3R - 92

GENERAL CORRESPONDENCE

YEAR(S):

2003 - 1993

Bill Olson

SMA
CIVIL/ENVIRONMENTAL
SCIENTISTS & ENGINEERS

RECEIVED
FEB 18 2003
OIL CONSERVATION
DIVISION

February 5, 2003

Conoco Philips
Mr. Neal Goates
RM&R Site Manager
Threadneedle Office
PO Box 2197
Houston, TX 77252-2197

RE: *Abandonment of Three Groundwater Monitoring Wells Located at the Salmon 1 Site.*

Per our conversation on February 3, 2003, SOUDER MILLER AND ASSOCIATES STAFF abandoned two monitoring wells DG-2 and DG-3 at the Salmon 1 location. Abandonment was accomplished following the protocols set fourth in the New Mexico Oil Conservation Division Guidelines and Regulations. DG-1 could not be located, the property owner stated that the well vault had been removed during the last year.

If you have any questions, please contact me at (505) 325-5667.

SOUDER MILLER AND ASSOCIATES

Respectfully submitted,

John Hagstrom
Environmental Technician

Larry Trujillo, CHMM
Environmental Specialist

cc: Denny Foust, NMOCD, Aztec, NM
Monica Rodhall, Conoco Phillips, 5525 Highway 64, Farmington, NM 87401

Tel. (505) 325-5667 Fax (505) 327-1496
P. O. BOX 2606 • FARMINGTON, NM 87499

ON SITE
TECHNOLOGIES, LTD.

RECEIVED

FEB 25 2002

ENVIRONMENTAL BUREAU
OIL CONSERVATION DIVISION

February 22, 2002

Bill Olson
New Mexico Oil Conservation Division
1220 South St. Francis Drive.
Santa Fe, New Mexico 87505

RE: Conoco Groundwater Report Summary

On behalf of Conoco ***On Site Technologies Limited Partnership***, is submitting the enclosed 2001 Annual Groundwater report for Ten (10) sites.

Location Name	Legal Description	Recommendation
Farmington B Com 1	Unit H, S 12, T29N, R12W	WSP-1 still has high BTEX, all other at or below NMWQCC standards, continue monitoring of WSP #1
Nell-Hall#1	Unit M, S 07, T30N, R11W	Continue to monitor as required in NMCOD letter dated September, 1998
Farmington C Com 1	Unit L, S 15, T29N, R13W	Continue to monitor as required in NMCOD letter dated September, 1998
Farmington B Com 1E	Unit O, S 15, T29N, R13W	Free product is still present in MW-1. Sampling stopped at this time IAW NMOCD direction, more aggressive recovery program being investigated.
Salmon # 1	Unit P, S 30, T29N, R11W	DG#2 has had BTEX levels below NMWQCC standards for the last six quarters. Close site and properly plug and abandon monitoring wells.
S&K1	Unit L, S 29, T29N, R11W	SB 12 still has high BTEX, all others at or below NMWQCC standards, continue monitoring of SB 12.

If there are any questions or concerns on this matter, feel free to contact me at (505) 325-5667.

Thank you for your time and considerations.

Respectfully submitted,

John Hagstrom
Environmental Technician
On Site Technologies Limited Partnership

CC:
Gary Ledbetter, SHEAR, Conoco Inc., 3315 Bloomfield HWY, Farmington, NM 87401
Bill Liess, BLM 1235 La Plata HWY, Farmington, NM 87401
Denny Foust, NMOCD 1000 Rio Brazos, Aztec, NM 87410
John Cofer, Sr. Environmental Specialist, Conoco Inc., 3315 Bloomfield HWY, Farmington, NM 87401
File

PO Box 2606
Farmington, NM 87499

505-325-5667

FAX: 505-327-1496

ON SITE

TECHNOLOGIES, LTD.

February 27, 2001

MAR 2 2 2001

Mr. Bill Olson
New Mexico Oil Conservation Division
2040 South Pacheco
Santa Fe, New Mexico 87505

RE: Conoco Groundwater Report Summary

On behalf of Conoco ***On Site Technologies Limited Partnership***, is submitting the enclosed 2000 Annual Groundwater report for Ten (10) sites.

LOCATION NAME	LEGAL DESCRIPTION	RECOMMENDATION
Farmington B Com 1	Unit H, S 12, T29N, R12W	WSP-1 still has high BTEX, all other at or below NMWQCC standards, continue monitoring of WSP #1
Nell-Hall#1	Unit M, S 07, T30N, R11W	Continue to monitor as required in NMCOD letter dated September, 1998
Farmington C Com 1	Unit L, S 15, T29N, R13W	Continue to monitor as required in NMCOD letter dated September, 1998
Farmington B Com 1E	Unit O, S 15, T29N, R13W	Free product is still present in MW-1. Sampling stopped at this time IAW NMOCD direction, more aggressive recovery program being investigated.
Salmon # 1	Unit P, S 30, T29N, R11W	DG#2 still has high BTEX, Continue monitoring in accordance with NMOCD letter dated September, 1998.
San Juan 28-7#126	Unit M, S 1, T27N, R7W	Research is being done to complete and submit the Pit closure forms and final reports
San Juan 28-7#219	Unit N, S 20, T28N, R7W	Research is being done to complete and submit the Pit closure forms and final reports
S&K1	Unit L, S 29, T29N, R11W	Research is being done to complete and submit the Pit closure forms and final reports
San Juan 28-7#19	Unit G, S 25, T28N, R7W	research is being done to complete and submit the Pit closure forms and final reports
San Juan 28-7#47	Unit A, S 20, T28N, R7W	Research is being done to complete and submit the Pit closure forms and final reports
Farmington Com #1	Unit P, Sec 11, T29N, R13W	Monitoring wells and piezometer plug and abandoned IAW NMOCD Letter dated December 13, 2000
Shephard & Kelsey #1E	Unit D, Sec. 29, T29N, R11W	Monitoring wells plug and abandoned IAW NMOCD Letter dated December 14, 2000

PO Box 2606
Farmington, NM 87499

505-325-5667 FAX: 505-327-1496

If there are any questions or concerns on this matter, feel free to contact me at (505) 325-5667.

Thank you for your time and considerations.

Respectfully submitted,

Larry Trujillo, CHMM
Environmental Specialist
On Site Technologies Limited Partnership

CC:
Gary Ledbetter, SHEAR, Conoco Inc., 3315 Bloomfield HWY, Farmington, NM 87401
John Cofer, Sr. Environmental Specialist, Conoco Inc., 3315 Bloomfield HWY, Farmington, NM 874
Denny Foust, NMOCD 1000 Rio Brazos, Aztec, NM 87410
Bill Liess, BLM 1235 La Plata HWY, Farmington, NM 87401
File

ON SITE
TECHNOLOGIES, LTD.

SEP - 1 1999

August 9, 1999

Mr. Wm. "Bill" Olsen, Hydrologist
NMOCD
2040 S. PACHECO ST
Santa Fe, NM, 87505

RE: Conoco Groundwater Report Summary

On behalf of Conoco Inc., ***On Site Technologies Limited Partnership*** requests a status of approval for the corrective actions on the following list of well locations.

LOCATION NAME	LEGAL DESCRIPTION	RECOMMENDATION
RECOMMEND	CONTINUED	MONITORING
Farmington B Com 1	Unit H, S 12, T29N, R12W	WSP-1 still has high BTEX, all other at or below NMWQCC standards, continue monitoring of WSP #1
San Juan 28-7#19	Unit G, S 25, T28N, R7W	Continue monitoring, BTEX levels still above NMWQCC standards
San Juan 28-7#47	Unit A, S 20, T28N, R7W	Continue monitoring, BTEX levels still above NMWQCC standards
Nell-Hall#1	Unit M, S 07, T30N, R11W	Continue to monitor as required in NMCOD letter dated September, 1998
Farmington C Com 1	Unit L, S 15, T29N, R13W	Continue to monitor as required in NMCOD letter dated September, 1998
Farmington B Com 1E	Unit O, S 15, T29N, R13W	Continue to monitor as required in NMCOD letter dated September, 1998
Salmon # 1	Unit P, S 30, T29N, R11W	DG#2 still has high BTEX, Continue monitoring in accordance with NMOCD letter dated September, 1998
RECOMMEND	**CLOSURE**	
San Juan 28-7#126	**Unit M, S 1, T27N, R7W**	**4 quarters of sampling below NMWQCC standards, recommend closure**
San Juan 28-7#219	**Unit N, S 20, T28N, R7W**	**4 quarters of sampling below NMWQCC standards, recommend closure**
S&K1	**Unit L, S 29, T29N, R11W**	**4 quarters of sampling below NMWQCC standards recommend closure.**
Farmington Com 1	**Unit P, S 11, T29N, R13W**	**Contamination level in MW 1 below OCD action levels for the last four quarters, MW2 and MW3 historically have not had any contamination above NMWQCC standards. Recommend closure of the location.**
S&K1E	**Unit D, S 29, T29N, R11W**	**4 quarters of sampling below OCD action levels recommend closure.**

PO Box 2606
Farmington, NM

505-325-5667

FAX: 505-327-1496

Recommendations listed above were included in the 1997 and 1998 Conoco Annual Ground Water Reports. Please advise ***On Site*** and Conoco of NMOCD's approval, as we are only scheduling the sites requiring continued monitoring.

If there are any questions or concerns on this matter, feel free to contact me at (505) 325-5667.

Thank you for your time and considerations.

Respectfully submitted,

Larry Trujillo CHMM
Senior Environmental Technician
On Site Technologies Limited Partnership

CC:

Shirley Ebert, SHEAR, Conoco Inc., Farmington Office
Neal Goates, Sr. Environmental Specialist, Conoco Inc.

ON SITE
TECHNOLOGIES, LTD.

RECEIVED
FEB 19 1999
ENVIRONMENTAL BUREAU
OIL CONSERVATION DIVISION

Letter of Transmittal

ATTENTION:

DATE: February 17, 1999

Mr. Bill Olson
New Mexico Oil Conservation Division.
2040 South Pacheco
Santa Fe, New Mexico 87505

RE: Conoco's 1998 Annual Groundwater Report

Dear Mr. Olson:
On behalf of Conoco ***On Site Technologies Limited Partnership***, is submitting the enclosed 1998 Annual Groundwater report for ten (10) sites.

Number of Originals	Description
1	Shephard & Kelsey #1E Unit D, Sec. 29, T29N, R11W
1	Shephard & Kelsey #1 Unit L, Sec. 29, T29N, R11W
1	Salmon #1 Unit P, Sec. 30, T29N, R7W
1	Nell-Hall #1 Unit, M, Sec 7, T30N, R11W
1	San Juan 28-7-19 Unit G, Sec. 25, T28N, R7W
1	San Juan 28-7-47 Unit A, Sec. 20, T28N, R7W
1	Farmington Com #1 Unit P, Sec 11, T29N, R13W
1	Farmington B Com #1 Unit H, T29N R13W
1	Farmington C Com 1 Unit L, Sec. 15, T29N, R13W
1	Farmington B Com 1E Unit O, Sec 15, T29, R13W

Thank you,

Larry Trujillo
Sr. Environmental Technician

CC:
Shirley Ebert
Neal Goates
Denny Foust
File

PO Box 2606
Farmington, NM

505-325-5667

FAX: 505-327-1496

On Site Technologies, Ltd.

RECEIVED

FEB 27 1998

Environmental Bureau
Oil Conservation Division

Letter of Transmittal

ATTENTION:

DATE: February 4, 1998

Mr. Bill Olson
New Mexico Oil Conservation Division
2040 South Pacheco
Santa Fe, New Mexico 87505

RE: Conoco's 1997 Annual Groundwater Report.

REMARKS:

Dear Mr. Olson:

On behalf of Conoco, ***On Site Technologies Limited Partnership***, is submitting the enclosed 1997 Annual Groundwater report for the twelve (12) sites

We are sending you:

No. Originals	No. Copies	Description
1		Farmington B Com 1, Unit H, Sec. 12, T29N, R12W
1		San Juan 28-7-19, Unit G, Sec. 25, T28N, R7W
1		San Juan 28-7-47, Unit A, Sec.20, T28N, R7W
1		San Juan 28-7-126, Unit M, Sec.1, T27N, R7W
1		San Juan 28-7-219, Unit N, Sec. 20, T28N, R7W
1		Shephard & Kelsey #1, Unit L, Sec. 29, T29N, R11W
1		Nell-Hall #1, Unit , Sec. 1, T30N, R11W
1		Farmington Com #1, Unit P, Sec. 11, T29N, R13W
1		Farmington C Com #1, Unit L, Sec. 15, T29N, R13W
1		Farmington B Com #1E, Unit O, Sec. 15, T29N, R13W
1		Salmon #1, Unit P Sec. 30, T29N, R11W
1		Shephard & Kelsey 1E, Unit D, Sec. 29, T29W, R11W

SIGNATURE:

Larry Trujillo
Sr. Environmental Technician
CC:

Denny Foust
Shirley Ebert
Neal Goates

STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION DIVISION
2040 S. PACHECO
SANTA FE, NEW MEXICO 87505
(505) 827-7131

June 5, 1998

CERTIFIED MAIL
RETURN RECEIPT NO. Z-235-437-284

Ms. Shirley Ebert
Conoco, Inc.
3315 Bloomfield Hwy.
Farmington, New Mexico 87401

RE: GROUND WATER INVESTIGATIONS
SAN JUAN BASIN PIT CLOSURES

Dear Ms. Ebert:

The New Mexico Oil Conservation Division (OCD) has completed a review of Conoco, Inc.'s (Conoco) February 4, 1998 "CONOCO'S 1997 ANNUAL GROUNDWATER REPORT" which was received by the OCD on February 27, 1998. This document, which was submitted on behalf of Conoco by their consultant On Site Technologies, Ltd., contains the results of Conoco's investigation, remediation and monitoring at 12 unlined oil and gas production pit sites with resulting ground water contamination.

Upon a review of the above referenced documents, the OCD has the following comments and requirements:

1. The data in the reports for the sites listed below show that the complete extent of ground water contamination has not been determined. The OCD requires that Conoco complete the definition of the extent of ground water contamination at these sites pursuant to Conoco's prior approved ground water investigation and remediation plan for the San Juan Basin.

-	Farmington B Com #1	Unit H, Sec. 12, T29N, R12W.
-	Farmington C Com #1	Unit L, Sec. 15, T29N, R13W.
-	Farmington Com #1	Unit P, Sec. 11, T29N, R13W.
-	Nell-Hall #1	Unit M, Sec. 07, T30N, R11W.
-	Salmon #1	Unit P, Sec. 30, T29N, R11W.

2. The ground water metals data for the site listed below shows that the concentrations of barium, chromium and lead in ground water are above the New Mexico Water Quality Control Commission (WQCC) ground water standards. The OCD requires that Conoco conduct additional metals sampling at this site

-	Farmington Com #1	Unit P, Sec. 11, T29N, R13W.

3. Some of the report site maps do not show the former locations of the pits, the excavated areas nor the locations of all monitor wells (former and current) . The OCD requires that Conoco include this information in future reports.

4. Some of the reports do not contain quarterly ground water potentiometric maps. The OCD requires that Conoco's future reports include ground water potentiometric maps for each sampling event. The maps will be created using the water table elevation in all site monitor wells.

5. Some of the report summary tables do not contain the results of all past water quality sampling. It is difficult for the OCD to evaluate remedial progress at a site without this data. The OCD requires that Conoco's future reports include summary tables that contain the results of all past and present water quality sampling.

If you have any questions, please call me at (505) 827-7154.

Sincerely,

William C. Olson
Hydrologist
Environmental Bureau

xc: Denny Foust, OCD Aztec District Office
Larry Trujillo, On Site Technologies, Ltd.

STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION DIVISION
2040 S. PACHECO
SANTA FE, NEW MEXICO 87505
(505) 827-7131

July 28, 1997

CERTIFIED MAIL
RETURN RECEIPT NO. P-410-431-198

Mr. Neal Goates
Conoco, Inc.
10 Desta Dr., Suite 100W
Midland, Texas 79705-4500

RE: ANNUAL PIT CLOSURE SUMMARY AND GROUND WATER IMPACTS

Dear Mr. Goates:

The New Mexico Oil Conservation Division (OCD) has reviewed Conoco's undated "ANNUAL PIT CLOSURES AND GROUND WATER IMPACT UPDATES, STATE OF NEW MEXICO, 1996" which was received by the OCD on May 20, 1997. This document contains the results of Conoco's recent work on the investigation and remediation of contamination from unlined production pits in the San Juan Basin. The document also contains Conoco's recommendations for future remedial actions.

The recommendations as contained in the above referenced document are approved with the following conditions:

1. General Conditions

   a. The ground water reports for each site do not include the cations/anions, metals and PAH ground water sample analyses that were supposed to be taken at each site. The OCD requires that Conoco conduct this sampling pursuant to Conoco's March 24, 1995 San Juan Basin ground water assessment plan which was conditionally approved by the OCD on April 5, 1995. The results of these analyses will be included in subsequent annual reports.

b. Upon review of Conoco's file, the OCD noted that Conoco does not have a long term ground water monitoring plan nor a ground water remediation plan for pit closure sites with ground water contamination. The OCD requires that Conoco submit a comprehensive ground water remediation plan and long term ground water monitoring plan to the OCD by October 10, 1997.

c. All future annual ground water reports will be submitted to the OCD by March 1 of each respective year. The ground water reports will present the information on each site as a separate case. Each ground water case report will contain:

I. A brief summary of all ground water remediation and monitoring activities which occurred during the prior calendar year.

ii. Summary tables of all past and present ground water quality sampling analytical results and copies of the laboratory analytical data sheets for samples taken during the last year.

iii. A site map showing the locations of relevant site features (ie. wellhead, pit, monitor wells, etc.)

iv. A quarterly ground water potentiometric map using the water table elevation in all site monitor wells.

v. A geologic log and well completion diagram for each monitor well.

2. <u>Farmington Com #1, Farmington C Com #1, Farmington B Com #1E and Farmington B Com #1</u>

Due to the potential for public impacts from soil and ground water contamination at these sites, the OCD requires that Conoco conduct the following actions:

a. By August 29, 1997, Conoco will complete the remediation of contaminated soils at each site according to Conoco's previously approved pit closure plan. Final reports containing the results of the soil remedial actions will be submitted to the OCD by September 26, 1997.

b. By August 29, 1997, Conoco will submit a ground water remediation work plan for each site to the OCD. The work plan will include information on how Conoco plans to remediate the contaminated ground water, a long term ground water monitoring plan, an implementation schedule and, if not already completed, a plan to define the full extent of ground water contamination at each site.

3. Shepherd & Kelsey #1E (Separator pit)

The report recommends no further actions except additional ground water monitoring for this site. However, a review of the report data shows that the extent of ground water contamination at this site has not been determined. Therefore, the OCD requires that Conoco investigate the extent of ground water contamination pursuant to Conoco's March 24, 1995 San Juan Basin ground water assessment plan which was conditionally approved by the OCD on April 5, 1995.

To simplify the approval process for both Conoco and OCD, the OCD requests that future annual reports only address the ongoing actions related to ground water investigation, remediation and monitoring. Pit closure actions involving only contaminated soils need to be reported to the OCD only upon completion of all pit soil remedial actions when Conoco submits a final pit closure report to the OCD for approval. Pit closure actions involving only contaminated soils do not need to be reported to the OCD on an interim basis.

Please be advised that OCD approval does not relieve Conoco of liability if remaining contaminants pose a future threat to surface water, ground water, human health or the environment. In addition, OCD approval does not relieve Conoco of responsibility for any federal, state, tribal, or local laws and/or regulations.

If you have any questions, please contact me at (505) 827-7154.

Sincerely,

William C. Olson
Hydrogeologist
Environmental Bureau

xc: Denny Foust, OCD Aztec District Office
Bill Liess, BLM Farmington District Office
John Andersen, Conoco, Inc.
Robert J. Bowie, City of Farmington

ON SITE
TECHNOLOGIES, LTD.

Verbal approval to Mike Lane on 7/7/97 at 1030 hrs
Wm C Olson

July 1, 1997

New Mexico Oil Conservation Division
Environmental Bureau
2040 S. Pacheco
Santa Fe, NM 87505

Attn.: William C. Olson, Hydrologist

SENT VIA FAX: (505) 827-8177
(3 pgs)

RE: Conoco Salmon #1
Ground Water Monitoring
Former Drip Pit Area
Unit P, Sec. 30, T29N, R11W, NMPM, San Juan Co., NM

This correspondence is to verify our conversation of June 25, 1997 regarding the ground water monitoring in the area of the former drip pit on the gathering line from the referenced gas well. On behalf of Conoco, On Site Technologies requests permission to plug and abandon the two (2) up-gradient monitoring wells.

Following excavation of the original drip pit in 1994, four ground water monitoring wells were installed, two up- and cross-gradient of the pit and two down-gradient of the pit area. Since 1994, periodic water sampling and analysis has shown contamination from BTEX constituents above the current NMOCD and NMWQCC standards for ground water in the down-gradient monitoring wells nearest the former pit. The two up-gradient wells have not shown any contamination above the NMWQCC standards for BTEX. Due to residential development in the immediate area of the former pit by the current landowner and continued BTEX contamination in ground water, on June 18-20, 1997, Conoco had Rosenbaum Construction of Farmington, New Mexico excavate an additional 460 cubic yards of contaminated soil down-gradient of the former drip pit area. The near pit down-gradient well that show contamination was removed during excavation and replaced following contaminated soil removal. A new additional well was installed at the down-gradient tip of the excavation. Refer to Site Sketch.

The two up-gradient wells no longer appear to be necessary to monitor the ground water quality given; the additional soil remediation effort and no history of contamination. Due to the new land use, the wells are a potential hazard to traffic and if accidentally damaged may become a potential migratory path for leaching of contamination to the shallow ground water. We recommend abandonment by attempting to remove the well casing and plugging with a bentonite rich cement grout from TD to the surface.

PO Box 2606
Farmington, NM
PHONE: 505-325-5667 FAX: 505-327-1496

NMOCD: Salmon #1
On Site Technologies, Ltd.
Monitoring Well Abandonment Request

July 1, 1997
Project 2-1377

The three down gradient wells will be secured with flush-mounted steel valve covers and locking plugs. Please contact either Cindy Gray or Myke Lane at On Site Technologies, (505) 325-5667, if the abandonment of the two up-gradient wells is acceptable to your office so we can schedule. Thanks for your assistance and time with this matter.

Respectfully submitted,
On Site Technologies, Limited Partnership

Michael K. Lane
Senior Engineer

Attachments: Figure 1: Site Sketch

CC: C. John Coy, Farmington Office
Neal Goates, Midland

MKL/mkl

file: 21377ltr.doc

SAL-DG3 NEW INSTALLATION 6/20/97

Conoco Midland Division - San Juan Basin Production Area
Groundwater Site Assessment

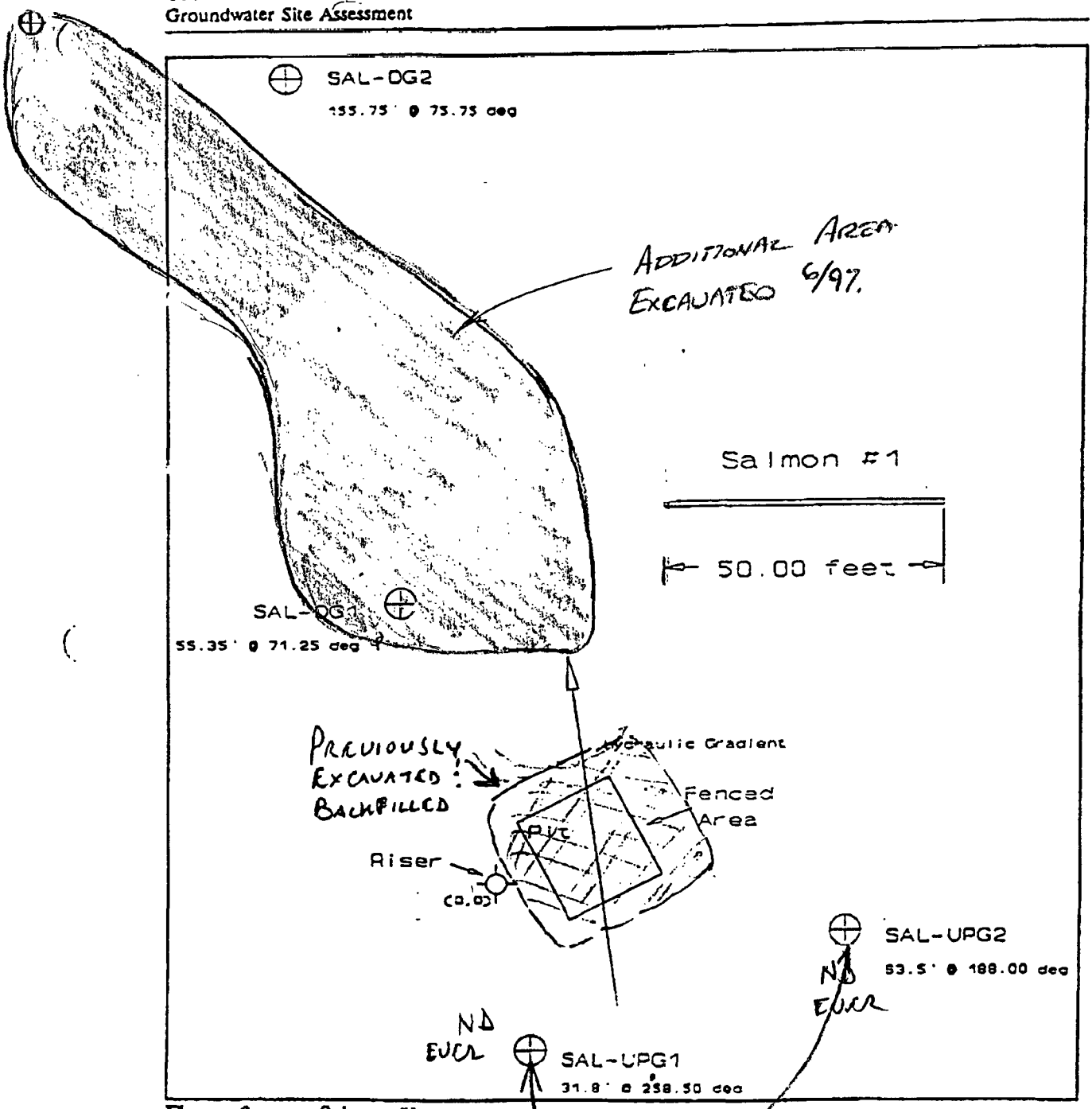


Figure 2 Salmon #1

SAL-UPG1 & UPG2 MONITORING WELLS RECOMMENDED FOR ABANDONMENT

Conoco Pictures

5/19/97

Salmon #1

ANNUAL SUMMARY

PIT CLOSURES
AND
GROUND WATER IMPACT UPDATES

STATE OF NEW MEXICO
1996

RECEIVED
MAY 2 0 1997
Environmental Bureau
Oil Conservation Division

Each site filed under seperate case files

Midland Division
Exploration Production

Conoco Inc.
10 Desta Drive, Suite 100W
Midland, TX 79705-4500
(915) 686-5400

Certified Mail
P 895 104 872

April 25, 1997

Mr. Denny Fouts
New Mexico Oil Conservation Commission
1000 Rio Brazos Rd.
Aztec, NM 87410

Dear Mr. Fouts:

Re: NMOCD letters P-471-215-177, P-471-215-178 and P-471-215-179

Reference NMOCD letters of February 18, 1997 (P-471-215-177 and P-471-215-178) directed to Conoco Inc. and NMOCD letter of February 18, 1997 (P-471-215-179) directed to Merrion Oil and Gas Corporation.

This letter is intended to update NMOCD on the progress made to date to evaluate the alleged environmental contamination identified in the subject NMOCD letters. Evaluation work was timely commenced at all sites under Conoco's supervision. Initial results are being documented and evaluated. Where appropriate, possible remediation plans are being considered. As you are aware, ownership of the sites have changed hands several times, and we are in the process of developing proposed plans consistent with the contractual obligations of the successive owners. As soon as reasonably possible, NMOCD will be advised of proposed remediation plans where appropriate, to resolve the environmental matters addressed in the subject NMOCD letters.

Regards,

Carl J. Coy
Field SHEAR Specialist

cc: Merrion
Mesa
Bill Olson - NMOCD Santa Fe

Table of Contents

ON SITE
TECHNOLOGIES, LTD.

Revised: May 15, 1997

Conoco, Inc., Midland Division
Exploration and Production, North America
10 Desta Drive, Suite 100W
Midland, Texas 79705-4500

Attn.: Mr. Neal Goates, Senior Environmental Specialist

RE: Transmittal of Information for 1996 Annual NMOCD Reporting

Per your request and at Mr. C. John Coy's (Farmington Office) direction, we have compiled the attached information to assist you with the annual reporting to NMOCD. The information listed in Table 1 is included.

If there are any questions regarding this status report, please contact either Cindy Gray or Myke Lane at On Site Technologies, (505) 325-5667. Thank you for considering On Site to assist you with this matter.

Respectfully submitted,
On Site Technologies Limited Partnership

Michael K. Lane, P.E.
Senior Engineer

Enclosures: Table 1 & Listed Attachments

CC: C. John Coy (w/o attachments)
MKL/mkl

file: 41303.doc

PO Box 2606
Farmington, NM
PHONE: 505-325-5667 FAX: 505-327-1496

TABLE 1: CONOCO SUMMARY
Transmittal of Information for 1996 Annual NMOCD Reporting

On Site Technologies Limited Partnership
May 15, 1997

Project: 4-1303

Well	Date	Documents	Comments
Farmington Com #1	Apr. 18, 97	Site Assessment Brief w/ lab and QA/QC	Corrective Action to address soil and/or ground water contamination pending negotiations with former lease operator.
Farmington C Com #1	Apr. 22, 97	Site Assessment Brief w/ lab and QA/QC	Corrective Action to address soil and/or ground water contamination pending negotiations with former lease operator.
Farmington B Com #1E	Apr. 22, 97	Site Assessment Brief w/ lab and QA/QC	Corrective Action to address soil and/or ground water contamination pending negotiations with former lease operator.
Smith #1 & Drip Pit	Apr. 22, 97	Site Assessment Brief w/ lab and QA/QC	Corrective Action to address soil and/or ground water contamination pending negotiations with former lease operator.
Shepherd & Kelsey #1	Mar. 21, 97 July 18, 96 Mar. 20, 97	Summary of Monitor Well Install & Map Sample Results w/ QA/QC (IML) Sample Results w/ QA/QC (On Site)	Continue ground water monitoring for 3 additional quarters to verify RBCA.
Shepherd & Kelsey #1E (Dehy/Sep Pit)	Apr. 16, 97	Pit Assessment & Remediation Summary w/ lab and QA/QC	No further reclamation efforts recommended, and propose continued ground water monitoring until four consecutive sample events are "clean".
Shepherd & Kelsey #1E (Production Tank Spill)	Apr. 28, 97	Spill Assessment & Remediation Summary w/ lab and QA/QC	No further corrective action, with plug and abandonment of monitor well proposed.
Farmington B Com #1	Apr. 16, 97	Investigation & Remediation Summary w/ lab and QA/QC	No further reclamation efforts recommended, and propose continued ground water monitoring until four consecutive sample events are "clean".
Federal Com #15	Apr. 28,97	Site Assessment Summary	No further action.
Salmon #1	May 12, 97 July 17, 96 Mar. 18, 96 Mar. 26, 97	Corrective Action Proposal (On Site) Lab Reports & QA/QC (IML) Lab Reports & QA/QC (On Site) Lab Reports & QA/QC (On Site)	Additional excavation and treatment of contaminated soil down-gradient of original pit proposed.

TABLE 1: CONOCO SUMMARY
Transmittal of Information for 1996 Annual NMOCD Reporting

On Site Technologies Limited Partnership
May 15, 1997

Project: 4-1303

Well	Date	Documents	Comments
Nell Hall #1	June 14, 97 June 28, 96 July 12, 96 Apr. 1, 97	Lab Reports & QA/QC (IML) Lab Reports & QA/QC (IML) Lab Reports & QA/QC (IML) Letter regarding no water (On Site)	Due to seasonal low water table, propose annual sampling to be scheduled in June to Aug. with closure once two consecutive sample events show "clean".
SJ 28-7 #19	Mar. 12, 96 July 17, 96 Mar. 19, 97 Apr. 21, 97	Lab Reports & QA/QC (IML) Lab Reports & QA/QC (IML) Lab Reports & QA/QC (On Site) Lab Reports & QA/QC (On Site)	Continue ground water monitoring for four additional quarters.
SJ 28-7 #47	Mar. 12, 96 Apr. 15, 96 July 17, 96 Mar. 19, 97 Apr. 21, 97	Lab Reports & QA/QC (IML) Lab Reports & QA/QC (IML) Lab Reports & QA/QC (IML) Lab Reports & QA/QC (On Site) Lab Reports & QA/QC (On Site)	Continue ground water monitoring for four additional quarters.
SJ 28-7 #126	Mar. 12, 96 July 17, 96 Mar. 26, 97	Lab Reports & QA/QC (IML) Lab Reports & QA/QC (IML) Lab Reports & QA/QC (On Site)	Continue ground water monitoring for an additional quarter.
SJ 28-7 #219	Mar. 12, 96 July 17, 96 Mar. 26, 97	Lab Reports & QA/QC (IML) Lab Reports & QA/QC (IML) Lab Reports & QA/QC (On Site)	Continue ground water monitoring for two additional quarters.

'NEW MEXICO PIT DATA
'CONOCO INC.

TYPES OF PITS	
SEP: Separator Pit	BDP: Blowdown Pit
DHP: Dehydrator Pit	FGP: Fiberglass Tank Pit
CSP: CompressorScrubberPit	LDHP: Lined Dehy Pit
TDP: Tank Drip Pit	DRP: Drilling Reserve Pit
LDP: Line Drip Pit	NONE: No Pits

#	WELL NAME AND NUMBER	FEDERAL, STATE INDIAN CONTRACT NO. OR FEE	LOCATION	TYPES OF PITS	PIT SIZE	VULN. AREA	EXPANDED VULN. AREA	NON-VULN. AREA	OTHER PARTY PIT	DATE STOPPED FLOW TO PIT	DATE PIT REMED-IATION STARTED	DATE PIT CLOSED
	SENSITIVE AREA PITS - JICARILLA											
1	Apache No. 1	Contract #98	Unit D, Sec. 18-26N-3W	SEP	30' x 24' x 4'		X			Unknown		05/06/96
2	Apache No. 3E	Contract #98	Unit H, Sec. 19-26N-3W	TDP	18' x 17' x 3'		X			Unknown		04/25/96
3	Apache No. 7	Contract #98	Unit D, Sec. 20-26N-3W	SEP	44' x 30' x 6'		X			Unknown		04/25/96
4	AXI Apache J No. 22	Contract #147	Unit L, Sec. 6-25N-5W	SEP	37' x 36' x 3'		X			09/10/96		09/30/96
5	AXI Apache N No. 14	Contract #121	Unit C, Sec. 1-25N-4W	SEP	19' x 19' x 4'		X			03/27/96		04/15/96
6	AXI Apache N No. 16A	Contract #121	Unit C, Sec.12-25N-4W	DHP	18'X18'X3'		X			03/18/96		03/26/96
7	Jicarilla No. 3	Contract #12	Unit D, Sec. 31-26N-4W	SEP	28' x 22' x 4'		X			Unknown		08/05/96
8	Jicarilla No. 4	Contract #12	Unit L, Sec. 31-26N-4W	TDP	10' x 8' x 3'		X			Unknown		08/05/96
9	Jicarilla No. 8	Contract #12	Unit L, Sec. 32-26N-4W	SEP	35' x 27' x 4'		X			Unknown		08/15/96
10	Jicarilla No. 11	Contract #12	Unit G, Sec. 30-26N-4W	SEP	21' x 20' x 4'		X			Unknown		08/15/96
11	Jicarilla No. 11	Contract #12	Unit G, Sec. 30-26N-4W	TDP	22' x 22' x 4'		X			Unknown		08/15/96
12	Jicarilla No. 13	Contract #12	Unit G, Sec. 31-26N-4W	TDP	18' x 16' x 4'		X			Unknown		08/05/96
13	Jicarilla No. 14	Contract #12	Unit P, Sec. 31-26N-4W	SEP	19' x 18' x 3'		X			Unknown		08/07/96
14	Jicarilla No. 14	Contract #12	Unit P, Sec. 31-26N-4W	TDP	18' x 17' x 4'		X			Unknown		08/15/96
15	Jicarilla No. 17	Contract #12	Unit B, Sec. 32-26N-4W	SEP	17' x 16' x 4'		X			Unknown		08/15/96
16	Jicarilla No. 17	Contract #12	Unit B, Sec. 32-26N-4W	TDP	19' x 17' x 4'		X			Unknown		08/15/96
17	Jicarilla No. 18	Contract #12	Unit I, Sec. 32-26N-4W	SEP	28' x 22' x 4'		X			Unknown		08/15/96
18	Jicarilla No. 18	Contract #12	Unit I, Sec. 32-26N-4W	TDP	25' x 25' x 4'		X			Unknown		08/15/96
19	Jicarilla A No. 8	Contract # 105	Unit E, Sec 23-26N-4W	SEP	20'x20'x3'		X			06/26/96		07/25/96
20	Jicarilla A No. 9	Contract # 105	Unit C, Sec 14-26N-4W	TDP	10'x10'x5'		X			05/15/96		05/22/96
21	Jicarilla A No. 10	Contract # 105	Unit D, Sec 23-26N-4W	SEP	16'x16'x4'		X			06/11/96		06/26/96
22	Jicarilla A No. 13	Contract # 105	Unit E, Sec 13-26N-4W	TDP	16'x16'x4'		X			05/08/96		05/15/96
23	Jicarilla B No. 2	Contract # 106	Unit K, Sec 25-26N-4W	BDP	15'x25'x3'		X			Unknown		07/25/96
24	Jicarilla B No. 8	Contract # 106	Unit K, Sec 25-26N-4W	SEP	10'x15'x3'		X			06/06/96		06/26/96
25	Jicarilla B No. 9	Contract # 106	Unit K, Sec 26-26N-4W	SEP	15'x15'x2'		X			05/22/96		05/31/96
26	Jicarilla B No. 9A	Contract # 106	Unit D, Sec 26-26N-4W	SEP	18'x18'x3'		X			06/10/96		08/15/96
27	Jicarilla B No. 13	Contract # 106	Unit M, Sec 36-26N-4W	SEP	16'x18'x4'		X			03/27/96		03/29/96
28	Jicarilla B No. 15	Contract # 106	Unit J, Sec 36-26N-4W	SEP	12'x12'x2'		X			03/29/96		03/29/96
29	Jicarilla D No. 11	Contract # 100	Unit A, Sec 29-26N-3W	TDP	12'x14'x4'		X			04/04/96		04/15/96
30	Jicarilla D No. 17	Contract # 100	Unit D, Sec 29-26N-3W	TDP	16'x18'x3'		X			04/09/96		04/15/96
31	Jicarilla D No. 18	Contract # 100	Unit A, Sec 30-26N-3W	SEP	15'x15'x2'		X			04/12/96		04/15/96
32	Jicarilla E No. 6	Contract # 104	Unit B, Sec 21-26N-4W	TDP	18'x18'x3'		X			07/29/96		08/15/96
33	Jicarilla E No. 8	Contract # 104	Unit C, Sec 15-26N-4W	TDP	10'x10'x3'		X			06/05/96		06/21/96
34	Jicarilla E No. 14	Contract # 104	Unit D, Sec 15-26N-4W	CSP	10'x12'x3'		X			03/25/96		06/05/96
35	Jicarilla K No. 12E	Contract No. 145	Unit M, Sec 02-25N-5W	SEP	12'x14'x3'		X			Unknown		09/24/96
36	Jicarilla K No. 15	Contract No. 145	Unit I, Sec 01-25N-5W	SEP	14'x16'x2'		X			08/26/96		09/03/96
37	Jicarilla K No. 22	Contract No. 145	Unit M, Sec 02-25N-5W	SEP	12'x14'x4'		X			Unknown		10/02/96
38	Jicarilla K No. 22A	Contract No. 145	Unit O, Sec 02-25N-5W	SEP	10'x10'x01'		X			Unknown		09/24/96

39	Tribal No. 2	Fed. 6090001150	Unit L, Sec. 9-26N-3W	SEP	30' x 24' x 6'		X			Unknown		05/06/96
40	Tribal No. 2	Fed. 6090001150	Unit L, Sec. 9-26N-3W	TDP	24' x 17' x 4'		X			Unknown		05/06/96

NON - SENSITIVE AREA PITS - JICARILLA

1	AXI Apache N No. 11A	Contract #121	Unit B, Sec. 12-25N-4W	SEP	22' x 19' x 3'			X		Unknown		03/22/96
2	AXI Apache N No. 12A	Contract #121	Unit L, Sec. 11-25N-4W	SEP	21' x 21' x 4'			X		03/22/96		03/29/96
3	AXI Apache N No.14A	Contract #121	Unit K, Sec. 1-25N-4W	SEP	19'x19'x3'			X		Unknown		03/22/96
4	AXI Apache N No. 12	Contract #121	Unit C, Sec. 11-25N-4W	SEP	20' x 18' x 3'			X		03/25/96		03/26/96
5	AXI Apache N No. 13	Contract #121	Unit G, Sec. 2-25N-4W	SEP	22' x 21' x 3'			X		03/25/96		03/29/96
6	AXI Apache O No. 10	Contract #122	Unit J, Sec. 3-25N-4W	SEP	23' x 21' x 3'			X		03/20/96		03/25/96
7	Jicarilla D No. 11A	Contract # 100	Unit P, Sec 29-26N-3W	TDP	16'x16'x3'			X		04/19/96		04/22/96
8	Jicarilla D No. 13	Contract # 100	Unit A, Sec 32-26N-3W	TDP	15'x15'x2'			X		04/16/96		04/22/96
9	Jicarilla D No. 13A	Contract # 100	Unit P, Sec 32-26N-3W	SEP	20'x20'x2'			X		04/15/96		04/22/96
10	Jicarilla D No. 19	Contract # 100	Unit I, Sec 31-26N-3W	TDP	25'x28'x2'			X		04/25/96		05/03/96
11	Jicarilla D No. 20	Contract # 100	Unit N, Sec 31-26N-3W	TDP	20'x30'x4'			X		04/25/96		05/03/96

ON SITE
TECHNOLOGIES, LTD.

May 12, 1997

Conoco, Inc., Midland Division
Exploration and Production, North America
10 Desta Drive, Suite 100W
Midland, Texas 79705-4500

RECEIVED
MAY 20 1997
Environmental Bureau
Oil Conservation Division

Attn.: Mr. Neal Goates, Senior Environmental Specialist

RE: Corrective Action Proposal
Salmon #1

Per Mr. C. John Coy's, Conoco SHEAR Specialist: Farmington Office, request, On Site Technologies Limited Partnership conducted a supplemental assessment in the area of a former Line Drip Pit associated with the referenced well. The intent of the assessment was to verify the extent of residual hydrocarbon contamination of soil and ground water at the site and develop a corrective action proposal to address the contamination.

PROJECT BRIEF:

In 1994 Conoco excavated and treated contaminated soil to ground water in the immediate area of an unlined line drip pit. Ground water samples collected indicated ground water impact of BTEX above NMOCD standards. Following excavation and backfilling with clean material, four monitor wells were installed and an effort was made to define the extent of residual contamination down-gradient of the pit area. In February , 1995, Bio-Rem Environmental Consultants proposed a bio-sparge system to treat the contamination in place. With NMOCD's concurrence, Conoco elected not to proceed with any additional soil reclamation efforts and to monitor the water quality on a quarterly basis. BioRem' s findings are reported in *" Bio-Air Sparging Remediation Project for Salmon Lease, CONOCO Inc., Midland Division Farmington, New Mexico,"* dated February, 1995.

Results of water sampling from 1996 reflect fluctuations of hydrocarbon contamination in ground water, most probably associated with seasonal changes in the water table (refer to lab results attached). In addition, the current land owner, Mr. Dewayne McFarland, selected the area of the former drip pit for a new home site including; a residential house, implement shed/barn, livestock pens, and other improvements.

Given the recent change in surface land use, from range to rural residential, Conoco requested that On Site perform a supplemental assessment of the site and prepare a revised reclamation proposal.

PO Box 2606
Farmington, NM
PHONE: 505-325-5667 FAX: 505-327-1496

SUPPLEMENTAL ASSESSMENT:

On May 1, 1997, Michael Lane and Cindy Gray of On Site advanced eighteen test holes in the area previously documented as having residual hydrocarbon contamination. Test holes were advanced using stainless steel hand augers to depths ranging from three to six feet. Auger cuttings were field screened for odor and visual discoloration. Several samples were also screened for volatile hydrocarbons using the NMOCD Heated Headspace Method with an organic vapor meter equipped with a PISD and calibrated to benzene. As the intent of the reassessment was to verify the extent of contamination, no soil logs were prepared nor lab samples collected. The attached site sketch shows the approximate boring locations and notes the estimated aerial extent of residual hydrocarbon contamination.

Based on the reassessment, site soils are silty to clayey fine sands with ground water at approximately three feet below the ground surface. The top 1 ½ to 2 feet of soil appear to be relatively "clean" with the contaminated soil horizon ranging from 2 to 4 feet below the site grade. The contaminated area appears to be consistent with the BioRem report and involves approximately 7,900 square feet. With two feet of contaminated soil, approximately 580 cubic yards of contaminated soil remain inplace.

CORRECTIVE ACTION PROPOSAL:

Given the recent change in surface use and apparent slow natural attenuation process occurring at the Salmon #1 Line Drip Pit area, the following corrective actions are proposed:

- Abandonment of the two upgradient wells which have never shown signs of hydrocarbon contamination, to minimize accidental damage or destruction.
- Salvage the top 1 to 3 feet of soil which is not contaminated for backfill and site reclamation.
- Excavate and remove offsite approximately 580 CY of contaminated soil in the residual plume down-gradient of the former pit.
- Backfill the excavation with salvaged soil and/or acceptable "clean" material.
- Replace the monitor well (DG1) following the reclamation effort, and continue quarterly ground water sampling of DG1 andDG2 to monitor water quality for BTEX.
- After four consecutive quarters with water quality meeting NMOCD requirements for BTEX, wells DG1 and DG2 will be properly abandoned.

LIMITATIONS AND CLOSURE:

This proposal documents visual observations of the referenced site, subsurface conditions encountered during assessment efforts, and analysis of ground water samples collected during quarterly monitoring.

Neal Goates: Conoco, Inc.
On Site Technologies, Ltd.
Corrective Action Proposal: Salmon #1 Line Drip Pit

May 12, 1997
Project: 2-1377

The scope of On Site Technologies' services consisted of the performance of a supplemental assessment for verification of former findings, field screening, ground water sampling and lab testing for quarterly monitoring of water quality for BTEX, and development of a corrective action proposal.

This document has been prepared by On Site Technologies for the exclusive use of Conoco Inc. as it pertains to the referenced line drip pit location operated by Conoco.

If there are any questions regarding the findings of the assessment or this proposal, please contact either Cindy Gray or Myke Lane at On Site Technologies, (505) 325-5667. Thank you for considering On Site Technologies to assist you with this matter.

Respectfully submitted,
On Site Technologies Limited Partnership

Michael K. Lane, P.E.
Senior Engineer

Attachments: Sheet 1: Site Sketch
Quarterly Monitoring Lab Results

CC: C. John Coy

MKL/mkl

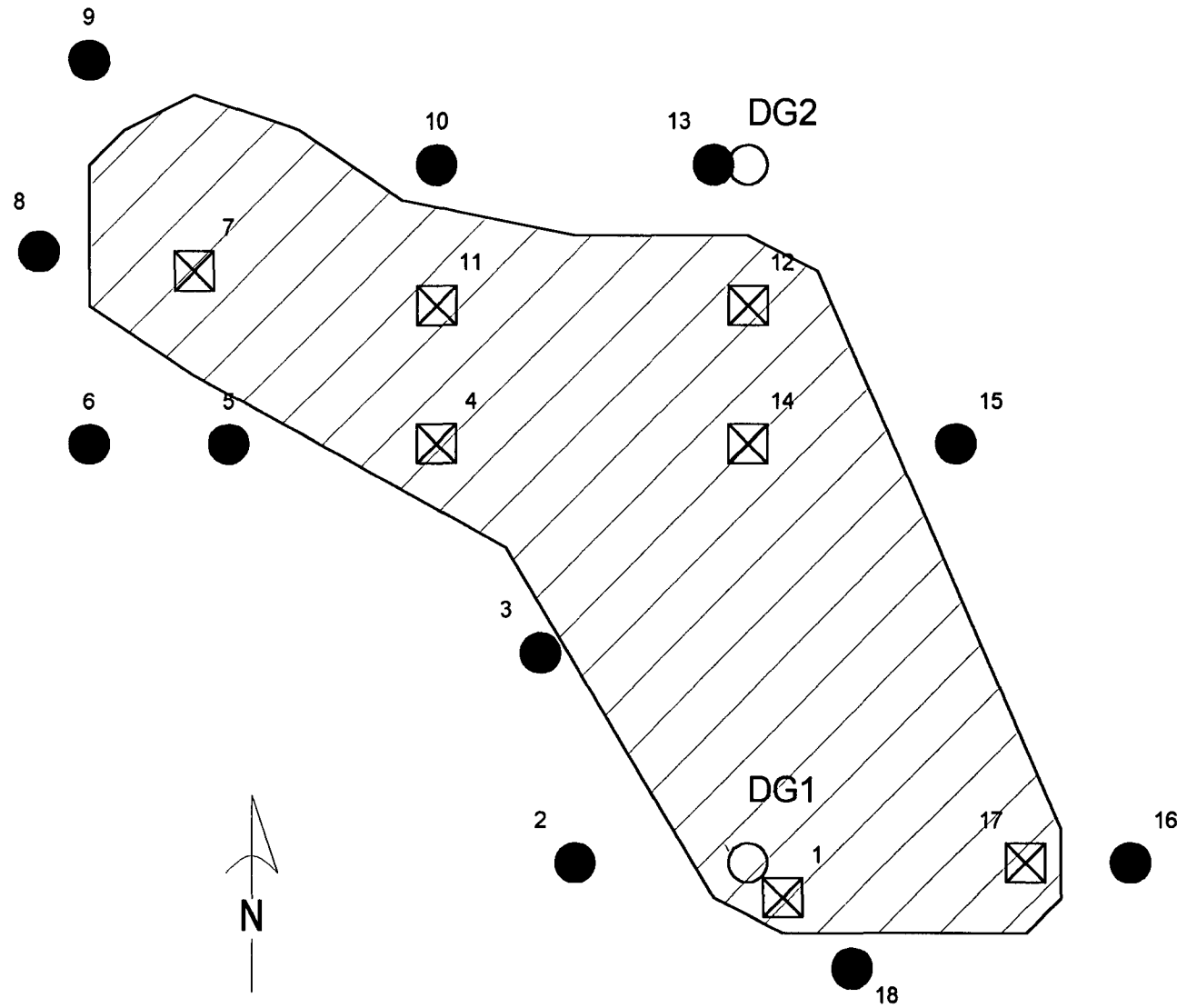
file: 21377cap.doc

CONOCO SALMON #1 SAN JUAN CO., NM	SITE SKETCH	ON SITE TECHNOLOGIES, LTD. P.O. BOX 2606, FARMINGTON, NM 87499 (505) 325-5667
PROJECT: ASSESSMENT	DRWN: MAY 1, 97	
PROJECT NO: 2-1377	DRWN BY: MKL	
SHEET: 1	REVISED:	

Estimates for soil volumes based on preliminary assessment completed 5/1/97:

AREA OF CONTAMINATION: 7863 sf

SALVAGE (CLEAN SURFACE SOIL 0-2ft): 582cy
CONTAMINATED SOILS (2-4 ft): 582cy



APPROXIMATE SCALE
1" = 25'

WATER SAMPLE POINTS

APPROXIMATE LOCATION OF TEST HOLES
WITH NO SIGNIFICANT SOIL CONTAMINATION

APPROXIMATE LOCATION OF TEST HOLES
WITH SIGNIFICANT SOIL CONTAMINATION

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

VOLATILE AROMATIC HYDROCARBONS

Conoco, Inc.

Project ID:	Not Given	Report Date:	07/30/96
Sample ID:	Salmon 1 UPG 1	Date Sampled:	07/17/96
Lab ID:	0396G01389	Date Received:	07/17/96
Sample Matrix:	Water	Date Extracted:	NA
Condition:	Cool/Intact	Date Analyzed:	07/26/96

Target Analyte	Concentration (ppb)	Detection Limit (ppb)
Benzene	ND	0.2
Toluene	ND	0.2
Ethylbenzene	ND	0.2
m,p-Xylenes	ND	0.2
o-Xylene	ND	0.2

ND - Analyte not detected at the stated detection limit.

Quality Control:

Surrogate	Percent Recovery	Acceptance Limits
Bromofluorobenzene	79.0%	75 -125%

Reference: Method 5030, Purge and Trap; Method 8020, Aromatic Volatile Organics; Test Methods for Evaluating Solid Wastes, SW-846, United States Environmental Protection Agency, September 1986.

Comments:

Analyst

Review

Inter·Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

VOLATILE AROMATIC HYDROCARBONS

Conoco, Inc.

Project ID:	Not Given	Report Date:	07/30/96
Sample ID:	Salmon 1 UPG 1	Date Sampled:	07/17/96
Lab ID:	0396G01388	Date Received:	07/17/96
Sample Matrix:	Water	Date Extracted:	NA
Condition:	Cool/Intact	Date Analyzed:	07/26/96

Target Analyte	Concentration (ppb)	Detection Limit (ppb)
Benzene	ND	0.2
Toluene	ND	0.2
Ethylbenzene	ND	0.2
m,p-Xylenes	ND	0.2
o-Xylene	ND	0.2

ND - Analyte not detected at the stated detection limit.

Quality Control:

Surrogate	Percent Recovery	Acceptance Limits
Bromofluorobenzene	96.8%	75 -125%

Reference: Method 5030, Purge and Trap; Method 8020, Aromatic Volatile Organics; Test Methods for Evaluating Solid Wastes, SW-846, United States Environmental Protection Agency, September 1986.

Comments:

Analyst

Review

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

VOLATILE AROMATIC HYDROCARBONS

Conoco, Inc.

Project ID:	Not Given	Report Date:	07/30/96
Sample ID:	Salmon 1 DG 1	Date Sampled:	07/17/96
Lab ID:	0396G01390	Date Received:	07/17/96
Sample Matrix:	Water	Date Extracted:	NA
Condition:	Cool/Intact	Date Analyzed:	7/26-29/96

Target Analyte	Concentration (ppb)	Detection Limit (ppb)
Benzene	0.7	0.4
Toluene	3.3	0.4
Ethylbenzene	2.8	0.4
m,p-Xylenes	2.9	0.4
o-Xylene	0.8	0.4

ND - Analyte not detected at the stated detection limit.

Quality Control:

Surrogate	Percent Recovery	Acceptance Limits
Bromofluorobenzene	104.5%	75 -125%

Reference: Method 5030, Purge and Trap; Method 8020, Aromatic Volatile Organics; Test Methods for Evaluating Solid Wastes, SW-846, United States Environmental Protection Agency, September 1986.

Comments:

Analyst

Review

Inter-Mountain Laboratories, Inc.

2506 W. Main Street
Farmington, New Mexico 87401

VOLATILE AROMATIC HYDROCARBONS

Conoco, Inc.

Project ID:	Not Given	Report Date:	07/30/96
Sample ID:	Salmon 1 DG 2	Date Sampled:	07/17/96
Lab ID:	0396G01391	Date Received:	07/17/96
Sample Matrix:	Water	Date Extracted:	NA
Condition:	Cool/Intact	Date Analyzed:	07/29/96

Target Analyte	Concentration (ppb)	Detection Limit (ppb)
Benzene	ND	0.2
Toluene	ND	0.2
Ethylbenzene	ND	0.2
m,p-Xylenes	ND	0.2
o-Xylene	ND	0.2

ND - Analyte not detected at the stated detection limit.

Quality Control:

Surrogate	Percent Recovery	Acceptance Limits
Bromofluorobenzene	88.4%	75 -125%

Reference: Method 5030, Purge and Trap; Method 8020, Aromatic Volatile Organics; Test Methods for Evaluating Solid Wastes, SW-846, United States Environmental Protection Agency, September 1986.

Comments:

Analyst

Review

2506 W Main Street
Farmington, New Mexico 87401

VOLATILE AROMATIC HYDROCARBONS
QUALITY CONTROL REPORT

Method Blank Analysis

Sample Matrix: Water
Lab ID: Method Blank

Report Date: 07/30/96
Date Analyzed: 07/29/96

Target Analyte	Concentration (ppb)	Detection Limit (ppb)
Benzene	ND	0.2
Toluene	ND	0.2
Ethylbenzene	ND	0.2
m,p-Xylenes	ND	0.2
o-Xylene	ND	0.2

ND - Analyte not detected at the stated detection limit.

Quality Control:

Surrogate	Percent Recovery	Acceptance Limits
Bromofluorobenzene	97.0%	75-125%

Reference: Method 5030, Purge and Trap; Method 8020, Aromatic Volatile Organics; Test Methods for Evaluating Solid Wastes, SW-846, United States Environmental Protection Agency, September 1986.

Comments:

Analyst

Review

2506 W Main Street
Farmington, New Mexico 87401

VOLATILE AROMATIC HYDROCARBONS
QUALITY CONTROL REPORT

Matrix Spike Analysis

Lab ID: 0396G01388
Sample Matrix: Water
Condition: Cool/Intact

Report Date: 07/30/96
Date Analyzed: 07/26/96

Target Analyte	Spiked Sample Result in ppb	Sample result in ppb	Spike Added (ppb)	% Recovery	Acceptance Limits (%)
Benzene	5.08	0.01	6.0	84.5%	70-130
Toluene	5.58	0.02	6.0	92.6%	70-130
Ethylbenzene	6.02	ND	6.0	100%	70-130
m,p-Xylenes	12.60	ND	12.0	105%	70-130
o-Xylene	6.01	ND	6.0	100%	70-130

ND - Analyte not detected at the stated detection limit.
NA - Not applicable or not calculated.

Quality Control:	Surrogate	Percent Recovery	Acceptance Limits
	Bromofluorobenzene	102.2%	75 -125%

Reference: Method 5030, Purge and Trap; Method 8020, Aromatic Volatile Organics; Test Methods for Evaluating Solid Wastes, SW-846, United States Environmental Protection Agency, September 1986.

Comments:

Analyst

Review

2506 W. Main Street
Farmington, New Mexico 87401

VOLATILE AROMATIC HYDROCARBONS
QUALITY CONTROL REPORT

Duplicate Analysis

Lab ID: 0396G01391
Sample Matrix: Water
Condition: Cool/Intact

Report Date: 07/30/96
Date Analyzed: 07/29/96

Target Analyte	Duplicate Concentration (ppb)	Original Concentration (ppb)	% Difference
Benzene	ND	ND	NA
Toluene	ND	ND	NA
Ethylbenzene	ND	ND	NA
m,p-Xylenes	ND	ND	NA
o-Xylene	ND	ND	NA

ND - Analyte not detected at the stated detection limit.
NA - Not applicable or not calculated.

Quality Control:	Surrogate	Percent Recovery	Acceptance Limits
	Bromofluorobenzene	96.2%	75 -125%

Reference: Method 5030, Purge and Trap; Method 8020, Aromatic Volatile Organics; Test Methods for Evaluating Solid Wastes, SW-846, United States Environmental Protection Agency, September 1986.

Comments:

Analyst

Review

2506 W. Main Street
Farmington, New Mexico 87401

Quality Control / Quality Assurance

Known Analysis

BTEX

Client: Conoco, Inc.
Project: Not Given

Date Reported: 07/30/96
Date Analyzed: 07/26/96

Known Analysis

Parameter	Found Concentration (ppb)	Known Concentration (ppb)	Percent Recovery	Acceptance Limits
Benzene	5.0	6.0	84%	70-130%
Toluene	5.4	6.0	90%	70-130%
Ethylbenzene	5.7	6.0	94%	70-130%
m+p-Xylene	12.0	12.0	100%	70-130%
o-Xylene	5.8	6.0	97%	70-130%

Quality Control:	Surrogate	Percent Recovery	Acceptance Limits
	Bromofluorobenzene	93.0%	75-125%

Reference: Method 5030, Purge and Trap: Method 8020, Aromatic Volatile Organics; Test Methods for Evaluating Solid Wastes, SW-846, United States Environmental Protection Agency, September 1986.

Comments:

Reported by: _____

Reviewed by: _____

OFF: (505) 325-5667

ON SITE TECHNOLOGIES, LTD.

LAB: (505) 325-1556

ANALYTICAL REPORT

Attn:	*John Coy*	Date:	18-Mar-97
Company:	*Conoco, Inc.*	COC No.:	*5045*
Address:	*3315 Bloomfield Hwy.*	Sample No.:	*13889*
City, State:	*Farmington, NM 87401*	Job No.:	*2-1377*

Project Name:	***Conoco, Inc. - Salmon #1***				
Project Location:	***MW-1; Northeast***				
Sampled by:	HR	Date:	13-Mar-97	Time:	15:40
Analyzed by:	DC	Date:	17-Mar-97		
Sample Matrix:	*Liquid*				

Parameter	*Result*	*Unit of Measure*	*Detection Limit*	*Unit of Measure*
Benzene	24.4	ug/L	0.2	ug/L
Toluene	0.4	ug/L	0.2	ug/L
Ethylbenzene	0.3	ug/L	0.2	ug/L
m,p-Xylene	1.1	ug/L	0.2	ug/L
o-Xylene	0.4	ug/L	0.2	ug/L
TOTAL	26.7	ug/L		

Method - *SW-846 EPA Method 8020 Aromatic Volatile Organics by Gas Chromatography*

Approved By: OK G

Date: 3/18/97

OFF: (505) 325-5667

ON SITE TECHNOLOGIES, LTD.

LAB: (505) 325-1556

ANALYTICAL REPORT

Attn:	*John Coy*	Date:	18-Mar-97
Company:	*Conoco, Inc.*	COC No.:	*5045*
Address:	*3315 Bloomfield Hwy.*	Sample No.:	*13890*
City, State:	*Farmington, NM 87401*	Job No.:	*2-1377*

Project Name:	***Conoco, Inc. - Salmon #1***				
Project Location:	***MW-2; North***				
Sampled by:	HR	Date:	13-Mar-97	Time:	15:30
Analyzed by:	DC	Date:	17-Mar-97		
Sample Matrix:	*Liquid*				

Parameter	*Result*	*Unit of Measure*	*Detection Limit*	*Unit of Measure*
Benzene	67.8	ug/L	0.2	ug/L
Toluene	32.9	ug/L	0.2	ug/L
Ethylbenzene	11.5	ug/L	0.2	ug/L
m,p-Xylene	93.8	ug/L	0.2	ug/L
o-Xylene	22.8	ug/L	0.2	ug/L
TOTAL	228.8	ug/L		

Method - *SW-846 EPA Method 8020 Aromatic Volatile Organics by Gas Chromatography*

Approved By: [signature]
Date: 3/18/97

OFF: (505) 325-5667

ON SITE TECHNOLOGIES, LTD.

LAB: (505) 325-1556

ANALYTICAL REPORT

Attn:	*John Coy*	Date:	18-Mar-97
Company:	*Conoco, Inc.*	COC No.:	*5045*
Address:	*3315 Bloomfield Hwy.*	Sample No.:	*13891*
City, State:	*Farmington, NM 87401*	Job No.:	*2-1377*

Project Name:	***Conoco, Inc. - Salmon #1***				
Project Location:	***MW-3; Southwest***				
Sampled by:	HR	Date:	13-Mar-97	Time:	15:10
Analyzed by:	DC	Date:	17-Mar-97		
Sample Matrix:	*Liquid*				

Parameter	*Result*	*Unit of Measure*	*Detection Limit*	*Unit of Measure*
Benzene	<0.2	ug/L	0.2	ug/L
Toluene	<0.2	ug/L	0.2	ug/L
Ethylbenzene	<0.2	ug/L	0.2	ug/L
m,p-Xylene	0.3	ug/L	0.2	ug/L
o-Xylene	<0.2	ug/L	0.2	ug/L
TOTAL	0.3	ug/L		

Method - *SW-846 EPA Method 8020 Aromatic Volatile Organics by Gas Chromatography*

Approved By: DAG

Date: 3/18/97

OFF: (505) 325-5667

ON SITE TECHNOLOGIES, LTD.

LAB: (505) 325-1556

ANALYTICAL REPORT

Attn:	*John Coy*	Date:	18-Mar-97
Company:	*Conoco, Inc.*	COC No.:	*5045*
Address:	*3315 Bloomfield Hwy.*	Sample No.:	*13892*
City, State:	*Farmington, NM 87401*	Job No.:	*2-1377*

Project Name:	***Conoco, Inc. - Salmon #1***				
Project Location:	***MW-4; Southeast***				
Sampled by:	HR	Date:	13-Mar-97	Time:	15:20
Analyzed by:	DC	Date:	17-Mar-97		
Sample Matrix:	*Liquid*				

Parameter	*Result*	*Unit of Measure*	*Detection Limit*	*Unit of Measure*
Benzene	<0.2	ug/L	0.2	ug/L
Toluene	<0.2	ug/L	0.2	ug/L
Ethylbenzene	<0.2	ug/L	0.2	ug/L
m,p-Xylene	0.2	ug/L	0.2	ug/L
o-Xylene	<0.2	ug/L	0.2	ug/L
TOTAL	0.2	ug/L		

Method - *SW-846 EPA Method 8020 Aromatic Volatile Organics by Gas Chromatography*

Approved By:

Date: 3/19/97

OFF: (505) 325-5667

ON SITE TECHNOLOGIES, LTD.

LAB: (505) 325-1556

QUALITY ASSURANCE REPORT

for EPA Method 8020

Date Analyzed: 17-Mar-97

Internal QC No.: 0527-STD
Surrogate QC No.: 0528-STD
Reference Standard QC No.: 0529/30-QC

Method Blank

Parameter	Result	Unit of Measure
Average Amount of All Analytes In Blank	<0.2	ppb

Calibration Check

Parameter	Unit of Measure	True Value	Analyzed Value	% Diff	Limit
Benzene	ppb	20.0	19.2	4	15%
Toluene	ppb	20.0	19.7	2	15%
Ethylbenzene	ppb	20.0	20.3	2	15%
m,p-Xylene	ppb	40.0	38.9	3	15%
o-Xylene	ppb	20.0	19.8	1	15%

Matrix Spike

Parameter	1- Percent Recovered	2 - Percent Recovered	Limit	%RSD	Limit
Benzene	95	89	(39-150)	4	20%
Toluene	98	92	(46-148)	4	20%
Ethylbenzene	100	94	(32-160)	4	20%
m,p-Xylene	98	90	(35-145)	6	20%
o-Xylene	98	92	(35-145)	4	20%

Surrogate Recoveries

Laboratory Identification	S1 Percent Recovered	S2 Percent Recovered	Laboratory Identification	S1 Percent Recovered	S2 Percent Recovered
Limit Percent Recovered	(70-130)		Limit Percent Recovered	(70-130)	
13889-5045	96				
13890-5045	90				
13891-5045	97				
13892-5045	97				

S1: Flourobenzene

DC

CHAIN OF CUSTODY RECORD

5045

ON SITE TECHNOLOGIES, LTD.

657 W. Maple • P. O. Box 2606 • Farmington NM 87499
LAB: (505) 325-5667 • FAX: (505) 325-6256

Date: 3/13/97

Page _____ of _____

Purchase Order No.:	Job No. 2-1377		
SEND INVOICE TO: Name	DAN COX, ON SITE TECH	REPORT RESULTS TO: Name	DAN COX Title PROJECT SUPERVISOR
Company CONOCO	Dept.	Company ON SITE TECHNOLOGIES	
Address		Mailing Address	
City, State, Zip		City, State, Zip	
		Telephone No.	Telefax No.
Sampling Location: SAN JUAN #1 UNIT F, SEC, T29N, R11W			
Sampler: HEATH KOOSO			

SAMPLE IDENTIFICATION	SAMPLE DATE	SAMPLE TIME	MATRIX	PRES.	Number of Containers	BTEX	LAB ID
NE MW-1	3/11/97	1510		ICE	2	✓	13711-01
N MW-2	"	1530			2	✓	13711-10
SW MW-3	"	1510			2	✓	13711-11
SE MW-4	"	1520			2	✓	13711-12

ANALYSIS REQUESTED

Relinquished by: Heath Kooso	Date/Time 3/11/97 1600	Received by:	Date/Time 3/11/97 0710
Relinquished by:	Date/Time	Received by:	Date/Time
Relinquished by:	Date/Time	Received by:	Date/Time

Method of Shipment:

Authorized by: Heath Kooso Date 3/11/97
(Client Signature Must Accompany Request)

Rush	24-48 Hours	10 Working Days	Special Instructions:

Distribution: White – On Site Yellow – LAB Pink – Sampler Goldenrod – Client

CHAIN OF CUSTODY RECORD

5045

ON SITE TECHNOLOGIES, LTD.

657 W. Maple • P. O. Box 2606 • Farmington NM 87499
LAB: (505) 325-5667 • FAX: (505) 325-6256

Date: 3/13/97

Page _____ of _____

Purchase Order No.: | Job No. Z-1377

SEND INVOICE TO
Name C/O DAVE COX, ON SITE TECH
Company CONOCO | Dept.
Address
City, State, Zip

REPORT RESULTS TO
Name DAVE COX | Title PROJECT MANAGER
Company ON SITE TECHNOLOGIES
Mailing Address
City, State, Zip
Telephone No. | Telefax No.

Sampling Location:
SALMON #1
UNIT P, SEC, T29N, R11W

Sampler:
HEIDI REESE

SAMPLE IDENTIFICATION	SAMPLE DATE	SAMPLE TIME	MATRIX	PRES.	Number of Containers	BTEX	LAB ID
NE mw-1	3/13/97	1540		4°C COOL	2	✓	13889-5045
NW mw-2	"	1530			2	✓	13890
SW mw-3	"	1510			2	✓	13891
SE mw-4	"	1520			2	✓	13892

ANALYSIS REQUESTED

Relinquished by: Heidi Reese	Date/Time 3/14/97 0710	Received by:
Relinquished by:	Date/Time	Received by:
Relinquished by:	Date/Time	Received by:

Date/Time 3/14/97 0710
Date/Time
Date/Time

Method of Shipment:

Authorized by: Heidi Reese Date 3/14/97
(Client Signature Must Accompany Request)

Rush	24-48 Hours	10 Working Days	Special Instructions:

Distribution: White – On Site Yellow – LAB Pink – Sampler Goldenrod – Client

OFF: (505) 325-5667

ON SITE TECHNOLOGIES, LTD.

LAB: (505) 325-1556

ANALYTICAL REPORT

Attn:	*Michael Lane*	Date:	26-Mar-97
Company:	*On Site Technologies, Ltd. c/o Conoco*	COC No.:	*5061*
Address:	*612 E. Murray Drive*	Sample No.:	*14000*
City, State:	*Farmington, NM 87401*	Job No.:	*4-1377*

Project Name:	***Conoco - Salmon #1***				
Project Location:	***MW-NE***				
Sampled by:	MKL	Date:	20-Mar-97	Time:	9:15
Analyzed by:	DC	Date:	24-Mar-97		
Sample Matrix:	*Liquid*				

Parameter	*Result*	*Unit of Measure*	*Detection Limit*	*Unit of Measure*
Benzene	<0.2	ug/L	0.2	ug/L
Toluene	<0.2	ug/L	0.2	ug/L
Ethylbenzene	<0.2	ug/L	0.2	ug/L
m,p-Xylene	0.3	ug/L	0.2	ug/L
o-Xylene	<0.2	ug/L	0.2	ug/L
TOTAL	0.3	ug/L		

Method - *SW-846 EPA Method 8020 Aromatic Volatile Organics by Gas Chromatography*

Approved By:
Date: 3/26/97

OFF: (505) 325-5667

ON SITE TECHNOLOGIES, LTD.

LAB: (505) 325-1556

ANALYTICAL REPORT

Attn:	*Michael Lane*	Date:	26-Mar-97
Company:	*On Site Technologies, Ltd. c/o Conoco*	COC No.:	*5061*
Address:	*612 E. Murray Drive*	Sample No.:	*14001*
City, State:	*Farmington, NM 87401*	Job No.:	*4-1377*

Project Name:	***Conoco - Salmon #1***				
Project Location:	***MW-N***				
Sampled by:	MKL	Date:	20-Mar-97	Time:	9:45
Analyzed by:	DC	Date:	24-Mar-97		
Sample Matrix:	*Liquid*				

Parameter	*Result*	*Unit of Measure*	*Detection Limit*	*Unit of Measure*
Benzene	40.7	ug/L	0.2	ug/L
Toluene	11.9	ug/L	0.2	ug/L
Ethylbenzene	8.6	ug/L	0.2	ug/L
m,p-Xylene	61.7	ug/L	0.2	ug/L
o-Xylene	12.5	ug/L	0.2	ug/L
TOTAL	135.4	ug/L		

Method - *SW-846 EPA Method 8020 Aromatic Volatile Organics by Gas Chromatography*

Approved By:

Date: 3/26/97

OFF: (505) 325-5667

ON SITE TECHNOLOGIES, LTD.

LAB: (505) 325-1556

QUALITY ASSURANCE REPORT

for EPA Method 8020

Date Analyzed: 24-Mar-97

Internal QC No.: 0527-STD
Surrogate QC No.: 0528-STD
Reference Standard QC No.: 0529/30-QC

Method Blank

Parameter	Result	Unit of Measure
Average Amount of All Analytes In Blank	<0.2	ppb

Calibration Check

Parameter	Unit of Measure	True Value	Analyzed Value	% Diff	Limit
Benzene	ppb	20.0	18.6	7	15%
Toluene	ppb	20.0	19.4	3	15%
Ethylbenzene	ppb	20.0	19.8	1	15%
m,p-Xylene	ppb	40.0	38.2	4	15%
o-Xylene	ppb	20.0	19.5	2	15%

Matrix Spike

Parameter	1- Percent Recovered	2 - Percent Recovered	Limit	%RSD	Limit
Benzene	89	88	(39-150)	1	20%
Toluene	92	92	(46-148)	0	20%
Ethylbenzene	94	94	(32-160)	0	20%
m,p-Xylene	90	90	(35-145)	0	20%
o-Xylene	93	93	(35-145)	0	20%

Surrogate Recoveries

Laboratory Identification	S1 Percent Recovered	S2 Percent Recovered	Laboratory Identification	S1 Percent Recovered	S2 Percent Recovered
Limit Percent Recovered	(70-130)		Limit Percent Recovered	(70-130)	
14000-5061	96				
14001-5061	85				

S1: Flourobenzene

(m) 3/26/97

CHAIN OF CUSTODY RECORD

5061

ON SITE TECHNOLOGIES, LTD.

657 W. Maple • P. O. Box 2606 • Farmington NM 87499
LAB: (505) 325-5667 • FAX: (505) 325-6256

Date: 3/20/97

Page 1 of

Purchase Order No.:	Job No. 4-1277		
SEND INVOICE TO: Name	Michael Lane - On Site	REPORT RESULTS TO: Name	Michael Lane — Title Sampler
Company	Conoco — Dept.	Company	On Site
Address		Mailing Address	
City, State, Zip		City, State, Zip	
		Telephone No.	Telefax No.
Sampling Location:	Falmon #1		
Sampler:	Michael K. Lane		

SAMPLE IDENTIFICATION	SAMPLE DATE	SAMPLE TIME	MATRIX	PRES.	Number of Containers	WO20 BTEX	LAB ID
MW-NE	3/20	915	WTR	H_2SO_4	2	✓	14ui-501
MW-N	3/20	945	WTR	H_2SO_4	2	✓	14ui-501

ANALYSIS REQUESTED

Relinquished by:	Date/Time 3/20/97 1645	Received by:	Date/Time 3/21/97 1645
Relinquished by:	Date/Time	Received by:	Date/Time
Relinquished by:	Date/Time	Received by:	Date/Time

Method of Shipment:

Authorized by: _____ Date _____
(Client Signature Must Accompany Request)

Rush	24-48 Hours	10 Working Days	Special Instructions:

Distribution: White – On Site Yellow – LAB Pink – Sampler Goldenrod – Client

Midland Division
Exploration Production

Conoco Inc.
10 Desta Drive, Suite 100W
Midland, TX 79705-4500
(915) 686-5400

March 2, 1995

RECEIVED
MAR 6 1995
Oil Conservation Division

Mr. William Olsen
New Mexico Oil Conservation Division
Post Office Box 2088
Santa Fe, NM 87503

Dear Mr. Olsen:

SALMON #1 LINE DRIP PIT UNIT P, S30-T29N-R11W
PROPOSED GROUNDWATER TREATMENT PLAN

Conoco proposes to treat the BTEX contamination in the groundwater at this site using bio-air sparging remediation technology as outlined in the treatment plan included with this letter.

Pending approval from the NMOCD, we plan install the project and begin treatment by mid to late April. As we discussed, I will call you the week of March 13 to discuss the project and tentatively receive OCD approval.

Please direct any questions concerning the project to myself or to Mr. Len Gawell, Conoco's consultant for this project. Mr. Gawell's phone number is (405) 762-3805.

Yours very truly,

Judy A. McLemore
Environmental Coordinator

cc: John Coy - Farmington

Denny Foust - NMOCD - Aztec

Midland Division
Exploration Production

Conoco Inc.
10 Desta Drive, Suite 100W
Midland, TX 79705-4500
(915) 686-5400

May 14, 1994

Mr. William C. Olson
New Mexico Oil Conservation Division
Post Office Box 2088
Santa Fe, NM 87504

Dear Mr. Olsen:

SAN JUAN BASIN GROUNDWATER SAMPLING RESULTS

Attached you will find a spreadsheet which summarizes the groundwater sampling performed at the Shepherd & Kelsey and the Salmon Line Drip Pit locations. If you will recall, we summarized the groundwater testing results from the tests run in the summer of 1993 in our annual report submitted to you on March 15, 1994. We also included our plan to sample the wells at these two locations in the early spring and to provide the results to you thereafter. The sampling was performed on March 28, using the same sampling procedure as noted in the Groundwater Assessment Report.

SHEPHERD & KELSEY

Both the upgradient wells show non detect for BTEX from the second sampling. If you will remember, Conoco trenched the pit last fall which allowed aeration of the water and removal of the hydrocarbon contaminated soil from the top of the groundwater. We suspect this may have influenced the change in the upgradient wells BTEX results.

The downgradient well at this location continues to demonstrate BTEX in concentrations in excess of the NM Groundwater standards. We do see some reduction in the BTEX but the TEX constituents have increased.

Conoco will proceed with the remediation plan as submitted in the our annual report upon concurrence by the NMOCD. This plan is to trench the location thus eliminating the source of the contamination while concurrently allowing the exposed groundwater to aerate.

SALMON LINE DRIP PIT

Again, the upgradient wells at this location are non-detect with the exception of xylenes. Although xylenes do show in Upgradient

Well 1, the concentration is well below the groundwater standard. The contents of this pit were excavated in the fall of 1993 and removed to the Salmon 1E where they were landfarmed.

Downgradient Well 2 samples all show non detect for BTEX. This gives a clear indication the lateral extent of the contamination is between the first and second downgradient wells. Downgradient well #1 continues to show BTEX concentrations. Levels have decreased significantly for all constituents of BTEX, on the order of 40-45%. This would indicate there has been significant progress achieved by removal of the source of contamination, or pit contents, last fall.

Remediation Plan. We are reviewing options for remediation of groundwater at this site. Because of the location of this pit (not on a large battery pad site), we are exploring non-intrusive methods for remediating the groundwater and anticipate providing a remediation plan for your approval by the end of June.

Please direct any questions to me at (915) 686-6559.

Yours very truly,

Judy A. McLemore

Judy A. McLemore
Environmental Coordinator

cc: RDK
Dan McCoy - Farmington
John Coy - Farmington

Mr. Frank Chavez
District Supervisor
NM Oil Conservation Division
1000 Rio Brazos Road
Aztec, NM 87410

CONOCO INC.

26-Apr-94

San Juan Basin

Groundwater Analytical Results

	Benzene	Toluene	Ethyl Benzene	m,p Xylene	o-Xylene	Total Xylenes
New Mexico Groundwater Standards	0.01	0.75	0.75			0.62
Shepherd & Kelsey Dehydrator Pit						
Upgradient Well 1						
8-93	0.084	0.048	0.023	0.079	0.065	0.252
3-28-94	ND	ND	ND	ND	ND	ND
Upgradient Well 2						
8-93	<.003	0.045	0.076	<.003	<.003	<.009
3-28-94	ND	ND	ND	ND	ND	ND
Downgradient Well 1						
8-93	0.160	1.600	0.530	4.900	1.300	6.200
3-28-94	0.075	3.530	0.987	9.900	5.140	15.040
Salmon Line Drip Pit						
Upgradient Well 1						
8-93	0.098	0.052	0.097	0.085	0.025	0.110
3-28-94	ND	ND	ND	0.000	0.003	0.003
Upgradient Well 2						
8-93	<.003	<.003	<.003	<.006	<.003	<.009
3-28-94	ND	ND	ND	ND	ND	ND
Downgradient Well 1						
8-93	8.300	12.000	<.3	2.310	0.660	2.970
3-28-94	4.710	6.350	0.072	1.140	0.595	1.735
Downgradient Well 2						
8-93	0.100	<.003	<.003	<.006	<.003	<.009
3-28-94	ND	ND	ND	ND	ND	ND

ALL RESULTS STATED IN MG/L

Midland Division
Exploration Production

Conoco Inc.
10 Desta Drive, Suite 100W
Midland, TX 79705-4500
(915) 686-5400

March 15, 1994

RECEIVED
MAR 22 1994
OIL CONSERVATION DIV.
SANTA FE

Mr. William C. Olson
Environmental Bureau
New Mexico Oil Conservation Division
Post Office Box 2088
Santa Fe, NM 87504

Dear Mr. Olson:

SAN JUAN BASIN PIT CLOSURE ANNUAL REPORT

This letter will provide the New Mexico OCD with the following information:

SECTION	INFORMATION PROVIDED
A	SUMMARY OF 1993 CLOSURE WORK
B	DETAIL RECORDS ON 1993 PIT CLOSURES
C	GROUNDWATER ASSESSMENT SUMMARY, REPORT AND 1994 PLAN OF ACTION
D	1994 WORK PLAN WITH PIT LIST
E	RESULTS OF CONOCO'S IN-SITU BIOREMEDIATION DEMONSTRATION PROJECT

With this letter, Conoco requests your approval of our proposed work plan for the two sites with groundwater contamination.

Any questions may be directed to Judy McLemore (915) 686-6559.

Yours very truly,

Judy A. McLemore

jlr R. D. Kiker
SHEAR Director

cc: Frank Chavez - Aztec NMOCD

John Coy/Dan McCoy - Farmington

GROUNDWATER ASSESSMENT FOR THREE PRODUCTION TANK BATTERIES
SAN JUAN BASIN PRODUCTION AREA
MIDLAND DIVISION
CONOCO, INC.

Submitted to:

William C. Olson
Hydrogeologist
Environmental Bureau
New Mexico Oil Conservation Division

Prepared for:

Judy McLemore
Environmental Coordinator
Midland Division
Conoco, Inc.
10 Desta Drive, Suite 100W
Midland, TX 79705

Prepared by:

John P. Hancock
Senior Environmental Engineer
Environmental Services Division
Conoco, Inc.
Ponca City, OK

September 30, 1993

Table of Contents

List of Tables

List of Figures

A. Introduction

In closing impoundments on state and fee lands identified in Conoco's San Juan Basin Pit Closure Plan using procedures described in guidelines issued by the New Mexico Energy, Minerals and Resources Oil Conservation Division Environmental Bureau (NMOCD), preliminary site assessments were performed. When using the ranking criteria of the guidelines, three impoundments required further assessment of oil and gas production operation impact upon localized groundwater. These further assessments were conducted by Conoco's Environmental Services Division (EvSD) with laboratory analysis performed by EvSD's compliance laboratory using EPA protocol analysis. Assessments were performed on impoundments at the following sites located in San Juan County New Mexico.

- Nye Com #1E Tank Drip Pit
- Salmon #1 Line Drip Pit
- Shepard and Kelsey #1 Dehydrator Pit

These assessments were performed on August 24, 25 and 26, 1993 by Conoco EvSD personnel Joel Wilson and Michael Boor.

B. Assessment Plan

The assessment for each site was to be performed by installing three small diameter monitoring wells at each site. One well was to be installed hydrologically downgradient from the surface impoundment with two wells installed upgradient. Each well was to be sampled using appropriate sampling methods and protocols for the following parameters.

- BTEX
- PAH (semivolatiles)
- Specific Conductance
- pH
- Temperature
- TDS

All samples were to be field screened for volatile organic compounds (field headspace analysis) using an Organic Vapor Meter (OVM). If the reading for any well was greater than 100 ppm, another well would be installed approximately 100 feet downgradient and sampled.

Following well installation a survey of the site was to be performed to horizontally locate the wells and to determine the hydraulic gradient.

Please refer to Appendix A for the complete workplan.

C. Well Installation and Sampling

All wells were installed to a depth of about three feet below the water table using a power auger or hand auger as needed. A 0.010" slotted screened PVC pipe was installed at a depth of about three feet below the water table to about three feet above the water table. Unscreened PVC casing was installed to the surface above the screened pipe. A one foot bentonite seal was placed at the surface to prevent surface water from entering the well bore. Colorado Environmental Spec 30 sand was used as the completion material to fill the annulus from the well total depth to the surface bentonite seal. After all materials were installed in each well, each bentonite seal was hydrated. All augering equipment was cleaned after the installation of each well. Construction logs for each well are detailed in Appendix B. Photographs of each well installation are included in Appendix C.

C.1. Nye Com #1E

Three wells were installed at the Nye Com #1E.

Please refer to Figure 1 and Appendices B and D for the site plot-plan, hydraulic gradient calculations and well construction logs.

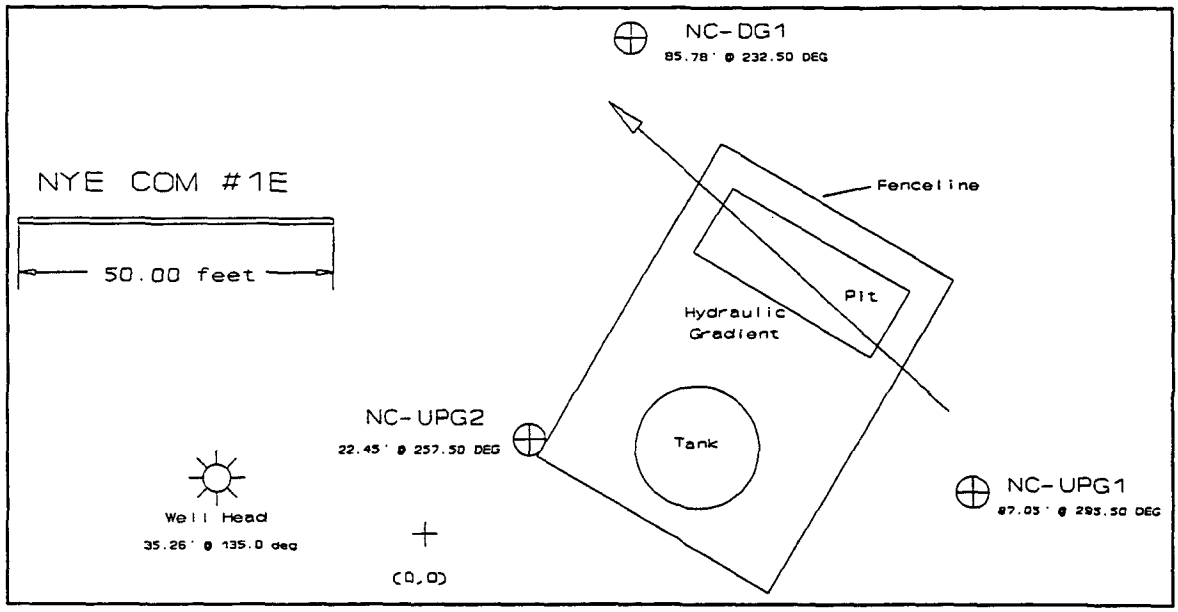


Figure 1 Nye Com #1E

The following table lists the surveyed water level data of this site.

Table 1 Survey Data - Nye Com #1E

Well	Water Level BTOC (feet)	Well Total Depth (feet)	Riser Height above ground (inches)	Elevation of TOC (feet)	Elevation of water table (feet)
NC-UPG1	-5.74	9.87	17	-3.57	-9.31
NC-UPG2	-6.22	9.88	16	-3.96	-10.18
NC-DG1	-6.53	11.60	34	-4.16	-10.69

Note: Elevation datum is height of surveying instrument.
BTOC = Below top of casing.

The hydraulic gradient at this site is 0.015 $^{feet}/_{foot}$.

The following table lists the field gathered data for this site.

Table 2 Field Data - Nye Com #1E

		NC-UPG1	NC-UPG2	NC-DG1
Temperature	(°C)	18.1	20.2	16.2
pH		7.25	7.06	7.00
Specific Conductance	(mmhos/cm)	6390	1660	3680
Total Dissolved Solids	(mg/l)	3190	8330	1838
OVM Reading	(ppm)	ND	ND	ND

Note: Total Dissolved Solids is calculated from the Specific Conductance Measurement.
ND - Not detected.

C.2. Salmon #1

Four wells were installed at this site.

Please refer to the following figure and Appendices B and D for the site plot-plan, hydraulic gradient calculations and well construction logs.

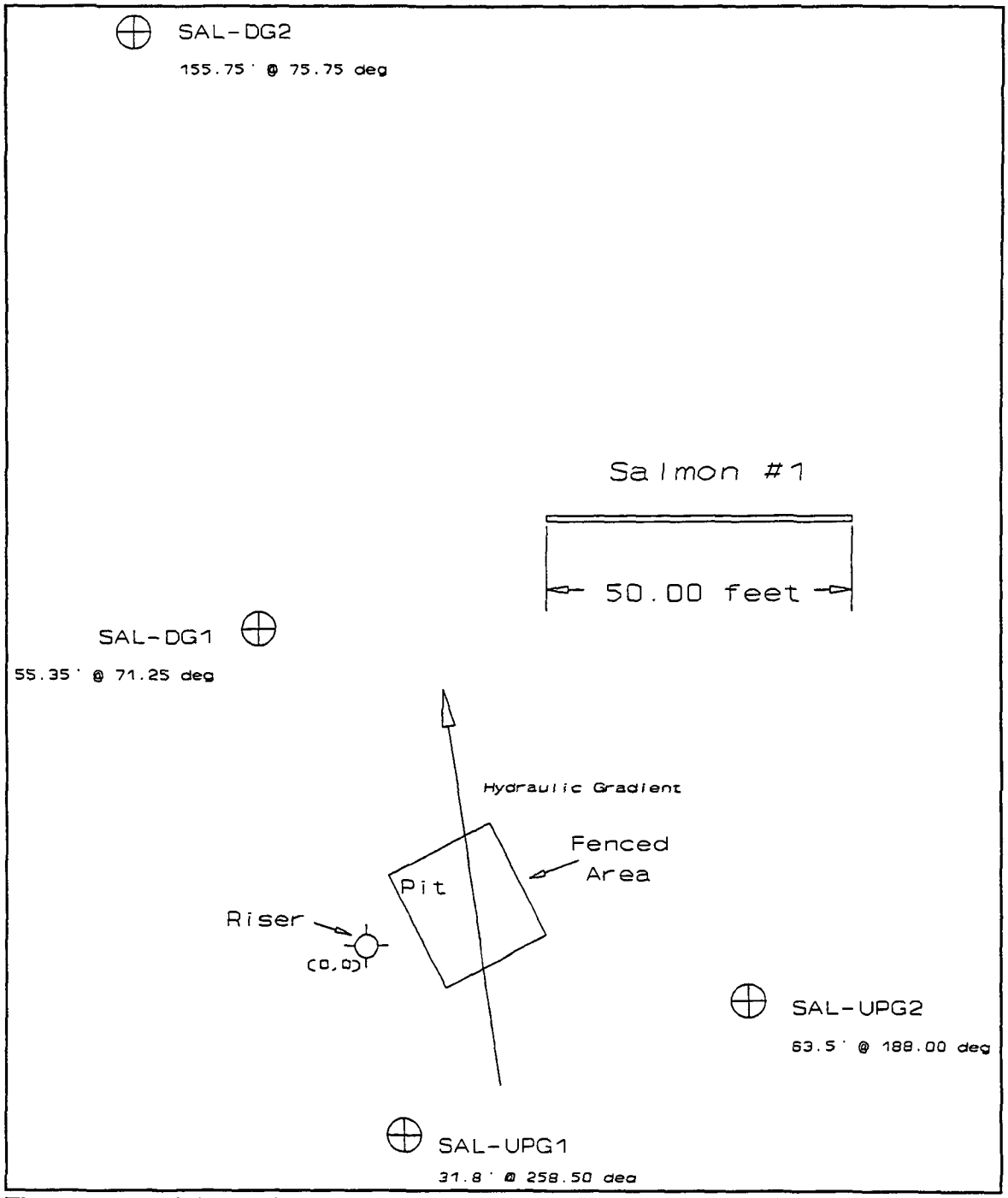


Figure 2 Salmon #1

The OVM reading for well SAL-DG1 was above 100 ppm indicating that another well should be installed farther downgradient. Well SAL-DG2 was installed approximately 100 feet

downgradient from well SAL-DG1. The OVM reading for well SAL-DG2 was less than 100 ppm and an additional downgradient well was not installed.

The following table lists the survey data of this site.

Table 3 Survey Data - Salmon #1

Well	Water Level BTOC (feet)	Well Total Depth (feet)	Riser Height above ground (inches)	Elevation of TOC (feet)	Elevation of water table (feet)
SAL-UPG1	-8.65	10.88	9	-3.98	-12.63
SAL-UPG2	-9.11	11.95	14	-3.63	-12.74
SAL-DG1	-2.62	7.67	6	-10.73	-13.35
SAL-DG2	-5.21	9.34	10	-9.45	-14.66

Note: Elevation datum is height of surveying instrument.
BTOC = Below top of casing.

The hydraulic gradient at this site is 0.009 $^{feet}/_{foot}$.

The following table lists the field gathered data for this site.

Table 4 Field Data - Salmon #1

		SA-UPG1	SA-UPG2	SA-DG1	SA-DG2
Temperature	(°C)	20.1	19.2	20.9	20.4
pH		7.48	7.63	7.84	7.56
Specific Conductance	(mmhos/cm)	1490	1620	1440	1860
Total Dissolved Solids	(mg/l)	7700	824	723	932
OVM Reading	(ppm)	77	ND	172	ND

Note: Total Dissolved Solids is calculated from the Specific Conductance Measurement.
ND- Not detected.

C.3. Shepard and Kelsey #1

Three wells were installed at this site. Please refer to the following figure and Appendices B and D for the site plot-plan, hydraulic gradient calculations and well construction logs.

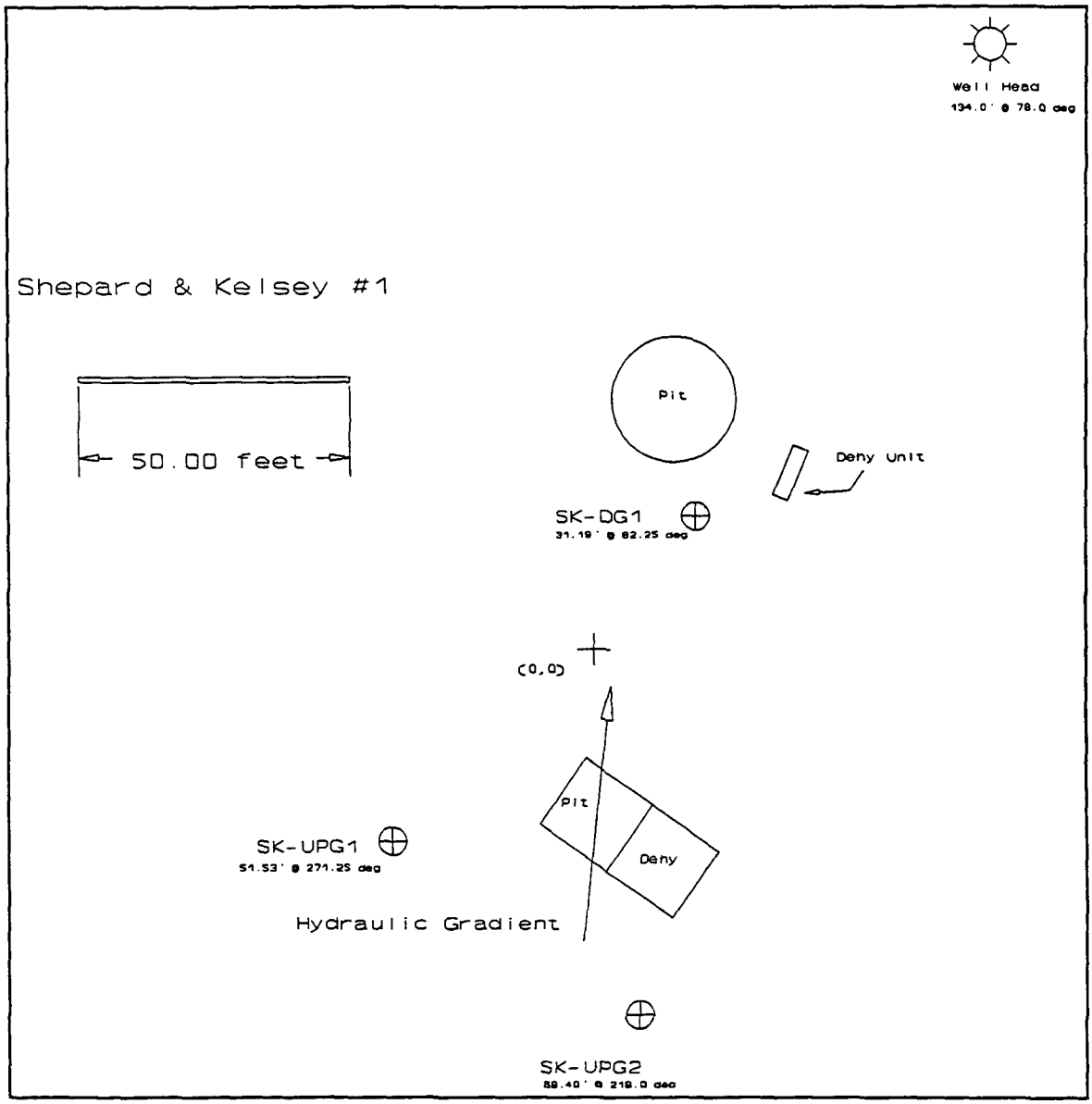


Figure 3 Shepard and Kelsey #1

The following table lists the survey data for this site.

Table 5 Survey Data - Shepard and Kelsey #1

Well	Water Level BTOC (feet)	Well Total Depth (feet)	Riser Height above Ground (inches)	Elevation of TOC (feet)	Elevation of water table (feet)
SK-UPG1	-6.20	10.10	5.5	-3.58	-9.78
SK-UPG2	-5.41	10.10	7.5	-4.05	-9.46
SK-DG1	-6.35	9.05	15.0	-4.38	-10.73

Note: Elevation datum is height of surveying instrument.
BTOC = Below top of casing.

The hydraulic gradient at this site is 0.013 $^{feet}/_{foot}$.

The following table lists the field gathered data for this site.

Table 6 Field Data - Shepard and Kelsey #1

		SK-UPG1	SK-UPG2	SK-DG1
Temperature	(°C)	18.0	23.3	20.7
pH		7.46	7.53	7.53
Specific Conductance	(mmhos/cm)	2110	2290	1960
Total Dissolved Solids	(mg/l)	1098	1162	978
OVM Reading	(ppm)	ND	ND	16.6

Note: Total Dissolved Solids is calculated from the Specific Conductance Measurement.
ND- Not detected.

D. Sample Protocol

All samples were taken after at least ten well volumes of water were purged from each well. The Polynuclear Aromatic Hydrocarbon (PAH or Semi-volatile) samples were taken using a peristaltic pump. All other samples were taken using a stainless steel bailer. All samples were collected, labeled, preserved, and shipped according to EPA guidelines and accompanied by a Chain-of-Custody form. Sampling equipment was washed and triple-rinsed with deionized water between samples. Chain-of-Custody forms are included in Appendix E.

E. Analytical Data

The following table should be used as a reference when referring to the laboratory analytical reports contained in the Analytical Reports Appendix.

Table 7 Sample Cross Reference

Chain-of-Custody Sample ID	*Sample Name*	*Lab ID*	*Date Sampled*
NC-DG1	SJN-NC-DG1	P308088-03	8/26/93
NC-UPG1	SJN-NC-UPG1	P308088-01	8/26/93
NC-UPG2	SJN-NC-UPG2	P308088-02	8/26/93
SAL-DG1	SJN-SAL-DG1	P308088-09	8/25/93
SAL-DG2	SJN-SAL-DG2	P308088-10	8/26/93
SAL-UPG1	SJN-SAL-UPG1	P308088-07	8/25/93
SAL-UPG2	SJN-SAL-UPG2	P308088-08	8/25/93
SK-DG1	SJN-SK-DG1	P308088-06	8/25/93
SK-UPG1	SJN-SK-UPG1	P308088-05	8/25/93
SK-UPG2	SJN-SK-UPG2	P308088-04	8/25/93
TRIP BLANK	SJN-TRIP BLANK	P308088-11	8/19/93

Notes: "NC" refers to Nye Com #1E
"SAL" refers to Salmon #1
"SK" refers to Shepard and Kelsey #1

The following table lists the laboratory results for BTEX and TDS.

Table 8 Laboratory Results - BTEX and TDS

Sample #	Benzene mg/l	Toluene mg/l	Eth-Benzene mg/l	p-Xylene mg/l	m-Xylene mg/l	o-Xylene mg/l	Total Xylenes mg/l	TDS mg/l
NC-UPG1	<.003	<.003	<.003	<.003	<.003	<.003	<.009	6496
NC-UPG2	<.003	<.003	<.003	<.003	<.003	<.003	<.009	1330
NC-DG1	<.003	<.003	<.003	<.003	<.003	<.003	<.009	2915
SK-UPG1	.084	.048	.023	.012	.067	.065	.252	1500
SK-UPG2	<.003	.045	.076	<.003	<.003	<.003	<.009	1828
SK-DG1	.160	1.600	.530	1.300	3.600	1.300	6.200	1288
SAL-UPG1	.098	.052	.097	.024	.061	.025	.110	1044
SAL-UPG2	<.003	<.003	<.003	<.003	<.003	<.003	<.009	1340
SAL-DG1	8.300	12.000	<.300	.610	1.700	.660	2.970	1116
SAL-DG2	.100	<.003	<.003	<.003	<.003	<.003	<.009	1344
TRIP BLANK	<.003	<.003	<.003	<.003	<.003	<.003	<.009	<3

Notes: "UPG" designates an upgradient well.
"DG" designates a downgradient well.
BTEX by EPA Method 8020 with preparation Method 5030.
TDS by EPA Method 160.1.
mg/l is equivalent to parts per million.
Total Xylenes is the sum of the concentrations of o-, m- and p-xylene.

All QA/QC analyte spikes and surrogate recoveries were within method specifications for the above analyses.

The following table lists the results of the laboratory analyses of Polynuclear Aromatic Hydrocarbons (PAHs).

Table 9 Laboratory Results - Polynuclear Aromatic Hydrocarbons (PAHs)

Analyte mg/l	NC-DG1	SAL-DG1	SK-DG1
2-Methylnapthalene	<.020	<0.010	<0.010
3-Methylcholanthrene	<.020	<0.010	<0.010
7,12-Dimethlybenz(a)anthracene	<.020	<0.010	<0.010
Acenaphthene	<.020	<0.010	<0.010
Acenaphthylene	<.020	<0.010	<0.010
Anthracene	<.020	<0.010	<0.010
Benzo(a)anthracene	<.020	<0.010	<0.010
Benzo(a)pyrene	<.020	<0.010	<0.010
Benzo(b)fluoranthene	<.020	<0.010	<0.010
Benzo(g,h,i)perylene	<.020	<0.010	<0.010
Benzo(k)fluoranthene	<.020	<0.010	<0.010
Chrysene	<.020	<0.010	<0.010
Dibenz(a,h)anthracene	<.020	<0.010	<0.010
Dibenz(a,j)acridine	<.020	<0.010	<0.010
Fluoranthene	<.020	<0.010	<0.010
Fluorene	<.020	<0.010	<0.010
Indeno (1,2,3-cd) pyrene	<.020	<0.010	<0.010
Naphthalene	<.020	<0.010	<0.010
Phenanthrene	<.020	<0.010	<0.010
Pyrene	<.020	<0.010	<0.010

Note: Samples were extracted using EPA method 3520 and analyzed using Method 8270.

Please note that terphenyl-d14 surrogate recoveries for the samples from wells SAL-DG1 and SK-DG1 were low. The samples were re-extracted and re-analyzed with no changes noted for the re-analysis. This indicates that a matrix interference is present. Please refer to the Analytical Results Appendix for detailed analysis data.

F. Summary

F.1. Nye Com #1E

Well NC-UPG1 was placed upgradient of the surface impoundment and well NC-DG1 was placed downgradient. No impact upon the groundwater by BTEX or PAHs was found at this location.

F.2. Salmon #1

Wells SAL-UPG1 and SAL-DG1 were about 20° from the hydraulic gradient line running directly through the surface impoundment. Well SAL-DG2 was placed downgradient. SAL-UPG2 showed no evidence of groundwater impact. Groundwater samples from well SAL-DG1 contained 8.300 and 12.000 mg/l of benzene and toluene respectively and contained 2.970 mg/l of total xylene. SAL-DG2 samples contained 0.100 mg/l of benzene. This indicates that the extent of the benzene plume is beyond the extreme downgradient well, but at a very low level.

No PAHs were found to be present at this site.

F.3. Shepard and Kelsey #1

Well SK-UPG2 was placed upgradient of the surface impoundment and well SK-DG1 was placed downgradient. SK-DG1 samples contained 0.160 and 1.600 mg/l benzene and toluene, respectively. Total xylenes for samples from well SK-DG1 at this site were 6.200 mg/l.

No PAHs were found to be present at this site.

Appendix A
Workplan

SAN JUAN BASIN
GROUNDWATER INVESTIGATION
WORKPLAN

INTRODUCTION

This workplan outlines the field and analytical procedures to assess groundwater quality at three pits in the San Juan Basin area. The following are the pits slated for investigation and subsequent closure:

NYC Com 1E -- Tank Drip Pit (TDP)
Salom 1 -- Line Drip Pit (LDP)
Shepard & Kelsey 1 -- Dehydrator Pit (DHP)

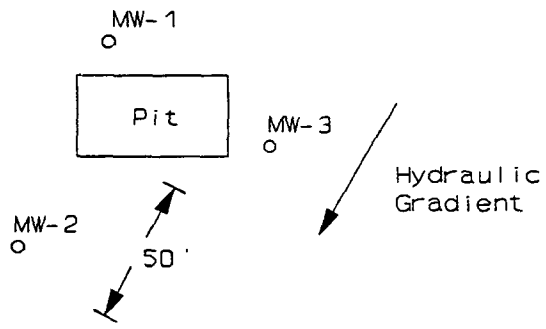
As part of the closure plan, a site assessment was conducted in early June 1993. The results of this investigation include further groundwater quality assessment around the three pits mentioned above. This workplan will describe the methodologies for sampling and analysis of the local groundwater near the pits. Basically, the work will follow the NMOCD Unlined Surface Impoundment Closure Guidelines Sec. III.2.c (Ground Water Sampling).

FIELD WORK

The field work will be conducted by Conoco Environmental Support personnel.

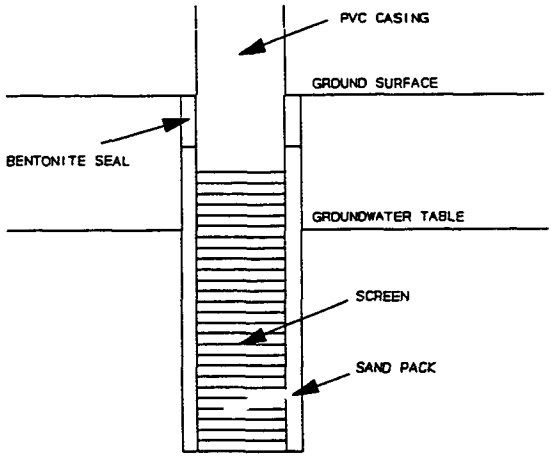
Temporary Monitor Well Installation

Three small diameter PVC monitoring wells will be installed adjacent to each impoundment. One of these will be located hydrologically down-gradient at a distance of not more than 50 feet from the pit boundary. The other two wells will be installed up-gradient near the pit boundary. The following diagram better describes the layout:



Each well will be installed by hand or power augering a 3- or 4-inch hole to a depth of approximately 3 feet below the water table. A clean one-inch-diameter PVC slotted screen will be placed to a depth of approximately 2-3 feet above the water table. The screen will be connected to a blank one-inch PVC casing.

The remaining annulus will be sand packed with clean sand with a bentonite clay seal near the top. The following illustrates the well construction:



TEMPORARY MONITOR WELL

Certain field conditions may require an alternate method for installing the monitor wells. In this case, a hollow steel rod will be driven to the desired depth. The one-inch PVC well casing and screen will then be inserted inside the steel rod and left in place while retracting the steel rods. The resulting annular space will be sand packed with an upper bentonite clay seal.

SAMPLING AND ANALYSIS

Prior to sampling, each well will be developed by pumping at least ten well volumes and monitoring pH to determine stabilization.

A clean teflon or stainless steel bailer will be used to collect samples for the following analysis:

8020	BTEX	2 ml - 40 ml
8270	PAH (Semivolatiles)	2 L - 1 L
--	TDS	125 mL
--	Specific Conductance	Field
--	pH	Field
--	Temp	Field

A peristaltic pump may be used to collect the larger volume samples. The BTEX sample will be collected with a bailer. Samples for PAHs will be collected only from down-gradient wells.

All samples will be collected, labelled, preserved, and shipped according to EPA guidelines and protocols. A Chain-of-Custody form will accompany each shipment. Sampling equipment will be triple-rinsed using deionized water.

PLUME DELINEATION

All samples will be screened (field headspace) for volatile organics using an Organic Vapor Meter (OVM) calibrated to isobutylene. Locations of samples with OVM readings greater than 100 ppm will be extended approximately 100 feet down-gradient and reassessed by installing another temporary monitor well and subsequent sampling.

SURVEYING

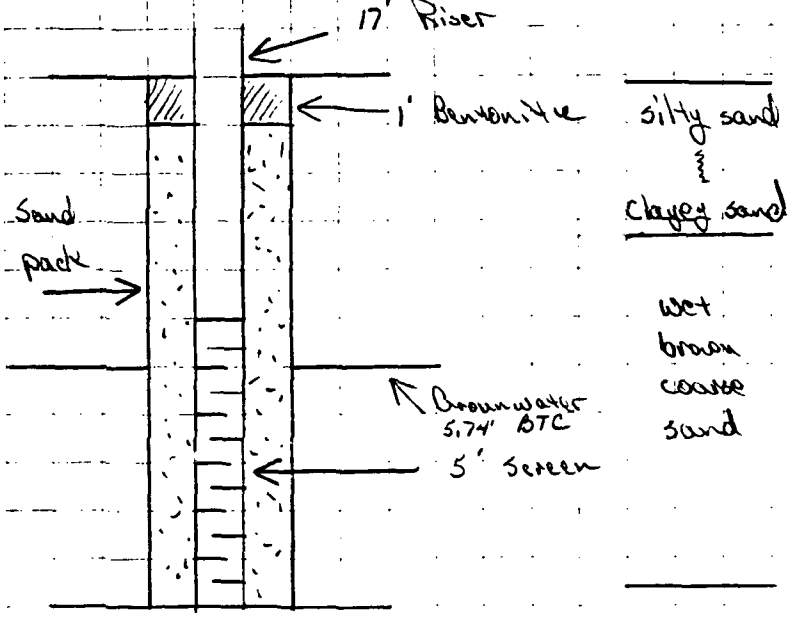
All monitor well locating will be surveyed to log both horizontal and vertical positions of the well casing. A fixed point will be used to reference the location of each well and to provide an elevation benchmark.

Water levels will be measured using a conductivity sounding probe and referenced to the top of the casing. This data may allow a more accurate determination of the local hydraulic gradient.

amr/jfw0819.93

Appendix B
Well Construction Logs
Site Plot Plans

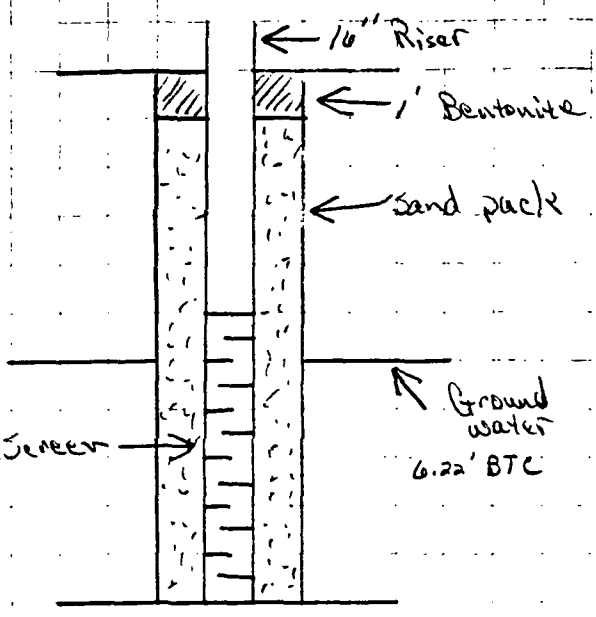
NC-UPG1



T.D. = 9.80' BTC

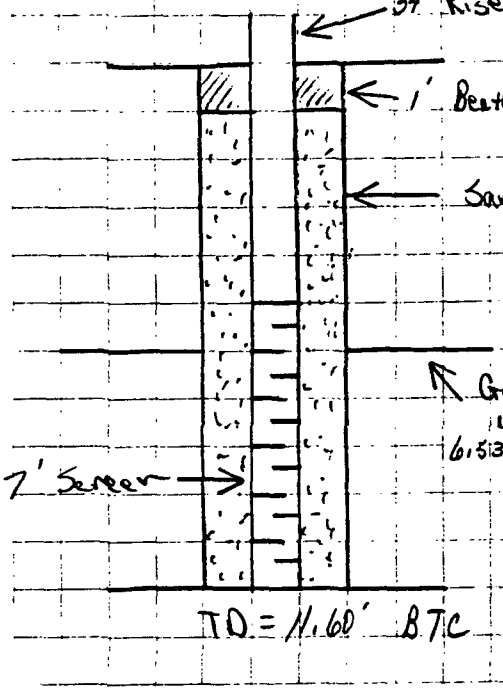
Material = 1" PVC w/ .010" slotted screen
Sand pack = Co. Env. Spec 20 sand

NC-UPG2



TD = 9.88' BTC

NC-DG1



TD = 11.60' BTC

Field Data

		NC-UPG1	NC-UPG2	NC-DG1	
Temp		18.1	20.2	16.2	°C
pH		7.25	7.06	7.00	
S.C.		6390	1660	3680	mS/cm
TDS		3.19	0.833	1.838	g/L
Quill		ND	ND	ND	ppm

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Checked By
Date 9-10-93
Page 1 of 4

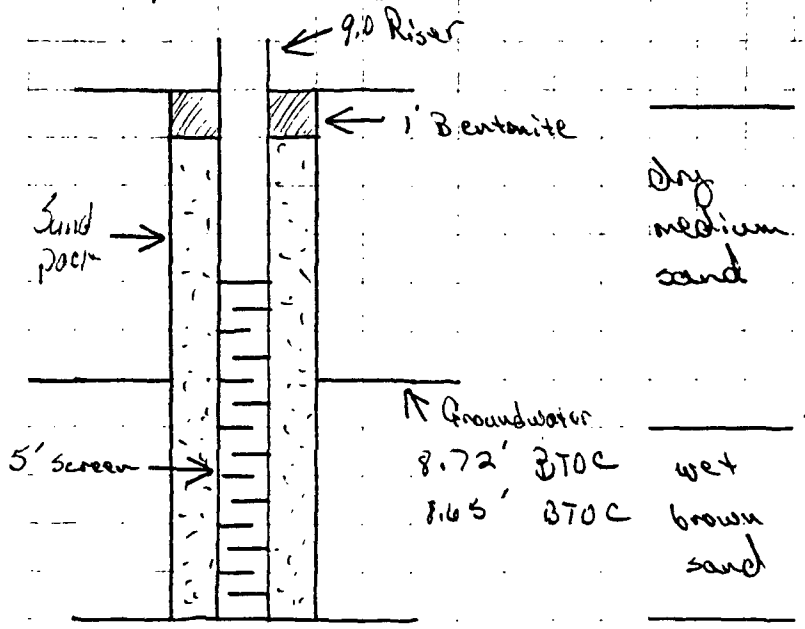
Conoco Inc.
Calculation Sheet

Title San Juan GW
NyE Co #1E

Job No.
Field San Juan
State N.M.

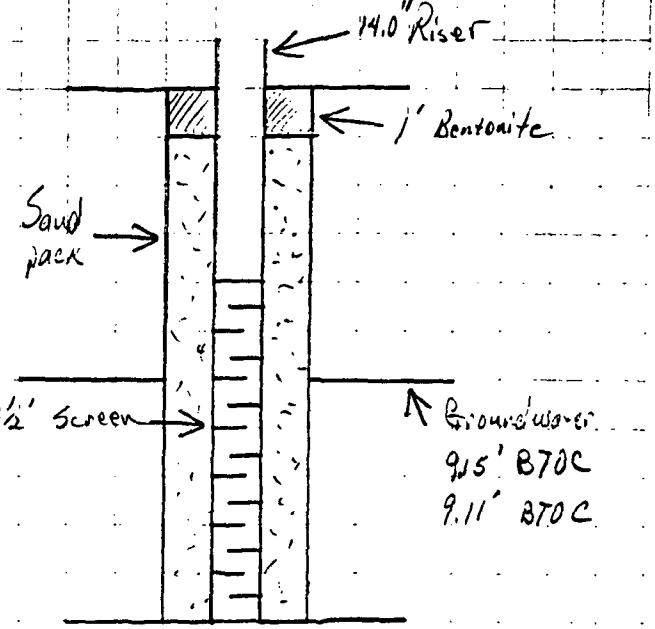
13-231-PB, 7

SAL-MPG1



TD = 10.88'

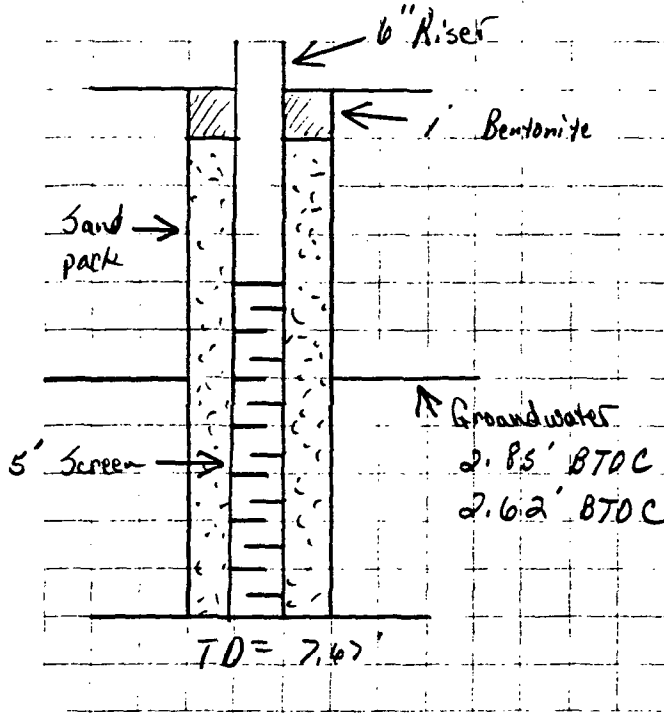
SAL-MPG2



TD = 11.95'

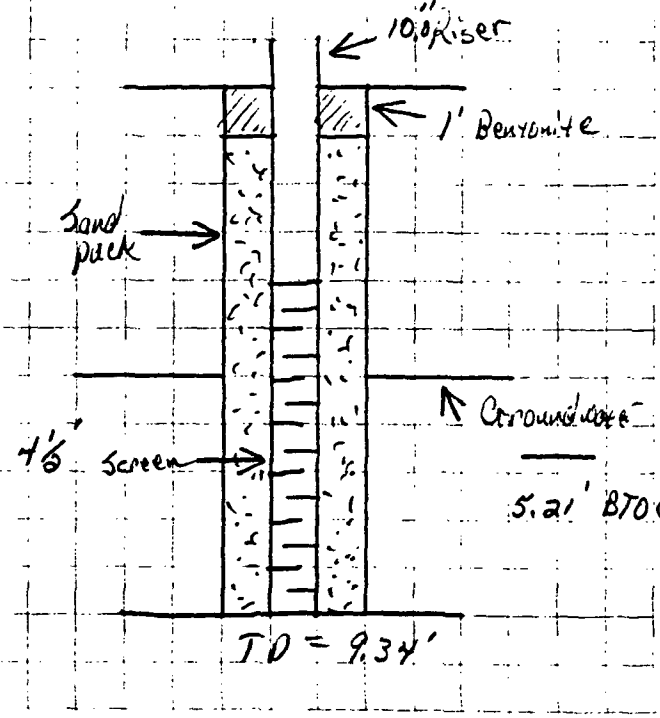
Material = 1" PVC w/ .010" slotted screen
Sand pack = C. Fnd. Sepe. 30 sand

SAL - DG1



TD = 7.67'

SAL-DG2



TD = 9.34'

13-231-PB

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Date 9-10-93
Page 2 of 4

Conoco Inc.
Calculation Sheet

Title San Juan GCU
Salmon #1

Job No.
Field San Juan
State NM

Salmon # 1

Field Data

	SAL-UPG1	SAL-UPG2	SAL-OG1	SAL-OG-2	Units
Temp	20.1	19.2	20.9	20.4	°C
pH	7.98	7.63	7.84	7.56	
S.C.	1490	1620	1440	1860	mS/cm
TDS	0.770	0.824	0.723	0.932	g/L
OVM	77	ND	172	ND	ppm

13-231-PB.

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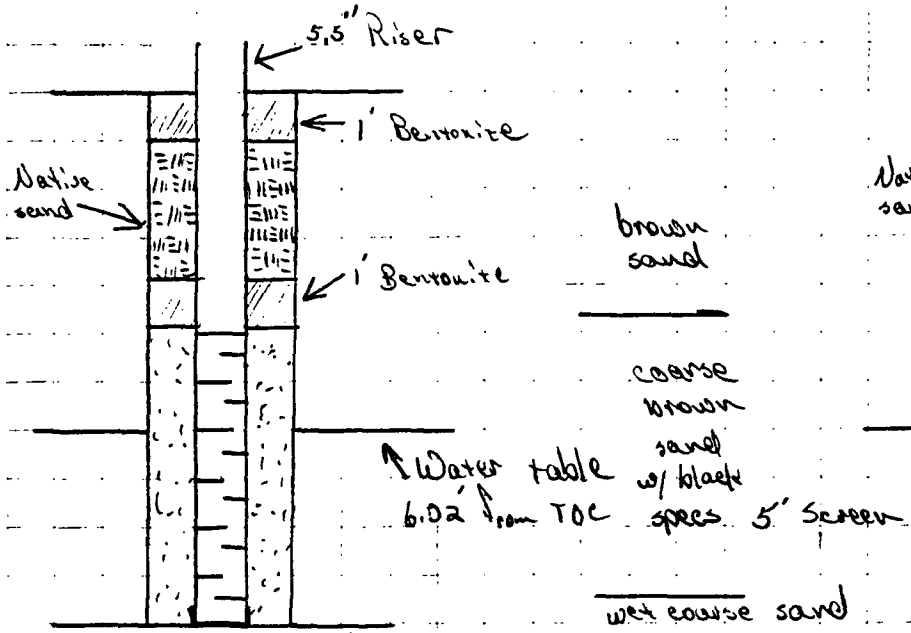
Date 9-10-93
Page 3 of 4

Conoco Inc.
Calculation Sheet

Title San Juan GW
Salmon #1

Job No.
Field San Juan
State NM

SK-uPG1

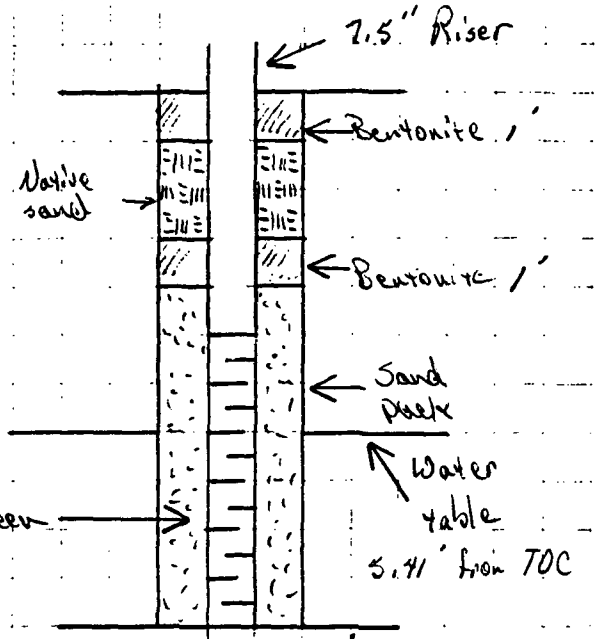


T.D. = 10.10' BTC

Material = 1" PVC w/ .010" slotted screen

Sand pack = Colorado Env. Spec 30 sand

SK-uPG2

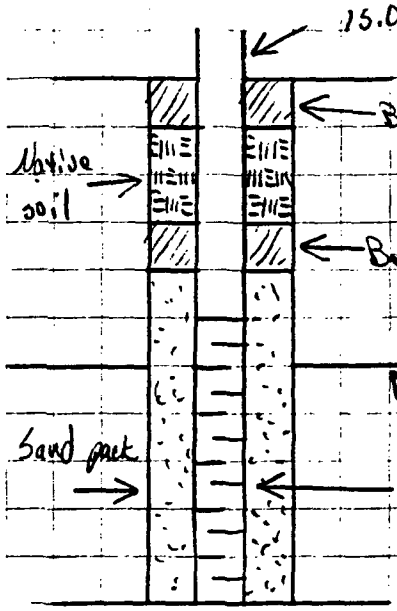


TD = 10.10' BTC

Screen length = 5'

Material = 1" PVC w/ .010" slotted screen

SK-DG1



TD = 9.05' BTC

Field data

	SK-uPG1	SK-uPG2	SK-DG1	Unit:
Temp	19.0	23.3	20.7	°C
pH	7.46	7.53	7.53	
S.C.	2110	2290	1960	mS/cm
TDS	1.098	1.162	.978	g/L
DUM	ND	ND	16.6	ppm

Made By J.P. Hancock

Checked By

Date 9-10-93

Page 4 of 4

Conoco Inc.
Calculation Sheet

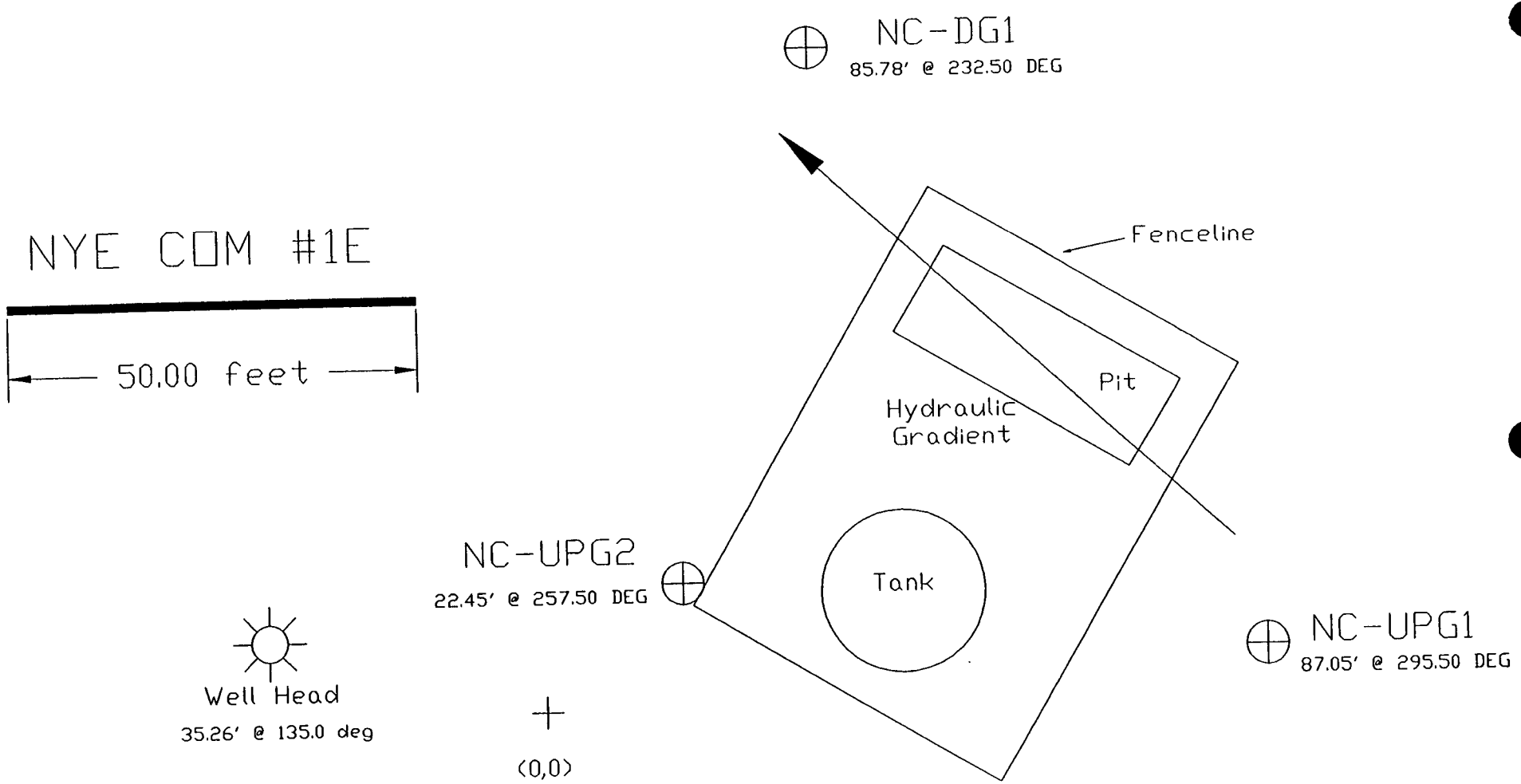
Title San Juan GW
Shepard & Kelsey #1

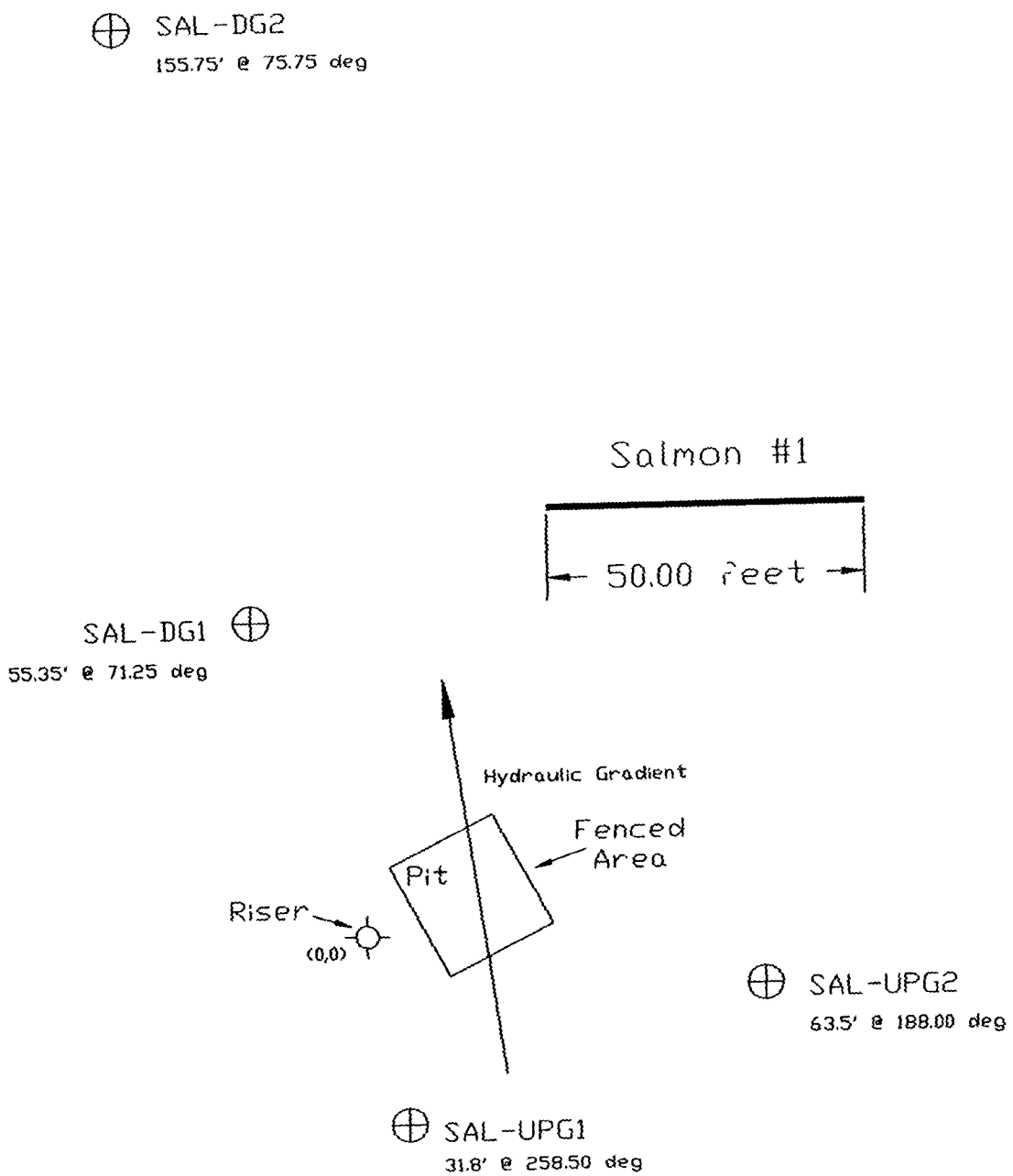
Job No.

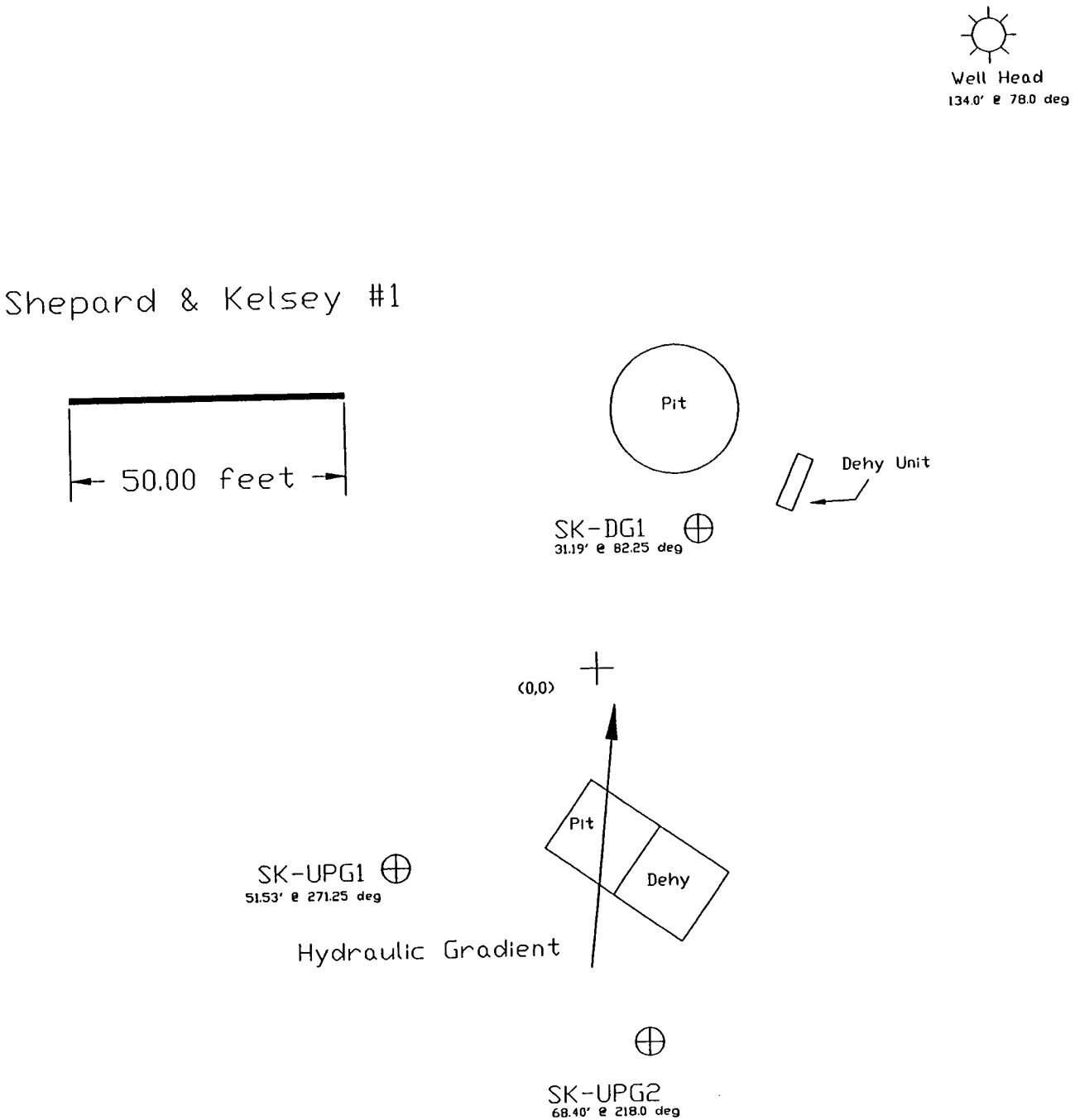
Field San Juan

State N.M.

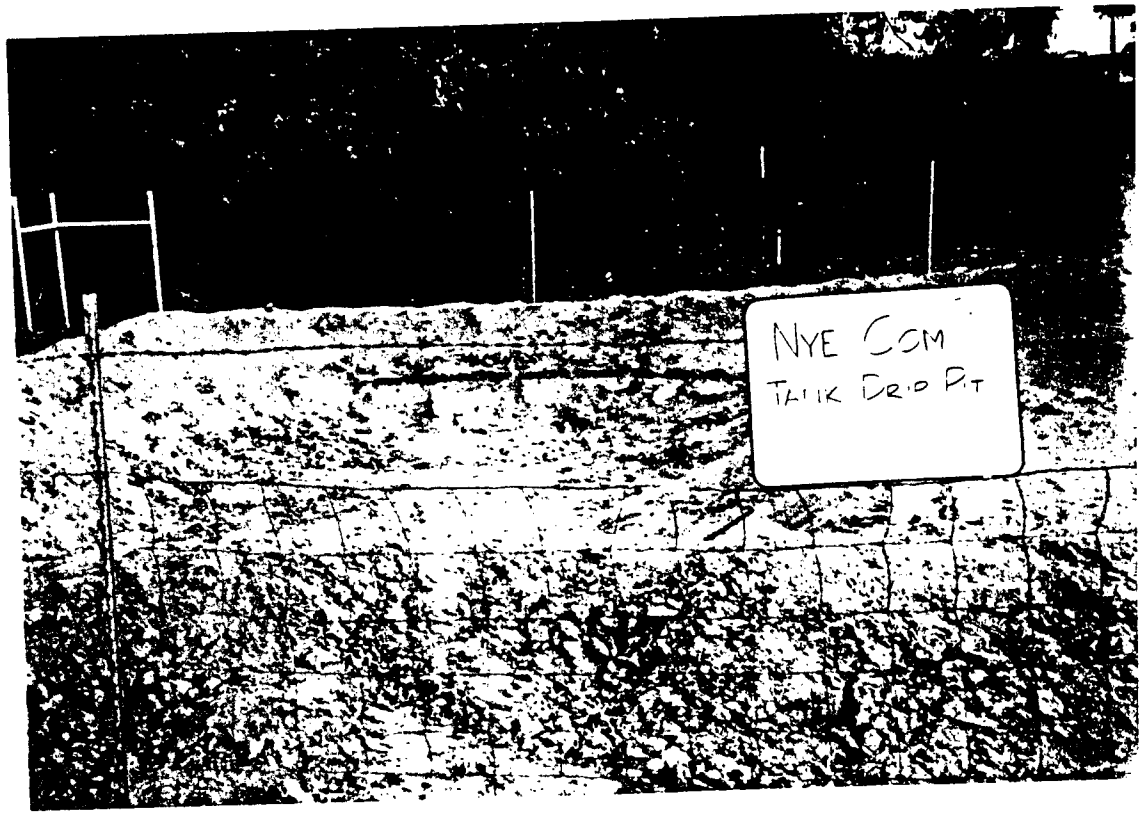
13-231-PB, *


NC-DG1
85.78' @ 232.50 DEG
NYE COM #1E
50.00 feet
Fenceline
Pit
Hydraulic
Gradient
NC-UPG2
22.45' @ 257.50 DEG
Tank
NC-UPG1
87.05' @ 295.50 DEG
Well Head
35.26' @ 135.0 deg
(0,0)

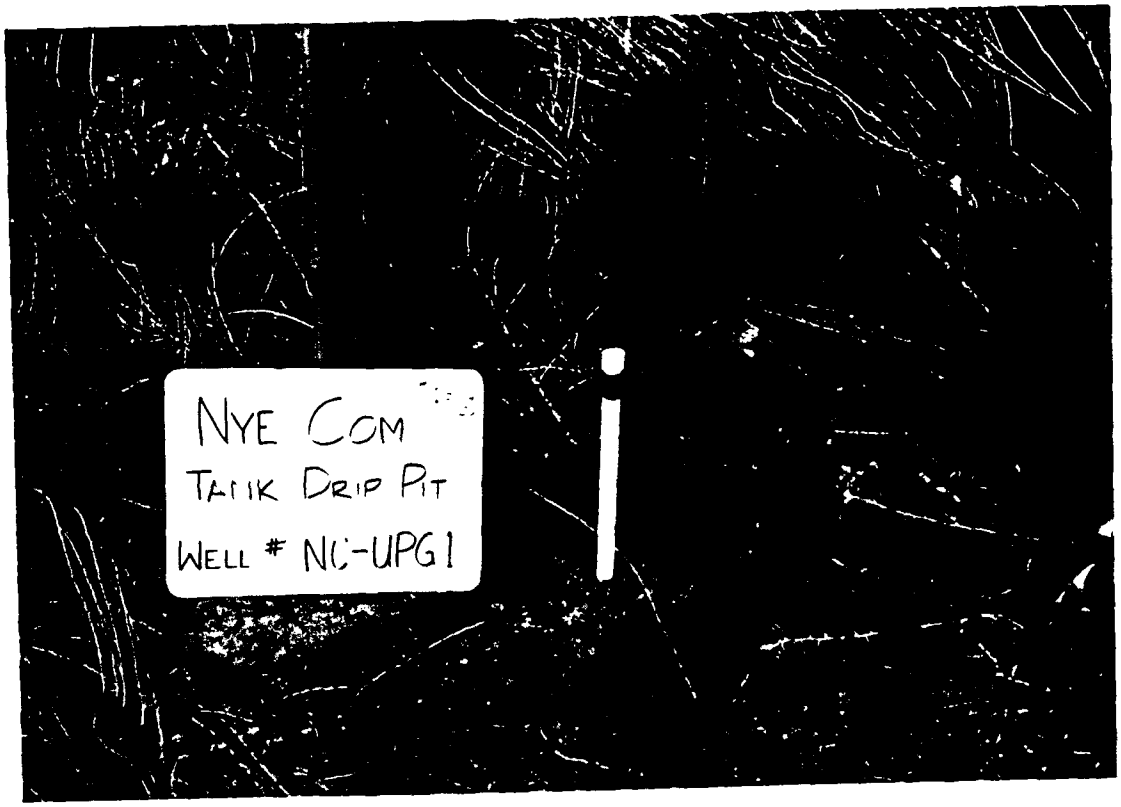

SAL-DG2
155.75' @ 75.75 deg
Salmon #1
50.00 Feet
SAL-DG1
55.35' @ 71.25 deg
Hydraulic Gradient
Fenced
Area
Pit
Riser
(0,0)
SAL-UPG2
63.5' @ 188.00 deg
SAL-UPG1
31.8' @ 258.50 deg


Well Head
134.0' @ 78.0 deg
Shepard & Kelsey #1
50.00 feet
Pit
Dehy Unit
SK-DG1
31.19' @ 82.25 deg
(0,0)
Pit
Dehy
SK-UPG1
51.53' @ 271.25 deg
Hydraulic Gradient
SK-UPG2
68.40' @ 218.0 deg

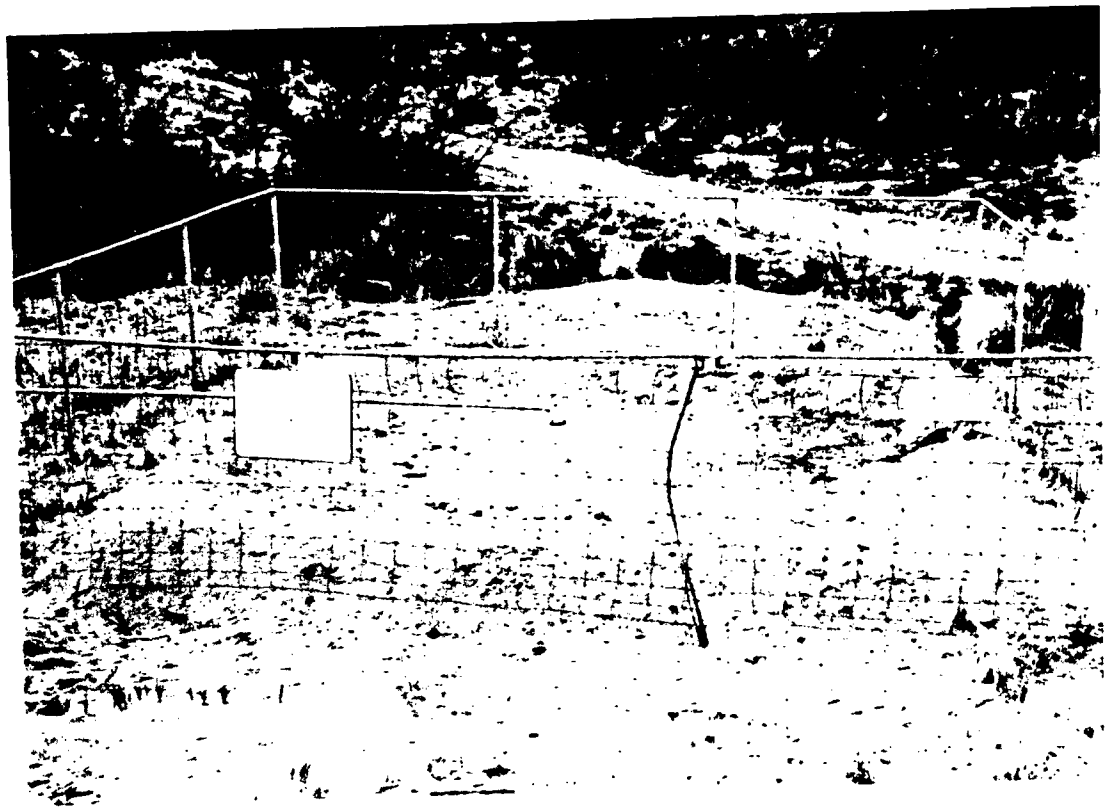
Appendix C
Photographs

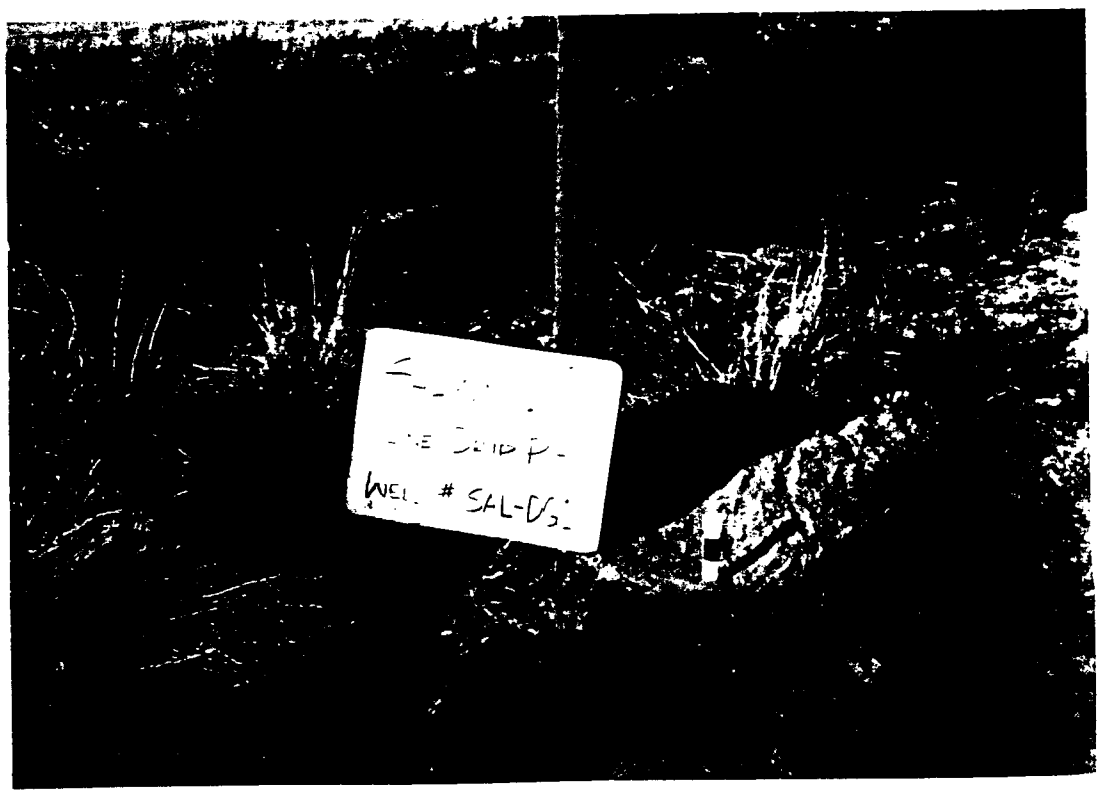

NYE COM
TANK DRIP PIT

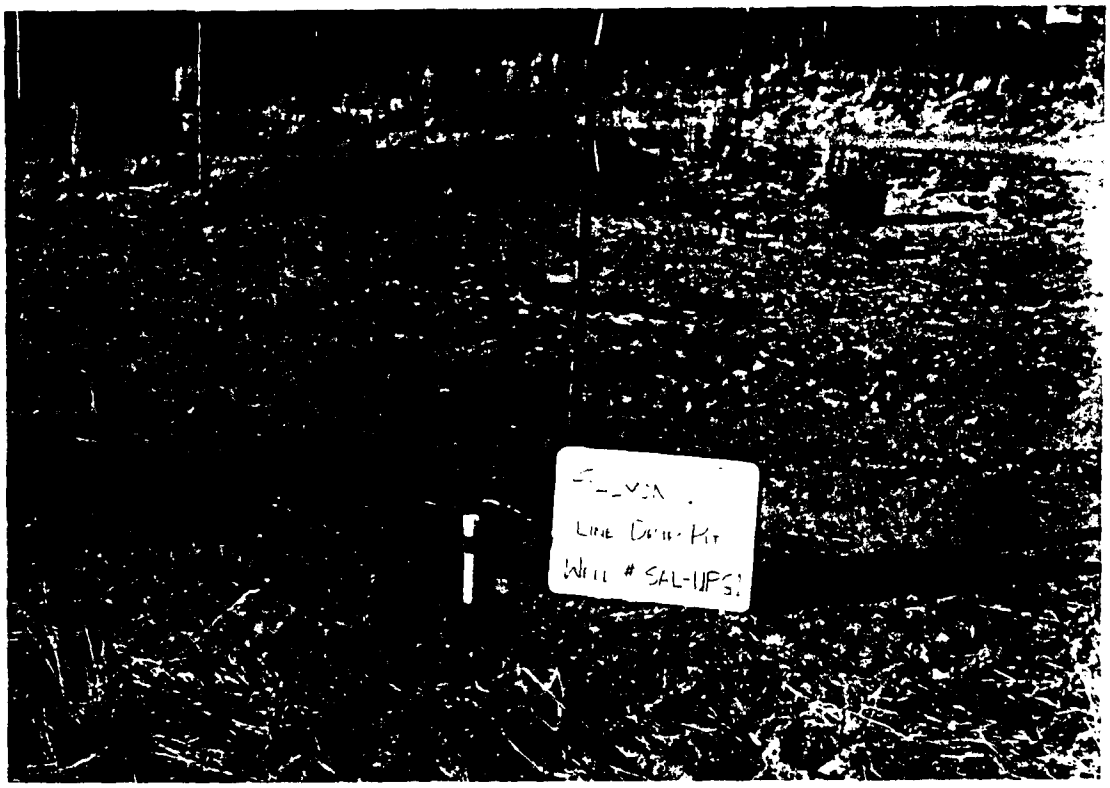

NYE COM

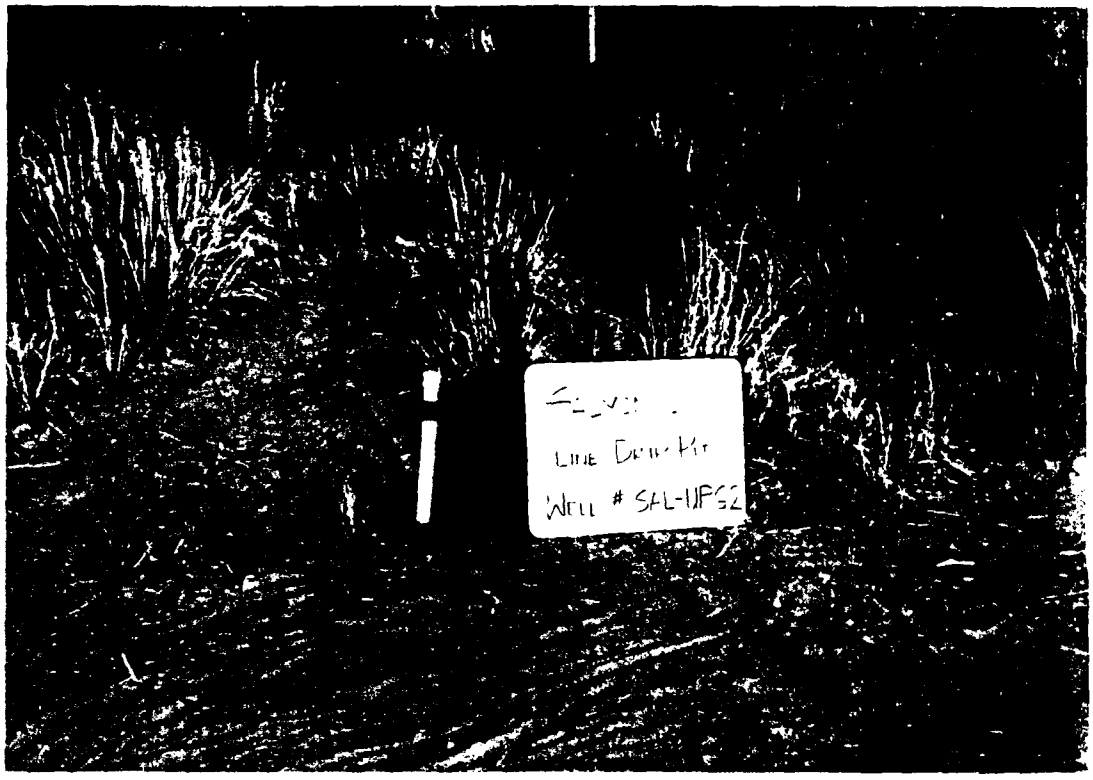

NYE COM
TANK DRIP PIT
WELL # NC-UPG1


NYE COM
TANK DRIP P-
WELL # NC-UPG2

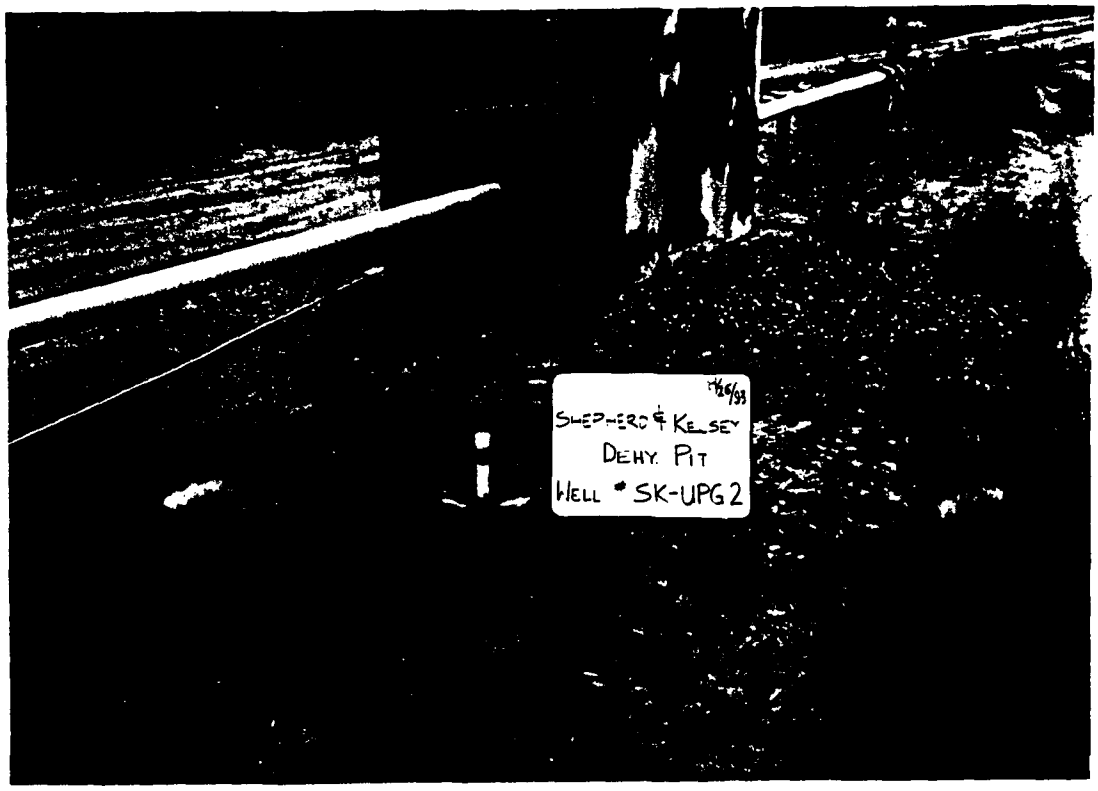



WELL # SAL-D5


Line Drip Kit
Well # SAL-IIFS1


Line Drip Kit
Well # SAL-IIFS2


7/26/93
SHEPHERD & KELSEY
DELHY PIT
WELL # SK-DG1


7/26/93
SHEPHERD & KELSEY
DEHY. PIT
WELL # SK-UPG 2


7/26/93
SHEPHERD & KELSEY
DEHY PIT
WELL # SK-UPG 1

Appendix D
Hydraulic Gradient Calculations

A= 85 88 $\frac{85}{88} \cdot 10 = 9.66$ 20 , 30 , 40 , 50 , 60 , 70 , 80
19.32, 28.98, 38.64, 48.30, 57.95, 67.61, 77.27

B= 79 51 $\frac{79}{51} \cdot 12 = 3.10$ 12 22 32 42 52 62 72
18.59 34.08 49.57 65.06

C= 109 139 $\frac{109}{139} \cdot 10 = 7.84$ 20 30 40 50 60 70 80 90 100 110 120 130 140
15.68 23.53 31.37 39.21 47.05 ~~54.89~~ ~~62.73~~ 72.67 80.74 88.81 96.89 104.96
54.89 62.73 70.58 78.84 86.26 94.10 101.94 109.78

Gradient

$\frac{59.3'}{50'} = \frac{38.9}{X}$ $\frac{.5}{32.80} = .015 \frac{ft}{ft}$

$X = 32.80$

NYE COM #1E

50.00 feet

$\frac{50'}{55.9} = \frac{X}{38.75}$

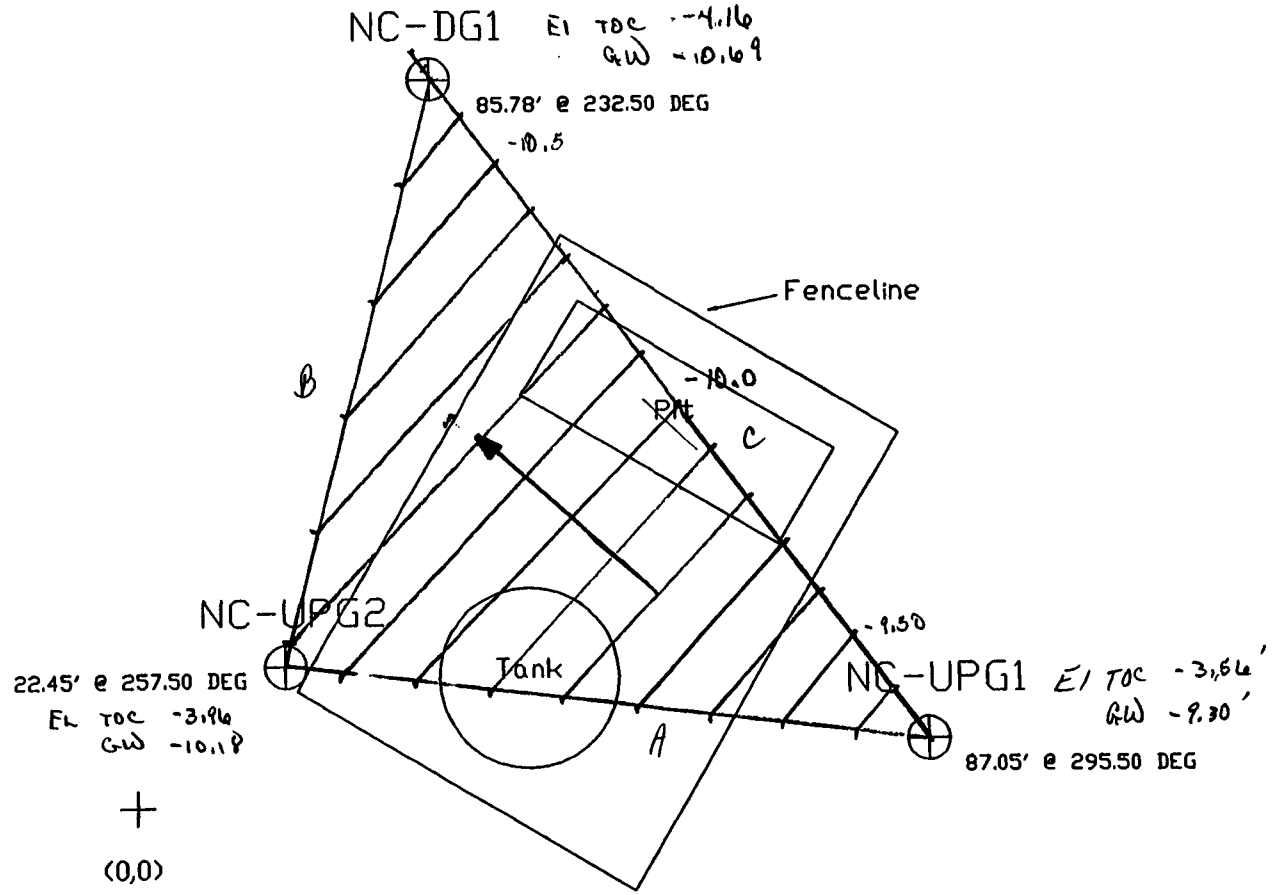
$X = 34.67'$

Gradient =

$\frac{.50'}{34.67'} = .014 \frac{ft}{ft}$

Well Head
35.26' @ 135.0 deg
EL. 0' TOCF

(0,0)



NYE.DWG

El -9.45' TOC
WL -5.21' FTOC
-14.66

	Length	Elev. @ 100				
A =	77	72	$\frac{7}{72}\cdot 77 = 7.5$	$\frac{17}{72}\cdot 77 = 18.2$	$\frac{27}{72}\cdot 77 = 28.9$	$\frac{37}{72}\cdot 77 = 39.6$
B =	89	61	$\frac{6}{61}\cdot 89 = 8.8$	$\frac{16}{61}\cdot 89 = 23.3$	$\frac{26}{61}\cdot 89 = 37.9$	$\frac{36}{61}\cdot 89 = 52.5$
C =	54	11	$\frac{7}{11}\cdot 54 = 34.4$			

$\frac{47}{72}\cdot 77 = 50.3$ $\quad \frac{57}{72}\cdot 77 = 61.0$ $\quad \frac{67}{72}\cdot 77 = 71.7$

$\frac{46}{61}\cdot 89 = 67.1$ $\quad \frac{56}{61}\cdot 89 = 81.7$

SAL-DG2
155.75' @ 75.75 deg

$\frac{31}{30} = \frac{44.2}{50'}$

$X = 35.07'$

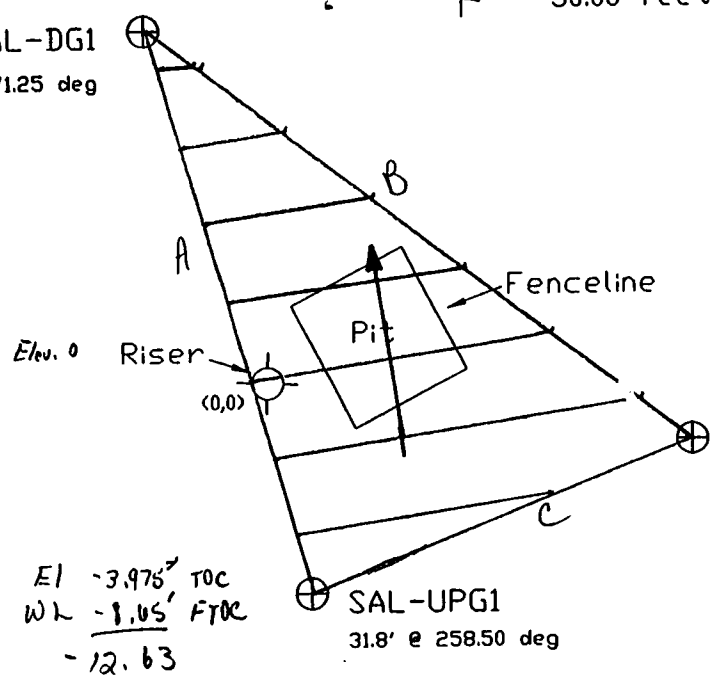
$\frac{30'}{35.07} = .009$ ft/ft

El -10.73' TOC
WL -2.02' FTOC
-13.35

SAL-DG1
55.35' @ 71.25 deg

Salmon #1

50.00 feet



SAL-UPG2
63.5' @ 188.00 deg

El -3.625' TOC
WL -9.11 FTOC
-12.74

El -3.975' TOC
WL -8.65' FTOC
-12.63

SAL-UPG1
31.8' @ 258.50 deg

SALMON.DWG

Gradient

$\frac{12.6}{50'} = \frac{31.5}{X}$

$X = 37.32'$

$\frac{.50'}{37.32'} = .013 \frac{ft}{ft}$

Well Head
134.0' @ 78.0 deg
Elv. 0.0 TOC F

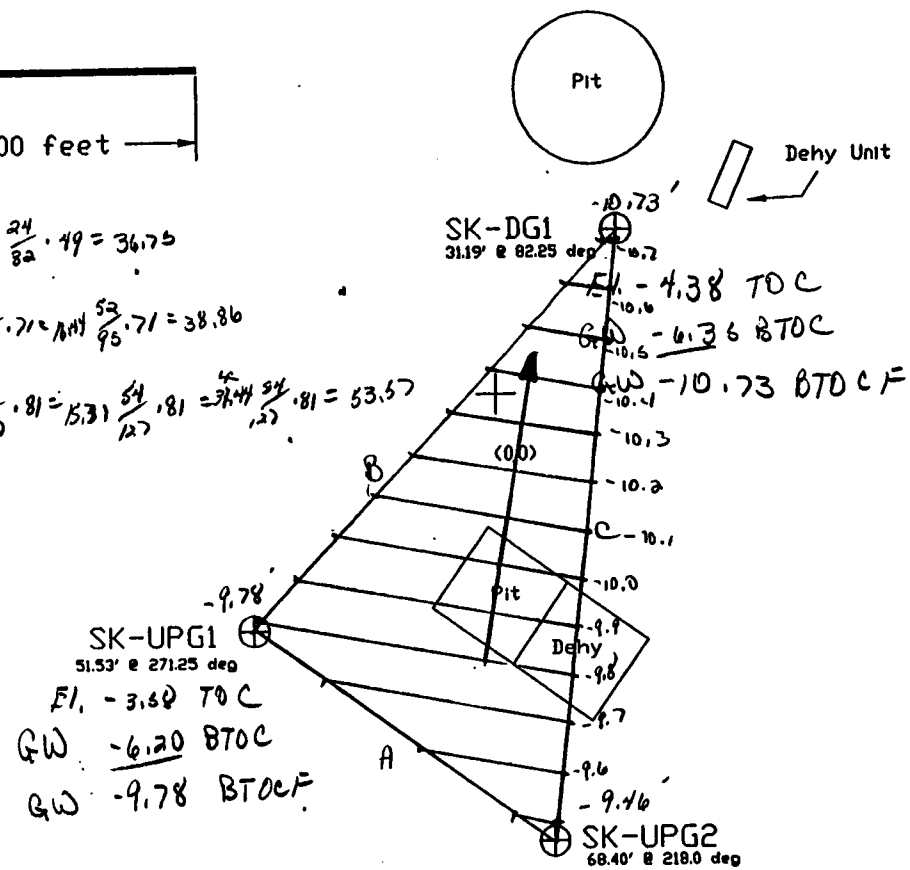
Shepard & Kelsey #1

50.00 feet

A= 49 78-46 = 32 $\frac{4}{32} \cdot 49 = 6.13$ $\frac{14}{32} \cdot 49 = 21.44$ $\frac{24}{32} \cdot 49 = 36.75$

B=71 $\frac{10.73}{9.78}$ 95 $\frac{2}{95} \cdot 71 = 1.49$ $\frac{13}{95} \cdot 71 = 9.87$ $\frac{25}{95} \cdot 71 = 18.44$ $\frac{53}{95} \cdot 71 = 38.86$

C=81 127 $\frac{4}{127} \cdot 81 = 2.55$ $\frac{14}{127} \cdot 81 = 8.93$ $\frac{24}{127} \cdot 81 = 15.31$ $\frac{54}{127} \cdot 81 = 34.44$ $\frac{54}{127} \cdot 81 = 53.57$



El. -4.38 TOC
GW -6.36 BTOC
GW -10.73 BTOC F

SK-UPG1
El. -3.58 TOC
GW -6.20 BTOC
GW -9.78 BTOC F

SK-UPG2
El. -4.05 TOC
GW -5.41 BTOC
GW -9.46 BTOC F

Appendix E
Chain-of-Custody Forms

CONOCO

Environmental Sample Chain of Custody and Log

Research and Engineering

Project Number

Type or Print Data

Facility Name	Telephone Number	Transporter Name	Telephone Number
NYE COM 1E LEASE	(NO) NUMBER	M.J. BOOR	( ) X-6646
Facility Address		**Transporter Address**	
SAN JUAN BASIN, NM, OFF HWY 64		FYSD	
Facility Supervisor		**Method of Shipping**	
JOHN COY, CONOCO EPNA, ETN 827-5813		HAND DELIVER	
Process Producing Sample	**Special Shipping Instructions**		
TEMP. WELLS			
Employee(s) Sampling	**Remarks**		
JF WILSON & MJ BOOR			
Other Employee(s) Handling			

Sample I.D. No. and Description	Date	Time	Sample Type	Total Volume	Containers Type	No.	Analysis Req. ▶ Preservative	BTEX	TDS	PNA's 8270
NC-UPG1	8/26/93	0905	WATER	80 ml	40ml VOA	2	YES, ACID	X		
NC-UPG1		0905		500 ml	DK-GL	1	NO		X	
NC-UPG2		0920		80 ml	40ml VOA	2	YES, ACID	X		
NC-UPG2		0920		500ml	DK-GL	1	NO		X	
NC-DG1		0935		80ml	40ml VOA	2	YES, ACID	X		
NC-DG1		0935		500ml	DK GL	1	N?		X	
NC-DG1		0935		2L	1LDKGL	2	N?			X

Signatures

	Bottles Relinquished by	Date/Time	Bottles Received by	Date/Time	Condition of Samples Upon Arrival at Final Destination
1	G. Engleking by JFW	8/20/93 1330	Jeff Wilson	8/25/93 0500	
2	Jeff Wilson	8/26/93 2235	M.J. Boor	8-28-93 2235	Good
3	M.J. Boor	8-30-93 08:20		8/30/93 0420	Signature / Date 8/30/93
4	Relinquished by	Date/Time	Received by	Date/Time	Temp. of Samples on Arrival (Temp. sensitive analysis only)
5	Relinquished by	Date/Time	Received by	Date/Time	4°C
6	Relinquished by	Date/Time	Received by	Date/Time	Signature / Date 8/30/93

Conoco

Environmental Sample Chain of Custody and Log
Research and Engineering

2221

Project Number

Type or Print Data

Facility Name SALMON 1 PROD. LEASE	**Telephone Number** (NO) NUMBER	**Transporter Name** M.J. BOOR	**Telephone Number** ( ) X-6646
Facility Address SAN JUAN BASIN, NM OFF HWY 64		**Transporter Address** EVGD	
Facility Supervisor JOHN COY, CONOCO FPNA, ETN 827-5813		**Method of Shipping** HAND DELIVER	
Process Producing Sample LINE DRIP PIT FROM GAS WELL	**Special Shipping Instructions**		
Employee(s) Sampling J.F. WILSON & M.J. BOOR	**Remarks**		
Other Employee(s) Handling			

Sample I.D. No. and Description	Date	Time	Sample Type	Total Volume	Containers Type	No.	Analysis Req. ▶ Preservative	BTEX	TDS	PNA's 8270
SAL-UPG1	8/25/93	1540	WATER	80ml	40ml VOA	2	YES, ACID	X		
SAL-UPG1		1540		500ml	DK-GL	1	NO		X	
SAL-UPG2		1600		80ml	40ml VOA	2	YES, ACID	X		
SAL-UPG2		1600		500ml	DK-GL	1	NO		X	
SAL-DG1		1640		80ml	40ml VOA	2	YES, ACID	X		
SAL-DG1		1640		500ml	DK-GL	1	NO		X	
SAL-DG1	↓	1640	↓	1L	DK-GL	2	NO			X
SAL-DG2	8/26/93	1445	WATER	80ml	40ml VOA	2	YES, ACID	X		
SAL-DG2	8/26/93	1445	↓	500ml	DK-GL	1	NO		X	

Signatures

	Date/Time		Date/Time	
Bottles Relinquished by G. Englekirk by JFW	8/20/93 1330	Bottles Received by	8/25/93 0800	Condition of Samples Upon Arrival at Final Destination
Relinquished by	8/26/93 2235	Received by	8-26-93 2235	
Relinquished by	8-30-93 08:20	Received by	8/30/93 0820	Signature Date 2/3/94
Relinquished by	Date/Time	Received by	Date/Time	Temp. of Samples on Arrival (Temp. sensitive analysis only)
Relinquished by	Date/Time	Received by	Date/Time	
Relinquished by	Date/Time	Received by	Date/Time	Signature Date 2/3/94

Environmental Sample Chain of Custody Log

Research and Engineering

Project Number 2cc76

Type or Print Data

Facility Name: SHEPARD & KELSEY LEASE	Telephone Number: ( ) NO NUMBER	Transporter Name: M. J. BOOR	Telephone Number: ( ) X-6646
Facility Address: MAGNUM ROAD, BLOOMINGTON, NM		Transporter Address: EYSD	
Facility Supervisor: JOHN COY, CONOCO EPNA, ETN827-5813		Method of Shipping: HAND DELIVER	
Process Producing Sample: TEMP. WELLS	Special Shipping Instructions:		
Employee(s) Sampling: WILSON, JF & BOOR, MJ	Remarks:		
Other Employee(s) Handling:			

Sample I.D. No. and Description	Date	Time	Sample Type	Total Volume	Containers Type	No.	Analysis Req. ▶ Preservative	BTEX	TDS	PNA's 8270
SK-UPG2	8/25/93	0915	WATER	80 ml	40ml VOA	2	Yes, ACID	X		
SK-UPG2	8/25/93	0915	"	500 ml	GL-DK	1	NO		X	
MS SK-UPG1	8/25/93	0930	"	80 ml	40ml VOA	2	Yes, ACID	X		
SK-UPG1	8/25/93	0930	"	500ml	GL-DK	1	NO		X	
SK-DG1	8/25/93	1100	"	80ml	40ml VOA	2	Yes, ACID	X		
SK-DG1	8/25/93	1100	"	500ml	DK-GL	1	NO		X	
SK-DG1	8/25/93	1100	"	2L	DK-GL	2	NO			X

Signatures

	Bottles Relinquished by	Date/Time	Bottles Received by	Date/Time
1	G. Engelking by JFW	8/26/93 1330	J. F. Wilson	8/25/93 0800
2	J. F. Wilson	8/26/93 2235	M. J. Boor	8/26/93 2235
3	M. J. Boor	8-30-93 08:20		
4	Relinquished by	Date/Time	Received by	Date/Time
5	Relinquished by	Date/Time	Received by	Date/Time
6	Relinquished by	Date/Time	Received by	Date/Time

Condition of Samples Upon Arrival at Final Destination

Signature: [signature] Date: 9/1/93

Temp. of Samples on Arrival (Temp. sensitive analysis only)

4°C

Signature: [signature] Date: 9/3/93

Appendix F
Analytical Reports

Location: SAN JUAN
Project Name: SAN JUAN BASIN CLOSURE
Sample Source: SJN-NC-DG1
Sample Name: SJN-NC-DG1
Date Sampled: August 26, 1993
Lab Sample ID: P308088-03 Analysis Lab: PONCA CITY

Method Number: 160_1

Analyte/Parameter	Dilution	Result	MDL	PQL	Unit	Date Analyzed
TOTAL DISSOLVED SOLIDS	1	2915		10	MG/L	Sep 1, 1993

Method Number: 8020 Prep Method: 5030

Analyte/Parameter	Dilution	Result	MDL	PQL	Unit	Date Analyzed
BENZENE	1	< 3		3	UG/L	Sep 3, 1993
ETHYLBENZENE	1	< 3		3	UG/L	Sep 3, 1993
M-XYLENE	1	< 3		3	UG/L	Sep 3, 1993
O-XYLENE	1	< 3		3	UG/L	Sep 3, 1993
P-XYLENE	1	< 3		3	UG/L	Sep 3, 1993
TOLUENE	1	< 3		3	UG/L	Sep 3, 1993

Surrogates:

Analyte/Parameter	Dilution	RPR	Date Analyzed
TRIFLUOROTOLUENE	1	83.0	Sep 3, 1993

Method Number: 8270 Prep Method: 3520

Analyte/Parameter	Dilution	Result	MDL	PQL	Unit	Date Analyzed
2-METHYLNAPHTHALENE	2	< 20		20	UG/L	Sep 10, 1993
3-METHYLCHOLANTHRENE	2	< 20		20	UG/L	Sep 10, 1993
7,12-DIMETHYLBENZ(A)ANTHRACENE	2	< 20		20	UG/L	Sep 10, 1993
ACENAPHTHENE	2	< 20		20	UG/L	Sep 10, 1993
ACENAPHTHYLENE	2	< 20		20	UG/L	Sep 10, 1993
ANTHRACENE	2	< 20		20	UG/L	Sep 10, 1993
BENZO(A)ANTHRACENE	2	< 20		20	UG/L	Sep 10, 1993
BENZO(A)PYRENE	2	< 20		20	UG/L	Sep 10, 1993
BENZO(B)FLUORANTHENE	2	< 20		20	UG/L	Sep 10, 1993
BENZO(G,H,I)PERYLENE	2	< 20		20	UG/L	Sep 10, 1993
BENZO(K)FLUORANTHENE	2	< 20		20	UG/L	Sep 10, 1993
CHRYSENE	2	< 20		20	UG/L	Sep 10, 1993
DIBENZ(A,H)ANTHRACENE	2	< 20		20	UG/L	Sep 10, 1993
DIBENZ(A,J)ACRIDINE	2	< 20		20	UG/L	Sep 10, 1993
FLUORANTHENE	2	< 20		20	UG/L	Sep 10, 1993
FLUORENE	2	< 20		20	UG/L	Sep 10, 1993
INDENO(1,2,3-CD)PYRENE	2	< 20		20	UG/L	Sep 10, 1993
NAPHTHALENE	2	< 20		20	UG/L	Sep 10, 1993
PHENANTHRENE	2	< 20		20	UG/L	Sep 10, 1993
PYRENE	2	< 20		20	UG/L	Sep 10, 1993

Surrogates:

Analyte/Parameter	Dilution	RPR	Date Analyzed
2-FLUOROBIPHENYL	2	71.0	Sep 10, 1993
NITROBENZENE-D5	2	71.0	Sep 10, 1993
TERPHENYL-D14	2	63.0	Sep 10, 1993

Location: SAN JUAN
Project Name: SAN JUAN BASIN CLOSURE
Sample Source: SJN-NC-UPG1
Sample Name: SJN-NC-UPG1
Date Sampled: August 26, 1993
Lab Sample ID: P308088-01 Analysis Lab: PONCA CITY

Method Number: 160_1

Analyte/Parameter	Dilution	Result	MDL	PQL	Unit	Date Analyzed
TOTAL DISSOLVED SOLIDS	1	6496		10	MG/L	Sep 1, 1993

Method Number: 8020 Prep Method: 5030

Analyte/Parameter	Dilution	Result	MDL	PQL	Unit	Date Analyzed
BENZENE	1	< 3		3	UG/L	Sep 3, 1993
ETHYLBENZENE	1	< 3		3	UG/L	Sep 3, 1993
M-XYLENE	1	< 3		3	UG/L	Sep 3, 1993
O-XYLENE	1	< 3		3	UG/L	Sep 3, 1993
P-XYLENE	1	< 3		3	UG/L	Sep 3, 1993
TOLUENE	1	< 3		3	UG/L	Sep 3, 1993

Surrogates:

Analyte/Parameter	Dilution	RPR	Date Analyzed
TRIFLUOROTOLUENE	1	90.0	Sep 3, 1993

Location: SAN JUAN
Project Name: SAN JUAN BASIN CLOSURE
Sample Source: SJN-NC-UPG2
Sample Name: SJN-NC-UPG2
Date Sampled: August 26, 1993
Lab Sample ID: P308088-02 Analysis Lab: PONCA CITY

Method Number: 160_1

Analyte/Parameter	Dilution	Result	MDL	PQL	Unit	Date Analyzed
TOTAL DISSOLVED SOLIDS	4	1330		40	MG/L	Sep 1, 1993

Method Number: 8020 Prep Method: 5030

Analyte/Parameter	Dilution	Result	MDL	PQL	Unit	Date Analyzed
BENZENE	1	< 3		3	UG/L	Sep 3, 1993
ETHYLBENZENE	1	< 3		3	UG/L	Sep 3, 1993
M-XYLENE	1	< 3		3	UG/L	Sep 3, 1993
O-XYLENE	1	< 3		3	UG/L	Sep 3, 1993
P-XYLENE	1	< 3		3	UG/L	Sep 3, 1993
TOLUENE	1	< 3		3	UG/L	Sep 3, 1993

Surrogates:

Analyte/Parameter	Dilution	RPR	Date Analyzed
TRIFLUOROTOLUENE	1	87.0	Sep 3, 1993

Location: SAN JUAN
Project Name: SAN JUAN BASIN CLOSURE
Sample Source: SJN-SAL-DG2
Sample Name: SJN-SAL-DG2
Date Sampled: August 26, 1993
Lab Sample ID: P308088-10 Analysis Lab: PONCA CITY

Method Number: 160_1

Analyte/Parameter	Dilution	Result	MDL	PQL	Unit	Date Analyzed
TOTAL DISSOLVED SOLIDS	4	1444		40	MG/L	Sep 1, 1993

Method Number: 8020 Prep Method: 5030

Analyte/Parameter	Dilution	Result	MDL	PQL	Unit	Date Analyzed
BENZENE	1	100		3	UG/L	Sep 7, 1993
ETHYLBENZENE	1	< 3		3	UG/L	Sep 7, 1993
M-XYLENE	1	< 3		3	UG/L	Sep 7, 1993
O-XYLENE	1	< 3		3	UG/L	Sep 7, 1993
P-XYLENE	1	< 3		3	UG/L	Sep 7, 1993
TOLUENE	1	< 3		3	UG/L	Sep 7, 1993

Surrogates:

Analyte/Parameter	Dilution	RPR	Date Analyzed
TRIFLUOROTOLUENE	1	80.0	Sep 7, 1993

Location: SAN JUAN
Project Name: SAN JUAN BASIN CLOSURE
Sample Source: SJN-SAL-UPG2
Sample Name: SJN-SAL-UPG2
Date Sampled: August 25, 1993
Lab Sample ID: P308088-08 Analysis Lab: PONCA CITY

Method Number: 160_1

Analyte/Parameter	Dilution	Result	MDL	PQL	Unit	Date Analyzed
TOTAL DISSOLVED SOLIDS	4	1340		40	MG/L	Sep 1, 1993

Method Number: 8020 Prep Method: 5030

Analyte/Parameter	Dilution	Result	MDL	PQL	Unit	Date Analyzed
BENZENE	1	< 3		3	UG/L	Sep 3, 1993
ETHYLBENZENE	1	< 3		3	UG/L	Sep 3, 1993
M-XYLENE	1	< 3		3	UG/L	Sep 3, 1993
O-XYLENE	1	< 3		3	UG/L	Sep 3, 1993
P-XYLENE	1	< 3		3	UG/L	Sep 3, 1993
TOLUENE	1	< 3		3	UG/L	Sep 3, 1993

Surrogates:

Analyte/Parameter	Dilution	RPR	Date Analyzed
TRIFLUOROTOLUENE	1	83.0	Sep 3, 1993

Location: SAN JUAN
Project Name: SAN JUAN BASIN CLOSURE
Sample Source: SJN-SK-DG1
Sample Name: SJN-SK-DG1
Date Sampled: August 25, 1993
Lab Sample ID: P308088-06 Analysis Lab: PONCA CITY

Method Number: 160_1

Analyte/Parameter	Dilution	Result	MDL	PQL	Unit	Date Analyzed
TOTAL DISSOLVED SOLIDS	4	1288		40	MG/L	Sep 1, 1993

Method Number: 8020 Prep Method: 5030

Analyte/Parameter	Dilution	Result	MDL	PQL	Unit	Date Analyzed
BENZENE	20	160		60	UG/L	Sep 3, 1993
ETHYLBENZENE	20	530		60	UG/L	Sep 3, 1993
M-XYLENE	20	3600		60	UG/L	Sep 3, 1993
O-XYLENE	20	1300		60	UG/L	Sep 3, 1993
P-XYLENE	20	1300		60	UG/L	Sep 3, 1993
TOLUENE	20	1600		60	UG/L	Sep 3, 1993

Surrogates:

Analyte/Parameter	Dilution	RPR	Date Analyzed
TRIFLUOROTOLUENE	20	115.0	Sep 3, 1993

Method Number: 8270 Prep Method: 3520

Analyte/Parameter	Dilution	Result	MDL	PQL	Unit	Date Analyzed
2-METHYLNAPHTHALENE	1	< 10		10	UG/L	Sep 10, 1993
3-METHYLCHOLANTHRENE	1	< 10		10	UG/L	Sep 10, 1993
7,12-DIMETHYLBENZ(A)ANTHRACENE	1	< 10		10	UG/L	Sep 10, 1993
ACENAPHTHENE	1	< 10		10	UG/L	Sep 10, 1993
ACENAPHTHYLENE	1	< 10		10	UG/L	Sep 10, 1993
ANTHRACENE	1	< 10		10	UG/L	Sep 10, 1993
BENZO(A)ANTHRACENE	1	< 10		10	UG/L	Sep 10, 1993
BENZO(A)PYRENE	1	< 10		10	UG/L	Sep 10, 1993
BENZO(B)FLUORANTHENE	1	< 10		10	UG/L	Sep 10, 1993
BENZO(G,H,I)PERYLENE	1	< 10		10	UG/L	Sep 10, 1993
BENZO(K)FLUORANTHENE	1	< 10		10	UG/L	Sep 10, 1993
CHRYSENE	1	< 10		10	UG/L	Sep 10, 1993
DIBENZ(A,H)ANTHRACENE	1	< 10		10	UG/L	Sep 10, 1993
DIBENZ(A,J)ACRIDINE	1	< 10		10	UG/L	Sep 10, 1993
FLUORANTHENE	1	< 10		10	UG/L	Sep 10, 1993
FLUORENE	1	< 10		10	UG/L	Sep 10, 1993
INDENO(1,2,3-CD)PYRENE	1	< 10		10	UG/L	Sep 10, 1993
NAPHTHALENE	1	< 10		10	UG/L	Sep 10, 1993
PHENANTHRENE	1	< 10		10	UG/L	Sep 10, 1993
PYRENE	1	< 10		10	UG/L	Sep 10, 1993

Surrogates:

Analyte/Parameter	Dilution	RPR	Date Analyzed
2-FLUOROBIPHENYL	1	66.0	Sep 10, 1993
NITROBENZENE-D5	1	78.0	Sep 10, 1993
TERPHENYL-D14	1	20.0	Sep 10, 1993

Comments:

8270: SURROGATE RECOVERY FOR TERPHENYL-D14 WAS LOW. THE SAMPLE WAS RE-ANALYZED WITH NO CHANGES NOTED. THE SAMPLE WAS THEN RE-EXTRACTED AND REANALYZED EVEN THOUGH HOLD TIMES HAD EXPIRED. NO CHANGES WERE NOTED ON THE RE-EXTRACT.

Location: SAN JUAN
Project Name: SAN JUAN BASIN CLOSURE
Sample Source: SJN-SK-UPG2
Sample Name: SJN-SK-UPG2
Date Sampled: August 25, 1993
Lab Sample ID: P308088-04 Analysis Lab: PONCA CITY

Method Number: 160_1

Analyte/Parameter	Dilution	Result	MDL	PQL	Unit	Date Analyzed
TOTAL DISSOLVED SOLIDS	4	1500		40	MG/L	Sep 1, 1993

Method Number: 8020 Prep Method: 5030

Analyte/Parameter	Dilution	Result	MDL	PQL	Unit	Date Analyzed
BENZENE	1	8.4		3	UG/L	Sep 3, 1993
ETHYLBENZENE	1	23		[illegible]	UG/L	Sep 3, 1993
M-XYLENE	1	6.7		3	UG/L	Sep 3, 1993
O-XYLENE	1	6.5		3	UG/L	Sep 3, 1993
P-XYLENE	1	12		3	UG/L	Sep 3, 1993
TOLUENE	1	4.8		3	UG/L	Sep 3, 1993

Location: SAN JUAN
Project Name: SAN JUAN BASIN CLOSURE
Sample Source: SJN-TRIP BLNK
Sample Name: SJN-TRIP BLNK
Date Sampled: August 19, 1993
Lab Sample ID: P308088-11 Analysis Lab: PONCA CITY

Method Number: 8020 Prep Method: 5030

Analyte/Parameter	Dilution	Result	MDL	PQL	Unit	Date Analyzed
BENZENE	1	< 3		3	UG/L	Sep 7, 1993
ETHYLBENZENE	1	< 3		3	UG/L	Sep 7, 1993
M-XYLENE	1	< 3		3	UG/L	Sep 7, 1993
O-XYLENE	1	< 3		3	UG/L	Sep 7, 1993
P-XYLENE	1	< 3		3	UG/L	Sep 7, 1993
TOLUENE	1	< 3		3	UG/L	Sep 7, 1993

Surrogates:

Analyte/Parameter	Dilution	RPR	Date Analyzed
TRIFLUOROTOLUENE	1	90.0	Sep 7, 1993

Location: SAN JUAN
Project Name: SAN JUAN BASIN CLOSURE

Analyte/Parameter	Result	Unit	MDL	PQL	Method No.	Analyzed	Sample Name
TOTAL DISSOLVED SOLIDS	2915	MG/L		10	160_1	93-09-01	SJN-NC-DG1
TOTAL DISSOLVED SOLIDS	6496	MG/L		10	160_1	93-09-01	SJN-NC-UPG1
TOTAL DISSOLVED SOLIDS	1330	MG/L		40	160_1	93-09-01	SJN-NC-UPG2
TOTAL DISSOLVED SOLIDS	1116	MG/L		40	160_1	93-09-01	SJN-SAL-DG1
BENZENE	8300	UG/L		300	8020	93-09-08	SJN-SAL-DG1
M-XYLENE	1700	UG/L		300	8020	93-09-08	SJN-SAL-DG1
O-XYLENE	660	UG/L		300	8020	93-09-08	SJN-SAL-DG1
P-XYLENE	610	UG/L		300	8020	93-09-08	SJN-SAL-DG1
TOLUENE	12000	UG/L		300	8020	93-09-08	SJN-SAL-DG1
TOTAL DISSOLVED SOLIDS	1444	MG/L		40	160_1	93-09-01	SJN-SAL-DG2
BENZENE	100	UG/L		3	8020	93-09-07	SJN-SAL-DG2
TOTAL DISSOLVED SOLIDS	1044	MG/L		40	160_1	93-09-01	SJN-SAL-UPG1
BENZENE	98	UG/L		3	8020	93-09-03	SJN-SAL-UPG1
ETHYLBENZENE	9.7	UG/L		3	8020	93-09-03	SJN-SAL-UPG1
M-XYLENE	61	UG/L		3	8020	93-09-03	SJN-SAL-UPG1
O-XYLENE	25	UG/L		3	8020	93-09-03	SJN-SAL-UPG1
P-XYLENE	24	UG/L		3	8020	93-09-03	SJN-SAL-UPG1
TOLUENE	52	UG/L		3	8020	93-09-03	SJN-SAL-UPG1
TOTAL DISSOLVED SOLIDS	1340	MG/L		40	160_1	93-09-01	SJN-SAL-UPG2
TOTAL DISSOLVED SOLIDS	1288	MG/L		40	160_1	93-09-01	SJN-SK-DG1
BENZENE	160	UG/L		60	8020	93-09-03	SJN-SK-DG1
ETHYLBENZENE	530	UG/L		60	8020	93-09-03	SJN-SK-DG1
M-XYLENE	3600	UG/L		60	8020	93-09-03	SJN-SK-DG1
O-XYLENE	1300	UG/L		60	8020	93-09-03	SJN-SK-DG1
P-XYLENE	1300	UG/L		60	8020	93-09-03	SJN-SK-DG1
TOLUENE	1600	UG/L		60	8020	93-09-03	SJN-SK-DG1
TOTAL DISSOLVED SOLIDS	1828	MG/L		40	160_1	93-09-01	SJN-SK-UPG1
ETHYLBENZENE	7.6	UG/L		3	8020	93-09-03	SJN-SK-UPG1
TOLUENE	4.5	UG/L		3	8020	93-09-03	SJN-SK-UPG1
TOTAL DISSOLVED SOLIDS	1500	MG/L		40	160_1	93-09-01	SJN-SK-UPG2
BENZENE	8.4	UG/L		3	8020	93-09-03	SJN-SK-UPG2
ETHYLBENZENE	23	UG/L		3	8020	93-09-03	SJN-SK-UPG2
M-XYLENE	6.7	UG/L		3	8020	93-09-03	SJN-SK-UPG2
O-XYLENE	6.5	UG/L		3	8020	93-09-03	SJN-SK-UPG2
P-XYLENE	12	UG/L		3	8020	93-09-03	SJN-SK-UPG2
TOLUENE	4.8	UG/L		3	8020	93-09-03	SJN-SK-UPG2

SJN-NC-DG1
Lab Sample ID: P308088-03 Analysis Lab: PONCA CITY

Method Number: 160_1
Batch Start Date: 01-SEP-93 Instrument: BAXTER DK-43 Batch Number: 1

Replicate:

Analyte/Parameter	Result	Unit	RPD	Lab Sample ID
TOTAL DISSOLVED SOLIDS	6656	MG/L	2.4	P308088-01 PONCA CITY

Method Number: 8020 Prep Method: 5030
Batch Start Date: 03-SEP-93 Instrument: HPGC5 Batch Number: 1

Spike:

Analyte/Parameter	RPR	Lab Sample ID
BENZENE	98.0	P308088-01 PONCA CITY
ETHYLBENZENE	98.0	P308088-01 PONCA CITY
M-XYLENE	98.0	P308088-01 PONCA CITY
O-XYLENE	98.0	P308088-01 PONCA CITY
P-XYLENE	98.0	P308088-01 PONCA CITY
TOLUENE	98.0	P308088-01 PONCA CITY
Surrogates:		
TRIFLUOROTOLUENE	90.0	P308088-01 PONCA CITY

Spike Duplicate:

Analyte/Parameter	RPR	RPD	Lab Sample ID
BENZENE	98.0	0.0	P308088-01 PONCA CITY
ETHYLBENZENE	98.0	0.0	P308088-01 PONCA CITY
M-XYLENE	98.0	0.0	P308088-01 PONCA CITY
O-XYLENE	98.0	0.0	P308088-01 PONCA CITY
P-XYLENE	98.0	0.0	P308088-01 PONCA CITY
TOLUENE	98.0	0.0	P308088-01 PONCA CITY
Surrogates:			
TRIFLUOROTOLUENE	90.0	0.0	P308088-01 PONCA CITY

Method Number: 8270 Prep Method: 3520
Batch Start Date: 10-SEP-93 Instrument: HP1 Batch Number: 1

Spike:

Analyte/Parameter	RPR	Lab Sample ID
2-METHYLNAPHTHALENE	92.0	P308088-03 PONCA CITY
3-METHYLCHOLANTHRENE	89.0	P308088-03 PONCA CITY
7,12-DIMETHYLBENZ(A)ANTHRACENE	34.0	P308088-03 PONCA CITY
ACENAPHTHENE	93.0	P308088-03 PONCA CITY
ACENAPHTHYLENE	94.0	P308088-03 PONCA CITY
ANTHRACENE	89.0	P308088-03 PONCA CITY
BENZO(A)ANTHRACENE	104.0	P308088-03 PONCA CITY
BENZO(A)PYRENE	104.0	P308088-03 PONCA CITY
BENZO(B)FLUORANTHENE	98.0	P308088-03 PONCA CITY
BENZO(G,H,I)PERYLENE	127.0	P308088-03 PONCA CITY
BENZO(K)FLUORANTHENE	104.0	P308088-03 PONCA CITY
CHRYSENE	105.0	P308088-03 PONCA CITY
DIBENZ(A,H)ANTHRACENE	120.0	P308088-03 PONCA CITY
DIBENZ(A,J)ACRIDINE	122.0	P308088-03 PONCA CITY
FLUORANTHENE	100.0	P308088-03 PONCA CITY

SJN-NC-DG1
Lab Sample ID: P308088-03 Analysis Lab: PONCA CITY

Analyte/Parameter	RPR	Lab Sample ID
FLUORENE	96.0	P308088-03 PONCA CITY
INDENO(1,2,3-CD)PYRENE	122.0	P308088-03 PONCA CITY
NAPHTHALENE	91.0	P308088-03 PONCA CITY
PHENANTHRENE	96.0	P308088-03 PONCA CITY
PYRENE	101.0	P308088-03 PONCA CITY
Surrogates:		
2-FLUOROBIPHENYL	76.0	P308088-03 PONCA CITY
NITROBENZENE-D5	76.0	P308088-03 PONCA CITY
TERPHENYL-D14	71.0	P308088-03 PONCA CITY

Spike Duplicate:

Analyte/Parameter	RPR	RPD	Lab Sample ID
2-METHYLNAPHTHALENE	100.0	8.0	P308088-03 PONCA CITY
3-METHYLCHOLANTHRENE	91.0	3.0	P308088-03 PONCA CITY
7,12-DIMETHYLBENZ(A)ANTHRACENE	27.0	21.0	P308088-03 PONCA CITY
ACENAPHTHENE	98.0	5.0	P308088-03 PONCA CITY
ACENAPHTHYLENE	100.0	7.0	P308088-03 PONCA CITY
ANTHRACENE	92.0	3.0	P308088-03 PONCA CITY
BENZO(A)ANTHRACENE	109.0	4.0	P308088-03 PONCA CITY
BENZO(A)PYRENE	109.0	5.0	P308088-03 PONCA CITY
BENZO(B)FLUORANTHENE	107.0	9.0	P308088-03 PONCA CITY
BENZO(G,H,I)PERYLENE	116.0	9.0	P308088-03 PONCA CITY
BENZO(K)FLUORANTHENE	110.0	6.0	P308088-03 PONCA CITY
CHRYSENE	110.0	4.0	P308088-03 PONCA CITY
DIBENZ(A,H)ANTHRACENE	114.0	5.0	P308088-03 PONCA CITY
DIBENZ(A,J)ACRIDINE	116.0	5.0	P308088-03 PONCA CITY
FLUORANTHENE	102.0	2.0	P308088-03 PONCA CITY
FLUORENE	99.0	3.0	P308088-03 PONCA CITY
INDENO(1,2,3-CD)PYRENE	113.0	8.0	P308088-03 PONCA CITY
NAPHTHALENE	102.0	11.0	P308088-03 PONCA CITY
PHENANTHRENE	100.0	4.0	P308088-03 PONCA CITY
PYRENE	110.0	8.0	P308088-03 PONCA CITY
Surrogates:			
2-FLUOROBIPHENYL	81.0		P308088-03 PONCA CITY
NITROBENZENE-D5	88.0		P308088-03 PONCA CITY
TERPHENYL-D14	75.0		P308088-03 PONCA CITY

SJN-NC-UPG1
Lab Sample ID: P308088-01 Analysis Lab: PONCA CITY

Method Number: 160_1
Batch Start Date: 01-SEP-93 Instrument: BAXTER DK-43 Batch Number: 1

Replicate:

Analyte/Parameter	Result	Unit	RPD	Lab Sample ID
TOTAL DISSOLVED SOLIDS	6656	MG/L	2.4	P308088-01 PONCA CITY

Method Number: 8020 Prep Method: 5030
Batch Start Date: 03-SEP-93 Instrument: HPGC5 Batch Number: 1

Spike:

Analyte/Parameter	RPR	Lab Sample ID
BENZENE	98.0	P308088-01 PONCA CITY
ETHYLBENZENE	98.0	P308088-01 PONCA CITY
M-XYLENE	98.0	P308088-01 PONCA CITY
O-XYLENE	98.0	P308088-01 PONCA CITY
P-XYLENE	98.0	P308088-01 PONCA CITY
TOLUENE	98.0	P308088-01 PONCA CITY
Surrogates:		
TRIFLUOROTOLUENE	90.0	P308088-01 PONCA CITY

Spike Duplicate:

Analyte/Parameter	RPR	RPD	Lab Sample ID
BENZENE	98.0	0.0	P308088-01 PONCA CITY
ETHYLBENZENE	98.0	0.0	P308088-01 PONCA CITY
M-XYLENE	98.0	0.0	P308088-01 PONCA CITY
O-XYLENE	98.0	0.0	P308088-01 PONCA CITY
P-XYLENE	98.0	0.0	P308088-01 PONCA CITY
TOLUENE	98.0	0.0	P308088-01 PONCA CITY
Surrogates:			
TRIFLUOROTOLUENE	90.0	0.0	P308088-01 PONCA CITY

SJN-NC-UPG2
Lab Sample ID: P308088-02 Analysis Lab: PONCA CITY

Method Number: 160_1
Batch Start Date: 01-SEP-93 Instrument: BAXTER DK-43 Batch Number: 1

Replicate:

Analyte/Parameter	Result	Unit	RPD	Lab Sample ID	
TOTAL DISSOLVED SOLIDS	6656	MG/L	2.4	P308088-01	PONCA CITY

Method Number: 8020 Prep Method: 5030
Batch Start Date: 03-SEP-93 Instrument: HPGC5 Batch Number: 1

Spike:

Analyte/Parameter	RPR	Lab Sample ID	
BENZENE	98.0	P308088-01	PONCA CITY
ETHYLBENZENE	98.0	P308088-01	PONCA CITY
M-XYLENE	98.0	P308088-01	PONCA CITY
O-XYLENE	98.0	P308088-01	PONCA CITY
P-XYLENE	98.0	P308088-01	PONCA CITY
TOLUENE	98.0	P308088-01	PONCA CITY
Surrogates:			
TRIFLUOROTOLUENE	90.0	P308088-01	PONCA CITY

Spike Duplicate:

Analyte/Parameter	RPR	RPD	Lab Sample ID	
BENZENE	98.0	0.0	P308088-01	PONCA CITY
ETHYLBENZENE	98.0	0.0	P308088-01	PONCA CITY
M-XYLENE	98.0	0.0	P308088-01	PONCA CITY
O-XYLENE	98.0	0.0	P308088-01	PONCA CITY
P-XYLENE	98.0	0.0	P308088-01	PONCA CITY
TOLUENE	98.0	0.0	P308088-01	PONCA CITY
Surrogates:				
TRIFLUOROTOLUENE	90.0	0.0	P308088-01	PONCA CITY

SJN-SAL-DG1
Lab Sample ID: P308088-09 Analysis Lab: PONCA CITY

Method Number: 160_1
Batch Start Date: 01-SEP-93 Instrument: BAXTER DK-43 Batch Number: 1

Replicate:

Analyte/Parameter	Result	Unit	RPD	Lab Sample ID	
TOTAL DISSOLVED SOLIDS	6656	MG/L	2.4	P308088-01	PONCA CITY

Method Number: 8020 Prep Method: 5030
Batch Start Date: 03-SEP-93 Instrument: HPGC5 Batch Number: 1

Spike:

Analyte/Parameter	RPR	Lab Sample ID	
BENZENE	98.0	P308088-01	PONCA CITY
ETHYLBENZENE	98.0	P308088-01	PONCA CITY
M-XYLENE	98.0	P308088-01	PONCA CITY
O-XYLENE	98.0	P308088-01	PONCA CITY
P-XYLENE	98.0	P308088-01	PONCA CITY
TOLUENE	98.0	P308088-01	PONCA CITY
Surrogates:			
TRIFLUOROTOLUENE	90.0	P308088-01	PONCA CITY

Spike Duplicate:

Analyte/Parameter	RPR	RPD	Lab Sample ID	
BENZENE	98.0	0.0	P308088-01	PONCA CITY
ETHYLBENZENE	98.0	0.0	P308088-01	PONCA CITY
M-XYLENE	98.0	0.0	P308088-01	PONCA CITY
O-XYLENE	98.0	0.0	P308088-01	PONCA CITY
P-XYLENE	98.0	0.0	P308088-01	PONCA CITY
TOLUENE	98.0	0.0	P308088-01	PONCA CITY
Surrogates:				
TRIFLUOROTOLUENE	90.0	0.0	P308088-01	PONCA CITY

Method Number: 8270 Prep Method: 3520
Batch Start Date: 10-SEP-93 Instrument: HP1 Batch Number: 1

Spike:

Analyte/Parameter	RPR	Lab Sample ID	
2-METHYLNAPHTHALENE	92.0	P308088-03	PONCA CITY
3-METHYLCHOLANTHRENE	89.0	P308088-03	PONCA CITY
7,12-DIMETHYLBENZ(A)ANTHRACENE	34.0	P308088-03	PONCA CITY
ACENAPHTHENE	93.0	P308088-03	PONCA CITY
ACENAPHTHYLENE	94.0	P308088-03	PONCA CITY
ANTHRACENE	89.0	P308088-03	PONCA CITY
BENZO(A)ANTHRACENE	104.0	P308088-03	PONCA CITY
BENZO(A)PYRENE	104.0	P308088-03	PONCA CITY
BENZO(B)FLUORANTHENE	98.0	P308088-03	PONCA CITY
BENZO(G,H,I)PERYLENE	127.0	P308088-03	PONCA CITY
BENZO(K)FLUORANTHENE	104.0	P308088-03	PONCA CITY
CHRYSENE	105.0	P308088-03	PONCA CITY
DIBENZ(A,H)ANTHRACENE	120.0	P308088-03	PONCA CITY
DIBENZ(A,J)ACRIDINE	122.0	P308088-03	PONCA CITY
FLUORANTHENE	100.0	P308088-03	PONCA CITY

SJN-SAL-DG1
Lab Sample ID: P308088-09 Analysis Lab: PONCA CITY

Analyte/Parameter	RPR	Lab Sample ID	
FLUORENE	96.0	P308088-03	PONCA CITY
INDENO(1,2,3-CD)PYRENE	122.0	P308088-03	PONCA CITY
NAPHTHALENE	91.0	P308088-03	PONCA CITY
PHENANTHRENE	96.0	P308088-03	PONCA CITY
PYRENE	101.0	P308088-03	PONCA CITY
Surrogates:			
2-FLUOROBIPHENYL	76.0	P308088-03	PONCA CITY
NITROBENZENE-D5	76.0	P308088-03	PONCA CITY
TERPHENYL-D14	71.0	P308088-03	PONCA CITY

Spike Duplicate:

Analyte/Parameter	RPR	RPD	Lab Sample ID	
2-METHYLNAPHTHALENE	100.0	8.0	P308088-03	PONCA CITY
3-METHYLCHOLANTHRENE	91.0	3.0	P308088-03	PONCA CITY
7,12-DIMETHYLBENZ(A)ANTHRACENE	27.0	21.0	P308088-03	PONCA CITY
ACENAPHTHENE	98.0	5.0	P308088-03	PONCA CITY
ACENAPHTHYLENE	100.0	7.0	P308088-03	PONCA CITY
ANTHRACENE	92.0	3.0	P308088-03	PONCA CITY
BENZO(A)ANTHRACENE	109.0	4.0	P308088-03	PONCA CITY
BENZO(A)PYRENE	109.0	5.0	P308088-03	PONCA CITY
BENZO(B)FLUORANTHENE	107.0	9.0	P308088-03	PONCA CITY
BENZO(G,H,I)PERYLENE	116.0	9.0	P308088-03	PONCA CITY
BENZO(K)FLUORANTHENE	110.0	6.0	P308088-03	PONCA CITY
CHRYSENE	110.0	4.0	P308088-03	PONCA CITY
DIBENZ(A,H)ANTHRACENE	114.0	5.0	P308088-03	PONCA CITY
DIBENZ(A,J)ACRIDINE	116.0	5.0	P308088-03	PONCA CITY
FLUORANTHENE	102.0	2.0	P308088-03	PONCA CITY
FLUORENE	99.0	3.0	P308088-03	PONCA CITY
INDENO(1,2,3-CD)PYRENE	113.0	8.0	P308088-03	PONCA CITY
NAPHTHALENE	102.0	11.0	P308088-03	PONCA CITY
PHENANTHRENE	100.0	4.0	P308088-03	PONCA CITY
PYRENE	110.0	8.0	P308088-03	PONCA CITY
Surrogates:				
2-FLUOROBIPHENYL	81.0		P308088-03	PONCA CITY
NITROBENZENE-D5	88.0		P308088-03	PONCA CITY
TERPHENYL-D14	75.0		P308088-03	PONCA CITY

SJN-SAL-DG2
Lab Sample ID: P308088-10 Analysis Lab: PONCA CITY

Method Number: 160_1
Batch Start Date: 01-SEP-93 Instrument: BAXTER DK-43 Batch Number: 1

Replicate:

Analyte/Parameter	Result	Unit	RPD	Lab Sample ID	
TOTAL DISSOLVED SOLIDS	6656	MG/L	2.4	P308088-01	PONCA CITY

Method Number: 8020 Prep Method: 5030
Batch Start Date: 03-SEP-93 Instrument: HPGC5 Batch Number: 1

Spike:

Analyte/Parameter	RPR	Lab Sample ID	
BENZENE	98.0	P308088-01	PONCA CITY
ETHYLBENZENE	98.0	P308088-01	PONCA CITY
M-XYLENE	98.0	P308088-01	PONCA CITY
O-XYLENE	98.0	P308088-01	PONCA CITY
P-XYLENE	98.0	P308088-01	PONCA CITY
TOLUENE	98.0	P308088-01	PONCA CITY
Surrogates:			
TRIFLUOROTOLUENE	90.0	P308088-01	PONCA CITY

Spike Duplicate:

Analyte/Parameter	RPR	RPD	Lab Sample ID	
BENZENE	98.0	0.0	P308088-01	PONCA CITY
ETHYLBENZENE	98.0	0.0	P308088-01	PONCA CITY
M-XYLENE	98.0	0.0	P308088-01	PONCA CITY
O-XYLENE	98.0	0.0	P308088-01	PONCA CITY
P-XYLENE	98.0	0.0	P308088-01	PONCA CITY
TOLUENE	98.0	0.0	P308088-01	PONCA CITY
Surrogates:				
TRIFLUOROTOLUENE	90.0	0.0	P308088-01	PONCA CITY

SJN-SAL-UPG1
Lab Sample ID: P308088-07 Analysis Lab: PONCA CITY

Method Number: 160_1
Batch Start Date: 01-SEP-93 Instrument: BAXTER DK-43 Batch Number: 1

Replicate:

Analyte/Parameter	Result	Unit	RPD	Lab Sample ID
TOTAL DISSOLVED SOLIDS	6656	MG/L	2.4	P308088-01 PONCA CITY

Method Number: 8020 Prep Method: 5030
Batch Start Date: 03-SEP-93 Instrument: HPGC5 Batch Number: 1

Spike:

Analyte/Parameter	RPR	Lab Sample ID
BENZENE	98.0	P308088-01 PONCA CITY
ETHYLBENZENE	98.0	P308088-01 PONCA CITY
M-XYLENE	98.0	P308088-01 PONCA CITY
O-XYLENE	98.0	P308088-01 PONCA CITY
P-XYLENE	98.0	P308088-01 PONCA CITY
TOLUENE	98.0	P308088-01 PONCA CITY
Surrogates:		
TRIFLUOROTOLUENE	90.0	P308088-01 PONCA CITY

Spike Duplicate:

Analyte/Parameter	RPR	RPD	Lab Sample ID
BENZENE	98.0	0.0	P308088-01 PONCA CITY
ETHYLBENZENE	98.0	0.0	P308088-01 PONCA CITY
M-XYLENE	98.0	0.0	P308088-01 PONCA CITY
O-XYLENE	98.0	0.0	P308088-01 PONCA CITY
P-XYLENE	98.0	0.0	P308088-01 PONCA CITY
TOLUENE	98.0	0.0	P308088-01 PONCA CITY
Surrogates:			
TRIFLUOROTOLUENE	90.0	0.0	P308088-01 PONCA CITY

SJN-SAL-UPG2
Lab Sample ID: P308088-08 Analysis Lab: PONCA CITY

Method Number: 160_1
Batch Start Date: 01-SEP-93 Instrument: BAXTER DK-43 Batch Number: 1

Replicate:

Analyte/Parameter	Result	Unit	RPD	Lab Sample ID	
TOTAL DISSOLVED SOLIDS	6656	MG/L	2.4	P308088-01	PONCA CITY

Method Number: 8020 Prep Method: 5030
Batch Start Date: 03-SEP-93 Instrument: HPGC5 Batch Number: 1

Spike:

Analyte/Parameter	RPR	Lab Sample ID	
BENZENE	98.0	P308088-01	PONCA CITY
ETHYLBENZENE	98.0	P308088-01	PONCA CITY
M-XYLENE	98.0	P308088-01	PONCA CITY
O-XYLENE	98.0	P308088-01	PONCA CITY
P-XYLENE	98.0	P308088-01	PONCA CITY
TOLUENE	98.0	P308088-01	PONCA CITY
Surrogates:			
TRIFLUOROTOLUENE	90.0	P308088-01	PONCA CITY

Spike Duplicate:

Analyte/Parameter	RPR	RPD	Lab Sample ID	
BENZENE	98.0	0.0	P308088-01	PONCA CITY
ETHYLBENZENE	98.0	0.0	P308088-01	PONCA CITY
M-XYLENE	98.0	0.0	P308088-01	PONCA CITY
O-XYLENE	98.0	0.0	P308088-01	PONCA CITY
P-XYLENE	98.0	0.0	P308088-01	PONCA CITY
TOLUENE	98.0	0.0	P308088-01	PONCA CITY
Surrogates:				
TRIFLUOROTOLUENE	90.0	0.0	P308088-01	PONCA CITY

SJN-SK-DG1
Lab Sample ID: P308088-06 Analysis Lab: PONCA CITY

Method Number: 160_1
Batch Start Date: 01-SEP-93 Instrument: BAXTER DK-43 Batch Number: 1

Replicate:

Analyte/Parameter	Result	Unit	RPD	Lab Sample ID	
TOTAL DISSOLVED SOLIDS	6656	MG/L	2.4	P308088-01	PONCA CITY

Method Number: 8020 Prep Method: 5030
Batch Start Date: 03-SEP-93 Instrument: HPGC5 Batch Number: 1

Spike:

Analyte/Parameter	RPR	Lab Sample ID	
BENZENE	98.0	P308088-01	PONCA CITY
ETHYLBENZENE	98.0	P308088-01	PONCA CITY
M-XYLENE	98.0	P308088-01	PONCA CITY
O-XYLENE	98.0	P308088-01	PONCA CITY
P-XYLENE	98.0	P308088-01	PONCA CITY
TOLUENE	98.0	P308088-01	PONCA CITY
Surrogates:			
TRIFLUOROTOLUENE	90.0	P308088-01	PONCA CITY

Spike Duplicate:

Analyte/Parameter	RPR	RPD	Lab Sample ID	
BENZENE	98.0	0.0	P308088-01	PONCA CITY
ETHYLBENZENE	98.0	0.0	P308088-01	PONCA CITY
M-XYLENE	98.0	0.0	P308088-01	PONCA CITY
O-XYLENE	98.0	0.0	P308088-01	PONCA CITY
P-XYLENE	98.0	0.0	P308088-01	PONCA CITY
TOLUENE	98.0	0.0	P308088-01	PONCA CITY
Surrogates:				
TRIFLUOROTOLUENE	90.0	0.0	P308088-01	PONCA CITY

Method Number: 8270 Prep Method: 3520
Batch Start Date: 10-SEP-93 Instrument: HP1 Batch Number: 1

Spike:

Analyte/Parameter	RPR	Lab Sample ID	
2-METHYLNAPHTHALENE	92.0	P308088-03	PONCA CITY
3-METHYLCHOLANTHRENE	89.0	P308088-03	PONCA CITY
7,12-DIMETHYLBENZ(A)ANTHRACENE	34.0	P308088-03	PONCA CITY
ACENAPHTHENE	93.0	P308088-03	PONCA CITY
ACENAPHTHYLENE	94.0	P308088-03	PONCA CITY
ANTHRACENE	89.0	P308088-03	PONCA CITY
BENZO(A)ANTHRACENE	104.0	P308088-03	PONCA CITY
BENZO(A)PYRENE	104.0	P308088-03	PONCA CITY
BENZO(B)FLUORANTHENE	98.0	P308088-03	PONCA CITY
BENZO(G,H,I)PERYLENE	127.0	P308088-03	PONCA CITY
BENZO(K)FLUORANTHENE	104.0	P308088-03	PONCA CITY
CHRYSENE	105.0	P308088-03	PONCA CITY
DIBENZ(A,H)ANTHRACENE	120.0	P308088-03	PONCA CITY
DIBENZ(A,J)ACRIDINE	122.0	P308088-03	PONCA CITY
FLUORANTHENE	100.0	P308088-03	PONCA CITY

SJN-SK-DG1
Lab Sample ID: P308088-06 Analysis Lab: PONCA CITY

Analyte/Parameter	RPR	Lab Sample ID
FLUORENE	96.0	P308088-03 PONCA CITY
INDENO(1,2,3-CD)PYRENE	122.0	P308088-03 PONCA CITY
NAPHTHALENE	91.0	P308088-03 PONCA CITY
PHENANTHRENE	96.0	P308088-03 PONCA CITY
PYRENE	101.0	P308088-03 PONCA CITY
Surrogates:		
2-FLUOROBIPHENYL	76.0	P308088-03 PONCA CITY
NITROBENZENE-D5	76.0	P308088-03 PONCA CITY
TERPHENYL-D14	71.0	P308088-03 PONCA CITY

Spike Duplicate:

Analyte/Parameter	RPR	RPD	Lab Sample ID
2-METHYLNAPHTHALENE	100.0	8.0	P308088-03 PONCA CITY
3-METHYLCHOLANTHRENE	91.0	3.0	P308088-03 PONCA CITY
7,12-DIMETHYLBENZ(A)ANTHRACENE	27.0	21.0	P308088-03 PONCA CITY
ACENAPHTHENE	98.0	5.0	P308088-03 PONCA CITY
ACENAPHTHYLENE	100.0	7.0	P308088-03 PONCA CITY
ANTHRACENE	92.0	3.0	P308088-03 PONCA CITY
BENZO(A)ANTHRACENE	109.0	4.0	P308088-03 PONCA CITY
BENZO(A)PYRENE	109.0	5.0	P308088-03 PONCA CITY
BENZO(B)FLUORANTHENE	107.0	9.0	P308088-03 PONCA CITY
BENZO(G,H,I)PERYLENE	116.0	9.0	P308088-03 PONCA CITY
BENZO(K)FLUORANTHENE	110.0	6.0	P308088-03 PONCA CITY
CHRYSENE	110.0	4.0	P308088-03 PONCA CITY
DIBENZ(A,H)ANTHRACENE	114.0	5.0	P308088-03 PONCA CITY
DIBENZ(A,J)ACRIDINE	116.0	5.0	P308088-03 PONCA CITY
FLUORANTHENE	102.0	2.0	P308088-03 PONCA CITY
FLUORENE	99.0	3.0	P308088-03 PONCA CITY
INDENO(1,2,3-CD)PYRENE	113.0	8.0	P308088-03 PONCA CITY
NAPHTHALENE	102.0	11.0	P308088-03 PONCA CITY
PHENANTHRENE	100.0	4.0	P308088-03 PONCA CITY
PYRENE	110.0	8.0	P308088-03 PONCA CITY
Surrogates:			
2-FLUOROBIPHENYL	81.0		P308088-03 PONCA CITY
NITROBENZENE-D5	88.0		P308088-03 PONCA CITY
TERPHENYL-D14	75.0		P308088-03 PONCA CITY

SJN-SK-UPG1
Lab Sample ID: P308088-05 Analysis Lab: PONCA CITY

Method Number: 160_1
Batch Start Date: 01-SEP-93 Instrument: BAXTER DK-43 Batch Number: 1

Replicate:

Analyte/Parameter	Result	Unit	RPD	Lab Sample ID	
TOTAL DISSOLVED SOLIDS	6656	MG/L	2.4	P308088-01	PONCA CITY

Method Number: 8020 Prep Method: 5030
Batch Start Date: 03-SEP-93 Instrument: HPGC5 Batch Number: 1

Spike:

Analyte/Parameter	RPR	Lab Sample ID	
BENZENE	98.0	P308088-01	PONCA CITY
ETHYLBENZENE	98.0	P308088-01	PONCA CITY
M-XYLENE	98.0	P308088-01	PONCA CITY
O-XYLENE	98.0	P308088-01	PONCA CITY
P-XYLENE	98.0	P308088-01	PONCA CITY
TOLUENE	98.0	P308088-01	PONCA CITY
Surrogates:			
TRIFLUOROTOLUENE	90.0	P308088-01	PONCA CITY

Spike Duplicate:

Analyte/Parameter	RPR	RPD	Lab Sample ID	
BENZENE	98.0	0.0	P308088-01	PONCA CITY
ETHYLBENZENE	98.0	0.0	P308088-01	PONCA CITY
M-XYLENE	98.0	0.0	P308088-01	PONCA CITY
O-XYLENE	98.0	0.0	P308088-01	PONCA CITY
P-XYLENE	98.0	0.0	P308088-01	PONCA CITY
TOLUENE	98.0	0.0	P308088-01	PONCA CITY
Surrogates:				
TRIFLUOROTOLUENE	90.0	0.0	P308088-01	PONCA CITY

SJN-SK-UPG2
Lab Sample ID: P308088-04 Analysis Lab: PONCA CITY

Method Number: 160_1
Batch Start Date: 01-SEP-93 Instrument: BAXTER DK-43 Batch Number: 1

Replicate:

Analyte/Parameter	Result	Unit	RPD	Lab Sample ID	
TOTAL DISSOLVED SOLIDS	6656	MG/L	2.4	P308088-01	PONCA CITY

Method Number: 8020 Prep Method: 5030
Batch Start Date: 03-SEP-93 Instrument: HPGC5 Batch Number: 1

Spike:

Analyte/Parameter	RPR	Lab Sample ID	
BENZENE	98.0	P308088-01	PONCA CITY
ETHYLBENZENE	98.0	P308088-01	PONCA CITY
M-XYLENE	98.0	P308088-01	PONCA CITY
O-XYLENE	98.0	P308088-01	PONCA CITY
P-XYLENE	98.0	P308088-01	PONCA CITY
TOLUENE	98.0	P308088-01	PONCA CITY
Surrogates:			
TRIFLUOROTOLUENE	90.0	P308088-01	PONCA CITY

Spike Duplicate:

Analyte/Parameter	RPR	RPD	Lab Sample ID	
BENZENE	98.0	0.0	P308088-01	PONCA CITY
ETHYLBENZENE	98.0	0.0	P308088-01	PONCA CITY
M-XYLENE	98.0	0.0	P308088-01	PONCA CITY
O-XYLENE	98.0	0.0	P308088-01	PONCA CITY
P-XYLENE	98.0	0.0	P308088-01	PONCA CITY
TOLUENE	98.0	0.0	P308088-01	PONCA CITY
Surrogates:				
TRIFLUOROTOLUENE	90.0	0.0	P308088-01	PONCA CITY

SJN-TRIP BLNK
Lab Sample ID: P308088-11 Analysis Lab: PONCA CITY

Method Number: 8020 Prep Method: 5030
Batch Start Date: 03-SEP-93 Instrument: HPGC5 Batch Number: 1

Spike:

Analyte/Parameter	RPR	Lab Sample ID	
BENZENE	98.0	P308088-01	PONCA CITY
ETHYLBENZENE	98.0	P308088-01	PONCA CITY
M-XYLENE	98.0	P308088-01	PONCA CITY
O-XYLENE	98.0	P308088-01	PONCA CITY
P-XYLENE	98.0	P308088-01	PONCA CITY
TOLUENE	98.0	P308088-01	PONCA CITY
Surrogates:			
TRIFLUOROTOLUENE	90.0	P308088-01	PONCA CITY

Spike Duplicate:

Analyte/Parameter	RPR	RPD	Lab Sample ID	
BENZENE	98.0	0.0	P308088-01	PONCA CITY
ETHYLBENZENE	98.0	0.0	P308088-01	PONCA CITY
M-XYLENE	98.0	0.0	P308088-01	PONCA CITY
O-XYLENE	98.0	0.0	P308088-01	PONCA CITY
P-XYLENE	98.0	0.0	P308088-01	PONCA CITY
TOLUENE	98.0	0.0	P308088-01	PONCA CITY
Surrogates:				
TRIFLUOROTOLUENE	90.0	0.0	P308088-01	PONCA CITY

Bio-Air Sparging Remediation Project for Salmon Lease

CONOCO INC.
Midland Division
Farmington, New Mexico

Designed
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Bio-Air Sparging

Introduction

When designed and operated properly "Bio-Air Sparging" is a cost-effective in situ remediation process. The bio-air sparging process is best suited for the remediation of volatile and semi-volatile organic compounds in groundwater and soil environments. The design of bio-air sparging can take many forms depending on the required application. The basic system includes a surface air injection system, properly placed injection wells, bacterial nutrient stimulation when required, and a reliable monitoring program.

However, it should be noted, site evaluation and analysis, system design, insulation, operation, and monitoring are not trivial processes. In fact, soil is the most complex component of the ecosystem. Soil is hard to evaluate, analyze, and remediate. From a remediation point we are dealing with sand, silt, clay, and water which are physically, chemically, and biologically interactive.

Bio-air sparging is a remediation technology which is relatively inexpensive to implement, operate, and maintain. The technology is best applied to contaminants in relatively permeable soil. In addition, the water phase should not contain large amounts of non-aqueous phase liquids (NAPL). Free hydrocarbons must be recovered before bio-air sparging is applied. The application of bio-air sparging must be evaluated on a case-by-case basis.

The major advantage of bio-air sparging over other more costly remediation processes is that contaminants can be removed from both the soil and water phases. The remediation is accomplished by physical, chemical, and biological processes. The bio-air sparging process removes both dissolved and adsorbed phases. Mass transfer in bio-air sparging employs several advantageous mechanisms to remove contaminants from the saturated and interface zones. Therefore, bio-air sparging exhibits a "lower" asymptotic behavior as compared to vapor extraction and pump-and- treat methods. Remediation goals with bio-air sparging are obtained in less time and with reduced costs when compared to current available remediation technology. Bio-air sparging is an environmentally safe remediation process.

The bio-air sparging process does not produce a secondary waste stream which would require additional treatment or disposal. The secondary waste stream may have a major environmental impact as well as additional handling, permitting, and cost. When required, bio-air sparging can be combined with other remediation technology.

Contaminant biodegradation is a very important part of the bio-air sparging technology. The hydrocarbon biodegradation must be balanced with the physical and chemical processes. All three processes operate simultaneously although they are controlled by different parameters. An understanding of soil science, hydrology, chemistry, and microbiology is necessary for a successful remediation project.

Past experience has shown that the unsaturated and saturated zones contain a variety of indigenous microorganisms capable of biodegrading organic carbon contaminants. Air sparging increases the oxygen content of the groundwater and soil. In many environments, the oxygen content is the primary limiting parameter for the biodegradation of an overbalance of hydrocarbon contamination. The groundwater and soil above the groundwater are now large chemostats for the biodegradation of the contaminants. The chemostat area is astronomically larger in volume and surface area as compared to the contaminant. This bioreaction area rapidly and efficiently biodegrades the organic contaminant to CO_2, H_2O, and cell mass. In cases of large volumes of organic contaminants, other nutrients (nitrogen and phosphorous) may be required. Oxygen concentrations of 0.3 mg/l are considered sufficient to biodegrade petroleum constituents. The rate of biodegradation can be significantly enhanced by optimizing the nutrient requirements of the microorganism ecosystem.

As in all remediation projects, accurate site characterization is essential for the success of the remediation. The site investigation must utilize delineation applicable to the design of bio-air sparging technology. Although there are key design parameters which can be utilized, a majority of the case studies do not include many design parameters. Therefore professional judgment and experience based on site characterization (soil type, soil layering, hydrology, and biodegradation) are a major part of a successful bio-air sparging system.

Sampling and Analysis

All sampling was conducted using state-of-the-art scientific protocol for soil and groundwater environments. When required, samples were stored in a cooled, insulated container (~4°C) and/or analyzed within 24 hours. On-site samples were also conducted for benzene, toluene, ethylbenzene and xylene (BTEX), temperature and pH.

On-site soil samples were screened for volatile organic compounds (VOC) using an Organic Vapor Meter (OVM). Corrections for benzene were calculated from the OVM readings by using a 0.47 correction constant. In addition, laboratory analyses were conducted for volatile organic compounds and polynuclear aromatic hydrocarbons (PAHs). It should be noted PAHs were not detected in any of the samples obtained from the Salmon site designated as samples SAL-DG-1. Results are reported in both parts per million (ppm) and parts per billion (ppb). Total xylene is the sum of the concentrations of o-, m-, and p-xylene.

Laboratory analytical methods for samples from the Salmon site employed the following Environmental Protection Agency (EPA) methods:

BTEX - Method 5030 and Method 8020

PAHs - Method 3520 and Method 8270

TDS - Method 160.1

In addition, during soil boring procedures, visual notations of the soil structure, texture, and moisture were recorded by experienced personnel. On-site visual observations are an important part of the total remediation design process.

Evaluation of the Contaminated Site

The Salmon #1 was contaminated with BTEX from a line drip pit. BTEX is the only petroleum product contaminant identified at the site. Polynuclear aromatic hydrocarbons (PAHs) and other petroleum products are not detected at the Salmon #1 site.

The site is approximately 10,000 square feet in area with the longest distance measuring 140 feet. The site is kidney-shaped (see attached drawing). The contaminated thickness ranged from 1 foot to 3 feet with a 1.5-foot average impacted thickness. Approximately 15,000 cubic feet are impacted with the BTEX contaminant.

The average BTEX concentration of the 9 highest soil borings was 335.1 ppm as measured with the OVM. The concentration distribution ranges from a high of 787 ppm to a low of 5 ppm. Only two soil boring wells were above 400 ppm BTEX—SB9 and SB11.

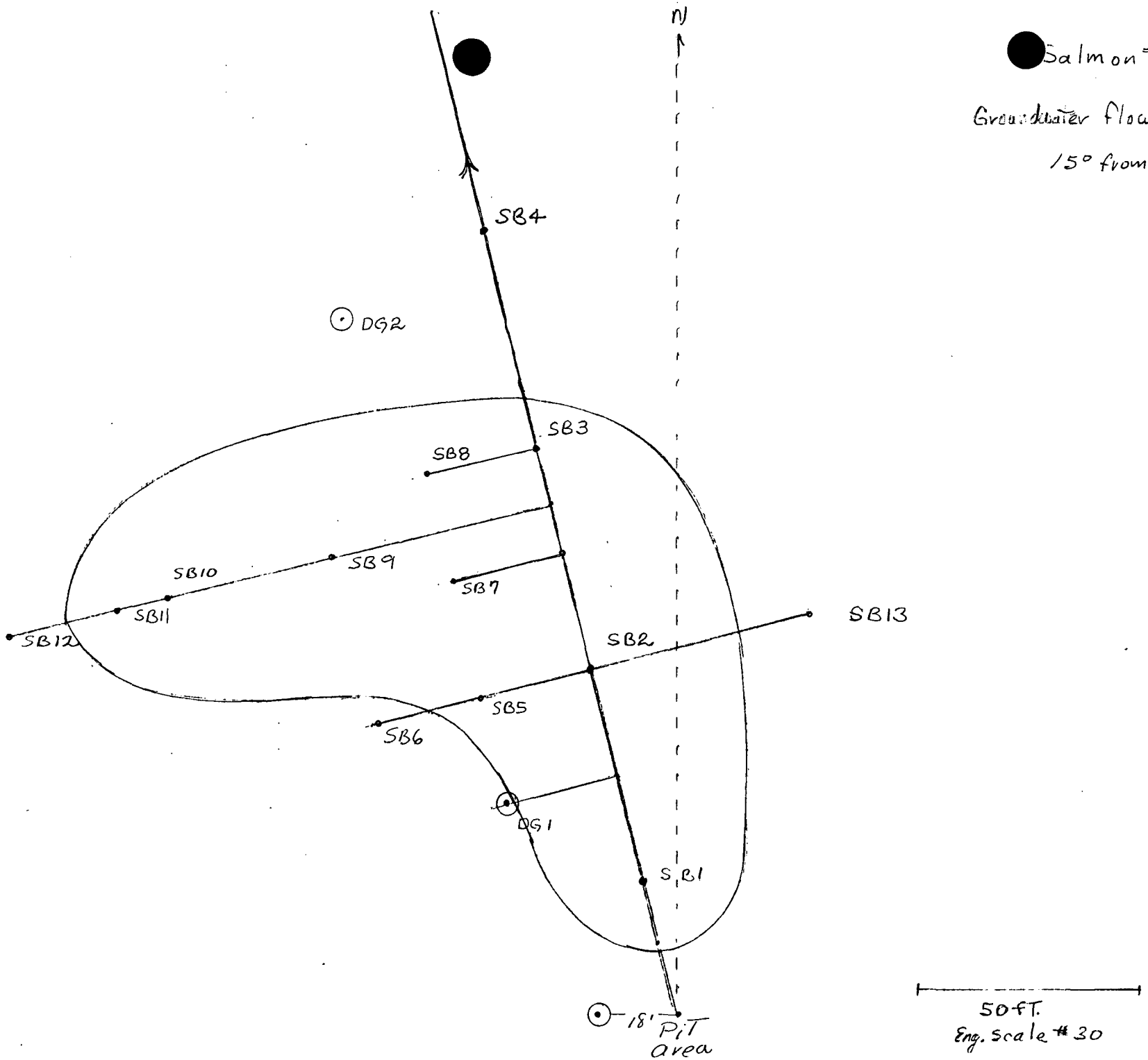
The contaminated area is primarily associated with a capillary fringe area that is the area between the unsaturated-saturated boundary. The majority of contamination is adsorbed on the sand particles. The soil profile in the area is primarily medium and coarse sand. Only a small amount of clay was observed in the contaminated area. The BTEX is strongly confined to the outline area due to the adsorption onto the sand particles. Only a limited amount of vertical distribute was observed. As shown by the soil boring, the BTEX concentration drops sharply with vertical direction. The contaminated area is very shallow.

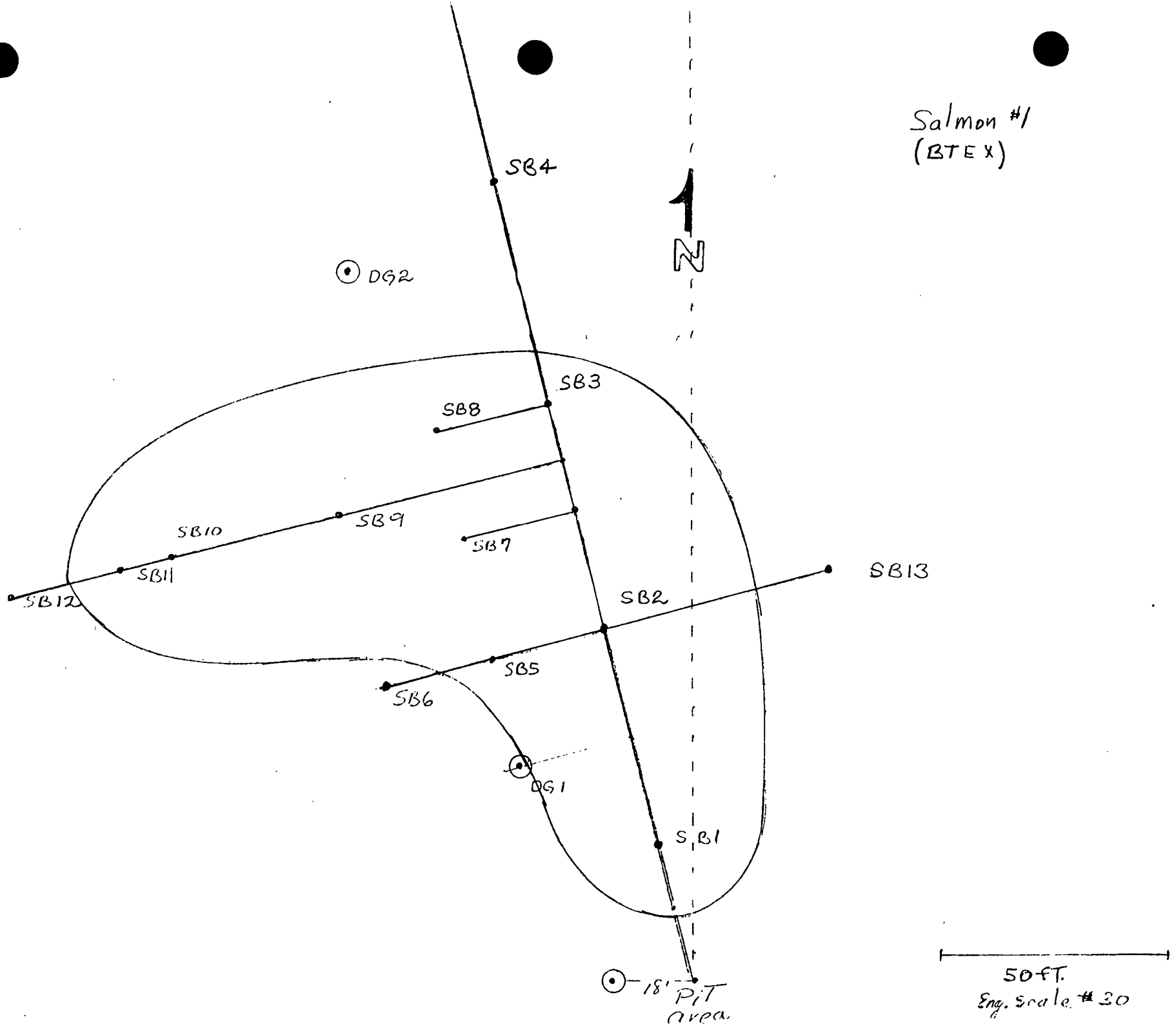
The aquifer immediately below the capillary fringe is an unconfined aquifer. Due to the small contaminated area, the water table is considered at the 6-foot level. Although the aquifer may dip slightly to the west, the small contaminated site (140 feet west) makes the dip difficult to measure and not a major factor.

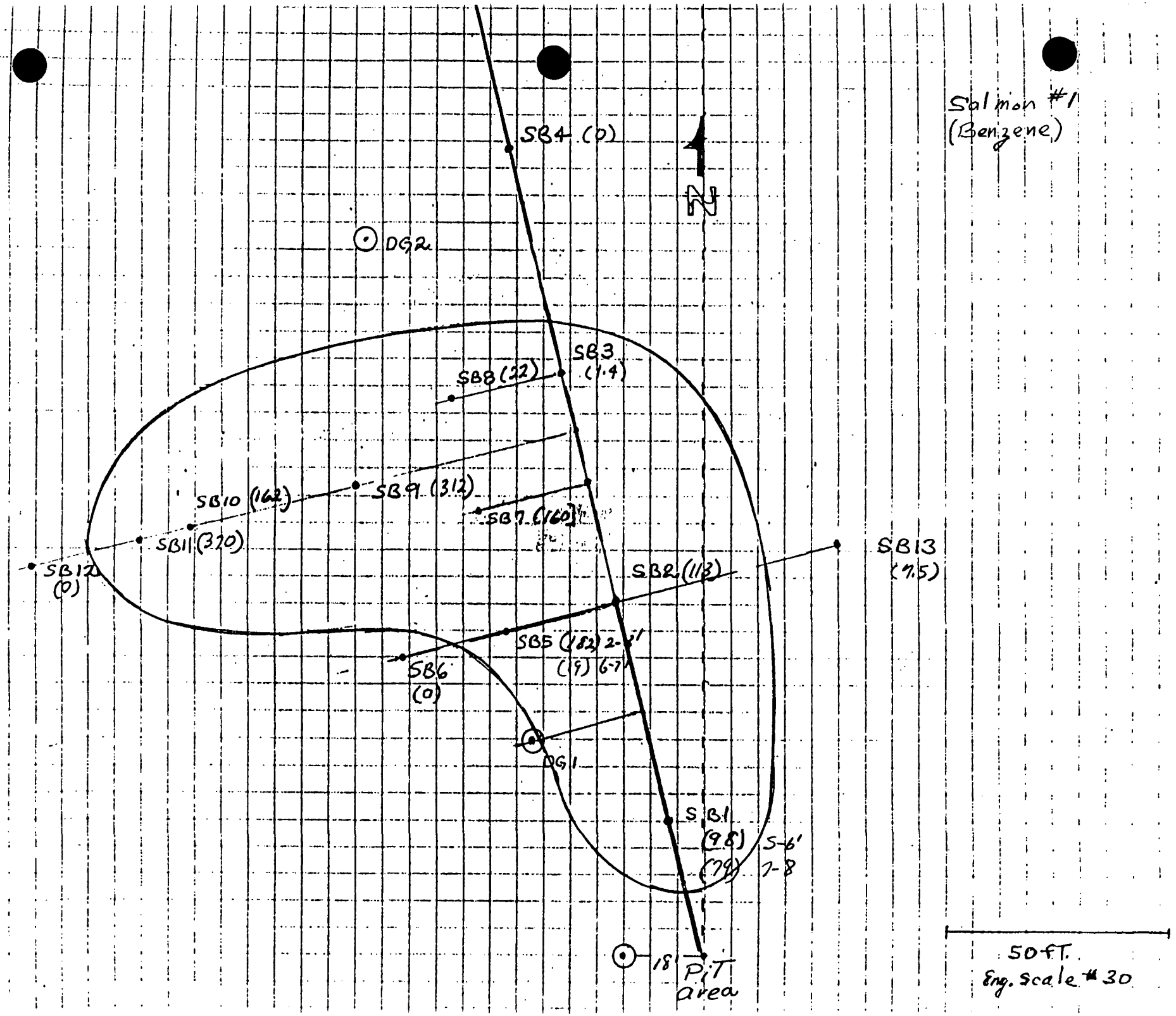
A groundwater flow direction has been calculated and plotted from data obtained in October 1994 (Plan Map). Groundwater flow is to the north-northwest, contains a hydraulic gradient of 0.012 ft/ft and an estimated hydraulic conductivity and porosity of 125 ft/day and 25% respectively. Using the above information, the estimated Darcy velocity for the aquifer is 1.5 ft/day. The hydraulic conductivity cited above is typical of a medium- to coarse-grained sand aquifer as referenced in *Groundwater and Wells* by Phil Driscoll and *Applied Hydrogeology* by C.W. Fetter.

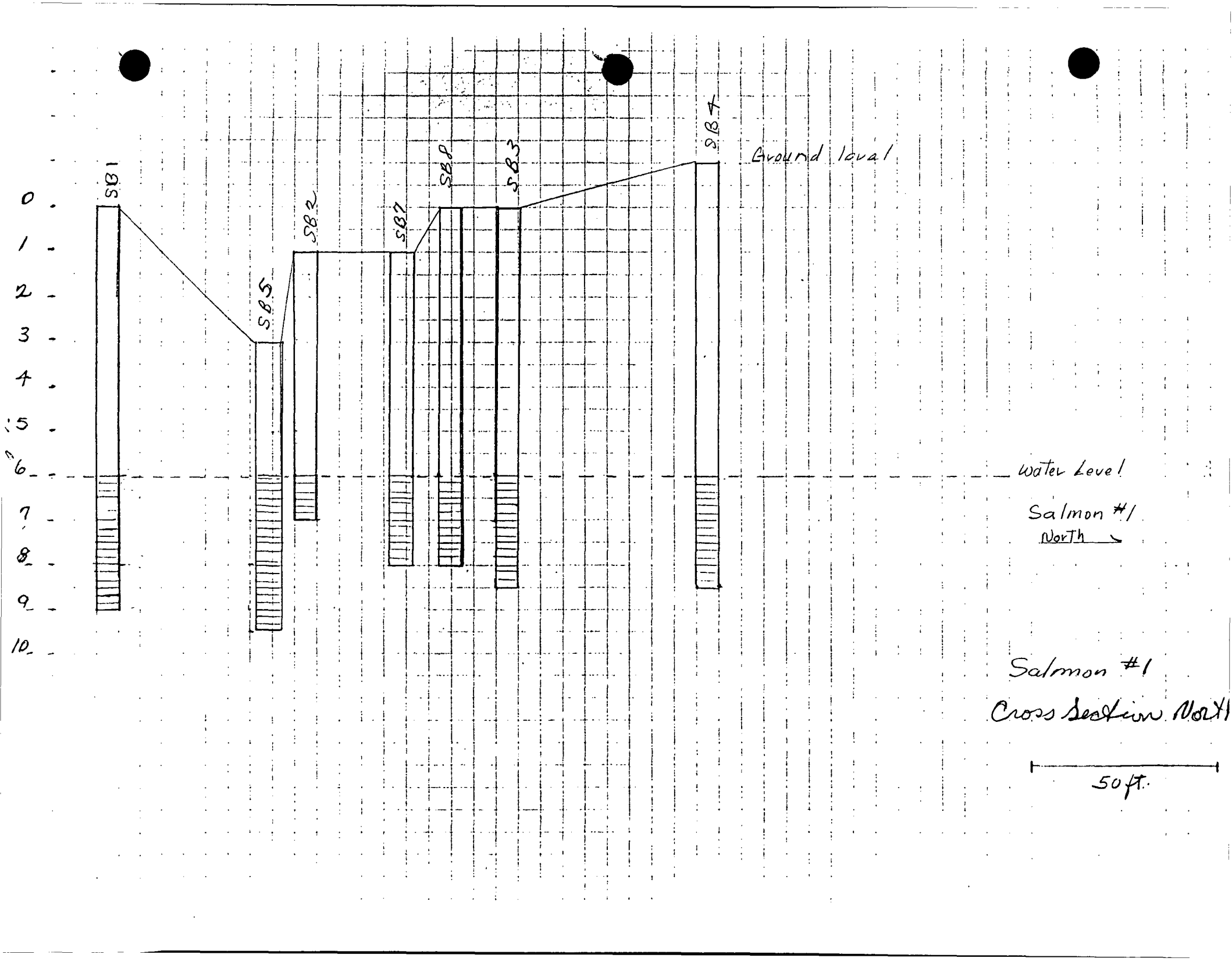
In summary, the aquifer hydraulics indicates that the site is very amiable to air sparging technology.

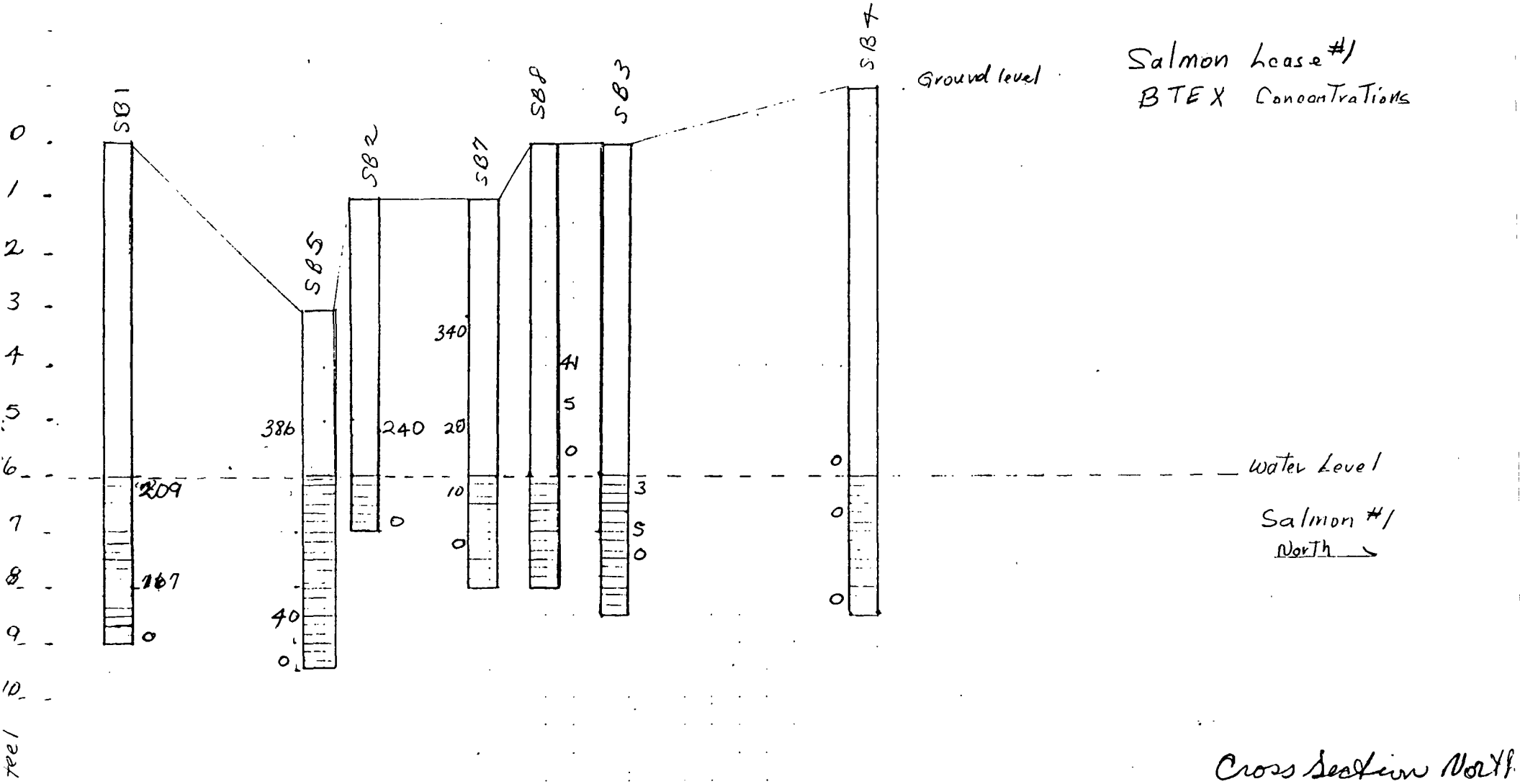
Directly north (1/4 mile) is the San Juan River. The contamination has not impacted the river. Due to its low contaminant concentration and adsorption on the sand in the capillary fringe, the BTEX will never reach the San Juan River. As shown on the two cross sections, the BTEX contamination is trapped between SB1 and SB4. The contamination turns west, but does not extend beyond SB12. (See attached cross sections.) The San Juan River, when carrying large amounts of water (spring), will effect the water table levels in the area.

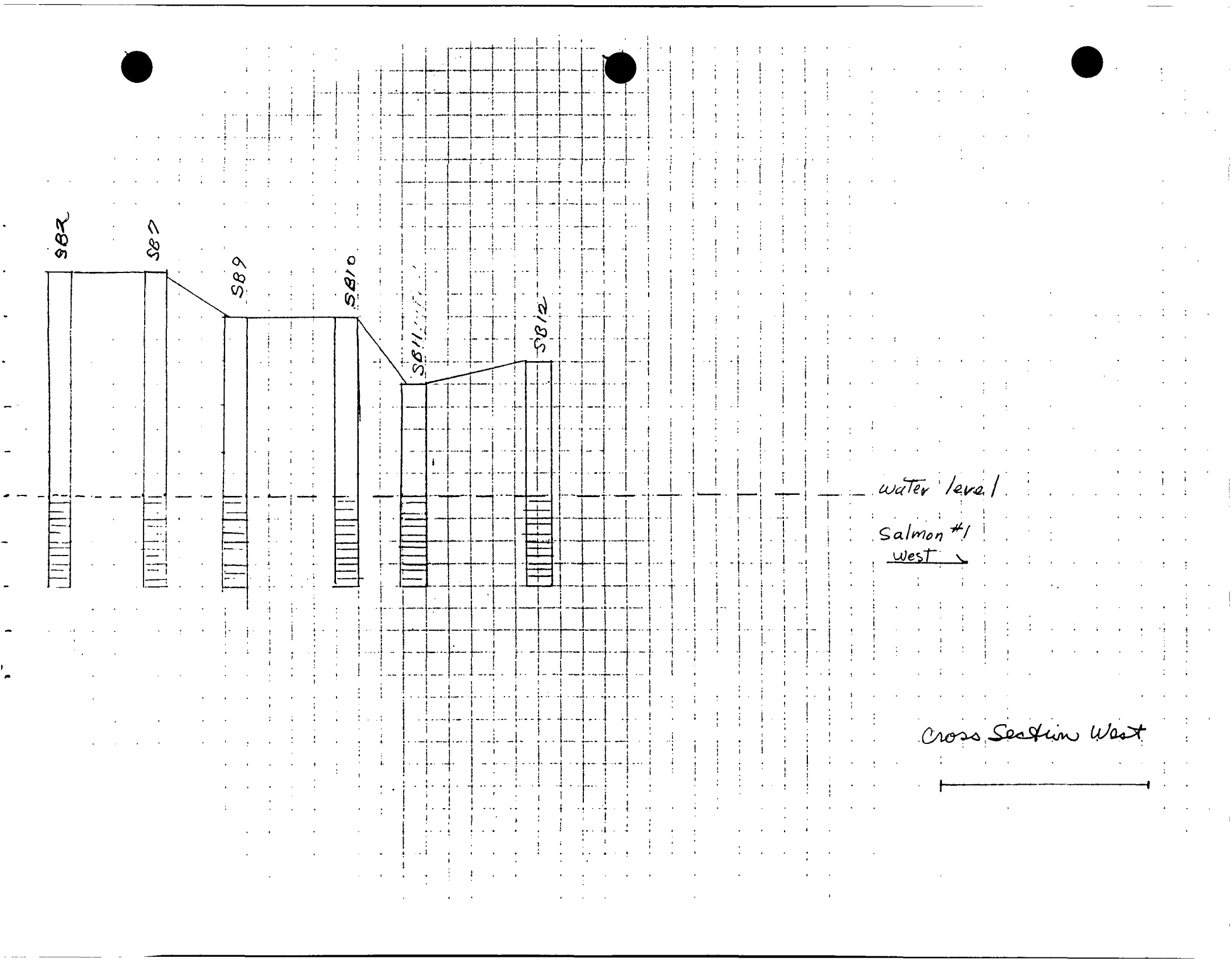

N
Salmon #1
Groundwater flow
15° from North
SB4
DG2
SB3
SB8
SB10
SB9
SB7
SB11
SB12
SB13
SB2
SB5
SB6
DG1
SB1
18' Pit area
50 FT.
Eng. scale #30


Salmon #1
(BTEX)
SB4
N
DG2
SB3
SB8
SB10
SB9
SB7
SB11
SB12
SB13
SB2
SB5
SB6
DG1
SB1
18' Pit
area
50 FT.
Eng. Scale # 30


Salmon #1
(Benzene)
SB4 (0)
N
DG2
SB3
(1.4)
SB8 (22)
SB10 (162)
SB9 (312)
SB7 (160)
SB11 (370)
SB12
(0)
SB13
(7.5)
SB2 (113)
SB5 (182) 2-3'
(9) 6-7'
SB6
(0)
DG1
SB1
(98)
(79)
5-6'
7-8
18'
P.T
area
50 FT.
Eng. Scale 1" = 30

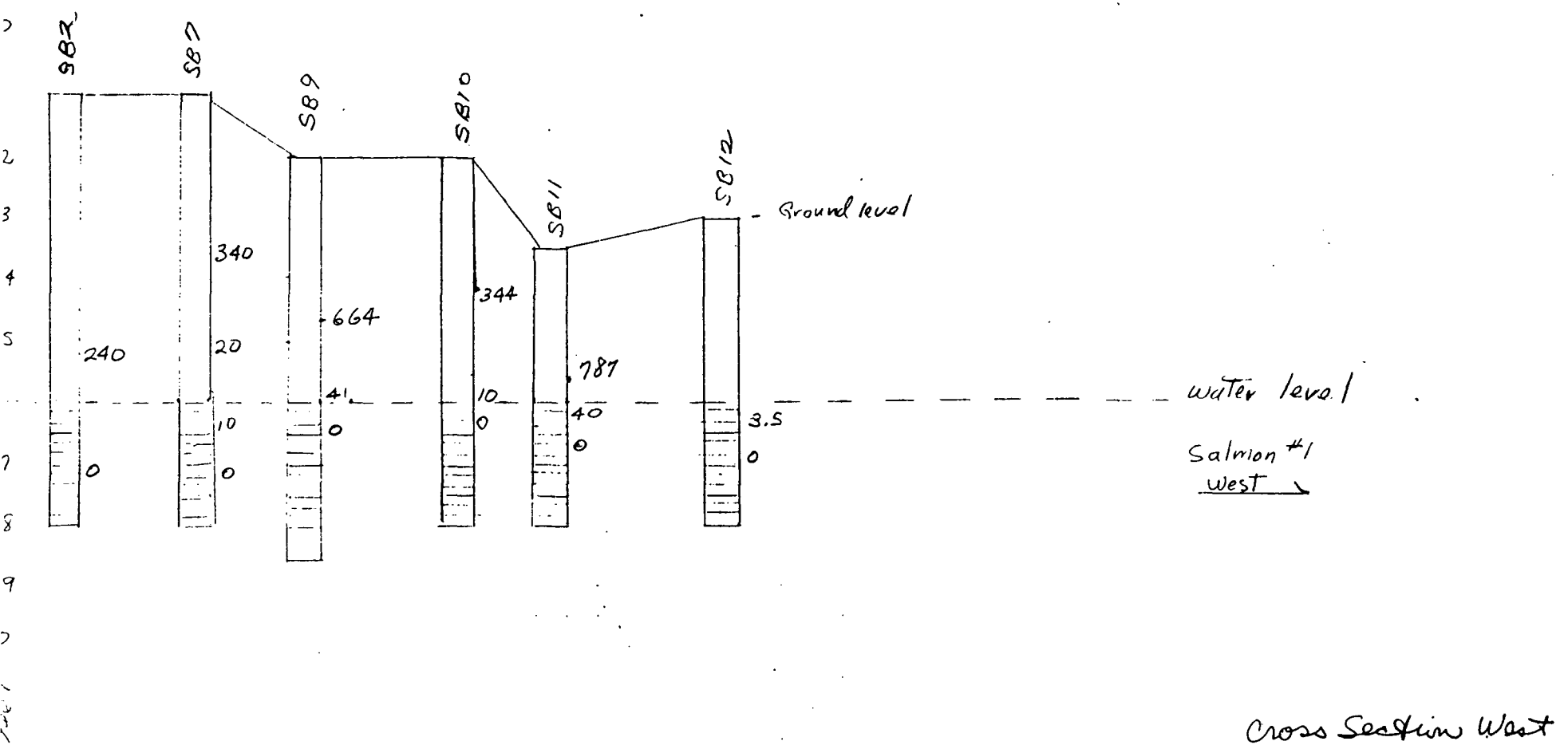

SB1
SB5
SB2
SB7
SB8
SB3
SB4
Ground level
0
1
2
3
4
5
6
7
8
9
10
Water Level
Salmon #1
North
Salmon #1
Cross Section North
50 ft.


Salmon Lease #1
BTEX Concentrations
SB1
SB5
SB2
SB7
SB8
SB3
SB4
Ground level
Water Level
Salmon #1
North
209
167
0
386
40
0
240
0
340
20
10
0
41
5
0
3
5
0
0
0
0
0
0
1
2
3
4
5
6
7
8
9
10
Cross Section North
50 ft.



Cross Section West

Salmon #1
BTEX concentrations



Cross Section West

50 ft

SURVEY NOTES FOR: SALMON #1 DRIP LINE
PROJECT NO: 4-1140 SURVEY BY: MKL
DATE: 10/28/94 (FILE:1140SVY2)

LOCATION	WATER LEVEL	RELATIVE ELEV	CORRECTED COORD X	Y	WATER ELEV
DRIP LINE		100	0	0	
No. WELL	5.25	94.199	-78.46502	133.07846	88.949
NW WELL	2.9	92.914	-31.28738	44.710245	90.014
SW WELL	9.51	99.694	14.088032	-28.83445	90.184
SE WELL	9.05	100.044	62.405406	8.7323597	90.994

Monitoring and Closure

In order to monitor progress of the bio-air sparging remediation and to apply the closure standards, the sampling and analytical procedures will utilize the methods identified in sampling and analytical protocol. Any modification to these protocols will be noted in the reporting of the data.

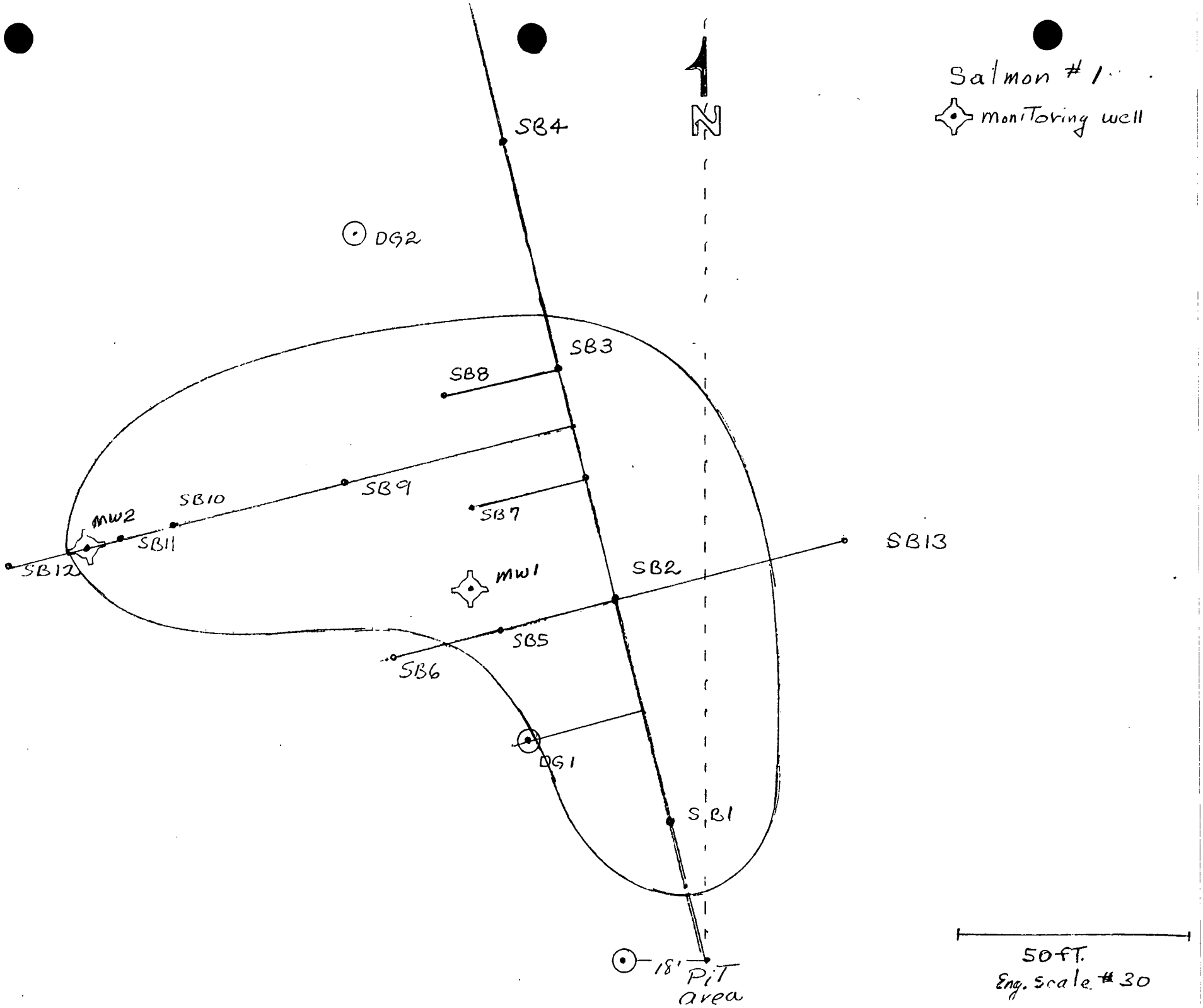
Two new monitoring wells will be installed in the area near SB5 and SB11 to monitor remediation progress and insure site cleanup. Installation procedures are described in the section "Monitor Well Design." In addition, presently installed wells SAL-UPG1, SAL-UPG2, SAL-DG1 and SAL-DG2 may be utilized as required for monitoring cleanup.

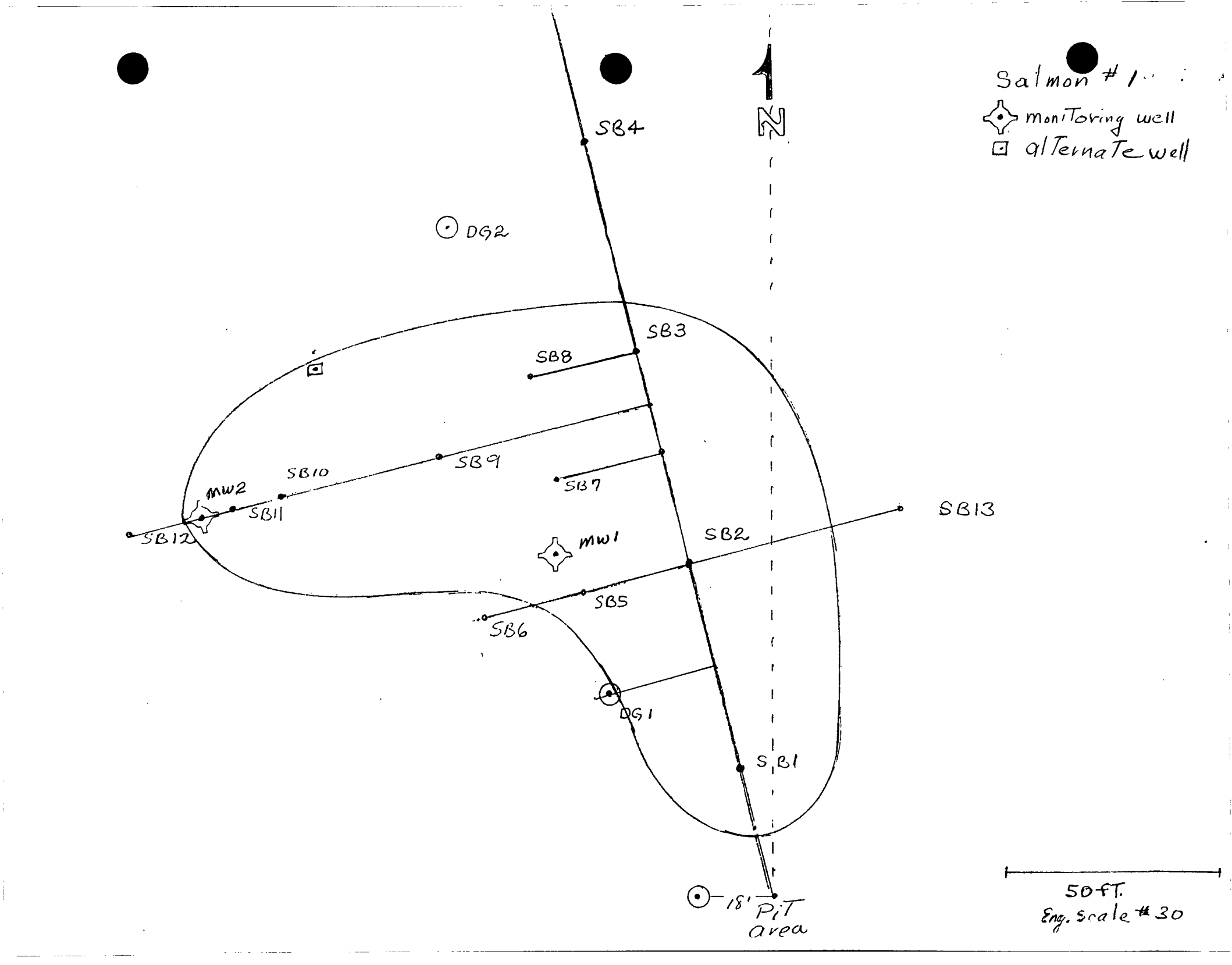
Remediation progress will be monitored by sampling water in the two new monitoring wells 1 and 2 (MW1 and MW2) for total BTEX. The monitoring schedule will be flexible and depend somewhat on the rate of cleanup. Baseline contamination levels will be established by monitoring 24 hours prior to bio-air sparging start up. Water samples will be analyzed for total BTEX. Before an individual water sample is obtained for analysis, a volume of water equal to the stagnant volume of the well must be removed from the well and the well allowed to recharge. Water samples will be obtained and analyzed using the below-listed schedule.

Initial monitoring	MW1, MW2, SAL-DG1 and SAL-UG1 (control)
One-month monitoring	MW1, MW2, and SAL-DG1
Additional monitoring[1]	MW1, MW2, and SAL-DG1 at 2-week intervals

[1] The monitoring time interval may be adjusted depending on the remediation rate of the bio-air sparging process.

The monitoring wells were placed in areas identified as the site's highest level of BTEX contamination (see Map #1 Monitoring Well Placement). In addition to using the wells for monitoring remediation progress, the well can be used for the addition of nutrients to stimulate bacterial degradation. However, at the Salmon site, we do not anticipate the need for nutrient addition.


Salmon # 1
monitoring well
N
SB4
DG2
SB3
SB8
SB9
SB10
SB7
MW2
SB11
SB12
SB13
MW1
SB2
SB5
SB6
DG1
SB1
18' Pit area
50 ft.
Eng. Scale # 30


Salmon #1
monitoring well
alternate well
N
SB4
DG2
SB3
SB8
SB9
SB10
SB7
MW2
SB11
SB12
SB13
MW1
SB2
SB5
SB6
DG1
SB1
18'
Pit
area
50ft.
Eng. scale # 30

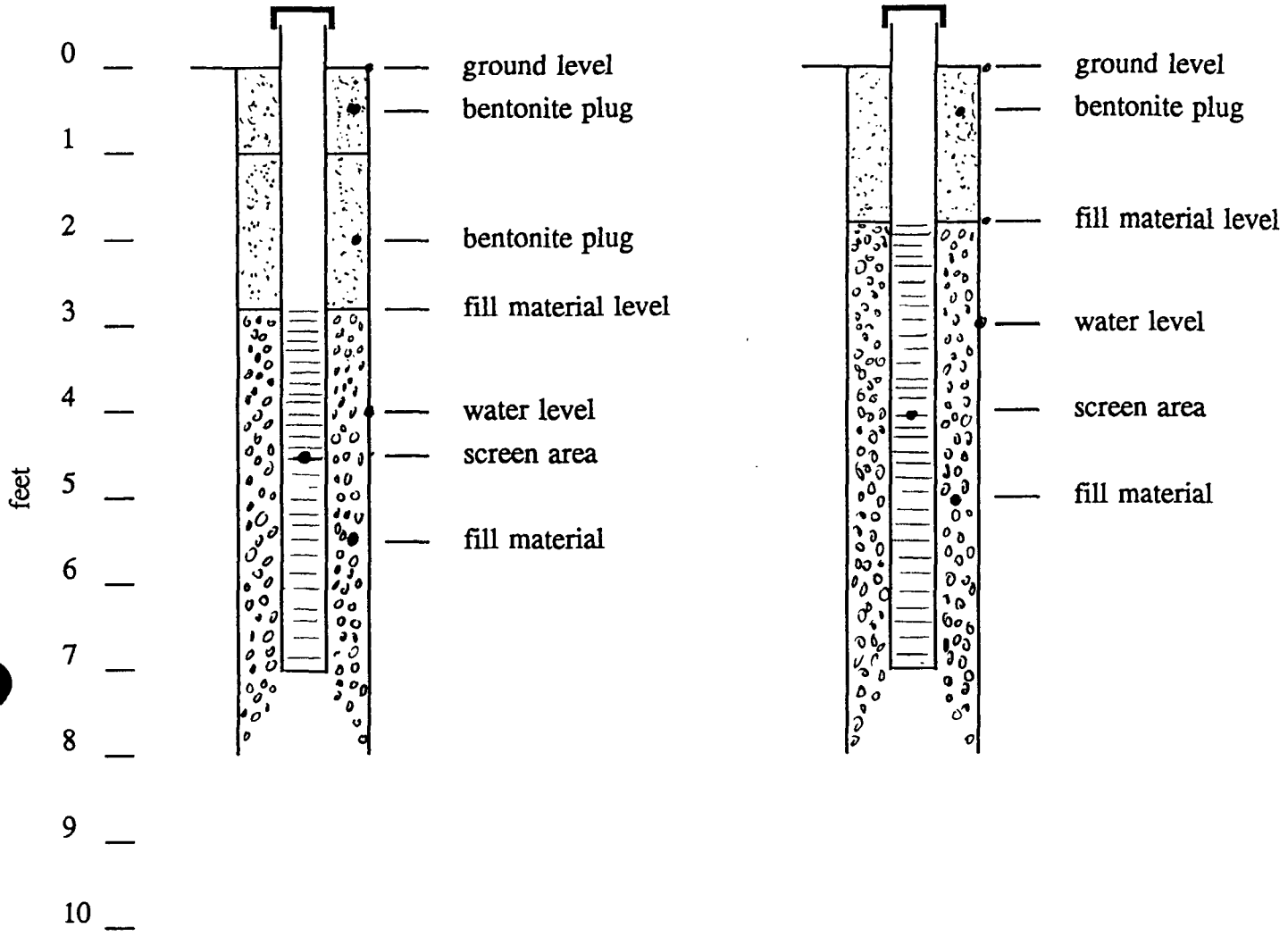
Monitoring Well Design

Monitoring wells 1 and 2 (MW1 and MW2) will be installed similarly to the procedure used to install SAL-DG1. The monitoring wells will be two inches in diameter. The well construction material is PVC with screened and unscreened sections. The screened PVC should use a 0.01-inch slotted screen (#10 slot screen). The screened section should be completed as to have 3 feet below the surface of the water table and 1 foot above the water table.

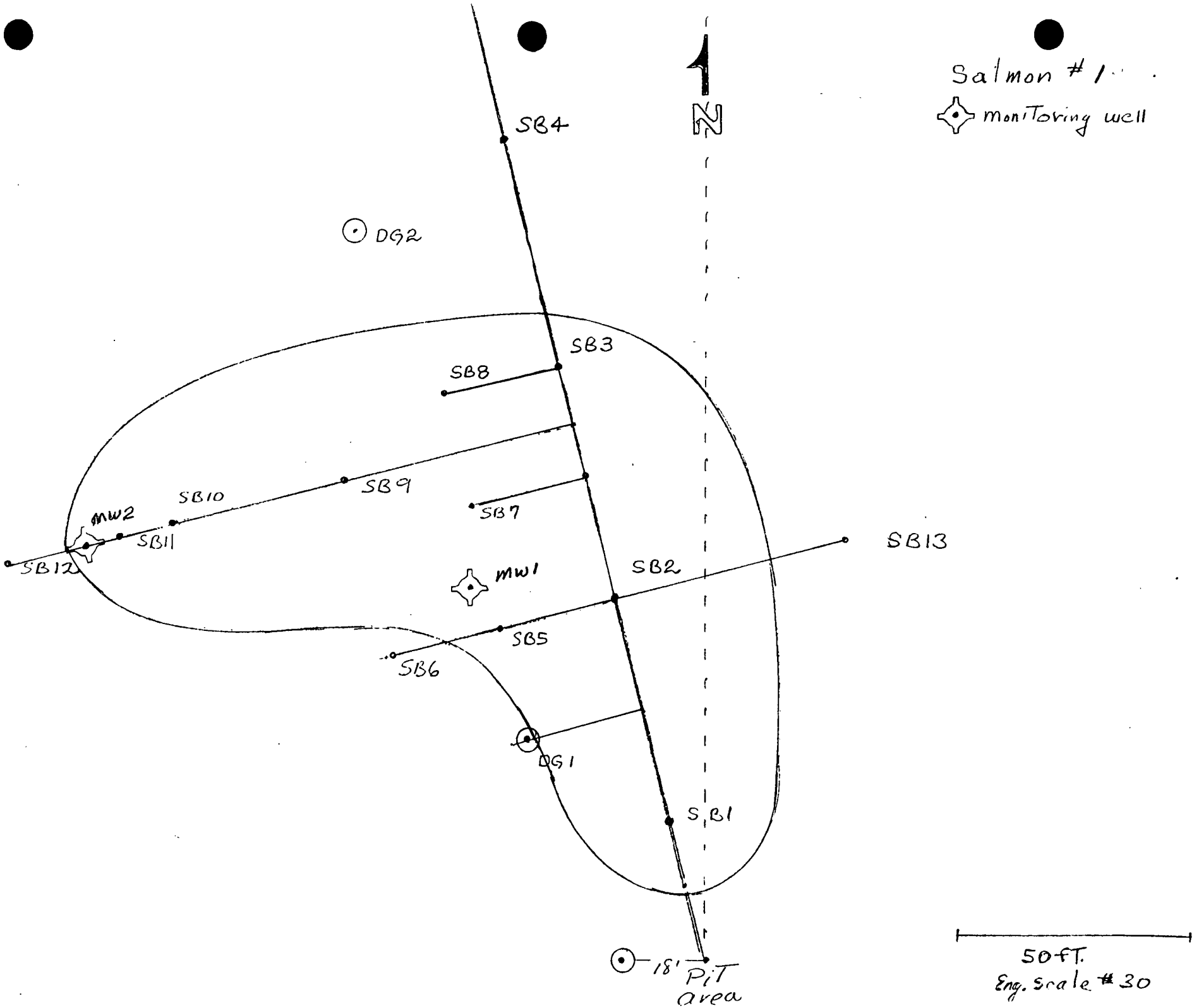
The annulus screened area of the well is completed with Colorado Environmental Spec 30 fill material 2 inches above the screened section. The fill material is secured by a 1.5-foot hydrated bentonite plug. The well is backfilled with soil and sealed to the surface with a 1-foot hydrated bentonite plug. The bentonite plugs will prevent surface-to-groundwater communication. The well can be installed using a hand auger with a 3 1/4" bit.

The PVC well riser should be completed with a screw cap for security and easy access for sampling. (See attached detailed drawings of the monitoring wells.)

Monitor Well Design



MW1 **MW2**


Salmon #1
monitoring well
N
SB4
DG2
SB3
SB8
SB9
SB10
SB7
MW2
SB11
SB12
SB13
MW1
SB2
SB5
SB6
DG1
SB1
18' Pit area
50 FT.
Eng. Scale #30

SLOT SIZE AND OPEN AREA OF PVC SCREENS

INTAKE AREA PER FOOT - .125 SPACING

SCHEDULE 40 PVC

PIPE SIZE	NUMBER OF ROWS	.006	.010	.012	.015	.018
1"	3	1.73	2.16	2.59	3.14	3.68
1 ¼"	3	1.73	2.16	2.59	3.14	3.68
1 ½"	4	3.01	3.76	4.51	5.52	6.48
2"	4	3.01	3.76	4.51	5.52	6.48
3"	6	4.51	5.64	6.77	8.28	9.72
4"	6	4.51	5.64	6.77	8.28	9.72
5"	8		7.52	9.02	11.04	12.96
6"	8		7.52	9.02	11.04	12.96
8"	8				11.04	12.96
10"	10				13.08	16.20

PIPE SIZE	NUMBER OF ROWS	.020	.025	.028	.040	.060	.125
1"	3	4.09	5.00	5.48	6.93		
1 ¼"	3	4.09	5.00	5.48	6.93		
1 ½"	4	7.20	8.80	9.63	12.16	15.36	
2"	4	7.20	8.80	9.63	12.16	15.36	23.00
3"	6	10.80	13.20	14.45	18.24	23.04	34.50
4"	6	10.80	13.20	14.45	18.24	23.04	34.50
5"	8	14.40	17.60	19.26	24.32	30.72	46.00
6"	8	14.40	17.60	19.26	24.32	30.72	46.00
8"	8	14.40	17.60	19.26	24.32	30.72	46.00
10"	10	18.00	22.00	24.08	30.40	38.40	57.50

1" and 1¼" pipe based on ¾" length of slot
Based on 1" of opening in I.D. of pipe.

Pipe sizes ½" through 18" can be slotted.

Specifications for other diameter pipe available from Big Foot Manufacturing.

Post-it® Fax Note 7671	Date 9/27/95	# of pages ▶ 1
To Al	From Lynn	
Co./Dept.	Co. Big Foot	
Phone #	Phone #	
Fax #	Fax #	

BIG FOOT IV
1490 Potthoff, P.O. Box 874, Cadillac, MI 49601
Phone 616-775-5586 Fax 800-346-2580

Well Placement and Design

A total of 7 air sparging wells (ASW) capable of achieving a 25-foot air distribution radius have been positioned to cover the contaminant site (see attached site map). The wells are numbered ASW1, ..., on the north axis. ASW7 is positioned to cover any potential BTEX moving in the down-gradient direction.

Each air sparging well is constructed of a 2-inch diameter schedule 80 pvc with a 4-foot-long well screen. The screen slot size of 0.01 inches or number 10 is recommended.

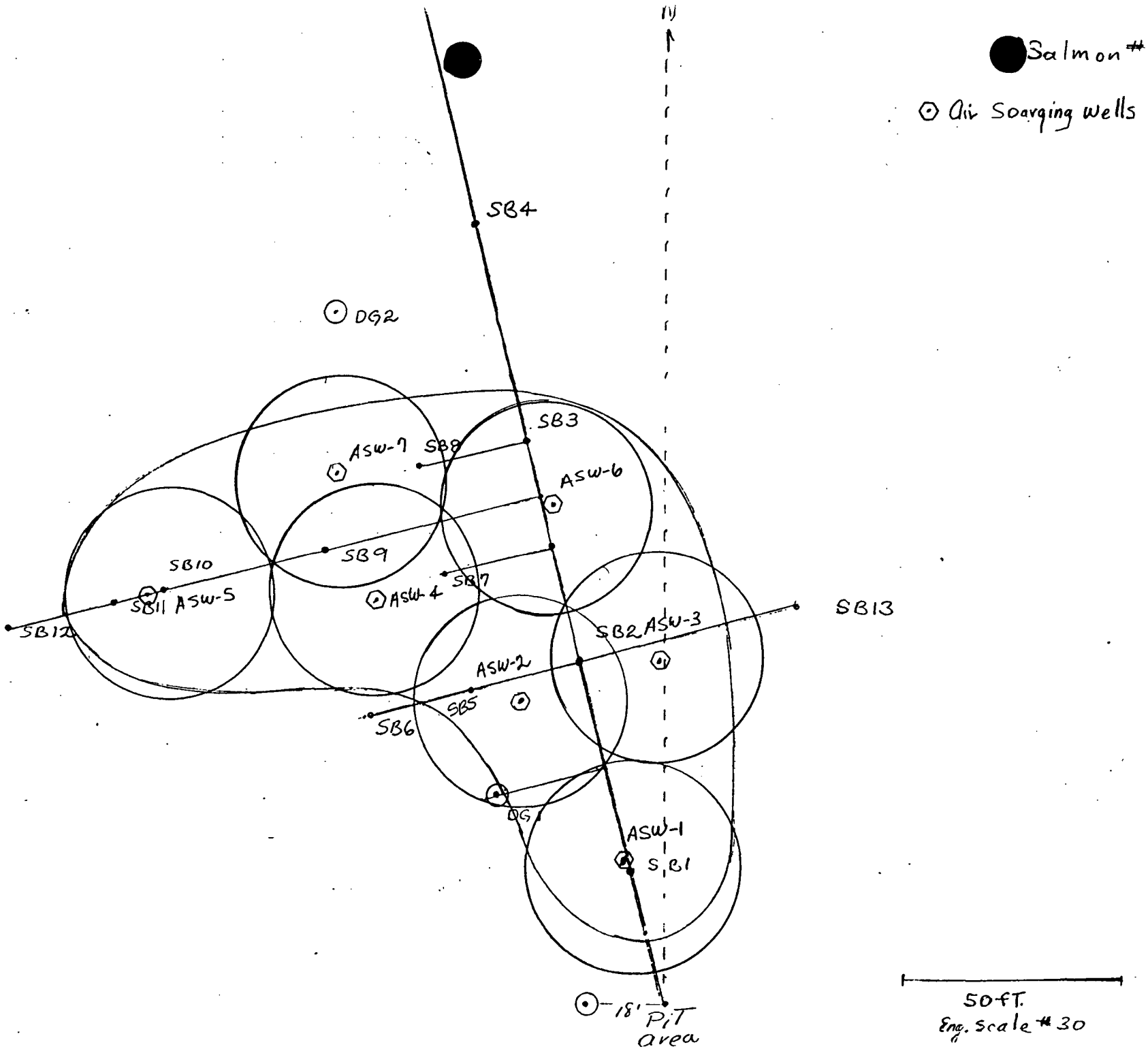
Place each well screen 5 feet below the water table surface. Each well is placed 5 feet below the water table regardless of the surface topography.

If possible, place a coarse sand pack in the screen area. Due to the presence of naturally occurring medium-to-coarse sand, the sand packing material is optional.

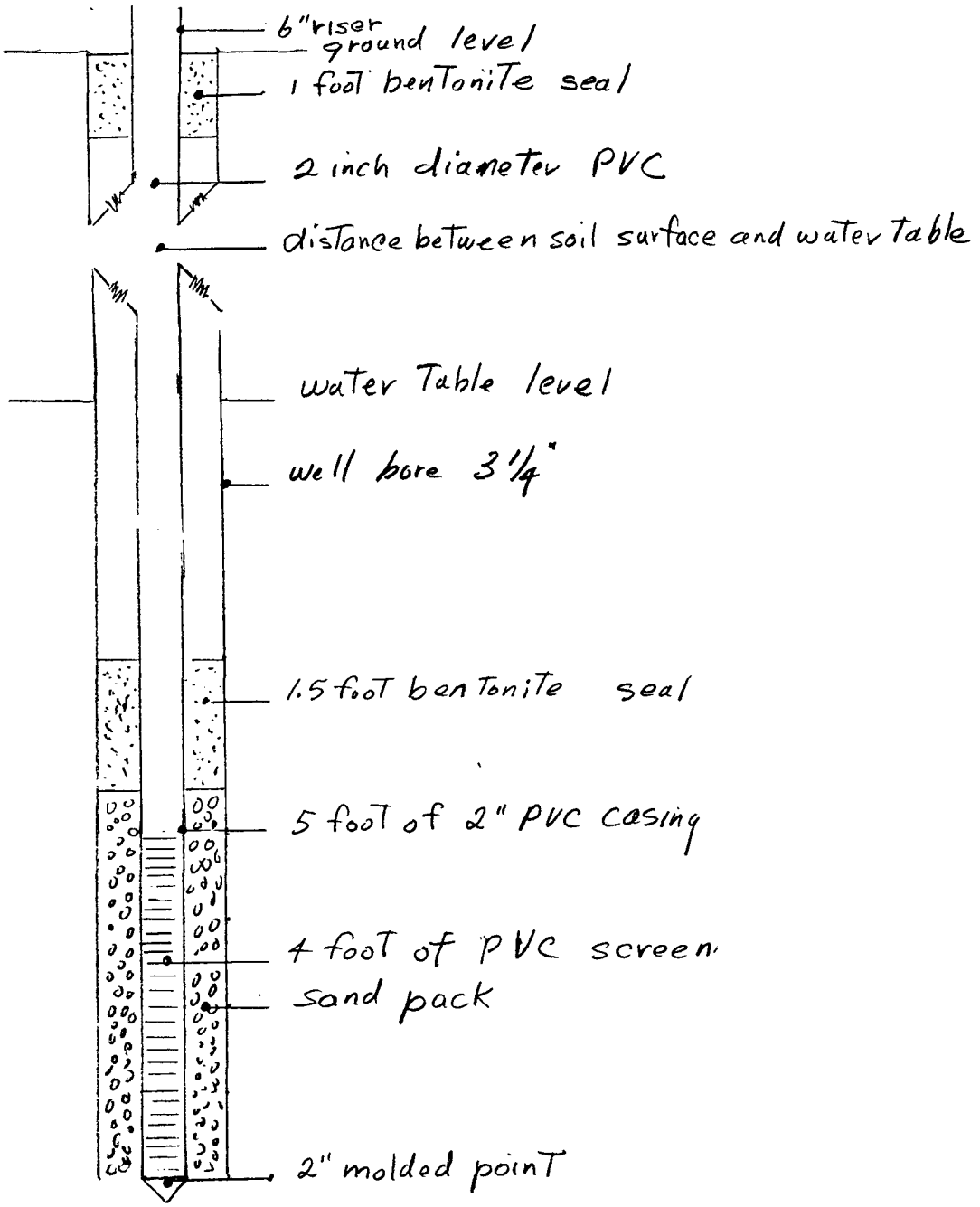
The well can be installed using a 3 1/4-inch bit size hand auger.

A 1.5-foot bentonite seal must be placed in the capillary fringe area and a 1-foot hydrated bentonite seal at ground level.

See attached well diagram for details of ASW construction.


N
Salmon #1
Air Sparging wells
SB4
DG2
SB3
ASW-7
SB8
ASW-6
SB10
SB9
SB11
ASW-5
ASW-4
SB7
SB12
SB13
SB2
ASW-3
ASW-2
SB5
SB6
DG
ASW-1
SB1
18'
Pit
area
50 ft.
Eng. scale #30

Air Sparging well



ASW lengths

Salmon #1

Well #	Screen length	Casing(1) length	Riser length
ASW-1	4'	11'	6"
ASW-2	4'	9'	6"
ASW-3	4'	8.5'	6"
ASW-4	4'	8.5'	6"
ASW-5	4'	9'	6"
ASW-6	4'	10'	6"
ASW-7	4'	9.5'	6"

(1) Casing length given for 5' casing. For 7.5 foot casings add 2.5 ft to the casing length and 5 ft. for the 10 ft. casing length.

Sparging Manifold

Sparge air from the atmosphere will be transferred through an air filter for dust and particulate removal. The air will be regulated by a 0- to 30-inch mercury vacuum gauge prior to the blower unit. Pipe material from the filter to the blower is 2" galvanized pipe. The galvanized pipe coupling with the air blower is required to withstand the possibility of high temperature generated by the blower. The 10- to 12-foot long galvanized pipe is attached to the manifold with a flexconnector. It is recommended that some type of safety protection around the air blower and galvanized piping be provided.

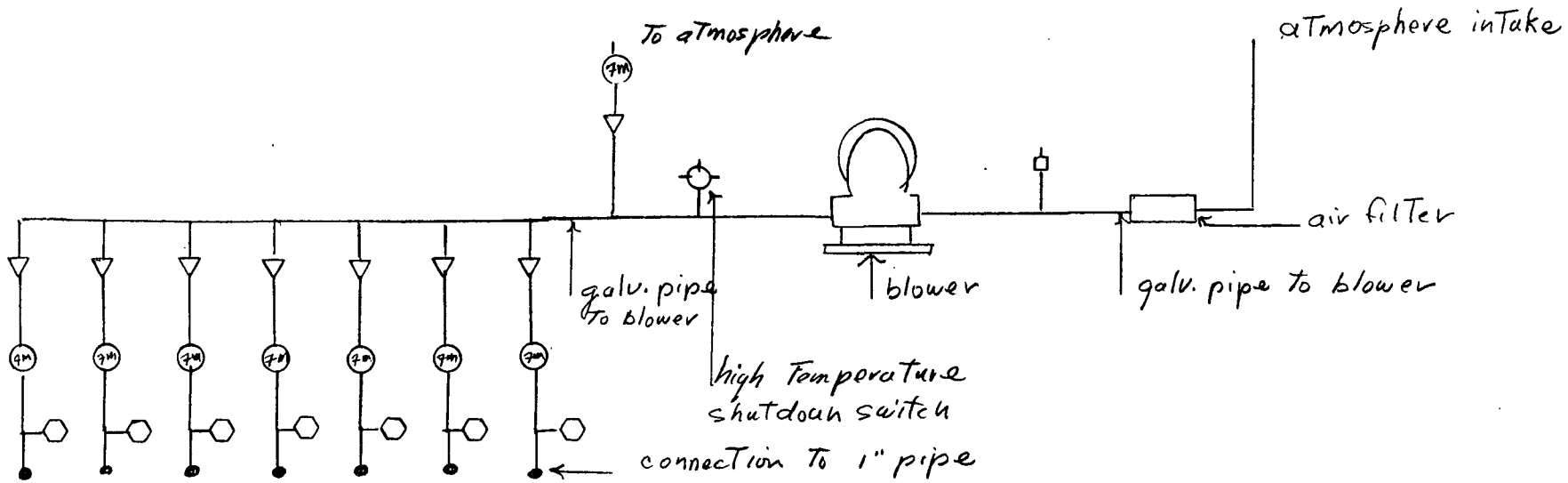
Galvanized pipe is also required from the blower to the sparging manifold. A high-temperature shut-down switch mounted on the 2-inch galvanized pipe on the exit side of the air blower is recommended. The high temperature shut-down is required to protect the blower from potentially overheating.

The sparging manifold is constructed from 2-inch SCH 80. Although an option, it is recommended that an air flow meter be used to regulate excess air to the atmosphere during operations. A Dwyer RM-123 with 3 to 30 scfm or equivalent is recommended for this service.

Air blower silencers are available, but not recommended at the Salmon lease site.

On the manifold, each ASW flow line consists of a ball valve, a 1-20 scfm flow meter and a 0-15 psi pressure gauge. In order to reduce cost of purchasing numerous flow meters and pressure gauges, the manifold can be constructed with tees and plugs. A pressure gauge and flow meter can be used on each individual well to set and check the well parameters. Once the individual wells are set, only periodical checks and adjustments are necessary. The spare air travels from the manifold to each individual well in a 1-inch diameter pipe. PVC or black polyethylene pipe can be used for the transfer lines. (See attached air sparging manifold diagrams for details.)

Sparging manifold diagram



- flow meter
- ball valve
- pressure gauge
- vacuum gauge
- To individual well head

Blowers

The air sparge blower has been designed for this application to deliver at least 40 standard cubic feet per minute (scfm) while maintaining up to 12 psi of wellhead pressure and 2 inches of mercury suction. Motors will range from 3 to 5 HP to turn the blower shaft (most are direct drive). A single-phase or three-phase motor is available depending on available power supply. The blower has been oversized to allow for variable use at future sites. ADditional options include air filter, silencer, high-temperature shut-in and relief valve.

Initial remediation will start with approximately 2 cfm. This relatively low sparging rate will minimize hydrocarbon stripping while maximizing biodegradation of the BTEX. Although not necessary, field monitoring of oxygen content in the monitoring well can assist in determining remediation progress and zone of influence.

Blower maintenance may include a change of oil and greasing the rotating shaft depending on the type of unit and maintenance manual specifications.

Remediation Parameters

The Bio-Air Sparger unit will be operated under the conditions listed below. Due to the response of the geoformation and aquifer, some adjustment may be necessary. The remediation is designed to be completed in 3 months.

Initial Startup (2 to 3 days)

Week	Duration	Flow Rate
2	2 weeks	2 scfm
4	2 weeks	3 scfm
8	4 weeks	4 scfm
9	1 week	5 scfm
11	2 weeks	4 scfm
12	1 week	final monitoring

Project Salmon #1 | Boring Well No. SB1

Location Farmington NM | Ground Elev.

Date 9-8-94 | Top of Casing Elev.

Drilling Method Hand Augure | Static Water Level(2) 6'

Bore Diameter 2 3/8" | Method

Casing No | Personnel

Screen No

Plugging Method Bentonite & Sand

Depth	Sample(4)	Method(1)	Soil Classification	(3)	(2)
1 feet			Tan Fine/Medium Sand dry		
2					
3					
4					
5	TPHV209 (Ben. 98)	OVM T-70°F	Dr. Br. Course Sand, Trace clay		
6			Bl. Course Sand, Free H_2O		
7			Bl Course Sand. clay 5%		
8	TPHV167 (Ben 79)		Bl Course Sand		
9			LT. Br. Med. Sand - No HC odor		
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

(1) OVM analysis of soil samples + 1.47 Benzene ajustment

(2) Free water depth.

(3) Total depth of Soil Boring

(4) TPHV as ppm (Benzene ≥ 0.47 ppm of OVM)

Project Salmon
Location Farmington NM
Date 9-8-94
Drilling Method Hand aqure
Bore Diameter 2 3/8
Casing No
Screen No
Plugging Method Bentonite & Sand

Boring Well No. SB2
Ground Elev.
Top of Casing Elev.
Static Water Level(2)
Method
Personnel

Depth	Sample	Method	Soil Classification	(2)
1 feet			Lt. Br. Med/Fine Sand, clay 1-2%	
2				
3			Dr. Grey Med Sand HC odor Trace, H_2O slight	
4	TVH240 (B,113)	OVM 75°	Dr. Grey Couse Sand, HC odor High	
5			Lt Grey Sand, HC odor Trace, FW	
			Lt. Grey Sand	▼
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

Project Salmon #1 | Boring Well No. SB 3

Location Farmington | Ground Elev.

Date 9-8-94 | Top of Casing Elev.

Drilling Method Hand agure | Static Water Level(2) 6.5'

Bore Diameter 2 3/8 | Method

Casing NO | Personnel

Screen NO

Plugging Method Bentonite

Depth	Sample	Method	Soil Classification	(2)
1 feet			Tan Fine/Med Sand	
2				
3				
4				
5				
6	TPHV 3	OVM 71°	LT. Grey Sand, HC odor Trace FW	
7	TPHV 5 (@ 1.4)	OVM 71°	LT. Grey Sand, FW, HC odor Trace	
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

Project Salmon #1 | Boring Well No. SB4

Location Farmington NH | Ground Elev.

Date 9-8-94 | Top of Casing Elev.

Drilling Method Hand agure | Static Water Level

Bore Diameter 2 3/8 | Method

Casing NO | Personnel

Screen NO

Plugging Method Bentonite

Depth	Sample	Method	Soil Classification
1 feet			
2			
3			clay lens 3 to 3.5'
4			
5			
6			LT. Grey course sand, clay 1-2%, HC odor No
7	TPHU-0	OVM 69°	LT Grey course Sand, clay slight ∇w HC odor NO,
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

Project Salmon #1 | Boring Well No. SB5

Location Farmington NM | Ground Elev.

Date 9-8-94 | Top of Casing Elev.

Drilling Method Hand aguer | Static Water Level 3'

Bore Diameter 2 3/8" | Method

Casing No | Personnel

Screen No

Plugging Method Bentonite

Depth	Sample	Method	Soil Classification
1 feet			
2	TPHU 386 (B 182)	OVM 77°	Dr. Grey med. Sand,
3			Dr. Grey course sand, HC odor Heavy, No clay FW
4			Dr. Gray med/course sand,
5			Dr. Gray med/course
			LT. Br. med. sand, clay 5%, HC odor LT.
7	TPHU 40 (B 19)	OVM 71°	LT Br. course sand, HC-O,
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

Project Salmon #1

Location Farmington

Date 9-8-94

Drilling Method Hand augur

Bore Diameter 2 3/4"

Casing No

Screen No

Plugging Method Bentonite

Boring Well No. SB6

Ground Elev.

Top of Casing Elev.

Static Water Level

Method

Personnel

Depth	Sample	Method	Soil Classification
1 feet			
2			
3	TPHV 0	OVM 70°	Lt Grey with black, course sand, H2O Med., Hc odor Trace
4			Lt Br Med/course sand, Hc odor NO, SW
5			
6			
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11			
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13			
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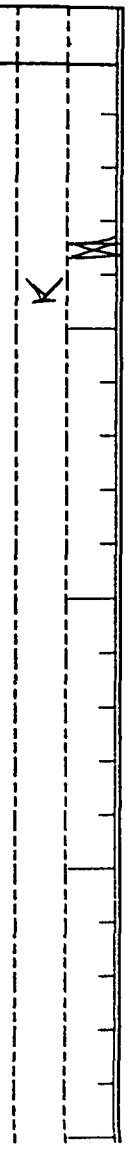
15			
16			
17			
18			
19			
20			



Project Salmon #1 | Boring Well No. SB 7
Location Farmington NH | Ground Elev.
Date 9-8-94 | Top of Casing Elev.
Drilling Method Hand agure | Static Water Level
Bore Diameter 2 3/8 | Method
Casing ND | Personnel
Screen ND
Plugging Method Bentonite

Depth	Sample	Method	Soil Classification
1 feet			Tan Fine/med Sand, Clay 5-10% - Dry
2	TPHV-340 (B,160)	OVM 78°	Grey med/course sand, Clay slight, H_2O - Med, HC odor.
3			
4	TPHV-20	OVM 74°	Dr. Grey course sand, Clay slight, H_2O
5			
6	TPHV-10	OVM 73°	Dr. Grey course sand, Clay slight. H_2O
7	TPHV 23	OVM 78°	Lt Grey course Sand, HC odor 0,
8			
9			
10			
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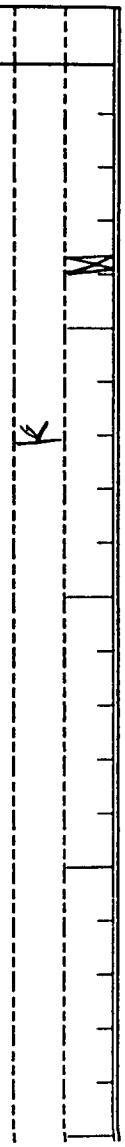
19			
20			



Project Salmon #1 | Boring Well No. SB 8

Location Farmington | Ground Elev.

Date 9-8-94 | Top of Casing Elev.

Drilling Method Hand aguve | Static Water Level 4.5'

Bore Diameter 2 3/8 | Method

Casing No | Personnel

Screen No

Plugging Method Bentonite

Depth	Sample	Method	Soil Classification
1 feet			
2			
3			
4	TPHU 41 (B,22)	OVM 78°	B1, Med. Sand, HC slight odor
5			B1, course sand, HC slight odor
	TPHU 5	OVM 72°	
7			
8			
9			
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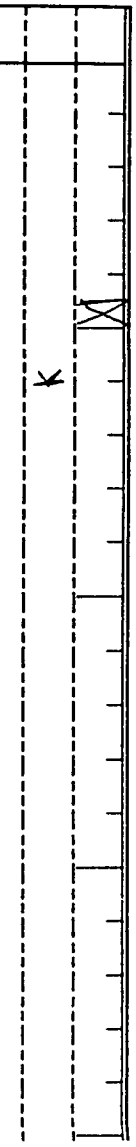
19			
20			



Project Salmon #1 | Boring Well No. SB9

Location Farmington | Ground Elev.

Date 9-8-94 | Top of Casing Elev.

Drilling Method Hand aguer | Static Water Level 4.5'

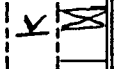
Bore Diameter 2 3/8 | Method

Casing No | Personnel

Screen No

Plugging Method Bentonite

Depth	Sample	Method	Soil Classification
1 feet			
2			
3	TPHV 664 (B 312)	OVM 74°	Dark Grey Fine/med sand, HC odor, clay 5%
4	TPHV 41	OVM 75°	Bl, Med. Sand, HC No odor, clay 5 %
5			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			



Project Salmon #1 | Boring Well No. SB 10

Location Farming Tool | Ground Elev.

Date 9-8-94 | Top of Casing Elev.

Drilling Method Hand agave | Static Water Level 4.5'

Bore Diameter 2 3/8 | Method

Casing No | Personnel

Screen No

Plugging Method Bentonite

Depth	Sample	Method	Soil Classification
1 feet			
2	TPHV344 (B,162)	OVM 72°	B1, fine/med Sand, clay 10%, HC slight Odor
3			
4	TPHV 10	OVM 69°	AT, Grey course Sand, No clay, F.W. HC No odor
5			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

Project Salmon #1 | Boring Well No. SB11

Location Farmington | Ground Elev.

Date 9-8-94 | Top of Casing Elev.

Drilling Method Hand augur | Static Water Level 3.5 (Not confirmed)

Bore Diameter 2 3/4" | Method

Casing No | Personnel

Screen No

Plugging Method Bentonite

Depth	Sample	Method	Soil Classification
1 feet			
2	TPHV 787 (B 370)	OVM 72°	Grey/Bl Med. Sand, No clay, HC odor,
3	TPHV 40	OVM 70°	Grey Med. Sand Clay 1-2%, HC odor No,
4			
5			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

Project Salmon #1 | Boring Well No. SB12

Location Farmington | Ground Elev.

Date 9-8-94 | Top of Casing Elev.

Drilling Method Hand auger | Static Water Level 3.5'

Bore Diameter 2 3/8" | Method visual

Casing No | Personnel

Screen No

Plugging Method Bentonite

Depth	Sample	Method	Soil Classification
1 feet			
2			
3	TPHV 3.5	OVM 610	Grey, Course sand, Wocky, Fw, HC odor ND,
4			HC odor ND,
5			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

Project Salmon #1 | Boring Well No. SB-13

Location Farming Tom | Ground Elev.

Date 9-8-94 | Top of Casing Elev.

Drilling Method Hand aguve | Static Water Level 5.5'

Bore Diameter 2 3/8 | Method

Casing No | Personnel

Screen No

Plugging Method Bentonite

Depth	Sample	Method	Soil Classification
1 feet			
2			
3			
4			LT, Grey med/course, clay slight,
5	TPHV 16 (B 7.5')	OVM 7.0	LT, Grey Med/course Sand, clay slight, HC odor No
			Dk, Grey med/course sand clay do, swampy / HC odor No
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

GROUNDWATER ASSESSMENT FOR THREE PRODUCTION TANK BATTERIES
SAN JUAN BASIN PRODUCTION AREA
MIDLAND DIVISION
CONOCO, INC.

Submitted to:

William C. Olson
Hydrogeologist
Environmental Bureau
New Mexico Oil Conservation Division

Prepared for:

Judy McLemore
Environmental Coordinator
Midland Division
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10 Desta Drive, Suite 100W
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September 30, 1993

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A. Introduction

In closing impoundments on state and fee lands identified in Conoco's San Juan Basin Pit Closure Plan using procedures described in guidelines issued by the New Mexico Energy, Minerals and Resources Oil Conservation Division Environmental Bureau (NMOCD), preliminary site assessments were performed. When using the ranking criteria of the guidelines, three impoundments required further assessment of oil and gas production operation impact upon localized groundwater. These further assessments were conducted by Conoco's Environmental Services Division (EvSD) with laboratory analysis performed by EvSD's compliance laboratory using EPA protocol analysis. Assessments were performed on impoundments at the following sites located in San Juan County New Mexico.

- Nye Com #1E Tank Drip Pit
- Salmon #1 Line Drip Pit
- Shepard and Kelsey #1 Dehydrator Pit

These assessments were performed on August 24, 25 and 26, 1993 by Conoco EvSD personnel Joel Wilson and Michael Boor.

B. Assessment Plan

The assessment for each site was to be performed by installing three small diameter monitoring wells at each site. One well was to be installed hydrologically downgradient from the surface impoundment with two wells installed upgradient. Each well was to be sampled using appropriate sampling methods and protocols for the following parameters.

- BTEX
- PAH (semivolatiles)
- Specific Conductance
- pH
- Temperature
- TDS

All samples were to be field screened for volatile organic compounds (field headspace analysis) using an Organic Vapor Meter (OVM). If the reading for any well was greater than 100 ppm, another well would be installed approximately 100 feet downgradient and sampled.

Following well installation a survey of the site was to be performed to horizontally locate the wells and to determine the hydraulic gradient.

Please refer to Appendix A for the complete workplan.

C. Well Installation and Sampling

All wells were installed to a depth of about three feet below the water table using a power auger or hand auger as needed. A 0.010" slotted screened PVC pipe was installed at a depth of about three feet below the water table to about three feet above the water table. Unscreened PVC casing was installed to the surface above the screened pipe. A one foot bentonite seal was placed at the surface to prevent surface water from entering the well bore. Colorado Environmental Spec 30 sand was used as the completion material to fill the annulus from the well total depth to the surface bentonite seal. After all materials were installed in each well, each bentonite seal was hydrated. All augering equipment was cleaned after the installation of each well. Construction logs for each well are detailed in Appendix B. Photographs of each well installation are included in Appendix C.

C.1. Nye Com #1E

Three wells were installed at the Nye Com #1E.

Please refer to Figure 1 and Appendices B and D for the site plot-plan, hydraulic gradient calculations and well construction logs.

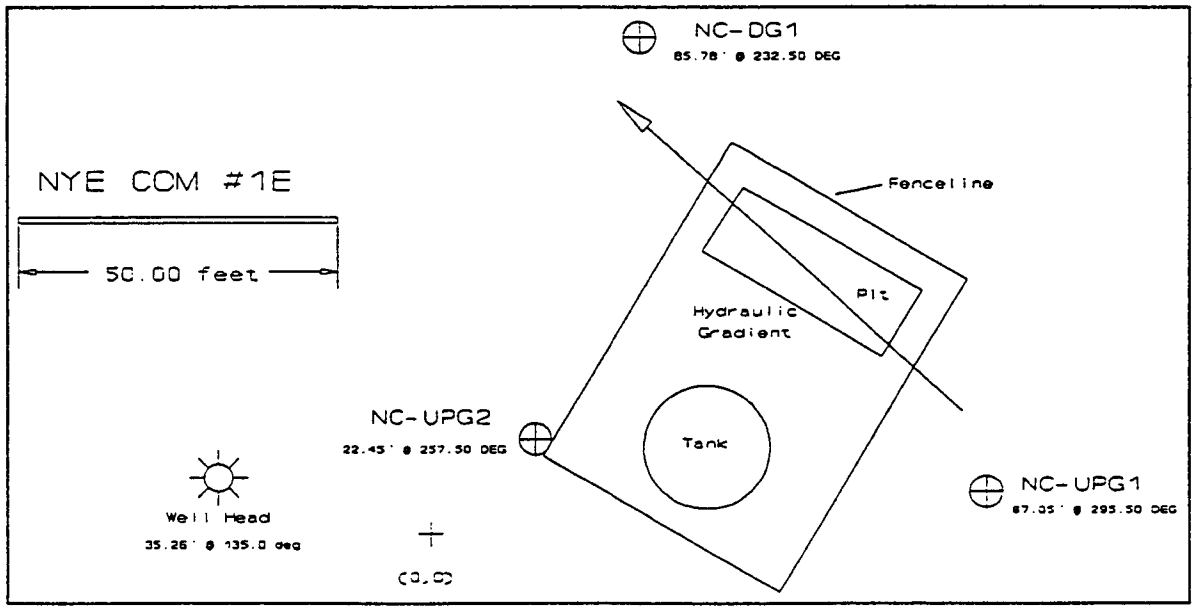


Figure 1 Nye Com #1E

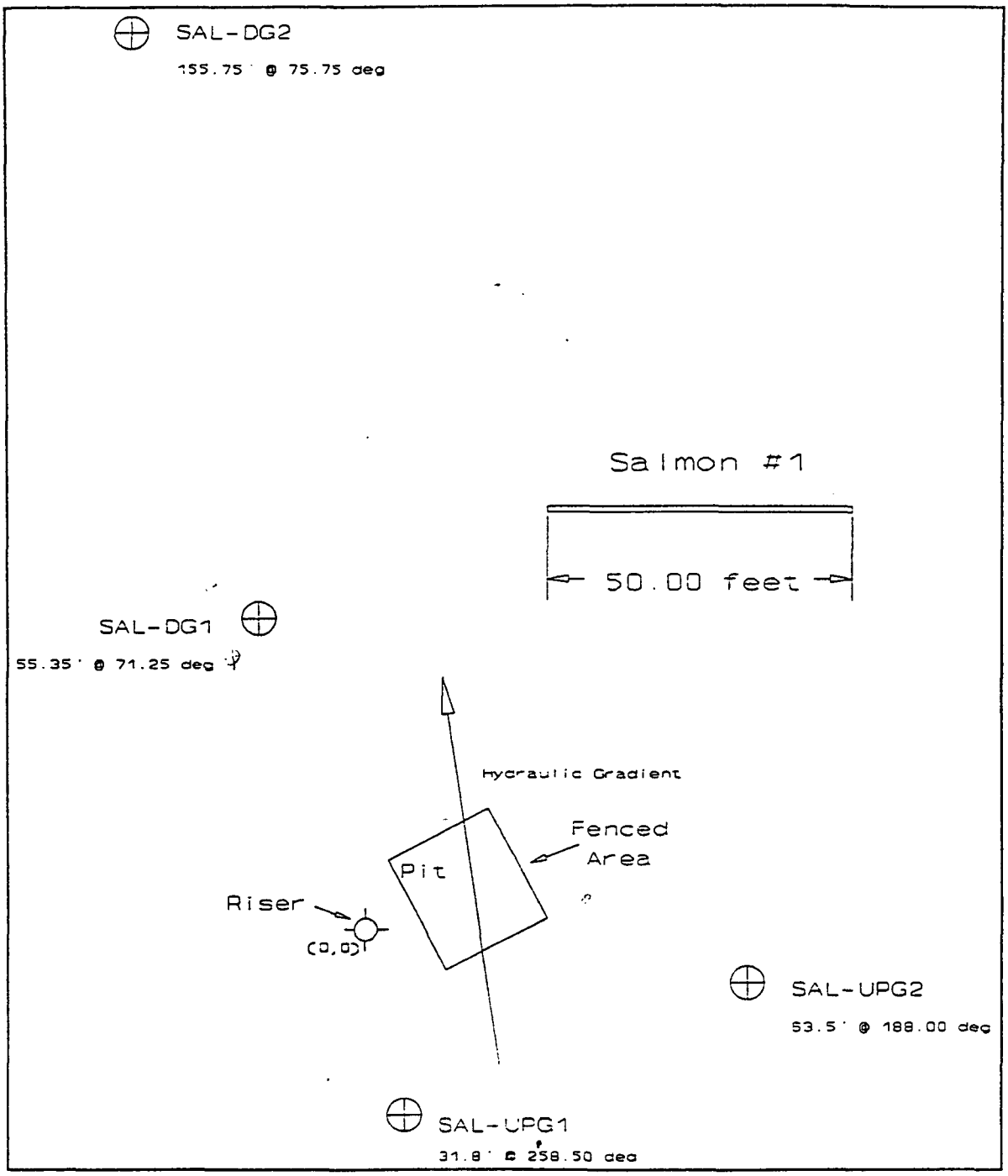


Figure 2 Salmon #1

The OVM reading for well SAL-DG1 was above 100 ppm indicating that another well should be installed farther downgradient. Well SAL-DG2 was installed approximately 100 feet

downgradient from well SAL-DG1. The OVM reading for well SAL-DG2 was less than 100 ppm and an additional downgradient well was not installed.

The following table lists the survey data of this site.

Table 3 Survey Data - Salmon #1

Well	Water Level BTOC (feet)	Well Total Depth (feet)	Riser Height above ground (inches)	Elevation of TOC (feet)	Elevation of water table (feet)
SAL-UPG1	-8.65	10.88	9	-3.98	-12.63
SAL-UPG2	-9.11	11.95	14	-3.63	-12.74
SAL-DG1	-2.62	7.67	6	-10.73	-13.35
SAL-DG2	-5.21	9.34	10	-9.45	-14.66

Note: Elevation datum is height of surveying instrument.
BTOC = Below top of casing.

The hydraulic gradient at this site is 0.009 $^{feet}/_{foot}$.

The following table lists the field gathered data for this site.

Table 4 Field Data - Salmon #1

		SA-UPG1	SA-UPG2	SA-DG1	SA-DG2
Temperature	(°C)	20.1	19.2	20.9	20.4
pH		7.48	7.63	7.84	7.56
Specific Conductance	(mmhos/cm)	1490	1620	1440	1860
Total Dissolved Solids	(mg/l)	770	824	723	932
OVM Reading	(ppm)	77	ND	172	ND

Note: Total Dissolved Solids is calculated from the Specific Conductance Measurement.
ND- Not detected.

C.3. Shepard and Kelsey #1

Three wells were installed at this site. Please refer to the following figure and Appendices B and D for the site plot-plan, hydraulic gradient calculations and well construction logs.

The following table lists the survey data for this site.

Table 5 Survey Data - Shepard and Kelsey #1

Well	Water Level BTOC (feet)	Well Total Depth (feet)	Riser Height above Ground (inches)	Elevation of TOC (feet)	Elevation of water table (feet)
SK-UPG1	-6.20	10.10	5.5	-3.58	-9.78
SK-UPG2	-5.41	10.10	7.5	-4.05	-9.46
SK-DG1	-6.35	9.05	15.0	-4.38	-10.73

Note: Elevation datum is height of surveying instrument.
BTOC = Below top of casing.

The hydraulic gradient at this site is 0.013 $^{feet}/_{foot}$.

The following table lists the field gathered data for this site.

Table 6 Field Data - Shepard and Kelsey #1

		SK-UPG1	SK-UPG2	SK-DG1
Temperature	(°C)	18.0	23.3	20.7
pH		7.46	7.53	7.53
Specific Conductance	(mmhos/cm)	2110	2290	1960
Total Dissolved Solids	(mg/l)	1098	1162	978
OVM Reading	(ppm)	ND	ND	16.6

Note: Total Dissolved Solids is calculated from the Specific Conductance Measurement.
ND- Not detected.

D. Sample Protocol

All samples were taken after at least ten well volumes of water were purged from each well. The Polynuclear Aromatic Hydrocarbon (PAH or Semi-volatile) samples were taken using a peristaltic pump. All other samples were taken using a stainless steel bailer. All samples were collected, labeled, preserved, and shipped according to EPA guidelines and accompanied by a Chain-of-Custody form. Sampling equipment was washed and triple-rinsed with deionized water between samples. Chain-of-Custody forms are included in Appendix E.

The following table lists the laboratory results for BTEX and TDS.

Table 8 Laboratory Results - BTEX and TDS

Sample #	Benzene mg/l	Toluene mg/l	Eth-Benzene mg/l	p-Xylene mg/l	m-Xylene mg/l	o-Xylene mg/l	Total Xylenes mg/l	TDS mg/l
NC-UPG1	<.003	<.003	<.003	<.003	<.003	<.003	<.009	6496
NC-UPG2	<.003	<.003	<.003	<.003	<.003	<.003	<.009	1330
NC-DG1	<.003	<.003	<.003	<.003	<.003	<.003	<.009	2915
SK-UPG1	.084	.048	.023	.012	.067	.065	.252	1500
SK-UPG2	<.003	.045	.076	<.003	<.003	<.003	<.009	1828
SK-DG1	.160	1.600	.530	1.300	3.600	1.300	6.200	1288
SAL-UPG1	.098	.052	.097	.024	.061	.025	.110	1044
SAL-UPG2	<.003	<.003	<.003	<.003	<.003	<.003	<.009	1340
SAL-DG1	8.300	12.000	<.300	.610	1.700	.660	2.970	1116
SAL-DG2	.100	<.003	<.003	<.003	<.003	<.003	<.009	1344
TRIP BLANK	<.003	<.003	<.003	<.003	<.003	<.003	<.009	<3

Notes:
"UPG" designates an upgradient well.
"DG" designates a downgradient well.
BTEX by EPA Method 8020 with preparation Method 5030.
TDS by EPA Method 160.1.
mg/l is equivalent to parts per million.
Total Xylenes is the sum of the concentrations of o-, m- and p-xylene.

All QA/QC analyte spikes and surrogate recoveries were within method specifications for the above analyses.

F. Summary

F.1. Nye Com #1E

Well NC-UPG1 was placed upgradient of the surface impoundment and well NC-DG1 was placed downgradient. No impact upon the groundwater by BTEX or PAHs was found at this location.

F.2. Salmon #1

Wells SAL-UPG1 and SAL-DG1 were about 20° from the hydraulic gradient line running directly through the surface impoundment. Well SAL-DG2 was placed downgradient. SAL-UPG2 showed no evidence of groundwater impact. Groundwater samples from well SAL-DG1 contained 8.300 and 12.000 mg/l of benzene and toluene respectively and contained 2.970 mg/l of total xylene. SAL-DG2 samples contained 0.100 mg/l of benzene. This indicates that the extent of the benzene plume is beyond the extreme downgradient well, but at a very low level.

No PAHs were found to be present at this site.

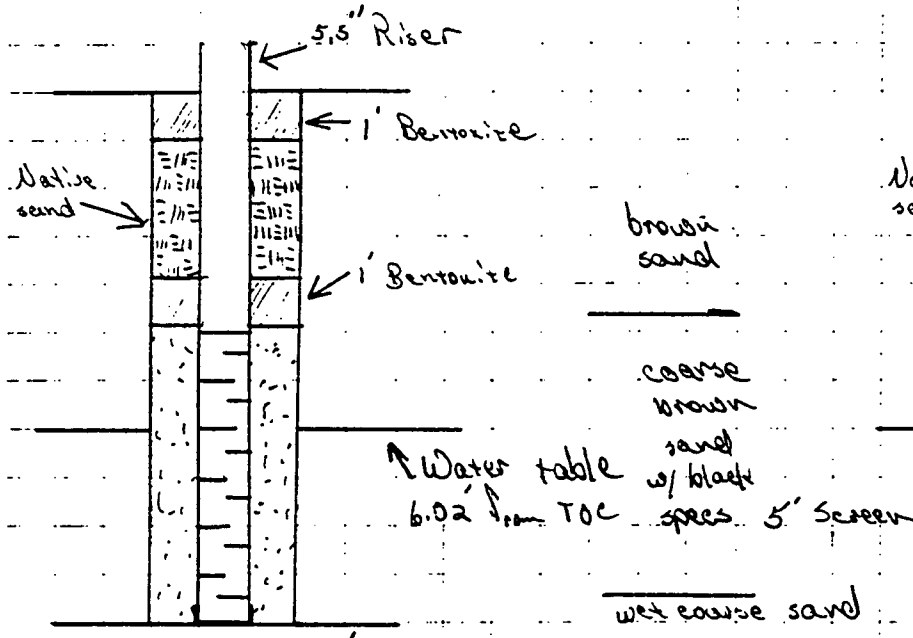
F.3. Shepard and Kelsey #1

Well SK-UPG2 was placed upgradient of the surface impoundment and well SK-DG1 was placed downgradient. SK-DG1 samples contained 0.160 and 1.600 mg/l benzene and toluene, respectively. Total xylenes for samples from well SK-DG1 at this site were 6.200 mg/l.

No PAHs were found to be present at this site.

Appendix B
Well Construction Logs
Site Plot Plans

SK-UPG1

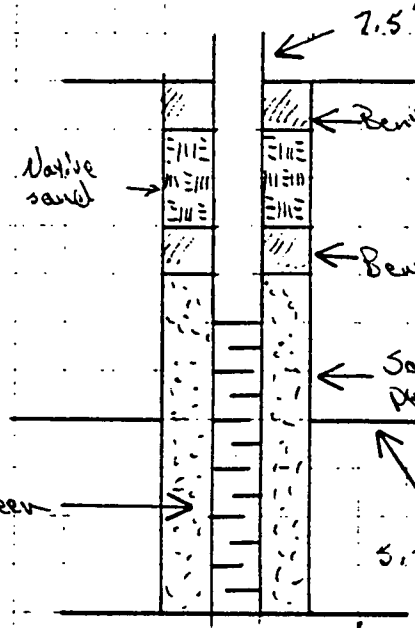


T.D. = 10.10' BTC

Material = 1" PVC w/ .010" slotted screen

Sand pack = Colorado Eng. Spec 30 sand

SK-UPA2

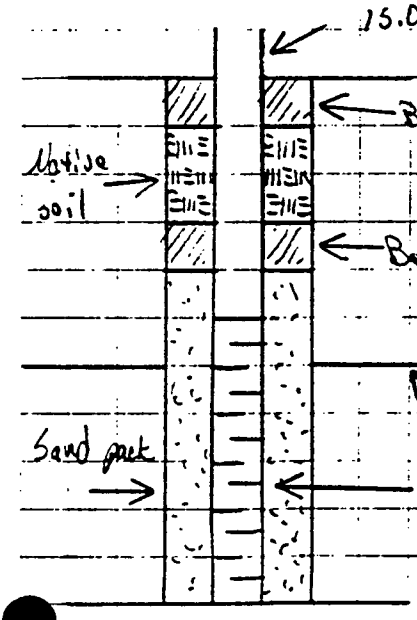


TD = 10.10' BTC

Screen length = 5'

Material = 1" PVC w/ .010" slotted screen

SK-DG1



TD = 9.05' BTC

Field data

	SK-UPG1	SK-UPA2	SK-DG1	Unit
Temp	19.0	23.3	20.2	°C
pH	7.46	7.53	7.53	
S.C.	2110	2290	1960	mS/cm
TDS	1.098	1.162	.978	g/L
DVM	ND	ND	16.6	ppm

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Date 9-10-93

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Conoco Inc.
Calculation Sheet

Title San Juan GW
Shepard & Kelsey #1

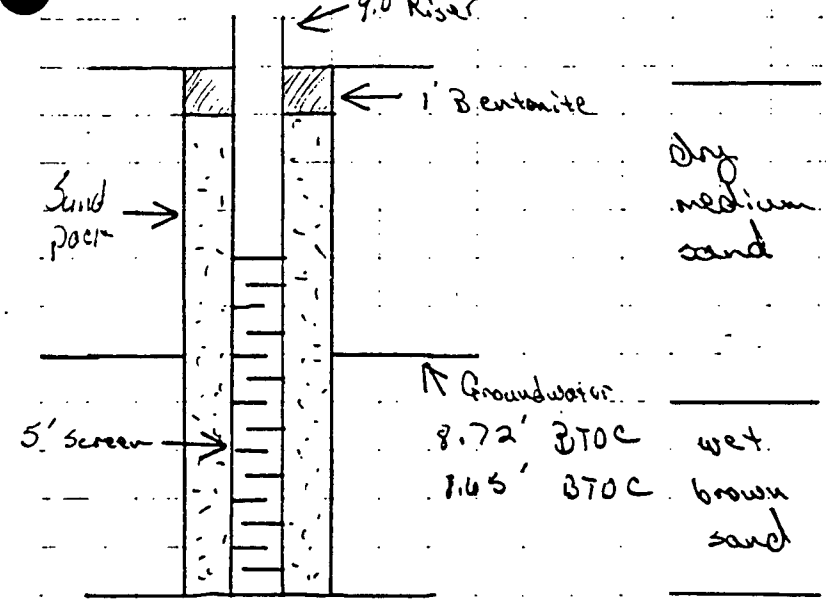
Job No.

Field San Juan

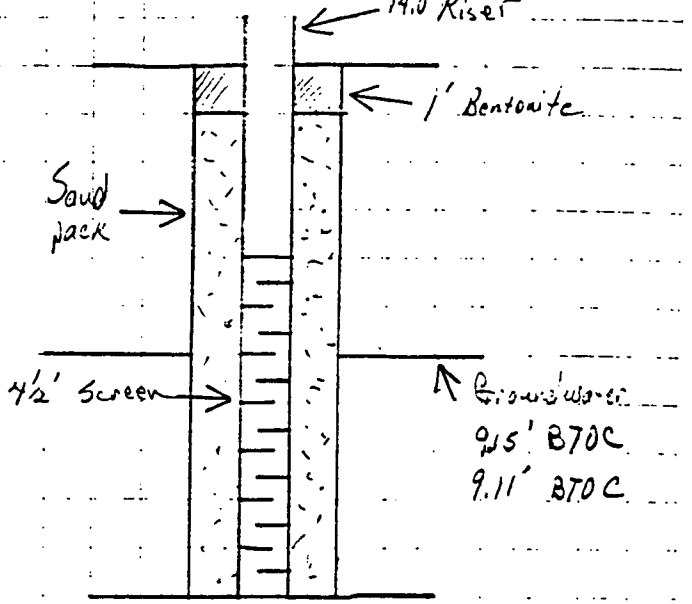
State N. M.

13-231-PB

SAL-UPG1

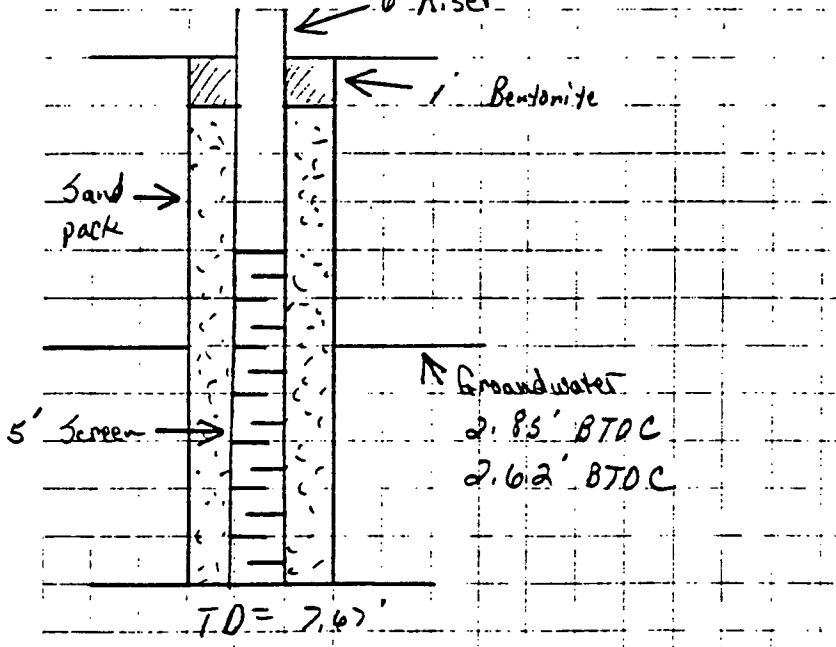


SAL-UPG2

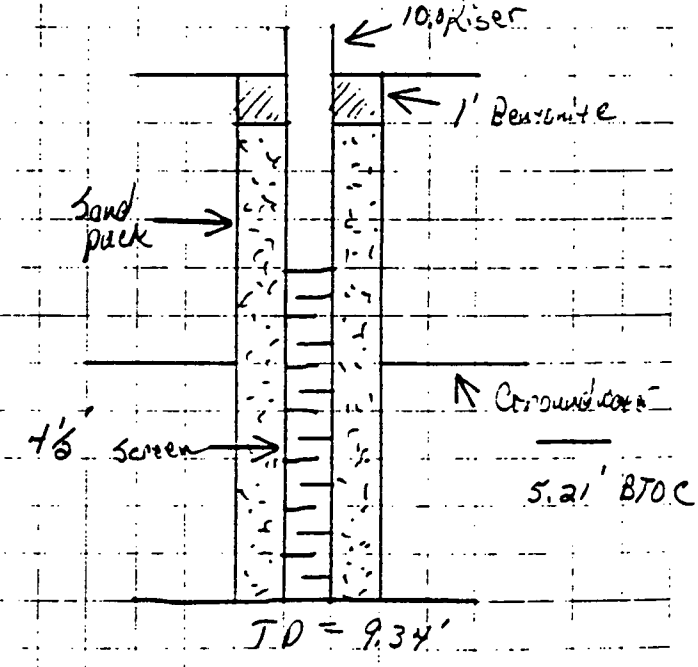


Material = 1" PVC w/ .010" slotted screen
Sand pack = C. Fnd. Spec. 30 sand

SAL - DG1



SAL-DG2



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Page 2 of 4

Conoco Inc.
Calculation Sheet

Title San Juan 6'10
Salmon #1

Job No.
Field San Juan
State NM

13-231-PB

Salmon #1

Field Data

	SAL-UPG1	SAL-UPG2	SAL-DG1	SAL-DG-2	Units
Temp	20.1	19.2	20.9	20.4	°C
pH	7.48	7.63	7.84	7.56	
S.C.	1490	1620	1440	1860	mS/cm
TDS	0.770	0.824	0.723	0.932	g/L
OVM	77	ND	172	ND	ppm

GROUNDWATER BTEX ANALYSIS

ppm

SAMPLE LOC	DATE	BENZENE	TOLUENE	E-BENZENE	XYLENES	COMMENTS
SAL-UPG1	8-26-93	.098	.052	.097	.110	
SAL-UPG1	3-28-94	ND	ND	ND	.0028	
SAL-UPG2	8-26-93	<.003	<.003	<.003	<.009	
SAL-UPG2	3-28-94	ND	ND	ND	ND	
SAL-DG1	8-26-93	8.300	12.00	<.003	2.970	
SAL-DG1	3-28-94	4.71	6.35	.0724	1.735	
SAL-DG1	8-26-94	ND	.002	.0091	.0617	
	9-01-94	.014	.0018	.0038	.006	ND - ND Soil 04 ppm
SAL-DG2	8-26-93	.100	<.003	<.003	<.009	
SAL-DG2	3-28-94	ND	ND	ND	ND	
	9-01-94	ND	ND	ND	ND	ND - ND water
SK-UPG1	8-24-93	.084	.048	.023	.252	
SK-UPG1	3-28-94	ND	ND	ND	ND	
SK-UPG2	8-24-93	<.003	.045	.076	<.009	
SK-UPG2	3-28-94	ND	ND	ND	.0004	
SK-DG1	8-24-93	.160	1.60	.530	6.20	
SK-DG1	3-28-94	.0747	3.53	.987	15.04	
SK-DG1	7-26-94	.095	.029	.44	2.67	

GW STANDARDS (mg/l): B – .01, T – .75, E – .75, X – .62, PAH – .03

	Length	Elev. @ 100			
A =	77	72	$\frac{7}{72} \cdot 77 = 7.5$	$\frac{29}{72} \cdot 77 = 28.9$	$\frac{53}{72} \cdot 77 = 61.0$
			$\frac{13}{72} \cdot 77 = 13.2$	$\frac{33}{72} \cdot 77 = 34.6$	$\frac{67}{72} \cdot 77 = 71.7$
B =	89	61	$\frac{9}{61} \cdot 89 = 8.8$	$\frac{29}{61} \cdot 89 = 37.9$	$\frac{46}{61} \cdot 89 = 67.1$
			$\frac{19}{61} \cdot 89 = 23.3$	$\frac{34}{61} \cdot 89 = 52.5$	$\frac{50}{61} \cdot 89 = 81.7$
C =	54	11	$\frac{7}{11} \cdot 54 = 34.4$		

El -9.45' TOC
WL -5.21' FTOC
-14.66

SAL-DG2
155.75' @ 75.75 deg

$\frac{31}{30} = \frac{44.2}{50}$

$x = 35.07'$

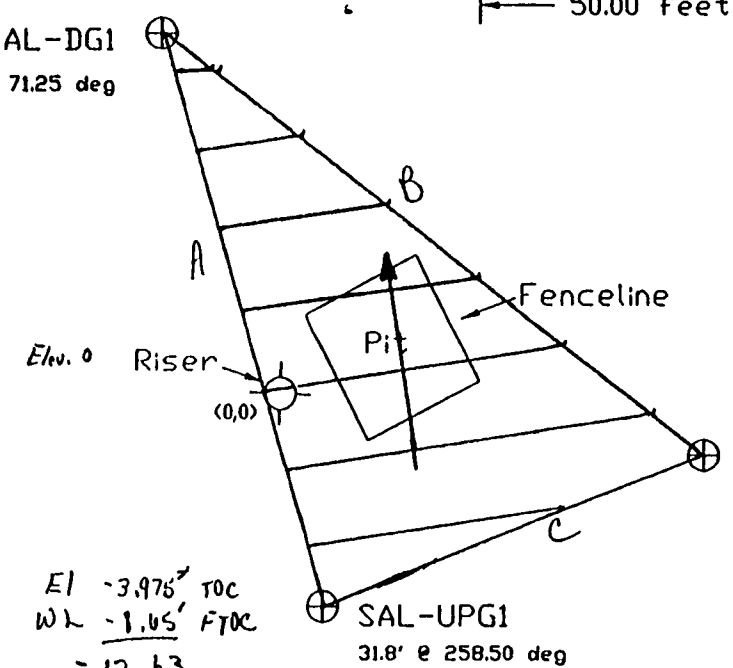
$\frac{30'}{35.07} = .009$ ft/ft

El -10.73' TOC
WL -2.62' FTOC
-13.35

SAL-DG1
55.35' @ 71.25 deg

Salmon #1

50.00 feet



SAL-UPG2
63.5' @ 188.00 deg

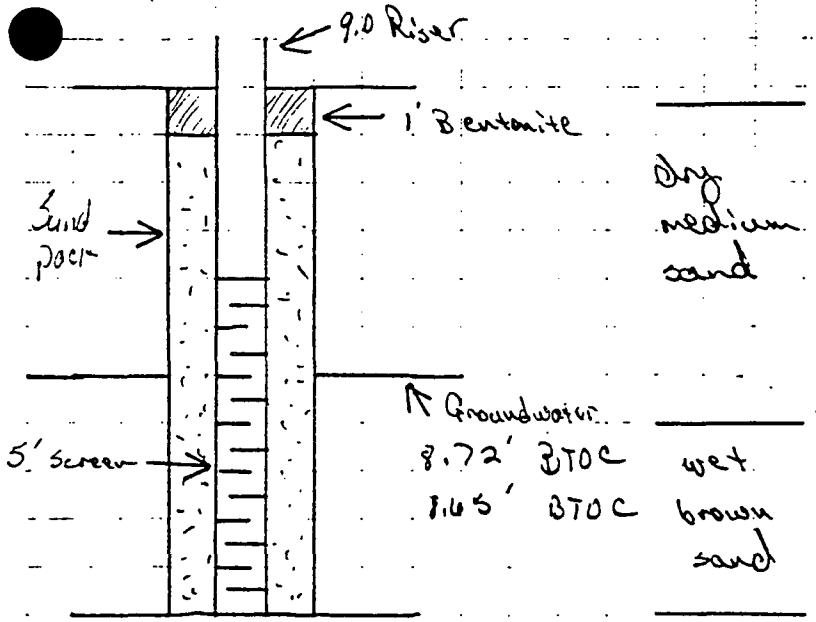
El. -3.625' TOC
WL -9.11' FTOC
-12.74

El -3.975' TOC
WL -1.65' FTOC
-12.63

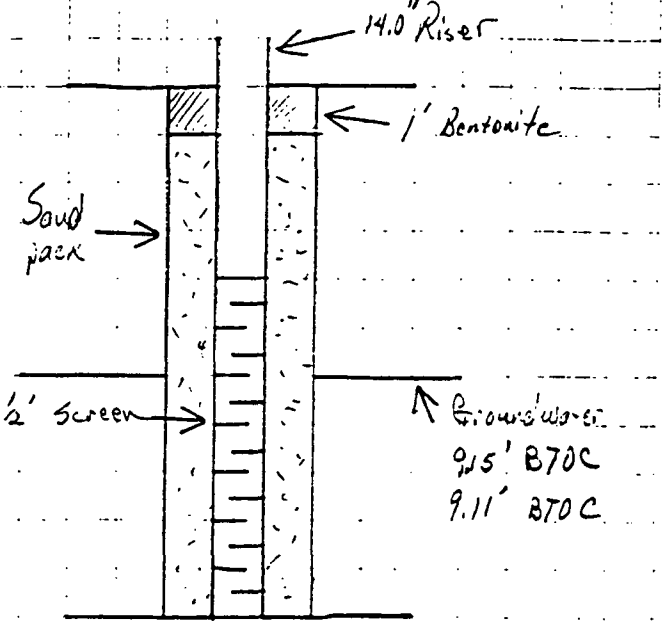
SAL-UPG1
31.8' @ 258.50 deg

SALMON.DWG

SAL-UPG1

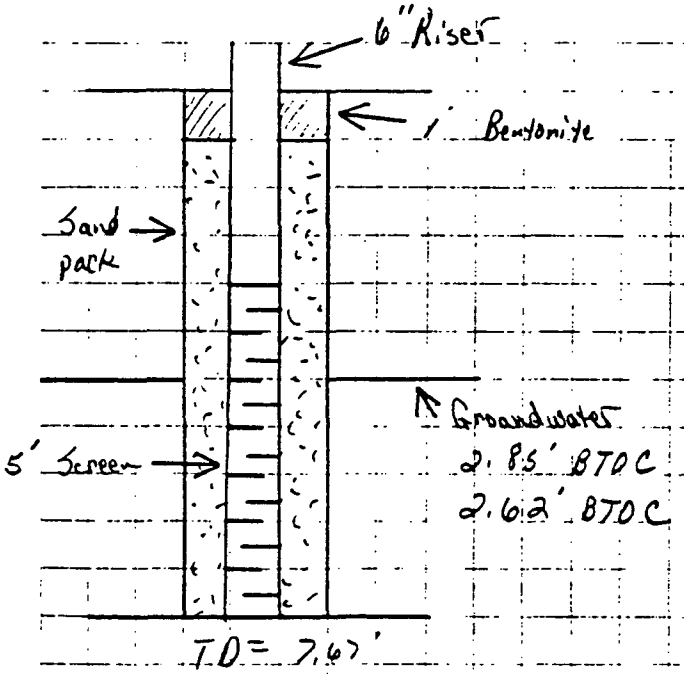


SAL-UPG2

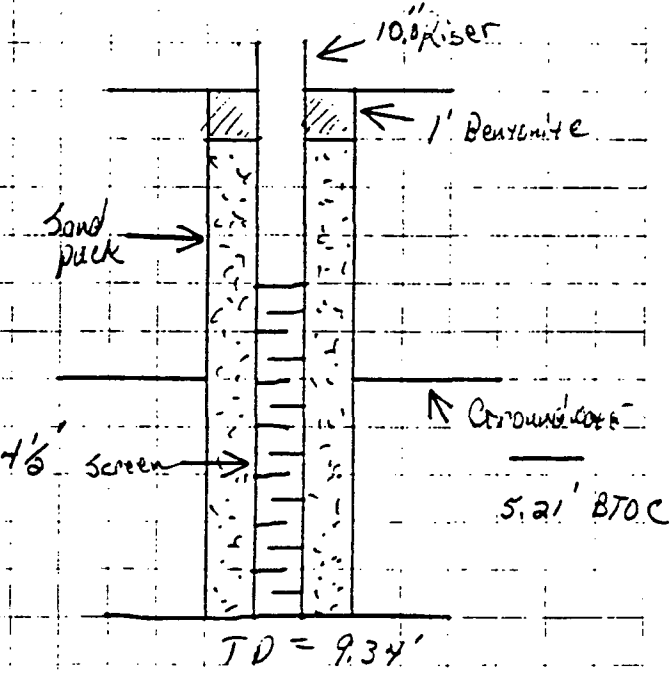


Material = 1" PVC w/ .010" slotted screen
Sand pack = C. Fnd. Sepc. 30 sand

SAL - DG1



SAL-DG2



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Date 9-10-93
Page 2 of 4

Conoco Inc.
Calculation Sheet
Title San Juan 6'10 Salmon #1

Job No.
Field San Juan
State NM

13-231-PB

Salmon #1

Field Data

	SAL-UPG1	SAL-UPG2	SAL-DG1	SAL-DG-2	Units
Temp	20.1	19.2	20.9	20.4	°C
pH	7.48	7.63	7.84	7.56	
S.C.	1480	1620	1440	1860	mS/cm
TDS	0.770	0.824	0.723	0.932	g/L
OVM	77	ND	172	ND	ppm

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Page 3 of 4

Conoco Inc.
Calculation Sheet

Title San Juan GW
Salmon #1

Job No.
Field San Juan
State NM

El -9.45' TOC
WL -5.21' FTOC
-14.66'

SAL-DG2
155.75' @ 75.75 deg

	Length	Elev. @ 100				
A =	77	72	$\frac{7}{72} \cdot 77 = 7.5$	$\frac{29}{72} \cdot 77 = 28.9$	$\frac{53}{72} \cdot 77 = 61.0$	$\frac{93}{72} \cdot 77 = 50.3$
			$\frac{17}{72} \cdot 77 = 18.2$	$\frac{32}{72} \cdot 77 = 34.6$	$\frac{67}{72} \cdot 77 = 71.7$	
B =	89	61	$\frac{6}{61} \cdot 89 = 8.8$	$\frac{26}{61} \cdot 89 = 37.9$	$\frac{46}{61} \cdot 89 = 67.1$	
			$\frac{16}{61} \cdot 89 = 23.3$	$\frac{36}{61} \cdot 89 = 52.5$	$\frac{56}{61} \cdot 89 = 81.7$	
C =	54	11	$\frac{7}{11} \cdot 54 = 34.4$			

$\frac{31}{30} = \frac{44.2}{50'}$

$x = 35.07'$

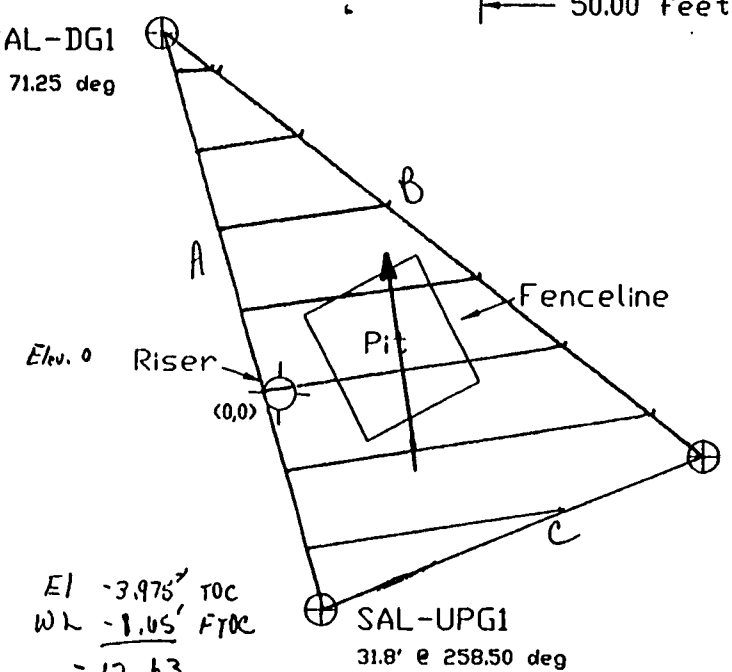
$\frac{30'}{35.07} = .009 \frac{ft}{ft}$

El -10.73' TOC
WL -2.62' FTOC
-13.35

SAL-DG1
55.35' @ 71.25 deg

Salmon #1

50.00 feet



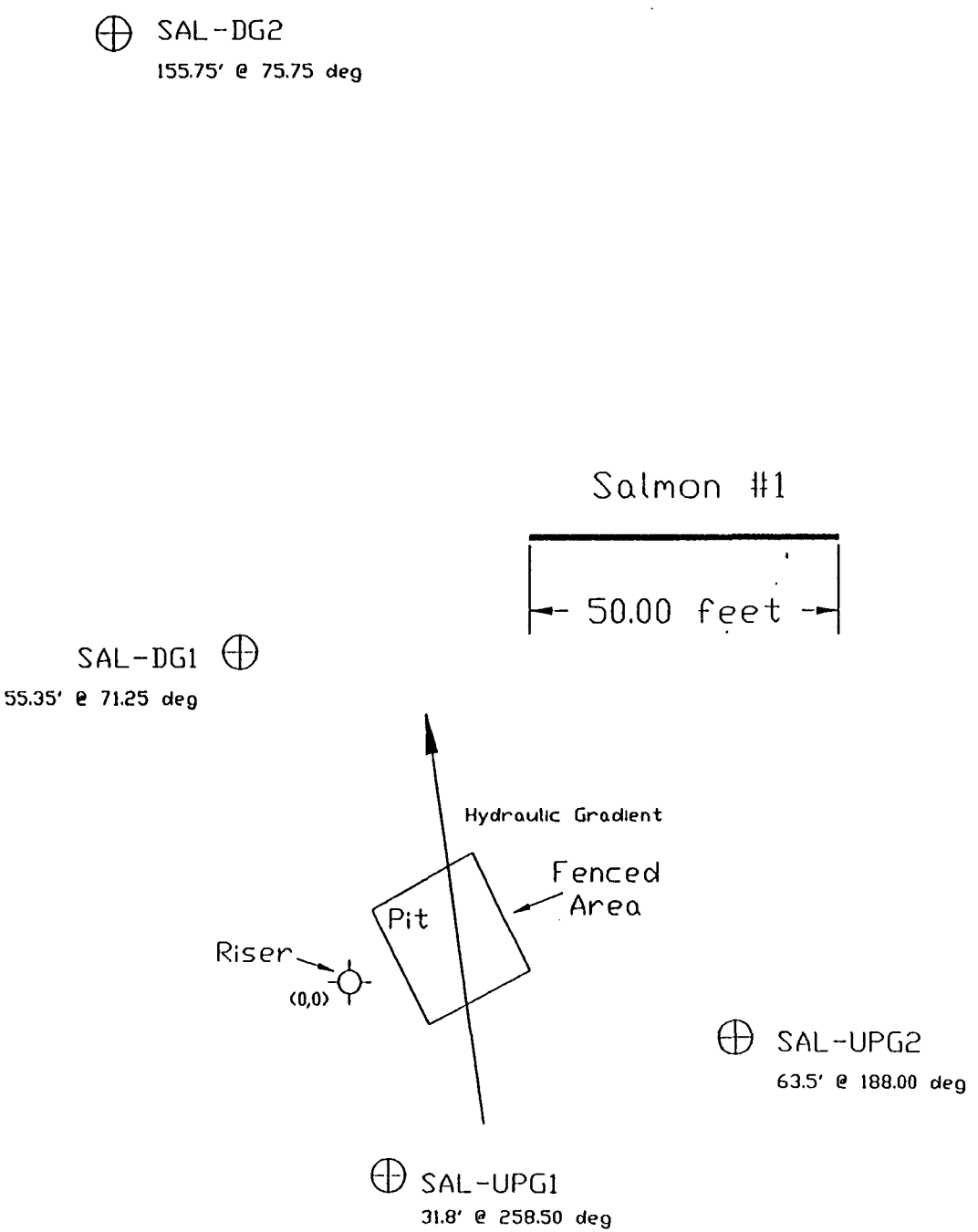
SAL-UPG2
63.5' @ 188.00 deg

El -3.625' TOC
WL -9.11 FTOC
-12.74

El -3.975' TOC
WL -9.05' FTOC
-12.63

SAL-UPG1
31.8' @ 258.50 deg

SALMON.DWG


SAL-DG2
155.75' @ 75.75 deg
Salmon #1
50.00 feet
SAL-DG1
55.35' @ 71.25 deg
Hydraulic Gradient
Fenced Area
Pit
Riser
(0,0)
SAL-UPG2
63.5' @ 188.00 deg
SAL-UPG1
31.8' @ 258.50 deg