OTIS Overview Report

Box 226
443905994

Log Number	**26-94-0025**	Site Name	**ROSE'S PARKING LOT**
City	**PORTLAND**	Address	**330 NW 23 AVE**
Zip	**97210**	Common Name	**Rose's Parking Lot**
Phone		See Also	

Received Date	**07 FEB 1994**	Lips Score	**168**	Cost Recovery Agreement Date	**30 MAY 1995**
Facility Id		Property Trans Pending?		Release Stopped Date	
Project Mgr	**Rich Reiter**	Regulated Tank?	**Y**	Cleanup Start Date	**15 MAY 2001**
PM Assign Date	**31 MAR 2004**	Swla Permit?		Final Invoice Request Date	**24 MAY 2001**
File Status		WQ Permit?		Closed Date	**25 JUL 2001**
Site Type	**Groundwater**	Public Notice?			
Status	**Active Remediation** **CAP Approved** **Compliance GW Monitor** **Confirmed Release** **GW Delineated** **Soil Delineated**				

Julie
Please order this file from Archives ASAP
Rich 3-31-04

Site Comment

Site Inspections

Total Number of Inspections at site

Contamination

Contaminant	Media
Diesel	**Groundwater**
Diesel	**Soil**
Misc. Gasoline	**Groundwater**
Misc. Gasoline	**Soil**

Reports Received

Number of Reports Received for Site **5**

Most Recent Report Received for Site

Report Type	**Site Characterization**
Date Received	**19 JAN 2001**

Contacts

Responible Party | Reported By | Invoice Contact

REITER Richard

From: RAWSON Stephanie
Sent: Friday, April 02, 2004 4:44 PM
To: REITER Richard
Subject: Archive Boxes

Rich the archive boxes you wanted arrived Friday. They are located against the cubicle wall near the out/in board.

Also, the CRA for former Roses' Parking Lot was faxed in on Friday afternoon. I don't believe that I can reopen the file. I'll have to check with Andree and I'll let you know if I can reopen the file or if I'll have to create a new one.

Thanks

Stephanie Rawson
NWR UST Support
503 229 6242

COST RECOVERY AGREEMENT

This document serves as an agreement between the undersigned (hereinafter "you") and the Department of Environmental Quality (DEQ) regarding DEQ review and oversight of the investigation and/or cleanup of petroleum (hazardous substances) at the property located at:

Facility Name: Former Rose's Parking Lot
Address: 330 N.W. 23rd Avenue
City, Zip: Portland
File/Log #: 26-94-0025 SP 4/2/04

DEQ agrees to review environmental documents submitted by you or on your behalf regarding the investigation and/or cleanup of the above-referenced site. Additional details regarding DEQ oversight will be established upon review of the initial site data.

DEQ requires that persons requesting DEQ review and oversight of investigation and cleanup activities agree to the terms of this cost recovery agreement and pay project oversight costs.

DEQ project oversight costs will include direct costs and indirect costs. Direct costs include site-specific expenses and legal costs. Indirect costs are those general management and support costs of the DEQ, including the Waste Management and Cleanup Division (WMCD), allocable to DEQ oversight of this agreement and not charged as direct, site-specific costs. Indirect charges are based on a percentage of direct personal services costs. Review and oversight costs shall not include any unreasonable costs or costs not otherwise recoverable by DEQ under ORS 465.255.

DEQ costs are due within thirty (30) days of issuance of the monthly statement, by a check made payable to the "Department of Environmental Quality".

Electing not to enter into this agreement does not release you from any responsibility that you might have for any reporting requirements, investigation and/or cleanup of petroleum (hazardous substances) at the above referenced facility. This does not preclude the DEQ from conducting audits or inspections of all or portions of the investigation and cleanup activities associated with this facility. Enforcement action may be initiated if any violation of DEQ requirements is found.

Either DEQ or you may terminate this agreement by giving 15 days advance written notice to the other. Only those costs incurred or obligated by DEQ prior to the effective date of any termination of the agreement shall be recoverable under this Agreement. Termination of this agreement will not affect any other right DEQ may have for recovery of costs under any applicable law.

You will hold DEQ harmless for any claims (including but not limited to claims of property damage or personal injury) arising from DEQ review and/or oversight activities under this agreement.

This agreement is not and shall not be construed to be an admission by you of any liability under ORS 465.255 or any other law or as a waiver by you of any defense to such liability. This agreement is not and shall not be construed to be a waiver, release, or settlement of claims that DEQ may have against you or any other responsible person nor is this agreement a waiver of any enforcement authority that DEQ may have.

The DEQ Northwest Region UST Cleanup and Compliance Section will be responsible for the review and oversight of the investigation and cleanup activities associated with the property. Please refer all site-specific inquiries to them at (503) 229-5263.

All inquiries regarding cost recovery and/or invoices should be directed to (503) 229-5812.

If the terms of this agreement are acceptable, please have it executed by an authorized officer in the space provided below. In order to more effectively schedule your project, please return this agreement within 30 days of receipt to: DEQ Northwest Region Office, UST Cleanup and Compliance Section, 2020 SW Fourth Avenue, Suite 400, Portland, Oregon 97201.

Accepted and agreed to this 2nd day of April, 2004

By: Richard D. Singer
(Sign Here)

Richard D. Singer Owner / Managing Member
(Please Print Name and Title Here)

Please provide the following information as to where the invoices should be sent (Please print or type.)

Individual Name: Don Singer
Title: Owner / Manager
Company Name: 23rd and Flanders L.L.C.
Mail Address: 416 N.W. Hermosa Blvd.
City, State, Zip: Portland, Oregon 97210
Phone Number: (503) 478-1085 SPR 416164

RICHARD SINGER

824 N.W. Albemarle Terrace
Portland, Oregon 97210
Phone: 503-228-4348
Fax: 503-220-3622

FAX TRANSMITTAL

PAGE 1 OF 3

TO: Richard Reiter
D.E.Q

FAX #: (503) 229-6945

PHONE/EXT.: _____

FROM: Richard Singer
23rd and Flanders L.L.C.

DATE: April 2, 2004 TIME: _____

COMMENTS: Hi Richard -

Here is the cost Recovery Agreement for the site located at N.W. 23rd and Flanders, the former "Rasers" parking lot. Our attorney Richard Allan, asked me to sign and fax this back to you. Thanks for your help.

Rich Singer

IF ANY PROBLEM OCCURS WITH TRANSMISSION, PLEASE PHONE US AT 503/228-4348

CONFIDENTIALITY NOTE: The documents accompanying this facsimile transmission may contain confidential and/or legally privileged information and (unless otherwise indicated) is intended only for the use of the addressee designated above.

If you are not the intended recipient, you are hereby notified that any disclosure, copying, distribution or the taking of any action in reliance on the contents of this telecopied information is strictly prohibited.

OTIS Overview Report

Log Number	**26-94-0025**	Site Name	**ROSE'S PARKING LOT**
City	**PORTLAND**	Address	**330 NW 23 AVE**
Zip	**97210**	Common Name	**Rose's Parking Lot**
Phone		See Also	

Received Date	**07 FEB 1994**	Lips Score	**168**	Cost Recovery Agreement Date	**30 MAY 1995**
Facility Id		Property Trans Pending?		Release Stopped Date	
Project Mgr	**Rich Reiter**	Regulated Tank?	**Y**	Cleanup Start Date	**15 MAY 2001**
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File Status		WQ Permit?		Closed Date	**25 JUL 2001**
Site Type	**Groundwater**	Public Notice?			
Status	**Active Remediation** **CAP Approved** **Compliance GW Monitor** **Confirmed Release** **GW Delineated** **Soil Delineated**				

Site Comment

Stephanie — a Cost Recovery Agreement will be coming in on the Site — Please open this file back up later creating new file

Site Inspections

Total Number of Inspections at site

Site Contamination

Contaminant	Media
Diesel	**Groundwater**
Diesel	**Soil**
Misc. Gasoline	**Groundwater**
Misc. Gasoline	**Soil**

Reports Received

Number of Reports Received for Site **5**

Most Recent Report Received for Site

Report Type **Site Characterization**

Date Received **19 JAN 2001**

Contacts

Responible Party | Reported By | Invoice Contact

RML

3-31-04

FILE NAME: Rose's Parking Lot LOG NO. 26-94-0025

NWR'S NFA TRACKING CHECKLIST

ROUTE TO	ACTIVITY	RESPONSIBLE PERSON	DATE COMPLETED
	Sequent checked by project manager to make sure fees paid and tanks closed and that UST compliance issues have been resolved.	RPR	4-22-04
	OTIS updated with soil disposal, public notice, and other applicable information by project manager.	RPR	4-22-04
	Draft NFA prepared by Project Manager (PM) and submitted to NRS-4 Hydro or Manager for review	RPR	4-22-04
	Draft NFA approved by NRS-4 Hydro (or Manager, if necessary) and submitted for data entry	Not Required Reviewed Construction Plans	
	SEQUENT updated with final invoice request date and new green sheet information.		
	To Administrative staff for cost recovery entries and proofreading letter		
	OPTIONAL STEP: Expedited payment request by responsible party (RP) is handled by ======>>		
	OPTIONAL STEP: Estimated Expedited Payment Amount given to RP by ======>>		
	Final invoice paid notice received from Business Office and PM informed by Manager	SR	4/23/04
	Final NFA drafted and signed by PM (and Manager, if necessary), and sent for data entry	RPR	4-22-04
	SEQUENT updated with filed closed information and file closure activities complete.	SR	4/26/04
	Copies made and mailed	↓	↓

NFA PROCESS COMPLETE

(10/30/03)

BALL JANIK LLP

ATTORNEYS

101 SOUTHWEST MAIN STREET, SUITE 1100
PORTLAND, OREGON 97204-3219

www.balljanik.com

RICHARD H. ALLAN

TELEPHONE 503-228-2525
FACSIMILE 503-295-1058

rallan@bjllp.com

April 26, 2004

By Messenger

Richard Reiter
Natural Resource Specialist,
UST Cleanup and Compliance Section
Department of Environmental Quality
Northwest Region Office
2020 S.W. Fourth Avenue, Suite 400
Portland, OR 97201

Re: DEQ UST File No. 26-94-0025/Payment of Account Balance

Dear Mr. Reiter:

Enclosed please find a check in the amount of $800 payable to the Oregon Department of Environmental Quality. It is my understanding that this covers the outstanding balance owed by 23rd and Flanders, LLC with regard to the Department's work on the former Rose's parking lot site, UST File No. 26-94-0025.

We appreciate your prompt and diligent work in providing DEQ's conditions for development of the property.

Very truly yours,

Richard H. Allan

RHA:crs
Enclosure
cc: Mr. Richard Singer

RECEIVED
APR 26 2004
DEPT OF ENVIRONMENTAL QUALITY
NORTHWEST REGION

Oregon
Theodore R. Kulongoski, Governor

Department of Environmental Quality
Northwest Region Portland Office
2020 SW 4th Avenue, Suite 400
Portland, OR 97201-4987
(503) 229-5263
FAX (503) 229-6945
TTY (503) 229-5471

April 22, 2004

RICHARD SINGER, OWNER & MANAGING MEMBER
23RD & FLANDERS LLC
416 NW HERMOSA BLVD
PORTLAND, OR 97210

Re: ROSE'S PARKING LOT
UST Cleanup File No. 26-94-0025

Dear Mr. Singer:

This will review and confirm our discussions of April 8, 2004 wherein preliminary architectural drawings for a two story commercial building to be constructed on the former Rose's Parking Lot UST Cleanup site located at 330 NW 23rd Avenue in Portland, Oregon were presented to DEQ. Under the two occupied floors will be an underground parking garage that is at least partially below ground surface. On April 13, 2004, DEQ received proposed design specifications for a mechanical ventilation system for parking garages based on Section 1203.2.11 of the 1997 Uniform Building Code (UBC).

DEQ's involvement with this construction project stems from a condition in a July 19, 2001 No Further Action letter that reads in part:

> *If any of the following site changes are considered the Department must be notified in advance and the adequacy of cleanup must be re-evaluated:*
> *...2. If any excavation in or near the pocket location is planned.*

Based on documents provided to date, DEQ offers the following two observations:

1. It appears the footing excavation in the area of proposed parking space 25 (Garage Plan 4.05.04) will likely encounter a pocket of petroleum-contaminated soil (PCS). You may want to consider moving this footing, if possible, to avoid encountering PCS. The alternative is to remove and dispose of the PCS, as required in Approval Condition 2 below.

2. It appears the area around parking space 25 will be constructed within three vertical feet of PCS. A potential exists that benzene vapors, a component of gasoline, may enter the parking garage level if cracks develop in the floor. Therefore, active ventilation of the parking garage is necessary as required in Approval Condition 3 below.

Approval to proceed with construction is subject to the following conditions:

1. The excavation specifications must contain language informing prospective bidders that PCS may be encountered. Further, the excavation contractor that is hired must be informed in writing

that PCS may be encountered. Further, it must be required that the excavation contractor have a health and safety contingency plan available that protects the health and safety of the contractor's employees and other construction personnel on site in the event that PCS is encountered.

2. Should PCS be encountered, it is considered a solid waste and must be handled as such. Any PCS shall be segregated from clean soils and be taken to a landfill or treatment facility authorized to receive PCS. This possibility should be expressly discussed as a contingency item in the design specifications for the project. If PCS is encountered, DEQ's UST Duty Officer must be informed within 24 hours of discovery at 503-229-5263. The person calling in the report must reference UST Cleanup File No. 26-94-0025 and give the site name as Rose's Parking Lot.

3. The ventilation system for the garage must meet the 1.5 cubic feet per minute per square foot of gross floor area standard in Section 1203.2.11 of the UBC. The developer must not seek an appeal for a lesser ventilation standard for this specific garage.

4. A copy of this letter must be included with the set of plans and specifications submitted to the City of Portland, Bureau of Development Services, for construction approval.

If there are any questions regarding these matters, please feel free to call me at (503) 229-5425.

Sincerely,

Richard Reiter, Natural Resource Specialist
UST Cleanup and Compliance Section

RPR.rpr/word/26-94-0025.proposed const app ltr 4-22-04

Cc: Richard Allan, Attorney
Ball Janik LLP
101 SW Main Street Suite 1100
Portland, OR 97204-3219

Jeff Stuhr
Holst Architecture PC
537 SE Ash Street # 42
Portland, OR 97214

City of Portland
Bureau of Development Services
1900 SW 4th Avenue
Portland, OR 97201

FAX Cover Sheet

To: RICHARD ALLAN

Office: BALL JANIK

Phone: 503-228-2525

Fax: 503-295-1058

Date: 4-22-04

From: RICHARD REITER

Office: DEQ NWR - TANKS

Phone: 503-229-5425

Number of Pages (including this cover sheet): 4

State of Oregon
Department of Environmental Quality
Northwest Region Office
2020 SW 4th Avenue
Suite 400
Portland, OR 97201
503-229-5263

Return Fax:
(503) 229-6945

Comments: REVISED Based on 4-22-04 Telephone conversation-

I'll be in today until 5PM
I'll be off tomorrow - Friday
I'll be back in the office
Monday April 26, 2004.

If you want the letter today remember I still need information regarding the City of Portland's Building Department

April 22, 2004

RICHARD SINGER, OWNER & MANAGING MEMBER
23RD & FLANDERS LLC
416 NW HERMOSA BLVD
PORTLAND, OR 97210

Re: ROSE'S PARKING LOT
UST Cleanup File No. 26-94-0025

Dear Mr. Singer:

This will review and confirm our discussions of April 8, 2004 wherein preliminary architectural drawings for a two story commercial building to be constructed on the former Rose's Parking Lot UST Cleanup site were presented to DEQ. Under the two occupied floors will be an underground parking garage that is at least partially below ground surface. On April 13, 2004 DEQ received proposed design specifications for a mechanical ventilation system for parking garages based on Section 1203.2.11 of the 1997 Uniform Building Code (UBC).

DEQ's involvement with this construction project stems from a condition in a July 19, 2001 No Further Action letter that reads in part:

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> *...2. If any excavation in or near the pocket location is planned.*

Based on documents provided to date, DEQ offers the following two observations:

1. It appears the footing excavation in the area of proposed parking space 25 (Garage Plan 4.05.04) will likely encounter a pocket of petroleum-contaminated soil (PCS). You may want to consider moving this footing, if possible, to avoid encountering PCS. The alternative is to remove and dispose of the PCS, as required in Approval Condition 2 below.

2. It appears the area around parking space 25 will be constructed within three vertical feet of PCS. A potential exists that benzene vapors, a component of gasoline, may enter the parking garage level if cracks develop in the floor. To ~~eliminate exposure to these benzene~~ vapors, active ventilation of the parking garage is necessary as required in Approval Condition 3 below..

DRAFT – FOR REVIEW AND COMMENT ONLY
REVISED 4-20-04

Approval to proceed with construction is subject to the following conditions:

1. The excavation specifications must contain language informing prospective bidders that PCS may be encountered. Further, the excavation contractor that is hired must be informed in writing that PCS may be encountered. Further, it must be required that the excavation contractor have a health and safety contingency plan available that protects the health and safety of the contractor's employees and other construction personnel on site in the event that PCS is encountered.

2. Should PCS be encountered, it is considered a solid waste and must be handled as such. Any PCS shall be segregated from clean soils and be taken to a landfill or treatment facility authorized to receive PCS. This possibility should be expressly discussed as a contingency item in the design specifications for the project. If PCS is encountered, DEQ's UST Duty Officer must be informed within 24 hours of discovery at 503-229-5263. The person calling in the report must reference UST Cleanup File No. 26-94-0025 and give the site name as Rose's Parking Lot.

3. The ventilation system for the garage must meet the 1.5 cubic feet per minute per square foot of gross floor area standard in Section 1203.2.11 of the UBC. The developer must not seek an appeal for a lesser ventilation standard for this specific garage.

4. A copy of this letter must be included with the set of plans and specifications submitted to the City of Portland for construction approval.

If there are any questions regarding these matters, please feel free to call me at (503) 229-5425.

Sincerely,

Richard Reiter, Natural Resource Specialist
UST Cleanup and Compliance Section

RPR.rpr/word/26-94-0025.proposed const app ltr 4-22-04

Cc: Richard Allan, Attorney
Ball Janik LLP
101 SW Main Street Suite 1100
Portland, OR 97204-3219

Jeff Stuhr

DRAFT – FOR REVIEW AND COMMENT ONLY
REVISED 4-20-04

Holst Architecture PC
537 SE Ash Street # 42
Portland, OR 97214

City of Portland Building Department
???
???

DRAFT – FOR REVIEW AND COMMENT ONLY
REVISED 4-20-04

UST CLEANUP TELEPHONE USE REPORT

CALL FROM/TO: Richard Allan – Richard Singer DATE: 4-22-04

WITH: Ball Janik TIME: 9:55

TELEPHONE NO: (503) 228 - 2525

REGARDING: Rose's Parking Lot

FILE NO: 26 - 94 - 0025

SUMMARY OF CALL

Called with further Comments on Draft 2 of Construction approval letter (see attached).

Indicated I would work on changes & get back with a revised draft.

3PM Richard Allan - Called with City of Portland, transaction and indicated the letter was acceptable with one minor change to the 2 page 1. Went back to language -- Draft 2 for last sentence

Rod Rutter

Staff Signature

April 20, 2004

RICHARD SINGER, OWNER & MANAGING MEMBER
23RD & FLANDERS LLC
416 NW HERMOSA BLVD
PORTLAND, OR 97210

Re: ROSE'S PARKING LOT
UST Cleanup File No. 26-94-0025

Dear Mr. Singer:

This will review and confirm our discussions of April 8, 2004 wherein preliminary architectural drawings for a two story commercial building to be constructed on the former Rose's Parking Lot UST Cleanup site were presented to DEQ. Under the two occupied floors will be an underground parking garage that is at least partially below ground surface. On April 13, 2004 DEQ received proposed design specifications for a mechanical ventilation system for parking garages based on Section 1203.2.11 of the 1997 Uniform Building Code (UBC).

DEQ's involvement with this construction project stems from a condition in a July 19, 2001 No Further Action letter that reads in part:

> *If any of the following site changes are considered the Department must be notified in advance and the adequacy of cleanup must be re-evaluated:*
> *...2. If any excavation in or near the pocket location is planned.*

Based on documents provided to date, DEQ has offers the following two observations:

1. It appears the footing excavation in the area of proposed parking space 25 (Garage Plan 4.05.04) will likely encounter a pocket of petroleum-contaminated soil (PCS). You may want to consider moving this footing, if possible, to avoid encountering PCS, or Remove & dispose of PCS soil

2. It appears the area around parking space 25 will be constructed within three vertical feet of PCS that had up to 4.5 parts per million of benzene in August 2000. This level of contamination will decrease over time due to natural attenuation. A potential exists that benzene vapors may enter the parking garage level if cracks develop in the floor. Therefore, active ventilation of the parking garage is necessary, as described in Condition #3 below

DRAFT – FOR REVIEW AND COMMENT ONLY
REVISED 4-20-04

a component of gasoline

Approval to proceed with construction is subject to the following conditions:

1. The excavation specifications must contain language informing prospective bidders that PCS may be encountered. Further, the excavation contractor that is hired must be informed in writing that PCS may be encountered. Further, it must be required that the excavation contractor have a health and safety contingency plan available that protects the health and safety of the contractor's employees and other construction personnel on site in the event that PCS is encountered.

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3. The ventilation system for the garage must meet the 1.5 cubic feet per minute per square foot of gross floor area standard in Section 1203.2.11 of the UBC. The developer must not seek an appeal for a lesser ventilation standard for this specific garage.

4. A copy of this letter must be included with the set of plans and specifications submitted to the City of Portland for construction approval.

If there are any questions regarding these matters, please feel free to call me at (503) 229-5425.

Sincerely,

Richard Reiter, Natural Resource Specialist
UST Cleanup and Compliance Section

RPR.rpr/word/26-94-0025.proposed const app ltr 4-19-04

Cc: Richard Allan, Attorney
Ball Janik LLP
101 SW Main Street Suite 1100
Portland, OR 97204-3219

Jeff Stuhr

DRAFT – FOR REVIEW AND COMMENT ONLY
REVISED 4-20-04

Holst Architecture PC
537 SE Ash Street # 42
Portland, OR 97214

City of Portland Building Department
???
???

DRAFT – FOR REVIEW AND COMMENT ONLY
REVISED 4-20-04

FAX Cover Sheet

To: RICHARD ALLAN

Office: BALL JANIK

Phone: 503 - 228 - 2525

Fax: 503 - 295 - 1058

Date: 4-15-04

From: RICHARD REITER

Office: DEQ NWR - TANKS

Phone: 503 - 229 - 5425

Number of Pages (including this cover sheet): 1

State of Oregon
Department of Environmental Quality
Northwest Region Office
2020 SW 4th Avenue
Suite 400
Portland, OR 97201
503-229-5263

Return Fax:
(503) 229-6945

Comments: RELIED BASED ON 4-20-04 telephone conversation.

Reminder, please provide me with an appropriate mailing address for the City of Portland office that will be reviewing the plans for this building

April 20, 2004

RICHARD SINGER, OWNER & MANAGING MEMBER
23RD & FLANDERS LLC
416 NW HERMOSA BLVD
PORTLAND, OR 97210

Re: ROSE'S PARKING LOT
UST Cleanup File No. 26-94-0025

Dear Mr. Singer:

This will review and confirm our discussions of April 8, 2004 wherein preliminary architectural drawings for a two story commercial building to be constructed on the former Rose's Parking Lot UST Cleanup site were presented to DEQ. Under the two occupied floors will be an underground parking garage that is at least partially below ground surface. On April 13, 2004 DEQ received proposed design specifications for a mechanical ventilation system for parking garages based on Section 1203.2.11 of the 1997 Uniform Building Code (UBC).

DEQ's involvement with this construction project stems from a condition in a July 19, 2001 No Further Action letter that reads in part:

> *If any of the following site changes are considered the Department must be notified in advance and the adequacy of cleanup must be re-evaluated:*
> *...2. If any excavation in or near the pocket location is planned.*

Based on documents provided to date, DEQ has offers the following two observations:

1. It appears the footing excavation in the area of proposed parking space 25 (Garage Plan 4.05.04) will likely encounter a pocket of petroleum-contaminated soil (PCS). You may want to consider moving this footing, if possible, to avoid encountering PCS.

2. It appears the area around parking space 25 will be constructed within three vertical feet of PCS that had up to 4.5 parts per million of benzene in August 2000. This level of contamination will decrease over time due to natural attenuation. A potential exists that benzene vapors may enter the parking garage level if cracks develop in the floor. Therefore, active ventilation of the parking garage is necessary.

DRAFT – FOR REVIEW AND COMMENT ONLY
REVISED 4-20-04

Approval to proceed with construction is subject to the following conditions:

1. The excavation specifications must contain language informing prospective bidders that PCS may be encountered. Further, the excavation contractor that is hired must be informed in writing that PCS may be encountered. Further, it must be required that the excavation contractor have a health and safety contingency plan available that protects the health and safety of the contractor's employees and other construction personnel on site in the event that PCS is encountered.

2. Should PCS be encountered, it is considered a solid waste and must be handled as such. Any PCS shall be segregated from clean soils and be taken to a landfill or treatment facility authorized to receive PCS. This possibility should be expressly discussed as a contingency item in the design specifications for the project. If PCS is encountered, DEQ's UST Duty Officer must be informed within 24 hours of discovery at 503-229-5263. The person calling in the report must reference UST Cleanup File No. 26-94-0025 and give the site name as Rose's Parking Lot.

3. The ventilation system for the garage must meet the 1.5 cubic feet per minute per square foot of gross floor area standard in Section 1203.2.11 of the UBC. The developer must not seek an appeal for a lesser ventilation standard for this specific garage.

4. A copy of this letter must be included with the set of plans and specifications submitted to the City of Portland for construction approval.

If there are any questions regarding these matters, please feel free to call me at (503) 229-5425.

Sincerely,

Richard Reiter, Natural Resource Specialist
UST Cleanup and Compliance Section

RPR.rpr/word/26-94-0025.proposed const app ltr 4-19-04

Cc: Richard Allan, Attorney
Ball Janik LLP
101 SW Main Street Suite 1100
Portland, OR 97204-3219

Jeff Stuhr

DRAFT – FOR REVIEW AND COMMENT ONLY
REVISED 4-20-04

Holst Architecture PC
537 SE Ash Street # 42
Portland, OR 97214

City of Portland Building Department
???
???

DRAFT – FOR REVIEW AND COMMENT ONLY
REVISED 4-20-04

UST CLEANUP TELEPHONE USE REPORT

CALL FROM/TO: Richard Allan DATE: 4-20-04

WITH: Ball Janik TIME: 11:35

TELEPHONE NO: (503) 228-2525

REGARDING: Roxy's Parking Lot

FILE NO: 26-94-0025

SUMMARY OF CALL

Called Richard to confirm my 4-15-04 fax was Received. He indicated yes and we discussed minor editing changes. I will redraft & Resent this PM.

(See Requested changes attached)

Rick Reiter

Staff Signature

April 19, 2004

RICHARD SINGER, OWNER & MANAGING MEMBER
23RD & FLANDERS LLC
416 NW HERMOSA BLVD
PORTLAND, OR 97210

Re: ROSE'S PARKING LOT
UST Cleanup File No. 26-94-0025

Dear Mr. Singer:

This will review and confirm our discussions of April 8, 2004 wherein preliminary architectural drawings for a two story commercial building to be constructed on the former Rose's Parking Lot UST Cleanup site were presented to DEQ. Under the two occupied floors will be an underground parking garage that is at least partially below ground surface. On April 13, 2004 DEQ received proposed design specifications for a mechanical ventilation system for parking garages based on Section 1203.2.11 of the 1997 Uniform Building Code (UBC).

DEQ's involvement with this construction project stems from a condition in a July 19, 2001 No Further Action letter that reads in part:

> *If any of the following site changes are considered the Department must be notified in advance and the adequacy of cleanup must be re-evaluated:*
> *...2. If any excavation in or near the pocket location is planned.*

Based on documents provided to date, DEQ has two concerns:

1. ~~Based on current plans,~~ it appears footing excavations in the area of proposed parking space 25 (Garage Plan 4.05.04) will likely encounter a pocket of petroleum-contaminated soil (PCS). It is less likely, but possible for PCS to be encountered throughout the middle portion of the garage excavation. You may want to consider moving this footing if possible to avoid the PCS

2. ~~Based on current plans,~~ it appears the area around parking space 25 will be constructed within three vertical feet of PCS that had up to 4.5 parts per million of benzene ~~as recently as~~ August 2000. A potential exists that benzene vapors may enter the parking garage level ~~through~~ cracks in the floor ~~at concentrations higher than DEQ's risk-based concentrations for indoor air~~. Therefore ventilation of the parking garage is expected to decrease naturally over time. This condition will develop level

Approval to proceed with construction is subject to the following conditions:

DRAFT – FOR REVIEW AND COMMENT ONLY

1. The excavation specifications must contain language informing prospective bidders that PCS may be encountered. Further, the excavation contractor that is hired must be informed in writing that PCS may be encountered. Further, it must be required that the excavation contractor have a health and safety contingency plan available that protects the health and safety of the contractor's employees and other construction personnel on site in the event that PCS is encountered.

2. Should PCS be encountered, it is considered a solid waste and must be handled as such. Any PCS shall be segregated from clean soils and be taken to a landfill or treatment facility authorized to receive PCS. This possibility should be expressly discussed as a contingency item in the design specifications for the project. If PCS is encountered, DEQ's UST Duty Officer must be informed within 24 hours of discovery at 503-229-5263. The person calling in the report must reference UST Cleanup File No. 26-94-0025 and give the site name as Rose's Parking Lot.

3. ~~Because users of the parking garage may be subject to both carbon monoxide vapors and benzene vapors,~~ the ventilation system for the garage must meet the 1.5 cubic feet per minute per square foot of gross floor area standard in Section 1203.2.11 of the UBC. The developer must not seek an appeal for a lesser ventilation standard for this specific garage.

4. A copy of this letter must be included with the set of plans and specifications submitted to the City of Portland for construction approval.

If there are any questions regarding these matters, please feel free to call me at (503) 229-5425.

Sincerely,

Richard Reiter, Natural Resource Specialist
UST Cleanup and Compliance Section

RPR.rpr/word/26-94-0025.proposed const app ltr 4-19-04

Cc: Richard Allan, Attorney
Ball Janik LLP
101 SW Main Street Suite 1100
Portland, OR 97204-3219

Jeff Stuhr
Holst Architecture PC
537 SE Ash Street # 42

DRAFT – FOR REVIEW AND COMMENT ONLY

Portland, OR 97214

City of Portland Building Department
???
???

DRAFT – FOR REVIEW AND COMMENT ONLY

FAX Cover Sheet

To: RICHARD ALLAN

Office: BALL JANIK

Phone: 503 - 228 - 2525

Fax: 503 - 295 - 1058

Date: 4-15-04

From: RICHARD REITER

Office: DEQ NWR - TANKS

Phone: 503 - 229 - 5425

Number of Pages (including this cover sheet): 4

State of Oregon
Department of Environmental Quality
Northwest Region Office
2020 SW 4th Avenue
Suite 400
Portland, OR 97201
503-229-5263

Return Fax:
(503) 229-6945

Comments: Draft for your Review and Comment
I'm off 2-16-04 but back in office
Monday 4-19-04.

I do not see continuing DEQ involvement assuming these conditions are acceptable.

Please provide me with and appropriate mailing address for the city of Portland office that will be reviewing the plans for this Building.

April 19, 2004

RICHARD SINGER, OWNER & MANAGING MEMBER
23RD & FLANDERS LLC
416 NW HERMOSA BLVD
PORTLAND, OR 97210

Re: ROSE'S PARKING LOT
UST Cleanup File No. 26-94-0025

Dear Mr. Singer:

This will review and confirm our discussions of April 8, 2004 wherein preliminary architectural drawings for a two story commercial building to be constructed on the former Rose's Parking Lot UST Cleanup site were presented to DEQ. Under the two occupied floors will be an underground parking garage that is at least partially below ground surface. On April 13, 2004 DEQ received proposed design specifications for a mechanical ventilation system for parking garages based on Section 1203.2.11 of the 1997 Uniform Building Code (UBC).

DEQ's involvement with this construction project stems from a condition in a July 19, 2001 No Further Action letter that reads in part:

> *If any of the following site changes are considered the Department must be notified in advance and the adequacy of cleanup must be re-evaluated:*
> *...2. If any excavation in or near the pocket location is planned.*

Based on documents provided to date, DEQ has two concerns:

1. Based on current plans, it appears footing excavations in the area of proposed parking space 25 (Garage Plan 4.05.04) will likely encounter a pocket of petroleum-contaminated soil (PCS). It is less likely, but possible for PCS to be encountered throughout the middle portion of the garage excavation.

2. Based on current plans, it appears the area around parking space 25 will be constructed within three vertical feet of PCS that had up to 4.5 parts per million of benzene as recently as August 2000. A potential exists that benzene vapors may enter the parking garage level through cracks in the floor at concentrations higher than DEQ's risk-based concentrations for indoor air.

Approval to proceed with construction is subject to the following conditions:

DRAFT – FOR REVIEW AND COMMENT ONLY

1. The excavation specifications must contain language informing prospective bidders that PCS may be encountered. Further, the excavation contractor that is hired must be informed in writing that PCS may be encountered. Further, it must be required that the excavation contractor have a health and safety contingency plan available that protects the health and safety of the contractor's employees and other construction personnel on site in the event that PCS is encountered.

2. Should PCS be encountered, it is considered a solid waste and must be handled as such. Any PCS shall be segregated from clean soils and be taken to a landfill or treatment facility authorized to receive PCS. This possibility should be expressly discussed as a contingency item in the design specifications for the project. If PCS is encountered, DEQ's UST Duty Officer must be informed within 24 hours of discovery at 503-229-5263. The person calling in the report must reference UST Cleanup File No. 26-94-0025 and give the site name as Rose's Parking Lot.

3. Because users of the parking garage may be subject to both carbon monoxide vapors and benzene vapors, the ventilation system for the garage must meet the 1.5 cubic feet per minute per square foot of gross floor area standard in Section 1203.2.11 of the UBC. The developer must not seek an appeal for a lesser ventilation standard for this specific garage.

4. A copy of this letter must be included with the set of plans and specifications submitted to the City of Portland for construction approval.

If there are any questions regarding these matters, please feel free to call me at (503) 229-5425.

Sincerely,

Richard Reiter, Natural Resource Specialist
UST Cleanup and Compliance Section

RPR.rpr/word/26-94-0025.proposed const app ltr 4-19-04

Cc: Richard Allan, Attorney
Ball Janik LLP
101 SW Main Street Suite 1100
Portland, OR 97204-3219

Jeff Stuhr
Holst Architecture PC
537 SE Ash Street # 42

DRAFT – FOR REVIEW AND COMMENT ONLY

Portland, OR 97214

City of Portland Building Department
???
???

DRAFT – FOR REVIEW AND COMMENT ONLY

HOLST

TRANSMITTAL

DATE: 4.14.2004

TO: DEQ

ATTENTION: Richard Reiter

FAX NUMBER: 503/229-6945

CC: Richard Allan, Richard Singer

FROM: Jeff Stuhr

PROJECT: NW 23rd and Flanders Bldg.

REGARDING: Garage Ventilation

ARCHITECTURE PC

ENCLOSURES:	DATE:	QUANTITY:	DESCRIPTION:
	4/12/04	1 copy 4 pages	Letter UBC Code and Speafication

REMARKS:		FOR YOUR USE		FOR YOUR REVIEW		FOR YOUR APPROVAL		FOR YOUR INFORMATION

Richard:

VOX 503.233.9856

Enclosed are copies of the section of the building code and a specification from a recent project which outlines our proposal.

Feel free to call me at 503/233-9856 if you need further assistance.

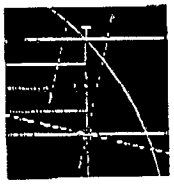
Jeff Stuhr

FAX 503.292.7135

TRAVIS

SIGNED:		COPY TO:	

STUDIO 42
437 SE 38th STREET
PORTLAND, OR 97214
HOLSTARCH@MSN.NET



THIS IS OUR RECORD OF DECISIONS REACHED FROM THE TRANSACTION ABOVE. PLEASE INFORM US IMMEDIATELY OF ANY OMMISSIONS OR DISCREPANCIES.

12 April 2004

HOLST

ARCHITECTURE PC

VOX 503.233.8836

FAX 503.232.7135

STUDIO 42
537 S.E. ASH STREET
PORTLAND, OR 97214

Richard Reiter
Department of Environmental Quality
750 Front Street NE, Suite 120
Salem, Oregon 97301

RE: Singer Group - NW 23rd and Flanders Building

Dear Richard:

Thank you again for taking the time to meet with us to review our project last Thursday. As discussed, I am enclosing information you requested about the proposed ventilation system that will be used in the garage of the new building.

For your reference, I have included a copy of the current building code as listed in Chapter 12 of the 1997 Uniform Building Code, Section 1203.2.11 Group S Parking Garages, which states the code requirements we must comply with. In addition, I have attached a specification from a recently completed mixed-use retail building, the R.E.I./Edge Lofts in the Pearl District, which included garage ventilation. We would be using a similar system for the purpose of exhausting fumes from the garage of this building. For the garage of the NW 23rd and Flanders Building, we would provide a ventilation system capable of exhausting at least 0.75 cubic feet per minute per square foot of gross floor area. To the extent the ventilation system is designed for less than 1.5 cfm/sq. ft., the design would have to be approved by the City as adequate through a Building Code appeal, as it was for the newly constructed R.E.I./Edge Loft project described above.

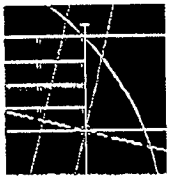
As mentioned in our meeting, the entry to the garage will allow some natural ventilation from the space in addition to the proposed mechanical ventilation system.

If you have any further questions, please contact me at my office at your convenience.

Sincerely,
HOLST Architecture p.c.

Jeffrey Stuhr, Principal

JCS/mv
cc: Richard Singer, Richard Allan



Chapter 12
INTERIOR ENVIRONMENT

SECTION 1201 — GENERAL

Buildings and portions thereof shall provide occupants with light and ventilation as set forth in this chapter or the principles of environmental technology specified in ASHRAE Standard 62-1989 including ASHRAE Addendum 62a-1990, Ventilation for Acceptable Indoor Air Quality, for occupancy ventilation. Accessible sanitary facilities shall also be provided as set forth in this chapter. For accessibility for persons with disabilities, see Chapter 11. For ventilation of hazardous vapors or fumes, see Section 306.5 and the Mechanical Code.

SECTION 1202 — DEFINITIONS

For the purposes of this chapter, certain terms are defined as follows:

OCCUPANCY VENTILATION is general ventilation required to ensure acceptable indoor air quality for the building occupants.

UNUSUALLY TIGHT CONSTRUCTION is construction where:

1. Walls and ceilings exposed to the outside atmosphere having a continuous air barrier with any openings gasketed or sealed, and

2. Weatherstripping on openable windows and doors, and

3. Caulking or sealants are applied to areas such as joints around window and door frames, between sole plates and floors, between wall-ceiling joints, between wall panels and at penetrations for plumbing, electrical and gas lines and at other openings.

SECTION 1203 — LIGHT AND VENTILATION IN GROUPS A, B, E, F, H, I, M AND S OCCUPANCIES

1203.1 Light. All enclosed portions of Groups A, B, E, F, H, I, M and S Occupancies customarily occupied by human beings shall be provided with natural light by means of exterior glazed openings with an area not less than one tenth of the total floor area, or shall be provided with artificial light. Such exterior openings shall open directly onto a public way or a yard or court as set forth in Section 1204.4. See Section 1003.2.9 for required means of egress illumination.

1203.2 Ventilation.

1203.2.1 General. Each enclosed portion of Groups A, B, E, F, H, I, M and S Occupancies customarily occupied by human beings, other than the locations specified in Sections 1203.2.5 through 1203.2.11, shall be provided with a natural ventilation system as specified in Section 1203.2.4 or mechanically operated ventilation system or combination thereof. The mechanically operated ventilation system shall be capable of supplying occupancy ventilation air in accordance with Table 12-A during such time as the building or space is occupied. The anticipated ventilation occupancy load, specifically for the design of occupancy ventilation, shall be documented on plans and specifications. The outdoor air flow rate may be determined on the basis of average ventilation occupancy load provided the average ventilation occupancy load used shall not be less than one-half the minimum specified in Section 1003.2.2.

1203.2.2 Other provisions. The provisions of *Oregon Occupational Safety and Health Code*, OAR Chapter 437, Division 2, General Occupational Safety and Health Rules (29 CFR 1910) shall apply for the control of contaminants in the work place.

1203.2.3 Register velocity. If the velocity of the air at a register exceeds 10 feet per second (3 m/s), the register shall be placed more than 8 feet (2438 mm) above the floor directly beneath.

1203.2.4 Natural ventilation. Natural occupancy ventilation systems shall have a minimum net free openable area to the exterior of $^1/_{20}$ of the floor area served.

EXCEPTION: The minimum net free openable area to the exterior in designated smoking areas shall be $^1/_5$ of the floor area.

1203.2.5 Toilet rooms. Rooms containing a water closet or urinal shall be provided with a fully openable exterior window with an area not less than 3 square feet (0.279 m²) in area; or a vertical duct not less than 100 square inches (64 516 mm²) in area for the first water closet or urinal, with an additional 50 square inches (32 258 mm²) of area for each additional water closet or urinal, or a mechanically operated exhaust system capable of exhausting 50 cubic feet of air per minute (23.6 L/s) for each water closet or urinal installed in the toilet room. Such mechanically operated exhaust systems shall be connected directly to the outside, and the point of discharge shall be at least 3 feet (914 mm) from any opening which allows air entry into occupied portions of the building.

1203.2.6 Groups B, F, M and S Occupancies. In all buildings classified as Group B, F, M and S Occupancies or portions thereof where Class I, II or III-A liquids are used, a mechanical exhaust shall be provided sufficient to produce six air changes per hour. Such exhaust ventilation shall be taken from a point at or near the floor level.

1203.2.7 Group H Occupancies. Rooms, areas or spaces of Group H Occupancies in which explosive, corrosive, combustible, flammable or highly toxic dusts, mists, fumes, vapors or gases are or may be emitted due to the processing, use, handling or storage of materials shall be mechanically ventilated as required by the Fire Code and the Mechanical Code.

Ducts conveying explosives or flammable vapors, fumes or dusts shall extend directly to the exterior of the building without entering other spaces. Exhaust ducts shall not extend into or through ducts and plenums.

EXCEPTION: Ducts conveying vapor or fumes having flammable constituents less than 25 percent of their lower flammability limit may pass through other spaces.

Emissions generated at work stations shall be confined to the area in which they are generated as specified in the Fire Code and the Mechanical Code.

The location of supply and exhaust openings shall be in accordance with the Mechanical Code. Exhaust air contaminated by highly toxic material shall be treated in accordance with the Fire Code.

A manual shutoff control shall be provided outside of the room in a position adjacent to the access door to the room or in a location approved by the chief. The switch shall be of the break-glass type and shall be labeled VENTILATION SYSTEM EMERGENCY SHUTOFF.

1203.2.8 Group H, Division 4 Occupancies. In buildings used for the repair or handling of motor vehicles operating under their

own power, mechanical ventilation shall be provided capable of exhausting a minimum of 1.5 cubic foot per minute per square foot (7.62 L/s/m^2) of floor area. Each engine repair stall shall be equipped with an exhaust pipe extension duct, extending to the outside of the building, which, if over 10 feet (3048 mm) in length, shall mechanically exhaust 300 cubic feet per minute (141.6 L/s). Connecting offices and waiting rooms shall be supplied with air of acceptable indoor air quality under positive pressure.

EXCEPTION: In repair garages and aircraft hangars the building official may authorize the omission of such ventilating equipment when, in his or her opinion, the building is supplied with unobstructed openings to the outer air which are well distributed and sufficient in size to provide necessary ventilation.

1203.2.9 Group H, Division 6 Occupancies. In Group H, Division 6 Occupancies, mechanical ventilation, which may include recirculated air, shall be provided throughout the fabrication area at the rate of not less than 1 cubic foot per minute per square foot (0.044 L/s/m^2) of floor area. The exhaust air duct system of one fabrication area shall not connect to another duct system outside that fabrication area within the building.

Ventilation systems shall comply with the Mechanical Code except that the automatic shutoffs need not be installed on air-moving equipment. However, smoke detectors shall be installed in the circulating airstream and shall initiate a signal at the emergency control station.

Except for exhaust systems, at least one manually operated remote control switch that will shut down the fabrication area ventilation system shall be installed at an approved location outside the fabrication area.

A ventilation system shall be provided to capture and exhaust fumes and vapors at work stations. Two or more operations shall not be connected to the same exhaust system when either one or the combination of the substances removed could constitute a fire, explosion or hazardous chemical reaction within the exhaust duct system.

Exhaust ducts penetrating occupancy separations shall be contained in a shaft of equivalent fire-resistive construction. Exhaust ducts shall not penetrate area separation walls. Fire dampers shall not be installed in exhaust ducts.

1203.2.10 Group S repair and storage garages and aircraft hangars. In Group S, Division 3 repair garages and storage garages and in Division 5 aircraft hangars, the mechanical ventilating system required by Section 1203.2.1 may be omitted when, in the opinion of the building official, the building is supplied with unobstructed openings to the outer air that are sufficient to provide the necessary ventilation.

1203.2.11 Group S parking garages. In Group S, Division 3 parking garages, other than open parking garages, used for storing or handling automobiles operating under their own power and on loading platforms in bus terminals, ventilation shall be provided capable of exhausting a minimum of 1.5 cubic feet per minute (cfm) per square foot (0.71 L/s/m^2) of gross floor area. The building official may approve an alternate ventilation system designed to exhaust a minimum of 14,000 cfm (6608 L/s) for each operating vehicle. Such system shall be based on the anticipated instantaneous movement rate of vehicles, but not less than 2.5 percent (or one vehicle) of the garage capacity. Automatic carbon monoxide-sensing devices may be employed to modulate the ventilation system to maintain a maximum average concentration of carbon monoxide of 50 parts per million during any eight-hour period, with a maximum concentration not greater than 200 parts per million for a period not exceeding one hour.

EXCEPTION: Ventilating system may be omitted in repair garages and motor vehicle fuel-dispensing stations without lubrication pits, storage garages and aircraft hangars when, in the building official's opinion, the building is supplied with unobstructed openings to the outer air which are sufficient to provide the necessary ventilation.

Connecting offices, waiting rooms, ticket booths and similar uses shall be supplied with air of acceptable indoor air quality under positive pressure.

SECTION 1204 — LIGHT AND VENTILATION IN GROUP R OCCUPANCIES, EXCEPT ONE- AND TWO-FAMILY DWELLINGS

1204.1 General. For the purpose of determining the light or occupancy ventilation and source control ventilation for Group R Occupancies required by this section and Table 12-A, any room may be considered as a portion of an adjoining room when one half of the area of the common wall is open and unobstructed and provides an opening of not less than one tenth of the floor area of the interior room or 25 square feet (2.3 m^2), whichever is greater.

Exterior openings for natural light or ventilation required by this section shall open directly onto a public way or a yard or court as set forth in Section 1204.4.

EXCEPTIONS: 1. Required exterior openings may open into a roofed porch where the porch:

1.1 Abuts a public way, yard or court;

1.2 Has a ceiling height of not less than 7 feet (2134 mm); and

1.3 Has a longer side at least 65 percent open and unobstructed.

2. Skylights.

1204.2 Light. Guest rooms and habitable rooms within a dwelling unit or congregate residence shall be provided with natural light by means of exterior glazed openings with an area not less than one tenth of the floor area of such rooms with a minimum of 10 square feet (0.93 m^2).

EXCEPTION: Kitchens in Group R Occupancies may be provided with artificial light.

1204.3 Ventilation. Guest rooms and habitable rooms within a dwelling unit or congregate residence shall be provided with natural ventilation as specified in Section 1203.2.4 or by a mechanical ventilation system which shall be capable of supplying ventilation air in accordance with Table 12-A during such time as the building or space is occupied.

EXCEPTION: See Section 310.4 for minimum net clear openable area of escape and rescue windows.

In lieu of required exterior openings for natural ventilation, a mechanical ventilating system may be provided. Such system shall be capable of providing outside ventilation air as specified in Table 12-A.

EXCEPTION: Buildings of ordinary tightness may meet one of the following two requirements in lieu of documenting achievement of required occupancy ventilation load:

1. For occupancy ventilation integrated with a central forced-air heating system, a 6-inch (152 mm) diameter or equivalent outdoor air inlet duct of not more than 35 feet (10 668 mm) in length, shall connect to the return air plenum within 6 feet (1829 mm) of the air handler/blower fan cabinet.

The forced-air heating system blower shall be equipped with an automatic 24-hour clock timer or with a manual switch located at the central thermostat and clearly labeled "ventilation." The manual switch and clock timer may be integrated with a central thermostat.

2. For occupancy ventilation other than forced air systems, one individual outdoor air inlet, a minimum of 4 square inches (2581 mm^2) in area, shall be provided for each habitable room, and for each 250 square feet (23.2 m^2) of habitable area or portion thereof exceeding 250 square feet (23.2 m^2).

REI/THE EDGE 08/23/02

SECTION 15005 - MECHANICAL DESIGN REQUIREMENTS

PART 1 - GENERAL

1.1 PURPOSE

A. The purpose of this Section is to define the design approach upon which the mechanical design/build contractor is to base his bid and establish the design criteria, and design submittals, which will be required in the preparation and execution of the design.

1.2 APPLICABLE REQUIREMENTS

A. All work under this Section shall comply with the requirements of General Conditions, Supplemental Conditions, Special Conditions and Division 1, "General Requirements," and shall include all Mechanical Sections specified herein.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. All Division 15 Mechanical sections included herein. Materials and Methods

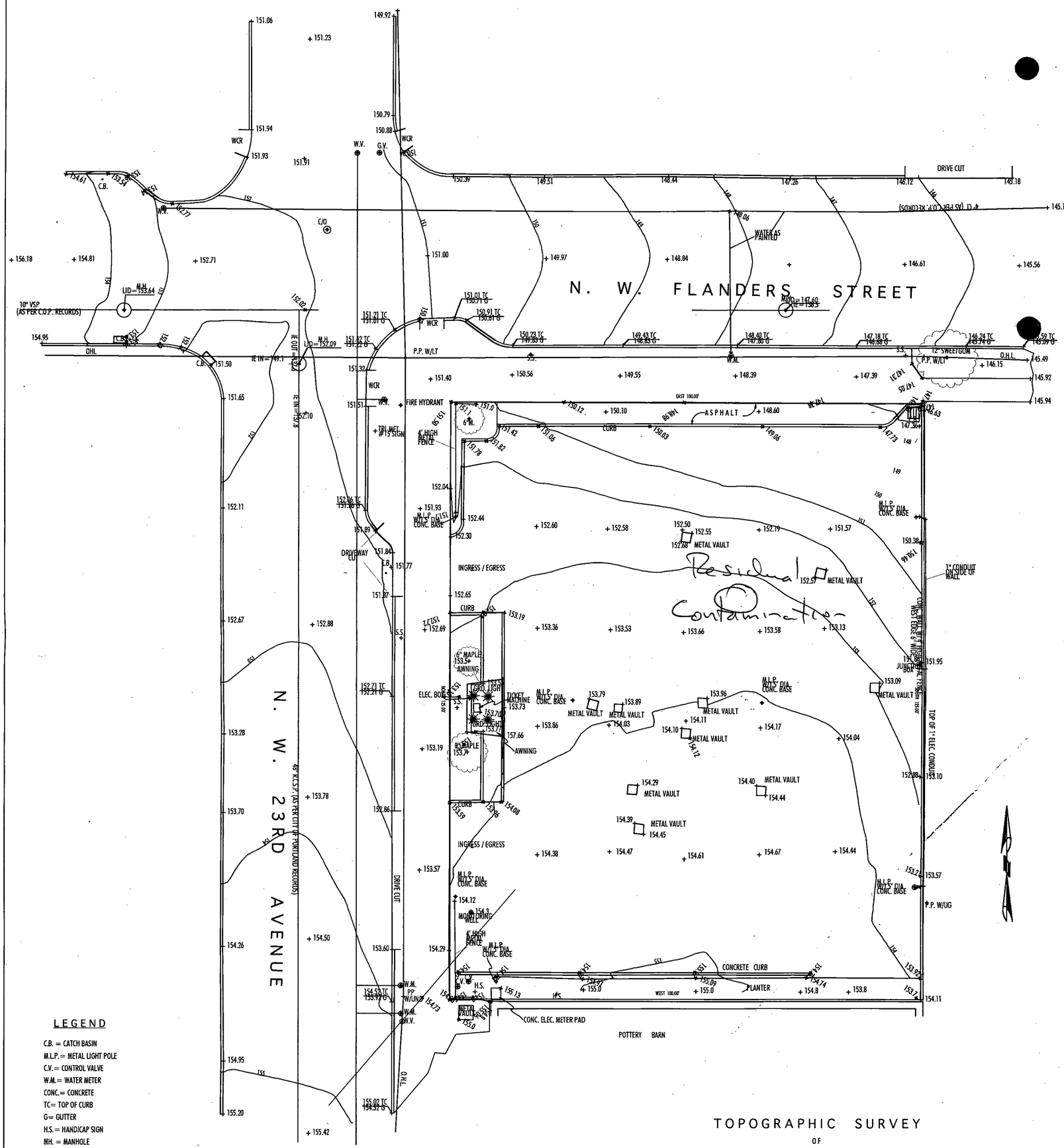
1.4 MECHANICAL DESIGN NARRATIVE

A. HVAC Systems:

1. General Design Conditions and Constraints:
   a. The building is a 11 story high rise building comprised of ground and 2nd floor retail space, Basement through 4 levels of parking, and floors 5 through 11 condominium residences. Floors 5 through 9 will be identical floors with floors 10 and 11 having a slightly smaller footprint and likely larger condominium units.
   b. The owner is pursuing a LEED Silver certification requiring that total building energy consumption be a minimum of 20% below ASHRAE 90.1 energy standards. The systems described here address this objective.
2. Ground Floor Condo Lobby and Retail Parking Lobby HVAC: Each entrance lobby is to be conditioned by commercial grade ceiling mounted split system fan coil with condensing unit located in the adjacent parking garage. Fresh air to be provided from an intake in the building face.
3. REI Retail HVAC: It is anticipated that the two floors of retail will be occupied by a single retail tenant (REI) comprised of 32,000 sq.ft. of conditioned space and 4210 sq.ft. of semi-conditioned storage space. The conditioned space is to be served by a variable air volume system served from two vertical self-contained air conditioning units located on the 4th level parking floor above the retail. Units will be down discharge to deliver supply air to ductwork and zone controls to be installed as tenant work. Retail shell work included in the base building will be:
   a. Two vertical self-contained air cooled air conditioning units located on the 4th parking level in mechanical rooms with 100% economizer intake from perimeter and economizer exhaust to the parking level.
   b. A DDC control system for the self-contained units with control of the shell components and capacity to extend to control of the tenant space.

c. All base building retail service HVAC equipment to be served from the retail electrical service.
d. REI Toilet rooms: Provide exterior louvers above the pedestrian right-of-way for exhaust. Toilet exhaust fan will be sized and provided as part of tenant work.

4. Level One Retail Shipping/Receiving and Storage: Provide a local exhaust fan to exhaust this area to the exterior at a rate of no less than 6 air changers per hour. Control the fan from a local switch in parallel with a CO sensor located at the receiving/storeroom.
5. Small Retail Tenant Provisions: (Future) Provide outside air/relief air louvers for connection to future tenant improvement split system unit.
6. REI Parking Garage: Levels 1 through the west side of 4 parking will be naturally ventilated. The east side of level four will be mechanically ventilated.
7. Ductwork:
   a. Supply ductwork to be a combination of medium and low pressure galvanized sheet metal type with fiberglass insulation with vapor barrier.
   b. Return air ductwork to be low pressure galvanized sheet metal type with 1" acoustical duct liner.
8. Condo Parking Garage:
   a. Code Requirements: The basement floor will require mechanical exhaust because the garage openings do not meet the UBC requirements for a naturally ventilated parking garage. Garage exhaust is to be designed to meet UBC requirements of 1.5 cfm/sq.ft., however, the contractor is to prepare a credit for the cost savings which will be realized by reducing ventilation to 0.75 cfm/sq.ft. and is to prepare a code appeal for use of 0.75 cfm/sq.ft. for submission through GBD Architects. Glumac International will provide supporting calculations for this effort.
   b. Design basis for the code appeal alternate of the parking exhaust system is the use of two fans. The south fan unit will be a utility style fan. It will be located on the ground floor parking suspended beneath the 2nd floor slab and will draw exhaust from ductwork on the south wall of the basement garage (See architectural concept drawings) and will exhaust air out exhaust louvers on the south face of the building. A second exhaust fan will be located in a small mechanical room on the northwest corner of the basement, just south of the NW stairwell. This fan will exhaust through a louver high on the west face of the ground level. Provide each fan with variable frequency drive.
      1) Control of garage exhaust: Provide a control system equipped with multiple carbon monoxide sensors (one per quadrant per floor) which modulates the controlled exhaust fan to the minimum exhaust necessary to maintain safe operating conditions and shuts the fan down when not necessary to maintain safe conditions.
9. Condominium Unit HVAC: Base Design
   a. Each condominium unit is to be served by its own dedicated premium efficiency split system variable speed heat pump fan coil with outdoor condensing unit on the roof of the condo tower. Condensing unit refrigerant to be a non-HCFC refrigerant. SEER to be a minimum of 14.0 with a heating COP of 2.5. The fan coil unit will distribute air from sheet metal ductwork to sidewall and ceiling diffusers in each condo unit.
   b. Toilet exhaust: Toilet exhaust from each condo bathroom is to be provided by a ceiling mounted exhaust fan discharging into a 4" subduct which in turn discharges into a toilet exhaust riser served by a roof mounted exhaust fan. The ceiling mounted exhaust fan will be switched by a wall switch. Each roof fan is to be sized with a diversity of 50% of the total bathroom flows. Exhaust rate to be 60 cfm per bathroom.



LEGEND

C.B. = CATCH BASIN
M.L.P.= METAL LIGHT POLE
C.V.= CONTROL VALVE
W.M.= WATER METER
CONC.= CONCRETE
TC= TOP OF CURB
G= GUTTER
H.S.= HANDICAP SIGN
MH. = MANHOLE
WCR. = WHEELCHAIR RAMP
P.P. = POWER POLE
W/LT = WITH LIGHT
L.P. = LIGHT POLE
O.L. = OVERHEAD LINES
W.V. = WATER VALVE
G.V. = GAS VALVE
M.L.P. = METAL LIGHT POLE
C.O.P. = CITY OF PORTLAND
UG = UNDERGROUND
C-L FC = CHAIN-LINK FENCE

NOTES

0. BENCH MARK: ELEVATIONS BASED ON CITY OF PORTLAND BENCH MARK NO. 4629, ELEVATION = 157.07
2. CONTOURS ARE AT ONE-FOOT INTERVALS AND ARE COMPUTER GENERATED.
3. UNDERGROUND UTILITIES ARE SUBJECT TO ACTUAL FIELD LOCATION.
4. ALL UTILITIES MAY NOT BE SHOWN.
5. TREE SPREADS ARE NOT TO SCALE.

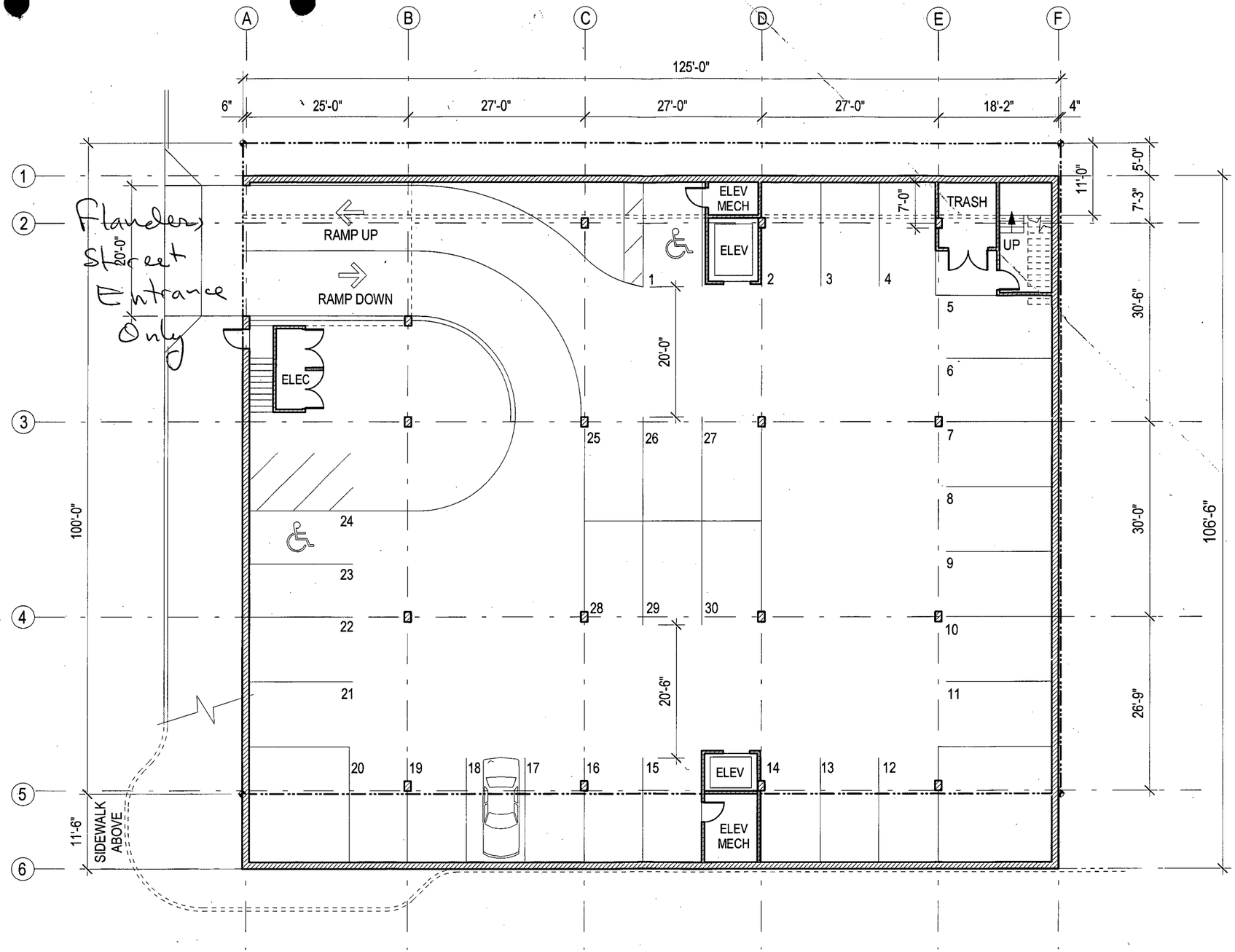
REGISTERED PROFESSIONAL LAND SURVEYOR

OREGON
JULY 16, 1982
ERRIC D. JONES
1996
EXPIRES: 6-30-05

TOPOGRAPHIC SURVEY

OF
LOTS 15, 16 & THE N. 25' OF LOT 17 BLOCK 3
"MEADS ADDITION"
SITUATED IN THE S. W. 1/4 SECTION 33, T. 1 N., R. 1 E., W. M.
MULTNOMAH COUNTY, OREGON

11224	3027	APRIL 7, 2004
J.H.R.	E.D.J.	1" = 10'



1/16" = 1'-0"

NORTH

0 5' 10' 20'

HOLST Architecturepc

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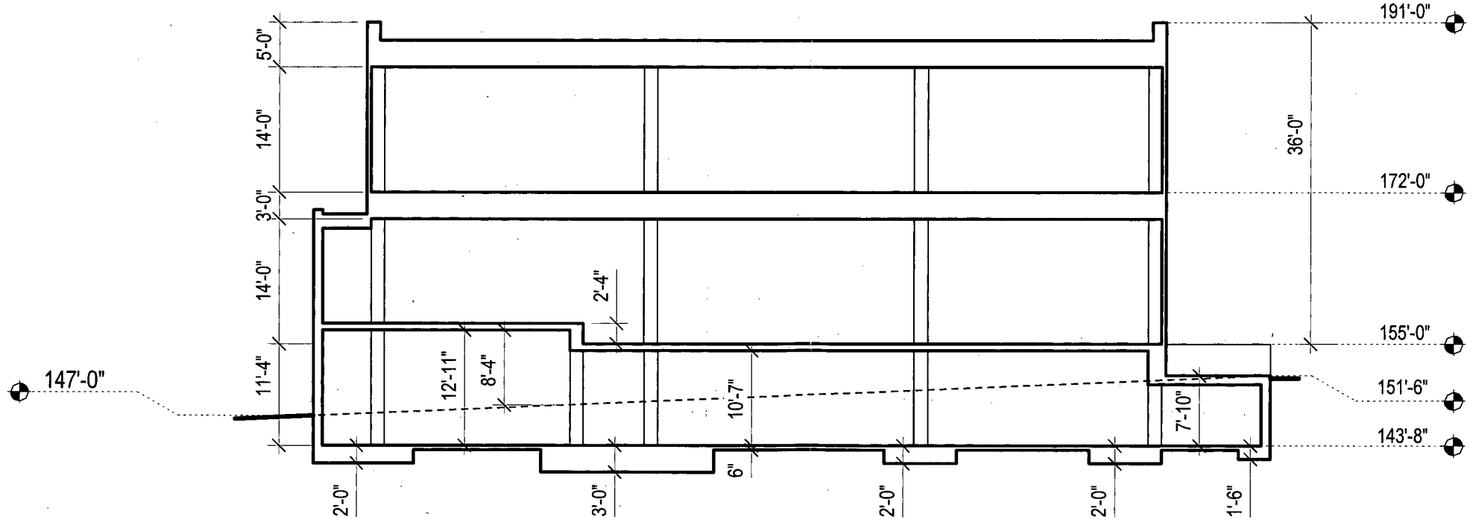
NW 23rd & FLANDERS BUILDING

GARAGE PLAN

4.05.04



1/16" = 1'-0"

NORTH

0 5' 10' 20'

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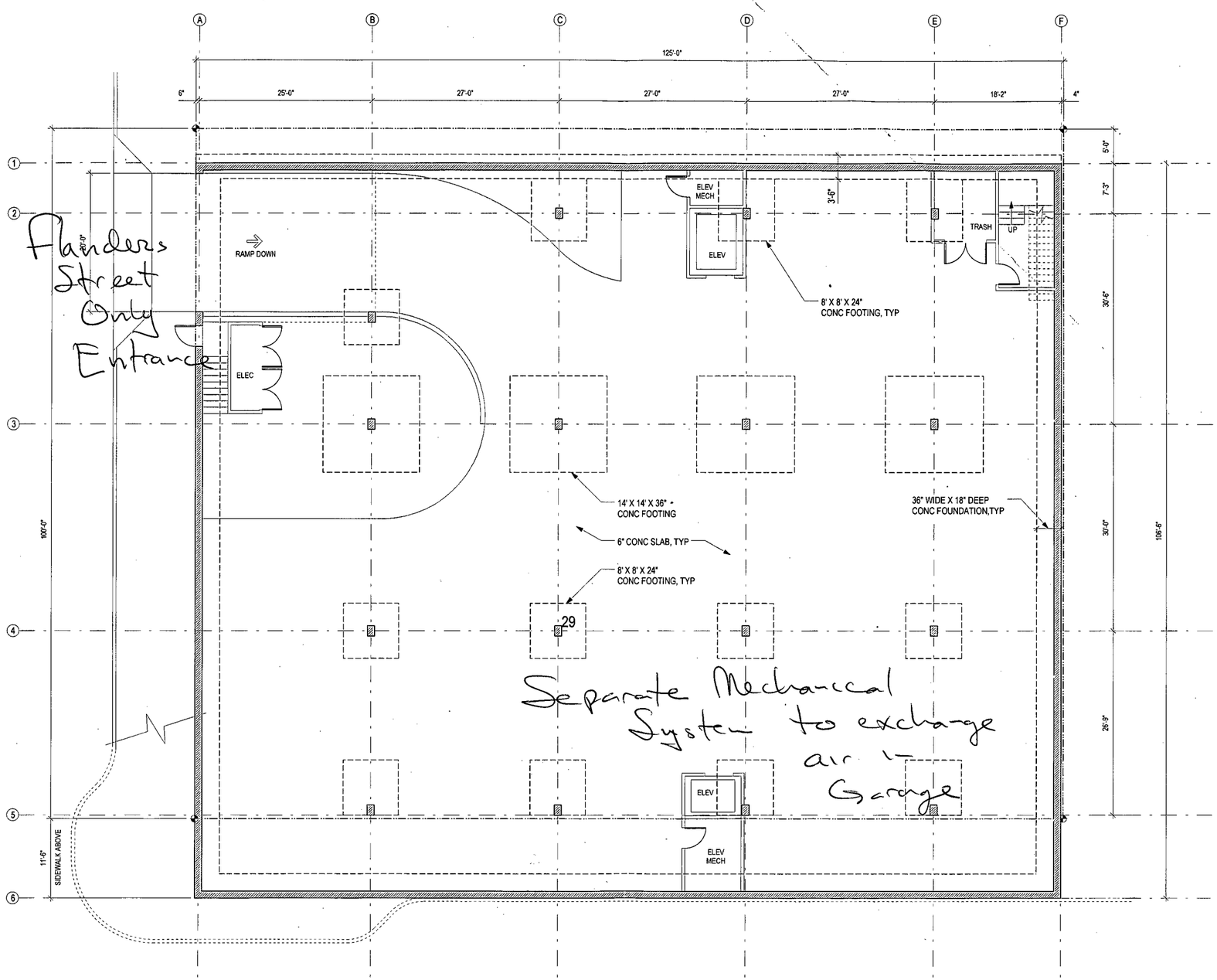
NW 23rd & FLANDERS BUILDING

BUILDING SECTION

4.08.04



1 / A2.1 BASEMENT PLAN
Scale: 1/8" = 1'-0"

HOLST
ARCHITECTURE P.C.

537 SE ASH STREET, #42
PORTLAND, OREGON 97214

VOX 503 . 233 . 9856
FAX 503 . 232 . 7135

23rd &
FLANDERS

330 NW 23rd AVE
PORTLAND, OR 97210

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DATE: 04.07.04

REVISION:

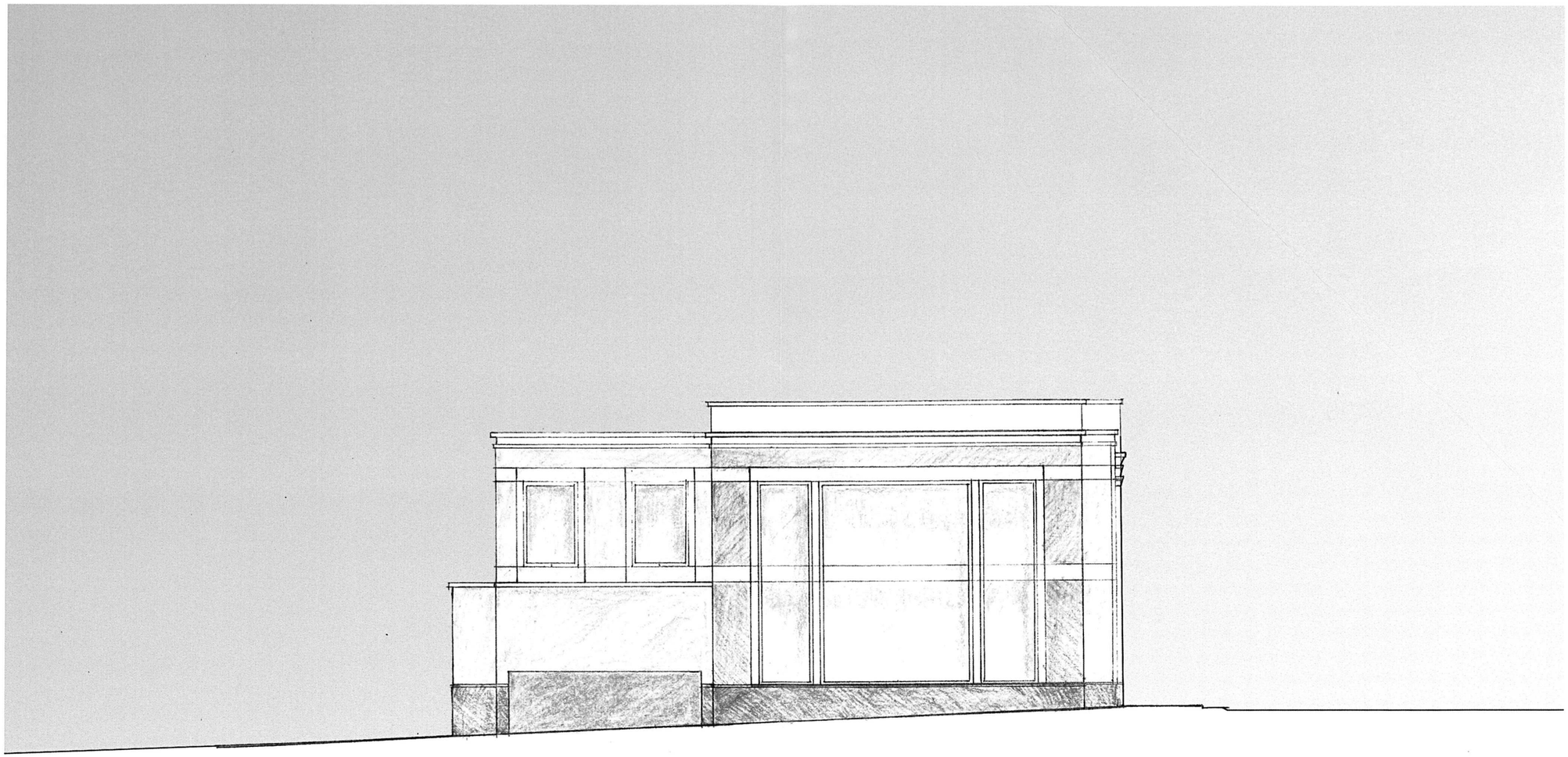
DRAWING:

BASEMENT PLAN

JOB NO. 02-030.00

SHEET:

A2.1



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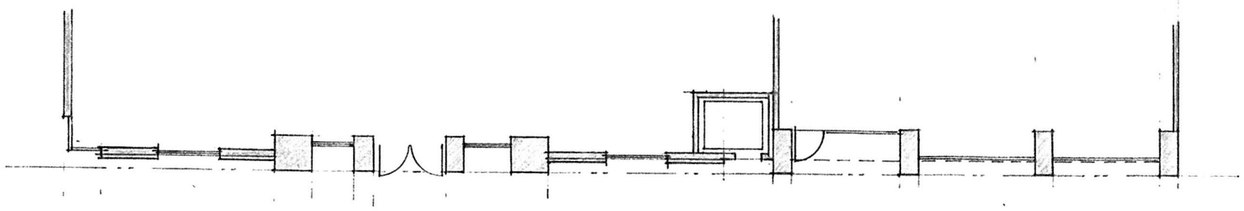
NW 23rd & FLANDERS BUILDING

FLANDERS ST ELEVATION
4.5.04



HOLST Architecture[pc]
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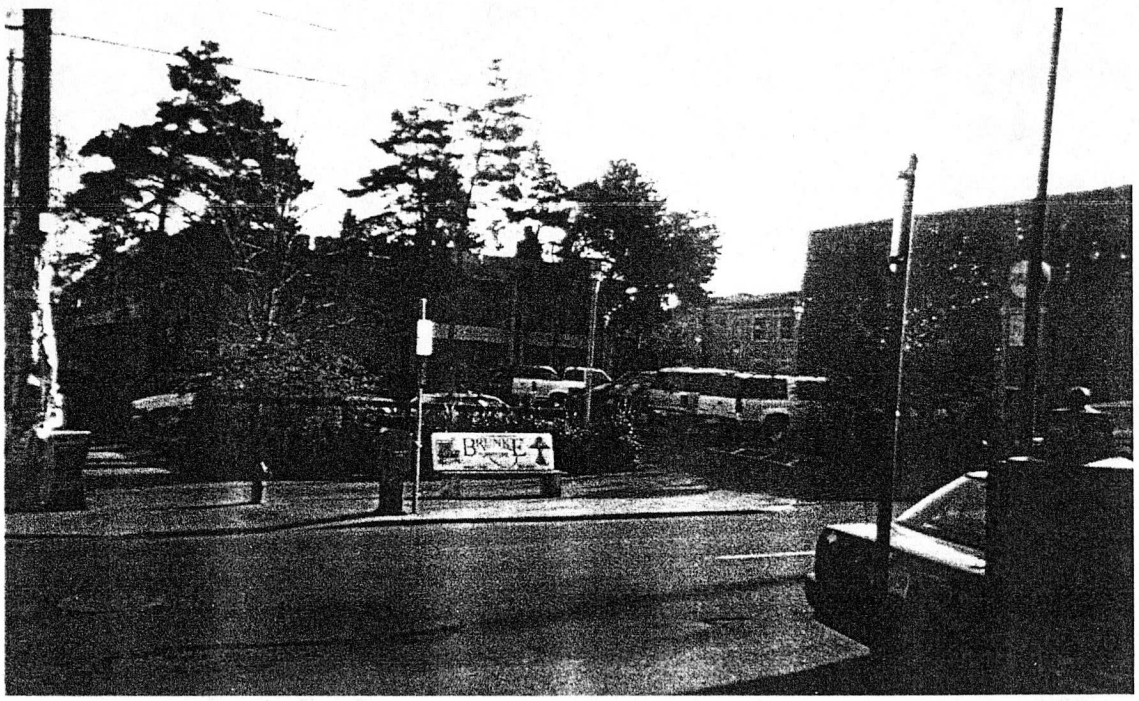
www.holstarc.com 503.233.9856 tel 503.232.7135 fax

NW 23rd & FLANDERS BUILDING

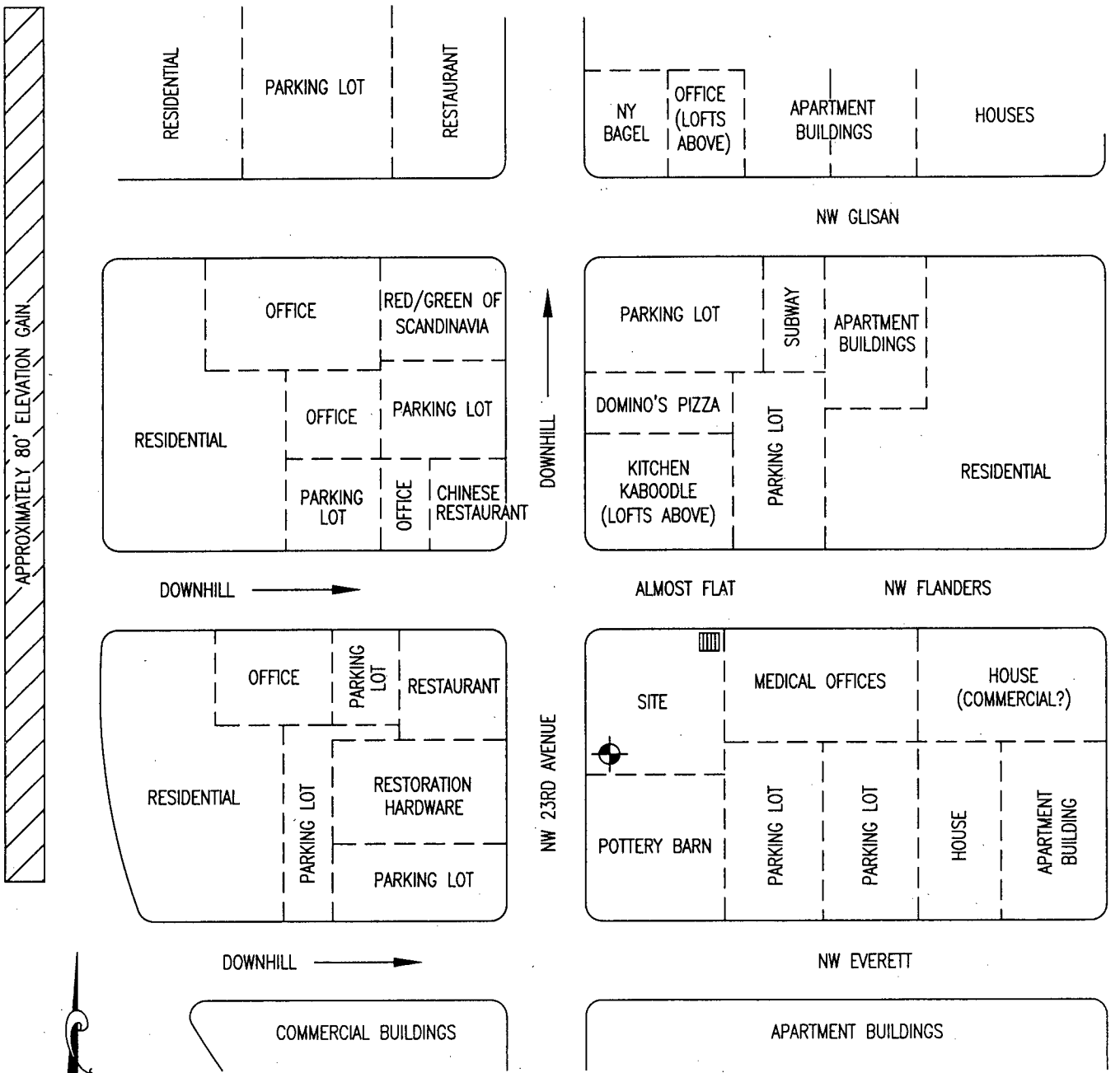
23RD AVE ELEVATION
4.5.04

Photographs 1 and 2: Present Site Use Taken 12/05/00

Looking southwest across the site. NW Flanders in foreground. Shows elevation change on north side of site.



Looking east-southeast across the site. NW 23rd Avenue is in the foreground.



NOTES:

ONE MONITORING WELL OBSERVED. LOCATED APPROXIMATELY 15' N AND 5' E OF SW CORNER OF LOT

STORM DRAIN LOCATED AT NE CORNER OF LOT

MULTIPLE ACCESS COVERS ACCROSS SITE

TERRA VAC

ROSE'S PARKING LOT
PORTLAND, OREGON

AREA MAP

DESIGNED BY:	CHECKED BY:	PROJECT #	FIGURE #
P. BIANCO	P. CATTERALL	32-0029	1
DRAWN BY:	**PROJECT MANAGER:**	**DATE:**	**SCALE:**
P. BIANCO	P. BIANCO	12-15-00	N.T.S.

TV-SEA\PROJECT # 32-0029\0029 CSM F1.DWG

RBDM APPENDIX A - SOIL RBCs

26-94-0025

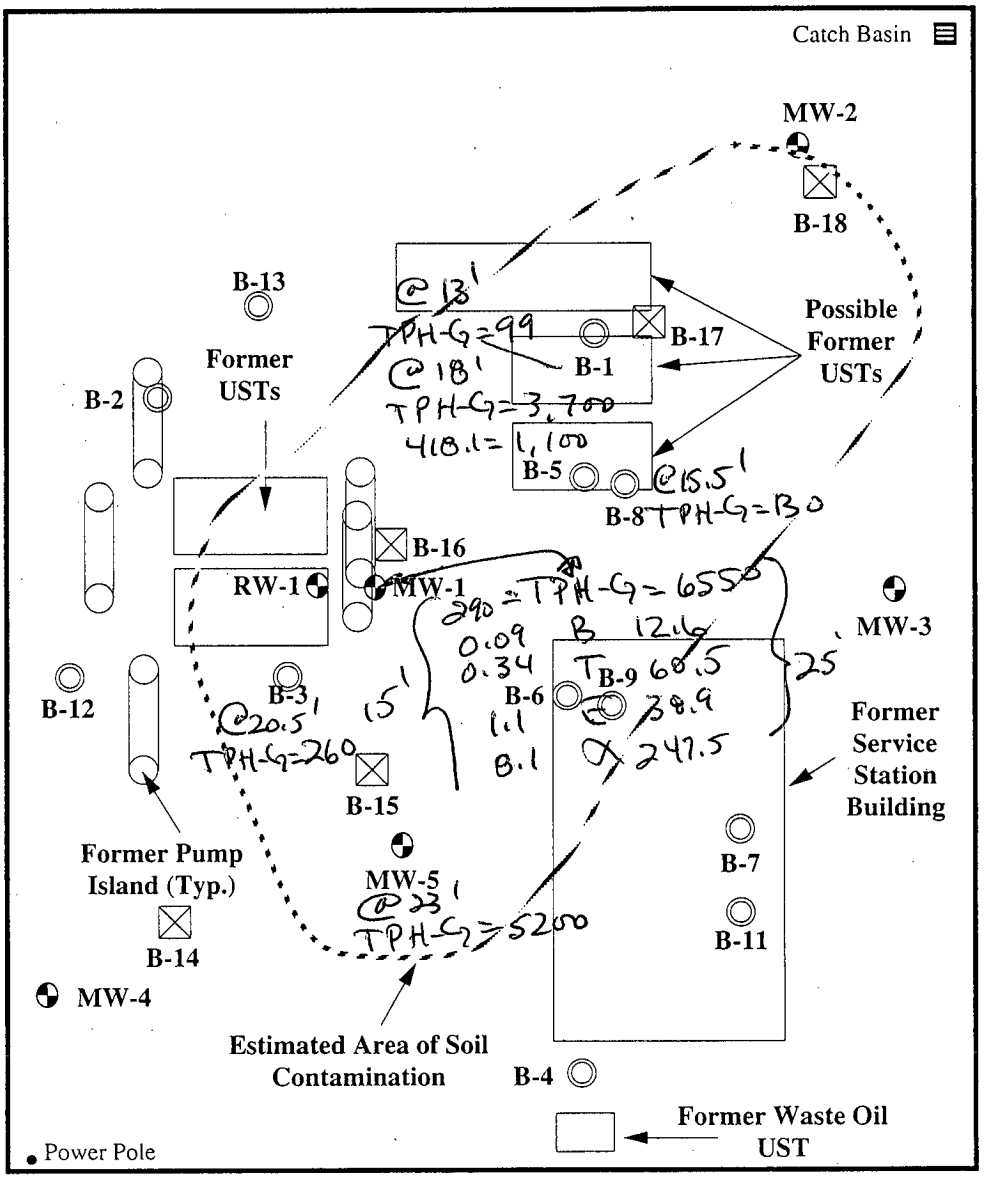
Project Name: Rose's Parking Lot Sample ID: Maximum Concentration - Before Remediation

Constituent	Sample Concentration	Soil RBCs													
		Residential				Urban Residential				Occupational Values				Const Wkr	Excav Wkr
		V to OA	VI into B	SSI,D,I	Leachate	V to OA	VI into B	SSI,D,I	Leachate	V to OA	VI into B	SSI,D,I	Leachate	SSI,D,I	SSI,D,I
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Benzene MW-1/25' [G,D]	12.6	8.5	0.068	6.9	**0.0084**	18	0.15	21	0.017	48	1.2	34	0.052	340	9,400
Toluene MW-1/25'	60.5	-	180	2,600	**44**	-	180	5,300	**44**	-	-	68,000	180	39,000	-
Ethylbenzene MW-1/25'	38.9	-	-	4,000	**160**	-	-	8,100	**160**	-	-	74,000	-	28,000	[redacted]
Xylenes MW-1/25'	247.5	-	110	790	**25**	-	110	1,600	**25**	-	-	24,000	100	19,000	-
Naphthalene [G,D]		240	290	34	**3.8**	240	290	67	**3.8**	-	-	770	15	710	20,000
MTBE [G]		130	2.1	150	**0.050**	270	4.4	500	0.10	720	35	760	0.30	9,000	-
EDB (1,2-dibromoethane)		0.30	0.022	0.0074	**8.2E-06**	0.64	0.047	0.020	0.000014	1.7	0.37	0.033	0.000059	0.25	7.1
EDC (1,2-dichloroethane)		2.5	0.033	2.9	**0.0012**	5.4	0.071	9.9	0.0025	14	0.56	15	0.0074	180	5,000
iso-propylbenzene [G]		-	-	**2,300**	-	-	-	4,500	-	-	-	51,000	-	24,000	-
n-propylbenzene		-	-	**840**	-	-	-	1,700	-	-	-	19,000	-	9,300	-
1,2,4-trimethylbenzene		200	70	48	**14**	200	70	97	**14**	790	840	1,500	55	1,400	40,000
1,3,5-trimethylbenzene		200	12	48	**3.1**	200	12	97	**3.1**	-	140	1,500	12	1,400	40,000
Acenaphthene [D]		-	-	**2,900**	-	-	-	5,900	-	-	-	41,000	-	16,000	-
Anthracene		-	-	**21,000**	-	-	-	41,000	-	-	-	-	-	90,000	-
Benz[a]anthracene		-	-	**0.62**	9.3	-	-	1.7	16	-	-	2.7	-	21	590
Benzo[b]fluoranthene		-	-	**0.62**	-	-	-	1.7	-	-	-	2.7	-	21	590
Benzo[k]fluoranthene		-	-	**6.2**	-	-	-	17	-	-	-	27	-	210	5,9[redacted]
Benzo[a]pyrene		-	-	**0.062**	2.4	-	-	0.17	4.1	-	-	0.27	-	2.1	59
Chrysene		-	-	**62**	-	-	-	170	-	-	-	270	-	2,100	59,000
Dibenz[a,h]anthracene		-	-	**0.062**	-	-	-	0.17	-	-	-	0.27	-	2.1	59
Fluoranthene		-	-	**2,300**	-	-	-	4,600	-	-	-	29,000	-	8,900	-
Fluorene		-	-	**2,600**	-	-	-	5,200	-	-	-	35,000	-	12,000	-
Indeno[1,2,3-cd]pyrene		-	-	**0.62**	-	-	-	1.7	-	-	-	2.7	-	21	590
Pyrene		-	-	**1,700**	-	-	-	3,400	-	-	-	21,000	-	6,700	-
Lead [G]		-	-	400	**30**	-	-	400	**30**	-	-	750	**30**	750	750
25' Generic Gasoline MW-1	6550	4,500	140	720	**26**	4,500	140	1500	**26**	80,000	-	22,000	110	13,000	-
18' Generic Diesel B-1	1,150	-	-	3,900	**2,800**	-	-	8,300	**2,800**	-	-	70,000	-	23,000	-
Generic Insulating Oil		-	-	**9,800**	-	-	-	20,000	-	-	-	-	-	40,000	-

N.W. FLANDERS STREET

N

N. W. 23RD AVENUE



LEGEND	
	Existing Recovery or Monitoring Well
	Soil Boring
	Soil Probe Locations

Notes:
(1) Base map from GeoEngineers report: "Subsurface Assessment Rose's Parking Lot Portland, Oregon" August 28, 1995. Site Plan, Figure 2

SCALE (Approximate ft.)

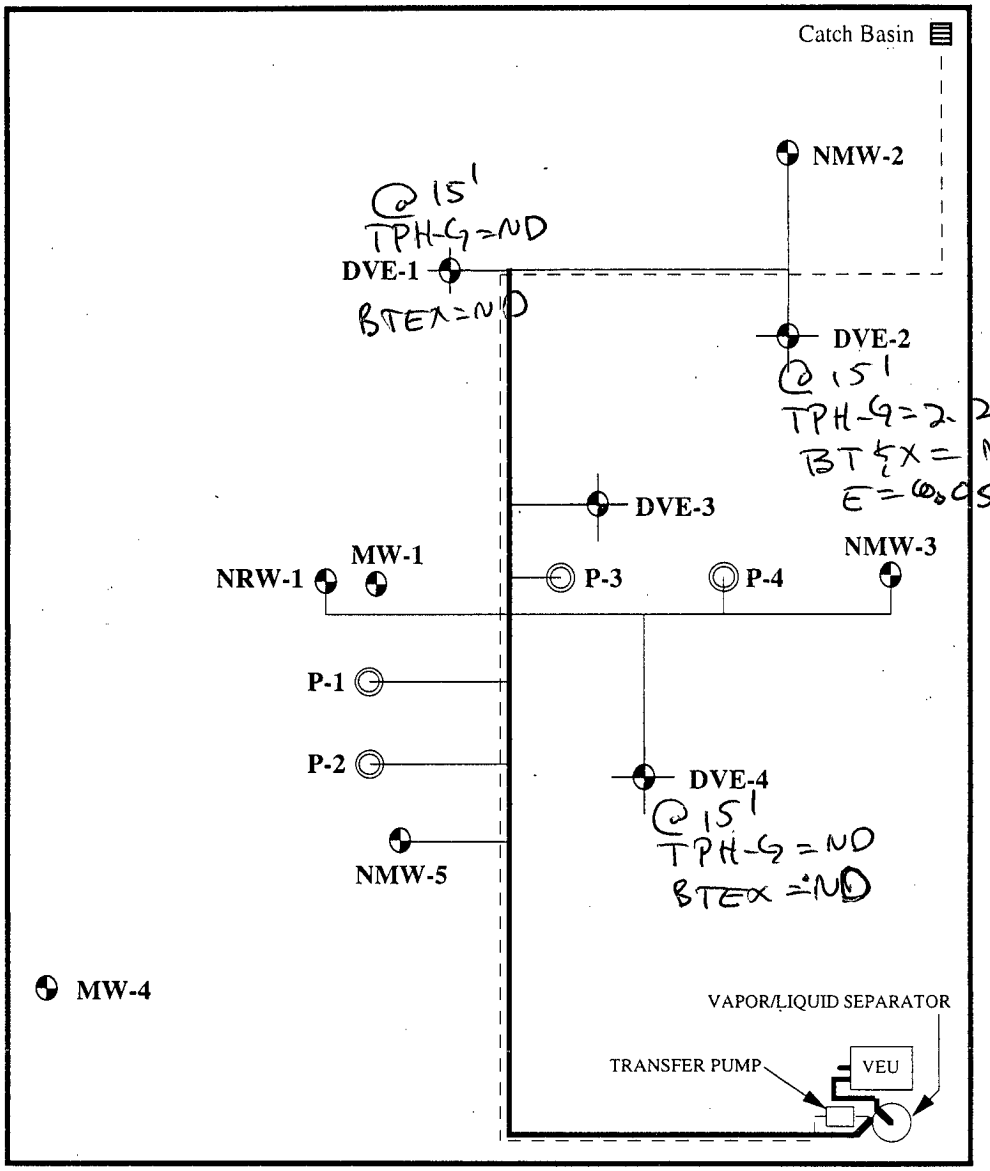
0 20 40

SITE MAP	Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon	TERRA VAC	Project No.	32-0029	Figure 1
			Date	August 29, 2000	
			Scale	1 Inch = 20 Feet	
			Revision		

N.W. FLANDERS STREET

N

N. W. 23RD AVENUE



LEGEND

- DVE Well (Former Monitoring Well)
- DVE Well
- SVE Well (Former Observation Well)
- 1-1/2" Water Discharge Pipe
- 1-1/2" DVE Branch Pipe
- 6" DVE Header Pipe

Notes:
(1) Base map from GeoEngineers report:
"Subsurface Assessment
Rose's Parking Lot Portland, Oregon"
August 28, 1995. Site Plan, Figure 2

SCALE (Approximate ft.)

0 20 40

REMEDIATION WELL LOCATIONS AND SYSTEM CONFIGURATION	ROSE'S PARKING LOT 330 NW 23RD AVENUE PORTLAND, OREGON	TERRA VAC	PROJECT NO. 32-0029 Date March 16, 1998 Scale 1 Inch = 20 Feet Revision PVB -3	Figure 3

TERRA VAC

TABLE 1
SOIL ANALYTICAL RESULTS
Rose's Parking Lot

LOCATION	DEPTH (Feet bgs)	DATE	TPH-gas (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	m,p-Xylene (mg/kg)	o-Xylene (mg/kg)	Naphthalene (mg/kg)
B-14	14.5	8/7/00	ND	ND	ND	ND	ND	ND	ND
B-15	13.5	8/7/00	ND	ND	ND	ND	ND	ND	ND
B-16	2.5	8/7/00	ND	ND	ND	ND	ND	ND	ND
B-17	13.5	8/7/00	890	ND	ND	0.38	4.0	1.2	NA
B-17	17.5	8/7/00	22,000	4.5	37	140	600	280	34
B-18	16.0	8/7/00	ND	ND	ND	ND	ND	ND	ND

NOTES:
1) bgs = Below Ground Surface
2) ND = Not Detected
3) mg/kg = milligrams per kilogram
4) NA = Not Analyzed
5) TPH-gas = Total Petroleum Hydrocarbons in the Gasoline Range

Table 2

TERRA VAC

Summary of Analytical Results for Soil Samples
Rose's Parking Lot
Portland, Oregon

Sample/ Boring Identification	Sampling Date	Sampling Depth (Feet bgs.)	Analytical Results (mg/Kg)									Flashpoint	Field Screening Results[2]	
			ODEQ Method TPH-HCID			ODEQ TPH-G	ODEQ TPH-418.1M	EPA Method 8020					Headspace Vapor (ppm)	Sheen
			Gasoline	Diesel	Oil	Gasoline	Diesel/Oil	Benzene	Toluene	Ethylbenzene	Xylenes			
B-1	1/3/1994	13.0	NA	NA	NA	99	NA	NA	NA	NA	NA	NA	NA	NA
B-1	1/3/1994	18.0	Detected	Detected	ND<100	3,700	1,100	NA	NA	NA	NA	NA	NA	NA
B-1	1/3/1994	25.5	ND<20	ND<50	ND<100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-2	1/3/1994	10.5	ND<20	ND<50	ND<100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-3	1/3/1994	10.5	NA	NA	NA	ND<5	NA	NA	NA	NA	NA	NA	NA	NA
B-3	1/3/1994	20.5	NA	NA	NA	260	NA	NA	NA	NA	NA	NA	NA	NA
B-3	1/3/1994	28.0	ND<20	ND<50	ND<100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-4	1/3/1994	10.5	ND<20	ND<50	ND<100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-5	9/28/1994	5.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-6	9/28/1994	5.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-7	9/28/1994	5.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-8	5/11/1995	15.5	>20	>50[1]	NO	130	NA	NA	NA	NA	NA	NA	160	MS
B-8	5/11/1995	23.0	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	>10,000	HS
B-9	5/11/1995	23.0	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	340	SS
B-11	5/12/1995	20.5	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	<100	NS
B-12	5/12/1995	20.5	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	<100	SS
B-13	5/12/1995	15.5	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	110	SS
B-13	5/12/1995	23.0	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	120	SS
MW-1	3/23/1994	15.0	NA	NA	NA	290	NA	0.09	0.34	1.1	8.1	NA	NA	NA
MW-1	3/23/1994	25.0	POS. ID	POS. ID[3]	<200	6,550	NA	12.6	60.5	38.9	247.5	88°F	NA	NA
MW-2	3/23/1994	15.0	NA	NA	NA	85	NA	<0.05	0.07	0.12	0.33	NA	NA	NA
MW-2	3/23/1994	25.0	NA	NA	NA	NA	NA	<0.05	<0.05	0.07	<0.05	NA	NA	NA
MW-3	3/23/1994	20.0	NA	NA	NA	NA	NA	<0.05	<0.05	<0.05	<0.05	NA	NA	NA
MW-4	9/28/1994	5.0	ND	POS. ID[4]	ND	NA	52.2	NA	NA	NA	NA	NA	NA	NA
MW-4	9/28/1994	20.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-5	5/11/1995	23.0	>20	>50[1]	NO	5,200	NA	NA	NA	NA	NA	NA	>10,000	HS
R-1	11/2/1995	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<100	NS
R-1	11/2/1995	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<100	SS
R-1	11/2/1995	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<100	SS
R-1	11/2/1995	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,600	HS
R-1	11/2/1995	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>10,000	HS
R-1	11/2/1995	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,100	NS

Table 2

Summary of Analytical Results for Soil Samples
Rose's Parking Lot
Portland, Oregon

Sample/ Boring Identification	Sampling Date	Sampling Depth (Feet bgs.)	Analytical Results (mg/Kg)									Flashpoint	Field Screening Results[2]	
			ODEQ Method TPH-HCID			ODEQ TPH-G	ODEQ TPH-418.1M	EPA Method 8020					Headspace Vapor (ppm)	Sheen
			Gasoline	Diesel	Oil	Gasoline	Diesel/Oil	Benzene	Toluene	Ethylbenzene	Xylenes			
DVE-1	1/24/1997	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-1	1/24/1997	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-1	1/24/1997	15.0	NA	NA	NA	ND	NA	ND	ND	ND	ND	NA	41	NS
DVE-1	1/24/1997	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	23	NS
DVE-1	1/24/1997	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	18	NS
DVE-1	1/24/1997	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-1	1/24/1997	35.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-2	1/24/1997	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	NS
DVE-2	1/24/1997	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	NS
DVE-2	1/24/1997	15.0	NA	NA	NA	2.23	NA	ND	ND	0.0565	ND	NA	100	NS
DVE-2	1/24/1997	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	40	NS
DVE-2	1/24/1997	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	22	NS
DVE-2	1/24/1997	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-3	1/24/1997	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1900	NS
DVE-3	1/24/1997	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	47	NS
DVE-3	1/24/1997	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	73	NS
DVE-3	1/24/1997	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20	NS
DVE-3	1/24/1997	35.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4	NS
DVE-4	1/24/1997	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5	NS
DVE-4	1/24/1997	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5	NS
DVE-4	1/24/1997	15.0	NA	NA	NA	ND	NA	ND	ND	ND	ND	NA	8	NS
DVE-4	1/24/1997	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	311	NS
DVE-4	1/24/1997	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1600	NS
DVE-4	1/24/1997	38.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4	NS

Notes:

bgs	Below Ground Surface
NA	Not Analyzed
NO	Not Observed
ND	Not Detected Above Detection Limit Indicated in Original Reports
mg/Kg	Milligrams per Kilogram
ODEQ	Oregon Department of Environmental Quality
TPH	Total Petroleum Hydrocarbons
ppm	Parts per Million

1. The laboratory reported that diesel-range hydrocarbons identified in the sample were the result of an overlap from the gasoline-range; therefore, diesel-range hydrocarbons were not quantified.
2. NS = No Sheen, SS = Slight Sheen, MS = Moderate Sheen, HS = Heavy Sheen
3. Peaks in the gasoline range extend into the diesel range
4. Peaks were present within the retention time window of the listed petroleum hydrocarbon, but the peak patterns indicate the presence of low level heavy oils extending into the diesel range.

26-94-0025

Depth to Water 23 feet

RBDM APPENDIX A - GROUND WATER & AIR RBCs

10-29-98

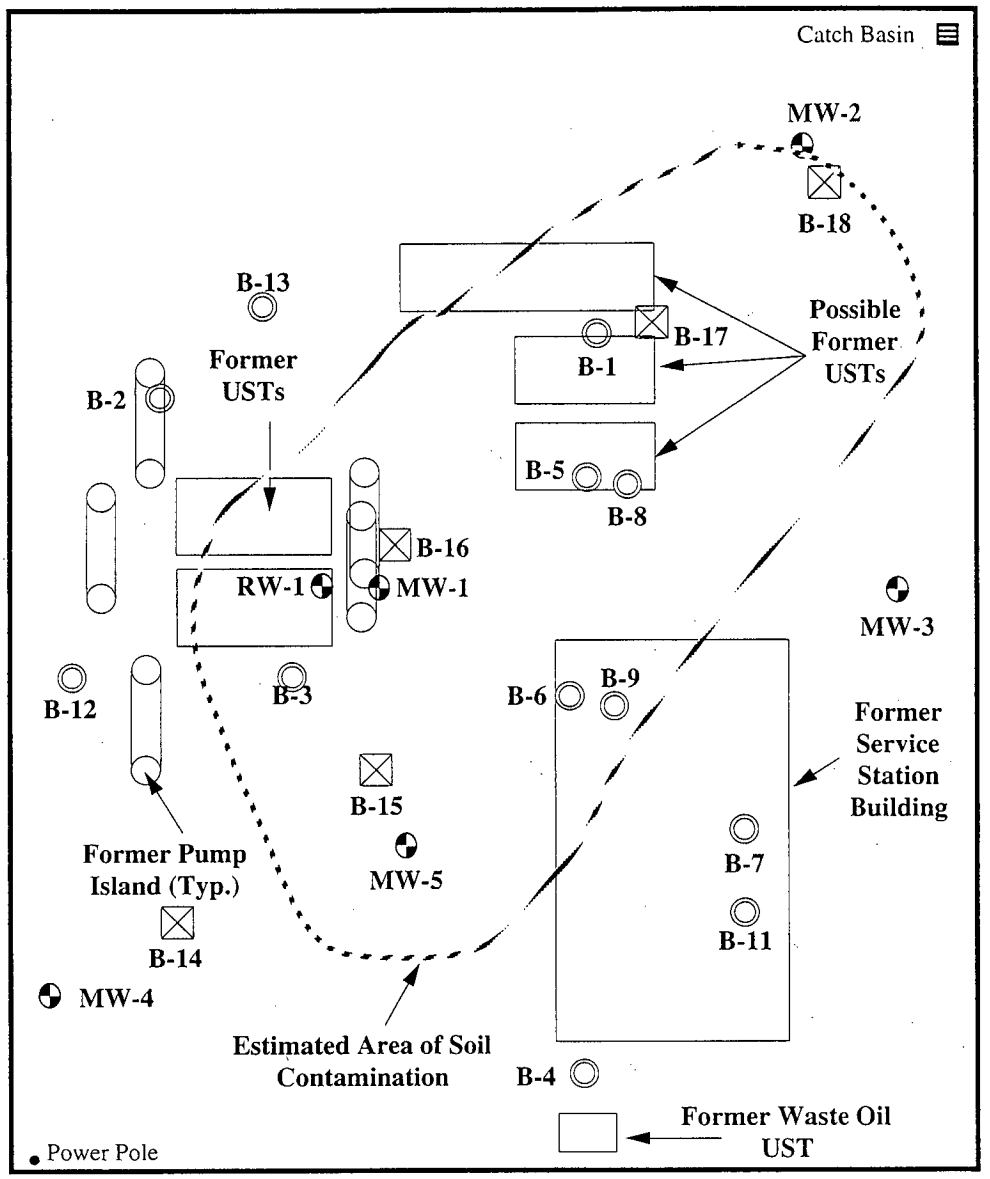
Project Name: Rose's Parking Lot Sample ID: Maximum Concentration

Constituent	Sample Concentration	Ground Water RBCs										Air RBCs		
		Residential			Urban Residential			Occupational			E & C Wkr	Res.	U. Res.	Occ.
		Tapwater	V to OA	VI into B	Tapwater.	V to OA	VI into B	Tapwater	V to OA	VI into B	GW in Exc	Inhalation	Inhalation	Inhalation
	ppb or µg/m³	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	µg/m³	µg/m³	µg/m³
Benzene MW-5 G,D	21.8	**0.35**	2,400	160	0.70	5,100	340	2.2	13,000	2,700	1,700	**0.27**	0.57	1.5
Toluene MW-5	57.0	**720**	-	210,000	**720**	-	210,000	2,900	-	-	78,000	**400**	**400**	1,600
Ethylbenzene MW-5	101	**1,300**	-	-	**1,300**	-	-	5,400	-	-	110,000	**1,100**	**1,100**	4,2
Xylenes MW-1	1,120	**210**	-	59,000	**210**	-	59,000	820	-	-	22,000	**110**	**110**	420
Naphthalene MW-1 G,D	516	**6.2**	-	29,000	**6.2**	-	29,000	25	-	-	680	**3.1**	**3.1**	13
MTBE G		**6.4**	96,000	17,000	13	210,000	36,000	38	550,000	280,000	31,000	**4.0**	8.5	23
EDB (1,2-dibromoethane)		**0.00064**	440	110	0.0011	940	230	0.0046	2,500	1,800	20	**0.0093**	0.020	0.053
EDC (1,2-dichloroethane)		**0.13**	1,600	210	0.26	3,400	460	0.75	9,000	3,600	600	**0.079**	0.17	0.45
iso-propylbenzene G		**660**	-	-	**660**	-	-	2,600	-	-	-	**400**	**400**	1,600
n-propylbenzene		**240**	-	-	**240**	-	-	970	-	-	-	**150**	**150**	580
1,2,4-trimethylbenzene		**12**	-	4,300	**12**	-	4,300	49	-	51,000	1,300	**6.2**	**6.2**	25
1,3,5-trimethylbenzene		**12**	-	3,200	**12**	-	3,200	49	-	38,000	1,400	**6.2**	**6.2**	25
Acenaphthene D		**370**	-	-	**370**	-	-	1,500	-	-	-	**220**	**220**	880
Anthracene		**1,800**	-	-	**1,800**	-	-	7,300	-	-	-	**1,100**	**1,100**	4,400
Benz[a]anthracene		**0.078**	-	-	0.13	-	-	0.56	-	-	9.1	**0.0098**	0.021	0.056
Benzo[b]fluoranthene		**0.078**	-	-	0.13	-	-	0.56	-	-	-	**0.0098**	0.021	0.056
Benzo[k]fluoranthene		**0.78**	-	-	1.3	-	-	5.6	-	-	-	**0.098**	0.21	0.5
Benzo[a]pyrene		**0.0078**	-	-	0.013	-	-	0.056	-	-	0.53	**0.00098**	0.0021	0.0056
Chrysene		**7.8**	-	-	13	-	-	56	-	-	-	**0.98**	2.1	5.6
Dibenz[a,h]anthracene		**0.0078**	-	-	0.013	-	-	0.056	-	-	0.21	**0.00098**	0.0021	0.0056
Fluoranthene		**1,500**	-	-	**1,500**	-	-	5,800	-	-	-	**150**	**150**	580
Fluorene		**240**	-	-	**240**	-	-	970	-	-	-	**150**	**150**	580
Indeno[1,2,3-cd]pyrene		**0.078**	-	-	0.13	-	-	0.56	-	-	-	**0.0098**	0.021	0.056
Pyrene		**1,100**	-	-	**1,100**	-	-	4,400	-	-	-	**110**	**110**	440
Lead Dissolved Pb G	490	**15**	-	-	**15**	-	-	**15**	-	-	-	-	-	-
Generic Gasoline MW-1	27,900	**100**	-	-	**100**	-	-	400	-	-	12,000	**650**	**650**	2,600
Generic Diesel		**88**	-	-	**88**	-	-	350	-	-	-	**120**	**120**	490
Generic Insulating Oil		**290**	-	-	**290**	-	-	1,100	-	-	-	**490**	**490**	2,000

N.W. FLANDERS STREET

N

N. W. 23RD AVENUE



LEGEND	
	Existing Recovery or Monitoring Well
	Soil Boring
	Soil Probe Locations

Notes:
(1) Base map from GeoEngineers report: "Subsurface Assessment Rose's Parking Lot Portland, Oregon" August 28, 1995. Site Plan, Figure 2

SCALE (Approximate ft.)

0 20 40

SITE MAP	Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon	TERRA VAC	Project No.	32-0029	Figure 1
			Date	August 29, 2000	
			Scale	1 Inch = 20 Feet	
			Revision		

Table 3

TERRA VAC

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		NLE	5	1,000	700	10,000	Napthalene = 28	5
MW-1	3/29/1994	NA	130	390	98	1,570	NA	NA
	10/4/1994	NA	27	46	6	70	NA	NA
	5/12/1995	NA	NA	NA	NA	NA	NA	NA
	1/4/1996	54,000	400	2,200	630	4,800	Naphthalene - 370 Acenaphthylene - 44	100
	4/24/1996	NA	NA	NA	NA	NA	NA	NA
	7/11/1996	81,000	710	1,800	730	2	Naphthalene - 750 Acenaphthylene - 160 Phenanthrene - 2.2 Fluoranthene - 4.5	NA
	11/3/1996	23,000	410	1,500	910	4,100	Naphthalene - 2,400 Acenaphthylene - 460 Acenaphthene -600 Fluorene - 12 Phenanthrene - 12 Anthracene - 0.89 Fluoranthene - 10 Pyrene - 2.1 Benzo(a)anthracene - 0.7 Chrysene - 1.3 Benzo(k)fluoranthene - 0.1 Benzo(a)pyrene - 0.3 Dibenzo(a,h)anthracene - 0.1 Benzo(g,h,i)perylene - 0.4	NA
	2/28/97*	57,200	1,130	3,890	1,220	7,430	Naphthalene - 760	20
	5/29/1997	14,900	65.9	49.3	205	1,010	NA	NA
	9/5/1997	14,600	10.9	11.8	47.3	642	Naphthalene - 54.2	NA
	12/31/1997	2960	ND	ND	ND	8.76	NA	NA
	5/18/1998	16,000	ND	7.63	ND	930	Naphthalene - 387	2,000
	7/31/1998	19,600	6.00	6.54	ND	1,020	Naphthalene - 104	787
	10/29/1998	27,900	13.90	ND	9.13	1,120	Naphthalene - 516	490

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		NLE	5	1,000	700	10,000	Napthalene = 28	5
NMW-2	3/29/1994	NA	4.9	1.4	0.7	3.0	NA	NA
	10/4/1994	NA	ND	ND	ND	ND	NA	NA
	5/12/1995	ND	1.2	ND	0.6	0.7	NA	NA
	1/4/1996	1,600	14	1.5	ND	1.7	ND	ND
	4/24/1996	NA	7.7	0.5	ND	ND	NA	NA
	7/11/1996	7,100	2.7	ND	ND	ND	ND	NA
	11/3/1996	ND	2.0	ND	ND	ND	NA	NA
	2/28/1997	ND	ND	ND	ND	ND	NA	NA
	5/29/1997	ND	ND	ND	ND	ND	NA	NA
	9/5/1997	ND	ND	ND	ND	ND	NA	NA
	12/31/1997	ND	ND	ND	ND	ND	NA	NA
	5/18/1998	ND	ND	ND	ND	ND	NA	NA
	7/31/1998	203	ND	ND	ND	ND	NA	NA
	10/29/1998	128	ND	ND	ND	ND	NA	NA
NMW-3	3/29/1994	NA	2,300	1,200	1,200	3,700	NA	NA
	10/4/1994	NA	1,520	600	790	1,600	NA	NA
	5/12/1995	3,500	1,300	740	800	2,000	Naphthalene - 130 Fluorene - 0.2 Phenanthrene - 0.09	NA
	1/4/1996	4,500	1,300	640	940	2,600	Naphthalene - 180 Acenaphthylene - 23	6
	4/16/1996	NA	900	500	600	1,400	NA	NA
	7/11/1996	2,100	460	130	380	430	Naphthalene - 71	NA
	11/3/1996	4,900	830	220	650	1,100	Naphthalene - 120 Acenaphthylene - 37	
	2/28/1997	4,400	261	124	153	404	Naphthalene - 32.6	NA
	5/29/1997	365	17.4	0.91	3.55	15.3	NA	NA
	9/5/1997	ND	ND	ND	ND	ND	NA	NA
	12/31/1997	ND	ND	ND	ND	ND	NA	NA
	5/18/1998	299	4.53	ND	9.26	ND	Naphthalene - 0.173	1.5
	7/31/1998	223	4.14	ND	4.68	ND	NA	NA
	10/29/1998	458	2.70	0.565	3.09	ND	NA	NA

Table 3

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		NLE	5	1,000	700	10,000	Napthalene = 28	5
MW-4	10/4/1994	NA	ND	ND	ND	ND	NA	NA
	5/12/1995	ND	ND	ND	ND	ND	NA	NA
	1/4/1996	900	ND	ND	ND	ND	ND	ND
	4/24/1996	NA	ND	ND	ND	ND	NA	NA
	7/11/1996	ND	ND	ND	ND	ND	NA	NA
	11/3/1996	NA	ND	ND	ND	ND	NA	NA
	2/28/1997	ND	0.7	ND	ND	ND	NA	NA
	5/29/1997	ND	ND	ND	ND	ND	NA	NA
	9/5/1997	ND	ND	ND	ND	ND	NA	NA
	12/31/1997	ND	ND	ND	ND	ND	NA	NA
	5/18/1998	ND	ND	ND	ND	ND	NA	NA
	7/31/1998	ND	ND	ND	ND	ND	NA	NA
	10/29/1998	ND	ND	ND	ND	ND	NA	NA
NMW-5	5/12/1995	13,000	660	13,000	1,900	11,000	Naphthalene - 450 Acenaphthylene - 66 Fluorene - 0.6 Phenanthrene - 0.42 Anthracene - 0.07	NA
	1/4/1996	6,600	4.6	22	24	230	Naphthalene - 29 Acenaphthylene - 13 Fluorene - 0.8	14
	4/24/1996	NA	ND	0.6	1.1	2.9	NA	NA
	7/11/1996	ND	ND	ND	ND	2.7	NA	NA
	11/3/1996	NA	ND	ND	2.5	5.6	NA	NA
	2/28/1997	5,440	70.3	23.5	88.6	230	Naphthalene - 28.5	NA
	5/29/1997	4,480	34.9	156	7.90	554	NA	NA
	9/5/1997	5,550	39.0	334	23.5	642	ND	NA
	12/31/1997	18,300	62.6	570	231.0	1,570	NA	NA
	5/18/1998	1,050	ND	ND	0.895	14	Naphthalene - 4.87	1.2
	7/31/1998	3,310	26.8	53.6	50.0	268	NA	NA
	10/29/1998	6,840	21.8	57.0	101	284	NA	NA

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		NLE	5	1,000	700	10,000	Napthalene = 28	5
MW-6	4/24/1996	ND	ND	ND	ND	ND	NA	ND
	7/11/1996	ND	ND	ND	ND	ND	NA	NA
	11/3/1996	NA	ND	ND	ND	ND	NA	NA
	2/28/1997	ND	ND	ND	ND	ND	NA	NA
	5/29/1997	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	102	ND	ND	ND	ND	NA	NA
	10/2/97***	NA	NA	NA	NA	NA	NA	NA
	12/31/1997	ND	ND	ND	ND	ND	NA	NA
	5/18/1998	NA	NA	NA	NA	NA	NA	NA
	7/31/1998	NA	NA	NA	NA	NA	NA	NA
	10/29/1998	NA	NA	NA	NA	NA	NA	NA
MW-7	4/24/1996	ND	ND	ND	ND	ND	NA	ND
	7/11/1996	ND	ND	ND	ND	ND	NA	NA
	11/3/1996	NA	ND	ND	ND	ND	NA	NA
	2/28/1997	ND	ND	ND	ND	ND	NA	NA
	5/29/1997	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	110	12	ND	ND	ND	NA	NA
	10/2/1997	ND	ND	ND	ND	ND	NA	NA
	12/31/1997	ND	ND	ND	ND	ND	NA	NA
	5/18/1998	NA	NA	NA	NA	NA	NA	NA
	7/31/1998	NA	NA	NA	NA	NA	NA	NA
	10/29/1998	NA	NA	NA	NA	NA	NA	NA

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-8	4/24/1996	ND	ND	ND	ND	ND	NA	ND
	7/11/1996	ND	ND	ND	ND	ND	NA	NA
	11/3/1996	NA	ND	ND	ND	ND	NA	NA
	2/28/1997	ND	ND	ND	ND	ND	NA	NA
	5/29/1997	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	111	ND	ND	ND	ND	NA	NA
	10/1/1997	ND	ND	ND	ND	ND	NA	NA
	12/31/1997	ND	ND	ND	ND	ND	NA	NA
	5/18/1998	NA	NA	NA	NA	NA	NA	NA
	7/31/1998	NA	NA	NA	NA	NA	NA	NA
	10/29/1998	NA	NA	NA	NA	NA	NA	NA

Notes:

Sampling between 3/29/94 and 11/3/96 performed by GeoEngineers. Data from 1/21/97 Groundwater Report.

Wells MW-2, MW-3, and MW-5 redrilled 1/23-1/25/97, and renamed NMW-2, NMW-3, and NMW-5 respectively.

* MW-1 sampled for lead 12/11/96.

** Sample Results were suspect. Well Resampled on 10/1/97 or 10/2/97

*** Well was dry. No analytical sample taken.

PAHs polycyclic aromatic hydrocarbons. Only analytes detected are listed. Refer to analytical results (Appendix A) for a complete list of analytes and their respective detection limits.

ug/L Micrograms per liter, or parts per billion

ND Not Detected at the reporting limits

NA Not Analyzed

TPH-G Total petroleum hydrocarbons within the gasoline range (benzene to naphthalene).

Remediation = 159 Days operation of Dual Vaccum Extraction System

RBDM APPENDIX A - SOIL RBCs

26-94-0025

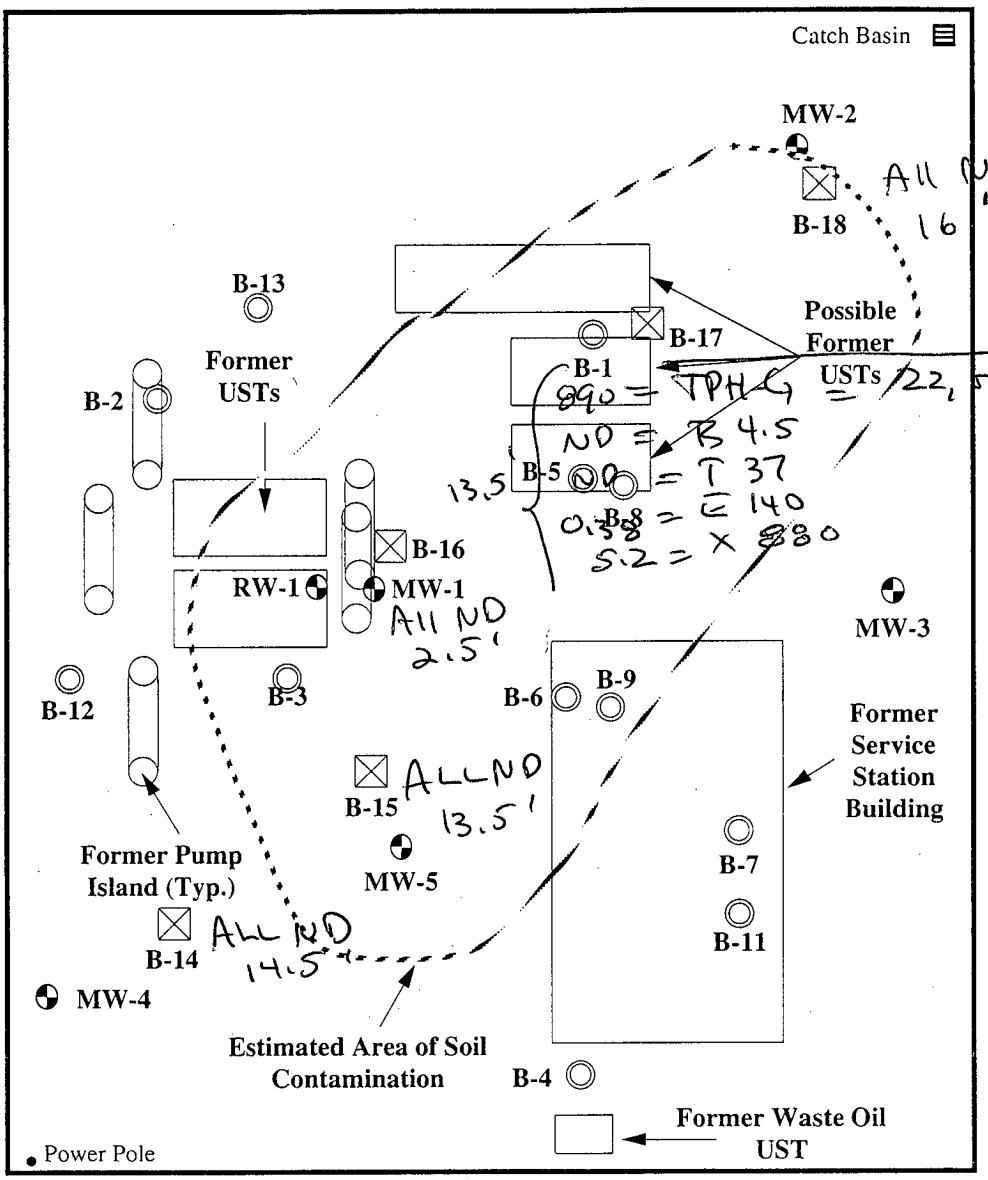
Project Name: Rose's Parking Lot Sample ID: Maximum Concentration Following Remediation

Constituent	Sample Concentration	Soil RBCs													
		Residential				Urban Residential				Occupational Values				Const Wkr	Excav Wkr
		V to OA	VI into B	SSI,D,I	Leachate	V to OA	VI into B	SSI,D,I	Leachate	V to OA	VI into B	SSI,D,I	Leachate	SSI,D,I	SSI,D,I
	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Benzene B-17 G,D	4.5	8.5	0.068	6.9	**0.0084**	18	0.15	21	0.017	48	1.2	34	0.052	340	9,400
Toluene B-17	37	-	180	2,600	**44**	-	180	5,300	**44**	-	-	68,000	180	39,000	-
Ethylbenzene B-17	140	-	-	4,000	**160**	-	-	8,100	**160**	-	-	74,000	-	28,000	-
Xylenes B-17	880	-	110	790	**25**	-	110	1,600	**25**	-	-	24,000	100	19,000	-
Naphthalene G,D	34	240	290	34	**3.8**	240	290	67	**3.8**	-	-	770	15	710	20,000
MTBE G	/	130	2.1	150	**0.050**	270	4.4	500	0.10	720	35	760	0.30	9,000	-
EDB (1,2-dibromoethane)		0.30	0.022	0.0074	**8.2E-06**	0.64	0.047	0.020	0.000014	1.7	0.37	0.033	0.000059	0.25	7.1
EDC (1,2-dichloroethane)		2.5	0.033	2.9	**0.0012**	5.4	0.071	9.9	0.0025	14	0.56	15	0.0074	180	5,000
iso-propylbenzene G		-	-	**2,300**	-	-	-	4,500	-	-	-	51,000	-	24,000	-
n-propylbenzene		-	-	**840**	-	-	-	1,700	-	-	-	19,000	-	9,300	-
1,2,4-trimethylbenzene		200	70	48	**14**	200	70	97	**14**	790	840	1,500	55	1,400	40,000
1,3,5-trimethylbenzene		200	12	48	**3.1**	200	12	97	**3.1**	-	140	1,500	12	1,400	40,000
Acenaphthene D	0.13	-	-	**2,900**	-	-	-	5,900	-	-	-	41,000	-	16,000	-
Anthracene	ND	-	-	**21,000**	-	-	-	41,000	-	-	-	-	-	90,000	-
Benz[a]anthracene	ND	-	-	**0.62**	9.3	-	-	1.7	16	-	-	2.7	-	21	590
Benzo[b]fluoranthene	ND	-	-	**0.62**	-	-	-	1.7	-	-	-	2.7	-	21	590
Benzo[k]fluoranthene	ND	-	-	**6.2**	-	-	-	17	-	-	-	27	-	210	5,9
Benzo[a]pyrene	ND	-	-	**0.062**	2.4	-	-	0.17	4.1	-	-	0.27	-	2.1	59
Chrysene	ND	-	-	**62**	-	-	-	170	-	-	-	270	-	2,100	59,000
Dibenz[a,h]anthracene	ND	-	-	**0.062**	-	-	-	0.17	-	-	-	0.27	-	2.1	59
Fluoranthene	ND	-	-	**2,300**	-	-	-	4,600	-	-	-	29,000	-	8,900	-
Fluorene	0.061	-	-	**2,600**	-	-	-	5,200	-	-	-	35,000	-	12,000	-
Indeno[1,2,3-cd]pyrene	ND	-	-	**0.62**	-	-	-	1.7	-	-	-	2.7	-	21	590
Pyrene	0.075	-	-	**1,700**	-	-	-	3,400	-	-	-	21,000	-	6,700	-
Lead G		-	-	400	**30**	-	-	400	**30**	-	-	750	**30**	750	750
Generic Gasoline B-17	22,000	4,500	140	720	**26**	4,500	140	1500	**26**	80,000	-	22,000	110	13,000	-
Generic Diesel		-	-	3,900	**2,800**	-	-	8,300	**2,800**	-	-	70,000	-	23,000	-
Generic Insulating Oil		-	-	**9,800**	-	-	-	20,000	-	-	-	-	-	40,000	-

N.W. FLANDERS STREET

N

N. W. 23RD AVENUE



LEGEND	
	Existing Recovery or Monitoring Well
	Soil Boring
	Soil Probe Locations

Notes:
(1) Base map from GeoEngineers report: "Subsurface Assessment Rose's Parking Lot Portland, Oregon" August 28, 1995. Site Plan, Figure 2

SCALE (Approximate ft.)

0 20 40

SITE MAP	Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon	TERRA VAC	Project No.	32-0029	Figure 1
			Date	August 29, 2000	
			Scale	1 Inch = 20 Feet	
			Revision		

TERRA VAC

TABLE 1
SOIL ANALYTICAL RESULTS
Rose's Parking Lot

LOCATION	DEPTH (Feet bgs)	DATE	TPH-gas (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	m,p-Xylene (mg/kg)	o-Xylene (mg/kg)	Naphthalene (mg/kg)
B-14	14.5	8/7/00	ND	ND	ND	ND	ND	ND	ND
B-15	13.5	8/7/00	ND	ND	ND	ND	ND	ND	ND
B-16	2.5	8/7/00	ND	ND	ND	ND	ND	ND	ND
B-17	13.5	8/7/00	890	ND	ND	0.38	4.0	1.2	NA
B-17	17.5	8/7/00	22,000	4.5	37	140	600	280	34
B-18	16.0	8/7/00	ND	ND	ND	ND	ND	ND	ND

NOTES:
1) bgs = Below Ground Surface
2) ND = Not Detected
3) mg/kg = milligrams per kilogram
4) NA = Not Analyzed
5) TPH-gas = Total Petroleum Hydrocarbons in the Gasoline Range

TERRA VAC

Table 2

Summary of Analytical Results for Soil Samples
Rose's Parking Lot
Portland, Oregon

Sample/ Boring Identification	Sampling Date	Sampling Depth (Feet bgs.)	Analytical Results (mg/Kg)									Flashpoint	Field Screening Results[2]	
			ODEQ Method TPH-HCID			ODEQ TPH-G	ODEQ TPH-418.1M	EPA Method 8020					Headspace Vapor (ppm)	Sheen
			Gasoline	Diesel	Oil	Gasoline	Diesel/Oil	Benzene	Toluene	Ethylbenzene	Xylenes			
B-1	1/3/1994	13.0	NA	NA	NA	99	NA	NA	NA	NA	NA	NA	NA	NA
B-1	1/3/1994	18.0	Detected	Detected	ND<100	3,700	1,100	NA	NA	NA	NA	NA	NA	NA
B-1	1/3/1994	25.5	ND<20	ND<50	ND<100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-2	1/3/1994	10.5	ND<20	ND<50	ND<100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-3	1/3/1994	10.5	NA	NA	NA	ND<5	NA	NA	NA	NA	NA	NA	NA	NA
B-3	1/3/1994	20.5	NA	NA	NA	260	NA	NA	NA	NA	NA	NA	NA	NA
B-3	1/3/1994	28.0	ND<20	ND<50	ND<100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-4	1/3/1994	10.5	ND<20	ND<50	ND<100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-5	9/28/1994	5.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-6	9/28/1994	5.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-7	9/28/1994	5.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-8	5/11/1995	15.5	>20	>50[1]	NO	130	NA	NA	NA	NA	NA	NA	160	MS
B-8	5/11/1995	23.0	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	>10,000	HS
B-9	5/11/1995	23.0	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	340	SS
B-11	5/12/1995	20.5	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	<100	NS
B-12	5/12/1995	20.5	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	<100	SS
B-13	5/12/1995	15.5	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	110	SS
B-13	5/12/1995	23.0	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	120	SS
MW-1	3/23/1994	15.0	NA	NA	NA	290	NA	0.09	0.34	1.1	8.1	NA	NA	NA
MW-1	3/23/1994	25.0	POS. ID	POS. ID[3]	<200	6,550	NA	12.6	60.5	38.9	247.5	88°F	NA	NA
MW-2	3/23/1994	15.0	NA	NA	NA	85	NA	<0.05	0.07	0.12	0.33	NA	NA	NA
MW-2	3/23/1994	25.0	NA	NA	NA	NA	NA	<0.05	<0.05	0.07	<0.05	NA	NA	NA
MW-3	3/23/1994	20.0	NA	NA	NA	NA	NA	<0.05	<0.05	<0.05	<0.05	NA	NA	NA
MW-4	9/28/1994	5.0	ND	POS. ID[4]	ND	NA	52.2	NA	NA	NA	NA	NA	NA	NA
MW-4	9/28/1994	20.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-5	5/11/1995	23.0	>20	>50[1]	NO	5,200	NA	NA	NA	NA	NA	NA	>10,000	HS
R-1	11/2/1995	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<100	NS
R-1	11/2/1995	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<100	SS
R-1	11/2/1995	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<100	SS
R-1	11/2/1995	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,600	HS
R-1	11/2/1995	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>10,000	HS
R-1	11/2/1995	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,100	NS

Table 2

Summary of Analytical Results for Soil Samples
Rose's Parking Lot
Portland, Oregon

Sample/ Boring Identification	Sampling Date	Sampling Depth (Feet bgs.)	Analytical Results (mg/Kg)									Flashpoint	Field Screening Results[2]	
			ODEQ Method TPH-HCID			ODEQ TPH-G	ODEQ TPH-418.1M	EPA Method 8020					Headspace Vapor (ppm)	Sheen
			Gasoline	Diesel	Oil	Gasoline	Diesel/Oil	Benzene	Toluene	Ethylbenzene	Xylenes			
DVE-1	1/24/1997	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-1	1/24/1997	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-1	1/24/1997	15.0	NA	NA	NA	ND	NA	ND	ND	ND	ND	NA	41	NS
DVE-1	1/24/1997	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	23	NS
DVE-1	1/24/1997	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	18	NS
DVE-1	1/24/1997	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-1	1/24/1997	35.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-2	1/24/1997	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	NS
DVE-2	1/24/1997	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	NS
DVE-2	1/24/1997	15.0	NA	NA	NA	2.23	NA	ND	ND	0.0565	ND	NA	100	NS
DVE-2	1/24/1997	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	40	NS
DVE-2	1/24/1997	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	22	NS
DVE-2	1/24/1997	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-3	1/24/1997	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1900	NS
DVE-3	1/24/1997	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	47	NS
DVE-3	1/24/1997	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	73	NS
DVE-3	1/24/1997	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20	NS
DVE-3	1/24/1997	35.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4	NS
DVE-4	1/24/1997	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5	NS
DVE-4	1/24/1997	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5	NS
DVE-4	1/24/1997	15.0	NA	NA	NA	ND	NA	ND	ND	ND	ND	NA	8	NS
DVE-4	1/24/1997	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	311	NS
DVE-4	1/24/1997	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1600	NS
DVE-4	1/24/1997	38.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4	NS

Notes:

bgs	Below Ground Surface
NA	Not Analyzed
NO	Not Observed
ND	Not Detected Above Detection Limit Indicated in Original Reports
mg/Kg	Milligrams per Kilogram
ODEQ	Oregon Department of Environmental Quality
TPH	Total Petroleum Hydrocarbons
ppm	Parts per Million

1. The laboratory reported that diesel-range hydrocarbons identified in the sample were the result of an overlap from the gasoline-range; therefore, diesel-range hydrocarbons were not quantified.
2. NS = No Sheen, SS = Slight Sheen, MS = Moderate Sheen, HS = Heavy Sheen
3. Peaks in the gasoline range extend into the diesel range
4. Peaks were present within the retention time window of the listed petroleum hydrocarbon, but the peak patterns indicate the presence of low level heavy oils extending into the diesel range.

HOLST

ARCHITECTURE PC

JEFF STUHR

537 SE ASH ST. # 42
PORTLAND, OR 97214

503.233.9856 VOX
503.232.7135 FAX
JSTUHR@HOLSTARC.COM

BALL JANIK LLP

ATTORNEYS

RICHARD H. ALLAN

TEL: 503-228-2525
FAX: 503-295-1058
rallan@bjllp.com

ONE MAIN PLACE
101 SW MAIN ST., SUITE 1100
PORTLAND, OREGON 97204-3219

ALSO ADMITTED IN WASHINGTON

FAX Cover Sheet

To: Richard Allan

Office: Ball Janik LLP

Phone: 503 228-2525

Fax: 503 295-1058

Date: 3-31-04

From: Richard Reiter

Office: DEQ - NWR - Tanks

Phone: 503 229-5425

Number of Pages (including this cover sheet): 3

Comments: Copy of Cost Recovery Agreement for Underground Storage Tank Program.

DEQ

State of Oregon
Department of Environmental Quality
Northwest Region Office
2020 SW 4th Avenue
Suite 400
Portland, OR 97201
503-229-5263

Return Fax:
(503) 229-6945

COST RECOVERY AGREEMENT

This document serves as an agreement between the undersigned (hereinafter "you") and the Department of Environmental Quality (DEQ) regarding DEQ review and oversight of the investigation and/or cleanup of petroleum (hazardous substances) at the property located at:

Facility Name: _____

Address: _____

City, Zip: _____

File/Log #: _____-_____-_____

DEQ agrees to review environmental documents submitted by you or on your behalf regarding the investigation and/or cleanup of the above-referenced site. Additional details regarding DEQ oversight will be established upon review of the initial site data.

DEQ requires that persons requesting DEQ review and oversight of investigation and cleanup activities agree to the terms of this cost recovery agreement and pay project oversight costs.

DEQ project oversight costs will include direct costs and indirect costs. Direct costs include site-specific expenses and legal costs. Indirect costs are those general management and support costs of the DEQ, including the Waste Management and Cleanup Division (WMCD), allocable to DEQ oversight of this agreement and not charged as direct, site-specific costs. Indirect charges are based on a percentage of direct personal services costs. Review and oversight costs shall not include any unreasonable costs or costs not otherwise recoverable by DEQ under ORS 465.255.

DEQ costs are due within thirty (30) days of issuance of the monthly statement, by a check made payable to the "Department of Environmental Quality".

Electing not to enter into this agreement does not release you from any responsibility that you might have for any reporting requirements, investigation and/or cleanup of petroleum (hazardous substances) at the above referenced facility. This does not preclude the DEQ from conducting audits or inspections of all or portions of the investigation and cleanup activities associated with this facility. Enforcement action may be initiated if any violation of DEQ requirements is found.

Either DEQ or you may terminate this agreement by giving 15 days advance written notice to the other. Only those costs incurred or obligated by DEQ prior to the effective date of any termination of the agreement shall be recoverable under this Agreement. Termination of this agreement will not affect any other right DEQ may have for recovery of costs under any applicable law.

You will hold DEQ harmless for any claims (including but not limited to claims of property damage or personal injury) arising from DEQ review and/or oversight activities under this agreement.

This agreement is not and shall not be construed to be an admission by you of any liability under ORS 465.255 or any other law or as a waiver by you of any defense to such liability. This agreement is not and shall not be construed to be a waiver, release, or settlement of claims that DEQ may have against you or any other responsible person nor is this agreement a waiver of any enforcement authority that DEQ may have.

The DEQ Northwest Region UST Cleanup and Compliance Section will be responsible for the review and oversight of the investigation and cleanup activities associated with the property. Please refer all site-specific inquiries to them at (503) 229-5263.

All inquiries regarding cost recovery and/or invoices should be directed to (503) 229-5812.

If the terms of this agreement are acceptable, please have it executed by an authorized officer in the space provided below. In order to more effectively schedule your project, please return this agreement within 30 days of receipt to: DEQ Northwest Region Office, UST Cleanup and Compliance Section, 2020 SW Fourth Avenue, Suite 400, Portland, Oregon 97201.

Accepted and agreed to this _____ day of _____, 200__

By:_____
(Sign Here)

_____
(Please Print Name and Title Here)

Please provide the following information as to where the invoices should be sent (Please print or type.)

Individual Name: _____

Title: _____ _____

Company Name:_____

Mail Address: _ _____

City, State, Zip:_____

Phone Number:_____

OTIS Overview Report

Log Number	**26-94-0025**	Site Name	**ROSE'S PARKING LOT**
City	**PORTLAND**	Address	**330 NW 23 AVE**
Zip	**97210**	Common Name	**Rose's Parking Lot**
Phone		See Also	

Received Date	**07 FEB 1994**	Lips Score	**168**	Cost Recovery Agreement Date	**30 MAY 1995**
Facility Id		Property Trans Pending?		Release Stopped Date	
Project Mgr	**Rich Reiter**	Regulated Tank?	**Y**	Cleanup Start Date	**15 MAY 2001**
PM Assign Date	**31 MAR 2004**	Swla Permit?		Final Invoice Request Date	**24 MAY 2001**
File Status		WQ Permit?		Closed Date	**25 JUL 2001**
Site Type	**Groundwater**	Public Notice?			
Status	**Active Remediation** **CAP Approved** **Compliance GW Monitor** **Confirmed Release** **GW Delineated** **Soil Delineated**				

Site Comment

Site Inspections

Total Number of Inspections at site

Contamination

Contaminant	Media
Diesel	**Groundwater**
Diesel	**Soil**
Misc. Gasoline	**Groundwater**
Misc. Gasoline	**Soil**

Reports Received

Number of Reports Received for Site **5**

Most Recent Report Received for Site

Report Type	**Site Characterization**
Date Received	**19 JAN 2001**

Contacts

Responible Party

Reported By

Invoice Contact

OTIS Overview Report

Log Number	**26-94-0025**	Site Name	**ROSE'S PARKING LOT**
City	**PORTLAND**	Address	**330 NW 23 AVE**
Zip	**97210**	Common Name	**Rose's Parking Lot**
Phone		See Also	

ACCOUNTS PAYABLE
Terra Vac Corp.
23106 100th Avenue West
Edmond WA 98020

Tim Warner
TerraVac, Inc
10740 Meridian Ave N
Seattle WA 98133

Summary of Hours charged to Timecenter(s) by Person

Hours Charged to

Title :

Qtime Nbr:

Project

Between 01-Jan-2000 and 31-Mar-2004

Log Nbr:

Task	Hours Charged	Staff Total
Staff Person		
Grand Total:		

Detailed Project Report

All Hours Charged to
26-94-0025 Rose's Parking Lot
Between 1-1-1995 And 1-1-2003

Staff Person	Activity Date	Activity	Activity Comments	Minutes Charged	Staffperson Total
Tim Brown					
	11/14/2000	Administrative Activities		6	
					6
Susan Farland-Patte					
	5/24/2001	Administrative Activities		54	
					54
Henning Larsen					
	9/15/1999	Meetings		18	
	9/21/1999	File Review		30	
	9/22/1999	File Review		42	
	4/21/2000	Meetings		24	
	10/31/2000	Meetings		24	
	1/29/2001	Meetings		24	
	5/14/2001	Report Review		30	
					192
Don Pettit					
	1/16/1996	Phone Call	return call to Julia Fowler	24	
	1/29/1996	Phone Call	FR + CALL TO J.F.	30	
	2/16/1996	Report Review	Review revised MW locations, call to Julia Fowler	30	
	4/15/1996	Report Review	Review QM Report	30	

Detailed Project Report

All Hours Charged to
26-94-0025 Rose's Parking Lot
Between 1-1-1995 And 1-1-2003

Staff Person	Activity Date	Activity	Activity Comments	Minutes Charged	Staffperson Total
	6/5/1996	File Review	File review + Discussion with Ken Hoppala	30	
	6/18/1996	Report Review	Review subsurface expl. and QGWM reports	60	
	7/15/1996	Phone Call	Callback to Rod Honda of Mult. Co. Assessor's Offic	18	
	7/16/1996	Phone Call	Phone call from Rod Honda	60	
	7/23/1996	Phone Call	call back to Julia Fowler	18	
	9/9/1996	Phone Call	Return call to Rose's Consultant	18	
	9/9/1996	Phone Call	Call from Terra-Vac	90	
	9/10/1996	Miscellaneous	Faxing "typical" closure letters to consultant	18	
	11/20/1996	Report Review	Review QGWM Report	48	
	11/21/1996	Phone Call	RR and Call to Julia Fowler	30	
	12/2/1996	File Review		60	
	12/3/1996	Phone Call	Call from Tim Warner	30	
	12/23/1996	Phone Call	Call from Consultant regarding AQ permitting	6	
	1/14/1997	Administrative Activities		30	
	1/16/1997	Report Review	Review work plan and ACDP request letter	90	
	1/17/1997	Project Meeting	Discussion with Richard Allan/photocopying	30	
	1/21/1997	Project Meeting	Meeting with Remed Cont, Consult, Lawyers	120	
	1/21/1997	File Review	Review site file in prep for meeting	90	
	2/14/1997	Administrative Activities	Project Management	18	
	2/28/1997	Administrative Activities	Call from Marci Beeson regarding billing	12	

Detailed Project Report

All Hours Charged to
26-94-0025 Rose's Parking Lot
Between 1-1-1995 And 1-1-2003

Staff Person	Activity Date	Activity	Activity Comments	Minutes Charged	Staffperson Total
	4/9/1997	Administrative Activities	Initiating change in billing, update release form, call t	30	
	4/14/1997	Administrative Activities	Changing Project Invoicing to Terra Vac	60	
	7/1/1997	Administrative Activities	Returning call to Terra Vac	18	
	7/2/1997	Phone Call	Calls from David Fleming	12	
	7/31/1997	Phone Call	Call from Rod Struck	18	
	8/1/1997	Report Review	Review May 97 Report	60	
	8/5/1997	Report Review	Review GWM Reports	120	
	11/17/1997	Report Review	Review QGWM and Remediation Reports	60	
	12/4/1997	Phone Call	Call from Tim Warner	30	
					1398
Andree Pollock					
	12/20/1996	Phone Call	call fr. terra vac	6	
	8/6/1998	File Review	fr/call to Terravac	84	
	8/14/1998	Phone Call	calls fr. GE	24	
	10/22/1998	Phone Call	call fr. Richard Allen	12	
	8/11/1999	File Review	fr/site reassign	30	
					156
Herrington Rose					
	8/25/1999	Miscellaneous		18	
					18

Detailed Project Report

All Hours Charged to
26-94-0025 Rose's Parking Lot
Between 1-1-1995 And 1-1-2003

Staff Person	Activity Date	Activity	Activity Comments	Minutes Charged	Staffperson Total
Mitch Scheel					
	3/25/1996	Phone Call		18	
					18
Robert Williams					
	8/13/1999	File Review	file	42	
	8/16/1999	File Review	file	180	
	9/21/1999	File Review	letter	72	
	9/22/1999	Letter Preparation	RBCA response	204	
	4/20/2000	File Review		30	
	4/21/2000	Letter Preparation	pm/lp	234	
	5/4/2000	Letter Preparation		36	
	6/16/2000	Phone Call		24	
	6/21/2000	Phone Call		6	
	6/22/2000	Phone Call		6	
	6/28/2000	Phone Call		12	
	8/9/2000	Phone Call		12	
	10/26/2000	File Review		72	
	10/31/2000	Project Meeting		18	
	11/6/2000	Letter Preparation		84	
	11/7/2000	Letter Preparation		96	

Detailed Project Report

All Hours Charged to
26-94-0025 Rose's Parking Lot
Between 1-1-1995 And 1-1-2003

Staff Person	Activity Date	Activity	Activity Comments	Minutes Charged	Staffperson Total
	11/9/2000	Letter Preparation		24	
	12/12/2000	Phone Call		18	
	12/14/2000	Phone Call		12	
	1/2/2001	Report Review		6	
	1/3/2001	Report Review	CSM and calc review	174	
	1/4/2001	Project Meeting		30	
	1/5/2001	Phone Call	site check	36	
	1/23/2001	Report Review		24	
	1/29/2001	Project Meeting		30	
	1/30/2001	Report Review		42	
	2/1/2001	Phone Call		18	
	3/27/2001	Phone Call		6	
	4/10/2001	Phone Call		6	
	4/27/2001	Report Review		6	
	5/4/2001	File Review	fr/lp	144	
	5/7/2001	Report Review		102	
	5/8/2001	Letter Preparation		192	
	5/11/2001	Letter Preparation		60	
	5/16/2001	Administrative Activities		42	

Detailed Project Report

All Hours Charged to
26-94-0025 Rose's Parking Lot
Between 1-1-1995 And 1-1-2003

Staff Person	Activity Date	Activity	Activity Comments	Minutes Charged	Staffperson Total
Total Minutes All Staff:					**3942**

BALL JANIK LLP

ATTORNEYS

101 SOUTHWEST MAIN STREET, SUITE 1100
PORTLAND, OREGON 97204-3219

www.balljanik.com

RICHARD H. ALLAN

TELEPHONE 503-228-2525
FACSIMILE 503-295-1058

rallan@bjllp.com

RECEIVED
MAR 24 2004
DEPT OF ENVIRONMENTAL QUALITY
NORTHWEST REGION

March 24, 2004

By Messenger

Andree Pollock
Oregon Department Environmental Quality
Northwest Regional Office
2020 SW 4th Avenue, Suite 400
Portland, OR 97204

Re: 23rd and Flanders, LLC
File No. 26-94-0025

Dear Mr. Pollock:

As you know, this firm represents 23rd and Flanders, LLC, which owns the surface parking lot at N.W. 23rd Avenue and N.W. Flanders Street in Portland, formerly referred to as "Rose's Parking Lot." The property, which was occupied by an automobile service station from 1954 to the mid 1970s, was the subject of extensive environmental investigations by several consulting firms between 1994 and 1996. In 1997, Terra Vac installed an active remediation system, a dual vacuum extraction ("DVE") system designed to remediate soil and groundwater.

On July 19, 2001, the Department of Environmental Quality issued a "no further action" determination for the property. The NFA letter noted that a pocket of approximately 25 cubic yards of contaminated soil remains below the northeast quadrant of the site at approximately 17 feet below ground surface. Based on evaluations showing that the pocket of contaminated soil meets residential risk standards, DEQ approved leaving the contaminated soil in place. The NFA letter states that DEQ "must be notified in advance and the adequacy of the cleanup must be re-evaluated" if a groundwater well is to be installed for any purpose, or any excavation in or near the pocket location is planned.

As we discussed last week, 23rd and Flanders, LLC is planning to develop the property with a new building devoted to retail use. The building will have one level of below-ground parking. As described in the enclosed letter from the architect, Jeffrey Stuhr of Holst Architecture, PC, the maximum depth of excavation will be three feet below the floor slab, to accommodate the footings. The lowest grade elevation on the property is in the northeast corner of the site. The maximum depth of excavation would be 6 ½ feet below the grade at the northeast corner of the property. Because the remaining pocket of contaminated soil is located in

the northeast quadrant of the property, the maximum depth of excavation, including foundation and footings, will be approximately 10-11 feet above that pocket of contaminated soil.

Although we do not yet have architectural plans for the building, Mr. Stuhr has informed me that the parking garage will be open to the outside air. As we have discussed, this will minimize the potential for volatile compounds to accumulate in occupied spaces.

My client has reviewed DEQ's boilerplate cost recovery agreement and is willing to enter into such an agreement and provide a deposit of $1,500 as an advance against DEQ's costs in evaluating this development proposal. Due to the timing of transactions with my client's lender and a potential tenant, we need to obtain DEQ's review within the next three weeks. If I can provide additional information, or be of assistance in any manner, please call me at your earliest convenience.

Very truly yours,

Richard H. Allan

RHA:crs
Enclosures
cc: Mr. Richard Singer
Mr. Don Singer

HOLST

ARCHITECTURE PC

VOX 503.233.9856

FAX 503.232.7135

STUDIO 42
537 S.E. ANKENY STREET
PORTLAND, OR 97214

March 18, 2004

Dick Singer
824 NW Albemarle Terrace
Portland, OR 97210

RE: NW 23rd and Flanders Building - Excavation Depth

Dear Dick:

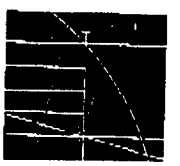
Regarding the underground garage portion of your 23rd & Flanders project, the garage level will be 10 to 11 feet below grade. According to information I received from our structural engineer, Blake Patsy of KPFF, the foundation would be an additional 30" below grade from the slab for a maximum depth of 13 1/2 feet. Dick, I'd add a couple more inches to allow for gravel, formwork, etc.

In summary, I anticipate that the maximum excavation would be no more than 14 feet below grade from the highest grade elevation and 6 1/2 feet from the lowest grade elevation.

If you have any questions please don't hesitate to call me.

Sincerely,

Jeffrey Stuhr
Holst Architecture pc



kpff Consulting Engineers

March 18, 2004

Mr. Jeff Stuhr
Holst Architects, PC
537 SE Ash Street. Studio 42
Portland, OR 97214

RE: NW 23rd & Flanders Building
Footing Depths

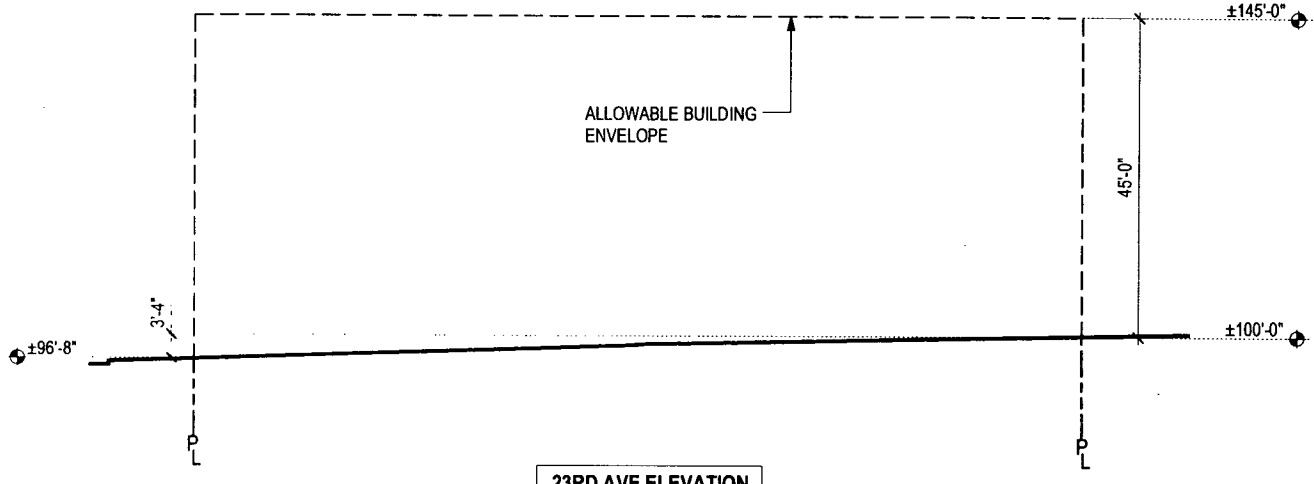
Dear Jeff:

As requested, we have reviewed the footing depths for the proposed building and have determined that the new foundations will be a maximum of 30 inches below the slab-on-grade elevation.

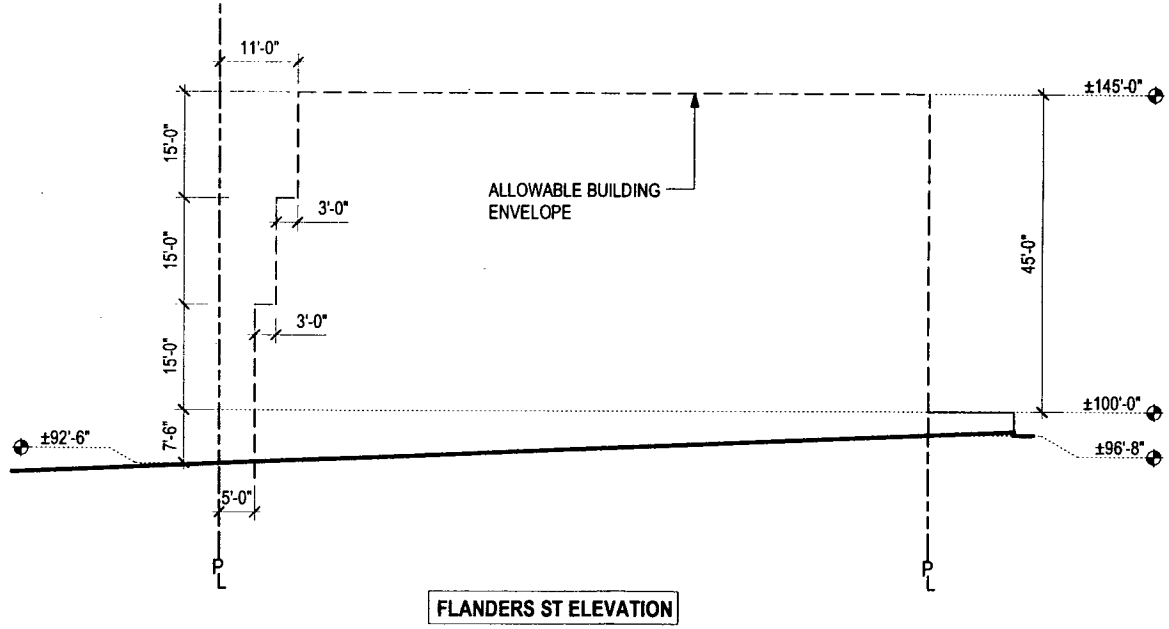
Sincerely,

Blake D. Patsy, P.E., S.E.
Principal/Manager Structural Engineering

[BP/bd204072-footing depths-3-18-04.doc]



23RD AVE ELEVATION



FLANDERS ST ELEVATION

1/16" = 1'-0"

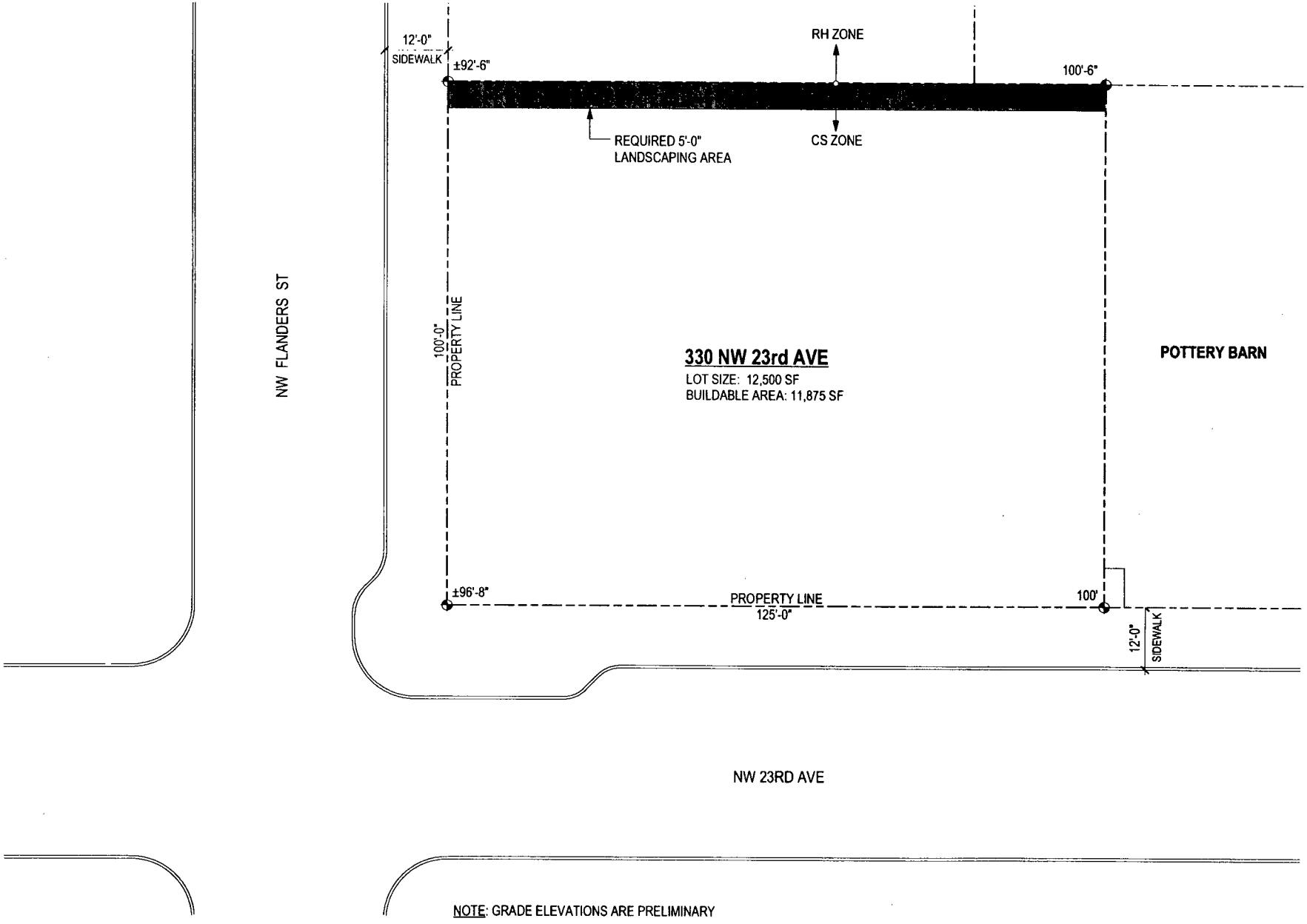
0 5' 10' 20'

HOLST Architecture pc
537 SE ASH Studio 42 PORTLAND, OR 97214
www.holstarc.com 503.233.9856 tel 503.232.7135 fax

NW 23rd & FLANDERS BUILDING

ALLOWABLE BUILDING ENVELOPE

3.10.04



NOTE: GRADE ELEVATIONS ARE PRELIMINARY

1/16" = 1'-0" NORTH

0 5' 10' 20'

HOLST Architecture pc
537 SE ASH studio 42 PORTLAND, OR 97214
www.holstarc.com 503.233.9856 tel 503.232.7135 fax

NW 23rd & FLANDERS BUILDING

SITE PLAN
3.10.04

◂ MORE ON BACK ▸

UPDATES:

* PETROLEUM RELEASE FORM * 4-15-97

Please Check All That Apply

INCIDENT INFORMATION

LOG NBR: 26-94-0025 RECEIVED BY: AVP

UST FAC NBR: _____ DATE REPORTED: 2-7-94

SITE NAME: Roses Parking Lot

SITE ADDRESS: 330 NW 23rd Avenue

SITE CITY: Portland ZIP: 97210

SITE COUNTY: Mult. PHONE: _____

PROJECT MANAGER: Don Pettit

155772

☑ REGULATED UST
☐ NON-REGULATED UST
☐ HEATING OIL TANK

FUNDING
☑ LUST ☑ HSRAF
☐ OHC ☐ FINANCIAL ASST

☑ INVOICE START LTR. AGR. DATE: _____
☐ INVOICE STOP
☐ NFA SENT

MAIL CONTACTS

REPORTED BY

NAME: Charles Williamson
COMPANY: Kell Alterman + Runstein
ADDRESS: 1001 SW 5th Ave St 1800
CITY: Portland ZIP: 97204-1194
STATE: OR PHONE: 222-3531

RESPONSIBLE PARTY

NAME: ACCTS PAYABLE
COMPANY: TERRA VAC CORP
ADDRESS: 23706 100th AVE WEST
CITY: EDMONDS ZIP: 98020
STATE: WA PHONE: _____

INVOICE CONTACT

NAME: PAUL BIANCO
COMPANY: Terra Vac Inc.
ADDRESS: 23706 100TH AVE WEST
CITY: EDMOND ZIP: 98020
STATE: WA PHONE: (206) 362-8128

OTHER CONTACT(S)

NAME: Tim Warner
COMPANY: Terra Vac, Inc.
ADDRESS: _____
CITY: _____ ZIP: _____
STATE: _____ PHONE: _____

SITE ASSESSMENT

DATE DISCOVERED: 1-3-94

☐ EMERGENCY RESP.
☐ ENFORCEMENT

NFA Closed SP 7/25/01

Fund 5/24/01 SP

☐ FURTHER CLEANUP REQ.
☐ NO FURTHER CLEANUP REQ.
☐ OFFSITE MIGRATION
_____ L.I.P.S. SCORE (Region)

CONFIRMATION:
- ☐ SI) STAFF
- ☐ LD) LAB:DEQ
- ☒ LR) LAB:RP
- ☐ LO) LAB:OTHER
- ☐ RR) RP REPORT
- ☐ CN) CONTRACTOR
- ☐ OT) OTHER _____

DISCOVERY:
- ☐ RM) ROUTINE MONITORING
- ☐ DC) DECOMMISSIONING
- ☐ CP) COMPLAINT
- ☐ IC) INVENTORY CONTROL
- ☒ SA) SITE ASSESSMENT
- ☐ TT) TANK TEST
- ☐ OT) OTHER _____

CAUSE:
- ☐ TL) TANK LEAK
- ☐ PL) PIPE LEAK
- ☐ OF) OVERFILL
- ☐ SS) SURFACE SPILL
- ☐ PV) PUMP/VALVE LEAK
- ☐ OT) OTHER _____
- ☒ UN) UNKNOWN

Reopened 4/04

Final invoice 4/23/04 SP

CONTAMINANTS - IMPACTS

CONTAMINANTS:

- ☒ UG) UNLEADED GASOLINE
- ☐ LG) LEADED GASOLINE
- ☒ MG) MISC. GASOLINE
- ☒ DS) DIESEL
- ☐ FO) FUEL OIL
- ☐ WO) WASTE OIL
- ☐ LB) LUBRICANT
- ☐ SV) SOLVENT
- ☐ BF) BUNKER FUEL
- ☐ OP) OTHER PET. DIST.
- ☐ CH) CHEMICAL
- ☐ HO) HEATING OIL
- ☐ UN) UNKNOWN
- ☐ OT) OTHER _____

MEDIA/IMPACT:

- ☒ SL) SOIL
- ☒ GW) GROUNDWATER
- ☐ SW) SURFACE WATER
- ☐ DW) DRINKING WATER
- ☐ FV) FACILITY (VAPOR)
- ☐ FP) FACILITY (FREE PROD)

SITE - SOIL MANAGEMENT

RELEASE STOPPED: 1979 (tanks removed) REMEDIATION COMPLETED: _____

CLEANUP STARTED: _____ NO FURTHER ACTION: _____

SWLA PERMIT NUMBER: _____ DATE ISSUED: _____

AMOUNT OF SOIL (yds3) TREATED ON SITE: _____

AMOUNT OF SOIL (yds3) TREATED OFF SITE: _____

TREATMENT METHOD:
- ☐ AREATION
- ☐ THERMAL
- ☐ BIOLOGICAL
- ☐ OTHER _____

AMOUNT OF SOIL (yds3) DISPOSED OF: _____ ☐ TREATED ☐ UNTREATED

FINAL DISPOSITION OF SOIL:
- ☐ ONSITE
- ☐ LANDFILL
- ☐ ROAD BASE
- ☐ OTHER _____

NOTES/COMMENTS: _____

This Space Provided For Regional Use

◂ MORE ON BACK ▸

UPDATES:
6-29-95

* PETROLEUM RELEASE FORM *

Please Check All That Apply

INCIDENT INFORMATION

LOG NBR: 26-94-025 RECEIVED BY: AVP

UST FAC NBR: _____ DATE REPORTED: 2-7-94

SITE NAME: Roses Parking lot

SITE ADDRESS: 330 NW 23rd Ave

SITE CITY: Portland ZIP: 97210

SITE COUNTY: Mult PHONE: _____

PROJECT MANAGER: Don Pettit

- [x] REGULATED UST
- [ ] NON-REGULATED UST
- [ ] HEATING OIL TANK

FUNDING

- [x] LUST
- [ ] OHC
- [x] HSRAF
- [ ] FINANCIAL ASST

- [x] INVOICE START LTR. AGR. DATE: _____
- [ ] INVOICE STOP
- [ ] NFA SENT

MAIL CONTACTS

REPORTED BY

NAME: Charles Williamson

COMPANY: Kell Alterman + Runstein

ADDRESS: 1001 SW 5th Ave Ste 1800

CITY: Portland ZIP: 97204-1194

STATE: OR PHONE: 222-3531

RESPONSIBLE PARTY Max Birnbach

NAME: C/O Charles Williamson

COMPANY: Kell, Alterman + Runstein

ADDRESS: 1001 SW 5th, Ste 1800

CITY: Portland ZIP: 97204-1194

STATE: OR PHONE: 222-3531

INVOICE CONTACT

NAME: Julia Fowler

COMPANY: Geo Engineers

ADDRESS: 7504 SW Bridgeport Rd

CITY: Portland ZIP: 97224

STATE: OR PHONE: 624-9274

OTHER CONTACT(S)

NAME: _____

COMPANY: _____

ADDRESS: _____

CITY: _____ ZIP: _____

STATE: _____ PHONE: _____

SITE ASSESSMENT

DATE DISCOVERED: 1-3-94

- [ ] EMERGENCY RESP.
- [ ] ENFORCEMENT
- [ ] FURTHER CLEANUP REQ.
- [ ] NO FURTHER CLEANUP REQ.
- [ ] OFFSITE MIGRATION

_____ L.I.P.S. SCORE (Region)

CONFIRMATION:

- [ ] SI) STAFF
- [ ] LD) LAB:DEQ
- [x] LR) LAB:RP
- [ ] LO) LAB:OTHER
- [ ] RR) RP REPORT
- [ ] CN) CONTRACTOR
- [ ] OT) OTHER _____

DISCOVERY:

- [ ] RM) ROUTINE MONITORING
- [ ] DC) DECOMMISSIONING
- [ ] CP) COMPLAINT
- [ ] IC) INVENTORY CONTROL
- [x] SA) SITE ASSESSMENT
- [ ] TT) TANK TEST
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CAUSE:

- [ ] TL) TANK LEAK
- [ ] PL) PIPE LEAK
- [ ] OF) OVERFILL
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CONTAMINANTS - IMPACTS

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- ☐ LG) LEADED GASOLINE
- ☐ MG) MISC. GASOLINE
- ☒ DS) DIESEL
- ☐ FO) FUEL OIL
- ☐ WO) WASTE OIL
- ☐ LB) LUBRICANT
- ☐ SV) SOLVENT
- ☐ BF) BUNKER FUEL
- ☐ OP) OTHER PET. DIST.
- ☐ CH) CHEMICAL
- ☐ HO) HEATING OIL
- ☐ UN) UNKNOWN
- ☐ OT) OTHER _____

MEDIA/IMPACT:

- ☒ SL) SOIL
- ☒ GW) GROUNDWATER
- ☐ SW) SURFACE WATER
- ☐ DW) DRINKING WATER
- ☐ FV) FACILITY (VAPOR)
- ☐ FP) FACILITY (FREE PROD)

SITE - SOIL MANAGEMENT

RELEASE STOPPED: 1979 when tanks removed

CLEANUP STARTED: _____

REMEDIATION COMPLETED: _____

NO FURTHER ACTION: _____

SWLA PERMIT NUMBER: _____

DATE ISSUED: _____

AMOUNT OF SOIL (yds3) TREATED ON SITE: _____

AMOUNT OF SOIL (yds3) TREATED OFF SITE: _____

TREATMENT METHOD:

- ☐ AREATION
- ☐ THERMAL
- ☐ BIOLOGICAL
- ☐ OTHER _____

AMOUNT OF SOIL (yds3) DISPOSED OF: _____ ☐ TREATED ☐ UNTREATED

FINAL DISPOSITION OF SOIL:

- ☐ ONSITE
- ☐ LANDFILL
- ☐ ROAD BASE
- ☐ OTHER _____

NOTES/COMMENTS: _____

This Space Provided For Regional Use

LUST FORM

INCIDENT INFORMATION

LUST Incident Nbr: _____ LUST Log Nbr: 26-94-025 UST Facility ID: _____

Date Received: 2/7/94 Received By: AVP Emergency Resp Taken: Y N

Tank Identification: File Name: Rose's Parking Lot

Street: 330 NW 23 Ave

City: Portland Zip: 97210

County: Mult Phone: _____

Incident Comments: HSRAF

CONTACT & MAIL TYPES

Reported By:	LUST Contact:	Responsible Party:
Name: Charles Williamson	Name:	Name: Max Brim Bach
Company: Kell, Alterman & Runstein	Company:	Company: C/o Charles Williamson
Street: 1001 SW Fifth Ave, Ste 1800	Street:	Street:
City: Portland Zip: 97204-1194	City: Zip:	City: Zip:
State: OR Phone: 222-3531	State: Phone:	State: Phone:

SITE ASSESSMENT

LUST Incident Nbr: (XXXXXXXXXXXXX)

Date Investigated: _____ Investigated By: _____

Release Exists: (Y) N (Circle)

Confirmation Method: (Circle) A)Staff B)Lab:DEQ C)Lab:RP D)Lab:Other E)RP F)Other

Cleanup Necessary: (Y) N (Circle)

Regulated Tank: (Y) N (Circle)

Exposure Assessment: Y N (Circle)

Off-Site Migration: Y (N) ? (Circle)

Estimated Gallons Released: Unk

Priority: 168

Discovery Date: 1/3/94

How Discovered: (Circle)
A)Routine Monitoring B)Inventory Control C)Decommissioning (D)Site Assessment
E)Complaint F)Tank Test G)Other

Material Released: (Circle)
A)Unleaded Gasoline B)Leaded Gasoline (C)Misc. Gasoline
(D)Diesel E)Fuel Oil F)Waste Oil
G)Lubricant H)Solvent I)Bunker Fuel
J)Other Pet. Dist. K)Chemical L)Unknown

Source of Release: (Circle)
A)Tank Leak B)Pipe Leak C)Overfill D)Surface Spill
E)Pump/Valve Leak F)Other (G)Unknown

Impacts: (Circle)				
Soil	(Y)	N	%	?
Groundwater	(Y)	N	%	?
Surface Water	Y	(N)	%	?
Drinking Water	Y	(N)	%	?
Facility (Vapor)	Y	(N)	%	?
Facility (Free Product)	Y	(N)	%	?

Site Assessment Comments: _____

SITE MANAGEMENT

LUST Incident Nbr: (XXXXXXXXXXXXX)

Date Released Stopped: 1978 (when tanks were removed)

Cleanup Activity: Start Date: _____ Under Control Date: _____

End Date: _____ Contractor Name: _____

Cleanup Guideline: (Circle) Matrix C.A.P. Cleanup Lead: (Circle) RP SLW/TF SLW/oTF

Free Product Disposal:		Soil Disposal:	
Est. Gallons:	_____	Est. Cu/Yds:	_____
Resp. Party:	_____	Resp. Party:	_____
Disposal Location:	_____	Disposal Location:	_____
Removal Date:	_____	Removal Date:	_____

Enforcement Action: (Circle) Y N

Cost Recovery Initiated: (Circle) Y N Source of Cost Recovery: Pct. R.P.: _____ Pct. SLW/TF: _____ Pct. SLW/oTF: _____

Estimations: Cost of Cleanup: _____ Staff Time On Project: _____

Site Management Comments: _____

[Version 102]

NWR UST CLEANUP SITE CHECKLIST
(for regional use only)

This site is:

_____ <40 ppm Matrix

_____ Regulated Tank

_____ Exempt Tank

_____ Oil Heat Commission eligible

_____ Other _____
(surface spill, non-petroleum UST, etc.)

Assign site to:

_____ Staff (your initials or staff for major RP)

_____ Unassigned at this time
(matrix only, soil aeration not anticipated)

_____ Needs to be tracked (supervisor to assign)
Reason:

Action:

_____ Send Initial Letter (with rules)

_____ Send Modified Letter (without rules)

_____ Send <40 ppm Letter (without rules)

_____ No letter required _____
(sending other letter, etc.)

Regulated Tank Information (Y/N):

_____ Tanks registered ID No._____

_____ Decommissioning notice (30 day) received

_____ 3 day notice received

_____ Fees current

_____ New tanks to be installed

Misc. Notes:

COST RECOVERY AGREEMENT

This document serves as an agreement between the undersigned (hereinafter "you") and the Department of Environmental Quality (DEQ) regarding DEQ review and oversight of the investigation and/or cleanup of petroleum (hazardous substances) at the property located at:

Facility Name:	Rose's Parking Lot
Address:	330 NW 23rd Avenue
City, Zip:	Portland, Oregon 97210
File/Log #:	26-94-0025
Date Sent:	June 6, 1995

DEQ agrees to review environmental documents submitted by you or on your behalf regarding the investigation and/or cleanup of the above-referenced site. Additional details regarding DEQ oversight will be established upon review of the initial site data.

DEQ requires that persons requiring DEQ review and oversight of investigation and cleanup activities agree to the terms of this agreement and pay project oversight costs.

DEQ project oversight costs will include direct costs and indirect costs. Direct costs include site-specific expenses and legal costs. Indirect costs are those general management and support costs of the DEQ and of the Environmental Cleanup Division (ECD) allocable to DEQ oversight of this agreement and not charged as direct, site-specific costs. Indirect charges are based on a percentage of direct personal services costs. Review and oversight costs shall not include any unreasonable costs or costs not otherwise recoverable by DEQ under ORS 465.255.

DEQ costs are payable within thirty (30) days of issuance of the monthly statement, by check made payable to the "Department of Environmental Quality".

If you elect not to enter into this agreement, it does not release you from any responsibility you might have from any reporting requirements, investigation and/or cleanup of petroleum (hazardous substances) at the above referenced facility. This does not preclude the DEQ from conducting audits or inspections of all or portions of the investigation and cleanup activities associated with this facility. Enforcement action may be initiated if violation of DEQ requirements is found.

Either DEQ or you may terminate this agreement by giving 15 days advance written notice to the other. Only those costs incurred or obligated by DEQ prior to the effective date of any termination of the agreement shall be recoverable under this Agreement. Termination of this agreement will not affect any other right DEQ may have for recovery of costs under any applicable law.

You will hold DEQ harmless for any claims (including but not limited to claims of property damage or personal injury) arising from activities reviewed or overseen under this agreement.

GeoEngineers

June 12, 1995

Consulting Engineers and Geoscientists
Offices in Washington, Oregon, and Alaska

Oregon Department of Environmental Quality
Northwest Region Office
2020 Southwest Fourth, Suite 400
Portland, Oregon 97201

Attention: Ms. Laurie McCulloch

Rose's Parking Lot
330 Northwest 23rd Avenue
Portland, Oregon
GEI File No. 4326-001-P62
DEQ No. 26-94-25

GeoEngineers is currently working on the Rose's parking lot site, located at 330 Northwest 23rd Avenue in Portland, Oregon, on behalf of the current property owner and other parties involved. All parties involved are anxious to begin discussions with DEQ regarding the site. A signed cost recovery agreement is attached. A draft report of the most recent activities is currently in preparation.

All communication with the current property owner, Mr. Max Birnbach, should be in care of Mr. Charles R. Williamson of Kell, Alterman & Runstein, Suite 1800, 1001 Southwest Fifth Avenue, Portland, Oregon 97204-1194, (503) 222-3531.

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
JUN 19 1995
NORTHWEST REGION

GeoEngineers, Inc.
7504 SW Bridgeport Road
Portland, OR 97224
Telephone (503) 624-9274
Fax (503) 620-5940

Printed on recycled paper.

We look forward to working with your department. Please call if you have questions regarding this cost recovery agreement and/or project.

Yours very truly,

GeoEngineers, Inc.

Sarah A. Kingery
Geologist

SAK:mln
Document ID: 4326001.l

Attachment

Mr. Max Birnbach
c/o Kell, Alterman & Runstein

Mr. Jeff C. Wishko
Bell & Ingram, P.S.

Mr. David Roy
Black Helterline

Ms. Janice M. McLain
Amoco - Chicago, IL

Mr. Jeff Miller
Amoco - Golden, CO

Mr. Jeff Scott
Gull Industries

Mr. Kipp Eckert
Unocal CERT - Northern Region

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Address: 330 NW 23rd Avenue
City, Zip: Portland, Oregon 97210
File/Log #: 26-94-0025
Date Sent: _____

DEQ agrees to review environmental documents submitted by you or on your behalf regarding the investigation and/or cleanup of the above-referenced site. Additional details regarding DEQ oversight will be established upon review of the initial site data.

DEQ requires that persons requiring DEQ review and oversight of investigation and cleanup activities agree to the terms of this agreement and pay project oversight costs.

DEQ project oversight costs will include direct costs and indirect costs. Direct costs include site-specific expenses and legal costs. Indirect costs are those general management and support costs of the DEQ and of the Environmental Cleanup Division (ECD) allocable to DEQ oversight of this agreement and not charged as direct, site-specific costs. Indirect charges are based on a percentage of direct personal services costs. Review and oversight costs shall not include any unreasonable costs or costs not otherwise recoverable by DEQ under ORS 465.255.

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You will hold DEQ harmless for any claims (including but not limited to claims of property damage or personal injury) arising from activities reviewed or overseen under this agreement.

This agreement is not and shall not be construed as an admission by you of any liability under ORS 465.255 or any other law or as a waiver by you of any defense to such liability.

This agreement is not and shall not be construed as a waiver, release, or settlement of claims DEQ may have against you or any other person or as a waiver of any enforcement authority DEQ may have.

The DEQ Regional Office will be responsible for the review and oversight of the investigation and cleanup activities associated with the property. Please refer all site-specific inquiries to that office.

All inquiries regarding cost recovery and/or invoices should be directed to Darby Bacon at (503) 229-6635.

If the terms of this agreement are acceptable, please have it executed by an authorized officer in the space provided below. In order to more effectively schedule your project, please return this agreement within 30 days of receipt to: Debi Smith, Department of Environmental Quality, Northwest Region Office, 2020 SW Fourth Avenue, Portland, OR 97201.

Accepted and agreed to this 30 day of May, 1995

By: Max Birnbach

Title: Max Birnbach, Owner

Please provide the following information on where the invoices should be sent.

Individual Name: Julia Fowler Title: Associate

Company: GeoEngineers, Inc.

Mail Address: 7504 SW Bridgeport Road

City, State, Zip: Portland, Oregon 97224

Phone Number: (503)624-9274

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
JUN 19 1995
NORTHWEST REGION

GeoEngineers

June 12, 1995

Consulting Engineers and Geoscientists
Offices in Washington, Oregon, and Alaska

Oregon Department of Environmental Quality
Northwest Region Office
2020 Southwest Fourth, Suite 400
Portland, Oregon 97201

Attention: Ms. Laurie McCulloch

Rose's Parking Lot
330 Northwest 23rd Avenue
Portland, Oregon
GEI File No. 4326-001-P62
DEQ No. 26-94-25

GeoEngineers is currently working on the Rose's parking lot site, located at 330 Northwest 23rd Avenue in Portland, Oregon, on behalf of the current property owner and other parties involved. All parties involved are anxious to begin discussions with DEQ regarding the site. A signed cost recovery agreement is attached. A draft report of the most recent activities is currently in preparation.

All communication with the current property owner, Mr. Max Birnbach, should be in care of Mr. Charles R. Williamson of Kell, Alterman & Runstein, Suite 1800, 1001 Southwest Fifth Avenue, Portland, Oregon 97204-1194, (503) 222-3531.

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
JUN 14 1995
NORTHWEST REGION

GeoEngineers, Inc.
7504 SW Bridgeport Road
Portland, OR 97224
Telephone (503) 624-9274
Fax (503) 620-5940

Printed on recycled paper.

We look forward to working with your department. Please call if you have questions regarding this cost recovery agreement and/or project.

Yours very truly,

GeoEngineers, Inc.

Sarah A. Kingery
Geologist

SAK:mln
Document ID: 4326001.1

Attachment

Mr. Max Birnbach
c/o Kell, Alterman & Runstein

Mr. Jeff C. Wishko
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Mr. David Roy
Black Helterline

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File/Log #: 26-94-0025
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Accepted and agreed to this 30 day of May, 1995

By: Max Birnbach

Title: Max Birnbach, Owner

Please provide the following information on where the invoices should be sent.

Individual Name: Julia Fowler Title: Associate

Company: GeoEngineers, Inc.

Mail Address: 7504 SW Bridgeport Road

City, State, Zip: Portland, Oregon 97224

Phone Number: (503)624-9274

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED

JUN 14 1995

NORTHWEST REGION

FILE NAME: Roses Parking Lot LOG NO. 26-94-25

NWR'S NFA TRACKING CHECKLIST

ROUTE TO	ACTIVITY	RESPONSIBLE PERSON	DATE COMPLETED
	Sequent checked by project manager to make sure fees paid and tanks closed and that UST compliance issues have been resolved.	Old site - No fac. ID	
	OTIS updated with soil disposal, public notice, and other applicable information by project manager.	TJW	5/16/01
	Draft NFA prepared by Project Manager (PM) and submitted to NRS-4 Hydro or Manager for review	TJW	5/11/01
	Draft NFA approved by NRS-4 Hydro (or Manager, if necessary) and submitted for data entry	HDL AW	5/14/01
	SEQUENT updated with final invoice request date and new green sheet information.	SP	5/24/01
	OPTIONAL STEP: Expedited payment request by responsible party (RP) is handled by ======>>		
	OPTIONAL STEP: Estimated Expedited Payment Amount given to RP by ======>>		
	To Administrative staff for cost recovery entries	SP	5/24/01
	Final invoice paid notice received from Business Office and PM informed by Manager		
	Final NFA drafted and signed by PM (and Manager, if necessary), and sent for data entry	AW FOR RKW	7/25
	SEQUENT updated with filed closed information.	SP	7/25
	Proofreading letter and file closure activities	SP	7/25
	Copies made and mailed	SP	7/25

NFA PROCESS COMPLETE

(11/26/1999)

GeoEngineers DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
JAN 2 2 1997
NORTHWEST REGION

January 21, 1997

Consulting Engineers and Geoscientists
Offices in Washington, Oregon, and Alaska

Mr. Max Birnbach
c/o Mr. Charles R. Williamson
Kell, Alterman & Runstein
1001 Southwest Fifth Avenue, Suite 1800
Portland, Oregon 97204-1194

Attention: Mr. Max Birnbach

Results of Quarterly Ground Water Monitoring
November 1996
Rose's Parking Lot
330 Northwest 23rd Avenue
Portland, Oregon
File No. 4326-001-62

INTRODUCTION

This report presents the results of GeoEngineers' November 1996 quarterly ground water monitoring and sampling activities at Rose's Parking Lot, located at 330 Northwest 23rd Avenue in Portland, Oregon. The DEQ (Oregon Department of Environmental Quality) UST (underground storage tank) Cleanup file number for this site is 26-94-25. The general layout of the site and surrounding features are shown in Figure 1.

Five ground water monitoring wells (MW-1 through MW-5) are located on the site. Three off-site monitoring wells (MW-6, MW-7 and MW-8) are located in public rights-of-way and on adjacent property. Ground water monitoring and sampling of the on- and off-site wells were conducted on November 3, 1996. This is the fourth quarterly ground water monitoring event for the five on-site monitoring wells and the third quarterly ground water monitoring event for the three off-site monitoring wells.

SCOPE OF SERVICES

GeoEngineers' scope of services completed during this quarterly ground water monitoring period was performed in general accordance with our work plan dated September 28, 1995 and is summarized below.

1. Measure the depths to ground water in the on- and off-site monitoring wells.
2. Measure combustible vapor concentrations in the monitoring well casings.

GeoEngineers, Inc.
7504 SW Bridgeport Road
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3. Obtain ground water samples from monitoring wells MW-1 through MW-8 for analytical testing of BETX (benzene, ethylbenzene, toluene and xylenes) by EPA (U.S. Environmental Protection Agency) Method 8020. In addition, analyze the ground water samples obtained from monitoring wells MW-1 through MW-3 for TPH (total petroleum hydrocarbons) by EPA Method 418.1 and, if appropriate, PAHs (polynuclear aromatic hydrocarbons) by EPA Method 8310.

   A description of field procedures for the above scope items is included in Attachment A.

NOVEMBER 1996 GROUND WATER MONITORING AND SAMPLING RESULTS

GROUND WATER ELEVATIONS

GeoEngineers measured the depths to ground water in the monitoring wells on November 3, 1996. At the time of our November 3 measurements, the depths to ground water ranged from 20.05 feet to 24.47 feet below the ground surface. Based on our measurements, the apparent direction of ground water flow beneath the site is toward the northeast, which is consistent with our previous ground water elevation data. However, the ground water flow direction in the southeast portion of the site appears to have a more northerly component of flow.

The depths to ground water and the calculated ground water elevations are summarized in Table 1. The calculated ground water elevations and the inferred direction of ground water flow for the November 3, 1996 monitoring event are shown in Figure 2.

COMBUSTIBLE VAPOR CONCENTRATIONS

The combustible vapor concentration measured in monitoring well MW-1 was greater than 10,000 ppm (parts per million) on November 3, 1996. The combustible vapor concentrations measured in monitoring wells MW-2 and MW-5 were 2,200 and 2,500 ppm, respectively. The combustible vapor concentrations in monitoring wells MW-3, MW-4 and MW-6 through MW-8 were less than 400 ppm during this monitoring event. Combustible vapor concentration measurements are presented in Table 1.

FREE PRODUCT THICKNESS

Free product was not detected in monitoring wells MW-1 through MW-8 on November 3, 1996. A sheen and odor were noted on water purged from monitoring wells MW-1, MW-3 and MW-5 during sampling. Previous product thickness measurements are presented in Table 1.

GROUND WATER QUALITY

Ground water samples were obtained from monitoring wells MW-1 through MW-8 on November 3, 1996 for analysis of BETX by EPA Method 8020. The ground water samples obtained from monitoring wells MW-1, MW-2 and MW-3 also were submitted for TPH analysis

by EPA Method 418.1. Based on the TPH analysis results, the ground water samples obtained from monitoring wells MW-1 and MW-3 were submitted for PAH analysis by EPA Method 8310.

BETX compounds were detected at concentrations greater than the DEQ ground water cleanup levels for UST sites in samples from monitoring wells MW-1 (benzene, ethylbenzene and toluene) and MW-3 (benzene). BETX compounds were detected in the ground water samples collected from monitoring wells MW-2 (benzene), MW-3 (ethylbenzene, toluene and xylenes) and MW-5 (ethylbenzene and xylenes); however, the concentrations were less than the DEQ ground water cleanup levels. BETX compounds were not detected in the ground water samples from monitoring wells MW-4, MW-6, MW-7 and MW-8.

TPH was detected in the ground water samples collected from monitoring wells MW-1 and MW-3. TPH was not detected in the ground water sample collected from monitoring well MW-2. A cleanup standard has not been established for TPH; however, the results of TPH analysis are used as an indicator test to determine whether PAH analysis should be conducted.

In accordance with DEQ requirements, the ground water samples from MW-1 and MW-3 were also analyzed for PAHs. The PAH compound naphthalene was detected at concentrations greater than the DEQ ground water cleanup level for UST sites in the ground water samples from MW-1 and MW-3. Naphthalene is a noncarcinogenic PAH compound. The following PAH compounds were also detected at concentrations greater than the DEQ ground water cleanup level for UST sites in the ground water sample collected from monitoring well MW-1: acenaphthene, benzo(a)anthracene, chrysene, and benzo(a)pyrene. Benzo(a)anthracene, chrysene and benzo(a)pyrene are carcinogenic PAH compounds.

A summary of the November 3, 1996 ground water analytical data for this monitoring event is presented in Table 2. Analytical data from previous sampling events and the DEQ ground water cleanup standards for the listed analytes are also included in Table 2. The analytical methods and laboratory data sheets from our November 3, 1996 sampling event are included in Attachment B. Concentrations of BETX compounds detected in ground water samples during the November 3, 1996 sampling event and the four previous sampling events also are presented in Figure 3.

DISCUSSION

GeoEngineers' November 1996 ground water monitoring event was the fourth quarterly ground water monitoring event for on-site monitoring wells MW-1 through MW-5 at Rose's

Parking Lot. It is the third sampling event for off-site monitoring wells MW-6, MW-7 and MW-8. Based on the results of the November 1996 monitoring event, the following summary is presented:

1. Measurable free product was not detected in the monitoring wells during this monitoring event. A sheen and petroleum-like odor were noted in water purged from MW-1, MW-3 and MW-5 during this monitoring event.
2. Benzene, ethylbenzene and toluene were detected in the ground water sample collected from monitoring well MW-1 at concentrations exceeding the DEQ ground water cleanup standards of 5 μg/l (micrograms per liter), 700 μg/l and 1,000 μg/l, respectively.
3. Benzene was detected in the ground water sample collected from monitoring well MW-3 at a concentration in excess of the DEQ ground water cleanup standard of 5 μg/l.
4. The PAH compound naphthalene was detected at concentrations greater than the DEQ cleanup standard of 28 μg/l in the ground water samples from monitoring wells MW-1 and MW-3. Naphthalene has been detected at elevated levels in monitoring wells MW-1 and MW-3 in several past sampling events.
5. The PAH compounds acenaphthene, benzo(a)anthracene, chrysene and benzo(a)pyrene were also detected at concentrations greater than the DEQ ground water cleanup levels for UST sites in the ground water sample collected from monitoring well MW-1.
6. The November 1996 ground water monitoring event was the last monitoring event to be conducted by GeoEngineers. We understand that the Birnbach, et al have contracted with Terra Vac for continued remedial efforts at Rose's Parking Lot.

LIMITATIONS

We have prepared this report for use by Mr. Max Birnbach, Amoco Corporation, Gull Industries and Unocal AMG - West Region. This report may be made available to regulatory agencies. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

Our services have been executed in accordance with the generally accepted practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

We appreciate the opportunity to provide these continued services to you. Please contact us if you have questions regarding this project.

Yours very truly,

GeoEngineers, Inc.

Marsi M. Beeson

Marsi M. Beeson
Environmental Scientist

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Associate

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TABLE 1 (Page 1 of 2)
GROUND WATER ELEVATIONS AND COMBUSTIBLE VAPOR CONCENTRATIONS

Monitoring Well[1]	Date Measured	Water Depth From Ground Surface (feet)	Ground Water Elevation[2] (feet)	Combustible Vapor Concentration[3] (ppm)	Product Thickness (feet)
MW-1	05/12/95	23.29	78.75[4]	Note[5]	0.5
	01/04/96	24.10	77.87	>10,000	Trace
	04/08/96	22.41	79.56[4]	>10,000	0.02
	04/24/96	22.45	79.55[4]	>10,000	0.05
	07/11/96	23.35	78.61	>10,000	Trace
	11/03/96	24.44	77.52	>10,000	Sheen
MW-2	05/12/95	20.75	77.54	>10,000	ND
	01/04/96	21.60	76.69	--[6]	ND
	04/08/96	19.73	78.56	400	ND
	04/24/96	19.90	78.39	<400	ND
	07/11/96	20.80	77.49	<400	Sheen
	11/03/96	21.87	76.42	2,200	ND
MW-3	05/12/95	23.48	77.86	<400	ND
	01/04/96	24.22	77.12	--[6]	ND
	04/08/96	22.31	79.03	<400	ND
	04/24/96	22.36	78.98	<400	ND
	07/11/96	23.37	77.97	<400	ND
	11/03/96	24.47	76.87	<400	Sheen
MW-4	05/12/95	22.55	79.93	<400	ND
	01/04/96	23.03	79.45	<400	ND
	04/08/96	21.60	80.88	500	ND
	04/24/96	21.34	81.14	<400	ND
	07/11/96	22.54	79.94	<400	ND
	11/03/96	23.45	79.03	<400	ND
MW-5	05/12/95	22.35	80.06	7,800	--
	01/04/96	22.84	79.57	>10,000	Trace
	04/08/96	21.40	81.01	1,200	ND
	04/24/96	20.04	82.37	<400	ND
	07/11/96	22.45	79.96	<400	ND
	11/03/96	23.38	79.03	2,500	Sheen
MW-6	04/08/96	21.53	73.93	<400	ND
	04/24/96	22.04	73.42	<400	ND
	07/11/96	22.61	72.85	<400	ND
	11/03/96	24.04	71.42	<400	ND
MW-7	04/08/96	21.50	70.61	<400	ND
	04/24/96	21.05	71.06	<400	ND
	07/11/96	22.40	69.71	<400	ND
	11/03/96	23.57	68.54	<400	ND
MW-8	04/08/96	20.19	72.93	<400	ND
	04/24/96	18.42	74.70	<400	ND
	07/11/96	18.88	74.24	<400	ND
	11/03/96	20.05	73.07	<400	ND

Notes appear on page 2 of 2.

TABLE 1 (Page 2 of 2)

Notes:

[1]Approximate locations of monitoring wells are shown in Figures 1, 2 and 3.

[2]Elevations are measured relative to the temporary benchmark shown in Figure 2. The benchmark has an assumed elevation of 100.00 feet.

[3]Measured with a Bacharch TLV Sniffer calibrated to hexane and equipped with a drop hose lowered to within 1 foot of the ground water table. The lower threshold of significance in this application is 400 ppm.

[4]The ground water elevation was corrected for the presence of free product using a specific gravity of 0.7.

[5]Combustible vapor measurements are not representative of soil conditions because the water table was above the top of the screen.

[6]TLV Sniffer was not functioning.

ppm = parts per million

ND = not detected

"--" = not measured

No. 4326001J

TABLE 2 (Page 1 of 6)
SUMMARY OF GROUND WATER SAMPLE ANALYTICAL DATA[1]

Monitoring Well Number[2]	Date Sampled[3]	BETX[4] (EPA Method 8020) (µg/l)				Total Petroleum Hydrocarbons (EPA Method 418.1) (mg/l)	PAHs[5] (EPA Method 8310) (µg/l)	EDB/EDC[6] (EPA Method 8010M) (µg/l)	Dissolved Lead (EPA Method 7421) (µg/l)
		B	E	T	X				
MW-1	03/29/94	130	98	390	1,570	--	--	--	--
	10/04/94	27	5.9	46	70.0	--	--	--	--
	05/12/95[7]	--	--	--	--	--	--	--	--
	01/04/96	400	630	2,200	4,800	54	Naphthalene - 370 Acenaphthylene - 44	EDB - 21 EDC - <1.0	100
	04/24/96[7]	--	--	--	--	--	--	--	--
	07/11/96	710	730	1,800	2,300	81	Napthalene - 750 Acenaphthylene - 160 Phenanthrene - 2.2 Fluoranthene - 4.5	--	--
DEQ Cleanup Levels		5	700	1,000	10,000	NE	Napthalene - 28 Acenaphthylene - NE Acenaphthene - 420 Fluorene - 280 Phenanthrene - NE Anthracene - 2,100 Fluoranthene - 280 Pyrene - 210 Benzo(a)anthracene - 0.1 Chrysene - 0.2 Benzo(k)fluoranthene - 0.2 Benzo(a)pyrene - 0.2 Dibenzo(a,h)anthracene - 0.3 Benzo(g,h,i)perylene - NE	EDB - 1 EDC - 5	5

Notes appear on page 6 of 6.

TABLE 2 (Page 2 of 6)

Monitoring Well Number[2]	Date Sampled[3]	BETX[4] (EPA Method 8020) (µg/l)				Total Petroleum Hydrocarbons (EPA Method 418.1) (mg/l)	PAHs[5] (EPA Method 8310) (µg/l)	EDB/EDC[6] (EPA Method 8010M) (µg/l)	Dissolved Lead (EPA Method 7421) (µg/l)
		B	E	T	X				
MW-1 (continued)	11/03/96	410	910	1,500	4,100	23	Napthalene - 2,400 Acenaphthylene - 460 Acenaphthene - 600 Fluorene - 12 Phenanthrene - 12 Anthracene - 0.89 Fluoranthene - 10 Pyrene - 2.1 Benzo(a)anthracene - 0.7 Chrysene - 1.3 Benzo(k)fluoranthene - 0.1 Benzo(a)pyrene - 0.3 Dibenzo(a,h)anthracene - 0.1 Benzo(g,h,i)perylene - 0.4	–	–
DEQ Cleanup Levels		5	700	1,000	10,000	NE	Napthalene - 28 Acenaphthylene - NE Acenaphthene - 420 Fluorene - 280 Phenanthrene - NE Anthracene - 2,100 Fluoranthene - 280 Pyrene - 210 Benzo(a)anthracene - 0.1 Chrysene - 0.2 Benzo(k)fluoranthene - 0.2 Benzo(a)pyrene - 0.2 Dibenzo(a,h)anthracene - 0.3 Benzo(g,h,i)perylene - NE	EDB - 1 EDC - 5	5

Notes appear on page 6 of 6.

TABLE 2 (Page 3 of 6)

Monitoring Well Number[2]	Date Sampled[3]	BETX[4] (EPA Method 8020) (µg/l)				Total Petroleum Hydrocarbons (EPA Method 418.1) (mg/l)	PAHs[5] (EPA Method 8310) (µg/l)	EDB/EDC[6] (EPA Method 8010M) (µg/l)	Dissolved Lead (EPA Method 7421) (µg/l)
		B	E	T	X				
MW-2	03/29/94	4.9	0.7	1.4	3.0	--	--	--	--
	10/04/94	<0.5	<0.5	<0.5	<0.5	--	--	--	--
	05/12/95	1.2	0.6	<0.5	0.7	<0.5	--	--	--
	01/04/96	14	<0.5	1.5	1.7	1.6	ND	EDB - <0.5	<2
	04/24/96	7.7	<0.5	0.5	<0.5	--	--	--	--
	07/11/96	2.7	<0.5	<0.5	<0.5	7.1	ND	--	--
	11/03/96	2.0	<0.5	<0.5	<0.5	<0.5	--	--	--
DEQ Cleanup Levels		5	700	1,000	10,000	NE	Napthalene - 28 Acenaphthylene - NE Acenaphthene - 420 Fluorene - 280 Phenanthrene - NE Anthracene - 2,100 Fluoranthene - 280 Pyrene - 210 Benzo(a)anthracene - 0.1 Chrysene - 0.2 Benzo(k)fluoranthene - 0.2 Benzo(a)pyrene - 0.2 Dibenzo(a,h)anthracene - 0.3 Benzo(g,h,i)perylene - NE	EDB - 1 EDC - 5	5

Notes appear on page 6 of 6.

TABLE 2 (Page 4 of 6)

Monitoring Well Number[2]	Date Sampled[3]	BETX[4] (EPA Method 8020) (µg/l)				Total Petroleum Hydrocarbons (EPA Method 418.1) (mg/l)	PAHs[5] (EPA Method 8310) (µg/l)	EDB/EDC[6] (EPA Method 8010M) (µg/l)	Dissolved Lead (EPA Method 7421) (µg/l)
		B	E	T	X				
MW-3	03/29/94	2,300	1,200	1,200	3,700	--	--	--	--
	10/04/94	1,520	790	600	1,600	--	--	--	--
	05/12/95	1,300	800	740	2,000	3.5	Naphthalene - 130 Fluorene - 0.2 Phenanthrene - 0.09	--	--
	01/04/96	1,300	940	640	2,600	4.5	Naphthalene - 160 Acenaphthylene - 23	EDB - <1.0 EDC - 7.1	6
	04/16/96	900	600	500	1,400	--	--	--	--
	07/11/96	460	380	130	430	2.1	Naphthalene - 71	--	--
	11/03/96	830	650	220	1,100	4.9	Naphthalene - 120 Acenaphthylene - 37	--	--
MW-4	10/04/94	<0.5	<0.5	<0.5	<0.5	--	--	--	--
	05/12/95	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	--
	01/04/96	<0.5	<0.5	<0.5	<0.5	0.9	ND	EDB - <0.5 EDC - <0.2	<2
	04/24/96	<0.5	<0.5	<0.5	<0.5	--	--	--	--
	07/11/96	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	--
	11/03/96	<0.5	<0.5	<0.5	<0.5	--	--	--	--
DEQ Cleanup Levels		5	700	1,000	10,000	NE	Napthalene - 28 Acenaphthylene - NE Acenaphthene - 420 Fluorene - 280 Phenanthrene - NE Anthracene - 2,100 Fluoranthene - 280 Pyrene - 210 Benzo(a)anthracene - 0.1 Chrysene - 0.2 Benzo(k)fluoranthene - 0.2 Benzo(a)pyrene - 0.2 Dibenzo(a,h)anthracene - 0.3 Benzo(g,h,i)perylene - NE	EDB - 1 EDC - 5	5

Notes appear on page 6 of 6.

TABLE 2 (Page 5 of 6)

Monitoring Well Number[2]	Date Sampled[3]	BETX[4] (EPA Method 8020) (µg/l)				Total Petroleum Hydrocarbons (EPA Method 418.1) (mg/l)	PAHs[5] (EPA Method 8310) (µg/l)	EDB/EDC[6] (EPA Method 8010M) (µg/l)	Dissolved Lead (EPA Method 7421) (µg/l)
		B	E	T	X				
MW-5	05/12/95	660	1,900	13,000	11,000	13	Naphthalene 450 Acenaphthylene 66 Fluorene 0.6 Phenanthrene 0.42 Anthracene 0.07	--	--
	01/04/96	4.6	24	22	230	6.6	Naphthalene 29 Acenaphthylene 13 Fluorene 0.8	EDB - <0.5 EDC - <0.2	14
	04/24/96	<0.5	1.1	0.6	2.9	--	--	--	--
	07/11/96	<0.5	<0.5	<0.5	2.7	<0.5	--	--	--
	11/03/96	<0.5	2.5	<0.5	5.6	--	--	--	--
MW-6	04/24/96	<0.5	<0.5	<0.5	<0.5	<0.5	--	EDB - <0.5 EDC - <0.2	<0.002
	07/11/96	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	--
	11/03/96	<0.5	<0.5	<0.5	<0.5	--	--	--	--
DEQ Cleanup Levels		5	700	1,000	10,000	NE	Napthalene - 28 Acenaphthylene - NE Acenaphthene - 420 Fluorene - 280 Phenanthrene - NE Anthracene - 2,100 Fluoranthene - 280 Pyrene - 210 Benzo(a)anthracene - 0.1 Chrysene - 0.2 Benzo(k)fluoranthene - 0.2 Benzo(a)pyrene - 0.2 Dibenzo(a,h)anthracene - 0.3 Benzo(g,h,i)perylene - NE	EDB - 1 EDC - 5	5

Notes appear on page 6 of 6.

TABLE 2 (Page 6 of 6)

Monitoring Well Number[2]	Date Sampled[3]	BETX[4] (EPA Method 8020) (µg/l)				Total Petroleum Hydrocarbons (EPA Method 418.1) (mg/l)	PAHs[5] (EPA Method 8310) (µg/l)	EDB/EDC[6] (EPA Method 8010M) (µg/l)	Dissolved Lead (EPA Method 7421) (µg/l)
		B	E	T	X				
MW-7	04/24/96	<0.5	<0.5	<0.5	<0.5	<0.5	--	EDB - <0.5 EDC - <0.2	<0.002
	07/11/96	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	--
	11/03/96	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-8	04/24/96	<0.5	<0.5	<0.5	<0.5	<0.5	--	EDB - <0.5 EDC - <0.2	<0.002
	07/11/96	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	--
	11/03/96	<0.5	<0.5	<0.5	<0.5	--	--	--	--
DEQ Cleanup Levels		5	700	1,000	10,000	NE	Napthalene - 28 Acenaphthylene - NE Acenaphthene - 420 Fluorene - 280 Phenanthrene - NE Anthracene - 2,100 Fluoranthene - 280 Pyrene - 210 Benzo(a)anthracene - 0.1 Chrysene - 0.2 Benzo(k)fluoranthene - 0.2 Benzo(a)pyrene - 0.2 Dibenzo(a,h)anthracene - 0.3 Benzo(g,h,i)perylene - NE	EDB - 1 EDC - 5	5

Notes:

[1]Chemical analyses were conducted by American Environmental Network, Inc. of Durham, Oregon (formerly ATI [Analytical Technologies, Inc.]).

[2]Approximate monitoring well locations are shown in Figures 1, 2 and 3.

[3]Ground water samples obtained prior to 05/12/95 were obtained by others. Analytical data were provided to GeoEngineers by Unocal.

[4]B = benzene, E = ethylbenzene, T = toluene, X = xylenes

[5]PAHs = polycyclic aromatic hydrocarbons. Only analytes detected are listed. Refer to attached chemical analytical data and data included with previous reports for a complete list of analytes and their respective detection limits.

[6]EDB/EDC = ethylene dibromide/ethylene dichloride

[7]Monitoring well MW-1 was not sampled because of the presence of free product.

µg/l = micrograms per liter, mg/l = milligrams per liter, "--" = not analyzed, NE = not established, ND = not detected

Shading indicates concentrations greater than DEQ cleanup levels for UST sites.

D:\PROJECTS\04326\001\GEO_SP2

Retail Building

Parking Lot

Residential Area

MW-6

Sidewalk

N.W. FLANDERS STREET

MW-7

Parking Strip/Sidewalk

Rose's Parking Lot

MW-2

Office Building

MW-3

RW-1

MW-1

Landscaped Area

MW-5

MW-8

MW-4

Parking

Under Construction

Parking

Residential Area

N.W. 23rd AVENUE

N.W. 22nd AVENUE

N.W. EVERETT STREET

N.W. 22nd PLACE

N

0 50 100

SCALE IN FEET

EXPLANATION:

MW-1 ◑ MONITORING WELL BY OTHERS

MW-5 ● MONITORING WELL BY GEOENGINEERS

RW-1 ⊕ RECOVERY WELL BY GEOENGINEERS

Note: The locations of all features shown are approximate.

Reference: Multnomah County Tax Assessor's Map.

4326-001-P36 SAK:MAM 08/31/95

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SITE PLAN

FIGURE 1

P:\4326001\CAD\GW_EL4

MW-6
71.42

Sidewalk

N

0 30 60
SCALE IN FEET

N.W. FLANDERS STREET

MW-7
68.54

Sidewalk

MW-2
76.42

BM

MW-3
76.87

RW-1

MW-1
77.52

N.W. 23rd AVENUE

MW-5
79.03

MW-4
79.03

Building

Parking

MW-8
73.07

Parking Lot

Under Construction

EXPLANATION:

MW-1 / 77.52 — MONITORING WELL BY OTHERS
GROUND WATER ELEVATION (IN FEET) ON 11/03/96

MW-5 / 79.03 — MONITORING WELL BY GEOENGINEERS
GROUND WATER ELEVATION (IN FEET) ON 11/03/96

R-1 — RECOVERY WELL BY GEOENGINEERS

APPROXIMATE DIRECTION OF GROUND WATER FLOW

BM — BENCHMARK AT NORTHEAST CORNER OF CATCH BASIN ON NW 23RD AVENUE: ASSUMED ELEVATION 100.00 FEET

Note: The locations of all features shown are approximate.

Reference: Multnomah County Tax Assessor's Map.

4326-001-P36 MB2:MAD 11/19/96

GeoEngineers

GROUND WATER ELEVATIONS NOVEMBER 3, 1996

FIGURE 2

P:\04326001\CAD\BETX_SP1

MW-8	B	E	T	X
04/24/96	<0.5	<0.5	<0.5	<0.5
07/11/96	<0.5	<0.5	<0.5	<0.5
11/03/96	<0.5	<0.5	<0.5	<0.5
DEQ Standards	5	700	1,000	10,000

N.W. FLANDERS STREET

MW-7	B	E	T	X
04/24/96	<0.5	<0.5	<0.5	<0.5
07/11/96	<0.5	<0.5	<0.5	<0.5
11/03/96	<0.5	<0.5	<0.5	<0.5
DEQ Standards	5	700	1,000	10,000

N

0 30 60

SCALE IN FEET

MW-2	B	E	T	X
01/04/96	14	<0.5	1.5	1.7
04/24/96	7.7	<0.5	0.5	<0.5
07/11/96	2.7	<0.5	<0.5	<0.5
11/03/96	2.0	<0.5	<0.5	<0.5
DEQ Standards	5	700	1,000	10,000

MW-1	B	E	T	X
01/04/96	400	630	2,200	4,800
04/24/96	--	--	--	--
07/11/96	710	730	1,800	2,300
11/03/96	410	910	1,500	4,100
DEQ Standards	5	700	1,000	10,000

MW-3	B	E	T	X
01/04/96	1,300	940	640	2,600
04/16/96	900	600	500	1,400
07/11/96	460	380	130	430
11/03/96	830	650	220	1,100
DEQ Standards	5	700	1,000	10,000

Building

RW-1

MW-6	B	E	T	X
01/04/96	4.6	24	22	230
04/24/96	<0.5	1.1	0.6	2.9
07/11/96	<0.5	<0.5	<0.5	2.7
11/03/96	<0.5	2.5	<0.5	5.6
DEQ Standards	5	700	1,000	10,000

MW-4	B	E	T	X
01/04/96	<0.5	<0.5	<0.5	<0.5
04/24/96	<0.5	<0.5	<0.5	<0.5
07/11/96	<0.5	<0.5	<0.5	<0.5
11/03/96	<0.5	<0.5	<0.5	<0.5
DEQ Standards	5	700	1,000	10,000

N.W. 23rd AVENUE

MW-8	B	E	T	X
04/24/96	<0.5	<0.5	<0.5	<0.5
07/11/96	<0.5	<0.5	<0.5	<0.5
11/03/96	<0.5	<0.5	<0.5	<0.5
DEQ Standards	5	700	1,000	10,000

EXPLANATION:

- ◐ MONITORING WELL BY GEOENGINEERS
- ◑ MONITORING WELL BY OTHERS
- RW-1 ⊕ RECOVERY WELL BY GEOENGINEERS
- B BENZENE (μg/l)
- E ETHYLBENZENE (μg/l)
- T TOLUENE (μg/l)
- X XYLENES (μg/l)
- -- NOT TESTED
- (μg/l) MICROGRAMS PER LITER

NOTES:

1. The locations of all features shown are approximate.
2. See Figure 2 for identification of site features.

Reference: Multnomah County Tax Assessor's Map.

GeoEngineers

BETX CONCENTRATIONS

FIGURE 3

4326-001-P36 MB2:MAD 11/19/96

ATTACHMENT A

FIELD PROCEDURES

GROUND WATER ELEVATIONS

Depths to the shallow ground water surface relative to the monitoring well casing rims were measured to an accuracy of 0.01 foot on November 3, 1996 using an ORS (Oil Recovery Systems, Inc.) interface probe. The interface probe was cleaned with a Liquinox wash and distilled water rinse prior to its use in each well. Ground water elevations were calculated by subtracting the depths to ground water from the casing rim elevations. The ground water elevations measured on November 3, 1996 are shown in Table 1. Ground water elevations for the November 1996 event also are shown in Figure 2.

COMBUSTIBLE VAPOR CONCENTRATIONS

Combustible vapor concentrations were measured in the monitoring well casings on November 3, 1996 using a Bacharach TLV Sniffer calibrated to hexane. The measurements were obtained by lowering a vinyl tube connected to the TLV Sniffer to within approximately 1 foot of the water surface. The TLV Sniffer measures combustible vapor concentrations and is used as a field indicator for combustible vapors present in the monitoring well casings. The lower threshold of significance for the Bacharach TLV Sniffer in this application is 400 ppm (parts per million), or 3.6 percent of the lower explosive limit of hexane. The combustible vapor concentrations measured on November 3, 1996 are shown in Table 1.

GROUND WATER SAMPLING PROGRAM

Ground water samples were collected from monitoring wells MW-1 through MW-8 on November 3, 1996. The water samples were collected with a disposable polyethylene bailer after at least three well volumes of water were removed from each monitoring well casing. A new bailer and cord were used to sample each monitoring well to minimize the possibility of cross-contamination between monitoring wells. The ground water samples were transferred in the field to 40-milliliter septum vials and 1-liter amber jars and kept cool during transport to the analytical laboratory. The laboratory provided septum vials containing hydrochloric acid as a preservative for the BETX samples, 1-liter amber jars containing hydrochloric acid as a preservative for the TPH samples and unpreserved 1-liter amber jars for the PAH samples. Chain-of-custody procedures were followed during transport of the ground water samples to the analytical laboratory.

DEVELOPMENT AND PURGE WATER DISPOSAL

Development and purge water from the monitoring wells was placed into a 55-gallon drum that is stored on site pending disposal at a recycling facility.

ATTACHMENT B

ATTACHMENT B

CHEMICAL ANALYTICAL PROGRAM

ANALYTICAL METHODS

The ground water samples were analyzed by AEN (American Environmental Network, Inc.) of Durham, Oregon. Chain-of-custody procedures were followed during transport of the samples to the analytical laboratory. Samples were held in cold storage pending analysis. The analytical results, analytical methods reference, and laboratory QA/QC (quality assurance/quality control) records are included in this attachment. The analytical results also are summarized in the text and in Table 2 of this report.

ANALYTICAL DATA REVIEW

The laboratory maintains an internal quality assurance program, as documented in its laboratory quality assurance manual. The laboratory uses a combination of blanks, surrogate recoveries, duplicates, matrix spike duplicate recoveries, blank spike recoveries and blank spike duplicate recoveries to evaluate the validity of the analytical results. The laboratory also uses data quality goals for individual chemicals or groups of chemicals based on the long-term performance of the test methods. The data quality goals were included in the laboratory report. The laboratory compared the samples with the existing data quality goals and noted any exceptions in the laboratory report. If data quality exceptions were documented by the laboratory in the laboratory report, the data quality exceptions were reviewed by GeoEngineers using the applicable data validation guidelines from the following documents: "National Functional Guidelines for Organic Data Review," draft dated 1991, and "Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses," dated 1988.

ANALYTICAL DATA REVIEW SUMMARY

The laboratory data for EPA Method 8310, Polynuclear Aromatic Hydrocarbons, indicates that matrix spikes were not extracted due to the limited quantity of sample. The blank spikes were extracted and are reported.

No other data quality exceptions were documented in the laboratory reports or noted during our review. Based on the data quality review, it is our opinion that the analytical data are acceptable for their intended use.

American Environmental Network, Inc.

17400 SW Upper Boones Ferry Rd. • Suite 270 • Durham, OR 97224 • (503) 684-0447

AEN I.D. 611515

November 21, 1996

Marsi Beeson
GeoEngineers
7504 SW Bridgeport Rd.
Portland, OR 97224

Project Name / Number: BirnBach / 4326-001-62

Attention: Marsi Beeson

On November 4, 1996, American Environmental Network (OR), Inc. received eight water samples for analysis for the above listed project. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed. The results from these samples relate only to the items tested. This report shall not be reproduced, except in full, without the written approval of the laboratory.

If you have any questions or comments, please do not hesitate to contact us at (503) 684-0447.

Andi Hoevet
Porject Manager

Steven E. Stanley
Laboratory Manager

AH/SES:alm
Enclosure

SAMPLE CROSS REFERENCE SHEET

CLIENT:	GeoEngineers, Inc.	**AEN I.D.:**	611515
PROJECT #:	4326-001-62		
PROJECT NAME:	Bimbach	**MATRIX:**	WATER

AEN #	CLIENT DESCRIPTION	DATE SAMPLED
611515-1	MW-1-110396	11/03/96
611515-2	MW-2-110396	11/03/96
611515-3	MW-3-110396	11/03/96
611515-4	MW-4-110396	11/03/96
611515-5	MW-5-110396	11/03/96
611515-6	MW-6-110396	11/03/96
611515-7	MW-7-110396	11/03/96
611515-8	MW-8-110396	11/03/96

----------TOTALS----------

MATRIX	# SAMPLES
WATER	8

AEN STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of the report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

ANALYTICAL SCHEDULE

CLIENT:	GeoEngineers, Inc.	**AEN I.D.:**	611515
PROJECT #:	4326-001-62		
PROJECT NAME:	Bimbach		

ANALYSIS	TECHNIQUE	REFERENCE	LAB
Petroleum Hydrocarbon	IR	EPA 418.1	PLD
BETX	GC/PID	EPA 8020M	PLD
PAHs	HPLC/UV/FLUOR	EPA 8310	PLD

PLD = AEN - Portland
PHX = AEN - Phoenix
PNR = AEN - Pensacola
CA = AEN - Pleasant Hill
MD = AEN - Columbia
SUB = Subcontract

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	611515-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	N/A
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	N/A
PROJECT #:	4326-001-62	**DATE ANALYZED:**	11/05/96
PROJECT NAME:	Bimbach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS	
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5
SURROGATE:		
TRIFLUOROTOLUENE (84%-120%)		114%

Analyst: JLK 11/6/96

Reviewer: MLB 11/6/96

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	611515-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	N/A
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	N/A
PROJECT #:	4326-001-62	**DATE ANALYZED:**	11/06/96
PROJECT NAME:	Bimbach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS	
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5
SURROGATE:		
TRIFLUOROTOLUENE (84%-120%)		110%

Analyst: JMC 11/7/96

Reviewer: WBU 11/7/96

American Environmental Network, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	611515-1
CLIENT I.D.:	MW-1-110396	**DATE SAMPLED:**	11/03/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	11/04/96
PROJECT #:	4326-001-62	**DATE ANALYZED:**	11/05/96
PROJECT NAME:	Bimbach	**DILUTION FACTOR:**	20
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS	
BENZENE	410	
TOLUENE	1500	
ETHYLBENZENE	910	
TOTAL XYLENES	4100	D
SURROGATE:		
TRIFLUOROTOLUENE (84%-120%)	103%	

D = Value from a 1:50 dilution analyzed on 11/06/96.

Analyst: MAC 11/7/96

Reviewer: MB 11/7/96

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	611515-2
CLIENT I.D.:	MW-2-110396	**DATE SAMPLED:**	11/03/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	11/04/96
PROJECT #:	4326-001-62	**DATE ANALYZED:**	11/05/96
PROJECT NAME:	Bimbach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		RESULTS
BENZENE		2.0
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5

SURROGATE:	
TRIFLUOROTOLUENE (84%-120%)	110%

Analyst: 11/6/96

Reviewer: 11/6/96

American Environmental Network, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	611515-3
CLIENT I.D.:	MW-3-110396	**DATE SAMPLED:**	11/03/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	11/04/96
PROJECT #:	4326-001-62	**DATE ANALYZED:**	11/06/96
PROJECT NAME:	Bimbach	**DILUTION FACTOR:**	10
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS
BENZENE	830
TOLUENE	220
ETHYLBENZENE	650
TOTAL XYLENES	1100
SURROGATE:	
TRIFLUOROTOLUENE (84%-120%)	106%

Analyst: JJC 11/7/96

Reviewer: MB 11/7/96

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	611515-4
CLIENT I.D.:	MW-4-110396	**DATE SAMPLED:**	11/03/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	11/04/96
PROJECT #:	4326-001-62	**DATE ANALYZED:**	11/05/96
PROJECT NAME:	Bimbach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS	
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5

SURROGATE:	
TRIFLUOROTOLUENE (84%-120%)	107%

Analyst: JLK 11/6/96

Reviewer: MLB 11/6/96

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	611515-5
CLIENT I.D.:	MW-5-110396	**DATE SAMPLED:**	11/03/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	11/04/96
PROJECT #:	4326-001-62	**DATE ANALYZED:**	11/05/96
PROJECT NAME:	Bimbach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS	
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE		2.5
TOTAL XYLENES		5.6
SURROGATE:		
TRIFLUOROTOLUENE (84%-120%)		101%

Analyst: JAK 11/6/96

Reviewer: WB 11/6/96

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	611515-6
CLIENT I.D.:	MW-6-110396	**DATE SAMPLED:**	11/03/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	11/04/96
PROJECT #:	4326-001-62	**DATE ANALYZED:**	11/05/96
PROJECT NAME:	Bimbach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS	
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5
SURROGATE:		
TRIFLUOROTOLUENE (84%-120%)		105%

Analyst: JLC 11/6/96

Reviewer: MB 11/6/96

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	611515-7
CLIENT I.D.:	MW-7-110396	**DATE SAMPLED:**	11/03/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	11/04/96
PROJECT #:	4326-001-62	**DATE ANALYZED:**	11/05/96
PROJECT NAME:	Bimbach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS	
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5

SURROGATE:

TRIFLUOROTOLUENE (84%-120%)	101%

Analyst: JLK 11/6/96

Reviewer: ALB 11/6/96

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	611515-8
CLIENT I.D.:	MW-8-110396	**DATE SAMPLED:**	11/03/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	11/04/96
PROJECT #:	4326-001-62	**DATE ANALYZED:**	11/05/96
PROJECT NAME:	Bimbach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		RESULTS
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5
SURROGATE:		
TRIFLUOROTOLUENE (84%-120%)		107%

Analyst: JLK 11/6/96

Reviewer: MB 11/6/96

GAS CHROMATOGRAPHY SPIKE RESULTS

METHOD:	BETX (EPA 8020M)	**AEN ID:**	611515
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	611519-1
PROJECT #:	4326-001-62	**DATE ANALYZED:**	11/05/96
PROJECT NAME:	Bimbach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<	0.5	20.0	20.6	103	21.0	105	2
TOLUENE	<	0.5	20.0	20.6	103	20.7	104	0
ETHYLBENZENE	<	0.5	20.0	19.7	99	19.7	99	0
TOTAL XYLENES	<	0.5	60.0	57.4	96	57.5	96	0
SURROGATE:								
TRIFLUOROTOLUENE (84% - 120%)					103%		105%	

CONTROL LIMITS

	% REC	RPD
BENZENE	81-119	20
TOLUENE	85-115	20
ETHYLBENZENE	85-115	20
TOTAL XYLENES	85-115	20

Analyst: JLC 11/6/96

Reviewer: KLB 11/6/96

GAS CHROMATOGRAPHY SPIKE RESULTS

METHOD:	BETX (EPA 8020M)	**AEN ID:**	611515
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	611523-1
PROJECT #:	4326-001-62	**DATE ANALYZED:**	11/06/96
PROJECT NAME:	Bimbach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<	0.5	20.0	20.2	101	20.3	102	0
TOLUENE	<	0.5	20.0	19.9	100	20.3	102	2
ETHYLBENZENE	<	0.5	20.0	19.5	98	20.0	100	3
TOTAL XYLENES	<	0.5	60.0	57.0	95	58.6	98	3
SURROGATE:								
TRIFLUOROTOLUENE (84% - 120%)					104%		102%	

CONTROL LIMITS

	% REC	RPD
BENZENE	81-119	20
TOLUENE	85-115	20
ETHYLBENZENE	85-115	20
TOTAL XYLENES	85-115	20

Analyst: JLK 11/7/96

Reviewer: RWB 11/7/96

GAS CHROMATOGRAPHY SPIKE RESULTS

METHOD:	BETX (EPA 8020M)	**AEN ID:**	611515
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	Method Blank
PROJECT #:	4326-001-62	**DATE ANALYZED:**	11/05/96
PROJECT NAME:	Bimbach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<	0.5	40.0	41.0	103	40.9	102	0
TOLUENE	<	0.5	40.0	39.8	100	41.3	103	4
ETHYLBENZENE	<	0.5	40.0	39.1	98	39.7	99	2
TOTAL XYLENES	<	0.5	80.0	76.8	96	79.4	99	3
SURROGATE:								
TRIFLUOROTOLUENE (84% - 120%)					106%		102%	

CONTROL LIMITS

	% REC	RPD
BENZENE	82-115	20
TOLUENE	85-115	20
ETHYLBENZENE	85-117	20
TOTAL XYLENES	84-116	20

Analyst: JK 11/6/96

Reviewer: MB 11/6/96

GAS CHROMATOGRAPHY SPIKE RESULTS

METHOD:	BETX (EPA 8020M)	**AEN ID:**	611515
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	Method Blank
PROJECT #:	4326-001-62	**DATE ANALYZED:**	11/06/96
PROJECT NAME:	Bimbach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<	0.5	20.0	20.8	104	20.3	102	2
TOLUENE	<	0.5	20.0	20.2	101	19.8	99	2
ETHYLBENZENE	<	0.5	20.0	19.9	100	19.7	99	1
TOTAL XYLENES	<	0.5	60.0	58.8	98	58.1	97	1
SURROGATE:								
TRIFLUOROTOLUENE (84% - 120%)					101%		105%	

CONTROL LIMITS

	% REC	RPD
BENZENE	82-115	20
TOLUENE	85-115	20
ETHYLBENZENE	85-117	20
TOTAL XYLENES	84-116	20

Analyst: JLC 11/7/96

Reviewer: MB 11/7/96

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**AEN I.D.:**	611515-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	N/A
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	N/A
PROJECT #:	4326-001-62	**DATE EXTRACTED:**	11/05/96
PROJECT NAME:	Bimbach	**DATE ANALYZED:**	11/06/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	< 0.5

Analyst: PK 11/7/96

Reviewer: JHC 11/7/96

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**AEN I.D.:**	611515-1
CLIENT I.D.:	MW-1-110396	**DATE SAMPLED:**	11/03/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	11/04/96
PROJECT #:	4326-001-62	**DATE EXTRACTED:**	11/05/96
PROJECT NAME:	Bimbach	**DATE ANALYZED:**	11/06/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	5
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	23

Analyst: PK 11/7/96

Reviewer: JMC 11/7/96

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**AEN I.D.:**	611515-2
CLIENT I.D.:	MW-2-110396	**DATE SAMPLED:**	11/03/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	11/04/96
PROJECT #:	4326-001-62	**DATE EXTRACTED:**	11/05/96
PROJECT NAME:	Bimbach	**DATE ANALYZED:**	11/06/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	< 0.5

Analyst: DK 11/7/96

Reviewer: JLK 11/7/96

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**AEN I.D.:**	611515-3
CLIENT I.D.:	MW-3-110396	**DATE SAMPLED:**	11/03/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	11/04/96
PROJECT #:	4326-001-62	**DATE EXTRACTED:**	11/05/96
PROJECT NAME:	Bimbach	**DATE ANALYZED:**	11/06/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	4.9

Analyst: PK 11/7/96

Reviewer: JLK 11/7/96

INFRARED SPECTROPHOTOMETRY SPIKE RESULTS

		AEN ACCESSION:	611515
METHOD:	EPA - 418.1	**QC SAMPLE:**	610653-1
CLIENT:	GeoEngineers, Inc.	**DATE EXTRACTED:**	11/05/96
PROJECT #:	4326-001-62	**DATE ANALYZED:**	11/06/96
PROJECT NAME:	Bimbach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	mg/L

PARAMETER	SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
3-Component Oil	< 0.5	10.0	9.5	95	8.9	89	7

CONTROL LIMITS

	%REC	RPD
3-Component Oil	65 - 124	20

Analyst: PK 11/7/96

Reviewer: JLK 11/7/96

INFRARED SPECTROPHOTOMETRY SPIKE RESULTS

METHOD:	EPA - 418.1	**AEN ACCESSION:**	611515
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	Method Blank
PROJECT #:	4326-001-62	**DATE EXTRACTED:**	11/05/96
PROJECT NAME:	Bimbach	**DATE ANALYZED:**	11/06/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
3-Component Oil	< 0.5	10.0	9.0	90	9.1	91	1

CONTROL LIMITS

	%REC	RPD
3-Component Oil	60 - 118	20

Analyst: PK 11/7/96

Reviewer: JMC 11/7/96

CASE NARRATIVE FOR EPA METHOD 8310

POLYNUCLEAR AROMATIC HYDROCARBONS

AEN ACCESSION NUMBER 611515

A 1.0 liter aliquot of each aqueous sample was extracted with methylene chloride by liquid:liquid method (EPA method 3510). The methylene chloride was reduced and exchanged to acetonitrile. Final volume was 1.0 ml.

The extracts were analyzed by HPLC with UV (254 nm) and fluorescence detectors in series. A gradient mobile phase of water and acetonitrile was utilized for the analysis. Five and six point calibration curves were generated and utilized for the analysis.

Due to limited sample no matrix spikes were extracted. Blank spikes were extracted and are reported.

Greg Ellsworth

LIQUID CHROMATOGRAPHY RESULTS

METHOD:	8310	**AEN I.D.:**	611515-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	NA
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	NA
PROJECT #:	4326-001-62	**DATE EXTRACTED:**	11/08/96
PROJECT NAME:	Bimbach	**DATE ANALYZED:**	11/14/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER	RESULTS	
NAPHTHALENE	<	0.5
ACENAPHTHYLENE	<	1.0
ACENAPHTHENE	<	1.0
FLUORENE	<	0.1
PHENANTHRENE	<	0.05
ANTHRACENE	<	0.05
FLUORANTHENE	<	0.1
PYRENE	<	0.1
BENZO(a)ANTHRACENE	<	0.1
CHRYSENE	<	0.1
BENZO(b)FLUORANTHENE	<	0.1
BENZO(k)FLUORANTHENE	<	0.1
BENZO(a)PYRENE	<	0.1
DIBENZO(a,h)ANTHRACENE	<	0.1
BENZO(g,h,i)PERYLENE	<	0.1
INDENO(1,2,3-cd)PYRENE	<	0.1

SURROGATE:	
BIPHENYL (28%-125%)	76%

Analyst: CE 11/19/96

Reviewer: PM 11/20/96

LIQUID CHROMATOGRAPHY RESULTS

METHOD:	8310	**AEN I.D.:**	611515-1
CLIENT I.D.:	MW-1-110396	**DATE SAMPLED:**	11/03/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	11/04/96
PROJECT #:	4326-001-62	**DATE EXTRACTED:**	11/08/96
PROJECT NAME:	Bimbach	**DATE ANALYZED:**	11/15/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER		RESULTS	
NAPHTHALENE		2400	D
ACENAPHTHYLENE		460	D
ACENAPHTHENE		600	D
FLUORENE		12	D
PHENANTHRENE		12	D
ANTHRACENE		0.89	
FLUORANTHENE		10	D
PYRENE		2.1	
BENZO(a)ANTHRACENE		0.7	
CHRYSENE		1.3	
BENZO(b)FLUORANTHENE	<	0.1	
BENZO(k)FLUORANTHENE		0.1	
BENZO(a)PYRENE		0.3	
DIBENZO(a,h)ANTHRACENE		0.1	
BENZO(g,h,i)PERYLENE		0.4	
INDENO(1,2,3-cd)PYRENE	<	0.1	

SURROGATE:		
BIPHENYL (28%-125%)	965%	F

D = Value from a 1:100 analyzed on 11/19/96.

F = Out of limits due to matrix interference.

Analyst: GE 11/21/96

Reviewer: pm 11/21/96

LIQUID CHROMATOGRAPHY RESULTS

METHOD:	8310	**AEN I.D.:**	611515-3
CLIENT I.D.:	MW-3-110396	**DATE SAMPLED:**	11/03/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	11/04/96
PROJECT #:	4326-001-62	**DATE EXTRACTED:**	11/08/96
PROJECT NAME:	Bimbach	**DATE ANALYZED:**	11/15/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER		RESULTS	
NAPHTHALENE		120	D
ACENAPHTHYLENE		37	
ACENAPHTHENE	<	1.0	
FLUORENE	<	0.1	
PHENANTHRENE	<	0.05	
ANTHRACENE	<	0.05	
FLUORANTHENE	<	0.1	
PYRENE	<	0.1	
BENZO(a)ANTHRACENE	<	0.1	
CHRYSENE	<	0.1	
BENZO(b)FLUORANTHENE	<	0.1	
BENZO(k)FLUORANTHENE	<	0.1	
BENZO(a)PYRENE	<	0.1	
DIBENZO(a,h)ANTHRACENE	<	0.1	
BENZO(g,h,i)PERYLENE	<	0.1	
INDENO(1,2,3-cd)PYRENE	<	0.1	

SURROGATE:	
BIPHENYL (28%-125%)	84%

D = Value from a 1:2 dilution analyzed on 11/19/96.

Analyst: GK 11/21/96

Reviewer: P~ 11/21/96

LIQUID CHROMATOGRAPHY BLANK SPIKE RESULTS

METHOD:	8310	**AEN I.D.:**	611515
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	Method Blank
PROJECT #:	4326-001-62	**DATE EXTRACTED:**	11/08/96
PROJECT NAME:	Bimbach	**DATE ANALYZED:**	11/14/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
ACENAPHTHYLENE	<	1.0	10.0	9.1	91	8.7	87	4
PHENANTHRENE	<	0.05	1.0	0.77	77	0.78	78	1
PYRENE	<	0.1	1.0	0.9	90	1.2	120	29
BENZO(k)FLUORANTHENE	<	0.1	1.0	0.8	80	0.9	90	12
DIBENZO(a,h)ANTHRACENE	<	0.1	1.0	0.8	80	0.8	80	0
SURROGATE:								
BIPHENYL (28% - 125%)				88%		84%		

CONTROL LIMITS

	% REC	RPD
ACENAPHTHYLENE	40 - 155	37
PHENANTHRENE	59 - 128	38
PYRENE	60 - 140	36
BENZO(k)FLUORANTHENE	50 - 100	32
DIBENZO(a,h)ANTHRACENE	50 - 140	30

Analyst: CE 11/21/96

Reviewer: [illegible] 11/21/96

DATE 11/4/96 PAGE 1 OF 1

Analytical Technologies, Inc.
17400 S.W. Upper Boones Ferry Rd., Suite 270
Durham, Oregon 97224 • (503) 684-0447 FAX: (503) 620-0393

Chain of Custody

LABORATORY NUMBER: 611515
PROJECT NOTICE NUMBER: _____

PROJECT MANAGER: Marsi Beeson
COMPANY: GeoEngineers
ADDRESS: 7504 SW Bridgeport Rd Portland, OR
PHONE: 503-6661 SAMPLED BY: MB2

SAMPLE DISPOSAL INSTRUCTIONS

☐ ATI Disposal @ $5.00 each ☐ Return

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID
MW-1-110396	11/3/96	1715	H_2O	-1
MW-2-110396		1545		-2
MW-3-110396		1740		-3
MW-4-110396		1600		-4
MW-5-110396		1700		-5
MW-6-110396		340		-6
MW-7-110396		1350		-7
MW-8-110396		1315		-8

PETROLEUM HYDROCARBONS											ORGANICS							INORGANICS			TCLP			OTHER										NUMBER OF CONTAINERS
TPH-HCID	State: OR / WA	TPH-G	State: OR / WA	TPH-D	State: OR / WA	418.1	EPA 418.1	8015M	8020M-BETX only	8310 HPLC PAHs	7421 Lead	% Moisture	8010 Halogenated VOCs	8020 Aromatic VOCs	8040 Phenols	8240 GCMS Volatiles	8270 GCMS Semivolatiles	8080 OC Pesticides/PCBs	8080M PCBs only	Drinking Water (8)	Priority Pollutant Metals (13)	Cyanide	TCLP Metals (8)	TCLP Volatiles 8240 ZH-EXT	TCLP Semivolatiles 8270									
							X		X	X				X																				
							X		X	X																								
							X		X	X																								
										X																								
										X																								
										X																								
										X																								
										X																								

PROJECT INFORMATION

PROJECT NUMBER: 4326001-62
PROJECT NAME: Bimbach
PURCHASE ORDER NUMBER:
ONGOING PROJECT? YES ☑ NO ☐

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS: 28
COC SEALS/INTACT? Y \ N \ NA
RECEIVED INTACT? Y \ N
RECEIVED COLD? Y \ N

PRIOR AUTHORIZATION REQUIRED FOR RUSH PROJECTS

TAT: (NORMAL) ☑ 2 WKS (RUSH) ☐ 24 HR ☐ 48 HRS ☐ 72 HRS ☐ 1 WK
GREATER THAN 24 HR. NOTICE? YES ☐ NO ☑ (LAB USE ONLY)

SPECIAL INSTRUCTIONS: Please run PAHs if TPH is detected.
Please fax results.

Received via:

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY 3.
Signature: Marsi Beeson Time: 1400	Signature Time:	Signature Time:
Printed Name: Marsi Beeson Date: 11/4/96	Printed Name: Date:	Printed Name: Date:
Company: GeoEngineers	Company:	Company:
RECEIVED BY: 1.	**RECEIVED BY: 2.**	**RECEIVED BY: (LAB) 3.**
Signature: Paul Spiegel Time: 14:10	Signature Time:	Signature Time:
Printed Name: Paul Spiegel Date: 11/4/96	Printed Name: Date:	Printed Name: Date:
Company: AEN	Company:	Analytical Technologies, Inc.

29

26-94-0025

TERRA VAC 10740 Meridian Avenue North, Suite 202, Seattle, WA 98133-9010
Tel (206) 362-8128 ❑ Fax (206) 362-9528

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED

JAN 17 1997

NORTHWEST REGION

January 13, 1997

Mr. Don Pettit
Oregon Department of Environmental Quality
2020 SW 4th Avenue, Suite 400
Portland, OR 97201

Re: Full-Scale Dual Vacuum Extraction System Air Permit Request
Rose's Parking Lot, 330 NE 23rd Avenue
Portland, Oregon

Dear Mr. Petit:

It is the intent of this correspondence to secure approval for an air discharge permit for the above referenced site. Between the mid 1950s to the late 1970s, the site was occupied by gasoline service stations. Both the subsurface soil and groundwater have been impacted with gasoline-range petroleum hydrocarbons. Terra Vac has been contracted to remediate the subsurface soil and groundwater. The chosen remediation method is dual vacuum extraction (DVE) which will remediate both the subsurface soils and groundwater at the site. The full-scale site layout is depicted in Figure 1.

The DVE system will simultaneously extract hydrocarbon impacted soil vapor and groundwater from the subsurface via existing and proposed groundwater monitoring and vapor extraction wells. A rotary lobe blower is utilized to create a vacuum in the subsurface and develop air flow through the soil matrix. The induced vacuum volatilizes the hydrocarbons in the vadose zone which diffuse into the air stream before being removed from the subsurface through the process piping. In addition, groundwater is entrained in the extracted vapor stream. As the groundwater table lowers, the "smear" and capillary fringe zones are exposed to the induced vacuum. Once exposed, these zones are remediated by soil vapor extraction (SVE) technology.

A DVE pilot test was performed at the site on December 11, 1996. The main objectives of the pilot test were to obtain groundwater and soil vapor extraction data which would be used for the full-scale design. During the pilot test extracted soil vapors were analyzed at Terra Vac's laboratory for total petroleum hydrocarbons (TPH) using a gas chromatograph (GC) equipped with a flame ionization detector (FID). At the time of vapor sampling, extracted vapor flow rates were measured using a self-averaging pitot tube. These data were used to calculate the extraction rates of the individual wells utilized during the pilot test. The calculated extraction rates are presented in the following table:

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Well ID	Vacuum (PSI)	Differential Pressure (Inches of H^2O)	Flow Rate (SCFM)[1]	TPH (mg/l)	TPH (lb/day)[2]
MW-1	5.16	0.25	20.5	1.77	3.25
MW-2	5.40	0.30	22.1	1.20	2.38
MW-2	5.40	0.30	22.1	4.11	8.15
MW-4	5.40	0.45	27.1	0.19	0.46

Notes:

1. Flow Rate Calculation:

$$Q\ (scfm) = 128.8 \times K \times D^2 \times ((P \times dP)/((T + 460) \times S_S))^{1/2}$$

Where,

Q = Flow expressed in standard cubic feet per minute
dP = Differential pressure expressed in inches of water column
K = Flow coefficient = 0.586 for 2-inch Pipe
D = Inside Diameter of pipe expressed in inches (2 inches)
P = Static line pressure expressed in PSIA
T = Temperature in degrees Fahrenheit
S_S = Specific Gravity at 60^o F = 1.0 for air

2. Pounds per Day (#/day) Calculation:

#/day = (Conc. in mg/l) x (2.2 x 10^6 lb/mg) x (Flow Rate in scfm) x (28.316 l/ft^3) x (1440 m/day)

Next, the average extraction rate per well is calculated:

(3.25 lb/day + 2.38 lb/day + 8.15 lb/day + 0.46 lb/day)/4 = <u>3.56 lb TPH/day/well</u>

For the full-scale system Terra Vac plans to use a total of 12 extraction wells.

Therefore, the total extraction rate of the system at startup is calculated:

(3.56 lb/day/well) x (12 wells) = <u>42.72 lb TPH/day</u>

It should be noted that this TPH discharge rate would be the maximum average discharge rate of the system during operations. Since SVE rates typically decline exponentially, the discharge rate after startup would decrease as the system operated.

Terra Vac appreciates your assistance in this matter. If you have any further questions or comments on this letter application, feel free to contact Terra Vac at (206) 362-8294.

Sincerely,
Terra Vac Corporation

Paul V. Bianco
Project Engineer,

Timothy Warner
Project Manager

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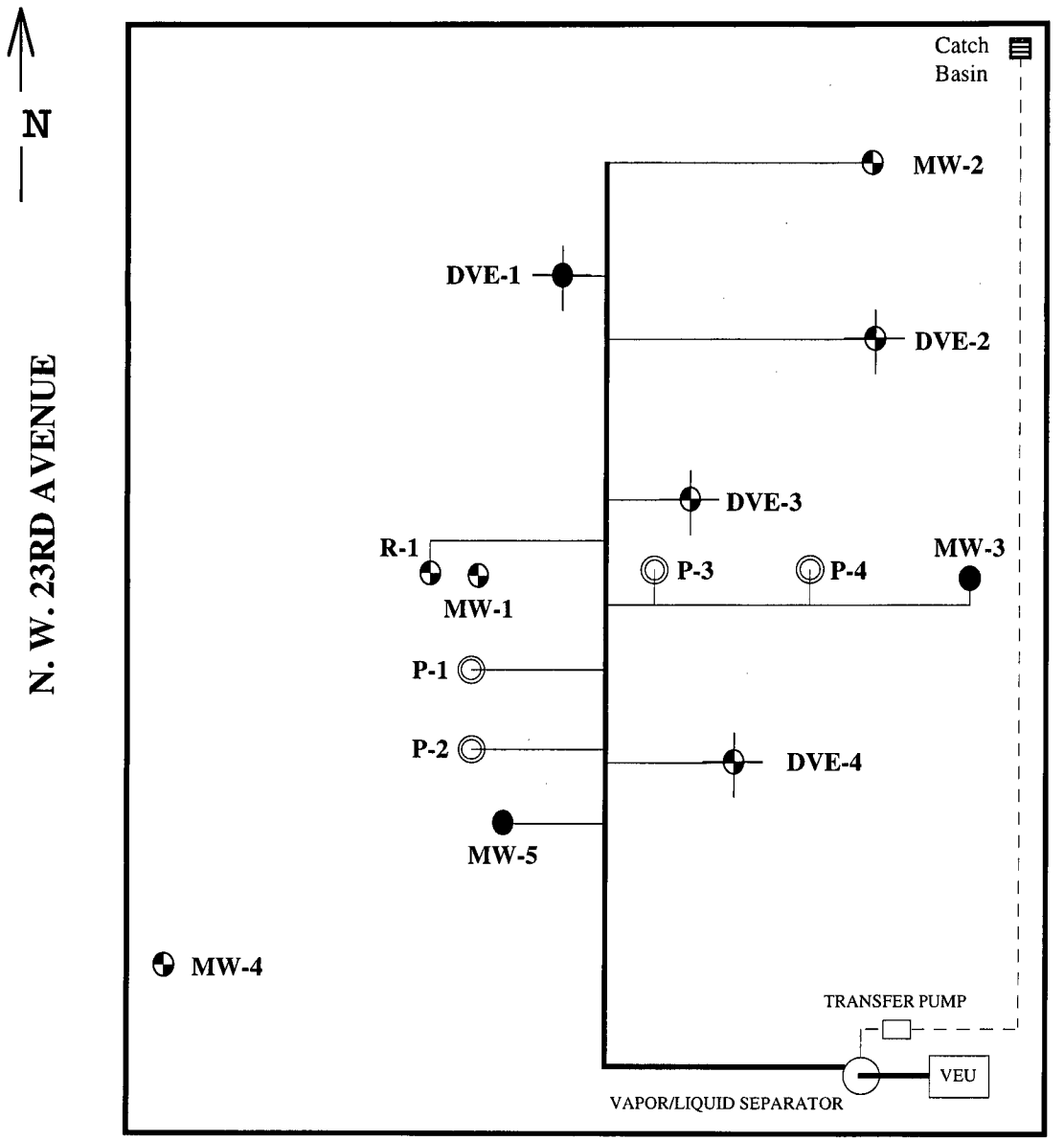
N.W. FLANDERS STREET



LEGEND

- Existing Monitoring Well Using EE
- Proposed DVE Well Using EE
- Existing Monitoring Probe
- Existing Monitoring Well Using Pumps
- Proposed DVE Well Using Pumps

Notes:
(1) Base map from GeoEngineers report: "Subsurface Assessment Rose's Parking Lot Portland, Oregon" August 28, 1995. Site Plan, Figure 2

SCALE (Approximate ft.)

0 20 40

DVE SYSTEM PIPING AND EQUIPMENT LAYOUT	**Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon**	TERRA VAC	Project No.	32-0029	Figure 1
			Date	January 9, 1997	
			Scale	1 Inch = 20 Feet	
			Revision	PVB -1	

26-94-0025

TERRA VAC
10740 Meridian Avenue North, Suite 202, Seattle, WA 98133-9010
Tel (206) 362-8128 ❑ Fax (206) 362-9528

January 10, 1997

Mr. Don Pettit
Oregon Department of Environmental Quality
2020 SW 4th Ave., Suite 400
Portland, OR 97201

RE: Rose's Parking Lot
330 NW 23rd Avenue, Portland, OR

Dear Mr. Pettit:

For your review, Terra Vac is enclosing a dual vacuum extraction pilot study report and work plan for remediation at the above referenced site.

Early next week, I will contact you to setup a meeting when we can discuss this site and the remediation plan we have proposed. As you suggested, I think it is a good idea to bring the property owner to this meeting to discuss the NFA letter that will be obtained from this remedial action.

Please feel free to call me at (206) 362-8294 to discuss this project if you have any questions or comments before I phone. I look forward to talking with you.

Sincerely,

Timothy Warner
Project Manager

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
JAN 13 1997
NORTHWEST REGION

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DUAL VACUUM EXTRACTION WORK PLAN

ROSE'S PARKING LOT
330 N.W. 23rd AVENUE
PORTLAND, OREGON

PREPARED FOR:

Mr. Charles R. Williamson
Kell, Alterman & Runstein, L.L.P.
1001 SW Fifth Avenue, Suite 1800
Portland, Oregon 97204-1194

Prepared by:

Paul V. Bianco
Project Engineer,
Northwest Division

Timothy M. Warner
Project Manager,
Northwest Division

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TABLE OF CONTENTS

1.0 INTRODUCTION

2.0 SITE BACKGROUND

3.0 TECHNICAL APPROACH

- **3.1 Dual Vacuum Extraction Wells**
- **3.2 Process Equipment**
- **3.3 Process Monitoring**

4.0 SCOPE OF WORK

- **4.1 Task 1: Engineering and Planning**
- **4.2 Task 2: Permitting**
- **4.3 Task 3: Drilling**
- **4.4 Task 4: Construction and Installation**
- **4.5 Task 5: System Startup**
- **4.6 Task 6: Operations and Maintenance**
- **4.7 Task 7: Confirmatory Borings and Demobilization**

5.0 APPROXIMATE SCHEDULE / DELIVERABLES

FIGURES

- FIGURE 1 DVE System: Well Layout
- FIGURE 2 DVE System Piping and Equipment Layout
- FIGURE 3 Process Flow Diagram

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1.0 INTRODUCTION

This remediation work plan was prepared for the Rose's Parking Lot located at 330 Northwest 23rd Avenue in Portland, Oregon. This plan outlines the work for the installation and operations of a full-scale remediation system at the site.

2.0 SITE BACKGROUND

The Rose's Parking Lot site is located at 330 Northwest 23rd Avenue in Portland, Oregon. All aboveground structures have been removed, and the site is an open, paved parking lot. Between the mid 1950s to the late 1970s, the site was occupied by gasoline service stations, and both subsurface soil and groundwater have been impacted with gasoline-range petroleum hydrocarbons.

A series of site investigations and interim remedial activities have been performed at the site. Interim remedial activities have included underground storage tank removal and soil vapor extraction pilot studies. Benzene, at concentrations exceeding Oregon State Department of Environmental Quality (DEQ) cleanup levels, has been detected in groundwater from monitoring wells MW-2 and MW-3, while wells MW-1 and MW-5 have periodically contained phase separated petroleum hydrocarbons. Additionally, groundwater from wells MW-1, MW-3, and MW-5 also contains naphthalene at concentrations above DEQ cleanup levels.

Salient site characteristics that effect site remediation include:

- Subsurface soil has been described as fill to approximately 10 - 15 feet below ground surface (bgs). Beneath the fill, native soil to 40 feet bgs has been described as fine to medium-grained sands and silty sands. Using slug testing, GeoEngineers measured hydraulic conductivities of 5×10^{-7} m/s (5×10^{-5} cm/s) to 8×10^{-7} m/s (8×10^{-5} cm/s) in the native soil.

- Site data indicates that subsurface soil is most impacted in the capillary fringe and "smear" zones (from 20 - 28 feet bgs). Gasoline-range total petroleum hydrocarbon concentrations up to 6,550 parts per million (ppm) have been reported.

- Seasonally, the groundwater table fluctuates from approximately 24 - 28 feet bgs, and these depths effectively set the upper and lower limits of the "smear" zone.

- Historically, free phase gasoline-range petroleum hydrocarbons have been reported at MW-3, MW-5, and RW-1.

- During a series of 8-hour EFRT tests, GeoEngineers was able to depress the water table across the site, indicating site dewatering is achievable. Analyses of recovered soil vapors indicated that vacuum extraction at wells RW-1, MW-1, and MW-5 could extract high concentrations of gasoline-range petroleum hydrocarbons.

In summary, subsurface impact at the site is greatest just above and below the groundwater table. To reach DEQ site closure requirements, remediation efforts must clean both groundwater and the soil in the zone from approximately 5 feet above and 5 feet below seasonal groundwater extremes. Thus, remedial efforts must focus on the zone located at approximately 19 to 33 feet bgs.

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3.0 TECHNICAL APPROACH

The proposed system will simultaneously extract hydrocarbon impacted soil vapor and groundwater from the subsurface via existing and proposed groundwater monitoring and vapor extraction wells. A rotary lobe blower is utilized to create a vacuum in the subsurface and develop air flow through the soil matrix. The induced vacuum volatilizes the hydrocarbons in the vadose zone which diffuse into the air stream and is then removed from the subsurface through the process piping. In addition, groundwater is entrained in the extracted vapor stream. As the groundwater table lowers, the "smear" and capillary fringe zones are exposed to the induced vacuum. Once exposed, these zones are remediated by soil vapor extraction.

During the pilot test operations, high groundwater recharge rates were experienced at two of three test wells. The pilot test utilized Entrainment Extraction (EE) at the test wells to dewater the soils surrounding the well. EE uses vacuum created by the vacuum extraction unit (VEU) to lift the groundwater in the well and transport it through the process piping to the vapor/liquid separator. Due to the high groundwater recharge rates at the pilot test wells, the vacuum created at the blower could not simultaneously lift the groundwater and apply adequate vacuum at the well head for the soil vapor extraction mechanisms. Since not all of the pilot test wells experienced high recharge rates, a combination of EE and submersible down well pumps will be utilized to dewater the subsurface soils. The use of submersible pumps will reduce the vacuum losses throughout the system, allowing increased vacuum at each wellhead for EE operations, while still dewatering the site.

Wells P-1 through P-4 will be connected to the vacuum piping and used exclusively for SVE. Since these wells are screened above the average groundwater levels and dewatering will be performed at nearby wells, dewatering will not occur at P-1 through P-4.

3.1 Dual Vacuum Extraction (DVE) Wells

The remediation system will incorporate four existing groundwater monitoring wells (RW-1, MW-2, MW-3, and MW-5). To more effectively remediate the site, the existing wells will be redrilled to a depth of 35 feet bgs and well diameters will be increased to 4 inches. To supplement the remediation effort, four additional DVE wells will be installed by Terra Vac. The existing monitoring wells and new DVE well locations are shown in Figure 1.

3.2 Process Equipment

The equipment which will be utilized for the remediation system is as follows:

Vapor/Liquid Separator:

Extracted soil vapors are separated from groundwater by a 150 gallon, centrifugal design, liquid/vapor separator. The separator allows dewatered vapors to pass through the separator to the vacuum blower, while retaining groundwater for discharge to the sanitary sewer.

Vacuum Extraction Unit:

Vacuum and flow will be provided by a positive displacement, rotary lobe blower coupled to a 30 horsepower (Hp) motor (VEU). The VEU is capable of generating a vacuum of 15 inches of mercury (" Hg) and flow rates up to 400 cubic feet per minute (cfm). The VEU has numerous safety devices including an automatic high-temperature shutdown switch, vacuum-relief valve, and is sound insulated to minimize the impact of noise. The blower/motor assembly is mounted on a common skid which allows for mobility during system mobilization and demobilization.

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Submersible Pumps:

Three submersible down well pumps will be installed to assist in dewatering the site. The submersible pumps will be installed in wells MW-3, MW-5, and DVE-1. The submersible pumps will be 1/2 horsepower pumps capable of a flow rate of 8 gallons per minute at 100 feet of water total head.

3.3 Process Monitoring

During the first week of operations (startup), vapor samples will be collected to optimize system operating parameters and collect baseline data. After the startup period, vapor samples will be taken on a monthly basis. During monthly sampling events, the vapor extraction system will be monitored using vapor samples analyzed by a gas chromatograph equipped with a flame ionization detector (FID). Air samples will be collected in Tedlar bags and analyzed in Terra Vac's laboratory for total volatile organic compounds (VOCs) and specifically for benzene, toluene, ethylbenzene, and total xylenes (BTEX). At the time of sampling, vacuum will be measured with standard vacuum gauges, while pitot tubes, read with water filled manometers, will be used to record air flow. These data will be used to quantify the emission rate in pounds per day.

Groundwater samples will be collected as necessary for permit compliance. Effluent groundwater samples will be collected and sent to a certified laboratory for analysis of gasoline range total petroleum hydrocarbons (TPH-g) and BTEX. The analysis will confirm that the effluent is in compliance with the Oregon state discharge limits. Groundwater totals will be monitored using an in-line flow meter. Extracted groundwater totals will be recorded during scheduled sampling events.

4.0 SCOPE OF WORK

4.1 Task 1: Engineering and Planning

Engineering and planning includes the drafting of this remediation work plan, review of previous work by other contractors, subcontractor selection, and the revised full-scale design plans included in this report.

4.2 Task 2: Permitting

Permits will be obtained by Terra Vac for full-scale operation of the system. Such permits include:

- An air permit from the Oregon Department of Environmental Quality.
- A sewer discharge permit from the city of Portland Environmental Services.
- Well construction permits.

4.3 Task 3: Drilling

Terra Vac proposes to install four (4) new DVE wells (DVE-1 through DVE-4). The locations of the proposed DVE wells are shown in Figure 1. Borings for the wells will be advanced to approximate depths of 35 feet below ground surface (bgs) using hollow stem augers. The designed remediation wells will be screened from approximately 15 feet bgs to the bottom of the well using 4-inch diameter, 0.020-inch slotted polyvinyl chloride (PVC) pipe. However, due to variations in soil permeability, groundwater elevation, and hydrocarbon impact, the actual screen length will be determined in the field by a Terra Vac geologist. A 4-inch diameter riser pipe will be installed from the top of the screened section to ground surface. A filter pack will be placed in the

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well annulus from the bottom of the well to approximately 13 feet bgs. A bentonite cement grout mixture will be used to seal the remaining annular space to ground surface.

The existing monitoring wells (RW-1, MW-2, MW-3, and MW-5) will be redrilled and constructed identical to the new wells installed by Terra Vac.

Decontamination of drilling equipment will be performed on-site. Augers will be steam cleaned after drilling activities. All decontamination water will be placed in DOT approved 55-gallon drums, with proper labeling, for treatment through the groundwater treatment system. Soil cuttings obtained from drilling activities will also be placed in 55-gallon DOT approved drums, composite sampled, and disposed of in a timely manner.

4.4 Task 4: Construction and Installation

The completed remediation system will consist of the equipment detailed in Section 3.2 (Process Equipment) in addition to 12 wells and a PVC piping system. The piping and equipment layout is depicted in Figure 2. Each well will be equipped with a flow monitoring report, a well head vacuum gauge, a sample port, and a line vacuum gauge. Branch piping to the wells will be 1-1/2-inch PVC. A generalized process flow diagram is shown in Figure 3.

The four existing monitoring wells, the four SVE wells and the four new DVE wells will be connected to the extraction system via a below ground piping system. The submersible pumps will be connected to the vapor/liquid separator via the same water piping system.

4.5 Task 5: System Startup

All equipment and control systems will be checked prior to start-up. Testing shall include electrical continuity checks, tests of safety shut-downs, verification of system set points, testing of the remote monitoring system, and proper rotation of machinery. A sound survey will be performed during normal operations to ensure that noise levels are below 70 decibels (dB) at the boundary of the site.

Startup will consist of the first week of operations. During this time the system will be closely monitored, as described in Section 3.0 (Process Monitoring). Each well will be brought on-line individually. Well flow rate, vacuum, and extracted vapor samples will be taken for each well during startup. Individual sampling will identify areas of hydrocarbon impact and of low permeability soils. The data collected will document initial conditions, determine mass extraction, overall system effectiveness, and air permit compliance. The system will then be optimized to effectively remediate the site.

4.6 Task 6: Operations and Maintenance

Site visits will be performed monthly during operations of the remediation system. During site visits, Terra Vac will collect vapor samples at the system outlet to calculate the total mass extraction. In addition, vapor samples will be taken at each remediation well to calculate the mass extraction of individual wells. Groundwater samples will be taken from the discharge line of the vapor/liquid separator and sent to a certified laboratory for analysis. In addition, quarterly groundwater samples will be collected.

4.7 Task 7: Confirmatory Borings and Demobilization

Terra Vac proposes that two confirmatory borings to depths of up to 35 feet bgs will be adequate to establish that the remediation goals have been achieved for the soils. Soil samples will be collected every five feet. Terra Vac will confer with the lead regulatory agency for exact placement of the

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confirmatory borings. The selected samples will be analyzed for TPH-g and BTEX to confirm that the soil criteria has been met. Quarterly groundwater monitoring will continue for 1 year after the remediation.

5.0 APPROXIMATE SCHEDULE / DELIVERABLES

The following table shows the approximate schedule and deliverables.

ITEM	SCHEDULE
Pilot Test Report / Work Plan	January, 1997
Air Permit	January, 1997
Well Permits and Installation	February, 1997
Construction	February, 1997
Startup	March, 1997
Final Report	March, 1998

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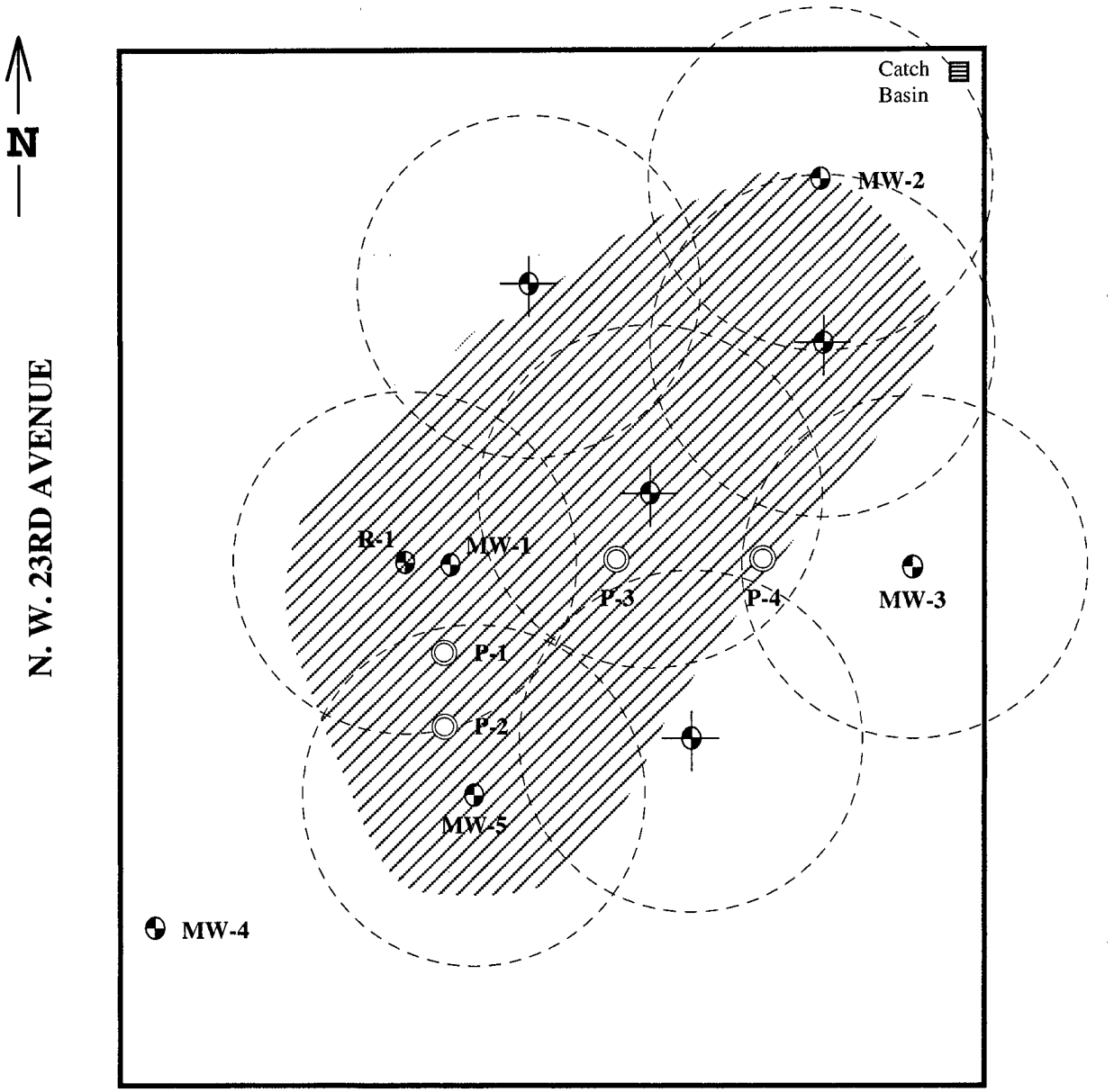

LEGEND

- Existing Recovery or Monitoring Well
- Proposed Dual Vacuum Extraction Well
- Existing Monitoring Probe
- Estimated Radius of Influence
- Estimated Area of Subsurface Soil Contamination (1)

Notes:
(1) Base map from GeoEngineers report: "Subsurface Assessment Rose's Parking Lot Portland, Oregon" August 28, 1995. Site Plan, Figure 2

SCALE (Approximate ft.)

0 20 40

Vacuum Extraction System: Radius of Influence	**Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon**	TERRA VAC	Project No.	32-0029	Figure 1
			Date	January 10, 1997	
			Scale	1 Inch = 20 Feet	
			Revision	PVB -1	

N.W. FLANDERS STREET

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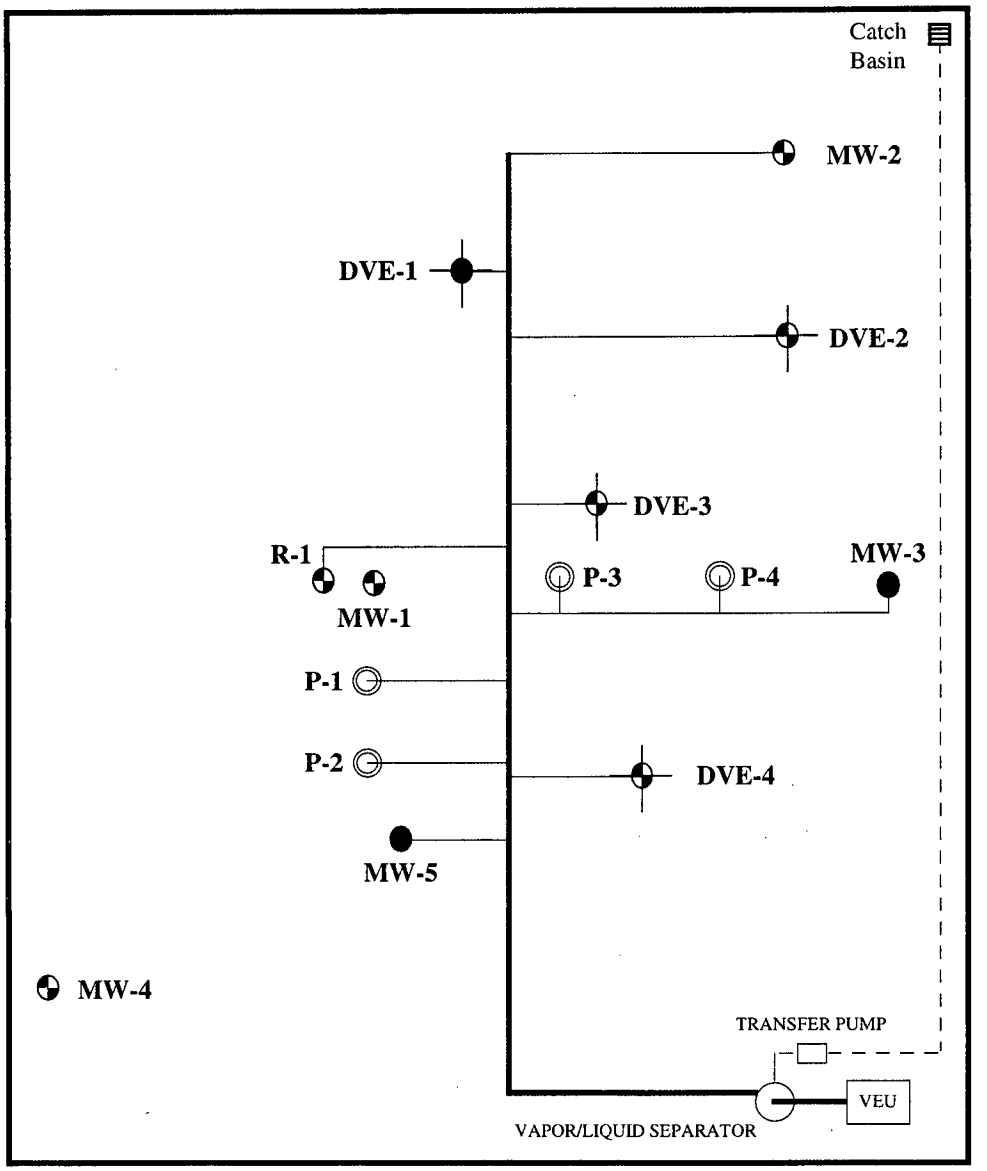
N. W. 23RD AVENUE



LEGEND

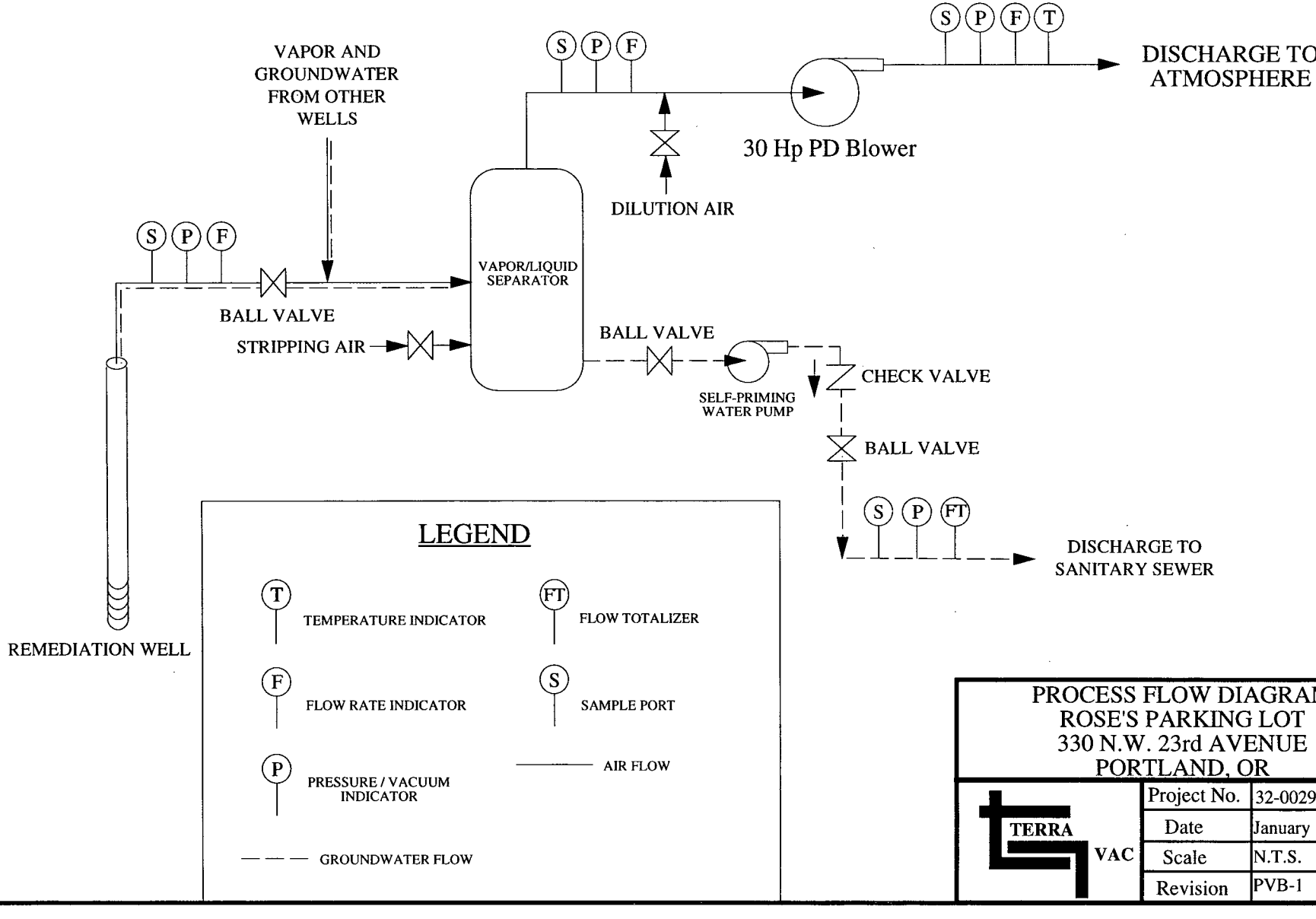
- Existing Monitoring Well Using EE
- Proposed Well Using EE
- Existing Monitoring Probe
- Existing Monitoring Well Using Pumps
- Proposed Well Using Pumps

SCALE (Approximate ft.)

0 20 40

Notes:
(1) Base map from GeoEngineers report:
"Subsurface Assessment
Rose's Parking Lot Portland, Oregon"
August 28, 1995. Site Plan, Figure 2

SYSTEM PIPING AND EQUIPMENT LAYOUT	**Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon**	TERRA VAC	Project No.	32-0029	Figure 2
			Date	January 10, 1997	
			Scale	1 Inch = 20 Feet	
			Revision	PVB -1	



PROCESS FLOW DIAGRAM
ROSE'S PARKING LOT
330 N.W. 23rd AVENUE
PORTLAND, OR

TERRA VAC

Project No.	32-0029
Date	January 10, 1997
Scale	N.T.S.
Revision	PVB-1

DUAL VACUUM EXTRACTION PILOT STUDY REPORT

ROSE'S PARKING LOT
330 N.W. 23rd AVENUE
PORTLAND, OREGON

PREPARED FOR:

Mr. Charles R. Williamson
Kell, Alterman & Runstein, L.L.P.
1001 SW Fifth Avenue, Suite 1800
Portland, Oregon 97204-1194

Prepared by:

Paul V. Bianco
Project Engineer,
Northwest Division

Timothy M. Warner
Project Manager,
Northwest Division

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TABLE OF CONTENTS

I. EXISTING SITE CONDITIONS

II. OBJECTIVES

III. PILOT STUDY APPROACH

IV. RESULTS

V. CONCLUSIONS

VI. RECOMMENDATIONS

FIGURES

FIGURE 1 Existing Site Conditions
FIGURE 2 Full-Scale Site Plan

TABLES

TABLE 1 Depth to Groundwater
TABLE 2 Pilot Study Operating Data
TABLE 3 Extracted Soil Vapor Concentrations Using the PID
TABLE 4 Extracted Soil Vapor Concentrations

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I. Existing Site Conditions

The Rose's Parking Lot site is located at 330 Northwest 23rd Avenue in Portland, Oregon. All aboveground structures have been removed, and the site is an open, paved parking lot. Between the mid 1950s to the late 1970s the site was occupied by gasoline service stations, and both subsurface soil and groundwater have been impacted with gasoline-range petroleum hydrocarbons.

A series of site investigations and interim remedial activities have been performed at the site. Interim remedial activities have included underground storage tank removal and soil vapor extraction pilot studies. Benzene, at concentrations exceeding Oregon State Department of Environmental Quality (DEQ) cleanup levels, has been detected in groundwater from monitoring wells MW-2 and MW-3, while wells MW-1 and MW-5 have periodically contained phase separated petroleum hydrocarbons. Additionally, groundwater from wells MW-1, MW-3, and MW-5 also contains naphthalene at concentrations above DEQ cleanup levels.

Salient site characteristics that effect site remediation include:

- Subsurface soil has been described as fill to approximately 10 - 15 feet below ground surface (bgs). Beneath the fill, native soil to 40 feet bgs has been described as fine to medium-grained sands and silty sands. Using slug testing, GeoEngineers measured hydraulic conductivities of 5×10^{-7} m/s (5×10^{-5} cm/s) to 8×10^{-7} m/s (8×10^{-5} cm/s) in the native soil.

- Site data indicates that subsurface soil is most impacted in the capillary fringe and "smear" zones (from 20 - 28 feet bgs). Gasoline-range total petroleum hydrocarbon concentrations to up 6,550 parts per million (ppm) have been reported.

- Seasonally, the groundwater table fluctuates from approximately 24 - 28 feet bgs, and these depths effectively set the upper and lower limits of the "smear" zone.

- Historically, free phase gasoline-range petroleum hydrocarbons have been reported at MW-3, MW-5, and RW-1.

- During a series of 8-hour EFRT tests, GeoEngineers was able to depress the water table across the site, indicating site dewatering is achievable. Analyses of recovered soil vapors indicated that vacuum extraction at wells RW-1, MW-1, and MW-5 could vent close to 200 pounds of gasoline range petroleum hydrocarbons per 24-hour period.

In summary, subsurface impact at the site is greatest just above and below the groundwater table. To reach DEQ site closure requirements, remediation efforts must clean both groundwater and the soil in the zone from approximately 5 feet above and 5 feet below seasonal groundwater extremes. Thus, remedial efforts must focus on the zone located at approximately 20 to 35 feet bgs.

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II. Objectives

For Dual Vacuum Extraction/Entrainment Extraction (DVE/EE) to be an effective remedial technology for this site, the following parameters must be meet:

- An applied well head vacuum of 10-15 inches of mercury (Hg) must be capable of lowering the water table 3-4 feet beneath the deepest extent of petroleum hydrocarbon impact, or approximately 25-30 feet bgs.

- The groundwater extraction rate per well under applied vacuums of 10-15 inches Hg must be low enough for economic water treatment and sewer discharge. A workable extraction rate is 2-3 gallons per minute (gpm) from each well.

- For system permitting and selection of vapor abatement technology, the characteristics of the recovered soil vapor stream must be known. Total petroleum hydrocarbon (TPH) concentrations in the vapor stream dictate if vapor abatement is necessary and, if necessary, which type of abatement system is most applicable.

III. Pilot Study Approach

On December 11, 1996 Terra Vac conducted a one day pilot study to determine the effectiveness of DVE/EE at this site. For the test, Terra Vac utilized the following equipment:

Extraction Equipment:
Vacuum and flow were provided by a 25 HP Duraflow positive displacement blower, capable of 75 scfm at 12 inches of mercury vacuum.

Vapor/Liquid Separator:
Recovered soil vapors are separated from groundwater by a 150 gallon, centrifugal design, liquid/vapor separator. The separator allowed dewatered vapors to pass through the separator to the vacuum blower, while retaining groundwater for discharge into 55-gallon storage drums.

Sampling Equipment:
Vacuum was measured with standard vacuum gauges, while pitot tubes, read with water filled manometers, were used to record air flow. Recovered soil vapors were analyzed for total volatile organic compounds (VOCs) using a portable photoionization detector (PID). Vapor samples were also collected in Tedlar bags for subsequent analyses at Terra Vac's laboratory.

During the test, Terra Vac evaluated the effectiveness of DVE/EE using three existing on-site groundwater monitoring wells, MW-1, MW-2, and MW-4. The locations of the test wells is depicted in Figure 1. Testing protocol involved performing DVE/EE on each well individually to determine how many of the parameters described in the objective section were met. While each well was being tested, vacuum radius of influence (ROI) and groundwater level measurements were taken at nearby wells.

DVE/EE was performed on each well for a period of approximately one hour to allow the measurement of vacuum, flow, and water production rate over time. Recovered soil vapors were sampled for determination of VOCs using a PID throughout the pilot test. In addition, sampling for analyses of petroleum range hydrocarbon concentrations was performed during the testing period.

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IV. Results

Before initiating the pilot test, groundwater levels and total depth measurements were taken at each on-site well to establish baseline conditions (Table 1). Groundwater levels ranged from 14.29 feet below top of casing (TOC) at P-2 to 21.92 feet below TOC at MW-3. On-site well depths ranged from 21.62 feet below TOC at P-2 to 37.71 feet below TOC at MW-1.

After establishing baseline, DVE/EE operations were initiated at MW-4. Within 15 minutes of operation, the groundwater table at MW-4 had been dropped 8.09 feet to a depth of 28 feet below TOC. However, due to increased groundwater recharge below 28 feet below TOC at MW-4, the groundwater entrainment system was unable to dewater MW-4 to the desired depth of 31.5 feet below TOC. After approximately 75 minutes of operations, the entrainment tube did not achieve the desired well depth of 31.5 feet TOC and 190-gallons of water had been extracted. The liquid/vapor separator was drained into 55 gallon drums and the pilot test was restarted at MW-4 using a new entrainment depth of 28 feet below TOC.

Within 15 minutes of operation, the groundwater table at MW-4 had been dropped 8.09 feet to a depth of 28 feet below TOC. After approximately one hour of operations at MW-4, an additional 190-gallons of water had been extracted. The calculated extraction rate is 2.86 gallons per minute (gpm).

Groundwater levels were measured at nearby monitoring wells P-2 and MW-5 after 35 minutes of testing. Groundwater level measurements taken at MW-5 indicates a 0.1 foot decrease in the groundwater level while measurements taken at P-2 indicates a 0.04 foot increase in the groundwater level. As the soils surrounding the DVE/EE well dewaters over time, the depth to groundwater at the surrounding wells will decrease, and air flow will occur through previously saturated soils.

At the initiation of DVE/EE, air flow through the soil matrix surrounding MW-4 was insufficient to entrain groundwater out of the well without the introduction of bleed air at the well head. This effect was observed at each well tested at the site, and is reflected in the difference between the line and well head vacuums recorded during the testing of each well (Table 2). A small difference in vacuum between these two measuring points, indicates that less bleed air is being used to entrain groundwater up the wells, and more air flow is passing through the soil matrix.

Over time, as the soil matrix surrounding the wells is dewatered, air flow through the matrix will increase. As subsurface air flow increases, the introduction of bleed air at the well head can be decreased and volatilization of petroleum hydrocarbons trapped in the smear zone will be maximized. During the pilot test, once the groundwater levels at each well had been lowered to final depth, it was possible to start reducing the amount of well head bleed air necessary to help groundwater entrainment. Overtime, it may be possible to operate wells at this site using very little, or no, well head bleed air.

After performing DVE/EE on MW-4 for approximately 45 minutes, an attempt was made to measure the ROI at nearby monitoring wells P-2 (approximately 45 feet from MW-4), P-1 (approximately 50 feet from MW-4), MW-5 (approximately 40 feet from MW-4), and RW-1 (approximately 50 feet from MW-4). No influence was recorded at these monitoring wells.

The on-site VOC measurement taken approximately 55 minutes after the start of the pilot test was greater than 2000 ppm.

Extracted vapor samples were taken at the wellhead using Tedlar bags and analyzed for total petroleum hydrocarbons (TPH) at Terra Vac's in-house laboratory. The results of the analysis are presented in Table 4. The concentration of TPH was used to calculate the mass extraction of TPH

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from MW-4. The mass extraction rate is used to determine the appropriate emission control technology to be utilized at the site.

Pilot Test results from MW-2 and MW-1 were similar to those obtained at MW-4, although the groundwater yield from MW-1 was less than half that measured for MW-4 and MW-2 (Table 2).

Groundwater at MW-2 was lowered 8.61 feet to 28 feet below TOC. Groundwater level measurements taken at MW-1 indicates a 0.03 foot increase in the groundwater level while measurements taken at MW-3 indicates a 0.34 foot decrease in the groundwater level. ROI vacuum measurements taken at MW-1 (approximately 60 feet from MW-2), MW-3 (approximately 45 feet from MW-2), and P-3 (approximately 50 feet from MW-2) showed no vacuum influence throughout testing at MW-2. On-site VOC analyses of the soil vapor stream ranged from 163 parts per million (ppm) to 340 ppm with bleed air being introduced. In general, the VOC concentrations in the extracted vapors decreased over the pilot test, typical for DVE/EE operations. Laboratory results and calculations of recovery rates for TPH are contained in Table 3.

Groundwater at MW-1 was lowered 6.12 feet to 28 feet below TOC. Groundwater level measurements taken at MW-5 and P-2 indicates a 0.39 and 0.11 foot increase in the groundwater level, respectively. However, measurements taken at RW-1 indicates a 0.94 foot decrease in the groundwater level. A vacuum influence of 0.1-inches of water was measured at RW-1 located approximately 5 feet from MW-1. However, vacuum influence was not detected at P-2, P-1, and MW-5 during pilot test operations. On-site VOC analyses of the soil vapor stream ranged from 92 ppm to greater than 2000 ppm with bleed air being introduced. The VOC concentrations in the extracted vapors decreased during the pilot test.

V. Conclusions

Results from the pilot study indicate that DVE using a combination of EE and submersible down well pumps would be an appropriate remediation technology for this site. All of the parameters discussed in the objective section could be met utilizing these technologies.

- Air flow through subsurface soil should develop sufficiently at most wells to allow entrainment of groundwater utilizing vacuum assisted entrainment tubes. Applied well head vacuums of 6-9 inches of mercury were able to lower the water table at two of the three wells tested to the depths selected for testing. At the higher water producing wells, groundwater extraction utilizing submersible down well pumps should be used.

- Subsurface air movement technologies will prove effective in remediating soil at the site. Extracted vapor TPH and VOC concentrations indicate that TPH and VOCs can be extracted from the subsurface using dual vacuum extraction technology.

- Subsurface soil is tight enough to limit groundwater recharge to acceptable rates for DVE/EE in most wells. The groundwater extraction rate at MW-4, the highest water producer, was low enough to allow for economical groundwater treatment and discharge.

- The concentrations of TPH in the recovered soil vapor stream from each well tested indicate that direct discharge without treatment is appropriate.

- Although radius of influence data was limited, it appears that the radius of vacuum effect during operations will increase overtime as the DVE system is operated. A conservative estimate of ROI at this site during DVE operations is 20-30 feet.

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- The existing 2-inch groundwater monitoring wells are not of suitable construction for inclusion in a site-wide DVE system. However, these wells can be redrilled and enlarged to 4 inches in diameter.

- For full scale operations, Terra Vac would design a system that could handle approximately 20 scfm of bleed air from each DVE/EE well and still provide sufficient flow capacity for remediation wells.

VI. Recommendations

Based on the pilot testing, Terra Vac concludes that DVE/EE in combination with down well pumps is a viable remedial technology at this site. With an estimated ROI of 20 feet, it will be necessary to install four additional recovery wells to effectively treat the entire impacted groundwater plume. Figure 2 presents an estimate and location of the additional wells needed to provide site coverage. A total of 8 DVE wells with the configuration shown in Figure 2 uses existing wells RW-1, MW-2, MW-3, and MW-5 in addition to the placement of 4 new DVE wells. In this configuration, wells MW-3, MW-5, and DVE-1 would be fitted with submersible pumps. Terra Vac believes that this configuration would be sufficient, with the use of existing SVE wells (P-1 through P-4), to bring the site to Oregon DEQ closure criteria.

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Table 1
Depth to Groundwater

Well Identification	Depth to Groundwater (Feet From TOC)	Total Well Depth (Feet From TOC)
MW-1	21.88	37.71
MW-2	19.39	32.30
MW-3	21.92	32.94
MW-4	19.91	35.80
MW-5	17.51	29.30
RW-1	21.41	32.50
P-2	14.29	21.62
P-1	21.71	21.80
P-3	DRY	22.00
P-4	DRY	21.82

Table 2
Pilot Study Operating Data

Well I.D.	Time (Min.)	Line Vac. (" Hg)	Well Vac. (" Hg)	Well Flow (scfm)	Water Yield (gpm)
MW-1	7	10.5	2.5	20.5	1.35
MW-1	15	10.5	2.5	20.5	1.35
MW-1	20	12.0	6.5	12.4	1.35
MW-1	30	11.0	4.0	12.4	1.35
MW-1	54	10.5	4.0	20.5	1.35
MW-2	6	11.0	2.5	22.1	2.83
MW-2	15	11.0	3.0	22.1	2.83
MW-2	49	11.0	3.0	22.1	2.83
MW-4	40	11.0	1.0	27.1	2.86
MW-4	52	11.0	1.0	27.1	2.86

Table 3
Extracted Soil Vapor Concentrations Using the PID

Well ID	Time (min)	Concentration (ppm)
MW-1	0	< 2000
MW-1	37	93.5
MW-1	60	92
MW-2	30	340
MW-2	33	340
MW-2	60	163
MW-4	55	< 2000

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Table 4
Extracted Soil Vapor Concentrations

Well ID	TPH (mg/l)	TPH (lb/day)[1]
MW-1	1.77	3.25
MW-2	1.20	2.38
MW-2	4.11	8.15
MW-4	0.19	0.46

Table 4 Notes:

1 Calculation of TPH recovery rates in pounds/day are based upon the flow rates presented in Table 2.

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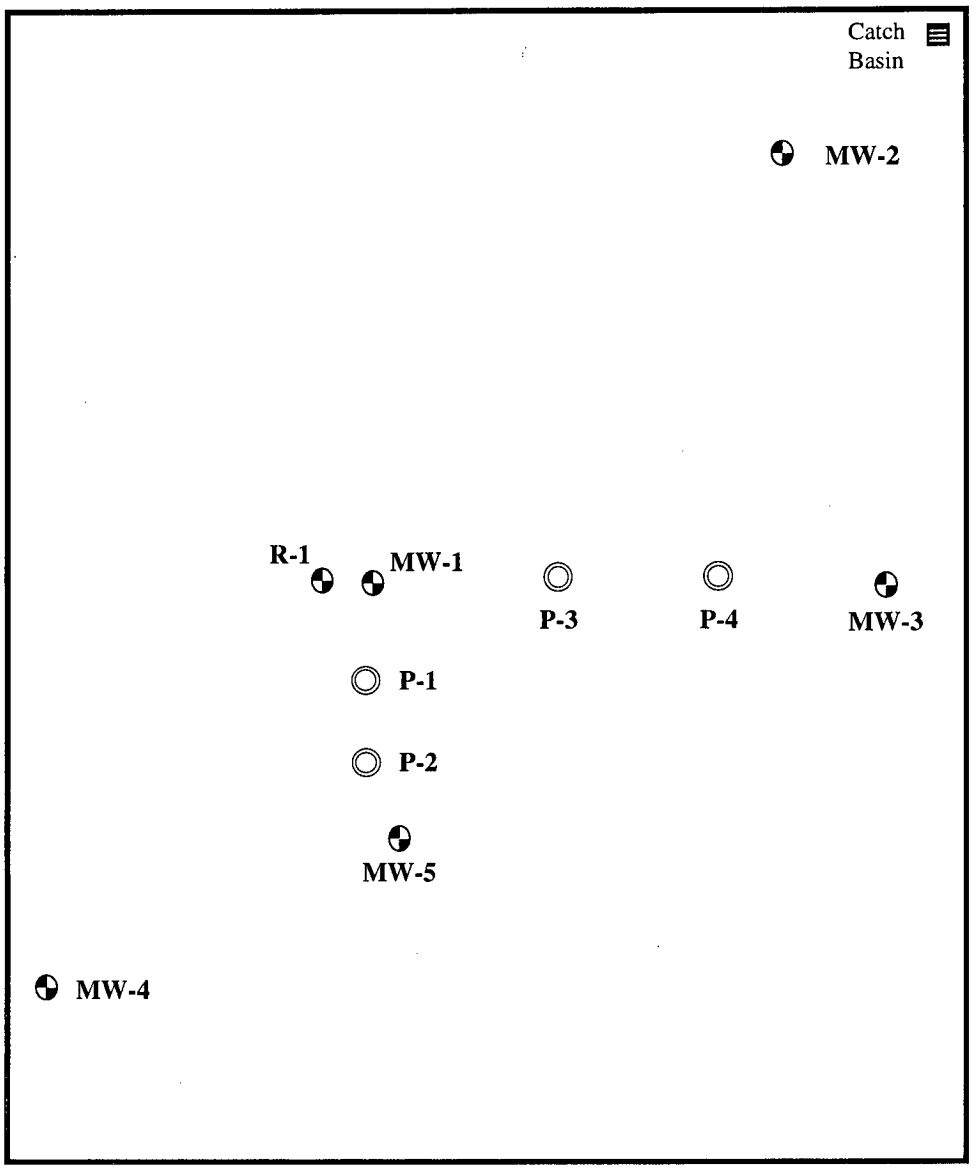

LEGEND

- Existing Recovery or Monitoring Well
- Proposed Dual Vacuum Extraction Well
- Existing Monitoring Probe

Notes:
(1) Base map from GeoEngineers report:
"Subsurface Assessment
Rose's Parking Lot Portland, Oregon"
August 28, 1995. Site Plan, Figure 2

SCALE (Approximate ft.)

0 20 40

Existing Site Conditions	**Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon**	TERRA VAC	Project No.	32-0029	Figure **1**
			Date	January 10, 1997	
			Scale	1 Inch = 20 Feet	
			Revision	PVB -1	

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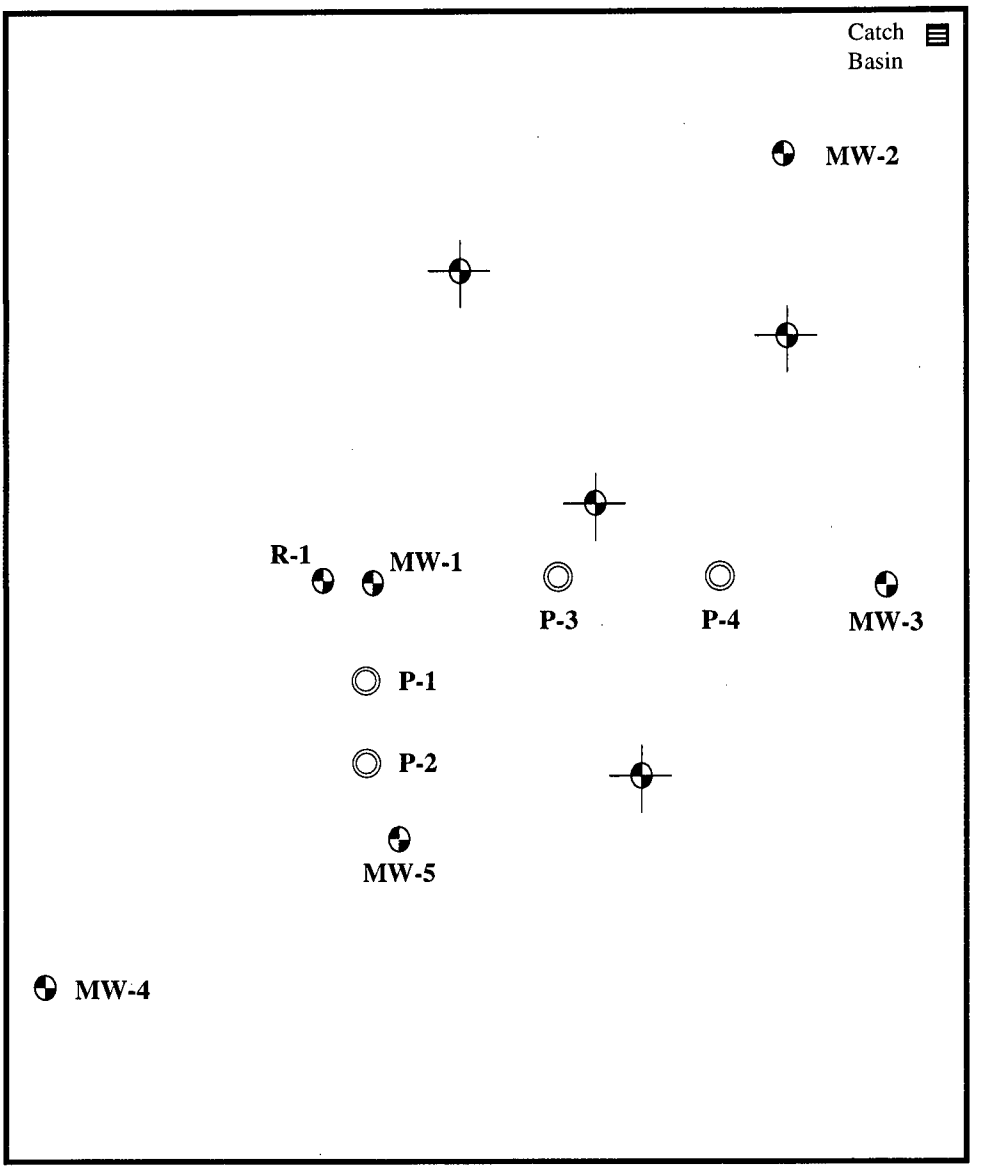

LEGEND

- Existing Recovery or Monitoring Well
- Proposed Dual Vacuum Extraction Well
- Existing Monitoring Probe

Notes:
(1) Base map from GeoEngineers report:
"Subsurface Assessment
Rose's Parking Lot Portland, Oregon"
August 28, 1995. Site Plan, Figure 2

SCALE (Approximate ft.)

0 20 40

DVE Full-Scale Well Layout	**Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon**	TERRA VAC	Project No. 32-0029 Date January 10, 1997 Scale 1 Inch = 20 Feet Revision PVB -1	Figure **2**

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26-94-0025

TERRA VAC

"We're gaining new ground"

FAX TRANSMITTAL

Voice: (206) 362-8128
FAX: (206) 362-9528

TERRA VAC
10740 Meridian Avenue North, Suite 202
Seattle, WA 98133

From: Paul Bianco

Date: 1/13/97

Time: 11:20

Company: Oregon DEQ

ATTN: Don Pettit

Fax No.: (503) 229-[redacted]6945

Number of Pages (Including Cover Page): 5

Message:

Don,

Hard copy will follow.

TERRA VAC
10740 Meridian Avenue North, Suite 202, Seattle, WA 98133-9010
Tel (206) 362-8128 ❑ Fax (206) 362-9528

January 13, 1997

Mr. Don Pettit
Oregon Department of Environmental Quality
2020 SW 4th Avenue, Suite 400
Portland, OR 97201

Re: Full-Scale Dual Vacuum Extraction System Air Permit Request
Rose's Parking Lot, 330 NE 23rd Avenue
Portland, Oregon

Dear Mr. Petit:

It is the intent of this correspondence to secure approval for an air discharge permit for the above referenced site. Between the mid 1950s to the late 1970s, the site was occupied by gasoline service stations. Both the subsurface soil and groundwater have been impacted with gasoline-range petroleum hydrocarbons. Terra Vac has been contracted to remediate the subsurface soil and groundwater. The chosen remediation method is dual vacuum extraction (DVE) which will remediate both the subsurface soils and groundwater at the site. The full-scale site layout is depicted in Figure 1.

The DVE system will simultaneously extract hydrocarbon impacted soil vapor and groundwater from the subsurface via existing and proposed groundwater monitoring and vapor extraction wells. A rotary lobe blower is utilized to create a vacuum in the subsurface and develop air flow through the soil matrix. The induced vacuum volatilizes the hydrocarbons in the vadose zone which diffuse into the air stream before being removed from the subsurface through the process piping. In addition, groundwater is entrained in the extracted vapor stream. As the groundwater table lowers, the "smear" and capillary fringe zones are exposed to the induced vacuum. Once exposed, these zones are remediated by soil vapor extraction (SVE) technology.

A DVE pilot test was performed at the site on December 11, 1996. The main objectives of the pilot test were to obtain groundwater and soil vapor extraction data which would be used for the full-scale design. During the pilot test extracted soil vapors were analyzed at Terra Vac's laboratory for total petroleum hydrocarbons (TPH) using a gas chromatograph (GC) equipped with a flame ionization detector (FID). At the time of vapor sampling, extracted vapor flow rates were measured using a self-averaging pitot tube. These data were used to calculate the extraction rates of the individual wells utilized during the pilot test. The calculated extraction rates are presented in the following table:

TERRA VAC

Well ID	Vacuum (PSI)	Differential Pressure (Inches of H_2O)	Flow Rate (SCFM)[1]	TPH (mg/l)	TPH (lb/day)[2]
MW-1	5.16	0.25	20.5	1.77	3.25
MW-2	5.40	0.30	22.1	1.20	2.38
MW-2	5.40	0.30	22.1	4.11	8.15
MW-4	5.40	0.45	27.1	0.19	0.46

Notes:

1. Flow Rate Calculation:

$$Q\ (scfm) = 128.8 \times K \times D^2 \times ((P \times dP)/((T + 460) \times S_S))^{1/2}$$

Where,

Q = Flow expressed in standard cubic feet per minute
dP = Differential pressure expressed in inches of water column
K = Flow coefficient = 0.586 for 2-inch Pipe
D = Inside Diameter of pipe expressed in inches (2 inches)
P = Static line pressure expressed in PSIA
T = Temperature in degrees Fahrenheit
S_S = Specific Gravity at 60° F = 1.0 for air

2. Pounds per Day (#/day) Calculation:

#/day = (Conc. in mg/l) x (2.2 x 10^6 lb/mg) x (Flow Rate in scfm) x (28.316 l/ft^3) x (1440 m/day)

Next, the average extraction rate per well is calculated:

(3.25 lb/day + 2.38 lb/day + 8.15 lb/day + 0.46 lb/day)/4 = 3.56 lb TPH/day/well

For the full-scale system Terra Vac plans to use a total of 12 extraction wells.

Therefore, the total extraction rate of the system at startup is calculated:

(3.56 lb/day/well) x (12 wells) = 42.72 lb TPH/day

It should be noted that this TPH discharge rate would be the maximum average discharge rate of the system during operations. Since SVE rates typically decline exponentially, the discharge rate after startup would decrease as the system operated.

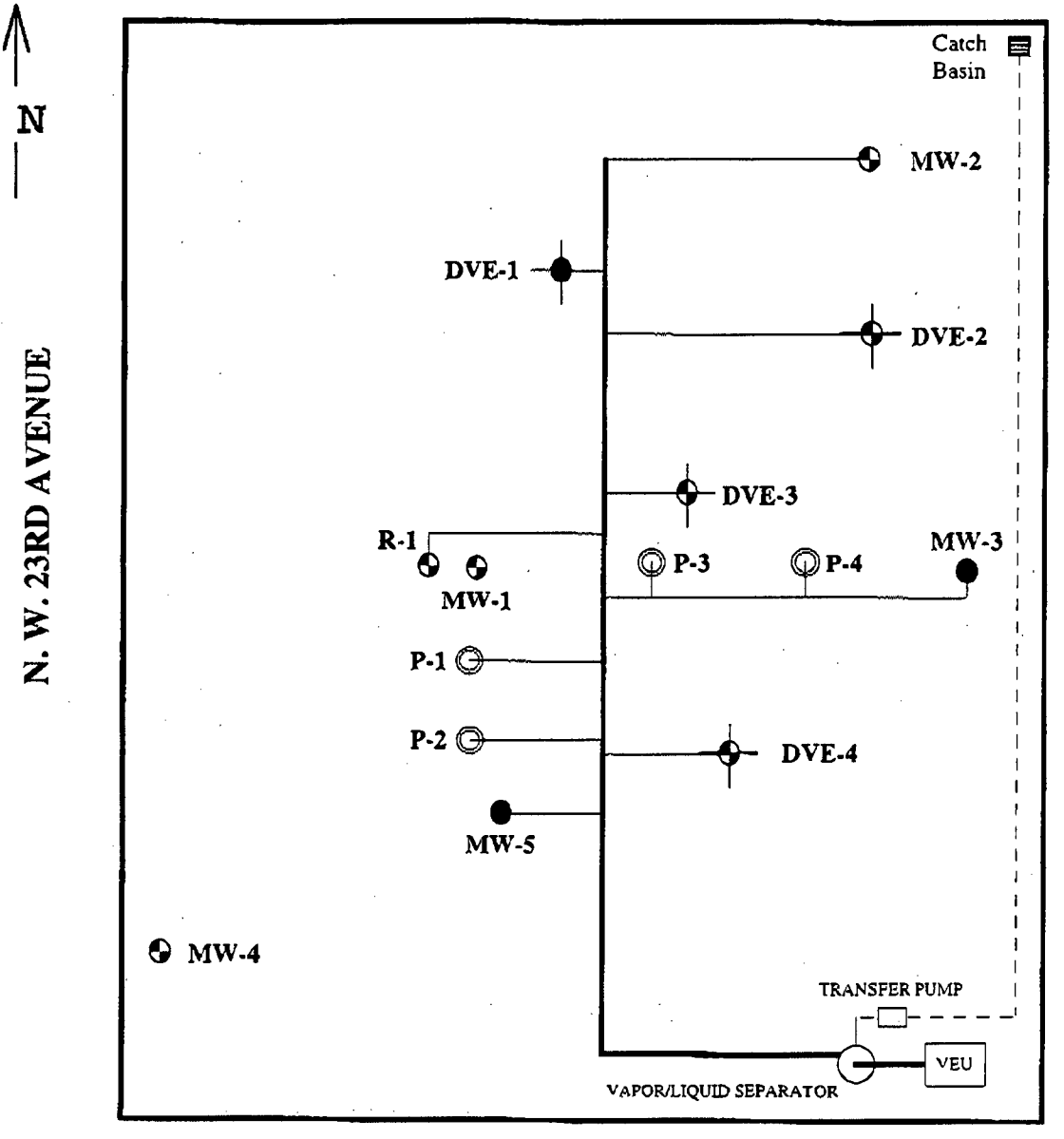
TERRA VAC

Terra Vac appreciates your assistance in this matter. If you have any further questions or comments on this letter application, feel free to contact Terra Vac at (206) 362-8294.

Sincerely,
Terra Vac Corporation

Paul V. Bianco
Project Engineer,

Timothy Warner
Project Manager



LEGEND

- Existing Monitoring Well Using EE
- Proposed DVE Well Using EE
- Existing Monitoring Probe
- Existing Monitoring Well Using Pumps
- Proposed DVE Well Using Pumps

Notes:
(1) Base map from GeoEngineers report: "Subsurface Assessment Rose's Parking Lot Portland, Oregon" August 28, 1995. Site Plan, Figure 2

SCALE (Approximate ft.)
0 20 40

DVE SYSTEM PIPING AND EQUIPMENT LAYOUT	**Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon**	TERRA VAC	Project No. 32-0029 Date January 9, 1997 Scale 1 Inch = 20 Feet Revision PVB -1	Figure 1

UST CLEANUP TELEPHONE USE REPORT

CALL FROM/TO: Julia Fowler DATE: 11/21/96

WITH: Geoprobe Engineer TIME: 4:00

TELEPHONE NO: ( ) 624-9274

REGARDING: Rose's Parking Lot

FILE NO: 26-94-0025

SUMMARY OF CALL

Terra Vac - New consultant selected

Charlie Williamson - 248-1854
Attorney @ Kell, Alterman & Runstein

Don J. Pettit
Staff Signature

C26-94-0025

GeoEngineers

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LETTER OF TRANSMITTAL

To: Kell, Alterman & Runstein
1001 S.W. Fifth Avenue, Suite 1800
Portland, Oregon 97204-1194

Date: November 15, 1996

File: 4326-001-62

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
NOV 18 1996
NORTHWEST REGION

Attention: Mr. Max Birnbach
c/o Mr. Charles R. Williamson

Regarding: Final Report

We are sending: ☒ Attached ☐ Under Separate Cover

Copies	Date	Description
01	11/15/96	Results of Quarterly Ground Water Monitoring July 1996 Rose's Parking Lot 330 Northwest 23rd Avenue Portland, Oregon

These are transmitted as checked below:

☒ For Your Use ☐ As Requested ☐ Returned

☐ For Review and Comment ☐ Other (see remarks)

Remarks: Attached please find 1 copy of our July 1996 ground water monitoring report. The next draft quarterly ground water monitoring report will be sent in the next couple of weeks.

cc: Ms. Janice McLain - Amoco
Mr. Martin Johnson - Amoco
Mr. Kipp Eckert - Unocal
Mr. Jeff Wishko - Bell & Ingram, P.S.
Mr. David Roy - Black Helterline
Mr. Jeff Scott - Gull Industries
Mr. Don Pettit - ODEQ - Northwest Region
Mr. Michael Dodson - Terra Vac

Signed: Marsi M. Beeson

Marsi M. Beeson

GeoEngineers

November 15, 1996

Consulting Engineers and Geoscientists
Offices in Washington, Oregon, and Alaska

DEPT OF ENVIRONMENTAL QUALITY
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NORTHWEST REGION

Mr. Max Birnbach
c/o Charles R. Williamson
Kell, Alterman & Runstein
1001 Southwest Fifth Avenue, Suite 1800
Portland, Oregon 97204-1194

Attention: Mr. Max Birnbach

Results of Quarterly Ground Water Monitoring
July 1996
Rose's Parking Lot
330 Northwest 23rd Avenue
Portland, Oregon
File No. 4326-001-62

INTRODUCTION

This report presents the results of GeoEngineers' July 1996 quarterly ground water monitoring and sampling activities at Rose's Parking Lot, located at 330 Northwest 23rd Avenue in Portland, Oregon. The DEQ (Oregon Department of Environmental Quality) UST (underground storage tank) Cleanup file number for this site is 26-94-25. The general layout of the site and surrounding features are shown in Figure 1.

Five ground water monitoring wells (MW-1 through MW-5) are located on the site. Three off-site monitoring wells (MW-6, MW-7 and MW-8) were installed in the public rights-of-way and on adjacent property on April 6, 1996. Ground water monitoring and sampling of the on- and off-site wells were conducted on July 11, 1996. This is the third quarterly ground water monitoring event for the five on-site monitoring wells and the second ground water monitoring event for the three off-site monitoring wells.

SCOPE OF SERVICES

GeoEngineers' scope of services completed during this quarterly ground water monitoring period was performed in general accordance with our work plan dated September 28, 1995 and is summarized below.

1. Measure the depths to ground water in the on- and off-site monitoring wells.
2. Measure combustible vapor concentrations in the monitoring well casings.

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3. Obtain ground water samples from monitoring wells MW-1 through MW-8 for analytical testing of BETX (benzene, ethylbenzene, toluene and xylenes) by EPA (U.S. Environmental Protection Agency) Method 8020, TPH (total petroleum hydrocarbons) by EPA Method 418.1 and, if appropriate, PAHs (polynuclear aromatic hydrocarbons) by EPA Method 8310.

   A description of field procedures for the above scope items is included in Attachment A.

JULY 1996 GROUND WATER MONITORING AND SAMPLING RESULTS

GROUND WATER ELEVATIONS

GeoEngineers measured the depths to ground water in the monitoring wells on July 11, 1996. At the time of our July 11 measurements, the depths to ground water ranged from 18.88 feet to 23.37 feet below the ground surface. Based on our measurements, the apparent direction of ground water flow beneath the site is toward the northeast, which is consistent with our previous ground water elevation data. However, the ground water flow direction in the southeast portion of the site appears to have a more northerly component of flow.

The depths to ground water and the calculated ground water elevations are summarized in Table 1. The calculated ground water elevations and the inferred direction of ground water flow for the July 11, 1996 monitoring event are shown in Figure 2.

COMBUSTIBLE VAPOR CONCENTRATIONS

The combustible vapor concentration measured in monitoring well MW-1 was greater than 10,000 ppm (parts per million) on July 11, 1996. The combustible vapor concentrations measured in monitoring wells MW-2 through MW-8 were less than 400 ppm during this monitoring event. Combustible vapor concentration measurements are presented in Table 1.

FREE PRODUCT THICKNESS

Trace amounts of free product were detected in monitoring well MW-1 on July 11, 1996. Additionally, a sheen and odor were noted on water purged from MW-2 during sampling. There was not enough product in monitoring well MW-1 to remove by bailing or to justify the installation of a product recovery canister. Free product was not detected in the remaining monitoring wells during this event. Product thickness measurements are presented in Table 1.

Free product thicknesses will be measured during the next quarterly ground water monitoring event. A product recovery canister will be installed if the free product thicknesses in the monitoring wells exceed 0.1 foot.

GROUND WATER QUALITY

Ground water samples were obtained from monitoring wells MW-1 through MW-8 on July 11, 1996 for analysis of BETX by EPA Method 8020 and TPH by EPA Method 418.1. The ground water samples obtained from monitoring wells MW-1, MW-2 and MW-3 also were submitted for PAH analysis by EPA Method 8310.

BETX compounds were detected at concentrations greater than the DEQ ground water cleanup levels for UST sites in samples from monitoring wells MW-1 (benzene, ethylbenzene and toluene) and MW-3 (benzene). BETX compounds were detected in the ground water samples collected from monitoring wells MW-2 (benzene) and MW-5 (xylenes); however, the concentrations were less than the DEQ ground water cleanup levels. BETX compounds were not detected in the ground water samples from monitoring wells MW-4, MW-6, MW-7 and MW-8.

TPH was detected in the ground water samples collected from monitoring wells MW-1, MW-2 and MW-3. In accordance with DEQ requirements, the ground water samples were also analyzed for PAHs. The PAH compound naphthalene was detected at concentrations greater than the DEQ ground water cleanup level for UST sites in the ground water samples from MW-1 and MW-3. Naphthalene is a noncarcinogenic PAH compound. PAH compounds were not detected in the ground water sample from monitoring well MW-2. TPH was not detected in the ground water samples collected from monitoring wells MW-4 through MW-8.

A summary of the July 11, 1996 ground water analytical data for this monitoring event is presented in Table 2. Analytical data from previous sampling events and the DEQ ground water cleanup standards for the listed analytes are also included in Table 2. The analytical methods and laboratory data sheets from our July 11, 1996 sampling event are included in Attachment B. Concentrations of BETX compounds detected in ground water samples during the July 11, 1996 sampling event and the four previous sampling events also are presented in Figure 3.

DISCUSSION

GeoEngineers' July 1996 ground water monitoring event was the third quarterly ground water monitoring event at Rose's Parking Lot. It is the second sampling event for off-site monitoring wells MW-6, MW-7 and MW-8. Based on the results of the July 1996 monitoring event, the following summary is presented:

1. A trace amount of free product was detected in monitoring well MW-1 and a sheen and petroleum-like odor were noted in water purged from MW-2 during this monitoring event. Free product was not detected in monitoring wells MW-3 through MW-8.
2. Benzene, ethylbenzene and toluene were detected in the ground water sample collected from monitoring well MW-1 at concentrations exceeding the DEQ ground water cleanup standards of 5 μg/l (micrograms per liter), 700 μg/l and 1,000 μg/l, respectively.
3. Benzene was detected in the ground water sample collected from monitoring well MW-3 at a concentration in excess of the DEQ ground water cleanup standard of 5 μg/l.

4. The PAH compound naphthalene was detected at concentrations greater than the DEQ cleanup standard of 28 μg/l in the ground water samples from monitoring wells MW-1 and MW-3. Naphthalene has been detected at elevated levels in monitoring well MW-1 in past sampling events and has been detected at elevated levels in monitoring well MW-3 for three consecutive sampling events.

FUTURE GROUND WATER MONITORING ACTIVITIES

The next round of quarterly ground water monitoring is scheduled for October 1996. Based on the results of our July 1996 ground water sampling event, we recommend collecting ground water samples for analytical testing of BETX in all on-site and off-site monitoring wells, and TPH (with follow-up analyses for PAHs [polycyclic aromatic hydrocarbons], if necessary) in monitoring wells MW-1 through MW-3. A cleanup standard has not been established for TPH; however, the results of TPH analysis are used as an indicator test to determine if PAH analysis should be conducted.

LIMITATIONS

We have prepared this report for use by Mr. Max Birnbach, Amoco Corporation, Gull Industries and Unocal ERS - West Region. This report may be made available to regulatory agencies. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

Our services have been executed in accordance with the generally accepted practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

We appreciate the opportunity to provide these continued services to you. Please contact us if you have questions regarding this project.

Yours very truly,

GeoEngineers, Inc.

Marsi M. Beeson
Environmental Scientist

Julia Fowler, P.E.
Associate

MMB:JF:mln
Document ID: 4326001r.qr3

Attachments

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TABLE 1
GROUND WATER ELEVATIONS AND COMBUSTIBLE VAPOR CONCENTRATIONS

Monitoring Well[1]	Date Measured	Water Depth From Ground Surface (feet)	Ground Water Elevation[2] (feet)	Combustible Vapor Concentration[3] (ppm)	Product Thickness (feet)
MW-1	05/12/95	23.29	78.75[4]	Note[5]	0.5
	01/04/96	24.10	77.87[4]	>10,000	Trace
	04/08/96	22.41	79.56[4]	>10,000	0.02
	04/24/96	22.45	79.55[4]	>10,000	0.05
	07/11/96	23.35	78.61	>10,000	Trace
MW-2	05/12/95	20.75	77.54	>10,000	ND
	01/04/96	21.60	76.69	--[6]	ND
	04/08/96	19.73	78.56	400	ND
	04/24/96	19.90	78.39	<400	ND
	07/11/96	20.80	77.49	<400	Sheen
MW-3	05/12/95	23.48	77.86	<400	ND
	01/04/96	24.22	77.12	--[6]	ND
	04/08/96	22.31	79.03	<400	ND
	04/24/96	22.36	78.98	<400	ND
	07/11/96	23.37	77.97	<400	ND
MW-4	05/12/95	22.55	79.93	<400	ND
	01/04/96	23.03	79.45	<400	ND
	04/08/96	21.60	80.88	500	ND
	04/24/96	21.34	81.14	<400	ND
	07/11/96	22.54	79.94	<400	ND
MW-5	05/12/95	22.35	80.06	7,800	--
	01/04/96	22.84	79.57	>10,000	Trace
	04/08/96	21.40	81.01	1,200	ND
	04/24/96	20.04	82.37	<400	ND
	07/11/96	22.45	79.96	<400	ND
MW-6	04/08/96	21.53	73.93	<400	ND
	04/24/96	22.04	73.42	<400	ND
	07/11/96	22.61	72.85	<400	ND
MW-7	04/08/96	21.50	70.61	<400	ND
	04/24/96	21.05	71.06	<400	ND
	07/11/96	22.40	69.71	<400	ND
MW-8	04/08/96	20.19	72.93	<400	ND
	04/24/96	18.42	74.70	<400	ND
	07/11/96	18.88	74.24	<400	ND

Notes:

[1]Approximate locations of monitoring wells are shown in Figures 1, 2 and 3.

[2]Elevations are measured relative to the temporary benchmark shown in Figure 2. The benchmark has an assumed elevation of 100.00 feet.

[3]Measured with a Bacharch TLV Sniffer calibrated to hexane and equipped with a drop hose lowered to within 1 foot of the ground water table. The lower threshold of significance in this application is 400 ppm.

[4]The ground water elevation was corrected for the presence of free product using a specific gravity of 0.7.

[5]Combustible vapor measurements are not representative of soil conditions because the water table was above the top of the screen.

[6]TLV Sniffer was not functioning.

ppm = parts per million, ND = not detected, "--" = not measured

TABLE 2 (Page 1 of 3)
SUMMARY OF GROUND WATER SAMPLE ANALYTICAL DATA[1]

Monitoring Well Number[2]	Date Sampled[3]	BETX[4] (EPA Method 8020) (µg/l)				Total Petroleum Hydrocarbons (EPA Method 418.1) (mg/l)	PAHs[5] (EPA Method 8310) (µg/l)	EDB/EDC[6] (EPA Method 8010M) (µg/l)	Dissolved Lead (EPA Method 7421) (µg/l)
		B	E	T	X				
MW-1	03/29/94	130	98	390	1,570	--	--	--	--
	10/04/94	27	5.9	46	70.0	--	--	--	--
	05/12/95[7]	--	--	--	--	--	--	--	--
	01/04/96	400	630	2,200	4,800	54	Naphthalene 370 Acenaphthylene 44	EDB - 21 EDC - <1.0	100
	04/24/96[7]	--	--	--	--	--	--	--	--
	07/11/96	710	730	1,800	2,300	81	Napthalene 750 Acenaphthylene 160 Phenanthrene 2.2 Fluoranthene 4.5	--	--
MW-2	03/29/94	4.9	0.7	1.4	3.0	--	--	--	--
	10/04/94	<0.5	<0.5	<0.5	<0.5	--	--	--	--
	05/12/95	1.2	0.6	<0.5	0.7	<0.5	--	--	--
	01/04/96	14	<0.5	1.5	1.7	1.6	ND	EDB - <0.5 EDC - <0.2	<2
	04/24/96	7.7	<0.5	0.5	<0.5	--	--	--	--
	07/11/96	2.7	<0.5	<0.5	<0.5	7.1	ND	--	--
MW-3	03/29/94	2,300	1,200	1,200	3,700	--	--	--	--
	10/04/94	1,520	790	600	1,600	--	--	--	--
	05/12/95	1,300	800	740	2,000	3.5	Naphthalene 130 Fluorene 0.2 Phenanthrene 0.09	--	--
	01/04/96	1,300	940	640	2,600	4.5	Naphthalene 180 Acenaphthylene 23	EDB - <1.0 EDC - 7.1	6
	04/16/96	900	600	500	1,400	--	--	--	--
	07/11/96	460	380	130	430	2.1	Napthalene 71	--	--
DEQ Cleanup Levels		5	700	1,000	10,000	NE	Naphthalene 28 Acenaphthylene NE Fluorene 280 Phenanthrene NE Fluoranthene 280 Anthracene 2,100	EDB - 1 EDC - 5	5

Notes appear on page 3 of 3.

TABLE 2 (Page 2 of 3)

Monitoring Well Number[2]	Date Sampled[3]	BETX[4] (EPA Method 8020) (µg/l)				Total Petroleum Hydrocarbons (EPA Method 418.1) (mg/l)	PAHs[5] (EPA Method 8310) (µg/l)	EDB/EDC[6] (EPA Method 8010M) (µg/l)	Dissolved Lead (EPA Method 7421) (µg/l)
		B	E	T	X				
MW-4	10/04/94	<0.5	<0.5	<0.5	<0.5	--	--	--	--
	05/12/95	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	--
	01/04/96	<0.5	<0.5	<0.5	<0.5	0.9	ND	EDB - <0.5 EDC - <0.2	<2
	04/24/96	<0.5	<0.5	<0.5	<0.5	--	--	--	--
	07/11/96	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	--
MW-5	05/12/95	660	1,900	13,000	11,000	13	Naphthalene 450 Acenaphthylene 66 Fluorene 0.6 Phenanthrene 0.42 Anthracene 0.07	--	--
	01/04/96	4.6	24	22	230	6.6	Naphthalene 29 Acenaphthylene 13 Fluorene 0.8	EDB - <0.5 EDC - <0.2	14
	04/24/96[8]	<0.5	1.1	0.6	2.9	--	--	--	--
	07/11/96	<0.5	<0.5	<0.5	2.7	<0.5	--	--	--
MW-6	04/24/96[8]	<0.5	<0.5	<0.5	<0.5	<0.5	--	EDB - <0.5 EDC - <0.2	<0.002
	07/11/96	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	--
MW-7	04/24/96[8]	<0.5	<0.5	<0.5	<0.5	<0.5	--	EDB - <0.5 EDC - <0.2	<0.002
	07/11/96	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	--
MW-8	04/24/96[8]	<0.5	<0.5	<0.5	<0.5	<0.5	--	EDB - <0.5 EDC - <0.2	<0.002
	07/11/96	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	--
DEQ Cleanup Levels		5	700	1,000	10,000	NE	Naphthalene 28 Acenaphthylene NE Fluorene 280 Phenanthrene NE Fluoranthene 280 Anthracene 2,100	EDB - 1 EDC - 5	5

Notes appear on page 3 of 3.

TABLE 2 (Page 3 of 3)

Notes:

[1]Chemical analyses were conducted by American Environmental Network, Inc. of Durham, Oregon (formerly ATI [Analytical Technologies, Inc.]).

[2]Approximate monitoring well locations are shown in Figures 1, 2 and 3.

[3]Ground water samples obtained prior to 05/12/95 were obtained by others. Analytical data were provided to GeoEngineers by Unocal.

[4]B = benzene, E = ethylbenzene, T = toluene, X = xylenes

[5]PAHs = polycyclic aromatic hydrocarbons. Only analytes detected are listed. Refer to attached chemical analytical data and data included with previous reports for a complete list of analytes and their respective detection limits.

[6]EDB/EDC = ethylene bibromide/ethylene dichloride

[7]Monitoring well MW-1 was not sampled because of the presence of free product.

µg/l = micrograms per liter, mg/l = milligrams per liter, "--" = not analyzed, NE = not established, ND = not detected

Shading indicates concentrations greater than DEQ cleanup levels for UST sites.

No. 4326001G

D:\PROJECTS\04326\001\GEO_SP2

Retail Building

Parking Lot

Residential Area

MW-6

Sidewalk

N.W. FLANDERS STREET

MW-7

Parking Strip/Sidewalk

Rose's Parking Lot

MW-2

Office Building

MW-3

RW-1

MW-1

Landscaped Area

MW-5

MW-8

MW-4

Parking

Under Construction

Parking

Residential Area

N.W. 23rd AVENUE

N.W. 22nd AVENUE

N.W. EVERETT STREET

N.W. 22nd PLACE

N

0 50 100

SCALE IN FEET

EXPLANATION:

MW-1 ◑ MONITORING WELL BY OTHERS

MW-5 ● MONITORING WELL BY GEOENGINEERS

RW-1 ⊕ RECOVERY WELL BY GEOENGINEERS

Note: The locations of all features shown are approximate.

Reference: Multnomah County Tax Assessor's Map.

4326-001-P36 SAK:MAM 08/31/95

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SITE PLAN

FIGURE 1

D:\04326\001\GW_EL3

MW-6
72.85

Sidewalk

N

0 30 60
SCALE IN FEET

N.W. FLANDERS STREET

MW-7
69.71

Sidewalk

MW-2
77.49

BM

MW-3
77.97

RW-1

MW-1
78.61

MW-5
79.96

MW-4
79.94

MW-8
74.24

Building

Parking

N.W. 23rd AVENUE

Under Construction

Parking Lot

EXPLANATION:

MW-1 78.61 ◑ — MONITORING WELL BY OTHERS
GROUND WATER ELEVATION (IN FEET) ON 07/11/96

MW-5 79.96 ● — MONITORING WELL BY GEOENGINEERS
GROUND WATER ELEVATION (IN FEET) ON 07/11/96

R-1 ⊕ — RECOVERY WELL BY GEOENGINEERS

APPROXIMATE DIRECTION OF GROUND WATER FLOW

BM — BENCHMARK AT NORTHEAST CORNER OF CATCH BASIN ON NW 23RD AVENUE: ASSUMED ELEVATION 100.00 FEET

Note: The locations of all features shown are approximate.

Reference: Multnomah County Tax Assessor's Map.

4326-001-P36 BDB:BDH 07/24/96

GeoEngineers

GROUND WATER ELEVATIONS JULY 11, 1996

FIGURE 2

P:\04326001\CAD\BETX_SP

MW-6	B	E	T	X
04/24/96	<0.5	<0.5	<0.5	<0.5
07/11/96	<0.5	<0.5	<0.5	<0.5
DEQ Standards	5	700	1,000	10,000

N.W. FLANDERS STREET

MW-7	B	E	T	X
04/24/96	<0.5	<0.5	<0.5	<0.5
07/11/96	<0.5	<0.5	<0.5	<0.5
DEQ Standards	5	700	1,000	10,000

N

0 30 60

SCALE IN FEET

MW-2	B	E	T	X
05/12/95	1.2	0.6	<0.5	0.7
01/04/96	14	<0.5	1.5	1.7
04/24/96	7.7	<0.5	0.5	<0.5
07/11/96	2.7	<0.5	<0.5	<0.5
DEQ Standards	5	700	1,000	10,000

MW-1	B	E	T	X
05/12/95	--	--	--	--
01/04/96	400	630	2,200	4,800
04/24/96	--	--	--	--
07/11/96	710	730	1,800	2,300
DEQ Standards	5	700	1,000	10,000

MW-3	B	E	T	X
05/12/95	1,300	800	740	2,000
01/04/96	1,300	940	640	2,600
04/16/96	900	600	500	1,400
07/11/96	460	380	130	430
DEQ Standards	5	700	1,000	10,000

Building

RW-1

MW-8	B	E	T	X
04/24/96	<0.5	<0.5	<0.5	<0.5
07/11/96	<0.5	<0.5	<0.5	<0.5
DEQ Standards	5	700	1,000	10,000

MW-5	B	E	T	X
05/12/95	660	1,900	13,000	11,000
01/04/96	4.6	24	22	230
04/24/96	<0.5	1.1	0.6	2.9
07/11/96	<0.5	<0.5	<0.5	2.7
DEQ Standards	5	700	1,000	10,000

MW-4	B	E	T	X
05/12/95	<0.5	<0.5	<0.5	<0.5
01/04/96	<0.5	<0.5	<0.5	<0.5
04/24/96	<0.5	<0.5	<0.5	<0.5
07/11/96	<0.5	<0.5	<0.5	<0.5
DEQ Standards	5	700	1,000	10,000

N.W. 23rd AVENUE

EXPLANATION:

- ◑ MONITORING WELL BY GEOENGINEERS
- ◑ MONITORING WELL BY OTHERS
- RW-1 ⊕ RECOVERY WELL BY GEOENGINEERS
- B BENZENE (μg/l)
- E ETHYLBENZENE (μg/l)
- T TOLUENE (μg/l)
- X XYLENES (μg/l)
- -- NOT TESTED
- (μg/l) MICROGRAMS PER LITER

NOTES:

1. The locations of all features shown are approximate.
2. See Figure 2 for identification of site features.

Reference: Multnomah County Tax Assessor's Map.

4326-001-P36 BDB:BDH 07/24/96

GeoEngineers

BETX CONCENTRATIONS

FIGURE 3

ATTACHMENT A

FIELD PROCEDURES

GROUND WATER ELEVATIONS

Depths to the shallow ground water surface relative to the monitoring well casing rims were measured to an accuracy of 0.01 foot on July 11, 1996 using an ORS (Oil Recovery Systems, Inc.) interface probe. The interface probe was cleaned with a Liquinox wash and distilled water rinse prior to its use in each well. Ground water elevations were calculated by subtracting the depths to ground water from the casing rim elevations. The ground water elevations measured on July 11, 1996 are shown in Table 1. Ground water elevations for the July 11 event also are shown in Figure 2.

COMBUSTIBLE VAPOR CONCENTRATIONS

Combustible vapor concentrations were measured in the monitoring well casings on July 11, 1996 using a Bacharach TLV Sniffer calibrated to hexane. The measurements were obtained by lowering a vinyl tube connected to the TLV Sniffer to within approximately 1 foot of the water surface. The TLV Sniffer measures combustible vapor concentrations and is used as a field indicator for combustible vapors present in the monitoring well casings. The lower threshold of significance for the Bacharach TLV Sniffer in this application is 400 ppm (parts per million), or 3.6 percent of the lower explosive limit of hexane. The combustible vapor concentrations measured on July 11, 1996 are shown in Table 1.

GROUND WATER SAMPLING PROGRAM

Ground water samples were collected from monitoring wells MW-1 through MW-8 on July 11, 1996. The water samples were collected with a disposable polyethylene bailer after at least three well volumes of water were removed from each monitoring well casing. A new bailer and cord were used to sample each monitoring well to minimize the possibility of cross-contamination between monitoring wells. The ground water samples were transferred in the field to 40-milliliter septum vials and 1-liter amber jars and kept cool during transport to the analytical laboratory. The laboratory provided septum vials containing hydrochloric acid as a preservative for the BETX samples, 1-liter amber jars containing hydrochloric acid as a preservative for the TPH samples and unpreserved 1-liter amber jars for the PAH samples. Chain-of-custody procedures were followed during transport of the ground water samples to the analytical laboratory.

DEVELOPMENT AND PURGE WATER DISPOSAL

Development and purge water from the monitoring wells was placed into a 55-gallon drum that is stored on-site pending disposal at a recycling facility.

ATTACHMENT B

CHEMICAL ANALYTICAL PROGRAM

ANALYTICAL METHODS

The ground water samples were analyzed by AEN (American Environmental Network, Inc.) of Durham, Oregon. Chain-of-custody procedures were followed during transport of the samples to the analytical laboratory. Samples were held in cold storage pending analysis. The analytical results, analytical methods reference, and laboratory QA/QC (quality assurance/quality control) records are included in this attachment. The analytical results also are summarized in the text and in Table 2 of this report.

ANALYTICAL DATA REVIEW

The laboratory maintains an internal quality assurance program, as documented in its laboratory quality assurance manual. The laboratory uses a combination of blanks, surrogate recoveries, duplicates, matrix spike duplicate recoveries, blank spike recoveries and blank spike duplicate recoveries to evaluate the validity of the analytical results. The laboratory also uses data quality goals for individual chemicals or groups of chemicals based on the long-term performance of the test methods. The data quality goals were included in the laboratory report. The laboratory compared the samples with the existing data quality goals and noted any exceptions in the laboratory report. If data quality exceptions were documented by the laboratory in the laboratory report, the data quality exceptions were reviewed by GeoEngineers using the applicable data validation guidelines from the following documents: "National Functional Guidelines for Organic Data Review," draft dated 1991, and "Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses," dated 1988.

ANALYTICAL DATA REVIEW SUMMARY

No significant data quality exceptions were documented in the laboratory reports or noted during our review. Based on the data quality review, it is our opinion that the analytical data are acceptable for their intended use.

American Environmental Network, Inc.

17400 SW Upper Boones Ferry Rd. • Suite 270 • Durham, OR 97224 • (503) 684-0447
(Formerly Analytical Technologies, Inc.)

AEN I.D. 607565

July 22, 1996

Marsi Beeson
GeoEngineers
7504 SW Bridgeport Rd.
Portland, OR 97224

Project Name / Number: BirnBach / 4326-001-36

Attention: Marsi Beeson

On July 11, 1996, American Environmental Network (OR), Inc. received eight water samples for analysis for the above listed project. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed. The results from these samples relate only to the items tested. This report shall not be reproduced, except in full, without the written approval of the laboratory.

If you have any questions or comments, please do not hesitate to contact us at (503)684-0447.

Natasha Schaefer
Project Manager

Steven E. Stanley
Laboratory Manager

SES:alm
Enclosure

SAMPLE CROSS REFERENCE SHEET

CLIENT:	GeoEngineers, Inc.	**AEN I.D.:**	607565
PROJECT #:	4326-001-36		
PROJECT NAME:	Birn Bach	**MATRIX:**	WATER

AEN #	CLIENT DESCRIPTION	DATE SAMPLED
607565-1	MW-1	7/11/96
607565-2	MW-2	7/11/96
607565-3	MW-3	7/11/96
607565-4	MW-4	7/11/96
607565-5	MW-5	7/11/96
607565-6	MW-6	7/11/96
607565-7	MW-7	7/11/96
607565-8	MW-8	7/11/96

----------TOTALS----------

MATRIX	# SAMPLES
WATER	8

AEN STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of the report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

ANALYTICAL SCHEDULE

CLIENT:	GeoEngineers, Inc.	**AEN I.D.:**	607565
PROJECT #:	4326-001-36		
PROJECT NAME:	Birn Bach		

ANALYSIS	TECHNIQUE	REFERENCE	LAB
BETX	GC/PID	EPA 8020M	PLD
Petroleum Hydrocarbon	IR	EPA 418.1	PLD
PAHs	HPLC/UV/FLUOR	EPA 8310	PLD

PLD = AEN - Portland
PHX = AEN - Phoenix
PNR = AEN - Pensacola
CA = AEN - Pleasant Hill
MD = AEN - Columbia
SUB = Subcontract

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	607565-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	NA
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	NA
PROJECT #:	4326-001-36	**DATE ANALYZED:**	07/12/96
PROJECT NAME:	Birn Bach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		RESULTS
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5

SURROGATE:	
TRIFLUOROTOLUENE (81%-116%)	103%

Analyst: BA 7/15/96

Reviewer: CS 7/15/96

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	607565-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	NA
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	NA
PROJECT #:	4326-001-36	**DATE ANALYZED:**	07/15/96
PROJECT NAME:	Birn Bach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		RESULTS
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5
SURROGATE:		
TRIFLUOROTOLUENE (81%-116%)		101%

Analyst: CS 7/16/96

Reviewer: JMC 7/16/96

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	607565-1
CLIENT I.D.:	MW-1	**DATE SAMPLED:**	07/11/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	07/11/96
PROJECT #:	4326-001-36	**DATE ANALYZED:**	07/12/96
PROJECT NAME:	Birn Bach	**DILUTION FACTOR:**	20
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS	
BENZENE	710	
TOLUENE	1800	
ETHYLBENZENE	730	
TOTAL XYLENES	2300	D
SURROGATE:		
TRIFLUOROTOLUENE (81%-116%)	100%	

D = Value from a 1:50 dilution analyzed on 7/15/96.

Analyst: CS 7/16/96

Reviewer: JK 7/16/96

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	607565-2
CLIENT I.D.:	MW-2	**DATE SAMPLED:**	07/11/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	07/11/96
PROJECT #:	4326-001-36	**DATE ANALYZED:**	07/12/96
PROJECT NAME:	Birn Bach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		RESULTS
BENZENE		2.7
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5
SURROGATE:		
TRIFLUOROTOLUENE (81%-116%)		101%

Analyst: TBT 7/15/96

Reviewer: CS 7/15/96

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	607565-3
CLIENT I.D.:	MW-3	**DATE SAMPLED:**	07/11/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	07/11/96
PROJECT #:	4326-001-36	**DATE ANALYZED:**	07/12/96
PROJECT NAME:	Birn Bach	**DILUTION FACTOR:**	10
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS
BENZENE	460
TOLUENE	130
ETHYLBENZENE	380
TOTAL XYLENES	430
SURROGATE:	
TRIFLUOROTOLUENE (81%-116%)	99%

Analyst: TBD 7/16/96

Reviewer: CS 7/15/96

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	607565-4
CLIENT I.D.:	MW-4	**DATE SAMPLED:**	07/11/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	07/11/96
PROJECT #:	4326-001-36	**DATE ANALYZED:**	07/12/96
PROJECT NAME:	Birn Bach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		RESULTS
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5

SURROGATE:	
TRIFLUOROTOLUENE (81%-116%)	98%

Analyst: JBH 7/15/96

Reviewer: CS 7/15/96

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	607565-5
CLIENT I.D.:	MW-5	**DATE SAMPLED:**	07/11/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	07/11/96
PROJECT #:	4326-001-36	**DATE ANALYZED:**	07/12/96
PROJECT NAME:	Birn Bach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS	
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES		2.7
SURROGATE:		
TRIFLUOROTOLUENE (81%-116%)		100%

Analyst: TBL 7/15/96

Reviewer: CS 7/15/96

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	607565-6
CLIENT I.D.:	MW-6	**DATE SAMPLED:**	07/11/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	07/11/96
PROJECT #:	4326-001-36	**DATE ANALYZED:**	07/12/96
PROJECT NAME:	Birn Bach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS	
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5
SURROGATE:		
TRIFLUOROTOLUENE (81%-116%)		96%

Analyst: BZ 7/15/96

Reviewer: CS 7/15/96

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	607565-7
CLIENT I.D.:	MW-7	**DATE SAMPLED:**	07/11/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	07/11/96
PROJECT #:	4326-001-36	**DATE ANALYZED:**	07/12/96
PROJECT NAME:	Birn Bach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS	
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5
SURROGATE:		
TRIFLUOROTOLUENE (81%-116%)		100%

Analyst: TBA 7/15/96

Reviewer: CS 7/15/96

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	607565-8
CLIENT I.D.:	MW-8	**DATE SAMPLED:**	07/11/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	07/11/96
PROJECT #:	4326-001-36	**DATE ANALYZED:**	07/12/96
PROJECT NAME:	Birn Bach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS	
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5
SURROGATE:		
TRIFLUOROTOLUENE (81%-116%)		95%

Analyst: BA 7/15/96

Reviewer: CS 7/15/96

GAS CHROMATOGRAPHY SPIKE RESULTS

METHOD:	BETX (EPA 8020M)	**AEN ID:**	607565
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	607565-2
PROJECT #:	4326-001-36	**DATE ANALYZED:**	07/12/96
PROJECT NAME:	Birn Bach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE		2.7	20.0	24.3	108	24.2	108	0
TOLUENE	<	0.5	20.0	20.6	103	20.5	103	0
ETHYLBENZENE	<	0.5	20.0	19.4	97	19.6	98	1
TOTAL XYLENES	<	0.5	60.0	56.3	94	56.6	94	1
SURROGATE:								
TRIFLUOROTOLUENE (81% - 116%)					101%		101%	

CONTROL LIMITS

	% REC	RPD
BENZENE	77-131	20
TOLUENE	79-125	20
ETHYLBENZENE	76-124	20
TOTAL XYLENES	74-127	20

Analyst: MC 7/15/96

Reviewer: CS 7/15/96

GAS CHROMATOGRAPHY SPIKE RESULTS

METHOD:	BETX (EPA 8020M)	**AEN ID:**	607565
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	607556-1
PROJECT #:	4326-001-36	**DATE ANALYZED:**	07/15/96
PROJECT NAME:	Birn Bach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<	0.5	20.0	23.8	119	23.7	119	0
TOLUENE	<	0.5	20.0	21.2	106	21.1	106	0
ETHYLBENZENE	<	0.5	20.0	19.9	100	19.9	100	0
TOTAL XYLENES	<	0.5	40.0	38.2	96	38.7	97	1
SURROGATE:								
TRIFLUOROTOLUENE (81% - 116%)					100%		100%	

CONTROL LIMITS

	% REC	RPD
BENZENE	77-131	20
TOLUENE	79-125	20
ETHYLBENZENE	76-124	20
TOTAL XYLENES	74-127	20

Analyst: CS 7/16/96

Reviewer: JLK 7/16/96

GAS CHROMATOGRAPHY SPIKE RESULTS

METHOD:	BETX (EPA 8020M)	**AEN ID:**	607565
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	Method Blank
PROJECT #:	4326-001-36	**DATE ANALYZED:**	07/12/96
PROJECT NAME:	Birn Bach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<	0.5	20.0	21.4	107	20.9	105	2
TOLUENE	<	0.5	20.0	20.4	102	20.2	101	1
ETHYLBENZENE	<	0.5	20.0	19.4	97	19.7	98	1
TOTAL XYLENES	<	0.5	60.0	57.0	95	57.3	96	1
SURROGATE:								
TRIFLUOROTOLUENE (81% - 116%)					101%		101%	

	CONTROL LIMITS	
	% REC	RPD
BENZENE	85-118	20
TOLUENE	85-119	20
ETHYLBENZENE	85-120	20
TOTAL XYLENES	85-120	20

Analyst: JLK 7/15/96

Reviewer: CS 7/15/96

GAS CHROMATOGRAPHY SPIKE RESULTS

METHOD:	BETX (EPA 8020M)	**AEN ID:**	607565
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	Method Blank
PROJECT #:	4326-001-36	**DATE ANALYZED:**	07/15/96
PROJECT NAME:	Birn Bach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<	0.5	20.0	21.9	110	21.9	110	0
TOLUENE	<	0.5	20.0	21.0	105	20.7	104	1
ETHYLBENZENE	<	0.5	20.0	20.6	103	20.2	101	2
TOTAL XYLENES	<	0.5	40.0	40.7	102	39.1	98	4
SURROGATE:								
TRIFLUOROTOLUENE (81% - 116%)					100%		99%	

CONTROL LIMITS

	% REC	RPD
BENZENE	85-118	20
TOLUENE	85-119	20
ETHYLBENZENE	85-120	20
TOTAL XYLENES	85-120	20

Analyst: CS 7/16/96

Reviewer: dlk 7/16/96

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**AEN I.D.:**	607565-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	N/A
CLIENT:	GeoEngineers	**DATE RECEIVED:**	N/A
PROJECT #:	4326-001-36	**DATE EXTRACTED:**	07/16/96
PROJECT NAME:	BirnBach	**DATE ANALYZED:**	07/16/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	< 0.5

Analyst: PK 7-16-96

Reviewer: CS 7-16-96

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**AEN I.D.:**	607565-1
CLIENT I.D.:	MW-1	**DATE SAMPLED:**	07/11/96
CLIENT:	GeoEngineers	**DATE RECEIVED:**	07/11/96
PROJECT #:	4326-001-36	**DATE EXTRACTED:**	07/16/96
PROJECT NAME:	BirnBach	**DATE ANALYZED:**	07/16/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	10
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	81

Analyst: PK 7-16-96

Reviewer: CS 7-16-96

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**AEN I.D.:**	607565-2
CLIENT I.D.:	MW-2	**DATE SAMPLED:**	07/11/96
CLIENT:	GeoEngineers	**DATE RECEIVED:**	07/11/96
PROJECT #:	4326-001-36	**DATE EXTRACTED:**	07/16/96
PROJECT NAME:	BirnBach	**DATE ANALYZED:**	07/16/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	7.1

Analyst: PK 7-16-96

Reviewer: CS 7-16-96

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**AEN I.D.:**	607565-3
CLIENT I.D.:	MW-3	**DATE SAMPLED:**	07/11/96
CLIENT:	GeoEngineers	**DATE RECEIVED:**	07/11/96
PROJECT #:	4326-001-36	**DATE EXTRACTED:**	07/16/96
PROJECT NAME:	BirnBach	**DATE ANALYZED:**	07/16/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	2.1

Analyst: PK 7-16-96

Reviewer: CS 7-16-96

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**AEN I.D.:**	607565-4
CLIENT I.D.:	MW-4	**DATE SAMPLED:**	07/11/96
CLIENT:	GeoEngineers	**DATE RECEIVED:**	07/11/96
PROJECT #:	4326-001-36	**DATE EXTRACTED:**	07/16/96
PROJECT NAME:	BirnBach	**DATE ANALYZED:**	07/16/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	< 0.5

Analyst: PL 7-16-96

Reviewer: CS 7-16-96

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**AEN I.D.:**	607565-5
CLIENT I.D.:	MW-5	**DATE SAMPLED:**	07/11/96
CLIENT:	GeoEngineers	**DATE RECEIVED:**	07/11/96
PROJECT #:	4326-001-36	**DATE EXTRACTED:**	07/16/96
PROJECT NAME:	BirnBach	**DATE ANALYZED:**	07/16/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	< 0.5

Analyst: PK 7-16-96

Reviewer: CS 7-16-96

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**AEN I.D.:**	607565-6
CLIENT I.D.:	MW-6	**DATE SAMPLED:**	07/11/96
CLIENT:	GeoEngineers	**DATE RECEIVED:**	07/11/96
PROJECT #:	4326-001-36	**DATE EXTRACTED:**	07/16/96
PROJECT NAME:	BirnBach	**DATE ANALYZED:**	07/16/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	< 0.5

Analyst: 7-16-96

Reviewer: CS 7-16-96

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**AEN I.D.:**	607565-7
CLIENT I.D.:	MW-7	**DATE SAMPLED:**	07/11/96
CLIENT:	GeoEngineers	**DATE RECEIVED:**	07/11/96
PROJECT #:	4326-001-36	**DATE EXTRACTED:**	07/16/96
PROJECT NAME:	BirnBach	**DATE ANALYZED:**	07/16/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	< 0.5

Analyst: PK 7-16-96

Reviewer: CS 7-16-96

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**AEN I.D.:**	607565-8
CLIENT I.D.:	MW-8	**DATE SAMPLED:**	07/11/96
CLIENT:	GeoEngineers	**DATE RECEIVED:**	07/11/96
PROJECT #:	4326-001-36	**DATE EXTRACTED:**	07/16/96
PROJECT NAME:	BirnBach	**DATE ANALYZED:**	07/16/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	< 0.5

Analyst: PK 7-16-96

Reviewer: CS 7-16-96

INFRARED SPECTROPHOTOMETRY SPIKE RESULTS

		AEN ACCESSION:	607565
METHOD:	EPA - 418.1	**QC SAMPLE:**	607577-1
CLIENT:	GeoEngineers	**DATE EXTRACTED:**	07/16/96
PROJECT #:	4326-001-36	**DATE ANALYZED:**	07/16/96
PROJECT NAME:	Birnbach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	mg/L

PARAMETER	SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
3-Component Oil	< 0.5	10.0	8.9	89	8.8	88	1

CONTROL LIMITS

	%REC	RPD
3-Component Oil	61 - 109	20

Analyst: PK 7-16-96

Reviewer: CS 7-16-96

INFRARED SPECTROPHOTOMETRY SPIKE RESULTS

		AEN ACCESSION:	607565
METHOD:	EPA - 418.1	**QC SAMPLE:**	Method Blank
CLIENT:	GeoEngineers	**DATE EXTRACTED:**	07/16/96
PROJECT #:	4326-001-36	**DATE ANALYZED:**	07/16/96
PROJECT NAME:	BirnBach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	mg/L

PARAMETER	SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
3-Component Oil	< 0.5	10.0	8.3	83	8.2	82	1

CONTROL LIMITS

	%REC	RPD
3-Component Oil	64 - 108	20

Analyst: PK 7-16-96

Reviewer: CS 7-16-96

LIQUID CHROMATOGRAPHY RESULTS

METHOD:	8310	**AEN I.D.:**	607565-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	NA
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	NA
PROJECT #:	4326-001-36	**DATE EXTRACTED:**	07/16/96
PROJECT NAME:	Birn Bach	**DATE ANALYZED:**	07/16/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER	RESULTS	
NAPHTHALENE	<	0.5
ACENAPHTHYLENE	<	1.0
ACENAPHTHENE	<	1.0
FLUORENE	<	0.1
PHENANTHRENE	<	0.05
ANTHRACENE	<	0.05
FLUORANTHENE	<	0.1
PYRENE	<	0.1
BENZO(a)ANTHRACENE	<	0.1
CHRYSENE	<	0.1
BENZO(b)FLUORANTHENE	<	0.1
BENZO(k)FLUORANTHENE	<	0.1
BENZO(a)PYRENE	<	0.1
DIBENZO(a,h)ANTHRACENE	<	0.1
BENZO(g,h,i)PERYLENE	<	0.1
INDENO(1,2,3-cd)PYRENE	<	0.1

SURROGATE:	
BIPHENYL (28%-125%)	73%

Analyst: BH 7/19/96

Reviewer: BH 7/19/96

LIQUID CHROMATOGRAPHY RESULTS

METHOD:	8310	**AEN I.D.:**	607565-1
CLIENT I.D.:	MW-1	**DATE SAMPLED:**	07/11/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	07/11/96
PROJECT #:	4326-001-36	**DATE EXTRACTED:**	07/16/96
PROJECT NAME:	Birn Bach	**DATE ANALYZED:**	07/18/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER		RESULTS	
NAPHTHALENE		750	D
ACENAPHTHYLENE		160	
ACENAPHTHENE	<	1.0	
FLUORENE	<	0.1	
PHENANTHRENE		2.2	
ANTHRACENE	<	0.05	
FLUORANTHENE		4.5	
PYRENE	<	0.1	
BENZO(a)ANTHRACENE	<	0.1	
CHRYSENE	<	0.1	
BENZO(b)FLUORANTHENE	<	0.1	
BENZO(k)FLUORANTHENE	<	0.1	
BENZO(a)PYRENE	<	0.1	
DIBENZO(a,h)ANTHRACENE	<	0.1	
BENZO(g,h,i)PERYLENE	<	0.1	
INDENO(1,2,3-cd)PYRENE	<	0.1	

SURROGATE:	
BIPHENYL (28%-125%)	60%

D = Value from a 20-fold dilution analyzed on 7/17/96.

Analyst: BJ 7/19/96

Reviewer: [illegible] 7/19/96

LIQUID CHROMATOGRAPHY RESULTS

METHOD:	8310	**AEN I.D.:**	607565-2
CLIENT I.D.:	MW-2	**DATE SAMPLED:**	07/11/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	07/11/96
PROJECT #:	4326-001-36	**DATE EXTRACTED:**	07/16/96
PROJECT NAME:	Birn Bach	**DATE ANALYZED:**	07/16/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER	RESULTS	
NAPHTHALENE	<	0.5
ACENAPHTHYLENE	<	1.0
ACENAPHTHENE	<	1.0
FLUORENE	<	0.1
PHENANTHRENE	<	0.05
ANTHRACENE	<	0.05
FLUORANTHENE	<	0.1
PYRENE	<	0.1
BENZO(a)ANTHRACENE	<	0.1
CHRYSENE	<	0.1
BENZO(b)FLUORANTHENE	<	0.1
BENZO(k)FLUORANTHENE	<	0.1
BENZO(a)PYRENE	<	0.1
DIBENZO(a,h)ANTHRACENE	<	0.1
BENZO(g,h,i)PERYLENE	<	0.1
INDENO(1,2,3-cd)PYRENE	<	0.1

SURROGATE:	
BIPHENYL (28%-125%)	69%

Analyst: BL 7/19/96

Reviewer: AH 7/19/96

LIQUID CHROMATOGRAPHY RESULTS

METHOD:	8310	**AEN I.D.:**	607565-3
CLIENT I.D.:	MW-3	**DATE SAMPLED:**	07/11/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	07/11/96
PROJECT #:	4326-001-36	**DATE EXTRACTED:**	07/16/96
PROJECT NAME:	Birn Bach	**DATE ANALYZED:**	07/16/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER	RESULTS	
NAPHTHALENE		71
ACENAPHTHYLENE	<	1.0
ACENAPHTHENE	<	1.0
FLUORENE	<	0.1
PHENANTHRENE	<	0.05
ANTHRACENE	<	0.05
FLUORANTHENE	<	0.1
PYRENE	<	0.1
BENZO(a)ANTHRACENE	<	0.1
CHRYSENE	<	0.1
BENZO(b)FLUORANTHENE	<	0.1
BENZO(k)FLUORANTHENE	<	0.1
BENZO(a)PYRENE	<	0.1
DIBENZO(a,h)ANTHRACENE	<	0.1
BENZO(g,h,i)PERYLENE	<	0.1
INDENO(1,2,3-cd)PYRENE	<	0.1

SURROGATE:	
BIPHENYL (28%-125%)	63%

Analyst: TSB 7/19/96

Reviewer: AJ 7-19-96

LIQUID CHROMATOGRAPHY SPIKE RESULTS

METHOD:	8310	**AEN I.D.:**	607565
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	607565-3
PROJECT #:	4326-001-36	**DATE EXTRACTED:**	07/16/96
PROJECT NAME:	Birn Bach	**DATE ANALYZED:**	07/16/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
ACENAPHTHYLENE	<	1.0	10.0	11.1	111%	10.7	107%	4
PHENANTHRENE	<	0.05	1.00	0.88	88%	0.94	94%	7
PYRENE	<	0.1	1.0	0.7	70%	0.9	90%	25
BENZO(k)FLUORANTHENE	<	0.1	1.0	0.5	50%	0.6	60%	18
DIBENZO(a,h)ANTHRACENE	<	0.1	1.0	0.7	70%	0.6	60%	15
SURROGATE:								
BIPHENYL (28% - 125%)				68%		71%		

CONTROL LIMITS

	% REC	RPD
ACENAPHTHYLENE	46 - 128	52
PHENANTHRENE	55 - 151	35
PYRENE	41 - 143	30
BENZO(k)FLUORANTHENE	43 - 127	33
DIBENZO(a,h)ANTHRACENE	29 - 148	39

Analyst: BH 7/19/96

Reviewer: BH 7/19/96

DATE 7/11/96 PAGE 1 OF 1

Analytical Technologies, Inc.
17400 S.W. Upper Boones Ferry Rd., Suite 270
Durham, Oregon 97224 • (503) 684-0447 FAX: (503) 620-0393

Chain of Custody

LABORATORY NUMBER: 607565
PROJECT NOTICE NUMBER:

PROJECT MANAGER: Marci Beeson
COMPANY: GeoEngineers
ADDRESS: 2504 SW Bridgeport Rd Portland, OR 97224
PHONE: 624-9274 SAMPLED BY: ICRS

SAMPLE DISPOSAL INSTRUCTIONS

☐ ATI Disposal @ $5.00 each ☐ Return

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID
MW-1	7/11/96	11:45	W	1
MW-2		12:30		2
MW-3		9:25		3
MW-4		11:00		4
MW-5		10:15		5
MW-6		13:20		6
MW-7		14:00		7
MW-8		8:10		8

PETROLEUM HYDROCARBONS										ORGANICS							INORGANICS			TCLP			OTHER	NUMBER OF CONTAINERS
TPH-HCID State: OR / WA	TPH-G State: OR / WA	TPH-D State: OR / WA	418.1 State: OR / WA	EPA 418.1	8015M	8020M-BETX only	8310 HPLC PAHs *	7421 Lead	% Moisture	8010 Halogenated VOCs	8020 Aromatic VOCs	8040 Phenols	8240 GCMS Volatiles	8270 GCMS Semivolatiles	8080 OC Pesticides/PCBs	8080M PCBs only	Drinking Water (8)	Priority Pollutant Metals (13)	Cyanide	TCLP Metals (8)	TCLP Volatiles 8240 ZH-EXT	TCLP Semivolatiles 8270		
				X		X	X																	7
				X		X	X																	7
				X		X	X																	7
				X		X	X																	7
				X		X	X																	7
				X		X	X																	7
				X		X	X																	7
				X		X	X																	7

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
NOV 18 1996
NORTHWEST REGION

PROJECT INFORMATION	SAMPLE RECEIPT	
PROJECT NUMBER: 4326-001-36	TOTAL NUMBER OF CONTAINERS	5/8
PROJECT NAME: Birnbaum	COC SEALS/INTACT? Y \ N \ NA	NA
PURCHASE ORDER NUMBER:	RECEIVED INTACT? Y \ N	Y
ONGOING PROJECT? YES ☑ NO ☐	RECEIVED COLD? Y \ N	Y

PRIOR AUTHORIZATION REQUIRED FOR RUSH PROJECTS

TAT: (NORMAL) ☒ 2 WKS (RUSH) ☐ 24 HR ☐ 48 HRS ☐ 72 HRS ☐ 1 WK

GREATER THAN 24 HR. NOTICE? YES ☐ NO ☐ (LAB USE ONLY)

SPECIAL INSTRUCTIONS: * Please run PAHs only if detect TPH above 1.5 mg/l.

Received via:

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY 3.
Signature: [signature] Time: 15:10	Signature Time:	Signature Time:
Printed Name: Kyle R. Sutton Date: 7/11/96	Printed Name: Date:	Printed Name: Date:
Company: GEI	Company:	Company:
RECEIVED BY: 1.	**RECEIVED BY: 2.**	**RECEIVED BY: (LAB) 3.**
Signature: Time:	Signature Time:	Signature Time: [signature] 1515
Printed Name: Date:	Printed Name: Date:	Printed Name: Date:
Company:	Company:	LISA M Koch 7/11/96 Analytical Technologies, Inc.

AEL

34

UST CLEANUP TELEPHONE USE REPORT

CALL FROM/(TO): Tim Warner DATE: 12/3/96

WITH: TerraVac TIME: 3:00

TELEPHONE NO: (206) 362-8295

REGARDING: Rose's Parking Lot

FILE NO: 26-94-025

SUMMARY OF CALL

Will conduct VES test Wed 12/11/96

Paul Bianco & Jim Orr from Terra-Vac
L 503 625-0625

Would like meeting after workplan is submitted.

Don J. Pettit
Staff Signature

UST CLEANUP TELEPHONE USE REPORT

CALL FROM/TO: Tim Warner DATE: 9/9/96

WITH: Terra-Vac TIME: 3:20

TELEPHONE NO: ( ) - INCOMING (206) 362-8294

REGARDING: Rose's Parking Lot

FILE NO: 26-94-0025 FAX 206-362-9528

SUMMARY OF CALL

Terra Vac has been awarded contract for cleanup.

Will use dual-phase extraction, treatment of early vapor extraction by Cat-Ox.

Discussed lead & EDC/EDB presence.

Discussed use of peroxide - by approval of work plan.

Discussed closure routes/NFA details.

Requested example closure letter be faxed.

Don J. Pettit
Staff Signature

Oregon

DEPARTMENT OF ENVIRONMENTAL QUALITY

NORTHWEST REGION

FAX COVER LETTER

DATE: 9/9/96 TIME: 4:35

COVER PAGE PLUS 7 PAGES

TO: Tim Warner – Terra VAC

FAX NUMBER: 206-362-9528 PH: 206-362-8294

FROM: Don Pettit

FAX: (503)229-6945 PH: (503) 229-6242

MESSAGE: Here are two pending NFAs:
1) GW & Soil Cleanup Limits met;
2) GW Cleanup Limits met, soil levels > matrix remain but do not impact site GW. Thought you might like to see how these might differ.

John A. Kitzhaber
Governor

2020 SW Fourth Avenue
Suite 400
Portland, OR 97201-4987
(503) 229-5263 Voice
TTY (503) 229-5471

DEQ-1

UST CLEANUP TELEPHONE USE REPORT

CALL FROM (TO): Marsi Beeson DATE: 6/18/96

WITH: GeoEngineers TIME: 11:00

TELEPHONE NO: ( ) 624-9274

REGARDING: Rose's Parking Lot

FILE NO: 26-94-025

SUMMARY OF CALL

Schedule still being worked out between involved parties.

GeoEngineers scope of work/contract ends with October 1996 GWM Report.

RP's are evaluating remedial options.

Don J. Pettit
Staff Signature

Don Pettit

GeoEngineers

15 YEARS

Consulting Engineers
and Geoscientists
Offices in Washington,
Oregon and Alaska

June 13, 1996

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
JUN 14 1996
NORTHWEST REGION

Mr. Max Birnbach
c/o Charles R. Williamson
Kell, Alterman & Runstein
1001 Southwest Fifth Avenue, Suite 1800
Portland, Oregon 97204-1194

Attention: Mr. Max Birnbach

Results of Off-site Subsurface Explorations
and Quarterly Ground Water Monitoring
April 1996
Rose's Parking Lot
330 Northwest 23rd Avenue
Portland, Oregon
File No. 4326-001-62

INTRODUCTION

This report presents the results of GeoEngineers' off-site subsurface explorations and April 1996 quarterly ground water monitoring and sampling activities at Rose's Parking Lot, located at 330 Northwest 23rd Avenue in Portland, Oregon. The DEQ (Oregon Department of Environmental Quality) UST (underground storage tank) Cleanup file number for this site is 26-94-25. The general layout of the site and surrounding features are shown in Figure 1.

Five ground water monitoring wells (MW-1 through MW-5) are located on the site. Three off-site monitoring wells (MW-6, MW-7 and MW-8) were installed on adjacent properties on April 6, 1996, prior to the quarterly ground water monitoring event. A permit was obtained from the City of Portland to install monitoring wells MW-6 and MW-7 in the public right-of-way northeast of the site. A license agreement was negotiated with the adjacent property owner, Mr. John Clement of Quantum Commercial Group Company, to install monitoring well MW-8 adjacent to the Flanders Professional Building located east of the subject site.

Ground water monitoring and sampling of the on- and off-site wells was conducted on April 8, 1996. The results of the ground water sample collected on April 8 from monitoring well MW-3 appeared to be anomalous compared to previous data. Therefore, monitoring well MW-3 was resampled on April 16, 1996. Based on the results of the resample from MW-3,

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Fax (503) 620-5940

Printed on recycled paper.

all of the original ground water sampling data were suspected to be questionable. Therefore, monitoring wells MW-2 and MW-4 through MW-8 were also resampled on April 24, 1996. Monitoring well MW-1 was not sampled because of the presence of free product. This is the second quarterly ground water monitoring event for the five on-site monitoring wells.

SCOPE OF SERVICES

OFF-SITE SUBSURFACE EXPLORATIONS

GeoEngineers' scope of services for off-site subsurface explorations was performed in general accordance with our work plan dated September 28, 1995 and is summarized below.

1. Obtain a right-of-way permit from the City of Portland to drill two borings and install monitoring wells (MW-6 and MW-7) in the borings in Northwest Flanders Street.
2. Obtain a license agreement to drill one boring and install a monitoring well (MW-8) on the adjacent property to the east of Rose's Parking Lot.
3. Contract with a utility locate service to conduct a magnetometer survey of the off-site boring locations for underground utilities prior to drilling.
4. Observe the drilling of the three off-site monitoring well borings.
5. Obtain discrete soil samples at 2.5-foot intervals from the borings using a split-spoon sampler. Field screen the soil samples for evidence of hydrocarbon-related contamination using visual examination, water sheen screening and headspace vapor screening methods. Visually classify the soil in general accordance with ASTM (American Society for Testing and Materials) D 2488-90 and prepare a detailed log of each boring.
6. Submit two discrete soil samples from each boring to an analytical testing laboratory for qualitative hydrocarbon identification by DEQ Method TPH-HCID.
7. Observe the construction of a 2-inch-diameter, Schedule 40 PVC (polyvinyl chloride) monitoring well with flush-grade, lockable surface monuments in each boring.
8. Develop the monitoring well screens by hand-bailing water from the wells with a disposable polyethylene bailer.

A description of field procedures for the above scope items is included in Attachment A.

QUARTERLY GROUND WATER MONITORING AND SAMPLING

GeoEngineers' scope of services completed during this quarterly ground water monitoring period was performed in general accordance with our work plan dated September 28, 1995 and is summarized below.

1. Measure the depths to ground water in the on- and off-site monitoring wells.
2. Measure combustible vapor concentrations in the monitoring well casings.

3. Obtain ground water samples from monitoring wells MW-2 through MW-8 for analytical testing of BETX (benzene, ethylbenzene, toluene and xylenes) by EPA (U.S. Environmental Protection Agency) Method 8020.
4. Obtain ground water samples from monitoring wells MW-6, MW-7 and MW-8 for analytical testing of EDB (ethylene dibromide) and EDC (ethylene dichloride) by EPA Method 8010M, dissolved lead by EPA Method 7421, and TPH (total petroleum hydrocarbons) by EPA Method 418.1.

A description of field procedures for the above scope items is included in Attachment A.

OFF-SITE SUBSURFACE EXPLORATIONS

GENERAL

A permit was obtained from the City of Portland to install two monitoring wells (MW-6 and MW-7) in the right-of-way of Northwest Flanders Street, located north of the site. A license agreement was negotiated with the adjacent property owner, Mr. John Clement of Quantum Commercial Group Company, to install one monitoring well (MW-8) adjacent to the Flanders Professional Building located east of the subject site.

The monitoring wells were installed on April 6, 1996. Monitoring well MW-6 was installed in the sidewalk on the north side of Northwest Flanders Street. Monitoring well MW-7 was installed approximately 5 feet north of the south curb of Northwest Flanders Street and monitoring well MW-8 was installed in the parking area of the Flanders Professional Building located east of the site (Figure 1).

GeoEngineers contracted Cascade Drilling of Portland, Oregon to install the monitoring wells using hollow-stem auger drilling equipment. All three of the borings were completed to a depth of 31.0 feet BGS (below ground surface). A 2-inch-diameter monitoring well was installed in each of the borings at the completion of drilling. The approximate monitoring well locations are shown in Figures 1, 2 and 3. The field procedures for installation of the monitoring wells are presented in Appendix A. The boring logs are shown in Figures A-3 through A-5.

SUBSURFACE SOIL CONDITIONS

Boring MW-6 penetrated approximately 5 inches of concrete sidewalk at the ground surface. Fill consisting of gravel with silt and sand was encountered beneath the concrete to a depth of approximately 7 feet BGS. The gravel fill is underlain by brown sandy silt grading to silt with sand from approximately 7 to 25 feet BGS. Brown silty fine sand was encountered from approximately 25 to 30 feet BGS and is underlain by brown silt with sand to 31.0 feet BGS, the maximum depth explored.

Boring MW-7 penetrated approximately 4 inches of asphalt at the ground surface. Fill consisting of gravel with silt and sand and sand with gravel was encountered beneath the asphalt

to a depth of approximately 12 feet BGS. Brown silt with sand was encountered from approximately 12 to 22 feet BGS. The silt is underlain by brown silty fine sand from approximately 22 to 31 feet BGS, the maximum depth explored.

Boring MW-8 penetrated approximately 4 inches of asphalt at the ground surface. Gravel with silt and sand (fill) was encountered beneath the asphalt to a depth of approximately 4 feet BGS. The gravel fill is underlain by alternating layers of brown silt with gravel and sand, and brown silty fine to coarse gravel from approximately 4 to 23 feet BGS. Brown silty fine sand was encountered from approximately 22 to 27 feet BGS. Brown fine sand with silt was encountered from approximately 27 to 31 feet BGS, the maximum depth explored.

GROUND WATER CONDITIONS

Monitoring wells MW-6, MW-7 and MW-8 were installed in the off-site borings during this phase of investigation. Ground water conditions beneath the site and in the off-site monitoring wells during our April 1996 quarterly ground water monitoring event are summarized later in this report. Construction details for the monitoring wells are presented in Appendix A, Figures A-3 through A-5.

FIELD SCREENING RESULTS

Petroleum-like sheens were not observed during field screening of soil samples obtained from borings MW-6, MW-7 and MW-8. Headspace vapor screening did not indicate evidence of petroleum contamination in soil samples obtained from these borings. Field screening methods are described in Appendix A.

CHEMICAL ANALYTICAL TESTING RESULTS

Soil Samples

Selected soil samples from the borings were submitted for petroleum hydrocarbon identification by DEQ Method TPH-HCID. Petroleum hydrocarbons were not detected in the soil samples submitted for chemical analysis from MW-6, MW-7 and MW-8.

The soil sample chemical analytical data is summarized in Table 1. Laboratory reports are included in Attachment B.

Ground Water Samples

Ground water samples were obtained from monitoring wells MW-6, MW-7 and MW-8 in conjunction with our April 1996 quarterly ground water monitoring event. The results of the chemical analytical testing for the monitoring wells are summarized in the following sections.

APRIL 1996 GROUND WATER MONITORING AND SAMPLING RESULTS

GROUND WATER ELEVATIONS

GeoEngineers measured the depths to ground water in the monitoring wells on April 8 and 24, 1996. The depths to ground water measured on April 8 ranged between 19.73 feet and 22.41 feet BGS. At the time of our April 24 measurements, the depths to ground water ranged from approximately 18.42 feet to 22.45 feet below the ground surface. Based on our measurements, the apparent direction of ground water flow beneath the site is toward the northeast, which is consistent with our previous ground water elevation data. However, the ground water elevation in the southeast portion of the site appears to have a more northerly component of flow.

The depths to ground water and the calculated ground water elevations are summarized in Table 2. The calculated ground water elevations and the inferred direction of ground water flow for the April 24, 1996 monitoring event are shown in Figure 2.

COMBUSTIBLE VAPOR CONCENTRATIONS

The combustible vapor concentration measured in monitoring well MW-1 was greater than 10,000 ppm (parts per million) on April 8 and 24, 1996. The combustible vapor concentrations measured in monitoring wells MW-2 through MW-8 were less than 400 ppm during these monitoring events, except in MW-4 (500 ppm) and MW-5 (1,200 ppm). Combustible vapor concentration measurements are presented in Table 2.

FREE PRODUCT THICKNESS

Free product thicknesses of 0.02 and 0.05 foot were detected in monitoring well MW-1 on April 8 and 24, 1996, respectively. There was not enough product in monitoring well MW-1 to remove by bailing or to justify the installation of a product recovery canister. Free product was not detected in the remaining monitoring wells during this event. Product thickness measurements are presented in Table 1.

Free product thicknesses will be measured during the next quarterly ground water monitoring event. A product recovery canister will be installed in MW-1 (or other well) if the free product thickness exceeds 0.1 foot.

GROUND WATER QUALITY

Ground water samples were obtained from monitoring wells MW-2 through MW-8 on April 8, 1996 for analysis of BETX by EPA Method 8020. A ground water sample was not obtained from monitoring well MW-1 because of the presence of free product. The ground water

samples obtained from monitoring wells MW-6 through MW-8 were also analyzed for TPH by EPA Method 418.1, EDB and EDC by EPA Method 8010M and dissolved lead by EPA Method 7421.

BETX compounds were not detected in the ground water sample obtained from MW-3 on April 8. Because individual BETX compounds had been detected in MW-3 at concentrations ranging between 600 and 3,700 µg/l (micrograms per liter) during the four previous sampling events, the April 8 "non detect" results were considered suspect. Therefore, monitoring well MW-3 was resampled on April 16 and the sample was submitted for analysis of BETX. The analytical results of the April 16 resampling of MW-3 indicated concentrations of individual BETX compounds ranging between 500 and 1,400 µg/l (Table 3). The April 16 sample results are generally consistent with the results of previous MW-3 sampling events.

Because the April 8 sampling event of MW-3 was determined to be anomalous, the analytical data for the remaining wells was considered to be questionable. Therefore, monitoring wells MW-2 and MW-4 through MW-8 were resampled on April 24, 1996. Table 3 summarizes the April 24 analytical results for these samples.

Benzene was detected at a concentration of 7.7 µg/l in the sample from monitoring well MW-2. BETX compounds were detected in the ground water sample obtained from monitoring well MW-5 on April 24, 1996; however, the concentrations were significantly less than the DEQ ground water cleanup levels. BETX compounds were not detected in the ground water samples obtained from monitoring wells MW-4, MW-6, MW-7 and MW-8.

TPH, EDB/EDC and dissolved lead were not detected in the ground water samples collected from monitoring wells MW-6, MW-7 and MW-8.

A summary of the April 24, 1996 ground water analytical data for this monitoring event is presented in Table 3. Analytical data from previous sampling events is also included in Table 3 for reference. DEQ ground water cleanup standards for the listed analytes are also included in Table 3. The analytical methods and laboratory data sheets from our April 8, 16, and 24, 1996 sampling events are included in Attachment B. Concentrations of BETX compounds detected in ground water samples during the April 24 sampling event and previous sampling events also are presented in Figure 3.

DISCUSSION

OFF-SITE SUBSURFACE EXPLORATIONS

Field screening and chemical analytical results did not indicate evidence of petroleum hydrocarbon soil or ground water contamination at the locations of borings MW-6, MW-7 and MW-8.

APRIL 1996 GROUND WATER MONITORING AND SAMPLING RESULTS

GeoEngineers' April 1996 ground water monitoring event was the second quarterly ground water monitoring event at Rose's Parking Lot. It is the first sampling event for the off-site monitoring wells MW-6, MW-7 and MW-8. Based on the results of the April 1996 monitoring event, the following summary is presented:

1. The free product thickness in monitoring well MW-1 increased slightly from the previous monitoring event in January 1996 (a trace amount) to 0.05 foot. Free product was not detected in monitoring wells MW-2 through MW-8.
2. Benzene was detected in the ground water samples collected from monitoring wells MW-2 and MW-3 at concentrations exceeding the DEQ ground water cleanup standard of 5 μg/l.
3. The enhanced fluid recovery technology pilot tests conducted at the site in November and December 1995 appear to have:
   - reduced the thickness of product in MW-1, and
   - reduced BETX concentrations in MW-3 and MW-5.

FUTURE GROUND WATER MONITORING ACTIVITIES

The next round of quarterly ground water monitoring is scheduled for July 1996. Based on the results of our April 1996 ground water sampling event, we recommend collecting ground water samples for analytical testing of BETX and TPH, with follow-up analyses for PAHs (polycyclic aromatic hydrocarbons), based on the TPH results. No cleanup standard has been established for TPH; however, the results of TPH analysis can be used as an indicator test to determine if PAH analysis should be conducted.

LIMITATIONS

We have prepared this report for use by Mr. Max Birnbach, Amoco Corporation, Gull Industries and Unocal. This report may be made available to regulatory agencies. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

Our services have been executed in accordance with the generally accepted practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

We appreciate the opportunity to provide these continued services to you. Please contact us if you have questions regarding this project.

Yours very truly,

GeoEngineers, Inc.

Marsi M. Beeson

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Environmental Scientist

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MMB:JF:mln
Document ID: 4326001r.qr2

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TABLE 1
SUMMARY OF SOIL SAMPLE ANALYTICAL DATA[1]

Sample Number	Date Sampled	Depth of Sample (feet)	Hydrocarbon Identification[2] (DEQ Method TPH-HCID) (mg/kg)		
			Gasoline	Diesel	Oil
MW-6-20.0	04/06/96	20.0	<20	<50	NO
MW-6-25.0	04/06/96	25.0	<20	<50	NO
MW-7-20.0	04/06/96	20.0	<20	<50	NO
MW-7-25.0	04/06/96	25.0	<20	<50	NO
MW-8-17.5	04/06/96	17.5	<20	<50	NO
MW-8-22.5	04/06/96	22.5	<20	<50	NO
DEQ Level 2 Soil Matrix Cleanup Standards			80	500	500

Notes:

[1]Chemical analyses were conducted by American Environmental Network, Inc. of Durham, Oregon (formerly ATI [Analytical Technologies, Inc.]). Laboratory reports are included in Attachment B.

[2]Reporting limits are 20 mg/kg for gasoline, 50 mg/kg for diesel and qualitative identification by the testing laboratory for the observed presence of oil-range hydrocarbons.

mg/kg = milligrams per kilogram

NO = not observed

TABLE 2
GROUND WATER ELEVATIONS AND COMBUSTIBLE VAPOR CONCENTRATIONS

Monitoring Well[1]	Date Measured	Water Depth From Ground Surface (feet)	Ground Water Elevation[2] (feet)	Combustible Vapor Concentration[3] (ppm)	Product Thickness (feet)
MW-1	05/12/95	23.29	78.75[4]	Note[5]	0.5
	01/04/96	24.10	77.87[4]	>10,000	Trace
	04/08/96	22.41	79.56[4]	>10,000	0.02
	04/24/96	22.45	79.55[4]	>10,000	0.05
MW-2	05/12/95	20.75	77.54	>10,000	ND
	01/04/96	21.60	76.69	--[6]	ND
	04/08/96	19.73	78.56	400	ND
	04/24/96	19.90	78.39	<400	ND
MW-3	05/12/95	23.48	77.86	<400	ND
	01/04/96	24.22	77.12	--[6]	ND
	04/08/96	22.31	79.03	<400	ND
	04/24/96	22.36	78.98	<400	ND
MW-4	05/12/95	22.55	79.93	<400	ND
	01/04/96	23.03	79.45	<400	ND
	04/08/96	21.60	80.88	500	ND
	04/24/96	21.34	81.14	<400	ND
MW-5	05/12/95	22.35	80.06	7,800	--
	01/04/96	22.84	79.57	>10,000	Trace
	04/08/96	21.40	81.01	1,200	ND
	04/24/96	20.04	82.37	<400	ND
MW-6	04/08/96	21.53	73.93	<400	ND
	04/24/96	22.04	73.42	<400	ND
MW-7	04/08/96	21.50	70.61	<400	ND
	04/24/96	21.05	71.06	<400	ND
MW-8	04/08/96	20.19	72.93	<400	ND
	04/24/96	18.42	74.70	<400	ND

Notes:

[1]Approximate locations of monitoring wells are shown in Figures 1, 2 and 3.

[2]Elevations are measured relative to the temporary benchmark shown in Figure 2. The benchmark has an assumed elevation of 100.00 feet.

[3]Measured with a Bacharch TLV Sniffer calibrated to hexane and equipped with a drop hose lowered to within 1 foot of the ground water table. The lower threshold of significance in this application is 400 ppm.

[4]The ground water elevation was corrected for the presence of free product using a specific gravity of 0.7.

[5]Combustible vapor measurements are not representative of soil conditions because the water table was above the top of the screen.

[6]TLV Sniffer was not functioning.

ppm = parts per million

"ND" = not detected

"--" = not measured

No. 4326001F

TABLE 3 (Page 1 of 2)
SUMMARY OF GROUND WATER SAMPLE ANALYTICAL DATA[1]

Monitoring Well Number[2]	Date Sampled[3]	BETX[4] (EPA Method 8020) (µg/l)				Total Petroleum Hydrocarbons (EPA Method 418.1) (mg/l)	PAHs[5] (EPA Method 8310) (µg/l)	EDB/EDC[6] (EPA Method 8010M) (µg/l)	Dissolved Lead (EPA Method 7421) (µg/l)
		B	E	T	X				
MW-1	03/29/94	130	98	390	1,570	--	--	--	--
	10/04/94	27	5.9	46	70.0	--	--	--	--
	05/12/95[7]	--	--	--	--	--	--	--	--
	01/04/96	400	630	2,200	4,800	54	Naphthalene 370 Acenaphthylene 44	EDB - 21 EDC - <1.0	100
	04/24/96[7]	--	--	--	--	--	--	--	--
MW-2	03/29/94	4.9	0.7	1.4	3.0	--	--	--	--
	10/04/94	<0.5	<0.5	<0.5	<0.5	--	--	--	--
	05/12/95	1.2	0.6	<0.5	0.7	<0.5	--	--	--
	01/04/96	14	<0.5	1.5	1.7	1.6	ND	EDB - <0.5 EDC - <0.2	<2
	04/24/96	7.7	<0.5	0.5	<0.5	--	--	--	--
MW-3	03/29/94	2,300	1,200	1,200	3,700	--	--	--	--
	10/04/94	1,520	790	600	1,600	--	--	--	--
	05/12/95	1,300	800	740	2,000	3.5	Naphthalene 130 Fluorene 0.2 Phenanthrene 0.09	--	--
	01/04/96	1,300	940	640	2,600	4.5	Naphthalene 180 Acenaphthylene 23	EDB - <1.0 EDC - 7.1	6
	04/16/96	900	600	500	1,400	--	--	--	--
MW-4	10/04/94	<0.5	<0.5	<0.5	<0.5	--	--	--	--
	05/12/95	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	--
	01/04/96	<0.5	<0.5	<0.5	<0.5	0.9	ND	EDB - <0.5 EDC - <0.2	<2
	04/24/96	<0.5	<0.5	<0.5	<0.5	--	--	--	--
DEQ Cleanup Levels		5	700	1,000	10,000	NE	Naphthalene 28 Acenaphthylene NE Fluorene 280 Phenanthrene NE Anthracene 2,100	EDB - 1 EDC - 5	5

Notes appear on page 2 of 2.

TABLE 3 (Page 2 of 2)

Monitoring Well Number[2]	Date Sampled[3]	BETX[4] (EPA Method 8020) (µg/l)				Total Petroleum Hydrocarbons (EPA Method 418.1) (mg/l)	PAHs[5] (EPA Method 8310) (µg/l)	EDB/EDC[6] (EPA Method 8010M) (µg/l)	Dissolved Lead (EPA Method 7421) (µg/l)
		B	E	T	X				
MW-5	05/12/95	660	1,900	13,000	11,000	13	Naphthalene 450 Acenaphthylene 66 Fluorene 0.6 Phenanthrene 0.42 Anthracene 0.07	--	--
	01/04/96	4.6	24	22	230	6.6	Naphthalene 29 Acenaphthylene 13 Fluorene 0.8	EDB - <0.5 EDC - <0.2	14
	04/24/96[8]	<0.5	1.1	0.6	2.9	--	--	--	--
MW-6	04/24/96[8]	<0.5	<0.5	<0.5	<0.5	<0.5	--	EDB - <0.5 EDC - <0.2	<0.002
MW-7	04/24/96[8]	<0.5	<0.5	<0.5	<0.5	<0.5	--	EDB - <0.5 EDC - <0.2	<0.002
MW-8	04/24/96[8]	<0.5	<0.5	<0.5	<0.5	<0.5	--	EDB - <0.5 EDC - <0.2	<0.002
DEQ Cleanup Levels		5	700	1,000	10,000	NE	Naphthalene 28 Acenaphthylene NE Fluorene 280 Phenanthrene NE Anthracene 2,100	EDB - 1 EDC - 5	5

Notes:

[1]Chemical analyses were conducted by American Environmental Network, Inc. of Durham, Oregon (formerly ATI [Analytical Technologies, Inc.]).

[2]Approximate monitoring well locations are shown in Figures 1, 2 and 3.

[3]Ground water samples obtained prior to 05/12/95 were obtained by others. Analytical data were provided to GeoEngineers by Unocal.

[4]B = benzene, E = ethylbenzene, T = toluene, X = xylenes

[5]PAHs = polycyclic aromatic hydrocarbons. Only analytes detected are listed. Refer to chemical analytical data included with previous reports for a complete list of analytes and their respective detection limits.

[6]EDB/EDC = ethylene bibromide/ethylene dichloride

[7]Monitoring well MW-1 was not sampled because of the presence of free product.

µg/l = micrograms per liter, mg/l = milligrams per liter, '--' = not analyzed, NE = not established, ND = not detected

Shading indicates concentrations greater than DEQ cleanup levels for UST sites.

No. 4326001G

D:\PROJECTS\04326\001\GEO_SP2

Retail Building

Parking Lot

Residential Area

MW-6

Sidewalk

N.W. FLANDERS STREET

MW-7

Parking Strip/Sidewalk

Rose's Parking Lot

MW-2

Office Building

MW-3

RW-1

MW-1

Landscaped Area

MW-5

MW-8

MW-4

Parking

Under Construction

Parking

Residential Area

N.W. 23rd AVENUE

N.W. 22nd AVENUE

N.W. EVERETT STREET

N.W. 22nd PLACE

N

0 50 100

SCALE IN FEET

EXPLANATION:

MW-1 ◑ MONITORING WELL BY OTHERS

MW-5 ● MONITORING WELL BY GEOENGINEERS

RW-1 ⊕ RECOVERY WELL BY GEOENGINEERS

Note: The locations of all features shown are approximate.

Reference: Multnomah County Tax Assessor's Map.

4326-001-P36 SAK:MAM 08/31/95

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SITE PLAN

FIGURE 1

D:\04326\001\GW_EL3

MW-6
73.42

Sidewalk

N

0 30 60
SCALE IN FEET

N.W. FLANDERS STREET

MW-7
71.06

Sidewalk

MW-2
78.39

BM

MW-3
78.98

RW-1

MW-1
79.55

MW-5
82.37

MW-4
81.14

MW-8
74.70

Building

Parking

N.W. 23rd AVENUE

Parking Lot

Under Construction

EXPLANATION:

MW-1 / 79.55 — MONITORING WELL BY OTHERS
GROUND WATER ELEVATION (IN FEET) ON 04/24/96

MW-5 / 82.37 — MONITORING WELL BY GEOENGINEERS
GROUND WATER ELEVATION (IN FEET) ON 04/24/96

R-1 — RECOVERY WELL BY GEOENGINEERS

APPROXIMATE DIRECTION OF GROUND WATER FLOW

BM — BENCHMARK AT NORTHEAST CORNER OF CATCH BASIN ON NW 23RD AVENUE: ASSUMED ELEVATION 100.00 FEET

Note: The locations of all features shown are approximate.

Reference: Multnomah County Tax Assessor's Map.

4326-001-P36 SAK:MAM 08/31/95

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GROUND WATER ELEVATIONS APRIL 24, 1996

FIGURE 2

D:\04326\001\BETX_SP

MW-6	B	E	T	X
04/24/96	<0.5	<0.5	<0.5	<0.5
DEQ Standards	5	700	1,000	10,000

N.W. FLANDERS STREET

MW-7	B	E	T	X
04/24/96	<0.5	<0.5	<0.5	<0.5
DEQ Standards	5	700	1,000	10,000

N

0 30 60

SCALE IN FEET

MW-2	B	E	T	X
10/04/94	<0.5	<0.5	<0.5	<0.5
05/12/95	1.2	0.6	<0.5	0.7
01/04/96	14	<0.5	1.5	1.7
04/24/96	7.7	<0.5	0.5	<0.5
DEQ Standards	5	700	1,000	10,000

MW-1	B	E	T	X
10/04/94	27	5.9	46	70
05/12/95	--	--	--	--
01/04/96	400	630	2,200	4,800
04/24/96	--	--	--	--
DEQ Standards	5	700	1,000	10,000

MW-3	B	E	T	X
10/04/94	1,520	790	600	1,600
05/12/95	1,300	800	740	2,000
01/04/96	1,300	940	640	2,600
04/16/96	900	600	500	1,400
DEQ Standards	5	700	1,000	10,000

Building

RW-1

MW-8	B	E	T	X
04/24/96	<0.5	<0.5	<0.5	<0.5
DEQ Standards	5	700	1,000	10,000

MW-5	B	E	T	X
05/12/95	660	1,900	13,000	11,000
01/04/96	4.6	24	22	230
04/24/96	<0.5	1.1	0.6	2.9
DEQ Standards	5	700	1,000	10,000

MW-4	B	E	T	X
10/04/94	<0.5	<0.5	<0.5	<0.5
05/12/95	<0.5	<0.5	<0.5	<0.5
01/04/96	<0.5	<0.5	<0.5	<0.5
04/24/96	<0.5	<0.5	<0.5	<0.5
DEQ Standards	5	700	1,000	10,000

N.W. 23rd AVENUE

EXPLANATION:

- ● MONITORING WELL BY GEOENGINEERS
- ◑ MONITORING WELL BY OTHERS
- RW-1 ⊕ RECOVERY WELL BY GEOENGINEERS
- B BENZENE (μg/l)
- E ETHYLBENZENE (μg/l)
- T TOLUENE (μg/l)
- X XYLENES (μg/l)
- -- NOT TESTED
- (μg/l) MICROGRAMS PER LITER

NOTES:

1. The locations of all features shown are approximate.
2. See Figure 2 for identification of site features.

Reference: Multnomah County Tax Assessor's Map.

4326-001-P36 SAK:MAM 08/31/95

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BETX CONCENTRATIONS

FIGURE 3

ATTACHMENT A

FIELD PROCEDURES

DRILLING AND SOIL SAMPLING PROGRAM

Subsurface conditions were explored by drilling three soil borings (MW-6, MW-7 and MW-8) to depths of about 31 feet on April 6, 1996. The borings were drilled using truck-mounted, hollow-stem auger drilling equipment owned and operated by Cascade Drilling of Portland, Oregon. The drilling and soil sampling equipment were cleaned with a hot-water pressure washer before drilling each boring.

A representative from GeoEngineers examined and classified the soils encountered and prepared a detailed log of each boring. Soils encountered were visually classified in general accordance with ASTM D 2488-90, which is described in Figure A-1. An explanation of the boring log symbols is presented in Figure A-2. The boring logs are presented in Figures A-3 through A-5.

Soil samples were obtained from the borings using a Dames & Moore split-barrel sampler (2.4-inch inside diameter). The sampler was driven 18 inches using a 140-pound weight falling a vertical distance of 30 inches. The number of blows needed to advance the sampler the final 12 inches or other specified interval is indicated to the left of the corresponding sample notations on the boring log.

The sampling equipment was cleaned between each sampling attempt with a Liquinox wash and a distilled water rinse. Soil samples were immediately transferred from the sampler to laboratory-provided glass jars with teflon seals and plastic caps to minimize volatilization of contaminants.

Soil cuttings generated during drilling were placed in nine labeled 55-gallon drums which are stored on site for disposal at a later date. The total number of soil drums currently on-site is 30. GeoEngineers is in the process of obtaining signatures on the disposal permit from all four parties that will be identified as waste generators for soil disposal at Columbia Ridge Landfill in Arlington, Oregon.

FIELD SCREENING OF SOIL SAMPLES

Our field representative performed field screening tests on the soil samples obtained from the borings. Field screening results are used as a general guideline to delineate areas of possible petroleum-related contamination. In addition, field screening results are used to aid in the selection of soil samples for chemical analysis. The field screening methods used include (1) visual screening, (2) water sheen screening, and (3) headspace vapor screening using a Bacharach TLV Sniffer calibrated to hexane. The results of headspace and sheen screening are included on the boring logs (Figures A-3 through A-5).

Visual screening consists of inspecting the soil for stains indicative of petroleum-related contamination. Visual screening generally is more effective when contamination is related to

heavy petroleum hydrocarbons, such as motor oil, or when hydrocarbon concentrations are high. Water sheen and headspace vapor screening are more sensitive screening methods that have been effective in detecting contamination at concentrations less than regulatory cleanup guidelines.

Water sheen screening involves placing soil in a pan of water and observing the water surface for signs of sheen. Sheen testing can detect the presence of volatile and nonvolatile hydrocarbons. Sheens observed are classified as follows:

No Sheen (NS)	No visible sheen on the water surface.
Slight Sheen (SS)	Light, colorless, dull sheen; spread is irregular, not rapid; sheen dissipates rapidly. Natural organic matter in the soil may produce a slight sheen.
Moderate Sheen (MS)	Light to heavy sheen; may have some color/iridescence; spread is irregular to flowing, may be rapid; few remaining areas of no sheen on the water surface.
Heavy Sheen (HS)	Heavy sheen with color/iridescence; spread is rapid; entire water surface may be covered with sheen.

Headspace vapor screening targets volatile hydrocarbons and involves placing a soil sample in a plastic sample bag. Air is captured in the bag, and the bag is shaken to expose the soil to the air trapped in the bag. The probe of a Bacharach TLV Sniffer is inserted in the bag, and the TLV Sniffer measures the concentration of combustible vapors in the air removed from the sample bag headspace. Headspace vapor screening targets volatile petroleum hydrocarbon compounds. The TLV Sniffer measures concentrations in ppm (parts per million) and is calibrated to hexane. The TLV Sniffer is designed to quantify combustible gas concentrations in the range between 100 and 10,000 ppm in this application.

Field screening results are site- and boring-specific. The results vary with temperature, moisture content, soil type and type of contaminant.

MONITORING WELL CONSTRUCTION

Two-inch-diameter, Schedule 40 PVC casing and screen was installed in borings MW-6 through MW-8 at the completion of drilling. The PVC screen is machine-slotted (0.02-inch slot width) to allow entry of water, floating hydrocarbons and combustible vapors into the well casing. Medium sand was placed in the borehole annulus surrounding the PVC screen. A bentonite seal was placed above the sand filter pack. The 2-inch-diameter well casing is protected within a lockable, flush-grade surface monument. Well construction details are shown in Figures A-3 through A-5.

The monitoring wells were developed by surging and removal of at least five standing well volumes of water. The monitoring well casing rim elevations were surveyed on April 16, 1996 to the nearest of 0.01 foot using an engineer's level and an assumed site datum of 100.00 feet.

GROUND WATER ELEVATIONS

Depths to the shallow ground water surface relative to the monitoring well casing rims were measured to an accuracy of 0.01 foot on April 8 and 24, 1996 using an ORS (Oil Recovery Systems, Inc.) interface probe. The interface probe was cleaned with a Liquinox wash and distilled water rinse prior to its use in each well. Ground water elevations were calculated by subtracting the depths to ground water from the casing rim elevations. The ground water elevations measured on April 8 and 24, 1996 are shown in Table 2. Ground water elevations for the April 24 event also are shown in Figure 2.

COMBUSTIBLE VAPOR CONCENTRATIONS

Combustible vapor concentrations were measured in the monitoring well casings on April 8 and 24, 1996 using a Bacharach TLV Sniffer calibrated to hexane. The measurements were obtained by lowering a vinyl tube connected to the TLV Sniffer to within approximately 1 foot of the water surface. The TLV Sniffer measures combustible vapor concentrations and is used as a field indicator for combustible vapors present in the monitoring well casings. The lower threshold of significance for the Bacharach TLV Sniffer in this application is 400 ppm (parts per million), or 3.6 percent of the lower explosive limit of hexane. The combustible vapor concentrations measured on April 8 and 24, 1996 are shown in Table 2.

GROUND WATER SAMPLING PROGRAM

Ground water samples were collected from monitoring wells MW-1 through MW-8 on April 8, 1996. Monitoring well MW-3 was resampled on April 16, 1996 and monitoring wells MW-2 and MW-4 through MW-8 were resampled on April 24, 1996. The water samples were collected with a disposable polyethylene bailer after at least three well volumes of water were removed from each monitoring well casing. A new bailer and cord were used to sample each monitoring well to minimize the possibility of cross-contamination between monitoring wells. The ground water samples were transferred in the field to 40-milliliter septum vials, 750-milliliter plastic containers and 1-liter amber jars and kept cool during transport to the analytical laboratory. The laboratory provided septum vials containing hydrochloric acid as a preservative for the BETX samples, 750-milliliter plastic containers for the dissolved lead samples, 1-liter amber jars containing hydrochloric acid as a preservative for the TPH samples and unpreserved 1-liter amber jars for the EDB/EDC and PAH samples. Chain-of-custody procedures were followed during transport of the ground water samples to the analytical laboratory.

DEVELOPMENT AND PURGE WATER DISPOSAL

Development and purge water from the monitoring wells was placed into a 55-gallon drum that is stored on-site pending disposal at a recycling facility.

SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE GRAINED SOILS More Than 50% Retained on No. 200 Sieve	GRAVEL More Than 50% of Coarse Fraction Retained on No. 4 Sieve	CLEAN GRAVEL	GW	WELL-GRADED GRAVEL, FINE TO COARSE GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SAND More Than 50% of Coarse Fraction Passes No. 4 Sieve	CLEAN SAND	SW	WELL-GRADED SAND, FINE TO COARSE SAND
			SP	POORLY-GRADED SAND
		SAND WITH FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE GRAINED SOILS More Than 50% Passes No. 200 Sieve	SILT AND CLAY Liquid Limit Less Than 50	INORGANIC	ML	SILT
			CL	CLAY
		ORGANIC	OL	ORGANIC SILT, ORGANIC CLAY
	SILT AND CLAY Liquid Limit 50 or More	INORGANIC	MH	SILT OF HIGH PLASTICITY, ELASTIC SILT
			CH	CLAY OF HIGH PLASTICITY, FAT CLAY
		ORGANIC	OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			PT	PEAT

NOTES:

1. Field classification is based on visual examination of soil in general accordance with ASTM D2488-90.
2. Soil classification using laboratory tests is based on ASTM D2487-90.
3. Descriptions of soil density or consistency are based on interpretation of blow count data, visual appearance of soils, and/or test data.

SOIL MOISTURE MODIFIERS:

Dry - Absence of moisture, dusty, dry to the touch

Moist - Damp, but no visible water

Wet - Visible free water or saturated, usually soil is obtained from below water table

GEI 85-85 Rev. 05/93

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SOIL CLASSIFICATION SYSTEM

FIGURE A-1

C:\DETAILS\K2BOR140

LABORATORY TESTS:

CA Chemical Analysis

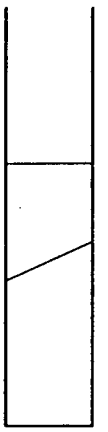
FIELD SCREENING TESTS:

Headspace vapor concentration data given in parts per million

Sheen classification system:

NS No Visible Sheen
SS Slight Sheen
MS Moderate Sheen
HS Heavy Sheen
-- Not Tested

SOIL GRAPH:



SM Soil Group Symbol (See Note 2)

Distinct Contact Between Soil Strata

Gradual or Approximate Location of Change Between Soil Strata

Water Level

Bottom of Boring

BLOW-COUNT/SAMPLE DATA:

Blows required to drive a 2.4-inch I.D. split-barrel sampler 12 inches or other indicated distances using a 140-pound hammer falling 30 inches.

22 Location of relatively undisturbed sample

12 Location of disturbed sample

17 Location of sampling attempt with no recovery

Blows required to drive a 1.5-inch I.D. (SPT) split-barrel sampler 12 inches or other indicated distances using a 140-pound hammer falling 30 inches.

10 Location of sample obtained in general accordance with Standard Penetration Test (ASTM D 1586) procedures

26 Location of SPT sampling attempt with no recovery

Location of grab sample

"P" indicates sampler pushed with weight of hammer or against weight of drill rig.

NOTES:

1. The reader must refer to the discussion in the report text, the Key to Boring Log Symbols and the exploration logs for a proper understanding of subsurface conditions.
2. Soil classification system is summarized in Figure A-1.

GEI 121-90

Geo Engineers

KEY TO BORING LOG SYMBOLS

FIGURE A-2

MONITORING WELL MW-6

WELL SCHEMATIC

Casing Elevation (ft.): 95.26
Casing Stickup (ft.): -0.20

Vapor Conc.(ppm) / Sheen	Blow Count	Samples	Group Symbol	DESCRIPTION (Surface Elevation (ft.): 95.46)
			CONCRETE	Approximately 5 inches concrete
			GW-GM	Brown gravel with silt and sand (fill)
				Brown fine to coarse gravel with silt and sand (medium dense, moist) (fill)
< 100 / NS	50/5"			
			ML	Brown sandy silt with occasional fine gravel (very stiff, moist)
< 100 / NS	33			
< 100 / NS	50/6"			Grades to brown silt with a trace of fine sand and occasional coarse gravel (very stiff, moist)
< 100 / NS	18			Grades to brown silt with sand (stiff, moist)
< 100 / NS	12			(medium stiff, moist)
< 100 / NS	10			(medium stiff, moist)
< 100 / NS	7	CA		
				▽ Ground water level at 22.04 feet on 04/24/96
< 100 / NS	7			
< 100 / NS	6	CA	SM	Brown silty fine sand (very loose, wet)
< 100 / NS	5			
			ML	Brown silt with sand (soft, wet)
< 100 / NS	6			

Flush-mount steel surface monument and concrete surface seal

Bentonite seal

2-inch, Schedule 40 PVC casing

2-inch, Schedule 40 PVC screen, 0.020-inch slot width

Medium sand backfill

End cap
Base of well at 31.0 feet

Boring completed at 31.0 feet on 04/06/96
Ground water encountered at about 25.5 feet during drilling

DEPTH IN FEET

0 5 10 15 20 25 30 35 40

Note: See Figure A- 2 for explanation of symbols

:JF:MMB:MLN 5/8/96

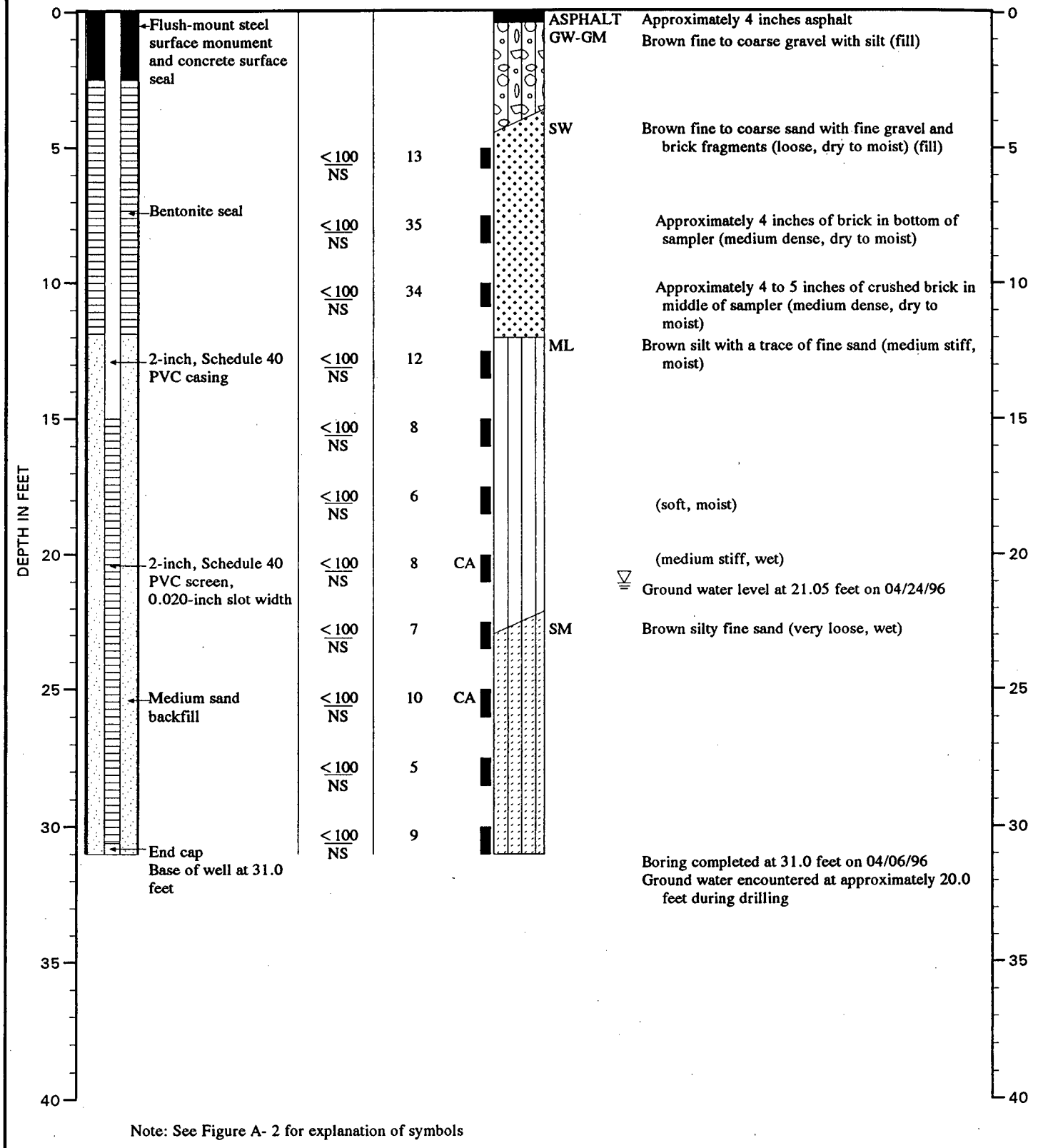
4326-001-62

Geo Engineers

LOG OF MONITORING WELL

FIGURE A-3

MONITORING WELL MW-7



Note: See Figure A- 2 for explanation of symbols

:JF:MMB:MLN 5/8/96

4326-001-62

Geo Engineers

LOG OF MONITORING WELL

FIGURE A-4

MONITORING WELL MW-[redacted]

WELL SCHEMATIC

Casing Elevation (ft.): 92.73
Casing Stickup (ft.): -0.39

Vapor Conc.(ppm) / Sheen	Blow Count	Samples	Group Symbol	DESCRIPTION (Surface Elevation (ft.): 93.12)
			ASPHALT	Approximately 4 inches asphalt
			GW-GM	Brown gravel with silt and sand (fill)
			ML	Brown silt with occasional gravel (medium stiff, moist)
<100 / NS	10			
<100 / MS	16		GM	Brown silty fine to coarse gravel (loose, moist)
<100 / NS	20		ML	Brown silt with a trace of fine sand and occasional gravel (stiff, moist)
<100 / NS	50/6"			(very stiff, moist)
<100 / NS	22		GM	Brown silty fine to coarse gravel (loose, wet)
<100 / NS	18	CA		▽ Ground water level at 18.42 feet on 04/24/96
<100 / NS	20		ML	Brown-gray silt with fine sand (stiff, moist)
<100 / NS	8	CA	SM	Brown silty fine sand (very loose, wet)
<100 / NS	6			
<100 / NS	5		SP-SM	Brown fine sand with silt (very loose, wet)
<100 / NS	9			

Flush-mount steel surface monument and concrete surface seal

Bentonite seal

2-inch, Schedule 40 PVC casing

2-inch, Schedule 40 PVC screen, 0.020-inch slot width

Medium sand backfill

End cap
Base of well at 31.0 feet

Boring completed at 31.0 feet on 04/06/96
Ground water encountered at approximately 19.0 feet during drilling

DEPTH IN FEET

0 5 10 15 20 25 30 35 40

Note: See Figure A- 2 for explanation of symbols

:JF:MMB:MLN 5/8/96

4326-001-62

Geo Engineers

LOG OF MONITORING WELL

FIGURE A-5

ATTACHMENT B

CHEMICAL ANALYTICAL PROGRAM

ANALYTICAL METHODS

The soil and ground water samples were analyzed by AEN (American Environmental Network, Inc.) of Durham, Oregon. Chain-of-custody procedures were followed during transport of the samples to the analytical laboratory. Samples were held in cold storage pending analysis. The analytical results, analytical methods reference, and laboratory QA/QC (quality assurance/quality control) records are included in this attachment. The analytical results also are summarized in the text and Tables 2 and 3 of this report.

ANALYTICAL DATA REVIEW

The laboratory maintains an internal quality assurance program, as documented in its laboratory quality assurance manual. The laboratory uses a combination of blanks, surrogate recoveries, duplicates, matrix spike duplicate recoveries, blank spike recoveries and blank spike duplicate recoveries to evaluate the validity of the analytical results. The laboratory also uses data quality goals for individual chemicals or groups of chemicals based on the long-term performance of the test methods. The data quality goals were included in the laboratory report. The laboratory compared the samples with the existing data quality goals and noted any exceptions in the laboratory report. If data quality exceptions were documented by the laboratory in the laboratory report, the data quality exceptions were reviewed by GeoEngineers using the applicable data validation guidelines from the following documents: "National Functional Guidelines for Organic Data Review," draft dated 1991, and "Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses," dated 1988.

ANALYTICAL DATA REVIEW SUMMARY

The laboratory results of the ground water sample collected from monitoring well MW-3 on April 8, 1996 appeared to be anomalous. Therefore, the well was resampled on April 16, 1996. The laboratory results of the resample appeared to be consistent with previous ground water sample results from MW-3. Based on the resampling results, all of the April 8, 1996 data were considered questionable and monitoring wells MW-2 and MW-4 through MW-8 were resampled on April 24, 1996. No significant differences in the analytical results of these samples were noted from the April 8, 1996 sampling event.

No other significant data quality exceptions were documented in the laboratory reports or noted during our review. Based on the data quality review, it is our opinion that the analytical data are acceptable for their intended use.

Analytical**Technologies,**Inc. 17400 S.W. Upper Boones Ferry Road, Suite 270 Durham, OR. 97224
(503) 684-0447 (503) 620-0393 (FAX)

ATI I.D. 604626

April 30, 1996

GeoEngineers
MAY 0 1 1996
Routing
File

Marsi Beeson
GeoEngineers
7504 SW Bridgeport Rd.
Portland, OR 97224

Project Name / Number: Rose's Parking / 4326-001-62

Attention: Marsi Beeson

On April 24, 1996, American Environmental Network (OR), Inc. received six water samples for analysis for the above listed project. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed. The results from these samples relate only to the items tested. This report shall not be reproduced, except in full, without the written approval of the laboratory.

If you have any questions or comments, please do not hesitate to contact us at (503)684-0447.

Natasha Schaefer
Project Manager

Steven E. Stanley
Laboratory Manager

SES:alm
Enclosure

Analytical Technologies, Inc.

SAMPLE CROSS REFERENCE SHEET

CLIENT:	GeoEngineers, Inc.	AEN I.D.:	604626
PROJECT #:	4326-001-62		
PROJECT NAME:	Rose's Parking Lot	MATRIX:	WATER

AEN #	CLIENT DESCRIPTION	DATE SAMPLED
604626-1	MW-2-042496	4/24/96
604626-2	MW-4-042496	4/24/96
604626-3	MW-5-042496	4/24/96
604626-4	MW6-042596	4/24/96
604626-5	MW-7-042496	4/24/96
604626-6	MW-8-042496	4/24/96

----------TOTALS----------

MATRIX	# SAMPLES
WATER	6

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of the report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical Technologies, Inc.

ANALYTICAL SCHEDULE

CLIENT:	GeoEngineers, Inc.	**AEN I.D.:**	604626
PROJECT #:	4326-001-62		
PROJECT NAME:	Rose's Parking Lot		

ANALYSIS	TECHNIQUE	REFERENCE	LAB
BETX	GC/PID	EPA 8020M	PLD
Petroleum Hydrocarbon	IR	EPA 418.1	PLD
EDB/EDC	GC/ELCD	EPA 8010M	PLD
Dissolved Lead	AA/GF	EPA 7421	PLD

PLD = AEN - Portland
R = ATI - Renton
PHX = AEN - Phoenix
PNR = AEN - Pensacola
FC = ATI - Fort Collins
SUB = Subcontract

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	604626-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	N/A
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	N/A
PROJECT #:	4326-001-62	**DATE ANALYZED:**	04/24/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS	
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5

SURROGATE:

TRIFLUOROTOLUENE (81%-116%)	100%

Analyst: CS 4/25/96

Reviewer: JK 4/25/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	AEN I.D.:	604626-1
CLIENT I.D.:	MW-2-042496	DATE SAMPLED:	04/24/96
CLIENT:	GeoEngineers, Inc.	DATE RECEIVED:	04/24/96
PROJECT #:	4326-001-62	DATE ANALYZED:	04/24/96
PROJECT NAME:	Rose's Parking Lot	DILUTION FACTOR:	1
SAMPLE MATRIX:	WATER	UNITS:	ug/L

PARAMETER		RESULTS
BENZENE		7.7
TOLUENE		0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5
SURROGATE:		
TRIFLUOROTOLUENE (81%-116%)		104%

Analyst: CS 4/25/96

Reviewer: JLK 4/25/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	604626-2
CLIENT I.D.:	MW-4-042496	**DATE SAMPLED:**	04/24/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	04/24/96
PROJECT #:	4326-001-62	**DATE ANALYZED:**	04/24/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		RESULTS
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5

SURROGATE:	
TRIFLUOROTOLUENE (81%-116%)	104%

Analyst: CS 4/25/96

Reviewer: JK 4/25/96

Analytical**Technologies**, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	604626-3
CLIENT I.D.:	MW-5-042496	**DATE SAMPLED:**	04/24/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	04/24/96
PROJECT #:	4326-001-62	**DATE ANALYZED:**	04/24/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		RESULTS
BENZENE	<	0.5
TOLUENE		0.6
ETHYLBENZENE		1.1
TOTAL XYLENES		2.9
SURROGATE:		
TRIFLUOROTOLUENE (81%-116%)		101%

Analyst: CS 4/25/96

Reviewer: JLK 4/25/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	604626-4
CLIENT I.D.:	MW-6-042496	**DATE SAMPLED:**	04/24/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	04/24/96
PROJECT #:	4326-001-62	**DATE ANALYZED:**	04/24/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		RESULTS
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5
SURROGATE:		
TRIFLUOROTOLUENE (81%-116%)		101%

Analyst: CS 4/25/96

Reviewer: JK 4/25/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	AEN I.D.:	604626-5
CLIENT I.D.:	MW-7-042496	DATE SAMPLED:	04/24/96
CLIENT:	GeoEngineers, Inc.	DATE RECEIVED:	04/24/96
PROJECT #:	4326-001-62	DATE ANALYZED:	04/24/96
PROJECT NAME:	Rose's Parking Lot	DILUTION FACTOR:	1
SAMPLE MATRIX:	WATER	UNITS:	ug/L

PARAMETER	RESULTS	
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5
SURROGATE:		
TRIFLUOROTOLUENE (81%-116%)		104%

Analyst: CS 4/25/96

Reviewer: JMC 4/25/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	604626-6
CLIENT I.D.:	MW-8-042496	**DATE SAMPLED:**	04/24/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	04/24/96
PROJECT #:	4326-001-62	**DATE ANALYZED:**	04/24/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		RESULTS
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5

SURROGATE:	
TRIFLUOROTOLUENE (81%-116%)	98%

Analyst: CS 4/25/96

Reviewer: JLK 4/25/96

AnalyticalTechnologies,Inc.

GAS CHROMATOGRAPHY SPIKE RESULTS

METHOD:	BETX (EPA 8020M)	AEN ID:	604626
CLIENT:	GeoEngineers, Inc.	QC SAMPLE:	604610-2
PROJECT #:	4326-001-62	DATE ANALYZED:	04/25/96
PROJECT NAME:	Rose's Parking Lot	DILUTION FACTOR:	1
SAMPLE MATRIX:	WATER	UNITS:	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<	0.5	20.0	19.6	98	20.3	102	4
TOLUENE	<	0.5	20.0	20.5	103	21.4	107	4
ETHYLBENZENE	<	0.5	20.0	20.4	102	21.0	105	3
TOTAL XYLENES	<	0.5	40.0	40.5	101	42.4	106	5
SURROGATE:								
TRIFLUOROTOLUENE (81% - 116%)					97%		104%	

CONTROL LIMITS

	% REC	RPD
BENZENE	77-131	20
TOLUENE	79-125	20
ETHYLBENZENE	76-124	20
TOTAL XYLENES	74-127	20

Analyst: CS 4/25/96

Reviewer: JLK 4/25/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY SPIKE RESULTS

METHOD:	BETX (EPA 8020M)	**AEN ID:**	604626
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	Method Blank
PROJECT #:	4326-001-62	**DATE ANALYZED:**	04/25/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<	0.5	20.0	19.9	100	20.3	102	2
TOLUENE	<	0.5	20.0	20.7	104	20.7	104	0
ETHYLBENZENE	<	0.5	20.0	20.9	105	20.6	103	1
TOTAL XYLENES	<	0.5	40.0	41.1	103	41.3	103	0
SURROGATE:								
TRIFLUOROTOLUENE (81% - 116%)					101%		100%	

CONTROL LIMITS

	% REC	RPD
BENZENE	85-118	20
TOLUENE	85-119	20
ETHYLBENZENE	85-120	20
TOTAL XYLENES	85-120	20

Analyst: CS 4/25/96

Reviewer: JLK 4/25/96

Analytical**Technologies,**Inc.

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**AEN I.D.:**	604626-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	N/A
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	N/A
PROJECT #:	4326-001-62	**DATE EXTRACTED:**	04/24/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	04/24/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	< 0.5

Analyst: PK 4-24-96

Reviewer: CS 4/24/96

AnalyticalTechnologies,Inc.

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	AEN I.D.:	604626-4
CLIENT I.D.:	MW-6-042496	DATE SAMPLED:	04/24/96
CLIENT:	GeoEngineers, Inc.	DATE RECEIVED:	04/24/96
PROJECT #:	4326-001-62	DATE EXTRACTED:	04/24/96
PROJECT NAME:	Rose's Parking Lot	DATE ANALYZED:	04/24/96
SAMPLE MATRIX:	WATER	DILUTION FACTOR:	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	< 0.5

Analyst: PK 4-24-96

Reviewer: CC 4/24/96

Analytical**Technologies**, Inc.

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**AEN I.D.:**	604626-5
CLIENT I.D.:	MW-7-042496	**DATE SAMPLED:**	04/24/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	04/24/96
PROJECT #:	4326-001-62	**DATE EXTRACTED:**	04/24/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	04/24/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	< 0.5

Analyst: PK 4-24-96

Reviewer: CS 4/24/96

Analytical**Technologies**, Inc.

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**AEN I.D.:**	604626-6
CLIENT I.D.:	MW-8-042496	**DATE SAMPLED:**	04/24/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	04/24/96
PROJECT #:	4326-001-62	**DATE EXTRACTED:**	04/24/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	04/24/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	< 0.5

Analyst: PK 4-24-96

Reviewer: CS 4/24/96

Analytical**Technologies**, Inc.

INFRARED SPECTROPHOTOMETRY SPIKE RESULTS

		AEN ACCESSION:	604626
METHOD:	EPA - 418.1	**QC SAMPLE:**	604610-2
CLIENT:	GeoEngineers, Inc.	**DATE EXTRACTED:**	04/24/96
PROJECT #:	4326-001-62	**DATE ANALYZED:**	04/24/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	mg/L

PARAMETER	SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
3-Component Oil	< 0.5	10.0	10.6	106	10.0	100	6

CONTROL LIMITS

	%REC	RPD
3-Component Oil	61 - 109	20

Analyst: PK 4-24-96

Reviewer: CS 4/24/96

Analytical Technologies, Inc.

INFRARED SPECTROPHOTOMETRY SPIKE RESULTS

		AEN ACCESSION:	604626
METHOD:	EPA - 418.1	QC SAMPLE:	Method Blank
CLIENT:	GeoEngineers, Inc.	DATE EXTRACTED:	04/24/96
PROJECT #:	4326-001-62	DATE ANALYZED:	04/24/96
PROJECT NAME:	Rose's Parking Lot	DILUTION FACTOR:	1
SAMPLE MATRIX:	WATER	UNITS:	mg/L

PARAMETER	SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
3-Component Oil	< 0.5	10.0	8.8	88	9.5	95	8

CONTROL LIMITS

	%REC	RPD
3-Component Oil	64 - 108	20

Analyst: PK 4-24-96

Reviewer: rs 4/24/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST:	EDB/EDC (EPA 8010M)	**AEN I.D.:**	604626-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	N/A
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	N/A
PROJECT #:	4326-001-62	**DATE ANALYZED:**	04/25/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS
1,2-DIBROMOETHANE (EDB)	< 0.5
1,2-DICHLOROETHANE (EDC)	< 0.2
SURROGATE:	
BROMOFLUOROBENZENE (69% - 121%)	92%

Analyst: MLB 4/25/96

Reviewer: LO 4/25/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST:	EDB/EDC (EPA 8010M)	AEN I.D.:	604626-4
CLIENT I.D.:	MW-6-042496	DATE SAMPLED:	04/24/96
CLIENT:	GeoEngineers, Inc.	DATE RECEIVED:	04/24/96
PROJECT #:	4326-001-62	DATE ANALYZED:	04/25/96
PROJECT NAME:	Rose's Parking Lot	DILUTION FACTOR:	1
SAMPLE MATRIX:	WATER	UNITS:	ug/L

PARAMETER	RESULTS
1,2-DIBROMOETHANE (EDB)	< 0.5
1,2-DICHLOROETHANE (EDC)	< 0.2

SURROGATE:

BROMOFLUOROBENZENE (69% - 121%)	88%

Analyst: MB 4/25/96

Reviewer: [illegible] 4/25/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST:	EDB/EDC (EPA 8010M)	**AEN I.D.:**	604626-5
CLIENT I.D.:	MW-7-042496	**DATE SAMPLED:**	04/24/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	04/24/96
PROJECT #:	4326-001-62	**DATE ANALYZED:**	04/25/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS
1,2-DIBROMOETHANE (EDB)	< 0.5
1,2-DICHLOROETHANE (EDC)	< 0.2
SURROGATE:	
BROMOFLUOROBENZENE (69% - 121%)	90%

Analyst: MB 4/25/96

Reviewer: 04/25/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST:	EDB/EDC (EPA 8010M)	**AEN I.D.:**	604626-6
CLIENT I.D.:	MW-8-042496	**DATE SAMPLED:**	04/24/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	04/24/96
PROJECT #:	4326-001-62	**DATE ANALYZED:**	04/25/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS
1,2-DIBROMOETHANE (EDB)	< 0.5
1,2-DICHLOROETHANE (EDC)	< 0.2
SURROGATE:	
BROMOFLUOROBENZENE (69% - 121%)	88%

Analyst: MG 4/25/96

Reviewer: JD 4/25/96

Analytical**Technologies**, Inc.

GAS CHROMATOGRAPHY SPIKE RESULTS

TEST:	EDB/EDC (EPA 8010M)	AEN I.D.:	604626
CLIENT:	GeoEngineers, Inc.	QC SAMPLE:	604626-5
PROJECT #:	4326-001-62	DATE ANALYZED:	04/25/96
PROJECT NAME:	Rose's Parking Lot	DILUTION FACTOR:	1
SAMPLE MATRIX:	WATER	UNITS:	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
1,2-DIBROMOETHANE	<	0.5	5.0	4.7	94	5.3	106	12
1,2-DICHLOROETHANE	<	0.2	5.0	5.2	104	5.7	114	9
SURROGATE:								
BROMOFLUOROBENZENE (69% - 121%)					97%		99%	

CONTROL LIMITS

	% REC	RPD
1,2-DIBROMOETHANE (EDB)	68% - 133%	21
1,2-DICHLOROETHANE (EDC)	64% - 143%	25

Analyst: JLB 4/25/96

Reviewer: LD 4/25/96

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY BLANK SPIKE RESULTS

TEST:	EDB/EDC (EPA 8010M)	**AEN I.D.:**	604626
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	Method Blank
PROJECT #:	4326-001-62	**DATE ANALYZED:**	04/25/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
1,2-DIBROMOETHANE	<	0.5	5.0	5.0	100	5.0	100	0
1,2-DICHLOROETHANE	<	0.2	5.0	5.2	104	5.1	102	2
SURROGATE:								
BROMOFLUOROBENZENE (69% - 121%)					95%		93%	

CONTROL LIMITS

	% REC	RPD
1,2-DIBROMOETHANE (EDB)	78% - 120%	20
1,2-DICHLOROETHANE (EDC)	79% - 129%	20

Analyst: MB 4/25/96

Reviewer: LO 4/25/96

Analytical Technologies, Inc.

DISSOLVED METALS RESULTS

CLIENT I.D.:	Method Blank	**AEN I.D.:**	604626-0
CLIENT:	GeoEngineers, Inc.	**DATE SAMPLED:**	NA
PROJECT #:	4326-001-62	**DATE RECEIVED:**	NA
PROJECT NAME:	Rose's Parking Lot	**DATE DIGESTED:**	04/24/96
SAMPLE MATRIX:	WATER	**DATE ANALYZED:**	04/25/96
		DILUTION FACTOR:	1
		UNITS:	mg/L

PARAMETER	RESULTS	METHOD
LEAD	< 0.002	7421

Analyst: KFL 4/25/96

Reviewer: SM 4/25/96

Analytical**Technologies,**Inc.

DISSOLVED METALS RESULTS

CLIENT I.D.:	MW-6-042496	**AEN I.D.:**	604626-4
CLIENT:	GeoEngineers, Inc.	**DATE SAMPLED:**	04/24/96
PROJECT #:	4326-001-62	**DATE RECEIVED:**	04/24/96
PROJECT NAME:	Rose's Parking Lot	**DATE DIGESTED:**	04/24/96
SAMPLE MATRIX:	WATER	**DATE ANALYZED:**	04/25/96
		DILUTION FACTOR:	1
		UNITS:	mg/L

PARAMETER	RESULTS	METHOD
LEAD	< 0.002	7421

Analyst: KFL 4/25/96

Reviewer: SM 4/25/96

Analytical Technologies, Inc.

DISSOLVED METALS RESULTS

CLIENT I.D.:	MW-7-042496	AEN I.D.:	604626-5
CLIENT:	GeoEngineers, Inc.	DATE SAMPLED:	04/24/96
PROJECT #:	4326-001-62	DATE RECEIVED:	04/24/96
PROJECT NAME:	Rose's Parking Lot	DATE DIGESTED:	04/24/96
SAMPLE MATRIX:	WATER	DATE ANALYZED:	04/25/96
		DILUTION FACTOR:	1
		UNITS:	mg/L

PARAMETER	RESULTS	METHOD
LEAD	< 0.002	7421

Analyst: KFL 4/25/96

Reviewer: SM 4/25/96

Analytical Technologies, Inc.

DISSOLVED METALS RESULTS

CLIENT I.D.:	MW-8-042496	AEN I.D.:	604626-6
CLIENT:	GeoEngineers, Inc.	DATE SAMPLED:	04/24/96
PROJECT #:	4326-001-62	DATE RECEIVED:	04/24/96
PROJECT NAME:	Rose's Parking Lot	DATE DIGESTED:	04/24/96
SAMPLE MATRIX:	WATER	DATE ANALYZED:	04/25/96
		DILUTION FACTOR:	1
		UNITS:	mg/L

PARAMETER	RESULTS	METHOD
LEAD	< 0.002	7421

Analyst: KFL 4/25/96

Reviewer: SM 4/25/96

Analytical**Technologies,**Inc.

METALS DUPLICATE RESULTS

METHOD:	7421	**AEN I.D.:**	604626
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	604626-5
PROJECT #:	4326-001-62	**DATE DIGESTED:**	04/24/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	04/25/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	SAMPLE RESULT	DUPLICATE RESULT	RPD	RPD CONTROL LIMIT
LEAD	< 0.002	< 0.002	NA	20

Analyst: KFL 4/26/96

Reviewer: SM 4/25/96

Analytical Technologies, Inc.

METALS SPIKE RESULTS

METHOD:	7421	AEN I.D.:	604626
CLIENT:	GeoEngineers, Inc.	QC SAMPLE:	604626-5
PROJECT #:	4326-001-62	DATE DIGESTED:	04/24/96
PROJECT NAME:	Rose's Parking Lot	DATE ANALYZED:	04/25/96
SAMPLE MATRIX:	WATER	DILUTION FACTOR:	1
		UNITS:	mg/L

PARAMETER	SAMPLE RESULT	SPIKE CONC	SPIKE RESULT	% RECOV	CONTROL LIMIT
LEAD	< 0.002	0.020	0.016	80	75-125%

Analyst: IKA 4/25/96

Reviewer: SM 4/25/96

AnalyticalTechnologies,Inc.

METALS BLANK SPIKE RESULTS

METHOD:	7421	**AEN I.D.:**	604626
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	Method Blank
PROJECT #:	4326-001-62	**DATE DIGESTED:**	04/24/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	04/25/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULT	TRUE VALUE	% RECOV	CONTROL LIMIT
LEAD	0.017	0.020	85	80-120%

Analyst: KFL 4/25/96

Reviewer: SM 4/25/96

Analytical Technologies, Inc.

DATE 4/24/96 PAGE 1 OF 1

17400 S.W. Upper Boones Ferry Rd., Suite 270
Durham, Oregon 97224 • (503) 684-0447 FAX: (503) 620-0393

Chain of Custody

LABORATORY NUMBER: 607626
PROJECT NOTICE NUMBER:

PROJECT MANAGER: Marsi Beeson
COMPANY: Geoengineers
ADDRESS: 7504 SW Bridgeport Rd. Portland, OR 97224
PHONE: 603-6061 SAMPLED BY: MB/LCM

SAMPLE DISPOSAL INSTRUCTIONS
☐ ATI Disposal @ $5.00 each ☐ Return

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	TPH-HCID State: OR / WA	TPH-G State: OR / WA	TPH-D State: OR / WA	418.1 State: OR / WA	EPA 418.1	8015M	8020M-BETX only	8310 HPLC PAHs	7421 Lead	% Moisture	8010 Halogenated VOCs	8020 Aromatic VOCs	8040 Phenols	8240 GCMS Volatiles	8270 GCMS Semivolatiles	8080 OC Pesticides/PCBs	8080M PCBs only	Drinking Water (8)	Priority Pollutant Metals (13)	Cyanide	TCLP Metals (8)	TCLP Volatiles 8240 ZH-EXT	TCLP Semivolatiles 8270	Dissolved Lead	EDB/EDC	PAHs	NUMBER OF CONTAINERS
MW-2-042496	4/24/96	920	H_2O	-1							X																				2
MW-4-042496		955		-2							X																				2
MW-5-042496		940		-3							X																				2
MW-6-042496		820		-4					X		X																	X	X		9
MW-7-042496		745		-5					X		X																	X	X		9
MW-8-042496		700		-6					X		X																	X	X		9

HSA

PROJECT INFORMATION		SAMPLE RECEIPT	
PROJECT NUMBER:	4326-001-62	TOTAL NUMBER OF CONTAINERS	33
PROJECT NAME:	Rose's Parking Lot	COC SEALS/INTACT? Y \ N \ NA	NA
PURCHASE ORDER NUMBER:		RECEIVED INTACT? Y \ N	Y
ONGOING PROJECT?	YES ☒ NO ☐	RECEIVED COLD? Y \ N	4.2°C Y

PRIOR AUTHORIZATION REQUIRED FOR RUSH PROJECTS

TAT: (NORMAL) ☐ 2 WKS (RUSH) ☐ 24 HR ☒ 48 HRS ☐ 72 HRS ☐ 1 WK

GREATER THAN 24 HR. NOTICE? YES ☐ NO ☐ (LAB USE ONLY)

SPECIAL INSTRUCTIONS: Dissolved Pb samples are not filtered and not preserved. Run PAH analysis if TPH is 70.5.
Due Fri 26 pm

Received via:

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY 3.
Signature: Marsi Beeson Time: 1410	Signature Time:	Signature Time:
Printed Name: Marsi Beeson Date: 4-24	Printed Name: Date:	Printed Name: Date:
Company: GeoEngineers	Company:	Company:
RECEIVED BY: 1.	**RECEIVED BY: 2.**	**RECEIVED BY: (LAB) 3.**
Signature: Liam Koch Time: 14:15	Signature Time:	Signature Time:
Printed Name: Lisa Koch Date: 4/24/96	Printed Name: Date:	Printed Name: Date:
Company: ATI	Company:	Analytical Technologies, Inc.

DISTRIBUTION: White - Original Yellow - Project Manager Pink - Originator

Analytical**Technologies,**Inc. 17400 S.W. Upper Boones Ferry Road, Suite 270 Durham, OR. 97224
(503) 684-0447 (503) 620-0393 (FAX)

ATI I.D. 604575

April 19, 1996

Marsi Beeson
GeoEngineers
7504 SW Bridgeport Rd.
Portland, OR 97224

Project Name / Number: Rose's Parking / 4326-000-P62

Attention: Marsi Beeson

On April 16, 1996, American Environmental Network (OR), Inc. received one water sample for analysis for the above listed project. The sample was analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed. The results from these samples relate only to the items tested. This report shall not be reproduced, except in full, without the written approval of the laboratory.

If you have any questions or comments, please do not hesitate to contact us at (503)684-0447.

Natasha Schaefer
Project Manager

Steven E. Stanley for
Laboratory Manager

SES:alm
Enclosure

Analytical Technologies, Inc.

SAMPLE CROSS REFERENCE SHEET

CLIENT:	GeoEngineers, Inc.	**AEN I.D.:**	604575
PROJECT #:	4326-000-62		
PROJECT NAME:	Rose's Parking Lot	**MATRIX:**	WATER

AEN #	CLIENT DESCRIPTION	DATE SAMPLED
604575-1	MW-3R-041696	4/16/96

----------TOTALS----------

MATRIX	# SAMPLES
WATER	1

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of the report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical**Technologies,**Inc.

ANALYTICAL SCHEDULE

CLIENT:	GeoEngineers, Inc.	**AEN I.D.:**	604575
PROJECT #:	4326-000-62		
PROJECT NAME:	Rose's Parking Lot		

ANALYSIS	TECHNIQUE	REFERENCE	LAB
BETX	GC/PID	EPA 8020M	PLD

PLD = AEN - Portland
R = ATI - Renton
PHX = AEN - Phoenix
PNR = AEN - Pensacola
FC = ATI - Fort Collins
SUB = Subcontract

Analytical**Technologies**, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	604575-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	N/A
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	N/A
PROJECT #:	4326-000-62	**DATE ANALYZED:**	04/17/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		RESULTS
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5

SURROGATE:	
TRIFLUOROTOLUENE (81%-116%)	101%

Analyst: Jlc 4/18/96

Reviewer: CS 4/18/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	AEN I.D.:	604575-1
CLIENT I.D.:	MW-3R-041696	DATE SAMPLED:	04/16/96
CLIENT:	GeoEngineers, Inc.	DATE RECEIVED:	04/16/96
PROJECT #:	4326-000-62	DATE ANALYZED:	04/17/96
PROJECT NAME:	Rose's Parking Lot	DILUTION FACTOR:	20
SAMPLE MATRIX:	WATER	UNITS:	ug/L

PARAMETER	RESULTS
BENZENE	900
TOLUENE	500
ETHYLBENZENE	600
TOTAL XYLENES	1400
SURROGATE:	
TRIFLUOROTOLUENE (81%-116%)	98%

Analyst: JK 4/18/96

Reviewer: CS 4/18/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY SPIKE RESULTS

METHOD:	BETX (EPA 8020M)	AEN ID:	604575
CLIENT:	GeoEngineers, Inc.	QC SAMPLE:	604564-1
PROJECT #:	4326-000-62	DATE ANALYZED:	04/18/96
PROJECT NAME:	Rose's Parking Lot	DILUTION FACTOR:	1
SAMPLE MATRIX:	WATER	UNITS:	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<	0.5	20.0	20.6	103	20.8	104	1
TOLUENE	<	0.5	20.0	21.3	107	21.2	106	0
ETHYLBENZENE	<	0.5	20.0	20.7	104	20.9	105	1
TOTAL XYLENES	<	0.5	40.0	41.4	104	41.7	104	1
SURROGATE:								
TRIFLUOROTOLUENE (81% - 116%)					94%		96%	

CONTROL LIMITS

	% REC	RPD
BENZENE	77-131	20
TOLUENE	79-125	20
ETHYLBENZENE	76-124	20
TOTAL XYLENES	74-127	20

Analyst: JLL 4/18/96

Reviewer: CS 4/18/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY SPIKE RESULTS

METHOD:	BETX (EPA 8020M)	AEN ID:	604575
CLIENT:	GeoEngineers, Inc.	QC SAMPLE:	Method Blank
PROJECT #:	4326-000-62	DATE ANALYZED:	04/18/96
PROJECT NAME:	Rose's Parking Lot	DILUTION FACTOR:	1
SAMPLE MATRIX:	WATER	UNITS:	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<	0.5	20.0	20.4	102	19.9	100	2
TOLUENE	<	0.5	20.0	20.7	104	20.1	101	3
ETHYLBENZENE	<	0.5	20.0	20.3	102	19.9	100	2
TOTAL XYLENES	<	0.5	40.0	40.1	100	39.4	99	2
SURROGATE:								
TRIFLUOROTOLUENE (81% - 116%)					94%		98%	

CONTROL LIMITS

	% REC	RPD
BENZENE	85-118	20
TOLUENE	85-119	20
ETHYLBENZENE	85-120	20
TOTAL XYLENES	85-120	20

Analyst: JVC 4/19/96

Reviewer: CS 4/18/96

Analytical Technologies, Inc.

DATE 4/16 PAGE 1 OF 1

17400 S.W. Upper Boones Ferry Rd., Suite 270
Durham, Oregon 97224 • (503) 684-0447 FAX: (503) 620-0393

Chain of Custody

LABORATORY NUMBER: 604575
PROJECT NOTICE NUMBER:

PROJECT MANAGER: Marsi Beeson
COMPANY: GeoEngineers
ADDRESS: 7504 SW Bridgeport Portland OR
PHONE: 624-9274 SAMPLED BY: MBB

SAMPLE DISPOSAL INSTRUCTIONS
☐ ATI Disposal @ $5.00 each ☐ Return

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID
MW-3R-041696	4/16/96	0830	H_2O	1

	PETROLEUM HYDROCARBONS										ORGANICS							INORGANICS			TCLP			OTHER										NUMBER OF CONTAINERS
	TPH-HCID State: OR / WA	TPH-G State: OR / WA	TPH-D State: OR / WA	418.1 State: OR / WA	EPA 418.1	8015M	8020M-BETX only	8310 HPLC PAHs	7421 Lead	% Moisture	8010 Halogenated VOCs	8020 Aromatic VOCs	8040 Phenols	8240 GCMS Volatiles	8270 GCMS Semivolatiles	8080 OC Pesticides/PCBs	8080M PCBs only	Drinking Water (8)	Priority Pollutant Metals (13)	Cyanide	TCLP Metals (8)	TCLP Volatiles 8240 ZH-EXT	TCLP Semivolatiles 8270										
MW-3R-041696							X																										1

RUSH

PROJECT INFORMATION		SAMPLE RECEIPT	
PROJECT NUMBER:	4326-000-62	TOTAL NUMBER OF CONTAINERS	2
PROJECT NAME:	Rose's Pkg Lot	COC SEALS/INTACT? Y \ N \ NA	NA
PURCHASE ORDER NUMBER:		RECEIVED INTACT? Y N	Y
ONGOING PROJECT?	YES ☑ NO ☐	RECEIVED COLD? Y N	Y

PRIOR AUTHORIZATION REQUIRED FOR RUSH PROJECTS

TAT: (NORMAL) ☑ 2 WKS | (RUSH) ☐ 24 HR ☑ 48 HRS ☐ 72 HRS ☐ 1 WK

GREATER THAN 24 HR. NOTICE? YES ☐ NO ☒ (LAB USE ONLY)

SPECIAL INSTRUCTIONS: Please fax results - 1 bottle has headspace - marked with X

Received via:

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY 3.
Signature: Marsi Beeson Time: 1945	Signature Time:	Signature Time:
Printed Name: Marsi Beeson Date: 4/16	Printed Name: Date:	Printed Name: Date:
Company: GeoEngineers	Company:	Company:
RECEIVED BY: 1.	**RECEIVED BY: 2.**	**RECEIVED BY: (LAB) 3.**
Signature: Jenna Gorham Time: 940	Signature Time:	Signature Time:
Printed Name: Jenna Gorham Date: 4/16/96	Printed Name: Date:	Printed Name: Date:
Company: AEW	Company:	Analytical Technologies, Inc.

ATI Labs: San Diego (619) 458-9141 • Phoenix (602) 496-4400 • Seattle (206) 228-8335 • Pensacola (904) 474-1001 • Portland (503) 684-0447 • Fort Collins (303) 490-1511

40

Analytical**Technologies,**Inc. 17400 S.W. Upper Boones Ferry Road, Suite 270 Durham, OR. 97224
(503) 684-0447 (503) 620-0393 (FAX)

ATI I.D. 604553

April 18, 1996

Marsi Beeson
GeoEngineers
7504 SW Bridgeport Rd.
Portland, OR 97224

Project Name / Number: Rose's Parking / 4326-001-P62

Attention: Marsi Beeson

On April 11, 1996, American Environmental Network (OR), Inc. received six soil samples for analysis for the above listed project. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed. The results from these samples relate only to the items tested. This report shall not be reproduced, except in full, without the written approval of the laboratory.

If you have any questions or comments, please do not hesitate to contact us at (503)684-0447.

Natasha Schaefer
Project Manager

Steven E. Stanley
Laboratory Manager

SES:alm
Enclosure

Analytical Technologies, Inc.

SAMPLE CROSS REFERENCE SHEET

CLIENT:	GeoEngineers, Inc.	AEN I.D.:	604553
PROJECT #:	4326-001-62		
PROJECT NAME:	Rose' s Parking Lot	MATRIX:	SOIL

AEN #	CLIENT DESCRIPTION	DATE SAMPLED
604553-1	MW-6-20.0	4/06/96
604553-2	MW-6-25.0	4/06/96
604553-3	MW-7-20.0	4/06/96
604553-4	MW-7-25.0	4/06/96
604553-5	MW-8-17.5	4/06/96
604553-6	MW-8-22.5	4/06/96

----------TOTALS----------

MATRIX	# SAMPLES
SOIL	6

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of the report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical Technologies, Inc.

ANALYTICAL SCHEDULE

CLIENT:	GeoEngineers, Inc.	AEN I.D.:	604553
PROJECT #:	4326-001-62		
PROJECT NAME:	Rose' s Parking Lot		

ANALYSIS	TECHNIQUE	REFERENCE	LAB
Hydrocarbon Identification	GC/FID	OR TPH-HCID	PLD

PLD = AEN - Portland
R = ATI - Renton
PHX = AEN - Phoenix
PNR = AEN - Pensacola
FC = ATI - Fort Collins
SUB = Subcontract

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	TPH-HCID (Oregon)	**AEN I.D.:**	604553-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	N/A
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	N/A
PROJECT #:	4326-001-62	**DATE EXTRACTED:**	04/15/96
PROJECT NAME:	Rose' s Parking Lot	**DATE ANALYZED:**	04/15/96
SAMPLE MATRIX:	SOIL	**DILUTION FACTOR:**	1
		UNITS:	mg/kg

PARAMETER	RESULTS
GASOLINE (C6 - C10)	LESS THAN 20 mg/kg
DIESEL (C10 - C28)	LESS THAN 50 mg/kg
(C28 - C40)	NOT OBSERVED
SURROGATES:	
1-CHLOROOCTANE (62% - 143%)	108%
O-TERPHENYL (62% - 143%)	108%

Analyst: JS 4/16/96

Reviewer: JLK 4/17/96

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	TPH-HCID (Oregon)	AEN I.D.:	604553-1
CLIENT I.D.:	MW-6-20.0	DATE SAMPLED:	04/06/96
CLIENT:	GeoEngineers, Inc.	DATE RECEIVED:	04/11/96
PROJECT #:	4326-001-62	DATE EXTRACTED:	04/15/96
PROJECT NAME:	Rose' s Parking Lot	DATE ANALYZED:	04/15/96
SAMPLE MATRIX:	SOIL	DILUTION FACTOR:	1
		UNITS:	mg/kg

PARAMETER	RESULTS
GASOLINE (C6 - C10)	LESS THAN 20 mg/kg
DIESEL (C10 - C28)	LESS THAN 50 mg/kg
(C28 - C40)	NOT OBSERVED
SURROGATES:	
1-CHLOROOCTANE (62% - 143%)	104%
O-TERPHENYL (62% - 143%)	104%

Analyst: CS 4/16/96

Reviewer: JLK 4/17/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	TPH-HCID (Oregon)	**AEN I.D.:**	604553-2
CLIENT I.D.:	MW-6-25.0	**DATE SAMPLED:**	04/06/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	04/11/96
PROJECT #:	4326-001-62	**DATE EXTRACTED:**	04/15/96
PROJECT NAME:	Rose' s Parking Lot	**DATE ANALYZED:**	04/15/96
SAMPLE MATRIX:	SOIL	**DILUTION FACTOR:**	1
		UNITS:	mg/kg

PARAMETER	RESULTS
GASOLINE (C6 - C10)	LESS THAN 20 mg/kg
DIESEL (C10 - C28)	LESS THAN 50 mg/kg
(C28 - C40)	NOT OBSERVED
SURROGATES:	
1-CHLOROOCTANE (62% - 143%)	120%
O-TERPHENYL (62% - 143%)	119%

Analyst: CS 4/16/96

Reviewer: JK 4/17/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	TPH-HCID (Oregon)	AEN I.D.:	604553-3
CLIENT I.D.:	MW-7-20.0	DATE SAMPLED:	04/06/96
CLIENT:	GeoEngineers, Inc.	DATE RECEIVED:	04/11/96
PROJECT #:	4326-001-62	DATE EXTRACTED:	04/15/96
PROJECT NAME:	Rose' s Parking Lot	DATE ANALYZED:	04/15/96
SAMPLE MATRIX:	SOIL	DILUTION FACTOR:	1
		UNITS:	mg/kg

PARAMETER	RESULTS
GASOLINE (C6 - C10)	LESS THAN 20 mg/kg
DIESEL (C10 - C28)	LESS THAN 50 mg/kg
(C28 - C40)	NOT OBSERVED

SURROGATES:

1-CHLOROOCTANE (62% - 143%)	111%
O-TERPHENYL (62% - 143%)	110%

Analyst: CS 4/16/96

Reviewer: JW 4/17/96

Analytical**Technologies**, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	TPH-HCID (Oregon)	**AEN I.D.:**	604553-4
CLIENT I.D.:	MW-7-25.0	**DATE SAMPLED:**	04/06/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	04/11/96
PROJECT #:	4326-001-62	**DATE EXTRACTED:**	04/15/96
PROJECT NAME:	Rose' s Parking Lot	**DATE ANALYZED:**	04/15/96
SAMPLE MATRIX:	SOIL	**DILUTION FACTOR:**	1
		UNITS:	mg/kg

PARAMETER	RESULTS
GASOLINE (C6 - C10)	LESS THAN 20 mg/kg
DIESEL (C10 - C28)	LESS THAN 50 mg/kg
(C28 - C40)	NOT OBSERVED

SURROGATES:

1-CHLOROOCTANE (62% - 143%)	130%
O-TERPHENYL (62% - 143%)	130%

Analyst: CS 4/16/96

Reviewer: JLK 4/17/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	TPH-HCID (Oregon)	AEN I.D.:	604553-5
CLIENT I.D.:	MW-8-17.5	DATE SAMPLED:	04/06/96
CLIENT:	GeoEngineers, Inc.	DATE RECEIVED:	04/11/96
PROJECT #:	4326-001-62	DATE EXTRACTED:	04/15/96
PROJECT NAME:	Rose' s Parking Lot	DATE ANALYZED:	04/15/96
SAMPLE MATRIX:	SOIL	DILUTION FACTOR:	1
		UNITS:	mg/kg

PARAMETER	RESULTS
GASOLINE (C6 - C10)	LESS THAN 20 mg/kg
DIESEL (C10 - C28)	LESS THAN 50 mg/kg
(C28 - C40)	NOT OBSERVED
SURROGATES:	
1-CHLOROOCTANE (62% - 143%)	115%
O-TERPHENYL (62% - 143%)	113%

Analyst: CS 4/16/96

Reviewer: JK 4/17/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	TPH-HCID (Oregon)	AEN I.D.:	604553-6
CLIENT I.D.:	MW-8-22.5	DATE SAMPLED:	04/06/96
CLIENT:	GeoEngineers, Inc.	DATE RECEIVED:	04/11/96
PROJECT #:	4326-001-62	DATE EXTRACTED:	04/15/96
PROJECT NAME:	Rose' s Parking Lot	DATE ANALYZED:	04/16/96
SAMPLE MATRIX:	SOIL	DILUTION FACTOR:	1
		UNITS:	mg/kg

PARAMETER	RESULTS
GASOLINE (C6 - C10)	LESS THAN 20 mg/kg
DIESEL (C10 - C28)	LESS THAN 50 mg/kg
(C28 - C40)	NOT OBSERVED
SURROGATES:	
1-CHLOROOCTANE (62% - 143%)	107%
O-TERPHENYL (62% - 143%)	108%

Analyst: CS 4/16/96

Reviewer: JLL 4/16/96

Analytical**Technologies**, Inc.

GAS CHROMATOGRAPHY SPIKE RESULTS

		AEN ACCESSION:	604553
METHOD:	TPH-HCID (Oregon)	**QC SAMPLE:**	Method Blank
CLIENT:	GeoEngineers, Inc.	**DATE EXTRACTED:**	04/15/96
PROJECT #:	4326-001-62	**DATE ANALYZED:**	04/15/96
PROJECT NAME:	Rose' s Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	SOIL	**UNITS:**	mg/kg

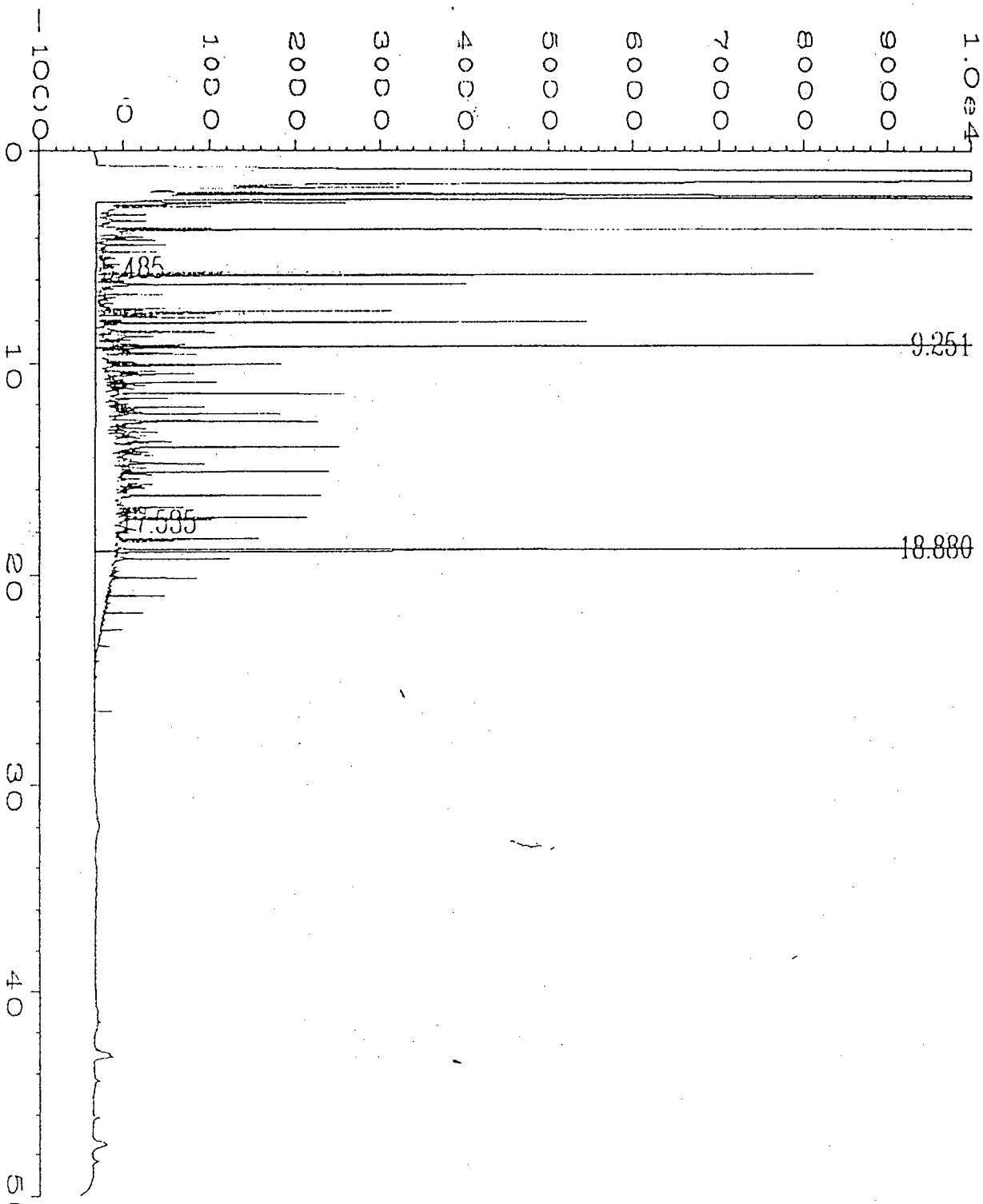
PARAMETER	SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
DIESEL	< 50	100	118	118	124	124	5
SURROGATE:							
1-CHLOROOCTANE (62% - 143%)				107%		107%	
O-TERPHENYL (62% - 143%)				108%		108%	

CONTROL LIMITS

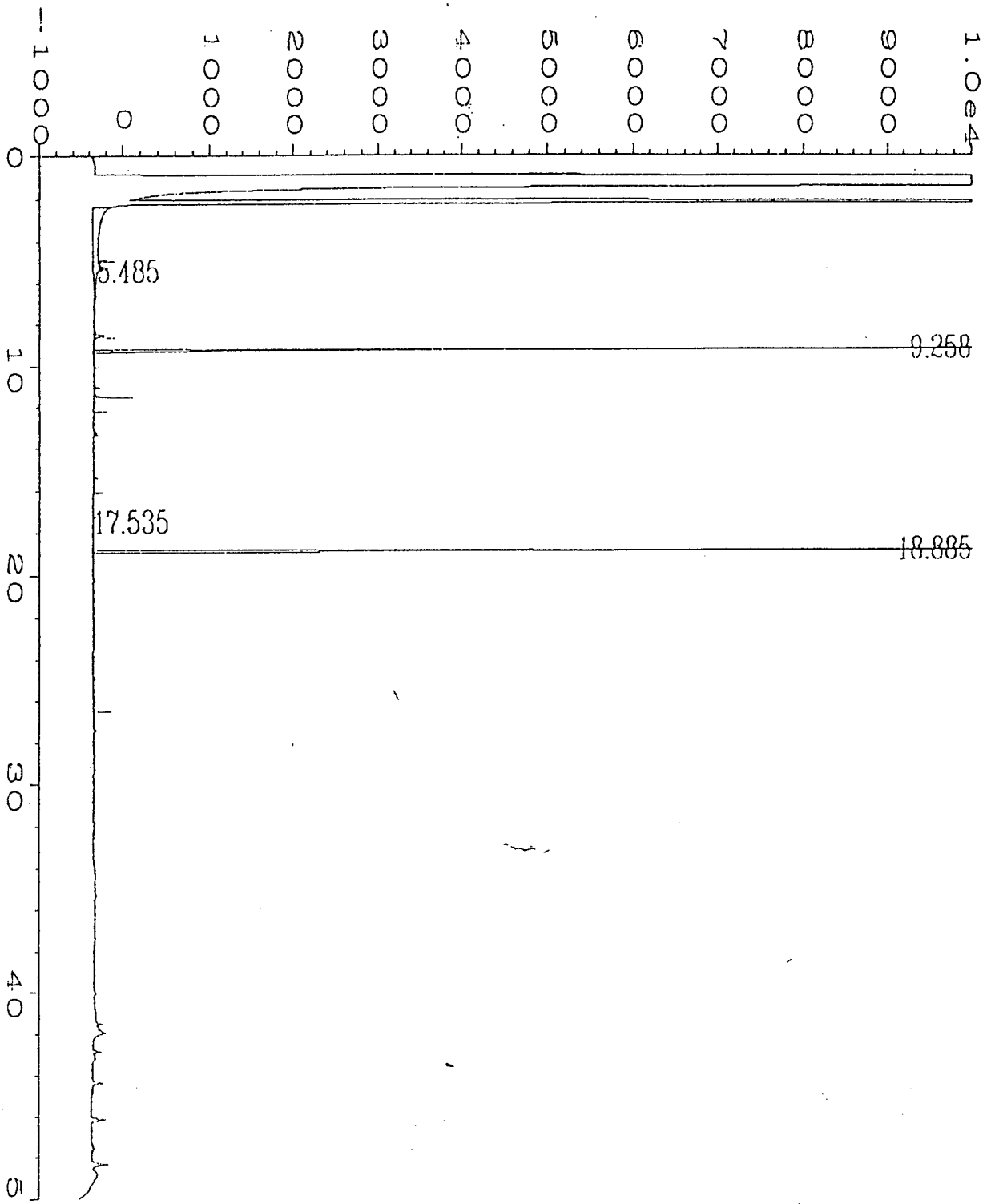
	% REC	RPD
DIESEL	69-128	20

Analyst: CS 4/16/96

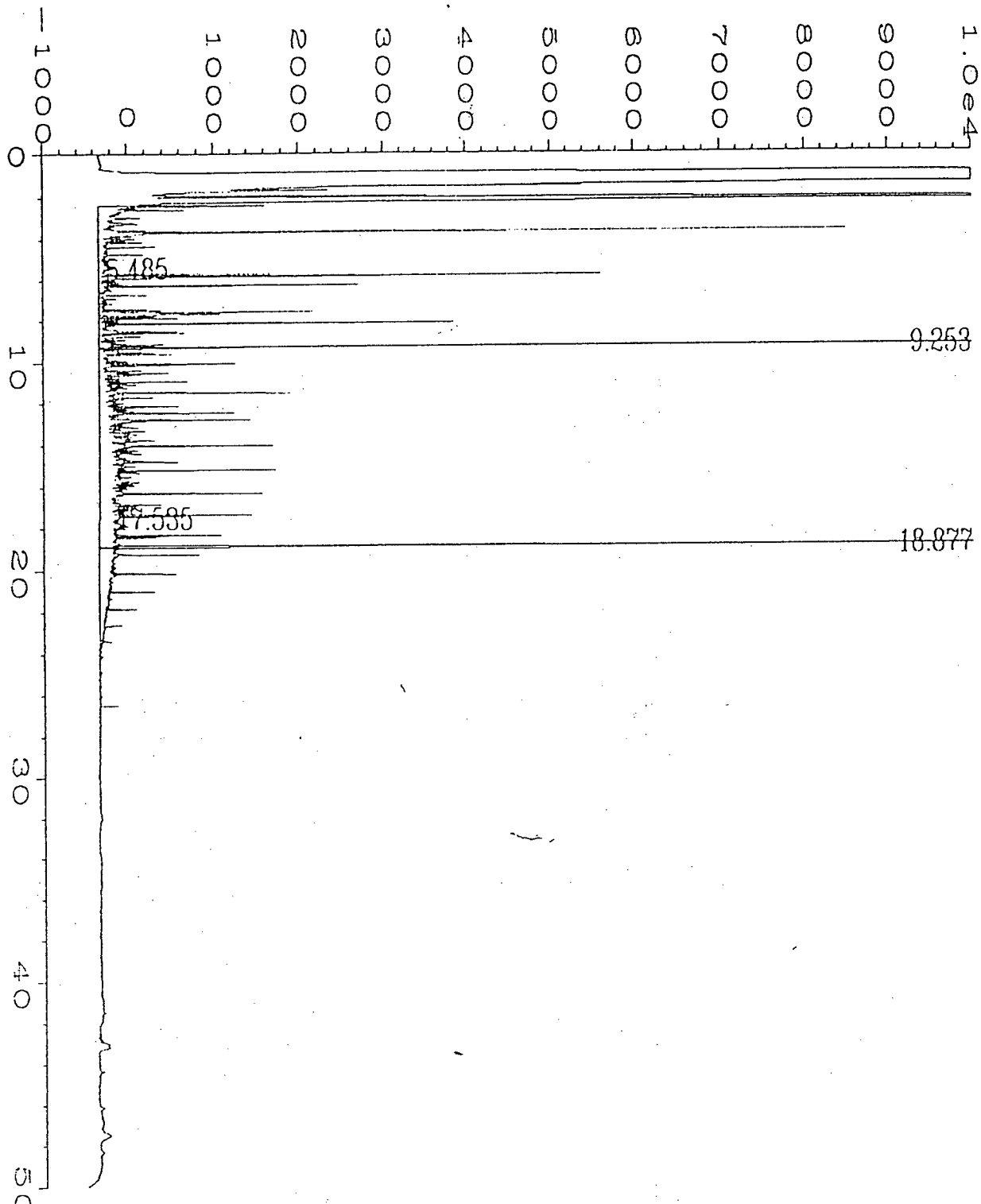
Reviewer: JH 4/17/96



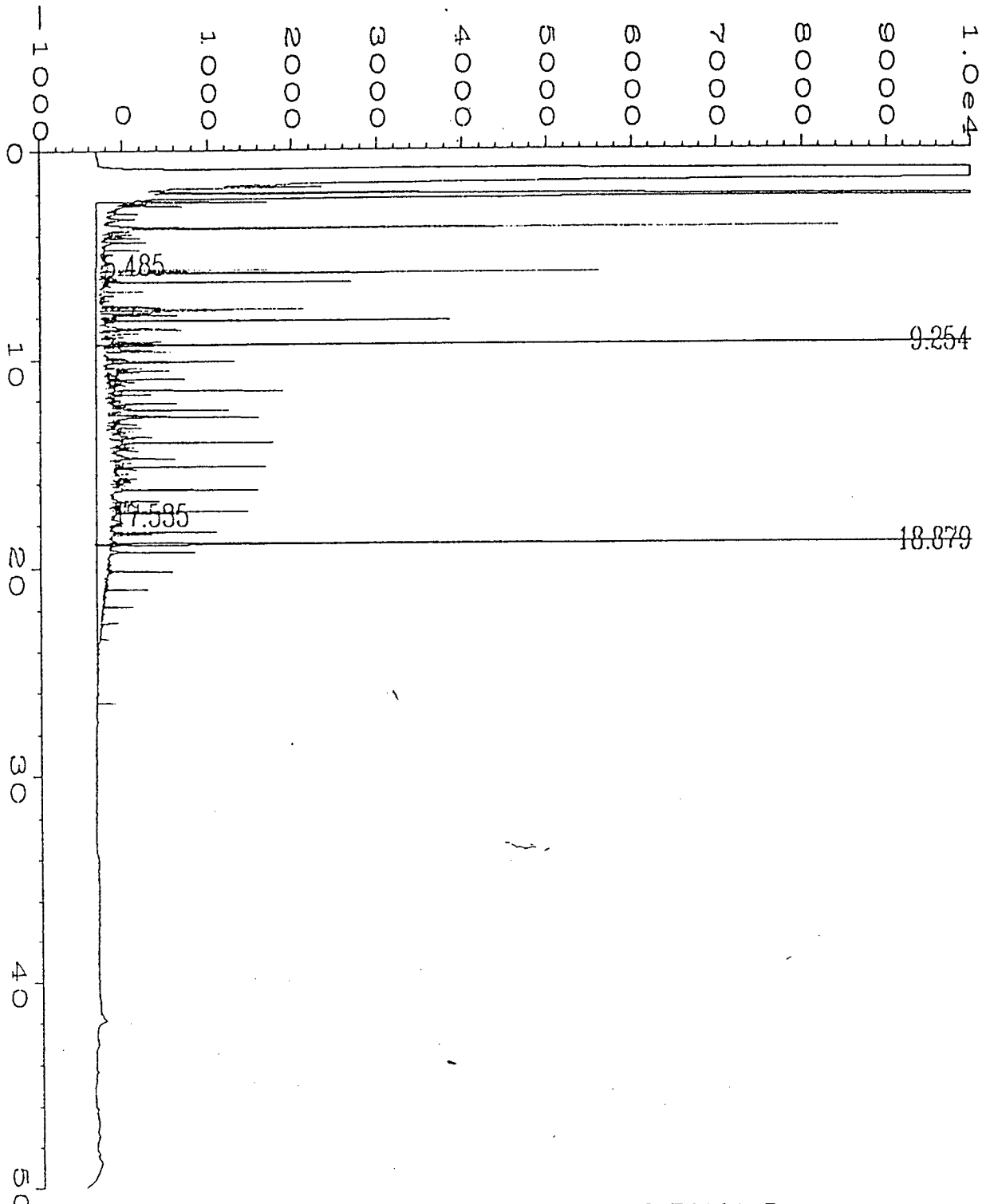
Data File Name	: F:\DATA\FUELS\DEEMTER\D\960415\051R0101.D		
Operator	: FUELS	Page Number	: 1
Instrument	: DEEMTER	Vial Number	: 51
Sample Name	: dg 150	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 15 Apr 96 01:27 PM	Instrument Method	: OHCID.MTH
Report Created on	: 15 Apr 96 02:34 PM	Analysis Method	: OR-HCID.MTH
Last Recalib on	: 27 MAR 96 01:51 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



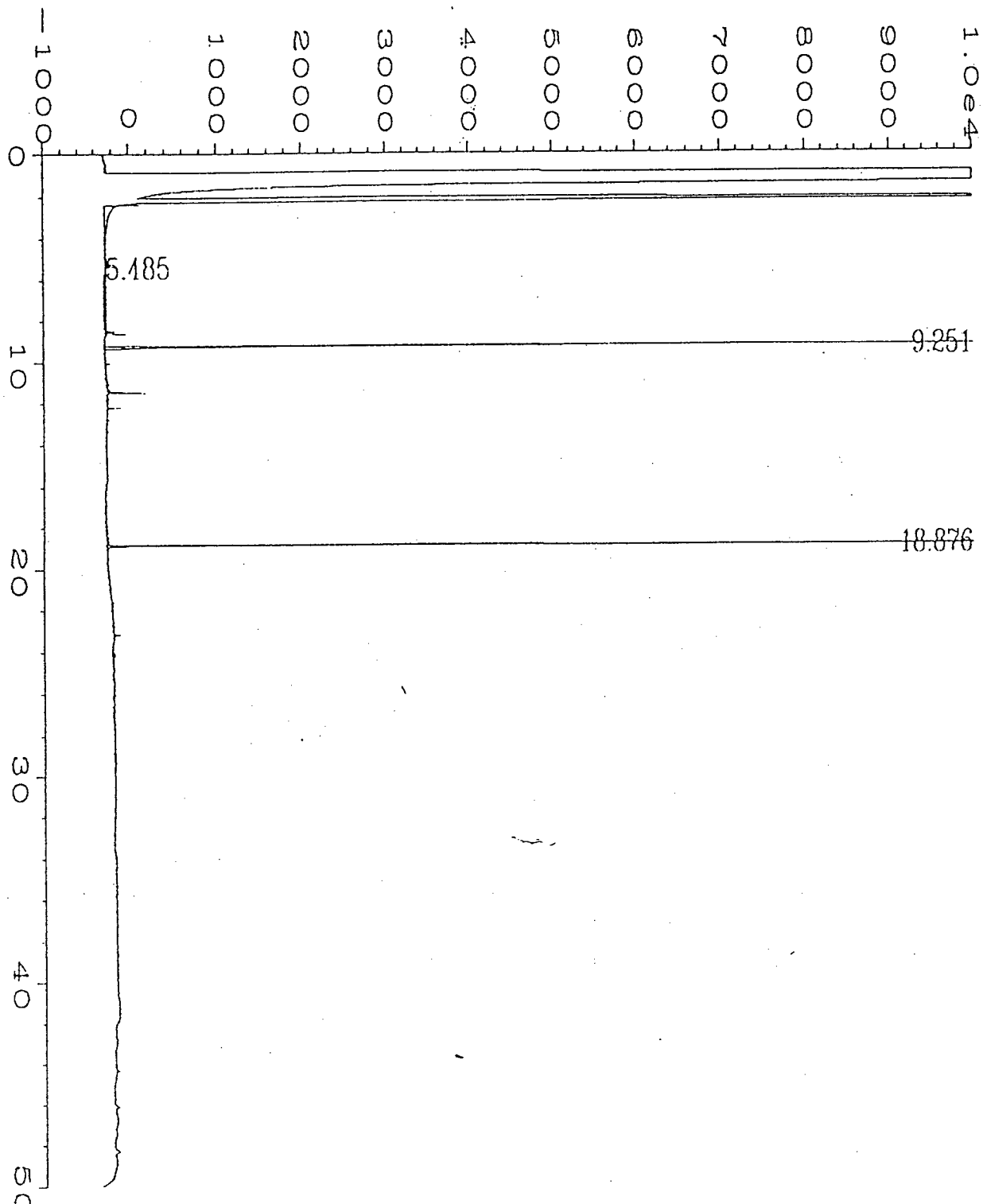
Data File Name	: F:\DATA\FUELS\DEEMTER\D\960415\052R0101.D		
Operator	: FUELS	Page Number	: 1
Instrument	: DEEMTER	Vial Number	: 52
Sample Name	: mb 4-15	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 15 Apr 96 04:06 PM	Instrument Method	: OHCID.MTH
Report Created on	: 16 Apr 96 07:17 AM	Analysis Method	: OR-HCID.MTH
Last Recalib on	: 27 MAR 96 01:51 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



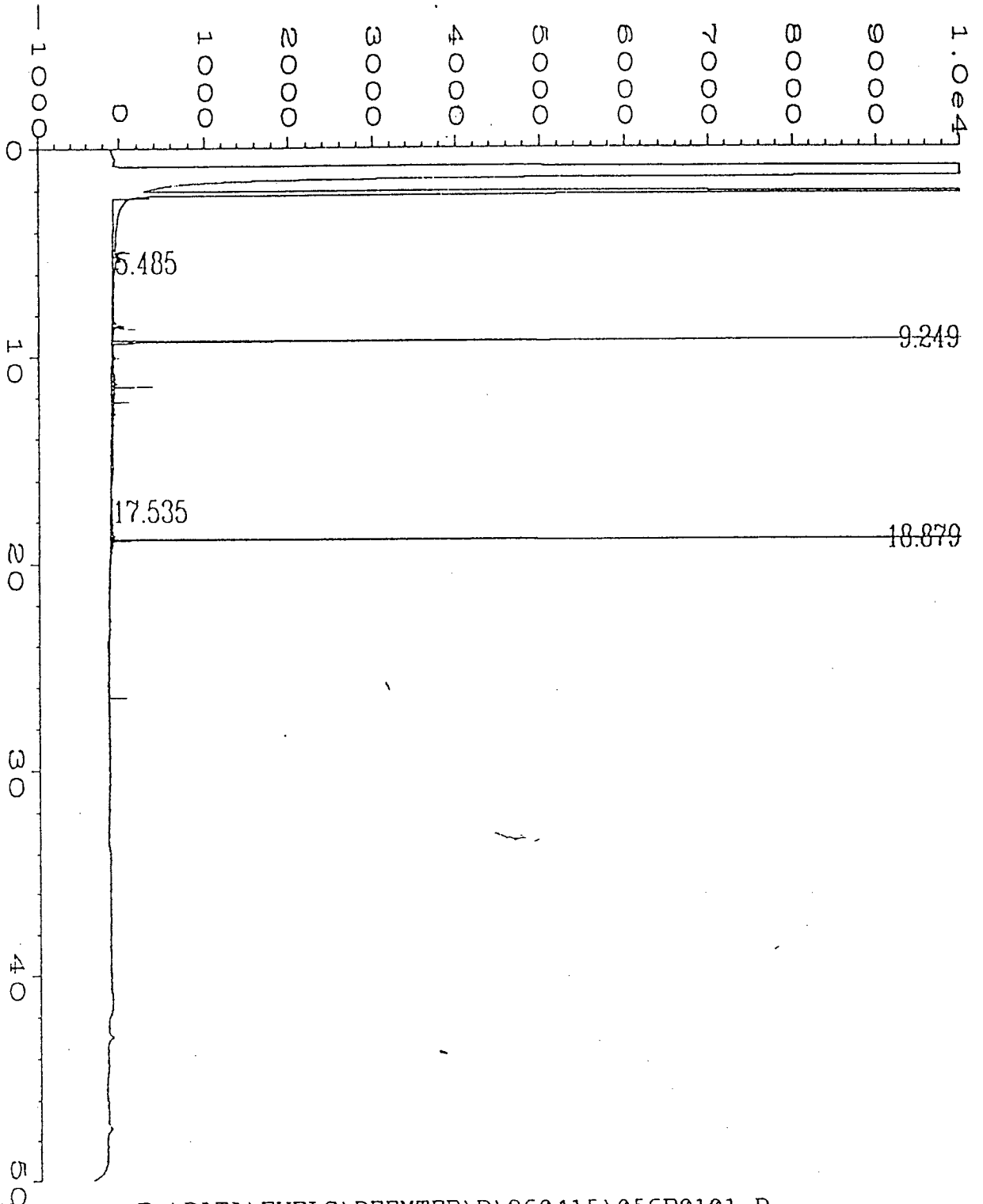
Data File Name	: F:\DATA\FUELS\DEEMTER\D\960415\053R0101.D		
Operator	: FUELS	Page Number	: 1
Instrument	: DEEMTER	Vial Number	: 53
Sample Name	: bs 4-15	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 15 Apr 96 04:57 PM	Instrument Method	: OHCID.MTH
Report Created on	: 16 Apr 96 07:19 AM	Analysis Method	: OR-HCID.MTH
Last Recalib on	: 27 MAR 96 01:51 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



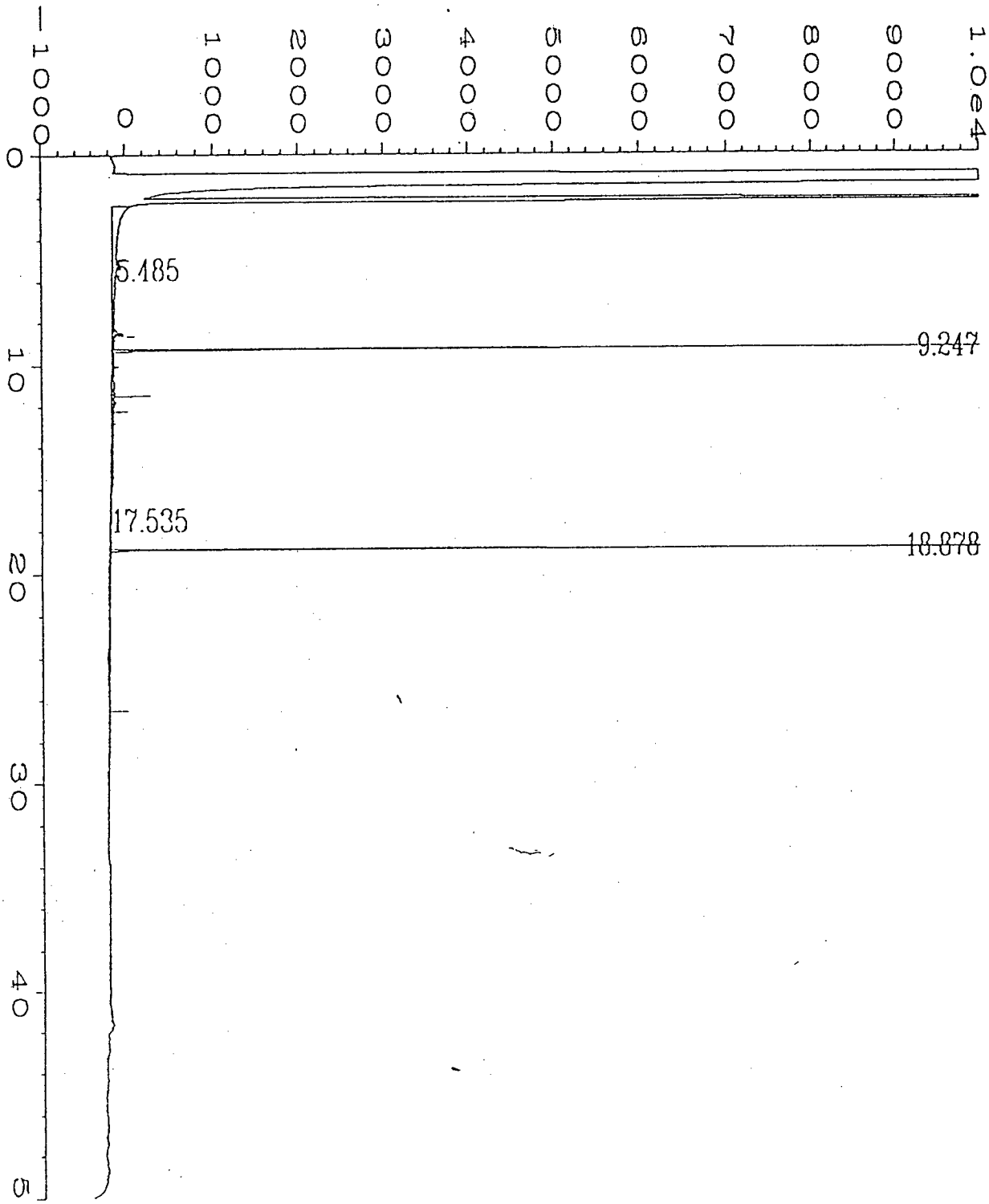
Data File Name	: F:\DATA\FUELS\DEEMTER\D\960415\054R0101.D		
Operator	: FUELS	Page Number	: 1
Instrument	: DEEMTER	Vial Number	: 54
Sample Name	: bsd 4-15	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 15 Apr 96 06:02 PM	Instrument Method	: OHCID.MTH
Report Created on	: 16 Apr 96 07:20 AM	Analysis Method	: OR-HCID.MTH
Last Recalib on	: 27 MAR 96 01:51 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



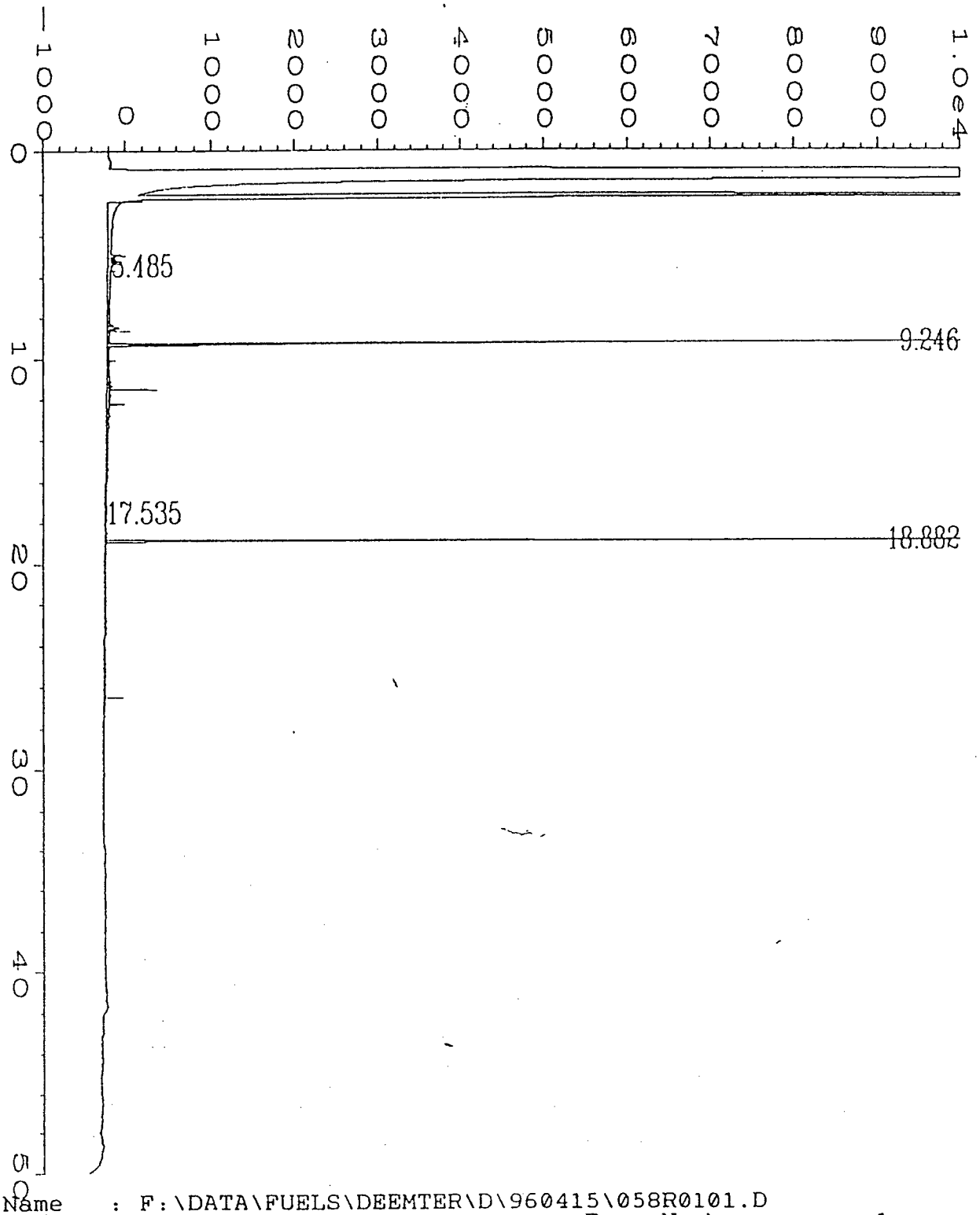
Data File Name	: F:\DATA\FUELS\DEEMTER\D\960415\055R0101.D		
Operator	: FUELS	Page Number	: 1
Instrument	: DEEMTER	Vial Number	: 55
Sample Name	: 604553-1	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 15 Apr 96 07:07 PM	Instrument Method	: OHCID.MTH
Report Created on	: 16 Apr 96 07:21 AM	Analysis Method	: OR-HCID.MTH
Last Recalib on	: 27 MAR 96 01:51 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



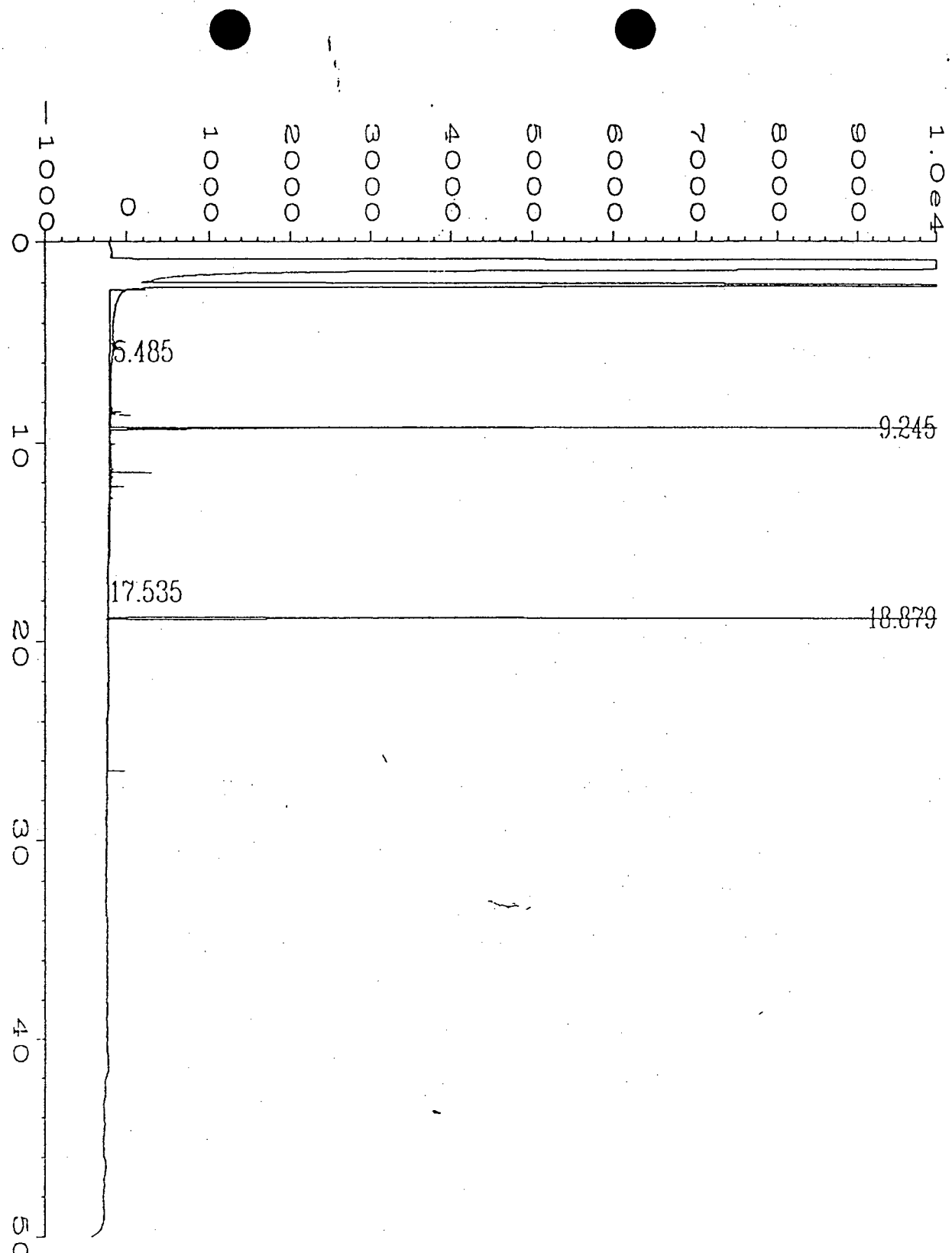
Data File Name	: F:\DATA\FUELS\DEEMTER\D\960415\056R0101.D		
Operator	: FUELS	Page Number	: 1
Instrument	: DEEMTER	Vial Number	: 56
Sample Name	: 604553-2	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 15 Apr 96 08:12 PM	Instrument Method	: OHCID.MTH
Report Created on	: 16 Apr 96 07:22 AM	Analysis Method	: OR-HCID.MTH
Last Recalib on	: 27 MAR 96 01:51 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



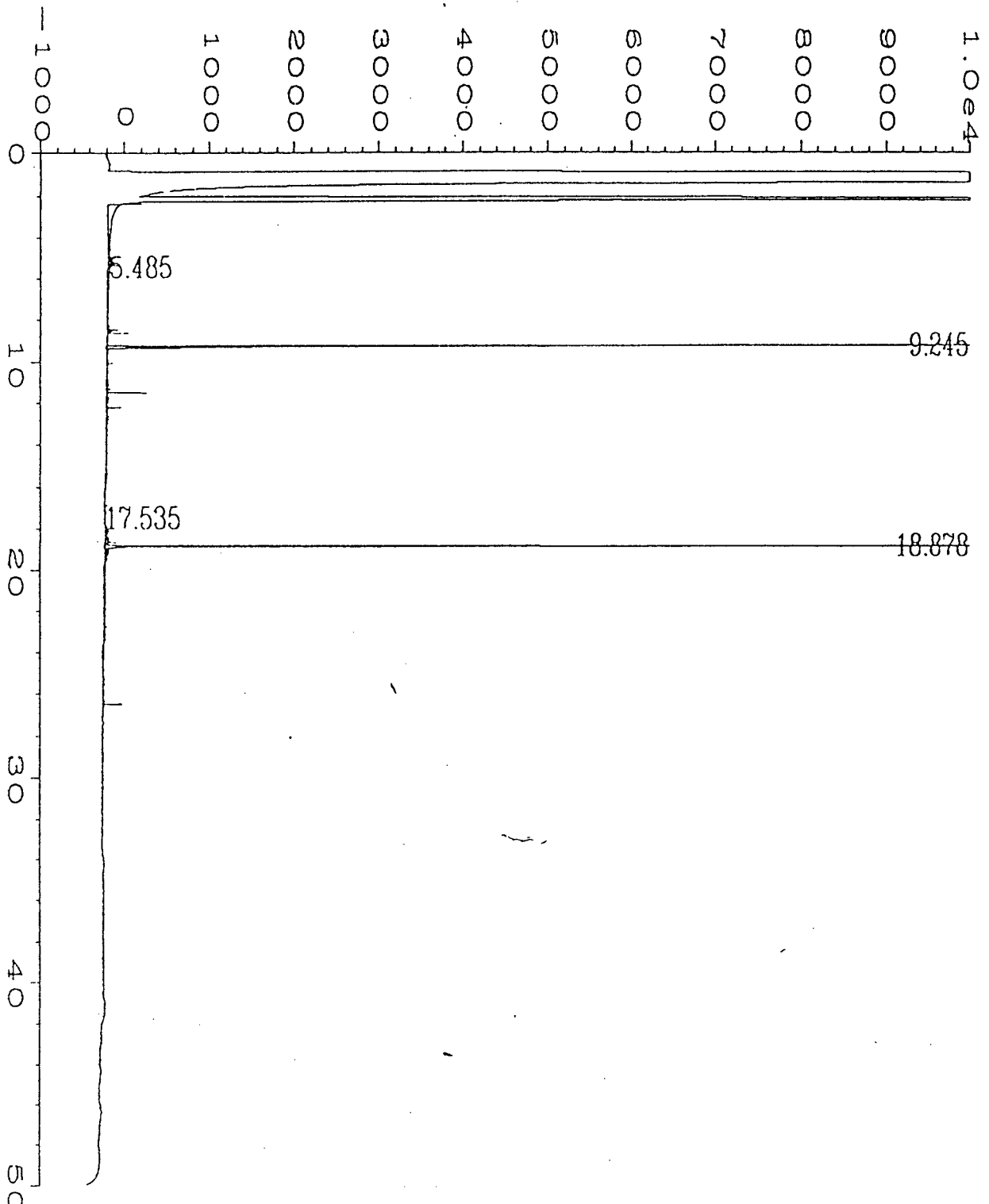
Data File Name	: F:\DATA\FUELS\DEEMTER\D\960415\057R0101.D		
Operator	: FUELS	Page Number	: 1
Instrument	: DEEMTER	Vial Number	: 57
Sample Name	: 604553-3	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 15 Apr 96 09:22 PM	Instrument Method	: OHCID.MTH
Report Created on	: 16 Apr 96 07:22 AM	Analysis Method	: OR-HCID.MTH
Last Recalib on	: 27 MAR 96 01:51 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



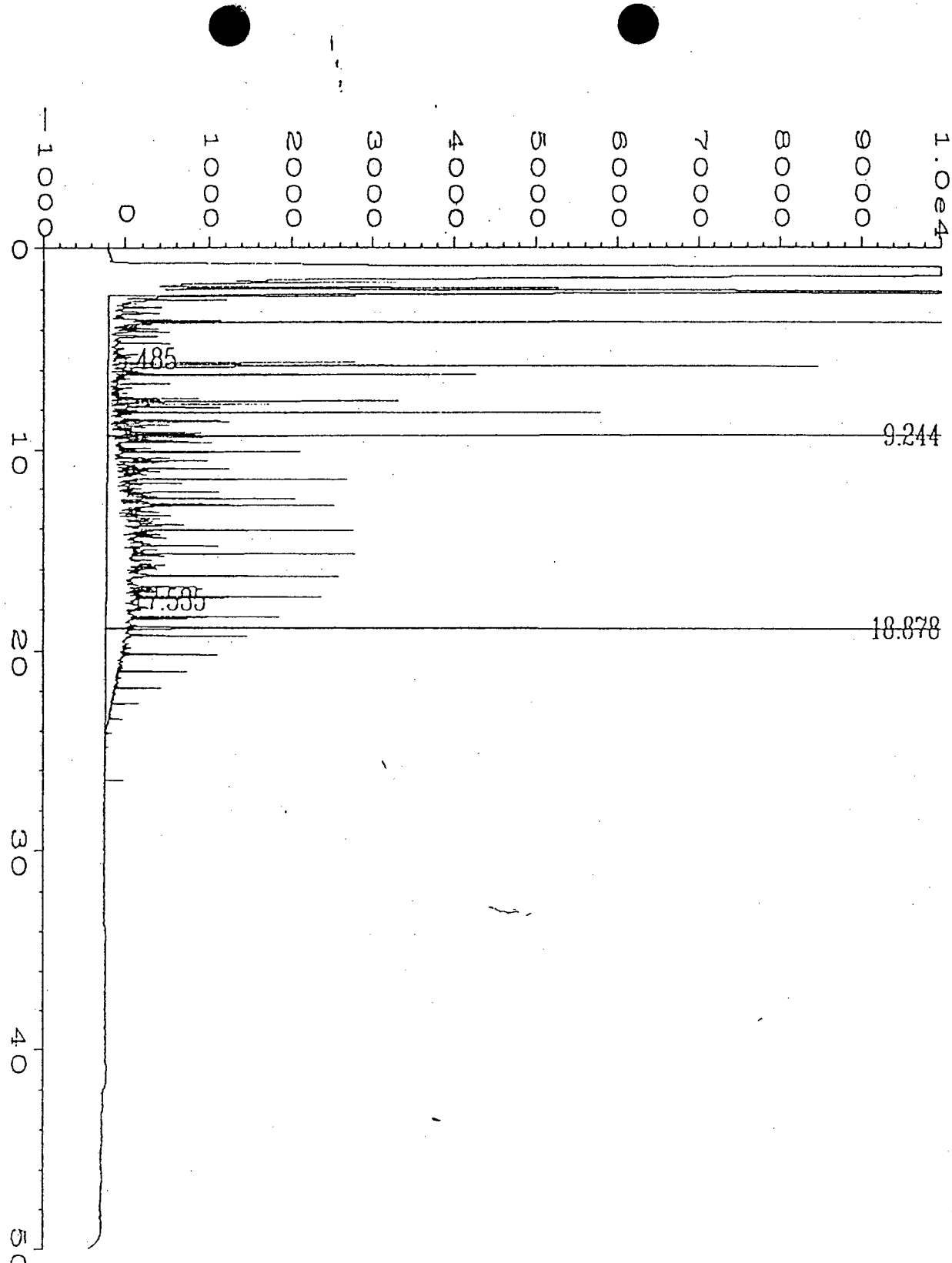
Data File Name	: F:\DATA\FUELS\DEEMTER\D\960415\058R0101.D		
Operator	: FUELS	Page Number	: 1
Instrument	: DEEMTER	Vial Number	: 58
Sample Name	: 604553-4	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 15 Apr 96 10:35 PM	Instrument Method	: OHCID.MTH
Report Created on	: 16 Apr 96 07:23 AM	Analysis Method	: OR-HCID.MTH
Last Recalib on	: 27 MAR 96 01:51 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



Data File Name	: F:\DATA\FUELS\DEEMTER\D\960415\059R0101.D		
Operator	: FUELS	Page Number	: 1
Instrument	: DEEMTER	Vial Number	: 59
Sample Name	: 604553-5	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 15 Apr 96 11:47 PM	Instrument Method	: OHCID.MTH
Report Created on	: 16 Apr 96 07:24 AM	Analysis Method	: OR-HCID.MTH
Last Recalib on	: 27 MAR 96 01:51 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



Data File Name	: F:\DATA\FUELS\DEEMTER\D\960415\060R0101.D		
Operator	: FUELS	Page Number	: 1
Instrument	: DEEMTER	Vial Number	: 60
Sample Name	: 604553-6	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 16 Apr 96 01:01 AM	Instrument Method	: OHCID.MTH
Report Created on	: 16 Apr 96 07:25 AM	Analysis Method	: OR-HCID.MTH
Last Recalib on	: 27 MAR 96 01:51 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



Data File Name	: F:\DATA\FUELS\DEEMTER\D\960415\061R0101.D		
Operator	: FUELS	Page Number	: 1
Instrument	: DEEMTER	Vial Number	: 61
Sample Name	: dg 150	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 16 Apr 96 02:14 AM	Instrument Method	: OHCID.MTH
Report Created on	: 16 Apr 96 07:26 AM	Analysis Method	: OR-HCID.MTH
Last Recalib on	: 27 MAR 96 01:51 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

Analytical Technologies, Inc.

17400 S.W. Upper Boones Ferry Rd., Suite 270
Durham, Oregon 97224 • (503) 684-0447 FAX: (503) 620-0393

DATE 4-11 PAGE 1 OF 1

Chain of Custody

LABORATORY NUMBER: 604553
PROJECT NOTICE NUMBER:

PROJECT MANAGER: Marsi Beeson
COMPANY: GEI
ADDRESS:
PHONE: 624-9274 SAMPLED BY: MB2

SAMPLE DISPOSAL INSTRUCTIONS

☐ ATI Disposal @ $5.00 each ☐ Return

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	PETROLEUM HYDROCARBONS: TPH-HCID	TPH-G	TPH-D	418.1	EPA 418.1	8015M	8020M-BETX only	8310 HPLC PAHs	7421 Lead	% Moisture	ORGANICS: 8010 Halogenated VOCs	8020 Aromatic VOCs	8040 Phenols	8240 GC/MS Volatiles	8270 GC/MS Semivolatiles	8080 OC Pesticides/PCBs	8080M PCBs only	INORGANICS: Drinking Water (8)	Priority Pollutant Metals (13)	Cyanide	TCLP: TCLP Metals (8)	TCLP Volatiles 8240 ZH-EXT	TCLP Semivolatiles 8270	OTHER	NUMBER OF CONTAINERS
MW-6-20.0	4-6-96	1010	SOIL	1	X																								1
MW-6-25.0	4-6-96	1020		2	X																								1
MW-7-20.0	4-6-96	1325		3	X																								1
MW-7-25.0	4-6-96	1335		4	X																								1
MW-8-17.5	4-6-96	1535		5	X																								1
MW-8-22.5	4-6-96	1545		6	X																								1

State: (OR) WA

PROJECT INFORMATION

PROJECT NUMBER: 4326-001-62
PROJECT NAME: Rose's Parking Lot
PURCHASE ORDER NUMBER:
ONGOING PROJECT? YES ☒ NO ☐

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS	6
COC SEALS/INTACT? Y \ N \ NA	
RECEIVED INTACT? Y \ N	
RECEIVED COLD? Y \ N	

PRIOR AUTHORIZATION REQUIRED FOR RUSH PROJECTS

TAT: (NORMAL) ☒ 2 WKS (RUSH) ☐ 24 HR ☐ 48 HRS ☐ 72 HRS ☐ 1 WK

GREATER THAN 24 HR. NOTICE? YES ☐ NO ☒ (LAB USE ONLY)

SPECIAL INSTRUCTIONS:
Please run appropriate follow-up analyses IF TPH is detected.

Received via:

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY 3.
Signature: Marsi Beeson Time: 1300	Signature Time:	Signature Time:
Printed Name: Marsi Beeson Date: 4-11	Printed Name: Date:	Printed Name: Date:
Company: GeoEngineers	Company:	Company:
RECEIVED BY: 1.	**RECEIVED BY: 2.**	**RECEIVED BY: (LAB) 3.**
Signature: Jenna Gorham Time: 1300	Signature Time:	Signature Time:
Printed Name: Jenna Gorham Date: 4/11/96	Printed Name: Date:	Printed Name: Date:
Company: AEN	Company:	Analytical Technologies, Inc.

Analytical**Technologies,**Inc.

17400 S.W. Upper Boones Ferry Road, Suite 270 Durham, OR. 97224
(503) 684-0447 (503) 620-0393 (FAX)

ATI I.D. 604539

April 17, 1996

Marsi Beeson
GeoEngineers
7504 SW Bridgeport Rd.
Portland, OR 97224

Project Name / Number: Rose's Parking / 4326-001-P62

Attention: Marsi Beeson

On April 8, 1996, American Environmental Network (OR), Inc. received seven water samples for analysis for the above listed project. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed. The results from these samples relate only to the items tested. This report shall not be reproduced, except in full, without the written approval of the laboratory.

If you have any questions or comments, please do not hesitate to contact us at (503)684-0447.

Natasha Schaefer
Project Manager

Steven E. Stanley
Laboratory Manager

SES:alm
Enclosure

Analytical Technologies, Inc.

SAMPLE CROSS REFERENCE SHEET

CLIENT:	GeoEngineers, Inc.	AEN I.D.:	604539
PROJECT #:	4326-001-62		
PROJECT NAME:	Rose's Parking Lot	MATRIX:	WATER

AEN #	CLIENT DESCRIPTION	DATE SAMPLED
604539-1	MW-2-4-8-96	4/08/96
604539-2	MW-3-4-8-96	4/08/96
604539-3	MW-4-4-8-96	4/08/96
604539-4	MW-5-4-8-96	4/08/96
604539-5	MW-6-4-8-96	4/08/96
604539-6	MW-7-4-8-96	4/08/96
604539-7	MW-8-4-8-96	4/08/96

----------TOTALS----------

MATRIX	# SAMPLES
WATER	7

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of the report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical Technologies, Inc.

ANALYTICAL SCHEDULE

CLIENT:	GeoEngineers, Inc.	AEN I.D.:	604539
PROJECT #:	4326-001-62		
PROJECT NAME:	Rose's Parking Lot		

ANALYSIS	TECHNIQUE	REFERENCE	LAB
BETX	GC/PID	EPA 8020M	PLD
Petroleum Hydrocarbon	IR	EPA 418.1	PLD
EDB/EDC	GC/ELCD	EPA 8010M	PLD
Dissolved Lead	AA/GF	EPA 7421	PLD

PLD = AEN - Portland
R = ATI - Renton
PHX = AEN - Phoenix
PNR = AEN - Pensacola
FC = ATI - Fort Collins
SUB = Subcontract

AnalyticalTechnologies,Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	604539-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	N/A
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	N/A
PROJECT #:	4326-001-62	**DATE ANALYZED:**	04/09/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		RESULTS
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5
SURROGATE:		
TRIFLUOROTOLUENE (81%-116%)		93%

Analyst: CS 4/10/96

Reviewer: JAK 4/11/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	604539-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	N/A
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	N/A
PROJECT #:	4326-001-62	**DATE ANALYZED:**	04/10/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS	
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5

SURROGATE:	
TRIFLUOROTOLUENE (81%-116%)	93%

Analyst: JK 4/11/96

Reviewer: CS 4/11/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	604539-1
CLIENT I.D.:	MW-2-4-8-96	**DATE SAMPLED:**	04/08/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	04/08/96
PROJECT #:	4326-001-62	**DATE ANALYZED:**	04/09/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		RESULTS
BENZENE		4.0
TOLUENE	<	0.5
ETHYLBENZENE		0.7
TOTAL XYLENES		2.1
SURROGATE:		
TRIFLUOROTOLUENE (81%-116%)		95%

Analyst: CS 4/11/96

Reviewer: JK 4/11/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	604539-2
CLIENT I.D.:	MW-3-4-8-96	**DATE SAMPLED:**	04/08/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	04/08/96
PROJECT #:	4326-001-62	**DATE ANALYZED:**	04/09/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		RESULTS
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5

SURROGATE:	
TRIFLUOROTOLUENE (81%-116%)	96%

Analyst: CS 4/10/96

Reviewer: JLC 4/11/96

Analytical**Technologies**, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	604539-3
CLIENT I.D.:	MW-4-4-8-96	**DATE SAMPLED:**	04/08/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	04/08/96
PROJECT #:	4326-001-62	**DATE ANALYZED:**	04/09/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		RESULTS
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5

SURROGATE:	
TRIFLUOROTOLUENE (81%-116%)	95%

Analyst: CS 4/10/96

Reviewer: JJE 4/11/96

AnalyticalTechnologies,Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	604539-4
CLIENT I.D.:	MW-5-4-8-96	**DATE SAMPLED:**	04/08/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	04/08/96
PROJECT #:	4326-001-62	**DATE ANALYZED:**	04/09/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		RESULTS
BENZENE	<	0.5
TOLUENE		0.6
ETHYLBENZENE	<	0.5
TOTAL XYLENES		4.4
SURROGATE:		
TRIFLUOROTOLUENE (81%-116%)		92%

Analyst: CS 4/10/96

Reviewer: JMC 4/11/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	604539-5
CLIENT I.D.:	MW-6-4-8-96	**DATE SAMPLED:**	04/08/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	04/08/96
PROJECT #:	4326-001-62	**DATE ANALYZED:**	04/09/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		RESULTS
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5

SURROGATE:	
TRIFLUOROTOLUENE (81%-116%)	96%

Analyst: CS 4/10/96

Reviewer: JK 4/11/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	604539-6
CLIENT I.D.:	MW-7-4-8-96	**DATE SAMPLED:**	04/08/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	04/08/96
PROJECT #:	4326-001-62	**DATE ANALYZED:**	04/09/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		RESULTS
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5

SURROGATE:	
TRIFLUOROTOLUENE (81%-116%)	96%

Analyst: CS 4/10/96

Reviewer: JK 4/11/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**AEN I.D.:**	604539-7
CLIENT I.D.:	MW-8-4-8-96	**DATE SAMPLED:**	04/08/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	04/08/96
PROJECT #:	4326-001-62	**DATE ANALYZED:**	04/10/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		RESULTS
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5

SURROGATE:	
TRIFLUOROTOLUENE (81%-116%)	102%

Analyst: JK 4/11/96

Reviewer: CS 4/11/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY SPIKE RESULTS

METHOD:	BETX (EPA 8020M)	AEN ID:	604539
CLIENT:	GeoEngineers, Inc.	QC SAMPLE:	604533-2
PROJECT #:	4326-001-62	DATE ANALYZED:	04/09/96
PROJECT NAME:	Rose's Parking Lot	DILUTION FACTOR:	1
SAMPLE MATRIX:	WATER	UNITS:	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<	0.5	20.0	18.9	95	18.3	92	3
TOLUENE	<	0.5	20.0	20.1	101	19.6	98	3
ETHYLBENZENE	<	0.5	20.0	20.1	101	19.6	98	3
TOTAL XYLENES	<	0.5	40.0	40.0	100	39.2	98	2
SURROGATE:								
TRIFLUOROTOLUENE (81% - 116%)					92%		90%	

CONTROL LIMITS

	% REC	RPD
BENZENE	77-131	20
TOLUENE	79-125	20
ETHYLBENZENE	76-124	20
TOTAL XYLENES	74-127	20

Analyst: CS 4/10/96

Reviewer: JMC 4/11/96

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY SPIKE RESULTS

METHOD:	BETX (EPA 8020M)	**AEN ID:**	604539
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	604539-7
PROJECT #:	4326-001-62	**DATE ANALYZED:**	04/10/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<	0.5	20.0	18.5	93	19.0	95	3
TOLUENE	<	0.5	20.0	18.3	92	18.9	95	3
ETHYLBENZENE	<	0.5	20.0	18.5	93	19.3	97	4
TOTAL XYLENES	<	0.5	40.0	36.7	92	38.0	95	3
SURROGATE:								
TRIFLUOROTOLUENE (81% - 116%)					98%		96%	

CONTROL LIMITS

	% REC	RPD
BENZENE	77-131	20
TOLUENE	79-125	20
ETHYLBENZENE	76-124	20
TOTAL XYLENES	74-127	20

Analyst: JHC 4/11/96

Reviewer: CS 4/11/96

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY SPIKE RESULTS

METHOD:	BETX (EPA 8020M)	**AEN ID:**	604539
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	Method Blank
PROJECT #:	4326-001-62	**DATE ANALYZED:**	04/09/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<	0.5	20.0	18.7	94	18.6	93	1
TOLUENE	<	0.5	20.0	20.1	101	19.5	98	3
ETHYLBENZENE	<	0.5	20.0	20.3	102	19.7	99	3
TOTAL XYLENES	<	0.5	40.0	40.1	100	39.3	98	2
SURROGATE:								
TRIFLUOROTOLUENE (81% - 116%)					97%		93%	

CONTROL LIMITS

	% REC	RPD
BENZENE	85-118	20
TOLUENE	85-119	20
ETHYLBENZENE	85-120	20
TOTAL XYLENES	85-120	20

Analyst: CS 4/10/96

Reviewer: JMC 4/11/96

AnalyticalTechnologies,Inc.

GAS CHROMATOGRAPHY SPIKE RESULTS

METHOD:	BETX (EPA 8020M)	AEN ID:	604539
CLIENT:	GeoEngineers, Inc.	QC SAMPLE:	Method Blank
PROJECT #:	4326-001-62	DATE ANALYZED:	04/11/96
PROJECT NAME:	Rose's Parking Lot	DILUTION FACTOR:	1
SAMPLE MATRIX:	WATER	UNITS:	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<	0.5	20.0	17.9	90	17.9	90	0
TOLUENE	<	0.5	20.0	18.2	91	18.1	91	1
ETHYLBENZENE	<	0.5	20.0	18.7	94	18.2	91	3
TOTAL XYLENES	<	0.5	40.0	36.5	91	36.2	91	1
SURROGATE:								
TRIFLUOROTOLUENE (81% - 116%)					95%		91%	

CONTROL LIMITS

	% REC	RPD
BENZENE	85-118	20
TOLUENE	85-119	20
ETHYLBENZENE	85-120	20
TOTAL XYLENES	85-120	20

Analyst: JMC 4/11/96

Reviewer: CS 4/11/96

Analytical**Technologies,**Inc.

CASE NARRATIVE
Accession #604539
EPA-418.1

One liter of sample is extracted with 1,1,2-trichloro-1,2,2-trifluoroethane (Freon-113) by EPA method 3510. The final volume is 50.0 milliliters.

The extracts are analyzed using an infrared spectrophotometer, scanning at approximately 2930 cm^{-1}. At least five point calibration curves are used for quantitation.

The BS and BSD had petroleum hydrocarbon results of 5.1 mg/L and 6.9 mg/L respectively. The Blank Spike recovery was 51% (below established control limits of 64-108). The RPD of the BS/BSD was 30. This is above the established control limit of 20. The Blank Spike recovery and RPD are "H" flagged, indicating out of limits. The matrix spikes met all criteria and are reported along with the blank spikes.

Patti Karaim

Analytical**Technologies,**Inc.

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**AEN I.D.:**	604539-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	N/A
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	N/A
PROJECT #:	4326-001-62	**DATE EXTRACTED:**	04/08/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	04/08/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	< 0.5

Analyst: PK 4-10-96

Reviewer: JK 4/10/96

Analytical Technologies, Inc.

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	AEN I.D.:	604539-5
CLIENT I.D.:	MW-6-4-8-96	DATE SAMPLED:	04/08/96
CLIENT:	GeoEngineers, Inc.	DATE RECEIVED:	04/08/96
PROJECT #:	4326-001-62	DATE EXTRACTED:	04/08/96
PROJECT NAME:	Rose's Parking Lot	DATE ANALYZED:	04/08/96
SAMPLE MATRIX:	WATER	DILUTION FACTOR:	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	< 0.5

Analyst: PK 4-10-96

Reviewer: JK 4/10/96

Analytical**Technologies,**Inc.

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**AEN I.D.:**	604539-6
CLIENT I.D.:	MW-7-4-8-96	**DATE SAMPLED:**	04/08/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	04/08/96
PROJECT #:	4326-001-62	**DATE EXTRACTED:**	04/08/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	04/08/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	< 0.5

Analyst: PK 4-10-96

Reviewer: JK 4/10/96

Analytical**Technologies,**Inc.

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**AEN I.D.:**	604539-7
CLIENT I.D.:	MW-8-4-8-96	**DATE SAMPLED:**	04/08/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	04/08/96
PROJECT #:	4326-001-62	**DATE EXTRACTED:**	04/08/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	04/08/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	< 0.5

Analyst: PK 4-10-96

Reviewer: JK 4/10/96

AnalyticalTechnologies, Inc.

INFRARED SPECTROPHOTOMETRY SPIKE RESULTS

		AEN ACCESSION:	604539
METHOD:	EPA - 418.1	QC SAMPLE:	604533-2
CLIENT:	GeoEngineers, Inc.	DATE EXTRACTED:	04/08/96
PROJECT #:	4326-001-62	DATE ANALYZED:	04/08/96
PROJECT NAME:	Rose's Parking Lot	DILUTION FACTOR:	1
SAMPLE MATRIX:	WATER	UNITS:	mg/L

PARAMETER	SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
3-Component Oil	< 0.5	10.0	7.7	77	7.8	78	1

CONTROL LIMITS

	%REC	RPD
3-Component Oil	61 - 109	20

Analyst: PK 4-10-96

Reviewer: HK 4/10/96

Analytical Technologies, Inc.

INFRARED SPECTROPHOTOMETRY SPIKE RESULTS

		AEN ACCESSION:	604539
METHOD:	EPA - 418.1	QC SAMPLE:	Method Blank
CLIENT:	GeoEngineers, Inc.	DATE EXTRACTED:	04/08/96
PROJECT #:	4326-001-62	DATE ANALYZED:	04/08/96
PROJECT NAME:	Rose's Parking Lot	DILUTION FACTOR:	1
SAMPLE MATRIX:	WATER	UNITS:	mg/L

PARAMETER	SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
3-Component Oil	< 0.5	10.0	5.1	51 H	6.9	69	30 H

CONTROL LIMITS

	%REC	RPD
3-Component Oil	64 - 108	20

H = Out of Limits

Analyst: PK 4-10-96

Reviewer: JK 4/10/96

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

TEST:	EDB/EDC (EPA 8010M)	AEN I.D.:	604539-0
CLIENT I.D.:	Method Blank	DATE SAMPLED:	N/A
CLIENT:	GeoEngineers, Inc.	DATE RECEIVED:	N/A
PROJECT #:	4326-001-62	DATE ANALYZED:	04/10/96
PROJECT NAME:	Rose's Parking Lot	DILUTION FACTOR:	1
SAMPLE MATRIX:	WATER	UNITS:	ug/L

PARAMETER	RESULTS
1,2-DIBROMOETHANE (EDB)	< 0.5
1,2-DICHLOROETHANE (EDC)	< 0.2
SURROGATE:	
BROMOFLUOROBENZENE (69% - 121%)	93%

Analyst: MB 4/11/96

Reviewer: LD 4/12/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST:	EDB/EDC (EPA 8010M)	AEN I.D.:	604539-5
CLIENT I.D.:	MW-6-4-8-96	DATE SAMPLED:	04/08/96
CLIENT:	GeoEngineers, Inc.	DATE RECEIVED:	04/08/96
PROJECT #:	4326-001-62	DATE ANALYZED:	04/10/96
PROJECT NAME:	Rose's Parking Lot	DILUTION FACTOR:	1
SAMPLE MATRIX:	WATER	UNITS:	ug/L

PARAMETER	RESULTS
1,2-DIBROMOETHANE (EDB)	< 0.5
1,2-DICHLOROETHANE (EDC)	< 0.2
SURROGATE:	
BROMOFLUOROBENZENE (69% - 121%)	95%

Analyst: MB 4/11/96

Reviewer: io 4/12/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST:	EDB/EDC (EPA 8010M)	**AEN I.D.:**	604539-6
CLIENT I.D.:	MW-7-4-8-96	**DATE SAMPLED:**	04/08/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	04/08/96
PROJECT #:	4326-001-62	**DATE ANALYZED:**	04/10/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS
1,2-DIBROMOETHANE (EDB)	< 0.5
1,2-DICHLOROETHANE (EDC)	< 0.2
SURROGATE:	
BROMOFLUOROBENZENE (69% - 121%)	93%

Analyst: MB 4/11/96

Reviewer: CO 4/12/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST:	EDB/EDC (EPA 8010M)	AEN I.D.:	604539-7
CLIENT I.D.:	MW-8-4-8-96	DATE SAMPLED:	04/08/96
CLIENT:	GeoEngineers, Inc.	DATE RECEIVED:	04/08/96
PROJECT #:	4326-001-62	DATE ANALYZED:	04/10/96
PROJECT NAME:	Rose's Parking Lot	DILUTION FACTOR:	1
SAMPLE MATRIX:	WATER	UNITS:	ug/L

PARAMETER	RESULTS
1,2-DIBROMOETHANE (EDB)	< 0.5
1,2-DICHLOROETHANE (EDC)	< 0.2
SURROGATE:	
BROMOFLUOROBENZENE (69% - 121%)	93%

Analyst: MLB 4/11/96

Reviewer: LO 4/12/96

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY SPIKE RESULTS

TEST:	EDB/EDC (EPA 8010M)	**AEN I.D.:**	604539
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	604539-5
PROJECT #:	4326-001-62	**DATE ANALYZED:**	04/10/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
1,2-DIBROMOETHANE	<	0.5	5.0	5.1	102	5.6	112	9
1,2-DICHLOROETHANE	<	0.2	5.0	5.2	104	5.4	108	4
SURROGATE:								
BROMOFLUOROBENZENE (69% - 121%)					98%		99%	

CONTROL LIMITS

	% REC	RPD
1,2-DIBROMOETHANE (EDB)	68% - 133%	21
1,2-DICHLOROETHANE (EDC)	64% - 143%	25

Analyst: MB 4/11/96

Reviewer: LD 4/12/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY BLANK SPIKE RESULTS

TEST:	EDB/EDC (EPA 8010M)	AEN I.D.:	604539
CLIENT:	GeoEngineers, Inc.	QC SAMPLE:	Method Blank
PROJECT #:	4326-001-62	DATE ANALYZED:	04/10/96
PROJECT NAME:	Rose's Parking Lot	DILUTION FACTOR:	1
SAMPLE MATRIX:	WATER	UNITS:	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
1,2-DIBROMOETHANE	<	0.5	5.0	5.1	102	4.9	98	4
1,2-DICHLOROETHANE	<	0.2	5.0	5.4	108	5.2	104	4
SURROGATE:								
BROMOFLUOROBENZENE (69% - 121%)					98%		95%	

CONTROL LIMITS

	% REC	RPD
1,2-DIBROMOETHANE (EDB)	78% - 120%	20
1,2-DICHLOROETHANE (EDC)	79% - 129%	20

Analyst: NLB 4/11/96

Reviewer: JO 4/12/96

Analytical**Technologies,**Inc.

DISSOLVED METALS RESULTS

CLIENT I.D.:	Method Blank	AEN I.D.:	604539-0
CLIENT:	GeoEngineers, Inc.	DATE SAMPLED:	NA
PROJECT #:	4326-001-62	DATE RECEIVED:	NA
PROJECT NAME:	Rose's Parking Lot	DATE DIGESTED:	04/09/96
SAMPLE MATRIX:	WATER	DATE ANALYZED:	04/09/96
		DILUTION FACTOR:	1
		UNITS:	mg/L

PARAMETER	RESULTS	METHOD
LEAD	< 0.002	7421

Analyst: KFL 4/10/96

Reviewer: KS 4/11/96

Analytical**Technologies,**Inc.

DISSOLVED METALS RESULTS

CLIENT I.D.:	MW-6-4-8-96	AEN I.D.:	604539-5
CLIENT:	GeoEngineers, Inc.	DATE SAMPLED:	04/08/96
PROJECT #:	4326-001-62	DATE RECEIVED:	04/08/96
PROJECT NAME:	Rose's Parking Lot	DATE DIGESTED:	04/09/96
SAMPLE MATRIX:	WATER	DATE ANALYZED:	04/09/96
		DILUTION FACTOR:	1
		UNITS:	mg/L

PARAMETER	RESULTS	METHOD
LEAD	< 0.002	7421

Analyst: KFL 4/10/96

Reviewer: JS 4/11/96

Analytical**Technologies,**Inc.

DISSOLVED METALS RESULTS

CLIENT I.D.:	MW-7-4-8-96	**AEN I.D.:**	604539-6
CLIENT:	GeoEngineers, Inc.	**DATE SAMPLED:**	04/08/96
PROJECT #:	4326-001-62	**DATE RECEIVED:**	04/08/96
PROJECT NAME:	Rose's Parking Lot	**DATE DIGESTED:**	04/09/96
SAMPLE MATRIX:	WATER	**DATE ANALYZED:**	04/09/96
		DILUTION FACTOR:	1
		UNITS:	mg/L

PARAMETER	RESULTS	METHOD
LEAD	< 0.002	7421

Analyst: KFL 4/10/96

Reviewer: NS 4/11/96

Analytical**Technologies,**Inc.

DISSOLVED METALS RESULTS

CLIENT I.D.:	MW-8-4-8-96	AEN I.D.:	604539-7
CLIENT:	GeoEngineers, Inc.	DATE SAMPLED:	04/08/96
PROJECT #:	4326-001-62	DATE RECEIVED:	04/08/96
PROJECT NAME:	Rose's Parking Lot	DATE DIGESTED:	04/09/96
SAMPLE MATRIX:	WATER	DATE ANALYZED:	04/09/96
		DILUTION FACTOR:	1
		UNITS:	mg/L

PARAMETER	RESULTS	METHOD
LEAD	< 0.002	7421

Analyst: KFL 4/10/96

Reviewer: KS 4/11/96

Analytical Technologies, Inc.

METALS DUPLICATE RESULTS

METHOD:	7421	AEN I.D.:	604539
CLIENT:	GeoEngineers, Inc.	QC SAMPLE:	604527-8 (Total)
PROJECT #:	4326-001-62	DATE DIGESTED:	04/09/96
PROJECT NAME:	Rose's Parking Lot	DATE ANALYZED:	04/09/96
SAMPLE MATRIX:	WATER	DILUTION FACTOR:	1
		UNITS:	mg/L

PARAMETER	SAMPLE RESULT	DUPLICATE RESULT	RPD	RPD CONTROL LIMIT
LEAD	< 0.002	< 0.002	NA	20

Analyst: KFL 4/10/96

Reviewer: KS 4/11/96

Analytical Technologies, Inc.

METALS SPIKE RESULTS

METHOD:	7421	AEN I.D.:	604539
CLIENT:	GeoEngineers, Inc.	QC SAMPLE:	604527-8 (Total)
PROJECT #:	4326-001-62	DATE DIGESTED:	04/09/96
PROJECT NAME:	Rose's Parking Lot	DATE ANALYZED:	04/09/96
SAMPLE MATRIX:	WATER	DILUTION FACTOR:	1
		UNITS:	mg/L

PARAMETER	SAMPLE RESULT	SPIKE CONC	SPIKE RESULT	% RECOV	CONTROL LIMIT
LEAD	< 0.002	0.020	0.018	90	75-125%

Analyst: KFL 4/10/96

Reviewer: KS 4/11/96

Analytical Technologies, Inc.

METALS BLANK SPIKE RESULTS

METHOD:	7421	AEN I.D.:	604539
CLIENT:	GeoEngineers, Inc.	QC SAMPLE:	Method Blank
PROJECT #:	4326-001-62	DATE DIGESTED:	04/09/96
PROJECT NAME:	Rose's Parking Lot	DATE ANALYZED:	04/09/96
SAMPLE MATRIX:	WATER	DILUTION FACTOR:	1
		UNITS:	mg/L

PARAMETER	RESULT	TRUE VALUE	% RECOV	CONTROL LIMIT
LEAD	0.018	0.020	90	80-120%

Analyst: KFL 4/10/96

Reviewer: [illegible] 4/11/96

AnalyticalTechnologies,Inc.
17400 S.W. Upper Boones Ferry Rd., Suite 270
Durham, Oregon 97224 • (503) 684-0447 FAX: (503) 620-0393

DATE 4/8/96 PAGE 1 OF 1

Chain of Custody

LABORATORY NUMBER: 604539
PROJECT NOTICE NUMBER:

PROJECT MANAGER: Marsi Beeson
COMPANY: Geo Engineers
ADDRESS: 7504 SW Bridgeport Rd. Portland, OR 97224
PHONE: 624-9274 SAMPLED BY: ~~MB~~

SAMPLE DISPOSAL INSTRUCTIONS
☒ ATI Disposal @ $5.00 each ☐ Return

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	PETROLEUM HYDROCARBONS: TPH-HCID State: OR/WA	TPH-G State: OR/WA	TPH-D State: OR/WA	418.1 State: OR/WA	EPA 418.1	8015M	8020M-BETX only	8310 HPLC PAHs	7421 Lead Dissolved	% Moisture	ORGANICS: 8010 Halogenated VOCs	8020 Aromatic VOCs	8040 Phenols	8240 GCMS Volatiles	8270 GCMS Semivolatiles	8080 OC Pesticides/PCBs	8080M PCBs only	INORGANICS: Drinking Water (8)	Priority Pollutant Metals (13)	Cyanide	TCLP: TCLP Metals (8)	TCLP Volatiles 8240 ZH-EXT	TCLP Semivolatiles 8270	OTHER: EDB/EDC	PAHs 8310	NUMBER OF CONTAINERS
~~MW-1-4-8-96~~	4-8-96	—	H_2O																											
MW-2-4-8-96		820		1							X																			2
MW-3-4-8-96		840		2							X																			2
MW-4-4-8-96		920		3							X																			2
MW-5-4-8-96		9:00		4							X																			2
MW-6-4-8-96		745		5					X		X		X															X		8
MW-7-4-8-96		7:00		6					X		X		X															X		8
MW-8-4-8-96		615		7					X		X		X															X		8

99

PROJECT INFORMATION
PROJECT NUMBER: 4326-001-02
PROJECT NAME: Rose's Parking Lot
PURCHASE ORDER NUMBER:
ONGOING PROJECT? YES ☒ NO ☐

SAMPLE RECEIPT
TOTAL NUMBER OF CONTAINERS
COC SEALS/INTACT? Y \ N \ NA
RECEIVED INTACT? Y \ N
RECEIVED COLD? Y \ N

PRIOR AUTHORIZATION REQUIRED FOR RUSH PROJECTS
TAT: (NORMAL) ☒ 2 WKS (RUSH) ☐ 24 HR ☐ 48 HRS ☐ 72 HRS ☐ 1 WK
GREATER THAN 24 HR. NOTICE? YES ☐ NO ☐ (LAB USE ONLY)
SPECIAL INSTRUCTIONS: Please fax results.
If TPH is 70.5 then run PAHs.
field filtered already
Received via:

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY 3.
Signature: Time: 1245	Signature Time:	Signature Time:
Printed Name: Patrick Immer Date: 4/8/96	Printed Name: Date:	Printed Name: Date:
Company: AEI	Company:	Company:
RECEIVED BY: 1.	**RECEIVED BY: 2.**	**RECEIVED BY: (LAB) 3.**
Signature: Time: 12.45	Signature Time:	Signature Time:
Printed Name: Natasha Schaefer Date: 4/8/96	Printed Name: Date:	Printed Name: Date:
Company: AEN	Company:	Analytical Technologies, Inc.

DOLI PERMIT

GeoEngineers

April 10, 1996

Consulting Engineers and Geoscientists
Offices in Washington, Oregon and Alaska

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED

APR 12 1996

NORTHWEST REGION

Mr. Max Birnbach
c/o Charles R. Williamson
Kell, Alterman & Runstein
1001 Southwest Fifth Avenue, Suite 1800
Portland, Oregon 97204-1194

Attention: Mr. Max Birnbach

Results of Quarterly Ground Water Monitoring
January 1996
Rose's Parking Lot
330 Northwest 23rd Avenue
Portland, Oregon
File No. 4326-001-62

INTRODUCTION

This letter presents the results of GeoEngineers' January 1996 quarterly ground water monitoring and sampling activities at Rose's Parking Lot, located at 330 Northwest 23rd Avenue in Portland, Oregon. The January 1996 event is the first quarterly ground water monitoring event to be performed at the site. The DEQ (Oregon Department of Environmental Quality) UST (underground storage tank) Cleanup file number for this site is 26-94-25. The general layout of the site is shown in Figure 1.

SCOPE

GeoEngineers' scope of services completed during this reporting period was performed in general accordance with our work plan dated September 28, 1995 and is summarized below.

1. Measure the depths to ground water in the existing monitoring wells and recovery well.
2. Measure combustible vapor concentrations in the monitoring well and recovery well casings.
3. Obtain ground water samples from monitoring wells MW-1 through MW-5 for analytical testing of BETX (benzene, ethylbenzene, toluene and xylenes) by EPA (U.S. Environmental Protection Agency) Method 8020, EDB (ethylene dibromide) and EDC (ethylene dichloride)

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by EPA Method 8010M, dissolved lead by EPA Method 7421, and TPH (total petroleum hydrocarbons) by EPA Method 418.1. Samples with TPH concentrations greater than 0.5 mg/l (milligrams per liter) were also analyzed for PAHs (polycyclic aromatic hydrocarbons) by EPA Method 8310.

A description of field procedures for the above scope items is included in Attachment A.

JANUARY 1996 MONITORING AND SAMPLING RESULTS

GROUND WATER ELEVATIONS

GeoEngineers measured the depths to ground water in the monitoring wells and recovery well on January 4, 1996. At the time of our measurements, the depths to ground water ranged from approximately 21.60 feet to 24.22 feet below the ground surface. Based on our January 1996 measurements, the apparent direction of ground water flow beneath the site is toward the northeast, which is consistent with our previous ground water elevation data. However, the ground water elevation in the southeast portion of the site appears to have a more northerly component of flow. The depths to ground water and the calculated ground water elevations are summarized in Table 1. The calculated ground water elevations and the inferred direction of ground water flow for the January 1996 monitoring event are shown in Figure 2. Measurements obtained during pilot testing activities are presented in our draft report dated January 18, 1996.

COMBUSTIBLE VAPOR CONCENTRATIONS

The combustible vapor concentration measured in monitoring well MW-4 was less than 400 ppm (parts per million) on January 4, 1996. The combustible vapor concentrations measured in monitoring wells MW-1 and MW-5 were greater than 10,000 ppm. The combustible vapor concentration measured in recovery well RW-1 was 5,000 ppm. Combustible vapor concentrations were not measured in monitoring wells MW-2 and MW-3 because of an equipment malfunction. Combustible vapor concentration measurements are presented in Table 1.

FREE PRODUCT THICKNESS

Trace amounts of free product were noted in recovery well RW-1 and monitoring wells MW-1 and MW-5. There was not enough product in these wells to remove by bailing or to justify the installation of a product recovery canister. Free product thicknesses will be measured during the next quarterly ground water monitoring event and the product recovery canister will be installed if the free product thicknesses increase to .04 feet or greater. Product thickness measurements are presented in Table 1.

GROUND WATER QUALITY

Ground water samples were obtained from monitoring wells MW-1 through MW-5 on January 4, 1996 for analysis of BETX by EPA Method 8020, TPH by EPA Method 418.1, EDB and EDC by EPA Method 8010M and dissolved lead by EPA Method 7421. Followup analyses were conducted for PAHs by EPA Method 8310.

BETX compounds were detected at concentrations greater than the DEQ ground water cleanup levels for UST sites in samples from monitoring wells MW-1 (benzene and toluene), MW-2 (benzene) and MW-3 (benzene and ethylbenzene). BETX compounds were not detected in the ground water sample from monitoring well MW-4. BETX compounds were detected in the ground water sample from monitoring well MW-5; however, the concentrations were less than DEQ ground water cleanup levels.

TPH was detected in the ground water samples collected from all of the monitoring wells. In accordance with DEQ requirements, the ground water samples were also analyzed for PAHs. The PAH compound naphthalene was detected at concentrations exceeding the DEQ ground water cleanup levels for UST sites in the ground water samples from monitoring wells MW-1, MW-3 and MW-5. Naphthalene is a noncarcinogenic PAH compound. PAH compounds were not detected in the ground water samples from monitoring wells MW-2 and MW-4.

The gasoline additive EDB was detected at a concentration greater than the DEQ cleanup standard in the ground water sample from monitoring well MW-1. EDB was not detected in the ground water samples collected from monitoring wells MW-2 through MW-5. EDC was detected at a concentration greater than the DEQ cleanup standard in the ground water sample from monitoring well MW-3. EDC was not detected in the ground water samples collected from the remaining monitoring wells.

Dissolved lead was detected at concentrations greater than the DEQ cleanup standard in ground water samples from monitoring wells MW-1, MW-3 and MW-5. Dissolved lead was not detected in the ground water samples collected from monitoring wells MW-2 and MW-4.

A summary of the ground water analytical data for this and previous monitoring events is presented in Table 2. DEQ ground water cleanup standards for the listed analytes are also included in Table 2 for reference. The analytical methods and laboratory data sheets are included in Attachment B. Concentrations of BETX compounds detected in ground water samples during this and previous sampling events are presented in Figure 3.

DISCUSSION

GeoEngineers' January 1996 ground water monitoring event was the first quarterly ground water monitoring event at Rose's Parking Lot. Based on the results of the January 1996 monitoring event, the following conclusions are presented:

1. Free product thicknesses have decreased in monitoring well MW-1.
2. BETX compounds were detected at concentrations greater than the DEQ ground water cleanup levels in ground water samples from monitoring wells MW-1, MW-2 and MW-3.
3. TPH was detected at concentrations greater than 0.5 μg/l in the ground water samples from all five monitoring wells.
4. The PAH compound naphthalene was detected at concentrations greater than the DEQ cleanup standard in the ground water samples from monitoring wells MW-1, MW-3 and MW-5. Naphthalene has been detected at elevated levels in monitoring wells MW-3 and MW-5 for two consecutive sampling events.
5. The compound EDB was detected at a concentration greater than the DEQ cleanup standard in the ground water sample from monitoring well MW-1. The compound EDC was detected at a concentration greater than the DEQ cleanup standard in the ground water sample from monitoring well MW-3.
6. Dissolved lead was detected at concentrations greater than the DEQ cleanup level in ground water samples collected from monitoring wells MW-1, MW-3 and MW-5.

FUTURE GROUND WATER MONITORING ACTIVITIES

The next round of quarterly ground water monitoring is scheduled for April 1996. Based on the results of our January 1996 ground water sampling event, we recommend collecting ground water samples for analytical testing of BETX, EDB/EDC, dissolved lead, and TPH. Samples with TPH concentrations greater than 0.5 mg/l will also be analyzed for PAHs.

LIMITATIONS

We have prepared this report for use by Mr. Max Birnbach, AMOCO, Gull and Unocal. This report may be made available to regulatory agencies. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

Our services have been executed in accordance with the generally accepted practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

We appreciate the opportunity to provide these continued services to you. Please contact us if you have questions regarding this project.

Yours very truly,

GeoEngineers, Inc.

Marsi M. Beeson

Marsi M. Beeson
Environmental Scientist

Julia Fowler

Julia Fowler, P.E.
Associate

MMB:JF:mln
Document ID: 4326001r.qrl

Attachments

cc: Amoco Corporation
Ms. Janice M. McLain

Amoco Corporation
Mr. Jeff Miller

Bell & Ingram, P.S.
Mr. Jeff C. Wishko

Black Helterline
Mr. David Roy

Gull Industries
Mr. Jeff Scott

Oregon Department of Environmental Quality
Mr. Don Pettit

PTI
Mr. David Livermore

Unocal
Mr. Kipp Eckert

TABLE 1
GROUND WATER ELEVATIONS AND COMBUSTIBLE VAPOR CONCENTRATIONS

Monitoring Well[1]	Date Measured	Water Depth From Ground Surface (feet)	Ground Water Elevation[2] (feet)	Combustible Vapor Concentration[3] (ppm)	Product Thickness (feet)
MW-1	05/12/95	23.29	78.75[4]	Note[5]	0.5
	01/04/96	24.10	77.87[4]	>10,000	Trace
MW-2	05/12/95	20.75	77.54	>10,000	ND
	01/04/96	21.60	76.69	--[6]	ND
MW-3	05/12/95	23.48	77.86	<400	ND
	01/04/96	24.22	77.12	--[6]	ND
MW-4	05/12/95	22.55	79.93	<400	ND
	01/04/96	23.03	79.45	<400	ND
MW-5[7]	05/12/95	22.35	80.06	7,800	--
	01/04/96	22.84	79.57	>10,000	Trace
RW-1[8]	01/04/96	23.79	78.14	5,000	Trace

Notes:

[1]Approximate locations of monitoring wells are shown in Figures 1, 2 and 3.

[2]Elevations are measured relative to the temporary benchmark shown in Figure 2. The benchmark has an assumed elevation of 100.00 feet.

[3]Measured with a Bacharch TLV Sniffer calibrated to hexane and equipped with a drop hose lowered to within 1 foot of the ground water table. The lower threshold of significance in this application is 400 ppm.

[4]The ground water elevation was corrected for the presence of free product using a specific gravity of 0.7.

[5]Combustible vapor measurements are not representative of soil conditions because the water table was above the top of the screen.

[6]TLV Sniffer was not functioning.

[7]Monitoring well MW-5 was installed on 5/12/95.

[8]Recovery well RW-1 was installed on 11/2/95.

ppm = parts per million

"ND" = not detected

"--" = not measured

No. 4326001A

TABLE 2 (Page 1 of 2)
SUMMARY OF GROUND WATER SAMPLE ANALYTICAL DATA[1]

Monitoring Well Number[2]	Date Sampled[3]	BETX[4] (EPA Method 8020) (µg/l)				Total Petroleum Hydrocarbons (EPA Method 418.1) (mg/l)	PAHs[5] (EPA Method 8310) (µg/l)	EDB/EDC[6] (EPA Method 8010M) (µg/l)	Dissolved Lead (EPA Method 7421) (µg/l)
		B	E	T	X				
MW-1	03/29/94	130	98	390	1,570	--	--	--	--
	10/04/94	27	5.9	46	70.0	--	--	--	--
	05/12/95[7]	--	--	--	--	--	--	--	--
	01/04/96	400	630	2,200	4,800	54	Naphthalene 370 Acenaphthylene 44	EDB - 21 EDC - <1.0	100
MW-2	03/29/94	4.9	0.7	1.4	3.0	--	--	--	--
	10/04/94	<0.5	<0.5	<0.5	<0.5	--	--	--	--
	05/12/95	1.2	0.6	<0.5	0.7	<0.5	--	--	--
	01/04/96	14	<0.5	1.5	1.7	1.6	ND	EDB - <0.5 EDC - <0.2	<2
MW-3	03/29/94	2,300	1,200	1,200	3,700	--	--	--	--
	10/04/94	1,520	790	600	1,600	--	--	--	--
	05/12/95	1,300	800	740	2,000	3.5	Naphthalene 130 Fluorene 0.2 Phenanthrene 0.09	--	--
	01/04/96	1,300	940	640	2,600	4.5	Naphthalene 180 Acenaphthylene 23	EDB - <1.0 EDC - 7.1	6
MW-4	10/04/94	<0.5	<0.5	<0.5	<0.5	--	--	--	--
	05/12/95	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	--
	01/04/96	<0.5	<0.5	<0.5	<0.5	0.9	ND	EDB - <0.5 EDC - <0.2	<2
MW-5	05/12/95	660	1,900	13,000	11,000	13	Naphthalene 450 Acenaphthylene 66 Fluorene 0.6 Phenanthrene 0.42 Anthracene 0.07	--	--
	01/04/96	4.6	24	22	230	6.6	Naphthalene 29 Acenaphthylene 13 Fluorene 0.8	EDB - <0.5 EDC - <0.2	14
DEQ Cleanup Levels		5	700	1,000	10,000	NE	Naphthalene 28 Acenaphthylene NE Fluorene 280 Phenanthrene NE Anthracene 2,100	EDB - 1 EDC - 5	5

Notes appear on page 2 of 2.

TABLE 2 (Page 2 of 2)

Notes:

[1]Chemical analyses were conducted by Analytical Technologies, Inc. of Durham, Oregon.

[2]Approximate monitoring well locations are shown in Figure 2.

[3]Ground water samples obtained prior to 05/12/95 were obtained by others. Analytical data were provided to GeoEngineers by Unocal.

[4]B = benzene, E = ethylbenzene, T = toluene, X = xylenes

[5]PAHs = polycyclic aromatic hydrocarbons. Only analytes detected are listed. Refer to chemical analytical data for a complete list of analytes and their respective detection limits.

[6]EDB/EDC = ethylene bibromide/ethylene dichloride

[7]Monitoring well MW-1 was not sampled due to the presence of free product.

µg/l = micrograms per liter

mg/l = milligrams per liter

"--" = not analyzed

NE = not established

ND = not detected

Shading indicates concentrations greater than DEQ cleanup levels for UST sites.

No. 4326001E

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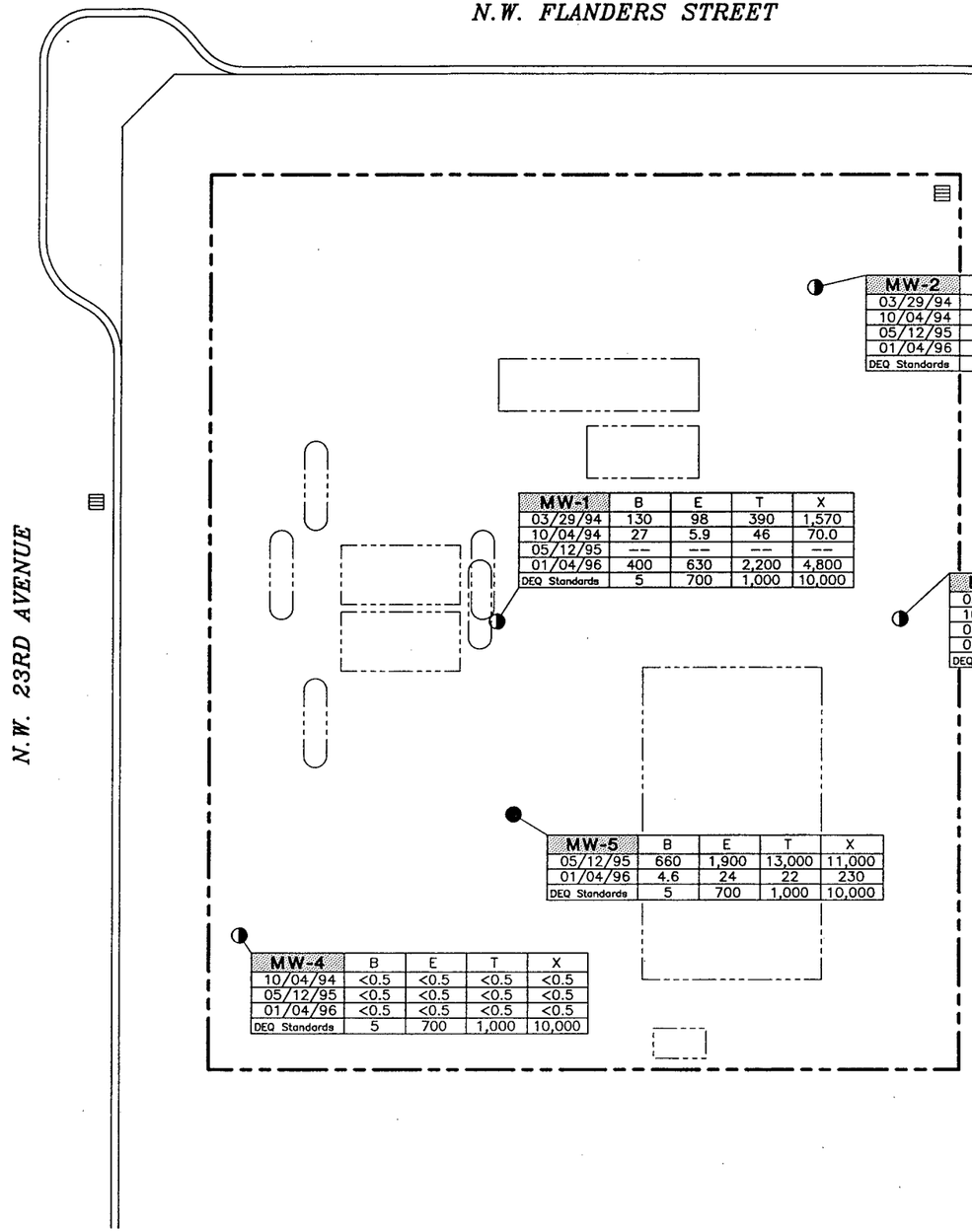

MW-2	B	E	T	X
03/29/94	4.9	0.7	1.4	3.0
10/04/94	<0.5	<0.5	<0.5	<0.5
05/12/95	1.2	0.6	<0.5	0.7
01/04/96	14	<0.5	1.5	1.7
DEQ Standards	5	700	1,000	10,000

MW-1	B	E	T	X
03/29/94	130	98	390	1,570
10/04/94	27	5.9	46	70.0
05/12/95	--	--	--	--
01/04/96	400	630	2,200	4,800
DEQ Standards	5	700	1,000	10,000

MW-3	B	E	T	X
03/29/94	2,300	1,200	1,200	3,700
10/04/94	1,520	790	600	1,600
05/12/95	1,300	800	740	2,000
01/04/96	1,300	940	640	2,600
DEQ Standards	5	700	1,000	10,000

MW-5	B	E	T	X
05/12/95	660	1,900	13,000	11,000
01/04/96	4.6	24	22	230
DEQ Standards	5	700	1,000	10,000

MW-4	B	E	T	X
10/04/94	<0.5	<0.5	<0.5	<0.5
05/12/95	<0.5	<0.5	<0.5	<0.5
01/04/96	<0.5	<0.5	<0.5	<0.5
DEQ Standards	5	700	1,000	10,000

N

0 20 40

SCALE IN FEET

EXPLANATION:

◑ MONITORING WELL BY OTHERS

● MONITORING WELL BY GEOENGINEERS

B BENZENE (μg/l)

E ETHYLBENZENE (μg/l)

T TOLUENE (μg/l)

X XYLENES (μg/l)

-- NOT TESTED

(μg/l) MICROGRAMS PER LITER

NOTES:

1. The locations of all features shown are approximate.
2. See Figure 1 for identification of site features.

Reference: Drawing entitled, "Soil Boring Location Map," dated 02/94, by Hahn & Associates Incorporated, and drawing entitled, "Golden Eagle Service Station," undated by Unocal, and drawing entitled, "Rose's Parking Lot, 330 NW 23rd Avenue," dated 10/94, by AGRA, and drawing entitled, "Site Diagram–Rosewood Parking Lot," undated, by GeoPotential.

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BETX CONCENTRATIONS

FIGURE 3

4326-001-P62 SAK:MAD 05/02/95

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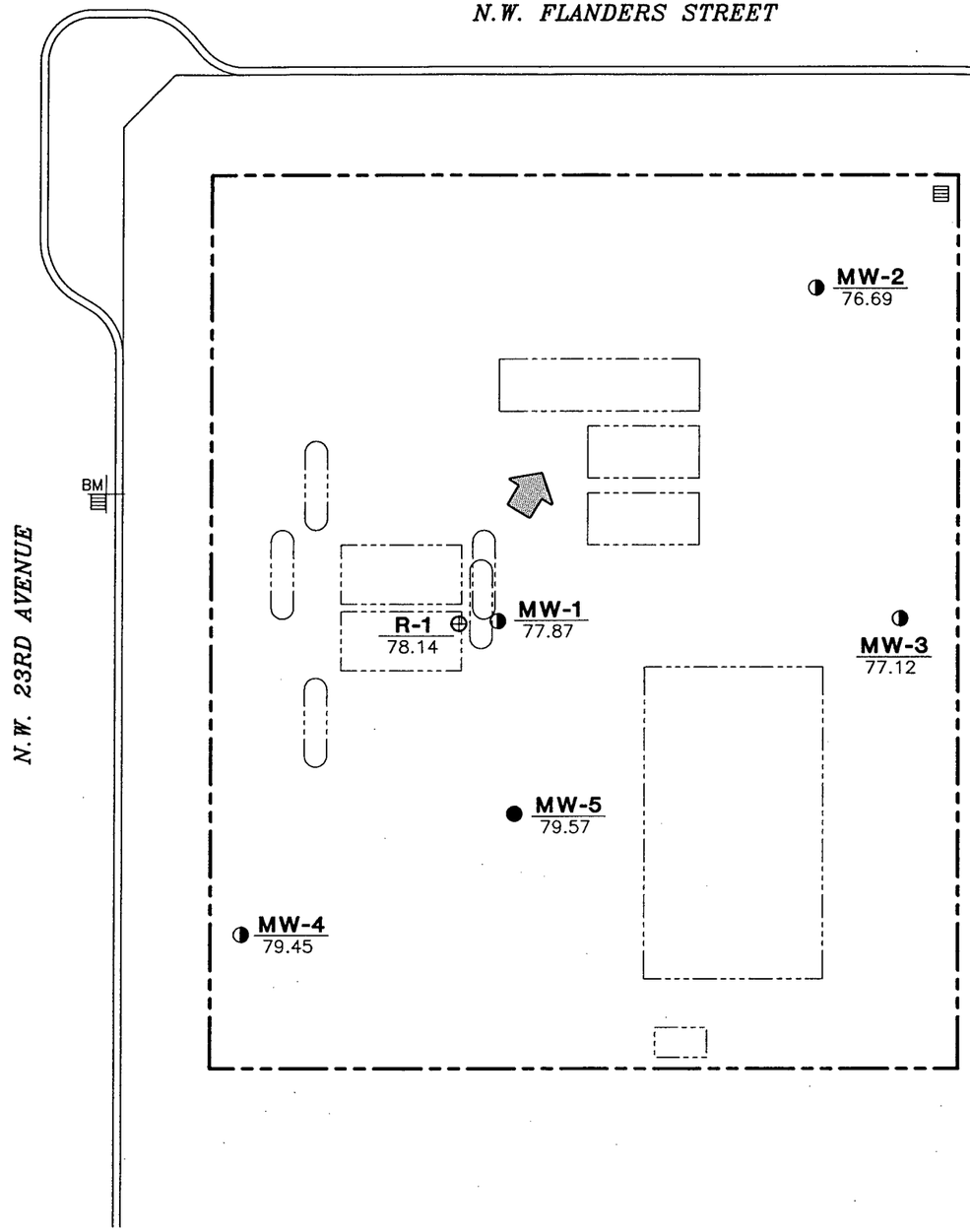

N

0 20 40

SCALE IN FEET

EXPLANATION:

MW-1 77.87 — MONITORING WELL BY OTHERS
GROUND WATER ELEVATION (IN FEET) ON 01/04/96

MW-5 79.57 — MONITORING WELL BY GEOENGINEERS
GROUND WATER ELEVATION (IN FEET) ON 01/04/96

R-1 78.14 — RECOVERY WELL BY GEOENGINEERS
GROUND WATER ELEVATION (IN FEET) ON 01/04/96

GENERAL DIRECTION OF GROUND WATER FLOW

BM — BENCHMARK AT NORTHEAST CORNER OF CATCH BASIN ON NW 23RD AVENUE: ASSUMED ELEVATION 100.00 FEET

Reference: Drawing entitled, "Soil Boring Location Map," dated 02/94, by Hahn & Associates Incorporated, and drawing entitled, "Golden Eagle Service Station," undated by Unocal, and drawing entitled, "Rose's Parking Lot, 330 NW 23rd Avenue," dated 10/94, by AGRA, and drawing entitled, "Site Diagram–Rosewood Parking Lot," undated, by GeoPotential.

Notes: 1. The locations of all features shown are approximate.
2. See Figure 1 for facilities identification.

GeoEngineers

GROUND WATER ELEVATIONS JANUARY 4, 1996

FIGURE 2

4326-001-P62 SAK:MAD 05/02/95

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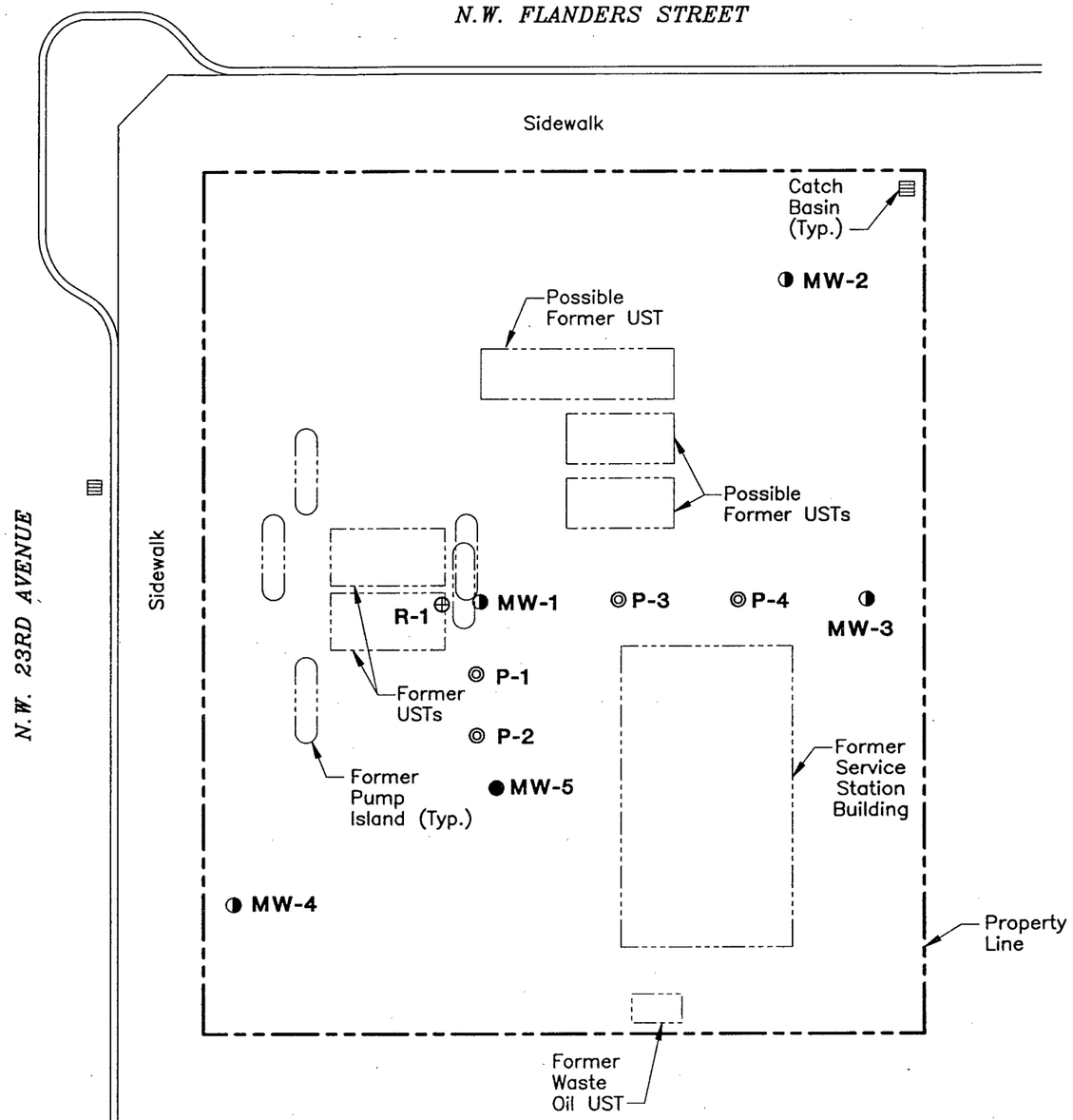
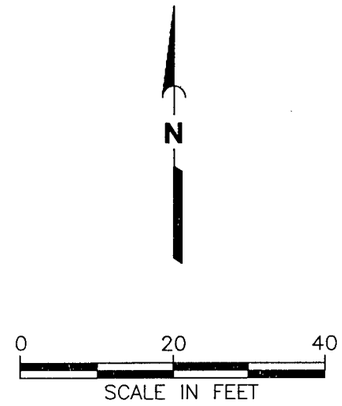




EXPLANATION:

MW-1 ◑	MONITORING WELL BY OTHERS
MW-5 ●	MONITORING WELL BY GEOENGINEERS
R-1 ⊕	RECOVERY WELL BY GEOENGINEERS
P-1 ◎	TEMPORARY MONITORING PROBE BY GEOENGINEERS
UST	UNDERGROUND STORAGE TANK

Note: The locations of all features shown are approximate.

Reference: Drawing entitled, "Soil Boring Location Map," dated 02/94, by Hahn & Associates Incorporated, and drawing entitled, "Golden Eagle Service Station," undated by Unocal, and drawing entitled, "Rose's Parking Lot, 330 NW 23rd Avenue," dated 10/94, by AGRA, and drawing entitled, "Site Diagram–Rosewood Parking Lot," undated, by GeoPotential.

Geo Engineers

SITE PLAN
ROSE'S PARKING LOT

FIGURE 1

4326-001-P62 SAK:MAD 05/02/95

ATTACHMENT B

CHEMICAL ANALYTICAL PROGRAM

ANALYTICAL METHODS

The ground water samples were analyzed by ATI (Analytical Technologies, Incorporated) of Durham, Oregon. Chain-of-custody procedures were followed during transport of the ground water samples to the analytical laboratory. Samples were held in cold storage pending analysis. The analytical results, analytical methods reference, and laboratory QA/QC (quality assurance/quality control) records are included in this attachment. The analytical results also are summarized in the text and Table 2 of this report.

ANALYTICAL DATA REVIEW

The laboratory maintains an internal quality assurance program, as documented in its laboratory quality assurance manual. The laboratory uses a combination of blanks, surrogate recoveries, duplicates, matrix spike duplicate recoveries, blank spike recoveries and blank spike duplicate recoveries to evaluate the validity of the analytical results. The laboratory also uses data quality goals for individual chemicals or groups of chemicals based on the long-term performance of the test methods. The data quality goals were included in the laboratory report. The laboratory compared the samples with the existing data quality goals and noted any exceptions in the laboratory report. If data quality exceptions were documented by the laboratory in the laboratory report, the data quality exceptions were reviewed by GeoEngineers using the applicable data validation guidelines from the following documents: "National Functional Guidelines for Organic Data Review," draft dated 1991, and "Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses," dated 1988.

ANALYTICAL DATA REVIEW SUMMARY

The laboratory data included a case narrative with regard to the PAH analyses. The case narrative indicates that during the initial extractions, the matrix spikes and blank spikes were inadvertently spiked at the reporting limit concentration. Because of this, the blank spikes and matrix spikes failed to fall within the laboratory quality control limits, however, all other quality control limits were met. The samples were re-extracted and all spike samples had acceptable recoveries of spike and surrogate.

The laboratory also included a case narrative with regard to the EDB/EDC analysis of ground water sample MW-3-1-4-96. The case narrative indicates that the sample was analyzed at a two fold dilution and the surrogate, bromofluorobenzene, had a 162 percent recovery which is above the quality control limits of 78 percent to 129 percent. Therefore the bromofluorobenzene surrogate is "F" flagged indicating that it is out of limits due to matrix interference.

No other significant data quality exceptions were documented in the laboratory reports or noted during our review. Based on the data quality review, it is our opinion that the analytical data are acceptable for their intended use.

Analytical**Technologies,**Inc.

17400 S.W. Upper Boones Ferry Road, Suite 270 Durham, OR. 97224
(503) 684-0447 (503) 620-0393 (FAX)

ATI I.D. 601516

January 26, 1996

Marsi Beeson
GeoEngineers, Inc.
7504 Bridgeport Rd.
Portland, OR 97224

Project Name/Number: Rose's Parking Lot / 4326-001-P62

Attention: Marsi Beeson

On January 4, 1996, Analytical Technologies, Inc. received five water samples for analysis for the above listed project. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

If you have any questions or comments, please do not hesitate to contact us at (503)684-0447.

Natasha Schaefer
Project Manager

Steven E. Stanley
Laboratory Manager

SES:alm
Enclosure

Analytical Technologies, Inc.

SAMPLE CROSS REFERENCE SHEET

CLIENT:	GeoEngineers, Inc.	**ATI I.D.:**	601516
PROJECT #:	4326-001-P62		
PROJECT NAME:	Rose's Parking Lot	**MATRIX:**	WATER

ATI #	CLIENT DESCRIPTION	DATE SAMPLED
601516-1	MW-1-1-4-96	1/04/96
601516-2	MW-2-1-4-96	1/04/96
601516-3	MW-3-1-4-96	1/04/96
601516-4	MW-4-1-4-96	1/04/96
601516-5	MW-5-1-4-96	1/04/96

----------TOTALS----------

MATRIX	# SAMPLES
WATER	5

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of the report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical Technologies, Inc.

ANALYTICAL SCHEDULE

CLIENT:	GeoEngineers, Inc.	**ATI I.D.:**	601516
PROJECT #:	4326-001-P62		
PROJECT NAME:	Rose's Parking Lot		

ANALYSIS	TECHNIQUE	REFERENCE	LAB
BETX	GC/PID	EPA 8020M	PLD
Petroleum Hydrocarbon	IR	EPA 418.1	PLD
EDB/EDC	GC/ELCD	EPA 8010M	PLD
PAHs	HPLC/UV/FLUOR	EPA 8310	PLD
Lead	AA/GF	EPA 7421	PLD

PLD = ATI - Portland
R = ATI - Renton
SD = ATI - San Diego
PHX = ATI - Phoenix
PNR = ATI - Pensacola
FC = ATI - Fort Collins
SUB = Subcontract

Analytical Technologies, Inc.

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**ATI I.D.:**	601516-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	N/A
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	N/A
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	01/05/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	01/05/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	< 0.5

Analyst: JJE 1/5/96

Reviewer: CS 1/10/96

Analytical Technologies, Inc.

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**ATI I.D.:**	601516-1
CLIENT I.D.:	MW-1-1-4-96	**DATE SAMPLED:**	01/04/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	01/05/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	01/05/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	10
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	54

Analyst: JK 1/5/96

Reviewer: CS 1/10/96

Analytical Technologies, Inc.

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**ATI I.D.:**	601516-2
CLIENT I.D.:	MW-2-1-4-96	**DATE SAMPLED:**	01/04/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	01/05/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	01/05/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	1.6

Analyst: JLK 1/5/96

Reviewer: CS 1/10/96

Analytical Technologies, Inc.

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**ATI I.D.:**	601516-3
CLIENT I.D.:	MW-3-1-4-96	**DATE SAMPLED:**	01/04/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	01/05/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	01/05/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	4.5

Analyst: JLK 1/5/96

Reviewer: CS 1/10/96

Analytical Technologies, Inc.

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**ATI I.D.:**	601516-4
CLIENT I.D.:	MW-4-1-4-96	**DATE SAMPLED:**	01/04/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	01/05/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	01/05/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	0.9

Analyst: JLE 1/8/96

Reviewer: CS 1/10/96

Analytical Technologies, Inc.

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**ATI I.D.:**	601516-5
CLIENT I.D.:	MW-5-1-4-96	**DATE SAMPLED:**	01/04/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	01/05/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	01/05/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	6.6

Analyst: JLK 1/5/96

Reviewer: CS 1/10/96

Analytical Technologies, Inc.

INFRARED SPECTROPHOTOMETRY SPIKE RESULTS

		ATI ACCESSION:	601516
METHOD:	EPA - 418.1	**QC SAMPLE:**	601516-4
CLIENT:	GeoEngineers, Inc.	**DATE EXTRACTED:**	01/05/96
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	01/05/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	mg/L

PARAMETER	SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
3-Component Oil	0.9	10.0	8.6	77	9.6	87	11

CONTROL LIMITS

	%REC	RPD
3-Component Oil	61 - 109	20

Analyst: JW 1/5/96

Reviewer: CS 1/10/96

Analytical Technologies, Inc.

INFRARED SPECTROPHOTOMETRY SPIKE RESULTS

		ATI ACCESSION:	601516
METHOD:	EPA - 418.1	**QC SAMPLE:**	Method Blank
CLIENT:	GeoEnginners, Inc.	**DATE EXTRACTED:**	01/05/96
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	01/05/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	mg/L

PARAMETER	SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
3-Component Oil	< 0.5	10.0	7.4	74	7.5	75	1

CONTROL LIMITS

	%REC	RPD
3-Component Oil	64 - 108	20

Analyst: JLK 1/8/96

Reviewer: CS 1/10/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**ATI I.D.:**	601516-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	N/A
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	N/A
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	01/11/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		RESULTS
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5

SURROGATE:	
TRIFLUOROTOLUENE (81%-116%)	101%

Analyst: MB 1/12/96

Reviewer: LO 1/15/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**ATI I.D.:**	601516-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	N/A
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	N/A
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	01/15/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		RESULTS
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5
SURROGATE:		
TRIFLUOROTOLUENE (81%-116%)		93%

Analyst: MB 1/15/96

Reviewer: LO 1/15/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**ATI I.D.:**	601516-1
CLIENT I.D.:	MW-1-1-4-96	**DATE SAMPLED:**	01/04/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	01/15/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	5
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS	
BENZENE	400	
TOLUENE	2200	D
ETHYLBENZENE	630	D
TOTAL XYLENES	4800	D
SURROGATE:		
TRIFLUOROTOLUENE (81%-116%)	97%	

D - Value is from a 50 fold dilution analyzed on 1/15/96.

Analyst: MB 1/15/96

Reviewer: LO 1/15/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**ATI I.D.:**	601516-2
CLIENT I.D.:	MW-2-1-4-96	**DATE SAMPLED:**	01/04/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	01/11/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		RESULTS
BENZENE		14
TOLUENE		1.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES		1.7
SURROGATE:		
TRIFLUOROTOLUENE (81%-116%)		99%

Analyst: RRB 1/12/96

Reviewer: LD 1/15/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**ATI I.D.:**	601516-3
CLIENT I.D.:	MW-3-1-4-96	**DATE SAMPLED:**	01/04/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	01/11/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	20
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS
BENZENE	1300
TOLUENE	640
ETHYLBENZENE	940
TOTAL XYLENES	2600
SURROGATE:	
TRIFLUOROTOLUENE (81%-116%)	99%

Analyst: MB 1/12/96

Reviewer: LO 1/15/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**ATI I.D.:**	601516-4
CLIENT I.D.:	MW-4-1-4-96	**DATE SAMPLED:**	01/04/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	01/11/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS	
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5

SURROGATE:

TRIFLUOROTOLUENE (81%-116%)	102%

Analyst: MB 1/12/96

Reviewer: LD 1/15/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**ATI I.D.:**	601516-5
CLIENT I.D.:	MW-5-1-4-96	**DATE SAMPLED:**	01/04/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	01/11/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS	
BENZENE	4.6	
TOLUENE	22	
ETHYLBENZENE	24	
TOTAL XYLENES	230	D
SURROGATE:		
TRIFLUOROTOLUENE (81%-116%)	106%	

D - Value is from a 10 fold dilution analzyed on 1/11/96.

Analyst: MB 1/12/96

Reviewer: CO 1/15/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY SPIKE RESULTS

METHOD:	BETX (EPA 8020M)	**ATI ID:**	601516
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	601516-4
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	01/11/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<	0.5	20.0	17.8	89	19.9	100	11
TOLUENE	<	0.5	20.0	17.8	89	19.9	100	11
ETHYLBENZENE	<	0.5	20.0	18.0	90	20.0	100	11
TOTAL XYLENES	<	0.5	40.0	36.3	91	40.0	100	10
SURROGATE:								
TRIFLUOROTOLUENE (81% - 116%)					101%		100%	

CONTROL LIMITS

	% REC	RPD
BENZENE	77% - 131%	20
TOLUENE	79% - 125%	20
ETHYLBENZENE	76% - 124%	20
TOTAL XYLENES	74% - 127%	20

Analyst: WB 1/12/96

Reviewer: LO 1/15/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY SPIKE RESULTS

METHOD:	BETX (EPA 8020M)	**ATI ID:**	601516
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	601560-2
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	01/15/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	4.6	20.0	22.4	89	23.3	94	4
TOLUENE	1.1	20.0	19.4	92	20.5	97	6
ETHYLBENZENE	0.7	20.0	18.9	91	19.5	94	3
TOTAL XYLENES	0.9	40.0	37.9	93	39.0	95	3
SURROGATE:							
TRIFLUOROTOLUENE (81% - 116%)				96%		97%	

CONTROL LIMITS

	% REC	RPD
BENZENE	77% - 131%	20
TOLUENE	79% - 125%	20
ETHYLBENZENE	76% - 124%	20
TOTAL XYLENES	74% - 127%	20

Analyst: LO 1/16/96

Reviewer: MB 1/16/96

Analytical Technologies, Inc.

CASE NARRATIVE
ATI Accession #601516
EDB/EDC (EPA 8010M)

Five milliliters of sample was analyzed using a gas chromatograph equipped with a photoionization detector (PID) in series with an electrolytic conductivity detector (ELCD). Five or more point calibration curves were used for quantitation.

ATI Accession #601516-3 was analyzed at a two fold dilution on 1/11/96. The surrogate, bromofluorobenzene, had a percent recovery of 162%, above the established limits of 78% - 129%. The bromofluorobenzene surrogate result is "F" flagged, indicating out of limits due to matrix interference. ATI Accession #601516-3 contains high levels of target analytes.

Margaret Brascher

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST:	EDB/EDC (EPA 8010M)	**ATI I.D.:**	601516-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	N/A
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	N/A
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	01/11/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS
1,2-DIBROMOETHANE (EDB)	< 0.5
1,2-DICHLOROETHANE (EDC)	< 0.2
SURROGATE:	
BROMOFLUOROBENZENE (71% - 129%)	97%

Analyst: DEB 1/12/96

Reviewer: LO 1/15/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST:	EDB/EDC (EPA 8010M)	**ATI I.D.:**	601516-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	N/A
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	N/A
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	01/15/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS
1,2-DIBROMOETHANE (EDB)	< 0.5
1,2-DICHLOROETHANE (EDC)	< 0.2
SURROGATE:	
BROMOFLUOROBENZENE (71% - 129%)	82%

Analyst: MB 1/15/96

Reviewer: ds 1/16/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST:	EDB/EDC (EPA 8010M)	**ATI I.D.:**	601516-1
CLIENT I.D.:	MW-1-1-4-96	**DATE SAMPLED:**	01/04/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	01/15/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	5
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS
1,2-DIBROMOETHANE (EDB)	21
1,2-DICHLOROETHANE (EDC)	< 1.0
SURROGATE:	
BROMOFLUOROBENZENE (71% - 129%)	98%

Analyst: MB 1/15/96

Reviewer: LD 1/16/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST:	EDB/EDC (EPA 8010M)	**ATI I.D.:**	601516-2
CLIENT I.D.:	MW-2-1-4-96	**DATE SAMPLED:**	01/04/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	01/11/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS
1,2-DIBROMOETHANE (EDB)	< 0.5
1,2-DICHLOROETHANE (EDC)	< 0.2
SURROGATE:	
BROMOFLUOROBENZENE (71% - 129%)	92%

Analyst: MB 1/12/96

Reviewer: LO 1/15/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST:	EDB/EDC (EPA 8010M)	**ATI I.D.:**	601516-3
CLIENT I.D.:	MW-3-1-4-96	**DATE SAMPLED:**	01/04/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	01/11/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	2
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS
1,2-DIBROMOETHANE (EDB)	< 1.0
1,2-DICHLOROETHANE (EDC)	7.1
SURROGATE:	
BROMOFLUOROBENZENE (71% - 129%)	162% F

F - Out of limits due to matrix interference.

Analyst: MB 1/12/96

Reviewer: CO 1/15/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST:	EDB/EDC (EPA 8010M)	**ATI I.D.:**	601516-4
CLIENT I.D.:	MW-4-1-4-96	**DATE SAMPLED:**	01/04/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	01/11/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS
1,2-DIBROMOETHANE (EDB)	< 0.5
1,2-DICHLOROETHANE (EDC)	< 0.2
SURROGATE:	
BROMOFLUOROBENZENE (71% - 129%)	94%

Analyst: MB 1/12/96

Reviewer: LO 1/15/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST:	EDB/EDC (EPA 8010M)	**ATI I.D.:**	601516-5
CLIENT I.D.:	MW-5-1-4-96	**DATE SAMPLED:**	01/04/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	01/11/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS
1,2-DIBROMOETHANE (EDB)	< 0.5
1,2-DICHLOROETHANE (EDC)	< 0.2
SURROGATE:	
BROMOFLUOROBENZENE (71% - 129%)	90%

Analyst: MB 1/12/96

Reviewer: LD 1/15/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY SPIKE RESULTS

TEST:	EDB/EDC (EPA 8010M)	**ATI I.D.:**	601516
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	601516-4
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	01/11/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
1,2-DIBROMOETHANE	<	0.5	5.0	4.4	88	5.2	104	17
1,2-DICHLOROETHANE	<	0.2	5.0	4.4	88	5.0	100	13
SURROGATE: BROMOFLUOROBENZENE (71% - 129%)					98%		101%	

	CONTROL LIMITS % REC	RPD
1,2-DIBROMOETHANE (EDB)	59% - 144%	20
1,2-DICHLOROETHANE (EDC)	62% - 148%	20

Analyst: MB 1/12/96

Reviewer: LO 1/15/96

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY SPIKE RESULTS

TEST:	EDB/EDC (EPA 8010M)	**ATI I.D.:**	601516
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	601560-2
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	01/15/96
PROJECT NAME:	Rose's Parking Lot	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
1,2-DIBROMOETHANE	<	0.5	5.0	4.8	96	4.8	96	0
1,2-DICHLOROETHANE	<	0.2	5.0	4.8	96	5.0	100	4
SURROGATE:								
BROMOFLUOROBENZENE (71% - 129%)					99%		101%	

CONTROL LIMITS

	% REC	RPD
1,2-DIBROMOETHANE (EDB)	59% - 144%	20
1,2-DICHLOROETHANE (EDC)	62% - 148%	20

Analyst: MB 1/16/96

Reviewer: LO 1/16/96

Analytical Technologies, Inc.

CASE NARRATIVE FOR EPA METHOD 8310

POLYNUCLEAR AROMATIC HYDROCARBONS

ATI ACCESSION NUMBER 601516

A 1.0 liter aliquot of each aqueous sample was extracted with methylene chloride by liquid:liquid method (EPA method 3510). The methylene chloride was reduced and exchanged to acetonitrile. Final volume was 1.0 ml.

The extracts were analyzed by HPLC with UV (254 nm) and fluorescence detectors in series. A gradient mobile phase of water and acetonitrile was utilized for the analysis. Five and six point calibration curves were generated and utilized for the analysis.

In the initial extraction, the matrix spikes and blank spikes were inadvertently spiked at the reporting limit concentration. Control limits used for reporting were established at different concentrations. Due to this the blank spikes and matrix spikes failed to fall within control limits. All other quality control was met (i.e., surrogate recoveries). All samples were re-extracted.

For the re-extraction, all spike samples had acceptable recoveries of spike and surrogate. Likewise, all samples had acceptable surrogate recovery. The re-extraction was done past the seven day holding time.

Greg Ellsworth

Analytical Technologies, Inc.

LIQUID CHROMATOGRAPHY RESULTS

METHOD:	8310	**ATI I.D.:**	601516-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	NA
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	NA
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	01/09/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	01/16/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER	RESULTS	
NAPHTHALENE	<	0.5
ACENAPHTHYLENE	<	1.0
ACENAPHTHENE	<	1.0
FLUORENE	<	0.1
PHENANTHRENE	<	0.05
ANTHRACENE	<	0.05
FLUORANTHENE	<	0.1
PYRENE	<	0.1
BENZO(a)ANTHRACENE	<	0.1
CHRYSENE	<	0.1
BENZO(b)FLUORANTHENE	<	0.1
BENZO(k)FLUORANTHENE	<	0.1
BENZO(a)PYRENE	<	0.1
DIBENZO(a,h)ANTHRACENE	<	0.1
BENZO(g,h,i)PERYLENE	<	0.1
INDENO(1,2,3-cd)PYRENE	<	0.1

SURROGATE:

BIPHENYL (28%-125%) 29%

Analyst: GE 1/18/96

Reviewer: BH 1-18-96

Analytical Technologies, Inc.

LIQUID CHROMATOGRAPHY RESULTS

METHOD:	8310	**ATI I.D.:**	601516-0 RE
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	NA
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	NA
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	01/18/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	01/22/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER	RESULTS	
NAPHTHALENE	<	0.5
ACENAPHTHYLENE	<	1.0
ACENAPHTHENE	<	1.0
FLUORENE	<	0.1
PHENANTHRENE	<	0.05
ANTHRACENE	<	0.05
FLUORANTHENE	<	0.1
PYRENE	<	0.1
BENZO(a)ANTHRACENE	<	0.1
CHRYSENE	<	0.1
BENZO(b)FLUORANTHENE	<	0.1
BENZO(k)FLUORANTHENE	<	0.1
BENZO(a)PYRENE	<	0.1
DIBENZO(a,h)ANTHRACENE	<	0.1
BENZO(g,h,i)PERYLENE	<	0.1
INDENO(1,2,3-cd)PYRENE	<	0.1

SURROGATE:

BIPHENYL (28%-125%) 88%

Analyst GE 1/23/96

Reviewer: BH 1/24/96

Analytical Technologies, Inc.

LIQUID CHROMATOGRAPHY RESULTS

METHOD:	8310	**ATI I.D.:**	601516-1
CLIENT I.D.:	MW-1-1-4-96	**DATE SAMPLED:**	01/04/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	01/09/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	01/16/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER		RESULTS	
NAPHTHALENE		340	D
ACENAPHTHYLENE		95	
ACENAPHTHENE	<	1.0	
FLUORENE	<	0.1	
PHENANTHRENE		0.44	
ANTHRACENE	<	0.05	
FLUORANTHENE	<	0.1	
PYRENE	<	0.1	
BENZO(a)ANTHRACENE	<	0.1	
CHRYSENE	<	0.1	
BENZO(b)FLUORANTHENE	<	0.1	
BENZO(k)FLUORANTHENE	<	0.1	
BENZO(a)PYRENE	<	0.1	
DIBENZO(a,h)ANTHRACENE	<	0.1	
BENZO(g,h,i)PERYLENE	<	0.1	
INDENO(1,2,3-cd)PYRENE	<	0.1	

SURROGATE:

BIPHENYL (28%-125%) 59%

D = Value from a 1:10 dilution, analized on 1/18/96

Analyst: CE 1/18/96

Reviewer: BH 1-18-96

Analytical Technologies, Inc.

LIQUID CHROMATOGRAPHY RESULTS

METHOD:	8310	**ATI I.D.:**	601516-1 RE
CLIENT I.D.:	MW-1-1-4-96	**DATE SAMPLED:**	01/04/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	01/18/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	01/22/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER		RESULTS	
NAPHTHALENE		370	D
ACENAPHTHYLENE		44	
ACENAPHTHENE	<	1.0	
FLUORENE	<	0.1	
PHENANTHRENE	<	0.05	
ANTHRACENE	<	0.05	
FLUORANTHENE	<	0.1	
PYRENE	<	0.1	
BENZO(a)ANTHRACENE	<	0.1	
CHRYSENE	<	0.1	
BENZO(b)FLUORANTHENE	<	0.1	
BENZO(k)FLUORANTHENE	<	0.1	
BENZO(a)PYRENE	<	0.1	
DIBENZO(a,h)ANTHRACENE	<	0.1	
BENZO(g,h,i)PERYLENE	<	0.1	
INDENO(1,2,3-cd)PYRENE	<	0.1	

SURROGATE:

BIPHENYL (28%-125%)	48%

D = Value from a 1:10 dilution, analyzed on 1/23/96

Analyst: GE 1/23/96

Reviewer: BH 1/24/96

Analytical Technologies, Inc.

LIQUID CHROMATOGRAPHY RESULTS

METHOD:	8310	**ATI I.D.:**	601516-2
CLIENT I.D.:	MW-2-1-4-96	**DATE SAMPLED:**	01/04/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	01/09/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	01/16/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER	RESULTS	
NAPHTHALENE	<	0.5
ACENAPHTHYLENE	<	1.0
ACENAPHTHENE	<	1.0
FLUORENE	<	0.1
PHENANTHRENE	<	0.05
ANTHRACENE	<	0.05
FLUORANTHENE	<	0.1
PYRENE	<	0.1
BENZO(a)ANTHRACENE	<	0.1
CHRYSENE	<	0.1
BENZO(b)FLUORANTHENE	<	0.1
BENZO(k)FLUORANTHENE	<	0.1
BENZO(a)PYRENE	<	0.1
DIBENZO(a,h)ANTHRACENE	<	0.1
BENZO(g,h,i)PERYLENE	<	0.1
INDENO(1,2,3-cd)PYRENE	<	0.1

SURROGATE:

BIPHENYL (28%-125%) 33%

Analyst: CE 1/18/96

Reviewer: BH 1-18-96

Analytical Technologies, Inc.

LIQUID CHROMATOGRAPHY RESULTS

METHOD:	8310	**ATI I.D.:**	601516-2 RE
CLIENT I.D.:	MW-2-1-4-96	**DATE SAMPLED:**	01/04/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	01/18/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	01/22/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER	RESULTS	
NAPHTHALENE	<	0.5
ACENAPHTHYLENE	<	1.0
ACENAPHTHENE	<	1.0
FLUORENE	<	0.1
PHENANTHRENE	<	0.05
ANTHRACENE	<	0.05
FLUORANTHENE	<	0.1
PYRENE	<	0.1
BENZO(a)ANTHRACENE	<	0.1
CHRYSENE	<	0.1
BENZO(b)FLUORANTHENE	<	0.1
BENZO(k)FLUORANTHENE	<	0.1
BENZO(a)PYRENE	<	0.1
DIBENZO(a,h)ANTHRACENE	<	0.1
BENZO(g,h,i)PERYLENE	<	0.1
INDENO(1,2,3-cd)PYRENE	<	0.1

SURROGATE:

BIPHENYL (28%-125%) 84%

Analyst: CE 1/23/96

Reviewer: BH 1/24/96

Analytical**Technologies**, Inc.

LIQUID CHROMATOGRAPHY RESULTS

METHOD:	8310	**ATI I.D.:**	601516-3
CLIENT I.D.:	MW-3-1-4-96	**DATE SAMPLED:**	01/04/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	01/09/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	01/16/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER		RESULTS
NAPHTHALENE		100
ACENAPHTHYLENE		21
ACENAPHTHENE	<	1.0
FLUORENE		0.4
PHENANTHRENE		0.17
ANTHRACENE	<	0.05
FLUORANTHENE	<	0.1
PYRENE	<	0.1
BENZO(a)ANTHRACENE	<	0.1
CHRYSENE	<	0.1
BENZO(b)FLUORANTHENE	<	0.1
BENZO(k)FLUORANTHENE	<	0.1
BENZO(a)PYRENE	<	0.1
DIBENZO(a,h)ANTHRACENE	<	0.1
BENZO(g,h,i)PERYLENE	<	0.1
INDENO(1,2,3-cd)PYRENE	<	0.1

SURROGATE:	
BIPHENYL (28%-125%)	67%

Analyst: CE 1/18/96

Reviewer: BH 1-18-96

Analytical Technologies, Inc.

LIQUID CHROMATOGRAPHY RESULTS

METHOD:	8310	**ATI I.D.:**	601516-3 RE
CLIENT I.D.:	MW-3-1-4-96	**DATE SAMPLED:**	01/04/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	01/18/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	01/22/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER		RESULTS	
NAPHTHALENE		180	D
ACENAPHTHYLENE		23	
ACENAPHTHENE	<	1.0	
FLUORENE	<	0.1	
PHENANTHRENE	<	0.05	
ANTHRACENE	<	0.05	
FLUORANTHENE	<	0.1	
PYRENE	<	0.1	
BENZO(a)ANTHRACENE	<	0.1	
CHRYSENE	<	0.1	
BENZO(b)FLUORANTHENE	<	0.1	
BENZO(k)FLUORANTHENE	<	0.1	
BENZO(a)PYRENE	<	0.1	
DIBENZO(a,h)ANTHRACENE	<	0.1	
BENZO(g,h,i)PERYLENE	<	0.1	
INDENO(1,2,3-cd)PYRENE	<	0.1	

SURROGATE:

BIPHENYL (28%-125%) 36%

D = Value from a 1:4 dilution, analyzed on 1/23/96

Analyst: GE 1/23/96

Reviewer: [illegible] 1/24/96

Analytical Technologies, Inc.

LIQUID CHROMATOGRAPHY RESULTS

METHOD:	8310	**ATI I.D.:**	601516-4
CLIENT I.D.:	MW-5-1-4-96	**DATE SAMPLED:**	01/04/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	01/09/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	01/16/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER	RESULTS	
NAPHTHALENE	<	0.5
ACENAPHTHYLENE	<	1.0
ACENAPHTHENE	<	1.0
FLUORENE	<	0.1
PHENANTHRENE	<	0.05
ANTHRACENE	<	0.05
FLUORANTHENE	<	0.1
PYRENE	<	0.1
BENZO(a)ANTHRACENE	<	0.1
CHRYSENE	<	0.1
BENZO(b)FLUORANTHENE	<	0.1
BENZO(k)FLUORANTHENE	<	0.1
BENZO(a)PYRENE	<	0.1
DIBENZO(a,h)ANTHRACENE	<	0.1
BENZO(g,h,i)PERYLENE	<	0.1
INDENO(1,2,3-cd)PYRENE	<	0.1

SURROGATE:

BIPHENYL (28%-125%) 18% H

H = Out of Limits

Analyst: CE 1/18/96

Reviewer: BH 1-18-96

Analytical Technologies, Inc.

LIQUID CHROMATOGRAPHY RESULTS

METHOD:	8310	**ATI I.D.:**	601516-4 RE
CLIENT I.D.:	MW-4-1-4-96	**DATE SAMPLED:**	01/04/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	01/18/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	01/22/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER	RESULTS	
NAPHTHALENE	<	0.5
ACENAPHTHYLENE	<	1.0
ACENAPHTHENE	<	1.0
FLUORENE	<	0.1
PHENANTHRENE	<	0.05
ANTHRACENE	<	0.05
FLUORANTHENE	<	0.1
PYRENE	<	0.1
BENZO(a)ANTHRACENE	<	0.1
CHRYSENE	<	0.1
BENZO(b)FLUORANTHENE	<	0.1
BENZO(k)FLUORANTHENE	<	0.1
BENZO(a)PYRENE	<	0.1
DIBENZO(a,h)ANTHRACENE	<	0.1
BENZO(g,h,i)PERYLENE	<	0.1
INDENO(1,2,3-cd)PYRENE	<	0.1

SURROGATE:

BIPHENYL (28%-125%) 76%

Analyst: GE 1/23/96

Reviewer: [illegible] 1/23/96

Analytical Technologies, Inc.

LIQUID CHROMATOGRAPHY RESULTS

METHOD:	8310	**ATI I.D.:**	601516-5
CLIENT I.D.:	MW-5-1-4-96	**DATE SAMPLED:**	01/04/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	01/09/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	01/16/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER		RESULTS
NAPHTHALENE		8.6
ACENAPHTHYLENE		5.6
ACENAPHTHENE	<	1.0
FLUORENE	<	0.1
PHENANTHRENE		0.24
ANTHRACENE	<	0.05
FLUORANTHENE	<	0.1
PYRENE	<	0.1
BENZO(a)ANTHRACENE	<	0.1
CHRYSENE	<	0.1
BENZO(b)FLUORANTHENE	<	0.1
BENZO(k)FLUORANTHENE	<	0.1
BENZO(a)PYRENE	<	0.1
DIBENZO(a,h)ANTHRACENE	<	0.1
BENZO(g,h,i)PERYLENE	<	0.1
INDENO(1,2,3-cd)PYRENE	<	0.1
SURROGATE:		
BIPHENYL (28%-125%)		47%

Analyst: CEi 1/18/96

Reviewer: BH 1-18-96

Analytical Technologies, Inc.

LIQUID CHROMATOGRAPHY RESULTS

METHOD:	8310	**ATI I.D.:**	601516-5 RE
CLIENT I.D.:	MW-5-1-4-96	**DATE SAMPLED:**	01/04/96
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	01/18/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	01/23/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER		RESULTS
NAPHTHALENE		29
ACENAPHTHYLENE		13
ACENAPHTHENE	<	1.0
FLUORENE		0.8
PHENANTHRENE	<	0.05
ANTHRACENE	<	0.05
FLUORANTHENE	<	0.1
PYRENE	<	0.1
BENZO(a)ANTHRACENE	<	0.1
CHRYSENE	<	0.1
BENZO(b)FLUORANTHENE	<	0.1
BENZO(k)FLUORANTHENE	<	0.1
BENZO(a)PYRENE	<	0.1
DIBENZO(a,h)ANTHRACENE	<	0.1
BENZO(g,h,i)PERYLENE	<	0.1
INDENO(1,2,3-cd)PYRENE	<	0.1

SURROGATE:	
BIPHENYL (28%-125%)	56%

Analyst: CE 1/25/96

Reviewer: BH 1/24/96

Analytical Technologies, Inc.

LIQUID CHROMATOGRAPHY SPIKE RESULTS

METHOD:	8310	**ATI I.D.:**	601516
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	601516-2
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	01/09/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	01/17/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
ACENAPHTHYLENE	<	1.0	1.0	0.94	94%	0.79	79%	17
PHENANTHRENE	<	0.05	0.10	0.12	120%	0.12	120%	0
PYRENE	<	0.1	0.1	0.05	50%	0.05	50%	0
BENZO(k)FLUORANTHENE	<	0.1	0.1	0.03	30% H	0.02	20% H	40 H
DIBENZO(a,h)ANTHRACENE	<	0.1	0.1	0.03	30%	0.02	20 % H	40 H
SURROGATE:								
BIPHENYL (28% - 125%)				47%		49%		

CONTROL LIMITS

	% REC	RPD
ACENAPHTHYLENE	46 - 128	52
PHENANTHRENE	55 - 151	35
PYRENE	41 - 143	30
BENZO(k)FLUORANTHENE	43 - 127	33
DIBENZO(a,h)ANTHRACENE	29 - 148	39

H = Out of Limits

Analyst: CE 1/18/96

Reviewer: BH 1-18-96

Analytical**Technologies**, Inc.

LIQUID CHROMATOGRAPHY SPIKE RESULTS

METHOD:	8310	**ATI I.D.:**	601516 RE
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	601516-3
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	01/18/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	01/22/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
ACENAPHTHYLENE		23	10.0	32.7	97%	32.7	97%	0
PHENANTHRENE	<	0.05	1.00	0.75	75%	0.77	77%	3
PYRENE	<	0.1	1.0	0.64	64%	0.69	69%	8
BENZO(k)FLUORANTHENE	<	0.1	1.0	0.60	60%	0.66	66%	10
DIBENZO(a,h)ANTHRACENE	<	0.1	1.0	0.64	64%	0.65	65%	2
SURROGATE:								
BIPHENYL (28% - 125%)				32%		33%		

CONTROL LIMITS

	% REC	RPD
ACENAPHTHYLENE	46 - 128	52
PHENANTHRENE	55 - 151	35
PYRENE	41 - 143	30
BENZO(k)FLUORANTHENE	43 - 127	33
DIBENZO(a,h)ANTHRACENE	29 - 148	39

Analyst: CE 1/23/96

Reviewer: RH 1/24/96

Analytical Technologies, Inc.

LIQUID CHROMATOGRAPHY BLANK SPIKE RESULTS

METHOD:	8310	**ATI I.D.:**	601516
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	Method Blank
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	01/04/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	01/17/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
ACENAPHTHYLENE	<	1.0	1.0	2.8	280 H	2.0	200 H	33
PHENANTHRENE	<	0.05	0.1	0.15	150 H	0.12	120	22
PYRENE	<	0.1	0.1	0.10	100	0.11	110	10
BENZO(k)FLUORANTHENE	<	0.1	0.1	0.05	50 H	0.05	50 H	0
DIBENZO(a,h)ANTHRACENE	<	0.2	0.1	0.05	50 H	0.05	50 H	0
SURROGATE:								
BIPHENYL (28% - 125%)				53%		55%		

CONTROL LIMITS

	% REC	RPD
ACENAPHTHYLENE	31 - 125	44
PHENANTHRENE	44 - 128	34
PYRENE	56 - 150	41
BENZO(k)FLUORANTHENE	57 - 136	35
DIBENZO(a,h)ANTHRACENE	57 - 140	39

H = OUT OF LIMITS

Analyst: GE 1/15/96

Reviewer: BH 1-18-96

Analytical Technologies, Inc.

LIQUID CHROMATOGRAPHY BLANK SPIKE RESULTS

METHOD:	8310	**ATI I.D.:**	601516 RE
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	Method Blank
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	01/18/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	01/22/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
ACENAPHTHYLENE	<	1.0	10.0	9.8	98	10.0	100	2
PHENANTHRENE	<	0.05	1.0	0.87	87	0.95	95	9
PYRENE	<	0.1	1.0	0.8	80	0.9	90	12
BENZO(k)FLUORANTHENE	<	0.1	1.0	0.6	60	0.6	60	0
DIBENZO(a,h)ANTHRACENE	<	0.2	1.0	0.8	80	1.0	100	22
SURROGATE:								
BIPHENYL (28% - 125%)				88%		93%		

	CONTROL LIMITS	
	% REC	RPD
ACENAPHTHYLENE	31 - 125	44
PHENANTHRENE	44 - 128	34
PYRENE	56 - 150	41
BENZO(k)FLUORANTHENE	57 - 136	35
DIBENZO(a,h)ANTHRACENE	57 - 140	39

Analyst: CE 1/23/96

Reviewer: [illegible] 1/24/96

Analytical Technologies, Inc.

DISSOLVED METALS RESULTS

CLIENT I.D.:	Method Blank	**ATI I.D.:**	601516-0
CLIENT:	GeoEngineers, Inc.	**DATE SAMPLED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE RECEIVED:**	01/04/96
PROJECT NAME:	Rose's Parking Lot	**DATE DIGESTED:**	01/05/96
SAMPLE MATRIX:	WATER	**DATE ANALYZED:**	01/16/96
		DILUTION FACTOR:	1
		UNITS:	mg/L

PARAMETER	RESULTS	METHOD
LEAD	< 0.002	7421

Analyst: KFL 1/17/96

Reviewer: NS 1/17/96

Analytical Technologies, Inc.

DISSOLVED METALS RESULTS

CLIENT I.D.:	MW-1-1-4-96	ATI I.D.:	601516-1
CLIENT:	GeoEngineers, Inc.	DATE SAMPLED:	01/04/96
PROJECT #:	4326-001-P62	DATE RECEIVED:	01/04/96
PROJECT NAME:	Rose's Parking Lot	DATE DIGESTED:	01/05/96
SAMPLE MATRIX:	WATER	DATE ANALYZED:	01/16/96
		DILUTION FACTOR:	1
		UNITS:	mg/L

PARAMETER	RESULTS		METHOD
LEAD	0.10	D	7421

D = Value from a 1:5 dilution analyzed on 01/16/96.

Analyst: KEL 1/17/96

Reviewer: KS 1/17/96

Analytical Technologies, Inc.

DISSOLVED METALS RESULTS

CLIENT I.D.:	MW-2-1-4-96	ATI I.D.:	601516-2
CLIENT:	GeoEngineers, Inc.	DATE SAMPLED:	01/04/96
PROJECT #:	4326-001-P62	DATE RECEIVED:	01/04/96
PROJECT NAME:	Rose's Parking Lot	DATE DIGESTED:	01/05/96
SAMPLE MATRIX:	WATER	DATE ANALYZED:	01/16/96
		DILUTION FACTOR:	1
		UNITS:	mg/L

PARAMETER	RESULTS	METHOD
LEAD	< 0.002	7421

Analyst: KFL 1/17/96

Reviewer: RS 1/17/96

Analytical Technologies, Inc.

DISSOLVED METALS RESULTS

CLIENT I.D.:	MW-3-1-4-96	**ATI I.D.:**	601516-3
CLIENT:	GeoEngineers, Inc.	**DATE SAMPLED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE RECEIVED:**	01/04/96
PROJECT NAME:	Rose's Parking Lot	**DATE DIGESTED:**	01/05/96
SAMPLE MATRIX:	WATER	**DATE ANALYZED:**	01/16/96
		DILUTION FACTOR:	1
		UNITS:	mg/L

PARAMETER	RESULTS	METHOD
LEAD	0.006	7421

Analyst: KFL 1/17/96

Reviewer: RSJ 1/17/96

Analytical**Technologies**, Inc.

DISSOLVED METALS RESULTS

CLIENT I.D.:	MW-4-1-4-96	**ATI I.D.:**	601516-4
CLIENT:	GeoEngineers, Inc.	**DATE SAMPLED:**	01/04/96
PROJECT #:	4326-001-P62	**DATE RECEIVED:**	01/04/96
PROJECT NAME:	Rose's Parking Lot	**DATE DIGESTED:**	01/05/96
SAMPLE MATRIX:	WATER	**DATE ANALYZED:**	01/16/96
		DILUTION FACTOR:	1
		UNITS:	mg/L

PARAMETER	RESULTS	METHOD
LEAD	< 0.002	7421

Analyst: KFL 1/17/96

Reviewer: RS 1/17/96

Analytical Technologies, Inc.

DISSOLVED METALS RESULTS

CLIENT I.D.:	MW-5-1-4-96	ATI I.D.:	601516-5
CLIENT:	GeoEngineers, Inc.	DATE SAMPLED:	01/04/96
PROJECT #:	4326-001-P62	DATE RECEIVED:	01/04/96
PROJECT NAME:	Rose's Parking Lot	DATE DIGESTED:	01/05/96
SAMPLE MATRIX:	WATER	DATE ANALYZED:	01/16/96
		DILUTION FACTOR:	1
		UNITS:	mg/L

PARAMETER	RESULTS	METHOD
LEAD	0.014	7421

Analyst: KFL 1/17/96

Reviewer: [illegible] 1/17/96

Analytical Technologies, Inc.

METALS DUPLICATE RESULTS

METHOD:	7421	ATI I.D.:	601516
CLIENT:	GeoEngineers, Inc.	QC SAMPLE:	601513-1
PROJECT #:	4326-001-P62	DATE DIGESTED:	01/05/96
PROJECT NAME:	Rose's Parking Lot	DATE ANALYZED:	01/16/96
SAMPLE MATRIX:	WATER	DILUTION FACTOR:	1
		UNITS:	mg/L

PARAMETER	SAMPLE RESULT	DUPLICATE RESULT	RPD	RPD CONTROL LIMIT
LEAD	0.005	0.006	18	20

Analyst: ICAL 1/17/96

Reviewer: RS 1/17/96

Analytical Technologies, Inc.

METALS SPIKE RESULTS

METHOD:	7421	**ATI I.D.:**	601516
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	601513-1
PROJECT #:	4326-001-P62	**DATE DIGESTED:**	01/05/96
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	01/16/96
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	SAMPLE RESULT	SPIKE CONC	SPIKE RESULT	% RECOV	CONTROL LIMIT
LEAD	0.005	0.020	0.021	80	75-125%

Analyst: KFL 1/17/96

Reviewer: NS 1/17/96

AnalyticalTechnologies,Inc.

METALS BLANK SPIKE RESULTS

METHOD:	7421	ATI I.D.:	601516
CLIENT:	GeoEngineers, Inc.	QC SAMPLE:	Method Blank
PROJECT #:	4326-001-P62	DATE DIGESTED:	01/05/96
PROJECT NAME:	Rose's Parking Lot	DATE ANALYZED:	01/16/96
SAMPLE MATRIX:	WATER	DILUTION FACTOR:	1
		UNITS:	mg/L

PARAMETER	RESULT	TRUE VALUE	% RECOV	CONTROL LIMIT
LEAD	0.021	0.020	105	80-120%

Analyst: KFL 1/17/96

Reviewer: [illegible] 1/17/96

DATE 1-4-96 PAGE 1 OF 1

AnalyticalTechnologies,Inc.

17400 S.W. Upper Boones Ferry Rd., Suite 270
Durham, Oregon 97224 • (503) 684-0447 FAX: (503) 620-0393

Chain of Custody

LABORATORY NUMBER: 60576
PROJECT NOTICE NUMBER: _____

PROJECT MANAGER: Marsi Beeson
COMPANY: GeoEngineers
ADDRESS: 7504 SW Bridgeport Rd
Portland, OR
PHONE: 624-9274 SAMPLED BY: MBB2

SAMPLE DISPOSAL INSTRUCTIONS
☐ ATI Disposal @ $5.00 each ☐ Return

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID
MW-1-1-4-96	1/4/96	0855	H_2O	1
MW-2-1-4-96	"	1500	"	2
MW-3-1-4-96	"	1345	"	3
MW-4-1-4-96	"	1145	"	4
MW-5-1-4-96	"	1030	"	5

PETROLEUM HYDROCARBONS											ORGANICS							INORGANICS			TCLP			OTHER										NUMBER OF CONTAINERS
TPH-HCID	State: OR / WA	State: OR / WA	State: OR / WA	State: OR / WA	EPA 418.1	8015M	8020M-BETX only	8310 HPLC PAHs	7421 Lead	% Moisture	8010 Halogenated VOCs	8020 Aromatic VOCs	8040 Phenols	8240 GCMS Volatiles	8270 GCMS Semivolatiles	8080 OC Pesticides/PCBs	8080M PCBs only	Drinking Water (8)	Priority Pollutant Metals (13)	Cyanide	TCLP Metals (8)	TCLP Volatiles 8240 ZH-EXT	TCLP Semivolatiles 8270	EDB/EDC	Dissolved lead 7421									
					X		X	X	added 1/10/96 per MB															X	X								1
					X		X	X																X	X								2
					X		X	X																X	X								3
					X		X	X																X	X								4
					X		X	X																X	X								5

PROJECT INFORMATION	SAMPLE RECEIPT	
PROJECT NUMBER: 4326-001-P62	TOTAL NUMBER OF CONTAINERS	40
PROJECT NAME: Rosa's Pkg. Lot	COC SEALS/INTACT? Y \ N \ NA	
PURCHASE ORDER NUMBER:	RECEIVED INTACT? Y N	
ONGOING PROJECT? YES ☒ NO ☐	RECEIVED COLD? Y N	

PRIOR AUTHORIZATION REQUIRED FOR RUSH PROJECTS

TAT: (NORMAL) ☒ 2 WKS (RUSH) ☐ 24 HR ☐ 48 HRS ☐ 72 HRS ☐ 1 WK

GREATER THAN 24 HR. NOTICE? YES ☐ NO ☐ (LAB USE ONLY)

SPECIAL INSTRUCTIONS:
If TPH is greater than 0.5 mg/l, run PAHs. MW-1 likely very contaminated.

Received via:

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY 3.
Signature: Marsi Beeson Time: 1600	Signature Time:	Signature Time:
Printed Name: Marsi Beeson Date: 1-4-96	Printed Name: Date:	Printed Name: Date:
Company: GeoEngineers	Company:	Company:
RECEIVED BY: 1.	**RECEIVED BY: 2.**	**RECEIVED BY: (LAB) 3.**
Signature: Jenna Gorton Time: 1600	Signature Time:	Signature Time:
Printed Name: Jenna Gorton Date: 1-4-95	Printed Name: Date:	Printed Name: Date:
Company: ATI	Company:	Analytical Technologies, Inc.

ATI Labs: San Diego (619) 458-9141 • Phoenix (602) 496-4400 • Seattle (206) 228-8335 • Pensacola (904) 474-1001 • Portland (503) 684-0447 • Fort Collins (303) 490-1511

GeoEngineers

7504 SW Bridgeport Road
Portland, Oregon 97224
Telephone: (503) 624-9274
Fax: (503) 620-5940

FAX TRANSMITTAL

To: DEQ Northwest Region

Date: February 13, 1996

File: 4326-001

Fax Number: 229-6945

Attention: Mr. Don Pettit

Regarding: Rose's Parking Lot

Pages	Date	Description
1	02/13/96	Fax Transmittal
1	02/13/96	Proposed off-site boring locations

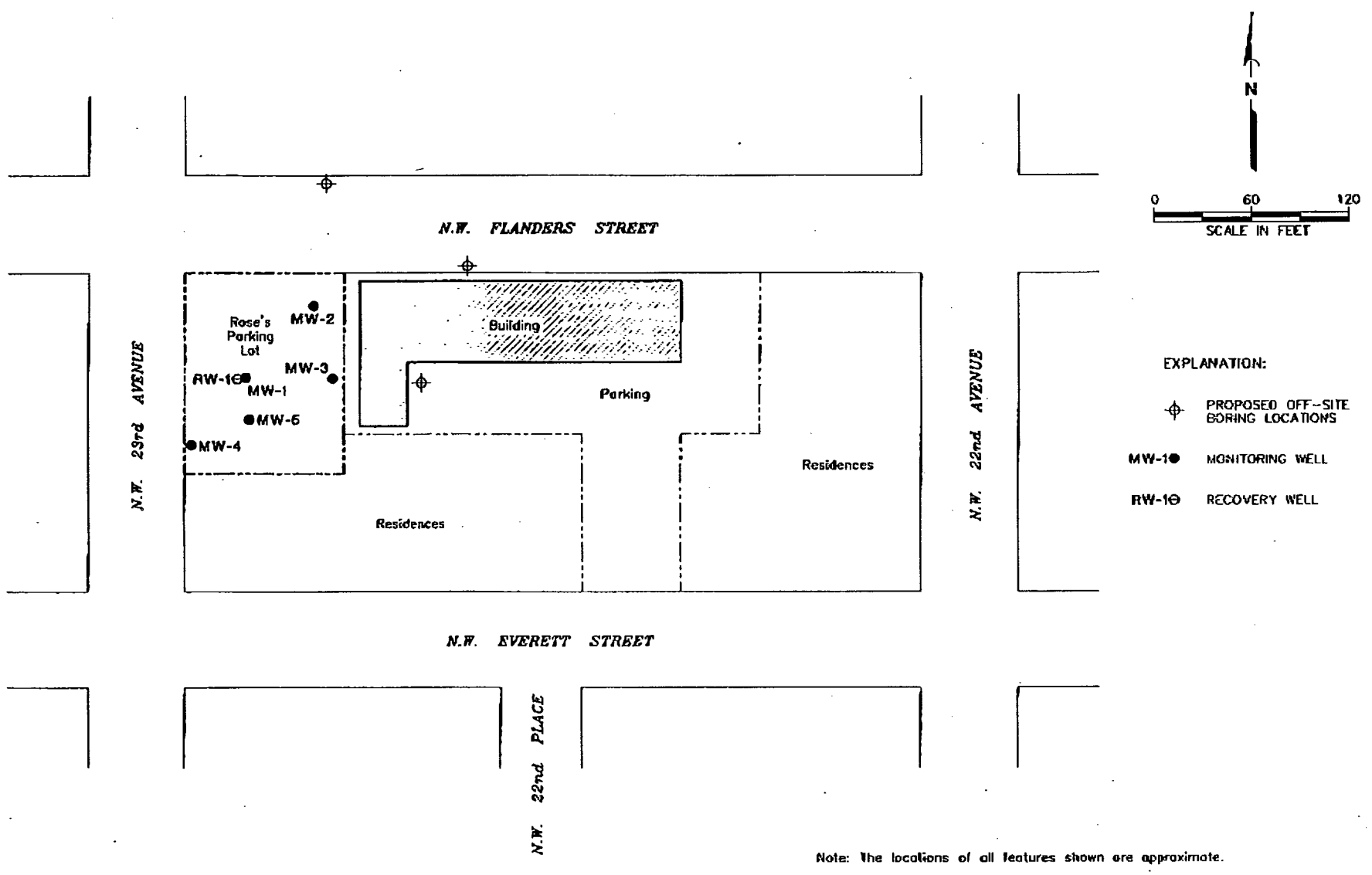
Total Pages: 2

Comments: As we discussed last Friday, here is a map showing the revised proposed off-site boring locations. Please call me or Marsi Beeson with any questions or comments. Thank you.

Signed: Julia Fowler

Julia Fowler

02/13/96 10:06 ☎1 503 620 5940 GEO ENGINEERS →→→ DEQ NW REGION ☑002



Note: The locations of all features shown are approximate.

Reference: Multnomah County Tax Assessor's Map.

Geo Engineers

PROPOSED OFF-SITE BORING LOCATIONS

FIGURE 1

UST CLEANUP TELEPHONE USE REPORT

CALL FROM (TO): Julia Fowler DATE: 1/16/96

WITH: GeoEngineers TIME: 11:00-11:20

TELEPHONE NO: ( ) 624-9274

REGARDING: Rose's Parking Lot

FILE NO: 26-94-025

SUMMARY OF CALL

Discussed RBCA approach to site.

Still negotiating access to drill offsite.

Report on QGWM & ERT (VES/PUMP) test to follow.

2/16/96 11:00 → Julia Fowler - Gave OK for new MW-locations.

Don J. Pettit
Staff Signature

PLEASE DO NOT ADD ANY NEW INFORMATION TO THIS FOLDER

PLEASE GO TO THE NEXT FOLDER

Box 226

BALL JANIK LLP

ATTORNEYS

101 SOUTHWEST MAIN STREET, SUITE 1100
PORTLAND, OREGON 97204-3219

www.balljanik.com

TELEPHONE 503-228-2525
FACSIMILE 503-295-1058

RECEIVED
SEP 5 2002
DEPT OF ENVIRONMENTAL QUALITY
NORTHWEST REGION

RICHARD H. ALLAN

rallan@bjllp.com

September 4, 2002

By Facsimile and
First Class Mail

Mr. Andree Pollock
Oregon Department of Environmental Quality
Northwest Regional Office
2020 SW 4th Avenue, Suite 400
Portland, OR 97204

Re: Rose's Parking Lot File No. 26-94-~~0225~~ 0025

Dear Mr. Pollock:

I am writing to follow up my letter of March 29, 2002 and our subsequent conversations regarding the above-named site. The purpose of this letter is to address the concerns of the property owner, 23rd & Flanders LLC, with several ambiguities in the Department's July 19, 2001 "no further action" letter for the site. We believe that the issues listed below, if not clarified, likely would create problems with a lender or purchaser.

The introductory paragraph of the NFA letter states the cleanup "appears" to have met DEQ's regulatory cleanup requirements. It is our understanding that all evidence indicates that the cleanup actually met DEQ standards.

Paragraph 2 states that free petroleum product "has been measured in MW-1 and MW-5 with a maximum thickness of 2.8 feet seen in MW-1." It is our understanding although free petroleum product historically was measured in MW-1 and MW-5, the free product has been successfully removed.

Paragraph 4 of the NFA letter indicates that TPH, BTEX, and naphthalene were not detected in four out of five push-probe points sampled in August 2000 to determine the success of the dual vacuum extraction and soil vapor extraction system in remediating soil contamination. It is our understanding of the results of confirmation soil sampling that one pocket of approximately 25 cubic yards of petroleum contaminated soil remains below the northeast quadrant of the site at a depth of approximately 17 feet below the ground surface, and that subsequent references in the NFA letter to a "pocket" on the site are references to this same pocket of approximately 25 cubic yards.

Paragraph 5 of the NFA letter indicates that the groundwater ingestion pathway was the only groundwater exposure route of concern. It is our understanding from the beneficial use study and Paragraph 5 of the NFA letter that groundwater is not a source of drinking water in the area and that as long as the groundwater is not being pumped for beneficial use, DEQ does not believe that residual groundwater contamination associated with the site is a pathway for exposure. In other words, as long as groundwater is not being used, the low level of contamination in groundwater at the site is not a threat to human health and the environment.

Paragraph 6 of the NFA letter refers to the residual pocket of contamination as a "hot spot." It is our understanding that the residual pocket of contamination does not constitute a "hot spot of contamination" as defined in OAR 340-122-0115 (31) and, therefore, is not subject to the statutory and regulatory provisions regarding preference for treatment or removal of hot spots.

Paragraph 6 also indicates that the conceptual site model prepared for this site shows that the pocket of contaminated soil would not result in volatilization to indoor air that would exceed the residential risk standard. It is our understanding that if the site meets the residential risk standard, commercial development of the site is also an acceptable alternative under DEQ's standards and that the presence of the pocket of contamination does not restrict the types of uses that may be placed in any building that might be built on the site in the future.

Finally, the NFA letter states at page 3 that DEQ must be notified in advance and the adequacy of cleanup must be reevaluated "if any excavation in or near the pocket location is planned." It is our understanding that the purpose of this requirement is to give DEQ the opportunity to evaluate whether a planned excavation would make it practical to remove the residual pocket of petroleum contaminated soil, but the Department would not reevaluate whether the site can be used for residential or commercial purposes. In other words, if excavation would provide access to the pocket of contaminated soil, DEQ at most may require that the contaminated soil be excavated and removed for offsite treatment and disposal at that time.

We would appreciate written confirmation from DEQ that our understanding of these issues is correct. If you foresee any problem in providing such a written response, we request the opportunity to meet with you. Please feel free to call me to arrange a mutually convenient time to meet.

Very truly yours,

Richard H. Allan

RHA: crs
cc by facsimile: Mr. Richard Singer
Mr. Don Singer

Oregon
Theodore R. Kulongoski, Governor

Department of Environmental Quality
Northwest Region Portland Office
2020 SW 4th Avenue, Suite 400
Portland, OR 97201-4987
(503) 229-5263
FAX (503) 229-6945
TTY (503) 229-5471

June 27, 2003

RICHARD ALLAN
BALL JANIK
101 SW MAIN STREET SUITE 1100
PORTLAND OREGON 97204-3219

Re: Rose's Parking Lot
File No. 26-94-0025

Dear Mr. Allan:

I am responding to your letter, dated September 4, 2002, concerning the underground storage tank cleanup at 330 NW 23rd Avenue in Portland, Oregon. Your client has expressed a desire to have the July 19, 2001, "no further action" (NFA) clarified to prevent problems in case of a property transaction in the future.

Many of the issues brought up in your letter are either standard language or otherwise clarified in rule or guidance. My conversations with Robert Williams indicate that he used the term "hot spot" to reflect an area with elevated levels of contamination and not to reflect a "hot spot" as defined by Oregon Administrative Rules (OAR) 340-122-0115 (32). As indicated in the NFA determination, the remaining pocket of contamination meets DEQ risk standards as long as site conditions do not change. If conditions change, the adequacy of cleanup must be reevaluated as stated in the NFA.

If your client would like to have the DEQ address all of the issues in your letter, we are willing to do so. However, this will require reopening the file and a detailed review of the information. For this reason, submittal of a signed cost recovery agreement will be required and the DEQ will bill its time for this effort.

If your client would like to reopen the file and have the NFA modified, please call me at (503) 229-5474.

Sincerely,

Andree Pollock, Manager
UST Cleanup and Compliance Section

Enclosures

(avp:AVP)

BALL JANIK LLP

ATTORNEYS

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PORTLAND, OREGON 97204-3219

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TELEPHONE 503-228-2525
FACSIMILE 503-295-1058

RICHARD H. ALLAN

rallan@bjllp.com

RECEIVED
APR 1 2002
DEPT OF ENVIRONMENTAL QUALITY
NORTHWEST REGION

March 29, 2002

Bx 226

By Facsimile and
First Class Mail

Mr. Andree Pollock
Oregon Department of Environmental Quality
Northwest Regional Office
2020 SW 4th Avenue, Suite 400
Portland, OR 97204

Re: Rose's Parking Lot File No. [redacted]
26-94-0025

Dear Mr. Pollock:

I am writing to follow up my letter of March 21, 2002 and our conversation earlier this week. As you know, this firm represents Richard and Don Singer and their company, 23rd & Flanders LLC, which owns the "Rose's Parking Lot" site at 330 NW 23rd Avenue in Portland.

You indicated in our conversation that you had reviewed the Department's July 19, 2001 "no further action" letter for the site, and you asked for clarification regarding the Singers' concerns with that letter. I will identify several passages in the letter that, if not clarified, likely would create problems with a lender or purchaser.

Paragraph 2 states that free petroleum product "has been measured" in MW-1 and MW-5 with a maximum thickness of 2.8 feet seen in MW-1." The letter does not reflect that the free product has been successfully removed.

Paragraph 4 of the NFA letter indicates that TPH, BTEX, and naphthalene were not detected in four out of five push-probe points sampled in August 2000 to determine the success of the dual vacuum extraction and oil vapor extraction system in remediating soil contamination. It is our understanding of the results of confirmation soil sampling that a pocket of approximately 25 cubic yards of petroleum contaminated soil remains below the northeast quadrant of the site at a depth of approximately 17 feet below the ground surface. Paragraph 6 of the NFA letter refers to the residual pocket of contamination as a "hot spot." It is our understanding that the residual pocket of contamination does not constitute a "hot spot of

contamination" as defined in OAR 340-122-0115 (31) and, therefore, is not subject to the statutory and regulatory provisions regarding preference for treatment or removal of hot spots.

Paragraph 6 also indicates that the conceptual site model prepared for this site shows that the pocket of contaminated soil would not result in volatilization to indoor air that would exceed the residential risk standard. It is our understanding that if the site meets the residential risk standard, commercial development of the site is also an acceptable alternative under DEQ's standards and that the presence of the pocket of contamination does not restrict the use of any building that might be placed on the site in the future.

Finally, the NFA letter states at page 3 that DEQ must be notified in advance and the adequacy of cleanup must be reevaluated "if any excavation in or near the pocket location is planned." It is our understanding that the purpose of this requirement is to give DEQ the opportunity to evaluate whether a planned excavation would make it practical to remove the residual pocket of petroleum contaminated soil, but the Department would not reevaluate whether the site can be used for residential or commercial purposes. In other words, if excavation would provide access near the pocket of contaminated soil, DEQ at most may require that the contaminated soil be excavated and removed for offsite treatment and disposal at that time.

Again, we would like to meet with you to discuss how we can obtain written clarification and concurrence from DEQ regarding these issues. My clients are available the week of April 1, and I am available at most times until the afternoon on Thursday, April 4.

Very truly yours,

Richard H. Allan

RHA: crs
cc by facsimile: Mr. Richard Singer
Mr. Don Singer

BALL JANIK LLP

ATTORNEYS

101 SOUTHWEST MAIN STREET, SUITE 1100
PORTLAND, OREGON 97204-3219

www.balljanik.com

TELEPHONE 503-228-2525
FACSIMILE 503-295-1058

RICHARD H. ALLAN

rallan@bjllp.com

RECEIVED
MAR 2 2 2002
DEPT OF ENVIRONMENTAL QUALITY
NORTHWEST REGION

March 21, 2002

By Facsimile and
First Class Mail

Mr. Andree Pollock, Manager
UST Cleanup and Compliance Section
Oregon Department of
Environmental Quality
Northwest Regional Office
2020 SW 4th Avenue, Suite 400
Portland, OR 97201-4987

Re: Rose's Parking Lot File No. 26-94-0025

Dear Mr. Pollock:

This firm represents Richard and Don Singer and their company, 23rd & Flanders, LLC, which owns the "Rose's Parking Lot" site at 330 NW 23rd Avenue in Portland. The Singers worked with TerraVac and DEQ for several years to obtain a "no further action" letter for conditions on the property related to a former gas station.

As you probably recall, the DEQ staff on this project changed several times over the years that remediation and confirmation monitoring were undertaken. At the outset, we were working with Don Pettit. In a meeting with Mr. Pettit, the Singers and an attorney from this firm were assured that they would have the opportunity to review a draft no further action determination prior to issuance of the final letter. Unfortunately, the July 19, 2001 no further action letter was issued without our opportunity to review a draft.

We are concerned that several statements in the letter could create misunderstandings for purchasers or lenders. That is problematic, given that the Singers had explained to staff that a clear resolution of DEQ environmental concerns is critical to future financing and development of the property, whether by the Singers or by a future purchaser.

We would like to meet with you to ensure that we share an understanding of the terms of the no further action letter and can reach agreement on a clarification letter. My clients will be available after April 1. I will call you to schedule a meeting.

Very truly yours,

Richard H. Allan

RHA:crs
Cc (by facsimile): Mr. Richard Singer
Mr. Don Singer

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
Northwest Region
2020 SW Fourth Avenue
Suite 400
Portland, OR 97201-4987
(503) 229-5263 Voice
TTY (503) 229-5471

July 19, 2001

RICHARD SINGER
824 NW ALBEMARLE TERRACE
PORTLAND, OREGON 97210

Re: Rose's Parking Lot
File No. 26-94-0025

Dear Mr. Singer:

The Department has completed its review of the information submitted to date concerning the underground storage tank (UST) cleanup at 330 NW 23rd Avenue in Portland, Oregon. The Department has determined that the cleanup appears to have met the requirements of Oregon Administrative Rules (OAR) 340-122-205 through 340-122-360 and that no further action is required at this time.

This determination is a result of our evaluation and judgment based on the regulations and facts as we now understand them, including:

1. The site was occupied by an auto service station from 1954 to the mid-1970s. Building permit records indicated that the station employed two gasoline USTs and one waste oil UST. In 1979 the service station building was demolished and the gasoline USTs were reportedly removed at that time. In 1994 a magnetic survey confirmed the presence of the waste oil UST on the south side of the site. In November 1995 the 550-gallon waste oil UST was removed from near the south property boundary. Approximately 550 gallons of residual waste oil and rinse water was transported to Harbor Oil in Portland, Oregon for disposal. The tank was recycled at Schnitzer Steel in Portland. Three confirmation soil samples were collected from the waste oil UST excavation. There was no evidence of a release from the tank and no petroleum hydrocarbons were detected. One sample was analyzed for PCBs, volatile organic compounds (VOCs), and TCLP metals. Waste oil constituents were not detected.

2. Several phases of soil and groundwater sampling were undertaken by four consulting firms. Total petroleum hydrocarbons (TPH) were detected at concentrations up to 6550 parts per million (ppm) in the gasoline range and 1100 ppm in the diesel range. Contaminated soil was generally found between 10 and 28 feet below ground surface (bgs). Five onsite groundwater monitoring wells and three offsite wells were eventually established. Wells were monitored for TPH in the gasoline range, benzene, toluene, ethylbenzene, and xylene (BTEX), polynuclear aromatic hydrocarbons (PAHs), lead, and 1,2-dibromoethane and 1,2-dichloroethane (EDB/EDC). Onsite wells MW-1, MW-3, and MW-5 all contained elevated concentrations of many of the target compounds. Free petroleum product has been measured in MW-1 and MW-5 with the maximum thickness of 2.8 feet seen in MW-1. Downgradient offsite wells have not shown groundwater impacts.

3. In 1995 vacuum-enhanced fluid recovery pilot testing was performed by GeoEngineers. In

March 1997 TerraVac began operation of a dual vacuum extraction and soil vapor extraction system to extract contaminated groundwater, free product, and soil vapor. The system ran for 158 days and extracted approximately 7500 pounds of petroleum hydrocarbons. Groundwater concentrations of BTEX compounds were reduced substantially during remediation.

4. Confirmation soil sampling was undertaken in August 2000 to determine the success of remediation on soil contamination. Five push probe points were driven and samples were collected for TPH, BTEX, and naphthalene. The analytes were not detected in all but one of the sample points. B-17 was located in the northeast quarter of the site where USTs may have been located in the past. TPH at 22000 ppm and benzene at 4.5 ppm was detected at 17.5 feet bgs. Water level measurements for the site suggest that contamination is found just above the water table.

5. In December 2000 a conceptual site model (CSM) was prepared for the site. The land use designation for the site is commercial but the adjacent downgradient properties are zoned for high density residential so residential risk standards were evaluated. Identified soil exposure routes of concern were leaching to groundwater and volatilization to indoor air. Groundwater ingestion was the only groundwater exposure route of concern. The leaching to groundwater and groundwater ingestion pathways were addressed with a beneficial use study. Drinking water in the area is provided by the City of Portland surface water supply system. A search of Oregon Water Resources records located four water supply wells within ¼ mile of the site but all wells were up- or cross-gradient from the site. Oregon Water Resources records do not show any points of use for groundwater water rights near the site.

6. Volatilization to indoor air remained an exposure route of concern due to the likelihood of a commercial building being constructed on the site. The "hot spot" identified in confirmation soil sampling was further evaluated using a calculation of the estimated benzene remaining within soil that would underlie a building constructed on the site. The volume of the hot spot was estimated at approximately 25 yards. The mass of benzene that could volatilize from the soil over a 30-year exposure period was calculated and compared with Department risk standards. The resulting concentration that might be expected was calculated to be below the residential risk standard.

A 25-yard pocket of soil contamination remains below the northeast quadrant of the site at approximately 17 feet bgs. The Department approves leaving contamination in place since evaluation shows that remaining soil meets risk standards and the depth precludes physical access.

The Department's approval to leave contamination is based on the site conditions described in the report as they exist today. Should conditions change allowing access to the contamination, you are responsible for further evaluation of the remaining contamination and any cleanup necessary

at that time. You are also responsible for notifying potential purchasers of the property about this remaining contamination.

If any of the following site changes are considered the Department must be notified in advance and the adequacy of cleanup must be re-evaluated:

1. If a groundwater well is to be installed for any purpose.
2. If any excavation in or near the pocket location is planned

You are responsible at that time for any Department re-evaluation costs.

The Department's determination will not be applicable if new or undisclosed facts show that the cleanup does not comply with the referenced rules. The Department's determination also does not apply to any conditions at the site other than the release of petroleum hydrocarbons specifically addressed in the report.

Please note that pursuant to OAR 340-122-360(2), a copy of your report must be retained until ten (10) years after the first transfer of the property. We recommend that a copy of this information be kept with the permanent property records.

Your efforts to comply with the regulations to ensure that your property has been adequately cleaned up have been appreciated. If you have any questions, please feel free to contact me at (503) 229-6242.

Sincerely,

Robert Williams
UST Cleanup Specialist

Andree Pollock, Manager
UST Cleanup and Compliance Section

cc: Paul Bianco
Terra Vac
23106 100th Avenue West
Edmond, Washington 98020-5018

Roses Parking Lot 5/8/01

Mass Calculations for indoor air intrusion of benzene

Commercial building height 3 m

Building area 90 ft × 110 ft. = 9900 ft.^{2} = 920 m^2

Building vol. = 3m × 920 m^2 = 2760 m^3 (Terra Vac used 3044 m^3)

Assume PCS is 3 ft. thick = 0.91 m in a double cone shape with radius of 15 ft. = 4.57 m

double cone vol. = $\frac{1}{3}\pi r^2 h$ = 20 m^3 (vol. of contaminated soil)

mass of benzene in soil

concentration of sample 4.5 mg/kg

density = 1700 kg/m^3

(4.5 mg/kg) (20 m^3) (1700 kg/m^3) = 153,000 mg or 153,000,000 mg

Building air exchange rate (residential) = 2/day

$$\frac{\text{mass of benzene / vol. of building}}{(30\text{ yrs.})(2/\text{day})\ 365\text{ days/yr.}} = \frac{153{,}000{,}000\text{ mg} / 2760\text{ m}^3}{262800} = 0.21\text{ mg/m}^3$$

(Terra Vac calculated 0.19 mg/m^3 using 3044 m^3 building vol.)

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED

APR 27 2001

NORTHWEST REGION

Terra Vac
Northwest Division
23106 100th Avenue West
Edmonds, WA 98020-5018
425-697-5131 Tel
425-697-6211 Fax

April 24, 2001

Mr. Robert Williams
Oregon Department of Environmental Quality
2020 SW 4th Avenue, Suite 400
Portland, OR 97201-4987

Re: Revised Conceptual Site Model – Rose's Parking Lot
330 NW 23rd Avenue, Portland, Oregon

Dear Mr. Williams:

Terra Vac has prepared this letter to address the questions raised during our phone conversation on February 1, 2001.

SITE MAPS

Presented in Figure 1 is a map showing the estimated benzene impacted soil from data collected during the August 7, 2000 sampling event.

THICKNESS OF CONTAMINATED SOIL

The estimated thickness of benzene contaminated soil is derived from the length of the sampling device from the August 7, 2000 soil probe investigation. The 17.5' foot sample at B-17 was collected with a 1.5 feet (0.46 meters) long sampler. This was the only soil sample collected that had detectable benzene concentrations. However, in order to provide a more conservative benzene mass estimate, the thickness of benzene impacted soil used for the indoor air calculations was doubled to 3 feet (0.91 meters).

BUILDING FOOTPRINT

The building footprint as shown on Figure 1 was reduced 5 feet on each side leaving a footprint that is 90' wide by 110' long. Reducing 5 feet on each side of the conceptual building decreased the volume from 3300 m^3 to 3044 m^3.

THEISSEN POLYGON METHOD

The area calculated by the Theissen Polygon Method was used in this calculation because it provided an overestimate of the amount of benzene that was discovered during the probe investigation completed on August 7, 2000. Figure 1 shows the small area where benzene was detected at B-17. The area calculated by the Polygon covers the soil plume shown in Figure 1 and up towards B-18 which had no detectable concentrations of TPH-G and BTEX+N. Therefore, Terra Vac believes that this method of estimating the quantity of benzene impacted soil is conservative based on the overestimated area calculated.

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BENZENE CONTOUR METHOD

The area calculated by the benzene contour method was used in addition to the Theissen Polygon Method as a worst case scenerio calculation. This method was used because it provides a greater overestimate of the benzene plume compared to the Theissen Polygon Method. Figure 2 shows the estimated benzene plume area used for this calculation. The area calculated by the contour method covers the benzene soil plume shown in Figure 2 and up towards B-5 which had no detectable concentrations of TPH-G and B-8 which had a detection of 130 mg/kg in 1994. Therefore, Terra Vac believes that this method of estimating the quantity of benzene impacted soil is very conservative based on the overestimated area calculated.

BENZENE EXPOSURE IN HYPOTHETICAL BUILDING USING THEISSEN METHOD

These assumptions were used in the following equation to calculate the average concentration of benzene in the hypothetical building over an exposure period of 30 years:

Table 1

Assumptions	Input Values	Source
Area of TPH Contaminated Soil	12.05 m^2	B-1,B-17, MW-2, B-5, & B-8(1)
Thickness of TPH Contaminated Soil	0.91 m	Based on sample B-17-17.5
Volume of TPH Contaminated Soil	10.97 m^3	Calculated
Density of Soil	1,700 kg/m^3	RBM Default Value
Concentration of Benzene in Soil	4.5 mg/kg	Sample B-17-17.5
Mass of Benzene in Contaminated Soil	83,920,500 µg	Calculated
Volume of Hypothetical Building (1 story)	3,044 m^3	Based on Zoning & RBM Default Value
Exposure Duration	30 years	RBM Default Value
Building Exchange Rate	24/day	RBM Default Value

(1) Theissen polygon method used to determine area

$$\frac{\text{Mass of Benzene (µg)/Volume of Building } (m^3)}{\text{Exposure Duration (yr) x Building Air Exchange Rate (1/day) x 365 (day/yr)}}$$

Based on the assumptions presented above, the average indoor air concentration for benzene is estimated to be 0.10 $µg/m^3$. The Oregon Department of Environmental Quality's (DEQ) generic residential risk based inhalation screening concentration (RBC air) is 0.30 $µg/m^3$. The equation presented above assumes that all the benzene gas in soil enters the building; therefore, the calculated concentration is conservative.

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BENZENE EXPOSURE IN HYPOTHETICAL BUILDING USING CONTOUR METHOD

These assumptions were used in the following equation to calculate the average concentration of benzene in the hypothetical building over an exposure period of 30 years:

Table 2

Assumptions	Input Values	Source
Circular Base Area of Benzene Contaminated Soil	65.64 m^2	B-1,B-17, MW-2, B-5, & B-8(1)
Thickness of Benzene Contaminated Soil	0.91 m	Based on sample B-17-17.5
Volume of Benzene Contaminated Soil	20.01 m^3	Calculated
Density of Soil	1,700 kg/m^3	RBM Default Value
Concentration of Benzene in Soil	4.5 mg/kg	Sample B-17-17.5
Mass of Benzene in Contaminated Soil	153,076,500 µg	Calculated
Volume of Hypothetical Building (1 story)	3,044 m^3	Based on Zoning & RBM Default Value
Exposure Duration	30 years	RBM Default Value
Building Exchange Rate	24/day	RBM Default Value

(1) Contour method used to determine area

$$\frac{\text{Mass of Benzene (µg)}}{\text{Volume of Building } (m^3)}$$
Exposure Duration (yr) x Building Air Exchange Rate (1/day) x 365 (day/yr)

The volume of benzene impacted soil was calculated using a mirrored conical figure with an initial height of three feet extending laterally a radius of 15 feet to a height of zero feet. An example volume figure is depicted as Figure 3.

Based on the assumptions presented above, the average indoor air concentration for benzene is estimated to be 0.19 $µg/m^3$. The Oregon Department of Environmental Quality's (DEQ) generic residential risk based inhalation screening concentration (RBC air) is 0.30 $µg/m^3$. In addition, the equation presented above assumes that all the benzene gas in soil enters the building; therefore, the calculated concentration is conservative.

If you have any questions regarding the letter report, please do not hesitate to call us at 425 697-5131.

Sincerely,
Terra Vac

Paul V. Bianco, P.E.
Senior Engineer

CC: Mr. Thomas Cammarata
Mr. Richard Singer
Mr. Richard Allen
32-0029.10.01

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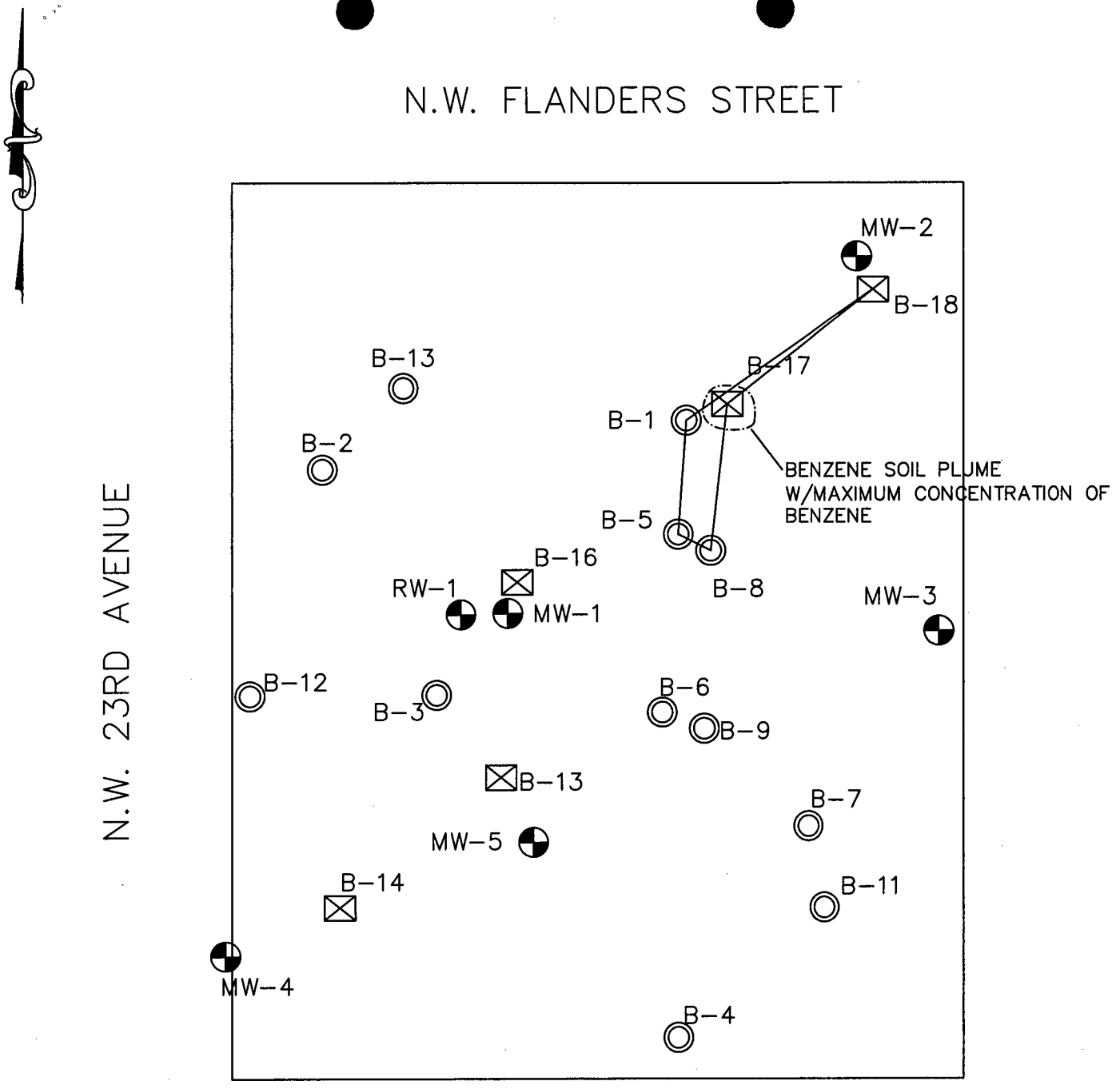


REVISED BUILDING
FOOTPRINT REFLECTING
5' CUT IN EACH SIDE

LEGEND

- EXISTING RECOVERY OR MONITORING WELL
- SOIL BORING
- RECENT SOIL PROBE LOCATIONS
- BENZENE SOIL PLUME OUTLINE

0 20 40

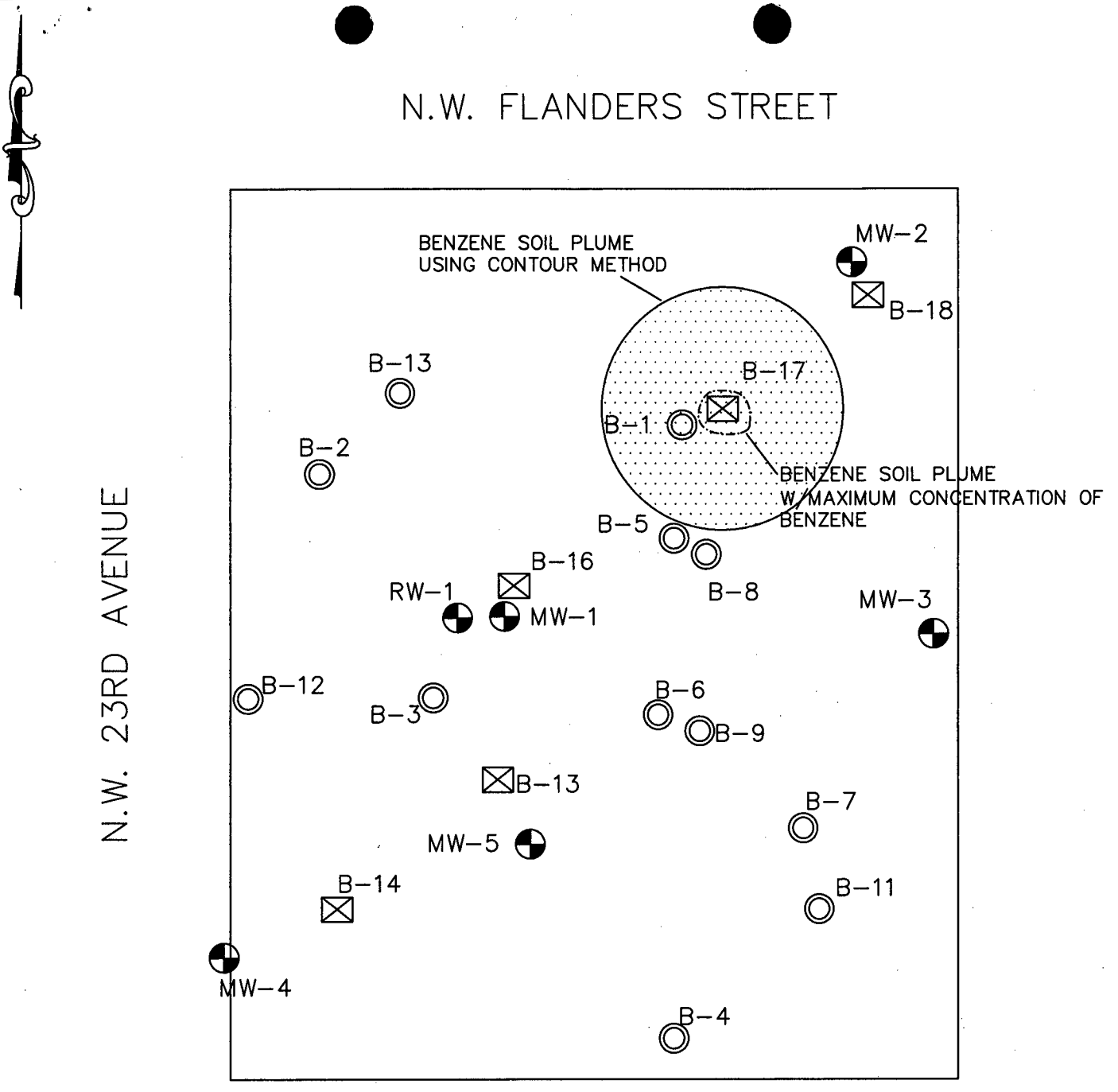
TERRA VAC

ROSE'S PARKING LOT
PORTLAND, OREGON

SOIL BENZENE PLUME USING THEISSEN POLYGON METHOD

DESIGNED BY:	CHECKED BY:	PROJECT #	FIGURE #
G. KLISE	P. BIANCO	32-0029	1
DRAWN BY:	PROJECT MANAGER:	DATE:	SCALE:
G. KLISE	P. BIANCO	4-23-01	1"=20'

TV-SEA\32-0029\CSM\DRAWINGS\0029 SITE PLAN REV 1.DWG



REVISED BUILDING
FOOTPRINT REFLECTING
5' CUT IN EACH SIDE

LEGEND

- EXISTING RECOVERY OR MONITORING WELL
- SOIL BORING
- RECENT SOIL PROBE LOCATIONS
- BENZENE SOIL PLUME OUTLINE

0 20 40

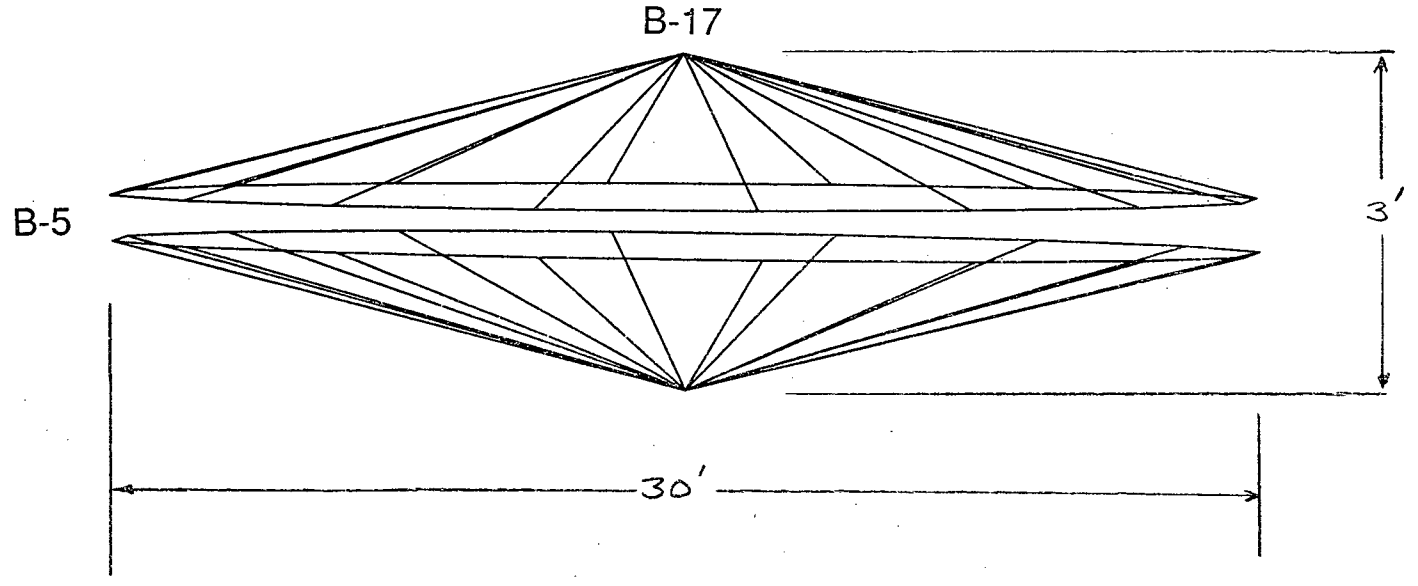
TERRA VAC

ROSE'S PARKING LOT
PORTLAND, OREGON

SOIL BENZENE PLUME USING CONTOUR METHOD

DESIGNED BY:	CHECKED BY:	PROJECT #	FIGURE #
G. KLISE	P. BIANCO	32-0029	2
DRAWN BY:	PROJECT MANAGER:	DATE:	SCALE:
G. KLISE	P. BIANCO	4-23-01	1"=20'

TV-SEA\32-0029\CSM\DRAWINGS\0029 SITE PLAN REV 2.DWG



CONE FORMULAS:

AREA OF BASE OF CONE=3.14(R)^2

VOLUME OF SINGLE CONE=1/3(AREA)(HEIGHT)

TERRA VAC

ROSE'S PARKING LOT
PORTLAND, OREGON

VOLUME OF BENZENE IMPACTED SOIL SHAPE

DESIGNED BY:	CHECKED BY:	PROJECT #	FIGURE #
P. BIANCO	G. KLISE	32-0029	3
DRAWN BY:	PROJECT MANAGER:	DATE:	SCALE:
P. BIANCO	P. BIANCO	4-23-01	AS SHOWN

TV-SEA\PROJECT # 32-0029\F3-CONE.DWG

26-94-0025

Terra Vac
Northwest Division
23106 100th Avenue West
Edmonds, WA 98020-5018
425-697-5131 Tel
425-697-6211 Fax

JAN 19 2001

January 12, 2001

Mr. Robert Williams
Oregon Department of Environmental Quality
2020 SW 4th Avenue, Suite 400
Portland, OR 97201-4987

RE: Conceptual Site Model – Rose's Parking Lot
330 NW 23rd Avenue, Portland, Oregon

Dear Mr. Williams:

At your request, Terra Vac Corporation (Terra Vac) has prepared a conceptual site model (CSM) for Rose's Parking Lot, 330 NW 23rd Avenue, Portland, Oregon (herein known as the Site). As noted in your November 9, 2000 letter to Terra Vac, residual petroleum contaminated soil (PCS) remains at the Site at a depth of 17.5 feet below ground surface (i.e., at soil boring B-17). The concentration of benzene in PCS at this depth is 4.5 mg/kg. Based on a review of groundwater levels at the Site, PCS resides above the season high watertable (~ 18.5 feet bgs) for most of the year. The concentration of benzene exceeds the Oregon Department of Quality (DEQ) generic risk-based concentrations (RBC) for indoor air vapor intrusion (0.5 mg/kg) and the leaching to groundwater pathways (0.1 mg/kg). Both RBCs assume occupational receptors.

Terra Vac developed the following CSM guidelines promulgated in the Oregon Department of Quality (DEQ) document entitled Risk Based Decision Making for the Remediation of Petroleum Contaminated Sites (DEQ 1999). The CSM presented below identifies the contaminates of potential concern (CPOCs), the potential exposure pathways (e.g., vapor intrusion into buildings) for the CPOCs, and the potential receptors (i.e., residential, occupation, and/or excavation workers) for the CPOCs.

RISK BASED ANALYSIS FOR SITE CLOSURE

The information presented below will be used to support the argument that the PCS at the Site does not pose a risk to human health and the environment. Rationale for this conclusion will be based on the following:

- Concentrations of COPCs in soil and groundwater at the Site are less than generic RBCs developed by the DEQ (DEQ 1999); and/or

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- The exposure pathway and or receptor does not exist at the Site for the COPCs.

Exposure Assessment

Land and Groundwater Use

Land Use

The City of Portland, Oregon zones land-use at the Site and surrounding area as Commercial Storefront (CS). This zone is intended to preserve and enhance older commercial areas that have store front character. Under CS the unconditional land-use includes household living, retail sales and services, offices, vehicle repair, commercial outdoor recreation, schools, medical centers, daycare, and religious institutions. Land-use zoning directly east of the Site is designated as High Density Residential (RH). Figures 1 and 2 show the location of the Site and the surrounding land-use and land-use zoning, respectively. The definition key of the Zoning Map is presented in Table 1. According to the City's 20 year Comprehensive Plan for the Site and surrounding area there are no zoning changes planned for the area.

At present, the Site is used as a commercial parking lot (Photographs 1 and 2 in Appendix A). Present land use adjacent to the Site includes restaurants, hardware and domestic houseware stores, and medical offices. The nearest residences are located approximate 500 feet or more northeast and southeast of the Site.

Groundwater Use

The Site and vicinity are within the City of Portland (City). Local area water needs are supplied by the Portland Water Bureau. The City's water is acquired from the Bull Run watershed 26 miles to the east of downtown Portland. Backup supplies are taken from an aquifer located near Troutdale, Oregon, east of Portland.

According to the State of Oregon Water Resources Department records, 98 wells are located within a half-mile mile radius of the Site. Ninety two of the wells are designated as groundwater monitoring wells and four are designated industrial. The use of the two remaining wells is unknown. A summary table of wells and a well location map is presented in Appendix B. Well logs for industrial wells are also presented in Appendix B.

Excluding the monitoring wells at the Site, four wells are located within a quarter-mile of the Site. These wells are designated as industrial wells. The nearest industrial well is located less than one-eighth of a mile from the Site (well record 1033) at NW Brewery Company located at the intersection of NW Everett Street and NW Weston Road (NW/4, SE/4, Sec 33, Township 1 North and Range 1E). The depth of the well was not reported; however, the water level was reported as "76 feet above land surface (flowing well)." There was no stratigraphy provided with the log. The remaining industrial wells located within one-quarter mile of the Site were drilled to depths of between 195 and

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563 feet bgs. The wells were installed between 1939 and 1951. At the time of drilling, static water levels in the wells ranged from 30 to 100 feet bgs. Groundwater from the wells was pumped from basalt aquifers located at 100 to 500 feet bgs. The four industrial wells are located hydraulically upgradient from the Site.

According to the Oregon Department of Water Resources' (DWR) water rights data base, there is no points of groundwater use or point of diversion near the Site .

Contaminants of Potential Concern

COPCs for soil were selected from confirmation soil results collected during the Terra Vac's August 7, 2000 post remediation soil quality investigation (Terra Vac 2000). COPCs for groundwater were selected from the October 29, 1998 groundwater sampling event, also representing a post remediation sampling event (Terra Vac 1999). A compilation of all soil and groundwater sample results is presented in Appendix C. COPCs for the site are as follows:

Contaminants of Potential Concern	Soil		Groundwater Maximum Concentration (µg/l)
	Maximum Concentration (mg/kg)	Depth of Sample (feet)	
Benzene	4.5	17.5	21.8
Toluene	37.0	17.5	57.0
Ethyl benzene	140	17.5	101
Total Xylenes	880	17.5	284
Dissolved Lead	Not Analyzed	Not Analyzed	490
Naphthalene	34	17.5	516

Conceptual Site Model

Figure 3 presents the conceptual site exposure model (CSM) for the Site. Based on current and future land and groundwater uses at the Site and surrounding area the potential receptors for COPCs are residential, occupation and excavation workers. This conclusion is based on the fact that present and future land-use at the Site, and for the surrounding area, are zoned CS. This zoning designation allows for household living and commercial development. Bases on the zoned land-use at the Site and surrounding area, exposure pathways will be screened against residential risk based criteria. Presented below is a detailed discussion of the CSM.

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Media Sources

Soil

For COPCs the only potential exposure routes for residential receptors are leaching to groundwater (RBCsw) and volatilization to indoor air (RBSsi). This conclusion is based the following rationale:

- Concentrations of COPCs remaining in soil at the Site are less than their associated generic risked based screening concentrations for ingestion, vapor, and dermal absorption pathway (RBCss). The applicable RBCs are presented in of Table 2;

- Concentrations of COPCs remaining in soil at the Site are less than their associated generic risked based screening concentrations for volatilization to the outdoor air exposure pathway (RBCso). The applicable RBCs are presented in Table 2;

- The maximum concentration of benzene remaining in the soil at the Site exceeds the associated generic based risked screening concentration for the volatilization to indoor air exposure pathway (RBCsi). The maximum concentrations of toluene, ethyl benzene, xylenes, and naphthalene are less than applicable RBCsi for the this pathway (Table 2); and

- The maximum concentration of benzene remaining in the soil at the Site exceeds the associated generic based risked screening concentration for the leaching to groundwater exposure pathway (RBCsw). The maximum concentrations of toluene, ethyl benzene, xylenes, and napthalene are less than applicable RBCsw for the same pathway (Table 2)

For the volatilization to indoor air pathway, concentrations of benzene in post remediation soil sample B-17-17.5 exceed the generic RBCsi. Although the benzene concentrations exceed the RBCsi, under existing Site conditions (i.e., parking lot no structures) the volatilization to indoor pathway can be eliminated based on the following rationale:

- All benzene contaminated soil was discovered at greater than 10 feet from the existing commercial building and greater than 50 feet from the nearest residential structure. According to guidance presented in DEQ's Risk Based Decision Making for the Remediation of Petroleum Contaminated Sites (DEQ 1999), the indoor air vapor pathway can be excluded whenever vadose zone volatile compounds are not located beneath or within 10 feet of a commercial building or residential building.

If in the future a building was constructed at the Site it is possible that benzene gas originating at depth (17.5 feet bgs) migrate up through the soil column (via the transport

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mechanisms of diffusion and convection and enter the building. To estimate the concentration of benzene gas that would enter a hypothetical building at the Site, the average benzene concentration in the building air was calculated using the assumptions presented in the table below.

Assumptions	Input Values	Source
Area of TPH Contaminated Soil	12.05 m^2	B-1,B-17, MW-2, B-5, & B-8(1)
Thickness of TPH Contaminated Soil	0.457 m	Based on sample B-17-17.5
Volume of TPH Contaminated Soil	5.51 m^3	Calculated
Density of Soil	1,700 kg/m^3	RBM Default Value
Concentration of Benzene in Soil	4.5 mg/kg	Sample B-17-17.5
Mass of Benzene in Contaminated Soil	42,151,500 µg	Calculated
Volume of Hypothetical Building (1 story)	3,330 m^3	Based on Zoning & RBM Default Value
Exposure Duration	30 years	RBM Default Value
Building Exchange Rate	24/day	RBM Default Value

(1) Theissen polygon method used to determine area

The following equation was use to calculate the average concentration of benzene in the hypothetical building over an exposure period of 30 years:

$$\frac{\text{Mass of Benzene (µg)/Volume of Building } (m^3)}{\text{Exposure Duration (yr) x Building Air Exchange Rate (1/day) x 365 (day/yr)}}$$

Based on the assumptions presented above, the average indoor air concentration for benzene is estimated to be 0.048 $\mu g/m^3$. The Oregon Department of Environmental Quality's (DEQ) generic residential risk based inhalation screening concentration (RBC air) is 0.30 $\mu g/m^3$. The equation presented above assumes that all the benzene gas in soil enters the building; therefore, the calculated concentration is conservative. Calculations for the determination of the concentration of benzene in the indoor air are presented in Appendix D.

Exposure to benzene through the leaching to groundwater pathway can also be eliminated based on the following rationale:

- Groundwater at the Site and surrounding area is not a current or future source of drinking water (as discussed above);
- Drinking water for the Site and surrounding area is supplied by the City's municipal water supply system. The City will continue to supply water to the area for the foreseeable future; and
- Concentrations of COPCs in the groundwater at on-Site wells are declining overtime as a result of intrinsic bioremediation and insitu remediation (i.e, dual vapor extraction system).

Groundwater

For petroleum contaminated groundwater at the Site, the potential exposure routes for residential, occupational, and excavation workers are groundwater ingestion (RBCdw) and the ingestion and inhalation of groundwater from tap water (RBCtw). This conclusion is based on the following rationale:

- Concentrations of BTEX, dissolved lead, and napthalene in the groundwater at the Site are less than their associated generic risked based screening concentrations for volatilization to indoor and outdoor air exposure pathway (RRCwi and RBCwo, respectively). The applicable RBCs are presented in Table 2;

- With the exception of benzene, the maximum concentrations of TEX in the groundwater at on-Site wells are less than generic RBCs for the groundwater ingestion and ingestion and inhalation of tap water exposure pathways. For benzene, the pathways can be eliminated based on the following rationale:

    - Groundwater at the Site and surrounding area is not a current or future source of drinking water (as discussed above);

    - Drinking water for the Site and surrounding area is supplied by the City's municipal water supply system. The City will continue to supply water to the area for the foreseeable future; and

    - Concentrations of COPCs in the groundwater at on-Site wells are declining overtime as a result of intrinsic bioremediation and insitu remediation.

Total Petroleum Hydrocarbons

With the exception of sample B-17-17.5, none of the post-remedial soil samples collected at the Site had a gasoline range TPH concentration that exceeds 1,000 mg/kg gasoline range TPHs. The 1,000 mg/kg threshold is an action level for Sites seeking closure using DEQ's Risk Based Decision Making process.

The concentration of TPH-G at sample B-17-17.5 (22,000 mg/kg), suggests that non-aqueous phase liquid (NAPL) may be present in the soil. However, since NAPL has not been detected on the groundwater, it can be assumed that if the NAPL is present, it is at residual saturation; and therefore, poses no threat to groundwater quality other than a leachable source of COPCs.

Contaminants of Concern

Under present Site conditions, the analysis of exposure pathways indicates that it is unlikely that residential, occupational, or excavation workers will be exposed to COPCs.

Exposure to COPCs from leaching to groundwater, groundwater ingestion, and ingestion and inhalation from tap-water have been eliminated as potential exposure pathways because the contaminated groundwater at the Site is not a present or likely future source of drinking water. Under present Site conditions (parking lot no structures), volatilization to indoor air can also be eliminated; however, if in the future a residential or commercial structure is constructed at the Site the volatilization to indoor air pathway could become a primary route of exposure given the current concentration of benzene in the soil at boring B-17. However, based on the estimated concentration of benzene in air for a hypothetical two story building at the Site, the average concentration of benzene in the building over a 30 year exposure period is less than DEQ's generic inhalation risk based concentration.

Given the nature and extent of contamination at the Site, the present land-use, present and future groundwater uses at the Site and surrounding area, and the positive impact of the Site remedial actions on soil and groundwater quality, there are no contaminants of concern at the Site under present Site conditions and in the future based on the air pathway modeling results.

ECOLOGICAL RISKS

Based on guidance provide in the DEQ 's Risk Based Decision Making For the Remediation of Petroleum Contaminated Sites (DEQ 1999), the Site is devoid of ecological risks. This conclusion is based on the following:

- Contaminated soil is only present at depths greater than three feet and the remaining PCS is covered by asphalt;
- Surface water has not been affected, nor is it likely to be affected in the future as a result of the release;
- Contaminated groundwater does not and is not reasonably likely to discharge to surface water or otherwise reach the surface in a manner that might result in contact with ecological receptors; and
- Contaminated groundwater does not and is not reasonably likely to come in contact with aquatic sediments.

PROPOSED INSTITUTIONAL OR ENGINEERING CONTROLS

At present there are no institutional or engineering controls planned for the Site.

REFERENCES

ODEQ, 1999a. Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites Under OAR 340-122-0205 through 340-122 0360, by the Oregon Department of Environmental Quality. September 29, 1999.

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Terra Vac Corporation. 2000. Soil Quality Investigation Report 330 NW 23rd Avenue, Portland, Oregon.

Terra Vac Corporation. 1999. Active Remediation Closure Report Rose's Parking Lot 330 NW 23rd Avenue, Portland, Oregon 97202.

If you have questions regarding this report, please feel free to contact me at (425) 697-5131.

Sincerely,
Terra Vac

Paul V. Bianco, P.E.
Senior Engineer

CC: Mr. Richard Singer
Mr. Richard Allen
Mr. Thomas Cammarata
32.0029.10.01

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FIGURES

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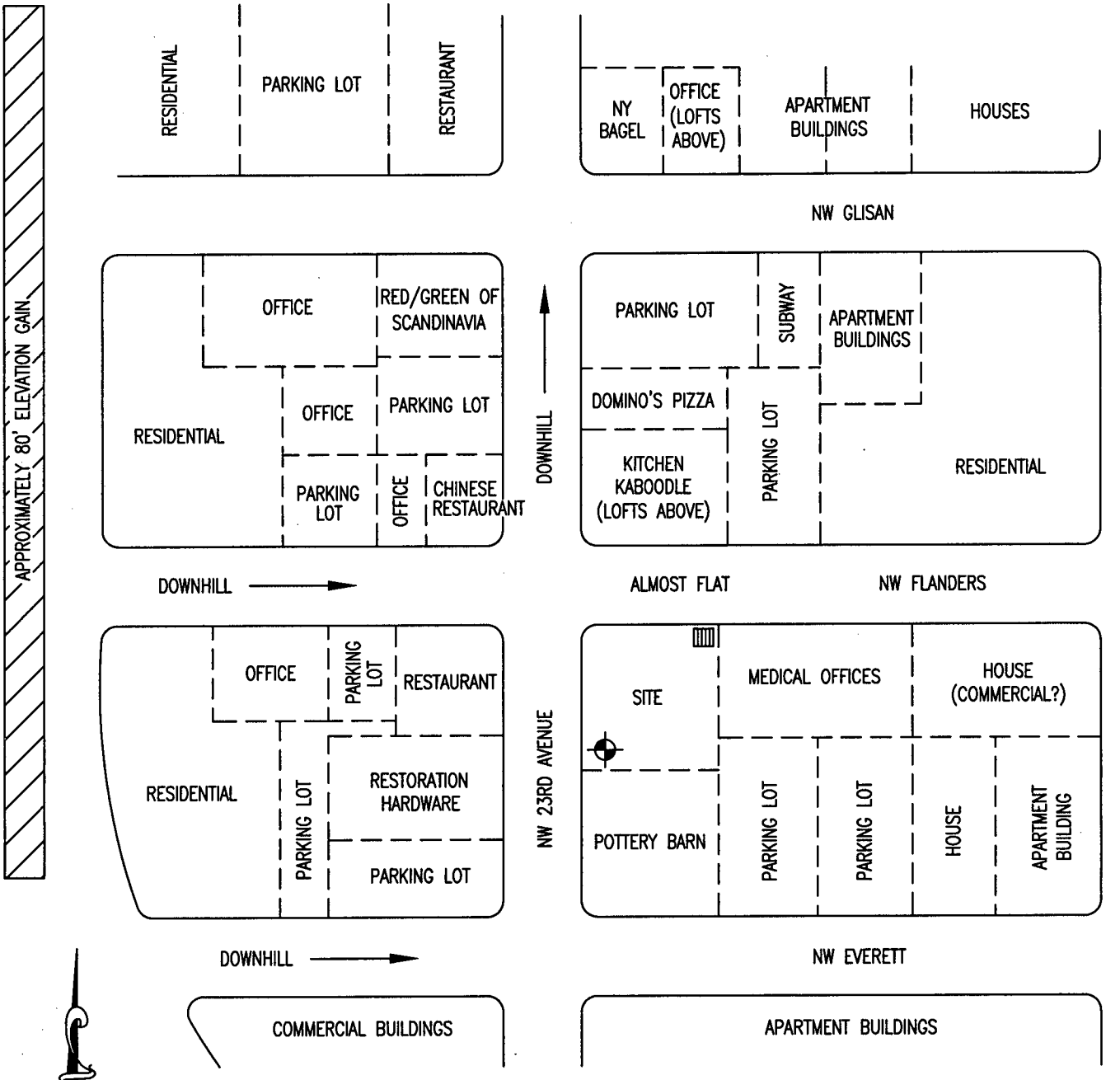


NOTES:

ONE MONITORING WELL OBSERVED. LOCATED APPROXIMATELY 15' N AND 5' E OF SW CORNER OF LOT

STORM DRAIN LOCATED AT NE CORNER OF LOT

MULTIPLE ACCESS COVERS ACCROSS SITE

TERRA VAC

ROSE'S PARKING LOT
PORTLAND, OREGON

AREA MAP

DESIGNED BY:	CHECKED BY:	PROJECT #	FIGURE #
P. BIANCO	P. CATTERALL	32-0029	1
DRAWN BY:	**PROJECT MANAGER:**	**DATE:**	**SCALE:**
P. BIANCO	P. BIANCO	12-15-00	N.T.S.

TV-SEA\PROJECT # 32-0029\0029 CSM F1.DWG

R1
1c
N.W.
ALPHABET HISTORIC
R1d
N.W.
CSd
GLISAN
RHd
ST.
OSd
AVE.
RHd
N.W.
FLANDERS
ST.
CSd
RHd
23RD
22ND
21ST
20TH
AVE.
N.W.
FL
CG
CSd
N.W.
RHd
EVERETT
ST.
PL.
N.W.
R1c
CGc
N.W. 23RD PL.
W. BURNSIDE ST.
CGs
N.W.
22ND
PL.
HISTORIC
DISTRICT
N.W.
RH
N.W. DAVIS ST
N.W. KING AVE.
N.W.
20TH
AVE.
RHd
CXd
CXd
CXd
CXd
CXd
CXd
OSc
CG
KINGHILL HISTORIC DISTRICT
S.W. MORRISON ST.
S.W. 20TH PL.
R1s
R1d
RH
S.W. YAMHILL ST.
OSc
R1
RHd
RHd
TA AVE.
IR AVE.
AVE.
21ST
DISTRICT
AVE.
S.W. TAYLOR
WESTOVER
CB
CA

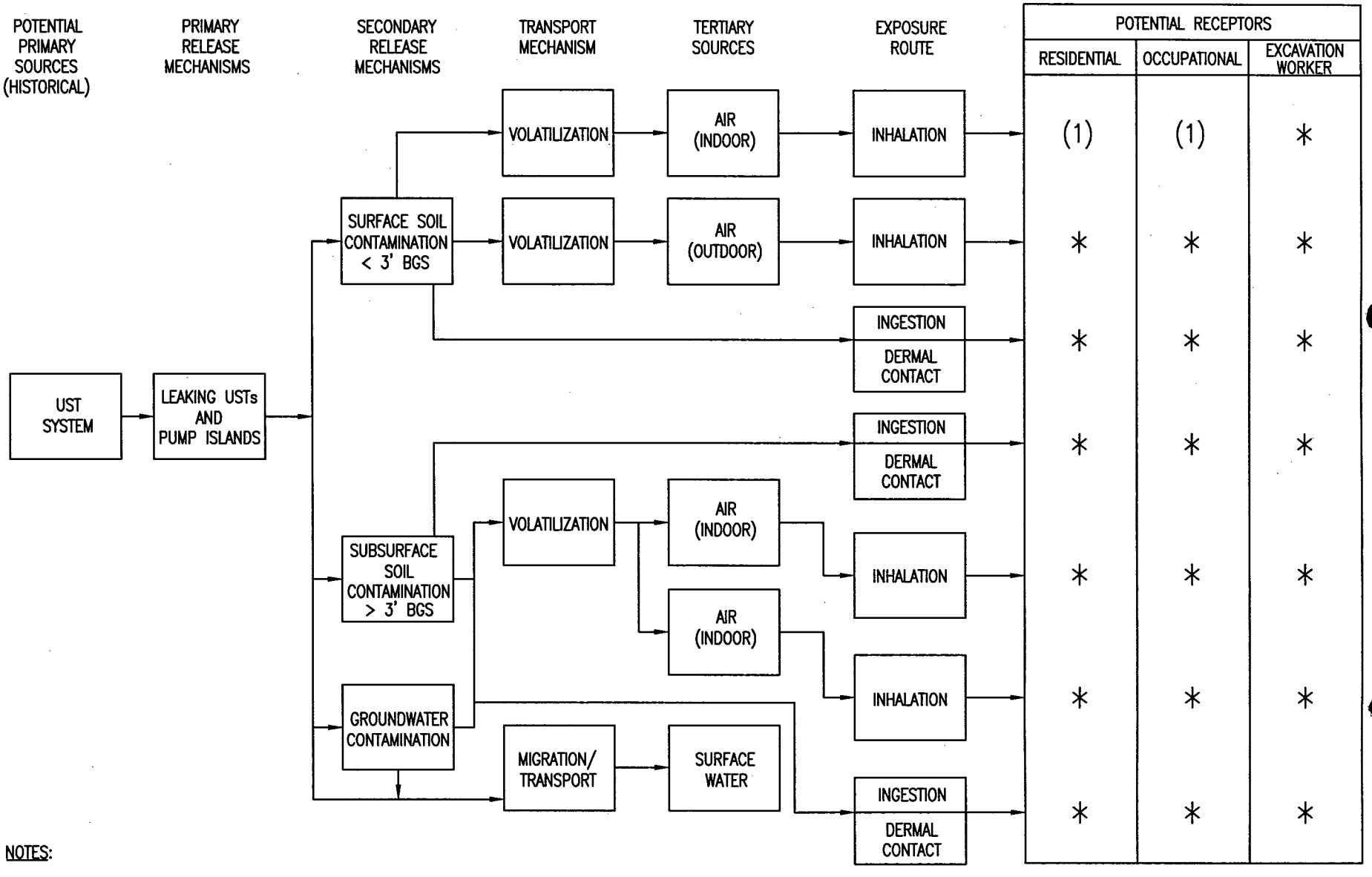
TERRA VAC

ROSE'S PARKING LOT
PORTLAND, OREGON

LAND USE AND ZONING MAP

DESIGNED BY:	CHECKED BY:	PROJECT #	FIGURE #
P. BIANCO	P. CATTERALL	32-0029	2
DRAWN BY:	PROJECT MANAGER:	DATE:	SCALE:
	P. BIANCO	12-18-00	N.T.S.

TV-SEA\PROJECT # 32-0029\0029 F2 ZONING.DWG



NOTES:

* EXPOSURE IS INCOMPLETE (NO RECEPTOR)

(1) EXPOSURE IS INCOMPLETE (SEE SECTION: MEDIA SOURCES–SOIL)

TERRA VAC

ROSE'S PARKING LOT
PORTLAND, OREGON

SITE CONCEPTUAL MODEL

DESIGNED BY:	CHECKED BY:	PROJECT #	FIGURE #
P. BIANCO	P. CATTERALL	32–0029	3
DRAWN BY:	PROJECT MANAGER:	DATE:	SCALE:
P. BIANCO	P. BIANCO	12–19–00	N.T.S.

TV-SEA\PROJECT # 32-0029\0029 CSM F3.DWG

TABLES

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TABLE 1

INDEX OF SYMBOLS ON THE OFFICIAL ZONING MAPS

	Symbol	Full Name	Chapter*
Base Zones	CG	General Commercial	33.130
	CM	Mixed Commercial/Residential	33.130
	CN1	Neighborhood Commercial 1	33.130
	CN2	Neighborhood Commercial 2	33.130
	CO1	Office Commercial 1	33.130
	CO2	Office Commercial 2	33.130
	CS	Storefront Commercial	33.130
	CX	Central Commercial	33.130
	EG1	General Employment 1	33.140
	EG2	General Employment 2	33.140
	EX	Central Employment	33.140
	IG1	General Industrial 1	33.140
	IG2	General Industrial 2	33.140
	IH	Heavy Industrial	33.140
	IR	Institutional Residential	33.120
	OS	Open Space	33.100
	R1	Residential 1,000	33.120
	R2	Residential 2,000	33.120
	R2.5	Residential 2,500	33.110
	R3	Residential 3,000	33.120
	R5	Residential 5,000	33.110
	R7	Residential 7,000	33.110
	R10	Residential 10,000	33.110
	R20	Residential 20,000	33.110
	RF	Residential Farm/Forest	33.110
	RH	High Density Residential	33.120

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TABLE 1

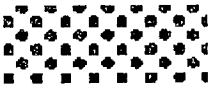
	RX	Central Residential	33.120
Overlay Zones	a	Alternative Design Density Overlay Zone	33.405
	b	Buffer Overlay Zone	33.410
	c	Environmental Conservation Overlay Zone	33.430
	d	Design Overlay Zone	33.420
	f	Future Urban Overlay Zone	33.435
	g	River General Overlay Zone	33.440
	h	Aircraft Landing Overlay Zone	33.400
	i	River Industrial Overlay Zone	33.440
	j	Main Street Node Overlay Zone	33.455
	m	Main Street Corridor Overlay Zone>	33.460
	n	River Natural Overlay Zone	33.440
	r	River Recreational Overlay Zone	33.440
	p	Environmental Protection Overlay Zone	33.430
	s	Scenic Resource Overlay Zone	33.480
t	Light Rail Transit Station Overlay Zone	33.450	
x	Portland International Airport Noise Impact Overlay Zone	33.470	
Special	(XX	Comprehensive Plan Map Designation	Comp. Plan
		Areas of difference between current zoning and Comprehensive Plan Map Designation	All
		Plan Districts	33.500 through 33.5XX
		Historic and Conservation Districts	33.445
		Natural Resource	NRMP

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TABLE 1

	Management Plans	documents
	Recreational Trails	33.272
	Historic Landmarks	33.445
	Conservation Landmarks	33.445

***For page numbers, see Table of Contents.**

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TABLE 2

Appendix A: Table of Risk-Based Concentrations (RBCs)

(See Notes on Page A-4.)

Contaminated Medium →		SOIL mg/kg (ppm)						SOIL mg/kg (ppm)				SOIL mg/kg (ppm)			
Exposure Pathway →		Surface Soil Ingestion, Dermal Contact, and Inhalation RBC_{ss}						Volatilization to Outdoor Air RBC_{so}				Vapor Intrusion into Buildings RBC_{si}			
Receptor Scenario →		Residential		Occupational		Excavation Worker		Residential		Occupational		Residential		Occupational	
Contaminant of Concern	Note		Note		Note		Note		Note		Note		Note		Note
Benzene	c, v	8.2		29		1100	>Csat	11		21		0.091		0.5	
Toluene	nc, v	1700	>Csat	31000	>Csat	40000	>Csat	540	=Csat	540	=Csat	190		540	=Csat
Ethylbenzene	nc, v	2000	>Csat	47000	>Csat	85000	>Csat	330	=Csat	330	=Csat	330	=Csat	330	=Csat
Xylenes	nc, v	4100	>Csat	63000	>Csat	72000	>Csat	360	=Csat	360	=Csat	360	=Csat	360	=Csat
Acenaphthene	nc, v	800	>Csat	25000	>Csat	110000	>Csat	100	=Csat	100	=Csat	100	=Csat	100	=Csat
Anthracene	nc, v	4400	>Csat	180000	>Csat	750000	>Csat	6.4	=Csat	6.4	=Csat	6.4	=Csat	6.4	=Csat
Benz[a]anthracene	c, nv	0.21		2.7		270	>Csat	19	=Csat	19	=Csat	19	=Csat	19	=Csat
Benzo[b]fluoranthene	c, nv	0.21		2.7		270	>Csat	9.2	=Csat	9.2	=Csat	9.2	=Csat	9.2	=Csat
Benzo[k]fluoranthene	c, nv	2.1		27	>Csat	2700	>Csat	4.9	=Csat	4.9	=Csat	4.9	=Csat	4.9	=Csat
Benzo[a]pyrene	c, nv	0.021		0.27		27	>Csat	8.3	=Csat	8.3	=Csat	8.3	=Csat	8.3	=Csat
Chrysene	c, nv	21	>Csat	270	>Csat	27000	>Csat	3.2	=Csat	3.2	=Csat	3.2	=Csat	3.2	=Csat
Dibenz[a,h]anthracene	c, nv	0.021		0.27		27	>Csat	4.7	=Csat	4.7	=Csat	4.7	=Csat	4.7	=Csat
Fluoranthene	nc, nv	600	>Csat	29000	>Csat	110000	>Csat	110	=Csat	110	=Csat	110	=Csat	110	=Csat
Fluorene	nc, v	570	>Csat	23000	>Csat	94000	>Csat	140	=Csat	140	=Csat	140	=Csat	140	=Csat
Indeno[1,2,3-cd]pyrene	c, nv	0.21		2.7	>Csat	270	>Csat	0.38	=Csat	0.38	=Csat	0.38	=Csat	0.38	=Csat
Naphthalene	nc, v	24		270		1000	>Csat	230		310	=Csat	290		310	=Csat
Pyrene	nc, nv	450	>Csat	21000	>Csat	84000	>Csat	71	=Csat	71	=Csat	71	=Csat	71	=Csat
MTBE (methyl t-butyl ether)	nc, v	19000	>Csat	280000	>Csat	310000	>Csat	6600	=Csat	6600	=Csat	1600		6600	=Csat
EDB (1,2-dibromoethane)	c, v	0.0033		0.030		3.6		0.43		0.78		0.026		0.17	
EDC (1,2-dichloroethane)	c, v	2.2		9.0		330		3.6		6.6		0.039		0.26	
Lead	NA, nv	400	L	1000	L	1000	L		NA		NA		NA		NA
iso-Propylbenzene	nc, v	140		2900	>Csat	4300	>Csat	330	=Csat	330	=Csat	140		330	=Csat
n-Propylbenzene	nc, v	140		2900	>Csat	4300	>Csat	200	=Csat	200	=Csat	180		200	=Csat
1,2,4-Trimethylbenzene	nc, v	47	>Csat	720	>Csat	960	>Csat	4.8	=Csat	4.8	=Csat	4.8	=Csat	4.8	=Csat
1,3,5-Trimethylbenzene	nc, v	47		720	>Csat	810	>Csat	210	=Csat	210	=Csat	15		65	

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TABLE 2

Appendix A: Table of RBCs (continued)

Contaminated Medium →		SOIL mg/kg (ppm)				GROUNDWATER µg/L (ppb)				GROUNDWATER µg/L (ppb)			
Exposure Pathway →		Leaching to Groundwater RBC_{sw}				Groundwater Ingestion RBC_{dw}				Volatilization to Outdoor Air RBC_{wo}			
Receptor Scenario →		Residential		Occupational		Residential		Occupational		Residential		Occupational	
Contaminant of Concern	Note		Note		Note		Note		Note		Note		Note
Benzene	c, v	0.044		0.10		1.8		4.3		2600		5800	
Toluene	nc, v	390		540	=Csat	6300		8900		530000	=S	530000	=S
Ethylbenzene	nc, v	330	=Csat	330	=Csat	3200		4400		170000	=S	170000	=S
Xylenes	nc, v	360	=Csat	360	=Csat	63000		89000		180000	=S	180000	=S
Acenaphthene	nc, v	100	=Csat	100	=Csat	1900		2700		4200	=S	4200	=S
Anthracene	nc, v	6.4	=Csat	6.4	=Csat	9500	>S	13000	>S	43	=S	43	=S
Benz[a]anthracene	c, nv	8.6		19	=Csat	0.072		0.17		9.4	=S	9.4	=S
Benzo[b]fluoranthene	c, nv	9.2	=Csat	9.2	=Csat	0.072		0.17		1.5	=S	1.5	=S
Benzo[k]fluoranthene	c, nv	4.9	=Csat	4.9	=Csat	0.72		1.7	>S	0.80	=S	0.80	=S
Benzo[a]pyrene	c, nv	2.2		5.2		0.0072		0.017		1.6	=S	1.6	=S
Chrysene	c, nv	3.2	=Csat	3.2	=Csat	7.2	>S	17	>S	1.6	=S	1.6	=S
Dibenz[a,h]anthracene	c, nv	4.7	=Csat	4.7	=Csat	0.0072		0.017		0.25	=S	0.25	=S
Fluoranthene	nc, nv	110	=Csat	110	=Csat	1300	>S	1800	>S	210	=S	210	=S
Fluorene	nc, v	140	=Csat	140	=Csat	1300		1800		2000	=S	2000	=S
Indeno[1,2,3-cd]pyrene	c, nv	0.38	=Csat	0.38	=Csat	0.072	>S	0.17	>S	0.022	=S	0.022	=S
Naphthalene	nc, v	310	=Csat	310	=Csat	630		890		31000	=S	31000	=S
Pyrene	nc, nv	71	=Csat	71	=Csat	950	>S	1300	>S	140	=S	140	=S
MTBE (methyl t-butyl ether)	nc, v	0.16		0.16		20	M	20	M	51000000	=S	51000000	=S
EDB (1,2-dibromoethane)	c, v	0.0000079		0.000019		0.00062		0.0015		520		1100	
EDC (1,2-dichloroethane)	c, v	0.0057		0.013		0.58		1.4		1900		4200	
Lead	NA, nv	0.40	L	1.5	L	4.0	L	15	L		NA		NA
iso-Propylbenzene	nc, v	210		300		320		440		30000	=S	30000	=S
n-Propylbenzene	nc, v	200	=Csat	200	=Csat	320		440		14000	=S	14000	=S
1,2,4-Trimethylbenzene	nc, v	4.8	=Csat	4.8	=Csat	1600	>S	2200	>S	260	=S	260	=S
1,3,5-Trimethylbenzene	nc, v	210	=Csat	210	=Csat	1600		2200		50000	=S	50000	=S

TABLE 2

Appendix A: Table of RBCs (continued)

Contaminated Medium →		GROUNDWATER µg/L (ppb)				GROUNDWATER µg/L (ppb)				GROUNDWATER µg/L (ppb)		AIR (see notes) µg/m³			
Exposure Pathway →		Vapor Intrusion into Buildings RBC_{wi}				Ingestion & Inhalation from Tapwater RBC_{tw}				GW in Excavation RBC_{we}		Inhalation RBC_{air}			
Receptor Scenario →		Residential		Occupational		Residential		Occupational		Excavation Worker		Residential		Occupational	
Contaminant of Concern	Note		Note		Note		Note		Note		Note		Note		Note
Benzene	c, v	180		1200		0.44		1.0		820		0.30		0.65	
Toluene	nc, v	210000		530000	=S	740		1000		30000		420		580	
Ethylbenzene	nc, v	170000	=S	170000	=S	1300		1800		45000		1000		1500	
Xylenes	nc, v	180000	=S	180000	=S	1400		2000		55000		730		1000	
Acenaphthene	nc, v	4200	=S	4200	=S	440		620		4200	=S	290		400	
Anthracene	nc, v	43	=S	43	=S	43	=S	43	=S	43	=S	1400	Pv	2000	Pv
Benz[a]anthracene	c, nv	9.4	=S	9.4	=S		NA		NA	4.1		0.028		0.061	
Benzo[b]fluoranthene	c, nv	1.5	=S	1.5	=S		NA		NA	1.5	=S	0.028		0.061	
Benzo[k]fluoranthene	c, nv	0.80	=S	0.80	=S		NA		NA	0.80	=S	0.28	Pv	0.61	Pv
Benzo[a]pyrene	c, nv	1.6	=S	1.6	=S		NA		NA	0.24		0.0028		0.0061	
Chrysene	c, nv	1.6	=S	1.6	=S		NA		NA	1.6	=S	2.8		6.1	
Dibenz[a,h]anthracene	c, nv	0.25	=S	0.25	=S		NA		NA	0.088		0.0028	Pv	0.0061	Pv
Fluoranthene	nc, nv	210	=S	210	=S		NA		NA	210	=S	190	Pv	270	Pv
Fluorene	nc, v	2000	=S	2000	=S	290		410		2000	=S	190		270	
Indeno[1,2,3-cd]pyrene	c, nv	0.022	=S	0.022	=S		NA		NA	0.022	=S	0.028	Pv	0.061	Pv
Naphthalene	nc, v	29000		31000	=S	6.2		8.7		240		3.1		4.4	
Pyrene	nc, nv	140	=S	140	=S		NA		NA	140	=S	140	Pv	200	Pv
MTBE (methyl t-butyl ether)	nc, v	13000000		51000000	=S	20		20		240000		3100		4400	
EDB (1,2-dibromoethane)	c, v	130		630		0.00060		0.0014		8.6		0.011		0.024	
EDC (1,2-dichloroethane)	c, v	250		1700		0.14		0.32		280		0.094		0.21	
Lead	NA, nv		NA		NA		NA		NA		NA		NA		NA
iso-Propylbenzene	nc, v	15000		30000	=S	74		100		1800		48		67	
n-Propylbenzene	nc, v	14000	=S	14000	=S	74		100		1600		48		67	
1,2,4-Trimethylbenzene	nc, v	260	=S	260	=S	16		23		260	=S	8.2		11	
1,3,5-Trimethylbenzene	nc, v	4200		18000		16		23		630		8.2		11	

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TABLE 2

Notes and References for Table of RBCs:

The numbers in this table will be updated as new information becomes available. The current version of this guidance document can be found on the Department's UST program web site at **http://www.deq.state.or.us/wmc/tank/ust-lust.htm**

Although RBC values for air are included in this table, the Department does not routinely require that air (indoor or outdoor) be tested at UST cleanup sites due to the great temporal and spatial variability in air concentrations which makes it difficult to collect representative samples. However, in cases where soil gas or air samples are collected because of vapor problems, or to better assess site-specific risk from breathing airborne volatiles, the RBCs for air should be used as the acceptable air concentrations.

The symbols in the "Note" columns have the following meanings:

c	This chemical is a known or suspected carcinogen. The RBCs in this row were calculated using equations for carcinogens described in Appendix B.
$>C_{sat}$	This soil RBC exceeds the limit of three-phase equilibrium partitioning. Refer to Appendix D for the corresponding value of C_{sat}. Soil concentrations in excess of C_{sat} indicate that free product might be present. See Section B.2.2.3 for additional information.
$=C_{sat}$	This number is NOT a risk-based concentration. It can be assumed that this constituent can not create an unacceptable risk by this pathway. However, concentrations in excess of this value indicate that free product may be present. See Section B.2.2.3 for additional information.
L	The values for lead reported in this table are not derived from the equations developed in Appendix B. See Section B.3.4.1 for the source of the lead numbers and information on applying them.
M	Because there is no published oral reference dose (RfDo) for MTBE, the following modifications have been made: (1) The RBC_{ss} and RBC_{we} values for MTBE are based solely on inhalation. (2) An interim standard for groundwater ingestion (RBC_{dw}) has been set at 20 µg/L (ppb) based on EPA guidance (EPA, 1997d). (3) An interim leaching-to-groundwater concentration (RBC_{sw}) has been calculated on the basis of the interim groundwater ingestion value. See Section B.3.4.2 for more information about MTBE.
NA	This pathway is not applicable to the chemical of interest.
nc	This chemical is a noncarcinogen. The RBCs in this row were calculated using equations for noncarcinogens described in Appendix B.
nv	This chemical is classified as "nonvolatile" for purposes of the exposure calculations in this document.
P_v	The air concentration reported for the RBC exceeds the vapor pressure of the pure chemical. It can be assumed that this constituent can not create an unacceptable risk by this pathway. See Section B.2.2.3 for additional information.
>S	This groundwater RBC exceeds the solubility limit. Refer to Appendix D for the corresponding value of S. Groundwater concentrations in excess of S indicate that free product may be present. See Section B.2.2.3 for additional information.
=S	This number is NOT a risk-based concentration. It can be assumed that this constituent can not create an unacceptable risk by this pathway. However, concentrations in excess of this value indicate that free product might be present. See Section B.2.2.3 for additional information.
v	This chemical is classified as "volatile" for purposes of the exposure calculations in this document.

APPENDIX A

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Photographs 1 and 2: Present Site Use Taken 12/05/00

Looking southwest across the site. NW Flanders in foreground. Shows elevation change on north side of site.

Looking east-southeast across the site. NW 23rd Avenue is in the foreground.

APPENDIX B

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Table 1

1/2-Mile Radius Well Search Summary Table

sorted by ID

ID	Q	QQ	Location	Well Type	Company Name	First Water (ft bgs)	Completion Depth	Tax Lot	Date Completed	Screened or Sealed Interval(s) (ft bgs)
382	SE	NW	2110 NW LOVEJOY	MW		7	20	—	8/12/91	—
383	SE	NW	2110 NW LOVEJOY	MW		7	20	—	8/12/91	—
384	SE	NW	2110 NW LOVEJOY	MW		7	20	—	8/12/91	—
615	SE	SW	950 SW 21ST AVE	MW	HARCH INVESTMENT CORP.	35	58	190	1/24/92	—
616	SE	SW	950 SW 21ST AVE	MW	HARCH INVESTMENT CORP.	30	43	190	1/22/92	—
1032	NW	SW	2305 W BURNSHID	Ind		30	281		5/31/51	cased to 136
1033	NW	SW		Ind	NORTHWEST BREWING CO.	—	—	—	—	unknown, see well log remarks
1034	NE	SW	2011 W BURNSIDE	?	FRED MEYER	> 100	195	—	12/31/39	cased to unknown depth
1036		SW	1015 NW 22ND	Ir	GOOD SAMARITAN HOSPITAL	static: 97	400	—	1/17/58	cased to 169
1038	SW	SE	2000 SW MORRISON	Ind	US NATIONAL BANK; STADIUM BRANCH	static: 100	563	—	7/31/46	cased to 428
1044	—	—	—	?	ICE COLISEUM	—	—	—	—	—
3260	SW	NE	930 NW 18TH	MW	UNOCAL CORP.	50	55	—	10/29/92	—
3301	NW	NE	1715 SW SALMON ST	MW	HARVESTER CO.	30	88	45	12/9/92	—
3303	NW	NE	1715 SW SALMON ST	MW	HARVESTER CO.	30	40	—	12/14/92	—
3304	NW	NE	1715 SW SALMON	MW	HARVESTER CO.	0	0	45	—	—
3758	—	—	1715 SW SALMON	MW	TRI-MET	40	45	45	10/15/93	—
3759	—	—	1715 SW SALMON	MW	TRI-MET	31	50	45	10/14/93	—
3760	—	—	1715 SW SALMON	MW	TRI-MET	31	50	45	10/12/93	—
3761	SE	SE	1715 SW SALMON	MW	TRI-MET	31	50	45	10/12/93	—
3762	SE	SE	1715 SW SALMON	MW	TRI-MET	31	50	45	10/8/93	—
3763	SE	SE	1715 SW SALMON	MW	TRI-MET	35	45	45	10/8/93	—
3764	SE	SE	1715 SW SALMON	MW	TRI-MET	35	45	45	10/7/93	—
3765	SE	SE	1715 SW SALMON	MW	TRI-MET	35	50	45	10/6/93	—
3766	SE	SE	1715 SW SALMON ST	MW	TRI-MET	35	50	45	10/6/93	—
3767	SE	SE	1715 SW SALMON ST	MW	TRI-MET	35	45	45	10/5/93	—
3768	—	—	1715 SW SALMON	MW	TRI-MET	—	43	45	10/14/93	—
3946	SW	SE	1715 SW SALMON	MW	TRI MET	40	49	45	11/29/93	—

Table 1

1/2-Mile Radius Well Search Summary Table

sorted by ID

ID	Q	QQ	Location	Well Type	Company Name	First Water (ft bgs)	Completion Depth	Tax Lot	Date Completed	Screened or Sealed Interval(s) (ft bgs)
3979	SW	SW	2360 SW BURNSIDE	MW	RREEF PROPERTIES	15	20	1	1/6/94	—
3980	SW	SW	2360 SW BURNSIDE	MW	RREEF PROPERTIES	15	20	1	1/6/94	—
3981	SW	SW	2360 SW BURNSIDE	MW	RREEF PROPERTIES	15	20	1	1/6/94	—
3982	SW	SW	2360 SW BURNSIDE	MW	RREEF PROPERTIES	17	23	1	1/6/94	—
4025	SE	SW	1849 SW SALMON ST	MW	MULTNOMAH ATHLETIC CLUB	10	0	46	1/25/94	—
4026	SE	SW	1849 SW SALMON ST	MW	MULTNOMAH ATHLETIC CLUB	17	0	46	1/26/94	—
4027	SE	SW	1849 SW SALMON ST	MW	MULTNOMAH ATHLETIC CLUB	16	0	46	1/25/94	—
4028	SE	SW	1849 SW SALMON ST	MW	MULTNOMAH ATHLETIC CLUB	24	0	46	1/26/94	—
4030	SW	SW	2360 SW BURNSIDE	MW	PREEF PROPERTIES	20	23	—	2/3/94	—
4100	NW	SW	330 NW 23RD AVE	MW	—		34	—	3/23/94	—
4101	NW	SW	330 NW 23RD AVE	MW	—		34	—	3/23/94	—
4102	NW	SW	330 NW 23RD AVE	MW	—		39	—	3/23/94	—
4116	SW	SE	1715 SW SALMON	MW	TRI MET	0	0	—	3/23/94	—
4117	SW	SE	1715 SW SALMON	MW	TRI MET	0	0	—	3/23/94	—
4118	SW	SE	1715 SW SALMON	MW	TRI MET	0	0	—	3/23/94	—
4119	SW	SE	1715 SW SALMON	MW	TRI MET	0	0	—	3/24/94	—
4120	SW	SE	1715 SW SALMON	MW	TRI MET	0	0	—	3/23/94	—
4121	SW	SE	1715 SW SALMON	MW	TRI MET	0	0	—	3/24/94	—
4122	SW	SE	1715 SW SALMON	MW	TRI MET	0	0	—	3/24/94	—
4123	SW	SE	1715 SW SALMON	MW	TRI MET	30	50	—	4/8/94	—
4124	SW	SE	1715 SW SALMON	MW	TRI MET	26	45	—	4/7/94	—
4125	SW	SE	1715 SW SALMON	MW	TRI MET	30	40	—	4/7/94	—
4126	SW	SE	1715 SW SALMON	MW	TRI MET	30	40	—	4/7/94	—
4127	SW	SE	1715 SW SALMON	MW	TRI MET	30	45	—	4/6/94	—
4128	SW	SE	1715 SW SALMON	MW	TRI MET	30	40	—	4/6/94	—
4129	SW	SW	1715 SW SALMON	MW	TRI MET	28	45	—	4/4/94	—

Table 1

1/2-Mile Radius Well Search Summary Table

sorted by ID

ID	Q	QQ	Location	Well Type	Company Name	First Water (ft bgs)	Completion Depth	Tax Lot	Date Completed	Screened or Sealed Interval(s) (ft bgs)
4130	SW	SE	1715 SW SALMON	MW	TRI MET	31	45	—	4/5/94	—
4131	SW	SE	1715 SW SALMON	MW	TRI MET	33	45	—	4/4/94	—
4132	SW	SE	1715 SW SALMON	MW	TRI MET	28	44	—	4/1/94	—
4133	SW	SE	1715 SW SALMON	MW	TRI MET	28	45	—	4/1/94	—
4134	SW	SE	1715 SW SALMON	MW	TRI MET	31	50	—	3/31/94	—
4135	SW	SE	1715 SW SALMON	MW	TRI MET	31	40	—	3/31/94	—
4136	SW	SE	1715 SW SALMON	MW	TRI MET	28	38	—	3/31/94	—
4137	SW	SE	1715 SW SALMON	MW	TRI MET	30	50	—	3/31/94	—
4138	SW	SE	1715 SW SALMON	MW	TRI MET	29	38	—	3/30/94	—
4139	SW	SE	1715 SW SALMON	MW	TRI MET	30	45	—	3/30/94	—
4140	SW	SE	1715 SW SALMON	MW	TRI MET	25	45	—	3/30/94	—
4141	SW	SE	1715 SW SALMON	MW	TRI MET	20	41	—	3/30/94	—
4142	SW	SE	1715 SW SALMON	MW	TRI MET	20	40	—	3/29/94	—
4143	SW	SE	1715 SW SALMON	MW	TRI MET	20	45	—	3/29/94	—
4144	SW	SE	1715 SW SALMON	MW	TRI MET	30	45	—	3/29/94	—
4145	SW	SE	1715 SW SALMON	MW	TRI MET	30	45	—	3/28/94	—
4146	SW	SE	1715 SW SALMON	MW	TRI MET	26	45	—	3/28/94	—
4147	SW	SE	1715 SW SALMON	MW	TRI MET	31	41	—	3/25/94	—
4148	SW	SE	1715 SW SALMON	MW	TRI MET	30	40	—	3/25/94	—
4149	SW	SE	1715 SW SALMON	MW	TRI MET	35	45	—	3/25/94	—
4150	SW	SE	1715 SW SALMON	MW	TRI MET	30	40	—	3/25/94	—
4151	SW	SE	1715 SW SALMON	MW	TRI MET	31	41	—	3/24/94	—
4152	SW	SE	1715 SW SALMON	MW	TRI MET	20	35	—	3/29/94	—
4400	NW	SW	330 NW 23RD AVE	M		27	40	—	9/28/94	—
50383	SW	NE	1812 NW KEARNEY ST	G	SHEFF ENTERPRISES, LTD.	—	16	—	1/22/96	—
50385	SW	NE	1816 NW KEARNEY ST	G	SHEFF ENTERPRISES, LTD	—	20	—	1/22/96	—
50386	SW	NE	1816 NW KEARNEY ST	G	SHEFF ENTERPRISES, LTD	—		—	1/22/96	—
50387	SW	NE	1812 KEARNEY ST NW	G	SHEFF ENT. LTD.	—	16	—	1/22/96	—
50388	SW	NE	1812 KEARNEY ST NW	G	SHEFF ENT. LTD	—	16	—	1/22/96	—
50724	SW	SE	1715 SW SALMON	MW	TRI-MET	—	52	45	12/19/95	—

Table 1

1/2-Mile Radius Well Search Summary Table

sorted by ID

ID	Q	QQ	Location	Well Type	Company Name	First Water (ft bgs)	Completion Depth	Tax Lot	Date Completed	Screened or Sealed Interval(s) (ft bgs)
50873	NW	NW	1015 NW 22ND	G	LEGACY GOOD SAMARITAN HOSPITAL	—	30	—	3/21/96	—
50874	NW	NW	1015 NW 22ND	G	LEGACY GOOD SAMARITAN HOSPITAL	—	30	—	3/21/96	—
50890	SE	SW	124 NW 20TH AVE	G	VOGLE & GATES (C/O)	—	—	1920	10/26/95	—
50894	SE	SW	124 NW 20TH AVE	G	VOGLE & GATES (C/O)	—	—	1920	10/26/95	—
50895	SE	SW	124 NW 20TH AVE	G	VOGLE AND GATES (C/O)	—	—	1920	10/26/95	—
52652	SW	SE	1710 SW MORRISON	G	TRI-MET	—	—	2800	11/1/96	—
52653	SW	SE	1710 SW MORRISON	G	TRI-MET	—	—	2800	10/31/96	—
52654	SW	SE	1710 SW MORRISON	G	TRI-MET	—	—	2800	10/31/96	—
52967	NW	SW	330 NW 23RD AVE	MW	—	15	37	600	1/24/97	—
52968	NW	SW	330 NW 23RD AVE	MW	—	18	37	600	1/24/97	—
52969	NW	SW	330 NW 23RD AVE	MW	—	15	37	600	1/23/97	—
52970	NW	SW	330 NW 23RD AVE	MW	—	15	37	600	1/23/97	—
52971	NW	SW	330 NW 23RD AVE	MW	—	15	38	600	1/23/97	—
52972	NW	SW	330 NW 23RD AVE	MW	—	—	0	600	1/25/97	—
52973	NW	SW	330 NW 23RD AVE	MW	—	15	0	600	1/24/97	—
52974	NW	SW	330 NW 23RD AVE	MW	—	15	0	600	1/23/97	—
52977	NW	SW	330 NW 23RD AVE	MW	—	15	0	600	1/23/97	—
52980	NW	SW	330 NW 23RD AVE	MW	—	15	37	600	1/25/97	—
52983	NW	SW	330 NW 23RD AVE	MW	—	15	37	600	1/24/97	—
52987	NW	SW	330 NW 23RD AVE	MW	—	15	37	600	1/24/97	—
53479	NW	NW	2110 NW LOVEJOY ST	G	—	—	26	—	4/11/97	—
53481	NW	NW	2110 NW LOVEJOY ST	G	—	—	20	—	4/11/97	—
53482	NW	NW	2110 NW LOVEJOY STREET	G	—	—	20	—	4/11/97	—
53483	NW	NW	2110 NW LOVEJOY ST	G	—	—	20	—	4/11/97	—
53708	SW	SE	1715 SW SALMON ST	MW	TRI MET	—	43	—	5/13/97	—
53709	SW	SE	1715 SW SALMON ST	MW	TRI MET	—	43	—	5/13/97	—
53710	SW	SE	1715 SW SALMON ST	MW	TRI MET	—	43	—	5/13/97	—
53712	SW	SE	1715 SW SALMON ST	MW	TRI MET	—	43	—	5/13/97	—

Table 1

1/2-Mile Radius Well Search Summary Table

sorted by ID

ID	Q	QQ	Location	Well Type	Company Name	First Water (ft bgs)	Completion Depth	Tax Lot	Date Completed	Screened or Sealed Interval(s) (ft bgs)
53713	SW	SE	1715 SW SALMON ST	MW	TRI MET	—	43	—	5/13/97	—
53714	SW	SE	1715 SW SALMON ST	MW	TRI MET	—	43	—	5/13/97	—
53715	SW	SE	1715 SW SALMON ST	MW	TRI MET	—	43	—	5/13/97	—
53716	SW	SE	1715 SW SALMON ST	MW	TRI MET	—	43	—	5/13/97	—
53717	SW	SE	1715 SW SALMON ST	MW	TRI MET	—	43	—	5/13/97	—
53718	SW	SE	1715 SW SALMON ST	MW	TRI MET	—	43	—	5/13/97	—
53719	SW	SE	1715 SW SALMON ST	MW	TRI MET	—	43	—	5/13/97	—
53720	SW	SE	1715 SW SALMON ST	MW	TRI MET	—	43	—	5/13/97	—
54038	NW	SE	2110 NW LOVEJOY STREET	MW		—	20	300	7/17/97	—
54053	NW	NW	2311 NW NORTHRUP ST	G	NORTHRUP HOUSE; SWEATTE, MR CLIFFORD C	—	0	—	8/9/97	—
54054	NW	NW	2311 NW NORTHRUP ST	G	NORTHRUP HOUSE; SWEATTE, MR CLIFFORD C	—	0	—	8/9/97	—
54055	NW	NW	2311 NW NORTHRUP ST	G	NORTHRUP HOUSE; SWEATTE, MR CLIFFORD C	—	0	—	8/9/97	—
54056	NW	NW	2311 NW NORTHRUP ST	G	NORTHRUP HOUSE; SWEATTE, MR CLIFFORD C	—	0	—	8/9/97	—
55140	SE	SW	1715 SW SALMON ST	G	TRI MET	—	28	—	1/28/98	—
55141	SE	SW	1715 SW SALMON ST	G	TRI MET	—	28	—	1/28/98	—
55142	SE	SW	1715 SW SALMON ST	G	TRI MET	—	28	—	1/28/98	—
55143	SE	SW	1715 SW SALMON ST	G	TRI MET	—	28	—	1/28/98	—
55365	NW	NW	1311 NW 23RD AVE	G	HMP INC.	—	0	—	4/2/98	—
55366	NW	NW	1311 NW 23RD AVE	G	HMP INC.	—	0	—	4/2/98	—
55368	NW	NW	1311 NW 23RD AVE	G	HMP INC.	—	0	—	4/3/98	—
56430	SE	NW	2110 NW LOVEJOY ST	MW	—	—	20	302	9/3/98	—
56872	SE	NW	2110 NW LOVEJOY STREET	G	—	—	24	302	10/20/98	—
59300	SE	SW	1844 SW MORRISON	G	CITY OF PORTLAND	—	0	800	10/18/99	—
59301	SE	SW	1844 SW MORRISON	G	CITY OF PORTLAND	—	0	800	10/18/99	—
59302	SE	SW	1844 SW MORRISON	G	CITY OF PORTLAND	—	0	800	10/18/99	—
59303	SE	SW	1844 SW MORRISON	G	CITY OF PORTLAND	—	0	800	10/18/99	—

Table 1

1/2-Mile Radius Well Search Summary Table

sorted by ID

ID	Q	QQ	Location	Well Type	Company Name	First Water (ft bgs)	Completion Depth	Tax Lot	Date Completed	Screened or Sealed Interval(s) (ft bgs)
59304	SE	SW	1844 SW MORRISON	G	CITY OF PORTLAND	—	0	800	10/18/99	—
59305	SE	SW	1844 SW MORRISON	G	CITY OF PORTLAND	—	0	800	10/18/99	—
59306	SE	SW	1844 SW MORRISON	G	CITY OF PORTLAND	—	0	800	10/18/99	—
59307	SE	SW	1844 SW MORRISON	G	CITY OF PORTLAND	—	0	800	10/18/99	—
59308	SE	SW	1844 SW MORRISON	G	CITY OF PORTLAND	—	0	800	10/18/99	—
59373	SE	SW	1844 SW MORRISON	G	CITY OF PORTLAND	—	0	800	10/18/99	—
59517	SE	NW	NW WESTOVER AND JOHNSON	G	WESTOVER LAND CORPORATION	—	95	—	10/15/99	—
59518	SE	NW	SW CORNER OF WESTOVER & JOHNSON	G	WESTOVER LAND CORPORATION	—	55	—	10/15/99	—
60233	SE	NW	803 NW 21ST STREET	G	CABLE HUSTON BENEDICT	—	65	—	2/7/00	—
60234	SE	NW	803 NW 21ST STREET	G	CABLE, HUSTON, BENEDICT	—	40	—	2/7/00	—
60235	SE	NW	803 NW 21ST STREET	G	CABLE, HOUSTON, BENEDICT	—	20	—	2/7/00	—
60250	NW	SE	2010 NW KEARNEY ST	G	HOUSING AUTHORITY OF PORTLAND	—	24	3400	2/10/00	—
60251	NW	SE	2010 NW KEARNEY ST	G	HOUSING AUTHORITY OF PORTLAND	—	24	3400	2/10/00	—
60778	SW	NE	1930 NW IRVING	G	PENDERGAST AND ASSOCIATES	—	0	8800	4/27/00	—
60779	SW	NE	1930 NW IRVING	G	PENDERGAST AND ASSOCIATES	—	0	8800	4/27/00	—
60780	SW	NE	1930 NW IRVING	G	PENDERGAST AND ASSOCIATES	—	0	8800	4/27/00	—
60781	SW	NE	1930 NW IRVING	G	PENDERGAST AND ASSOCIATES	—	0	8800	4/27/00	—
61662	SW	NE	NW LOVEJOY ST	G	CITY OF PORTLAND	—	26	—	6/24/00	—
61665	SW	NE	NW LOVEJOY ST	G	CITY OF PORTLAND; DEPARTMENT OF TRANSPORTATION	—	26	—	6/24/00	—
61666	SW	NE	NW LOVEJOY ST	G	CITY OF PORTLAND	—	26	—	6/24/00	—

Table 1

1/2-Mile Radius Well Search Summary Table

sorted by ID

ID	Q	QQ	Location	Well Type	Company Name	First Water (ft bgs)	Completion Depth	Tax Lot	Date Completed	Screened or Sealed Interval(s) (ft bgs)
61667	SW	NE	NW LOVEJOY ST	G	CITY OF PORTLAND	—	26	—	6/24/00	—
61669	SW	NE	NW LOVEJOY ST	G	CITY OF PORTLAND	—	26	—	6/23/00	—
61671	SW	NE	NW LOVEJOY ST	G	CITY OF PORTLAND	—	16	—	6/23/00	—
61672	SW	NE	NW LOVEJOY ST	G	CITY OF PORTLAND	—	22	—	6/24/00	—
61673	SW	NE	NW LOVEJOY ST	G	CITY OF PORTLAND	—	16	—	6/23/00	—
61674	SW	NE	NW LOVEJOY ST	G	CITY OF PORTLAND	—	16	—	6/23/00	—
61680	SW	NE	NW LOVEJOY ST	G	CITY OF PORTLAND	—	16	—	6/23/00	—
61860	NW	SW	330 NW 23RD AVE	G	—	—	0	—	8/7/00	—
61861	NW	SW	330 NW 23RD AVE	G	—	—	0	—	8/7/00	—
61862	NW	SW	330 NW 23RD AVE	G	—	—	0	—	8/7/00	—
61863	NW	SW	330 NW 23RD AVE	G	—	—	0	—	8/7/00	—
61864	NW	SW	330 NW 23RD AVE	G	—	—	0	—	8/7/00	—
61865	NW	SW	330 NW 23RD AVE	G	—	—	0	—	8/7/00	—

NOTES:

All wells located in Multnomah County, Township 1 North, Range 1 East, Section 33, within 1/2 mile radius of the site.

Data from the Oregon Water Resource Department database.

Q = quarter.

QQ = quarter's quarter.

ft bgs = feet below ground surface.

— = not reported.

Well Types:

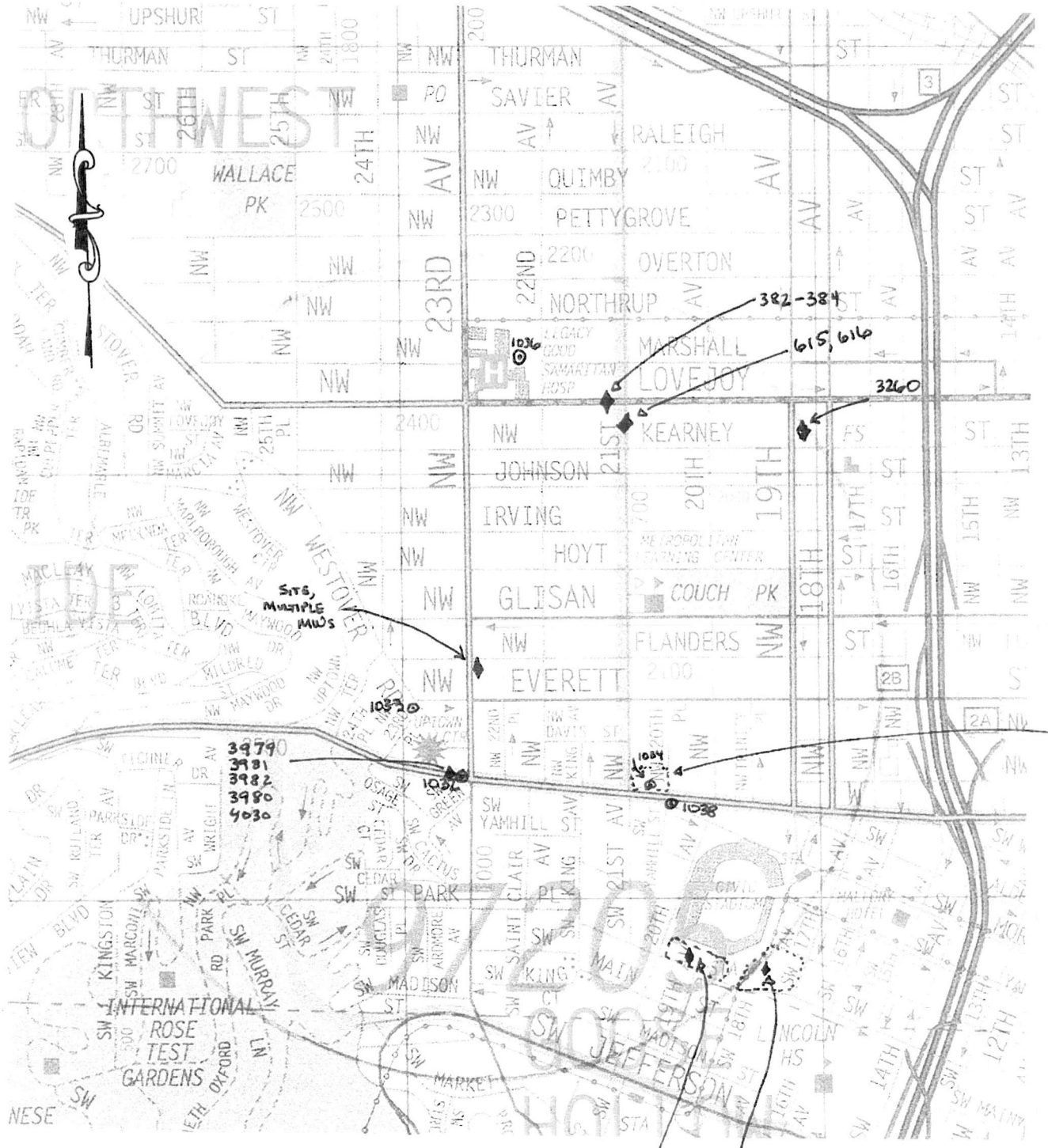
MW = monitoring well.

Ind = industrial well.

? = not clear from well log.

Ir = well used for irrigation.

G = geoprobe.



TERRA VAC

ROSE'S PARKING LOT PORTLAND, OREGON			
WELL LOCATION MAP			
DESIGNED BY:	CHECKED BY: P. BIANCO	PROJECT # 32-0029	FIGURE #
DRAWN BY:	PROJECT MANAGER: P. BIANCO	DATE: 12-18-00	SCALE: N.T.S.

TV-SEA\PROJECT # 32-0029\WELL MAP.DWG

STATE ENGINEER
Salem, Oregon

MULT 1082

Well Record

STATE WELL NO. 1N/1-33M2
COUNTY Multnomah
APPLICATION NO. .....

OWNER: Henry Thiele

MAILING ADDRESS: 2305 W. Burnshid

CITY AND STATE: .....

LOCATION OF WELL: Owner's No. .....

.....¼ .....¼ Sec. ..... T. ..... N. S., R. ..... E. W., W.M.

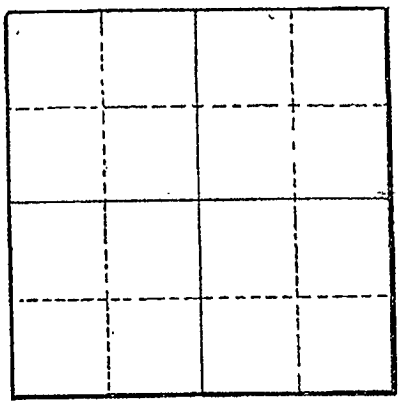
Bearing and distance from section or subdivision corner .....

.....

.....

.....

Altitude at well .....



Section .....

TYPE OF WELL: Drilled Date Constructed May '51

Depth drilled 281 Depth cased 136

CASING RECORD:

8 inch casing set to 136 feet

FINISH:

AQUIFERS:

Basalt from 125 to 281 feet

WATER LEVEL:

30 feet below land surface

PUMPING EQUIPMENT: Type ..... H.P. .....
Capacity ..... G.P.M.

WELL TESTS:
Drawdown 120 ft. after 1 hours pumping 75 G.P.M.
Drawdown ..... ft. after ..... hours ..... G.P.M.

USE OF WATER Industrial Temp. ..... °F. ....., 19

SOURCE OF INFORMATION Driller's log

DRILLER or DIGGER A. M. Jannsen

ADDITIONAL DATA:
Log x Water Level Measurements ..... Chemical Analysis ..... Aquifer Test .....

REMARKS:

Broken rock & clay 0 to 110'
Rock, lava 110 to 125'
Rock, brown & black 125 to 281'

STATE ENGINEER
Salem, Oregon

MULT 1033

Well Record

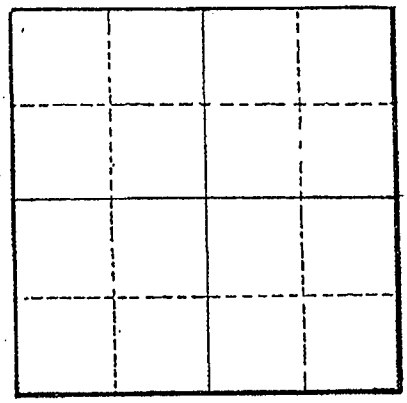
STATE WELL NO. 1N/1-33M1
COUNTY Multnomah
APPLICATION NO. .....

OWNER: Northwest Brewing Co.
MAILING ADDRESS: .....
CITY AND STATE: .....

LOCATION OF WELL: Owner's No. .....

..... ¼ ..... ¼ Sec. ..... T. ..... N. S., R. ..... E. W., W.M.

Bearing and distance from section or subdivision corner 150' W. of Westover Road & 100' S. of Everett St. N.W.



Section 33

Altitude at well .....

TYPE OF WELL: ..... Date Constructed .....

Depth drilled ..... Depth cased .....

CASING RECORD:

FINISH:

AQUIFERS:

WATER LEVEL:
76 feet above land surface (flowing well)

PUMPING EQUIPMENT: Type ..... H.P. .....
Capacity ..... G.P.M.

WELL TESTS:
Drawdown ..... ft. after ..... hours ..... G.P
Drawdown ..... ft. after ..... hours ..... G.P

USE OF WATER Industrial - Brewery Temp. ..... °F. ....., 19..
SOURCE OF INFORMATION Geo. Otten Oregon State Hwy. Dept. May 27, 1938 U.S.G.S.
DRILLER or DIGGER .....
ADDITIONAL DATA:
Log ..... Water Level Measurements ..... Chemical Analysis ..... Aquifer Test .....

REMARKS:
150 feet west of Westover Road & 100 feet South of Everett St. NW
June 28, 1938 plant long unused stripped of equipment No wells found in building may have been concealed by trash in building

STATE ENGINEER
Salem, Oregon

MULT 1034

Well Record

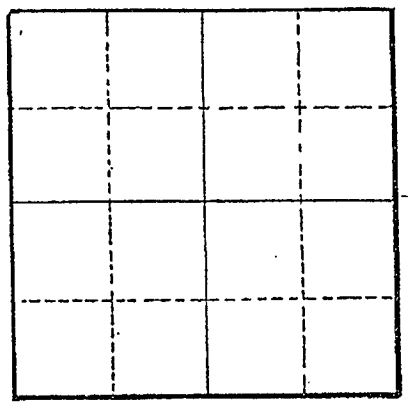
STATE WELL NO. 1N/1-33L1
COUNTY Multnomah
APPLICATION NO. .....

OWNER: Fred Meyer
MAILING ADDRESS: 2011 W. Burnside
CITY AND STATE: Portland, Oregon

LOCATION OF WELL: Owner's No. .....

NW ¼ SE ¼ Sec. 33 T. 1 N. S., R. 1 E. W., W.M.

Bearing and distance from section or subdivision corner .....



Section .....

Altitude at well .....

TYPE OF WELL: Drilled Date Constructed 1939

Depth drilled 195 Depth cased .....

CASING RECORD:

12 inch casing set

FINISH:

AQUIFERS:

WATER LEVEL:

PUMPING EQUIPMENT: Type Turbine Elect. H.P. .....
Capacity 200 G.P.M.

WELL TESTS:
Drawdown ..... ft. after ..... hours ..... G.P.
Drawdown ..... ft. after ..... hours ..... G.P.

USE OF WATER Air Conditioning Temp. 53 °F. ....., 19..
SOURCE OF INFORMATION Mr. Monahan Public Works Dept - U.S.G. S.
DRILLER or DIGGER R/ J. Strasser
ADDITIONAL DATA:
Log ..... Water Level Measurements ..... Chemical Analysis ..... Aquifer Test .....

REMARKS:

ORIGINAL
File Original and Duplicate with the STATE ENGINEER, SALEM, OREGON

MULT 1036

RECEIVED
APR 21 1958
STATE ENGINEER
SALEM, OREGON

WATER WELL REPORT
STATE OF OREGON

State Well No. 1N/1-33 C(2)

State Permit No. G 804

(1) OWNER:
Name Good Samaritan Hospital
Address 1015 N.W. 22nd
Portland 10, Oregon

(2) LOCATION OF WELL:
County Multnomah Owner's number, if any— #1
¼ ¼ Section ... T. ... R. ... W.M.
Bearing and distance from section or subdivision corner
Well located sixty feet north of the curb on N.W. Marshall Street one half way between 22nd and 23rd street. North side of Marshall st.
Elev 95 feet

(3) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED:
Threaded ☐ Welded ☒
10" Diam. from 0 ft. to 169 ft. Gage Std.
" Diam. from ... ft. to ... ft. Gage ...
" Diam. from ... ft. to ... ft. Gage ...

(7) PERFORATIONS:
Perforated? ☐ Yes ☒ No
Type of perforator used
SIZE of perforations ... in. by ... in.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.

(8) SCREENS:
Well screen installed ☐ Yes ☒ No
Manufacturer's Name
Type ... Model No.
Diam. ... Slot size ... Set from ... ft. to ... ft.
... Slot size ... Set from ... ft. to ... ft.

(9) CONSTRUCTION:
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ... ft. to ... ft.
Was a surface seal provided? ☐ Yes ☐ No To what depth? ... ft.
Material used in seal—
Did any strata contain unusable water? ☒ Yes ☐ No
Type of water? Yellow silt Depth of strata 146' to 156'
Method of sealing strata off Cementing casing into rock

(10) WATER LEVELS:
Static level 97 ft. below land surface Date 1/17/58
Artesian pressure ... lbs. per square inch Date ...

Log Accepted by:
Signed X ... (Owner) Date April 15, 1958
F.K. Teeple

(11) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☒ Yes ☐ No If yes, by whom? Pump, pipe and power
Yield: 385 gal./min. with 209 ft. drawdown after 2 hr
" " " " "
" " " " "
Bailer test ... gal./min. with ... ft. drawdown after ... hr
Artesian flow ... g.p.m. Date ...
Temperature of water 55 Was a chemical analysis made? ☐ Yes ☒ No

(12) WELL LOG:
Diameter of well 10 inches
Depth drilled 400 ft. Depth of completed well 400 ft.
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation

MATERIAL	FROM	TO
Fill	0	6
Yellow silt and sand	6	70
Brown cemented gravel	70	88
Loose gravel (4 inch minus)	88	92
Grey cemented gravel	92	146
Yellow silt	146	156
Decomposed rock	156	213
Hard grey rock	213	244
Black rock Approx. 50 gpm	244	293
Hard grey basalt	293	351
Seamy grey rock	351	356
Black and grey honeycomb rock	356	362
Seamy black rock	362	400
Water between 351 and 400		

Work started November 1957 Completed January 1958

(13) PUMP:
Manufacturer's Name
Type: ... H.P. ...

Well Driller's Statement:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Steinman Bros.
(Person, firm, or corporation) (Type or print)
Address 15112 S.E. McLoughlin Milwaukie 22, Ore.
Driller's well number 49-57
[Signed] E.E. McConnell
(Well Driller)
License No. 1 Date February 12, 1958

(USE ADDITIONAL SHEETS IF NECESSARY)

1038
MULT

OBSERVATION WELL

File Original and First Copy with the STATE ENGINEER, SALEM, OREGON

Record from Well Registration No. GR-3607

WATER WELL REPORT
STATE OF OREGON

State Well No. 1N/1-33B(1)

State Permit No. Pg 1 of 5

(1) OWNER:
Name United States National Bank
Address Stadium Branch
2000 SW Morrison Portland, Oregon

(2) LOCATION OF WELL:
County Multnomah Owner's number, if any—
SE ¼ SW ¼ Section 33 T. 1 N R. 1 E W.M.
Bearing and distance from section or subdivision corner
Block 1, Russel Addition

Elevation 115

(3) TYPE OF WORK (check):
New Well ☐ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(5) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED: Threaded ☐ Welded ☐
8 " Diam. from 0 ft. to 203 ft. Gage
6 " Diam. from 184 ft. to 428 ft. Gage
" Diam. from ft. to ft. Gage

(7) PERFORATIONS: Perforated? ☐ Yes ☐ No
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(8) SCREENS: Well screen installed ☐ Yes ☐ No
Manufacturer's Name
Type Model No.
Slot size Set from ft. to ft.
Slot size Set from ft. to ft.

(9) CONSTRUCTION:
Was well gravel packed? ☐ Yes ☐ No Size of gravel:
Gravel placed from ft. to ft.
Was a surface seal provided? ☐ Yes ☐ No To what depth? ft.
Material used in seal—
Did any strata contain unusable water? ☐ Yes ☐ No
Type of water? Depth of strata
Method of sealing strata off

(10) WATER LEVELS:
Static level 100 ft. below land surface Date 1946
Artesian pressure lbs. per square inch Date

Log Accepted by:

[Signed] (Owner) Date , 19

(11) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☐ No If yes, by whom?
Yield: 65 gal./min. with 75 ft. drawdown after hrs.
" 100 " 140 " "
" " " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

(12) WELL LOG: Diameter of well 8-6 inches.
Depth drilled 563 ft. Depth of completed well 563 ft.
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
sand	0	40
gravel, loose	40	116
gravel, cemented	116	128
sand and gravel	128	148
gravel, cemented	148	177
sand	177	181
gravel, cemented	181	228
lava rock	228	300
lime rock	300	317
rock, hard black	317	354
rock, broken some shale	354	390
lava rock, small amount of water	390	403
sand, black	403	425
conglomerate, rock and clay	425	455
basalt rock	455	480
lava rock	480	488
basalt rock	488	563

Work started May 19 46 Completed July 1946

(13) PUMP:
Manufacturer's Name F. M. Pomona
Type: Turbine H.P. 15

Well Driller's Statement:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME (Person, firm, or corporation) (Type or print)
Address
Driller's well number
[Signed] (Well Driller)
License No. Date , 19

(USE ADDITIONAL SHEETS IF NECESSARY)

STATE ENGINEER
Salem, Oregon

MULT 1038

Well Record

STATE WELL NO. 1N/1-33
COUNTY Multnomah
~~APPLICATION NO.~~ GR-3607

OWNER: Stadium Branch of U.S. National Bank of Portland

MAILING ADDRESS: 2000 S.W. Morrison

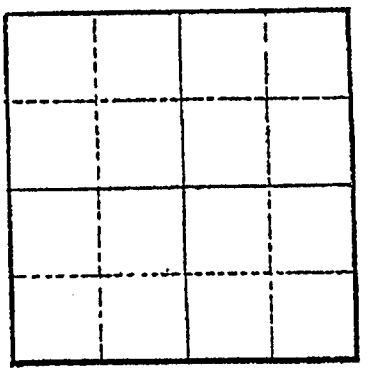
CITY AND STATE: Portland, Oregon

P3 3.45

LOCATION OF WELL: Owner's No. _____
Russell Addition
¼ ¼ Sec. 33 T. 1 ~~S.~~ N., R. 1 ~~W.~~ E., W.M.

Bearing and distance from section or subdivision corner 45' S. & 5' W from NE Cor. of Block 1, Lot 8

Altitude at well _____



Section _____

TYPE OF WELL: drilled Date Constructed 1946

Depth drilled 563' Depth cased 428'

CASING RECORD:

8" and 6"

FINISH:

AQUIFERS:

sand, gravel, rock, shale, clay, basalt rock

WATER LEVEL:

100'

PUMPING EQUIPMENT: Type Fairbanks Morse H.P. 15
Capacity 100 G.P.M.

WELL TESTS:
Drawdown 240 ft. after _____ hours pumping 100 G.P.M.
Drawdown 175 ft. after _____ hours pumping 65 G.P.M.

USE OF WATER air-conditioning Temp. _____ °F. _____, 19____
SOURCE OF INFORMATION GR-3155
DRILLER or DIGGER _____
ADDITIONAL DATA:
Log X Water Level Measurements _____ Chemical Analysis _____ Aquifer Test _____

REMARKS:

State Printing 89216

STATE ENGINEER — mult 1038
Salem, Oregon

State Well No. 1N/1-33
County Multnomah
~~Application No.~~ GR-3607

Pg 4 of 5

Well Log

Owner: Stadium Branch of U.S. National Bank of Portland Owner's No. _____

Driller: _____ Date Drilled 1946

CHARACTER OF MATERIAL	(Feet below land surface) From	To	Thickness (feet)
Sand	0'	40'	
Loose gravel	40	116	
Cement gravel	116	128	
Sand and gravel	128	148	
Cement gravel	148	177	
Sand	177	181	
Cement gravel	181	228	
Lava rock	228	300	
Lime rock	300	317	
Hard black rock	317	354	
Broken rock with some shale	354	390	
Lava rock carrying a small amount of water	390	403	
Black sand	403	425	
Conglomerate (rock & clay)	425	455	
Basalt rock	455	480	
Lava rock	480	488	
Basalt rock	488	563	

STATE ENGINEER
Salem, Oregon

MULT
10424

Well Record

STATE WELL NO. 1N/1-33C1
COUNTY Multnomah
APPLICATION NO. .....

OWNER: Ice Coliseum
MAILING ADDRESS: .....
CITY AND STATE: .....

LOCATION OF WELL: Owner's No. .....

.....¼ .....¼ Sec. ..... T. ..... N. S., R. ..... E. W., W.M.

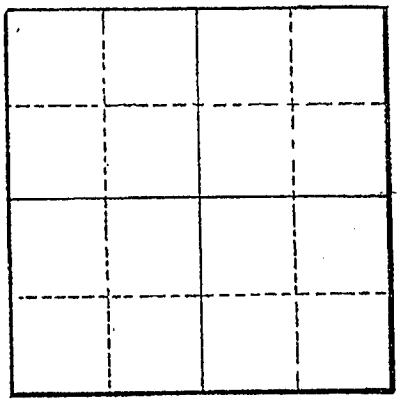
Bearing and distance from section or subdivision corner .....

.....

.....

.....

Altitude at well .....



Section .....

TYPE OF WELL: ..... Date Constructed .....

Depth drilled ..... Depth cased .....

CASING RECORD:

FINISH:

AQUIFERS:

WATER LEVEL:

PUMPING EQUIPMENT: Type ..... H.P. .....
Capacity .....75..... G.P.M.

WELL TESTS:
Drawdown ..... ft. after ..... hours ..... G.P
Drawdown ..... ft. after ..... hours ..... G.P

USE OF WATER ..... Temp. ..... °F. ....., 19.
SOURCE OF INFORMATION .....
DRILLER or DIGGER .....
ADDITIONAL DATA:
Log ..... Water Level Measurements ..... Chemical Analysis ..... Aquifer Test .....

REMARKS:

APPENDIX C

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TERRA VAC

TABLE 1
SOIL ANALYTICAL RESULTS
Rose's Parking Lot

LOCATION	DEPTH (Feet bgs)	DATE	TPH-gas (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	m,p-Xylene (mg/kg)	o-Xylene (mg/kg)	Naphthalene (mg/kg)
B-14	14.5	8/7/2000	ND	ND	ND	ND	ND	ND	ND
B-15	13.5	8/7/2000	ND	ND	ND	ND	ND	ND	ND
B-16	2.5	8/7/2000	ND	ND	ND	ND	ND	ND	ND
B-17	13.5	8/7/2000	890	ND	ND	0.38	4.0	1.2	NA
B-17[6]	17.5	8/7/2000	22,000	4.5	37	140	600	280	34
B-18	16.0	8/7/2000	ND	ND	ND	ND	ND	ND	ND

NOTES:
1) bgs = Below Ground Surface
2) ND = Not Detected
3) mg/kg = milligrams per kilogram
4) NA = Not Analyzed
5) TPH-gas = Total Petroleum Hydrocarbons in the Gasoline Range

printed on recycled paper

Table 2

TERRA VAC

Summary of Analytical Results for Soil Samples
Rose's Parking Lot
Portland, Oregon

Sample/ Boring Identification	Sampling Date	Sampling Depth (Feet bgs.)	Analytical Results (mg/Kg)									Flashpoint	Field Screening Results[2]	
			ODEQ Method TPH-HCID			ODEQ TPH-G	ODEQ TPH-418.1M	EPA Method 8020					Headspace	
			Gasoline	Diesel	Oil	Gasoline	Diesel/Oil	Benzene	Toluene	Ethylbenzene	Xylenes		Vapor (ppm)	Sheen
B-1	1/3/1994	13.0	NA	NA	NA	99	NA	NA	NA	NA	NA	NA	NA	NA
B-1	1/3/1994	18.0	Detected	Detected	ND<100	3,700	1,100	NA	NA	NA	NA	NA	NA	NA
B-1	1/3/1994	25.5	ND<20	ND<50	ND<100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-2	1/3/1994	10.5	ND<20	ND<50	ND<100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-3	1/3/1994	10.5	NA	NA	NA	ND<5	NA	NA	NA	NA	NA	NA	NA	NA
B-3	1/3/1994	20.5	NA	NA	NA	260	NA	NA	NA	NA	NA	NA	NA	NA
B-3	1/3/1994	28.0	ND<20	ND<50	ND<100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-4	1/3/1994	10.5	ND<20	ND<50	ND<100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-5	9/28/1994	5.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-6	9/28/1994	5.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-7	9/28/1994	5.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-8	5/11/1995	15.5	>20	>50[1]	NO	130	NA	NA	NA	NA	NA	NA	160	MS
B-8	5/11/1995	23.0	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	>10,000	HS
B-9	5/11/1995	23.0	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	340	SS
B-11	5/12/1995	20.5	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	<100	NS
B-12	5/12/1995	20.5	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	<100	SS
B-13	5/12/1995	15.5	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	110	SS
B-13	5/12/1995	23.0	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	120	SS
MW-1	3/23/1994	15.0	NA	NA	NA	290	NA	0.09	0.34	1.1	8.1	NA	NA	NA
MW-1	3/23/1994	25.0	POS. ID	POS. ID[3]	<200	6,550	NA	12.6	60.5	38.9	247.5	88°F	NA	NA
MW-2	3/23/1994	15.0	NA	NA	NA	85	NA	<0.05	0.07	0.12	0.33	NA	NA	NA
MW-2	3/23/1994	25.0	NA	NA	NA	NA	NA	<0.05	<0.05	0.07	<0.05	NA	NA	NA
MW-3	3/23/1994	20.0	NA	NA	NA	NA	NA	<0.05	<0.05	<0.05	<0.05	NA	NA	NA
MW-4	9/28/1994	5.0	ND	POS. ID[4]	ND	NA	52.2	NA	NA	NA	NA	NA	NA	NA
MW-4	9/28/1994	20.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-5	5/11/1995	23.0	>20	>50[1]	NO	5,200	NA	NA	NA	NA	NA	NA	>10,000	HS
R-1	11/2/1995	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<100	NS
R-1	11/2/1995	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<100	SS
R-1	11/2/1995	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<100	SS
R-1	11/2/1995	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,600	HS
R-1	11/2/1995	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>10,000	HS
R-1	11/2/1995	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,100	NS

Table 2

TERRA VAC

Summary of Analytical Results for Soil Samples
Rose's Parking Lot
Portland, Oregon

Sample/ Boring Identification	Sampling Date	Sampling Depth (Feet bgs.)	Analytical Results (mg/Kg)									Flashpoint	Field Screening Results[2]	
			ODEQ Method TPH-HCID			ODEQ TPH-G	ODEQ TPH-418.1M	EPA Method 8020					Headspace	
			Gasoline	Diesel	Oil	Gasoline	Diesel/Oil	Benzene	Toluene	Ethylbenzene	Xylenes		Vapor (ppm)	Sheen
DVE-1	1/24/1997	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-1	1/24/1997	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-1	1/24/1997	15.0	NA	NA	NA	ND	NA	ND	ND	ND	ND	NA	41	NS
DVE-1	1/24/1997	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	23	NS
DVE-1	1/24/1997	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	18	NS
DVE-1	1/24/1997	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-1	1/24/1997	35.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-2	1/24/1997	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	NS
DVE-2	1/24/1997	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	NS
DVE-2	1/24/1997	15.0	NA	NA	NA	2.23	NA	ND	ND	0.0565	ND	NA	100	NS
DVE-2	1/24/1997	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	40	NS
DVE-2	1/24/1997	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	22	NS
DVE-2	1/24/1997	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-3	1/24/1997	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1900	NS
DVE-3	1/24/1997	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	47	NS
DVE-3	1/24/1997	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	73	NS
DVE-3	1/24/1997	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20	NS
DVE-3	1/24/1997	35.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4	NS
DVE-4	1/24/1997	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5	NS
DVE-4	1/24/1997	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5	NS
DVE-4	1/24/1997	15.0	NA	NA	NA	ND	NA	ND	ND	ND	ND	NA	8	NS
DVE-4	1/24/1997	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	311	NS
DVE-4	1/24/1997	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1600	NS
DVE-4	1/24/1997	38.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4	NS

Notes:

bgs	Below Ground Surface
NA	Not Analyzed
NO	Not Observed
ND	Not Detected Above Detection Limit Indicated in Original Reports
mg/Kg	Milligrams per Kilogram
ODEQ	Oregon Department of Environmental Quality
TPH	Total Petroleum Hydrocarbons
ppm	Parts per Million

1. The laboratory reported that diesel-range hydrocarbons identified in the sample were the result of an overlap from the gasoline-range; therefore, diesel-range hydrocarbons were not quantified.
2. NS = No Sheen, SS = Slight Sheen, MS = Moderate Sheen, HS = Heavy Sheen
3. Peaks in the gasoline range extend into the diesel range
4. Peaks were present within the retention time window of the listed petroleum hydrocarbon, but the peak patterns indicate the presence of low level heavy oils extending into the diesel range.

Table 3

TERRA VAC

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		NLE	5	1,000	700	10,000	Napthalene = 28	5
MW-1	3/29/1994	NA	130	390	98	1,570	NA	NA
	10/4/1994	NA	27	46	6	70	NA	NA
	5/12/1995	NA	NA	NA	NA	NA	NA	NA
	1/4/1996	54,000	400	2,200	630	4,800	Naphthalene - 370 Acenaphthylene - 44	100
	4/24/1996	NA	NA	NA	NA	NA	NA	NA
	7/11/1996	81,000	710	1,800	730	2	Naphthalene - 750 Acenaphthylene - 160 Phenanthrene - 2.2 Fluoranthene - 4.5	NA
	11/3/1996	23,000	410	1,500	910	4,100	Naphthalene - 2,400 Acenaphthylene - 460 Acenaphthene -600 Fluorene - 12 Phenanthrene - 12 Anthracene - 0.89 Fluoranthene - 10 Pyrene - 2.1 Benzo(a)anthracene - 0.7 Chrysene - 1.3 Benzo(k)fluoranthene - 0.1 Benzo(a)pyrene - 0.3 Dibenzo(a,h)anthracene - 0.1 Benzo(g,h,i)perylene - 0.4	NA
	2/28/97*	57,200	1,130	3,890	1,220	7,430	Naphthalene - 760	20
	5/29/1997	14,900	65.9	49.3	205	1,010	NA	NA
	9/5/1997	14,600	10.9	11.8	47.3	642	Naphthalene - 54.2	NA
	12/31/1997	2960	ND	ND	ND	8.76	NA	NA
	5/18/1998	16,000	ND	7.63	ND	930	Naphthalene - 387	2,000
	7/31/1998	19,600	6.00	6.54	ND	1,020	Naphthalene - 104	787
	10/29/1998	27,900	13.90	ND	9.13	1,120	Naphthalene - 516	490

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		NLE	5	1,000	700	10,000	Napthalene = 28	5
NMW-2	3/29/1994	NA	4.9	1.4	0.7	3.0	NA	NA
	10/4/1994	NA	ND	ND	ND	ND	NA	NA
	5/12/1995	ND	1.2	ND	0.6	0.7	NA	NA
	1/4/1996	1,600	14	1.5	ND	1.7	ND	ND
	4/24/1996	NA	7.7	0.5	ND	ND	NA	NA
	7/11/1996	7,100	2.7	ND	ND	ND	ND	NA
	11/3/1996	ND	2.0	ND	ND	ND	NA	NA
	2/28/1997	ND	ND	ND	ND	ND	NA	NA
	5/29/1997	ND	ND	ND	ND	ND	NA	NA
	9/5/1997	ND	ND	ND	ND	ND	NA	NA
	12/31/1997	ND	ND	ND	ND	ND	NA	NA
	5/18/1998	ND	ND	ND	ND	ND	NA	NA
	7/31/1998	203	ND	ND	ND	ND	NA	NA
	10/29/1998	128	ND	ND	ND	ND	NA	NA
NMW-3	3/29/1994	NA	2,300	1,200	1,200	3,700	NA	NA
	10/4/1994	NA	1,520	600	790	1,600	NA	NA
	5/12/1995	3,500	1,300	740	800	2,000	Naphthalene - 130 Fluorene - 0.2 Phenanthrene - 0.09	NA
	1/4/1996	4,500	1,300	640	940	2,600	Naphthalene - 180 Acenaphthylene - 23	6
	4/16/1996	NA	900	500	600	1,400	NA	NA
	7/11/1996	2,100	460	130	380	430	Naphthalene - 71	NA
	11/3/1996	4,900	830	220	650	1,100	Naphthalene - 120 Acenaphthylene - 37	
	2/28/1997	4,400	261	124	153	404	Naphthalene - 32.6	NA
	5/29/1997	365	17.4	0.91	3.55	15.3	NA	NA
	9/5/1997	ND	ND	ND	ND	ND	NA	NA
	12/31/1997	ND	ND	ND	ND	ND	NA	NA
	5/18/1998	299	4.53	ND	9.26	ND	Naphthalene - 0.173	1.5
	7/31/1998	223	4.14	ND	4.68	ND	NA	NA
	10/29/1998	458	2.70	0.565	3.09	ND	NA	NA

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Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		NLE	5	1,000	700	10,000	Napthalene = 28	5
MW-4	10/4/1994	NA	ND	ND	ND	ND	NA	NA
	5/12/1995	ND	ND	ND	ND	ND	NA	NA
	1/4/1996	900	ND	ND	ND	ND	ND	ND
	4/24/1996	NA	ND	ND	ND	ND	NA	NA
	7/11/1996	ND	ND	ND	ND	ND	NA	NA
	11/3/1996	NA	ND	ND	ND	ND	NA	NA
	2/28/1997	ND	0.7	ND	ND	ND	NA	NA
	5/29/1997	ND	ND	ND	ND	ND	NA	NA
	9/5/1997	ND	ND	ND	ND	ND	NA	NA
	12/31/1997	ND	ND	ND	ND	ND	NA	NA
	5/18/1998	ND	ND	ND	ND	ND	NA	NA
	7/31/1998	ND	ND	ND	ND	ND	NA	NA
	10/29/1998	ND	ND	ND	ND	ND	NA	NA
NMW-5	5/12/1995	13,000	660	13,000	1,900	11,000	Naphthalene - 450 Acenaphthylene - 66 Fluorene - 0.6 Phenanthrene - 0.42 Anthracene - 0.07	NA
	1/4/1996	6,600	4.6	22	24	230	Naphthalene - 29 Acenaphthylene - 13 Fluorene - 0.8	14
	4/24/1996	NA	ND	0.6	1.1	2.9	NA	NA
	7/11/1996	ND	ND	ND	ND	2.7	NA	NA
	11/3/1996	NA	ND	ND	2.5	5.6	NA	NA
	2/28/1997	5,440	70.3	23.5	88.6	230	Naphthalene - 28.5	NA
	5/29/1997	4,480	34.9	156	7.90	554	NA	NA
	9/5/1997	5,550	39.0	334	23.5	642	ND	NA
	12/31/1997	18,300	62.6	570	231.0	1,570	NA	NA
	5/18/1998	1,050	ND	ND	0.895	14	Naphthalene - 4.87	1.2
	7/31/1998	3,310	26.8	53.6	50.0	268	NA	NA
	10/29/1998	6,840	21.8	57.0	101	284	NA	NA

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Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		NLE	5	1,000	700	10,000	Napthalene = 28	5
MW-6	4/24/1996	ND	ND	ND	ND	ND	NA	ND
	7/11/1996	ND	ND	ND	ND	ND	NA	NA
	11/3/1996	NA	ND	ND	ND	ND	NA	NA
	2/28/1997	ND	ND	ND	ND	ND	NA	NA
	5/29/1997	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	102	ND	ND	ND	ND	NA	NA
	10/2/97***	NA	NA	NA	NA	NA	NA	NA
	12/31/1997	ND	ND	ND	ND	ND	NA	NA
	5/18/1998	NA	NA	NA	NA	NA	NA	NA
	7/31/1998	NA	NA	NA	NA	NA	NA	NA
	10/29/1998	NA	NA	NA	NA	NA	NA	NA
MW-7	4/24/1996	ND	ND	ND	ND	ND	NA	ND
	7/11/1996	ND	ND	ND	ND	ND	NA	NA
	11/3/1996	NA	ND	ND	ND	ND	NA	NA
	2/28/1997	ND	ND	ND	ND	ND	NA	NA
	5/29/1997	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	110	12	ND	ND	ND	NA	NA
	10/2/1997	ND	ND	ND	ND	ND	NA	NA
	12/31/1997	ND	ND	ND	ND	ND	NA	NA
	5/18/1998	NA	NA	NA	NA	NA	NA	NA
	7/31/1998	NA	NA	NA	NA	NA	NA	NA
	10/29/1998	NA	NA	NA	NA	NA	NA	NA

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Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		NLE	5	1,000	700	10,000	Napthalene = 28	5
MW-8	4/24/1996	ND	ND	ND	ND	ND	NA	ND
	7/11/1996	ND	ND	ND	ND	ND	NA	NA
	11/3/1996	NA	ND	ND	ND	ND	NA	NA
	2/28/1997	ND	ND	ND	ND	ND	NA	NA
	5/29/1997	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	111	ND	ND	ND	ND	NA	NA
	10/1/1997	ND	ND	ND	ND	ND	NA	NA
	12/31/1997	ND	ND	ND	ND	ND	NA	NA
	5/18/1998	NA	NA	NA	NA	NA	NA	NA
	7/31/1998	NA	NA	NA	NA	NA	NA	NA
	10/29/1998	NA	NA	NA	NA	NA	NA	NA

Notes:

Sampling between 3/29/94 and 11/3/96 performed by GeoEngineers. Data from 1/21/97 Groundwater Report.

Wells MW-2, MW-3, and MW-5 redrilled 1/23-1/25/97, and renamed NMW-2, NMW-3, and NMW-5 respectively.

* MW-1 sampled for lead 12/11/96.

** Sample Results were suspect. Well Resampled on 10/1/97 or 10/2/97

*** Well was dry. No analytical sample taken.

PAHs polycyclic aromatic hydrocarbons. Only analytes detected are listed. Refer to analytical results (Appendix A) for a complete list of analytes and their respective detection limits.

ug/L Micrograms per liter, or parts per billion

ND Not Detected at the reporting limits

NA Not Analyzed

TPH-G Total petroleum hydrocarbons within the gasoline range (benzene to naphthalene).

APPENDIX D

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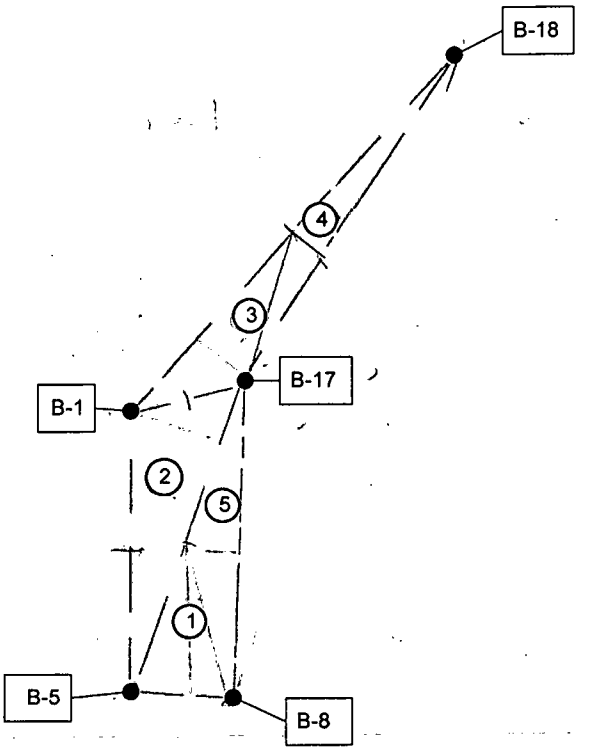
Rose's UST

Theissen Method

Scale 1" = 10'



Polygon	Area (ft^2)
1	30.5 ft^2
2	42.5 ft^2
3	25.75 ft^2
4	18.0 ft^2
5	13.0 ft^2
Total Area	129.75 ft^2

CALCULATIONS FOR AIR CONCENTRATION IN 1 STORY BUILDING

Five Polygons

Polygon	Area (ft^2)
1	30.5
2	42.5
3	25.75
4	18
5	13
Total Area:	**129.75** **ft^2**
Total Area:	**12.05** **m^2**

Volume of 1-Story Building

	100	ft
	120	ft
	9.8	(ft Height)
Total Volume:	**117,600**	**ft^3**
Total Volume:	**3,330**	**m^3**

Volume of Contaminated Soil

	129.75	ft^2
	1.5	ft
Total Volume:	**194.63**	**ft^3**
Total Volume:	**5.51**	**m^3**

Mass of Benzene

Concentration of Benzene:	4.5	mg/kg
Soil Bulk Density:	1,700	kg/m^3
Benzene Impacted Soil Volume:	5.51	m^3
Mass of Benzene:	42,151.5	mg
Mass of Benzene:	42,151,500	µg

Exposure Parameters

Building Exchange Rate:	24	Days
Exposure Duration:	30	Years
Conversion Factor:	365	Days/Year

Concentration of Benzene in Building: 0.048 $\mu g/m^3$

Notes:
1. Theissen Method Used to Determine Area of Benzene Impacted Soil
2. Building Volume Based on Approximate Lot Size of 120 feet by 100 feet and Height of 3 meters.

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UST CLEANUP TELEPHONE USE REPORT

CALL FROM/(TO): Paul Bianco DATE: 1-5-01

WITH: Terra Vac TIME: 9:30

TELEPHONE NO: (425) 697-5131

REGARDING: Roses Parking Lot

FILE NO: 26-94-0025

SUMMARY OF CALL

Checking calculation on mass determination for vapor intrusion I found some errors. Building vol. is excessively large and vol of PCS seems to be too small. Rework the numbers with more realistic parameters and provide detailed documentation. Need a key for zoning map. Residential standards appropriate due to nearby residential use.

T St Griffin

Staff Signature

2000-94-0025

Terra Vac
Northwest Division
23106 100th Avenue West
Edmonds, WA 98020-5018
425-697-5131 Tel
425-697-6211 Fax

December 21, 2000

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
DEC 26 2000
NORTHWEST REGION

Mr. Robert Williams
Oregon Department of Environmental Quality
2020 SW 4th Avenue, Suite 400
Portland, OR 97201-4987

RE: Conceptual Site Model – Rose's Parking Lot
330 NW 23rd Avenue, Portland, Oregon

Dear Mr. Williams:

At your request, Terra Vac Corporation (Terra Vac) has prepared a conceptual site model (CSM) for Rose's Parking Lot, 330 NW 23rd Avenue, Portland, Oregon (herein known as the Site). As noted in your November 9, 2000 letter to Terra Vac, residual petroleum contaminated soil (PCS) remains at the Site at a depth of 17.5 feet below ground surface (i.e., at soil boring B-17). The concentration of benzene in PCS at this depth is 4.5 mg/kg. Based on a review of groundwater levels at the Site, PCS resides above the season high watertable (~ 18.5 feet bgs) for most of the year. The concentration of benzene exceeds the Oregon Department of Quality (DEQ) generic risk-based concentrations (RBC) for indoor air vapor intrusion (0.5 mg/kg) and the leaching to groundwater pathways (0.1 mg/kg). Both RBCs assume occupational receptors.

Terra Vac developed the following CSM guidelines promulgated in the Oregon Department of Quality (DEQ) document entitled Risk Based Decision Making for the Remediation of Petroleum Contaminated Sites (DEQ 1999). The CSM presented below identifies the contaminates of potential concern (CPOCs), the potential exposure pathways (e.g., vapor intrusion into buildings) for the CPOCs, and the potential receptors (i.e., residential, occupation, and/or excavation workers) for the CPOCs.

RISK BASED ANALYSIS FOR SITE CLOSURE

The information presented below will be used to support the argument that the PCS at the Site does not pose a risk to human health and the environment. Rationale for this conclusion will be based on the following:

- Concentrations of COPCs in soil and groundwater at the Site are less than generic RBCs developed by the DEQ (DEQ 1999); and/or

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- The exposure pathway and or receptor does not exist at the Site for the COPCs.

Exposure Assessment

Land and Groundwater Use

Land Use

The City of Portland, Oregon zones land-use at the Site and surrounding area as Commercial Storefront (CS). This zone is intended to preserve and enhance older commercial areas that have store front character. Under CS the unconditional land-use includes household living, retail sales and services, offices, vehicle repair, commercial outdoor recreation, schools, medical centers, daycare, and religious institutions. Land-use zoning directly east of the Site is designated as High Density Residential (RH). Figures 1 and 2 show the location of the Site and the surrounding land-use and land-use zoning, respectively. According to the City's 20 year Comprehensive Plan for the Site and surrounding area there are no zoning changes planned for the area.

At present, the Site is used as a commercial parking lot (Photographs 1 and 2 in Appendix A). Present land use adjacent to the Site includes restaurants, hardware and domestic houseware stores, and medical offices. The nearest residences are located approximate 500 feet or more northeast and southeast of the Site.

Groundwater Use

The Site and vicinity are within the City of Portland (City). Local area water needs are supplied by the Portland Water Bureau. The City's water is acquired from the Bull Run watershed 26 miles to the east of downtown Portland. Backup supplies are taken from an aquifer located near Troutdale, Oregon, east of Portland.

According to the State of Oregon Water Resources Department records, 98 wells are located within a half-mile mile radius of the Site. Ninety two of the wells are designated as groundwater monitoring wells and four are designated industrial. The use of the two remaining wells is unknown. A summary table of wells and a well location map is presented in Appendix B. Well logs for industrial wells are also presented in Appendix B.

Excluding the monitoring wells at the Site, four wells are located within a quarter-mile of the Site. These wells are designated as industrial wells. The nearest industrial well is located less than one-eighth of a mile from the Site (well record 1033) at NW Brewery Company located at the intersection of NW Everett Street and NW Weston Road (NW/4, SE/4, Sec 33, Township 1 North and Range 1E). The depth of the well was not reported; however, the water level was reported as "76 feet above land surface (flowing well)." There was no stratigraphy provided with the log. The remaining industrial wells located within one-quarter mile of the Site were drilled to depths of between 195 and 563 feet bgs. The wells were installed between 1939 and 1951. At the time of drilling,

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static water levels in the wells ranged from 30 to 100 feet bgs. Groundwater from the wells was pumped from basalt aquifers located at 100 to 500 feet bgs. The four industrial wells are located hydraulically upgradient from the Site.

According to the Oregon Department of Water Resources' (DWR) water rights data base, there is no points of groundwater use or point of diversion near the Site .

Contaminants of Potential Concern

COPCs for soil were selected from confirmation soil results collected during the Terra Vac's August 7, 2000 post remediation soil quality investigation (Terra Vac 2000). COPCs for groundwater were selected from the October 29, 1998 groundwater sampling event, also representing a post remediation sampling event (Terra Vac 1999). A compilation of all soil and groundwater sample results is presented in Appendix C. COPCs for the site are as follows:

Contaminants of Potential Concern	Soil		Groundwater Maximum Concentration (µg/l)
	Maximum Concentration (mg/kg)	Depth of Sample (feet)	
Benzene	4.5	17.5	21.8
Toluene	37.0	17.5	57.0
Ethyl benzene	140	17.5	101
Total Xylenes	880	17.5	284
Dissolved Lead	Not Analyzed	Not Analyzed	490
Naphthalene	34	17.5	516

Conceptual Site Model

Figure 3 presents the conceptual site exposure model (CSM) for the Site. Based on current and future land and groundwater uses at the Site and surrounding area the potential receptors for COPCs are residential, occupation and excavation workers. This conclusion is based on the fact that present and future land-use at the Site, and for the surrounding area, are zoned CS. This zoning designation allows for household living and commercial development. Bases on the zoned land-use at the Site and surrounding area, exposure pathways will be screened against residential risk based criteria. Presented below is a detailed discussion of the CSM.

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Media Sources

Soil

For COPCs the only potential exposure routes for residential receptors are leaching to groundwater (RBCsw) and volatilization to indoor air (RBSsi). This conclusion is based the following rationale:

- Concentrations of COPCs remaining in soil at the Site are less than their associated generic risked based screening concentrations for ingestion, vapor, and dermal absorption pathway (RBCss). The applicable RBCs are presented in of Table 1;

- Concentrations of COPCs remaining in soil at the Site are less than their associated generic risked based screening concentrations for volatilization to the outdoor air exposure pathway (RBCso). The applicable RBCs are presented in Table 1;

- The maximum concentration of benzene remaining in the soil at the Site exceeds the associated generic based risked screening concentration for the volatilization to indoor air exposure pathway (RBCsi). The maximum concentrations of toluene, ethyl benzene, xylenes, and naphthalene are less than applicable RBCsi for the this pathway (Table 1); and

- The maximum concentration of benzene remaining in the soil at the Site exceeds the associated generic based risked screening concentration for the leaching to groundwater exposure pathway (RBCsw). The maximum concentrations of toluene, ethyl benzene, xylenes, and napthalene are less than applicable RBCsw for the same pathway (Table 1)

For the volatilization to indoor air pathway, concentrations of benzene in post remediation soil sample B-17-17.5 exceed the generic RBCsi. Although the benzene concentrations exceed the RBCsi, under existing Site conditions (i.e., parking lot no structures) the volatilization to indoor pathway can be eliminated based on the following rationale:

- All benzene contaminated soil was discovered at greater than 10 feet from the existing commercial building and greater than 50 feet from the nearest residential structure. According to guidance presented in DEQ's Risk Based Decision Making for the Remediation of Petroleum Contaminated Sites (DEQ 1999), the indoor air vapor pathway can be excluded whenever vadose zone volatile compounds are not located beneath or within 10 feet of a commercial building or residential building.

If in the future a building was constructed at the Site it is possible that benzene gas originating at depth (17.5 feet bgs) migrate up through the soil column (via the transport

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mechanisms of diffusion and convection and enter the building. To estimate the concentration benzene gas that would enter a hypothetical building at the Site, the average benzene concentration in the building air was calculated using the assumptions presented in the table below.

Assumptions	Input Values	Source
Area of TPH Contaminated Soil	12.05 m^2	B-1,B-17, MW-2, B-5, & B-8(1)
Thickness of TPH Contaminated Soil	0.472 m	Based on sample B-17-17.5
Volume of TPH Contaminated Soil	5.57 m^3	Calculated
Density of Soil	1,700 kg/m^3	RBM Default Value
Concentration of Benzene in Soil	4.5 mg/kg	Sample B-17-17.5
Mass of Benzene in Contaminated Soil	42,610,500 µg	Calculated
Volume of Hypothetical Building (1 story)	50,970 m^3	Based on Zoning
Exposure Duration	30 years	RBM Default Value
Building Exchange Rate	24/day	RBM Default Value

(1) Theissen polygon method used to determine area

The following equation was use to calculate the average concentration of benzene in the hypothetical building over an exposure period of 30 years:

$$\frac{\text{Mass of Benzene (µg)/Volume of Building } (m^3)}{\text{Exposure Duration (yr) x Building Air Exchange Rate (1/day) x 365 (day/yr)}}$$

Based on the assumptions presented above, the average indoor air concentration for benzene is estimated to be 0.0032 $\mu g/m^3$. The Oregon Department of Environmental Quality's (DEQ) generic residential risk based inhalation screening concentration (RBC air) is 0.30 $\mu g/m^3$. The equation presented above assumes that all the benzene gas in soil enters the building; therefore, the calculated concentration is conservative.

Exposure to benzene through the leaching to groundwater pathway can also be eliminated based on the following rationale:

- Groundwater at the Site and surrounding area is not a current or future source of drinking water (as discussed above);
- Drinking water for the Site and surrounding area is supplied by the City's municipal water supply system. The City will continue to supply water to the area for the foreseeable future; and
- Concentrations of COPCs in the groundwater at on-Site wells are declining overtime as a result of intrinsic bioremediation and insitu remediation (i.e, dual vapor extraction system).

Groundwater

For petroleum contaminated groundwater at the Site, the potential exposure routes for residential, occupational, and excavation workers are groundwater ingestion (RBCdw)

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and the ingestion and inhalation of groundwater from tap water (RBCtw). This conclusion is based on the following rationale:

- Concentrations of BTEX, dissolved lead, and napthalene in the groundwater at the Site are less than their associated generic risked based screening concentrations for volatilization to indoor and outdoor air exposure pathway (RRCwi and RBCwo, respectively). The applicable RBCs are presented in Table 1;

- With the exception of benzene, the maximum concentrations of TEX in the groundwater at on-Site wells are less than generic RBCs for the groundwater ingestion and ingestion and inhalation of tap water exposure pathways. For benzene, the pathways can be eliminated based on the following rationale:

  - Groundwater at the Site and surrounding area is not a current or future source of drinking water (as discussed above);

  - Drinking water for the Site and surrounding area is supplied by the City's municipal water supply system. The City will continue to supply water to the area for the foreseeable future; and

  - Concentrations of COPCs in the groundwater at on-Site wells are declining overtime as a result of intrinsic bioremediation and insitu remediation.

Total Petroleum Hydrocarbons

With the exception of sample B-17-17.5, none of the post-remedial soil samples collected at the Site had a gasoline range TPH concentration that exceeds 1,000 mg/kg gasoline range TPHs. The 1,000 mg/kg threshold is an action level for Sites seeking closure using DEQ's Risk Based Decision Making process. No! Low Impact sites

The concentration of TPH-G at sample B-17-17.5 (22,000 mg/kg), suggests that non-aqueous phase liquid (NAPL) may be present in the soil. However, since NAPL has not been detected on the groundwater, it can be assumed that if the NAPL is present, it is at residual saturation; and therefore, poses no threat to groundwater quality other than a leachable source of COPCs.

Contaminants of Concern

Under present Site conditions, the analysis of exposure pathways indicates that it is unlikely that residential, occupational, or excavation workers will be exposed to COPCs.

Exposure to COPCs from leaching to groundwater, groundwater ingestion, and ingestion and inhalation from tap-water have been eliminated as potential exposure pathways because the contaminated groundwater at the Site is not a present or likely

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future source of drinking water. Under present Site conditions (parking lot no structures), volatilization to indoor air can also be eliminated; however, if in the future a residential or commercial structure is constructed at the Site the volatilization to indoor air pathway could become a primary route of exposure given the current concentration of benzene in the soil at boring B-17. However, based on the estimated concentration of benzene in air for a hypothetical two story building at the Site, the average concentration of benzene in the building over a 30 year exposure period is less than DEQ's generic inhalation risk based concentration.

Given the nature and extent of contamination at the Site, the present land-use, present and future groundwater uses at the Site and surrounding area, and the positive impact of the Site remedial actions on soil and groundwater quality, there are no contaminants of concern at the Site under present Site conditions and in the future based on the air pathway modeling results.

ECOLOGICAL RISKS

Based on guidance provide in the DEQ 's Risk Based Decision Making For the Remediation of Petroleum Contaminated Sites (DEQ 1999), the Site is devoid of ecological risks. This conclusion is based on the following:

- Contaminated soil is only present at depths greater than three feet and the remaining PCS is covered by asphalt;
- Surface water has not been affected, nor is it likely to be affected in the future as a result of the release;
- Contaminated groundwater does not and is not reasonably likely to discharge to surface water or otherwise reach the surface in a manner that might result in contact with ecological receptors; and
- Contaminated groundwater does not and is not reasonably likely to come in contact with aquatic sediments.

PROPOSED INSTITUTIONAL OR ENGINEERING CONTROLS

At present there are no institutional or engineering controls planned for the Site.

REFERENCES

ODEQ, 1999a. Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites Under OAR 340-122-0205 through 340-122 0360, by the Oregon Department of Environmental Quality. September 29, 1999.

Terra Vac Corporation. 2000. Soil Quality Investigation Report 330 NW 23rd Avenue, Portland, Oregon.

Terra Vac Corporation. 1999. Active Remediation Closure Report Rose's Parking Lot 330 NW 23rd Avenue, Portland, Oregon 97202.

If you have questions regarding this report, please feel free to contact me at (425) 697-5131.

Sincerely,
Terra Vac

Paul V. Bianco, P.E.
Senior Engineer

CC: Mr. Richard Singer
Mr. Richard Allen
Mr. Thomas Cammarata
32.0029.10.01

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FIGURES

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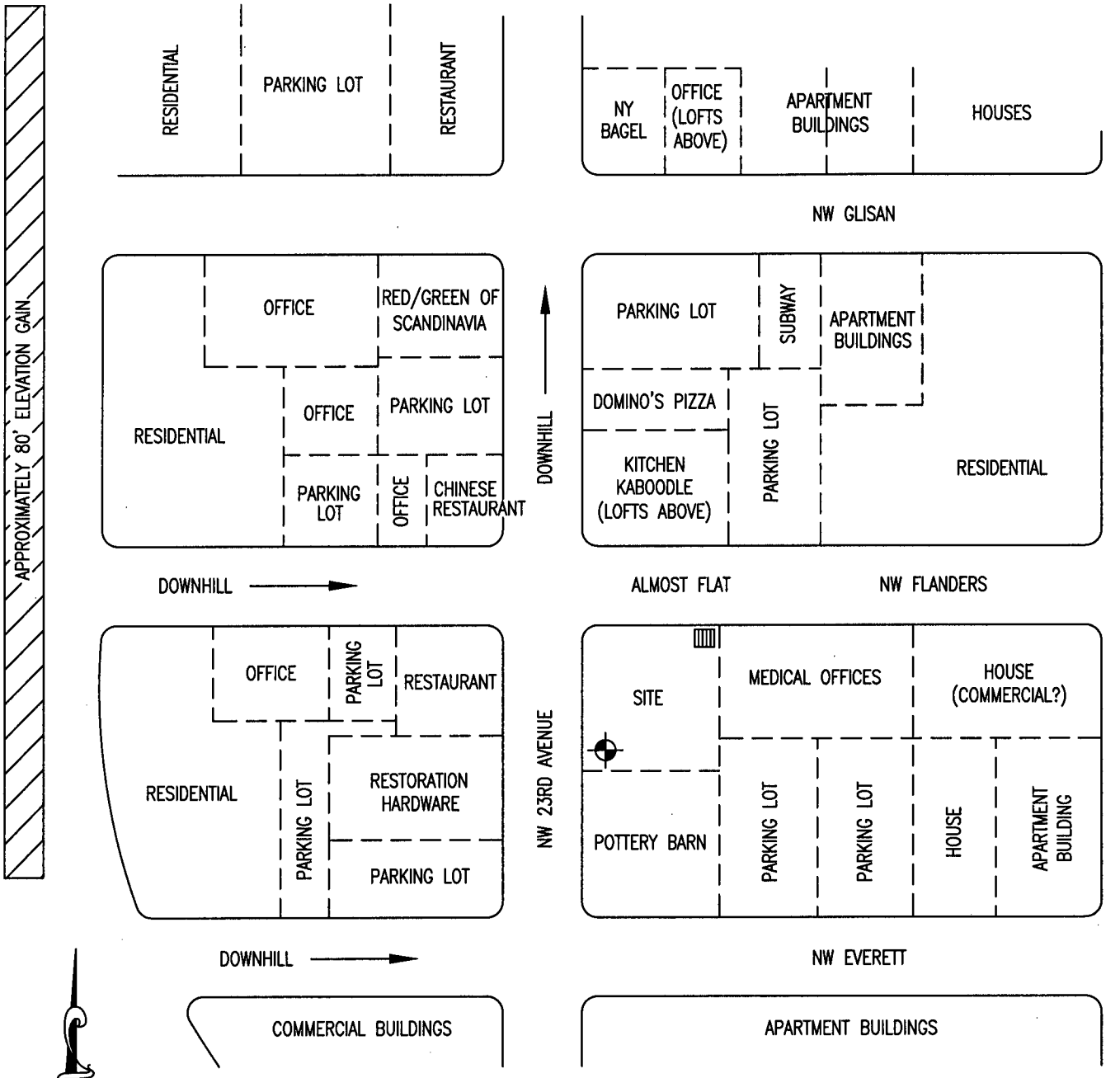


NOTES:

ONE MONITORING WELL OBSERVED. LOCATED APPROXIMATELY 15' N AND 5' E OF SW CORNER OF LOT

STORM DRAIN LOCATED AT NE CORNER OF LOT

MULTIPLE ACCESS COVERS ACCROSS SITE

TERRA VAC

ROSE'S PARKING LOT
PORTLAND, OREGON

AREA MAP

DESIGNED BY:	CHECKED BY:	PROJECT #	FIGURE #
P. BIANCO	P. CATTERALL	32-0029	1
DRAWN BY:	**PROJECT MANAGER:**	**DATE:**	**SCALE:**
P. BIANCO	P. BIANCO	12-15-00	N.T.S.

TV-SEA\PROJECT # 32-0029\0029 CSM F1.DWG

R1
1c
N.W.
ALPHABET HISTORIC
R1d
N.W.
CSd
GLISAN
RHd
ST.
OSd
AVE.
RHd
N.W.
FLANDERS
ST.
CSd
RHd
AVE.
AVE.
N.W.
FL.
23RD
22ND
21ST
20TH
CG
CB
CA
CSd
N.W.
RHd
EVERETT
ST.
PL.
N.W.
N.W.
R1c
CGc
N.W. 23RD PL.
W. BURNSIDE ST.
N.W.
HISTORIC DISTRICT
RH
N.W. DAVIS ST
N.W.
RHd
OSc
CG
CXd
CXd
CXd
CXd
CXd
CXd
N.W. KING AVE.
S.W. MORRISON ST.
S.W. 20TH PL.
R1c
R1d
RH
S.W. YAMHILL ST.
OSc
RHd
AVE.
AVE.
21ST AVE.
S.W. TAYLOR
R1

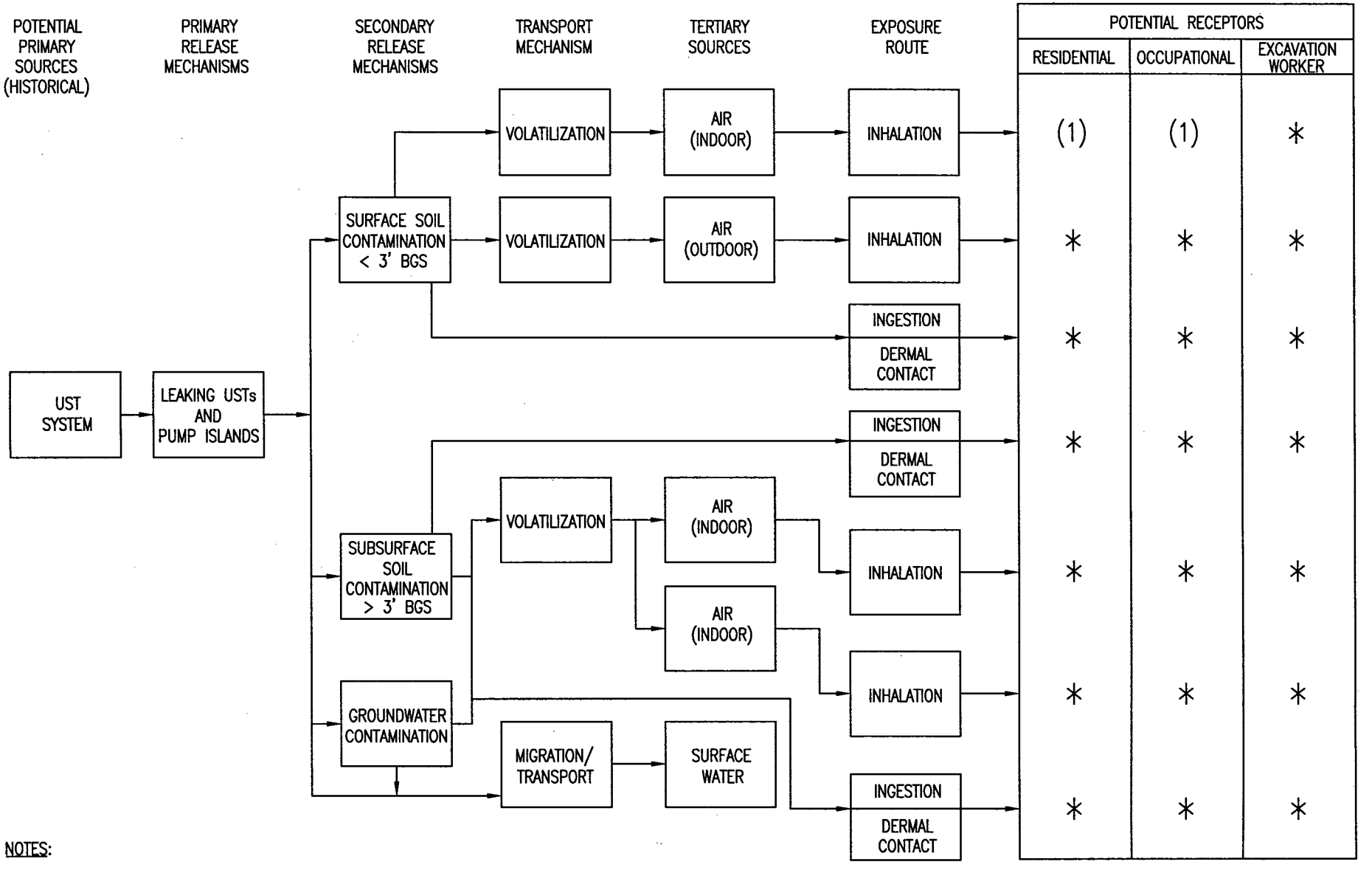
TV-SEA\PROJECT # 32-0029\0029 F2 ZONING.DWG

TERRA VAC

ROSE'S PARKING LOT
PORTLAND, OREGON

LAND USE AND ZONING MAP

DESIGNED BY:	CHECKED BY:	PROJECT #:	FIGURE #:
P. BIANCO	P. CATTERALL	32-0029	2
DRAWN BY:	PROJECT MANAGER:	DATE:	SCALE:
	P. BIANCO	12-18-00	N.T.S.



NOTES:

* EXPOSURE IS INCOMPLETE (NO RECEPTOR)

(1) EXPOSURE IS INCOMPLETE (SEE SECTION: MEDIA SOURCES–SOIL)

TERRA VAC

ROSE'S PARKING LOT
PORTLAND, OREGON

SITE CONCEPTUAL MODEL

DESIGNED BY:	CHECKED BY:	PROJECT #	FIGURE #
P. BIANCO	P. CATTERALL	32–0029	3
DRAWN BY:	PROJECT MANAGER:	DATE:	SCALE:
P. BIANCO	P. BIANCO	12–19–00	N.T.S.

TV-SEA\PROJECT # 32-0029\0029 CSM F3.DWG

TABLES

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TABLE 1
Appendix A: Table of Risk-Based Concentrations (RBCs)

(See Notes on Page A-4.)

Contaminated Medium →		SOIL mg/kg (ppm)						SOIL mg/kg (ppm)				SOIL mg/kg (ppm)			
Exposure Pathway →		Surface Soil Ingestion, Dermal Contact, and Inhalation RBC_{ss}						Volatilization to Outdoor Air RBC_{so}				Vapor Intrusion into Buildings RBC_{si}			
Receptor Scenario →		Residential		Occupational		Excavation Worker		Residential		Occupational		Residential		Occupational	
Contaminant of Concern	Note		Note		Note		Note		Note		Note		Note		Note
Benzene	c, v	8.2		29		1100	>Csat	11		21		0.091		0.5	
Toluene	nc, v	1700	>Csat	31000	>Csat	40000	>Csat	540	=Csat	540	=Csat	190		540	=Csat
Ethylbenzene	nc, v	2000	>Csat	47000	>Csat	85000	>Csat	330	=Csat	330	=Csat	330	=Csat	330	=Csat
Xylenes	nc, v	4100	>Csat	63000	>Csat	72000	>Csat	360	=Csat	360	=Csat	360	=Csat	360	=Csat
Acenaphthene	nc, v	800	>Csat	25000	>Csat	110000	>Csat	100	=Csat	100	=Csat	100	=Csat	100	=Csat
Anthracene	nc, v	4400	>Csat	180000	>Csat	750000	>Csat	6.4	=Csat	6.4	=Csat	6.4	=Csat	6.4	=Csat
Benz[a]anthracene	c, nv	0.21		2.7		270	>Csat	19	=Csat	19	=Csat	19	=Csat	19	=Csat
Benzo[b]fluoranthene	c, nv	0.21		2.7		270	>Csat	9.2	=Csat	9.2	=Csat	9.2	=Csat	9.2	=Csat
Benzo[k]fluoranthene	c, nv	2.1		27	>Csat	2700	>Csat	4.9	=Csat	4.9	=Csat	4.9	=Csat	4.9	=Csat
Benzo[a]pyrene	c, nv	0.021		0.27		27	>Csat	8.3	=Csat	8.3	=Csat	8.3	=Csat	8.3	=Csat
Chrysene	c, nv	21	>Csat	270	>Csat	27000	>Csat	3.2	=Csat	3.2	=Csat	3.2	=Csat	3.2	=Csat
Dibenz[a,h]anthracene	c, nv	0.021		0.27		27	>Csat	4.7	=Csat	4.7	=Csat	4.7	=Csat	4.7	=Csat
Fluoranthene	nc, nv	600	>Csat	29000	>Csat	110000	>Csat	110	=Csat	110	=Csat	110	=Csat	110	=Csat
Fluorene	nc, v	570	>Csat	23000	>Csat	94000	>Csat	140	=Csat	140	=Csat	140	=Csat	140	=Csat
Indeno[1,2,3-cd]pyrene	c, nv	0.21		2.7	>Csat	270	>Csat	0.38	=Csat	0.38	=Csat	0.38	=Csat	0.38	=Csat
Naphthalene	nc, v	24		270		1000	>Csat	230		310	=Csat	290		310	=Csat
Pyrene	nc, nv	450	>Csat	21000	>Csat	84000	>Csat	71	=Csat	71	=Csat	71	=Csat	71	=Csat
MTBE (methyl t-butyl ether)	nc, v	19000	>Csat	280000	>Csat	310000	>Csat	6600	=Csat	6600	=Csat	1600		6600	=Csat
EDB (1,2-dibromoethane)	c, v	0.0033		0.030		3.6		0.43		0.78		0.026		0.17	
EDC (1,2-dichloroethane)	c, v	2.2		9.0		330		3.6		6.6		0.039		0.26	
Lead	NA, nv	400	L	1000	L	1000	L		NA		NA		NA		NA
iso-Propylbenzene	nc, v	140		2900	>Csat	4300	>Csat	330	=Csat	330	=Csat	140		330	=Csat
n-Propylbenzene	nc, v	140		2900	>Csat	4300	>Csat	200	=Csat	200	=Csat	180		200	=Csat
1,2,4-Trimethylbenzene	nc, v	47	>Csat	720	>Csat	960	>Csat	4.8	=Csat	4.8	=Csat	4.8	=Csat	4.8	=Csat
1,3,5-Trimethylbenzene	nc, v	47		720	>Csat	810	>Csat	210	=Csat	210	=Csat	15		65	

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TABLE 1

Appendix A: Table of RBCs (continued)

Contaminated Medium →		SOIL mg/kg (ppm)				GROUNDWATER µg/L (ppb)				GROUNDWATER µg/L (ppb)			
Exposure Pathway →		Leaching to Groundwater RBC_{sw}				Groundwater Ingestion RBC_{dw}				Volatilization to Outdoor Air RBC_{wo}			
Receptor Scenario →		Residential		Occupational		Residential		Occupational		Residential		Occupational	
Contaminant of Concern	Note		Note		Note		Note		Note		Note		Note
Benzene	c, v	0.044		0.10		1.8		4.3		2600		5800	
Toluene	nc, v	390		540	=Csat	6300		8900		530000	=S	530000	=S
Ethylbenzene	nc, v	330	=Csat	330	=Csat	3200		4400		170000	=S	170000	=S
Xylenes	nc, v	360	=Csat	360	=Csat	63000		89000		180000	=S	180000	=S
Acenaphthene	nc, v	100	=Csat	100	=Csat	1900		2700		4200	=S	4200	=S
Anthracene	nc, v	6.4	=Csat	6.4	=Csat	9500	>S	13000	>S	43	=S	43	=S
Benz[a]anthracene	c, nv	8.6		19	=Csat	0.072		0.17		9.4	=S	9.4	=S
Benzo[b]fluoranthene	c, nv	9.2	=Csat	9.2	=Csat	0.072		0.17		1.5	=S	1.5	=S
Benzo[k]fluoranthene	c, nv	4.9	=Csat	4.9	=Csat	0.72		1.7	>S	0.80	=S	0.80	=S
Benzo[a]pyrene	c, nv	2.2		5.2		0.0072		0.017		1.6	=S	1.6	=S
Chrysene	c, nv	3.2	=Csat	3.2	=Csat	7.2	>S	17	>S	1.6	=S	1.6	=S
Dibenz[a,h]anthracene	c, nv	4.7	=Csat	4.7	=Csat	0.0072		0.017		0.25	=S	0.25	=S
Fluoranthene	nc, nv	110	=Csat	110	=Csat	1300	>S	1800	>S	210	=S	210	=S
Fluorene	nc, v	140	=Csat	140	=Csat	1300		1800		2000	=S	2000	=S
Indeno[1,2,3-cd]pyrene	c, nv	0.38	=Csat	0.38	=Csat	0.072	>S	0.17	>S	0.022	=S	0.022	=S
Naphthalene	nc, v	310	=Csat	310	=Csat	630		890		31000	=S	31000	=S
Pyrene	nc, nv	71	=Csat	71	=Csat	950	>S	1300	>S	140	=S	140	=S
MTBE (methyl t-butyl ether)	nc, v	0.16		0.16		20	M	20	M	51000000	=S	51000000	=S
EDB (1,2-dibromoethane)	c, v	0.0000079		0.000019		0.00062		0.0015		520		1100	
EDC (1,2-dichloroethane)	c, v	0.0057		0.013		0.58		1.4		1900		4200	
Lead	NA, nv	0.40	L	1.5	L	4.0	L	15	L		NA		NA
Iso-Propylbenzene	nc, v	210		300		320		440		30000	=S	30000	=S
n-Propylbenzene	nc, v	200	=Csat	200	=Csat	320		440		14000	=S	14000	=S
1,2,4-Trimethylbenzene	nc, v	4.8	=Csat	4.8	=Csat	1600	>S	2200	>S	260	=S	260	=S
1,3,5-Trimethylbenzene	nc, v	210	=Csat	210	=Csat	1600		2200		50000	=S	50000	=S

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TABLE 1
Appendix A: Table of RBCs (continued)

Contaminated Medium →		GROUNDWATER µg/L (ppb)				GROUNDWATER µg/L (ppb)				GROUNDWATER µg/L (ppb)		AIR (see notes) µg/m³			
Exposure Pathway →		Vapor Intrusion into Buildings RBC_{wi}				Ingestion & Inhalation from Tapwater RBC_{tw}				GW in Excavation RBC_{we}		Inhalation RBC_{air}			
Receptor Scenario →		Residential		Occupational		Residential		Occupational		Excavation Worker		Residential		Occupational	
Contaminant of Concern	Note		Note		Note		Note		Note		Note		Note		Note
Benzene	c, v	180		1200		0.44		1.0		820		0.30		0.65	
Toluene	nc, v	210000		530000	=S	740		1000		30000		420		580	
Ethylbenzene	nc, v	170000	=S	170000	=S	1300		1800		45000		1000		1500	
Xylenes	nc, v	180000	=S	180000	=S	1400		2000		55000		730		1000	
Acenaphthene	nc, v	4200	=S	4200	=S	440		620		4200	=S	290		400	
Anthracene	nc, v	43	=S	43	=S	43	=S	43	=S	43	=S	1400	Pv	2000	Pv
Benz[a]anthracene	c, nv	9.4	=S	9.4	=S		NA		NA	4.1		0.028		0.061	
Benzo[b]fluoranthene	c, nv	1.5	=S	1.5	=S		NA		NA	1.5	=S	0.028		0.061	
Benzo[k]fluoranthene	c, nv	0.80	=S	0.80	=S		NA		NA	0.80	=S	0.28	Pv	0.61	Pv
Benzo[a]pyrene	c, nv	1.6	=S	1.6	=S		NA		NA	0.24		0.0028		0.0061	
Chrysene	c, nv	1.6	=S	1.6	=S		NA		NA	1.6	=S	2.8		6.1	
Dibenz[a,h]anthracene	c, nv	0.25	=S	0.25	=S		NA		NA	0.088		0.0028	Pv	0.0061	Pv
Fluoranthene	nc, nv	210	=S	210	=S		NA		NA	210	=S	190	Pv	270	Pv
Fluorene	nc, v	2000	=S	2000	=S	290		410		2000	=S	190		270	
Indeno[1,2,3-cd]pyrene	c, nv	0.022	=S	0.022	=S		NA		NA	0.022	=S	0.028	Pv	0.061	Pv
Naphthalene	nc, v	29000		31000	=S	6.2		8.7		240		3.1		4.4	
Pyrene	nc, nv	140	=S	140	=S		NA		NA	140	=S	140	Pv	200	Pv
MTBE (methyl t-butyl ether)	nc, v	13000000		51000000	=S	20		20		240000		3100		4400	
EDB (1,2-dibromoethane)	c, v	130		830		0.00060		0.0014		8.6		0.011		0.024	
EDC (1,2-dichloroethane)	c, v	250		1700		0.14		0.32		280		0.094		0.21	
Lead	NA, nv		NA		NA		NA		NA		NA		NA		NA
iso-Propylbenzene	nc, v	15000		30000	=S	74		100		1800		48		67	
n-Propylbenzene	nc, v	14000	=S	14000	=S	74		100		1600		48		67	
1,2,4-Trimethylbenzene	nc, v	260	=S	260	=S	16		23		260	=S	8.2		11	
1,3,5-Trimethylbenzene	nc, v	4200		18000		16		23		630		8.2		11	

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TABLE 1

Notes and References for Table of RBCs:

The numbers in this table will be updated as new information becomes available. The current version of this guidance document can be found on the Department's UST program web site at **http://www.deq.state.or.us/wmc/tank/ust-lust.htm**

Although RBC values for air are included in this table, the Department does not routinely require that air (indoor or outdoor) be tested at UST cleanup sites due to the great temporal and spatial variability in air concentrations which makes it difficult to collect representative samples. However, in cases where soil gas or air samples are collected because of vapor problems, or to better assess site-specific risk from breathing airborne volatiles, the RBCs for air should be used as the acceptable air concentrations.

The symbols in the "Note" columns have the following meanings:

c	This chemical is a known or suspected carcinogen. The RBCs in this row were calculated using equations for carcinogens described in Appendix B.
>C_{sat}	This soil RBC exceeds the limit of three-phase equilibrium partitioning. Refer to Appendix D for the corresponding value of C_{sat}. Soil concentrations in excess of C_{sat} indicate that free product might be present. See Section B.2.2.3 for additional information.
=C_{sat}	This number is NOT a risk-based concentration. It can be assumed that this constituent can not create an unacceptable risk by this pathway. However, concentrations in excess of this value indicate that free product may be present. See Section B.2.2.3 for additional information.
L	The values for lead reported in this table are not derived from the equations developed in Appendix B. See Section B.3.4.1 for the source of the lead numbers and information on applying them.
M	Because there is no published oral reference dose (RfDo) for MTBE, the following modifications have been made: (1) The RBC_{ss} and RBC_{we} values for MTBE are based solely on inhalation. (2) An interim standard for groundwater ingestion (RBC_{dw}) has been set at 20 µg/L (ppb) based on EPA guidance (EPA, 1997d). (3) An interim leaching-to-groundwater concentration (RBC_{sw}) has been calculated on the basis of the interim groundwater ingestion value. See Section B.3.4.2 for more information about MTBE.
NA	This pathway is not applicable to the chemical of interest.
nc	This chemical is a noncarcinogen. The RBCs in this row were calculated using equations for noncarcinogens described in Appendix B.
nv	This chemical is classified as "nonvolatile" for purposes of the exposure calculations in this document.
P_v	The air concentration reported for the RBC exceeds the vapor pressure of the pure chemical. It can be assumed that this constituent can not create an unacceptable risk by this pathway. See Section B.2.2.3 for additional information.
>S	This groundwater RBC exceeds the solubility limit. Refer to Appendix D for the corresponding value of S. Groundwater concentrations in excess of S indicate that free product may be present. See Section B.2.2.3 for additional information.
=S	This number is NOT a risk-based concentration. It can be assumed that this constituent can not create an unacceptable risk by this pathway. However, concentrations in excess of this value indicate that free product might be present. See Section B.2.2.3 for additional information.
v	This chemical is classified as "volatile" for purposes of the exposure calculations in this document.

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APPENDIX A

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Photographs 1 and 2: Present Site Use Taken 12/05/00

Looking southwest across the site. NW Flanders in foreground. Shows elevation change on north side of site.

Looking east-southeast across the site. NW 23rd Avenue is in the foreground.

APPENDIX B

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Table 1

1/2-Mile Radius Well Search Summary Table

sorted by ID

ID	Q	QQ	Location	Well Type	Company Name	First Water (ft bgs)	Completion Depth	Tax Lot	Date Completed	Screened or Sealed Interval(s) (ft bgs)
382	SE	NW	2110 NW LOVEJOY	MW		7	20	—	8/12/91	—
383	SE	NW	2110 NW LOVEJOY	MW		7	20	—	8/12/91	—
384	SE	NW	2110 NW LOVEJOY	MW		7	20	—	8/12/91	—
615	SE	SW	950 SW 21ST AVE	MW	HARCH INVESTMENT CORP.	35	58	190	1/24/92	—
616	SE	SW	950 SW 21ST AVE	MW	HARCH INVESTMENT CORP.	30	43	190	1/22/92	—
1032	NW	SW	2305 W BURNSHID	Ind		30	281		5/31/51	cased to 136
1033	NW	SW		Ind	NORTHWEST BREWING CO.	—	—	—	—	unknown, see well log remarks
1034	NE	SW	2011 W BURNSIDE	?	FRED MEYER	> 100	195	—	12/31/39	cased to unknown depth
1036		SW	1015 NW 22ND	Ir	GOOD SAMARITAN HOSPITAL	static: 97	400	—	1/17/58	cased to 169
1038	SW	SE	2000 SW MORRISON	Ind	US NATIONAL BANK; STADIUM BRANCH	static: 100	563	—	7/31/46	cased to 428
1044	—	—	—	?	ICE COLISEUM	—	—	—	—	—
3260	SW	NE	930 NW 18TH	MW	UNOCAL CORP.	50	55	—	10/29/92	—
3301	NW	NE	1715 SW SALMON ST	MW	HARVESTER CO.	30	88	45	12/9/92	—
3303	NW	NE	1715 SW SALMON ST	MW	HARVESTER CO.	30	40	—	12/14/92	—
3304	NW	NE	1715 SW SALMON	MW	HARVESTER CO.	0	0	45	—	—
3758	—	—	1715 SW SALMON	MW	TRI-MET	40	45	45	10/15/93	—
3759	—	—	1715 SW SALMON	MW	TRI-MET	31	50	45	10/14/93	—
3760	—	—	1715 SW SALMON	MW	TRI-MET	31	50	45	10/12/93	—
3761	SE	SE	1715 SW SALMON	MW	TRI-MET	31	50	45	10/12/93	—
3762	SE	SE	1715 SW SALMON	MW	TRI-MET	31	50	45	10/8/93	—
3763	SE	SE	1715 SW SALMON	MW	TRI-MET	35	45	45	10/8/93	—
3764	SE	SE	1715 SW SALMON	MW	TRI-MET	35	45	45	10/7/93	—
3765	SE	SE	1715 SW SALMON	MW	TRI-MET	35	50	45	10/6/93	—
3766	SE	SE	1715 SW SALMON ST	MW	TRI-MET	35	50	45	10/6/93	—
3767	SE	SE	1715 SW SALMON ST	MW	TRI-MET	35	45	45	10/5/93	—
3768	—	—	1715 SW SALMON	MW	TRI-MET	—	43	45	10/14/93	—
3946	SW	SE	1715 SW SALMON	MW	TRI MET	40	49	45	11/29/93	—

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Table 1

1/2-Mile Radius Well Search Summary Table

sorted by ID

ID	Q	QQ	Location	Well Type	Company Name	First Water (ft bgs)	Completion Depth	Tax Lot	Date Completed	Screened or Sealed Interval(s) (ft bgs)
3979	SW	SW	2360 SW BURNSIDE	MW	RREEF PROPERTIES	15	20	1	1/6/94	—
3980	SW	SW	2360 SW BURNSIDE	MW	RREEF PROPERTIES	15	20	1	1/6/94	—
3981	SW	SW	2360 SW BURNSIDE	MW	RREEF PROPERTIES	15	20	1	1/6/94	—
3982	SW	SW	2360 SW BURNSIDE	MW	RREEF PROPERTIES	17	23	1	1/6/94	—
4025	SE	SW	1849 SW SALMON ST	MW	MULTNOMAH ATHLETIC CLUB	10	0	46	1/25/94	—
4026	SE	SW	1849 SW SALMON ST	MW	MULTNOMAH ATHLETIC CLUB	17	0	46	1/26/94	—
4027	SE	SW	1849 SW SALMON ST	MW	MULTNOMAH ATHLETIC CLUB	16	0	46	1/25/94	—
4028	SE	SW	1849 SW SALMON ST	MW	MULTNOMAH ATHLETIC CLUB	24	0	46	1/26/94	—
4030	SW	SW	2360 SW BURNSIDE	MW	PREEF PROPERTIES	20	23	—	2/3/94	—
4100	NW	SW	330 NW 23RD AVE	MW	—		34	—	3/23/94	—
4101	NW	SW	330 NW 23RD AVE	MW	—		34	—	3/23/94	—
4102	NW	SW	330 NW 23RD AVE	MW	—		39	—	3/23/94	—
4116	SW	SE	1715 SW SALMON	MW	TRI MET	0	0	—	3/23/94	—
4117	SW	SE	1715 SW SALMON	MW	TRI MET	0	0	—	3/23/94	—
4118	SW	SE	1715 SW SALMON	MW	TRI MET	0	0	—	3/23/94	—
4119	SW	SE	1715 SW SALMON	MW	TRI MET	0	0	—	3/24/94	—
4120	SW	SE	1715 SW SALMON	MW	TRI MET	0	0	—	3/23/94	—
4121	SW	SE	1715 SW SALMON	MW	TRI MET	0	0	—	3/24/94	—
4122	SW	SE	1715 SW SALMON	MW	TRI MET	0	0	—	3/24/94	—
4123	SW	SE	1715 SW SALMON	MW	TRI MET	30	50	—	4/8/94	—
4124	SW	SE	1715 SW SALMON	MW	TRI MET	26	45	—	4/7/94	—
4125	SW	SE	1715 SW SALMON	MW	TRI MET	30	40	—	4/7/94	—
4126	SW	SE	1715 SW SALMON	MW	TRI MET	30	40	—	4/7/94	—
4127	SW	SE	1715 SW SALMON	MW	TRI MET	30	45	—	4/6/94	—
4128	SW	SE	1715 SW SALMON	MW	TRI MET	30	40	—	4/6/94	—
4129	SW	SW	1715 SW SALMON	MW	TRI MET	28	45	—	4/4/94	—

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Table 1

1/2-Mile Radius Well Search Summary Table

sorted by ID

ID	Q	QQ	Location	Well Type	Company Name	First Water (ft bgs)	Completion Depth	Tax Lot	Date Completed	Screened or Sealed Interval(s) (ft bgs)
4130	SW	SE	1715 SW SALMON	MW	TRI MET	31	45	—	4/5/94	—
4131	SW	SE	1715 SW SALMON	MW	TRI MET	33	45	—	4/4/94	—
4132	SW	SE	1715 SW SALMON	MW	TRI MET	28	44	—	4/1/94	—
4133	SW	SE	1715 SW SALMON	MW	TRI MET	28	45	—	4/1/94	—
4134	SW	SE	1715 SW SALMON	MW	TRI MET	31	50	—	3/31/94	—
4135	SW	SE	1715 SW SALMON	MW	TRI MET	31	40	—	3/31/94	—
4136	SW	SE	1715 SW SALMON	MW	TRI MET	28	38	—	3/31/94	—
4137	SW	SE	1715 SW SALMON	MW	TRI MET	30	50	—	3/31/94	—
4138	SW	SE	1715 SW SALMON	MW	TRI MET	29	38	—	3/30/94	—
4139	SW	SE	1715 SW SALMON	MW	TRI MET	30	45	—	3/30/94	—
4140	SW	SE	1715 SW SALMON	MW	TRI MET	25	45	—	3/30/94	—
4141	SW	SE	1715 SW SALMON	MW	TRI MET	20	41	—	3/30/94	—
4142	SW	SE	1715 SW SALMON	MW	TRI MET	20	40	—	3/29/94	—
4143	SW	SE	1715 SW SALMON	MW	TRI MET	20	45	—	3/29/94	—
4144	SW	SE	1715 SW SALMON	MW	TRI MET	30	45	—	3/29/94	—
4145	SW	SE	1715 SW SALMON	MW	TRI MET	30	45	—	3/28/94	—
4146	SW	SE	1715 SW SALMON	MW	TRI MET	26	45	—	3/28/94	—
4147	SW	SE	1715 SW SALMON	MW	TRI MET	31	41	—	3/25/94	—
4148	SW	SE	1715 SW SALMON	MW	TRI MET	30	40	—	3/25/94	—
4149	SW	SE	1715 SW SALMON	MW	TRI MET	35	45	—	3/25/94	—
4150	SW	SE	1715 SW SALMON	MW	TRI MET	30	40	—	3/25/94	—
4151	SW	SE	1715 SW SALMON	MW	TRI MET	31	41	—	3/24/94	—
4152	SW	SE	1715 SW SALMON	MW	TRI MET	20	35	—	3/29/94	—
4400	NW	SW	330 NW 23RD AVE	M		27	40	—	9/28/94	—
50383	SW	NE	1812 NW KEARNEY ST	G	SHEFF ENTERPRISES, LTD.	—	16	—	1/22/96	—
50385	SW	NE	1816 NW KEARNEY ST	G	SHEFF ENTERPRISES, LTD	—	20	—	1/22/96	—
50386	SW	NE	1816 NW KEARNEY ST	G	SHEFF ENTERPRISES, LTD	—		—	1/22/96	—
50387	SW	NE	1812 KEARNEY ST NW	G	SHEFF ENT. LTD.	—	16	—	1/22/96	—
50388	SW	NE	1812 KEARNEY ST NW	G	SHEFF ENT. LTD	—	16	—	1/22/96	—
50724	SW	SE	1715 SW SALMON	MW	TRI-MET	—	52	45	12/19/95	—

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Table 1

1/2-Mile Radius Well Search Summary Table

sorted by ID

ID	Q	QQ	Location	Well Type	Company Name	First Water (ft bgs)	Completion Depth	Tax Lot	Date Completed	Screened or Sealed Interval(s) (ft bgs)
50873	NW	NW	1015 NW 22ND	G	LEGACY GOOD SAMARITAN HOSPITAL	—	30	—	3/21/96	—
50874	NW	NW	1015 NW 22ND	G	LEGACY GOOD SAMARITAN HOSPITAL	—	30	—	3/21/96	—
50890	SE	SW	124 NW 20TH AVE	G	VOGLE & GATES (C/O)	—	—	1920	10/26/95	—
50894	SE	SW	124 NW 20TH AVE	G	VOGLE & GATES (C/O)	—	—	1920	10/26/95	—
50895	SE	SW	124 NW 20TH AVE	G	VOGLE AND GATES (C/O)	—	—	1920	10/26/95	—
52652	SW	SE	1710 SW MORRISON	G	TRI-MET	—	—	2800	11/1/96	—
52653	SW	SE	1710 SW MORRISON	G	TRI-MET	—	—	2800	10/31/96	—
52654	SW	SE	1710 SW MORRISON	G	TRI-MET	—	—	2800	10/31/96	—
52967	NW	SW	330 NW 23RD AVE	MW	—	15	37	600	1/24/97	—
52968	NW	SW	330 NW 23RD AVE	MW	—	18	37	600	1/24/97	—
52969	NW	SW	330 NW 23RD AVE	MW	—	15	37	600	1/23/97	—
52970	NW	SW	330 NW 23RD AVE	MW	—	15	37	600	1/23/97	—
52971	NW	SW	330 NW 23RD AVE	MW	—	15	38	600	1/23/97	—
52972	NW	SW	330 NW 23RD AVE	MW	—	—	0	600	1/25/97	—
52973	NW	SW	330 NW 23RD AVE	MW	—	15	0	600	1/24/97	—
52974	NW	SW	330 NW 23RD AVE	MW	—	15	0	600	1/23/97	—
52977	NW	SW	330 NW 23RD AVE	MW	—	15	0	600	1/23/97	—
52980	NW	SW	330 NW 23RD AVE	MW	—	15	37	600	1/25/97	—
52983	NW	SW	330 NW 23RD AVE	MW	—	15	37	600	1/24/97	—
52987	NW	SW	330 NW 23RD AVE	MW	—	15	37	600	1/24/97	—
53479	NW	NW	2110 NW LOVEJOY ST	G	—	—	26	—	4/11/97	—
53481	NW	NW	2110 NW LOVEJOY ST	G	—	—	20	—	4/11/97	—
53482	NW	NW	2110 NW LOVEJOY STREET	G	—	—	20	—	4/11/97	—
53483	NW	NW	2110 NW LOVEJOY ST	G	—	—	20	—	4/11/97	—
53708	SW	SE	1715 SW SALMON ST	MW	TRI MET	—	43	—	5/13/97	—
53709	SW	SE	1715 SW SALMON ST	MW	TRI MET	—	43	—	5/13/97	—
53710	SW	SE	1715 SW SALMON ST	MW	TRI MET	—	43	—	5/13/97	—
53712	SW	SE	1715 SW SALMON ST	MW	TRI MET	—	43	—	5/13/97	—

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Table 1

1/2-Mile Radius Well Search Summary Table

sorted by ID

ID	Q	QQ	Location	Well Type	Company Name	First Water (ft bgs)	Completion Depth	Tax Lot	Date Completed	Screened or Sealed Interval(s) (ft bgs)
53713	SW	SE	1715 SW SALMON ST	MW	TRI MET	—	43	—	5/13/97	—
53714	SW	SE	1715 SW SALMON ST	MW	TRI MET	—	43	—	5/13/97	—
53715	SW	SE	1715 SW SALMON ST	MW	TRI MET	—	43	—	5/13/97	—
53716	SW	SE	1715 SW SALMON ST	MW	TRI MET	—	43	—	5/13/97	—
53717	SW	SE	1715 SW SALMON ST	MW	TRI MET	—	43	—	5/13/97	—
53718	SW	SE	1715 SW SALMON ST	MW	TRI MET	—	43	—	5/13/97	—
53719	SW	SE	1715 SW SALMON ST	MW	TRI MET	—	43	—	5/13/97	—
53720	SW	SE	1715 SW SALMON ST	MW	TRI MET	—	43	—	5/13/97	—
54038	NW	SE	2110 NW LOVEJOY STREET	MW		—	20	300	7/17/97	—
54053	NW	NW	2311 NW NORTHRUP ST	G	NORTHRUP HOUSE; SWEATTE, MR CLIFFORD C	—	0	—	8/9/97	—
54054	NW	NW	2311 NW NORTHRUP ST	G	NORTHRUP HOUSE; SWEATTE, MR CLIFFORD C	—	0	—	8/9/97	—
54055	NW	NW	2311 NW NORTHRUP ST	G	NORTHRUP HOUSE; SWEATTE, MR CLIFFORD C	—	0	—	8/9/97	—
54056	NW	NW	2311 NW NORTHRUP ST	G	NORTHRUP HOUSE; SWEATTE, MR CLIFFORD C	—	0	—	8/9/97	—
55140	SE	SW	1715 SW SALMON ST	G	TRI MET	—	28	—	1/28/98	—
55141	SE	SW	1715 SW SALMON ST	G	TRI MET	—	28	—	1/28/98	—
55142	SE	SW	1715 SW SALMON ST	G	TRI MET	—	28	—	1/28/98	—
55143	SE	SW	1715 SW SALMON ST	G	TRI MET	—	28	—	1/28/98	—
55365	NW	NW	1311 NW 23RD AVE	G	HMP INC.	—	0	—	4/2/98	—
55366	NW	NW	1311 NW 23RD AVE	G	HMP INC.	—	0	—	4/2/98	—
55368	NW	NW	1311 NW 23RD AVE	G	HMP INC.	—	0	—	4/3/98	—
56430	SE	NW	2110 NW LOVEJOY ST	MW	—	—	20	302	9/3/98	—
56872	SE	NW	2110 NW LOVEJOY STREET	G	—	—	24	302	10/20/98	—
59300	SE	SW	1844 SW MORRISON	G	CITY OF PORTLAND	—	0	800	10/18/99	—
59301	SE	SW	1844 SW MORRISON	G	CITY OF PORTLAND	—	0	800	10/18/99	—
59302	SE	SW	1844 SW MORRISON	G	CITY OF PORTLAND	—	0	800	10/18/99	—
59303	SE	SW	1844 SW MORRISON	G	CITY OF PORTLAND	—	0	800	10/18/99	—

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Table 1

1/2-Mile Radius Well Search Summary Table

sorted by ID

ID	Q	QQ	Location	Well Type	Company Name	First Water (ft bgs)	Completion Depth	Tax Lot	Date Completed	Screened or Sealed Interval(s) (ft bgs)
59304	SE	SW	1844 SW MORRISON	G	CITY OF PORTLAND	—	0	800	10/18/99	—
59305	SE	SW	1844 SW MORRISON	G	CITY OF PORTLAND	—	0	800	10/18/99	—
59306	SE	SW	1844 SW MORRISON	G	CITY OF PORTLAND	—	0	800	10/18/99	—
59307	SE	SW	1844 SW MORRISON	G	CITY OF PORTLAND	—	0	800	10/18/99	—
59308	SE	SW	1844 SW MORRISON	G	CITY OF PORTLAND	—	0	800	10/18/99	—
59373	SE	SW	1844 SW MORRISON	G	CITY OF PORTLAND	—	0	800	10/18/99	—
59517	SE	NW	NW WESTOVER AND JOHNSON	G	WESTOVER LAND CORPORATION	—	95	—	10/15/99	—
59518	SE	NW	SW CORNER OF WESTOVER & JOHNSON	G	WESTOVER LAND CORPORATION	—	55	—	10/15/99	—
60233	SE	NW	803 NW 21ST STREET	G	CABLE HUSTON BENEDICT	—	65	—	2/7/00	—
60234	SE	NW	803 NW 21ST STREET	G	CABLE, HUSTON, BENEDICT	—	40	—	2/7/00	—
60235	SE	NW	803 NW 21ST STREET	G	CABLE, HOUSTON, BENEDICT	—	20	—	2/7/00	—
60250	NW	SE	2010 NW KEARNEY ST	G	HOUSING AUTHORITY OF PORTLAND	—	24	3400	2/10/00	—
60251	NW	SE	2010 NW KEARNEY ST	G	HOUSING AUTHORITY OF PORTLAND	—	24	3400	2/10/00	—
60778	SW	NE	1930 NW IRVING	G	PENDERGAST AND ASSOCIATES	—	0	8800	4/27/00	—
60779	SW	NE	1930 NW IRVING	G	PENDERGAST AND ASSOCIATES	—	0	8800	4/27/00	—
60780	SW	NE	1930 NW IRVING	G	PENDERGAST AND ASSOCIATES	—	0	8800	4/27/00	—
60781	SW	NE	1930 NW IRVING	G	PENDERGAST AND ASSOCIATES	—	0	8800	4/27/00	—
61662	SW	NE	NW LOVEJOY ST	G	CITY OF PORTLAND	—	26	—	6/24/00	—
61665	SW	NE	NW LOVEJOY ST	G	CITY OF PORTLAND; DEPARTMENT OF TRANSPORTATION	—	26	—	6/24/00	—
61666	SW	NE	NW LOVEJOY ST	G	CITY OF PORTLAND	—	26	—	6/24/00	—

Table 1

1/2-Mile Radius Well Search Summary Table

sorted by ID

ID	Q	QQ	Location	Well Type	Company Name	First Water (ft bgs)	Completion Depth	Tax Lot	Date Completed	Screened or Sealed Interval(s) (ft bgs)
61667	SW	NE	NW LOVEJOY ST	G	CITY OF PORTLAND	—	26	—	6/24/00	—
61669	SW	NE	NW LOVEJOY ST	G	CITY OF PORTLAND	—	26	—	6/23/00	—
61671	SW	NE	NW LOVEJOY ST	G	CITY OF PORTLAND	—	16	—	6/23/00	—
61672	SW	NE	NW LOVEJOY ST	G	CITY OF PORTLAND	—	22	—	6/24/00	—
61673	SW	NE	NW LOVEJOY ST	G	CITY OF PORTLAND	—	16	—	6/23/00	—
61674	SW	NE	NW LOVEJOY ST	G	CITY OF PORTLAND	—	16	—	6/23/00	—
61680	SW	NE	NW LOVEJOY ST	G	CITY OF PORTLAND	—	15	—	6/23/00	—
61860	NW	SW	330 NW 23RD AVE	G	—	—	0	—	8/7/00	—
61861	NW	SW	330 NW 23RD AVE	G	—	—	0	—	8/7/00	—
61862	NW	SW	330 NW 23RD AVE	G	—	—	0	—	8/7/00	—
61863	NW	SW	330 NW 23RD AVE	G	—	—	0	—	8/7/00	—
61864	NW	SW	330 NW 23RD AVE	G	—	—	0	—	8/7/00	—
61865	NW	SW	330 NW 23RD AVE	G	—	—	0	—	8/7/00	—

NOTES:

All wells located in Multnomah County, Township 1 North, Range 1 East, Section 33, within 1/2 mile radius of the site.

Data from the Oregon Water Resource Department database.

Q = quarter.

QQ = quarter's quarter.

ft bgs = feet below ground surface.

— = not reported.

Well Types:

MW = monitoring well.

Ind = industrial well.

? = not clear from well log.

Ir = well used for irrigation.

G = geoprobe.

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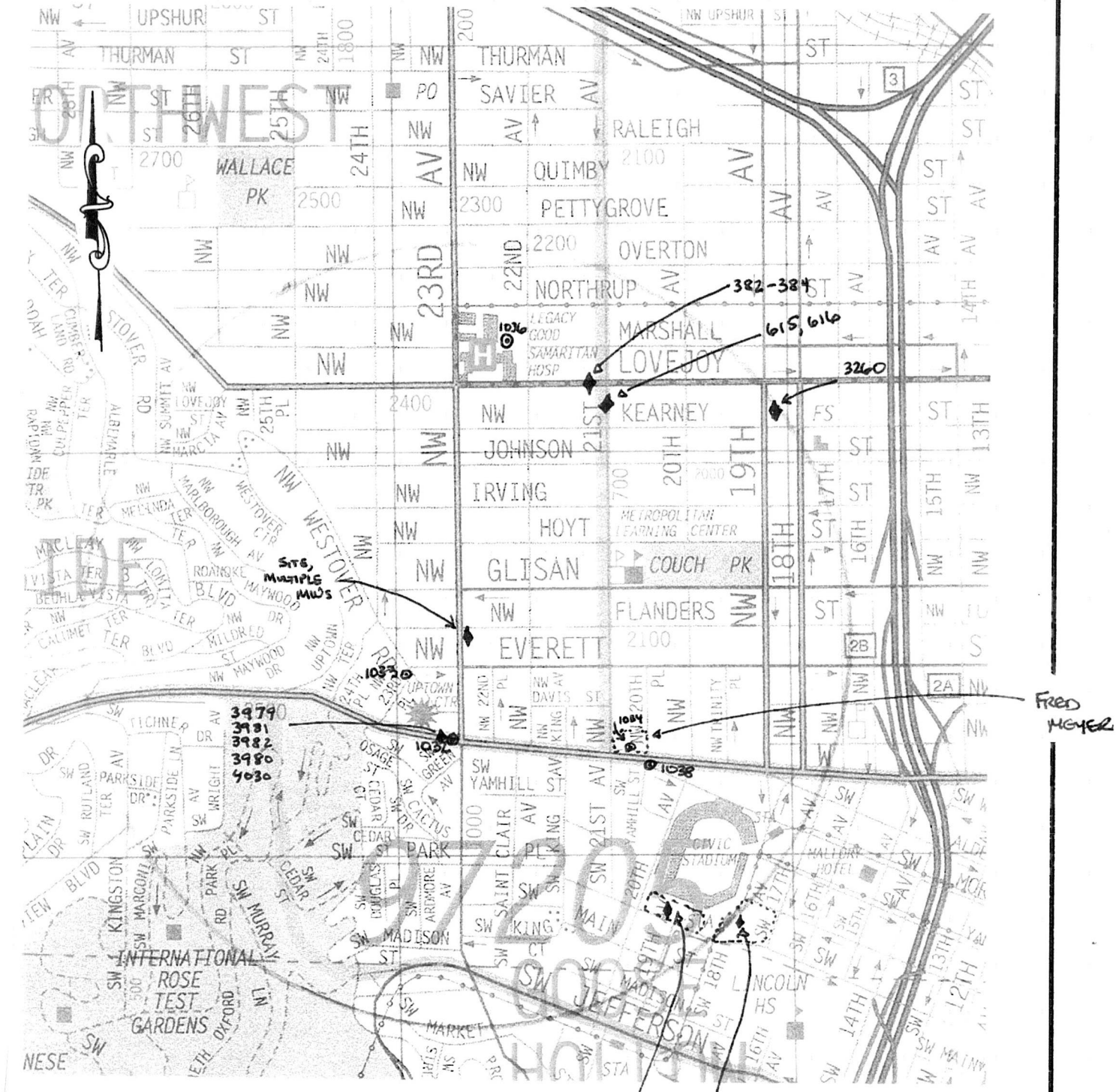


TERRA VAC	ROSE'S PARKING LOT PORTLAND, OREGON		
	WELL LOCATION MAP		
DESIGNED BY:	CHECKED BY: P. BIANCO	PROJECT # 32-0029	FIGURE #
DRAWN BY:	PROJECT MANAGER: P. BIANCO	DATE: 12-18-00	SCALE: N.T.S.

TV-SEA\PROJECT # 32-0029\WELL MAP.DWG

STATE ENGINEER
Salem, Oregon

MULT 1032

Well Record

STATE WELL NO. 1N/1-33M2
COUNTY Multnomah
APPLICATION NO. .....

OWNER: Henry Thiele

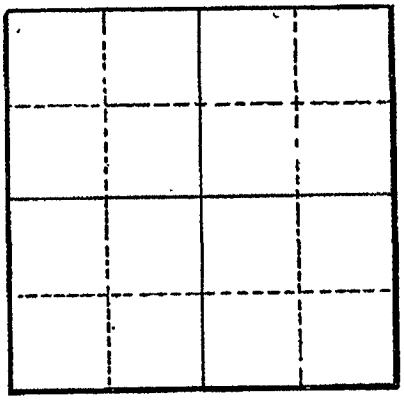
MAILING ADDRESS: 2305 W. Burnshid

CITY AND STATE: .....

LOCATION OF WELL: Owner's No. .....

.....¼ .....¼ Sec. ..... T. ..... N. S., R. ..... E. W., W.M.

Bearing and distance from section or subdivision corner .....



Section .....

Altitude at well .....

TYPE OF WELL: Drilled Date Constructed May '51

Depth drilled 281 Depth cased 136

CASING RECORD:

8 inch casing set to 136 feet

FINISH:

AQUIFERS:

Basalt from 125 to 281 feet

WATER LEVEL:

30 feet below land surface

PUMPING EQUIPMENT: Type ..... H.P. .....
Capacity ..... G.P.M.

WELL TESTS:
Drawdown 120 ft. after 1 hours pumping 75 G.P.M
Drawdown ..... ft. after ..... hours ..... G.P.M

USE OF WATER Industrial Temp. ..... °F. ....., 19.....
SOURCE OF INFORMATION Driller's log
DRILLER or DIGGER A. M. Jannsen
ADDITIONAL DATA:
Log x Water Level Measurements ..... Chemical Analysis ..... Aquifer Test .....

REMARKS:

Broken rock & clay	0	to 110'
Rock, lava	110	to 125'
Rock, brown & black	125	to 281'

STATE ENGINEER
Salem, Oregon

MULT 1083

Well Record

STATE WELL NO. 1N/1-33M1
COUNTY Multnomah
APPLICATION NO. .....

OWNER: Northwest Brewing Co.

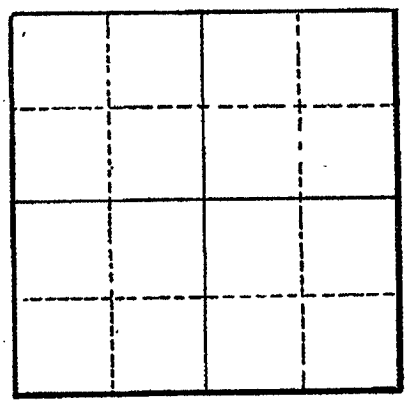
MAILING ADDRESS: .....

CITY AND STATE: .....

LOCATION OF WELL: Owner's No. .....

..... ¼ ..... ¼ Sec. ..... T. ..... N. S., R. ..... E. W., W.M.

Bearing and distance from section or subdivision corner 150' W. of Westover Road & 100' S. of Evertt St. N.W.



Section 33

Altitude at well .....

TYPE OF WELL: ..... Date Constructed .....

Depth drilled ..... Depth cased .....

CASING RECORD:

FINISH:

AQUIFERS:

WATER LEVEL:
76 feet above land surface (flowing well)

PUMPING EQUIPMENT: Type ..... H.P. .....
Capacity ..... G.P.M.

WELL TESTS:
Drawdown ..... ft. after ..... hours ..... G.P.M
Drawdown ..... ft. after ..... hours ..... G.P.M

USE OF WATER Industrial - Brewery Temp. ..... °F. ....., 19.....
SOURCE OF INFORMATION Geo. Otten Oregon State Hwy. Dept May 27, 1938 U.S.G.S.
DRILLER or DIGGER .....
ADDITIONAL DATA:
Log ..... Water Level Measurements ..... Chemical Analysis ..... Aquifer Test .....

REMARKS:
150 feet west of Westover Road & 100 feet South of Everett St. NW
June 28, 1938 plant long unused stripped of equipment No wells found in building may have been concealed by trash in building

STATE ENGINEER
Salem, Oregon

MULT 1034

Well Record

STATE WELL NO. 1N/1-33L1
COUNTY Multnomah
APPLICATION NO. .....

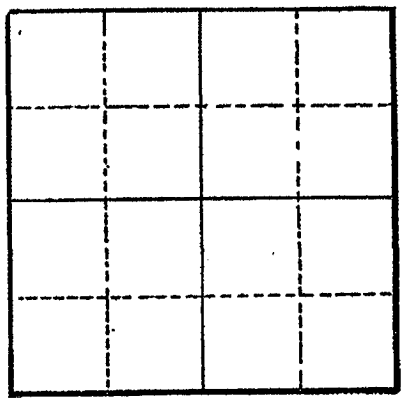
OWNER: Fred Meyer
MAILING ADDRESS: 2011 W. Burnside
CITY AND STATE: Portland, Oregon

LOCATION OF WELL: Owner's No. .....

NW ¼ SE ¼ Sec. 33 T. 1 N. S., R. 1 E. W., W.M.

Bearing and distance from section or subdivision corner .....

Altitude at well .....



TYPE OF WELL: Drilled Date Constructed 1939

Depth drilled 195 Depth cased .....

Section .....

CASING RECORD:

12 inch casing set

FINISH:

AQUIFERS:

WATER LEVEL:

PUMPING EQUIPMENT: Type Turbine Elect. H.P. .....
Capacity 200 G.P.M.

WELL TESTS:
Drawdown ..... ft. after ..... hours ..... G.P.M.
Drawdown ..... ft. after ..... hours ..... G.P.M.

USE OF WATER Air Conditioning Temp. 53 °F. ....., 19....
SOURCE OF INFORMATION Mr. Monahan Public Works Dept - U.S.G.S.
DRILLER or DIGGER R. J. Strasser
ADDITIONAL DATA:
Log ..... Water Level Measurements ..... Chemical Analysis ..... Aquifer Test .....

REMARKS:

ORIGINAL
File Original and Duplicate with the STATE ENGINEER, SALEM, OREGON

MULT 1036

RECEIVED
APR 21 1958
STATE ENGINEER
SALEM, OREGON

WATER WELL REPORT
STATE OF OREGON

State Well No. 1N/1-33 (2) C(2)

State Permit No. G 804

(1) OWNER:
Name Good Samaritan Hospital
Address 1015 N.W. 22nd
Portland 10, Oregon

(2) LOCATION OF WELL:
County Multnomah Owner's number, if any— #1

¼ ¼ Section T. R. W.M.

Bearing and distance from section or subdivision corner

Well located sixty feet north of the curb on N.W. Marshall Street one half way between 22nd and 23rd street. North side of Marshall st.

Elev 95 Fut

(3) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☒ Test Well ☐ Other ☐

(5) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED:
Threaded ☐ Welded ☒
10" Diam. from 0 ft. to 169 ft. Gage Std.
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(7) PERFORATIONS:
Perforated? ☐ Yes ☒ No
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(8) SCREENS:
Well screen installed ☐ Yes ☒ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Slot size Set from ft. to ft.

(9) CONSTRUCTION:
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.
Was a surface seal provided? ☐ Yes ☐ No To what depth? ft.
Material used in seal—
Did any strata contain unusable water? ☒ Yes ☐ No
Type of water? Yellow silt Depth of strata 146' to 156'
Method of sealing strata of Cementing casing into rock

(10) WATER LEVELS:
Static level 97 ft. below land surface Date 1/17/58
Artesian pressure lbs. per square inch Date

Log Accepted by:
Signed X Wood Samaritan Hosp (Owner) Date April 15, 1958
F.K. Teeple

(11) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☒ Yes ☐ No If yes, by whom? Pump, pipe and Power Co
Yield: 385 gal./min. with 209 ft. drawdown after 2 hrs.
" " " "
" " " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water 55 Was a chemical analysis made? ☐ Yes ☒ No

(12) WELL LOG:
Diameter of well 10 inches.
Depth drilled 400 ft. Depth of completed well 400 ft.

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Fill	0	6
Yellow silt and sand	6	70
Brown cemented gravel	70	88
Loose gravel (4 inch minus)	88	92
Grey cemented gravel	92	146
Yellow silt	146	156
Decomposed rock	156	213
Hard grey rock	213	244
Black rock Approx. 50 gpm	244	293
Hard grey basalt	293	351
Seamy grey rock	351	356
Black and grey honeycomb rock	356	362
Seamy black rock	362	400
Water between 351 and 400		

Work started November 1957 Completed January 1958

(13) PUMP:
Manufacturer's Name
Type: H.P.

Well Driller's Statement:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Steinman Bros.
(Person, firm, or corporation) (Type or print)
Address 15112 S.E. McLoughlin Milwaukie 22, Ore.
Driller's well number 49-57
[Signed] R.E. McConnell
(Well Driller)
License No. 1 Date February 12, 1958

(USE ADDITIONAL SHEETS IF NECESSARY)

OBSERVATION WELL

1038 MULT

File Original and First Copy with the STATE ENGINEER, SALEM, OREGON

Record from Well Registration No. GR-3607

WATER WELL REPORT
STATE OF OREGON

State Well No. 1N/1-33B(1)

State Permit No. Pg 1 of 5

(1) OWNER:
Name United States National Bank

Address Stadium Branch
2000 SW Morrison Portland, Oregon

(2) LOCATION OF WELL:
County Multnomah Owner's number, if any—

SE ¼ SW ¼ Section 33 T. 1 N R. 1 E W.M.

Bearing and distance from section or subdivision corner

Block 1, Russel Addition

Elevation 115

(3) TYPE OF WORK (check):
New Well ☐ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐

Irrigation ☐ Test Well ☐ Other ☐

(5) TYPE OF WELL:
Rotary ☐ Driven ☐

Cable ☐ Jetted ☐

Dug ☐ Bored ☐

(6) CASING INSTALLED:
Threaded ☐ Welded ☐

8 " Diam. from 0 ft. to 203 ft. Gage

6 " Diam. from 184 ft. to 428 ft. Gage

" Diam. from ft. to ft. Gage

(7) PERFORATIONS:
Perforated? ☐ Yes ☐ No

Type of perforator used

SIZE of perforations in. by in.

perforations from ft. to ft.

perforations from ft. to ft.

perforations from ft. to ft.

perforations from ft. to ft.

perforations from ft. to ft.

(8) SCREENS:
Well screen installed ☐ Yes ☐ No

Manufacturer's Name

Type Model No.

Slot size Set from ft. to ft.

Slot size Set from ft. to ft.

(9) CONSTRUCTION:
Was well gravel packed? ☐ Yes ☐ No Size of gravel:

Gravel placed from ft. to ft.

Was a surface seal provided? ☐ Yes ☐ No To what depth? ft.

Material used in seal—

Did any strata contain unusable water? ☐ Yes ☐ No

Type of water? Depth of strata

Method of sealing strata off

(10) WATER LEVELS:
Static level 100 ft. below land surface Date 1946

Artesian pressure lbs. per square inch Date

Log Accepted by:

[Signed] (Owner) Date , 19

(11) WELL TESTS:
Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☐ No If yes, by whom?

Yield: 65 gal./min. with 75 ft. drawdown after hrs.

" 100 " 140 " "

" " " "

Bailer test gal./min. with ft. drawdown after hrs.

Artesian flow g.p.m. Date

Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

(12) WELL LOG:
Diameter of well 8-6 inches.

Depth drilled 563 ft. Depth of completed well 563 ft.

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
sand	0	40
gravel, loose	40	116
gravel, cemented	116	128
sand and gravel	128	148
gravel, cemented	148	177
sand	177	181
gravel, cemented	181	228
lava rock	228	300
lime rock	300	317
rock, hard black	317	354
rock, broken some shale	354	390
lava rock, small amount of water	390	403
sand, black	403	425
conglomerate, rock and clay	425	455
basalt rock	455	480
lava rock	480	488
basalt rock	488	563

Work started May 1946 Completed July 1946

(13) PUMP:
Manufacturer's Name F. M. Pomona

Type: Turbine H.P. 15

Well Driller's Statement:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME (Person, firm, or corporation) (Type or print)

Address

Driller's well number

[Signed] (Well Driller)

License No. Date , 19

(USE ADDITIONAL SHEETS IF NECESSARY)

STATE ENGINEER
Salem, Oregon

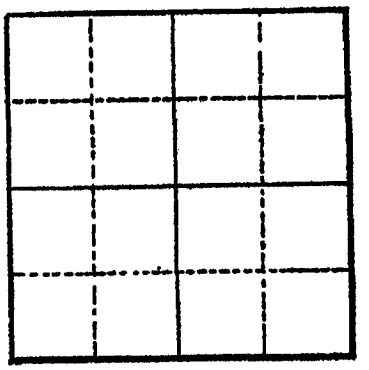
MULT 1038

Well Record

STATE WELL NO. 1N/1-33
COUNTY Multnomah
~~APPLICATION NO.~~ GR-3607

OWNER: Stadium Branch of U.S. National Bank of Portland
MAILING ADDRESS: 2000 S.W. Morrison
CITY AND STATE: Portland, Oregon B 3 of 5

LOCATION OF WELL: Owner's No. ____
Russell Addition
____¼ ____¼ Sec. 33 T. 1 ~~S.~~ N., R. 1 ~~W.~~ E., W.M.
Bearing and distance from section or subdivision corner 45' S. & 5' W from NE Cor. of Block 1, Lot 8



Section ____

Altitude at well ____

TYPE OF WELL: drilled Date Constructed 1946
Depth drilled 563' Depth cased 428'

CASING RECORD:

8" and 6"

FINISH:

AQUIFERS:

sand, gravel, rock, shale, clay, basalt rock

WATER LEVEL:

100'

PUMPING EQUIPMENT: Type Fairbanks Morse H.P. 15
Capacity 100 G.P.M.

WELL TESTS:
Drawdown 240 ft. after ____ hours pumping 100 G.P.M.
Drawdown 175 ft. after ____ hours pumping 65 G.P.M.

USE OF WATER air-conditioning Temp. ____ °F. ____, 19____
SOURCE OF INFORMATION GR-3155
DRILLER or DIGGER ____
ADDITIONAL DATA:
Log X Water Level Measurements ____ Chemical Analysis ____ Aquifer Test ____

REMARKS:

State Printing 83916

STATE ENGINEER - mult 10-38
Salem, Oregon

State Well No. 1N/1-33
County Multnomah
~~Application No.~~ GR-3607

Well Log

Pg 4 of 5

Owner: Stadium Branch of U.S. National Bank of Portland Owner's No. _____

Driller: _____ Date Drilled 1946

CHARACTER OF MATERIAL	(Feet below land surface) From	To	Thickness (feet)
Sand	0'	40'	
Loose gravel	40	116	
Cement gravel	116	128	
Sand and gravel	128	148	
Cement gravel	148	177	
Sand	177	181	
Cement gravel	181	228	
Lava rock	228	300	
Lime rock	300	317	
Hard black rock	317	354	
Broken rock with some shale	354	390	
Lava rock carrying a small amount of water	390	403	
Black sand	403	425	
Conglomerate (rock & clay)	425	455	
Basalt rock	455	480	
Lava rock	480	488	
Basalt rock	488	563	

STATE ENGINEER
Salem, Oregon

MULT
1044

Well Record

STATE WELL NO. 1N/1-33C1
COUNTY Multnomah
APPLICATION NO. .....

OWNER: Ice Coliseum
MAILING ADDRESS: .....
CITY AND STATE: .....

LOCATION OF WELL: Owner's No. .....

..... ¼ ..... ¼ Sec. ..... T. ..... N. S., R. ..... E. W., W.M.

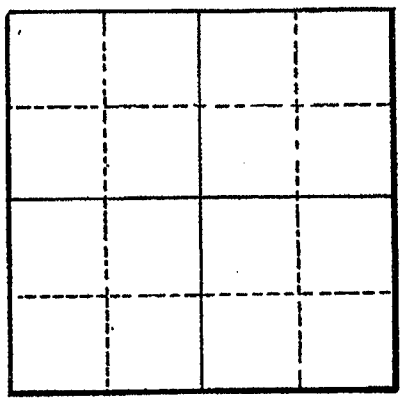
Bearing and distance from section or subdivision corner .....

.....

.....

.....

Altitude at well .....



Section .....

TYPE OF WELL: ..... Date Constructed .....

Depth drilled ..... Depth cased .....

CASING RECORD:

FINISH:

AQUIFERS:

WATER LEVEL:

PUMPING EQUIPMENT: Type ..... H.P. .....
Capacity ..... 75 ..... G.P.M.

WELL TESTS:
Drawdown ..... ft. after ..... hours ..... G.P.M
Drawdown ..... ft. after ..... hours ..... G.P.M

USE OF WATER ..... Temp. ..... °F. ....., 19.....
SOURCE OF INFORMATION .....
DRILLER or DIGGER .....
ADDITIONAL DATA:
Log ..... Water Level Measurements ..... Chemical Analysis ..... Aquifer Test .....

REMARKS:

APPENDIX C

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TERRA VAC

TABLE 1
SOIL ANALYTICAL RESULTS
Rose's Parking Lot

LOCATION	DEPTH (Feet bgs)	DATE	TPH-gas (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	m,p-Xylene (mg/kg)	o-Xylene (mg/kg)	Naphthalene (mg/kg)
B-14	14.5	8/7/2000	ND	ND	ND	ND	ND	ND	ND
B-15	13.5	8/7/2000	ND	ND	ND	ND	ND	ND	ND
B-16	2.5	8/7/2000	ND	ND	ND	ND	ND	ND	ND
B-17	13.5	8/7/2000	890	ND	ND	0.38	4.0	1.2	NA
B-17	17.5	8/7/2000	22,000	4.5	37	140	600	280	34
B-18	16.0	8/7/2000	ND	ND	ND	ND	ND	ND	ND

NOTES:
1) bgs = Below Ground Surface
2) ND = Not Detected
3) mg/kg = milligrams per kilogram
4) NA = Not Analyzed
5) TPH-gas = Total Petroleum Hydrocarbons in the Gasoline Range

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Table 2

TERRA VAC

Summary of Analytical Results for Soil Samples
Rose's Parking Lot
Portland, Oregon

Sample/ Boring Identification	Sampling Date	Sampling Depth (Feet bgs.)	Analytical Results (mg/Kg)									Flashpoint	Field Screening Results[2]	
			ODEQ Method TPH-HCID			ODEQ TPH-G	ODEQ TPH-418.1M	EPA Method 8020					Headspace Vapor (ppm)	Sheen
			Gasoline	Diesel	Oil	Gasoline	Diesel/Oil	Benzene	Toluene	Ethylbenzene	Xylenes			
B-1	1/3/1994	13.0	NA	NA	NA	99	NA	NA	NA	NA	NA	NA	NA	NA
B-1	1/3/1994	18.0	Detected	Detected	ND<100	3,700	1,100	NA	NA	NA	NA	NA	NA	NA
B-1	1/3/1994	25.5	ND<20	ND<50	ND<100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-2	1/3/1994	10.5	ND<20	ND<50	ND<100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-3	1/3/1994	10.5	NA	NA	NA	ND<5	NA	NA	NA	NA	NA	NA	NA	NA
B-3	1/3/1994	20.5	NA	NA	NA	260	NA	NA	NA	NA	NA	NA	NA	NA
B-3	1/3/1994	28.0	ND<20	ND<50	ND<100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-4	1/3/1994	10.5	ND<20	ND<50	ND<100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-5	9/28/1994	5.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-6	9/28/1994	5.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-7	9/28/1994	5.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-8	5/11/1995	15.5	>20	>50[1]	NO	130	NA	NA	NA	NA	NA	NA	160	MS
B-8	5/11/1995	23.0	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	>10,000	HS
B-9	5/11/1995	23.0	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	340	SS
B-11	5/12/1995	20.5	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	<100	NS
B-12	5/12/1995	20.5	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	<100	SS
B-13	5/12/1995	15.5	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	110	SS
B-13	5/12/1995	23.0	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	120	SS
MW-1	3/23/1994	15.0	NA	NA	NA	290	NA	0.09	0.34	1.1	8.1	NA	NA	NA
MW-1	3/23/1994	25.0	POS. ID	POS. ID[3]	<200	6,550	NA	12.6	60.5	38.9	247.5	88°F	NA	NA
MW-2	3/23/1994	15.0	NA	NA	NA	85	NA	<0.05	0.07	0.12	0.33	NA	NA	NA
MW-2	3/23/1994	25.0	NA	NA	NA	NA	NA	<0.05	<0.05	0.07	<0.05	NA	NA	NA
MW-3	3/23/1994	20.0	NA	NA	NA	NA	NA	<0.05	<0.05	<0.05	<0.05	NA	NA	NA
MW-4	9/28/1994	5.0	ND	POS. ID[4]	ND	NA	52.2	NA	NA	NA	NA	NA	NA	NA
MW-4	9/28/1994	20.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-5	5/11/1995	23.0	>20	>50[1]	NO	5,200	NA	NA	NA	NA	NA	NA	>10,000	HS
R-1	11/2/1995	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<100	NS
R-1	11/2/1995	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<100	SS
R-1	11/2/1995	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<100	SS
R-1	11/2/1995	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,600	HS
R-1	11/2/1995	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>10,000	HS
R-1	11/2/1995	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,100	NS

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Table 2

Summary of Analytical Results for Soil Samples
Rose's Parking Lot
Portland, Oregon

Sample/ Boring Identification	Sampling Date	Sampling Depth (Feet bgs.)	Analytical Results (mg/Kg)									Flashpoint	Field Screening Results[2]	
			ODEQ Method TPH-HCID			ODEQ TPH-G	ODEQ TPH-418.1M	EPA Method 8020					Headspace	
			Gasoline	Diesel	Oil	Gasoline	Diesel/Oil	Benzene	Toluene	Ethylbenzene	Xylenes		Vapor (ppm)	Sheen
DVE-1	1/24/1997	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-1	1/24/1997	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-1	1/24/1997	15.0	NA	NA	NA	ND	NA	ND	ND	ND	ND	NA	41	NS
DVE-1	1/24/1997	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	23	NS
DVE-1	1/24/1997	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	18	NS
DVE-1	1/24/1997	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-1	1/24/1997	35.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-2	1/24/1997	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	NS
DVE-2	1/24/1997	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	NS
DVE-2	1/24/1997	15.0	NA	NA	NA	2.23	NA	ND	ND	0.0565	ND	NA	100	NS
DVE-2	1/24/1997	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	40	NS
DVE-2	1/24/1997	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	22	NS
DVE-2	1/24/1997	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-3	1/24/1997	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1900	NS
DVE-3	1/24/1997	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	47	NS
DVE-3	1/24/1997	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	73	NS
DVE-3	1/24/1997	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20	NS
DVE-3	1/24/1997	35.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4	NS
DVE-4	1/24/1997	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5	NS
DVE-4	1/24/1997	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5	NS
DVE-4	1/24/1997	15.0	NA	NA	NA	ND	NA	ND	ND	ND	ND	NA	8	NS
DVE-4	1/24/1997	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	311	NS
DVE-4	1/24/1997	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1600	NS
DVE-4	1/24/1997	38.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4	NS

Notes:

bgs	Below Ground Surface
NA	Not Analyzed
NO	Not Observed
ND	Not Detected Above Detection Limit Indicated in Original Reports
mg/Kg	Milligrams per Kilogram
ODEQ	Qregon Department of Environmental Quality
TPH	Total Petroleum Hydrocarbons
ppm	Parts per Million

1. The laboratory reported that diesel-range hydrocarbons identified in the sample were the result of an overlap from the gasoline-range; therefore, diesel-range hydrocarbons were not quantified.
2. NS = No Sheen, SS = Slight Sheen, MS = Moderate Sheen, HS = Heavy Sheen
3. Peaks in the gasoline range extend into the diesel range
4. Peaks were present within the retention time window of the listed petroleum hydrocarbon, but the peak patterns indicate the presence of low level heavy oils extending into the diesel range.

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Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-1	3/29/1994	NA	130	390	98	1,570	NA	NA
	10/4/1994	NA	27	46	6	70	NA	NA
	5/12/1995	NA	NA	NA	NA	NA	NA	NA
	1/4/1996	54,000	400	2,200	630	4,800	Naphthalene - 370 Acenaphthylene - 44	100
	4/24/1996	NA	NA	NA	NA	NA	NA	NA
	7/11/1996	81,000	710	1,800	730	2	Naphthalene - 750 Acenaphthylene - 160 Phenanthrene - 2.2 Fluoranthene - 4.5	NA
	11/3/1996	23,000	410	1,500	910	4,100	Naphthalene - 2,400 Acenaphthylene - 460 Acenaphthene -600 Fluorene - 12 Phenanthrene - 12 Anthracene - 0.89 Fluoranthene - 10 Pyrene - 2.1 Benzo(a)anthracene - 0.7 Chrysene - 1.3 Benzo(k)fluoranthene - 0.1 Benzo(a)pyrene - 0.3 Dibenzo(a,h)anthracene - 0.1 Benzo(g,h,i)perylene - 0.4	NA
	2/28/97*	57,200	1,130	3,890	1,220	7,430	Naphthalene - 760	20
	5/29/1997	14,900	65.9	49.3	205	1,010	NA	NA
	9/5/1997	14,600	10.9	11.8	47.3	642	Naphthalene - 54.2	NA
	12/31/1997	2960	ND	ND	ND	8.76	NA	NA
	5/18/1998	16,000	ND	7.63	ND	930	Naphthalene - 387	2,000
	7/31/1998	19,600	6.00	6.54	ND	1,020	Naphthalene - 104	787
	10/29/1998	27,900	13.90	ND	9.13	1,120	Naphthalene - 516	490

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Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
NMW-2	3/29/1994	NA	4.9	1.4	0.7	3.0	NA	NA
	10/4/1994	NA	ND	ND	ND	ND	NA	NA
	5/12/1995	ND	1.2	ND	0.6	0.7	NA	NA
	1/4/1996	1,600	14	1.5	ND	1.7	ND	ND
	4/24/1996	NA	7.7	0.5	ND	ND	NA	NA
	7/11/1996	7,100	2.7	ND	ND	ND	ND	NA
	11/3/1996	ND	2.0	ND	ND	ND	NA	NA
	2/28/1997	ND	ND	ND	ND	ND	NA	NA
	5/29/1997	ND	ND	ND	ND	ND	NA	NA
	9/5/1997	ND	ND	ND	ND	ND	NA	NA
	12/31/1997	ND	ND	ND	ND	ND	NA	NA
	5/18/1998	ND	ND	ND	ND	ND	NA	NA
	7/31/1998	203	ND	ND	ND	ND	NA	NA
	10/29/1998	128	ND	ND	ND	ND	NA	NA
NMW-3	3/29/1994	NA	2,300	1,200	1,200	3,700	NA	NA
	10/4/1994	NA	1,520	600	790	1,600	NA	NA
	5/12/1995	3,500	1,300	740	800	2,000	Naphthalene - 130 Fluorene - 0.2 Phenanthrene - 0.09	NA
	1/4/1996	4,500	1,300	640	940	2,600	Naphthalene - 180 Acenaphthylene - 23	6
	4/16/1996	NA	900	500	600	1,400	NA	NA
	7/11/1996	2,100	460	130	380	430	Naphthalene - 71	NA
	11/3/1996	4,900	830	220	650	1,100	Naphthalene - 120 Acenaphthylene - 37	
	2/28/1997	4,400	261	124	153	404	Naphthalene - 32.6	NA
	5/29/1997	365	17.4	0.91	3.55	15.3	NA	NA
	9/5/1997	ND	ND	ND	ND	ND	NA	NA
	12/31/1997	ND	ND	ND	ND	ND	NA	NA
	5/18/1998	299	4.53	ND	9.26	ND	Naphthalene - 0.173	1.5
	7/31/1998	223	4.14	ND	4.68	ND	NA	NA
	10/29/1998	458	2.70	0.565	3.09	ND	NA	NA

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Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-4	10/4/1994	NA	ND	ND	ND	ND	NA	NA
	5/12/1995	ND	ND	ND	ND	ND	NA	NA
	1/4/1996	900	ND	ND	ND	ND	ND	ND
	4/24/1996	NA	ND	ND	ND	ND	NA	NA
	7/11/1996	ND	ND	ND	ND	ND	NA	NA
	11/3/1996	NA	ND	ND	ND	ND	NA	NA
	2/28/1997	ND	0.7	ND	ND	ND	NA	NA
	5/29/1997	ND	ND	ND	ND	ND	NA	NA
	9/5/1997	ND	ND	ND	ND	ND	NA	NA
	12/31/1997	ND	ND	ND	ND	ND	NA	NA
	5/18/1998	ND	ND	ND	ND	ND	NA	NA
	7/31/1998	ND	ND	ND	ND	ND	NA	NA
	10/29/1998	ND	ND	ND	ND	ND	NA	NA
NMW-5	5/12/1995	13,000	660	13,000	1,900	11,000	Naphthalene - 450 Acenaphthylene - 66 Fluorene - 0.6 Phenanthrene - 0.42 Anthracene - 0.07	NA
	1/4/1996	6,600	4.6	22	24	230	Naphthalene - 29 Acenaphthylene - 13 Fluorene - 0.8	14
	4/24/1996	NA	ND	0.6	1.1	2.9	NA	NA
	7/11/1996	ND	ND	ND	ND	2.7	NA	NA
	11/3/1996	NA	ND	ND	2.5	5.6	NA	NA
	2/28/1997	5,440	70.3	23.5	88.6	230	Naphthalene - 28.5	NA
	5/29/1997	4,480	34.9	156	7.90	554	NA	NA
	9/5/1997	5,550	39.0	334	23.5	642	ND	NA
	12/31/1997	18,300	62.6	570	231.0	1,570	NA	NA
	5/18/1998	1,050	ND	ND	0.895	14	Naphthalene - 4.87	1.2
	7/31/1998	3,310	26.8	53.6	50.0	268	NA	NA
	10/29/1998	6,840	21.8	57.0	101	284	NA	NA

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Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		NLE	5	1,000	700	10,000	Napthalene = 28	5
MW-6	4/24/1996	ND	ND	ND	ND	ND	NA	ND
	7/11/1996	ND	ND	ND	ND	ND	NA	NA
	11/3/1996	NA	ND	ND	ND	ND	NA	NA
	2/28/1997	ND	ND	ND	ND	ND	NA	NA
	5/29/1997	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	102	ND	ND	ND	ND	NA	NA
	10/2/97***	NA	NA	NA	NA	NA	NA	NA
	12/31/1997	ND	ND	ND	ND	ND	NA	NA
	5/18/1998	NA	NA	NA	NA	NA	NA	NA
	7/31/1998	NA	NA	NA	NA	NA	NA	NA
	10/29/1998	NA	NA	NA	NA	NA	NA	NA
MW-7	4/24/1996	ND	ND	ND	ND	ND	NA	ND
	7/11/1996	ND	ND	ND	ND	ND	NA	NA
	11/3/1996	NA	ND	ND	ND	ND	NA	NA
	2/28/1997	ND	ND	ND	ND	ND	NA	NA
	5/29/1997	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	110	12	ND	ND	ND	NA	NA
	10/2/1997	ND	ND	ND	ND	ND	NA	NA
	12/31/1997	ND	ND	ND	ND	ND	NA	NA
	5/18/1998	NA	NA	NA	NA	NA	NA	NA
	7/31/1998	NA	NA	NA	NA	NA	NA	NA
	10/29/1998	NA	NA	NA	NA	NA	NA	NA

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Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-8	4/24/1996	ND	ND	ND	ND	ND	NA	ND
	7/11/1996	ND	ND	ND	ND	ND	NA	NA
	11/3/1996	NA	ND	ND	ND	ND	NA	NA
	2/28/1997	ND	ND	ND	ND	ND	NA	NA
	5/29/1997	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	111	ND	ND	ND	ND	NA	NA
	10/1/1997	ND	ND	ND	ND	ND	NA	NA
	12/31/1997	ND	ND	ND	ND	ND	NA	NA
	5/18/1998	NA	NA	NA	NA	NA	NA	NA
	7/31/1998	NA	NA	NA	NA	NA	NA	NA
	10/29/1998	NA	NA	NA	NA	NA	NA	NA

Notes:

Sampling between 3/29/94 and 11/3/96 performed by GeoEngineers. Data from 1/21/97 Groundwater Report.

Wells MW-2, MW-3, and MW-5 redrilled 1/23-1/25/97, and renamed NMW-2, NMW-3, and NMW-5 respectively.

* MW-1 sampled for lead 12/11/96.

** Sample Results were suspect. Well Resampled on 10/1/97 or 10/2/97

*** Well was dry. No analytical sample taken.

PAHs polycyclic aromatic hydrocarbons. Only analytes detected are listed. Refer to analytical results (Appendix A) for a complete list of analytes and their respective detection limits.

ug/L Micrograms per liter, or parts per billion

ND Not Detected at the reporting limits

NA Not Analyzed

TPH-G Total petroleum hydrocarbons within the gasoline range (benzene to naphthalene).

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UST CLEANUP TELEPHONE USE REPORT

CALL FROM/TO: Paul Blanco DATE: 12-14-00

WITH: Terra-Vac TIME: 4:45

TELEPHONE NO: ( ) -

REGARDING: Rosas Parking Lot

FILE NO: 26-94-25

SUMMARY OF CALL

Paul called to request extension of due date for further evaluation of site. Was due on 12-15. Paul should have it to me by early next week

Bob Williams
Staff Signature

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
Northwest Region
2020 SW Fourth Avenue
Suite 400
Portland, OR 97201-4987
(503) 229-5263 Voice
TTY (503) 229-5471

November 9, 2000

RICHARD SINGER
824 NW ALBEMARLE TERRACE
PORTLAND, OREGON 97210

Re: Rose's Parking Lot
File No. 26-94-0025

Dear Mr. Singer:

The Department has completed its review of the Terra Vac Soil Quality Investigation Report, dated October 4, 2000 for the underground storage tank (UST) cleanup at the Rose's Parking Lot at 330 NW 23rd Avenue in Portland, Oregon.

This investigation indicates that a "hot spot" of soil contamination exists at 17.5 feet below ground surface (bgs) at B-17. Based on water levels in surrounding monitoring wells the depth to seasonally high groundwater at this location is approximately 18.5-21 feet bgs. Water levels suggest that contamination is above the water table for most or all the year. Benzene in the pocket of contamination was measured at 4.5 parts per million (ppm). The Department risk-based standard for indoor air vapor intrusion is 0.5 ppm in a commercial setting so this concentration exceeds the standard by nine times. The leaching to groundwater standard at 0.1 ppm, is also greatly exceeded.

To address the hot spot and proceed to closure some options are presented below:

- The vapor intrusion pathway is currently not applicable if no structures exist on the property. If future buildings are not planned then a deed restriction prohibiting the construction of structures could be placed on the property.

- The site remediation system could be restarted for localized treatment of the hot spot.

- The volume of remaining contaminated soil could be estimated by contouring the total petroleum hydrocarbon (TPH) concentration in B-17 along with that seen historically in surrounding points B-1, B-5, B-8, and MW-2. A weighted average-approach (like the Theissen polygon method) might also be used for this step. The maximum benzene concentration can then be used to calculate benzene mass. A hypothetical building volume could be proposed and the resulting thirty-year average indoor benzene concentration calculated and compared with the inhalation risk standards. Due to general uncertainty, this kind of calculation incorporates the conservative assumption that all benzene in the hot spot will infiltrate to the building. It is important to clearly document all assumptions and calculations.

In order to eliminate the leaching to groundwater pathway it will be necessary to demonstrate that the aquifer below contamination is not used nor is likely to be used in the future.

Site closure using Risk-Based Decision Making (RBDM) is anticipated. Part of this task will involve preparation of a conceptual site model (CSM). Please present a CSM for the site and a plan for addressing hot spot contamination by **December 15, 2000**. Please note that future reports that involve hydrogeologic interpretation must be reviewed and stamped by a geologist registered in Oregon. If you have any questions, please feel free to contact me at (503) 229-6242.

Sincerely,

Robert Williams
UST Cleanup Specialist

cc: Paul Bianco
Terra Vac
23106 100th Avenue West
Edmond, Washington 98020-5018

(rkw:RKW)

TERRA VAC

Terra Vac
Northwest Division
23106 100th Avenue West
Edmonds, WA 98020-5018
425-697-5131 Tel
425-697-6211 Fax

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED

OCT 09 2000

NORTHWEST REGION

October 4, 2000

26-94-0028
BW

Mr. Robert Williams
Oregon Department of Environmental Quality
2020 SW 4th Avenue, Suite 400
Portland, OR 97201-4987

RE: Soil Quality Investigation Report
330 NW 23rd Avenue, Portland, Oregon

Dear Mr. Williams:

Terra Vac has prepared this letter report presenting the results for characterizing subsurface soil quality at Rose's Parking Lot, 330 NW 23rd Avenue, Portland, Oregon (herein known as the Site). The purpose of the investigation was to confirm, at the request of the Oregon Department of Environmental Quality (DEQ), that Terra Vac's Dual Vapor Extraction (DVE) system has effectively treated petroleum contaminated soil at the Site. The soil sampling was performed on August 7, 2000 in accordance with the Soil Quality Investigation Workplan dated June 12, 2000. A discussion of work performed at the subject property is presented below.

Field Investigation

Probe Locations and Sample Depths

Five soil probes (B-14, B-15, B-16, B-17, and B-18) were pushed at the Site using a geoprobe. With the exception of probes B-14 and B-16, probes were pushed to approximately 20 feet below ground surface (bgs) or until groundwater was encountered. Due to the difficult soil conditions, probes B-14 and B-16 were pushed to depths of 16 feet bgs and 4.6 feet bgs, respectively. Numerous attempts were made to push probe B-16 to the proposed depth, but with no success. The soil probe locations are presented in Figure 1.

Sampling Procedures

Soil samples were collected from each probe at 5-foot sampling depth intervals using a split-spoon sampler driven to the desired sampling depth. Soil was extracted from the sampler using a stainless steal spoon and placed in pre-condition serialized glass jar provided by the laboratory.

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Each soil sample was field screened using the head-space technique for total volatile organic compounds using a portable gas analyzer equipped with a photoionization detector (PID). Based on the highest field screening results, and with the exception of probe B-17, one soil sample from each probe was analyzed for the contaminants of potential concern (COPCs). Two soil samples were collected at boring B-17 at depths of 13.5 and 17.5 feet bgs. Soil sample depths are presented in Table 1. The soil boring logs are presented in Appendix A.

All samples were stored in an iced chest while at the Site and during transportation to the laboratory. A chain of custody form accompanied the chest containing the laboratory samples. Field personnel retained a copy of the chain of custody; the original form was sent with the samples to the laboratory.

Abandonment of Probes

All probe holes were closed using hydrated bentonite chips and the surface restored to its original condition using asphalt patch.

Sample Analyses

With the exception of probe B-17, one soil sample each probe location was analyzed for the following COPCs:

- Gasoline range TPHs (TPH-g) using Oregon State Test Method NWTPH-G;
- Benzene, toluene, ethylbenzene, and xylenes (BTEX) using EPA 8021; and
- Poly-aromatic hydrocarbons (PAHs) and naphthalene using EPA Test Method 8270C.

Findings

A summary of the results of the soil analyses is presented in Table 1 and the complete laboratory report is attached as Appendix B. A summary of the soil analytical results from previous investigations is presented in Table 2. A summary of results for the August 2000 sampling event is as follows:

- Soil samples collected at borings B-14, B-15, B-16, and B-18 showed non-detectable concentrations of TPH-gas, BTEX, and naphthalene;
- The analytical results from soil boring B-17 at a depth of 13.5 feet bgs, presumably taken at the groundwater smear zone, showed concentrations of TPH-g, ethylbenzene, and total xylenes of 890 mg/kg, 0.38 mg/kg, 5.2 mg/kg, respectively. Benzene and toluene were not detected at B-17 at a depth of 13.5 feet bgs.

- The analytical results from soil boring B-17 at a depth of 17.5 feet bgs showed concentrations of TPH-g, benzene, toluene, ethylbenzene, total xylenes, and naphthalene of 22,000 mg/kg, 4.5 mg/kg, 37 mg/kg, 140 mg/kg, 880 mg/kg, and 34 mg/kg, respectively.

- The PID results indicate the vertical petroleum impact at B-17 is confined to the interval from 13 feet bgs to 15 feet bgs (the presumed depth of the capillary fringe soils in this area);

- The horizontal extent of petroleum impacted soil is localized near boring B-17. This conclusion is based the fact that historical analytical results for soil samples collected at borings B-5 and B-18 showed non-detectable levels of TPH-g. Borings B-5 and B-18 are located approximately 15 and 20 feet southwest and northeast of B-17, respectively; and

- At borings B-1 and B-8 historical results showed lower TPH-g concentrations than detected at boring B-17 (e.g., B-1 @ 18 feet bgs 3,200 mg/kg TPH-g vs. B-17 @ 17.5 feet bgs 22,000 mg/kg). Borings B-1 and B-8 are located approximately 5 and 15 feet southwest and south of boring B-17, respectively.

Strategy for Site Closure

Elevated concentrations of TPH were discovered in the soil at boring B-17 below the groundwater table. Field data indicates the TPH impacted soil is localized near boring B-17. Based on consultation with the DEQ, Terra Vac will determine the necessary course of action required and develop a strategy to obtain a DEQ approved no further action designation for the site.

If we may provide any additional information or you require clarification of this report, please do not hesitate to call at (425) 697-5131.

Sincerely,
Terra Vac

Paul V. Bianco, P.E.
Senior Engineer

CC: Mr. Thomas Cammarata
Mr. Richard Singer
Mr. Richard Allen
32-0029.10.01

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TERRA VAC

TABLE 1
SOIL ANALYTICAL RESULTS
Rose's Parking Lot

LOCATION	DEPTH (Feet bgs)	DATE	TPH-gas (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	m,p-Xylene (mg/kg)	o-Xylene (mg/kg)	Naphthalene (mg/kg)
B-14	14.5	8/7/00	ND	ND	ND	ND	ND	ND	ND
B-15	13.5	8/7/00	ND	ND	ND	ND	ND	ND	ND
B-16	2.5	8/7/00	ND	ND	ND	ND	ND	ND	ND
B-17	13.5	8/7/00	890	ND	ND	0.38	4.0	1.2	NA
B-17	17.5	8/7/00	22,000	4.5	37	140	600	280	34
B-18	16.0	8/7/00	ND	ND	ND	ND	ND	ND	ND

NOTES:
1) bgs = Below Ground Surface
2) ND = Not Detected
3) mg/kg = milligrams per kilogram
4) NA = Not Analyzed
5) TPH-gas = Total Petroleum Hydrocarbons in the Gasoline Range

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Table 2

TERRA VAC

Summary of Analytical Results for Soil Samples
Rose's Parking Lot
Portland, Oregon

Sample/ Boring Identification	Sampling Date	Sampling Depth (Feet bgs.)	Analytical Results (mg/Kg)									Flashpoint	Field Screening Results[2]	
			ODEQ Method TPH-HCID			ODEQ TPH-G	ODEQ TPH-418.1M	EPA Method 8020					Headspace Vapor (ppm)	Sheen
			Gasoline	Diesel	Oil	Gasoline	Diesel/Oil	Benzene	Toluene	Ethylbenzene	Xylenes			
B-1	1/3/1994	13.0	NA	NA	NA	99	NA	NA	NA	NA	NA	NA	NA	NA
B-1	1/3/1994	18.0	Detected	Detected	ND<100	3,700	1,100	NA	NA	NA	NA	NA	NA	NA
B-1	1/3/1994	25.5	ND<20	ND<50	ND<100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-2	1/3/1994	10.5	ND<20	ND<50	ND<100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-3	1/3/1994	10.5	NA	NA	NA	ND<5	NA	NA	NA	NA	NA	NA	NA	NA
B-3	1/3/1994	20.5	NA	NA	NA	260	NA	NA	NA	NA	NA	NA	NA	NA
B-3	1/3/1994	28.0	ND<20	ND<50	ND<100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-4	1/3/1994	10.5	ND<20	ND<50	ND<100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-5	9/28/1994	5.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-6	9/28/1994	5.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-7	9/28/1994	5.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-8	5/11/1995	15.5	>20	>50[1]	NO	130	NA	NA	NA	NA	NA	NA	160	MS
B-8	5/11/1995	23.0	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	>10,000	HS
B-9	5/11/1995	23.0	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	340	SS
B-11	5/12/1995	20.5	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	<100	NS
B-12	5/12/1995	20.5	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	<100	SS
B-13	5/12/1995	15.5	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	110	SS
B-13	5/12/1995	23.0	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	120	SS
MW-1	3/23/1994	15.0	NA	NA	NA	290	NA	0.09	0.34	1.1	8.1	NA	NA	NA
MW-1	3/23/1994	25.0	POS. ID	POS. ID[3]	<200	6,550	NA	12.6	60.5	38.9	247.5	88°F	NA	NA
MW-2	3/23/1994	15.0	NA	NA	NA	85	NA	<0.05	0.07	0.12	0.33	NA	NA	NA
MW-2	3/23/1994	25.0	NA	NA	NA	NA	NA	<0.05	<0.05	0.07	<0.05	NA	NA	NA
MW-3	3/23/1994	20.0	NA	NA	NA	NA	NA	<0.05	<0.05	<0.05	<0.05	NA	NA	NA
MW-4	9/28/1994	5.0	ND	POS. ID[4]	ND	NA	52.2	NA	NA	NA	NA	NA	NA	NA
MW-4	9/28/1994	20.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-5	5/11/1995	23.0	>20	>50[1]	NO	5,200	NA	NA	NA	NA	NA	NA	>10,000	HS
R-1	11/2/1995	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<100	NS
R-1	11/2/1995	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<100	SS
R-1	11/2/1995	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<100	SS
R-1	11/2/1995	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,600	HS
R-1	11/2/1995	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>10,000	HS
R-1	11/2/1995	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,100	NS

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Table 2

TERRA VAC

Summary of Analytical Results for Soil Samples
Rose's Parking Lot
Portland, Oregon

Sample/ Boring Identification	Sampling Date	Sampling Depth (Feet bgs.)	Analytical Results (mg/Kg)									Flashpoint	Field Screening Results[2]	
			ODEQ Method TPH-HCID			ODEQ TPH-G	ODEQ TPH-418.1M	EPA Method 8020					Headspace Vapor (ppm)	Sheen
			Gasoline	Diesel	Oil	Gasoline	Diesel/Oil	Benzene	Toluene	Ethylbenzene	Xylenes			
DVE-1	1/24/1997	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-1	1/24/1997	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-1	1/24/1997	15.0	NA	NA	NA	ND	NA	ND	ND	ND	ND	NA	41	NS
DVE-1	1/24/1997	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	23	NS
DVE-1	1/24/1997	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	18	NS
DVE-1	1/24/1997	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-1	1/24/1997	35.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-2	1/24/1997	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	NS
DVE-2	1/24/1997	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	NS
DVE-2	1/24/1997	15.0	NA	NA	NA	2.23	NA	ND	ND	0.0565	ND	NA	100	NS
DVE-2	1/24/1997	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	40	NS
DVE-2	1/24/1997	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	22	NS
DVE-2	1/24/1997	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-3	1/24/1997	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1900	NS
DVE-3	1/24/1997	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	47	NS
DVE-3	1/24/1997	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	73	NS
DVE-3	1/24/1997	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20	NS
DVE-3	1/24/1997	35.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4	NS
DVE-4	1/24/1997	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5	NS
DVE-4	1/24/1997	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5	NS
DVE-4	1/24/1997	15.0	NA	NA	NA	ND	NA	ND	ND	ND	ND	NA	8	NS
DVE-4	1/24/1997	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	311	NS
DVE-4	1/24/1997	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1600	NS
DVE-4	1/24/1997	38.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4	NS

Notes:

bgs	Below Ground Surface
NA	Not Analyzed
NO	Not Observed
ND	Not Detected Above Detection Limit Indicated in Original Reports
mg/Kg	Milligrams per Kilogram
ODEQ	Qregon Department of Environmental Quality
TPH	Total Petroleum Hydrocarbons
ppm	Parts per Million

1. The laboratory reported that diesel-range hydrocarbons identified in the sample were the result of an overlap from the gasoline-range; therefore, diesel-range hydrocarbons were not quantified.
2. NS = No Sheen, SS = Slight Sheen, MS = Moderate Sheen, HS = Heavy Sheen
3. Peaks in the gasoline range extend into the diesel range
4. Peaks were present within the retention time window of the listed petroleum hydrocarbon, but the peak patterns indicate the presence of low level heavy oils extending into the diesel range.

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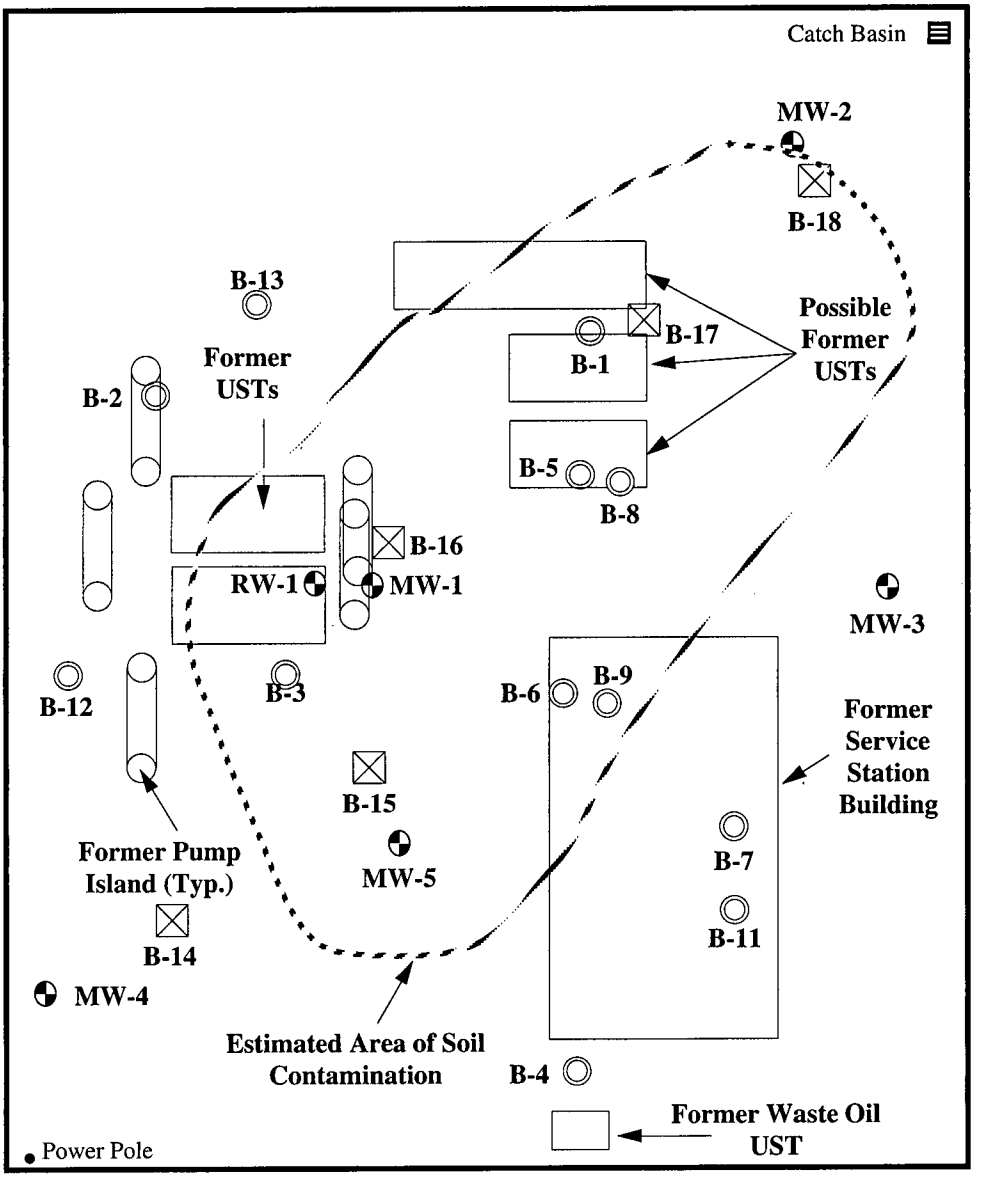
N.W. FLANDERS STREET

N

N. W. 23RD AVENUE



LEGEND	
	Existing Recovery or Monitoring Well
	Soil Boring
	Soil Probe Locations

Notes:
(1) Base map from GeoEngineers report: "Subsurface Assessment Rose's Parking Lot Portland, Oregon" August 28, 1995. Site Plan, Figure 2

SCALE (Approximate ft.)

0 20 40

SITE MAP	Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon	TERRA VAC	Project No.	32-0029	Figure 1
			Date	August 29, 2000	
			Scale	1 Inch = 20 Feet	
			Revision		

APPENDIX A
SOIL BORING LOGS

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TERRA VAC

Date Drilled: 8/7/00 **Boring/Well Number:** B-14

Project: Rose's Parking Lot Project Number: 32-0029

Address: 330 NW 23rd Ave., Portland, Oregon

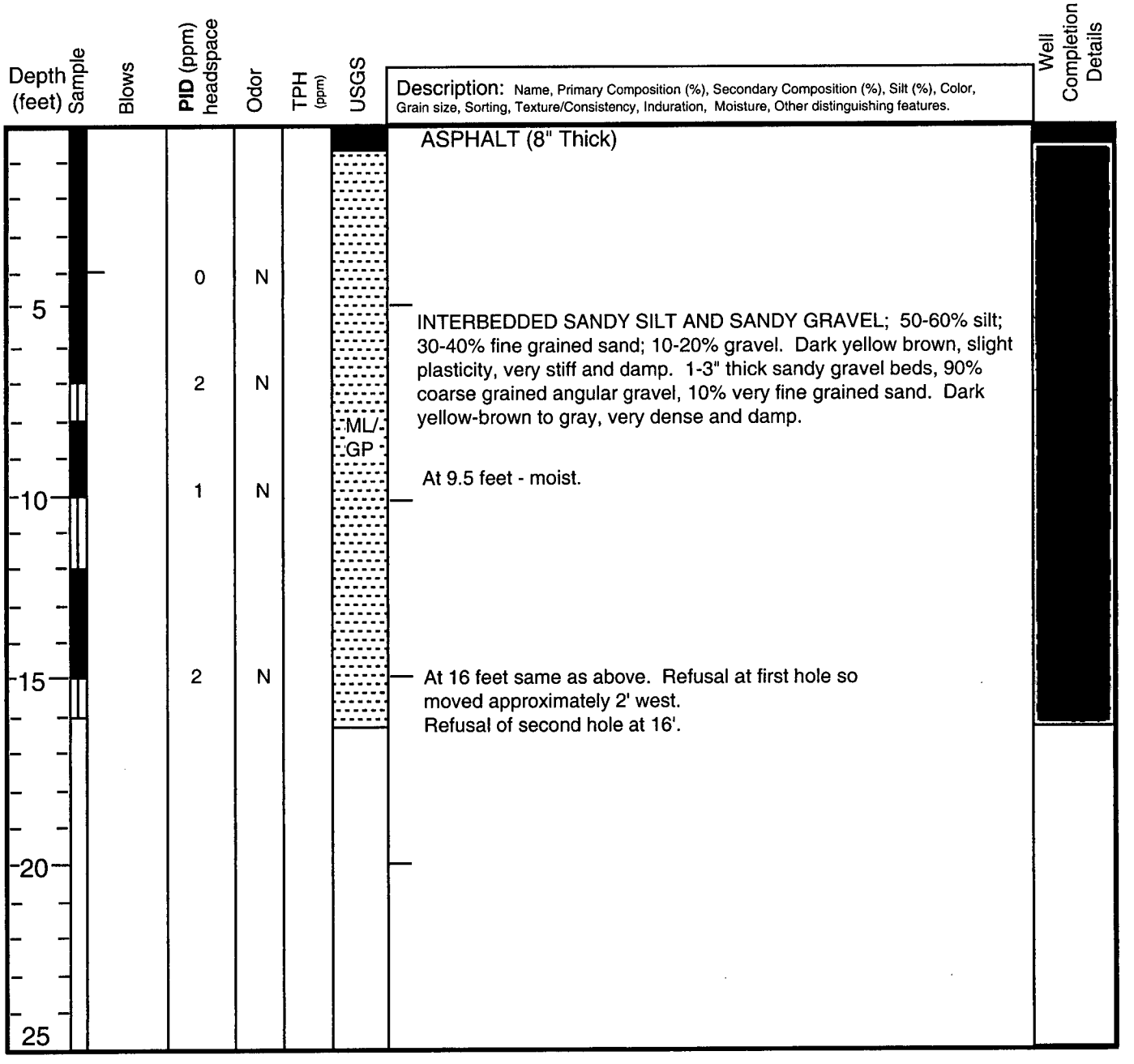
Drilling Contractor: Cascade Drilling, Inc. Log by: J. Orr

Drill Rig: Geoprobe Auger Size/Type: N/A Sample Method: Tube

Total Depth: 16 feet Depth to Groundwater: N/A Backfill or Grout Material: Bentonite

Well Casing/Screen Material: N/A Filter Material/Size: N/A

Well: Casing/Screen Diameter: N/A Slot Size: N/A Seal: 0.5 - 16 feet Screened Interval: N/A



General Remarks:

- TPH = Total Petroleum Hydrocarbon concentrations analyzed using Method _____.
- ND = Not detected, or levels were below analytical detection limits.
- NA = Not Analyzed.

This summary applies only at the location of this boring, and at the time of drilling. Subsurface conditions may differ at other locations, and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

TERRA VAC

Date Drilled: 8/7/00 **Boring/Well Number: B-15**

Project: Rose's Parking Lot Project Number: 32-0029

Address: 330 NW 23rd Ave., Portland, Oregon

Drilling Contractor: Cascade Drilling, Inc. Log by: J. Orr

Drill Rig: Geoprobe Auger Size/Type: N/A Sample Method: Tube

Total Depth: 14.5 feet Depth to Groundwater: 13 Backfill or Grout Material: Bentonite

Well Casing/Screen Material: N/A Filter Material/Size: N/A

Well: Casing/Screen Diameter: N/A Slot Size: N/A Seal: 0 - 14.5 feet Screened Interval: N/A

Depth (feet)	Sample	Blows	PID (ppm) headspace	Odor	TPH (ppm)	USGS	Description: Name, Primary Composition (%), Secondary Composition (%), Silt (%), Color, Grain size, Sorting, Texture/Consistency, Induration, Moisture, Other distinguishing features.	Well Completion Details
						GP	ASPHALT (6" Thick) GRAVEL; 95% medium to coarse grained gravel, 5% medium grained sand. Brown, very dense and damp.	
5			1	N			SANDY SILT; 50-60% silt; 30-40% very fine to fine grained sand, trace fine to medium grained angular gravel. Dark yellow brown, very stiff and damp.	
			2	N		ML	At 6-7 feet glass and white pot shards. SANDY SILT; 50-60% silt, 20-25% very fine to fine grained sand, 20-25% fine to medium grained angular gravel. Very dark grayish-brown.	
10			6	N				
			6	N				
							At 13.5 feet same as above but wet.	
15			6	N			At 14.5 feet - refusal.	
20								
25								

General Remarks:

- TPH = Total Petroleum Hydrocarbon concentrations analyzed using Method _____.
- ND = Not detected, or levels were below analytical detection limits.
- NA = Not Analyzed.

This summary applies only at the location of this boring, and at the time of drilling. Subsurface conditions may differ at other locations, and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

TERRA VAC

Date Drilled: 8/7/00 **Boring/Well Number: B-16**

Project: Rose's Parking Lot Project Number: 32-0029

Address: 330 NW 23rd Ave., Portland, Oregon

Drilling Contractor: Cascade Drilling, Inc. Log by: J. Orr

Drill Rig: Geoprobe Auger Size/Type: N/A Sample Method: Tube

Total Depth: feet Depth to Groundwater: N/A Backfill or Grout Material: Bentonite

Well Casing/Screen Material: N/A Filter Material/Size: N/A

Well: Casing/Screen Diameter: N/A Slot Size: N/A Seal: feet Screened Interval: N/A

Depth (feet)	Sample	Blows	PID (ppm) headspace	Odor	TPH (ppm)	USGS	Description: Name, Primary Composition (%), Secondary Composition (%), Silt (%), Color, Grain size, Sorting, Texture/Consistency, Induration, Moisture, Other distinguishing features.	Well Completion Details
0			0	N		ML	ASPHALT (5" Thick) SANDY SILT; 60-70% silt; 30-40% fine grained sand, trace fine grained angular gravel. Very dark gray- brown, very dense and damp. 2-3' sand interbeds.	
5							At 4' 7" refusal due to concrete. Moved 2' west - refusal again at 4'7".	
10								
15								
20								
25								

General Remarks:

- TPH = Total Petroleum Hydrocarbon concentrations analyzed using Method _____.
- ND = Not detected, or levels were below analytical detection limits.
- NA = Not Analyzed.

This summary applies only at the location of this boring, and at the time of drilling. Subsurface conditions may differ at other locations, and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

TERRA VAC

Date Drilled: 8/7/00 **Boring/Well Number: B-17**

Project: Rose's Parking Lot Project Number: 32-0029

Address: 330 NW 23rd Ave., Portland, Oregon

Drilling Contractor: Cascade Drilling, Inc. Log by: J. Orr

Drill Rig: Geoprobe Auger Size/Type: N/A Sample Method: Tube

Total Depth: 20 feet Depth to Groundwater: 15 feet Backfill or Grout Material: Bentonite

Well Casing/Screen Material: N/A Filter Material/Size: N/A

Well: Casing/Screen Diameter: N/A Slot Size: N/A Seal: 0-20 feet Screened Interval: N/A

Depth (feet)	Sample	Blows	PID (ppm) headspace	Odor	TPH (ppm)	USGS	Description: Name, Primary Composition (%), Secondary Composition (%), Silt (%), Color, Grain size, Sorting, Texture/Consistency, Induration, Moisture, Other distinguishing features.	Well Completion Details
							ASPHALT (5" Thick)	
							At 2.5' interbedded gravel.	
			0	N				
5							SANDY SILT; 50-60% silt; 30-40% very fine grained sand, trace fine to coarse grained gravel. Dark yellow- brown, slight plasticity, very stiff and damp.	
			5	N		ML	At 7' red brick fragments.	
10			4	N				
			177	Y		GP	SILTY GRAVEL; 70-80% angular coarse grained gravel, 10-15% silt, 10-15% very fine to fine grained sand. Black, very dense and wet. Moderate product odor - gas-like.	
15						ML	SANDY SILT; 70-80% silt; 10-20% gravel, 10-20% fine to coarse angular gravel. Dark gray, very dense and wet. Moderate product odor - gas-like.	
			1320	Y		SP	SAND; 100% fine grained sand, trace silt. Dark gray, dense and wet.	
			51	N		ML	SANDY SILT; 60-70% silt; 30-40% very fine sand, trace fine grained angular gravel. Dark gray, slight plasticity and wet.	
20							Refusal at 20'.	
25								

n Hydrocarbon concentrations analyzed using Method _____.
or levels were below analytical detection limits.

y at the location of this boring, and at the time of drilling. Subsurface conditions may differ at other
e at this location with the passage of time. The data presented is a simplification of actual

TERRA VAC

Date Drilled: 8/7/00 **Boring/Well Number: B-18**

Project: Rose's Parking Lot Project Number: 32-0029

Address: 330 NW 23rd Ave., Portland, Oregon

Drilling Contractor: Cascade Drilling, Inc. Log by: J. Orr

Drill Rig: Geoprobe Auger Size/Type: N/A Sample Method: Tube

Total Depth: 16.5 feet Depth to Groundwater: 15 feet Backfill or Grout Material: Bentonite

Well Casing/Screen Material: N/A Filter Material/Size: N/A

Well: Casing/Screen Diameter: N/A Slot Size: N/A Seal: N/A Screened Interval: N/A

Depth (feet)	Sample	Blows	PID (ppm) headspace	Odor	TPH (ppm)	USGS	Description: Name, Primary Composition (%), Secondary Composition (%), Silt (%), Color, Grain size, Sorting, Texture/Consistency, Induration, Moisture, Other distinguishing features.	Well Completion Details
							ASPHALT (5" Thick)	
			0	N			SANDY SILT; 60-70% silt; 30-40% very fine grained sand. Dark yellow- brown, trace iron oxide veins, slight plasticity, very stiff and damp.	
5								
			0	N		ML	At 7' to 11' coarse grained angular gravel layer 3-6" thick.	
10			0	N				
							At 13' same as above trace - gravel. Faint product odor.	
15							At 15' - wet.	
			104	Y			Refusal at 16.5'.	
20								
25								

General Remarks:

- TPH = Total Petroleum Hydrocarbon concentrations analyzed using Method _____.
- ND = Not detected, or levels were below analytical detection limits.
- NA = Not Analyzed.

This summary applies only at the location of this boring, and at the time of drilling. Subsurface conditions may differ at other locations, and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

APPENDIX B
LABORATORY REPORT

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OnSite Environmental Inc.
Analytical Testing and Mobile Laboratory Services

August 23, 2000

Paul Bianco
Terra Vac
23106 100th Avenue West
Edmonds, WA 98020

Re: Analytical Data for Project 32-0029
Laboratory Reference No. 0008-098

Dear Paul:

Enclosed are the analytical results and associated quality control data for samples submitted on August 10, 2000.

The standard policy of OnSite Environmental Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister
Project Manager

Enclosures

14648 NE 95th Street, Redmond, WA 98052 • (425) 883-3881 • Fax (425) 885-4603

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

NWTPH-Gx/BTEX

Date Extracted: 8-11-00
Date Analyzed: 8-12-00

Matrix: Soil
Units: mg/Kg (ppm)

Client ID:	**B-15-13.5**			**B18-16**		
Lab ID:	08-098-01			08-098-02		
	Result	Flags	PQL	**Result**	Flags	PQL
Benzene	**ND**		0.063	**ND**		0.066
Toluene	**ND**		0.063	**ND**		0.066
Ethyl Benzene	**ND**		0.063	**ND**		0.066
m,p-Xylene	**ND**		0.063	**ND**		0.066
o-Xylene	**ND**		0.063	**ND**		0.066
TPH-Gas	**ND**		6.3	**ND**		6.6
Surrogate Recovery:						
Fluorobenzene	77%			80%		

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

NWTPH-Gx/BTEX

Date Extracted: 8-11-00
Date Analyzed: 8-12&13-00

Matrix: Soil
Units: mg/Kg (ppm)

Client ID:	**B17-13.5**			**B16-2.5**		
Lab ID:	08-098-03			08-098-04		
	Result	Flags	PQL	**Result**	Flags	PQL
Benzene	**ND**		0.35	**ND**		0.063
Toluene	**ND**		0.35	**ND**		0.063
Ethyl Benzene	**0.38**		0.35	**ND**		0.063
m,p-Xylene	**4.0**		0.35	**ND**		0.063
o-Xylene	**1.2**		0.35	**ND**		0.063
TPH-Gas	**890**		35	**ND**		6.3
Surrogate Recovery: Fluorobenzene	75%			82%		

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

NWTPH-Gx/BTEX

Date Extracted: 8-11-00
Date Analyzed: 8-12&13-00

Matrix: Soil
Units: mg/Kg (ppm)

Client ID:	**B17-17.5**			**B14-14.5**		
Lab ID:	08-098-05			08-098-06		
	Result	Flags	PQL	**Result**	Flags	PQL
Benzene	**4.5**		1.3	**ND**		0.064
Toluene	**37**		1.3	**ND**		0.064
Ethyl Benzene	**140**	**E**	1.3	**ND**		0.064
m,p-Xylene	**600**	**E**	1.3	**ND**		0.064
o-Xylene	**280**	**E**	1.3	**ND**		0.064
TPH-Gas	**22000**	**E**	130	**ND**		6.4
Surrogate Recovery:						
Fluorobenzene	114%			92%		

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

NWTPH-Gx/BTEX
METHOD BLANK QUALITY CONTROL

Date Extracted: 8-11-00
Date Analyzed: 8-12-00

Matrix: Soil
Units: mg/Kg (ppm)

Lab ID: MB0811S3

	Result	Flags	PQL
Benzene	**ND**		0.050
Toluene	**ND**		0.050
Ethyl Benzene	**ND**		0.050
m,p-Xylene	**ND**		0.050
o-Xylene	**ND**		0.050
TPH-Gas	**ND**		5.0

Surrogate Recovery:
Fluorobenzene 89%

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

NWTPH-Gx/BTEX
METHOD BLANK QUALITY CONTROL

Date Extracted: 8-11-00
Date Analyzed: 8-12-00

Matrix: Soil
Units: mg/Kg (ppm)

Lab ID: MB0811S4

	Result	Flags	PQL
Benzene	**ND**		0.050
Toluene	**ND**		0.050
Ethyl Benzene	**ND**		0.050
m,p-Xylene	**ND**		0.050
o-Xylene	**ND**		0.050
TPH-Gas	**ND**		5.0

Surrogate Recovery:
Fluorobenzene 94%

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

NWTPH-Gx/BTEX 8021
DUPLICATE QUALITY CONTROL

Date Extracted: 8-11-00
Date Analyzed: 8-13-00

Matrix: Soil
Units: mg/Kg (ppm)

Lab ID:	08-081-02 Original	08-081-02 Duplicate	RPD	Flags
Benzene	ND	ND	NA	
Toluene	ND	ND	NA	
Ethyl Benzene	ND	ND	NA	
m,p-Xylene	ND	ND	NA	
o-Xylene	ND	ND	NA	
TPH-Gas	ND	ND	NA	
Surrogate Recovery:				
Fluorobenzene	88%	89%		

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

NWTPH-Gx/BTEX
DUPLICATE QUALITY CONTROL

Date Extracted: 8-11-00
Date Analyzed: 8-12-00

Matrix: Soil
Units: mg/Kg (ppm)

Lab ID:	08-122-03 **Original**	08-122-03 **Duplicate**	**RPD**	**Flags**
Benzene	**ND**	**ND**	NA	
Toluene	**ND**	**ND**	NA	
Ethyl Benzene	**ND**	**ND**	NA	
m,p-Xylene	**ND**	**ND**	NA	
o-Xylene	**ND**	**ND**	NA	
TPH-Gas	**ND**	**ND**	NA	
Surrogate Recovery:				
Fluorobenzene	86%	86%		

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

NWTPH-Gx/BTEX
MS/MSD QUALITY CONTROL

Date Extracted: 8-11-00
Date Analyzed: 8-12-00

Matrix: Soil
Units: mg/Kg (ppm)

Spike Level: 1.00 ppm

Lab ID:	08-081-02 **MS**	Percent Recovery	08-081-02 **MSD**	Percent Recovery	**RPD**	**Flags**
Benzene	**0.870**	**87**	**0.921**	**92**	5.7	
Toluene	**0.873**	**87**	**0.917**	**92**	4.9	
Ethyl Benzene	**0.864**	**86**	**0.907**	**91**	4.9	
m,p-Xylene	**0.868**	**87**	**0.911**	**91**	4.8	
o-Xylene	**0.876**	**88**	**0.917**	**92**	4.5	

Surrogate Recovery:

Fluorobenzene	83%	87%

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

SEMIVOLATILES by EPA 8270C
page 1 of 3

Date Extracted:	8-15-00
Date Analyzed:	8-15-00
Matrix:	Soil
Units:	mg/Kg (ppm)
Lab ID:	08-098-01
Client ID:	**B-15-13.5**

Compound:	**Results**	**Flags**	**PQL**
Aniline	ND		0.042
bis(2-Chloroethyl)ether	ND		0.042
Phenol	ND		0.042
2-Chlorophenol	ND		0.042
1,3-Dichlorobenzene	ND		0.042
1,4-Dichlorobenzene	ND		0.042
1,2-Dichlorobenzene	ND		0.042
Benzyl alcohol	ND		0.042
bis(2-chloroisopropyl)ether	ND		0.042
2-Methylphenol	ND		0.042
Hexachloroethane	ND		0.042
N-Nitroso-di-n-propylamine	ND		0.042
4-Methylphenol	ND		0.042
Nitrobenzene	ND		0.042
Isophorone	ND		0.042
2-Nitrophenol	ND		0.42
2,4-Dimethylphenol	ND		0.042
bis(2-Chloroethoxy)methane	ND		0.042
2,4-Dichlorophenol	ND		0.42
Benzoic acid	ND		1.0
1,2,4-Trichlorobenzene	ND		0.042
Naphthalene	ND		0.042
4-Chloroaniline	ND		0.042
Hexachlorobutadiene	ND		0.042
4-Chloro-3-methylphenol	ND		0.42
2-Methylnaphthalene	ND		0.042

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

SEMIVOLATILES by EPA 8270C
page 2 of 3

Lab ID: 08-098-01
Client ID: B-15-13.5

Compound:	Results	Flags	PQL
Hexachlorocyclopentadiene	ND		0.42
2,4,6-Trichlorophenol	ND		0.42
2,4,5-Trichlorophenol	ND		0.42
2-Chloronaphthalene	ND		0.042
2-Nitroaniline	ND		0.42
Acenaphthylene	ND		0.042
Dimethylphthalate	ND		0.042
2,6-Dinitrotoluene	ND		0.042
Acenaphthene	ND		0.042
3-Nitroaniline	ND		0.42
2,4-Dinitrophenol	ND		0.42
Dibenzofuran	ND		0.042
2,4-Dinitrotoluene	ND		0.042
4-Nitrophenol	ND		0.42
Fluorene	ND		0.042
4-Chlorophenyl-phenylether	ND		0.042
Diethylphthalate	ND		0.042
4-Nitroaniline	ND		0.42
4,6-Dinitro-2-methylphenol	ND		0.42
n-Nitrosodiphenylamine	ND		0.042
4-Bromophenyl-phenylether	ND		0.042
Hexachlorobenzene	ND		0.042
Pentachlorophenol	ND		0.42
Phenanthrene	ND		0.042
Anthracene	ND		0.042
Carbazole	ND		0.042
Di-n-butylphthalate	ND		0.042
Fluoranthene	ND		0.042
Benzidine	ND		0.42
Pyrene	ND		0.042

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

SEMIVOLATILES by EPA 8270C
page 3 of 3

Lab ID: 08-098-01
Client ID: B-15-13.5

Compound:	**Results**	**Flags**	**PQL**
Butylbenzylphthalate	ND		0.042
3,3'-Dichlorobenzidine	ND		0.042
Benzo[a]anthracene	ND		0.042
Chrysene	ND		0.042
bis(2-Ethylhexyl)phthalate	0.21		0.21
Di-n-octylphthalate	ND		0.042
Benzo[b]fluoranthene	ND		0.042
Benzo[k]fluoranthene	ND		0.042
Benzo[a]pyrene	ND		0.042
Indeno[1,2,3-cd]pyrene	ND		0.042
Dibenz[a,h]anthracene	ND		0.042
Benzo[g,h,i]perylene	ND		0.042

Surrogate :	**Percent Recovery**	**Control Limits**
2-Fluorophenol	57	25 - 121
Phenol-d6	64	24 - 113
Nitrobenzene-d5	63	23 - 120
2-Fluorobiphenyl	67	30 - 115
2,4,6-Tribromophenol	85	19 - 122
Terphenyl-d14	95	18 - 137

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

SEMIVOLATILES by EPA 8270C
page 1 of 3

Date Extracted:	8-15-00
Date Analyzed:	8-16-00
Matrix:	Soil
Units:	mg/Kg (ppm)
Lab ID:	08-098-02
Client ID:	**B18-16**

Compound:	**Results**	**Flags**	**PQL**
Aniline	ND		0.044
bis(2-Chloroethyl)ether	ND		0.044
Phenol	ND		0.044
2-Chlorophenol	ND		0.044
1,3-Dichlorobenzene	ND		0.044
1,4-Dichlorobenzene	ND		0.044
1,2-Dichlorobenzene	ND		0.044
Benzyl alcohol	ND		0.044
bis(2-chloroisopropyl)ether	ND		0.044
2-Methylphenol	ND		0.044
Hexachloroethane	ND		0.044
N-Nitroso-di-n-propylamine	ND		0.044
4-Methylphenol	ND		0.044
Nitrobenzene	ND		0.044
Isophorone	ND		0.044
2-Nitrophenol	ND		0.44
2,4-Dimethylphenol	ND		0.044
bis(2-Chloroethoxy)methane	ND		0.044
2,4-Dichlorophenol	ND		0.44
Benzoic acid	ND		1.1
1,2,4-Trichlorobenzene	ND		0.044
Naphthalene	ND		0.044
4-Chloroaniline	ND		0.044
Hexachlorobutadiene	ND		0.044
4-Chloro-3-methylphenol	ND		0.44
2-Methylnaphthalene	ND		0.044

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

SEMIVOLATILES by EPA 8270C
page 2 of 3

Lab ID: 08-098-02
Client ID: B18-16

Compound:	Results	Flags	PQL
Hexachlorocyclopentadiene	ND		0.44
2,4,6-Trichlorophenol	ND		0.44
2,4,5-Trichlorophenol	ND		0.44
2-Chloronaphthalene	ND		0.044
2-Nitroaniline	ND		0.44
Acenaphthylene	ND		0.044
Dimethylphthalate	ND		0.044
2,6-Dinitrotoluene	ND		0.044
Acenaphthene	ND		0.044
3-Nitroaniline	ND		0.44
2,4-Dinitrophenol	ND		0.44
Dibenzofuran	ND		0.044
2,4-Dinitrotoluene	ND		0.044
4-Nitrophenol	ND		0.44
Fluorene	ND		0.044
4-Chlorophenyl-phenylether	ND		0.044
Diethylphthalate	ND		0.044
4-Nitroaniline	ND		0.44
4,6-Dinitro-2-methylphenol	ND		0.44
n-Nitrosodiphenylamine	ND		0.044
4-Bromophenyl-phenylether	ND		0.044
Hexachlorobenzene	ND		0.044
Pentachlorophenol	ND		0.44
Phenanthrene	ND		0.044
Anthracene	ND		0.044
Carbazole	ND		0.044
Di-n-butylphthalate	ND		0.044
Fluoranthene	ND		0.044
Benzidine	ND		0.44
Pyrene	ND		0.044

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

SEMIVOLATILES by EPA 8270C
page 3 of 3

Lab ID: 08-098-02
Client ID: B18-16

Compound:	**Results**	**Flags**	**PQL**
Butylbenzylphthalate	ND		0.044
3,3'-Dichlorobenzidine	ND		0.044
Benzo[a]anthracene	ND		0.044
Chrysene	ND		0.044
bis(2-Ethylhexyl)phthalate	25	H	2.2
Di-n-octylphthalate	ND		0.044
Benzo[b]fluoranthene	ND		0.044
Benzo[k]fluoranthene	ND		0.044
Benzo[a]pyrene	ND		0.044
Indeno[1,2,3-cd]pyrene	ND		0.044
Dibenz[a,h]anthracene	ND		0.044
Benzo[g,h,i]perylene	ND		0.044

Surrogate :	**Percent Recovery**	**Control Limits**
2-Fluorophenol	59	25 - 121
Phenol-d6	67	24 - 113
Nitrobenzene-d5	68	23 - 120
2-Fluorobiphenyl	78	30 - 115
2,4,6-Tribromophenol	91	19 - 122
Terphenyl-d14	100	18 - 137

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

SEMIVOLATILES by EPA 8270C
page 1 of 3

Date Extracted:	8-15-00
Date Analyzed:	8-16-00
Matrix:	Soil
Units:	mg/Kg (ppm)
Lab ID:	08-098-04
Client ID:	**B16-2.5**

Compound:	**Results**	**Flags**	**PQL**
Aniline	ND		0.042
bis(2-Chloroethyl)ether	ND		0.042
Phenol	ND		0.042
2-Chlorophenol	ND		0.042
1,3-Dichlorobenzene	ND		0.042
1,4-Dichlorobenzene	ND		0.042
1,2-Dichlorobenzene	ND		0.042
Benzyl alcohol	ND		0.042
bis(2-chloroisopropyl)ether	ND		0.042
2-Methylphenol	ND		0.042
Hexachloroethane	ND		0.042
N-Nitroso-di-n-propylamine	ND		0.042
4-Methylphenol	ND		0.042
Nitrobenzene	ND		0.042
Isophorone	ND		0.042
2-Nitrophenol	ND		0.42
2,4-Dimethylphenol	ND		0.042
bis(2-Chloroethoxy)methane	ND		0.042
2,4-Dichlorophenol	ND		0.42
Benzoic acid	ND		1.0
1,2,4-Trichlorobenzene	ND		0.042
Naphthalene	ND		0.042
4-Chloroaniline	ND		0.042
Hexachlorobutadiene	ND		0.042
4-Chloro-3-methylphenol	ND		0.42
2-Methylnaphthalene	ND		0.042

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

SEMIVOLATILES by EPA 8270C
page 2 of 3

Lab ID: 08-098-04
Client ID: B16-2.5

Compound:	Results	Flags	PQL
Hexachlorocyclopentadiene	ND		0.42
2,4,6-Trichlorophenol	ND		0.42
2,4,5-Trichlorophenol	ND		0.42
2-Chloronaphthalene	ND		0.042
2-Nitroaniline	ND		0.42
Acenaphthylene	ND		0.042
Dimethylphthalate	ND		0.042
2,6-Dinitrotoluene	ND		0.042
Acenaphthene	ND		0.042
3-Nitroaniline	ND		0.42
2,4-Dinitrophenol	ND		0.42
Dibenzofuran	ND		0.042
2,4-Dinitrotoluene	ND		0.042
4-Nitrophenol	ND		0.42
Fluorene	ND		0.042
4-Chlorophenyl-phenylether	ND		0.042
Diethylphthalate	ND		0.042
4-Nitroaniline	ND		0.42
4,6-Dinitro-2-methylphenol	ND		0.42
n-Nitrosodiphenylamine	ND		0.042
4-Bromophenyl-phenylether	ND		0.042
Hexachlorobenzene	ND		0.042
Pentachlorophenol	ND		0.42
Phenanthrene	ND		0.042
Anthracene	ND		0.042
Carbazole	ND		0.042
Di-n-butylphthalate	ND		0.042
Fluoranthene	ND		0.042
Benzidine	ND		0.42
Pyrene	ND		0.042

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

SEMIVOLATILES by EPA 8270C
page 3 of 3

Lab ID: 08-098-04
Client ID: B16-2.5

Compound:	**Results**	**Flags**	**PQL**
Butylbenzylphthalate	ND		0.042
3,3'-Dichlorobenzidine	ND		0.042
Benzo[a]anthracene	ND		0.042
Chrysene	ND		0.042
bis(2-Ethylhexyl)phthalate	ND		0.21
Di-n-octylphthalate	ND		0.042
Benzo[b]fluoranthene	ND		0.042
Benzo[k]fluoranthene	ND		0.042
Benzo[a]pyrene	ND		0.042
Indeno[1,2,3-cd]pyrene	ND		0.042
Dibenz[a,h]anthracene	ND		0.042
Benzo[g,h,i]perylene	ND		0.042

Surrogate :	**Percent Recovery**	**Control Limits**
2-Fluorophenol	59	25 - 121
Phenol-d6	65	24 - 113
Nitrobenzene-d5	64	23 - 120
2-Fluorobiphenyl	75	30 - 115
2,4,6-Tribromophenol	83	19 - 122
Terphenyl-d14	97	18 - 137

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

SEMIVOLATILES by EPA 8270C
page 1 of 3

Date Extracted:	8-15-00
Date Analyzed:	8-16-00
Matrix:	Soil
Units:	mg/Kg (ppm)
Lab ID:	08-098-05
Client ID:	**B17-17.5**

Compound:	Results	Flags	PQL
Aniline	ND		0.43
bis(2-Chloroethyl)ether	ND		0.43
Phenol	ND		0.43
2-Chlorophenol	ND		0.43
1,3-Dichlorobenzene	ND		0.43
1,4-Dichlorobenzene	ND		0.43
1,2-Dichlorobenzene	ND		0.43
Benzyl alcohol	ND		0.43
bis(2-chloroisopropyl)ether	ND		0.43
2-Methylphenol	ND		0.43
Hexachloroethane	ND		0.43
N-Nitroso-di-n-propylamine	ND		0.43
4-Methylphenol	ND		0.43
Nitrobenzene	ND		0.43
Isophorone	ND		0.43
2-Nitrophenol	ND		4.3
2,4-Dimethylphenol	ND		0.43
bis(2-Chloroethoxy)methane	ND		0.43
2,4-Dichlorophenol	ND		4.3
Benzoic acid	ND		11
1,2,4-Trichlorobenzene	ND		0.43
Naphthalene	34		0.43
4-Chloroaniline	ND		0.43
Hexachlorobutadiene	ND		0.43
4-Chloro-3-methylphenol	ND		4.3
2-Methylnaphthalene	32		0.43

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

SEMIVOLATILES by EPA 8270C
page 2 of 3

Lab ID: 08-098-05
Client ID: B17-17.5

Compound:	Results	Flags	PQL
Hexachlorocyclopentadiene	ND		0.43
2,4,6-Trichlorophenol	ND		0.43
2,4,5-Trichlorophenol	ND		0.43
2-Chloronaphthalene	ND		0.043
2-Nitroaniline	ND		0.43
Acenaphthylene	ND		0.043
Dimethylphthalate	ND		0.043
2,6-Dinitrotoluene	ND		0.043
Acenaphthene	0.13		0.043
3-Nitroaniline	ND		0.43
2,4-Dinitrophenol	0.7		0.43
Dibenzofuran	ND		0.043
2,4-Dinitrotoluene	ND		0.043
4-Nitrophenol	ND		0.43
Fluorene	0.061		0.043
4-Chlorophenyl-phenylether	ND		0.043
Diethylphthalate	ND		0.043
4-Nitroaniline	ND		0.43
4,6-Dinitro-2-methylphenol	ND		0.43
n-Nitrosodiphenylamine	ND		0.043
4-Bromophenyl-phenylether	ND		0.043
Hexachlorobenzene	ND		0.043
Pentachlorophenol	ND		0.43
Phenanthrene	0.13		0.043
Anthracene	ND		0.043
Carbazole	ND		0.043
Di-n-butylphthalate	ND		0.043
Fluoranthene	ND		0.043
Benzidine	ND		0.43
Pyrene	0.075		0.043

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

SEMIVOLATILES by EPA 8270C
page 3 of 3

Lab ID: 08-098-05
Client ID: B17-17.5

Compound:	Results	Flags	PQL
Butylbenzylphthalate	ND		0.043
3,3'-Dichlorobenzidine	ND		0.043
Benzo[a]anthracene	ND		0.043
Chrysene	ND		0.043
bis(2-Ethylhexyl)phthalate	ND		0.21
Di-n-octylphthalate	ND		0.043
Benzo[b]fluoranthene	ND		0.043
Benzo[k]fluoranthene	ND		0.043
Benzo[a]pyrene	ND		0.043
Indeno[1,2,3-cd]pyrene	ND		0.043
Dibenz[a,h]anthracene	ND		0.043
Benzo[g,h,i]perylene	ND		0.043

Surrogate :	Percent Recovery		Control Limits
2-Fluorophenol	0	R	25 - 121
Phenol-d6	0	R	24 - 113
Nitrobenzene-d5	0	R	23 - 120
2-Fluorobiphenyl	92		30 - 115
2,4,6-Tribromophenol	94		19 - 122
Terphenyl-d14	102		18 - 137

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

SEMIVOLATILES by EPA 8270C
page 1 of 3

Date Extracted:	8-15-00
Date Analyzed:	8-16-00
Matrix:	Soil
Units:	mg/Kg (ppm)
Lab ID:	08-098-06
Client ID:	**B14-14.5**

Compound:	**Results**	**Flags**	**PQL**
Aniline	ND		0.043
bis(2-Chloroethyl)ether	ND		0.043
Phenol	ND		0.043
2-Chlorophenol	ND		0.043
1,3-Dichlorobenzene	ND		0.043
1,4-Dichlorobenzene	ND		0.043
1,2-Dichlorobenzene	ND		0.043
Benzyl alcohol	ND		0.043
bis(2-chloroisopropyl)ether	ND		0.043
2-Methylphenol	ND		0.043
Hexachloroethane	ND		0.043
N-Nitroso-di-n-propylamine	ND		0.043
4-Methylphenol	ND		0.043
Nitrobenzene	ND		0.043
Isophorone	ND		0.043
2-Nitrophenol	ND		0.43
2,4-Dimethylphenol	ND		0.043
bis(2-Chloroethoxy)methane	ND		0.043
2,4-Dichlorophenol	ND		0.43
Benzoic acid	ND		1.1
1,2,4-Trichlorobenzene	ND		0.043
Naphthalene	ND		0.043
4-Chloroaniline	ND		0.043
Hexachlorobutadiene	ND		0.043
4-Chloro-3-methylphenol	ND		0.43
2-Methylnaphthalene	ND		0.043

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

SEMIVOLATILES by EPA 8270C
page 2 of 3

Lab ID: 08-098-06
Client ID: B14-14.5

Compound:	Results	Flags	PQL
Hexachlorocyclopentadiene	ND		0.43
2,4,6-Trichlorophenol	ND		0.43
2,4,5-Trichlorophenol	ND		0.43
2-Chloronaphthalene	ND		0.043
2-Nitroaniline	ND		0.43
Acenaphthylene	ND		0.043
Dimethylphthalate	ND		0.043
2,6-Dinitrotoluene	ND		0.043
Acenaphthene	ND		0.043
3-Nitroaniline	ND		0.43
2,4-Dinitrophenol	ND		0.43
Dibenzofuran	ND		0.043
2,4-Dinitrotoluene	ND		0.043
4-Nitrophenol	ND		0.43
Fluorene	ND		0.043
4-Chlorophenyl-phenylether	ND		0.043
Diethylphthalate	ND		0.043
4-Nitroaniline	ND		0.43
4,6-Dinitro-2-methylphenol	ND		0.43
n-Nitrosodiphenylamine	ND		0.043
4-Bromophenyl-phenylether	ND		0.043
Hexachlorobenzene	ND		0.043
Pentachlorophenol	ND		0.43
Phenanthrene	ND		0.043
Anthracene	ND		0.043
Carbazole	ND		0.043
Di-n-butylphthalate	ND		0.043
Fluoranthene	ND		0.043
Benzidine	ND		0.43
Pyrene	ND		0.043

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

SEMIVOLATILES by EPA 8270C
page 3 of 3

Lab ID: 08-098-06
Client ID: B14-14.5

Compound:	**Results**	**Flags**	**PQL**
Butylbenzylphthalate	ND		0.043
3,3'-Dichlorobenzidine	ND		0.043
Benzo[a]anthracene	ND		0.043
Chrysene	ND		0.043
bis(2-Ethylhexyl)phthalate	ND		0.21
Di-n-octylphthalate	ND		0.043
Benzo[b]fluoranthene	ND		0.043
Benzo[k]fluoranthene	ND		0.043
Benzo[a]pyrene	ND		0.043
Indeno[1,2,3-cd]pyrene	ND		0.043
Dibenz[a,h]anthracene	ND		0.043
Benzo[g,h,i]perylene	ND		0.043

Surrogate :	**Percent Recovery**	**Control Limits**
2-Fluorophenol	49	25 - 121
Phenol-d6	56	24 - 113
Nitrobenzene-d5	56	23 - 120
2-Fluorobiphenyl	71	30 - 115
2,4,6-Tribromophenol	79	19 - 122
Terphenyl-d14	96	18 - 137

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

SEMIVOLATILES by EPA 8270C
METHOD BLANK QUALITY CONTROL
page 1 of 3

Date Extracted:	8-15-00
Date Analyzed:	8-15-00
Matrix:	Soil
Units:	mg/Kg (ppm)
Lab ID:	MB0815S1

Compound:	Results	Flags	PQL
Aniline	ND		0.033
bis(2-Chloroethyl)ether	ND		0.033
Phenol	ND		0.033
2-Chlorophenol	ND		0.033
1,3-Dichlorobenzene	ND		0.033
1,4-Dichlorobenzene	ND		0.033
1,2-Dichlorobenzene	ND		0.033
Benzyl alcohol	ND		0.033
bis(2-chloroisopropyl)ether	ND		0.033
2-Methylphenol	ND		0.033
Hexachloroethane	ND		0.033
N-Nitroso-di-n-propylamine	ND		0.033
4-Methylphenol	ND		0.033
Nitrobenzene	ND		0.033
Isophorone	ND		0.033
2-Nitrophenol	ND		0.33
2,4-Dimethylphenol	ND		0.033
bis(2-Chloroethoxy)methane	ND		0.033
2,4-Dichlorophenol	ND		0.33
Benzoic acid	ND		0.83
1,2,4-Trichlorobenzene	ND		0.033
Naphthalene	ND		0.033
4-Chloroaniline	ND		0.033
Hexachlorobutadiene	ND		0.033
4-Chloro-3-methylphenol	ND		0.33
2-Methylnaphthalene	ND		0.033

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

SEMIVOLATILES by EPA 8270C
METHOD BLANK QUALITY CONTROL
page 2 of 3

Lab ID: MB0815S1

Compound:	Results	Flags	PQL
Hexachlorocyclopentadiene	ND		0.33
2,4,6-Trichlorophenol	ND		0.33
2,4,5-Trichlorophenol	ND		0.33
2-Chloronaphthalene	ND		0.033
2-Nitroaniline	ND		0.33
Acenaphthylene	ND		0.033
Dimethylphthalate	ND		0.033
2,6-Dinitrotoluene	ND		0.033
Acenaphthene	ND		0.033
3-Nitroaniline	ND		0.33
2,4-Dinitrophenol	ND		0.33
Dibenzofuran	ND		0.033
2,4-Dinitrotoluene	ND		0.033
4-Nitrophenol	ND		0.33
Fluorene	ND		0.033
4-Chlorophenyl-phenylether	ND		0.033
Diethylphthalate	ND		0.033
4-Nitroaniline	ND		0.33
4,6-Dinitro-2-methylphenol	ND		0.33
n-Nitrosodiphenylamine	ND		0.033
4-Bromophenyl-phenylether	ND		0.033
Hexachlorobenzene	ND		0.033
Pentachlorophenol	ND		0.33
Phenanthrene	ND		0.033
Anthracene	ND		0.033
Carbazole	ND		0.033
Di-n-butylphthalate	ND		0.033
Fluoranthene	ND		0.033
Benzidine	ND		0.33
Pyrene	ND		0.033

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

SEMIVOLATILES by EPA 8270C
METHOD BLANK QUALITY CONTROL
page 3 of 3

Lab ID: MB0815S1

Compound:	Results	Flags	PQL
Butylbenzylphthalate	ND		0.033
3,3'-Dichlorobenzidine	ND		0.033
Benzo[a]anthracene	ND		0.033
Chrysene	ND		0.033
bis(2-Ethylhexyl)phthalate	ND		0.17
Di-n-octylphthalate	ND		0.033
Benzo[b]fluoranthene	ND		0.033
Benzo[k]fluoranthene	ND		0.033
Benzo[a]pyrene	ND		0.033
Indeno[1,2,3-cd]pyrene	ND		0.033
Dibenz[a,h]anthracene	ND		0.033
Benzo[g,h,i]perylene	ND		0.033

Surrogate :	Percent Recovery	Control Limits
2-Fluorophenol	65	25 - 121
Phenol-d6	73	24 - 113
Nitrobenzene-d5	73	23 - 120
2-Fluorobiphenyl	80	30 - 115
2,4,6-Tribromophenol	89	19 - 122
Terphenyl-d14	97	18 - 137

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

SEMIVOLATILES by EPA 8270C
MS/MSD QUALITY CONTROL

Date Extracted: 8-15-00
Date Analyzed: 8-15-00

Matrix: Soil
Units: mg/Kg (ppm)

Lab ID: 08-108-08

Compound:	Spike Amount	MS	Percent Recovery	MSD	Percent Recovery	RPD	Flags
Phenol	3.47	2.38	68	2.30	66	3.3	
2-Chlorophenol	3.47	2.35	68	2.28	66	3.2	
1,4-Dichlorobenzene	1.74	1.03	59	0.975	56	5.4	
N-Nitroso-di-n-propylamine	1.74	1.28	74	1.20	69	6.6	
1,2,4-Trichlorobenzene	1.74	1.20	69	1.17	67	2.6	
4-Chloro-3-methylphenol	3.47	2.95	85	2.67	77	9.9	
Acenaphthene	1.74	1.56	90	1.37	79	13	
2,4-Dinitrotoluene	1.74	1.69	97	1.46	84	14	
4-Nitrophenol	3.47	3.17	91	2.94	85	7.4	
Pentachlorophenol	3.47	2.79	80	2.79	80	0.1	
Pyrene	1.74	1.60	92	1.56	90	2.5	

Date of Report: August 23, 2000
Samples Submitted: August 10, 2000
Lab Traveler: 08-098
Project: 32-0029

Date Analyzed: 8-11-00

% MOISTURE

Client ID	Lab ID	% Moisture
B-15-13.5	08-098-01	20
B18-16	08-098-02	24
B17-13.5	08-098-03	28
B16-2.5	08-098-04	20
B17-17.5	08-098-05	22
B14-14.5	08-098-06	22

OnSite Environmental Inc.

DATA QUALIFIERS AND ABBREVIATIONS

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

D - Data from 1:____ dilution.

E - The value reported exceeds the quantitation range, and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

G - Insufficient sample quantity for duplicate analysis.

H - The analyte indicated may have been introduced during sample preparation. This is consistent with contamination that has been attributed to the laboratory Nitrogen Evaporation system that concentrates the final extracts. Since the levels present in the sample are well below clean-up levels, the analyte is reported and the sample was not re-extracted.

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeniety. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range (toluene-napthalene) are present in the sample.

O - Hydrocarbons outside the defined gasoline range are present in the sample; NWTPH-Dx recommended.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

R - The internal standard area counts of 1,4-Dichlorobenzene-$_{d4}$ and Naphthalene-$_{d8}$ could not be determined due to severe matrix effects. Consequently, all analytes and surrogates associated with these two internal standards could not be determined. The affected analytes were re-analyzed utilizing a 10 fold dilution that had acceptable area counts for all of the internal standards.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical _____.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.

X - Sample extract treated with a silica gel cleanup procedure.

Y - Sample extract treated with an acid cleanup procedure.

Chain of Custody

OnSite Environmental Inc.
14648 NE 95th Street • Redmond, WA 98052
Fax: (425) 885-4603 • Phone: (425) 883-3881

Turnaround Request (in working days)

(Check One)

☐ Same Day ☐ 1 Day
☐ 2 Day ☐ 3 Day
☒ Standard
(Hydrocarbon analyses: 5 days, All other analyses: 7 days)
☐ 8/17 - 8/18 (other)

Project Chemist: DB

Laboratory No. 08-098

Company: Terra Vac
Project No.: 32-0029
Project Name: Roses Parking Lot
Project Manager: Mr. Paul Bianco

Requested Analysis

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	# of Cont.	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Dx	Volatiles by 8260B	Halogenated Volatiles by 8260B	Semivolatiles by 8270C	PAHs by 8270C	PCB's by 8082	Pesticides by 8081	Total RCRA Metals (8)	TCLP Metals	VPH	EPH	Lead 6010 DB 8/10/00	% Moisture
1	B-15-13.5	8.7.00	10:20	S	1		X				X								X	X
2	B 18-16	8.7.00	13:05	S	1		X				X								X	X
3	B 17-13.5	8.7.00	11:43	S	2		X												X	X
4	B16-2.5	8.7.00	10:48	S	1		X				X								X	X
5	B17-17.5	8.7.00	11:53	S	1		X				X								X	X
6	B14-14.5	8.7.00	08:21	S	1		X				X								X	X

RELINQUISHED BY	DATE	RECEIVED BY	DATE
	8.9.00	Speedy 31 Jon Larson	
FIRM Terra Vac	TIME	FIRM Speedy Messenger	TIME
RELINQUISHED BY	DATE	RECEIVED BY	DATE 8/10/00
FIRM	TIME	FIRM OSE	TIME
REVIEWED BY		DATE REVIEWED	

COMMENTS:

Chromatographs with final report ☐

DISTRIBUTION LEGEND: White - OnSite Copy Yellow - Report Copy Pink - Client Copy

UST CLEANUP TELEPHONE USE REPORT

CALL FROM (TO): Paul Bianco DATE: 8/9/00

WITH: Tara Vac TIME: 4:30

TELEPHONE NO: (425) 697-5131

REGARDING: Rosas Parking Lot

FILE NO: 26-94-25

SUMMARY OF CALL

Push probe work was done 8/8/00. They forgot to notify me of fieldwork. Expect results in a couple weeks and report soon after. One hole had significant PID hits the others light. Most holes bottomed out at 17'

Staff Signature

TERRA VAC

Terra Vac
Northwest Division
23106 100th Avenue West
Edmonds, WA 98020-5018
425-697-5131 Tel
425-697-6211 Fax

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
JUN 15 2000
NORTHWEST REGION

June 12, 2000

Mr. Robert Williams
Oregon Department of Environmental Quality
2020 SW 4th Avenue, Suite 400
Portland, OR 97201-4987

Subject: Soil Quality Investigation Workplan
330 NW 23rd Avenue, Portland, Oregon

Dear Mr. Williams:

Terra Vac has prepared a workplan for characterizing subsurface soil quality at Rose's Parking Lot, 330 NW 23rd Avenue, Portland, Oregon (herein known as the Site). The purpose of this investigation is to confirm, at the request of the Oregon Department of Environmental Quality (DEQ), that Terra Vac's Dual Vapor Extraction (DVE) system has effectively treated petroleum contaminated soil at the Site. Terra Vac's objectives for the soil quality investigation are as follows:

- Install five soil probes at the Site and collect a sufficient number of subsurface soil samples to aid in documenting the post-remediation concentrations of the contaminants of concern (COC);
- Provide soil quality data to the DEQ showing that the concentrations of COC are equal to or less than applicable cleanup levels; and
- Prepare a report detailing our findings, conclusions, and recommendations.

Our scope of work for this project is presented below.

SCOPE OF WORK

Task 1. Underground Utility Locating

Prior to installing soil probes, Terra Vac will locate underground utilities. Terra Vac will contact both local utilities and private firms to identify, locate, and mark utilities at the Site.

Task 2. Subsurface Soil Sampling

Five soil probes (B-14, B-15, B-16, B-17, and B-18) will be pushed at the Site using a geoprobe or similar device. Probes will be pushed to approximately 20 feet below ground surface (bgs) or

printed on recycled paper

until groundwater is encountered. Soil samples will be collected at 5-foot sampling depth intervals using a split-spoon sampler driven to the desired sampling depth. Using a stainless steel spoon, a soil sample will be extracted from the sampler and placed in a preconditioned sterilized glass jar provided by the laboratory. The proposed probe locations are presented in Figure 1.

All soil samples will be screened in the field using a portable gas analyzer equipped with a photoionization detector (PID). Each field screened sample will be prepared by placing an aliquot of soil into a zip-lock plastic bag and sealing the bag. Headspace vapors in the bag will be allowed to equilibrate for at least 10 minutes. After this time, the bag will be partially opened; the PID probe will then be pushed into the headspace above the soil. The concentration of total volatile organics will be read from the PID display and recorded.

All probe holes will be closed using hydrated bentonite chips. Any soil cuttings generated during drilling will be placed in 55-gallon drums. The drums will be stored at the Site and disposed of following analysis.

Decontamination Procedures

Sampling equipment will be decontaminated between samples according to the following procedures:

- Scrub equipment thoroughly with phosphate-free detergent and potable water using a brush to remove any particulate matter or surface film;
- Rinse with clean potable water;
- Triple rinse with clean, deionized, carbon-free water;
- Air dry on plastic sheeting; and
- Wrap or package equipment in aluminum foil, plastic bags, or other appropriate containers to prevent recontamination.

Task 3. Chemical Analyses

All soil samples from each hole that show significant petroleum impact during field screening will be analyzed for total petroleum hydrocarbons (TPH). In addition one soil sample from each probe location will be analyzed for BTEX+N (benzene, toluene, ethylbenzene, xylenes and naphthalene,) and poly-aromatic hydrocarbons (PAHs) using EPA Test Method 8020B and EPA Test Method 8270, respectively. Terra Vac will select soil samples for constituent analysis based on the highest PID readings from each probe location. Soil samples will not be analyzed for 1,2-dibromoethane (EDB) or 1,2-dichloroethane (EDC) because these compounds have not been historically detected.

Sample Storage, Packing, and Shipment

All samples will be stored in an iced chest while at the Site and during transportation to the laboratory. Samples will be stored in the dark at 4° C.

Chain of Custody Procedures

A chain of custody form will accompany each chest containing laboratory samples. Field personnel will retain a copy of the chain of custody; the original form will be sent with the samples to the laboratory.

Task 4. Reporting

Two weeks after receiving analytical results from the laboratory, the project manager will prepare a letter report detailing Terra Vac's findings. A copy of this report will be provided to the DEQ.

If we may provide any additional information or clarification of this workplan, please do not hesitate to call us at 425- 697-5131.

Sincerely,
Terra Vac

Paul V. Bianco, P.E.
Senior Engineer

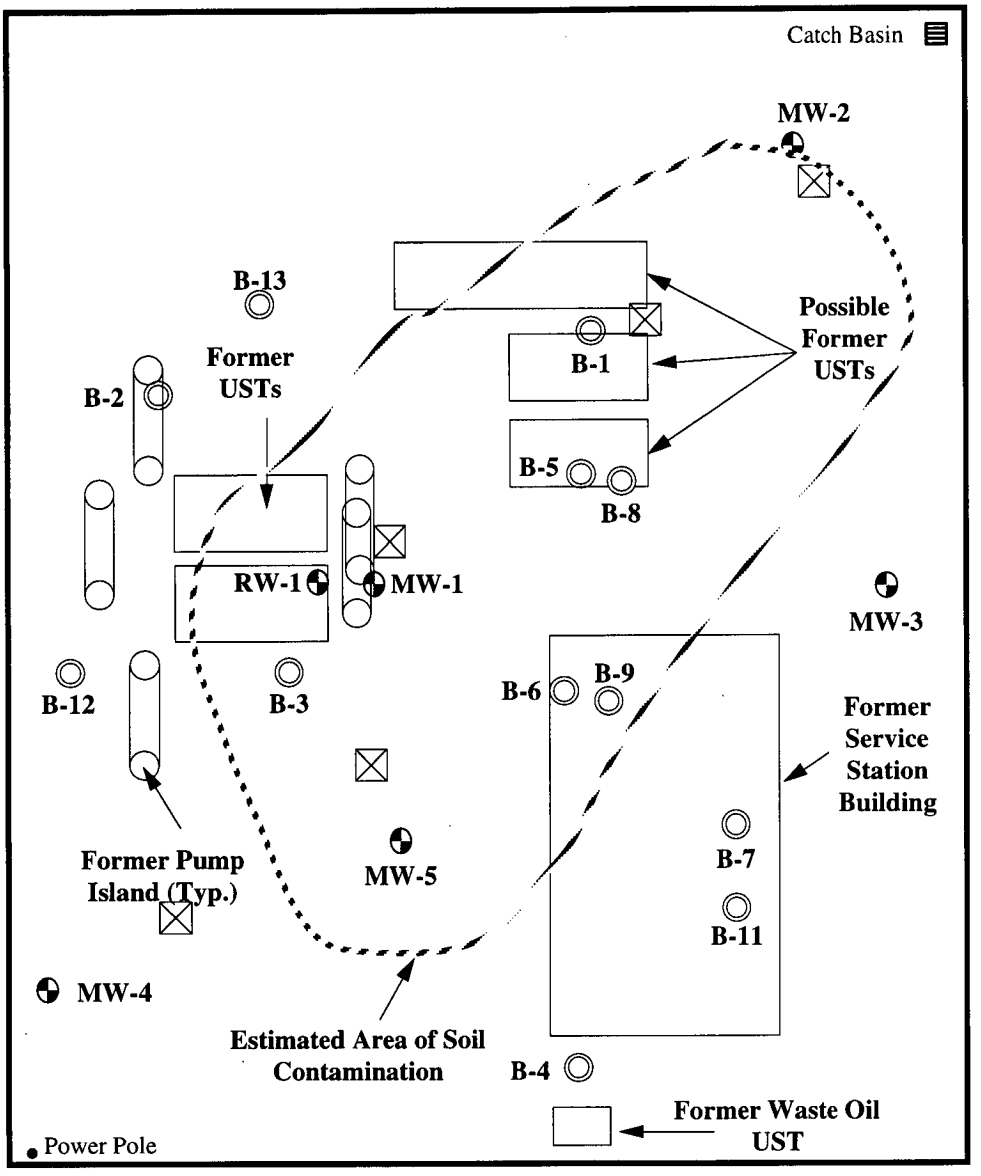
CC: Mr. Thomas Cammarata
Mr. Richard Singer
Mr. Richard Allen
32-0029.10.01

printed on recycled paper

N.W. FLANDERS STREET

N

N. W. 23RD AVENUE



LEGEND	
	Existing Recovery or Monitoring Well
	Soil Boring
	Proposed Soil Probe Locations

Notes:
(1) Base map from GeoEngineers report: "Subsurface Assessment Rose's Parking Lot Portland, Oregon" August 28, 1995. Site Plan, Figure 2

SCALE (Approximate ft.)

0 20 40

SITE MAP	Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon	TERRA VAC	Project No.	32-0029	Figure 1
			Date	June 12, 2000	
			Scale	1 Inch = 20 Feet	
			Revision	MAM -1	

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
Northwest Region
2020 SW Fourth Avenue
Suite 400
Portland, OR 97201-4987
(503) 229-5263 Voice
TTY (503) 229-5471

May 4, 2000

RICHARD SINGER
824 NW ALBEMARLE TERRACE
PORTLAND, OREGON 97210

Re: Rose's Parking Lot
File No. 26-94-0025

Dear Mr. Singer:

The Department has completed its review of the Terra Vac Soil Quality Investigation Workplan, dated April 17, 2000 for the underground storage tank (UST) cleanup at the Rose's Parking Lot at 330 NW 23rd Avenue in Portland, Oregon.

The Department approves the work plan with the following comments. The number of soil sample points and locations are not adequate. The majority of soil contamination data at the site was collected in 1994 and 1995. Primary source area locations for soil contamination appear to be located at the possible former USTs in the northern half of the site and at the pump island and former USTs near MW-1. High levels of gasoline contamination were found at B-1, B-8, B-3, MW-1, and MW-2. Lower levels of diesel contamination were found at MW-4. As shown in the GeoEngineers UST Removal and EFRT Pilot Test report, free product was found in MW-1 (up to 2.8 feet), MW-5, and RW-1. The Department proposes five sample location points. Terra Vac points SP-1 and SP-3 are maintained as shown in the Soil Probe Location Site Map. Point SP-2 has been moved to a location between MW-5 and MW-1. Two additional points have been added: one near MW-1 and another near MW-2. This layout of points should ensure that all hot spots located in the 1994-95 soil sampling, are resampled following site remediation. Sample points are marked on the enclosed map.

The primary petroleum contaminant at the site appears to be gasoline but diesel was detected in soil samples from B-1, B-8, MW-1, MW-4, and MW-5. Significant concentrations of polynuclear aromatic hydrocarbons (PAHs) have been detected in groundwater at MW-1. Please add PAHs to the list of petroleum constituent analytes for soil samples. The horizontal and vertical extent and magnitude of all remaining soil contamination must be determined and mapped before closure. To determine the vertical extent of contamination, all samples from each hole that show significant contamination in field screening should be analyzed for total petroleum hydrocarbon (TPH). The most contaminated sample from each hole should be analyzed for all petroleum constituents.

Site closure using Risk-Based Decision Making (RBDM) is anticipated. Part of this task will involve preparation of a conceptual site model (CSM). It is recommended that a CSM be submitted before remaining risk-based documentation. Earlier preparation of the CSM should provide a better understanding of site conditions and agreement between the Department and Terra Vac on CSM details can be reached, before proceeding. Elements that should be included in the CSM include: hydrogeologic cross section, plots of groundwater chemical concentration versus time, plots of chemical concentration versus distance from source area along plume centerline, plume contour

maps, and calculation of groundwater flow velocity, location and concentration of remaining contaminated soil, a survey of utility conduits in the area, and a survey of any receptor wells in the immediate area. Scope of Work Task 1 should be expanded to locate and document all underground utilities for RBDM documentation.

Please notify the Department with a schedule for fieldwork. If you have any questions, please feel free to contact me at (503) 229-6242.

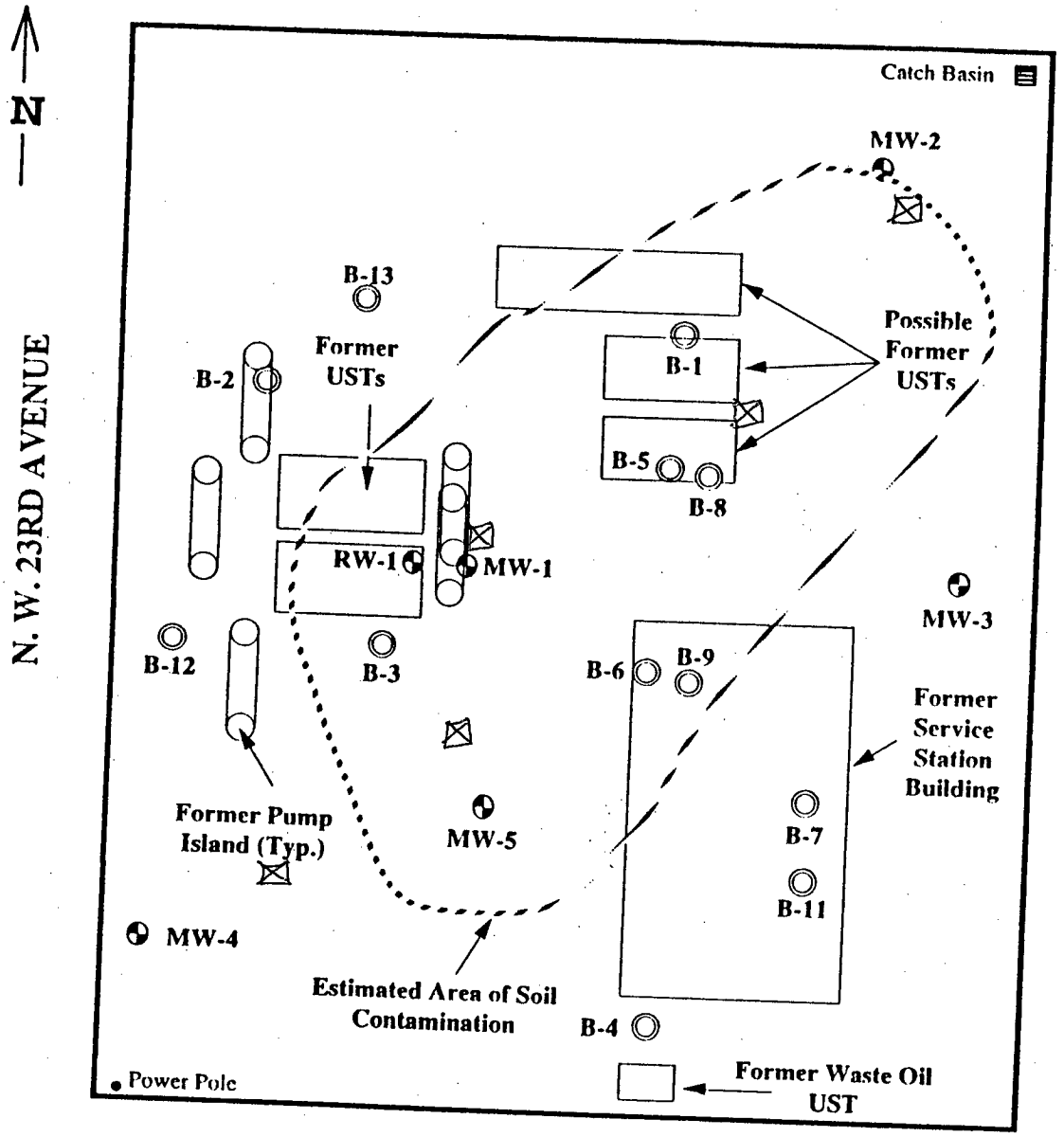
Sincerely,

Robert Williams
UST Cleanup Specialist

cc: Paul Bianco
Terra Vac
23106 100th Avenue West
Edmond, Washington 98020-5018

Enclosure: Soil Sample Map

(rkw:RKW)



LEGEND

- Existing Recovery or Monitoring Well
- Soil Boring
- Proposed soil probe locations

Notes:
(1) Base map from GeoEngineers report: "Subsurface Assessment Rose's Parking Lot Portland, Oregon" August 28, 1995. Site Plan, Figure 2

SCALE (Approximate ft.)

0 20 40

SITE MAP	Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon	TERRA VAC	Project No. 32-0029 Date July 16, 1999 Scale 1 Inch = 20 Feet Revision MAM-1	Figure 2

TERRA VAC

Terra Vac
Northwest Division
23106 100th Avenue West
Edmonds, WA 98020-5018
425-697-5131 Tel
425-697-6211 Fax

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APR 20 2000

NORTHWEST REGION

April 17, 2000

Mr. Robert Williams
Oregon Department of Environmental Quality
2020 SW 4th Avenue, Suite 400
Portland, OR 97201-4987

Subject: Soil Quality Investigation Workplan
330 NW 23rd Avenue, Portland, Oregon

Dear Mr. Williams:

Terra Vac has prepared a workplan for characterizing subsurface soil quality at Rose's Parking Lot, 330 NW 23rd Avenue, Portland, Oregon (herein known as the Site). The purpose of this investigation is to confirm, at the request of the Oregon Department of Environmental Quality (DEQ), that Terra Vac's Dual Vapor Extraction (DVE) system has effectively treated petroleum contaminated soil at the Site. Terra Vac's objectives for the soil quality investigation are as follows:

- Install three soil probes at the Site and collect a sufficient number of subsurface soil samples to aid in documenting the post-remediation concentrations of the contaminants of concern (COC);
- Provide soil quality data to the DEQ showing that the concentrations of COC are equal to or less than applicable cleanup levels; and
- Prepare a report detailing our findings, conclusions, and recommendations.

Our scope of work for this project is presented below.

SCOPE OF WORK

Task 1. Underground Utility Locating

Prior to installing soil probes, Terra Vac will locate underground utilities. Terra Vac will contact both local utilities and private firms to identify, locate, and mark utilities at the Site.

Task 2. Subsurface Soil Sampling

Three soil probes (B-14, B-15, and B-16) will be pushed at the Site using a geoprobe or similar device. Probes will be pushed to approximately 20 feet below ground surface (bgs) or until

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groundwater is encountered. Soil samples will be collected at 5-foot sampling depth intervals using a split-spoon sampler driven to the desired sampling depth. Using a stainless steel spoon, a soil sample will be extracted from the sampler and placed in a preconditioned sterilized glass jar provided by the laboratory. The proposed probe locations are presented in Figure 1.

Terra Vac selected the location of its probes based on the highest historical concentrations of gasoline range total petroleum hydrocarbons (TPHs) reported at the Site. For example, probe B-14 will be pushed near the former location of boring B-1. Prior to treatment, concentrations of TPH in soil at this boring ranged from 99 mg/Kg to 3,700 mg/Kg, at depths of 13 and 18 feet bgs, respectively. Probes B-15 and B-16 will be pushed near the locations of wells MW-1 and MW-5. Historically, TPH soil concentrations at MW-1 and MW-5 (formerly boring B-10) were reported as 6,550 mg/Kg and 5,300 mg/Kg at depths of 25 and 23 feet bgs, respectively.

All soil samples will be screened in the field using a portable gas analyzer equipped with a photoionization detector (PID). Each field screening sample will be prepared by placing an aliquot of soil into a zip-lock plastic bag and sealing the bag. Headspace vapors in the bag will be allowed to equilibrate for at least 10 minutes. After this time, the bag will be partially opened; the PID probe will then be pushed into the headspace above the soil. The concentration of total volatile organics will be read from the PID display and recorded.

All probe holes will be closed using hydrated bentonite chips. Any soil cuttings generated during drilling will be placed in 55-gallon drums. The drums will be stored at the Site and disposed of following analysis.

Decontamination Procedures

Sampling equipment will be decontaminated between samples according to the following procedures:

- Scrub equipment thoroughly with phosphate-free detergent and potable water using a brush to remove any particulate matter or surface film;
- Rinse with clean potable water;
- Triple rinse with clean, deionized, carbon-free water;
- Air dry on plastic sheeting; and
- Wrap or package equipment in aluminum foil, plastic bags, or other appropriate containers to prevent recontamination.

Task 3. Chemical Analyses

One soil sample from each probe will be analyzed for BTEX+N (benzene, toluene, ethylbenzene, xylenes and naphthalene,), and gasoline range TPHs using EPA Test Method 8020B and Oregon State Test Method TPH-G, respectively. Terra Vac will select soil samples for analysis based on the highest PID readings from each probe. Soil samples will not be analyzed for 1,2-dibromoethane (EDB) or 1,2-dichloroethane (EDC) because these compounds have not been historically detected.

Sample Storage, Packing, and Shipment

All samples will be stored in an iced chest while at the Site and during transportation to the laboratory. Samples will be stored in the dark at 4° C.

Chain of Custody Procedures

A chain of custody form will accompany each chest containing laboratory samples. Field personnel will retain a copy of the chain of custody; the original form will be sent with the samples to the laboratory.

Task 4. Reporting

Two weeks after receiving analytical results from the laboratory, the project manager will prepare a letter report detailing Terra Vac's findings, conclusions, and recommendations. A copy of this report will be provided to the DEQ.

If we may provide any additional information or clarification of this workplan, please do not hesitate to call us at 425- 697-5131.

Sincerely,
Terra Vac

Paul V. Bianco, P.E.
Senior Engineer

CC: Mr. Thomas Cammarata
Mr. Richard Singer
Mr. Richard Allen
32-0029.10.01

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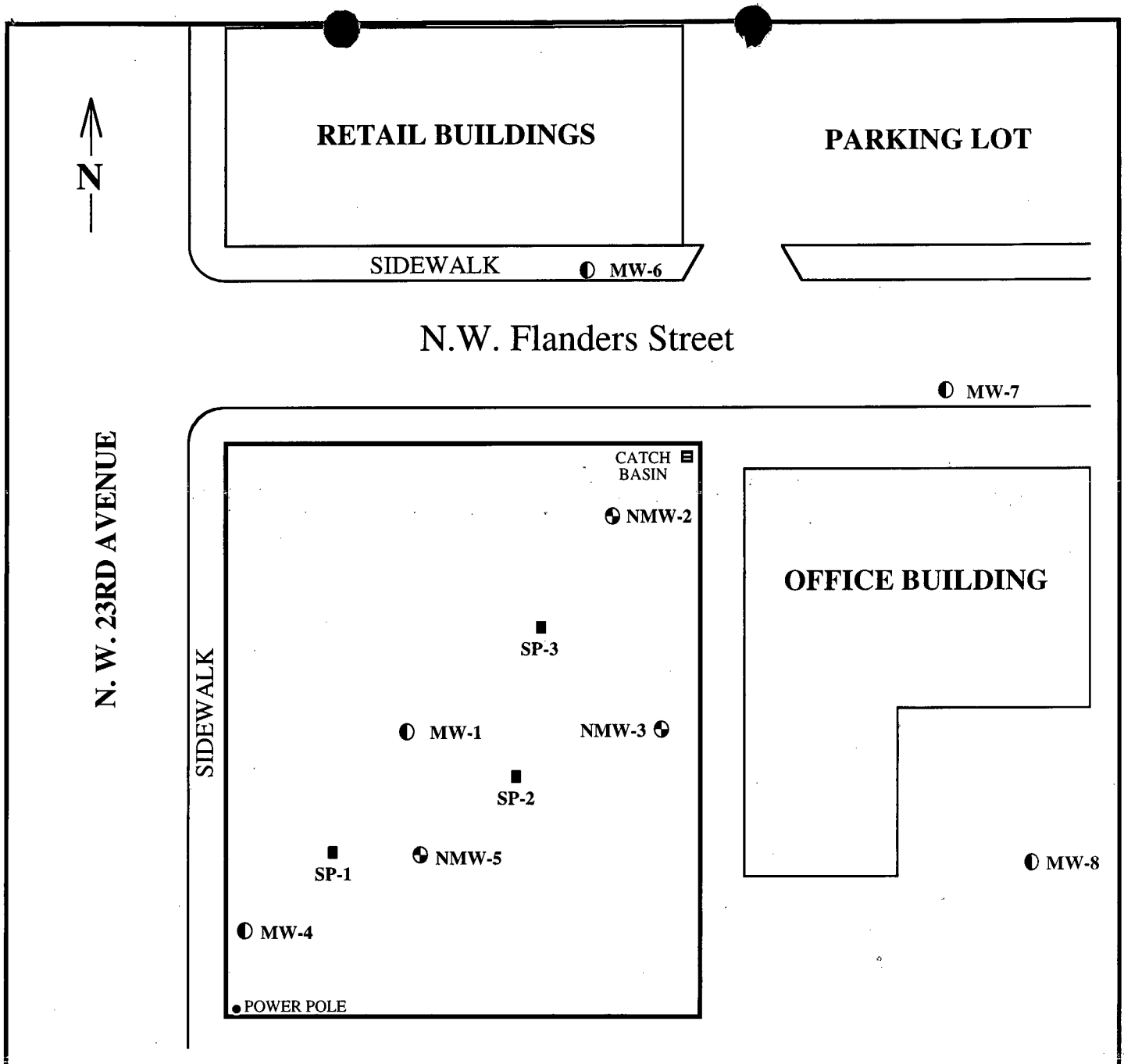

LEGEND	
◐	EXISTING RECOVERY OR MONITORING WELL
◓	REDRILLED MONITORING WELL
■	PROPOSED LOCATION OF SOIL PROBE

SCALE (Approximate ft.)

0 30 60

Notes:

(1) Base map from GeoEngineers report: "Subsurface Assessment Rose's Parking Lot Portland, Oregon" August 28, 1995. Site Plan, Figure 2

SOIL PROBE LOCATION SITE MAP	**Rose's Parking Lot 330 NW 23rd Ave. Portland, Oregon**	TERRA VAC	PROJECT NO. 32-0029 DATE April 18, 2000 SCALE 1 INCH ≈ 30 FEET REVISION	Figure 1

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
Northwest Region
2020 SW Fourth Avenue
Suite 400
Portland, OR 97201-4987
(503) 229-5263 Voice
TTY (503) 229-5471

September 22, 1999

RICHARD SINGER
824 NW ALBEMARLE TERRACE
PORTLAND, OREGON 97210

Re: Rose's Parking Lot
File No. 26-94-0025

Dear Mr. Singer:

The Department has completed its review of the Active Remediation Closure Report, dated July16, 1999 submitted for the underground storage tank (UST) cleanup at the Rose's Parking Lot at 330 NW 23rd Avenue in Portland, Oregon. The report is not considered sufficient for final Department approval or site closure.

The Department recommends that you review the Oregon Administrative Rules (OAR) for Risk-Based Concentration, OAR 340-122-0244 and Corrective Action Plan, OAR 340-122-0250. In addition, the guidance document titled UST Cleanup Program RBCA Checklist should be reviewed. A final document which will be most important to review is titled Risk-Based Decision Making for the Remediation of Petroleum-Contaminated Sites. The public comment period for this new document was completed July 30, 1999 and the final release is anticipated by the end of September 1999. This new guidance includes a revised table of generic risk-based concentrations which will directly affect cleanup goals for the project. Many of the cleanup concentration levels will be relaxed. All the above documents are available from the ODEQ web site with the following URL: http://www.deq.state.or.us/wmc/tank/.

The following comments may not address everything necessary for completion of an approved CAP. A thorough review of the above documentation is recommended.

Site history is not adequately described. Where were the likely areas of gasoline releases at the site? All source locations should be clearly marked on a site map in the RBCA CAP. Where was free product found? How much free product was removed and does any remain? Has any contaminated soil been removed? Figure 2 presents the area of soil contamination. The area of groundwater contamination should also be presented. The RBCA CAP is meant to be a stand-alone document. A thorough list of contaminants of potential concern (COPC) and a conceptual site model (CSM) must be developed for the site.

Soil sample results for fuel constituents at the site are limited to samples from borings for wells MW-1, MW-2, MW-3, DV-1, DV-2, and DV-4. Results from MW-1 indicate very high concentrations of benzene, toluene, ethylbenzene, and xylene (BTEX) in 1994. The laboratory analytical data could not be located in the file to confirm these results. It may be that operation of the dual vacuum extraction (DVE) system has eliminated these contaminants in soil but it will be necessary to collect confirmation soil samples to confirm this. Apparently there is no soil contamination data for the area around MW-5. Additional sampling is appropriate for this area.

The vertical as well as horizontal extent of remaining soil contamination should be well defined.

The use of the ASTM RBCA model is not appropriate. If the site can not meet the generic Oregon Risk-Based Concentrations (RBCs) for all the contaminants of concern (COCs) then site specific RBCs should be calculated with Oregon RBCA model equations. All site-specific calculations should be well documented and supported.

The site currently fails the groundwater ingestion pathway for RBCA. Has current and reasonably likely future landuse been fully explored? Has groundwater use in the area been completely explored? What is the groundwater flow velocity? Oregon Water Resources well records are generally not complete. In the Conclusions and Recommendations section, a restriction prohibiting use of groundwater on the site is suggested. Does the site owner agree to a deed restriction specifying this prohibition? A deed restriction may not be necessary if present and future use of groundwater in the area can be thoroughly documented as negligible.

In summary, the Department believes that the site can be closed under RBCA rules with reasonable additional work including confirmation sampling of contaminated soil, analysis of groundwater use in the area, and improving documentation for the RBCA CAP.

The Department concurs with discontinuing groundwater monitoring but does not recommend abandoning monitoring wells until formal closure is achieved. Please submit a work plan for soil confirmation sampling before undertaking additional work.

If you have any questions, please feel free to contact me at (503) 229-6242.

Sincerely,

Robert Williams
UST Cleanup Specialist

cc: Paul Bianco
Terra Vac
23106 100th Avenue West
Edmond, Washington 98020-5018

(rkw:RKW)

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MAR 23 1998

NORTHWEST REGION

ACTIVE REMEDIATION CLOSURE REPORT

ROSE'S PARKING LOT
330 NORTHWEST 23RD AVENUE
PORTLAND, OREGON 97202

26-94-0025

March 16, 1998

PREPARED FOR:

Mr. Charles R. Williamson
Kell, Alterman & Runstein, L.L.P.
1001 SW Fifth Avenue, Suite 1800
Portland, Oregon 97204-1194

PREPARED BY:

Paul V. Bianco
Project Engineer

Michael E Dodson for

Timothy Warner
Project Manager

TABLE OF CONTENTS

1.0 INTRODUCTION Page 1

2.0 BACKGROUND INFORMATION Page 1

2.1 Site Description Page 1
2.2 Previous Work Page 1
2.3 Geology and Hydrogeology Page 2

3.0 SUMMARY OF SITE SPECIFIC ANALYTICAL DATA Page 2

3.1 Soil Analytical Page 2
3.1.2 Soil Borings Page 2
3.1.2 UST Excavation Page 4
3.2 Groundwater Analytical Page 4

4.0 SITE REMEDIATION Page 5

4.1 Remediation System Design Page 5
4.1.1 Pilot Testing of Subsurface Air Movement Technologies Page 5
4.1.2 Remediation Theory Page 5
4.1.3 System Equipment and Design Parameters Page 6
4.2 Summary of Remediation System Operations Page 6

5.0 RISK-BASED CORRECTIVE ACTION ANALYSIS Page 8

5.1 Tier 2: Site-Specific Corrective Action Goals Page 8
5.2 Results of Tier 2 RBCA Analysis Page 8

6.0 RECOMMENDATIONS Page 9

FIGURES

1. Site Location Map
2. Site Map
3. Remediation Well Locations and System Configuration
4. Process and Instrumentation Diagram
5. Proposed Confirmatory Soil Boring Locations

TABLES

1. Summary of Analytical Results for Soil Samples
2. Groundwater Analytical Results from Monitoring Well Locations
3. Well Survey Analytical Data
4. System Operational and Analytical Data
5. RBCA Input Data
6. RBCA Site Assessment - Groundwater
7. RBCA Site Assessment - Soil

APPENDIX A Fourth Quarter Groundwater Monitoring Report

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1.0 INTRODUCTION

This document addresses the instrument of placing a "no further action" approval for the Rose's Parking Lot site, located at 330 Northwest 23rd Avenue, Portland, Oregon. This document presents a site background, site and chemical characterization information, and a health based risk assessment.

2.0 BACKGROUND INFORMATION

2.1 Site Description

The site is located at 330 Northwest 23rd Avenue in Portland, Oregon. It is bound by NW 23rd to the west and by NW Flanders Street to the north. The site is approximately 1/3 acre in size and is relatively flat, sloping slightly towards NW Flanders Street. A site location map is included as Figure 1. The Oregon Department of Environmental Quality (DEQ) underground storage tank (UST) Cleanup List Number for the site is 26-94-25.

The site was occupied by gasoline service stations from the 1950s to the 1970s. These service stations were operated by Unocal (Union Oil Company of California), AMOCO (AMOCO Oil Company), and Gull (Gull Industries, Inc.). All above ground structures have been removed, and the site is currently an open paved parking lot.

A review of reports containing site history indicate that a gasoline service station was constructed on the site in 1954. Station facilities included three pump islands, two 5,000-gallon USTs, one 550-gallon waste oil tank, and the station building. The station was renovated in 1964 to include two pump islands, two 5,000-gallon USTs, one 550-gallon waste oil tank, and a service station. It has been reported that the gasoline USTs have been removed from the site. General site features, including the location of former USTs, are shown on the site map presented as Figure 2.

2.2 Previous Work

Numerous investigations have been conducted at this site, including the following:

"Subsurface Investigation", prepared by Hahn and Associates, Inc. on February 2, 1994.

"Subsurface Groundwater Investigation, Former Service Station Site", prepared by RZA AGRA, Inc. on April 8, 1994.

"Subsurface Groundwater Investigation, Former Service Station Site", prepared by AGRA Earth & Environmental, Inc. on October 27, 1994.

"Subsurface Assessment, Rose's Parking Lot", prepared by GeoEngineers on August 28, 1995.

"UST Removal and EFRT Pilot Test, Rose's Parking Lot, Portland Oregon", prepared by GeoEngineers on February 28, 1996.

"Results of Quarterly Ground Water Monitoring", prepared by GeoEngineers on April 10, 1996.

"Results of Off-site Subsurface Explorations and Quarterly Ground Water Monitoring", prepared by GeoEngineers on June 13, 1996.

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"Results of Quarterly Ground Water Monitoring", prepared by GeoEngineers on November 15, 1996.

" Site Investigation Report", prepared by Terra Vac Corporation on May 28, 1997.

" System Operations Report", prepared by Terra Vac Corporation on July 1, 1997.

" System Operations Report", prepared by Terra Vac Corporation on October 17, 1997.

In summary, environmental studies indicated that subsurface soil and groundwater at the site had been impacted by gasoline-range petroleum hydrocarbons. Impact to subsurface soil was greatest just above and below the groundwater table, which fluctuates seasonally from approximately 22 to 28 feet below ground surface (bgs). Soil in this impacted zone has been described as consisting primarily of silty sand and silt. Across the site, groundwater impact ranged from non detectable levels of petroleum hydrocarbons to a measurable thickness of free phase gasoline.

Based upon known site data, Terra Vac designed, installed and operated a dual vapor extraction (DVE) remediation system to simultaneously address impact to site soil and groundwater. To reach DEQ site closure requirements, remediation efforts were focused on groundwater and soil in the zone from 5 feet above to 5 feet below the seasonal groundwater extremes, or from approximately 17 to 33 feet bgs.

2.3 Geology and Hydrogeology

The site is located near the western margin of the Portland Basin at an elevation of approximately 150 feet above mean sea level (msl). Near surface geology consist of Quaternary Alluvium which extends to depths of approximately 100 feet bgs. This alluvium lens represents the flood plain deposits of the Willamette and Columbia rivers and consists of silt, sand, and clay. The Quaternary Alluvium is underlain by the Pliocene Troutdale Formation which extends to depths of approximately 250 feet bgs. The Pliocene Troutdale Formation consists of silts, clays, sands, and occasional gravels and is underlain by the Miocene Columbia River Basalt.

The primary regional aquifer is the Troutdale Gravel Aquifer which, in the vicinity of the site, occurs at approximately 100 feet bgs. However, a shallower groundwater table is encountered beneath the site at an average depth of approximately 25 feet bgs. The apparent direction of groundwater flow within this saturated zone has been reported to be northeast across the site at an estimated gradient of 0.08 feet/feet.

3.0 SUMMARY OF SITE SPECIFIC ANALYTICAL DATA

3.1 Soil Analytical

3.1.1 Soil Borings

Previous reports indicate that 13 soil borings (B-1 through B-13) have been advanced at the site. Groundwater monitoring well MW-5 was constructed in boring B-10 and the remaining borings were abandoned. In addition to MW-5, four groundwater monitoring wells (MW-1 through MW-4), one recovery well (R-1), four shallow observation wells (P-1 through P-4), and four remediation wells (DVE-1 through DVE-4) have been constructed

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on-site. Additionally, three monitoring wells (MW-6 through MW-8) have been constructed off site.

The locations of soil borings, on-site groundwater monitoring wells, and recovery well R-1 are shown on Figure 2. The locations of the shallow observations wells and remediation wells are shown on Figure 3.

During drilling, soil samples were typically collected for soil logging and field screening of petroleum hydrocarbon impact. Selected soil samples were additionally analyzed for the concentrations of specific petroleum range hydrocarbons. A summary of field screening and analytical results for site soil samples is presented in Table 1.

Hahn and Associates, Inc. (HAI) performed a subsurface investigation on January 3, 1994. As part of the investigation, soil borings B-1 through B-4 were drilled and soil samples collected. Petroleum hydrocarbons were not detected in soil samples from B-2, located near a former pump island, or from B-4 located near the waste oil UST. Recordable concentrations of petroleum hydrocarbons were reported at depths of 13.0 and 18 feet bgs in B-1 and at 20.5 feet bgs in B-3. Borings B-1 and B-3 were located in the vicinity of the former USTs. The highest petroleum hydrocarbon concentrations were recorded in soil from boring B-1 at a depth of 18 feet bgs. That sample contained 3,700 parts per million (ppm) of total petroleum hydrocarbons in the gasoline range (TPH-G) and 1,100 ppm of diesel-range petroleum hydrocarbons. Complete results of the HAI investigation are summarized in their February 2, 1994 report.

RZA AGRA, Inc. (AGRA) supervised the installation of groundwater monitoring wells MW-1 through MW-3 on March 3, 1994. Soil samples obtained from MW-2 and MW-3 showed limited impact from petroleum hydrocarbons. Soil from MW-1, constructed in the vicinity of the former USTs, had recordable concentrations of TPH-G, and of benzene, toluene, ethylbenzene, and total xylenes (BTEX) at depths of 15 to 25 feet bgs. The highest TPH-G and BTEX concentrations were recorded in soil from boring MW-1 at a depth of 25 feet bgs. Concentrations of TPH-G and benzene in that sample were 6,550 ppm and 12.6 ppm, respectively. Details of AGRA's investigation are provided in their report dated April 8, 1994.

AGRA directed the placement of soil borings B-5 through B-7, and the construction of an upgradient monitoring well (MW-4) on September 28, 1994. Soil samples from each boring at a depth of 5 feet bgs contained non detectable concentrations of petroleum hydrocarbons. Petroleum hydrocarbons were detected in soil from MW-4 at 5 feet bgs, but not in soil from MW-4 at 20 feet bgs. AGRA's field efforts are detailed in their report dated October 27, 1994.

GeoEngineers supervised the placement of soil borings B-8, B-9, B-10, B-11, B-12, and B-13 on May 11 and 12, 1995. Field activities also included the construction of monitoring well MW-5 in boring B-10. Petroleum hydrocarbons were not detected in soil samples from B-9, B-11, B-12, and B-13. The soil sample from B-8 at a depth of 15.5 feet bgs contained 130 ppm TPH-G, while the soil sample from MW-5 at 23.0 feet bgs contained 5,300 ppm TPH-g. The results of GeoEngineers' site investigation are summarized in their report dated August 28, 1995. In that report, GeoEngineers provided an estimate of the area of subsurface soil impact. This estimated area of impact is shown on Figure 2.

On November 2, 1995, GeoEngineers supervised the construction of four observation wells (P-1 through P-4) and a recovery well (R-1). These five wells were constructed for use in an enhanced fluid recovery pilot test. No data was presented to indicated that soil

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samples were recovered during the construction of the four observation wells. Field screening of soil samples from R-1 indicate petroleum hydrocarbon impact was present in that boring from approximately 18 to 25 feet bgs. GeoEngineers' field observations are provided in their report dated February 28, 1996.

Terra Vac, Corp. (Terra Vac) supervised the construction of remediation wells DVE-1, DVE-2, DVE-3, and DVE-4 on February 3, 1997. Recordable concentrations of petroleum hydrocarbons were found only in soil from DVE-2 at a depth of 15 feet bgs. TPH-G concentrations in that sample were 2.23 ppm and ethylbenzene concentrations were 0.0565 ppm. Terra Vac's field activities are detailed in our report dated May 28, 1997.

3.1.2 UST Excavation

On November 2, 1995, GeoEngineers monitored the removal of the 550-gallon waste oil UST located along the south property boundary (Figure 2). Three soil samples were obtained from the limits of the excavation following removal of the UST and one sample was obtained from the excavated soil stockpile. These four samples were analyzed for petroleum hydrocarbons by DEQ Method TPH-HCID and no petroleum hydrocarbons were detected. Additionally, one of these samples was analyzed for volatile organic compounds (VOCs), Polychlorinated Biphenyls (PCBs), and Toxic Characteristics Leaching Procedure (TCLP) metals. Analytical results indicated no impact from VOCs, PCBs, or TCLP metals.

3.2 Groundwater Analytical

On-site groundwater sampling was initiated by AGRA on March 29, 1994. Water samples from wells MW-1 through MW-3 were analyzed for BTEX concentrations and the sample from MW-3 was additionally analyzed for the gasoline additives EDB and EDC. Results indicated that groundwater from all three wells had been impacted by petroleum hydrocarbons with impact being greatest at MW-3 and lowest at MW-2. Benzene concentrations were 4.9 parts per billion (ppb) at MW-2, 130 ppb at MW-2, and 2,300 ppb at MW-3. Neither EDB or EDC were detected in the sample from MW-3.

GeoEngineers sampled on-site groundwater monitoring wells MW-1 through MW-4 on October 4, 1994 and on-site wells MW-1 through MW-5 on May 12, 1995. Quarterly groundwater monitoring of wells MW-1 through MW-5 was initiated by GeoEngineers on January 4, 1996. By April 24, 1996, three off-site wells (MW-6 through MW-8) had been installed and were included in the quarterly groundwater monitoring program.

Terra Vac began performing quarterly groundwater monitoring with the February, 1997 sampling event. The most recent quarterly groundwater monitoring report, which presents results of sampling performed on December 31, 1997, has been included as Appendix A.

The quarterly groundwater monitoring program has tracked the concentrations of TPH-G, BTEX, polycyclic aromatic hydrocarbons (PAHs), dissolved lead, and EDB/EDC over time. TPH-G concentrations have been measured by methods EPA Methods 418.1 and 8015, BTEX by EPA Method 8020A, PAHs by EPA Method 8310, EDB/EDC by EPA Method 8010M, and dissolved lead by EPA Method 7421. A summary of historical groundwater quality is presented in Table 2.

Groundwater monitoring of the off-site wells MW-6, MW-7, and MW-8 has shown non detectable levels of TPH-G and BTEX for the past seven quarters. Before initiation of DVE operations in March, 1997, groundwater quality across the site ranged from non detect levels of TPH-G at wells MW-2 and MW-4 to TPH-G concentrations of 57,200 ug/l

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at MW-1 which, along with MW-5, has historically contained free phase gasoline. Similarly, benzene concentrations ranged from non detect levels at MW-2 to 1,130 micrograms per liter (ug/l) at MW-1. Groundwater quality at the site prior to initiation of remediation by DVE can be summarized from Table 2 as follows:

Well	Date	TPH-G (µg/l)	Benzene (µg/l)	Toluene (µg/l)	Ethylbenzene (µg/l)	Total Xylenes (µg/l)
MW-1	2/28/97	57,200	1,130	3,890	1,220	7,430
MW-2	2/28/97	ND	ND	ND	ND	ND
MW-3	2/28/97	4,400	261	124	153	404
MW-4	2/28/97	ND	0.7	ND	ND	ND
MW-5	2/28/97	5,400	70.3	23.5	88.6	230

4.0 SITE REMEDIATION

4.1 Remediation System Design

4.1.1 Pilot Testing of Subsurface Air Movement Technologies

During late November and early December 1995, GeoEngineers performed three separate enhanced fluid recovery technology (EFRT) pilot tests. Recovery well R-1 and monitoring wells MW-1 and MW-5 were used as test wells. Observation wells P-1 through P-4 and monitoring wells MW-2, MW-3, and MW-4 were used as observation wells.

In general, pilot testing involved placing a stinger tube down each test well so that it extended from the top of the well casing to the approximate free product/water interface. With the stinger in place, a vacuum was applied to pull free product, groundwater, and soil vapors up the well and into a vacuum tanker truck. As wells were being tested, vacuum was measured at the surrounding observation and monitoring wells.

Pilot testing results indicated that if an applied vacuum of 18 to 20 inches of mercury was placed on a test well, vacuums ranging between 4.1 and 53.7 inches of water were measured at the surrounding observation wells. From the pilot test results, GeoEngineers calculated a radius of influence (ROI) of greater than 70 feet from the points of extraction. Additionally, subsequent to the three EFRT pilot tests, free product thickness decreased in monitoring wells MW-1 and MW-5.

4.1.2 Remediation Theory

After reviewing the available site data, Terra Vac chose DVE as the most appropriate technology to accomplish site remediation. DVE is a subsurface air movement remediation technology which synergistically combines the attributes of vacuum extraction and groundwater extraction to simultaneously treat both impacted soil and groundwater. The DVE process is able to:

- Directly recover free phase petroleum hydrocarbons floating on the groundwater table in a manner similar to the EFRT pilot tested at the site.
- Recover residual contaminants from capillary fringe soils above the static groundwater table in a manner similar to traditional vacuum extraction systems.

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- Recover residual contaminants from below the static water table, where vacuum extraction alone is not applicable.

- Increase the rate and magnitude of water table drawdowns, improving hydraulic containment and exposing smear zone soil to vacuum extraction.

DVE effectively remediates capillary fringe soil and the complete smear zone by the combined use of vapor and groundwater extraction. The static water table is lowered by groundwater entrainment extraction. This opens up the capillary fringe and smear zone soil in the formerly saturated area to the air flow induced by the applied well head vacuum. This applied vacuum induces a negative pressure gradient in the soil matrix, causing volatile contaminants partitioned onto soil particles and trapped in soil pores to vaporize. Once in the vapor phase, the contaminant is drawn to the extraction well by the vacuum induced air flow.

Using induced air flow, a DVE entrainment system is able to extract a groundwater and soil vapor mixture from the subsurface and transport it through the vacuum header to a centralized equipment location. At this location, a vapor/liquid separator partitions the entrained groundwater and soil vapors into separate streams. Soil vapors are routed through the vacuum blower and vented to the atmosphere under a DEQ air permit, while the groundwater stream is discharged to sanitary sewer under a City of Portland permit.

4.1.3 System Equipment and Design Parameters

The final remediation system design utilized eight DVE wells placed on a conservative well to well spacing of approximately 25 feet. Design implementation required the construction of four new DVE remediation wells (DVE-1 through DVE-4), the conversion of existing groundwater monitoring wells MW-2, MW-3, and MW-5 to DVE wells NMW-2, NMW-3, and NMW-5, and the conversion of existing remediation well R-1 to DVE well NRW-1. Additionally, observation wells P-1 through P-4 were utilized as soil vapor extraction (SVE) wells. The final remediation well configuration is shown on Figure 3.

DVE and SVE well heads are located subsurface in traffic-rated well boxes which allow access to the well head flow control valves, gauges, and soil vapor sampling ports. The remediation wells are connected to the equipment compound by subsurface piping (Figure 3). During system installation, provisions were made to allow submersible pumps to be placed in the DVE wells to assist in site dewatering, if needed.

The DVE system is designed to operate at a vacuum up to 14 inches of mercury (in. Hg.) and at flows up to 750 standard cubic feet per minute (scfm). Vacuum is provided by a 40 horsepower positive displacement blower which is protected from moisture by a 150 gallon vapor/liquid separator. As soil vapors pass through the separator, entrained moisture is removed. A high water level switch in the separator is wired to automatically shut down the remediation system to prevent water from reaching the vacuum blower.

Valves, gauges, and sampling ports are provided at the blower for flow control, measurement of system performance parameters, and the sampling of recovered soil vapors for chemical analyses. A Process and Instrumentation Diagram of the DVE remediation system equipment is presented in Figure 4.

4.2 Summary of Remediation System Operations

The primary function of the DVE system was to remove free product and to remediate gasoline-range hydrocarbon impacted soil and groundwater. DVE system operations were

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started on March 14, 1997. During startup, the system was shut off intermittently to troubleshoot and optimize various parameters associated with system operations. Due to lower than expected groundwater extraction rates, it was not necessary to install submersible pumps in any DVE wells to achieve the desired levels of site dewatering.

During operations, samples of extracted vapors were collected from the individual well heads and from the system main header. Vapor samples were analyzed for TPH-G and specifically for BTEX constituents by gas chromatography using Terra Vac's in-house laboratory. Air flow rates were measured at the time of vapor sampling with a self-averaging annubar. Together, air flow and vapor concentration data were used to quantify mass extraction rates (expressed as pounds of TPH-G extracted per day) and the cumulative mass of TPH-G extracted by the system over time.

Extracted soil vapor well head surveys were performed three times during DVE system operations (May 2, 1997, July 17, 1997, and September 9, 1997). Results of these well head surveys are presented in Table 3. The percent reduction of TPH-G in the extracted vapors from the well heads ranged from 22% to 96.3 % with an average calculated reduction of 65.4 %. The benzene concentrations measured in the extracted vapors from the well heads were significantly reduced during system operations.

Operational and analytical data for the system are presented in Table 4. At system shutdown, total operating time equaled 158 days and approximately 7,511 pounds of TPH-G had been removed from the subsurface.

On-site groundwater quality improved as site remediation progressed. Groundwater quality data from the just prior to initiation of DVE operations (February 28, 1997) and from fourth quarter 1997 groundwater monitoring is summarized below.

Well	Date	TPH-G (µg/l)	Benzene (µg/l)	Toluene (µg/l)	Ethylbenzene (µg/l)	Total Xylenes (µg/l)
MW-1	2/28/97	57,200	1,130	3,890	1,220	7,430
MW-1	12/31/97	2,960	ND	ND	ND	ND
MW-2	2/28/97	ND	ND	ND	ND	ND
MW-2	12/31/97	ND	ND	ND	ND	ND
MW-3	2/28/97	4,400	261	124	153	404
MW-3	12/31/97	ND	ND	ND	ND	ND
MW-4	2/28/97	ND	0.7	ND	ND	ND
MW-4	12/31/97	ND	ND	ND	ND	ND
MW-5	2/28/97	5,400	70.3	23.5	88.6	230
MW-5	12/31/97	18,300	62.6	570	231	1,570

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As of the fourth quarter 1997 groundwater monitoring event, TPH-G and BTEX concentrations have been non detectable at wells NMW-2 and MW-4 for four quarters, and at well NMW-3 for two quarters.

5.0 RISK BASED CORRECTIVE ACTION ANALYSIS

A Risk Based Corrective Action (RBCA) analysis was performed to calculate Site-Specific Target Levels (SSTLs). The analysis was performed using the ASTM RBCA software developed by Groundwater Services, Inc. This software completes all calculations required for Tier 2 of the RBCA planning process as defined in ASTM Standard E-1739 "Guide to Risk-Based Corrective Action Applied at Petroleum Release Sites". Under the RBCA approach, petroleum release sites are characterized in terms of sources, transport mechanisms, and receptors. The site-specific analysis utilized the most current groundwater quality and soil impact data available for the site. For groundwater quality, the most current data is from the results of fourth quarter 1997 groundwater monitoring. For soil impact, the most current data was obtained during the construction of groundwater monitoring and remediation wells.

5.1 Tier 2: Site Specific Corrective Action Goals

Under Tier 2 of the RBCA planing process, SSTLs for soil and groundwater cleanup goals are determined on the basis of site-specific information and/or points of exposure. Analytical models are employed in conjunction with additional site data to calculate Tier 2 SSTL values in a manner consistent with EPA-recommended practices.

The Tier 2 SSTL values represent concentration limits for constituents within the source zone. SSTLs differ from the generic Risk-Based Screening Levels (RBSLs) in three significant ways:

- SSTLs use site-specific data to calculate risk-based cleanup goals,
- Human exposure to affected media may be assumed to occur not at the source zone, but at a separate "point of exposure" when calculating SSTLs, and
- The effects of natural attenuation of constituent concentrations during lateral transport from the source to an off-site "point of exposure" may be considered in the SSTL calculation.

5.2 Results of Tier 2 RBCA Analysis

The input data used to generate the site-specific SSTL values is shown in Table 5. The information contained in Table 5 includes the following:

- **Source Zone Characteristics:** Lateral and vertical limits of affected soil and groundwater zones; representative concentrations of constituents of concern.
- **Hydrogeologic Site Conditions:** Site stratigraphy, surface soil conditions, rate and direction of groundwater flow, attenuation factors, etc.

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- **Relevant Points of Exposure:** Distance from source zone(s) to potential receptors (i.e., likely points of contact with affected soil, water, or air); receptor type and applicable exposure factors.

- **Applicable Risk Goals:** Human health protection criteria for individual and cumulative effects of exposure to site constituents. One in one million was used for Class A and B carcinogens and one in 100,000 was used for Class C carcinogens.

The Tier 2 evaluation results for groundwater and soil are presented in Tables 6 and 7, respectively. The exposure pathway of groundwater and soil volatilization to indoor air is not applicable at this site and was not used in determining the SSTLs for groundwater or soil.

As shown on Table 6, the concentrations of the contaminants of concern (COC) is less than the calculated SSTL for each compound in site groundwater. As shown in Table 7, the concentrations of the COCs is less than the calculated SSTL for each compound in soil except for benzene. However, the representative concentrations used for these calculations were taken from the analyses of soil samples collected during the installation of groundwater monitoring and remediation wells prior to active site remediation.

Operations of DVE system resulted in the removal of approximately 7,511 pounds of volatile organic compounds from the subsurface. Therefore, to calculate the current exposure risk, soil sampling should be performed at several locations across the former source area to collect data on post remediation vadose zone benzene concentrations.

6.0 RECOMMENDATIONS

Based on the available site and operations data collected to date and the calculated risk-based analysis, Terra Vac recommends the following:

- Continued DVE operations until all wells reach DEQ cleanup levels is not feasible, nor does it provide greater safety to human health.

- Dissolved petroleum hydrocarbon concentrations in site groundwater have reached a level conducive to natural attenuation to DEQ groundwater cleanup levels and the remaining concentrations will not impact human health adversely.

  To monitor the decrease in dissolved hydrocarbon concentration, Terra Vac recommends that quarterly monitoring of the five on-site wells (MW-1, NMW-2, NMW-3, MW-4, and NMW-5) be continued and that the off-site monitoring wells (MW-6, MW-7, MW-8) be properly abandoned.

  When the remaining on-site monitoring wells show stable or decreasing dissolved petroleum hydrocarbon concentrations for three consecutive sampling events (four including the fourth quarter 1997 results), Terra Vac recommends dropping these wells from the sampling schedule and properly abandoning these wells.

  Conversely, if any on-site well shows increases in dissolved concentrations for two consecutive sampling events above the SSTL's, Terra Vac will evaluate remediation methods for these impacted wells.

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- Terra Vac proposes to Geoprobe three soil borings across the site to confirm that soil BTEX concentrations have reached acceptable levels. Geoprobe borings will be advanced to 20 feet bgs which corresponds to the lowest depth needed for future site renovations. A soil sample will be taken every five feet during the boring and a composite sample at each boring will be analyzed for TPH-G and BTEX.

  Data from the soil borings will be used to update the RBCA Tier 2 information and to calculate risk-based exposure levels based upon post remediation impact to the site vadose zone. The locations of the proposed soil borings are presented in Figure 5.

- Terra Vac recommends analyzing wells MW-1, NMW-3, and NMW-5 for EDB, EDC, naphthalenes, and lead. These monitoring wells have had concentrations of EDB, EDC, naphthalenes, and lead above DEQ cleanup standards during previous sampling events. If results show that the concentrations of EDB, EDC, naphthalenes, and lead are below the cleanup criteria, then Terra Vac will cease sampling for these specific compounds and only sample for TPH-g and BTEX during quarterly sampling events.

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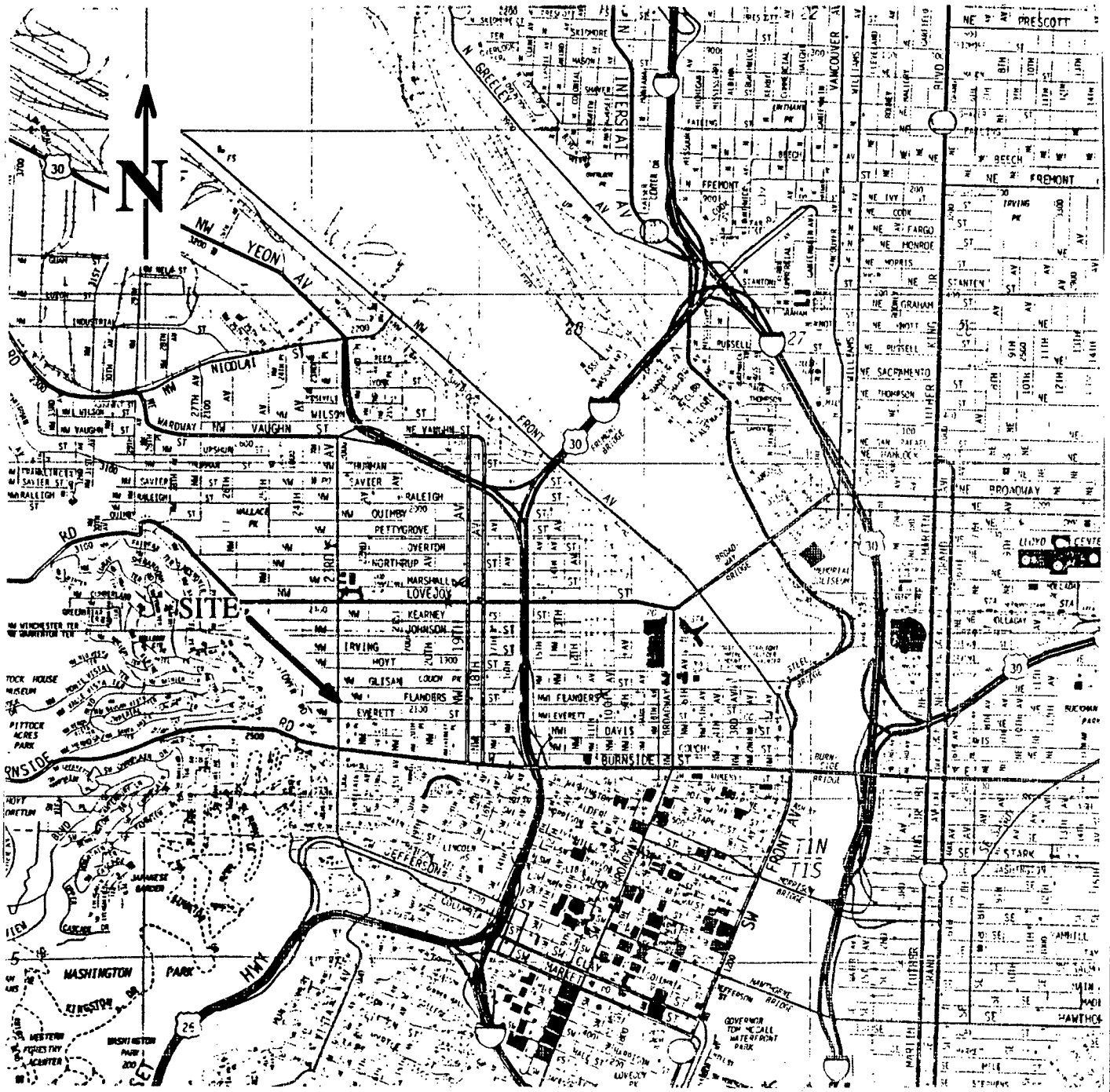
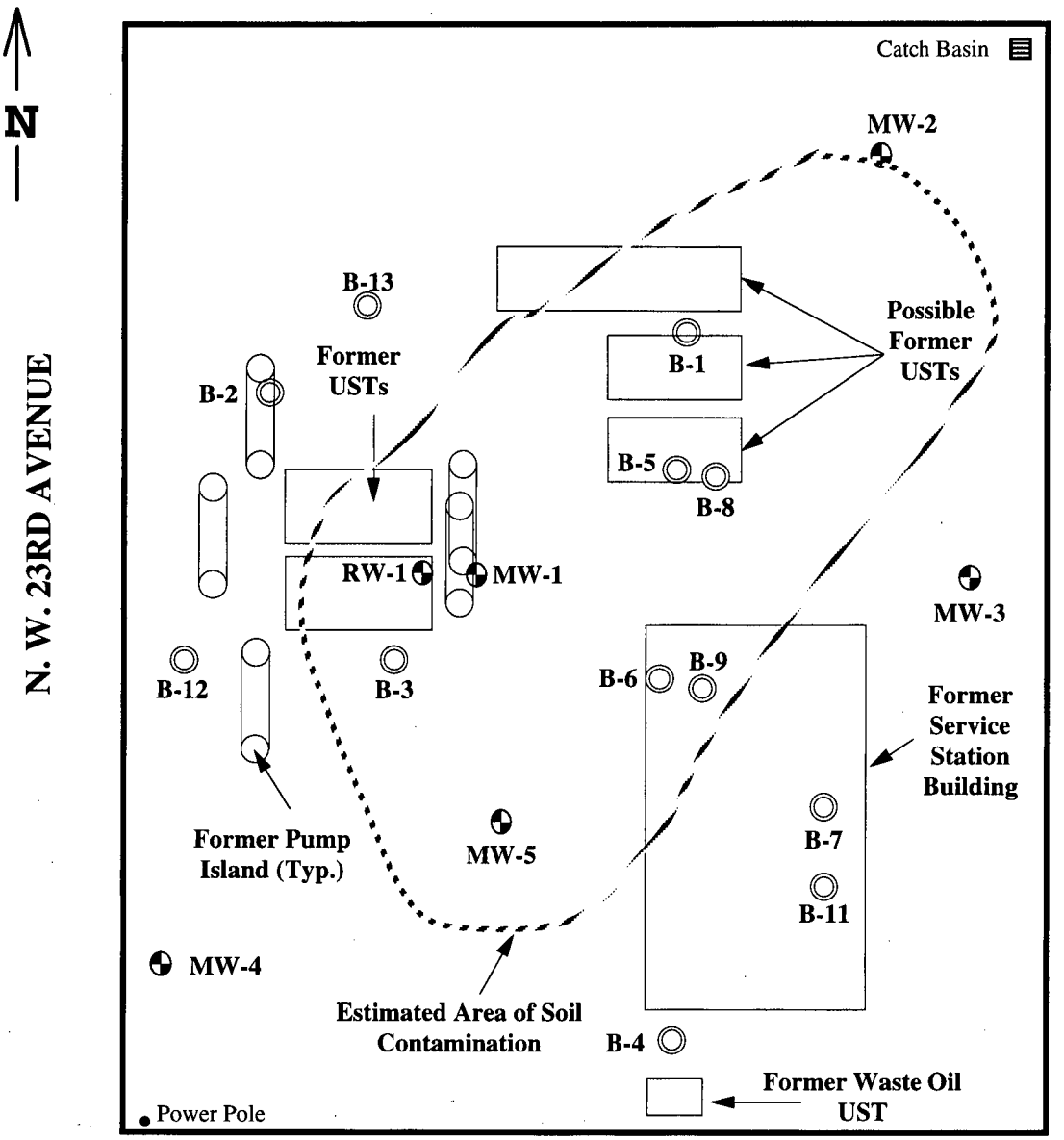


SITE LOCATION MAP SOURCE: THE THOMAS GUIDE, 1994, PORTLAND METRO AREA STREET GUIDE & DIRECTORY	**ROSE'S PARKING LOT** **330 NW 23RD AVENUE** **PORTLAND, OREGON**	TERRA VAC	PROJECT NO. 32-0029 Date March 16, 1998 Scale 1 Inch = 20 Feet Revision MAM-1	**Figure 1**



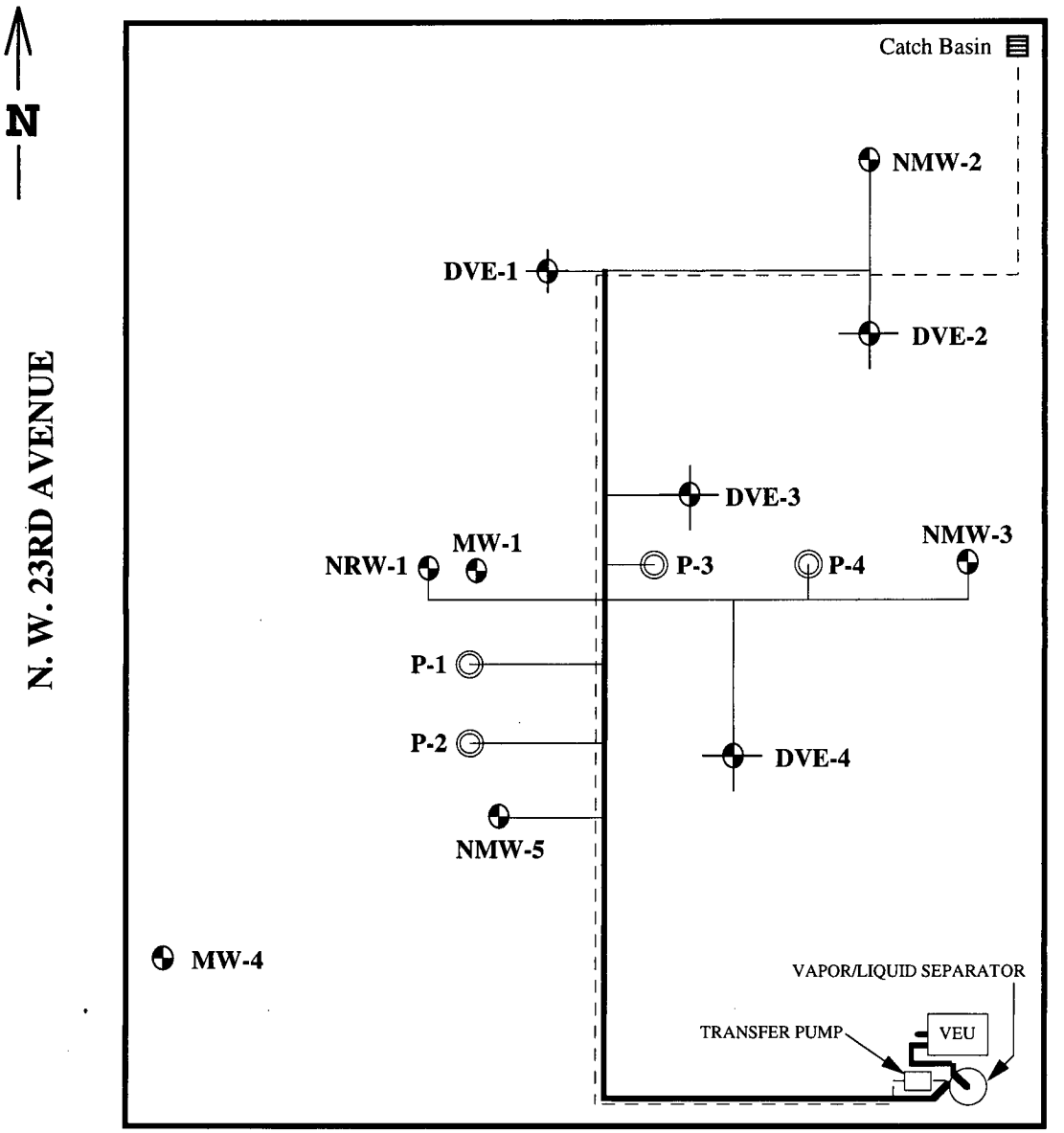
LEGEND	
	Existing Recovery or Monitoring Well
	Soil Boring

Notes:
(1) Base map from GeoEngineers report:
"Subsurface Assessment
Rose's Parking Lot Portland, Oregon"
August 28, 1995. Site Plan, Figure 2

SCALE (Approximate ft.)

0 20 40

SITE MAP	**Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon**	TERRA VAC	Project No.	32-0029	**Figure 2**
			Date	February 12, 1997	
			Scale	1 Inch = 20 Feet	
			Revision	MAM -1	



LEGEND

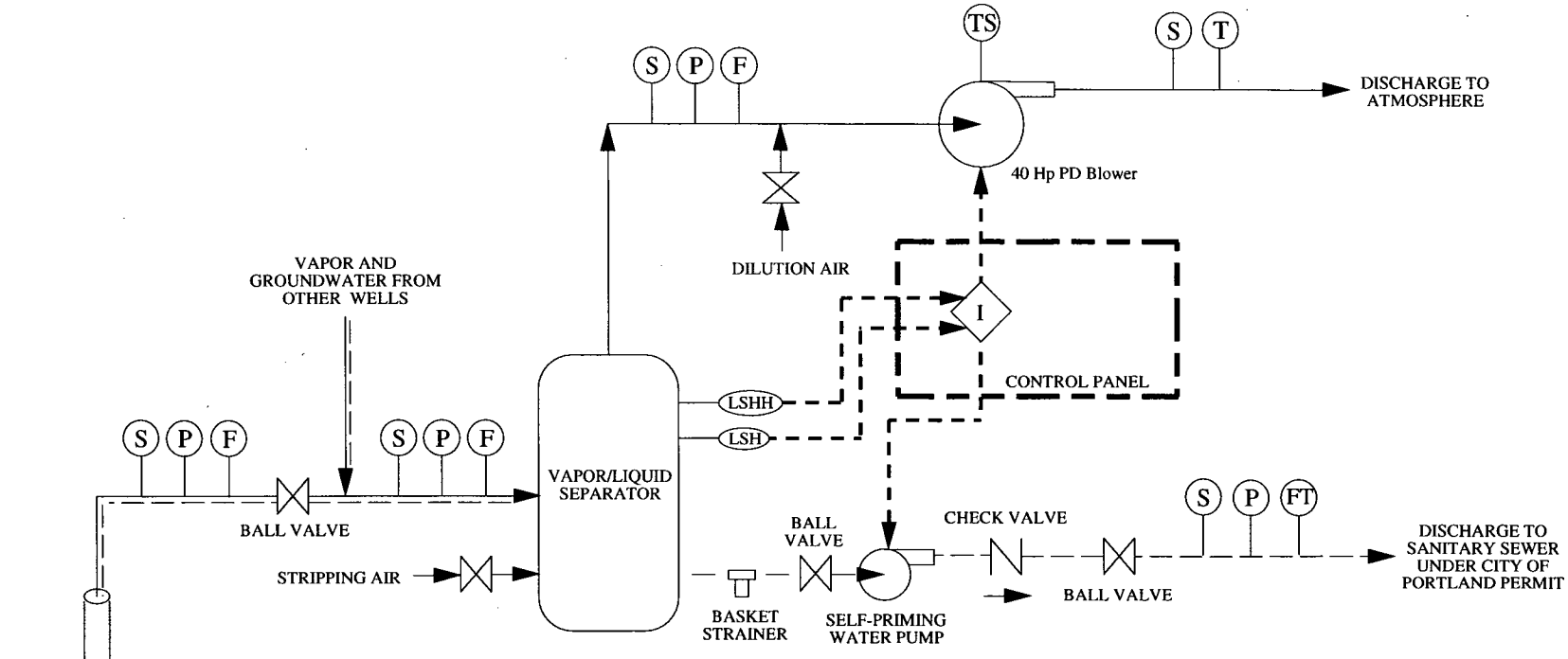
- DVE Well (Former Monitoring Well)
- DVE Well
- SVE Well (Former Observation Well)
- 1-1/2" Water Discharge Pipe
- 1-1/2" DVE Branch Pipe
- 6" DVE Header Pipe

Notes:
(1) Base map from GeoEngineers report:
"Subsurface Assessment
Rose's Parking Lot Portland, Oregon"
August 28, 1995. Site Plan, Figure 2

SCALE (Approximate ft.)

0 20 40

REMEDIATION WELL LOCATIONS AND SYSTEM CONFIGURATION	**ROSE'S PARKING LOT 330 NW 23RD AVENUE PORTLAND, OREGON**	TERRA VAC	PROJECT NO. 32-0029 Date March 16, 1998 Scale 1 Inch = 20 Feet Revision PVB -3	**Figure 3**



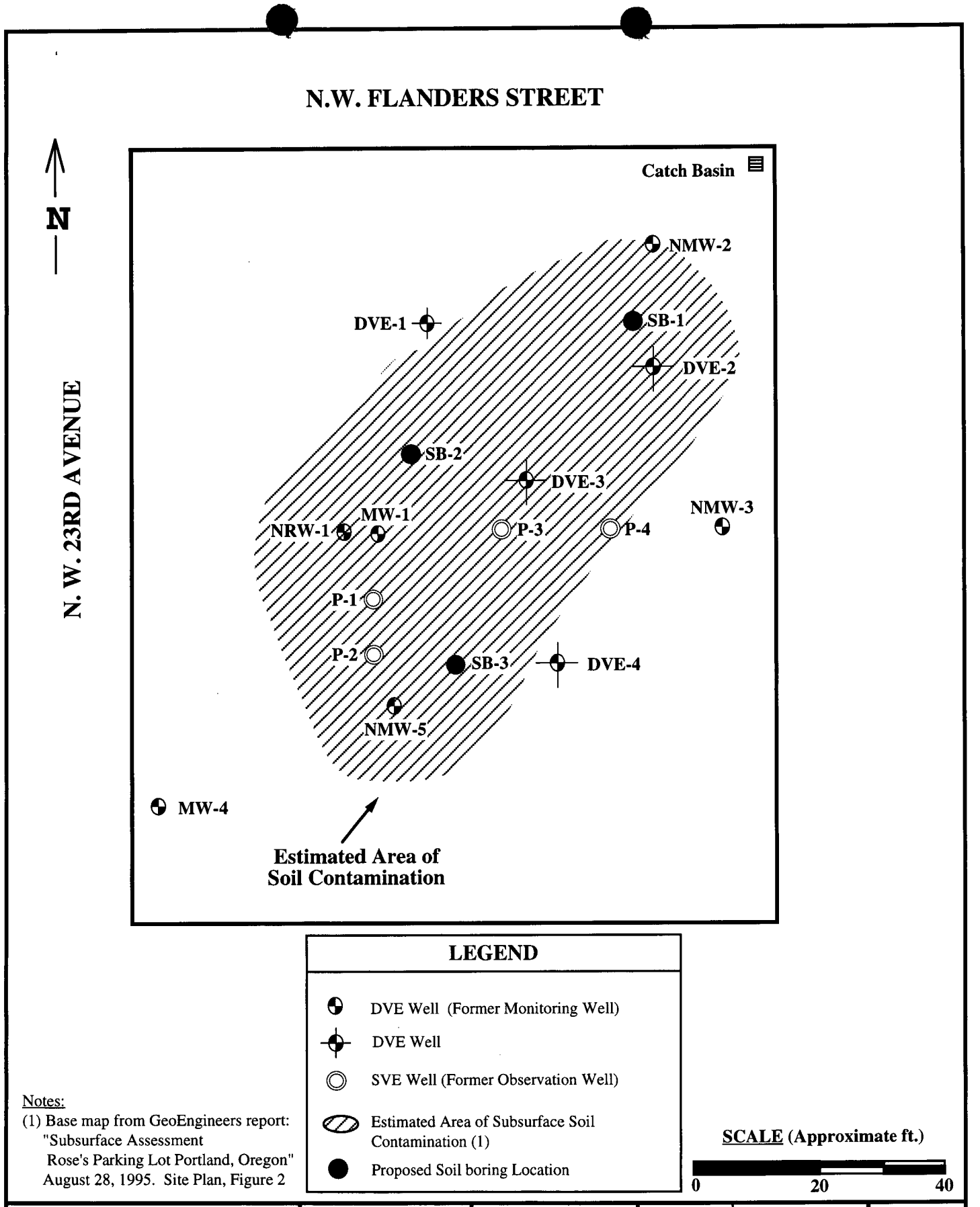
LEGEND

- T — TEMPERATURE INDICATOR
- F — FLOW RATE INDICATOR
- P — PRESSURE / VACUUM INDICATOR
- LSHH — LEVEL SWITCH HIGH-HIGH
- LSH — LEVEL SWITCH HIGH
- I — INTERLOCK
- FT — FLOW TOTALIZER
- S — SAMPLE PORT
- TS — TEMPERATURE SWITCH
- GROUNDWATER FLOW
- AIR FLOW
- CONTROL LINES

FIGURE 4
PROCESS & INSTRUMENTATION DIAGRAM
ROSE'S PARKING LOT
330 N.W. 23rd AVENUE
PORTLAND, OR

TERRA VAC

PROJECT NO.	32-0029
DATE	MAY 28, 1997
SCALE	N.T.S.
REVISION	PVB-1



Notes:
(1) Base map from GeoEngineers report: "Subsurface Assessment Rose's Parking Lot Portland, Oregon" August 28, 1995. Site Plan, Figure 2

PROPOSED CONFIRMATORY SOIL BORING LOCATIONS	**ROSE'S PARKING LOT 330 NW 23RD AVENUE PORTLAND, OREGON**	TERRA VAC	PROJECT NO. 32-0029 Date March 16, 1998 Scale 1 Inch = 20 Feet Revision PVB -2	**Figure 5**

TERRA VAC

Table 1

Summary of Analytical Results for Soil Samples
Rose's Parking Lot
Portland, Oregon

Sample/ Boring Identification	Sampling Date	Sampling Depth (Feet bgs.)	Analytical Results (mg/Kg)										Field Screening Results[2]	
			ODEQ Method TPH-HCID			ODEQ TPH-G	ODEQ TPH-418.1M	EPA Method 8020				Flashpoint	Headspace Vapor (ppm)	Sheen
			Gasoline	Diesel	Oil	Gasoline	Diesel/Oil	Benzene	Toluene	Ethylbenzene	Xylenes			
B-1	1/3/94	13.0	NA	NA	NA	99	NA	NA	NA	NA	NA	NA	NA	NA
B-1	1/3/94	18.0	Detected	Detected	ND>100	3,700	1,100	NA	NA	NA	NA	NA	NA	NA
B-1	1/3/94	25.5	ND>20	ND>50	ND>100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-2	1/3/94	10.5	ND>20	ND>50	ND>100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-3	1/3/94	10.5	NA	NA	NA	ND>5	NA	NA	NA	NA	NA	NA	NA	NA
B-3	1/3/94	20.5	NA	NA	NA	260	NA	NA	NA	NA	NA	NA	NA	NA
B-3	1/3/94	28.0	ND>20	ND>50	ND>100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-4	1/3/94	10.5	ND>20	ND>50	ND>100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-5	9/28/94	5.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-6	9/28/94	5.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-7	9/28/94	5.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-8	5/11/95	15.5	>20	>50[1]	NO	130	NA	NA	NA	NA	NA	NA	160	MS
B-8	5/11/95	23.0	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	>10,000	HS
B-9	5/11/95	23.0	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	340	SS
B-11	5/12/95	20.5	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	<100	NS
B-12	5/12/95	20.5	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	<100	SS
B-13	5/12/95	15.5	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	110	SS
B-13	5/12/95	23.0	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	120	SS
MW-1	3/23/94	15.0	NA	NA	NA	290	NA	0.09	0.34	1.1	8.1	NA	NA	NA
MW-1	3/23/94	25.0	POS. ID	POS. ID[3]	<200	6,550	NA	12.6	60.5	38.9	247.5	88°F	NA	NA
MW-2	3/23/94	15.0	NA	NA	NA	85	NA	<0.05	0.07	0.12	0.33	NA	NA	NA
MW-2	3/23/94	25.0	NA	NA	NA	NA	NA	<0.05	<0.05	0.07	<0.05	NA	NA	NA
MW-3	3/23/94	20.0	NA	NA	NA	NA	NA	<0.05	<0.05	<0.05	<0.05	NA	NA	NA
MW-4	9/28/94	5.0	ND	POS. ID[4]	ND	NA	52.2	NA	NA	NA	NA	NA	NA	NA
MW-4	9/28/94	20.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-5	5/11/95	23.0	>20	>50[1]	NO	5,200	NA	NA	NA	NA	NA	NA	>10,000	HS
R-1	11/2/95	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<100	NS
R-1	11/2/95	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<100	SS
R-1	11/2/95	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<100	SS
R-1	11/2/95	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,600	HS
R-1	11/2/95	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>10,000	HS
R-1	11/2/95	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,100	NS

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Table 1

Summary of Analytical Results for Soil Samples
Rose's Parking Lot
Portland, Oregon

Sample/ Boring Identification	Sampling Date	Sampling Depth (Feet bgs.)	Analytical Results (mg/Kg)										Field Screening Results[2]	
			ODEQ Method TPH-HCID			ODEQ TPH-G	ODEQ TPH-418.1M	EPA Method 8020				Flashpoint	Headspace Vapor (ppm)	Sheen
			Gasoline	Diesel	Oil	Gasoline	Diesel/Oil	Benzene	Toluene	Ethylbenzene	Xylenes			
DVE-1	1/24/97	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-1	1/24/97	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-1	1/24/97	15.0	NA	NA	NA	ND	NA	ND	ND	ND	ND	NA	41	NS
DVE-1	1/24/97	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	23	NS
DVE-1	1/24/97	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	18	NS
DVE-1	1/24/97	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-1	1/24/97	35.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-2	1/24/97	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	NS
DVE-2	1/24/97	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	NS
DVE-2	1/24/97	15.0	NA	NA	NA	2.23	NA	ND	ND	0.0565	ND	NA	100	NS
DVE-2	1/24/97	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	40	NS
DVE-2	1/24/97	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	22	NS
DVE-2	1/24/97	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-3	1/24/97	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1900	NS
DVE-3	1/24/97	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	47	NS
DVE-3	1/24/97	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	73	NS
DVE-3	1/24/97	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20	NS
DVE-3	1/24/97	35.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4	NS
DVE-4	1/24/97	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5	NS
DVE-4	1/24/97	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5	NS
DVE-4	1/24/97	15.0	NA	NA	NA	ND	NA	ND	ND	ND	ND	NA	8	NS
DVE-4	1/24/97	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	311	NS
DVE-4	1/24/97	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1600	NS
DVE-4	1/24/97	38.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4	NS

Notes:

bgs.	Below Ground Surface
NA	Not Analyzed
NO	Not Observed
ND	Not Detected Above Detection Limit Indicated in Original Reports
mg/Kg	Milligrams per Kilogram
ODEQ	Qregon Department of Environmental Quality
TPH	Total Petroleum Hydrocarbons
ppm	Parts per Million

1. The laboratory reported that diesel-range hydrocarbons identified in the sample were the result of an overlap from the gasoline-range; therefore, diesel-range hydrocarbons were not quantified.
2. NS = No Sheen, SS = Slight Sheen, MS = Moderate Sheen, HS = Heavy Sheen
3. Peaks in the gasoline range extend into the diesel range
4. Peaks were present within the retention time window of the listed petroleum hydrocarbon, but the peak patterns indicate the presence of low level heavy oils extending into the diesel range.

Table 2

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Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, µg/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Naphthalene = 28**	**5**
MW-1	3/29/94	NA	130	390	98	1,570	NA	NA
	10/4/94	NA	27	46	6	70	NA	NA
	5/12/95	NA	NA	NA	NA	NA	NA	NA
	1/4/96	54	400	2,200	630	4,800	Naphthalene - 370 Acenaphthylene - 44	100
	4/24/96	NA	NA	NA	NA	NA	NA	NA
	7/11/96	81	710	1,800	730	2	Naphthalene - 750 Acenaphthylene - 160 Phenanthrene - 2.2 Fluoranthene - 4.5	NA
	11/3/96	23	410	1,500	910	4,100	Naphthalene - 2,400 Acenaphthylene - 460 Acenaphthene -600 Fluorene - 12 Phenanthrene - 12 Anthracene - 0.89 Fluoranthene - 10 Pyrene - 2.1 Benzo(a)anthracene - 0.7 Chrysene - 1.3 Benzo(k)fluoranthene - 0.1 Benzo(a)pyrene - 0.3 Dibenzo(a,h)anthracene - 0.1 Benzo(g,h,i)perylene - 0.4	NA
	2/28/97*	57,200	1,130	3,890	1,220	7,430	Naphthalene - 760	20
	5/29/97	14,900	65.9	49.3	205	1,010	NA	NA
	9/5/97	14,600	10.9	11.8	47.3	642	Naphthalene - 54.2	NA
	12/31/97	2,960	ND	ND	ND	8.76	NA	NA

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Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, µg/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Naphthalene = 28**	**5**
NMW-2	3/29/94	NA	4.9	1.4	0.7	3.0	NA	NA
	10/4/94	NA	ND	ND	ND	ND	NA	NA
	5/12/95	ND	1.2	ND	0.6	0.7	NA	NA
	1/4/96	1,600	14	1.5	ND	1.7	ND	ND
	4/24/96	NA	7.7	0.5	ND	ND	NA	NA
	7/11/96	7,100	2.7	ND	ND	ND	ND	NA
	11/3/96	ND	2.0	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
NMW-3	3/29/94	NA	2,300	1,200	1,200	3,700	NA	NA
	10/4/94	NA	1,520	600	790	1,600	NA	NA
	5/12/95	3,500	1,300	740	800	2,000	Naphthalene - 130 Fluorene - 0.2 Phenanthrene - 0.09	NA
	1/4/96	4,500	1,300	640	940	2,600	Naphthalene - 180 Acenaphthylene - 23	6
	4/16/96	NA	900	500	600	1,400	NA	NA
	7/11/96	2,100	460	130	380	430	Naphthalene - 71	NA
	11/3/96	4,900	830	220	650	1,100	Naphthalene - 120 Acenaphthylene - 37	
	2/28/97	4,400	261	124	153	404	Naphthalene - 32.6	NA
	5/29/97	365	17.4	0.91	3.55	15.3	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA

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Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, µg/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Naphthalene = 28**	**5**
MW-4	10/4/94	NA	ND	ND	ND	ND	NA	NA
	5/12/95	ND	ND	ND	ND	ND	NA	NA
	1/4/96	900	ND	ND	ND	ND	ND	ND
	4/24/96	NA	ND	ND	ND	ND	NA	NA
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	0.7	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
NMW-5	5/12/95	13,000	660	13,000	1,900	11,000	Naphthalene - 450 Acenaphthylene - 66 Fluorene - 0.6 Phenanthrene - 0.42 Anthracene - 0.07	NA
	1/4/96	6,600	4.6	22	24	230	Naphthalene - 29 Acenaphthylene - 13 Fluorene - 0.8	14
	4/24/96	NA	ND	0.6	1.1	2.9	NA	NA
	7/11/96	ND	ND	ND	ND	2.7	NA	NA
	11/3/96	NA	ND	ND	2.5	5.6	NA	NA
	2/28/97	5,440	70.3	23.5	88.6	230	Naphthalene - 28.5	NA
	5/29/97	4,480	34.9	156	7.90	554	NA	NA
	9/5/97	5,550	39.0	334	23.5	642	ND	NA
	12/31/97	18,300	62.6	570	231.0	1,570	NA	NA

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Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, µg/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Naphthalene = 28**	**5**
MW-6	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	102	ND	ND	ND	ND	NA	NA
	10/2/97***	NA	NA	NA	NA	NA	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
MW-7	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	110	12	ND	ND	ND	NA	NA
	10/2/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA

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Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, µg/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Naphthalene = 28**	**5**
MW-8	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	111	ND	ND	ND	ND	NA	NA
	10/1/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA

Notes:

Sampling prior to 5/12/95 performed by RZA AGRA. Data from RZA AGRA report dated10/28/95.

Sampling between 5/12/94 and 11/3/96 performed by GeoEngineers. Data from GeoEngineers report dated1/21/97.

Wells MW-2, MW-3, and MW-5 redrilled 1/23-1/25/97, and renamed NMW-2, NMW-3, and NMW-5 respectively.

Analytical methods are provided in the referenced reports. In general analyses were performed using the following methods:

TPH-G EPA Method 418.1 or EPA Method 8015 Modified

BTEX EPA Method 8020A

PAHs EPA Method 8310

Lead Dissolved Lead by EPA Method 7421

* MW-1 sampled for lead 12/11/96.

** Sample Results were suspect. Well Resampled on 10/1/97 or 10/2/97.

*** Well was dry. No analytical sample taken.

NEL No Limit Established.

PAHs polycyclic aromatic hydrocarbons. Only analytes detected are listed. Refer to analytical results (Appendix A) for a complete list of analytes and their respective detection limits.

µg/L Micrograms per liter, or parts per billion.

ND Not Detected at the reporting limits Presented in the Original Reports.

NA Not Analyzed.

TPH-G Total petroleum hydrocarbons within the gasoline range (benzene to naphthalene).

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Table 3
Well Survey Analytical Data
Rose's Parking Lot
Portland, Oregon

Sampling Location	Sampling Date	Well Vacuum (in. Hg)	Line Vacuum (in. Hg)	dP (in. H2O)	Vapor Flow Rate (scfm)	Benzene (mg/l)	Toluene (mg/l)	Ethylbenzene (mg/l)	Total Xylenes (mg/l)	TPH-G (mg/l)	Percent TPH-G Reduction (%)
DVE-1	5/2/97	5.0	12.0	NA	NA	0.0189	0.0207	ND	0.1101	1.5000	0.0
	9/9/97	4.0	11.5	1.5	27.2	ND	0.0022	0.0006	0.0119	0.0561	96.3
DVE-2	5/2/97	3.0	10.0	NA	NA	ND	0.0034	ND	0.0020	0.0890	0.0
	9/9/97	5.0	11.5	0.7	18.6	ND	0.0023	0.0005	0.0098	0.0694	22.0
DVE-3	5/2/97	2.5	12.0	NA	NA	0.0963	0.1629	ND	0.4084	5.5440	0.0
	7/17/97	5.0	12.0	NA	NA	NA	NA	NA	NA	3.8044	31.4
	9/9/97	4.0	11.5	0.8	19.8	0.0085	0.0166	0.0146	0.0800	0.9300	83.2
DVE-4	5/2/97	3.0	11.0	NA	NA	0.0406	0.0125	ND	0.0559	0.6430	0.0
	7/17/97	6.0	12.0		NA	NA	NA	NA	NA	1.6039	0.0
	9/9/97	5.5	11.0	NA	NA	ND	0.0064	ND	0.0083	0.1870	70.9
NRW-1	5/2/97	3.0	11.5	NA	NA	2.0680	3.5732	ND	2.3118	27.1330	0.0
	7/17/97	6.0	10.5	0.6	17.6	NA	NA	NA	NA	13.5979	49.9
	9/9/97	5.0	10.5	0.5	16.1	0.0474	0.0840	0.0524	0.2842	4.3469	84.0
NMW-2	5/2/97	3.0	11.5	NA	NA	0.0026	0.0034	ND	0.0301	0.1540	0.0
	9/9/97	5.0	11.0	0.7	18.8	ND	0.0034	ND	0.0093	0.0733	52.4
NMW-3	5/2/97	5.0	12.0	NA	NA	0.0038	0.0024	ND	0.0085	0.0860	0.0
	7/17/97	5.0	11.0	0.9	21.3	NA	NA	NA	NA	0.1313	0.0
	9/9/97	5.0	10.5	1.7	29.7	ND	ND	ND	ND	0.0350	59.3
NMW-5	7/17/97	5.0	12.0	NA	NA	NA	NA	NA	NA	4.5456	0.0
	9/9/97	5.0	11.5	NA	NA	0.0414	0.0410	0.0213	0.1232	2.9175	35.8
P-1	5/2/97	4.0	9.5	NA	NA	0.0081	0.0070	ND	0.0626	0.3860	0.0
	9/9/97	5.0	10.0	6.0	56.5	ND	ND	ND	0.0069	0.0353	90.9
P-2	5/2/97	7.0	9.5	NA	NA	0.0229	0.0243	ND	0.1171	1.0000	0.0
	7/17/97	8.0	12.0	1.1	22.9	NA	NA	NA	NA	4.1750	0.0
	9/9/97	4.5	11.5	1.0	22.2	0.0060	0.0245	0.0085	0.0390	0.5913	40.9
P-3	5/2/97	5.0	11.0	NA	NA	0.0032	0.0052	ND	0.0344	0.2620	0.0
	9/9/97	5.0	10.0	5.0	51.6	ND	ND	ND	0.0062	0.0435	83.4
P-4	5/2/97	8.0	13.0	NA	NA	ND	ND	ND	ND	0.0370	0.0

Notes:

dp	Differential Pressure
in. H20	Inches of Water
scfm	Standard cubic feet per minute
mg/l	Milligrams per liter
TPH-G	Total petroleum hydrocarbons within the gasoline range
NA	Not Analyzed
ND	Not Detected at the reporting limit of 0.002 mg/l

TERRA VAC

Table 4
System Operational and Analytical Data
Rose's Parking Lot
Portland, Oregon

Sampling Date	Line Vacuum (in. Hg)	dP (in. H2O)	Vapor Flow Rate (scfm)	Run Time (Days)	Benzene (mg/l)	Toluene (mg/l)	Ethylbenzene (mg/l)	Total Xylenes (mg/l)	Total TPH-G Conc. (mg/l)	Total TPH-G Extraction Rate (lbs/day)	Cumulative TPH-G Extracted (lbs)
3/18/97	15.0	0.2	179	2.3	0.0285	0.0980	0.0537	0.2811	2.8082	45.10	101.48
3/19/97	13.0	0.4	269	3.8	NA	NA	NA	NA	NA	67.92	186.25
3/24/97	13.0	0.2	190	7.5	NA	NA	NA	NA	NA	48.03	403.65
3/27/97	13.0	0.2	190	9.8	NA	NA	NA	NA	NA	48.03	511.71
4/3/97	13.0	0.3	233	15.0	NA	NA	NA	NA	NA	58.82	792.18
4/4/97	13.5	0.3	230	15.8	NA	NA	NA	NA	NA	57.95	835.97
4/8/97	13.5	0.4	265	18.8	NA	NA	NA	NA	NA	66.91	1023.26
4/9/97	13.5	0.3	230	19.5	NA	NA	NA	NA	NA	57.95	1070.08
4/10/97	12.5	0.4	273	20.3	NA	NA	NA	NA	NA	68.92	1117.65
4/14/97	13.0	0.4	269	23.3	NA	NA	NA	NA	NA	67.92	1322.90
4/16/97	12.0	0.4	277	24.8	NA	NA	NA	NA	NA	69.90	1426.27
4/21/97	12.8	0.4	271	28.5	NA	NA	NA	NA	NA	68.42	1685.61
4/25/97	13.0	0.2	190	31.5	NA	NA	NA	NA	NA	48.03	1860.28
5/1/97	13.5	0.3	230	36.0	NA	NA	NA	NA	NA	57.95	2098.72
5/2/97	10.0	0.6	358	36.8	0.0591	0.0356	0.0058	0.0752	0.9875	31.74	2132.35
5/7/97	14.0	0.2	185	40.5	NA	NA	NA	NA	NA	16.38	2222.57
5/15/97	13.5	0.2	187	46.5	NA	NA	NA	NA	NA	16.64	2321.63
5/16/97	14.0	0.2	185	47.3	NA	NA	NA	NA	NA	16.38	2334.02
5/19/97	13.5	0.3	230	49.5	0.0534	0.0947	0.0067	0.2313	2.9623	61.13	2421.21
6/4/97	13.5	0.2	187	61.5	NA	NA	NA	NA	NA	49.91	3087.42
6/5/97	14.0	0.5	292	62.3	0.0285	0.0980	0.0537	0.2811	2.8082	73.66	3133.76
6/16/97	14.0	0.5	292	70.5	NA	NA	NA	NA	NA	73.66	3741.47
6/19/97	NA	NA	NA	72.8	NA	NA	NA	NA	NA	NA	3907.21
6/20/97	14.0	0.4	261	73.5	0.0026	0.0041	0.0054	0.0145	0.0619	1.45	3935.38
7/17/97	12.5	0.3	236	95.1	NA	NA	NA	NA	2.9828	63.39	4635.71
9/5/97	13.0	0.3	233	140.0	0.0178	0.0346	0.0225	0.1517	1.7377	36.40	6876.02
9/9/97	13.0	0.3	233	144.0	0.0139	0.0376	0.0263	0.1790	1.6962	35.53	7019.88
9/23/97	12.5	0.3	236	158.0	ND	ND	ND	ND	1.6288	34.62	7510.90

Notes:

in. Hg	Inches of mercury
dp	Differential Pressure
in. H2O	Inches of water
scfm	Standard cubic feet per minute
mg/l	Milligrams per liter, or parts per million
lbs/day	Pounds per day
lbs	Pounds
TPH-G	Total petroleum hydrocarbons within the gasoline range
NA	Not Analyzed
ND	Not Detected at the reporting limit of 0.002 mg/l

RBCA TIER 1/TIER 2 EVALUATION

Output Table 1

Site Name: Rose's Parking Lot | Job Identification: 32-0029 | Software: GSI RBCA Spreadsheet
Site Location: Portland, Oregon | Date Completed: 1/30/98 | Version: 1.0.1
Completed By: Eric Maki

NOTE: values which differ from Tier 1 default values are shown in bold italics and underlined.

Exposure Parameter	Definition (Units)	Residential Adult	Residential (1-6yrs)	Residential (1-16 yrs)	Commercial/Industrial Chronic	Commercial/Industrial Constrctn
ATc	Averaging time for carcinogens (yr)	70				
ATn	Averaging time for non-carcinogens (yr)	30	6	16	25	1
BW	Body Weight (kg)	70	15	35	70	
ED	Exposure Duration (yr)	30	6	16	25	1
t	Averaging time for vapor flux (yr)	30			25	1
EF	Exposure Frequency (days/yr)	350			250	180
EF.Derm	Exposure Frequency for dermal exposure	350			250	
IRgw	Ingestion Rate of Water (L/day)	2			1	
IRs	Ingestion Rate of Soil (mg/day)	100	200		50	100
IRadj	Adjusted soil ing. rate (mg-yr/kg-d)	1.1E+02			9.4E+01	
IRa.in	Inhalation rate indoor (m^3/day)	15			20	
IRa.out	Inhalation rate outdoor (m^3/day)	20			20	10
SA	Skin surface area (dermal) (cm^2)	5.8E+03		2.0E+03	5.8E+03	5.8E+03
SAadj	Adjusted dermal area (cm^2-yr/kg)	2.1E+03			1.7E+03	
M	Soil to Skin adherence factor	1				
AAFs	Age adjustment on soil ingestion	FALSE			FALSE	
AAFd	Age adjustment on skin surface area	FALSE			FALSE	
tox	Use EPA tox data for air (or PEL based)?	TRUE				
gwMCL?	Use MCL as exposure limit in groundwater?	FALSE				

Matrix of Exposed Persons to Complete Exposure Pathways		Residential	Commercial/Industrial Chronic	Commercial/Industrial Constrctn
Outdoor Air Pathways:				
SS.v	Volatiles and Particulates from Surface Soils	FALSE	FALSE	TRUE
S.v	Volatilization from Subsurface Soils	FALSE	TRUE	
GW.v	Volatilization from Groundwater	FALSE	TRUE	
Indoor Air Pathways:				
S.b	Vapors from Subsurface Soils	FALSE	FALSE	
GW.b	Vapors from Groundwater	FALSE	FALSE	
Soil Pathways:				
SS.d	Direct Ingestion and Dermal Contact	FALSE	FALSE	TRUE
Groundwater Pathways:				
GW.I	Groundwater Ingestion	FALSE	TRUE	
S.l	Leaching to Groundwater from all Soils	FALSE	TRUE	

Matrix of Receptor Distance and Location On- or Off-Site		Residential Distance	Residential On-Site	Commercial/Industrial Distance	Commercial/Industrial On-Site
GW	Groundwater receptor (cm)	3.7E+03	FALSE	3.7E+03	FALSE
S	Inhalation receptor (cm)		FALSE		TRUE

Matrix of Target Risks		Individual	Cumulative
TRab	Target Risk (class A&B carcinogens)	1.0E-06	***1.0E-06***
TRc	Target Risk (class C carcinogens)	1.0E-05	
THQ	Target Hazard Quotient	1.0E+00	1.0E+00
Opt	Calculation Option (1, 2, or 3)	3	
Tier	RBCA Tier	2	

Surface Parameters	Definition (Units)	Residential	Constrctn
A	Contaminated soil area (cm^2)	2.2E+06	1.0E+06
W	Length of affect. soil parallel to wind (cm)	1.5E+03	1.0E+03
W.gw	Length of affect. soil parallel to groundwater (cm	***1.6E+03***	
Uair	Ambient air velocity in mixing zone (cm/s)	2.3E+02	
delta	Air mixing zone height (cm)	2.0E+02	
Lss	Thickness of affected surface soils (cm)	1.0E+02	
Pe	Particulate areal emission rate (g/cm^2/s)	6.9E-14	

Groundwater	Definition (Units)	Value
delta.gw	Groundwater mixing zone depth (cm)	2.0E+02
I	Groundwater infiltration rate (cm/yr)	3.0E+01
Ugw	Groundwater Darcy velocity (cm/yr)	***5.1E+01***
Ugw.tr	Groundwater seepage velocity (cm/yr)	***1.3E+02***
Ks	Saturated hydraulic conductivity(cm/s)	7.0E-05
grad	Groundwater gradient (cm/cm)	2.3E-02
Sw	Width of groundwater source zone (cm)	1.8E+03
Sd	Depth of groundwater source zone (cm)	3.0E+02
phi.eff	Effective porosity in water-bearing unit	3.8E-01
foc.sat	Fraction organic carbon in water-bearing unit	1.0E-03
BIO?	Is biosttenuation considered?	TRUE
BC	Biodegradation Capacity (mg/L)	

Soil	Definition (Units)	Value		
hc	Capillary zone thickness (cm)	***9.1E+01***		
hv	Vadose zone thickness (cm)	***6.7E+02***		
rho	Soil density (g/cm^3)	1.7		
foc	Fraction of organic carbon in vadose zone	0.01		
phi	Soil porosity in vadose zone	0.38		
Lgw	Depth to groundwater (cm)	***7.6E+02***		
Ls	Depth to top of affected subsurface soil (cm)	***3.0E+02***		
Lsubs	Thickness of affected subsurface soils (cm)	***3.7E+02***		
pH	Soil/groundwater pH	6.5		
		capillary	vadose	foundation
phi.w	Volumetric water content	0.342	0.12	0.12
phi.a	Volumetric air content	0.038	0.26	0.26

Building	Definition (Units)	Residential	Commercial
Lb	Building volume/area ratio (cm)	2.0E+02	3.0E+02
ER	Building air exchange rate (s^-1)	1.4E-04	2.3E-04
Lcrk	Foundation crack thickness (cm)	1.5E+01	
eta	Foundation crack fraction	0.01	

Transport Parameters	Definition (Units)	Residential	Commercial
Groundwater			
ax	Longitudinal dispersivity (cm)		2.4E+02
ay	Transverse dispersivity (cm)		2.4E+01
az	Vertical dispersivity (cm)		2.4E+00
Vapor			
dcy	Transverse dispersion coefficient (cm)		
dcz	Vertical dispersion coefficient (cm)		

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Table 6

RBCA SITE ASSESSMENT — Tier 2 Worksheet 9.3

Site Name: Rose's Parking Lot
Site Location: Portland, Oregon
Completed By: Eric Maki
Date Completed: 1/30/1998

GROUNDWATER SSTL VALUES

Target Risk (Class A & B) 1.0E-6
Target Risk (Class C) 1.0E-5
Target Hazard Quotient 1.0E+0

☐ MCL exposure limit?
☐ PEL exposure limit?

Calculation Option: 3
Groundwater DAF Option: Domenico - First Order (One-directional vert. dispersion)

SSTL Results For Complete Exposure Pathways ("x" If Complete)

CONSTITUENTS OF CONCERN		Representative Concentration	X Groundwater Ingestion			Groundwater Volatilization to Indoor Air		X Groundwater Volatilization to Outdoor Air		Applicable SSTL	SSTL Exceeded ?	Required CRF
CAS No.	Name	(mg/L)	Residential (on-site)	Commercial: 120 feet	Regulatory(MCL): 120 feet	Residential (on-site)	Commercial (on-site)	Residential (on-site)	Commercial: (on-site)	(mg/L	"■" If yes	Only if "yes" left
71-43-2	Benzene	6.3E-2	NA	1.9E+1	NA	NA	NA	NA	2.9E+2	1.9E+1	☐	<1
100-41-4	Ethylbenzene	2.3E-1	NA	>Sol	NA	NA	NA	NA	>Sol	>Sol	☐	<1
108-88-3	Toluene	5.7E-1	NA	>Sol	NA	NA	NA	NA	>Sol	>Sol	☐	<1
1330-20-7	Xylene (mixed isomers)	1.6E+0	NA	>Sol	NA	NA	NA	NA	>Sol	>Sol	☐	<1

>Sol indicates risk-based target concentration greater than constituent solubility

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Software: GSI RBCA Spreadsheet Serial: 0
Version: 1.0.1

Table 7

RBCA SITE ASSESSMENT — Tier 2 Worksheet 9.2

Site Name: Rose's Parking Lot
Site Location: Portland, Oregon
Completed By: Eric Maki
Date Completed: 1/30/1998

SUBSURFACE SOIL SSTL VALUES (> 3.3 FT BGS)

Target Risk (Class A & B) 1.0E-6
Target Risk (Class C) 1.0E-5
Target Hazard Quotient 1.0E+0

☐ MCL exposure limit?
☐ PEL exposure limit?

Calculation Option: 3
Groundwater DAF Option: Domenico - First Order (One-directional vert. dispersion)

SSTL Results For Complete Exposure Pathways ("x" If Complete)

CONSTITUENTS OF CONCERN		Representative Concentration	X	Soil Leaching to Groundwater				Soil Volatilization to Indoor Air		X	Soil Volatilization to Outdoor Air		Applicable SSTL	SSTL Exceeded ?	Required CRF
CAS No.	Name	(mg/kg)		Residential: (on-site)	Commercial: 120 feet	Regulatory(MCL): 120 feet		Residential: (on-site)	Commercial: (on-site)		Residential: (on-site)	Commercial: (on-site)	(mg/kg)	"■" If yes	Only if "yes" left
71-43-2	Benzene	1.3E+1		NA	1.1E+1	NA		NA	NA		NA	1.9E+1	1.1E+1	■	1.0E+00
100-41-4	Ethylbenzene	3.9E+1		NA	>Res	NA		NA	NA		NA	>Res	>Res	☐	<1
108-88-3	Toluene	6.1E+1		NA	>Res	NA		NA	NA		NA	>Res	>Res	☐	<1
1330-20-7	Xylene (mixed isomers)	2.5E+2		NA	>Res	NA		NA	NA		NA	>Res	>Res	☐	<1

>Res indicates risk-based target concentration greater than constituent residual saturation value

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Software: GSI RBCA Spreadsheet Serial: 0
Version: 1.0.1

TERRA VAC

APPENDIX A

Fourth Quarter Groundwater Monitoring Report

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TERRA VAC 10740 Meridian Avenue North, Suite 202, Seattle, WA 98133-9010
Tel (206) 362-8128 ❑ Fax (206) 362-9528

March 3, 1998

Mr. Max Birnbach
c/o Mr. Charles R. Williamson
Kell, Alterman & Runstein
1001 Southwest Fifth Avenue, Suite 1800
Portland, OR 97204-1194

RE: Fourth Quarter 1997 Groundwater Monitoring Report
Rose's Parking Lot
330 Northwest 23rd Avenue, Portland, Oregon

Dear Mr. Birnbach:

Terra Vac performed quarterly groundwater monitoring at this site on December 31, 1997. Eight monitoring wells were sounded for depth to groundwater. Groundwater samples were collected from the monitoring wells for analyses of total gasoline-range petroleum hydrocarbons (TPH-G), benzene, toluene, ethylbenzene, and total xylenes (BTEX). A site location map is shown on Figure 1. Well construction details, including construction dates, well diameters, total depths, and screened intervals are provided in Table 1.

Groundwater elevations increased in all eight monitoring wells since the previous monitoring event. Analytical results indicate groundwater from one of the eight sampled wells exceeded the current Oregon Department of Environmental Quality (ODEQ) Groundwater Cleanup Levels for benzene (monitoring well NMW-5).

Groundwater monitoring and sampling were performed using standard field procedures. In short, each well was sounded for depth to groundwater and the presence of free phase petroleum hydrocarbons using an electronic interface probe. If free phase petroleum hydrocarbons were not detected, total well depth was measured. A minimum of three well volumes were bailed from each well sampled, and groundwater allowed to recover to at least 80 percent of original elevation. Analytical samples were then collected with new disposable bailers and immediately placed in sampling vials prepared specifically for the sampled media and selected analyses. Once collected, samples were immediately acidified and cooled for transportation to the laboratory under proper chain of custody.

Existing top of casing elevations, as determined by a March, 1997 well survey, were used to establish reference points for well depths, screen intervals, and groundwater elevations for wells MW-1, MW-4, MW- 6, NMW-2, NMW-3 and NMW-5. Elevations for MW-7 and MW-8 were calculated using previous survey data from GeoEngineers, corrected to the new local assumed datum. Historical groundwater elevations are presented in Table 2. Fourth quarter 1997 groundwater elevations as measured on December 31, 1997 are also presented on Figure 2. Historically, the inferred direction of groundwater flow has been to the northeast. Prior to sampling, the remediation system had been offline since October 31, 1997.

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Since February 1997, groundwater samples have been analyzed for TPH-G by EPA Method 8015, for BTEX constituents by EPA Method 8020A, for PAHs by EPA Method 8310, and for dissolved lead by EPQ Method 200.8. Previous groundwater sampling performed by GeoEngineers included in this report used EPA Method 418.1 for TPH-G, EPA Method 8020 for BTEX, EPA Method 8310 for PAHs, and EPA Method 7421 for dissolved lead. Results of these analyses, and historical groundwater quality data, are presented in Table 3. Groundwater quality results from the fourth quarter 1997 sampling are also shown on Figure 3. Analytical reports from the laboratory are contained in Appendix A.

Field activities were performed in a manner consistent with the level of skill and care standard for local environmental professionals. Findings and conclusions presented in this report have been prepared based upon the specific site conditions at the time of field activities and no warranty, expressed or implied, is made.

If you have any questions, please do not hesitate to contact us.

Sincerely,
Terra Vac Corporation

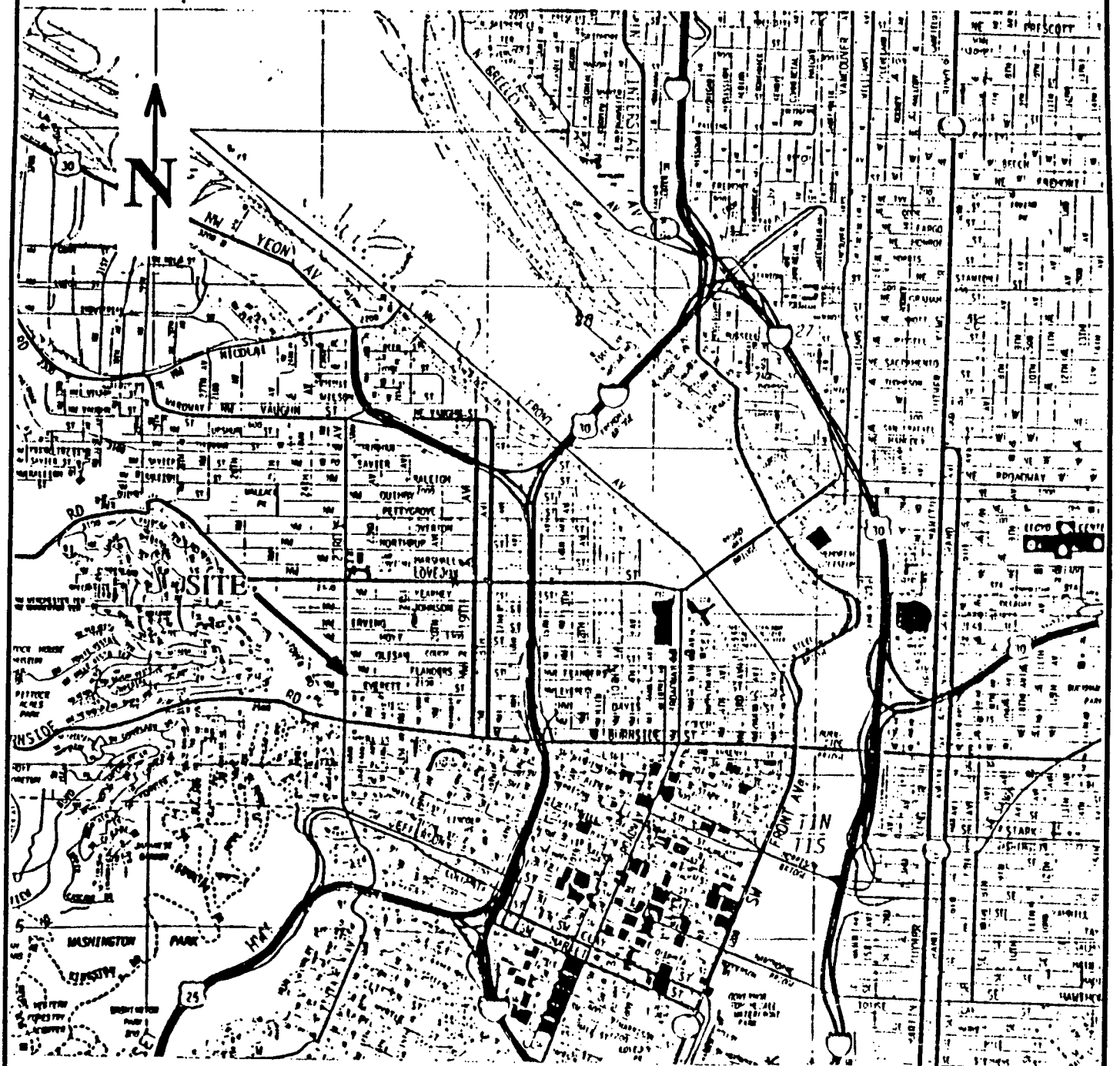
Paul V. Bianco,
Project Engineer

Timothy Warner,
Project Manager

cc: Dave Roy
Rich Kostecki
Jeffrey Wishko
Richard Singer (2 copies)
Richard Allen
Edward Crow
Don Pettit

32-0029.20.01

FIGURES

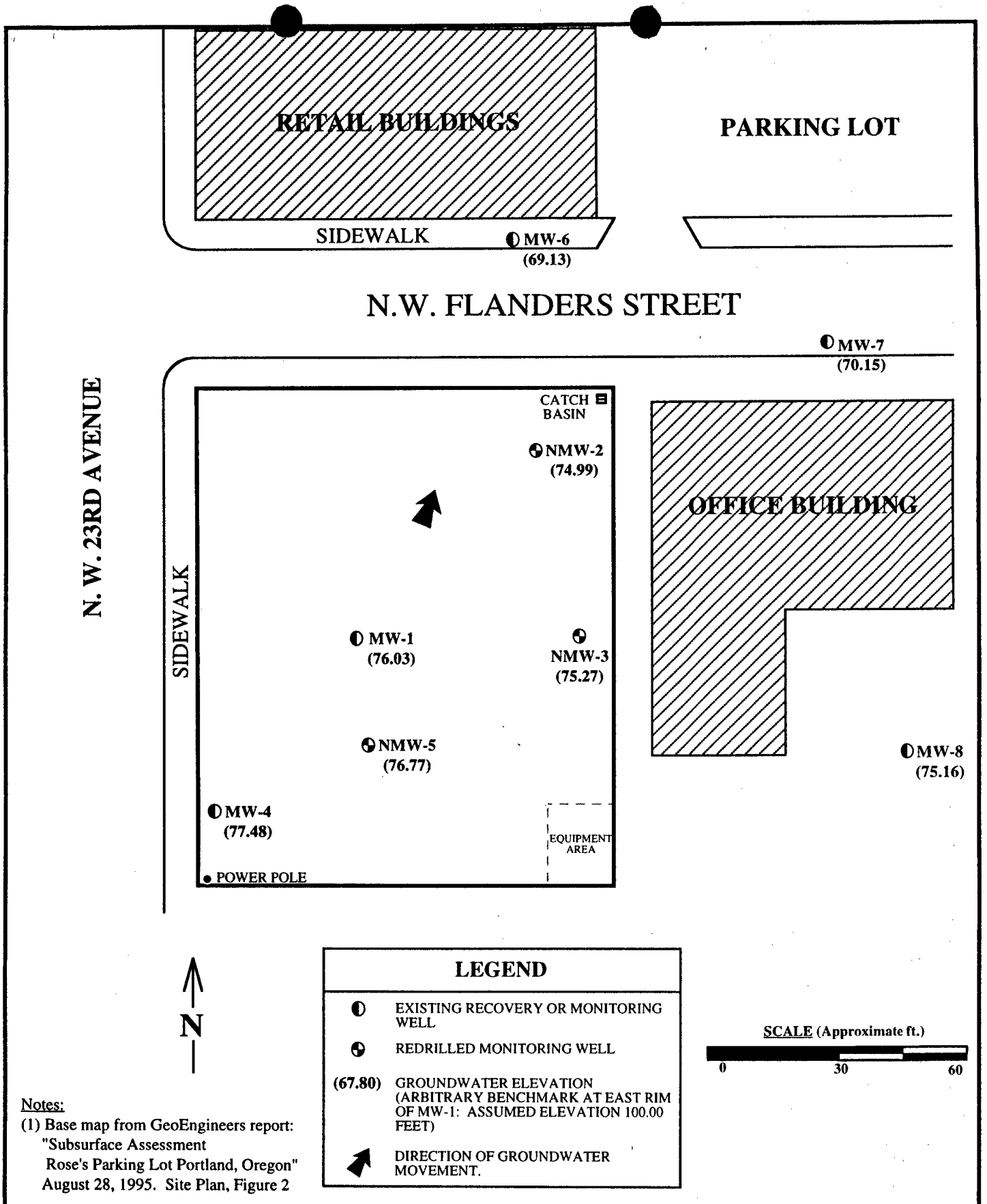


Source: The Thomas Guide, 1994
Portland Metro Area
Street Guide and Directory

Figure 1
Site Location Map
Rose's Parking Lot
Portland, OR

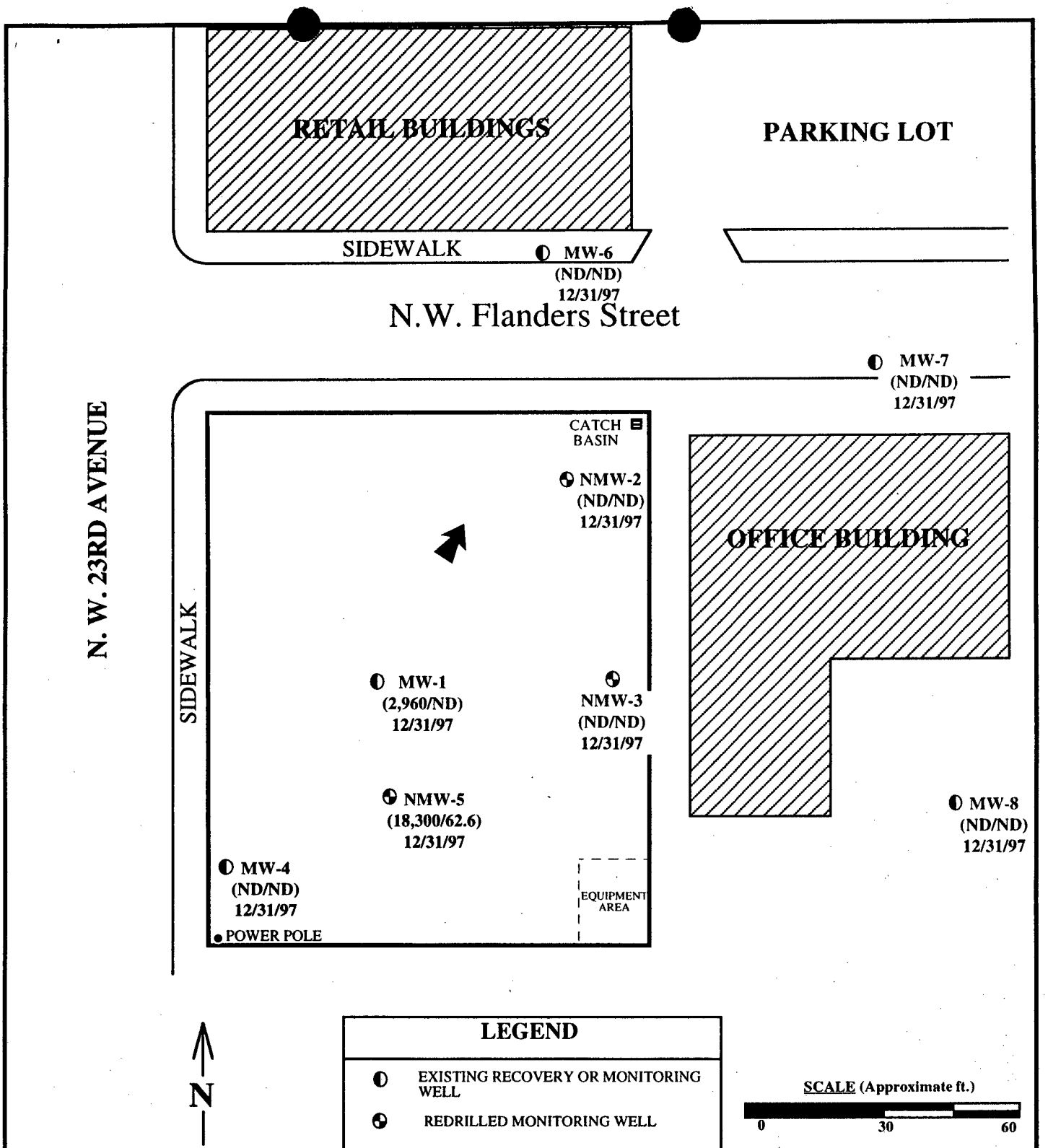
TERRA VAC

Project No.	32-0029
Date	February 12, 1997
Revision	MAM-1



Notes:
(1) Base map from GeoEngineers report: "Subsurface Assessment Rose's Parking Lot Portland, Oregon" August 28, 1995. Site Plan, Figure 2

GROUNDWATER ELEVATIONS	**Rose's Parking Lot 330 NW 23rd Ave. Portland, Oregon**	TERRA VAC	PROJECT NO. 32-0029 DATE JANUARY 13, 1998 SCALE 1 INCH ≈ 30 FEET REVISION PVB-3	Figure 2



Notes:
(1) Base map from GeoEngineers report:
"Subsurface Assessment
Rose's Parking Lot Portland, Oregon"
August 28, 1995. Site Plan, Figure 2

GROUNDWATER ANALYTICAL RESULTS	**Rose's Parking Lot 330 NW 23rd Ave. Portland, Oregon**	TERRA VAC	PROJECT NO. 32-0029 DATE JANUARY 13, 1998 SCALE 1 INCH ≈ 30 FEET REVISION PVB-3	Figure 3

TABLES

Table 1

Remediation Well Construction Data
Rose's Parking Lot
Portland, Oregon

Well Identification	Date Installed	Total Depth (feet)	Screen Interval		Well Diameter (inches)
			Top (feet)	Bottom (feet)	
MW-1	3/23/94	39	24	38.5	2
NMW-2	1/24/97	38	15	37	4
NMW-3	1/25/97	38	15.5	37.5	4
MW-4	9/28/94	40	20	39.5	2
NMW-5	1/23/97	38	15	37	4
MW-6	4/6/96	31	15	30.5	2
MW-7	4/6/96	31	15	30.5	2
MW-8	4/6/96	31	15	30.5	2

Notes:

Data on NMW-2, NMW-3, and NMW-5 is from Terra Vac field notes and well logs.

Data on MW-1 from RZA Agra Inc. well logs in April, 1994 report.

Data on MW-4 from RZA Agra Inc. well logs in October, 1994 report.

Data on MW-6 through MW-8 from well logs in GeoEngineers June, 1996 Report

Table 2

Groundwater Elevation Data
Rose's Parking Lot
Portland, Oregon

Well I.D.	Top of Casing Elevation (feet)	Date Sounded	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Water Level Elevation (feet MSL)	Difference from Previous Measurement (feet)
MW-1	100.00	5/12/95	22.79	23.29	0.5	76.71	**
		1/4/96	--	24.10	Trace	75.90	-0.81
		4/8/96	22.39	22.41	0.02	77.59	1.69
		4/24/96	22.40	22.45	0.05	77.55	-0.04
		7/11/96	--	23.35	Trace	76.65	-0.90
		11/3/96	--	24.44	Sheen	75.56	-1.09
		2/28/97	--	21.11	0	78.89	3.33
		5/29/97	--	26.90	0	73.10	-5.79
		9/5/97	--	27.86	0	72.14	-0.96
		12/31/97	--	23.97	0	76.03	3.89
NMW-2	96.21	5/12/95	--	20.75	0	75.46	**
		1/4/96	--	21.60	0	74.61	-0.85
		4/8/96	--	19.73	0	76.48	1.87
		4/24/96	--	19.90	0	76.31	-0.17
		7/11/96	Sheen	20.80	0	75.41	-0.90
		11/3/96	--	21.87	0	74.34	-1.07
		2/28/97	--	18.51	0	77.70	3.36
		5/29/97	--	25.30	0	70.91	-6.79
		9/5/97	--	26.83	0	69.38	-1.53
		12/31/97	--	21.22	0	74.99	5.61
NMW-3	99.15	5/12/95	--	23.48	0	75.67	**
		1/4/96	--	24.22	0	74.93	-0.74
		4/8/96	--	22.31	0	76.84	1.91
		4/24/96	--	22.36	0	76.79	-0.05
		7/11/96	--	23.37	0	75.78	-1.01
		11/3/96	Sheen	24.47	0	74.68	-1.10
		2/28/97	--	21.28	0	77.87	3.19
		5/29/97	--	29.78	0	69.37	-8.50
		9/5/97	--	27.77	0	71.38	2.01
		12/31/97	--	23.88	0	75.27	3.89

Table 2

Groundwater Elevation Data
Rose's Parking Lot
Portland, Oregon

Well I.D.	Top of Casing Elevation (feet)	Date Sounded	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Water Level Elevation (feet MSL)	Difference from Previous Measurement (feet)
MW-4	100.48	5/12/95	--	22.55	0	77.93	**
		1/4/96	--	23.03	0	77.45	-0.48
		4/8/96	--	21.60	0	78.88	1.43
		4/24/96	--	21.34	0	79.14	0.26
		7/11/96	--	22.54	0	77.94	-1.20
		11/3/96	--	23.45	0	77.03	-0.91
		2/28/97	--	20.24	0	80.24	3.21
		5/29/97	--	26.04	0	74.44	-5.80
		9/5/97	--	26.58	0	73.90	-0.54
		12/31/97	--	23.00	0	77.48	3.58
NMW-5	100.45	5/12/95	--	22.35	0	78.10	**
		1/4/96	Trace	22.84	0	77.61	-0.49
		4/8/96	--	21.40	0	79.05	1.44
		4/24/96	--	20.04	0	80.41	1.36
		7/11/96	--	22.45	0	78.00	-2.41
		11/3/96	Sheen	23.38	0	77.07	-0.93
		2/28/97	--	21.07	0	79.38	2.31
		5/29/97	--	31.75	0	68.70	-10.68
		9/5/97	--	27.52	0	72.93	4.23
		12/31/97	--	23.68	0	76.77	3.84
MW-6	93.89	4/8/96	--	21.53	0	72.36	**
		4/24/96	--	22.04	0	71.85	-0.51
		7/11/96	--	22.61	0	71.28	-0.57
		11/3/96	--	24.04	0	69.85	-1.43
		2/28/97	--	20.89	0	73.00	3.15
		5/29/97	--	23.50	0	70.39	-2.61
		9/5/97	--	26.09	0	67.80	-2.59
		10/2/97	NA	NA	NA	NA	NA
		12/31/97	--	24.76	0	69.13	1.33

Table 2

Groundwater Elevation Data
Rose's Parking Lot
Portland, Oregon

Well I.D.	Top of Casing Elevation (feet)	Date Sounded	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Water Level Elevation (feet MSL)	Difference from Previous Measurement (feet)
MW-7	94.07	4/8/96	--	21.50	0	72.57	**
		4/24/96	--	21.05	0	73.02	0.45
		7/11/96	--	22.40	0	71.67	-1.35
		11/3/96	--	23.57	0	70.50	-1.17
		2/28/97	--	20.70	0	73.37	2.87
		5/29/97	--	22.20	0	71.87	-1.50
		9/5/97	--	24.89	0	69.18	-2.69
		10/2/97	NA	NA	NA	NA	NA
		12/31/97	--	23.92	0	70.15	0.97
MW-8	95.08	4/8/96	--	20.19	0	74.89	**
		4/24/96	--	18.42	0	76.66	1.77
		7/11/96	--	18.88	0	76.20	-0.46
		11/3/96	--	20.05	0	75.03	-1.17
		2/28/97	--	18.45	0	76.63	1.60
		9/5/97	--	22.49	0	72.59	-4.04
		10/1/97	NA	NA	NA	NA	NA
		12/31/97	--	19.92	0	75.16	2.57

Notes:

Data from 5/12/95-11/3/96 from GeoEngineers Groundwater Report January, 1997.

Wells MW-2, MW-3, and MW-5 redrilled 1/23-1/25/97, and renamed NMW-2, NMW-3, and NMW-5 respectively.

Depth to water measurements made from top of casing.

Elevations for wells except for MW-7 and MW-8 based on monitoring well survey conducted 3/3/97.
Elevations are measured to the local assumed datum of 100.00 feet at MW-1.
Elevations for MW-7 and MW-8 based on GeoEngineers' data, corrected for change in arbitrary reference point.

ft MSL feet above Mean Sea Level

** Not calculated; previous measurements not available.

-- Not Applicable; no free product detected in well.

NA Not Analyzed.

Table 3

TERRA VAC

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-1	3/29/94	NA	130	390	98	1,570	NA	NA
	10/4/94	NA	27	46	6	70	NA	NA
	5/12/95	NA	NA	NA	NA	NA	NA	NA
	1/4/96	54	400	2,200	630	4,800	Naphthalene - 370 Acenaphthylene - 44	100
	4/24/96	NA	NA	NA	NA	NA	NA	NA
	7/11/96	81	710	1,800	730	2	Naphthalene - 750 Acenaphthylene - 160 Phenanthrene - 2.2 Fluoranthene - 4.5	NA
	11/3/96	23	410	1,500	910	4,100	Naphthalene - 2,400 Acenaphthylene - 460 Acenaphthene -600 Fluorene - 12 Phenanthrene - 12 Anthracene - 0.89 Fluoranthene - 10 Pyrene - 2.1 Benzo(a)anthracene - 0.7 Chrysene - 1.3 Benzo(k)fluoranthene - 0.1 Benzo(a)pyrene - 0.3 Dibenzo(a,h)anthracene - 0.1 Benzo(g,h,i)perylene - 0.4	NA
	2/28/97*	57,200	1,130	3,890	1,220	7,430	Naphthalene - 760	20
	5/29/97	14,900	65.9	49.3	205	1,010	NA	NA
	9/5/97	14,600	10.9	11.8	47.3	642	Naphthalene - 54.2	NA
	12/31/97	2960	ND	ND	ND	8.76	NA	NA

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
NMW-2	3/29/94	NA	4.9	1.4	0.7	3.0	NA	NA
	10/4/94	NA	ND	ND	ND	ND	NA	NA
	5/12/95	ND	1.2	ND	0.6	0.7	NA	NA
	1/4/96	1,600	14	1.5	ND	1.7	ND	ND
	4/24/96	NA	7.7	0.5	ND	ND	NA	NA
	7/11/96	7,100	2.7	ND	ND	ND	ND	NA
	11/3/96	ND	2.0	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
NMW-3	3/29/94	NA	2,300	1,200	1,200	3,700	NA	NA
	10/4/94	NA	1,520	600	790	1,600	NA	NA
	5/12/95	3,500	1,300	740	800	2,000	Naphthalene - 130 Fluorene - 0.2 Phenanthrene - 0.09	NA
	1/4/96	4,500	1,300	640	940	2,600	Naphthalene - 180 Acenaphthylene - 23	6
	4/16/96	NA	900	500	600	1,400	NA	NA
	7/11/96	2,100	460	130	380	430	Naphthalene - 71	NA
	11/3/96	4,900	830	220	650	1,100	Naphthalene - 120 Acenaphthylene - 37	
	2/28/97	4,400	261	124	153	404	Naphthalene - 32.6	NA
	5/29/97	365	17.4	0.91	3.55	15.3	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA

Table 3

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-4	10/4/94	NA	ND	ND	ND	ND	NA	NA
	5/12/95	ND	ND	ND	ND	ND	NA	NA
	1/4/96	900	ND	ND	ND	ND	ND	ND
	4/24/96	NA	ND	ND	ND	ND	NA	NA
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	0.7	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
NMW-5	5/12/95	13,000	660	13,000	1,900	11,000	Naphthalene - 450 Acenaphthylene - 66 Fluorene - 0.6 Phenanthrene - 0.42 Anthracene - 0.07	NA
	1/4/96	6,600	4.6	22	24	230	Naphthalene - 29 Acenaphthylene - 13 Fluorene - 0.8	14
	4/24/96	NA	ND	0.6	1.1	2.9	NA	NA
	7/11/96	ND	ND	ND	ND	2.7	NA	NA
	11/3/96	NA	ND	ND	2.5	5.6	NA	NA
	2/28/97	5,440	70.3	23.5	88.6	230	Naphthalene - 28.5	NA
	5/29/97	4,480	34.9	156	7.90	554	NA	NA
	9/5/97	5,550	39.0	334	23.5	642	ND	NA
	12/31/97	18,300	62.6	570	231.0	1,570	NA	NA

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-6	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	102	ND	ND	ND	ND	NA	NA
	10/2/97***	NA	NA	NA	NA	NA	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
MW-7	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	110	12	ND	ND	ND	NA	NA
	10/2/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-8	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	111	ND	ND	ND	ND	NA	NA
	10/1/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA

Notes:

Sampling between 3/29/94 and 11/3/96 performed by GeoEngineers. Data from 1/21/97 Groundwater Report.

Wells MW-2, MW-3, and MW-5 redrilled 1/23-1/25/97, and renamed NMW-2, NMW-3, and NMW-5 respectively.

* MW-1 sampled for lead 12/11/96.

** Sample Results were suspect. Well Resampled on 10/1/97 or 10/2/97

*** Well was dry. No analytical sample taken.

PAHs polycyclic aromatic hydrocarbons. Only analytes detected are listed. Refer to analytical results (Appendix A) for a complete list of analytes and their respective detection limits.

ug/L Micrograms per liter, or parts per billion

ND Not Detected at the reporting limits

NA Not Analyzed

TPH-G Total petroleum hydrocarbons within the gasoline range (benzene to naphthalene).

APPENDIX A

- LABORATORY REPORTS

Table 2

Groundwater Elevation Data
Rose's Parking Lot
Portland, Oregon

Well I.D.	Top of Casing Elevation (feet)	Date Sounded	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Water Level Elevation (feet MSL)	Difference from Previous Measurement (feet)
MW-4	100.48	5/12/95	--	22.55	0	77.93	**
		1/4/96	--	23.03	0	77.45	-0.48
		4/8/96	--	21.60	0	78.88	1.43
		4/24/96	--	21.34	0	79.14	0.26
		7/11/96	--	22.54	0	77.94	-1.20
		11/3/96	--	23.45	0	77.03	-0.91
		2/28/97	--	20.24	0	80.24	3.21
		5/29/97	--	26.04	0	74.44	-5.80
		9/5/97	--	26.58	0	73.90	-0.54
		12/31/97	--	23.00	0	77.48	3.58
NMW-5	100.45	5/12/95	--	22.35	0	78.10	**
		1/4/96	Trace	22.84	0	77.61	-0.49
		4/8/96	--	21.40	0	79.05	1.44
		4/24/96	--	20.04	0	80.41	1.36
		7/11/96	--	22.45	0	78.00	-2.41
		11/3/96	Sheen	23.38	0	77.07	-0.93
		2/28/97	--	21.07	0	79.38	2.31
		5/29/97	--	31.75	0	68.70	-10.68
		9/5/97	--	27.52	0	72.93	4.23
		12/31/97	--	23.68	0	76.77	3.84
MW-6	93.89	4/8/96	--	21.53	0	72.36	**
		4/24/96	--	22.04	0	71.85	-0.51
		7/11/96	--	22.61	0	71.28	-0.57
		11/3/96	--	24.04	0	69.85	-1.43
		2/28/97	--	20.89	0	73.00	3.15
		5/29/97	--	23.50	0	70.39	-2.61
		9/5/97	--	26.09	0	67.80	-2.59
		10/2/97	NA	NA	NA	NA	NA
		12/31/97	--	24.76	0	69.13	1.33

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Seattle, WA 98133	Project Manager:	Tim Warner	Reported:	1/13/98 10:03

ANALYTICAL REPORT FOR SAMPLES:

Sample Description	Laboratory Sample Number	Sample Matrix	Date Sampled
MW-1	P801003-01	Water	12/31/97
NMW-2	P801003-02	Water	12/31/97
NMW-3	P801003-03	Water	12/31/97
MW-4	P801003-04	Water	12/31/97
NMW-5	P801003-05	Water	12/31/97
MW-6	P801003-06	Water	12/31/97
MW-7	P801003-07	Water	12/31/97
MW-8	P801003-08	Water	12/31/97
TRIP BLANK	P801003-09	Water	12/31/97

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Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-1			P801003-01				Water	
Benzene	0180004	1/2/98	1/2/98		1.00	ND	ug/l	1
Toluene	"	"	"		1.00	ND	"	1
Ethylbenzene	"	"	"		1.00	ND	"	1
Xylenes (total)	"	"	"		2.00	**8.76**	"	1
Gasoline Range Hydrocarbons	"	"	"		160	**2960**	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*114*	%	
NMW-2			P801003-02				Water	
Benzene	0180004	1/2/98	1/2/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*104*	%	
NMW-3			P801003-03				Water	
Benzene	0180004	1/2/98	1/2/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*97.4*	%	
MW-4			P801003-04				Water	
Benzene	0180004	1/2/98	1/2/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*95.6*	%	
NMW-5			P801003-05				Water	
Benzene	0180025	1/5/97	1/5/98		5.00	**62.6**	ug/l	
Toluene	"	"	"		5.00	**570**	"	
Ethylbenzene	"	"	"		5.00	**231**	"	
Xylenes (total)	"	"	"		10.0	**1570**	"	
Gasoline Range Hydrocarbons	"	"	"		800	**18300**	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*108*	%	

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for Sandra K. Wright, Project Manager

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Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-6			**P801003-06**				**Water**	
Benzene	0180004	1/2/98	1/2/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*91.4*	%	
MW-7			**P801003-07**				**Water**	
Benzene	0180004	1/2/98	1/2/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*98.4*	%	
MW-8			**P801003-08**				**Water**	
Benzene	0180004	1/2/98	1/2/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*97.4*	%	
TRIP BLANK			**P801003-09**				**Water**	
Benzene	0180004	1/2/98	1/2/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*89.6*	%	

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Sandra K. Wright, Project Manager

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Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 1/13/98 10:03

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0180004	**Date Prepared: 1/2/98**					**Extraction Method: EPA 5030**				
Blank	**0180004-BLK1**									
Benzene	1/2/98			ND	ug/l	0.500				
Toluene	"			ND	"	0.500				
Ethylbenzene	"			ND	"	0.500				
Xylenes (total)	"			ND	"	1.00				
Gasoline Range Hydrocarbons	"			ND	"	80.0				
Surrogate: 4-BFB	"	*50.0*		*52.9*	"	*50.0-150*	*106*			
LCS	**0180004-BS1**									
Gasoline Range Hydrocarbons	1/2/98	1250		1120	ug/l	50.0-150	89.6			
Surrogate: 4-BFB	"	*50.0*		*49.9*	"	*50.0-150*	*99.8*			
LCS	**0180004-BS2**									
Benzene	1/2/98	20.0		20.9	ug/l	67.0-130	104			
Toluene	"	20.0		20.7	"	75.0-126	104			
Ethylbenzene	"	20.0		20.7	"	76.0-124	104			
Xylenes (total)	"	60.0		62.9	"	75.0-126	105			
Surrogate: 4-BFB	"	*50.0*		*52.1*	"	*50.0-150*	*104*			
Duplicate	**0180004-DUP1**		**P801003-01**							
Gasoline Range Hydrocarbons	1/2/98		2960	ND	ug/l			50.0		
Surrogate: 4-BFB	"	*50.0*		*50.4*	"	*50.0-150*	*101*			
Duplicate	**0180004-DUP2**		**P801003-02**							
Gasoline Range Hydrocarbons	1/2/98		ND	ND	ug/l			50.0		
Surrogate: 4-BFB	"	*50.0*		*48.8*	"	*50.0-150*	*97.6*			
Matrix Spike	**0180004-MS1**		**P801003-03**							
Benzene	1/2/98	20.0	ND	17.3	ug/l	67.0-130	**86.5**			
Toluene	"	20.0	ND	18.5	"	75.0-126	**92.5**			
Ethylbenzene	"	20.0	ND	18.9	"	76.0-124	**94.5**			
Xylenes (total)	"	60.0	ND	58.0	"	75.0-126	**96.7**			
Surrogate: 4-BFB	"	*50.0*		*52.8*	"	*50.0-150*	*106*			
Matrix Spike Dup	**0180004-MSD1**		**P801003-03**							
Benzene	1/2/98	20.0	ND	21.6	ug/l	67.0-130	**108**	13.0	**22.1**	2
Toluene	"	20.0	ND	21.8	"	75.0-126	**109**	13.0	16.4	2
Ethylbenzene	"	20.0	ND	22.5	"	76.0-124	**113**	15.0	17.8	2

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Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 1/13/98 10:03

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Matrix Spike Dup (continued)	**0180004-MSD1**		**P801003-03**							
Xylenes (total)	1/2/98	60.0	ND	68.9	ug/l	75.0-126	**115**	13.0	**17.3**	2
Surrogate: 4-BFB	"	*50.0*		*50.9*	"	*50.0-150*	*102*			
Batch: 0180025	**Date Prepared: 1/5/97**					**Extraction Method: EPA 5030**				
Blank	**0180025-BLK1**									
Benzene	1/5/98			**ND**	ug/l	**0.500**				
Toluene	"			**ND**	"	**0.500**				
Ethylbenzene	"			**ND**	"	**0.500**				
Xylenes (total)	"			**ND**	"	**1.00**				
Gasoline Range Hydrocarbons	"			**ND**	"	**80.0**				
Surrogate: 4-BFB	"	*50.0*		*49.3*	"	*50.0-150*	*98.6*			
LCS	**0180025-BS1**									
Gasoline Range Hydrocarbons	1/5/98	1250		1260	ug/l	50.0-150	101			
Surrogate: 4-BFB	"	*50.0*		*56.4*	"	*50.0-150*	*113*			
LCS	**0180025-BS2**									
Benzene	1/5/98	20.0		20.1	ug/l	67.0-130	101			
Toluene	"	20.0		20.3	"	75.0-126	101			
Ethylbenzene	"	20.0		20.1	"	76.0-124	101			
Xylenes (total)	"	60.0		61.1	"	75.0-126	102			
Surrogate: 4-BFB	"	*50.0*		*56.1*	"	*50.0-150*	*112*			

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Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 1/13/98 10:03

Notes and Definitions

	Note
1	Reporting limits raised due to matrix interference.
2	The RPD for this QC sample is outside of established control limits. Review of associated batch QC indicates the recovery for this analyte does not represent an out-of-control condition for the batch.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
Recov.	Recovery
RPD	Relative Percent Difference

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COPY

CHAIN OF CUSTODY REPORT

Work Order # P801003

REPORT TO: Terra Vac	INVOICE TO: Same As Report To:
ATTENTION: Mr. Tim Warner	ATTENTION:
ADDRESS: 10740 Meridian Ave N #202, Seattle, WA 98133	ADDRESS:
PHONE (206)362-8294 FAX: (206)362-9528	P.O. NUMBER: NCA QUOTE #:
PROJECT NAME: Rose's Parking Lot	
PROJECT NUMBER: 32-0029	
SAMPLED BY: James Orr	

TURNAROUND REQUEST in Business Days *
Organic & Inorganic Analyses: 10 (Standard) | 7 | 5 | 4 | 3 | 2 | 1 | Same Day
Fuels & Hydrocarbon Analyses: X (Standard) | 3-4 | 2 | 1 | Same Day
OTHER Specify:
* Turnaround Requests less than standard may incur Rush Charges.

#	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	NCA SAMPLE ID (Laboratory Use Only)	Analysis Request: BTEX	MATRIX (W, S, A, O)	# OF CONTAINERS	COMMENTS
1.	MW-1	12-31-97/1750		X			
2.	NMW-2	1745		X			
3.	NMW-3	1740		X			
4.	MW-4	1735		X			
5.	NMW-5	1730		X			
6.	MW-6	1725		X			
7.	MW-7	1720		X			
8.	MW-8	1715		X			
9.	Trip Blank	1630		X			
10.							

RELINQUISHED BY (Signature): James Orr	DATE: 1-2-98	RECEIVED BY (Signature): Sara McClurg	DATE: 1-2-97
PRINT NAME: James Orr FIRM: Terra Vac	TIME: 1025	PRINT NAME: Sara McClurg FIRM: NCA	TIME: 1025
RELINQUISHED BY (Signature):	DATE:	RECEIVED BY (Signature):	DATE:
PRINT NAME: FIRM:	TIME:	PRINT NAME: FIRM:	TIME:

ADDITIONAL REMARKS:

PAGE 1 OF 1

TMB

26-94-0022

AOP

[redacted]

TERRA VAC

We're gaining new ground.

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED

AUG 06 1999

NORTHWEST REGION

ACTIVE REMEDIATION CLOSURE REPORT

ROSE'S PARKING LOT
330 NORTHWEST 23RD AVENUE
PORTLAND, OREGON 97202

July 16, 1999

PREPARED FOR:

Mr. Richard Singer
824 NW Albemarle Terrace
Portland, Oregon 97210

PREPARED BY:

Paul V. Bianco
Project Engineer

Timothy Warner
Project Manager

TABLE OF CONTENTS

1.0	**INTRODUCTION**	Page 1
2.0	**BACKGROUND INFORMATION**	Page 1
2.1	Site Description	Page 1
2.2	Previous Work	Page 1
2.3	Geology and Hydrogeology	Page 2
3.0	**SUMMARY OF SITE SPECIFIC ANALYTICAL DATA**	Page 3
3.1	Soil Analytical	Page 3
3.1.1	Soil Borings	Page 3
3.1.2	UST Excavation	Page 4
3.2	Groundwater Analytical	Page 4
4.0	**SITE REMEDIATION**	Page 5
4.1	Remediation System Design	Page 5
4.1.1	Pilot Testing of Subsurface Air Movement Technologies	Page 5
4.1.2	Remediation Theory	Page 6
4.1.3	System Equipment and Design Parameters	Page 7
4.2	Summary of Remediation System Operations	Page 7
5.0	**RISK BASED CORRECTIVE ACTION ANALYSIS**	Page 8
5.1	Tier 1: Generic Screening – Level Corrective Action Goals	Page 9
5.2	Tier 2: Site Specific Corrective Action Goals	Page 9
5.3	Results of Tier 1 RBCA Analysis	Page 9
5.4	Results of Tier 2 RBCA Analysis	Page 10
6.0	**RECOMMENDATIONS**	Page 11

FIGURES

1. Site Location Map
2. Site Map
3. Remediation Well Locations and System Configuration
4. Process and Instrumentation Diagram

TABLES

1. Summary of Analytical Results for Soil Samples
2. Groundwater Analytical Results from Monitoring Well Locations
3. Well Survey Analytical Data
4. System Operational and Analytical Data
5. RBCA Tier 1 and Tier 2 Input Data Summary
6. RBCA Tier 1 Groundwater Results
7. RBCA Tier 1 Soil Results
8. RBCA Tier 2 Groundwater Results
9. RBCA Tier 2 Soil Results

APPENDIX A Fourth Quarter 1998 Groundwater Monitoring Report

APPENDIX B RBCA Evaluation

1.0 INTRODUCTION

This document addresses the instrument of placing a "no further action" approval for the Rose's Parking Lot site, located at 330 Northwest 23rd Avenue, Portland, Oregon. This document presents a site background, site and chemical characterization information, and a health based risk assessment.

2.0 BACKGROUND INFORMATION

2.1 Site Description

The site is located at 330 Northwest 23rd Avenue in Portland, Oregon. It is bound by NW 23rd to the west and by NW Flanders Street to the north. The site is approximately 1/3 acre in size and is relatively flat, sloping slightly towards NW Flanders Street. A site location map is included as Figure 1. The Oregon Department of Environmental Quality (DEQ) underground storage tank (UST) Cleanup List Number for the site is 26-94-25.

The site was occupied by gasoline service stations from the 1950s to the 1970s. These service stations were operated by Unocal (Union Oil Company of California), AMOCO (AMOCO Oil Company), and Gull (Gull Industries, Inc.). All above ground structures have been removed, and the site is currently an open paved parking lot.

A review of reports containing site history indicate that a gasoline service station was constructed on the site in 1954. Station facilities included three pump islands, two 5,000-gallon USTs, one 550-gallon waste oil tank, and the station building. The station was renovated in 1964 to include two pump islands, two 5,000-gallon USTs, one 550-gallon waste oil tank, and a service station. It has been reported that the gasoline USTs have been removed from the site. General site features, including the location of former USTs, are shown on the site map presented as Figure 2.

2.2 Previous Work

Numerous investigations have been conducted at this site, including the following:

> *"Subsurface Investigation"*, prepared by Hahn and Associates, Inc. on February 2, 1994.
>
> *"Subsurface Groundwater Investigation, Former Service Station Site"*, prepared by RZA AGRA, Inc. on April 8, 1994.
>
> *"Subsurface Groundwater Investigation, Former Service Station Site"*, prepared by AGRA Earth & Environmental, Inc. on October 27, 1994.
>
> *"Subsurface Assessment, Rose's Parking Lot"*, prepared by GeoEngineers on August 28, 1995.
>
> *"UST Removal and EFRT Pilot Test, Rose's Parking Lot, Portland Oregon"*, prepared by GeoEngineers on February 28, 1996.

"Results of Quarterly Ground Water Monitoring", prepared by GeoEngineers on April 10, 1996.

"Results of Off-site Subsurface Explorations and Quarterly Ground Water Monitoring", prepared by GeoEngineers on June 13, 1996.

"Results of Quarterly Ground Water Monitoring", prepared by GeoEngineers on November 15, 1996.

" Site Investigation Report", prepared by Terra Vac Corporation on May 28, 1997.

" System Operations Report", prepared by Terra Vac Corporation on July 1, 1997.

" System Operations Report", prepared by Terra Vac Corporation on October 17, 1997.

In summary, environmental studies indicated that subsurface soil and groundwater at the site had been impacted by gasoline-range petroleum hydrocarbons. Impact to subsurface soil was greatest just above and below the groundwater table, which fluctuates seasonally from approximately 22 to 28 feet below ground surface (bgs). Soil in this impacted zone has been described as consisting primarily of silty sand and silt. Across the site, groundwater impact ranged from non detectable levels of petroleum hydrocarbons to a measurable thickness of free phase gasoline.

Based upon known site data, Terra Vac designed, installed and operated a dual vacuum extraction (DVE) remediation system to simultaneously address impact to site soil and groundwater. To reach DEQ site closure requirements, remediation efforts were focused on groundwater and soil in the zone from 5 feet above to 5 feet below the seasonal groundwater extremes, or from approximately 17 to 33 feet bgs.

2.3 Geology and Hydrogeology

The site is located near the western margin of the Portland Basin at an elevation of approximately 150 feet above mean sea level (msl). Near surface geology consist of Quaternary Alluvium which extends to depths of approximately 100 feet bgs. This alluvium lens represents the flood plain deposits of the Willamette and Columbia rivers and consists of silt, sand, and clay. The Quaternary Alluvium is underlain by the Pliocene Troutdale Formation which extends to depths of approximately 250 feet bgs. The Pliocene Troutdale Formation consists of silts, clays, sands, and occasional gravels and is underlain by the Miocene Columbia River Basalt.

The primary regional aquifer is the Troutdale Gravel Aquifer which, in the vicinity of the site, occurs at approximately 100 feet bgs. However, a shallower groundwater table is encountered beneath the site at an average depth of approximately 25 feet bgs. The apparent direction of groundwater flow within this saturated zone has been reported to be northeast across the site at an estimated gradient of 0.08 feet/feet.

3.0 SUMMARY OF SITE SPECIFIC ANALYTICAL DATA

3.1 Soil Analytical

3.1.1 Soil Borings

Previous reports indicate that 13 soil borings (B-1 through B-13) have been advanced at the site. Groundwater monitoring well MW-5 was constructed in boring B-10 and the remaining borings were abandoned. In addition to MW-5, four groundwater monitoring wells (MW-1 through MW-4), one recovery well (R-1), four shallow observation wells (P-1 through P-4), and four remediation wells (DVE-1 through DVE-4) have been constructed on-site. Additionally, three monitoring wells (MW-6 through MW-8) have been constructed off site.

The locations of soil borings, on-site groundwater monitoring wells, and recovery well R-1 are shown on Figure 2. The locations of the shallow observations wells and remediation wells are shown on Figure 3.

During drilling, soil samples were typically collected for soil logging and field screening of petroleum hydrocarbon impact. Selected soil samples were additionally analyzed for the concentrations of specific petroleum range hydrocarbons. A summary of field screening and analytical results for site soil samples is presented in Table 1.

Hahn and Associates, Inc. (HAI) performed a subsurface investigation on January 3, 1994. As part of the investigation, soil borings B-1 through B-4 were drilled and soil samples collected. Petroleum hydrocarbons were not detected in soil samples from B-2, located near a former pump island, or from B-4, located near the waste oil UST. Recordable concentrations of petroleum hydrocarbons were reported at depths of 13.0 and 18 feet bgs in B-1 and at 20.5 feet bgs in B-3. Borings B-1 and B-3 were located in the vicinity of the former USTs. The highest petroleum hydrocarbon concentrations were recorded in soil from boring B-1 at a depth of 18 feet bgs. That sample contained 3,700 parts per million (ppm) of total petroleum hydrocarbons in the gasoline range (TPH-G) and 1,100 ppm of diesel-range petroleum hydrocarbons. Complete results of the HAI investigation are summarized in their February 2, 1994 report.

RZA AGRA, Inc. (AGRA) supervised the installation of groundwater monitoring wells MW-1 through MW-3 on March 3, 1994. Soil samples obtained from MW-2 and MW-3 showed limited impact from petroleum hydrocarbons. Soil from MW-1, constructed in the vicinity of the former USTs, had recordable concentrations of TPH-G, and of benzene, toluene, ethylbenzene, and total xylenes (BTEX) at depths of 15 to 25 feet bgs. The highest TPH-G and BTEX concentrations were recorded in soil from boring MW-1 at a depth of 25 feet bgs. Concentrations of TPH-G and benzene in that sample were 6,550 ppm and 12.6 ppm, respectively. Details of AGRA's investigation are provided in their report dated April 8, 1994.

AGRA directed the placement of soil borings B-5 through B-7, and the construction of an upgradient monitoring well (MW-4) on September 28, 1994. Soil samples from each boring at a depth of 5 feet bgs contained non detectable concentrations of petroleum

hydrocarbons. Petroleum hydrocarbons were detected in soil from MW-4 at 5 feet bgs, but not in soil from MW-4 at 20 feet bgs. AGRA's field efforts are detailed in their report dated October 27, 1994.

GeoEngineers supervised the placement of soil borings B-8, B-9, B-10, B-11, B-12, and B-13 on May 11 and 12, 1995. Field activities also included the construction of monitoring well MW-5 in boring B-10. Petroleum hydrocarbons were not detected in soil samples from B-9, B-11, B-12, and B-13. The soil sample from B-8 at a depth of 15.5 feet bgs contained 130 ppm TPH-G, while the soil sample from MW-5 at 23.0 feet bgs contained 5,300 ppm TPH-g. The results of GeoEngineers' site investigation are summarized in their report dated August 28, 1995. In that report, GeoEngineers provided an estimate of the area of subsurface soil impact. This estimated area of impact is shown on Figure 2.

On November 2, 1995, GeoEngineers supervised the construction of four observation wells (P-1 through P-4) and a recovery well (R-1). These five wells were constructed for use in an enhanced fluid recovery pilot test. No data was presented to indicate that soil samples were recovered during the construction of the four observation wells. Field screening of soil samples from R-1 indicate petroleum hydrocarbon impact was present in that boring from approximately 18 to 25 feet bgs. GeoEngineers' field observations are provided in their report dated February 28, 1996.

Terra Vac Corp. (Terra Vac) supervised the construction of remediation wells DVE-1, DVE-2, DVE-3, and DVE-4 on February 3, 1997. Recordable concentrations of petroleum hydrocarbons were found only in soil from DVE-2 at a depth of 15 feet bgs. TPH-G concentrations in that sample were 2.23 ppm and ethylbenzene concentrations were 0.0565 ppm. Terra Vac's field activities are detailed in our report dated May 28, 1997.

3.1.2 UST Excavation

On November 2, 1995, GeoEngineers monitored the removal of the 550-gallon waste oil UST located along the south property boundary (Figure 2). Three soil samples were obtained from the limits of the excavation following removal of the UST and one sample was obtained from the excavated soil stockpile. These four samples were analyzed for petroleum hydrocarbons by DEQ Method TPH-HCID and no petroleum hydrocarbons were detected. Additionally, one of these samples was analyzed for volatile organic compounds (VOCs), Polychlorinated Biphenyls (PCBs), and Toxic Characteristics Leaching Procedure (TCLP) metals. Analytical results indicated no impact from VOCs, PCBs, or TCLP metals.

3.2 Groundwater Analytical

On-site groundwater sampling was initiated by AGRA on March 29, 1994. Water samples from wells MW-1 through MW-3 were analyzed for BTEX concentrations and the sample from MW-3 was additionally analyzed for the gasoline additives EDB and EDC. Results indicated that groundwater from all three wells had been impacted by petroleum hydrocarbons with impact being greatest at MW-3 and lowest at MW-2.

Benzene concentrations were 4.9 parts per billion (ppb) at MW-2, 130 ppb at MW-2, and 2,300 ppb at MW-3. Neither EDB or EDC were detected in the sample from MW-3.

GeoEngineers sampled on-site groundwater monitoring wells MW-1 through MW-4 on October 4, 1994 and on-site wells MW-1 through MW-5 on May 12, 1995. Quarterly groundwater monitoring of wells MW-1 through MW-5 was initiated by GeoEngineers on January 4, 1996. By April 24, 1996, three off-site wells (MW-6 through MW-8) had been installed and were included in the quarterly groundwater monitoring program.

Terra Vac began performing quarterly groundwater monitoring with the February, 1997 sampling event. The most recent quarterly groundwater monitoring report, which presents results of sampling performed on October 29, 1998, has been included as Appendix A.

The quarterly groundwater monitoring program has tracked the concentrations of TPH-G, BTEX, polycyclic aromatic hydrocarbons (PAHs), dissolved lead, and EDB/EDC over time. TPH-G concentrations have been measured by methods EPA Methods 418.1 and 8015, BTEX by EPA Method 8020A, PAHs by EPA Method 8310, EDB/EDC by EPA Method 8010M, and dissolved lead by EPA Method 7421. A summary of historical groundwater quality is presented in Table 2.

Groundwater monitoring of the off-site wells MW-6, MW-7, and MW-8 has shown non detectable levels of TPH-G and BTEX for a minimum of six quarters. Before initiation of DVE operations in March, 1997, groundwater quality across the site ranged from non detect levels of TPH-G at wells MW-2 and MW-4 to TPH-G concentrations of 57,200 µg/l at MW-1 which, along with MW-5, has historically contained free phase gasoline. Similarly, benzene concentrations ranged from non detect levels at MW-2 to 1,130 micrograms per liter (µg/l) at MW-1. Groundwater quality at the site prior to initiation of remediation by DVE can be summarized from Table 2 as follows:

Well	Date	TPH-G (µg/l)	Benzene (µg/l)	Toluene (µg/l)	Ethylbenzene (µg/l)	Total Xylenes (µg/l)
MW-1	2/28/97	57,200	1,130	3,890	1,220	7,430
MW-2	2/28/97	ND	ND	ND	ND	ND
MW-3	2/28/97	4,400	261	124	153	404
MW-4	2/28/97	ND	0.7	ND	ND	ND
MW-5	2/28/97	5,400	70.3	23.5	88.6	230

4.0 SITE REMEDIATION

4.1 Remediation System Design

4.1.1 Pilot Testing of Subsurface Air Movement Technologies

During late November and early December 1995, GeoEngineers performed three separate enhanced fluid recovery technology (EFRT) pilot tests. Recovery well R-1 and monitoring wells MW-1 and MW-5 were used as test wells. Observation wells P-1

through P-4 and monitoring wells MW-2, MW-3, and MW-4 were used as observation wells.

In general, pilot testing involved placing a stinger tube down each test well so that it extended from the top of the well casing to the approximate free product/water interface. With the stinger in place, a vacuum was applied to pull free product, groundwater, and soil vapors up the well and into a vacuum tanker truck. As wells were being tested, vacuum was measured at the surrounding observation and monitoring wells.

Pilot testing results indicated that if an applied vacuum of 18 to 20 inches of mercury was placed on a test well, vacuums ranging between 4.1 and 53.7 inches of water were measured at the surrounding observation wells. From the pilot test results, GeoEngineers calculated a radius of influence (ROI) of greater than 70 feet from the points of extraction. Additionally, subsequent to the three EFRT pilot tests, free product thickness decreased in monitoring wells MW-1 and MW-5.

4.1.2 Remediation Theory

After reviewing the available site data, Terra Vac chose DVE as the most appropriate technology to accomplish site remediation. DVE is a subsurface air movement remediation technology which synergistically combines the attributes of vacuum extraction and groundwater extraction to simultaneously treat both impacted soil and groundwater. The DVE process is able to:

- Directly recover free phase petroleum hydrocarbons floating on the groundwater table in a manner similar to the EFRT pilot tested at the site.
- Recover residual contaminants from capillary fringe soils above the static groundwater table in a manner similar to traditional vacuum extraction systems.
- Recover residual contaminants from below the static water table, where vacuum extraction alone is not applicable.
- Increase the rate and magnitude of water table drawdowns, improving hydraulic containment and exposing smear zone soil to vacuum extraction.

DVE effectively remediates capillary fringe soil and the complete smear zone by the combined use of vapor and groundwater extraction. The static water table is lowered by groundwater entrainment extraction. This opens up the capillary fringe and smear zone soil in the formerly saturated area to the air flow induced by the applied well head vacuum. This applied vacuum induces a negative pressure gradient in the soil matrix, causing volatile contaminants partitioned onto soil particles and trapped in soil pores to vaporize. Once in the vapor phase, the contaminant is drawn to the extraction well by the vacuum induced air flow.

Using induced air flow, a DVE entrainment system is able to extract a groundwater and soil vapor mixture from the subsurface and transport it through the vacuum header to a centralized equipment location. At this location, a vapor/liquid separator partitions the

entrained groundwater and soil vapors into separate streams. Soil vapors are routed through the vacuum blower and vented to the atmosphere under a DEQ air permit, while the groundwater stream is discharged to sanitary sewer under a City of Portland permit.

4.1.3 System Equipment and Design Parameters

The final remediation system design utilized eight DVE wells placed on a conservative well to well spacing of approximately 25 feet. Design implementation required the construction of four new DVE remediation wells (DVE-1 through DVE-4), the conversion of existing groundwater monitoring wells MW-2, MW-3, and MW-5 to DVE wells NMW-2, NMW-3, and NMW-5, and the conversion of existing remediation well R-1 to DVE well NRW-1. Additionally, observation wells P-1 through P-4 were utilized as soil vapor extraction (SVE) wells. The final remediation well configuration is shown on Figure 3.

DVE and SVE well heads are located subsurface in traffic-rated well boxes which allow access to the well head flow control valves, gauges, and soil vapor sampling ports. The remediation wells are connected to the equipment compound by subsurface piping (Figure 3). During system installation, provisions were made to allow submersible pumps to be placed in the DVE wells to assist in site dewatering, if needed.

The DVE system is designed to operate at a vacuum up to 14 inches of mercury (in. Hg.) and at flows up to 750 standard cubic feet per minute (scfm). Vacuum is provided by a 40 horsepower positive displacement blower which is protected from moisture by a 150 gallon vapor/liquid separator. As soil vapors pass through the separator, entrained moisture is removed. A high water level switch in the separator is wired to automatically shut down the remediation system to prevent water from reaching the vacuum blower.

Valves, gauges, and sampling ports are provided at the blower for flow control, measurement of system performance parameters, and the sampling of recovered soil vapors for chemical analyses. A Process and Instrumentation Diagram of the DVE remediation system equipment is presented in Figure 4.

4.2 Summary of Remediation System Operations

The primary function of the DVE system was to remove free product and to remediate gasoline-range hydrocarbon impacted soil and groundwater. DVE system operations were started on March 14, 1997. During startup, the system was shut off intermittently to troubleshoot and optimize various parameters associated with system operations. Due to lower than expected groundwater extraction rates, it was not necessary to install submersible pumps in any DVE wells to achieve the desired levels of site dewatering.

During operations, samples of extracted vapors were collected from the individual well heads and from the system main header. Vapor samples were analyzed for TPH-G and specifically for BTEX constituents by gas chromatography using Terra Vac's in-house laboratory. Air flow rates were measured at the time of vapor sampling with a self-averaging pitot tube. Together, air flow and vapor concentration data were used to

quantify mass extraction rates (expressed as pounds of TPH-G extracted per day) and the cumulative mass of TPH-G extracted by the system over time.

Extracted soil vapor well head surveys were performed three times during DVE system operations (May 2, 1997, July 17, 1997, and September 9, 1997). Results of these well head surveys are presented in Table 3. The percent reduction of TPH-G in the extracted vapors from the well heads ranged from 22% to 96.3% with an average calculated reduction of 65.4 %. The benzene concentrations measured in the extracted vapors from the well heads were significantly reduced during system operations.

Operational and analytical data for the system are presented in Table 4. At system shutdown, total operating time equaled 158 days and approximately 7,511 pounds of TPH-G had been removed from the subsurface.

On-site groundwater quality improved as site remediation progressed. Groundwater quality data from the just prior to initiation of DVE operations (February 28, 1997) and from fourth quarter 1998 groundwater monitoring is summarized below.

Well	Date	TPH-G (µg/l)	Benzene (µg/l)	Toluene (µg/l)	Ethylbenzene (µg/l)	Total Xylenes (µg/l)
MW-1	2/28/97	57,200	1,130	3,890	1,220	7,430
MW-1	10/29/98	27,900	13.90	ND	9.13	1,120
MW-2	2/28/97	ND	ND	ND	ND	ND
MW-2	10/29/98	128	ND	ND	ND	ND
MW-3	2/28/97	4,400	261	124	153	404
MW-3	10/29/98	458	2.70	0.565	3.09	ND
MW-4	2/28/97	ND	0.7	ND	ND	ND
MW-4	10/29/98	ND	ND	ND	ND	ND
MW-5	2/28/97	5,400	70.3	23.5	88.6	230
MW-5	10/29/98	6,840	21.8	57.0	101	284

5.0 RISK BASED CORRECTIVE ACTION ANALYSIS

A Risk Based Corrective Action (RBCA) analysis was performed to calculate Site-Specific Target Levels (SSTLs). The analysis was performed using the ASTM RBCA software developed by Groundwater Services, Inc. This software completes all calculations required for Tier 1 and Tier 2 of the RBCA planning process as defined in ASTM Standard E-1739 "Guide to Risk-Based Corrective Action Applied at Petroleum Release Sites". Under the RBCA approach, petroleum release sites are characterized in

terms of sources, transport mechanisms, and receptors. The site-specific analysis utilized the most current groundwater quality and soil impact data available for the site. For groundwater quality, the most current data is from the results of fourth quarter 1998 groundwater monitoring. For soil impact, the most current data was obtained during the construction of groundwater monitoring and remediation wells.

5.1 Tier 1: Generic Screening-Level Corrective Action Goals

Tier 1 of the RBCA process involves comparison of site constituent concentrations to generic Risk-Based Screening Levels (RBSLs) to determine whether further evaluation is required. RBSL values are derived from standard exposure equations and reasonable maximum exposure estimates per U.S. EPA guidelines. RBSL concentration limits are designed to be protective of human health even if exposure occurs directly within the on-site area of affected soil or groundwater.

5.2 Tier 2: Site Specific Corrective Action Goals

Under Tier 2 of the RBCA planing process, SSTLs for soil and groundwater cleanup goals are determined on the basis of site-specific information and/or points of exposure. Analytical models are employed in conjunction with additional site data to calculate Tier 2 SSTL values in a manner consistent with EPA-recommended practices.

The Tier 2 SSTL values represent concentration limits for constituents within the source zone. SSTLs differ from the generic RBSLs in three significant ways:

- SSTLs use site-specific data to calculate risk-based cleanup goals,
- Human exposure to affected media may be assumed to occur not at the source zone, but at a separate "point of exposure" when calculating SSTLs, and
- The effects of natural attenuation of constituent concentrations during lateral transport from the source to an off-site "point of exposure" may be considered in the SSTL calculation.

5.3 Results of Tier 1 RBCA Analysis

The input data used to calculate the Tier 1 values are shown in Table 5. The information contained in Table 5 includes the following:

- **Source Zone Characteristics:** Lateral and vertical limits of affected soil and groundwater zones; representative concentrations of constituents of concern.
- **Hydrogeologic Site Conditions:** Site stratigraphy, surface soil conditions, rate and direction of groundwater flow, attenuation factors, etc.

- **Relevant Points of Exposure:** Distance from source zone(s) to potential receptors (i.e., likely points of contact with affected soil, water, or air); receptor type and applicable exposure factors.

- **Applicable Risk Goals:** Human health protection criteria for individual and cumulative effects of exposure to site constituents. One in one million was used for Class A and B carcinogens and one in 100,000 was used for Class C carcinogens.

The Tier 1 evaluation results for groundwater and soil are presented in Tables 6 and 7, respectively. The exposure pathway of groundwater and soil volatilization to indoor air for a commercial building was used in determining the SSTLs for groundwater and soil in the event that future site uses change.

As shown on Table 6, the concentrations of the contaminants of concern (COC) is less than the RBSLs for each compound in site groundwater. As shown in Table 7, the concentrations of the COCs is less than the RBSLs for each compound in soil. In addition, the representative concentrations used for these calculations were taken from the analyses of soil samples collected during the installation of groundwater monitoring and remediation wells prior to active site remediation. The complete RBCA evaluation is attached as Appendix B.

5.4 Results of Tier 2 RBCA Analysis

The input data used to generate the site-specific SSTL values is shown in Table 5. The information contained in Table 5 includes the following:

- **Source Zone Characteristics:** Lateral and vertical limits of affected soil and groundwater zones; representative concentrations of constituents of concern.

- **Hydrogeologic Site Conditions:** Site stratigraphy, surface soil conditions, rate and direction of groundwater flow, attenuation factors, etc.

- **Relevant Points of Exposure:** Distance from source zone(s) to potential receptors (i.e., likely points of contact with affected soil, water, or air); receptor type and applicable exposure factors.

- **Applicable Risk Goals:** Human health protection criteria for individual and cumulative effects of exposure to site constituents. One in one million was used for Class A and B carcinogens and one in 100,000 was used for Class C carcinogens.

The Tier 2 evaluation results for groundwater and soil are presented in Tables 8 and 9, respectively. The exposure pathway of groundwater and soil volatilization to indoor air for a commercial building was used in determining the SSTLs for groundwater and soil in the event that future site uses change.

As shown on Table 8, the concentrations of the contaminants of concern (COC) is less than the calculated SSTL for each compound in site groundwater. As shown in Table 9,

the concentrations of the COCs is less than the calculated SSTL for each compound in soil. In addition, the representative concentrations used for these calculations were taken from the analyses of soil samples collected during the installation of groundwater monitoring and remediation wells prior to active site remediation. The complete RBCA evaluation is attached as Appendix B.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the available site and operations data collected and the calculated risk-based analysis, Terra Vac concludes that dissolved hydrocarbon concentrations in groundwater have reached a level conducive to natural attenuation to DEQ clean-up levels. In addition, based on the risk based calculations, the remaining concentrations will not adversely impact human health. Therefore, continued operation of the DVE system will not provide greater safety to human health. Terra Vac therefore recommends the following:

- The DVE equipment should be removed from the property and the system permanently disassembled.
- Groundwater monitoring should be discontinued, and the existing wells should be abandoned in accordance with applicable regulations.
- A "no further action" determination should be issued by the Oregon DEQ, with only a restriction prohibiting future beneficial use of groundwater on the property.

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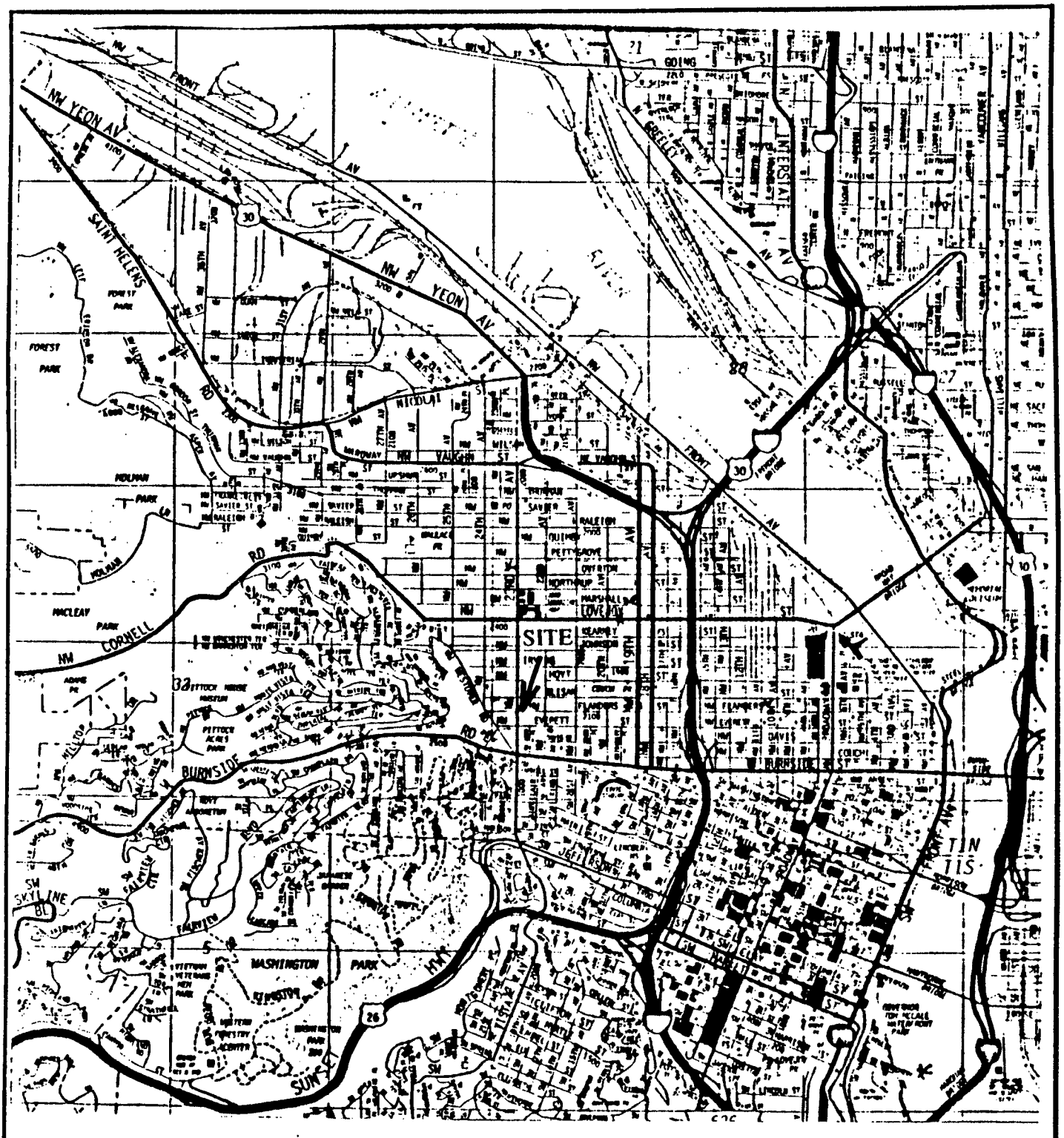
Figures

TERRA VAC

FIGURES



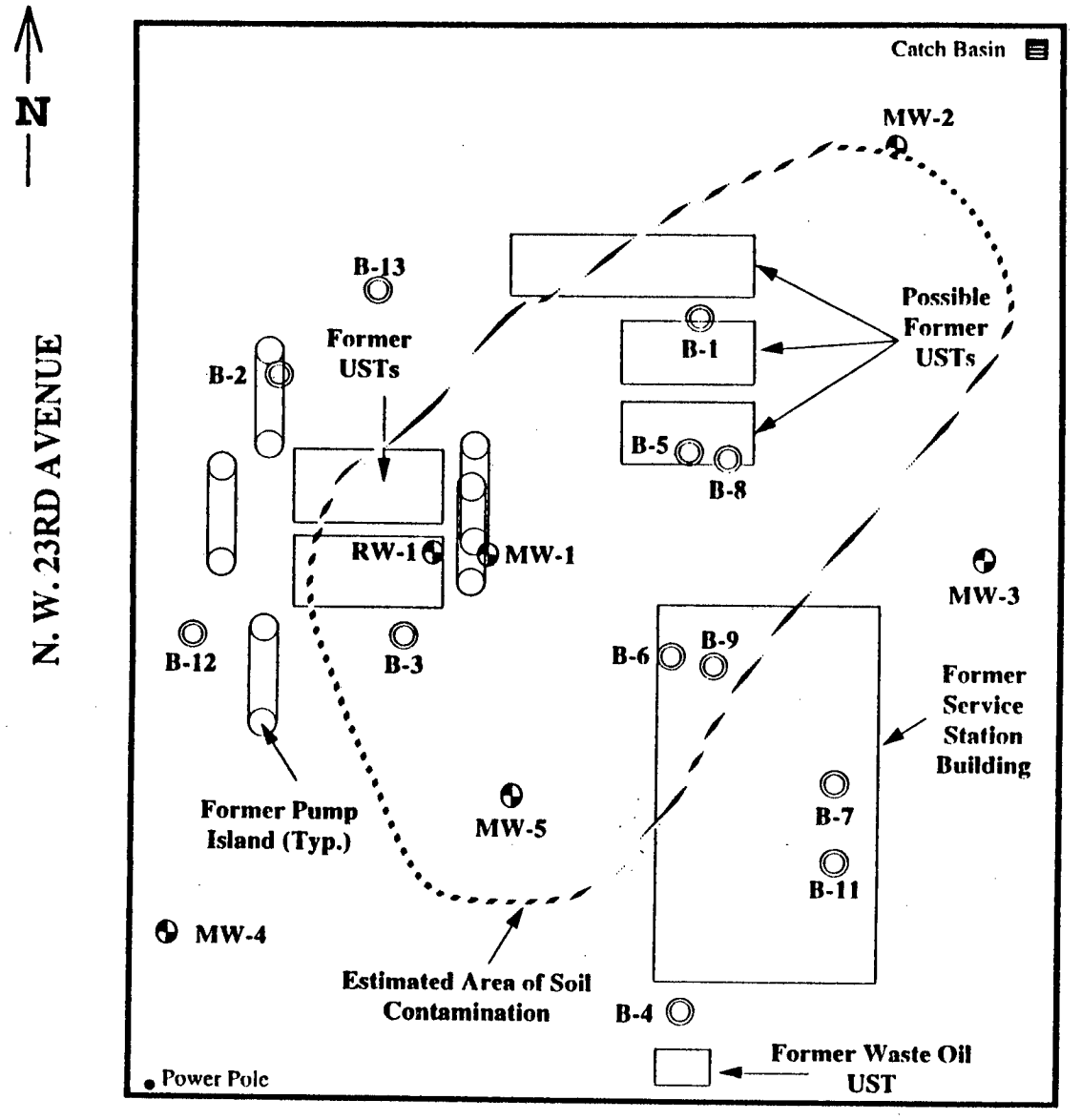
Source: THE THOMAS GUIDE, 1994.

N

FIGURE 1
SITE LOCATION MAP
ROSE'S PARKING LOT
PORTLAND, OREGON

TERRA VAC

PROJECT NO	32-0029
DATE	SEPTEMBER 10, 1998
REVISION	PVB-2



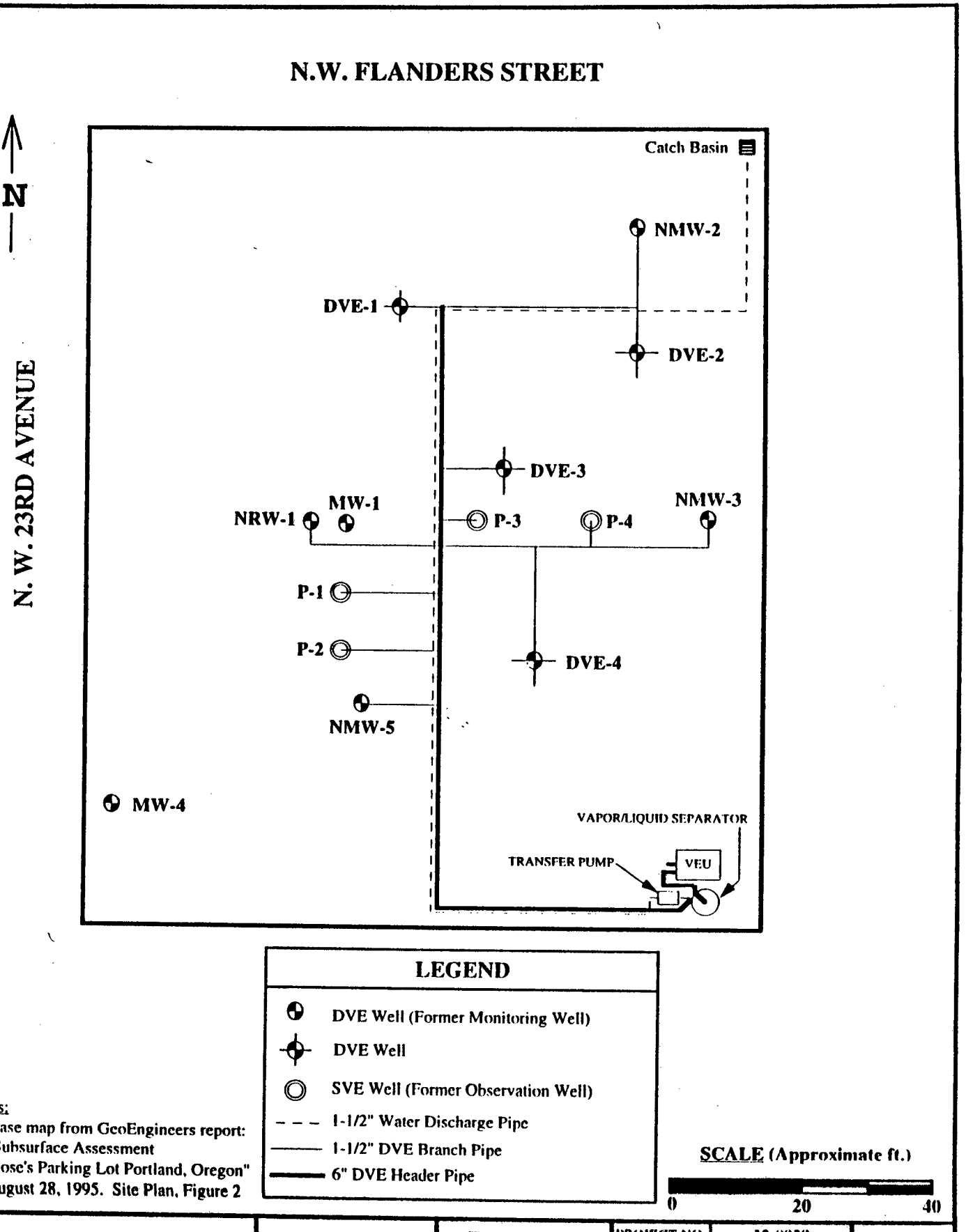
LEGEND	
	Existing Recovery or Monitoring Well
	Soil Boring

Notes:
(1) Base map from GeoEngineers report:
"Subsurface Assessment
Rose's Parking Lot Portland, Oregon"
August 28, 1995. Site Plan, Figure 2

SCALE (Approximate ft.)

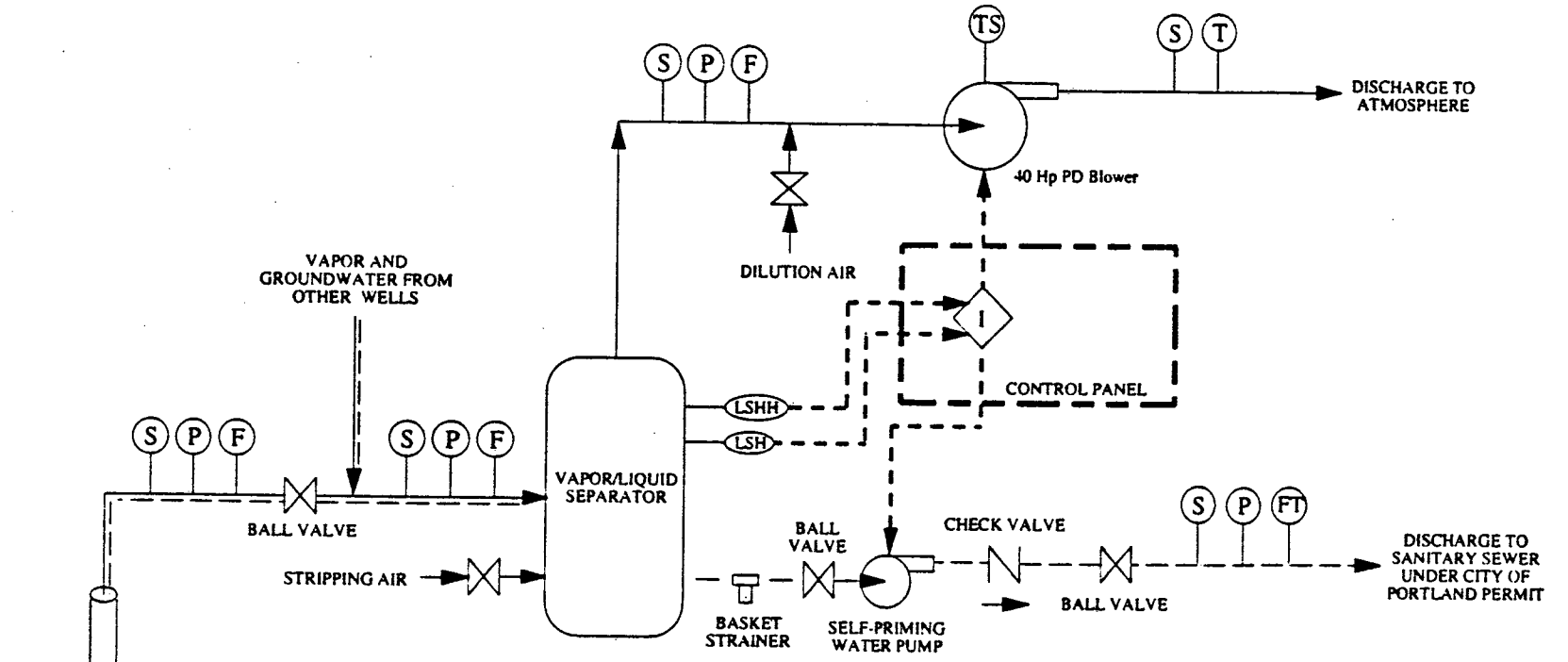
0 20 40

SITE MAP	Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon	TERRA VAC	Project No.	32-0029	Figure 2
			Date	July 16, 1999	
			Scale	1 Inch = 20 Feet	
			Revision	MAM -1	



Notes:
(1) Base map from GeoEngineers report:
"Subsurface Assessment
Rose's Parking Lot Portland, Oregon"
August 28, 1995. Site Plan, Figure 2

REMEDIATION WELL LOCATIONS AND SYSTEM CONFIGURATION	**ROSE'S PARKING LOT 330 NW 23RD AVENUE PORTLAND, OREGON**	TERRA VAC	PROJECT NO.	32-0029	**Figure 3**
			Date	July 16, 1999	
			Scale	1 Inch = 20 Feet	
			Revision	PVB -3	



LEGEND

- T — TEMPERATURE INDICATOR
- FT — FLOW TOTALIZER
- F — FLOW RATE INDICATOR
- S — SAMPLE PORT
- P — PRESSURE / VACUUM INDICATOR
- TS — TEMPERATURE SWITCH
- LSHH — LEVEL SWITCH HIGH-HIGH
- GROUNDWATER FLOW
- LSH — LEVEL SWITCH HIGH
- AIR FLOW
- I — INTERLOCK
- CONTROL LINES

FIGURE 4
PROCESS & INSTRUMENTATION DIAGRAM
ROSE'S PARKING LOT
330 N.W. 23rd AVENUE
PORTLAND, OR

TERRA VAC

PROJECT NO.	32-0029
DATE	July 16, 1999
SCALE	N.T.S.
REVISION	PVB-1

TERRA VAC

TABLES

Table 1

TERRA VAC

Summary of Analytical Results for Soil Samples
Rose's Parking Lot
Portland, Oregon

Sample/ Boring Identification	Sampling Date	Sampling Depth (Feet bgs.)	Analytical Results (mg/Kg)									Flashpoint	Field Screening Results[2]	
			ODEQ Method TPH-HCID			ODEQ TPH-G	ODEQ TPH-418.1M	EPA Method 8020					Headspace	
			Gasoline	Diesel	Oil	Gasoline	Diesel/Oil	Benzene	Toluene	Ethylbenzene	Xylenes		Vapor (ppm)	Sheen
B-1	1/3/94	13.0	NA	NA	NA	99	NA	NA	NA	NA	NA	NA	NA	NA
B-1	1/3/94	18.0	Detected	Detected	ND>100	3,700	1,100	NA	NA	NA	NA	NA	NA	NA
B-1	1/3/94	25.5	ND>20	ND>50	ND>100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-2	1/3/94	10.5	ND>20	ND>50	ND>100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-3	1/3/94	10.5	NA	NA	NA	ND>5	NA	NA	NA	NA	NA	NA	NA	NA
B-3	1/3/94	20.5	NA	NA	NA	260	NA	NA	NA	NA	NA	NA	NA	NA
B-3	1/3/94	28.0	ND>20	ND>50	ND>100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-4	1/3/94	10.5	ND>20	ND>50	ND>100	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-5	9/28/94	5.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-6	9/28/94	5.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-7	9/28/94	5.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
B-8	5/11/95	15.5	>20	>50[1]	NO	130	NA	NA	NA	NA	NA	NA	160	MS
B-8	5/11/95	23.0	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	>10,000	HS
B-9	5/11/95	23.0	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	340	SS
B-11	5/12/95	20.5	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	<100	NS
B-12	5/12/95	20.5	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	<100	SS
B-13	5/12/95	15.5	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	110	SS
B-13	5/12/95	23.0	<20	<50	NO	NA	NA	NA	NA	NA	NA	NA	120	SS
MW-1	3/23/94	15.0	NA	NA	NA	290	NA	0.09	0.34	1.1	8.1	NA	NA	NA
MW-1	3/23/94	25.0	POS. ID	POS. ID[3]	<200	6,550	NA	12.6	60.5	38.9	247.5	88°F	NA	NA
MW-2	3/23/94	15.0	NA	NA	NA	85	NA	<0.05	0.07	0.12	0.33	NA	NA	NA
MW-2	3/23/94	25.0	NA	NA	NA	NA	NA	<0.05	<0.05	0.07	<0.05	NA	NA	NA
MW-3	3/23/94	20.0	NA	NA	NA	NA	NA	<0.05	<0.05	<0.05	<0.05	NA	NA	NA
MW-4	9/28/94	5.0	ND	POS. ID[4]	ND	NA	52.2	NA	NA	NA	NA	NA	NA	NA
MW-4	9/28/94	20.0	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-5	5/11/95	23.0	>20	>50[1]	NO	5,200	NA	NA	NA	NA	NA	NA	>10,000	HS
R-1	11/2/95	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<100	NS
R-1	11/2/95	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<100	SS
R-1	11/2/95	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<100	SS
R-1	11/2/95	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,600	HS
R-1	11/2/95	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	>10,000	HS
R-1	11/2/95	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,100	NS

Table 1

Summary of Analytical Results for Soil Samples
Rose's Parking Lot
Portland, Oregon

Sample/ Boring Identification	Sampling Date	Sampling Depth (Feet bgs.)	Analytical Results (mg/Kg)									Flashpoint	Field Screening Results[2]	
			ODEQ Method TPH-HCID			ODEQ TPH-G	ODEQ TPH-418.1M	EPA Method 8020					Headspace	
			Gasoline	Diesel	Oil	Gasoline	Diesel/Oil	Benzene	Toluene	Ethylbenzene	Xylenes		Vapor (ppm)	Sheen
DVE-1	1/24/97	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-1	1/24/97	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-1	1/24/97	15.0	NA	NA	NA	ND	NA	ND	ND	ND	ND	NA	41	NS
DVE-1	1/24/97	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	23	NS
DVE-1	1/24/97	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	18	NS
DVE-1	1/24/97	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-1	1/24/97	35.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-2	1/24/97	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	NS
DVE-2	1/24/97	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	NS
DVE-2	1/24/97	15.0	NA	NA	NA	2.23	NA	ND	ND	0.0565	ND	NA	100	NS
DVE-2	1/24/97	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	40	NS
DVE-2	1/24/97	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	22	NS
DVE-2	1/24/97	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NS
DVE-3	1/24/97	15.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1900	NS
DVE-3	1/24/97	20.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	47	NS
DVE-3	1/24/97	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	73	NS
DVE-3	1/24/97	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20	NS
DVE-3	1/24/97	35.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4	NS
DVE-4	1/24/97	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5	NS
DVE 4	1/24/97	10.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5	NS
DVE-4	1/24/97	15.0	NA	NA	NA	ND	NA	ND	ND	ND	ND	NA	8	NS
DVE-4	1/24/97	25.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	311	NS
DVE-4	1/24/97	30.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1600	NS
DVE-4	1/24/97	38.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4	NS

Notes:

bgs	Below Ground Surface
NA	Not Analyzed
NO	Not Observed
ND	Not Detected Above Detection Limit Indicated in Original Reports
mg/Kg	Milligrams per Kilogram
ODEQ	Oregon Department of Environmental Quality
TPH	Total Petroleum Hydrocarbons
ppm	Parts per Million

1. The laboratory reported that diesel-range hydrocarbons identified in the sample were the result of an overlap from the gasoline-range; therefore, diesel-range hydrocarbons were not quantified.
2. NS = No Sheen, SS = Slight Sheen, MS = Moderate Sheen, HS = Heavy Sheen
3. Peaks in the gasoline range extend into the diesel range
4. Peaks were present within the retention time window of the listed petroleum hydrocarbon, but the peak patterns indicate the presence of low level heavy oils extending into the diesel range.

Table 2

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		NLE	5	1,000	700	10,000	Napthalene = 28	5
MW-1	3/29/94	NA	130	390	98	1,570	NA	NA
	10/4/94	NA	27	46	6	70	NA	NA
	5/12/95	NA	NA	NA	NA	NA	NA	NA
	1/4/96	54,000	400	2,200	630	4,800	Naphthalene - 370 Acenaphthylene - 44	100
	4/24/96	NA	NA	NA	NA	NA	NA	NA
	7/11/96	81,000	710	1,800	730	2	Naphthalene - 750 Acenaphthylene - 160 Phenanthrene - 2.2 Fluoranthene - 4.5	NA
	11/3/96	23,000	410	1,500	910	4,100	Naphthalene - 2,400 Acenaphthylene - 460 Acenaphthene -600 Fluorene - 12 Phenanthrene - 12 Anthracene - 0.89 Fluoranthene - 10 Pyrene - 2.1 Benzo(a)anthracene - 0.7 Chrysene - 1.3 Benzo(k)fluoranthene - 0.1 Benzo(a)pyrene - 0.3 Dibenzo(a,h)anthracene - 0.1 Benzo(g,h,i)perylene - 0.4	NA
	2/28/97*	57,200	1,130	3,890	1,220	7,430	Naphthalene - 760	20
	5/29/97	14,900	65.9	49.3	205	1,010	NA	NA
	9/5/97	14,600	10.9	11.8	47.3	642	Naphthalene - 54.2	NA
	12/31/97	2960	ND	ND	ND	8.76	NA	NA
	5/18/98	16,000	ND	7.63	ND	930	Naphthalene - 387	2,000
	7/31/98	19,600	6.00	6.54	ND	1,020	Naphthalene - 104	787
	10/29/98	27,900	13.90	ND	9.13	1,120	Naphthalene - 516	490

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		NLE	5	1,000	700	10,000	Napthalene = 28	5
NMW-2	3/29/94	NA	4.9	1.4	0.7	3.0	NA	NA
	10/4/94	NA	ND	ND	ND	ND	NA	NA
	5/12/95	ND	1.2	ND	0.6	0.7	NA	NA
	1/4/96	1,600	14	1.5	ND	1.7	ND	ND
	4/24/96	NA	7.7	0.5	ND	ND	NA	NA
	7/11/96	7,100	2.7	ND	ND	ND	ND	NA
	11/3/96	ND	2.0	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
	5/18/98	ND	ND	ND	ND	ND	NA	NA
	7/31/98	203	ND	ND	ND	ND	NA	NA
	10/29/98	128	ND	ND	ND	ND	NA	NA
NMW-3	3/29/94	NA	2,300	1,200	1,200	3,700	NA	NA
	10/4/94	NA	1,520	600	790	1,600	NA	NA
	5/12/95	3,500	1,300	740	800	2,000	Naphthalene - 130 Fluorene - 0.2 Phenanthrene - 0.09	NA
	1/4/96	4,500	1,300	640	940	2,600	Naphthalene - 180 Acenaphthylene - 23	6
	4/16/96	NA	900	500	600	1,400	NA	NA
	7/11/96	2,100	460	130	380	430	Naphthalene - 71	NA
	11/3/96	4,900	830	220	650	1,100	Naphthalene - 120 Acenaphthylene - 37	
	2/28/97	4,400	261	124	153	404	Naphthalene - 32.6	NA
	5/29/97	365	17.4	0.91	3.55	15.3	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
	5/18/98	299	4.53	ND	9.26	ND	Naphthalene - 0.173	1.5
	7/31/98	223	4.14	ND	4.68	ND	NA	NA
	10/29/98	458	2.70	0.565	3.09	ND	NA	NA

Table 2

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		NLE	5	1,000	700	10,000	Napthalene = 28	5
MW-4	10/4/94	NA	ND	ND	ND	ND	NA	NA
	5/12/95	ND	ND	ND	ND	ND	NA	NA
	1/4/96	900	ND	ND	ND	ND	ND	ND
	4/24/96	NA	ND	ND	ND	ND	NA	NA
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	0.7	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
	5/18/98	ND	ND	ND	ND	ND	NA	NA
	7/31/98	ND	ND	ND	ND	ND	NA	NA
	10/29/98	ND	ND	ND	ND	ND	NA	NA
NMW-5	5/12/95	13,000	660	13,000	1,900	11,000	Naphthalene - 450 Acenaphthylene - 66 Fluorene - 0.6 Phenanthrene - 0.42 Anthracene - 0.07	NA
	1/4/96	6,600	4.6	22	24	230	Naphthalene - 29 Acenaphthylene - 13 Fluorene - 0.8	14
	4/24/96	NA	ND	0.6	1.1	2.9	NA	NA
	7/11/96	ND	ND	ND	ND	2.7	NA	NA
	11/3/96	NA	ND	ND	2.5	5.6	NA	NA
	2/28/97	5,440	70.3	23.5	88.6	230	Naphthalene - 28.5	NA
	5/29/97	4,480	34.9	156	7.90	554	NA	NA
	9/5/97	5,550	39.0	334	23.5	642	ND	NA
	12/31/97	18,300	62.6	570	231.0	1,570	NA	NA
	5/18/98	1,050	ND	ND	0.895	14	Naphthalene - 4.87	1.2
	7/31/98	3,310	26.8	53.6	50.0	268	NA	NA
	10/29/98	6,840	21.8	57.0	101	284	NA	NA

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Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		NLE	5	1,000	700	10,000	Napthalene = 28	5
MW-6	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	102	ND	ND	ND	ND	NA	NA
	10/2/97***	NA	NA	NA	NA	NA	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
	5/18/98	NA	NA	NA	NA	NA	NA	NA
	7/31/98	NA	NA	NA	NA	NA	NA	NA
	10/29/98	NA	NA	NA	NA	NA	NA	NA
MW-7	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	110	12	ND	ND	ND	NA	NA
	10/2/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
	5/18/98	NA	NA	NA	NA	NA	NA	NA
	7/31/98	NA	NA	NA	NA	NA	NA	NA
	10/29/98	NA	NA	NA	NA	NA	NA	NA

Table 2

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		NLE	5	1,000	700	10,000	Napthalene = 28	5
MW-8	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	111	ND	ND	ND	ND	NA	NA
	10/1/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
	5/18/98	NA	NA	NA	NA	NA	NA	NA
	7/31/98	NA	NA	NA	NA	NA	NA	NA
	10/29/98	NA	NA	NA	NA	NA	NA	NA

Notes:

Sampling between 3/29/94 and 11/3/96 performed by GeoEngineers. Data from 1/21/97 Groundwater Report.

Wells MW-2, MW-3, and MW-5 redrilled 1/23-1/25/97, and renamed NMW-2, NMW-3, and NMW-5 respectively.

* MW-1 sampled for lead 12/11/96.

** Sample Results were suspect. Well Resampled on 10/1/97 or 10/2/97

*** Well was dry. No analytical sample taken.

PAHs polycyclic aromatic hydrocarbons. Only analytes detected are listed. Refer to analytical results (Appendix A) for a complete list of analytes and their respective detection limits.

ug/L Micrograms per liter, or parts per billion

ND Not Detected at the reporting limits

NA Not Analyzed

TPH-G Total petroleum hydrocarbons within the gasoline range (benzene to naphthalene).

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Table 3
Well Survey Analytical Data
Rose's Parking Lot
Portland, Oregon

Sampling Location	Sampling Date	Well Vacuum (in. Hg)	Line Vacuum (in. Hg)	dP (in. H2O)	Vapor Flow Rate (scfm)	Benzene (mg/l)	Toluene (mg/l)	Ethylbenzene (mg/l)	Total Xylenes (mg/l)	TPH-G (mg/l)	Percent TPH-G Reduction (%)
DVE-1	5/2/97	5.0	12.0	NA	NA	0.0189	0.0207	ND	0.1101	1.5000	0.0
	9/9/97	4.0	11.5	1.5	27.2	ND	0.0022	0.0006	0.0119	0.0561	96.3
DVE-2	5/2/97	3.0	10.0	NA	NA	ND	0.0034	ND	0.0020	0.0890	0.0
	9/9/97	5.0	11.5	0.7	18.6	ND	0.0023	0.0005	0.0098	0.0694	22.0
DVE-3	5/2/97	2.5	12.0	NA	NA	0.0963	0.1629	ND	0.4084	5.5440	0.0
	7/17/97	5.0	12.0	NA	NA	NA	NA	NA	NA	3.8044	31.4
	9/9/97	4.0	11.5	0.8	19.8	0.0085	0.0166	0.0146	0.0800	0.9300	83.2
DVE-4	5/2/97	3.0	11.0	NA	NA	0.0406	0.0125	ND	0.0559	0.6430	0.0
	7/17/97	6.0	12.0		NA	NA	NA	NA	NA	1.6039	0.0
	9/9/97	5.5	11.0	NA	NA	ND	0.0064	ND	0.0083	0.1870	70.9
NRW-1	5/2/97	3.0	11.5	NA	NA	2.0680	3.5732	ND	2.3118	27.1330	0.0
	7/17/97	6.0	10.5	0.6	17.6	NA	NA	NA	NA	13.5979	49.9
	9/9/97	5.0	10.5	0.5	16.1	0.0474	0.0840	0.0524	0.2842	4.3469	84.0
NMW-2	5/2/97	3.0	11.5	NA	NA	0.0026	0.0034	ND	0.0301	0.1540	0.0
	9/9/97	5.0	11.0	0.7	18.8	ND	0.0034	ND	0.0093	0.0733	52.4
NMW-3	5/2/97	5.0	12.0	NA	NA	0.0038	0.0024	ND	0.0085	0.0860	0.0
	7/17/97	5.0	11.0	0.9	21.3	NA	NA	NA	NA	0.1313	0.0
	9/9/97	5.0	10.5	1.7	29.7	ND	ND	ND	ND	0.0350	59.3
NMW-5	7/17/97	5.0	12.0	NA	NA	NA	NA	NA	NA	4.5456	0.0
	9/9/97	5.0	11.5	NA	NA	0.0414	0.0410	0.0213	0.1232	2.9175	35.8
P-1	5/2/97	4.0	9.5	NA	NA	0.0081	0.0070	ND	0.0626	0.3860	0.0
	9/9/97	5.0	10.0	6.0	56.5	ND	ND	ND	0.0069	0.0353	90.9
P-2	5/2/97	7.0	9.5	NA	NA	0.0229	0.0243	ND	0.1171	1.0000	0.0
	7/17/97	8.0	12.0	1.1	22.9	NA	NA	NA	NA	4.1750	0.0
	9/9/97	4.5	11.5	1.0	22.2	0.0060	0.0245	0.0085	0.0390	0.5913	40.9
P-3	5/2/97	5.0	11.0	NA	NA	0.0032	0.0052	ND	0.0344	0.2620	0.0
	9/9/97	5.0	10.0	5.0	51.6	ND	ND	ND	0.0062	0.0435	83.4
P-4	5/2/97	8.0	13.0	NA	NA	ND	ND	ND	ND	0.0370	0.0

Notes:

dp	Differential Pressure
in. H20	Inches of Water
scfm	Standard cubic feet per minute
mg/l	Milligrams per liter
TPH-G	Total petroleum hydrocarbons within the gasoline range
NA	Not Analyzed
ND	Not Detected at the reporting limit of 0.002 mg/l

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Table 4
System Operational and Analytical Data
Rose's Parking Lot
Portland, Oregon

Sampling Date	Line Vacuum (in. Hg)	dP (in. H2O)	Vapor Flow Rate (scfm)	Run Time (Days)	Benzene (mg/l)	Toluene (mg/l)	Ethylbenzene (mg/l)	Total Xylenes (mg/l)	Total TPH-G Conc. (mg/l)	Total TPH-G Extraction Rate (lbs/day)	Cumulative TPH-G Extracted (lbs)
3/18/97	15.0	0.2	179	2.3	0.0285	0.0980	0.0537	0.2811	2.8082	45.10	101.48
3/19/97	13.0	0.4	269	3.8	NA	NA	NA	NA	NA	67.92	186.25
3/24/97	13.0	0.2	190	7.5	NA	NA	NA	NA	NA	48.03	403.65
3/27/97	13.0	0.2	190	9.8	NA	NA	NA	NA	NA	48.03	511.71
4/3/97	13.0	0.3	233	15.0	NA	NA	NA	NA	NA	58.82	792.18
4/4/97	13.5	0.3	230	15.8	NA	NA	NA	NA	NA	57.95	835.97
4/8/97	13.5	0.4	265	18.8	NA	NA	NA	NA	NA	66.91	1023.26
4/9/97	13.5	0.3	230	19.5	NA	NA	NA	NA	NA	57.95	1070.08
4/10/97	12.5	0.4	273	20.3	NA	NA	NA	NA	NA	68.92	1117.65
4/14/97	13.0	0.4	269	23.3	NA	NA	NA	NA	NA	67.92	1322.90
4/16/97	12.0	0.4	277	24.8	NA	NA	NA	NA	NA	69.90	1426.27
4/21/97	12.8	0.4	271	28.5	NA	NA	NA	NA	NA	68.42	1685.61
4/25/97	13.0	0.2	190	31.5	NA	NA	NA	NA	NA	48.03	1860.28
5/1/97	13.5	0.3	230	36.0	NA	NA	NA	NA	NA	57.95	2098.72
5/2/97	10.0	0.6	358	36.8	0.0591	0.0356	0.0058	0.0752	0.9875	31.74	2132.35
5/7/97	14.0	0.2	185	40.5	NA	NA	NA	NA	NA	16.38	2222.57
5/15/97	13.5	0.2	187	46.5	NA	NA	NA	NA	NA	16.64	2321.63
5/16/97	14.0	0.2	185	47.3	NA	NA	NA	NA	NA	16.38	2334.02
5/19/97	13.5	0.3	230	49.5	0.0534	0.0947	0.0067	0.2313	2.9623	61.13	2421.21
6/4/97	13.5	0.2	187	61.5	NA	NA	NA	NA	NA	49.91	3087.42
6/5/97	14.0	0.5	292	62.3	0.0285	0.0980	0.0537	0.2811	2.8082	73.66	3133.76
6/16/97	14.0	0.5	292	70.5	NA	NA	NA	NA	NA	73.66	3741.47
6/19/97	NA	NA	NA	72.8	NA	NA	NA	NA	NA	NA	3907.21
6/20/97	14.0	0.4	261	73.5	0.0026	0.0041	0.0054	0.0145	0.0619	1.45	3935.38
7/17/97	12.5	0.3	236	95.1	NA	NA	NA	NA	2.9828	63.39	4635.71
9/5/97	13.0	0.3	233	140.0	0.0178	0.0346	0.0225	0.1517	1.7377	36.40	6876.02
9/9/97	13.0	0.3	233	144.0	0.0139	0.0376	0.0263	0.1790	1.6962	35.53	7019.88
9/23/97	12.5	0.3	236	158.0	ND	ND	ND	ND	1.6288	34.62	7510.90

Notes:

in. Hg	Inches of mercury
dp	Differential Pressure
in. H2O	Inches of water
scfm	Standard cubic feet per minute
mg/l	Milligrams per liter, or parts per million
lbs/day	Pounds per day
lbs	Pounds
TPH-G	Total petroleum hydrocarbons within the gasoline range
NA	Not Analyzed
ND	Not Detected at the reporting limit of 0.002 mg/l

TABLE 5

RBCA Tier 1/Tier 2 Input Data Summary

RBCA TIER 1/TIER 2 EVALUATION

Output Table 1

Site Name: Rose's Parking Lot
Site Location: Portland, Oregon
Job Identification: 32-0029
Date Completed: 4/1/99
Completed By: Peter Catterall
Software: GSI RBCA Spreadsheet
Version: 1.0.1

NOTE: values which differ from Tier 1 default values are shown in bold italics and underlined.

Exposure Parameter	Definition (Units)	Residential Adult	Residential (1-6yrs)	Residential (1-16 yrs)	Commercial/Industrial Chronic	Commercial/Industrial Construct
ATc	Averaging time for carcinogens (yr)	70				
ATn	Averaging time for non-carcinogens (yr)	30	6	16	25	1
BW	Body Weight (kg)	70	15	35	70	
ED	Exposure Duration (yr)	30	6	16	25	1
t	Averaging time for vapor flux (yr)	30			25	1
EF	Exposure Frequency (days/yr)	350			250	180
EF Derm	Exposure Frequency for dermal exposure	350			250	
IRgw	Ingestion Rate of Water (L/day)	2			1	
IRs	Ingestion Rate of Soil (mg/day)	100	200		50	100
IRadj	Adjusted soil ing. rate (mg-yr/kg-d)	1.1E+02			9.4E+01	
IRa.in	Inhalation rate indoor (m^3/day)	15			20	
IRa.out	Inhalation rate outdoor (m^3/day)	20			20	10
SA	Skin surface area (dermal) (cm^2)	5.8E+03		2.0E+03	5.8E+03	5.8E+03
SAadj	Adjusted dermal area (cm^2-yr/kg)	2.1E+03			1.7E+03	
M	Soil to Skin adherence factor	1				
AAFs	Age adjustment on soil ingestion	FALSE			FALSE	
AAFd	Age adjustment on skin surface area	FALSE			FALSE	
tox	Use EPA tox data for air (or PEL based)?	TRUE				
gwMCL?	Use MCL as exposure limit in groundwater?	FALSE				

Matrix of Exposed Persons to Complete Exposure Pathways		Residential	Commercial/Industrial Chronic	Commercial/Industrial Construct
Outdoor Air Pathways:				
SS.v	Volatiles and Particulates from Surface Soils	FALSE	FALSE	TRUE
S.v	Volatilization from Subsurface Soils	FALSE	TRUE	
GW.v	Volatilization from Groundwater	FALSE	TRUE	
Indoor Air Pathways:				
S.b	Vapors from Subsurface Soils	FALSE	TRUE	
GW.b	Vapors from Groundwater	FALSE	TRUE	
Soil Pathways:				
SS.d	Direct Ingestion and Dermal Contact	FALSE	TRUE	TRUE
Groundwater Pathways:				
GW.i	Groundwater Ingestion	FALSE	FALSE	
S.l	Leaching to Groundwater from all Soils	FALSE	FALSE	

Matrix of Receptor Distance and Location On- or Off-Site		Residential Distance	Residential On-Site	Commercial/Industrial Distance	Commercial/Industrial On-Site
GW	Groundwater receptor (cm)		TRUE		TRUE
S	Inhalation receptor (cm)		TRUE		TRUE

Matrix of Target Risks		Individual	Cumulative
TRac	Target Risk (class A&B carcinogens)	1.0E-06	
TRc	Target Risk (class C carcinogens)	1.0E-05	
THQ	Target Hazard Quotient	1.0E+00	
Opt	Calculation Option (1, 2, or 3)	1	
Tier	RBCA Tier	2	

Surface Parameters	Definition (Units)	Residential	Construct
A	Contaminated soil area (cm^2)	***1.1E+06***	
W	Length of affect. soil parallel to wind (cm)	***1.5E+03***	
W.gw	Length of affect. soil parallel to groundwater (cm	***2.8E+03***	
Uair	Ambient air velocity in mixing zone (cm/s)	2.3E+02	
delta	Air mixing zone height (cm)	2.0E+02	
Lss	Thickness of affected surface soils (cm)		
Pe	Particulate areal emission rate (g/cm^2/s)	6.9E-14	

Groundwater	Definition (Units)	Value
delta.gw	Groundwater mixing zone depth (cm)	***1.7E+02***
I	Groundwater infiltration rate (cm/yr)	3.0E+01
Ugw	Groundwater Darcy velocity (cm/yr)	***6.7E+01***
Ugw.tr	Groundwater seepage velocity (cm/yr)	***2.5E+02***
Ks	Saturated hydraulic conductivity(cm/s)	1.0E-04
grad	Groundwater gradient (cm/cm)	2.0E-02
Sw	Width of groundwater source zone (cm)	
Sd	Depth of groundwater source zone (cm)	
phi.eff	Effective porosity in water-bearing unit	2.5E-01
foc.sat	Fraction organic carbon in water-bearing unit	1.0E-03
BIO?	Is biattenuation considered?	FALSE
BC	Biodegradation Capacity (mg/L)	

Soil	Definition (Units)	Value		
hc	Capillary zone thickness (cm)	***5.1E+01***		
hv	Vadose zone thickness (cm)	***2.4E+02***		
rho	Soil density (g/cm^3)	1.7		
foc	Fraction of organic carbon in vadose zone	***0.006***		
phi	Soil porosity in vadose zone	***0.25***		
Lgw	Depth to groundwater (cm)	***3.0E+02***		
Ls	Depth to top of affected subsurface soil (cm)	***3.0E+02***		
Lsubs	Thickness of affected subsurface soils (cm)	***3.0E+02***		
pH	Soil/groundwater pH	***7.7***		
		capillary	**vadose**	**foundation**
phi.w	Volumetric water content	***0.2***	0.05	0.12
phi.a	Volumetric air content	***0.05***	***0.2***	0.26

Building	Definition (Units)	Residential	Commercial
Lb	Building volume/area ratio (cm)	2.0E+02	3.0E+02
ER	Building air exchange rate (s^-1)	1.4E-04	2.3E-04
Lcrk	Foundation crack thickness (cm)	1.5E+01	
eta	Foundation crack fraction	0.01	

Transport Parameters	Definition (Units)	Residential	Commercial
Groundwater			
ax	Longitudinal dispersivity (cm)		
ay	Transverse dispersivity (cm)		
az	Vertical dispersivity (cm)		
Vapor			
dcy	Transverse dispersion coefficient (cm)		
dcz	Vertical dispersion coefficient (cm)		

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TABLE 6
RBCA Tier 1 Groundwater Results

RBCA SITE ASSESSMENT — Tier 1 Worksheet 6.3

Site Name: Rose's Parking Lot
Site Location: Portland, Oregon
Completed By: Peter Catterall
Date Completed: 4/1/1999

GROUNDWATER RBSL VALUES

Target Risk (Class A & B): 1.0E-6
Target Risk (Class C): 1.0E-5
Target Hazard Quotient: 1.0E+0
☐ MCL exposure limit?
☐ PEL exposure limit?
Calculation Option: 1

RBSL Results For Complete Exposure Pathways ("X" If Complete)

CONSTITUENTS OF CONCERN		Representative Concentration		Groundwater Ingestion			X	Groundwater Volatilization to Indoor Air		X	Groundwater Volatilization to Outdoor Air		Applicable RBSL	RBSL Exceeded ?	Required CRF
CAS No.	Name	(mg/L)	Residential: (on-site)	Commercial: (on-site)	Regulatory(MCL): (on-site)		Residential: (on-site)	Commercial: (on-site)		Residential (on-site)	Commercial: (on-site)	(mg/L	"■" If yes	Only if "yes" left
71-43-2	Benzene	2.2E-2	NA	NA	NA		NA	1.7E-1		NA	5.8E+1	1.7E-1	☐	<1
100-41-4	Ethylbenzene	1.0E-1	NA	NA	NA		NA	>Sol		NA	>Sol	>Sol	☐	<1
91-20-3	Naphthalene	5.4E-2	NA	NA	NA		NA	NA		NA	NA	>Sol	☐	<1
108-88-3	Toluene	5.7E-2	NA	NA	NA		NA	1.8E+2		NA	>Sol	1.8E+2	☐	<1
1330-20-7	Xylene (mixed isomers)	1.1E+0	NA	NA	NA		NA	>Sol		NA	>Sol	>Sol	☐	<1

>Sol indicates risk-based target concentration greater than constituent solubility

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Software: GSI RBCA Spreadsheet
Version: 1.0.1
Serial: G-337-YAX-542

TABLE 7
RBCA Tier 1 Soil Results

RBCA SITE ASSESSMENT | Tier 1 Worksheet 6.2

Site Name: Rose's Parking Lot | Completed By: Peter Catterall

Site Location: Portland, Oregon | Date Completed: 4/1/1999

SUBSURFACE SOIL RBSL VALUES (> 0 FT BGS)

Target Risk (Class A & B) 1.0E-6 | ☐ MCL exposure limit? | Calculation Option: 1

Target Risk (Class C) 1.0E-5 | ☐ PEL exposure limit?

Target Hazard Quotient 1.0E+0

RBSL Results For Complete Exposure Pathways ("x" If Complete)

CONSTITUENTS OF CONCERN		Representative Concentration		Soil Leaching to Groundwater			X	Soil Volatilization to Indoor Air		X	Soil Volatilization to Outdoor Air		Applicable RBSL	RBSL Exceeded ?	Required CRF
CAS No.	Name	(mg/kg)	Residential: (on-site)	Commercial: (on-site)	Regulatory(MCL): (on-site)		Residential: (on-site)	Commercial: (on-site)		Residential: (on-site)	Commercial: (on-site)	(mg/kg)	"■" If yes	Only if "yes" left
71-43-2	Benzene	0.0E+0	NA	NA	NA		NA	5.2E-2		NA	2.2E+1	5.2E-2	☐	<1
100-41-4	Ethylbenzene	5.6E-2	NA	NA	NA		NA	>Res		NA	>Res	>Res	☐	<1
91-20-3	Naphthalene	0.0E+0	NA	NA	NA		NA	NA		NA	NA	>Res	☐	<1
108-88-3	Toluene	0.0E+0	NA	NA	NA		NA	6.1E+1		NA	>Res	6.1E+1	☐	<1
1330-20-7	Xylene (mixed isomers)	0.0E+0	NA	NA	NA		NA	>Res		NA	>Res	>Res	☐	<1

>Res indicates risk-based target concentration greater than constituent residual saturation value

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Software: GSI RBCA Spreadsheet Serial: G-337-YAX-542

Version: 1.0.1

TABLE 8
RBCA Tier 2 Groundwater Results

RBCA SITE ASSESSMENT | Tier 2 Worksheet 9.3

Site Name: Rose's Parking Lot | Completed By: Peter Catterall

Site Location: Portland, Oregon | Date Completed: 4/1/1999

GROUNDWATER SSTL VALUES

Target Risk (Class A & B) 1.0E-6 ☐ MCL exposure limit?

Target Risk (Class C) 1.0E-5 ☐ PEL exposure limit?

Target Hazard Quotient 1.0E+0

Calculation Option: 1

SSTL Results For Complete Exposure Pathways ("X" If Complete)

CONSTITUENTS OF CONCERN		Representative Concentration		Groundwater Ingestion			X	Groundwater Volatilization to Indoor Air	X	Groundwater Volatilization to Outdoor Air		Applicable SSTL	SSTL Exceeded ?	Required CRF
CAS No.	Name	(mg/L)	Residential: (on-site)	Commercial: (on-site)	Regulatory(MCL): (on-site)		Residential: (on-site)	Commercial: (on-site)		Residential (on-site)	Commercial: (on-site)	(mg/L	"■" If yes	Only if "yes" left
71-43-2	Benzene	2.2E-2	NA	NA	NA		NA	1.7E-1		NA	5.8E+1	1.7E-1	☐	<1
100-41-4	Ethylbenzene	1.0E-1	NA	NA	NA		NA	>Sol		NA	>Sol	>Sol	☐	<1
91-20-3	Naphthalene	5.4E-2	NA	NA	NA		NA	NA		NA	NA	>Sol	☐	<1
108-88-3	Toluene	5.7E-2	NA	NA	NA		NA	1.8E+2		NA	>Sol	1.8E+2	☐	<1
1330-20-7	Xylene (mixed isomers)	1.1E+0	NA	NA	NA		NA	>Sol		NA	>Sol	>Sol	☐	<1

>Sol Indicates risk-based target concentration greater than constituent solubility

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Software: GSI RBCA Spreadsheet Serial: G-337-YAX-542

Version: 1.0.1

TABLE 9

RBCA Tier 2 Soil Results

RBCA SITE ASSESSMENT — Tier 2 Worksheet 9.2

Site Name: Rose's Parking Lot — Completed By: Peter Catterall

Site Location: Portland, Oregon — Date Completed 4/1/1999

SUBSURFACE SOIL SSTL VALUES (> 0 FT BGS)

Target Risk (Class A & B) 1.0E-6 — ☐ MCL exposure limit? — Calculation Option: 1

Target Risk (Class C) 1.0E-6 — ☐ PEL exposure limit?

Target Hazard Quotient 1.0E+0

SSTL Results For Complete Exposure Pathways ("X" If Complete)

CONSTITUENTS OF CONCERN		Representative Concentration		Soil Leaching to Groundwater			X	Soil Volatilization to Indoor Air		X	Soil Volatilization to Outdoor Air		Applicable SSTL	SSTL Exceeded ?	Required CRF
CAS No.	Name	(mg/kg)	Residential: (on-site)	Commercial: (on-site)	Regulatory(MCL): (on-site)		Residential: (on-site)	Commercial: (on-site)		Residential: (on-site)	Commercial: (on-site)	(mg/kg)	"■" If yes	Only if "yes" left
71-43-2	Benzene	0.0E+0	NA	NA	NA		NA	5.2E-2		NA	2.2E+1	5.2E-2	☐	<1
100-41-4	Ethylbenzene	5.6E-2	NA	NA	NA		NA	>Res		NA	>Res	>Res	☐	<1
91-20-3	Naphthalene	0.0E+0	NA	NA	NA		NA	NA		NA	NA	>Res	☐	<1
108-88-3	Toluene	0.0E+0	NA	NA	NA		NA	6.1E+1		NA	>Res	6.1E+1	☐	<1
1330-20-7	Xylene (mixed isomers)	0.0E+0	NA	NA	NA		NA	>Res		NA	>Res	>Res	☐	<1

>Res indicates risk-based target concentration greater than constituent residual saturation value

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Software: GSI RBCA Spreadsheet — Serial: G-337-YAX-542

Version: 1.0.1

TERRA VAC

APPENDIX A
Fourth Quarter 1998 Groundwater Monitoring Report

TERRA VAC 10740 Meridian Avenue North, Suite 202, Seattle, WA 98133-9010
Tel (206) 362-8128 ❑ Fax (206) 362-9528

December 7, 1998

Mr. Max Birnbach
c/o Mr. Charles R. Williamson
Kell, Alterman & Runstein
1001 Southwest Fifth Avenue, Suite 1800
Portland, OR 97204-1194

RE: Third Quarter 1998 Groundwater Monitoring Report
Rose's Parking Lot
330 Northwest 23rd Avenue, Portland, Oregon

Dear Mr. Birnbach:

Terra Vac performed quarterly groundwater monitoring at this site on October 29, 1998. Five monitoring wells were sounded for depth to groundwater. Groundwater samples were collected from the monitoring wells for analyses of total gasoline-range petroleum hydrocarbons (TPH-G), benzene, toluene, ethylbenzene, and total xylenes (BTEX). In addition, a groundwater sample from monitoring well MW-1 was analyzed for polycyclic aromatic hydrocarbons (PAHs) and dissolved lead. A site location map is shown on Figure 1. Well construction details, including construction dates, well diameters, total depths, and screened intervals are provided in Table 1.

Groundwater elevations decreased in all five monitoring wells since the previous monitoring event. Analytical results indicate groundwater from MW-1 exceeded the current Oregon Department of Environmental Quality (ODEQ) Groundwater Cleanup Levels for naphthalene, benzene, and dissolved lead and NMW-5 exceeded the current ODEQ levels for benzene. However, the levels of dissolved lead in MW-1 have decreased from 2,000 µg/l on May 18, 1998 to 490 µg/l for the most recent monitoring event. This data shows a significant downward trend in dissolved lead concentrations in MW-1. In addition, dissolved lead has not been detected at significant concentrations in any other monitoring well.

Groundwater monitoring and sampling were performed using standard field procedures. In short, each well was sounded for depth to groundwater and the presence of free phase petroleum hydrocarbons using an electronic interface probe. If free phase petroleum hydrocarbons were not detected, total well depth was measured. A minimum of three well volumes were bailed from each well sampled, and groundwater allowed to recover to at least 80 percent of original elevation. Analytical samples were then collected with new disposable bailers and immediately placed in sampling vials prepared specifically for the sampled media and selected analyses.

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Once collected, samples were immediately acidified and cooled for transportation to the laboratory under proper chain of custody.

Existing top of casing elevations, as determined by a March, 1997 well survey, were used to establish reference points for well depths, screen intervals, and groundwater elevations for wells MW-1, NMW-2, NMW-3, MW-4, NMW- 5, and MW-6. Historical groundwater elevations are presented in Table 2. Third quarter 1998 groundwater elevations as measured on October 29, 1998 are also presented on Figure 2. Historically, the inferred direction of groundwater flow has been to the northeast. Prior to sampling, the remediation system had been offline since October 31, 1997.

Since February 1997, groundwater samples have been analyzed for TPH-G by EPA Method 8015 (modified), for BTEX constituents by EPA Method 8020A, for PAHs by EPA Method 8270M-SIM, and for dissolved lead by EPQ Method 200.8. Previous groundwater sampling performed by GeoEngineers included in this report used EPA Method 418.1 for TPH-G, EPA Method 8020 for BTEX, EPA Method 8310 for PAHs, and EPA Method 7421 for dissolved lead. Results of these analyses, and historical groundwater quality data, are presented in Table 3. Groundwater quality results from the third quarter 1998 sampling are also shown on Figure 3. Analytical reports from the laboratory are contained in Appendix A.

Field activities were performed in a manner consistent with the level of skill and care standard for local environmental professionals. Findings and conclusions presented in this report have been prepared based upon the specific site conditions at the time of field activities and no warranty, expressed or implied, is made.

If you have any questions, please do not hesitate to contact us.

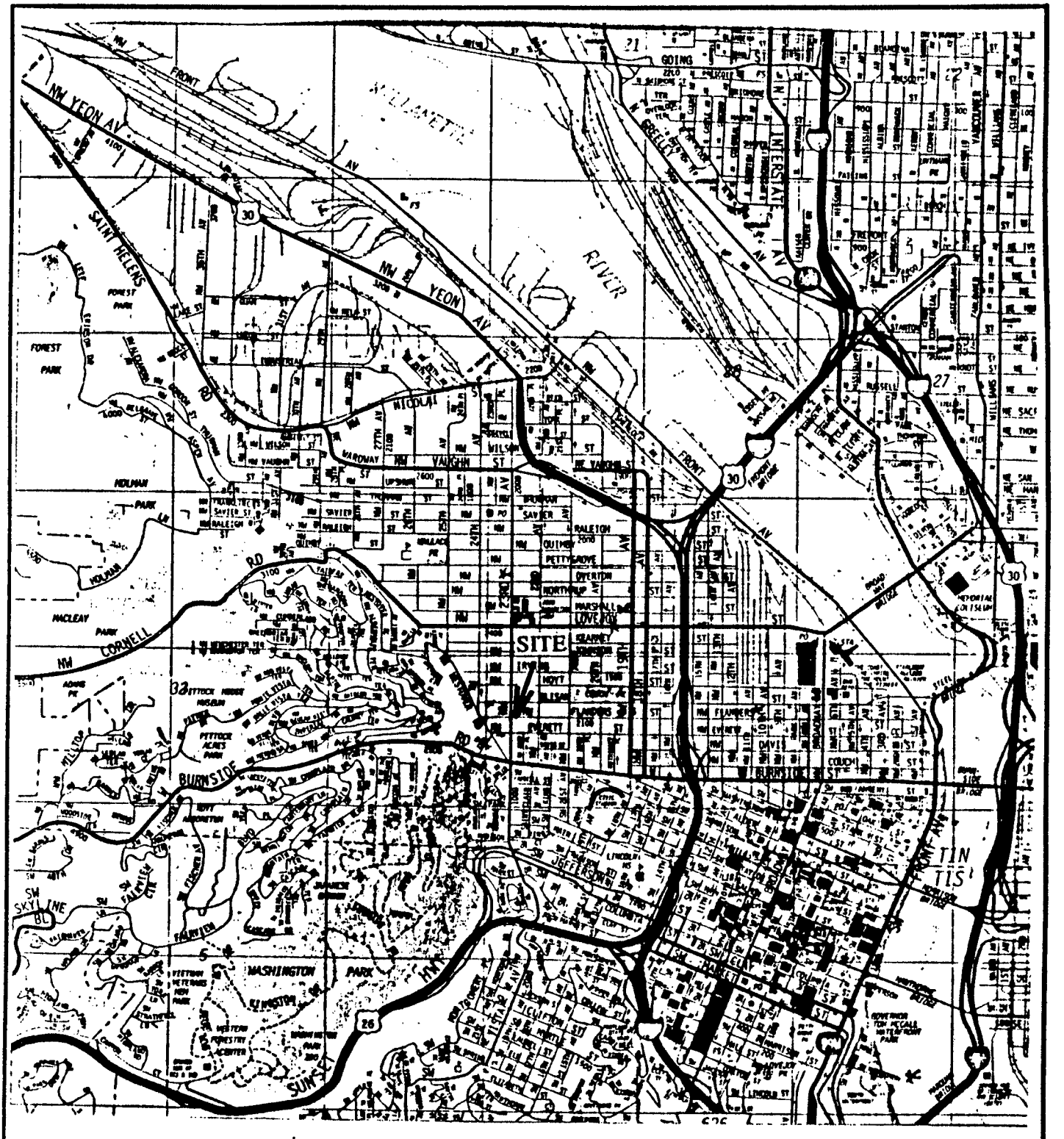
Sincerely,
Terra Vac Corporation

Paul V. Bianco,
Project Engineer

Timothy Warner,
Project Manager

cc: Dave Roy
Rich Kostecki
Jeffrey Wishko
Richard Singer (2 copies)
Richard Allen
Edward Crow
Don Pettit

FIGURES



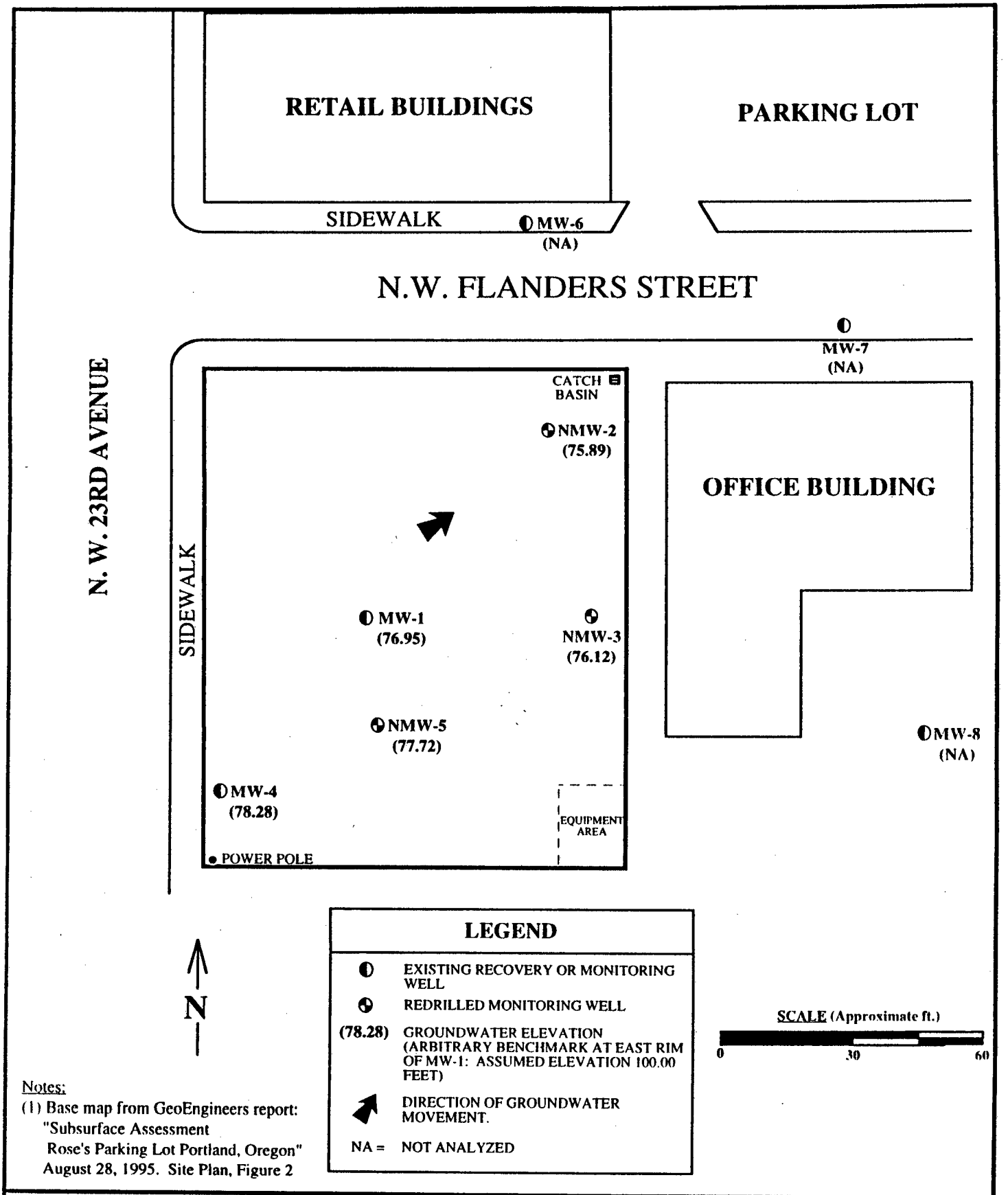
Source: THE THOMAS GUIDE, 1994.

N

FIGURE 1
SITE LOCATION MAP
ROSE'S PARKING LOT
PORTLAND, OREGON

TERRA VAC

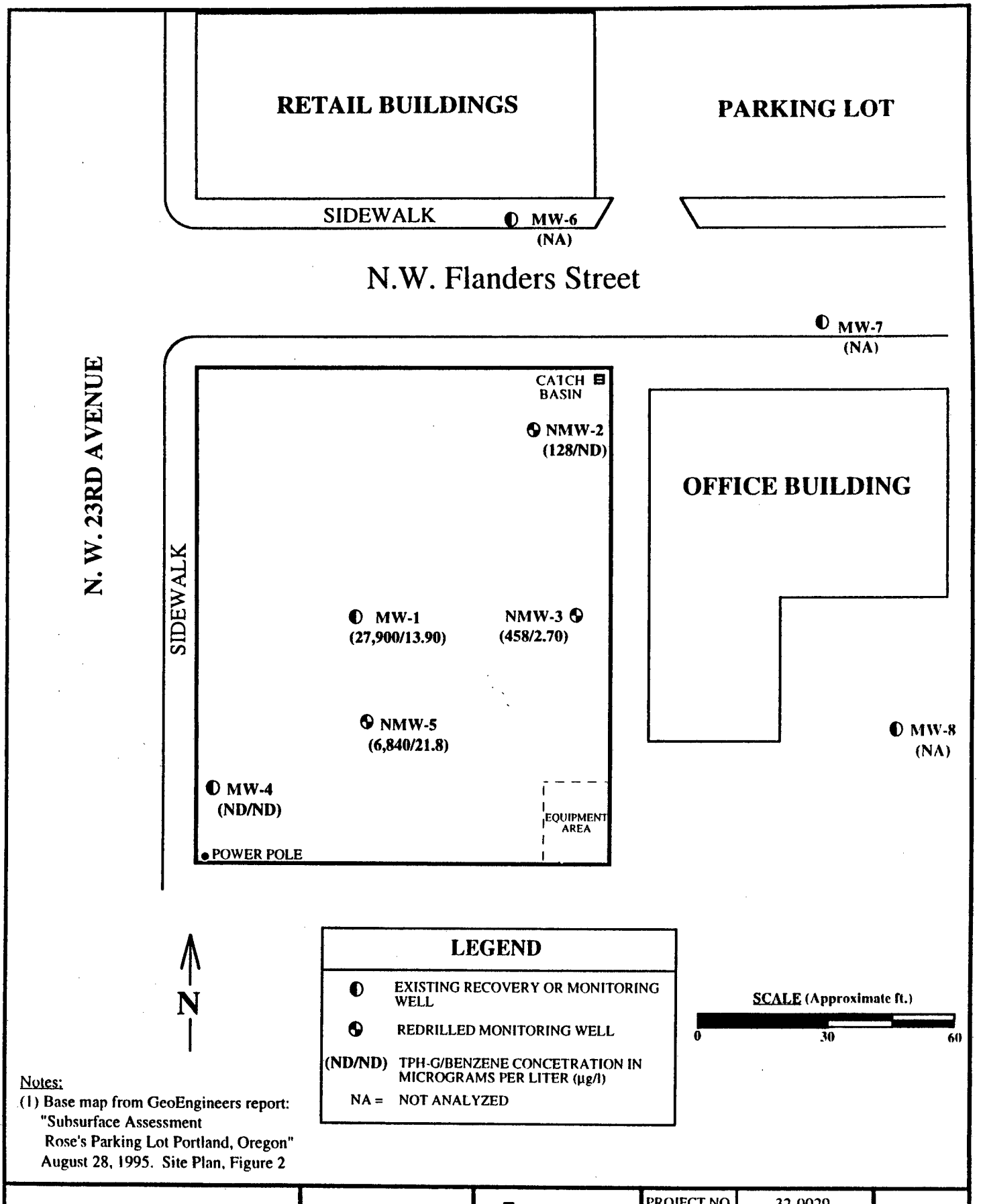
PROJECT NO.	32-0029
DATE	SEPTEMBER 10, 1998
REVISION	PVB-2



Notes:

(1) Base map from GeoEngineers report: "Subsurface Assessment Rose's Parking Lot Portland, Oregon" August 28, 1995. Site Plan, Figure 2

GROUNDWATER ELEVATIONS	**Rose's Parking Lot 330 NW 23rd Ave. Portland, Oregon**	TERRA VAC	PROJECT NO. 32-0029 DATE DECEMBER 7, 1998 SCALE 1 INCH ≈ 30 FEET REVISION PVB-3	Figure 2



Notes:
(1) Base map from GeoEngineers report:
"Subsurface Assessment
Rose's Parking Lot Portland, Oregon"
August 28, 1995. Site Plan, Figure 2

GROUNDWATER ANALYTICAL RESULTS	**Rose's Parking Lot 330 NW 23rd Ave. Portland, Oregon**	TERRA VAC	PROJECT NO.	32-0029	Figure 3
			DATE	DECEMBER 7, 1998	
			SCALE	1 INCH ≈ 30 FEET	
			REVISION	PVB-3	

TABLES

Table 1

Remediation Well Construction Data
Rose's Parking Lot
Portland, Oregon

Well Identification	Date Installed	Total Depth (feet)	Screen Interval		Well Diameter (inches)
			Top (feet)	Bottom (feet)	
MW-1	3/23/94	39	24	38.5	2
NMW-2	1/24/97	38	15	37	4
NMW-3	1/25/97	38	15.5	37.5	4
MW-4	9/28/94	40	20	39.5	2
NMW-5	1/23/97	38	15	37	4
MW-6	4/6/96	31	15	30.5	2
MW-7	4/6/96	31	15	30.5	2
MW-8	4/6/96	31	15	30.5	2

Notes:
Data on NMW-2, NMW-3, and NMW-5 is from Terra Vac field notes and well logs.
Data on MW-1 from RZA Agra Inc. well logs in April, 1994 report.
Data on MW-4 from RZA Agra Inc. well logs in October, 1994 report.
Data on MW-6 through MW-8 from well logs in GeoEngineers June, 1996 Report

Table 2

Groundwater Elevation Data
Rose's Parking Lot
Portland, Oregon

Well I.D.	Top of Casing Elevation (feet)	Date Sounded	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Water Level Elevation (feet MSL)	Difference from Previous Measurement (feet)
MW-1	100.00	5/12/95	22.79	23.29	0.5	76.71	**
		1/4/96	--	24.10	Trace	75.90	-0.81
		4/8/96	22.39	22.41	0.02	77.59	1.69
		4/24/96	22.40	22.45	0.05	77.55	-0.04
		7/11/96	--	23.35	Trace	76.65	-0.90
		11/3/96	--	24.44	Sheen	75.56	-1.09
		2/28/97	--	21.11	0	78.89	3.33
		5/29/97	--	26.90	0	73.10	-5.79
		9/5/97	--	27.86	0	72.14	-0.96
		12/31/97	--	23.97	0	76.03	3.89
		5/18/98	--	21.63	0	78.37	2.34
		7/31/98	--	22.18	0	77.82	-0.55
		10/29/98	--	23.05	0	76.95	-0.87
NMW-2	96.21	5/12/95	--	20.75	0	75.46	**
		1/4/96	--	21.60	0	74.61	-0.85
		4/8/96	--	19.73	0	76.48	1.87
		4/24/96	--	19.90	0	76.31	-0.17
		7/11/96	Sheen	20.80	0	75.41	-0.90
		11/3/96	--	21.87	0	74.34	-1.07
		2/28/97	--	18.51	0	77.70	3.36
		5/29/97	--	25.30	0	70.91	-6.79
		9/5/97	--	26.83	0	69.38	-1.53
		12/31/97	--	21.22	0	74.99	5.61
		5/18/98	--	18.62	0	77.59	2.60
		7/31/98	--	19.60	0	76.61	-0.98
		10/29/98	--	20.32	0	75.89	-0.72
NMW-3	99.15	5/12/95	--	23.48	0	75.67	**
		1/4/96	--	24.22	0	74.93	-0.74
		4/8/96	--	22.31	0	76.84	1.91
		4/24/96	--	22.36	0	76.79	-0.05
		7/11/96	--	23.37	0	75.78	-1.01
		11/3/96	Sheen	24.47	0	74.68	-1.10
		2/28/97	--	21.28	0	77.87	3.19
		5/29/97	--	29.78	0	69.37	-8.50
		9/5/97	--	27.77	0	71.38	2.01
		12/31/97	--	23.88	0	75.27	3.89
		5/18/98	--	21.73	0	77.42	2.15
		7/31/98	--	22.21	0	76.94	-0.48
		10/29/98	--	23.03	0	76.12	-0.82

Table 2

Groundwater Elevation Data
Rose's Parking Lot
Portland, Oregon

Well I.D.	Top of Casing Elevation (feet)	Date Sounded	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Water Level Elevation (feet MSL)	Difference from Previous Measurement (feet)
MW-4	100.48	5/12/95	--	22.55	0	77.93	**
		1/4/96	--	23.03	0	77.45	-0.48
		4/8/96	--	21.60	0	78.88	1.43
		4/24/96	--	21.34	0	79.14	0.26
		7/11/96	--	22.54	0	77.94	-1.20
		11/3/96	--	23.45	0	77.03	-0.91
		2/28/97	--	20.24	0	80.24	3.21
		5/29/97	--	26.04	0	74.44	-5.80
		9/5/97	--	26.58	0	73.90	-0.54
		12/31/97	--	23.00	0	77.48	3.58
		5/18/98	--	20.83	0	79.65	2.17
		7/31/98	--	21.36	0	79.12	-0.53
		10/29/98	--	22.20	0	78.28	-0.84
NMW-5	100.45	5/12/95	--	22.35	0	78.10	**
		1/4/96	Trace	22.84	0	77.61	-0.49
		4/8/96	--	21.40	0	79.05	1.44
		4/24/96	--	20.04	0	80.41	1.36
		7/11/96	--	22.45	0	78.00	-2.41
		11/3/96	Sheen	23.38	0	77.07	-0.93
		2/28/97	--	21.07	0	79.38	2.31
		5/29/97	--	31.75	0	68.70	-10.68
		9/5/97	--	27.52	0	72.93	4.23
		12/31/97	--	23.68	0	76.77	3.84
		5/18/98	--	19.93	0	80.52	3.75
		7/31/98	--	21.68	0	78.77	-1.75
		10/29/98	--	22.73	0	77.72	-1.05
MW-6	93.89	4/8/96	--	21.53	0	72.36	**
		4/24/96	--	22.04	0	71.85	-0.51
		7/11/96	--	22.61	0	71.28	-0.57
		11/3/96	--	24.04	0	69.85	-1.43
		2/28/97	--	20.89	0	73.00	3.15
		5/29/97	--	23.50	0	70.39	-2.61
		9/5/97	--	26.09	0	67.80	-2.59
		10/2/97	NA	NA	NA	NA	NA
		12/31/97	--	24.76	0	69.13	1.33
		5/18/98	NA	NA	NA	NA	NA
		7/31/98	NA	NA	NA	NA	NA
		10/29/98	NA	NA	NA	NA	NA

Table 2

Groundwater Elevation Data
Rose's Parking Lot
Portland, Oregon

Well I.D.	Top of Casing Elevation (feet)	Date Sounded	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Water Level Elevation (feet MSL)	Difference from Previous Measurement (feet)
MW-7	94.07	4/8/96	--	21.50	0	72.57	**
		4/24/96	--	21.05	0	73.02	0.45
		7/11/96	--	22.40	0	71.67	-1.35
		11/3/96	--	23.57	0	70.50	-1.17
		2/28/97	--	20.70	0	73.37	2.87
		5/29/97	--	22.20	0	71.87	-1.50
		9/5/97	--	24.89	0	69.18	-2.69
		10/2/97	NA	NA	NA	NA	NA
		12/31/97	--	23.92	0	70.15	0.97
		5/18/98	NA	NA	NA	NA	NA
		7/31/98	NA	NA	NA	NA	NA
		10/29/98	NA	NA	NA	NA	NA
MW-8	95.08	4/8/96	--	20.19	0	74.89	**
		4/24/96	--	18.42	0	76.66	1.77
		7/11/96	--	18.88	0	76.20	-0.46
		11/3/96	--	20.05	0	75.03	-1.17
		2/28/97	--	18.45	0	76.63	1.60
		9/5/97	--	22.49	0	72.59	-4.04
		10/1/97	NA	NA	NA	NA	NA
		12/31/97	--	19.92	0	75.16	2.57
		5/18/98	NA	NA	NA	NA	NA
		7/31/98	NA	NA	NA	NA	NA
		10/29/98	NA	NA	NA	NA	NA

Notes:

Data from 5/12/95-11/3/96 from GeoEngineers Groundwater Report January, 1997.

Wells MW-2, MW-3, and MW-5 redrilled 1/23-1/25/97, and renamed NMW-2, NMW-3, and NMW-5 respectively.

Depth to water measurements made from top of casing.

Elevations for wells except for MW-7 and MW-8 based on monitoring well survey conducted 3/3/97.
Elevations are measured to the local assumed datum of 100.00 feet at MW-1.
Elevations for MW-7 and MW-8 based on GeoEngineers' data, corrected for change in arbitrary reference point.

ft MSL feet above Mean Sea Level

** Not calculated; previous measurements not available.

-- Not Applicable; no free product detected in well.

NA Not Analyzed.

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-1	3/29/94	NA	130	390	98	1,570	NA	NA
	10/4/94	NA	27	46	6	70	NA	NA
	5/12/95	NA	NA	NA	NA	NA	NA	NA
	1/4/96	54,000	400	2,200	630	4,800	Naphthalene - 370 Acenaphthylene - 44	100
	4/24/96	NA	NA	NA	NA	NA	NA	NA
	7/11/96	81,000	710	1,800	730	2	Naphthalene - 750 Acenaphthylene - 160 Phenanthrene - 2.2 Fluoranthene - 4.5	NA
	11/3/96	23,000	410	1,500	910	4,100	Naphthalene - 2,400 Acenaphthylene - 460 Acenaphthene -600 Fluorene - 12 Phenanthrene - 12 Anthracene - 0.89 Fluoranthene - 10 Pyrene - 2.1 Benzo(a)anthracene - 0.7 Chrysene - 1.3 Benzo(k)fluoranthene - 0.1 Benzo(a)pyrene - 0.3 Dibenzo(a,h)anthracene - 0.1 Benzo(g,h,i)perylene - 0.4	NA
	2/28/97*	57,200	1,130	3,890	1,220	7,430	Naphthalene - 760	20
	5/29/97	14,900	65.9	49.3	205	1,010	NA	NA
	9/5/97	14,600	10.9	11.8	47.3	642	Naphthalene - 54.2	NA
	12/31/97	2960	ND	ND	ND	8.76	NA	NA
	5/18/98	16,000	ND	7.63	ND	930	Naphthalene - 387	2,000
	7/31/98	19,600	6.00	6.54	ND	1,020	Naphthalene - 104	787
	10/29/98	27,900	13.90	ND	9.13	1,120	Naphthalene - 516	490

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		NLE	5	1,000	700	10,000	Napthalene = 28	5
NMW-2	3/29/94	NA	4.9	1.4	0.7	3.0	NA	NA
	10/4/94	NA	ND	ND	ND	ND	NA	NA
	5/12/95	ND	1.2	ND	0.6	0.7	NA	NA
	1/4/96	1,600	14	1.5	ND	1.7	ND	ND
	4/24/96	NA	7.7	0.5	ND	ND	NA	NA
	7/11/96	7,100	2.7	ND	ND	ND	ND	NA
	11/3/96	ND	2.0	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
	5/18/98	ND	ND	ND	ND	ND	NA	NA
	7/31/98	203	ND	ND	ND	ND	NA	NA
	10/29/98	128	ND	ND	ND	ND	NA	NA
NMW-3	3/29/94	NA	2,300	1,200	1,200	3,700	NA	NA
	10/4/94	NA	1,520	600	790	1,600	NA	NA
	5/12/95	3,500	1,300	740	800	2,000	Naphthalene - 130 Fluorene - 0.2 Phenanthrene - 0.09	NA
	1/4/96	4,500	1,300	640	940	2,600	Naphthalene - 180 Acenaphthylene - 23	6
	4/16/96	NA	900	500	600	1,400	NA	NA
	7/11/96	2,100	460	130	380	430	Naphthalene - 71	NA
	11/3/96	4,900	830	220	650	1,100	Naphthalene - 120 Acenaphthylene - 37	
	2/28/97	4,400	261	124	153	404	Naphthalene - 32.6	NA
	5/29/97	365	17.4	0.91	3.55	15.3	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
	5/18/98	299	4.53	ND	9.26	ND	Naphthalene - 0.173	1.5
	7/31/98	223	4.14	ND	4.68	ND	NA	NA
	10/29/98	458	2.70	0.565	3.09	ND	NA	NA

Table 3

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (ug/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		NLE	5	1,000	700	10,000	Napthalene = 28	5
MW-4	10/4/94	NA	ND	ND	ND	ND	NA	NA
	5/12/95	ND	ND	ND	ND	ND	NA	NA
	1/4/96	900	ND	ND	ND	ND	ND	ND
	4/24/96	NA	ND	ND	ND	ND	NA	NA
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	0.7	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
	5/18/98	ND	ND	ND	ND	ND	NA	NA
	7/31/98	ND	ND	ND	ND	ND	NA	NA
	10/29/98	ND	ND	ND	ND	ND	NA	NA
NMW-5	5/12/95	13,000	660	13,000	1,900	11,000	Naphthalene - 450 Acenaphthylene - 66 Fluorene - 0.6 Phenanthrene - 0.42 Anthracene - 0.07	NA
	1/4/96	6,600	4.6	22	24	230	Naphthalene - 29 Acenaphthylene - 13 Fluorene - 0.8	14
	4/24/96	NA	ND	0.6	1.1	2.9	NA	NA
	7/11/96	ND	ND	ND	ND	2.7	NA	NA
	11/3/96	NA	ND	ND	2.5	5.6	NA	NA
	2/28/97	5,440	70.3	23.5	88.6	230	Naphthalene - 28.5	NA
	5/29/97	4,480	34.9	156	7.90	554	NA	NA
	9/5/97	5,550	39.0	334	23.5	642	ND	NA
	12/31/97	18,300	62.6	570	231.0	1,570	NA	NA
	5/18/98	1,050	ND	ND	0.895	14	Naphthalene - 4.87	1.2
	7/31/98	3,310	26.8	53.6	50.0	268	NA	NA
	10/29/98	6,840	21.8	57.0	101	284	NA	NA

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		NLE	5	1,000	700	10,000	Napthalene = 28	5
MW-6	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	102	ND	ND	ND	ND	NA	NA
	10/2/97***	NA	NA	NA	NA	NA	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
	5/18/98	NA	NA	NA	NA	NA	NA	NA
	7/31/98	NA	NA	NA	NA	NA	NA	NA
	10/29/98	NA	NA	NA	NA	NA	NA	NA
MW-7	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	110	12	ND	ND	ND	NA	NA
	10/2/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
	5/18/98	NA	NA	NA	NA	NA	NA	NA
	7/31/98	NA	NA	NA	NA	NA	NA	NA
	10/29/98	NA	NA	NA	NA	NA	NA	NA

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		NLE	5	1,000	700	10,000	Napthalene = 28	5
MW-8	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	111	ND	ND	ND	ND	NA	NA
	10/1/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
	5/18/98	NA	NA	NA	NA	NA	NA	NA
	7/31/98	NA	NA	NA	NA	NA	NA	NA
	10/29/98	NA	NA	NA	NA	NA	NA	NA

Notes:

Sampling between 3/29/94 and 11/3/96 performed by GeoEngineers. Data from 1/21/97 Groundwater Report.

Wells MW-2, MW-3, and MW-5 redrilled 1/23-1/25/97, and renamed NMW-2, NMW-3, and NMW-5 respectively.

* MW-1 sampled for lead 12/11/96.

** Sample Results were suspect. Well Resampled on 10/1/97 or 10/2/97

*** Well was dry. No analytical sample taken.

PAHs polycyclic aromatic hydrocarbons. Only analytes detected are listed. Refer to analytical results (Appendix A) for a complete list of analytes and their respective detection limits.

ug/L Micrograms per liter, or parts per billion

ND Not Detected at the reporting limits

NA Not Analyzed

TPH-G Total petroleum hydrocarbons within the gasoline range (benzene to naphthalene).

APPENDIX A

LABORATORY REPORTS

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

BOTHELL ▪ (425) 420-9200 ▪ FAX 420-9210
SPOKANE ▪ (509) 924-9200 ▪ FAX 924-9290
PORTLAND ▪ (503) 906-9200 ▪ FAX 906-9210

Terra Vac	Project:	Rose's Parking Lot	Sampled: 10/29/98
PO Box 818	Project Number:	32-0029	Received: 10/29/98
Sherwood, OR 97140	Project Manager:	Jim Orr	Reported: 12/8/98 14:34

ANALYTICAL REPORT FOR SAMPLES:

Sample Description	Laboratory Sample Number	Sample Matrix	Date Sampled
MW-1	P810616-01	Water	10/29/98
MW-2	P810616-02	Water	10/29/98
MW-3	P810616-03	Water	10/29/98
MW-4	P810616-04	Water	10/29/98
NMW-5	P810616-05	Water	10/29/98
Trip Blank	P810616-06	Water	10/29/98

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Terra Vac	Project: Rose's Parking Lot	Sampled:	10/29/98
PO Box 818	Project Number: 32-0029	Received:	10/29/98
Sherwood, OR 97140	Project Manager: Jim Orr	Reported:	12/8/98 14:34

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-1			**P810616-01**				**Water**	
Benzene	1180004	11/1/98	11/1/98		5.00	**13.9**	ug/l	
Toluene	"	"	"		5.00	ND	"	
Ethylbenzene	"	"	"		5.00	**9.13**	"	
Xylenes (total)	"	"	"		10.0	**1120**	"	
Gasoline Range Hydrocarbons	"	"	"		800	**27900**	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*95.2*	%	
MW-2			**P810616-02**				**Water**	
Benzene	1080859	10/31/98	10/31/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	**128**	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*90.4*	%	
MW-3			**P810616-03**				**Water**	
Benzene	1080859	10/31/98	10/31/98		0.500	**2.70**	ug/l	
Toluene	"	"	"		0.500	**0.565**	"	
Ethylbenzene	"	"	"		0.500	**3.09**	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	**458**	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*97.0*	%	
MW-4			**P810616-04**				**Water**	
Benzene	1080859	10/31/98	10/31/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*91.2*	%	
NMW-5			**P810616-05**				**Water**	
Benzene	1180004	11/1/98	11/2/98		2.50	**21.8**	ug/l	
Toluene	"	"	"		2.50	**57.0**	"	
Ethylbenzene	"	"	"		2.50	**101**	"	
Xylenes (total)	"	"	"		5.00	**284**	"	

North Creek Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

Lisa Domenighini, Project Manager

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NORTH CREEK ANALYTICAL
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Terra Vac	Project:	Rose's Parking Lot	Sampled: 10/29/98
PO Box 818	Project Number:	32-0029	Received: 10/29/98
Sherwood, OR 97140	Project Manager:	Jim Orr	Reported: 12/8/98 14:34

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
NMW-5 (continued)			P810616-05				Water	
Gasoline Range Hydrocarbons	1180004	11/1/98	11/2/98		400	6840	ug/l	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*98.0*	%	
Trip Blank			P810616-06				Water	
Benzene	1080859	10/31/98	10/31/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*92.0*	%	

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Terra Vac	Project:	Rose's Parking Lot	Sampled: 10/29/98
PO Box 818	Project Number:	32-0029	Received: 10/29/98
Sherwood, OR 97140	Project Manager:	Jim Orr	Reported: 12/8/98 14:34

Dissolved Metals per EPA 200 Series Methods
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Specific Method	Reporting Limit	Result	Units	Notes*
MW-1			P810616-01				Water	
Lead	1180351	11/11/98	11/13/98	EPA 200.8	0.00100	0.556	mg/l	

NORTH CREEK ANALYTICAL
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PORTLAND • (503) 906-9200 • FAX 906-9210

Terra Vac	Project:	Rose's Parking Lot	Sampled: 10/29/98
PO Box 818	Project Number:	32-0029	Received: 10/29/98
Sherwood, OR 97140	Project Manager:	Jim Orr	Reported: 12/8/98 14:34

Polynuclear Aromatic Compounds per EPA 8270M-SIM
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-1			P810616-01				Water	2
Acenaphthene	1180036	11/2/98	11/3/98		2.50	ND	ug/l	
Acenaphthylene	"	"	"		2.50	ND	"	
Anthracene	"	"	"		2.50	ND	"	
Benzo (a) anthracene	"	"	"		2.50	ND	"	
Benzo (a) pyrene	"	"	"		2.50	ND	"	
Benzo (b) fluoranthene	"	"	"		2.50	ND	"	
Benzo (ghi) perylene	"	"	"		2.50	ND	"	
Benzo (k) fluoranthene	"	"	"		2.50	ND	"	
Chrysene	"	"	"		2.50	ND	"	
Dibenzo (a,h) anthracene	"	"	"		5.00	ND	"	
Fluoranthene	"	"	"		2.50	ND	"	
Fluorene	"	"	"		2.50	ND	"	
Indeno (1,2,3-cd) pyrene	"	"	"		2.50	ND	"	
Naphthalene	"	"	11/4/98		5.00	516	"	
Phenanthrene	"	"	11/3/98		2.50	ND	"	
Pyrene	"	"	"		2.50	ND	"	
Surrogate: 2-Fluorobiphenyl	"	"	"	*37.0-135*		*94.5*	%	
Surrogate: Nitrobenzene-d5	"	"	*11/4/98*	*48.0-140*		*NR*	"	*3*
Surrogate: p-Terphenyl-d14	"	"	*11/3/98*	*25.0-147*		*65.7*	"	

North Creek Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

Lisa Domenighini, Project Manager

NORTH CREEK ANALYTICAL
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Terra Vac	Project:	Rose's Parking Lot	Sampled: 10/29/98
PO Box 818	Project Number:	32-0029	Received: 10/29/98
Sherwood, OR 97140	Project Manager:	Jim Orr	Reported: 12/8/98 14:34

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 1080859	**Date Prepared: 10/31/98**					**Extraction Method: EPA 5030**				
Blank	1080859-BLK1									
Benzene	10/31/98			ND	ug/l	0.500				
Toluene	"			ND	"	0.500				
Ethylbenzene	"			ND	"	0.500				
Xylenes (total)	"			ND	"	1.00				
Gasoline Range Hydrocarbons	"			ND	"	80.0				
Surrogate: 4-BFB	"	*50.0*		*47.1*	"	*50.0-150*	*94.2*			
LCS	1080859-BS1									
Gasoline Range Hydrocarbons	10/31/98	1250		1340	ug/l	50.0-150	107			
Surrogate: 4-BFB	"	*50.0*		*53.0*	"	*50.0-150*	*106*			
LCS	1080859-BS2									
Benzene	10/31/98	20.0		21.3	ug/l	67.0-130	106			
Toluene	"	20.0		20.4	"	75.0-126	102			
Ethylbenzene	"	20.0		20.0	"	76.0-124	100			
Xylenes (total)	"	60.0		60.8	"	75.0-126	101			
Surrogate: 4-BFB	"	*50.0*		*47.1*	"	*50.0-150*	*94.2*			
Duplicate	1080859-DUP1		P810629-11							
Gasoline Range Hydrocarbons	10/31/98		ND	ND	ug/l			50.0		
Surrogate: 4-BFB	"	*50.0*		*46.3*	"	*50.0-150*	*92.6*			
Duplicate	1080859-DUP2		P810616-01							
Gasoline Range Hydrocarbons	10/31/98		11900	11700	ug/l			50.0	1.69	
Surrogate: 4-BFB	"	*50.0*		*134*	"	*50.0-150*	*NR*			3
Matrix Spike	1080859-MS1		P810637-01							
Benzene	10/31/98	20.0	10.0	31.2	ug/l	67.0-130	106			
Toluene	"	20.0	10.7	31.3	"	75.0-126	103			
Ethylbenzene	"	20.0	ND	21.3	"	76.0-124	106			
Xylenes (total)	"	60.0	53.4	116	"	75.0-126	104			
Surrogate: 4-BFB	"	*50.0*		*49.5*	"	*50.0-150*	*99.0*			
Matrix Spike Dup	1080859-MSD1		P810637-01							
Benzene	10/31/98	20.0	10.0	29.5	ug/l	67.0-130	97.5	13.0	8.35	
Toluene	"	20.0	10.7	29.6	"	75.0-126	94.5	13.0	8.61	
Ethylbenzene	"	20.0	ND	19.8	"	76.0-124	99.0	15.0	6.83	

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Terra Vac	Project:	Rose's Parking Lot	Sampled: 10/29/98
PO Box 818	Project Number:	32-0029	Received: 10/29/98
Sherwood, OR 97140	Project Manager:	Jim Orr	Reported: 12/8/98 14:34

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Matrix Spike Dup (continued)	**1080859-MSD1**		**P810637-01**							
Xylenes (total)	10/31/98	60.0	53.4	111	ug/l	75.0-126	96.0	13.0	8.00	
Surrogate: 4-BFB	"	*50.0*		*47.9*	"	*50.0-150*	*95.8*			
Batch: 1180004	**Date Prepared: 11/1/98**					**Extraction Method: EPA 5030**				
Blank	**1180004-BLK1**									
Benzene	11/1/98			ND	ug/l	0.500				
Toluene	"			ND	"	0.500				
Ethylbenzene	"			ND	"	0.500				
Xylenes (total)	"			ND	"	1.00				
Gasoline Range Hydrocarbons	"			ND	"	80.0				
Surrogate: 4-BFB	"	*50.0*		*46.6*	"	*50.0-150*	*93.2*			
LCS	**1180004-BS1**									
Gasoline Range Hydrocarbons	11/1/98	1250		1340	ug/l	50.0-150	107			
Surrogate: 4-BFB	"	*50.0*		*52.5*	"	*50.0-150*	*105*			
LCS	**1180004-BS2**									
Benzene	11/1/98	20.0		21.8	ug/l	67.0-130	109			
Toluene	"	20.0		21.0	"	75.0-126	105			
Ethylbenzene	"	20.0		21.0	"	76.0-124	105			
Xylenes (total)	"	60.0		63.9	"	75.0-126	107			
Surrogate: 4-BFB	"	*50.0*		*50.6*	"	*50.0-150*	*101*			

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Terra Vac	Project:	Rose's Parking Lot	Sampled: 10/29/98
PO Box 818	Project Number:	32-0029	Received: 10/29/98
Sherwood, OR 97140	Project Manager:	Jim Orr	Reported: 12/8/98 14:34

Dissolved Metals per EPA 200 Series Methods/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 1180351	**Date Prepared: 11/11/98**					**Extraction Method: EPA 200/3005**				
Blank	**1180351-BLK1**									
Lead	11/13/98			ND	mg/l	0.00100				
LCS	**1180351-BS1**									
Lead	11/13/98	0.100		0.104	mg/l	85.0-115	104			
Duplicate	**1180351-DUP1**		**P810645-02**							
Lead	11/13/98		ND	ND	mg/l			20.0		
Matrix Spike	**1180351-MS1**		**P810645-02**							
Lead	11/13/98	0.100	ND	0.0918	mg/l	70.0-130	91.8			
Matrix Spike	**1180351-MS2**		**P811104-04**							
Lead	11/13/98	0.100	0.00640	0.0911	mg/l	70.0-130	84.7			

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Terra Vac	Project:	Rose's Parking Lot	Sampled: 10/29/98
PO Box 818	Project Number:	32-0029	Received: 10/29/98
Sherwood, OR 97140	Project Manager:	Jim Orr	Reported: 12/8/98 14:34

Polynuclear Aromatic Compounds per EPA 8270M-SIM/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 1180036	**Date Prepared: 11/2/98**					**Extraction Method: EPA 3520/600 Series**				
Blank	1180036-BLK1									
Acenaphthene	11/3/98			ND	ug/l	0.100				
Acenaphthylene	"			ND	"	0.100				
Anthracene	"			ND	"	0.100				
Benzo (a) anthracene	"			ND	"	0.100				
Benzo (a) pyrene	"			ND	"	0.100				
Benzo (b) fluoranthene	"			ND	"	0.100				
Benzo (ghi) perylene	"			ND	"	0.100				
Benzo (k) fluoranthene	"			ND	"	0.100				
Chrysene	"			ND	"	0.100				
Dibenzo (a,h) anthracene	"			ND	"	0.200				
Fluoranthene	"			ND	"	0.100				
Fluorene	"			ND	"	0.100				
Indeno (1,2,3-cd) pyrene	"			ND	"	0.100				
Naphthalene	"			ND	"	0.100				
Phenanthrene	"			ND	"	0.100				
Pyrene	"			ND	"	0.100				
Surrogate: 2-Fluorobiphenyl	"	*2.50*		*2.46*	"	*37.0-135*	*98.4*			
Surrogate: Nitrobenzene-d5	"	*2.50*		*3.50*	"	*48.0-140*	*140*			
Surrogate: p-Terphenyl-d14	"	*2.50*		*2.91*	"	*25.0-147*	*116*			
LCS	1180036-BS1									
Acenaphthene	11/3/98	5.00		2.52	ug/l	50.0-150	50.4			
Benzo (a) pyrene	"	5.00		6.50	"	50.0-150	130			
Pyrene	"	5.00		6.04	"	50.0-150	121			
Surrogate: 2-Fluorobiphenyl	"	*2.50*		*2.41*	"	*37.0-135*	*96.4*			
Surrogate: Nitrobenzene-d5	"	*2.50*		*3.54*	"	*48.0-140*	*142*			4
Surrogate: p-Terphenyl-d14	"	*2.50*		*2.83*	"	*25.0-147*	*113*			
LCS Dup	1180036-BSD1									
Acenaphthene	11/3/98	5.00		2.80	ug/l	50.0-150	56.0	60.0	10.5	
Benzo (a) pyrene	"	5.00		6.34	"	50.0-150	127	60.0	2.33	
Pyrene	"	5.00		5.77	"	50.0-150	115	60.0	5.08	
Surrogate: 2-Fluorobiphenyl	"	*2.50*		*2.49*	"	*37.0-135*	*99.6*			
Surrogate: Nitrobenzene-d5	"	*2.50*		*3.41*	"	*48.0-140*	*136*			
Surrogate: p-Terphenyl-d14	"	*2.50*		*2.76*	"	*25.0-147*	*110*			

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Terra Vac	Project:	Rose's Parking Lot	Sampled: 10/29/98
PO Box 818	Project Number:	32-0029	Received: 10/29/98
Sherwood, OR 97140	Project Manager:	Jim Orr	Reported: 12/8/98 14:34

Notes and Definitions

#	Note
1	results entered for duplicate calculation; do not report
2	Reporting limits raised due to dilution necessary for analysis.
3	The surrogate recovery for this sample is not available due to sample dilution required from high analyte concentration and/or matrix interferences.
4	The spike recovery for this QC sample is outside of established control limits. Review of associated batch QC indicates the recovery for this analyte does not represent an out-of-control condition for the batch.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
Recov.	Recovery
RPD	Relative Percent Difference

North Creek Analytical, Inc.

Lisa Domenighini, Project Manager

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

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9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202

CHAIN OF CUSTODY REPORT

14.0°

Work Order # 810616

REPORT TO: Terra Vac	INVOICE TO: Terra Vac
ATTENTION: Mr. Paul Bianco	ATTENTION:
ADDRESS: 10740 Meridian Ave N. #202 Seattle WA 98133	ADDRESS:
PHONE: 206-362-8128 FAX: 206-362-9528	P.O. NUMBER: NCA QUOTE #:
PROJECT NAME: Rose's Parking Lot	
PROJECT NUMBER: 32-0029	
SAMPLED BY: Jim Orr	

TURNAROUND REQUEST in Business Days *

Organic & Inorganic Analyses: (X) Standard | 10 | 7 | 5 | 4 | 3 | 2 | 1 | Same Day

Fuels & Hydrocarbon Analyses: (X) Standard | 3-4 | 2 | 1 | Same Day

OTHER Specify:

* Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	NCA SAMPLE ID (Laboratory Use Only)	Analysis Request: TPH-G/BTEX	PAH	Diss. Pb	MATRIX (W, S, A, O)	# OF CONTAINERS	COMMENTS
1.	MW-1	10-29-98/1355		X	X	X	W	4	Filter Pb Sample
2.	NMW-2	1350		X				2	
3.	NMW-3	1345		X				2	
4.	MW-4	1340		X				2	
5.	NMW-5	1335		X				2	
6.	Trip Blank	1330		X			↓	2	
7.									
8.									
9.									
10.									

RELINQUISHED BY (Signature): James Orr	DATE: 10-29-98
PRINT NAME: James Orr	FIRM: Terra Vac TIME: 1435
RELINQUISHED BY (Signature):	DATE:
PRINT NAME:	FIRM: TIME:

RECEIVED BY (Signature): Mary M. Shene	DATE: 10/29/98
PRINT NAME: Mary M. Shene	FIRM: NCA TIME: 1435
RECEIVED BY (Signature):	DATE:
PRINT NAME:	FIRM: TIME:

ADDITIONAL REMARKS:

PAGE 1 OF 1

TERRA VAC

APPENDIX B
RBCA Evaluation

RBCA TIER 1/TIER 2 EVALUATION

Output Table 1

Site Name: Rose's Parking Lot | Job Identification: 32-0029 | Software: GSI RBCA Spreadsheet
Site Location: Portland, Oregon | Date Completed: 4/1/99 | Version: 1.0.1
Completed By: Peter Catterall

NOTE: values which differ from Tier 1 default values are shown in bold italics and underlined.

Exposure Parameter	Definition (Units)	Residential Adult	Residential (1-6yrs)	Residential (1-16 yrs)	Commercial/Industrial Chronic	Commercial/Industrial Constructn
ATc	Averaging time for carcinogens (yr)	70				
ATn	Averaging time for non-carcinogens (yr)	30	6	16	25	1
BW	Body Weight (kg)	70	15	35	70	
ED	Exposure Duration (yr)	30	6	16	25	1
t	Averaging time for vapor flux (yr)	30			25	1
EF	Exposure Frequency (days/yr)	350			250	180
EF.Derm	Exposure Frequency for dermal exposure	350			250	
IRgw	Ingestion Rate of Water (L/day)	2			1	
IRs	Ingestion Rate of Soil (mg/day)	100	200		50	100
IRadj	Adjusted soil ing. rate (mg-yr/kg-d)	1.1E+02			9.4E+01	
IRa.in	Inhalation rate indoor (m^3/day)	15			20	
IRa.out	Inhalation rate outdoor (m^3/day)	20			20	10
SA	Skin surface area (dermal) (cm^2)	5.8E+03		2.0E+03	5.8E+03	5.8E+03
SAadj	Adjusted dermal area (cm^2-yr/kg)	2.1E+03			1.7E+03	
M	Soil to Skin adherence factor	1				
AAFs	Age adjustment on soil ingestion	FALSE			FALSE	
AAFd	Age adjustment on skin surface area	FALSE			FALSE	
tox	Use EPA tox data for air (or PEL based)?	TRUE				
gwMCL?	Use MCL as exposure limit in groundwater?	FALSE				

Matrix of Exposed Persons to Complete Exposure Pathways		Residential	Commercial/Industrial Chronic	Commercial/Industrial Constructn
Outdoor Air Pathways:				
SS.v	Volatiles and Particulates from Surface Soils	FALSE	FALSE	TRUE
S.v	Volatilization from Subsurface Soils	FALSE	TRUE	
GW.v	Volatilization from Groundwater	FALSE	TRUE	
Indoor Air Pathways:				
S.b	Vapors from Subsurface Soils	FALSE	TRUE	
GW.b	Vapors from Groundwater	FALSE	TRUE	
Soil Pathways:				
SS.d	Direct Ingestion and Dermal Contact	FALSE	TRUE	TRUE
Groundwater Pathways:				
GW.i	Groundwater Ingestion	FALSE	FALSE	
S.l	Leaching to Groundwater from all Soils	FALSE	FALSE	

Matrix of Receptor Distance and Location On- or Off-Site		Residential Distance	Residential On-Site	Commercial/Industrial Distance	Commercial/Industrial On-Site
GW	Groundwater receptor (cm)		TRUE		TRUE
S	Inhalation receptor (cm)		TRUE		TRUE

Matrix of Target Risks		Individual	Cumulative
TRab	Target Risk (class A&B carcinogens)	1.0E-06	
TRc	Target Risk (class C carcinogens)	1.0E-05	
THQ	Target Hazard Quotient	1.0E+00	
Opt	Calculation Option (1, 2, or 3)	1	
Tier	RBCA Tier	2	

Surface Parameters	Definition (Units)	Residential	Constructn
A	Contaminated soil area (cm^2)	***3.1E+06***	
W	Length of affect. soil parallel to wind (cm)	***1.5E+03***	
W.gw	Length of affect. soil parallel to groundwater (cm	***2.8E+03***	
Uair	Ambient air velocity in mixing zone (cm/s)	2.3E+02	
delta	Air mixing zone height (cm)	2.0E+02	
Lss	Thickness of affected surface soils (cm)		
Pe	Particulate areal emission rate (g/cm^2/s)	6.9E-14	

Groundwater	Definition (Units)	Value
delta.gw	Groundwater mixing zone depth (cm)	***3.7E+02***
I	Groundwater infiltration rate (cm/yr)	3.0E+01
Ugw	Groundwater Darcy velocity (cm/yr)	***8.1E+01***
Ugw.tr	Groundwater seepage velocity (cm/yr)	***2.5E+02***
Ks	Saturated hydraulic conductivity(cm/s)	1.0E-04
grad	Groundwater gradient (cm/cm)	2.0E-02
Sw	Width of groundwater source zone (cm)	
Sd	Depth of groundwater source zone (cm)	
phi.eff	Effective porosity in water-bearing unit	2.5E-01
foc.sat	Fraction organic carbon in water-bearing unit	1.0E-03
BIO?	Is biodegradation considered?	FALSE
BC	Biodegradation Capacity (mg/L)	

Soil	Definition (Units)	Value	capillary	vadose	foundation
hc	Capillary zone thickness (cm)	***6.1E+01***			
hv	Vadose zone thickness (cm)	***2.4E+02***			
rho	Soil density (g/cm^3)	1.7			
foc	Fraction of organic carbon in vadose zone	***0.006***			
phi	Soil porosity in vadose zone	***0.26***			
Lgw	Depth to groundwater (cm)	***3.0E+02***			
Ls	Depth to top of affected subsurface soil (cm)	***3.0E+02***			
Lsubs	Thickness of affected subsurface soils (cm)	***3.0E+02***			
pH	Soil/groundwater pH	***7.7***			
phi.w	Volumetric water content		***0.2***	0.05	0.12
phi.a	Volumetric air content		***0.06***	***0.2***	0.26

Building	Definition (Units)	Residential	Commercial
Lb	Building volume/area ratio (cm)	2.0E+02	3.0E+02
ER	Building air exchange rate (s^-1)	1.4E-04	2.3E-04
Lcrk	Foundation crack thickness (cm)	1.5E+01	
eta	Foundation crack fraction	0.01	

Transport Parameters	Definition (Units)	Residential	Commercial
Groundwater			
ax	Longitudinal dispersivity (cm)		
ay	Transverse dispersivity (cm)		
az	Vertical dispersivity (cm)		
Vapor			
dcy	Transverse dispersion coefficient (cm)		
dcz	Vertical dispersion coefficient (cm)		

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RBCA CHEMICAL DATABASE

Physical Property Data

CAS Number	Constituent	type	Molecular Weight (g/mole) MW	ref	Diffusion Coefficients in air (cm2/s) Dair	ref	in water (cm2/s) Dwat	ref	log (Koc) or log(Kd) (@ 20 - 25 C) log(l/kg)	ref	Henry's Law Constant (@ 20 - 25 C) (atm-m3/mol)	(unitless)	ref	Vapor Pressure (@ 20 - 25 C) (mm Hg)	ref	Solubility (@ 20 - 25 C) (mg/L)	ref	acid pKa	base pKb	ref
71-43-2	Benzene	A	78.1	5	9.30E-02	A	1.10E-05	A	1.58	A	5.29E-03	2.20E-01	A	9.52E+01	4	1.75E+03	A			
100-41-4	Ethylbenzene	A	106.2	5	7.60E-02	A	8.50E-06	A	1.98	A	7.69E-03	3.20E-01	A	1.00E+01	4	1.52E+02	5			
91-20-3	Naphthalene	PAH	128.2	4	7.20E-02	A	9.40E-06	A	3.11	A	1.18E-03	4.90E-02	A	2.30E-01	4	3.29E+01	4			
108-88-3	Toluene	A	92.4	5	8.50E-02	A	9.40E-06	A	2.13	A	6.25E-03	2.60E-01	A	3.00E+01	4	5.15E+02	29			
1330-20-7	Xylene (mixed isomers)	A	106.2	5	7.20E-02	A	8.50E-06	A	2.38	A	6.97E-03	2.90E-01	A	7.00E+00	4	1.98E+02	5			

Site Name: Rose's Parking Lot Site Location: Portland, Oregon Completed By: Peter Catterall Date Completed: 4/1/1999

Software version: 1.0.1

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RBCA CHEMICAL DATABASE

Toxicity Data

CAS Number	Constituent	Reference Dose (mg/kg/day) Oral RfD_oral	ref	Inhalation RfD_inhal	ref	Slope Factors 1/(mg/kg/day) Oral SF_oral	ref	Inhalation SF_inhal	ref	EPA Weight of Evidence	Is Constituent Carcinogenic ?
71-43-2	Benzene	-		1.70E-03	R	2.90E-02	A	2.90E-02	A	A	TRUE
100-41-4	Ethylbenzene	1.00E-01	A	2.86E-01	A	-		-		D	FALSE
91-20-3	Naphthalene	4.00E-03	A	-		-		-		D	FALSE
108-88-3	Toluene	2.00E-01	A,R	1.14E-01	A,R	-		-		D	FALSE
1330-20-7	Xylene (mixed isomers)	2.00E+00	A,R	2.00E+00	A	-		-		D	FALSE

Site Name: Rose's Parking Lot Site Location: Portland, Oregon Completed By: Peter Catterall Date Completed: 4/1/1999

Software version: 1.0.1

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RBCA CHEMICAL DATABASE

Miscellaneous Chemical Data

CAS Number	Constituent	Maximum Contaminant Level MCL (mg/L)	Maximum Contaminant Level reference	Permissible Exposure Limit PEL/TLV (mg/m3)	PEL/TLV ref	Relative Absorption Factors Oral	Relative Absorption Factors Dermal	Detection Limits Groundwater (mg/L)	Groundwater ref	Detection Limits Soil (mg/kg)	Soil ref	Half Life (First-Order Decay) (days) Saturated	Half Life (First-Order Decay) (days) Unsaturated	ref
71-43-2	Benzene	5.00E-03	52 FR 25690	3.20E+00	OSHA	1	0.5	0.002	C	0.005	S	720	720	H
100-41-4	Ethylbenzene	7.00E-01	56 FR 3526 (30 Jan 91)	4.34E+02	ACGIH	1	0.5	0.002	C	0.005	S	228	228	H
91-20-3	Naphthalene			5.00E+01	OSHA	1	0.05	0.01	C	0.01	S	258	258	H
108-88-3	Toluene	1.00E+00	56 FR 3526 (30 Jan 91)	1.47E+02	ACGIH	1	0.5	0.002	C	0.005	S	28	28	H
1330-20-7	Xylene (mixed isomers)	1.00E+01	56 FR 3526 (30 Jan 91)	4.34E+02	ACGIH	1	0.5	0.005	C	0.005	S	360	360	H

Site Name: Rose's Parking Lot Site Location: Portland, Oregon Completed By: Peter Catterall Date Completed: 4/1/1999

Software version: 1.0.1

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REPRESENTATIVE COC CONCENTRATIONS IN SOURCE MEDIA

(Complete the following table)

CONSTITUENT	Representative COC Concentration					
	In Groundwater		In Surface Soil		In Subsurface Soil	
	value (mg/L)	note	value (mg/kg)	note	value (mg/kg)	note
Benzene	2.2E-2					max
Ethylbenzene	1.0E-1				5.6E-2	max
Naphthalene	5.4E-2					max
Toluene	5.7E-2					max
Xylene (mixed isomers)	1.1E+0					max

Site Name: Rose's Parking Lot
Site Location: Portland, Oregon

Completed By: Peter Catterall
Date Completed: 4/1/1999

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RBCA SITE ASSESSMENT | Input Screen 6.3

CONSTITUENT MOLE FRACTIONS

(Complete the following table)

CONSTITUENT	Mole Fraction of Constituent in Source Material
Benzene	
Ethylbenzene	
Naphthalene	
Toluene	
Xylene (mixed isomers)	

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Site Location: Portland, Oregon

Completed By: Peter Catterall
Date Completed: 4/1/1999

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RBCA SITE ASSESSMENT | Input Screen 9.4

GROUNDWATER DAF VALUES

(Enter DAF values in the grey area of the following table)

CONSTITUENT	Dilution Attenuation Factor (DAF) in Groundwater	
	Residential Receptor	Comm./Ind. Receptor
Benzene	1.0E+0	1.0E+0
Ethylbenzene	1.0E+0	1.0E+0
Naphthalene	1.0E+0	1.0E+0
Toluene	1.0E+0	1.0E+0
Xylene (mixed isomers)	1.0E+0	1.0E+0

Site Name: Rose's Parking Lot
Site Location: Portland, Oregon

Completed By: Peter Catterall
Date Completed: 4/1/1999

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RBCA SITE ASSESSMENT | Input Screen 9.1

CONSTITUENT HALF-LIFE VALUES

(Complete the following table)

CONSTITUENT	Half-Life of Constituent (day)
Benzene	720
Ethylbenzene	228
Naphthalene	
Toluene	28
Xylene (mixed isomers)	360

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Site Location: Portland, Oregon

Completed By: Peter Catterall
Date Completed: 4/1/1999

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RBCA SITE ASSESSMENT

EXPOSURE LIMITS IN GROUNDWATER AND AIR

CONSTITUENT	Exposure Limits Applied to Receptors	
	Groundwater (MCL) (mg/L)	Air (Comm. only) (PEL/TLV) (mg/m^3)
Benzene		
Ethylbenzene		
Naphthalene		
Toluene		
Xylene (mixed isomers)		

Site Name: Rose's Parking Lot
Site Location: Portland, Oregon

Completed By: Peter Catterall
Date Completed: 4/1/1999

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Site Name: Rose's Parking Lot | Site Location: Portland, Oregon | Completed By: Peter Catterall | Date Completed: 4/1/1999 | 1 OF 9

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ☐ (CHECKED IF PATHWAY IS ACTIVE)

SURFACE SOILS: VAPOR AND DUST INHALATION Constituents of Concern	Exposure Concentration 1) Source Medium Surface Soil Conc. (mg/kg)	2) NAF Value (m^3/kg) Receptor		3) Exposure Medium Outdoor Air: POE Conc. (mg/m^3) (1) / (2)		4) Exposure Multiplier (IRxEFxED)/(BWxAT) (m^3/kg-day)		5) Average Daily Intake Rate (mg/kg-day) (3) X (4)	
Benzene	0.0E+0								
Ethylbenzene	0.0E+0								
Naphthalene	0.0E+0								
Toluene	0.0E+0								
Xylene (mixed isomers)	0.0E+0								

NOTE: ABS = Dermal absorpoon factor (dim); AF = Adherance factor (mg/cm^2); AT = Averaging time (days); BW = Body weight (kg); CF = Units conversion factor; ED = Exposure duration (yrs); EF = Exposure frequencey (days/yr); ET = Exposure time (hrs/day); IR = Inhalation rate (m^3/day); POE = Point of exposure; SA = Skin exposure area (cm^2/day)

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Site Name: Rose's Parking Lot | Site Location: Portland, Oregon | Completed By: Peter Catterall | Date Completed: 4/1/1999 | 2 OF 9

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS — ■ (CHECKED IF PATHWAY IS ACTIVE)

SUBSURFACE SOIL: VAPOR INHALATION

Constituents of Concern	Exposure Concentration: 1) Source Medium — Subsurface Soil Conc. (mg/kg)	2) NAF Value (m^3/kg) — Receptor: On-Site Commercial		3) Exposure Medium — Outdoor Air: POE Conc. (mg/m^3) (1) / (2): On-Site Commercial		4) Exposure Multiplier ((IRxEFxED)/(BWxAT)) (m^3/kg-day): On-Site Commercial		5) Average Daily Intake Rate (mg/kg-day) (3) X (4): On-Site Commercial	
Benzene	0.0E+0	4.5E+4		0.0E+0		7.0E-2		0.0E+0	
Ethylbenzene	5.6E-2	4.5E+4		1.2E-6		2.0E-1		2.4E-7	
Naphthalene	0.0E+0	2.2E+5		0.0E+0		2.0E-1		0.0E+0	
Toluene	0.0E+0	4.5E+4		0.0E+0		2.0E-1		0.0E+0	
Xylene (mixed isomers)	0.0E+0	4.5E+4		0.0E+0		2.0E-1		0.0E+0	

NOTE: ABS = Dermal absorption factor (dim); AF = Adherance factor (mg/cm^2); AT = Averaging time (days); BW = Body weight (kg); CF = Units conversion factor; ED = Exposure duration (yrs); EF = Exposure frequency (days/yr); ET = Exposure time (hrs/day); IR = Inhalation rate (m^3/day); POE = Point of exposure; SA = Skin exposue area (cm^2/day)

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TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAY IS ACTIVE)

GROUNDWATER: VAPOR INHALATION

Constituents of Concern	Exposure Concentration: 1) Source Medium — Groundwater Conc. (mg/L)	2) NAF Value (m^3/L) Receptor — On-Site Commercial		3) Exposure Medium — Outdoor Air: POE Conc. (mg/m^3) (1) / (2) — On-Site Commercial		4) Exposure Multiplier (IRxEFxED)/(BWxAT) (m^3/kg-day) — On-Site Commercial		5) Average Daily Intake Rate (mg/kg-day) (3) X (4) — On-Site Commercial		TOTAL PATHWAY INTAKE (mg/kg-day) (Sum intake values from surface, subsurface & groundwater routes.) — On-Site Commercial	
Benzene	2.2E-2	1.2E+5		1.9E-7		7.0E-2		1.3E-8		1.3E-8	
Ethylbenzene	1.0E-1	1.0E+5		1.0E-6		2.0E-1		2.0E-7		4.4E-7	
Naphthalene	5.4E-2	5.7E+5		9.5E-8		2.0E-1		1.9E-8		1.9E-8	
Toluene	5.7E-2	1.1E+5		5.2E-7		2.0E-1		1.0E-7		1.0E-7	
Xylene (mixed isomers)	1.1E+0	1.2E+5		9.7E-6		2.0E-1		1.9E-6		1.9E-6	

NOTE: ABS = Dermal absorption factor (dim); AF = Adherance factor (mg/cm^2); AT = Averaging time (days); BW = Body weight (kg); CF = Units conversion factor; ED = Exposure duration (yrs); EF = Exposure frequency (days/yr); ET = Exposure time (hrs/day); IR = Inhalation rate (m^3/day); POE = Point of exposure; SA = Skin exposure area (cm^2/day)

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RBCA SITE ASSESSMENT | Tier 1 Worksheet 8.2

Site Name: Rose's Parking Lot | Site Location: Portland, Oregon | Completed By: Peter Catterall | Date Completed: 4/1/1999 |

TIER 1 PATHWAY RISK CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAYS ARE ACTIVE)

	CARCINOGENIC RISK						TOXIC EFFECTS			
	(1) EPA	(2) Total Carcinogenic Intake Rate (mg/kg/day)		(3) Inhalation Slope Factor	(4) Individual COC Risk (2) x (3)		(5) Total Toxicant Intake Rate (mg/kg/day)		(6) Inhalation Reference Dose	(7) Individual COC Hazard Quotient (5) / (6)	
Constituents of Concern	Carcinogenic Classification	On-Site Commercial		(mg/kg-day)^-1	On-Site Commercial		On-Site Commercial		(mg/kg-day)	On-Site Commercial	
Benzene	A	1.3E-8		2.9E-2	3.8E-10		3.7E-8		1.7E-3	2.2E-5	
Ethylbenzene	D						4.4E-7		2.9E-1	1.5E-6	
Naphthalene	D										
Toluene	D						1.0E-7		1.1E-1	8.9E-7	
Xylene (mixed isomers)	D						1.9E-6		2.0E+0	9.5E-7	
Total Pathway Carcinogenic Risk =					3.8E-10	0.0E+0	***Total Pathway Hazard Index =***			2.5E-5	0.0E+0

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Site Name: Rose's Parking Lot | Site Location: Portland, Oregon | Completed By: Peter Catterall | Date Completed: 4/1/1999 | 4 OF 9

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS (CHECKED IF PATHWAY IS ACTIVE)

SUBSURFACE SOILS: VAPOR INTRUSION TO BUILDINGS

Exposure Concentration

Constituents of Concern	1) Source Medium: Subsurface Soil Conc. (mg/kg)	2) NAF Value (m^3/kg) Receptor: On-Site Commercial	3) Exposure Medium: Indoor Air: POE Conc. (mg/m^3) (1) / (2): On-Site Commercial	4) Exposure Multiplier: (IR x EF x ED)/(BW x AT) (m^3/kg-day): On-Site Commercial	5) Average Daily Intake Rate: (mg/kg-day) (3) X (4): On-Site Commercial
Benzene	0.0E+0	1.0E+2	0.0E+0	7.0E-2	0.0E+0
Ethylbenzene	5.6E-2	1.0E+2	5.3E-4	2.0E-1	1.0E-4
Naphthalene	0.0E+0	2.9E+3	0.0E+0	2.0E-1	0.0E+0
Toluene	0.0E+0	1.0E+2	0.0E+0	2.0E-1	0.0E+0
Xylene (mixed isomers)	0.0E+0	1.0E+2	0.0E+0	2.0E-1	0.0E+0

NOTE:
ABS = Dermal absorption factor (dim)
AF = Adherance factor (mg/cm^2)
AT = Averaging time (days)
BW = Body weight (kg)
CF = Units conversion factor
ED = Exposure duration (yrs)
EF = Exposure frequency (days/yr)
ET = Exposure time (hrs/day)
IR = Inhalation rate (m^3/day)
POE = Point of exposure
SA = Skin exposure area (cm^2/day)

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Site Name: Rose's Parking Lot | Site Location: Portland, Oregon | Completed By: Peter Catterall | Date Completed: 4/1/1999 | 5 OF 9

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAY IS ACTIVE)

GROUNDWATER:
VAPOR INTRUSION TO BUILDINGS

Constituents of Concern	Exposure Concentration: 1) Source Medium — Groundwater Conc. (mg/L)	2) NAF Value (m^3/L) — Receptor: On-Site Commercial	3) Exposure Medium — Indoor Air: POE Conc. (mg/m^3) (1) / (2) — On-Site Commercial	4) Exposure Multiplier (IRxEFxED)/(BWxAT) (m^3/kg-day) — On-Site Commercial	5) Average Daily Intake Rate (mg/kg-day) (3) X (4) — On-Site Commercial	TOTAL PATHWAY INTAKE (mg/kg-day) (Sum intake values from subsurface & groundwater routes.) — On-Site Commercial
Benzene	2.2E-2	3.4E+2	6.5E-5	7.0E-2	4.6E-6	4.6E-6
Ethylbenzene	1.0E-1	2.9E+2	3.5E-4	2.0E-1	6.9E-5	1.7E-4
Naphthalene	5.4E-2	1.7E+3	3.2E-5	2.0E-1	6.2E-6	6.2E-6
Toluene	5.7E-2	3.2E+2	1.8E-4	2.0E-1	3.5E-5	3.5E-5
Xylene (mixed isomers)	1.1E+0	3.3E+2	3.4E-3	2.0E-1	6.6E-4	6.6E-4

NOTE:
ABS = Dermal absorption factor (dim)
AF = Adherance factor (mg/cm^2)
AT = Averaging time (days)
BW = Body weight (kg)
CF = Units conversion factor
ED = Exposure duration (yrs)
EF = Exposure frequencey (days/yr)
ET = Exposure time (hrs/day)
IR = Inhalation rate (m^3/day)
POE = Point of exposure
SA = Skin exposure area (cm^2/day)

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Site Name: Rose's Parking Lot | Site Location: Portland, Oregon | Completed By: Peter Catterall | Date Completed: 4/1/1999 | 2 OF 4

TIER 1 PATHWAY RISK CALCULATION

INDOOR AIR EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAYS ARE ACTIVE)

Constituents of Concern	(1) EPA Carcinogenic Classification	CARCINOGENIC RISK: (2) Total Carcinogenic Intake Rate (mg/kg/day) On-Site Commercial	(3) Inhalation Slope Factor (mg/kg-day)^-1	(4) Individual COC Risk (2) x (3) On-Site Commercial	TOXIC EFFECTS: (5) Total Toxicant Intake Rate (mg/kg/day) On-Site Commercial	(6) Inhalation Reference Dose (mg/kg-day)	(7) Individual COC Hazard Quotient (5) / (6) On-Site Commercial
Benzene	A	4.6E-6	2.9E-2	1.3E-7	1.3E-5	1.7E-3	7.5E-3
Ethylbenzene	D				1.7E-4	2.9E-1	6.1E-4
Naphthalene	D						
Toluene	D				3.5E-5	1.1E-1	3.1E-4
Xylene (mixed isomers)	D				6.6E-4	2.0E+0	3.3E-4

Total Pathway Carcinogenic Risk = 0.0E+0 | 1.3E-7

Total Pathway Hazard Index = 0.0E+0 | 8.7E-3

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Software: GSI RBCA Spreadsheet
Version: 1.0.1
Serial: G-337-YAX-542

Site Name: Rose's Parking Lot Site Location: Portland, Oregon Completed By: Peter Catte Date Completed: 4/1/1999 *6 OF 9*

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

SOIL EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAY IS ACTIVE)

SURFACE SOILS OR SEDIMENTS:
DERMAL CONTACT

Constituents of Concern	Exposure Concentration: 1) Source Medium — Surface Soil Conc. (mg/kg)	2) Exposure Multiplier (SAxAFxABSxCFxEFxED)/(BWxAT) (kg/kg-day) — On-Site Residential	2) Exposure Multiplier — On-Site Commercial	3) Average Daily Intake Rate (mg/kg-day) (1) x (2) — On-Site Residential	3) Average Daily Intake Rate — On-Site Commercial
Benzene	0.0E+0		1.0E-5		0.0E+0
Ethylbenzene	0.0E+0		2.8E-5		0.0E+0
Naphthalene	0.0E+0		2.8E-6		0.0E+0
Toluene	0.0E+0		2.8E-5		0.0E+0
Xylene (mixed isomers)	0.0E+0		2.8E-5		0.0E+0

NOTE: ABS = Dermal absorption factor (dim) | BW = Body weight (kg) | EF = Exposure frequency (days/yr) | POE = Point of exposure
AF = Adherance factor (mg/cm^2) | CF = Units conversion factor | ET = Exposure time (hrs/day) | SA = Skin exposure area (cm^2/day)
AT = Averaging time (days) | ED = Exposure duration (yrs) | IR = Intake rate (mg/day)

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Software: GSI RBCA Spreadsheet Serial: G-337-YAX-542
Version: 1.0.1

Site Name: Rose's Parking Lot Site Location: Portland, Oregon Completed By: Peter Catterall Date Completed: 4/1/1999 7 OF 9

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

SOIL EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAY IS ACTIVE)

SURFACE SOILS OR SEDIMENTS:
INGESTION

Constituents of Concern	Exposure Concentration: 1) Source Medium — Surface Soil Conc. (mg/kg)	2) Exposure Multiplier (IRxCFxEFxED)/(BWxAT) (kg/kg-day) — On-Site Residential	2) Exposure Multiplier — On-Site Commercial	3) Average Daily Intake Rate (mg/kg-day) (1) x (2) — On-Site Residential	3) Average Daily Intake Rate — On-Site Commercial	TOTAL PATHWAY INTAKE (mg/kg-day) (Sum intake values from dermal & ingestion routes.) — On-Site Residential	TOTAL PATHWAY INTAKE — On-Site Commercial
Benzene	0.0E+0		1.7E-7		0.0E+0		0.0E+0
Ethylbenzene	0.0E+0		4.9E-7		0.0E+0		0.0E+0
Naphthalene	0.0E+0		4.9E-7		0.0E+0		0.0E+0
Toluene	0.0E+0		4.9E-7		0.0E+0		0.0E+0
Xylene (mixed isomers)	0.0E+0		4.9E-7		0.0E+0		0.0E+0

NOTE: ABS = Dermal absorpsion factor (dim); AF = Adherance factor (mg/cm^2); AT = Averaging time (days); BW = Body weight (kg); CF = Units conversion factor; ED = Exposure duration (yrs); EF = Exposure frequency (days/yr); ET = Exposure time (hrs/day); IR = Intake rate (mg/day); POE = Point of exposure; SA = Skin exposure area (cm^2/day)

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Site Name: Rose's Parking Lot | Site Location: Portland, Oregon | Completed By: Peter Catterall | Date Completed: 4/1/1999 | 3 OF 4

TIER 1 PATHWAY RISK CALCULATION

SOIL EXPOSURE PATHWAYS ■ CHECKED IF PATHWAYS ARE ACTIVE

	CARCINOGENIC RISK							TOXIC EFFECTS			
	(1) EPA	(2) Total Carcinogenic Intake Rate (mg/kg/day)		(3) Oral Slope Factor	(4) Individual COC Risk (2) x (3)		(5) Total Toxicant Intake Rate (mg/kg/day)		(6) Oral Reference Dose	(7) Individual COC Hazard Quotient (5) / (6)	
Constituents of Concern	Carcinogenic Classification	On-Site Residential	On-Site Commercial	(mg/kg-day)^-1	On-Site Residential	On-Site Commercial	On-Site Residential	On-Site Commercial	(mg/kg-day)	On-Site Residential	On-Site Commercial
Benzene	A		0.0E+0	2.9E-2		0.0E+0					
Ethylbenzene	D							0.0E+0	1.0E-1		0.0E+0
Naphthalene	D							0.0E+0	4.0E-3		0.0E+0
Toluene	D							0.0E+0	2.0E-1		0.0E+0
Xylene (mixed isomers)	D							0.0E+0	2.0E+0		0.0E+0
Total Pathway Carcinogenic Risk =					0.0E+0	0.0E+0	***Total Pathway Hazard Index =***			0.0E+0	0.0E+0

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Site Name: Rose's Parking Lot Site Location: Portland, Oregon Completed By: Peter Catterall Date Completed: 4/1/1999

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS ☐ (CHECKED IF PATHWAY IS ACTIVE)

SOIL: LEACHING TO GROUNDWATER/ GROUNDWATER INGESTION

Constituents of Concern	Exposure Concentration 1) Source Medium: Soil Concentration (mg/kg)	2) NAF Value (L/kg) Receptor		3) Exposure Medium: Groundwater: POE Conc. (mg/L) (1)/(2)		4) Exposure Multiplier: (IRxEFxED)/(BWxAT) (L/kg-day)		5) Average Daily Intake Rate: (mg/kg-day) (3) x (4)	
Benzene	0.0E+0								
Ethylbenzene	5.6E-2								
Naphthalene	0.0E+0								
Toluene	0.0E+0								
Xylene (mixed isomers)	0.0E+0								

NOTE: ABS = Dermal absorption factor (dim); AF = Adherance factor (mg/cm^2); AT = Averaging time (days); BW = Body Weight (kg); CF = Units conversion factor; ED = Exposure duration (yrs); EF = Exposure frequency (days/yr); ET = Exposure time (hrs/day); IR = Intake rate (L/day); POE = Point of exposure; SA = Skin exposure area (cm^2/day)

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Site Name: Rose's Parking Lot | Site Location: Portland, Oregon | Completed By: Peter Catterall | Date Completed: 4/1/1999 | 9 OF 9

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS ☐ (CHECKED IF PATHWAY IS ACTIVE)

GROUNDWATER: INGESTION

Constituents of Concern	Exposure Concentration: 1) Source Medium — Groundwater Conc. (mg/L)	2) NAF Value (dim) — Receptor		3) Exposure Medium — Groundwater: POE Conc. (mg/L) (1)x(2)		4) Exposure Multiplier — (IRxEFxED)/(BWxAT) (L/kg-day)		5) Average Daily Intake Rate — (mg/kg-day) (3) x (4)		MAX. PATHWAY INTAKE (mg/kg-day) (Maximum intake of active pathways and inhaling & groundwater routes.)	
Benzene	2.2E-2										
Ethylbenzene	1.0E-1										
Naphthalene	5.4E-2										
Toluene	5.7E-2										
Xylene (mixed isomers)	1.1E+0										

NOTE: ABS = Dermal absorption factor (dim); AF = Adherance factor (mg/cm^2); AT = Averaging time (days); BW = Body weight (kg); CF = Units conversion factor; ED = Exposure duration (yrs); EF = Exposure frequency (days/yr); ET = Exposure time (hrs/day); IR = Intake rate (L/day); POE = Point of exposure; SA = Skin exposure area (cm^2/day)

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Site Name: Rose's Parking Lot | Site Location: Portland, Oregon | Completed By: Peter Catterall | Date Completed: 4/1/1999 | 4 OF 4

TIER 1 PATHWAY RISK CALCULATION

GROUNDWATER EXPOSURE PATHWAYS ☐ (CHECKED IF PATHWAYS ARE ACTIVE)

Constituents of Concern	CARCINOGENIC RISK (1) EPA Classification	(2) Total Carcinogenic Intake Rate (mg/kg/day)		(3) Oral Slope Factor (mg/kg-day)^-1	(4) Individual COC Risk (2) x (3)		TOXIC EFFECTS (5) Total Toxicant Intake Rate (mg/kg/day)		(6) Oral Reference Dose (mg/kg-day)	(7) Individual COC Hazard Quotient (5) / (6)	
Benzene	A			2.9E-2							
Ethylbenzene	D								1.0E-1		
Naphthalene	D								4.0E-3		
Toluene	D								2.0E-1		
Xylene (mixed isomers)	D								2.0E+0		

Total Pathway Carcinogenic Risk = 0.0E+0 | 0.0E+0

Total Pathway Hazard Index = 0.0E+0 | 0.0E+0

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RBCA SITE ASSESSMENT | **Tier 1 Worksheet 8.3**

Site Name: Rose's Parking Lot
Site Location: Portland, Oregon

Completed By: Peter Catterall
Date Completed: 4/1/1999

TIER 1 BASELINE RISK SUMMARY TABLE

EXPOSURE PATHWAY	BASELINE CARCINOGENIC RISK: Individual COC Risk – Maximum Value	Individual COC Risk – Target Risk	Cumulative COC Risk – Total Value	Cumulative COC Risk – Target Risk	Risk Limit(s) Exceeded?	BASELINE TOXIC EFFECTS: Hazard Quotient – Maximum Value	Hazard Quotient – Applicable Limit	Hazard Index – Total Value	Hazard Index – Applicable Limit	Toxicity Limit(s) Exceeded?
OUTDOOR AIR EXPOSURE PATHWAYS										
Complete:	3.8E-10	1.0E-6	3.8E-10	N/A	☐	2.2E-5	1.0E+0	2.5E-5	N/A	☐
INDOOR AIR EXPOSURE PATHWAYS										
Complete:	1.3E-7	1.0E-6	1.3E-7	N/A	☐	7.5E-3	1.0E+0	8.7E-3	N/A	☐
SOIL EXPOSURE PATHWAYS										
Complete:	NC	1.0E-6	NC	N/A	■	NC	1.0E+0	NC	N/A	■
GROUNDWATER EXPOSURE PATHWAYS										
Complete:	NC	1.0E-6	NC	N/A	■	NC	1.0E+0	NC	N/A	■
CRITICAL EXPOSURE PATHWAY (Select Maximum Values From Complete Pathways)										
	1.3E-7	1.0E-6	1.3E-7	N/A	☐	7.5E-3	1.0E+0	8.7E-3	N/A	☐

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RBCA SITE ASSESSMENT | Tier 1 Worksheet 6.1

Site Name: Rose's Parking Lot | Completed By: Peter Catterall

Site Location: Portland, Oregon | Date Completed: 4/1/1999

SURFACE SOIL RBSL VALUES (< 0 FT BGS)

Target Risk (Class A & B) 1.0E-6 ☐ MCL exposure limit? Calculation Option: 1

Target Risk (Class C) 1.0E-5 ☐ PEL exposure limit?

Target Hazard Quotient 1.0E+0

RBSL Results For Complete Exposure Pathways ("X" If Complete)

CONSTITUENTS OF CONCERN		Representative Concentration		Soil Leaching to Groundwater			X	Ingestion and Dermal Contact		X	Construction Worker	Applicable RBSL	RBSL Exceeded ?	Required CRF
CAS No.	Name	(mg/kg)		Residential: (on-site)	Commercial: (on-site)	Regulatory(MCL): (on-site)		Residential: (on-site)	Commercial: (on-site)		Commercial: (on-site)	(mg/kg)	"■" If yes	Only if "yes" left
71-43-2	Benzene	0.0E+0		NA	NA	NA		NA	3.3E+0		1.1E+2	3.3E+0	☐	<1
100-41-4	Ethylbenzene	0.0E+0		NA	NA	NA		NA	>Res		>Res	>Res	☐	<1
91-20-3	Naphthalene	0.0E+0		NA	NA	NA		NA	>Res		>Res	>Res	☐	<1
108-88-3	Toluene	0.0E+0		NA	NA	NA		NA	>Res		>Res	>Res	☐	<1
1330-20-7	Xylene (mixed isomers)	0.0E+0		NA	NA	NA		NA	>Res		>Res	>Res	☐	<1

>Res indicates risk-based target concentration greater than constituent residual saturation value

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Software: GSI RBCA Spreadsheet Serial: G-337-YAX-542

Version: 1.0.1

RBCA SITE ASSESSMENT

Tier 1 Worksheet 6.2

Site Name: Rose's Parking Lot
Site Location: Portland, Oregon

Completed By: Peter Catterall
Date Completed: 4/1/1999

SUBSURFACE SOIL RBSL VALUES (> 0 FT BGS)

Target Risk (Class A & B) 1.0E-6
Target Risk (Class C) 1.0E-5
Target Hazard Quotient 1.0E+0

☐ MCL exposure limit?
☐ PEL exposure limit?

Calculation Option: 1

RBSL Results For Complete Exposure Pathways ("X" If Complete)

CONSTITUENTS OF CONCERN		Representative Concentration		Soil Leaching to Groundwater			X	Soil Volatilization to Indoor Air		X	Soil Volatilization to Outdoor Air		Applicable RBSL	RBSL Exceeded ?	Required CRF
CAS No.	Name	(mg/kg)		Residential: (on-site)	Commercial: (on-site)	Regulatory(MCL): (on-site)		Residential: (on-site)	Commercial: (on-site)		Residential: (on-site)	Commercial: (on-site)	(mg/kg)	"■" If yes	Only if "yes" left
71-43-2	Benzene	0.0E+0		NA	NA	NA		NA	5.2E-2		NA	2.2E+1	5.2E-2	☐	<1
100-41-4	Ethylbenzene	5.6E-2		NA	NA	NA		NA	>Res		NA	>Res	>Res	☐	<1
91-20-3	Naphthalene	0.0E+0		NA	NA	NA		NA	NA		NA	NA	>Res	☐	<1
108-88-3	Toluene	0.0E+0		NA	NA	NA		NA	6.1E+1		NA	>Res	6.1E+1	☐	<1
1330-20-7	Xylene (mixed isomers)	0.0E+0		NA	NA	NA		NA	>Res		NA	>Res	>Res	☐	<1

>Res indicates risk-based target concentration greater than constituent residual saturation value

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Serial: G-337-YAX-542

RBCA SITE ASSESSMENT

Tier 1 Worksheet 6.3

Site Name: Rose's Parking Lot
Site Location: Portland, Oregon

Completed By: Peter Catterall
Date Completed: 4/1/1999

GROUNDWATER RBSL VALUES

Target Risk (Class A & B) 1.0E-6
Target Risk (Class C) 1.0E-5
Target Hazard Quotient 1.0E+0

☐ MCL exposure limit?
☐ PEL exposure limit?

Calculation Option: 1

RBSL Results For Complete Exposure Pathways ("x" If Complete)

CONSTITUENTS OF CONCERN		Representative Concentration		Groundwater Ingestion			X	Groundwater Volatilization to Indoor Air		X	Groundwater Volatilization to Outdoor Air		Applicable RBSL	RBSL Exceeded ?	Required CRF
CAS No.	Name	(mg/L)	Residential: (on-site)	Commercial: (on-site)	Regulatory(MCL): (on-site)		Residential: (on-site)	Commercial: (on-site)		Residential (on-site)	Commercial: (on-site)	(mg/L	"■" If yes	Only if "yes" left
71-43-2	Benzene	2.2E-2	NA	NA	NA		NA	1.7E-1		NA	5.8E+1	1.7E-1	☐	<1
100-41-4	Ethylbenzene	1.0E-1	NA	NA	NA		NA	>Sol		NA	>Sol	>Sol	☐	<1
91-20-3	Naphthalene	5.4E-2	NA	NA	NA		NA	NA		NA	NA	>Sol	☐	<1
108-88-3	Toluene	5.7E-2	NA	NA	NA		NA	1.8E+2		NA	>Sol	1.8E+2	☐	<1
1330-20-7	Xylene (mixed isomers)	1.1E+0	NA	NA	NA		NA	>Sol		NA	>Sol	>Sol	☐	<1

>Sol indicates risk-based target concentration greater than constituent solubility

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Software: GSI RBCA Spreadsheet
Version: 1.0.1

Serial: G-337-YAX-542

Site Name: Rose's Parking Lot | Site Location: Portland, Oregon | Completed By: Peter Catterall | Date Completed: 4/1/1999 | 1 OF 9

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ☐ (CHECKED IF PATHWAY IS ACTIVE)

SURFACE SOILS: VAPOR AND DUST INHALATION Constituents of Concern	Exposure Concentration 1) Source Medium Surface Soil Conc. (mg/kg)	2) NAF Value (m^3/kg) Receptor		3) Exposure Medium Outdoor Air: POE Conc. (mg/m^3) (1) / (2)		4) Exposure Multiplier (IRxEFxED)/(BWxAT) (m^3/kg-day)		5) Average Daily Intake Rate (mg/kg-day) (3) X (4)	
Benzene	0.0E+0								
Ethylbenzene	0.0E+0								
Naphthalene	0.0E+0								
Toluene	0.0E+0								
Xylene (mixed isomers)	0.0E+0								

NOTE:
ABS = Dermal absorption factor (dim)
AF = Adherance factor (mg/cm^2)
AT = Averaging time (days)
BW = Body weight (kg)
CF = Units conversion factor
ED = Exposure duration (yrs)
EF = Exposure frequencey (days/yr)
ET = Exposure time (hrs/day)
IR = Inhalation rate (m^3/day)
POE = Point of exposure
SA = Skin exposure area (cm^2/day)

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Site Name: Rose's Parking Lot | Site Location: Portland, Oregon | Completed By: Peter Catterall | Date Completed: 4/1/1999 | 2 OF 9

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAY IS ACTIVE)

SUBSURFACE SOILS: VAPOR INHALATION

Constituents of Concern	Exposure Concentration 1) Source Medium: Subsurface Soil Conc. (mg/kg)	2) NAF Value (m^3/kg) Receptor: On-Site Commercial		3) Exposure Medium: Outdoor Air: POE Conc. (mg/m^3) (1) / (2) On-Site Commercial		4) Exposure Multiplier ((IRxEFxED)/(BWxAT) (m^3/kg-day)) On-Site Commercial		5) Average Daily Intake Rate (mg/kg-day) (3) X (4) On-Site Commercial	
Benzene	0.0E+0	4.5E+4		0.0E+0		7.0E-2		0.0E+0	
Ethylbenzene	5.6E-2	4.5E+4		1.2E-6		2.0E-1		2.4E-7	
Naphthalene	0.0E+0	2.2E+5		0.0E+0		2.0E-1		0.0E+0	
Toluene	0.0E+0	4.5E+4		0.0E+0		2.0E-1		0.0E+0	
Xylene (mixed isomers)	0.0E+0	4.5E+4		0.0E+0		2.0E-1		0.0E+0	

NOTE:
ABS = Dermal absorption factor (dim)
AF = Adherance factor (mg/cm^2)
AT = Averaging time (days)
BW = Body weight (kg)
CF = Units conversion factor
ED = Exposure duration (yrs)
EF = Exposure frequencey (days/yr)
ET = Exposure time (hrs/day)
IR = Inhalation rate (m^3/day)
POE = Point of exposure
SA = Skin exposue area (cm^2/day)

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Site Name: Rose's Parking Lot | Site Location: Portland, Oregon | Completed By: Peter Catterall | Date Completed: 4/1/1999 | 3 OF 9

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAY IS ACTIVE)

GROUNDWATER: VAPOR INHALATION

Constituents of Concern	Exposure Concentration: 1) Source Medium — Groundwater Conc. (mg/L)	2) NAF Value (m^3/L) Receptor — On-Site Commercial		3) Exposure Medium — Outdoor Air: POE Conc. (mg/m^3) (1) / (2) — On-Site Commercial		4) Exposure Multiplier (IRxEFxED)/(BWxAT) (m^3/kg-day) — On-Site Commercial		5) Average Daily Intake Rate (mg/kg-day) (3) X (4) — On-Site Commercial		TOTAL PATHWAY INTAKE (mg/kg-day) (Sum intake values from surface, subsurface & groundwater routes.) — On-Site Commercial	
Benzene	2.2E-2	1.2E+5		1.9E-7		7.0E-2		1.3E-8		1.3E-8	
Ethylbenzene	1.0E-1	1.0E+5		1.0E-6		2.0E-1		2.0E-7		4.4E-7	
Naphthalene	5.4E-2	5.7E+5		9.5E-8		2.0E-1		1.9E-8		1.9E-8	
Toluene	5.7E-2	1.1E+5		5.2E-7		2.0E-1		1.0E-7		1.0E-7	
Xylene (mixed isomers)	1.1E+0	1.2E+5		9.7E-6		2.0E-1		1.9E-6		1.9E-6	

NOTE:
ABS = Dermal absorption factor (dim)
AF = Adherance factor (mg/cm^2)
AT = Averaging time (days)
BW = Body weight (kg)
CF = Units conversion factor
ED = Exposure duration (yrs)
EF = Exposure frequencey (days/yr)
ET = Exposure time (hrs/day)
IR = Inhalation rate (m^3/day)
POE = Point of exposure
SA = Skin exposure area (cm^2/day)

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RBCA SITE ASSESSMENT | Tier 2 Worksheet 8.2

Site Name: Rose's Parking Lot | Site Location: Portland, Oregon | Completed By: Peter Catterall | Date Completed: 4/1/1999 |

TIER 2 PATHWAY RISK CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAYS ARE ACTIVE)

	CARCINOGENIC RISK						TOXIC EFFECTS		
Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Total Carcinogenic Intake Rate (mg/kg/day) On-Site Commercial		(3) Inhalation Slope Factor (mg/kg-day)^-1	(4) Individual COC Risk (2) x (3) On-Site Commercial		(5) Total Toxicant Intake Rate (mg/kg/day) On-Site Commercial		(6) Inhalation Reference Dose (mg/kg-day)	(7) Individual COC Hazard Quotient (5) / (6) On-Site Commercial	
Benzene	A	1.3E-8		2.9E-2	3.8E-10		3.7E-8		1.7E-3	2.2E-5	
Ethylbenzene	D						4.4E-7		2.9E-1	1.5E-6	
Naphthalene	D										
Toluene	D						1.0E-7		1.1E-1	8.9E-7	
Xylene (mixed isomers)	D						1.9E-6		2.0E+0	9.5E-7	
Total Pathway Carcinogenic Risk =					3.8E-10	0.0E+0	***Total Pathway Hazard Index =***			2.5E-5	0.0E+0

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Site Name: Rose's Parking Lot | Site Location: Portland, Oregon | Completed By: Peter Catterall | Date Completed: 4/1/1999 | 4 OF 9

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAY IS ACTIVE)

SUBSURFACE SOILS: Exposure Concentration

VAPOR INTRUSION TO BUILDINGS

Constituents of Concern	1) Source Medium: Subsurface Soil Conc. (mg/kg)	2) NAF Value (m^3/kg) Receptor: On-Site Commercial	3) Exposure Medium: Indoor Air: POE Conc. (mg/m^3) (1) / (2): On-Site Commercial	4) Exposure Multiplier: (IRxEFxED)/(BWxAT) (m^3/kg-day): On-Site Commercial	5) Average Daily Intake Rate: (mg/kg-day) (3) X (4): On-Site Commercial
Benzene	0.0E+0	1.0E+2	0.0E+0	7.0E-2	0.0E+0
Ethylbenzene	5.6E-2	1.0E+2	5.3E-4	2.0E-1	1.0E-4
Naphthalene	0.0E+0	2.9E+3	0.0E+0	2.0E-1	0.0E+0
Toluene	0.0E+0	1.0E+2	0.0E+0	2.0E-1	0.0E+0
Xylene (mixed isomers)	0.0E+0	1.0E+2	0.0E+0	2.0E-1	0.0E+0

NOTE:
ABS = Dermal absorption factor (dim)
AF = Adherance factor (mg/cm^2)
AT = Averaging time (days)
BW = Body weight (kg)
CF = Units conversion factor
ED = Exposure duration (yrs)
EF = Exposure frequency (days/yr)
ET = Exposure time (hrs/day)
IR = Inhalation rate (m^3/day)
POE = Point of exposure
SA = Skin exposure area (cm^2/day)

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Software: GSI RBCA Spreadsheet
Version: 1.0.1
Serial: G-337-YAX-542

Site Name: Rose's Parking Lot | Site Location: Portland, Oregon | Completed By: Peter Catterall | Date Completed: 4/1/1999 | 5 OF 9

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAY IS ACTIVE)

GROUNDWATER:
VAPOR INTRUSION TO BUILDINGS

Constituents of Concern	Exposure Concentration: 1) Source Medium — Groundwater Conc. (mg/L)	2) NAF Value (m^3/L) Receptor — On-Site Commercial	3) Exposure Medium — Indoor Air: POE Conc. (mg/m^3) (1) / (2) — On-Site Commercial	4) Exposure Multiplier (IRxEFxED)/(BWxAT) (m^3/kg-day) — On-Site Commercial	5) Average Daily Intake Rate (mg/kg-day) (3) X (4) — On-Site Commercial	TOTAL PATHWAY INTAKE (mg/kg-day) (Sum intake values from subsurface & groundwater routes.) — On-Site Commercial
Benzene	2.2E-2	3.4E+2	6.5E-5	7.0E-2	4.6E-6	4.6E-6
Ethylbenzene	1.0E-1	2.9E+2	3.5E-4	2.0E-1	6.9E-5	1.7E-4
Naphthalene	5.4E-2	1.7E+3	3.2E-5	2.0E-1	6.2E-6	6.2E-6
Toluene	5.7E-2	3.2E+2	1.8E-4	2.0E-1	3.5E-5	3.5E-5
Xylene (mixed isomers)	1.1E+0	3.3E+2	3.4E-3	2.0E-1	6.6E-4	6.6E-4

NOTE:
ABS = Dermal absorption factor (dim)
AF = Adherance factor (mg/cm^2)
AT = Averaging time (days)
BW = Body weight (kg)
CF = Units conversion factor
ED = Exposure duration (yrs)
EF = Exposure frequency (days/yr)
ET = Exposure time (hrs/day)
IR = Inhalation rate (m^3/day)
POE = Point of exposure
SA = Skin exposure area (cm^2/day)

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Software: GSI RBCA Spreadsheet
Version: 1.0.1
Serial: G-337-YAX-542

Site Name: Rose's Parking Lot | Site Location: Portland, Oregon | Completed By: Peter Catterall | Date Completed: 4/1/1999 | 2 OF 4

TIER 2 PATHWAY RISK CALCULATION

INDOOR AIR EXPOSURE PATHWAYS ■ **(CHECKED IF PATHWAYS ARE ACTIVE)**

	CARCINOGENIC RISK						TOXIC EFFECTS			
	(1) EPA	(2) Total Carcinogenic Intake Rate (mg/kg/day)		(3) Inhalation Slope Factor	(4) Individual COC Risk (2) x (3)		(5) Total Toxicant Intake Rate (mg/kg/day)		(6) Inhalation Reference Dose	(7) Individual COC Hazard Quotient (5) / (6)	
Constituents of Concern	Carcinogenic Classification		On-Site Commercial	(mg/kg-day)^-1		On-Site Commercial		On-Site Commercial	(mg/kg-day)		On-Site Commercial
Benzene	A		4.6E-6	2.9E-2		1.3E-7		1.3E-5	1.7E-3		7.5E-3
Ethylbenzene	D							1.7E-4	2.9E-1		6.1E-4
Naphthalene	D										
Toluene	D							3.5E-5	1.1E-1		3.1E-4
Xylene (mixed isomers)	D							6.6E-4	2.0E+0		3.3E-4
Total Pathway Carcinogenic Risk =					0.0E+0	1.3E-7	***Total Pathway Hazard Index =***			0.0E+0	8.7E-3

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Site Name: Rose's Parking Lot Site Location: Portland, Oregon Completed By: Peter Catte Date Completed: 4/1/1999

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

SOIL EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAY IS ACTIVE)

SURFACE SOILS OR SEDIMENTS:

DERMAL CONTACT

Exposure Concentration

Constituents of Concern	1) Source Medium: Surface Soil Conc. (mg/kg)	2) Exposure Multiplier (SAxAFxABSxCFxEFxED)/(BWxAT) (kg/kg-day): On-Site Residential	2) Exposure Multiplier: On-Site Commercial	3) Average Daily Intake Rate (mg/kg-day) (1) x (2): On-Site Residential	3) Average Daily Intake Rate: On-Site Commercial
Benzene	0.0E+0		1.0E-5		0.0E+0
Ethylbenzene	0.0E+0		2.8E-5		0.0E+0
Naphthalene	0.0E+0		2.8E-6		0.0E+0
Toluene	0.0E+0		2.8E-5		0.0E+0
Xylene (mixed isomers)	0.0E+0		2.8E-5		0.0E+0

NOTE:
ABS = Dermal absorption factor (dim)
AF = Adherance factor (mg/cm^2)
AT = Averaging time (days)
BW = Body weight (kg)
CF = Units conversion factor
ED = Exposure duration (yrs)
EF = Exposure frequency (days/yr
ET = Exposure time (hrs/day)
IR = Intake rate (mg/day)
POE = Point of exposure
SA = Skin exposure area (cm^2/day)

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Site Name: Rose's Parking Lot Site Location: Portland, Oregon Completed By: Peter Catterall Date Completed: 4/1/1999 7 OF 9

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

SOIL EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAY IS ACTIVE)

SURFACE SOILS OR SEDIMENTS:
INGESTION

Constituents of Concern	Exposure Concentration: 1) Source Medium — Surface Soil Conc. (mg/kg)	2) Exposure Multiplier (IRxCFxEFxED)/(BWxAT) (kg/kg-day) — On-Site Residential	2) Exposure Multiplier — On-Site Commercial	3) Average Daily Intake Rate (mg/kg-day) (1) x (2) — On-Site Residential	3) Average Daily Intake Rate — On-Site Commercial	TOTAL PATHWAY INTAKE (mg/kg-day) (Sum intake values from dermal & ingestion routes.) — On-Site Residential	TOTAL PATHWAY INTAKE — On-Site Commercial
Benzene	0.0E+0		1.7E-7		0.0E+0		0.0E+0
Ethylbenzene	0.0E+0		4.9E-7		0.0E+0		0.0E+0
Naphthalene	0.0E+0		4.9E-7		0.0E+0		0.0E+0
Toluene	0.0E+0		4.9E-7		0.0E+0		0.0E+0
Xylene (mixed isomers)	0.0E+0		4.9E-7		0.0E+0		0.0E+0

NOTE:
ABS = Dermal absorption factor (dim)
AF = Adherance factor (mg/cm^2)
AT = Averaging time (days)
BW = Body weight (kg)
CF = Units conversion factor
ED = Exposure duration (yrs)
EF = Exposure frequency (days/yr)
ET = Exposure time (hrs/day)
IR = Intake rate (mg/day)
POE = Point of exposure
SA = Skin exposure area (cm^2/day)

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Site Name: Rose's Parking Lot | Site Location: Portland, Oregon | Completed By: Peter Catterall | Date Completed: 4/1/1999 | 3 OF 4

TIER 2 PATHWAY RISK CALCULATION

SOIL EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAYS ARE ACTIVE)

	CARCINOGENIC RISK						TOXIC EFFECTS				
	(1) EPA Carcinogenic Classification	(2) Total Carcinogenic Intake Rate (mg/kg/day)		(3) Oral Slope Factor	(4) Individual COC Risk (2) x (3)		(5) Total Toxicant Intake Rate (mg/kg/day)		(6) Oral Reference Dose	(7) Individual COC Hazard Quotient (5) / (6)	
Constituents of Concern		On-Site Residential	On-Site Commercial	(mg/kg-day)^-1	On-Site Residential	On-Site Commercial	On-Site Residential	On-Site Commercial	(mg/kg-day)	On-Site Residential	On-Site Commercial
Benzene	A		0.0E+0	2.9E-2		0.0E+0					
Ethylbenzene	D							0.0E+0	1.0E-1		0.0E+0
Naphthalene	D							0.0E+0	4.0E-3		0.0E+0
Toluene	D							0.0E+0	2.0E-1		0.0E+0
Xylene (mixed isomers)	D							0.0E+0	2.0E+0		0.0E+0
Total Pathway Carcinogenic Risk =					0.0E+0	0.0E+0	***Total Pathway Hazard Index =***			0.0E+0	0.0E+0

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Site Name: Rose's Parking Lot Site Location: Portland, Oregon Completed By: Peter Catterall Date Completed: 4/1/1999

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS ☐ (CHECKED IF PATHWAY IS ACTIVE)

SOIL: LEACHING TO GROUNDWATER/ GROUNDWATER INGESTION

Constituents of Concern	Exposure Concentration 1) Source Medium: Soil Concentration (mg/kg)	2) NAF Value (L/kg) Receptor		3) Exposure Medium: Groundwater: POE Conc. (mg/L) (1)/(2)		4) Exposure Multiplier: (IRxEFxED)/(BWxAT) (L/kg-day)		5) Average Daily Intake Rate: (mg/kg-day) (3) x (4)	
Benzene	0.0E+0								
Ethylbenzene	5.6E-2								
Naphthalene	0.0E+0								
Toluene	0.0E+0								
Xylene (mixed isomers)	0.0E+0								

NOTE: ABS = Dermal absorption factor (dim); AF = Adherance factor (mg/cm^2); AT = Averaging time (days); BW = Body Weight (kg); CF = Units conversion factor; ED = Exposure duration (yrs); EF = Exposure frequency (days/yr); ET = Exposure time (hrs/day); IR = Intake rate (L/day); POE = Point of exposure; SA = Skin exposure area (cm^2/day)

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Site Name: Rose's Parking Lot | Site Location: Portland, Oregon | Completed By: Peter Catterall | Date Completed: 4/1/1999 | *4 OF 4*

TIER 2 PATHWAY RISK CALCULATION

GROUNDWATER EXPOSURE PATHWAYS ☐ (CHECKED IF PATHWAYS ARE ACTIVE)

		CARCINOGENIC RISK					TOXIC EFFECTS				
Constituents of Concern	(1) EPA Classification	(2) Total Carcinogenic Intake Rate (mg/kg/day)		(3) Oral Slope Factor (mg/kg-day)^-1	(4) Individual COC Risk (2) x (3)		(5) Total Toxicant Intake Rate (mg/kg/day)		(6) Oral Reference Dose (mg/kg-day)	(7) Individual COC Hazard Quotient (5) / (6)	
Benzene	A			2.9E-2							
Ethylbenzene	D								1.0E-1		
Naphthalene	D								4.0E-3		
Toluene	D								2.0E-1		
Xylene (mixed isomers)	D								2.0E+0		

Total Pathway Carcinogenic Risk = 0.0E+0 | 0.0E+0

Total Pathway Hazard Index = 0.0E+0 | 0.0E+0

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Site Name: Rose's Parking Lot | Site Location: Portland, Oregon | Completed By: Peter Catterall | Date Completed: 4/1/1999 | 9 OF 9

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS ☐ (CHECKED IF PATHWAY IS ACTIVE)

GROUNDWATER: INGESTION

Constituents of Concern	Exposure Concentration: 1) Source Medium — Groundwater Conc. (mg/L)	2) NAF Value (dim) — Receptor		3) Exposure Medium — Groundwater: POE Conc. (mg/L) (1)/(2)		4) Exposure Multiplier (IRxEFxED)/(BWxAT) (L/kg-day)		5) Average Daily Intake Rate (mg/kg-day) (3) x (4)		MAX. PATHWAY INTAKE (mg/kg-day) (Maximum intake of active pathways soil leaching & groundwater routes)	
Benzene	2.2E-2										
Ethylbenzene	1.0E-1										
Naphthalene	5.4E-2										
Toluene	5.7E-2										
Xylene (mixed isomers)	1.1E+0										

NOTE: ABS = Dermal absorption factor (dim); AF = Adherance factor (mg/cm^2); AT = Averaging time (days); BW = Body weight (kg); CF = Units conversion factor; ED = Exposure duration (yrs); EF = Exposure frequency (days/yr); ET = Exposure time (hrs/day); IR = Intake rate (L/day); POE = Point of exposure; SA = Skin exposure area (cm^2/day)

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Software: GSI RBCA Spreadsheet
Version: 1.0.1
Serial: G-337-YAX-542

RBCA SITE ASSESSMENT | **Tier 2 Worksheet 8.3**

Site Name: Rose's Parking Lot
Site Location: Portland, Oregon
Completed By: Peter Catterall
Date Completed: 4/1/1999

TIER 2 BASELINE RISK SUMMARY TABLE

EXPOSURE PATHWAY	BASELINE CARCINOGENIC RISK: Individual COC Risk – Maximum Value	Individual COC Risk – Target Risk	Cumulative COC Risk – Total Value	Cumulative COC Risk – Target Risk	Risk Limit(s) Exceeded?	BASELINE TOXIC EFFECTS: Hazard Quotient – Maximum Value	Hazard Quotient – Applicable Limit	Hazard Index – Total Value	Hazard Index – Applicable Limit	Toxicity Limit(s) Exceeded?
OUTDOOR AIR EXPOSURE PATHWAYS										
Complete:	3.8E-10	1.0E-6	3.8E-10	N/A	☐	2.2E-5	1.0E+0	2.5E-5	N/A	☐
INDOOR AIR EXPOSURE PATHWAYS										
Complete:	1.3E-7	1.0E-6	1.3E-7	N/A	☐	7.5E-3	1.0E+0	8.7E-3	N/A	☐
SOIL EXPOSURE PATHWAYS										
Complete:	NC	1.0E-6	NC	N/A	■	NC	1.0E+0	NC	N/A	■
GROUNDWATER EXPOSURE PATHWAYS										
Complete:	NC	1.0E-6	NC	N/A	■	NC	1.0E+0	NC	N/A	■
CRITICAL EXPOSURE PATHWAY (Select Maximum Values From Complete Pathways)										
	1.3E-7	1.0E-6	1.3E-7	N/A	☐	7.5E-3	1.0E+0	8.7E-3	N/A	☐

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Software: GSI RBCA Spreadsheet
Version: 1.0.1
Serial: G-337-YAX-542

RBCA SITE ASSESSMENT | Tier 2 Worksheet 9.1

Site Name: Rose's Parking Lot
Site Location: Portland, Oregon

Completed By: Peter Catterall
Date Completed: 4/1/1999

SURFACE SOIL SSTL VALUES (< 0 FT BGS)

Target Risk (Class A & B) 1.0E-6
Target Risk (Class C) 1.0E-5
Target Hazard Quotient 1.0E+0

☐ MCL exposure limit?
☐ PEL exposure limit?

Calculation Option: 1

SSTL Results For Complete Exposure Pathways ("x" If Complete)

CONSTITUENTS OF CONCERN		Representative Concentration		Soil Leaching to Groundwater			X	Ingestion and Dermal Contact		X	Construction Worker	Applicable SSTL	SSTL Exceeded ?	Required CRF
CAS No.	Name	(mg/kg)		Residential: (on-site)	Commercial: (on-site)	Regulatory(MCL): (on-site)		Residential: (on-site)	Commercial: (on-site)		Commercial: (on-site)	(mg/kg)	"■" If yes	Only if "yes" left
71-43-2	Benzene	0.0E+0		NA	NA	NA		NA	3.3E+0		1.1E+2	3.3E+0	☐	<1
100-41-4	Ethylbenzene	0.0E+0		NA	NA	NA		NA	>Res		>Res	>Res	☐	<1
91-20-3	Naphthalene	0.0E+0		NA	NA	NA		NA	>Res		>Res	>Res	☐	<1
108-88-3	Toluene	0.0E+0		NA	NA	NA		NA	>Res		>Res	>Res	☐	<1
1330-20-7	Xylene (mixed isomers)	0.0E+0		NA	NA	NA		NA	>Res		>Res	>Res	☐	<1

>Res indicates risk-based target concentration greater than constituent residual saturation value

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Software: GSI RBCA Spreadsheet
Version: 1.0.1

Serial: G-337-YAX-542

RBCA SITE ASSESSMENT | **Tier 2 Worksheet 9.2**

Site Name: Rose's Parking Lot
Site Location: Portland, Oregon

Completed By: Peter Catterall
Date Completed: 4/1/1999

SUBSURFACE SOIL SSTL VALUES (> 0 FT BGS)

Target Risk (Class A & B) 1.0E-6
Target Risk (Class C) 1.0E-5
Target Hazard Quotient 1.0E+0

☐ MCL exposure limit?
☐ PEL exposure limit?

Calculation Option: 1

SSTL Results For Complete Exposure Pathways ("x" If Complete)

CONSTITUENTS OF CONCERN		Representative Concentration		Soil Leaching to Groundwater			X Soil Volatilization to Indoor Air		X Soil Volatilization to Outdoor Air		Applicable SSTL	SSTL Exceeded ?	Required CRF
CAS No.	Name	(mg/kg)	Residential: (on-site)	Commercial: (on-site)	Regulatory(MCL): (on-site)	Residential: (on-site)	Commercial: (on-site)	Residential: (on-site)	Commercial: (on-site)	(mg/kg)	"■" If yes	Only if "yes" left
71-43-2	Benzene	0.0E+0	NA	NA	NA	NA	5.2E-2	NA	2.2E+1	5.2E-2	☐	<1
100-41-4	Ethylbenzene	5.6E-2	NA	NA	NA	NA	>Res	NA	>Res	>Res	☐	<1
91-20-3	Naphthalene	0.0E+0	NA	NA	NA	NA	NA	NA	NA	>Res	☐	<1
108-88-3	Toluene	0.0E+0	NA	NA	NA	NA	6.1E+1	NA	>Res	6.1E+1	☐	<1
1330-20-7	Xylene (mixed isomers)	0.0E+0	NA	NA	NA	NA	>Res	NA	>Res	>Res	☐	<1

>Res indicates risk-based target concentration greater than constituent residual saturation value

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Serial: G-337-YAX-542

RBCA SITE ASSESSMENT | Tier 2 Worksheet 9.3

Site Name: Rose's Parking Lot
Site Location: Portland, Oregon

Completed By: Peter Catterall
Date Completed: 4/1/1999

GROUNDWATER SSTL VALUES

Target Risk (Class A & B) 1.0E-6
Target Risk (Class C) 1.0E-5
Target Hazard Quotient 1.0E+0

☐ MCL exposure limit?
☐ PEL exposure limit?

Calculation Option: 1

SSTL Results For Complete Exposure Pathways ("x" If Complete)

CONSTITUENTS OF CONCERN		Representative Concentration		Groundwater Ingestion			X Groundwater Volatilization to Indoor Air		X Groundwater Volatilization to Outdoor Air		Applicable SSTL	SSTL Exceeded ?	Required CRF
CAS No.	Name	(mg/L)	Residential: (on-site)	Commercial: (on-site)	Regulatory(MCL): (on-site)	Residential: (on-site)	Commercial: (on-site)	Residential (on-site)	Commercial: (on-site)	(mg/L	"■" If yes	Only if "yes" left
71-43-2	Benzene	2.2E-2	NA	NA	NA	NA	1.7E-1	NA	5.8E+1	1.7E-1	☐	<1
100-41-4	Ethylbenzene	1.0E-1	NA	NA	NA	NA	>Sol	NA	>Sol	>Sol	☐	<1
91-20-3	Naphthalene	5.4E-2	NA	NA	NA	NA	NA	NA	NA	>Sol	☐	<1
108-88-3	Toluene	5.7E-2	NA	NA	NA	NA	1.8E+2	NA	>Sol	1.8E+2	☐	<1
1330-20-7	Xylene (mixed isomers)	1.1E+0	NA	NA	NA	NA	>Sol	NA	>Sol	>Sol	☐	<1

>Sol indicates risk-based target concentration greater than constituent solubility

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Carrollton, Texas

Darien, Illinois

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26--94-C25

UST Removal and EFRT Pilot Test
Rose's Parking Lot
Portland, Oregon

February 28, 1996

For

Birnbach, AMOCO, Gull and Unocal

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED

FEB 29 1996

NORTHWEST REGION

GeoEngineers

15 YEARS

Consulting Engineers and Geoscientists
Offices in Washington, Oregon and Alaska

February 28, 1996

Mr. Max Birnbach
c/o Charles R. Williamson
Kell, Alterman & Runstein
1001 Southwest Fifth Avenue, Suite 1800
Portland, Oregon 97204

Attention: Mr. Max Birnbach

We are submitting one copy of our report entitled "UST Removal and EFRT Pilot Test" for Rose's Parking Lot located at 330 Northwest 23rd Avenue in Portland, Oregon. Our scope of services for this project is listed in our confirming agreement dated October 16, 1995. Our services were authorized in writing by Mr. Max Birnbach on October 17, 1995. AMOCO, Gull and Unocal also have authorized our services in writing.

We appreciate the opportunity to be of service to you. Please call if you have questions regarding this report or our services.

Yours very truly,
GeoEngineers, Inc.

Julia Fowler, P.E.
Associate

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Document ID: 4326001.r2

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CONTENTS

	Page No.
INTRODUCTION	1
PREVIOUS STUDIES	1
SCOPE OF SERVICES	2
UST REMOVAL	3
EFRT PILOT TESTS	3
DECONTAMINATION/DEVELOPMENT/PURGE WATER DISPOSAL	4
SITE DESCRIPTION	4
UST REMOVAL	4
GENERAL	4
TANK CLEANING AND UST REMOVAL	4
SOIL SAMPLING AND CHEMICAL ANALYSES	5
EFRT PILOT TESTS	5
RECOVERY WELL AND TEMPORARY MONITORING PROBES	5
SOIL CONDITIONS	6
GROUND WATER AND FREE PRODUCT CONDITIONS	6
EFRT FIELD METHODS	7
SUMMARY	9
FUTURE ACTIVITIES	9
LIMITATIONS.	10

TABLES

	Table No.
Summary of Soil Chemical Analytical Data, Waste Oil UST Removal	1
Ground Water Elevations and Free Product Thicknesses	2
Summary of EFRT Data, Pilot Test Number 1, November 15, 1995, Extraction From Well R-1	3
Summary of EFRT Data, Pilot Test Number 2, November 29, 1995, Extraction From Wells R-1, MW-1 and MW-5	4
Summary of EFRT Data, Pilot Test Number 3, December 9, 1995, Extraction From Wells R-1, MW-1 and MW-5	5

CONTENTS (continued)

FIGURES	Figure No.
Vicinity Map	1
Site Plan, Rose's Parking Lot	2
Ground Water Elevations, November 29, 1995	3
EFRT Average Vacuum Pressures	4

APPENDICES	Page No.
Appendix A - UST Disposal Receipt	
Used Oil Disposal Receipt, EFRT Water/Product Disposal Receipts	1 ... 4
Appendix B - Field Procedures	B-1
UST Removal and Soil Sampling Program	B-1
Drilling and Soil Sampling Program	B-1
Field Screening of Soil Samples	B-2
Monitoring Well Construction	B-3
Ground Water Elevations	B-3
EFRT Pilot Test	B-3
EFRT Calculations	B-4

APPENDIX B FIGURES	Figure No.
Soil Classification System	B-1
Key to Boring Log Symbols	B-2
Log of Recovery Well R-1	B-3
Logs of Monitoring Probes P-1 Through P-4	B-4 ... B-7
Appendix C - Chemical Analytical Program	C-1
Analytical Methods	C-1
Analytical Data Review	C-1
Analytical Data Review Summary	C-1
Chemical Analytical Data	1 ... 44

UST REMOVAL AND EFRT PILOT TEST
ROSE'S PARKING LOT
PORTLAND, OREGON
FOR
BIRNBACH, AMOCO, GULL AND UNOCAL

INTRODUCTION

This report summarizes the results of GeoEngineers' UST (underground storage tank) removal and EFRT (Enhanced Fluid Recovery Technology) pilot test activities performed at Rose's Parking Lot in November and December 1995. The site is located at 330 Northwest 23rd Avenue in Portland, Oregon. The location of the site relative to surrounding physical features is shown in Figure 1. The DEQ (Oregon Department of Environmental Quality) UST Cleanup List number for the site is 26-94-25.

The site was occupied by service stations operated by Unocal (Union Oil Company Of California), AMOCO (AMOCO Oil Company) and Gull (Gull Industries, Inc.) between the mid 1950s to the late 1970s. All aboveground structures have been removed, and the site currently is used for parking. The property owner is Mr. Max Birnbach. Previous investigations were conducted at the site by HAI (Hahn and Associates, Inc.) and by AGRA (AGRA Earth & Environmental, Inc.). In addition, GeoEngineers conducted subsurface investigation and remedial feasibility testing at the site in May 1995.

Based on our review of the reports prepared by HAI and AGRA, a service station was first constructed at the site in 1954. The original service station facilities consisted of three service islands, two 5,000-gallon USTs (reported by AGRA to contain gasoline), one 550-gallon waste oil tank and a service station building. The station apparently was remodeled in 1964. Post-1964 facilities included two service islands, two 5,000-gallon USTs (reported by AGRA to contain gasoline), a 550-gallon waste oil tank and a service station building. Records indicate that plans to install a 10,000-gallon UST were submitted to the city of Portland; however, it is unclear whether this tank was installed. Our understanding of the documented and proposed locations of the service station facilities between the mid 1950s to the late 1970s is presented in Figure 2.

PREVIOUS STUDIES

HAI conducted a subsurface investigation of soils at the site in January 1994. The results of HAI's investigation are summarized in their report to the EDR Corporation, dated February 2, 1994.

AGRA conducted a subsurface ground water investigation at the site in March 1994. The results of AGRA's subsurface ground water investigation are summarized in their report to Kell, Alterman & Runstein, dated April 8, 1994.

AGRA conducted a supplemental subsurface ground water investigation at the site in September 1994. The results of AGRA's supplemental subsurface investigation are summarized in their report to Kell, Alterman & Runstein, dated October 27, 1994.

GeoEngineers conducted a subsurface assessment of the site in May 1995. Our subsurface assessment included drilling five borings and installing one ground water monitoring well (MW-5). A vapor extraction test and in-situ permeability tests (slug tests) were also performed during our May 1995 assessment.

The results of the environmental studies indicate that gasoline-related soil and ground water contamination is present beneath the site. Petroleum-impacted soils consist primarily of silty sand and silt located between the depths of 13 to 26 feet. Petroleum-related compounds were detected at concentrations exceeding DEQ cleanup levels in ground water samples from three monitoring wells at the site (MW-1, MW-3 and MW-5). During the May 1995 study, free product was detected in MW-1. The results of the May 1995 subsurface assessment are summarized in GeoEngineers report to AMOCO, Birnbach, Gull and Unocal, dated August 28, 1995.

SCOPE OF SERVICES

GeoEngineers prepared a work plan, dated September 28, 1995, in response to DEQ requirements that were presented in a letter to Mr. Birnbach dated August 10, 1995. The DEQ letter indicated that recovery of free product should be initiated immediately and a work plan should be submitted to DEQ outlining actions to characterize on-site and off-site contamination.

The scope of services presented in the work plan includes (1) conducting quarterly ground water monitoring and sampling, (2) monitoring the removal of a waste oil UST, (3) initiating interim free product recovery actions, (4) completing off-site subsurface explorations, and (5) performing EFRT pilot tests at the site of Rose's Parking Lot.

The scope of services completed during this phase of work was performed in general accordance with the September 28 work plan, with the exception of conducting quarterly ground water monitoring and sampling, and completing off-site subsurface explorations. Quarterly ground water monitoring and sampling will begin at the site in January 1996. Off-site subsurface explorations have not been authorized by the adjacent property owner. We anticipate receiving authorization to perform off-site explorations in early 1996. The results of the quarterly ground water sampling and off-site explorations will be presented in separate reports.

In addition to the scope of services summarized above, GeoEngineers coordinated the removal of twelve 55-gallon drums containing decontamination/development/purge water for recycling at Harbor Oil, Inc. in Portland, Oregon. The specific scope of services completed during this phase of study is outlined below.

UST REMOVAL

1. Subcontract a licensed UST removal contractor to remove and dispose of the waste oil UST, dispose of UST oil/water rinseate, backfill the excavation, and repave the excavation area.
2. Obtain three soil samples from the UST removal excavation and one soil sample from the stockpile of excavated soil for visual field screening and chemical analysis.
3. Submit the soil samples from the excavation and stockpile to an analytical testing laboratory for qualitative hydrocarbon identification by DEQ Method TPH-HCID (total petroleum hydrocarbons-hydrocarbon identification). In addition, submit one soil sample obtained from the waste oil UST excavation for analysis of PCBs (polychlorinated biphenyls) by EPA (U.S. Environmental Protection Agency) Method 8080M, VOCs (volatile organic compounds) by EPA Methods 8010/8020 and TCLP (toxicity characteristic leachate procedure) metals by EPA Methods 1311 and 6010/7000 series.
4. Register the UST with DEQ and remit the appropriate fees.

EFRT PILOT TESTS

1. Observe the drilling of one recovery well boring (R-1) and four temporary monitoring probe borings (P-1 through P-4) at the approximate locations shown in Figure 2.
2. Obtain discrete soil samples at approximate 2.5-foot to 5-foot intervals from the recovery well boring using a Dames & Moore sampler. Field screen the soil samples for evidence of hydrocarbon-related contamination using visual examination, water sheen screening and headspace vapor screening methods. Visually classify soils in general accordance with ASTM (American Society for Testing and Materials) D 2488-90 and prepare a detailed log of the boring.
3. Observe the construction of a 4-inch-diameter, Schedule 40 PVC (polyvinyl chloride) well (R-1) with a flush-grade, lockable surface monument in the recovery well boring.
4. Develop the recovery well screen by hand-bailing water from the well with a stainless steel bailer.
5. Observe the construction of four temporary monitoring probes in borings P-1 through P-4. The probes consist of 2-inch-diameter, Schedule 40 PVC with flush-grade, lockable surface monuments.
6. Construct a manifold to connect recovery well R-1, and monitoring wells MW-1 and MW-5 to the EFRT pilot test equipment.
7. Obtain baseline water level and subsurface air pressure measurements from the on-site wells and monitoring probes before beginning each pilot test.
8. Conduct three 8.5-hour pilot tests using a high-pressure vacuum truck. Monitoring wells MW-1, MW-5 and recovery well R-1 were used as extraction wells during the pilot tests.

9. Monitor the combustible vapor concentrations and flow rates in the vacuum truck exhaust stream every 15, 30 or 60 minutes during each test using a Bacharach TLV Sniffer with a dilution probe.
10. Periodically monitor water levels and induced subsurface vacuum pressures in the remaining monitoring wells and temporary monitoring probes during each test.
11. Coordinate the disposal or recycling of liquids generated during the EFRT pilot tests.

DECONTAMINATION/DEVELOPMENT/PURGE WATER DISPOSAL

1. Coordinate the removal of twelve 55-gallon drums containing decontamination/ development/purge liquids generated during subsurface explorations conducted on site.

SITE DESCRIPTION

The site is located at an elevation of approximately 150 feet above mean sea level based on the USGS (United States Geological Survey) 7.5 minute topographic quadrangle map for Portland, Oregon, dated 1977. The southern portion of the site is relatively flat; however, the northern portion of the site slopes down toward Northwest Flanders Street with an elevation change of approximately 10 feet. The site is currently paved. There are no above-grade structures on the property, except for parking lot access gates.

UST REMOVAL

GENERAL

HAI conducted a magnetometer survey in January 1994 and identified the possible presence of a waste oil UST at the south property boundary. The UST had reportedly been out-of-service since the late 1970s. The UST was not registered with DEQ at the time of removal. GeoEngineers completed a UST permit application which has been submitted to DEQ.

TANK CLEANING AND UST REMOVAL

On November 2, 1995, GeoEngineers monitored the removal of the 550-gallon waste oil UST located at the south property boundary. C. Wark Trucking, Inc. of Tualatin, Oregon, was contracted to perform the UST removal. The UST was approximately 2/3 full of black, viscous oil and sludge. The oil was removed from the tank using a vacuum truck and the UST was lifted from the excavation and placed on plastic sheeting to remove the remaining sludge and clean the tank. Approximately 550 gallons of water/product rinseate were generated while cleaning the UST. The rinseate was temporarily stored in 55-gallon drums prior to being transported off site to an approved facility for recycling. On December 11, 1995, the water/product rinseate was transported off site for recycling at Harbor Oil, Inc. in Portland, Oregon. A receipt from Harbor Oil, Inc. is included in Appendix A.

The top of the UST was encountered approximately 2 feet BGS (below ground surface). One steel line associated with the UST extended eastward from the tank beneath the paved

parking surface. The steel line was not removed to avoid additional damage to the asphalt pavement. The soil beneath the line did not appear to be stained and the piping did not appear to contain product.

The exterior of the UST appeared to be moderately corroded; however, no holes were noted in the tank. After the tank was removed from the excavation and cleaned, the UST was transported to Schnitzer Steel Products Company for recycling. The disposal receipt from Schnitzer Steel Products Company is included in Appendix A. The excavation was backfilled with the soil removed from the excavation and imported fill.

GeoEngineers completed and submitted a DEQ UST Program permit application, signed by Max Birnbach, to register the UST with DEQ.

SOIL SAMPLING AND CHEMICAL ANALYSES

Three soil samples (USTEXC-01-EAST, USTEXC-02-CENTER and USTEXC-03-WEST) were obtained from the limits of the excavation following removal of the UST. In addition, one composite soil sample (STOCKPILE) was obtained from the stockpile of soil removed from the excavation. The soil samples were analyzed for petroleum hydrocarbons by DEQ Method TPH-HCID. Additionally, soil sample USTEXC-01-EAST was analyzed for PCBs, VOCs and TCLP metals. No evidence of staining was noted in the backfill or native soils in the excavation.

Petroleum hydrocarbons were not detected in the samples. VOCs and PCBs were not detected in sample 01-EAST. Barium (at a concentration of 1.0 mg/l) was the only metal detected by TCLP methods in sample USTEXC-01-EAST. A summary of the soil chemical analytical data is presented in Table 1.

EFRT PILOT TESTS

EFRT was proposed for use at the subject site to evaluate the effectiveness of enhanced fluid recovery as a remedial option for the site.

RECOVERY WELL AND TEMPORARY MONITORING PROBES

GeoEngineers contracted Cascade Drilling of Portland, Oregon to install one recovery well and four monitoring probes, in preparation for the EFRT tests, on the subject property on November 2, 1995 (Figure 2). Recovery well boring R-1 was completed to a depth of 31.5 feet BGS and temporary monitoring probe borings P-1 through P-4 were completed to depths of 22.5 feet BGS. One 4-inch-diameter recovery well was installed in boring R-1 and four 2-inch-diameter temporary monitoring probes were installed in borings P-1 through P-4 at the completion of drilling. The field procedures for installation of the recovery well and probes are presented in Appendix B. Boring logs are shown in Figures B-3 through B-7.

SOIL CONDITIONS

Soil conditions were observed during the installation of recovery well R-1 and monitoring probes P-1 through P-4. Soil conditions in boring R-1 were observed by obtaining samples at 2.5-foot intervals using a Dames & Moore sampler. Approximately 3 inches of asphalt pavement was present at each of the boring locations. Soils encountered in well R-1 consist of brown silt with sand, gravel and occasional brick fragments (fill) from beneath the asphalt surface to a depth of approximately 12 feet BGS. Brown silt with fine sand grading to sandy silt was observed beneath the fill to a depth of approximately 17 feet BGS. Gray fine sand with varying amounts of silt was encountered from approximately 17 feet to 28 feet. Brownish gray silty fine sand was observed from 28 to 31 feet BGS.

Soil conditions in borings P-1 through P-4 were documented by observing the soil cuttings generated by the auger during drilling, therefore, only general descriptions are provided. Soil encountered in borings P-1 and P-2 generally consist of brown silt with sand, gravel, occasional organic material and brick fragments (fill) from beneath the asphalt surface to a depth of about 8 feet BGS. Sandy fine to coarse gravel grading to silty sand with gravel was encountered from about 8 to 12 feet BGS. Brown silty sand grading to brown silt with sand was noted from about 12 to 22 feet BGS.

Soils encountered in borings P-3 and P-4 generally consisted of gray or brown silt with sand, gravel and occasional brick fragments (fill) from beneath the asphalt surface to about 8 feet BGS. In addition, approximately 6 inches of concrete was penetrated just beneath the asphalt surface in boring P-3. Brown silt or sandy silt, with sand and gravel, was encountered from about 8 to 14 feet BGS. Brown silt with sand, grading to gray silt with sand was noted from about 14 to 22 feet BGS.

Temporary monitoring probes P-1 through P-4 were installed to measure vacuum pressure radius of influence during the pilot tests and extended to depths of about 22.5 feet, just above the average depth to the water table.

GROUND WATER AND FREE PRODUCT CONDITIONS

Ground water conditions in the five existing monitoring wells (MW-1 through MW-5) and recovery well R-1 were measured on November 2, 15 and 29, and December 9, 1995. The measurements obtained on November 15 and 29 and December 9 were obtained prior to beginning the EFRT pilot tests. The depths to ground water in the wells ranged from about 22.5 to 28.3 feet BGS. The depth to ground water beneath the site decreased by approximately 1 to 3 feet between November 2 and December 9, 1995.

Ground water elevation data collected on the above dates indicates a general ground water flow direction toward the northeast. However, the ground water elevation in the southeast portion of the site appears to have a more northerly component of flow. Ground water elevations and the ground water flow direction based on the November 29, 1995 water level data (chosen as representative data from the four measurements) are shown in Figure 3.

Free product was encountered in wells MW-1, MW-5 and R-1 at the time of the November and December measurements. The product thicknesses were measured prior to starting the EFRT pilot tests. Product thicknesses in MW-1 ranged from 2.84 feet (November 15) to 0.02 foot (December 9). Product thicknesses in MW-5 ranged from 0.39 foot (November 15) to nondetect (November 29 and December 9). Free product thicknesses in R-1 ranged from 0.45 foot (November 29) to 0.13 foot (December 9).

The depths to ground water, ground water elevations and free product thicknesses measured during our site visits on November 2, 15 and 29 and December 9, 1995 are shown in Table 2.

EFRT FIELD METHODS

A vacuum truck capable of producing up to 29 inches of mercury vacuum and a flow rate of up to 350 cfm (cubic feet per minute) was used to conduct the EFRT pilot tests. The vacuum truck was connected to the wells via a manifold that was constructed by AMOCO. Prior to the startup of each test, a PVC "stinger" was placed in each extraction well. The stingers extended from the top of each casing to the approximate product/water interface (about 25 feet). The stinger in well R-1 was 2 inches in diameter. The stingers installed in wells MW-1 and MW-5 were 1 inch in diameter. The work plan specified that three 10-hour tests would be conducted. Instead, the three pilot tests were conducted for a period of 8.5 hours because of the limited daylight hours during the winter months.

Recovery well R-1 was utilized as the extraction well during the first pilot test. Recovery well R-1 and monitoring wells MW-1 and MW-5 were utilized during the second and third pilot tests. Monitoring probes P-1 through P-4 and monitoring wells MW-2, MW-3 and MW-4 were used as observation wells during the events. A summary of the data collected during the pilot tests is presented in Tables 3 through 5.

Applied Vacuum Pressures

The applied vacuum pressures were 18 inches of mercury in the first EFRT test and 20 inches of mercury in the second and third EFRT tests.

Combustible Vapor Concentrations

Combustible vapor concentrations were measured throughout each test at specific time intervals to calculate the mass of VOCs removed. Vapor concentrations were measured using a Bacharach TLV Sniffer equipped with a dilution probe. The measurements were taken directly from the vacuum truck exhaust stack during the first event. The measurements were obtained from a sample port in a PVC exhaust stack that was constructed for the second and third events. The exhaust stack was constructed to direct vapors away from the breathing zone.

Combustible vapor concentrations in the exhaust stack ranged from 14,000 to 40,000 ppm (parts per million) during the first event, 8,000 to 18,000 ppm during the second event and 4,600 to 8,600 ppm during the third event.

Air Flow Rates

Exhaust air flow rate data also were collected throughout each test at specific time intervals to calculate the mass of VOCs removed. Exhaust flow velocities were measured using an anemometer. The measurements were collected directly from a port in the vacuum truck exhaust stack.

The average air flow rate during the November 15 test was 37.1 cfm (cubic feet per minute). The average air flow rates were 69.86 and 75.25 cfm, respectively during the November 29 test and December 9 tests. The air flow measurements for the first test are believed to be lower than the actual air flow rate due to a faulty anemometer.

Based on our calculations, the following quantities of gasoline vapors were removed during each event:

Date of Test	Total Pounds of Gasoline	Equivalent Gallons of Gasoline
November 15, 1995	72.42 (144.84)*	11.57 (23.14)*
November 29, 1995	90.26	14.42
December 9, 1995	44.57	7.12

* Because of the faulty anemometer, it appears that the data from the November 15 test are about 50 percent lower than expected. If we assume that the velocities from the November 15 test were 50 percent higher than measured, the recalculated pounds and gallons of gasoline that were recovered are shown in parentheses.

The equations used in determining these quantities are presented in Appendix B.

Vacuum Pressures and Ground Water Levels in Temporary Monitoring Probes and Observation Wells

Magnehelic differential pressure gauges connected to PVC slip caps were used to measure the vacuum pressures in the temporary monitoring probes and observation wells at the site. The vacuum pressure measurements in the temporary monitoring probes and observation wells should be considered approximate because of possible variability inherent in using hand-held instrumentation. The average vacuum pressures in the observation wells and probes for the three EFRT tests are shown on Figure 4.

Ground water levels were measured in the observation wells at specific intervals during each test. The ground water levels were measured using an ORS (Oil Recovery Systems) oil/water interface probe. Fluctuations in ground water levels were noted during the tests. However, the depths to ground water in observation wells MW-2, MW-3, MW-4 and MW-5 generally increased by 0.8 feet to 1.5 feet during the first test. During the second and third pilot tests, depths to ground water in observation wells MW-2, MW-3 and MW-4 generally increased by 0.5 to 1.7 feet.

Ground Water and Free Product Extraction

Ground water and free product extracted from the wells during the tests were collected in the vacuum truck for transportation to and recycling at Harbor Oil, Inc. Receipts for disposal are presented in Appendix A. The following quantities of liquid were generated during the pilot tests:

Date of Test	Quantity
November 15, 1995	291 gallons
November 29, 1995	960 gallons
December 9, 1995	1,437 gallons

SUMMARY

Based on the results of this phase of activities, the following summary is presented:

1. The waste oil UST was removed from the site on November 2, 1995. Petroleum hydrocarbons, VOCs and PCBs were not detected in soil samples obtained from the excavation limits or the soil stockpile. Barium was detected at a concentration of 1.0 mg/l by TCLP methods in sample USTEXC-01-EAST. This concentration is significantly below the regulatory cleanup standard of 100 mg/l.
2. An application and fees to register the waste oil UST have been submitted to the DEQ.
3. Subsequent to the three EFRT pilot tests, free product thicknesses have decreased in monitoring wells MW-1 and MW-5.
4. Approximately 280 pounds of gasoline (as vapors) were removed from the subsurface during the three EFRT pilot tests. This quantity calculates into an equivalent of about 33 gallons of gasoline.
5. Using an applied vacuum pressure of 18 and 20 inches of mercury, average vacuum pressures ranging between 4.1 and 53.7 inches of water were measured in the observation wells. These results indicate a radius of influence of greater than 70 feet from the points of extraction.
6. Average vacuum pressures measured in the monitoring probes ranged between 0.1 and 9 inches of water. We expect that the vacuum pressures measured in the monitoring probes are low compared to the observation (monitoring) wells because the monitoring probes do not extend into the deeper, more permeable sand and sand with silt units.

FUTURE ACTIVITIES

Future project activities include conducting quarterly ground water monitoring, conducting off-site explorations, and abandoning the monitoring probes. We anticipate receiving authorization to perform off-site explorations in early 1996. The initial quarterly ground water monitoring event was conducted on January 4, 1996. The results of the quarterly ground water sampling and off-site explorations will be presented in separate reports. The monitoring probes will be abandoned following the implementation of a remediation plan.

LIMITATIONS

We have prepared this report for use by Max Birnbach, AMOCO, Gull, Unocal and their authorized agents. This report may be made available to regulatory agencies. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

Our services have been executed in accordance with generally accepted practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

We appreciate the opportunity to be of service to you. Please call if you have questions regarding this report.

Yours very truly,

GeoEngineers, Inc.

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MMB:TTF:JF:mln
Document ID: 4326001.r2

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TABLE 1
SUMMARY OF SOIL SAMPLE CHEMICAL ANALYTICAL DATA
WASTE OIL UST REMOVAL

Sample Number	Date Sampled	Depth of Sample (feet)	Hydrocarbon Identification[1] (DEQ Method TPH-HCID) (mg/kg)			Halogenated Volatile Organic Compounds[2] (EPA Method 8010) (mg/kg)	Aromatic Volatile Organic Compounds[2] (EPA Method 8020) (mg/kg)	Polychlorinated Biphenyls[2] (EPA Method 8080M) (mg/kg)	TCLP Metals (8)[3] (EPA Method 1311) (mg/l)
			Gasoline	Diesel	Oil				
USTEXC-01-EAST	11/02/95	7.0	<20	<50	NO	Not detected	Not detected	Not detected	Barium - 1.0
USTEXC-02-CENTER	11/02/95	7.0	<20	<50	NO	--	--	--	--
USTEXC-03-WEST	11/02/95	7.0	<20	<50	NO	--	--	--	--
STOCKPILE	11/02/95	NA	<20	<50	NO	--	--	--	--
DEQ Level 2 Soil Matrix Cleanup Standards			80	500	500	NA	NA	NA	Barium - 100.0

Notes:

Chemical analyses were conducted by Analytical Technologies, Inc. of Durham, Oregon. Laboratory reports are included in Appendix C.

[1]Reporting limits are 20 mg/kg for gasoline, 50 mg/kg for diesel and qualitative identification by the testing laboratory of the observed presence of oil-range hydrocarbons.

[2]No compounds detected. For a complete listing of compounds analyzed and their respective detection limits, see the laboratory reports in Appendix C.

[3]Only those compounds that were detected and the concentrations at which they were detected are listed. For a complete listing of compounds analyzed and their respective detection limits, see the laboratory reports in Appendix C.

mg/kg = milligrams per kilogram

mg/l = milligrams per liter

NO = not observed

"--" = not analyzed

NA = not applicable

TABLE 2
GROUND WATER TABLE ELEVATIONS AND FREE PRODUCT THICKNESSES

Monitoring Well[1]	Date Measured	Water Depth From Ground Surface (feet)	Ground Water Elevation[2] (feet)	Free Product Thickness[3] (feet)
MW-1	11/02/95	28.32	75.54[4]	2.72
	11/15/95	28.35	75.60[4]	2.84
	11/29/95	25.79	76.19[4]	0.03
	12/09/95	25.06	76.91[4]	0.02
MW-2	11/02/95	23.58	74.71	--
	11/15/95	23.56	74.73	--
	11/29/95	23.19	75.10	--
	12/09/95	22.53	75.76	--
MW-3	11/02/95	26.29	75.05	--
	11/15/95	26.23	75.11	--
	11/29/95	25.90	75.44	--
	12/09/95	25.27	76.05	--
MW-4	11/02/95	25.44	77.04	--
	11/15/95	25.39	77.09	--
	11/29/95	24.92	77.56	--
	12/09/95	23.86	78.62	--
MW-5	11/02/95	25.58	77.09[4]	0.37
	11/15/95	25.49	77.19[4]	0.39
	11/29/95	24.77	77.64	--
	12/09/95	23.58	78.83	--
R-1	11/15/95	26.07	75.97[4]	0.16
	11/29/95	25.91	76.34[4]	0.45
	12/09/95	24.95	77.07[4]	0.13

Notes:

[1]Approximate locations of monitoring wells are shown in Figures 2, 3 and 4.

[2]Elevations are measured relative to the temporary benchmark shown in Figure 2. The benchmark has an assumed elevation of 100.00 feet.

[3]Measured with an oil/water interface probe.

[4]The ground water elevation was corrected for the presence of free product using a specific gravity of 0.70.

No. 43260014

TABLE 3 (Page 1 of 2)
SUMMARY OF EFRT DATA
PILOT TEST NUMBER 1, NOVEMBER 15, 1995
EXTRACTION FROM WELL R-1

Elapsed Time (minutes)	System Measurements					Influence Measurements							
						MW-1		MW-2		MW-3		MW-4	
	System Vacuum Pressure[1] (inches Hg)	Estimated Air Flow Rate[2] (fpm)	Stack[3] Air Flow (cfm)	Stack[4] Emissions (ppm)	Pounds Removed Per Hour[5]	Vacuum Pressure[6] (inches H_2O)	Depth to Water[7] (feet)	Vacuum Pressure[6] (inches H_2O)	Depth to Water[7] (feet)	Vacuum Pressure[6] (inches H_2O)	Depth to Water[7] (feet)	Vacuum Pressure[6] (inches H_2O)	Depth to Water[7] (feet)
0	0	0	0	0	0	0	27.70	0	23.01	0	25.66	0	24.68
15	18	500	43.5	30,000	15.49	40.0	--	3.6	--	1.0	--	8.2	--
30	18	400	34.8	25,500	10.54	40.0	--	4.8	--	3.0	--	12.5	--
45	18	400	34.8	26,500	10.95	12.5	--	4.4	--	5.0	--	15.0	--
60	18	500	43.5	26,000	13.43	4.2	--	6.1	--	1.8	--	11.0	--
75	18	500	43.5	22,000	11.36	--	--	--	--	--	--	--	--
90	18	400	34.8	21,000	8.68	8.50	--	7.1	--	2.3	--	14.0	--
105	18	500	43.5	19,000	9.81	--	--	--	--	--	--	--	--
145	18	450	39.2	20,000	9.30	17.0	25.85	7.1	23.61	2.2	26.96	16.5	25.89
175	18	380	33.1	19,000	7.46	4.60	--	9.5	--	6.4	--	18.0	--
210	18	400	34.8	29,000	11.98	--	--	--	--	--	--	--	--
235	18	400	34.8	27,000	11.16	24.5	25.80	9.8	23.35	2.1	27.15	24.0	24.91
295	18	500	43.5	15,000	7.75	13.5	--	8.8	--	3.9	--	30.0	--
355	18	300	26.1	17,000	5.27	7.0	25.10	9.0	23.82	6.2	27.09	28.0	24.53
415	18	400	34.8	18,000	7.44	48.0	--	13.4	--	11.5	--	35.0	--
475	18	400	34.8	18,000	7.44	--	24.45	--	23.40	--	26.03	--	24.53
505	18	400	34.8	14,000	5.78	--	--	--	--	--	--	--	--

Notes appear on page 2 of 2.

TABLE 3 (Page 2 of 2)

Elapsed Time (minutes)	System Measurements					Influence Measurements					
						MW-5		P-1	P-2	P-3	P-4
	System Vacuum Pressure[1] (inches Hg)	Estimated Air Flow Rate[2] (fpm)	Stack[3] Air Flow (cfm)	Stack[4] Emissions (ppm)	Pounds Removed Per Hour[5]	Vacuum Pressure[6] (inches H_2O)	Depth to Water[7] (feet)	Vacuum Pressure[6] (inches H_2O)	Vacuum Pressure[7] (inches H_2O)	Vacuum Pressure[6] (inches H_2O)	Vacuum Pressure[7] (inches H_2O)
0	0	0	0	0	0	0	25.11	0	0	0	0
15	18	500	43.5	30,000	15.49	11.0	--	5.2	0.11	2.3	0.36
30	18	400	34.8	25,500	10.54	13.0	--	6.2	0.15	2.5	0.33
45	18	400	34.8	26,500	10.95	15.5	--	6.8	0.23	2.8	2.8
60	18	500	43.5	26,000	13.43	9.0	--	6.4	0.20	2.8	2.5
75	18	500	43.5	22,000	11.36	--	--	--	--	--	--
90	18	400	34.8	21,000	8.68	12.0	--	6.9	0.24	3.0	2.1
105	18	500	43.5	19,000	9.81	--	--	--	--	--	--
145	18	450	39.2	20,000	9.30	14.0	25.96	7.0	0.19	3.0	2.3
175	18	380	33.1	19,000	7.46	16.0	--	7.1	0.36	3.2	3.6
210	18	400	34.8	29,000	11.98	--	--	--	--	--	--
235	18	400	34.8	27,000	11.16	21.0	26.02	7.4	0.40	3.4	2.2
295	18	500	43.5	15,000	7.75	39.0	--	7.1	0.40	3.4	1.6
355	18	300	26.1	17,000	5.27	20.0	26.28	7.2	0.40	3.5	6.3
415	18	400	34.8	18,000	7.44	39.0	--	7.4	0.45	3.5	8.25
475	18	400	34.8	18,000	7.44	--	25.04	--	--	--	--
505	18	400	34.8	14,000	5.78	--	--	--	--	--	--

Total Pounds of Gasoline Removed: 72.24 pounds

Equivalent Gallons of Gasoline: 11.57 gallons

Total Gallons of Water Removed: 291 gallons

Note: Gasoline is 6.26 pounds per gallon

Notes:

[1]Read from vacuum truck gauge.

[2]Measured in feet per minute with an Omega HHF-40 air velocity meter within the 4-inch-diameter vacuum truck exhaust stack.

[3]Converted to cubic feet per minute by multiplying the air velocity by the cross-sectional area of the stack.

[4]Average vapor concentration within the exhaust stack measured with a Bacharach TLV Sniffer calibrated to hexane.

[5]Pounds of gasoline removed per hour.

[6]Measured with a Dwyer Magnehelic pressure gauge at the approximate elapsed time noted. Vacuum pressure should be considered as approximate because of possible variability inherent in using hand-held instrumentation.

[7]Measured with an ORS oil/water interface probe at the approximate elapsed time indicated. Depth below top of well casing.

Hg = mercury, H_2O = water, ppm = parts per million, cfm = cubic feet per minute, "--" = not measured

No. 43260015

TABLE 4 (Page 1 of 2)
SUMMARY OF EFRT DATA
PILOT TEST NUMBER 2, NOVEMBER 29, 1995
EXTRACTION FROM WELLS R-1, MW-1 AND MW-5

Elapsed Time (minutes)	System Measurements					Influence Measurements					
						MW-2		MW-3		MW-4	
	System Vacuum Pressure[1] (inches Hg)	Estimated Air Flow Rate[2] (fpm)	Stack Air Flow[3] (cfm)	Stack Emissions[4] (ppm)	Pounds Removed Per Hour[5]	Vacuum Pressure[6] (inches H_2O)	Depth to Water[7] (feet)	Vacuum Pressure[6] (inches H_2O)	Depth to Water[7] (feet)	Vacuum Pressure[6] (inches H_2O)	Depth to Water[7] (feet)
0	0	0	0	0	0	0	22.64	0	25.33	0	24.21
15	20	900	78.3	12,000	11.16	--	--	--	--	--	--
30	20	750	65.3	13,000	10.08	--	--	--	--	--	--
45	20	850	74.0	14,000	12.30	7.8	--	12.5	--	30.0	--
60	20	850	74.0	13,500	11.86	--	--	--	--	--	--
75	20	800	69.6	15,500	12.81	--	--	--	--	--	--
90	20	800	69.6	17,500	14.46	13.5	--	24.0	--	47.0	--
105	20	800	69.6	16,500	13.64	--	--	--	--	--	--
120	20	800	69.6	15,500	12.81	15.5	22.9	28.0	26.20	53.0	25.50
150	20	750	65.3	14,500	11.24	15.5	--	19.5	--	51.0	--
180	20	800	69.6	14,000	11.57	16.0	--	20.0	--	55.0	--
210	20	850	74.0	14,000	12.30	16.0	--	24.0	--	57.0	--
240	20	800	69.6	13,000	10.74	16.0	23.23	25.0	27.03	59.0	25.61
300	20	750	65.3	12,000	9.30	15.5	--	23.0	--	59.0	--
360	20	800	69.6	14,000	11.57	14.0	23.70	20.0	27.05	60.0	24.68
420	20	800	69.6	13,000	10.74	16.0	--	15.0	--	60.0	--
480	20	800	69.6	9,000	7.44	16.0	--	15.0	--	60.0	--
510	20	750	65.3	9,000	6.98	--	--	--	--	--	--

Notes appear on page 2 of 2.

TABLE 4 (Page 2 of 2)

Elapsed Time (minutes)	System Measurements					Influence Measurements			
						P-1	P-2	P-3	P-4
	System Vacuum Pressure[1] (inches Hg)	Estimated Air Flow Rate[2] (fpm)	Stack Air Flow[3] (cfm)	Stack Emissions[4] (ppm)	Pounds Removed Per Hour[5]	Vacuum Pressure[6] (inches H_2O)	Vacuum Pressure[6] (inches H_2O)	Vacuum Pressure[6] (inches H_2O)	Vacuum Pressure[6] (inches H_2O)
0	0	0	0	0	0	0	0	0	0
15	20	900	78.3	12,000	11.16	--	--	--	--
30	20	750	65.3	13,000	10.08	--	--	--	--
45	20	850	74.0	14,000	12.30	8.0	0.26	3.2	2.5
60	20	850	74.0	13,500	11.86	--	--	--	--
75	20	800	69.6	15,500	12.81	--	--	--	--
90	20	800	69.6	17,500	14.46	9.1	0.30	4.0	4.0
105	20	800	69.6	16,500	13.64	--	--	--	--
120	20	800	69.6	15,500	12.81	9.2	0.22	4.0	4.2
150	20	750	65.3	14,500	11.24	8.9	0.51	4.3	4.2
180	20	800	69.6	14,000	11.57	9.1	0.30	4.3	4.4
210	20	850	74.0	14,000	12.30	9.1	0.08	4.3	4.4
240	20	800	69.6	13,000	10.74	9.2	0.02	4.3	4.4
300	20	750	65.3	12,000	9.30	9.4	0.02	4.3	4.0
360	20	800	69.6	14,000	11.57	9.1	0.00	4.3	4.0
420	20	800	69.6	13,000	10.74	9.0	0.00	4.3	4.5
480	20	800	69.6	9,000	7.44	9.0	0.00	4.3	4.5
510	20	750	65.3	9,000	6.98	--	--	--	--

Total Pounds of Gasoline Removed: 90.26 pounds

Equivalent Gallons of Gasoline: 14.42 gallons

Total Gallons of Water Removed: 960 gallons

Note: Gasoline is 6.26 pounds per gallon

Notes:

[1]Read from vacuum truck gauge.

[2]Measured in feet per minute with an Omega HHF-40 air velocity meter within the 4-inch-diameter vacuum truck exhaust stack.

[3]Converted to cubic feet per minute by multiplying the air velocity by the cross-sectional area of the stack.

[4]Average vapor concentration within the exhaust stack measured with a Bacharach TLV Sniffer calibrated to hexane.

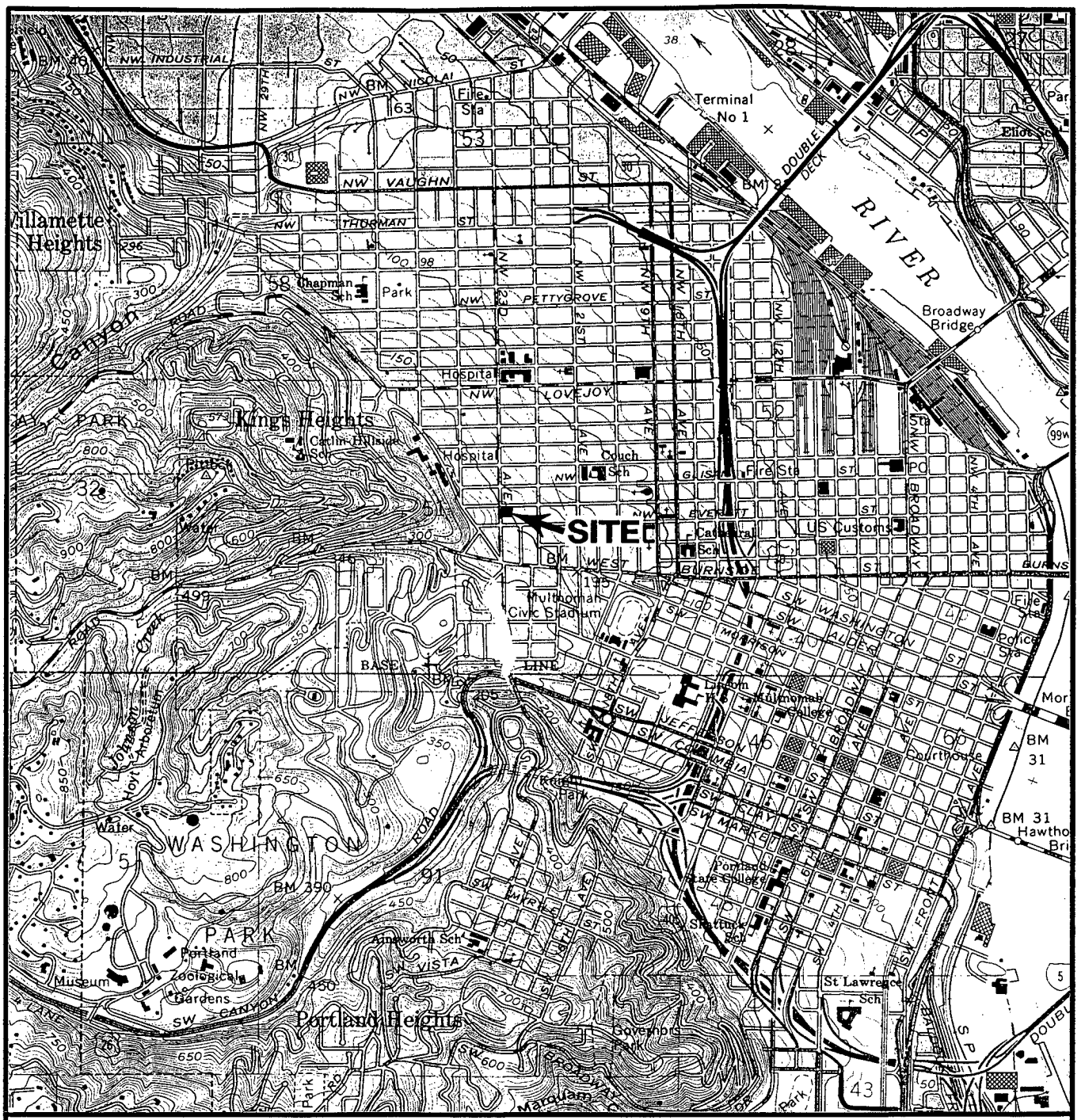
[5]Pounds of gasoline removed per hour.

[6]Measured with a Dwyer Magnehelic pressure gauge at the approximate elapsed time noted. Vacuum pressure should be considered as approximate because of possible variability inherent in using hand-held instrumentation.

[7]Measured with an ORS oil/water interface probe at the approximate elapsed time indicated. Depth below top of well casing.

Hg = mercury, H_2O = water, ppm = parts per million, cfm = cubic feet per minute, "--" = not measured

No. 43260017



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SCALE IN FEET

N

Reference: USGS 7.5' topographic quadrangle map, "Portland, OR – WA," photorevised 1977.

4326-001-P62 SAK:MAD 05/25/95

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VICINITY MAP

FIGURE 1

TABLE 5 (Page 1 of 2)
SUMMARY OF EFRT DATA
PILOT TEST NUMBER 3, DECEMBER 9, 1995
EXTRACTION FROM WELLS R-1, MW-1 AND MW-5

Elapsed Time (minutes)	System Measurements					Influence Measurements					
						MW-2		MW-3		MW-4	
	System Vacuum Pressure[1] (inches Hg)	Estimated Air Flow Rate[2] (fpm)	Stack Air Flow[3] (cfm)	Stack Emissions[4] (ppm)	Pounds Removed Per Hour[5]	Vacuum Pressure[6] (inches H_2O)	Depth to Water[7] (feet)	Vacuum Pressure[6] (inches H_2O)	Depth to Water[7] (feet)	Vacuum Pressure[6] (inches H_2O)	Depth to Water[7] (feet)
0	0	0	0	0	0	0	21.98	0	24.72	0	23.15
15	19	1,200	104.4	6,000	7.44	4.0	--	4.5	--	8.0	--
30	20	950	82.7	6,000	5.89	8.2	--	10.0	--	23.0	--
45	20	900	78.3	6,000	5.58	--	--	--	--	--	--
60	20	850	74.0	5,500	4.83	11.5	--	15.0	--	35.0	--
75	20	850	74.0	6,800	5.97	13.2	21.96	17.0	25.27	43.0	22.93
105	20	900	78.3	7,900	7.34	--	--	--	--	--	--
135	20	850	74.0	7,400	6.50	--	--	--	--	--	--
165	20	850	74.0	7,050	6.19	19.5	--	15.2	--	48.0	--
195	20	850	74.0	6,550	5.75	15.0	--	23.0	--	48.0	--
225	20	800	69.6	6,500	5.37	--	22.48	--	24.90	--	22.83
255	20	850	74.0	6,500	5.71	13.0	--	22.0	--	48.0	--
285	20	850	74.0	6,200	5.44	--	--	--	--	--	--
315	20	800	69.6	5,800	4.79	16.0	--	26.0	--	49.0	--
375	20	800	69.6	5,400	4.46	15.5	22.49	23.0	25.12	48.0	22.89
435	20	800	69.6	5,100	4.21	15.5	--	23.0	--	43.0	--
495	20	800	69.6	4,800	3.97	--	22.51	--	25.33	--	23.70
510	20	800	69.6	4,600	3.80	--	--	--	--	--	--

Notes appear on page 2 of 2.

TABLE 5 (Page 2 of 2)

Elapsed Time (minutes)	System Measurements					Influence Measurements			
						P-1	P-2	P-3	P-4
	System Vacuum Pressure[1] (inches Hg)	Estimated Air Flow Rate[2] (fpm)	Stack Air Flow[3] (cfm)	Stack Emissions[4] (ppm)	Pounds Removed Per Hour[5]	Vacuum Pressure[6] (inches H_2O)	Vacuum Pressure[6] (inches H_2O)	Vacuum Pressure[6] (inches H_2O)	Vacuum Pressure[6] (inches H_2O)
0	0	0	0	0	0	0	0	0	0
15	19	1,200	104.4	6,000	7.44	4.2	0.27	3.0	3.0
30	20	950	82.7	6,000	5.89	4.8	0.38	4.0	3.8
45	20	900	78.3	6,000	5.58	--	--	--	--
60	20	850	74.0	5,500	4.83	8.0	<1.0	4.0	8.8
75	20	850	74.0	6,800	5.97	8.5	<1.0	4.5	7.8
105	20	900	78.3	7,900	7.34	--	--	--	--
135	20	850	74.0	7,400	6.50	--	--	--	--
165	20	850	74.0	7,050	6.19	5.7	<1.0	1.7	3.8
195	20	850	74.0	6,550	5.75	9.0	<1.0	1.9	2.1
225	20	800	69.6	6,500	5.37	--	--	--	--
255	20	850	74.0	6,500	5.71	6.0	<1.0	2.0	4.6
285	20	850	74.0	6,200	5.44	--	--	--	--
315	20	800	69.6	5,800	4.79	5.3	<1.0	2.0	4.7
375	20	800	69.6	5,400	4.46	5.4	<1.0	1.9	5.5
435	20	800	69.6	5,100	4.21	5.5	<1.0	1.8	5.9
495	20	800	69.6	4,800	3.97	--	--	--	--
510	20	800	69.6	4,600	3.80	--	--	--	--

Total Pounds of Gasoline Removed: 44.57 pounds

Equivalent Gallons of Gasoline: 7.12 gallons

Total Gallons of Water Removed: 1,437 gallons

Note: Gasoline is 6.26 pounds per gallon

Notes:

[1]Read from vacuum truck gauge.

[2]Measured in feet per minute with an Omega HHF-40 air velocity meter within the 4-inch-diameter vacuum truck exhaust stack.

[3]Converted to cubic feet per minute by multiplying the air velocity by the cross-sectional area of the stack.

[4]Average vapor concentration within the exhaust stack measured with a Bacharach TLV Sniffer calibrated to hexane.

[5]Pounds of gasoline removed per hour.

[6]Measured with a Dwyer Magnehelic pressure gauge at the approximate elapsed time noted. Vacuum pressure should be considered as approximate because of possible variability inherent in using hand-held instrumentation.

[7]Measured with an oil/water interface probe at the approximate elapsed time indicated. Depth below top of well casing.

Hg = mercury, H_2O = water, ppm = parts per million, cfm = cubic feet per minute, "--" = not measured

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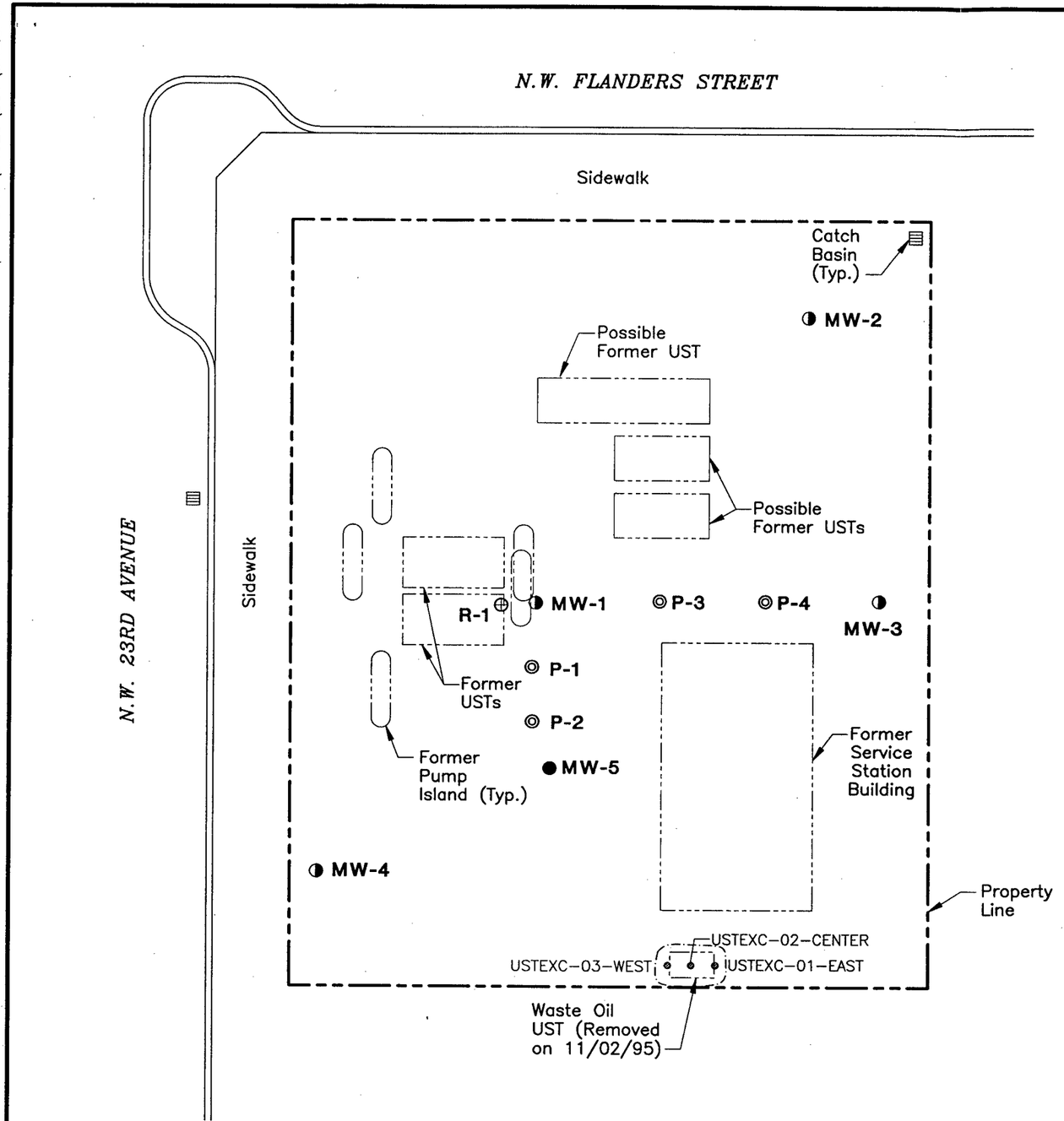

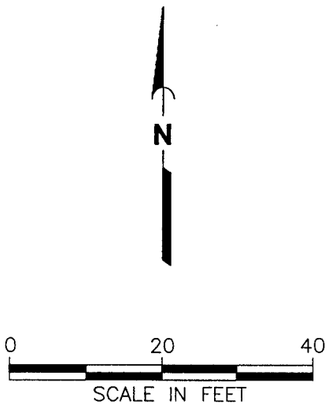

EXPLANATION:

MW-1 ◑	MONITORING WELL BY OTHERS
MW-5 ●	MONITORING WELL BY GEOENGINEERS
R-1 ⊕	RECOVERY WELL BY GEOENGINEERS
P-1 ◎	MONITORING PROBE BY GEOENGINEERS
USTEXC-01-EAST ⊙	SOIL SAMPLE
⬭	WASTE OIL UST REMOVAL EXCAVATION
UST	UNDERGROUND STORAGE TANK

Note: The locations of all features shown are approximate.

Reference: Drawing entitled, "Soil Boring Location Map," dated 02/94, by Hahn & Associates Incorporated,
and drawing entitled, "Golden Eagle Service Station," undated by Unocal,
and drawing entitled, "Rose's Parking Lot, 330 NW 23rd Avenue," dated 10/94, by AGRA,
and drawing entitled, "Site Diagram-Rosewood Parking Lot," undated, by GeoPotential.

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SITE PLAN
ROSE'S PARKING LOT

FIGURE 2

4326-001-P62 SAK:MAD 05/02/95

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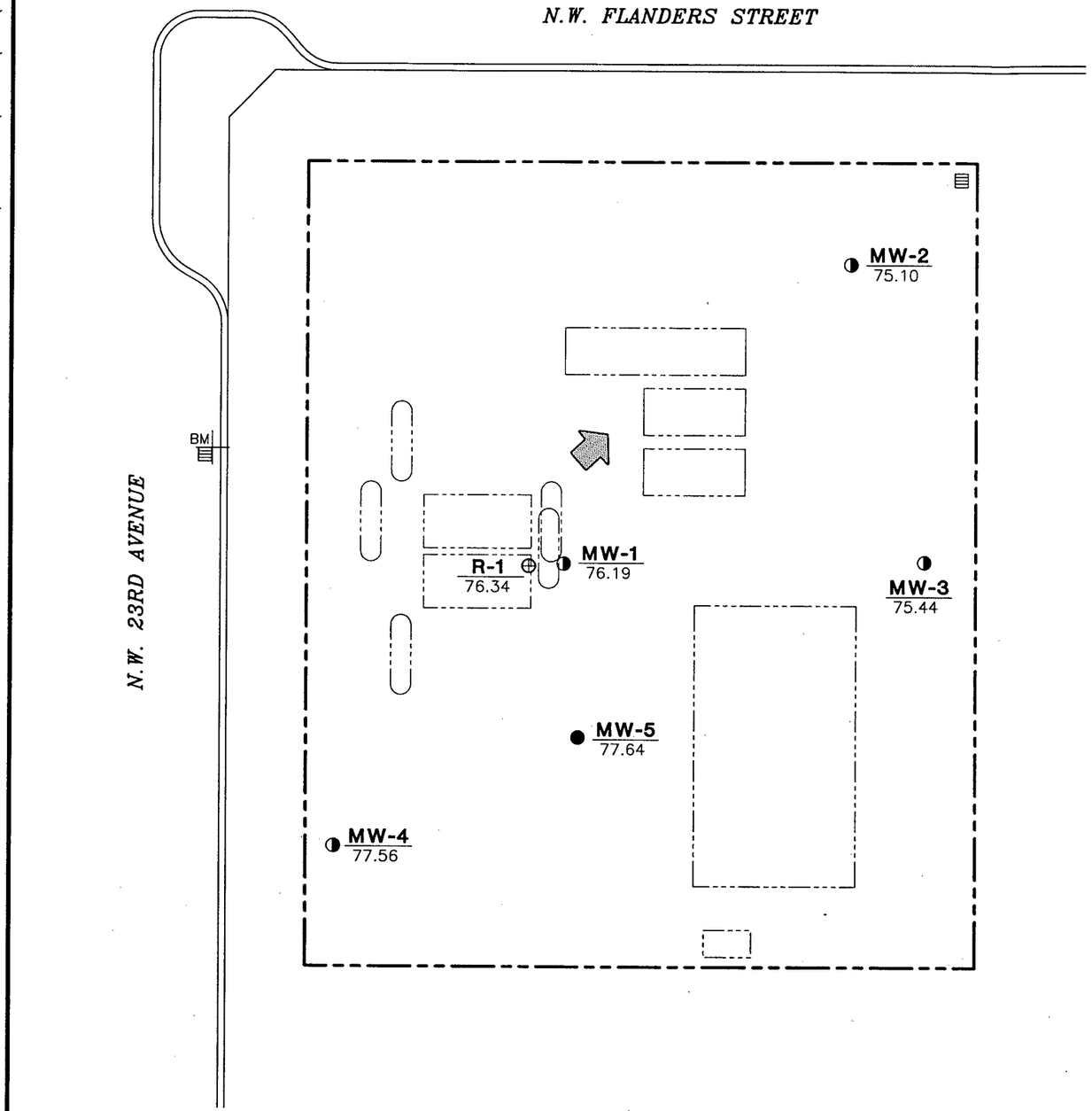

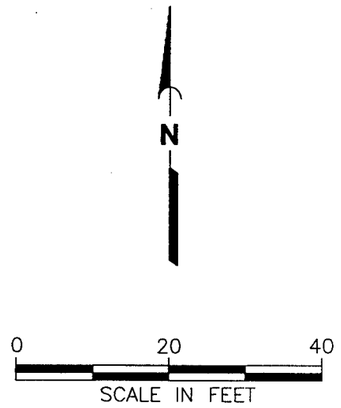

EXPLANATION:

MW-1 76.19 — MONITORING WELL BY OTHERS
GROUND WATER ELEVATION (IN FEET) ON 11/29/95

MW-5 77.64 — MONITORING WELL BY GEOENGINEERS
GROUND WATER ELEVATION (IN FEET) ON 11/29/95

R-1 76.34 — RECOVERY WELL BY GEOENGINEERS
GROUND WATER ELEVATION (IN FEET) ON 11/29/95

GENERAL DIRECTION OF GROUND WATER FLOW

BM — BENCHMARK AT NORTHEAST CORNER OF CATCH BASIN ON NW 23RD AVENUE: ASSUMED ELEVATION 100.00 FEET

Reference: Drawing entitled, "Soil Boring Location Map," dated 02/94, by Hahn & Associates Incorporated, and drawing entitled, "Golden Eagle Service Station," undated by Unocal, and drawing entitled, "Rose's Parking Lot, 330 NW 23rd Avenue," dated 10/94, by AGRA, and drawing entitled, "Site Diagram—Rosewood Parking Lot," undated, by GeoPotential.

Notes: 1. The locations of all features shown are approximate.
2. See Figure 2 for facilities identification.

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GROUND WATER ELEVATIONS NOVEMBER 29, 1995

FIGURE 3

4326-001-P62 SAK:MAD 05/02/95

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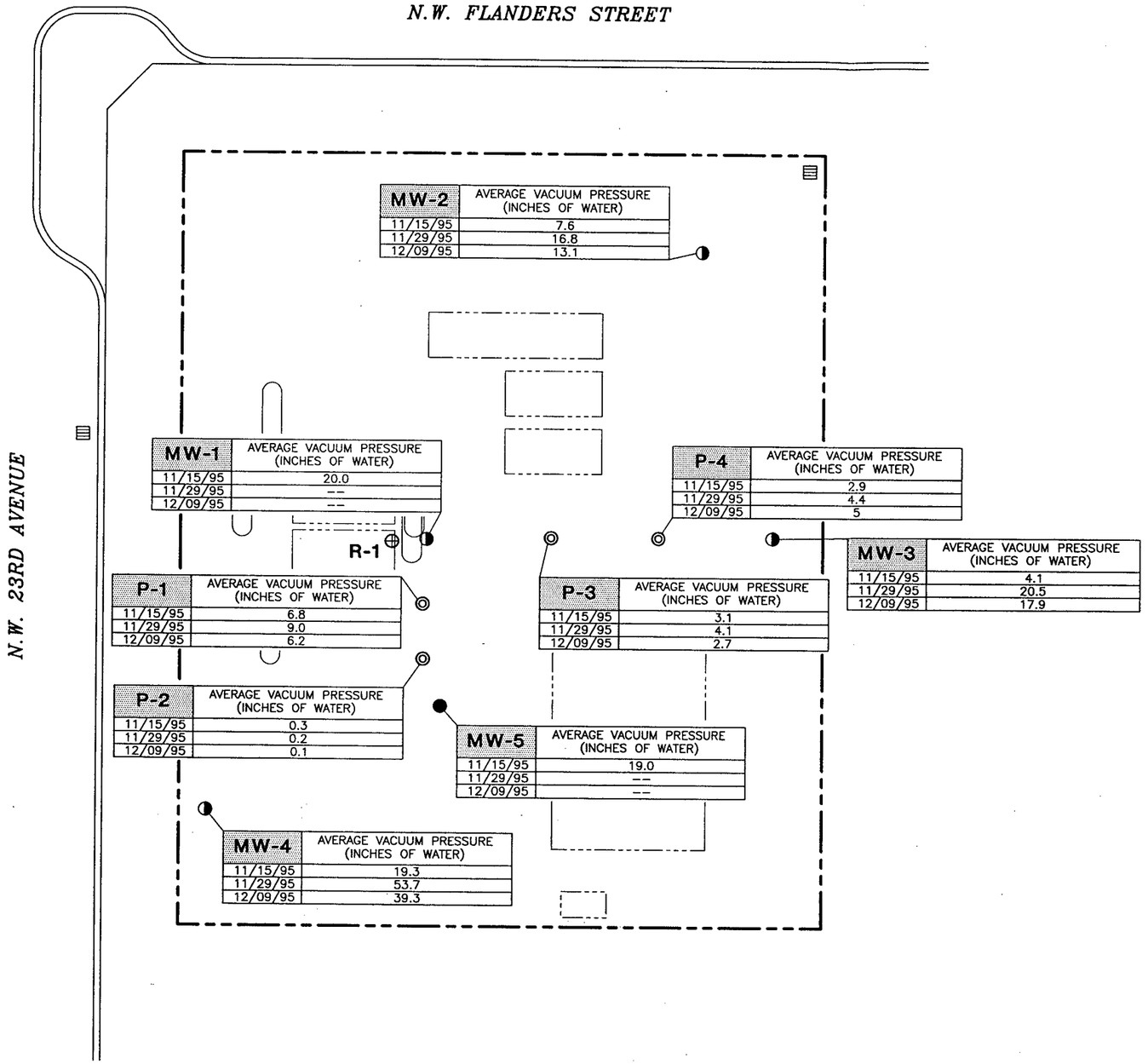

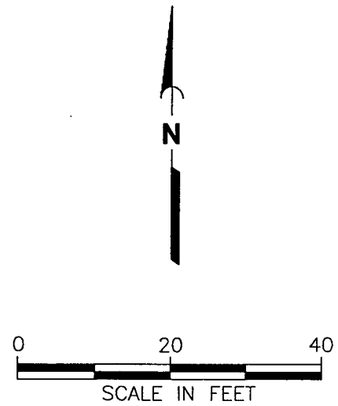

EXPLANATION:

- ◑ MONITORING WELL BY OTHERS
- ● MONITORING WELL BY GEOENGINEERS
- ⊕ RECOVERY WELL BY GEOENGINEERS
- ◎ MONITORING PROBE BY GEOENGINEERS
- -- NOT MEASURED (WELL WAS CONNECTED TO VACUUM DURING TEST)

Reference: Drawing entitled, "Soil Boring Location Map," dated 02/94, by Hahn & Associates Incorporated, and drawing entitled, "Golden Eagle Service Station," undated by Unocal, and drawing entitled, "Rose's Parking Lot, 330 NW 23rd Avenue," dated 10/94, by AGRA, and drawing entitled, "Site Diagram–Rosewood Parking Lot," undated, by GeoPotential.

Notes: 1. The locations of all features shown are approximate.
2. See Figure 2 for facilities identification.

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EFRT AVERAGE VACUUM PRESSURES

FIGURE 4

4326-001-P62 SAK:MAD 05/02/95

APPENDIX A

GeoEngineers

Harbor Oil, Inc.

No. 00038

JAN 10 1996

Routing MBA

File

11535 N. Force Avenue • Portland, OR 97217
Phone: (503) 285-4648 • Fax: (503) 285-9521

MATERIALS RECIEPT

Generator C-Wark Trucking Date 12/5/95

Address

Transporter C-Wark Trucking Purchase Order No.

Truck No. 6

Trailer No. 2

Product Oily H2O

			Gals Loaded
API	Weight	HAL	Gross Gals
TEMP	GROSS	DIST	Net Gals 2180
CORR FACTOR	TARE	SW	
WT GAL	NET	SS	

OFFICE USE ONLY

Unit Price

Product	Sub Total-
Freight	Sub Total
Tax	Sub Total
Hours	Sub Total
	TOTAL

REMARKS: (EATON) GEO ENGINEERS) 10 GALLON (EATON)
(ROSES) GEO ENGINEERS) 660 GALLON PURGE WATER
(ROSES) GEO ENGINEERS) 550 GALLONS WASTE OIL
PETE BATCHELOR
ROSES GEO ENGINEERS) 960 GALLON (VAPOR EXTRACTION)

DRIVER RECEIVED BY

White: Customer Canary: Office Pink: Billing Goldenrod: Yard

Harbor Oil, Inc.

No. 00075

Roses

11535 N. Force Avenue • Portland, OR 97217
Phone: (503) 285-4648 • Fax: (503) 285-9521

MATERIALS RECIEPT

Generator C - Wark

Date 12/11/95

Address

Transporter C - Wark

Truck No. 6

Purchase Order No.

Trailer No. ~~8~~

Product Oily H20

API	Weight	HAL	Gals Loaded	OFFICE USE ONLY
TEMP	GROSS	DIST	Gross Gals	Unit Price
CORR FACTOR	TARE	SW	Net Gals 1437	Product / Sub Total
WT GAL	NET	SS		Freight / Sub Total
				Tax / Sub Total
				Hours / Sub Total
				TOTAL

REMARKS:

Pete Batchelor

DRIVER

RECEIVED BY

White: Customer Canary: Office Pink: Billing Goldenrod: Yard

Roses

TOMER: C. Wack Trucking

RL

SCHNITZER STEEL PRODUCTS CO.
INTERNATIONAL TERMINAL
12005 N. BURGARD, PORTLAND, OR 97203
(503) 286-5771

BILL OF SALE NO.
FE- 433180

CONTRACT NUMBER

VENDOR NUMBER | COMMODITY NUMBER 103 | COMM. DESC. Lumpy

I REPRESENT AND WARRANT THAT THIS MATERIAL DOES NOT CONTAIN A HAZARDOUS SUBSTANCE AS DEFINED BY FEDERAL OR STATE LAW, AND I AGREE TO INDEMNIFY SCHNITZER STEEL PROD. CO. AGAINST ALL CLAIMS.

FURTHER, IF YOU SELL US CAR BODIES, REFRIGERATORS, AIR CONDITIONERS OR OTHER MANUFACTURED ITEMS THAT CONTAIN CFC'S OR FREONS, YOU CERTIFY THAT THE CFC'S OR FREONS HAVE BEEN REMOVED IN ACCORDANCE WITH THE CLEAN AIR ACT, AND, THAT "SEALED UNITS" AND COMPRESSORS HAVE BEEN EMPTIED OF ALL OIL OR OIL PRODUCTS.

N 9700 G lb 10:00 AM 11/03/95 ◀ G

A 9020 G lb 10:16 AM 11/03/95 ◀ T

N 680 ◀ N

ICE	EXTENDED	WEIGHER
68	2312	SR
RRIER	TRACTOR NO. WHT / FH Red	TIME

I hereby state that I am the lawful owner of the material described hereon, that I have a right to sell same and that for payment received in full, hereby acknowledged, I sell and convey title of same to SCHNITZER STEEL PRODUCTS CO.

X Robert G Buck

CUSTOMER

Harbor Oil, Inc.

Nº 23131

11535 N. Force Avenue
(503) 285-4648 Portland, Oregon 97217

INDUSTRIAL FUEL OILS
DIESEL

DUST OIL ASPHALTS
DISTRIBUTOR - SERVICE

CONSIGNEE Harbor Oil DATE 11/16/95

DESTINATION Portland, Or CARRIER C-Work

SHIPPER C-Work PURCHASE NO.

CONTENTS	SHIPPING NAME	CLASSIFICATION	I.D. NO.	PLACARD NO.
	Non	Hazardous Segment	NO	Placards

TRK NO. 6	PRODUCT	GALS LOADED
TRL NO. 8	Dsly	
	H20	
API	TOTALS	291

EMERGENCY CONTACT # 1-800-473-2042
EPA # ORD 071803985

NET GALS	BBLS	TONS

DISPATCHED

TEMP	WEIGHT	LOADING	UNLOADING
	GROSS	TIME DUE	TIME DUE
CORR FACTOR	TARE	TIME START	TIME START
WT GAL	NET	TIME FINISH	TIME FINISH

Office Use Only

UNIT PRICE		
PRODUCT	SUB TOTAL	
FREIGHT	SUB TOTAL	
TAX	SUB TOTAL	
HOURS	SUB TOTAL	
	TOTAL	

HAL
DIST
SW
SS

REMARKS: Pete Batchelor

011770

DRIVER RECD BY

WHITE: Customer CANARY: Office PINK: Billing GOLDENROD: Yard

2

APPENDIX B

APPENDIX B

FIELD PROCEDURES

UST REMOVAL AND SOIL SAMPLING PROGRAM

The UST removal was completed on November 2, 1995 by C. Wark Trucking, Inc. of Tualatin, Oregon. A backhoe was used to remove the ground surface above the tank and locate the limits of the UST. Viscous oil and sludge were removed from the tank using a vacuum truck. The UST was lifted from the excavation and placed on plastic sheeting to finish cleaning the tank.

Approximately 550 gallons of water/product rinseate were generated while cleaning the UST. The rinseate was temporarily stored in 55-gallon drums prior to being transported off site to an approved facility for recycling. On December 11, 1995, the water/product rinseate was transported off site for recycling at Harbor Oil, Inc. in Portland, Oregon. A receipt from Harbor Oil, Inc. is included in Appendix A.

After the tank was removed from the excavation and cleaned, the UST was transported to Schnitzer Steel Products Company for recycling. The disposal receipt from Schnitzer Steel Products Company is included in Appendix A. The excavation was backfilled with the soil removed from the excavation and imported fill.

Soil samples were obtained from the excavation limits for chemical analysis. A GeoEngineers representative obtained samples of freshly exposed soil in the backhoe bucket. A clean pair of disposable gloves was used to obtain each sample. Soil samples were packed with a minimum headspace into laboratory-prepared 8-ounce jars and kept cool prior to transport to the analytical laboratory. Chain-of-custody procedures were followed in transporting the soil samples to the laboratory.

DRILLING AND SOIL SAMPLING PROGRAM

Subsurface conditions at Rose's Parking Lot were explored by drilling five soil borings (P-1 through P-4, and R-1) on November 2, 1995. The borings were drilled using truck-mounted, hollow-stem auger drilling equipment owned and operated by Cascade Drilling of Portland, Oregon. The drilling and soil sampling equipment was cleaned with a hot-water pressure washer before drilling each boring.

A representative from our staff examined and classified the soils encountered and prepared a detailed log of each boring. Soils encountered were visually classified in general accordance with ASTM D 2488-90, which is described in Figure B-1. An explanation of the boring log symbols is presented in Figure B-2. The boring logs are presented in Figures B-3 through B-7.

Soil samples were obtained from boring R-1 using a Dames & Moore split-barrel sampler (2.4-inch inside diameter). The sampler was driven 18 inches using a 300-pound weight falling a vertical distance of 30 inches. The number of blows needed to advance the sampler the final 12 inches or other specified interval is indicated to the left of the corresponding sample notations

on the boring log. Samples were not obtained from borings P-1 through P-4; soil cuttings generated during the advancement of the auger were used for classification of soil types and development of the boring logs.

The sampling equipment was cleaned between each sampling attempt with a Liquinox wash and a distilled water rinse. Clean brass liners were used in the Dames & Moore samplers to obtain soil samples. Soil samples were immediately covered with a teflon seal and plastic cap to minimize volatilization of contaminants. Soil samples from the borings were not submitted for chemical analysis.

Soil cuttings generated during drilling were placed in seven labeled 55-gallon drums which are stored on site for disposal at a later date. The total number of soil drums currently on-site is 24. GeoEngineers is in the process of profiling the soil for disposal at Columbia Ridge Landfill in Arlington, Oregon.

FIELD SCREENING OF SOIL SAMPLES

Our field representative performed field screening tests on the soil samples obtained from boring R-1. Field screening results are used as a general guideline to delineate areas of possible petroleum-related contamination. In addition, field screening results are used to aid in the selection of soil samples for chemical analysis. The field screening methods used include (1) visual screening, (2) water sheen screening, and (3) headspace vapor screening using a Bacharach TLV Sniffer calibrated to hexane. The results of headspace and sheen screening are included on the boring log (Figure B-3).

Visual screening consists of inspecting the soil for stains indicative of petroleum-related contamination. Visual screening generally is more effective when contamination is related to heavy petroleum hydrocarbons, such as motor oil, or when hydrocarbon concentrations are high. Water sheen and headspace vapor screening are more sensitive screening methods that have been effective in detecting contamination at concentrations less than regulatory cleanup guidelines.

Water sheen screening involves placing soil in a pan of water and observing the water surface for signs of sheen. Sheen testing can detect the presence of volatile and nonvolatile hydrocarbons. Sheens observed are classified as follows:

No Sheen (NS)	No visible sheen on the water surface.
Slight Sheen (SS)	Light, colorless, dull sheen; spread is irregular, not rapid; sheen dissipates rapidly. Natural organic matter in the soil may produce a slight sheen.
Moderate Sheen (MS)	Light to heavy sheen; may have some color/iridescence; spread is irregular to flowing, may be rapid; few remaining areas of no sheen on the water surface.
Heavy Sheen (HS)	Heavy sheen with color/iridescence; spread is rapid; entire water surface may be covered with sheen.

Headspace vapor screening targets volatile hydrocarbons and involves placing a soil sample in a plastic sample bag. Air is captured in the bag, and the bag is shaken to expose the soil to the air trapped in the bag. The probe of a Bacharach TLV Sniffer is inserted in the bag, and the TLV Sniffer measures the concentration of combustible vapors in the air removed from the sample bag headspace. Headspace vapor screening targets volatile petroleum hydrocarbon compounds. The TLV Sniffer measures concentrations in ppm (parts per million) and is calibrated to hexane. The TLV Sniffer is designed to quantify combustible gas concentrations in the range between 100 and 10,000 ppm in this application.

Field screening results are site- and boring-specific. The results vary with temperature, moisture content, soil type and type of contaminant.

MONITORING WELL CONSTRUCTION

Four-inch-diameter, Schedule 40 PVC casing and screen was installed in boring R-1 at the completion of drilling. The PVC screen is machine-slotted (0.02-inch slot width) to allow entry of water, floating hydrocarbons and combustible vapors into the well casing. Medium sand was placed in the borehole annulus surrounding the PVC screen. The 4-inch-diameter well casing is protected within a lockable, flush-grade surface monument. Well construction details are shown in Figure B-3.

The recovery well was developed by surging and removal of at least five standing well volumes of water. The recovery well casing rim elevation was surveyed on December 9, 1995 to the nearest of 0.01 foot using an engineer's level and an assumed site datum of 100.00 feet.

Recovery well development and purge water was temporarily contained in 55-gallon drums and stored on site. The drums and water were removed from the site by C. Wark Trucking, Inc. on December 11, 1995 for recycling at Harbor Oil, Inc. A receipt for the water disposal is included in Appendix A.

GROUND WATER ELEVATIONS

The depths to the ground water table relative to the monitoring well casing rims were measured in monitoring wells MW-1 through MW-5 and recovery well R-1 on November 2, November 15, November 29 and December 9, 1995. The depths to ground water were measured using an ORS (Oil Recovery Systems) oil/water interface probe to the nearest of 0.01 foot. Water table elevations were calculated by subtracting the water table depths from the casing rim elevations. Depths to water from ground surface and ground water elevations are summarized in Table 2. Ground water elevations from the November 29, 1995 measurements are shown on Figure 3.

EFRT PILOT TEST

The EFRT pilot test was conducted using a subcontracted vacuum truck owned and operated by C. Wark Trucking, Inc. of Tualatin, Oregon. Air velocity was measured using an Omega

Model HHF-40 air velocity meter (anemometer) that was inserted into a port in the exhaust stack. Combustible vapor concentrations within the exhaust stack were obtained using a Bacharach TLV Sniffer calibrated to hexane, and equipped with a 10X dilution probe. Induced subsurface vacuum pressures were measured using Dwyer Magnehelic gauges.

EFRT CALCULATIONS

The following equation was used in determining the pounds of gasoline removed per hour during the test:

$$lb/hr = \frac{(ppm)\ (60\ minutes/hour)\ (cfm)\ (M.W.\ gasoline)}{(1 \times 10^6) \times (379\ ft^3/lb\text{-}mole)}$$

where:

lb/hr = pounds per hour
ppm = parts per million by volume
cfm = cubic feet per minute (air flow)
M.W. gasoline = molecular weight of gasoline = 75 grams/mole
I.G.C = ideal gas constant = 379 ft^3/lb-mole

The following calculation was used in determining the equivalent gallons of gasoline removed during the test:

Gallons of Gasoline Removed =

$$\frac{Total\ Pounds\ of\ Gasoline\ Removed}{6.26\ lb/gal.\ gasoline}$$

The following equation was used to determine air flow (cfm):

cfm = velocity (feet per minute) x cross-sectional (square feet) area of the stack

SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE GRAINED SOILS More Than 50% Retained on No. 200 Sieve	GRAVEL More Than 50% of Coarse Fraction Retained on No. 4 Sieve	CLEAN GRAVEL	GW	WELL-GRADED GRAVEL, FINE TO COARSE GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SAND More Than 50% of Coarse Fraction Passes No. 4 Sieve	CLEAN SAND	SW	WELL-GRADED SAND, FINE TO COARSE SAND
			SP	POORLY-GRADED SAND
		SAND WITH FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE GRAINED SOILS More Than 50% Passes No. 200 Sieve	SILT AND CLAY Liquid Limit Less Than 50	INORGANIC	ML	SILT
			CL	CLAY
		ORGANIC	OL	ORGANIC SILT, ORGANIC CLAY
	SILT AND CLAY Liquid Limit 50 or More	INORGANIC	MH	SILT OF HIGH PLASTICITY, ELASTIC SILT
			CH	CLAY OF HIGH PLASTICITY, FAT CLAY
		ORGANIC	OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			PT	PEAT

NOTES:

1. Field classification is based on visual examination of soil in general accordance with ASTM D2488-90.
2. Soil classification using laboratory tests is based on ASTM D2487-90.
3. Descriptions of soil density or consistency are based on interpretation of blow count data, visual appearance of soils, and/or test data.

SOIL MOISTURE MODIFIERS:

Dry - Absence of moisture, dusty, dry to the touch

Moist - Damp, but no visible water

Wet - Visible free water or saturated, usually soil is obtained from below water table

GEI 85-85 Rev. 05/93

Geo Engineers

SOIL CLASSIFICATION SYSTEM

FIGURE B-1

C:\DETAILS\K2BOR300

LABORATORY TESTS:

CA Chemical Analysis

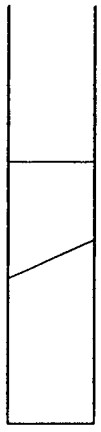
FIELD SCREENING TESTS:

Headspace vapor concentration data given in parts per million

Sheen classification system:

NS No Visible Sheen
SS Slight Sheen
MS Moderate Sheen
HS Heavy Sheen
-- Not Tested

SOIL GRAPH:



SM Soil Group Symbol (See Note 2)

Distinct Contact Between Soil Strata

Gradual or Approximate Location of Change Between Soil Strata

Water Level

Bottom of Boring

BLOW-COUNT/SAMPLE DATA:

Blows required to drive a 2.4-inch I.D. split-barrel sampler 12 inches or other indicated distances using a 300-pound hammer falling 30 inches.

22 Location of relatively undisturbed sample

12 Location of disturbed sample

17 Location of sampling attempt with no recovery

Blows required to drive a 1.5-inch I.D. (SPT) split-barrel sampler 12 inches or other indicated distances using a 140-pound hammer falling 30 inches.

10 Location of sample obtained in general accordance with Standard Penetration Test (ASTM D 1586) procedures

26 Location of SPT sampling attempt with no recovery

Location of grab sample

"P" indicates sampler pushed with weight of hammer or against weight of drill rig.

NOTES:

1. The reader must refer to the discussion in the report text, the Key to Boring Log Symbols and the exploration logs for a proper understanding of subsurface conditions.
2. Soil classification system is summarized in Figure B-1.

GEI 121-90

GeoEngineers

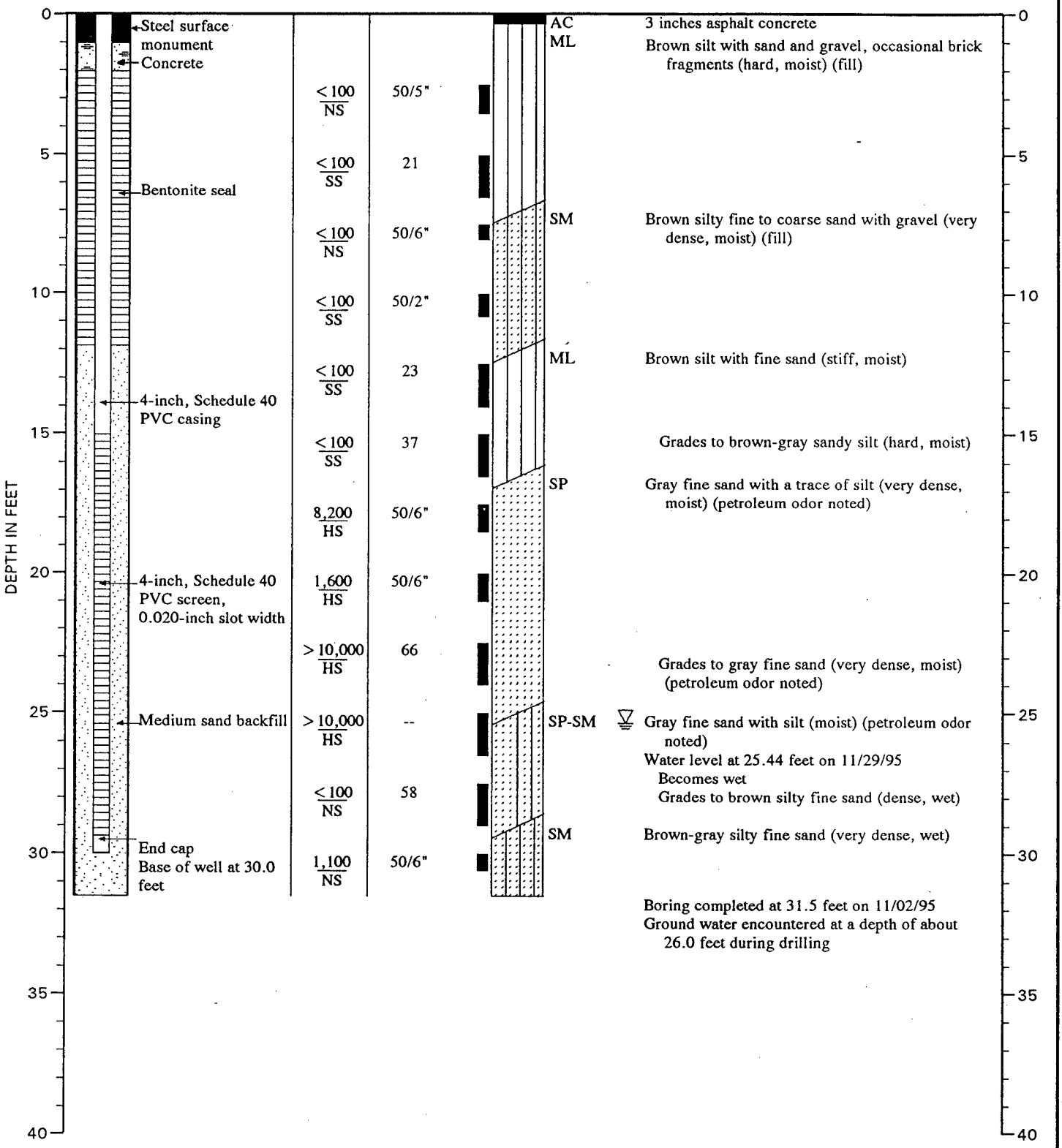
KEY TO BORING LOG SYMBOLS

FIGURE B-2

RECOVERY WELL R-1

WELL SCHEMATIC

Casing Elevation (ft.): 101.35
Casing Stickup (ft.): -0.58



Note: See Figure B- 2 for explanation of symbols

:JF:MMB:MLN 2/2/96

4326-001-P62

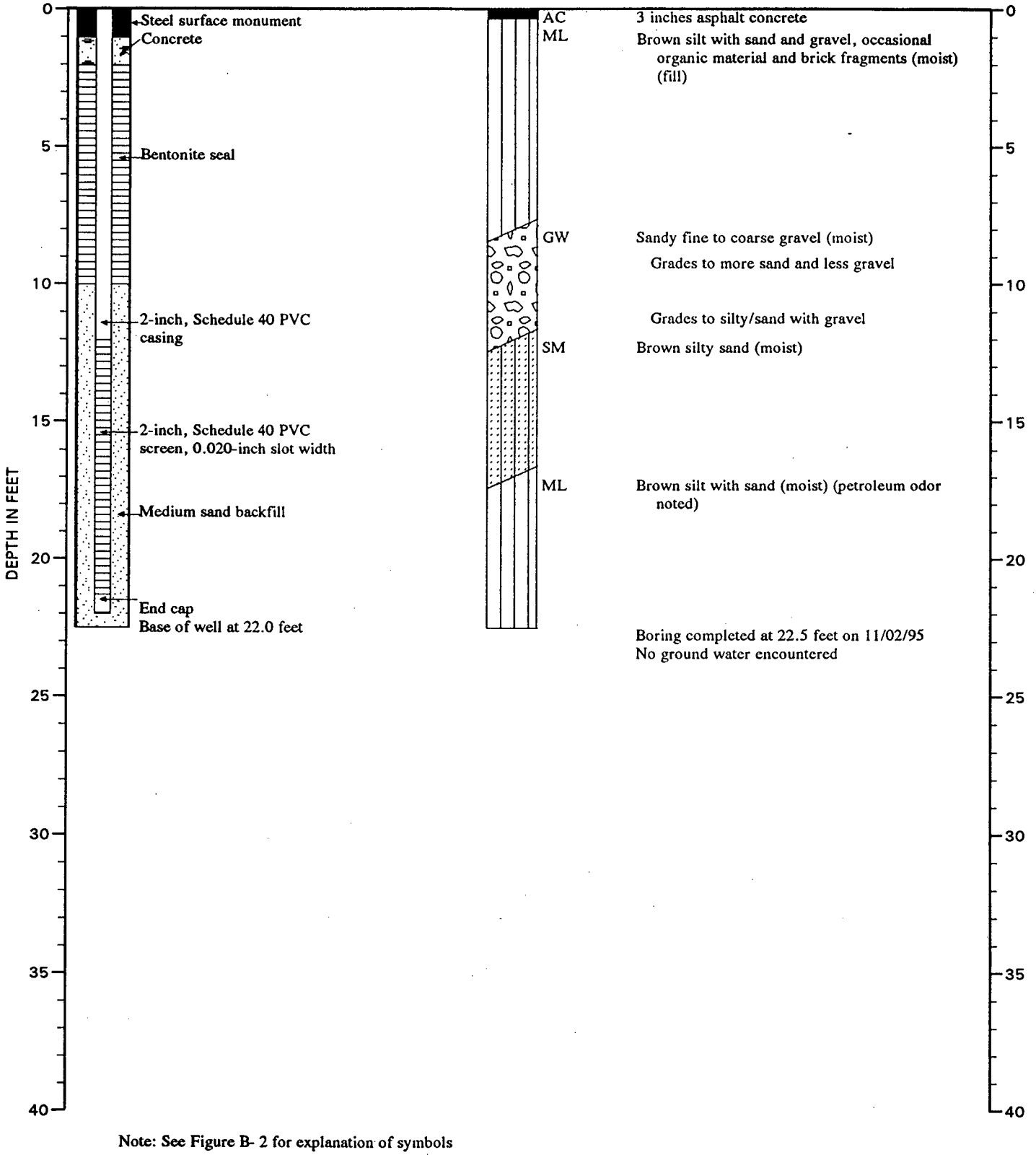
Geo Engineers

LOG OF RECOVERY WELL

FIGURE B-3

MONITORING PROBE P-1

WELL SCHEMATIC



Note: See Figure B- 2 for explanation of symbols

:JF:MMB:MLN 1/18/96

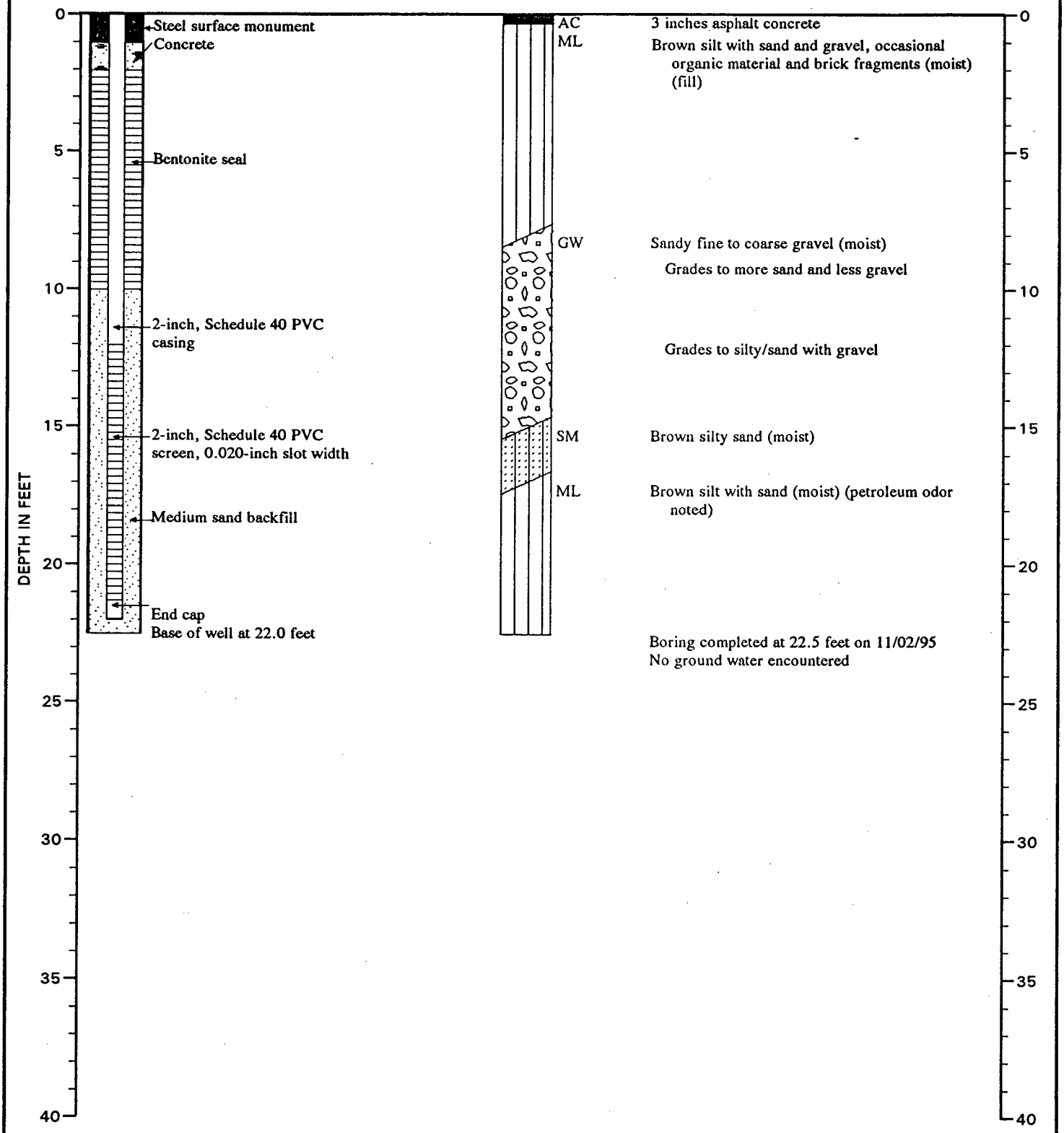
4326-001-P62

GeoEngineers

LOG OF MONITORING PROBE

FIGURE B-4

MONITORING PROBE P-2



Note: See Figure B- 2 for explanation of symbols

:JF:MMB:MLN 1/18/96

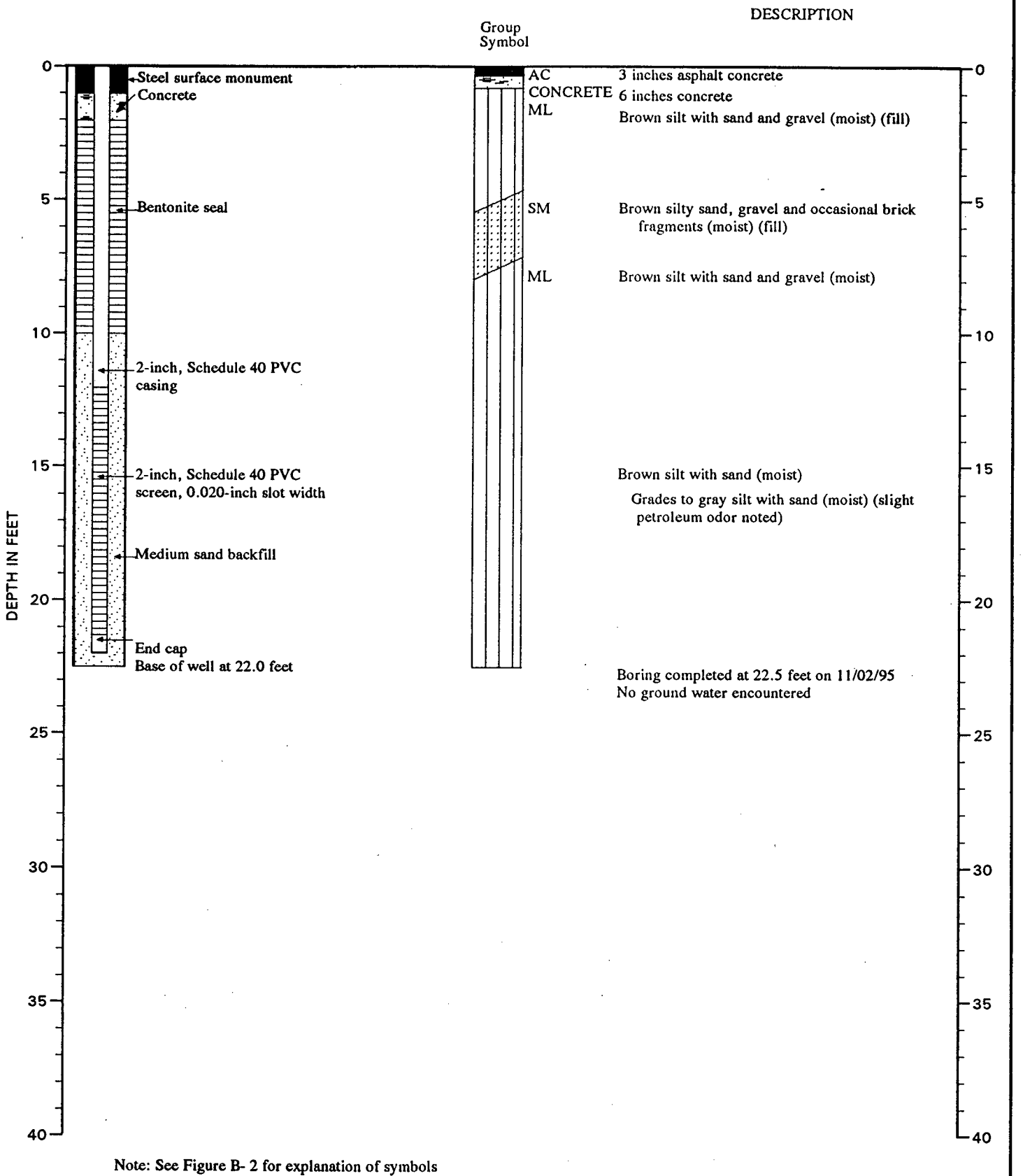
4326-001-P62

GeoEngineers

LOG OF MONITORING PROBE

FIGURE B-5

MONITORING PROBE P-3



Note: See Figure B- 2 for explanation of symbols

:JF:MMB:MLN 1/18/96

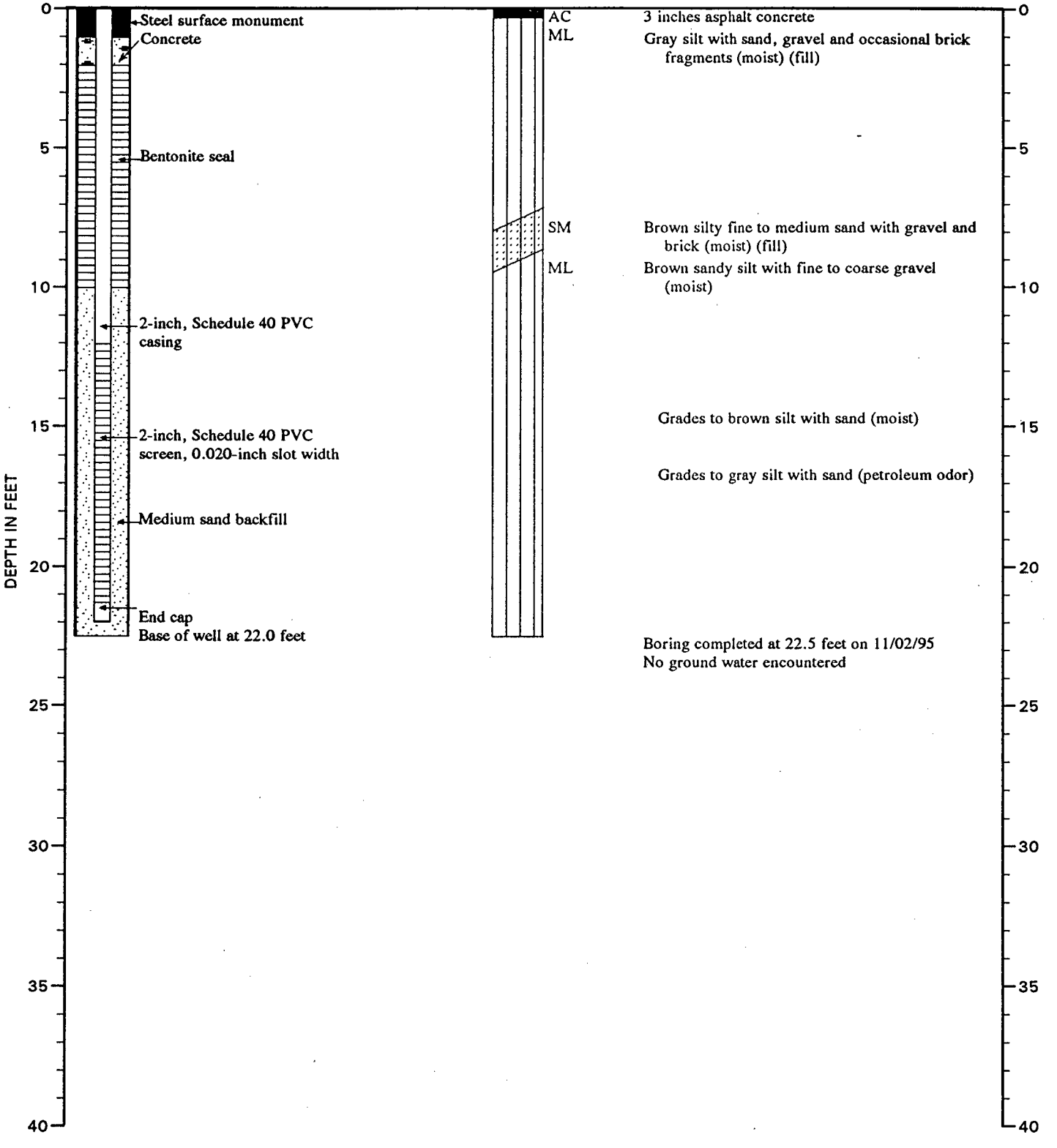
4326-001-P62

Geo Engineers

LOG OF MONITORING PROBE

FIGURE B-6

MONITORING PROBE P-4



Note: See Figure B- 2 for explanation of symbols

:JF:MMB:MLN 1/18/96

4326-001-P62

Geo Engineers

LOG OF MONITORING PROBE

FIGURE B-7

APPENDIX C

APPENDIX C

CHEMICAL ANALYTICAL PROGRAM

ANALYTICAL METHODS

Chain-of-custody procedures were followed during transport of the field samples to the analytical laboratory. The samples were held in cold storage pending extraction and/or analysis. The analytical results, analytical methods reference and laboratory QA/QC (quality assurance/quality control) records are included in this appendix. The analytical results are also summarized in the text and tables of this report.

ANALYTICAL DATA REVIEW

The laboratory maintains an internal quality assurance program, as documented in its laboratory quality assurance manual. The laboratory uses a combination of blanks, surrogate recoveries, duplicates, matrix spike recoveries, matrix spike duplicate recoveries, blank spike recoveries and blank spike duplicate recoveries to evaluate the validity of the analytical results. The laboratory also uses data quality goals for individual chemicals or groups of chemicals based on the long-term performance of the test methods. The data quality goals were included in the laboratory reports. The laboratory compared each group of samples with the existing data quality goals and noted any exceptions in the laboratory report. The laboratory QA/QC and data quality exceptions documented by the laboratory were reviewed by GeoEngineers using the applicable data validation guidelines from the following documents: "National Functional Guidelines For Organic Data Review" draft dated 1991, and "Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses" dated 1988.

ANALYTICAL DATA REVIEW SUMMARY

Significant data quality exceptions were not documented in the laboratory report or noted during our review. Based on the data quality review, it is our opinion that the analytical data are acceptable for their intended use.

Analytical**Technologies,**Inc.

17400 S.W. Upper Boones Ferry Road, Suite 270 Durham, OR. 97224
(503) 684-0447 (503) 620-0393 (FAX)

ATI I.D. 511526

November 10, 1995

GeoEngineers
NOV 14 1995
Routing
File

Marsi Beeson
GeoEngineers, Inc.
7504 Bridgeport Rd.
Portland, OR 97224

Project Name/Number: Birnbach / 4326-001-P62

Attention: Marsi Beeson

On November 6, 1995, Analytical Technologies, Inc. received one soil sample for analysis for the above listed project. The sample was analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

If you have any questions or comments, please do not hesitate to contact us at (503)684-0447.

Natasha Schaefer
Natasha Schaefer
Project Manager

Steven E. Stanley
Steven E. Stanley
Laboratory Manager

SES:alm
Enclosure

Analytical Technologies, Inc.

SAMPLE CROSS REFERENCE SHEET

CLIENT:	GeoEngineers, Inc.	**ATI I.D.:**	511526
PROJECT #:	4326-001-P62		
PROJECT NAME:	Birnbach	**MATRIX:**	SOIL

ATI #	CLIENT DESCRIPTION	DATE SAMPLED
511526-1	Stockpile	11/02/95

----------TOTALS----------

MATRIX	# SAMPLES
SOIL	1

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of the report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical Technologies, Inc.

ANALYTICAL SCHEDULE

CLIENT:	GeoEngineers, Inc.	**ATI I.D.:**	511526
PROJECT #:	4326-001-P62		
PROJECT NAME:	Birnbach		

ANALYSIS	TECHNIQUE	REFERENCE	LAB
Hydrocarbon Identification	GC/FID	OR TPH-HCID	PLD

PLD = ATI - Portland
R = ATI - Renton
SD = ATI - San Diego
PHX = ATI - Phoenix
PNR = ATI - Pensacola
FC = ATI - Fort Collins
SUB = Subcontract

AnalyticalTechnologies,Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	TPH-HCID (Oregon)	**ATI I.D.:**	511526-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	N/A
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	N/A
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	11/07/95
PROJECT NAME:	Birnbach	**DATE ANALYZED:**	11/07/95
SAMPLE MATRIX:	SOIL	**DILUTION FACTOR:**	1
		UNITS:	mg/kg

PARAMETER	RESULTS
GASOLINE (C6 - C10)	LESS THAN 20 mg/kg
DIESEL (C10 - C28)	LESS THAN 50 mg/kg
(C28 - C40)	NOT OBSERVED
SURROGATES:	
1-CHLOROOCTANE (62% - 143%)	105%
O-TERPHENYL (62% - 143%)	105%

Analyst: [signature] 11/5/95

Reviewer: CS 11/8/95

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	TPH-HCID (Oregon)	ATI I.D.:	511526-1
CLIENT I.D.:	Stockpile	DATE SAMPLED:	11/02/95
CLIENT:	GeoEngineers, Inc.	DATE RECEIVED:	11/06/95
PROJECT #:	4326-001-P62	DATE EXTRACTED:	11/07/95
PROJECT NAME:	Birnbach	DATE ANALYZED:	11/08/95
SAMPLE MATRIX:	SOIL	DILUTION FACTOR:	1
		UNITS:	mg/kg

PARAMETER	RESULTS
GASOLINE (C6 - C10)	LESS THAN 20 mg/kg
DIESEL (C10 - C28)	LESS THAN 50 mg/kg
(C28 - C40)	NOT OBSERVED
SURROGATES:	
1-CHLOROOCTANE (62% - 143%)	104%
O-TERPHENYL (62% - 143%)	103%

Analyst: JK 11/9/95

Reviewer: CS 11/9/95

GAS CHROMATOGRAPHY SPIKE RESULTS

		ATI ACCESSION:	511526
METHOD:	TPH-HCID (Oregon)	QC SAMPLE:	Method Blank
CLIENT:	GeoEngineers, Inc.	DATE EXTRACTED:	11/07/95
PROJECT #:	4326-001-P62	DATE ANALYZED:	11/07/95
PROJECT NAME:	Birnbach	DILUTION FACTOR:	1
SAMPLE MATRIX:	SOIL	UNITS:	mg/kg

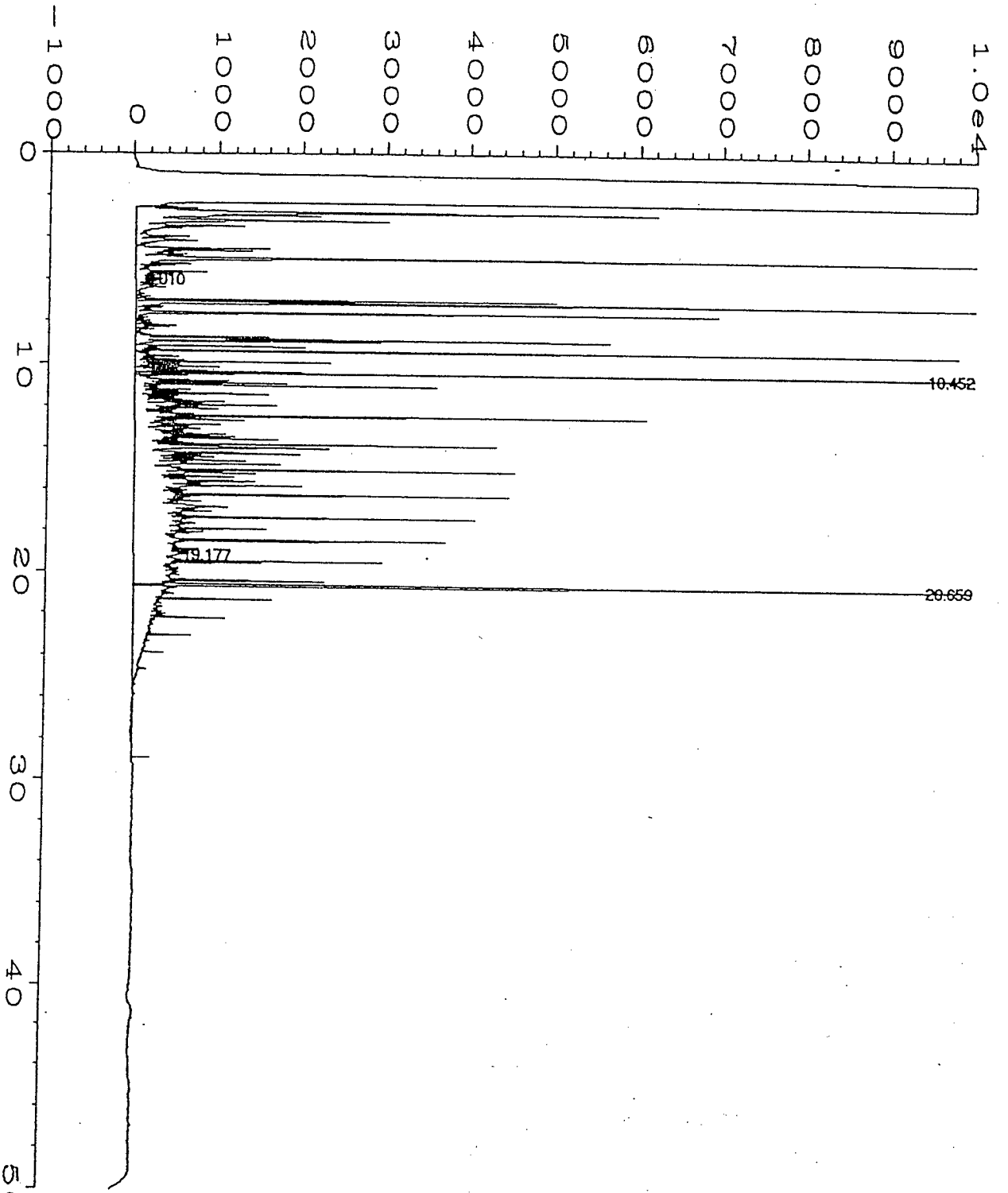
PARAMETER	SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
DIESEL	< 50	100	104	104	99	99	5
SURROGATE:							
1-CHLOROOCTANE (62% - 143%)				102%		107%	
O-TERPHENYL (62% - 143%)				101%		107%	

CONTROL LIMITS

	% REC	RPD
DIESEL	69-128	20

Analyst: JK 11/8/95

Reviewer: CS 11/8/95



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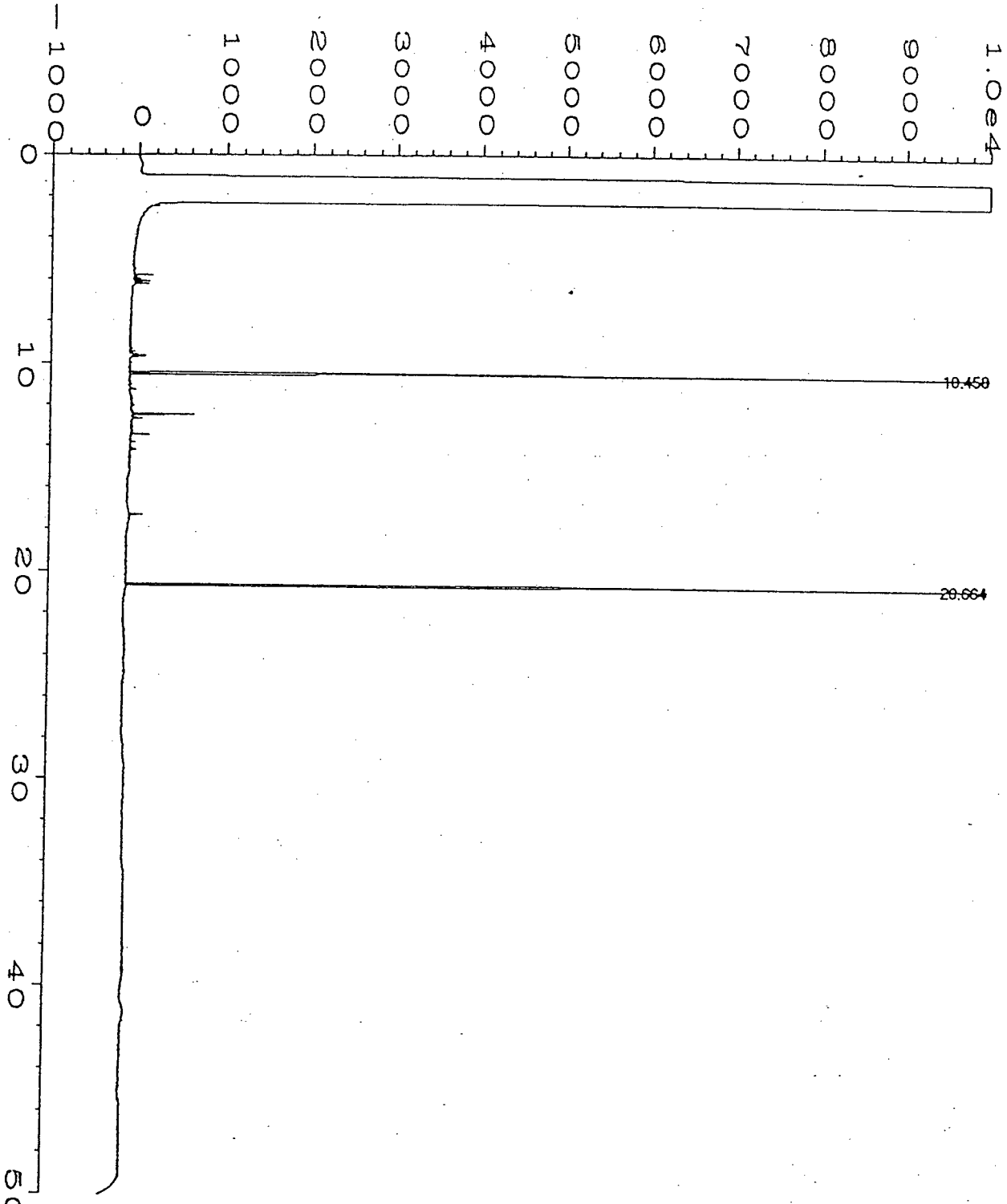
erator	: FUELS	Page Number	: 1
strument	: GAUSS	Vial Number	: 51
ample Name	: DG 150	Injection Number	: 1
un Time Bar Code:		Sequence Line	: 1
quired on	: 07 Nov 95 11:46 AM	Instrument Method	: OHCID.MTH
port Created on:	07 Nov 95 12:49 PM	Analysis Method	: OR-HCID.MTH
ast Recalib on	: 11 SEP 95 05:42 PM	Sample Amount	: 0
ultiplier	: 1	ISTD Amount	:



)ata File Name : F:\DATA\FUELS\GAUSS\D\951107\054R0101.D
)perator : FUELS
nstrument : GAUSS
ample Name : MB 11/7
un Time Bar Code:
cquired on : 07 Nov 95 06:56 PM
eport Created on: 08 Nov 95 09:04 AM
ast Recalib on : 11 SEP 95 05:42 PM
ultiplier : 1

Page Number : 1
Vial Number : 54
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Sequence Line : 1
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Analysis Method : OR-HCID.MTH
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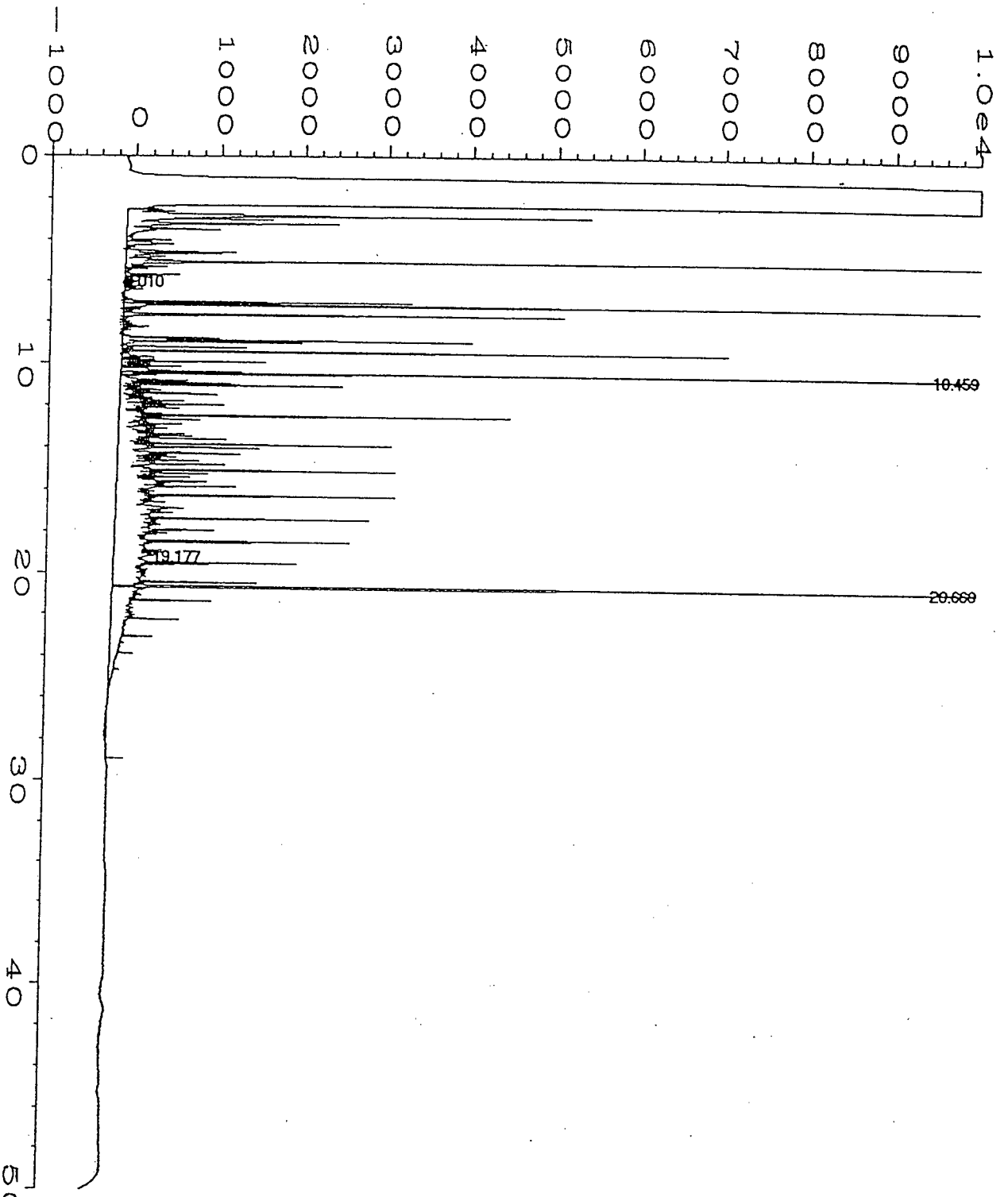
ISTD Amount :



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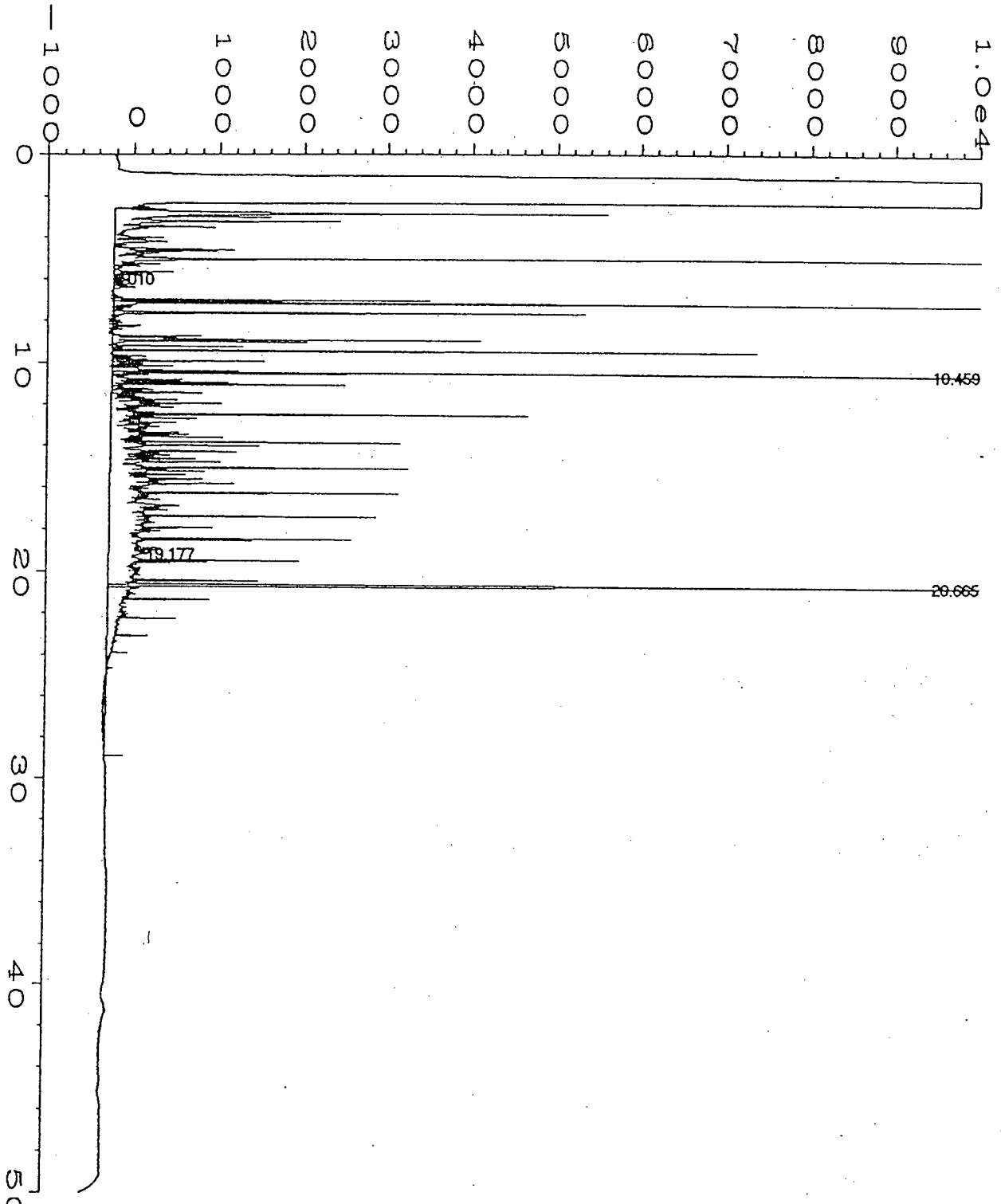
Report Created on: 08 Nov 95 09:07 AM
Last Recalib on : 11 SEP 95 05:42 PM
Multiplier : 1

Page Number : 1
Vial Number : 55
Injection Number : 1
Sequence Line : 1
Instrument Method: OHCID.MTH
Analysis Method : OR-HCID.MTH
Sample Amount : 0
ISTD Amount :



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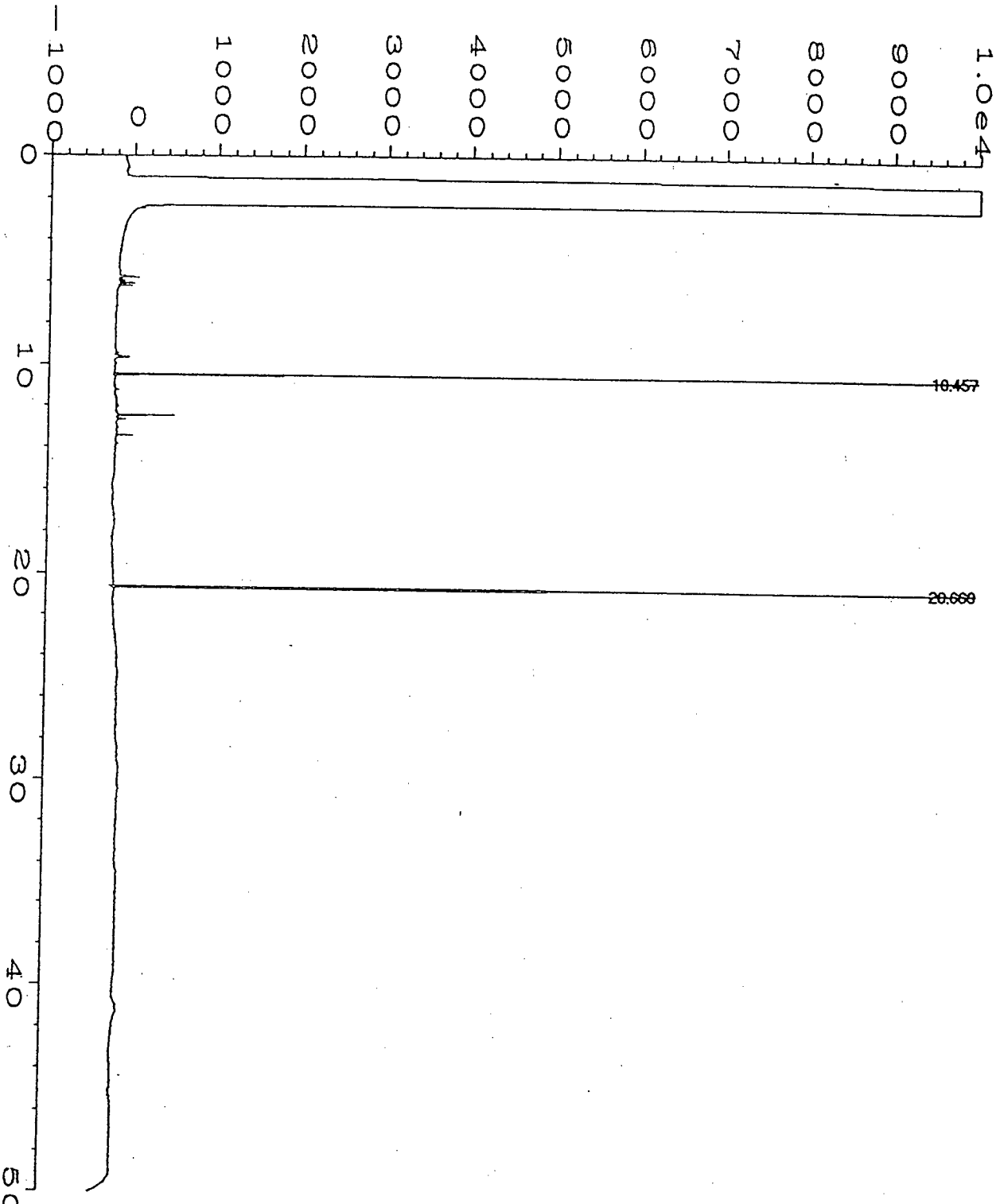
Instrument : GAUSS
Sample Name : BSD 11/7
Run Time Bar Code:
Acquired on : 07 Nov 95 08:56 PM
Report Created on: 08 Nov 95 09:08 AM
Last Recalib on : 11 SEP 95 05:42 PM
Multiplier : 1

Page Number : 1
Vial Number : 56
Injection Number : 1
Sequence Line : 1
Instrument Method: OHCID.MTH
Analysis Method : OR-HCID.MTH
Sample Amount : 0
ISTD Amount :



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nstrument : GAUSS
ample Name : 511526-1
un Time Bar Code:
cquired on : 08 Nov 95 00:57 AM
eport Created on: 08 Nov 95 09:14 AM
ast Recalib on : 11 SEP 95 05:42 PM
ultiplier : 1

Page Number : 1
Vial Number : 60
Injection Number : 1
Sequence Line : 1
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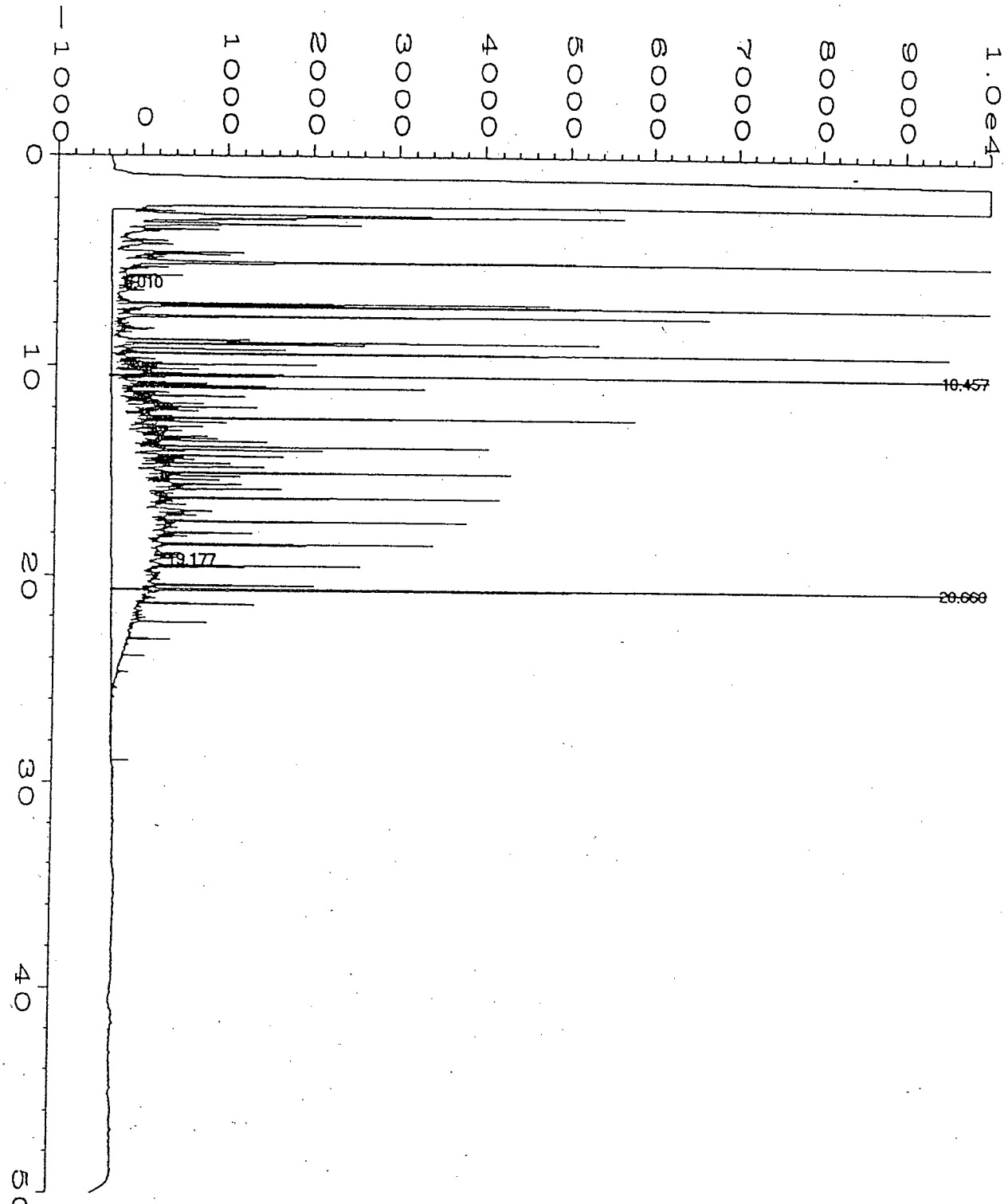
Analysis Method : OR-HCID.MTH
Sample Amount : 0
ISTD Amount :



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ample Name	: DG 150	Injection Number	: 1
un Time Bar Code:		Sequence Line	: 1
cquired on	: 08 Nov 95 09:22 AM	Instrument Method	: OHCID.MTH
eport Created on	: 08 Nov 95 10:23 AM	Analysis Method	: OR-HCID.MTH
ast Recalib on	: 11 SEP 95 05:42 PM	Sample Amount	: 0
ultiplier	: 1	ISTD Amount	:

Analytical Technologies, Inc.
17400 S.W. Upper Boones Ferry Rd., Suite 270
Durham, Oregon 97224 • (503) 684-0447 FAX: (503) 620-0393

DATE 11-6 PAGE 1 OF 1

Chain of Custody

LABORATORY NUMBER: 511526
PROJECT NOTICE NUMBER:

PROJECT MANAGER: Marsi Beeson
COMPANY: GeoEngineers
ADDRESS: 7504 SW Bridgeport Rd
Portland, OR 97224
PHONE: 624-9274 SAMPLED BY: MBB

SAMPLE DISPOSAL INSTRUCTIONS

☐ ATI Disposal @ $5.00 each ☐ Return

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID
Stockpile	11-2-95		Soil	1

PETROLEUM HYDROCARBONS											ORGANICS							INORGANICS			TCLP			OTHER										NUMBER OF CONTAINERS
State: ORY WA	State: OR / WA	State: OR / WA	State: OR / WA																															
TPH-HCID	TPH-G	TPH-D	418.1	EPA 418.1	8015M	8020M-BETX only	8310 HPLC PAHs	7421 Lead	% Moisture	8010 Halogenated VOCs	8020 Aromatic VOCs	8040 Phenols	8240 GCMS Volatiles	8270 GCMS Semivolatiles	8080 OC Pesticides/PCBs	8080M PCBs only	Drinking Water (8)	Priority Pollutant Metals (13)	Cyanide	TCLP Metals (8)	TCLP Volatiles 8240 ZH-EXT	TCLP Semivolatiles 8270											
X																																	1

PROJECT INFORMATION

PROJECT NUMBER: 4326-001-P62
PROJECT NAME: Birnbach
PURCHASE ORDER NUMBER:
ONGOING PROJECT? YES ☒ NO ☐

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS: 1
COC SEALS/INTACT? Y \ N \ (NA)
RECEIVED INTACT? (Y) N
RECEIVED COLD? (Y) N

PRIOR AUTHORIZATION REQUIRED FOR RUSH PROJECTS

TAT: (NORMAL) ☒ 2 WKS | (RUSH) ☐ 24 HR ☐ 48 HRS ☐ 72 HRS ☐ 1 WK
GREATER THAN 24 HR. NOTICE? YES ☐ NO ☐ (LAB USE ONLY)

SPECIAL INSTRUCTIONS:
please fax results 620-5940

Received via:

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY 3.
Signature: Time: Marsi Beeson 9am	Signature Time:	Signature Time:
Printed Name: Date: Marsi Beeson 11-6	Printed Name: Date:	Printed Name: Date:
Company: GeoEngineers	Company:	Company:
RECEIVED BY: 1.	**RECEIVED BY: 2.**	**RECEIVED BY: (LAB) 3.**
Signature: Time:	Signature Time:	Signature Time: Jenna Gorham 9a
Printed Name: Date:	Printed Name: Date:	Printed Name: Date: Jenna Gorham 11/6/95
Company:	Company:	Analytical Technologies, Inc.

Analytical Technologies, Inc.
17400 S.W. Upper Boones Ferry Road, Suite 270 Durham, OR. 97224
(503) 684-0447 (503) 620-0393 (FAX)

ATI I.D. 511518

November 16, 1995

GeoEngineers
NOV 2 0 1995
Routing
File

Marsi Beeson
GeoEngineers, Inc.
7504 Bridgeport Rd.
Portland, OR 97224

Project Name/Number: Rose's Parking Lot / 4326-001-P62

Attention: Marsi Beeson

On November 3, 1995, Analytical Technologies, Inc. received three soil samples for analysis for the above listed project. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

If you have any questions or comments, please do not hesitate to contact us at (503)684-0447.

Natasha Schaefer
Project Manager

Steven E. Stanley
Laboratory Manager

SES:alm
Enclosure

Analytical Technologies, Inc.

SAMPLE CROSS REFERENCE SHEET

CLIENT:	GeoEngineers, Inc.	**ATI I.D.:**	511518
PROJECT #:	4326-001-P62		
PROJECT NAME:	Rose's Parking Lot	**MATRIX:**	SOIL

ATI #	CLIENT DESCRIPTION	DATE SAMPLED
511518-1	USTEXC-01-EAST	11/02/95
511518-2	USTEXC-02-CENTER	11/02/95
511518-3	USTEXC-03-WEST	11/02/95

----------TOTALS----------

MATRIX	# SAMPLES
SOIL	3

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of the report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical Technologies, Inc.

ANALYTICAL SCHEDULE

CLIENT:	GeoEngineers, Inc.	**ATI I.D.:**	511518
PROJECT #:	4326-001-P62		
PROJECT NAME:	Rose's Parking Lot		

ANALYSIS	TECHNIQUE	REFERENCE	LAB
Hydrocarbon Identification	GC/FID	OR TPH-HCID	PLD
Halogenated VOCs	GC/ELCD	EPA 8010	PLD
Aromatic VOCs	GC/PID	EPA 8020	PLD
PCBs	GC/ECD	EPA 8080M	PLD
TCLP Arsenic	ICAP	EPA 6010	PLD
TCLP Barium	ICAP	EPA 6010	PLD
TCLP Cadmium	ICAP	EPA 6010	PLD
TCLP Chromium	ICAP	EPA 6010	PLD
TCLP Lead	ICAP	EPA 6010	PLD
TCLP Mercury	AA/Cold Vapor	EPA 7470	PLD
TCLP Selenium	ICAP	EPA 6010	PLD
TCLP Silver	ICAP	EPA 6010	PLD

PLD = ATI - Portland
R = ATI - Renton
SD = ATI - San Diego
PHX = ATI - Phoenix
PNR = ATI - Pensacola
FC = ATI - Fort Collins
SUB = Subcontract

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	TPH-HCID (Oregon)	ATI I.D.:	511518-0
CLIENT I.D.:	Method Blank	DATE SAMPLED:	N/A
CLIENT:	GeoEngineers, Inc.	DATE RECEIVED:	N/A
PROJECT #:	4326-001-P62	DATE EXTRACTED:	11/07/95
PROJECT NAME:	Rose's Parking Lot	DATE ANALYZED:	11/07/95
SAMPLE MATRIX:	SOIL	DILUTION FACTOR:	1
		UNITS:	mg/kg

PARAMETER	RESULTS
GASOLINE (C6 - C10)	LESS THAN 20 mg/kg
DIESEL (C10 - C28)	LESS THAN 50 mg/kg
(C28 - C40)	NOT OBSERVED
SURROGATES:	
1-CHLOROOCTANE (62% - 143%)	105%
O-TERPHENYL (62% - 143%)	105%

Analyst: JLE 11/8/95

Reviewer: CS 11/8/95

Analytical**Technologies**, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	TPH-HCID (Oregon)	**ATI I.D.:**	511518-1
CLIENT I.D.:	USTEXC-01-EAST	**DATE SAMPLED:**	11/02/95
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	11/03/95
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	11/07/95
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	11/07/95
SAMPLE MATRIX:	SOIL	**DILUTION FACTOR:**	1
		UNITS:	mg/kg

PARAMETER	RESULTS
GASOLINE (C6 - C10)	LESS THAN 20 mg/kg
DIESEL (C10 - C28)	LESS THAN 50 mg/kg
(C28 - C40)	NOT OBSERVED
SURROGATES:	
1-CHLOROOCTANE (62% - 143%)	99%
O-TERPHENYL (62% - 143%)	100%

Analyst: JLK 11/8/95

Reviewer: CS 11/8/95

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	TPH-HCID (Oregon)	ATI I.D.:	511518-2
CLIENT I.D.:	USTEXC-02-CENTER	DATE SAMPLED:	11/02/95
CLIENT:	GeoEngineers, Inc.	DATE RECEIVED:	11/03/95
PROJECT #:	4326-001-P62	DATE EXTRACTED:	11/07/95
PROJECT NAME:	Rose's Parking Lot	DATE ANALYZED:	11/07/95
SAMPLE MATRIX:	SOIL	DILUTION FACTOR:	1
		UNITS:	mg/kg

PARAMETER	RESULTS
GASOLINE (C6 - C10)	LESS THAN 20 mg/kg
DIESEL (C10 - C28)	LESS THAN 50 mg/kg
(C28 - C40)	NOT OBSERVED
SURROGATES:	
1-CHLOROOCTANE (62% - 143%)	98%
O-TERPHENYL (62% - 143%)	100%

Analyst: JLK 11/8/95

Reviewer: CS 11/8/95

AnalyticalTechnologies,Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	TPH-HCID (Oregon)	**ATI I.D.:**	511518-3
CLIENT I.D.:	USTEXC-03-WEST	**DATE SAMPLED:**	11/02/95
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	11/03/95
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	11/07/95
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	11/07/95
SAMPLE MATRIX:	SOIL	**DILUTION FACTOR:**	1
		UNITS:	mg/kg

PARAMETER	RESULTS
GASOLINE (C6 - C10)	LESS THAN 20 mg/kg
DIESEL (C10 - C28)	LESS THAN 50 mg/kg
(C28 - C40)	NOT OBSERVED
SURROGATES:	
1-CHLOROOCTANE (62% - 143%)	103%
O-TERPHENYL (62% - 143%)	104%

Analyst: JK 11/8/95

Reviewer: CS 11/8/95

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY SPIKE RESULTS

		ATI ACCESSION:	511518
METHOD:	TPH-HCID (Oregon)	QC SAMPLE:	Method Blank
CLIENT:	GeoEngineers, Inc.	DATE EXTRACTED:	11/07/95
PROJECT #:	4326-001-P62	DATE ANALYZED:	11/07/95
PROJECT NAME:	Rose's Parking Lot	DILUTION FACTOR:	1
SAMPLE MATRIX:	SOIL	UNITS:	mg/kg

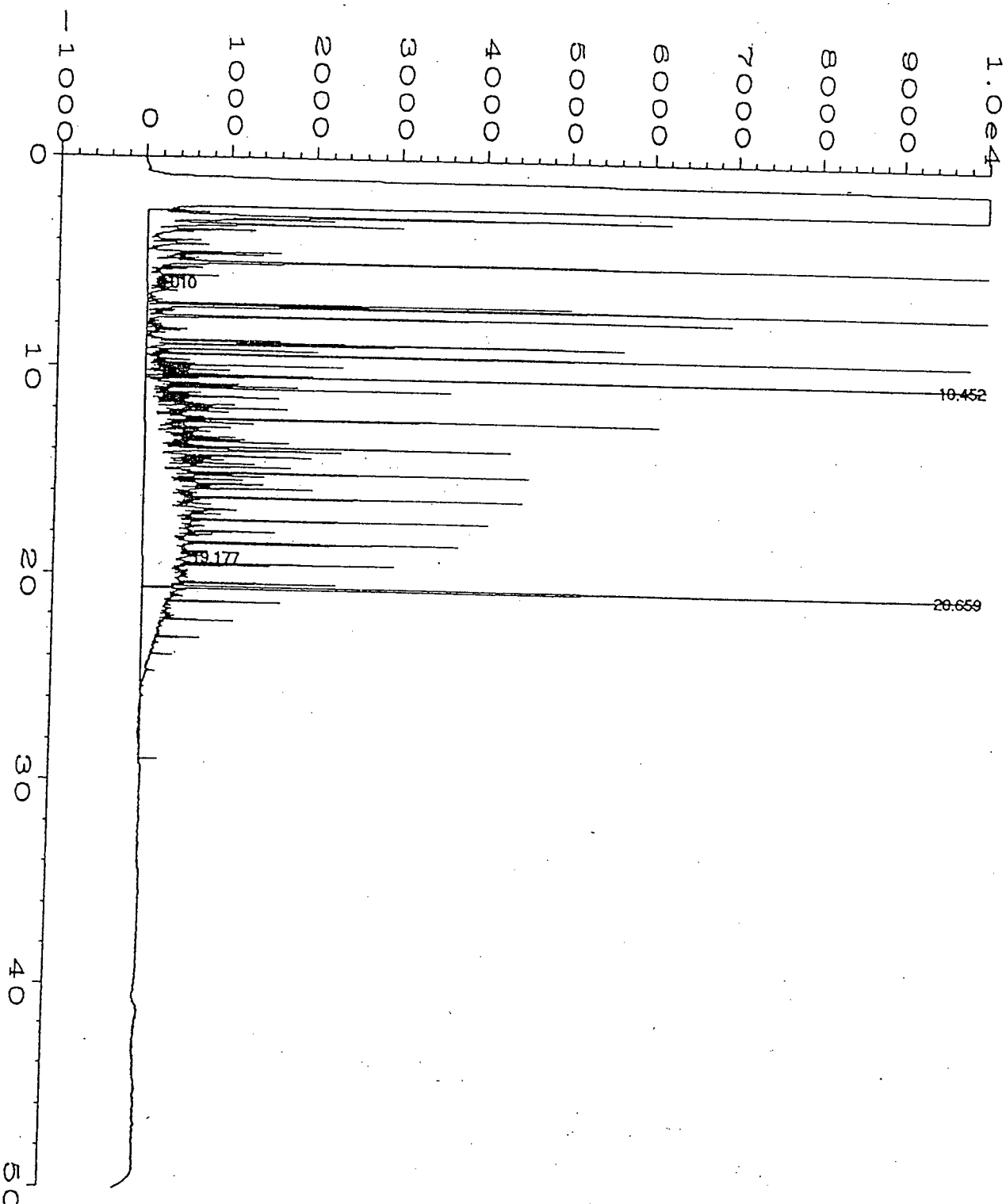
PARAMETER	SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
DIESEL	< 50	100	104	104	99	99	5
SURROGATE:							
1-CHLOROOCTANE (62% - 143%)				102%		107%	
O-TERPHENYL (62% - 143%)				101%		107%	

CONTROL LIMITS

	% REC	RPD
DIESEL	69-128	20

Analyst: JJK 11/8/95

Reviewer: CS 11/8/95



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nstrument : GAUSS
ample Name : DG 150
un Time Bar Code:
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eport Created on: 07 Nov 95 12:49 PM
ast Recalib on : 11 SEP 95 05:42 PM
ultiplier : 1

Page Number : 1
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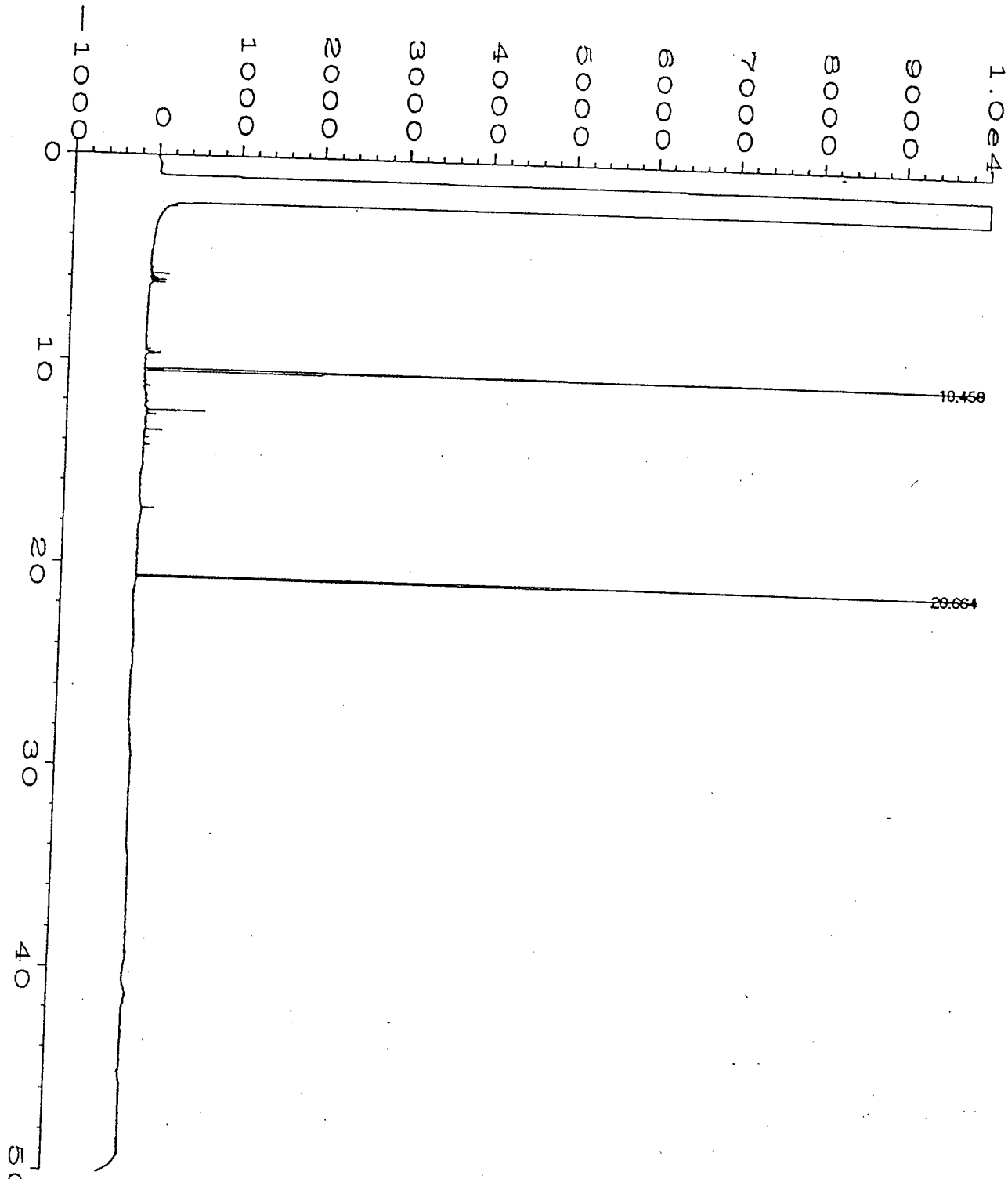
Injection Number : 1
Sequence Line : 1
Instrument Method: OHCID.MTH
Analysis Method : OR-HCID.MTH
Sample Amount : 0
ISTD Amount :



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erator : FUELS
strument : GAUSS
mple Name : MB 11/7
un Time Bar Code:
cquired on : 07 Nov 95 06:56 PM
port Created on: 08 Nov 95 09:04 AM
st Recalib on : 11 SEP 95 05:42 PM
ultiplier : 1

Page Number : 1
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Injection Number : 1
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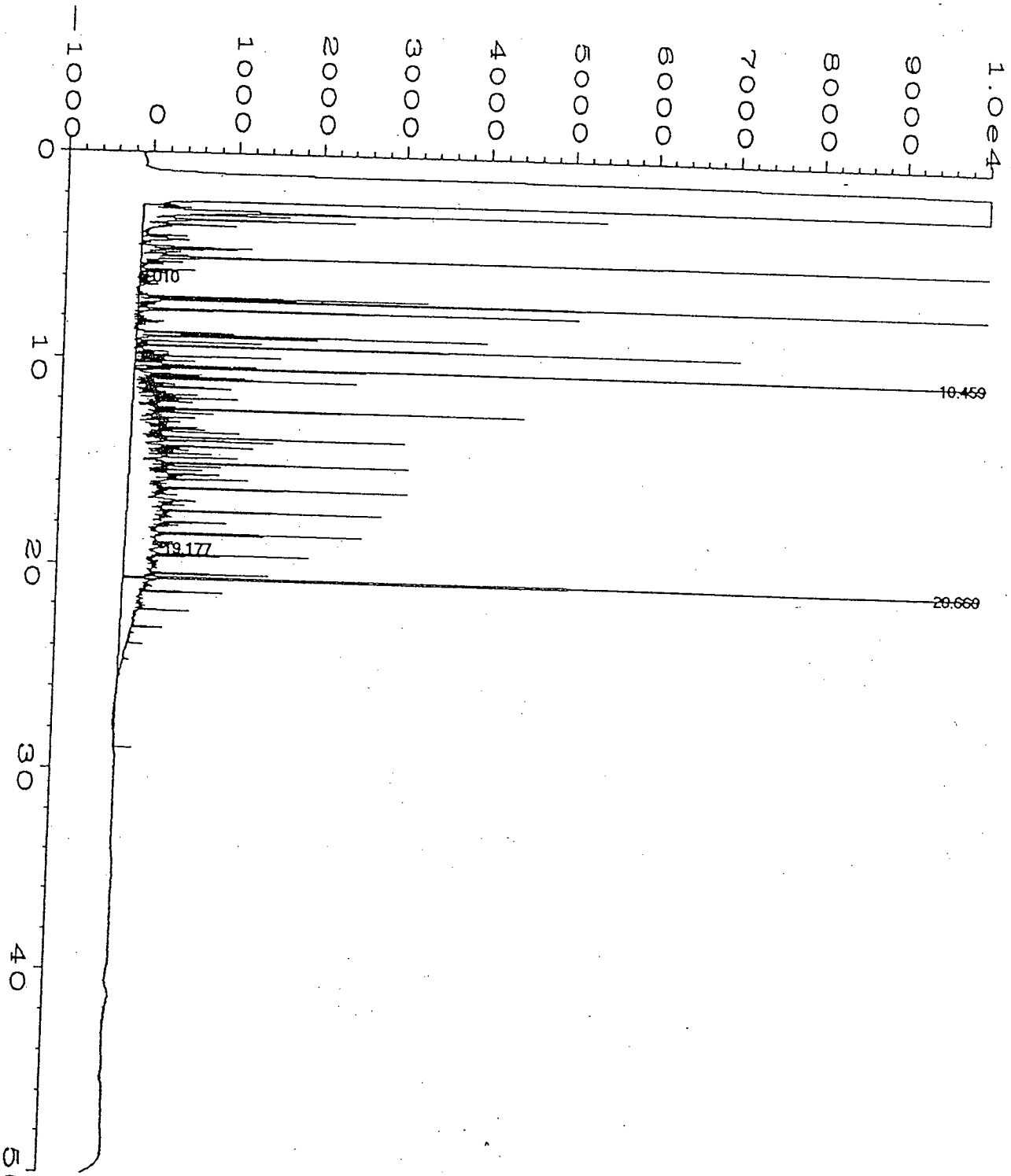
Instrument Method: OHCID.MTH
Analysis Method : OR-HCID.MTH
Sample Amount : 0
ISTD Amount :



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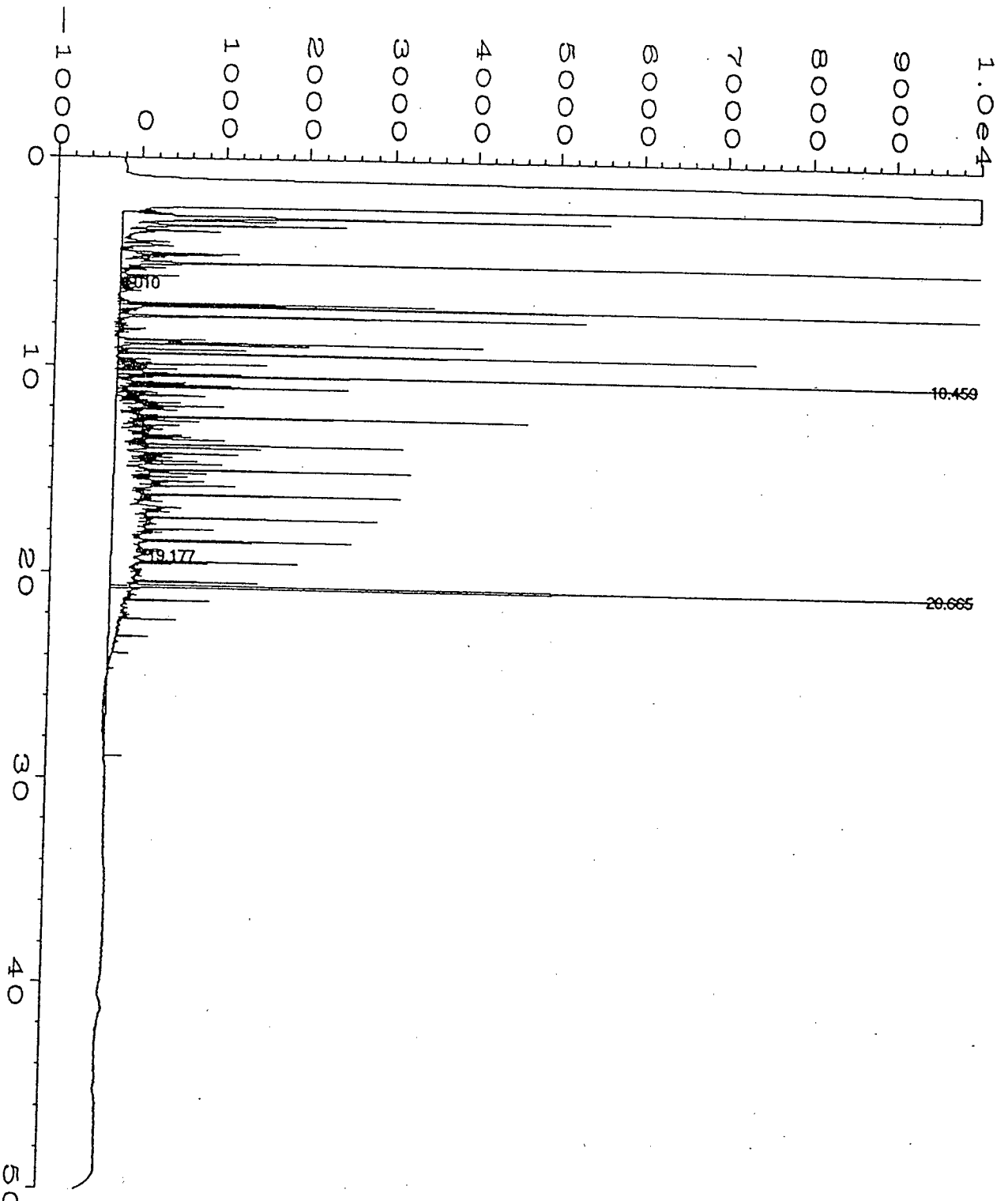
)perator : FUELS
nstrument : GAUSS
ample Name : BS 11/7
un Time Bar Code:
cquired on : 07 Nov 95 07:56 PM
eport Created on: 08 Nov 95 09:07 AM
ast Recalib on : 11 SEP 95 05:42 PM
ultiplier : 1

Page Number : 1
Vial Number : 55
Injection Number : 1
Sequence Line : 1
Instrument Method: OHCID.MTH
Analysis Method : OR-HCID.MTH
Sample Amount : 0
ISTD Amount :



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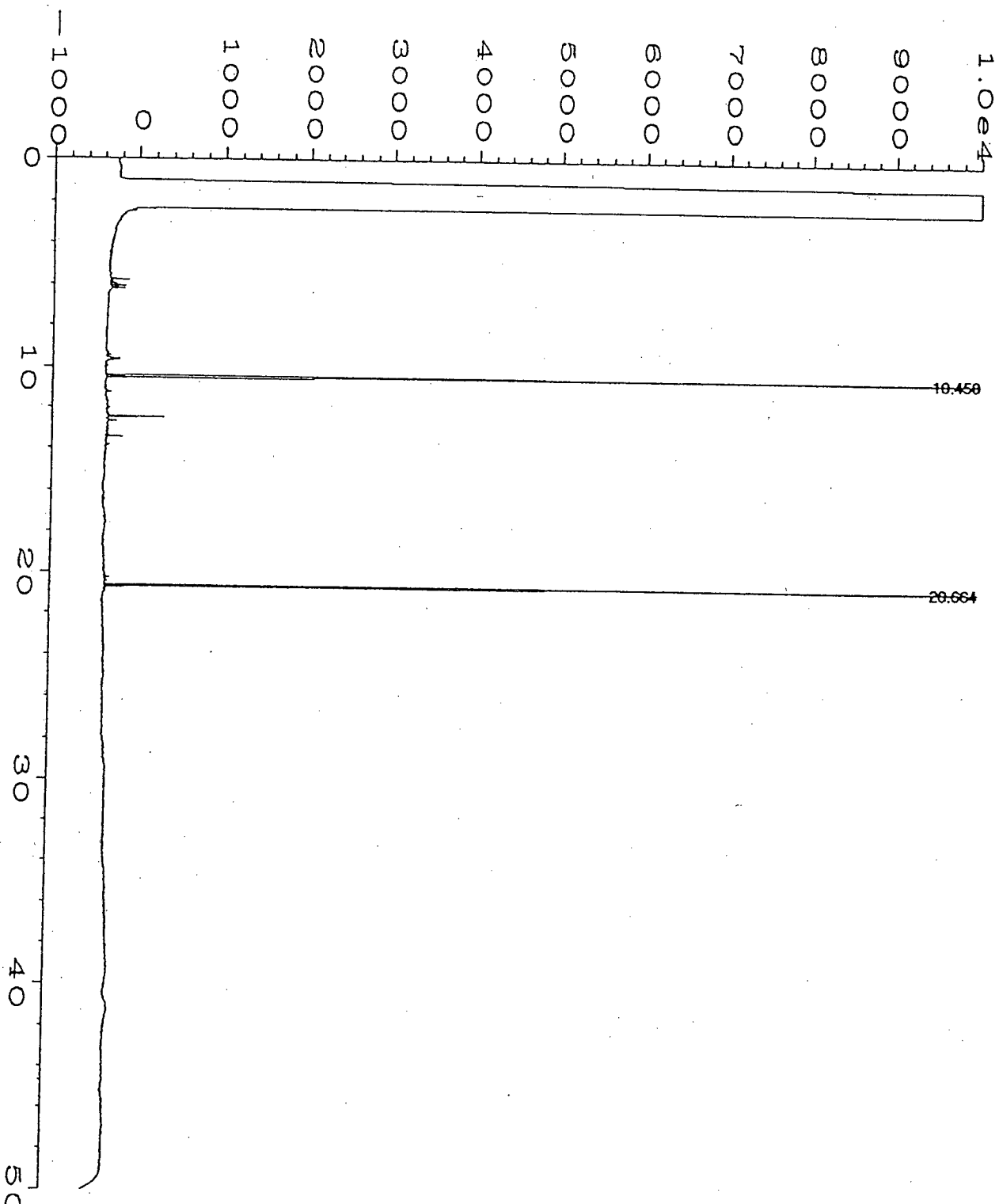
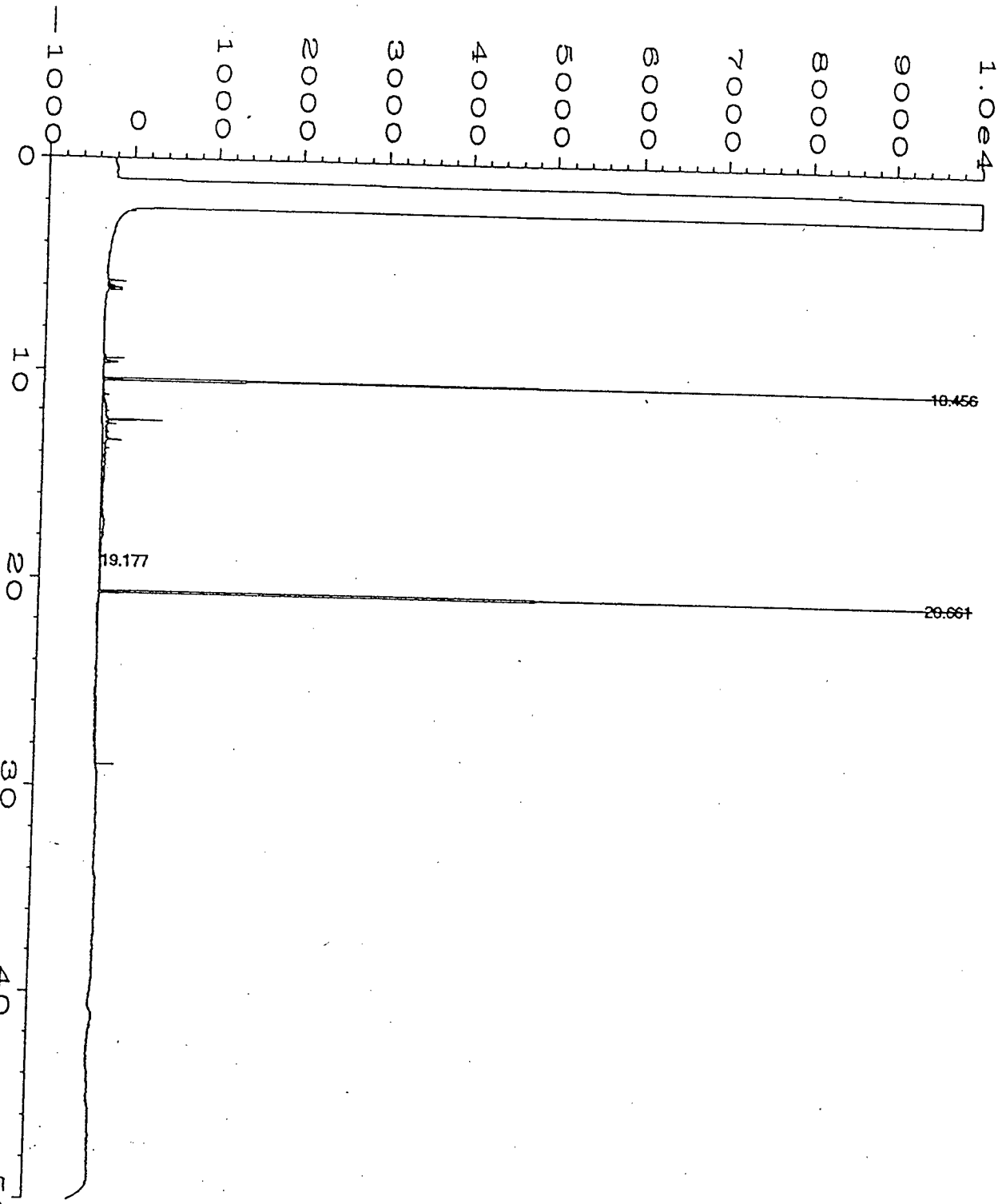
Operator : FUELS
Instrument : GAUSS
Sample Name : BSD 11/7
Run Time Bar Code:
Acquired on : 07 Nov 95 08:56 PM
Report Created on: 08 Nov 95 09:08 AM
Last Recalib on : 11 SEP 95 05:42 PM
Multiplier : 1

Page Number : 1
Vial Number : 56
Injection Number : 1
Sequence Line : 1
Instrument Method: OHCID.MTH
Analysis Method : OR-HCID.MTH
Sample Amount : 0
ISTD Amount :



ata File Name : F:\DATA\FUELS\GAUSS\D\951107\057R0101.D
perator : FUELS
nstrument : GAUSS
ample Name : 511518-1
un Time Bar Code:
cquired on : 07 Nov 95 09:56 PM
eport Created on: 08 Nov 95 09:09 AM
ast Recalib on : 11 SEP 95 05:42 PM
ultiplier : 1

Page Number : 1
Vial Number : 57
Injection Number : 1
Sequence Line : 1
Instrument Method: OHCID.MTH
Analysis Method : OR-HCID.MTH
Sample Amount : 0
ISTD Amount :



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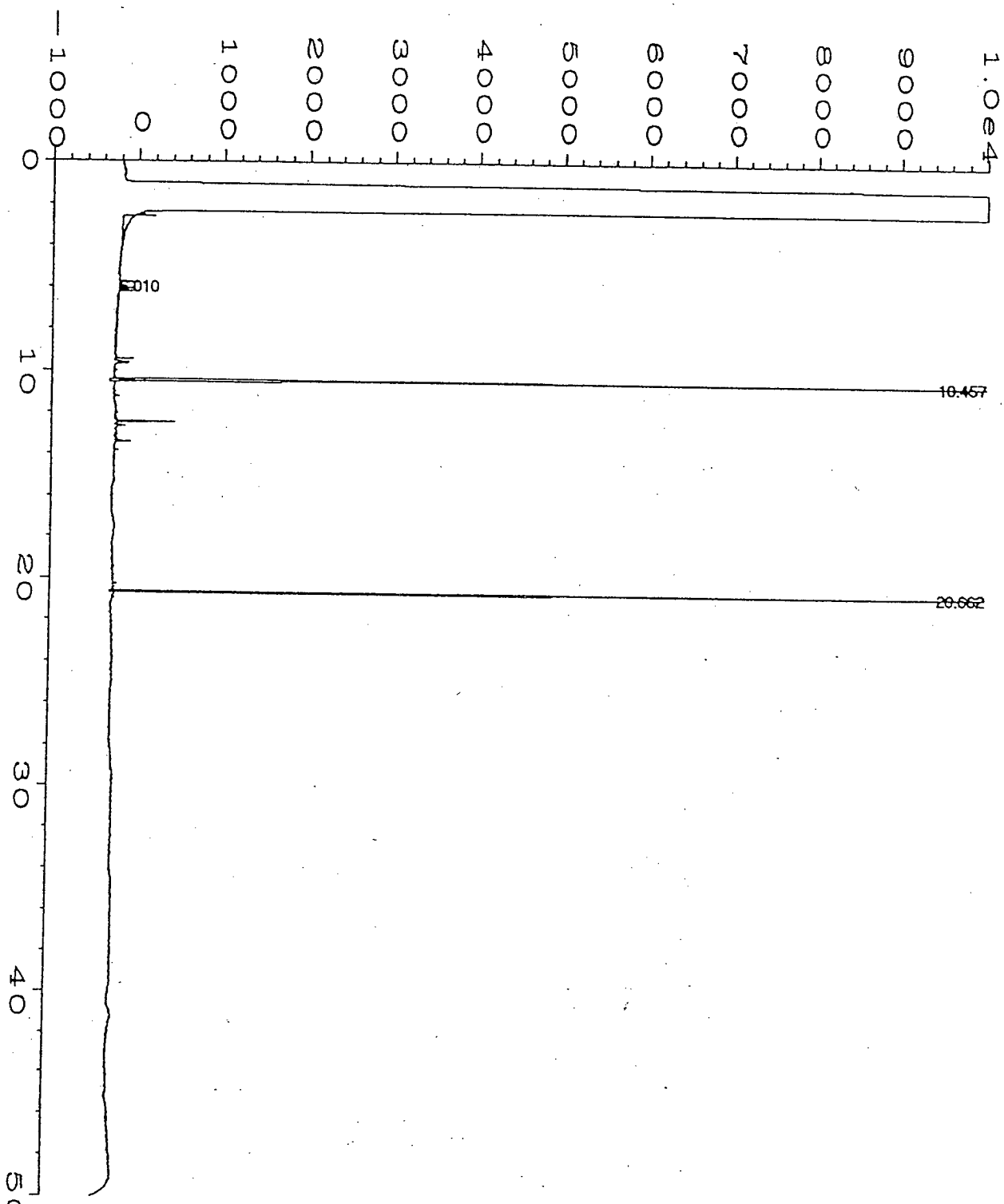
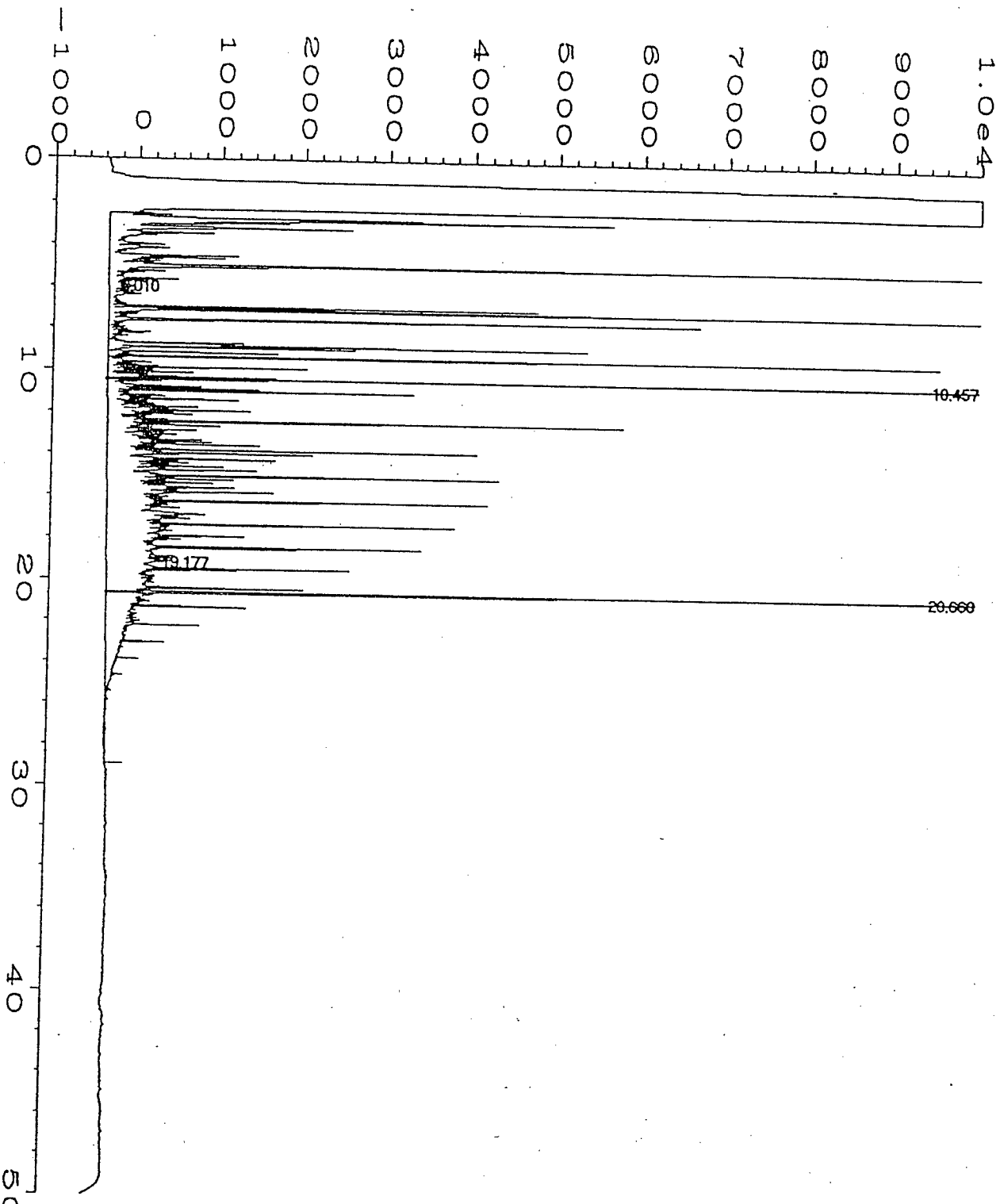
perator : FUELS
trument : GAUSS
ple Name : 511518-2
un Time Bar Code:
cquired on : 07 Nov 95 10:56 PM
ort Created on: 08 Nov 95 09:10 AM
t Recalib on : 11 SEP 95 05:42 PM
ultiplier : 1

Page Number : 1
Vial Number : 58
Injection Number : 1
Sequence Line : 1
Instrument Method: OHCID.MTH
Analysis Method : OR-HCID.MTH
Sample Amount : 0
ISTD Amount :



Data File Name : F:\DATA\FUELS\GAUSS\D\951107\059R0101.D
Operator : FUELS
Instrument : GAUSS
Sample Name : 511518-3
Run Time Bar Code:
Acquired on : 07 Nov 95 11:56 PM
Report Created on: 08 Nov 95 09:13 AM
Last Recalib on : 11 SEP 95 05:42 PM
Multiplier : 1

Page Number : 1
Vial Number : 59
Injection Number : 1
Sequence Line : 1
Instrument Method: OHCID.MTH
Analysis Method : OR-HCID.MTH
Sample Amount : 0
ISTD Amount :



)ata File Name : F:\DATA\FUELS\GAUSS\D\951107\062R0101.D
perator : FUELS
strument : GAUSS
mple Name : DG 150
un Time Bar Code:
cquired on : 08 Nov 95 09:22 AM
port Created on: 08 Nov 95 10:23 AM
st Recalib on : 11 SEP 95 05:42 PM
ultiplier : 1

Page Number : 1
Vial Number : 62
Injection Number : 1
Sequence Line : 1
Instrument Method: OHCID.MTH
Analysis Method : OR-HCID.MTH
Sample Amount : 0
ISTD Amount :

AnalyticalTechnologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	EPA 8010/8020	**ATI I.D.:**	511518-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	N/A
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	N/A
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	11/10/95
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	11/10/95
SAMPLE MATRIX:	SOIL	**DILUTION FACTOR:**	1
		UNITS:	mg/kg

PARAMETER		RESULTS
BENZENE	<	0.025
BROMODICHLOROMETHANE	<	0.010
BROMOFORM	<	0.025
BROMOMETHANE	<	0.10
CARBON TETRACHLORIDE	<	0.010
CHLOROBENZENE	<	0.025
CHLOROETHANE	<	0.10
CHLOROFORM	<	0.010
CHLOROMETHANE	<	0.050
1,2-DIBROMOETHANE (EDB)	<	0.025
1,2-DICHLOROBENZENE	<	0.025
1,3-DICHLOROBENZENE	<	0.025
1,4-DICHLOROBENZENE	<	0.025
DIBROMOCHLOROMETHANE	<	0.010
1,1-DICHLOROETHANE	<	0.010
1,2-DICHLOROETHANE (EDC)	<	0.010
1,1-DICHLOROETHENE	<	0.010
CIS-1,2-DICHLOROETHENE	<	0.010
TRANS-1,2-DICHLOROETHENE	<	0.010
1,2-DICHLOROPROPANE	<	0.010
CIS-1,3-DICHLOROPROPENE	<	0.010
TRANS-1,3-DICHLOROPROPENE	<	0.010
ETHYLBENZENE	<	0.025
METHYLENE CHLORIDE	<	0.50
1,1,2,2-TETRACHLOROETHANE	<	0.010
TETRACHLOROETHENE	<	0.010
TOLUENE	<	0.025
1,1,1-TRICHLOROETHANE	<	0.025
1,1,2-TRICHLOROETHANE	<	0.010
TRICHLOROETHENE	<	0.010
TRICHLOROFLUOROMETHANE	<	0.025
VINYL CHLORIDE	<	0.050
TOTAL XYLENES	<	0.025

SURROGATES:	
BROMOFLUOROBENZENE (50% - 140%)	80%
TRIFLUOROTOLUENE (56% - 132%)	91%

Analyst: 10 11/13/95

Reviewer: MB 11/13/95

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	EPA 8010/8020	ATI I.D.:	511518-1
CLIENT I.D.:	USTEXC-01-EAST	DATE SAMPLED:	11/02/95
CLIENT:	GeoEngineers, Inc.	DATE RECEIVED:	11/03/95
PROJECT #:	4326-001-P62	DATE EXTRACTED:	11/10/95
PROJECT NAME:	Rose's Parking Lot	DATE ANALYZED:	11/10/95
SAMPLE MATRIX:	SOIL	DILUTION FACTOR:	1
		UNITS:	mg/kg

RESULTS CORRECTED FOR MOISTURE CONTENT

PARAMETER	RESULTS	
BENZENE	<	0.031
BROMODICHLOROMETHANE	<	0.013
BROMOFORM	<	0.031
BROMOMETHANE	<	0.13
CARBON TETRACHLORIDE	<	0.013
CHLOROBENZENE	<	0.031
CHLOROETHANE	<	0.13
CHLOROFORM	<	0.013
CHLOROMETHANE	<	0.063
1,2-DIBROMOETHANE (EDB)	<	0.031
1,2-DICHLOROBENZENE	<	0.031
1,3-DICHLOROBENZENE	<	0.031
1,4-DICHLOROBENZENE	<	0.031
DIBROMOCHLOROMETHANE	<	0.013
1,1-DICHLOROETHANE	<	0.013
1,2-DICHLOROETHANE (EDC)	<	0.013
1,1-DICHLOROETHENE	<	0.013
CIS-1,2-DICHLOROETHENE	<	0.013
TRANS-1,2-DICHLOROETHENE	<	0.013
1,2-DICHLOROPROPANE	<	0.013
CIS-1,3-DICHLOROPROPENE	<	0.013
TRANS-1,3-DICHLOROPROPENE	<	0.013
ETHYLBENZENE	<	0.031
METHYLENE CHLORIDE	<	0.63
1,1,2,2-TETRACHLOROETHANE	<	0.013
TETRACHLOROETHENE	<	0.013
TOLUENE	<	0.031
1,1,1-TRICHLOROETHANE	<	0.031
1,1,2-TRICHLOROETHANE	<	0.013
TRICHLOROETHENE	<	0.013
TRICHLOROFLUOROMETHANE	<	0.031
VINYL CHLORIDE	<	0.063
TOTAL XYLENES	<	0.031

SURROGATES:	
BROMOFLUOROBENZENE (50% - 140%)	69%
TRIFLUOROTOLUENE (56% - 132%)	81%

Analyst: LO 11/13/95

Reviewer: M 11/13/95

Analytical**Technologies**, Inc.

GAS CHROMATOGRAPHY SPIKE RESULTS

		ATI I.D.:	511518
METHOD:	EPA 8010/8020	QC SAMPLE:	511559-6
CLIENT:	GeoEngineers, Inc.	DATE EXTRACTED:	11/10/95
PROJECT #:	4326-001-P62	DATE ANALYZED:	11/10/95
PROJECT NAME:	Rose's Parking Lot	DILUTION FACTOR:	1
SAMPLE MATRIX:	SOIL	UNITS:	mg/kg

RESULTS CORRECTED FOR MOISTURE CONTENT

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<	0.027	0.54	0.50	93	0.49	91	2
CHLOROBENZENE	<	0.027	0.54	0.50	93	0.49	91	2
1,1-DICHLOROETHENE	<	0.011	0.54	0.43	80	0.41	76	5
TRICHLOROETHENE	<	0.011	0.54	0.50	93	0.50	93	0
TOLUENE	<	0.027	0.54	0.52	96	0.51	94	2
SURROGATES:								
BROMOFLUOROBENZENE (50% - 140%)					68%		70%	
TRIFLUOROTOLUENE (56% - 132%)					72%		77%	

CONTROL LIMITS

	% REC	RPD
BENZENE	56% - 123%	20
CHLOROBENZENE	42% - 122%	20
1,1-DICHLOROETHENE	37% - 124%	28
TRICHLOROETHENE	51% - 119%	20
TOLUENE	59% - 132%	20

Analyst: LO 11/13/95

Reviewer: MMB 11/13/95

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY BLANK SPIKE RESULTS

METHOD:	EPA 8010/8020	**ATI I.D.:**	511518
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	Method Blank
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	11/10/95
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	11/10/95
SAMPLE MATRIX:	SOIL	**DILUTION FACTOR:**	1
		UNITS:	mg/kg

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<	0.025	0.50	0.49	98	0.48	96	2
CHLOROBENZENE	<	0.025	0.50	0.48	96	0.49	98	2
1,1-DICHLOROETHENE	<	0.010	0.50	0.43	86	0.42	84	2
TRICHLOROETHENE	<	0.010	0.50	0.49	98	0.49	98	0
TOLUENE	<	0.025	0.50	0.50	100	0.50	100	0
SURROGATES:								
BROMOFLUOROBENZENE (50% - 140%)					79%		78%	
TRIFLUOROTOLUENE (56% - 132%)					94%		91%	

CONTROL LIMITS

	% REC	RPD
BENZENE	73% - 129%	20
CHLOROBENZENE	53% - 117%	20
1,1-DICHLOROETHENE	46% - 138%	25
TRICHLOROETHENE	60% - 134%	20
TOLUENE	76% - 128%	20

Analyst: LO 11/13/95

Reviewer: MB 11/13/95

Analytical Technologies, Inc.

CASE NARRATIVE FOR EPA METHOD 8080 MOD

POLYCHLORINATED BIPHENYLS

ATI ACCESSION NUMBER 820430

A 30.0 gram aliquot of soil sample was extracted with methylene chloride by horn sonication extraction (EPA method 3550). The methylene chloride was reduced and exchanged to hexane. Final volume was 10.0 mls.

The extracts were analyzed by Gas Chromatography (GC) using DB-5 and DB-608 megabore capillary columns and electron capture detectors (ECD). A calibration curve of five or six points was generated for each analyte reported.

The blank spike duplicate had low recoveries for surrogate and spiking solution. The matrix spikes recovered at acceptable levels and are reported.

Greg Ellsworth

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	PCBs (EPA 8080M)	**ATI I.D.:**	511518-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	N/A
CLIENT:	GeoEngineers	**DATE RECEIVED:**	N/A
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	11/03/95
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	11/03/95
SAMPLE MATRIX:	Soil	**DILUTION FACTOR:**	1
		UNITS:	mg/kg

PARAMETER	RESULTS
AROCLOR 1016	< 0.033
AROCLOR 1221	< 0.033
AROCLOR 1232	< 0.033
AROCLOR 1242	< 0.033
AROCLOR 1248	< 0.033
AROCLOR 1254	< 0.033
AROCLOR 1260	< 0.033
Tetrachloro-m-xylene (38% - 130%)	88%
Decachlorobiphenyl (42% - 134 %)	85%

Analyst: GE 11/6/95

Reviewer: BH 11-6-95

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	PCBs (EPA 8080M)	**ATI I.D.:**	511518-1
CLIENT I.D.:	USTEXC-01-EAST	**DATE SAMPLED:**	11/02/95
CLIENT:	GeoEngineers	**DATE RECEIVED:**	11/03/95
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	11/03/95
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	11/03/95
SAMPLE MATRIX:	Soil	**DILUTION FACTOR:**	1
		UNITS:	mg/kg

RESULTS CORRECTED FOR MOISTURE CONTENT

PARAMETER	RESULTS
AROCLOR 1016	< 0.041
AROCLOR 1221	< 0.041
AROCLOR 1232	< 0.041
AROCLOR 1242	< 0.041
AROCLOR 1248	< 0.041
AROCLOR 1254	< 0.041
AROCLOR 1260	< 0.041
Tetrachloro-m-xylene (38% - 130%)	83%
Decachlorobiphenyl (42% - 134 %)	94%

Analyst: CE 11/6/95

Reviewer: [illegible] 11-6-95

Analytical**Technologies**, Inc.

GAS CHROMATOGRAPHY SPIKE RESULTS

METHOD:	PCB (EPA 8080)	**ATI I.D.:**	511518
CLIENT:	GeoEngineers	**QC SAMPLE:**	511508-2
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	11/03/95
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	11/03/95
SAMPLE MATRIX:	Soil	**DILUTION FACTOR:**	1
		UNITS:	mg/kg

RESULTS CORRECTED FOR MOISTURE CONTENT

PARAMETER	SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
AROCLOR 1260	< 0.036	0.366	0.253	69%	0.352	96%	33
SURROGATE: TETRACHLORO-m-XYLENE (38%-130%)				67		90	
DECACHLOROBIPHENYL (42%-134%)				73		99	
	CONTROL LIMITS						
				% REC			RPD
AROCLOR 1260				60 - 153			40

Analyst: GE 11/6/95

Reviewer: BH 11/6/95

Analytical**Technologies,** Inc.

GAS CHROMATOGRAPHY BLANK SPIKE RESULTS

METHOD:	PCB (EPA 8080M)	**ATI I.D.:**	511518
CLIENT:	GeoEngineers	**QC SAMPLE:**	Method Blank
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	11/03/95
PROJECT NAME:	Rose's Parking Lot	**DATE ANALYZED:**	11/03/95
SAMPLE MATRIX:	Soil	**DILUTION FACTOR:**	1
		UNITS:	mg/kg

PARAMETER	SAMPLE RESULTS	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
AROCLOR 1260	< 0.033	0.333	0.408	123%	0.074	22% H	139 H
SURROGATE: TETRACHLORO-m-XYLENE (38%-130%)				79		3 H	
DECACHLOROBIPHENYL (42%-134%)				91		39 H	
	CONTROL LIMITS						
				% REC			RPD
AROCLOR 1260				75 -141			23

H = Out of Control Limits

Analyst CE 11/6/95

Reviewer: BH 11-6-95

Analytical Technologies, Inc.

TCLP METALS RESULTS

METHOD:	1311	ATI I.D.:	511518-0
CLIENT I.D.:	Method Blank	DATE SAMPLED:	NA
CLIENT:	GeoEngineers, Inc.	DATE RECEIVED:	NA
PROJECT #:	4326-001-P62	DATE EXTRACTED:	11/06/95
PROJECT NAME:	Rose's Parking Lot	DATE DIGESTED:	11/08/95
SAMPLE MATRIX:	SOIL	DATE ANALYZED:	11/09,10/95
		DILUTION FACTOR:	1
		UNITS:	mg/L in Extract

PARAMETER	RESULTS	METHOD
ARSENIC	< 0.1	6010
BARIUM	< 0.4	6010
CADMIUM	< 0.01	6010
CHROMIUM	< 0.01	6010
LEAD	< 0.05	6010
MERCURY	< 0.0002	7470
SELENIUM	< 0.1	6010
SILVER	< 0.01	6010

Analyst: [illegible] 11/16/95

Reviewer: KEL 11/16/95

Analytical Technologies, Inc.

TCLP METALS RESULTS

METHOD:	1311	**ATI I.D.:**	511518-1
CLIENT I.D.:	USTEXC-01-EAST	**DATE SAMPLED:**	11/02/95
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	11/03/95
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	11/06/95
PROJECT NAME:	Rose's Parking Lot	**DATE DIGESTED:**	11/08/95
SAMPLE MATRIX:	SOIL	**DATE ANALYZED:**	11/09,10/95
		DILUTION FACTOR:	1
		UNITS:	mg/L in Extract

PARAMETER	RESULTS	METHOD	REGULATORY LIMIT*
ARSENIC	< 0.1	6010	5.0
BARIUM	1.0	6010	100.0
CADMIUM	< 0.01	6010	1.0
CHROMIUM	< 0.01	6010	5.0
LEAD	< 0.05	6010	5.0
MERCURY	< 0.0002	7470	0.2
SELENIUM	< 0.1	6010	1.0
SILVER	< 0.01	6010	5.0

* From 40 CFR Part 261, et al., and Federal Register, March 29,1990 and June 29,1990

Analyst: [illegible] 11/16/95

Reviewer: KFL 11/16/95

AnalyticalTechnologies,Inc.

TCLP METALS DUPLICATE RESULTS

METHOD:	1311	ATI I.D.:	511518
CLIENT:	GeoEngineers, Inc.	QC SAMPLE:	511518-1
PROJECT #:	4326-001-P62	DATE EXTRACTED:	11/06/95
PROJECT NAME:	Rose's Parking Lot	DATE DIGESTED:	11/08/95
SAMPLE MATRIX:	SOIL	DATE ANALYZED:	11/09,10/95
		DILUTION FACTOR:	1
		UNITS:	mg/L in Extract

PARAMETER	SAMPLE RESULT	DUPLICATE RESULT	RPD	RPD CONTROL LIMIT
ARSENIC	< 0.1	< 0.1	NA	20
BARIUM	1.0	1.1	10	20
CADMIUM	< 0.01	< 0.01	NA	20
CHROMIUM	< 0.01	< 0.01	NA	20
LEAD	< 0.05	< 0.05	NA	20
MERCURY	< 0.0002	< 0.0002	NA	20
SELENIUM	< 0.1	< 0.1	NA	20
SILVER	< 0.01	< 0.01	NA	20

Analyst: LB 11/16/95

Reviewer: KFL 11/16/95

Analytical Technologies, Inc.

TCLP METALS SPIKE RESULTS

METHOD:	1311	ATI I.D.:	511518
CLIENT:	GeoEngineers, Inc.	QC SAMPLE:	511518-1
PROJECT #:	4326-001-P62	DATE EXTRACTED:	11/06/95
PROJECT NAME:	Rose's Parking Lot	DATE DIGESTED:	11/08/95
SAMPLE MATRIX:	SOIL	DATE ANALYZED:	11/09,10/95
		DILUTION FACTOR:	1
		UNITS:	mg/L in Extract

PARAMETER	SAMPLE RESULT	SPIKE CONC	SPIKE RESULT	% RECOV	CONTROL LIMIT
ARSENIC	< 0.1	1.0	1.1	110	75-125%
BARIUM	1.0	2.0	3.1	105	75-125%
CADMIUM	< 0.01	1.00	0.99	99	75-125%
CHROMIUM	< 0.01	1.00	1.02	102	75-125%
LEAD	< 0.05	2.00	2.04	102	75-125%
MERCURY	< 0.0002	0.0020	0.0021	105	75-125%
SELENIUM	< 0.1	1.0	1.1	110	75-125%
SILVER	< 0.01	1.00	1.01	101	75-125%

Analyst: WS 11/16/95

Reviewer: KFL 11/16/95

AnalyticalTechnologies,Inc.

TCLP METALS BLANK SPIKE RESULTS

METHOD:	1311	ATI I.D.:	511518
CLIENT:	GeoEngineers, Inc.	QC SAMPLE:	Method Blank
PROJECT #:	4326-001-P62	DATE EXTRACTED:	11/06/95
PROJECT NAME:	Rose's Parking Lot	DATE DIGESTED:	11/08/95
SAMPLE MATRIX:	SOIL	DATE ANALYZED:	11/09,10/95
		DILUTION FACTOR:	1
		UNITS:	mg/L in Extract

PARAMETER	SPIKE CONC	SPIKE RESULT	% RECOV	CONTROL LIMIT
ARSENIC	1.0	1.0	100	80-120%
BARIUM	2.0	2.3	115	80-120%
CADMIUM	1.00	0.98	98	80-120%
CHROMIUM	1.00	0.98	98	80-120%
LEAD	2.00	2.00	100	80-120%
MERCURY	0.0020	0.0022	110	80-120%
SELENIUM	1.0	1.1	110	80-120%
SILVER	1.00	0.99	99	80-120%

Analyst: MS 11/16/95

Reviewer: KFL 11/16/95

Analytical Technologies, Inc.
17400 S.W. Upper Boones Ferry Rd., Suite 270
Durham, Oregon 97224 • (503) 684-0447 FAX: (503) 620-0393

DATE 11/3/95 PAGE 1 OF 1

Chain of Custody

LABORATORY NUMBER: 5-11518
PROJECT NOTICE NUMBER:

PROJECT MANAGER: Marsi Beeson
COMPANY: GeoEngineers
ADDRESS: 7504 SW Bridgeport Rd
Portland, OR 97266
PHONE: 624-5274 SAMPLED BY: MB2

SAMPLE DISPOSAL INSTRUCTIONS

☐ ATI Disposal @ $5.00 each ☐ Return

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	PETROLEUM HYDROCARBONS: TPH-HCID	State: OR/WA TPH-G	State: OR/WA TPH-D	State: OR/WA 418.1	EPA 418.1	8015M	8020M-BETX only	8310 HPLC PAHs	7421 Lead	% Moisture	ORGANICS: 8010 Halogenated VOCs	8020 Aromatic VOCs	8040 Phenols	8240 GCMS Volatiles	8270 GCMS Semivolatiles	8080 OC Pesticides/PCBs	8080M PCBs only	INORGANICS: Drinking Water (8)	Priority Pollutant Metals (13)	Cyanide	TCLP: TCLP Metals (8)	TCLP Volatiles 8240 ZH-EXT	TCLP Semivolatiles 8270	OTHER	NUMBER OF CONTAINERS
USTEXC-01-EAST	11/2/95		Soil	1	X										X	X					X				X				4
USTEXC-02-CENTER	11/2/95		Soil	2	X																								2
USTEXC-03-WEST	11/2/95		Soil	3	X																								2

PROJECT INFORMATION

PROJECT NUMBER: 4326-001-P62
PROJECT NAME: Rose's Parking Lot
PURCHASE ORDER NUMBER:
ONGOING PROJECT? YES X NO ☐

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS: 8
COC SEALS/INTACT? Y \ N (NA)
RECEIVED INTACT? (Y) \ N
RECEIVED COLD? (Y) \ N

PRIOR AUTHORIZATION REQUIRED FOR RUSH PROJECTS

TAT: (NORMAL) X 2 WKS (RUSH) ☐ 24 HR ☐ 48 HRS ☐ 72 HRS ☐ 1 WK
GREATER THAN 24 HR. NOTICE? YES ☐ NO ☐ (LAB USE ONLY)

SPECIAL INSTRUCTIONS:

Received via:

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY 3.
Signature: Marsi Beeson 10am	Signature	Signature
Printed Name: Marsi Beeson 11/3/95	Printed Name:	Printed Name:
Company: GeoEngineers	Company:	Company:
RECEIVED BY: 1.	**RECEIVED BY: 2.**	**RECEIVED BY: (LAB) 3.**
Signature:	Signature	Signature: Jenna Gorham 1010
Printed Name:	Printed Name:	Printed Name: Jenna Gorham 11-3-95
Company:	Company:	Analytical Technologies, Inc.

Don Pettit

26-94-025

Subsurface Assessment
Rose's Parking Lot
Portland, Oregon

August 28, 1995

For

AMOCO, Birnbach, Gull and Unocal

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED

AUG 29 1995

NORTHWEST REGION

GeoEngineers

File No. 4326-001-P62

GeoEngineers

August 28, 1995

Consulting Engineers and Geoscientists
Offices in Washington, Oregon, and Alaska

Mr. Max Birnbach
c/o Charles R. Williamson
Kell, Alterman & Runstein
1001 Southwest Fifth Avenue, Suite 1800
Portland, Oregon 97204

Attention: Mr. Max Birnbach

We are submitting one copy of our report of Subsurface Assessment for the site of Rose's Parking Lot located at 330 Northwest 23rd Avenue in Portland, Oregon. Our scope of services for this project is listed in our confirming agreement dated April 7, 1995. Our services were authorized in writing by Mr. Max Birnbach on April 10, 1995. Other parties involved with this project also have authorized our services.

We appreciate the opportunity to be of service to you. Please call if you have questions regarding this report or our services.

Yours very truly,
GeoEngineers, Inc.

Julia Fowler

Julia Fowler, P.E.
Associate

SAK:JF:mln
Document ID: 4326001.r1

cc: AMOCO
Ms. Janice M. McLain
Mr. Jeff Miller

Bell & Ingram, P.S.
Mr. Jeff C. Wishko

Gull Industries
Mr. Jeff Scott

Black Helterline
Mr. David Roy

Unocal
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Oregon Department of Environmental Quality
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CONTENTS

	Page No.
INTRODUCTION	1
PREVIOUS STUDIES	1
SCOPE OF SERVICES	2
SUBSURFACE SOIL EXPLORATIONS	3
REMEDIAL FEASIBILITY TESTING	3
REGULATORY CRITERIA	4
SOIL	4
GROUND WATER	4
SITE CONDITIONS	5
GENERAL	5
SUBSURFACE SOIL CONDITIONS	5
GROUND WATER AND FREE PRODUCT CONDITIONS	5
SUBSURFACE CONTAMINATION	6
Soil Contamination Observations	6
Analytical Testing Results for Soil Samples	6
Combustible Vapor Measurements	6
Ground Water Analytical Results	7
REMEDIAL FEASIBILITY TESTING	7
SOIL VAPOR EXTRACTION TEST	7
General	7
Test Well MW-5	7
Test Well MW-3	8
AQUIFER TESTING	8
CONCLUSIONS AND RECOMMENDATIONS	8
LIMITATIONS.	9

TABLES

	Table No.
Ground Water Elevations and Combustible Vapor Concentrations	1
Summary of Soil Field Screening and Chemical Analytical Results, Soil Borings	2
Summary of Ground Water Analytical Data, Monitoring Wells	3
Summary of Soil Vapor Extraction Pilot Test, Monitoring Data	4
Slug Test Results	5

CONTENTS (continued)

FIGURES	Figure No.
Vicinity Map	1
Site Plan	2
Ground Water Elevations, May 12, 1995	3

APPENDICES	Page No.
Appendix A - Field Explorations	A-1
Drilling and Soil Sampling Program	A-1
Field Screening of Soil Samples	A-1
Soils Laboratory Testing	A-2
Monitoring Well Construction	A-3
Combustible Vapor Concentrations	A-3
Ground Water Elevations	A-3
Ground Water Sampling Program	A-3
VES Pilot Test	A-4
Aquifer Test Data Analysis	A-4

APPENDIX A FIGURES	Figure No.
Soil Classification System	A-1
Key to Boring Log Symbols	A-2
Logs of Borings	A-3 ... A-8
Gradation Curves	A-9 ... A-10
Constant Values for Bouwer and Rice Equations	A-11
Definition of Terms	A-12
MW-5 Rising-head Test Elapsed Time vs. Drawdown	A-13
MW-2 Rising-head Test Elapsed Time vs. Drawdown	A-14
MW-4 Falling-head Test Elapsed Time vs. Drawdown	A-15
MW-5 Falling-head Test Elapsed Time vs. Drawdown	A-16
MW-4 Rising-head Test Elapsed Time vs. Drawdown	A-17

Appendix B - Chemical Analytical Program	B-1
Analytical Methods	B-1
Analytical Data Review	B-1
Analytical Data Review Summary	B-1
Chemical Analytical Data	1 . . . 79

SUBSURFACE ASSESSMENT
ROSE'S PARKING LOT
PORTLAND, OREGON
FOR
AMOCO, BIRNBACH, GULL AND UNOCAL

INTRODUCTION

This report summarizes the results of GeoEngineers' subsurface assessment conducted at the site of Rose's Parking Lot in May 1995. The site is located at 330 Northwest 23rd Avenue in Portland, Oregon. The location of the site relative to surrounding physical features is shown in Figure 1. The DEQ (Oregon Department of Environmental Quality) UST (underground storage tank) Cleanup List number for the site is 26-94-25.

The site was occupied by service stations operated by Unocal (Union Oil Company Of California), AMOCO (AMOCO Oil Company) and Gull (Gull Industries, Inc.) between the mid 1950s to the late 1970s. All aboveground structures have been removed, and the site currently is used for parking. The current owner of the property is Mr. Max Birnbach. Three previous investigations were conducted at the site by HAI (Hahn and Associates, Inc.) in January 1994 and by AGRA (AGRA Earth & Environmental, Inc.) in March and October 1994.

Based on our review of the reports prepared by HAI and AGRA, a service station was first constructed at the site in 1954. The original service station facilities consisted of three service islands, two 5,000-gallon USTs, one 550-gallon waste oil tank and a service station building. The station apparently was remodeled in 1964. Post-1964 facilities included two service islands, two 5,000-gallons USTs, a 550-gallon waste oil tank and a service station building. Records indicate that plans to install a 10,000-gallon UST were submitted to the city of Portland; however, it is unclear whether this tank was installed. Our understanding of the documented and proposed locations of the service station facilities between the mid 1950s to the late 1970s is presented in Figure 2.

PREVIOUS STUDIES

A subsurface investigation of soils was conducted at the site in January 1994 by HAI. Four soil borings (B-1 through B-4) were drilled and a magnetometer survey was performed. The magnetometer survey indicated the possible presence of a waste oil UST at the south property boundary. Soils encountered were described primarily as clayey silt and silty sand from approximately 10 feet below ground surface to the final depths of the borings. Silty gravel fill was encountered above the silts and sands. Petroleum hydrocarbons were detected in subsurface soil in the vicinity of the former USTs at depths of 13 and 18 feet in B-1 and at a depth of 20.5 feet in B-3. Petroleum hydrocarbons were not detected in soil samples obtained from B-2

located near a former pump island and B-4 located near the possible waste oil UST. Ground water was not analyzed during this study. The results of HAI's investigation are summarized in their report to the EDR Corporation, dated February 2, 1994.

AGRA conducted subsurface ground water investigation at the site in March 1994. AGRA's investigation included historical research and the installation of three monitoring wells (MW-1 through MW-3).

Soils encountered were described as fine- to medium-grained sand and silty sand. Concrete debris was encountered in the upper 8 feet during drilling of MW-1 in the vicinity of a former pump island. Gasoline-range hydrocarbons were detected in soil samples obtained from MW-1 between 13 and 18 feet below ground surface and in soil samples obtained from MW-2 at a depth of 15 feet. Ground water samples were obtained from MW-1 through MW-3 for chemical analysis. Benzene was detected in ground water samples obtained from MW-1 and MW-3 at concentrations greater than DEQ cleanup guidelines. The results of AGRA's subsurface ground water investigation are summarized in their report to Kell, Alterman & Runstein, dated April 8, 1994.

AGRA conducted a supplemental subsurface ground water investigation at the site in September 1994. The supplemental subsurface investigation included the drilling of three borings (B-5 through B-7), the installation of one upgradient monitoring well (MW-4) and conducting a geophysical survey of the site. The results of the geophysical survey indicated the presence of a UST near the southeast corner of the site. Additionally, two large anomalies were identified in the central portion of the site.

Petroleum hydrocarbons were detected at concentrations less than DEQ cleanup guidelines in one soil sample obtained from boring MW-4 at a depth of 5 feet. Petroleum hydrocarbons were not detected in soil samples obtained from borings B-5 through B-7. However, soil samples submitted for chemical analysis were obtained from relatively shallow depths of 5 feet below grade.

Monitoring wells MW-1 through MW-4 were tested for BETX (benzene, ethylbenzene, toluene and xylenes). BETX compounds were detected in water samples obtained from MW-1 and MW-3 at concentrations greater than the DEQ cleanup levels. The results of AGRA's supplemental subsurface investigation are summarized in their report to Kell, Alterman & Runstein, dated October 27, 1994.

SCOPE OF SERVICES

The purposes of our study were to (1) resolve apparently conflicting information regarding soil types beneath the site, (2) evaluate subsurface conditions in previously unexplored areas of the site, (3) identify feasible locations for completing off-site explorations, (4) evaluate horizontal hydraulic conductivity, and (5) evaluate the feasibility of soil vapor extraction as a remedial option for this site. The specific scope of services is outlined below.

SUBSURFACE SOIL EXPLORATIONS

1. Conduct a site visit to mark boring locations. Perform a reconnaissance of surrounding properties to evaluate potential off-site boring locations.
2. Drill three soil borings (B-11, B-12 and MW-5) in the southern half of the site and one boring (B-13) in the northwest portion of the site using hollow-stem auger drilling methods. Additionally, drill two borings (B-8 and B-9) to approximate depths of 30 feet in the vicinity of AGRA borings B-5 and B-6.
3. Obtain soil samples from the borings at approximately 2.5-foot or 5-foot intervals. Field screen the soil samples for evidence of petroleum hydrocarbons using visual examination, sheen screening and headspace vapor screening methods. Visually classify the soil types encountered in general accordance with ASTM (American Society for Testing and Materials) D 2488-90 and maintain a detailed log of each boring.
4. Submit at least one soil sample from each boring to a laboratory for chemical analysis of petroleum hydrocarbons by DEQ Method TPH-HCID and/or TPH-G.
5. Perform two laboratory grain-size distribution tests on soil samples obtained from borings B-8 and B-9.
6. Install 2-inch-diameter PVC (polyvinyl chloride) monitoring well casing with flush-grade, lockable surface monuments in boring MW-5.
7. Develop the well screen by hand-bailing using a stainless-steel bailer.
8. Determine the monitoring well casing rim elevations to the nearest 0.01 foot relative to an assumed site datum using an engineer's level.
9. Measure the airspace in the new and existing well casings for combustible vapors using a Bacharach TLV Sniffer.
10. Measure water table depths in the new and existing wells and measure the thickness of free (floating) product, if present.
11. Obtain ground water samples from the new and existing monitoring wells (MW-2 through MW-5) and submit the samples to a laboratory for analysis of BETX by EPA (U.S. Environmental Protection Agency) Method 8020 and TPH (total petroleum hydrocarbons) by EPA Method 418.1. Analyze two ground water samples for PAHs (polycyclic aromatic hydrocarbons) by EPA Method 8310.
12. Place soil cuttings and the decontamination/purge/development water in labeled 55-gallon drums.

REMEDIAL FEASIBILITY TESTING

1. Conduct rising-head aquifer slug tests in three of the monitoring wells and falling-head aquifer slug tests in two monitoring wells and monitor ground water levels during these tests. Calculate the in-situ horizontal hydraulic conductivities at the locations of the monitoring wells based on the slug test data.

2. Conduct 2-hour vapor extraction tests in two test wells using an explosion-proof regenerative blower. Obtain baseline measurements from the monitoring wells before beginning the vapor extraction pilot tests. Baseline measurements in the wells consisted of water levels and combustible vapor concentrations.
3. Monitor the air pressure, flow rate and water level in each test well on a periodic basis throughout each test.
4. Monitor the combustible vapor concentration in the exhaust stream on a periodic basis during each test.
5. Monitor induced subsurface vacuum pressures and combustible vapor concentrations in selected observation wells on a periodic basis through each test.
6. Estimate effective radius of vacuum influence. Review the results of previous studies and the current study to evaluate the potential effectiveness of vapor extraction as a remedial technology for this site.

REGULATORY CRITERIA

SOIL

DEQ has developed soil Matrix cleanup standards for UST sites with petroleum-contaminated soil where ground water is not affected. Ground water at the site has been affected by petroleum hydrocarbons. However, DEQ may elect to use the Matrix cleanup standards as discretionary soil cleanup guidelines for sites where petroleum hydrocarbons have been detected in ground water. In AGRA's report dated April 8, 1994 the site was rated as a Level 2 soil Matrix site with corresponding cleanup standards of 80 mg/kg (milligrams per kilogram) TPH for soil contaminated by gasoline and 500 mg/kg TPH for soil contaminated by diesel or heavier petroleum hydrocarbons.

GROUND WATER

DEQ's UST Cleanup Section has developed cleanup standards for ground water affected by releases from UST systems. The cleanup standards, which became effective October 1, 1992, include standards for BETX, PAHs and dissolved lead. A cleanup standard for TPH has not been established by DEQ or EPA. DEQ cleanup standards for selected compounds are as follows:

Compound	Ground Water Cleanup Level
Benzene	5 µg/l (micrograms per liter)
Ethylbenzene	700 µg/l
Toluene	1,000 µg/l
Xylenes	10,000 µg/l
Lead	5 µg/l
Naphthalene	28 µg/l
Acenaphthylene	NE
Fluorene	280 µg/l

Compound	Ground Water Cleanup Level
Phenanthrene	NE
Anthracene	2,100 µg/l

NE = not established

SITE CONDITIONS

GENERAL

The site is at an elevation of approximately 150 feet above mean sea level based on the USGS (United States Geological Service) 7.5 minute topographic quadrangle map for Portland, Oregon, dated 1977. The southern portion of the site is relatively flat, however, the northern portion of the site slopes down toward Northwest Flanders Street with an elevation change of approximately 10 feet. The site is currently paved. There are no above-grade structures on the property, except for parking lot access gates.

SUBSURFACE SOIL CONDITIONS

Exploratory borings were drilled to further explore subsurface soil conditions at the site. Six borings (B-8, B-9, MW-5 and B-11 through B-13) were drilled at the site between May 11 and 12, 1995. Approximate boring locations are shown on Figure 2. The logs for the borings are included in Appendix A.

The borings penetrated between 2 and 4 inches of asphalt concrete at the ground surface. Heterogeneous soil conditions were encountered beneath the pavement and generally consist of silt and sand with varying amounts of silt and gravel, with the exception of B-11. Soils encountered in B-11 consist of silt beneath the base of the paving which extends to the final depth of the boring (26.5 feet below grade). A 5-foot-thick layer of silty gravel was encountered with the silt in B-11 at a depth of approximately 12 feet below ground surface. Fill material was encountered in each boring to depths ranging between 5 and 12 feet. A definitive contact between fill material and native soils could not be determined in the field.

Soil samples obtained from depth of 20.5 and 15.5 feet from borings B-8 and B-9, respectively, were analyzed for grain-size. The sample from B-8 was classified as a sandy silt. The B-9 sample was classified as a silt with a trace of fine sand. The gradation curves for the two samples are included in Appendix A.

GROUND WATER AND FREE PRODUCT CONDITIONS

As discussed previously, four monitoring wells were installed at the site prior to GeoEngineers' investigation. Ground water conditions beneath the site were evaluated further during this study by constructing a monitoring well in one boring (MW-5). Construction details for the monitoring well are presented in Appendix A.

Ground water conditions in the monitoring wells were measured on May 12, 1995. The depths to ground water in MW-1 through MW-5 ranged from 20.75 to 23.48 feet below ground surface. The depths to ground water and ground water elevations measured during our site visit on May 12, 1995 are shown in Table 1.

Ground water elevations indicate a ground water flow direction toward the northeast. Ground water elevations and the inferred direction of flow based on the May 12, 1995 water level data are shown in Figure 3.

Free product, approximately 6 inches in thickness, was encountered in MW-1 on May 11, 1995. Construction records for MW-1 indicate that water and product levels measured in MW-1 were above the top of the well screen at the time of our May 11 measurements.

SUBSURFACE CONTAMINATION

Soil Contamination Observations

Slight to no sheens were observed during field screening of soil samples obtained from borings B-9 and B-11 through B-13. Headspace vapor screening did not indicate evidence of petroleum contamination in soil samples obtained from these borings. Heavy sheens and headspace vapors greater than 10,000 ppm (parts per million) were observed during field screening of soil samples obtained from MW-5 at depths of 23 and 25.5 feet below ground surface. Moderate to heavy sheens and relatively high headspace vapors were observed during field screening of soil obtained from B-8 at depths of 23 to 28 feet below ground surface. A moderate sheen also was observed in the soil sample obtained from B-8 at a depth of 15 feet. Field screening methods and results are included in Appendix A.

Analytical Testing Results for Soil Samples

Selected soil samples from the borings were submitted for petroleum hydrocarbon identification by DEQ methods TPH-HCID and/or TPH-G. Petroleum hydrocarbon were not detected in the soil samples submitted from B-9, B-11, B-12 and B-13. Gasoline-range hydrocarbons were detected at concentrations greater than the DEQ cleanup standard for Level 2 sites in the soil sample obtained from B-8 at a depth of 15.5 feet and in the soil sample obtained from MW-5 at a depth of 23 feet.

Chemical analytical data are summarized in Table 2. Laboratory reports are included in Appendix B.

Combustible Vapor Measurements

Combustible vapor concentrations were measured in the well casings (MW-2 through MW-5) on May 12, 1995 using a Bacharach TLV Sniffer calibrated to hexane. Combustible vapor concentrations were less than 400 ppm in monitoring wells MW-3 and MW-4. The combustible vapor concentrations were greater than 10,000 ppm in monitoring well MW-2 and were 7,800 ppm in MW-5. Combustible vapor concentrations in MW-1 do not represent vadose

zone conditions because of the presence of water above the top of the well screen and therefore are not presented. Combustible vapor concentrations measured in the monitoring well casings are summarized in Table 1.

Ground Water Analytical Results

Ground water samples were obtained from monitoring wells MW-2 through MW-5 on May 12, 1995 and analyzed for one or more of the following: BETX by EPA Method 8020, TPH by EPA Method 418.1, and PAHs by EPA Method 8310. Ground water samples were not obtained from MW-1 because of the presence of free product in the well.

BETX and TPH either were not detected or were detected at concentrations less than the DEQ cleanup levels in the ground water samples obtained from monitoring wells MW-2 and MW-4. BETX were detected at concentrations greater than DEQ cleanup levels in the ground water sample obtained from MW-5. Benzene and ethylbenzene were detected at concentrations greater than DEQ cleanup guidelines in MW-3. Total petroleum hydrocarbons were detected in monitoring wells MW-3 and MW-5. Subsequent analysis for PAHs detected several non-carcinogenic PAH compounds in the samples, including naphthalene, acenaphthylene, fluorene, phenanthrene and anthracene. Naphthalene was detected in both MW-3 and MW-5 at concentrations greater than the DEQ cleanup level. The other detected PAH compounds either were detected at concentrations less than the DEQ cleanup levels or do not have established DEQ cleanup levels. Ground water chemical analytical results are summarized on Table 3. Laboratory reports are included in Appendix B.

REMEDIAL FEASIBILITY TESTING

SOIL VAPOR EXTRACTION TESTS

General

Two SVE (soil vapor extraction) pilot tests were performed at the site on May 15, 1995. Monitoring wells MW-5 and MW-3 were each used as a test well. The vapor extraction pilot tests were each conducted for approximately 2 hours, as shown in the schedule presented in Table 4. Combustible vapor concentrations and/or ground vacuum pressure were measured in selected observation wells during each test. Applied vacuum pressure was gradually increased during each test. An air dilution valve was used to modify the applied vacuum pressure. Depths to water were measured during the test to confirm that the water level remained below the top of the screen in the test well.

Test Well MW-5

An SVE test was conducted on monitoring well MW-5 for 2 hours. Airflow rates as measured in the emissions stack ranged between 7 and 96 cfm (cubic feet per minute). The highest airflow measurement was obtained when the applied vacuum pressure was 10 inches water

column. The highest concentrations of combustible vapors in the emissions stack (500 to 5,000 ppm) were observed when applied vacuum pressures ranged between 40 and 51 inches water column.

Monitoring wells MW-1, MW-3 and MW-4 were used as observation wells during the test. Changes in vacuum pressure and combustible vapor concentrations were not observed in the observation wells during the test.

Test Well MW-3

An SVE test was conducted on MW-3 for 2 hours. Airflow rates as measured in the exhaust stack ranged between 14 and 74 cfm. The highest airflow rate was measured when the applied vacuum pressure was 10 inches water column. Emission stack vapors greater than 100 ppm were not observed during the test.

Monitoring wells MW-2 and MW-5 were selected as observation wells during the test. Significant changes in vacuum pressure and combustible vapor concentrations were not observed in the observation wells during the test.

AQUIFER TESTING

Rising- and/or falling-head slug tests were conducted in monitoring wells (MW-2, MW-4 and MW-5) on May 16, 1995. Equations that were used to calculate hydraulic conductivities are presented in Appendix A. Calculated values of horizontal hydraulic conductivity, based on the plots of drawdown versus elapsed time (Figures A-13 through A-17) and the equations presented in Appendix A, ranged from 5×10^{-7} m/s (meters per second) to 8×10^{-7} m/s. The average calculated hydraulic conductivity beneath the site is 7×10^{-7} m/s, which generally corresponds with published values for silt to silty sand. The hydraulic conductivity values calculated based on the slug tests are presented in Table 5.

CONCLUSIONS AND RECOMMENDATIONS

Free product was detected in MW-1 at the time of our May 1995 site activities. Well MW-1 is located in the central portion of the site. Water and product levels were above the top of the well screen at the time of our measurements. Therefore, free product conditions in this area could not be adequately characterized.

Soil contamination is present in the central portion of the site and appears to be related to former USTs and pump islands. Gasoline-range hydrocarbons were detected in soil between depths of 13 and 26 feet below ground surface. Our estimate of the approximate lateral extent of soil with contamination exceeding DEQ cleanup level is shown in Figure 2.

Petroleum-related compounds were detected at concentrations greater than DEQ cleanup levels in ground water from three monitoring wells at the site (MW-1, MW-3 and MW-5). Petroleum-related compounds also were detected in MW-2, however, concentrations were less than the DEQ cleanup levels.

We identified three potential off-site boring locations during our May site visits. The potential boring locations are in the sidewalk along Northwest Flanders Street, directly east of the property between MW-2 and MW-3, and in a parking lot located adjacent to the southeast property corner.

Petroleum-impacted soil consists primarily of silty sand and silt. The results of aquifer slug testing indicate that the saturated soil has a relatively low hydraulic conductivity.

We recommend that select representatives of the involved parties discuss potential remedial options and goals for the site in the near future.

LIMITATIONS

We have prepared this report for use by Max Birnbach, AMOCO, Gull, Unocal and their authorized agents. This report may be made available to regulatory agencies. This report is not intended for use by anyone else not listed above, and the information contained herein is not applicable to other sites.

Our interpretations of subsurface conditions are based on data from widely spaced sampling locations. It is always possible that contamination exists in areas of the property that were not explored, sampled or tested.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Yours very truly,

GeoEngineers, Inc.

Sarah A. Kingery
Geologist

Julia Fowler, P.E.
Associate

SAK:JF:mln
Document ID: 4326001.r1

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TABLE 1
GROUND WATER ELEVATIONS AND COMBUSTIBLE VAPOR CONCENTRATIONS

Monitoring Well[1]	Date Measured	Water Depth From Ground Surface (feet)	Ground Water Elevation[2] (feet)	Combustible Vapor Concentration[3] (ppm)
MW-1	5/12/95	23.29	78.75[4]	Note[5]
MW-2	5/12/95	20.75	77.54	>10,000
MW-3	5/12/95	23.48	77.86	<400
MW-4	5/12/95	22.55	79.93	<400
MW-5	5/12/95	22.35	80.06	7,800

Notes:

[1]Approximate locations of monitoring wells are shown in Figures 2 and 3.

[2]Elevations are measured relative to the temporary benchmark shown in Figure 2. The benchmark has an assumed elevation of 100.00 feet.

[3]Measured with a Bacharch TLV Sniffer calibrated to hexane and equipped with a drop hose lowered to within 1 foot of the ground water table. The lower threshold of significance in this application is 400 ppm.

[4]Approximately 0.11 foot of product was encountered. The ground water elevation was corrected for the presence of free product using a specific gravity of 0.7.

[5]Combustible vapor measurements are not representative of soil conditions because the water table was above the top of the screen.

ppm = parts per million

No. 4326001A

TABLE 2
SUMMARY OF SOIL FIELD SCREENING AND CHEMICAL ANALYTICAL RESULTS[1]
SOIL BORINGS

Boring Number	Sample Number	Date Sampled	Sample Depth (feet)	Field Screening Results[2]		Hydrocarbon Identification (DEQ Method TPH-HCID) (mg/kg)			Gasoline-range Hydrocarbons (DEQ Method TPH-G) (mg/kg)
				Headspace Vapor (ppm)	Sheen	Gasoline	Diesel	Heavy Oil	
B-8	B-8-15.5	05/11/95	15.5	160	MS	>20	>50[3]	NO	130
B-8	B-8-23.0	05/11/95	23.0	>10,000	HS	<20	<50	NO	--
B-9	B-9-23.0	05/11/95	23.0	340	SS	<20	<50	NO	--
MW-5	B-10/MW-5-23.0	05/11/95	23.0	>10,000	HS	>20	>50[3]	NO	5,200
B-11	B-11-20.5	05/12/95	20.5	<100	NS	<20	<50	NO	--
B-12	B-12-20.5	05/12/95	20.5	<100	SS	<20	<50	NO	--
B-13	B-13-15.5	05/12/95	15.5	110	SS	<20	<50	NO	--
B-13	B-13-23.0	05/12/95	23.0	120	SS	<20	<50	NO	--
DEQ Level 2 Soil Matrix Cleanup Standard						NA	NA	NA	80

Notes:

[1]Samples were analyzed by Analytical Technologies, Inc. of Durham, Oregon.

[2]Field screening procedures are described in Appendix A. NS = no sheen, SS = slight sheen, MS = moderate sheen, HS = heavy sheen

[3]The laboratory reported that diesel-range hydrocarbons identified in the sample were the result of an overlap from the gasoline-range; therefore, diesel-range hydrocarbons were not quantified.

DEQ = Oregon Department of Environmental Quality

ppm = parts per million

mg/kg = milligrams per kilogram

'--' = not analyzed

NO = not observed

NA = not applicable

TABLE 3
SUMMARY OF GROUND WATER ANALYTICAL DATA[1]
MONITORING WELLS

Monitoring Well Number[2]	Date Sampled[3]	BETX[4] (EPA Method 8020) (µg/l)				Total Petroleum Hydrocarbons (EPA Method 418.1) (mg/l)	PAHs[5] (EPA Method 8310) (µg/l)
		B	E	T	X		
MW-1	03/29/94	130	98	390	1,570	--	--
	10/04/94	27	5.9	46	70.0	--	--
	05/12/95[6]	--	--	--	--	--	--
MW-2	03/29/94	4.9	0.7	1.4	3.0	--	--
	10/04/94	<0.5	<0.5	<0.5	<0.5	--	--
	05/12/95	1.2	0.6	<0.5	0.7	<0.5	--
MW-3	03/29/94	2,300	1,200	1,200	3,700	--	--
	10/04/94	1,520	790	600	1,600	--	--
	05/12/95	1,300	800	740	2,000	3.5	Naphthalene 130 Fluorene 0.2 Phenanthrene 0.09
MW-4	10/04/94	<0.5	<0.5	<0.5	<0.5	--	--
	05/12/95	<0.5	<0.5	<0.5	<0.5	<0.5	--
MW-5	05/12/95	660	1,900	13,000	11,000	13	Naphthalene 450 Acenaphthylene 66 Fluorene 0.6 Phenanthrene 0.42 Anthracene 0.07
DEQ Cleanup Levels		5	700	1,000	10,000	NA	Naphthalene 28 Acenaphthylene NE Fluorene 280 Phenanthrene NE Anthracene 2,100

Notes:

[1]Chemical analyses were conducted by Analytical Technologies, Inc. of Durham, Oregon.

[2]Approximate monitoring well locations are shown in Figure 2.

[3]Ground water samples obtained prior to 05/12/95 were obtained by others. Analytical data were provided to GeoEngineers by Unocal.

[4]B = benzene, E = ethylbenzene, T = toluene, X = xylenes

[5]PAHs = polycyclic aromatic hydrocarbons. Only analytes detected are listed.

[6]Monitoring well MW-1 was not sampled due to the presence of free product.

µg/l = micrograms per liter

mg/l = milligrams per liter

"--" = not analyzed

NA = not applicable

NE = not estbalished

Shading indicates concentrations greater than DEQ cleanup levels.

No. 4326001B

TABLE 4
SUMMARY OF SOIL VAPOR EXTRACTION PILOT TEST MONITORING DATA[1]

Test Well Number	Time of Day (24-hour basis)	VES Monitoring Data: System Vacuum Pressure[2] (inches water column)	VES Monitoring Data: Emissions Stack Vapors[3] (ppm)	VES Monitoring Data: Emissions Stack Airflow Rate[4] (cfm)	Observation Well Data Vacuum Pressure[2]/Combustible Vapors[3] (inches water column/ppm): MW-1	MW-3	MW-4
MW-5	1115	0	0	0	0/>10,000	0/140	0/<100
	1120	10	80	96	--	--	--
	1123	20	160	44	--	--	--
	1125	30	120	65	0/>10,000	0/<100	0/<100
	1135	40	5,000	61	--	--	--
	1140	51	550	10	--	--	--
	1142	51	400	10	--	--	--
	1200	47	400	9	0/>10,000	0/<100	0/<100
	1206	40	100	33	--	--	--
	1230	40	500	7	--	--	--
	1236	35	70	57	--	--	--
	1302	35	76	57	--	--	--
	1320	34	20	59	0/>10,000	0/<100	0/<100

Test Well Number	Time of Day (24-hour basis)	VES Monitoring Data: System Vacuum Pressure[2] (inches water column)	VES Monitoring Data: Emissions Stack Vapors[3] (ppm)	VES Monitoring Data: Emissions Stack Airflow Rate[4] (cfm)	Observation Well Data Vacuum Pressure[2]/ Combustible Vapors[3] (inches water column/ppm): MW-2	MW-5
MW-3	1430	0	<100	0	0/200	0/<100
	1434	10	<100	74	--	--
	1436	20	<100	70	--	--
	1438	30	<100	57	0/250	0/<100
	1444	30	<100	57	--	--
	1508	30	<100	57	0/--	0/--
	1512	40	<100	48	0/--	0/--
	1516	40	<100	44	--	--
	1532	40	<100	48	--	--
	1535	45	<100	14	0/--	0/--
	1539	45	<100	14	--	--
	1614	45	<100	22	0/--	0/--
	1630	45	<100	15	0/--	0/--

Notes:

[1]The vapor extraction equipment was connected to monitoring wells MW-3 and MW-5 on 05/15/95. Each test was operated for 2 hours.

[2]Vacuum pressure readings were obtained using portable Dwyer Magnehelic vacuum pressure gauges. The system vacuum pressure is the vacuum applied by the blower to the vapor extraction well.

[3]Combustible vapor measurements were obtained with a Bacharach TLV Sniffer calibrated to hexane. The lower threshold of significance for the TLV Sniffer in this application is 100 ppm.

[4]Airflow velocity measurements were obtained with a Dwyer Series 470 air velocity meter. Velocity measurements were converted to flow rate (cfm) by multiplying the velocity by the cross-sectional area of the emissions stack.

ppm = parts per million, cfm = cubic feet per minute, "--" = not measured

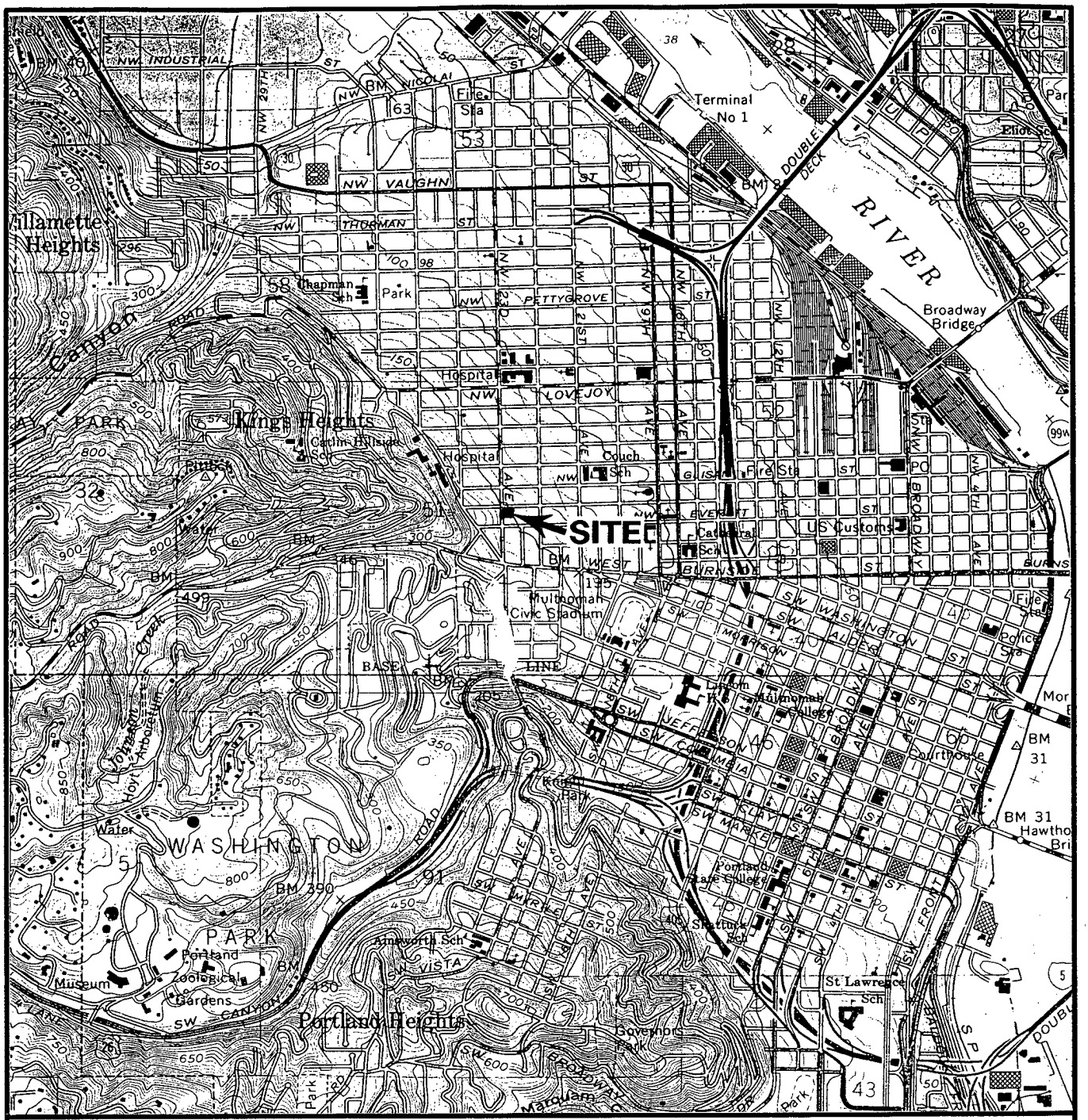
No. 4326001C

TABLE 5
SLUG TEST RESULTS

Monitoring Well Number	Aquifer Test	Horizontal Hydraulic Conductivity (m/s)	Corresponding Soil Type[1]
MW-2	Rising-head	6×10^{-7}	Silt to silty sand
MW-4	Falling-head	5×10^{-7}	Silt to silty sand
	Rising-head	7×10^{-7}	Silt to silty sand
MW-5	Falling-head	8×10^{-7}	Silt to silty sand
	Rising-head	8×10^{-7}	Silt to silty sand

Notes:
[1]From Freeze and Cherry, 1979.
m/s = meters per second

No. 4326001



Reference: USGS 7.5' topographic quadrangle map, "Portland, OR – WA," photorevised 1977.

4326-001-P62 SAK:MAD 05/25/95

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VICINITY MAP

FIGURE 1

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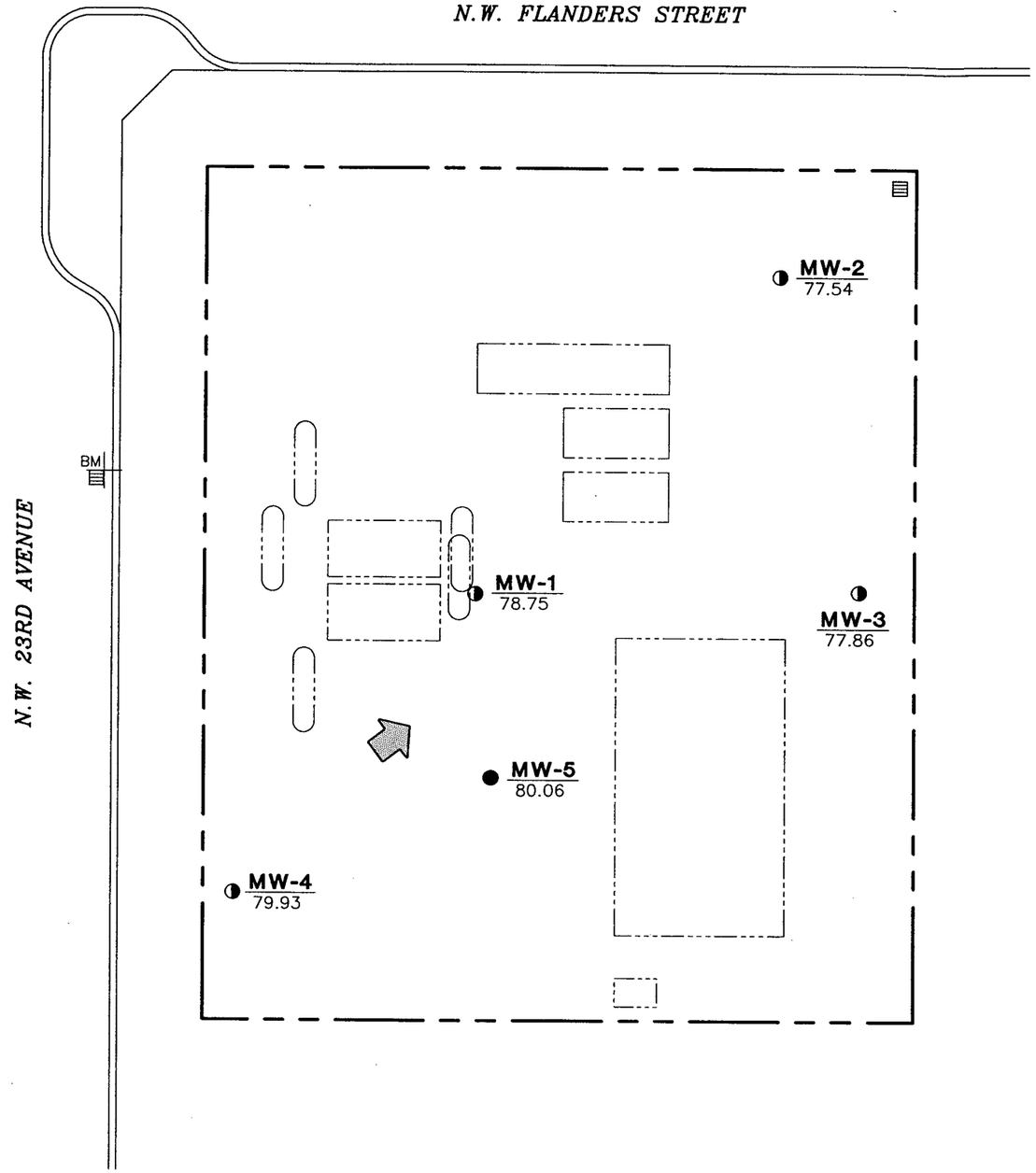

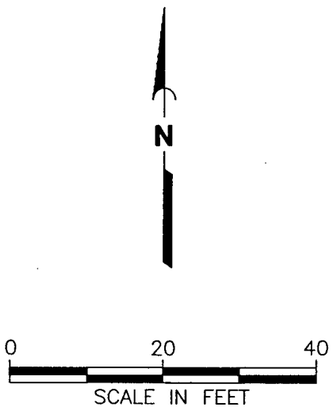

EXPLANATION:

MW-5 80.06 ● — MONITORING WELL BY GEOENGINEERS; GROUND WATER ELEVATION (IN FEET) ON 05/12/95

MW-1 78.75 ◑ — MONITORING WELL BY OTHERS; GROUND WATER ELEVATION (IN FEET) ON 05/12/95

APPROXIMATE DIRECTION OF GROUND WATER FLOW

BM — BENCHMARK AT NORTHEAST CORNER OF CATCH BASIN ON NW 23RD AVENUE: ASSUMED ELEVATION 100.00 FEET

Reference: Drawing entitled, "Soil Boring Location Map," dated 02/94, by Hahn & Associates Incorporated, and drawing entitled, "Golden Eagle Service Station," undated by Unocal, and drawing entitled, "Rose's Parking Lot, 330 NW 23rd Avenue," dated 10/94, by AGRA, and drawing entitled, "Site Diagram—Rosewood Parking Lot," undated, by GeoPotential.

Notes: 1. The locations of all features shown are approximate.
2. See Figure 2 for facilities identification.

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GROUND WATER ELEVATIONS MAY 12, 1995

FIGURE 3

4326-001-P62 SAK:MAD 05/02/95

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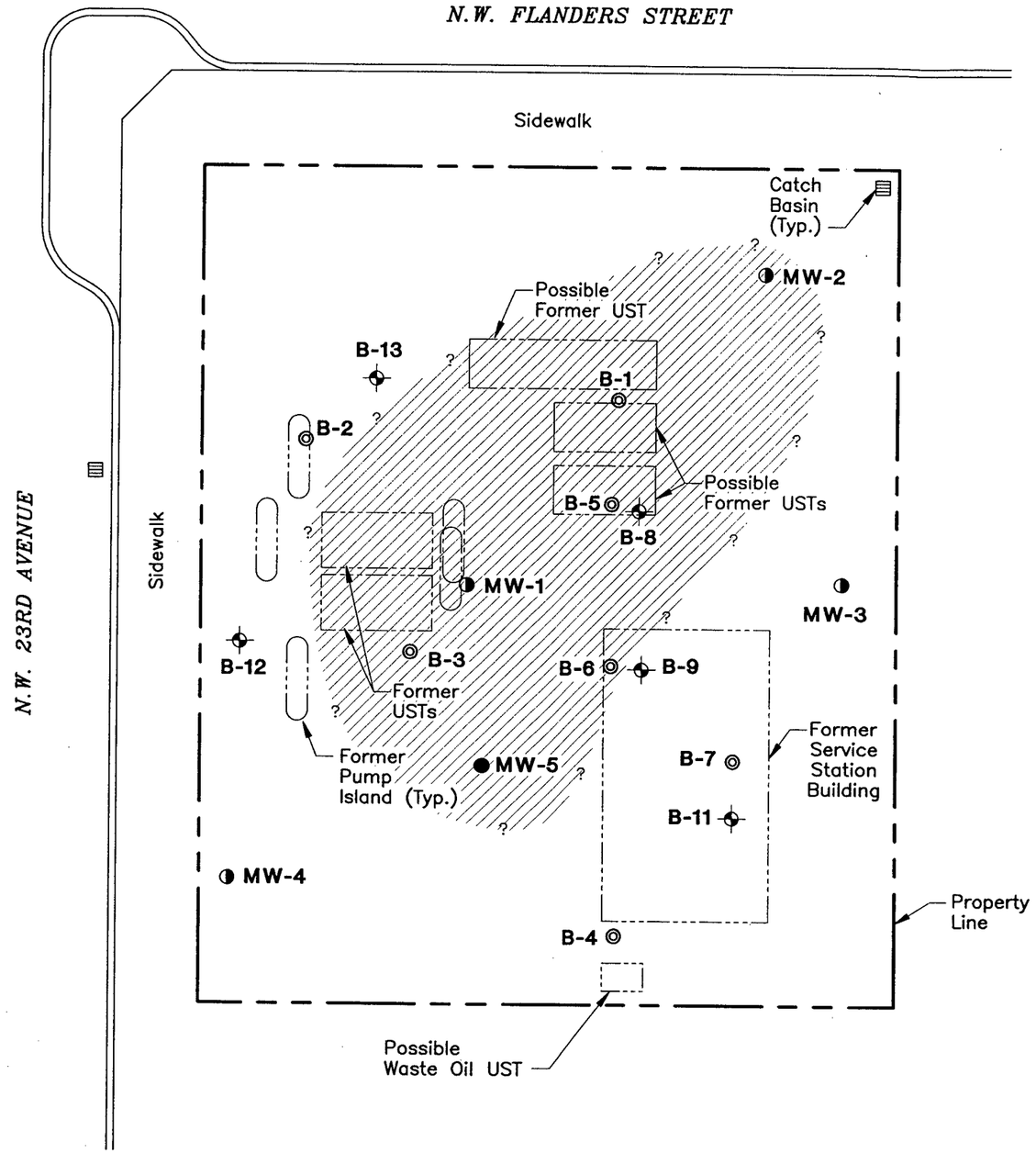

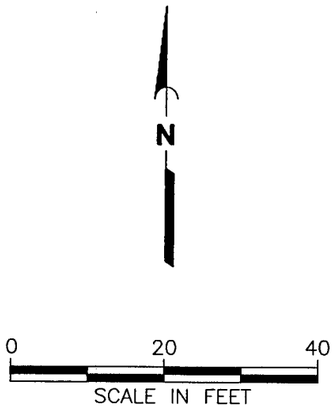

EXPLANATION:

MW-5 ●	MONITORING WELL BY GEOENGINEERS
B-8 ⊕	BORING BY GEOENGINEERS
MW-1 ◑	MONITORING WELL BY OTHERS
B-1 ◎	BORING BY OTHERS
UST	UNDERGROUND STORAGE TANK
? ? ?	ESTIMATED AREA OF SUBSURFACE SOIL CONTAMINATION

Reference: Drawing entitled, "Soil Boring Location Map," dated 02/94, by Hahn & Associates Incorporated, and drawing entitled, "Golden Eagle Service Station," undated by Unocal, and drawing entitled, "Rose's Parking Lot, 330 NW 23rd Avenue," dated 10/94, by AGRA, and drawing entitled, "Site Diagram—Rosewood Parking Lot," undated, by GeoPotential.

Note: The locations of all features shown are approximate.

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SITE PLAN

FIGURE 2

4326-001-P62 SAK:MAD 05/02/95

APPENDIX A

APPENDIX A

FIELD PROCEDURES

DRILLING AND SOIL SAMPLING PROGRAM

Subsurface soil conditions at the former Rose's Parking Lot were explored by drilling six borings (B-8, B-9, MW-5, and B-11 through B-13) between May 11 and 12, 1995. The borings were drilled using truck-mounted, hollow-stem auger drilling equipment owned and operated by Cascade Drilling of Portland, Oregon. The drilling and soil sampling equipment was cleaned with a hot-water pressure washer before drilling each boring.

A representative from our staff examined and classified the soils encountered and prepared a detailed log of each boring. Soils encountered were visually classified in general accordance with ASTM (American Society for Testing and Materials) D 2488-90, which is described in Figure A-1. An explanation of the boring log symbols is presented in Figure A-2. The boring logs are presented in Figures A-3 through A-8.

Soil samples were obtained from each boring using a Dames & Moore split-barrel sampler (2.4-inch inside diameter). The sampler was driven 18 inches using a 300-pound weight falling a vertical distance of 30 inches. The number of blows needed to advance the sampler the final 12 inches or other specified interval is indicated to the left of the corresponding sample notations on the appropriate boring logs.

The sampling equipment was cleaned between each sampling attempt with a Liquinox wash and a distilled water rinse. Clean brass liners were used in the Dames & Moore samplers to obtain soil samples. Soil samples were immediately covered with a teflon seal and cap to minimize volatilization of contaminants. Based on field screening results, at least one sample from each boring was selected for chemical analysis. Each soil sample analyzed is denoted in our boring logs with a "CA." The soil samples were kept cool in the field and during transport to the analytical laboratory. Chain-of-custody procedures were followed in transporting the soil samples to the laboratory. Analytical results are summarized in Table 2. The laboratory reports are presented in Appendix B.

Two soil samples were selected for sieve analysis. Each soil sample submitted for grain-size analysis is denoted in our boring logs with a "SA."

Soil cuttings generated during drilling were placed in seventeen labeled 55-gallon drums which are stored on site for disposal at a later date.

FIELD SCREENING OF SOIL SAMPLES

Our field representative performed field screening tests on the soil samples obtained from the soil borings. Field screening results are used as a general guideline to delineate areas of possible petroleum-related contamination. In addition, field screening results are used to aid in the selection of soil samples for chemical analysis. The field screening methods used include (1) visual

screening, (2) water sheen screening, and (3) headspace vapor screening using a Bacharach TLV Sniffer calibrated to hexane. The results of headspace and sheen screening are included in Table 2 and on the boring logs.

Visual screening consists of inspecting the soil for stains indicative of petroleum-related contamination. Visual screening generally is more effective when contamination is related to heavy petroleum hydrocarbons, such as motor oil, or when hydrocarbon concentrations are high. Water sheen and headspace vapor screening are more sensitive screening methods that have been effective in detecting contamination at concentrations less than regulatory cleanup guidelines.

Water sheen screening involves placing soil in a pan of water and observing the water surface for signs of sheen. Sheen testing can detect the presence of volatile and nonvolatile hydrocarbons. Sheens observed are classified as follows:

No Sheen (NS)	No visible sheen on the water surface.
Slight Sheen (SS)	Light, colorless, dull sheen; spread is irregular, not rapid; sheen dissipates rapidly. Natural organic matter in the soil may produce a slight sheen.
Moderate Sheen (MS)	Light to heavy sheen; may have some color/iridescence; spread is irregular to flowing, may be rapid; few remaining areas of no sheen on the water surface.
Heavy Sheen (HS)	Heavy sheen with color/iridescence; spread is rapid; entire water surface may be covered with sheen.

Headspace vapor screening targets volatile hydrocarbons and involves placing a soil sample in a plastic sample bag. Air is captured in the bag, and the bag is shaken to expose the soil to the air trapped in the bag. The probe of a Bacharach TLV Sniffer is inserted in the bag, and the TLV Sniffer measures the concentration of combustible vapors in the air removed from the sample bag headspace. Headspace vapor screening targets volatile petroleum hydrocarbon compounds. The TLV Sniffer measures concentrations in ppm (parts per million) and is calibrated to hexane. The TLV Sniffer is designed to quantify combustible gas concentrations up to 10,000 ppm.

Field screening results are site- and boring-specific. The results vary with temperature, moisture content, soil type and type of contaminant.

SOILS LABORATORY TESTING

Selected soil samples from the subsurface explorations were tested in GeoEngineers' soil testing laboratory to verify field classifications. Soil samples were classified in the laboratory in general accordance with ASTM D 2487 based on the results of each test. The laboratory classifications are included in the boring logs where those classifications differed from the field classifications.

MONITORING WELL CONSTRUCTION

Two-inch-diameter, Schedule 40 PVC pipe was installed in boring MW-5 at the completion of drilling. The lower portion of the PVC pipe is machine-slotted (0.02-inch slot width) to allow entry of water, floating hydrocarbons and combustible vapors into the well casing. Medium sand was placed in the borehole annulus surrounding the slotted portion of the PVC pipe. The 2-inch-diameter well casing is protected with a lockable, flush-grade surface monument. Monitoring well construction details are shown in Figure A-6.

The monitoring well was developed by surging and removal of at least five standing well volumes of water. The monitoring well casing rim elevations of the new and existing monitoring wells were surveyed on May 11, 1995 to the nearest of 0.01 foot using an engineer's level and an assumed site datum of 100.00 feet.

Monitoring well development and purge water was contained and currently is stored on site in eleven 55-gallon drums.

COMBUSTIBLE VAPOR CONCENTRATIONS

Combustible vapor concentrations were measured in the monitoring well casings of MW-2 through MW-5 on May 12, 1995. Combustible vapor concentrations were measured using a Bacharach TLV Sniffer calibrated to hexane. The probe connected to the TLV Sniffer was lowered into the well casing. The lower threshold of significance for the TLV Sniffer in this application is 400 ppm, or 3.6 percent of the lower explosive limit for hexane. Combustible vapor concentrations are summarized in Table 1.

GROUND WATER ELEVATIONS

The depths to the ground water table relative to the monitoring well casing rims were measured in monitoring wells MW-1 through MW-5 on May 12, 1995. The depths to ground water were measured using an electric water level indicator to the nearest of 0.01 foot. The approximate thickness of free product was determined by observing the volume of product recovered in a disposable bailer. Water table elevations were calculated by subtracting the water table depths from the casing rim elevations. Depths to water from ground surface and ground water elevations are summarized in Table 1. Ground water elevations from the May 12, 1995 measurements are shown on Figure 3.

GROUND WATER SAMPLING PROGRAM

Ground water samples were obtained from monitoring wells MW-2 through MW-5 on May 12, 1995. Ground water samples were not obtained from MW-1 because of the presence of free product in the well. Each ground water sample was obtained using a disposable polyethylene bailer after at least three well volumes of water were removed from each well casing. A new bailer and cord were used in each monitoring well to reduce the possibility of cross-contamination.

The water samples were transferred to containers provided by the analytical laboratory. Ground water chemical analytical data are summarized in Table 3. Laboratory reports are included in Appendix B.

VES PILOT TEST

The vapor extraction test was conducted using a Rotron Model EN454, 1.5-horsepower regenerative blower. Applied vacuum pressure was measured on an in-line pressure gauge installed on the vacuum side of the blower. Air flow was measured using an Omega Model HHF-40 air velocity meter that was inserted into the exhaust stack. Extracted vapors were emitted to the atmosphere through an 8-foot-high exhaust stack. Combustible vapor concentrations in the well casings were obtained using a Bacharach TLV Sniffer. Induced subsurface pressures vacuum were measured using Dwyer Magnehelic gauges. Stack emissions were measured using a Bacharach TLV Sniffer calibrated to hexane.

AQUIFER TEST DATA ANALYSIS

Hydraulic conductivities were calculated using the Bouwer and Rice slug test method as presented in the journal *Ground Water* (Vol. 27, No. 3, May-June 1989, pages 304-309) by H. Bouwer. Hydraulic conductivities were calculated using the following equations.

$$K = \frac{r_c^2 \ln(R_e/r_w)}{2L_e} \frac{1}{t} \ln \frac{Y_o}{Y_t}$$

where

$$\ln \frac{R_e}{r_w} = \left(\frac{1.1}{\ln(L_w/r_w)} + \frac{A + B \ln [(H - L_w)/r_w]}{L_e/r_w} \right)^{-1}$$

Note: The values of the coefficients *A and C* as a function of L_e/r_w for the calculation of $\ln(R_e/r_w)$ are determined using the plot shown in Figure A-11.

The terms used in these equations are defined in Appendix Figure A-12. The equations are based on the following assumptions. These assumptions are based on an ideal aquifer; however, for the scale at which the slug testing is completed, the assumptions are valid.

- All layers are horizontal and extend infinitely in the radial direction.
- The initial piezometric surface (before extraction) is horizontal and extends infinitely in the radial direction.
- The aquifer is homogeneous and isotropic.
- Ground water density and viscosity are constant.
- Ground water flow can be described by Darcy's Law.
- A volume of water is displaced instantaneously at time $t=0$.

- Head losses through the well screen, filter material, and developed zone (if present) are negligible.
- The aquifer is incompressible.
- Change in the piezometric surface is small compared to the aquifer saturated thickness.

Based on our knowledge of the site soils, monitoring well drilling methods, and monitoring well materials and construction method, we made the following site-specific assumptions.

- The radius of the borings (r_w) is approximately 4.5 inches (0.375 feet).
- The filter pack porosity is approximately 0.25 and is greater than the surrounding soil.

Plots of drawdown (Y_i) versus elapsed time for the tests in the three monitoring wells tested are shown in appendix Figures A-13 through A-17. Best fit lines through the data were selected visually. The best fit lines were chosen assuming that the initial rapid head rise was caused by recharge from the highly permeable sand pack surrounding the well. Calculated horizontal hydraulic conductivities based on the rising- and falling-head data are summarized in Table 5.

SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE GRAINED SOILS More Than 50% Retained on No. 200 Sieve	GRAVEL More Than 50% of Coarse Fraction Retained on No. 4 Sieve	CLEAN GRAVEL	GW	WELL-GRADED GRAVEL, FINE TO COARSE GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SAND More Than 50% of Coarse Fraction Passes No. 4 Sieve	CLEAN SAND	SW	WELL-GRADED SAND, FINE TO COARSE SAND
			SP	POORLY-GRADED SAND
		SAND WITH FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE GRAINED SOILS More Than 50% Passes No. 200 Sieve	SILT AND CLAY Liquid Limit Less Than 50	INORGANIC	ML	SILT
			CL	CLAY
		ORGANIC	OL	ORGANIC SILT, ORGANIC CLAY
	SILT AND CLAY Liquid Limit 50 or More	INORGANIC	MH	SILT OF HIGH PLASTICITY, ELASTIC SILT
			CH	CLAY OF HIGH PLASTICITY, FAT CLAY
		ORGANIC	OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			PT	PEAT

NOTES:

1. Field classification is based on visual examination of soil in general accordance with ASTM D2488-90.
2. Soil classification using laboratory tests is based on ASTM D2487-90.
3. Descriptions of soil density or consistency are based on interpretation of blow count data, visual appearance of soils, and/or test data.

SOIL MOISTURE MODIFIERS:

Dry - Absence of moisture, dusty, dry to the touch

Moist - Damp, but no visible water

Wet - Visible free water or saturated, usually soil is obtained from below water table

GEI 85-85 Rev. 05/93

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SOIL CLASSIFICATION SYSTEM

FIGURE A-1

C:\DETAILS\K2BOR300

LABORATORY TESTS:

CA Chemical Analysis

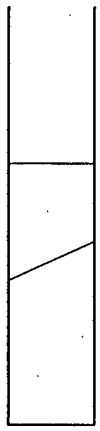
FIELD SCREENING TESTS:

Headspace vapor concentration data given in parts per million

Sheen classification system:

NS No Visible Sheen
SS Slight Sheen
MS Moderate Sheen
HS Heavy Sheen
-- Not Tested

SOIL GRAPH:



SM Soil Group Symbol (See Note 2)

Distinct Contact Between Soil Strata

Gradual or Approximate Location of Change Between Soil Strata

Water Level

Bottom of Boring

BLOW-COUNT/SAMPLE DATA:

Blows required to drive a 2.4-inch I.D. split-barrel sampler 12 inches or other indicated distances using a 300-pound hammer falling 30 inches.

22 ■ Location of relatively undisturbed sample

12 ⊠ Location of disturbed sample

17 □ Location of sampling attempt with no recovery

Blows required to drive a 1.5-inch I.D. (SPT) split-barrel sampler 12 inches or other indicated distances using a 140-pound hammer falling 30 inches.

10 ◨ Location of sample obtained in general accordance with Standard Penetration Test (ASTM D 1586) procedures

26 ▯ Location of SPT sampling attempt with no recovery

▤ Location of grab sample

"P" indicates sampler pushed with weight of hammer or against weight of drill rig.

NOTES:

1. The reader must refer to the discussion in the report text, the Key to Boring Log Symbols and the exploration logs for a proper understanding of subsurface conditions.
2. Soil classification system is summarized in Figure A-1.

GEI 121-90

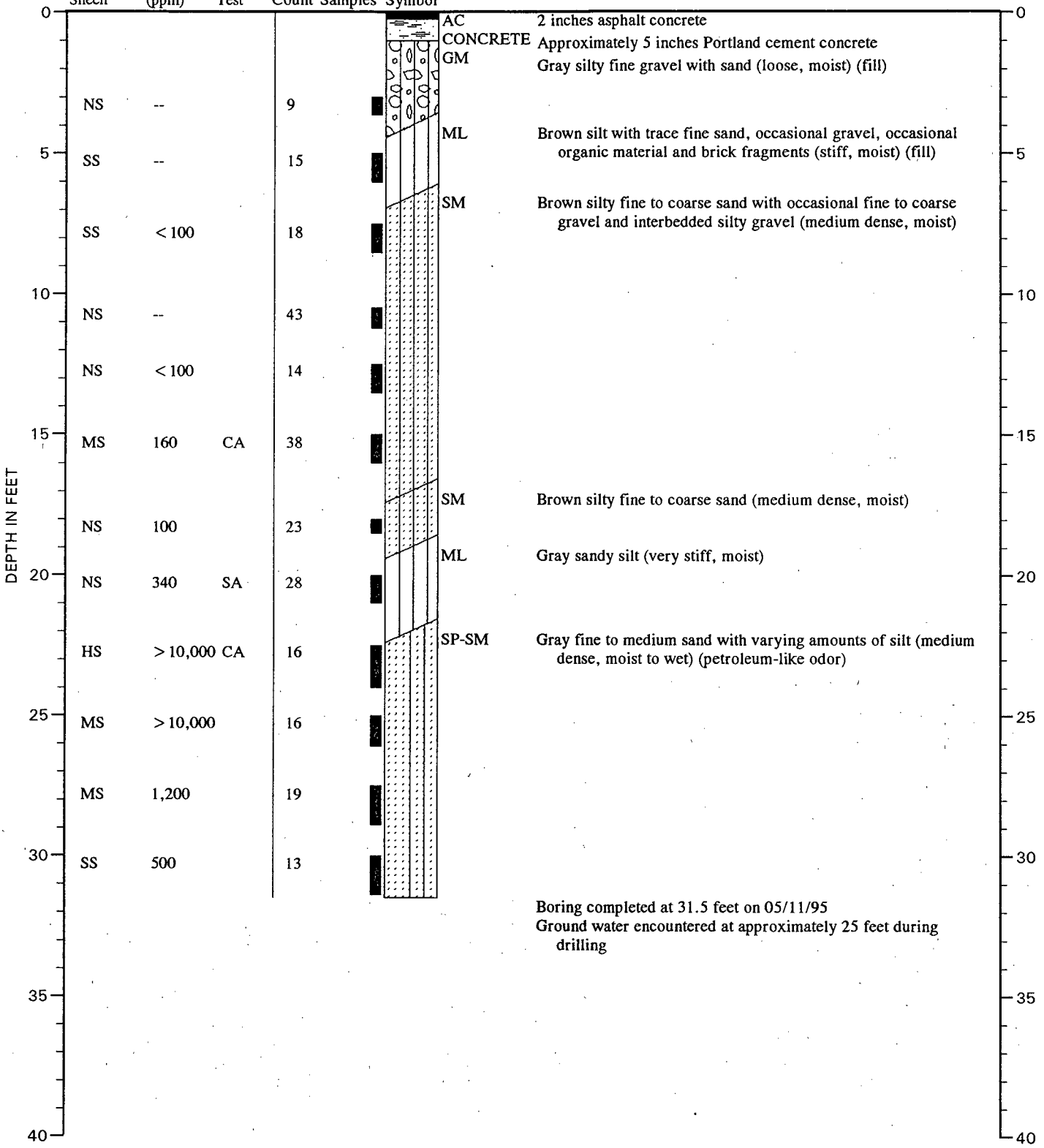
GeoEngineers

KEY TO BORING LOG SYMBOLS

FIGURE A-2

TEST DATA

BORING B-8



Note: See Figure A-2 for explanation of symbols

JF:SAK:MLN 6/26/95

4326-001-P62

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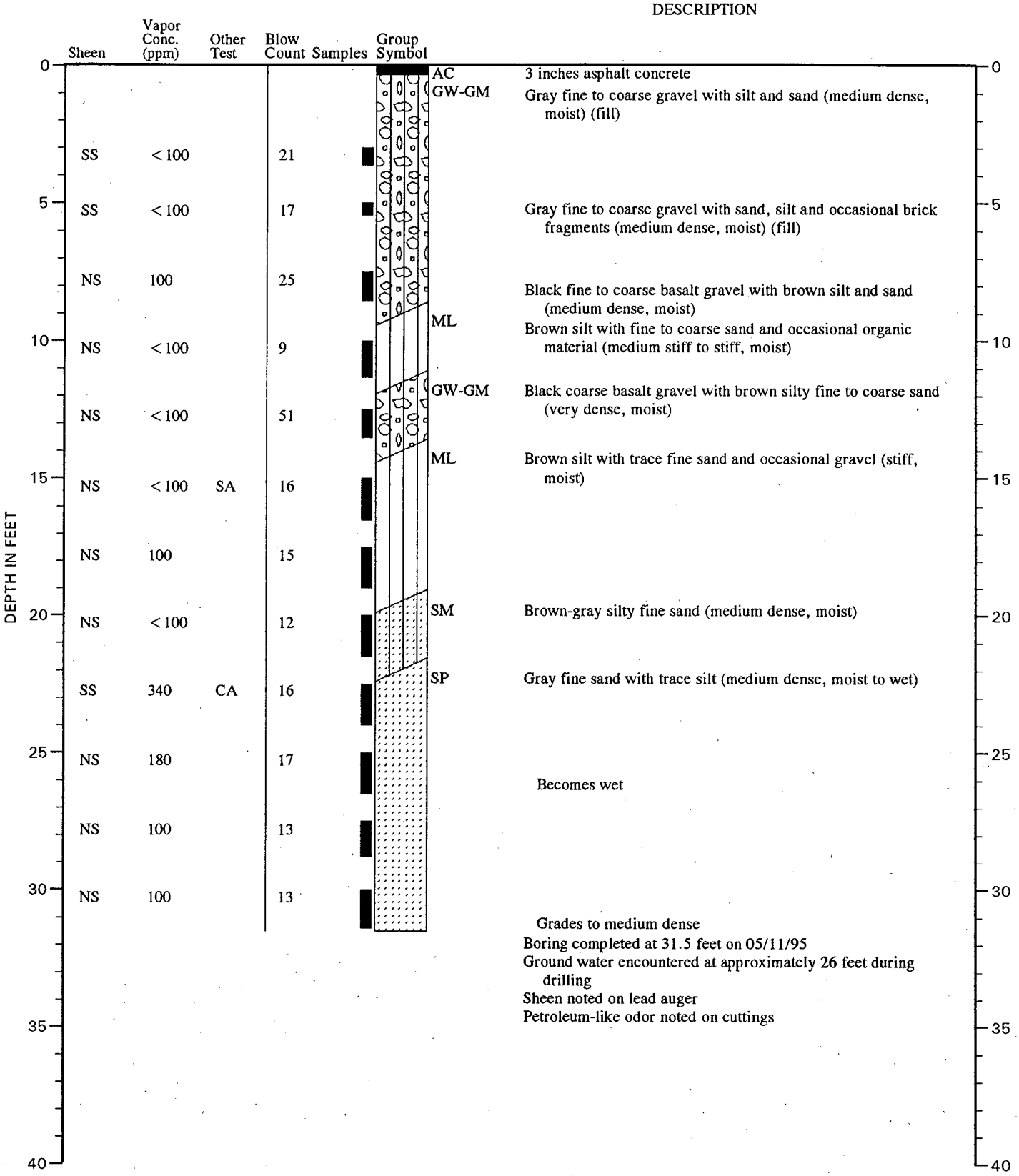
LOG OF BORING

FIGURE A-3

TEST DATA

BORING B-9



Note: See Figure A-2 for explanation of symbols

JF:SAK:MLN 6/26/95

4326-001-P62

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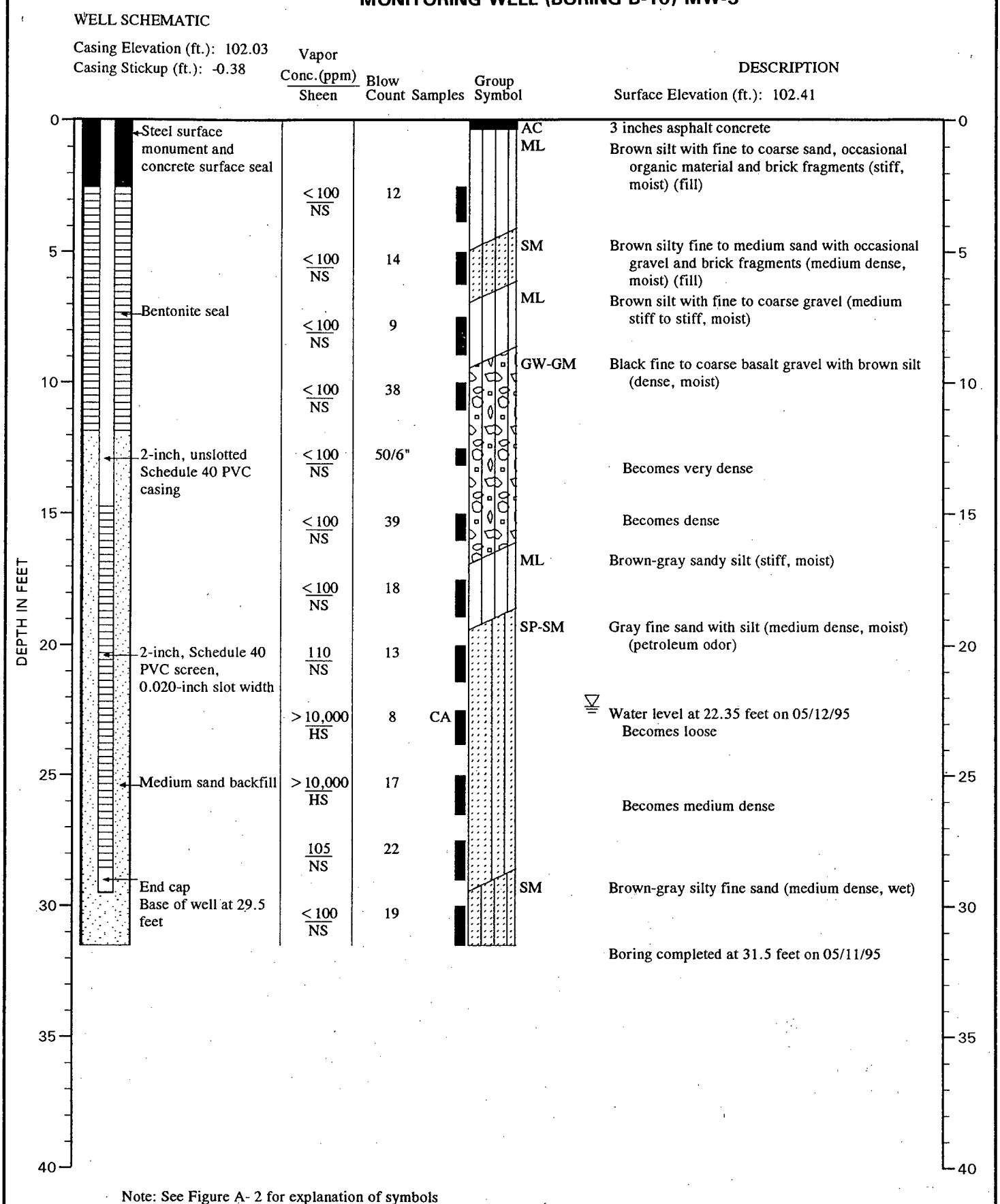
LOG OF BORING

FIGURE A-4

MONITORING WELL (BORING B-10) MW-5



Note: See Figure A- 2 for explanation of symbols

JF:SAK:MLN 5/24/95

4326-001-P62

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LOG OF MONITORING WELL (BORING B-10)

FIGURE A-5

BORING B-11

Depth (ft)	Sheen	Vapor Conc. (ppm)	Other Test	Blow Count	Samples	Group Symbol	DESCRIPTION
0						AC	4 inches asphalt concrete
						ML	Brown silt with fine sand, occasional organic material and occasional fine gravel (stiff, moist) (fill)
	NS	< 100		11			
5	--	--		14			
	--	--		50/6"			
10	NS	< 100		18			
	NS	< 100		24		GM	Brown silty fine to coarse basalt gravel (medium dense, moist)
15	NS	< 100		49			Becomes very dense
	NS	< 100		9		ML	Brown silt with trace fine sand (medium stiff, moist to wet)
20	NS	< 100	CA	5			
	NS	< 100		8			Becomes wet
25	NS	< 100		12			Becomes stiff, wet
							Boring completed at 26.5 feet on 05/11/95
							Ground water encountered at approximately 23.5 feet during drilling
30							
35							
40							

DEPTH IN FEET

Note: See Figure A-2 for explanation of symbols

:JF:SAK:MLN 5/24/95

4326-001-P62

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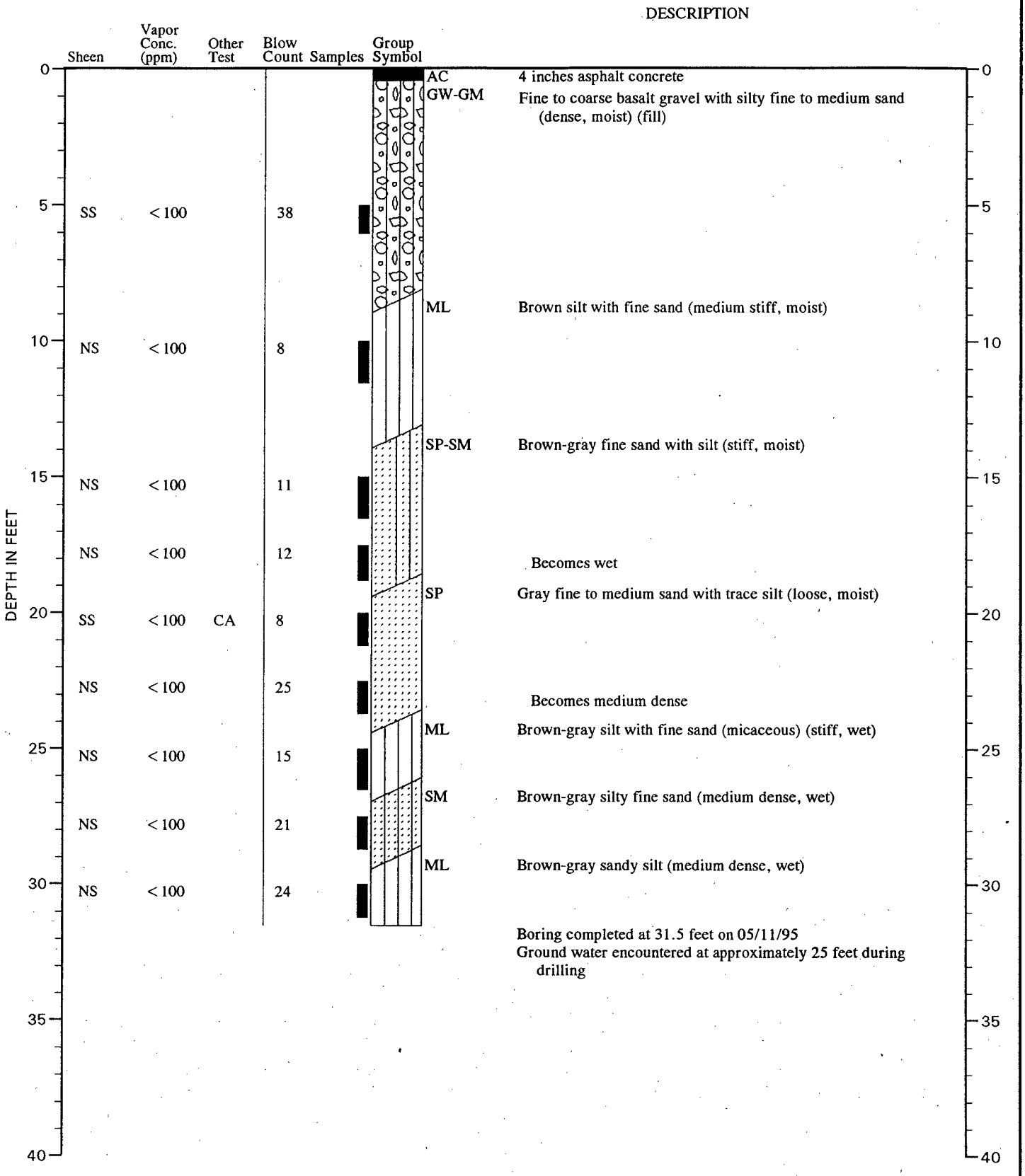
LOG OF BORING

FIGURE A-6

TEST DATA

BORING B-12



Note: See Figure A-2 for explanation of symbols

:JF:SAK:MLN 6/21/95

4326-001-P62

Geo Engineers

LOG OF BORING

FIGURE A-7

TEST DATA

BORING B-13

Depth (ft)	Sheen	Vapor Conc. (ppm)	Other Test	Blow Count	Samples	Group Symbol	DESCRIPTION
0						AC	4 inches asphalt concrete
						GP	Brown fine gravel with trace silt (medium dense, moist) (fill)
5	SS	< 100		22			
						GM	Brown silty fine to coarse gravel (loose, moist)
10	NS	< 100		7			
						SP-SM	Brown-gray fine to medium sand with silt (medium dense, moist) (petroleum odor)
15	SS	110	CA	15			
20	NS	120		14			Sand becomes fine with interbedded with silt
	SS	120	CA	27			(petroleum odor)
						SM	Brown-gray silty fine sand (micaceous) (medium dense, wet)
25	NS	< 100		13			
						SP-SM	Brown-gray fine sand with silt (medium dense, wet)
	NS	< 100		19			
30	NS	< 100		17			
							Boring completed at 31.5 feet on 05/11/95
							Ground water encountered at approximately 20 feet during drilling
35							
40							

DEPTH IN FEET

Note: See Figure A-2 for explanation of symbols

JF:SAK:MLN 5/24/95

4326-001-P62

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LOG OF BORING

FIGURE A-8

4326-001-P62 SAK:MAD 06/22/95

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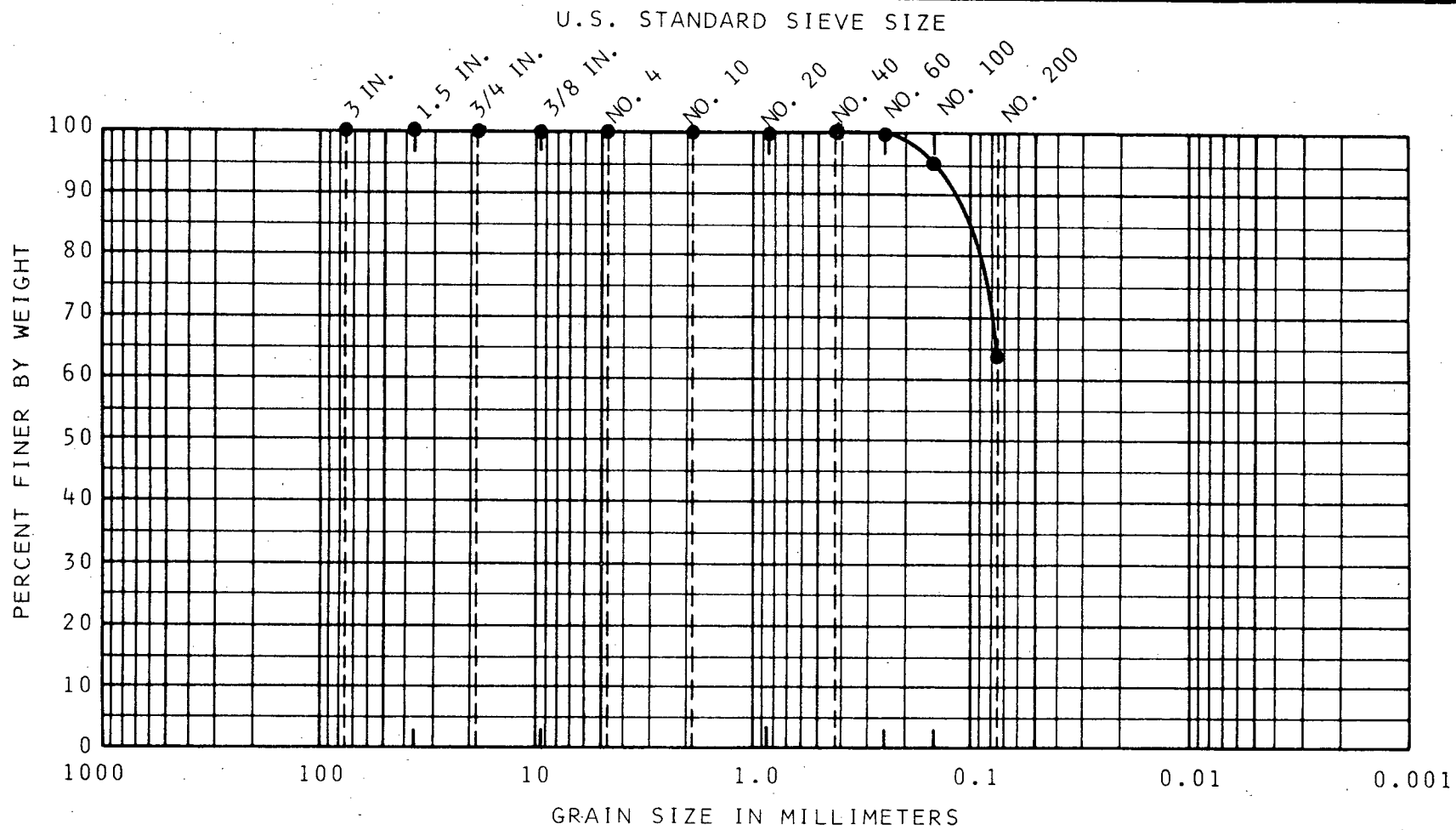


COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

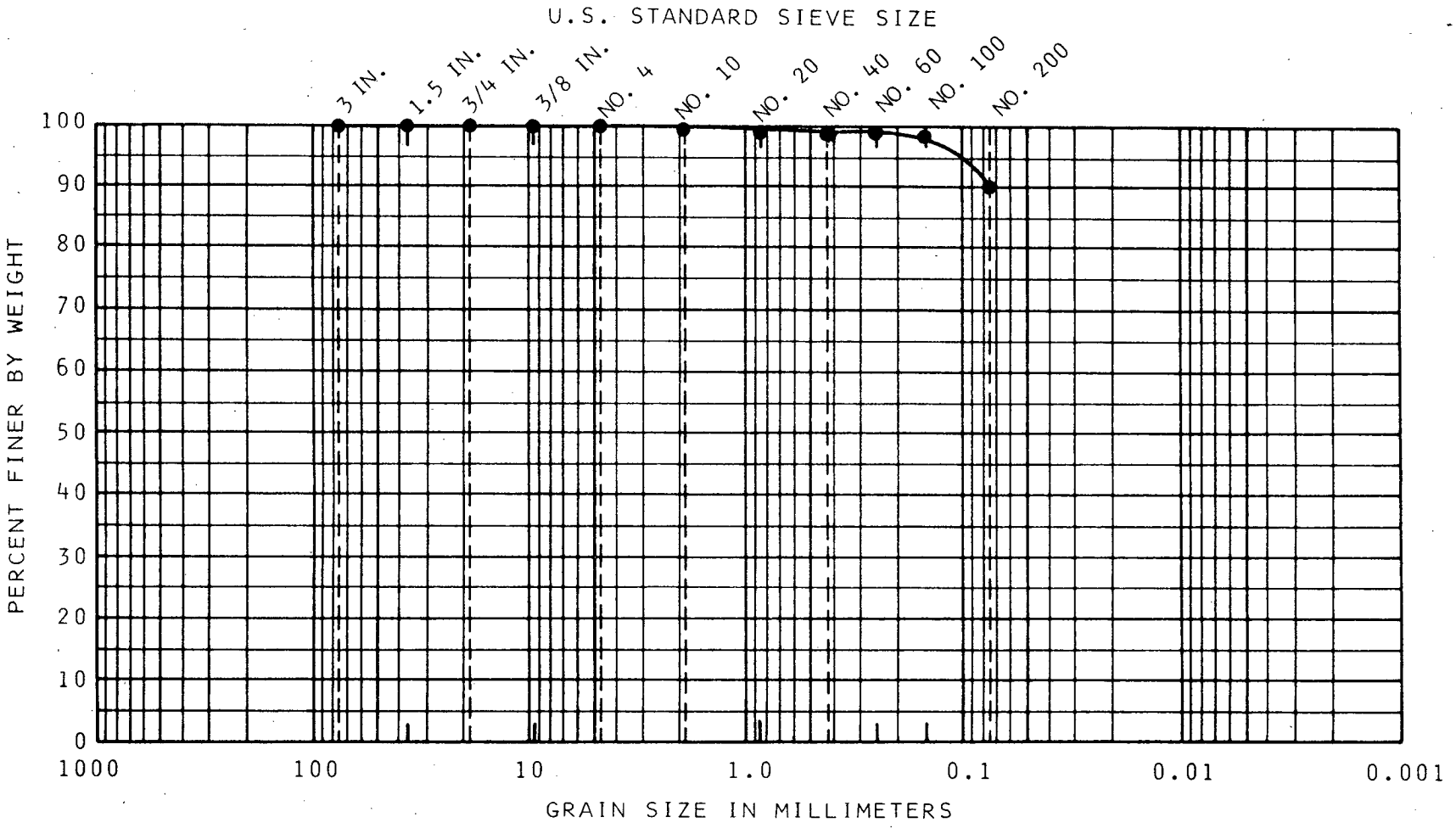
SYMBOL	EXPLORATION NUMBER	SAMPLE DEPTH	SOIL DESCRIPTION
●	B-8	20.5	Light gray sandy silt (ML)

GRADATION CURVES

FIGURE A-9

4326-001-P62 SAK:MAD 06/22/95

Geo Engineers

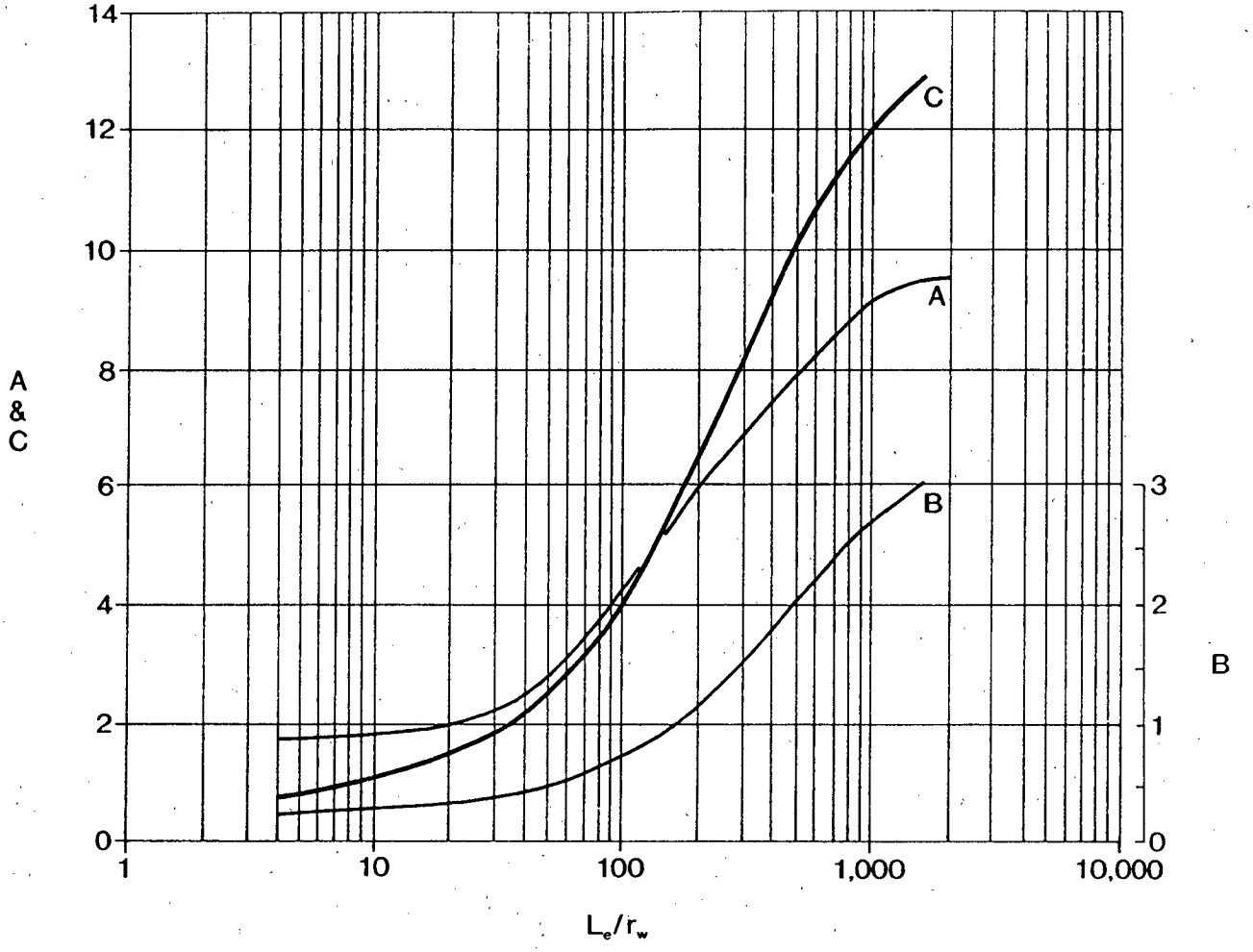


COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SYMBOL	EXPLORATION NUMBER	SAMPLE DEPTH	SOIL DESCRIPTION
●	B-9	15.5	Light brown silt with trace fine sand (ML)

GRADATION CURVES

FIGURE A-10



Values of the coefficients A, B and C for use in estimating the radius of influence, R_e(from Bouwer, 1989, p. 305)

4326-001-P62 SAK:MAD 06/14/95

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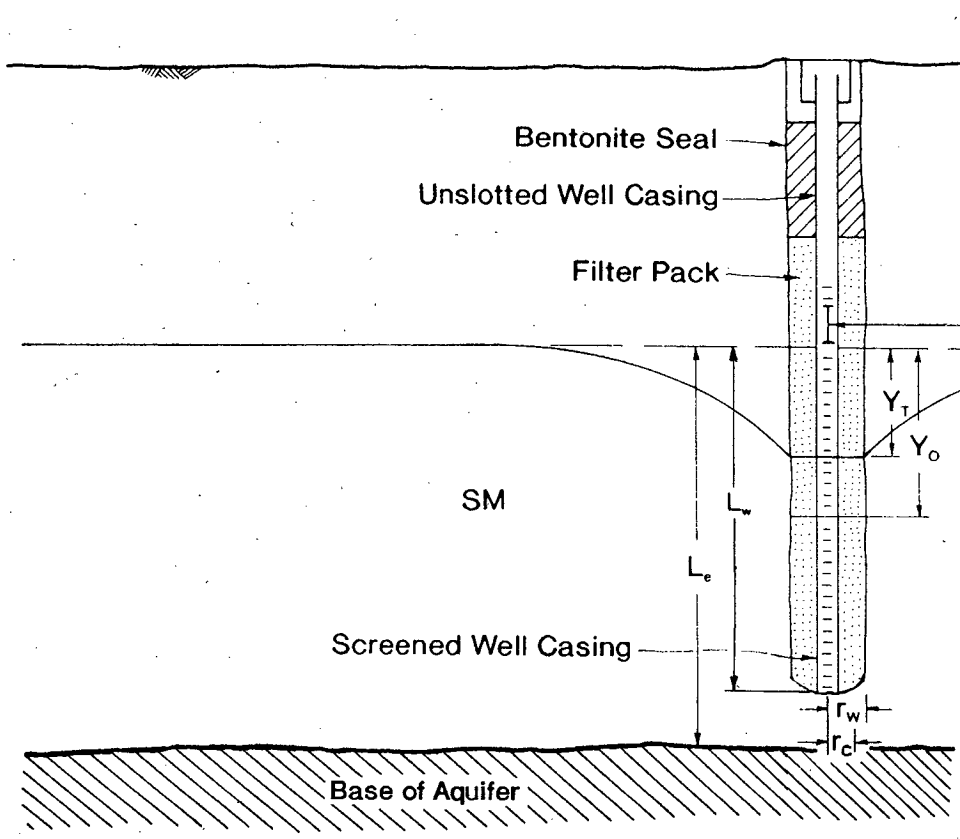
CONSTANT VALUES FOR BOUWER AND RICE EQUATIONS

FIGURE A-11

Geo Engineers



Definition of Terms

Y_O = measured instantaneous change in water level in well casing due to removal of a volume of water V at time t = 0. (Length)

Y_T = depth of water level below static water level in well casing at time t = T>0. (Length)

L_e = saturated aquifer thickness. (Length)

L_w = length of screen

r_w = effective radius of boring = radius of boring if filter pack is much more permeable than the aquifer. (Length)

r_c = effective radius of the well casing. (Length)

t = time since removal of volume of water. (Time)

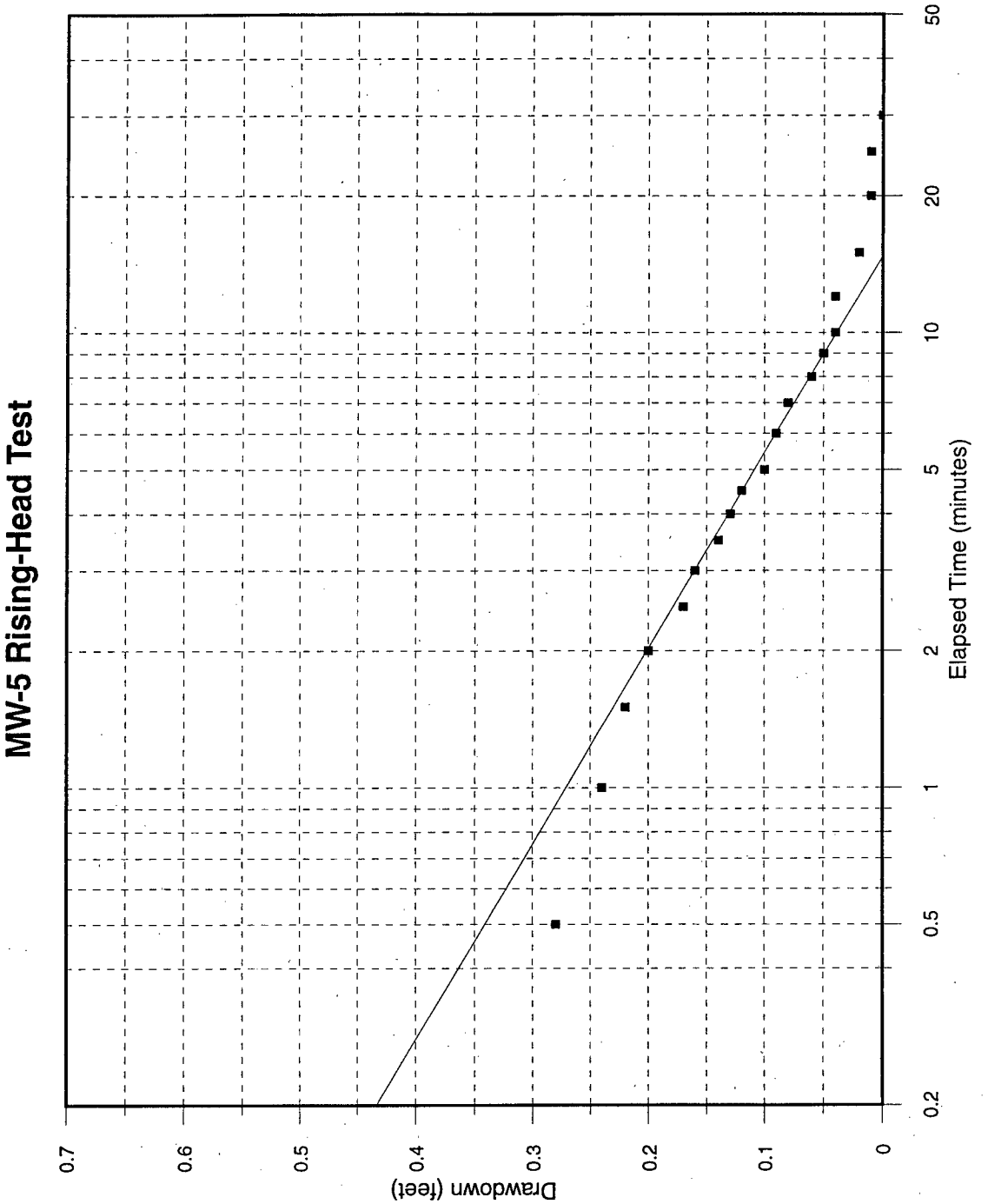
R_e = effective radial distance over which Y is dissipated

SM = silty sand

Note: The Value of the coefficient C as a function of L_e/r_w for the calculation of $\ln(R_e/r_w)$ is determined using the plot shown in Figure A-11. In this case curve "C" is used because the well screens are fully penetrating.

DEFINITION OF TERMS

FIGURE A-12

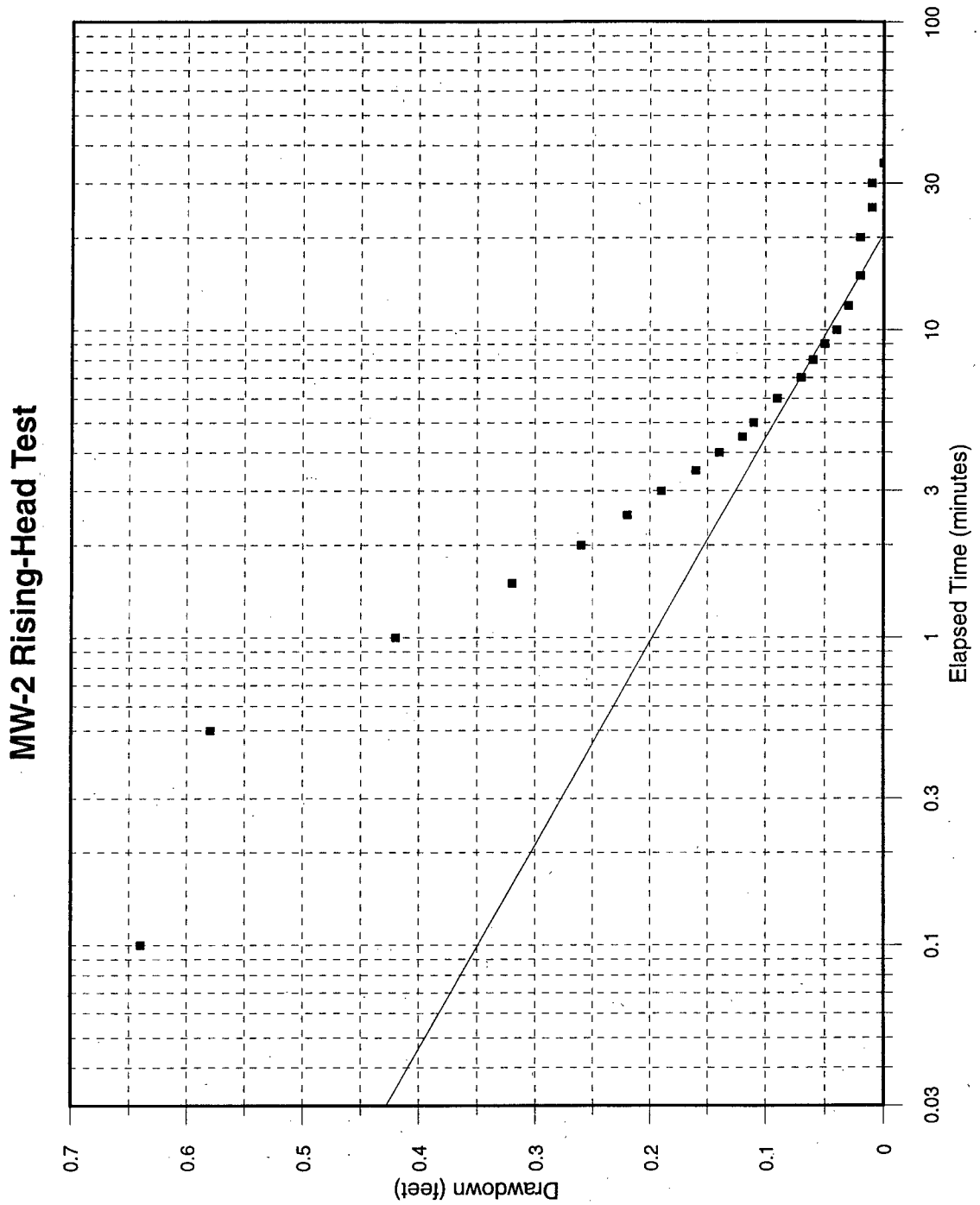


GeoEngineers

MW-5 RISING-HEAD TEST
ELAPSED TIME VS. DRAWDOWN

FIGURE A–13

4326-001-P62 SAK:JF:vvl 05/30/95 (432601G1.PRE)

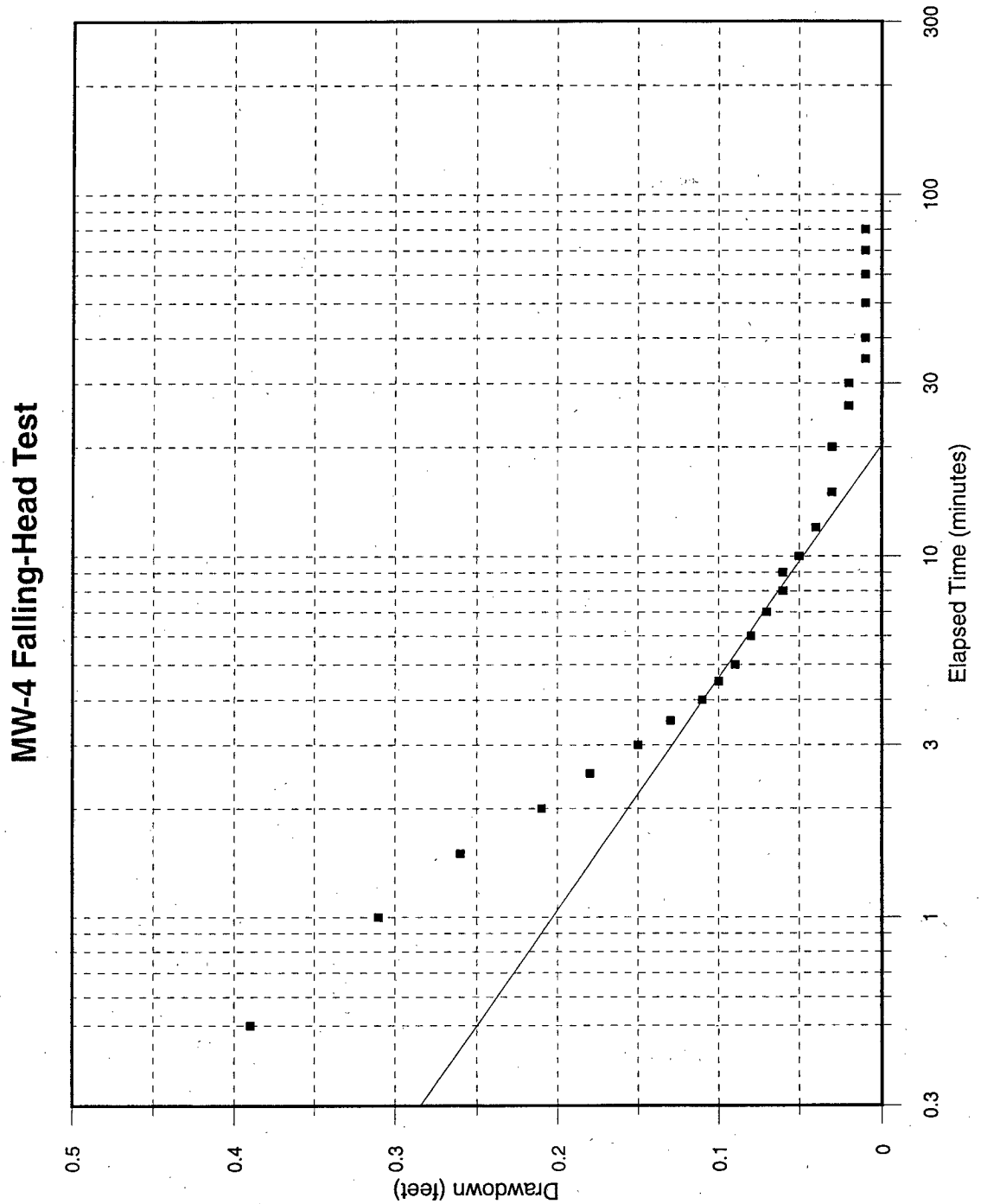


Geo Engineers

MW-2 RISING-HEAD TEST
ELAPSED TIME VS. DRAWDOWN

FIGURE A–14

4326-001-P62 SAK:JF:vvl 05/30/95 (432601G2.PRE)

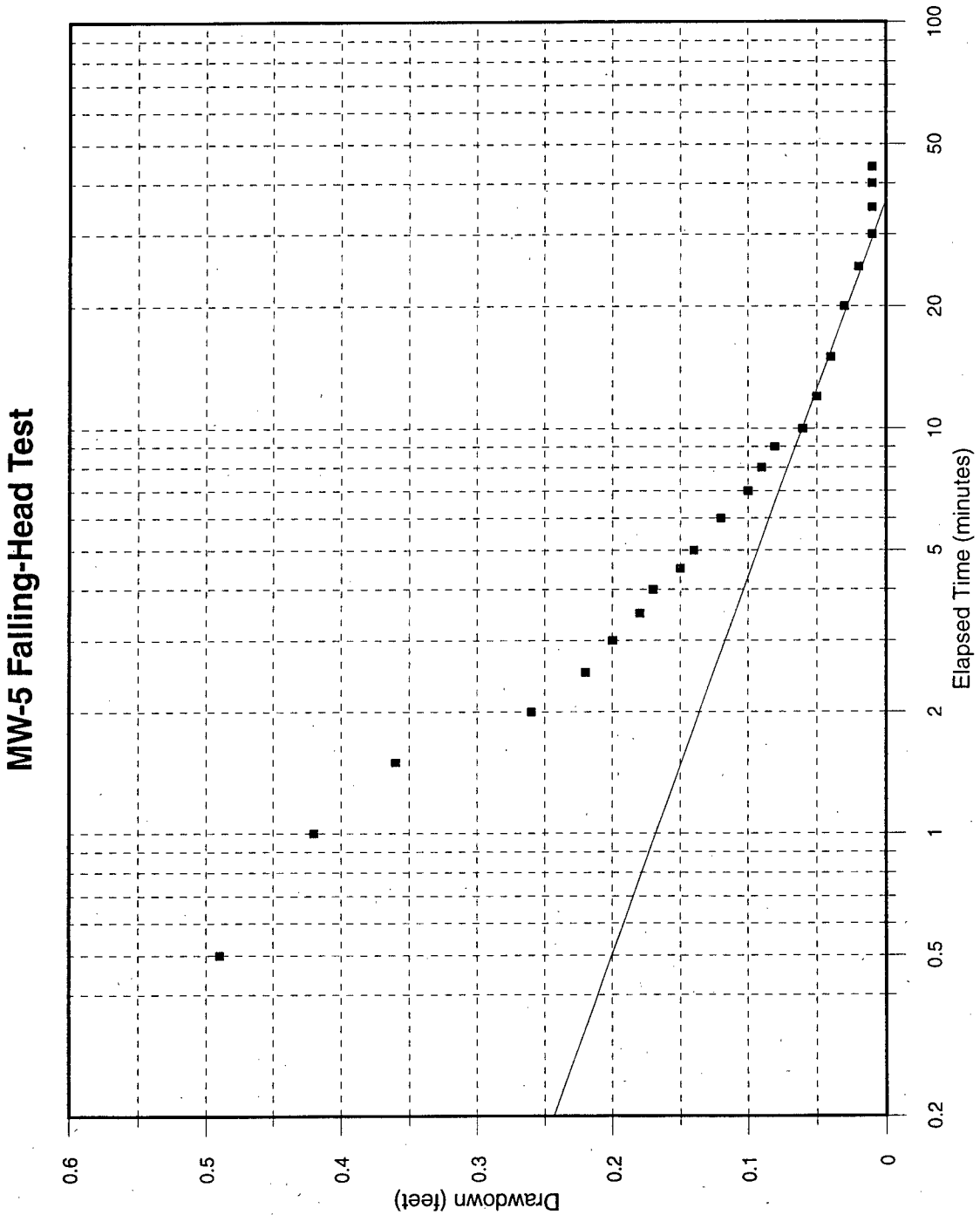


4326-001-P62 SAK:JF:wl 05/30/95 (432601G3.PRE)

Geo Engineers

MW-4 FALLING-HEAD TEST
ELAPSED TIME VS. DRAWDOWN

FIGURE A–15

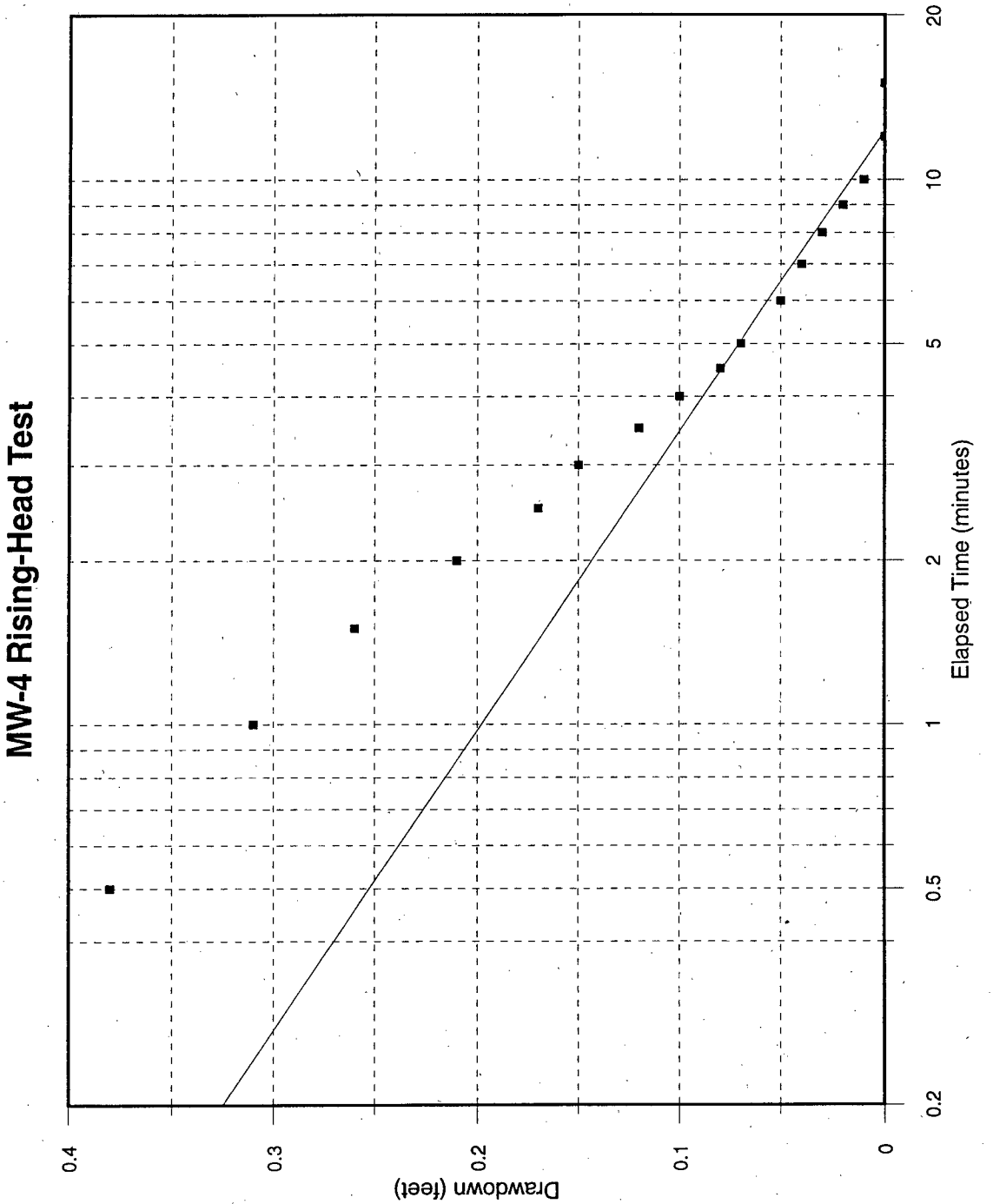


Geo Engineers

MW-5 FALLING-HEAD TEST
ELAPSED TIME VS. DRAWDOWN

FIGURE A–16

4326-001-P62 SAK:JF:vvl 05/30/95 (432601G4.PRE)



4326-001-P62 SAK:JF:vvl 05/30/95 (432601G5.PRE)

Geo Engineers

MW-4 RISING-HEAD TEST
ELAPSED TIME VS. DRAWDOWN

FIGURE A–17

APPENDIX B

APPENDIX B
CHEMICAL ANALYTICAL PROGRAM

ANALYTICAL METHODS

Chain-of-custody procedures were followed during the transport of the field samples to the analytical laboratory. The samples were held in cold storage pending extraction and/or analysis. The analytical results, analytical methods reference and laboratory QA/QC (quality assurance/quality control) records are included in this appendix. The analytical results are also summarized in the text and tables of this report.

ANALYTICAL DATA REVIEW

The laboratory maintains an internal quality assurance program, as documented in its laboratory quality assurance manual. The laboratory uses a combination of blanks, surrogate recoveries, duplicates, matrix spike recoveries, matrix spike duplicate recoveries, blank spike recoveries and blank spike duplicate recoveries to evaluate the validity of the analytical results. The laboratory also uses data quality goals for individual chemicals or groups of chemicals based on the long-term performance of the test methods. The data quality goals were included in the laboratory reports. The laboratory compared each group of samples with the existing data quality goals and noted any exceptions in the laboratory report. The laboratory QA/QC and data quality exceptions documented by the laboratory were reviewed by GeoEngineers using the applicable data validation guidelines from the following documents: "Guidance Document for the Assessment of RCRA Environmental Data Quality" draft dated 1988; "National Functional Guidelines For Organic Data Review" draft dated 1991; and "Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses" dated 1988.

ANALYTICAL DATA REVIEW SUMMARY

No significant data quality exceptions were documented in the laboratory report or noted during our review. Based on the data quality review, it is our opinion that the analytical data are acceptable for their intended use.

Analytical**Technologies,**Inc.

17400 S.W. Upper Boones Ferry Road, Suite 270 Durham, OR. 97224
(503) 684-0447 (503) 620-0393 (FAX)

ATI I.D. 505589

May 25, 1995

GeoEngineers
MAY 25 1995
Routing
File

Julia Fowler
GeoEngineers, Inc.
7504 SW Bridgeport Rd.
Portland, OR 97224

Project Name / Number: Birnbach / 4326-001

Attention: Julia Fowler

On May 15, 1995, Analytical Technologies, Inc. received eight soil samples for analysis for the above listed project. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

If you have any questions or comments, please do not hesitate to contact us at (503)684-0447.

Fred Voosen for
Project Manager

Steven E. Stanley
Laboratory Manager

SES:alm
Enclosure

Analytical Technologies, Inc.

SAMPLE CROSS REFERENCE SHEET

CLIENT:	GeoEngineers, Inc.	**ATI I.D.:**	505589
PROJECT #:	4326-001		
PROJECT NAME:	Birnbach	**MATRIX:**	SOIL

ATI #	CLIENT DESCRIPTION	DATE SAMPLED
505589-1	B-8-15.5	5/11/95
505589-2	B-8-23.0	5/11/95
505589-3	B-9-23.0	5/11/95
505589-4	B-10/MW-5-23.0	5/11/95
505589-5	B-11-20.5	5/12/95
505589-6	B-12-20.5	5/12/95
505589-7	B-13-15.5	5/12/95
505589-8	B-13-23.0	5/12/95

----------TOTALS----------

MATRIX	# SAMPLES
SOIL	8

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of the report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical**Technologies,** Inc.

ANALYTICAL SCHEDULE

CLIENT:	GeoEngineers, Inc.	**ATI I.D.:**	505589
PROJECT #:	4326-001		
PROJECT NAME:	Birnbach		

ANALYSIS	TECHNIQUE	REFERENCE	LAB
Hydrocarbon Identification	GC/FID	OR TPH-HCID	PLD
Petroleum Hydrocarbon	GC/PID	OR TPH-G	PLD

PLD = ATI - Portland
R = ATI - Renton
SD = ATI - San Diego
PHX = ATI - Phoenix
PNR = ATI - Pensacola
FC = ATI - Fort Collins
SUB = Subcontract

Analytical Technologies, Inc.

CASE NARRATIVE
Accession # 505589
TPH-HCID (Oregon)

Ten grams of sample was extracted with methylene chloride. The final volume was 10.0 mls. The resulting extract was analyzed using a gas chromatograph equipped with a flame ionization detector (FID). The chromatogram was quantitated between C6 and C10 for gasoline, and C10 to C28 for diesel using at least five point calibration curves.

Due to the high levels of gasoline in sample 505589-4, the recovery for the surrogate 1-chlorooctane was 312%, outside of the method control limits of 62-143%. The surrogate recovery is flagged "F = Out of limits due to matrix interference". The surrogate o-terphenyl was within limits at 113%.

Carol L. Schnell

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	TPH-HCID (Oregon)	**ATI I.D.:**	505589-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	N/A
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	N/A
PROJECT #:	4326-001	**DATE EXTRACTED:**	05/15/95
PROJECT NAME:	Birnbach	**DATE ANALYZED:**	05/15/95
SAMPLE MATRIX:	SOIL	**DILUTION FACTOR:**	1
		UNITS:	mg/kg

PARAMETER	RESULTS
GASOLINE (C6 - C10)	LESS THAN 20 mg/kg
DIESEL (C10 - C28)	LESS THAN 50 mg/kg
(C28 - C40)	NOT OBSERVED
SURROGATES:	
1-CHLOROOCTANE (62% - 143%)	108%
O-TERPHENYL (62% - 143%)	112%

Analyst: CS 5-16-95

Reviewer: [illegible] 5/16/95

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	TPH-HCID (Oregon)	**ATI I.D.:**	505589-1
CLIENT I.D.:	B-8-15.5	**DATE SAMPLED:**	05/11/95
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	05/15/95
PROJECT #:	4326-001	**DATE EXTRACTED:**	05/15/95
PROJECT NAME:	Birnbach	**DATE ANALYZED:**	05/15/95
SAMPLE MATRIX:	SOIL	**DILUTION FACTOR:**	1
		UNITS:	mg/kg

PARAMETER	RESULTS
GASOLINE (C6 - C10)	GREATER THAN 20 mg/kg
DIESEL (C10 - C28)	GREATER THAN 50 mg/kg
(C28 - C40)	NOT OBSERVED
SURROGATES:	
1-CHLOROOCTANE (62% - 143%)	112%
O-TERPHENYL (62% - 143%)	108%

Analyst: CS 5-16-95

Reviewer: GKJ 5/16/95

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	TPH-HCID (Oregon)	**ATI I.D.:**	505589-2
CLIENT I.D.:	B-8-23.0	**DATE SAMPLED:**	05/11/95
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	05/15/95
PROJECT #:	4326-001	**DATE EXTRACTED:**	05/15/95
PROJECT NAME:	Birnbach	**DATE ANALYZED:**	05/15/95
SAMPLE MATRIX:	SOIL	**DILUTION FACTOR:**	1
		UNITS:	mg/kg

PARAMETER	RESULTS
GASOLINE (C6 - C10)	LESS THAN 20 mg/kg
DIESEL (C10 - C28)	LESS THAN 50 mg/kg
(C28 - C40)	NOT OBSERVED
SURROGATES:	
1-CHLOROOCTANE (62% - 143%)	110%
O-TERPHENYL (62% - 143%)	114%

Analyst: CS 5-16-95

Reviewer: 05/16/95

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	TPH-HCID (Oregon)	**ATI I.D.:**	505589-3
CLIENT I.D.:	B-9-23.0	**DATE SAMPLED:**	05/11/95
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	05/15/95
PROJECT #:	4326-001	**DATE EXTRACTED:**	05/15/95
PROJECT NAME:	Birnbach	**DATE ANALYZED:**	05/15/95
SAMPLE MATRIX:	SOIL	**DILUTION FACTOR:**	1
		UNITS:	mg/kg

PARAMETER	RESULTS
GASOLINE (C6 - C10)	LESS THAN 20 mg/kg
DIESEL (C10 - C28)	LESS THAN 50 mg/kg
(C28 - C40)	NOT OBSERVED
SURROGATES:	
1-CHLOROOCTANE (62% - 143%)	105%
O-TERPHENYL (62% - 143%)	109%

Analyst: CS 5-16-95

Reviewer: 5/16/95

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	TPH-HCID (Oregon)	ATI I.D.:	505589-4
CLIENT I.D.:	B-10/MW-5-23.0	DATE SAMPLED:	05/11/95
CLIENT:	GeoEngineers, Inc.	DATE RECEIVED:	05/15/95
PROJECT #:	4326-001	DATE EXTRACTED:	05/15/95
PROJECT NAME:	Birnbach	DATE ANALYZED:	05/15/95
SAMPLE MATRIX:	SOIL	DILUTION FACTOR:	1
		UNITS:	mg/kg

PARAMETER	RESULTS	
GASOLINE (C6 - C10)	GREATER THAN 20 mg/kg	
DIESEL (C10 - C28)	GREATER THAN 50 mg/kg	
(C28 - C40)	NOT OBSERVED	
SURROGATES:		
1-CHLOROOCTANE (62% - 143%)	312%	F
O-TERPHENYL (62% - 143%)	113%	

F = Out of limits due to matrix interference.

Analyst: CS 5-16-95

Reviewer: MS-16-95

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	TPH-HCID (Oregon)	**ATI I.D.:**	505589-5
CLIENT I.D.:	B-11-20.5	**DATE SAMPLED:**	05/12/95
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	05/15/95
PROJECT #:	4326-001	**DATE EXTRACTED:**	05/15/95
PROJECT NAME:	Birnbach	**DATE ANALYZED:**	05/15/95
SAMPLE MATRIX:	SOIL	**DILUTION FACTOR:**	1
		UNITS:	mg/kg

PARAMETER	RESULTS
GASOLINE (C6 - C10)	LESS THAN 20 mg/kg
DIESEL (C10 - C28)	LESS THAN 50 mg/kg
(C28 - C40)	NOT OBSERVED
SURROGATES:	
1-CHLOROOCTANE (62% - 143%)	104%
O-TERPHENYL (62% - 143%)	108%

Analyst: CS 5-16-95

Reviewer: JMS/16/95

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	TPH-HCID (Oregon)	**ATI I.D.:**	505589-6
CLIENT I.D.:	B-12-20.5	**DATE SAMPLED:**	05/12/95
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	05/15/95
PROJECT #:	4326-001	**DATE EXTRACTED:**	05/15/95
PROJECT NAME:	Birnbach	**DATE ANALYZED:**	05/15/95
SAMPLE MATRIX:	SOIL	**DILUTION FACTOR:**	1
		UNITS:	mg/kg

PARAMETER	RESULTS
GASOLINE (C6 - C10)	LESS THAN 20 mg/kg
DIESEL (C10 - C28)	LESS THAN 50 mg/kg
(C28 - C40)	NOT OBSERVED
SURROGATES:	
1-CHLOROOCTANE (62% - 143%)	112%
O-TERPHENYL (62% - 143%)	116%

Analyst: CS 5-16-95

Reviewer: [illegible] 5/16/95

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	TPH-HCID (Oregon)	**ATI I.D.:**	505589-7
CLIENT I.D.:	B-13-15.5	**DATE SAMPLED:**	05/12/95
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	05/15/95
PROJECT #:	4326-001	**DATE EXTRACTED:**	05/15/95
PROJECT NAME:	Birnbach	**DATE ANALYZED:**	05/15/95
SAMPLE MATRIX:	SOIL	**DILUTION FACTOR:**	1
		UNITS:	mg/kg

PARAMETER	RESULTS
GASOLINE (C6 - C10)	LESS THAN 20 mg/kg
DIESEL (C10 - C28)	LESS THAN 50 mg/kg
(C28 - C40)	NOT OBSERVED
SURROGATES:	
1-CHLOROOCTANE (62% - 143%)	99%
O-TERPHENYL (62% - 143%)	102%

Analyst: CS 5-16-95

Reviewer: 5-16-95

Analytical**Technologies**, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	TPH-HCID (Oregon)	**ATI I.D.:**	505589-8
CLIENT I.D.:	B-13-23.0	**DATE SAMPLED:**	05/12/95
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	05/15/95
PROJECT #:	4326-001	**DATE EXTRACTED:**	05/15/95
PROJECT NAME:	Birnbach	**DATE ANALYZED:**	05/15/95
SAMPLE MATRIX:	SOIL	**DILUTION FACTOR:**	1
		UNITS:	mg/kg

PARAMETER	RESULTS
GASOLINE (C6 - C10)	LESS THAN 20 mg/kg
DIESEL (C10 - C28)	LESS THAN 50 mg/kg
(C28 - C40)	NOT OBSERVED
SURROGATES:	
1-CHLOROOCTANE (62% - 143%)	103%
O-TERPHENYL (62% - 143%)	106%

Analyst: CS 5-16-95

Reviewer: 5/16/95

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY SPIKE RESULTS

		ATI ACCESSION:	505589
METHOD:	TPH-HCID (Oregon)	**QC SAMPLE:**	Method Blank
CLIENT:	GeoEngineers, Inc.	**DATE EXTRACTED:**	05/15/95
PROJECT #:	4326-001	**DATE ANALYZED:**	05/15/95
PROJECT NAME:	Birnbach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	SOIL	**UNITS:**	mg/kg

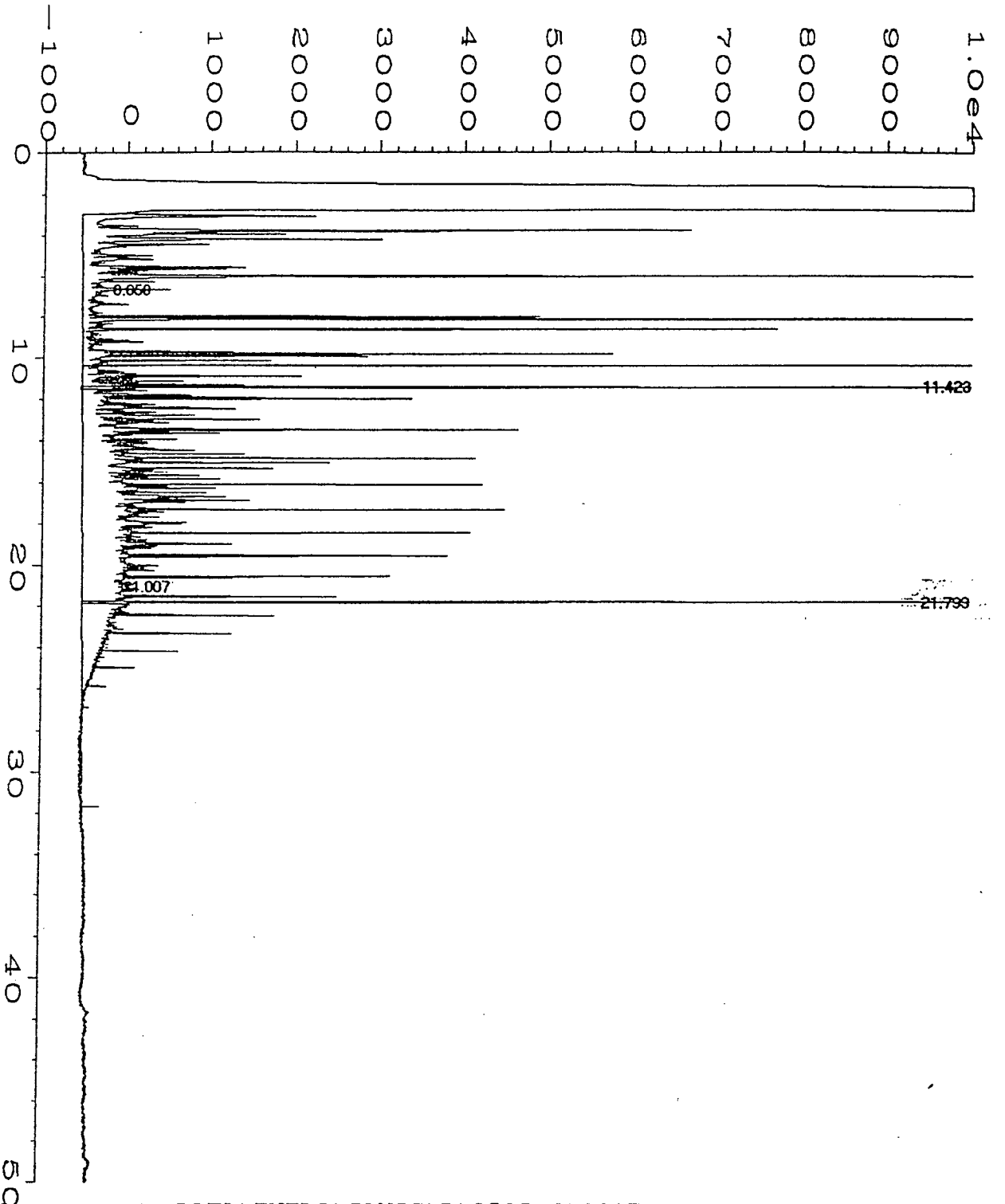
PARAMETER	SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
DIESEL	< 50	100	84	84	101	101	18
SURROGATE:							
1-CHLOROOCTANE (62% - 143%)				87%		100%	
O-TERPHENYL (62% - 143%)				96%		110%	

CONTROL LIMITS

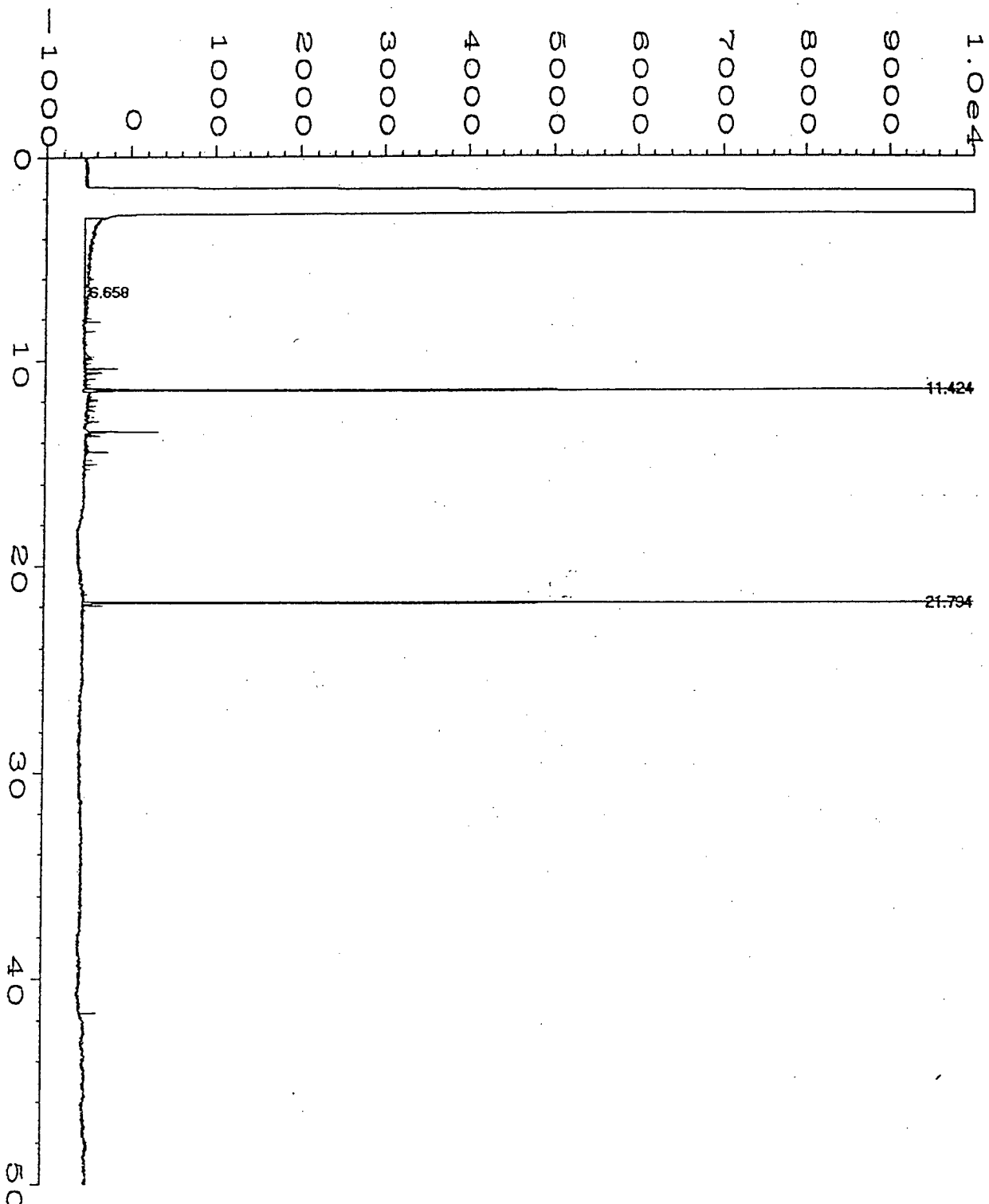
	% REC	RPD
DIESEL	69-128	20

Analyst: CS 5-14-95

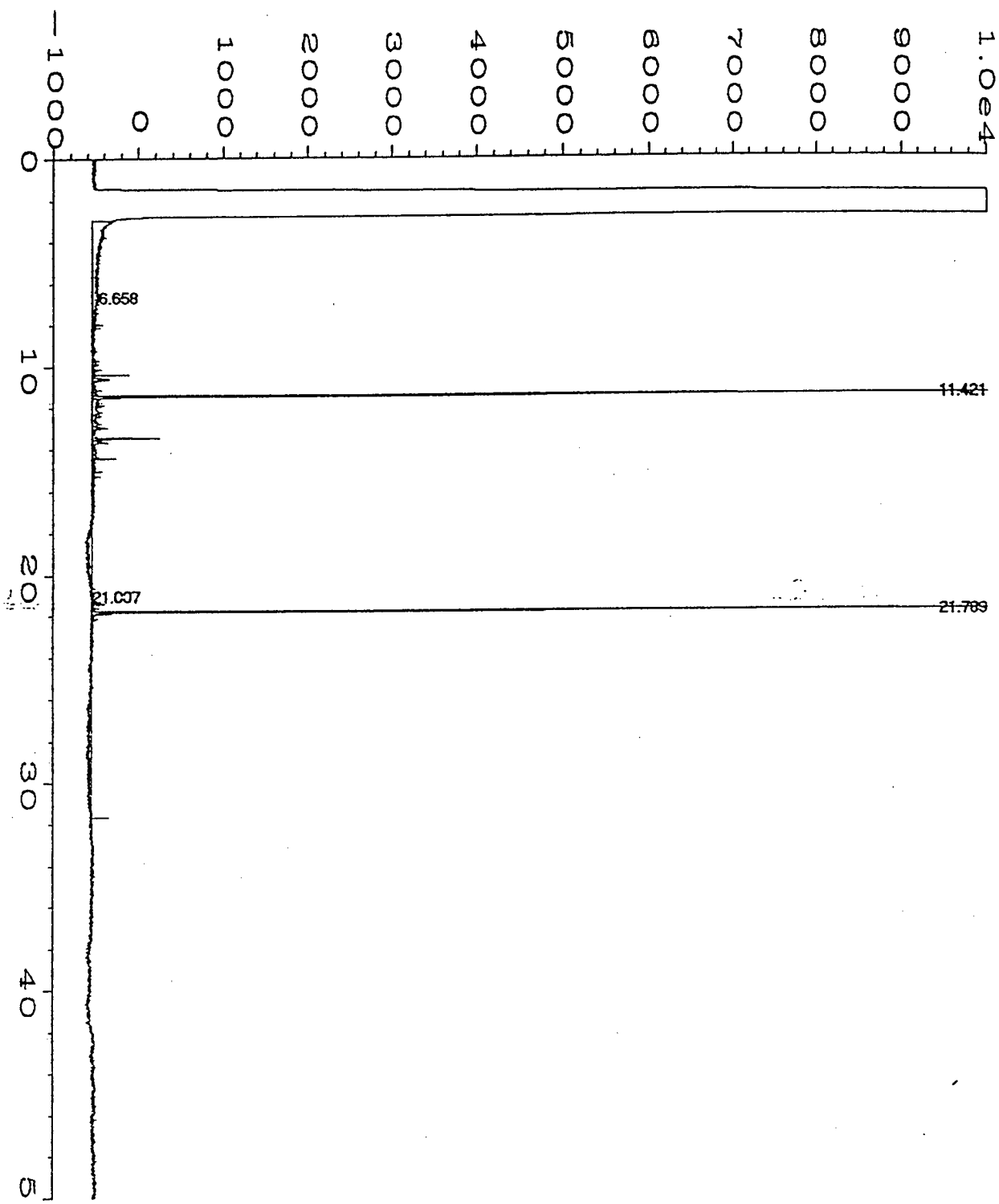
Reviewer: CM 5/16/95



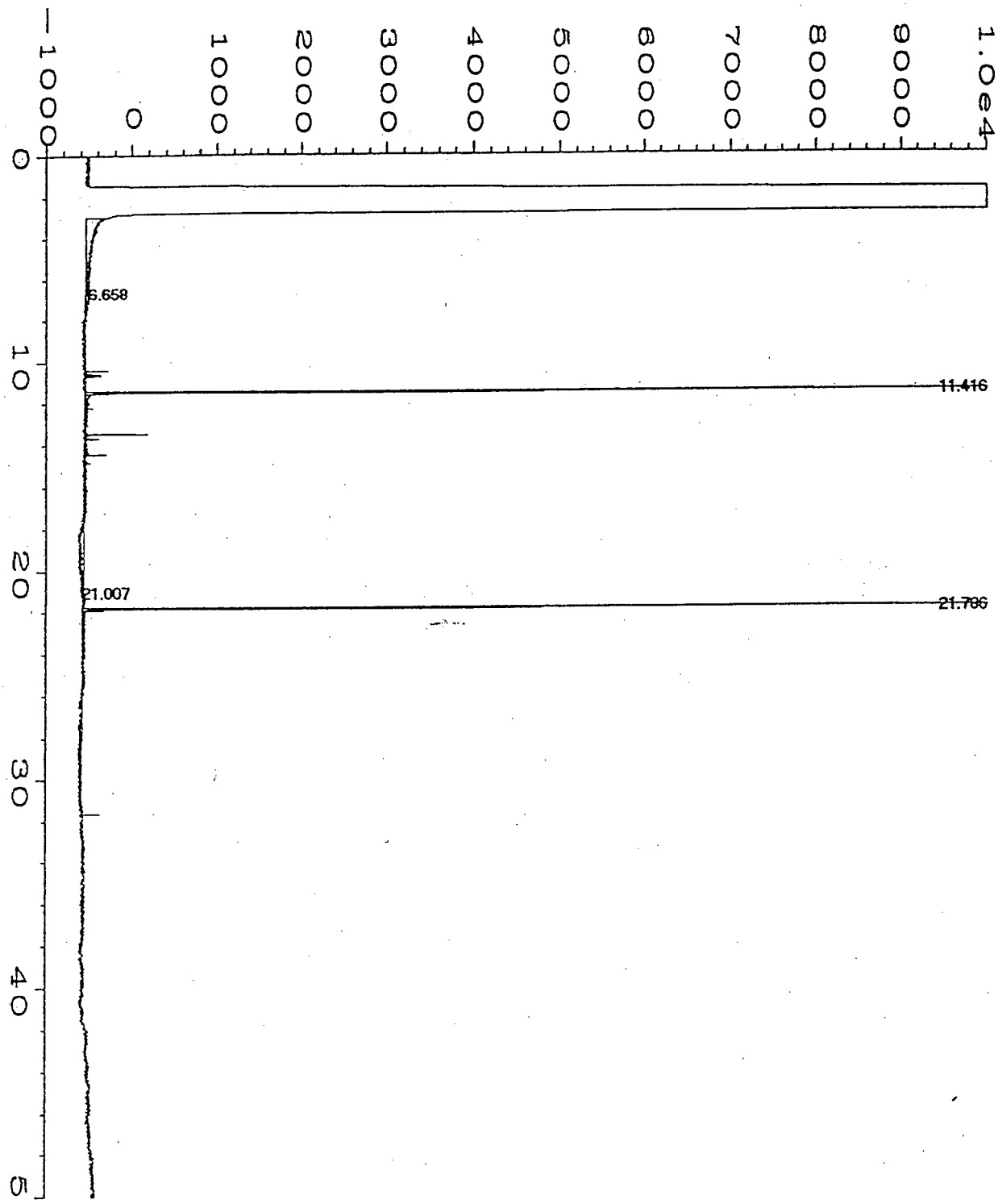
Data File Name	: F:\DATA\FUELS\GAUSS\D\950515\001F0101.D		
Operator	: FUELS	Page Number	: 1
Instrument	: GAUSS	Vial Number	: 1
Sample Name	: dg 150	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 12 May 95 12:42 PM	Instrument Method	: OHCID.MTH
Report Created on	: 12 May 95 01:40 PM	Analysis Method	: OF-HCID.MTH
Last Recalib on	: 25 APR 95 11:12 AM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



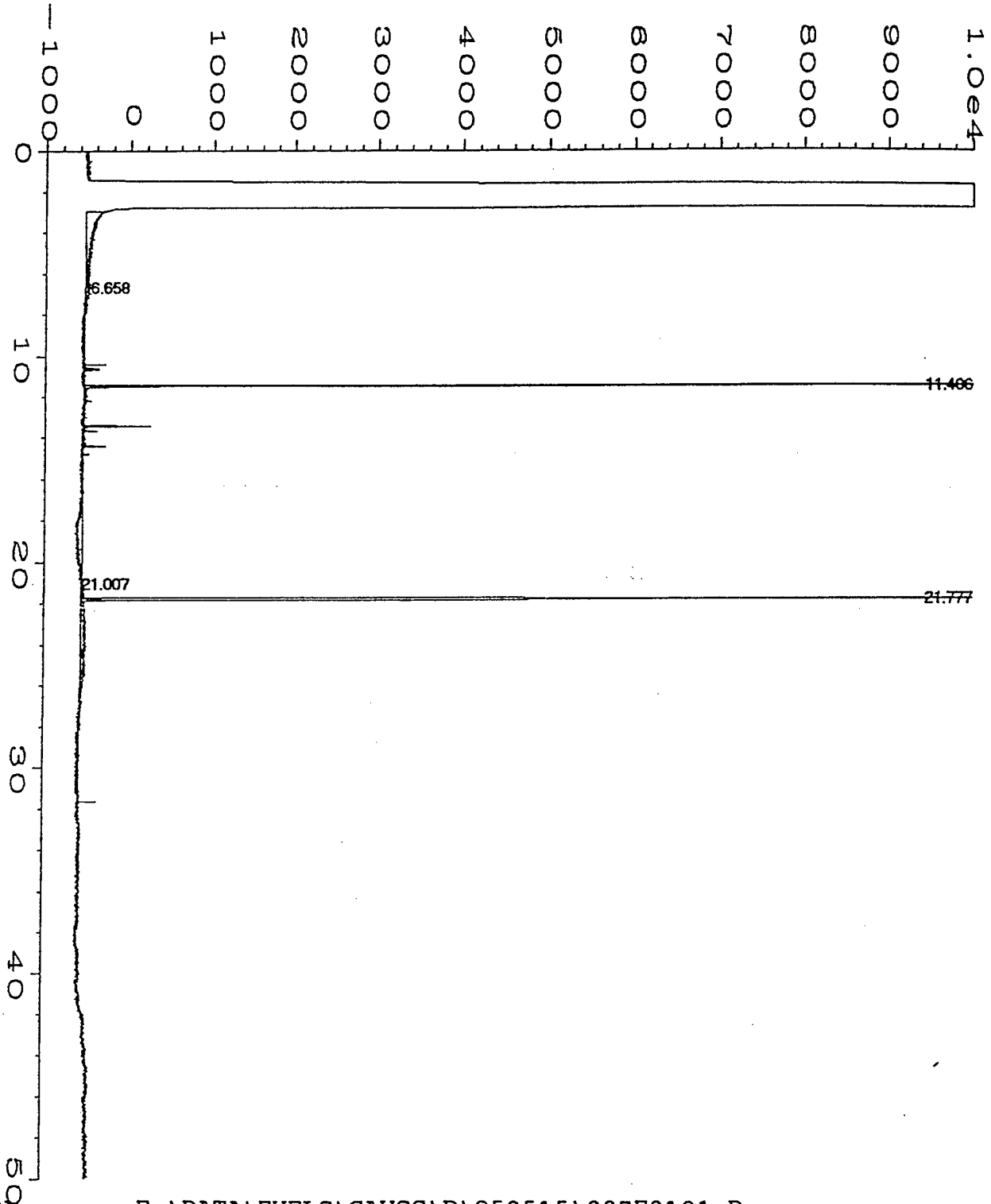
ata File Name	: F:\DATA\FUELS\GAUSS\D\950515\003F0101.D		
perator	: FUELS	Page Number	: 1
nstrument	: GAUSS	Vial Number	: 3
ample Name	: 505589-2	Injection Number	: 1
un Time Bar Code:		Sequence Line	: 1
cquired on	: 15 May 95 03:39 PM	Instrument Method	: OHCID.MTH
eport Created on	: 15 May 95 04:52 PM	Analysis Method	: OF-HCID.MTH
ast Recalib on	: 25 APR 95 11:12 AM	Sample Amount	: 0
ultiplier	: 1	ISTD Amount	:



Data File Name	: F:\DATA\FUELS\GAUSS\D\950515\004F0101.D		
Operator	: FUELS	Page Number	: 1
Instrument	: GAUSS	Vial Number	: 4
Sample Name	: 505589-3	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 15 May 95 04:37 PM	Instrument Method	: OHCID.MTH
Report Created on	: 16 May 95 09:04 AM	Analysis Method	: OF-HCID.MTH
Last Recalib on	: 25 APR 95 11:12 AM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



Data File Name	: F:\DATA\FUELS\GAUSS\D\950515\006F0101.D		
Operator	: FUELS	Page Number	: 1
Instrument	: GAUSS	Vial Number	: 6
Sample Name	: 505589-5	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 15 May 95 06:35 PM	Instrument Method	: OHCID.MTH
Report Created on	: 16 May 95 09:08 AM	Analysis Method	: OF-HCID.MTH
Last Recalib on	: 25 APR 95 11:12 AM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



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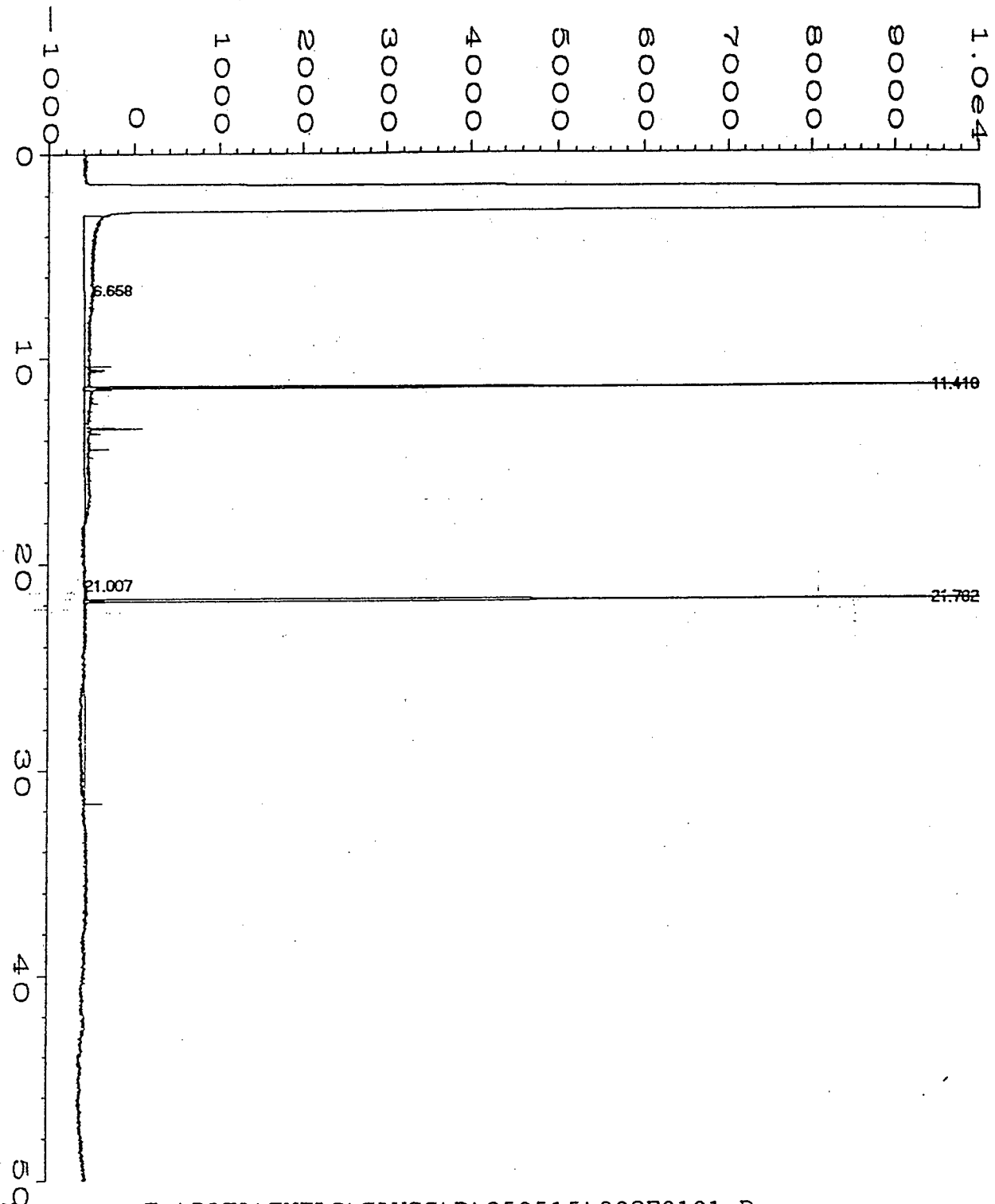
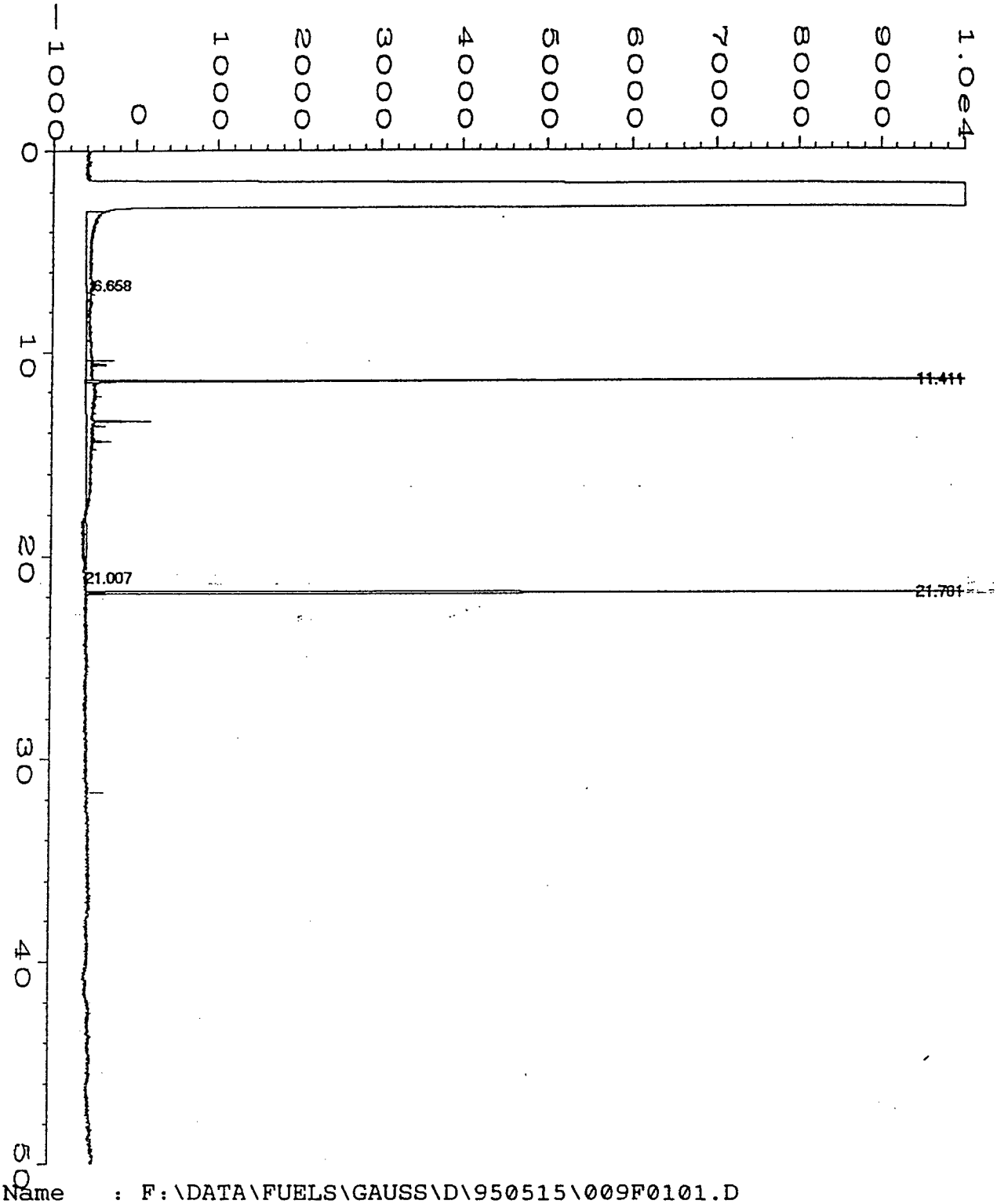
Operator : FUELS
Instrument : GAUSS
Sample Name : 505589-6
Run Time Bar Code:
Acquired on : 15 May 95 07:35 PM
Report Created on: 16 May 95 09:10 AM
Last Recalib on : 25 APR 95 11:12 AM
Multiplier : 1

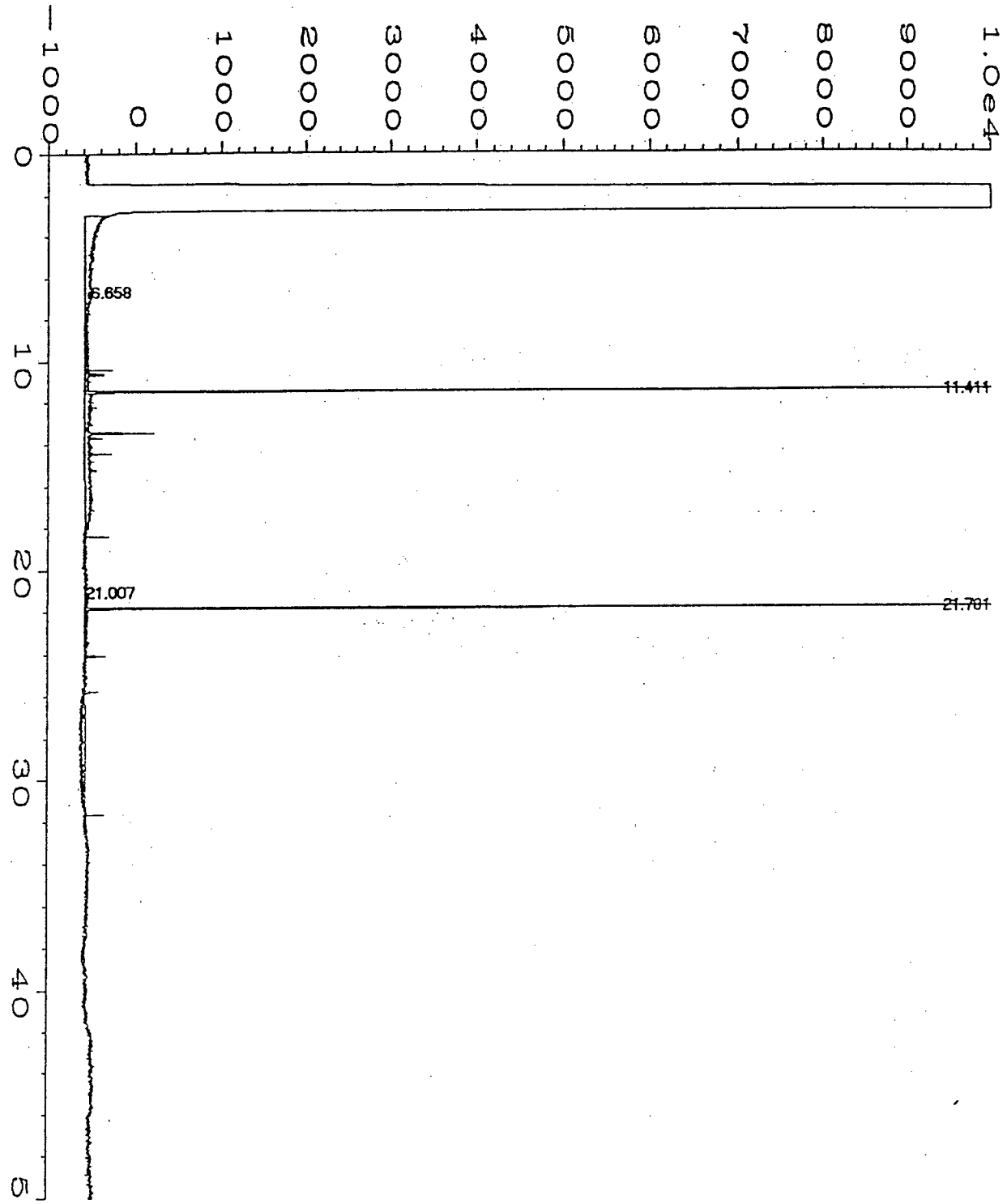
Page Number : 1
Vial Number : 7
Injection Number : 1
Sequence Line : 1
Instrument Method: OHCID.MTH
Analysis Method : OF-HCID.MTH
Sample Amount : 0
ISTD Amount :



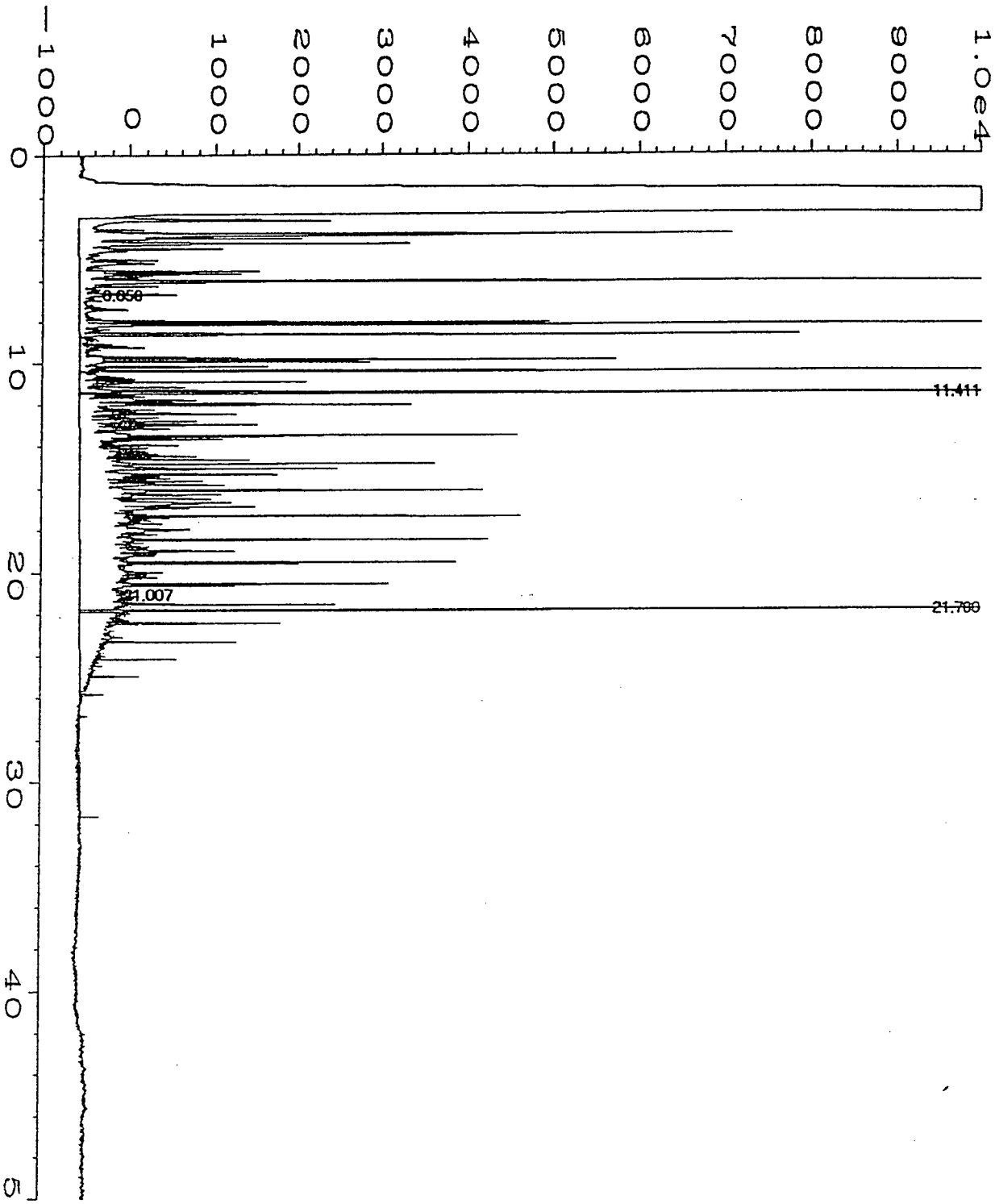
Data File Name	: F:\DATA\FUELS\GAUSS\D\950515\008F0101.D		
Operator	: FUELS	Page Number	: 1
Instrument	: GAUSS	Vial Number	: 8
Sample Name	: 505589-7	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 15 May 95 08:36 PM	Instrument Method	: OHCID.MTH
Report Created on	: 16 May 95 09:11 AM	Analysis Method	: OF-HCID.MTH
Last Recalib on	: 25 APR 95 11:12 AM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



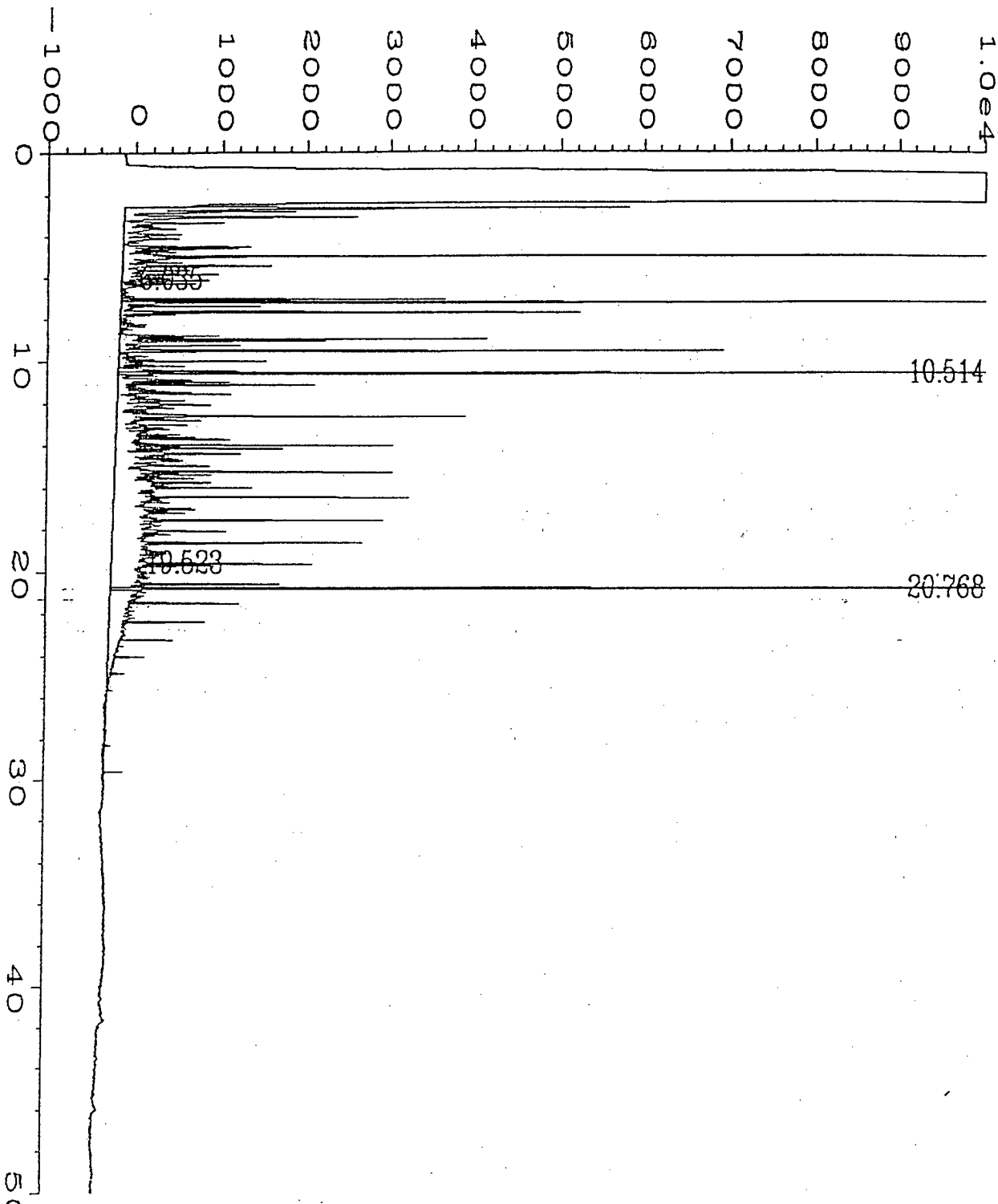
ata File Name	: F:\DATA\FUELS\GAUSS\D\950515\009F0101.D		
perator	: FUELS	Page Number	: 1
nstrument	: GAUSS	Vial Number	: 9
ample Name	: 505589-8	Injection Number	: 1
un Time Bar Code:		Sequence Line	: 1
cquired on	: 15 May 95 09:35 PM	Instrument Method	: OHCID.MTH
eport Created on	: 16 May 95 09:13 AM	Analysis Method	: OF-HCID.MTH
ast Recalib on	: 25 APR 95 11:12 AM	Sample Amount	: 0
ultiplier	: 1	ISTD Amount	:



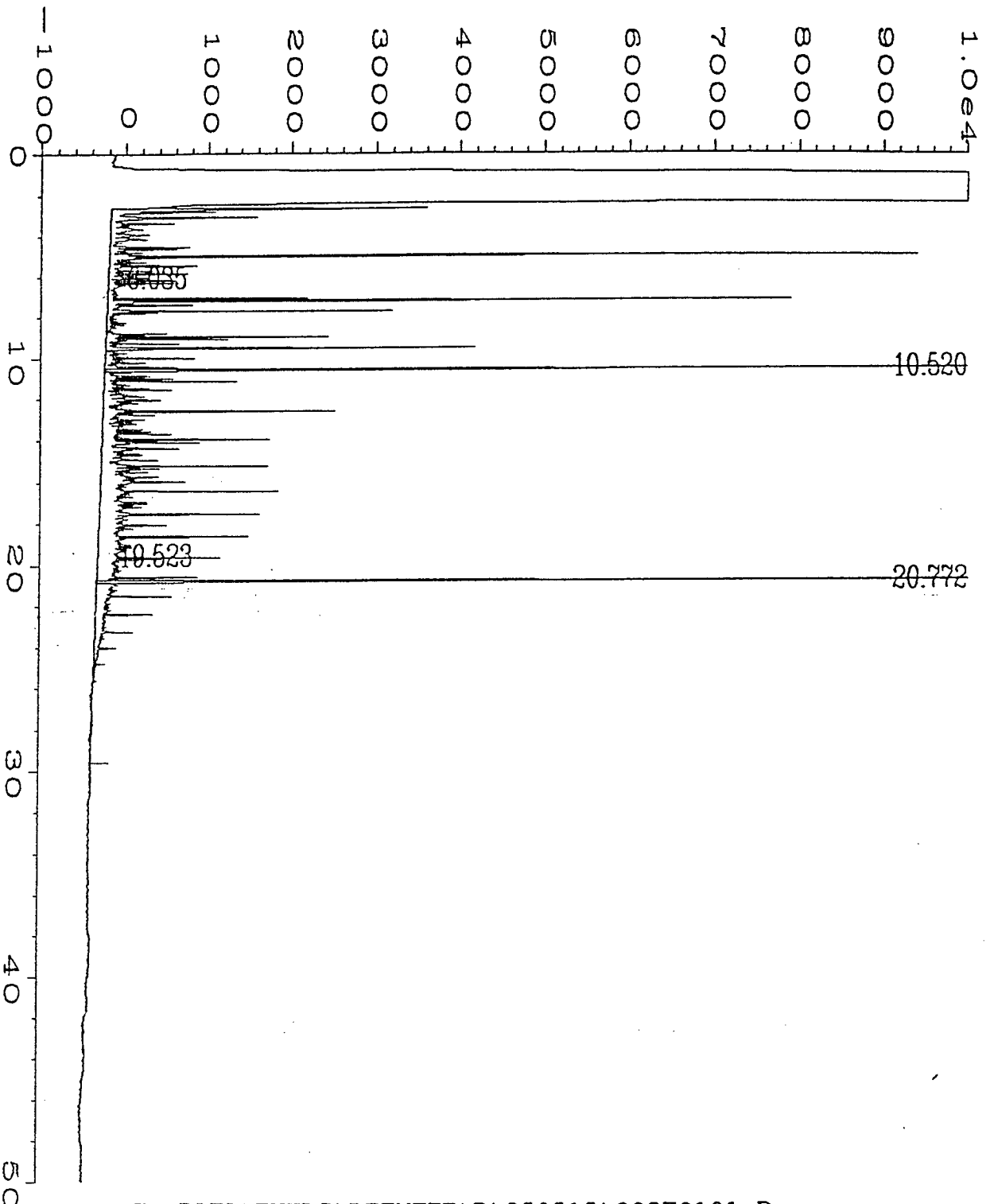
Data File Name	: F:\DATA\FUELS\GAUSS\D\950515\010F0101.D		
Operator	: FUELS	Page Number	: 1
Instrument	: GAUSS	Vial Number	: 10
Sample Name	: mb 5-15	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 15 May 95 10:34 PM	Instrument Method	: OHCID.MTH
Report Created on	: 16 May 95 09:13 AM	Analysis Method	: OF-HCID.MTH
Last Recalib on	: 25 APR 95 11:12 AM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



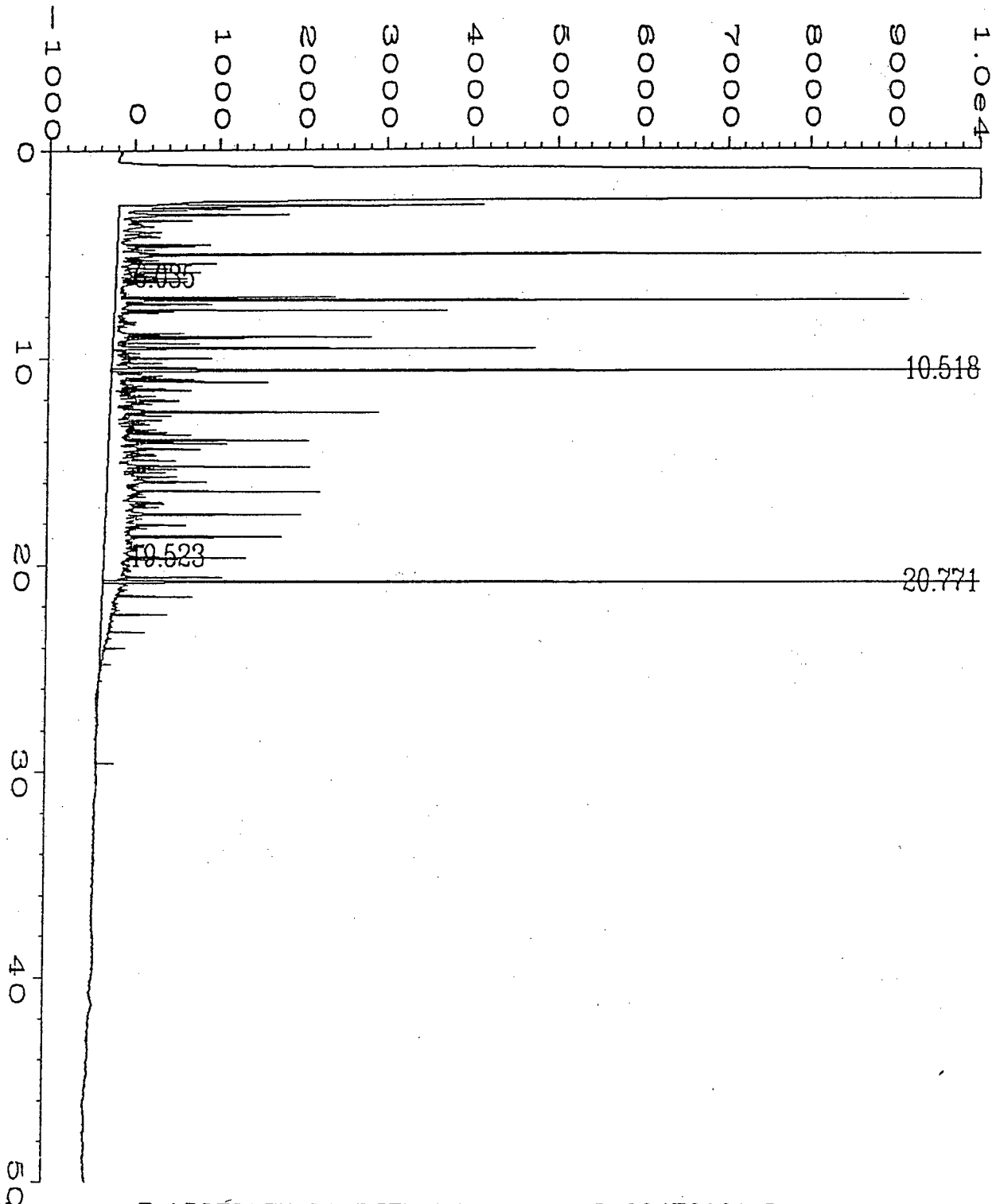
Data File Name	: F:\DATA\FUELS\GAUSS\D\950515\011F0101.D		
Operator	: FUELS	Page Number	: 1
Instrument	: GAUSS	Vial Number	: 11
Sample Name	: dg 150	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 15 May 95 11:34 PM	Instrument Method	: OHCID.MTH
Report Created on	: 16 May 95 09:14 AM	Analysis Method	: OF-HCID.MTH
Last Recalib on	: 25 APR 95 11:12 AM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



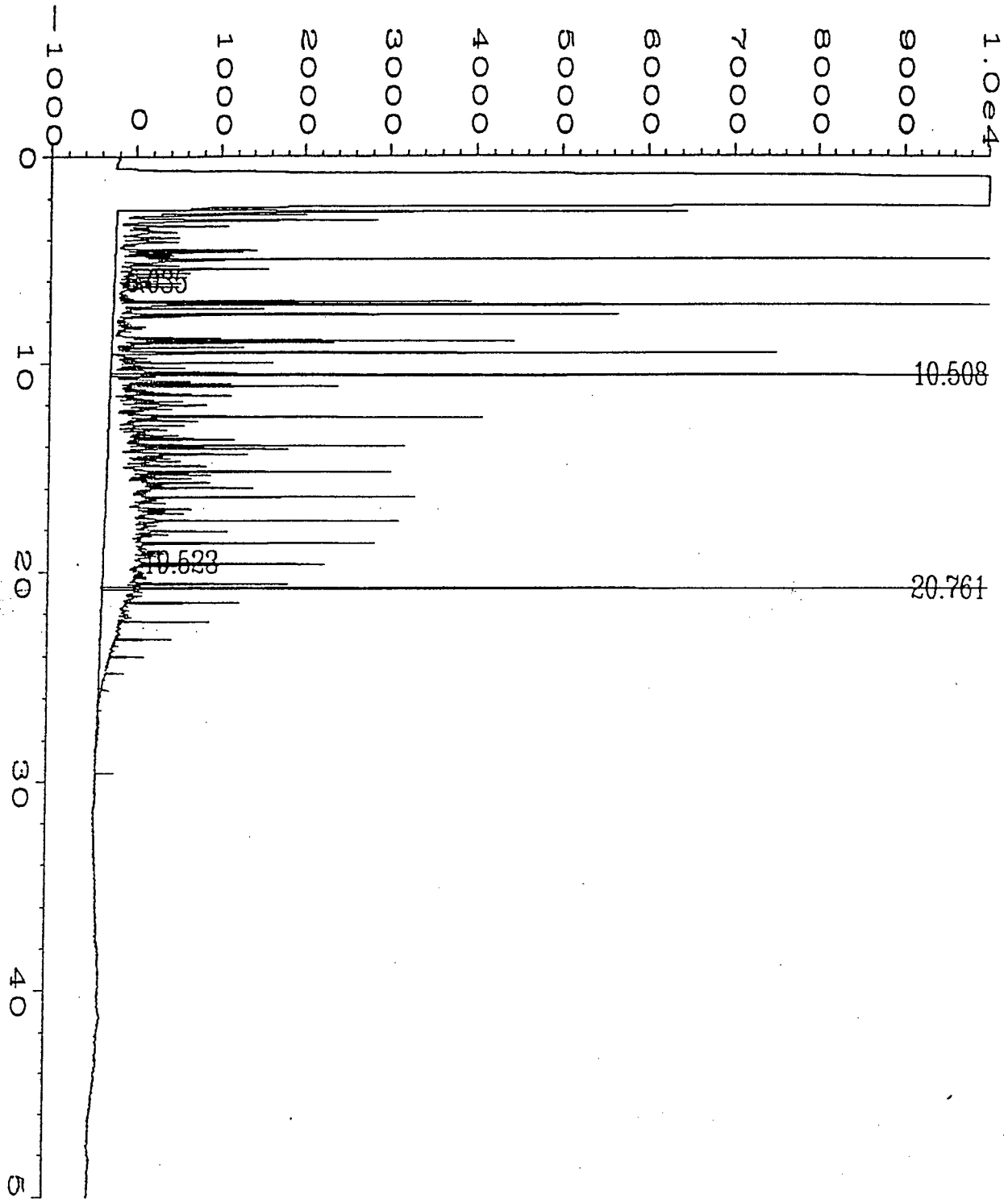
Data File Name	: F:\DATA\FUELS\DEEMTER\D\950515\001F0101.D		
Operator	: FUELS	Page Number	: 1
Instrument	: DEEMTER	Vial Number	: 1
Sample Name	: DG 150	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 12 May 95 10:49 AM	Instrument Method	: OHCID.MTH
Report Created on	: 12 May 95 12:06 PM	Analysis Method	: OF-HCID.MTH
Last Recalib on	: 25 APR 95 09:55 AM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



Data File Name	: F:\DATA\FUELS\DEEMTER\D\950515\003F0101.D		
Operator	: FUELS	Page Number	: 1
Instrument	: DEEMTER	Vial Number	: 3
Sample Name	: BS 5-15	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 15 May 95 03:36 PM	Instrument Method	: OHCID.MTH
Report Created on	: 16 May 95 08:50 AM	Analysis Method	: OF-HCID.MTH
Last Recalib on	: 25 APR 95 09:55 AM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

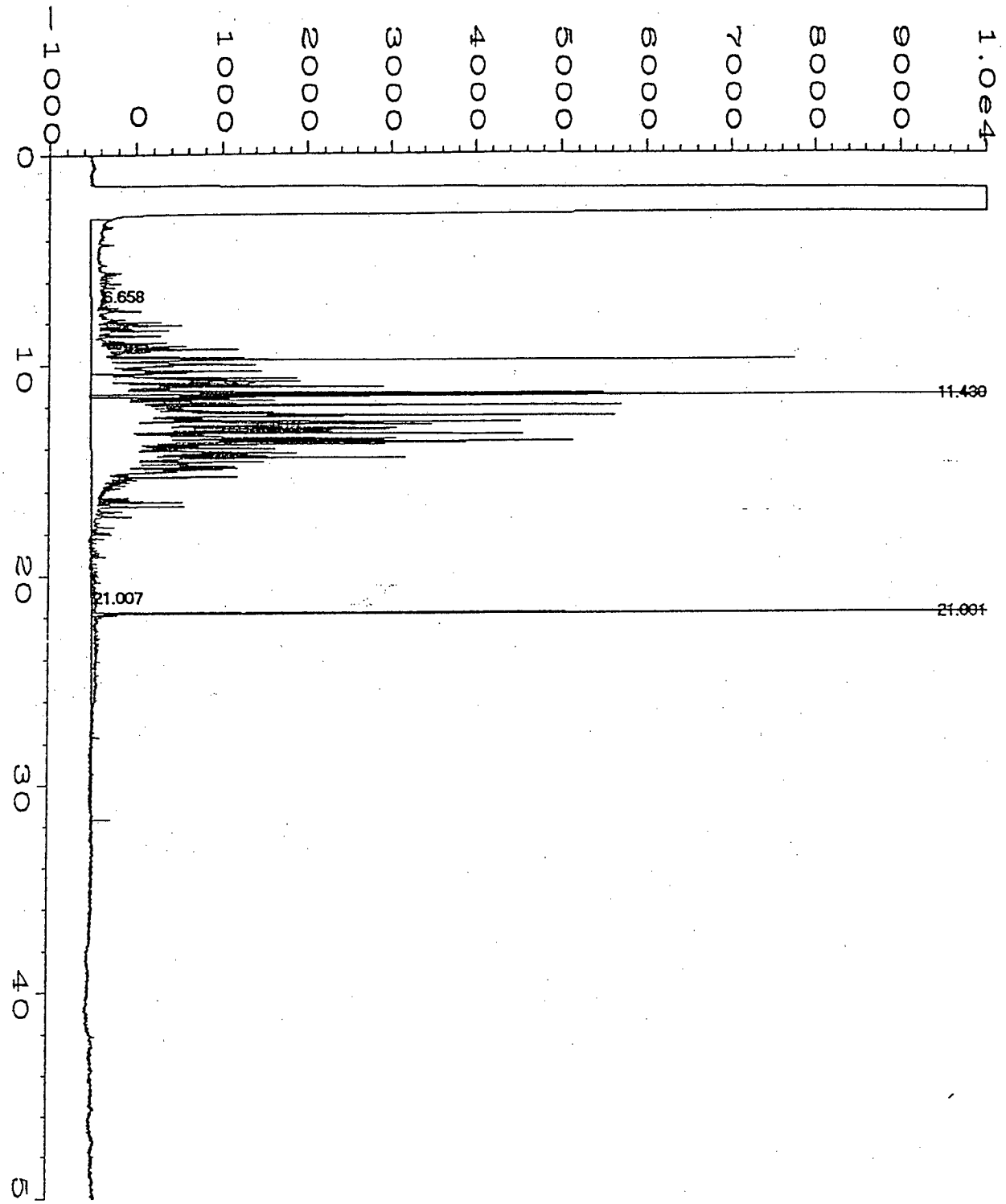


Data File Name	: F:\DATA\FUELS\DEEMTER\D\950515\004F0101.D		
Operator	: FUELS	Page Number	: 1
Instrument	: DEEMTER	Vial Number	: 4
Sample Name	: BSD 5-15	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 15 May 95 04:37 PM	Instrument Method	: OHCID.MTH
Report Created on	: 16 May 95 09:02 AM	Analysis Method	: OF-HCID.MTH
Last Recalib on	: 25 APR 95 09:55 AM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

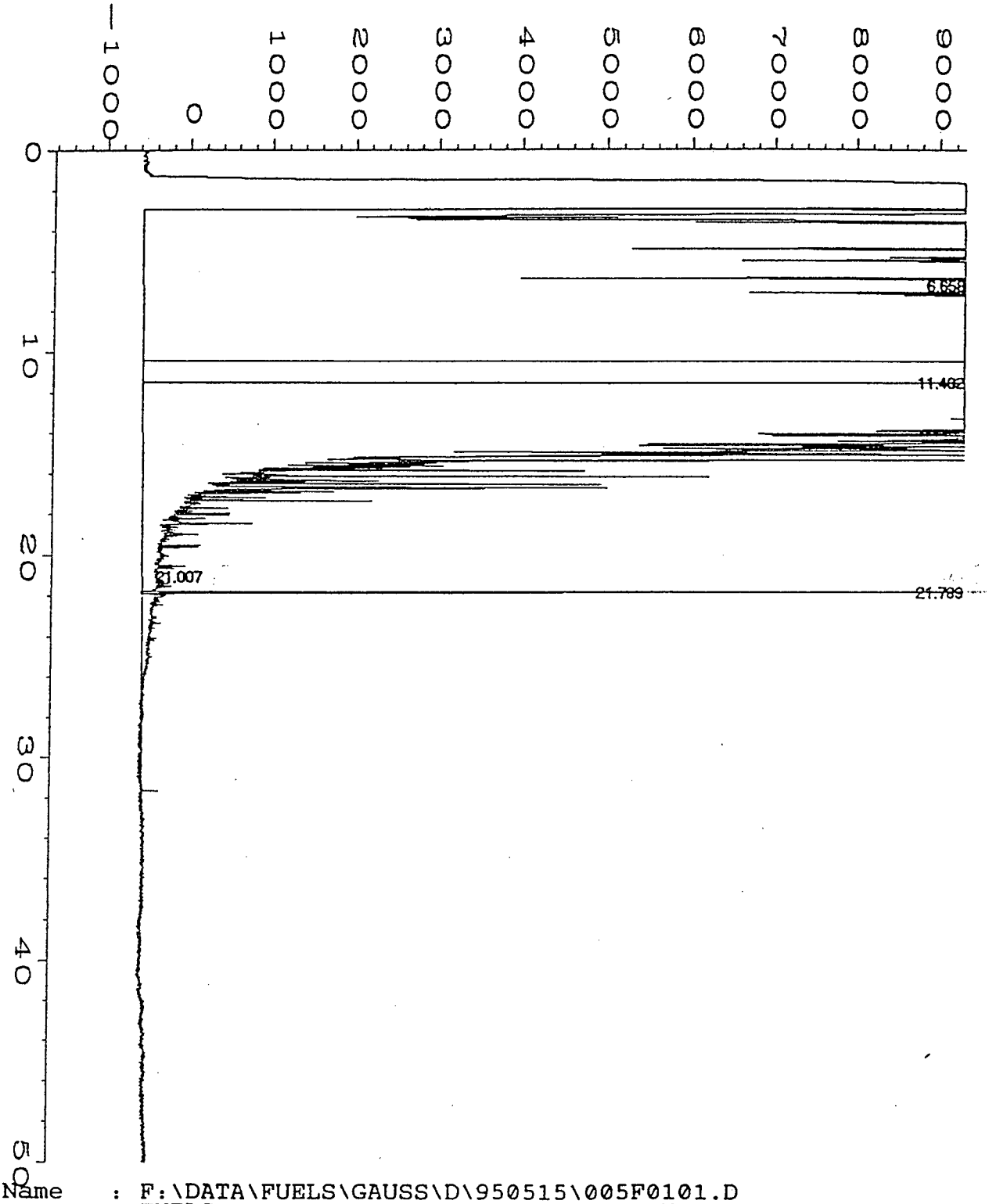


Data File Name : F:\DATA\FUELS\DEEMTER\D\950515\008F0101.D
Operator : FUELS
Instrument : DEEMTER
Sample Name : dg 150
Run Time Bar Code:
Acquired on : 15 May 95 08:45 PM
Report Created on: 16 May 95 08:58 AM
Last Recalib on : 25 APR 95 09:55 AM
Multiplier : 1

Page Number : 1
Vial Number : 8
Injection Number : 1
Sequence Line : 1
Instrument Method: OHCID.MTH
Analysis Method : OF-HCID.MTH
Sample Amount : 0
ISTD Amount :



)ata File Name	: F:\DATA\FUELS\GAUSS\D\950515\002F0101.D		
)perator	: FUELS	Page Number	: 1
.nstrument	: GAUSS	Vial Number	: 2
:ample Name	: 505589-1	Injection Number	: 1
:un Time Bar Code:		Sequence Line	: 1
:cquired on	: 15 May 95 02:46 PM	Instrument Method	: OHCID.MTH
?eport Created on:	15 May 95 03:56 PM	Analysis Method	: OF-HCID.MTH
;ast Recalib on	: 25 APR 95 11:12 AM	Sample Amount	: 0
:ultiplier	: 1	ISTD Amount	:



ata File Name : F:\DATA\FUELS\GAUSS\D\950515\005F0101.D
perator : FUELS
nstrument : GAUSS
ample Name : 505589-4
un Time Bar Code:
quired on : 15 May 95 05:36 PM
eport Created on: 16 May 95 09:07 AM
ast Recalib on : 25 APR 95 11:12 AM
ultiplier : 1

Page Number : 1
Vial Number : 5
Injection Number : 1
Sequence Line : 1
Instrument Method: OHCID.MTH
Analysis Method : OF-HCID.MTH
Sample Amount : 0
ISTD Amount :

Analytical**Technologies,**Inc.

CASE NARRATIVE
TPH-G (Oregon)
ACCESSION # 505589

Ten grams of sample is extracted with methanol. 100 microliters of the extract is then added to five milliliters of water and analyzed using a gas chromatograph equipped with a photoionization detector (PID). The resulting chromatogram in quantitated from benzene to naphthalene using five point calibration curves.

ATI sample #505589-4 was analyzed at a 1:100 dilution. There was not surrogate recovery at this dilution. The surrogate is flagged "I" indicating surrogate not recovered due to sample dilution.

Carol L. Schnell

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	TPH-GASOLINE (Oregon)	**ATI I.D.:**	505589-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	N/A
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	N/A
PROJECT #:	4326-001	**DATE EXTRACTED:**	05/18/95
PROJECT NAME:	Birnbach	**DATE ANALYZED:**	05/18/95
SAMPLE MATRIX:	SOIL	**DILUTION FACTOR:**	1
		UNITS:	mg/kg

PARAMETER	RESULTS
GASOLINE	< 5.0
BENZENE-NAPHTHALENE	
SURROGATE:	
TRIFLUOROTOLUENE (50% - 142%)	96%

Analyst: [signature] 5/19/95

Reviewer: [signature] 5-19-95

Analytical**Technologies**, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	TPH-GASOLINE (Oregon)	**ATI I.D.:**	505589-1
CLIENT I.D.:	B-8-15.5	**DATE SAMPLED:**	05/11/95
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	05/15/95
PROJECT #:	4326-001	**DATE EXTRACTED:**	05/18/95
PROJECT NAME:	Birnbach	**DATE ANALYZED:**	05/19/95
SAMPLE MATRIX:	SOIL	**DILUTION FACTOR:**	1
		UNITS:	mg/kg

PARAMETER	RESULTS
GASOLINE	130
BENZENE-NAPHTHALENE	
SURROGATE:	
TRIFLUOROTOLUENE (50% - 142%)	78%

Analyst: 5/22/95

Reviewer: 5-22-95

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	TPH-GASOLINE (Oregon)	**ATI I.D.:**	505589-4
CLIENT I.D.:	B-10/MW-5-23.0	**DATE SAMPLED:**	05/11/95
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	05/15/95
PROJECT #:	4326-001	**DATE EXTRACTED:**	05/18/95
PROJECT NAME:	Birnbach	**DATE ANALYZED:**	05/19/95
SAMPLE MATRIX:	SOIL	**DILUTION FACTOR:**	100
		UNITS:	mg/kg

PARAMETER	RESULTS
GASOLINE	5200
BENZENE-NAPHTHALENE	
SURROGATE:	
TRIFLUOROTOLUENE (50% - 142%)	I

I = Surrogate not recovered due to sample dilution.

Analyst: 5/22/95

Reviewer: CS 5-22-95

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY DUPLICATE RESULTS

		ATI ACCESSION:	505589
TEST:	TPH-GASOLINE (Oregon)	QC SAMPLE:	505601-4
CLIENT:	GeoEngineers, Inc.	DATE EXTRACTED:	05/18/95
PROJECT #:	4326-001	DATE ANALYZED:	05/18/95
PROJECT NAME:	Birnbach	DILUTION FACTOR:	1
SAMPLE MATRIX:	SOIL	UNITS:	mg/kg

PARAMETER	SAMPLE RESULT	SAMPLE DUP RESULT	RPD
GASOLINE	< 5.0	< 5.0	N/A
SURROGATE:			
TRIFLUOROTOLUENE (50% - 142%)	82%	78%	

CONTROL LIMITS

GASOLINE	20

Analyst: 5/22/95

Reviewer: 5-27-95

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY SPIKE RESULTS

		ATI ACCESSION:	505589
TEST:	TPH-GASOLINE (Oregon)	QC SAMPLE:	Method Blank
CLIENT:	GeoEngineers, Inc.	DATE EXTRACTED:	05/18/95
PROJECT #:	4326-001	DATE ANALYZED:	05/19/95
PROJECT NAME:	Birnbach	DILUTION FACTOR:	1
SAMPLE MATRIX:	SOIL	UNITS:	mg/kg

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
GASOLINE	<	5.0	100	95	95	90	90	5
SURROGATE:								
TRIFLUOROTOLUENE (50% - 142%)					95%		89%	

CONTROL LIMITS

	% REC	RPD
Gasoline	77 - 114	20

Analyst: JD 5/22/95

Reviewer: CS 5-22-95

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY SPIKE RESULTS

		ATI ACCESSION:	505589
TEST:	TPH-GASOLINE (Oregon)	QC SAMPLE:	505602-2
CLIENT:	GeoEngineers, Inc.	DATE EXTRACTED:	05/18/95
PROJECT #:	4326-001	DATE ANALYZED:	05/18/95
PROJECT NAME:	Birnbach	DILUTION FACTOR:	1
SAMPLE MATRIX:	SOIL	UNITS:	mg/kg

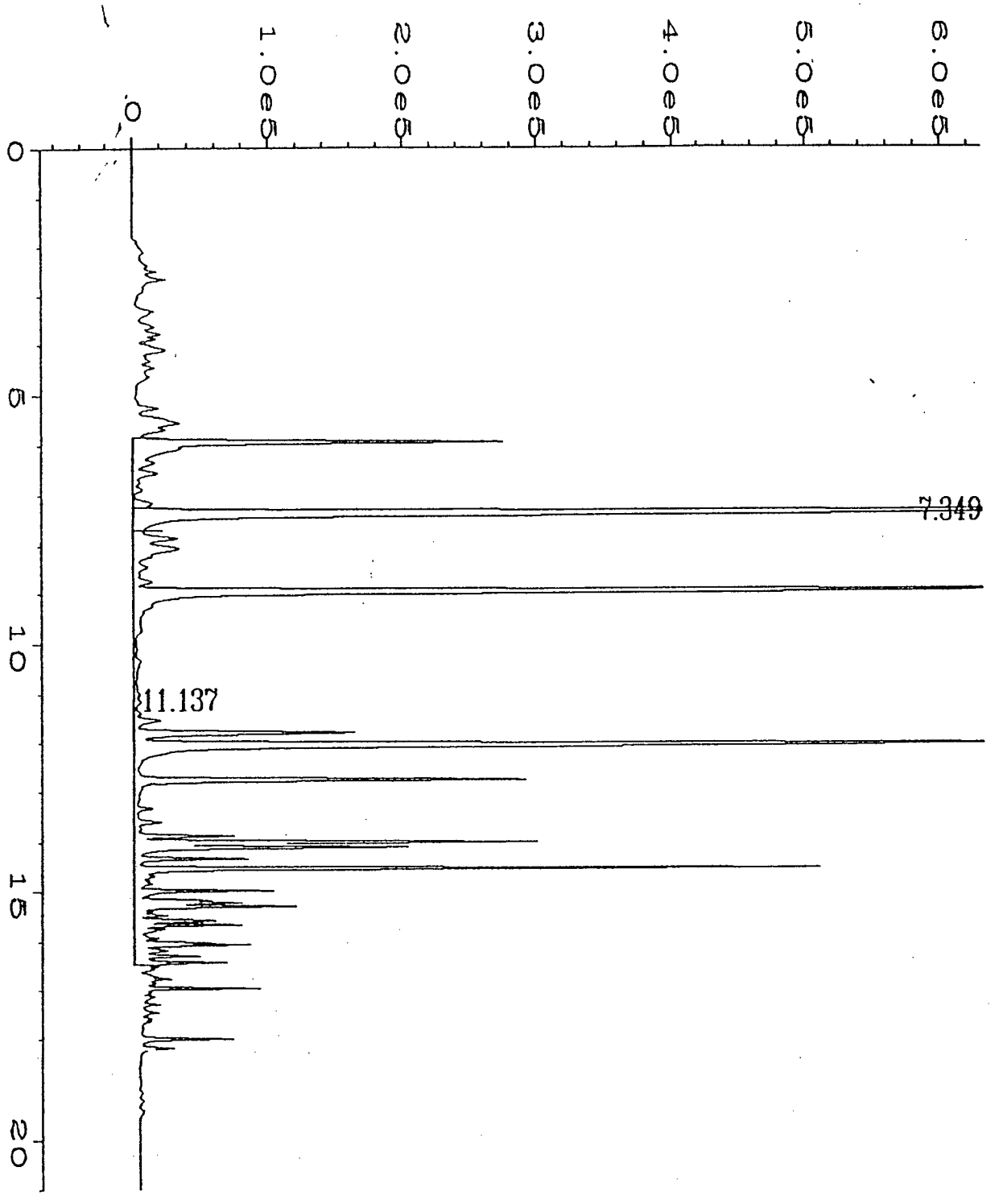
PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
GASOLINE	<	5.0	100	80	80	74	74	7
SURROGATE:								
TRIFLUOROTOLUENE (50% - 142%)					66%		65%	

CONTROL LIMITS

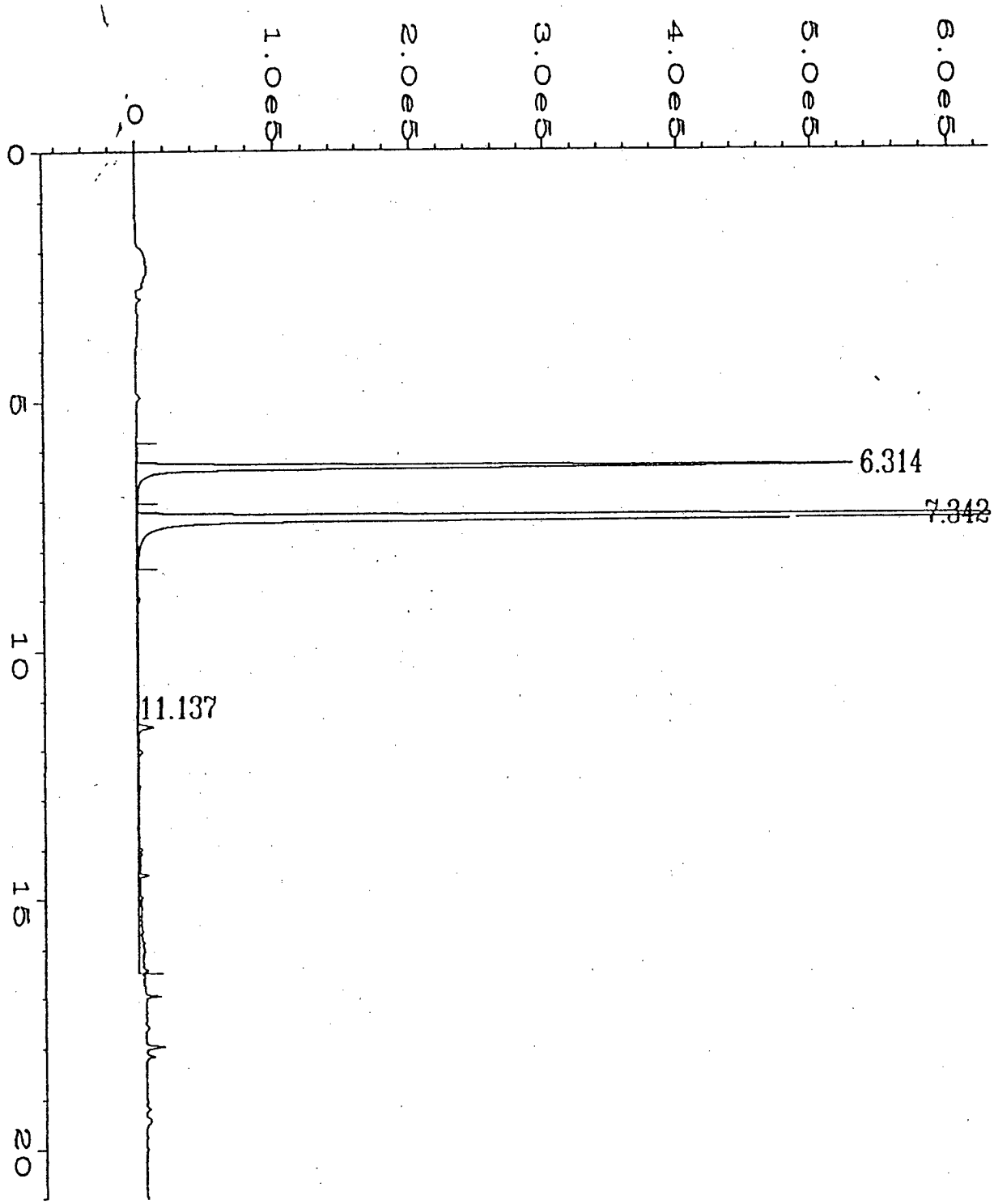
	% REC	RPD
Gasoline	50 - 134	20

Analyst: AM 5/22/95

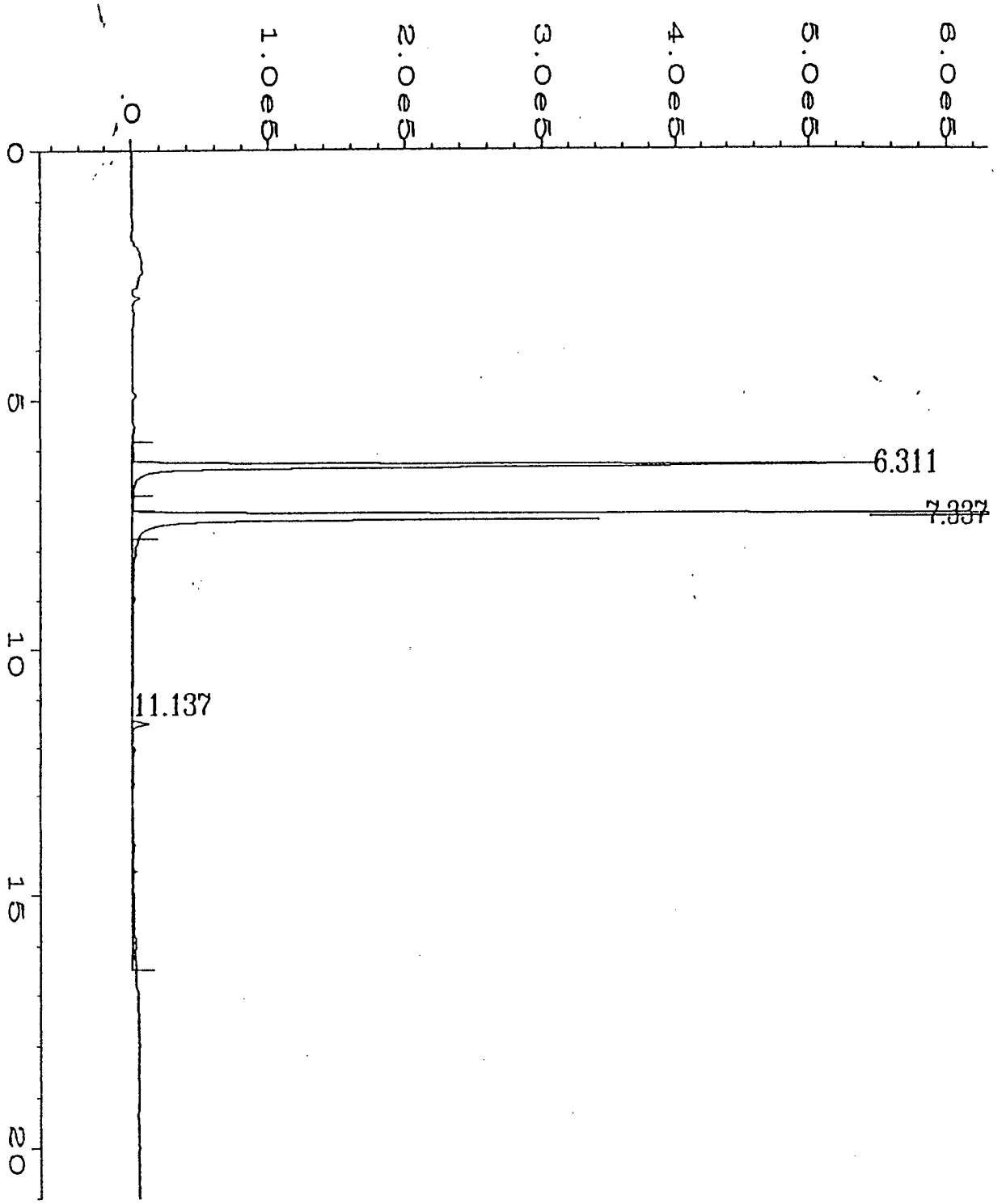
Reviewer: CS 5-22-95



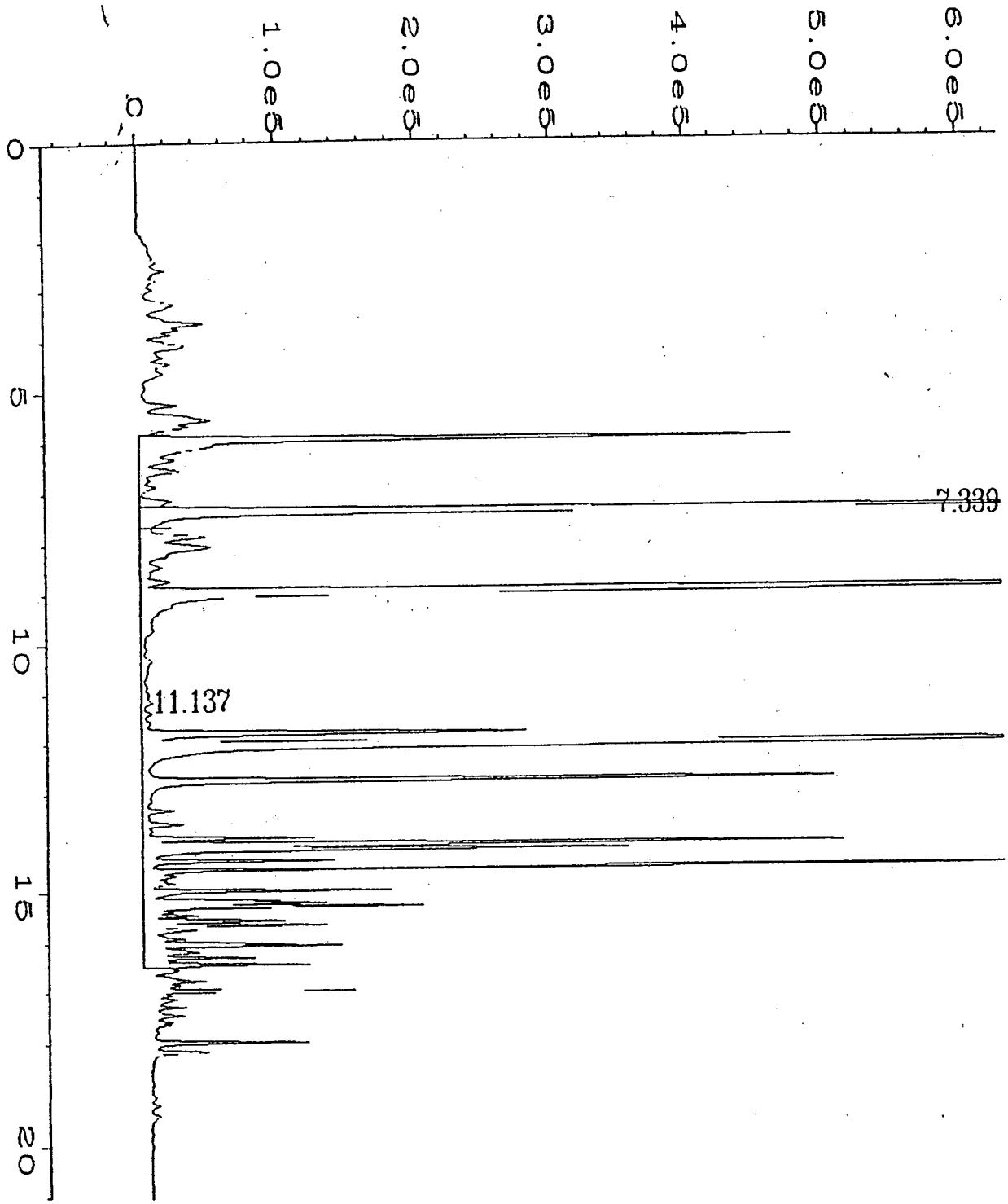
Data File Name	: F:\DATA\FUELS\CRICK\D\950518\001F0101.D		
Operator	: !!FUELS!!	Page Number	: 1
Instrument	: CRICK	Vial Number	: 1
Sample Name	: STD-C	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 18 May 95 01:19 PM	Instrument Method	: STDBETX.MT
Report Created on	: 18 May 95 01:55 PM	Analysis Method	: O-TPHG.MTH
Last Recalib on	: 16 MAY 95 12:04 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



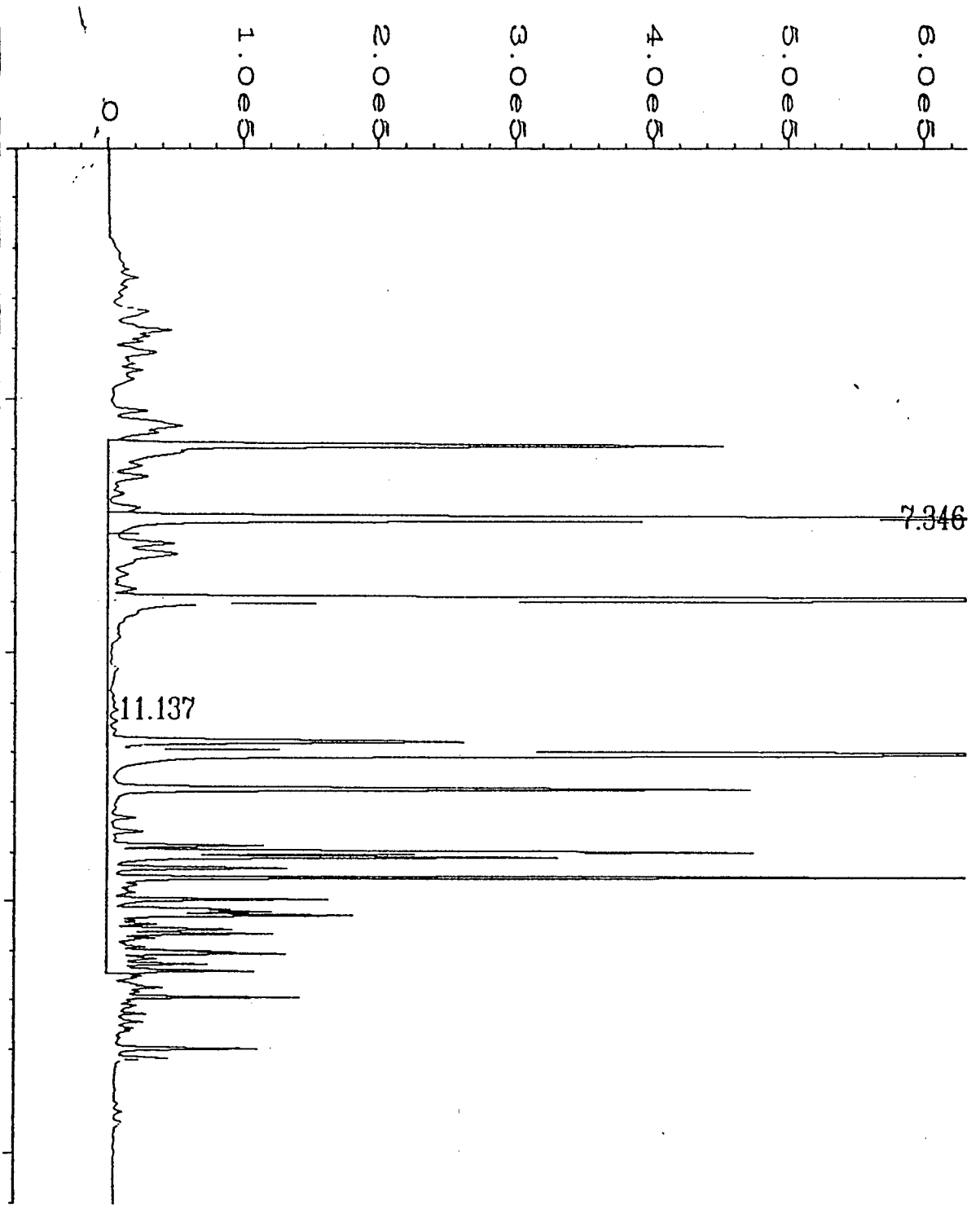
Data File Name	: F:\DATA\FUELS\CRICK\D\950518\005F0101.D		
Operator	: !!FUELS!!	Page Number	: 1
Instrument	: CRICK	Vial Number	: 5
Sample Name	: MB 5-8	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 18 May 95 04:45 PM	Instrument Method	: STDBETX.M
Report Created on	: 19 May 95 09:16 AM	Analysis Method	: O-TPHG.M
Last Recalib on	: 16 MAY 95 12:04 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



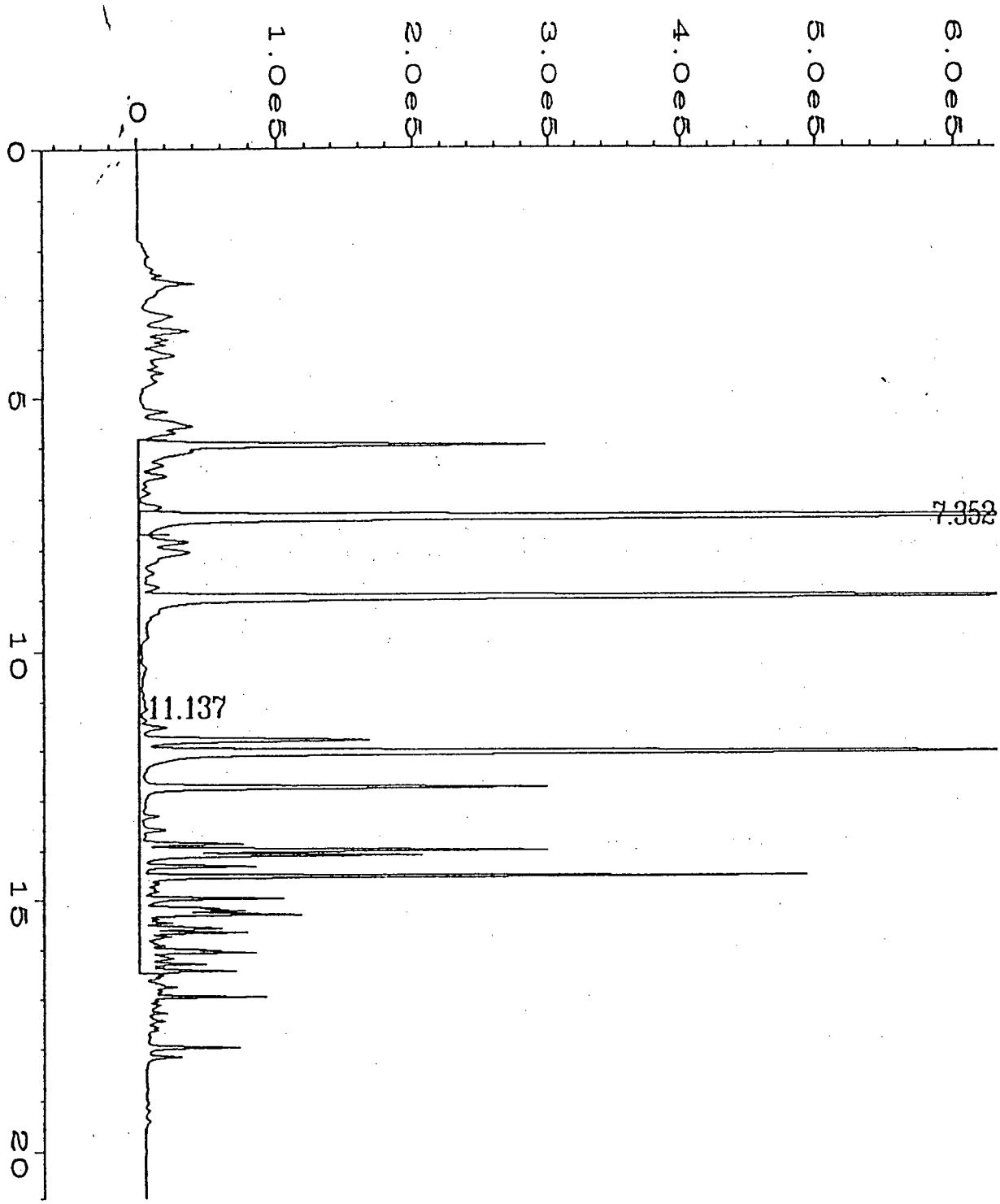
Data File Name	: F:\DATA\FUELS\CRICK\D\950518\008F0101.D		
Operator	: !!FUELS!!	Page Number	: 1
Instrument	: CRICK	Vial Number	: 8
Sample Name	: 505602-2	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 18 May 95 06:08 PM	Instrument Method	: STDBETX.MTH
Report Created on	: 19 May 95 09:21 AM	Analysis Method	: O-TPHG.MTH
Last Recalib on	: 16 MAY 95 12:04 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



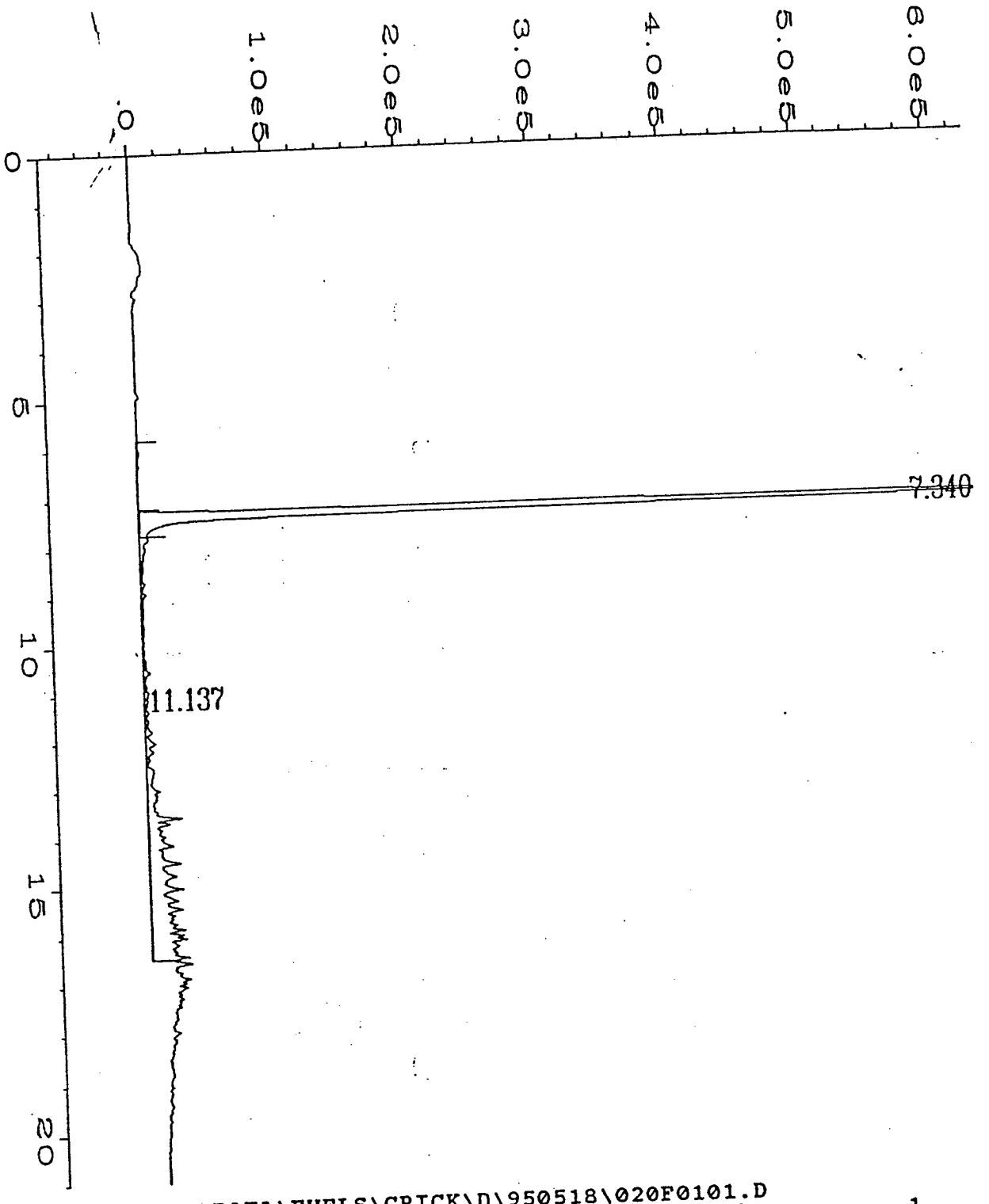
Data File Name	: F:\DATA\FUELS\CRICK\D\950518\009F0101.D		
Operator	: !!FUELS!!	Page Number	: 1
Instrument	: CRICK	Vial Number	: 9
Sample Name	: 505602-2 MS	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 18 May 95 06:36 PM	Instrument Method	: STDBETX.MT
Report Created on	: 19 May 95 09:45 AM	Analysis Method	: O-TPHG.MTH
Last Recalib on	: 16 MAY 95 12:04 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



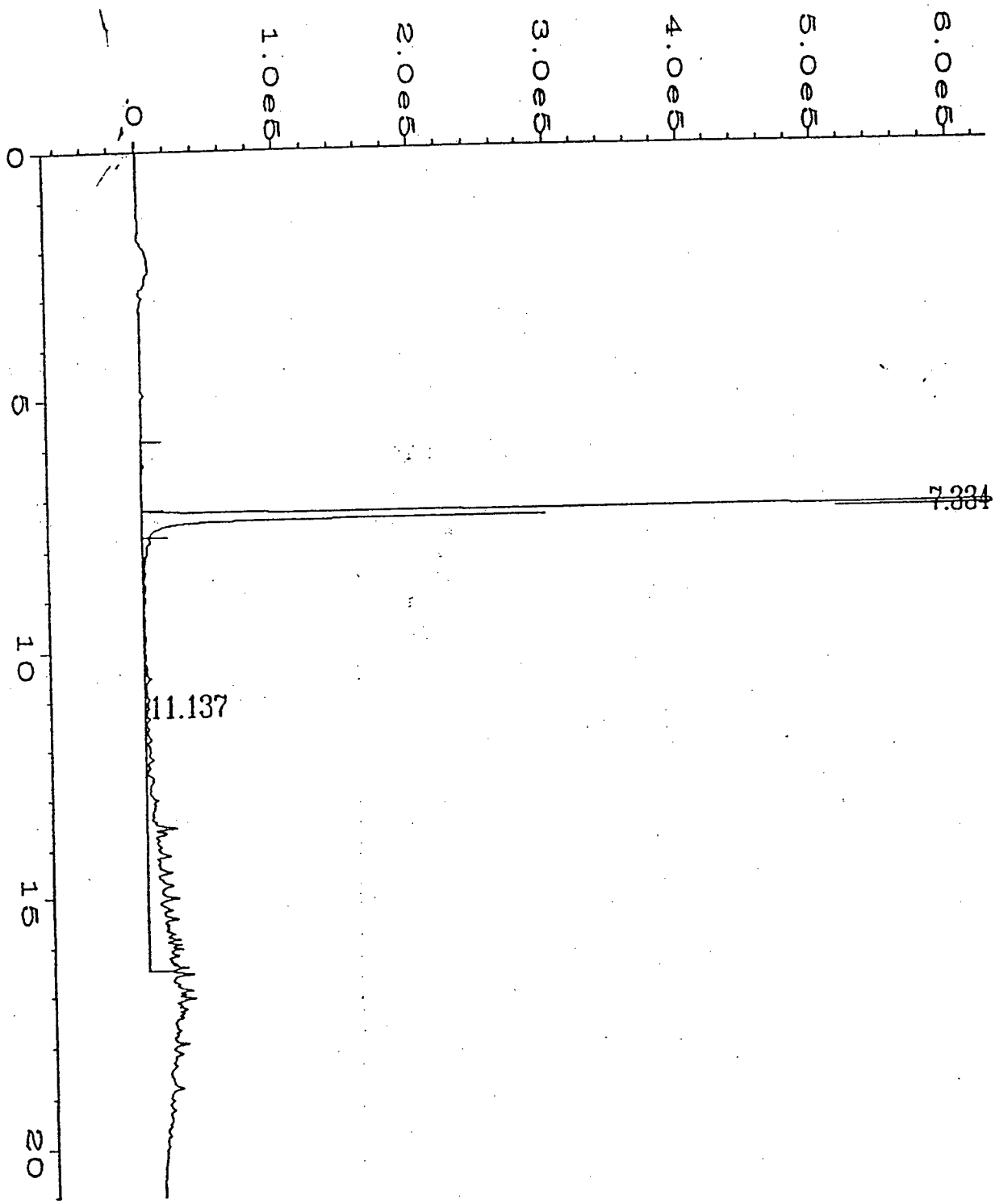
Name : F:\DATA\FUELS\CRICK\D\950518\010F0101.D
: !!FUELS!! Page Number : 1
: CRICK Vial Number : 10
: 505602-2 MSD Injection Number : 1
ar Code: Sequence Line : 1
n : 18 May 95 07:04 PM Instrument Method: STDBETX.MTH
ed on: 19 May 95 09:52 AM Analysis Method : O-TPHG.MTH
on : 16 MAY 95 12:04 PM Sample Amount : 0
: 1 ISTD Amount :



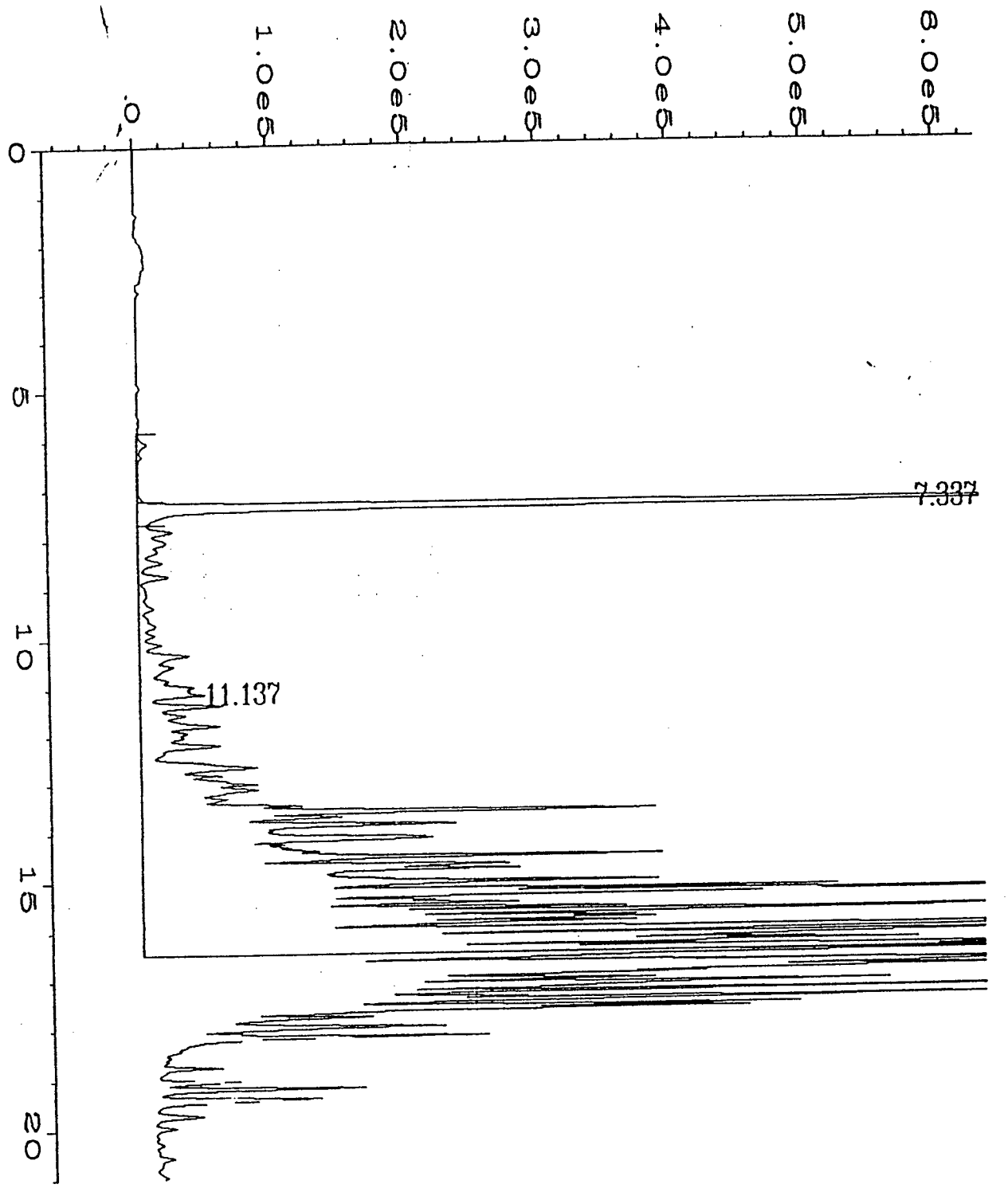
Data File Name	: F:\DATA\FUELS\CRICK\D\950518\013F0101.D		
Operator	: !!FUELS!!	Page Number	: 1
Instrument	: CRICK	Vial Number	: 13
Sample Name	: STD-C	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 18 May 95 08:28 PM	Instrument Method	: STDBETX.MTH
Report Created on	: 19 May 95 09:56 AM	Analysis Method	: O-TPHG.MTH
Last Recalib on	: 16 MAY 95 12:04 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



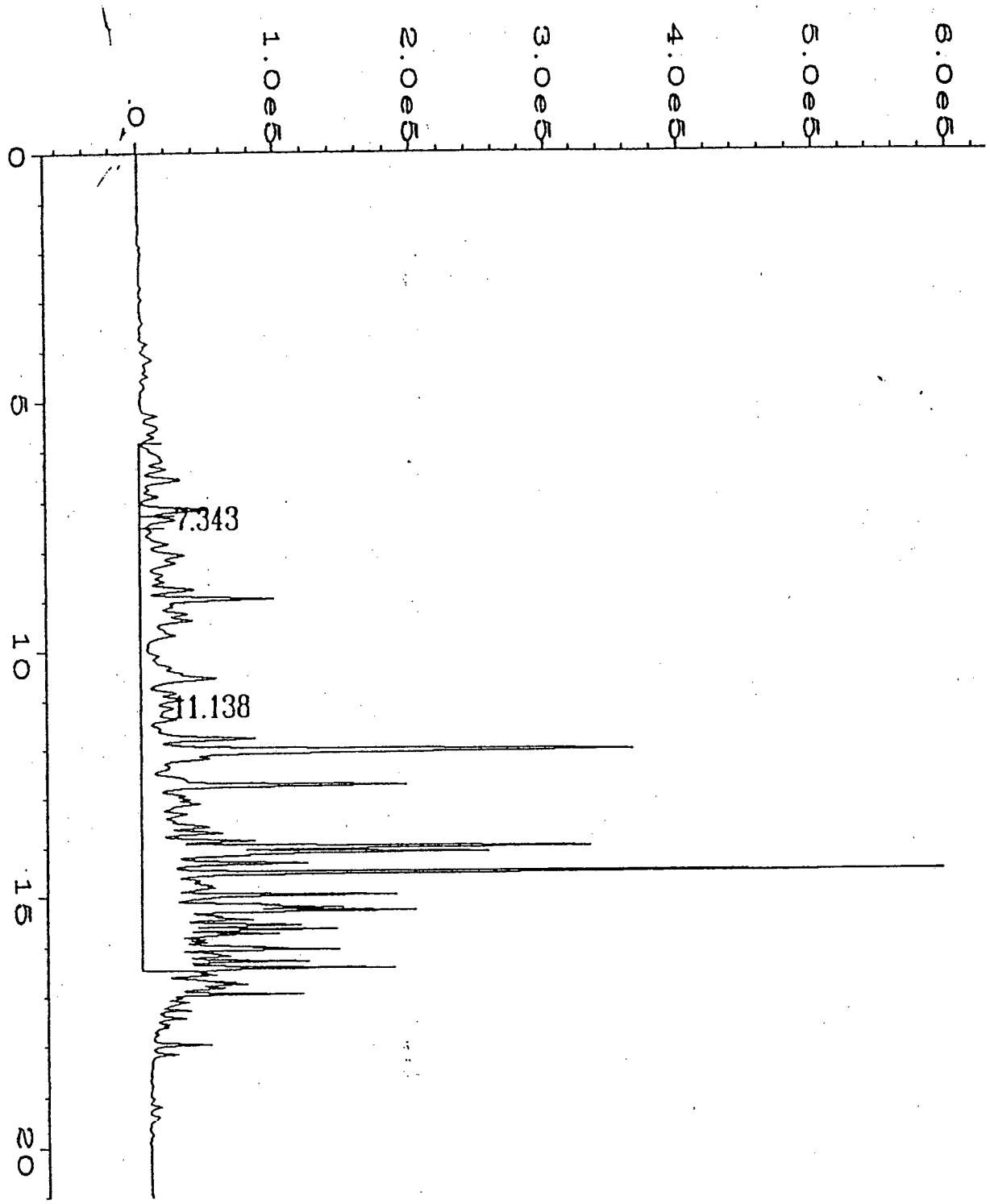
Data File Name	: F:\DATA\FUELS\CRICK\D\950518\020F0101.D	Page Number	: 1
Operator	: !!FUELS!!	Vial Number	: 20
Instrument	: CRICK	Injection Number	: 1
Sample Name	: 505601-4	Sequence Line	: 1
Run Time Bar Code:		Instrument Method	: STDBETX
Acquired on	: 18 May 95 11:43 PM	Analysis Method	: O-TPHG.!
Report Created on	: 19 May 95 10:01 AM	Sample Amount	: 0
Last Recalib on	: 16 MAY 95 12:04 PM	ISTD Amount	:
Multiplier	: 1		



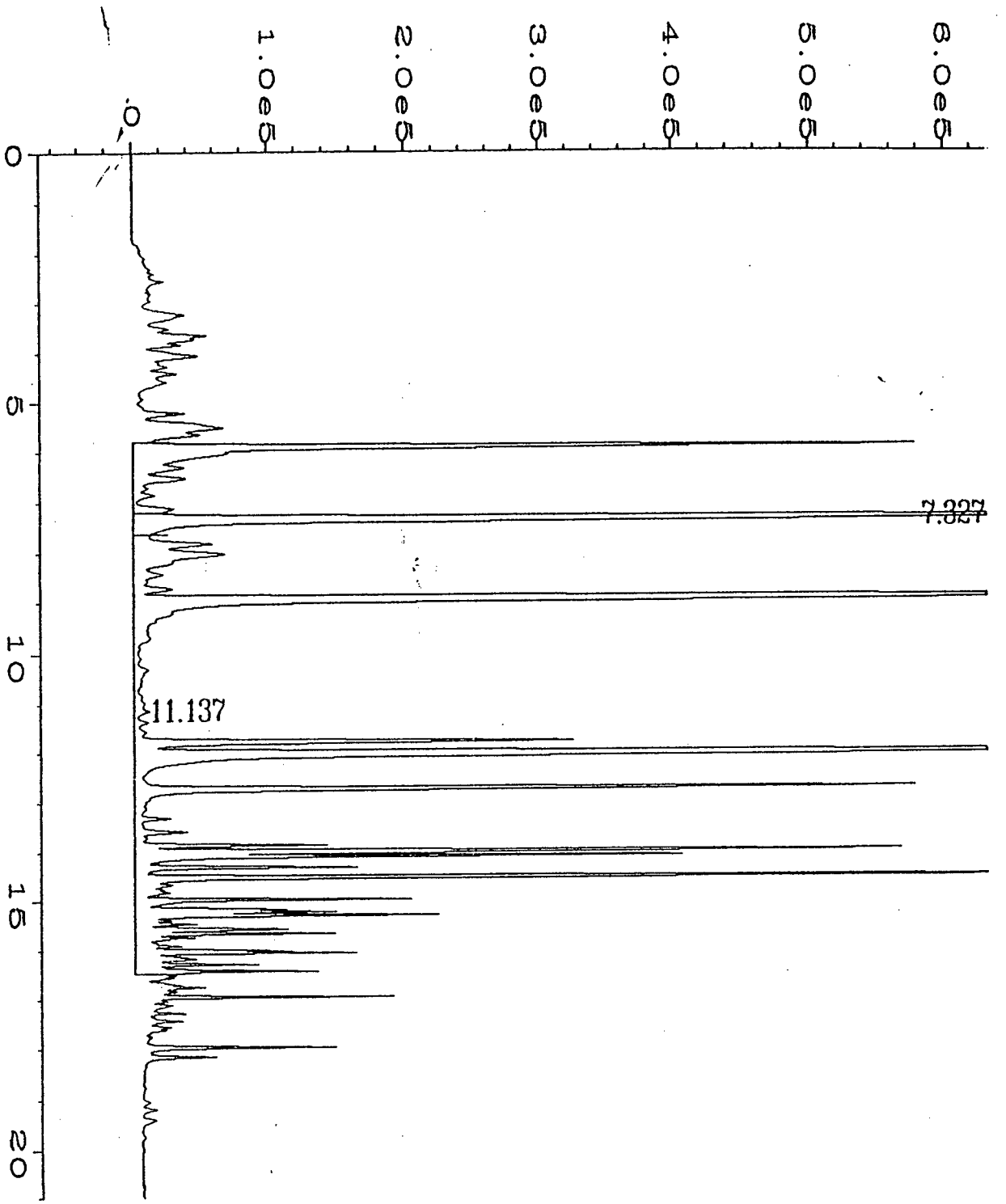
Data File Name	: F:\DATA\FUELS\CRICK\D\950518\021F0101.D		
Operator	: !!FUELS!!	Page Number	: 1
Instrument	: CRICK	Vial Number	: 21
Sample Name	: 505601-4 DP	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 19 May 95 00:11 AM	Instrument Method	: STDBET
Report Created on	: 19 May 95 10:02 AM	Analysis Method	: O-TPHG
Last Recalib on	: 16 MAY 95 12:04 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



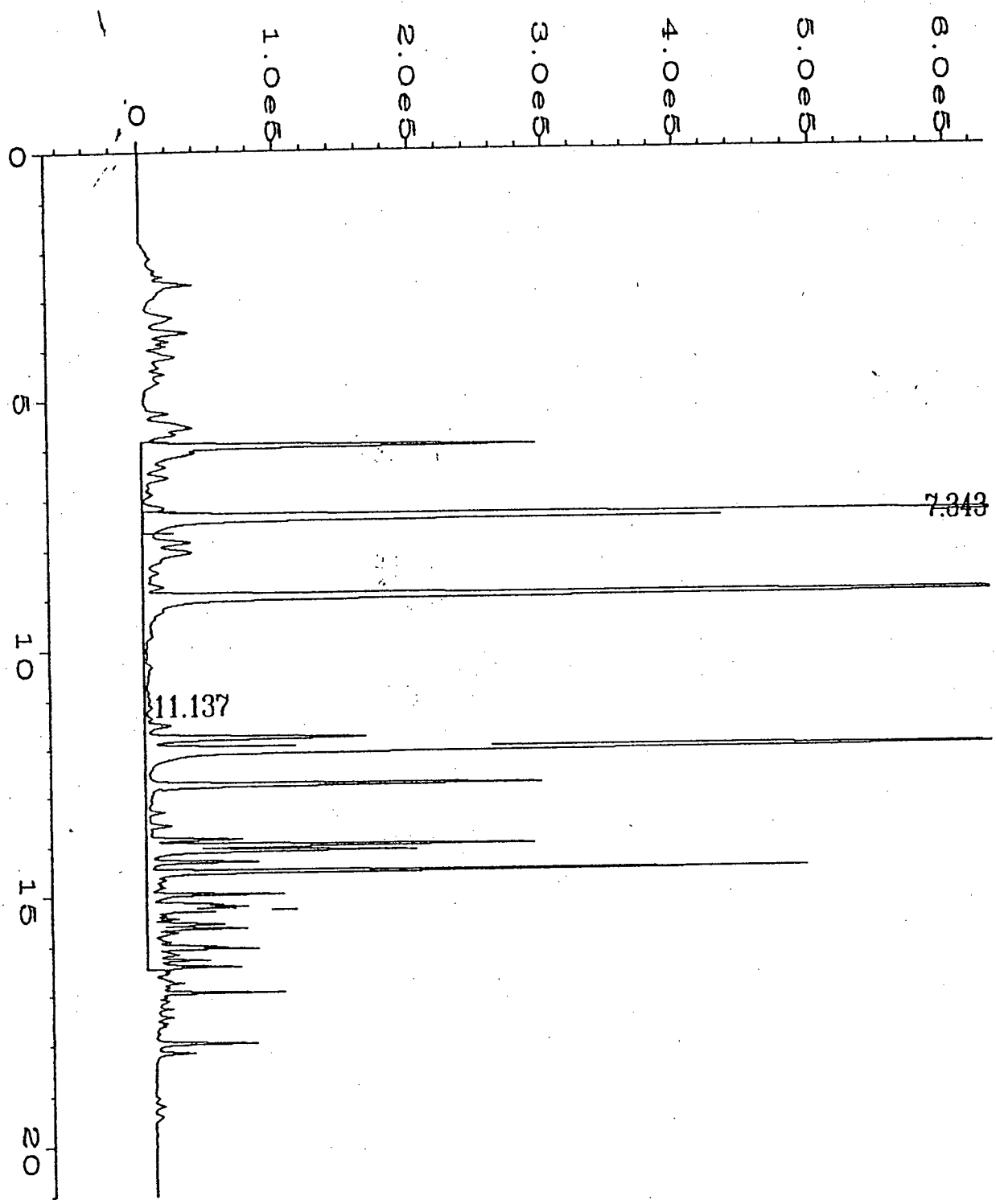
Data File Name	: F:\DATA\FUELS\CRICK\D\950518\023F0101.D		
Operator	: !!FUELS!!	Page Number	: 1
Instrument	: CRICK	Vial Number	: 23
Sample Name	: 505589-1	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 19 May 95 01:07 AM	Instrument Method	: STDBETX.
Report Created on	: 19 May 95 10:04 AM	Analysis Method	: 0-TPHG.M
Last Recalib on	: 16 MAY 95 12:04 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



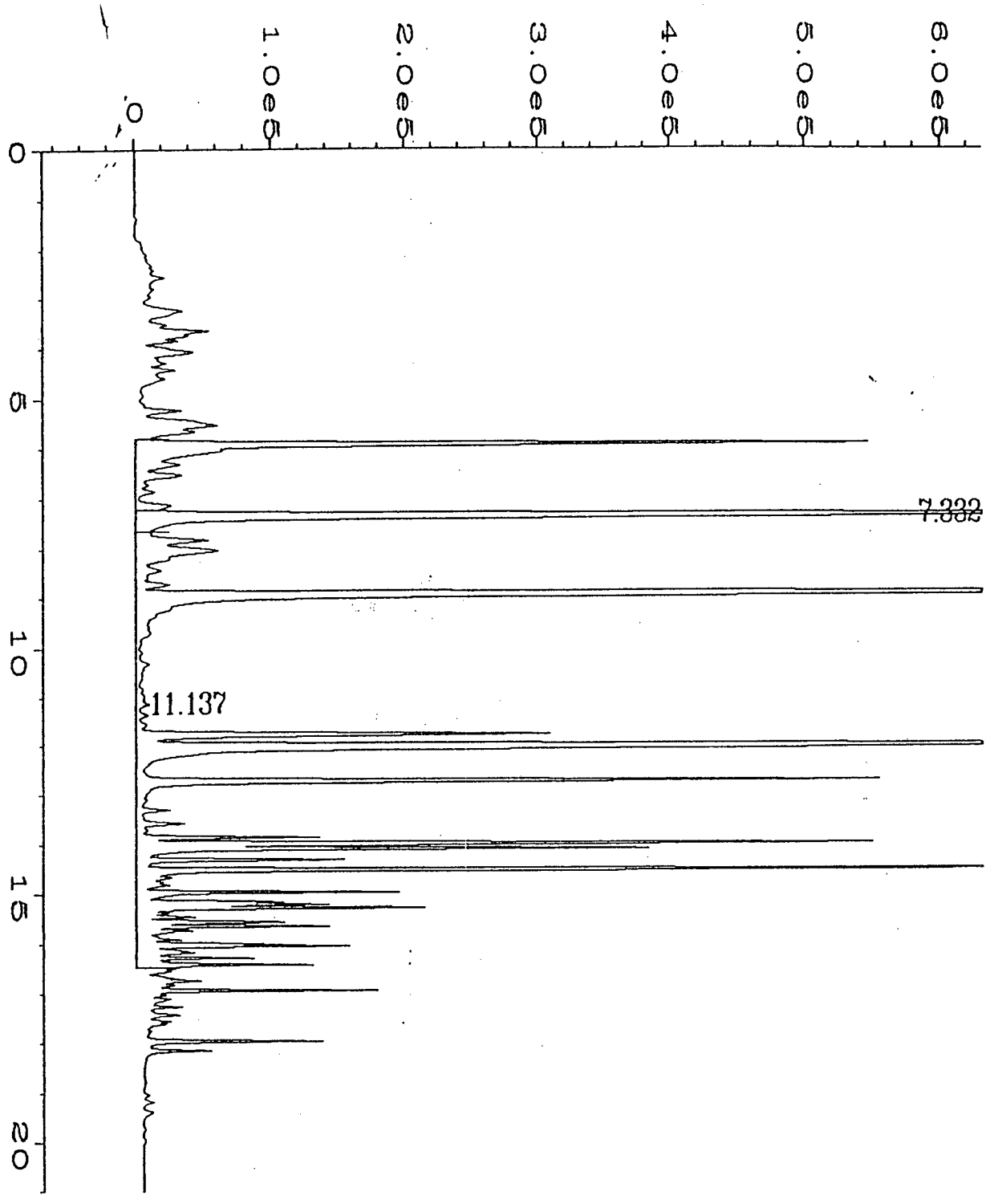
Data File Name	: F:\DATA\FUELS\CRICK\D\950518\024F0101.D		
Operator	: !!FUELS!!	Page Number	: 1
Instrument	: CRICK	Vial Number	: 24
Sample Name	: 505589-4 1:100	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 19 May 95 01:35 AM	Instrument Method	: STDBETX
Report Created on	: 19 May 95 10:06 AM	Analysis Method	: O-TPHG.
Last Recalib on	: 16 MAY 95 12:04 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



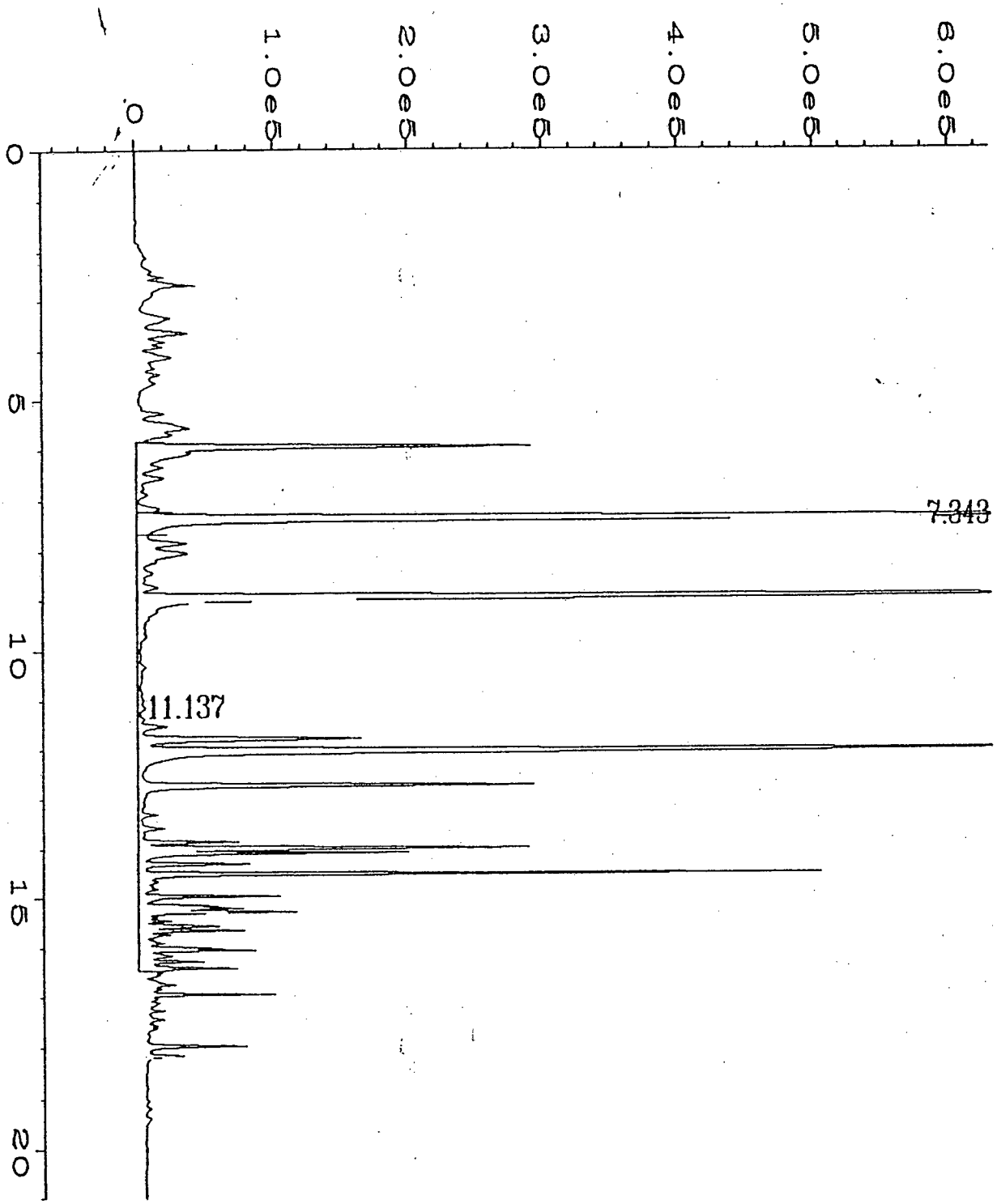
Data File Name	: F:\DATA\FUELS\CRICK\D\950518\025F0101.D		
Operator	: !!FUELS!!	Page Number	: 1
Instrument	: CRICK	Vial Number	: 25
Sample Name	: BS TPHG	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 19 May 95 02:04 AM	Instrument Method	: STDBETX.
Report Created on	: 19 May 95 10:07 AM	Analysis Method	: O-TPHG.M
Last Recalib on	: 16 MAY 95 12:04 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



Data File Name	: F:\DATA\FUELS\CRICK\D\950518\026F0101.D		
Operator	: !!FUELS!!	Page Number	: 1
Instrument	: CRICK	Vial Number	: 26
Sample Name	: STD-C	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 19 May 95 02:31 AM	Instrument Method	: STDBETX
Report Created on	: 19 May 95 10:08 AM	Analysis Method	: O-TPHG.
Last Recalib on	: 16 MAY 95 12:04 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



Data File Name	: F:\DATA\FUELS\CRICK\D\950518\028F0101.D		
Operator	: !!FUELS!!	Page Number	: 1
Instrument	: CRICK	Vial Number	: 28
Sample Name	: BSD	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 19 May 95 03:27 AM	Instrument Method	: STDBETX.
Report Created on	: 19 May 95 10:09 AM	Analysis Method	: O-TPHG.M
Last Recalib on	: 16 MAY 95 12:04 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:



Data File Name	: F:\DATA\FUELS\CRICK\D\950518\029F0101.D		
Operator	: !!FUELS!!	Page Number	: 1
Instrument	: CRICK	Vial Number	: 29
Sample Name	: STD-C	Injection Number	: 1
Run Time Bar Code:		Sequence Line	: 1
Acquired on	: 19 May 95 03:55 AM	Instrument Method	: STDBETX
Report Created on	: 19 May 95 10:10 AM	Analysis Method	: O-TPHG.
Last Recalib on	: 16 MAY 95 12:04 PM	Sample Amount	: 0
Multiplier	: 1	ISTD Amount	:

Analytical Technologies, Inc.
17400 S.W. Upper Boones Ferry Rd., Suite 270
Durham, Oregon 97224 • (503) 684-0447 FAX: (503) 620-0393

Chain of Custody

DATE 5-15-95 PAGE 1 OF 1

LABORATORY NUMBER: 505589
PROJECT NOTICE NUMBER: _____

PROJECT MANAGER: Julia Fowler
COMPANY: GeoEngineers
ADDRESS: 7504 SW Bridgeport Rd Portland OR 97224
PHONE: 624-9274 SAMPLED BY: SAK/MB

SAMPLE DISPOSAL INSTRUCTIONS
☐ ATI Disposal @ $5.00 each ☐ Return

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	PETROLEUM HYDROCARBONS: State: OR/WA TPH-HCID	State: OR/WA TPH-G	State: OR/WA TPH-D	State: OR/WA 418.1	EPA 418.1	8015M	8020M-BETX only	8310 HPLC PAHs	7421 Lead	% Moisture	ORGANICS: 8010 Halogenated VOCs	8020 Aromatic VOCs	8040 Phenols	8240 GCMS Volatiles	8270 GCMS Semivolatiles	8080 OC Pesticides/PCBs	8080M PCBs only	INORGANICS: Drinking Water (8)	Priority Pollutant Metals (13)	Cyanide	TCLP: TCLP Metals (8)	TCLP Volatiles 8240 ZH-EXT	TCLP Semivolatiles 8270	OTHER	NUMBER OF CONTAINERS
B-8-15.5	5/11		Soil	1	X	X																							1
B-8-23.0	5/11			2	X																								1
B-9-23.0	5/11			3	X																								1
B-10/MW-5-23.0	5/11			4	X	X																							1
B-11-20.5	5/12			5	X																								1
B-12-20.5	5/12			6	X																								1
B-13-15.5	5/12			7	X																								1
B-13-23.0	5/12			8	X																								1

MS/MSD
Rush
Follow up: Add 5/19 if not positive

PROJECT INFORMATION		SAMPLE RECEIPT	
PROJECT NUMBER:	4326-001	TOTAL NUMBER OF CONTAINERS	8
PROJECT NAME:	Brnbach	COC SEALS/INTACT? Y \ N \ NA	
PURCHASE ORDER NUMBER:		RECEIVED INTACT? Y \ N	
ONGOING PROJECT?	YES ☒ NO ☐	RECEIVED COLD? Y \ N	

PRIOR AUTHORIZATION REQUIRED FOR RUSH PROJECTS

TAT: (NORMAL) ☒ 2 WKS | (RUSH) ☐ 24 HR ☐ 48 HRS ☐ 72 HRS ☐ 1 WK

GREATER THAN 24 HR. NOTICE? YES ☐ NO ☐ (LAB USE ONLY)

SPECIAL INSTRUCTIONS:
Quantify as appropriate - use TPH-D for quantifying diesel.

Received via: HAND

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY 3.
Signature: Marsi Beeson 1115	Signature	Signature
Printed Name: Marsi Beeson 5-15-95	Printed Name:	Printed Name:
Company: GeoEngineers	Company:	Company:
RECEIVED BY: 1.	**RECEIVED BY: 2.**	**RECEIVED BY: (LAB) 3.**
Signature: 1115	Signature	Signature
Printed Name: Andi Mutsch 5/15/95	Printed Name:	Printed Name:
Company: ATI	Company:	Analytical Technologies, Inc.

51

Analytical **Technologies,** Inc.

17400 S.W. Upper Boones Ferry Road, Suite 270 Durham, OR. 97224
(503) 684-0447 (503) 620-0393 (FAX)

ATI I.D. 505584

May 26, 1995

GeoEngineers
MAY 30 1995
Routing
File

Sarah Kingery
GeoEngineers, Inc.
7504 SW Bridgeport Rd.
Portland, OR 97224

Project Name / Number: Birnbach / 4326-001-P62

Attention: Sarah Kingery

On May 12, 1995, Analytical Technologies, Inc. received five water samples for analysis for the above listed project. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

If you have any questions or comments, please do not hesitate to contact us at (503)684-0447.

N. Fredrick for
Fred Voosen
Project Manager

Steven E. Stanley
Laboratory Manager

SES:alm
Enclosure

Analytical Technologies, Inc.

SAMPLE CROSS REFERENCE SHEET

CLIENT:	GeoEngineers, Inc.	**ATI I.D.:**	505584
PROJECT #:	4326-001-P62		
PROJECT NAME:	Birnbach	**MATRIX:**	WATER

ATI #	CLIENT DESCRIPTION	DATE SAMPLED
505584-1	MW-4	5/12/95
505584-2	MW-2	5/12/95
505584-3	MW-3	5/12/95
505584-4	MW-5	5/12/95
505584-5	Trip Blank	5/12/95

----------TOTALS----------

MATRIX	# SAMPLES
WATER	5

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of the report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical**Technologies,**Inc.

ANALYTICAL SCHEDULE

CLIENT:	GeoEngineers, Inc.	**ATI I.D.:**	505584
PROJECT #:	4326-001-P62		
PROJECT NAME:	Birnbach		

ANALYSIS	TECHNIQUE	REFERENCE	LAB
BETX	GC/PID	EPA 8020M	PLD
Petroleum Hydrocarbon	IR	EPA 418.1	PLD
PAHs	HPLC/UV/FLUOR	EPA 8310	PLD

PLD = ATI - Portland
R = ATI - Renton
SD = ATI - San Diego
PHX = ATI - Phoenix
PNR = ATI - Pensacola
FC = ATI - Fort Collins
SUB = Subcontract

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**ATI I.D.:**	505584-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	N/A
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	N/A
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	05/15/95
PROJECT NAME:	Birnbach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		RESULTS
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5

SURROGATE:

TRIFLUOROTOLUENE (81%-116%)	103%

Analyst: CS 5-16-95

Reviewer: 5-16-95

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**ATI I.D.:**	505584-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	N/A
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	N/A
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	05/16/95
PROJECT NAME:	Birnbach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS
BENZENE	< 0.5
TOLUENE	< 0.5
ETHYLBENZENE	< 0.5
TOTAL XYLENES	< 0.5
SURROGATE:	
TRIFLUOROTOLUENE (81%-116%)	95%

Analyst: 05/17/95

Reviewer: CS 5-17-95

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**ATI I.D.:**	505584-1
CLIENT I.D.:	MW-4	**DATE SAMPLED:**	05/12/95
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	05/12/95
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	05/15/95
PROJECT NAME:	Birnbach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		RESULTS
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5

SURROGATE:

TRIFLUOROTOLUENE (81%-116%)	100%

Analyst: CS 5-16-95

Reviewer: 5/16/95

Analytical**Technologies,**Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**ATI I.D.:**	505584-2
CLIENT I.D.:	MW-2	**DATE SAMPLED:**	05/12/95
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	05/12/95
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	05/15/95
PROJECT NAME:	Birnbach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		RESULTS
BENZENE		1.2
TOLUENE	<	0.5
ETHYLBENZENE		0.6
TOTAL XYLENES		0.7
SURROGATE:		
TRIFLUOROTOLUENE (81%-116%)		98%

Analyst: CS 5-16-95

Reviewer: 5/16/95

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**ATI I.D.:**	505584-3
CLIENT I.D.:	MW-3	**DATE SAMPLED:**	05/12/95
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	05/12/95
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	05/15/95
PROJECT NAME:	Birnbach	**DILUTION FACTOR:**	20
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS
BENZENE	1300
TOLUENE	740
ETHYLBENZENE	800
TOTAL XYLENES	2000
SURROGATE:	
TRIFLUOROTOLUENE (81%-116%)	100%

Analyst: PS 5-16-95

Reviewer: 5/16/95

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**ATI I.D.:**	505584-4
CLIENT I.D.:	MW-5	**DATE SAMPLED:**	05/12/95
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	05/12/95
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	05/15/95
PROJECT NAME:	Birnbach	**DILUTION FACTOR:**	20
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	RESULTS	
BENZENE	660	
TOLUENE	13000	D
ETHYLBENZENE	1900	
TOTAL XYLENES	11000	D
SURROGATE:		
TRIFLUOROTOLUENE (81%-116%)	96%	

D = Value from a 1:200 dilution analyzed on 5/16/95.

Analyst: 5/17/95

Reviewer: 5-17-95

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

METHOD:	BETX (EPA 8020M)	**ATI I.D.:**	505584-5
CLIENT I.D.:	Trip Blank	**DATE SAMPLED:**	05/12/95
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	05/12/95
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	05/16/95
PROJECT NAME:	Birnbach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		RESULTS
BENZENE	<	0.5
TOLUENE	<	0.5
ETHYLBENZENE	<	0.5
TOTAL XYLENES	<	0.5
SURROGATE:		
TRIFLUOROTOLUENE (81%-116%)		98%

Analyst: 5/17/95

Reviewer: CS 5-17-95

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY SPIKE RESULTS

METHOD:	BETX (EPA 8020M)	**ATI ID:**	505584
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	505584-2
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	05/15/95
PROJECT NAME:	Birnbach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE		1.2	20.0	20.0	94	20.6	97	3
TOLUENE	<	0.5	20.0	19.6	98	20.0	100	2
ETHYLBENZENE		0.6	20.0	19.8	96	20.0	97	1
TOTAL XYLENES		0.7	40.0	39.3	97	39.7	98	1
SURROGATE:								
TRIFLUOROTOLUENE (81% - 116%)					98%		97%	

CONTROL LIMITS

	% REC	RPD
BENZENE	77-131	20
TOLUENE	79-125	20
ETHYLBENZENE	76-124	20
TOTAL XYLENES	74-127	20

Analyst: CS 5-16-95

Reviewer: 5/16/95

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY SPIKE RESULTS

METHOD:	BETX (EPA 8020M)	**ATI ID:**	505584
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	Method Blank
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	05/16/95
PROJECT NAME:	Birnbach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<	0.5	20.0	19.9	100	18.9	95	5
TOLUENE	<	0.5	20.0	20.4	102	19.1	96	7
ETHYLBENZENE	<	0.5	20.0	20.4	102	19.1	96	7
TOTAL XYLENES	<	0.5	40.0	40.9	102	38.5	96	6
SURROGATE:								
TRIFLUOROTOLUENE (81% - 116%)					96%		97%	

CONTROL LIMITS

	% REC	RPD
BENZENE	85-118	20
TOLUENE	85-119	20
ETHYLBENZENE	85-120	20
TOTAL XYLENES	85-120	20

Analyst: CS 5-16-95

Reviewer: 05/16/95

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY SPIKE RESULTS

METHOD:	BETX (EPA 8020M)	**ATI ID:**	505584
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	505581-1
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	05/16/95
PROJECT NAME:	Birnbach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER	SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	6.4	20.0	26.1	99	26.1	99	0
TOLUENE	7.4	20.0	26.8	97	26.6	96	1
ETHYLBENZENE	0.9	20.0	20.3	97	20.0	96	1
TOTAL XYLENES	9.1	40.0	46.2	93	45.8	92	1
SURROGATE:							
TRIFLUOROTOLUENE (81% - 116%)				92%		93%	

CONTROL LIMITS

	% REC	RPD
BENZENE	77-131	20
TOLUENE	79-125	20
ETHYLBENZENE	76-124	20
TOTAL XYLENES	74-127	20

Analyst: 05/17/95

Reviewer: CS 5-17-95

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY SPIKE RESULTS

METHOD:	BETX (EPA 8020M)	**ATI ID:**	505584
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	Method Blank
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	05/17/95
PROJECT NAME:	Birnbach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<	0.5	20.0	19.9	100	20.3	102	2
TOLUENE	<	0.5	20.0	20.1	101	20.4	102	1
ETHYLBENZENE	<	0.5	20.0	19.6	98	19.8	99	1
TOTAL XYLENES	<	0.5	40.0	37.8	95	38.3	96	1
SURROGATE:								
TRIFLUOROTOLUENE (81% - 116%)					94%		94%	

CONTROL LIMITS

	% REC	RPD
BENZENE	85-118	20
TOLUENE	85-119	20
ETHYLBENZENE	85-120	20
TOTAL XYLENES	85-120	20

Analyst: 5/17/95

Reviewer: 5-17-95

Analytical Technologies, Inc.

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**ATI I.D.:**	505584-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	N/A
CLIENT:	Geo Engineers	**DATE RECEIVED:**	N/A
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	05/15/95
PROJECT NAME:	Birnbach	**DATE ANALYZED:**	05/15/95
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	< 0.5

Analyst: A.S 5/17/95

Reviewer: CS 5-17-95

Analytical Technologies, Inc.

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	ATI I.D.:	505584-1
CLIENT I.D.:	MW-4	DATE SAMPLED:	05/12/95
CLIENT:	GeoEngineers, Inc.	DATE RECEIVED:	05/12/95
PROJECT #:	4326-001-P62	DATE EXTRACTED:	05/15/95
PROJECT NAME:	Birnbach	DATE ANALYZED:	05/15/95
SAMPLE MATRIX:	WATER	DILUTION FACTOR:	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	< 0.5

Analyst: AS 5/17/95

Reviewer: CS 5-17-95

AnalyticalTechnologies,Inc.

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**ATI I.D.:**	505584-2
CLIENT I.D.:	MW-2	**DATE SAMPLED:**	05/12/95
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	05/12/95
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	05/15/95
PROJECT NAME:	Birnbach	**DATE ANALYZED:**	05/15/95
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	< 0.5

Analyst: AS 5/17/95

Reviewer: CS 5-17-95

Analytical**Technologies,**Inc.

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**ATI I.D.:**	505584-3
CLIENT I.D.:	MW-3	**DATE SAMPLED:**	05/12/95
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	05/12/95
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	05/15/95
PROJECT NAME:	Birnbach	**DATE ANALYZED:**	05/15/95
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	3.5

Analyst: AS 5/17/95

Reviewer: CS 5-17-95

Analytical Technologies, Inc.

INFRARED SPECTROPHOTOMETRY RESULTS

METHOD:	EPA - 418.1	**ATI I.D.:**	505584-4
CLIENT I.D.:	MW-5	**DATE SAMPLED:**	05/12/95
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	05/12/95
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	05/15/95
PROJECT NAME:	Birnbach	**DATE ANALYZED:**	05/15/95
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	mg/L

PARAMETER	RESULTS
PETROLEUM HYDROCARBONS	13

Analyst: AS 5/17/95

Reviewer: CS 5-17-95

Analytical Technologies, Inc.

INFRARED SPECTROPHOTOMETRY SPIKE RESULTS

		ATI ACCESSION:	505584
METHOD:	EPA - 418.1	**QC SAMPLE:**	Method Blank
CLIENT:	GeoEngineers, Inc.	**DATE EXTRACTED:**	05/15/95
PROJECT #:	4326-001-P62	**DATE ANALYZED:**	05/15/95
PROJECT NAME:	Birnbach	**DILUTION FACTOR:**	1
SAMPLE MATRIX:	WATER	**UNITS:**	mg/L

PARAMETER	SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
3-Component Oil	< 0.5	10.0	8.2	82	7.7	77	6

CONTROL LIMITS

	%REC	RPD
3-Component Oil	64 - 108	20

Analyst: A S 5/15/95

Reviewer: CS 5-17-95

Analytical Technologies, Inc.

INFRARED SPECTROPHOTOMETRY SPIKE RESULTS

		ATI ACCESSION:	505584
METHOD:	EPA - 418.1	QC SAMPLE:	505571-2
CLIENT:	GeoEngineers, Inc.	DATE EXTRACTED:	05/15/95
PROJECT #:	4326-001-P62	DATE ANALYZED:	05/15/95
PROJECT NAME:	Birnbach	DILUTION FACTOR:	1
SAMPLE MATRIX:	WATER	UNITS:	mg/L

PARAMETER	SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
3-Component Oil	< 0.5	10.0	8.9	89	8.5	85	5

CONTROL LIMITS

	%REC	RPD
3-Component Oil	61 - 109	20

Analyst: A. S 5/15/95

Reviewer: CSS-17-95

Analytical Technologies, Inc.

CASE NARRATIVE FOR EPA METHOD 8310

POLYNUCLEAR AROMATIC HYDROCARBONS

ATI ACCESSION NUMBER 505584

A 1.0 liter aliquot of each aqueous sample was extracted with methylene chloride by liquid:liquid method (EPA method 3510). The methylene chloride was reduced and exchanged to acetonitrile. Final volume was 1.0 ml.

The extracts were analyzed by HPLC with UV (254 nm) and fluorescence detectors in series. A gradient mobile phase of water and acetonitrile was utilized for the analysis. Five and six point calibration curves were generated and utilized for the analysis.

The recoveries of acenapthylene and phenanthrene from the matrix spike were out of accepted criteria. The blank spikes produced acceptable results for all spiking compounds and have been reported.

Mark Ritzheimer

Analytical**Technologies**, Inc.

LIQUID CHROMATOGRAPHY RESULTS

METHOD:	8310	**ATI I.D.:**	505584-0
CLIENT I.D.:	Method Blank	**DATE SAMPLED:**	NA
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	NA
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	05/19/95
PROJECT NAME:	Birnbach	**DATE ANALYZED:**	05/22/95
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER	RESULTS	
NAPHTHALENE	<	0.5
ACENAPHTHYLENE	<	1.0
ACENAPHTHENE	<	0.5
FLUORENE	<	0.1
PHENANTHRENE	<	0.05
ANTHRACENE	<	0.05
FLUORANTHENE	<	0.1
PYRENE	<	0.1
BENZO(a)ANTHRACENE	<	0.1
CHRYSENE	<	0.1
BENZO(b)FLUORANTHENE	<	0.1
BENZO(k)FLUORANTHENE	<	0.1
BENZO(a)PYRENE	<	0.1
DIBENZO(a,h)ANTHRACENE	<	0.2
BENZO(g,h,i)PERYLENE	<	0.1
INDENO(1,2,3-cd)PYRENE	<	0.1

SURROGATE:	
BIPHENYL (28%-125%)	121%

Analyst: MK 5/25/95

Reviewer: BH 5-24-95

Analytical**Technologies,**Inc.

LIQUID CHROMATOGRAPHY RESULTS

METHOD:	8310	**ATI I.D.:**	505584-3
CLIENT I.D.:	MW-3	**DATE SAMPLED:**	05/12/95
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	05/12/95
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	05/19/95
PROJECT NAME:	Birnbach	**DATE ANALYZED:**	05/22/95
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER		RESULTS
NAPHTHALENE		130 D
ACENAPHTHYLENE	<	1.0
ACENAPHTHENE	<	0.5
FLUORENE		0.2
PHENANTHRENE		0.09
ANTHRACENE	<	0.05
FLUORANTHENE	<	0.1
PYRENE	<	0.1
BENZO(a)ANTHRACENE	<	0.1
CHRYSENE	<	0.1
BENZO(b)FLUORANTHENE	<	0.1
BENZO(k)FLUORANTHENE	<	0.1
BENZO(a)PYRENE	<	0.1
DIBENZO(a,h)ANTHRACENE	<	0.2
BENZO(g,h,i)PERYLENE	<	0.1
INDENO(1,2,3-cd)PYRENE	<	0.1

SURROGATE:

BIPHENYL (28%-125%) 76%

D = VALUE FROM A 2 FOLD DILUTION ANALYZED 05/24/95

Analyst: [illegible] 5/25/95

Reviewer: BH 5-25-95

Analytical**Technologies,**Inc.

LIQUID CHROMATOGRAPHY RESULTS

METHOD:	8310	**ATI I.D.:**	505584-4
CLIENT I.D.:	MW-5	**DATE SAMPLED:**	05/12/95
CLIENT:	GeoEngineers, Inc.	**DATE RECEIVED:**	05/12/95
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	05/19/95
PROJECT NAME:	Birnbach	**DATE ANALYZED:**	05/22/95
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER		RESULTS
NAPHTHALENE		450 D
ACENAPHTHYLENE		66
ACENAPHTHENE	<	0.6
FLUORENE		0.6
PHENANTHRENE		0.42
ANTHRACENE		0.07
FLUORANTHENE	<	0.1
PYRENE	<	0.1
BENZO(a)ANTHRACENE	<	0.1
CHRYSENE	<	0.1
BENZO(b)FLUORANTHENE	<	0.1
BENZO(k)FLUORANTHENE	<	0.1
BENZO(a)PYRENE	<	0.1
DIBENZO(a,h)ANTHRACENE	<	0.2
BENZO(g,h,i)PERYLENE	<	0.1
INDENO(1,2,3-cd)PYRENE	<	0.1

SURROGATE:

BIPHENYL (28%-125%) 51%

D = VALUE FROM A 10 FOLD DILUTION ANALYZED 05/24/95

Analyst: MK 5/25/95

Reviewer: BH 5-25-95

Analytical Technologies, Inc.

LIQUID CHROMATOGRAPHY BLANK SPIKE RESULTS

METHOD:	8310	**ATI I.D.:**	505584
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	Method Blank
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	05/19/95
PROJECT NAME:	Birnbach	**DATE ANALYZED:**	05/22/95
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
ACENAPHTHYLENE	<	1.0	10.0	6.4	64	7.1	71	10
PHENANTHRENE	<	0.05	1.0	0.61	61	0.66	66	8
PYRENE	<	0.1	1.0	0.7	70	0.8	80	13
BENZO(k)FLUORANTHENE	<	0.1	1.0	0.6	60	0.6	60	0
DIBENZO(a,h)ANTHRACENE	<	0.2	1.0	0.7	70	0.6	60	15
SURROGATE:								
BIPHENYL (28% - 125%)				95%		112%		

CONTROL LIMITS

	% REC	RPD
ACENAPHTHYLENE	31 - 125	44
PHENANTHRENE	44 - 128	34
PYRENE	56 - 150	41
BENZO(k)FLUORANTHENE	57 - 136	35
DIBENZO(a,h)ANTHRACENE	57 - 140	39

Analyst: MK 5/25/95

Reviewer: [illegible] 5-24-95

Analytical**Technologies,**Inc.

LIQUID CHROMATOGRAPHY SPIKE RESULTS

METHOD:	8310	**ATI I.D.:**	505584
CLIENT:	GeoEngineers, Inc.	**QC SAMPLE:**	505619-3
PROJECT #:	4326-001-P62	**DATE EXTRACTED:**	05/19/95
PROJECT NAME:	Birnbach	**DATE ANALYZED:**	05/22/95
SAMPLE MATRIX:	WATER	**DILUTION FACTOR:**	1
		UNITS:	ug/L

PARAMETER		SAMPLE RESULT	SPIKE CONC.	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
ACENAPHTHYLENE	<	1.0	10.0	4.4	44 H	5.7	57	26
PHENANTHRENE	<	0.05	1.00	0.51	51 H	0.59	59	15
PYRENE	<	0.1	1.0	0.7	70	0.8	80	13
BENZO(k)FLUORANTHENE	<	0.1	1.0	0.6	60	0.6	60	0
DIBENZO(a,h)ANTHRACENE	<	0.2	1.0	0.8	80	0.8	80	0
SURROGATE:								
BIPHENYL (28% - 125%)				82%		90%		

CONTROL LIMITS

	% REC	RPD
ACENAPHTHYLENE	46 - 128	52
PHENANTHRENE	55 - 151	35
PYRENE	41 - 143	30
BENZO(k)FLUORANTHENE	43 - 127	33
DIBENZO(a,h)ANTHRACENE	29 - 148	39

H = OUT OF LIMITS

Analyst: MR 5/23/95

Reviewer: BH 5.24.95

Analytical Technologies, Inc.

17400 S.W. Upper Boones Ferry Rd., Suite 270
Durham, Oregon 97224 • (503) 684-0447 FAX: (503) 620-0393

Chain of Custody

DATE 5/12/95 PAGE 1

LABORATORY NUMBER: 505584
PROJECT NOTICE NUMBER: _____

PROJECT MANAGER: Sarah Kingery
COMPANY: GeoEngineers
ADDRESS: _____
PHONE: 624/9274 SAMPLED BY: S Kingery

SAMPLE DISPOSAL INSTRUCTIONS

☒ ATI Disposal @ $5.00 each ☐ Return

SAMPLE ID	DATE	TIME	MATRIX	LAB ID
MW-4	5/12/95	1207	W	-1
MW-2		1245		-2
MW-3		1340		-3
MW-5		1400		-4
Trip Blank	5/12/95	—	W	-5

ANALYSIS REQUEST

	PETROLEUM HYDROCARBONS									ORGANICS						INORGANICS			TCLP			OTHER		NUMBER OF CONTAINERS
	TPH-HCID State: OR / WA	TPH-G State: OR / WA	TPH-D State: OR / WA	418.1 State: OR / WA	EPA 418.1	8015M	8020M-BETX only	8310 HPLC PAHs	7421 Lead	% Moisture	8010 Halogenated VOCs	8020 Aromatic VOCs	8040 Phenols	8240 GCMS Volatiles	8270 GCMS Semivolatiles	8080 OC Pesticides/PCBs	8080M PCBs only	Drinking Water (8)	Priority Pollutant Metals (13)	Cyanide	TCLP Metals (8)	TCLP Volatiles 8240 ZH-EXT	TCLP Semivolatiles 8270		
MW-4					X		X	X																6
MW-2					X		X	X																6
MW-3					X		X	X																6
MW-5					X		X	X																6
Trip Blank							X																	1

PROJECT INFORMATION

PROJECT NUMBER: 4326-001-R02
PROJECT NAME: Birnbach
PURCHASE ORDER NUMBER:
ONGOING PROJECT? YES ☒ NO ☐

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS	24
COC SEALS/INTACT? Y \ N \ NA	NA
RECEIVED INTACT? Y \ N	
RECEIVED COLD? Y \ N	

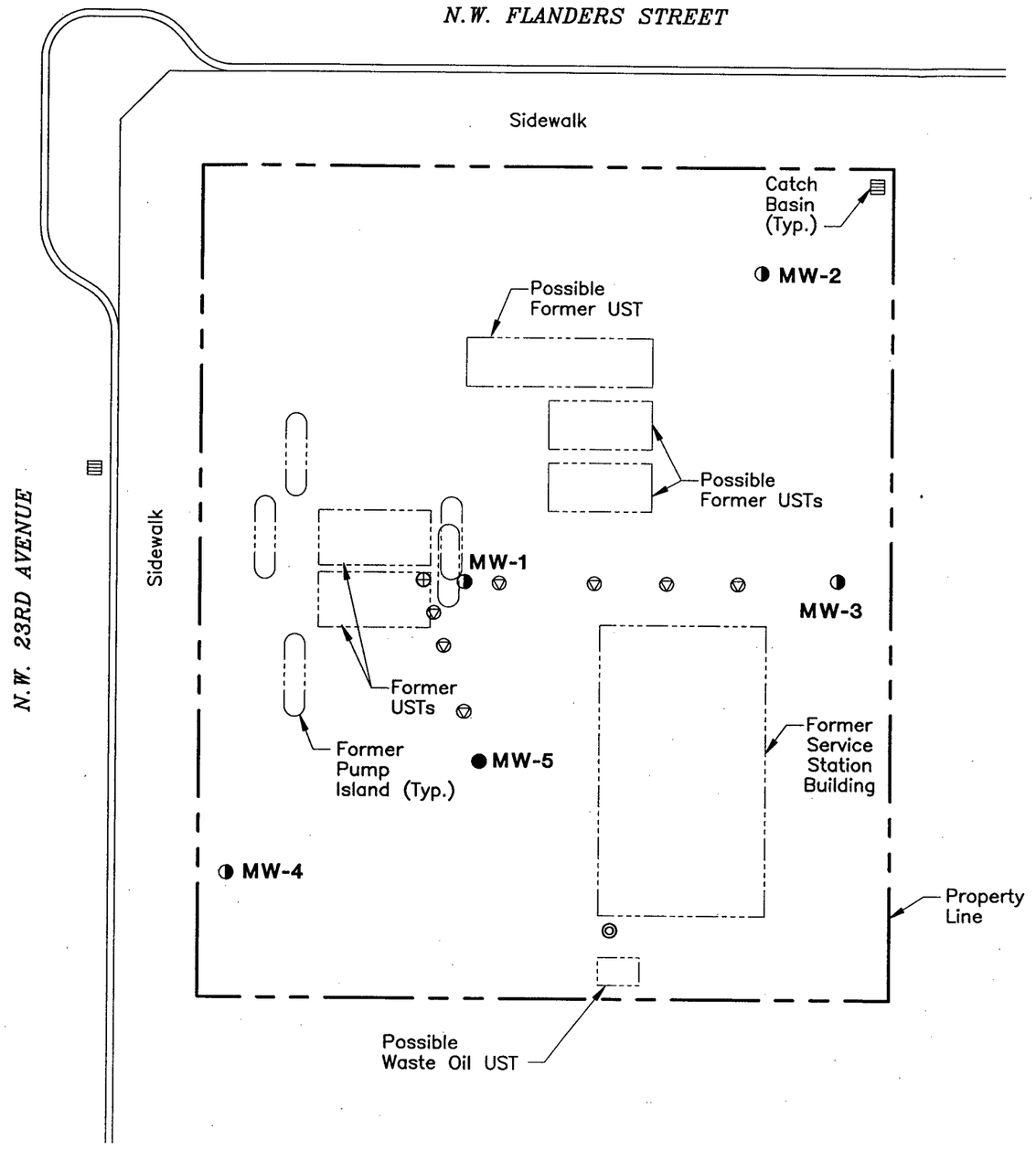
PRIOR AUTHORIZATION REQUIRED FOR RUSH PROJECTS

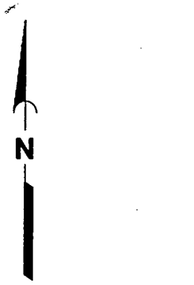
TAT: (NORMAL) ☒ 2 WKS (RUSH) ☐ 24 HR ☐ 48 HRS ☐ 72 HRS ☐ 1 WK
GREATER THAN 24 HR. NOTICE? YES ☒ NO ☐ (LAB USE ONLY)

SPECIAL INSTRUCTIONS:
Will run 8310 if TPH result > 0.5
MW-4 (418.1 Not preserved) MW-5 8310 bottles rinsed no
MW-2 Received via: Preserv.

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY 3.
Signature: Sarah Kingery Time: 455	Signature Time:	Signature Time:
Printed Name: Sarah Kingery Date: 5/12/95	Printed Name: Date:	Printed Name: Date:
Company: GeoEngineers	Company:	Company:
RECEIVED BY: 1.	**RECEIVED BY: 2.**	**RECEIVED BY: (LAB) 3.**
Signature: Time: 4:55	Signature Time:	Signature Time:
Printed Name: V. Fuchise Date: 5/12/95	Printed Name: Date:	Printed Name: Date:
Company: ATI-PDX	Company:	Analytical Technologies, Inc.

C:\04326\001\GW_SP2





0 20 40

SCALE IN FEET

EXPLANATION:

MW-5 ●	MONITORING WELL BY GEOENGINEERS
MW-1 ◑	MONITORING WELL BY OTHERS
UST	UNDERGROUND STORAGE TANK
⊘	PROPOSED MONITORING PROBE
⊕	PROPOSED RECOVERY WELL

Reference: Drawing entitled, "Soil Boring Location Map," dated 02/94, by Hahn & Associates Incorporated, and drawing entitled, "Golden Eagle Service Station," undated by Unocal, and drawing entitled, "Rose's Parking Lot, 330 NW 23rd Avenue," dated 10/94, by AGRA, and drawing entitled, "Site Diagram–Rosewood Parking Lot," undated, by GeoPotential.

Note: The locations of all features shown are approximate.

GeoEngineers

SITE PLAN

FIGURE 1

4326-001-P62 SAK:MAD 05/02/95

DO NOT

ADD ANY NEW INFORMATION

TO THIS FOLDER

GO TO NEXT FOLDER

GeoEngineers

15 YEARS

Consulting Engineers and Geoscientists
Offices in Washington, Oregon and Alaska

November 6, 1995

26-94-025

Quantum Commercial Group Company
1111 Main Street, Suite 306
Vancouver, Washington 98660-2955

Attention: Mr. John Clement

Property Access Request
2250 Northwest Flanders Street
Portland, Oregon
File No. 4326-001-P62

The wrong figure was inadvertently attached to the Property Access Request dated October 31, 1995. The attached Figure 1, which identifies the proposed off-site boring locations (two borings on the adjacent property and one boring in Northwest Flanders Street) replaces the Figure 1 that was attached to the previous letter.

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
NOV 7 1995
NORTHWEST REGION

GeoEngineers, Inc.
7504 SW Bridgeport Road
Portland, OR 97224
Telephone (503) 624-9274
Fax (503) 620-5940

Printed on recycled paper.

We apologize for the inconvenience. Please call if you have any questions.

Yours very truly,

GeoEngineers, Inc.

Marsi Beeson

Marsi M. Beeson
Environmental Scientist

Julia Fowler

Julia Fowler, P.E.
Associate

SAK:MMB:JF:mln
Document ID: 43260011.3

Attachments

cc: AMOCO
Ms. Janice M. McLain
Mr. Jeff Miller

Bell & Ingram, P.S.
Mr. Jeff C. Wishko

Gull Industries
Mr. Jeff Scott

Kell, Alterman & Runstein
Mr. Max Birnbach
c/o Charles R. Williamson

Black Helterline
Mr. David Roy

Unocal
Mr. Kipp Eckert

Oregon Department of Environmental Quality
Mr. Don Pettit

D:\04326\001\GEO_SP

N

0 60 120

SCALE IN FEET

N.W. FLANDERS STREET

Rose's Parking Lot

Building

Parking

Residences

Residences

N.W. 23rd AVENUE

N.W. 22nd AVENUE

N.W. EVERETT STREET

N.W. 22nd PLACE

EXPLANATION:

⊕ PROPOSED OFF-SITE BORING LOCATIONS

Note: The locations of all features shown are approximate.

Reference: Multnomah County Tax Assessor's Map.

4326-001-P36 SAK:MAM 08/31/95

GeoEngineers

PROPOSED OFF-SITE BORING LOCATIONS

FIGURE 1

DON PETTIT

GeoEngineers

October 31, 1995

15 YEARS

Consulting Engineers and Geoscientists
Offices in Washington, Oregon and Alaska

Quantum Commercial Group Company
1111 Main Street, Suite 306
Vancouver, Washington 98660-2955

ROSE'S PARKING LOT
26E24-025

Attention: Mr. John Clement

Property Access Request
2250 Northwest Flanders Street
Portland, Oregon
File No. 4326-001-P62

GeoEngineers is assisting Mr. Max Birnbach, Amoco Oil Company, Gull Industries, Inc. and Unocal Corporation with exploring subsurface conditions at 330 Northwest 23rd Avenue in Portland, Oregon. This property is located adjacent to the Quantum Commercial Group property at 2250 Northwest Flanders Street. On behalf of the four parties listed above, GeoEngineers is requesting authorization to access the Quantum Commercial Group property to complete a subsurface environmental investigation of your property.

The property at 330 Northwest 23rd Avenue (referred to as Rose's Parking Lot) was formerly occupied by service stations operated by Amoco, Gull and Unocal. Studies conducted to date at the Rose's Parking Lot site indicate that ground water and soil beneath the site has been impacted by petroleum hydrocarbons. DEQ (Oregon Department of Environmental Quality) has requested that the extent of possible off-site subsurface contamination be evaluated. In response to DEQ's request, we are proposing to drill exploratory borings and install monitoring wells at three off-site locations. The approximate locations of the proposed off-site borings/monitoring wells are shown on the attached figure (Figure 1).

Two of the proposed locations are on your property at 2250 Northwest Flanders Street. The work to be performed may impact the availability of some parking spaces for a short period of time in the parking lot adjacent to your building.

A licensed drilling contractor will perform the drilling activities. The estimated time for drilling activities on your site is 1 day. During drilling activities, the contractor will have a support truck and a drill rig. Prior to the drilling activities, a utilities locate will be performed

DEPT OF ENVIRONMENTAL QUALITY
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NORTHWEST REGION

GeoEngineers, Inc.
7504 SW Bridgeport Road
Portland, OR 97224
Telephone (503) 624-9274
Fax (503) 620-5940

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at the proposed drilling locations. In order to minimize the risk of damage to below-ground utilities, we request a copy of the utility plans (as built, if available) for your property.

Figure 2 shows the construction design of a typical monitoring well. The monitoring wells will be covered by cast aluminum monuments installed flush with the grade of the asphalt and secured with concrete. The monitoring wells will extend to a depth up to approximately 30 feet.

GeoEngineers also requests permission to access the property on a quarterly basis to obtain ground water samples from the monitoring wells. Periodic sampling of the monitoring wells will cause only minor temporary disruption to use of the parking area. We anticipate that ground water sampling activities on your property will last 2 hours or less. When DEQ indicates that ground water monitoring is no longer necessary, the monitoring wells will be abandoned according to the Oregon Department of Water Resources "Monitoring Well Abandonment Procedures."

Reports summarizing previous investigations at the Rose's Parking Lot site are on file at DEQ's Northwest Region Office. The Leaking UST (underground storage tank) facility identification number for Rose's Parking Lot site is 26-94-025 and the DEQ project manager is Mr. Don Pettit.

We will work with you closely during the planning stages of the proposed activities to ensure that the impact to your tenants is as minimal as possible. We look forward to hearing from you. Please call if you have any questions.

Yours very truly,

GeoEngineers, Inc.

Marsi Beeson

Marsi M. Beeson
Environmental Scientist

Julia Fowler

Julia Fowler, P.E.
Associate

SAK:MMB:JF:mln
Document ID: 43260011.1

Attachments

cc: AMOCO
Ms. Janice M. McLain
Mr. Jeff Miller

Bell & Ingram, P.S.
Mr. Jeff C. Wishko

Gull Industries
Mr. Jeff Scott

c/o Charles R. Williamson
Kell, Alterman & Runstein
Mr. Max Birnbach

Black Helterline
Mr. David Roy

Unocal
Mr. Kipp Eckert

Oregon Department of Environmental Quality
Mr. Don Pettit

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SCALE IN FEET

N.W. FLANDERS STREET

Rose's Parking Lot

Building

Parking

Residences

Residences

N.W. 23rd AVENUE

N.W. 22nd AVENUE

EXPLANATION:

⊕ PROPOSED OFF-SITE BORING LOCATIONS

N.W. EVERETT STREET

N.W. 22nd PLACE

Note: The locations of all features shown are approximate.

Reference: Multnomah County Tax Assessor's Map.

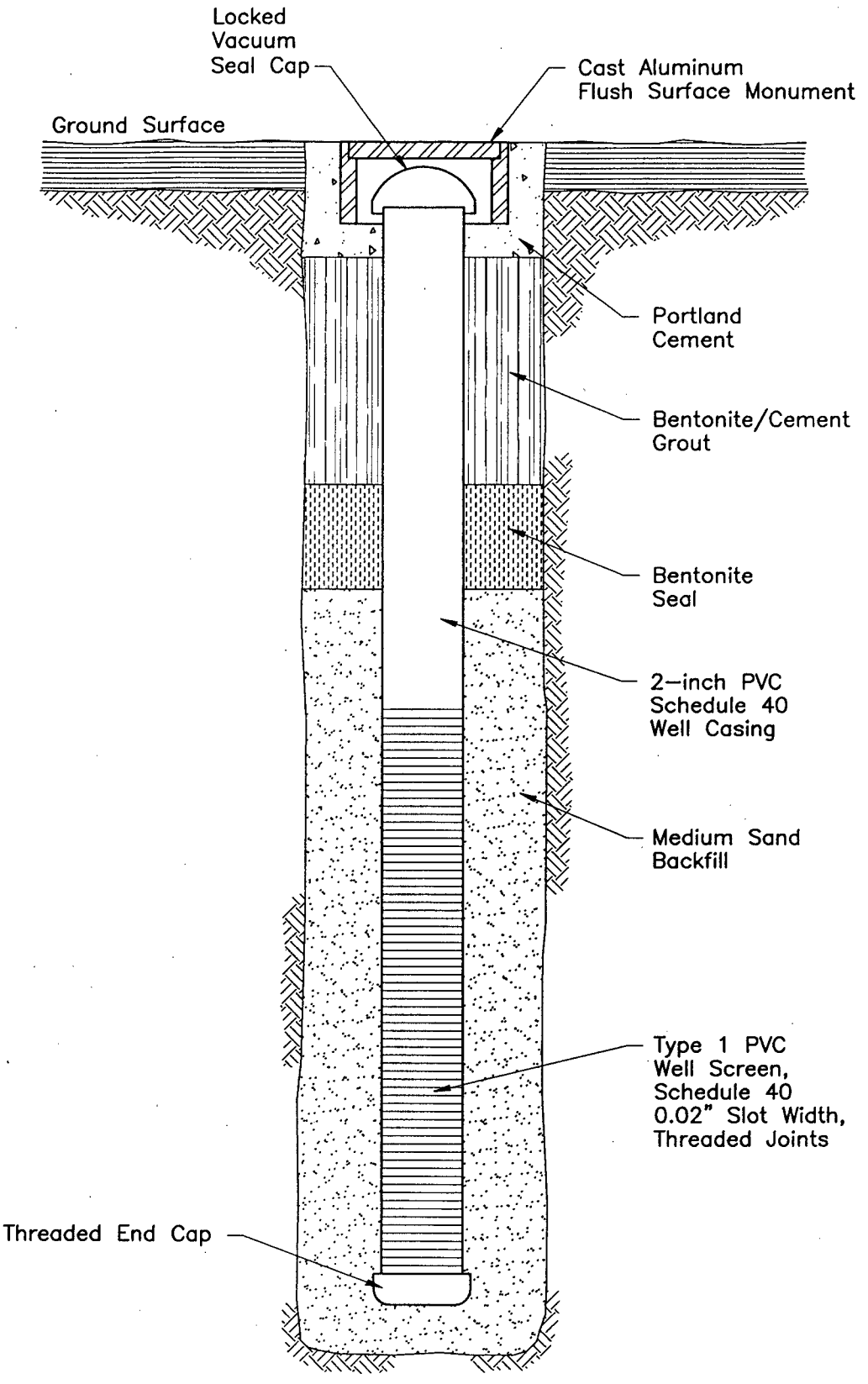
4326-001-P36 SAK:MAM 08/31/95

Geo Engineers

PROPOSED OFF-SITE BORING LOCATIONS

FIGURE 1

C:\00GEO\DETAILS\MONWELL2



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TYPICAL MONITORING WELL CONSTRUCTION SCHEMATIC

FIGURE 2

00000000

UST CLEANUP TELEPHONE USE REPORT

CALL ~~FROM~~/TO: Sarah Kingery DATE: 10/2/95

WITH: GeoEngineers TIME: 1:00

TELEPHONE NO: ( ) -

REGARDING: Rose's Parking Lot

FILE NO: 26-94-025

SUMMARY OF CALL

Discussed work plan - tentatively approved new plan via phone. New plan has one less MW - in ~~down~~ cross gradient direction & additional monitoring of vapor extraction test.

Don J. Pettit
Staff Signature

GeoEngineers

September 28, 1995

Consulting Engineers and Geoscientists
Offices in Washington, Oregon, and Alaska

Mr. Max Birnbach
c/o Mr. Charles R. Williamson
Kell, Alterman & Runstein
1001 Southwest Fifth Avenue, Suite 1800
Portland, Oregon 97204

Attention: Mr. Max Birnbach

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
SEP 29 1995
NORTHWEST REGION

Work Plan
Quarterly Ground Water Monitoring, UST Removal, Free Product Recovery, Off-Site Subsurface Explorations and EFRT Vent Tests
Rose's Parking Lot
Portland, Oregon
File No. 4326-001-P36

INTRODUCTION

GeoEngineers is pleased to present our work plan for (1) conducting quarterly ground water monitoring and sampling, (2) monitoring the removal of a waste oil UST (underground storage tank), (3) initiating interim free product recovery, (4) completing off-site subsurface explorations, and (5) performing EFRT (Enhanced Fluid Recovery Technology) vent tests at the site of Rose's Parking Lot. The site is located at 330 Northwest 23rd Avenue in Portland, Oregon. The location of the site relative to surrounding physical features is shown in Figure 1. The DEQ (Oregon Department of Environmental Quality) UST Cleanup List number for the site is 26-94-25.

The site was occupied by service stations operated by Unocal (Union Oil Company Of California), AMOCO (AMOCO Oil Company) and Gull (Gull Industries, Inc.) from the mid-1950s to the late 1970s. All aboveground structures have been removed, and the site is currently used for parking. The current owner of the property is Mr. Max Birnbach. Previous investigations were conducted at the site by HAI (Hahn and Associates, Inc.) in January 1994 and by AGRA (AGRA Earth & Environmental, Inc.) in March and October 1994.

GeoEngineers conducted a supplemental subsurface assessment of the site in May 1995. Our subsurface assessment included drilling five borings and installing one monitoring well. A

GeoEngineers, Inc.
7504 SW Bridgeport Road
Portland, OR 97224
Telephone (503) 624-9274
Fax (503) 620-5940

Printed on recycled paper.

vapor extraction test and ground water slug tests were also performed during our May 1995 assessment. The results of our supplemental subsurface assessment are summarized in our report dated August 28, 1995.

PURPOSE AND SCOPE OF SERVICES

In a letter dated August 10, 1995, to Mr. Birnbach, DEQ stated that recovery of free product should be initiated immediately, quarterly ground water monitoring and sampling should be conducted, and a plan should be submitted to the department outlining actions to characterize on-site and off-site contamination. The purpose of this work plan is to respond to DEQ's requirements and to outline the procedure for conducting an EFRT vent test. Additionally, this plan presents our scope of services for removal of a waste oil UST that was apparently associated with former service station operations. The presence of the UST was determined by a geophysical survey that was conducted by AGRA in September 1994.

EFRT has been developed and proposed for use at the subject site by AMOCO. The EFRT portion of this work plan is based on a scope of work dated August 11, 1995, provided by AMOCO, and on subsequent communications with Mr. Lyle Bruce of AMOCO.

Our planned scope of services for each task is as follows:

INTERIM FREE PRODUCT RECOVERY AND QUARTERLY GROUND WATER MONITORING AND SAMPLING

1. Install a passive product recovery canister in MW-1.
2. Remove product from the canister weekly or biweekly, as necessary. Store the product on site in a labelled and secured "overpack" drum.
3. Measure the depths to ground water in all existing monitoring wells and sample each well for the possible presence of free product.
4. Measure the combustible vapor concentrations in the airspace of the monitoring wells.
5. Obtain ground water samples on a quarterly basis from all existing wells for analytical testing. The initial ground water samples will be submitted for analysis of BETX (benzene, ethylbenzene, toluene and xylenes) by EPA (U.S. Environmental Protection Agency) Method 8020, EDB (ethylene dibromide) and EDC (ethylene dichloride) by EPA Method 8010, dissolved lead by EPA Method 7421, and TPH (total petroleum hydrocarbons) by EPA Method 418.1M. Samples with TPH concentrations greater than 0.5 mg/l (milligrams per liter) will be analyzed for PAHs (polycyclic aromatic hydrocarbons) by EPA Method 8310. Samples will not be obtained from wells where free product is present. Chemical analyses for subsequent quarterly sampling events may be modified based on the results of the initial ground water sampling event.

6. Evaluate the field and laboratory data relative to applicable regulatory criteria and prepare written quarterly reports summarizing the results of free product recovery and quarterly ground water monitoring.
7. Arrange for disposal of purge water generated during sampling activities and free product generated during free product recovery.

WASTE OIL UST REMOVAL

1. Subcontract a licensed UST removal contractor to remove and dispose of the waste oil UST, dispose of UST rinseate, backfill the excavation, and repave the excavation area.
2. Obtain soil samples from the excavation for field screening and chemical analysis.
3. Submit soil samples from the excavation to an analytical testing laboratory for qualitative hydrocarbon identification by DEQ Method TPH-HCID and quantitative identification of petroleum hydrocarbons by DEQ Methods TPH-G, TPH-D and/or TPH-418.1M, as appropriate. Additionally, submit one soil sample obtained from the waste oil UST excavation for analyses of VOCs (volatile organic compounds) by EPA Methods 8010/8020 and TCLP (toxicity characteristic leachate procedure) metals (lead, chromium and cadmium) by EPA Methods 1311 and 6010/7000 series.

OFF-SITE SUBSURFACE EXPLORATIONS

1. Coordinate obtaining an access agreement for drilling two borings and installing monitoring wells in the borings on the adjacent property to the east of Rose's Parking lot.
2. Obtain a public right-of-way permit from the City of Portland to drill one boring and install a monitoring well in the boring in Northwest Flanders Street.
3. Contract with a utility locate service to conduct a magnetometer survey of the proposed off-site boring locations for underground utilities prior to drilling.
4. Observe the drilling of the three off-site monitoring well borings. The approximate locations of the proposed off-site borings are shown in Figure 2. The specific boring locations will be determined based on the results of the utility locate and any requirements of the off-site property owner.
5. Obtain discrete soil samples at approximate 2.5-foot intervals from the borings using a split-barrel sampler. Field screen the soil samples for evidence of hydrocarbon-related contamination using visual examination, water sheen screening and headspace vapor screening methods. Visually classify soils in general accordance with ASTM (American Society for Testing and Materials) D 2488-90 and prepare a detailed log of each boring.
6. Submit two discrete soil samples from each boring to an analytical testing laboratory for qualitative hydrocarbon identification by DEQ Method TPH-HCID and quantification of detected hydrocarbons by DEQ Methods TPH-G, TPH-D and TPH-418.1M, as appropriate.

7. Observe the construction of a 2-inch-diameter, Schedule 40 PVC (polyvinyl chloride) monitoring well with flush-grade, lockable surface monuments in each boring.
8. Develop the monitoring well screens by hand-bailing water from the well with a stainless steel bailer. The wells will be constructed so that the screen interval intersects the ground water surface.
9. Measure the depths to the ground water table relative to the monitoring well casing rims in on- and off-site wells using a water level indicator and calculate the ground water elevations.
10. Measure combustible vapor concentrations in all monitoring well casings using a Bacharach TLV Sniffer.
11. Obtain ground water samples from the new monitoring wells using a disposable polyethylene bailer. If possible, this sampling event will occur in conjunction with the first quarterly monitoring and sampling event.
12. Submit the ground water samples for chemical analysis of BETX by EPA Method 8020.
13. Evaluate the data with regard to regulatory concerns and prepare a written report summarizing our findings.

ENHANCED FLUID RECOVERY TECHNOLOGY VENT TEST

1. Observe the drilling of one recovery well boring and seven temporary monitoring probe borings at the approximate locations shown in Figure 1.
2. Obtain discrete soil samples at approximate 2.5-foot to 5-foot intervals from the recovery well boring using a split-barrel sampler. Field screen the soil samples for evidence of hydrocarbon-related contamination using visual examination, water sheen screening and headspace vapor screening methods. Visually classify soils in general accordance with ASTM D 2488-90 and prepare a detailed log of the boring.
3. Observe the construction of a 4-inch-diameter, Schedule 40 PVC monitoring well with flush-grade, lockable surface monuments in the recovery well boring.
4. Observe the construction of seven temporary monitoring probes. Each probe will consist of 1-inch-diameter hand-slotted PVC casing that extends to the capillary fringe with flush-grade, lockable surface monuments in each temporary monitoring probe boring.
5. Develop the recovery well screen by hand-bailing water from the well with a stainless steel bailer.
6. Construct a manifold with AMOCO's assistance to connect MW-1 and the new recovery well to the EFRT vent test system.
7. Obtain baseline measurements from the on-site wells and monitoring probes before beginning each vent test. Baseline measurements in the wells will consist of water levels, subsurface air pressure and combustible vapor concentrations.

8. Conduct three 10-hour vent tests using a vacuum truck capable of producing a vacuum pressure up to 28 inches of mercury and a vapor flow rate of approximately 350 cfm (cubic feet per minute). Monitoring well MW-1 and the new recovery well will be used as test wells during the vent tests. The passive product recovery canister will be removed from MW-1 before each test is conducted. The tests will be conducted in 2-week intervals.
9. Monitor the combustible vapor concentrations and flow rate in the exhaust stream every 30 minutes for the first hour of operation and once per hour thereafter during each test using a Bacharach TLV Sniffer with a dilution probe.
10. Monitor water levels, induced subsurface vacuum pressures, and combustible vapor concentrations in the temporary monitoring probes every 15 minutes for the first 4 hours of operation and every 30 minutes thereafter during each test.
11. Coordinate the disposal or recycling of fluids generated during the EFRT vent tests.
12. Prepare a written report summarizing our findings.

SCHEDULE

We will begin free product recovery and ground water monitoring activities upon receiving authorization to proceed from all parties (Unocal, AMOCO, Gull and Birnbach). Draft quarterly monitoring reports will be submitted within 3 weeks after completion of each monitoring event. Following authorization to proceed, GeoEngineers also will begin coordinating the off-site subsurface exploration and the UST removal activities. The EFRT vent test will occur immediately following installation of the recovery well. The draft report presenting the results of our field activities will be submitted within 6 weeks after completion of our field activities.

Please call if you have questions regarding this work plan or other aspects of the project.

Yours very truly,

GeoEngineers, Inc.

Sarah A. Kingery
Geologist

Julia Fowler, P.E.
Associate

SAK:JF:mln
Document ID: 4326001.wp

cc: AMOCO
Ms. Janice M. McLain
Mr. Jeff Miller

Bell & Ingram, P.S.
Mr. Jeff C. Wishko

Gull Industries
Mr. Jeff Scott

Black Helterline
Mr. David Roy

Unocal
Mr. Kipp Eckert

Oregon Department of Environmental Quality
Mr. Don Pettit

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SCALE IN FEET

N.W. FLANDERS STREET

Rose's Parking Lot

Building

Parking

Residences

N.W. 23rd AVENUE

N.W. 22nd AVENUE

N.W. EVERETT STREET

N.W. 22nd PLACE

EXPLANATION:

⊕ PROPOSED OFF-SITE BORING LOCATIONS

Note: The locations of all features shown are approximate.

Reference: Multnomah County Tax Assessor's Map.

4326-001-P36 SAK:MAM 08/31/95

GeoEngineers

PROPOSED OFF-SITE BORING LOCATIONS

FIGURE 2

[26-94-025]

GeoEngineers

LETTER OF TRANSMITTAL

7504 SW Bridgeport Road
Portland, Oregon 97224
Telephone: (503) 624-9274
Fax: (503) 620-5940

To: Oregon Department of Environmental Quality
Northwest Region
2020 SW 4th Ave, Ste 400
Portland, OR 97201

Date: September 1, 1995

File: 4326-001-P62

Attention: Mr. Don Pettit

Regarding: Draft Work Plan
Rose's Parking Lot

We are sending: ☒ Attached ☐ Under Separate Cover

Copies	Date	Description
01	09/01/95	Draft Work Plan, Rose's Parking Lot

These are transmitted as checked below:

☒ For Your Use ☐ As Requested ☐ Returned
☒ For Review and Comment ☐ Other (see remarks)

Remarks:

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
SEP 5 1995
NORTHWEST REGION

Copy To:

Signed: Sarah Kingery

Sarah Kingery

DRAFT

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
SEP 5 1995
NORTHWEST REGION

September 1, 1995

Mr. Max Birnbach
c/o Mr. Charles R. Williamson
Kell, Alterman & Runstein
1001 Southwest Fifth Avenue, Suite 1800
Portland, Oregon 97204

Attention: Mr. Max Birnbach

Work Plan
Quarterly Ground Water Monitoring, UST Removal, Free Product Recovery, Off-Site Subsurface Explorations and EFRT Vent Tests
Rose's Parking Lot
Portland, Oregon
File No. 4326-001-P36

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The site was occupied by service stations operated by Unocal (Union Oil Company Of California), AMOCO (AMOCO Oil Company) and Gull (Gull Industries, Inc.) from the mid-1950s to the late 1970s. All aboveground structures have been removed, and the site is currently used for parking. The current owner of the property is Mr. Max Birnbach. Previous investigations were conducted at the site by HAI (Hahn and Associates, Inc.) in January 1994 and by AGRA (AGRA Earth & Environmental, Inc.) in March and October 1994.

GeoEngineers conducted a supplemental subsurface assessment of the site in May 1995. Our subsurface assessment included drilling five borings and installing one monitoring well. A

vapor extraction test and ground water slug tests were also performed during our May 1995 assessment. The results of our supplemental subsurface assessment are summarized in our report dated August 28, 1995.

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5. Obtain ground water samples on a quarterly basis from all existing wells for analytical testing. The initial ground water samples will be submitted for analysis of BETX (benzene, ethylbenzene, toluene and xylenes) by EPA (U.S. Environmental Protection Agency) Method 8020, EDB (ethylene dibromide) and EDC (ethylene dichloride) by EPA Method 8010, dissolved lead by EPA Method 7421, and TPH (total petroleum hydrocarbons) by EPA Method 418.1M. Samples with TPH concentrations greater than 0.5 mg/l (milligrams per liter) will be analyzed for PAHs (polycyclic aromatic hydrocarbons) by EPA Method 8310. Samples will not be obtained from wells where free product is present. Chemical analyses for subsequent quarterly sampling events may be modified based on the results of the initial ground water sampling event.

6. Evaluate the field and laboratory data relative to applicable regulatory criteria and prepare written quarterly reports summarizing the results of free product recovery and quarterly ground water monitoring.
7. Arrange for disposal of purge water generated during sampling activities and free product generated during free product recovery.

WASTE OIL UST REMOVAL

1. Subcontract a licensed UST removal contractor to remove and dispose of the waste oil UST, dispose of UST rinseate, backfill the excavation, and repave the excavation area.
2. Obtain soil samples from the excavation for field screening and chemical analysis.
3. Submit soil samples from the excavation to an analytical testing laboratory for qualitative hydrocarbon identification by DEQ Method TPH-HCID and quantitative identification of petroleum hydrocarbons by DEQ Methods TPH-G, TPH-D and/or TPH-418.1M, as appropriate. Additionally, submit one soil sample obtained from the waste oil UST excavation for analyses of VOCs (volatile organic compounds) by EPA Methods 8010/8020 and TCLP (toxicity characteristic leachate procedure) metals (lead, chromium and cadmium) by EPA Methods 1311 and 6010/7000 series.

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1. Coordinate obtaining an access agreement for drilling three borings and installing monitoring wells in the borings on the adjacent property to the east of Rose's Parking lot.
2. Obtain a public right-of-way permit from the City of Portland to drill one boring and install a monitoring well in the boring in Northwest Flanders Street.
3. Contract with a utility locate service to conduct a magnetometer survey of the proposed off-site boring locations for underground utilities prior to drilling.
4. Observe the drilling of the four off-site monitoring well borings. The approximate locations of the proposed off-site borings are shown in Figure 2. The specific boring locations will be determined based on the results of the utility locate and any requirements of the off-site property owner.
5. Obtain discrete soil samples at approximate 2.5-foot intervals from the borings using a split-barrel sampler. Field screen the soil samples for evidence of hydrocarbon-related contamination using visual examination, water sheen screening and headspace vapor screening methods. Visually classify soils in general accordance with ASTM (American Society for Testing and Materials) D 2488-90 and prepare a detailed log of each boring.
6. Submit two discrete soil samples from each boring to an analytical testing laboratory for qualitative hydrocarbon identification by DEQ Method TPH-HCID and quantification of detected hydrocarbons by DEQ Methods TPH-G, TPH-D and TPH-418.1M, as appropriate.

7. Observe the construction of a 2-inch-diameter, Schedule 40 PVC (polyvinyl chloride) monitoring well with flush-grade, lockable surface monuments in each boring.
8. Develop the monitoring well screens by hand-bailing water from the well with a stainless steel bailer. The wells will be constructed so that the screen interval intersects the ground water surface.
9. Measure the depths to the ground water table relative to the monitoring well casing rims in on- and off-site wells using a water level indicator and calculate the ground water elevations.
10. Measure combustible vapor concentrations in all monitoring well casings using a Bacharach TLV Sniffer.
11. Obtain ground water samples from the new monitoring wells using a disposable polyethylene bailer. If possible, this sampling event will occur in conjunction with the first quarterly monitoring and sampling event.
12. Submit the ground water samples for chemical analysis of BETX by EPA Method 8020.
13. Evaluate the data with regard to regulatory concerns and prepare a written report summarizing our findings.

ENHANCED FLUID RECOVERY TECHNOLOGY VENT TEST

1. Observe the drilling of one recovery well boring and seven temporary monitoring probe borings at the approximate locations shown in Figure 2.
2. Obtain discrete soil samples at approximate 2.5-foot to 5-foot intervals from the recovery well boring using a split-barrel sampler. Field screen the soil samples for evidence of hydrocarbon-related contamination using visual examination, water sheen screening and headspace vapor screening methods. Visually classify soils in general accordance with ASTM D 2488-90 and prepare a detailed log of the boring.
3. Observe the construction of a 4-inch-diameter, Schedule 40 PVC monitoring well with flush-grade, lockable surface monuments in the recovery well boring.
4. Observe the construction of seven temporary monitoring probes. Each probe will consist of 1-inch-diameter hand-slotted PVC casing that extends to the capillary fringe with flush-grade, lockable surface monuments in each temporary monitoring probe boring.
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6. Construct a manifold with AMOCO's assistance to connect MW-1 and the new recovery well to the EFRT vent test system.
7. Obtain baseline measurements from the on-site wells and monitoring probes before beginning each vent test. Baseline measurements in the wells will consist of water levels, subsurface air pressure and combustible vapor concentrations.

8. Conduct three 10-hour vent tests using a vacuum truck capable of producing a vacuum pressure up to 28 inches of mercury and a vapor flow rate of approximately 350 cfm (cubic feet per minute). Monitoring well MW-1 and the new recovery well will be used as test wells during the vent tests. The passive product recovery canister will be removed from MW-1 before each test is conducted. The tests will be conducted in 2-week intervals.
9. Monitor the combustible vapor concentrations in the exhaust stream every 30 minutes for the first hour of operation and once per hour thereafter during each test using a Bacharach TLV Sniffer with a dilution probe.
10. Monitor water levels, induced subsurface vacuum pressures, and combustible vapor concentrations in the temporary monitoring probes every 30 minutes for the first hour of operation and once per hour thereafter during each test.
11. Coordinate the disposal or recycling of fluids generated during the EFRT vent tests.
12. Prepare a written report summarizing our findings.

SCHEDULE

We will begin free product recovery and ground water monitoring activities upon receiving authorization to proceed from all parties (Unocal, AMOCO, Gull and Birnbach). Draft quarterly monitoring reports will be submitted within 3 weeks after completion of each monitoring event. Following authorization to proceed, GeoEngineers also will begin coordinating the off-site subsurface exploration and the UST removal activities. The EFRT vent test will occur immediately following installation of the recovery well. The draft report presenting the results of our field activities will be submitted within 6 weeks after completion of our field activities.

DRAFT

Please call if you have questions regarding this work plan or other aspects of the project.

Yours very truly,

GeoEngineers, Inc.

Sarah A. Kingery
Geologist

Julia Fowler, P.E.
Associate

SAK:JF:mln
Document ID: 4326001.wp

cc: AMOCO
Ms. Janice M. McLain
Mr. Jeff Miller

Bell & Ingram, P.S.
Mr. Jeff C. Wishko

Gull Industries
Mr. Jeff Scott

Black Helterline
Mr. David Roy

Unocal
Mr. Kipp Eckert

Oregon Department of Environmental Quality
Mr. Don Pettit

DRAFT

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SCALE IN FEET

N.W. FLANDERS STREET

Rose's Parking Lot

Building

Parking

Residences

Residences

N.W. 23rd AVENUE

N.W. 22nd AVENUE

N.W. EVERETT STREET

N.W. 22nd PLACE

EXPLANATION:

PROPOSED OFF-SITE BORING LOCATIONS

Note: The locations of all features shown are approximate.

Reference: Multnomah County Tax Assessor's Map.

Geo Engineers

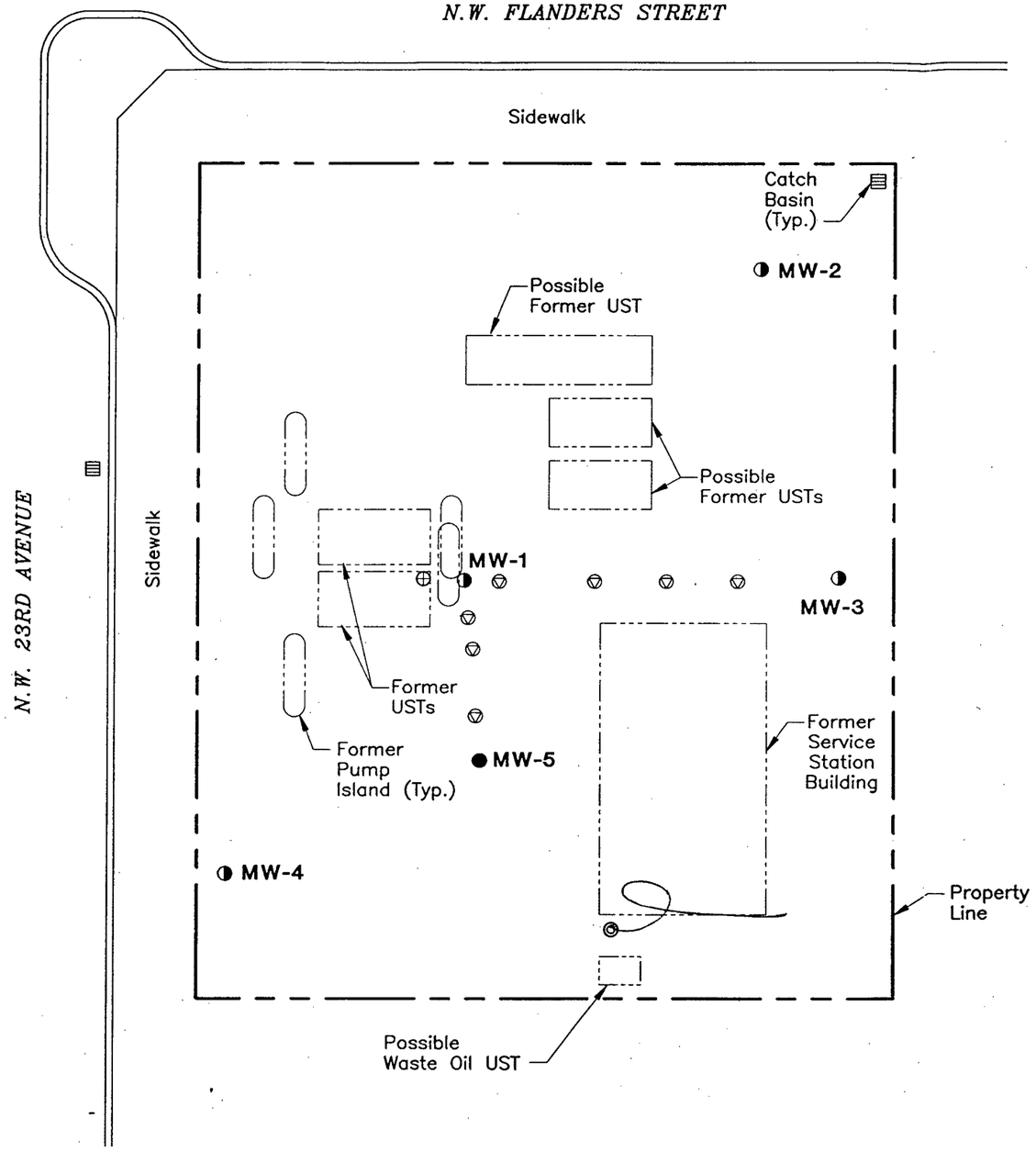
PROPOSED OFF-SITE BORING LOCATIONS

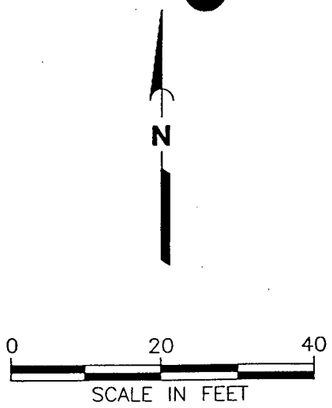
FIGURE 2

4326-001-P36 SAK:MAM 08/31/95

DRAFT

C:\04326\001\GW_SP2





EXPLANATION:

MW-5●	MONITORING WELL BY GEOENGINEERS
MW-1◑	MONITORING WELL BY OTHERS
UST	UNDERGROUND STORAGE TANK
⊽	PROPOSED MONITORING PROBE
⊕	PROPOSED RECOVERY WELL

Note: The locations of all features shown are approximate.

Reference: Drawing entitled, "Soil Boring Location Map," dated 02/94, by Hahn & Associates Incorporated, and drawing entitled, "Golden Eagle Service Station," undated by Unocal, and drawing entitled, "Rose's Parking Lot, 330 NW 23rd Avenue," dated 10/94, by AGRA, and drawing entitled, "Site Diagram—Rosewood Parking Lot," undated, by GeoPotential.

GeoEngineers

SITE PLAN

FIGURE 1

4326-001-P62 SAK:MAD 05/02/95

Oregon

August 10, 1995

DEPARTMENT OF
ENVIRONMENTAL
QUALITY

NORTHWEST REGION

MAX BIRNBACH
C/O CHARLES WILLIAMSON
KELL ALTERMAN AND RUNSTEIN
1001 SW FIFTH AVENUE SUITE 1800
PORTLAND OREGON 97212

Re: Rose's Parking Lot
File No. 26-94-025

Dear Mr. Birnbach:

The Department has completed a review of information submitted to date regarding the investigation of soil and groundwater contamination from the underground storage tank (UST) system formerly located at 330 Northwest 23rd Avenue in Portland, Oregon. It is the Department's understanding that free-product was noted in one of the site monitoring wells during the course of a remedial investigation which was completed in June 1995. OAR 340-122-235 requires that free product be removed to the maximum extent possible and that the results be submitted in a report. The Department has not received a report of findings for the remedial investigation which included the installation of soil borings, the completion of vapor extraction and groundwater slug tests, and sediment grain-size analyses.

As a reminder, Oregon Adminstrative Rules (OARs) 340-122-240 through 340-122-242 require that the complete horizontal and vertical extent and magnitude of soil and groundwater be investigated at sites where UST releases have occurred. It is further required that all potential contaminants of concern be identified and that groundwater monitoring be performed on a quarterly basis. To date the Department has not received quarterly groundwater monitoring reports even though monitoring wells have been in place for over a year.

The following actions are required:

1) Please begin implementing free product recovery immediately.

2) Please submit the results of all investigations conducted to date by **September 1, 1995**.

3) By **September 29, 1995**, please submit a plan to accomplish the characterization of impacted soil and groundwater at the site in accordance with the requirements of OAR 340-122-242. The plan should include a site plan showing the location of proposed monitoring wells, a description of proposed

John A. Kitzhaber
Governor

2020 SW Fourth Avenue
Suite 400
Portland, OR 97201-4987
(503) 229-5263 Voice
TTY (503) 229-5471
DEQ-1

soil and groundwater sampling and analysis methods, and a schedule for accomplishing the field/laboratory investigation and the submittal of reports to the DEQ. The site characterization plan should be designed to accomplish the characterization of the magnitude and extent of contamination both on the subject site, and adjacent properties, as necessary. If off-site access has been denied, please submit copies of correspondence regarding attempts to gain authorization to install off-site monitoring wells by the September 29, 1995 deadline.

4) Please begin quarterly groundwater monitoring at the site immediately. A quarterly groundwater monitoring report should be submitted no later than **October 20, 1995**. The free product recovery report may be combined with the quarterly groundwater monitoring reports if so desired.

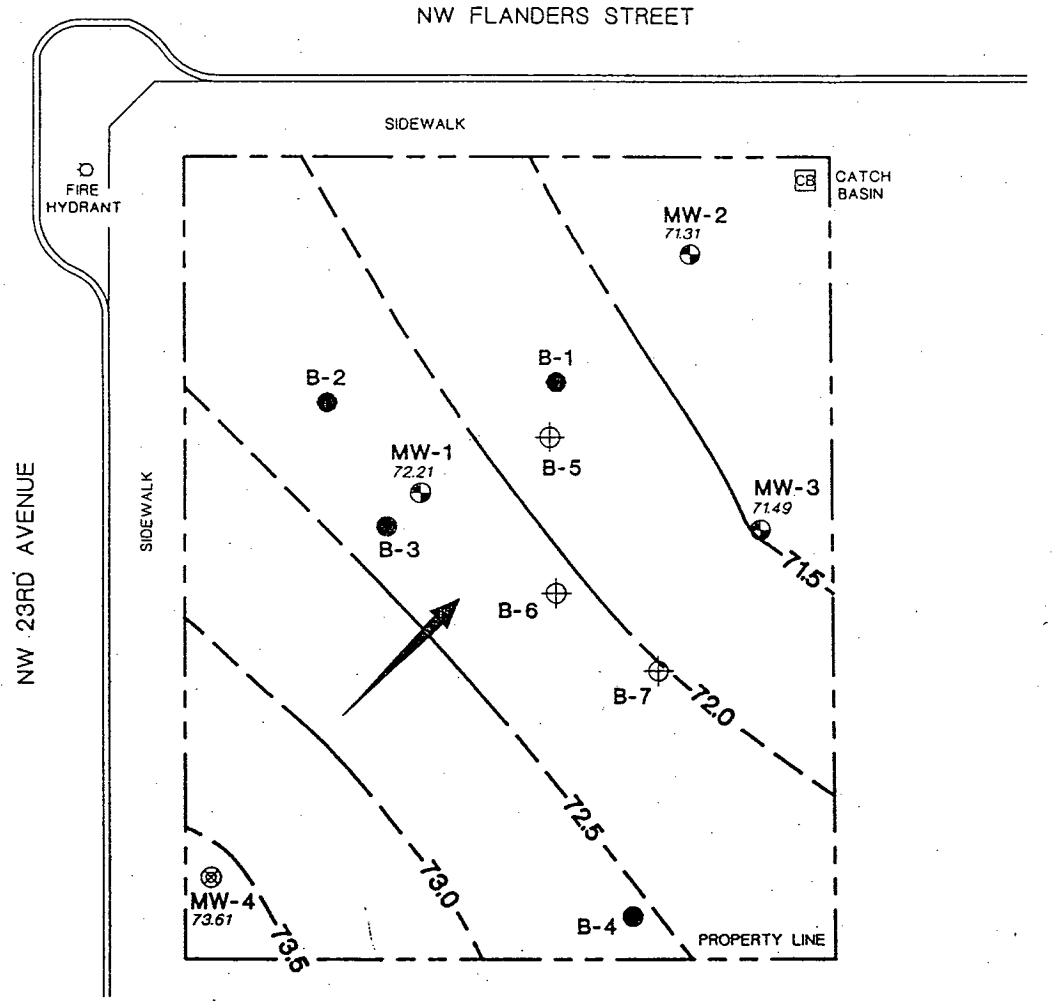
The Department appreciates your cooperation in complying with the UST regulations. If you have any questions, please call me at (503) 229-5497.

Sincerely,

Don J. Pettit

Don Joseph Pettit
UST Cleanup Specialist
Northwest Region

cc: Sara Kingery
GeoEngineers, Inc.
7504 Southwest Bridgeport Road
Portland, Oregon 97224



LEGEND

MW-3	MONITORING WELL NUMBER AND LOCATION (INSTALLED BY RZA, MARCH 1994)
B-4	SOIL BORING NUMBER AND LOCATION (INSTALLED HY HAI, JAN. 1994)
B-5	SOIL BORING NUMBER AND LOCATION (INSTALLED AGRA, SEPT. 1994)
MW-4	MONITORING WELL NUMBER AND LOCATION (INSTALLED BY AGRA, SEPT. 1994)
—73.5—	INFERRED GROUNDWATER SURFACE ELEVATION CONTOUR IN FEET
73.61	SPOT GROUNDWATER SURFACE ELEVATION IN FEET
←	INFERRED DIRECTION OF GROUNDWATER MIGRATION

0 20 40

SCALE IN FEET

FIGURE 4

AGRA
Earth & Environmental
7477 SW Tech Center Drive
Portland Oregon 97223-8025

W.O.	21-07423-00
DESIGN	LCF
DRAWN	JMR
DATE	OCT 1994
SCALE	1"=20'

ROSE'S PARKING LOT
330 NW 23RD AVENUE
PORTLAND, OREGON

GROUNDWATER GRADIENT MAP
FOR OCTOBER 04, 1994

AGRA EARTH & ENVIRONMENTAL, INC. DRAWING NO. \21\07423\GW-1094.DWG

SUMMARY

AGRA Earth & Environmental (AGRA), Inc., recently completed a subsurface investigation at 330 NW 23rd Avenue, Portland, Oregon. The presence of petroleum hydrocarbons in site soils was first discovered in January 1994, during a limited subsurface investigation conducted by Hahn and Associates, Inc. (HAI), Portland, Oregon. A second assessment phase was conducted by AGRA in March 1994, to determine if site groundwater had been impacted. The objectives of the recent follow-up assessment were to: 1) obtain additional data regarding the history of the site, 2) to better characterize potential groundwater contaminant source areas, and 3) to determine if there was a potential up-gradient source for on-site groundwater impact.

Our Subsurface Investigation Indicated:

- **Site History:** The original configuration of the underground storage tank (UST) system has been determined to consist of two 5,000-gallon gasoline USTs, and a 550-gallon waste oil UST. The station was remodelled in 1964. Plans for the remodel indicate that three new USTs were to be installed, though it is not clear whether they ever were installed. Portland Fire Bureau records also indicate that a 10,000-gallon UST was installed at th e site in 1974. No records indicating that any site USTs were decommissioned have been identified.

- **Geophysical Surveys:** Magnetic, electromagnetic, and ground penetrating radar geophysical surveys were conducted at the subject site to determine if USTs are still present. The geophysical surveys were performed by Geopotential, Gresham, Oregon. A UST was identified near the southeast corner of the property. Two large geophysical anomalies also were identified near the center of the property.

- **Subsurface Explorations:** Significant additional areas of soil contamination were not identified during recent subsurface exploration activities. Petroleum hydrocarbons wer e not detected in soil samples collected from three shallow soil borings drilled near the central portion of the site, or in soil samples collected from a monitoring well boring drilled near the southwest corner of the property.

  Groundwater testing of the well (MW-4) installed near the up-gradient property boundary indicated no evidence of a potential up-gradient contaminant source. Elevated levels of gasoline constituents were detected in monitoring wells MW-2 and MW-3. The levels of gasoline constituents detected in MW-3 are an order of magnitude higher than those detected in monitoring well MW-2. The distribution of contaminants identified in site groundwater during the October 1994 sampling event is very similar to the distribution initially detected in March 1994.

- **Hydrogeology:** Water levels measured in site monitoring wells ranged from approximat ely 24 to 28 feet below ground surface (bgs). On October 4, 1994, the top of the water table was measured as dipping towards the northeast at a gradient of approximately 0. 020 vertical feet per lateral foot.

- **Conclusions:** Based upon our review of site building records, and upon the distribution of petroleum hydrocarbons in site soils, it appears that the most likely source area for the on-site groundwater contaminant plume is the west-central portion of the site. This is the only area in which gasoline dispensing has occurred, and it is also the only location where the former presence of gasoline USTs has been confirmed. While it appears likely that a second set of USTs were installed directly northeast of the original USTs, some questions regarding this issue still remain.

  Groundwater contamination appears to extend from monitoring well MW-1 to the eastern margin of the property. Since the water table currently dips to the northeast, the presence of significant gasoline constituent concentrations in MW-3 (and not MW-2) is puzzling. This groundwater contaminant plume distribution may be due to the presence of preferential migration pathways which link the area of MW-3 with the suspected source area.

  Based upon the results of all work to date, we have found no evidence that links petroleum contamination in soil or groundwater to a specific set of tanks or other UST system features. Because we have found no evidence of a UST system remaining in the main area of contamination, it may no longer be possible to determine the exact source or sources of contamination.

  The soil and groundwater contamination at this property will have to be addressed through remedial action in order to bring the site into compliance with the ODEQ. Cleanup options will be submitted to you under separate cover.

The preceding summary is intended for introductory and reference use only, and should be used in conjunction with the full text of this report.

Oregon

July 20, 1995

DEPARTMENT OF
ENVIRONMENTAL
QUALITY

NORTHWEST REGION

MAX BIRNBACH
C/O CHARLES WILLIAMSON
KELL ALTERMAN & RUNSTEIN
1001 SW FIFTH SUITE 1800
PORTLAND OREGON 97204-1194

RE: Roses Parking Lot
File No.: 26-94-025

Dear Mr. Birnbach:

This is to notify you that your Underground Storage Tank cleanup project has been assigned to a project manager, Don Pettit, in Northwest Region. He will contact you and/or your consultant if any additional information is required or as necessary as your cleanup project proceeds. Mr. Pettit can be reached at (503) 229-5497.

If you have any questions about the cost recovery process or invoices you receive, please contact the Waste Management and Cleanup Program at (503) 229-5913.

We look forward to a successful completion of your project.

Sincerely,

Richard P. Reiter
UST Section Manager

John A. Kitzhaber
Governor

2020 SW Fourth Avenue
Suite 400
Portland, OR 97201-4987
(503) 229-5263 Voice
TTY (503) 229-5471

DEQ-1

UST CLEANUP TELEPHONE USE REPORT

CALL FROM/TO: Sarah Kingery DATE: 7-6-95

WITH: _____ TIME: 1:10

TELEPHONE NO: ( ) -

REGARDING: Roses Parking Lot

FILE NO: 26-94-025

SUMMARY OF CALL

Wanted to know place on waiting list. Reminded me that they have free product.

8/9/95 10:30 To Sara Kingery: June - remedial investigation.

New soil borings, VES test, slug test. Soil gradation & water sampling.

MW-1 may be screened too low. Had free product.

B. Segal

Staff Signature

June 29, 1995

Oregon

DEPARTMENT OF
ENVIRONMENTAL
QUALITY

NORTHWEST REGION

MAX BIRNBACH
C/O CHARLES WILLIAMSON
KELL, ALTERMAN AND RUNSTEIN
1001 SW FIFTH AVENUE SUITE 1800
PORTLAND OREGON 97212

Re: Rose's Parking Lot
File No.: 26-94-025

Dear Mr. Birnbach:

On June 19, 1995, we received the signed Cost Recovery Agreement which indicated your interest in participating in the Underground Storage Tank Cleanup Voluntary Cost Recovery Program.

At the current time, we have a backlog of projects which have signed up for Departmental oversight through this program, and these are currently being assigned on a first come, first serve, basis. As additional staff resources become available, your project will be assigned to a project manager.

Our goal is to assign projects as soon as possible. However, at current demand levels, we are estimating there will be a six to eight week wait before your project can be assigned. You will be notified as soon your project has been assigned and provided the name and phone number of the project manager who will be working with you. Your status on the waiting list will not delay processing of a soil treatment application, if you propose to conduct soil treatment and have applied for a letter of authorization.

We do appreciate your interest in this program and look forward to working with you in the near future.

If you have any questions about the status of your site for assignment, please contact Rachel Segal at (503) 229-5492. If you have a general question about the regulations or cleanup activities at your site, please call 229-5489 and ask to speak to the Underground Storage Tank Duty Officer.

Sincerely,

Rachel Gallin Segal

Laurie J. McCulloch
UST Section Manager

cc: Julia Fowler
GeoEngineers
7504 SW Bridgeport Road
Portland Oregon 97224

John A. Kitzhaber
Governor

2020 SW Fourth Avenue
Suite 400
Portland, OR 97201-4987
(503) 229-5263 Voice
TTY (503) 229-5471

DEQ-1

UST CLEANUP TELEPHONE USE REPORT

CALL FROM/TO: Sulia Fowler DATE: 5-11-95

WITH: Geo Engineers TIME: 1615

TELEPHONE NO: ( ) 624-9274

REGARDING: Rose's Parking Lot

FILE NO: 26-94-25

SUMMARY OF CALL

Free product in wells; will be signing up for Cost Recovery

Staff Signature

KELL, ALTERMAN & RUNSTEIN

CLIFFORD B. ALTERMAN
TED E. RUNSTEIN
LEE DAVIS KELL, CPA*
WAYNE D. PALMER
LLOYD R. SUMMERS
WILLIAM DICKAS
GARY P. COMPA‡
CHARLES R. WILLIAMSON
MARY ELLEN PAGE FARR
ERIC SOGGE
LARRY J. BRANT***‡
THOMAS J. MATSUDA**

DEAN N. ALTERMAN
DANA L. BARNES
TINA-MARIE BASKIN***
THOMAS R. RASK III
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TELEPHONE (503) 222-3531

TELECOPIER (503) 227-2980

RAYMOND M. KELL
(1911-1991)

ALSO ADMITTED IN
* CALIFORNIA
** HAWAII
*** WASHINGTON

‡ LL.M. IN TAXATION

October 29, 1994

DEPARTMENT OF ENVIRONMENTAL QUALITY
RECEIVED

OCT 31 1994

NORTHWEST REGION

Mr. Andre Pollock
Oregon Department of Environmental Quality
Northwest Region
Underground Storage Tank Duty Officer
2020 S. W. Fourth Avenue, Suite 400
Portland, Oregon 97201

RE: ROSE'S PARKING LOT, 330 N. W. 23RD AVENUE
ODEQ FILE NO: 26-94-025

Dear Mr. Pollock:

Enclosed please find a further study by AGRA of the above site.

We expect that we will be able to work out an agreement with the responsible oil companies and commence cleanup within the next two months.

Thank you very much for your forbearance with respect to this site.

Very truly yours,

Charles R. Williamson

CRW/rw

Enclosures

cc: Max Birnbach
George Mack
Douglas Smith, AGRA

SUBSURFACE GROUNDWATER INVESTIGATION

FORMER SERVICE STATION SITE
330 N. W. 23rd AVENUE
PORTLAND, OREGON

Submitted To:

Kell, Alterman & Runstein
1001 S. W. Fifth Avenue, Suite 1800
Portland, Oregon 97204-1194

Submitted By:

AGRA Earth & Environmental, Inc.
7477 S. W. Tech Center Drive
Portland, Oregon 97223-8025

21-07423-01

October 1994

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AGRA
Earth & Environmental

AGRA
Earth & Environmental

October 27, 1994
21-07423-01

AGRA Earth & Environmental, Inc.
7477 SW Tech Center Drive
Portland, Oregon
U.S.A. 97223-8025
Tel (503) 639-3400
Fax (503) 620-7892

Mr. Charles Williamson
Kell, Alterman & Runstein
1001 SW Fifth Avenue, Suite 1800
Portland, Oregon 97204-1194

Dear Mr. Williamson:

RE: SUBSURFACE GROUNDWATER INVESTIGATION
FORMER SERVICE STATION SITE
330 NW 23RD AVENUE
PORTLAND, OREGON

AGRA Earth & Environmental, Inc. (AGRA) is pleased to provide you with our report on recent assessment work performed at the subject property. We are working on a revised estimate of remediation costs which incorporates the new data acquired during recent assessment activities.

Thank you for the opportunity to assist you with this project. If you have any questions, please feel free to contact the undersigned at (503) 639-3400.

Sincerely,

AGRA Earth & Environmental, Inc.

Leonard C. Farr Jr., P.G.
Staff Geologist

Douglas A. Smith, P.G.
Associate

LCF/skh

7423-01.l&r

TABLE OF CONTENTS

PAGE

SUMMARY iii

1.0 INTRODUCTION 1
1.1 OBJECTIVES AND SCOPE-OF-WORK 1
1.2 SITE HISTORY 1
1.3 PREVIOUS WORK 3
1.3.1 HAI INVESTIGATION 3
1.3.2 INITIAL AGRA INVESTIGATION 3

2.0 SITE CONDITIONS 4
2.1 CLIMATE 4
2.2 REGIONAL GEOLOGY AND HYDROGEOLOGY 4

3.0 SUBSURFACE EXPLORATIONS 4
3.1 GEOPHYSICAL SURVEY 4
3.2 SOIL AND GROUNDWATER SAMPLING 5
3.3 SUBSURFACE CONDITIONS 6
3.3.1 SUBSURFACE SOIL CONDITIONS 6
3.3.2 FIELD VOLATILE SCREENING 6
3.3.3 GROUNDWATER 7

4.0 QUANTITATIVE CHEMICAL ANALYSES 7
4.1 SOIL ANALYSES 7
4.1.1 HYDROCARBON IDENTIFICATION (ODEQ METHOD TPH-HCID) .. 7
4.2 GROUNDWATER ANALYSES 8
4.2.1 AROMATIC VOLATILE ORGANIC COMPOUNDS (EPA METHOD 8020) 8

5.0 STATE OF OREGON SOIL AND GROUNDWATER CLEANUP GUIDELINES 8
5.1 SOIL CLEANUP GUIDELINES 8
5.2 GROUNDWATER CLEANUP GUIDELINES 9

6.0 CONCLUSIONS AND RECOMMENDATIONS 9

FIGURES

Figure 1 Site Location Map
Figure 2 Site and Exploration Plan
Figure 3 Historical Site Plan
Figure 4 Groundwater Potentiometric Gradient Map (October 4, 1994)
Figure 5 Summary of Groundwater Sample Analysis

APPENDICES

Appendix A Building Permit Inspection Reports
Plumbing Inspection Reports

Appendix B Geopotential Report

Appendix C Water Table Measurements and Survey Data
Summary of Soil Sample Analytical Data
Summary of Groundwater Sample Analytical Data

Appendix D Sampling Methods
Boring Logs

Appendix E AGRA Laboratory Reports
Amoco Laboratory Report
Chain-of-Custody Documents

SUMMARY

AGRA Earth & Environmental (AGRA), Inc., recently completed a subsurface investigation at 330 NW 23rd Avenue, Portland, Oregon. The presence of petroleum hydrocarbons in site soils was first discovered in January 1994, during a limited subsurface investigation conducted by Hahn and Associates, Inc. (HAI), Portland, Oregon. A second assessment phase was conducted by AGRA in March 1994, to determine if site groundwater had been impacted. The objectives of the recent follow-up assessment were to: 1) obtain additional data regarding the history of the site, 2) to better characterize potential groundwater contaminant source areas, and 3) to determine if there was a potential up-gradient source for on-site groundwater impact.

Our Subsurface Investigation Indicated:

- **Site History:** The original configuration of the underground storage tank (UST) system has been determined to consist of two 5,000-gallon gasoline USTs, and a 550-gallon waste oil UST. The station was remodelled in 1964. Plans for the remodel indicate that three new USTs were to be installed, though it is not clear whether they ever were installed. Portland Fire Bureau records also indicate that a 10,000-gallon UST was installed at th e site in 1974. No records indicating that any site USTs were decommissioned have been identified.

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  Groundwater testing of the well (MW-4) installed near the up-gradient property boundary indicated no evidence of a potential up-gradient contaminant source. Elevated levels of gasoline constituents were detected in monitoring wells MW-2 and MW-3. The levels of gasoline constituents detected in MW-3 are an order of magnitude higher than those detected in monitoring well MW-2. The distribution of contaminants identified in site groundwater during the October 1994 sampling event is very similar to the distribution initially detected in March 1994.

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- **Conclusions:** Based upon our review of site building records, and upon the distribution of petroleum hydrocarbons in site soils, it appears that the most likely source area for the on-site groundwater contaminant plume is the west-central portion of the site. This is the only area in which gasoline dispensing has occurred, and it is also the only location where the former presence of gasoline USTs has been confirmed. While it appears likely that a second set of USTs were installed directly northeast of the original USTs, some questions regarding this issue still remain.

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  Based upon the results of all work to date, we have found no evidence that links petroleum contamination in soil or groundwater to a specific set of tanks or other UST system features. Because we have found no evidence of a UST system remaining in the main area of contamination, it may no longer be possible to determine the exact source or sources of contamination.

  The soil and groundwater contamination at this property will have to be addressed through remedial action in order to bring the site into compliance with the ODEQ. Cleanup options will be submitted to you under separate cover.

The preceding summary is intended for introductory and reference use only, and should be used in conjunction with the full text of this report.

1.0 INTRODUCTION

This report presents the results of our subsurface investigation conducted at 330 NW 23rd Avenue, Portland, Oregon (Figure 1). This work constitutes the third phase of subsurface assessment performed at the site. Data acquired during previous assessment phases is also discussed in the report. Figure 2 indicates approximate site boundaries and the locations of previous exploration points.

1.1 OBJECTIVES AND SCOPE-OF-WORK

The scope-of-work and objectives for the recent assessment included:

1) obtaining all available data indicating former UST system configurations at the site,

2) performing a geophysical survey to determine if USTs are still present at the site,

3) drilling three shallow soil borings in order to determine if there is a second source of soil and groundwater contamination at the site,

4) installing one additional monitoring well near the northwest corner of the site to determine the potential for an up-gradient, off-site source of contamination,

5) sampling the three previously installed monitoring wells and new monitoring well to assess the current contaminant distribution at the site, and to obtain additional data regarding site hydrogeologic conditions, and

6) preparing a report presenting the results of our work.

This report has been prepared for the exclusive use of Kell, Alterman & Runstein and its agents, for specific application to this project, in accordance with generally accepted environmental engineering and geology practices. No other warranty, expressed or implied, is made.

1.2 SITE HISTORY

The history of the subject site was documented in AGRA's April 1994 report. A review was made of Polk City Directories and Sanborne Fire Insurance Maps available at the Oregon Historical Library. We also reviewed aerial photographs, and a chain-of-ownership review was completed by Western American Property Research (WAPR). Using information obtained in Polk City Directories and chain-of-ownership documents, the history of service station operations and ownership has been established.

In order to determine potential source areas for the gasoline constituents detected in site groundwater, an additional records review was performed to identify the former locations of UST system components. Sources of information reviewed included City of Portland plumbing and

building permit inspection records, Portland Fire Bureau records, and additional records provided by the Union Oil Company of California (Unocal) and the current owner.

A service station was first constructed at the site in 1954. City of Portland plumbing inspection reports indicate that a residence occupying the site was demolished in January 1954. Building inspection reports indicate that a steel service station building and drive slab were constructed in March 1954. The owner of the property is listed as the George Lawrence Estate in the plumbing and building inspection reports. The building permit and plumbing inspection reports are included in Appendix A.

A plot plan for the original Golden Eagle Service Station was provided by the Unocal. The original fuel dispensing UST system consisted of three pump islands and two 5,000 gallon USTs. A 550-gallon waste oil tank also was installed during initial construction activities. The configuration of the original service station is depicted in Figure 3. A review of aerial photographs confirms that the station was constructed as shown in the Golden Eagle Service Station plot plan. Portland Fire Bureau records also indicate that two 5,000-gallon USTs and a 550-gallon waste oil UST were installed at the site in 1954.

In 1964, the service station was apparently remodeled by the American Oil Company (Amoco). The WAPR chain-of-ownership indicates that Amoco began leasing the property in August 1964. Building inspection records indicate that two pump island slabs, canopy footings, and a light pole footing were installed in December 1964, and January 1965 (Appendix A). An Amoco plot plan on file with the City of Portland also indicates that two 5,000-gallon USTs and one 10,000-gallon UST would be installed as part of the remodel (Figure 3). Installation of the USTs is not confirmed in building permit records, so there is some question as to whether the USTs ever were installed at the locations shown in the Amoco plot plan. A 1971 aerial photograph confirms that a canopy was constructed at the site at the location shown in the Amoco plot plan. A concrete slab does not appear to be present in the 1971 photograph in the area designated for UST emplacement in the Amoco plot plan.

The Portland Fire Bureau records indicate that a 10,000-gallon UST was installed at the site in 1974. In 1974, the property was being leased by Gull Oil Company. The City of Portland building permits section had no record of the installation of a UST in 1974.

A plot plan dated July 17, 1979, showing a proposed layout for the parking lot, was provided by Mr. Max Birnbach. The proposed layout is consistent with the current configuration of the parking lot. The locations of two existing fill spouts are noted in the plot plan, and are consistent with the locations of the original two 5,000-gallon USTs. The location of the waste oil UST or its corresponding fill spout is not noted on the plot plan. Based upon our aerial photograph review, the parking lot apparently was constructed prior to 1980. The property has not changed significantly since 1980.

1.3 PREVIOUS WORK

This subsurface investigation constitutes the third phase of subsurface assessment performed at the site. Data summary tables providing water level data and the results of soil and groundwater testing performed during each assessment phase are included in Appendix C.

1.3.1 Hai Investigation

In January 1994, HAI was retained by the EDA Corporation, Portland, Oregon, to perform a subsurface investigation at the subject property. At the time of the HAI field work, the property was owned by the EDA Corporation. Four soil borings were drilled during the investigation.

Based upon the results of field and laboratory testing, gasoline was identified in site soils. Groundwater quality was not assessed during the HAI investigation.

A magnetometer survey also was performed as part of HAI's investigation, in order to determine if USTs were still present at the site. The survey identified the presence of a buried metallic object in an area formerly occupied by a waste oil tank. A report documenting the results of HAI's subsurface investigation was submitted to the EDA Corporation in February, 1994.

1.3.2 Initial AGRA Investigation

In March 1994, AGRA was retained by Kell, Alterman & Runstein to perform a subsurface investigation. At the time of the initial AGRA assessment, the property was owned by Mr. Max Birnbach. Three soil borings were drilled, and monitoring wells were installed in each of the borings.

Additional evidence of the presence of gasoline was identified in site soils. Gasoline and it's constituents also were detected in site groundwater. The results of the AGRA investigation were provided in a report (April 8, 1994) submitted to Kell, Alterman & Runstein.

2.0 SITE CONDITIONS

The project site is located southeast of the intersection of NW 23rd Avenue and NW Flanders St. in Northwest Portland, Oregon (Figure 1). The area surrounding the subject site includes commercial and residential properties. No active service stations are present within a two block area surrounding the property.

2.1 CLIMATE

The Portland area has a modified marine climate with a mean annual precipitation rate of 37 inches. Approximately 80% of the annual precipitation falls as rain between the months of October and March. Summers are generally dry and sunny.

2.2 REGIONAL GEOLOGY AND HYDROGEOLOGY

The subject property is located near the western margin of a northwest-southeast trending, sediment-filled structural depression termed the Portland Basin. The general near-surface geology within the basin, and in the Northwest Portland area, consists of Quaternary Alluvium. The alluvium consists of silt, sand, and clay, and comprise flood plain deposits of the Willamette and Columbia Rivers.

The Quaternary Alluvium is underlain by silts, clays, sands and occasional gravels of the Pliocene Troutdale Formation. The depth to the top of the Troutdale Formation near the subject site is approximately 100 feet. The thickness of the Troutdale Formation near the subject site is approximately 150 feet. The Troutdale Formation is underlain by the Miocene Columbia River Basalt (CRB). The thickness of the CRB near the subject site is not known.

Groundwater is first encountered in the Northwest Portland Area in the Quaternary Alluvium. However, the primary aquifer is the Troutdale Gravel Aquifer, which occurs at a depth of approximately 100 feet bgs near the subject site.

3.0 SUBSURFACE EXPLORATIONS

3.1 GEOPHYSICAL SURVEY

A subsurface geophysical locating survey was performed at the site on September 19, 1994, by Geopotential, Gresham, Oregon. A copy of the report prepared by Geopotential has been included in Appendix B. The survey included three geophysical techniques; electromagnetics, magnetics, and ground penetrating radar. Based upon subsurface data acquired using the three geophysical techniques, a UST was identified near the southern property boundary. The location and size of the UST is consistent with the suspected location of the 550-gallon waste oil UST, installed at the site in 1954.

Two large geophysical anomalies also were identified near the center of the site. The anomalies were identified as reinforced concrete slabs. The mesh and/or rebar present in the slabs effectively "mask" geophysical responses from below the slabs. The two anomalies do not correspond very well with suspected former UST locations, although one of the anomalies overlaps approximately 50% with the USTs suspected of having been installed during 1964. Two of the borings drilled during recent assessment activities were located within the anomalies. The borings encountered approximately six-inches of concrete. USTs were not encountered by the borings, nor was fill material of sufficient thickness encountered that would indicate a former UST cavity.

3.2 SOIL AND GROUNDWATER SAMPLING

On September 13, 1994, water levels were measured in the three existing site monitoring wells in order to determine if the direction of groundwater migration had changed since March 1994. The water levels measured are shown in the Water Table Measurements and Survey Data table included in Appendix C. The direction of groundwater migration was found to be northwesterly, and was consistent with the direction measured in March 1994.

Drilling activities were completed on September 28, 1994. Three soil borings (B-5, B-6, and B-7) were advanced to a depth of 10 feet, and monitoring well MW-4 was installed near the up-gradient boundary of the site (Figure 2). Geotech Explorations, Tualatin, performed the drilling and monitoring well installation. All drill cuttings were placed in 55-gallon drums which were labeled and are currently being stored at the subject site.

Soil samples were collected at five foot intervals in each boring. The samples were obtained using a split-spoon sampler and standard penetration test (SPT) sampling techniques. SPT sampling methodologies are described in Appendix D. This sampling, combined with the logging of drilling character, provided the basis of our geologic characterization of the site. A geologic boring log showing well specifications, sampling intervals, vapor screening data, and a graphic representation of the subsurface geology at the location of monitoring well MW-4 is provided in Appendix D.

Samples were observed and classified in the field by a registered professional geologist from our firm. Representative portions of each sample were collected, placed in air-tight, laboratory prepared Teflon-sealed containers, and were returned to AGRA's in-house laboratory for analysis.

Petroleum-like odors were not detected during the drilling of any of the borings. Detection of petroleum-like odors is dependent on the olfactory sensitivity of the person classifying the sample, as well as other factors, including air and sample temperature, wind velocity, the length of time the sample is out of the boring, product type, and the degree of product degradation. Because these constraints are not readily quantifiable, and no test standards exist, the detection of petroleum-like odors during drilling should be considered subjective information.

Monitoring well MW-4 was developed by a combination of surging and bailing. During the development of MW-4, approximately 30 gallons of groundwater were removed. Sampling of MW-4 and the three previously installed monitoring wells was performed on October 4, 1994. A minimum of three wetted casing volumes were purged from each monitoring well prior to groundwater sampling. Groundwater sampling procedures are described in detail in Appendix D.

The relative top-of-casing elevation of monitoring well MW-4 was determined using a rod and construction level. An arbitrary datum, the top of the fire hydrant located near the intersection of NW 23rd Avenue and NW Flanders Street, was assigned an elevation of 100 feet. Water level

measurements collected on October 4, 1994, were used in calculating the gradient of the water table underlying the site. A water table contour map showing the approximate locations of the monitoring wells, and the inferred direction of groundwater migration is presented on Figure 4.

3.3 SUBSURFACE CONDITIONS

3.3.1 Subsurface Soil Conditions

Soils first encountered under the asphalt and base course at the site consist of fill material which varies considerably in its composition. At the location of HAI soil borings B-1, B-2, and B-3 and AGRA monitoring well boring MW-1, abundant debris and fill material is present in the uppermost eight to 12 feet. These areas of deep fill may indicate the locations of former UST cavities. Underlying the fill material is very fine- to medium-grained sands and silty sands.

3.3.2 Field Volatile screening

Petroleum-like odors were not detected during recent drilling of the three shallow soil borings or monitoring well MW-4. No significantly elevated levels of volatile organic vapors were detected. The results of vapor screening performed during the drilling of MW-4 are summarized on the boring log included in Appendix D.

3.3.3 Groundwater

Static groundwater levels were measured immediately prior to monitoring well sampling (October 4, 1994). Groundwater levels ranged from 24.56 to 27.40 feet bgs. The groundwater gradient was found to be dipping towards the northeast, at a gradient of approximately 0.020 vertical feet per lateral foot (Figure 4). All groundwater extracted from the monitoring wells during development and purging was placed in 55-gallon drums which are currently being stored at the subject site.

4.0 QUANTITATIVE CHEMICAL ANALYSES

Soil samples collected from soil borings B-5, B-6 and B-7, and monitoring well boring MW-4 were evaluated for the presence of petroleum hydrocarbons. The test methods utilized included Oregon Department of Environmental Quality (ODEQ) Method TPH-HCID, and EPA Method 418.1. Groundwater samples collected from each of the monitoring wells were evaluated for the presence of aromatic volatile organic compounds including benzene, toluene, ethylbenzene, and xylenes (BTEX) by EPA Method 8020.

Laboratory analyses for this project were carried out at AGRA's in-house laboratory, Portland, Oregon. Laboratory reports and chain-of-custody documents for all soil and groundwater analyses are provided in Appendix E. Duplicate groundwater samples also were shipped to

Amoco for analysis. Analytical data for soil and groundwater samples analyzed by AGRA has been summarized in tables included in Appendix C.

4.1 SOIL ANALYSES

4.1.1 Hydrocarbon Identification (ODEQ Method TPH-HCID)

A single soil sample from each of the shallow soil borings, and two soil samples collected from monitoring well boring MW-4, were analyzed by ODEQ Method TPH-HCID. Petroleum hydrocarbons were detected only in a sample collected at a depth of five feet in monitoring well boring MW-4. The type of petroleum hydrocarbons detected were characterized as heavy oils.

4.1.2 Total Petroleum Hydrocarbons (EPA Method 418.1)

In order to quantify the concentration of heavy oil present in the soil sample collected at a depth of five feet in MW-4, it was tested by EPA Method 418.1. The total petroleum hydrocarbon concentration detected in the sample was 52.2 milligrams per kilogram.

4.2 GROUNDWATER ANALYSES

4.2.1 Aromatic Volatile Organic Compounds (EPA Method 8020)

Groundwater samples from monitoring well MW-4 and each of the three previously installed monitoring wells were analyzed for BTEX. BTEX compounds were not detected in monitoring wells MW-2 or MW-4. Total BTEX concentrations detected in monitoring wells MW-1 and MW-3 were 149 micrograms per liter (µg/l) and 4,510 µg/l, respectively. The results of groundwater testing have been tabulated in Appendix C, and are illustrated in Figure 5.

Contaminant concentrations determined by Amoco compared well with the concentrations determined by AGRA. The levels of BTEX detected in groundwater samples collected in monitoring wells MW-1 and MW-3, and analyzed by the two laboratories, are compared in Table 1. The range in relative percent difference is 1.8 to 52 percent.

TABLE 1
COMPARISON OF AGRA AND AMOCO TESTING DATA

WELL #	COMPOUND	AGRA (µg/l)	AMOCO (µg/l)	%RPD
MW-1	B	27	18	40
	T	46	43	6.7
	E	5.9	10	52
	X	70	77	9.5
MW-3	B	1520	1290	16
	T	600	589	1.8
	E	790	871	9.8
	X	1600	1770	10

5.0 STATE OF OREGON SOIL AND GROUNDWATER CLEANUP GUIDELINES

5.1 SOIL CLEANUP GUIDELINES

Based upon the results of groundwater testing performed as part of the investigation, it is apparent that site groundwater has been impacted by one or more fuel hydrocarbon releases. Therefore, site specific soil cleanup levels must be determined by the ODEQ. However, as general guidance, soil matrix cleanup levels are often utilized at groundwater sites. A matrix level cleanup score sheet was completed as part of the previous report prepared by AGRA. The total matrix score for the subject property was 39, indicating that Level 2 numeric soil clean-up standards could be used as a general soil cleanup guideline for the site. Cleanup standards for Level 2 sites are 500 mg/kg for diesel and other non-gasoline fraction hydrocarbons, as referenced to ODEQ Method TPH-D, or ODEQ Method 418.1 (modified), and 80 mg/kg for gasoline, as referenced to ODEQ Method TPH-G.

5.2 GROUNDWATER CLEANUP GUIDELINES

Numeric standards for groundwater cleanup at UST sites were established by the ODEQ in 1992. Basic numeric groundwater cleanup levels were set for BTEX, gasoline additives, and polynuclear aromatic hydrocarbons (PAHs). Groundwater testing performed during the investigation has included BTEX and the gasoline additives 1,2-dibromoethane (EDB) and 1,2-dichloroethane (EDC). The PAHs are generally associated with diesel, which was not detected at the subject

site. Basic numeric groundwater cleanup levels for BTEX and the gasoline additives are provided below.

Benzene	5 µg/l
Toluene	1,000 µg/l
Ethylbenzene	700 µg/l
Total Xylene	10,000 µg/l
EDB	1 µg/l
EDC	5 µg/l

6.0 CONCLUSIONS AND RECOMMENDATIONS

A third phase of site characterization was recently performed at 330 NW 23rd Avenue. The recent assessment included a thorough review of records indicating the former configuration of site UST systems, soil sampling in three shallow soil borings, the installation of a fourth monitoring well, groundwater sampling, relative surveying of monitoring well MW-4 and determination of the water table gradient, and laboratory testing of soil and groundwater samples.

The original configuration of the underground storage tank (UST) system has been determined to consist of two 5,000-gallon gasoline USTs, and a 550-gallon waste oil UST. Plans for a station remodel dated 1964 were reviewed. The plans indicate that three new USTs were to be installed at the site. Portland Fire Bureau records indicate that a 10,000-gallon UST was installed at the site in 1974. No records indicating that any site USTs were decommissioned have been identified.

Subsurface conditions in the areas explored were found to consist of asphalt and/or concrete, underlain by one to five feet of fill material, underlain by alluvial sands and silty sands. Groundwater levels measured on October 4, 1994, ranged from 24 to 28 feet bgs. Based upon water level measurements collected from site monitoring wells, the water table gradient was found to be dipping towards the northeast at 0.020 vertical feet per lateral foot.

No petroleum hydrocarbons were detected in site soils sampled at shallow boring locations B-5, B-6 and B-7. Low levels of heavy oil (52.2 mg/kg) were detected at a depth of five feet in monitoring well boring MW-4. BTEX compounds were detected in groundwater from monitoring wells MW-1 and MW-3. The groundwater numeric cleanup standard for benzene (5 µg/l) was exceeded in both monitoring well MW-1 and MW-3. Monitoring well MW-4 was installed at the up-gradient edge of the subject property to determine if there were evidence of an up-gradient, off-site source for groundwater contamination. Gasoline constituents were not detected in monitoring well MW-4. Thus, no evidence of an up-gradient source was identified.

Based upon the results of all work to date, we have found no evidence that links petroleum contamination in soil or groundwater to a specific set of tanks or other UST system features.

Because we have found no evidence of a UST system remaining in the main area of contamination, it may no longer be possible to determine the exact source or sources of contamination.

Because soil and groundwater cleanup standards are exceeded at the subject property, we anticipate that cleanup will be required in order to bring the site into compliance with the ODEQ. Updated recommendations regarding site cleanup will be provided under separate cover.

We are pleased to have had the opportunity to assist you on this project. If you have any questions or desire further clarification, please do not hesitate to contact the undersigned at (503) 639-3400.

AGRA Earth & Environmental, Inc.

Leonard C. Farr Jr., P.G.
Staff Geologist

REGISTERED PROFESSIONAL
OREGON
LEONARD C. FARR JR.
#G1169
GEOLOGIST
5/31/95

Douglas A. Smith, P.G.
Associate Geologist

LCF/skh

7423-01.l&r

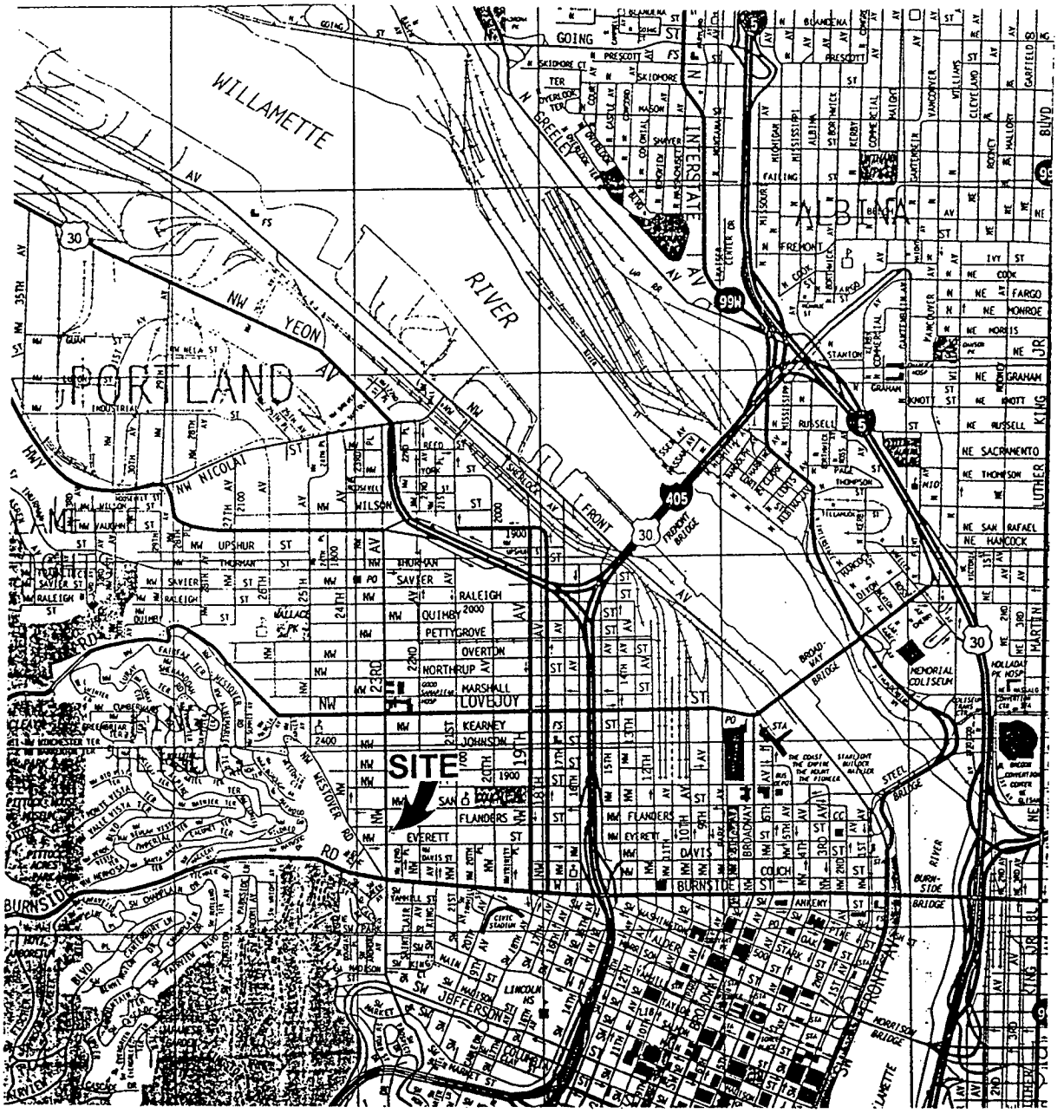


FIGURE 1

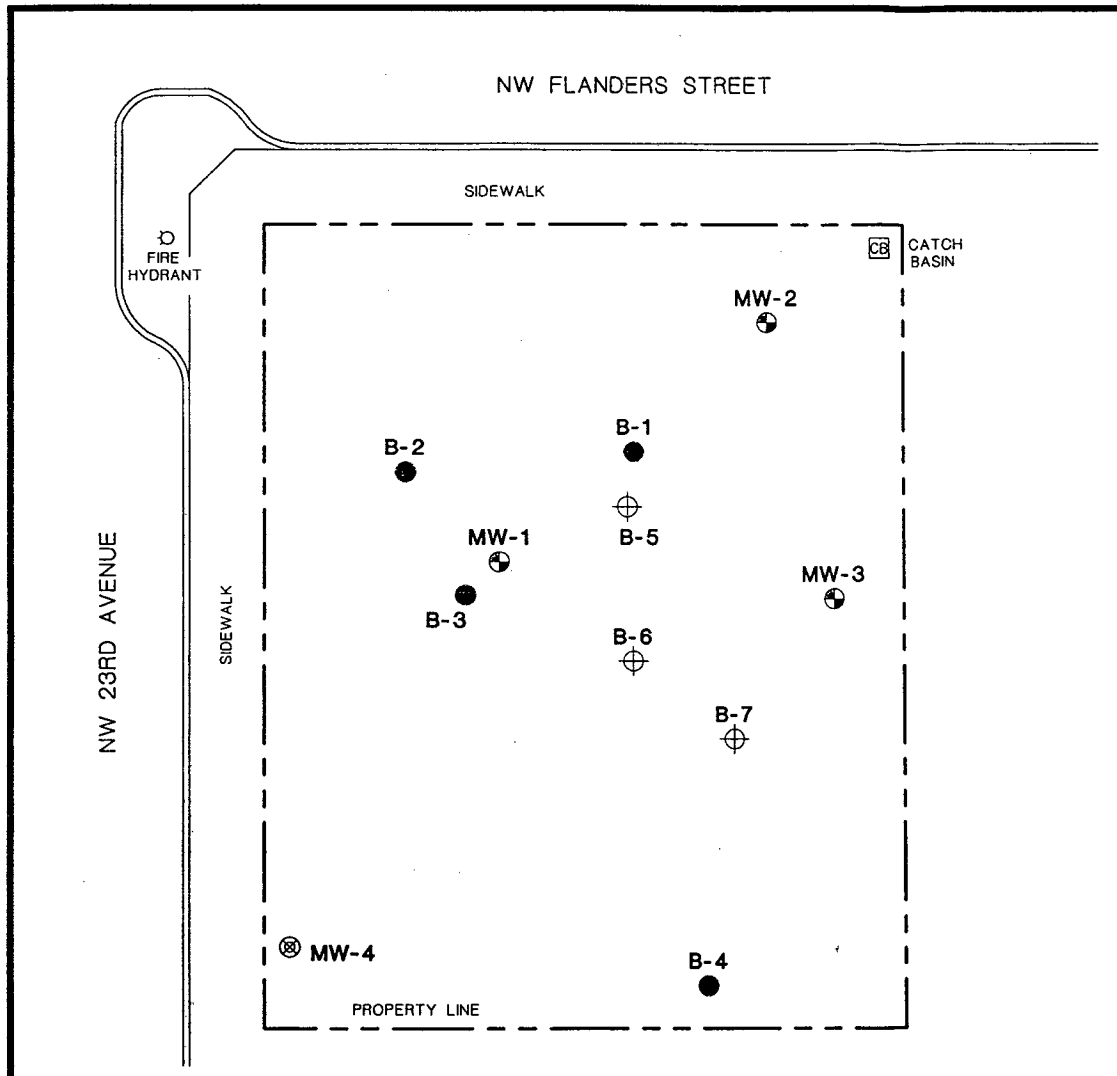
AGRA
Earth & Environmental
7477 SW Tech Center Drive
Portland Oregon 97223-8025

W.O.	21-07423-00
DESIGN	LCF
DRAWN	JMR
DATE	OCT 1994
SCALE	

ROSE'S PARKING LOT
330 NW 23RD AVENUE
PORTLAND, OREGON

SITE LOCATION PLAN

AGRA EARTH & ENVIRONMENTAL, INC. DRAWING NO. \21\07423\LOCATE94.DWG



LEGEND

MW-3	MONITORING WELL NUMBER AND LOCATION (INSTALLED BY RZA, MARCH 1994)
B-4	SOIL BORING NUMBER AND LOCATION (INSTALLED HY HAI, JAN. 1994)
B-5	SOIL BORING NUMBER AND LOCATION (INSTALLED AGRA, SEPT. 1994)
MW-4	MONITORING WELL NUMBER AND LOCATION (INSTALLED BY AGRA, SEPT. 1994)

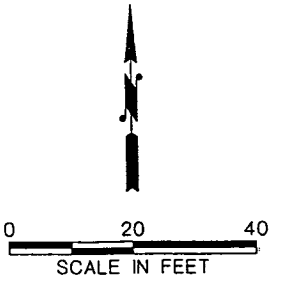


FIGURE 2

AGRA
Earth & Environmental
7477 SW Tech Center Drive
Portland Oregon 97223-8025

W.O.	21-07423-00
DESIGN	LCF
DRAWN	JMR
DATE	OCT 1994
SCALE	1"=20'

ROSE'S PARKING LOT
330 NW 23RD AVENUE
PORTLAND, OREGON

SITE PLAN

AGRA EARTH & ENVIRONMENTAL, INC. DRAWING NO. \21\07423\SITE94.DWG

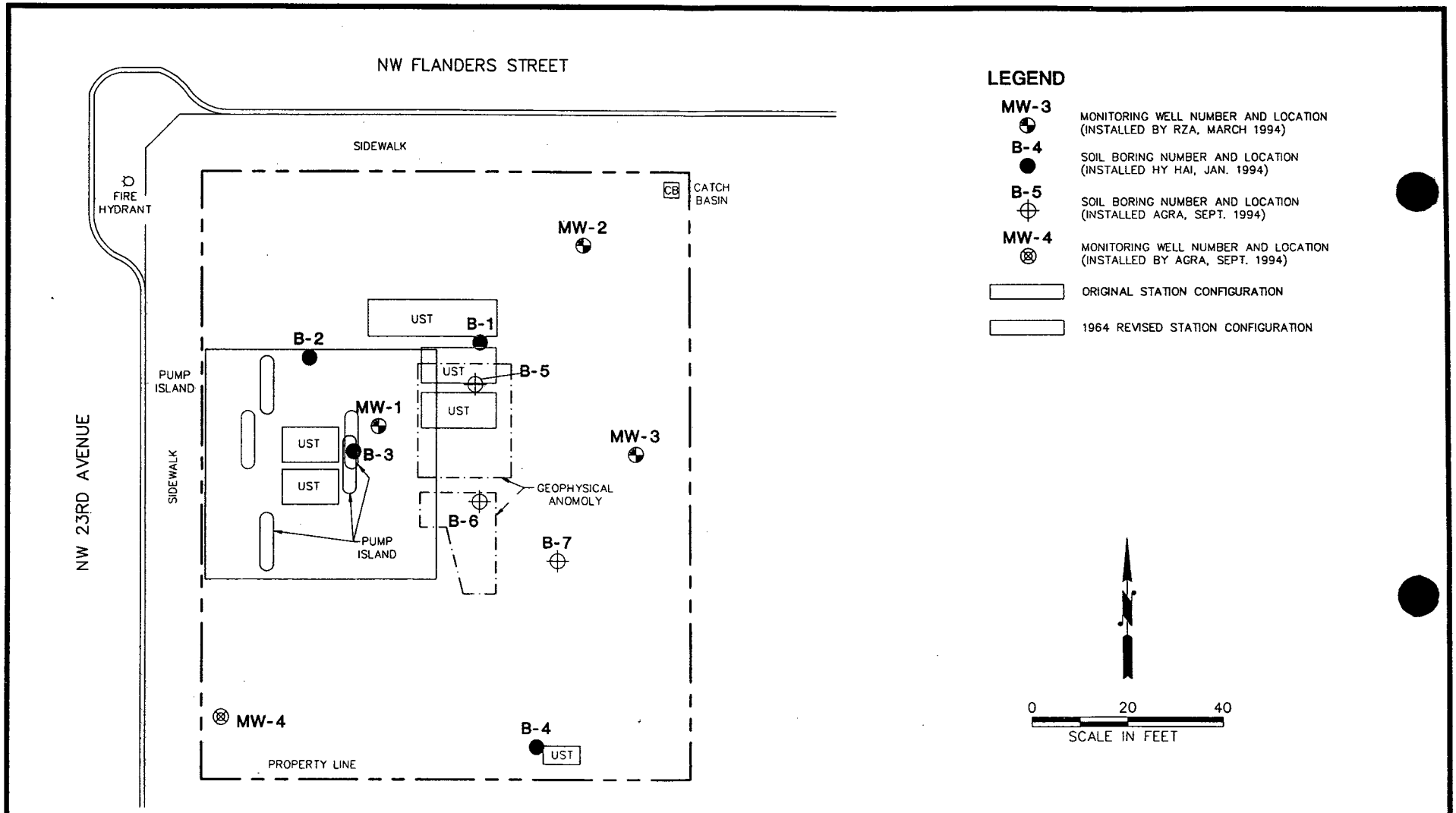


FIGURE 3

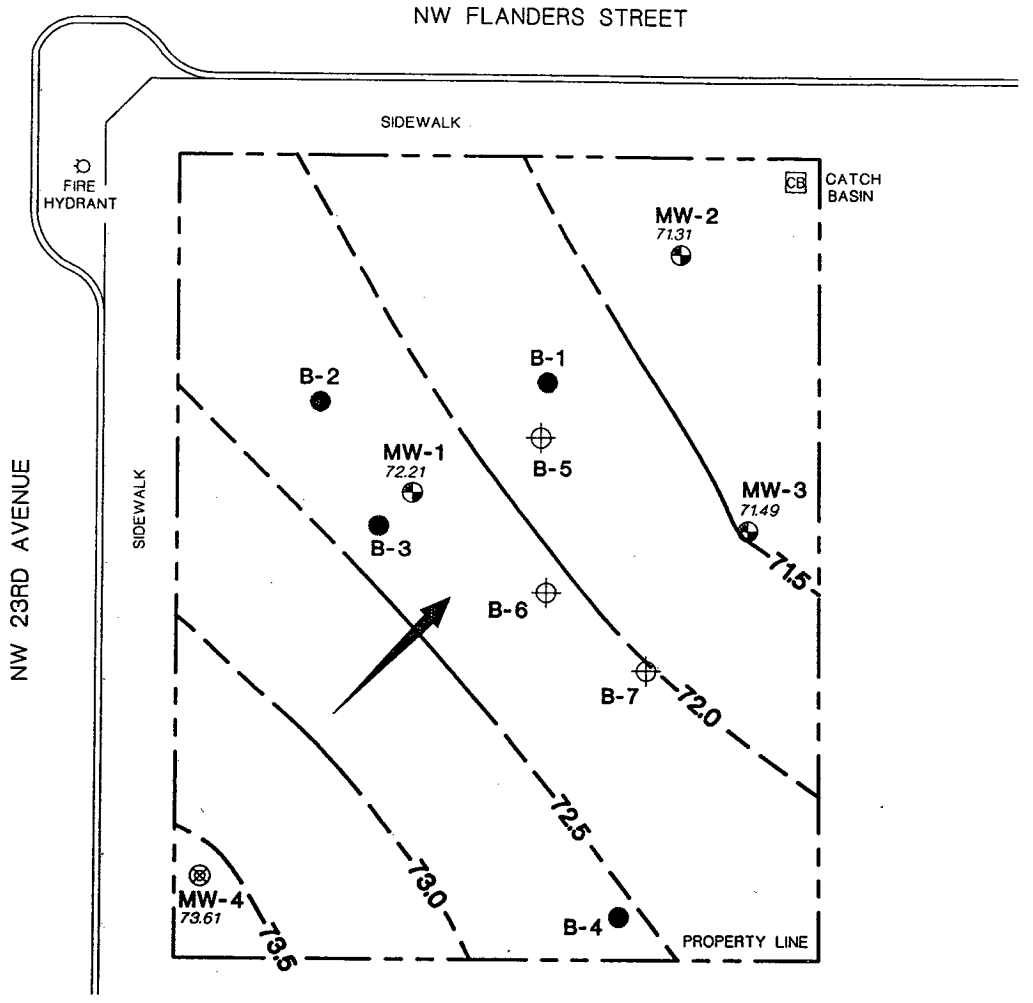
AGRA
Earth & Environmental
7477 SW Tech Center Drive
Portland Oregon 97223-8025

W.O.	21-07423-00
DESIGN	LCF
DRAWN	BDT
DATE	OCT 1994
SCALE	1"=20'

ROSE'S PARKING LOT
330 NW 23RD AVENUE
PORTLAND, OREGON

HISTORICAL SITE PLAN

AGRA EARTH & ENVIRONMENTAL, INC. DRAWING NO. \21\07423\HISTORY.DWG



LEGEND

- MW-3 — MONITORING WELL NUMBER AND LOCATION (INSTALLED BY RZA, MARCH 1994)
- B-4 — SOIL BORING NUMBER AND LOCATION (INSTALLED HY HA!, JAN. 1994)
- B-5 — SOIL BORING NUMBER AND LOCATION (INSTALLED AGRA, SEPT. 1994)
- MW-4 — MONITORING WELL NUMBER AND LOCATION (INSTALLED BY AGRA, SEPT. 1994)
- —73.5— INFERRED GROUNDWATER SURFACE ELEVATION CONTOUR IN FEET
- 73.61 SPOT GROUNDWATER SURFACE ELEVATION IN FEET
- INFERRED DIRECTION OF GROUNDWATER MIGRATION

0 20 40
SCALE IN FEET

FIGURE 4

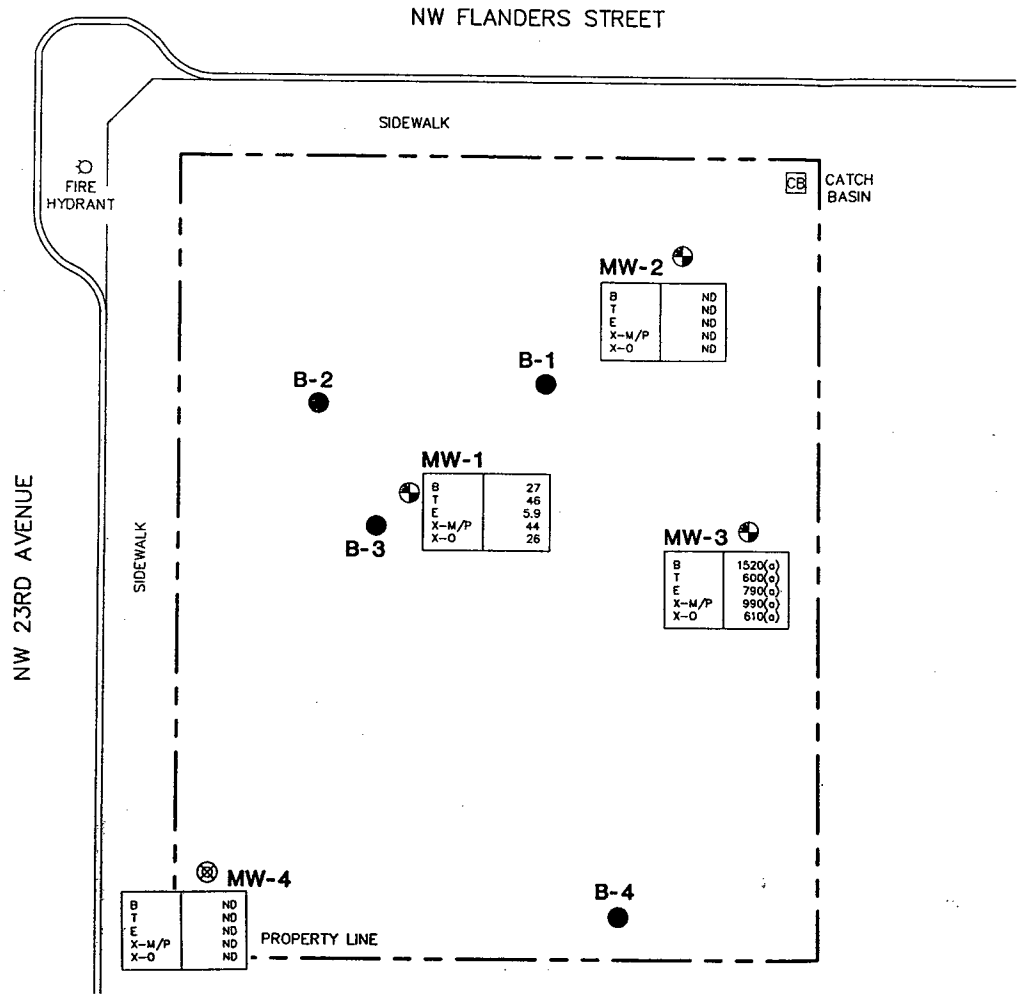
AGRA Earth & Environmental
7477 SW Tech Center Drive
Portland Oregon 97223-8025

W.O.	21-07423-00
DESIGN	LCF
DRAWN	JMR
DATE	OCT 1994
SCALE	1"=20'

ROSE'S PARKING LOT
330 NW 23RD AVENUE
PORTLAND, OREGON

GROUNDWATER GRADIENT MAP
FOR OCTOBER 04, 1994

AGRA EARTH & ENVIRONMENTAL, INC. DRAWING NO. \21\07423\GW-1094.DWG



LEGEND

MW-3 — MONITORING WELL NUMBER AND LOCATION (INSTALLED BY RZA)

B-4 — SOIL BORING NUMBER AND LOCATION (INSTALLED HY HAI, JAN. 1994)

GROUNDWATER ANALYTICAL TEST RESULTS
10 OCTOBER 1994

CONCENTRATIONS IN PARTS PER BILLION (PPB)

B	BENZENE
T	TOLUENE
E	ETHYLBENZENE
X-M/P	M/P XYLENE
X-O	O-XYLENE

B	PPB
T	PPB
E	PPB
X-M/P	PPB
X-O	PPB

CONCENTRATIONS IN PPB

COMPOUNDS

0 20 40

SCALE IN FEET

FIGURE 5

AGRA
Earth & Environmental
7477 SW Tech Center Drive
Portland, Oregon 97223-8025

W.O.	21-07423-00
DESIGN	LCF
DRAWN	MJF
DATE	OCT 1994
SCALE	1"=20'

ROSE'S PARKING LOT
330 NW 23RD AVENUE
PORTLAND, OREGON

GROUNDWATER ANALYTICAL TEST RESULTS FOR 10 OCTOBER 1994

DRAWING NO. \21\07423\BTX-1094.DWG

APPENDIX A

Building Permit Inspection Reports

Plumbing Inspection Reports

FORM W-206
(5-63)

CITY OF PORTLAND, OREGON
BUREAU OF BUILDINGS

OX

Date 10-8-64

Permit No. 415783

REPORT OF BUILDING INSPECTION

330 NW 23rd Ave. Between Flanders and Everett Sts.
Lot 15,16 & N½ of 17 Block 3 in Meads Addition
Owner American Oil Co. * Address 7336 132nd NE Kirkland, Wn.
Contractor per above Address
1 Story, Type V-N, Group F-1, F.D. 2 Zone C 2 Cost $2000
Plan Examiner Worthington Structural Engineer

DATE	HOUR	DESCRIPTION OF ALTERATIONS AND REPAIRS
		Remodel exis. serv. stat. per plans; incombustible flexible conn. to be used on furn.; filed w/ 415782.
12-4-64	11:25	Call. cd to pour Canopy footings & PEJ.
12-24-64	10:15	Call. cd to pour light pole Bases PEJ
1-5-65	2:10	Call-cd to pour pump Island & 2 Slab PEJ
1-7-65	4:00	Calls cd to pour tire rack base & slab PEJ
4-21-66		Plbg. & Final OK. Final

FORM W-68
2-1-52

CITY OF PORTLAND, OREGON
BUREAU OF BUILDINGS

QA 8257

Date 11-30-53

Permit No. 339588

REPORT OF BUILDING INSPECTION

330 NW. 23rd ave. Between Flanders and Everett
Lot 15-16-½ 17 Block 3 in Meads Addition
Owner GEO. LAWRENCE ST. Address 711 S.W. Alder
Contractor C.M. EMEIS AND CO. Address 2519 N. Miss. ave.
1 Story, Class vii, Grade 2.c. ser.sta. Zone 3 Cost $20,000.

DATE	HOUR	REMARKS
		Plans attached. RGR. 11-24-53
12-7-53	2:25	REMOVING HOUSES BEFORE BUILDING SERVICE STATION Rmmf
1-12-54	10:15	CALL - CD TO POUR FDN. Rmmf
2-3-54	11:55	FDN IN, POURING APRONS Rmmf
3-9-54	1:35	STEEL BLDG GOING UP Rmmf
3-19-54		POURING DRIVE SLAB. NO INSP 1-3-5 MIX. STOPPED POURING. SERVICE AREA IN STATION POURED, NO INSP, LEFT INST. Rmmf

over

Form W-8½A

BUREAU OF BUILDINGS 228-7 5-23-19

REPORT OF PLUMBING INSPECTION ✓ Flanders

Street and No. 752 Flanders St. Permit No. 10140

Owner Geo. Lawrance

Contractor H. Woodhouse Wrecked-

Block Addition 1-15-54

Stories and class of building 2 story frame res. Galv.

Water Closets 2 Sinks Urinals

Bath Tubs Laundry Tubs Slop Sinks

Basins 1 Floor Drains 1 Connected to sewer

Rain Drains Connected to

Kind of Vents Galv. Kind of Drains 1-15-54

No. and Size of Stacks Total No. Fixtures

Other Plumbing Fixtures Con. to C.I. Sewer in Basement

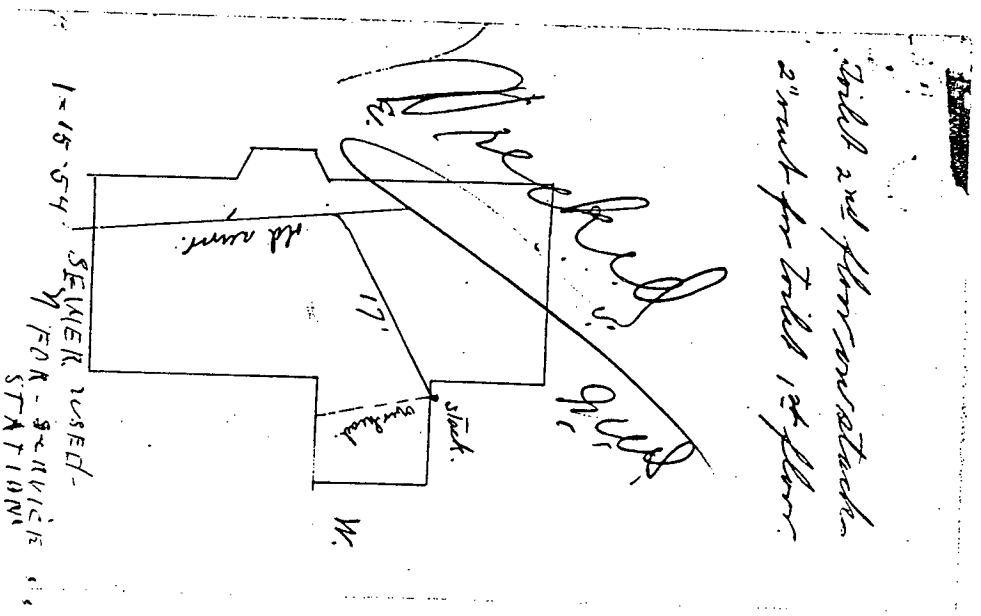
Water Permits 5/23/19-26129

Date of First Inspection May 27, 1919 Date of Final Inspection June 18, 1919

May Inspector. Whitstadt Inspector.

Date of First Certificate Date of Final Certificate

SEE OTHER SIDE FOR REMARKS



FORM W-89a
(5-2-52)

BUREAU OF BUILDINGS
REPORT OF PLUMBING INSPECTION

Date 1/12/54

Address 330 N. W. 23rd Avenue Permit 44577

Lot 15,16,pt17 Blk 3 Add Mead

Owner Geo. Laurence Estate

Contractor Gaittens Plbg & Htg Service

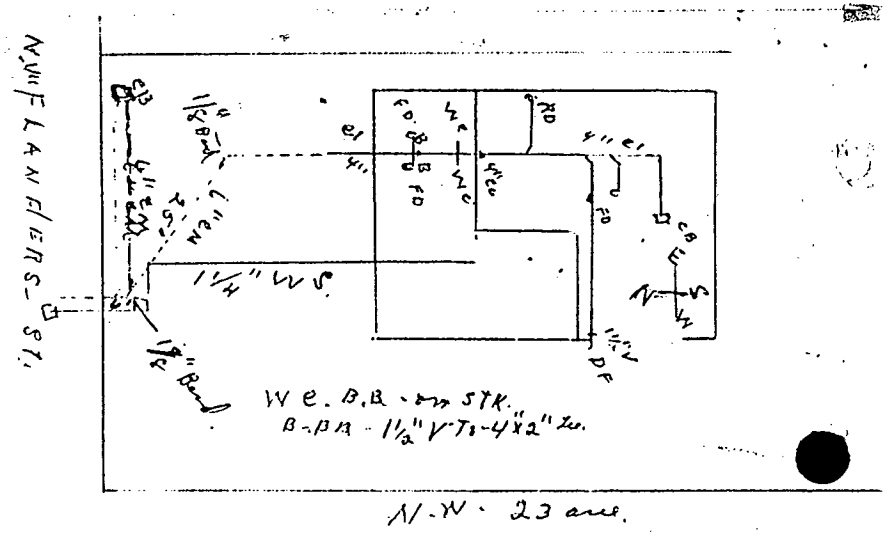
Stories and class of building 1-story new service station

Toilets 2	Floor Drains 3	Beer Cab.	
Bath Tubs	Rain Drains 1	Refr. Drains	
Bath Showers	Fountains Drkg 1	Urinals	
Basins 2	H. W. Tanks 1	Catch Basins	
Sinks	Cesspool	Water Service 1	
Laundry Trays	Dry Wells	Conn. To Sewer	
Water Permit 210790	Bldg. Pmt. 339588	Sewer Permit 67023	

Remarks

Date of First Inspection 2-1-54 Date of Final Inspection 5-28-54

GAB Inspector GAB Inspector



FORM W-89
(3-56)

BUREAU OF BUILDINGS
REPORT OF PLUMBING INSPECTION

Date 12/4/64

Address 330 N. W. 23rd Avenue Permit 131204

Lot Blk Add

Owner American Oil Company

Contractor Avery Plumbing & Heating Co.

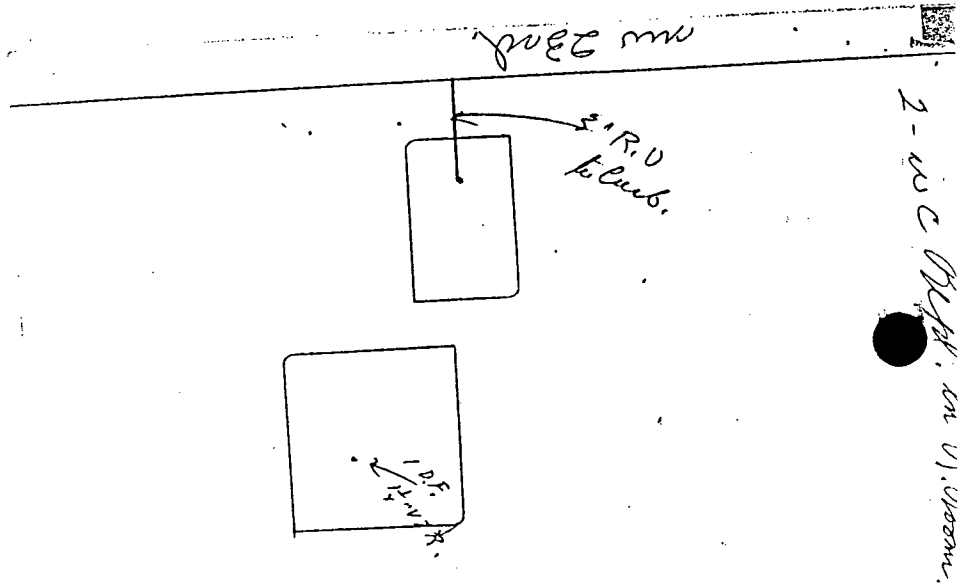
Stories and class of building Old 1 Story Service Station

Toilets 2 Repl	Floor Drains	Beer Cab.	
Bath Tubs	Rain Drains 1 New	Refr. Drains	
Bath Showers	Fountains 1 Move	Urinals	
Basins	H. W. Tanks 1 Repl	Catch Basins	
Sinks	Cesspool	Water Service	
Laundry Trays	Dry Wells	Conn. To	
Water Permit	Bldg. Pmt.	Sewer Permit	

Remarks

Date of First Inspection 12-10-64 Date of Final Inspection 5-1-65

Phillips Inspector Phillips Inspector



APPENDIX B

Geopotential Report

GeoPotential

ENVIRONMENTAL & EXPLORATION GEOPHYSICS

437 N.E. LIBERTY AVE. GRESHAM, OR 97030 • PH (503) 665-7520 • FAX (503) 492-4404

RESULTS

SUBSURFACE LOCATING SURVEY FOR UNDERGROUND STORAGE TANKS AND UTILITIES

AT

ROSEWOOD PARKING LOT
PORTLAND, OREGON

PERFORMED FOR

RZA AGRA, INC.
7477 SW TECH CENTER DRIVE
PORTLAND, OREGON 97223

PERFORMED BY

GEOPOTENTIAL
437 NE LIBERTY AVENUE
GRESHAM, OREGON 97030

SEPTEMBER 21, 1994

INTRODUCTION

GeoPotential performed a subsurface locating survey for RZA AGRA, INC., Portland, Oregon.

TIMING

Field work was performed on September 19, 1994. Report and site diagram completed and mailed to RZA AGRA on September 21, 1994.

PURPOSE

The subsurface locating survey was designed to locate any underground storage tanks (USTs) and underground utilities located within the site.

SURVEY SITE

The Survey site consisted of the Rosewood parking lot located on the Southeast corner of the intersections of NW Flanders Street and NW 23rd Avenue in Portland, Oregon (see accompanying site diagram.). The site is currently covered with asphalt. Historical records indicated USTs may occur under the asphalt. The site is approximately 15,000 square feet in area.

SURVEY SPECIFICATIONS

Four geophysical instruments were used for the survey:

1. AQUA-TRONICS A-6 ELECTROMAGNETIC TRACER (EM SURVEY).
2. AQUA-TRONICS AT-9 POWER PUP (EM SURVEY).
3. SCHONSTEDT GA-52B MAGNETIC GRADIOMETER (MAG SURVEY).
4. GEOPHYSICAL SURVEY SYSTEMS SIR-3 GROUND PENETRATING RADAR (GPR SURVEY).

Both EM and MAG surveys can detect USTs and conductive utilities. Continuous readings on detailed traverses were made across the site measuring both magnetic and electromagnetic fields. In areas of suspected USTs, more detailed traverses were performed. Profiles AA′ through GG′ were selected for detailed EM and GPR analysis.
The AT-9 was used to locate underground power cables.

Northwest Geophysical Associates, Inc. performed GPR data acquisition along profiles AA′ through GG′ with a 500 MHz antenna.

GeoPotential acquired EM and MAG data and performed the integrated interpretation of the data as presented in this report.

RESULTS

The results are shown on the accompanying site diagram and are posted on EM and GPR profiles AA′ through GG′. The following symbols were used on the site diagram and profiles:

UST - Underground Storage Tank.
ANOM I & II - Zones of anomalous EM/GPR readings.
U - Underground utilities of unknown function.
W - Underground water line.
P - Underground power cable.
A ..... A′ - Location of EM and GPR profiles.

The UST along profile AA′ is approximately 5 feet in diameter and 7 feet long with a 1,000 gallon capacity. The top of the UST is about 2.5 feet below the surface. The MAG, EM and GPR all clearly demonstrate the UST.

Anom I is a reinforced (wire mesh or rebar) concrete slab which produces large EM, MAG and GPR anomalies. The slab sits about 6 inches below the top of the asphalt. The mesh and rebar effectively "mask" the geophysical responses from deeper objects such as USTs which may occur beneath the slab. However the GPR along profile GG′ and BB′ suggests a UST may occur at a depth of 2 to 3 feet and we recommend that a subsurface investigation be carried out in the vicinity of the intersection of these two profiles to test for the existence of a UST.

ANOM II is another reinforced concrete slab which is highly fractured. There is no evidence of a UST under this slab.

P, W, and U are subsurface utilities consisting of a power cable, water line and three utilities of unknown function.

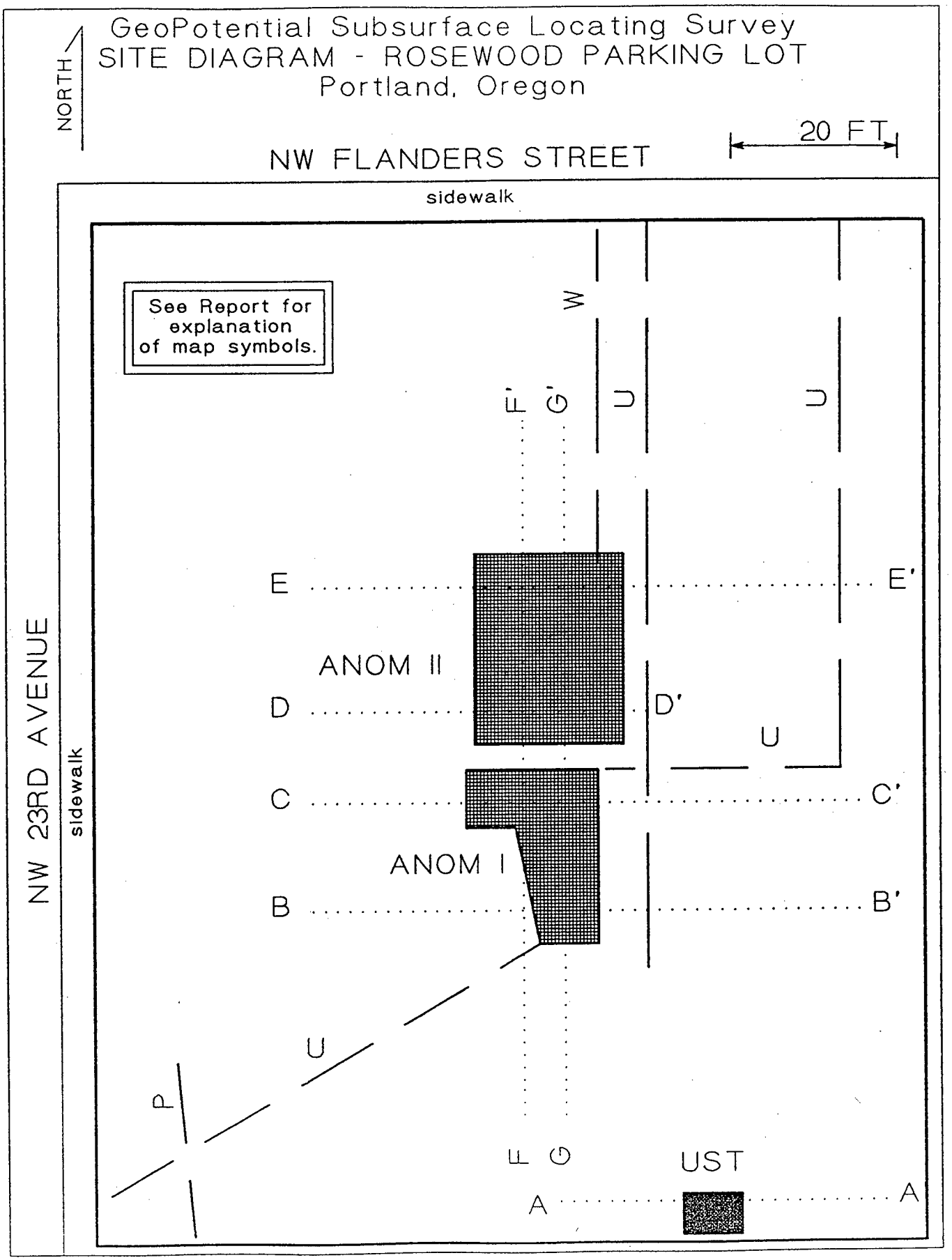
LIMITATIONS

Geophysical surveys consist of interpreting geophysical responses from subsurface objects. Since a variety of subsurface objects can produce identical geophysical responses it is necessary to perform intrusive investigations (drilling or excavating) to confirm the geophysical interpretation. In addition many subsurface objects may produce no geophysical response. The use of this geophysical interpretation is the sole responsibility of the client.

Ralph Soule

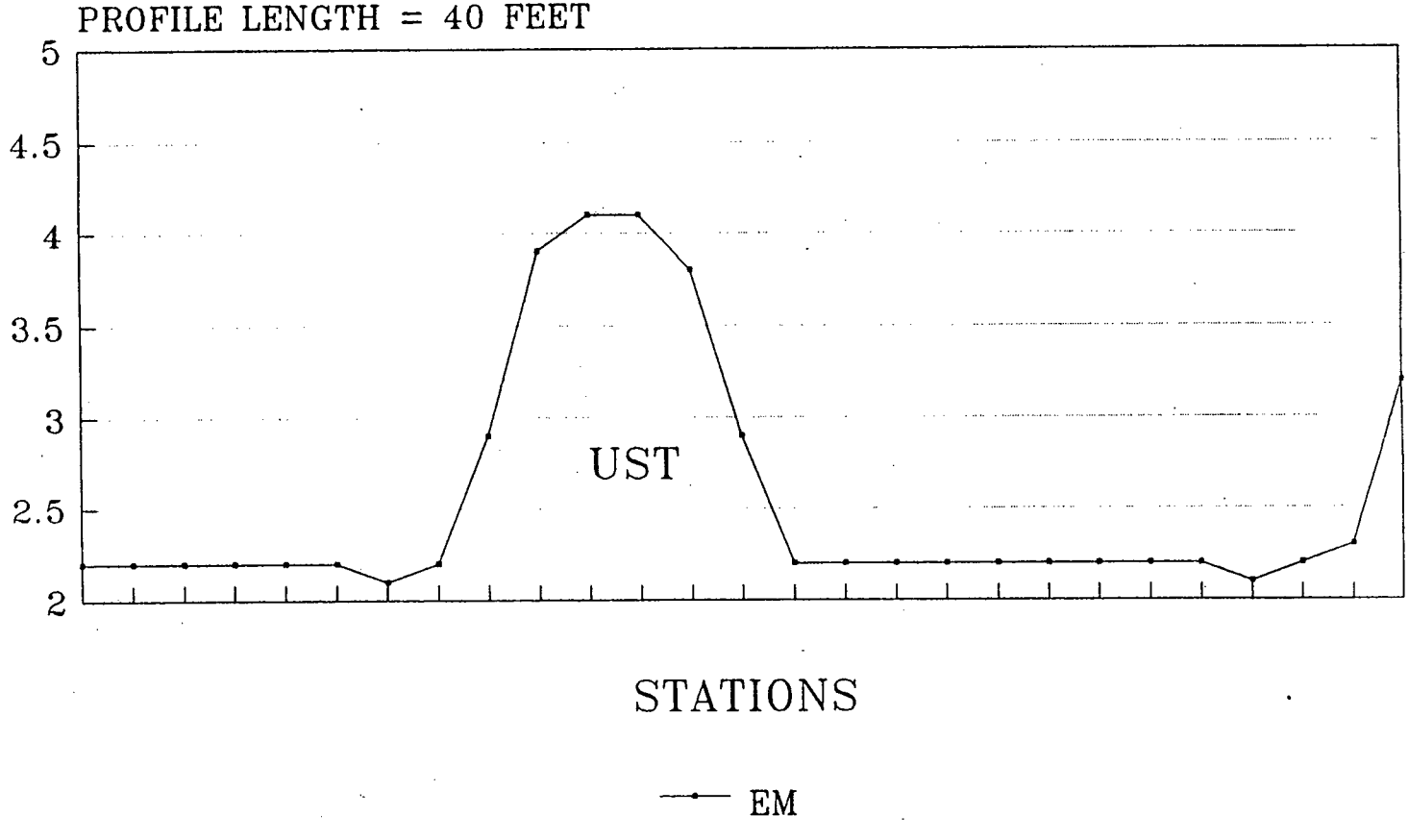
Ralph Soule
GeoPotential

September 21, 1994


GeoPotential Subsurface Locating Survey
SITE DIAGRAM - ROSEWOOD PARKING LOT
Portland, Oregon
NORTH
20 FT
NW FLANDERS STREET
sidewalk
See Report for explanation of map symbols.
W
F
G
U
U
E
E'
ANOM II
D
D'
U
C
C'
ANOM I
B
B'
NW 23RD AVENUE
sidewalk
U
P
F
G
UST
A
A'

GeoPotential

EM Profile AA'

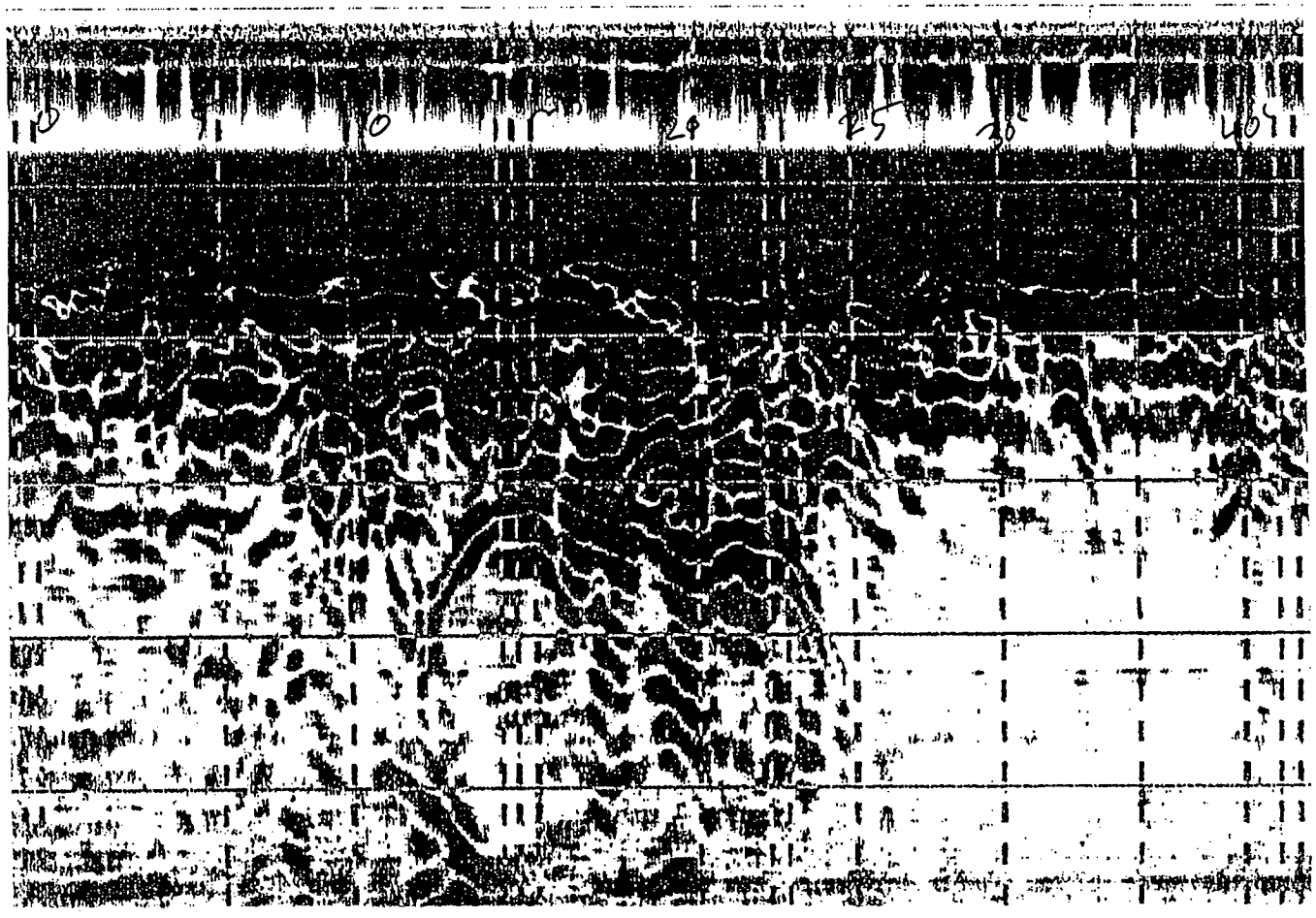


ROSEWOOD PARKING LOT

GeoPotential Subsurface Locating Survey
GPR RECORDS - ROSEWOOD PARKING LOT
Portland, Oregon
September 19, 1994

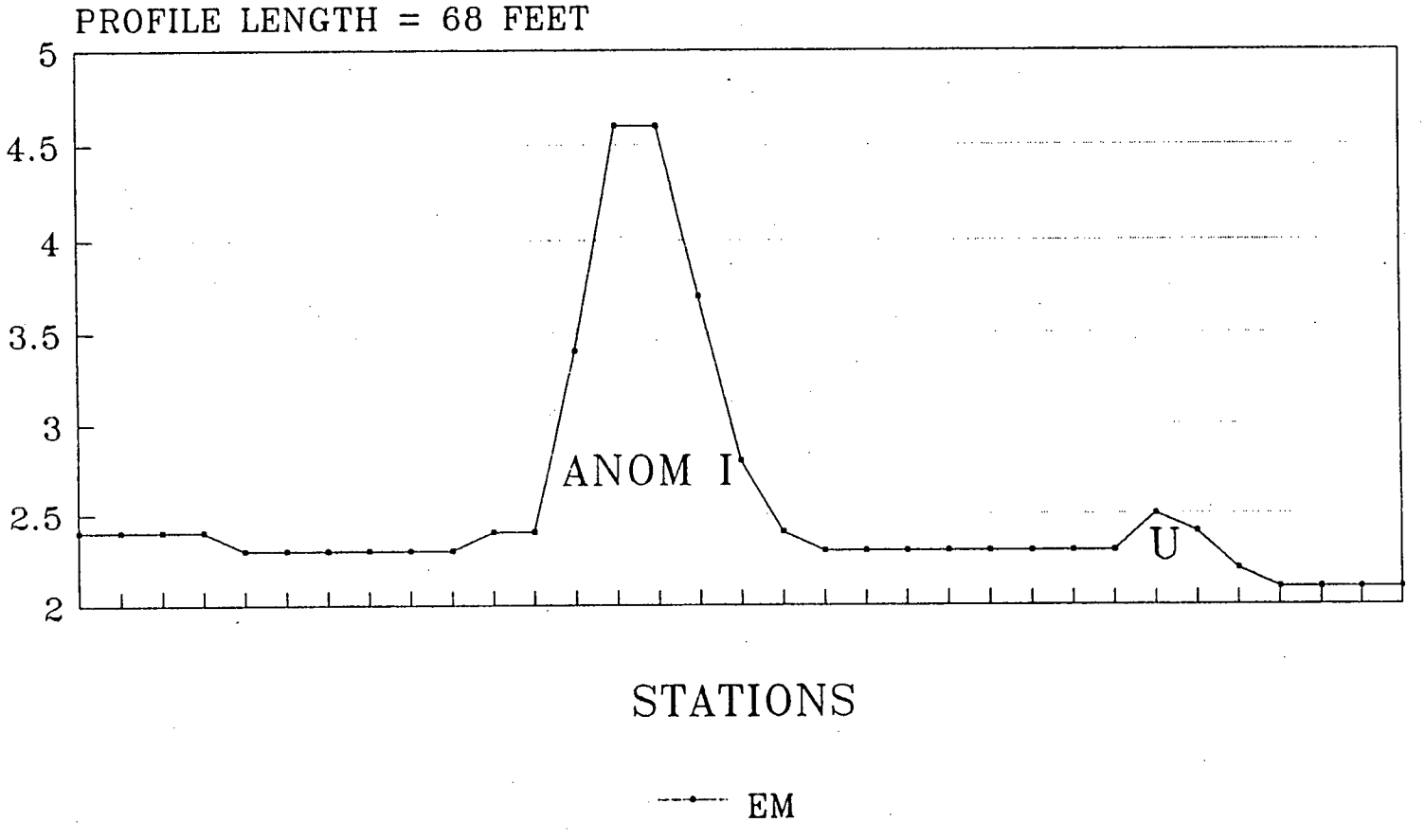
GPR PROFILE AA'
LENGTH = 40 FEET VERTICAL SCALE = 1 FOOT PER SCALE DIVISION
ANTENNA SIZE = 500 MHZ

A UST A'



GeoPotential

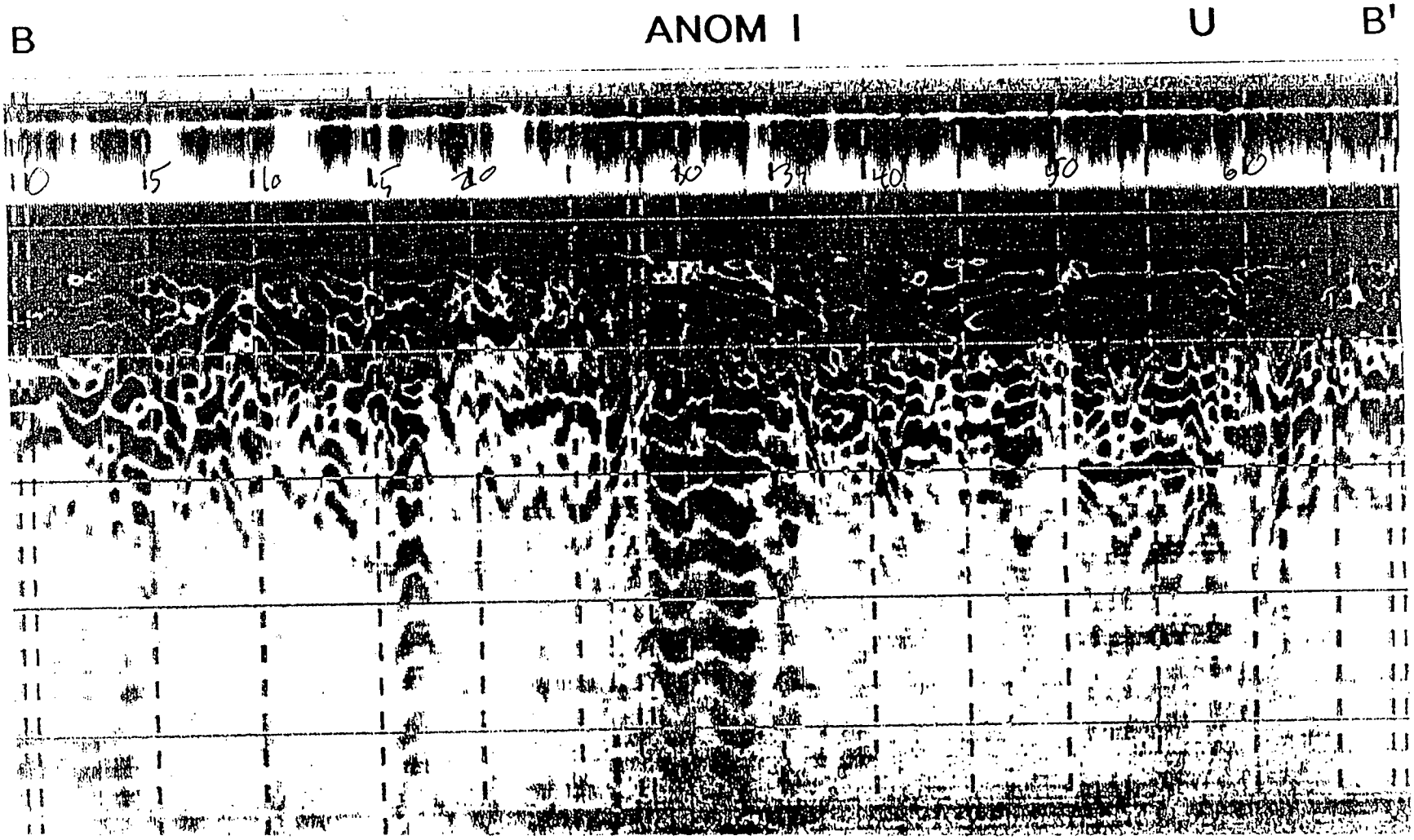
EM Profile BB'



ROSEWOOD PARKING LOT

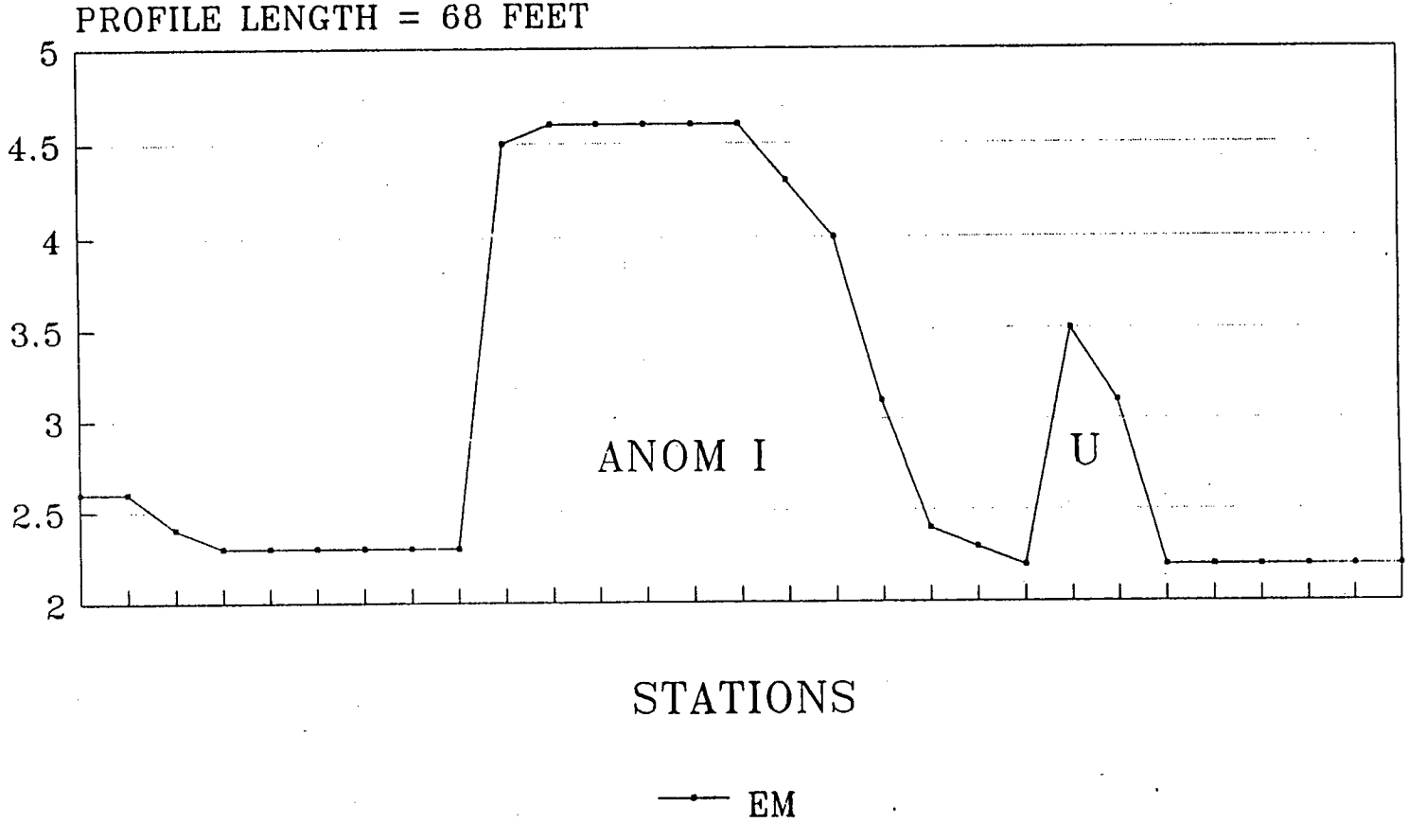
GeoPotential Subsurface Locating Survey
GPR RECORDS - ROSEWOOD PARKING LOT
Portland, Oregon
September 19, 1994

GPR PROFILE BB'
LENGTH = 68 FEET VERTICAL SCALE = 1 FOOT PER SCALE DIVISION
ANTENNA SIZE = 500 MHZ



GeoPotential

EM Profile CC'

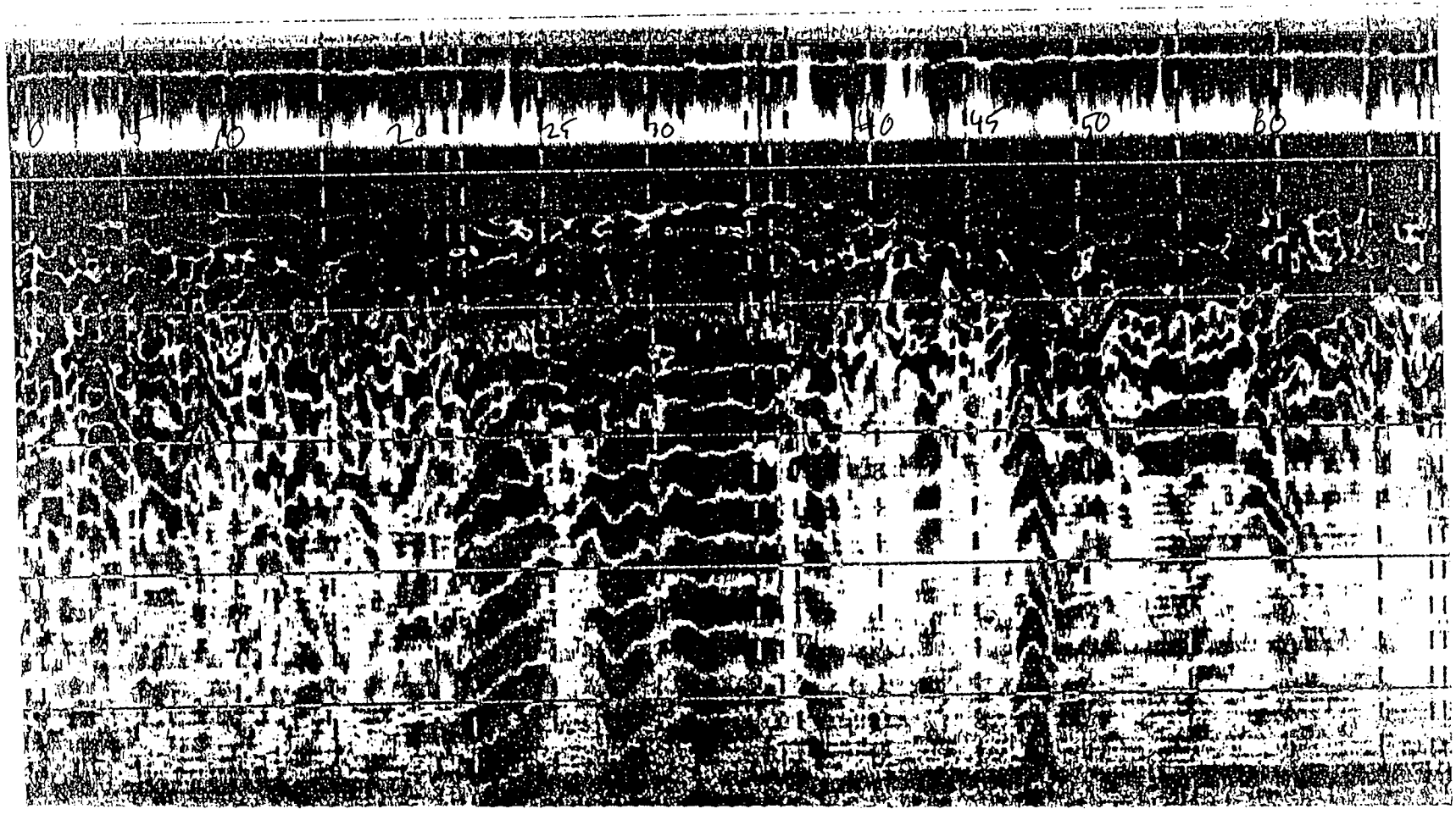


ROSEWOOD PARKING LOT

GeoPotential Subsurface Locating Survey
GPR RECORDS - ROSEWOOD PARKING LOT
Portland, Oregon
September 19, 1994

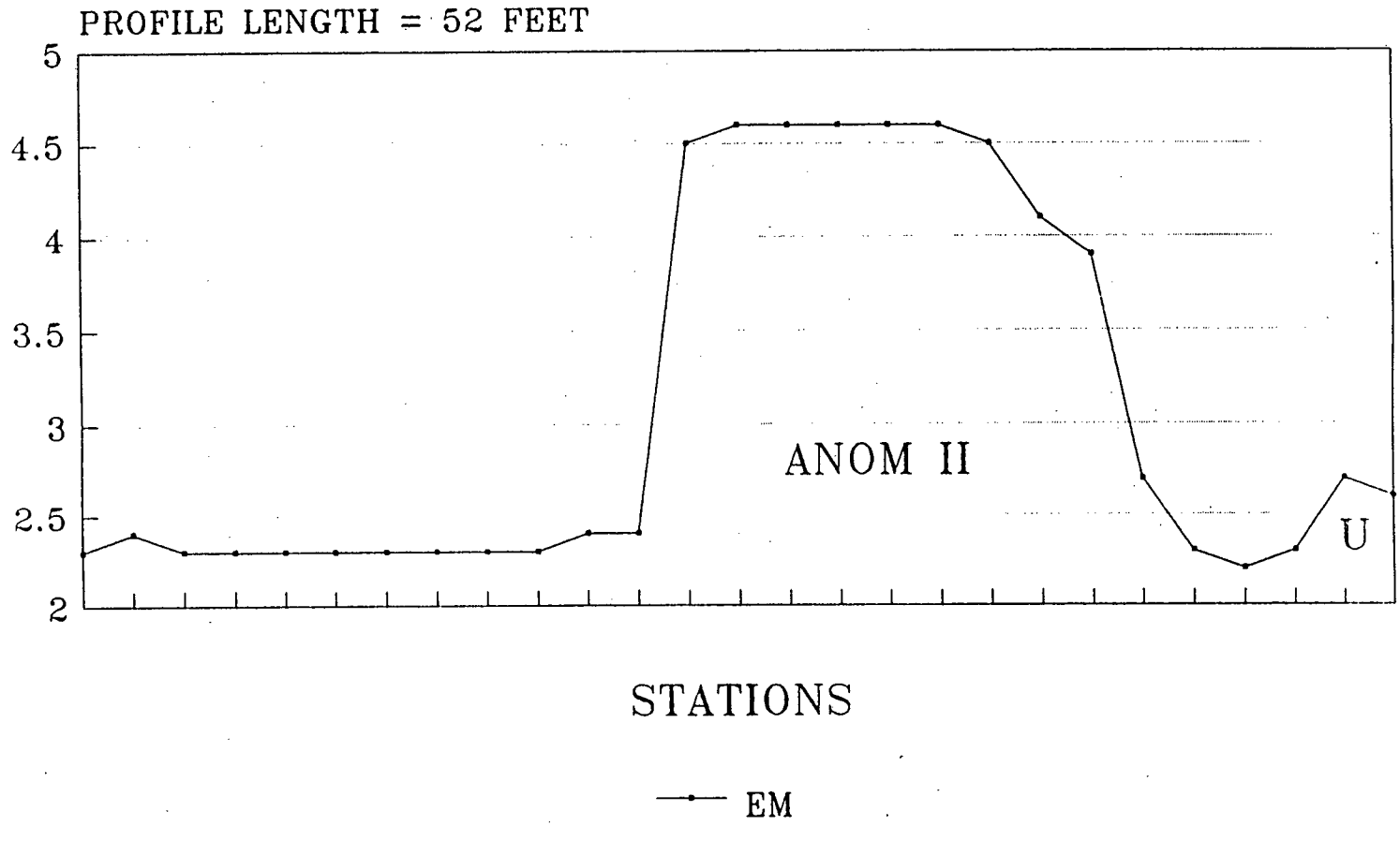
GPR PROFILE CC'
LENGTH = 68 FEET VERTICAL SCALE = 1 FOOT PER SCALE DIVISION
ANTENNA SIZE = 500 MHZ

C ANOM I U C'



GeoPotential

EM Profile DD'

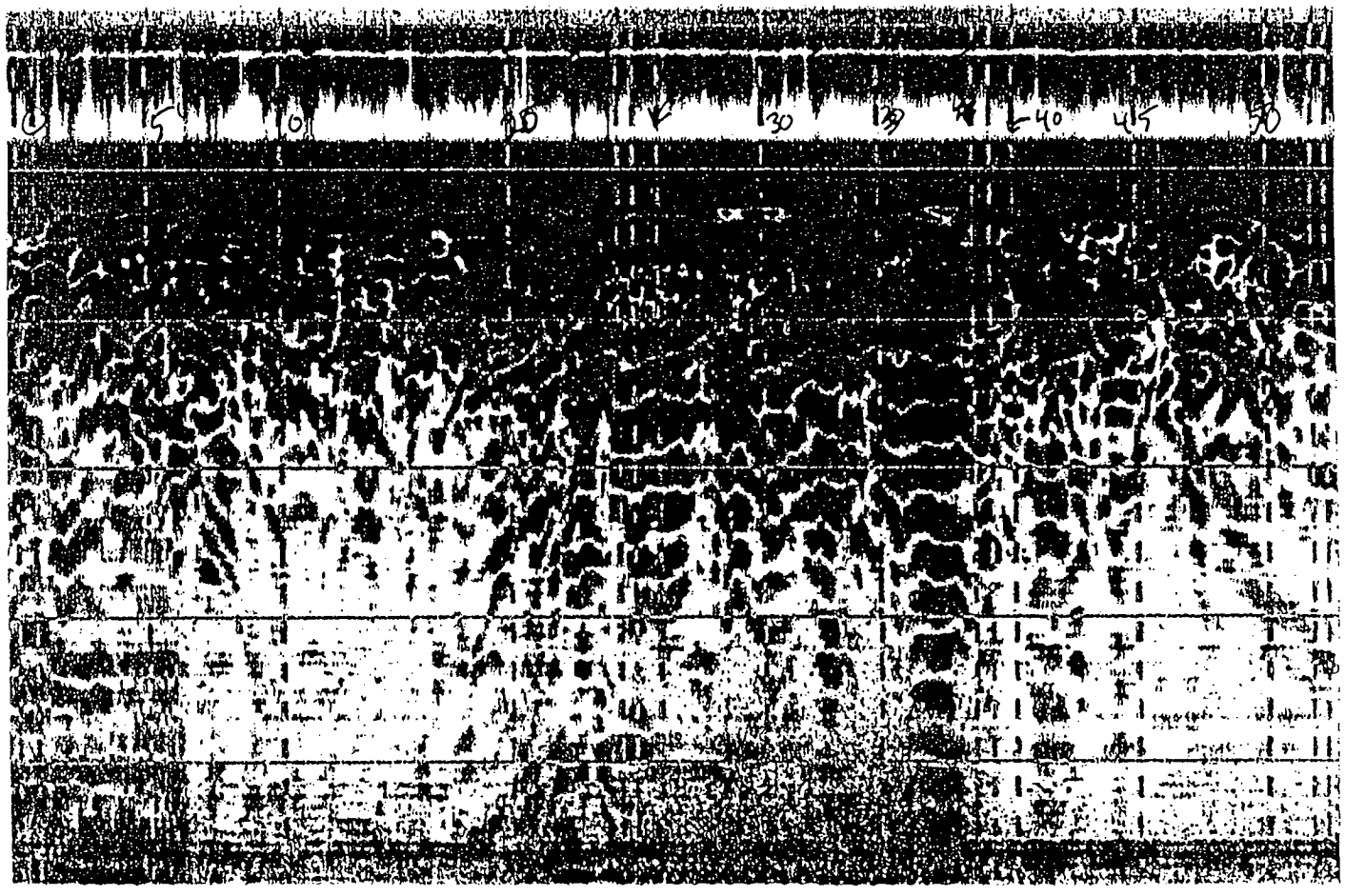


ROSEWOOD PARKING LOT

GeoPotential Subsurface Locating Survey
GPR RECORDS - ROSEWOOD PARKING LOT
Portland, Oregon
September 19, 1994

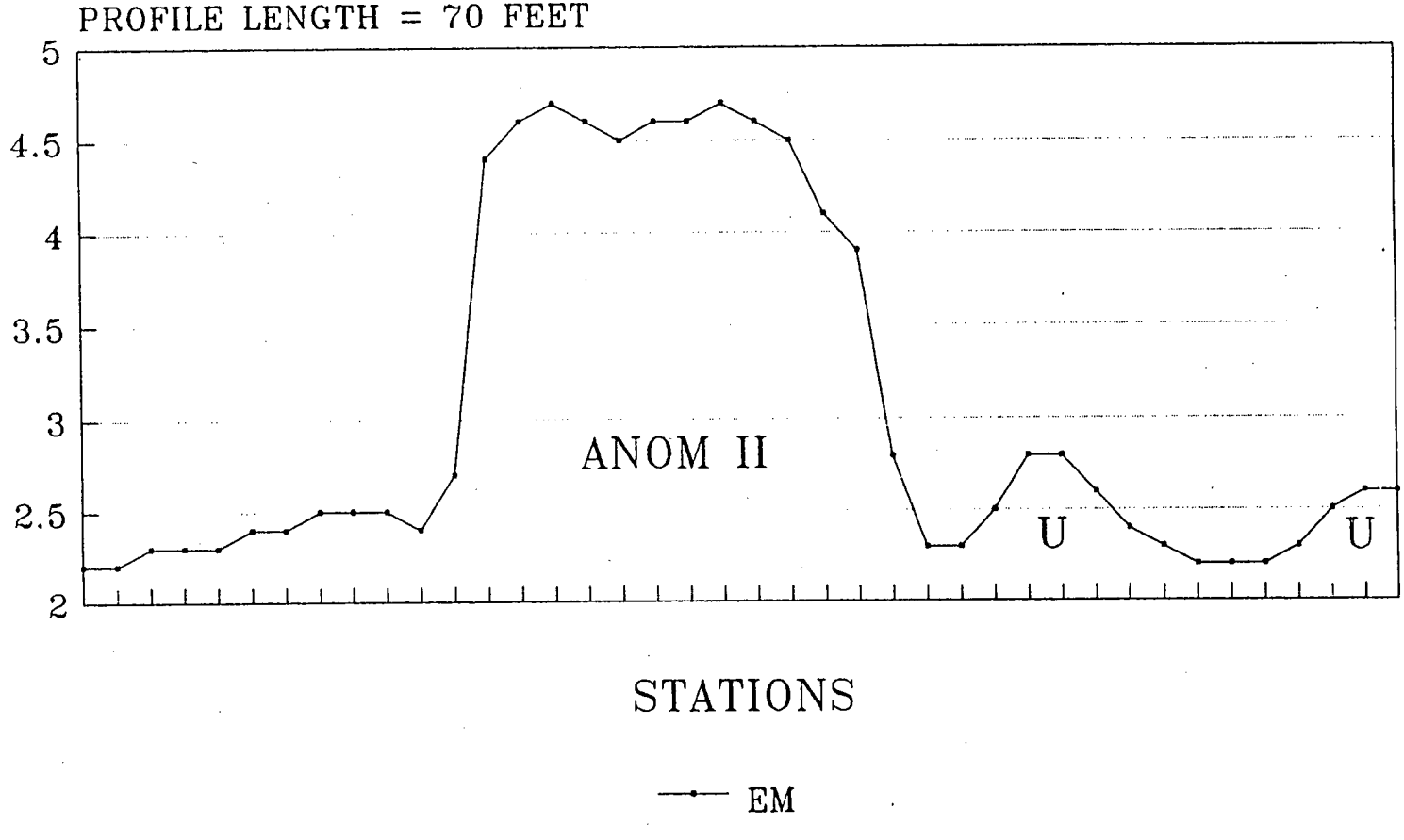
GPR PROFILE DD'
LENGTH = 42 FEET VERTICAL SCALE = 1 FOOT PER SCALE DIVISION
ANTENNA SIZE = 500 MHZ

D ANOM II D'



GeoPotential

EM Profile EE'

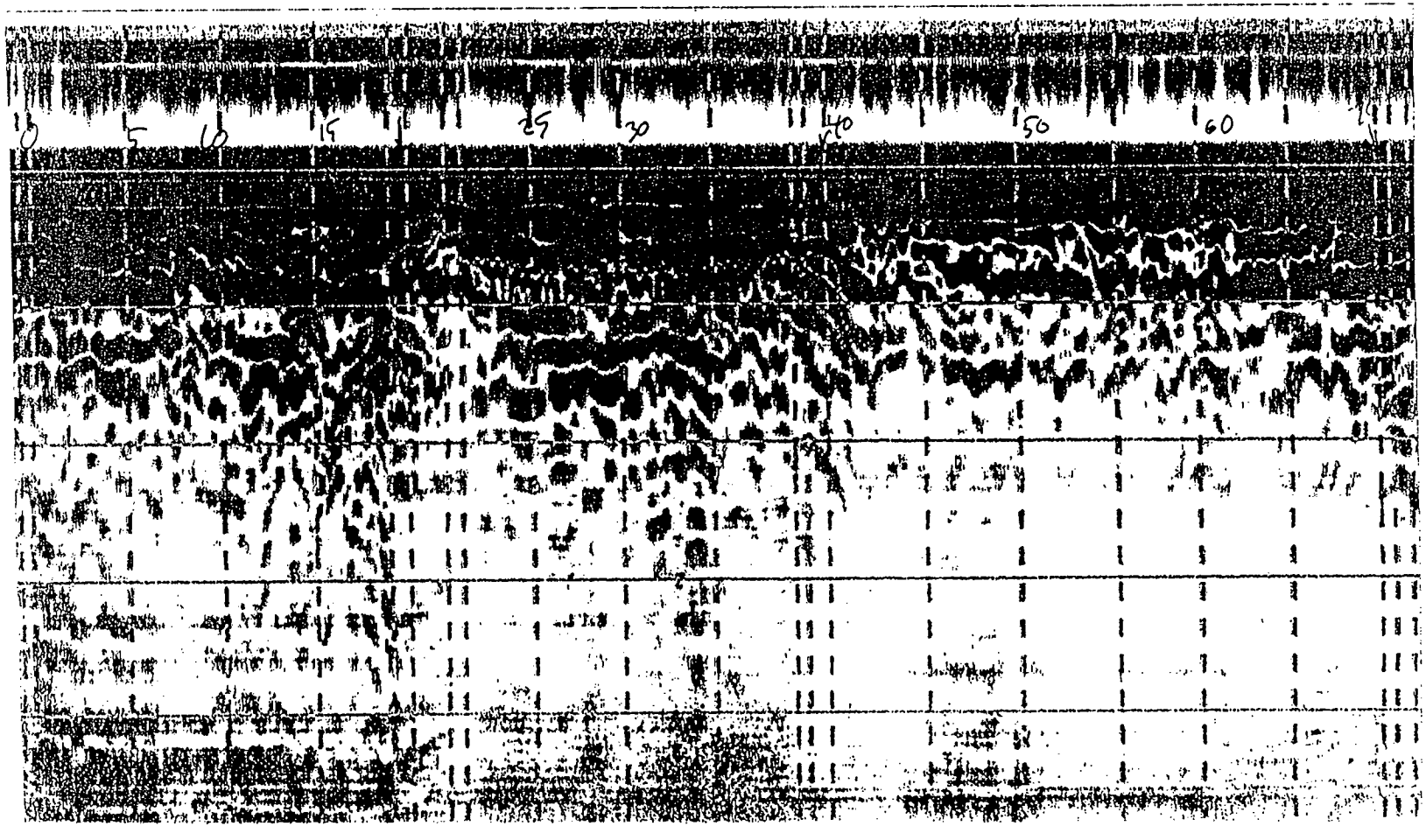


ROSEWOOD PARKING LOT

GeoPotential Subsurface Locating Survey
GPR RECORDS - ROSEWOOD PARKING LOT
Portland, Oregon
September 19, 1994

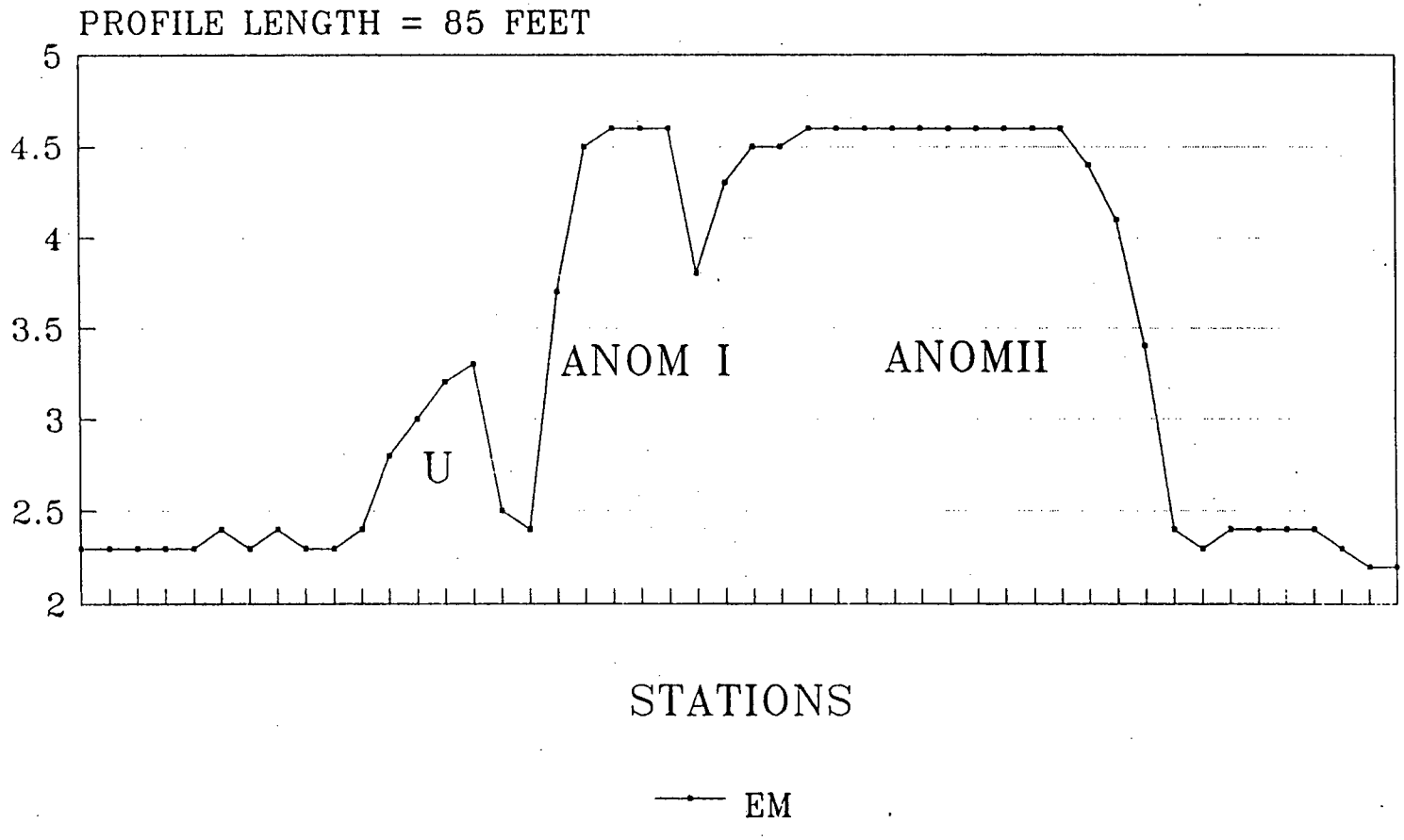
GPR PROFILE EE'
LENGTH = 70 FEET VERTICAL SCALE = 1 FOOT PER SCALE DIVISION
ANTENNA SIZE = 500 MHZ

E ANOM II E'



GeoPotential

EM Profile FF'

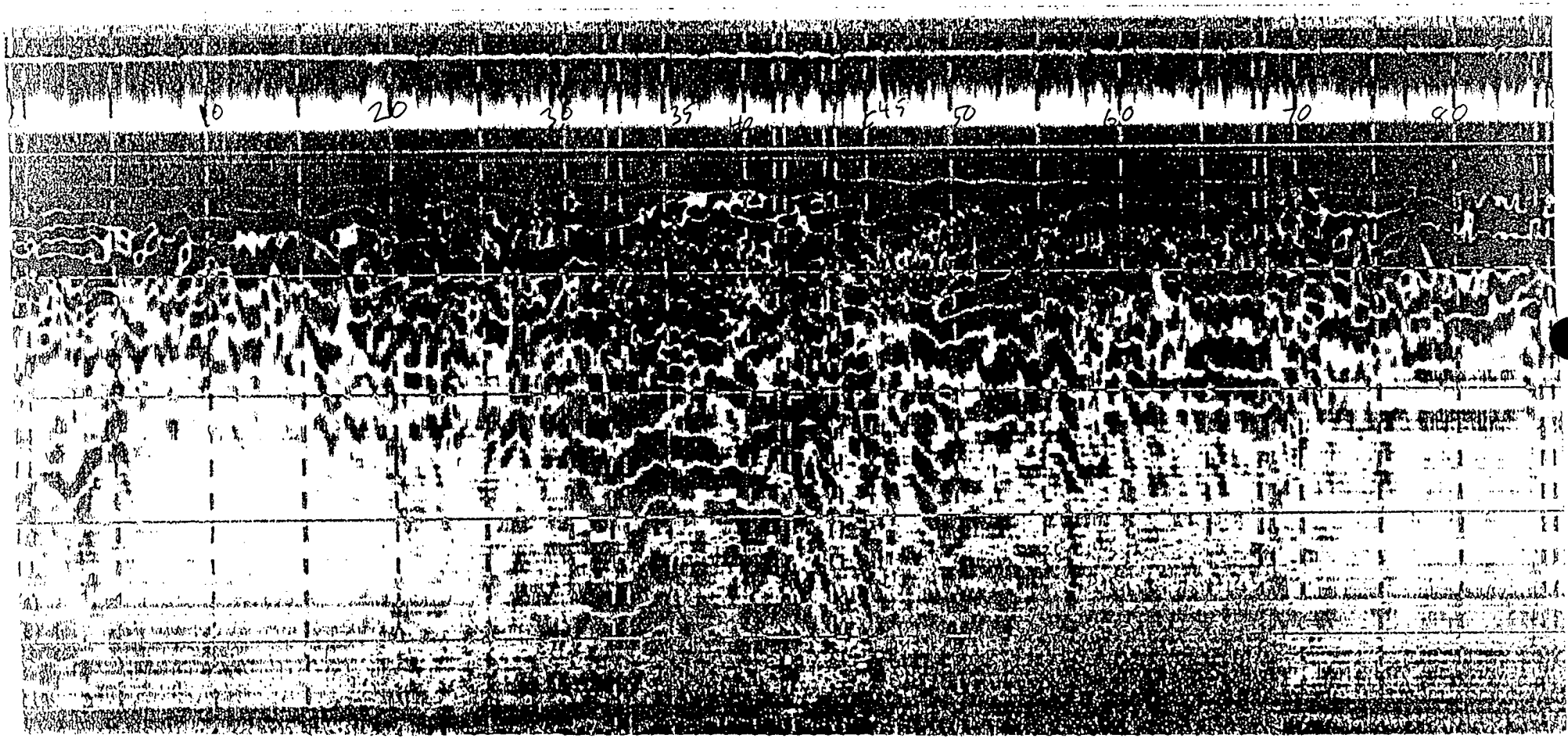


ROSEWOOD PARKING LOT

GeoPotential Subsurface Locating Survey
GPR RECORDS - ROSEWOOD PARKING LOT
Portland, Oregon
September 19, 1994

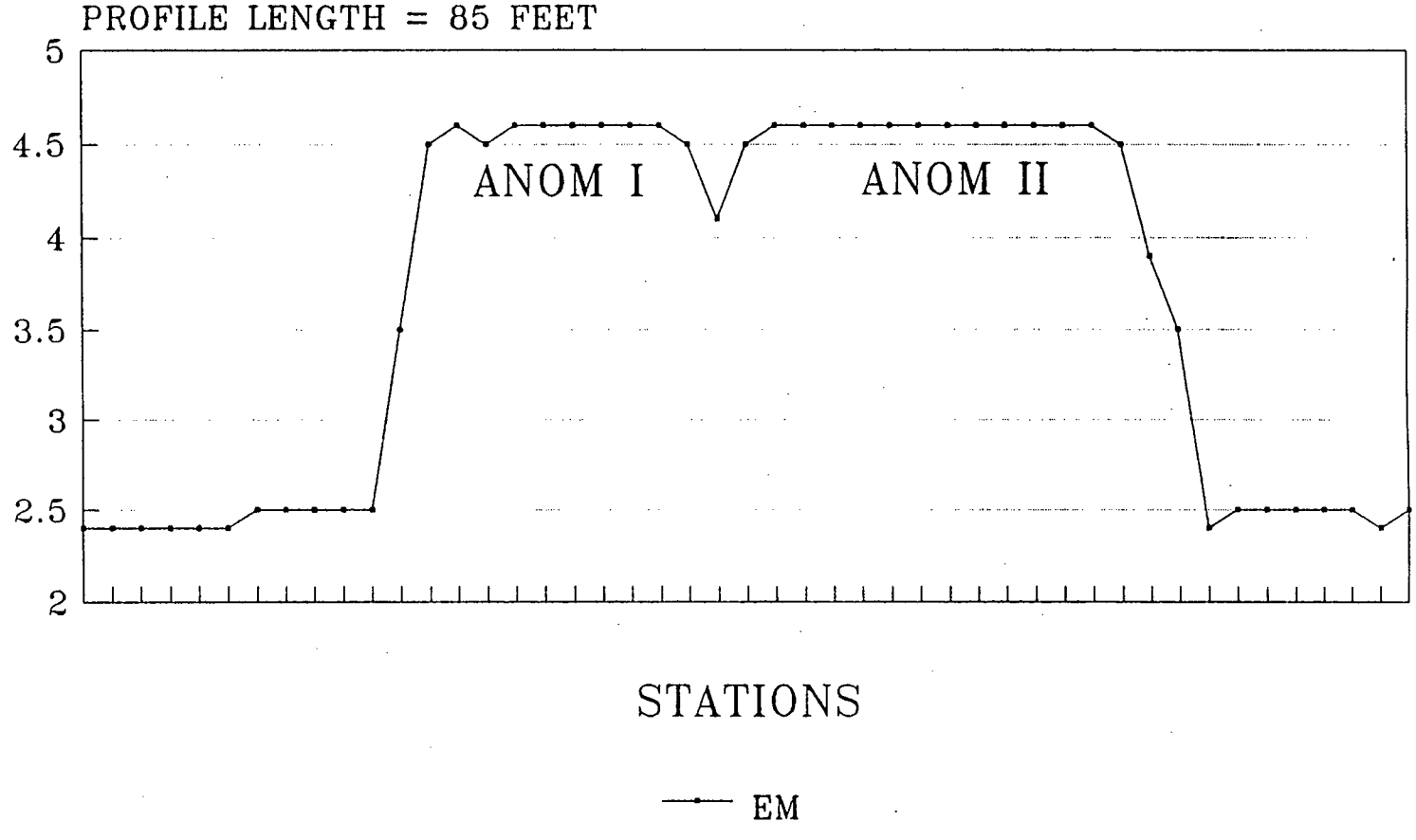
GPR PROFILE FF'
LENGTH = 85 FEET VERTICAL SCALE = 1 FOOT PER SCALE DIVISION
ANTENNA SIZE = 500 MHZ

F U ANOM I ANOM II F'



GeoPotential

EM Profile GG'

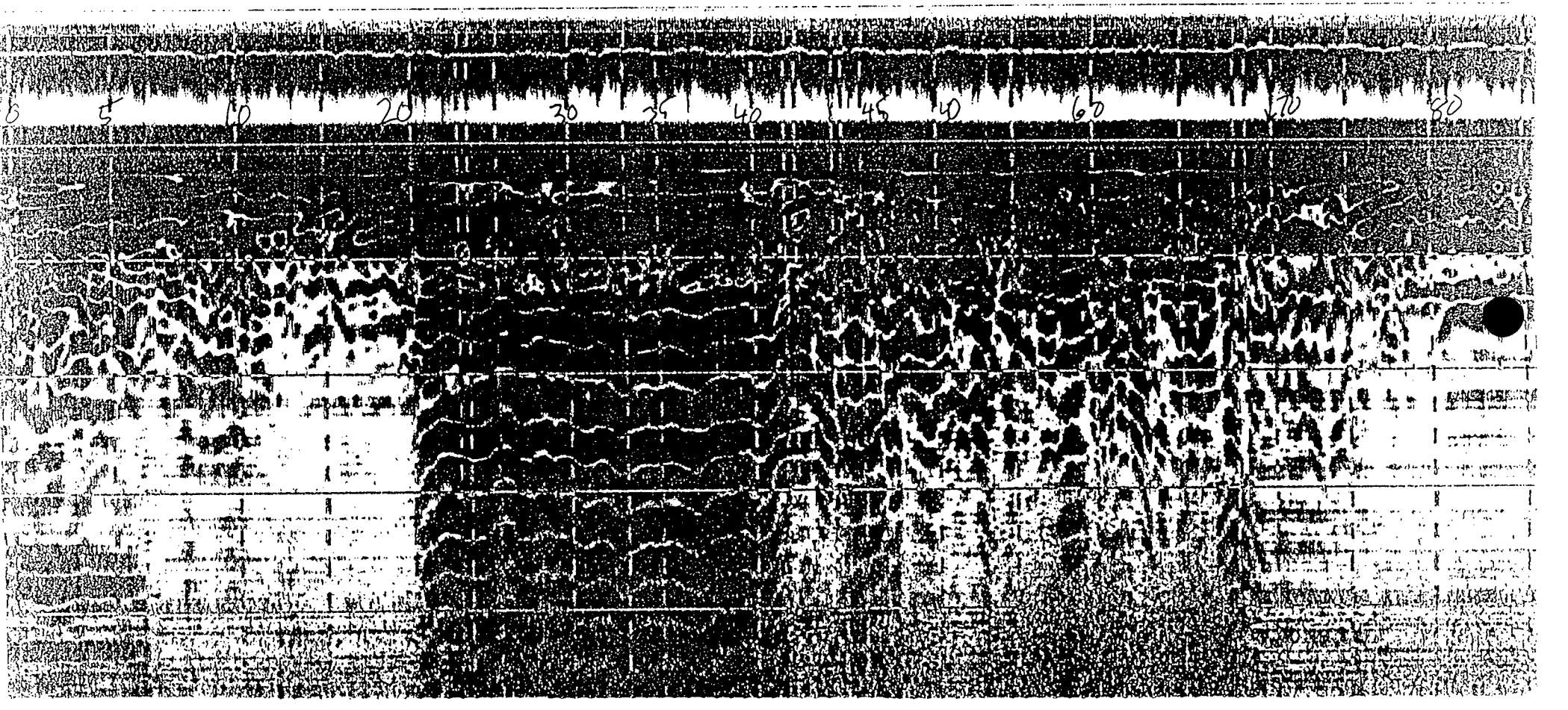


ROSEWOOD PARKING LOT

GeoPotential Subsurface Locating Survey
GPR RECORDS - ROSEWOOD PARKING LOT
Portland, Oregon
September 19, 1994

GPR PROFILE GG'
LENGTH = 85 FEET VERTICAL SCALE = 1 FOOT PER SCALE DIVISION
ANTENNA SIZE = 500 MHZ

G ANOM I ANOM II G



APPENDIX C

Water Table Measurements and Survey Data

Summary of Soil Sample Analytical Data

Summary of Groundwater Sample Analytical Data

WATER TABLE MEASUREMENTS AND SURVEY DATA
ROSE'S PARKING LOT
AGRA Job #21-07423-01

Monitoring Well #	Depth to Water Top of Casing	Relative Groundwater Elevation	Relative Well/Datum Elevation	Date
Hydrant	-	-	100.00	3/25/94
MW-1	26.35	73.07	99.42	3/29/94
	27.29	72.13	99.42	9/13/94
	27.21	72.21	99.42	10/4/94
MW-2	23.59	72.28	95.87	3/29/94
	24.67	71.20	95.87	9/13/94
	24.56	71.31	95.87	10/4/94
MW-3	26.14	72.75	98.89	3/29/94
	27.48	71.41	98.89	9/13/94
	27.40	71.49	98.89	10/4/94
MW-4	26.31	73.61	99.92	10/4/94

All units are in feet.

SOIL ANALYTICAL SUMMARY (mg/kg)

ROSE'S PARKING LOT

AGRA Job #21-07423-01

Date	Sample/Boring ID	Depth	Benzene	Toluene	Ethyl-benzene	Total Xylenes	TPH-HCID			TPH-G	TPH-D	EPA 418.1	Flashpoint
							Gasoline	Diesel	Heavy Oil				
BORINGS (HAI)													
1/3/94	B-1	13 ft	-	-	-	-	-	-	-	99	-	-	-
	B-1	18 ft	-	-	-	-	POS. ID	POS. ID	ND	3700	1100	-	-
	B-1	25.5 ft	-	-	-	-	<20	<50	ND	-	-	-	-
	B-2	10.5	-	-	-	-	<20	<50	ND	-	-	-	-
	B-3	10.5 ft	-	-	-	-	-	-	-	<5.0	-	-	-
	B-3	20.5 ft	-	-	-	-	-	-	-	260	-	-	-
	B-3	28 ft	-	-	-	-	<20	<50	ND	-	-	-	-
	B-4	10.5	-	-	-	-	<20	<50	ND	-	-	-	-
BORINGS (AGRA)													
3/23/94	MW-1	15 ft	0.09	0.34	1.1	8.1	-	-	-	290	-	-	-
	MW-1	25 ft	12.6	60.5	38.9	247.5	POS. ID	POS. ID (a)	<200	6550	-	-	88°F
	MW-2	15 ft	<0.05	0.07	0.12	0.33	-	-	-	85	-	-	-
	MW-2	25 ft	<0.05	<0.05	0.07	<0.05	-	-	-	-	-	-	-
	MW-3	20 ft	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-	-	-
9/28/94	B-5	5 ft	-	-	-	-	ND	ND	ND	-	-	-	-
	B-6	5 ft	-	-	-	-	ND	ND	ND	-	-	-	-
	B-7	5 ft	-	-	-	-	ND	ND	ND	-	-	-	-
	MW-4	5 ft	-	-	-	-	ND	POS. ID (b)	ND	-	-	52.2	-
	MW-4	20 ft	-	-	-	-	ND	ND	ND	-	-	-	-

(a) Peaks in the gasoline range extend into the diesel range.

(b) Peaks were present within the retention time window of the listed petroleum hydrocarbon, but the peak patterns indicate the presence of low level heavy oils extending into the diesel range.

GROUNDWATER ANALYTICAL SUMMARY (µg/l)

ROSE'S PARKING LOT

AGRA Job #21-07423-01

Date	Monitoring Well ID	Benzene	Toluene	Ethyl-benzene	Total Xylenes	EDB	EDC
MONITORING WELLS							
3/29/94	MW-1	130	390	98	1570	<1.00	<1.00
	MW-2	4.9	1.4	0.7	3.0	<1.00	<1.00
	MW-3	2300	1200	1200	3700	<1.00	<1.00
10/4/94	MW-1	27	46	5.9	70.0	-	-
	MW-2	<0.5	<0.5	<0.5	<0.5	-	-
	MW-3	1520	600	790	1600	-	-
	MW-4	<0.5	<0.5	<0.5	<0.5	-	-

APPENDIX D

Sampling Methods

Boring Logs

1.0 DRILLING METHODS AND SOIL SAMPLING PROCEDURES

1.1 STANDARD PENETRATION TEST SAMPLING

Subsurface soil sampling conducted by AGRA was accomplished through the use of a hollow-stem drilling rig and Standard Penetration Test (SPT) sampling, as described in ASTM D-1586. Blow counts collected during hammering of the sample in monitoring well boring MW-4 are provided on the boring log, Appendix C. This method of sampling allows soil samples to be collected ahead of the drilling apparatus, and any contaminants they may introduce.

After retrieving the split barrel sampler, it was opened on a clean surface. A representative portion of the soils within the sampler were transferred immediately to appropriate sample containers, and to an air-tight polyethylene bag. Care was to minimize disturbance and volatilization of the sample. Sample containers were labeled with the following information: 1) project name, 2) job number, 3) date, 4) time, 5) sample designation, and 6) initials of sampler. After labeling was completed, the containers were placed in a cooler which was used to preserve the samples, and to transport the samples to a laboratory. The sample which was placed in the polyethylene bag was used for field volatile screening and for descriptive purposes, in accordance with the procedures described in Section 2.0 and 3.0.

Between sampling events, the sampler was decontaminated using the following procedure. The sampler was first thoroughly washed in a non-phosphatic detergent and tap water solution, followed by a tap water rinse. The sampler was then triple-rinsed with deionized water.

1.2 FIELD VOLATILE (HEAD-SPACE) SCREENING

In order to measure levels of volatile organic compound vapors within the soil samples collected, field head-space screening was performed utilizing a Gastech Model 1314 explosivity/oxygen meter. The Gastech probe was inserted into the polyethylene, and VOCs were measured while the sample was being agitated. No outside air was allowed to enter the bag while taking the measurement. The results of soil screening are shown on the boring logs, Appendix C.

1.3 SOIL DESCRIPTIONS

Soil samples were described using the following modifiers:

1) density,
2) moisture,
3) color,
4) classification utilizing the Unified Soil Classification System, and
5) texture.

1.4 SOIL BORING DECONTAMINATION PROCEDURES

All down-hole drilling equipment was decontaminated between each drilling location to prevent cross-contamination. The decontamination procedure consisted of: 1) removing all large chunks of soil adhering to the auger with a putty knife, and 2) thoroughly cleaning the auger with a hot pressure washer. All water generated during drilling equipment decontamination was collected, and placed in a 55-gallon drum. The drum is currently being stored at the site as disposal of the wastewater is coordinated.

2.0 MONITORING WELL INSTALLATION PROCEDURES

After attaining total depth in each boring, the borings were converted to monitoring wells. Groundwater was encountered at a depth of approximately 25 feet below grade at the subject site. Screened intervals and lengths were selected so that screens extended a minimum of approximately 7.5 feet below the top of the water table, to account for fluctuations in the water table. An attempt was also made to have a minimum of 7.5 feet of well screen above the top of the water table.

After placement of the well screen and casing in the boring, Colorado Silica Sand was placed in the well annulus as the augers were removed. Care was taken to prevent any native soils from bridging the sand pack. The top of the sand pack was installed to a level of approximately two feet above the top of the well screen. The remaining well annulus was filled with bentonite chips. A flush, traffic grade monument was installed at the surface. All monitoring wells were secured with a locking cap and padlock prior to demobilization from the site. As-built monitoring well dimensions are given for monitoring well MW-4 on the boring log in Appendix C.

3.0 GROUNDWATER SAMPLING PROCEDURES

Sampling was carried out a minimum of 24 hours after the completion of monitoring well development. A minimum of three wetted casing volumes were purged from each well prior to collecting a groundwater sample. Groundwater samples collected for testing by EPA Method 8020 were placed in 40 milliliter glass VOA containers sealed with Teflon septa. The groundwater samples were placed expeditiously on-ice and were transported to AGRA's in-house laboratory. Rigid chain-of-custody protocols were followed from the time that samples were collected, until the samples were received by the contract laboratory.

PROJECT: ROSE'S PARKING LO[redacted] START CARD No.: 70758 BORING No.: MW-4 (1 OF 2)

Elevation Reference: Arbitrary 100' DATUM
Groundwater Surface Elevation: 73.61
Well Completed: 9-28-94
Relative Casing Elevation: 99.92
Boring Method: H S A
Borehole Diameter: 10"

Depth (feet)	SOIL DESCRIPTION	Graphic Log	Sample Type	Blow Counts	Volatile Readings ppm	Ground Water
0	3" asphalt pavement, underlain by 8" lift of silty gravel FILL.					
	Stiff, moist to wet, red-brown, gravelly, very silty micaceous, fine SAND (SM). Gravel content decreasing with depth.	SM	S-7	15	20	
5						
	Black mottling observed; no gravel content.		S-8			
10	Dense, ,moist to wet, brown, very silty fine sandy GRAVEL (GM). Subrounded and angular clasts 1" to 4" diameter.	GM		36	40	
			S-9			
15	Stiff, moist, brown, slightly silty fine and medium SAND (SW).	SW		39	20	
			S-10			
20				24	20	
			S-11			
25	Very stiff, moist, dark brown, micaceous slightly silty medium SAND (SW).			20	20	SW
	Sand unit becoming saturated, color becoming brown.					WD
			S-12			
30						

AS-BUILT DESIGN

EMCO-WHEATON Flush Monument
Quick-Set Sacrete
Locking Cap
Casing (Schedule 40 2-inch PVC)
Volclay coarse Bentonite Chips
Threaded Connection
#8 - 12 Filter Pack
Wellscreen (2-inch PVC with 0.020-inch slots)

ANALYSES: HCID 418.1; HCID; 8020

LEGEND

- 2-inch O.D. split-spoon sample with % recovered
- WD — Encountered groundwater level While drilling
- SW — Measured static groundwater level
- Groundwater Analysis (Sample No. Shown)
- BTEX / TPH-G — Soil Analysis (Test Method Shown)

AGRA E. & E. JOB No. 21-7423-00
Rose's Parking Lot
330 NW 23rd Avenue
Portland, Oregon

AGRA EARTH AND ENVIROMENTAL, Inc.
7477 SW Tech Center Drive
Portland, Oregon 97223-8024
Phone: (503) 639-3400 Fax: (503) 620-7892

Drilling Started: 9-28-94 Drilling Completed: 9-28-94 Logged By: P.E.

PROJECT: ROSE'S PARKING LOT | START CARD No.: 70758 | BORING No.: MW-4 (2 OF 2)

Elevation Reference: Arbitrary 100' DATUM
Groundwater Surface Elevation: 73.61
Well Completed: 9-28-94
Relative Casing Elevation: 99.92
Boring Method: H S A
Borehole Diameter: 10"

Depth (feet)	SOIL DESCRIPTION	Graphic Log	Sample Type	Blow Counts	Volatile Readings ppm	Ground Water	AS-BUILT DESIGN	ANALYSES
30								
			S-13				Wellscreen (2-inch PVC with 0.020-inch slots)	
35		SW		11	50		#8 - 12 Filter Pack	
			S14					
	Sand unit becoming fine grained and silty below 39.5'.						Threaded End Cap	
40	Total Depth = 40 feet			8	220			
45								
50								
55								
60								

LEGEND

- 2-inch O.D. split-spoon sample with % recovered
- WD — Encountered groundwater level While drilling
- SW — Measured static groundwater level
- Groundwater Analysis (Sample No. Shown)
- BTEX / TPH-G — Soil Analysis (Test Method Shown)

AGRA JOB E. & E. No. 21-7423-00
Rose's Parking Lot
330 NW 23rd Avenue
Portland, Oregon

AGRA EARTH AND ENVIROMENTAL, Inc.
7477 SW Tech Center Drive
Portland, Oregon 97223-8024
Phone: (503) 639-3400 Fax: (503) 620-7892

Drilling Started: 9-28-94 | Drilling Completed: 9-28-94 | Logged By: P.E.

APPENDIX E

AGRA Laboratory Reports

AMOCO Laboratory Report

Chain-of-Custody Documents

AGRA
Earth & Environmental

AGRA Earth & Environmental, Inc.
7477 SW Tech Center Drive
Portland, Oregon
U.S.A. 97223-8025
Tel (503) 639-3400
Fax (503) 620-7892

October 4, 1994

AGRA Earth & Environmental, Inc.
7477 SW Tech Center Drive
Portland, OR 97223-8024

Attention: Mr. Paul Ecker

Dear Mr. Ecker:

RE: Analytical Results For Project 21-07423-00

Attached are the results for the samples submitted on September 29, 1994 from the above referenced project. For your reference, our project number associated with these samples is OR940535.

The samples were analyzed for hydrocarbon identification at the AGRA Earth & Environmental Portland Chemistry Laboratory, and sample MW4/928/S7/5 was also analyzed for TPH by EPA Method 418.1 Modified.

All analyses were conducted in accordance with applicable QA/QC guidelines. The results apply only to the samples submitted.

Please feel free to contact me if you have any questions regarding this report, or if I can be of any assistance in any other matter.

Respectfully submitted,

AGRA Earth & Environmental

Sean Gormley
Laboratory Manager

Project: Rose's Parking
Project No.: 21-07423-00
Project Manager: Paul Ecker
Sample Matrix: Soil

Service Request No.: OR940535
Report Date: 10/3/94
Report No.: 94053501
C.O.C. No.: 0772

Hydrocarbon Identification Scan
ODEQ Method TPH-HCID
mg/kg(ppm)

Sample Name: / Lab Code:	B5/928/S1/5 0535-1	B6/928/S3/5 0535-3	B7/928/S5/5 0535-5	MW4/928/S7/5 0535-7	MW4/928/S10/20 0535-10	Lab Blank 0535-MB	Reporting Limit
(C4-C10) Gasoline Range	ND	ND	ND	ND	ND	ND	10.0
(C11-C24) Diesel Range	ND	ND	ND	Present(a)	ND	ND	50.0
(C25-C35) Heavy Oil Range	ND	ND	ND	ND	ND	ND	200
Sample Date:	9/28/94	9/28/94	9/28/94	9/28/94	9/28/94	9/29/94	
Extraction Date:	9/29/94	9/29/94	9/29/94	9/29/94	9/29/94	9/29/94	
Analysis Date:	9/29/94	9/29/94	9/29/94	9/29/94	9/29/94	9/29/94	
Surrogate Recovery:							Control Limits
a,a,a - Trifluorotoluene:	90%	95%	93%	92%	101%	90%	50%-150%
2-Fluorobiphenyl:	65%	65%	64%	67%	70%	68%	50%-150%

ND Not Detected
(a) Peaks were present within the retention time window of the listed petroleum hydrocarbon, but the peak patterns indicate the presence of low level heavy oils extending into the diesel range.

Signature of Chemist

Laboratory Manager

AGRA
Earth & Environmental

Project: Rose's Parking
Project No.: 21-07423-00
Project Manager: Paul Ecker
Sample Matrix: Soil

Service Request No.: OR940535
Report Date: 10/3/94
Report No.: 94053503
C.O.C. No.: 0772

Total Petroleum Hydrocarbons by IR
EPA Method 418.1 Modified
mg/kg(ppm)

Sample Name	Lab Code	Sample Date	Extraction Date	Analysis Date	Method Reporting Limit	Result
MW4/928/S7/5	0535-7	9/28/94	10/3/94	10/3/94	4.00	52.2
Lab Blank	0535-MB	10/3/94	10/3/94	10/3/94	4.00	ND

ND Not Detected

Signature of Chemist

Laboratory Manager

AGRA
Earth & Environmental

Project: Rose's Parking
Project No.: 21-07423-00
Project Manager: Paul Ecker
Sample Matrix: Soil

Service Request No.: OR940535
Report Date: 10/3/94
Report No.: 94053504
C.O.C. No.: 0772

Quality Assurance Data Report
Total Petroleum Hydrocarbons by IR
EPA Method 418.1 Modified
mg/kg(ppm)

Sample Name	Lab Code	Sample Result	Dup. Result	Relative Percent Difference	Spike Level	Spiked Result	Percent Recovery
Batch QC	0537-1	147	136	5.29	500	589	88.4
Lab Control Sample	0535-LCS	2105	-	-	-	-	110
Acceptance Limits(%):				<25			75%-125%

LCS = ERA TPH in Soil Standard, TPH-91, Lot #91028, TV=1920.

Signature of Chemist

Laboratory Manager

AGRA
Earth & Environmental

RZA AGRA, Inc.
(Formerly: Rittenhouse-Zeman & Associates, Inc.)
Engineering & Environmental Services
7477 SW Tech Center Drive • Portland, OR 97223-8024
(503) 639-3400 • FAX (503) 620-7892

Chain-of-Custody Record / Laboratory Analyses Request

Project: ROSE'S PARKING Job #: 21-7423-00

Client:

Project Manager: FARR Phone #: 639-3400

Sampler's Name: ECKER Phone #:

Sampler's Signature: Paul Ecker

Analysis Requested: (Circle, Check Box, or Write Preferred Method in Box)

Sample I.D. #	Date	Time	Preserv.	Matrix	Halogenated Volatiles EPA 601 EPA 8010	Volatile Aromatics EPA 602 EPA 8020	BTXE or BTXE; TPH-G	WA. TPH-G or OR. TPH-G	WA. TPH-D or OR. TPH-D	Fuel Scan / TPH by GC 8015-modified	GC Fingerprint (HCID)	WA. 418.1 Modified or OR. 418.1 Modified	GC / MS Volatiles	GC / MS Semi Volatiles	Total Metals ICP AA Other	TC LP Metals	pH Cond. Alk Color			# of Containers	Comments
1. B5/928/S1/5	9/28/94	8:05	ice	SOIL							X									1	
2. B5/928/S2/10		8:15																		1	HOLD
3. B6/928/S3/5		8:56									X									1	
4. B6/928/S4/10		9:04																		2	HOLD
5. B7/928/S5/5		9:40									X									2	
6. B7/928/S6/10		9:49																		2	HOLD
7. MW4/928/S7/5		11:12									X									2	
8. MW4/928/S8/10		11:25																		2	HOLD
9. MW4/928/S9/15		11:38																		2	HOLD
10. MW4/928/S10/20		11:52									X									2	

Relinquished by RZA:	Relinquished by:	Relinquished by:	Laboratory:	Sample Receipt:
Signature: Paul Ecker	Signature:	Signature:		
Printed Name: AGRA/PAUL ECKER	Printed Name:	Printed Name:	Shipping I.D.#:	Total # Containers:
Firm: AGRA	Firm:	Firm:	Carrier:	Condition of Containers:
Date/Time:	Date/Time:	Date/Time:	DOT Designation:	Condition of Seals:

Received by:	Received by:	Received by:	Special Instructions/Comments:
Signature:	Signature:	Signature: Cynthia Nuxoll	If HCID detected, run appropriate follow-up TPH. Only received the samples for the indicated tests. The samples marked "Hold" were not received. 9/29/94 CEN
Printed Name:	Printed Name:	Printed Name: CYNTHIA NUXOLL	
Firm:	Firm:	Firm: AGRA	
Date/Time:	Date/Time:	Date/Time: 9/29/94 8am	

DISTRIBUTION: WHITE & PINK returned to project manager, YELLOW - lab.

SERVICE REQUEST #: OR940535

AGRA
Earth & Environmental

AGRA Earth & Environmental, Inc.
7477 SW Tech Center Drive
Portland, Oregon
U.S.A. 97223-8025
Tel (503) 639-3400
Fax (503) 620-7892

October 24, 1994

AGRA Earth & Environmental
7477 SW Tech Center Drive
Portland, OR 97223-8025

Attention: Mr. Paul Ecker

Dear Mr. Ecker:

RE: Analytical Results For Project 21-07423-00

Attached are the results for the samples submitted on October 5, 1994 from the above referenced project. For your reference, our project number associated with these samples is OR940541.

The samples were analyzed for volatile aromatic hydrocarbons at the AGRA Earth & Environmental Portland Chemistry Laboratory.

The samples were also split and sent to the Amoco GMS Laboratory in Tulsa, Oklahoma for analysis.

All analyses were conducted in accordance with applicable QA/QC guidelines. The results apply only to the samples submitted.

Please feel free to contact me if you have any questions regarding this report, or if I can be of any assistance in any other matter.

Respectfully submitted,

AGRA Earth & Environmental

Sean Gormley
Laboratory Manager

Project: Rose's
Project No.: 21-07423-00
Project Manager: Paul Ecker/Len Farr
Sample Matrix: Water

Service Request No.: OR940541
Report Date: 10/14/94
Report No.: 94054101
C.O.C. No.: 0773

Volatile Aromatic Hydrocarbons
EPA Method 5030/8020
ug/L (ppb)

Sample Name:	MW4/104/W1	MW1/104/W2	MW2/104/W2	MW3/104/W4	Lab Blank	**Reporting**
Lab Code:	0541-1	0541-2	0541-3	0541-4	0541-MB	**Limit**
Benzene	ND	27	ND	1520(a)	ND	0.5
Toluene	ND	46	ND	600(a)	ND	0.5
Chlorobenzene	ND	ND	ND	ND	ND	0.5
Ethylbenzene	ND	5.9	ND	790(a)	ND	0.5
m,p-Xylene	ND	44	ND	990(a)	ND	0.5
o-Xylene	ND	26	ND	610(a)	ND	0.5
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	0.5
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	0.5
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	0.5
Sample Date:	10/4/94	10/4/94	10/4/94	10/4/94	10/4/94	
Analysis Date:	10/10/94	10/10/94	10/10/94	10/10/94	10/10/94	
Surrogate Recovery:						**Control Limits**
a,a,a-Trifluorotoluene:	81.4%	98.9%	81.5%	102%	83.6%	38%-150%
4-Bromofluorobenzene:	76.0%	89.1%	77.1%	96.7%	76.1%	55%-111%

ND Not Detected
(a) Reported results from a 1:50 dilution analyzed on 10/13/94.

Signature of Chemist

Laboratory Manager

AGRA
Earth & Environmental

RZA AGRA, Inc.
(Formerly: Rittenhouse-Zeman & Associates, Inc.)
Engineering & Environmental Services
7477 SW Tech Center Drive • Portland, OR 97223-8024
(503) 639-3400 • FAX (503) 620-7892

Chain-of-Custody Record / Laboratory Analyses Request

Project: ROSE'S Job #: 7423

Client:

Project Manager: ECKER/FARR Phone #: 639-3400

Sampler's Name: ECKER Phone #: ✓

Sampler's Signature: Paul Ecker

Analysis Requested: (Circle, Check Box, or Write Preferred Method in Box)

Sample I.D. #	Date	Time	Preserv.	Matrix	Halogenated Volatiles EPA 601 EPA 8010	Volatile Aromatics EPA 602 EPA 8020	BTXE or BTXE / TPH-G	WA. TPH-G or OR. TPH-G	WA. TPH-D or OR. TPH-D	Fuel Scan / TPH by GC 8015-modified	GC Fingerprint / HCID	WA. 418.1 Modified or OR. 418.1 Modified	GC / MS Volatiles	GC / MS Semi Volatiles	Total Metals ICP AA Other	TC LP Metals	pH Cond. Alk Color			# of Containers	Comments
1. MW4/104/W1	10-4-94	20:15	ice	H_2O		X														3	*
2. MW1/104/W2		20:28				X														3	*
3. MW2/104/W3		20:43				X														3	*
4. MW3/104/W4		20:56				X														3	*
5.																					
6.																					
7.																					
8.																					
9.																					
10.																					

Relinquished by RZA:	Relinquished by:	Relinquished by:	Laboratory:	Sample Receipt:
Signature: Paul Ecker	Signature:	Signature:		
Printed Name: PAUL ECKER	Printed Name:	Printed Name:	Shipping I.D.#	Total # Containers:
Firm: AGRA	Firm:	Firm:	Carrier:	Condition of Containers:
Date/Time: 10/5/94 8:29	Date/Time:	Date/Time:	DOT Designation:	Condition of Seals:

Received by:	Received by:	Received by:	Special Instructions/Comments:
Signature:	Signature:	Signature: Cynthia Nuxoll	* NOTE - Send split to Amoco Lab
Printed Name:	Printed Name:	Printed Name: CYNTHIA NUXOLL	
Firm:	Firm:	Firm: AGRA	
Date/Time:	Date/Time:	Date/Time: 10/5/94 8:30am	

DISTRIBUTION: WHITE & PINK returned to project manager, YELLOW - lab.

Page 1 of 1

SERVICE REQUEST #: ORA940541

AMOCO CORPORATION: GROUNDWATER MANAGEMENT SERVICES

ANALYTICAL RESULTS FOR DISSOLVED HYDROCARBONS IN WATER

Location: Roses's Parking Lot/ 330 NW 23rd/ Portland/ OR

Lab Number: 94W2274 | **Method: AMOCO Modified 8015**

Date Sampled: 10/4/94 | **Date Extracted: 10/11/94**

Date Received: 10/11/94 | **Date Analyzed: 10/12/94**

Sample ID	Benz	Tolu	EtBz	Xyls	Total BTEX	Surr
IW1	0.018	0.043	0.010	0.077	0.148	93
IW2	ND	ND	0.002	ND	0.002	86
IW3	1.29	0.589	0.871	1.77	4.52	92
IW4	ND	ND	0.002	ND	0.002	86

NOTES

. Unit of data is mg/L.
. ND = not detected at or above reporting limit.
. Benz = benzene Tolu = toluene EtBz = ethylbenzene Xyls = xylenes
. Reporting limit for benzene - toluene - ethylbenzene - and each xylene is 0.001 mg/L.
. Surr = Percent surrogate recovery. Acceptable range is 70-125%.

Flags: D - Dilution factor = 20

Comments: Method blank showed 0.002 mg/L of ethylbenzene.

Sampled by: AGRA E & E -- Paul Ecker

Checked by: Toney Miller

Groundwater Management Services
Environment, Health and Safety Department

Sample Transmittal Form

***Amoco Representative Authorizing Work:**

Ray Dempsey
Ivan Beauscleil

Amoco Person Who Contacted You*

***Operating Company Affiliation:** (Check one)

- ☐ Amoco Corporation (AC)
- ☐ Amoco Oil Company (AOC)
- ☐ Amoco Chemical Company (ACC)
- ☐ Amoco Production Company (APC)
- ☐ Amoco Pipeline Company (APL)
- ☐ Remediation Services Division (RSD)
- ☐ ECOVA

Business Unit/Marketing District

Note: Laboratory Results will not be mailed out unless this section is completed.

***Facility/Service Station Information**

Ross's Parking Lot
Facility Name

Facility Type/Number (if available)

330 NW 23rd
Street Address

Portland OR
City, State, Zip

Call Amoco Contact for information

***Consultant Information**

Geology Laboratory Results
Len Farr Sean Gormley
Name of Consulting Company Representative

AGRA Earth And Environmental, Inc.
Name of Consulting Company

7477 SW Tech Center Drive
Street Address/Suite Number

Portland, OR 97223
City, State, Zip

(503) 639-3400
Telephone Number

(503) 620-7892
FAX Number

Analyses Requested:
(Check Appropriate Box or Boxes)

Groundwater
- ☐ BTEX
- ☐ MTBE
- ☐ PHC
- ☐ Naphthalene

Product
- ☐ Product Characterization
- ☐ Lead Content

Date Results Required:
Call Amoco Contact

(Results can be faxed if the FAX number is provided.)

Send Results to:
- ☒ Amoco Representative
- ☐ Consultant
- ☐ Other (Provide Information Below)

Send Samples to:

Amoco Corporation
GMS Laboratory
7201 East 38th Street
Space 7253
Tulsa, OK 74145

Telephone Number: (918) 660-4420

FAX Number: (918) 660-4443

Reason for Sampling or Additional Remarks: _____

Shipped by: _____ Date: 10/10/94 Received By: _____ Date: _____

Please Attach Original "Chain of Custody" Form or Complete Form on Reverse Side.

AGRA
Earth & Environmental
7477 SW Tech Center Drive
Portland, Oregon, U.S.A. 97223-8025
Tel (503) 639-3400 Fax (503) 8620-7892

Note: Samples preserved w/ HCl to pH ≤ 2 &

00156

CHAIN OF CUSTODY

PROJECT Rose's	PROJECT No. 21-07423-00
CLIENT	PHONE No.
PROJECT MANAGER Ecker/Farr	PHONE No. (503)639-3400
SAMPLER'S NAME (please print) Paul Ecker	PHONE No. (503)639-3400
SAMPLER'S SIGNATURE	

ANALYSIS REQUESTED (circle, check box or write preferred method in box)

SAMPLE I.D. W2274	DATE	TIME	MATRIX	PRESERVATIVE	CONTAINERS No.	CONTAINERS VOL.	BTEX by EPA 602 / 8020	TPH-G	BTEX / TPH-G	TPH-HCID	TPH-D / TPH-D EXTENDED	TPH by EPA 8015 MODIFIED	TPH-418.1 MODIFIED	TPH by EPA 418.1	GC/MS EPA 624 / 8240 or EPA 8260 Volatiles	GC / MS EPA 625 / 8270 Semi-volatiles	(VOCs) EPA 601 / 8010 & EPA 602 / 8020	PCBs EPA 608 / 8080	LEAD EPA 6010 / EPA 7421 Total / Dissolved	TOTAL METALS	TCLP				
D 1. MW4/104/W1	10/4/94	20:15	H_2O	ice, HCl	1												X								
A 2. MW1/104/W2	"	20:28	"	"	1												X								
B 3. MW2/104/W3	"	20:43	"	"	1												X								
C 4. MW3/104/W4	"	20:56	"	"	1												X								
5.																									
6.																									
7.																									
8.																									
9.																									
10.																									

SAMPLE RECEIPT	LABORATORY Amoco GMS Laboratory	TURNAROUND TIME	SPECIAL INSTRUCTIONS / ADDITIONAL COMMENTS
TOTAL # CONTAINERS	SHIPPING I.D. / AIRBILL # 0590 6384 584	☐ 8 HOUR ☐ 24 HOUR ☐ 1 WEEK ☒ 2 WEEK (standard) ☐ OTHER	Original COC #0773 Only 1 VOA vial due to limited sample volume. Volume verified w/ Judy Parley on 10/7/94.
CONDITION OF CONTAINERS	CARRIER UPS		
CONDITION OF SEALS	DOT DESIGNATION NA		

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
1. Sean Stanley ACRA E+E	10/10/94		1. GMS	10-11-94	
2.			2.		
3.			3.		

Samples received at 1.0°C. 10-11-94

PAGE 1 OF 1

DISTRIBUTION: White, Yellow - Laboratory, Pink - Originator

TO: Doug Smith - R2A AGRA-620-7892 (F)
FR: Charlie Williamson - 222-3531 (Voice)
FYI - 5/3/94 Mailed: 2/8/94

Oregon

DEPARTMENT OF ENVIRONMENTAL QUALITY

NORTHWEST REGION

DEQ FILE NO.: 26-94-025

SITE NAME: Rose's Parking Lot
SITE ADDRESS: 330 NW 23rd Ave.
Portland, OR
RESPONSIBLE PARTY NAME: Max Birnbach
RP COMPANY NAME: c/o Charles Williamson Rose's Parking Lot
MAILING ADDRESS: 330 NW 23rd Ave
Portland, OR 97210

DATE RELEASE REPORTED TO DEQ: 2/7/94

A release has been reported from an underground storage tank (UST) system at your facility located at the address listed above. As the responsible party for the facility, you are required to clean up the release according to OAR 340-122-201 through 340-122-360.

An Initial Report Form for UST Cleanup Projects is enclosed, which needs to be completed and returned to this office within twenty (20) days from the date the release was reported. An outline of additional reporting requirements and due dates is also enclosed.

Please read the rules carefully. As the responsible party, you should be aware of the regulations and requirements, even if you have hired a qualified consultant or service provider to do the actual work.

Please reference the DEQ File Number listed in the top left corner of this letter in all future correspondence and reports.

The Department is required to recover oversight costs on projects that we review and provide a final notice of compliance or "closure letter". As provided in the law, all petroleum contamination sites are eligible for recovery of costs by the Department. In order to receive oversight and more effectively schedule your project you will be asked to sign, and return within 30 days, an agreement to pay oversight costs with the Department. Not entering into the agreement does not release you from responsibility for investigation and/or cleanup of the contamination. Please read the attached information on the cost recovery process; contact Darby Bacon at 503-229-6635 if you have questions on cost recovery.

Thank you for your cooperation and continued efforts to comply with the regulations. If you have any questions, please contact the UST Section of Northwest Region at 503-229-5263.

A copy of the UST Cleanup Manual
___ is enclosed
X will be provided upon request

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
JUN 20 1994
NORTHWEST REGION

2020 SW Fourth Avenue
Suite 400
Portland, OR 97201-4987
(503) 229-5263 Voice/TDD

This report is due within twenty (20) days from the date of the release*

SITE INFORMATION

*DEQ File No.: 26-94-025 *Date of Release: 2/7/94

Site Name: Rose's Parking Lot

Site Address: 330 N.W. 23rd Ave.
Portland, OR

Owner ~~Responsible Party~~: Max Birnbach Phone: c/o Charles Williamson 222-3531

RP Mail Address: c/o Charles R. Williamson
1800 Security Pacific Plaza - 1001 SW 5th Ave Portland, OR 97204-1134

Service Provider: RZA AGRA, Inc. Phone: 639-3400

SP Mail Address: 7477 SW Tech Center Dr.
Ptld OR 97223

* Ultimately Responsible Party is Gull Industries, Inc. FKA Gull Oil Co.

Address:
c/o David Roy
1200 Bank of Calif. Tower
707 S.W. Washington St
Portland, OR 97205
Tel. 224-5560

* Note: This information is listed on the cover letter received by the Responsible Party.

INITIAL CLEANUP INFORMATION

(Y) N Do you believe that this cleanup project can be conducted under the requirements for an UST Cleanup Matrix site?

► Groundwater use in the immediate area of the project (check all that apply) - complete whether or not the release is believed to have impacted groundwater.

___ Drinking water supply
___ Agricultural
___ Industrial
X Groundwater not used

► Facility location (check all that apply)

___ <100 ft. from a wetland or surface stream (circle one or both)
___ within a residential area
X within an industrial/commercial area
___ Other (describe): _____

► 25' Current approximate depth to groundwater (in feet).

► _____ Seasonal high groundwater level (in feet) if different.

► Describe how depths were determined: With electronic water level probe in a monitoring well

INITIAL REPORT FORM FOR UST CLEANUP PROJECTS -- PAGE 2

Y N (NA) Did you take immediate action to prevent any further release of the regulated substance into the environment? EXPLAIN: USTs removed in early '70s

Y N (NA) Were steps taken to identify and mitigate fire, explosion, and vapor hazards? EXPLAIN: None of these hazards were noted

Y N (NA) Did you remove as much of the regulated substance from the UST system as necessary to prevent further release to the environment? EXPLAIN:

Y N (NA) Did you visually inspect any aboveground releases or exposed below ground releases and prevent further migration of the released substance in surrounding soils and groundwater? EXPLAIN:

Y (N) NA Are/were there any vapors present in buildings or utility corridors? If yes, are you continuing to monitor and mitigate any additional fire and safety hazards posed by vapors and free product? EXPLAIN:

(Y) N NA Have you remedied any hazards posed by contaminated soils that were excavated or exposed as a result of release confirmation, site investigation, abatement, or cleanup activities? EXPLAIN: All investigation derived wastes have been treated/disposed.

(Y) N NA Have you measured for the presence of a release where contamination is most likely to be present at the UST site? EXPLAIN: Borings/Wells located in areas with a high potential for contamination

(Y) N NA Did you investigate to determine the possible presence of free product and begin free product removal as soon as practicable? If yes, was the region notified? EXPLAIN: No free-product noted in monitoring wells.

Y N Was groundwater initially encountered in the excavation? If yes, how was this water handled/disposed? How many gallons involved? EXPLAIN: No information available regard UST decommissioning

Y N Was a sheen or odor observed on any water in the excavation? If yes, DESCRIBE OBSERVATIONS: N/A

INITIAL REPORT FORM FOR UST CLEANUP PROJECTS - PAGE 3

Y N Did groundwater recharge 24 hours after pumping the accumulated water in the excavation? If yes, what actions have you taken as a result? Did you resample the recharge water? EXPLAIN: N/A

(Y) N Are any SOIL OR WATER SAMPLE RESULTS available at the time of this report? If yes, attach all laboratory analysis reports and chain of custody forms.

GENERAL INFORMATION FOR ALL CONTAMINATED SOILS MANAGEMENT

Note: All soils temporarily stockpiled onsite prior to treatment or disposal must be contained within a bermed area, kept covered (and the cover anchored), and the entire area secured to prevent unauthorized access by the public. Non-contaminated soils should be protected and kept separated from contaminated soil.

Y (N) The level of contamination noted is expected to require removal of contaminated soil for treatment or disposal. If yes, complete the following. If no, go to Page 4, "Report Prepared By".

► Type of petroleum contamination (check all that apply):

___ Gasoline ___ Diesel ___ Waste Oil ___ Heating Oil

___ Other contamination (specify): _____

► Estimated volume of soil if known (tons or cubic yards): _____

► Intended Disposition of Soils (check appropriate method):

___ Treatment

___ Thermal treatment offsite at an authorized facility

Facility Name: _____ Phone No.: _____

Facility Address: _____

___ Thermal treatment onsite with a mobil treatment unit **

Company Name: _____ Phone No.: _____

___ Offsite soil aeration[1] or bioremediation **

Treatment Site Address: _____

___ Onsite soil aeration or bioremediation **

___ Disposal

Landfill Name: _____ Phone No.: _____

Landfill Address: _____

1 Offsite soil aeration is banned within the Portland METRO area - see enclosed fact sheet.

** Permit from DEQ required, see page 5 if you would like forms mailed.

INITIAL REPORT FORM FOR UST CLEANUP PROJECTS - PAGE 4

► Who will be conducting the soil treatment or disposal work?

Company Name: Undetermined Phone: _____

Contact Name: _____

► What date(s) is the treatment or disposal intended to be started?

Undetermined

Note: You have approximately 30 days to stockpile contaminated soils onsite while making arrangements for proper disposal or treatment. After that time, you may be required to obtain a permit from DEQ for onsite management of the contaminated soil if you fail to take active measures to manage the soil in an appropriate manner.

THIS REPORT WAS PREPARED BY: Date: 6/15/94

Individual: Len Farr Phone: 639.3400

Company: RZA AGRA, Inc.

Address: 7477 SW Tech Center Dr. Portland

If this report was NOT prepared by the Responsible Party:

(Y) N NA Are you the licensed Matrix Service Provider for the project and authorized by the Responsible Party to submit reports on their behalf?

Matrix Service Provider License No.: 11106/11105

NOTE: This initial report is intended to provide the Department with the basic initial information about activities associated with the release. It is anticipated that future reports will be much more detailed and will provide a more complete picture of the entire cleanup project. If appropriate, you may reference this initial report in subsequent reports if the information does not need to be repeated for clarity.

► Please attach additional information as necessary to explain any unusual circumstances associated with the project or if you need more space to respond to any of the questions in this report form.

Return this form to:

DEQ - NORTHWEST REGION
UST Section
2020 SW Fourth Avenue Suite 400
Portland, OR 97201

If you have questions, call 503-229-5263 and ask for the underground storage tank (UST) Duty Officer.

►►►►►►► KEEP A COPY OF THIS REPORT FOR YOUR FACILITY RECORDS ◄◄◄◄◄◄◄

REPORT DUE DATES AND INFORMATION TO BE SUBMITTED FOR UST CLEANUP PROJECTS

A. Within 20 days from the date the release was reported*

1. Complete all portions of the Initial Report Form for UST Cleanup Projects.

B. Within 45 days from the date the release was reported*

1. If cleanup (and the final report) cannot be completed within 45 days from the date of the release, submit an interim status report. The interim report must a) summarize the findings to-date, b) outline your planned actions for additional work, and c) include anticipated dates of completion for each action. Attach copies of any sample results and chain of custody forms for all samples collected to-date.

2. If cleanup is on-going, submit quarterly status reports (as described in item B.1 above) each January 1st, April 1st, July 1st, and October 1st unless otherwise specified by the DEQ Regional Office until cleanup is complete. Note: you do not need to resubmit copies of sample results already provided, but all data collected to-date should be mentioned in your summary reports.

C. Within 60 days from the date CLEANUP is considered COMPLETE

1. Submit the final cleanup report. The information that must be included is outlined in the UST Cleanup Manual, OAR 340-122-360.

D. Corrective Action Plans (CAP)

1. Once groundwater contamination has been confirmed and the investigation is complete, you will be required to submit a CAP for approval (some complex soil remediation projects may also require a CAP). If your project is not just a simple Matrix cleanup, contact the regional office listed below for specific information on how to proceed and what your reporting requirements will be.

* Note: The date the release was reported to DEQ is listed on the cover letter received by the Responsible Party.

Complete, step-by-step guidance on cleanup and reporting requirements is provided in the UST Cleanup Manual. Please refer to this manual for any specific information you may require. If you have further questions, please contact the regional office listed below.

SEND UST CLEANUP REPORTS TO:

DEQ - NORTHWEST REGION
UST Section
2020 SW Fourth Avenue Suite 400
Portland, OR 97201 229-6385

INITIAL REPORT FORM FOR UST CLEANUP PROJECTS - PAGE 5

General Information:

▶▶▶▶▶▶▶ A permit from DEQ is required for the following activities ◀◀◀◀◀◀◀

___ Soil aeration, bioremediation (onsite or offsite) or onsite thermal treatment.

___ Water discharges to a stream/storm drain from excavations or treated groundwater.

Note: If there will be air emissions from pollution control equipment (e.g. air strippers, vapor extraction systems, etc.), notify the regional office by phone before installation. Have actual or estimated emissions calculated before calling.

Check any activities listed above that are anticipated for your cleanup project and the Department will send you the appropriate application forms to complete, information on permit fees and guidance documents as appropriate.

REMINDER: Submit UST Decommissioning/Change-in-Service Report forms and UST Decommissioning Checklists and Reports DIRECTLY to:

DEQ-UST Compliance Program
811 SW 6th
Portland, OR 97204

Phone: 503-229-5759

Failure to do so can result in delays to your project; these reports must be received by the UST Compliance Program or the tank owner will continue to be billed for tank permit fees.

State of Oregon
Department of Environmental Quality

Memorandum

Date: June 13, 1994

To: Kurt Burkholder, DOJ

From: Laurie McCulloch, NWR

Subject: Notice of Citizen Suit

RE: Your memo of May 26, 1994, regarding receipt of 90-day notice of intended citizen suit at 330 NW 23rd, Portland.

This is an UST Cleanup project in NWR, known as Rose's Parking Lot, File No. 26-94-025. There appears to be significant groundwater contamination; the RP has conducted some investigation. Future enforcement may be taken if the RP does not continue to be cooperative or conduct required investigations and cleanup. However, we have no reason to believe at this point that they will not continue to be cooperative.

cc: Tom Bispham, NWR
Mary Wahl, WMC
Thomas Miller, WMC
Lon Revall, WMC
Michael Huston, DOJ

THEODORE R. KULONGOSKI
ATTORNEY GENERAL

THOMAS A. BALMER
DEPUTY ATTORNEY GENERAL

1515 SW 5th Avenue
Suite 410
Portland, Oregon 97201
FAX: (503) 229-5120
TDD: (503) 378-5938
Telephone: (503) 229-5725

DEPARTMENT OF JUSTICE
PORTLAND OFFICE

MEMORANDUM

DATE: May 26, 1994

TO: Distribution

FROM: Kurt Burkholder
Assistant Attorney General

RE: UST Contamination: Notice of Citizen Suit Rose's Parking Lot
26-94-025

On May 9, 1994, DEQ received 90-day notice of an intended citizen suit against private parties under RCRA § 7002. The suit would seek remediation at a former service station property at 330 N.W. 23rd, Portland. Under RCRA, the citizen suit cannot be brought if DEQ is diligently prosecuting cleanup.

Please inform me, no later than June 24, 1994, whether you currently are enforcing or directing investigation or cleanup activities at the property, or whether you intend to commence enforcement or cleanup activities in the near future.

Attached for your information are the 90-day notice and executive summaries of two investigations performed at the property. Full copies of the investigation reports have been forwarded to Lon Revall if you want to see them.

By this query, I am not recommending that DEQ action is necessary at the site, and there is no reason to dissuade one private party from compelling another to undertake cleanup. However, if DEQ is already taking enforcement or cleanup action, we would need to inform the court and evaluate whether the private party action affects DEQ's.

Please call me with any questions.

KBB

dld KBB0290.mem
Distribution w/enc.:
Tom Bispham
Thomas Miller
Lon Revall
c w/o enc.: Michael Huston
Mary Wahl

NOTICE PURSUANT TO 42 U.S.C.A. § 6972(b) OF SOLID OR HAZARDOUS WASTE

State of Oregon
DEPARTMENT OF ENVIRONMENTAL QUALITY
RECEIVED
MAY - 9 1994
OFFICE OF THE DIRECTOR

RECEIVED
MAY 19 1994
DEPARTMENT OF JUSTICE
PORTLAND LEGAL

TO: Administrator
United States Government
Environmental Protection Agency

Mr. Fred Hansen, Administrator
Oregon Department of Environmental Quality

EDA Corporation
c/o John H. Draneas, Registered Agent

Gull Industries, Inc.
c/o David Paul Roy, Registered Agent

George Lawrence Estate Company
c/o James J. Damis

Union Oil Company of California
C T Corporation System, Registered Agent

Union Oil Company of California
(Harbor Service Stations - formerly Westway)
c/o Lois Ellen Gold

Amoco Corporation
The Prentice-Hall Corporation System, Inc.
Registered Agent

Amoco Corporation
c/o Janice M. McLain

Sunset Oil Company, Inc.
(Address unknown at this time)

Golden Eagle Service Station
(Address unknown at this time)

Mr. Max Birnbach

PLEASE TAKE NOTICE pursuant to 42 U.S.C.A. § 6972 that certain solid or hazardous waste which may present an imminent and substantial danger to the health or the environment exists upon the property at Northwest 23rd Avenue and Flanders Street known as 330 N. W. 23rd Avenue in the form of subsurface gasoline leakage and/or spillage. The site, its history, and the solid or hazardous waste present thereon are described more fully in the attached two environmental reports of Hahn and Associates, Inc., and RZA Agra, Inc.

Pursuant to the provisions of 42 U.S.C.A. § 6972, Max Birnbach will commence an action against the George Lawrence Estate, Gull Oil Company, Amoco, Unocal, Sunset Oil Company, Golden Eagle Service Station, and EDA to require remediation of the property after ninety (90) days from your receipt of this notice.

In such action plaintiff will seek an award of attorney fees and costs together with a declaratory judgment and injunction requiring remediation of the property in addition to other claims for damages and injunctive relief.

DATED this sixth day of May, 1994.

Charles R. Williamson

Charles R. Williamson
KELL, ALTERMAN & RUNSTEIN
Suite 1800
1001 S. W. Fifth Avenue
Portland, Oregon 97204-1134

Phone: (503) 222-3531
Fax: (503) 227-2980

Attorneys for Max Birnbach

SUBSURFACE GROUNDWATER INVESTIGATION
FORMER SERVICE STATION SITE
330 N. W. 23rd AVENUE
PORTLAND, OREGON

Submitted To:

Kell, Alterman & Runstein
1001 S.W. Fifth Ave, Suite 1800
Portland, Oregon 97204-1194

Submitted By:

RZA AGRA, Inc.
7477 S. W. Tech Center Drive
Portland, Oregon 97223-8024

April 1994

21-07423-00

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RZA AGRA, Inc.
Engineering & Environmental Services

AGRA
Earth & Environmental Group

RZA AGRA, Inc.
(Formerly: Rittenhouse-Zeman & Associates, Inc.)
Engineering & Environmental Services

7437 SW Tech Center Drive
Portland, Oregon 97223-8024
(503) 639-3400
FAX (503) 620-7892

April 8, 1994
21-07423-00

Mr. Charles Williamson
Kell, Alterman & Runstein
1001 SW Fifth Avenue, Suite 1800
Portland, OR 97204-1194

Dear Mr. Williamson:

RE: SUBSURFACE GROUNDWATER INVESTIGATION
FORMER SERVICE STATION SITE
330 NW 23RD AVENUE
PORTLAND, OREGON

RZA AGRA, Inc. (RZA) is pleased to provide you with our report on RZA's subsurface investigation of the subject property. We have scheduled the removal of the drums currently present at the site for Monday, April 11. It appears that disposal costs for the drums will total approximately $750.

We look forward to sitting down with you and discussing the results of our investigation. Thank you for the opportunity to assist you with this project. If you have any questions, please contact us at 503-639-3400.

Sincerely,

RZA AGRA, Inc.

Leonard C. Farr Jr., P.G.
Staff Geologist

Douglas A. Smith, P.G.
Associate

SUBSURFACE INVESTIGATION

EDA Corporation Property
330 NW 23rd Avenue
Portland, Oregon

February 2, 1994

Prepared for:

EDA Corporation
Portland, Oregon

Prepared by:

Hahn and Associates, Inc.
Portland, Oregon

Project #2605

SUBSURFACE INVESTIGATION

EDA Corporation Property
330 NW 23rd Avenue
Portland, Oregon

February 2, 1994

EXECUTIVE SUMMARY

EDA Corporation retained the environmental management firm of Hahn and Associates, Inc. to perform a subsurface investigation of soils at the location of a former service station at 330 NW 23rd Avenue in Portland, Oregon. Four soil borings were installed at the site in January 1994. A magnetic survey performed during the investigation indicates that a former used oil underground storage tank may still be present at the site.

The results of the analytical testing of the soil samples indicate that the soil has been impacted by gasoline and diesel petroleum hydrocarbons at concentrations in excess of regulatory standards in two soil borings. It appears that a zone of petroleum contaminated soils is present at the site between the depths of approximately 12 to 25 feet below ground surface. The zone of soil contamination appears to extend to the depth of the water table. Although the vertical extent of soil contamination was defined during this investigation, the full lateral extent of contamination was not defined.

Based on the results of the data gathered during this subsurface investigation, it is recommended that the used oil underground storage tank at the subject site be decommissioned by removal. Furthermore, it is recommended that additional investigation take place to determine the lateral extent of the detected soil contamination, and to characterize any impacts to groundwater.

UST CLEANUP TELEPHONE USE REPORT

Message
CALL FROM/TO: Charlie Williamson DATE: 5-10-94

WITH: _____ TIME: 3:49

TELEPHONE NO: ( ) 222-3531

REGARDING: Rose's Parking

FILE NO: 26-94-025

SUMMARY OF CALL

Have filed RCRA notice w/Administrator (CA?) in order to sue previous owners for cleanup.

R. Segal
Staff Signature

KELL, ALTERMAN & RUNSTEIN

CLIFFORD B. ALTERMAN
TED E. RUNSTEIN
LEE DAVIS KELL, CPA*
WAYNE D. PALMER
LLOYD R. SUMMERS
WILLIAM DICKAS
GARY P. COMPA‡
CHARLES R. WILLIAMSON
MARY ELLEN PAGE FARR
ERIC SOGGE
LARRY J. BRANT***‡
THOMAS J. MATSUDA**

DEAN N. ALTERMAN
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RAYMOND M. KELL
(1911-1991)

TELEX NUMBER
4937785 KELMAN

ALSO ADMITTED IN
* CALIFORNIA
** HAWAII
*** WASHINGTON

‡ LL.M. IN TAXATION

April 8, 1994

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
APR 8 1994
NORTHWEST REGION

Department of Environmental Quality
Northwest Region
ATTN: ANDRE POLLOCK
Underground Storage Tank Duty Officer
2020 S. W. Fourth Avenue, Suite 400
Portland, Oregon 97201

RE: LOG NO. 26-94-025 - PARKING LOT/
NORTHWEST FLANDERS AND 23RD AVENUE (330 N. W. 23RD)

Dear Mr. Pollock:

Enclosed please find a copy of the RZA Agra report on the above property. Per our agreement, this is your notice that there does appear to be some ground water contamination as described in the report.

Very truly yours,

Charles R. Williamson

CRW/rw

Enclosure

cc: David Roy
James Damis
Walt McMonies
David Gibson
George Mack

SUBSURFACE GROUNDWATER INVESTIGATION
FORMER SERVICE STATION SITE
330 N. W. 23rd AVENUE
PORTLAND, OREGON

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
APR 08 1994
NORTHWEST REGION

Submitted To:

Kell, Alterman & Runstein
1001 S.W. Fifth Ave, Suite 1800
Portland, Oregon 97204-1194

Submitted By:

RZA AGRA, Inc.
7477 S. W. Tech Center Drive
Portland, Oregon 97223-8024

April 1994

21-07423-00

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RZA AGRA, Inc.
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April 8, 1994
21-07423-00

Mr. Charles Williamson
Kell, Alterman & Runstein
1001 SW Fifth Avenue, Suite 1800
Portland, OR 97204-1194

Dear Mr. Williamson:

RE: SUBSURFACE GROUNDWATER INVESTIGATION
FORMER SERVICE STATION SITE
330 NW 23RD AVENUE
PORTLAND, OREGON

RZA AGRA, Inc. (RZA) is pleased to provide you with our report on RZA's subsurface investigation of the subject property. We have scheduled the removal of the drums currently present at the site for Monday, April 11. It appears that disposal costs for the drums will total approximately $750.

We look forward to sitting down with you and discussing the results of our investigation. Thank you for the opportunity to assist you with this project. If you have any questions, please contact us at 503-639-3400.

Sincerely,

RZA AGRA, Inc.

Leonard C. Farr Jr., P.G.
Staff Geologist

Douglas A. Smith, P.G.
Associate

TABLE OF CONTENTS

Page Number

SUMMARY 1

1.0 INTRODUCTION 2
1.1 OBJECTIVES AND SCOPE-OF-WORK 2
1.2 SITE HISTORY 2
1.2.1 Polk City Directories and Aerial Photographs 2
1.2.2 Sanborne Fire Insurance Maps 4
1.2.3 Aerial Photograph Review 4
1.2.4 Chain of Ownership Review 5
1.3 PREVIOUS WORK 5

2.0 SITE CONDITIONS 6
2.1 CLIMATE 6
2.2 REGIONAL GEOLOGYAND HYDROGEOLOGY 6

3.0 SUBSURFACE EXPLORATION AND CONDITIONS 6
3.1 SUBSURFACE EXPLORATION 6
3.2 SUBSURFACE CONDITIONS 8
3.2.1 Subsurface Soil Conditions 8
3.2.2 Field Volatile Screening 8
3.2.3 Groundwater 8

4.0 QUANTITATIVE CHEMICAL ANALYSES 8
4.1 SOIL ANALYSES 9
4.1.1 Hydrocarbon Identification (ODEQ Method TPH-HCID) 9
4.1.2 Total Petroleum Hydrocarbons as Gasoline (ODEQ Method TPH-G) . . . 9
4.1.3 Aromatic Volatile Organic Compounds (EPA Method 8020) 9
4.1.4 Flashpoint (EPA Method 1010) 9
4.2 GROUNDWATER ANALYSES 9
4.2.1 Aromatic Volatile Organic Compounds (EPA Method 8020) 9
4.2.2 Halogenated Volatile Organic Compounds (EPA Method 8010) 10
4.3 QUALITY CONTROL ANALYSES 10

5.0 STATE OF OREGON SOIL AND GROUNDWATER CLEANUP GUIDELINES 10
5.1 SOIL CLEANUP GUIDELINES 10
5.2 GROUNDWATER CLEANUP GUIDELINES 11

6.0 CONCLUSIONS AND RECOMMENDATIONS 12

TABLES

Table 1.	Water Table Measurements and Survey Data
Table 2.	Summary of Soil Sample Analytical Data
Table 3.	Summary of Groundwater Sample Analytical Data

PLATES

Plate 1	Site Location Map
Plate 2	Site Plan
Plate 3	Groundwater Potentiometric Gradient Map (March 29, 1994)
Plate 4	Summary of Soil Sample Analyses
Plate 5	Summary of Groundwater Sample Analysis

APPENDICES

Appendix A	WAPR Report Sanborne Fire Insurance Maps
Appendix B	Sampling Methods
Appendix C	Boring Logs
Appendix D	Laboratory Reports Chain-of-Custody Documents

SUMMARY

RZA AGRA, Inc. (RZA) recently completed a subsurface investigation at 330 NW 23rd Avenue, Portland, Oregon. The presence of petroleum hydrocarbons in site soils was discovered in January 1994, during a subsurface investigation by Hahn and Associates, Inc. (HAI), Portland, Oregon. The primary purpose of RZA's follow-up investigation was to better characterize the horizontal and vertical extent of petroleum hydrocarbons in site soils and groundwater, and to determine if soil and groundwater cleanup likely would be required by the ODEQ.

Our Subsurface Investigation Indicated:

- **Site History:** The property was the site of operating service stations from the mid-1950s until the late 1970s. During that time period, it appears that pump islands and underground storage tanks (USTs) were located near the west central portion of the property.

- **Subsurface Explorations:** Test results for soil samples collected during the HAI and RZA investigations have indicated elevated TPH (gasoline) and soil BTEX concentrations in four of the seven borings drilled. Three monitoring wells were installed in order to determine if site groundwater were impacted. The wells range in depth from 34 to 39 feet below ground surface. Groundwater test results have indicated aromatic volatile organic compound (AVOCs) concentrations above basic numeric groundwater cleanup levels (BNGCLs) in two of the three site monitoring wells. Halogenated volatile organic compounds (HVOCs), including the common gasoline additives 1,2-dibromoethane (EDB) and 1,2-dichloroethane (EDC), were not detected in site groundwater.

- **Hydrogeology:** Water levels within the monitoring wells stabilized between 23 and 26 feet below ground surface (bgs). On March 29, 1994, the top of the water table was measured as dipping towards the northeast at a gradient of approximately 0.026 vertical feet per lateral foot.

- **Conclusions:** Based upon the results of all work to date, it appears that there has been a release of fuel hydrocarbons to subsurface soils and groundwater. Contamination in soils extends down to and below the water table, with much of this contamination concentrated in the central and west central portion of the property. Groundwater contamination appears to extend across a 50-foot area, to the eastern margin of the property. Because one of the two down-gradient wells is the most contaminated, it is not known if the plume has moved off-site. We have found no evidence of chlorinated solvents in groundwater. We anticipate that the ODEQ will require soil and groundwater.cleanup at the subject property.

The preceding summary is intended for introductory and reference use only, and should be used in conjunction with the full text of this report.

1.0 INTRODUCTION

This report presents the results of our subsurface investigation conducted at 330 NW 23rd Avenue, Portland, Oregon (Plate 1). Our report also includes data obtained during a previous investigation performed by HAI. The investigation area is presented in the Site Plan, Plate 2.

1.1 OBJECTIVES AND SCOPE-OF-WORK

The purpose of RZA's investigation was to better characterize the vertical and lateral extent and magnitude of petroleum hydrocarbons in site soils, and to determine if groundwater had been impacted. The scope-of-work for the investigation included: 1) drilling three borings to depths ranging from 34 to 39 feet below ground surface, 2) collecting soil samples at five foot intervals while drilling, 3) installing two-inch monitoring wells in each boring, 4) developing and sampling the monitoring wells, 5) determining the relative water table elevations and site groundwater gradient, and 6) preparing a report on our work at the site, with conclusions and recommendations for further work.

This report has been prepared for the exclusive use of Kell, Alterman & Runstein and its agents, for specific application to this project, in accordance with generally accepted environmental engineering and geology practices. No other warranty, expressed or implied, is made.

1.2 SITE HISTORY

The history of the subject site was documented through the review of Polk City Directories and Sanborne Fire Insurance Maps available at the Oregon Historical Library, through a review of aerial photographs, and through a chain-of-ownership review completed by Western American Property Research (WAPR). The WAPR report has been included in Appendix A.

1.2.1 Polk City Directories and Aerial Photographs

Polk City Directories dating from 1935, were reviewed at five year intervals in order to document occupancy of the site and adjacent properties. Additional years were reviewed to define the years of occupancy for service stations located at the site. Polk City Directories prior to the year 1935, record street names and numbering systems which differ from the later directories, making it difficult to trace property occupancy.

Based on the Polk City Directory review, it appears that service stations were present at the subject site between 1955 and 1978. Selected directory listings of the businesses occupying the site, and adjacent properties, are provided below.

1987 Directory

315 NW 23rd	Rose's Restaurant
330 NW 23rd	Physician Building; Richard B. Rosebaum, et. al.

1981 Directory

314 NW 23rd	Metro Family Services Building
315 NW 23rd	Rose's Restaurant
333 NW 23rd	Physician Building; Richard B. Rosebaum, et. al.
405 NW 23rd	Travel Planners Travel Agency
407 NW 23rd	Beauty Shop
415 NW 23rd	Office Building

1979 Directory

322 NW 23rd	Apartment Building
326 NW 23rd	Marilyn Jacob (residence)
330 NW 23rd	**Vacant**

1977 Directory

330 NW 23rd	**Jerry's Service Station**

1975 Directory

314 NW 23rd	Rose's Deli
315 NW 23rd	Rose's Restaurant
330 NW 23rd	**Jerry's Service Station**
333 NW 23rd	Physician Building
405 NW 23rd	Travel Agency
407 NW 23rd	Beauty Shop
419 NW 23rd	Office Building

1970 Directory

305 NW 23rd	Elliott House Interior Decorating
314 NW 23rd	James McGraw & Associates
315 NW 23rd	Rose's Restaurant
330 NW 23rd	**Zinda's American Oil Service**
333 NW 23rd	Physician Building
407 NW 23rd	Beauty Shop
419 NW 23rd	Physician Building

1965 Directory

305 NW 23rd	Interior Decorating Service
315 NW 23rd	Rose's Restaurant
330 NW 23rd	**American Service Station**
333 NW 23rd	Physician Building
407 NW 23rd	Beauty Shop
419 NW 23rd	Dentists' Office Building

1960 Directory	
305 NW 23rd	Interior Decorating Service
314 NW 23rd	Optometrist Office
315 NW 23rd	Rose's Restaurant
317 NW 23rd	Home Fashions & Carpet Retail Center
330 NW 23rd	**Golden Eagle Service Station**
333 NW 23rd	Physician Building
1955 Directory	
305 NW 23rd	Interior Decorating Service
330 NW 23rd	**Golden Eagle Service Station**
333 NW 23rd	Dr. Rosenbaum Physician Office
425 NW 23rd	Office Building
1950 Directory	
305 NW 23rd	Interior Decorating Service
314 NW 23rd	Store Designers
330 NW 23rd	Physician Building
400 block	Residential
1945 Directory	
300 block	Residential
400 block	Residential

1.2.2 Sanborne Fire Insurance Maps

Sanborne Fire Insurance Maps corrected to 1926, 1932, 1955, and 1965 were reviewed on microfilm in order to document occupancy of the site and adjacent properties. Photocopies of the street block on which the subject property is located were made for each year reviewed and are presented in Appendix A.

Based on the Sanborne Fire Insurance Map review, it appears that the subject site was occupied by a service station in 1965 and 1955. The 1932 map indicates that the subject site may have been occupied by a boarding house or domestic residence. The 1926 map shows a domestic residence located on the subject site. The maps indicate that properties surrounding the subject site were residential or vacant until 1955, when the majority of the surrounding properties were developed with office buildings.

1.2.3 Aerial Photograph Review

Aerial photographs were also review for 1940, 1956, 1961, 1971, 1980, and 1990 to supplement information obtained through other sources. A chronological history based upon aerial photographs is provided below.

In 1940, a residence was present at the site. Prior to 1956, the residence was demolished, and a service station was constructed. The service station building was located in the southeast corner of the property, and a large concrete slab and pump islands were present near the west-central portion of the property.

No changes to the property were noted in the 1961 aerial photograph. The pump islands were covered with a canopy prior to 1971. The service station was removed, and a parking lot constructed prior to 1980. No changes to the property were noted in the 1990 photograph.

1.2.4 Chain of Ownership Review

Based on the chain of ownership review conducted by WAPR, it appears that the subject property had been in noncommercial use from 1902 until at least 1928. As indicated in the title review, first mention of a lease to an oil company was made in 1953 between the George Lawrence Estate Company and Sunset Oil Company.

In 1955, it appears that Sunset Oil Company assigned their lease to Westway Petroleum Company. The Golden Eagle Service Station was apparently operated by the Westway Petroleum Company for approximately nine years. In 1964, the Sunset Oil Company lease was cancelled by the George Lawrence Estate Company. The George Lawrence Estate Company then re-leased the property to The American Oil Company later in 1964. Apparently The American Oil Company operated the American Service Station and Zinda's American Service Station for approximately seven years. In 1971, the American Oil Company assigned its lease to Gull Oil Company, which apparently operated Jerry's Service Station for approximately seven years.

The George Lawrence Estate Company apparently sold the property to EDA Corporation in 1978 while, at the same time, nullified the lease agreement with Gull Oil Company. EDA Corporation sold the property to Mr. Max Birnbach, the current owner, in January 1994. A copy of the chain of ownership report is presented in Appendix A.

1.3 PREVIOUS WORK

In January 1994, HAI was retained by the EDA Corporation, Portland, Oregon to perform a subsurface investigation at the subject property. At the time of the HAI field work, the property was owned by the EDA Corporation. Four soil borings were drilled during the investigation.

Based upon the results of field and laboratory testing, gasoline was identified in site soils. Groundwater quality was not assessed during the HAI investigation.

A magnetometer survey was also performed as part of HAI's investigation, in order to determine if underground storage tanks (USTs) were still present at the site. The survey identified the presence of a buried metallic object in an area formerly occupied by a waste oil

tank. A report documenting the results of HAI's subsurface investigation was submitted to the EDA Corporation in February, 1994.

2.0 SITE CONDITIONS

The project site is located southeast of the intersection of NW 23rd Avenue and NW Flanders St. in Northwest Portland, Oregon (Plate 1). The area surrounding the subject site includes commercial and residential properties. No active service stations are present within a two block area surrounding the property.

2.1 CLIMATE

The Portland Area has a modified marine climate with a mean annual precipitation rate of 37 inches. Approximately 80% of the annual precipitation falls as rain between the months of October and March. Summers are generally dry and sunny.

2.2 REGIONAL GEOLOGYAND HYDROGEOLOGY

The subject property is located near the western margin of a northwest-southeast trending, sediment-filled structural depression termed the Portland Basin. The general near-surface geology within the basin, and in the Northwest Portland area consists of Quaternary Alluvium. The alluvium consists of silt, sand, and clay, and comprise flood plain deposits of the Willamette and Columbia Rivers.

The Quaternary Alluvium is underlain by silts, clays, sands and occasional gravels of the Pliocene Troutdale Formation. The depth to the top of the Troutdale Formation near the subject site is approximately 100 feet. The thickness of the Troutdale Formation near the subject site is approximately 150 feet. The Troutdale Formation is underlain by the Miocene Columbia River Basalt (CRB). The thickness of the CRB near the subject site is not known.

Groundwater is first encountered in the Northwest Portland Area in the Quaternary Alluvium. However, the primary aquifer is the Troutdale Gravel Aquifer, which occurs at a depth of approximately 100 feet bgs near the subject site.

3.0 SUBSURFACE EXPLORATION AND CONDITIONS

3.1 SUBSURFACE EXPLORATION

Our field exploration began on March 23, 1994, and it was concluded on March 29, 1994. Field activities consisted of drilling and installing three monitoring wells, and developing and sampling the monitoring wells. Bayland Drilling, Woodburn, Oregon, performed the drilling and monitoring well installation. All drill cuttings were placed in 55-gallon drums which were labeled and are currently being stored at the subject site.

Soil samples were collected at five foot intervals in each boring. The samples were obtained using a split-spoon sampler and standard penetration test (SPT) sampling techniques. SPT

sampling methodologies have been described in detail in Appendix B. This sampling, combined with the logging of drilling character, provided the basis of our geologic characterization of the site. Geologic boring logs showing well specifications, sampling intervals, and a graphic representation of the subsurface geology of the subject site, are provided in Appendix C.

Samples were observed and classified in the field by a registered professional geologist from our firm. Representative portions of each sample were collected, placed in air-tight, laboratory prepared Teflon-sealed containers, and were returned to RZA's in-house laboratory for analysis.

Petroleum-like odors were detected during the drilling of monitoring well borings MW-1 and MW-2. Detection of petroleum-like odors is dependent on the olfactory sensitivity of the person classifying the sample, as well as other factors, including air and sample temperature, wind velocity, the length of time the sample is out of the boring, product type, and the degree of product degradation. Because these constraints are not readily quantifiable, and no test standards exist, the detection of petroleum-like odors during drilling should be considered subjective information.

Each soil sample collected was screened for volatile organic compounds using a Photovac Microtip photoionization detector. The organic vapor concentrations measured are shown on the boring logs in Appendix C. Vapor screening procedures are described in Appendix B.

Monitoring well MW-1 was installed to a depth of 39 feet below ground surface (bgs), and monitoring wells MW-2 and MW-3 were installed to a depth of 34 feet bgs. As-built monitoring well dimensions are shown for each monitoring well in the boring logs in Appendix C.

Monitoring wells were developed by a combination of surging and bailing. During well development, 20 gallons of groundwater were removed from each monitoring well. Groundwater was removed throughout the entire water column by lowering and raising the bailer stopping point.

Sampling of each of the installed monitoring wells was carried out on March 29, 1994. A total of 10 gallons of groundwater was purged from monitoring well MW-1, and eight gallons from monitoring wells MW-2 and MW-3 prior to groundwater sampling. Groundwater sampling procedures are described in detail in Appendix B.

The relative top-of-casing elevation of each monitoring well was determined using a rod and construction level. An arbitrary datum, the top of the fire hydrant located near the intersection of NW 23rd Avenue and NW Flanders Street, was assigned an elevation of 100 feet. Water level measurements collected on March 29, 1994 were used in calculating the gradient of the water table underlying the site. A water table contour map showing the approximate locations of the monitoring wells, and the inferred direction of groundwater

migration in the water table aquifer, is presented on Plate 3. Water table measurements and relative top-of-casing elevation data are presented in Table 1.

3.2 SUBSURFACE CONDITIONS

3.2.1 Subsurface Soil Conditions

Soils first encountered under the asphalt and base course at the site consisted of fill material which varied considerably in its composition. At the location of monitoring well boring MW-1, abundant concrete debris was present in the uppermost eight feet. This is probably an indication that a former UST cavity was present at the location of MW-1. Underlying the fill material were very fine- to medium-grained sands and silty sands.

Unconfined groundwater was encountered while drilling between 24 and 26 feet bgs. Groundwater stabilized at a depth of 23 to 26 feet bgs.

3.2.2 Field Volatile Screening

Petroleum-like odors were detected during the drilling of monitoring well boring MW-1 and MW-2. Significantly elevated levels of volatile organic vapors were detected only in monitoring well boring MW-1.

3.2.3 Groundwater

Static groundwater levels were measured immediately prior to monitoring well sampling (March 29, 1994). Groundwater levels ranged from 23.59 to 26.35 feet bgs. The groundwater gradient was found to be dipping towards the northeast, at a gradient of approximately 0.026 vertical feet per lateral foot (Plate 3).

Development and/or sampling purge water from the monitoring wells MW-1 and MW-3 had a detectable gasoline odor, but no sheen. Groundwater removed from monitoring well MW-2 had no odor or sheen. All groundwater extracted from the monitoring wells during development and purging was placed in 55-gallon drums which are currently being stored at the subject site.

4.0 QUANTITATIVE CHEMICAL ANALYSES

Soil samples were evaluated for the presence of petroleum hydrocarbon fuels and constituents. Test methods utilized included ODEQ Method TPH-HCID, ODEQ Method TPH-G, and EPA Method 8020. Groundwater samples collected from each of the monitoring wells were evaluated for the presence of aromatic volatile organic compounds including benzene, toluene, ethylbenzene, and xylenes (BTEX) by EPA Method 8020. Groundwater collected from monitoring well MW-3 was additionally tested for halogenated volatile organic compounds by EPA Method 8010.

Laboratory analyses for this project were carried out at RZA's in-house laboratory, Portland, Oregon. Laboratory reports and chain-of-custody documents for all soil and groundwater analyses are provided in Appendix D. Analytical data for soil and groundwater samples has been summarized in Tables 2 and 3, respectively.

4.1 SOIL ANALYSES

4.1.1 Hydrocarbon Identification (ODEQ Method TPH-HCID)

A single soil sample (RZA1-S5) was analyzed by ODEQ Method TPH-HCID in order to determine the type of petroleum hydrocarbon fuels present in site soils. The analyses for TPH-HCID were conducted using a gas chromatograph with a flame-ionization detector.

Gasoline and diesel range hydrocarbons were detected in the sample analyzed. Based upon the character of the chromatogram, the laboratory determined that the diesel range hydrocarbons detected were gasoline peaks which extended into the diesel range.

4.1.2 Total Petroleum Hydrocarbons as Gasoline (ODEQ Method TPH-G)

This analytical method is utilized to quantify gasoline concentrations in soil samples identified as containing gasoline using ODEQ Method TPH-HCID. The analyses for TPH-G were conducted using a gas chromatograph with a photo-ionization detector.

A total of three soil samples were analyzed by ODEQ Method TPH-G. Gasoline concentrations detected ranged from 85 milligrams per kilogram (mg/kg) to 6550 mg/kg.

4.1.3 Aromatic Volatile Organic Compounds (EPA Method 8020)

Five soil samples were analyzed for BTEX. BTEX were not detected in a soil sample collected at a depth of 20 feet bgs in boring MW-3. Only low levels of total BTEX (<0.52 mg/kg) were detected in two soil samples collected from boring MW-2. Levels of total BTEX as high as 359.5 mg/kg were detected in soil samples collected from boring MW-1.

4.1.4 Flashpoint (EPA Method 1010)

In order to acquire permits for disposal of drill cuttings generated during the investigation, a single soil sample (RZA1-S5) was analyzed for flashpoint. The samples flashed at 88°F.

4.2 GROUNDWATER ANALYSES

4.2.1 Aromatic Volatile Organic Compounds (EPA Method 8020)

Groundwater samples from each of the three monitoring wells were analyzed for BTEX. Total BTEX concentrations ranged from 10.0 micrograms per liter (µg/l) to 8400 µg/l. Benzene concentrations ranged from 4.9 µg/l to 2,300 µg/l.

4.2.2 Halogenated Volatile Organic Compounds (EPA Method 8010)

A single groundwater sample collected from monitoring well MW-3 was submitted for HVOC analysis. HVOCs, including the common gasoline additives EDB and EDC, were not detected in the sample.

4.3 QUALITY CONTROL ANALYSES

A field duplicate, trip blank, and laboratory blank were analyzed for BTEX as a quality control/ quality assurance (QA/QC) measure. BTEX was not detected in the laboratory method blank.

Concentrations of BTEX in the trip blank were below detection limits, with the exception of toluene. However, since concentrations of toluene were greater than 5X the concentration detected in monitoring wells MW-1 and MW-3, only the toluene concentration detected in monitoring well MW-2 need be qualified.

A blind field duplicate collected from monitoring well MW-3 was submitted for laboratory testing. The sample was designated as MW4-A. The relative percent difference (%RPD) between the field duplicate sample and groundwater sample MW3-A ranged from zero to 4.3 %RPD. A %RPD of less than 20 is generally considered to be within an acceptable range for groundwater duplicate samples.

5.0 STATE OF OREGON SOIL AND GROUNDWATER CLEANUP GUIDELINES

5.1 SOIL CLEANUP GUIDELINES

Based upon the results of groundwater testing performed as part of the investigation, it is apparent that groundwater underlying the site has been impacted by fuel hydrocarbon releases. Therefore, site specific soil cleanup levels must be determined by the ODEQ. However, as general guidance, soil matrix cleanup levels are often utilized at groundwater sites. Therefore, a matrix level cleanup score sheet has been completed.

1) **Depth to groundwater**
   Depth to groundwater determined during assessment work performed at the site is approximately 25 feet. If a This results in a score of "10".

2) **Mean annual precipitation**
   The mean annual precipitation is in the Portland Area is less than 45 inches, resulting in a score of "5".

3) **Soil type**
   Based on the soil type containing the first aquifer, fine and silty sands, we assign a rating of "10".

4) **Sensitivity of the uppermost aquifer**
In the area of the project site, the water table aquifer is not currently used for drinking water, but the quality is such that it could be used. This results in a score of **"4"**.

5) **Potential Receptors**

(a) Based on the distance to the nearest well, and taking into account the regional and local groundwater migration direction and gradient, the distance descriptor would be considered **"near"**. It is common knowledge that there are no domestic well users in this vicinity. However, OAR-122-330 requires that one assume "many" rerceptors in lieu of a door-to-door survey.

(b) The number of people at risk, based on the number of people served by drinking water wells within two miles of the site would be deemed to be **"many"**.

(c) The combination of these two factors would give the subject site a score of **"10"**.

The total score for the subject property would be 39, indicating that Level 2 numeric soil clean-up standards could be used as a general soil cleanup guideline for the site. Cleanup standards for Level 2 sites are 500 mg/kg for diesel and other non-gasoline fraction hydrocarbons, as referenced to ODEQ Method TPH-D, or ODEQ Method 418.1 (modified), and 80 mg/kg for gasoline, as referenced to ODEQ Method TPH-G.

5.2 GROUNDWATER CLEANUP GUIDELINES

Guidelines for groundwater cleanup at UST sites were established by the ODEQ in 1992. Basic numeric groundwater cleanup levels were set for BTEX, gasoline additives, and polynuclear aromatic hydrocarbons (PAHs). Groundwater testing performed during the investigation included BTEX and the gasoline additives EDB and EDC. The PAHs are generally associated with diesel, which was not detected at the subject site. Basic numeric groundwater cleanup levels for BTEX are provided below.

Benzene	5 µg/l
Toluene	1,000 µg/l
Ethylbenzene	700 µg/l
Total Xylene	10,000 µg/l
EDB	1 µg/l
EDC	5 µg/l

6.0 CONCLUSIONS AND RECOMMENDATIONS

Our subsurface investigation performed at 330 NW 23rd Avenue has included the installation of three monitoring wells, soil and groundwater sampling, relative surveying of the well heads and determination of the water table gradient, and laboratory testing to determine if the subsurface were impacted by fuel hydrocarbons that would require cleanup.

Subsurface conditions were found to consist of 11 to 17 feet of fill material, underlain by alluvial sands and silty sands. Groundwater levels stabilized between 23.59 and 26.35 feet bgs. Based upon water level measurements collected from site monitoring wells, the water table gradient was found to be dipping towards the northeast at 0.026 vertical feet per lateral foot.

Petroleum hydrocarbons were not detected in site soils sampled in HAI borings B-2 or B-4, or in RZA monitoring well boring MW-3. Elevated gasoline concentrations were detected in HAI borings B-1 and B-3, and in RZA monitoring well borings MW-1 and MW-2.

BTEX was detected in groundwater from monitoring well MW-2, but at concentrations below ODEQ numeric cleanup levels. The BNGCL for benzene was exceeded in MW-1, and the BNGCL for benzene, toluene, and ethylbenzene was exceeded in monitoring well MW-3. HVOCs and gasoline additives EDB and EDC were not detected in site groundwater.

Based upon data collected regarding groundwater migration direction and constituent concentrations, it appears that the lateral extent and magnitude of groundwater contamination has not been fully delineated. Significant BTEX concentrations were detected in monitoring well MW-3 near the eastern (down-gradient) boundary of the site. Therefore, the length of the BTEX groundwater plume in an easterly direction has not been determined. Because soil and groundwater cleanup standards are exceeded we anticipate that cleanup will be required by the ODEQ. Recommendations will be provided under separate cover.

We are pleased to have had the opportunity to assist you on this project. If you have any questions or desire further clarification, do not hesitate to contact the undersigned.

RZA AGRA, Inc.

Leonard C. Farr Jr., Geologic and Environmental Associate

Douglas A. Smith, P.G., Associate

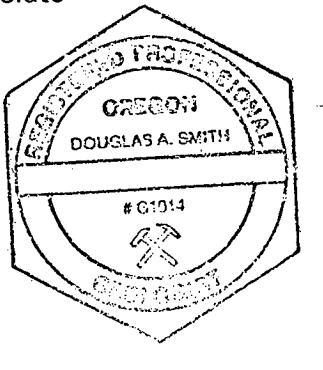


TABLE 1
Water Table Measurements and Survey Data
ROSE'S PARKING LOT
RZA Job #21-7423-00

Monitoring Well #	Depth to Water Top of Casing	Relative Groundwater Elevation	Relative Well/Datum Elevation	Date
Hydrant	-	-	100.00	3/25/94
MW-1	26.35	73.07	99.42	3/29/94
MW-2	23.59	72.28	95.87	3/29/94
MW-3	26.14	72.75	98.89	3/29/94

All units are in feet.

TABLE 2
Soil Analytical Summary (mg/kg)
ROSE'S PARKING LOT
RZA Job #21-7423-00

Date	Sample/Boring ID	Depth	Benzene	Toluene	Ethyl-benzene	Total Xylenes	TPH-HCID			TPH-G	TPH-D	Flashpoint
							Gasoline	Diesel	Heavy Oil			
BORINGS (HAI)												
1/3/94	B-1	13 ft	-	-	-	-	-	-	-	99	-	-
	B-1	18 ft	-	-	-	-	POS. ID	POS. ID	ND	3700	1100	-
	B-1	25.5 ft	-	-	-	-	<20	<50	ND	-	-	-
	B-2	10.5	-	-	-	-	<20	<50	ND	-	-	-
	B-3	10.5 ft	-	-	-	-	-	-	-	<5.0	-	-
	B-3	20.5 ft	-	-	-	-	-	-	-	260	-	-
	B-3	28 ft	-	-	-	-	<20	<50	ND	-	-	-
	B-4	10.5	-	-	-	-	<20	<50	ND	-	-	-
BORINGS (RZA)												
3/23/94	MW-1	15 ft	0.09	0.34	1.1	8.1	-	-	-	290	-	-
	MW-1	25 ft	12.6	60.5	38.9	247.5	POS. ID	POS. ID*	<200	6550	-	88°F
	MW-2	15 ft	<0.05	0.07	0.12	0.33	-	-	-	85	-	-
	MW-2	25 ft	<0.05	<0.05	0.07	<0.05	-	-	-	-	-	-
	MW-3	20 ft	<0.05	<0.05	<0.05	<0.05	-	-	-	-	-	-

* Peaks in the gasoline range extend into the diesel range.

TABLE 3
Groundwater Analytical Summary (µg/L)
ROSE'S PARKING LOT
RZA Job #21-7423-00

Date	Monitoring Well ID	Benzene	Toluene	Ethyl-benzene	Total Xylenes	EDB	EDC
MONITORING WELLS							
3/29/94	MW-1	130	390	98	1570	--	--
	MW-2	4.9	1.4	0.7	3.0	--	--
	MW-3	2300	1200	1200	3700	<1.00	<1.00

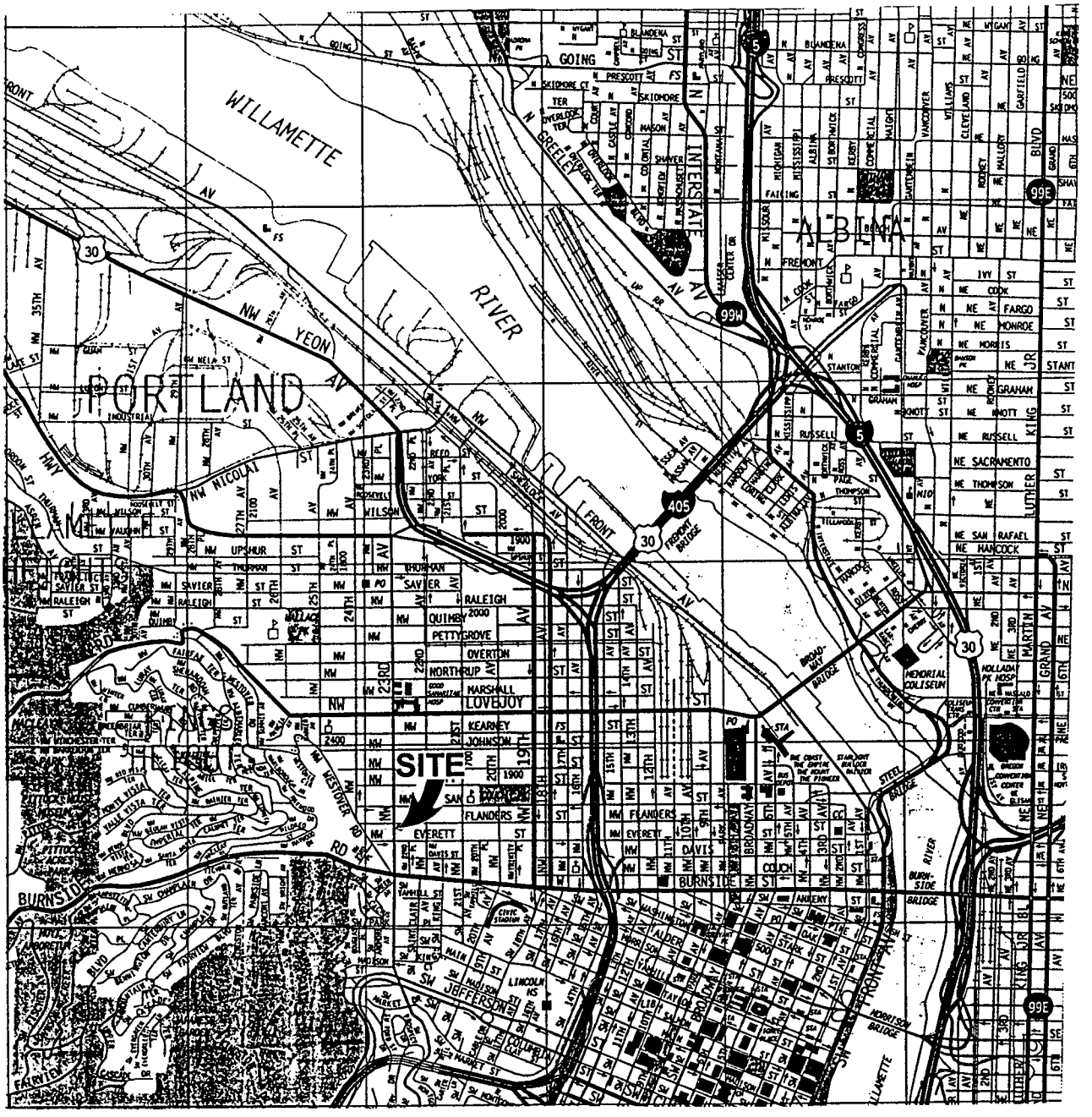


PLATE 1

RZA AGRA, INC.
Engineering & Environmental Services

7477 SW Tech Center Drive
Portland, Oregon 97223-8025

W.O.	21-07423
DESIGN	LCF
DRAWN	MJF
DATE	APR 1994
SCALE	N.T.S.

ROSE'S PARKING LOT
330 NW 23RD AVENUE
PORTLAND, OREGON

SITE LOCATION PLAN

DRAWING NO. \21\07423\LOCATION.DWG

APPENDIX A

WAPR Report

Sandborne Fire Insurance Maps

RECEIVED MAR 3 1 1994

Western American Property Research

401 SW Fourth Avenue, Portland, Oregon 97204
(503) 796-6616 FAX: (503) 229-0615

RECORDED DOCUMENT SEARCH

Order: 567394-P99-
Ref.: MAX BIRNBACH
Charge: $200.00

Effective Date: March 23, 1994

A. The Subject Property is situated in Multnomah County, Oregon, and is described as follows:

Lots 15, 16, and the North one-half of Lot 17, Block 3, MEAD'S ADDITION TO THE CITY OF PORTLAND, in the City of Portland, Multnomah County, Oregon.

B. Pursuant to that certain Application and Agreement for the Issuance of a Recorded Document Search, dated March 29, 1994, and subject to the terms and provisions thereof, FIDELITY NATIONAL TITLE COMPANY OF OREGON certifies that a search of the public records of Multnomah County, Oregon discloses the following Deeds, Contracts, Leases, Assignments and Sub-Leases and/or memoranda thereof, describing the Subject Property, recorded during the period beginning January 1, 1900, and ending on the above effective date.

The public records are those records established under state statutes for the purpose of imparting constructive notice of matters relating to real property to purchasers for value and with knowledge.

C. THIS INFORMATION IS A PLANT SERVICE OF FIDELITY NATIONAL TITLE. IT IS NOT TITLE INSURANCE OR A GUARANTEE. THIS SERVICE DOES NOT INCLUDE ANY SUPPLEMENTAL REPORTS OR ANY OTHER INFORMATION. LIABILITY FOR ERRORS IS LIMITED TO THE AMOUNT CHARGED.

(Continue to page two for list of documents)

RECORDED DOCUMENT SEARCH LIST

1. Deed, including the terms and provisions thereof,

Between			
First Party	: JOSHUA ROBERTS MEAD, ANNA LEOCADIE LEE, STELLA BEHAM MEAD, and WILLIAM WESLEY MEAD, children of STEPHEN MEAD, deceased		
Second Party	: R. L. RUSH		
Recorded	: June 4, 1902		
Book	: 291	Page	: 360

2. Deed, including the terms and provisions thereof,

Between			
First Party	: R. L RUSH and MYRTLE RUSH, his wife		
Second Party	: MAMIE F. RAYMOND		
Recorded	: June 16, 1902		
Book	: 292	Page	: 291

3. Deed, including the terms and provisions thereof,

Between			
First Party	: *		
Second Party	: GEORGE LAWRENCE		
Recorded	: May 9, 1904		
Book	: 320	Page	: 396

*First Party : JOSHUA ROBERTS MEAD, ANNA LEOCADIE LEE, STELLA BAHEM MEAD, and WILLIAM WESLEY MEAD, children of STEPHEN MEAD, deceased, and under his last will and testment

4. Deed, including the terms and provisions thereof,

Between	: MAMIE F. RAYMOND and W.H. RAYMOND		
First Party	: E. HENRY WEMME		
Second Party	: October 25, 1909		
Recorded	: 329	Page	: 151
Book			

5. Deed, including the terms and provisions thereof,

Between			
First Party	: E. HENRY WEMME		
Second Party	: R.L. RUSH		
Recorded	: June 5, 1905		
Book	: 336	Page	: 420

6. DEED, including the terms and provisions thereof,

Between			
First Party	: R.L. RUSH and MYRTLE RUSH, his wife		
Second Party	: GEO. W. LAWRENCE SENIOR		
Recorded	: November 7, 1905		
Book	: 345	Page	: 351

7. DEED, including the terms and provisions thereof,

Between			
First Party	: GEORGE LAWRENCE and ANNIET LAWRENCE		
Second Party	: GEORGE LAWRENCE ESTATE CO.		
Recorded	: July 5, 1928		
Book	: 1131	Page	: 353

8. Lease, including the terms and provisions thereof,

Between			
First Party	: GEORGE LAWRENCE ESTATE COMPANY		
Second Party	: SUNSET OIL COMPANY		
Recorded	: October 8, 1953		
Book	: 1625	Page	: 305

9. Assignment of Lease, including the terms and provisions thereof,

Between			
First Party	: SUNSET OIL COMPANY		
Second Party	: WESTWAY PETROLEUM CO.		
Recorded	: October 18, 1955		
Book	: 1750	Page	: 596

10. Cancellation Agreement, including the terms and provisions thereof,

Between			
First Party	: GEORGE LAWRENCE ESTATE COMPANY, an Oregon Corporation		
Second Party	: SUNSET OIL COMPANY, a California corporation, Assigned to WESTWAY PETROLEUM CO., A California Corporation		
Recorded	: February 3, 1964		
Book	: 2205	Page	: 606

11. Lease, including the terms and provisions thereof,

Between			
First Party	: GEORGE LAWRENCE ESTATE CO., an Oregon Corporation		
Second Party	: THE AMERICAN OIL COMPANY, a Maryland Corporation		
Recorded	: August 27, 1964		
Book	: 116	Page	: 150

12. Assignment of Lease, including the terms and provisions thereof,

Between			
First Party	: THE AMERICAN OIL COMPANY, a Maryland corporation		
Second Party	: GULL OIL COMPANY, a Washington Corporation		
Recorded	: March 11, 1971		
Book	: 776	Page	: 913

13. Real Estate Contract, including the terms and provisions thereof,

Between			
First Party	: GEORGE LAWRENCE ESTATE CO., an Oregon corporation		
Second Party	: EDA CORPORATION, an Oregon Corporation		
Recorded	: March 3, 1978		
Book	: 1245	Page	: 2262

14. Agreement, including the terms and provisions thereof,

Between			
First Party	: GEORGE LAWRENCE ESTATE CO. an Oregon Corporation		
Second Party	: GULL OIL CO., A Washington Corporation		
Recorded	: March 3, 1978		
Book	: 1245	Page	: 2269

15. Warranty Deed, including the terms and provisions thereof,

Between	
First Party	: EDA CORPORATION
Second Party	: MAX BIRNBACH
Recorded	: January 12, 1994
Fee No.	: 94-5974

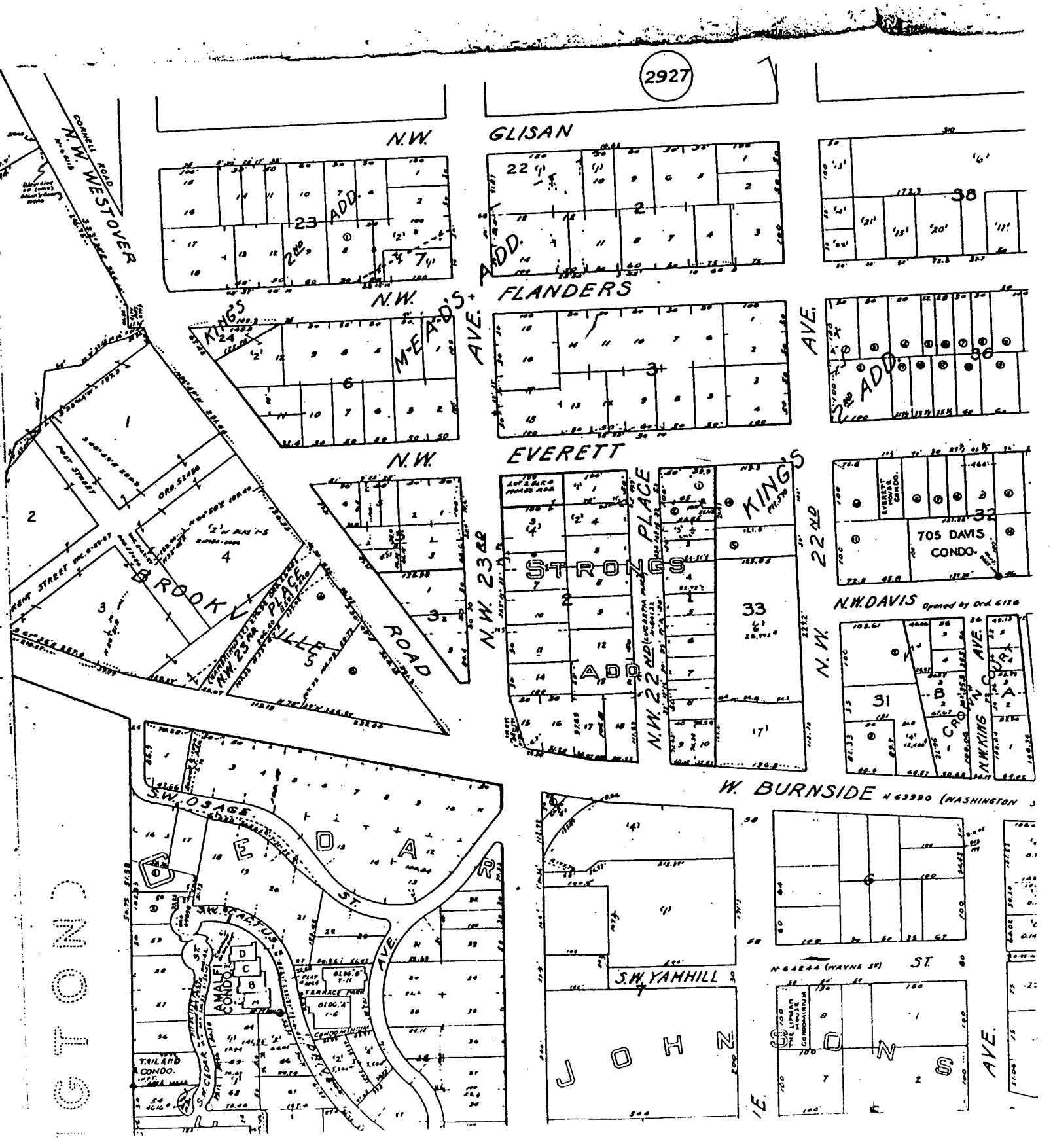
16. Assignment of Contract, including the terms and provisions thereof,

Between	
First Party	: MAX BIRNBACH
Second Party	: EDA CORPORATION
Recorded	: January 12, 1994
Fee No.	: 94-5975

Fidelity National Title Co. of Oregon

The sketch below is made solely for the purpose of assisting in locating said premises and the Company assumes no liability for variations, if any, in dimensions and location ascertained by actual survey.

MAP 3027



APPENDIX B

Sampling Methods

1.0 DRILLING METHODS AND SOIL SAMPLING PROCEDURES

1.1 Standard Penetration Test Sampling

Subsurface soil sampling conducted by RZA was accomplished through the use of a hollow-stem drilling rig and Standard Penetration Test (SPT) sampling, as described in ASTM D-1586. Blow counts collected during hammering of the sample are provided on the boring logs, Appendix B. This method of sampling allows soil samples to be collected ahead of the drilling apparatus, and any contaminants they may introduce.

After retrieving the split barrel sampler, it was opened on a clean surface. A representative portion of the soils within the sampler were transferred immediately to appropriate sample containers, and to an air-tight polyethylene bag. Care was to minimize disturbance and volatilization of the sample. Sample containers were labeled with the following information: 1) project name, 2) job number, 3) date, 4) time, 5) sample designation, and 6) initials of sampler. After labeling was completed, the containers were placed in a cooler which was used to preserve the samples, and to transport the samples to a laboratory. The sample which was placed in the polyethylene bag was used for field volatile screening and for descriptive purposes, in accordance with the procedures described in Section 2.0 and 3.0.

Between sampling events, the sampler was decontaminated using the following procedure. The sampler was first thoroughly washed in a non-phosphatic detergent and tap water solution, followed by a tap water rinse. The sampler was then triple-rinsed with deionized water.

1.2 Field Volatile (Head-space) Screening

In order to measure levels of volatile organic compound vapors within the soil samples collected, field head-space screening was performed utilizing a Photovac Microtip photoionization detector (PID). The PID probe was inserted into the polyethylene, and VOCs were measured while the sample was being agitated. No outside air was allowed to enter the bag while taking the measurement. The results of soil screening are shown on the boring logs, Appendix B.

1.3 Soil Descriptions

Soil samples were described using the following modifiers: 1) density, 2) moisture, 3) color, 4) classification utilizing the Unified Soil Classification System, and 5) texture.

1.4 Soil Boring Decontamination Procedures

All down-hole drilling equipment was decontaminated between each drilling location to prevent cross-contamination. The decontamination procedure consisted of: 1) removing all large chunks of soil adhering to the auger with a putty knife, and 2) thoroughly cleaning the auger with a hot pressure washer. All water generated during drilling equipment decontamination was collected, and placed in a 55-gallon drum. The drum is currently being stored at the site as disposal of the wastewater is coordinated.

2.0 MONITORING WELL INSTALLATION PROCEDURES

After attaining total depth in each boring, the borings were converted to monitoring wells. Groundwater was encountered at a depth of approximately 25 feet below grade at the subject site. Screened intervals and lengths were selected so that screens extended a minimum of approximately 7.5 feet below the top of the water table, to account for fluctuations in the water table. An attempt was also made to have a minimum of 7.5 feet of well screen above the top of the water table.

After placement of the well screen and casing in the boring, 10-20 Colorado Silica Sand was placed in the well annulus as the augers were removed. Care was taken to prevent any native soils from bridging the sand pack. The top of the sand pack was installed to a level of approximately two feet above the top of the well screen. The remaining well annulus was filled with coarse Volclay bentonite chips. A flush, traffic grade monument was installed at the surface. All monitoring wells were secured with a locking cap and padlock prior to demobilization from the site. As-built monitoring well dimensions are given for each monitoring well on the boring logs in Appendix C.

3.0 MONITORING WELL DEVELOPMENT AND GROUNDWATER SAMPLING PROCEDURES

Sampling was carried out a minimum of 24 hours after the completion of monitoring well development. A minimum of three wetted casing volumes were purged from each well prior to collecting a groundwater sample. Groundwater samples collected for TPH-G/BTEX analysis were placed in 40 milliliter glass VOA containers sealed with Teflon septa. The groundwater samples were placed expeditiously on-ice and were transported to RZA's in-house laboratory. Rigid chain-of-custody protocols were followed from the time that samples were collected, until the samples were received by the contract laboratory.

APPENDIX C

Boring Logs

PROJECT: ROSE'S PARKING LOT | **START CARD No.: 63348** | **BORING No.: MW-1 (1 OF 2)**

Elevation Reference: Arbitrary
Groundwater Surface Elevation: N / A
Well Completed: 3-23-94
Relative Casing Elevation: 99.42
Boring Method: H S A
Borehole Diameter: 8"

Depth (feet)	SOIL DESCRIPTION	Graphic Log	Sample Type	Blow Counts	Volatile Readings ppm	Ground Water	AS-BUILT DESIGN	ANALYSES
0	Asphalt and base course.						EMCO-WHEAT Flush Monument; Pre-Mix Concrete	
	Gravel FILL with abundant concrete debris.						Locking Cap; Volclay coarse Bentonite Chips	
5			S-1	22	5.8		Casing (Schedule 40 2-inch PVC)	
10	Moist, loose, medium brown, medium to coarse-grained sand FILL.		S-2	7	10.7			
15			S-3	9	697			TPH-G BTEX Flash Point
20	Damp to saturated, medium dense, medium gray, fine to medium-grained SAND with silty sand interbeds. Gasoline-like odor detected in 15, 20, 25, and 30 foot samples.	SP	S-4	13	200		10-20 CSSI	
25			S-5	17	2050	SW; WD	Wellscreen (2-inch PVC with 0.020-inch slots)	TPH-G BTEX
30								

LEGEND

- 2-inch O.D. split-spoon sample with % recovered
- WD — Encountered groundwater level While drilling
- SW — Measured static groundwater level
- Groundwater Analysis (Sample No. Shown)
- BTEX / TPH-G — Soil Analysis (Test Method Shown)

RZA AGRA JOB No. 21-7423-00
Rose's Parking Lot
330 NW 23rd Avenue
Portland, Oregon

RZA AGRA, Inc.
ENGINEERING & ENVRONMENTAL SERVICES
7477 SW Tech Center Drive
Portland, Oregon 97223-8024
Phone (503) 639-3400

Drilling Started: 3-23-94 | Drilling Completed: 3-23-94 | Logged By: LCF

PROJECT: ROSE'S PARKING LOT START CARD No.: 63348 BORING No.: MW-1 (2 OF 2)

Elevation Reference: Arbitrary
Groundwater Surface Elevation: N / A
Well Completed: 3-23-94
Relative Casing Elevation: 99.42
Boring Method: H S A
Borehole Diameter: 8"

Depth (feet)	SOIL DESCRIPTION	Graphic Log	Sample Type	Blow Counts	Volatile Readings	Ground Water	AS-BUILT DESIGN	ANALYSES
30		SP	S-6	11	1550 ppm		Wellscreen (2-inch PVC with 0.020-inch slots)	
	Saturated, loose medium brown, very fine-grained silty SAND.							
35		SM	S-7	8	169		10-20 CSSI	
			S-8	4	240		Slip Cap With Screws	
	Total Depth = 39 feet							
40								
45								
50								
55								
60								

LEGEND

- 2-inch O.D. split-spoon sample with % recovered
- WD — Encountered groundwater level While drilling
- SW — Measured static groundwater level
- Groundwater Analysis (Sample No. Shown)
- BTEX / TPH-G — Soil Analysis (Test Method Shown)

RZA AGRA JOB No. 21-7423-00
Rose's Parking Lot
330 NW 23rd Avenue
Portland, Oregon

RZA AGRA, Inc.
ENGINEERING & ENVRONMENTAL SERVICES
7477 SW Tech Center Drive
Portland, Oregon 97223-8024
Phone (503) 639-3400

Drilling Started: 3-23-94 Drilling Completed: 3-23-94 Logged By: LCF

PROJECT: ROSE'S PARKING LOT

START CARD No.: 63349

BORING No.: MW-2 (1 OF 2)

Elevation Reference: Arbitrary

Groundwater Surface Elevation: N / A

Well Completed: 3-23-94

Relative Casing Elevation: 95.87

Boring Method: H S A

Borehole Diameter: 8"

Depth (feet)	SOIL DESCRIPTION	Graphic Log	Sample Type	Blow Counts	Volatile Readings ppm	Ground Water	AS-BUILT DESIGN	ANALYSES
0	Asphalt and base course.						EMCO-WHEAT Flush Monument; Pre-Mix Concrete; Locking Cap; Volclay coarse Bentonite Chips	
	Dry, medium dense, medium brown, silty very fine-grained sand FILL.		S-1	18	3.1		Casing (Schedule 40 2-inch PVC)	
5								
	Dry, dense gravel FILL.		S-2	40	2.1			
10								
	Moist, dense, dark gray silty gravel FILL.		S-3	42	22.6			TPH-G BTEX
15								
			S-4	10	8.3			
20	Moist to saturated, loose medium to dark gray, fine to very fine-grained SAND with medium-grained sand interbeds.	SM				WD SW	10-20 CSSI	
			S-5	7	8.9		Wellscreen (2-inch PVC with 0.020-inch slots)	BTEX
25								
30								

LEGEND

- 2-inch O.D. split-spoon sample with % recovered
- WD — Encountered groundwater level While drilling
- SW — Measured static groundwater level
- Groundwater Analysis (Sample No. Shown)
- BTEX / TPH-G — Soil Analysis (Test Method Shown)

RZA AGRA JOB No. 21-7423-00
Rose's Parking Lot
330 NW 23rd Avenue
Portland, Oregon

RZA AGRA, Inc.
ENGINEERING & ENVRONMENTAL SERVICES
7477 SW Tech Center Drive
Portland, Oregon 97223-8024
Phone (503) 639-3400

Drilling Started: 3-23-94

Drilling Completed: 3-23-94

Logged By: LCF

PROJECT: ROSE'S PARKING LOT | START CARD No.: 63349 | BORING No.: MW-2 (2 OF 2)

Elevation Reference: Arbitrary | Well Completed: 3-23-94 | Boring Method: H S A

Groundwater Surface Elevation: N / A | Relative Casing Elevation: 95.87 | Borehole Diameter: 8"

Depth (feet)	SOIL DESCRIPTION	Graphic Log	Sample Type	Blow Counts	Volatile Readings	Ground Water	AS-BUILT DESIGN	ANALYSES
30	Moist to saturated, loose medium to dark gray, fine to very fine-grained SAND with medium-grained sand interbeds.	SM	S-6	11	0 ppm		10-20 CSSI; Wellscreen (2-inch PVC with 0.020-inch slots)	
			S-7	7	0		Slip Cap With Screws	
	Total Depth = 34 feet							
35								
40								
45								
50								
55								
60								

LEGEND

- 2-inch O.D. split-spoon sample with % recovered
- WD — Encountered groundwater level While drilling
- SW — Measured static groundwater level
- Groundwater Analysis (Sample No. Shown)
- BTEX / TPH-G — Soil Analysis (Test Method Shown)

RZA AGRA JOB No. 21-7423-00
Rose's Parking Lot
330 NW 23rd Avenue
Portland, Oregon

RZA AGRA, Inc.
ENGINEERING & ENVRONMENTAL SERVICES
7477 SW Tech Center Drive
Portland, Oregon 97223-8024
Phone (503) 639-3400

Drilling Started: 3-23-94 | Drilling Completed: 3-23-94 | Logged By: LCF

PROJECT: ROSE'S PARKING LOT | START CARD No.: 63350 | BORING No.: MW-3 (1 OF 2)

Elevation Reference: Arbitrary | Well Completed: 3-23-94 | Drilling Method: H S A

Groundwater Surface Elevation: N / A | Relative Casing Elevation: 98.89 | Borehole Diameter: 8"

Depth (feet)	SOIL DESCRIPTION	Graphic Log	Sample Type	Blow Counts	Volatile Readings ppm	Ground Water	AS-BUILT DESIGN	ANALYSES
0	Asphalt and base course.						EMCO-WHEAT Flush Monument; Pre-Mix Concrete; Locking Cap; Volclay coarse Bentonite Chips	
5	Dry to damp, medium dense, red brown, silty gravel FILL.		S-1	20	4.8		Casing (Schedule 40 2-inch PVC)	
10			S-2	16	4.1			
15			S-3	16	3.8			
20	Damp to saturated, medium dense, medium brown to dark gray, very fine to medium-grained SAND.	SM	S-4	9	2.2			BTEX
25			S-5	4		SW	10-20 CSSI; Wellscreen (2-inch PVC with 0.020-inch slots)	
30								

LEGEND

- 2-inch O.D. split-spoon sample with % recovered
- WD — Encountered groundwater level While drilling
- SW — Measured static groundwater level
- Groundwater Analysis (Sample No. Shown)
- BTEX / TPH-G — Soil Analysis (Test Method Shown)

RZA AGRA JOB No. 21-7423-00
Rose's Parking Lot
330 NW 23rd Avenue
Portland, Oregon

RZA AGRA, Inc.
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7477 SW Tech Center Drive
Portland, Oregon 97223-8024
Phone (503) 639-3400

Drilling Started: 3-23-94 | Drilling Completed: 3-23-94 | Logged By: LCF

PROJECT: ROSE'S PARKING LOT | START CARD No.: 63350 | BORING No.: MW-3 (2 OF 2)

Elevation Reference: Arbitrary
Groundwater Surface Elevation: N / A
Well Completed: 3-23-94
Relative Casing Elevation: 98.89
Boring Method: H S A
Borehole Diameter: 8"

Depth (feet)	SOIL DESCRIPTION	Graphic Log	Sample Type	Blow Counts	Volatile Readings	Ground Water	AS-BUILT DESIGN	ANALYSES
30	Damp to saturated, medium dense, medium brown to dark gray, very fine to medium-grained SAND.	SM	S-6	7	5.2 ppm		10-20 CSSI; Wellscreen (2-inch PVC with 0.020-inch slots)	
			S-7	13	4.8		Slip Cap With Screws	
	Total Depth = 34 feet							
35								
40								
45								
50								
55								
60								

LEGEND

- 2-inch O.D. split-spoon sample with % recovered
- WD — Encountered groundwater level While drilling
- SW — Measured static groundwater level
- Groundwater Analysis (Sample No. Shown)
- BTEX / TPH-G — Soil Analysis (Test Method Shown)

RZA AGRA JOB No. 21-7423-00
Rose's Parking Lot
330 NW 23rd Avenue
Portland, Oregon

RZA AGRA, Inc.
ENGINEERING & ENVRONMENTAL SERVICES
7477 SW Tech Center Drive
Portland, Oregon 97223-8024
Phone (503) 639-3400

Drilling Started: 3-23-94 | Drilling Completed: 3-23-94 | Logged By: LCF

APPENDIX D

Laboratory Reports

Chain-of-Custody Documents

RZA AGRA, Inc.
(Formerly: Rittenhouse-Zeman & Associates, Inc.)
Engineering & Environmental Services

7477 SW Tech Center Drive
Portland, Oregon 97223-8024
(503) 639-3400
FAX (503) 620-7892

April 7, 1994

RZA AGRA, Inc.
7477 SW Tech Center Drive
Portland Oregon, 97223-8024

Attn: Mr. Len Farr

SUBJECT: Analytical Results for Project Number 21-07423-00

Dear Mr. Farr:

Attached are the results for the samples submitted on March 29, 1994 from the above referenced project. For your reference, our project number associated with these samples is OR940160.

The samples were analyzed for BTEX by EPA Methods 5030/8020. Sample MW3-A was also analyzed for volatile halocarbons by EPA Methods 5030/8010. All analyses were conducted in accordance with applicable SW-846 QA/QC guidelines. The reported results apply only to the samples submitted.

Please feel free to contact me if you have any questions regarding this report, or if I can be of assistance in any other matter.

Respectfully submitted,

RZA AGRA, Inc.

Sean Gormley, Laboratory Manager

RZA AGRA, Inc.

(Formerly: Rittenhouse-Zeman & Associates, Inc.)
Engineering & Environmental Services

7477 SW Tech Center Drive
Portland, Oregon 97223-8024
(503) 639-3400
FAX (503) 620-7892

Project: Rose's Parking Lot
Project No.: 21-07423-00
Project Manager: Len Farr
Sample Matrix: Water

Service Request No.: OR940160
Report Date: 4/4/94
Report No.: 94016001
C.O.C. No.: 0319

BTEX Compounds
EPA Methods 5030/8020
ug/l(ppb)

Sample Name:	MW4-A	MW3-A	MW2-A	MW1-A	Trip Blank	Lab Blank	Detection
Lab Code:	0160-1(a)	0160-2(a)	0160-3	0160-4	0160-5	0160-MB	Limit
Benzene	2300	2300	4.9	130	ND	ND	0.50
Toluene	1200	1200	1.4	390	0.51	ND	0.50
Ethylbenzene	1200	1200	0.7	98	ND	ND	0.50
m/p-Xylene	2400	2300	2.2	1100	ND	ND	0.50
o-Xylene	1400	1400	0.8	470	ND	ND	0.50
Sample Date:	3/29/94	3/29/94	3/29/94	3/29/94	3/29/94	4/1/94	
Analysis Date:	4/2/94	4/2/94	4/2/94	4/2/94	4/2/94	4/2/94	**Control Limits**
Surrogate Recovery:							
a,a,a - Trifluorotoluene:	80.8%	79.0%	83.7%	85.4%	79.3%	73.9%	51.4%-133%

ND Not Detected

(a) Results are from a 1:50 dilution.

Signature of Chemist

Laboratory Manager

AGRA
Earth & Environmental Group

RZA AGRA, Inc.

(Formerly: Rittenhouse-Zeman & Associates, Inc.)
Engineering & Environmental Services

7477 SW Tech Center Drive
Portland, Oregon 97223-8024
(503) 639-3400
FAX (503) 620-7892

Project: Rose's Parking Lot
Project No.: 21-07423-00
Project Manager: Len Farr
Sample Matrix: Water

Service Request No.: OR940160
Report Date: 4/6/94
Report No.: 94016002
C.O.C. No.: 0319

Volatile Organic Halocarbons
EPA Methods 5030/8010
ug/l (ppb)

Sample Name:	MW3-A	Lab Blank	**Detection**
Lab Code:	0160-2	0160-MB	**Limit**
Bromodichloromethane	ND	ND	0.50
Bromoform	ND	ND	0.50
Bromomethane	ND	ND	1.00
Carbon Tetrachloride	ND	ND	0.50
Chlorobenzene	ND	ND	0.50
Chloroethane	ND	ND	1.00
2-Chloroethylvinyl ether	ND	ND	0.50
Chloroform	ND	ND	0.50
Chloromethane	ND	ND	1.00
Dibromochloromethane	ND	ND	0.50
1,2-Dibromoethane(EDB)	ND	ND	0.50
1,2-Dichlorobenzene	ND	ND	0.50
1,3-Dichlorobenzene	ND	ND	0.50
1,4-Dichlorobenzene	ND	ND	0.50
1,1-Dichloroethane	ND	ND	0.50
1,2-Dichloroethane(EDC)	ND	ND	0.50
1,1-Dichloroethene	ND	ND	0.50
C-1,2-Dichloroethene	ND	ND	0.50
T-1,2-Dichloroethene	ND	ND	0.50
1,2-Dichloropropane	ND	ND	0.50
C-1,3-Dichloropropene	ND	ND	0.50
T-1,3-Dichloropropene	ND	ND	0.50
Methylene Chloride	ND	ND	0.50
1,1,2,2-Tetrachloroethane	ND	ND	0.50
Tetrachloroethene (PCE)	ND	ND	0.50
1,1,1-Trichloroethane (TCA)	ND	ND	0.50
1,1,2-Trichloroethane	ND	ND	0.50
Trichloroethene (TCE)	ND	ND	0.50
Trichlorofluoromethane	ND	ND	0.50
Vinyl Chloride	ND	ND	1.00
Sample Date:	3/29/94	4/2/94	
Analysis Date:	4/2/94	4/2/94	

ND Not Detected

AGRA
Earth & Environmental Group

RZA AGRA, Inc.
(Formerly: Rittenhouse-Zeman & Associates, Inc.)
Engineering & Environmental Services

7477 SW Tech Center Drive
Portland, Oregon 97223-8024
(503) 639-3400
FAX (503) 620-7892

ANALYSIS
EPA Methods 8010

Surrogate Recoveries:

Sample Name:	MW3-A	Lab Blank	**Control**
Lab Code:	0160-2	0160-MB	**Limits**
Bromochloromethane:	78.9%	96.6%	72.7%-132%
1,4 - Dichlorobutane:	87.2%	77.9%	77.7%-123%
a,a,a-Trifluorotoluene	103%	96.9%	51.4%-133%

Signature of Chemist

Laboratory Manager

RZA AGRA, Inc.
(Formerly: Rittenhouse-Zeman & Associates, Inc.)
Engineering & Environmental Services
7477 SW Tech Center Drive • Portland, OR 97223-8024
(503) 639-3400 • FAX (503) 620-7892

Chain-of-Custody Record / Laboratory Analyses Request

Project: Rose's Parking Lot Job #: 7433
Client: Kell, Alterman, and Runstein
Project Manager: Len Farr Phone #: 639-3400
Sampler's Name: Phone #:
Sampler's Signature: Len Farr

Analysis Requested: (Circle, Check Box, or Write Preferred Method In Box)

Sample I.D. #	Date	Time	Preserv.	Matrix	Halogenated Volatiles EPA 601 EPA 8010	Volatile Aromatics EPA 602 EPA 8020	BTXE or BTXE / TPH-G	WA. TPH-G or OR. TPH-G	WA. TPH-D or OR. TPH-D	Fuel Scan / TPH by GC 8015-modified	GC Fingerprint / HCID	WA. 418.1 Modified or OR. 418.1 Modified	GC / MS Volatiles	GC / MS Semi Volatiles	Total Metals ICP AA Other	TC LP Metals	pH Cond. Alk Color			# of Containers	Comments
1. MW4-A	3.29.94	10:00	4°C	Water			X														↑ gasoline odor
2. MW3-A	↓	10:22	and	↓	X		X														
3. MW2-A		10:40	HCl				X														
4. MW1-A		10:55	↓	↓			X														gasoline odor
5. Trip	↓	—																			
6.																					
7.																					
8.																					
9.																					
10.																					

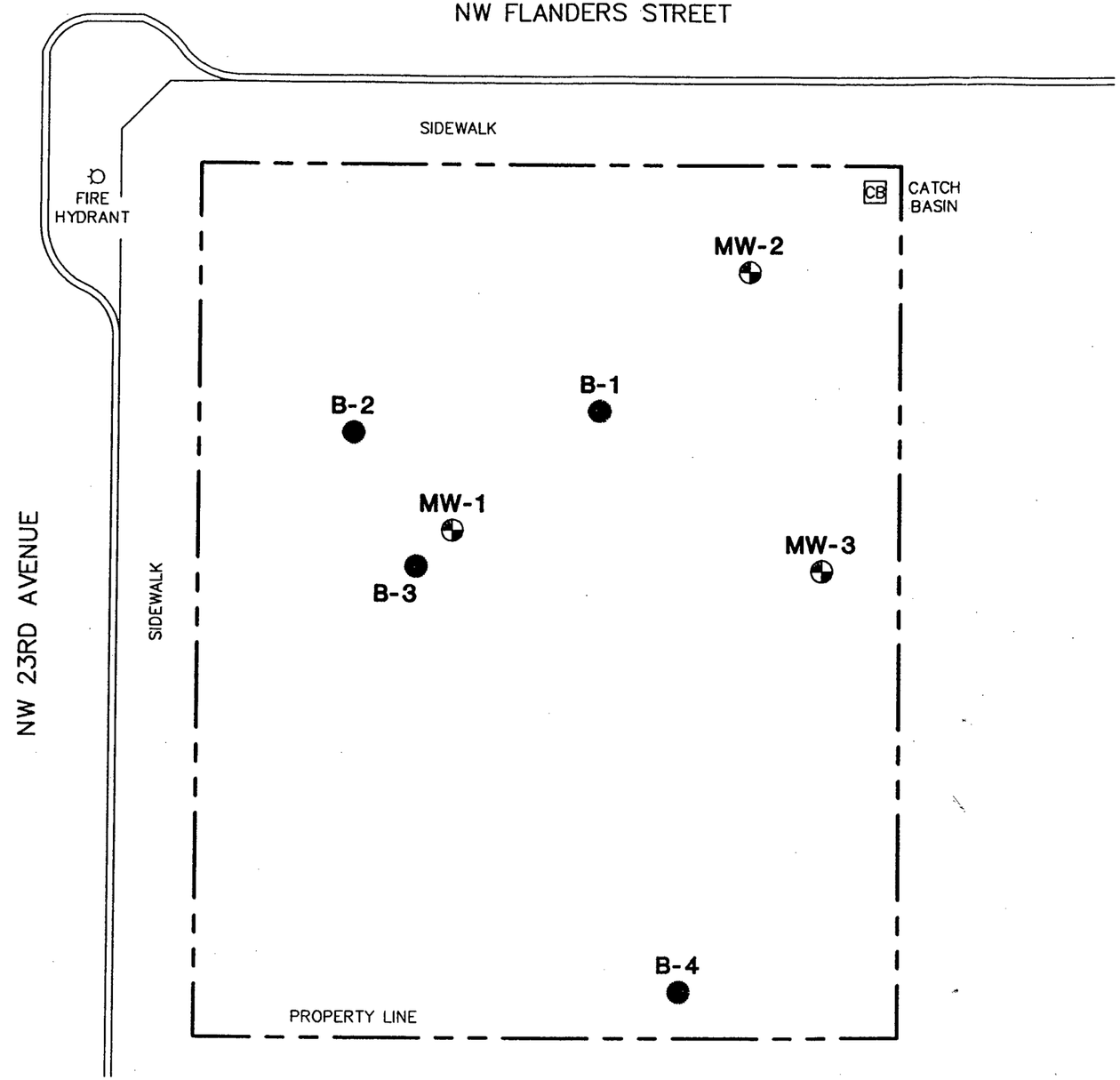
Relinquished by RZA:	Relinquished by:	Relinquished by:	Laboratory:	Sample Receipt:
Signature: Len Farr	Signature:	Signature:		
Printed Name: Len Farr	Printed Name:	Printed Name:	Shipping I.D.#	Total # Containers:
Firm: RZA AGRA	Firm:	Firm:	Carrier:	Condition of Containers:
Date/Time: 3/29/94/12:00	Date/Time:	Date/Time:	DOT Designation:	Condition of Seals:

Received by:	Received by:	Received by:	Special Instructions/Comments:
Signature:	Signature:	Signature:	
Printed Name: Tim Dean	Printed Name:	Printed Name:	
Firm: RZA-AGRA	Firm:	Firm:	
Date/Time: 3/29/94/12:07pm	Date/Time:	Date/Time:	

DISTRIBUTION: WHITE & PINK returned to project manager, YELLOW - lab.

Page ____ of ____.

SERVICE REQUEST #:_____



LEGEND

MW-3 — MONITORING WELL NUMBER AND LOCATION (INSTALLED BY RZA)

B-4 — SOIL BORING NUMBER AND LOCATION (INSTALLED HY HAI, JAN. 1994)

0 20 40

SCALE IN FEET

PLATE 2

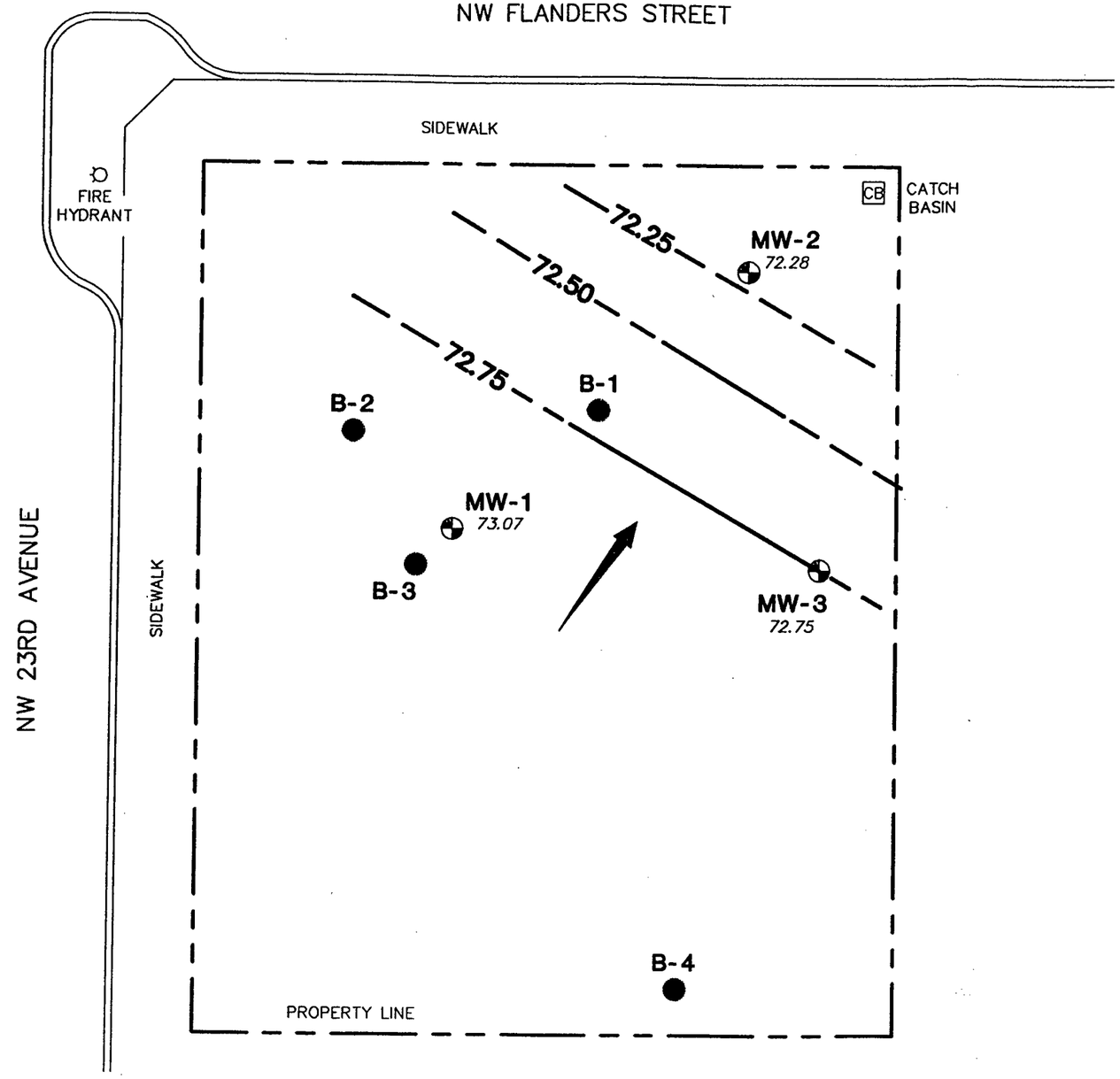
RZA AGRA, INC.
Engineering & Environmental Services
7477 SW Tech Center Drive
Portland, Oregon 97223-8025

W.O.	21-07423
DESIGN	LCF
DRAWN	MJF
DATE	APR 1994
SCALE	1"=20'

ROSE'S PARKING LOT
330 NW 23RD AVENUE
PORTLAND, OREGON

SITE PLAN

DRAWING NO. \21\07423\SITE.DWG



LEGEND

MW-3 — MONITORING WELL NUMBER AND LOCATION (INSTALLED BY RZA)

B-4 — SOIL BORING NUMBER AND LOCATION (INSTALLED HY HAI, JAN. 1994)

–00.00– — INFERRED GROUNDWATER SURFACE ELEVATION CONTOUR IN FEET

00.00 — SPOT GROUNDWATER SURFACE ELEVATION IN FEET

INFERRED DIRECTION OF GROUNDWATER MIGRATION

0 20 40

SCALE IN FEET

PLATE 3

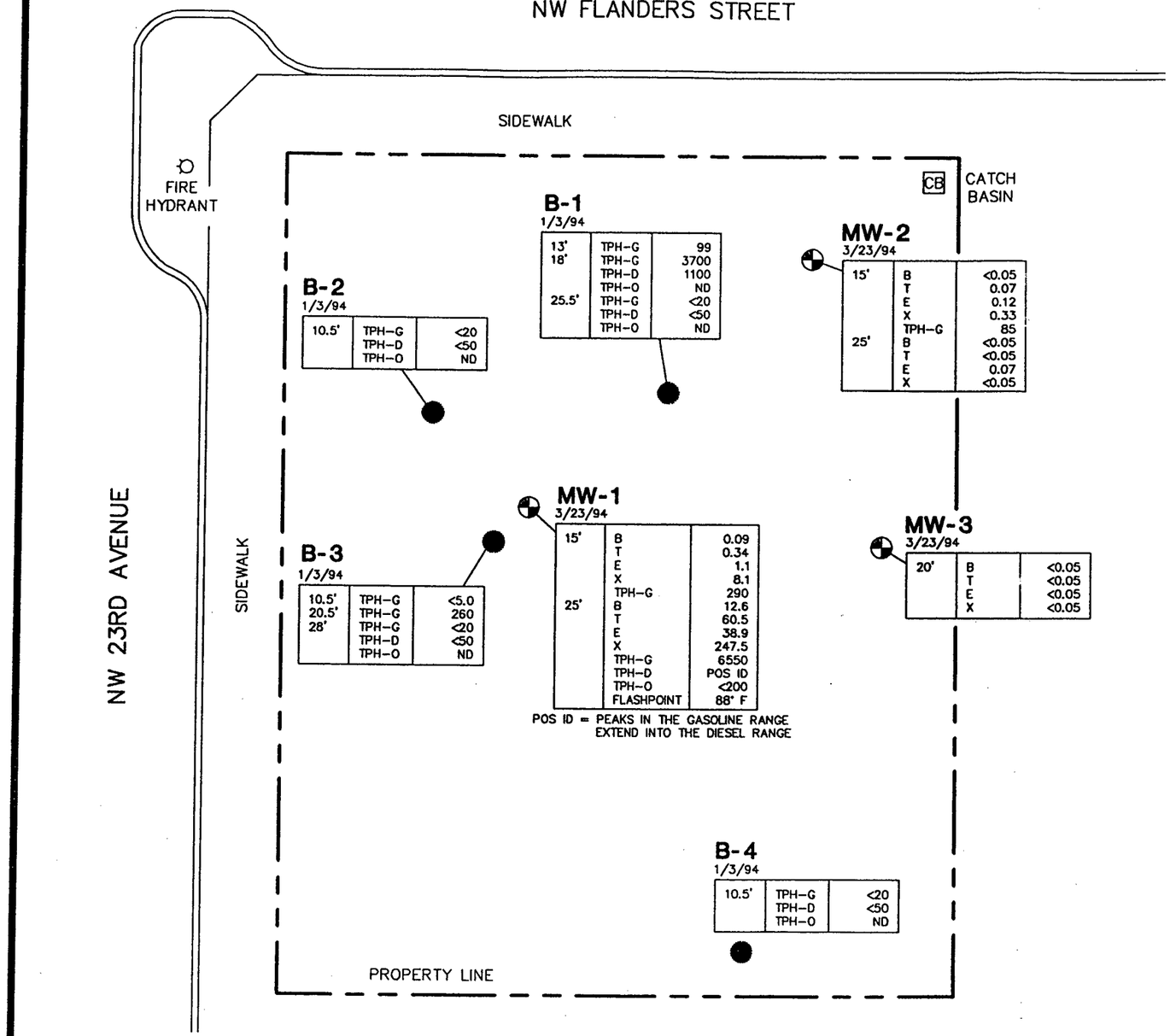
RZA AGRA, INC.
Engineering & Environmental Services
7477 SW Tech Center Drive
Portland, Oregon 97223–8025

W.O.	21–07423
DESIGN	LCF
DRAWN	MJF
DATE	APR 1994
SCALE	1"=20'

ROSE'S PARKING LOT
330 ~~NW~~ 23RD AVENUE
PORTLAND, OREGON

GROUNDWATER SURFACE ELEVATION CONTOUR MAP FOR 29 MARCH 1994

DRAWING NO. \21\07423\GW-03-94.DWG



POS ID = PEAKS IN THE GASOLINE RANGE EXTEND INTO THE DIESEL RANGE

LEGEND

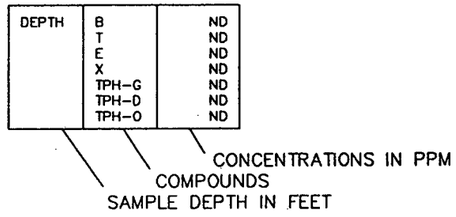
MW-3 — MONITORING WELL NUMBER AND LOCATION (INSTALLED BY RZA)

B-4 — SOIL BORING NUMBER AND LOCATION (INSTALLED HY HAI, JAN. 1994)

SOIL ANALYTICAL TEST RESULTS JANUARY AND MARCH 1994

CONCENTRATIONS IN PARTS PER MILLION (PPM)

ND	NOT DETECTED, BELOW METHOD DETECTION LIMITS
B	BENZENE
T	TOLUENE
E	ETHYLBENZENE
X	XYLENES
TPH-G	TOTAL PETROLEUM HYDROCARBONS GASOLINE RANGE (EPA METHOD 8015)
TPH-D	TOTAL PETROLEUM HYDROCARBONS DIESEL RANGE (EPA METHOD 8015)
TPH-O	TOTAL PETROLEUM HYDROCARBONS HEAVY OIL RANGE (EPA METHOD 8015)



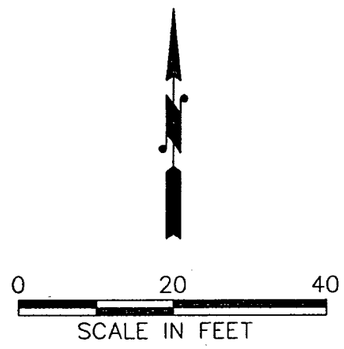


PLATE 4

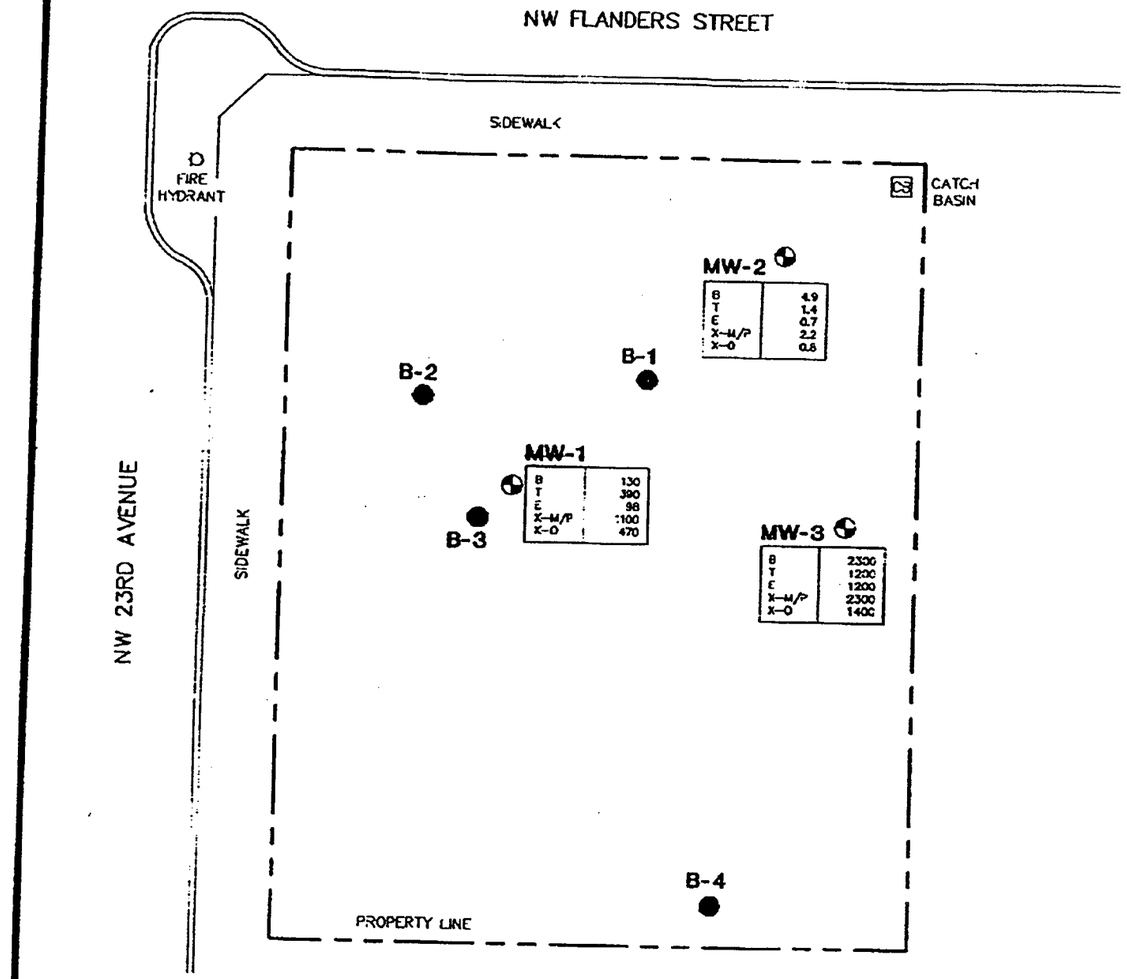
RZA AGRA, INC.
Engineering & Environmental Services
7477 SW Tech Center Drive
Portland, Oregon 97223-8025

W.O.	21-07423
DESIGN	LCF
DRAWN	MJF
DATE	APR 1994
SCALE	1"=20'

ROSE'S PARKING LOT
330 NW 23RD AVENUE
PORTLAND, OREGON

SOIL ANALYTICAL TEST RESULTS FOR JANUARY AND MARCH 1994

DRAWING NO. \21\07423\BTX-0394.DWG



LEGEND

MW-3 — MONITORING WELL NUMBER AND LOCATION (INSTALLED BY RZA)

B-4 — SOIL BORING NUMBER AND LOCATION (INSTALLED BY HAI, JAN. 1994)

SOIL ANALYTICAL TEST RESULTS
29 MARCH 1994

CONCENTRATIONS IN PARTS PER BILLION (PPB)

B	BENZENE
T	TOLUENE
E	ETHYLBENZENE
X-M/P	M/P XYLENE
X-O	O-XYLENE

B	PPB
T	PPB
E	PPB
X-M/P	PPB
X-O	PPB

CONCENTRATIONS IN PPB
COMPOUNDS

0 20 40
SCALE IN FEET

PLATE 5

RZA AGRA, INC.
Engineering & Environmental Services
7477 SW Tech Center Drive
Portland, Oregon 97223-8025

W.O.	21-07423
DESIGN	LCF
DRAWN	MJF
DATE	APR 1994
SCALE	1"=20'

ROSE'S PARKING LOT
330 NW 23RD AVENUE
PORTLAND, OREGON

GROUNDWATER ANALYTICAL TEST RESULTS FOR 29 MARCH 1994

DRAWING NO. \21\07423\BT-0394A.DWG

N. W. 23RD AV. (ST. N.)

N.W. HOYT

N.W. GLISAN

N.W. FLANDERS

N.W. EVERETT

2616

22 Apartments

4 Apts

4-Apts.

BOARD & RM'S.

4 Apts

3 Apts.

8-D.

24-APARTMENTS (VENO.)

OFF.

HOTEL CAMPBELL

IR. BEAMS IR. POSTS

OFF.

2611

2614

OFF'S

F.P. 1963 (CONC.) A-1-a

GREASING

OFF.

GAS & OIL

(12.)

3-APTS.

1965

6" W. PIPE

2615

AUTO BODY REP'G & PAINTG

IRON WOOD POSTS, PILASTER WALLS, BEAM & REINF CONC. CONC. FL

4-F.

C. B. & B. FACED

(VEND.)

15-APTS.

WIRE FENCE

TRANSFMR. STAND.

OFF.

2617

2568

THE BOYS & GIRLS AID SOCIETY

REINF. CONC. PLANTERS AND WOOD UNITS

PARK'G

CLINIC

(CONCRETE) AUTO HOUSES

NURSERY SCHOOL

NURSING HOME

A.F.A.

2567

6-APTS

2 APTS

AUTO

10 APTS

2569

DR'S CLINIC

DR. OFF

REST.

DISPLAY

FURN'E

REINF. CONC. PILASTERS IN POST

PARK'G IN F.P. BST

2570

64

6" W. PIPE

6" N.W. PIPE

6" N.W. 22ND PL

539 23RD AV.

535 23RD AV.

425 419

23 RD. AV. 405

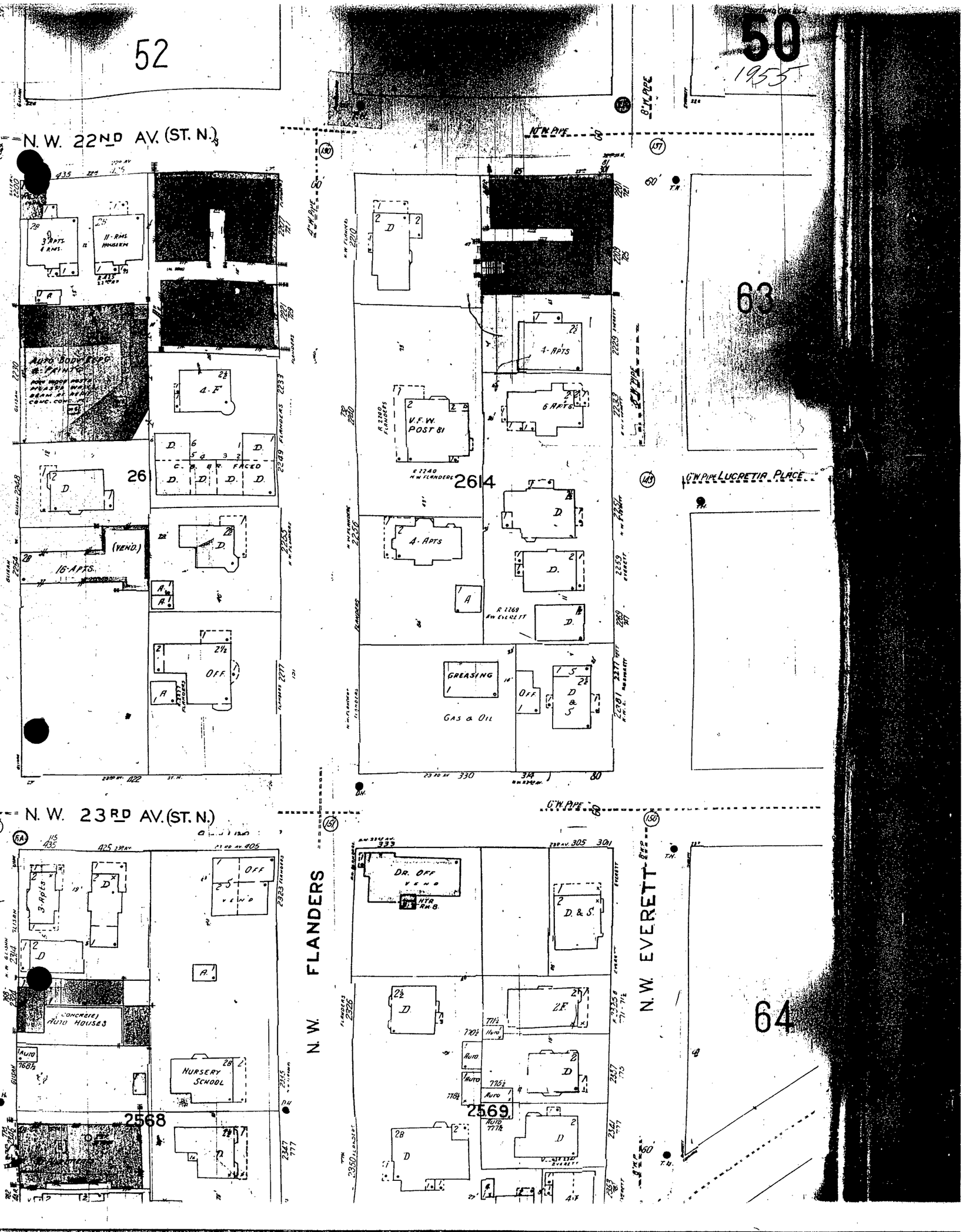
333

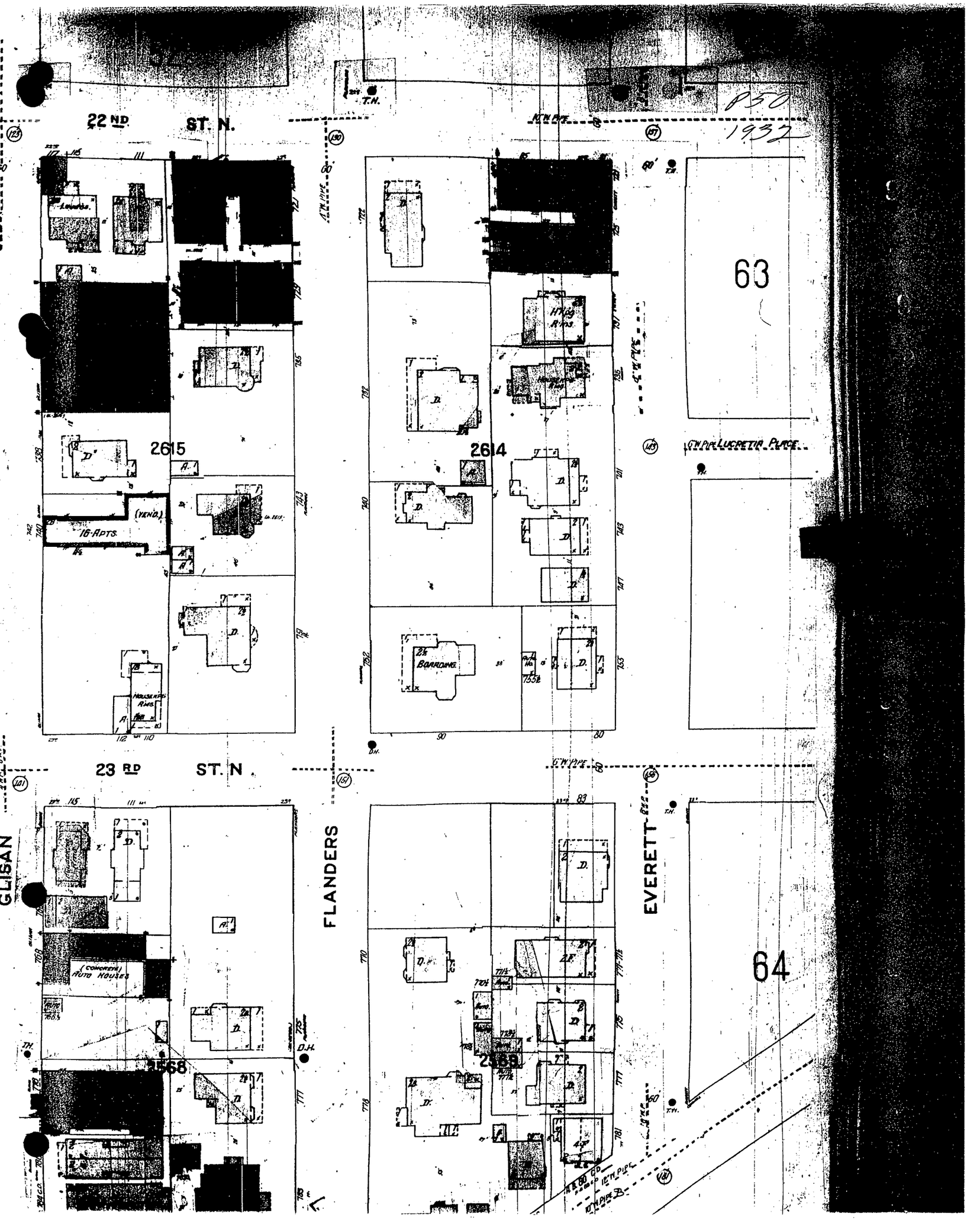
315 311

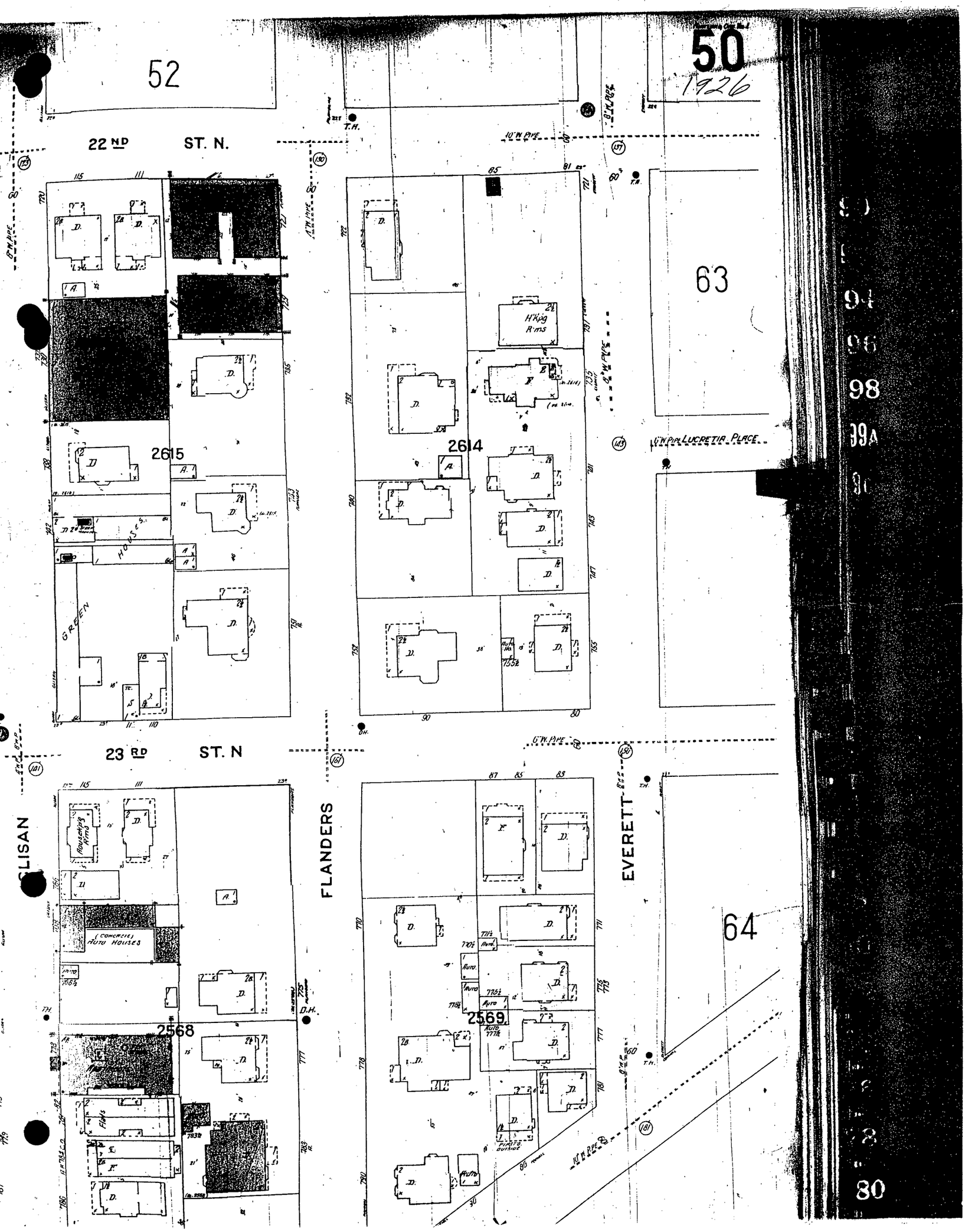
305 301

522 520 510 500 23RD AV.

330 314 80


52
50
1955
N. W. 22ND AV. (ST. N.)
8" W. PIPE
N.W. PIPE
63
4-APTS
6 APTS
V.F.W. POST 81
2614
4-APTS
GREASING
OFF
GAS & OIL
D & S
GW PIPE LUCRETIA PLACE
N. W. 23RD AV. (ST. N.)
GW PIPE
N. W. FLANDERS
DR. OFF
VENO
D. & S.
2F.
2569
N. W. EVERETT
64
3-APTS
CONCRETE AUTO HOUSES
NURSERY SCHOOL
2568
AUTO BODY SHOP
PAINTING
(VEND.)
16-APTS.
OFF.
FACED


22 ND ST. N.
23 RD ST. N.
FLANDERS
EVERETT
GLISAN
2615
2614
2568
2558
63
64
16 APTS.
(VENDO)
HOUSEKEEPING RMS.
(CONCRETE) AUTO HOUSES
BARBOME
LUCRETIA PLACE
T.H.
D.H.
P50
1932


50
1926
52
22 ND ST. N.
63
64
2615
2614
2568
2569
23 RD ST. N
FLANDERS
EVERETT
LUCRETIA PLACE
GREEN HOUSES
H'Kpg Rms
Housekpg Rms
(CONCRETE) AUTO HOUSES
Auto
T.H.
D.H.
G.W. PIPE
S.W. PIPE
N.W. PIPE
94
96
98
99A
80

UST CLEANUP TELEPHONE USE REPORT

CALL FROM/TO: Charlie Williamson DATE: 2-18-94

WITH: attorney for TIME: _____

TELEPHONE NO: ( ) 222-3531

REGARDING: Rose's Parking Lot

FILE NO: 26-94-025

SUMMARY OF CALL

Need 90 days for 20 day report because they're ~~bidding~~ putting out bids to do next phases of work. Also working w/ 3rd Party - Gulf O.I. Re Approved. Requested that they notify us if they find impacted gw. Even if report don't ready.

R Segal

Staff Signature

Oregon

DEPARTMENT OF ENVIRONMENTAL QUALITY

NORTHWEST REGION

Mailed: 2/8/94

DEQ FILE NO.: 26-94-025

SITE NAME: Rose's Parking Lot

SITE ADDRESS: 330 NW 23rd Ave.
Portland, OR

RESPONSIBLE PARTY NAME: Max Birnbach

RP COMPANY NAME: C/o Charles Williamson
Rose's Parking Lot

MAILING ADDRESS: 330 NW 23rd Ave
Portland, OR 97210

DATE RELEASE REPORTED TO DEQ: 2/7/94

A release has been reported from an underground storage tank (UST) system at your facility located at the address listed above. As the responsible party for the facility, you are required to clean up the release according to OAR 340-122-201 through 340-122-360.

An Initial Report Form for UST Cleanup Projects is enclosed, which needs to be completed and returned to this office within twenty (20) days from the date the release was reported. An outline of additional reporting requirements and due dates is also enclosed.

Please read the rules carefully. As the responsible party, you should be aware of the regulations and requirements, even if you have hired a qualified consultant or service provider to do the actual work.

Please reference the DEQ File Number listed in the top left corner of this letter in all future correspondence and reports.

The Department is required to recover oversight costs on projects that we review and provide a final notice of compliance or "closure letter". As provided in the law, all petroleum contamination sites are eligible for recovery of costs by the Department. In order to receive oversight and more effectively schedule your project you will be asked to sign, and return within 30 days, an agreement to pay oversight costs with the Department. Not entering into the agreement does not release you from responsibility for investigation and/or cleanup of the contamination. Please read the attached information on the cost recovery process; contact Darby Bacon at 503-229-6635 if you have questions on cost recovery.

Thank you for your cooperation and continued efforts to comply with the regulations. If you have any questions, please contact the UST Section of Northwest Region at 503-229-5263.

A copy of the UST Cleanup Manual
___ is enclosed
_X_ will be provided upon request

2020 SW Fourth Avenue
Suite 400
Portland, OR 97201-4987
(503) 229-5263 Voice/TDD

KELL, ALTERMAN & RUNSTEIN

CLIFFORD B. ALTERMAN
TED E. RUNSTEIN
LEE DAVIS KELL, CPA*
WAYNE D. PALMER
LLOYD R. SUMMERS
WILLIAM DICKAS
GARY P. COMPA‡
CHARLES R. WILLIAMSON
MARY ELLEN PAGE FARR
ERIC SOGGE
LARRY J. BRANT***‡
THOMAS J. MATSUDA**

DEAN N. ALTERMAN
DANA L. BARNES
TINA-MARIE BASKIN***
WILLIAM LEWIS
THOMAS R. RASK III
NEISHA A. SAXENA

JUDY SHIPLER HENRY
OF COUNSEL

ATTORNEYS AT LAW
SECURITY PACIFIC PLAZA
1001 S.W. FIFTH AVENUE, SUITE 1800
PORTLAND, OREGON 97204-1194

TELEPHONE (503) 222-3531

TELECOPIER (503) 227-2980

RAYMOND M. KELL
(1911-1991)

TELEX NUMBER
4937785 KELMAN

ALSO ADMITTED IN
* CALIFORNIA
** HAWAII
*** WASHINGTON

‡ LL.M. IN TAXATION

February 7, 1994

Department of Environmental Quality
Northwest Region
ATTN: ANDRE POLLOCK
Underground Storage Tank Duty Officer
2020 S. W. Fourth Avenue, Suite 400
Portland, Oregon 97201

RE: LOG NO. 26-94-025 - PARKING LOT/
NORTHWEST FLANDERS AND 23RD AVENUE (330 N. W. 23RD)

Dear Mr. Pollock:

Enclosed please find an environmental study prepared by Hahn and Associates, Inc. with respect to the property at 330 Northwest 23rd Avenue. My client, Max Birnbach, is now the owner of the property; and he just became aware at the end of last week of this report prepared by the previous owner.

We are in the process of soliciting bids to conduct another study to determine the extent of the lateral seepage and attempting to get the prior owners of the property, including Gull Industries, Inc. fka Gull Oil Company, to clean it up or at least assume financial responsibility in its cleanup.

You may communicate with Mr. Birnbach through this office.

Please do not hesitate to call me if I can provide you with any further information whatsoever.

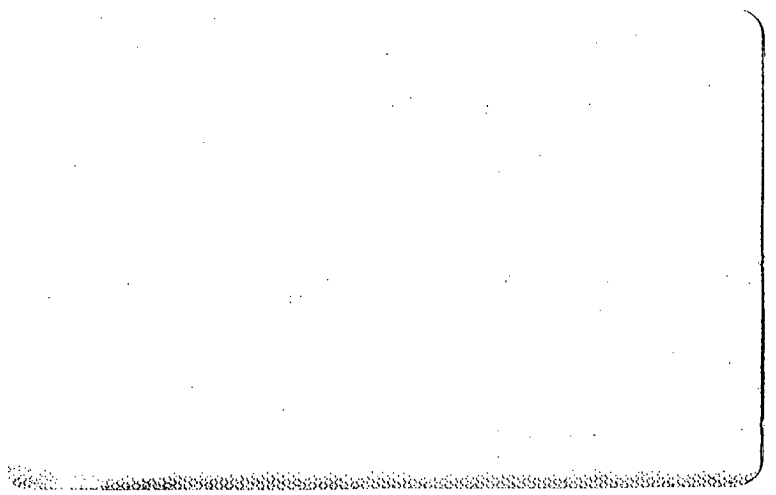
Thank you for your courtesies on the telephone today and for the information you have provided us.

Very truly yours,

Charles R. Williamson

Enclosure

cc: Max Birnbach
George Mack



HAHN AND ASSOCIATES, INC.
Environmental Management

434 NW 6th Avenue, Suite 203
Portland, Oregon 97209-3600
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SUBSURFACE INVESTIGATION

EDA Corporation Property
330 NW 23rd Avenue
Portland, Oregon

February 2, 1994

Prepared for:

EDA Corporation
Portland, Oregon

Prepared by:

Hahn and Associates, Inc.
Portland, Oregon

Project #2605

TABLE OF CONTENTS

EXECUTIVE SUMMARY 1
1.0 INTRODUCTION 2
2.0 SCOPE OF WORK 2
3.0 BACKGROUND 3
3.1 Site Description 3
3.2 Site History 3
4.0 FIELD ACTIVITIES 4
5.0 ANALYTICAL TESTS 4
6.0 RESULTS AND DISCUSSION 5
6.1 Subsurface Conditions 5
6.2 Soil Cleanup Standards 5
6.3 Soil Impacts 6
7.0 CONCLUSIONS AND RECOMMENDATIONS 7
8.0 LIMITATIONS 9
GLOSSARY OF ABBREVIATIONS

TABLE OF CONTENTS
(continued)

TABLES

1 Summary of Analytical Results for Soil Samples

FIGURES

1 Location Map
2 Site Map
3 Soil Boring Location Map
4 Analytical Results Map

APPENDICES

A Field Methods
B Soil Boring Logs
C Laboratory Analytical Reports and Chain-of-Custody Documentation
D Soil Cleanup Level Decision Matrix Worksheet

SUBSURFACE INVESTIGATION

EDA Corporation Property
330 NW 23rd Avenue
Portland, Oregon

February 2, 1994

EXECUTIVE SUMMARY

EDA Corporation retained the environmental management firm of Hahn and Associates, Inc. to perform a subsurface investigation of soils at the location of a former service station at 330 NW 23rd Avenue in Portland, Oregon. Four soil borings were installed at the site in January 1994. A magnetic survey performed during the investigation indicates that a former used oil underground storage tank may still be present at the site.

The results of the analytical testing of the soil samples indicate that the soil has been impacted by gasoline and diesel petroleum hydrocarbons at concentrations in excess of regulatory standards in two soil borings. It appears that a zone of petroleum contaminated soils is present at the site between the depths of approximately 12 to 25 feet below ground surface. The zone of soil contamination appears to extend to the depth of the water table. Although the vertical extent of soil contamination was defined during this investigation, the full lateral extent of contamination was not defined.

Based on the results of the data gathered during this subsurface investigation, it is recommended that the used oil underground storage tank at the subject site be decommissioned by removal. Furthermore, it is recommended that additional investigation take place to determine the lateral extent of the detected soil contamination, and to characterize any impacts to groundwater.

1.0 INTRODUCTION

EDA Corporation (EDA) retained the environmental management firm of Hahn and Associates, Inc. (HAI) to perform a subsurface investigation of soils relating to a former gasoline service station located 330 Northwest 23rd Avenue in Portland, Oregon (Figure 1).

Research to locate former underground storage tanks (USTs), pump islands, and structures at the subject site was performed utilizing aerial photographs and city building permit records. Soil samples were obtained by HAI from four subsurface soil borings that were installed at the site in January 1994. Selected soil samples were analyzed for the presence of petroleum hydrocarbons.

2.0 SCOPE OF WORK

The scope of work for the subsurface investigative activities included the following tasks:

1) Review of aerial photographs and building permit records to determine the locations of former site structures and USTs

2) Drilling, field screening and soil sampling of four subsurface soil borings in the vicinity of the former USTs and pump islands

3) Laboratory analyses of selected soil samples

4) Data synthesis and report preparation

3.0 BACKGROUND

3.1 Site Description

The subject property is located at 330 NW 23rd Avenue in Portland, (Multnomah County) Oregon (Figure 1). The site is approximately 1/3 acre in size. The site is bounded by NW 23rd Avenue to the west and NW Flanders Street to the north. The site is presently the location of a parking lot and the entire site is currently surface with asphalt.

The subject property is generally level with the northern portion sloping down towards NW Flanders Street. The site is at an average elevation of approximately 150 feet above mean sea level (MSL). It is located approximately one mile west of the Willamette River. Topographically, the surrounding land surface generally slopes to the northeast towards the Willamette River.

3.2 Site History

Based on the aerial photograph review the subject site was the location of a gasoline service station from the early 1960's until 1979. Based on building permit records, the service station included at least two gasoline USTs, a used oil UST, an underground hydraulic lift, and two pump islands covered by a canopy (Figure 2). The number and locations of the USTs were not consistent from building permit records for 1963 and 1964. The 1963 records showed three USTs located east of the pump islands. The 1964 records showed two 5,000-gallon USTs located between the two pump islands. In 1979, the service station was demolished and the parking lot was constructed. According to EDA, the gasoline USTs were removed from the site at that time.

4.0 FIELD ACTIVITIES

To investigate for the possible presence of petroleum contamination of soils associated with the former USTs and pump islands at the subject site, four soil borings were installed by HAI on January 3, 1994 (Figure 3). The soil borings were installed to depths ranging from 16.5 to 29 feet bgs. In total, 32 soil samples were collected during the field activities. Eight soil samples were selected for laboratory analyses.

Prior to the installation of the soil borings at the site, a magnetic survey and utility locate was performed to identify potential drilling hazards. The magnetic survey identified the presence of a buried metallic object in the location of where the building permit records showed there to be a used oil UST, possibly indicating that the tank may still be in-place.

Details of the field methods employed to install the soil borings and details of the soil sampling protocols are included in Appendix A. Boring logs, which describe the soils encountered are included in Appendix B for each of the subsurface soil borings.

5.0 ANALYTICAL TESTS

The soil samples were shipped with chain-of-custody documentation in sealed and chilled containers to Pacific Environmental Laboratory Inc. of Beaverton, Oregon.

Five soil samples collected during the investigation were analyzed for a hydrocarbon identification (HCID) of total petroleum hydrocarbons (TPH) by the Oregon Department of Environmental Quality (DEQ) Method TPH-HCID. Four soil samples were also analyzed for gasoline by DEQ Method TPH-G and one sample was analyzed for diesel/oil by DEQ Method TPH-418.1M.

The results of the analytical testing for soil samples are summarized in Table 1. The laboratory reports and chain-of-custody documentation for the soil sampling are included in Appendix C.

6.0 RESULTS AND DISCUSSION

6.1 Subsurface Conditions

The native soils encountered in the soil borings during this investigation were predominantly composed of clayey silts and silty sands from approximately 10 feet below ground surface (bgs) to the maximum depth explored which was at 29 feet bgs. Below the asphalt surface, fill material consisting of silty gravels containing building debris was encountered in soil borings B-1, B-2, and B-3 to a depth of approximately 10 to 12 feet bgs. In soil boring B-4, silty and clayey gravel and clayey silt fill material was encountered to a depth of approximately 15 feet bgs. The fill material may indicate the locations of where former USTs were previously removed at the site.

Groundwater was encountered in soil borings B-1 and B-3 during the drilling activities at approximately 25 to 27 feet bgs. Based on the local topography, it is estimated that the uppermost groundwater beneath the subject site may flow in a northeasterly direction. Groundwater flow direction was not determined by direct measurement during this investigation.

6.2 Soil Cleanup Standards

The cleanup standards for soils contaminated with petroleum hydrocarbons from USTs where groundwater is not encountered, are determined by a matrix as defined in the *Numeric Soil Cleanup Levels For Motor Fuel And Heating Oil* [Oregon Administrative Rules (OAR) 340-122-301 to 340-122-360] and administered by the DEQ. However, when groundwater is impacted, as may be the case at the subject site, the DEQ may choose not to

use the these cleanup standards, but may determine cleanup standards on a case-by-case basis.

A calculation of the matrix parameters suggests that the subject property would be a Level 2 site. Therefore, an 80 parts per million (ppm) cleanup standard may apply to any gasoline contamination and a 500 ppm cleanup standard may apply to any diesel fuel and heavier-petroleum (oil) contamination at the site (Appendix D).

6.3 Soil Impacts

The results of the analytical testing of the soil samples indicate that petroleum hydrocarbons were detected above analytical detection limits in soil borings B-1 and B-3 (Table 1, Figure 4). Petroleum hydrocarbons in the gasoline range were detected at depths of 13 and 18 feet bgs in boring B-1 at concentrations of 99 and 3,700 ppm respectively. Gasoline petroleum hydrocarbons were also detected in boring B-3 at a depth of 20.5 feet bgs at a concentration of 260 ppm. Petroleum hydrocarbons in the diesel range were detected at a depth of 18 feet bgs in boring B-1 at a concentration of 1,100 ppm. Petroleum hydrocarbons were not detected in soil boring B-1 at a depth of 25.5 feet bgs and in soil boring B-3 at depths of 10.5 and 28 feet bgs. All the detected petroleum hydrocarbon concentrations were in excess of DEQ Level 2 Soil Cleanup Standards.

Based on the results of both the field screening indicators and the analytical testing, it appears that a zone of petroleum contaminated soils is present at the site between the depths of approximately 12 to 25 feet bgs. It appears that the soil contamination extends to the depth of the water table. Although the vertical extent of soil contamination was defined during this investigation, the full lateral extent of contamination was not defined.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Four soil borings were installed at the subject site to depths ranging from 16.5 to 29 feet bgs. The results of the analytical testing of soil samples indicate that the soil has been impacted by gasoline and diesel petroleum hydrocarbons at concentrations in excess of DEQ Level 2 Cleanup Standards in soil borings B-1 and B-3.

Based on the results of the field screening indicators and the analytical testing, it appears that a zone of petroleum contaminated soils is present at the site between the depths of approximately 12 to 25 feet bgs. The zone of soil contamination appears to extend to the depth of the water table. Although the vertical extent of soil contamination was defined during this investigation, the full lateral extent of contamination was not defined.

A magnetic survey performed during the investigation indicates that a former used oil UST may still be present at the site.

Based on the results of the data gathered during this subsurface investigation, the following recommendations are presented:

1) Decommission by removal the former used oil UST located at the southeast corner of the property.

2) Perform additional investigative activities to determine the lateral extent of the detected soil contamination, and to characterize any impacts to groundwater.

Any questions regarding the information presented in this report are welcome and should be referred to the undersigned. Thank you for the opportunity to be of service to EDA Corporation in this manner.

Hahn and Associates, Inc.

Prepared by:

Hans P. Feige
Environmental Scientist
Staff Geologist

Date 2-2-94

Reviewed by:

Roger E. Brown, Jr.
Associate

8.0 LIMITATIONS

Analytical results presented in this report document only the concentrations of the target analytes in the particular sample and not the property as a whole. We have taken samples from those areas we have identified as having the greatest risk of contamination. Unless a comprehensive statistical sampling program is conducted, however, one cannot conclude with confidence that contaminants may not be found in significantly higher or lower concentrations in other parts of the property. The scope of this investigation was dictated by the client's determination of an appropriate balance between cost and the increased certainty that flows from comprehensive investigation.

(HAI 10/90)

GLOSSARY OF ABBREVIATIONS

B-1	soil boring
bgs	below existing ground surface
DEQ	Oregon Department of Environmental Quality
EDA	EDA Corporation
HAI	Hahn and Associates, Inc.
HCID	hydrocarbon identification
ID	inside diameter
ml	milliliter
MSL	mean sea level
OAR	Oregon Administrative Rules
OD	outside diameter
ppm	parts per million
SPT	Standard Penetration Test
TPH	total petroleum hydrocarbons
USCS	Unified Soil Classification System
UST	underground storage tank

TABLE 1
Summary of Analytical Results for Soil Samples

EDA Corporation Property
330 NW 23rd Avenue
Portland, Oregon

Project #2605

Soil Boring Number	HAI Sample Number*	Date Sampled	Depth	Analytical Results mg/kg (ppm)				
				DEQ Method TPH-HCID			DEQ TPH-G	DEQ TPH-418.1M
			(feet)	Gasoline	Diesel	Oil	Gasoline	Diesel/Oil
B-1	B1-5	3-Jan-94	13.0	-	-	-	99	-
B-1	B1-7	3-Jan-94	18.0	Detected	Detected	ND>100	3,700	1,100
B-1	B1-10	3-Jan-94	25.5	ND>20	ND>50	ND>100	-	-
B-2	B2-4	3-Jan-94	10.5	ND>20	ND>50	ND>100	-	-
B-3	B3-2	3-Jan-94	10.5	-	-	-	ND>5	-
B-3	B3-6	3-Jan-94	20.5	-	-	-	260	-
B-3	B3-9	3-Jan-94	28.0	ND>20	ND>50	ND>100	-	-
B-4	B4-4	3-Jan-94	10.5	ND>20	ND>50	ND>100	-	-

NOTE: * = sample number prefix is 2605-940103-
- - not analyzed
DEQ - Oregon Department of Environmental Quality
mg/kg - milligram per kilogram
ND - not detected above detection limit indicated
ppm - parts per million
TPH - total petroleum hydrocarbons

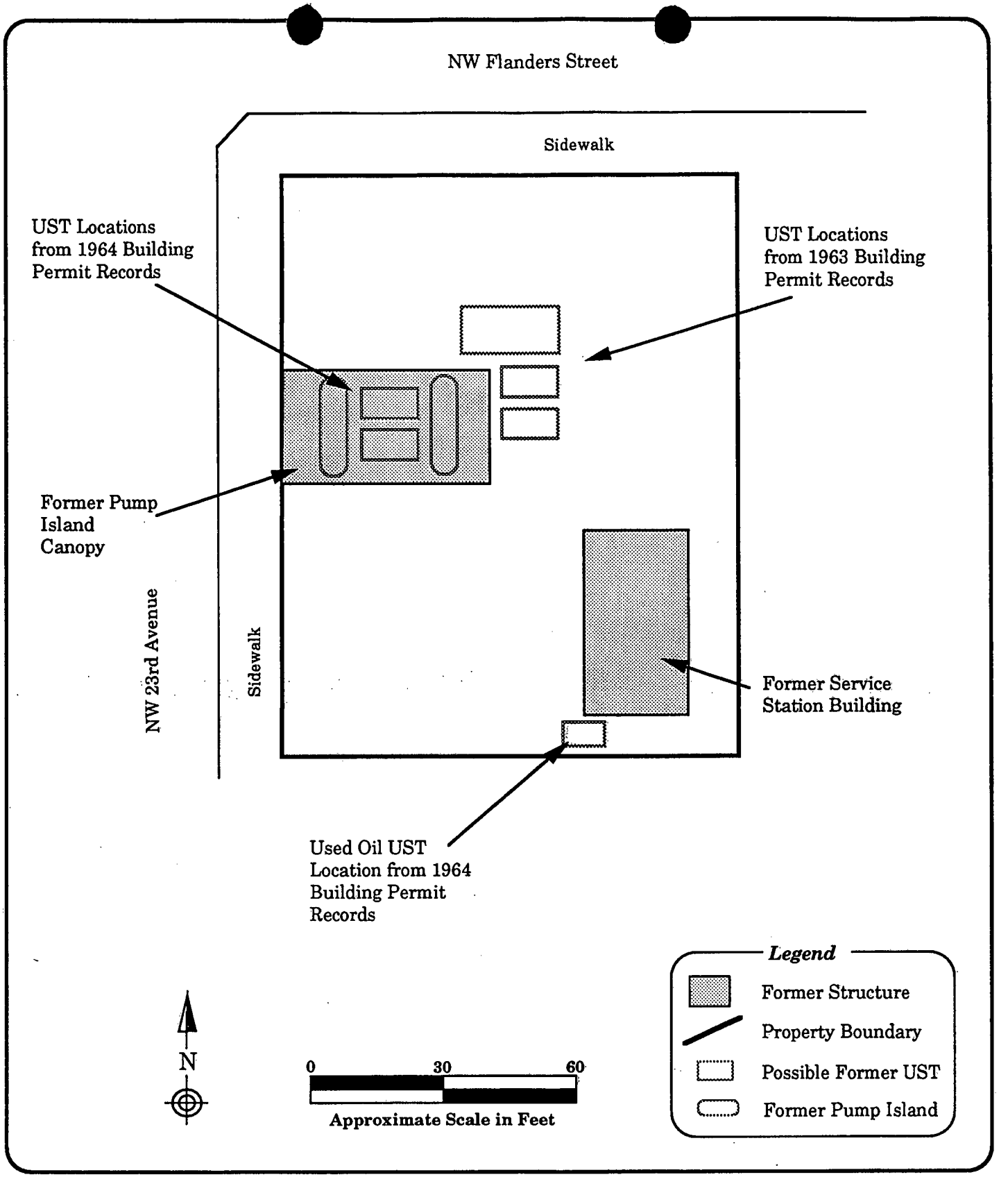
N

0 2000 4000

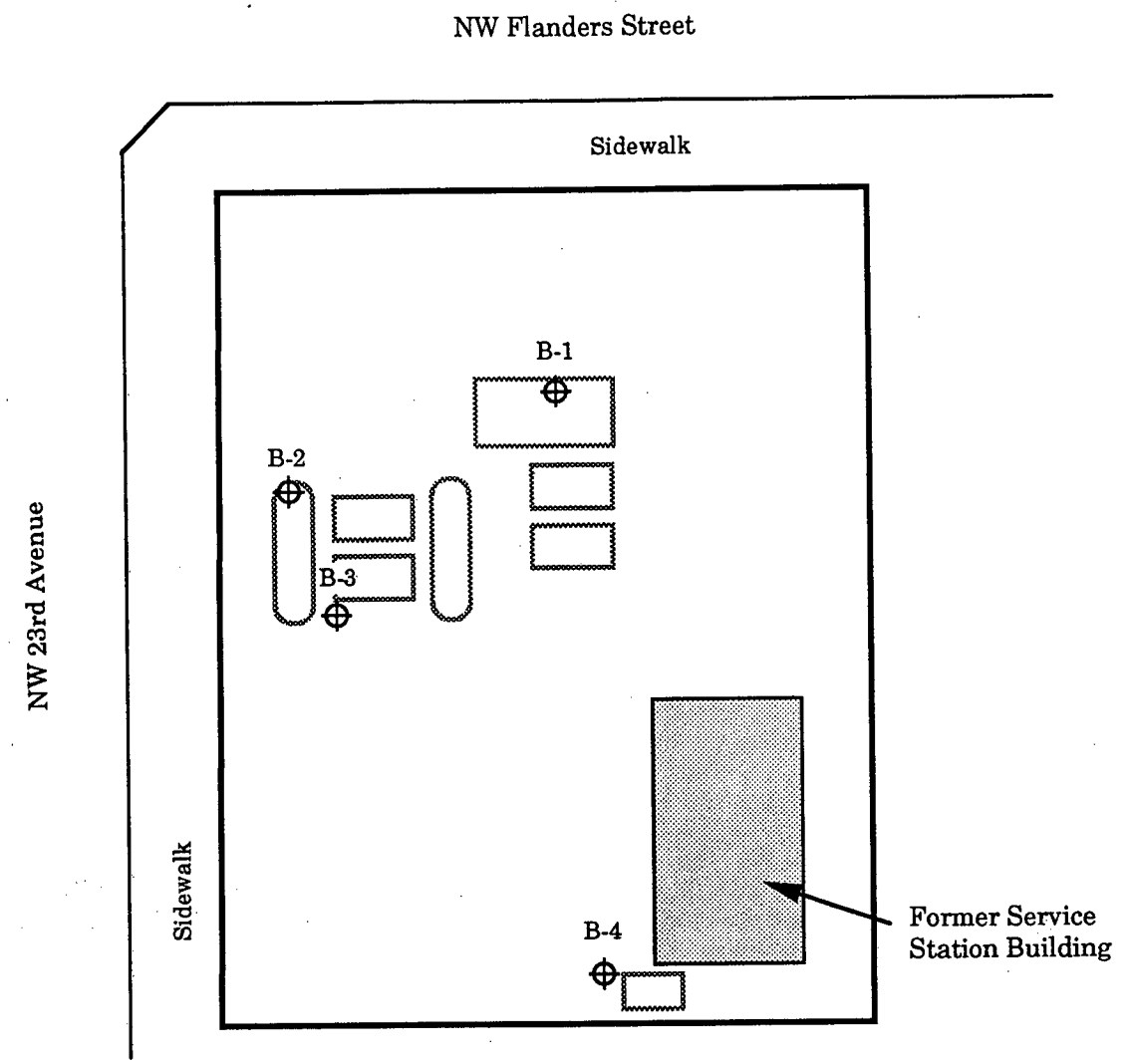
Scale in Feet

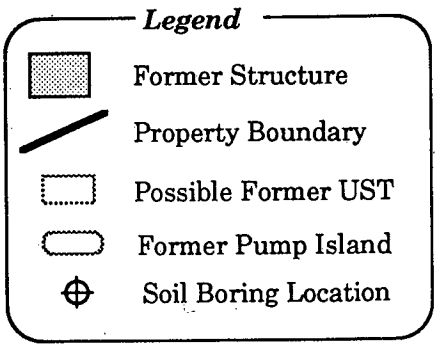
Source: Portland Oregon U.S.G.S. 7.5 Minute Quadrangle

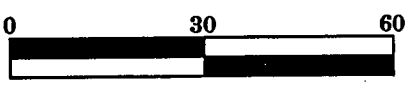
Project #2605 February 1994	**HAHN & ASSOCIATES** **INCORPORATED** ENVIRONMENTAL MANAGEMENT 434 NW SIXTH AVENUE, SUITE 203 PORTLAND, OREGON 97209 503/796-0717	**LOCATION MAP** Subsurface Investigation EDA Corporation Property 330 NW 23rd Avenue Portland, Oregon	**FIGURE** **1**



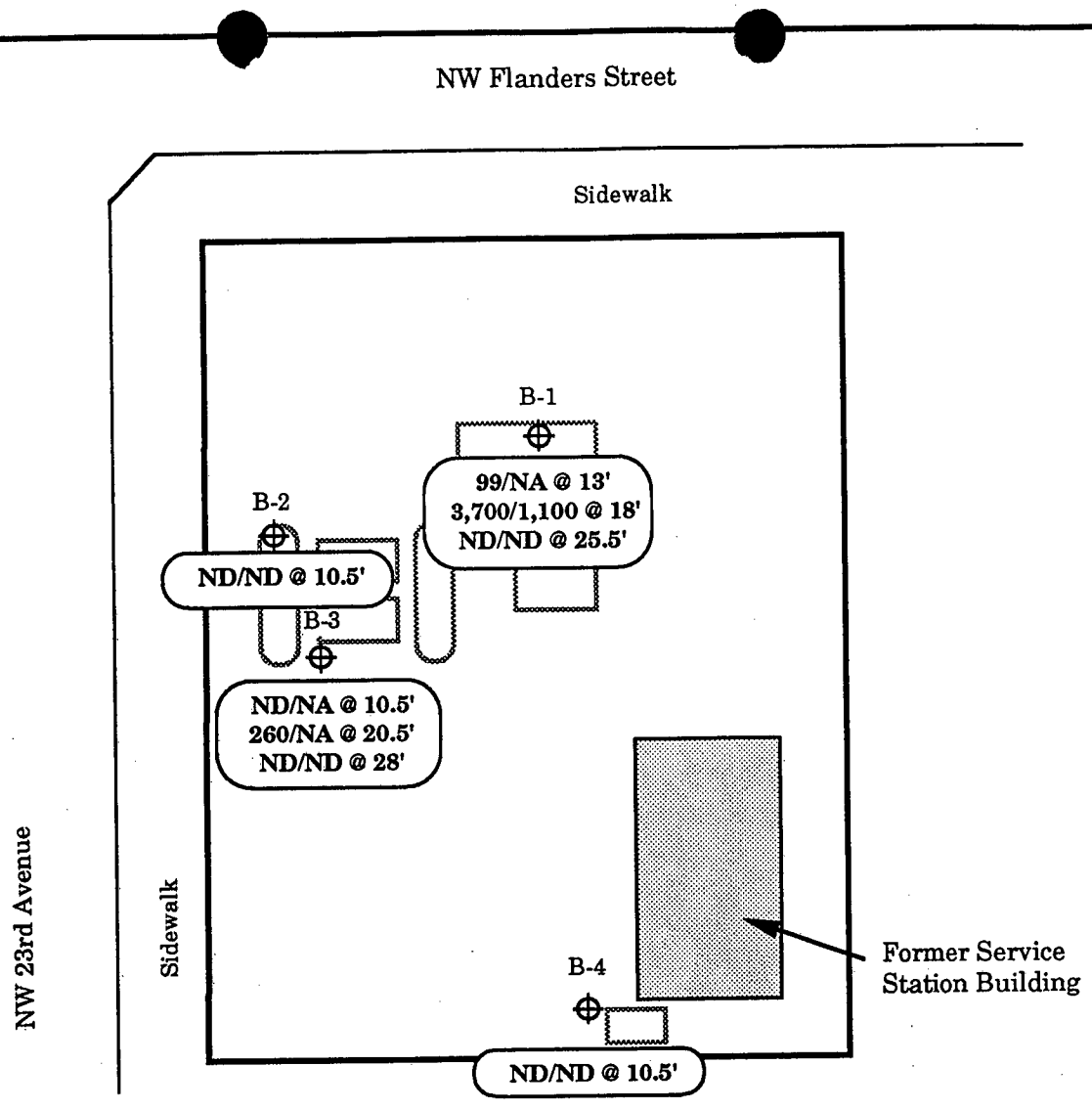
Project #2605 February 1994	**HAHN & ASSOCIATES** INCORPORATED ENVIRONMENTAL MANAGEMENT 434 NW SIXTH AVENUE, SUITE 203 PORTLAND, OREGON 97209 503/796-0717	**SITE MAP** Subsurface Investigation EDA Corporation Property 330 NW 23rd Avenue Portland, Oregon	**FIGURE** **2**







Project #2605 February 1994	**HAHN & ASSOCIATES** **INCORPORATED** ENVIRONMENTAL MANAGEMENT 434 NW SIXTH AVENUE, SUITE 203 PORTLAND, OREGON 97209 503/796-0717	**SOIL BORING LOCATION MAP** Subsurface Investigation EDA Corporation Property 330 NW 23rd Avenue Portland, Oregon	**FIGURE** **3**



Legend

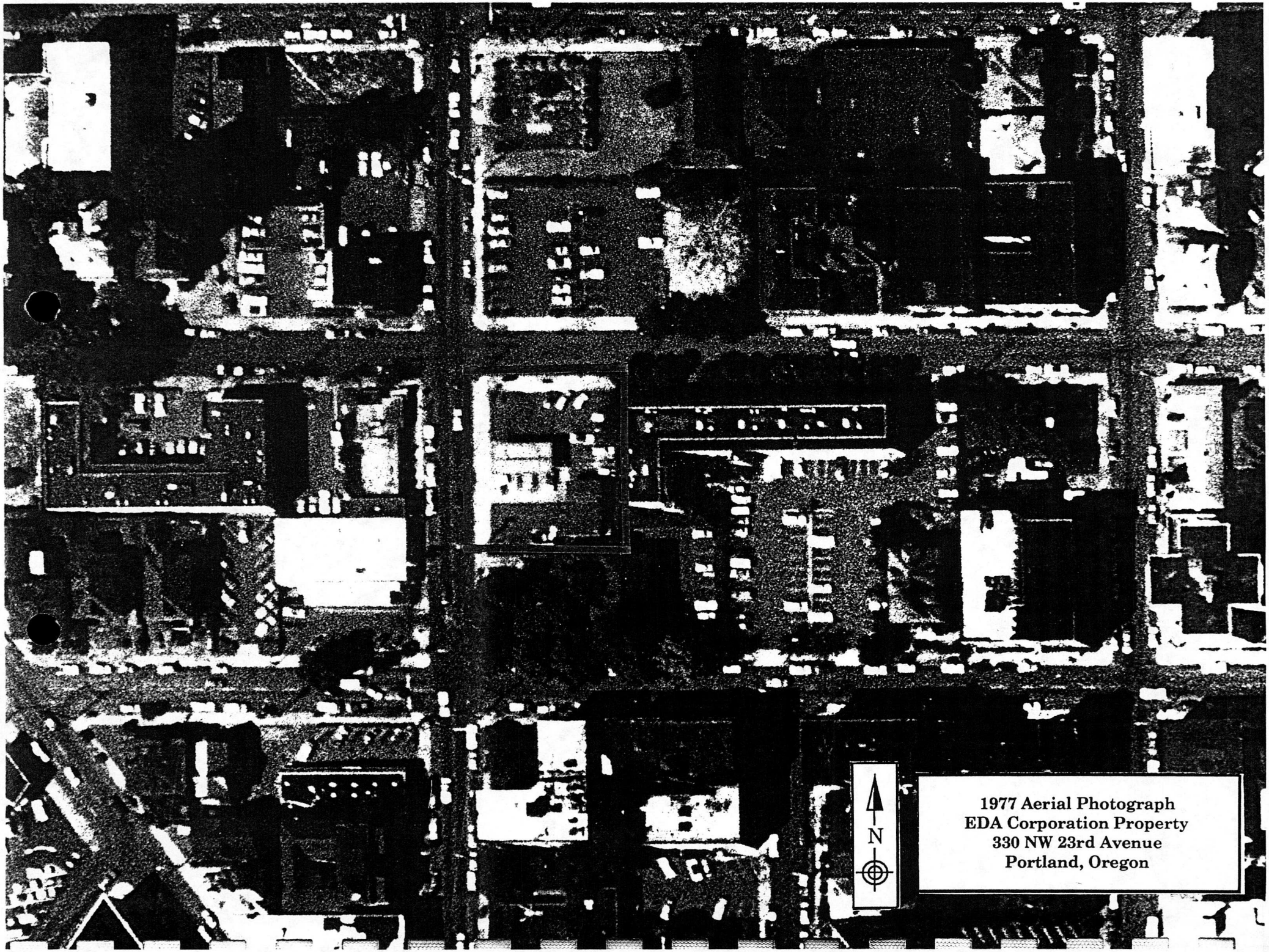
- Former Structure
- Property Boundary
- Possible Former UST
- Former Pump Island
- Soil Boring Location
- 60/90 @ 13' — TPH as Gasoline/Diesel in parts per million (ppm) @ feet below ground surface
- ND — Not Detected
- NA — Not Analyzed

N

0 30 60

Approximate Scale in Feet

Project #2605 February 1994	**HAHN & ASSOCIATES** **INCORPORATED** ENVIRONMENTAL MANAGEMENT 434 NW SIXTH AVENUE, SUITE 203 PORTLAND, OREGON 97209 503/796-0717	**ANALYTICAL RESULTS MAP** Subsurface Investigation EDA Corporation Property 330 NW 23rd Avenue Portland, Oregon	**FIGURE** **4**


N
1977 Aerial Photograph
EDA Corporation Property
330 NW 23rd Avenue
Portland, Oregon

APPENDIX A

Field Methods

APPENDIX A

FIELD METHODS

SUBSURFACE INVESTIGATION

EDA Corporation Property
330 NW 23rd Avenue
Portland, Oregon

February 1994

Soil Boring Installation

Four subsurface soil borings were drilled at the subject site on January 3, 1994 with a hollow stem auger drilling rig. The soil borings were installed with a Central Mining Equipment (CME) Model 65 drilling rig. The drilling rig was equipped with 3 3/4-inch inside diameter (ID) hollow stem augers. Bayland Drilling, Inc. of Woodburn, Oregon was the drilling contractor.

The soil borings were drilled and sampled to depths ranging from 16.5 to 29 feet below ground surface (bgs). The soil borings were abandoned by filling with 3/8-inch bentonite chips to within two feet of the surface and then filling the borehole to grade with concrete. The soil cuttings generated during drilling were placed in drums, labeled and left on-site for appropriate disposal at a later date.

Soil Sampling Procedures – Soil Borings

Generally, soil sampling was attempted for descriptive purposes at 2.5-foot intervals in the soil borings. The soil samples were collected with a 2-inch outside diameter (OD) split spoon sampling device. The split spoon was driven into the undisturbed soils 2 feet ahead of the augering bit using the Standard Penetration Test (SPT).

Upon being brought to the surface, a portion of the soil sample was immediately placed in a pre-cleaned 9-ounce sample jar and capped with a Teflon-lined lid. The sample jars were then labeled and transferred to a chilled container for shipment to the analytical laboratory. A portion of the soil sample was also transferred to a one-quart plastic bag for a headspace analysis for the presence of petroleum hydrocarbon vapors. Standard sampling protocols, including the use of chain-of-custody documentation, were followed for all sampling procedures.

The properties of each soil sample were noted by an HAI geologist in the field. Boring logs, which describe the soils encountered, are included in Appendix B for each of the subsurface soil borings. An estimate of the Unified Soil Classification System (USCS) soil type designation is also shown on the boring logs. The USCS designation was a field estimate only and was not confirmed by laboratory analyses. Visual or olfactory evidence of petroleum hydrocarbon occurrence in the samples, if present, was also noted on the boring logs.

All of the soil samples were field-screened for the presence of hydrocarbon vapors by the headspace method using a portable GasTech combustible gas meter. Immediately following the collection of the sample, approximately 8 ounces of soil was placed in a one-quart plastic bag and sealed. The sample was then set aside for a 20-minute stabilization period, whereupon the detector probe was inserted through the seal into the bag. The results of the headspace hydrocarbon screening are recorded on the boring logs in parts per million (ppm). Due to interferences with natural moisture and soil gas in the soil, the

lower threshold of significance for the headspace method is about 100 ppm. The headspace method results should be considered qualitative and should be used for comparison purposes only.

Decontamination Procedures

All drilling and sampling equipment was steam-cleaned between drilling locations to prevent cross-contamination between borings. All sampling equipment was steam cleaned prior to each sample event. Two drums of decontamination water were left on-site for appropriate disposal at a later date.

Investigative Derived Waste

In total, four drums of soil cuttings and two drums of decontamination water were generated during the drilling activities at the subject site. The soil cuttings and decontamination water were labeled as non-hazardous waste and left on-site for appropriate disposal at a later date.

APPENDIX B

Soil Boring Logs

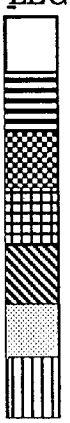
KEY TO BORING LOGS

Soil classification in this report is based upon visual and manual field observations which include moisture, consistency, plasticity and grading estimates and should not be construed to imply field or laboratory testing unless presented herein. Soils are classified in accordance with the Unified Soil Classification System. Stratigraphic boundaries are approximate representations only. No warranty is provided as to the continuity of soil strata between borings

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISIONS				TYPICAL NAMES
COARSE GRAINED SOILS (MORE THAN HALF IS LARGER THAN # 200 SIEVE)	GRAVELS (MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE)	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVELS, POORLY GRADED GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, POORLY GRADED GRAVEL-SAND-CLAY MIXTURES
	SANDS (MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIZE SIEVE)	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS
			SP	POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS, POORLY GRADED SAND-SILT MIXTURES
			SC	CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES
FINE GRAINED SOILS (MORE THAN HALF IS < #200 SIEVE)	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50%		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS

LEGENDS



- BLANK CASING
- SCREENED CASING
- CEMENT GROUT
- CONCRETE
- BENTONITE
- SAND PACK
- FILL MATERIAL

ABBREVIATIONS

NS	Not Sampled
NA	Not Analyzed
N/A	Not Applicable
NR	No Recovery
ND	Not Detected above the detection limit parts per million
TPH	Total Petroleum Hydrocarbons as per EPA Method 418.1
SPT	Standard Penetration Test
USCS	Unified Soil Classification System
▽	Measured water level in well
▼	Estimated water level during drilling

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**SOIL BORING NUMBER B-1**			
PROJECT: EDA Corporation 330 NW 23rd Avenue Portland, Oregon	HAI LOGGER:	Hans Feige	DRILL START Time: 835	DRILL FINISH Time: 1000
	SAMPLING METHOD:	2-inch OD Split Spoon		
	DRILLING METHOD:	3 3/4-inch ID Hollow Stem Auger		
	EQUIPMENT TYPE	Central Mining Equipment - Model 65		
	DRILLER:	Bob Roberts	Date: 3-Jan-94	Date: 3-Jan-94
PROJECT #: 2605	DRILLING CONTRACTOR:	Bayland Drilling, Inc.		

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	Not Surveyed
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER	TIME	HEADSPACE (ppm)	LAB RESULTS TPH-G (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Concrete							1			Asphalt - approximately 6 inches Road base - approximately 12 inches
							2			
					2	0	3		ML	Gravelly SILT - brown/gray, moist, medium stiff, slightly plastic, no petroleum odor, wood material, fill
	B1-1	840	94	-	2	100				
					3	100	4			
							5			
					2	0			ML	Gravelly SILT - as above, brown, brick material, fill
	B1-2	845	91	-	2	50	6			
					3	100				
							7			
					14	0	8		GM	Silty GRAVEL - gray, moist, dense, non-plastic, no petroleum odor, possible building material, fill
	B1-3	853	NA	-	18	0				
					22	50	9			
							10			
Bentonite Chips					20	0			GM	Silty GRAVEL - as above, very dense, fill
	B1-4	858	66	-	25	50	11			
					33	100				
							12			
					2	100	13		ML	Clayey SILT - gray, moist, medium stiff, slightly plastic, petroleum odor
	B1-5	904	170	99	3	100				
					5	100	14			
							15			
					3	100			ML	Clayey SILT - as above, stiff
	B1-6	909	780	-	4	100	16			
					6	100				
							17			
					4	100	18			
	B1-7	915	2,200	3,700	5	100			ML	Clayey SILT - as above
					8	100	19			
							20			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**SOIL BORING NUMBER B-1**		DRILL START	DRILL FINISH
PROJECT: EDA Corporation 330 NW 23rd Avenue Portland, Oregon	HAI LOGGER:	Hans Feige	Time:	Time:
	SAMPLING METHOD:	2-inch OD Split Spoon	835	1000
	DRILLING METHOD:	3 3/4-inch ID Hollow Stem Auger	Date:	Date:
	EQUIPMENT TYPE	Central Mining Equipment - Model 65	3-Jan-94	3-Jan-94
PROJECT #: 2605	DRILLER:	Bob Roberts		
	DRILLING CONTRACTOR:	Bayland Drilling, Inc.		

ABANDONMENT DETAILS	SAMPLE NUMBER	TIME	HEADSPACE (ppm)	LAB RESULTS TPH-G (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Bentonite Chips					9	100				
	B1-8	920	1,600	-	6	100	21		SM	Silty SAND - gray, moist, medium dense, non-plastic, petroleum odor
					7	100	22			
					4	100	23		SM	Silty SAND - as above
	B1-9	927	420	-	6	100	24	1/3/94		
					9	100	25			
					9	100				
	B1-10	933	60	ND	6	100	26		SM	Silty SAND - as above
					8	100	27			
					3	100	28			Silty SAND - as above
	B1-11	945	280	-	5	100			SM	
					9	100	29			
							30			
							31			
							32			
							33			
							34			
							35			
							36			
							37			
							38			
							39			
							40			

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	Not Surveyed
TOP OF CASING ELEVATION:	Not Applicable

Boring terminated at 27.5 feet bgs
Sampled to 29.0 feet bgs
Boring abandoned with bentonite chips - 1/3/94

Materials:
11 bags of 3/8-inch bentonite chips
1 bag of Readi-mix concrete

HAHN & ASSOCIATES, INC.	SOIL BORING NUMBER B-2		
434 NW Sixth Avenue Portland, Oregon (503) 796-0717	HAI LOGGER: Hans Feige	DRILL START	DRILL FINISH
PROJECT: EDA Corporation 330 NW 23rd Avenue Portland, Oregon	SAMPLING METHOD: 2-inch OD Split Spoon	Time: 1015	Time: 1130
	DRILLING METHOD: 3 3/4-inch ID Hollow Stem Auger		
	EQUIPMENT TYPE Central Mining Equipment - Model 65		
	DRILLER: Bob Roberts	Date: 3-Jan-94	Date: 3-Jan-94
PROJECT #: 2605	DRILLING CONTRACTOR: Bayland Drilling, Inc.		

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	Not Surveyed
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER	TIME	HEADSPACE (ppm)	LAB RESULTS TPH-G (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Concrete							1			Asphalt - approximately 6 inches Road base - approximately 12 inches
							2			
					3	100	3			
	B2-1	1030	140	-	9	100	4		ML	Gravelly SILT - brown/gray, moist, very stiff, slightly plastic, no petroleum odor, wood material, fill
					7	100	5			
					8	100	6		ML	Gravelly SILT - as above, brown, brick material, fill
	B2-2	1035	53	-	8	100				
					22	100	7		GM	Silty GRAVEL - gray, moist, dense, non-plastic, no petroleum odor, fill
Bentonite Chips					9	100	8			Silty GRAVEL - as above, medium dense, fill
	B2-3	1041	65	-	10	100	9		GM	
					11	100	10			
					3	100	11		ML	Clayey SILT - brown, moist, medium stiff, slightly plastic, no petroleum odor
	B2-4	1046	78	ND	3	100				
					5	100	12			
					3	100	13			Clayey SILT - as above
	B2-5	1052	60	-	4	100	14		ML	
					5	100	15			
					2	100	16		ML	Clayey SILT - as above
	B2-6	1058	79	-	4	100				
					8	100	17			Boring terminated at 15 feet bgs Sampled to 16.5 feet bgs Boring abandoned with bentonite chips - 1/3/94
							18			Materials: 6 bags of 3/8-inch bentonite chips 1 bag of Readi-mix concrete
							19			
							20			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	SOIL BORING NUMBER B-3		DRILL START	DRILL FINISH
PROJECT: EDA Corporation 330 NW 23rd Avenue Portland, Oregon	HAI LOGGER:	Hans Feige	Time: 1215	Time: 1415
	SAMPLING METHOD:	2-inch OD Split Spoon	Date: 3-Jan-94	Date: 3-Jan-94
	DRILLING METHOD:	3 3/4-inch ID Hollow Stem Auger		
	EQUIPMENT TYPE	Central Mining Equipment - Model 65		
	DRILLER:	Bob Roberts		
PROJECT #: 2605	DRILLING CONTRACTOR:	Bayland Drilling, Inc.		

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	Not Surveyed
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER	TIME	HEADSPACE (ppm)	LAB RESULTS TPH-G (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Concrete							1			Asphalt - approximately 6 inches Road base - approximately 12 inches
							2			
							3			
							4			
							5			
					9	0				
	B3-1	1230	360	-	11	50	6		GM	Silty GRAVEL - gray, moist, very dense, non-plastic, no petroleum odor, concrete chips, nail, bricks, fill
					50	100	7			
							8			
							9			
							10			
Bentonite Chips					2	100				
	B3-2	1240	190	ND	2	100	11		SP	SAND - brown/gray mottling, moist, loose, non-plastic, petroleum odor
					4	100	12			
							13			
					3	100				
	B3-3	1251	260	-	3	100	14		ML	Clayey SILT - gray, moist, medium stiff, slightly plastic, petroleum odor
					4	100				
							15			
					3	100				
	B3-4	1301	580	-	4	100	16		ML	Clayey SILT - as above, stiff
					6	100	17			
							18			
					4	100				
	B3-5	1310	4,000	-	5	100	19		ML	Clayey SILT - as above
					6	100				
							20			

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**SOIL BORING NUMBER B-3**		DRILL START	DRILL FINISH
PROJECT: EDA Corporation 330 NW 23rd Avenue Portland, Oregon	HAI LOGGER:	Hans Feige	Time:	Time:
	SAMPLING METHOD:	2-inch OD Split Spoon	1215	1415
	DRILLING METHOD:	3 3/4-inch ID Hollow Stem Auger	Date:	Date:
	EQUIPMENT TYPE	Central Mining Equipment - Model 65	3-Jan-94	3-Jan-94
	DRILLER:	Bob Roberts		
PROJECT #: 2605	DRILLING CONTRACTOR:	Bayland Drilling, Inc.		

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	Not Surveyed
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER	TIME	HEADSPACE (ppm)	LAB RESULTS TPH-G (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Bentonite Chips					6	100				
	B3-6	1315	8,500	260	6	100	21		SM	Silty SAND - gray, moist, medium dense, non-plastic, petroleum odor
					7	100				
							22			
					5	100	23		SP	
	B3-7	1325	8,000	-	6	100				SAND - brown, moist, medium dense, non-plastic, petroleum odor
					12	100	24			
							25			
					9	100				
	B3-8	1331	7,700	-	6	100	26	1/3/94	SP	SAND - as above
					8	100				
							27			
					5	100	28			SAND - as above
	B3-9	1338	320	ND	6	100			SP	
					8	100	29			
							30			
							31			
							32			
							33			
							34			
							35			
							36			
							37			
							38			
							39			
							40			

Boring terminated at 27.5 feet bgs
Sampled to 29.0 feet bgs
Boring abandoned with bentonite chips - 1/3/94

Materials:
11 bags of 3/8-inch bentonite chips
1 bag of Readi-mix concrete

HAHN & ASSOCIATES, INC. 434 NW Sixth Avenue Portland, Oregon (503) 796-0717	**SOIL BORING NUMBER B-4**			
PROJECT: EDA Corporation 330 NW 23rd Avenue Portland, Oregon PROJECT #: 2605	HAI LOGGER:	Hans Feige	DRILL START Time: 1515 Date: 3-Jan-94	DRILL FINISH Time: 1630 Date: 3-Jan-94
	SAMPLING METHOD:	2-inch OD Split Spoon		
	DRILLING METHOD:	3 3/4-inch ID Hollow Stem Auger		
	EQUIPMENT TYPE	Central Mining Equipment - Model 65		
	DRILLER:	Bob Roberts		
	DRILLING CONTRACTOR:	Bayland Drilling, Inc.		

BORING DIAMETER:	8-inch
CASING DIAMETER:	Not Applicable
SURFACE ELEVATION:	Not Surveyed
TOP OF CASING ELEVATION:	Not Applicable

ABANDONMENT DETAILS	SAMPLE NUMBER	TIME	HEADSPACE (ppm)	LAB RESULTS TPH-G (ppm)	SPT (blows/0.5 feet)	RECOVERY (%)	DEPTH (feet)	GROUNDWATER	STRATA (USCS)	SOIL DESCRIPTION
Concrete							1			Asphalt - approximately 6 inches Road base - approximately 12 inches
							2			
					4	0	3		ML	Clayey SILT - brown, moist, medium stiff, slightly plastic, no petroleum odor
	B4-1	1535	NA	-	4	50				
					4	100	4			
							5			
					6	0			GM	Silty GRAVEL - brown/red, moist, medium dense, non-plastic, no petroleum odor
	B4-2	1539	26	-	6	100	6			
					8	100	7			
					2	100	8		ML	Clayey SILT - brown, moist, stiff, slightly plastic, no petroleum odor
Bentonite Chips	B4-3	1545	34	-	3	100				
					9	100	9			
							10			
					12	100			GC	Clayey GRAVEL - brown, moist, dense, slightly plastic, no petroleum odor
	B4-4	1550	32	ND	16	100	11			
					22	100	12			
					7	50	13		GC	Clayey GRAVEL - as above, medium dense
	B4-5	1556	32	-	9	100				
					7	100	14			
							15			
					2	100			ML	Clayey SILT - brown, moist, stiff, slightly plastic, no petroleum odor
	B4-6	1606	34	-	3	100	16			
					5	100	17			
										Boring terminated at 15 feet bgs Sampled to 16.5 feet bgs Boring abandoned with bentonite chips - 1/3/94
							18			
							19			Materials: 6 bags of 3/8-inch bentonite chips 1 bag of Readi-mix concrete
							20			

APPENDIX C

Laboratory Reports and Chain-of-Custody Documentation

Soil Samples

HAHN AND ASSOCIATES, INC.
ENVIRONMENTAL MANAGEMENT

434 NW 6th Ave., Suite 203 • Portland, Oregon 97209-3600
503/796-0717 Office • 503/227-2209 FAX

LABORATORY Pacific Environmental Laboratory

Lab Project No. 94-0026

CHAIN OF CUSTODY

☐ Please bill the Port of Portland
☒ Please bill Hahn and Associates, Inc.

Project Manager Hans P. Feige
Project No. 2605
Project Name ROSINV
Collected by Hans P. Feige

LIQUID WITH SEDIMENT SAMPLE
___ Test Filtrate ___ Test Sediment ___ Test Both
MULTI-PHASE SAMPLE (_____)
___ Test one (which) ___ Test Separately ___ Shake

Samples Received at 4°C ☐ YES ☐ NO
Appropriate Containers Used ☐ YES ☐ NO
Provide Verbal Results ☐ YES ☒ NO
Provide Preliminary FAX Results ☒ YES ☐ NO

COMMENTS

*= Sample ID Prefix is 2605-940103-

LAB I.D.	SAMPLE I.D.	DATE	TIME	SAMPLE DESCRIPTION	MATRIX: Soil	Water	Other	Number of Containers	ANALYSES TO BE PERFORMED: TPH-HCID (OAR/DEQ)	Quantify HCID (if detected)	TPH-G (OAR/DEQ)	TPH-D (OAR/DEQ)	TPH-418.1 Mod. (OAR/DEQ)	TPH (EPA 418.1)	BTEX (EPA 8020)	PAHs (EPA 8310-OAR/DEQ)	PAHs (GC/MS SIM Mode)	Halo.-Volatiles (EPA 8010)	Volatiles (EPA 8240)	Semivolatiles (EPA 8270)	TCLP (3) Metals	TCLP (8) Metals	Pesticides (EPA 8080)	PCBs (EPA 8080)	RUSH	REMARKS
1	* B1-1	01/03/94	840	3' Bgs	X			1																	
2	* B1-2	01/03/94	0845	5.5' Bgs	X			1																	
3	* B1-3	01/03/94	0853	8' Bgs	X			1																	
4	* B1-4	01/03/94	0858	10.5' Bgs	X			1																	
5	* B1-5	01/03/94	0904	13.0' Bgs	X			1																	
6	* B1-6	01/03/94	0909	15.5' Bgs	X			1																	
7	* B1-7	01/03/94	0915	18.0' Bgs	X			1																	
8	* B1-8	01/03/94	0920	20.5' Bgs	X			1																	
9	* B1-9	01/03/94	0927	23' Bgs	X			1																	
10	* B1-10	01/03/94	0933	25.5' Bgs	X			1	X																

Relinquished by Hans Feige	Company Hahn And Associates Inc.	Date 1/5/94 1-4-94	Time @1000 1700	Received by	Company PEL	# Seal #3734
Relinquished by	Company	Date 1-5-94/1045	Time	Received by	Company PEL	
Relinquished by	Company	Date	Time	Received by	Company	

HAHN AND ASSOCIATES, INC.
ENVIRONMENTAL MANAGEMENT

434 NW 6th Ave., Suite 203 • Portland, Oregon 97209-3600
503/796-0717 Office • 503/227-2209 FAX

LABORATORY Pacific Environmental Laboratory

Lab Project No. 94-0026

CHAIN OF CUSTODY

☐ Please bill the Port of Portland
☒ Please bill Hahn and Associates, Inc.

Project Manager Hans P. Feige
Project No. 2605
Project Name ROSINV
Collected by Hans P. Feige

LIQUID WITH SEDIMENT SAMPLE
___ Test Filtrate ___ Test Sediment ___ Test Both
MULTI-PHASE SAMPLE (_____)
___ Test one (which) ___ Test Separately ___ Shake

Samples Received at 4°C ☐ YES ☐ NO
Appropriate Containers Used ☐ YES ☐ NO
Provide Verbal Results ☐ YES ☒ NO
Provide Preliminary FAX Results ☒ YES ☐ NO

COMMENTS

*= Sample ID Prefix is 2605-940103-

LAB I.D.	SAMPLE I.D.	DATE	TIME	SAMPLE DESCRIPTION	MATRIX: Soil	Water	Other	Number of Containers	ANALYSES TO BE PERFORMED: TPH-HCID (OAR/DEQ)	Quantify HCID (if detected)	TPH-G (OAR/DEQ)	TPH-D (OAR/DEQ)	TPH-418.1 Mod. (OAR/DEQ)	TPH (EPA 418.1)	BTEX (EPA 8020)	PAHs (EPA 8310-OAR/DEQ)	PAHs (GC/MS SIM Mode)	Halo.-Volatiles (EPA 8010)	Volatiles (EPA 8240)	Semivolatiles (EPA 8270)	TCLP (3) Metals	TCLP (8) Metals	Pesticides (EPA 8080)	PCBs (EPA 8080)				RUSH	REMARKS
11	* B1-11	01/03/94	0945	28' Bgs	X			1																				
12	* B2-1	01/03/94	1030	3' Bgs	X			1																				
13	* B2-2	01/03/94	1035	5.5' Bgs	X			1																				
14	* B2-3	01/03/94	1041	8.0' Bgs	X			1																				
15	* B2-4	01/03/94	1046	10.5' Bgs	X			1	x																			
16	* B2-5	01/03/94	1052	13.0' Bgs	X			1																				
17	* B2-6	01/03/94	1058	15.5' Bgs	X			1																				
18	* B3-1	01/03/94	1230	5.5' Bgs	X			1																				
19	* B3-2	01/03/94	1240	10.5' Bgs	X			1																				
20	* B3-3	01/03/94	1251	13.0' Bgs	X			1																				

Relinquished by: Hans Feige	Company: Hahn And Associates Inc.	Date: 1-4-94	Time: @1000 1700	Received by: Bob Fahsbury	Company: PEL seal # 3734
Relinquished by: Bob Fahsbury	Company:	Date: 1-5-94	Time: 1045	Received by: Julie Reynolds	Company: PEL
Relinquished by:	Company:	Date:	Time:	Received by:	Company:

HAHN AND ASSOCIATES, INC.
ENVIRONMENTAL MANAGEMENT

434 NW 6th Ave., Suite 203 • Portland, Oregon 97209-3600
503/796-0717 Office • 503/227-2209 FAX

LABORATORY Pacific Environmental Laboratory

Lab Project No. 94-0026

CHAIN OF CUSTODY

☐ Please bill the Port of Portland
☒ Please bill Hahn and Associates, Inc.

Project Manager Hans P. Feige
Project No. 2605
Project Name ROSINV
Collected by Hans P. Feige

LIQUID WITH SEDIMENT SAMPLE
___ Test Filtrate ___ Test Sediment ___ Test Both
MULTI-PHASE SAMPLE (_____)
___ Test one (which) ___ Test Separately ___ Shake

Samples Received at 4°C ☐ YES ☐ NO
Appropriate Containers Used ☐ YES ☐ NO
Provide Verbal Results ☐ YES ☒ NO
Provide Preliminary FAX Results ☒ YES ☐ NO

COMMENTS

*= Sample ID Prefix is 2605-940103-

LAB I.D.	SAMPLE I.D.	DATE	TIME	SAMPLE DESCRIPTION	MATRIX: Soil	Water	Other	Number of Containers	TPH-HCID (OAR/DEQ)	Quantify HCID (if detected)	TPH-G (OAR/DEQ)	TPH-D (OAR/DEQ)	TPH-418.1 Mod. (OAR/DEQ)	TPH (EPA 418.1)	BTEX (EPA 8020)	PAHs (EPA 8310-OAR/DEQ)	PAHs (GC/MS SIM Mode)	Halo.-Volatiles (EPA 8010)	Volatiles (EPA 8240)	Semivolatiles (EPA 8270)	TCLP (3) Metals	TCLP (8) Metals	Pesticides (EPA 8080)	PCBs (EPA 8080)	RUSH	REMARKS
21	* B3-4	01/03/94	1301	15.5' Bgs	X			1																		
22	* B3-5	01/03/94	1310	18.0' Bgs	X			1																		
23	* B3-6	01/03/94	1315	20.5' Bgs	X			1																		
24	* B3-7	01/03/94	1325	23' Bgs	X			1																		
25	* B3-8	01/03/94	1331	25.5' Bgs	X			1																		
26	* B3-9	01/03/94	1338	28.0' Bgs	X			1	X																	
27	* B4-1	01/03/94	1535	3.0' Bgs	X			1																		
28	* B4-2	01/03/94	1539	5.5' Bgs	X			1																		
29	* B4-3	01/03/94	1545	8.0' Bgs	X			1																		
30	* B4-4	01/03/94	1550	10.5' Bgs	X			1	x																	

Relinquished by Hans Feige	Company Hahn And Associates Inc.	Date 1-4-94	Time @1000 1700	Received by Bob Lahaney	Company PEL seal # 3734
Relinquished by	Company	Date 1-5-94	Time 1045	Received by Julie Reynolds	Company PEL
Relinquished by	Company	Date	Time	Received by	Company

HAHN AND ASSOCIATES, INC.
ENVIRONMENTAL MANAGEMENT

434 NW 6th Ave., Suite 203 • Portland, Oregon 97209-3600
503/796-0717 Office • 503/227-2209 FAX

LABORATORY Pacific Environmental Laboratory

Lab Project No. 94-0026

CHAIN OF CUSTODY

☐ Please bill the Port of Portland
☒ Please bill Hahn and Associates, Inc.

Project Manager Hans P. Feige
Project No. 2605
Project Name ROSINV
Collected by Hans P. Feige

LIQUID WITH SEDIMENT SAMPLE
___ Test Filtrate ___ Test Sediment ___ Test Both
MULTI-PHASE SAMPLE (_____)
___ Test one (which) ___ Test Separately ___ Shake

Samples Received at 4°C ☐ YES ☐ NO
Appropriate Containers Used ☐ YES ☐ NO
Provide Verbal Results ☐ YES ☒ NO
Provide Preliminary FAX Results ☒ YES ☐ NO

COMMENTS

*= Sample ID Prefix is 2605-940103-

LAB I.D.	SAMPLE I.D.	DATE	TIME	SAMPLE DESCRIPTION	MATRIX: Soil	Water	Other	Number of Containers	TPH-HCID (OAR/DEQ)	Quantify HCID (if detected)	TPH-G (OAR/DEQ)	TPH-D (OAR/DEQ)	TPH-418.1 Mod. (OAR/DEQ)	TPH (EPA 418.1)	BTEX (EPA 8020)	PAHs (EPA 8310-OAR/DEQ)	PAHs (GC/MS SIM Mode)	Halo.-Volatiles (EPA 8010)	Volatiles (EPA 8240)	Semivolatiles (EPA 8270)	TCLP (3) Metals	TCLP (8) Metals	Pesticides (EPA 8080)	PCBs (EPA 8080)				RUSH	REMARKS
31	* B4-5	01/03/94	1556	13' BGS	X			1																					
32	* B4-6	01/03/94	1606	15.5' BGS	X			1																					

Relinquished by	Company	Date	Time	Received by	Company
Hans Feige	Hahn And Associates, Inc.	1-4-94	1700	Bill Fabrey	PEL seal # 3734
Relinquished by	Company	Date	Time	Received by	Company
Bill Fabrey		1-5-94	1045	Julie Reynolds	PEL
Relinquished by	Company	Date	Time	Received by	Company

PACIFIC
ENVIRONMENTAL
LABORATORY INC.

January 17, 1994

Hahn and Associates, Inc.
434 N.W. 6th Avenue
Suite 203
Portland, OR 97209-3600

Attention: Hans P. Feige

RE: JOB # 2605
P.O.#
PROJECT - ROSINV

Enclosed are test results for your samples received in this lab on Jan. 05, 1994. For your reference, these analyses have been assigned our PEL # 94-0026.

Solid samples are reported on a dry weight basis except for Oregon DEQ Fuels Methods and where otherwise noted.

Please call if you have any questions.

Respectfully,

Howard Holmes
Project Manager

Robert R. May
Rob May
Project Manager

9405 S.W. Nimbus Ave. ■ Beaverton, OR 97005 ■ (503) 644-0660 ■ FAX # (503) 644-2202

PACIFIC
ENVIRONMENTAL
LABORATORY INC.

TPH-G per Oregon DEQ
Results In mg/kg (ppm)

Client: Hahn and Associates, Inc.
Project: ROSINV
Received: 01/05/1994

PEL Number: 94-0026
Matrix: soil

Sample Name	Analyte	Result	MRL	Date Prepped	Date Analyzed
2605-940103-B1-5	Gasoline	99	25	01/13/94	01/13/94
2605-940103-B1-7	Gasoline	3700	500	01/12/94	01/12/94
2605-940103-B3-2	Gasoline	ND	5.0	01/13/94	01/13/94
2605-940103-B3-6	Gasoline	260	50	01/06/94	01/07/94
Method Blank	Gasoline	ND	5.0		

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

PACIFIC
ENVIRONMENTAL
LABORATORY INC.

TPH-HCID per Oregon DEQ
Results In mg/kg (ppm)

Client: Hahn and Associates, Inc.
Project: ROSINV
Received: 01/05/1994

PEL Number: 94-0026
Matrix: soil

Sample Name	Analyte	Result	MRL	Date Prepped	Date Analyzed
2605-940103-B1-7	Diesel	DET	50	01/06/94	01/10/94
	Gasoline	DET	20		
	Heavy/Bunker	ND	--		
2605-940103-B1-10	Diesel	ND	50	01/05/94	01/06/94
	Gasoline	ND	20		
	Heavy/Bunker	ND	--		
2605-940103-B2-4	Diesel	ND	50	01/05/94	01/05/94
	Gasoline	ND	20		
	Heavy/Bunker	ND	--		
2605-940103-B3-9	Diesel	ND	50	01/05/94	01/06/94
	Gasoline	ND	20		
	Heavy/Bunker	ND	--		
2605-940103-B4-4	Diesel	ND	50	01/05/94	01/06/94
	Gasoline	ND	20		
	Heavy/Bunker	ND	--		
Method Blank	Diesel	ND	50		
	Gasoline	ND	20		
	Heavy/Bunker	ND	--		

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

TPH-418.1M per Oregon DEQ
Results In mg/kg (ppm)

Client: Hahn and Associates, Inc.
Project: ROSINV
Received: 01/05/1994

PEL Number: 94-0026
Matrix: soil

Sample Name	Analyte	Result	MRL	Date Prepped	Date Analyzed
2605-940103-B1-7	TPH	1,100	20	01/12/94	01/13/94
Method Blank	TPH	ND	20		

MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

SURROGATE RECOVERIES (%)

Client: Hahn and Associates, Inc.
Project: ROSINV

PEL Number: 94-0026
Received: 01/05/1994

Sample Name	Analyte	Result	Control Limits
TPH-G per Oregon DEQ			
2605-940103-B1-5	4-Bromofluorobenzene	104	63-126
	Trifluorotoluene	78	50-150
2605-940103-B1-7	4-Bromofluorobenzene	96	63-126
	Trifluorotoluene	-- *[1]	50-150
2605-940103-B3-2	4-Bromofluorobenzene	100	63-126
	Trifluorotoluene	86	50-150
2605-940103-B3-6	4-Bromofluorobenzene	117	63-126
	Trifluorotoluene	99	50-150
TPH-HCID per Oregon DEQ			
2605-940103-B1-7	1-Chlorooctadecane	96	50-150
2605-940103-B1-10	1-Chlorooctadecane	60	50-150
2605-940103-B2-4	1-Chlorooctadecane	65	50-150
2605-940103-B3-9	1-Chlorooctadecane	82	50-150
2605-940103-B4-4	1-Chlorooctadecane	83	50-150

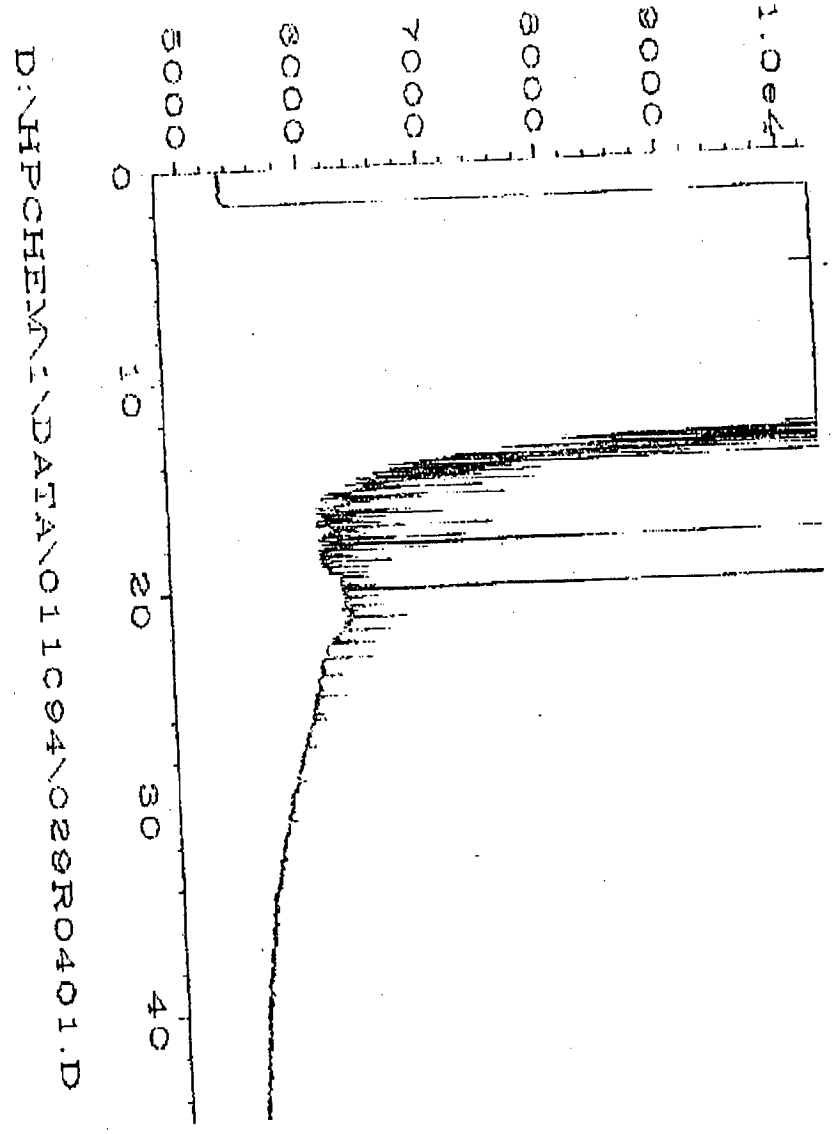
MRL Method Reporting Level
ND None Detected at or above the method reporting level
* See Comment Section at end of report

COMMENTS

Client: Hahn and Associates, Inc.
Project: ROSINV

PEL Number: 94-0026
Received: 01/05/1994

1. Unable to calculate surrogate recovery due to dilution necessary for analysis.



94-002 IA-7

C_6-C_{10}: DET

C_{10}-C_{28}: DET

Heavy: ND

Surr: 29098/96%

1/10

APPENDIX D

Soil Cleanup Standard Matrix Worksheet

SOIL CLEANUP STANDARD MATRIX WORKSHEET

INTRODUCTION: This worksheet is intended to be used to determine the soil cleanup standard for the remediation of motor fuel and heating oil releases from underground storage tanks (USTs). OAR 340-122-305 to 340-122-360

EVALUATION PARAMETERS:

1. DEPTH TO GROUNDWATER: Vertical distance (to nearest foot) from the surface of the ground to the highest seasonal elevation of the saturated zone.

Depth:	>100'	51-100'	25-50	<25'
Points:	1	4	7	**10**

POINTS: 10

Source: Field observation

2. MEAN ANNUAL PRECIPITATION: From nearest appropriate weather station.

Inches:	<20"	20-45"	>45"
Points:	1	**5**	10

POINTS: 5

Source: Oregon Climate Service Map, March 1993

3.NATIVE SOIL OR ROCK TYPE:

Permeability:	Low	Moderate	High
Points:	1	**5**	10

POINTS: 5

Source: Field Observation

4. SENSITIVITY TO THE UPPERMOST AQUIFER:

Sensitivity:	Unusable	Potable not used	Potable	Sole Source
Points:	1	4	**7**	10

POINTS: 7

Source: Worse case estimate

5. POTENTIAL RECEPTORS: Distance to nearest well that draws water from aquifer of concern and the number of people at risk.

Nearest Well:	<1/2 mile	1/2 - 2 miles	>2 mile
Description:	**Near**	Medium	Far

Number of People:	>3,000	100-3,000	<100
Description:	**Many**	Medium	Few

POINTS: 10

Sources: Worst Case Estimate

TOTAL POINTS: 37

SOIL CLEANUP STANDARD MATRIX WORKSHEET

TOTAL POINTS: 37
Level 2 Cleanup Standard

If the Matrix Score evaluated is:

A) Greater than 40, the site must be cleaned up to at least the Level 1 standard

B) From 25 to 40, inclusive, the site must be cleaned up to at least Level 2 standards

C) Less than 25, the site must be cleaned up to at least the Level 3 standard

NUMERIC SOIL CLEANUP STANDARDS

	Level 1	Level 2	Level 3
TPH (Gasoline)	40 ppm	**80 ppm**	130 ppm
TPH (Diesel)	100 ppm	**500 ppm**	1,000 ppm

NUMERIC SOIL CLEANUP STANDARDS FOR THIS SITE

Level 2 Cleanup Standard

Total Petroleum Hydrocarbons (TPH):
< 80 parts per million (ppm) for gasoline
< 500 ppm for diesel fuel and heavier petroleum hydrocarbons

(1/92)

26-94-0025

TERRA VAC 10740 Meridian Avenue North, Suite 202, Seattle, WA 98133-9010
Tel (206) 362-8128 ❑ Fax (206) 362-9528

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED

OCT 08 1998

NORTHWEST REGION

October 5, 1998

Mr. Max Birnbach
c/o Mr. Charles R. Williamson
Kell, Alterman & Runstein
1001 Southwest Fifth Avenue, Suite 1800
Portland, OR 97204-1194

RE: Second Quarter 1998 Groundwater Monitoring Report
Rose's Parking Lot
330 Northwest 23rd Avenue, Portland, Oregon

Dear Mr. Birnbach:

Terra Vac performed quarterly groundwater monitoring at this site on July 31, 1998. Five monitoring wells were sounded for depth to groundwater. Groundwater samples were collected from the monitoring wells for analyses of total gasoline-range petroleum hydrocarbons (TPH-G), benzene, toluene, ethylbenzene, and total xylenes (BTEX). In addition, a groundwater sample from monitoring well MW-1 was analyzed for polycyclic aromatic hydrocarbons (PAHs) and dissolved lead. A site location map is shown on Figure 1. Well construction details, including construction dates, well diameters, total depths, and screened intervals are provided in Table 1.

Groundwater elevations decreased in all five monitoring wells since the previous monitoring event. Analytical results indicate groundwater from MW-1 exceeded the current Oregon Department of Environmental Quality (ODEQ) Groundwater Cleanup Levels for naphthalene, benzene, and dissolved lead and NMW-5 exceeded the current ODEQ levels for benzene.

Groundwater monitoring and sampling were performed using standard field procedures. In short, each well was sounded for depth to groundwater and the presence of free phase petroleum hydrocarbons using an electronic interface probe. If free phase petroleum hydrocarbons were not detected, total well depth was measured. A minimum of three well volumes were bailed from each well sampled, and groundwater allowed to recover to at least 80 percent of original elevation. Analytical samples were then collected with new disposable bailers and immediately placed in sampling vials prepared specifically for the sampled media and selected analyses. Once collected, samples were immediately acidified and cooled for transportation to the laboratory under proper chain of custody.

Existing top of casing elevations, as determined by a March, 1997 well survey, were used to establish reference points for well depths, screen intervals, and groundwater elevations for wells MW-1, NMW-2, NMW-3, MW-4, NMW- 5, and MW-6. Historical groundwater elevations are presented in Table 2. Second quarter 1998 groundwater elevations as measured on July 31, 1998 are also presented on Figure 2. Historically, the inferred direction of groundwater flow has been to the northeast. Prior to sampling, the remediation system had been offline since October 31, 1997.

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Since February 1997, groundwater samples have been analyzed for TPH-G by EPA Method 8015, for BTEX constituents by EPA Method 8020A, for PAHs by EPA Method 8310, and for dissolved lead by EPQ Method 200.8. Previous groundwater sampling performed by GeoEngineers included in this report used EPA Method 418.1 for TPH-G, EPA Method 8020 for BTEX, EPA Method 8310 for PAHs, and EPA Method 7421 for dissolved lead. Results of these analyses, and historical groundwater quality data, are presented in Table 3. Groundwater quality results from the second quarter 1998 sampling are also shown on Figure 3. Analytical reports from the laboratory are contained in Appendix A.

Field activities were performed in a manner consistent with the level of skill and care standard for local environmental professionals. Findings and conclusions presented in this report have been prepared based upon the specific site conditions at the time of field activities and no warranty, expressed or implied, is made.

If you have any questions, please do not hesitate to contact us.

Sincerely,
Terra Vac Corporation

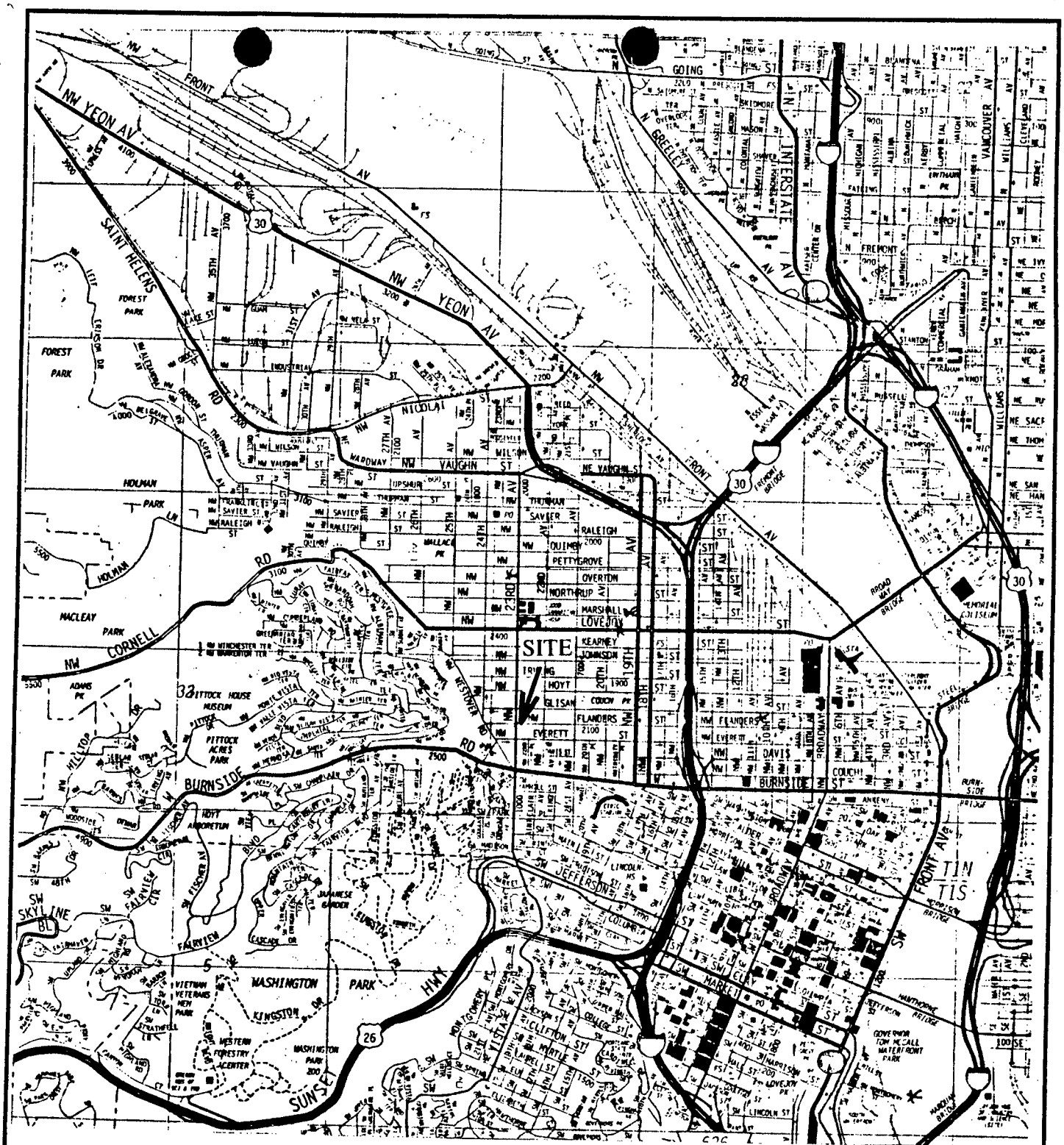
Paul V. Bianco,
Project Engineer

Timothy Warner,
Project Manager

cc: Dave Roy
Rich Kostecki
Jeffrey Wishko
Richard Singer (2 copies)
Richard Allen
Edward Crow
Don Pettit

32-0029.20.01

FIGURES


SITE
NW YEON AV
SAINT HELENS RD
NW FRONT AV
INTERSTATE 405
N GREELEY
N GOING ST
NW VAUGHN ST
NE VAUGHN ST
NW NICOLAI ST
NW WARDWAY
NW CORNELL RD
BURNSIDE RD
SW BURNSIDE
SW JEFFERSON
SW MARKET
SW CLAY
SW SKYLINE BL
SW FAIRVIEW
WASHINGTON PARK
HWY 26
FOREST PARK
MACLEAY PARK
HOLMAN PARK
PITTOCK ACRES PARK
PITTOCK HOUSE MUSEUM
HOYT ARBORETUM
VIETNAM VETERANS MEM PARK
KINGSTON
WESTERN FORESTRY CENTER
JAPANESE GARDEN
RALEIGH
QUIMBY
PETTYGROVE
OVERTON
NORTHRUP
MARSHALL
LOVEJOY
KEARNEY
JOHNSON
IRVING
HOYT
GLISAN
FLANDERS
EVERETT
DAVIS
COUCH
COLUMBIA
MAIN
LINCOLN
CLIFTON
MYRTLE
LAUREL
HALL
JACKSON
LOVEJOY
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3RD AV
2ND AV
1ST AV
FRONT AV
23RD
21ST
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BROADWAY BRIDGE
MORRISON BRIDGE
HAWTHORNE BRIDGE
MARQUAM BRIDGE
GOVERNOR TOM MCCALL WATERFRONT PARK
MEMORIAL COLISEUM
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WILLIAMS AV
MISSISSIPPI AV
ALBINA
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BURNSIDE
COUCH
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KILLINGSWORTH
PRESCOTT
SKIDMORE
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ARMSTRONG
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CRESTON
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CRYSTAL SPRINGS
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CURRY
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DONAHUE
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DOSCH
DOUGLAS
DRAKE
DUNCAN
DUNDEE
DUNLAP
DURHAM
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EVERETT
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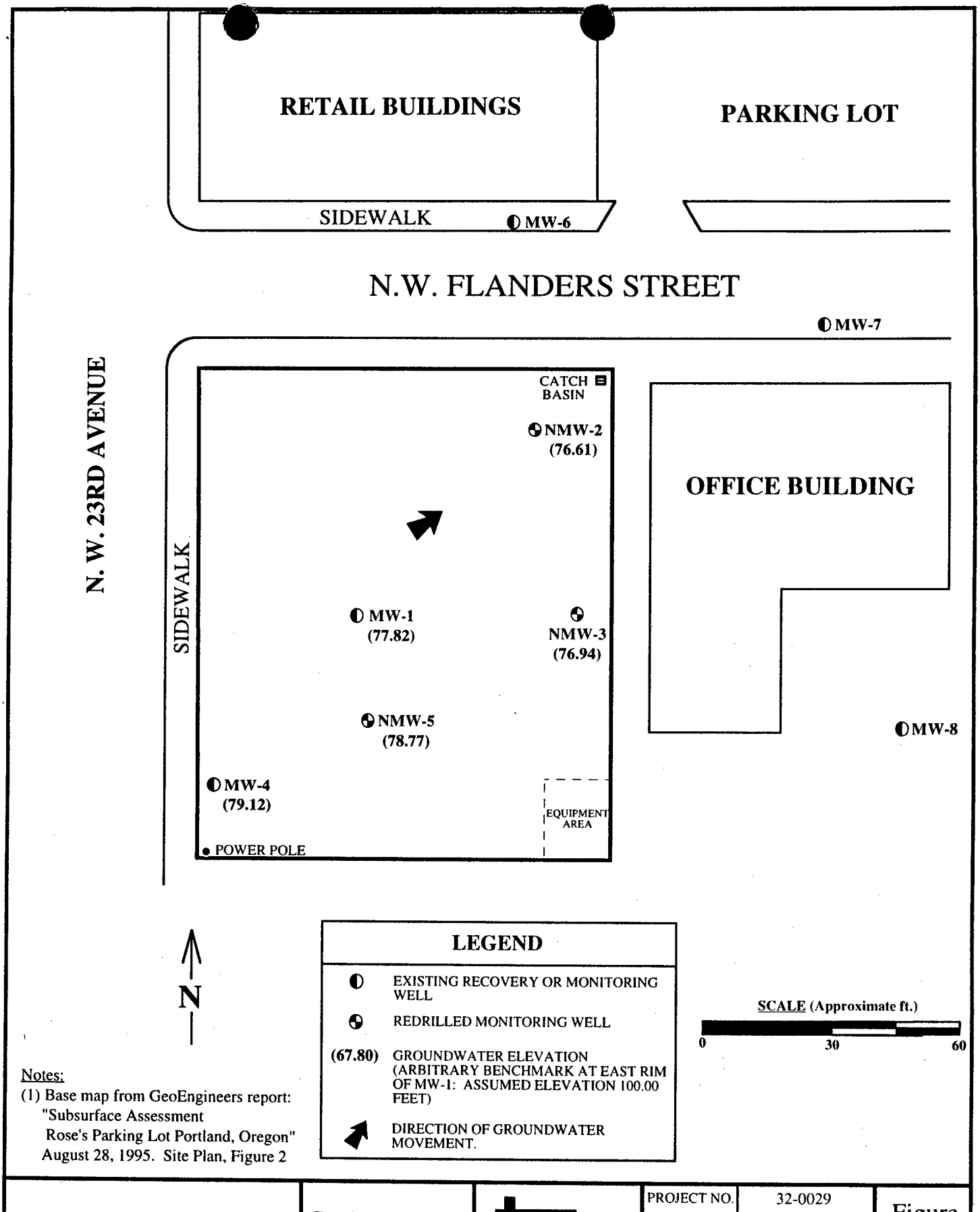
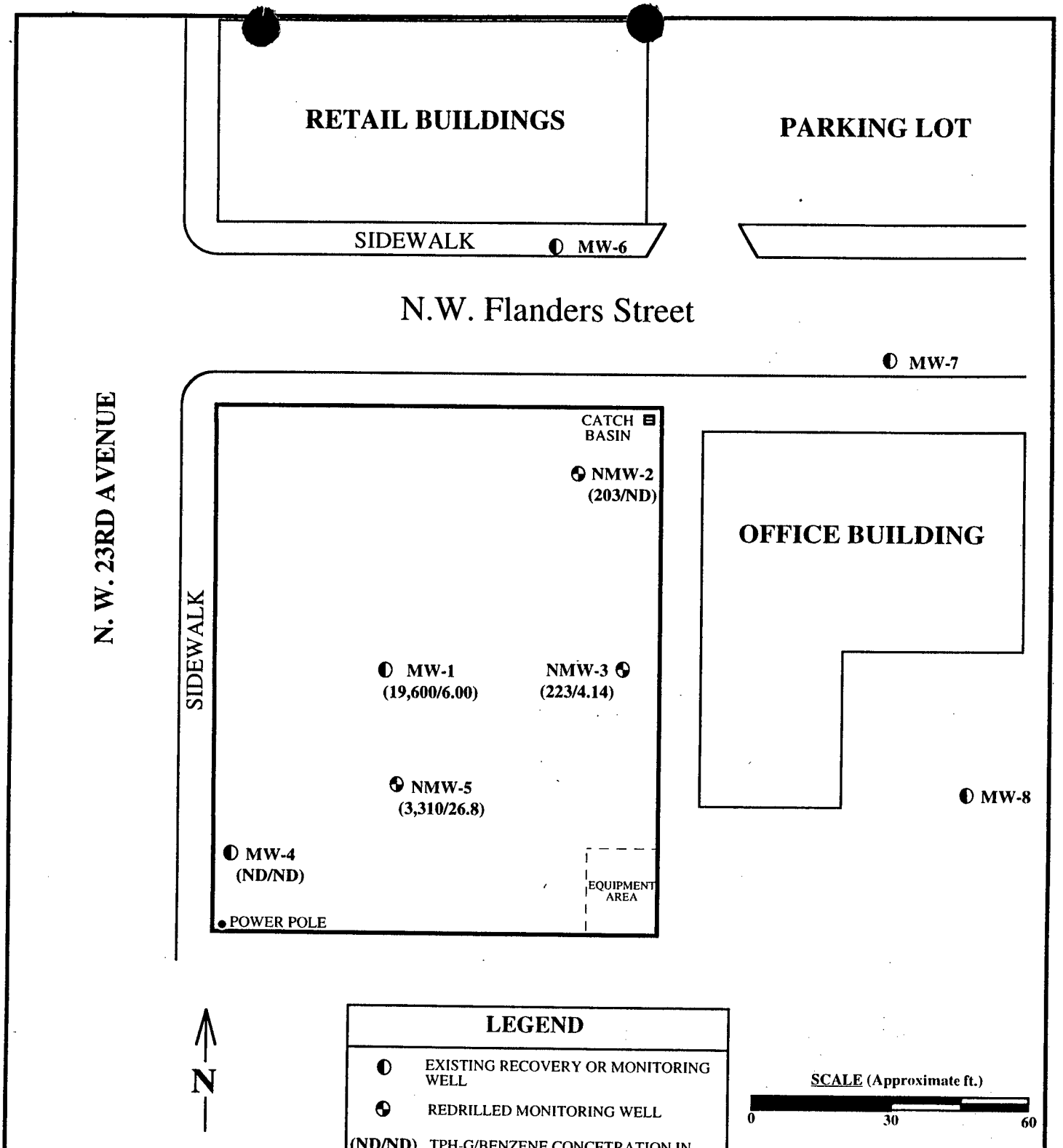


Notes:
(1) Base map from GeoEngineers report: "Subsurface Assessment Rose's Parking Lot Portland, Oregon" August 28, 1995. Site Plan, Figure 2

GROUNDWATER ELEVATIONS	**Rose's Parking Lot 330 NW 23rd Ave. Portland, Oregon**	TERRA VAC	PROJECT NO.	32-0029	Figure 2
			DATE	SEPTEMBER 18, 1998	
			SCALE	1 INCH ≈ 30 FEET	
			REVISION	PVB-3	



Notes:

(1) Base map from GeoEngineers report: "Subsurface Assessment Rose's Parking Lot Portland, Oregon" August 28, 1995. Site Plan, Figure 2

GROUNDWATER ANALYTICAL RESULTS	**Rose's Parking Lot 330 NW 23rd Ave. Portland, Oregon**	TERRA VAC	PROJECT NO.	32-0029	Figure 3
			DATE	SEPTEMBER 18, 1998	
			SCALE	1 INCH ≈ 30 FEET	
			REVISION	PVB-3	

TABLES

Remediation Well Construction Data
Rose's Parking Lot
Portland, Oregon

Well Identification	Date Installed	Total Depth (feet)	Screen Interval		Well Diameter (inches)
			Top (feet)	Bottom (feet)	
MW-1	3/23/94	39	24	38.5	2
NMW-2	1/24/97	38	15	37	4
NMW-3	1/25/97	38	15.5	37.5	4
MW-4	9/28/94	40	20	39.5	2
NMW-5	1/23/97	38	15	37	4
MW-6	4/6/96	31	15	30.5	2
MW-7	4/6/96	31	15	30.5	2
MW-8	4/6/96	31	15	30.5	2

Notes:

Data on NMW-2, NMW-3, and NMW-5 is from Terra Vac field notes and well logs.

Data on MW-1 from RZA Agra Inc. well logs in April, 1994 report.

Data on MW-4 from RZA Agra Inc. well logs in October, 1994 report.

Data on MW-6 through MW-8 from well logs in GeoEngineers June, 1996 Report

Groundwater Elevation Data
Rose's Parking Lot
Portland, Oregon

Well I.D.	Top of Casing Elevation (feet)	Date Sounded	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Water Level Elevation (feet MSL)	Difference from Previous Measurement (feet)
MW-1	100.00	5/12/95	22.79	23.29	0.5	76.71	**
		1/4/96	--	24.10	Trace	75.90	-0.81
		4/8/96	22.39	22.41	0.02	77.59	1.69
		4/24/96	22.40	22.45	0.05	77.55	-0.04
		7/11/96	--	23.35	Trace	76.65	-0.90
		11/3/96	--	24.44	Sheen	75.56	-1.09
		2/28/97	--	21.11	0	78.89	3.33
		5/29/97	--	26.90	0	73.10	-5.79
		9/5/97	--	27.86	0	72.14	-0.96
		12/31/97	--	23.97	0	76.03	3.89
		5/18/98	--	21.63	0	78.37	2.34
		7/31/98	--	22.18	0	77.82	-0.55
NMW-2	96.21	5/12/95	--	20.75	0	75.46	**
		1/4/96	--	21.60	0	74.61	-0.85
		4/8/96	--	19.73	0	76.48	1.87
		4/24/96	--	19.90	0	76.31	-0.17
		7/11/96	Sheen	20.80	0	75.41	-0.90
		11/3/96	--	21.87	0	74.34	-1.07
		2/28/97	--	18.51	0	77.70	3.36
		5/29/97	--	25.30	0	70.91	-6.79
		9/5/97	--	26.83	0	69.38	-1.53
		12/31/97	--	21.22	0	74.99	5.61
		5/18/98	--	18.62	0	77.59	2.60
		7/31/98	--	19.60	0	76.61	-0.98

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Groundwater Elevation Data
Rose's Parking Lot
Portland, Oregon

Well I.D.	Top of Casing Elevation (feet)	Date Sounded	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Water Level Elevation (feet MSL)	Difference from Previous Measurement (feet)
NMW-3	99.15	5/12/95	--	23.48	0	75.67	**
		1/4/96	--	24.22	0	74.93	-0.74
		4/8/96	--	22.31	0	76.84	1.91
		4/24/96	--	22.36	0	76.79	-0.05
		7/11/96	--	23.37	0	75.78	-1.01
		11/3/96	Sheen	24.47	0	74.68	-1.10
		2/28/97	--	21.28	0	77.87	3.19
		5/29/97	--	29.78	0	69.37	-8.50
		9/5/97	--	27.77	0	71.38	2.01
		12/31/97	--	23.88	0	75.27	3.89
		5/18/98	--	21.73	0	77.42	2.15
		7/31/98	--	22.21	0	76.94	-0.48
MW-4	100.48	5/12/95	--	22.55	0	77.93	**
		1/4/96	--	23.03	0	77.45	-0.48
		4/8/96	--	21.60	0	78.88	1.43
		4/24/96	--	21.34	0	79.14	0.26
		7/11/96	--	22.54	0	77.94	-1.20
		11/3/96	--	23.45	0	77.03	-0.91
		2/28/97	--	20.24	0	80.24	3.21
		5/29/97	--	26.04	0	74.44	-5.80
		9/5/97	--	26.58	0	73.90	-0.54
		12/31/97	--	23.00	0	77.48	3.58
		5/18/98	--	20.83	0	79.65	2.17
		7/31/98	--	21.36	0	79.12	-0.53

Groundwater Elevation Data
Rose's Parking Lot
Portland, Oregon

Well I.D.	Top of Casing Elevation (feet)	Date Sounded	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Water Level Elevation (feet MSL)	Difference from Previous Measurement (feet)
NMW-5	100.45	5/12/95	--	22.35	0	78.10	**
		1/4/96	Trace	22.84	0	77.61	-0.49
		4/8/96	--	21.40	0	79.05	1.44
		4/24/96	--	20.04	0	80.41	1.36
		7/11/96	--	22.45	0	78.00	-2.41
		11/3/96	Sheen	23.38	0	77.07	-0.93
		2/28/97	--	21.07	0	79.38	2.31
		5/29/97	--	31.75	0	68.70	-10.68
		9/5/97	--	27.52	0	72.93	4.23
		12/31/97	--	23.68	0	76.77	3.84
		5/18/98	--	19.93	0	80.52	3.75
		7/31/98	--	21.68	0	78.77	-1.75
MW-6	93.89	4/8/96	--	21.53	0	72.36	**
		4/24/96	--	22.04	0	71.85	-0.51
		7/11/96	--	22.61	0	71.28	-0.57
		11/3/96	--	24.04	0	69.85	-1.43
		2/28/97	--	20.89	0	73.00	3.15
		5/29/97	--	23.50	0	70.39	-2.61
		9/5/97	--	26.09	0	67.80	-2.59
		10/2/97	NA	NA	NA	NA	NA
		12/31/97	--	24.76	0	69.13	1.33
		5/18/98	NA	NA	NA	NA	NA
		7/31/98	NA	NA	NA	NA	NA

Groundwater Elevation Data
Rose's Parking Lot
Portland, Oregon

Well I.D.	Top of Casing Elevation (feet)	Date Sounded	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Water Level Elevation (feet MSL)	Difference from Previous Measurement (feet)
MW-7	94.07	4/8/96	--	21.50	0	72.57	**
		4/24/96	--	21.05	0	73.02	0.45
		7/11/96	--	22.40	0	71.67	-1.35
		11/3/96	--	23.57	0	70.50	-1.17
		2/28/97	--	20.70	0	73.37	2.87
		5/29/97	--	22.20	0	71.87	-1.50
		9/5/97	--	24.89	0	69.18	-2.69
		10/2/97	NA	NA	NA	NA	NA
		12/31/97	--	23.92	0	70.15	0.97
		5/18/98	NA	NA	NA	NA	NA
		7/31/98	NA	NA	NA	NA	NA
MW-8	95.08	4/8/96	--	20.19	0	74.89	**
		4/24/96	--	18.42	0	76.66	1.77
		7/11/96	--	18.88	0	76.20	-0.46
		11/3/96	--	20.05	0	75.03	-1.17
		2/28/97	--	18.45	0	76.63	1.60
		9/5/97	--	22.49	0	72.59	-4.04
		10/1/97	NA	NA	NA	NA	NA
		12/31/97	--	19.92	0	75.16	2.57
		5/18/98	NA	NA	NA	NA	NA
		7/31/98	NA	NA	NA	NA	NA

Notes:

Data from 5/12/95-11/3/96 from GeoEngineers Groundwater Report January, 1997.

Wells MW-2, MW-3, and MW-5 redrilled 1/23-1/25/97, and renamed NMW-2, NMW-3, and NMW-5 respectively.

Depth to water measurements made from top of casing.

Elevations for wells except for MW-7 and MW-8 based on monitoring well survey conducted 3/3/97.
Elevations are measured to the local assumed datum of 100.00 feet at MW-1.
Elevations for MW-7 and MW-8 based on GeoEngineers' data, corrected for change in arbitrary reference point.

ft MSL feet above Mean Sea Level

** Not calculated; previous measurements not available.

-- Not Applicable; no free product detected in well.

NA Not Analyzed.

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Table 3

TERRA VAC

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-1	3/29/94	NA	130	390	98	1,570	NA	NA
	10/4/94	NA	27	46	6	70	NA	NA
	5/12/95	NA	NA	NA	NA	NA	NA	NA
	1/4/96	54,000	400	2,200	630	4,800	Naphthalene - 370 Acenaphthylene - 44	100
	4/24/96	NA	NA	NA	NA	NA	NA	NA
	7/11/96	81,000	710	1,800	730	2	Naphthalene - 750 Acenaphthylene - 160 Phenanthrene - 2.2 Fluoranthene - 4.5	NA
	11/3/96	23,000	410	1,500	910	4,100	Naphthalene - 2,400 Acenaphthylene - 460 Acenaphthene -600 Fluorene - 12 Phenanthrene - 12 Anthracene - 0.89 Fluoranthene - 10 Pyrene - 2.1 Benzo(a)anthracene - 0.7 Chrysene - 1.3 Benzo(k)fluoranthene - 0.1 Benzo(a)pyrene - 0.3 Dibenzo(a,h)anthracene - 0.1 Benzo(g,h,i)perylene - 0.4	NA
	2/28/97*	57,200	1,130	3,890	1,220	7,430	Naphthalene - 760	20
	5/29/97	14,900	65.9	49.3	205	1,010	NA	NA
	9/5/97	14,600	10.9	11.8	47.3	642	Naphthalene - 54.2	NA
	12/31/97	2960	ND	ND	ND	8.76	NA	NA
	5/18/98	16,000	ND	7.63	ND	930	Naphthalene - 387	2,000
	7/31/98	19,600	6.00	6.54	ND	1,020	Naphthalene - 104	787

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
NMW-2	3/29/94	NA	4.9	1.4	0.7	3.0	NA	NA
	10/4/94	NA	ND	ND	ND	ND	NA	NA
	5/12/95	ND	1.2	ND	0.6	0.7	NA	NA
	1/4/96	1,600	14	1.5	ND	1.7	ND	ND
	4/24/96	NA	7.7	0.5	ND	ND	NA	NA
	7/11/96	7,100	2.7	ND	ND	ND	ND	NA
	11/3/96	ND	2.0	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
	5/18/98	ND	ND	ND	ND	ND	NA	NA
	7/31/98	203	ND	ND	ND	ND	NA	NA
NMW-3	3/29/94	NA	2,300	1,200	1,200	3,700	NA	NA
	10/4/94	NA	1,520	600	790	1,600	NA	NA
	5/12/95	3,500	1,300	740	800	2,000	Naphthalene - 130 Fluorene - 0.2 Phenanthrene - 0.09	NA
	1/4/96	4,500	1,300	640	940	2,600	Naphthalene - 180 Acenaphthylene - 23	6
	4/16/96	NA	900	500	600	1,400	NA	NA
	7/11/96	2,100	460	130	380	430	Naphthalene - 71	NA
	11/3/96	4,900	830	220	650	1,100	Naphthalene - 120 Acenaphthylene - 37	
	2/28/97	4,400	261	124	153	404	Naphthalene - 32.6	NA
	5/29/97	365	17.4	0.91	3.55	15.3	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
	5/18/98	299	4.53	ND	9.26	ND	Naphthalene - 0.173	1.5
	7/31/98	223	4.14	ND	4.68	ND	NA	NA

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Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-4	10/4/94	NA	ND	ND	ND	ND	NA	NA
	5/12/95	ND	ND	ND	ND	ND	NA	NA
	1/4/96	900	ND	ND	ND	ND	ND	ND
	4/24/96	NA	ND	ND	ND	ND	NA	NA
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	0.7	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
	5/18/98	ND	ND	ND	ND	ND	NA	NA
	7/31/98	ND	ND	ND	ND	ND	NA	NA
NMW-5	5/12/95	13,000	660	13,000	1,900	11,000	Naphthalene - 450 Acenaphthylene - 66 Fluorene - 0.6 Phenanthrene - 0.42 Anthracene - 0.07	NA
	1/4/96	6,600	4.6	22	24	230	Naphthalene - 29 Acenaphthylene - 13 Fluorene - 0.8	14
	4/24/96	NA	ND	0.6	1.1	2.9	NA	NA
	7/11/96	ND	ND	ND	ND	2.7	NA	NA
	11/3/96	NA	ND	ND	2.5	5.6	NA	NA
	2/28/97	5,440	70.3	23.5	88.6	230	Naphthalene - 28.5	NA
	5/29/97	4,480	34.9	156	7.90	554	NA	NA
	9/5/97	5,550	39.0	334	23.5	642	ND	NA
	12/31/97	18,300	62.6	570	231.0	1,570	NA	NA
	5/18/98	1,050	ND	ND	0.895	14	Naphthalene - 4.87	1.2
	7/31/98	3,310	26.8	53.6	50.0	268	NA	NA

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-6	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	102	ND	ND	ND	ND	NA	NA
	10/2/97***	NA	NA	NA	NA	NA	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
	5/18/98	NA	NA	NA	NA	NA	NA	NA
	7/31/98	NA	NA	NA	NA	NA	NA	NA
MW-7	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	110	12	ND	ND	ND	NA	NA
	10/2/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
	5/18/98	NA	NA	NA	NA	NA	NA	NA
	7/31/98	NA	NA	NA	NA	NA	NA	NA

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Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-8	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	111	ND	ND	ND	ND	NA	NA
	10/1/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
	5/18/98	NA	NA	NA	NA	NA	NA	NA
	7/31/98	NA	NA	NA	NA	NA	NA	NA

Notes:

Sampling between 3/29/94 and 11/3/96 performed by GeoEngineers. Data from 1/21/97 Groundwater Report.

Wells MW-2, MW-3, and MW-5 redrilled 1/23-1/25/97, and renamed NMW-2, NMW-3, and NMW-5 respectively.

* MW-1 sampled for lead 12/11/96.

** Sample Results were suspect. Well Resampled on 10/1/97 or 10/2/97

*** Well was dry. No analytical sample taken.

PAHs polycyclic aromatic hydrocarbons. Only analytes detected are listed. Refer to analytical results (Appendix A) for a complete list of analytes and their respective detection limits.

ug/L Micrograms per liter, or parts per billion

ND Not Detected at the reporting limits

NA Not Analyzed

TPH-G Total petroleum hydrocarbons within the gasoline range (benzene to naphthalene).

APPENDIX A

LABORATORY REPORTS

NORTH CREEK ANALYTICAL
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BOTHELL ▪ (425) 420-9200 ▪ FAX 420-9210
SPOKANE ▪ (509) 924-9200 ▪ FAX 924-9290
PORTLAND ▪ (503) 906-9200 ▪ FAX 906-9210

Terra Vac - Seattle	Project: Rose's Parking Lot	Sampled: 7/31/98
10740 Meridian Ave. N. Ste 202	Project Number: 32-0029	Received: 7/31/98
Seattle, WA 98133	Project Manager: Tim Warner	Reported: 8/21/98 11:43

ANALYTICAL REPORT FOR SAMPLES:

Sample Description	Laboratory Sample Number	Sample Matrix	Date Sampled
MW-1	P807627-01	Water	7/31/98
MW-2	P807627-02	Water	7/31/98
NMW3	P807627-03	Water	7/31/98
MW-4	P807627-04	Water	7/31/98
NMW-5	P807627-05	Water	7/31/98
Trip Blank	P807627-06	Water	7/31/98

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Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 7/31/98
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029	Received: 7/31/98
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 8/21/98 11:43

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-1			**P807627-01**				**Water**	
Benzene	0880037	8/4/98	8/4/98		5.00	**6.00**	ug/l	
Toluene	"	"	"		5.00	**6.54**	"	
Ethylbenzene	"	"	"		5.00	ND	"	
Xylenes (total)	"	"	"		10.0	**1020**	"	
Gasoline Range Hydrocarbons	"	"	"		800	**19600**	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*104*	%	
MW-2			**P807627-02**				**Water**	
Benzene	0880009	8/2/98	8/2/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	**203**	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*88.8*	%	
NMW3			**P807627-03**				**Water**	
Benzene	0880009	8/2/98	8/2/98		0.500	**4.14**	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	**4.68**	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	**223**	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*94.6*	%	
MW-4			**P807627-04**				**Water**	
Benzene	0880009	8/2/98	8/2/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*90.0*	%	
NMW-5			**P807627-05**				**Water**	
Benzene	0880037	8/4/98	8/4/98		1.00	**26.8**	ug/l	
Toluene	"	"	"		1.00	**53.6**	"	
Ethylbenzene	"	"	"		1.00	**50.0**	"	
Xylenes (total)	"	"	"		2.00	**268**	"	
Gasoline Range Hydrocarbons	"	"	"		160	**3310**	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*109*	%	

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**Refer to end of report for text of notes and definitions.*

Lisa Domenighini, Project Manager

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Terra Vac - Seattle	Project: Rose's Parking Lot	Sampled: 7/31/98
10740 Meridian Ave. N. Ste 202	Project Number: 32-0029	Received: 7/31/98
Seattle, WA 98133	Project Manager: Tim Warner	Reported: 8/21/98 11:43

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
Trip Blank			**P807627-06**				**Water**	
Benzene	0880009	8/2/98	8/3/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*94.4*	%	

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Terra Vac - Seattle	Project: Rose's Parking Lot	Sampled: 7/31/98
10740 Meridian Ave. N. Ste 202	Project Number: 32-0029	Received: 7/31/98
Seattle, WA 98133	Project Manager: Tim Warner	Reported: 8/21/98 11:43

Dissolved Metals per EPA 6000/7000 Series Methods
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Specific Method	Reporting Limit	Result	Units	Notes*
MW-1			**P807627-01**				**Water**	
Lead	0880208	8/10/98	8/12/98	EPA 6020	0.00100	**0.787**	mg/l	

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Refer to end of report for text of notes and definitions.

Lisa Domenighini, Project Manager

18939 120th Avenue N.E., Suite 101, Bothell, WA 98011-9508
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Terra Vac - Seattle	Project: Rose's Parking Lot	Sampled: 7/31/98
10740 Meridian Ave. N. Ste 202	Project Number: 32-0029	Received: 7/31/98
Seattle, WA 98133	Project Manager: Tim Warner	Reported: 8/21/98 11:43

Polynuclear Aromatic Hydrocarbons per EPA Method 610 (HPLC)
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-1			**P807627-01**				**Water**	
Acenaphthene	0880032	8/3/98	8/11/98		100	ND	ug/l	1
Acenaphthylene	"	"	"		100	ND	"	1
Anthracene	"	"	8/10/98		5.00	ND	"	
Benzo (a) anthracene	"	"	"		0.100	ND	"	
Benzo (a) pyrene	"	"	"		0.100	ND	"	
Benzo (b) fluoranthene	"	"	"		0.100	ND	"	
Benzo (ghi) perylene	"	"	"		0.100	ND	"	
Benzo (k) fluoranthene	"	"	"		0.100	ND	"	
Chrysene	"	"	"		0.100	ND	"	
Dibenzo (a,h) anthracene	"	"	"		0.100	ND	"	
Fluoranthene	"	"	"		0.100	ND	"	
Fluorene	"	"	"		0.500	ND	"	
Indeno (1,2,3-cd) pyrene	"	"	"		0.100	ND	"	
Naphthalene	"	"	8/11/98		100	**104**	"	1
Phenanthrene	"	"	8/10/98		5.00	ND	"	
Pyrene	"	"	"		0.200	ND	"	2
Surrogate: 2-Fluorobiphenyl	"	"	"	*30.0-100*		*43.2*	*%*	*3*

North Creek Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

Lisa Domenighini, Project Manager

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Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 7/31/98
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029	Received: 7/31/98
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 8/21/98 11:43

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes
Batch: 0880009	**Date Prepared: 8/2/98**					**Extraction Method: EPA 5030**				
Blank	**0880009-BLK1**									
Benzene	8/2/98			ND	ug/l	0.500				
Toluene	"			ND	"	0.500				
Ethylbenzene	"			ND	"	0.500				
Xylenes (total)	"			ND	"	1.00				
Gasoline Range Hydrocarbons	"			ND	"	80.0				
Surrogate: 4-BFB	"	*50.0*		*43.4*	"	*50.0-150*	*86.8*			
LCS	**0880009-BS1**									
Gasoline Range Hydrocarbons	8/2/98	1250		1160	ug/l	50.0-150	92.8			
Surrogate: 4-BFB	"	*50.0*		*48.4*	"	*50.0-150*	*96.8*			
LCS	**0880009-BS2**									
Benzene	8/2/98	20.0		18.0	ug/l	67.0-130	90.0			
Toluene	"	20.0		18.2	"	75.0-126	91.0			
Ethylbenzene	"	20.0		19.0	"	76.0-124	95.0			
Xylenes (total)	"	60.0		57.1	"	75.0-126	95.2			
Surrogate: 4-BFB	"	*50.0*		*44.8*	"	*50.0-150*	*89.6*			
Duplicate	**0880009-DUP1**		**P807627-02**							
Gasoline Range Hydrocarbons	8/2/98		203	ND	ug/l			50.0		
Surrogate: 4-BFB	"	*50.0*		*44.3*	"	*50.0-150*	*88.6*			
Matrix Spike	**0880009-MS1**		**P807627-02**							
Benzene	8/2/98	20.0	ND	16.5	ug/l	67.0-130	**82.5**			
Toluene	"	20.0	ND	16.6	"	75.0-126	**83.0**			
Ethylbenzene	"	20.0	ND	17.3	"	76.0-124	**86.5**			
Xylenes (total)	"	60.0	ND	52.2	"	75.0-126	**87.0**			
Surrogate: 4-BFB	"	*50.0*		*43.3*	"	*50.0-150*	*86.6*			
Matrix Spike Dup	**0880009-MSD1**		**P807627-02**							
Benzene	8/2/98	20.0	ND	16.2	ug/l	67.0-130	**81.0**	13.0	**1.83**	
Toluene	"	20.0	ND	16.3	"	75.0-126	**81.5**	13.0	**1.82**	
Ethylbenzene	"	20.0	ND	16.9	"	76.0-124	**84.5**	15.0	**2.34**	
Xylenes (total)	"	60.0	ND	50.1	"	75.0-126	**83.5**	13.0	**4.11**	
Surrogate: 4-BFB	"	*50.0*		*44.8*	"	*50.0-150*	*89.6*			

North Creek Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

Lisa Domenighini, Project Manager

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

BOTHELL • (425) 420-9200 • FAX 420-9210
SPOKANE • (509) 924-9200 • FAX 924-9290
PORTLAND • (503) 906-9200 • FAX 906-9210

Terra Vac - Seattle	Project: Rose's Parking Lot	Sampled: 7/31/98
10740 Meridian Ave. N. Ste 202	Project Number: 32-0029	Received: 7/31/98
Seattle, WA 98133	Project Manager: Tim Warner	Reported: 8/21/98 11:43

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0880037	**Date Prepared: 8/4/98**					**Extraction Method: EPA 5030**				
Blank	**0880037-BLK1**									
Benzene	8/4/98			ND	ug/l	0.500				
Toluene	"			ND	"	0.500				
Ethylbenzene	"			ND	"	0.500				
Xylenes (total)	"			ND	"	1.00				
Gasoline Range Hydrocarbons	"			ND	"	80.0				
Surrogate: 4-BFB	"	*50.0*		*51.5*	"	*50.0-150*	*103*			
LCS	**0880037-BS1**									
Gasoline Range Hydrocarbons	8/4/98	1250		1080	ug/l	50.0-150	86.4			
Surrogate: 4-BFB	"	*50.0*		*55.8*	"	*50.0-150*	*112*			
LCS	**0880037-BS2**									
Benzene	8/4/98	20.0		19.6	ug/l	67.0-130	98.0			
Toluene	"	20.0		20.3	"	75.0-126	101			
Ethylbenzene	"	20.0		19.9	"	76.0-124	99.5			
Xylenes (total)	"	60.0		59.0	"	75.0-126	98.3			
Surrogate: 4-BFB	"	*50.0*		*52.7*	"	*50.0-150*	*105*			

North Creek Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

Lisa Domenighini, Project Manager

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PORTLAND • (503) 906-9200 • FAX 906-9210

Terra Vac - Seattle	Project: Rose's Parking Lot	Sampled: 7/31/98
10740 Meridian Ave. N. Ste 202	Project Number: 32-0029	Received: 7/31/98
Seattle, WA 98133	Project Manager: Tim Warner	Reported: 8/21/98 11:43

Dissolved Metals per EPA 6000/7000 Series Methods/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0880208	**Date Prepared: 8/10/98**					**Extraction Method: EPA 200/3005**				
Blank	**0880208-BLK1**									
Lead	8/12/98			**ND**	mg/l	**0.00100**				
LCS	**0880208-BS1**									
Lead	8/12/98	0.100		0.103	mg/l	80.0-120	103			
Duplicate	**0880208-DUP1**		**P808123-02**							
Lead	8/12/98		ND	ND	mg/l			20.0		
Matrix Spike	**0880208-MS1**		**P808123-02**							
Lead	8/12/98	0.100	ND	0.101	mg/l	75.0-125	**101**			

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SPOKANE • (509) 924-9200 • FAX 924-9290
PORTLAND • (503) 906-9200 • FAX 906-9210

Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 7/31/98
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029	Received: 7/31/98
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 8/21/98 11:43

Polynuclear Aromatic Hydrocarbons per EPA Method 610 (HPLC)/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0880032	**Date Prepared: 8/3/98**					**Extraction Method: EPA 3520/600 Series**				
Blank	**0880032-BLK1**									
Acenaphthene	8/10/98			ND	ug/l	5.00				
Acenaphthylene	"			ND	"	5.00				
Anthracene	"			ND	"	5.00				
Benzo (a) anthracene	"			ND	"	0.100				
Benzo (a) pyrene	"			ND	"	0.100				
Benzo (b) fluoranthene	"			ND	"	0.100				
Benzo (ghi) perylene	"			ND	"	0.100				
Benzo (k) fluoranthene	"			ND	"	0.100				
Chrysene	"			ND	"	0.100				
Dibenzo (a,h) anthracene	"			ND	"	0.100				
Fluoranthene	"			ND	"	0.100				
Fluorene	"			ND	"	0.100				
Indeno (1,2,3-cd) pyrene	"			ND	"	0.500				
Naphthalene	"			ND	"	0.100				
Phenanthrene	"			ND	"	5.00				
Pyrene	"			ND	"	5.00				
Surrogate: 2-Fluorobiphenyl	"	*25.0*		*17.4*	"	0.100 / *30.0-100*	*69.6*			
LCS	**0880032-BS1**									
Acenaphthylene	8/10/98	10.0		9.02	ug/l	20.0-124	90.2			
Benzo (k) fluoranthene	"	0.500		0.544	"	20.0-159	109			
Pyrene	"	0.500		0.598	"	50.0-150	120			
Surrogate: 2-Fluorobiphenyl	"	*25.0*		*16.9*	"	*30.0-100*	*67.6*			
LCS Dup	**0880032-BSD1**									
Acenaphthylene	8/10/98	10.0		9.23	ug/l	20.0-124	92.3	20.0	2.30	
Benzo (k) fluoranthene	"	0.500		0.538	"	20.0-159	108	20.0	0.922	
Pyrene	"	0.500		0.588	"	50.0-150	118	20.0	1.68	
Surrogate: 2-Fluorobiphenyl	"	*25.0*		*16.6*	"	*30.0-100*	*66.4*			

North Creek Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

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Terra Vac - Seattle	Project: Rose's Parking Lot	Sampled: 7/31/98
10740 Meridian Ave. N. Ste 202	Project Number: 32-0029	Received: 7/31/98
Seattle, WA 98133	Project Manager: Tim Warner	Reported: 8/21/98 11:43

Notes and Definitions

#	Note
1	Reporting limits raised due to dilution necessary for analysis.
2	The reporting limit for this analyte was raised due to matrix interference.
3	Surrogate recoveries reported from original, undiluted analysis; analyte(s) reported from analysis of sample dilution.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
Recov.	Recovery
RPD	Relative Percent Difference

North Creek Analytical, Inc.

Lisa Domenighini, Project Manager

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9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202

17.9

CHAIN OF CUSTODY REPORT

Work Order # PE07627

REPORT TO: Terra Vac	INVOICE TO:
ATTENTION: Mr. Paul Bianco	ATTENTION: (SAME)
ADDRESS: 10740 Meridian Ave. N. #202 Seattle WA 98133	ADDRESS:
PHONE: 206-362-8128 FAX: 206-362-9528	P.O. NUMBER: NCA QUOTE #:
PROJECT NAME: Rose's Packing Lot	
PROJECT NUMBER: 32-0029	
SAMPLED BY: James Orr	

TURNAROUND REQUEST in Business Days *

Organic & Inorganic Analyses: ~~10 Standard~~ | 7 | 5 | 4 | 3 | 2 | 1 | Same Day

Fuels & Hydrocarbon Analyses: ~~5 Standard~~ | 3-4 | 2 | 1 | Same Day

OTHER Specify:

* Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	NCA SAMPLE ID (Laboratory Use Only)	TPH-G, BTEX	PAH	EDB/EDC	P.S.S. Pb*	MATRIX (W, S, A, O)	# OF CONTAINERS	COMMENTS
1.	MW-1	7-31-98/1300		X	X	X	X	W	4	
2.	NMW-2	1305		X					2	
3.	NMW-3	1310		X	X	X	X		4	
4.	MW-4	1315		X					2	
5.	NMW-5	1320		X	X	X	X		4	
6.	Trip Blank	1325		X				W	2	
7.										
8.										
9.										
10.										

RELINQUISHED BY (Signature): James Orr	DATE: 7-31-98	RECEIVED BY (Signature): Sara McClurg	DATE: 7-31-9
PRINT NAME: James Orr	FIRM: TerraVac TIME: 1418	PRINT NAME: Sara McClurg	FIRM: NCA TIME: 1418
RELINQUISHED BY (Signature):	DATE:	RECEIVED BY (Signature):	DATE:
PRINT NAME:	FIRM: TIME:	PRINT NAME:	FIRM: TIME:

ADDITIONAL REMARKS: * Please filter and preserve

PAGE 1 OF 1

26-94-0025

TERRA VAC 10740 Meridian Avenue North, Suite 202, Seattle, WA 98133-9010
Tel (206) 362-8128 ❑ Fax (206) 362-9528

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED

OCT 08 1998

NORTHWEST REGION

October 2, 1998

Mr. Max Birnbach
c/o Mr. Charles R. Williamson
Kell, Alterman & Runstein
1001 Southwest Fifth Avenue, Suite 1800
Portland, OR 97204-1194

RE: First Quarter 1998 Groundwater Monitoring Report
Rose's Parking Lot
330 Northwest 23rd Avenue, Portland, Oregon

Dear Mr. Birnbach:

Terra Vac performed quarterly groundwater monitoring at this site on May 18, 1998. Five monitoring wells were sounded for depth to groundwater. Groundwater samples were collected from the monitoring wells for analyses of total gasoline-range petroleum hydrocarbons (TPH-G), benzene, toluene, ethylbenzene, and total xylenes (BTEX). In addition, groundwater samples from monitoring wells MW-1, NMW-3, and NMW-5 were analyzed for polycyclic aromatic hydrocarbons (PAHs), dissolved lead, and EDB/EDC. A site location map is shown on Figure 1. Well construction details, including construction dates, well diameters, total depths, and screened intervals are provided in Table 1.

Groundwater elevations increased in all five monitoring wells since the previous monitoring event. Analytical results indicate groundwater from MW-1 exceeded the current Oregon Department of Environmental Quality (ODEQ) Groundwater Cleanup Levels for naphthalene and dissolved lead.

Groundwater monitoring and sampling were performed using standard field procedures. In short, each well was sounded for depth to groundwater and the presence of free phase petroleum hydrocarbons using an electronic interface probe. If free phase petroleum hydrocarbons were not detected, total well depth was measured. A minimum of three well volumes were bailed from each well sampled, and groundwater allowed to recover to at least 80 percent of original elevation. Analytical samples were then collected with new disposable bailers and immediately placed in sampling vials prepared specifically for the sampled media and selected analyses. Once collected, samples were immediately acidified and cooled for transportation to the laboratory under proper chain of custody.

Existing top of casing elevations, as determined by a March, 1997 well survey, were used to establish reference points for well depths, screen intervals, and groundwater elevations for wells MW-1, MW-4, MW- 6, NMW-2, NMW-3 and NMW-5. Historical groundwater elevations are presented in Table 2. First quarter 1998 groundwater elevations as measured on May 18, 1998 are also presented on Figure 2. Historically, the inferred direction of groundwater flow has been to the northeast. Prior to sampling, the remediation system had been offline since October 31, 1997.

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Since February 1997, groundwater samples have been analyzed for TPH-G by EPA Method 8015, for BTEX constituents by EPA Method 8020A, for PAHs by EPA Method 8310, and for dissolved lead by EPA Method 200.8. Previous groundwater sampling performed by GeoEngineers included in this report used EPA Method 418.1 for TPH-G, EPA Method 8020 for BTEX, EPA Method 8310 for PAHs, and EPA Method 7421 for dissolved lead. Results of these analyses, and historical groundwater quality data, are presented in Table 3. Groundwater quality results from the first quarter 1998 sampling are also shown on Figure 3. Analytical reports from the laboratory are contained in Appendix A.

Field activities were performed in a manner consistent with the level of skill and care standard for local environmental professionals. Findings and conclusions presented in this report have been prepared based upon the specific site conditions at the time of field activities and no warranty, expressed or implied, is made.

If you have any questions, please do not hesitate to contact us.

Sincerely,
Terra Vac Corporation

Paul V. Bianco,
Project Engineer

Timothy Warner,
Project Manager

cc: Dave Roy
Rich Kostecki
Jeffrey Wishko
Richard Singer (2 copies)
Richard Allen
Edward Crow
Don Pettit

32-0029.20.01

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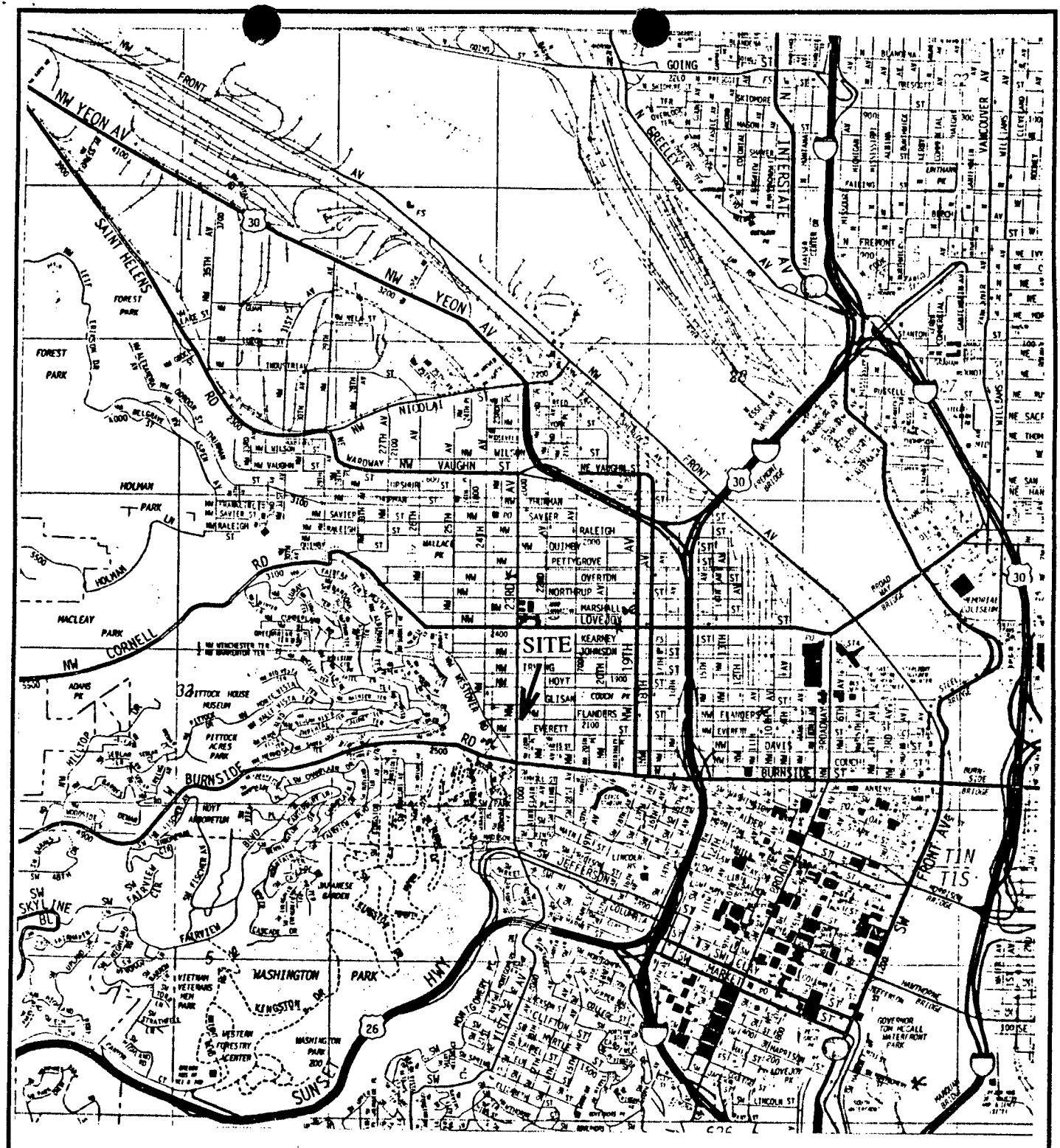
FIGURES



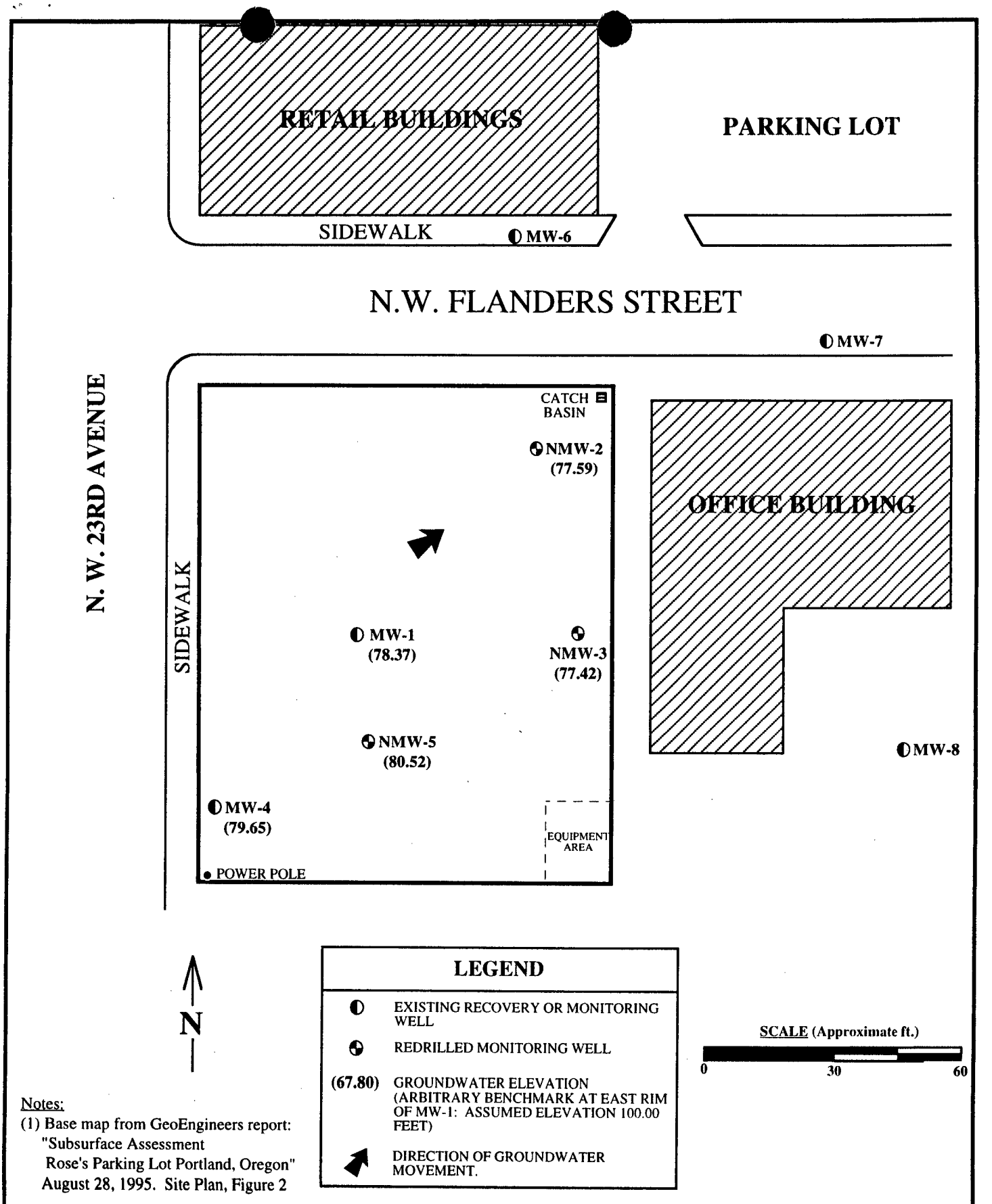
Source: THE THOMAS GUIDE, 1994.

N

FIGURE 1
SITE LOCATION MAP
ROSE'S PARKING LOT
PORTLAND, OREGON

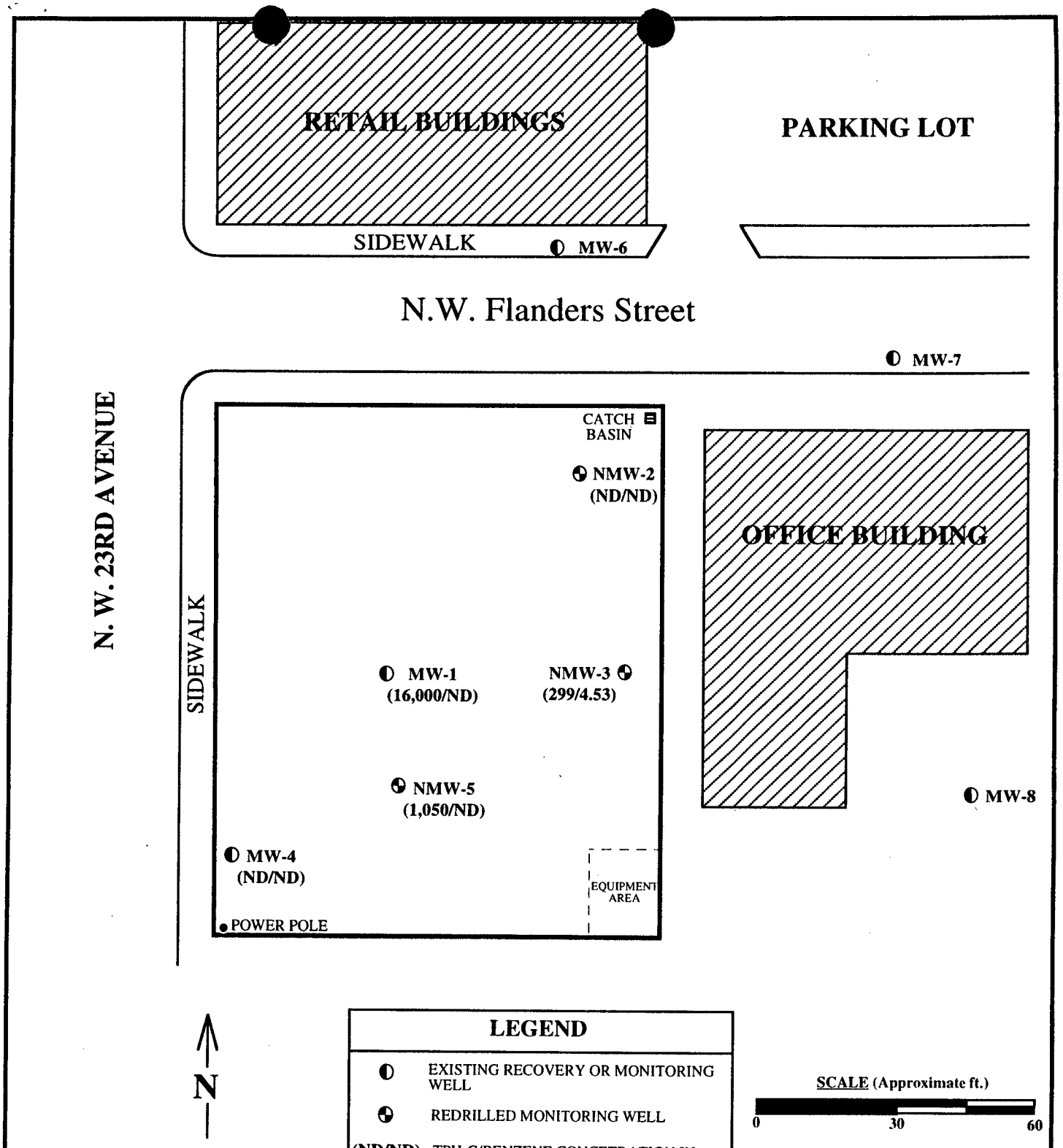
TERRA VAC

PROJECT NO.	32-0029
DATE	SEPTEMBER 10, 1998
REVISION	PVB-2



Notes:
(1) Base map from GeoEngineers report: "Subsurface Assessment Rose's Parking Lot Portland, Oregon" August 28, 1995. Site Plan, Figure 2

GROUNDWATER ELEVATIONS	**Rose's Parking Lot 330 NW 23rd Ave. Portland, Oregon**	TERRA VAC	PROJECT NO. 32-0029 DATE SEPTEMBER 10, 1998 SCALE 1 INCH ≈ 30 FEET REVISION PVB-3	Figure 2



Notes:

(1) Base map from GeoEngineers report: "Subsurface Assessment Rose's Parking Lot Portland, Oregon" August 28, 1995. Site Plan, Figure 2

GROUNDWATER ANALYTICAL RESULTS	**Rose's Parking Lot 330 NW 23rd Ave. Portland, Oregon**	TERRA VAC	PROJECT NO.	32-0029	Figure 3
			DATE	SEPTEMBER 10, 1998	
			SCALE	1 INCH ≈ 30 FEET	
			REVISION	PVB-3	

TABLES

Table 1

Remediation Well Construction Data
Rose's Parking Lot
Portland, Oregon

Well Identification	Date Installed	Total Depth (feet)	Screen Interval		Well Diameter (inches)
			Top (feet)	Bottom (feet)	
MW-1	3/23/94	39	24	38.5	2
NMW-2	1/24/97	38	15	37	4
NMW-3	1/25/97	38	15.5	37.5	4
MW-4	9/28/94	40	20	39.5	2
NMW-5	1/23/97	38	15	37	4
MW-6	4/6/96	31	15	30.5	2
MW-7	4/6/96	31	15	30.5	2
MW-8	4/6/96	31	15	30.5	2

Notes:

Data on NMW-2, NMW-3, and NMW-5 is from Terra Vac field notes and well logs.

Data on MW-1 from RZA Agra Inc. well logs in April, 1994 report.

Data on MW-4 from RZA Agra Inc. well logs in October, 1994 report.

Data on MW-6 through MW-8 from well logs in GeoEngineers June, 1996 Report

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Table 2

Groundwater Elevation Data
Rose's Parking Lot
Portland, Oregon

Well I.D.	Top of Casing Elevation (feet)	Date Sounded	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Water Level Elevation (feet MSL)	Difference from Previous Measurement (feet)
MW-1	100.00	5/12/95	22.79	23.29	0.5	76.71	**
		1/4/96	--	24.10	Trace	75.90	-0.81
		4/8/96	22.39	22.41	0.02	77.59	1.69
		4/24/96	22.40	22.45	0.05	77.55	-0.04
		7/11/96	--	23.35	Trace	76.65	-0.90
		11/3/96	--	24.44	Sheen	75.56	-1.09
		2/28/97	--	21.11	0	78.89	3.33
		5/29/97	--	26.90	0	73.10	-5.79
		9/5/97	--	27.86	0	72.14	-0.96
		12/31/97	--	23.97	0	76.03	3.89
		5/18/98	--	21.63	0	78.37	2.34
NMW-2	96.21	5/12/95	--	20.75	0	75.46	**
		1/4/96	--	21.60	0	74.61	-0.85
		4/8/96	--	19.73	0	76.48	1.87
		4/24/96	--	19.90	0	76.31	-0.17
		7/11/96	Sheen	20.80	0	75.41	-0.90
		11/3/96	--	21.87	0	74.34	-1.07
		2/28/97	--	18.51	0	77.70	3.36
		5/29/97	--	25.30	0	70.91	-6.79
		9/5/97	--	26.83	0	69.38	-1.53
		12/31/97	--	21.22	0	74.99	5.61
		5/18/98	--	18.62	0	77.59	2.60
NMW-3	99.15	5/12/95	--	23.48	0	75.67	**
		1/4/96	--	24.22	0	74.93	-0.74
		4/8/96	--	22.31	0	76.84	1.91
		4/24/96	--	22.36	0	76.79	-0.05
		7/11/96	--	23.37	0	75.78	-1.01
		11/3/96	Sheen	24.47	0	74.68	-1.10
		2/28/97	--	21.28	0	77.87	3.19
		5/29/97	--	29.78	0	69.37	-8.50
		9/5/97	--	27.77	0	71.38	2.01
		12/31/97	--	23.88	0	75.27	3.89
		5/18/98	--	21.73	0	77.42	2.15

Table 2

TERRA VAC

Groundwater Elevation Data
Rose's Parking Lot
Portland, Oregon

Well I.D.	Top of Casing Elevation (feet)	Date Sounded	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Water Level Elevation (feet MSL)	Difference from Previous Measurement (feet)
MW-4	100.48	5/12/95	--	22.55	0	77.93	**
		1/4/96	--	23.03	0	77.45	-0.48
		4/8/96	--	21.60	0	78.88	1.43
		4/24/96	--	21.34	0	79.14	0.26
		7/11/96	--	22.54	0	77.94	-1.20
		11/3/96	--	23.45	0	77.03	-0.91
		2/28/97	--	20.24	0	80.24	3.21
		5/29/97	--	26.04	0	74.44	-5.80
		9/5/97	--	26.58	0	73.90	-0.54
		12/31/97	--	23.00	0	77.48	3.58
		5/18/98	--	20.83	0	79.65	2.17
NMW-5	100.45	5/12/95	--	22.35	0	78.10	**
		1/4/96	Trace	22.84	0	77.61	-0.49
		4/8/96	--	21.40	0	79.05	1.44
		4/24/96	--	20.04	0	80.41	1.36
		7/11/96	--	22.45	0	78.00	-2.41
		11/3/96	Sheen	23.38	0	77.07	-0.93
		2/28/97	--	21.07	0	79.38	2.31
		5/29/97	--	31.75	0	68.70	-10.68
		9/5/97	--	27.52	0	72.93	4.23
		12/31/97	--	23.68	0	76.77	3.84
		5/18/98	--	19.93	0	80.52	3.75
MW-6	93.89	4/8/96	--	21.53	0	72.36	**
		4/24/96	--	22.04	0	71.85	-0.51
		7/11/96	--	22.61	0	71.28	-0.57
		11/3/96	--	24.04	0	69.85	-1.43
		2/28/97	--	20.89	0	73.00	3.15
		5/29/97	--	23.50	0	70.39	-2.61
		9/5/97	--	26.09	0	67.80	-2.59
		10/2/97	NA	NA	NA	NA	NA
		12/31/97 5/18	--	24.76	0	69.13	1.33

Groundwater Elevation Data
Rose's Parking Lot
Portland, Oregon

Well I.D.	Top of Casing Elevation (feet)	Date Sounded	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Water Level Elevation (feet MSL)	Difference from Previous Measurement (feet)
MW-7	94.07	4/8/96	--	21.50	0	72.57	**
		4/24/96	--	21.05	0	73.02	0.45
		7/11/96	--	22.40	0	71.67	-1.35
		11/3/96	--	23.57	0	70.50	-1.17
		2/28/97	--	20.70	0	73.37	2.87
		5/29/97	--	22.20	0	71.87	-1.50
		9/5/97	--	24.89	0	69.18	-2.69
		10/2/97	NA	NA	NA	NA	NA
		12/31/97 5/18	--	23.92	0	70.15	0.97
MW-8	95.08	4/8/96	--	20.19	0	74.89	**
		4/24/96	--	18.42	0	76.66	1.77
		7/11/96	--	18.88	0	76.20	-0.46
		11/3/96	--	20.05	0	75.03	-1.17
		2/28/97	--	18.45	0	76.63	1.60
		9/5/97	--	22.49	0	72.59	-4.04
		10/1/97	NA	NA	NA	NA	NA
		12/31/97 5/18	--	19.92	0	75.16	2.57

Notes:

Data from 5/12/95-11/3/96 from GeoEngineers Groundwater Report January, 1997.

Wells MW-2, MW-3, and MW-5 redrilled 1/23-1/25/97, and renamed NMW-2, NMW-3, and NMW-5 respectively.

Depth to water measurements made from top of casing.

Elevations for wells except for MW-7 and MW-8 based on monitoring well survey conducted 3/3/97.
Elevations are measured to the local assumed datum of 100.00 feet at MW-1.
Elevations for MW-7 and MW-8 based on GeoEngineers' data, corrected for change in arbitrary reference point.

ft MSL feet above Mean Sea Level

** Not calculated; previous measurements not available.

-- Not Applicable; no free product detected in well.

NA Not Analyzed.

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-1	3/29/94	NA	130	390	98	1,570	NA	NA
	10/4/94	NA	27	46	6	70	NA	NA
	5/12/95	NA	NA	NA	NA	NA	NA	NA
	1/4/96	54,000	400	2,200	630	4,800	Naphthalene - 370 Acenaphthylene - 44	100
	4/24/96	NA	NA	NA	NA	NA	NA	NA
	7/11/96	81,000	710	1,800	730	2	Naphthalene - 750 Acenaphthylene - 160 Phenanthrene - 2.2 Fluoranthene - 4.5	NA
	11/3/96	23,000	410	1,500	910	4,100	Naphthalene - 2,400 Acenaphthylene - 460 Acenaphthene -600 Fluorene - 12 Phenanthrene - 12 Anthracene - 0.89 Fluoranthene - 10 Pyrene - 2.1 Benzo(a)anthracene - 0.7 Chrysene - 1.3 Benzo(k)fluoranthene - 0.1 Benzo(a)pyrene - 0.3 Dibenzo(a,h)anthracene - 0.1 Benzo(g,h,i)perylene - 0.4	NA
	2/28/97*	57,200	1,130	3,890	1,220	7,430	Naphthalene - 760	20
	5/29/97	14,900	65.9	49.3	205	1,010	NA	NA
	9/5/97	14,600	10.9	11.8	47.3	642	Naphthalene - 54.2	NA
	12/31/97	2960	ND	ND	ND	8.76	NA	NA
	5/18/98	16,000	ND	7.63	ND	930	Naphthalene - 387	2,000

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Table 3

TERRA VAC

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
NMW-2	3/29/94	NA	4.9	1.4	0.7	3.0	NA	NA
	10/4/94	NA	ND	ND	ND	ND	NA	NA
	5/12/95	ND	1.2	ND	0.6	0.7	NA	NA
	1/4/96	1,600	14	1.5	ND	1.7	ND	ND
	4/24/96	NA	7.7	0.5	ND	ND	NA	NA
	7/11/96	7,100	2.7	ND	ND	ND	ND	NA
	11/3/96	ND	2.0	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
	5/18/98	ND	ND	ND	ND	ND	NA	NA
NMW-3	3/29/94	NA	2,300	1,200	1,200	3,700	NA	NA
	10/4/94	NA	1,520	600	790	1,600	NA	NA
	5/12/95	3,500	1,300	740	800	2,000	Naphthalene - 130 Fluorene - 0.2 Phenanthrene - 0.09	NA
	1/4/96	4,500	1,300	640	940	2,600	Naphthalene - 180 Acenaphthylene - 23	6
	4/16/96	NA	900	500	600	1,400	NA	NA
	7/11/96	2,100	460	130	380	430	Naphthalene - 71	NA
	11/3/96	4,900	830	220	650	1,100	Naphthalene - 120 Acenaphthylene - 37	
	2/28/97	4,400	261	124	153	404	Naphthalene - 32.6	NA
	5/29/97	365	17.4	0.91	3.55	15.3	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
	5/18/98	299	4.53	ND	9.26	ND	Naphthalene - 0.173	1.5

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-4	10/4/94	NA	ND	ND	ND	ND	NA	NA
	5/12/95	ND	ND	ND	ND	ND	NA	NA
	1/4/96	900	ND	ND	ND	ND	ND	ND
	4/24/96	NA	ND	ND	ND	ND	NA	NA
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	0.7	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
	5/18/98	ND	ND	ND	ND	ND	NA	NA
NMW-5	5/12/95	13,000	660	13,000	1,900	11,000	Naphthalene - 450 Acenaphthylene - 66 Fluorene - 0.6 Phenanthrene - 0.42 Anthracene - 0.07	NA
	1/4/96	6,600	4.6	22	24	230	Naphthalene - 29 Acenaphthylene - 13 Fluorene - 0.8	14
	4/24/96	NA	ND	0.6	1.1	2.9	NA	NA
	7/11/96	ND	ND	ND	ND	2.7	NA	NA
	11/3/96	NA	ND	ND	2.5	5.6	NA	NA
	2/28/97	5,440	70.3	23.5	88.6	230	Naphthalene - 28.5	NA
	5/29/97	4,480	34.9	156	7.90	554	NA	NA
	9/5/97	5,550	39.0	334	23.5	642	ND	NA
	12/31/97	18,300	62.6	570	231.0	1,570	NA	NA
	5/18/98	1,050	ND	ND	0.895	14	Naphthalene - 4.87	1.2

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Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-6	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	102	ND	ND	ND	ND	NA	NA
	10/2/97***	NA	NA	NA	NA	NA	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
MW-7	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	110	12	ND	ND	ND	NA	NA
	10/2/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA

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Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-8	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	111	ND	ND	ND	ND	NA	NA
	10/1/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA

Notes:

Sampling between 3/29/94 and 11/3/96 performed by GeoEngineers. Data from 1/21/97 Groundwater Report.

Wells MW-2, MW-3, and MW-5 redrilled 1/23-1/25/97, and renamed NMW-2, NMW-3, and NMW-5 respectively.

* MW-1 sampled for lead 12/11/96.

** Sample Results were suspect. Well Resampled on 10/1/97 or 10/2/97

*** Well was dry. No analytical sample taken.

PAHs polycyclic aromatic hydrocarbons. Only analytes detected are listed. Refer to analytical results (Appendix A) for a complete list of analytes and their respective detection limits.

ug/L Micrograms per liter, or parts per billion

ND Not Detected at the reporting limits

NA Not Analyzed

TPH-G Total petroleum hydrocarbons within the gasoline range (benzene to naphthalene).

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APPENDIX A

LABORATORY REPORTS

NORTH CREEK ANALYTICAL
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PORTLAND ▪ (503) 906-9200 ▪ FAX 906-9210

Terra Vac	Project: Rose's Parking Lot	Sampled: 5/18/98
PO Box 818	Project Number: 32-0029	Received: 5/18/98
Sherwood, OR 97140	Project Manager: Jim Orr	Reported: 6/16/98 14:42

ANALYTICAL REPORT FOR SAMPLES:

Sample Description	Laboratory Sample Number	Sample Matrix	Date Sampled
MW-1	P805406-01	Water	5/18/98
NMW-2	P805406-02	Water	5/18/98
NMW-3	P805406-03	Water	5/18/98
MW-4	P805406-04	Water	5/18/98
NMW-5	P805406-05	Water	5/18/98
Trip Blank	P805406-06	Water	5/18/98

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Terra Vac	Project:	Rose's Parking Lot	Sampled: 5/18/98
PO Box 818	Project Number:	32-0029	Received: 5/18/98
Sherwood, OR 97140	Project Manager:	Jim Orr	Reported: 6/16/98 14:42

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-1			**P805406-01**				**Water**	
Benzene	0580633	5/26/98	"		5.00	ND	ug/l	
Toluene	"	"	"		5.00	**7.63**	"	
Ethylbenzene	"	"	"		5.00	ND	"	
Xylenes (total)	"	"	"		10.0	**930**	"	
Gasoline Range Hydrocarbons	"	"	"		800	**16000**	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*126*	%	
NMW-2			**P805406-02**				**Water**	
Benzene	0580563	5/21/98	5/21/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*84.4*	%	
NMW-3			**P805406-03**				**Water**	
Benzene	0580563	5/21/98	5/21/98		0.500	**4.53**	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	**9.26**	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	**299**	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*78.0*	%	
MW-4			**P805406-04**				**Water**	
Benzene	0580563	5/21/98	5/21/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*85.4*	%	
NMW-5			**P805406-05**				**Water**	
Benzene	0580563	5/21/98	5/21/98		0.500	ND	ug/l	
Toluene	0580563	5/21/98	5/21/98		0.500	ND	ug/l	
Ethylbenzene	"	"	"		0.500	**0.895**	"	
Xylenes (total)	"	"	"		1.00	**14.0**	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	**1050**	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*81.8*	%	

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**Refer to end of report for text of notes and definitions.*

Lisa Domenighini, Project Manager

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Terra Vac	Project:	Rose's Parking Lot	Sampled: 5/18/98
PO Box 818	Project Number:	32-0029	Received: 5/18/98
Sherwood, OR 97140	Project Manager:	Jim Orr	Reported: 6/16/98 14:42

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
Trip Blank			**P805406-06**				**Water**	
Benzene	0580563	5/21/98	5/21/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*81.4*	%	

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Terra Vac	Project: Rose's Parking Lot	Sampled: 5/18/98
PO Box 818	Project Number: 32-0029	Received: 5/18/98
Sherwood, OR 97140	Project Manager: Jim Orr	Reported: 6/16/98 14:42

Dissolved Metals per EPA 200 Series Methods
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Specific Method	Reporting Limit	Result	Units	Notes*
MW-1			**P805406-01**				**Water**	
Lead	0680273	9/8/98	6/10/98	EPA 200.8	0.0200	**2.00**	mg/l	
NMW-3			**P805406-03**				**Water**	
Lead	0680273	9/8/98	6/11/98	EPA 200.8	0.00100	**0.00150**	mg/l	
NMW-5			**P805406-05**				**Water**	
Lead	0680273	9/8/98	6/11/98	EPA 200.8	0.00100	**0.00120**	mg/l	

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Lisa Domenighini, Project Manager

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Terra Vac	Project: Rose's Parking Lot	Sampled: 5/18/98
PO Box 818	Project Number: 32-0029	Received: 5/18/98
Sherwood, OR 97140	Project Manager: Jim Orr	Reported: 6/16/98 14:42

EDB & EDC per EPA Method 8010B (modified)
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-1			**P805406-01**				**Water**	
1,2-Dibromoethane	0580586	5/22/98	5/22/98		1.00	ND	ug/l	
1,2-Dichloroethane	"	"	"		1.00	ND	"	
Surrogate: 4-BFB (ELCD)	"	"	"	*50.0-127*		*69.2*	*%*	
NMW-3			**P805406-03**				**Water**	
1,2-Dibromoethane	0580586	5/22/98	5/22/98		1.00	ND	ug/l	
1,2-Dichloroethane	"	"	"		1.00	ND	"	
Surrogate: 4-BFB (ELCD)	"	"	"	*50.0-127*		*85.8*	*%*	
NMW-5			**P805406-05**				**Water**	
1,2-Dibromoethane	0580586	5/22/98	5/22/98		1.00	ND	ug/l	
1,2-Dichloroethane	"	"	"		1.00	ND	"	
Surrogate: 4-BFB (ELCD)	"	"	"	*50.0-127*		*98.6*	*%*	

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**Refer to end of report for text of notes and definitions.*

Lisa Domenighini, Project Manager

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Terra Vac	Project: Rose's Parking Lot	Sampled: 5/18/98
PO Box 818	Project Number: 32-0029	Received: 5/18/98
Sherwood, OR 97140	Project Manager: Jim Orr	Reported: 6/16/98 14:42

Polynuclear Aromatic Compounds per EPA 8270M-SIM
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-1			**P805406-01**				**Water**	**1**
Acenaphthene	0580501	5/19/98	6/2/98		10.0	ND	ug/l	
Acenaphthylene	"	"	"		10.0	ND	"	
Anthracene	"	"	"		10.0	ND	"	
Benzo (a) anthracene	"	"	"		10.0	ND	"	
Benzo (a) pyrene	"	"	"		10.0	ND	"	
Benzo (b) fluoranthene	"	"	"		10.0	ND	"	
Benzo (ghi) perylene	"	"	"		10.0	ND	"	
Benzo (k) fluoranthene	"	"	"		10.0	ND	"	
Chrysene	"	"	"		10.0	ND	"	
Dibenzo (a,h) anthracene	"	"	"		20.0	ND	"	
Fluoranthene	"	"	"		10.0	ND	"	
Fluorene	"	"	"		10.0	ND	"	
Indeno (1,2,3-cd) pyrene	"	"	"		10.0	ND	"	
Naphthalene	"	"	"		10.0	**387**	"	
Phenanthrene	"	"	"		10.0	ND	"	
Pyrene	"	"	"		10.0	ND	"	
Surrogate: 2-Fluorobiphenyl	"	"	"	*43.0-116*		*NR*	*%*	*2*
Surrogate: Nitrobenzene-d5	"	"	"	*35.0-114*		*NR*	"	*2*
Surrogate: p-Terphenyl-d14	"	"	"	*33.0-141*		*NR*	"	*2*
NMW-3			**P805406-03**				**Water**	
Acenaphthene	0580501	5/19/98	6/2/98		0.100	ND	ug/l	
Acenaphthylene	"	"	"		0.100	ND	"	
Anthracene	"	"	"		0.100	ND	"	
Benzo (a) anthracene	"	"	"		0.100	ND	"	
Benzo (a) pyrene	"	"	"		0.100	ND	"	
Benzo (b) fluoranthene	"	"	"		0.100	ND	"	
Benzo (ghi) perylene	"	"	"		0.100	ND	"	
Benzo (k) fluoranthene	"	"	"		0.100	ND	"	
Chrysene	"	"	"		0.100	ND	"	
Dibenzo (a,h) anthracene	"	"	"		0.200	ND	"	
Fluoranthene	"	"	"		0.100	ND	"	
Fluorene	"	"	"		0.100	ND	"	
Indeno (1,2,3-cd) pyrene	"	"	"		0.100	ND	"	
Naphthalene	"	"	"		0.100	**0.173**	"	
Phenanthrene	"	"	"		0.100	ND	"	
Pyrene	"	"	"		0.100	ND	"	
Surrogate: 2-Fluorobiphenyl	"	"	"	*43.0-116*		*70.8*	*%*	

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**Refer to end of report for text of notes and definitions.*

Lisa Domenighini, Project Manager

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Terra Vac	Project: Rose's Parking Lot	Sampled: 5/18/98
PO Box 818	Project Number: 32-0029	Received: 5/18/98
Sherwood, OR 97140	Project Manager: Jim Orr	Reported: 6/16/98 14:42

Polynuclear Aromatic Compounds per EPA 8270M-SIM
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
NMW-3 (continued)			**P805406-03**				**Water**	
Surrogate: Nitrobenzene-d5	*0580501*	*5/19/98*	*6/2/98*	*35.0-114*		*94.9*	*%*	
Surrogate: p-Terphenyl-d14	"	"	"	*33.0-141*		*87.3*	"	
NMW-5			**P805406-05**				**Water**	
Acenaphthene	0580501	5/19/98	6/2/98		0.100	ND	ug/l	
Acenaphthylene	"	"	"		0.100	ND	"	
Anthracene	"	"	"		0.100	ND	"	
Benzo (a) anthracene	"	"	"		0.100	ND	"	
Benzo (a) pyrene	"	"	"		0.100	ND	"	
Benzo (b) fluoranthene	"	"	"		0.100	ND	"	
Benzo (ghi) perylene	"	"	"		0.100	ND	"	
Benzo (k) fluoranthene	"	"	"		0.100	ND	"	
Chrysene	"	"	"		0.100	ND	"	
Dibenzo (a,h) anthracene	"	"	"		0.100	ND	"	
Fluoranthene	"	"	"		0.200	ND	"	
Fluorene	"	"	"		0.100	ND	"	
Indeno (1,2,3-cd) pyrene	"	"	"		0.100	ND	"	
Naphthalene	"	"	"		0.100	ND	"	
Phenanthrene	"	"	"		0.100	**4.87**	"	
Pyrene	"	"	"		0.100	ND	"	
Surrogate: 2-Fluorobiphenyl	"	"	"	*43.0-116*	0.100	ND	"	
Surrogate: Nitrobenzene-d5	"	"	"	*35.0-114*		*82.2*	*%*	
Surrogate: p-Terphenyl-d14	"	"	"	*33.0-141*		*99.6*	"	
						96.6	"	

North Creek Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

Lisa Donlenighini, Project Manager

18939 120th Avenue N.E., Suite 101, Bothell, WA 98011-9508
East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
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Terra Vac	Project: Rose's Parking Lot	Sampled: 5/18/98
PO Box 818	Project Number: 32-0029	Received: 5/18/98
Sherwood, OR 97140	Project Manager: Jim Orr	Reported: 6/16/98 14:42

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0580563	**Date Prepared: 5/21/98**					**Extraction Method: EPA 5030**				
Blank	**0580563-BLK1**									
Benzene	5/21/98			ND	ug/l	0.500				
Toluene	"			ND	"	0.500				
Ethylbenzene	"			ND	"	0.500				
Xylenes (total)	"			ND	"	1.00				
Gasoline Range Hydrocarbons	"			ND	"	80.0				
Surrogate: 4-BFB	"	*50.0*		*43.3*	"	*50.0-150*	*86.6*			
LCS	**0580563-BS1**									
Gasoline Range Hydrocarbons	5/21/98	1250		1200	ug/l	50.0-150	96.0			
Surrogate: 4-BFB	"	*50.0*		*43.1*	"	*50.0-150*	*86.2*			
LCS	**0580563-BS2**									
Benzene	5/21/98	20.0		17.6	ug/l	67.0-130	88.0			
Toluene	"	20.0		19.3	"	75.0-126	96.5			
Ethylbenzene	"	20.0		19.4	"	76.0-124	97.0			
Xylenes (total)	"	60.0		60.8	"	75.0-126	101			
Surrogate: 4-BFB	"	*50.0*		*54.9*	"	*50.0-150*	*110*			
Duplicate	**0580563-DUP1**	**P805406-03**								
Gasoline Range Hydrocarbons	5/21/98		299	276	ug/l			50.0	**8.00**	
Surrogate: 4-BFB	"	*50.0*		*39.4*	"	*50.0-150*	*78.8*			
Matrix Spike	**0580563-MS1**	**P805406-02**								
Benzene	5/21/98	20.0	ND	14.8	ug/l	67.0-130	**74.0**			
Toluene	"	20.0	ND	17.0	"	75.0-126	**85.0**			
Ethylbenzene	"	20.0	ND	17.8	"	76.0-124	**89.0**			
Xylenes (total)	"	60.0	ND	54.8	"	75.0-126	**91.3**			
Surrogate: 4-BFB	"	*50.0*		*51.4*	"	*50.0-150*	*103*			
Matrix Spike Dup	**0580563-MSD1**	**P805406-02**								
Benzene	5/21/98	20.0	ND	14.5	ug/l	67.0-130	**72.5**	13.0	**2.05**	
Toluene	"	20.0	ND	16.3	"	75.0-126	**81.5**	13.0	**4.20**	
Ethylbenzene	"	20.0	ND	17.2	"	76.0-124	**86.0**	15.0	**3.43**	
Xylenes (total)	"	60.0	ND	51.7	"	75.0-126	**86.2**	13.0	**5.75**	
Surrogate: 4-BFB	"	*50.0*		*48.6*	"	*50.0-150*	*97.2*			

North Creek Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

Lisa Domenighini, Project Manager

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Terra Vac	Project:	Rose's Parking Lot	Sampled: 5/18/98
PO Box 818	Project Number:	32-0029	Received: 5/18/98
Sherwood, OR 97140	Project Manager:	Jim Orr	Reported: 6/16/98 14:42

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0580633	**Date Prepared: 5/26/98**					**Extraction Method: EPA 5030**				
Blank	**0580633-BLK1**									
Benzene	5/26/98			ND	ug/l	0.500				
Toluene	"			ND	"	0.500				
Ethylbenzene	"			ND	"	0.500				
Xylenes (total)	"			ND	"	1.00				
Gasoline Range Hydrocarbons	"			ND	"	80.0				
Surrogate: 4-BFB	"	*50.0*		*55.1*	"	*50.0-150*	*110*			
LCS	**0580633-BS1**									
Gasoline Range Hydrocarbons	5/26/98	1250		1170	ug/l	50.0-150	93.6			
Surrogate: 4-BFB	"	*50.0*		*43.2*	"	*50.0-150*	*86.4*			
LCS	**0580633-BS2**									
Benzene	5/26/98	20.0		19.7	ug/l	67.0-130	98.5			
Toluene	"	20.0		21.7	"	75.0-126	109			
Ethylbenzene	"	20.0		21.9	"	76.0-124	109			
Xylenes (total)	"	60.0		67.3	"	75.0-126	112			
Surrogate: 4-BFB	"	*50.0*		*51.8*	"	*50.0-150*	*104*			

North Creek Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

Lisa Domenighini, Project Manager

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Terra Vac	Project: Rose's Parking Lot	Sampled: 5/18/98
PO Box 818	Project Number: 32-0029	Received: 5/18/98
Sherwood, OR 97140	Project Manager: Jim Orr	Reported: 6/16/98 14:42

Dissolved Metals per EPA 200 Series Methods/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0680273	**Date Prepared: 9/8/98**					**Extraction Method: EPA 200/3005**				
Blank	**0680273-BLK1**									
Lead	6/11/98			ND	mg/l	0.00100				
LCS	**0680273-BS1**									
Lead	6/10/98	0.100		0.0965	mg/l	85.0-115	96.5			
Duplicate	**0680273-DUP1**		**P805397-10**							
Lead	6/11/98		ND	ND	mg/l			20.0		
Matrix Spike	**0680273-MS1**		**P805397-10**							
Lead	6/11/98	0.100	ND	0.0976	mg/l	70.0-130	97.6			
Matrix Spike	**0680273-MS2**		**P805397-08**							
Lead	6/11/98	0.100	ND	0.0998	mg/l	70.0-130	99.8			

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Lisa Domenighini, Project Manager

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Terra Vac	Project: Rose's Parking Lot	Sampled: 5/18/98
PO Box 818	Project Number: 32-0029	Received: 5/18/98
Sherwood, OR 97140	Project Manager: Jim Orr	Reported: 6/16/98 14:42

EDB & EDC per EPA Method 8010B (modified)/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0580586	**Date Prepared: 5/22/98**					**Extraction Method: EPA 5030**				
Blank	**0580586-BLK1**									
1,2-Dibromoethane	5/22/98			ND	ug/l	0.500				
1,2-Dichloroethane	"			ND	"	0.500				
Chlorobenzene	"			ND	"	0.500				
1,1-Dichloroethene	"			ND	"	0.500				
Trichloroethene	"			ND	"	0.500				
Surrogate: 4-BFB (ELCD)	"	*50.0*		*51.4*	"	*50.0-127*	*103*			
LCS	**0580586-BS1**									
Chlorobenzene	5/22/98	20.0		21.6	ug/l	76.0-127	108			
1,1-Dichloroethene	"	20.0		19.4	"	61.0-145	97.0			
Trichloroethene	"	20.0		20.2	"	75.0-130	101			
Surrogate: 4-BFB (ELCD)	"	*50.0*		*54.3*	"	*50.0-127*	*109*			
Matrix Spike	**0580586-MS1**		**P805365-05**							
Chlorobenzene	5/22/98	20.0	ND	22.4	ug/l	76.0-127	**112**			
1,1-Dichloroethene	"	20.0	ND	11.6	"	61.0-145	**58.0**			3
Trichloroethene	"	20.0	ND	22.8	"	75.0-130	**114**			
Surrogate: 4-BFB (ELCD)	"	*50.0*		*50.5*	"	*50.0-127*	*101*			
Matrix Spike Dup	**0580586-MSD1**		**P805365-05**							
Chlorobenzene	5/22/98	20.0	ND	21.5	ug/l	76.0-127	**108**	11.0	**3.64**	
1,1-Dichloroethene	"	20.0	ND	14.7	"	61.0-145	**73.5**	14.0	**23.6**	3
Trichloroethene	"	20.0	ND	20.7	"	75.0-130	**104**	13.0	**9.17**	
Surrogate: 4-BFB (ELCD)	"	*50.0*		*41.1*	"	*50.0-127*	*82.2*			

North Creek Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

Lisa Domenighini, Project Manager

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Terra Vac	Project:	Rose's Parking Lot	Sampled: 5/18/98
PO Box 818	Project Number:	32-0029	Received: 5/18/98
Sherwood, OR 97140	Project Manager:	Jim Orr	Reported: 6/16/98 14:42

Polynuclear Aromatic Compounds per EPA 8270M-SIM/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0580501	**Date Prepared: 5/19/98**					**Extraction Method: EPA 3520/600 Series**				
Blank	**0580501-BLK1**									
Acenaphthene	5/22/98			ND	ug/l	0.100				
Acenaphthylene	"			ND	"	0.100				
Anthracene	"			ND	"	0.100				
Benzo (a) anthracene	"			ND	"	0.100				
Benzo (a) pyrene	"			ND	"	0.100				
Benzo (b) fluoranthene	"			ND	"	0.100				
Benzo (ghi) perylene	"			ND	"	0.100				
Benzo (k) fluoranthene	"			ND	"	0.100				
Chrysene	"			ND	"	0.100				
Dibenzo (a,h) anthracene	"			ND	"	0.100				
Fluoranthene	"			ND	"	0.200				
Fluorene	"			ND	"	0.100				
Indeno (1,2,3-cd) pyrene	"			ND	"	0.100				
Naphthalene	"			ND	"	0.100				
Phenanthrene	"			ND	"	0.100				
Pyrene	"			ND	"	0.100				
Surrogate: 2-Fluorobiphenyl	"	*2.50*		*2.45*	"	*43.0-116*	*98.0*			
Surrogate: Nitrobenzene-d5	"	*2.50*		*2.52*	"	*35.0-114*	*101*			
Surrogate: p-Terphenyl-d14	"	*2.50*		*2.62*	"	*33.0-141*	*105*			
LCS	**0580501-BS1**									
Acenaphthylene	5/22/98	5.00		4.86	ug/l	50.0-150	97.2			
Benzo (k) fluoranthene	"	5.00		4.08	"	50.0-150	81.6			
Pyrene	"	5.00		5.03	"	50.0-150	101			
Surrogate: 2-Fluorobiphenyl	"	*2.50*		*2.27*	"	*43.0-116*	*90.8*			
Surrogate: Nitrobenzene-d5	"	*2.50*		*2.55*	"	*35.0-114*	*102*			
Surrogate: p-Terphenyl-d14	"	*2.50*		*2.48*	"	*33.0-141*	*99.2*			
LCS Dup	**0580501-BSD1**									
Acenaphthylene	5/22/98	5.00		5.04	ug/l	50.0-150	101	60.0	3.83	
Benzo (k) fluoranthene	"	5.00		4.24	"	50.0-150	84.8	60.0	3.85	
Pyrene	"	5.00		4.90	"	50.0-150	98.0	60.0	3.02	
Surrogate: 2-Fluorobiphenyl	"	*2.50*		*2.56*	"	*43.0-116*	*102*			
Surrogate: Nitrobenzene-d5	"	*2.50*		*2.57*	"	*35.0-114*	*103*			
Surrogate: p-Terphenyl-d14	"	*2.50*		*2.41*	"	*33.0-141*	*96.4*			

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**Refer to end of report for text of notes and definitions.*

Lisa Domenighini, Project Manager

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Terra Vac	Project: Rose's Parking Lot	Sampled: 5/18/98
PO Box 818	Project Number: 32-0029	Received: 5/18/98
Sherwood, OR 97140	Project Manager: Jim Orr	Reported: 6/16/98 14:42

Notes and Definitions

#	Note
1	Reporting limits raised due to dilution necessary for analysis.
2	The surrogate recovery for this sample is not available due to sample dilution required from high analyte concentration and/or matrix interferences.
3	The spike recovery for this QC sample is outside of established control limits. Review of associated batch QC indicates the recovery for this analyte does not represent an out-of-control condition for the batch.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
Recov.	Recovery
RPD	Relative Percent Difference

North Creek Analytical, Inc.

Lisa Domenighini, Project Manager

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9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202

CHAIN OF CUSTODY REPORT

Work Order # P805-406

REPORT TO:		INVOICE TO:	
ATTENTION:	Mr. Tim Warner	ATTENTION:	Same As Report To:
ADDRESS:	10740 Meridian Ave N. #202 Seattle WA 98133	ADDRESS:	
PHONE:	206-362-8294	FAX: 206-362-9528	
PROJECT NAME:	Rose's Parking Lot	P.O. NUMBER:	NCA QUOTE #:
PROJECT NUMBER:	32-0029		
SAMPLED BY:	J. ORR		

TURNAROUND REQUEST in Business Days *
Organic & Inorganic Analyses: (10 Standard) 7 5 4 3 2 1 Same Day
Fuels & Hydrocarbon Analyses: (5 Standard) 3-4 2 1 Same Day
OTHER Specify:
* Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	NCA SAMPLE ID (Laboratory Use Only)	TPH G/BTEX	PAH	EDB/EDC	Dissolved Pb	MATRIX (W, S, A, O)	# OF CONTAINERS	COMMENTS
1.	MW-1	5-18-98/1235		X	X	X	X	W	6	
2.	NMW-2	1215		X					2	
3.	NMW-3	1220		X	X	X	X		6	
4.	MW-4	1230		X					2	
5.	NMW-5	1225		X	X	X	X		6	
6.	Trip Blank	1240		X					2	
7.										
8.										
9.										
10.										

RELINQUISHED BY (Signature):	James Orr	DATE: 5-18-98	RECEIVED BY (Signature):	Sara McClurg	DATE: 5-18-98
PRINT NAME:	James Orr	FIRM: TerraVac TIME: 1430	PRINT NAME:	Sara McClurg	FIRM: NCA TIME: 1430
RELINQUISHED BY (Signature):		DATE:	RECEIVED BY (Signature):		DATE:
PRINT NAME:		FIRM: TIME:	PRINT NAME:		FIRM: TIME:

ADDITIONAL REMARKS: Please Filter Pb Samples

PAGE | OF |

26-94-002R

TERRA VAC
10740 Meridian Avenue North, Suite 202, Seattle, WA 98133-9010
Tel (206) 362-8128 ❑ Fax (206) 362-9528

October 6, 1998

Mr. Max Birnbach
c/o Mr. Charles R. Williamson
Kell, Alterman & Runstein
1001 Southwest Fifth Avenue, Suite 1800
Portland, OR 97204-1194

RE: First and Second Quarter 1998 Groundwater Monitoring Reports
Rose's Parking Lot
330 Northwest 23rd Avenue, Portland, OR

Dear Mr. Birnbach:

Enclosed please find the first and second quarter 1998 groundwater report for Rose's Parking Lot, located at 330 Northwest 23rd Avenue, Portland, Oregon. Our next monitoring event will occur in approximately one month.

The present closure strategy for the site is to continue groundwater monitoring for the third quarter of 1998. After this groundwater monitoring event, a no further action approval will be requested from the Oregon Department of Environmental Quality.

If you have any questions, or require additional information, please do not hesitate to call me at (206) 362-8128.

Sincerely,
Terra Vac Corporation

Paul V. Bianco,
Project Engineer

for
Timothy Warner
Project Manager

cc: Dave Roy
Rich Kostecki
Jeffrey Wishko
Richard Singer (2 copies)
Richard Allen
Edward Crow
Don Pettit

32-0029.20.01

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
OCT 08 1998
NORTHWEST REGION

printed on recycled paper

UST CLEANUP TELEPHONE USE REPORT

CALL FROM/TO: Timothy Warner DATE: 8/6/98

WITH: Terra Vac TIME: _____

TELEPHONE NO: ( ) _____ - _____

REGARDING: Rose's Parking Lot.

FILE NO: 26-94-0025

SUMMARY OF CALL

Spoke re: Jan 23, 98 Rept. There are a number of problems with risk assessmt. 1st for G.W pathways deq's model is different for Actn. They would have to use own model. They said others re pathways of concern well. additional documentation would be nec. Tim indicated that last Quarter all of COC's were below cleanup standards. I suggested that they propose closure under OAR 340-122-242 rather than RBCA. This would require an additional Quarter of Data but would save preparing a RBCA closure rept. If conc. increase at the site still can pursue RBCA Route.

Staff Signature

26-94-0025

TERRA VAC
10740 Meridian Avenue North, Suite 202, Seattle, WA 98133-9010
Tel (206) 362-8128 ❑ Fax (206) 362-9528

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
MAR 23 1998
NORTHWEST REGION

March 16, 1998

Mr. Don Pettit
Oregon Department of Environmental Quality
2020 SW 4th Avenue, Suite 400
Portland, Oregon 97201

RE: Active Remediation Closure Report
Rose's Parking Lot
330 Northwest 23rd Avenue, Portland, OR

Dear Mr. Petit:

Enclosed please find one copy of our Active Remediation Closure Report and one copy of the Fourth Quarter 1997 Groundwater Report for Rose's Parking Lot located at 330 Northwest 23rd Avenue, Portland, Oregon

If you have any questions please do not hesitate to call me at (206) 362-8294.

Sincerely,
Terra Vac Corporation

Paul V. Bianco
Project Engineer

for
Timothy Warner
Project Manager

cc: 32-0029.20

printed on recycled paper

26-94-0025

TERRA VAC 10740 Meridian Avenue North, Suite 202, Seattle, WA 98133-9010
Tel (206) 362-8128 ❑ Fax (206) 362-9528

March 3, 1998

Mr. Max Birnbach
c/o Mr. Charles R. Williamson
Kell, Alterman & Runstein
1001 Southwest Fifth Avenue, Suite 1800
Portland, OR 97204-1194

RE: Fourth Quarter 1997 Groundwater Monitoring Report
Rose's Parking Lot
330 Northwest 23rd Avenue, Portland, Oregon

Dear Mr. Birnbach:

Terra Vac performed quarterly groundwater monitoring at this site on December 31, 1997. Eight monitoring wells were sounded for depth to groundwater. Groundwater samples were collected from the monitoring wells for analyses of total gasoline-range petroleum hydrocarbons (TPH-G), benzene, toluene, ethylbenzene, and total xylenes (BTEX). A site location map is shown on Figure 1. Well construction details, including construction dates, well diameters, total depths, and screened intervals are provided in Table 1.

Groundwater elevations increased in all eight monitoring wells since the previous monitoring event. Analytical results indicate groundwater from one of the eight sampled wells exceeded the current Oregon Department of Environmental Quality (ODEQ) Groundwater Cleanup Levels for benzene (monitoring well NMW-5).

Groundwater monitoring and sampling were performed using standard field procedures. In short, each well was sounded for depth to groundwater and the presence of free phase petroleum hydrocarbons using an electronic interface probe. If free phase petroleum hydrocarbons were not detected, total well depth was measured. A minimum of three well volumes were bailed from each well sampled, and groundwater allowed to recover to at least 80 percent of original elevation. Analytical samples were then collected with new disposable bailers and immediately placed in sampling vials prepared specifically for the sampled media and selected analyses. Once collected, samples were immediately acidified and cooled for transportation to the laboratory under proper chain of custody.

Existing top of casing elevations, as determined by a March, 1997 well survey, were used to establish reference points for well depths, screen intervals, and groundwater elevations for wells MW-1, MW-4, MW- 6, NMW-2, NMW-3 and NMW-5. Elevations for MW-7 and MW-8 were calculated using previous survey data from GeoEngineers, corrected to the new local assumed datum. Historical groundwater elevations are presented in Table 2. Fourth quarter 1997 groundwater elevations as measured on December 31, 1997 are also presented on Figure 2. Historically, the inferred direction of groundwater flow has been to the northeast. Prior to sampling, the remediation system had been offline since October 31, 1997.

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Since February 1997, groundwater samples have been analyzed for TPH-G by EPA Method 8015, for BTEX constituents by EPA Method 8020A, for PAHs by EPA Method 8310, and for dissolved lead by EPQ Method 200.8. Previous groundwater sampling performed by GeoEngineers included in this report used EPA Method 418.1 for TPH-G, EPA Method 8020 for BTEX, EPA Method 8310 for PAHs, and EPA Method 7421 for dissolved lead. Results of these analyses, and historical groundwater quality data, are presented in Table 3. Groundwater quality results from the fourth quarter 1997 sampling are also shown on Figure 3. Analytical reports from the laboratory are contained in Appendix A.

Field activities were performed in a manner consistent with the level of skill and care standard for local environmental professionals. Findings and conclusions presented in this report have been prepared based upon the specific site conditions at the time of field activities and no warranty, expressed or implied, is made.

If you have any questions, please do not hesitate to contact us.

Sincerely,
Terra Vac Corporation

Paul V. Bianco,
Project Engineer

for
Timothy Warner,
Project Manager

cc: Dave Roy
Rich Kostecki
Jeffrey Wishko
Richard Singer (2 copies)
Richard Allen
Edward Crow
Don Pettit

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FIGURES

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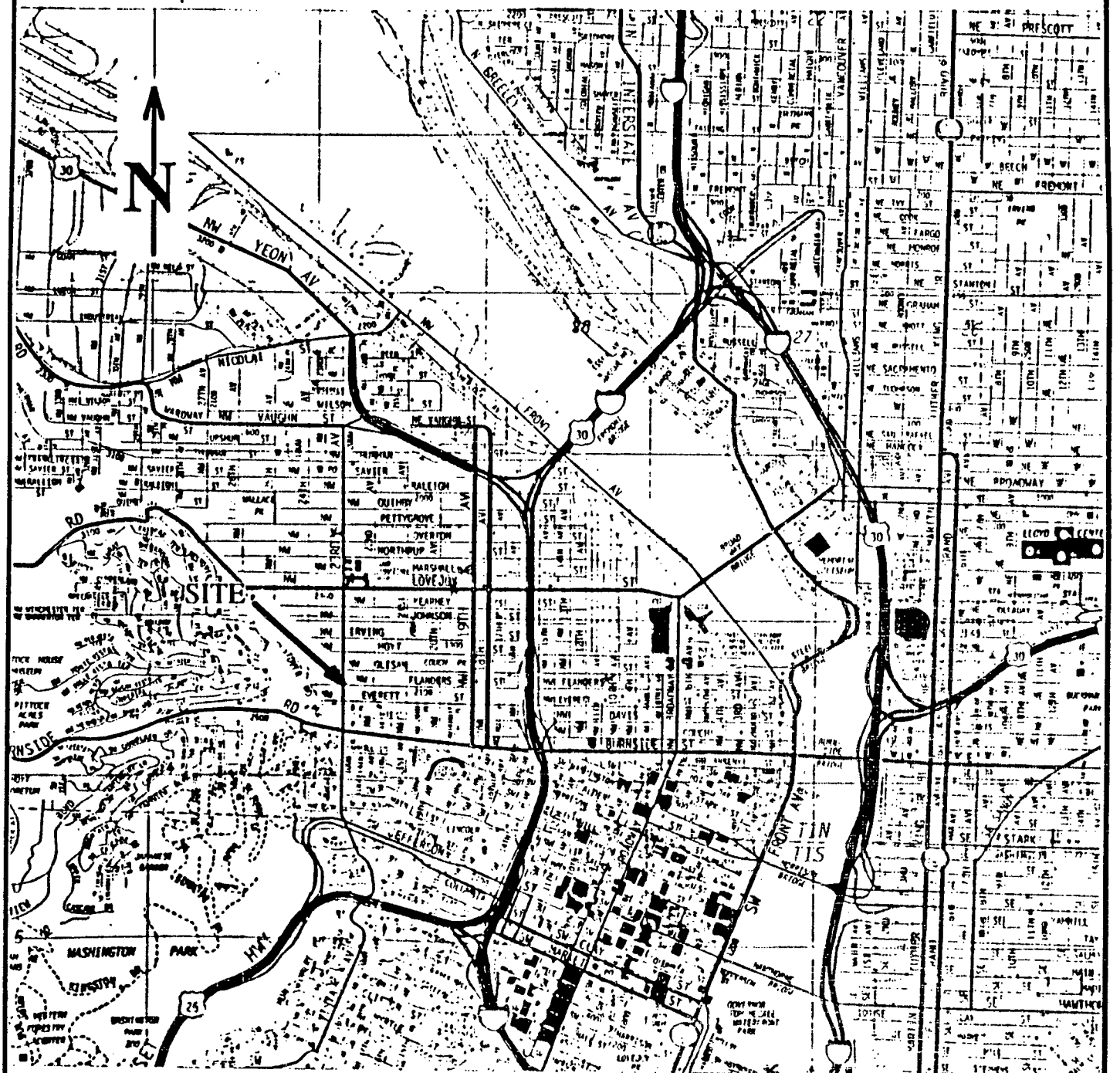
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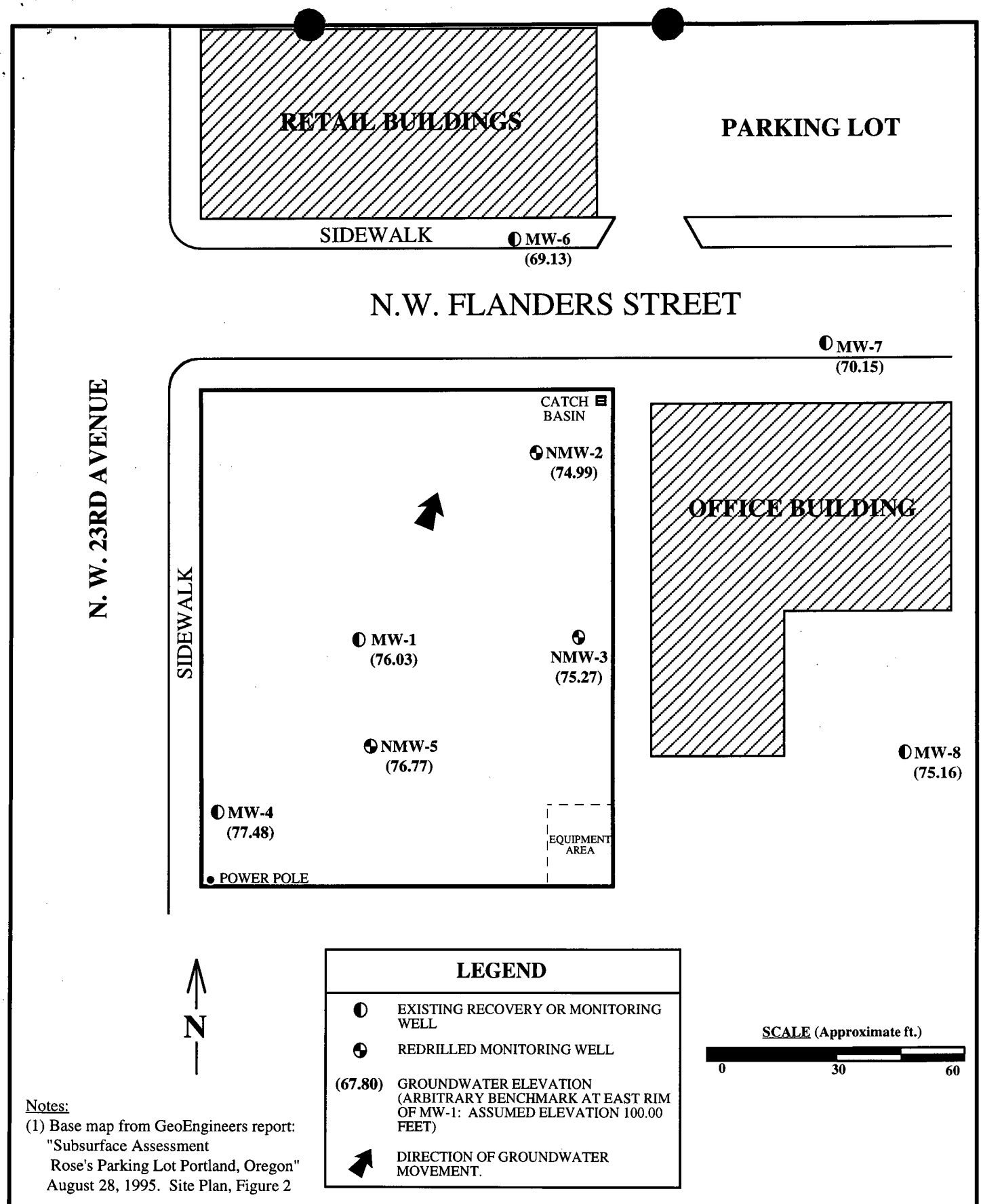
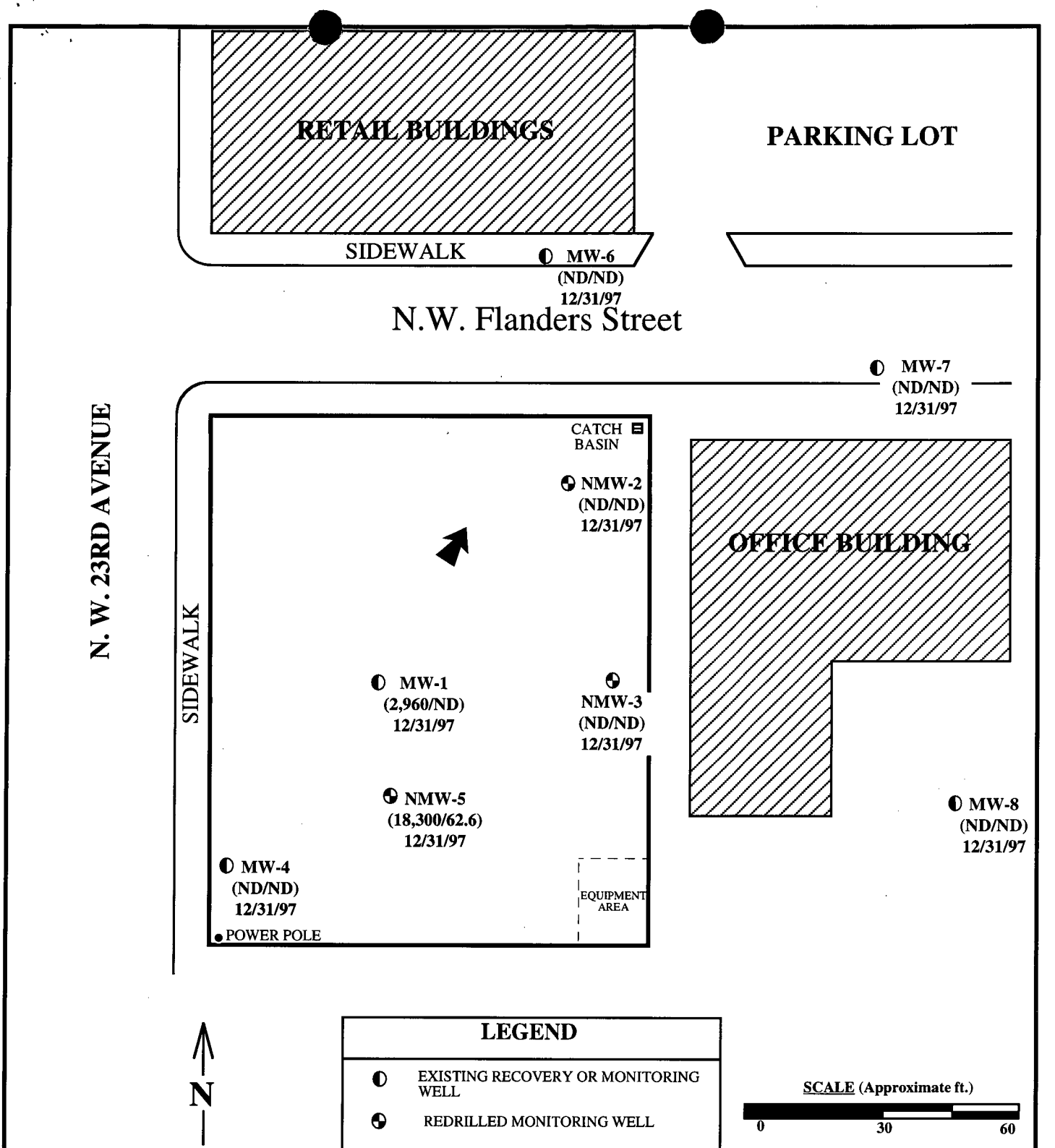


Notes:
(1) Base map from GeoEngineers report:
"Subsurface Assessment
Rose's Parking Lot Portland, Oregon"
August 28, 1995. Site Plan, Figure 2

GROUNDWATER ELEVATIONS	**Rose's Parking Lot 330 NW 23rd Ave. Portland, Oregon**	TERRA VAC	PROJECT NO.	32-0029	Figure 2
			DATE	JANUARY 13, 1998	
			SCALE	1 INCH ≈ 30 FEET	
			REVISION	PVB-3	



Notes:
(1) Base map from GeoEngineers report:
"Subsurface Assessment
Rose's Parking Lot Portland, Oregon"
August 28, 1995. Site Plan, Figure 2

GROUNDWATER ANALYTICAL RESULTS	**Rose's Parking Lot 330 NW 23rd Ave. Portland, Oregon**	TERRA VAC	PROJECT NO. 32-0029 DATE JANUARY 13, 1998 SCALE 1 INCH ≈ 30 FEET REVISION PVB-3	Figure 3

TABLES

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Table 1

Remediation Well Construction Data
Rose's Parking Lot
Portland, Oregon

Well Identification	Date Installed	Total Depth (feet)	Screen Interval		Well Diameter (inches)
			Top (feet)	Bottom (feet)	
MW-1	3/23/94	39	24	38.5	2
NMW-2	1/24/97	38	15	37	4
NMW-3	1/25/97	38	15.5	37.5	4
MW-4	9/28/94	40	20	39.5	2
NMW-5	1/23/97	38	15	37	4
MW-6	4/6/96	31	15	30.5	2
MW-7	4/6/96	31	15	30.5	2
MW-8	4/6/96	31	15	30.5	2

Notes:

Data on NMW-2, NMW-3, and NMW-5 is from Terra Vac field notes and well logs.

Data on MW-1 from RZA Agra Inc. well logs in April, 1994 report.

Data on MW-4 from RZA Agra Inc. well logs in October, 1994 report.

Data on MW-6 through MW-8 from well logs in GeoEngineers June, 1996 Report

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Table 2

Groundwater Elevation Data
Rose's Parking Lot
Portland, Oregon

Well I.D.	Top of Casing Elevation (feet)	Date Sounded	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Water Level Elevation (feet MSL)	Difference from Previous Measurement (feet)
MW-1	100.00	5/12/95	22.79	23.29	0.5	76.71	**
		1/4/96	--	24.10	Trace	75.90	-0.81
		4/8/96	22.39	22.41	0.02	77.59	1.69
		4/24/96	22.40	22.45	0.05	77.55	-0.04
		7/11/96	--	23.35	Trace	76.65	-0.90
		11/3/96	--	24.44	Sheen	75.56	-1.09
		2/28/97	--	21.11	0	78.89	3.33
		5/29/97	--	26.90	0	73.10	-5.79
		9/5/97	--	27.86	0	72.14	-0.96
		12/31/97	--	23.97	0	76.03	3.89
NMW-2	96.21	5/12/95	--	20.75	0	75.46	**
		1/4/96	--	21.60	0	74.61	-0.85
		4/8/96	--	19.73	0	76.48	1.87
		4/24/96	--	19.90	0	76.31	-0.17
		7/11/96	Sheen	20.80	0	75.41	-0.90
		11/3/96	--	21.87	0	74.34	-1.07
		2/28/97	--	18.51	0	77.70	3.36
		5/29/97	--	25.30	0	70.91	-6.79
		9/5/97	--	26.83	0	69.38	-1.53
		12/31/97	--	21.22	0	74.99	5.61
NMW-3	99.15	5/12/95	--	23.48	0	75.67	**
		1/4/96	--	24.22	0	74.93	-0.74
		4/8/96	--	22.31	0	76.84	1.91
		4/24/96	--	22.36	0	76.79	-0.05
		7/11/96	--	23.37	0	75.78	-1.01
		11/3/96	Sheen	24.47	0	74.68	-1.10
		2/28/97	--	21.28	0	77.87	3.19
		5/29/97	--	29.78	0	69.37	-8.50
		9/5/97	--	27.77	0	71.38	2.01
		12/31/97	--	23.88	0	75.27	3.89

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Table 2

Groundwater Elevation Data
Rose's Parking Lot
Portland, Oregon

Well I.D.	Top of Casing Elevation (feet)	Date Sounded	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Water Level Elevation (feet MSL)	Difference from Previous Measurement (feet)
MW-4	100.48	5/12/95	--	22.55	0	77.93	**
		1/4/96	--	23.03	0	77.45	-0.48
		4/8/96	--	21.60	0	78.88	1.43
		4/24/96	--	21.34	0	79.14	0.26
		7/11/96	--	22.54	0	77.94	-1.20
		11/3/96	--	23.45	0	77.03	-0.91
		2/28/97	--	20.24	0	80.24	3.21
		5/29/97	--	26.04	0	74.44	-5.80
		9/5/97	--	26.58	0	73.90	-0.54
		12/31/97	--	23.00	0	77.48	3.58
NMW-5	100.45	5/12/95	--	22.35	0	78.10	**
		1/4/96	Trace	22.84	0	77.61	-0.49
		4/8/96	--	21.40	0	79.05	1.44
		4/24/96	--	20.04	0	80.41	1.36
		7/11/96	--	22.45	0	78.00	-2.41
		11/3/96	Sheen	23.38	0	77.07	-0.93
		2/28/97	--	21.07	0	79.38	2.31
		5/29/97	--	31.75	0	68.70	-10.68
		9/5/97	--	27.52	0	72.93	4.23
		12/31/97	--	23.68	0	76.77	3.84
MW-6	93.89	4/8/96	--	21.53	0	72.36	**
		4/24/96	--	22.04	0	71.85	-0.51
		7/11/96	--	22.61	0	71.28	-0.57
		11/3/96	--	24.04	0	69.85	-1.43
		2/28/97	--	20.89	0	73.00	3.15
		5/29/97	--	23.50	0	70.39	-2.61
		9/5/97	--	26.09	0	67.80	-2.59
		10/2/97	NA	NA	NA	NA	NA
		12/31/97	--	24.76	0	69.13	1.33

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Table 2

Groundwater Elevation Data
Rose's Parking Lot
Portland, Oregon

Well I.D.	Top of Casing Elevation (feet)	Date Sounded	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Water Level Elevation (feet MSL)	Difference from Previous Measurement (feet)
MW-7	94.07	4/8/96	--	21.50	0	72.57	**
		4/24/96	--	21.05	0	73.02	0.45
		7/11/96	--	22.40	0	71.67	-1.35
		11/3/96	--	23.57	0	70.50	-1.17
		2/28/97	--	20.70	0	73.37	2.87
		5/29/97	--	22.20	0	71.87	-1.50
		9/5/97	--	24.89	0	69.18	-2.69
		10/2/97	NA	NA	NA	NA	NA
		12/31/97	--	23.92	0	70.15	0.97
MW-8	95.08	4/8/96	--	20.19	0	74.89	**
		4/24/96	--	18.42	0	76.66	1.77
		7/11/96	--	18.88	0	76.20	-0.46
		11/3/96	--	20.05	0	75.03	-1.17
		2/28/97	--	18.45	0	76.63	1.60
		9/5/97	--	22.49	0	72.59	-4.04
		10/1/97	NA	NA	NA	NA	NA
		12/31/97	--	19.92	0	75.16	2.57

Notes:

Data from 5/12/95-11/3/96 from GeoEngineers Groundwater Report January, 1997.

Wells MW-2, MW-3, and MW-5 redrilled 1/23-1/25/97, and renamed NMW-2, NMW-3, and NMW-5 respectively.

Depth to water measurements made from top of casing.

Elevations for wells except for MW-7 and MW-8 based on monitoring well survey conducted 3/3/97.
Elevations are measured to the local assumed datum of 100.00 feet at MW-1.
Elevations for MW-7 and MW-8 based on GeoEngineers' data, corrected for change in arbitrary reference point.

ft MSL feet above Mean Sea Level

** Not calculated; previous measurements not available.

-- Not Applicable; no free product detected in well.

NA Not Analyzed.

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Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-1	3/29/94	NA	130	390	98	1,570	NA	NA
	10/4/94	NA	27	46	6	70	NA	NA
	5/12/95	NA	NA	NA	NA	NA	NA	NA
	1/4/96	54	400	2,200	630	4,800	Naphthalene - 370 Acenaphthylene - 44	100
	4/24/96	NA	NA	NA	NA	NA	NA	NA
	7/11/96	81	710	1,800	730	2	Naphthalene - 750 Acenaphthylene - 160 Phenanthrene - 2.2 Fluoranthene - 4.5	NA
	11/3/96	23	410	1,500	910	4,100	Naphthalene - 2,400 Acenaphthylene - 460 Acenaphthene -600 Fluorene - 12 Phenanthrene - 12 Anthracene - 0.89 Fluoranthene - 10 Pyrene - 2.1 Benzo(a)anthracene - 0.7 Chrysene - 1.3 Benzo(k)fluoranthene - 0.1 Benzo(a)pyrene - 0.3 Dibenzo(a,h)anthracene - 0.1 Benzo(g,h,i)perylene - 0.4	NA
	2/28/97*	57,200	1,130	3,890	1,220	7,430	Naphthalene - 760	20
	5/29/97	14,900	65.9	49.3	205	1,010	NA	NA
	9/5/97	14,600	10.9	11.8	47.3	642	Naphthalene - 54.2	NA
	12/31/97	2960	ND	ND	ND	8.76	NA	NA

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Table 3

TERRA VAC

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
NMW-2	3/29/94	NA	4.9	1.4	0.7	3.0	NA	NA
	10/4/94	NA	ND	ND	ND	ND	NA	NA
	5/12/95	ND	1.2	ND	0.6	0.7	NA	NA
	1/4/96	1,600	14	1.5	ND	1.7	ND	ND
	4/24/96	NA	7.7	0.5	ND	ND	NA	NA
	7/11/96	7,100	2.7	ND	ND	ND	ND	NA
	11/3/96	ND	2.0	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
NMW-3	3/29/94	NA	2,300	1,200	1,200	3,700	NA	NA
	10/4/94	NA	1,520	600	790	1,600	NA	NA
	5/12/95	3,500	1,300	740	800	2,000	Naphthalene - 130 Fluorene - 0.2 Phenanthrene - 0.09	NA
	1/4/96	4,500	1,300	640	940	2,600	Naphthalene - 180 Acenaphthylene - 23	6
	4/16/96	NA	900	500	600	1,400	NA	NA
	7/11/96	2,100	460	130	380	430	Naphthalene - 71	NA
	11/3/96	4,900	830	220	650	1,100	Naphthalene - 120 Acenaphthylene - 37	
	2/28/97	4,400	261	124	153	404	Naphthalene - 32.6	NA
	5/29/97	365	17.4	0.91	3.55	15.3	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA

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Table 3

TERRA VAC

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-4	10/4/94	NA	ND	ND	ND	ND	NA	NA
	5/12/95	ND	ND	ND	ND	ND	NA	NA
	1/4/96	900	ND	ND	ND	ND	ND	ND
	4/24/96	NA	ND	ND	ND	ND	NA	NA
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	0.7	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
NMW-5	5/12/95	13,000	660	13,000	1,900	11,000	Naphthalene - 450 Acenaphthylene - 66 Fluorene - 0.6 Phenanthrene - 0.42 Anthracene - 0.07	NA
	1/4/96	6,600	4.6	22	24	230	Naphthalene - 29 Acenaphthylene - 13 Fluorene - 0.8	14
	4/24/96	NA	ND	0.6	1.1	2.9	NA	NA
	7/11/96	ND	ND	ND	ND	2.7	NA	NA
	11/3/96	NA	ND	ND	2.5	5.6	NA	NA
	2/28/97	5,440	70.3	23.5	88.6	230	Naphthalene - 28.5	NA
	5/29/97	4,480	34.9	156	7.90	554	NA	NA
	9/5/97	5,550	39.0	334	23.5	642	ND	NA
	12/31/97	18,300	62.6	570	231.0	1,570	NA	NA

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Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-6	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	102	ND	ND	ND	ND	NA	NA
	10/2/97***	NA	NA	NA	NA	NA	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA
MW-7	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	110	12	ND	ND	ND	NA	NA
	10/2/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA

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Table 3

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-8	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	111	ND	ND	ND	ND	NA	NA
	10/1/97	ND	ND	ND	ND	ND	NA	NA
	12/31/97	ND	ND	ND	ND	ND	NA	NA

Notes:

Sampling between 3/29/94 and 11/3/96 performed by GeoEngineers. Data from 1/21/97 Groundwater Report.

Wells MW-2, MW-3, and MW-5 redrilled 1/23-1/25/97, and renamed NMW-2, NMW-3, and NMW-5 respectively.

* MW-1 sampled for lead 12/11/96.

** Sample Results were suspect. Well Resampled on 10/1/97 or 10/2/97

*** Well was dry. No analytical sample taken.

PAHs polycyclic aromatic hydrocarbons. Only analytes detected are listed. Refer to analytical results (Appendix A) for a complete list of analytes and their respective detection limits.

ug/L Micrograms per liter, or parts per billion

ND Not Detected at the reporting limits

NA Not Analyzed

TPH-G Total petroleum hydrocarbons within the gasoline range (benzene to naphthalene).

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APPENDIX A

- LABORATORY REPORTS

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SPOKANE ▪ (509) 924-9200 ▪ FAX 924-9290
PORTLAND ▪ (503) 643-9200 ▪ FAX 644-2202

Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled:	12/31/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029 "D"	Received:	1/2/98
Seattle, WA 98133	Project Manager:	Tim Warner	Reported:	1/13/98 10:03

ANALYTICAL REPORT FOR SAMPLES:

Sample Description	Laboratory Sample Number	Sample Matrix	Date Sampled
MW-1	P801003-01	Water	12/31/97
NMW-2	P801003-02	Water	12/31/97
NMW-3	P801003-03	Water	12/31/97
MW-4	P801003-04	Water	12/31/97
NMW-5	P801003-05	Water	12/31/97
MW-6	P801003-06	Water	12/31/97
MW-7	P801003-07	Water	12/31/97
MW-8	P801003-08	Water	12/31/97
TRIP BLANK	P801003-09	Water	12/31/97

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Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 12/31/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029 "D"	Received: 1/2/98
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 1/13/98 10:03

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-1			**P801003-01**				**Water**	
Benzene	0180004	1/2/98	1/2/98		1.00	ND	ug/l	1
Toluene	"	"	"		1.00	ND	"	1
Ethylbenzene	"	"	"		1.00	ND	"	1
Xylenes (total)	"	"	"		2.00	**8.76**	"	1
Gasoline Range Hydrocarbons	"	"	"		160	**2960**	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*114*	%	
NMW-2			**P801003-02**				**Water**	
Benzene	0180004	1/2/98	1/2/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*104*	%	
NMW-3			**P801003-03**				**Water**	
Benzene	0180004	1/2/98	1/2/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*97.4*	%	
MW-4			**P801003-04**				**Water**	
Benzene	0180004	1/2/98	1/2/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*95.6*	%	
NMW-5			**P801003-05**				**Water**	
Benzene	0180025	1/5/97	1/5/98		5.00	**62.6**	ug/l	
Toluene	"	"	"		5.00	**570**	"	
Ethylbenzene	"	"	"		5.00	**231**	"	
Xylenes (total)	"	"	"		10.0	**1570**	"	
Gasoline Range Hydrocarbons	"	"	"		800	**18300**	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*108*	%	

North Creek Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

for Sandra K. Wright, Project Manager

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Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled:	12/31/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029 "D"	Received:	1/2/98
Seattle, WA 98133	Project Manager:	Tim Warner	Reported:	1/13/98 10:03

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-6			**P801003-06**				**Water**	
Benzene	0180004	1/2/98	1/2/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*91.4*	*%*	
MW-7			**P801003-07**				**Water**	
Benzene	0180004	1/2/98	1/2/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*98.4*	*%*	
MW-8			**P801003-08**				**Water**	
Benzene	0180004	1/2/98	1/2/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*97.4*	*%*	
TRIP BLANK			**P801003-09**				**Water**	
Benzene	0180004	1/2/98	1/2/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*89.6*	*%*	

North Creek Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

for Sandra K. Wright, Project Manager

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East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132

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PORTLAND ▪ (503) 643-9200 ▪ FAX 644-2202

Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 12/31/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029 "D"	Received: 1/2/98
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 1/13/98 10:03

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0180004	**Date Prepared: 1/2/98**					**Extraction Method: EPA 5030**				
Blank	**0180004-BLK1**									
Benzene	1/2/98			**ND**	ug/l	**0.500**				
Toluene	"			**ND**	"	**0.500**				
Ethylbenzene	"			**ND**	"	**0.500**				
Xylenes (total)	"			**ND**	"	**1.00**				
Gasoline Range Hydrocarbons	"			**ND**	"	**80.0**				
Surrogate: 4-BFB	"	*50.0*		*52.9*	"	*50.0-150*	*106*			
LCS	**0180004-BS1**									
Gasoline Range Hydrocarbons	1/2/98	1250		1120	ug/l	50.0-150	89.6			
Surrogate: 4-BFB	"	*50.0*		*49.9*	"	*50.0-150*	*99.8*			
LCS	**0180004-BS2**									
Benzene	1/2/98	20.0		20.9	ug/l	67.0-130	104			
Toluene	"	20.0		20.7	"	75.0-126	104			
Ethylbenzene	"	20.0		20.7	"	76.0-124	104			
Xylenes (total)	"	60.0		62.9	"	75.0-126	105			
Surrogate: 4-BFB	"	*50.0*		*52.1*	"	*50.0-150*	*104*			
Duplicate	**0180004-DUP1**		**P801003-01**							
Gasoline Range Hydrocarbons	1/2/98		2960	ND	ug/l			50.0		
Surrogate: 4-BFB	"	*50.0*		*50.4*	"	*50.0-150*	*101*			
Duplicate	**0180004-DUP2**		**P801003-02**							
Gasoline Range Hydrocarbons	1/2/98		ND	ND	ug/l			50.0		
Surrogate: 4-BFB	"	*50.0*		*48.8*	"	*50.0-150*	*97.6*			
Matrix Spike	**0180004-MS1**		**P801003-03**							
Benzene	1/2/98	20.0	ND	17.3	ug/l	67.0-130	**86.5**			
Toluene	"	20.0	ND	18.5	"	75.0-126	**92.5**			
Ethylbenzene	"	20.0	ND	18.9	"	76.0-124	**94.5**			
Xylenes (total)	"	60.0	ND	58.0	"	75.0-126	**96.7**			
Surrogate: 4-BFB	"	*50.0*		*52.8*	"	*50.0-150*	*106*			
Matrix Spike Dup	**0180004-MSD1**		**P801003-03**							
Benzene	1/2/98	20.0	ND	21.6	ug/l	67.0-130	**108**	13.0	**22.1**	2
Toluene	"	20.0	ND	21.8	"	75.0-126	**109**	13.0	**16.4**	2
Ethylbenzene	"	20.0	ND	22.5	"	76.0-124	**113**	15.0	**17.8**	2

North Creek Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

for Sandra K. Wright, Project Manager

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PORTLAND ▪ (503) 643-9200 ▪ FAX 644-2202

Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 12/31/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029 "D"	Received: 1/2/98
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 1/13/98 10:03

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Matrix Spike Dup (continued)	**0180004-MSD1**		**P801003-03**							
Xylenes (total)	1/2/98	60.0	ND	68.9	ug/l	75.0-126	**115**	13.0	**17.3**	2
Surrogate: 4-BFB	"	*50.0*		*50.9*	"	*50.0-150*	*102*			
Batch: 0180025	**Date Prepared: 1/5/97**					**Extraction Method: EPA 5030**				
Blank	**0180025-BLK1**									
Benzene	1/5/98			**ND**	ug/l	**0.500**				
Toluene	"			**ND**	"	**0.500**				
Ethylbenzene	"			**ND**	"	**0.500**				
Xylenes (total)	"			**ND**	"	**1.00**				
Gasoline Range Hydrocarbons	"			**ND**	"	**80.0**				
Surrogate: 4-BFB	"	*50.0*		*49.3*	"	*50.0-150*	*98.6*			
LCS	**0180025-BS1**									
Gasoline Range Hydrocarbons	1/5/98	1250		1260	ug/l	50.0-150	101			
Surrogate: 4-BFB	"	*50.0*		*56.4*	"	*50.0-150*	*113*			
LCS	**0180025-BS2**									
Benzene	1/5/98	20.0		20.1	ug/l	67.0-130	101			
Toluene	"	20.0		20.3	"	75.0-126	101			
Ethylbenzene	"	20.0		20.1	"	76.0-124	101			
Xylenes (total)	"	60.0		61.1	"	75.0-126	102			
Surrogate: 4-BFB	"	*50.0*		*56.1*	"	*50.0-150*	*112*			

North Creek Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

for Sandra K. Wright, Project Manager

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Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled:	12/31/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029 "D"	Received:	1/2/98
Seattle, WA 98133	Project Manager:	Tim Warner	Reported:	1/13/98 10:03

Notes and Definitions

#	Note
1	Reporting limits raised due to matrix interference.
2	The RPD for this QC sample is outside of established control limits. Review of associated batch QC indicates the recovery for this analyte does not represent an out-of-control condition for the batch.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
Recov.	Recovery
RPD	Relative Percent Difference

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COPY

CHAIN OF CUSTODY REPORT

Work Order # P801003

REPORT TO: Terra Vac	INVOICE TO: Same As Report To:
ATTENTION: Mr. Tim Warner	ATTENTION:
ADDRESS: 10740 Meridian Ave N. #202, Seattle, WA 98133	ADDRESS:
PHONE: (206)362-8294 FAX: (206)362-9528	P.O. NUMBER: NCA QUOTE #:
PROJECT NAME: Rose's Parking Lot	
PROJECT NUMBER: 32-0029	
SAMPLED BY: James Orr	

TURNAROUND REQUEST in Business Days *

Organic & Inorganic Analyses: 10 Standard | 7 | 5 | 4 | 3 | 2 | 1 | Same Day

Fuels & Hydrocarbon Analyses: X Standard | 3-4 | 2 | 1 | Same Day

OTHER Specify:

* Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	NCA SAMPLE ID (Laboratory Use Only)	Analysis Request: TPH-G, BTEX	MATRIX (W, S, A, O)	# OF CONTAINERS	COMMENTS
1.	MW-1	12-31-97/1740		X			
2.	NMW-2	1745		X			
3.	NMW-3	1740		X			
4.	MW-4	1735		X			
5.	NMW-5	1730		X			
6.	MW-6	1725		X			
7.	MW-7	1720		X			
8.	MW-8	1715		X			
9.	Trip Blank	1630		X			
10.							

RELINQUISHED BY (Signature): James Orr	DATE: 1-2-98	RECEIVED BY (Signature): Sara McClurg	DATE: 1-2-97
PRINT NAME: James Orr	FIRM: Terra Vac TIME: 1025	PRINT NAME: Sara McClurg	FIRM: NCA TIME: 1025
RELINQUISHED BY (Signature):	DATE:	RECEIVED BY (Signature):	DATE:
PRINT NAME:	FIRM: TIME:	PRINT NAME:	FIRM: TIME:

ADDITIONAL REMARKS:

PAGE 1 OF 1

26-94-0025
DJP

TERRA VAC
10740 Meridian Avenue North, Suite 202, Seattle, WA 98133-9010
Tel (206) 362-8128 ❑ Fax (206) 362-9528

November 5, 1997

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
NOV 14 1997
NORTHWEST REGION

Mr. Max Birnbach
c/o Mr. Charles R. Williamson
Kell, Alterman & Runstein
1001 Southwest Fifth Avenue, Suite 1800
Portland, OR 97204-1194

RE: Third Quarter 1997 Groundwater Monitoring Report
Rose's Parking Lot
330 Northwest 23rd Avenue, Portland, OR

Dear Mr. Birnbach:

Enclosed, please find our third quarter 1997 groundwater report for Rose's Parking Lot, located at 330 Northwest 23rd Avenue, Portland, Oregon. Our next monitoring event will occur in approximately two months.

If you have any questions, or require additional information, please do not hesitate to call me at (206) 362-8294.

Sincerely,
Terra Vac Corporation

Timothy Warner
Project Manager

cc: Dave Roy
Rich Kostecki
Jeffrey Wishko
Richard Singer (2 copies)
Richard Allen
Edward Crow
Don Pettit

32-0029.20.01

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TERRA VAC
10740 Meridian Avenue North, Suite 202, Seattle, WA 98133-9010
Tel (206) 362-8128 ❑ Fax (206) 362-9528

November 5, 1997

Mr. Max Birnbach
c/o Mr. Charles R. Williamson
Kell, Alterman & Runstein
1001 Southwest Fifth Avenue, Suite 1800
Portland, OR 97204-1194

RE: Third Quarter 1997 Groundwater Monitoring Report
Rose's Parking Lot
330 Northwest 23rd Avenue, Portland, OR

Dear Mr. Birnbach:

Terra Vac performed quarterly groundwater monitoring at this site on September 5, 1997. Eight monitoring wells were sounded for depth to groundwater. On October 1-2, 1997, monitoring wells MW-6, MW-7, and MW-8 were resampled due to possible cross contamination of the previous samples. Groundwater samples were collected from the monitoring wells for analyses of total gasoline-range petroleum hydrocarbons (TPH-G), benzene, toluene, ethylbenzene, and total xylenes (BTEX). A site location map is shown on Figure 1. Well construction details, including construction dates, well diameters, total depths, and screened intervals are provided in Table 1.

Groundwater elevations decreased in six wells, and increased in two wells since the previous monitoring event. Analytical results indicate groundwater from two of the eight sampled wells exceeded the current Oregon Department of Environmental Quality (ODEQ) Groundwater Cleanup Levels for benzene.

Groundwater monitoring and sampling were performed using standard field procedures. In short, each well was sounded for depth to groundwater and the presence of free phase petroleum hydrocarbons using an electronic interface probe. If free phase petroleum hydrocarbons were not detected, total well depth was measured. A minimum of three well volumes were hand bailed from each well sampled, and groundwater allowed to recover to at least 80 percent of original elevation. Analytical samples were then collected with new disposable bailers and immediately placed in sampling vials prepared specifically for the sampled media and selected analyses. Once collected, samples were immediately acidified and cooled for transportation to the laboratory under chain of custody.

Existing top of casing elevations, as determined by a March, 1997 well survey, were used to establish reference points for well depths, screen intervals, and groundwater elevations for wells MW-1, MW-4, MW- 6, NMW-2, NMW-3 and NMW-5. Elevations for MW-7 and MW-8 were calculated using previous survey data from GeoEngineers, corrected to the new local assumed datum. Historical groundwater elevations are presented in Table 2. Third quarter 1997 groundwater elevations as measured on September 5, 1997 are also presented on Figure 2.

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Historically, the inferred direction of groundwater flow has been to the northeast. Prior to sampling, the remediation system had been offline for a period of two days.

Since February 1997, groundwater samples have been analyzed for TPH-G by EPA Method 8015, for BTEX constituents by EPA Method 8020A, for PAHs by EPA Method 8310, and for dissolved lead by EPQ Method 200.8. Previous groundwater sampling performed by GeoEngineers included in this report used EPA Method 418.1 for TPH-G, EPA Method 8020 for BTEX, EPA Method 8310 for PAHs, and EPA Method 7421 for dissolved lead. Results of these analyses, and historical groundwater quality data, are presented in Table 3. Groundwater quality results from the third quarter 1997 sampling are also shown on Figure 3. Analytical reports from the laboratory are contained in Appendix A.

Field activities were performed in a manner consistent with the level of skill and care standard for local environmental professionals. Findings and conclusions presented in this report have been prepared based upon the specific site conditions at the time of field activities and no warranty, expressed or implied, is made.

If you have any questions, please do not hesitate to contact us.

Sincerely,
Terra Vac Corporation

Timothy Warner,
Project Manager

cc: Dave Roy
Rich Kostecki
Jeffrey Wishko
Richard Singer (2 copies)
Richard Allen
Edward Crow
Don Pettit

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FIGURES

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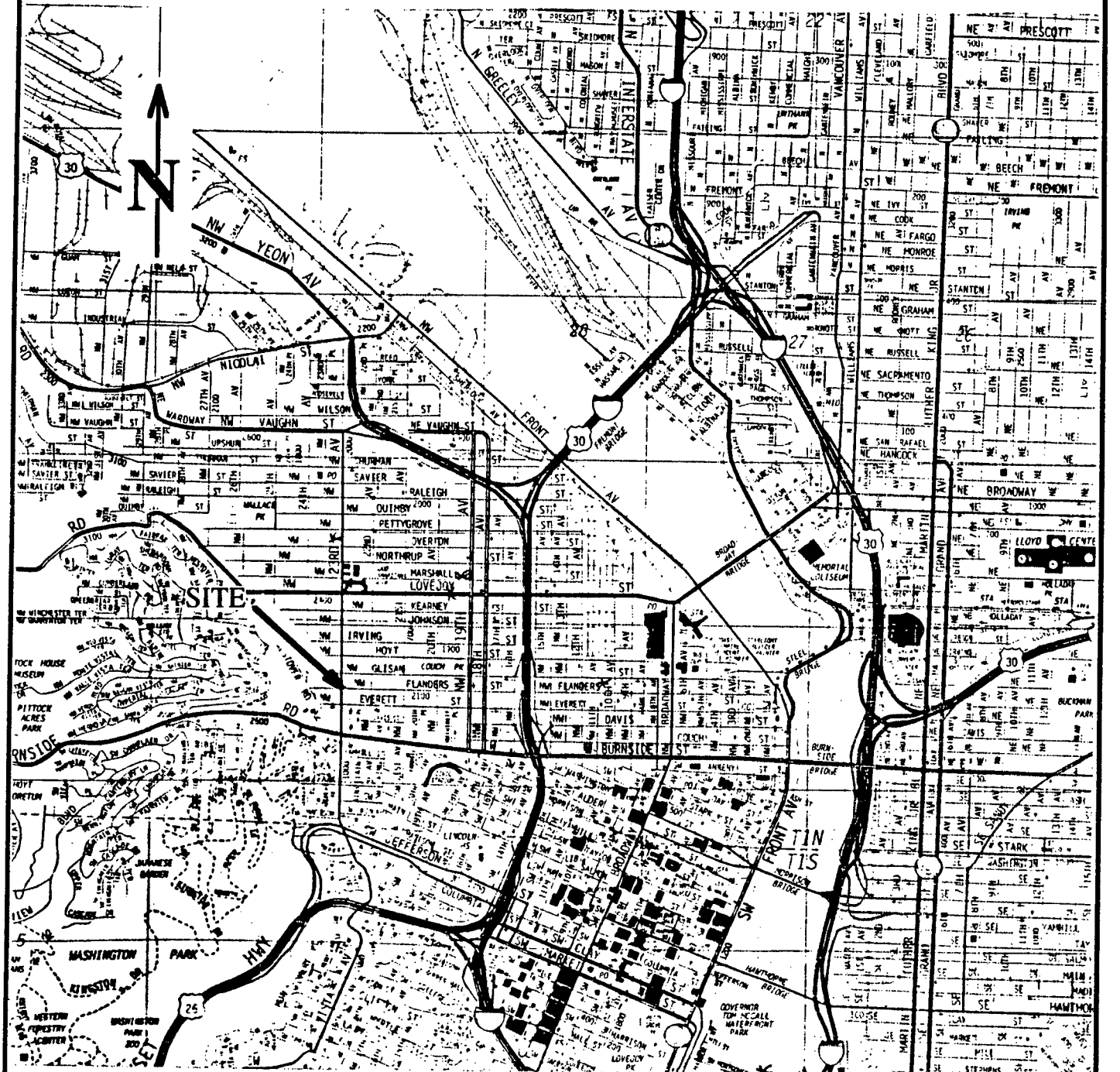
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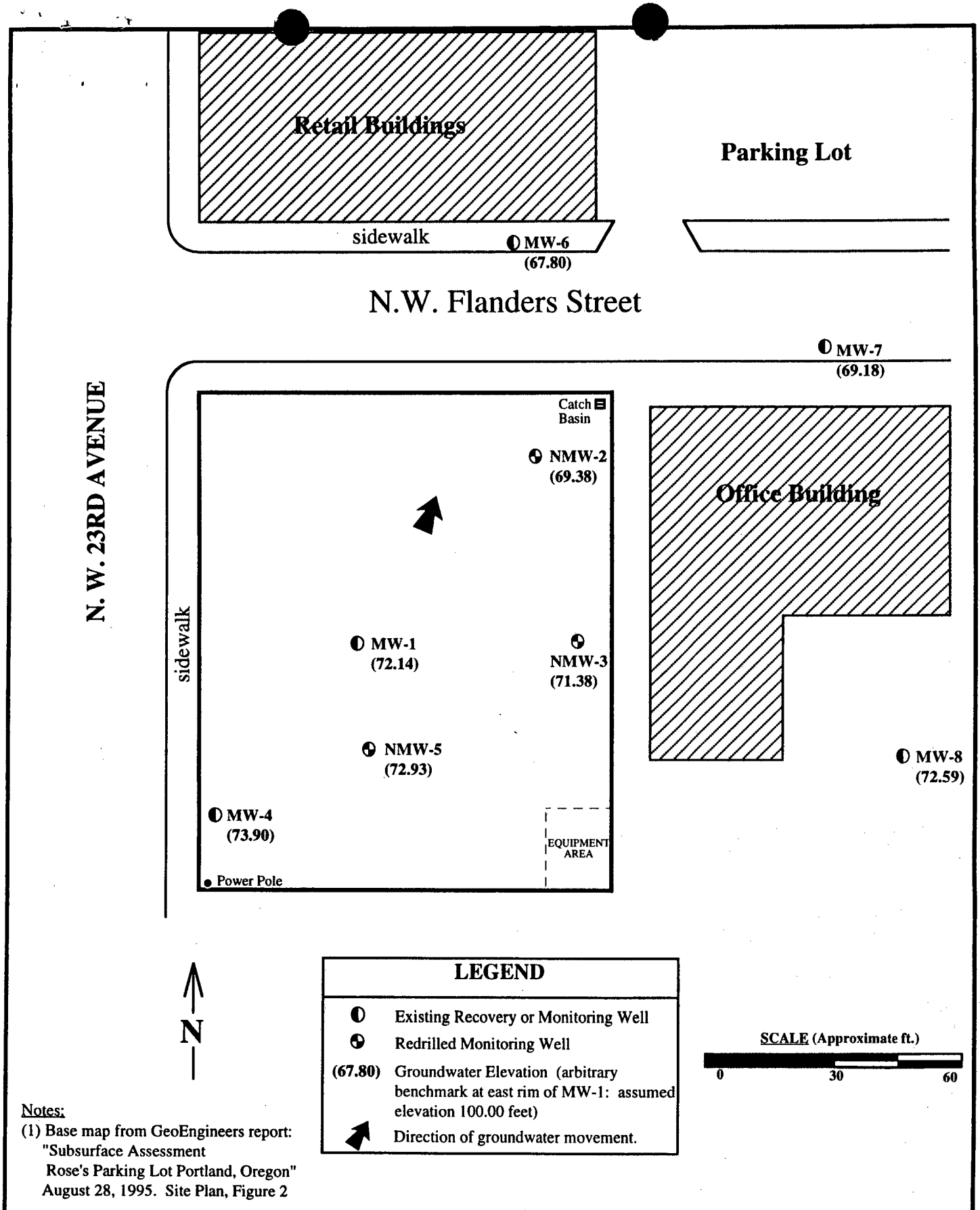
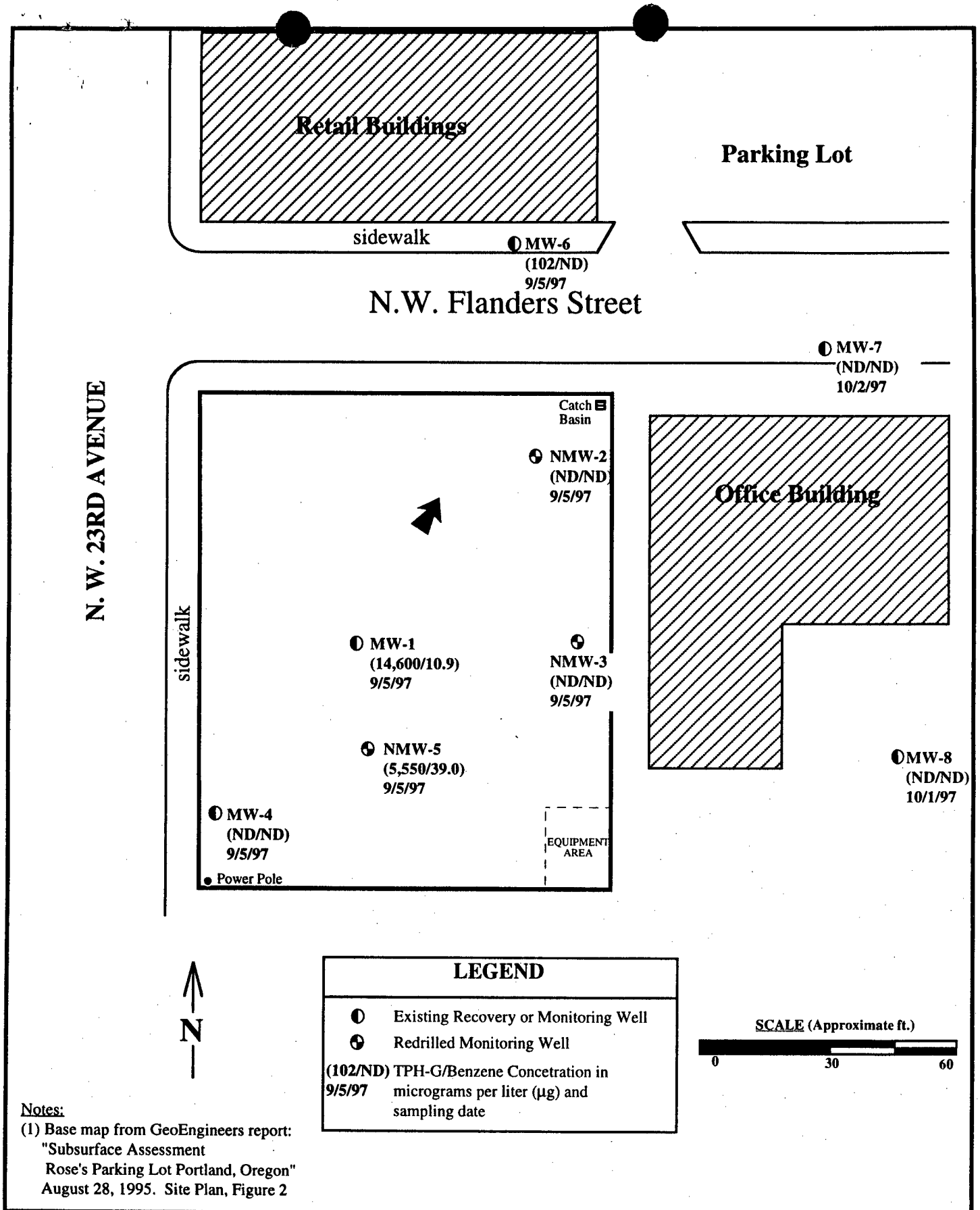


Notes:
(1) Base map from GeoEngineers report:
"Subsurface Assessment
Rose's Parking Lot Portland, Oregon"
August 28, 1995. Site Plan, Figure 2

Groundwater Elevations	**Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon**	TERRA VAC	Project No.	32-0029	Figure 2
			Date	November 5, 1997	
			Scale	1 inch ≈ 30 Feet	
			Revision	MKF-2	



Notes:
(1) Base map from GeoEngineers report:
"Subsurface Assessment
Rose's Parking Lot Portland, Oregon"
August 28, 1995. Site Plan, Figure 2

Groundwater Analytical Results	**Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon**	TERRA VAC	Project No. 32-0029 Date November 5, 1997 Scale 1 inch ≈ 30 Feet Revision MKF-2	Figure 3

TABLES

Table 1

Remediation Well Construction Data
Rose's Parking Lot
Portland, Oregon

Well Identification	Date Installed	Total Depth (feet)	Screen Interval		Well Diameter (inches)
			Top (feet)	Bottom (feet)	
MW-1	3/23/94	39	24	38.5	2
NMW-2	1/24/97	38	15	37	4
NMW-3	1/25/97	38	15.5	37.5	4
MW-4	9/28/94	40	20	39.5	2
NMW-5	1/23/97	38	15	37	4
MW-6	4/6/96	31	15	30.5	2
MW-7	4/6/96	31	15	30.5	2
MW-8	4/6/96	31	15	30.5	2

Notes:

Data on NMW-2, NMW-3, and NMW-5 is from Terra Vac field notes and well logs.

Data on MW-1 from RZA Agra Inc. well logs in April, 1994 report.

Data on MW-4 from RZA Agra Inc. well logs in October, 1994 report.

Data on MW-6 through MW-8 from well logs in GeoEngineers June, 1996 Report

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Table 2

Groundwater Elevation Data
Rose's Parking Lot
Portland, Oregon

Well I.D.	Top of Casing Elevation (feet)	Date Sounded	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Water Level Elevation (feet MSL)	Difference from Previous Measurement (feet)
MW-1	100.00	5/12/95	22.79	23.29	0.5	76.71	**
		1/4/96	--	24.10	Trace	75.90	-0.81
		4/8/96	22.39	22.41	0.02	77.59	1.69
		4/24/96	22.40	22.45	0.05	77.55	-0.04
		7/11/96	--	23.35	Trace	76.65	-0.90
		11/3/96	--	24.44	Sheen	75.56	-1.09
		2/28/97	--	21.11	0	78.89	3.33
		5/29/97	--	26.90	0	73.10	-5.79
		9/5/97	--	27.86	0	72.14	-0.96
NMW-2	96.21	5/12/95	--	20.75	0	75.46	**
		1/4/96	--	21.60	0	74.61	-0.85
		4/8/96	--	19.73	0	76.48	1.87
		4/24/96	--	19.90	0	76.31	-0.17
		7/11/96	Sheen	20.80	0	75.41	-0.90
		11/3/96	--	21.87	0	74.34	-1.07
		2/28/97	--	18.51	0	77.70	3.36
		5/29/97	--	25.30	0	70.91	-6.79
		9/5/97	--	26.83	0	69.38	-1.53
NMW-3	99.15	5/12/95	--	23.48	0	75.67	**
		1/4/96	--	24.22	0	74.93	-0.74
		4/8/96	--	22.31	0	76.84	1.91
		4/24/96	--	22.36	0	76.79	-0.05
		7/11/96	--	23.37	0	75.78	-1.01
		11/3/96	Sheen	24.47	0	74.68	-1.10
		2/28/97	--	21.28	0	77.87	3.19
		5/29/97	--	29.78	0	69.37	-8.50
		9/5/97	--	27.77	0	71.38	2.01

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Table 2

Groundwater Elevation Data
Rose's Parking Lot
Portland, Oregon

Well I.D.	Top of Casing Elevation (feet)	Date Sounded	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Water Level Elevation (feet MSL)	Difference from Previous Measurement (feet)
MW-4	100.48	5/12/95	--	22.55	0	77.93	**
		1/4/96	--	23.03	0	77.45	-0.48
		4/8/96	--	21.60	0	78.88	1.43
		4/24/96	--	21.34	0	79.14	0.26
		7/11/96	--	22.54	0	77.94	-1.20
		11/3/96	--	23.45	0	77.03	-0.91
		2/28/97	--	20.24	0	80.24	3.21
		5/29/97	--	26.04	0	74.44	-5.80
		9/5/97	--	26.58	0	73.90	-0.54
NMW-5	100.45	5/12/95	--	22.35	0	78.10	**
		1/4/96	Trace	22.84	0	77.61	-0.49
		4/8/96	--	21.40	0	79.05	1.44
		4/24/96	--	20.04	0	80.41	1.36
		7/11/96	--	22.45	0	78.00	-2.41
		11/3/96	Sheen	23.38	0	77.07	-0.93
		2/28/97	--	21.07	0	79.38	2.31
		5/29/97	--	31.75	0	68.70	-10.68
		9/5/97	--	27.52	0	72.93	4.23
MW-6	93.89	4/8/96	--	21.53	0	72.36	**
		4/24/96	--	22.04	0	71.85	-0.51
		7/11/96	--	22.61	0	71.28	-0.57
		11/3/96	--	24.04	0	69.85	-1.43
		2/28/97	--	20.89	0	73.00	3.15
		5/29/97	--	23.50	0	70.39	-2.61
		9/5/97	--	26.09	0	67.80	-2.59
		10/2/97	NA	NA	NA	NA	NA

Table 2

Groundwater Elevation Data
Rose's Parking Lot
Portland, Oregon

Well I.D.	Top of Casing Elevation (feet)	Date Sounded	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Water Level Elevation (feet MSL)	Difference from Previous Measurement (feet)
MW-7	94.07	4/8/96	--	21.50	0	72.57	**
		4/24/96	--	21.05	0	73.02	0.45
		7/11/96	--	22.40	0	71.67	-1.35
		11/3/96	--	23.57	0	70.50	-1.17
		2/28/97	--	20.70	0	73.37	2.87
		5/29/97	--	22.20	0	71.87	-1.50
		9/5/97	--	24.89	0	69.18	-2.69
		10/2/97	NA	NA	NA	NA	NA
MW-8	95.08	4/8/96	--	20.19	0	74.89	**
		4/24/96	--	18.42	0	76.66	1.77
		7/11/96	--	18.88	0	76.20	-0.46
		11/3/96	--	20.05	0	75.03	-1.17
		2/28/97	--	18.45	0	76.63	1.60
		9/5/97	--	22.49	0	72.59	-4.04
		10/1/97	NA	NA	NA	NA	NA

Notes:

Data from 5/12/95-11/3/96 from GeoEngineers Groundwater Report January, 1997.

Wells MW-2, MW-3, and MW-5 redrilled 1/23-1/25/97, and renamed NMW-2, NMW-3, and NMW-5 respectively.

Depth to water measurements made from top of casing.

Elevations for wells except for MW-7 and MW-8 based on monitoring well survey conducted 3/3/97.
Elevations are measured to the local assumed datum of 100.00 feet at MW-1.
Elevations for MW-7 and MW-8 based on GeoEngineers' data, corrected for change in arbitrary reference point.

ft MSL feet above Mean Sea Level

** Not calculated; previous measurements not available.

-- Not Applicable; no free product detected in well.

NA Not Analyzed.

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-1	3/29/94	NA	130	390	98	1,570	NA	NA
	10/4/94	NA	27	46	6	70	NA	NA
	5/12/95	NA	NA	NA	NA	NA	NA	NA
	1/4/96	54	400	2,200	630	4,800	Naphthalene - 370 Acenaphthylene - 44	100
	4/24/96	NA	NA	NA	NA	NA	NA	NA
	7/11/96	81	710	1,800	730	2	Naphthalene - 750 Acenaphthylene - 160 Phenanthrene - 2.2 Fluoranthene - 4.5	NA
	11/3/96	23	410	1,500	910	4,100	Naphthalene - 2,400 Acenaphthylene - 460 Acenaphthene -600 Fluorene - 12 Phenanthrene - 12 Anthracene - 0.89 Fluoranthene - 10 Pyrene - 2.1 Benzo(a)anthracene - 0.7 Chrysene - 1.3 Benzo(k)fluoranthene - 0.1 Benzo(a)pyrene - 0.3 Dibenzo(a,h)anthracene - 0.1 Benzo(g,h,i)perylene - 0.4	NA
	2/28/97*	57,200	1,130	3,890	1,220	7,430	Naphthalene - 760	20
	5/29/97	14,900	65.9	49.3	205	1,010	NA	NA
	9/5/97	14,600	10.9	11.8	47.3	642	Naphthalene - 54.2	NA

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Table 3

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
NMW-2	3/29/94	NA	4.9	1.4	0.7	3.0	NA	NA
	10/4/94	NA	ND	ND	ND	ND	NA	NA
	5/12/95	ND	1.2	ND	0.6	0.7	NA	NA
	1/4/96	1,600	14	1.5	ND	1.7	ND	ND
	4/24/96	NA	7.7	0.5	ND	ND	NA	NA
	7/11/96	7,100	2.7	ND	ND	ND	ND	NA
	11/3/96	ND	2.0	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA
NMW-3	3/29/94	NA	2,300	1,200	1,200	3,700	NA	NA
	10/4/94	NA	1,520	600	790	1,600	NA	NA
	5/12/95	3,500	1,300	740	800	2,000	Naphthalene - 130 Fluorene - 0.2 Phenanthrene - 0.09	NA
	1/4/96	4,500	1,300	640	940	2,600	Naphthalene - 180 Acenaphthylene - 23	6
	4/16/96	NA	900	500	600	1,400	NA	NA
	7/11/96	2,100	460	130	380	430	Naphthalene - 71	NA
	11/3/96	4,900	830	220	650	1,100	Naphthalene - 120 Acenaphthylene - 37	
	2/28/97	4,400	261	124	153	404	Naphthalene - 32.6	NA
	5/29/97	365	17.4	0.91	3.55	15.3	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-4	10/4/94	NA	ND	ND	ND	ND	NA	NA
	5/12/95	ND	ND	ND	ND	ND	NA	NA
	1/4/96	900	ND	ND	ND	ND	ND	ND
	4/24/96	NA	ND	ND	ND	ND	NA	NA
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	0.7	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA
NMW-5	5/12/95	13,000	660	13,000	1,900	11,000	Naphthalene - 450 Acenaphthylene - 66 Fluorene - 0.6 Phenanthrene - 0.42 Anthracene - 0.07	NA
	1/4/96	6,600	4.6	22	24	230	Naphthalene - 29 Acenaphthylene - 13 Fluorene - 0.8	14
	4/24/96	NA	ND	0.6	1.1	2.9	NA	NA
	7/11/96	ND	ND	ND	ND	2.7	NA	NA
	11/3/96	NA	ND	ND	2.5	5.6	NA	NA
	2/28/97	5,440	70.3	23.5	88.6	230	Naphthalene - 28.5	NA
	5/29/97	4,480	34.9	156	7.90	554	NA	NA
	9/5/97	5,550	39.0	334	23.5	642	ND	NA
MW-6	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	102	ND	ND	ND	ND	NA	NA
	10/2/97***	NA	NA	NA	NA	NA	NA	NA

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Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-7	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	110	12	ND	ND	ND	NA	NA
	10/2/97	ND	ND	ND	ND	ND	NA	NA
MW-8	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	111	ND	ND	ND	ND	NA	NA
	10/1/97	ND	ND	ND	ND	ND	NA	NA

Notes:

Sampling between 3/29/94 and 11/3/96 performed by GeoEngineers. Data from 1/21/97 Groundwater Report.

Wells MW-2, MW-3, and MW-5 redrilled 1/23-1/25/97, and renamed NMW-2, NMW-3, and NMW-5 respectively.

* MW-1 sampled for lead 12/11/96.

** Sample Results were suspect. Well Resampled on 10/1/97 or 10/2/97

*** Well was dry. No analytical sample taken.

PAHs polycyclic aromatic hydrocarbons. Only analytes detected are listed. Refer to analytical results (Appendix A) for a complete list of analytes and their respective detection limits.

ug/L Micrograms per liter, or parts per billion

ND Not Detected at the reporting limits

NA Not Analyzed

TPH-G Total petroleum hydrocarbons within the gasoline range (benzene to naphthalene).

APPENDIX A

- LABORATORY REPORTS

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NORTH CREEK ANALYTICAL
Environmental Laboratory Services

BOTHELL ▪ (425) 481-9200 ▪ FAX 485-2992
SPOKANE ▪ (509) 924-9200 ▪ FAX 924-9290
PORTLAND ▪ (503) 643-9200 ▪ FAX 644-2202

Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 9/5/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029 "D"	Received: 9/5/97
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 9/24/97 10:44

ANALYTICAL REPORT FOR SAMPLES:

Sample Description	Laboratory Sample Number	Sample Matrix	Date Sampled
MW-1	P709106-01	Water	9/5/97
NMW-2	P709106-02	Water	9/5/97
NMW-3	P709106-03	Water	9/5/97
MW-4	P709106-04	Water	9/5/97
MW-5	P709106-05	Water	9/5/97
MW-6	P709106-06	Water	9/5/97
MW-7	P709106-07	Water	9/5/97
MW-8	P709106-08	Water	9/5/97
Discharge	P709106-09	Water	9/5/97
Trip Blank	P709106-10	Water	9/5/97

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

BOTHELL ▪ (425) 481-9200 ▪ FAX 485-2992
SPOKANE ▪ (509) 924-9200 ▪ FAX 924-9290
PORTLAND ▪ (503) 643-9200 ▪ FAX 644-2202

Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 9/5/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029 "D"	Received: 9/5/97
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 9/24/97 10:44

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-1			**P709106-01**				**Water**	
Benzene	0970223	9/10/97	9/10/97		2.50	**10.9**	ug/l	
Toluene	"	"	"		2.50	**11.8**	"	
Ethylbenzene	"	"	"		2.50	**47.3**	"	
Xylenes (total)	"	"	"		5.00	**642**	"	
Gasoline Range Hydrocarbons	"	"	"		400	**14600**	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*99.8*	%	
NMW-2			**P709106-02**				**Water**	
Benzene	0970157	9/8/97	9/8/97		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*93.2*	%	
NMW-3			**P709106-03**				**Water**	
Benzene	0970183	9/9/97	9/9/97		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*85.4*	%	
MW-4			**P709106-04**				**Water**	
Benzene	0970157	9/8/97	9/8/97		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*92.8*	%	
MW-5			**P709106-05**				**Water**	
Benzene	0970183	9/9/97	9/9/97		2.50	**39.0**	ug/l	
Toluene	"	"	"		2.50	**334**	"	
Ethylbenzene	"	"	"		2.50	**23.5**	"	
Xylenes (total)	"	"	"		5.00	**642**	"	
Gasoline Range Hydrocarbons	"	"	"		400	**5550**	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*94.2*	%	

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Sandra K. Wright, Project Manager

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Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 9/5/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029 "D"	Received: 9/5/97
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 9/24/97 10:44

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-6			**P709106-06**				**Water**	
Benzene	0970157	9/8/97	9/8/97		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	**102**	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*92.8*	%	
MW-7			**P709106-07**				**Water**	
Benzene	0970157	9/8/97	9/8/97		0.500	**12.1**	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	**110**	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*92.0*	%	
MW-8			**P709106-08**				**Water**	
Benzene	0970157	9/8/97	9/8/97		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	**111**	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*91.4*	%	
Trip Blank			**P709106-10**				**Water**	
Benzene	0970157	9/8/97	9/8/97		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*91.6*	%	

North Creek Analytical, Inc.

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Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 9/5/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029 "D"	Received: 9/5/97
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 9/24/97 10:44

Polynuclear Aromatic Compounds per EPA Method 8310
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-1			**P709106-01**				**Water**	
Acenaphthene	0970267	9/11/97	9/16/97		125	ND	ug/l	1
Acenaphthylene	"	"	"		75.0	ND	"	1
Anthracene	"	"	"		5.00	ND	"	
Benzo (a) anthracene	"	"	"		0.100	ND	"	
Benzo (a) pyrene	"	"	"		0.100	ND	"	
Benzo (b) fluoranthene	"	"	"		0.100	ND	"	
Benzo (ghi) perylene	"	"	"		0.100	ND	"	
Benzo (k) fluoranthene	"	"	"		0.100	ND	"	
Chrysene	"	"	"		0.100	ND	"	
Dibenzo (a,h) anthracene	"	"	"		0.100	ND	"	
Fluoranthene	"	"	"		0.200	ND	"	1
Fluorene	"	"	"		7.50	ND	"	1
Indeno (1,2,3-cd) pyrene	"	"	"		0.100	ND	"	
Naphthalene	"	"	"		5.00	**54.2**	"	
Phenanthrene	"	"	"		5.00	ND	"	
Pyrene	"	"	"		0.100	ND	"	
Surrogate: 2-Fluorobiphenyl	"	"	"	*30.0-100*		*90.0*	*%*	
MW-5			**P709106-05**				**Water**	
Acenaphthene	0970267	9/11/97	9/16/97		10.0	ND	ug/l	1
Acenaphthylene	"	"	"		7.50	ND	"	1
Anthracene	"	"	"		5.00	ND	"	
Benzo (a) anthracene	"	"	"		0.100	ND	"	
Benzo (a) pyrene	"	"	"		0.100	ND	"	
Benzo (b) fluoranthene	"	"	"		0.100	ND	"	
Benzo (ghi) perylene	"	"	"		0.100	ND	"	
Benzo (k) fluoranthene	"	"	"		0.100	ND	"	
Chrysene	"	"	"		0.100	ND	"	
Dibenzo (a,h) anthracene	"	"	"		0.100	ND	"	
Fluoranthene	"	"	"		0.100	ND	"	
Fluorene	"	"	"		0.500	ND	"	
Indeno (1,2,3-cd) pyrene	"	"	"		0.100	ND	"	
Naphthalene	"	"	"		5.00	ND	"	
Phenanthrene	"	"	"		5.00	ND	"	
Pyrene	"	"	"		0.100	ND	"	
Surrogate: 2-Fluorobiphenyl	"	"	"	*30.0-100*		*83.2*	*%*	

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Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 9/5/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029 "D"	Received: 9/5/97
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 9/24/97 10:44

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0970157	**Date Prepared: 9/8/97**					**Extraction Method: EPA 5030**				
Blank	**0970157-BLK1**									
Benzene	9/8/97			ND	ug/l	0.500				
Toluene	"			ND	"	0.500				
Ethylbenzene	"			ND	"	0.500				
Xylenes (total)	"			ND	"	1.00				
Gasoline Range Hydrocarbons	"			ND	"	80.0				
Surrogate: 4-BFB	"	*50.0*		*46.6*	"	*50.0-150*	*93.2*			
LCS	**0970157-BS1**									
Gasoline Range Hydrocarbons	9/8/97	1250		1200	ug/l	50.0-150	96.0			
Surrogate: 4-BFB	"	*50.0*		*46.8*	"	*50.0-150*	*93.6*			
LCS	**0970157-BS2**									
Benzene	9/8/97	20.0		20.0	ug/l	67.0-130	100			
Toluene	"	20.0		19.6	"	75.0-126	98.0			
Ethylbenzene	"	20.0		19.5	"	76.0-124	97.5			
Xylenes (total)	"	60.0		58.9	"	75.0-126	98.2			
Surrogate: 4-BFB	"	*50.0*		*52.2*	"	*50.0-150*	*104*			
Duplicate	**0970157-DUP1**		**P709099-01**							
Gasoline Range Hydrocarbons	9/8/97		ND	ND	ug/l			50.0		
Surrogate: 4-BFB	"	*50.0*		*48.3*	"	*50.0-150*	*96.6*			
Duplicate	**0970157-DUP2**		**P709099-05**							
Gasoline Range Hydrocarbons	9/8/97		2360	2290	ug/l			50.0	**3.01**	
Surrogate: 4-BFB	"	*50.0*		*46.0*	"	*50.0-150*	*92.0*			
Duplicate	**0970157-DUP3**		**P709099-07**							
Gasoline Range Hydrocarbons	9/8/97		20000	19400	ug/l			50.0	**3.05**	
Surrogate: 4-BFB	"	*50.0*		*51.2*	"	*50.0-150*	*102*			
Matrix Spike	**0970157-MS1**		**P709099-08**							
Benzene	9/8/97	20.0	ND	20.8	ug/l	67.0-130	**104**			
Toluene	"	20.0	ND	20.2	"	75.0-126	**101**			
Ethylbenzene	"	20.0	ND	20.1	"	76.0-124	**101**			
Xylenes (total)	"	60.0	ND	59.9	"	75.0-126	**99.8**			
Surrogate: 4-BFB	"	*50.0*		*47.7*	"	*50.0-150*	*95.4*			

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Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 9/5/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029 "D"	Received: 9/5/97
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 9/24/97 10:44

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Matrix Spike Dup	**0970157-MSD1**		**P709099-08**							
Benzene	9/8/97	20.0	ND	21.1	ug/l	67.0-130	**106**	13.0	**1.90**	
Toluene	"	20.0	ND	20.5	"	75.0-126	**103**	13.0	**1.96**	
Ethylbenzene	"	20.0	ND	20.2	"	76.0-124	**101**	15.0	**0**	
Xylenes (total)	"	60.0	ND	60.0	"	75.0-126	**100**	13.0	**0.200**	
Surrogate: 4-BFB	"	*50.0*		*48.3*	"	*50.0-150*	*96.6*			
Batch: 0970183	**Date Prepared: 9/9/97**					**Extraction Method: EPA 5030**				
Blank	**0970183-BLK1**									
Benzene	9/9/97			ND	ug/l	**0.500**				
Toluene	"			ND	"	**0.500**				
Ethylbenzene	"			ND	"	**0.500**				
Xylenes (total)	"			ND	"	**1.00**				
Gasoline Range Hydrocarbons	"			ND	"	**80.0**				
Surrogate: 4-BFB	"	*50.0*		*47.2*	"	*50.0-150*	*94.4*			
LCS	**0970183-BS1**									
Gasoline Range Hydrocarbons	9/9/97	1250		1140	ug/l	50.0-150	91.2			
Surrogate: 4-BFB	"	*50.0*		*45.8*	"	*50.0-150*	*91.6*			
LCS	**0970183-BS2**									
Benzene	9/9/97	20.0		20.0	ug/l	67.0-130	100			
Toluene	"	20.0		20.4	"	75.0-126	102			
Ethylbenzene	"	20.0		20.7	"	76.0-124	104			
Xylenes (total)	"	60.0		63.0	"	75.0-126	105			
Surrogate: 4-BFB	"	*50.0*		*51.4*	"	*50.0-150*	*103*			
Batch: 0970223	**Date Prepared: 9/10/97**					**Extraction Method: EPA 5030**				
Blank	**0970223-BLK1**									
Benzene	9/10/97			ND	ug/l	**0.500**				
Toluene	"			ND	"	**0.500**				
Ethylbenzene	"			ND	"	**0.500**				
Xylenes (total)	"			ND	"	**1.00**				
Gasoline Range Hydrocarbons	"			ND	"	**80.0**				
Surrogate: 4-BFB	"	*50.0*		*46.2*	"	*50.0-150*	*92.4*			
LCS	**0970223-BS1**									
Gasoline Range Hydrocarbons	9/10/97	1250		1370	ug/l	50.0-150	110			
Surrogate: 4-BFB	"	*50.0*		*47.8*	"	*50.0-150*	*95.6*			

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Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 9/5/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029 "D"	Received: 9/5/97
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 9/24/97 10:44

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
LCS	**0970223-BS2**									
Benzene	9/10/97	20.0		21.6	ug/l	67.0-130	108			
Toluene	"	20.0		21.2	"	75.0-126	106			
Ethylbenzene	"	20.0		20.7	"	76.0-124	104			
Xylenes (total)	"	60.0		62.5	"	75.0-126	104			
Surrogate: 4-BFB	"	*50.0*		*48.7*	"	*50.0-150*	*97.4*			

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Terra Vac - Seattle	Project: Rose's Parking Lot	Sampled: 9/5/97
10740 Meridian Ave. N. Ste 202	Project Number: 32-0029 "D"	Received: 9/5/97
Seattle, WA 98133	Project Manager: Tim Warner	Reported: 9/24/97 10:44

Polynuclear Aromatic Compounds per EPA Method 8310/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0970267	**Date Prepared: 9/11/97**					**Extraction Method: EPA 3520/600 Series**				
Blank	**0970267-BLK1**									
Acenaphthene	9/16/97			ND	ug/l	5.00				
Acenaphthylene	"			ND	"	5.00				
Anthracene	"			ND	"	5.00				
Benzo (a) anthracene	"			ND	"	0.100				
Benzo (a) pyrene	"			ND	"	0.100				
Benzo (b) fluoranthene	"			ND	"	0.100				
Benzo (ghi) perylene	"			ND	"	0.100				
Benzo (k) fluoranthene	"			ND	"	0.100				
Chrysene	"			ND	"	0.100				
Dibenzo (a,h) anthracene	"			ND	"	0.100				
Fluoranthene	"			ND	"	0.100				
Fluorene	"			ND	"	0.500				
Indeno (1,2,3-cd) pyrene	"			ND	"	0.100				
Naphthalene	"			ND	"	5.00				
Phenanthrene	"			ND	"	5.00				
Pyrene	"			ND	"	0.100				
Surrogate: 2-Fluorobiphenyl	"	*50.0*		*40.0*	"	*30.0-100*	*80.0*			
LCS	**0970267-BS1**									
Acenaphthylene	9/16/97	20.0		17.9	ug/l	20.0-124	89.5			
Benzo (k) fluoranthene	"	1.00		0.830	"	20.0-159	83.0			
Pyrene	"	1.00		0.998	"	50.0-150	99.8			
Surrogate: 2-Fluorobiphenyl	"	*50.0*		*44.2*	"	*30.0-100*	*88.4*			
LCS Dup	**0970267-BSD1**									
Acenaphthylene	9/16/97	20.0		16.7	ug/l	20.0-124	83.5	50.0	6.94	
Benzo (k) fluoranthene	"	1.00		0.794	"	20.0-159	79.4	50.0	4.43	
Pyrene	"	1.00		0.952	"	50.0-150	95.2	50.0	4.72	
Surrogate: 2-Fluorobiphenyl	"	*50.0*		*41.2*	"	*30.0-100*	*82.4*			

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Terra Vac - Seattle	Project: Rose's Parking Lot	Sampled: 9/5/97
10740 Meridian Ave. N. Ste 202	Project Number: 32-0029 "D"	Received: 9/5/97
Seattle, WA 98133	Project Manager: Tim Warner	Reported: 9/24/97 10:44

Notes and Definitions

#	Note
1	Reporting limits raised due to hydocarbon matrix interference.
2	Since sample was non-detected, analysis of nonpolar hydrocarbons not necessary.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
Recov.	Recovery
RPD	Relative Percent Difference

North Creek Analytical, Inc.

Sandra K. Wright, Project Manager

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COPY

CHAIN OF CUSTODY REPORT

Work Order # P709106

REPORT TO: Terra Vac	INVOICE TO: Terra Vac
ATTENTION: Mr. Tim Warner	ATTENTION: Mr. Tim Warner
ADDRESS: 10740 Meridian Ave. North #202 Seattle, WA 98133	ADDRESS: Same as ←
PHONE: (206)362-8294 FAX: (206) 362-9528	P.O. NUMBER: NCA QUOTE #:
PROJECT NAME: Rose's	
PROJECT NUMBER: 32-0029	
SAMPLED BY: J. ORR	

TURNAROUND REQUEST in Business Days *

Organic & Inorganic Analyses: ~~10 Standard~~ | 7 | 5 | 4 | 3 | 2 | 1 | Same Day

Fuels & Hydrocarbon Analyses: 5 Standard | 3-4 | 2 | 1 | Same Day

OTHER Specify:

* Turnaround Requests less than standard may incur Rush Charges.

Analysis Request: TPH Gas / PAH (see No 2) / pH / Oil & Grease (EPA 1664) / Dissolved Lead / 601, 602 / Flash Point

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	NCA SAMPLE ID (Laboratory Use Only)	TPH Gas	PAH	pH	Oil & Grease	Dissolved Lead	601, 602	Flash Point	MATRIX (W, S, A, O)	# OF CONTAINERS	COMMENTS
1.	MW-1	9-5-97/1245		X	(X)						W	3	Run PAH
2.	NMW-2	1250		X								3	on Any Sample
3.	NMW-3	1255		X								3	MW-1 → MW-8
4.	MW-4	1300		X								3	with Detectable
5.	MW-5	1305		X	(X)							3	BTEX.
6.	MW-6	1310		X								3	Please Filter
7.	MW-7	1315		X								3	Pb Sample
8.	MW-8	1320		X								3	
9.	Discharge	1500				X	X	X	X	X		7	
10.	Trip Blank	1230		X		~~X~~ No pH on						3	

RELINQUISHED BY: James Orr	DATE: 9-5-97	RECEIVED BY: Sara McClung	DATE: 9-5-97
PRINT NAME: James Orr FIRM: Terra Vac	TIME: 1615	PRINT NAME: Sara McClung FIRM: NCA	TIME: 1615
RELINQUISHED BY:	DATE:	RECEIVED BY:	DATE:
PRINT NAME: FIRM:	TIME:	PRINT NAME: FIRM:	TIME:

ADDITIONAL REMARKS:

PAGE 1 OF 1

COC Rev 8, 1/96

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PORTLAND ▪ (503) 643-9200 ▪ FAX 644-2202

Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled:	10/2/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029	Received:	10/2/97
Seattle, WA 98133	Project Manager:	Tim Warner	Reported:	10/7/97 09:41

ANALYTICAL REPORT FOR SAMPLES:

Sample Description	Laboratory Sample Number	Sample Matrix	Date Sampled
MW-7	P710046-01	Water	10/2/97

North Creek Analytical, Inc.

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Sandra K. Wright, Project Manager

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Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 10/2/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029	Received: 10/2/97
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 10/7/97 09:41

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-7			P710046-01				Water	
Benzene	1070110	10/4/97	10/5/97		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*92.4*	%	

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Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 10/2/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029	Received: 10/2/97
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 10/7/97 09:41

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 1070110	**Date Prepared: 10/4/97**					**Extraction Method: EPA 5030**				
Blank	**1070110-BLK1**									
Benzene	10/4/97			ND	ug/l	0.500				
Toluene	"			ND	"	0.500				
Ethylbenzene	"			ND	"	0.500				
Xylenes (total)	"			ND	"	1.00				
Gasoline Range Hydrocarbons	"			ND	"	80.0				
Surrogate: 4-BFB	"	*50.0*		*47.3*	"	*50.0-150*	*94.6*			
LCS	**1070110-BS1**									
Gasoline Range Hydrocarbons	10/4/97	1250		1280	ug/l	50.0-150	102			
Surrogate: 4-BFB	"	*50.0*		*49.8*	"	*50.0-150*	*99.6*			
LCS	**1070110-BS2**									
Benzene	10/4/97	20.0		22.1	ug/l	67.0-130	111			
Toluene	"	20.0		22.5	"	75.0-126	113			
Ethylbenzene	"	20.0		22.8	"	76.0-124	114			
Xylenes (total)	"	60.0		69.3	"	75.0-126	116			
Surrogate: 4-BFB	"	*50.0*		*55.8*	"	*50.0-150*	*112*			
Duplicate	**1070110-DUP1**		**P710019-02**							
Gasoline Range Hydrocarbons	10/4/97		ND	ND	ug/l			50.0		
Surrogate: 4-BFB	"	*50.0*		*47.2*	"	*50.0-150*	*94.4*			
Duplicate	**1070110-DUP2**		**P710019-10**							
Gasoline Range Hydrocarbons	10/4/97		ND	ND	ug/l			50.0		
Surrogate: 4-BFB	"	*50.0*		*45.6*	"	*50.0-150*	*91.2*			
Matrix Spike	**1070110-MS1**		**P710019-02**							
Benzene	10/4/97	20.0	0.708	23.2	ug/l	67.0-130	112			
Toluene	"	20.0	ND	23.2	"	75.0-126	116			
Ethylbenzene	"	20.0	ND	23.1	"	76.0-124	116			
Xylenes (total)	"	60.0	ND	71.0	"	75.0-126	118			
Surrogate: 4-BFB	"	*50.0*		*54.1*	"	*50.0-150*	*108*			
Matrix Spike Dup	**1070110-MSD1**		**P710019-02**							
Benzene	10/4/97	20.0	0.708	23.3	ug/l	67.0-130	113	13.0	0.889	
Toluene	"	20.0	ND	23.0	"	75.0-126	115	13.0	0.866	
Ethylbenzene	"	20.0	ND	22.8	"	76.0-124	114	15.0	1.74	

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**Refer to end of report for text of notes and definitions.*

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Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 10/2/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029	Received: 10/2/97
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 10/7/97 09:41

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Matrix Spike Dup (continued)	**1070110-MSD1**		**P710019-02**							
Xylenes (total)	10/4/97	60.0	ND	70.2	ug/l	75.0-126	117	13.0	0.851	
Surrogate: 4-BFB	"	*50.0*		*54.3*	"	*50.0-150*	*109*			

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**Refer to end of report for text of notes and definitions.*

Sandra K. Wright, Project Manager

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Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 10/2/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029	Received: 10/2/97
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 10/7/97 09:41

Notes and Definitions

#	Note
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
Recov.	Recovery
RPD	Relative Percent Difference

56°

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COPY

CHAIN OF CUSTODY REPORT

Work Order # P710046

REPORT TO: Terra Vac	INVOICE TO:
ATTENTION: Mr. Tim Warner	ATTENTION: (Same As ←)
ADDRESS: 10740 Meridian Ave N. #202 Seattle, WA 98133	ADDRESS:
PHONE: (206) 362-8294 FAX: (206) 362-9528	P.O. NUMBER: NCA QUOTE #:
PROJECT NAME: Rose's Parking Lot	
PROJECT NUMBER: 32-0029	
SAMPLED BY: J. ORR	

TURNAROUND REQUEST in Business Days *

Organic & Inorganic Analyses: 10 (Standard) | 7 | 5 | 4 | 3 | 2 | 1 | Same Day

Fuels & Hydrocarbon Analyses: 5 (Standard) | 3-4 | X | 1 | Same Day

OTHER Specify: Early

* Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	NCA SAMPLE ID (Laboratory Use Only)	Analysis Request: TPH 6, BTEX	MATRIX (W, S, A, O)	# OF CONTAINERS	COMMENTS
1.	MW-7	10-29-97/1015		X	W	2	
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							

RELINQUISHED BY (Signature): James Orr	DATE: 10-29-97	RECEIVED BY (Signature): Sara McClung	DATE: 10-29-97
PRINT NAME: James Orr	FIRM: Terra Vac TIME: 1405	PRINT NAME: Sara McClung	FIRM: NCA TIME: 1405
RELINQUISHED BY (Signature):	DATE:	RECEIVED BY (Signature):	DATE:
PRINT NAME:	FIRM: TIME:	PRINT NAME:	FIRM: TIME:

ADDITIONAL REMARKS:

PAGE ( ) OF

COC Rev 8, 1/98

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PORTLAND ▪ (503) 643-9200 ▪ FAX 644-2202

Terra Vac	Project:	Rose's Parking Lot	Sampled: 10/1/97
10740 Meridian Ave N Suite 202	Project Number:	32-0029	Received: 10/3/97
Seattle, WA 98133	Project Manager:	Timothy Warner	Reported: 10/6/97 09:14

ANALYTICAL REPORT FOR SAMPLES:

Sample Description	Laboratory Sample Number	Sample Matrix	Date Sampled
MW-8	B710072-01	Water	10/1/97

NORTH CREEK ANALYTICAL
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PORTLAND ▪ (503) 643-9200 ▪ FAX 644-2202

Terra Vac	Project:	Rose's Parking Lot	Sampled:	10/1/97
10740 Meridian Ave N Suite 202	Project Number:	32-0029	Received:	10/3/97
Seattle, WA 98133	Project Manager:	Timothy Warner	Reported:	10/6/97 09:14

Gasoline Hydrocarbons (Toluene to Dodecane) and BTEX by WTPH-G and EPA 8020A
North Creek Analytical - Bothell

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-8			**B710072-01**				**Water**	
Gasoline Range Hydrocarbons	1070095	10/3/97	10/4/97		50.0	ND	ug/l	
Benzene	"	"	"		0.500	ND	"	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Surrogate: 4-BFB (FID)	"	"	"	*50.0-150*		*76.2*	%	
Surrogate: 4-BFB (PID)	"	"	"	*50.0-150*		*77.1*	"	

North Creek Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

Kirk Gendron, Project Manager

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SPOKANE • (509) 924-9200 • FAX 924-9290
PORTLAND • (503) 643-9200 • FAX 644-2202

Terra Vac	Project:	Rose's Parking Lot	Sampled: 10/1/97
10740 Meridian Ave N Suite 202	Project Number:	32-0029	Received: 10/3/97
Seattle, WA 98133	Project Manager:	Timothy Warner	Reported: 10/6/97 09:14

Gasoline Hydrocarbons (Toluene to Dodecane) and BTEX by WTPH-G and EPA 8020A/Quality Control
North Creek Analytical - Bothell

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 1070095	**Date Prepared: 10/3/97**					**Extraction Method: EPA 5030 (P/T)**				
Blank	**1070095-BLK1**									
Gasoline Range Hydrocarbons	10/3/97			ND	ug/l	50.0				
Benzene	"			ND	"	0.500				
Toluene	"			ND	"	0.500				
Ethylbenzene	"			ND	"	0.500				
Xylenes (total)	"			ND	"	1.00				
Surrogate: 4-BFB (FID)	"	*48.0*		*37.5*	"	*50.0-150*	*78.1*			
Surrogate: 4-BFB (PID)	"	*48.0*		*41.3*	"	*50.0-150*	*86.0*			
LCS	**1070095-BS1**									
Gasoline Range Hydrocarbons	10/3/97	500		451	ug/l	80.0-120	90.2			
Surrogate: 4-BFB (FID)	"	*48.0*		*43.6*	"	*50.0-150*	*90.8*			
Duplicate	**1070095-DUP1**		**B709471-01**							
Gasoline Range Hydrocarbons	10/3/97		6850	7570	ug/l			25.0	9.99	
Surrogate: 4-BFB (FID)	"	*48.0*		*43.0*	"	*50.0-150*	*89.6*			
Duplicate	**1070095-DUP2**		**B709640-01**							
Gasoline Range Hydrocarbons	10/3/97		64900	71900	ug/l			25.0	10.2	
Surrogate: 4-BFB (FID)	"	*48.0*		*43.5*	"	*50.0-150*	*90.6*			
Matrix Spike	**1070095-MS1**		**B709471-09**							
Benzene	10/4/97	10.0	ND	10.9	ug/l	70.0-130	109			
Toluene	"	10.0	ND	10.4	"	70.0-130	104			
Ethylbenzene	"	10.0	ND	10.3	"	70.0-130	103			
Xylenes (total)	"	30.0	1.64	31.2	"	70.0-130	98.5			
Surrogate: 4-BFB (PID)	"	*48.0*		*41.5*	"	*50.0-150*	*86.5*			
Matrix Spike Dup	**1070095-MSD1**		**B709471-09**							
Benzene	10/4/97	10.0	ND	10.9	ug/l	70.0-130	109	15.0	0	
Toluene	"	10.0	ND	10.3	"	70.0-130	103	15.0	0.966	
Ethylbenzene	"	10.0	ND	10.1	"	70.0-130	101	15.0	1.96	
Xylenes (total)	"	30.0	1.64	30.4	"	70.0-130	95.9	15.0	2.67	
Surrogate: 4-BFB (PID)	"	*48.0*		*40.0*	"	*50.0-150*	*83.3*			

North Creek Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

Kirk Gendron, Project Manager

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Terra Vac	Project:	Rose's Parking Lot	Sampled: 10/1/97
10740 Meridian Ave N Suite 202	Project Number:	32-0029	Received: 10/3/97
Seattle, WA 98133	Project Manager:	Timothy Warner	Reported: 10/6/97 09:14

Notes and Definitions

#	Note
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
Recov.	Recovery
RPD	Relative Percent Difference

North Creek Analytical, Inc.

Kirk Gendron, Project Manager

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NORTH CREEK ANALYTICAL
Environmental Laboratory Services

CHAIN OF CUSTODY REPORT

Work Order # B710072

REPORT TO:	INVOICE TO:
ATTENTION: Mr. Tim Warner	ATTENTION: Mr. Tim Warner
ADDRESS: 10740 Meridian Ave. N., Suite 202 Seattle, WA 98133-9010	ADDRESS: 10740 Meridian Ave N., Suite 202 Seattle, WA, 98133-9010
PHONE: 206-362-8128 FAX: 206-362-9528	P.O. NUMBER: NCA QUOTE #:
PROJECT NAME: Rose's Parking Lot	
PROJECT NUMBER: 32-0029-0	
SAMPLED BY: Mr. Mike Quinn	

TURNAROUND REQUEST in Business Days *

Organic & Inorganic Analyses: 10 (Standard) | 7 | 5 | 4 | 3 | 2 | 1 | Same Day

Fuels & Hydrocarbon Analyses: 5 (Standard) | 3-4 | X | 1 | Same Day

OTHER Specify:

* Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	NCA SAMPLE ID (Laboratory Use Only)	Analysis Request: GAS/BTEX	MATRIX (W, S, A, O)	# OF CONTAINERS	COMMENTS
1.	MW-8	10.1.97/9:35	B710072-01	X	W	2	
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							

RELINQUISHED BY:	DATE: 10/3/97	RECEIVED BY:	DATE: 10-3-97		
PRINT NAME: Paul Bianco	FIRM: Terra Vac	TIME: 10:25	PRINT NAME: Kendra Barker	FIRM: NCA	TIME: 10:22
RELINQUISHED BY:	DATE: 10/3/97	RECEIVED BY:	DATE: 10/3/97		
PRINT NAME: Kendra Barker	FIRM: NCA	TIME: 12:30	PRINT NAME: D. HEUE	FIRM: NCAB	TIME: 12:30

ADDITIONAL REMARKS:

-3.0° w/o cust.

26-94-0025

TERRA VAC 10740 Meridian Avenue North, Suite 202, Seattle, WA 98133-9010
Tel (206) 362-8128 ❑ Fax (206) 362-9528

October 17, 1997

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
NOV 14 1997
NORTHWEST REGION

Mr. Max Birnbach
c/o Mr. Charles R. Williamson
Kell, Alterman, & Runstein
1001 Southwest Fifth Avenue, Suite 1800
Portland, OR 97204-1194

RE: System Operations Report
Rose's Parking Lot
330 Northwest 23rd Avenue, Portland, OR
Operating Period: March 14, 1997 - September 9, 1997
Terra Vac Project #32-0029

Dear Mr. Birnbach:

This letter report summarizes the subsurface remedial operations at the Rose's Parking Lot site during the above-referenced operating period. A description of the performance of the system during operations is summarized in the following sections.

1.0 Operations

The dual phase soil vapor extraction (DVE) system was started on March 14, 1997. The DVE system incorporates eight groundwater/vapor extraction wells and four soil vapor extraction (SVE) wells. The DVE system is designed to remediate impacted soil and groundwater caused by leaking underground storage tanks (USTs). A site map of the DVE system and process and instrumentation diagram is depicted in Figures 1 and 2, respectively. Since March 14, 1997, the system has operated for approximately 144 days. The system operational data are presented in Table 1.

2.0 Vapor Sampling and Analysis

Samples of the extracted vapors were taken and analyzed by gas chromatography (GC) using Terra Vac's in-house laboratory. Vapor samples were analyzed for gasoline range petroleum hydrocarbons (TPH-G) and specifically for benzene, toluene, ethylbenzene, and xylenes (BTEX). Samples of the extracted vapors were taken from the individual well heads and the system main header. Air flow rates were measured at the time of vapor sampling with a self-averaging annubar. These data were used for the quantification of the system mass extraction rate (expressed as pounds of TPH-G extracted per day) and the cumulative mass of TPH-G extracted over time. The system analytical data are presented in Table 1.

As of September 9, 1997 approximately 7,020 pounds of hydrocarbons have been extracted from the subsurface. Figure 3 graphically depicts the cumulative pounds of hydrocarbons removed from the subsurface.

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3.0 Groundwater Extraction

The volume of groundwater extracted from startup to September 9, 1997, was 981562.5 gallons. The average groundwater extraction rate from startup to September 9, 1997, is approximately 4.7 gpm.

5.0 Recommendations

Groundwater sampling results (Appendix A) show significant progress in reducing BTEX and TPH-G concentrations in the groundwater. DVE operations will continue at the site with efforts concentrating on the wells showing higher BTEX concentrations during the quarterly sampling.

Please feel free to call if you have questions with this report.

Sincerely,
Terra Vac Corp.

Mary Ferguson for

Paul V. Bianco
Project Engineer

Timothy Warner
Project Manager

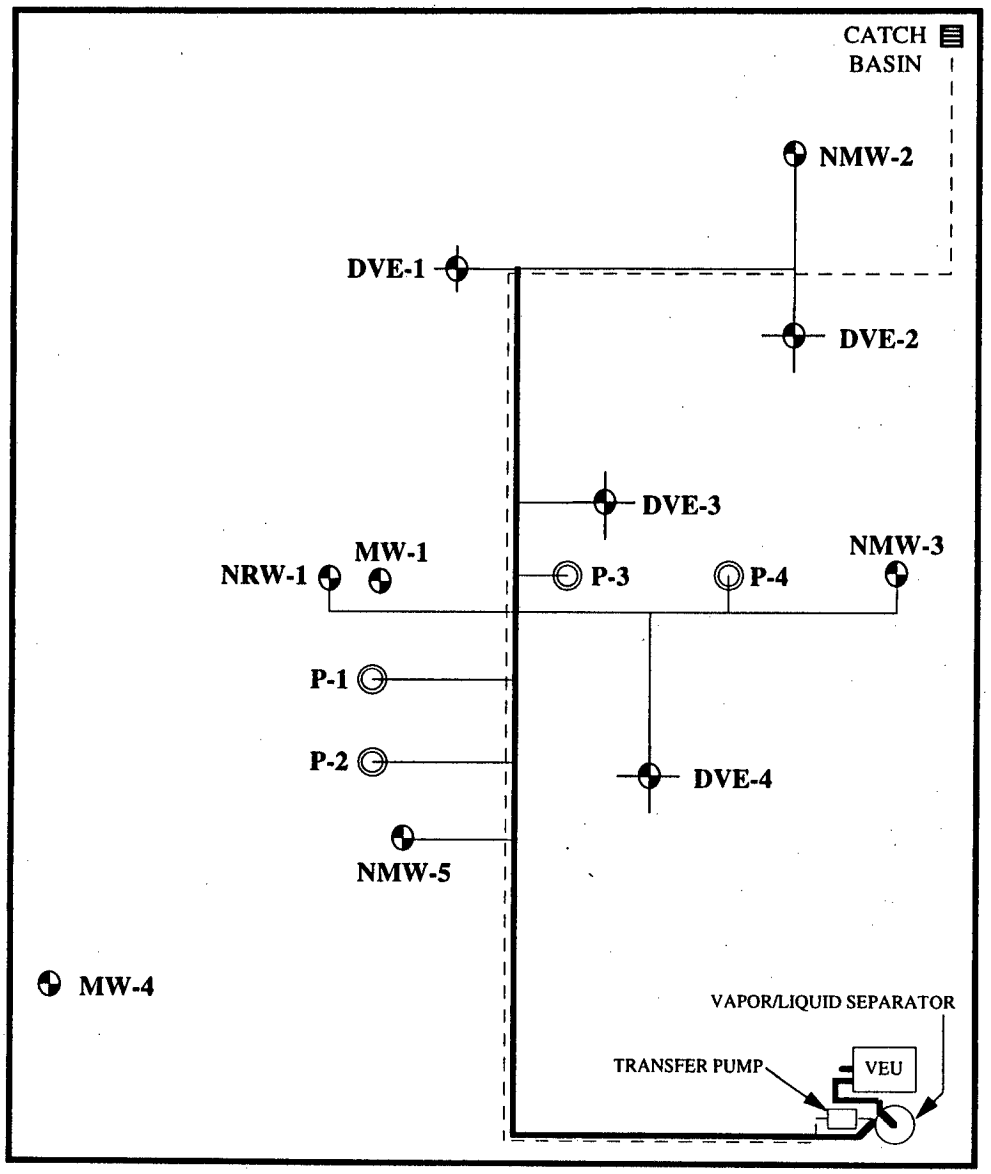
Attachments

cc: Dave Roy
Rich Kostecki
Jeffrey Wishko
Richard Singer (2 copies)
Richard Allen
Edward Crow
Don Pettit

N.W. FLANDERS STREET

N

N. W. 23RD AVENUE



LEGEND

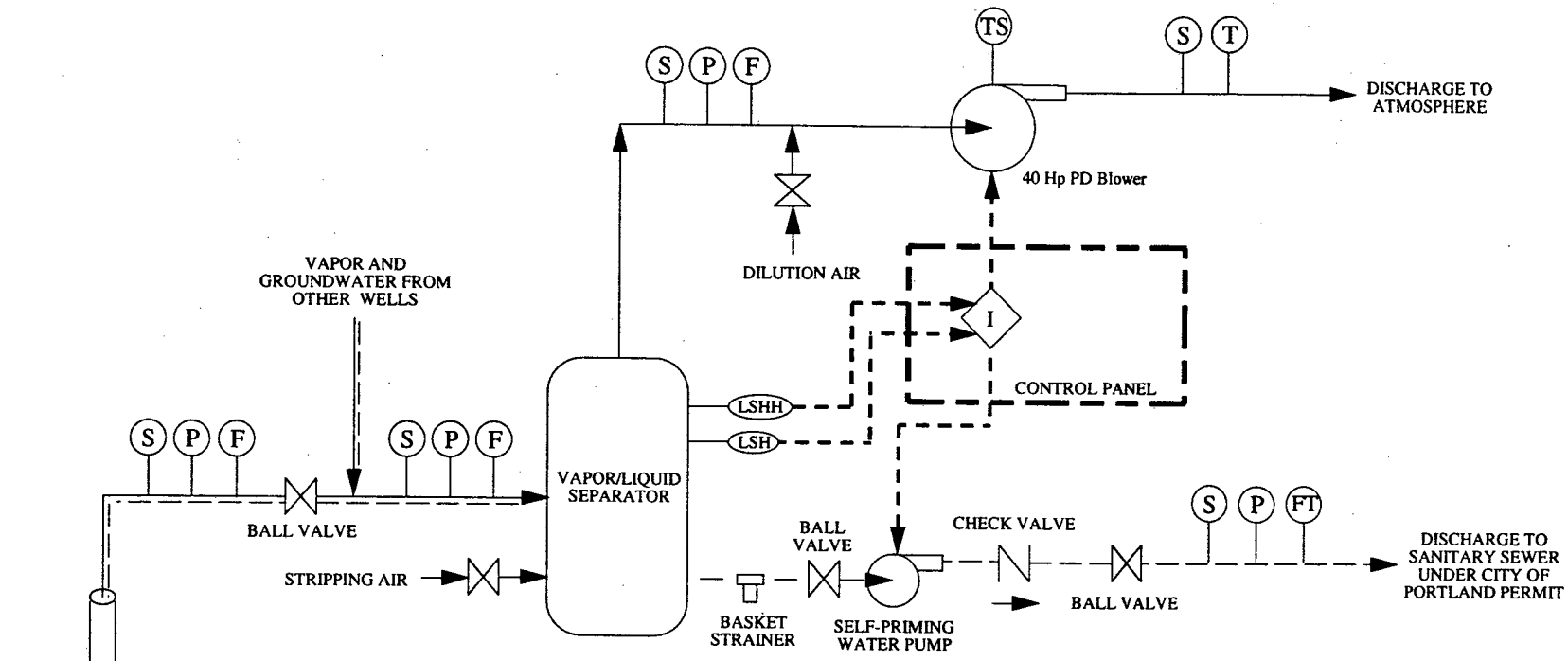
- REDRILLED MONITORING WELL USING EE
- DVE WELL USING EE
- SVE WELL
- 1-1/2" WATER DISCHARGE PIPE
- 1-1/2" DVE PIPE
- 6" DVE PIPE

SCALE (Approximate ft.)

0 20 40

Notes:
(1) Base map from GeoEngineers report: "Subsurface Assessment Rose's Parking Lot Portland, Oregon" August 28, 1995. Site Plan, Figure 2

SYSTEM PIPING AND EQUIPMENT LAYOUT	**ROSE'S PARKING LOT 330 NE 23RD AVENUE PORTLAND, OREGON**	TERRA VAC	PROJECT NO.	32-0029	FIGURE 1
			DATE	JULY 1, 1997	
			SCALE	1 INCH = 20 FEET	
			REVISION	PVB -2	



LEGEND

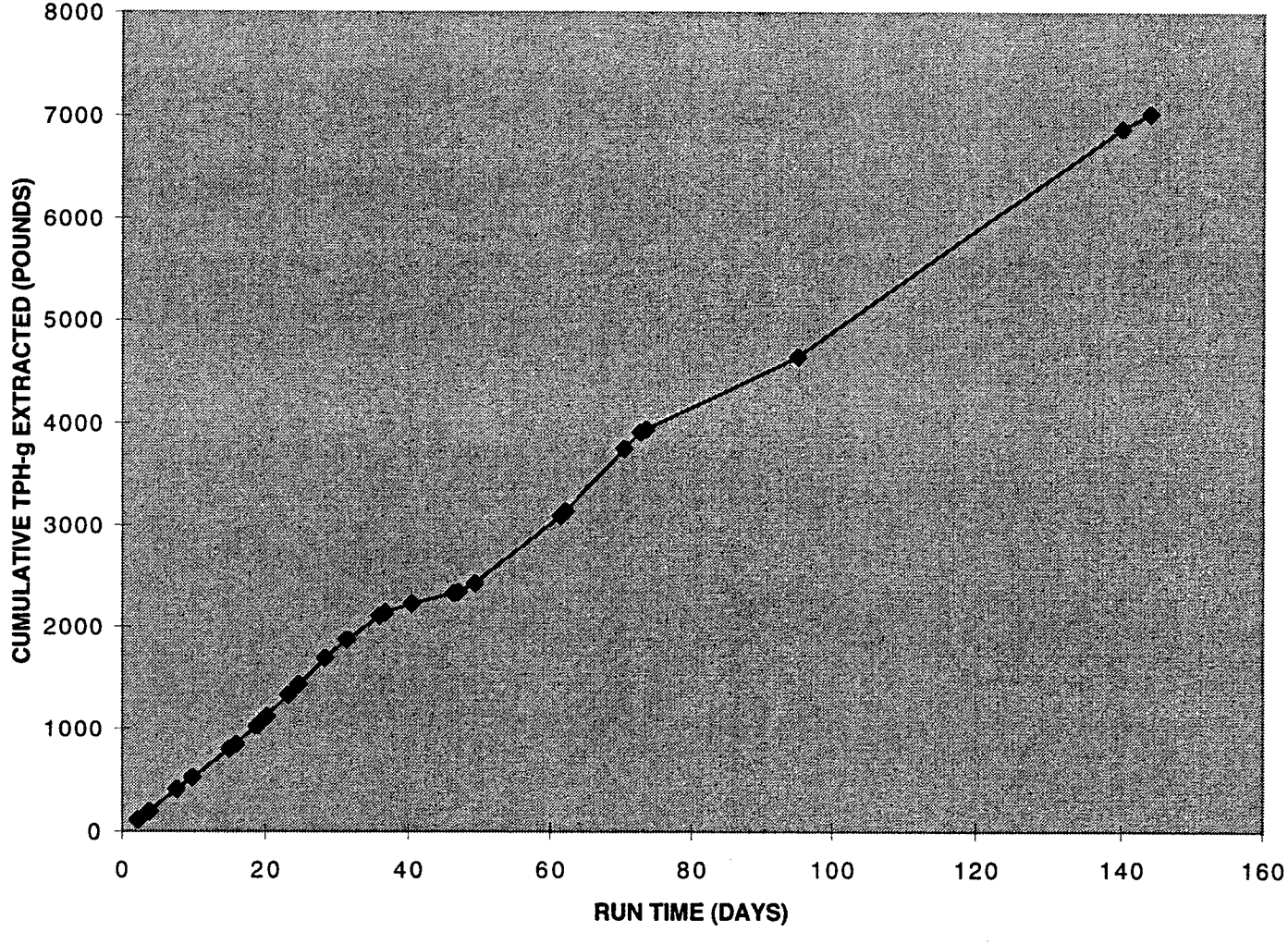
(T) TEMPERATURE INDICATOR	(FT) FLOW TOTALIZER
(F) FLOW RATE INDICATOR	(S) SAMPLE PORT
(P) PRESSURE / VACUUM INDICATOR	(TS) TEMPERATURE SWITCH
(LSHH) LEVEL SWITCH HIGH-HIGH	GROUNDWATER FLOW
(LSH) LEVEL SWITCH HIGH	AIR FLOW
(I) INTERLOCK	CONTROL LINES

FIGURE 2
PROCESS & INSTRUMENTATION DIAGRAM
ROSE'S PARKING LOT
330 N.W. 23rd AVENUE
PORTLAND, OR

TERRA VAC

PROJECT NO.	32-0029
DATE	MAY 28, 1997
SCALE	N.T.S.
REVISION	PVB-1

FIGURE 3
CUMULATIVE POUNDS REMOVED



TERRA VAC

TABLE 1
ROSE'S PARKING LOT
SYSTEM OPERATIONAL AND ANALYTICAL DATA
TERRA VAC # 32-0029

LOCATION:	TOTAL										
Date	Line Vacuum (in. Hg)	Flow dP (in. H2O)	Vapor Flow Rate (scfm)	Run Time (Days)	Benzene Conc. (mg/l)	Toluene Conc. (mg/l)	Ethylbenezene Conc. (mg/l)	Total Xylenes Conc. (mg/l)	Total TPH-G Conc. (mg/l)	Total TPH-G Extraction Rate (lbs/day)	Cumulative TPH-G Extracted (lbs)
3/18/97	15.0	0.2	179	2.3	0.0285	0.0980	0.0537	0.2811	2.8082	45.10	101.48
3/19/97	13.0	0.4	269	3.8	NA	NA	NA	NA	NA	67.92	186.25
3/24/97	13.0	0.2	190	7.5	NA	NA	NA	NA	NA	48.03	403.65
3/27/97	13.0	0.2	190	9.8	NA	NA	NA	NA	NA	48.03	511.71
4/3/97	13.0	0.3	233	15.0	NA	NA	NA	NA	NA	58.82	792.18
4/4/97	13.5	0.3	230	15.8	NA	NA	NA	NA	NA	57.95	835.97
4/8/97	13.5	0.4	265	18.8	NA	NA	NA	NA	NA	66.91	1023.26
4/9/97	13.5	0.3	230	19.5	NA	NA	NA	NA	NA	57.95	1070.08
4/10/97	12.5	0.4	273	20.3	NA	NA	NA	NA	NA	68.92	1117.65
4/14/97	13.0	0.4	269	23.3	NA	NA	NA	NA	NA	67.92	1322.90
4/16/97	12.0	0.4	277	24.8	NA	NA	NA	NA	NA	69.90	1426.27
4/21/97	12.8	0.4	271	28.5	NA	NA	NA	NA	NA	68.42	1685.61
4/25/97	13.0	0.2	190	31.5	NA	NA	NA	NA	NA	48.03	1860.28
5/1/97	13.5	0.3	230	36.0	NA	NA	NA	NA	NA	57.95	2098.72
5/2/97	10.0	0.6	358	36.8	0.0591	0.0356	0.0058	0.0752	0.9875	31.74	2132.35
5/7/97	14.0	0.2	185	40.5	NA	NA	NA	NA	NA	16.38	2222.57
5/15/97	13.5	0.2	187	46.5	NA	NA	NA	NA	NA	16.64	2321.63
5/16/97	14.0	0.2	185	47.3	NA	NA	NA	NA	NA	16.38	2334.02
5/19/97	13.5	0.3	230	49.5	0.0534	0.0947	0.0067	0.2313	2.9623	61.13	2421.21
6/4/97	13.5	0.2	187	61.5	NA	NA	NA	NA	NA	49.91	3087.42
6/5/97	14.0	0.5	292	62.3	0.0285	0.0980	0.0537	0.2811	2.8082	73.66	3133.76
6/16/97	14.0	0.5	292	70.5	NA	NA	NA	NA	NA	73.66	3741.47
6/19/97	NA	NA	NA	72.8	NA	NA	NA	NA	NA	NA	3907.21
6/20/97	14.0	0.4	261	73.5	0.0026	0.0041	0.0054	0.0145	0.0619	1.45	3935.38
7/17/97	12.5	0.3	236	95.1	NA	NA	NA	NA	2.9828	63.39	4635.71
9/5/97	13.0	0.3	233	140.0	0.0178	0.0346	0.0225	0.1517	1.7377	36.40	6876.02
9/9/97	13.0	0.3	233	144.0	0.0139	0.0376	0.0263	0.1790	1.6962	35.53	7019.88

TERRA VAC

APPENDIX A

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Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

TERRA VAC

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-1	3/29/94	NA	130	390	98	1,570	NA	NA
	10/4/94	NA	27	46	6	70	NA	NA
	5/12/95	NA	NA	NA	NA	NA	NA	NA
	1/4/96	54	400	2,200	630	4,800	Naphthalene - 370 Acenaphthylene - 44	100
	4/24/96	NA	NA	NA	NA	NA	NA	NA
	7/11/96	81	710	1,800	730	2	Naphthalene - 750 Acenaphthylene - 160 Phenanthrene - 2.2 Fluoranthene - 4.5	NA
	11/3/96	23	410	1,500	910	4,100	Naphthalene - 2,400 Acenaphthylene - 460 Acenaphthene -600 Fluorene - 12 Phenanthrene - 12 Anthracene - 0.89 Fluoranthene - 10 Pyrene - 2.1 Benzo(a)anthracene - 0.7 Chrysene - 1.3 Benzo(k)fluoranthene - 0.1 Benzo(a)pyrene - 0.3 Dibenzo(a,h)anthracene - 0.1 Benzo(g,h,i)perylene - 0.4	NA
	2/28/97*	57,200	1,130	3,890	1,220	7,430	Naphthalene - 760	20
	5/29/97	14,900	65.9	49.3	205	1,010	NA	NA
	9/5/97	14,600	10.9	11.8	47.3	642	Naphthalene - 54.2	NA

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

TERRA VAC

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
NMW-2	3/29/94	NA	4.9	1.4	0.7	3.0	NA	NA
	10/4/94	NA	ND	ND	ND	ND	NA	NA
	5/12/95	ND	1.2	ND	0.6	0.7	NA	NA
	1/4/96	1,600	14	1.5	ND	1.7	ND	ND
	4/24/96	NA	7.7	0.5	ND	ND	NA	NA
	7/11/96	7,100	2.7	ND	ND	ND	ND	NA
	11/3/96	ND	2.0	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA
NMW-3	3/29/94	NA	2,300	1,200	1,200	3,700	NA	NA
	10/4/94	NA	1,520	600	790	1,600	NA	NA
	5/12/95	3,500	1,300	740	800	2,000	Naphthalene - 130 Fluorene - 0.2 Phenanthrene - 0.09	NA
	1/4/96	4,500	1,300	640	940	2,600	Naphthalene - 180 Acenaphthylene - 23	6
	4/16/96	NA	900	500	600	1,400	NA	NA
	7/11/96	2,100	460	130	380	430	Naphthalene - 71	NA
	11/3/96	4,900	830	220	650	1,100	Naphthalene - 120 Acenaphthylene - 37	
	2/28/97	4,400	261	124	153	404	Naphthalene - 32.6	NA
	5/29/97	365	17.4	0.91	3.55	15.3	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

TERRA VAC

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-4	10/4/94	NA	ND	ND	ND	ND	NA	NA
	5/12/95	ND	ND	ND	ND	ND	NA	NA
	1/4/96	900	ND	ND	ND	ND	ND	ND
	4/24/96	NA	ND	ND	ND	ND	NA	NA
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	0.7	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97	ND	ND	ND	ND	ND	NA	NA
NMW-5	5/12/95	13,000	660	13,000	1,900	11,000	Naphthalene - 450 Acenaphthylene - 66 Fluorene - 0.6 Phenanthrene - 0.42 Anthracene - 0.07	NA
	1/4/96	6,600	4.6	22	24	230	Naphthalene - 29 Acenaphthylene - 13 Fluorene - 0.8	14
	4/24/96	NA	ND	0.6	1.1	2.9	NA	NA
	7/11/96	ND	ND	ND	ND	2.7	NA	NA
	11/3/96	NA	ND	ND	2.5	5.6	NA	NA
	2/28/97	5,440	70.3	23.5	88.6	230	Naphthalene - 28.5	NA
	5/29/97	4,480	34.9	156	7.90	554	NA	NA
	9/5/97	5,550	39.0	334	23.5	642	ND	NA
MW-6	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/1997**	102	ND	ND	ND	ND	NA	NA
	10/2/97***	NA	NA	NA	NA	NA	NA	NA

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

TERRA VAC

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-7	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/1997**	110	12	ND	ND	ND	NA	NA
	10/2/97	ND	ND	ND	ND	ND	NA	NA
MW-8	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
	9/5/97**	111	ND	ND	ND	ND	NA	NA
	10/1/97	ND	ND	ND	ND	ND	NA	NA

Notes:

Sampling between 3/29/94 and 11/3/96 performed by GeoEngineers. Data from 1/21/97 Groundwater Report.

Wells MW-2, MW-3, and MW-5 redrilled 1/23-1/25/97, and renamed NMW-2, NMW-3, and NMW-5 respectively.

* MW-1 sampled for lead 12/11/96.

** Sample Results were suspect. Well Resampled on 10/1/97 or 10/2/97

*** Well was dry. No analytical sample taken.

PAHs polycyclic aromatic hydrocarbons. Only analytes detected are listed. Refer to analytical results (Appendix A) for a complete list of analytes and their respective detection limits.

ug/L Micrograms per liter, or parts per billion

ND Not Detected at the reporting limits

NA Not Analyzed

TPH-G Total petroleum hydrocarbons within the gasoline range (benzene to naphthalene).

26-94-0025

TERRA VAC
10740 Meridian Avenue North, Suite 202, Seattle, WA 98133-9010
Tel (206) 362-8128 ❑ Fax (206) 362-9528

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
JUL 15 1997
NORTHWEST REGION

May 29, 1997

Mr. Max Birnbach
c/o Mr. Charles R. Williamson
Kell, Alterman & Runstein
1001 Southwest Fifth Avenue, Suite 1800
Portland, OR 97204-1194

RE: First Quarter 1997 Groundwater Monitoring Report
Rose's Parking Lot
330 Northwest 23rd Avenue, Portland, OR

Dear Mr. Birnbach:

Terra Vac performed quarterly groundwater monitoring at this site in late February, 1997. Eight monitoring wells were sounded for depth to groundwater. Groundwater samples were collected from the eight monitoring wells for analyses of total gasoline-range petroleum hydrocarbons (TPH-G), benzene, toluene, ethylbenzene, and total xylenes (BTEX). Additionally, MW-1, NMW-3 and NMW-5 were tested for polycyclic aromatic hydrocarbons (PAHs). In December, MW-1 was analyzed for dissolved lead. A site location map is shown on Figure 1. Well construction details, including construction dates, well diameters, total depths, and screened intervals are provided in Table 1.

In general, groundwater elevations increased 2.5-3.5 feet across the site since the previous monitoring event. Analytical results indicate groundwater from three of the eight sampled wells exceeded the current Oregon Department of Environmental Quality (ODEQ) Groundwater Cleanup Levels for BTEX and PAHs.

Groundwater monitoring and sampling were performed using standard field procedures. In short, each well was sounded for depth to groundwater and the presence of free phase petroleum hydrocarbons using an electronic interface probe. If free phase petroleum hydrocarbons were not detected, total well depth was measured. A minimum of three well volumes were hand bailed from each well sampled, and groundwater allowed to recover to at least 80 percent of original elevation. Analytical samples were then collected with new disposable bailers and immediately placed in sampling vials prepared specifically for the sampled media and selected analyses. Once collected, samples were immediately acidified and cooled for transportation to the laboratory under chain of custody.

Existing top of casing elevations, as determined by a March, 1997 well survey, were used to establish reference points for well depths, screen intervals, and groundwater elevations for wells MW-1, MW-4, MW- 6, NMW-2, NMW-3 and NMW-5. Elevations for MW-7 and MW-8 were calculated using previous survey data from GeoEngineers, corrected to the new local assumed datum. Historical groundwater elevations are presented in Table 2. First quarter 1997

groundwater elevations are also presented on Figure 2. Historically, the inferred direction of groundwater flow has been to the northeast. The groundwater data collected during this sampling event indicates that the groundwater flow is still to the northeast, although groundwater contours could not be accurately established with the collected data.

Groundwater samples were analyzed for TPH-G by EPA Method 8015, for BTEX constituents by EPA Method 8020A, for PAHs by EPA Method 8310, and for dissolved lead by EPA Method 200.8. Previous groundwater sampling performed by GeoEngineers included in this report used EPA Method 418.1 for TPH-G, EPA Method 8020 for BTEX, EPA Method 8310 for PAHs, and EPA Method 7421 for dissolved lead. Results of these analyses, and historical groundwater quality data, are presented in Table 3. Groundwater quality results from the first quarter 1997 sampling are also shown on Figure 3. Analytical reports from the laboratory are contained in Appendix A.

Field activities were performed in a manner consistent with the level of skill and care standard for local environmental professionals. Findings and conclusions presented in this report have been prepared based upon the specific site conditions at the time of field activities and no warranty, expressed or implied, is made.

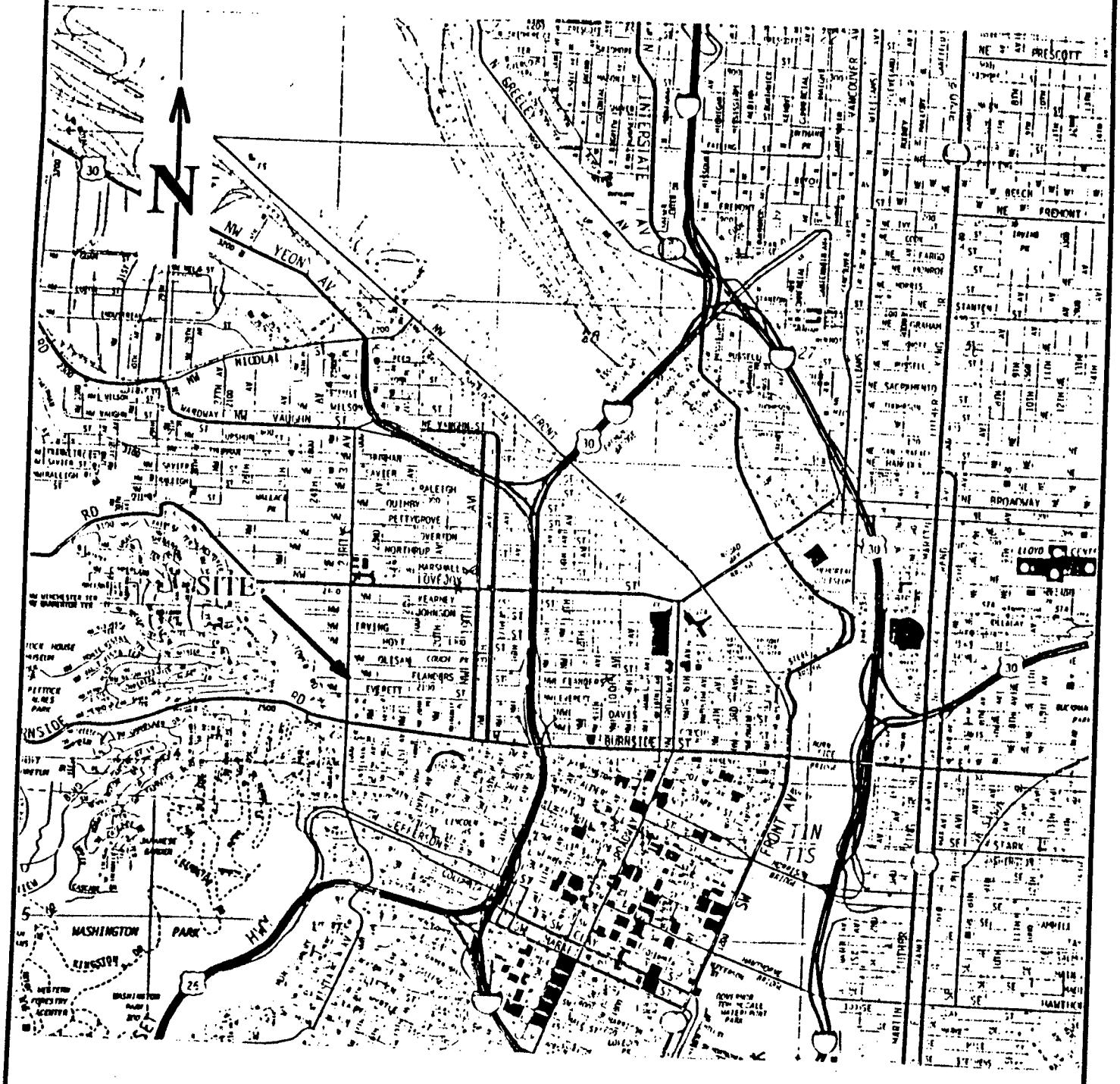
If you have any questions, please do not hesitate to contact us.

Sincerely,
Terra Vac Corporation

Timothy Warner,
Project Manager

cc: Dave Roy
Rich Kostecki
Jeffrey Wishko
Richard Singer (2 copies)
Richard Allen
Edward Crow

FIGURES

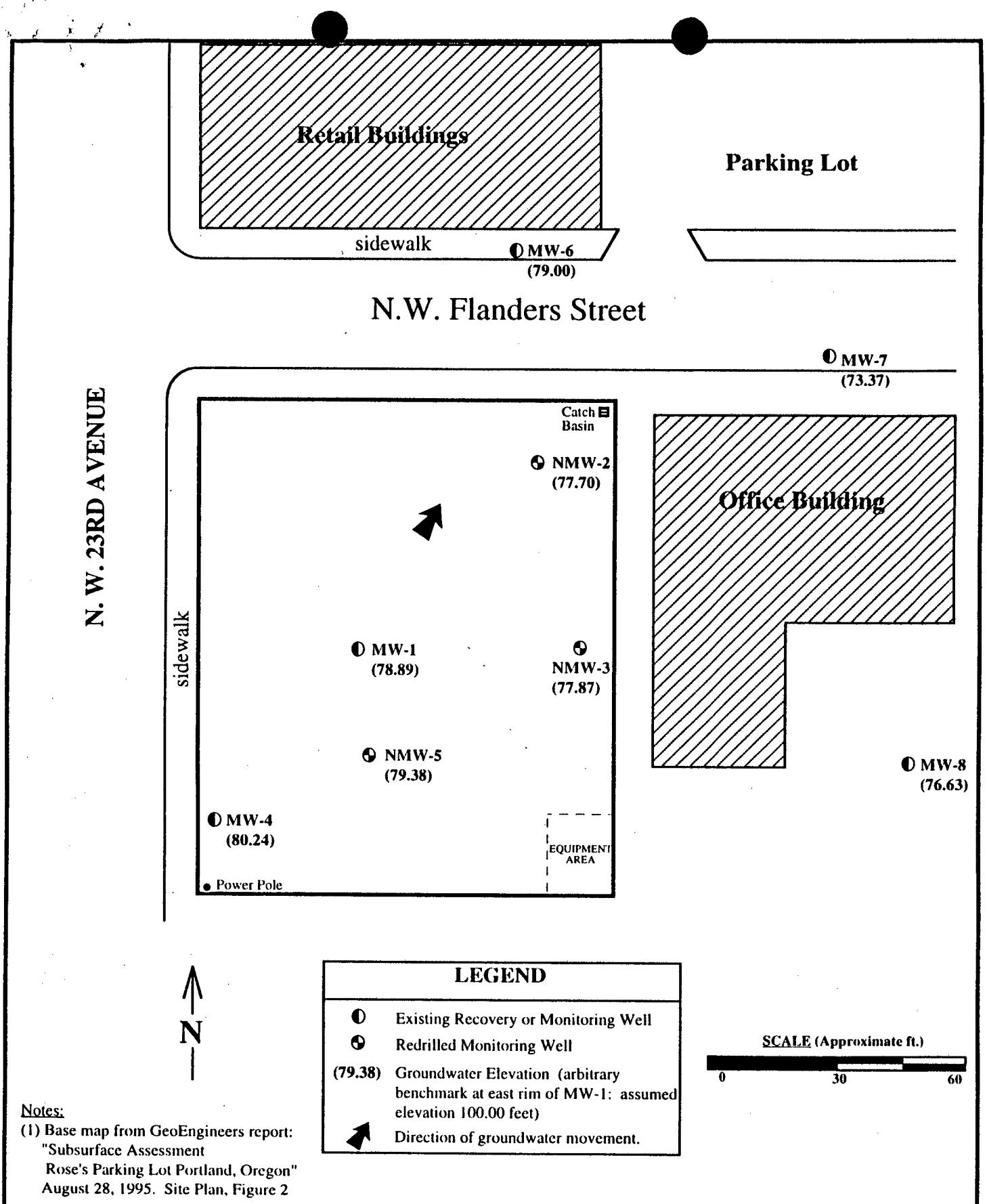


Source: The Thomas Guide, 1994
Portland Metro Area
Street Guide and Directory

Figure 1
Site Location Map
Rose's Parking Lot
Portland, OR

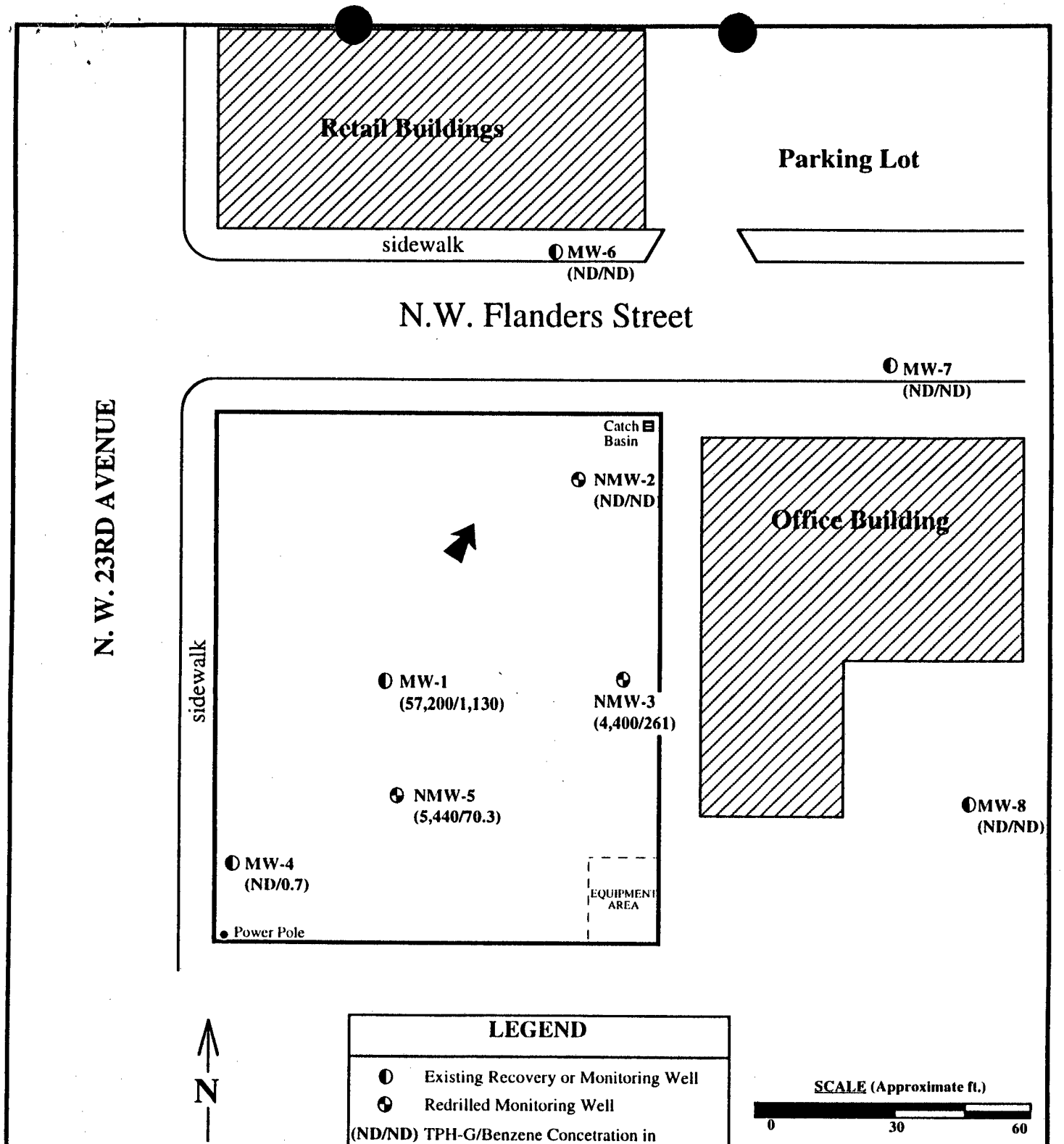
TERRA VAC

Project No.	32-0029
Date	February 12, 1997
Revision	MAM-1



Notes:
(1) Base map from GeoEngineers report: "Subsurface Assessment Rose's Parking Lot Portland, Oregon" August 28, 1995. Site Plan, Figure 2

Groundwater Elevations	**Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon**	TERRA VAC	Project No.	32-0029	Figure 2
			Date	May 29, 1997	
			Scale	1 inch ≈ 30 Feet	
			Revision	MKF-1	



Notes:
(1) Base map from GeoEngineers report:
"Subsurface Assessment
Rose's Parking Lot Portland, Oregon"
August 28, 1995. Site Plan, Figure 2

Groundwater Analytical Results	**Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon**	TERRA VAC	Project No.	32-0029	Figure 3
			Date	May 29, 1997	
			Scale	1 inch ≈ 30 Feet	
			Revision	MKF-1	

TABLES

Table 1

TERRA VAC

Remediation Well Construction Data
Rose's Parking Lot
Portland, Oregon

Well Identification	Date Installed	Total Depth (feet)	Screen Interval		Well Diameter (inches)
			Top (feet)	Bottom (feet)	
MW-1	3/23/94	39	24	38.5	2
NMW-2	1/24/97	38	15	37	4
NMW-3	1/25/97	38	15.5	37.5	4
MW-4	9/28/94	40	20	39.5	2
NMW-5	1/23/97	38	15	37	4
MW-6	4/6/96	31	15	30.5	2
MW-7	4/6/96	31	15	30.5	2
MW-8	4/6/96	31	15	30.5	2

Note:

Data on NMW-2, NMW-3, and NMW-5 is from Terra Vac field notes and well logs

Data on MW-1 from RZA Agra Inc. well logs in April, 1994 report.

Data on MW-4 from RZA Agra Inc. well logs in October, 1994 report.

Data on MW-6 through MW-8 from well logs in GeoEngineers June, 1996 Report

TERRA VAC

Table 2

Groundwater Elevation Data
Rose's Parking Lot
Portland, Oregon

Well I.D.	Top of Casing Elevation (feet)	Date Sounded	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Water Level Elevation (feet MSL)	Difference from Previous Measurement (feet)
MW-1	100.00	5/12/95	22.79	23.29	0.5	76.71	**
		1/4/96	--	24.10	Trace	75.90	-0.81
		4/8/96	22.39	22.41	0.02	77.59	1.69
		4/24/96	22.40	22.45	0.05	77.55	-0.04
		7/11/96	--	23.35	Trace	76.65	-0.90
		11/3/96	--	24.44	Sheen	75.56	-1.09
		2/28/97	--	21.11	0	78.89	3.33
NMW-2	96.21	5/12/95	--	20.75	0	75.46	**
		1/4/96	--	21.60	0	74.61	-0.85
		4/8/96	--	19.73	0	76.48	1.87
		4/24/96	--	19.90	0	76.31	-0.17
		7/11/96	Sheen	20.80	0	75.41	-0.90
		11/3/96	--	21.87	0	74.34	-1.07
		2/28/97	--	18.51	0	77.70	3.36
NMW-3	99.15	5/12/95	--	23.48	0	75.67	**
		1/4/96	--	24.22	0	74.93	-0.74
		4/8/96	--	22.31	0	76.84	1.91
		4/24/96	--	22.36	0	76.79	-0.05
		7/11/96	--	23.37	0	75.78	-1.01
		11/3/96	Sheen	24.47	0	74.68	-1.10
		2/28/97	--	21.28	0	77.87	3.19
MW-4	100.48	5/12/95	--	22.55	0	77.93	**
		1/4/96	--	23.03	0	77.45	-0.48
		4/8/96	--	21.60	0	78.88	1.43
		4/24/96	--	21.34	0	79.14	0.26
		7/11/96	--	22.54	0	77.94	-1.20
		11/3/96	--	23.45	0	77.03	-0.91
		2/28/97	--	20.24	0	80.24	3.21

Table 2

Groundwater Elevation Data
Rose's Parking Lot
Portland, Oregon

Well I.D.	Top of Casing Elevation (feet)	Date Sounded	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Water Level Elevation (feet MSL)	Difference from Previous Measurement (feet)
NMW-5	100.45	5/12/95	--	22.35	0	78.10	**
		1/4/96	Trace	22.84	0	77.61	-0.49
		4/8/96	--	21.40	0	79.05	1.44
		4/24/96	--	20.04	0	80.41	1.36
		7/11/96	--	22.45	0	78.00	-2.41
		11/3/96	Sheen	23.38	0	77.07	-0.93
		2/28/97	--	21.07	0	79.38	2.31
MW-6	93.89	4/8/96	--	21.53	0	72.36	**
		4/24/96	--	22.04	0	71.85	-0.51
		7/11/96	--	22.61	0	71.28	-0.57
		11/3/96	--	24.04	0	69.85	-1.43
		2/28/97	--	20.89	0	73.00	3.15
MW-7	94.07	4/8/96	--	21.50	0	72.57	**
		4/24/96	--	21.05	0	73.02	0.45
		7/11/96	--	22.40	0	71.67	-1.35
		11/3/96	--	23.57	0	70.50	-1.17
		2/28/97	--	20.70	0	73.37	2.87

TERRA VAC

Table 2

Groundwater Elevation Data
Rose's Parking Lot
Portland, Oregon

Well I.D.	Top of Casing Elevation (feet)	Date Sounded	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Water Level Elevation (feet MSL)	Difference from Previous Measurement (feet)
MW-8	95.08	4/8/96	--	20.19	0	74.89	**
		4/24/96	--	18.42	0	76.66	1.77
		7/11/96	--	18.88	0	76.20	-0.46
		11/3/96	--	20.05	0	75.03	-1.17
		2/28/97	--	18.45	0	76.63	1.60

Notes:

Data from 5/12/95-11/3/96 from GeoEngineers Groundwater Report January, 1997.

Wells MW-2, MW-3, and MW-5 redrilled 1/23-1/25/97, and renamed NMW-2, NMW-3, and NMW-5 respectively.

Depth to water measurements made from top of casing.

Elevations for wells except for MW-7 and MW-8 based on monitoring well survey conducted 3/3/97.
Elevations are measured to the local assumed datum of 100.00 feet at MW-1.
Elevations for MW-7 and MW-8 based on GeoEngineers' data, corrected for change in arbitrary reference point.

ft MSL feet above Mean Sea Level

** Not calculated; previous measurements not available.

-- Not Applicable; no free product detected in well.

Table 3

TERRA VAC

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-1	3/29/94	NA	130	390	98	1,570	NA	NA
	10/4/94	NA	27	46	6	70	NA	NA
	5/12/95	NA	NA	NA	NA	NA	NA	NA
	1/4/96	54	400	2,200	630	4,800	Naphthalene - 370 Acenaphthylene - 44	100
	4/24/96	NA	NA	NA	NA	NA	NA	NA
	7/11/96	81	710	1,800	730	2	Naphthalene - 750 Acenaphthylene - 160 Phenanthrene - 2.2 Fluoranthene - 4.5	NA
	11/3/96	23	410	1,500	910	4,100	Naphthalene - 2,400 Acenaphthylene - 460 Acenaphthene -600 Fluorene - 12 Phenanthrene - 12 Anthracene - 0.89 Fluoranthene - 10 Pyrene - 2.1 Benzo(a)anthracene - 0.7 Chrysene - 1.3 Benzo(k)fluoranthene - 0.1 Benzo(a)pyrene - 0.3 Dibenzo(a,h)anthracene - 0.1 Benzo(g,h,i)perylene - 0.4	NA
	2/28/97*	57,200	1,130	3,890	1,220	7,430	Naphthalene - 760	20

Table 3

TERRA VAC

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
NMW-2	3/29/94	NA	4.9	1.4	0.7	3.0	NA	NA
	10/4/94	NA	ND	ND	ND	ND	NA	NA
	5/12/95	ND	1.2	ND	0.6	0.7	NA	NA
	1/4/96	1,600	14	1.5	ND	1.7	ND	ND
	4/24/96	NA	7.7	0.5	ND	ND	NA	NA
	7/11/96	7,100	2.7	ND	ND	ND	ND	NA
	11/3/96	ND	2.0	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
NMW-3	3/29/94	NA	2,300	1,200	1,200	3,700	NA	NA
	10/4/94	NA	1,520	600	790	1,600	NA	NA
	5/12/95	3,500	1,300	740	800	2,000	Naphthalene - 130 Fluorene - 0.2 Phenanthrene - 0.09	NA
	1/4/96	4,500	1,300	640	940	2,600	Naphthalene - 180 Acenaphthylene - 23	6
	4/16/96	NA	900	500	600	1,400	NA	NA
	7/11/96	2,100	460	130	380	430	Naphthalene - 71	NA
	11/3/96	4,900	830	220	650	1,100	Naphthalene - 120 Acenaphthylene - 37	
	2/28/97	4,400	261	124	153	404	Naphthalene - 32.6	NA
MW-4	10/4/94	NA	ND	ND	ND	ND	NA	NA
	5/12/95	ND	ND	ND	ND	ND	NA	NA
	1/4/96	900	ND	ND	ND	ND	ND	ND
	4/24/96	NA	ND	ND	ND	ND	NA	NA
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	0.7	ND	ND	ND	NA	NA

Table 3

TERRA VAC

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
NMW-5	5/12/95	13,000	660	13,000	1,900	11,000	Naphthalene - 450 Acenaphthylene - 66 Fluorene - 0.6 Phenanthrene - 0.42 Anthracene - 0.07	NA
	1/4/96	6,600	4.6	22	24	230	Naphthalene - 29 Acenaphthylene - 13 Fluorene - 0.8	14
	4/24/96	NA	ND	0.6	1.1	2.9	NA	NA
	7/11/96	ND	ND	ND	ND	2.7	NA	NA
	11/3/96	NA	ND	ND	2.5	5.6	NA	NA
	2/28/97	5,440	70.3	23.5	88.6	230	Naphthalene - 28.5	NA
MW-6	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
MW-7	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA

Table 3

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-8	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA

Notes:

Sampling between 3/29/94 and 11/3/96 performed by GeoEngineers. Data from 1/21/97 Groundwater Report.

Wells MW-2, MW-3, and MW-5 redrilled 1/23-1/25/97, and renamed NMW-2, NMW-3, and NMW-5 respectively.

* MW-1 sampled for lead 12/11/96.

PAHs polycyclic aromatic hydrocarbons. Only analytes detected are listed. Refer to analytical results (Appendix A) for a complete list of analytes and their respective detection limits.

ug/L Micrograms per liter, or parts per billion

ND Not Detected at the reporting limits

NA Not Analyzed

TPH-G Total petroleum hydrocarbons within the gasoline range (benzene to naphthalene).

APPENDIX A

- LABORATORY REPORTS

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

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PORTLAND ■ (503) 643-9200 ■ FAX 644-2202

Terra Vac	Project:	Rose's Parking Lot	Sampled: 2/28/97
PO Box 818	Project Number:	32-0029	Received: 3/4/97
Sherwood, OR 97140	Project Manager:	Jim Orr	Reported: 3/20/97 11:18

ANALYTICAL REPORT FOR SAMPLES:

Sample Description	Laboratory Sample Number	Sample Matrix	Date Sampled
MW-1	P703031-01	Water	2/28/97
NMW-2	P703031-02	Water	2/28/97
NMW-3	P703031-03	Water	2/28/97
MW-4	P703031-04	Water	2/28/97
NMW-5	P703031-05	Water	2/28/97
MW-6	P703031-06	Water	2/28/97
MW-7	P703031-07	Water	2/28/97
MW-8	P703031-08	Water	2/28/97
TRIP BLANK	P703031-09	Water	2/28/97

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Terra Vac	Project:	Rose's Parking Lot	Sampled: 2/28/97
PO Box 818	Project Number:	32-0029	Received: 3/4/97
Sherwood, OR 97140	Project Manager:	Jim Orr	Reported: 3/20/97 11:18

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-1			**P703031-01**				**Water**	
Benzene	0370128	3/6/97	3/6/97		50.0	1130	ug/l	
Toluene	"	"	"		50.0	3890	"	
Ethylbenzene	"	"	"		50.0	1220	"	
Xylenes (total)	"	"	"		100	7430	"	
Gasoline Range Hydrocarbons	"	"	"		8000	57200	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*83.6*	%	
NMW-2			**P703031-02**				**Water**	
Benzene	0370128	3/6/97	3/6/97		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*80.8*	%	
NMW-3			**P703031-03**				**Water**	
Benzene	0370128	3/6/97	3/6/97		2.50	261	ug/l	
Toluene	"	"	"		2.50	124	"	
Ethylbenzene	"	"	"		2.50	153	"	
Xylenes (total)	"	"	"		5.00	404	"	
Gasoline Range Hydrocarbons	"	"	"		400	4400	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*88.6*	%	
MW-4			**P703031-04**				**Water**	
Benzene	0370103	3/5/97	3/5/97		0.500	ND	ug/l	
Toluene	"	"	"		0.500	0.700	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*105*	%	

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Terra Vac	Project:	Rose's Parking Lot	Sampled: 2/28/97
PO Box 818	Project Number:	32-0029	Received: 3/4/97
Sherwood, OR 97140	Project Manager:	Jim Orr	Reported: 3/20/97 11:18

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
NMW-5			**P703031-05**				**Water**	
Benzene	0370128	3/6/97	3/7/97		1.00	70.3	ug/l	
Toluene	"	"	"		1.00	23.5	"	
Ethylbenzene	"	"	"		1.00	88.6	"	
Xylenes (total)	"	"	"		2.00	230	"	
Gasoline Range Hydrocarbons	"	"	"		160	5440	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*90.0*	%	
MW-6			**P703031-06**				**Water**	
Benzene	0370103	3/5/97	3/5/97		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*107*	%	
MW-7			**P703031-07**				**Water**	
Benzene	0370103	3/5/97	3/5/97		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*102*	%	
MW-8			**P703031-08**				**Water**	
Benzene	0370103	3/5/97	3/5/97		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*112*	%	
TRIP BLANK			**P703031-09**				**Water**	
Benzene	0370103	3/5/97	3/5/97		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*112*	%	

North Creek Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

Tabatha A Brochu, Project Manager

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Terra Vac	Project: Rose's Parking Lot	Sampled: 2/28/97
PO Box 818	Project Number: 32-0029	Received: 3/4/97
Sherwood, OR 97140	Project Manager: Jim Orr	Reported: 3/20/97 11:18

Polynuclear Aromatic Compounds per EPA Method 8310
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-1			**P703031-01**				**Water**	
Acenaphthene	0370159	3/7/97	3/19/97		50.0	ND	ug/l	I
Acenaphthylene	"	"	"		50.0	ND	"	I
Anthracene	"	"	3/18/97		5.00	ND	"	
Benzo (a) anthracene	"	"	"		0.100	ND	"	
Benzo (a) pyrene	"	"	"		0.100	ND	"	
Benzo (b) fluoranthene	"	"	"		0.100	ND	"	
Benzo (ghi) perylene	"	"	"		0.100	ND	"	
Benzo (k) fluoranthene	"	"	"		0.100	ND	"	
Chrysene	"	"	"		0.100	ND	"	
Dibenzo (a,h) anthracene	"	"	"		0.100	ND	"	
Fluoranthene	"	"	"		0.100	ND	"	
Fluorene	"	"	3/19/97		5.00	ND	"	I
Indeno (1,2,3-cd) pyrene	"	"	3/18/97		0.100	ND	"	
Naphthalene	"	"	3/19/97		50.0	760	"	I
Phenanthrene	"	"	"		50.0	ND	"	I
Pyrene	"	"	3/18/97		0.100	ND	"	
Surrogate: 2-Fluorobiphenyl	"	"	"	*30.0-100*		*80.4*	*%*	
NMW-3			**P703031-03**				**Water**	
Acenaphthene	0370159	3/7/97	3/18/97		5.00	ND	ug/l	
Acenaphthylene	"	"	"		5.00	ND	"	
Anthracene	"	"	"		5.00	ND	"	
Benzo (a) anthracene	"	"	"		0.100	ND	"	
Benzo (a) pyrene	"	"	"		0.100	ND	"	
Benzo (b) fluoranthene	"	"	"		0.100	ND	"	
Benzo (ghi) perylene	"	"	"		0.100	ND	"	
Benzo (k) fluoranthene	"	"	"		0.100	ND	"	
Chrysene	"	"	"		0.100	ND	"	
Dibenzo (a,h) anthracene	"	"	"		0.100	ND	"	
Fluoranthene	"	"	"		0.100	ND	"	
Fluorene	"	"	"		0.500	ND	"	
Indeno (1,2,3-cd) pyrene	"	"	"		0.100	ND	"	
Naphthalene	"	"	"		5.00	32.6	"	
Phenanthrene	"	"	"		5.00	ND	"	
Pyrene	"	"	"		0.100	ND	"	
Surrogate: 2-Fluorobiphenyl	"	"	"	*30.0-100*		*78.2*	*%*	

North Creek Analytical, Inc.

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Terra Vac	Project:	Rose's Parking Lot	Sampled: 2/28/97
PO Box 818	Project Number:	32-0029	Received: 3/4/97
Sherwood, OR 97140	Project Manager:	Jim Orr	Reported: 3/20/97 11:18

Polynuclear Aromatic Compounds per EPA Method 8310
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
NMW-5			**P703031-05**				**Water**	
Acenaphthene	0370159	3/7/97	3/18/97		5.00	ND	ug/l	
Acenaphthylene	"	"	"		5.00	ND	"	
Anthracene	"	"	"		5.00	ND	"	
Benzo (a) anthracene	"	"	"		0.100	ND	"	
Benzo (a) pyrene	"	"	"		0.100	ND	"	
Benzo (b) fluoranthene	"	"	"		0.100	ND	"	
Benzo (ghi) perylene	"	"	"		0.100	ND	"	
Benzo (k) fluoranthene	"	"	"		0.100	ND	"	
Chrysene	"	"	"		0.100	ND	"	
Dibenzo (a,h) anthracene	"	"	"		0.100	ND	"	
Fluoranthene	"	"	"		0.100	ND	"	
Fluorene	"	"	"		0.500	ND	"	
Indeno (1,2,3-cd) pyrene	"	"	"		0.100	ND	"	
Naphthalene	"	"	"		5.00	**28.5**	"	
Phenanthrene	"	"	"		5.00	ND	"	
Pyrene	"	"	"		0.100	ND	"	
Surrogate: 2-Fluorobiphenyl	"	"	"	*30.0-100*		*74.0*	%	

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Terra Vac	Project: Rose's Parking Lot	Sampled: 2/28/97
PO Box 818	Project Number: 32-0029	Received: 3/4/97
Sherwood, OR 97140	Project Manager: Jim Orr	Reported: 3/20/97 11:18

Notes and Definitions

#	Note

1	The reporting limit for this analyte was raised due to the high analyte concentration present in the sample.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
Recov.	Recovery
RPD	Relative Percent Difference

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Terra Vac	Project:	Rose's Parking Lot	Sampled: 2/28/97
PO Box 818	Project Number:	32-0029	Received: 3/4/97
Sherwood, OR 97140	Project Manager:	Jim Orr	Reported: 3/20/97 11:18

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0370103	**Date Prepared: 3/5/97**					**Extraction Method: EPA 5030**				
Blank	**0370103-BLK1**									
Benzene	3/5/97			ND	ug/l	0.500				
Toluene	"			ND	"	0.500				
Ethylbenzene	"			ND	"	0.500				
Xylenes (total)	"			ND	"	1.00				
Gasoline Range Hydrocarbons	"			ND	"	80.0				
Surrogate: 4-BFB	"	*50.0*		*54.8*	"	*50.0-150*	*110*			
LCS	**0370103-BS1**									
Gasoline Range Hydrocarbons	3/5/97	1250		1170	ug/l	50.0-150	93.6			
Surrogate: 4-BFB	"	*50.0*		*56.6*	"	*50.0-150*	*113*			
LCS	**0370103-BS2**									
Benzene	3/5/97	20.0		18.8	ug/l	67.0-130	94.0			
Toluene	"	20.0		19.0	"	75.0-126	95.0			
Ethylbenzene	"	20.0		19.5	"	76.0-124	97.5			
Xylenes (total)	"	60.0		58.5	"	75.0-126	97.5			
Surrogate: 4-BFB	"	*50.0*		*51.4*	"	*50.0-150*	*103*			
Duplicate	**0370103-DUP1**		**P703031-02**							
Gasoline Range Hydrocarbons	3/5/97		ND	ND	ug/l			50.0		
Surrogate: 4-BFB	"	*50.0*		*57.4*	"	*50.0-150*	*115*			
Duplicate	**0370103-DUP2**		**P703031-08**							
Gasoline Range Hydrocarbons	3/5/97		ND	ND	ug/l			50.0		
Surrogate: 4-BFB	"	*50.0*		*53.5*	"	*50.0-150*	*107*			
Matrix Spike	**0370103-MS1**		**P703031-02**							
Benzene	3/5/97	20.0	ND	19.6	ug/l	67.0-130	98.0			
Toluene	"	20.0	ND	20.2	"	75.0-126	101			
Ethylbenzene	"	20.0	ND	20.9	"	76.0-124	104			
Xylenes (total)	"	60.0	ND	64.1	"	75.0-126	107			
Surrogate: 4-BFB	"	*50.0*		*57.2*	"	*50.0-150*	*114*			
Matrix Spike Dup	**0370103-MSD1**		**P703031-02**							
Benzene	3/5/97	20.0	ND	19.4	ug/l	67.0-130	97.0	13.0	1.03	
Toluene	"	20.0	ND	20.1	"	75.0-126	101	13.0	0	
Ethylbenzene	"	20.0	ND	20.3	"	76.0-124	101	15.0	2.93	

North Creek Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

Tabatha A Brochu, Project Manager

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Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Matrix Spike Dup (continued)	**0370103-MSD1**		**P703031-02**							
Xylenes (total)	3/5/97	60.0	ND	62.2	ug/l	75.0-126	104	13.0	2.84	
Surrogate: 4-BFB	"	*50.0*		*56.5*	"	*50.0-150*	*113*			
Batch: 0370128	**Date Prepared: 3/6/97**					**Extraction Method: EPA 5030**				
Blank	**0370128-BLK1**									
Benzene	3/6/97			ND	ug/l	0.500				
Toluene	"			ND	"	0.500				
Ethylbenzene	"			ND	"	0.500				
Xylenes (total)	"			ND	"	1.00				
Gasoline Range Hydrocarbons	"			ND	"	80.0				
Surrogate: 4-BFB	"	*50.0*		*43.1*	"	*50.0-150*	*86.2*			
LCS	**0370128-BS1**									
Gasoline Range Hydrocarbons	3/6/97	1250		1180	ug/l	50.0-150	94.4			
Surrogate: 4-BFB	"	*50.0*		*50.4*	"	*50.0-150*	*101*			
LCS	**0370128-BS2**									
Benzene	3/6/97	20.0		17.3	ug/l	67.0-130	86.5			
Toluene	"	20.0		17.2	"	75.0-126	86.0			
Ethylbenzene	"	20.0		17.8	"	76.0-124	89.0			
Xylenes (total)	"	60.0		53.9	"	75.0-126	89.8			
Surrogate: 4-BFB	"	*50.0*		*44.5*	"	*50.0-150*	*89.0*			

North Creek Analytical, Inc.

*Refer to end of report for text of notes and definitions.

Tabatha A Brochu, Project Manager

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

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PORTLAND • (503) 643-9200 • FAX 644-2202

Terra Vac	Project:	Rose's Parking Lot	Sampled: 2/28/97
PO Box 818	Project Number:	32-0029	Received: 3/4/97
Sherwood, OR 97140	Project Manager:	Jim Orr	Reported: 3/20/97 11:18

Polynuclear Aromatic Compounds per EPA Method 8310/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0370159	**Date Prepared: 3/7/97**					**Extraction Method: EPA 3510/600 Series**				
Blank	**0370159-BLK1**									
Acenaphthene	3/18/97			ND	ug/l	5.00				
Acenaphthylene	"			ND	"	5.00				
Anthracene	"			ND	"	5.00				
Benzo (a) anthracene	"			ND	"	0.100				
Benzo (a) pyrene	"			ND	"	0.100				
Benzo (b) fluoranthene	"			ND	"	0.100				
Benzo (ghi) perylene	"			ND	"	0.100				
Benzo (k) fluoranthene	"			ND	"	0.100				
Chrysene	"			ND	"	0.100				
Dibenzo (a,h) anthracene	"			ND	"	0.100				
Fluoranthene	"			ND	"	0.100				
Fluorene	"			ND	"	0.500				
Indeno (1,2,3-cd) pyrene	"			ND	"	0.100				
Naphthalene	"			ND	"	5.00				
Phenanthrene	"			ND	"	5.00				
Pyrene	"			ND	"	0.100				
Surrogate: 2-Fluorobiphenyl	"	*50.0*		*33.6*	"	*30.0-100*	*67.2*			
LCS	**0370159-BS1**									
Acenaphthylene	3/18/97	20.0		17.2	ug/l	20.0-124	86.0			
Benzo (k) fluoranthene	"	1.00		0.980	"	20.0-159	98.0			
Pyrene	"	1.00		0.928	"	50.0-150	92.8			
Surrogate: 2-Fluorobiphenyl	"	*50.0*		*37.9*	"	*30.0-100*	*75.8*			
LCS Dup	**0370159-BSD1**									
Acenaphthylene	3/18/97	20.0		18.4	ug/l	20.0-124	92.0	50.0	6.74	
Benzo (k) fluoranthene	"	1.00		1.08	"	20.0-159	108	50.0	9.71	
Pyrene	"	1.00		0.954	"	50.0-150	95.4	50.0	2.76	
Surrogate: 2-Fluorobiphenyl	"	*50.0*		*39.6*	"	*30.0-100*	*79.2*			

North Creek Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

Tabatha A Brochu, Project Manager

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

18939 120th Avenue N.E., Suite 101, Bothell, WA 98011-9508 (206) 481-9200 FAX 485-2992
East 11115 Montgomery, Suite B, Spokane, WA 99206-4779 (509) 924-9200 FAX 924-9290
9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202

CHAIN OF CUSTODY REPORT

Work Order # P703031

REPORT TO:	INVOICE TO:
ATTENTION: Tim Warner Terra Vac	ATTENTION: Mr. Tim Warner
ADDRESS: 16740 Meridian Ave N Seattle, WA 98133	ADDRESS: Same as Report To ←
PHONE (206) 362-8294 FAX (206) 362-1578	P.O. NUMBER: 32-0029'G'3-740 NCA QUOTE #:
PROJECT NAME: Rose's Parking Lot	
PROJECT NUMBER: 32-0029'G'	
SAMPLED BY: Jim Orr	

TURNAROUND REQUEST in Business Days *

Organic & Inorganic Analyses: 10 Standard | 7 | 5 | 4 | 3 | 2 | 1 | Same Day

Fuels & Hydrocarbon Analyses: ~~5~~ Standard | 3-4 | 2 | 1 | Same Day

OTHER Specify:

* Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	NCA SAMPLE ID (Laboratory Use Only)	Analysis Request: ORTPH-GBTEX PAH's EPA 610	MATRIX (W, S, A, O)	# OF CONTAINERS	COMMENTS
1.	MW-1	2-28-97/1600		X	W	3-40ml 1-1L	SEE PAH Note Below
2.	NMW-2	/1605		X			
3.	NMW-3	/1610		X			
4.	MW-4	/1615		X			
5.	NMW-5	/1620		X			
6.	MW-6	/1401		X			
7.	MW-7	/1350		X			
8.	MW-8	/1355		X			
9.	Trip Blank	/1400		X			
10.							

RELINQUISHED BY:		DATE: 3-3-97	RECEIVED BY:		DATE: 3-4-97
PRINT NAME: James Orr	FIRM: Terra Vac	TIME: 1310	PRINT NAME: Larry Spangler	FIRM: NCA	TIME: 0930
RELINQUISHED BY:		DATE: 3-4-97	RECEIVED BY:		DATE: 3-4-97
PRINT NAME: Larry Spangler	FIRM: NCA	TIME: 1050	PRINT NAME: Karin L. Stanley	FIRM: NCA	TIME: 1200

ADDITIONAL REMARKS: Run PAH's on any sample with ~~Extractable TPH-G~~ Benzene > 5ppb.
Also Fax Results to (503) 625-3777

PAGE 1 OF 1

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SPOKANE ▪ (509) 924 9200 ▪ FAX 924-9290
PORTLAND ▪ (503) 643-9200 ▪ FAX 644-2202

Terra Vac	Project:	Rose's Parking Lot	Sampled:	12/11/96
PO Box 818	Project Number:	32-0029	Received:	12/13/96
Sherwood, OR 97140	Project Manager:	Jim Orr	Reported:	12/23/96 13:37

ANALYTICAL REPORT FOR SAMPLES:

Sample Description	Laboratory Sample Number	Sample Matrix	Date Sampled
MW1-W	P612260-01	Water	12/11/96

NORTH CREEK ANALYTICAL
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Terra Vac	Project:	Rose's Parking Lot	Sampled: 12/11/96
PO Box 818	Project Number:	32-0029	Received: 12/13/96
Sherwood, OR 97140	Project Manager:	Jim Orr	Reported: 12/23/96 13:37

Dissolved Metals per EPA 200 Series Methods
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Specific Method	Reporting Limit	Result	Units	Notes*
MW1-W			**P612260-01**				**Water**	
Lead	1260344	12/17/96	12/20/96	EPA 200.8	0.00100	**0.0197**	mg/l	

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SPOKANE ▪ (509) 924-9200 ▪ FAX 924-9290
PORTLAND ▪ (503) 643-9200 ▪ FAX 644-2202

Terra Vac	Project: Rose's Parking Lot	Sampled: 12/11/96
PO Box 818	Project Number: 32-0029	Received: 12/13/96
Sherwood, OR 97140	Project Manager: Jim Orr	Reported: 12/23/96 13:37

Dissolved Metals per EPA 200 Series Methods/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 1260344	**Date Prepared: 12/17/96**					**Extraction Method: EPA 200/3005**				
Blank	**1260344-BLK1**									
Lead	12/20/96			ND	mg/l	0.00100				
LCS	**1260344-BS1**									
Lead	12/20/96	0.100		0.111	mg/l	85.0-115	111			
Duplicate	**1260344-DUP1**		**P612257-01**							
Lead	12/20/96		ND	ND	mg/l			20.0		
Matrix Spike	**1260344-MS1**		**P612257-01**							
Lead	12/20/96	0.100	ND	0.103	mg/l	70.0-130	103			
Matrix Spike	**1260344-MS2**		**P612260-01**							
Lead	12/20/96	0.100	0.0197	0.125	mg/l	70.0-130	105			

NORTH CREEK ANALYTICAL
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BOTHELL ■ (206) 481-9200 ■ FAX 485 2992
SPOKANE ■ (509) 924-9200 ■ FAX 921-9290
PORTLAND ■ (503) 643-9200 ■ FAX 644-2202

Terra Vac	Project:	Rose's Parking Lot	Sampled: 12/11/96
PO Box 818	Project Number:	32-0029	Received: 12/13/96
Sherwood, OR 97140	Project Manager:	Jim Orr	Reported: 12/23/96 13:37

Notes and Definitions

#	Note
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
Recov.	Recovery
RPD	Relative Percent Difference

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9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

CHAIN OF CUSTODY REPORT

Work Order #

REPORT TO:	INVOICE TO:
ATTENTION: Jim Orr Terra Vac	ATTENTION: Jim Orr Terra Vac
ADDRESS: P.O. Box 619 Sherwood, OR 97140	ADDRESS: (Same)
PHONE: (503) 625-0625 FAX: (503) 625 3777	P.O. NUMBER: NCA QUOTE #:
PROJECT NAME: Rose's Parking Lot	Analysis Request: Diesel 8021
PROJECT NUMBER: 32-0029	
SAMPLED BY:	

TURNAROUND REQUEST in Business Days *

Organic & Inorganic Analyses: 10 (Standard) | 7 | 5 | 4 | 3 | 2 | 1 | Same Day

Fuels & Hydrocarbon Analyses: 5 (Standard) | 3-4 | 2 | 1 | Same Day

OTHER Specify:

* Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	NCA SAMPLE ID (Laboratory Use Only)	Diesel 8021	MATRIX (W, S, A, O)	# OF CONTAINERS	COMMENTS
1.	MW-W	12-11-96/1612		X			
2.							
3.							
4.							
5.							
6.							
8.							
9.							
10.							

RELINQUISHED BY: James Orr	DATE: 12-13-96	RECEIVED BY: Karin Stanley	DATE: 12/13/
PRINT NAME: James Orr	FIRM: Terra Vac TIME: 1220	PRINT NAME: Karin Stanley	FIRM: NCA TIME: 1220
RELINQUISHED BY:	DATE:	RECEIVED BY:	DATE:
PRINT NAME:	FIRM: TIME:	PRINT NAME:	FIRM: TIME:

ADDITIONAL REMARKS:

PAGE OF

26-94-0025

TERRA VAC 10740 Meridian Avenue North, Suite 202, Seattle, WA 98133-9010
Tel (206) 362-8128 ❑ Fax (206) 362-9528

June 9, 1997

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
JUL 15 1997
NORTHWEST REGION

Mr. Max Birnbach
c/o Mr. Charles R. Williamson
Kell, Alterman & Runstein
1001 Southwest Fifth Avenue, Suite 1800
Portland, OR 97204-1194

RE: Second Quarter 1997 Groundwater Monitoring Report
Rose's Parking Lot
330 Northwest 23rd Avenue, Portland, OR

Dear Mr. Birnbach:

Terra Vac performed quarterly groundwater monitoring at this site in late May, 1997. Eight monitoring wells were sounded for depth to groundwater. Groundwater samples were collected from the eight monitoring wells for analyses of total gasoline-range petroleum hydrocarbons (TPH-G), benzene, toluene, ethylbenzene, and total xylenes (BTEX). A site location map is shown on Figure 1. Well construction details, including construction dates, well diameters, total depths, and screened intervals are provided in Table 1.

In general, groundwater elevations decreased across the site since the previous monitoring event with the drop in water level varying from 1.35 to 10.68 feet. Analytical results indicate groundwater from three of the eight sampled wells exceeded the current Oregon Department of Environmental Quality (ODEQ) Groundwater Cleanup Levels for benzene.

Groundwater monitoring and sampling were performed using standard field procedures. In short, each well was sounded for depth to groundwater and the presence of free phase petroleum hydrocarbons using an electronic interface probe. If free phase petroleum hydrocarbons were not detected, total well depth was measured. A minimum of three well volumes were hand bailed from each well sampled, and groundwater allowed to recover to at least 80 percent of original elevation. Analytical samples were then collected with new disposable bailers and immediately placed in sampling vials prepared specifically for the sampled media and selected analyses. Once collected, samples were immediately acidified and cooled for transportation to the laboratory under chain of custody.

Existing top of casing elevations, as determined by a March, 1997 well survey, were used to establish reference points for well depths, screen intervals, and groundwater elevations for wells MW-1, MW-4, MW- 6, NMW-2, NMW-3 and NMW-5. Elevations for MW-7 and MW-8 were calculated using previous survey data from GeoEngineers, corrected to the new local assumed datum. Historical groundwater elevations are presented in Table 2. Second quarter 1997 groundwater elevations are also presented on Figure 2. Historically, the inferred direction of groundwater flow has been to the northeast. The groundwater data collected during this sampling

event indicates that the groundwater flow is still to the northeast, although groundwater contours could not be accurately established due to the operation of a full scale remediation system.

Since February 1997, groundwater samples have been analyzed for TPH-G by EPA Method 8015, for BTEX constituents by EPA Method 8020A, for PAHs by EPA Method 8310, and for dissolved lead by EPQ Method 200.8. Previous groundwater sampling performed by GeoEngineers included in this report used EPA Method 418.1 for TPH-G, EPA Method 8020 for BTEX, EPA Method 8310 for PAHs, and EPA Method 7421 for dissolved lead. Results of these analyses, and historical groundwater quality data, are presented in Table 3. Groundwater quality results from the second quarter 1997 sampling are also shown on Figure 3. Analytical reports from the laboratory are contained in Appendix A.

Field activities were performed in a manner consistent with the level of skill and care standard for local environmental professionals. Findings and conclusions presented in this report have been prepared based upon the specific site conditions at the time of field activities and no warranty, expressed or implied, is made.

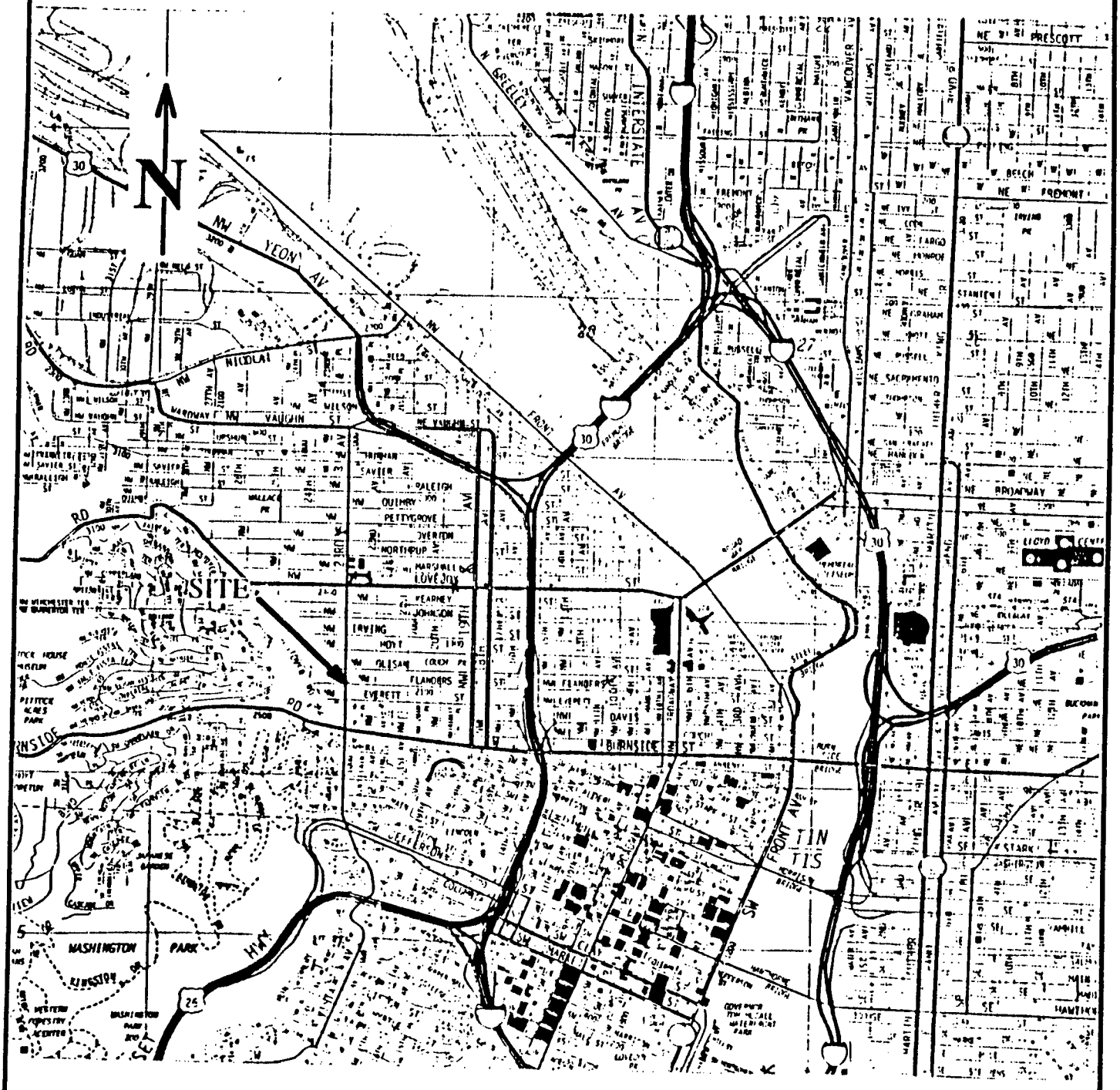
If you have any questions, please do not hesitate to contact us.

Sincerely,
Terra Vac Corporation

Timothy Warner,
Project Manager

cc: Dave Roy
Rich Kostecki
Jeffrey Wishko
Richard Singer (2 copies)
Richard Allen
Edward Crow

FIGURES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SITE
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NW QUIMBY
NW PETTYGROVE
NW OVERTON
NW NORTHRUP
NW PEARNEY
NW JOHNSON
NW IRVING
NW HOYT
NW GLISAN
NW COUCH
NW FLANDERS
NW EVERETT
NW DAVIS
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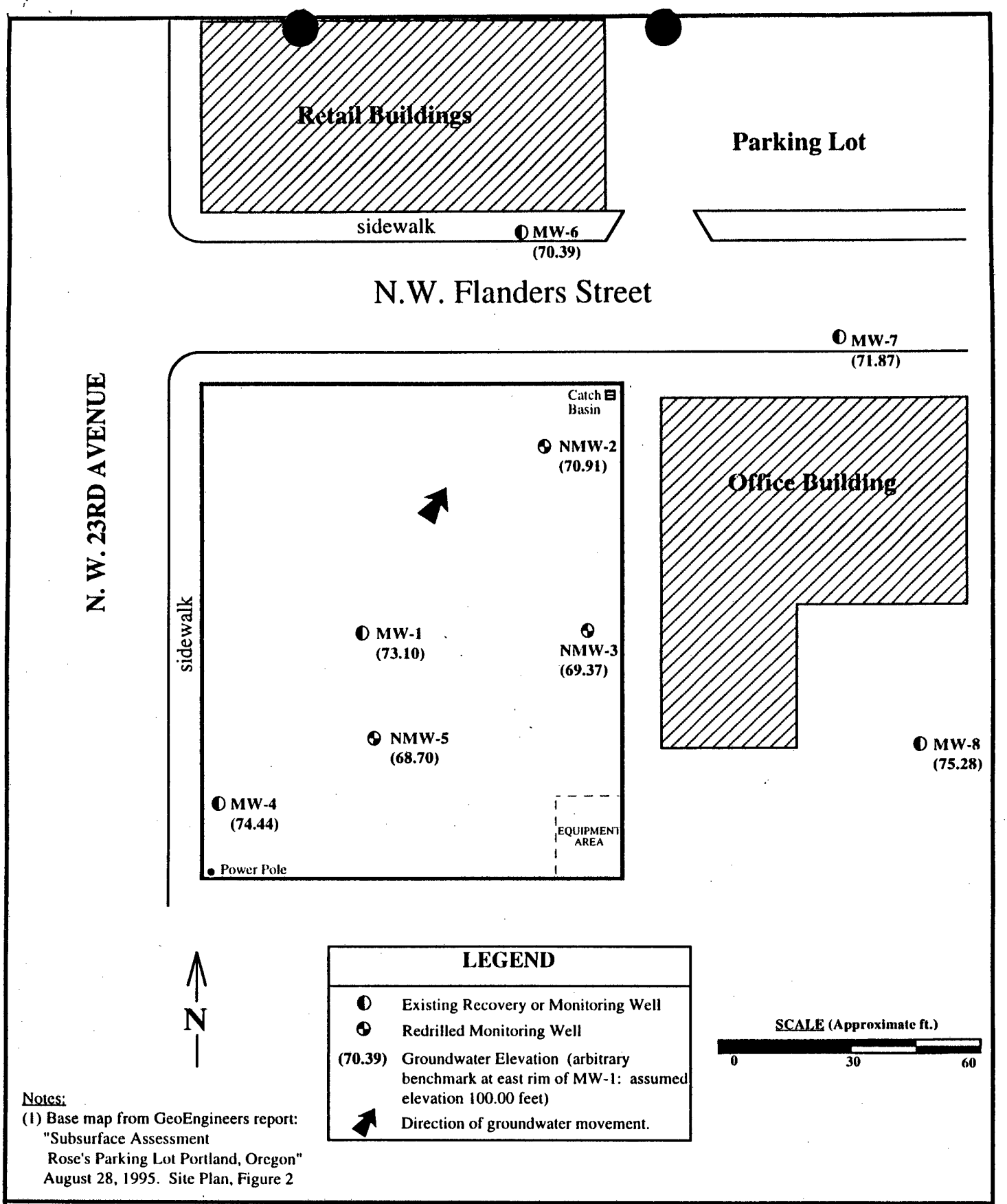
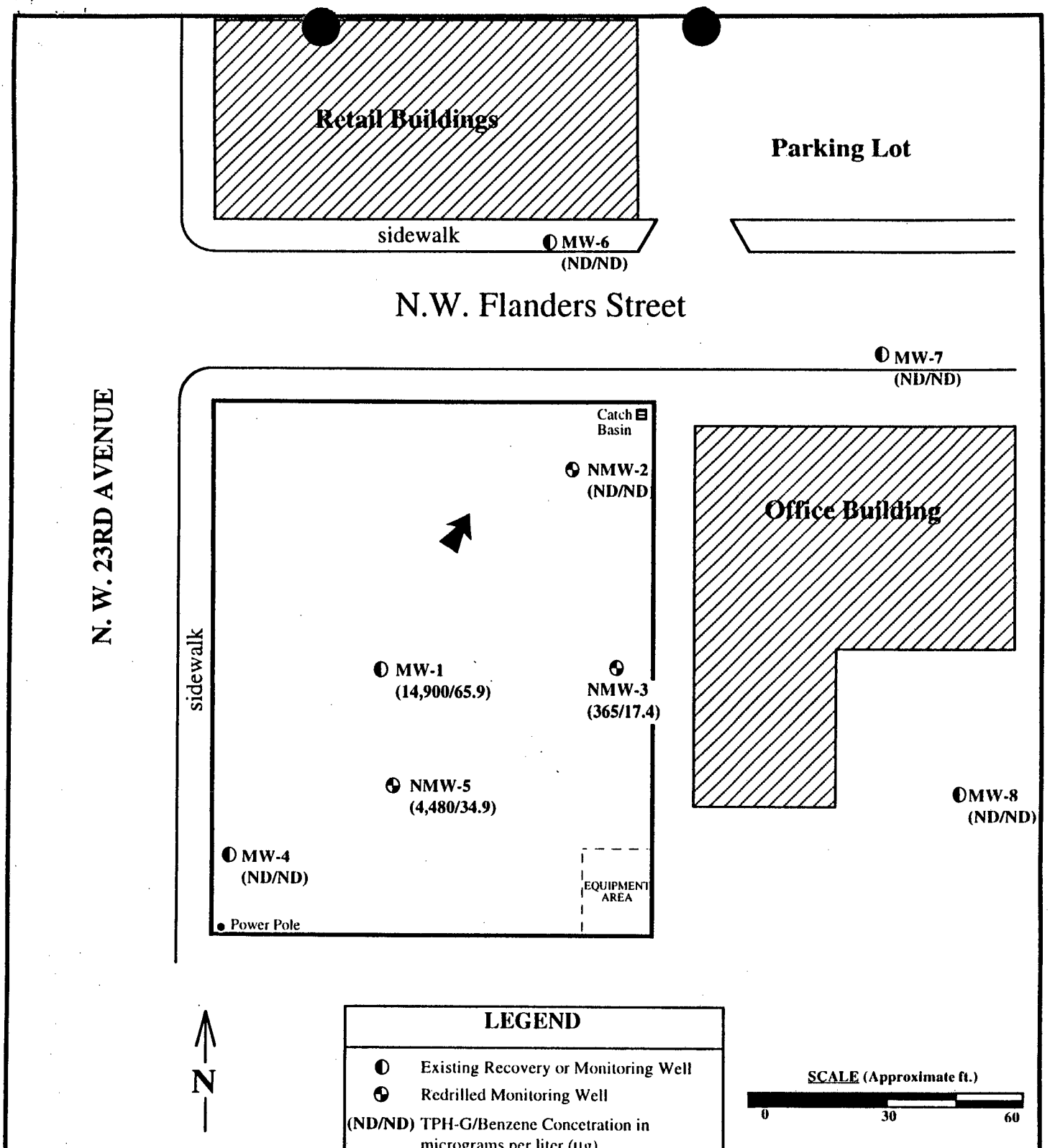
SW MADISON
SW JEFFERSON
SW COLUMBIA



Notes:
(1) Base map from GeoEngineers report:
"Subsurface Assessment
Rose's Parking Lot Portland, Oregon"
August 28, 1995. Site Plan, Figure 2

Groundwater Elevations	**Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon**	TERRA VAC	Project No.	32-0029	Figure 2
			Date	June 9, 1997	
			Scale	1 inch ≈ 30 Feet	
			Revision	MKF-1	



Notes:
(1) Base map from GeoEngineers report:
"Subsurface Assessment
Rose's Parking Lot Portland, Oregon"
August 28, 1995. Site Plan, Figure 2

Groundwater Analytical Results	**Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon**	TERRA VAC	Project No.	32-0029	Figure 3
			Date	June 9, 1997	
			Scale	1 inch ≈ 30 Feet	
			Revision	MKF-1	

TABLES

Table 1

Remediation Well Construction Data
Rose's Parking Lot
Portland, Oregon

Well Identification	Date Installed	Total Depth (feet)	Screen Interval		Well Diameter (inches)
			Top (feet)	Bottom (feet)	
MW-1	3/23/94	39	24	38.5	2
NMW-2	1/24/97	38	15	37	4
NMW-3	1/25/97	38	15.5	37.5	4
MW-4	9/28/94	40	20	39.5	2
NMW-5	1/23/97	38	15	37	4
MW-6	4/6/96	31	15	30.5	2
MW-7	4/6/96	31	15	30.5	2
MW-8	4/6/96	31	15	30.5	2

Notes:

Data on NMW-2, NMW-3, and NMW-5 is from Terra Vac field notes and well logs.

Data on MW-1 from RZA Agra Inc. well logs in April, 1994 report.

Data on MW-4 from RZA Agra Inc. well logs in October, 1994 report.

Data on MW-6 through MW-8 from well logs in GeoEngineers June, 1996 Report

Table 2

TERRA VAC

Groundwater Elevation Data
Rose's Parking Lot
Portland, Oregon

Well I.D.	Top of Casing Elevation (feet)	Date Sounded	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Water Level Elevation (feet MSL)	Difference from Previous Measurement (feet)
MW-1	100.00	5/12/95	22.79	23.29	0.5	76.71	**
		1/4/96	--	24.10	Trace	75.90	-0.81
		4/8/96	22.39	22.41	0.02	77.59	1.69
		4/24/96	22.40	22.45	0.05	77.55	-0.04
		7/11/96	--	23.35	Trace	76.65	-0.90
		11/3/96	--	24.44	Sheen	75.56	-1.09
		2/28/97	--	21.11	0	78.89	3.33
		5/29/97	--	26.90	0	73.10	-5.79
NMW-2	96.21	5/12/95	--	20.75	0	75.46	**
		1/4/96	--	21.60	0	74.61	-0.85
		4/8/96	--	19.73	0	76.48	1.87
		4/24/96	--	19.90	0	76.31	-0.17
		7/11/96	Sheen	20.80	0	75.41	-0.90
		11/3/96	--	21.87	0	74.34	-1.07
		2/28/97	--	18.51	0	77.70	3.36
		5/29/97	--	25.30	0	70.91	-6.79
NMW-3	99.15	5/12/95	--	23.48	0	75.67	**
		1/4/96	--	24.22	0	74.93	-0.74
		4/8/96	--	22.31	0	76.84	1.91
		4/24/96	--	22.36	0	76.79	-0.05
		7/11/96	--	23.37	0	75.78	-1.01
		11/3/96	Sheen	24.47	0	74.68	-1.10
		2/28/97	--	21.28	0	77.87	3.19
		5/29/97	--	29.78	0	69.37	-8.50

TERRA VAC

Table 2

Groundwater Elevation Data
Rose's Parking Lot
Portland, Oregon

Well I.D.	Top of Casing Elevation (feet)	Date Sounded	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Water Level Elevation (feet MSL)	Difference from Previous Measurement (feet)
MW-4	100.48	5/12/95	--	22.55	0	77.93	**
		1/4/96	--	23.03	0	77.45	-0.48
		4/8/96	--	21.60	0	78.88	1.43
		4/24/96	--	21.34	0	79.14	0.26
		7/11/96	--	22.54	0	77.94	-1.20
		11/3/96	--	23.45	0	77.03	-0.91
		2/28/97	--	20.24	0	80.24	3.21
		5/29/97	--	26.04	0	74.44	-5.80
NMW-5	100.45	5/12/95	--	22.35	0	78.10	**
		1/4/96	Trace	22.84	0	77.61	-0.49
		4/8/96	--	21.40	0	79.05	1.44
		4/24/96	--	20.04	0	80.41	1.36
		7/11/96	--	22.45	0	78.00	-2.41
		11/3/96	Sheen	23.38	0	77.07	-0.93
		2/28/97	--	21.07	0	79.38	2.31
		5/29/97	--	31.75	0	68.70	-10.68
MW-6	93.89	4/8/96	--	21.53	0	72.36	**
		4/24/96	--	22.04	0	71.85	-0.51
		7/11/96	--	22.61	0	71.28	-0.57
		11/3/96	--	24.04	0	69.85	-1.43
		2/28/97	--	20.89	0	73.00	3.15
		5/29/97	--	23.50	0	70.39	-2.61
MW-7	94.07	4/8/96	--	21.50	0	72.57	**
		4/24/96	--	21.05	0	73.02	0.45
		7/11/96	--	22.40	0	71.67	-1.35
		11/3/96	--	23.57	0	70.50	-1.17
		2/28/97	--	20.70	0	73.37	2.87
		5/29/97	--	22.20	0	71.87	-1.50

Table 2

Groundwater Elevation Data
Rose's Parking Lot
Portland, Oregon

Well I.D.	Top of Casing Elevation (feet)	Date Sounded	Depth to Product (feet)	Depth to Water (feet)	Product Thickness (feet)	Water Level Elevation (feet MSL)	Difference from Previous Measurement (feet)
MW-8	95.08	4/8/96	--	20.19	0	74.89	**
		4/24/96	--	18.42	0	76.66	1.77
		7/11/96	--	18.88	0	76.20	-0.46
		11/3/96	--	20.05	0	75.03	-1.17
		2/28/97	--	18.45	0	76.63	1.60
		5/29/97	--	19.80	0	75.28	-1.35

Notes:

Data from 5/12/95-11/3/96 from GeoEngineers Groundwater Report January, 1997.

Wells MW-2, MW-3, and MW-5 redrilled 1/23-1/25/97, and renamed NMW-2, NMW-3, and NMW-5 respectively.

Depth to water measurements made from top of casing.

Elevations for wells except for MW-7 and MW-8 based on monitoring well survey conducted 3/3/97.
Elevations are measured to the local assumed datum of 100.00 feet at MW-1.
Elevations for MW-7 and MW-8 based on GeoEngineers' data, corrected for change in arbitrary reference point.

ft MSL feet above Mean Sea Level

** Not calculated; previous measurements not available.

-- Not Applicable; no free product detected in well.

Table 3

TERRA VAC

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-1	3/29/94	NA	130	390	98	1,570	NA	NA
	10/4/94	NA	27	46	6	70	NA	NA
	5/12/95	NA	NA	NA	NA	NA	NA	NA
	1/4/96	54	400	2,200	630	4,800	Naphthalene - 370 Acenaphthylene - 44	100
	4/24/96	NA	NA	NA	NA	NA	NA	NA
	7/11/96	81	710	1,800	730	2	Naphthalene - 750 Acenaphthylene - 160 Phenanthrene - 2.2 Fluoranthene - 4.5	NA
	11/3/96	23	410	1,500	910	4,100	Naphthalene - 2,400 Acenaphthylene - 460 Acenaphthene -600 Fluorene - 12 Phenanthrene - 12 Anthracene - 0.89 Fluoranthene - 10 Pyrene - 2.1 Benzo(a)anthracene - 0.7 Chrysene - 1.3 Benzo(k)fluoranthene - 0.1 Benzo(a)pyrene - 0.3 Dibenzo(a,h)anthracene - 0.1 Benzo(g,h,i)perylene - 0.4	NA
	2/28/97*	57,200	1,130	3,890	1,220	7,430	Naphthalene - 760	20
	5/29/97	14,900	65.9	49.3	205	1,010	NA	NA

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
NMW-2	3/29/94	NA	4.9	1.4	0.7	3.0	NA	NA
	10/4/94	NA	ND	ND	ND	ND	NA	NA
	5/12/95	ND	1.2	ND	0.6	0.7	NA	NA
	1/4/96	1,600	14	1.5	ND	1.7	ND	ND
	4/24/96	NA	7.7	0.5	ND	ND	NA	NA
	7/11/96	7,100	2.7	ND	ND	ND	ND	NA
	11/3/96	ND	2.0	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
NMW-3	3/29/94	NA	2,300	1,200	1,200	3,700	NA	NA
	10/4/94	NA	1,520	600	790	1,600	NA	NA
	5/12/95	3,500	1,300	740	800	2,000	Naphthalene - 130 Fluorene - 0.2 Phenanthrene - 0.09	NA
	1/4/96	4,500	1,300	640	940	2,600	Naphthalene - 180 Acenaphthylene - 23	6
	4/16/96	NA	900	500	600	1,400	NA	NA
	7/11/96	2,100	460	130	380	430	Naphthalene - 71	NA
	11/3/96	4,900	830	220	650	1,100	Naphthalene - 120 Acenaphthylene - 37	
	2/28/97	4,400	261	124	153	404	Naphthalene - 32.6	NA
	5/29/97	365	17.4	0.91	3.55	15.3	NA	NA
MW-4	10/4/94	NA	ND	ND	ND	ND	NA	NA
	5/12/95	ND	ND	ND	ND	ND	NA	NA
	1/4/96	900	ND	ND	ND	ND	ND	ND
	4/24/96	NA	ND	ND	ND	ND	NA	NA
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	0.7	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
NMW-5	5/12/95	13,000	660	13,000	1,900	11,000	Naphthalene - 450 Acenaphthylene - 66 Fluorene - 0.6 Phenanthrene - 0.42 Anthracene - 0.07	NA
	1/4/96	6,600	4.6	22	24	230	Naphthalene - 29 Acenaphthylene - 13 Fluorene - 0.8	14
	4/24/96	NA	ND	0.6	1.1	2.9	NA	NA
	7/11/96	ND	ND	ND	ND	2.7	NA	NA
	11/3/96	NA	ND	ND	2.5	5.6	NA	NA
	2/28/97	5,440	70.3	23.5	88.6	230	Naphthalene - 28.5	NA
	5/29/97	4,480	34.9	156	7.90	554	NA	NA
MW-6	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA
MW-7	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA

Table 3

TERRA VAC

Groundwater Analytical Results from Monitoring Well Locations
Rose's Parking Lot
Portland, Oregon

Well	Sample Date	Parameters, ug/L						Dissolved Lead (µg/L)
		TPH-G	Benzene	Toluene	Ethylbenzene	Xylenes	PAHs()	
ODEQ Groundwater Cleanup Levels		**NLE**	**5**	**1,000**	**700**	**10,000**	**Napthalene = 28**	**5**
MW-8	4/24/96	ND	ND	ND	ND	ND	NA	ND
	7/11/96	ND	ND	ND	ND	ND	NA	NA
	11/3/96	NA	ND	ND	ND	ND	NA	NA
	2/28/97	ND	ND	ND	ND	ND	NA	NA
	5/29/97	ND	ND	ND	ND	ND	NA	NA

Notes:

Sampling between 3/29/94 and 11/3/96 performed by GeoEngineers. Data from 1/21/97 Groundwater Report.

Wells MW-2, MW-3, and MW-5 redrilled 1/23-1/25/97, and renamed NMW-2, NMW-3, and NMW-5 respectively.

* MW-1 sampled for lead 12/11/96.

PAHs polycyclic aromatic hydrocarbons. Only analytes detected are listed. Refer to analytical results (Appendix A) for a complete list of analytes and their respective detection limits.

ug/L Micrograms per liter, or parts per billion

ND Not Detected at the reporting limits

NA Not Analyzed

TPH-G Total petroleum hydrocarbons within the gasoline range (benzene to naphthalene).

APPENDIX A

- LABORATORY REPORTS

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

BOTHELL ▪ (425) 481-9200 ▪ FAX 485-2992
SPOKANE ▪ (509) 924-9200 ▪ FAX 924-9290
PORTLAND ▪ (503) 643-9200 ▪ FAX 644-2202

Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 5/29/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029 GW	Received: 5/30/97
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 6/4/97 13:17

ANALYTICAL REPORT FOR SAMPLES:

Sample Description	Laboratory Sample Number	Sample Matrix	Date Sampled
MW-1	P705447-01	Water	5/29/97
NMW-2	P705447-02	Water	5/29/97
NMW-3	P705447-03	Water	5/29/97
MW-4	P705447-04	Water	5/29/97
NMW-5	P705447-05	Water	5/29/97
MW-6	P705447-06	Water	5/29/97
MW-7	P705447-07	Water	5/29/97
MW-8	P705447-08	Water	5/29/97
Blank	P705447-09	Water	5/29/97

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Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 5/29/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029 GW	Received: 5/30/97
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 6/4/97 13:17

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-1			**P705447-01**				**Water**	
Benzene	0670002	6/1/97	6/1/97		5.00	**65.9**	ug/l	
Toluene	"	"	"		5.00	**49.3**	"	
Ethylbenzene	"	"	"		5.00	**205**	"	
Xylenes (total)	"	"	"		10.0	**1010**	"	
Gasoline Range Hydrocarbons	"	"	"		800	**14900**	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*97.6*	%	
NMW-2			**P705447-02**				**Water**	
Benzene	0570650	5/31/97	5/31/97		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*81.6*	%	
NMW-3			**P705447-03**				**Water**	
Benzene	0670002	6/1/97	6/1/97		0.500	**17.4**	ug/l	
Toluene	"	"	"		0.500	**0.912**	"	
Ethylbenzene	"	"	"		0.500	**3.55**	"	
Xylenes (total)	"	"	"		1.00	**15.3**	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	**365**	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*68.2*	%	
MW-4			**P705447-04**				**Water**	
Benzene	0570650	5/31/97	5/31/97		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*83.8*	%	

North Creek Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

Tabatha A Brochu, Project Manager

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

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SPOKANE ▪ (509) 924-9200 ▪ FAX 924-9290
PORTLAND ▪ (503) 643-9200 ▪ FAX 644-2202

Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 5/29/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029 GW	Received: 5/30/97
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 6/4/97 13:17

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
NMW-5			**P705447-05**				**Water**	
Benzene	0670002	6/1/97	6/1/97		5.00	**34.9**	ug/l	
Toluene	"	"	"		5.00	**156**	"	
Ethylbenzene	"	"	"		5.00	**7.90**	"	
Xylenes (total)	"	"	"		10.0	**554**	"	
Gasoline Range Hydrocarbons	"	"	"		800	**4480**	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*90.0*	%	
MW-6			**P705447-06**				**Water**	
Benzene	0670002	6/1/97	6/1/97		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*92.0*	%	
MW-7			**P705447-07**				**Water**	
Benzene	0670002	6/1/97	6/1/97		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*87.8*	%	
MW-8			**P705447-08**				**Water**	
Benzene	0670002	6/1/97	6/1/97		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*87.6*	%	
Blank			**P705447-09**				**Water**	
Benzene	0570650	5/31/97	5/31/97		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*71.2*	%	

North Creek Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

Tabatha A Brochu, Project Manager

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PORTLAND ▪ (503) 643-9200 ▪ FAX 644-2202

Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 5/29/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029 GW	Received: 5/30/97
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 6/4/97 13:17

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0570650	**Date Prepared: 5/31/97**					**Extraction Method: EPA 5030**				
Blank	**0570650-BLK1**									
Benzene	5/31/97			ND	ug/l	0.500				
Toluene	"			ND	"	0.500				
Ethylbenzene	"			ND	"	0.500				
Xylenes (total)	"			ND	"	1.00				
Gasoline Range Hydrocarbons	"			ND	"	80.0				
Surrogate: 4-BFB	"	*50.0*		*45.5*	"	*50.0-150*	*91.0*			
LCS	**0570650-BS1**									
Gasoline Range Hydrocarbons	5/31/97	1250		1290	ug/l	50.0-150	103			
Surrogate: 4-BFB	"	*50.0*		*45.7*	"	*50.0-150*	*91.4*			
LCS	**0570650-BS2**									
Benzene	5/31/97	20.0		20.6	ug/l	67.0-130	103			
Toluene	"	20.0		19.0	"	75.0-126	95.0			
Ethylbenzene	"	20.0		17.8	"	76.0-124	89.0			
Xylenes (total)	"	60.0		53.8	"	75.0-126	89.7			
Surrogate: 4-BFB	"	*50.0*		*45.0*	"	*50.0-150*	*90.0*			
Duplicate	**0570650-DUP1**		**P705397-01**							
Gasoline Range Hydrocarbons	5/31/97		ND	ND	ug/l			50.0		
Surrogate: 4-BFB	"	*50.0*		*39.3*	"	*50.0-150*	*78.6*			
Duplicate	**0570650-DUP2**		**P705447-02**							
Gasoline Range Hydrocarbons	5/31/97		ND	ND	ug/l			50.0		
Surrogate: 4-BFB	"	*50.0*		*41.4*	"	*50.0-150*	*82.8*			
Matrix Spike	**0570650-MS1**		**P705447-03**							
Benzene	5/31/97	20.0	17.4	31.8	ug/l	67.0-130	**72.0**			
Toluene	"	20.0	0.912	20.1	"	75.0-126	**95.9**			
Ethylbenzene	"	20.0	3.55	20.1	"	76.0-124	**82.8**			
Xylenes (total)	"	60.0	15.3	62.8	"	75.0-126	**79.2**			
Surrogate: 4-BFB	"	*50.0*		*42.8*	"	*50.0-150*	*85.6*			
Matrix Spike Dup	**0570650-MSD1**		**P705447-03**							
Benzene	5/31/97	20.0	17.4	32.4	ug/l	67.0-130	**75.0**	13.0	4.08	
Toluene	"	20.0	0.912	21.0	"	75.0-126	**100**	13.0	4.19	
Ethylbenzene	"	20.0	3.55	20.9	"	76.0-124	**86.7**	15.0	4.60	

North Creek Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

Tabatha A Brochu, Project Manager

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Environmental Laboratory Services

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PORTLAND ▪ (503) 643-9200 ▪ FAX 644-2202

Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 5/29/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029 GW	Received: 5/30/97
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 6/4/97 13:17

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Matrix Spike Dup (continued)	**0570650-MSD1**		**P705447-03**							
Xylenes (total)	5/31/97	60.0	15.3	66.1	ug/l	75.0-126	**84.7**	13.0	**6.71**	
Surrogate: 4-BFB	"	*50.0*		*45.3*	"	*50.0-150*	*90.6*			
Batch: 0670002	**Date Prepared: 6/1/97**					**Extraction Method: EPA 5030**				
Blank	**0670002-BLK1**									
Benzene	6/1/97			**ND**	ug/l	**0.500**				
Toluene	"			**ND**	"	**0.500**				
Ethylbenzene	"			**ND**	"	**0.500**				
Xylenes (total)	"			**ND**	"	**1.00**				
Gasoline Range Hydrocarbons	"			**ND**	"	**80.0**				
Surrogate: 4-BFB	"	*50.0*		*35.3*	"	*50.0-150*	*70.6*			
LCS	**0670002-BS1**									
Gasoline Range Hydrocarbons	6/1/97	1250		1170	ug/l	50.0-150	93.6			
Surrogate: 4-BFB	"	*50.0*		*43.0*	"	*50.0-150*	*86.0*			
LCS	**0670002-BS2**									
Benzene	6/1/97	20.0		18.5	ug/l	67.0-130	92.5			
Toluene	"	20.0		18.1	"	75.0-126	90.5			
Ethylbenzene	"	20.0		18.6	"	76.0-124	93.0			
Xylenes (total)	"	60.0		55.8	"	75.0-126	93.0			
Surrogate: 4-BFB	"	*50.0*		*45.7*	"	*50.0-150*	*91.4*			

NORTH CREEK ANALYTICAL
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Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 5/29/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029 GW	Received: 5/30/97
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 6/4/97 13:17

Notes and Definitions

#	Note
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
Recov.	Recovery
RPD	Relative Percent Difference

North Creek Analytical, Inc.

Tabatha A Brochu, Project Manager

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

18939 120th Avenue N.E., Suite 101, Bothell, WA 98011-9508 (206) 481-9200 FAX 485-2992
East 11115 Montgomery, Suite B, Spokane, WA 99206-4779 (509) 924-9200 FAX 924-9290
9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202

CHAIN OF CUSTODY REPORT

Work Order # D705447

REPORT TO: Terra Vac 10710 Meridian Ave No. 4th Suite 202 Seattle, WA 98133	INVOICE TO:
ATTENTION: Tim Warner	ATTENTION: To Left
ADDRESS: As Above	ADDRESS:
PHONE: (206) 362-8294 FAX: (206) 362-9528	P.O. NUMBER: 32-0029- NCA QUOTE #:
PROJECT NAME: Ross's Parking Lot	
PROJECT NUMBER: 32-0029 GW	
SAMPLED BY: Jim Orr	

TURNAROUND REQUEST in Business Days *

Organic & Inorganic Analyses: 10 (Standard) | 7 | 5 | 4 | 3 | 2 | 1 | Same Day

Fuels & Hydrocarbon Analyses: 5 (Standard) | 3-4 | 2 | 1 | Same Day

OTHER Specify:

* Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	NCA SAMPLE ID (Laboratory Use Only)	Analysis Request: ORIGINAL BTEX PAH	MATRIX (W, S, A, O)	# OF CONTAINERS	COMMENTS
1.	MW-1	5-29-97/1330		X	W	2	
2.	NMW-2	/1545		X			
3.	NMW-3	/1540		X			
4.	MW-4	/1535		X			
5.	NMW-5	/1530		X			
6.	MW-6	/1345		X			
7.	MW-7	/1340		X			
8.	MW-8	/1335		X			
9.	Blank	/1030		X			
10.		2002					

RELINQUISHED BY (Signature): James Orr	DATE: 5-30-97	RECEIVED BY (Signature): Claire Knill	DATE: 5/30/97
PRINT NAME: James Orr	FIRM: Terra Vac TIME: 0900	PRINT NAME: Claire Knill	FIRM: NCA TIME: 09:05
RELINQUISHED BY (Signature):	DATE:	RECEIVED BY (Signature):	DATE:
PRINT NAME:	FIRM: TIME:	PRINT NAME:	FIRM: TIME:

ADDITIONAL REMARKS: PO # will be Faxed. Please Run any samples for PAH If above are detected run TPH-G

PAGE OF

26-94-0025

TERRA VAC

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
JUL 15 1997
NORTHWEST REGION

SITE INVESTIGATION REPORT:

ROSE'S PARKING LOT
330 NORTHWEST 23RD AVENUE
PORTLAND, OREGON

May 28, 1997

PREPARED FOR:

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Kell, Alterman & Runstein, L.L.P.
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Portland, Oregon 97204-1194

PREPARED BY:

Paul V. Bianco
Project Engineer

Timothy Warner
Project Manager

1.0 EXECUTIVE SUMMARY

During the week of January 21, 1997, Terra Vac drilled four new wells and redrilled four existing wells to install a full-scale dual phase soil vapor extraction (DVE) system at the Rose's Parking Lot site in Portland, Oregon. The DVE system incorporates eight groundwater/vapor extraction wells and four soil vapor extraction (SVE) wells. The DVE system is designed to remediate impacted soil and groundwater caused by leaking underground storage tanks (USTs). The following report details the site driling activities and outlines the remediation system.

2.0 BACKGROUND INFORMATION

2.1 Site Description

The site is located at 330 Northwest 23rd Avenue, Portland, Oregon. It is bound by NW 23rd to the west and by NW Flanders Street to the north. The site is approximately 1/3 acre in size and is relatively flat, sloping towards NW Flanders Street. A site location map and a site map are included as Figures 1 and 2, respectively.

The site was occupied by service stations from the 1950s to the 1970s. These service stations were operated by Unocal (Union Oil Company of California), AMOCO (AMOCO Oil Company), and Gull (Gull Industries, Inc.). All above ground structures have been removed. The site is currently an open paved parking lot.

A review of reports previously conducted for this site indicate a service station was constructed on the site in 1954. This station had three pump islands, two 5,000-gallon USTs, one 550-gallon waste oil tank, and a service station. The station was renovated in 1964 to include two pump islands, two 5,000-gallon USTs, one 550-gallon waste oil tank, and a service station. It has been reported that the gasoline USTs have been removed from the site.

2.2 Previous Work

Numerous investigations have been conducted at this site including the following:

"*Subsurface Investigation*", prepared by Hahn and Associates, Inc. on February 2, 1994

"*Subsurface Groundwater Investigation, Former Service Station Site*", prepared by RZA AGRA, Inc. in April 1994.

"*Subsurface Groundwater Investigation, Former Service Station Site*", prepared by AGRA, Inc. in October 1994.

"*Subsurface Assessment, Rose's Parking Lot*", prepared by GeoEngineers on August 28, 1995.

"*Results of Quarterly Ground Water Monitoring*", prepared by GeoEngineers on April 10, 1996.

"*Results of Off-site Subsurface Explorations and Quarterly Ground Water Monitoring*", prepared by GeoEngineers on June 13, 1996.

"*Results of Quarterly Ground Water Monitoring*", prepared by GeoEngineers on November 15, 1996.

In conjunction with these investigations, numerous soil samples and groundwater samples have been collected from both on- and off-site locations. Analytical results of these samples indicate that both gasoline-range and diesel-range hydrocarbons, and the gasoline additives lead, EDB, and EDC have been released, impacting the subsurface soil and groundwater.

The apparent direction of groundwater flow was reported to be northeast across the site at an estimated gradient of 0.08 feet/feet. The average depth to groundwater across the site at that time was reported to be approximately 22 feet below the top of well casings (TOC). Benzene, at concentrations exceeding Oregon State Department of Environmental Quality (ODEQ) cleanup levels, has been detected in groundwater from monitoring wells MW-2 and MW-3, while wells MW-1 and MW-5 have periodically contained phase separated petroleum hydrocarbons. Additionally, groundwater from wells MW-1, MW-3, and MW5 also contain the BTEX constituents, naphthalene, and the gasoline additives of lead, EDB, and EDC at concentrations above ODEQ cleanup levels.

Salient site characteristics that effect site remediation include:

- Subsurface soil has been described as fill to approximately 10 - 15 feet below ground surface (bgs). Beneath the fill, native soil to 40 feet bgs has been described as fine to medium-grained sands and silty sands. Using slug testing, GeoEngineers measured hydraulic conductivities of 5×10^{-7} m/s (5×10^{-5} cm/s) to 8×10^{-7} m/s (8×10^{-5} cm/s) in the native soil.

- Site data indicates that subsurface soil is most impacted in the capillary fringe and "smear" zones (from 20 - 28 feet bgs). Vadose zone soils are also impacted in the location of the former UST's. Gasoline-range total petroleum hydrocarbon concentrations to up 6,550 parts per million (ppm) have been reported.

- Seasonally, the groundwater table fluctuates from approximately 24 - 28 feet bgs. These depths effectively set the upper and lower limits of the "smear" zone.

- Historically, free phase gasoline-range petroleum hydrocarbons have been reported at MW-3, MW-5, and RW-1.

- During a series of 8-hour EFRT tests, GeoEngineers was able to depress the water table across the site, indicating site dewatering is achievable. Analyses of recovered soil vapors indicated that soil vapor extraction (SVE) at wells RW-1, MW-1, and MW-5 could vent close to 200 pounds of gasoline range petroleum hydrocarbons per 24-hour period.

In summary, subsurface impact at the site is greatest just above and below the groundwater table. To reach ODEQ site closure requirements, remediation efforts must clean the vadose zone soils around the former UST's in addition to the groundwater and the soil in the zone from approximately 5 feet above and 5 feet below seasonal groundwater extremes.

2.3 Geology and Hydrogeology

The site is located at an elevation of approximately 150 feet above mean sea level (msl) in the Portland Basin. Quarternary Alluvium comprises the near-surface geology to approximately 100 feet below ground surface (bgs). This alluvium consists of silt, sand, and clay. The Quarternary Alluvium is underlain by the Pliocene Troutdale Formation to a depth of approximately 250 feet bgs. This formation consists of silts, clays, sands, and occasional gravels. The Pliocene Troutdale Formation is underlain by the Miocene Columbia River Basalt (CRB). Groundwater is first found within the Quarternary Alluvium. The primary aquifer, however, is the Troutdale Gravel Aquifer found at approximately 100 feet bgs.

3.0 REMEDIATION WELLS

3.1 Well Design

Well locations are shown on Figure 2. Locations were chosen to provide remediation across the soil and groundwater plumes delineated by GeoEngineers (Figure 3). In general, well depths and screened intervals are based on seasonal groundwater levels, while well spacing is based upon soil type and conservative estimates of the dual vacuum extraction DVE radius of influence (ROI) at each well. Final well construction details were determined in the field using information obtained by Terra Vac during drilling activities.

Remediation wells were installed on January 23, 24, and 25, 1997 in accordance with Terra Vac's Drilling, Sampling, and Well Construction protocols (Appendix A). Eight soil borings were advanced to 38 feet bgs and a DVE well was constructed in each boring. Four of the eight wells installed were redrilled existing monitoring wells.

Remediation wells were constructed of 4-inch diameter PVC well casing. The DVE wells are screened from approximately 15 to 37 feet bgs. Screened intervals consist of 0.01-inch slot PVC screen surrounded by a 10-20 Colorado Silica Sand filter pack extending from approximately 13 feet bgs to the bottom of the well. The annular space between the top of the filter pack and ground surface is sealed with hydrated bentonite. Well construction details are summarized in Table 1 and pictured on the drilling logs contained in Appendix B.

3.2 Drilling and Sampling Methods

Drilling was performed by Cascade Drilling, Inc. using a CME-75 drill rig and 15-inch O.D. hollow stem auger. Augers were steam-cleaned prior to arrival on site, between each boring, and at the conclusion of drilling activities. A Terra Vac field geologist was present to provide oversight during drilling activities.

Soil samples were collected at 5-foot intervals in each of the four newly installed borings beginning at 5 feet bgs. Soil samples were not collected from wells NRW-1, NMW-2, NMW-3, and NMW-5 which were redrilled monitoring wells. Material encountered above 5 feet bgs showed no signs of impact by petroleum hydrocarbons. Samples were collected using 1-3/8-inch I.D. by 18-inch split spoon samplers, which were decontaminated between sampling events to minimize cross contamination. Each soil sample was visually inspected, logged for soil type, and subsampled for field screening and possible laboratory analyses.

Field screening involved placing a subsample of soil into a sealable plastic bag. Headspace vapors in the bag were allowed to equilibrate for at least ten minutes, and then analyzed with a calibrated photoionization detector (PID). Analytical samples were prepared by completely filling precleaned glass I-Chem containers with the selected portion of the soil sample. Containers were properly labeled and immediately placed into a pre-cooled ice chest. At the conclusion of drilling activities, selected analytical samples were delivered to North Creek Analytical under proper temperature and chain-of-custody control.

Soil samples for laboratory analyses were selected based upon visual observations, field screening results, and to best characterize gasoline-range petroleum hydrocarbon impact to the vadose zone/groundwater interface at each soil boring location.

Drill cuttings were placed on 6-mil plastic sheeting, covered with plastic sheeting and stored on-site pending the results of soil analyses. Decontamination water was contained in 55-gallon DOT-approved drums and stored on-site pending the results of water analyses. Terra Vac supervised the proper removal and disposal of all cuttings and drilling fluids.

4.0 GEOLOGY AND GROUNDWATER

Silty sands and sandy silts were encountered in the on-site soils during the installation of the remediation wells. The sands were typically comprised of very fine to medium grained sands. Clayey sands were found in DVE-3 and DVE-4 from approximately 2-inches bgs to approximately 15 feet bgs in DVE-3 and to approximately 5 feet bgs in DVE-4. Gravel fills were encountered in NRW-1, NMW-2, NMW-3, and DVE-2 to depths ranging up to 11 feet bgs. During drilling, groundwater was encountered at approximately 15 feet bgs in NRW-1, NMW-2, NMW-3 and NMW-5. Groundwater was encountered at approximately 20 feet bgs in DVE-1, at 10 feet bgs in DVE-2 and DVE-3, and at 23 feet bgs in DVE-4.

5.0 SOIL SCREENING AND ANALYSES

Volatile organic compounds (VOCs) were detected during the installation of DVE-1, DVE-2, DVE-3, and DVE-4. PID readings were not collected during the redrilling to the monitoring wells. Field screening results are presented on the drilling logs contained in Appendix B.

Samples for laboratory analyses were collected from boring at 15 feet bgs and analyzed for concentrations of total petroleum hydrocarbons in the gasoline-range (TPH-G) using method WTPH-G, and benzene, toluene, ethylbenzene, and total xylenes (BTEX) using method EPA 8020A.

Analytical results for soil samples collected from the site showed TPH-G ranging from not detected (minimum detection limit was 2.00 mg/Kg) to 2.23 mg/kg (milligrams per kilogram) at DVE-2. Benzene concentrations were below the minimum detection limit of 0.0500 mg/Kg for DVE-1, DVE-2, and DVE-4. Analytical results are summarized in Table 2. Figure 4 provides a graphical depiction of the soil analytical results. A complete analytical laboratory report for soil samples is contained in Appendix C.

6.0 SYSTEM DESIGN AND CONFIGURATION

6.1 Remediation Theory

The primary function of the DVE system is to remove free product and to remediate the gasoline-range hydrocarbon impacted soil and groundwater. The DVE system is designed to extract and treat the impacted soil and groundwater from the eight remediation wells located on the subject site. The DVE process utilizes air flow to entrain groundwater and transport the entrained water to the surface for treatment. In addition, three submersible groundwater pumps were installed to assist in the extraction of groundwater. The water level will be lowered to expose soils in the saturated zone for treatment by soil vapor extraction.

Volatile constituents in the groundwater partition to the vapor phase. The extracted groundwater will be removed from the vapor stream in the vapor-liquid separator. The vapor stream will be discharged to the atmosphere under an ODEQ air permit. The groundwater stream will be discharged to the on-site combined sewer under a City of Portland permit.

6.2 System Piping

DVE well heads are located below grade in traffic-rated well boxes which allow access to the well head flow control valves, gauges, and soil vapor sampling ports. The remediation wells are connected to the equipment compound by subsurface piping.

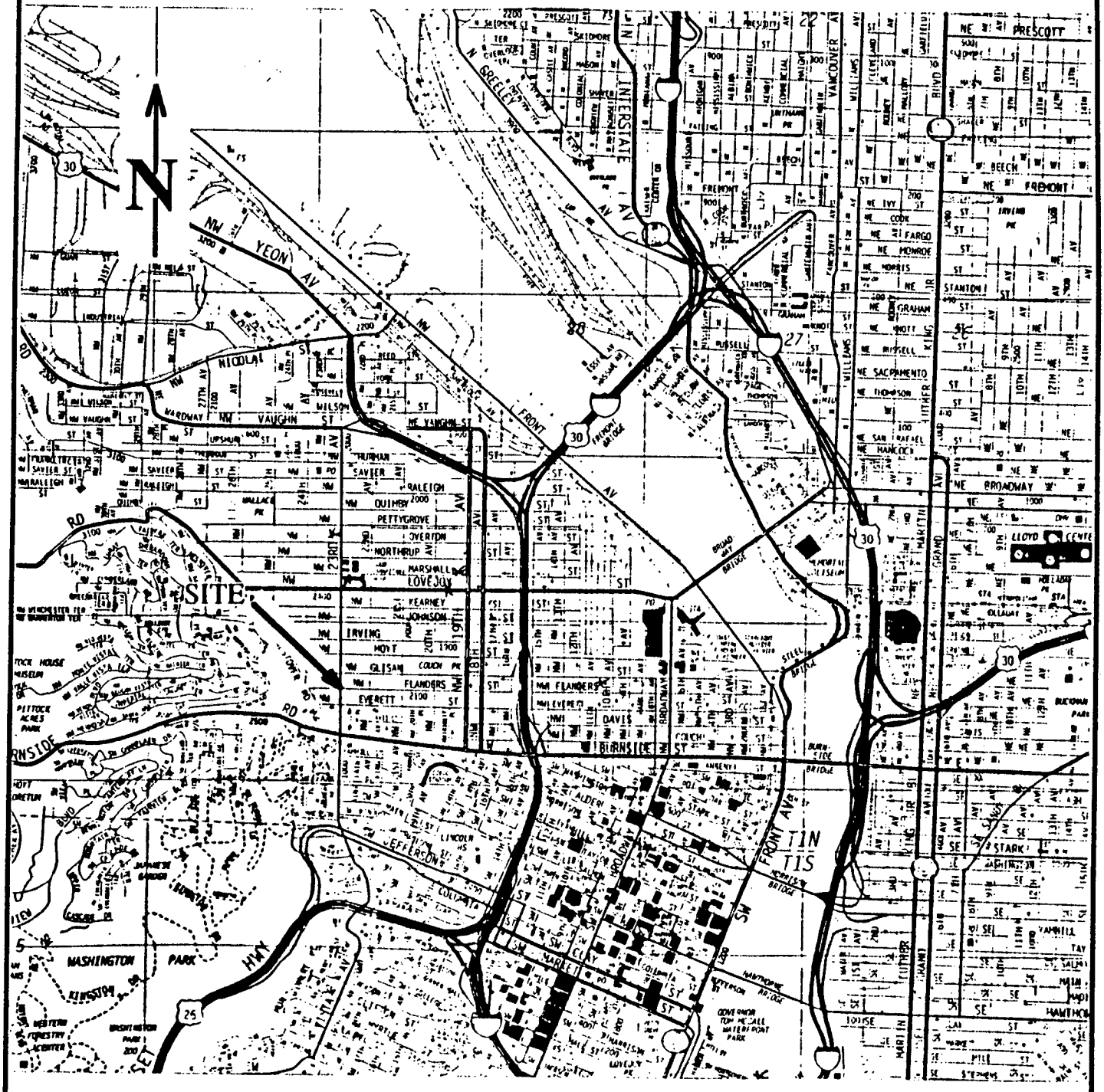
6.3 System Equipment and Design Parameters

The DVE system is designed to operate at a vacuum up to 14 inches of mercury (in. Hg.) and at flows up to 400 standard cubic feet per minute (scfm). Vacuum is provided by a 40 horsepower positive displacement blower which is protected from moisture by a 150 gallon liquid/vapor separator. As soil vapors pass through the separator, entrained moisture is removed. A high water level switch in the separator is wired to automatically shut down the remediation system to prevent water from reaching the vacuum blower.

Valves, gauges, and sampling ports are provided at the blower for flow control, measurement of system performance parameters, and the collection of recovered soil vapors for chemical analyses. A generalized schematic of the DVE remediation system equipment configuration is presented in Figure 5.

7.0 LIMITATIONS

This report has been prepared for the use of Kell, Alterman, & Runstein, L.L.P. Information contained in this report is not applicable to other sites or remediation systems. Our interpretations of subsurface conditions at this site are based only on information made available for our review and data gathered as part of the remediation system installation. Within reasonable limitations, our services have been executed in accordance with generally accepted practices in the local area at the time these services were performed.



Source: The Thomas Guide, 1994
Portland Metro Area
Street Guide and Directory

Figure 1
Site Location Map
Rose's Parking Lot
Portland, OR

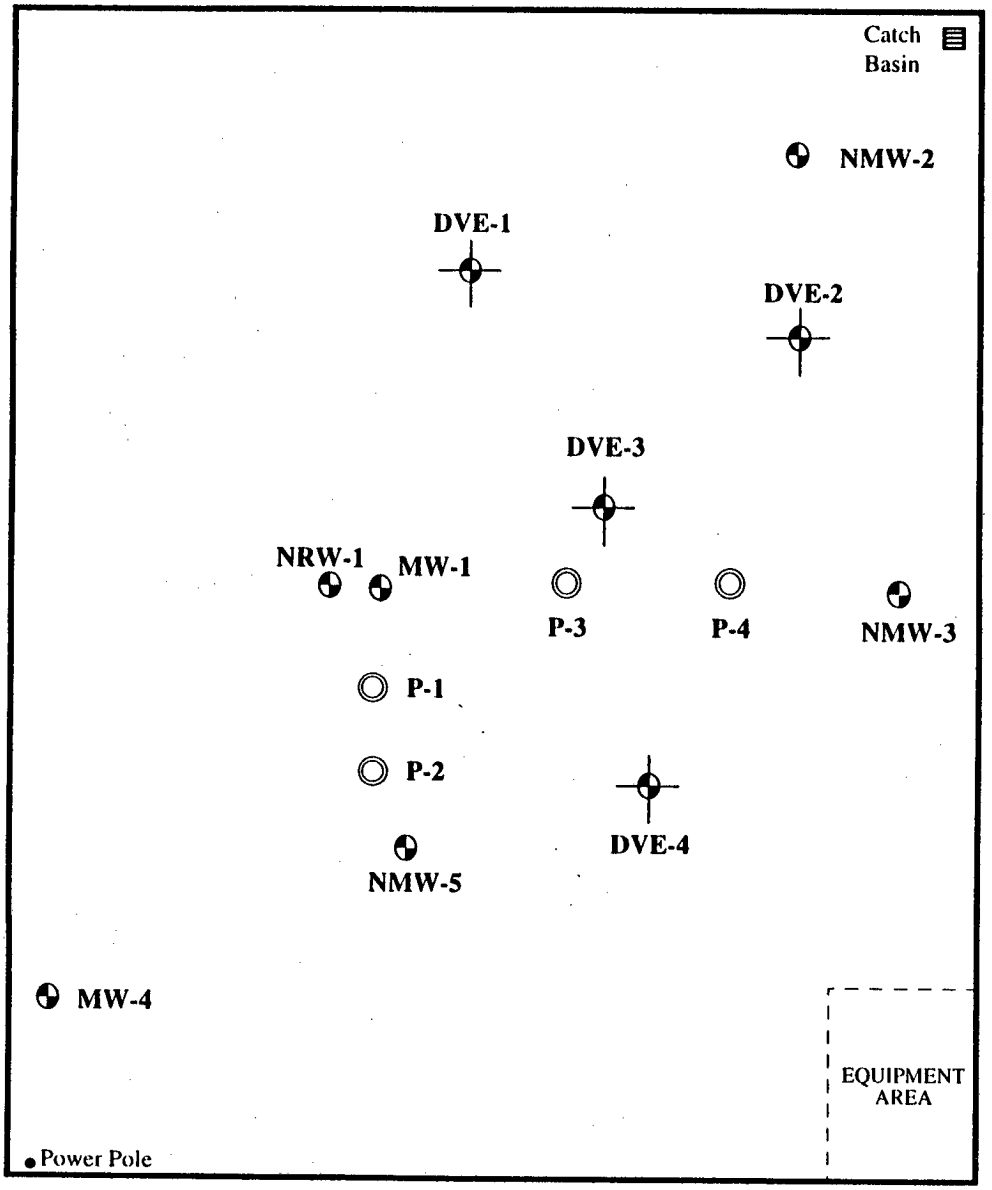
TERRA VAC

Project No.	32-0029
Date	February 12, 1997
Revision	MAM-1

N.W. FLANDERS STREET

N

N. W. 23RD AVENUE



LEGEND	
◓	Existing Recovery or Monitoring Well
✛	Dual Vacuum Extraction Well
◎	Existing Monitoring Probe

Notes:
(1) Base map from GeoEngineers report: "Subsurface Assessment Rose's Parking Lot Portland, Oregon" August 28, 1995. Site Plan, Figure 2

SCALE (Approximate ft.)

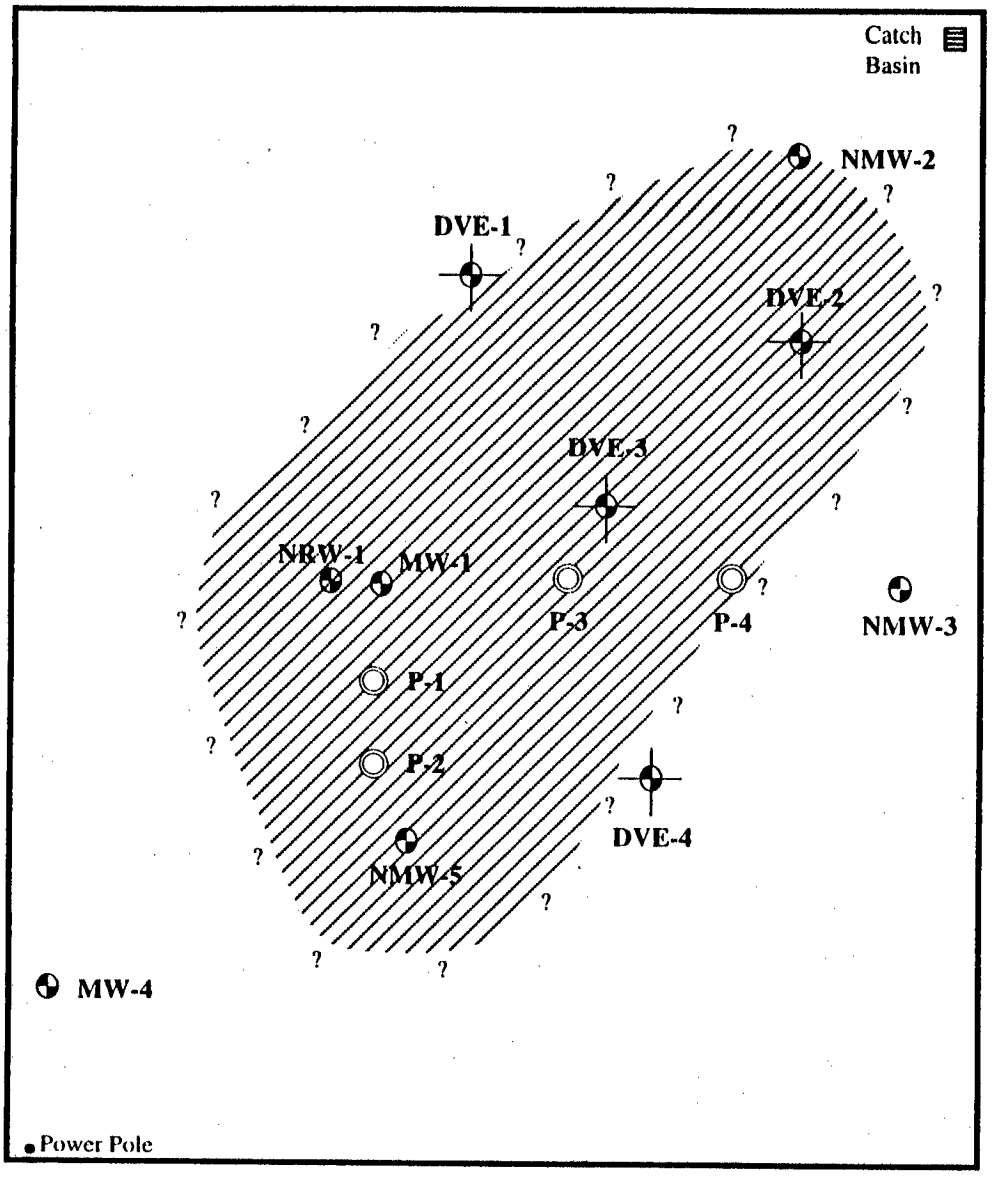
0 20 40

SITE MAP	Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon	TERRA VAC	Project No. 32-0029 Date May 28, 1997 Scale 1 Inch = 20 Feet Revision MAM -1	Figure 2

N.W. FLANDERS STREET

N

N. W. 23RD AVENUE



LEGEND

- Existing Recovery or Monitoring Well
- Dual Vacuum Extraction Well
- Existing Monitoring Probe
- Estimated Area of Subsurface Soil Contamination (1)

SCALE (Approximate ft.)

0 20 40

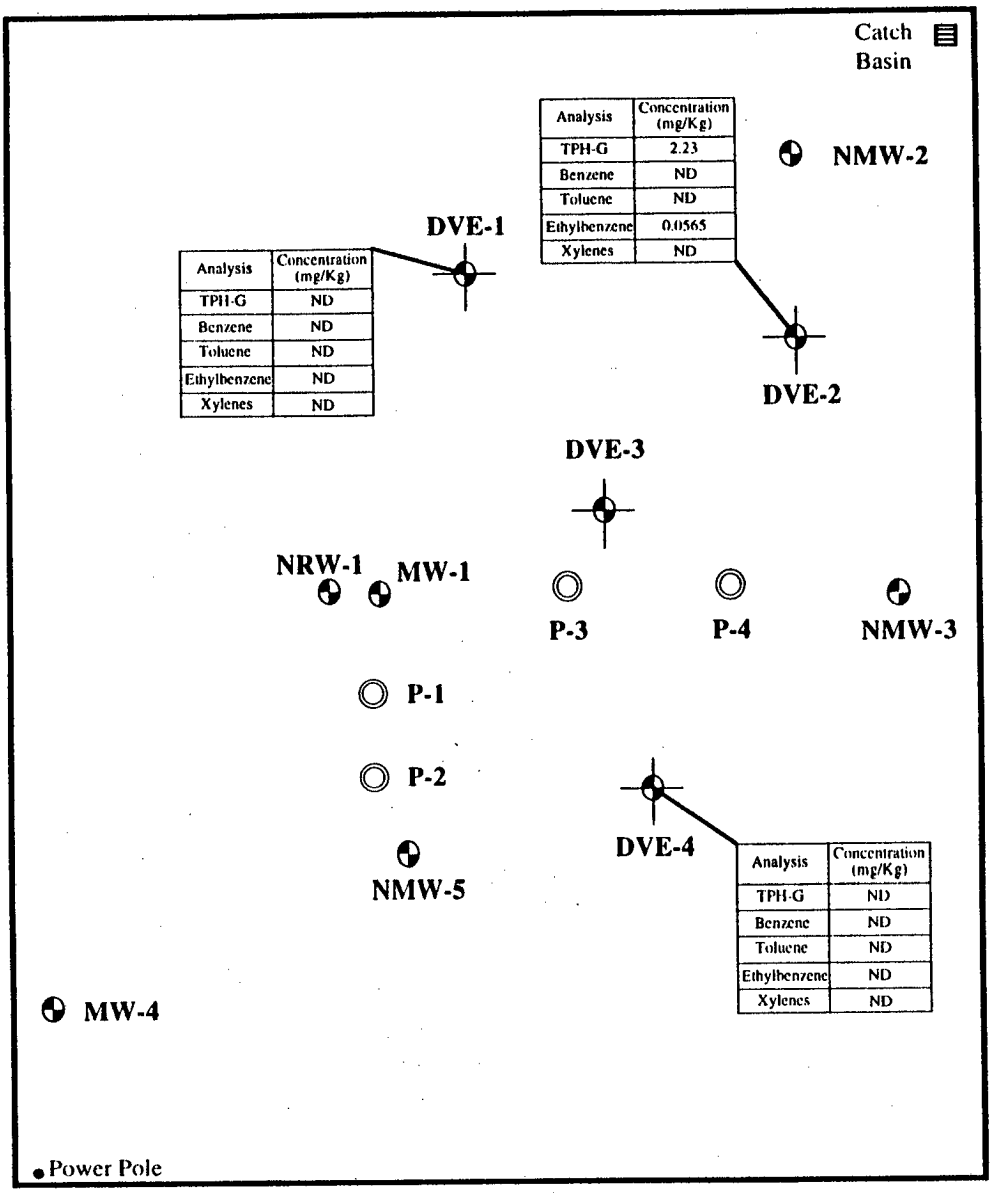
Notes:
(1) Base map from GeoEngineers report: "Subsurface Assessment Rose's Parking Lot Portland, Oregon" August 28, 1995. Site Plan, Figure 2

Estimated Contamination Plume	**Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon**	TERRA VAC	Project No.	32-0029	Figure 3
			Date	May 28, 1997	
			Scale	1 Inch = 20 Feet	
			Revision	MAM -1	

N.W. FLANDERS STREET

N

N. W. 23RD AVENUE



Analysis	Concentration (mg/Kg)
TPH-G	2.23
Benzene	ND
Toluene	ND
Ethylbenzene	0.0565
Xylenes	ND

Analysis	Concentration (mg/Kg)
TPH-G	ND
Benzene	ND
Toluene	ND
Ethylbenzene	ND
Xylenes	ND

Analysis	Concentration (mg/Kg)
TPH-G	ND
Benzene	ND
Toluene	ND
Ethylbenzene	ND
Xylenes	ND

LEGEND

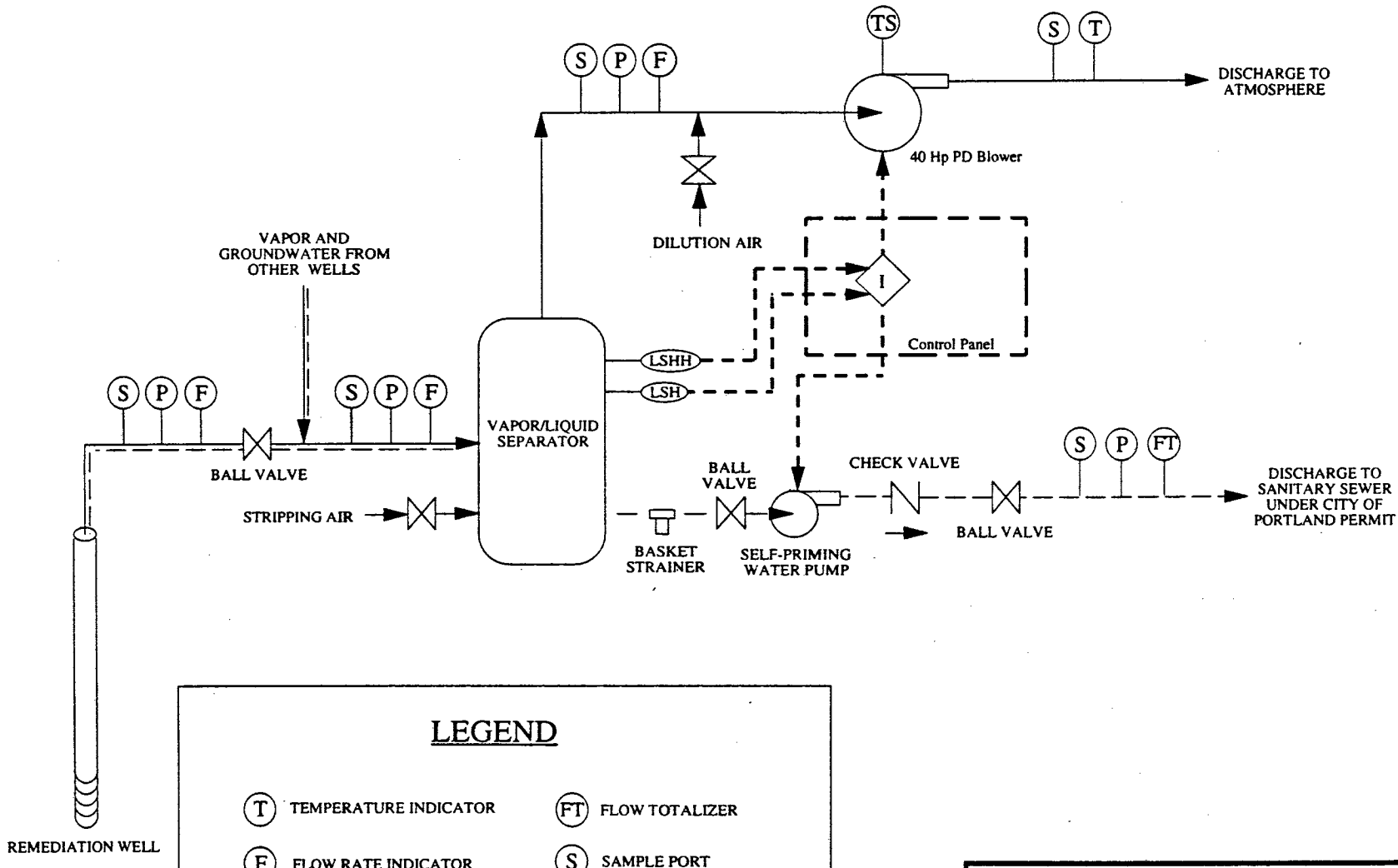
- Existing Recovery or Monitoring Well
- Dual Vacuum Extraction Well
- Existing Monitoring Probe

Notes:
(1) Base map from GeoEngineers report: "Subsurface Assessment Rose's Parking Lot Portland, Oregon" August 28, 1995. Site Plan, Figure 2

SCALE (Approximate ft.)

0 20 40

Soil Analytical Data	**Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon**	TERRA VAC	Project No. 32-0029 Date May 28, 1997 Scale 1 Inch = 20 Feet Revision MAM -1	Figure 4



LEGEND

- T — TEMPERATURE INDICATOR
- F — FLOW RATE INDICATOR
- P — PRESSURE / VACUUM INDICATOR
- LSHH — LEVEL SWITCH HIGH-HIGH
- LSH — LEVEL SWITCH HIGH
- I — INTERLOCK
- FT — FLOW TOTALIZER
- S — SAMPLE PORT
- TS — TEMPERATURE SWITCH
- GROUNDWATER FLOW
- AIR FLOW
- CONTROL LINES

FIGURE 5
PROCESS & INSTRUMENTATION DIAGRAM
ROSE'S PARKING LOT
330 N.W. 23rd AVENUE
PORTLAND, OR

TERRA VAC

Project No.	32-0029
Date	May 28, 1997
Scale	N.T.S.
Revision	PVB-1

Table 1

Remediation Well Construction Data
Rose's Parking Lot
Portland, Oregon

Well Identification	Date Installed	Total Depth (feet)	Screen Interval		Well Diameter (inches)
			Top (feet)	Bottom (feet)	
NRW-1	1/24/97	38	15.5	37.5	4
NMW-2	1/24/97	38	15	37	4
NMW-3	1/25/97	38	15.5	37.5	4
NMW-5	1/23/97	38	15	37	4
P-1	11/2/95	22.5	12	22	2
P-2	11/2/95	22.5	12	22	2
P-3	11/2/95	22.5	12	22	2
P-4	11/2/95	22.5	12	22	2
DVE-1	1/24/97	38	15	37	4
DVE-2	1/24/97	38	15	37	4
DVE-3	1/23/97	38	16	38	4
DVE-4	1/24/97	38	15.5	37.5	4

Table 2

Subsurface Soil Analytical Results from Drilling
Rose's Parking Lot
Portland, Oregon

Sample ID	Sample Date	Parameters, mg/kg					
		TPH-D	TPH-G	Benzene	Toluene	Ethylbenzene	Total Xylenes
DVE-1	2/3/97	NA	ND	ND	ND	ND	ND
DVE-2	2/3/97	NA	2.23	ND	ND	0.0565	ND
DVE-4	2/3/97	NA	ND	ND	ND	ND	ND
SOIL PILE	2/3/97	NA	203	ND	0.82	1.26	6.66
SOIL PILE	2/5/97	20.4	NA	NA	NA	NA	NA

Notes:

mg/kg	Milligrams per kilogram
TPH-G	Total petroleum hydrocarbons within the gasoline range (benzene to naphthalene).
TPH-D	Total petroleum hydrocarbons within the diesel range.
ND	Not Detected
NA	Not Analyzed

APPENDIX A

TERRA VAC - STANDARD OPERATING PROCEDURES

TERRA VAC
STANDARD OPERATING PROCEDURES

DUAL ENTRAINMENT, GROUNDWATER MONITORING, OR EXTRACTION WELL CONSTRUCTION PROTOCOL

Drilling and Sampling

Well borings will be drilled using hollow stem augers (or air rotary drill rigs) with sufficient diameter to accommodate well casings and proper annular space during well construction. All well borings will be drilled a minimum of 10 feet below the water table unless a confining layer is encountered. Drilling will not progress more than 5 feet into any confining layer. A 10 inch inside diameter hollow stem auger will typically be used for construction of 4-inch diameter dual extraction well.

Drilling and sampling procedures will be conducted as per Terra Vac's Standard Operating Procedures, Drilling and Sampling Protocol using a Hollow Stem Auger, or Air Rotary Drilling Protocol, as applicable. Decontamination procedures employed during drilling will conform to Terra Vac's Standard Operating Procedures, Decontamination Protocol.

Permits

Permits to construct the wells will be obtained in advance from the appropriate regulatory agency.

Well Construction

Casing Material. Schedule 40, Polyvinyl chloride (ASTM standard specification F480-88A) is the preferred casing material for soil and water contaminated with gasoline and diesel fuel and low concentrations (less than 1 part per million (ppm)) of halogenated solvents.

Well screen in groundwater suspected to contain concentrations of halogenated solvents greater than 1 ppm will be stainless steel instead of PVC per the California Department of

Health Services Scientific and Technical Standards for Hazardous Waste Sites (Vol. 1, chapter. 8, August 1990, Draft). Type 304 stainless steel screens will be used for halogenated solvent concentrations of 1 to 1,000 ppm. Type 316 stainless steel screens will be used for concentrations of halogenated solvents greater than 1,000 ppm. Use of stainless steel screens, if applicable, will be designated in the drilling and sampling plan or work plan for the site.

Terra Vac dual entrainment or groundwater monitoring wells will be constructed of the following materials unless otherwise specified:

Screen: 2" or 4" diameter, Schedule 40 PVC, 0.02 slot, 0.125" spacing with bottom cap
Blank: 2" or 4" diameter, Schedule 40 PVC flush threaded riser with slip cap

Unless otherwise specified in the site specific drilling and sampling plan, well screen will be comprised of 2 or 4" diameter 0.02 -inch slotted pipe and will be joined together with the blank casing using flush threaded connections. Well screen slot sizes may be adjusted based on the size of the filter pack, however, the well screen slot sizes will be designed to prevent 90% of the filter pack from entering the well.

The PVC casing will be installed down the center of the hollow stem auger (or in the open borehole if an air rotary drill rig is used) in order to centralize the casing and to ensure uniform packing of the filter pack. The well casings will have appropriate screened intervals as specified by Terra Vac's geologist. Typical screened intervals for dual entrainment wells will extend five feet above the water table and ten feet below. Typical screened intervals for groundwater monitoring wells may vary, depending on the purpose of the well. For wells installed to monitor halogenated solvents, the well screen may be placed at the bottom of the aquifer, rather than transposed across the water table (as in the case of wells designed to monitor or extract petroleum hydrocarbons).

Filter Pack. Unless otherwise specified, filter pack consisting of clean No. 3 Monterey silica sand will be placed in the annular space from the bottom of the borehole to two feet above the top of the well screen. A different size filter pack may be designated in the drilling and sampling plan based on an aquifer sieve analysis. The filter pack will be designed to prevent the entrance of fine silts, sands, and clays into the well.

The filter pack will be delivered to the site in unopened bags and will be gravity fed from the top of the hollow stem auger, using the auger as a tremie pipe. The hollow stem auger will be withdrawn in approximately two foot increments as the filter pack fills the annular space. A weighted tape measure or similar device will be constantly raised and lowered within the annular space during pouring of the filter pack to prevent bridging of the filter material. The filter pack will extend from the bottom of the boring to approximately two feet above the top of the well screen.

Prior to placement of a bentonite seal above the filter pack, a surge block will be alternately lowered and raised within the well casing for a minimum of five minutes. The purpose of this 'surging' process is to alternately flush well water in and out of the well and through the filter pack, thereby allowing for settling of the filter pack, and removal of any bridging gaps that may have occurred in the filter material. A measurement from the ground surface to the top of the filter pack must then be made to determine whether the filter pack has settled. If subsidence has occurred, additional filter pack will be added to achieve the desired height of the filter pack within the borehole, and in relation to top of the well screen. The hollow stem auger will be completely removed from the boring after surging of the well and placement of the filter pack.

Bentonite Seal. A two to five foot thick bentonite seal, consisting of tamped bentonite pellets, gravity fed from the top of the boring, will be placed above the sand pack. An equivalent volume of potable water will then be added to induce swelling of the bentonite pellets. The bentonite will be delivered to the job-site in unopened multi-wall, non-tear, waterproof bags. A minimum of thirty minutes will be allowed for the bentonite pellets to swell, prior to placement of any further well construction materials in the well.

Annular Grout Seal. A concrete-bentonite grout (mixed with potable water and grout expander) will be placed from the top of the bentonite seal to just below the ground surface. Powdered sodium bentonite which is free of impurities and additives will be used on annular grout seals. The bentonite will be delivered to the job-site in unopened multi-wall, non-tear, waterproof bags.

Grout seal shall be gravity fed in a continuous pour from the top of the boring. The grout seal will extend from the top of the bentonite seal to within a one to two feet of the ground surface, leaving sufficient space below the ground surface for placement of the desired christy box or monument casing.

Well Head Completion

Dual entrainment or groundwater extraction wells are designed to be connected via manifolding to a groundwater treatment /remediation system. Well head completion details shall be dictated by the type of manifolding required in the remediation design criteria (i.e. above or below ground completion). Monitoring well heads will be completed in one of two ways as specified below. Appropriate well head covers shall be designated in the remediation plan or drilling and sampling plan for each site.

Flush Mounted Christy Box. The top of each well will be protected by a water-tight, traffic rated, flush mounted, 12-inch diameter christy box set into concrete at the ground surface. For a flush mounted well head, the well housing will be raised approximately 2 to 3" above the ground surface. Concrete surrounding the well housing will be of class A specifications (in accordance with ASTM C33 Standard Specifications for Concrete Aggregates) to provide a minimum of 4000 pound compressive strength value with a 28 day cure time and will be sloped away from the well head cover to provide an avenue for surface runoff.

Monument Casing. In cases where traffic boxes are not required, and well head protection is warranted, an above ground water-tight, monument casing may be chosen to surround the well head. Any above ground well heads installed in areas where vehicles may be driven, will be surrounded by traffic barriers in the form of yellow steel guard posts.

Locking Well Caps. Unless otherwise specified or requested by the client, locking well caps will not be used.

Labeling. Well head covers shall be permanently marked with the well number both inside and outside of the PVC slip cap, and on the well head cover. All measurements to groundwater will be taken from a permanently marked reference point on the top of the well casing. This point will also serve as the survey point in the case of groundwater monitoring wells.

Well Construction Log

A monitoring well log will be completed in the field for each borehole in which a dual entrainment extraction or groundwater well is installed. The following information will be included on the well construction log:

1. Depth interval of blank casing and well screen
2. Depth interval of filter pack, bentonite seal, and annular grout seal
3. Type of well head cover installed, if any

In the case of groundwater monitoring wells, the following information will be recorded in the field notebook and only provided to the client upon request:

4. Number of sacks (and weight) of filter pack used
5. Number of sacks of bentonite chips used
6. Number of sacks of cement or concrete and type of cement or concrete used
7. Number of sacks of granular bentonite used

Completion of the wells may be revised in the field at the direction of the Terra Vac geologist.

TERRA VAC
STANDARD OPERATING PROCEDURES

WELL DEVELOPMENT, SURVEYING, AND GROUNDWATER SAMPLING PROTOCOL

Applications

Groundwater well development will be conducted for all groundwater wells from which samples will be collected for analysis. Surveying of groundwater wells will be performed only on wells which will be used for calculation of groundwater gradient and flow direction. Dual entrainment and groundwater extraction wells which do not fall into this category will not be developed or surveyed unless otherwise specified in the work plan or drilling and sampling plan for the project or on client request.

Groundwater Well Development

The purpose of well development is to settle the filter pack and to dislodge and remove fines from the nearby formation into the well bore.

Low Permeability Aquifers. Low permeability aquifers will be developed by surging. Surging will be accomplished using a surge block, consisting of a flat rubber attachment slightly smaller in diameter then the casing of the well to be surged, which is attached to the end of a stainless steel rod. The surge block and rod is then lowered to the level of the water table and alternately raised and lowered within the water column forcing water in and out of the well and its attendant annular space. The surging process will continue for at least one hour in low permeability aquifers. At the conclusion of surging, the well should be bailed dry to remove the fines. This method will be used whenever the recharge of the well is more than 15 minutes.

All Other Aquifers. Well development will be accomplished by bailing and surging each well until silt-free water is produced. Surging will be accomplished in the manner described above, however, bailing will be accomplished using a pre-cleaned Teflon or disposable bailer.

Measurements. Depth to water, specific conductance, temperature, and pH will be measured before starting and periodically during the well development procedure. A Solinst electronic well sounder will be used to measure groundwater levels to the nearest 0.01 foot. The instrument uses an indicator probe attached by an insulated wire line to an alarm. The alarm sounds when the probe comes in contact with water, and the electronic circuit is completed. All downhole equipment will be triple rinsed before and after use in each well, as detailed in Terra Vac's Standard Operating Procedures, Decontamination Protocol. The probe will be carefully lowered into the well to measure static water levels. Two successive readings within 0.01 foot of each other will be considered valid water level measurements.

Documentation. Well development activities will be recorded on a well development log which will include well surging start and finish times, amount of water bailed, periodic measurements of temperature, water level, pH, and conductivity obtained during purging.

Calibration of the instruments used for measuring the above parameters shall be calibrated each day, before use. Proof of calibration will be recorded in the field sampling book used for the project.

Surveying

All new groundwater monitoring wells which will be used to calculate groundwater gradient and for collection of groundwater samples, will be surveyed by a California licensed land surveyor to the nearest 0.01 foot in elevation using a third-order vertical survey. All survey elevations will be reported relative to the nearest permanent benchmark. All new monitoring wells shall be surveyed in the horizontal plane to an accuracy of +/- 0.5 feet.

Groundwater Sampling Procedures

Purging. Generally, 3 to 10 well volumes will be purged from each well prior to sampling. The purpose of purging is to remove stagnant water from the well, and to obtain a fresh sample which is representative of the surrounding aquifer. Temperature, pH, and conductivity measurements will be conducted before, periodically during, and after the purging process. Stabilization of these measurements must occur prior to collection of a sample. The acceptable stabilization parameters are outlined below:

Parameter	Stabilization Factor
Temperature	Within 1 degree Centigrade
pH	Within 0.1
Conductivity	Within 10%

All instruments used to measure the above parameters will be rinsed with distilled water before and after each measurement.

Purging may be performed by a vacuum truck, bailer, or pump. If a vacuum truck is used, only clean stingers will be inserted in the monitoring well. Stingers which are reused will be triple rinsed as detailed in Terra Vac's Standard Operating Procedures, Decontamination Protocol. Bailers and pumps will be thoroughly decontaminated (as above), prior to and in between monitoring wells. Bailers will be lowered into the well with new lengths of polypropylene rope or Teflon coated wire which is capable of being decontaminated.

Documentation. Well purging and sampling activities will be recorded on a well purging and sampling log which will include well purging start and finish times, amount of water purged, periodic measurements of temperature, water level, pH, and conductivity obtained during purging. Sampling information to be recorded on the log will include a description of the sample, corresponding well number, collection time, date, and initials of the person collecting the sample.

Instrument Calibration. Calibration of the instruments used for measuring the above parameters shall be calibrated each day, before use. Calibration shall be performed in accordance with manufacturer's specifications and will be recorded on calibration documents kept with the instrument.

Sampling. Pre-cleaned sample bottles (cleaned according to EPA standards) will be obtained in advance from the contracted laboratory. The laboratory will be notified in advance of the specific analyses to be performed, and will provide pre-preserved bottles and vials appropriate for collection of the correct amount of water and proper preservation of samples as required for each analysis. All sample containers to be used for organic analyses will have Teflon linings inside of the covers.

Groundwater samples will be collected immediately after purging, using a clean Teflon or disposable bailer. Reused Teflon bailers will be pre-cleaned according to Terra Vac's Standard Operating Procedures, Decontamination Protocol. Disposable bailers will be pre-cleaned prior to use unless they have been factory sealed in plastic sleeves, and are opened immediately prior to use in the field. Bailers will be lowered into the well with new lengths of polypropylene rope or Teflon coated wire which is capable of being decontaminated. Care will be taken to gently lower the bailer into the water to minimize turbulence, aeration, or degassing of the well water.

Sample containers will be held in a covered storage area until used, and only opened immediately prior to filling. Prior to sampling, sampling personnel will put on new, clean, latex, surgical gloves to avoid sample or container contamination. The water in the bailer will be slowly dispensed into the sample bottle(s) using a bottom emptying device on the bailer to minimize aeration of the water. All sample containers will be filled completely to the top of the bottle and sealed with zero head space. The bottles will be immediately labeled, logged, placed in ziplock bags, and stored in a pre-cooled ice chest pending delivery to the laboratory.

When possible, wells shall be sampled in order from least to most contaminated. Samples from wells with observable floating product will not be analyzed for dissolved phase constituents, however, the thickness of the floating product layer will be noted on the purging and sampling log, if possible. A chain of custody form will be completed in the field and accompany all samples submitted to the laboratory. Chain of custody procedures will conform to Terra Vac's Standard Operating Procedures, QA/QC Protocol.

Sample Numbering. Unless otherwise specified in the work plan or drilling and sampling plan for this project, groundwater samples will be numbered with the well number followed by a 'W' and a number designation (i.e. TV-1-W1, TV-1-W2, etc.). During sample collection, all samples will be labeled and properly packed for shipment. At a minimum, sample labels shall include Terra Vac's job number, job name, sample number, date, geologist initials, and time collected.

Samples will be contained in sealed, clear, plastic zip-lock bags with all sample labels and identifiers easily visible. Samples will be packed and shipped in coolers pre-chilled to 4 degrees Centigrade. Temperature will be maintained using dry ice or conventional ice in double plastic bags. Adequate sample protection during shipment will be ensured by

surrounding samples with vermiculite, foam pieces, foam rubber, or some comparable packing material, as required for protection during shipment.

Purged Water Disposition. All groundwater purged from the wells will be contained in 55 gallon DOT drums or a polyethylene tank and held on-site pending laboratory analysis. Upon completion of field activities, all drums will be transported to a pre-determined on site location for temporary storage. Each drum shall be clearly marked with a Terra Vac "Potentially Hazardous Waste" or client -provided label (using indelible ink) with the following information:

1) Container Number/Designation
2) Owner Name
3) Site Address and Phone Number
4) Contents
5) Corresponding well or boring number
6) Corresponding depths of soil cuttings, if applicable
7) Date Accumulated
8) Any applicable comments, (i.e., sample collection date, etc.)

An inventory of drums, along with any analytical results collected during the sampling event or otherwise requested by the client, pertaining to the contents, shall be provided to the facility operator to facilitate proper disposal.

APPENDIX B

DRILLING LOGS

TERRA VAC

Date Drilled: 01/24/97 **Boring/Well Number:** NRW-1

Project: Rose's Parking Lot Project Number: 32-0029

Address: 330 NW 23rd Ave., Portland, Oregon

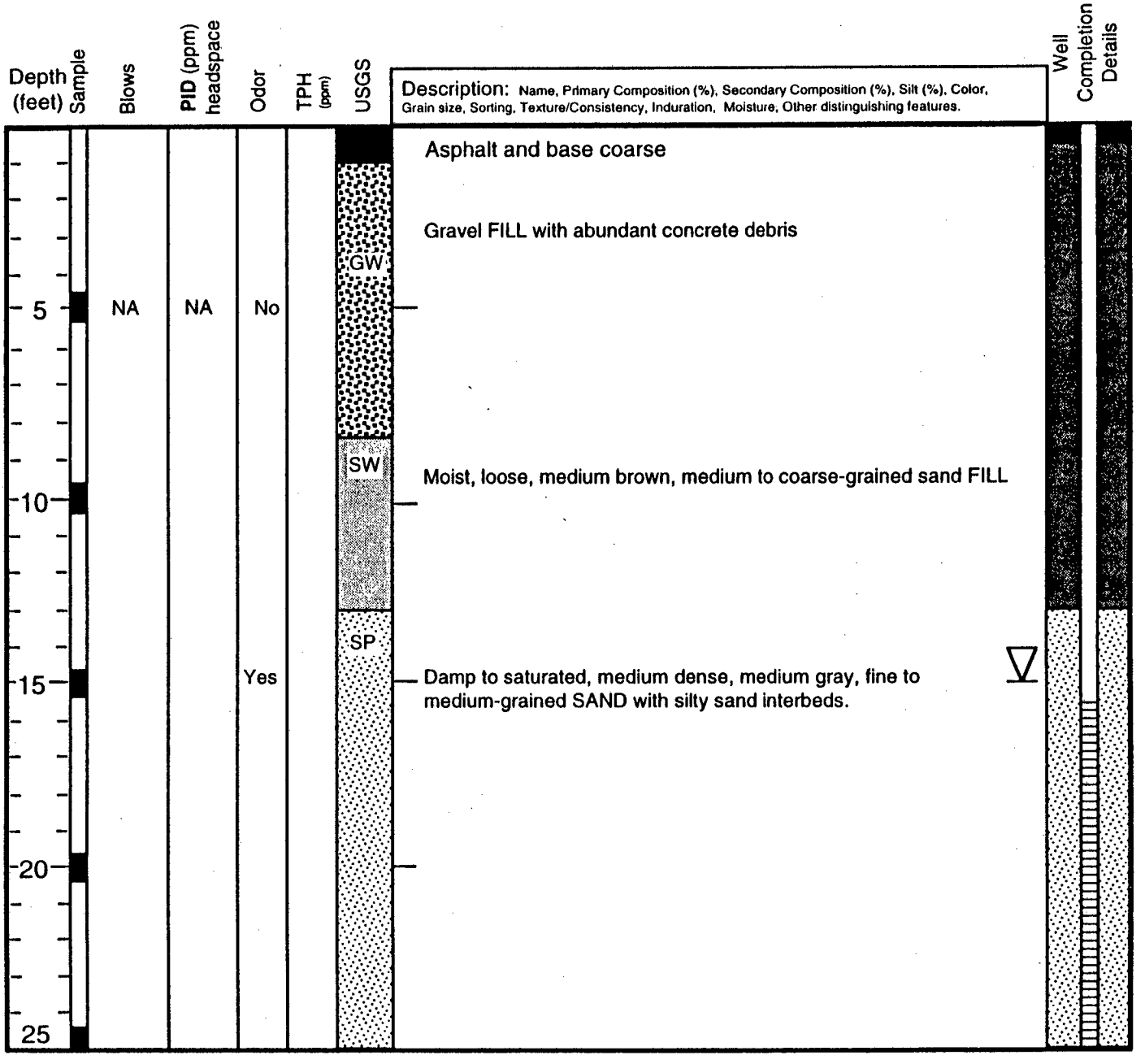
Drilling Contractor: Cascade Drilling, Inc. Log by: J. Orr

Drill Rig: CME-75 Auger Size/Type: 15" O.D. Hollow Stem Sample Method: Split Spoon

Total Depth: 38 feet Depth to Groundwater: 15 feet Backfill or Grout Material: Bentonite Chips

Well Casing/Screen Material: Sched. 40 PVC Filter Material/Size: 10-20 Colorado Silica Sand

Well: Casing/Screen Diameter: 4 in. Slot Size: 0.01" Seal: 0 - 13 feet Screened Interval: 15.5-37.5 feet



General Remarks:

- Blow counts are recorded for 12 inches of sampler penetration using a 140 lb hammer unless otherwise specified.
- TPH = Total Petroleum Hydrocarbon concentrations analyzed using Method DEQ TPH-G/BTEX
- ND = Not detected, or levels were below analytical detection limits.
- NA = Not Analyzed.

This summary applies only at the location of this boring, and at the time of drilling. Subsurface conditions may differ at other locations, and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

TERRA VAC

Date Drilled: 01/24/97 **Boring/Well Number:** NRW-1

Project: Rose's Parking Lot Project Number: 32-0029

Address: 330 NW 23rd Ave., Portland, Oregon

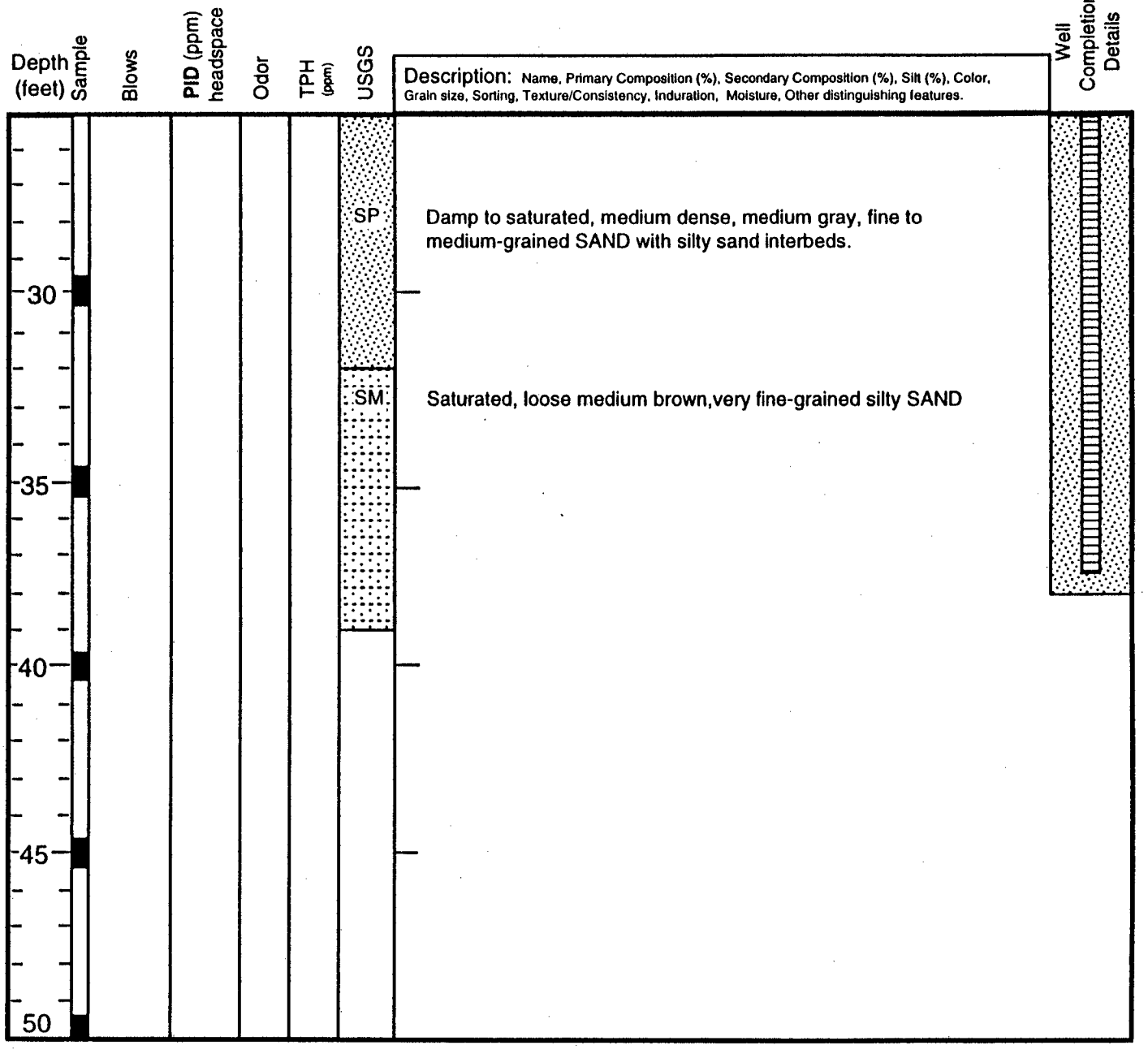
Drilling Contractor: Cascade Drilling, Inc. Log by: J. Orr

Drill Rig: CME-75 Auger Size/Type: 15" O.D. Hollow Stem Sample Method: Split Spoon

Total Depth: 38 feet Depth to Groundwater: 15 feet Backfill or Grout Material: Bentonite Chips

Well Casing/Screen Material: Sched. 40 PVC Filter Material/Size: 10-20 Colorado Silica Sand

Well: Casing/Screen Diameter: 4 in. Slot Size: 0.01" Seal: 0 - 13 feet Screened Interval: 15.5-37.5 feet



General Remarks:

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- TPH = Total Petroleum Hydrocarbon concentrations analyzed using Method DEQ TPH-G/BTEX
- ND = Not detected, or levels were below analytical detection limits.
- NA = Not Analyzed.

This summary applies only at the location of this boring, and at the time of drilling. Subsurface conditions may differ at other locations, and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

TERRA VAC

Date Drilled: 01/24/97 **Boring/Well Number:** NMW-2

Project: Rose's Parking Lot Project Number: 32-0029

Address: 330 NW 23rd Ave., Portland, Oregon

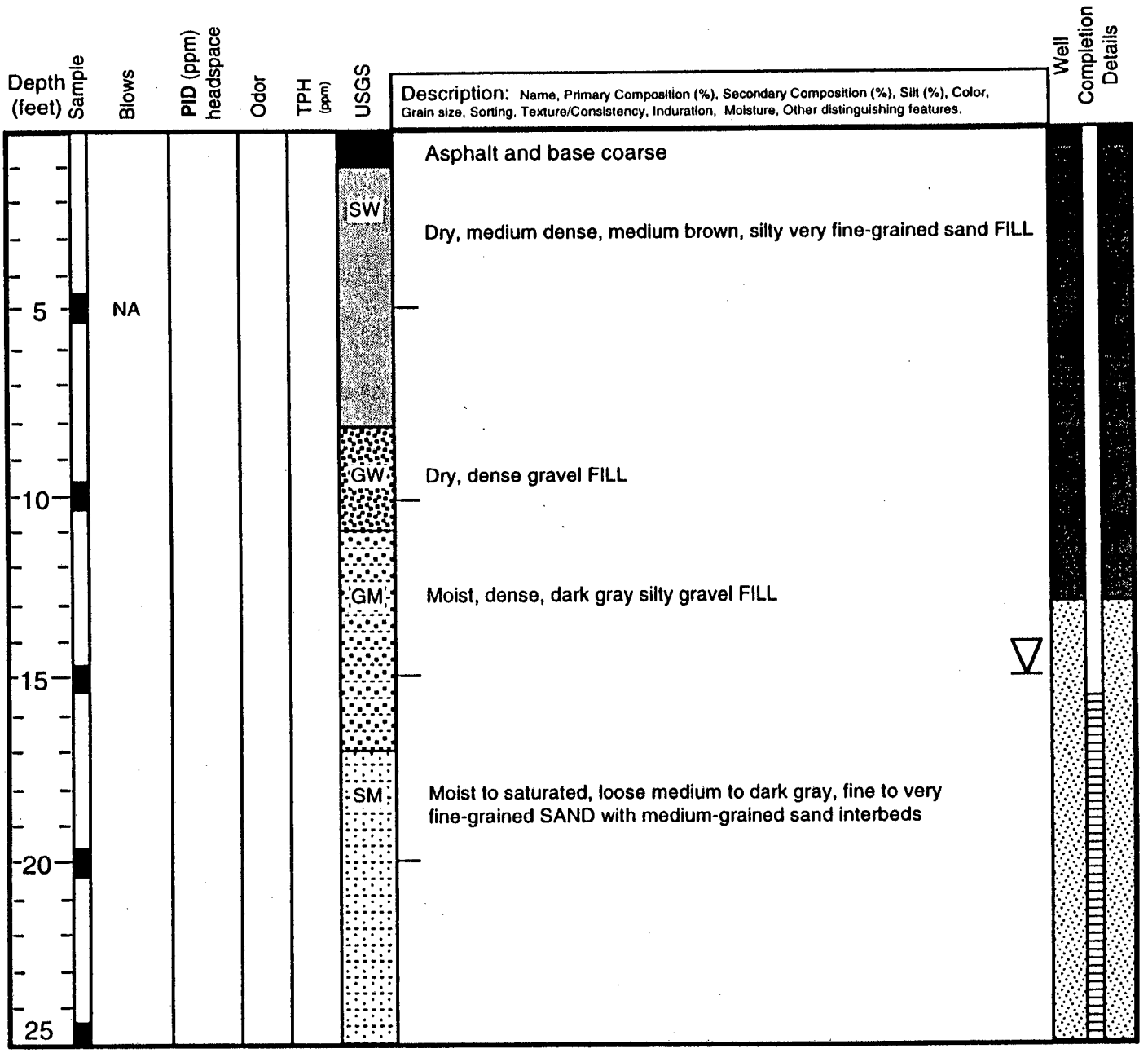
Drilling Contractor: Cascade Drilling, Inc. Log by: J. Orr

Drill Rig: CME-75 Auger Size/Type: 15" O.D. Hollow Stem Sample Method: Split Spoon

Total Depth: 38 feet Depth to Groundwater: 15 feet Backfill or Grout Material: Bentonite Chips

Well Casing/Screen Material: Sched. 40 PVC Filter Material/Size: 10-20 Colorado Silica Sand

Well: Casing/Screen Diameter: 4 in. Slot Size: 0.01" Seal: 0 - 13 feet Screened Interval: 15-37 feet



General Remarks:

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- TPH = Total Petroleum Hydrocarbon concentrations analyzed using Method DEQ TPH-G/BTEX
- ND = Not detected, or levels were below analytical detection limits.
- NA = Not Analyzed.

This summary applies only at the location of this boring, and at the time of drilling. Subsurface conditions may differ at other locations, and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

TERRA VAC

Date Drilled: 01/24/97 **Boring/Well Number: NMW-2**

Project: Rose's Parking Lot Project Number: 32-0029

Address: 330 NW 23rd Ave., Portland, Oregon

Drilling Contractor: Cascade Drilling, Inc. Log by: J. Orr

Drill Rig: CME-75 Auger Size/Type: 15" O.D. Hollow Stem Sample Method: Split Spoon

Total Depth: 38 feet Depth to Groundwater: 15 feet Backfill or Grout Material: Bentonite Chips

Well Casing/Screen Material: Sched. 40 PVC Filter Material/Size: 10-20 Colorado Silica Sand

Well: Casing/Screen Diameter: 4 in. Slot Size: 0.01" Seal: 0 - 13 feet Screened Interval: 15-37 feet

Depth (feet)	Sample	Blows	PID (ppm) headspace	Odor	TPH (ppm)	USGS	Description: Name, Primary Composition (%), Secondary Composition (%), Silt (%), Color, Grain size, Sorting, Texture/Consistency, Induration, Moisture, Other distinguishing features.	Well Completion Details
30						SM	Moist to saturated, loose medium to dark gray, fine to very fine-grained SAND with medium-grained sand interbeds	
35								
40								
45								
50								

General Remarks:

- Blow counts are recorded for 12 inches of sampler penetration using a 140 lb hammer unless otherwise specified.
- TPH = Total Petroleum Hydrocarbon concentrations analyzed using Method DEQ TPH-G/BTEX
- ND = Not detected, or levels were below analytical detection limits.
- NA = Not Analyzed.

This summary applies only at the location of this boring, and at the time of drilling. Subsurface conditions may differ at other locations, and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

TERRA VAC

Date Drilled: 01/25/97 **Boring/Well Number:** NMW-3

Project: Rose's Parking Lot Project Number: 32-0029

Address: 330 NW 23rd Ave., Portland, Oregon

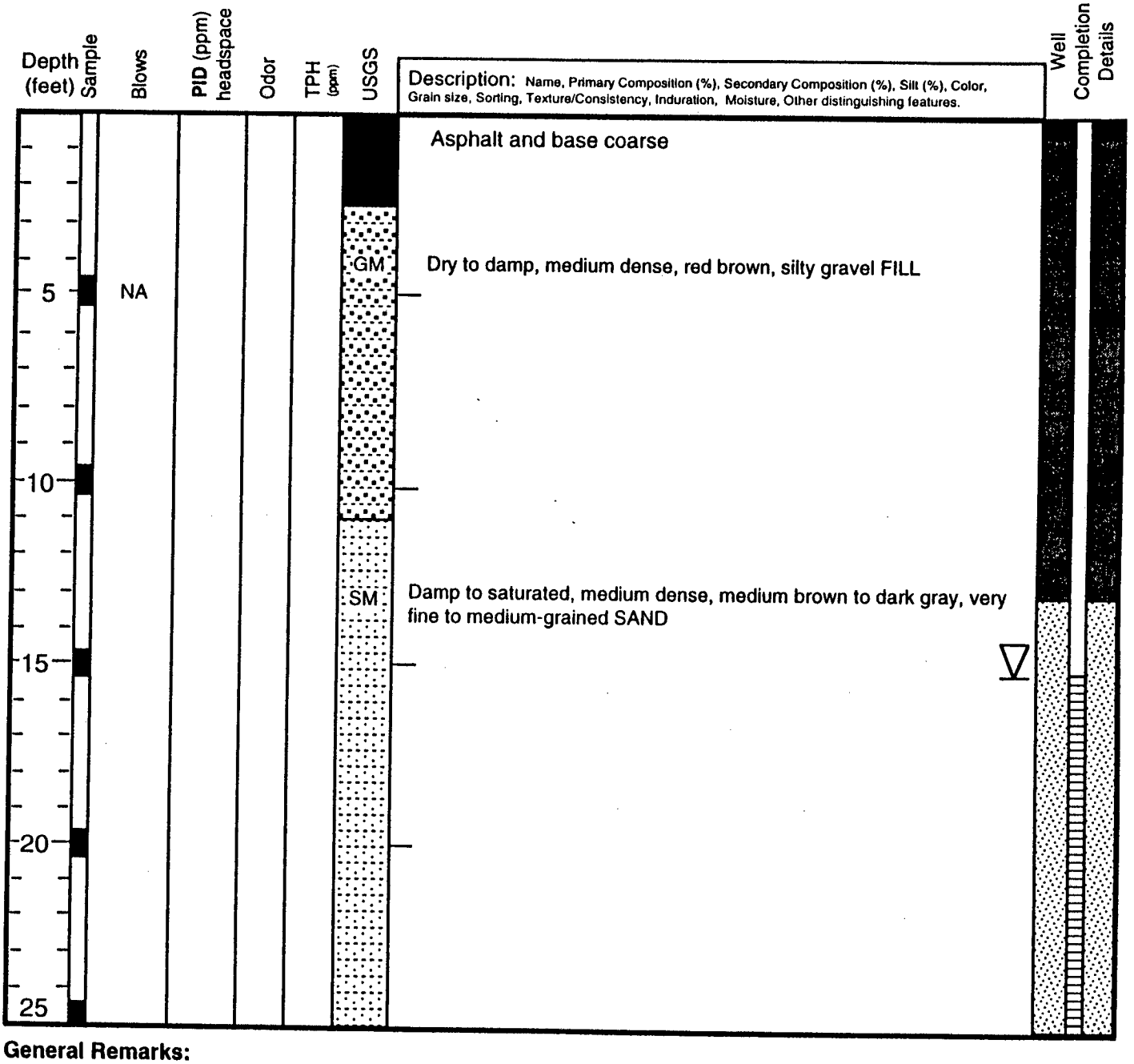
Drilling Contractor: Cascade Drilling, Inc. Log by: J. Orr

Drill Rig: CME-75 Auger Size/Type: 15" O.D. Hollow Stem Sample Method: Split Spoon

Total Depth: 38 feet Depth to Groundwater: 15 feet Backfill or Grout Material: Bentonite Chips

Well Casing/Screen Material: Sched. 40 PVC Filter Material/Size: 10-20 Colorado Silica Sand

Well: Casing/Screen Diameter: 4 in. Slot Size: 0.01" Seal: 0 - 13 feet Screened Interval: 15.5-37.5 feet



General Remarks:

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- TPH = Total Petroleum Hydrocarbon concentrations analyzed using Method DEQ TPH-G/BTEX
- ND = Not detected, or levels were below analytical detection limits.
- NA = Not Analyzed.

This summary applies only at the location of this boring, and at the time of drilling. Subsurface conditions may differ at other locations, and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

TERRA VAC

Date Drilled: 01/25/97 **Boring/Well Number:** NMW-3

Project: Rose's Parking Lot Project Number: 32-0029

Address: 330 NW 23rd Ave., Portland, Oregon

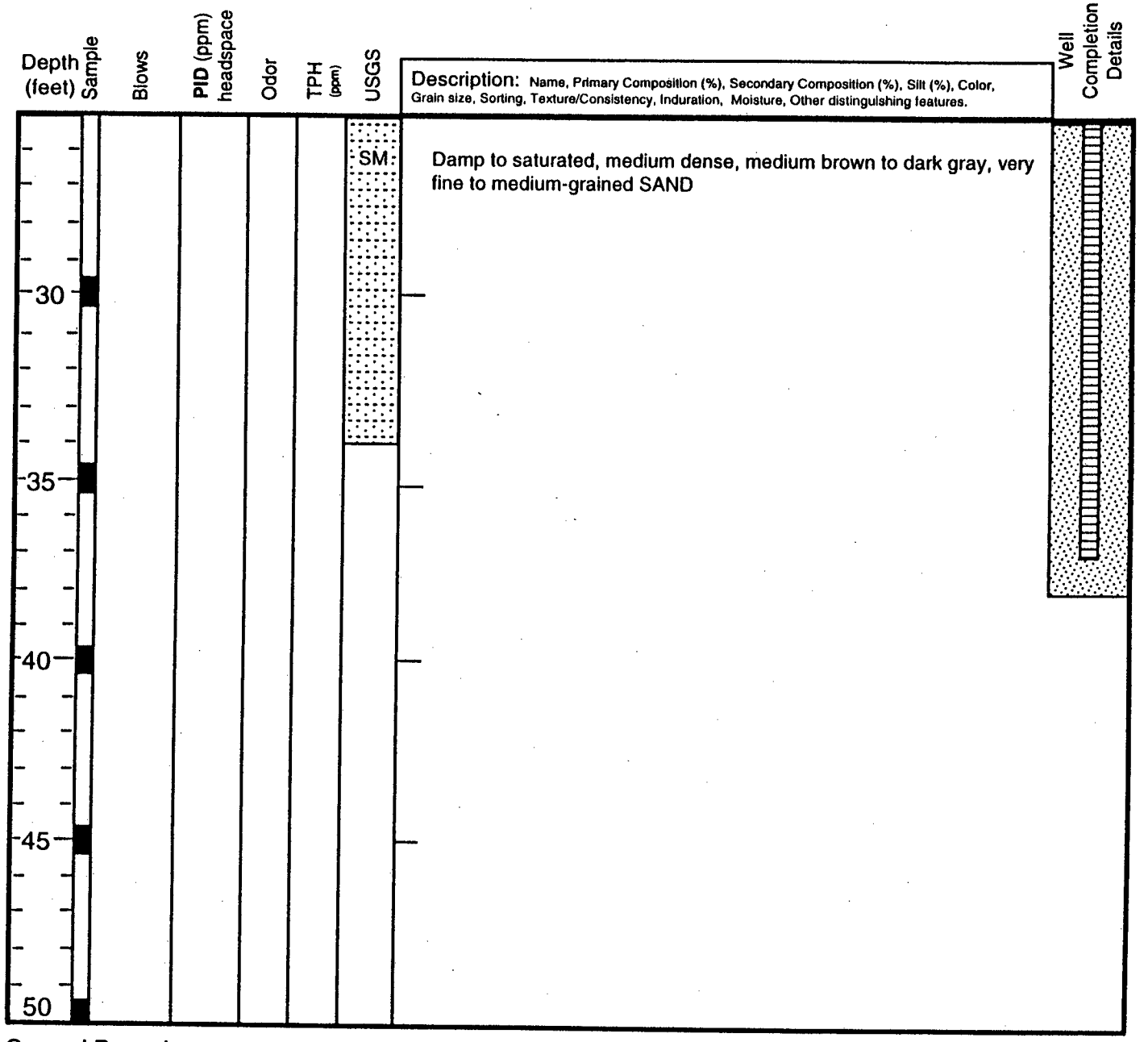
Drilling Contractor: Cascade Drilling, Inc. Log by: J. Orr

Drill Rig: CME-75 Auger Size/Type: 15" O.D. Hollow Stem Sample Method: Split Spoon

Total Depth: 38 feet Depth to Groundwater: 15 feet Backfill or Grout Material: Bentonite Chips

Well Casing/Screen Material: Sched. 40 PVC Filter Material/Size: 10-20 Colorado Silica Sand

Well: Casing/Screen Diameter: 4 in. Slot Size: 0.01" Seal: 0 - 13 feet Screened Interval: 15.5-37.5 feet



General Remarks:

- Blow counts are recorded for 12 inches of sampler penetration using a 140 lb hammer unless otherwise specified.
- TPH = Total Petroleum Hydrocarbon concentrations analyzed using Method DEQ TPH-G/BTEX
- ND = Not detected, or levels were below analytical detection limits.
- NA = Not Analyzed.

This summary applies only at the location of this boring, and at the time of drilling. Subsurface conditions may differ at other locations, and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

TERRA VAC

Date Drilled: 01/23/97 **Boring/Well Number:** NMW-5

Project: Rose's Parking Lot Project Number: 32-0029

Address: 330 NW 23rd Ave., Portland, Oregon

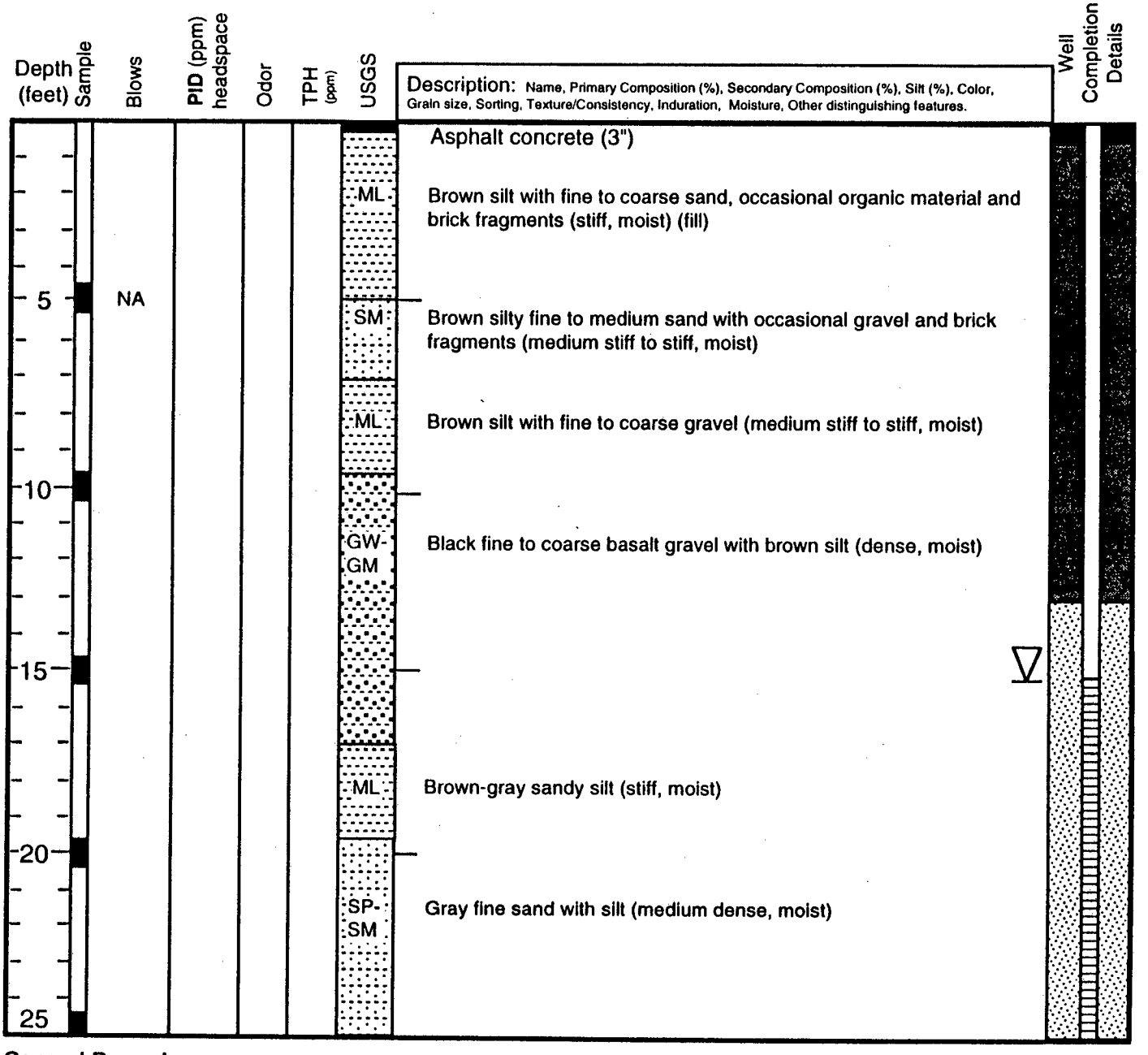
Drilling Contractor: Cascade Drilling, Inc. Log by: J. Orr

Drill Rig: CME-75 Auger Size/Type: 15" O.D. Hollow Stem Sample Method: Split Spoon

Total Depth: 38 feet Depth to Groundwater: 15 feet Backfill or Grout Material: Bentonite Chips

Well Casing/Screen Material: Sched. 40 PVC Filter Material/Size: 10-20 Colorado Silica Sand

Well: Casing/Screen Diameter: 4 in. Slot Size: 0.01" Seal: 0 - 13 feet Screened Interval: 15-37 feet



General Remarks:

- Blow counts are recorded for 12 inches of sampler penetration using a 140 lb hammer unless otherwise specified.
- TPH = Total Petroleum Hydrocarbon concentrations analyzed using Method DEQ TPH-G/BTEX
- ND = Not detected, or levels were below analytical detection limits.
- NA = Not Analyzed.

This summary applies only at the location of this boring, and at the time of drilling. Subsurface conditions may differ at other locations, and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

TERRA VAC

Date Drilled: 01/23/97 **Boring/Well Number:** NMW-5

Project: Rose's Parking Lot Project Number: 32-0029

Address: 330 NW 23rd Ave., Portland, Oregon

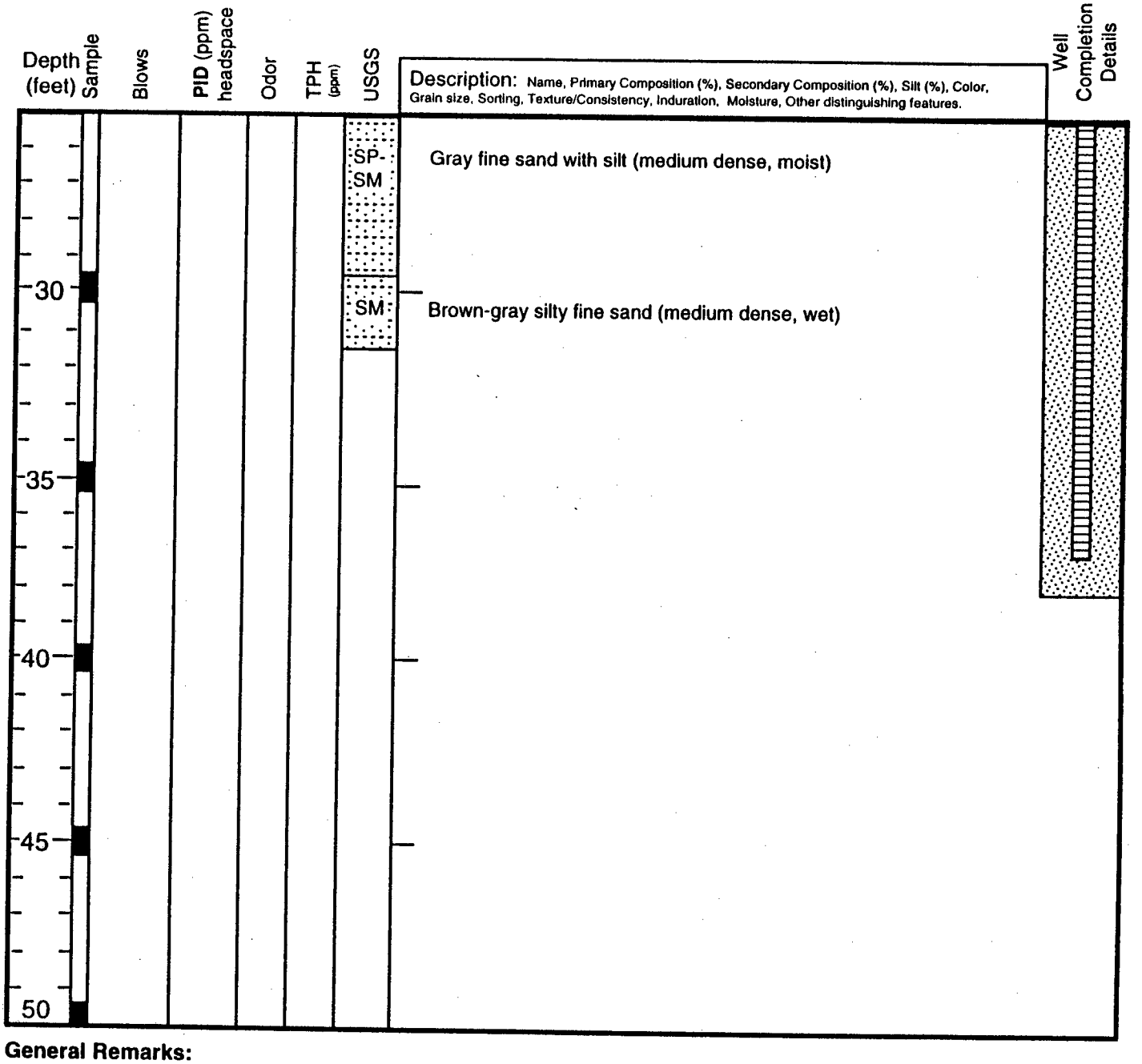
Drilling Contractor: Cascade Drilling, Inc. Log by: J. Orr

Drill Rig: CME-75 Auger Size/Type: 15" O.D. Hollow Stem Sample Method: Split Spoon

Total Depth: 38 feet Depth to Groundwater: 15 feet Backfill or Grout Material: Bentonite Chips

Well Casing/Screen Material: Sched. 40 PVC Filter Material/Size: 10-20 Colorado Silica Sand

Well: Casing/Screen Diameter: 4 in. Slot Size: 0.01" Seal: 0 - 13 feet Screened Interval: 15-37 feet



General Remarks:

- Blow counts are recorded for 12 inches of sampler penetration using a 140 lb hammer unless otherwise specified.
- TPH = Total Petroleum Hydrocarbon concentrations analyzed using Method DEQ TPH-G/BTEX
- ND = Not detected, or levels were below analytical detection limits.
- NA = Not Analyzed.

This summary applies only at the location of this boring, and at the time of drilling. Subsurface conditions may differ at other locations, and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

TERRA VAC

Date Drilled: 01/24/97 **Boring/Well Number:** DVE-1

Project: Rose's Parking Lot Project Number: 32-0029

Address: 330 NW 23rd Ave., Portland, Oregon

Drilling Contractor: Cascade Drilling, Inc. Log by: J. Orr

Drill Rig: CME-75 Auger Size/Type: 12" O.D. Hollow Stem Sample Method: Split Spoon

Total Depth: 38 feet Depth to Groundwater: 20 feet Backfill or Grout Material: Bentonite Chips

Well Casing/Screen Material: Sched. 40 PVC Filter Material/Size: 10-20 Colorado Silica Sand

Well: Casing/Screen Diameter: 4 in. Slot Size: 0.01" Seal: 0 - 13 feet Screened Interval: 15-37 feet

Depth (feet)	Sample	Blows	PID (ppm) headspace	Odor	TPH (ppm)	USGS	Description: Name, Primary Composition (%), Secondary Composition (%), Silt (%), Color, Grain size, Sorting, Texture/Consistency, Induration, Moisture, Other distinguishing features.	Well Completion Details
							ASPHALT (4")	
5		5, 9, 12, 21	0	No		ML	SANDY SILT; 70-80% silt; 20-30% very fine grained sand; trace fine to medium gravel and brick fragments; Yellow-brown; Very stiff; Damp; 0.5-1" silty sand beds. No product odor.	
10		56 (6")	0	No			At 10 feet, no recovery; rock in shoe, hard drilling cobbles	
15		10, 10, 11, 21	41	Yes		SM	SILTY SAND; 60-70% very fine grained sand; 30-40% silt; trace clay; Greenish gray; Medium dense; Moist.	
20		15, 15, 16, 31	23	Yes			At 20 feet, same as above, 2" thick fine to very fine grained sand bed; Wet ▽	
25								

General Remarks:

- Blow counts are recorded for 12 inches of sampler penetration using a 140 lb hammer unless otherwise specified.
- TPH = Total Petroleum Hydrocarbon concentrations analyzed using Method DEQ TPH-G/BTEX
- ND = Not detected, or levels were below analytical detection limits.
- NA = Not Analyzed.

This summary applies only at the location of this boring, and at the time of drilling. Subsurface conditions may differ at other locations, and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

TERRA VAC

Date Drilled: 01/24/97 **Boring/Well Number: DVE-1**

Project: Rose's Parking Lot Project Number: 32-0029

Address: 330 NW 23rd Ave., Portland, Oregon

Drilling Contractor: Cascade Drilling, Inc. Log by: J. Orr

Drill Rig: CME-75 Auger Size/Type: 12" O.D. Hollow Stem Sample Method: Split Spoon

Total Depth: 38 feet Depth to Groundwater: 20 feet Backfill or Grout Material: Bentonite Chips

Well Casing/Screen Material: Sched. 40 PVC Filter Material/Size: 10-20 Colorado Silica Sand

Well: Casing/Screen Diameter: 4 in. Slot Size: 0.01" Seal: 0 - 13 feet Screened Interval: 15-37 feet

Depth (feet)	Sample	Blows	PID (ppm) headspace	Odor	TPH (ppm)	USGS	Description: Name, Primary Composition (%), Secondary Composition (%), Silt (%), Color, Grain size, Sorting, Texture/Consistency, Induration, Moisture, Other distinguishing features.
		15, 16, 19, 35	18	Yes		SM	At 25 feet, same as above
30		18, 20, 20, 40	0	No			SILTY SAND; 70-80% very fine grained sand; 20-30% silt; trace clay; Yellow brown; Dense; Wet; 1-2" fine to very fine sand beds
35		16, 18, 20, 38	0	No			At 35 feet, same as above
40							
45							
50							

Well Completion Details

General Remarks:

- Blow counts are recorded for 12 inches of sampler penetration using a 140 lb hammer unless otherwise specified.
- TPH = Total Petroleum Hydrocarbon concentrations analyzed using Method DEQ TPH-G/BTEX
- ND = Not detected, or levels were below analytical detection limits.
- NA = Not Analyzed.

This summary applies only at the location of this boring, and at the time of drilling. Subsurface conditions may differ at other locations, and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

TERRA VAC

Date Drilled: 01/24/97 **Boring/Well Number:** DVE-2

Project: Rose's Parking Lot Project Number: 32-0029

Address: 330 NW 23rd Ave., Portland, Oregon

Drilling Contractor: Cascade Drilling, Inc. Log by: J. Orr

Drill Rig: CME-75 Auger Size/Type: 12" O.D. Hollow Stem Sample Method: Split Spoon

Total Depth: 38 feet Depth to Groundwater: 10 feet Backfill or Grout Material: Bentonite Chips

Well Casing/Screen Material: Sched. 40 PVC Filter Material/Size: 10-20 Colorado Silica Sand

Well: Casing/Screen Diameter: 4 in. Slot Size: 0.01" Seal: 0 - 13 feet Screened Interval: 15-37 feet

Depth (feet)	Sample	Blows	PID (ppm) headspace	Odor	TPH (ppm)	USGS	Description: Name, Primary Composition (%), Secondary Composition (%), Silt (%), Color, Grain size, Sorting, Texture/Consistency, Induration, Moisture, Other distinguishing features.
						GP	ASPHALT (4") GRAVEL FILL; 70-80% medium to coarse grained gravel; 20-30% fine to medium grained sand; trace silt and clay; Dark gray; Dense; Damp
5		7, 13, 15, 28	2	No		ML	SANDY SILT; 70-80% silt; 20-30% very fine grained sand; trace clay and fine grained gravel; Yellow-brown; Very stiff; Damp; Low plasticity. No product odor.
10		13, 15, 16, 31	2	No			SILTY SAND; 60-70% very fine grained sand; 30-40% silt, trace clay and fine grained gravel; Yellow brown; Dense; Wet; Iron oxide vein and staining
15		10, 12, 14, 26	100	Yes		SM	At 15 feet, same as above; Mottled green gray and yellow brown
20		20, 22, 25, 47	40	Yes			SILTY SAND; 70-80% very fine grained sand; 20-30% silt; trace clay; Greenish gray; Dense; Wet
25							

Well Completion Details

General Remarks:

- Blow counts are recorded for 12 inches of sampler penetration using a 140 lb hammer unless otherwise specified.
- TPH = Total Petroleum Hydrocarbon concentrations analyzed using Method DEQ TPH-G/BTEX
- ND = Not detected, or levels were below analytical detection limits.
- NA = Not Analyzed.

This summary applies only at the location of this boring, and at the time of drilling. Subsurface conditions may differ at other locations, and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

TERRA VAC

Date Drilled: 01/24/97 **Boring/Well Number: DVE-2**

Project: Rose's Parking Lot Project Number: 32-0029

Address: 330 NW 23rd Ave., Portland, Oregon

Drilling Contractor: Cascade Drilling, Inc. Log by: J. Orr

Drill Rig: CME-75 Auger Size/Type: 12" O.D. Hollow Stem Sample Method: Split Spoon

Total Depth: 38 feet Depth to Groundwater: 10 feet Backfill or Grout Material: Bentonite Chips

Well Casing/Screen Material: Sched. 40 PVC Filter Material/Size: 10-20 Colorado Silica Sand

Well: Casing/Screen Diameter: 4 in. Slot Size: 0.01" Seal: 0 - 13 feet Screened Interval: 15-37 feet

Depth (feet)	Sample	Blows	PID (ppm) headspace	Odor	TPH (ppm)	USGS	Description: Name, Primary Composition (%), Secondary Composition (%), Silt (%), Color, Grain size, Sorting, Texture/Consistency, Induration, Moisture, Other distinguishing features.	Well Completion Details
		10, 12, 13, 25	22	Yes		SP	SAND; 100% very fine to fine grained sand; trace silt and clay; Greenish gray; Medium dense; Wet; Product stain	
30		12, 15, 16, 31	0	No			SAND; 100% very fine to fine grained sand; 20-30% silt; trace silt and clay; Yellow brown; Wet	
35		12, 18, 20, 38	NA	NA				
40								
45								
50								

General Remarks:

- Blow counts are recorded for 12 inches of sampler penetration using a 140 lb hammer unless otherwise specified.
- TPH = Total Petroleum Hydrocarbon concentrations analyzed using Method DEQ TPH-G/BTEX
- ND = Not detected, or levels were below analytical detection limits.
- NA = Not Analyzed.

This summary applies only at the location of this boring, and at the time of drilling. Subsurface conditions may differ at other locations, and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

TERRA VAC

Date Drilled: 01/23/97 Boring/Well Number: DVE-3

Project: Rose's Parking Lot Project Number: 32-0029

Address: 330 NW 23rd Ave., Portland, Oregon

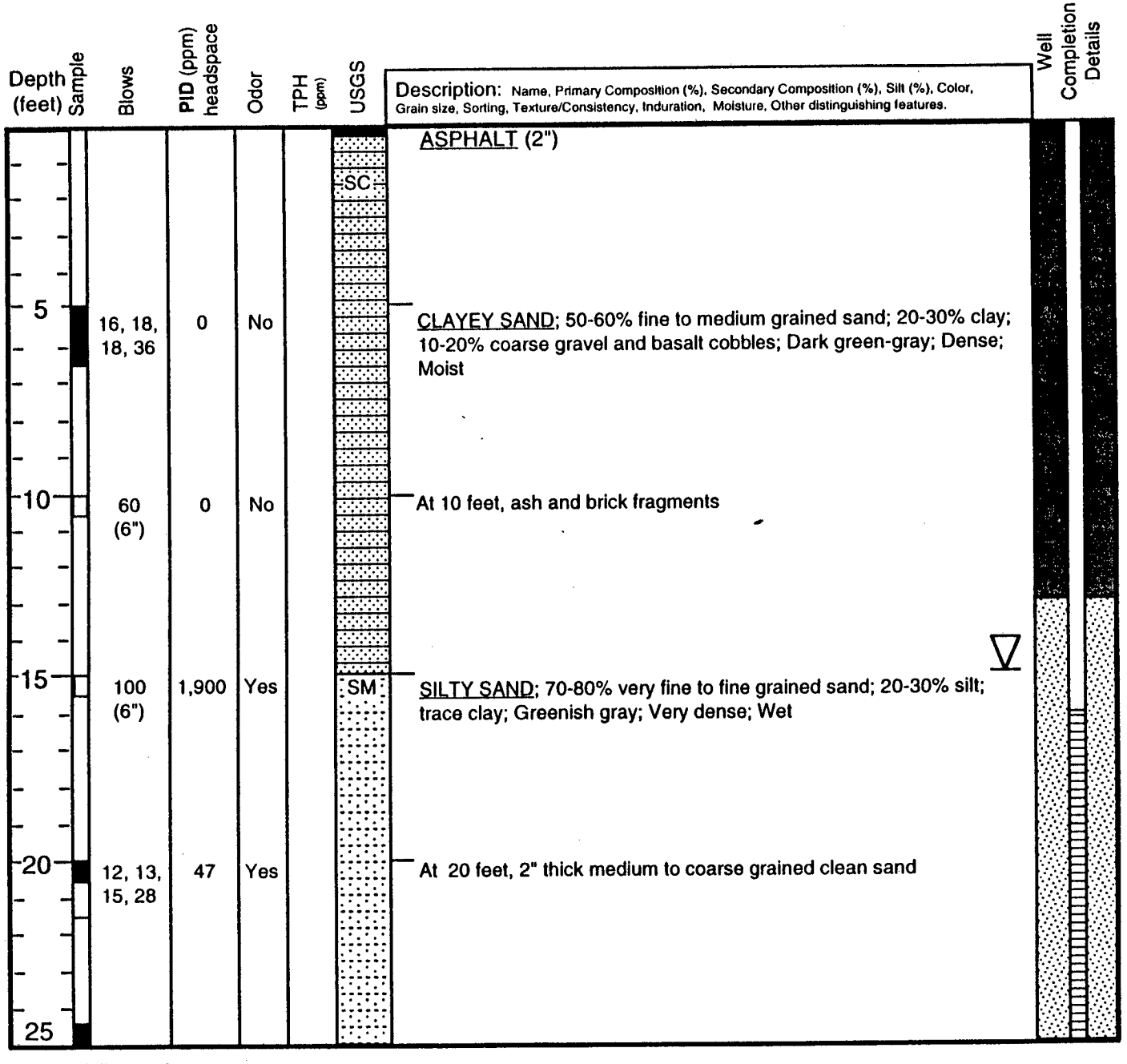
Drilling Contractor: Cascade Drilling, Inc. Log by: J. Orr

Drill Rig: CME-75 Auger Size/Type: 15" O.D. Hollow Stem Sample Method: Split Spoon

Total Depth: 38 feet Depth to Groundwater: 15 feet Backfill or Grout Material: Bentonite Chips

Well Casing/Screen Material: Sched. 40 PVC Filter Material/Size: 10-20 Colorado Silica Sand

Well: Casing/Screen Diameter: 4 in. Slot Size: 0.01" Seal: 0 - 13 feet Screened Interval: 16-38 feet



General Remarks:

- Blow counts are recorded for 12 inches of sampler penetration using a 140 lb hammer unless otherwise specified.
- TPH = Total Petroleum Hydrocarbon concentrations analyzed using Method DEQ TPH-G/BTEX
- ND = Not detected, or levels were below analytical detection limits.
- NA = Not Analyzed.

This summary applies only at the location of this boring, and at the time of drilling. Subsurface conditions may differ at other locations, and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

TERRA VAC

Date Drilled: 01/23/97 Boring/Well Number: DVE-3

Project: Rose's Parking Lot Project Number: 32-0029

Address: 330 NW 23rd Ave., Portland, Oregon

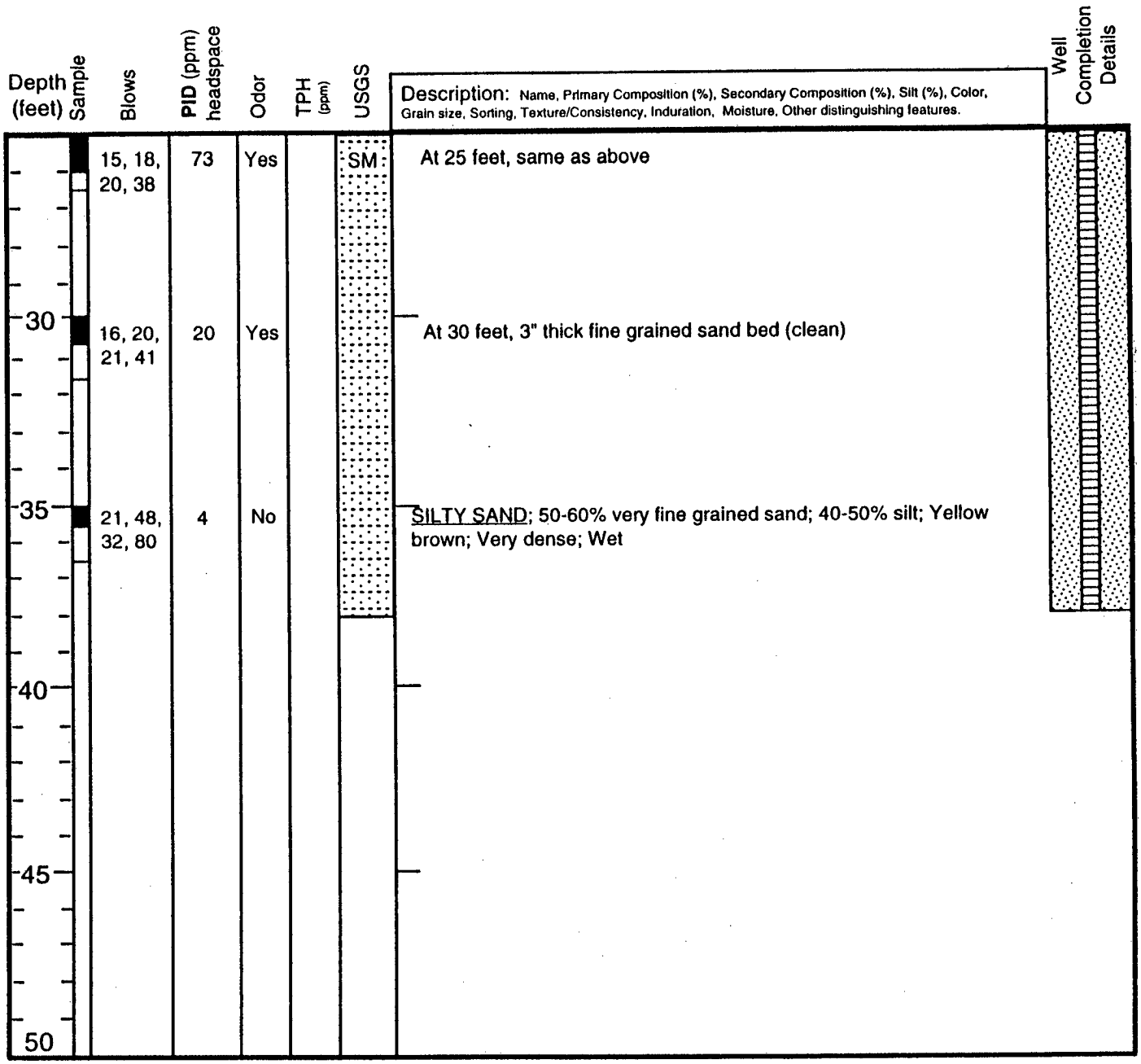
Drilling Contractor: Cascade Drilling, Inc. Log by: J. Orr

Drill Rig: CME-75 Auger Size/Type: 15" O.D. Hollow Stem Sample Method: Split Spoon

Total Depth: 38 feet Depth to Groundwater: 15 feet Backfill or Grout Material: Bentonite Chips

Well Casing/Screen Material: Sched. 40 PVC Filter Material/Size: 10-20 Colorado Silica Sand

Well: Casing/Screen Diameter: 4 in. Slot Size: 0.01" Seal: 0 - 13 feet Screened Interval: 16-38 feet



General Remarks:

- Blow counts are recorded for 12 inches of sampler penetration using a 140 lb hammer unless otherwise specified.
- TPH = Total Petroleum Hydrocarbon concentrations analyzed using Method DEQ TPH-G/BTEX
- ND = Not detected, or levels were below analytical detection limits.
- NA = Not Analyzed.

This summary applies only at the location of this boring, and at the time of drilling. Subsurface conditions may differ at other locations, and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

TERRA VAC

Date Drilled: 01/24/97 **Boring/Well Number:** DVE-4

Project: Rose's Parking Lot Project Number: 32-0029

Address: 330 NW 23rd Ave., Portland, Oregon

Drilling Contractor: Cascade Drilling, Inc. Log by: J. Orr

Drill Rig: CME-75 Auger Size/Type: 12" O.D. Hollow Stem Sample Method: Split Spoon

Total Depth: 38 feet Depth to Groundwater: 23 feet Backfill or Grout Material: Bentonite Chips

Well Casing/Screen Material: Sched. 40 PVC Filter Material/Size: 10-20 Colorado Silica Sand

Well: Casing/Screen Diameter: 4 in. Slot Size: 0.01" Seal: 0 - 13 feet Screened Interval: 15.5-37.5 feet

Depth (feet)	Sample	Blows	PID (ppm) headspace	Odor	TPH (ppm)	USGS	Description: Name, Primary Composition (%), Secondary Composition (%), Silt (%), Color, Grain size, Sorting, Texture/Consistency, Induration, Moisture, Other distinguishing features.
							ASPHALT (4")
						SC	CLAYEY SAND; 50-60% fine to medium grained sand 10-20% clay; 20-30% medium to coarse grained silt; Dark green-gray; Very dense; Moist
						CL	SILTY CLAY; 60-70% clay; 30-40% silt; trace fine grained gravel and very fine sand; Black; Very stiff; Moderate plasticity; Moist; Organic-like odor
5		16, 45, 50, 95	5	No		SM	SILTY SAND; 60-7-% fine to medium grained sand; 10-20% silty clay; 10-20% medium to coarse grained gravel and asphalt and concrete fragments; Dark gray; Very dense; Damp
10		18, 12, 15, 27	5	No		ML	SANDY SILT; 50-60% silt; 40-50% fine grained sand; trace clay; Yellow brown; Very stiff; Low Plasticity; Moist; Iron oxide veins
15		15, 15, 15	8	No			
20		13, 15, 15, 30		No			At 20 feet, same as above; hole dry during drilling
25						SM	

Well Completion Details

General Remarks:

- Blow counts are recorded for 12 inches of sampler penetration using a 140 lb hammer unless otherwise specified.
- TPH = Total Petroleum Hydrocarbon concentrations analyzed using Method DEQ TPH-G/BTEX
- ND = Not detected, or levels were below analytical detection limits.
- NA = Not Analyzed.

This summary applies only at the location of this boring, and at the time of drilling. Subsurface conditions may differ at other locations, and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

TERRA VAC

Date Drilled: 01/24/97 Boring/Well Number: DVE-4

Project: Rose's Parking Lot Project Number: 32-0029

Address: 330 NW 23rd Ave., Portland, Oregon

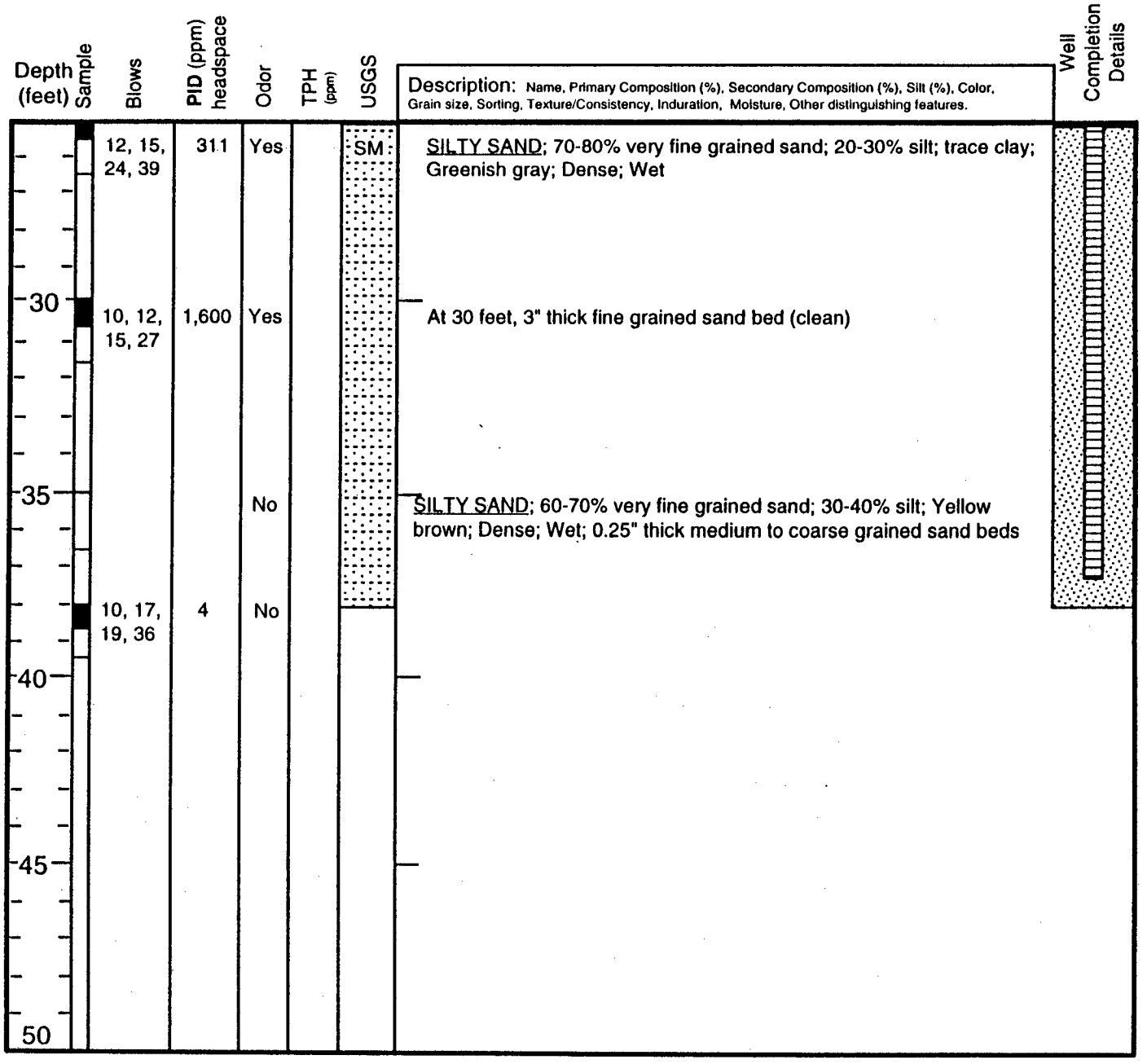
Drilling Contractor: Cascade Drilling, Inc. Log by: J. Orr

Drill Rig: CME-75 Auger Size/Type: 12" O.D. Hollow Stem Sample Method: Split Spoon

Total Depth: 38 feet Depth to Groundwater: 23 feet Backfill or Grout Material: Bentonite Chips

Well Casing/Screen Material: Sched. 40 PVC Filter Material/Size: 10-20 Colorado Silica Sand

Well: Casing/Screen Diameter: 4 in. Slot Size: 0.01" Seal: 0 - 13 feet Screened Interval: 15.5-37.5 feet



General Remarks:

- Blow counts are recorded for 12 inches of sampler penetration using a 140 lb hammer unless otherwise specified.
- TPH = Total Petroleum Hydrocarbon concentrations analyzed using Method DEQ TPH-G/BTEX
- ND = Not detected, or levels were below analytical detection limits.
- NA = Not Analyzed.

This summary applies only at the location of this boring, and at the time of drilling. Subsurface conditions may differ at other locations, and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

APPENDIX C

COMPLETE LABORATORY ANALYTICAL REPORTS

APPENDIX C

COMPLETE LABORATORY ANALYTICAL REPORTS

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

BOTHELL ▪ (206) 481-9200 ▪ FAX 485-2992
SPOKANE ▪ (509) 924-9200 ▪ FAX 924-9290
PORTLAND ▪ (503) 643-9200 ▪ FAX 644-2202

Terra Vac - Seattle	Project: Rose's Parking Lot	Sampled: 2/3/97 to 1/24/97
10470 Meridian Ave. N. Ste 202	Project Number: 32-0029 "D"	Received: 2/3/97
Seattle, WA 98133	Project Manager: Tim Warner	Reported: 2/7/97 15:14

ANALYTICAL REPORT FOR SAMPLES:

Sample Description	Laboratory Sample Number	Sample Matrix	Date Sampled
Spoil Pile	P702009-01	Soil	2/3/97
DVE2-15	P702009-02	Soil	1/24/97
DVE4-15	P702009-03	Soil	1/24/97
DVE1-15	P702009-04	Soil	1/24/97

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Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 2/3/97 to 1/24/97
10470 Meridian Ave. N. Ste 202	Project Number:	32-0029 "D"	Received: 2/3/97
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 2/7/97 15:14

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per Oregon DEQ TPH-G and EPA 8020A
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
Spoil Pile			P702009-01				Soil	
Benzene	0270022	2/3/97	2/4/97		0.250	ND	mg/kg	
Toluene	"	"	"		0.250	0.820	"	
Ethylbenzene	"	"	"		0.250	1.26	"	
Xylenes (total)	"	"	"		0.250	6.66	"	
Gasoline Range Hydrocarbons	"	"	"		10.0	203	"	
Surrogate: a,a,a-TFT	"	"	"	*50.0-150*		*97.2*	%	
DVE2-15			P702009-02				Soil	
Benzene	0270022	2/3/97	2/4/97		0.0500	ND	mg/kg	
Toluene	"	"	"		0.0500	ND	"	
Ethylbenzene	"	"	"		0.0500	0.0565	"	
Xylenes (total)	"	"	"		0.0500	ND	"	
Gasoline Range Hydrocarbons	"	"	"		2.00	2.23	"	
Surrogate: a,a,a-TFT	"	"	"	*50.0-150*		*71.2*	%	
DVE4-15			P702009-03				Soil	
Benzene	0270022	2/3/97	2/4/97		0.0500	ND	mg/kg	
Toluene	"	"	"		0.0500	ND	"	
Ethylbenzene	"	"	"		0.0500	ND	"	
Xylenes (total)	"	"	"		0.0500	ND	"	
Gasoline Range Hydrocarbons	"	"	"		2.00	ND	"	
Surrogate: a,a,a-TFT	"	"	"	*50.0-150*		*68.0*	%	
DVE1-15			P702009-04				Soil	
Benzene	0270022	2/3/97	2/4/97		0.0500	ND	mg/kg	
Toluene	"	"	"		0.0500	ND	"	
Ethylbenzene	"	"	"		0.0500	ND	"	
Xylenes (total)	"	"	"		0.0500	ND	"	
Gasoline Range Hydrocarbons	"	"	"		2.00	ND	"	
Surrogate: a,a,a-TFT	"	"	"	*50.0-150*		*61.6*	%	

North Creek Analytical, Inc.

**Refer to end of report for text of notes and definitions*

Tabatha A Brochu, Project Manager

18939 120th Avenue N.E., Suite 101, Bothell, WA 98011-9508
East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132

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Terra Vac - Seattle	Project: Rose's Parking Lot	Sampled: 2/3/97 to 1/24/97
10470 Meridian Ave. N. Ste 202	Project Number: 32-0029 "D"	Received: 2/3/97
Seattle, WA 98133	Project Manager: Tim Warner	Reported: 2/7/97 15:14

Heavy Oil Range Hydrocarbons per Oregon DEQ Method 418.1 (modified)
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Specific Method	Reporting Limit	Result	Units	Notes*
Spoil Pile			P702009-01				Soil	
Petroleum Oil Hydrocarbons	0270012	2/5/97	2/5/97	DEQ 418.1 M	20.0	20.4	mg/kg	

North Creek Analytical, Inc.

Refer to end of report for text of notes and definitions.

Tabatha A Brochu, Project Manager

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Terra Vac - Seattle	Project: Rose's Parking Lot	Sampled: 2/3/97 to 1/24/97
10470 Meridian Ave. N. Ste 202	Project Number: 32-0029 "D"	Received: 2/3/97
Seattle, WA 98133	Project Manager: Tim Warner	Reported: 2/7/97 15:14

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per Oregon DEQ TPH-G and EPA 8020A/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0270022	**Date Prepared: 2/3/97**					**Extraction Method: MeOH Extraction**				
Blank	**0270022-BLK1**									
Benzene	2/5/97			ND	mg/kg	0.0500				
Toluene	"			ND	"	0.0500				
Ethylbenzene	"			ND	"	0.0500				
Xylenes (total)	"			ND	"	0.0500				
Gasoline Range Hydrocarbons	"			ND	"	2.00				
Surrogate: a,a,a-TFT	"	*2.50*		*2.02*	"	*50.0-150*	*80.8*			
LCS	**0270022-BS1**									
Gasoline Range Hydrocarbons	2/5/97	37.5		25.8	mg/kg	50.0-150	68.8			
Surrogate: a,a,a-TFT	*2/4/97*	*2.50*		*2.45*	"	*50.0-150*	*98.0*			
LCS	**0270022-BS2**									
Benzene	2/4/97	0.500		0.472	mg/kg	69.0-138	94.4			
Toluene	"	0.500		0.463	"	53.0-151	92.6			
Ethylbenzene	"	0.500		0.440	"	61.0-141	88.0			
Xylenes (total)	"	1.50		1.37	"	62.0-144	91.3			
Surrogate: a,a,a-TFT	"	*2.50*		*1.85*	"	*50.0-150*	*74.0*			
Duplicate	**0270022-DUP1**		**P701437-01**							
Gasoline Range Hydrocarbons	2/4/97		ND	ND	mg/kg			50.0		
Surrogate: a,a,a-TFT	"	*2.50*		*1.72*	"	*50.0-150*	*68.8*			
Matrix Spike	**0270022-MS1**		**P701436-07**							
Benzene	2/4/97	0.500	ND	0.458	mg/kg	56.0-123	91.6			
Toluene	"	0.500	ND	0.472	"	54.0-123	94.4			
Ethylbenzene	"	0.500	ND	0.472	"	45.0-130	94.4			
Xylenes (total)	"	1.50	ND	1.45	"	50.0-127	96.7			
Surrogate: a,a,a-TFT	"	*2.50*		*1.37*	"	*50.0-150*	*54.8*			
Matrix Spike Dup	**0270022-MSD1**		**P701436-07**							
Benzene	2/4/97	0.500	ND	0.472	mg/kg	56.0-123	94.4	17.0	3.01	
Toluene	"	0.500	ND	0.472	"	54.0-123	94.4	24.0	0	
Ethylbenzene	"	0.500	ND	0.468	"	45.0-130	93.6	20.0	0.851	
Xylenes (total)	"	1.50	ND	1.42	"	50.0-127	94.7	20.0	2.09	
Surrogate: a,a,a-TFT	"	*2.50*		*1.37*	"	*50.0-150*	*54.8*			

*Refer to end of report for text of notes and definitio

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PORTLAND • (503) 643-9200 • FAX 644-2202

Terra Vac - Seattle	Project: Rose's Parking Lot	Sampled: 2/3/97 to 1/24/97
10470 Meridian Ave. N. Ste 202	Project Number: 32-0029 "D"	Received: 2/3/97
Seattle, WA 98133	Project Manager: Tim Warner	Reported: 2/7/97 15:14

Heavy Oil Range Hydrocarbons per Oregon DEQ Method 418.1 (modified)/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0270012	**Date Prepared: 2/3/97**					**Extraction Method: TPH-418.1 (OR)**				
Blank	**0270012-BLK1**									
Petroleum Oil Hydrocarbons	2/3/97			ND	mg/kg	20.0				
LCS	**0270012-BS2**									
Petroleum Oil Hydrocarbons	2/3/97	175		111	mg/kg	50.0-150	63.4			
LCS	**0270012-BS3**									
Petroleum Oil Hydrocarbons	2/5/97	175		137	mg/kg	50.0-150	78.3			
Duplicate	**0270012-DUP1**		**P701449-01**							
Petroleum Oil Hydrocarbons	2/3/97		ND	ND	mg/kg			50.0		
Duplicate	**0270012-DUP2**		**P702009-01**							
Petroleum Oil Hydrocarbons	2/5/97		20.4	ND	mg/kg			50.0		1

*Refer to end of report for text of notes and definitions.

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Terra Vac - Seattle	Project: Rose's Parking Lot	Sampled: 2/3/97 to 1/24/97
10470 Meridian Ave. N. Ste 202	Project Number: 32-0029 "D"	Received: 2/3/97
Seattle, WA 98133	Project Manager: Tim Warner	Reported: 2/7/97 15:14

Notes and Definitions

#	Note
1	Analyses are not controlled on RPD values from sample concentrations less than 5 times the reporting limit.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
Recov.	Recovery
RPD	Relative Percent Difference

North Creek Analytical, Inc.

Tabatha A Brochu, Project Manager

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9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

CHAIN OF CUSTODY REPORT

Work Order # P702009

REPORT TO: TERRA VAC	INVOICE TO: TERRA VAC
ATTENTION: Mr. Tim Warner	ATTENTION: Tim Warner
ADDRESS: Sand Ac B:11	ADDRESS: 10740 Meridian Av. N #202 SeaHlo WA 98133
PHONE: (206) 362-8294 FAX: (206) 362-9528	P.O. NUMBER: 32-0029-3-7415 NCA QUOTE #:
PROJECT NAME: Ross's Parking Lot	
PROJECT NUMBER: 32-0029 "D"	
SAMPLED BY: J. ORR	

TURNAROUND REQUEST in Business Days *
Organic & Inorganic Analyses: 10 Standard | 7 | 5 | 4 | 3 | 2 | 1 | Same Day
Fuels & Hydrocarbon Analyses: 5 Standard | 3-4 | 2 | 1 | Same Day → See Comments
OTHER Specify:
* Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	NCA SAMPLE ID (Laboratory Use Only)	418.1	TPH-G/BTEX "D"	MATRIX (W. S. A. O)	# OF CONTAINERS	COMMENTS
1.	Spoil Pile	2-3-97/1040		X	X	S	1	48 Hour!!
2.	~~DVE1-15~~ Dom							
3.	DVE2-15	1-27-97/1125			X	S	1	Standard Turn
4.	DVE4-15	1-27-97/0900			X	S	1	
5.	DVE1-15	1-24-97/125			X	S	1	
6.								
7.								
8.								
9								
10.								

RELINQUISHED BY: James Orr DATE: 2-3-97
PRINT NAME: James Orr FIRM: Terra Vac TIME: 1159
RECEIVED BY: Amy Spangler DATE: 2-3-
PRINT NAME: Amy Spangler FIRM: NCA TIME: 1159

RELINQUISHED BY: Amy Spangler DATE: 2-3-97
PRINT NAME: Amy Spangler FIRM: NCA TIME: 1230
RECEIVED BY: Sara McClurg DATE: 2-3-
PRINT NAME: Sara McClurg FIRM: NCA TIME: 123

ADDITIONAL REMARKS: Fax Results to (206) 362-9528 and (503) 625-3777
Hold Extra Samples Standard Time thanks JA

PAGE 1 OF 1

TERRA VAC
10740 Meridian Avenue North, Suite 202, Seattle, WA 98133-9010
Tel (206) 362-8128 ❑ Fax (206) 362-9528

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
JUL 7 1997
NORTHWEST REGION

June 30, 1997

Mr. Max Birnbach
c/o Mr. Charles R. Williamson
Kell, Alterman & Runstein
1001 Southwest Fifth Avenue, Suite 1800
Portland, OR 97204-1194

RE: Corrections to First and Second Quarter 1997 Groundwater Monitoring Reports
Rose's Parking Lot
330 Northwest 23rd Avenue, Portland, OR

Dear Mr. Birnbach:

The first and second quarter groundwater reports for Rose's Parking Lot contained incorrect figures 2 and 3. The figures for the first quarter report were mistakenly inserted into the second quarter groundwater report, and vice versa. For this reason, the data in the tables does not match the figures for groundwater elevations and analytical data.

Copies of figures 2 and 3 are enclosed, labeled with the groundwater report they should be inserted into. Please remove the figures in your copies and replace them with the enclosed figures.

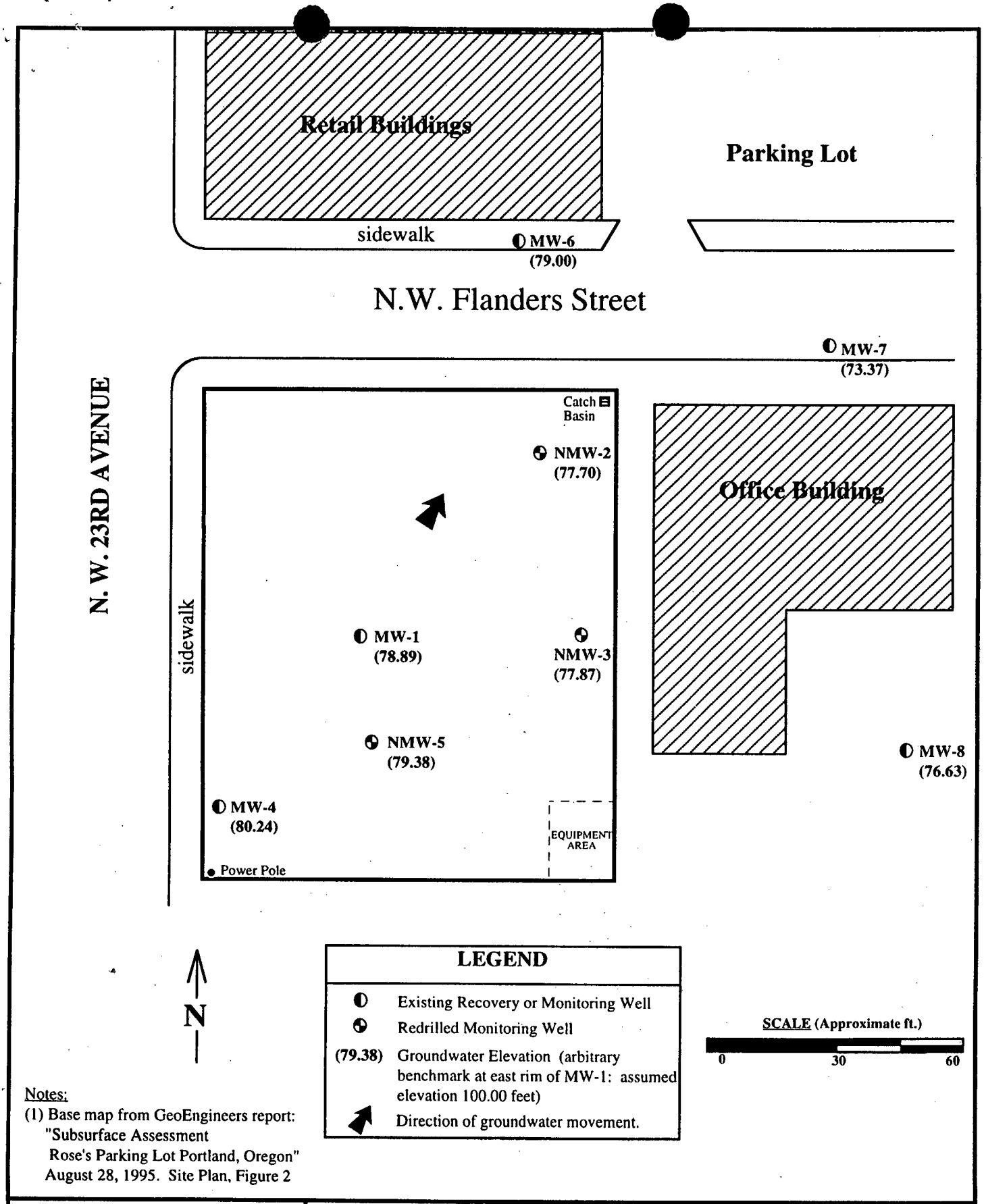
We greatly regret this mistake, and any confusion it may have caused. If you have any questions, or require additional information, please do not hesitate to call me at (206) 362-8294.

Sincerely,
Terra Vac Corporation

Timothy Warner
Project Manager

cc: Dave Roy
Rich Kostecki
Jeffrey Wishko
Richard Singer (2 copies)
Richard Allen
Edward Crow
Don Pettit

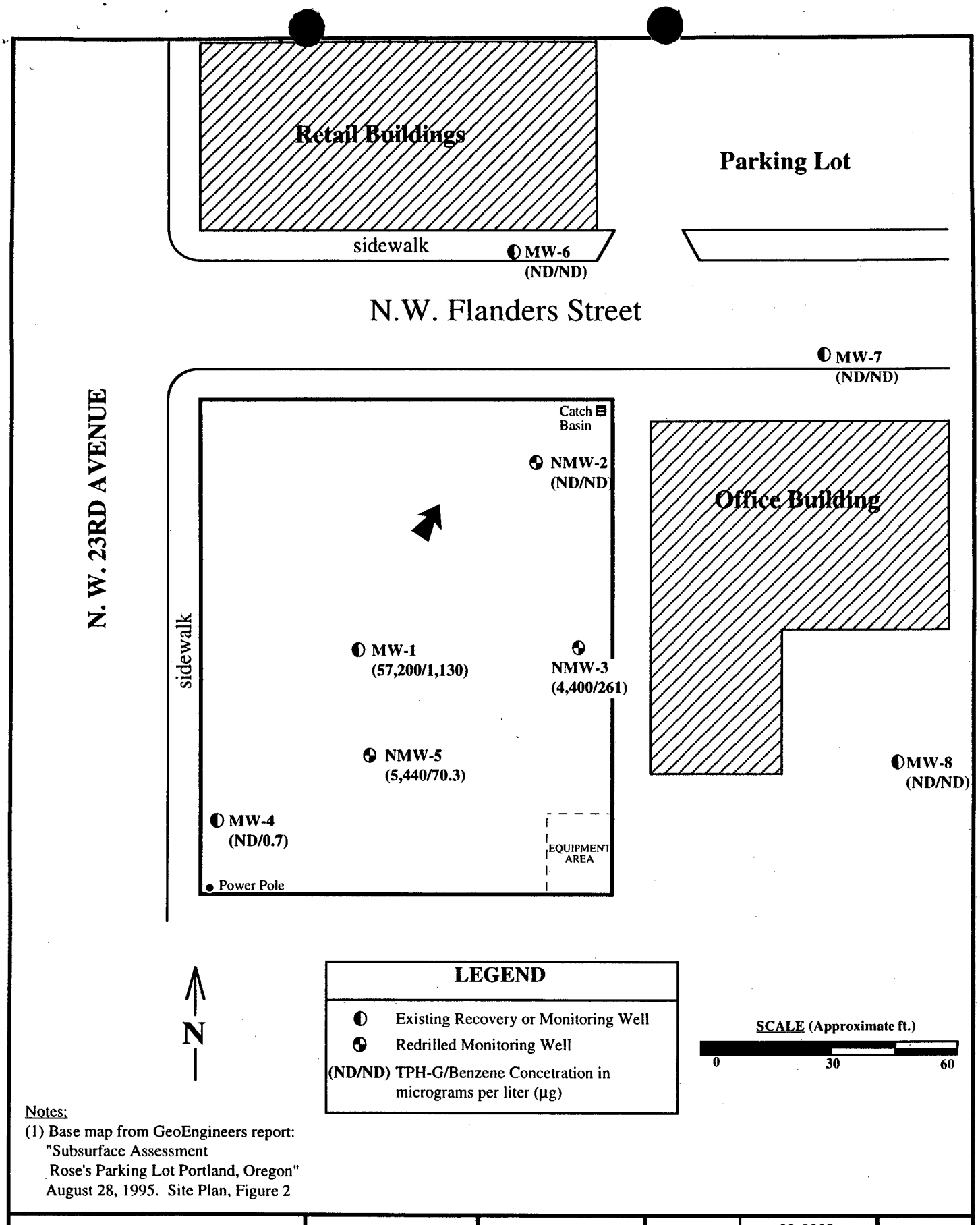
printed on recycled paper



Notes:
(1) Base map from GeoEngineers report:
"Subsurface Assessment
Rose's Parking Lot Portland, Oregon"
August 28, 1995. Site Plan, Figure 2

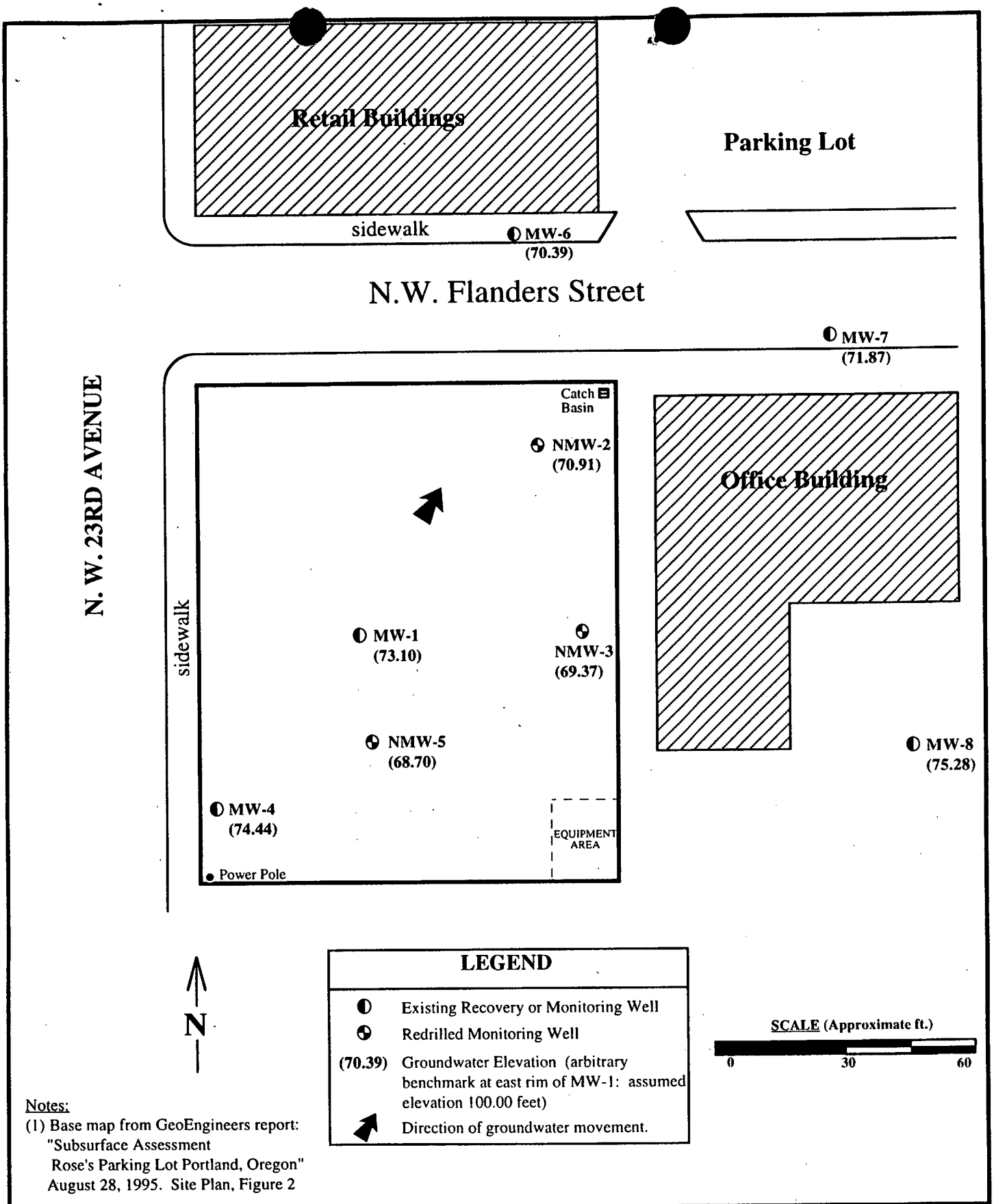
Groundwater Elevations	**Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon**	TERRA VAC	Project No.	32-0029	Figure 2
			Date	May 29, 1997	
			Scale	1 inch ≈ 30 Feet	
			Revision	MKF-1	

1ST QTR GW REPORT



Notes:
(1) Base map from GeoEngineers report:
"Subsurface Assessment
Rose's Parking Lot Portland, Oregon"
August 28, 1995. Site Plan, Figure 2

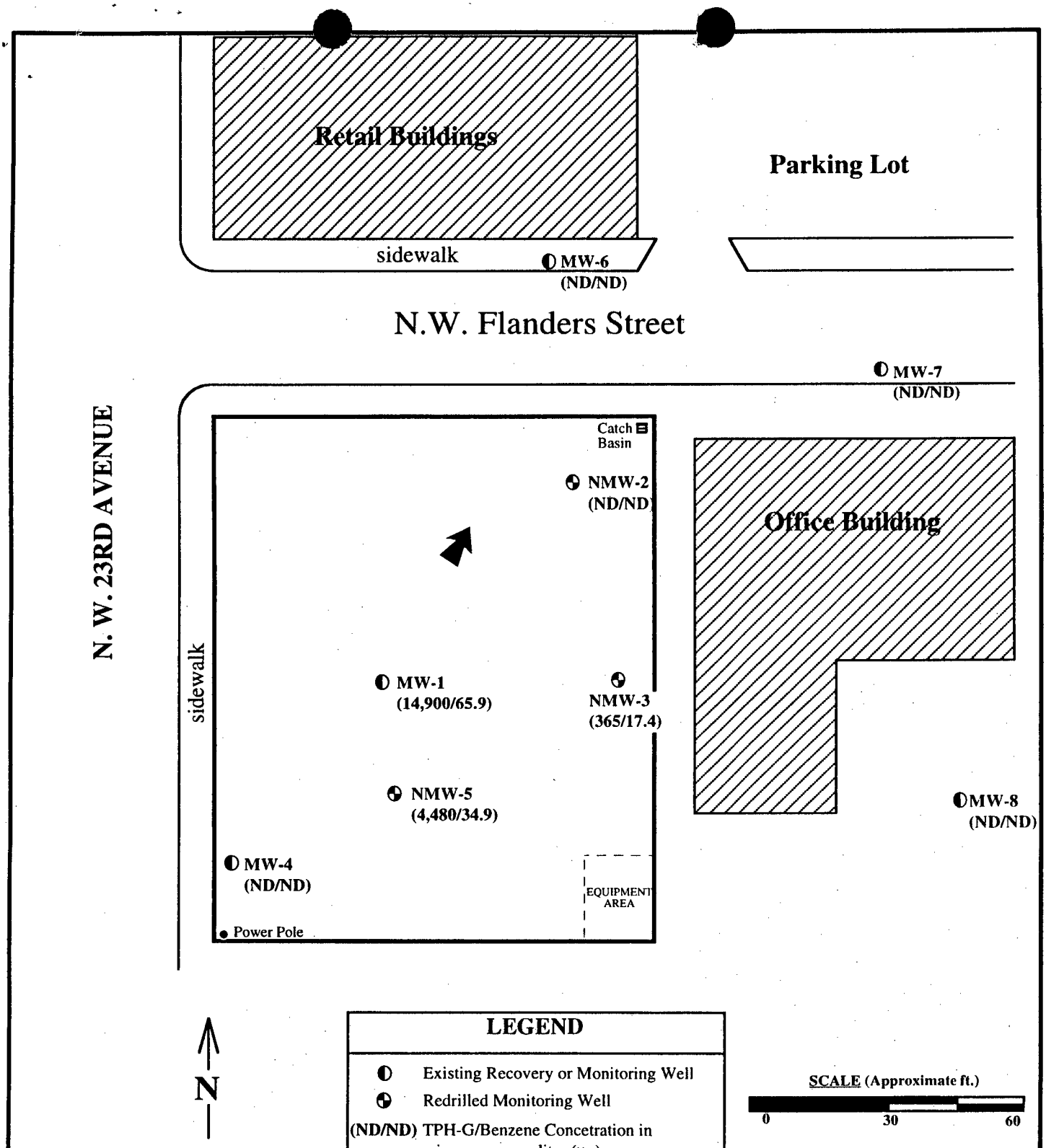
Groundwater Analytical Results	**Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon**	TERRA VAC	Project No.	32-0029	Figure 3
			Date	May 29, 1997	
			Scale	1 inch ≈ 30 Feet	
			Revision	MKF-1	



Notes:
(1) Base map from GeoEngineers report: "Subsurface Assessment Rose's Parking Lot Portland, Oregon" August 28, 1995. Site Plan, Figure 2

Groundwater Elevations	**Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon**	TERRA VAC	Project No. 32-0029 Date June 9, 1997 Scale 1 inch ≈ 30 Feet Revision MKF-1	Figure 2

2ND QTR GW REPORT



Notes:
(1) Base map from GeoEngineers report:
"Subsurface Assessment
Rose's Parking Lot Portland, Oregon"
August 28, 1995. Site Plan, Figure 2

Groundwater Analytical Results	**Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon**	TERRA VAC	Project No.	32-0029	Figure 3
			Date	June 9, 1997	
			Scale	1 inch ≈ 30 Feet	
			Revision	MKF-1	

Don Pettit NWR
26-94-0025

GeoEngineers

March 28, 1997

Consulting Engineers and Geoscientists
Offices in Washington, Oregon, and Alaska

Oregon Department of Environmental Quality
811 Southwest Sixth Avenue
Portland, Oregon 97204-1390

Attention: Business Office

Rose's Parking Lot
Portland, Oregon
File No. 4326-001-62

As of January 31, 1997, GeoEngineers is no longer responsible for paying Oregon Department of Environmental Quality (DEQ) costs associated with the Rose's Parking Lot site. The DEQ project number for this site is L7884000. The DEQ project manager for this site is Mr. Don Pettit.

Costs incurred prior to January 31, 1997 should be invoiced to GeoEngineers, Inc. Costs incurred after January 31, 1997 should be directed to TERRA VAC, Inc. of Seattle, Washington under authorization from our former clients. TERRA VAC, Inc. is assisting Mr. Max Birnbach, Amoco Oil Company, Gull Industries, Inc. and Unocal Corporation with remedial activities at Rose's Parking Lot.

Please call if you have any questions.

Yours very truly,

GeoEngineers, Inc.

Marsi M. Beeson

Marsi M. Beeson
Environmental Scientist

Julia Fowler

Julia Fowler, P.E.
Associate

MMB:JF:mln
Document ID: 43260011.6

cc: Mr. Max Birnbach
c/o Charles R. Williamson
Kell, Alterman & Runstein

GeoEngineers, Inc.
7504 SW Bridgeport Road
Portland, OR 97224
Telephone (503) 624-9274
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Printed on recycled paper

DJP 26-94-0025

TERRA VAC
10740 Meridian Avenue North, Suite 202, Seattle, WA 98133-9010
Tel (206) 362-8128 ❑ Fax (206) 362-9528

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
JUL 7 1997
NORTHWEST REGION

July 1, 1997

Mr. Max Birnbach
c/o Mr. Charles R. Williamson
Kell, Alterman, & Runstein
1001 Southwest Fifth Avenue, Suite 1800
Portland, OR 97204-1194

RE: System Operations Report
Rose's Parking Lot
330 Northwest 23rd Avenue, Portland, OR
Operating Period: March 14, 1997 - June 20, 1997
Terra Vac Project #32-0029-O

Dear Mr. Birnbach:

This letter report summarizes the subsurface remedial operations at the Rose's Parking Lot site during the above-referenced operating period. A description of the performance of the system during operations is summarized in the following sections.

1.0 Operations

The dual phase soil vapor extraction (DVE) system was started on March 14, 1997. The DVE system incorporates eight groundwater/vapor extraction wells and four soil vapor extraction (SVE) wells. The DVE system is designed to remediate impacted soil and groundwater caused by leaking underground storage tanks (USTs). A site map of the DVE system and process and instrumentation diagram is depicted in figures 1 and 2, respectively. During startup, the system was shut off intermittently to troubleshoot and optimize various parameters associated with the operations of the system. Since March 14, 1997, the system has operated for approximately 75 days. The system operational data are presented in Table 1.

Due to the lower than expected groundwater extraction rates during operations, the submersible pumps were not installed in wells NMW-2, NMW-3, and NRW-1. Like the other DVE wells on-site, these wells utilize an entrainment tube to extract the groundwater from the well at a sufficient rate for dewatering.

2.0 Vapor Sampling and Analysis

Samples of the extracted vapors were taken and analyzed by gas chromatography (GC) using Terra Vac's in-house laboratory. Vapor samples were analyzed for gasoline range petroleum hydrocarbons (TPH-G) and specifically for benzene, toluene, ethylbenzene, and xylenes (BTEX). Samples of the extracted vapors were taken from the individual well heads and the system main header. Air flow rates were measured at the time of vapor sampling with a self-averaging annubar. These data were used for the quantification of the system mass extraction rate (expressed as

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pounds of TPH-G extracted per day) and the cumulative mass of TPH-G extracted over time. The system analytical data are presented in Table 1.

As of June 20, 1997 approximately 3,711 pounds of hydrocarbons have been extracted from the subsurface. Figure 3 graphically depicts the cumulative pounds of hydrocarbons removed from the subsurface.

3.0 Groundwater Extraction

The volume of groundwater extracted from startup to June 20, 1997, was approximately 500,000 gallons. The average groundwater extraction rate from startup to June 20, 1997, is approximately 5 gpm.

4.0 Groundwater Discharge

The treatment system effluent was sampled on May 2 and 29, 1997. The samples were sent to an Oregon certified laboratory for analysis of BTEX, oil and grease, chlorinated hydrocarbons, closed cup flash point, cadmium, total chromium, total copper, total nickel, total lead, and total zinc. In addition field measurements were taken to determine the pH and lower explosive limit (LEL). The analyses were done to verify that the discharge was in compliance with the City of Portland discharge permit. The results of the May 2 and 29 sampling events are presented in Table 2. The results show that the concentrations of the parameters were less than the permit limits.

5.0 Recommendations

Groundwater sampling results (Appendix A) show significant progress in reducing BTEX and TPH-G concentrations in the groundwater. DVE operations will continue at the site with efforts concentrating on the wells showing higher BTEX concentrations during the quarterly sampling.

Please feel free to call if you have questions with this report.

Sincerely,
Terra Vac Corp.

Paul V. Bianco
Project Engineer

Timothy Warner
Project Manager

Attachments

cc: Dave Roy
Rich Kostecki
Jeffrey Wishko
Richard Singer (2 copies)
Richard Allen
Edward Crow
Don Pettit

TABLE 1
ROSE'S PARKING LOT
SYSTEM OPERATIONAL ANALYTICAL DATA
TERRA VAC # 32-0029

LOCATION:	TOTAL											
Date	Well Vacuum (in. Hg)	Line Vacuum (in. Hg)	Flow ΔP (in. H2O)	Vapor Flow Rate (scfm)	Run Time (Days)	Benzene Conc. (mg/l)	Toluene Conc. (mg/l)	Ethylbenzene Conc. (mg/l)	Total Xylenes Conc. (mg/l)	Total TPH-G Conc. (mg/l)	Total TPH-G Extraction Rate (lbs/day)	Cumulative TPH-G Extracted (lbs)
3/18/97	NA	15.0	0.2	179	2.3	0.0285	0.0980	0.0537	0.2811	2.81	45.10	101.48
3/19/97	NA	13.0	0.4	269	3.8	NA	NA	NA	NA	NA	67.92	203.36
3/24/97	NA	13.0	0.2	190	7.5	NA	NA	NA	NA	NA	48.03	383.46
3/27/97	NA	13.0	0.2	190	9.8	NA	NA	NA	NA	NA	48.03	491.52
4/3/97	NA	13.0	0.3	233	15.0	NA	NA	NA	NA	NA	58.82	800.33
4/4/97	NA	13.5	0.3	230	15.8	NA	NA	NA	NA	NA	57.95	843.79
4/8/97	NA	13.5	0.4	265	18.8	NA	NA	NA	NA	NA	66.91	1044.52
4/9/97	NA	13.5	0.3	230	19.5	NA	NA	NA	NA	NA	57.95	1087.98
4/10/97	NA	12.5	0.4	273	20.3	NA	NA	NA	NA	NA	68.92	1139.67
4/14/97	NA	13.0	0.4	269	23.3	NA	NA	NA	NA	NA	67.92	1343.43
4/16/97	NA	12.0	0.4	277	24.8	NA	NA	NA	NA	NA	69.90	1448.27
4/21/97	NA	12.8	0.4	271	28.5	NA	NA	NA	NA	NA	68.42	1704.85
4/25/97	NA	13.0	0.2	190	31.5	NA	NA	NA	NA	NA	48.03	1848.93
5/1/97	NA	13.5	0.3	230	36.0	NA	NA	NA	NA	NA	57.95	2109.69
5/2/97	NA	10.0	0.6	358	36.8	0.0591	0.0356	0.0058	0.0752	0.99	31.74	2133.49
5/7/97	NA	14.0	0.2	185	40.5	NA	NA	NA	NA	NA	16.38	2194.92
5/15/97	NA	13.5	0.2	187	46.5	NA	NA	NA	NA	NA	16.64	2294.75
5/16/97	NA	14.0	0.2	185	47.3	NA	NA	NA	NA	NA	16.38	2307.03
5/19/97	NA	13.5	0.3	230	49.5	0.0534	0.0947	0.0067	0.2313	2.96	61.13	2444.57
6/4/97	NA	13.5	0.2	187	61.5	NA	NA	NA	NA	NA	49.91	3043.48
6/5/97	NA	14.0	0.5	292	62.3	0.0285	0.0980	0.0537	0.2811	2.81	73.66	3098.72
6/16/97	NA	14.0	0.5	292	70.5	NA	NA	NA	NA	NA	73.66	3706.43
6/19/97	NA	NA	NA	NA	72.8	NA	NA	NA	NA	NA	NA	3708.61
6/20/97	NA	14.0	0.4	261	73.5	0.0026	0.0041	0.0054	0.0145	0.06	1.45	3710.79

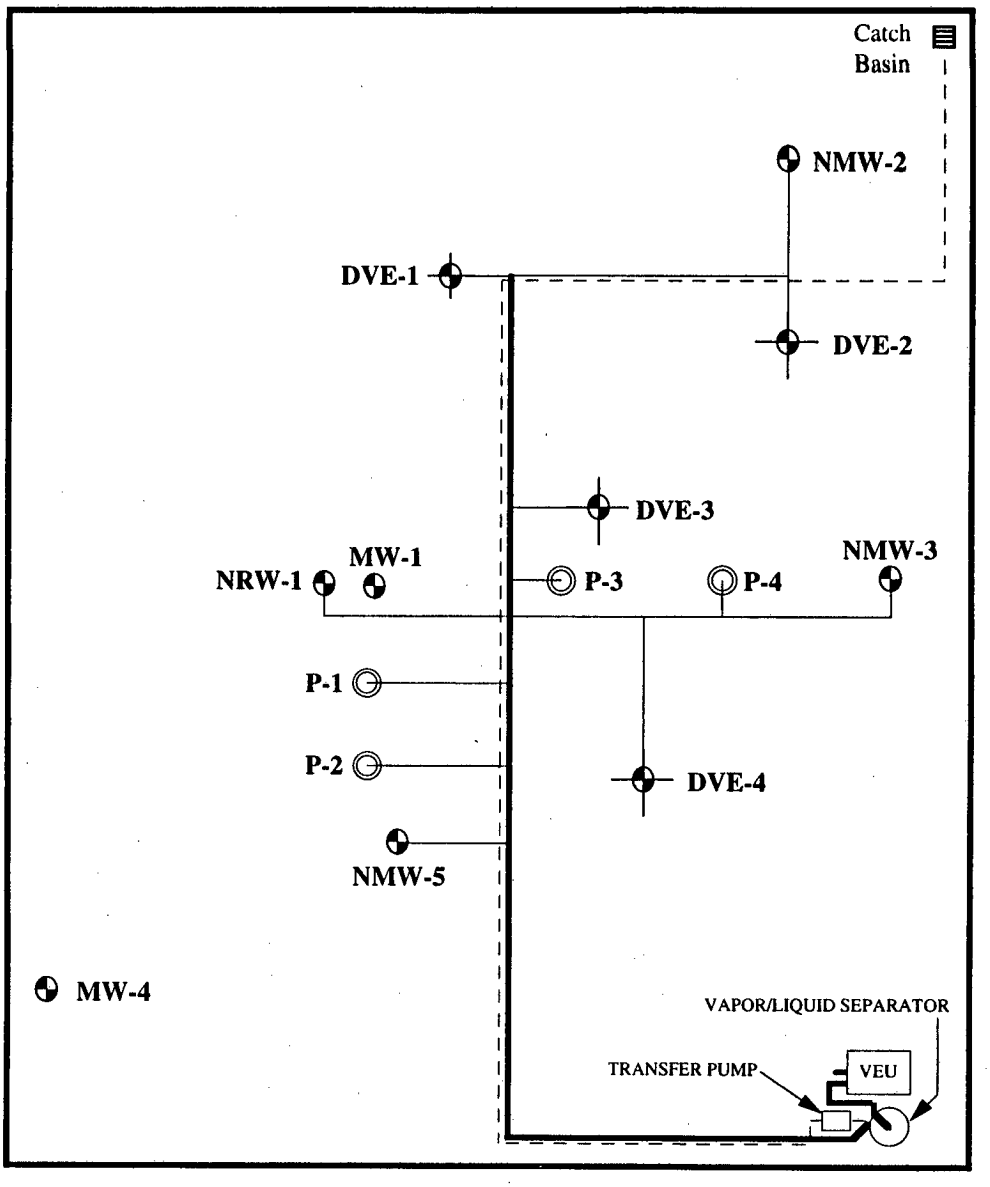
TABLE 2
Rose's Parking Lot
Water Discharge Analyses Results
Terra Vac # 32-0029

Parameter	5/2/97	5/29/97	Discharge Limits	Units
pH	5.93	6.6	6.0 - 9.0	S.U.
Oil and Grease	Non Detect	0.692	10	mg/l
BTEX (Total)	0.232	0.37704	0.75	mg/l
Benzene	0.008	0.00704	0.05	mg/l
Chlorinated Hydrocarbons	Non Detect	0.00332	0.5	mg/l
Lower Explosive Limit	1	0	10	%
Closed Cup Flash Point	150	150	140 or greater	degrees F
Cadmium	<0.0100	<0.00100	0.06	mg/l
Chromium (Total)	0.0024	0.00163	0.34	mg/l
Copper (Total)	0.00506	0.00243	0.23	mg/l
Nickel (Total)	0.0113	0.00328	0.25	mg/l
Lead (Total)	0.00232	0.00258	0.1	mg/l
Zinc (Total)	0.0175	<0.00500	0.47	mg/l
Flow (Average)	NA	6.2	NA	gpm

N.W. FLANDERS STREET

N

N. W. 23RD AVENUE



LEGEND

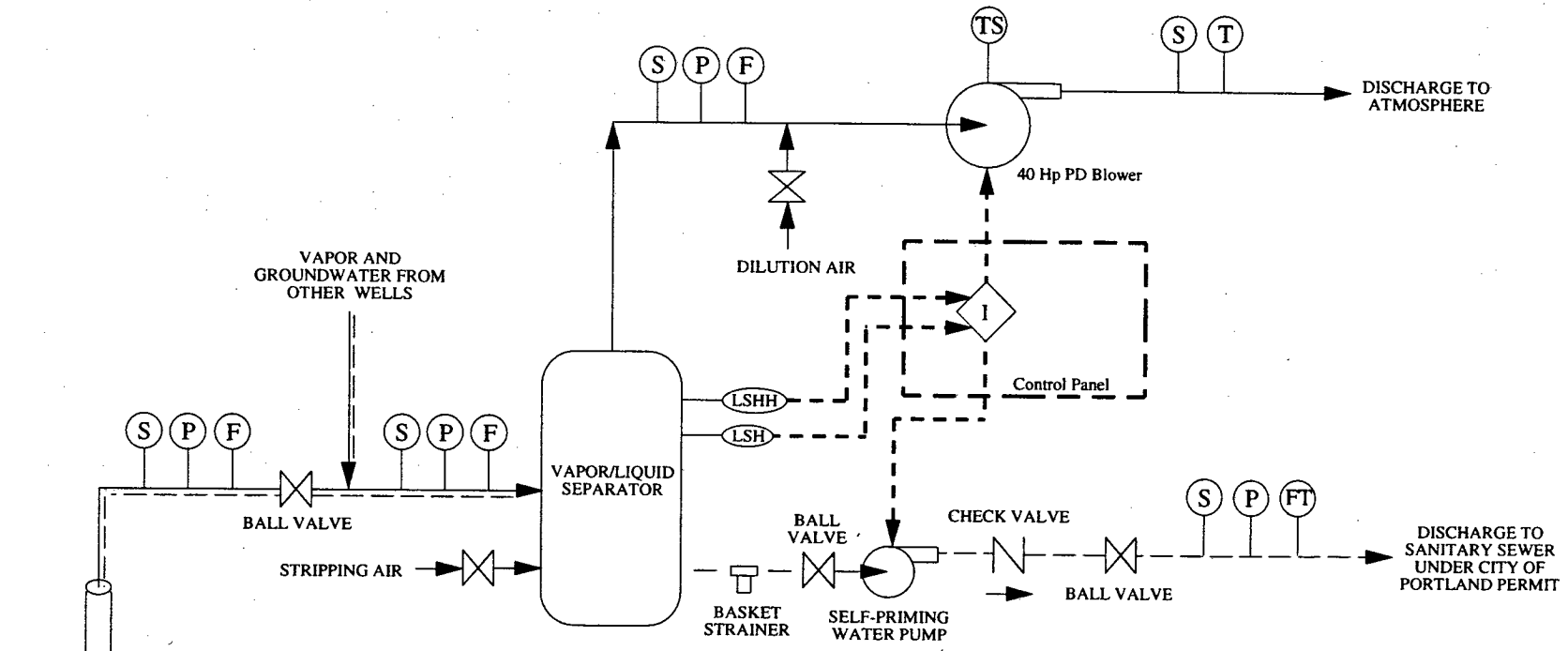
- Redrilled Monitoring Well Using EE
- DVE Well Using EE
- SVE Well
- 1-1/2" Water Discharge Pipe
- 1-1/2" DVE Pipe
- 6" DVE Pipe

Notes:
(1) Base map from GeoEngineers report: "Subsurface Assessment Rose's Parking Lot Portland, Oregon" August 28, 1995. Site Plan, Figure 2

SCALE (Approximate ft.)

0 20 40

SYSTEM PIPING AND EQUIPMENT LAYOUT	**Rose's Parking Lot 330 NE 23rd Avenue Portland, Oregon**	TERRA VAC	Project No.	32-0029	Figure 1
			Date	July 1, 1997	
			Scale	1 Inch = 20 Feet	
			Revision	PVB -2	



LEGEND

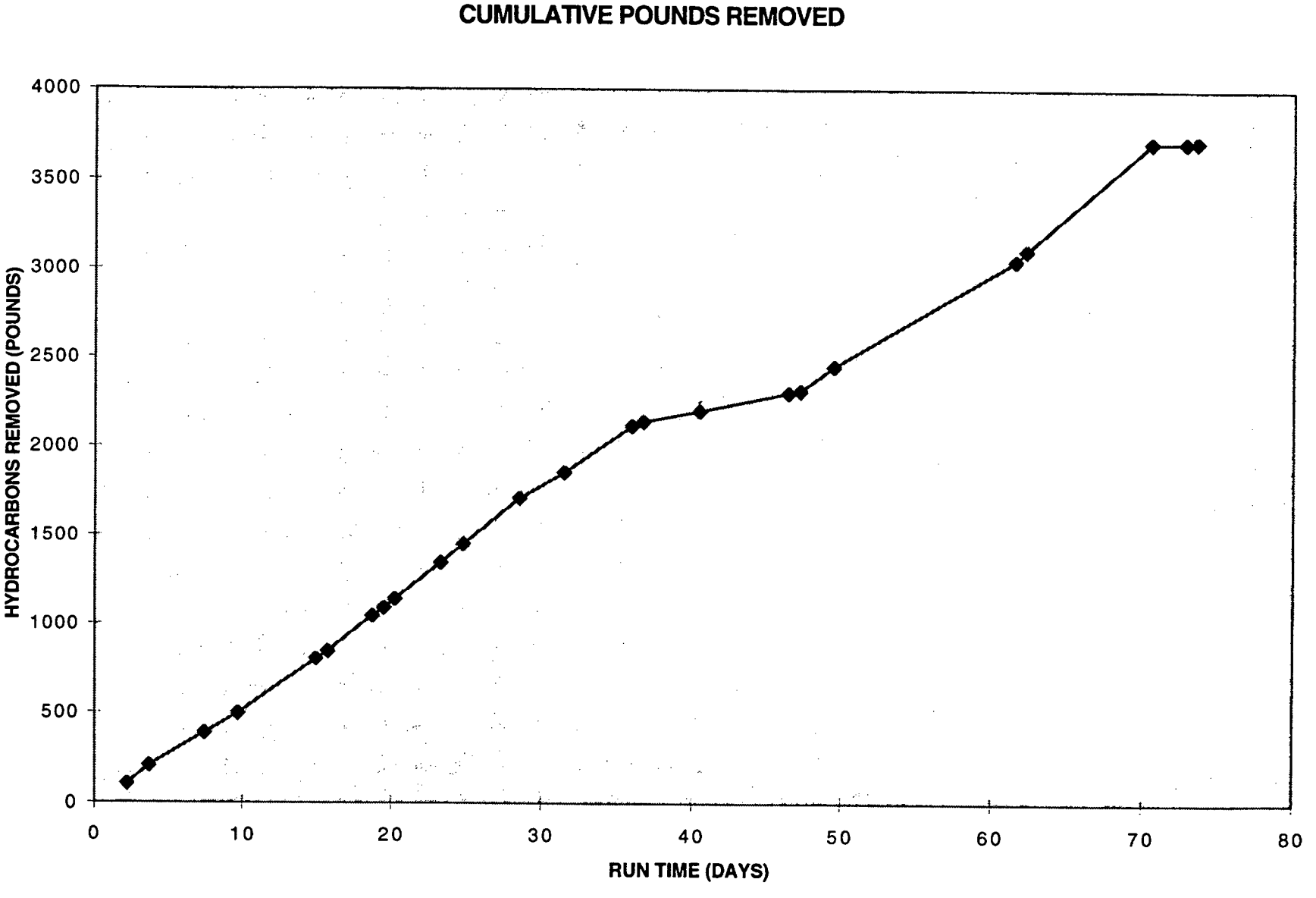
- T — TEMPERATURE INDICATOR
- F — FLOW RATE INDICATOR
- P — PRESSURE / VACUUM INDICATOR
- LSHH — LEVEL SWITCH HIGH-HIGH
- LSH — LEVEL SWITCH HIGH
- I — INTERLOCK
- FT — FLOW TOTALIZER
- S — SAMPLE PORT
- TS — TEMPERATURE SWITCH
- GROUNDWATER FLOW
- AIR FLOW
- CONTROL LINES

FIGURE 2
PROCESS & INSTRUMENTATION DIAGRAM
ROSE'S PARKING LOT
330 N.W. 23rd AVENUE
PORTLAND, OR

TERRA VAC

Project No.	32-0029
Date	May 28, 1997
Scale	N.T.S.
Revision	PVB-1

FIGURE 3


CUMULATIVE POUNDS REMOVED
HYDROCARBONS REMOVED (POUNDS)
4000
3500
3000
2500
2000
1500
1000
500
0
0
10
20
30
40
50
60
70
80
RUN TIME (DAYS)

APPENDIX A

TERRA VAC - GROUNDWATER ANALYTICAL RESULTS

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

BOTHELL ▪ (425) 481-9200 ▪ FAX 485-2992
SPOKANE ▪ (509) 924-9200 ▪ FAX 924-9290
PORTLAND ▪ (503) 643-9200 ▪ FAX 644-2202

Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 5/29/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029 GW	Received: 5/30/97
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 6/4/97 13:17

ANALYTICAL REPORT FOR SAMPLES:

Sample Description	Laboratory Sample Number	Sample Matrix	Date Sampled
MW-1	P705447-01	Water	5/29/97
NMW-2	P705447-02	Water	5/29/97
NMW-3	P705447-03	Water	5/29/97
MW-4	P705447-04	Water	5/29/97
NMW-5	P705447-05	Water	5/29/97
MW-6	P705447-06	Water	5/29/97
MW-7	P705447-07	Water	5/29/97
MW-8	P705447-08	Water	5/29/97
Blank	P705447-09	Water	5/29/97

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

BOTHELL • (425) 481-9200 • FAX 485-2992
SPOKANE • (509) 924-9200 • FAX 924-9290
PORTLAND • (503) 643-9200 • FAX 644-2202

Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 5/29/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029 GW	Received: 5/30/97
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 6/4/97 13:17

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-1			**P705447-01**				**Water**	
Benzene	0670002	6/1/97	6/1/97		5.00	65.9	ug/l	
Toluene	"	"	"		5.00	49.3	"	
Ethylbenzene	"	"	"		5.00	205	"	
Xylenes (total)	"	"	"		10.0	1010	"	
Gasoline Range Hydrocarbons	"	"	"		800	14900	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*97.6*	%	
NMW-2			**P705447-02**				**Water**	
Benzene	0570650	5/31/97	5/31/97		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*81.6*	%	
NMW-3			**P705447-03**				**Water**	
Benzene	0670002	6/1/97	6/1/97		0.500	17.4	ug/l	
Toluene	"	"	"		0.500	0.912	"	
Ethylbenzene	"	"	"		0.500	3.55	"	
Xylenes (total)	"	"	"		1.00	15.3	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	365	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*68.2*	%	
MW-4			**P705447-04**				**Water**	
Benzene	0570650	5/31/97	5/31/97		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*83.8*	%	

North Creek Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

Tabatha A Brochu, Project Manager

18939 120th Avenue N.E., Suite 101, Bothell, WA 98011-9508
East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

BOTHELL • (425) 481-9200 • FAX 485-2992
SPOKANE • (509) 924-9200 • FAX 924-9290
PORTLAND • (503) 643-9200 • FAX 644-2202

Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 5/29/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029 GW	Received: 5/30/97
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 6/4/97 13:17

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
NMW-5			P705447-05				Water	
Benzene	0670002	6/1/97	6/1/97		5.00	34.9	ug/l	
Toluene	"	"	"		5.00	156	"	
Ethylbenzene	"	"	"		5.00	7.90	"	
Xylenes (total)	"	"	"		10.0	554	"	
Gasoline Range Hydrocarbons	"	"	"		800	4480	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*90.0*	%	
MW-6			P705447-06				Water	
Benzene	0670002	6/1/97	6/1/97		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*92.0*	%	
MW-7			P705447-07				Water	
Benzene	0670002	6/1/97	6/1/97		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*87.8*	%	
MW-8			P705447-08				Water	
Benzene	0670002	6/1/97	6/1/97		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*87.6*	%	
Blank			P705447-09				Water	
Benzene	0570650	5/31/97	5/31/97		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB	"	"	"	*50.0-150*		*71.2*	%	

North Creek Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

Tabatha A Brochu, Project Manager

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

BOTHELL • (425) 481-9200 • FAX 485-2992
SPOKANE • (509) 924-9200 • FAX 924-9290
PORTLAND • (503) 643-9200 • FAX 644-2202

Terra Vac - Seattle	Project: Rose's Parking Lot	Sampled: 5/29/97
10740 Meridian Ave. N. Ste 202	Project Number: 32-0029 GW	Received: 5/30/97
Seattle, WA 98133	Project Manager: Tim Warner	Reported: 6/4/97 13:17

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0570650	**Date Prepared: 5/31/97**					**Extraction Method: EPA 5030**				
Blank	**0570650-BLK1**									
Benzene	5/31/97			ND	ug/l	0.500				
Toluene	"			ND	"	0.500				
Ethylbenzene	"			ND	"	0.500				
Xylenes (total)	"			ND	"	1.00				
Gasoline Range Hydrocarbons	"			ND	"	80.0				
Surrogate: 4-BFB	"	*50.0*		*45.5*	"	*50.0-150*	*91.0*			
LCS	**0570650-BS1**									
Gasoline Range Hydrocarbons	5/31/97	1250		1290	ug/l	50.0-150	103			
Surrogate: 4-BFB	"	*50.0*		*45.7*	"	*50.0-150*	*91.4*			
LCS	**0570650-BS2**									
Benzene	5/31/97	20.0		20.6	ug/l	67.0-130	103			
Toluene	"	20.0		19.0	"	75.0-126	95.0			
Ethylbenzene	"	20.0		17.8	"	76.0-124	89.0			
Xylenes (total)	"	60.0		53.8	"	75.0-126	89.7			
Surrogate: 4-BFB	"	*50.0*		*45.0*	"	*50.0-150*	*90.0*			
Duplicate	**0570650-DUP1**	**P705397-01**								
Gasoline Range Hydrocarbons	5/31/97		ND	ND	ug/l			50.0		
Surrogate: 4-BFB	"	*50.0*		*39.3*	"	*50.0-150*	*78.6*			
Duplicate	**0570650-DUP2**	**P705447-02**								
Gasoline Range Hydrocarbons	5/31/97		ND	ND	ug/l			50.0		
Surrogate: 4-BFB	"	*50.0*		*41.4*	"	*50.0-150*	*82.8*			
Matrix Spike	**0570650-MS1**	**P705447-03**								
Benzene	5/31/97	20.0	17.4	31.8	ug/l	67.0-130	72.0			
Toluene	"	20.0	0.912	20.1	"	75.0-126	95.9			
Ethylbenzene	"	20.0	3.55	20.1	"	76.0-124	82.8			
Xylenes (total)	"	60.0	15.3	62.8	"	75.0-126	79.2			
Surrogate: 4-BFB	"	*50.0*		*42.8*	"	*50.0-150*	*85.6*			
Matrix Spike Dup	**0570650-MSD1**	**P705447-03**								
Benzene	5/31/97	20.0	17.4	32.4	ug/l	67.0-130	75.0	13.0	4.08	
Toluene	"	20.0	0.912	21.0	"	75.0-126	100	13.0	4.19	
Ethylbenzene	"	20.0	3.55	20.9	"	76.0-124	86.7	15.0	4.60	

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**Refer to end of report for text of notes and definitions.*

Tabatha A Brochu, Project Manager

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

BOTHELL • (425) 481-9200 • FAX 485-2992
SPOKANE • (509) 924-9200 • FAX 924-9290
PORTLAND • (503) 643-9200 • FAX 644-2202

Terra Vac - Seattle	Project:	Rose's Parking Lot	Sampled: 5/29/97
10740 Meridian Ave. N. Ste 202	Project Number:	32-0029 GW	Received: 5/30/97
Seattle, WA 98133	Project Manager:	Tim Warner	Reported: 6/4/97 13:17

Gasoline Hydrocarbons (Benzene to Naphthalene) and BTEX per EPA Method 8015 (modified) and 8020A/Quality Control
North Creek Analytical - Portland

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Matrix Spike Dup (continued)	**0570650-MSD1**		**P705447-03**							
Xylenes (total)	5/31/97	60.0	15.3	66.1	ug/l	75.0-126	84.7	13.0	6.71	
Surrogate: 4-BFB	"	*50.0*		*45.3*	"	*50.0-150*	*90.6*			
Batch: 0670002	**Date Prepared: 6/1/97**					**Extraction Method: EPA 5030**				
Blank	**0670002-BLK1**									
Benzene	6/1/97			ND	ug/l	0.500				
Toluene	"			ND	"	0.500				
Ethylbenzene	"			ND	"	0.500				
Xylenes (total)	"			ND	"	1.00				
Gasoline Range Hydrocarbons	"			ND	"	80.0				
Surrogate: 4-BFB	"	*50.0*		*35.3*	"	*50.0-150*	*70.6*			
LCS	**0670002-BS1**									
Gasoline Range Hydrocarbons	6/1/97	1250		1170	ug/l	50.0-150	93.6			
Surrogate: 4-BFB	"	*50.0*		*43.0*	"	*50.0-150*	*86.0*			
LCS	**0670002-BS2**									
Benzene	6/1/97	20.0		18.5	ug/l	67.0-130	92.5			
Toluene	"	20.0		18.1	"	75.0-126	90.5			
Ethylbenzene	"	20.0		18.6	"	76.0-124	93.0			
Xylenes (total)	"	60.0		55.8	"	75.0-126	93.0			
Surrogate: 4-BFB	"	*50.0*		*45.7*	"	*50.0-150*	*91.4*			

North Creek Analytical, Inc.

**Refer to end of report for text of notes and definitions.*

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Notes and Definitions

#	Note
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
Recov.	Recovery
RPD	Relative Percent Difference

North Creek Analytical, Inc.

Tabatha A Brochu, Project Manager

NORTH CREEK ANALYTICAL
Environmental Laboratory Services

18939 120th Avenue N.E., Suite 101, Bothell, WA 98011-9508 (206) 481-9200 FAX 485-2992
East 11115 Montgomery, Suite B, Spokane, WA 99206-4779 (509) 924-9200 FAX 924-9290
9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132 (503) 643-9200 FAX 644-2202

CHAIN OF CUSTODY REPORT

Work Order # D705447

REPORT TO: Terra Vac 10710 Meridian Hwy No. 14 Suite 202 Seattle, WA 98133
ATTENTION: Tim Wagner
ADDRESS: As Above
PHONE: (206) 362-8294 FAX (206) 362-0152
PROJECT NAME: Rose's Parking Lot
PROJECT NUMBER: 32-0029 G-W
SAMPLED BY: Jim Orr

INVOICE TO:
ATTENTION: To Left
ADDRESS:
P.O. NUMBER: 32-0029- NCA QUOTE #:

TURNAROUND REQUEST in Business Days *
Organic & Inorganic Analyses: 10 Standard | 7 | 5 | 4 | 3 | 2 | 1 | Same Day
Fuels & Hydrocarbon Analyses: ~~5~~ Standard | 3-4 | 2 | 1 | Same Day
OTHER Specify:
* Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	NCA SAMPLE ID (Laboratory Use Only)	Analysis Requested: GRPH-6 BTEX PAH	MATRIX (W, S, A, O)	# OF CONTAINERS	COMMENTS
1.	MW-1	5-29-97/1330		X	W	2	
2.	NMW-2	/1545		X			
3.	NMW-3	/1540		X			
4.	MW-4	/1535		X			
5.	NMW-5	/1530		X			
6.	MW-6	/1345		X			
7.	MW-7	/1340		X			
8.	MW-8	/1335		X			
9.	Blank	/1030		X			
10.		DC2					

RELINQUISHED BY: James Orr DATE: 5-30-97
PRINT NAME: James Orr FIRM: Terra Vac TIME: 0900

RECEIVED BY: Clare Nuell DATE: 5/30/97
PRINT NAME: Clare Nuell FIRM: NCA TIME: 09:05

RELINQUISHED BY: DATE:
PRINT NAME: FIRM: TIME:

RECEIVED BY: DATE:
PRINT NAME: FIRM: TIME:

ADDITIONAL REMARKS: PO # will be Faxed. Please Run any Sample for PAH If above are detected TPH-G

PAGE OF