

MEMORANDUM

ERM/GOLDER Los Alamos Project Team

To: Garry Allen, CST-18
From: Derek Faulk *DF*
Date: 11 May 1995
Re: Revised DP Tank Farm Technical Memorandum

CONFIDENTIAL
00-1106

ERM/Golder is pleased to submit the referenced document for your review and comment. I added a statement in Section 3.0 clarifying the depth to which boreholes will be advanced beyond 30 feet below ground surface if petroleum contamination is detected to that depth.

Please return any other comments to me at your earliest convenience.

cc: Al Funk
Beverly Martin
John Smith
Project File 19576.7



10193

ERM/Golder Los Alamos Project Team

TV

**Field Unit 1, TA-21, SWMU 21-029
Former DP Tank Farm
Technical Memorandum**

1.0 INTRODUCTION

This technical memorandum presents the history of the former DP Tank Farm and summarizes the results of an underground storage tank (UST) removal performed in 1988 and a Phase I Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) performed in 1994. The former DP Tank Farm is designated as Solid Waste Management Unit (SWMU) 21-029 and is listed in the Los Alamos National Laboratory's (LANL's) Hazardous Waste Permit in accordance with RCRA as amended by the Hazardous and Solid Waste Amendments of 1984. Although not historically a part of Technical Area 21 (TA-21), DP Tank Farm is included in the TA-21 Operable Unit RFI Workplan because of its close proximity to TA-21.

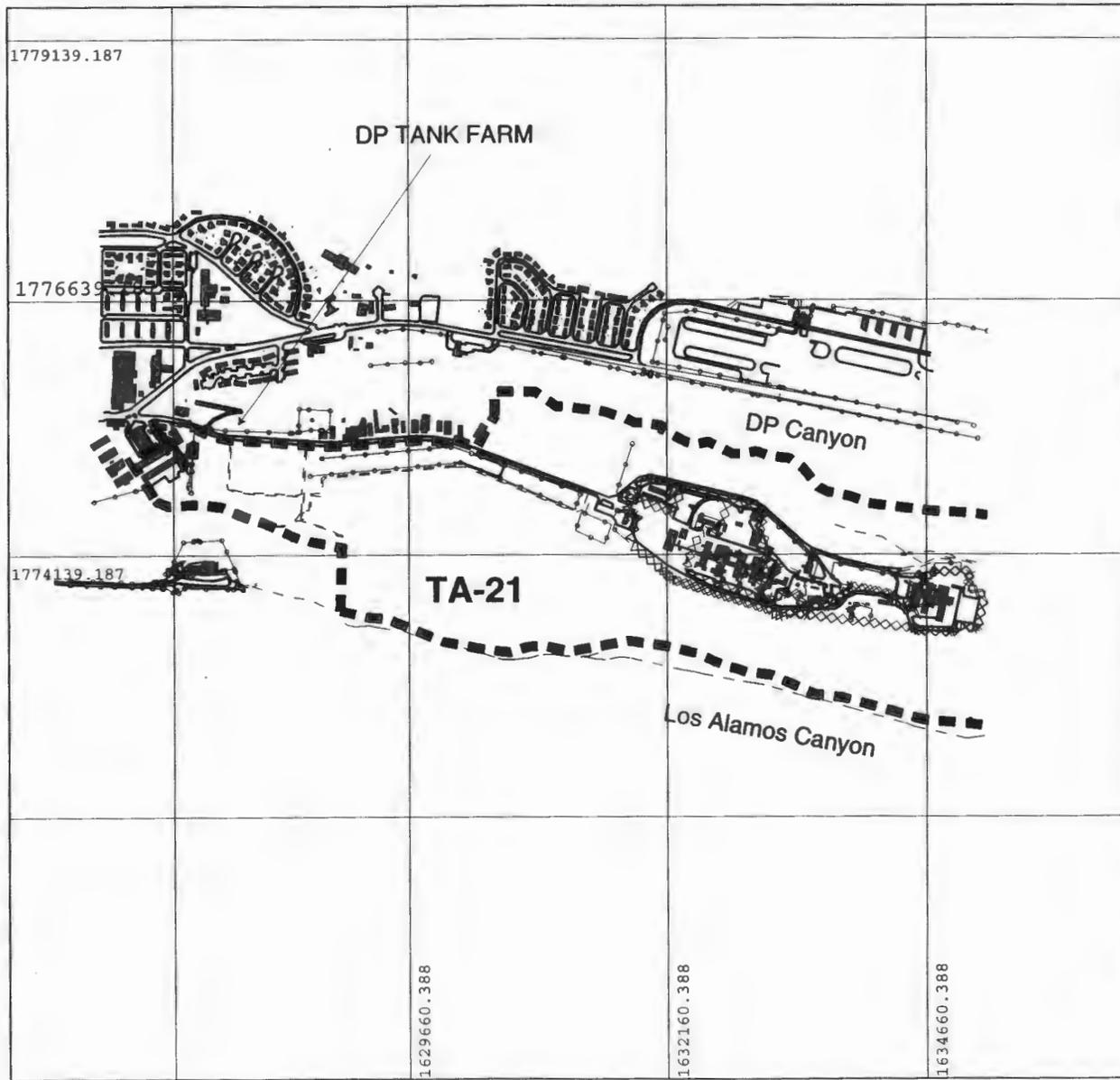
This memorandum provides the United States Environmental Protection Agency (EPA), Region VI, the New Mexico Environment Department (NMED), and other interested parties with a summary of the UST removal activities and RFI activities performed to date and plans for future action at the site.

1.1 Facility Background

The former DP Tank Farm site is located near the western end of DP Mesa immediately east-southeast of the Los Alamos townsite. The site is located on a slope descending from DP Road north towards DP Canyon and occupies property which is currently bounded by the Knights of Columbus Hall on the west and a Los Alamos County fire station on the east. The site is surrounded by a 8-foot chain-link fence and lies entirely within the jurisdiction of the Department of Energy (Figure 1-1).

The DP Tank Farm site is the former location of 15 fuel storage tanks and two fill stations (Figure 1-2). The tank farm operated from January 1946 to February 1985. Reported tank capacities ranged from approximately 2,100 gallons upwards to approximately 51,000 gallons. The tanks were used for the storage of petroleum hydrocarbon products such as gasoline, diesel, kerosene, and No. 2 fuel oil. The tanks may not have been dedicated to the storage of a single petroleum product and may have contained different substances at different times. One tank was reported to have contained ethanol. There are no known records of any radioactive materials associated with this site. Descriptive information for the 15 tanks is presented in Table 1-1.

All tanks and structures at the site were decommissioned and removed in 1988. At the time of removal, one tank was found to have leaked from a deteriorated gasket. According to the TA-21 RFI Workplan, it is assumed that the leaking gasket was located where the gravity flow pipe met the tank. Approximately 4 cubic yards of diesel-contaminated soil was removed. Analytical results of soil samples collected around the site at the time indicated little potential for significant environmental contamination (TA-21 Operable Unit RFI Workplan, LANL, 1991)



LEGEND

-  Dirt Roads
-  Road, Paved
-  Outline for TA-21
-  Industrial Fences
-  Security Fences
-  Buildings

Produced by: Belinda Scheber, 103248

Modified by: Kirsten Oschwald 5/8/95


State Plane Coordinate System, New Mexico Central Zone,
1983 North American Datum

NOTICE: The information on this map is provisional. Feature locations are dependent on scale and symbology and their accuracy may not have been confirmed. Los Alamos National Laboratory boundary is based on legal description established in 1988. Other boundary, structure and utility data are from Los Alamos National Laboratory Engineering Division and Los Alamos County Utility and Engineering Departments. Contour data are from Los Alamos National Laboratory Environmental Restoration Project aerial survey, September, 1991.

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Figure 1-1. TA-21, DP Tank Farm Site Location

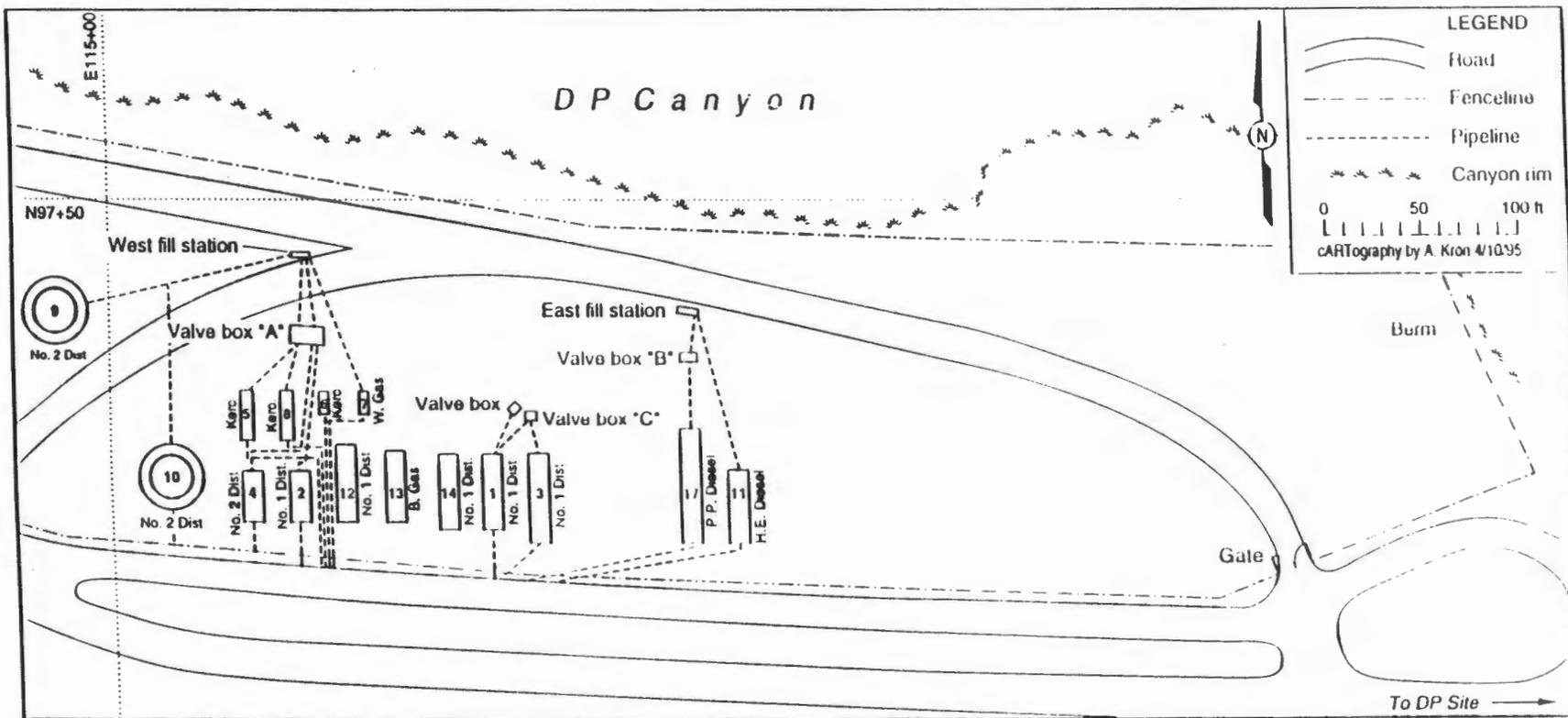


Figure 1-2. DP Tank Farm (SWMU 21-029) showing layout of tanks, pipelines, and fill stations.

TABLE 1-1

DESCRIPTION OF FORMER STORAGE TANKS AT DP TANK FARM

Tank No.	Tank Structure Number	Capacity (gallons)	Substance Stored
1	TA-21-ATF-1	28,500 or 21,000	No. 2 fuel oil or diesel
2	TA-21-ATF-2	14,900 or 21,500 or 14,994	No. 2 fuel oil or diesel
3	TA-21-ATF-3	23,900 or 26,000 or 23,967	No. 2 fuel oil or diesel
4	TA-21-ATF-4	14,900 or 22,000 or 14,994	No. 2 fuel oil or diesel
5	TA-21-ATF-5	5,100 or 5,500 or 5,170	kerosene or diesel
6	TA-2-ATF-6	2,100 or 3,000 or 2,099	kerosene or diesel
7	TA-21-ATF-7	2,900 or 2,500 or 2,978	kerosene or leaded gasoline or gasoline
8	TA-21-ATF-8	5,100 or 5,500 or 7,170	kerosene or diesel
9	TA-21-ATF-9	21,600 or 25,000 or 21,644	No. 2 fuel oil or diesel
10	TA-21-ATF-10	21,600 pr 25,000 or 21,644	No. 2 fuel oil or diesel

Tank No.	Tank Structure Number	Capacity (gallons)	Substance Stored
11	TA-21-ATF-11	23,900 or 38,000 or 23,967	diesel or leaded gasoline or ethanol
12	TA-21-ATF-12	20,200 or 38,000 or 20,266	No. 2 fuel oil or kerosene
13	TA-21-ATF-13	24,700 or 36,000 or 24,770	gasoline or diesel
14	TA-21-ATF-14	20,200 or 26,500 or 20,226	No. 2 fuel oil or diesel
17	TA-21-ATF-17	51,000 or 49,000 or 51,015	diesel or leaded gasoline or gasoline

TA-21 Operable Unit RFI Workplan for Environmental Restoration, 1991.

1.2 Environmental Setting

DP Tank Farm is located on DP Mesa at an elevation of approximately 7,140 feet. DP Mesa is located between the drainage channel in DP Canyon, on the north, and the drainage channel to Los Alamos Canyon, on the south. The site is underlain by approximately 800 feet of the Bandelier Tuff, or volcanic ash deposits, which is the bedrock throughout TA-21. Members of the Bandelier Tuff (from top to bottom) include the Tshirege, Cerro Toledo, Otowi, and Guaje. The Bandelier Tuff is underlain by the sediments of the Santa Fe Group (Puye and Tesuque Formations) and basalt flows (basaltic rocks of Chino Mesa).

The main aquifer lies at a depth of approximately 1,150 feet in the sediments well below the base of the Bandelier Tuff. While general flow of the aquifer is from recharge areas in the Jemez Mountains on the west toward the Rio Grande on the east, the exact groundwater flow direction beneath the former DP Tank Farm is not known.

A summary of vadose zone studies on mesa tops and the physical and hydrogeochemical properties of the Bandelier Tuff is presented in the Installation Work Plan for Environmental Restoration (LANL, 1991). In general, the findings summarized in the IWP suggest that the tuff does not bear water, except in shallow and localized areas. For example, a shallow alluvial aquifer and a perched aquifer were located at an intermediate depth (325 feet below Los Alamos Canyon) in drill hole LADP-3 (Broxton, et al., in preparation). Based on the results from drilling the LADP-4 borehole (approximately 0.75 mile east of DP Tank Farm) in 1994, it is unlikely that a localized water bearing zone is present between the surface of SWMU 21-029 and the main aquifer. Groundwater was not encountered in the 95-foot borehole drilled by Roy F. Weston, Inc. at the site during the 1994 field season.

2.0 INVESTIGATION SUMMARIES AND DATA EVALUATION

2.1 Initial Investigations

In 1985, liquid and sludge samples were collected from the tanks to assess if they must be classified as a hazardous waste (TA-21 RFI Workplan, 1991). The results indicated that the contents were petroleum distillates and, in one instance, up to 50 percent ethyl alcohol. Analysis of the liquids for radioactivity showed no contamination. This information as presented in the RFI Workplan was obtained from memoranda. The analytical methods, original laboratory reports, and chain of custody reports were not available.

In 1984 and 1985, surface soil samples were collected at the drain outfall, the fill stations and along the base of an earthen berm that ran along the northern site boundary. Lead results were below the laboratory detection limit of 1 µg/L. Results of seven of eleven samples analyzed for arsenic were below the laboratory detection limit of 0.0016 mg/L. The concentration of arsenic in the remaining samples ranged from 0.0019 mg/L to 0.0042 mg/L. Background soil samples analyzed for lead and arsenic provided results similar to these sample results.

At the time of the sampling, the Environmental Protection Group (HSE-8) concluded that the surface soil at the DP Tank Farm was not contaminated with hazardous wastes, and the small volumes of contaminated soils could be mixed with on-site soil rather than being disposed of at a landfill.

In 1985, subsurface sampling was performed at areas where tank leaks were found and in the fuel-soaked soil in the vicinity of the two fill stations. Although no documentation of the location and depth from which the samples were collected or the analytical results could be located for preparation of the TA-21 RFI Workplan, the workplan states that this does indicate that fuel-saturated soils existed at the tank farm.

During the decommissioning of the DP Tank Farm in 1988, soil sampling and analyses for lead by EP Toxicity were performed in the locations of former tanks TA-21-ATF-7, TA-21-ATF-11, and TA-21-ATF-17. Twenty-two samples were collected from these three former tank locations. The analytical results of samples collected from the locations of tanks TA-21-ATF-11 and TA-21-ATF-17 showed all samples contained <1 µg/L lead. Five of the six soil samples collected beneath tank TA-21-ATF-7 contained 1 µg/L or less lead. The sixth soil sample beneath the tank contained 238 µg/L lead. However, the high value was considered to be an outlier because a duplicate sample showed <1 µg/L lead. Based upon these analytical results, the soil beneath the three gasoline tanks was considered to be free of contamination. The original laboratory reports and chain of custody reports are not available (TA-21 RFI Workplan, 1991).

In June 1988, soil sampling of the fill station areas was initiated. Soils were excavated, sampled, and analyzed for benzene, toluenes, and xylene (BTX) and lead. It is not clear whether EPA analytical methodology was followed for sample analysis, and the original laboratory reports and chain of custody reports are not available. All lead analyses showed concentrations <2 µg/L lead. Total BTX results ranged from 107.2 µg/kg to 2,733.9 µg/kg in excavated soil. However, concentrations of BTX in soil remaining after excavation ranged from 37.4 µg/kg to 78.5 µg/kg. Surrogate recoveries for these BTX analyses ranged from 0 to 58 percent. The area was considered "clean" and backfilled (TA-21 RFI Workplan, 1991).

2.2 1994 Investigations

A Phase I RFI was performed at the former DP Tank Farm in September 1994. In accordance with the RFI workplan, the investigation was conducted to confirm the absence of contamination at the site. Previous sampling may have addressed the major locations and contaminants of concern at the DP Tank Farm, but available documentation was considered to be insufficient to support a recommendation of no further action.

Surface and subsurface samples were collected at the former locations of tanks TA-21-ATF-6, TA-21-ATF-10, and TA-21-ATF-13. Surface samples were collected from the drain outfall. Boreholes were drilled and subsurface samples collected from the east and west fill stations, which had exhibited fuel-soaked soil during the course of decontamination and decommissioning. Samples were analyzed for volatile organic compounds (VOCs) by EPA Method 8240, semi-volatile organic compounds (SVOCs) by EPA Method 8270, metals by EPA Method 6010 and Toxicity Characteristic Leaching Procedure (TCLP), arsenic, and ethanol.

The results of the investigation indicated that petroleum hydrocarbons, in the form benzene, toluene, ethylbenzene, and xylenes (BTEX), other volatile constituents of gasoline and diesel fuel, and semi-volatile organic compounds (SVOCs), and lead are not present in concentrations above LANL Screening Action Levels (SALs) or State of New Mexico UST cleanup levels in the area of the former tanks. Boreholes 21-2553, 21-2554, 21-2555, 21-2560, 21-2561, and 21-2562 were each drilled and sampled in the former tank locations to a depth of 10 feet below ground surface(bgs) (Figure 2-1).

1,3,5-trimethylbenzene (1,3,5-TMB) and 1,2,4-trimethylbenzene (1,2,4-TMB), both gasoline constituents, were detected in concentrations above LANL SALs in subsurface samples collected from the areas of the two former fill stations. Total BTEX was also detected in samples collected from boreholes in both fill station locations in concentrations in excess of the UST cleanup threshold of 50 mg/kg. The locations of samples and the reported concentrations of BTEX and the trimethylbenzenes in those samples indicate that the horizontal and vertical extent of the contamination has not been adequately defined at either of the former fill station locations. A summary of analytical results is shown in Table 2-1.

At the west fill station location, the vertical extent of the hydrocarbon contamination appears to have been bounded at a depth of 10 feet bgs by borehole 21-2556. Borehole 21-2556 was drilled and sampled at the approximate source location to a depth of 27.5 feet bgs, however, no samples were collected between 10 and 17.5 feet bgs. Volatile organics, including methyl ethyl ketone (MEK) and acetone, and semi-volatile organics were detected in soil samples from this borehole, but only 1,2,4-TMB was detected in concentrations above SALs. The acetone was detected in one sample in a concentration of 6.4 mg/kg, which indicates that it may be a laboratory contaminant.

One other borehole (21-2557) was drilled and sampled in the area of the west fill station. The borehole was drilled to a depth of 10 feet bgs and no contamination was detected in the one sample collected from a depth of 7.5 feet to 10 feet bgs. With information available from only two boreholes at this former fill station location, the horizontal extent of the contamination has not been determined adequately. The locations of the boreholes associated with the west fill station are shown in Figure 2-1.

Three boreholes were drilled in the vicinity of the east fill station. Borehole 21-2558 was drilled and sampled at the approximate source location to a depth of 94 feet bgs. Samples were collected every 2.5 feet to a depth of 10 feet bgs. Two additional samples were collected from this borehole at depths of 70.0 - 75.0 feet and 92.5 - 94.0 feet bgs. 1,3,5-TMB and 1,2,4-TMB were detected in concentrations exceeding SALs in samples collected from the top 10 feet of the

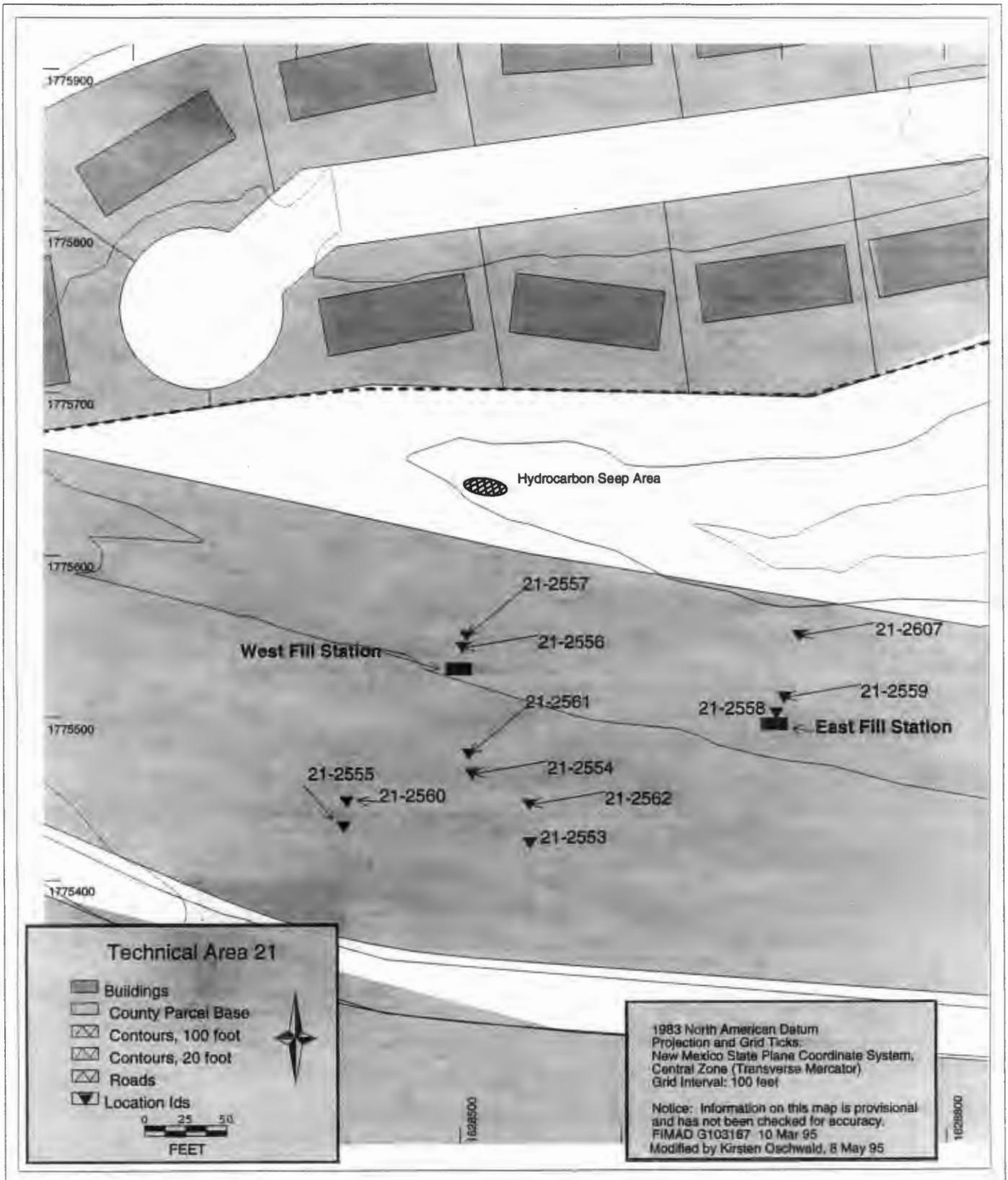


Figure 2-1. Borings Installed at DP Tank Farm During FY94

**Table 2-1
DP Tank Farm
Analytical Results of Soil Samples with Analyte Concentrations above Detection Limits**

Borehole	Sample ID Number	Sample Depth (ft.)		Volatile Organic Compounds (mg/kg)														SVOCs(1) (mg/kg)			Lead(2)	
		From	To	Total BTEX	Benzene	Butylbenzene	Ethylbenzene	Toluene	Total Xylenes	2-Butanone (MEK)	1,3,5-Trimethylbenzene	1,2,4-Trimethylbenzene	Acetone	Isopropylbenzene	propylbenzene	isopropyltoluene	2-Methylnaphthalene	bis-(2-Ethylhexyl) Phthalate	Naphthalene	Lead (mg/kg)	TCLP Lead (mg/l)	
21-2553	9702	2.5	5.0	0.009					0.009											10.1		
	9704	7.5	10.0	0																3.9		
21-2554	9706	2.5	5.0	0																6.1		
	9708	7.5	10.0	0																2.7		
21-2555	9710	2.5	5.0	0																9.1		
	9712	7.5	10.0	0																		
21-2556	9713	0.0	2.5	15					15	22	8.3	19								13.6	<0.037	
	9714	2.5	5.0	81.9		2.8	2.9	13	66	20	29	110	6.4			16	110		40	14.3	0.135	
	9715	5.0	7.5	82.6			4.8	6.8	71	27	30	100		2.5	3.4	19	96			21.4	0.193	
	9716	7.5	10.0	55.4			6.3	4.1	45		16	50		3.5	4	1.5	49			22.8	0.208	
	9749	17.5	18.5	0																		
	9884	25.0	27.5	0																		
21-2557	9720	7.5	10.0	0																7.8		
21-2558	9721	0.0	2.5	0.029					0.029		2.1	0.051				0.14	8			13.7	0.147	
	9722	2.5	5.0	169.6				9.6	160		31	120				7.1				12.5	0.165	
	9723	5.0	7.5	531			55	56	420		65	270		7.6	29	12	56		42	4.6	0.045	
	9724	7.5	10.0	1008	8		110	260	630		69	260		9.9	36	13	49			3.7	0.045	
	9887	70.0	75.0	0																		
	9886	92.5	94.0	0																	2.8	
21-2559	9725	0.0	2.5	144					144		49	160				6.5				12.3	0.054	
	9726	2.5	5.0	221					221		50	210				10	38			12.7	<0.037	
	9727	5.0	7.5	660			90	100	470		70	270		9.8	37	16	79		50	9.9	0.106	
	9728	7.5	10.0	839			99	210	530		59	250		10	35	14	93		49	6.0	<0.037	
21-2560	9732	7.5	10.0	0																8.1		
	9742(3)	7.5	10.0	0																		
21-2561	9736	7.5	10.0	0																3.5		
21-2562	9738	2.5	5.0	0														0.87		18		
	9741(3)	2.5	5.0	0																		
21-2607	9885	65.0	70.0	0																3.3		

Surface Sampling

21-1684	9818	0.0	0.5	0																	
21-1685	9819	0.0	0.5	0																	

Relevant SALs (mg/kg):

Benzene (0.67)
Ethylbenzene (3,100)
Toluene (910)
Total Xylenes (160,000)
1,3,5-TMB (32)
1,2,4-TMB (40)
2-Butanone (4,000)
Lead (400)

1 = Semi-Volatile Organic Compound

2 = Lead Results Reported from Unvalidated Data

3 = Field Duplicates

borehole. Also, BTEX was routinely detected at concentrations greater than 50 mg/kg, with a maximum observed concentration of 988 mg/kg. No additional samples were collected from the 10-foot to 70 feet bgs. Therefore, an adequate number of samples was not collected from this borehole to confirm the vertical extent of contamination.

Samples collected from borehole 21-2559 contained elevated concentrations of hydrocarbons, but drilling was terminated at a depth of 10 feet bgs prior to determining the vertical extent of soil contamination. Benzene was detected in a concentration of 8 mg/kg in one sample from borehole 21-2559. This concentration is greater than the LANL SAL of 0.67 mg/kg for benzene but lower than the UST cleanup threshold of 10 mg/kg. Total BTEX was detected in concentrations in excess of 50 mg/kg, with a maximum reported concentration of 850 mg/kg. Borehole 21-2607, which is located approximately 60 feet northeast of the east fill station location, was drilled and sampled to a depth of 70 feet bgs. No VOCs or SVOCs were detected in this borehole in concentrations above SALs. The locations of the boreholes associated with the east fill station are shown in Figure 2-1.

3.0 RECOMMENDATIONS FOR FURTHER ACTION

An investigation is proposed for the spring of 1995 to be performed in accordance with the State of New Mexico UST regulations. The investigation will be performed in order to confirm and define the vertical and horizontal extent of petroleum hydrocarbons in the subsurface at the former DP Tank Farm.

Three vertical boreholes and one angled boring will be drilled and sampled at the former west fill station location to assess the lateral and vertical extent of petroleum hydrocarbon contamination. The angled boring will be drilled at a 45-degree angle in an east-to-west direction to assess the extent of contamination on the east side of the former fill station location as well as to assess the presence of subsurface fractures. By intercepting the fractures, an assessment may be made regarding the possibility of contaminant flow through the fractures. All boreholes will be drilled to a vertical depth of 30 feet bgs. Soil samples will be collected every 5 feet and analyzed by the Mobile Chemical Analytical Laboratory (MCAL) for total petroleum hydrocarbons (TPH) by modified EPA Method 8015 and BTEX and MEK by EPA Method 8020. Samples will also be collected at the same intervals for field screening of VOCs by a headspace analysis method, per the State of New Mexico UST regulations. Borehole locations are shown on Figure 3-1.

Four vertical boreholes and one angled boring will be drilled and sampled at the former east fill station location to assess the lateral and vertical extent of petroleum hydrocarbon contamination. The angled boring will be drilled at a 45-degree angle in an east-to-west direction to assess the extent of contamination on the east side of the former fill station location as well as to assess the presence of subsurface fractures. As stated above, an assessment may then be made regarding the possibility of contaminant flow through the fractures. All boreholes will be drilled to a vertical depth of 30 feet bgs. Soil samples will be collected every 5 feet and analyzed by the MCAL for TPH by modified EPA Method 8015 and BTEX and MEK by EPA Method 8020. Additional samples will be collected at the same intervals for field screening of VOCs by a headspace analysis method. All borehole locations are shown on Figure 3-1.

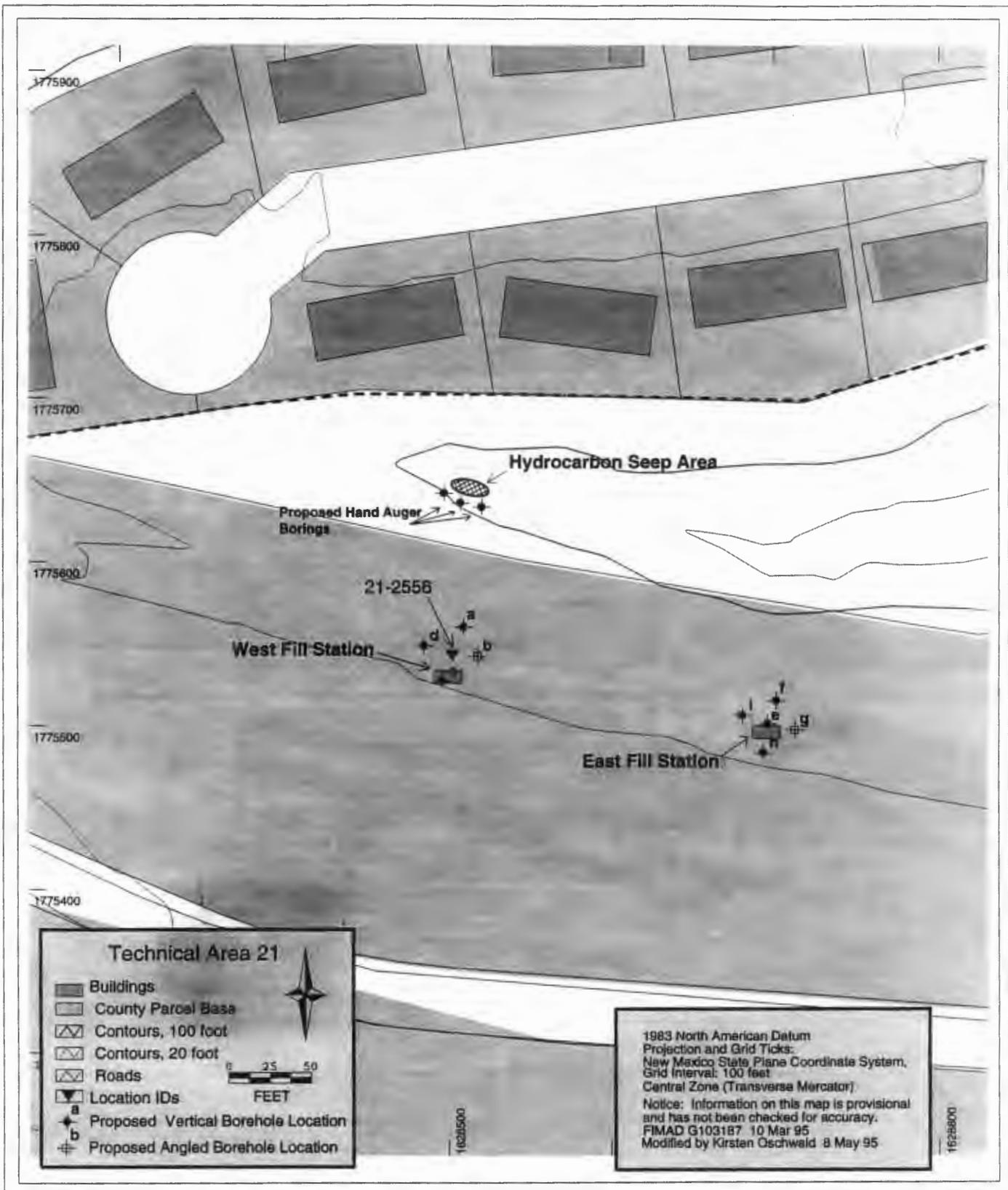


Figure 3-1. Proposed Borehole Locations at DP Tank Farm

During drilling, drill core and cuttings will be screened in the field for VOCs with an organic vapor meter (OVM). As each borehole is drilled, an assessment of the need to drill deeper than 30 feet to bound the vertical extent of contamination will be made by the FTL and site geologist. The assessment will be made based on field screening with the OVM and MCAL analyses. Boreholes will be advanced and sampled to a depth of 10 feet below the depth at which soil contaminated with total aromatic hydrocarbon concentration of 100 parts per million or greater was last encountered. As the boreholes are completed at each location, an assessment of the need for additional boreholes to bound the lateral extent of contamination will be made. If the analytical results indicate that the hydrocarbon contamination extends laterally beyond the location of the proposed boreholes, the Field Team Manager (FTM) will inform the Field Project Leader (FPL) and recommend additional boreholes to define the extent of the contamination. The number and locations of additional boreholes will be chosen by the FPL and FTM.

In addition to the drilling and sampling of boreholes around the former fill stations, subsurface samples will be collected from a seep north of the site. An intermittent stream at the head of DP Canyon is located approximately 75 feet north of the northern boundary of DP Tank Farm. A seep is located in the southern bank of the stream almost due north of the western fill station location. A hydrocarbon sheen has been observed on the surface of the water in the area of the seep. In order to assess the possibility of a hydraulic connection between the fill station location and the seep, three shallow boreholes will be drilled around the seep in the southern bank of the stream. The boreholes will be drilled with an electric hand-held power auger to an estimated depth of 5 feet bgs to assess the presence of hydrocarbons in the soil. Soil samples will be collected and analyzed by the MCAL for TPH by modified EPA Method 8015 and BTEX by EPA Method 8020.

The total depth of the boreholes around the seep is only an estimate. The actual depth will depend on site conditions, the presence of hydrocarbons (based on field screening and visual observations), and the capabilities of the power auger. If possible, additional shallow boreholes may be drilled and sampled farther up the slope (toward the DP Tank Farm site in a southerly direction) to further assess a hydraulic connection and possible hydrocarbon contamination between the western fill station and the seep. Any additional samples collected will also be analyzed by the MCAL for TPH and BTEX by EPA Methods 8015 and 8020, respectively.

4.0 REFERENCES

Broxton, D. E., Eller, P. G., and Flores, D., in preparation. "Preliminary Drilling Results for Boreholes LADP-3 and LADP-4 at Technical Area 21, Los Alamos National Laboratory, New Mexico." Los Alamos National Laboratory, Los Alamos, New Mexico. (Broxton et. al., in preparation, 1162).

LANL, November 1991. "Installation Work Plan for Environmental Restoration, Revision No. 1, Los Alamos National Laboratory Report No. LA-UR-91-3310, Los Alamos, New Mexico. (LANL, 1991).

LANL, May 1991. "TA-21 Operable Unit RFI Work Plan for Environmental Restoration", Los Alamos National Laboratory Report No. LA-UR-91-962, Los Alamos, New Mexico,. (LANL, 1991).