill 4
CLIENT: USACE / Fort Carson
CONTRACTOR:
EQUIPMENT USED: Komatsu PC150LC tracked excavator

JOB NO: 29188.090102
LOCATION: Landfill 4
ELEVATION:
DATE START: 01/29/01
DATE FINISH: 01/29/01
LOGGED BY: DCB

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
0.0				
1.5			SILT-ML - soft, dry, brown (10 YR 4/2) mostly silt, trace cobbles (6-inch diam.), abundant roots, nonplastic, non-cohesive, massive; FILL-ALLUVIUM?	Excavated from N to South on south side of B-Ditch. Worked up-slope and excavated through topographic break.
2.0				
4.0			SILT-ML - soft, dry brown (10 YR 4/2) mostly silt, trace, caliche and iron staining, non-plastic, noncohesive, massive; ALLUVIUM.	
6.0				No Samples Collected
			Trenching Logs	
8.0				
10.0				
10.5			SILTSTONE - soft, severely weathered, gray (5 YR 4/1), aphanitic siltstone, fractures and bedding not apparent, blocky structure with localized iron staining and dark (mn?) stains; PIERRE SHALE.	
12.0 Base of Excavation 12.0'				
14.0				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
NOT ENCOUNTERED		* HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

30' (L) x 26" (W) bucket 24" x 12.0 (D) = 792 CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

James Mascellino
Dan Gooden
operators

TEST PIT NO. LF4TP20

EARTH TECH

TEST PIT REPORT

TEST PIT NO. LF4TP21

PROJECT: Landfill 4

CLIENT:

CONTRACTOR:

EQUIPMENT USED:

JOB NO: 29188 090102
LOCATION: Landfill 4
ELEVATION:
DATE START: 01/29/01
DATE FINISH: 01/29/01
LOGGED BY: DCB

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
0.0			SILT-ML soft, dry, brown (10 YR 4/2), mostly silt, trace cobbles, trace root fragments, nonplastic, noncohesive, massive; FILL/ALLUVIUM?	
1.8				
2.0			SILT-ML soft, dry, brown (10 YR 4/3), mostly silt, trace iron staining and caliche, nonplastic, noncohesive, massive; ALLUVIUM.	No Samples Collected.
4.0				
6.0				
6.5			SILTSTONE - soft, severely weathered, gray (5 YR 4/1), aphanitic siltstone, fractures and bedding not apparent, blocky structure with localized caliche and iron staining; PIERRE SHALE.	
8.0	Base of Excavation			
10.0				
12.0				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
NOT ENCOUNTERED		* HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

15' (L) x 26" (W) x 8' (D) = 264 CU. FT.

bucket 24"

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. LF4TP21

EARTH TECH

TEST PIT REPORT

TEST PIT NO. LF4TP22

PROJECT: Landfill 4

CLIENT:

CONTRACTOR:

EQUIPMENT USED:

JOB NO: 29188.090102
LOCATION: Landfill 4
ELEVATION: —
DATE START: 01/29/01
DATE FINISH: 01/30/01
LOGGED BY: DCB

DEPTH (FT)	SAMPLE NO/ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
0.0			SILT-ML soft, dry, brown (10 YR 4/3), mostly silt, trace root fragments, non plastic, non cohesive, massive; FILL/ALLUVIUM?	Hit Sanitary Sewer at ~6 feet. Repair work occurred during 01/29/01 and should be completed tomorrow
1.8				
2.0			LEAN CLAY-CL soft, moist, olive black (5Y 2/1), mostly lean clay trace medium sand, moderate plasticity, cohesive, massive alluvium.	— slight humic organic odor. Presumed to be organic layer described in previous LF4 logs.
4.0				
6.0				collected LF~~TP~~4EX22 @ 2.5 feet @ 2:55 COC 7571 VOCs 8260 SVOCs 8270 metals 6010/7471
8.0				
9.0				
10.0	Base of Excavation			7565-TOC
				7561-DUPE02 8260 8270 metals
12.0				
14.0				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
NONE		

NOT ENCOUNTERED

* HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

20' (L) x 15' (W) x 9' (D) = 2700 CU. FT.

and extension 25' x ~~2.5~~ DCB 26" x 2.5' 137.5

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL._____CU. FT.

OVER 18 INCH DIAM: NO. _____ = VOL._____CU. FT.

TEST PIT NO. LF4TP22

Note: odors of petroleum hydrocarbons or other organic chemicals were not associated with the dark soil horizon. DCB 2/19/01

EARTH TECH

TEST PIT REPORT

TEST PIT NO. LFTP423

PROJECT: Landfill 4
CLIENT: USACE/Fort Carson
CONTRACTOR: Earth Tech
EQUIPMENT USED: Komatsu

JOB NO: 29188.090102
LOCATION: Landfill 4
ELEVATION: —
DATE START: 01/29/01
DATE FINISH: 01/29/01
LOGGED BY: DCB

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
0.0			SILT - ML - soft, dry, brown (10YR 4/2), mostly silt, trace roots, nonplastic, noncohesive, massive; ALLUVIUM/FILL?	
2.0			LEAN CLAY - CL soft, moist olive black (5Y 2/1), mostly lean clay, trace medium sand, moderate plasticity, cohesive, massive; ALLUVIUM	collect ~~LHT~~ LF4~~TP~~EX23 @ 3:30pm from 2.5 ft' slight humic odor from dark soil
4.0				COC 7572
6.0				8260 8270 6010/747
8.0				COC 7566 TOC
10.0				
12.0	Estimated within 6 inches			
14.5	Base of Excavation 14.5		SILTSTONE - soft severely weathered gray (5YR 4/1), aphanitic siltstone, fractures and bedding not apparent, blocky structure, localized iron staining; PIERRE SHALE.	

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
NONE		
NOT ENCOUNTERED		* HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

10 (L) x 26" (W) bucket 24" x 14.5 (D) = 36.5 CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. LF4TP23

Note: odors of petroleum hydrocarbons or other organic chemicals were not associated with the dark soil horizon DCB 2/19/01

APPENDIX K

JAR HEADSPACE TESTING FOR VOLATILES FORMS

HEADSPACE TESTING FOR VOLATILES

PROJECT: Fort Carson Military Reservation	PROJECT NUMBER: 89840.200
LOCATION: [ ] Equalization Basin [ ] Fire Training Area	DATE: 1/25/95
[ ] Landfill # [X] Group A [ ] Group B Landfill #4	CALIBRATION DATE: 1/25/95
INSTRUMENT: Photoionization Detector (PID)	CALIBRATION GAS TYPE/CONCENTRATION:
SERIAL NO: S/N DET: 47963 279	100ppm, Isobutylene
BULB POWER (eV): 10.2 eV	

	SAMPLE IDENTIFICATION	SAMPLE DEPTH (FT)	SAMPLE MATRIX	PEAK INSTRUMENT READING (PPM)	BREATHING ZONE (PPM)	AMBIENT AIR TEMP. (°F)	COMMENTS
	LF4-SB1-0/1	0-1	SOIL	0.0	0.0-2.0	70°F	0.0 BKGD MEASURED IN VEHICLE AT END OF DAY
X	-4/5	4-5		1.0			0.1-.4 BKGD
X	-9/10	9-10		2.0			0.1 BKGD
	-14/15	14-15		2.0			0.1-0.4 BKGD
	-19/20	19-20		1.2			
	LF4-SB2-0/1	0-1	SOIL	0.6	0.0		0.1 BKGD
X	-4/5	4-5		2.3			0.1-0.4 BKGD
X	-9/10	9-10		2.6			0.1-0.4 BKGD
	-14/15	14-15		2.0			0.1 BKGD
	19/20	19-20		1.5			0.1-0.4
X	LF4-SB3-0/1	0-1	SOIL	2.0	0.0		0.1-0.4 BKGD
X	-4/5	4-5		2.0			
	-9/10	9-10		~~1.5~~ 2.3 TBH			0.1-0.4 BKGD, H_2O IN SAMPLE

X = SENT TO LABORATORY

D REPRESENTATIVE SIGNATURE: Austin Sarah Hudson

FTCHDSPC.WK4

HEADSPACE TESTING FOR VOLATILES

PROJECT: Fort Carson Military Reservation	PROJECT NUMBER: 89840.200
LOCATION: [ ] Equalization Basin [ ] Fire Training Area	DATE: 1/26/95
[ ] Landfill # [✓] Group A [ ] Group B	CALIBRATION DATE: 1/26/95
INSTRUMENT: Photoionization Detector (PID)	CALIBRATION GAS TYPE/CONCENTRATION:
SERIAL NO: S/N DET: 47963 279	100ppm, Isobutylene
BULB POWER (eV): 10.2 eV	

Landfill #4,

SAMPLE IDENTIFICATION	SAMPLE DEPTH (FT)	SAMPLE MATRIX	PEAK INSTRUMENT READING (PPM)	*In Vehicle BREATHING ZONE (PPM)	AMBIENT AIR TEMP. (°F)	COMMENTS
LF4-SB4-0/1	0-1	Soil	1.1	0.1-0.4	70	(Measured in Vehicle - all LF4-SB4)
-4/5	4-5		0.8			
-9/10	9-10		0.8			No Analytical Sample Collected b/c v. moist-wet clay
VWR-SB1-0/1	0-1	Soil	1.7	0.1-0.4	70°	Measured In Vehicle
4/5	4-5		2.7	0.8-1.1		
9/10	9-10		3.4	0.8-1.1		
VWR-SB2-0/1	0-1	Soil	3.7	0.8-1.1		
4/5	4-5		3.0	0.8-1.1		
9/10	9-10		3.4	0.8-1.1		
14/15	14-15		2.4			
				Breathing Zone		
				While Drilling Was 0.0PPM.		

FIELD REPRESENTATIVE SIGNATURE: Christine Sarah Hudson 1/26/95

FTCHDSPC.WK4

HEADSPACE TESTING FOR VOLATILES

PROJECT: Fort Carson Military Reservation	PROJECT NUMBER: 89840.200
LOCATION: [ ] Equalization Basin [ ] Fire Training Area	DATE: 3/22/95
[ ] Landfill # [X] Group A [ ] Group B	CALIBRATION DATE: 3/22/95
INSTRUMENT: Photoionization Detector (PID)	CALIBRATION GAS TYPE/CONCENTRATION:
SERIAL NO: 580B30201277	100PPM Isobutylene
BULB POWER (eV): 10.2	

SAMPLE IDENTIFICATION	SAMPLE DEPTH (FT)	SAMPLE MATRIX	PEAK INSTRUMENT READING (PPM)	BREATHING ZONE (PPM)	AMBIENT AIR TEMP. (°F)	COMMENTS
LF4-mw1-0/1	0-1	SOIL	19.5	0.6	65-70	warmest samples
-4/5	4-5		43.0	0.9-1.0		
LF4-mw2-0/1	0-1		2.5	0.9		
LF4-mw3-0/1	0-1		2.6	0.9		
-4/5	4-5		2.9	0.9		
-9/10	9-10		2.0	0.8		

D REPRESENTATIVE SIGNATURE: Christin Hodson

FTCHDSPC.WK4

RUST ENVIRONMENT & INFRASTRUCTURE

JAR HEADSPACE TESTING FOR VOLATILES

Project Name: LF4	Project No.: 29188
RUST Field Representative: Lindsay Groom	Date: 1/17/00
Instrument Type: RAE-	Calibration Date: 1/15/00
Serial No.: 095-505023	Calibration Gas Type/ Concentration:
Photoionization Bulb Power (eV):	isobutylene

SAMPLE NUMBER	SAMPLING LOCATION	SAMPLE DEPTH (FT)	SAMPLE MATRIX	PEAK INSTRUMENT READING (PPM)	BREATHING ZONE (PPM)	AMBIENT AIR TEMP. (°F)	COMMENTS
LF4MW04	LF4	4.0/5.0	SOIL	0.0	0.0	25°	
" "		8.0/9.0	" "	0.0	0.0	25°	
" "		13'/14'	" "	0.0	0.0	27°	
		18'-19'	" "	0.0	0.0	27°	
LF4MW05		1/2	"	0.0	0.0	27°	
"		3/4	"	0.0	0.0	27°	
"		8/9	"	0.0	0.0	27°	
"		4/5	"	0.0	0.0		organic roots w/ decay
"		13/14	"	0.0	0.0	27°	

Lindsay Groom 1/17/01

123/hdspc.wk3

RUST ENVIRONMENT & INFRASTRUCTURE

JAR HEADSPACE TESTING FOR VOLATILES

Project Name: FT. CARSON LF-4 WELL INSTALLATION & DIRECT PUSH	Project No.: 29188 Ø9Ø1Ø2
RUST Field Representative: DANNY GODDEN	Date: Ø1/18/2K1
Instrument Type: MULTI RAE PLUS	Calibration Date: Ø1/18/2K1
Serial No.: Ø95-5Ø5Ø23	Calibration Gas Type/ Concentration: ISOBUTYLE 100 ppm
Photoionization Bulb Power (eV):	

SAMPLE NUMBER	SAMPLING LOCATION	SAMPLE DEPTH (FT)	SAMPLE MATRIX	PEAK INSTRUMENT READING (PPM)	BREATHING ZONE (PPM)	AMBIENT AIR TEMP. (°F)	COMMENTS
LF4DP1	LF-4	3'-4'	SOIL	Ø.Ø	Ø.Ø	24°F	
		7.5-8'		Ø.Ø	Ø.Ø	24°F	
		9'-11'		Ø.Ø	Ø.Ø	24°F	
LF4DP4		Ø-2'		Ø.Ø	Ø.Ø	26°F	
		3'-4'		Ø.Ø	Ø.Ø	26°F	
		9'-1Ø'		Ø.Ø	Ø.Ø	26°F	
		13'-15		Ø.Ø	Ø.Ø	26°F	
LF4DP3		6'-7'		Ø.Ø	Ø.Ø	25°F	
		1'-2'		Ø.Ø	Ø.Ø	31°F	
		9'-1Ø'		Ø.Ø	Ø.Ø	31°F	

123/hdspc.wk3

RUST ENVIRONMENT & INFRASTRUCTURE

JAR HEADSPACE TESTING FOR VOLATILES

Project Name: FT. CARSON - LF 4 WELL INSTALLATION	Project No.: 29188-090102
RUST Field Representative: DANNY GOODEN	Date: 01/19/2K1
Instrument Type: MULTI RAE PLUS 2000	Calibration Date: 01/19/2K1
Serial No.: 201131	Calibration Gas Type/ Concentration: ISOBUTYL 100ppm
Photoionization Bulb Power (eV):	

SAMPLE NUMBER	SAMPLING LOCATION	SAMPLE DEPTH (FT)	SAMPLE MATRIX	PEAK INSTRUMENT READING (PPM)	BREATHING ZONE (PPM)	AMBIENT AIR TEMP. (°F)	COMMENTS
LF4Dp2	LF-4	0'-2'	SOIL	0.0	0.0	28°	SAMPLE TAKEN
		4'-5'		0.1	0.1	28°	SAMPLE TAKEN
LF4Dp5		0'-3'		0.0	0.0	28°	
		3'-4'		0.1	0.0	28°	SAMPLE TAKEN
		~~7'-8.5'~~					~~SAMPLE TAKEN~~
		6'-7'		0.1	0.1	29°	SAMPLE TAKEN
LF4Dp6		0'-3'		0.1	0.1	29°	
		7.5'-8.5'		0.0	0.0	29°	SAMPLE TAKEN
		7.5-8.5		2.2ppm	0.0	30°	

123/hdspc.wk3

HEADSPACE TESTING FOR VOLATILES

PROJECT: Fort Carson Military Reservation	PROJECT NUMBER: 29188-090101
LOCATION: Landfill 4 Areas S+W of B Ditch	DATE: 01/29/01
INSTRUMENT: Photoionization Detector (PID) Mini Rae-Plus	CALIBRATION DATE: 01/29/01
SERIAL NO: 095 505023	CALIBRATION GAS TYPE/CONCENTRATION: Multigas,
BULB POWER (eV): 11.7	Isobutylene, Nitrogen

SAMPLE IDENTIFICATION	SAMPLE DEPTH (FT)	SAMPLE MATRIX	PEAK INSTRUMENT READING (PPM)	BREATHING ZONE (PPM)	AMBIENT AIR TEMP. (°F)	COMMENTS
LF4~~AP~~ES22	2.5	Soil	0	0	30s	dark soil horizon
LF4~~AP~~ES23 EX	2.5	Soil	0	0	"	" " "

DCB

FIELD REPRESENTATIVE SIGNATURE: [signature] 01/29/01

HTFV.WK4

APPENDIX L

SLUG TEST ANALYSES

SLUG TEST RESULTS
LANDFILL 4
FORT CARSON, COLORADO
JULY 2001
29188 090204

SITE ID	Test #	# of observations read from file	# of observations retained	# of duplicate observations removed	# of observations in data set	COMMENTS
LF4MW2	T1--SI	363	361	0	361	
[07-10-01]	**T2--SO**	**522**	**522**	**0**	**522**	used for report
(unconfined)	T3--SI	473	473	0	473	
	T4--SO	406	406	0	406	
LF4MW4	T1--SI	398	398	0	398	
[07-10-01]	T2--SO	249	249	0	249	
(unconfined)	T3--SI	229	229	0	229	
	T4--SO	**394**	**394**	**0**	**394**	used for report
LF4MW5	T1--SI					NOT USING FOR ANALYSIS
[07-10-01]	T2--SO					
(confined)	T3--SI					
	T4--SO					

Bolded Test #'s=included in report to state

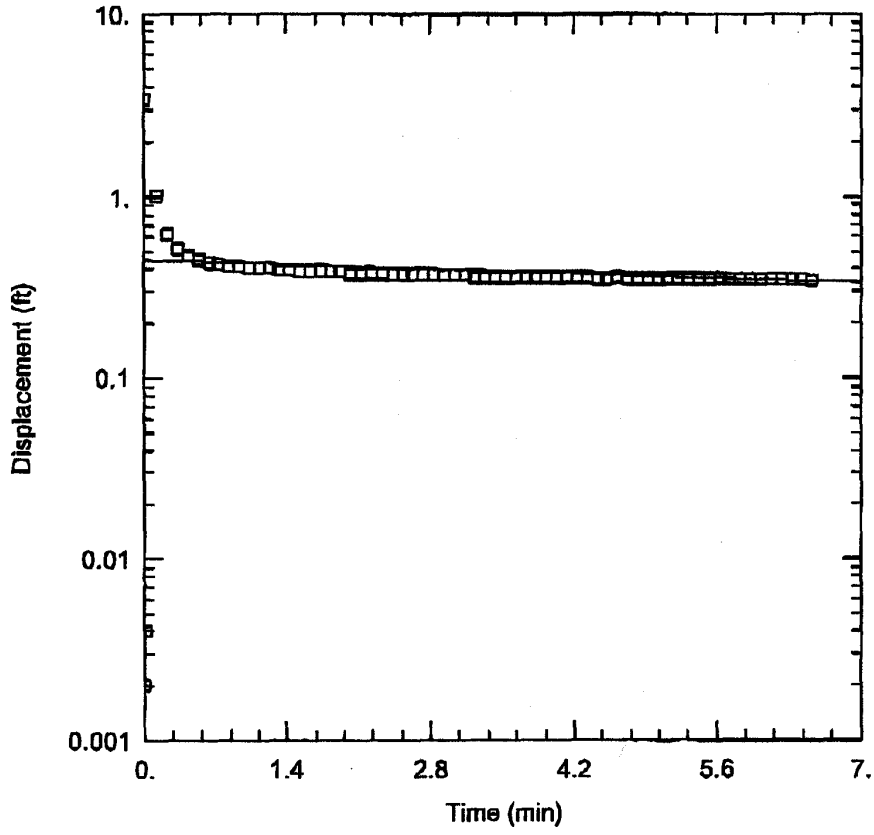
SLUG TEST DATA
LANDFILL 4
FORT CARSON, COLORADO
JULY 2001
29188 090204

Well ID		Slug Displacement (feet)	Depth to Bedrock (feet)	Static Water Level (feet)	Saturated Thickness of Aquifer (feet)	Hydraulic Conductivity Anisotropy Ratio	Length of Well Screen (feet)	Depth to Bottom of well screen (feet)	Depth of Penetration By Well Screen In Aquifer	Inner Radius of Well (feet)	Effective Radius of Well Screen/Wellbore (feet)	Outer Radius of Well Skin (feet)	Effective Porosity of Gravel Pack (n)	Is The Screen Partially Submerged?
					(bedrock - static water level)	(Kv/Kh)			(bottom of well screen - static water level)					
LF4MW02	T1-SI	0.589	15.41	9.72	5.69	1	10	15.00	5.28	0.083	0.26	0.26	0.456	yes
(unconfined)	T2-SO	1.116												
	T3-SI	0.691												
	T4-SO	1.118												
LF4MW04	T1-SI	0.878	16.76	8.96	7.8	1	10	16.76	7.8	0.083	0.333	0.333	0.456	yes
(unconfined)	T2-SO	1.296												
	T3-SI	0.399												
	T4-SO	3.403												
LF4MW05	T1-SI	2.469				NOT	USING	FOR	ANALYSIS					
(confined)	T2-SO	1.944												
	T3-SI	2.570												
	T4-SO	1.450												

Notes:
Because bedrock is so shallow and severely weathered, groundwater is found flowing through bedrock. In this case, depth used to bedrock is also TD.
Underlined values in slug displacement column are negative (on slug in).
Will use absolute values for negative data readings.
Values corrected for 2.57 ft. stick-up on LF4MW02
LF4MW4 is a flush mount
The depth values for LF4MW5 on the HTW log and the well completion log are too ambiguous to use for an accurate analysis.

2 inch inner diameter well = 1 inch radius = 0.083 foot radius
2.375 inch outer diameter well = 1.1875 inch radius = 0.09 foot radius
8 inch diameter borehole = 4 inch radius = 0.33 foot radius

6.25 inch diameter borehole = 3.125 inch radius = 0.26 foot radius



WELL TEST ANALYSIS

Data Set: L:\HOME\DButler\basket\Landfill 4\AqteSolve_final\LF4MW04\LF4MW04_T4_SO_filtered.aqt
Date: 07/29/01 Time: 12:58:29

PROJECT INFORMATION

Company: Earth Tech
Client: USACE
Project: 29188 090204
Test Location: Fort Carson, CO--Landfill 4
Test Well: LF4MW04
Test Date: 07-10-01

AQUIFER DATA

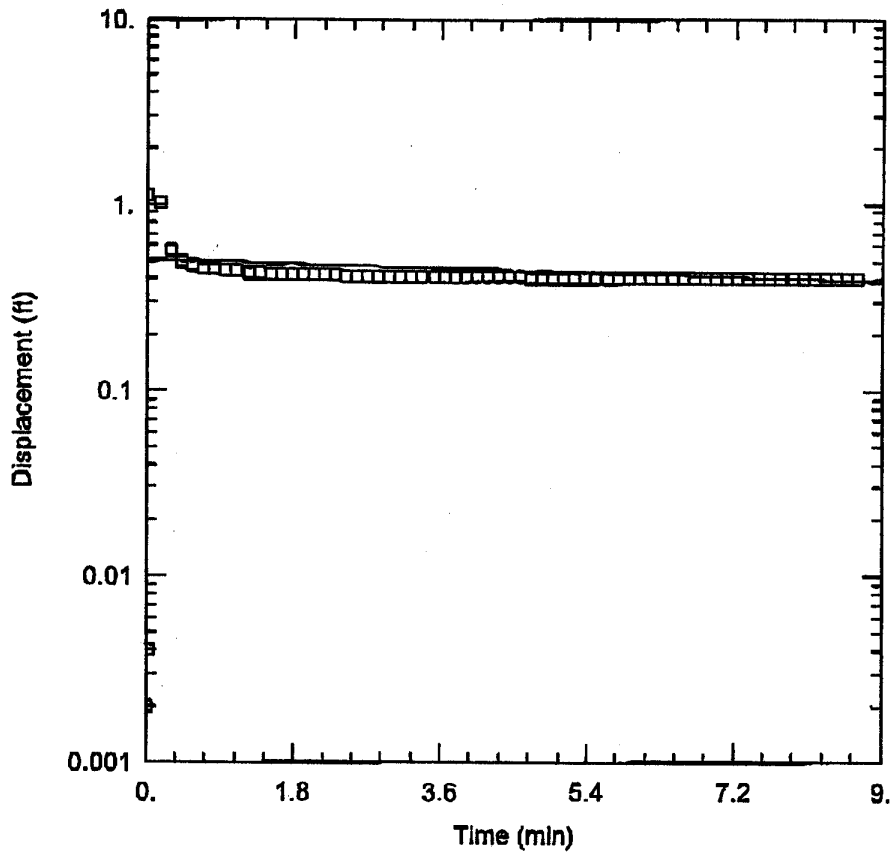
Saturated Thickness: 7.8 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (LF4MW04)

Initial Displacement: 3.403 ft
Wellbore Radius: 0.333 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.456
Casing Radius: 0.083 ft
Well Skin Radius: 0.333 ft
Total Well Penetration Depth: 7.8 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.3788 ft/day
y0 = 0.4489 ft



WELL TEST ANALYSIS

Data Set: L:\HOME\DButler\basket\Landfill 4\AqteSolve_final\LF4MW02\LF4MW02_T2_SO_filtered.aqt
Date: 07/29/01 Time: 12:57:53

PROJECT INFORMATION

Company: Earth Tech
Client: USACE
Project: 29188 090204
Test Location: Fort Carson, CO--Landfill 4
Test Well: LF4MW02
Test Date: 07-10-01

AQUIFER DATA

Saturated Thickness: 5.69 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (LF4MW02)

Initial Displacement: 1.116 ft
Wellbore Radius: 0.26 ft
Screen Length: 10. ft
Gravel Pack Porosity: 0.456
Casing Radius: 0.083 ft
Well Skin Radius: 0.26 ft
Total Well Penetration Depth: 5.28 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.164 ft/day
y0 = 0.5065 ft