Ash Creek Associates, Inc.
Environmental and Geotechnical Consultants

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Portland, Oregon 97005-4814
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Portland (503) 924-4704
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Fax (503) 924-4707

TRANSMITTAL MEMORANDUM

Date: August 3, 2006	**Project Number:** 1126-00
Subject: Supplemental Reports	

To: Mr. Joseph A. Aldridge
Valero LP
One Valero Way F2A-196A
San Antonio, TX 78249

WE ARE SENDING YOU: ☒ Attached or ☐ Under Separate Cover:			
☒ Report	☐ Letter	☐ Plans	☐ Specifications
☐ Proposal	☐ Contract	☐ Samples	☐ Other

THESE ARE TRANSMITTED AS CHECKED BELOW:			
☐ As Requested	☒ For Your Use	☐ For Review and Comment	☐ For Approval

Copies	Date	Description
1	05/2002	Phase II Environmental Site Assessment
		Cenex Harvest States Cooperatives – Vancouver, Washington Terminal
1	12/2002	Subsurface Investigation and Soil Removal Report
		Cenex Harvest States Cooperatives – Vancouver, Washington Terminal
1	2001-2005	Supplemental Information
		Cenex Harvest States Cooperatives – Vancouver, Washington Terminal

Remarks:

Enclosed please find one copy each of the above-referenced reports and supplemental information. Please feel free to contact me with any questions. Thank you.

Stephen Tan (FOR)

Amanda L. Spencer, P.E., R.G.
Principal Hydrogeologist

Cc: Mr. Stephen Tan, Cascadia Law Group PLLC (w/ enclosure)

amec

PHASE II ENVIRONMENTAL SITE ASSESSMENT

CENEX HARVEST STATES COOPERATIVES
5420 N W FRUIT VALLEY ROAD
VANCOUVER, WASHINGTON

Submitted To:

Cenex Harvest States Cooperatives
803 Highway 212 South
Laurel, Montana 59044

Submitted By:

AMEC Earth & Environmental, Inc
7376 SW Durham Road
Portland, Oregon 97224

1-61M-11061-0

May 2002

amec

May 8, 2002

1-61M-11061-0

Mr. Mike Stahly
Cenex Harvest States Cooperatives
803 Highway 212 South
P.O. Box 909
Laurel, Montana 59044

Dear Mr. Stahly:

Re: Phase II Environmental Site Assessment
Cenex Harvest States Cooperatives Terminal Facility
5420 N.W. Fruit Valley Road
Vancouver, Washington

AMEC Earth & Environmental, Inc. (AMEC) is pleased to provide Cenex Harvest States Cooperatives (CENEX) with this report summarizing the results of a Phase II Environmental Site Assessment (ESA) conducted on April 10 and 11, 2002 at the above-referenced site in Vancouver, Washington.

We appreciate the opportunity to be of service to you on this project. If you have any questions or need further assistance, please do not hesitate to contact the undersigned at (503) 639-3400.

Sincerely,

AMEC Earth & Environmental, Inc.

Paul D. Stull, III
Environmental Engineer

John L. Kuiper, R.G.
Senior Associates

attachments

JK/jm

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1.0 INTRODUCTION

This report summarizes the results of a Phase II Environmental Site Assessment (ESA) conducted by AMEC Earth & Environmental, Inc (AMEC) on behalf of the Cenex Harvest States Cooperatives (Cenex) The Phase II ESA was conducted at the Cenex Fueling Terminal Facility (Site) located at 5420 NW Fruit Valley Road in Vancouver, Washington (Figure 1) Work for this project included obtaining soil and groundwater samples for chemical analysis Additionally, current and past uses of the Site were discussed with Cenex personnel during on-site activities

2.0 BACKGROUND

Based on conversations with Cenex personnel, the Site was developed in 1957 as a truck fueling terminal Historically, chemicals and other products stored at the Site have included liquid fertilizers, refined petroleum products such as gasoline, diesel and kerosene, de-natured alcohol, and petroleum product additives such as dyes

According to Cenex, petroleum-impacted subsurface soils were encountered during the recent decommissioning of an underground gasoline-vapor recovery tank associated with a large vapor recovery system on-site In an effort to delineate the extent of the subsurface impact, Cenex excavated several test pits in the vicinity of the vapor recovery tank Based upon visual and olfactory evidence, the soils excavated from these test pits appeared to have varying degrees of impact Approximately 60 to 100 cubic yards of excavated soil were placed on visqueen located approximately 50 yards north of the excavations

3.0 PROJECT SCOPE

The scope of work for this project included an evaluation of the potential subsurface impact in the vicinity of the former underground gasoline vapor recovery tank The results of this investigation were to be interpreted relative to possible remedial options

4.0 SITE DESCRIPTION

The approximate 33-acre Site is located in a mixed industrial-agricultural area and includes five 55,000-gallon and one 10,000-gallon above ground fuel storage tanks (ASTs), a covered truck refueling rack, and several buildings used for equipment storage and offices A former UST associated with a large vapor recovery system also was located on the Site and was removed approximately one year ago The vapor recovery system and an associated oil/water separator remain on-site All product was removed from the ASTs and associated piping approximately one year ago The surface of the Site is comprised of graveled areas and grass fields, with asphalt-paved roads providing access to the fueling areas, ASTs, and office buildings

5.0 SUBSURFACE EXPLORATION

On April 10 and 11, 2002, AMEC conducted soil and groundwater sampling activities at the Site Geo-Tech Explorations, Inc of Tualatin, Oregon provided drilling services Twelve borings (GP1 through GP12) were completed using either a truck-mounted direct-push drilling rig or hand-operated rotohammer equipment Boring locations are shown on Figure 3 Soil samples were collected and logged in 4-foot intervals in the borings Boring depths ranged from 20 to 32 feet below ground surface (bgs)

Borings were placed around the vapor recovery system and the former UST location The first five feet of all borings located near the vapor recovery system were augered by hand to verify that there was no shallow product or utility piping Some areas were limited in access due to the presence of above ground product piping or previous excavations left open following decommissioning of the former UST Three locations (GP-2, GP-7, and GP-8) near the former UST and piping were not accessible with the truck-mounted direct-push drill rig and required the use of a manually-operated rotohammer to advance the soil and groundwater samplers

5.1 Subsurface Soil Conditions

During the field investigation, AMEC personnel assessed and logged soil types and conducted field screening of soil samples using a photo-ionization detector (PID) to screen for evidence of volatile organic compound (VOC) vapors (measured in parts per million (ppm)) These data are reported on boring logs included in Appendix A.

Subsurface conditions varied somewhat across the site; however, in general, silty fine sand was encountered from the surface to approximately 10 feet bgs Below this depth, a well-sorted, medium-grained sand with little to no silt, was encountered to the total depths explored (up to 32 feet bgs) Visual and olfactory evidence indicating the presence of petroleum-impacted soils was observed in shallow soils in borings GP-2 and GP-5 PID measurements of soil samples collected from these borings ranged between 0 and 800 ppm

5.2 Subsurface Groundwater Conditions

During drilling operations, groundwater was encountered at various depths ranging between 18 and 28 feet bgs Generally, water production was good; however, given that groundwater recharge was slow in shallower borings GP-2 and GP-7, it is likely that the soil lithology at shallower depths consist of more fine-grained material Field screening observations revealed petroleum odors from groundwater samples collected from GP-8, GP-10, and GP-11 Groundwater samples were collected from the twelve borings and placed in appropriate containers for chemical analysis

5.3 Soil Sampling

The direct-push sampling technique involved advancing a hollow rod using a truck-mounted percussion hammer Each soil sample core recovered was up to 48 inches in length, approximately 1 5 inches in diameter, and was collected within a dedicated disposable clear polyethylene tube Following the completion of sample collection, each boring was abandoned by filling with dry bentonite chips and hydrated The surfaces of the borings were restored to original conditions at each location (soil or gravel)

Based on field screening results, seven soil samples were selected from the twelve direct-push borings and were submitted for chemical analysis In addition to the soil samples obtained from the direct-push borings, two composite soil samples also were collected from the stockpiled soils located west of the office buildings and submitted for chemical analysis Selected soil samples were placed in the appropriate sampling containers and then labeled, placed on ice, and transported under chain-of-custody procedures to North Creek Analytical (NCA) laboratory in Beaverton, Oregon

Soil samples were analyzed for petroleum hydrocarbons using method NWTPH-HCID Additionally, the two composite samples were analyzed for diesel-range hydrocarbons by Method NWTPH-Dx, PAHs by EPA Method 8270M-SIM, and VOCs by EPA Method 8260B

5.4 Groundwater sampling

Groundwater samples were obtained from each of the twelve borings using a temporary, 4-foot length stainless steel well screen set into the bottom of each boring Groundwater samples were collected using disposable tubing and either a peristaltic pump or inertial pumping techniques All groundwater samples were collected in appropriate bottles, labeled, placed on ice, and transported under chain-of-custody procedures to NCA Selected groundwater samples were analyzed for one or more of the following: petroleum hydrocarbon identification by NWTPH-HCID, diesel-range hydrocarbons by Method NWTPH-Dx, gasoline-range hydrocarbons by Method NWTPH-Gx, PAHs by EPA Method 8270M-SIM, and VOCs by EPA Method 8260B

6.0 ANALYTICAL RESULTS

AMEC evaluated the soil and groundwater analytical results by comparing them with Washington State Department of Ecology (DOE) Model Toxics Control Act (MTCA) regulatory standards MTCA regulatory standards were first published in February 1991, with amendments in January 1996 and February 2001 The MTCA standards define a two step approach for establishing cleanup requirements for individual sites including: 1) establishing of cleanup standards, which include cleanup levels for various constituents and points of regulatory compliance and, 2) selecting remedial actions By comparing the chemical analytical results obtained for this project to the MTCA regulatory standards, an evaluation can be made as to whether a particular constituent is present in a sufficient quantity as to pose a threat to human health or the environment, based on the MTCA cleanup standards

6.1 Soil

Selected soil samples (Composite #1, Composite #2, GP-2/10-12, GP-3/10-12, GP-5/17-19, GP-8/6-8, GP-7/14-16, GP-9/16-18, and GP-12/22-24) were analyzed for the presence of petroleum hydrocarbons using NWTPH-HCID Based on the chemical analytical results, petroleum hydrocarbons in the diesel- and heavy oil-ranges were detected in composite soil samples Composite #1 and Composite #2 Petroleum hydrocarbons were not detected in the remaining soil samples submitted for chemical analysis Follow-up chemical analyses performed on the two composite soil samples indicated the presence of diesel-range petroleum hydrocarbons: VOCs including 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene, and n-Butylbenzene; and PAHs including Phenanthrene and Pyrene Currently, MTCA regulatory standards do not exist for the VOC and PAH constituents detected

Soil laboratory results are summarized and compared to current MTCA cleanup standards in Table 1 It should be noted that the excavated soils were stockpiled for several months prior to sampling, and that detected concentrations may not be indicative of concentrations in remaining undisturbed soil in the vicinity of the former tank Laboratory reports and chain-of-custody documents are provided in Appendix B

6.2 Groundwater

Based on field screening results and the location of each boring on the Site, selected groundwater samples (GP-3/GW-24, GP-5/GW-22, GP-8/GW-23, GP-9/GW-24, GP-10/GW-23, GP-11/GW-32, and GP-12/GW-32) were analyzed for the presence of petroleum hydrocarbons using NWTPH-HCID and/or VOCs using EPA method 8260B

Based on the chemical analytical results, petroleum hydrocarbons were detected in the gasoline-, diesel-, and/or heavy oil-ranges in four of the groundwater samples submitted for analysis Follow-up quantification testing of these samples identified gasoline-range petroleum hydrocarbons at concentrations ranging between 536 micrograms per liter (µg/L) to 159,000 µg/L The DOE MTCA regulatory standard for gasoline-range petroleum hydrocarbons in groundwater is 800 µg/L Diesel-range petroleum hydrocarbons were detected in one groundwater sample (GP-10/GW-32) at a concentration just above the laboratory method reporting limit Diesel-range petroleum hydrocarbons were not detected in the remaining groundwater samples submitted for analysis

One or more VOCs were detected in each of the groundwater samples submitted for chemical analysis, at concentrations exceeding the MTCA regulatory standards With the exception of the groundwater sample obtained from GP-9, benzene was detected in all of the groundwater samples at significant concentrations ranging from 698 µg/L to 15,000 µg/L The MTCA regulatory standard for benzene in groundwater is 5 µg/L Benzene was not detected in the groundwater sample obtained from GP-9 Benzene concentrations were highest (3,970 to 15,000 µg/L) in groundwater samples obtained from those borings placed in an inferred downgradient location relative to the truck fueling rack Other VOC constituents also were detected in the groundwater samples at concentrations exceeding MTCA regulatory standards, including ethylbenzene, naphthalene, toluene, and total xylenes VOCs were detected in the groundwater sample submitted from GP-9, however, those constituents were detected at concentrations below the MTCA regulatory standard

Chemical analysis of three groundwater samples (GP-3/GW-24, GP-7/GW-24, and GP-10/GW-32) submitted for analysis of PAHs, identified concentrations of naphthalene at concentrations ranging between 132 µg/L to 598 µg/L The MTCA regulatory standard for naphthalene is 160 Other PAH constituents were detected at concentrations below MTCA regulatory standards

There is a likelihood that benzene and other VOC constituents may be related to the truck fueling rack or similar source However, our experience in the site vicinity indicates that there is a potential for tidal influence at the site and groundwater flow direction can only be inferred based on surface topography at this time

Groundwater laboratory results are summarized and compared to current MTCA cleanup standards in Table 2 Laboratory reports and chain-of-custody documents are provided in Appendix B

7.0 CONCLUSIONS

AMEC recently completed a Phase II ESA at the Cenex Harvest States Cooperatives fuel terminal facility located at 5420 N W Fruit Valley Road in Vancouver, Washington The purpose of our Phase II ESA investigation was to evaluate the extent of soil and groundwater impact related to the former gasoline vapor recovery tank

Based on the results of our investigation we have concluded the following:

Results of the chemical analysis indicated that in six of the seven groundwater samples submitted for analysis, the VOC benzene was detected at concentrations significantly exceeding the MTCA cleanup standard of 5 µg/L Concentrations of benzene in these groundwater samples ranged between 698 µg/L and 15,000 µg/L

Benzene concentrations were highest (3,970 to 15,000 µg/L) in groundwater samples obtained from those borings placed in an inferred upgradient location relative to the former underground gasoline vapor recovery tank

Based on the inferred upgradient location of the truck fueling rack relative to groundwater sampling locations, there is a likelihood that benzene and other VOC concentrations may be related to activities associated with the fueling rack or similar upgradient source

This investigation evaluated soil and groundwater quality in the vicinity of the former gasoline recovery tank The lateral and vertical extent of impact identified from the Phase II ESA has not been defined at this time

Based on AMEC's experience in the site vicinity, there is a potential for tidal influence at the site Therefore, no firm conclusions can be made regarding groundwater flow direction at this time

AMEC Earth & Environmental, Inc.

Paul D Stull, III
Environmental Engineer

John L Kuiper, R G
Senior Associate

JK/jm

LIMITATIONS

This report was prepared exclusively for Cenex Harvest States Cooperative by AMEC Earth & Environmental, Inc The quality of information, conclusions and estimates contained herein is consistent with the level of effort involved in AMEC services and based on: i) information available at the time of preparation, ii) data supplied by outside sources, and iii) the assumptions, conditions and qualifications set forth in this report This Phase II ESA Report is intended to be used by Cenex for the Terminal Facility in Vancouver, Washington only, subject to the terms and conditions of its contract with AMEC Any other use of, or reliance on, this report by any third party is at that party's sole risk

The findings contained herein are relevant to the dates of the AMEC Site visit and should not be relied upon to represent conditions at later dates In the event that changes in the nature, usage, or layout of the property or nearby properties are made, the conclusions and recommendations contained in this report may not be valid If additional information becomes available, it should be provided to AMEC so the original conclusions and recommendations can be modified as necessary

TABLES

Table 1
Soil Analytical Results[1]
Cenex - Fuel Terminal Facility
5420 NW Fruit Valley Road
Vancouver, Washington

Sample Name	Composite #1	Composite #2	MTCA Standards[2]
Sample Date	04/10/02	04/10/02	
NWTPH-HCID (mg/kg)			
Gasoline-range hydrocarbons	ND	ND	100
Diesel-range hydrocarbons	DET	DET	2,000
Heavy oil-range hydrocarbons	ND	DET	2,000
NW TPH-Dx (mg/kg)			
Diesel-range hydrocarbons (mg/l)	530.0	712.0	2000
Heavy oil-range hydrocarbons (mg/l)	ND	ND	2000
Detected VOCs (ug/kg) EPA Method 8260B			
n-Butylbenzene	ND	638	-
1,2,4-Trimethylbenzene	164	289	-
1,3,5-Trimethylbenzene	637	1,650	-
Detected PAHS (ug/kg) EPA Method 8270M-SIM			
Phenanthrene	ND	60.9	-
Pyrene	98.6	31.4	-

Notes:

[1]Only those analytes detected from soil chemical analysis are included in this table

[2]MTCA = Model Toxics Control Act. Standards for Remediation of Soil and Groundwater Contamination - Chapter 173-340 WAC

PAHs = polynuclear aromatic hydrocarbons

NWTPH-HCID = Northwest Total Petroleum Hydrocarbons - Hydrocarbon Identification

NW TPH-Dx = NWTPH - Diesel-range

VOCs = volatile organic compounds

ND = not detected

DET = detected

- = no established standard

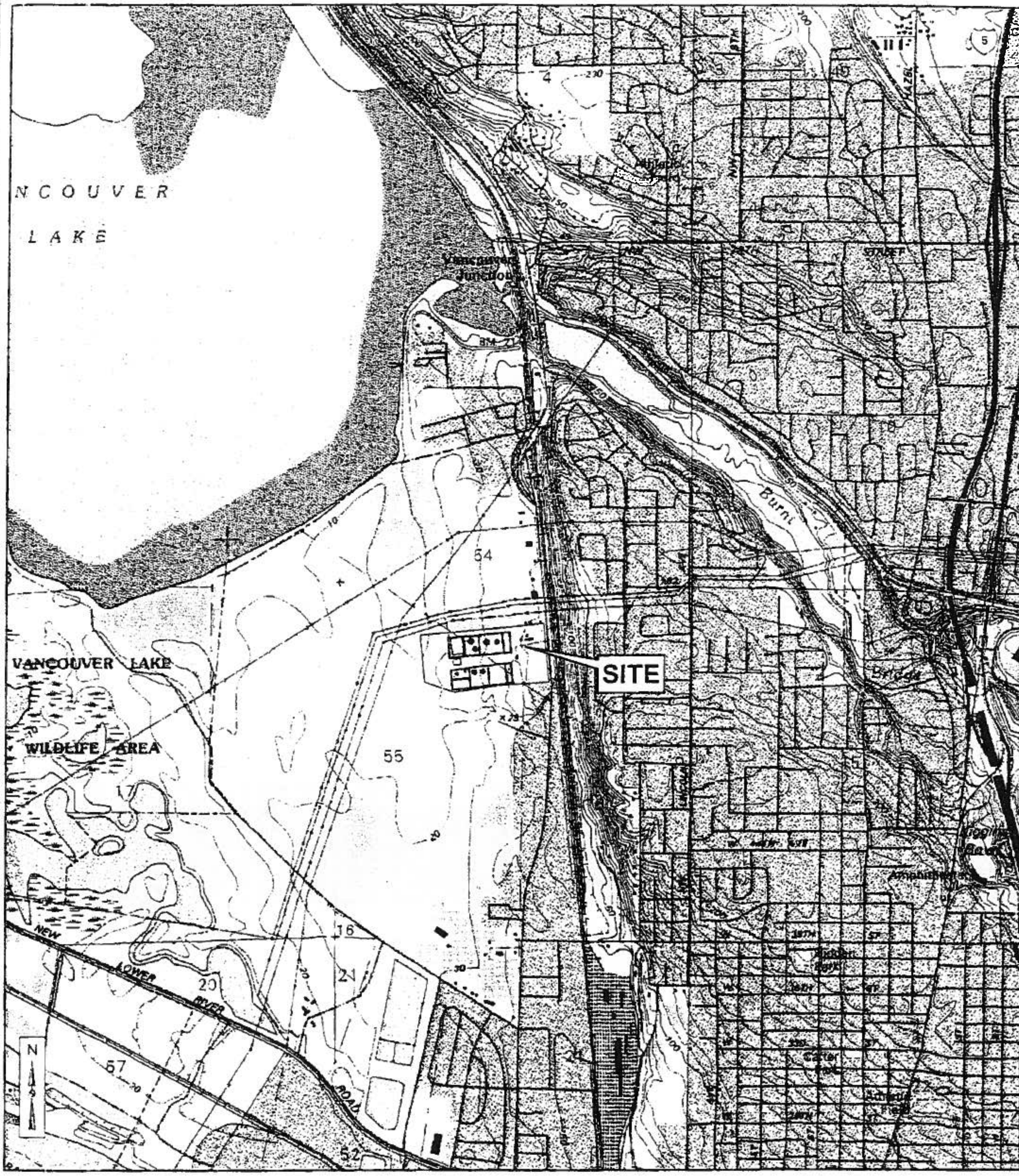
mg/kg = milligrams per kilogram

ug/kg = micrograms per kilogram

Sample Name	GP-12/GW-32	MTCA Standards (ug/L) [2]
Sample Date	04/11/02	
NWTPH-HCID (mg/L)		
Gasoline-range hydrocarbons	NA	800
Diesel-range hydrocarbons	NA	500
Heavy oil-range hydrocarbons	NA	500
NW TPH-Gx and Dx (ug/L)		
Gasoline-range hydrocarbons	NA	800
Diesel-range hydrocarbons	NA	500
Heavy oil-range hydrocarbons	NA	500
Detected PAHs (ug/l) EPA Method		
Flourene	NA	-
Napthalene	NA	160
Phenanthrene	NA	-
Detected VOCs (ug/L) EPA Metho		
Benzene	698	5
Ethylbenzene	363	700
Total Xylenes	899	
Napthalene	ND	160
n-Propylbenzene	24.4	
sec-Butylbenzene	ND	-
Toluene	1640	1,000
1,2,4-Trimethylbenzene	110	-
1,3,5-Trimethylbenzene	31.80	-

Notes:
[1] Only those analytes detected from
PAHs = polynuclear aromatic hydroc
VOCs = volatile organic compounds
[2] MTCA Standards = Model Toxics C
NWTPH - HCID = Northwest Total P
NWTPH - Gx and Dx = NWTPH Gas
mg/L = milligrams per liter
ug/L = micrograms per liter
DET = detected
NA = not analyzed
ND = not detected
* shading indicates thoses concentra

FIGURES



USGS Quad - 45122F6 - Vancouver

0 0.25 0.5 0.75 1 Miles

FIGURE 1

amec

7376 SW Durham Road
Portland OR U.S.A. 97224

W.O.	1-61M-11061-0 T2
DESIGN	JWM
DRAWN	BRJ
DATE	APRIL 2002

CENEX HARVEST STATES COOPERATIVES
5420 N.W. FRUIT VALLEY ROAD
VANCOUVER, WASHINGTON

SITE LOCATION

K:\11000\11061\dwg\Figure 1.mxd

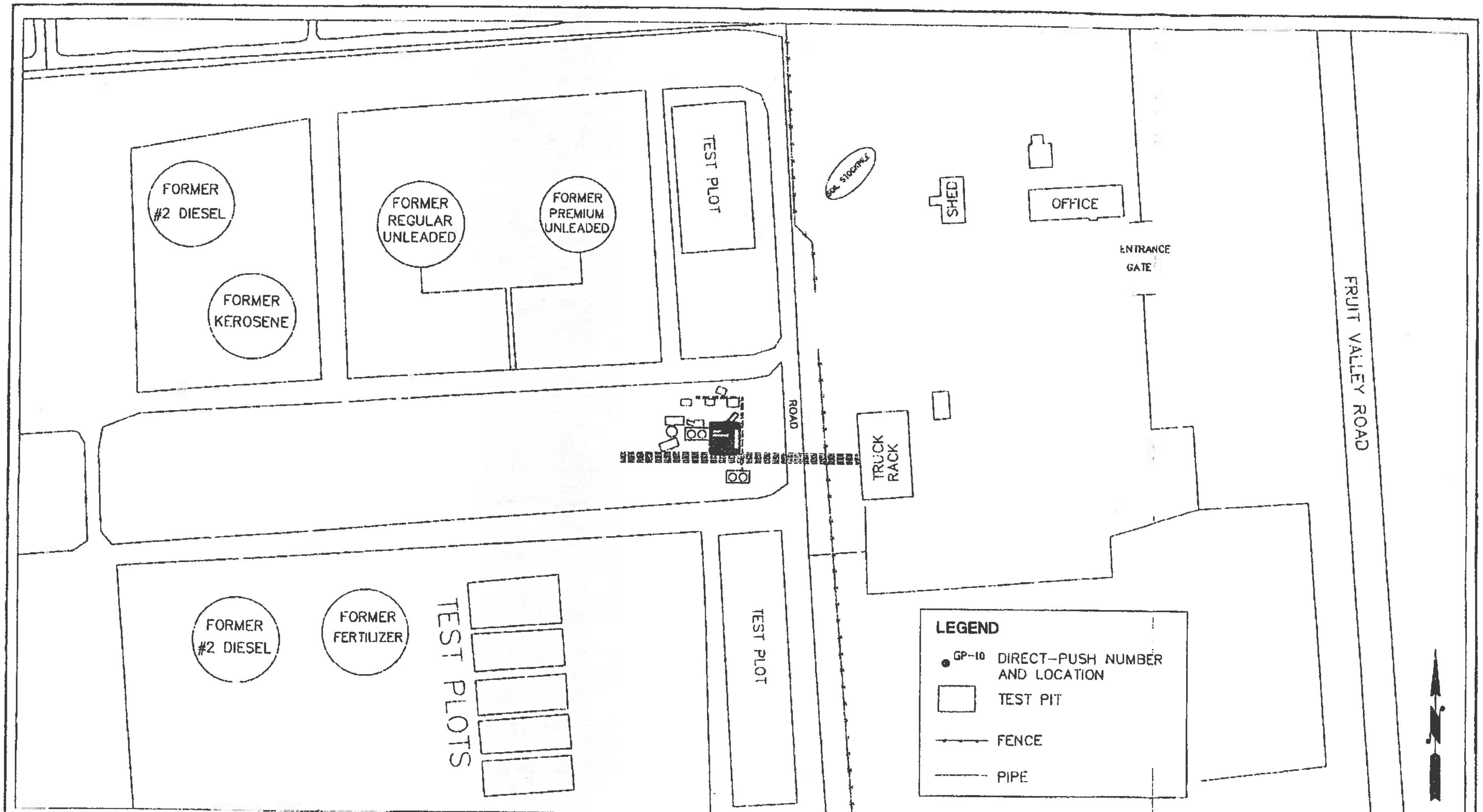


FIGURE 2

amec

W.O.	1-61M-11061-0 T2
DESIGN	JM
DRAWN	BRJ
DATE	APRIL, 2002
SCALE	1"=100'

CENEX HARVEST STATES
5420 NW FRUIT VALLEY ROAD
VANCOUVER, WA 98660

SITE PLAN

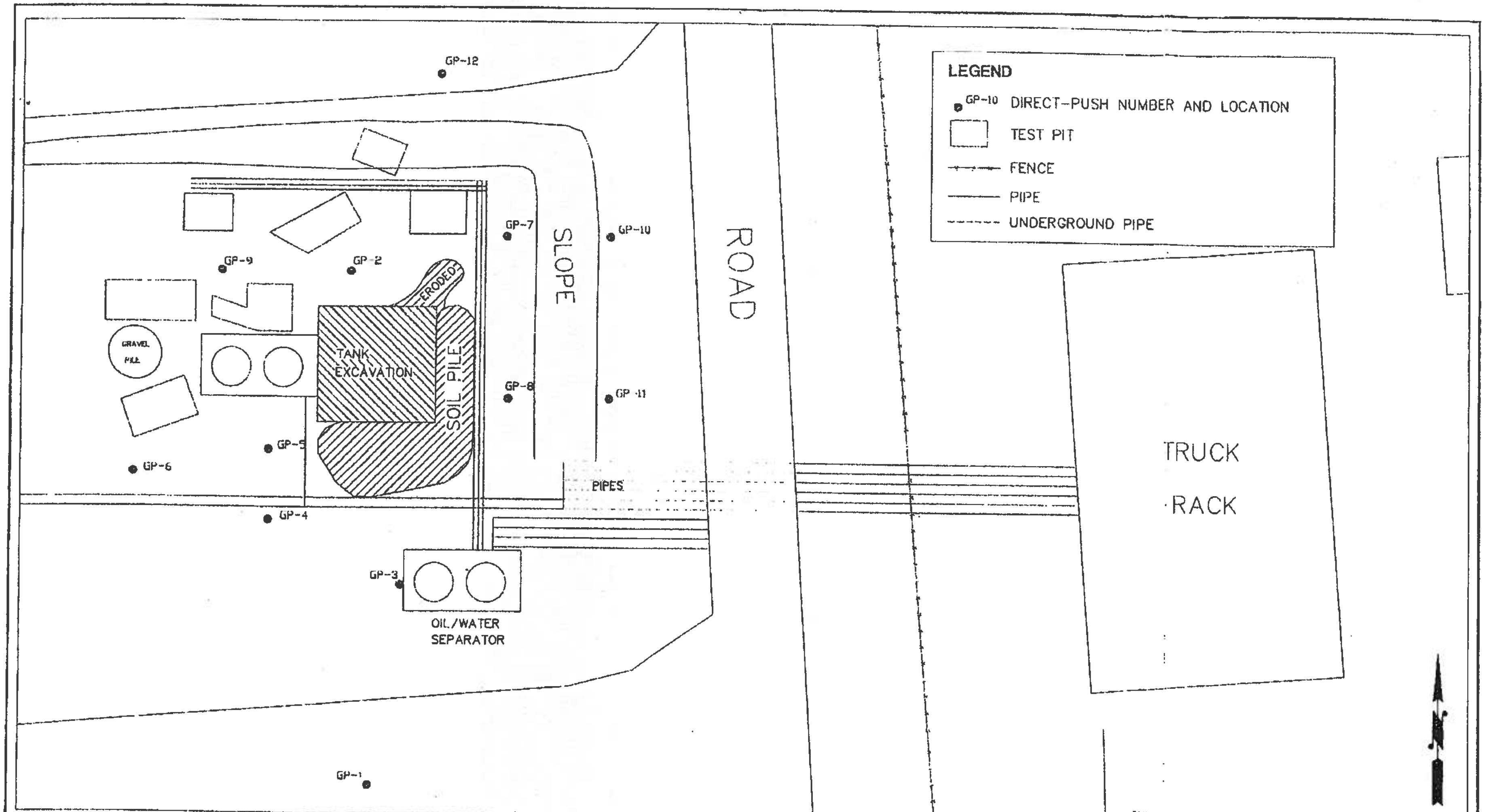


FIGURE 3

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2376 S.W. Durham Road Portland, OR, U.S.A. 97224

W.O.	i-61M-11061-0 T2
DESIGN	JM
DRAWN	BRJ
DATE	APRIL, 2002
SCALE	1"=20'

CENEX HARVEST STATES
5420 NW FRUIT VALLEY ROAD
VANCOUVER, WA 98660
DIRECT PUSH BORING LOCATIONS
APRIL 10-11, 2002

AMEC DRAWING NO. k:\11000\11061\DWG\Figures 2-3.dwg – Layout 'Figure 3'

SUBSURFACE INVESTIGATION
AND
SOIL REMOVAL REPORT

CENEX HARVEST STATES COOPERATIVES
5420 N.W. FRUIT VALLEY ROAD
VANCOUVER, WASHINGTON

Submitted to:

Cenex Harvest States Cooperatives
803 Highway 212 South
Laurel, Montana 59044

Submitted by:

AMEC Earth & Environmental, Inc.
7376 SW Durham Road
Portland, Oregon 97224

1-61M-11061-0

December 2002

amec

December 30, 2002

1-61M-11061-0

Mr. Mike Stahly
Cenex Harvest States Cooperatives
803 Highway 212 South
P.O. Box 909
Laurel, Montana 59044

Dear Mr Stahly:

Re: Subsurface Investigation and Soil Removal Report
Cenex Harvest States Cooperatives Terminal Facility
5420 N.W. Fruit Valley Road
Vancouver, Washington

AMEC Earth & Environmental, Inc. (AMEC) is pleased to provide Cenex Harvest States Cooperatives (CENEX) with this report summarizing the results of a subsurface investigation and soil removal activities conducted in May and June 2002 at the above-referenced site in Vancouver, Washington.

We appreciate the opportunity to be of service to you on this project. If you have any questions or need further assistance, please do not hesitate to contact the undersigned at (503) 639-3400.

Sincerely,

AMEC Earth & Environmental, Inc.

Paul D. Stull, III
Environmental Engineer

John L. Kuiper, R.G.
Senior Associate

Attachments

JK/lp

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1.0 INTRODUCTION

This report summarizes the results of a subsurface investigation and soil removal activities conducted by AMEC Earth & Environmental, Inc (AMEC) on behalf of the Cenex Harvest States Cooperatives (Cenex). The work was conducted at the Cenex Loading Terminal Facility (Site) located at 5420 NW Fruit Valley Road in Vancouver, Washington (Figure 1)

2.0 BACKGROUND

The Site was developed in 1957 as a truck loading terminal Historically, chemicals and other products stored at the Site included liquid fertilizers and refined petroleum products such as gasoline, diesel and kerosene, de-natured alcohol, and petroleum product additives. During the decommissioning of a large petroleum-vapor tank at the site in 2001, petroleum-impacted subsurface soils were encountered Several test pits were excavated in the vicinity of the former tank to evaluate the extent of subsurface impact. Approximately 328 tons of excavated soil was placed on visqueen located approximately 50 yards north of the former petroleum-vapor tank

AMEC conducted an initial Phase I RI in the vicinity of the former petroleum-vapor tank on April 10 and 11, 2002, the results of which are presented in our report dated June 14, 2002, titled "Phase I Remedial Investigation, Vapor Recovery Unit Knockout Tank" Selected groundwater samples were obtained from 12 Geoprobe borings (GP-1 through GP-12) and submitted to North Creek Analytical (NCA) Laboratories in Beaverton, Oregon for analytical testing

Analytical results of groundwater samples obtained from direct-push borings advanced in the vicinity of the excavation and main product lines revealed benzene at concentrations up to 15,000 micrograms per liter (µg/L) These concentrations exceeded the Washington Department of Ecology's (Ecology) Model Toxics Control Act (MTCA) cleanup standard of 5 µg/L for benzene in groundwater Benzene concentrations were greatest in groundwater samples obtained from direct-push borings advanced in an inferred upgradient location relative to the former underground petroleum-vapor tank Based on the results of the sampling, AMEC recommended that further investigation be conducted in the vicinity of the former petroleum-vapor tank as well as the existing and former truck loading racks. both located to the east of the former petroleum-vapor tank

3.0 PURPOSE AND PROJECT SCOPE

The purpose of our subsurface investigation was to evaluate the extent of petroleum hydrocarbons in soil and groundwater in the vicinity of the former petroleum-vapor tank and the existing and former truck loading racks Additionally, the work included obtaining a representative soil sample from beneath the existing vapor recovery unit on-site to characterize soil remaining in-place beneath the unit

The scope of work for this project included advancing 25 direct-push borings (GP-13 through GP-37) and installing four groundwater monitoring wells on the Site Soil and groundwater samples were obtained from the direct-push borings and groundwater monitoring wells for chemical analysis This phase of the project also included removal of gasoline-impacted soils from the former underground petroleum vapor recovery tank area, including a soil stockpile previously generated by Cenex in 2001 during test pit excavation activities Test pits had been excavated to evaluate for visible evidence of petroleum contamination associated with the former underground petroleum-vapor recovery tank Specific work scopes for this phase of the project are presented in our proposals to CENEX dated May 7, 2002 and June 18, 2002 and are based on conversations with CENEX personnel

4.0 SITE DESCRIPTION

The approximately 33-acre Site is located in a mixed industrial-agricultural area and includes five 55,000-gallon and two 10,000-gallon above ground fuel storage tanks (ASTs), a covered truck loading rack and former truck loading rack, and several buildings used for equipment storage and offices. The former underground petroleum-vapor recovery tank associated with the large vapor recovery system also was located at the Site and was removed in 2001 All product was removed from the ASTs and associated piping at that time. The vapor recovery system and an associated oil/water separator remain on-site The surface of the Site is comprised of graveled areas and grass fields, with asphalt-paved roads providing access to the loading areas, ASTs, and office buildings

5.0 SUBSURFACE SOIL AND GROUNDWATER CONDITIONS

During the field investigations, AMEC personnel assessed and logged soil types and conducted field screening of soil samples using a photo-ionization detector (PID) to screen for evidence of volatile organic compound (VOC) vapors as measured in parts per million (ppm). These data are reported on boring logs included in Appendix A.

Subsurface conditions varied somewhat across the Site; however, in general, fine sandy silt was encountered from the surface to approximately 10 feet below ground surface (bgs) Below this depth, a poorly graded, fine to medium-grained sand with little to no silt, was encountered to the total depths explored (up to 50 feet bgs). Boring depths ranged from 24 to 50 feet bgs. Visual and olfactory evidence indicating the possible presence of petroleum was observed in soil samples obtained from borings

GP-14, GP-26, GP-31 through GP-34, and MW-2. PID measurements of soil samples collected from these borings ranged between 0 and 1,600 ppm

During drilling operations, groundwater was encountered at various depths ranging between 18 and 32 feet bgs. Groundwater samples were obtained from the thirteen direct-push borings and four groundwater monitoring wells, and placed in appropriate containers for chemical analysis

6.0 DIRECT-PUSH BORING EXPLORATIONS

On May 9 and 10, 2002, thirteen borings (GP-13 through GP-25) were completed using a truck-mounted direct-push drilling rig operated by Geo-Tech Explorations, Inc. (GeoTech) of Tualatin, Oregon. A follow-up subsurface investigation was conducted on June 26, 2002 and included advancing twelve additional direct-push borings GP-26 through GP-37. Boring locations are shown on Figure 2. Boring logs are presented in Appendix A

6.1 Soil Sampling

Based on field screening results, soil samples were selected from the direct-push borings and submitted for chemical analysis. Soil samples were selected from several borings advanced within the former truck loading rack (GP-14, GP-31 through GP35) and from beneath the existing vapor recovery unit (GP-26). Direct-push boring GP-26 was advanced at 30 degree angle from vertical, under the existing vapor recovery unit. Additionally, one soil sample was obtained from the south end of the former underground petroleum-vapor recovery tank excavation to confirm that contaminated soil removal had been completed. Selected soil samples were placed in appropriate sampling containers, labeled, placed on ice, and transported under chain-of-custody procedures to North Creek Analytical (NCA) laboratory in Beaverton, Oregon. Soil sampling methodology using the direct-push unit is presented in Appendix A. Soil samples were analyzed for one or more of the following:

- Petroleum hydrocarbons using method NWTPH-HCID;
- Gasoline-, diesel- and heavy oil-range petroleum hydrocarbons using Oregon and Washington Method NWTPH-Gx and NWTPH-Dx;
- Benzene, ethylbenzene, toluene, and total xylenes (BETX) using EPA Method 8021B;
- Polynuclear aromatic hydrocarbons (PAHs) using EPA Method 8270M-SIM; and/or
- Volatile organic compounds (VOCs) using EPA Method 8260B

6.2 Groundwater Sampling

Groundwater samples were obtained from selected direct-push borings using a temporary, 4-foot length stainless steel well screen set into the bottom of each boring Groundwater samples were collected using disposable tubing and a peristaltic pump With the exception of boring GP-29, all groundwater samples were obtained from depths ranging between 24 and 34 feet bgs Boring GP-29 was advanced adjacent to the boring location of GP-11, with a deeper target depth Previously, groundwater sampled at a depth of 32 feet from GP-11 was determined to contain benzene at a concentration of 14,200 µg/L. As part of the current investigation, groundwater from boring GP-29 was sampled at a depth of 50 feet bgs to evaluate vertical concentrations of BETX near the central area of benzene impact. All groundwater samples were collected in appropriate bottles, labeled, placed on ice, and transported under chain-of-custody procedures to NCA laboratory Groundwater samples were analyzed for one or more of the following:

- VOCs using EPA Method 8260B; and/or
- BETX using EPA Method 8021B or EPA Method 8260B

7.0 MONITORING WELL INSTALLATION

On May 9, 2002 four groundwater monitoring wells (MW-1 through MW-4) were installed using a hollow-stem auger drilling rig operated by GeoTech Locations of the groundwater monitoring wells are shown on Figure 2. Monitoring well MW-1 was completed at a depth of 25 feet bgs Monitoring wells MW-2, MW-3 and MW-4 each were completed to a depth of 35 feet bgs Monitoring well construction methodology is presented in Appendix A. Details for each monitoring well construction are included with the boring logs in Appendix A.

On May 17, 2002, AMEC personnel surveyed each monitoring well relative to one another. The elevation of the top of casing for MW-1 was arbitrarily set at 100 feet above mean sea level, with the remaining three monitoring wells measured and casing elevations calculated relative to monitoring well MW-1. On May 14, 2002, depth to water measurements were recorded at the four monitoring wells. Depth to groundwater measurements were subtracted from relative casing elevations in each well to determine the relative elevation of groundwater Groundwater elevation data from the May 14, 2002 site visit were used in preparing a groundwater elevation contour map, presented as Figure 3 Groundwater elevations obtained during the May 14, 2002 site visit are shown in Table 1

7.1 Soil Sampling

One soil sample was obtained from monitoring well boring MW-2 at a depth of 25-26.5 feet bgs (MW2@25-26.5), in the vicinity of the existing truck loading rack. The soil sample was placed in the appropriate sampling containers, labeled, placed on ice, and transported under chain-of-custody procedures to NCA laboratory and submitted for analysis of: petroleum hydrocarbons using method NWTPH-HCID and gasoline-, diesel- and heavy oil-range petroleum hydrocarbons using Method NWTPH-Gx and NWTPH-Dx.

7.2 Groundwater Sampling

Groundwater samples were obtained from the monitoring wells on May 14, 2002, using a dual valve pump, placed at a depth corresponding to the middle of the screen. Groundwater sampling methodology for the monitoring wells is presented in Appendix A. Analytical reports and chain of custody documentation are included in Appendix B. All groundwater samples were collected in appropriate bottles, labeled, placed on ice, and transported under chain-of-custody procedures to NCA. Groundwater samples obtained from the monitoring wells were analyzed for one or more of the following:

- Gasoline-, diesel- and heavy oil-range petroleum hydrocarbons using Oregon and Washington Method NWTPH-Gx and NWTPH-Dx;
- Selected VOCs (1,2-dibromoethane; 1,2-dibromoethene; benzene; toluene; ethylbenzene; total xylenes; MTBE; Naphthalene; 1,2,4-trimethylbenzene; 1,3,5-trimethylbenzene; isopropylbenzene; and n-propylbenzene) using EPA Method 8260B; and/or
- Total and dissolved lead using EPA 200 Series Methods.

8.0 ANALYTICAL RESULTS

AMEC evaluated the soil and groundwater analytical results by comparing them with Ecology MTCA regulatory standards. The MTCA regulatory standards were amended in February 2001, and define a two-step approach for establishing cleanup requirements for individual sites. This includes: 1) establishing cleanup standards, which include cleanup levels for various constituents and points of regulatory compliance and, 2) selecting remedial actions. By comparing the chemical analytical results obtained for this project to the MTCA regulatory standards, an evaluation can be made as to whether Ecology may require any cleanup.

8.1 Soil Analytical Results

Soil laboratory results are summarized and compared to current MTCA cleanup standards in Table 2 Laboratory reports and chain-of-custody documents are provided in Appendix B Soil analytical results are shown on Figure 4 A discussion of the soil analytical results is presented in the following sections

8.1.1 Truck Loading Rack

Chemical analytical results revealed no detectable concentrations of petroleum hydrocarbons in the diesel- or heavy oil-range from the soil sample obtained at a depth of 25 to 26 5 feet bgs from boring MW-2 located near the southwest corner of the existing truck loading rack (MW2@25-26 5) Gasoline-range petroleum hydrocarbons were detected in this sample at a concentration of 314 milligrams per kilogram (mg/Kg), exceeding the MTCA cleanup standard of 100 mg/Kg

8.1.2 Former Truck Loading Rack

Chemical analytical results revealed an area of petroleum-containing soil within the footprint of the former truck loading rack (see Figure 4) Selected soil samples obtained from four of the eight direct-push borings advanced in this area (GP-14 and GP-32 through GP-34) revealed the presence of gasoline-range petroleum hydrocarbons at concentrations ranging between 363 mg/Kg and 3,230 mg/Kg, exceeding the MTCA cleanup standard of 100 mg/Kg Additionally, diesel-range petroleum hydrocarbons were detected in the soil samples at concentrations ranging between 2,530 mg/Kg and 31,500 mg/kg. These concentrations exceed the MTCA cleanup standard of 2,000 mg/Kg for diesel-range petroleum hydrocarbons. Concentrations of petroleum hydrocarbons were greatest at depths of 8 to 12 feet bgs in the borings Soil samples obtained from borings on the east side of the former truck loading rack generally contained lower to non-detectable concentrations of petroleum hydrocarbons

Concentrations of PAHs, particularly naphthalene, were detected in soil samples obtained from borings GP-32, GP-33, and GP-34, within the footprint of the former truck loading rack. Naphthalene was detected at concentrations ranging from 11,900 at 8 to 10 feet in GP-33, to 19,800 at 6 5 to 8 feet in GP-32 For those PAHs where MTCA standards exist, concentrations were exceeded in three of the four soil samples submitted for analysis The soil sample obtained from a depth of 22 feet in boring GP-31 revealed no detectable concentrations of PAHs

Concentrations of BETX either were below or slightly greater than MTCA cleanup standards in the soil samples obtained from depths to 10 feet BETX concentrations were not detected in the soil sample obtained from a depth of 22 feet in GP-31

8.1.3 Vapor Recovery Unit and Former Underground Petroleum-Vapor Recovery Tank Excavation

Chemical analytical results for the soil sample obtained at a depth of approximately 7 feet, from beneath the existing vapor recovery unit (GP26/6-8), revealed gasoline-range petroleum hydrocarbons at a concentration of 5,580 mg/kg, exceeding the MTCA cleanup standard Diesel- and heavy oil-range petroleum hydrocarbons were not detected in this sample The VOCs ethylbenzene, total xylenes, naphthalene, and toluene were detected at concentrations of 91.3 mg/Kg, 825 mg/Kg, 124 mg/Kg, and 9 74 mg/Kg, respectively The MTCA standards for ethylbenzene, total xylenes, naphthalene, and toluene are 6 mg/Kg, 9 mg/Kg, 5 mg/Kg, and 7 mg/Kg, respectively

The soil sample obtained from the south end of the former petroleum vapor recovery tank (GP-27/10-12) revealed no detectable concentrations of VOCs Gasoline-range petroleum hydrocarbons were detected at a concentration of 4.96, less than the MTCA cleanup standard Diesel- and heavy oil-range petroleum hydrocarbons were not analyzed in this sample

8.2 Groundwater Analytical Results

Groundwater samples were obtained from direct-push borings in the vicinity of the former underground petroleum-vapor recovery tank and existing vapor recovery unit, in the former truck loading rack area, and in inferred upgradient and downgradient locations relative to the former petroleum-vapor tank Additionally, groundwater samples were obtained from the monitoring wells installed at pre-selected locations, based on the results of earlier work Groundwater laboratory results are summarized and compared to current MTCA cleanup standards in Table 2 Laboratory reports and chain-of-custody documents are provided in Appendix B Groundwater analytical results are shown on Figures 5 and 6 A discussion of the groundwater analytical results is provided in the following sections

8.2.1 Direct-Push Groundwater Results

Chemical analytical results revealed that BETX was detected at concentrations exceeding MTCA cleanup standards in groundwater samples obtained from direct-push borings GP-17, GP-22, GP-23, and GP-29 BETX concentrations were greatest in direct push borings GP-22 and GP-29, located approximately 150 feet and 100 feet east (respectively) of the former vapor tank excavation and existing vapor recovery unit As discussed in Section 6 2, boring GP-29 was advanced in close proximity to the location of boring GP-11, to obtain a groundwater sample at a greater depth This was done to evaluate whether benzene concentrations decreased significantly with depth in the area of greatest Benzene impact Benzene had been identified in the groundwater sample from GP-11 at a concentration of 14,200 µg/L Benzene was detected at a concentration of 5,810 µg/L in the groundwater sample obtained from a depth of 34 feet in direct-push boring GP-22 Benzene was detected at a concentration of 538 µg/L in the groundwater sample obtained from a depth of 50 feet in direct-push boring GP-29 Concentrations of benzene in groundwater samples from borings GP-17 and GP-23 were 24 3 and 5 44, respectively The MTCA cleanup standard for benzene is 5 µg/L

Ethylbenzene, total xylenes, and toluene were detected in the groundwater sample obtained from GP-22 at concentrations of 6,310 µg/L; 28,600 µg/L; and 29,200 µg/L, respectively Ethylbenzene, total xylenes, and toluene were detected in the groundwater sample obtained from GP-29 at concentrations of 1,550 µg/L; 6,140 µg/L; and 7,140 µg/L, respectively The MTCA cleanup standard for ethylbenzene is 800 µg/L The MTCA cleanup standard for both total xylenes and toluene is 1,000 µg/L

8.2.2 Groundwater Monitoring Well Results

Chemical analytical results for groundwater samples obtained from monitoring wells MW-1 and MW-4 revealed diesel-range petroleum hydrocarbons at concentrations just above method reporting limits, well below MTCA cleanup standards Gasoline- and heavy oil-range petroleum hydrocarbons were not detected in groundwater samples from these monitoring wells. Additionally, VOCs were not detected in the groundwater samples from these wells

Gasoline-range petroleum hydrocarbons were detected at concentrations of 41,400 µg/L and 4,500 µg/L in groundwater samples obtained from monitoring wells MW-2 and MW-3, respectively Diesel- and heavy oil-range petroleum hydrocarbons were not detected in the groundwater samples from these wells. With the exception of benzene, VOCs were detected at concentrations below MTCA cleanup standards in the groundwater sample from MW-3 Benzene was detected at a concentration of 41.9 µg/L in the groundwater sample from MW-3 Several VOCs were detected at concentrations exceeding MTCA cleanup standards in the groundwater sample obtained from MW-2. These included benzene, ethylbenzene, total xylenes, methyl tert-butyl ether (MTBE), and toluene which were detected at concentrations of 4,350 µg/L; 1,840 µg/L; 8,720 µg/L; 700 µg/L; and 2,680 µg/L, respectively

9.0 SOIL STOCKPILE REMOVAL AND CONFIRMATION SOIL SAMPLING

On May 20 and 21, 2002, AMEC personnel observed and documented the removal of approximately 328 tons of stockpiled soil from the Site The stockpiled soil was removed by Anderson Environmental of Kelso, Washington and transported by Taylor Trucking (Vancouver, Washington) to the Hillsboro Landfill for disposal The stockpiled soil had been generated during previous test pit explorations conducted by CENEX in the vicinity of the vapor recovery unit to evaluate for visual evidence of impact from petroleum hydrocarbons identified during the removal of the former underground petroleum-vapor recovery tank Stockpiled soils included a stockpile of soil located at the north entrance of the site as well as stockpiled soils in the vicinity of the former petroleum vapor recovery tank

Upon completion of the removal and transport of the stockpiled material, clean fill material consisting of crushed rock was imported to the Site and used to fill nine open test pits as well as the former petroleum vapor tank excavation. The test pits were filled first for easier access to the former petroleum vapor tank excavation. Prior to filling the tank excavation, four confirmation soil samples were obtained from the north (N. Wall-3 ft, N. Wall 10-ft) and east (E. Wall 3-ft, E. Wall 10-ft) walls of the excavation. Confirmation soil samples could not be obtained on the west and south walls of the excavation due to the presence of the existing vapor recovery system (on the west) and product piping and fiber optic lines (on the south). The four confirmation soil samples were submitted to NCA for chemical analysis of VOCs. No detectable concentrations of VOCs were identified in the soil samples Chemical analytical reports for the soil samples are included in Appendix B. Soil stockpile disposal waste manifests are included in Appendix C

10.0 PRELIMINARY SCREENING OF REMEDIAL OPTIONS

Information from the Phase II Remedial Investigation indicates the presence of a region of predominantly diesel impacted soils under the former truck loading rack and a separate region of predominantly gasoline impacted soil and groundwater centered near the former UST cavity Investigative data indicates that the diesel-impacted soils extend to a depth between 12 feet bgs and 22 feet bgs in the region around the former truck loading rack, and groundwater in the same region is not significantly impacted In the region around the former UST cavity, little impacted soils were detected, but the gasoline impacted groundwater extends up to approximately 300 feet away from the suspected source area. Due to differences in the nature of the contaminants and the extent of contamination, separate remedial options must be considered for each of the two regions of concern Support documentation for the excavation costs is included in Appendix D

10.1 Remedial Options for the Diesel-Impacted Soils

The preliminary remedial options for diesel impacted soils are soil excavation/disposal, bioventing, and natural attenuation. Each option is described below along with approximate costs. The cost estimates include all anticipated costs (including quarterly sampling and system decommissioning) required to bring the site to regulatory closure.

The excavation option involves excavation of the diesel-impacted soils, transportation of the soils, and disposal of the soils at an approved landfill or incinerator. Confirmation soil sampling would be performed during excavation to delineate the extent of contamination. Clean fill will be placed in the excavation void. Assuming diesel-impacted soils account for an area of approximately 40 feet by 50 feet and an average depth of 15 feet bgs, approximately 1,100 cubic yards (CY) of soils would be removed. Using 1.3 tons per CY of soils, 1,430 tons would be removed from the site. At an anticipated cost of approximately $44/ton for excavate/haul/dispose/backfill, the total cost remediation of the diesel-impacted soils by excavation would be approximately **$63,000**. Project management, excavation oversight, sampling, analytical costs, and reporting would bring the total cost to around **$85,000**. It should be noted that this option may not result in complete cleanup due to the challenge of working in and around existing site structures.

The bioventing option involves introduction of air (oxygen) and nutrients for enhancement of possible in-situ bio-degradation of contaminants. A bioventing system would consist of bioventing wells, connection piping, a remediation compound for bioventing blowers and equipment, and nutrient injection piping. The total cost for a bioventing system that operates for three years would be approximately **$235,000**.

The natural attenuation option is essentially a "do-nothing" approach that allows for natural degradation processes to reduce contaminant levels over time. Natural attenuation processes would likely require decades to degrade soil contaminant levels down to clean-up levels.

10.2 Remedial Options for the Gasoline-impacted Groundwater and Soil

The preliminary remedial options for the gasoline impacted groundwater plume include air sparging with soil vapor extraction (AS/SVE), air sparging (AS) only, and groundwater pump and treat. Each option is described below along with approximate costs. The cost estimates include all anticipated costs (including quarterly sampling and system decommissioning) required to bring the site to regulatory closure. It is assumed that the relatively small volume of gasoline impacted soil remaining in this area would be treated by the remediation system or left in place.

The AS/SVE remedial option involves injection of air into the aquifer to volatilize and remove contaminants upward to the unsaturated zone The oxygen injected into the aquifer also serves to enhance aerobic biodegradation of contaminants The SVE portion of the AS/SVE system serves to capture AS vapors and remove contaminants from the unsaturated zone A conceptual AS/SVE system design would include 16 AS wells installed to depths close to 15 feet below the average water table elevation and 16 SVE wells installed to depths near the top of the water table Blowers would be used to inject/extract the air, and granular activated carbon (GAC) treatment units would be used to treat the recovered air before discharge to the atmosphere. The concentrations of VOCs in the recovered air stream is not expected to be very high, because much of the source area impacted soils have been removed and volatilization from the impacted groundwater should produce a minor amount of contaminant mass An air discharge permit from Southwest Clean Air Agency would be required for operation of the system. The conceptual AS/SVE system would require approximately three years of continuous operation to reduce contaminant concentrations to regulatory clean-up levels An additional year of groundwater monitoring would be required for regulatory closure The estimated cost for remediating and closing the site using the AS/SVE strategy is approximately **$392,000**

An air sparging remediation system would be implemented as described above in the AS/SVE system, except the SVE portion of the system would be eliminated It should be noted that operation of an air sparging system without an SVE system is not recommended as untreated volatilized contaminants may escape to the atmosphere through the ground surface Biosparging, a method of oxygen delivery to the saturated zone using flow rates lower than those used for air sparging, may be allowed by regulators without operation of an SVE system, because volatilization and mobilization of contaminants is minimized while contaminants are degraded *in-situ*. Due to the relatively volatile nature of benzene, biosparging is not expected to be as effective as air sparging for remediating the gasoline-impacted groundwater plume and the project duration is expected to take six years of active remediation with a follow-up year of closure monitoring The estimated cost for remediating and closing the site using air sparging only is approximately **$434,000**

A groundwater pump and treat remedial option would involve containing and extracting impacted groundwater Groundwater would be extracted from one or more groundwater pumping wells and directed through a treatment system before discharge to the sanitary sewer, storm system, or subsurface under proper permit(s) The pump and treat system may need to operate for approximately eight years before contaminant levels are reduced to regulatory standards The estimated cost for remediating and closing the site using the pump and treat option is approximately **$975,000**

10.3 Recommended Remedial Options

Excavation is the recommended remedial option for the diesel impacted soils, and AS/SVE is the recommended remedial option for the gasoline-impacted groundwater plume Excavation and disposal of the diesel impacted soils is a low risk clean-up alternative for a comparably low cost Installation of an AS/SVE system over the gasoline-impacted groundwater plume is expected to produce relatively quick reduction of the volatile contaminant of concern, benzene AS/SVE also offers the shortest remedial schedule, which is important due to the proposed installation of the new Clark County Utilities (CCU) water well field This proposed well field is expected to be installed within one mile of the Site during the next 12 to 18 months and will produce over 30 million gallons per day (MGD) Recent aquifer tests conducted by CCU indicate that sites located within one mile will be hydraulically influenced by the well field The apparent confined nature of the plume suggests that pumping will not be needed to contain the plume during treatment

11.0 CONCLUSIONS AND RECOMMENDATIONS

AMEC has completed a subsurface investigation at the Cenex Harvest States Cooperatives fuel terminal facility located at 5420 N.W Fruit Valley Road in Vancouver, Washington The purpose of our subsurface investigation was to evaluate the extent of petroleum hydrocarbons in soil and groundwater identified during the earlier work. Based on the results of the subsurface investigation, we conclude the following:

11.1 Soil

- Gasoline- and diesel-range petroleum hydrocarbons as well as some PAHs, were detected at concentrations exceeding the MTCA cleanup standards in subsurface soils within the footprint of the former truck loading rack Analytical results showed that petroleum hydrocarbons appear to be vertically confined to depths shallower than 22 feet bgs. According to MTCA cleanup standard WAC 173-340-740 (6) (d) 2001), a 15 foot depth cut off for contaminated soil removal is allowed if it can be demonstrated that groundwater is not contaminated Based on the analytical results for groundwater samples from this area, it appears that this route can be pursued. Therefore, for estimating purposes, AMEC has assumed that approximately 1,430 tons of diesel impacted soils remains in the vicinity of the former truck loading dock
- Gasoline-range petroleum hydrocarbons and selected VOCs were detected at concentrations exceeding the MTCA cleanup standards in a soil sample obtained from a depth of approximately 7 feet beneath the existing vapor recovery unit,

adjacent to the west wall of the former petroleum-vapor recovery tank excavation Due to structural limitations associated with the existing vapor recovery system, it would not be feasible to remove petroleum-impacted soil in this area However, because a representative soil sample from beneath the unit has been analyzed to characterize remaining petroleum impact, we recommend that the affected soil remain in-situ Using the footprint dimensions of the vapor recovery unit (10 feet by 20 feet) and an estimated depth of 12 feet, the volume of petroleum contaminated soil with concentrations exceeding MTCA cleanup standards is estimated to be approximately 115 tons

- Gasoline-range petroleum hydrocarbons were detected at concentrations less than the MTCA cleanup standards in the soil sample obtained from a direct-push boring (GP-27) at the south end of the former petroleum-vapor recovery tank Additionally, no detectable concentrations of VOCs were identified. Therefore, with the exception of the west wall of the former tank excavation, it appears that soil sampling and analysis has confirmed that petroleum hydrocarbon-impacted soil associated with the former petroleum vapor recovery tank has been removed

11.2 Groundwater

- Benzene, ethylbenzene, toluene and total xylenes were detected at concentrations exceeding MTCA cleanup standards in groundwater samples obtained from direct-push borings located east and southeast of the existing vapor recovery system and former petroleum vapor tank Concentrations of BETX were greatest in direct-push borings nearest the former tank excavation, with lower concentrations further southeast This suggests a possible southeast migration trend of petroleum hydrocarbons in the shallow groundwater Although the groundwater gradient, as measured on May 14, 2002, showed a slight southwest trend, the generally level topography coupled with a possible tidal influence at the Site may account for the contaminant trend to the southeast
- Based on a comparison of groundwater analytical results for VOCs in boring GP-29 and previously completed boring GP-11, benzene was shown to decrease in concentration with an increase in depth Benzene was detected at a concentration of 538 µg/L in a groundwater sample obtained from a depth of 50 feet bgs in GP-29 Benzene was detected at a concentration of 14,200 µg/L at a depth of 34 feet in GP-11
- Gasoline-range petroleum hydrocarbons were detected at concentrations exceeding MTCA cleanup standards in groundwater samples obtained from monitoring wells located northeast (MW-3) and southeast (MW-2) of the former petroleum vapor tank.

- MTCA cleanup standards for VOCs, including Benzene and/or MTBE, were exceeded in groundwater samples obtained from MW-2, GP-3, GP-7, GP-8, GP-10, GP-11, GP-12, GP-17, GP-22, GP-23, and GP-29

11.3 Remedial Options

Remediation of the diesel-impacted soils could be addressed by the following options:

1. **Excavation** - AMEC estimates that approximately 1,430 tons of diesel impacted soils will be removed by excavation to a depth of approximately 15 feet bgs This option will require approximately five weeks to complete (field time, analytical testing, final reporting, etc)

2. **Bioventing** - This option consists of in-situ air injection to enhance natural degradation of the contamination. AMEC estimates that approximately three years of active bioventing would be required to address this area

3. **Natural Attenuation** - This option basically assumes that natural degradation processes would reduce the contamination to acceptable levels This option is expected to take several decades.

AMEC recommends excavation due to the cost and short schedule Active remediation of the gasoline groundwater plume and impacted soils could be addressed by the following options:

1. **SVE/AS** - AMEC estimates that this option would require approximately three years of active remediation with a follow-up year of closure sampling

2. **Biosparging** - AMEC estimates that low volume, in-situ, air sparging (biosparging), will require approximately six years of active remediation

3. **Pump and Treat** - The recovery and ex-situ treatment of gasoline impacted groundwater is expected to require at least eight years to complete at an estimated cost of $975,000

Based on our preliminary review of remedial options, in situ sparging with soil vapor extraction may be an appropriate method of remediating the gasoline-impacted groundwater and soil for this Site.

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LIMITATIONS

This report was prepared exclusively for Cenex Harvest States Cooperative by AMEC Earth & Environmental, Inc. The quality of information, conclusions and estimates contained herein is consistent with the level of effort involved in AMEC services and based on: i) information available at the time of preparation, ii) data supplied by outside sources, and iii) the assumptions, conditions and qualifications set forth in this report This Phase II ESA Report is intended to be used by Cenex for the Terminal Facility in Vancouver, Washington only, subject to the terms and conditions of its contract with AMEC Any other use of, or reliance on, this report by any third party is at that party's sole risk.

The findings contained herein are relevant to the dates of the AMEC Site visit and should not be relied upon to represent conditions at later dates In the event that changes in the nature, usage, or layout of the property or nearby properties are made, the conclusions and recommendations contained in this report may not be valid If additional information becomes available, it should be provided to AMEC so the original conclusions and recommendations can be modified as necessary

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TABLES

Table 1
Groundwater Elevations

Monitoring Well ID	Date	Relative Top of Casing Elevation (feet)	Depth to Water (feet)	Relative Groundwater Elevation (feet)
MW-1	05/14/2002	100 00	16.00	84.00
MW-2	05/14/2002	111 56	27.46	84.10
MW-3	05/14/2002	112 46	28.15	84.31
MW-4	05/14/2002	113.51	29.40	84.11

Table 2
Soil Analytical Results
Cenex Fuel Terminal Facility
5420 NW Fruit Valley Road
Vancouver, Washington

Sample Name	Composite #1	Composite #2	GP14/10-12	GP16/10-12	MW2 @ 25-26.5	GP26/6-8	GP27/10-12	GP31/22-24	GP32/6.5-8	GP33/8-10	GP34/6-8	GP35/8-10	MTCA Standards (mg/Kg)[2]
Sample Date	04/10/02	04/10/02	05/09/02	05/09/02	05/09/02	06/26/02	06/26/02	06/26/02	06/26/02	06/26/02	06/26/02	06/26/02	
NWTPH-HCID (mg/Kg)													
Gasoline-range hydrocarbons	ND	ND	DET	ND	ND	NA	NA	NA	NA	NA	NA	NA	100
Diesel-range hydrocarbons	DET	DET	DET	ND	ND	NA	NA	NA	NA	NA	NA	NA	2,000
Heavy oil-range hydrocarbons	ND	DET	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	2,000
NW TPH-Gx and Dx (mg/Kg)													
Gasoline-range hydrocarbons	NA	NA	[illegible]	NA	[illegible]	[illegible]	4.96	ND	[illegible]	[illegible]	[illegible]	10.3	100
Diesel-range hydrocarbons	530	712	[illegible]	NA	ND	NA	NA	ND	[illegible]	[illegible]	[illegible]	ND	2,000
Heavy oil-range hydrocarbons	ND	ND	ND	NA	ND	NA	NA	ND	ND	ND	ND	ND	2,000
BETX (mg/kg) EPA Method 8021B													
Benzene	ND	ND	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	0.03
Toluene	ND	ND	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	7
Ethylbenzene	ND	ND	NA	NA	NA	NA	NA	ND	ND	[illegible]	[illegible]	ND	6
Xylenes	ND	ND	NA	NA	NA	NA	NA	ND	[illegible]	[illegible]	[illegible]	ND	9
Detected PAHs (mg/Kg) EPA Method 8270M-SIM													
Acenaphthene	ND	ND	NA	NA	NA	NA	NA	ND	1.73	6.27	4.34	ND	NS
Anthracene	ND	ND	NA	NA	NA	NA	NA	ND	0.968	8.35	ND	ND	NS
Benzo(a)anthracene	ND	ND	NA	NA	NA	NA	NA	ND	0.828	0.0458	0.485	ND	NS
Benzo(a)pyrene	ND	ND	NA	NA	NA	NA	NA	ND	0.343	0.0146	0.198	ND	2
Benzo (b) fluoranthene	ND	ND	NA	NA	NA	NA	NA	ND	0.283	0.0144	0.182	ND	NS
Benzo (ghi) perylene	ND	ND	NA	NA	NA	NA	NA	ND	0.142	ND	0.0903	ND	NS
Benzo (k) fluoranthene	ND	ND	NA	NA	NA	NA	NA	ND	0.316	ND	0.170	ND	NS
Chrysene	ND	ND	NA	NA	NA	NA	NA	ND	0.648	0.0863	0.388	ND	NS
Dibenzo (a,h) anthracone	ND	ND	NA	NA	NA	NA	NA	ND	0.0648	ND	0.037	ND	NS
Fluoranthene	ND	ND	NA	NA	NA	NA	NA	ND	1.74	ND	1.380	ND	NS
Flourene	ND	ND	NA	NA	NA	NA	NA	ND	2.870	8.950	5.910	ND	NS
Indeno (1,2,3-cd) pyrene	ND	ND	NA	NA	NA	NA	NA	ND	0.151	ND	0.0941	ND	NS
Naphthalene	ND	ND	NA	NA	NA	NA	NA	ND	[illegible]	[illegible]	[illegible]	ND	5
Phenanthrene	ND	0.0609	NA	NA	NA	NA	NA	ND	6.75	33.40	19.10	ND	NS
Pyrene	0.986	0.0314	NA	NA	NA	NA	NA	ND	2.05	0.989	3.33	ND	NS
Detected VOCs (m+A13g/kg) EPA Method 8260B													
Ethylbenzene	ND	ND	NA	NA	NA	[illegible]	ND	NA	NA	NA	NA	NA	6
Total Xylenes	ND	ND	NA	NA	NA	[illegible]	ND	NA	NA	NA	NA	NA	9
Napthalene	ND	ND	NA	NA	NA	[illegible]	ND	NA	NA	NA	NA	NA	5
n-Butylbenzene	ND	0.638	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NS
n-Propylbenzene	ND	ND	NA	NA	NA	125	ND	NA	NA	NA	NA	NA	NS
Isopropylbenzene	ND	ND	NA	NA	NA	29.7	ND	NA	NA	NA	NA	NA	NS
Toluene	ND	ND	NA	NA	NA	[illegible]	ND	NA	NA	NA	NA	NA	7
1,2,4-Trimethylbenzene	0.164	0.289	NA	NA	NA	891	ND	NA	NA	NA	NA	NA	NS
1,3,5-Trimethylbenzene	0.637	1.65	NA	NA	NA	293	ND	NA	NA	NA	NA	NA	NS

Notes:
[1] Only those analytes detected from chemical analysis are included in this table
PAHs = polynuclear aromatic hydrocarbons
VOCs = volatile organic compounds
[2] MTCA Standards = Model Toxics Control Act Standards for remediation of soil and groundwater. Chapter 173-340 WAC
NS = No Standards exist under MTCA
NWTPH - HCID = Northwest Total Petroleum Hydrocarbons - Hydrocarbon Identification
NWTPH - Gx and Dx = NWTPH Gasoline-range and diesel-range

mg/Kg = milligrams per kilogram
µg/Kg = micrograms per kilogram
DET = detected
NA = not analyzed
ND = not detected
[a] shading indicates those concentrations that exceed MTCA cleanup standards

Table 3
Direct-Push Groundwater Analytical Results '
Cenex - Fuel Terminal Facility
5420 NW Fruit Valley Road
Vancouver, Washington

Sample Name	GP-3/GW-24	GP-7/GW-24	GP-8/GW-23	GP-9/GW-24	GP-10/GW-32	GP-11/GW-32	GP-12/GW-32	GP13/GW32	GP14/GW34	GP15/GW34	GP16/GW34	GP17/GW34	GP18/GW34
Sample Date	04/11/02	04/11/02	04/11/02	04/11/02	04/11/02	04/11/02	04/11/02	05/09/02	05/09/02	05/09/02	05/09/02	05/09/02	05/09/02
NWTPH-HCID (mg/L)													
Gasoline-range hydrocarbons	DET	DET	NA	DET	DET	NA	NA	NA	NA	NA	NA	NA	NA
Diesel-range hydrocarbons	DET	DET	NA	ND	DET	NA	NA	NA	NA	NA	NA	NA	NA
Heavy oil-range hydrocarbons	ND	ND	NA	ND	DET	NA	NA	NA	NA	NA	NA	NA	NA
NW TPH-Gx and Dx (ug/L)													
Gasoline-range hydrocarbons	[redacted]	[redacted]	NA	536	[redacted]	NA	NA	NA	NA	NA	NA	NA	NA
Diesel-range hydrocarbons	ND	ND	NA	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA
Heavy oil-range hydrocarbons	ND	ND	NA	NA	2.1	NA	NA	NA	NA	NA	NA	NA	NA
Detected PAHs (ug/l) EPA Method 8270M-SIM													
Fluorene	ND	0.105	NA	NA	1.68	NA	NA	NA	NA	NA	NA	NA	NA
Napthalene	132	[redacted]	NA	NA	[redacted]	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	ND	ND	NA	NA	1.84	NA	NA	NA	NA	NA	NA	NA	NA
Detected VOCs (ug/L) EPA Method 8260B or BETX (ug/L) EPA Method 8021													
Benzene	[redacted]	[redacted]	[redacted]	ND	[redacted]	[redacted]	[redacted]	ND	ND	ND	ND	[redacted]	0.640
Ethylbenzene	[redacted]	[redacted]	[redacted]	i	[redacted]	[redacted]	363	ND	ND	1.9	5.15	1.86	0.510
Total Xylenes	[redacted]	[redacted]	[redacted]	12	[redacted]	[redacted]	899	ND	5.18	18.6	52.2	14.6	4.11
Napthalene	140	[redacted]	[redacted]	78	[redacted]	[redacted]	ND	NA	ND	NA	NA	NA	NA
n-Propylbenzene	113	113	268	3	358	835	24.4	NA	ND	NA	NA	NA	NA
sec-Butylbenzene	ND	ND	ND	2	ND	ND	ND	NA	ND	NA	NA	NA	NA
Toluene	ND	[redacted]	[redacted]	ND	[redacted]	[redacted]	[redacted]	ND	ND	ND	ND	0.560	0.530
1,2,4-Trimethylbenzene	338	914	2,110	10	2,790	6,400	110	NA	2.19	NA	NA	NA	NA
1,3,5-Trimethylbenzene	128	228	550	11	728	1,760	31.8	NA	ND	NA	NA	NA	NA

Table 3
Direct-Push Groundwater Analytical Results [1]
Cenex - Fuel Terminal Facility
5420 NW Fruit Valley Road
Vancouver, Washington

Sample Name	GP19/GW34	GP20/GW34	GP21/GW34	GP22/GW34	GP23/GW34	GP24/GW24	GP25/GW24	GP28/GW26	GP29/GW50	GP30/GW26	MTCA Standards
Sample Date	05/09/02	05/09/02	05/10/02	05/10/02	05/10/02	05/10/02	05/10/02	06/26/02	06/26/02	06/26/02	(ug/L) [2]
NWTPH-HCID (mg/L)											
Gasoline-range hydrocarbons	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	800
Diesel-range hydrocarbons	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	500
Heavy oil-range hydrocarbons	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	500
NW TPH-Gx and Dx (ug/L)											
Gasoline-range hydrocarbons	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	800
Diesel-range hydrocarbons	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	500
Heavy oil-range hydrocarbons	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	500
Detected PAHs (ug/l) EPA Method 8270M-SIM											
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Napthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	160
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Detected VOCs (ug/L) EPA Method 8260B or BETX (ug/L) EPA Method 8021											
Benzene	ND	ND	ND	[illegible]	[illegible]	0.940	0.62	ND	[illegible]	ND	5
Ethylbenzene	ND	ND	ND	[illegible]	66.7	8.46	3.98	ND	[illegible]	0.507	700
Total Xylenes	ND	ND	ND	[illegible]	302	42.2	19.3	ND	[illegible]	0.626	1,000
Napthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	160
n-Propylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NS
sec-Butylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NS
Toluene	ND	ND	ND	[illegible]	101	14.4	8.82	ND	[illegible]	ND	1,000
1,2,4-Trimethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NS
1,3,5-Trimethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NS

Notes:

[1] Only those analytes detected from chemical analysis are included in this table.

PAHs = polynuclear aromatic hydrocarbons

VOCs = volatile organic compounds

[2] MTCA Standards = Model Toxics Control Act Standards for remediation of soil and groundwater, Chapter 173-340 WAC

NS = No Standards exist under MTCA

NWTPH - HCID = Northwest Total Petroleum Hydrocarbons - Hydrocarbon Identification

NWTPH - Gx and Dx = NWTPH Gasoline - range and direct range

mg/L = milligrams per liter

ug/L = micrograms per liter

DET = detected

NA = not analyzed

ND = not detected

[3] shading indicates those concentrations that exceed MTCA cleanup standards

Table 4
Monitoring Well Groundwater Analytical Results
Cenex-Fuel Terminal Facility
5420 Fruit Valley Road
Vancouver, Washington

Sample Name	MW1-051402	MW2-051402	MW3-051402	MW4-051402	MTCA Standards
Sample Date	05/14/02	05/14/02	05/14/02	05/14/02	(ug/L)[2]
NW TPH-Gx and Dx (ug/L)					
Gasoline-range hydrocarbons	ND	41,400	4,600	ND	800
Diesel-range hydrocarbons	0.455	ND	ND	0.358	500
Heavy oil-range hydrocarbons	ND	ND	ND	ND	500
Total Lead (mg/L) EPA 200 Series Methods					
	0.00238	ND	ND	0.00156	15
Dissolved Lead (mg/L) EPA 200 Series Methods					
	ND	ND	ND	ND	0
Detected VOCs (ug/L) EPA Method 8260B					
Benzene	ND	4,350	41.9	ND	5
Ethylbenzene	ND	1,840	293	ND	700
Total Xylenes	ND	8,720	521	ND	1,000
Methyl tert-butyl ether (MTBE)	ND	700	ND	ND	20
Isopropylbenzene	ND	ND	21.3	ND	NS
Napthalene	ND	106	48.9	ND	160
n-Propylbenzene	ND	71	59.1	ND	NS
Toluene	ND	2,680	9.62	ND	1,000
1,2,4-Trimethylbenzene	ND	665	296	ND	NS
1,3,5-Trimethylbenzene	ND	194	106	ND	NS

Notes:

[1] Only those analytes detected from chemical analysis are included in this table.

PAHs = polynuclear aromatic hydrocarbons

VOCs = volatile organic compounds

[2] MTCA Standards = Model Toxics Control Act Standards for remediation of soil and groundwater. Chapter 173-340 WAC

NS = No Standards exist under MTCA

NWTPH - HCID = Northwest Total Petroleum Hydrocarbons - Hydrocarbon Identification

NWTPH - Gx and Dx = NWTPH Gasoline - range and direct range

mg/L = milligrams per liter

ug/L = micrograms per liter

DET = detected

NA = not analyzed

ND = not detected

* shading indicates those concentrations that exceed MTCA cleanup standards

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FIGURES

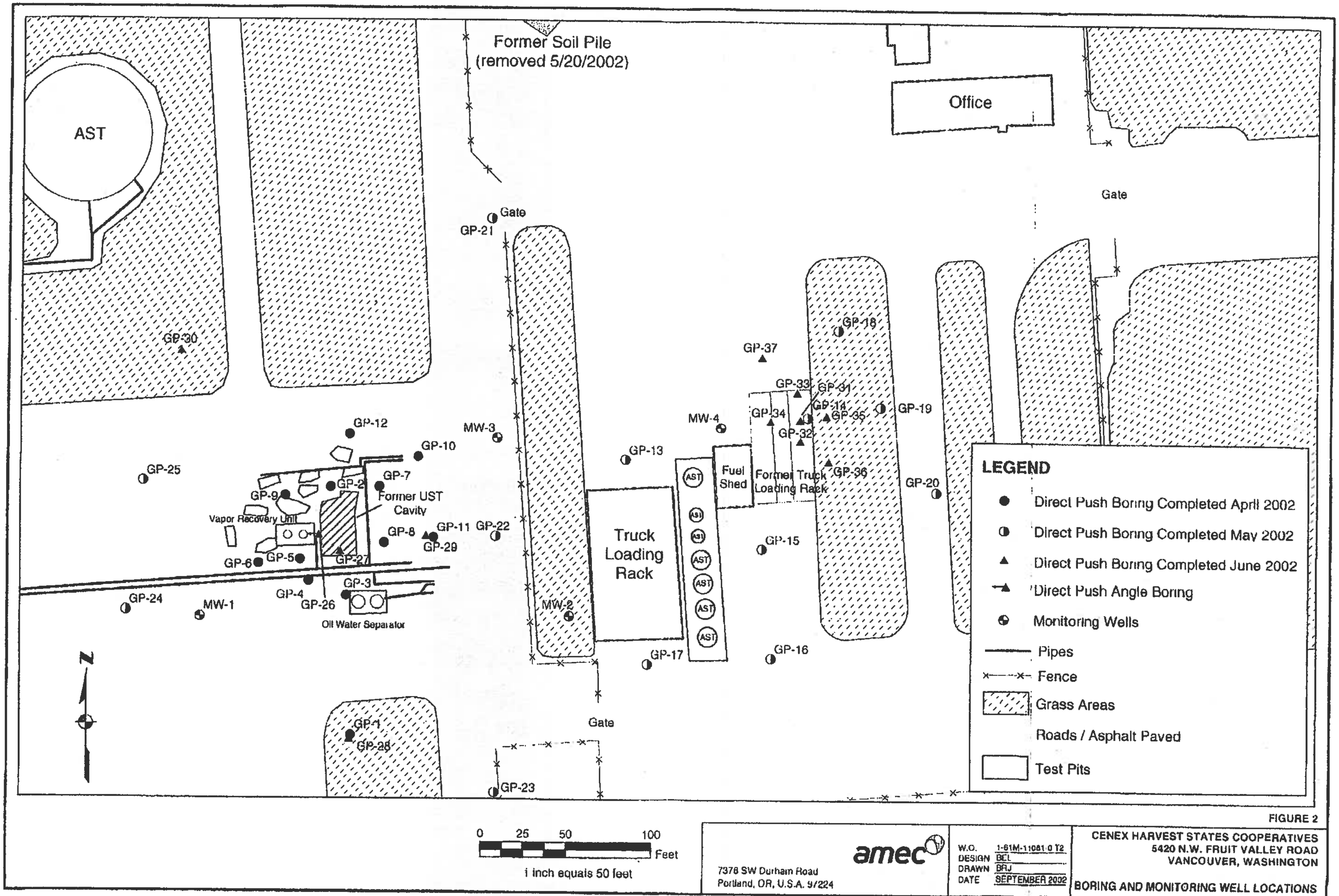
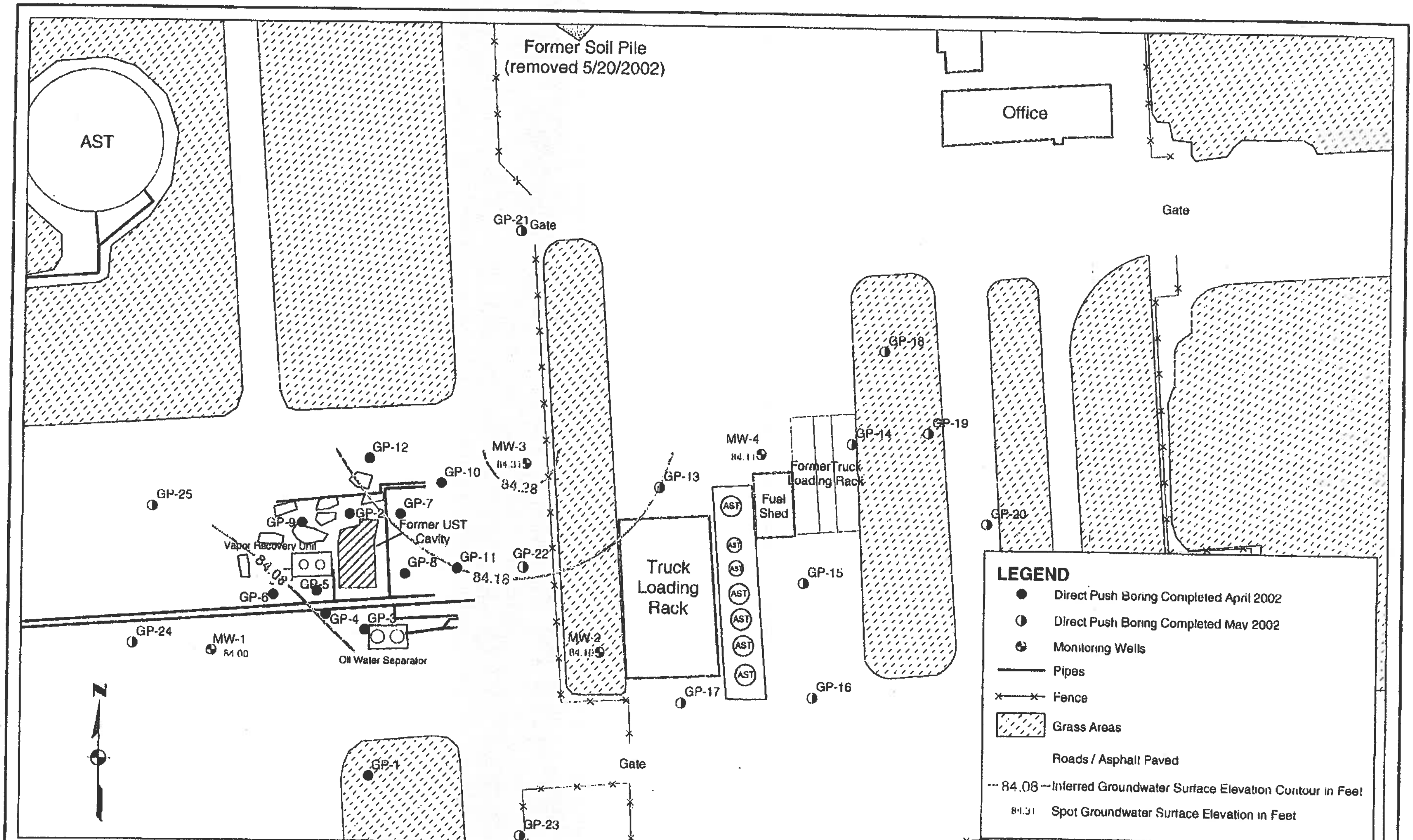


FIGURE 2

CENEX HARVEST STATES COOPERATIVES
5420 N.W. FRUIT VALLEY ROAD
VANCOUVER, WASHINGTON

BORING AND MONITORING WELL LOCATIONS



7376 SW Durham Road
Portland, OR, U.S.A. 97224

amec

W.O. 1-61M-11061-0 T2
DESIGN BEL
DRAWN BRJ
DATE SEPTEMBER 2002

FIGURE 3

CENEX HARVEST STATES COOPERATIVES
5420 N.W. FRUIT VALLEY ROAD
VANCOUVER, WASHINGTON

GROUNDWATER ELEVATION CONTOUR MAP FOR MAY 14, 2002

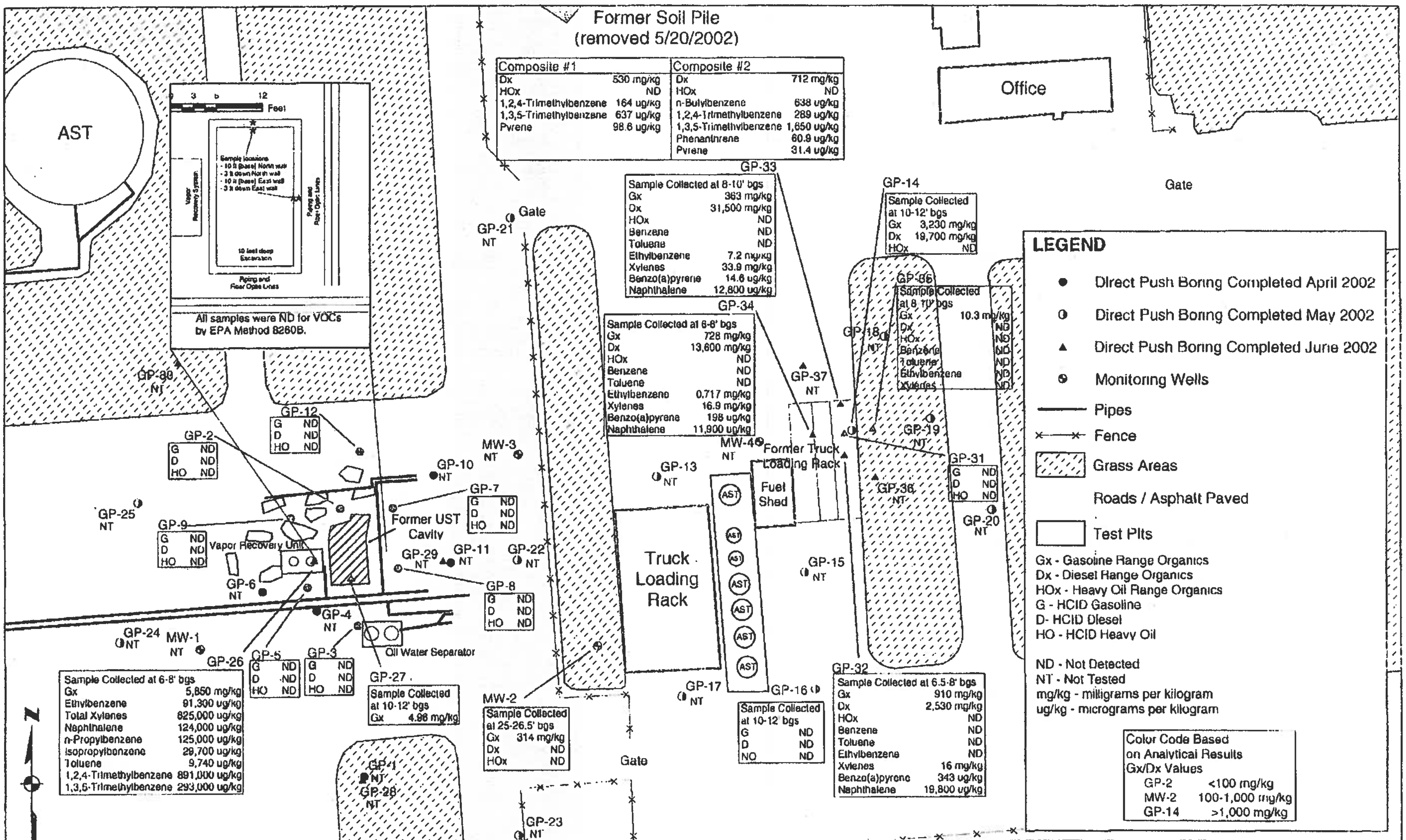


FIGURE 4

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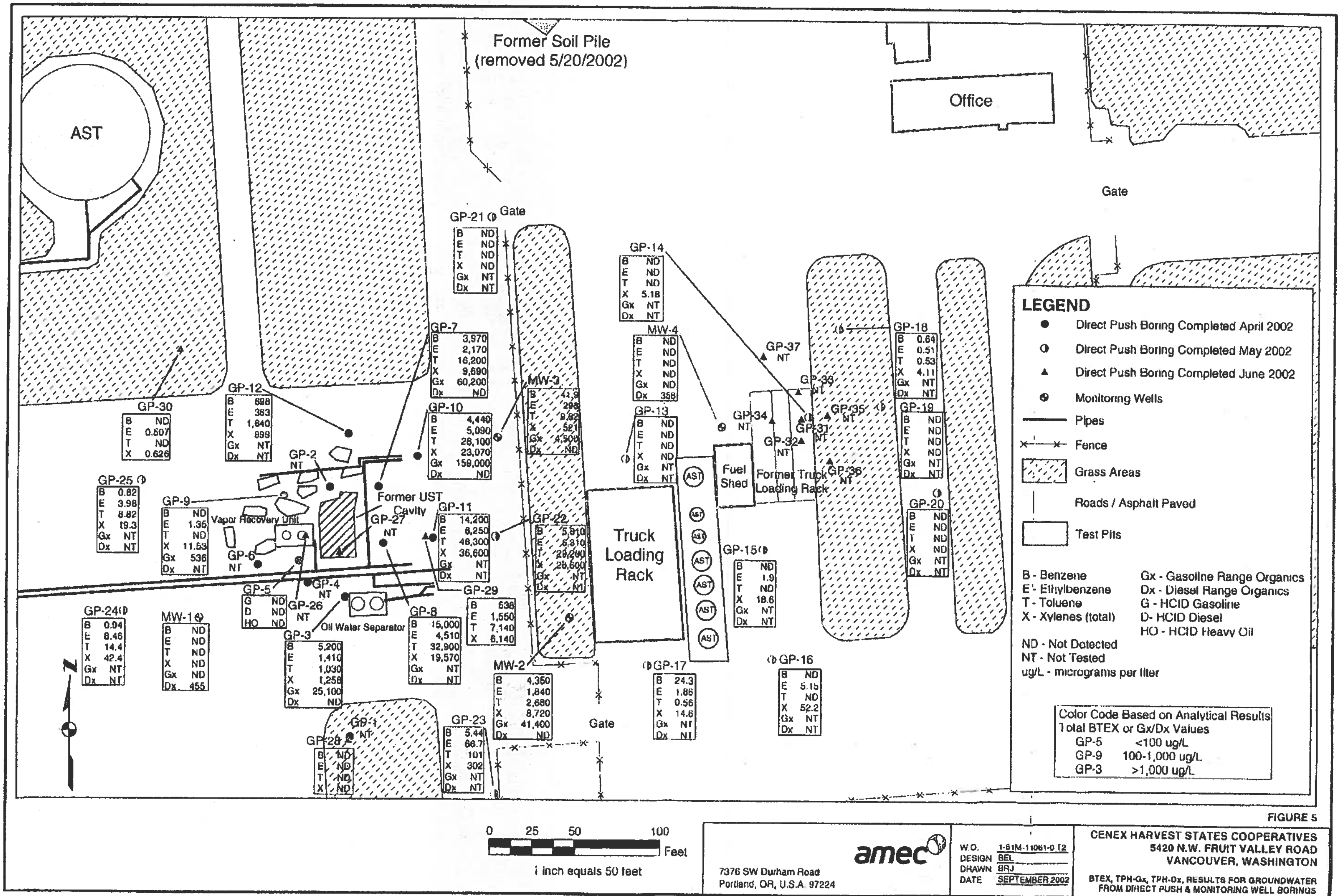
7376 SW Durham Road
Portland, OR U.S.A. 97224

W.O. 1-61M-11061 0 T2
DESIGN BEL
DRAWN BRJ
DATE SEPTEMBER 2002

CENEX HARVEST STATES COOPERATIVES
5420 N.W. FRUIT VALLEY ROAD
VANCOUVER, WASHINGTON

SOIL ANALYTICAL RESULTS

K:\11000\11000\11061\dwg\arcview\Phase II RI\Figure 4 - Soil Analytical Results.mxd



Former Soil Pile
(removed 5/20/2002)
Office
AST
Gate
Truck Loading Rack
Fuel Shed
Former Truck Loading Rack
Former UST Cavity
Vapor Recovery Unit
Oil Water Separator
LEGEND
Direct Push Boring Completed April 2002
Direct Push Boring Completed May 2002
Direct Push Boring Completed June 2002
Monitoring Wells
Pipes
Fence
Grass Areas
Roads / Asphalt Paved
Test Pits
B - Benzene
E - Ethylbenzene
T - Toluene
X - Xylenes (total)
Gx - Gasoline Range Organics
Dx - Diesel Range Organics
G - HCID Gasoline
D - HCID Diesel
HO - HCID Heavy Oil
ND - Not Detected
NT - Not Tested
ug/L - micrograms per liter
Color Code Based on Analytical Results
Total BTEX or Gx/Dx Values
GP-5 <100 ug/L
GP-9 100-1,000 ug/L
GP-3 >1,000 ug/L
0 25 50 100 Feet
1 inch equals 50 feet
amec
7376 SW Durham Road
Portland, OR, U.S.A. 97224
W.O. 1-61M-11061-0 T2
DESIGN BEL
DRAWN BRJ
DATE SEPTEMBER 2002
FIGURE 5
CENEX HARVEST STATES COOPERATIVES
5420 N.W. FRUIT VALLEY ROAD
VANCOUVER, WASHINGTON
BTEX, TPH-Gx, TPH-Dx, RESULTS FOR GROUNDWATER FROM DIRECT PUSH & MONITORING WELL BORINGS

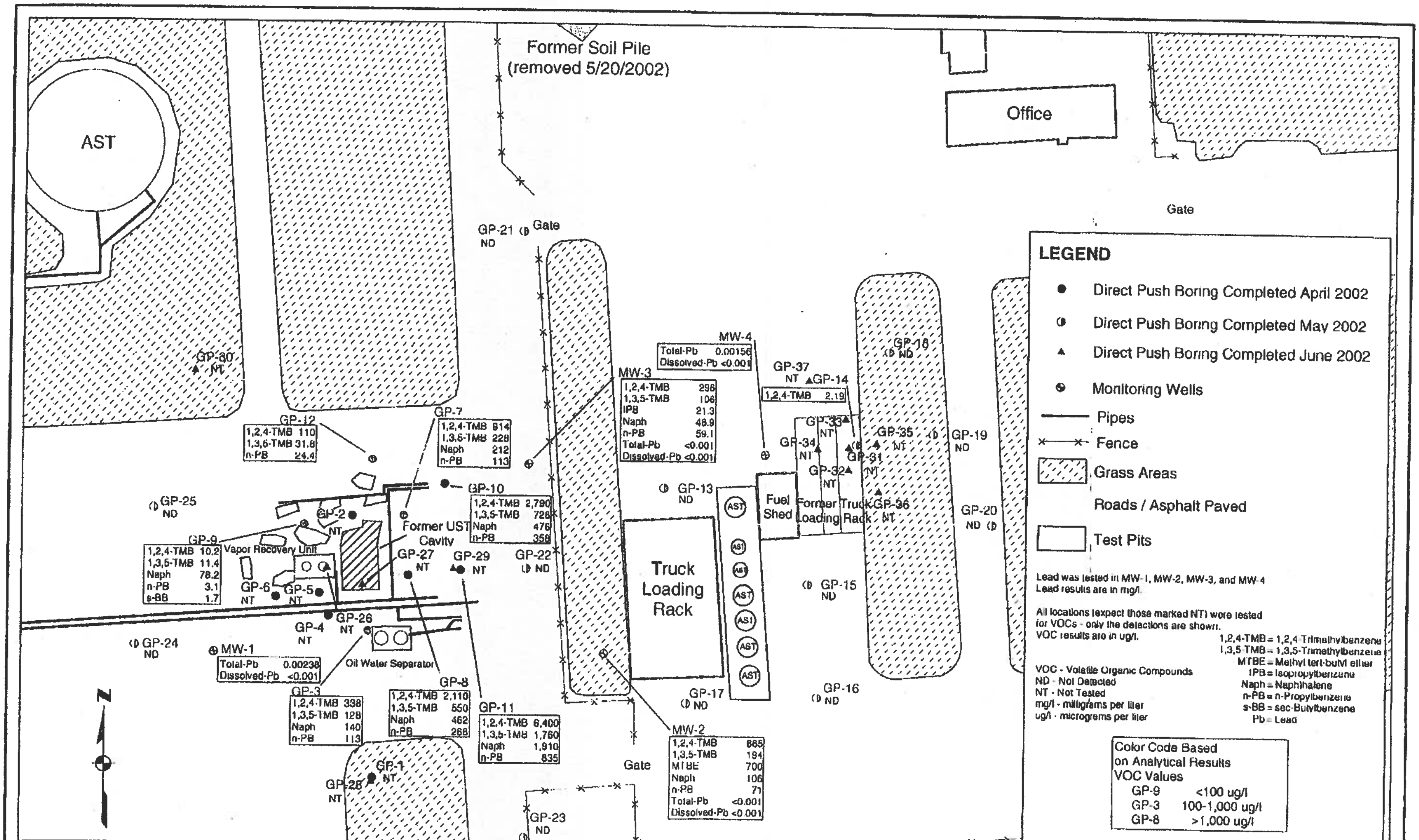


FIGURE 6

amec

7376 SW Durham Road
Portland, OR, U.S.A. 97224

W.O.	1-61M-11061-0 T2
DESIGN	BEL
DRAWN	BRJ
DATE	SEPTEMBER 2002

CENEX HARVEST STATES COOPERATIVES
5420 N.W. FRUIT VALLEY ROAD
VANCOUVER, WASHINGTON

VOC and Pb RESULTS FOR GROUNDWATER FROM DIRECT PUSH & MONITORING WELL BORINGS

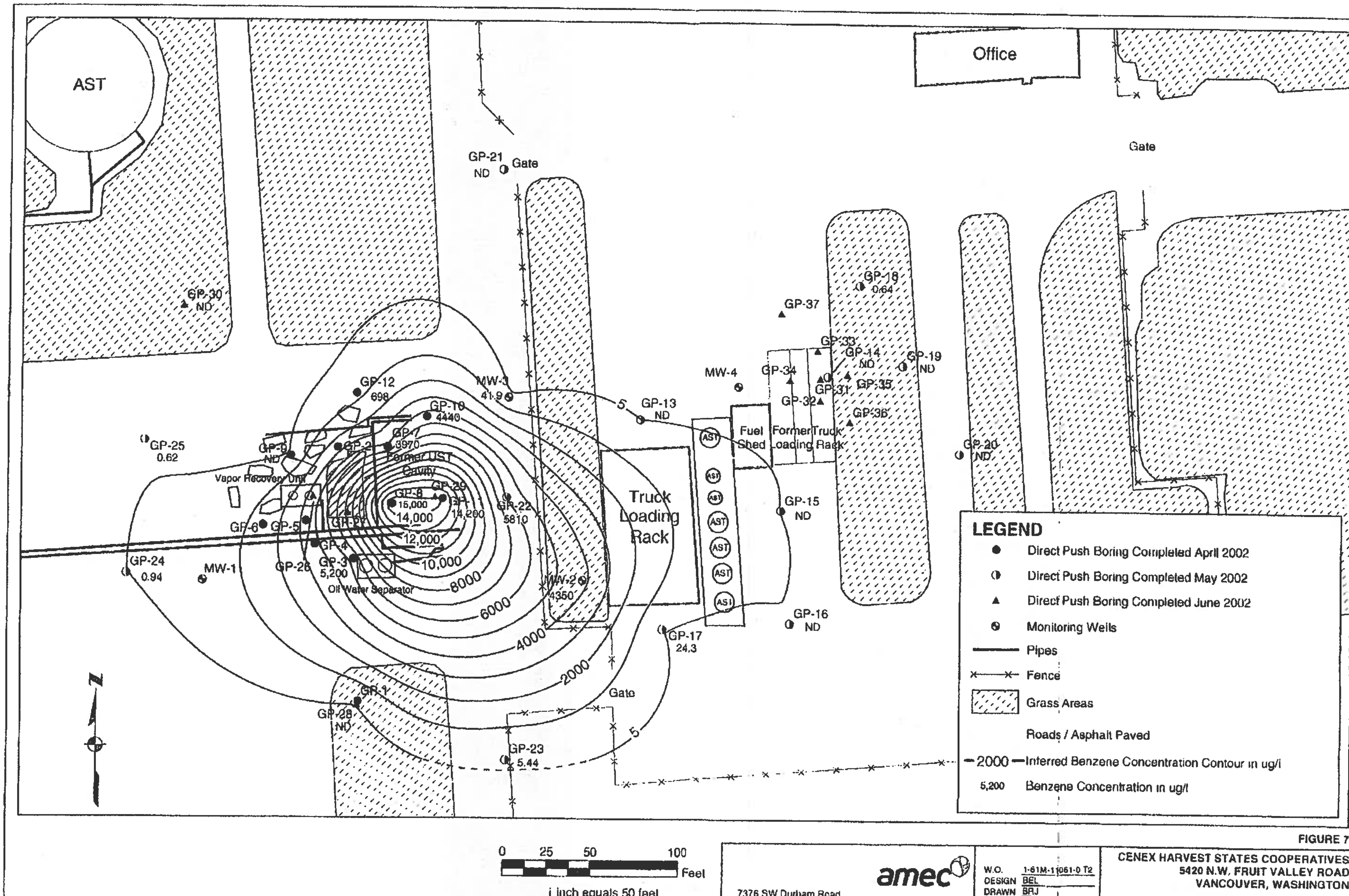


FIGURE 7

amec

7376 SW Durham Road
Portland, OR, U.S.A. 97224

W.O. 1-61M-11061-0 T2
DESIGN BEL
DRAWN BRJ
DATE SEPTEMBER 2002

CENEX HARVEST STATES COOPERATIVES
5420 N.W. FRUIT VALLEY ROAD
VANCOUVER, WASHINGTON

BENZENE CONCENTRATIONS AND INFERRED CONTOUR FOR APRIL - JUNE 2002