# GW - 35

# GENERAL CORRESPONDENCE

# YEAR(S):

2007 - 1997

Martyne Kielmg

CONOCO

**Conoco Inc.**
San Juan Gas Plant
P.O. Box 217
Bloomfield, NM 87413
(505) 632-4900

March 11, 1998

Mr. Denny Foust
Oil Conservation District
Aztec Division
Aztec, NM

Dear Mr. Foust,

As per our conversation earlier this month, Conoco has completed a norm survey on the Sulfa-Clean Material that we are wanting to dispose of at the San Juan County Landfill.

The following test was performed by John Cabot, Conoco Rocky Mountain District Safety Coordinator:

The survey equipment used was a Lud-Lum Model 3 Survey Meter. The Backround Check showed a level of 4 microrem/hour and the Sulfa Clean material itself showed a level of 8 microrem/hour.

I am faxing this letter along with a Waste Generators Profile Sheet and the Analytical Data from Quanterra Labs.

If you have any questions or need to contact me please call (505)632-4905.

Thank you for your assistance.

Sincerely,

David S. Friess

NEW MEXICO ENERGY, MINERALS
& NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION
AZTEC DISTRICT OFFICE
AZTEC NM 87410
(505) 334-6178 FAX: (505) 334-6170
http:\\emnrd.state.nm.us/ocd/District III/3distric.htm

GARY E. JOHNSON
GOVERNOR

Jennifer A. Salisbury
CABINET SECRETARY

Certified Receipt #P 471 215 209

March 12, 1998

Conoco Inc
San Juan Gas Plant
Attn David Friess
PO Box 217
Bloomfield NM 87413

RE: Used Sulfa-Clean Material Generated at Arrowhead Pump Station

Dear Mr. Friess:

Based on your letter of March 11, 1998 stating your NORM testing showed a reading of 8 microrem/hour, the MSDS sheet and analytical data from Quanterra labs, the used Sulfa-Clean product may be disposed of at a public landfill without objection from the Oil Conservation Division. OCD approval does not relieve Conoco Inc. of responsibility for compliance with any other state, federal and local laws and/or regulations for disposing of waste at a public landfill.

Please feel free to contact me if you have questions.

Yours truly,

Denny G. Foust
Environmental Geologist

MAY 2001
RECEIVED
OIL CON. DIV
DIST. 3

DGF/sh

xc: DGF File
Santa Fe-Environmental Bureau

InterMountain Laboratories, Inc.
Phone (505) 326-4737 Fax (505) 325-4182
2506 West Main Street, Farmington, NM 87401

March 30, 2001

MAY 2001
RECEIVED
OIL CON. DIV
DIST. 3

Don Lostak
Conoco Inc.
P.O. Box 217
Bloomfield, NM 87413

Mr. Lostak:

Enclosed please find the reports for the sample received by our laboratory for analysis on March 9, 2001.

If you have any questions about the results of these analyses, please don't hesitate to call at your convenience.

Thank you for choosing IML for your analytical needs!

Sincerely,

Sharon Williams
Organics Lab Supervisor

Enclosure

xc: File

Inter-Mountain Laboratories, Inc.
Phone (505) 326-4737 Fax (505) 325-4182
2506 West Main Street, Farmington, NM 87401

# CONOCO, INC.

## Case Narrative

On March 9, 2001, one sample was submitted to Inter-Mountain Laboratories - Farmington for analysis. The sample was analyzed for the parameters indicated on the accompanying Chain of Custody form.

Analysis for TCLP Volatiles were performed by Method 8260, Gas Chromatography/Mass Spectrometry for Volatile Organics: "Test Methods for Evaluating Solid Waste", SW-846, U.S.E.P.A., September 1994.

TCLP Metals were performed by: "Toxicity Characteristic Leaching Procedure", Method 1311, SW-846, Rev.0, July 1992. Trace metals were performed on the sample by "Test Methods for Evaluating Solid Waste: Physical/Chemical Methods", SW-846, U.S.E.P.A., November 1986.

It is the policy of this laboratory to employ, whenever possible, preparatory and analytical methods which have been approved by regulatory agencies.

Quality control reports appear at the end of the analytical package and may be identified by title. If there are any questions regarding the information presented in this package, please feel free to call me at your convenience.

Sincerely,

Sharon Williams

Sharon Williams
Organics Lab Supervisor

# TOXICITY CHARACTERISTIC LEACHING PROCEDURE
# EPA METHOD 8260B
# VOLATILE ORGANIC COMPOUNDS BY GC/MS

| | | | |
|---|---|---|---|
| Client: | **Conoco** | Date Reported: | 03/28/01 |
| Project ID: | Conoco | Date Sampled: | 03/09/01 |
| Sample ID: | Arrowhead Pump | Date Received: | 03/12/01 |
| Laboratory ID: | 0301W01186 | Date Extracted: | 03/20/01 |
| Sample Matrix: | Soil | Date Analyzed: | 03/27/01 |

| Parameter | Analytical Result | Detection Limit | Regulatory Level | Units |
|---|---|---|---|---|
| Benzene | ND | 0.025 | 0.5 | mg/L |
| Carbon Tetrachloride | ND | 0.025 | 0.5 | mg/L |
| Chlorobenzene | ND | 0.025 | 100 | mg/L |
| Chloroform | ND | 0.025 | 6.0 | mg/L |
| 1,2-Dichloroethane | ND | 0.025 | 0.5 | mg/L |
| 1,1-Dichloroethylene | ND | 0.025 | 0.7 | mg/L |
| Methyl Ethyl Ketone (2-Butanone) | ND | 0.100 | 200 | mg/L |
| Tetrachloroethylene | ND | 0.025 | 0.7 | mg/L |
| Trichloroethylene | ND | 0.025 | 0.5 | mg/L |
| Vinyl Chloride | ND | 0.025 | 0.2 | mg/L |

ND - Compound not detected at stated Detection Limit.

| Surrogate Recovery | % | QC Limits |
|---|---|---|
| Dibromofluoromethane | 87 | 86 - 118 |
| 1,2-Dichloroethane-d4 | 90 | 80 - 120 |
| Toluene-d8 | 93 | 88 - 110 |
| 4-Bromofluorobenzene | 86 | 86 - 116 |

Reference: Test Methods for Evaluating Water, Wastewater and Solid Waste, SW-846,U.S.E.P.A., Volume IB, Revision 2, December 1996.

Reveiwed By: ______________

Analyst: ______________

Inter-Mountain Laboratories, Inc.

2506 West Main Street
Farmington, NM 87401

| | | | |
|---|---|---|---|
| **Client:** | **Conoco, Inc. Bloomfield** | **Date Reported:** | 03/22/01 |
| **Project:** | **Arrowhead Pump Station** | **Date Sampled:** | 03/09/01 |
| **Sample ID:** | 1 | **Date Received:** | 03/09/01 |
| **Lab ID:** | 0301W01185 | | |
| **Matrix:** | Soil | **Date Analyzed:** | 03/21/01 |
| **Condition:** | Cool/Intact | | |

| Parameter | Analytical Result | PQL | MCL | Units |
|---|---|---|---|---|
| **TCLP METALS - EPA METHOD 1311** | | | | |
| Arsenic | <0.1 | 0.1 | 5.0 | mg/L |
| Barium | 0.8 | 0.5 | 100 | mg/L |
| Cadmium | <0.01 | 0.01 | 1.0 | mg/L |
| Chromium | <0.02 | 0.02 | 5.0 | mg/L |
| Lead | <0.1 | 0.1 | 5.0 | mg/L |
| Mercury | <0.01 | 0.01 | 0.2 | mg/L |
| Selenium | <0.1 | 0.1 | 1.0 | mg/L |
| Silver | <0.05 | 0.05 | 5.0 | mg/L |

Reference: SW-846 - "Test Methods for Evaluating Solid Waste: Physical/Chemical Methods", United States Environmental Protection Agency, November, 1986.

Reviewed By: [signature]
William Lipps

# QUALITY CONTROL / QUALITY ASSURANCE

# Quality Control / Quality Assurance

## Spike Analysis / Blank Analysis

## TOXICITY CHARACTERISTIC LEACHING PROCEDURE

| | | | |
|---|---|---|---|
| Client: | **Conoco, Inc.** | Date Reported: | 03/30/01 |
| Project: | Conoco | Date Analyzed: | 03/20/01 |
| Sample Matrix: | Extract | Date Received: | 03/09/01 |

### Spike Analysis

| Parameter | Spike Result (mg/L) | Sample Result (mg/L) | Spike Added (mg/L) | Percent Recovery |
|---|---|---|---|---|
| **Arsenic** | 0.92 | <0.1 | 1.00 | **92%** |
| **Barium** | 0.86 | <0.5 | 1.00 | **86%** |
| **Cadmium** | 1.00 | <0.01 | 1.00 | **100%** |
| **Chromium** | 0.97 | <0.02 | 1.00 | **97%** |
| **Lead** | 0.91 | <0.1 | 1.00 | **91%** |
| **Mercury** | 0.002 | <0.01 | 0.002 | **93%** |
| **Selenium** | 0.96 | <0.1 | 1.00 | **96%** |
| **Silver** | 0.10 | <0.05 | 0.10 | **95%** |

### Method Blank Analysis

| Parameter | Result | Detection Limit | Units |
|---|---|---|---|
| **Arsenic** | **ND** | 0.1 | mg/L |
| **Barium** | **ND** | 0.5 | mg/L |
| **Cadmium** | **ND** | 0.01 | mg/L |
| **Chromium** | **ND** | 0.02 | mg/L |
| **Lead** | **ND** | 0.1 | mg/L |
| **Mercury** | **ND** | 0.01 | mg/L |
| **Selenium** | **ND** | 0.1 | mg/L |
| **Silver** | **ND** | 0.05 | mg/L |

**References:**

Method 1311: Toxicity Characteristic Leaching Procedure, SW-846, Rev. 0, July 1992.

Method 3010A: Acid Digestion of Aqueous Samples and Extracts for Total Metals, SW-846, Rev. 1, July 1992.

**Comments:**

Reported by________________ Reviewed by________________

# Quality Control / Quality Assurance

## Known Analysis

## TOXICITY CHARACTERISTIC LEACHING PROCEDURE

| | | | |
|---|---|---|---|
| Client: | **Conoco, Inc.** | Date Reported: | 03/30/01 |
| Project: | Conoco | Date Analyzed: | 03/20/01 |
| Sample Matrix: | Extract | Date Received: | 03/09/01 |

**Known Analysis**

| Parameter | Found Result | Known Result | Percent Recovery | Units |
|---|---|---|---|---|
| **Arsenic** | 1.90 | 2.00 | **95%** | mg/L |
| **Barium** | 1.82 | 2.00 | **91%** | mg/L |
| **Cadmium** | 1.84 | 2.00 | **92%** | mg/L |
| **Chromium** | 1.84 | 2.00 | **92%** | mg/L |
| **Lead** | 1.82 | 2.00 | **91%** | mg/L |
| **Mercury** | 0.002 | 0.003 | **96%** | mg/L |
| **Selenium** | 1.90 | 2.00 | **95%** | mg/L |
| **Silver** | 0.23 | 0.25 | **92%** | mg/L |

**References:**

Method 1311: Toxicity Characteristic Leaching Procedure, SW-846, Rev. 0, July 1992.

Method 3010A: Acid Digestion of Aqueous Samples and Extracts for Total Metals, SW-846, Rev. 1, July 1992.

**Comments:**

Reported by __________

Reviewed by __________

# TOXICITY CHARACTERISTIC LEACHING PROCEDURE
# EPA METHOD 8260B
# VOLATILE ORGANIC COMPOUNDS BY GC/MS

TCLP Method Blank Analysis

| | | | |
|---|---|---|---|
| Sample ID: | TCLP Method Blank | Date Reported: | 03/28/01 |
| Laboratory ID: | TMB01-079 | Date Extracted: | 03/20/01 |
| Sample Matrix: | Extraction Fluid | Date Analyzed: | 03/27/01 |

| Parameter | Analytical Result | Detection Limit | Regulatory Level | Units |
|---|---|---|---|---|
| Benzene | ND | 0.025 | 0.5 | mg/L |
| Carbon Tetrachloride | ND | 0.025 | 0.5 | mg/L |
| Chlorobenzene | ND | 0.025 | 100 | mg/L |
| Chloroform | ND | 0.025 | 6.0 | mg/L |
| 1,2-Dichloroethane | ND | 0.025 | 0.5 | mg/L |
| 1,1-Dichloroethylene | ND | 0.025 | 0.7 | mg/L |
| Methyl Ethyl Ketone (2-Butanone) | ND | 0.100 | 200 | mg/L |
| Tetrachloroethylene | ND | 0.025 | 0.7 | mg/L |
| Trichloroethylene | ND | 0.025 | 0.5 | mg/L |
| Vinyl Chloride | ND | 0.025 | 0.2 | mg/L |

ND - Compound not detected at stated Detection Limit.

| Surrogate Recovery | % | QC Limits |
|---|---|---|
| Dibromofluoromethane | 88 | 86 - 118 |
| 1,2-Dichloroethane-d4 | 90 | 80 - 120 |
| Toluene-d8 | 93 | 88 - 110 |
| 4-Bromofluorobenzene | 85* | 86 - 116 |

* - Out of Limits

Reference: Test Methods for Evaluating Water, Wastewater and Solid Waste, SW-846,U.S.E.P.A., Volume IB, Revision 2, December 1996.

Reveiwed By: ______________

Analyst: ______________

# TOXICITY CHARACTERISTIC LEACHING PROCEDURE
# EPA METHOD 8260B
# VOLATILE ORGANIC COMPOUNDS BY GC/MS
Method Blank Analysis

| | | | |
|---|---|---|---|
| Sample ID: | Method Blank | Date Reported: | 03/28/01 |
| Laboratory ID: | V3MB01-086 | Date Extracted: | NA |
| Sample Matrix: | Water | Date Analyzed: | 03/27/01 |

| Parameter | Analytical Result | Detection Limit | Regulatory Level | Units |
|---|---|---|---|---|
| Benzene | ND | 0.005 | 0.5 | mg/L |
| Carbon Tetrachloride | ND | 0.005 | 0.5 | mg/L |
| Chlorobenzene | ND | 0.005 | 100 | mg/L |
| Chloroform | ND | 0.005 | 6.0 | mg/L |
| 1,2-Dichloroethane | ND | 0.005 | 0.5 | mg/L |
| 1,1-Dichloroethylene | ND | 0.005 | 0.7 | mg/L |
| Methyl Ethyl Ketone (2-Butanone) | ND | 0.020 | 200 | mg/L |
| Tetrachloroethylene | ND | 0.005 | 0.7 | mg/L |
| Trichloroethylene | ND | 0.005 | 0.5 | mg/L |
| Vinyl Chloride | ND | 0.005 | 0.2 | mg/L |

ND - Compound not detected at stated Detection Limit.

| Surrogate Recovery | % | QC Limits |
|---|---|---|
| Dibromofluoromethane | 89 | 86 - 118 |
| 1,2-Dichloroethane-d4 | 88 | 80 - 120 |
| Toluene-d8 | 92 | 88 - 110 |
| 4-Bromofluorobenzene | 87 | 86 - 116 |

*Reference: Test Methods for Evaluating Water, Wastewater and Solid Waste, SW-846,U.S.E.P.A., Volume IB, Revision 2, December 1996.*

Reveiwed By: ____________

Analyst: ____________

# TOXICITY CHARACTERISTIC LEACHING PROCEDURE
# EPA METHOD 8260B
# VOLATILE ORGANIC COMPOUNDS BY GC/MS

Blank Spike Duplicate Analysis

Sample ID: Blank Spike Duplicate
Laboratory ID: BSD01-086
Sample Matrix: Water

Date Reported: 03/28/01
Date Extracted: NA
Date Analyzed: 03/27/01

| Parameter | Analytical Result mg/L | Spike Added mg/L | Spike Results mg/L | Spike Recovery % | Duplicate Results mg/L | Duplicate Recovery % | Relative Difference %RSD |
|---|---|---|---|---|---|---|---|
| Benzene | ND | 0.05 | 0.046 | 93 | 0.047 | 94 | 1 |
| Carbon Tetrachloride | ND | 0.05 | 0.033 | 65 | 0.037 | 75 | 13 |
| Chlorobenzene | ND | 0.05 | 0.040 | 81 | 0.043 | 86 | 6 |
| Chloroform | ND | 0.05 | 0.042 | 84 | 0.040 | 81 | 4 |
| 1,2-Dichloroethane | ND | 0.05 | 0.040 | 80 | 0.039 | 79 | 2 |
| 1,1-Dichloroethylene | ND | 0.05 | 0.035 | 70 | 0.039 | 79 | 12 |
| Tetrachloroethylene | ND | 0.05 | 0.026 | 51 | 0.037 | 74 | 36 |
| Trichloroethylene | ND | 0.05 | 0.032 | 64 | 0.037 | 75 | 16 |
| Vinyl Chloride | ND | 0.05 | 0.039 | 78 | 0.039 | 78 | 0 |

ND - Compound not detected at stated Detection Limit.

| Surrogate Recoveries | % | Duplicate % | QC Limits |
|---|---|---|---|
| Dibromofluoromethane | 91 | 88 | 86 - 118 |
| 1,2-Dichloroethane-d4 | 93 | 91 | 80 - 120 |
| Toluene-d8 | 88 | 94 | 88 - 110 |
| 4-Bromofluorobenzene | 85* | 87 | 86 - 116 |

* - Out of Limits

Reference: Test Methods for Evaluating Water, Wastewater and Solid Waste, SW-846,U.S.E.P.A., Volume IB, Revision 2, December 1996.

Reveiwed By: 

Analyst: 

Inter-Mountain Laboratories, Inc.

# CHAIN OF CUSTODY RECORD

| Client/Project Name | Project Location | ANALYSES / PARAMETERS |
|---|---|---|
| [illegible] Inc. | [illegible] Pump Station | |

| Sampler: (Signature) | Chain of Custody Tape No. |
|---|---|
| [illegible] | |

| Sample No./ Identification | Date | Time | Lab Number | Matrix | No. of Containers | [illegible] | [illegible] | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3/7 | [illegible] | [illegible] | [illegible] | 1 | ✓ | | | | |
| 2 | 3/5 | [illegible] | [illegible] | [illegible] | 1 | [illegible] | ✓ | | | |

| Relinquished by: (Signature) | Date | Time | Received by: (Signature) | Date | Time |
|---|---|---|---|---|---|
| [illegible] | 3/7 | [illegible] | | | |
| Relinquished by: (Signature) | Date | Time | Received by: (Signature) | Date | Time |
| | | | | | |
| Relinquished by: (Signature) | Date | Time | Received by laboratory: (Signature) | Date | Time |
| | | | [illegible] Williams | [illegible]/01 | [illegible] |

## Inter-Mountain Laboratories, Inc.

- ☐ 555 Absaraka, Sheridan, Wyoming 82801, Telephone (307) 674-7506
- ☐ 1633 Terra Avenue, Sheridan, Wyoming 82801, Telephone (307) 672-8945
- ☐ 1701 Phillips Circle, Gillette, Wyoming 82718, Telephone (307) 682-8945
- ☑ 2506 West Main Street, Farmington, NM 87401, Telephone (505) 326-4737
- ☐ 11183 State Hwy. 30, College Station, TX 77845, Telephone (979) 776-8945

[illegible]

Inter-Mountain Laboratories, Inc.
Phone (505) 326-4737 Fax (505) 325-4182
2506 West Main Street, Farmington, NM 87401

# CONOCO, INC.

RECEIVED
MAY 2001
OIL CON. DIV
DIST. 3

## Case Narrative

On April 27, 2001, one sample was submitted to Inter-Mountain Laboratories - Farmington for analysis. Analysis for Benzene-Toluene-Ethylbenzene-Xylenes (BTEX); Total Petroleum Hydrocarbons (TPH), was performed on the sample as per the accompanying Chain of Custody document.

BTEX analysis on the sample was performed by EPA Method 5030, Purge and Trap, and EPA Method 8021B, Aromatic Volatile Hydrocarbons, using an Tekmar LSC 2000 Purge and Trap and a Hewlett-Packard 5890 Gas Chromatograph, equipped with a photoionization detector.

The TPH sample was extracted by Method 3510, "Separatory Funnel Liquid - Liquid Extraction", with 1,1,2-trichloro 1,2,2-trifluoroethane (Freon) as the extraction solvent. Analysis was by Method 418.1, "Total Recoverable Petroleum Hydrocarbons", using a Buck Scientific Infrared Spectrophotometer.

It is the policy of this laboratory to employ, whenever possible, preparatory and analytical methods which have been approved by regulatory agencies. The methods used in the analysis of the sample reported herein are found in "Test Methods for Evaluation of Solid Waste", SW-846, USEPA, 1986 and "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, USEPA, 1983.

If there are questions regarding the information presented in this package, please feel free to contact me at your convenience.

Sincerely,

Sharon Williams

Sharon Williams
Organic Analyst/IML-Farmington

Inter-Mountain Laboratories, Inc.

2506 West Main Street
Farmington, NM 87401

| | | | |
|---|---|---|---|
| **Client:** | **Conoco, Inc.** | | |
| **Project:** | **Arrow Receiving Pump Station** | **Date Reported:** | 05/03/01 |
| **Sample ID:** | Sample 1 Spent Chemical | **Date Sampled:** | 04/21/01 |
| **Lab ID:** | 0301G02045 | **Date Received:** | 04/27/01 |
| **Matrix:** | Solid | **Date Extracted:** | N/A |
| **Condition:** | Cool/Intact | | |

| Parameter | Analytical Result | PQL | Units |
|---|---|---|---|
| **BTEX - Method 8021B** | | | |
| Benzene | <50 | 50 | ug/Kg |
| Toluene | <50 | 50 | ug/Kg |
| Ethylbenzene | <50 | 50 | ug/Kg |
| Xylenes (total) | <150 | 150 | ug/Kg |

| Quality Control - Surrogate Recovery | % | QC Limits |
|---|---|---|
| 4-Bromofluorobenzene(SUR-8021B) | 108 | 70 - 130 |
| a,a,a-Trifluorotoluene(SUR-8021B) | 103 | 70 - 130 |

Reference: Method 8021b, Volatile Organic Compounds, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, United States Environmental Protection Agency, SW-846, Volume IB.

Reviewed By: 
William Lipps

Analyst: 

Inter-Mountain Laboratories, Inc.

2506 West Main Street
Farmington, NM 87401

| | | | |
|---|---|---|---|
| **Client:** | **Conoco, Inc.** | | |
| **Project:** | **Arrow Receiving Pump Station** | **Date Reported:** | 05/03/01 |
| **Sample ID:** | Sample 1 Spent Chemical | **Date Sampled:** | 04/21/01 |
| **Lab ID:** | 0301G02045 | **Date Received:** | 04/27/01 |
| **Matrix:** | Solid | **Date Extracted:** | N/A |
| **Condition:** | Cool/Intact | **Date Analyzed:** | 05/02/01 |

| Parameter | Analytical Result | PQL | Units |
|---|---|---|---|
| **TPH - Method 418.1** | | | |
| Total Petroleum Hydrocarbons 418.1 | 76 | 20 | mg/Kg |

Reference: Method 8021b, Volatile Organic Compounds, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, United States Environmental Protection Agency, SW-846, Volume IB.

Reviewed By: ____________
William Lipps

Analyst: ____________

Inter-Mountain Laboratories, Inc.

# CHAIN OF CUSTODY RECORD

Client/Project Name: Conoco

Project Location: [illegible] Pump Station

Sampler: (Signature) [illegible]

Chain of Custody Tape No.

ANALYSES / PARAMETERS

| Sample No./ Identification | Date | Time | Lab Number | Matrix | No. of Containers | [illegible] | [illegible] | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4/26/01 | 8:30 | [illegible]2045 | Spent Chemical | 1 | ✓ | ✓ | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
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| | | | | | | | | | | |

| Relinquished by: (Signature) | Date | Time | Received by: (Signature) | Date | Time |
|---|---|---|---|---|---|
| [illegible] | 4-27 | | | | |
| [illegible] | 4-27 | 14:45 | [illegible] | | |
| | ~~Date~~ | | Received by laboratory: (Signature) [illegible] | 4/27/01 | 14:45 |

## Inter-Mountain Laboratories, Inc.

☐ 555 Absaraka, Sheridan, Wyoming 82801, Telephone (307) 674-7506

☐ 1633 Terra Avenue, Sheridan, Wyoming 82801, Telephone (307) 672-8945

☐ 1701 Phillips Circle, Gillette, Wyoming 82718, Telephone (307) 682-8945

☒ 2506 West Main Street, Farmington, NM 87401, Telephone (505) 326-4737

☐ 11183 State Hwy. 30, College Station, TX 77845, Telephone (979) 776-8945

# GENERATOR'S WASTE PROFILE SHEET

PLEASE PRINT IN INK OR TYPE

Service Agreement on File? ☐YES ☐NO | Profile Number: WMI **CD** 1349

☐Hazardous ☐Non-Hazardous ☐TSCA | Renewal Date: 10 / 9 / 2000

## A. Waste Generator Information

1. Generator Name: Conoco San Juan Gas Plant
2. SIC Code:
3. Facility Street Address: 61 CR 4900
4. Phone: (505) 632-4900
5. Facility City: Bloomfield N.M
6. State/Province:
7. Zip/Postal Code: 87413
8. Generator USEPA/Federal ID #:
9. County: San Juan
10. State/Province ID #:
11. Customer Name: Conoco
12. Customer Phone: (     )
13. Customer Contact: Don Lostak
14. Customer Fax:
15. Billing Address PO box 217 Bloomfield N.M 87413 ☐Same as above

## B. Waste Stream Information

1. **Description**
   a. Name of Waste: SulfaClean
   b. Process Generating Waste: Gas Sweetening

| c. Color | d. Strong odor (describe): | e. Physical state @ 70°F | f. Layers | g. Free liquid range |
|---|---|---|---|---|
| Black | None | ☒Solid ☐Liquid ☐Gas ☐Sludge ☐Other | ☒Single Layer ☐Multi-layer | ___ to ___ % h. pH: Range ___ to ___ % |

i. Liquid Flash Point: ☐<73°F ☐73-99°F ☐100-139°F ☐140-199°F ☐≥ 200°F ☐Not applicable

j. Chemical Composition (List all constituents [including halogenated organics, debris, and UHC's] present in any concentration and submit representative analysis):

| Constituents | Concentration Range | Constituents | Concentration Range |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

TOTAL COMPOSITION MUST EQUAL OR EXCEED 100%

k. ☐Oxidizer ☐Pyrophoric ☐Explosive ☐Radioactive ☐Carcinogen ☐Infectious ☐Shock Sensitive ☐Water Reactive

l. Does the waste represented by this profile contain any of the carcinogens which require OSHA notification? (list in Section B.1.j)........ ☐YES ☒NO

m. Does the waste represented by this profile contain dioxins? (list in Section B.1.j)........ ☐YES ☒NO

n. Does the waste represented by this profile contain asbestos?........ ☐YES ☒NO
If yes........ ☐friable ☐non-friable

o. Does the waste represented by this profile contain benzene?........ ☐YES ☒NO
If yes, concentration ________ ppm
Is the waste subject to the benzene waste operations NESHAP?........ ☐YES ☒NO

p. Is the waste subject to RCRA Subpart CC controls?........ ☐YES ☒NO
If yes, volatile organic concentration ________ ppmw

q. Does the waste contain any Class I or Class II ozone-depleting substances?........ ☐YES ☒NO

r. Does the waste contain debris? (list in Section B.1.j)........ ☐YES ☒NO

MAY 2001 RECEIVED OIL CON. DIV. DIST. 3

2. **Quantity of Waste**
Estimated Annual Volume 25 ☒Tons ☐Yards ☐Drums ☐Other (specify) ________

3. **Shipping Information**
   a. Packaging:
   ☒Bulk Solid; Type/Size: ________ ☐Bulk Liquid; Type/Size: ________
   ☐Drum; Type; Size: ________ ☐Other: ________
   b. Shipping Frequency: Units 4 Per: ☐Month ☐Quarter ☒Year ☐One time ☐Other ________
   c. Is this a U.S. Department of Transportation (USDOT) Hazardous Material? (If no, skip d, e, and f)........ ☐YES ☒NO

# GENERATOR'S WASTE PROFILE SHEET

PLEASE PRINT IN INK OR TYPE

d. Reportable Quantity (lbs.; kgs.): ________ e. Hazard Class/ID #: ________

f. USDOT Shipping Name: ________

g. Personal Protective Equipment Requirements: Cotton Gloves, Safety Glasses

h. Transporter/Transfer Station: Riley industrial / Waste management

**C. Generator's Certification** (Please check appropriate responses, sign, and date below.)

1. Is this a USEPA hazardous waste (40 CFR Part 261)? If the answer is no, skip to 2. ☐YES ☒NO
   a. If yes, identify ALL USEPA listed and characteristic waste code numbers (D, F, K, P, U) ________
   b. If a characteristic hazardous waste, do underlying hazardous constituents (UHCs) apply? (if yes, list in Section B.1.j). ☐YES ☐NO
   c. Does this waste contain debris? (if yes, list size and type in Chemical Composition - B.1.). ☐YES ☐NO
2. Is this a state hazardous waste? ☐YES ☒NO
   Identify ALL state hazardous waste codes ________
3. Is the waste from a CERCLA (40 CFR 300, Appendix B) or state mandated clean-up? ☐YES ☒NO
   If yes, attach Record of Decision (ROD), 104/106 or 122 order or court order that governs site clean-up activity. For state mandated clean-up, provide relevant documentation.
4. Does the waste represented by this waste profile sheet contain radioactive material, or is disposal regulated by the Nuclear Regulatory Commission? ☐YES ☒NO
5. Does the waste represented by this waste profile sheet contain concentrations of Polychlorinated Biphenyls (PCBs) regulated by 40 CFR 761? (if yes, list in Chemical Composition - B.1.j). ☐YES ☒NO
   a. If yes, were the PCBs imported into the U.S.? ☐YES ☐NO
6. Do the waste profile sheet and all attachments contain true and accurate descriptions of the waste material, and has all relevant information within the possession of the Generator regarding known or suspected hazards pertaining to the waste been disclosed to the Contractor? ☒YES ☐NO
7. Will all changes which occur in the character of the waste be identified by the Generator and disclosed to the Contractor prior to providing the waste to the Contractor? ☒YES ☐NO

☐Check here if a Certificate of Destruction or Disposal is required.

Any sample submitted is representative as defined in 40 CFR 261 - Appendix I or by using an equivalent method. I authorize WMI to obtain a sample from any waste shipment for purposes of recertification. If this certification is made by a broker, the undersigned signs as authorized agent of the generator and has confirmed the information contained in this Profile Sheet from information provided by the generator and additional information as it has determined to be reasonably necessary. If approved for management, Contractor has all the necessary permits and licenses for the waste that has been characterized and identified by this approved profile.

Certification Signature: David Fkiess Conoco inc Title: Maint Tech III

Name (Type or Print): David Fkiess Company Name: Conoco Date: ________

☒Check if additional information is attached. Indicate the number of attached pages ________

**D. WMI Management's Decision** **FOR WMI USE ONLY**

1. Management Method ☐Landfill ☐Non-hazardous Solidification ☐Bioremediation ☐Incineration ☐Hazardous Stabilization ☐Other (Specify) ________
2. Proposed Ultimate Management Facility: ________
3. Precautions, Special Handling Procedures, or Limitation on Approval: ________
4. Waste Form ________ 5. Source ________ 6. System Type ________

Special Waste Decision. ☐Approved ☐Disapproved

Salesperson's Signature: ________ Date: ________

Division Approval Signature (Optional): ________ Date: ________

Special Waste Approvals Person Signature: ________ Date: ________

# MATERIAL SAFETY DATA SHEET

## I. PRODUCT IDENTIFICATION

TRADE NAME: SulfaClean ™ - HC

HMIS Hazard Ratings
H: 0
F: 0
R: 0
P:

MANUFACTURER'S NAME & ADDRESS:
The SulfaTreat Company.
17998 Chesterfield Airport Rd. Suite 215
Chesterfield, MO. 63005

EMERGENCY PHONE: 1-800-726-7687 or 1-314-532-2189 FAX: 1-314-532-2764

## II. HAZARDOUS INGREDIENTS

| Chemical Names | CAS Numbers | % | Exposure Limits in Air (Units) |
|---|---|---|---|
| None | N/A | N/A | N/A |

SulfaClean contains no hazardous materials as listed by ACGIH (America Conference of Governmental Hygenists). Less than 1% of the product is a hazardous substance and less than 0.1% is carcinogenic as defined by Title 8 California Code of Regulations Section 5194.

## III. CHEMICAL & PHYSICAL PROPERTIES

| | | | |
|---|---|---|---|
| Vapor Density (Air = 1) | N/A | Melting Point or Range °F | N/A |
| Specific Gravity | 1.1 | Boiling Point or Range °F | N/A |
| Solubility in Water | 0 | Evaporation Rate (BuAcetate=1) | N/A |
| Vapor Pressure, mmHg @20 °C | 0 | VOC (EPA Method 24) | 0 |
| PH | N/A | | |
| Appearance & Odor | Black, Granular, Odorless Solid | | |

## IV. SHIPPING REGULATIONS

| | |
|---|---|
| DOT Proper Shipping Name: | N/A |
| DOT Hazard Class: | N/A |
| DOT I.D. Number: | N/A |
| DOT Hazardous Substance: | N/A |

## V. FLAMMABILITY & EXPLOSIVE PROPERTIES

Flash Point °F: N/A Auto Ignition Temperature °F: N/A
Flammability limits in Air, Volume %: LEL (Lower): N/A UEL (Upper): N/A
Fire Extinguishing Materials: N/A
Special Fire fighting Procedures: None
Unusual Fire & Explosion Hazards: None
Hazardous Products formed by Fire: None



## VI. HEALTH HAZARD INFORMATION

SYMPTOMS OF OVEREXPOSURE (for each potential route of exposure)

Inhalation: Overexposure to dust may irritate the nasal passage,
Eyes: May cause eye irritation similar to dust.
Skin: Contact with skin has no effect.
Absorbed through skin: None Swallowed: None

## HEALTH EFFECTS OR RISKS FROM EXPOSURE:

Acute: No acute effects to health are known. Not toxic.
$LD_{50}$ greater than 3990 mg.kg (Highest practical test level).

Chronic: No chronic effects to health known.

## FIRST AID: EMERGENCY PROCEDURES

Eye Contact: Flush with water Skin Contact: None Ingestion: None

Inhalation: None

## SUSPECTED CANCER AGENT:

NO - This product's ingredients are not found in the lists below.

OSHA, NTP or IARC.

## MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

None Known.

## TOXIC SUBSTANCES CONTROL ACT (TSCA):

All ingredients are not required to be listed on the TSCA inventory.

## VII. REACTIVITY DATA

Stability: Stable: X Unstable:
Conditions to Avoid: N/A Incompatibility (Materials to avoid): N/A
Hazardous decomposition products (including combustion products): None
Hazardous polymerization: Will not occur.

## VIII. SPILL, LEAK & DISPOSAL PROCEDURES

Spill Response Procedures (include employee protection measures):
*No special procedures required.*
Preparing Waste for Disposal (container types, neutralization, etc.)
No special procedures required.
Recommended Methods of Disposal:
Dispose of all wastes in accordance with Federal, State & Local regulations.

## IX. SPECIAL HANDLING INFORMATION

Ventilation & Engineering Controls: No Special Requirements.
Respiratory Protection (type): NIOSH/MSHA approved dust mask (TC-21C-132).
Eye Protection: None required. Gloves (specify material): None required.
Other Clothing & Equipment: No special requirements.
Work Practices, Hygienic Practices: No special requirements.
Other Handling & Storage Requirements: No special requirements.
Protective measures during maintenance of contaminated equipment: N/A

## X. PREPARATION INFORMATION

Revision Date: May 20, 1997

**Certificate of Analysis**

Quanterra Incorporated
5307 Industrial Oaks Boulevard, Suite 160
Austin, Texas 78735

512 892-6684 Direct
512 892-6652 Fax

**Quanterra**
Environmental Services

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Environmental Bureau
Oil Conservation Division

# ANALYTICAL REPORT

San Juan Gas Plant
Lot#: I6G120107

Chris Hansen Room #HU 3006

Conoco Inc.

QUANTERRA INCORPORATED

Chris J. Schepcoff
Project Manager

July 24, 1996

Quanterra
Environmental Services

# EXECUTIVE SUMMARY - Detection Highlights

I6G120107

| PARAMETER | RESULT | REPORTING LIMIT | UNIT | METHOD |
|---|---|---|---|---|
| **SAN JUAN AMINE WASHER WATER 07/08/96 00:00** | | | | |
| Chromium | 2.2 | 0.10 | mg/L | SW846 6010A |
| Flashpoint | >150 | >150 | deg F | SW846 1010 |
| pH (liquid) | 4.1 | 0.10 | No Units | MCAWW 150.1 |
| Total Solids (Residue) | 75000 | 10 | mg/L | MCAWW 160.3 |

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# ANALYTICAL METHODS SUMMARY

I6G120107

| PARAMETER | METHOD |
|---|---|
| pH (Electrometric) | MCAWW 150.1 |
| Inductively Coupled Plasma (ICP) Metals | SW846 6010A |
| Mercury in Liquid Waste (Manual Cold-Vapor) | SW846 7470 |
| Pensky-Martens Method for Determining Ignitability | SW846 1010 |
| Reactive Cyanide | SW846 7.3.3 |
| Reactive Sulfide | SW846 7.3.4 |
| Total Residue (TS) | MCAWW 160.3 |
| Volatile Organics by GC/MS | SW846 8240A |

**References:**


MCAWW "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, March 1983 and subsequent revisions.

SW846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 and its updates.

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# METHOD / ANALYST SUMMARY

I6G120107

| ANALYTICAL METHOD | ANALYST | ID # |
|---|---|---|
| MCAWW 150.1 | Jay Harris | 060505 |
| MCAWW 160.3 | Jay Harris | 060505 |
| SW846 1010 | Jay Harris | 060505 |
| SW846 6010A | Scott Butler | 010399 |
| SW846 7.3.3 | Jay Harris | 060505 |
| SW846 7.3.4 | Jay Harris | 060505 |
| SW846 7470 | Todd Marion | 026009 |
| SW846 8240A | Sam Bivone | 011612 |

**References:**

MCAWW "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, March 1983 and subsequent revisions.

SW846 "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 and its updates.

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# QC DATA ASSOCIATION SUMMARY

Sample Preparation and Analysis Control Numbers

| Lot#-Sample# | Matrix | Method | Pgm Code | Leach Batch# | QC Batch Number | MS Run Number |
|---|---|---|---|---|---|---|
| I6G110105-001 | WATER | MCAWW 245.1 | 03 | | 6197166 | 6197035 |
| | WATER | SW846 1010 | 01 | | 6200111 | 6200005 |
| | WATER | MCAWW 150.1 | 01 | | 6197132 | 6197016 |
| | WATER | MCAWW 160.3 | 01 | | 6198195 | 6198056 |
| | WATER | SW846 6010A | 01 | | 6197182 | 6197048 |
| | WATER | SW846 7470 | 01 | | 6197166 | 6197035 |
| | WATER | SW846 8240A | 01 | | 6200138 | 6205027 |
| | WATER | SW846 7.3.3 | 01 | | 6198108 | 6198002 |
| | WATER | SW846 7.3.4 | 01 | | 6198110 | 6198004 |
| I6G120161-003 | WATER | MCAWW 200.7 | 01 | | 6197182 | 6197048 |
| | WATER | MCAWW 239.2 | 01 | | 6197182 | 6197048 |
| | WATER | SW846 6010A | 01 | | 6197182 | 6197048 |
| I6G160116-001 | WATER | SW846 8240B | 01 | | 6200138 | 6205027 |

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# SAMPLE SUMMARY

The analytical results of the samples listed below are presented on the following pages.

| WO # | LOT-SAMPLE # | SAMPLE IDENTIFICATION | DATE/TIME SAMPLED |
|---|---|---|---|
| C4R4P | I6G120107-001 | SAN JUAN AMINE WASHER WATER | 07/08/96 00:00 |

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CONOCO INC.

Client Sample ID: SAN JUAN AMINE WASHER WATER

GC/MS Volatiles

Lot-Sample #.: I6G120107 - 001
Work Order #.: C4R4P107
Matrix.......: WATER
Date Sampled.: 07/08/96 00:00
Date Received: 07/10/96 09:18
Prep Date....: 07/17/96
Analysis Date: 07/22/96
Prep Batch #.: 6200138
MS Run #.....: 6205027
Dilution Fact: 1
Percent Moist:

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD |
|---|---|---|---|---|
| Benzene | ND | 0.050 | mg/L | SW846 8240A |
| Carbon tetrachloride | ND | 0.050 | mg/L | SW846 8240A |
| Chlorobenzene | ND | 0.050 | mg/L | SW846 8240A |
| Chloroform | ND | 0.050 | mg/L | SW846 8240A |
| 1,2-Dichloroethane | ND | 0.050 | mg/L | SW846 8240A |
| 1,1-Dichloroethylene | ND | 0.050 | mg/L | SW846 8240A |
| Methyl ethyl ketone | ND | 0.20 | mg/L | SW846 8240A |
| Tetrachloroethylene | ND | 0.050 | mg/L | SW846 8240A |
| Trichloroethylene | ND | 0.050 | mg/L | SW846 8240A |
| Vinyl chloride | ND | 0.10 | mg/L | SW846 8240A |

| SURROGATE | PERCENT RECOVERY | RECOVERY LIMITS |
|---|---|---|
| 4-Bromofluorobenzene | 97 | (86 - 115) |
| 1,2-Dichloroethane-d4 | 100 | (76 - 114) |
| Toluene-d8 | 97 | (88 - 110) |

NOTE(S):

ND Parameter was not detected at or above the stated reporting limit.

Quanterra Environmental Services

CONOCO INC.

Client Sample ID: SAN JUAN AMINE WASHER WATER

General Chemistry

**Lot-Sample #.:** I6G120107 - 001 **Work Order #.:** C4R4P **Matrix.......:** WATER
**Date Sampled.:** 07/08/96 00:00 **Date Received:** 07/10/96 09:18
**Percent Moist:**

| PARAMETER | RESULT | RL | UNITS | METHOD | PREPARATION-ANALYSIS DATE | PREP BATCH # |
|---|---|---|---|---|---|---|
| **Flashpoint** | **>150** | **>150** | **deg F** | **SW846 1010** | **07/17/96** | **6200111** |
| | | DIL Factor...: 1 | | | | |
| | | MS Run #.....: 6200005 | | | | |
| **pH (liquid)** | **4.1** | **0.10** | **No Units** | **MCAWW 150.1** | **07/12/96** | **6197132** |
| | | DIL Factor...: 1 | | | | |
| | | MS Run #.....: 6197016 | | | | |
| **Total Solids (Residue)** | **75000** | **10** | **mg/L** | **MCAWW 160.3** | **07/15/96** | **6198195** |
| | | DIL Factor...: 1 | | | | |
| | | MS Run #.....: 6198056 | | | | |
| Reactive Cyanide | ND | 200 | mg/L | SW846 7.3.3 | 07/16/96 | 6198108 |
| | | DIL Factor...: 1 | | | | |
| | | MS Run #.....: 6198002 | | | | |
| Reactive Sulfide | ND | 200 | mg/L | SW846 7.3.4 | 07/16/96 | 6198110 |
| | | DIL Factor...: 1 | | | | |
| | | MS Run #.....: 6198004 | | | | |

**NOTE(S):**

RL Reporting Limit

ND Parameter was not detected at or above the stated reporting limit.

Quanterra Environmental Services

CONOCO INC.

Client Sample ID: SAN JUAN AMINE WASHER WATER

TOTAL Metals

Lot-Sample #.: I6G120107 - 001    Work Order #.: C4R4P    Matrix.......: WATER
Date Sampled.: 07/08/96 00:00    Date Received: 07/10/96 09:18
Percent Moist:

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | PREP BATCH # |
|---|---|---|---|---|---|---|
| Mercury | ND | 0.00020 | mg/L | SW846 7470 | 07/15/96 | 6197166 |
| | | Dilution Fact: 1 | | | | |
| | | MS Run #.....: 6197035 | | | | |
| Barium | ND | 2.0 | mg/L | SW846 6010A | 07/15-07/19/96 | 6197182 |
| | | Dilution Fact: 10 | | | | |
| | | MS Run #.....: 6197048 | | | | |
| Cadmium | ND | 0.050 | mg/L | SW846 6010A | 07/15-07/19/96 | 6197182 |
| | | Dilution Fact: 10 | | | | |
| | | MS Run #.....: 6197048 | | | | |
| **Chromium** | **2.2** | **0.10** | **mg/L** | **SW846 6010A** | **07/15-07/19/96** | **6197182** |
| | | Dilution Fact: 10 | | | | |
| | | MS Run #.....: 6197048 | | | | |
| Silver | ND | 0.10 | mg/L | SW846 6010A | 07/15-07/19/96 | 6197182 |
| | | Dilution Fact: 10 | | | | |
| | | MS Run #.....: 6197048 | | | | |
| Arsenic | ND | 3.0 | mg/L | SW846 6010A | 07/15-07/19/96 | 6197182 |
| | | Dilution Fact: 10 | | | | |
| | | MS Run #.....: 6197048 | | | | |
| Lead | ND | 1.0 | mg/L | SW846 6010A | 07/15-07/19/96 | 6197182 |
| | | Dilution Fact: 10 | | | | |
| | | MS Run #.....: 6197048 | | | | |
| Selenium | ND | 2.5 | mg/L | SW846 6010A | 07/15-07/19/96 | 6197182 |
| | | Dilution Fact: 10 | | | | |
| | | MS Run #.....: 6197048 | | | | |

NOTE(S):

Calculations are performed before rounding to avoid round-off errors in calculated results.

ND Parameter was not detected at or above the stated reporting limit.

Quanterra
Environmental Services

## MATRIX SPIKE SAMPLE EVALUATION REPORT

### TOTAL Metals

**Client Lot #:** I6G120107 **MS Sample:** I6G110105-001 **Matrix:** WATER
**Percent Moist:** 100

| PARAMETER | PERCENT RECOVERY | RECOVERY LIMITS | RPD | RPD LIMITS | METHOD | PREPARATION-ANALYSIS DATE | BATCH # |
|---|---|---|---|---|---|---|---|
| Mercury | 115 | (75-125) | | | MCAWW 245.1 | 07/15/96 | 6197166 |
| | 106 | (75-125) | 7.5 | (0-20) | MCAWW 245.1 | 07/15/96 | 6197166 |

Dilution Factor: 1
MS Run #: 6197035

**NOTE(S):**

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quanterra
Environmental Services

# MATRIX SPIKE SAMPLE EVALUATION REPORT

## TOTAL Metals

**Client Lot #:** I6G120107 **MS Sample:** I6G120161-003 **Matrix:** WATER
**Percent Moist:** 100

| PARAMETER | PERCENT RECOVERY | RECOVERY LIMITS | RPD | RPD LIMITS | METHOD | PREPARATION-ANALYSIS DATE | BATCH # |
|---|---|---|---|---|---|---|---|
| Copper | 84 | (80-120) | | | MCAWW 200.7 | 07/15-07/19/96 | 6197182 |
| | 99 | (80-120) | 4.3 | (0-20) | MCAWW 200.7 | 07/15-07/19/96 | 6197182 |
| | | Dilution Factor: 1 | | | | | |
| | | MS Run #: 6197048 | | | | | |
| Cadmium | 91 | (80-120) | | | MCAWW 200.7 | 07/15-07/19/96 | 6197182 |
| | 93 | (80-120) | 1.9 | (0-20) | MCAWW 200.7 | 07/15-07/19/96 | 6197182 |
| | | Dilution Factor: 1 | | | | | |
| | | MS Run #: 6197048 | | | | | |
| Lead | 115 | (80-120) | | | MCAWW 239.2 | 07/15-07/16/96 | 6197182 |
| | 120 | (80-120) | 3.5 | (0-20) | MCAWW 239.2 | 07/15-07/16/96 | 6197182 |
| | | Dilution Factor: 1 | | | | | |
| | | MS Run #: 6197048 | | | | | |
| Nickel | 100 | (80-120) | | | MCAWW 200.7 | 07/15-07/19/96 | 6197182 |
| | 88 | (80-120) | 11 | (0-20) | MCAWW 200.7 | 07/15-07/19/96 | 6197182 |
| | | Dilution Factor: 1 | | | | | |
| | | MS Run #: 6197048 | | | | | |
| Silver | 88 | (80-120) | | | MCAWW 200.7 | 07/15-07/19/96 | 6197182 |
| | 90 | (80-120) | 2.8 | (0-20) | MCAWW 200.7 | 07/15-07/19/96 | 6197182 |
| | | Dilution Factor: 1 | | | | | |
| | | MS Run #: 6197048 | | | | | |
| Zinc | 95 | (80-120) | | | MCAWW 200.7 | 07/15-07/19/96 | 6197182 |
| | 97 | (80-120) | 1.9 | (0-20) | MCAWW 200.7 | 07/15-07/19/96 | 6197182 |
| | | Dilution Factor: 1 | | | | | |
| | | MS Run #: 6197048 | | | | | |
| Chromium | 92 | (80-120) | | | MCAWW 200.7 | 07/15-07/19/96 | 6197182 |
| | 93 | (80-120) | 1.2 | (0-20) | MCAWW 200.7 | 07/15-07/19/96 | 6197182 |
| | | Dilution Factor: 1 | | | | | |
| | | MS Run #: 6197048 | | | | | |
| Arsenic | 93 | (80-120) | | | SW846 6010A | 07/15-07/19/96 | 6197182 |
| | 95 | (80-120) | 2.1 | (0-20) | SW846 6010A | 07/15-07/19/96 | 6197182 |
| | | Dilution Factor: 1 | | | | | |
| | | MS Run #: 6197048 | | | | | |
| Selenium | 90 | (80-120) | | | SW846 6010A | 07/15-07/19/96 | 6197182 |
| | 93 | (80-120) | 2.4 | (0-20) | SW846 6010A | 07/15-07/19/96 | 6197182 |
| | | Dilution Factor: 1 | | | | | |
| | | MS Run #: 6197048 | | | | | |

(Continued on next page)

Quanterra
Environmental Services

# MATRIX SPIKE SAMPLE EVALUATION REPORT

## TOTAL Metals

**Client Lot #:** I6G120107 **MS Sample:** I6G120161-003 **Matrix:** WATER

| PARAMETER | PERCENT RECOVERY | RECOVERY LIMITS | RPD | RPD LIMITS | METHOD | PREPARATION-ANALYSIS DATE | BATCH # |
|---|---|---|---|---|---|---|---|
| Barium | 87 | (80-120) | | | SW846 6010A | 07/15-07/19/96 | 6197182 |
| | 89 | (80-120) | 2.0 | (0-20) | SW846 6010A | 07/15-07/19/96 | 6197182 |

Dilution Factor: 1
MS Run #: 6197048

**NOTE(S):**

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quanterra
Environmental Services

# MATRIX SPIKE SAMPLE EVALUATION REPORT

## GC/MS Volatiles

**Client Lot #:** I6G120107 **Work Order #:** C4T6K112-MS **Matrix:** WATER
**MS Lot #:** I6G160116-001 C4T6K113-MSD

**Date Sampled:** 07/08/96 11:00 **Date Received:** 07/09/96 08:54
**Prep Date:** 07/17/96 **Analysis Date:** 07/22/96
**Prep Batch #:** 6200138 **MS Run #:** 6205027
**Dilution Factor:** 1 **Percent Moist:** 100

| PARAMETER | PERCENT RECOVERY | RECOVERY LIMITS | RPD | RPD LIMITS | METHOD |
|---|---|---|---|---|---|
| Vinyl chloride | 76 | (1.0-251) | | | SW846 8240B |
| | 76 | (1.0-251) | 0.11 | (0-30) | SW846 8240B |
| 1,1-Dichloroethylene | 107 | (59-155) | | | SW846 8240B |
| | 106 | (59-155) | 1.8 | (0-30) | SW846 8240B |
| Chloroform | 102 | (51-136) | | | SW846 8240B |
| | 104 | (51-136) | 1.6 | (0-30) | SW846 8240B |
| 1,2-Dichloroethane | 111 | (49-155) | | | SW846 8240B |
| | 110 | (49-155) | 0.90 | (0-30) | SW846 8240B |
| Methyl ethyl ketone | 134 | (25-250) | | | SW846 8240B |
| | 140 | (25-250) | 4.2 | (0-30) | SW846 8240B |
| Carbon tetrachloride | 104 | (71-240) | | | SW846 8240B |
| | 108 | (71-240) | 4.2 | (0-30) | SW846 8240B |
| Trichloroethylene | 105 | (71-157) | | | SW846 8240B |
| | 108 | (71-157) | 2.7 | (0-30) | SW846 8240B |
| Benzene | 107 | (37-151) | | | SW846 8240B |
| | 110 | (37-151) | 3.0 | (0-30) | SW846 8240B |
| Tetrachloroethylene | 105 | (46-157) | | | SW846 8240B |
| | 108 | (46-157) | 3.0 | (0-30) | SW846 8240B |
| Chlorobenzene | 110 | (37-160) | | | SW846 8240B |
| | 112 | (37-160) | 2.0 | (0-30) | SW846 8240B |
| 1,4-Dichlorobenzene | 108 | (75-137) | | | SW846 8240B |
| | 109 | (75-137) | 0.49 | (0-30) | SW846 8240B |

| SURROGATE | PERCENT RECOVERY | RECOVERY LIMITS |
|---|---|---|
| 4-Bromofluorobenzene | 100 | (86-115) |
| | 99 | (86-115) |
| 1,2-Dichloroethane-d4 | 99 | (76-114) |
| | 95 | (76-114) |
| Toluene-d8 | 98 | (88-110) |
| | 98 | (88-110) |

**NOTE(S):**

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quanterra Environmental Services

## MATRIX SPIKE SAMPLE EVALUATION REPORT

### General Chemistry

**Client Lot #:** I6G120107 **Matrix:** WATER
**Percent Moist:** 100

| PARAMETER | PERCENT RECOVERY | RECOVERY LIMITS | RPD | RPD LIMITS | METHOD | PREPARATION-ANALYSIS DATE | BATCH # |
|---|---|---|---|---|---|---|---|
| Reactive Cyanide | | C4R4P10J-MS/C4R4P10K-MSD | | | MS Lot/Sample #: I6G120107-001 | | |
| | 2.5 | (1.0-64) | | | SW846 7.3.3 | 07/16/96 | 6198108 |
| | 0.58 N | (1.0-64) | 105 | (0-213) | SW846 7.3.3 | 07/16/96 | 6198108 |
| | | Dilution Factor: 1 | | | | | |
| | | MS Run #: 6198002 | | | | | |

**NOTE(S):**

Calculations are performed before rounding to avoid round-off errors in calculated results.

N Spiked analyte recovery is outside stated control limits.

**Quanterra**
Environmental Services

# LABORATORY CONTROL SAMPLE EVALUATION REPORT

## Metals

**Client Lot #:** I6G120107 **Matrix:** WATER

| PARAMETER | PERCENT RECOVERY | RECOVERY LIMITS | RPD | RPD LIMITS | METHOD | PREPARATION-ANALYSIS DATE | BATCH # |
|---|---|---|---|---|---|---|---|
| Cadmium | 103 | (80-120) | | | MCAWW 200.7 | 07/15-07/19/96 | 6197182 |
| | 104 | (80-120) | 1.5 | (0-20) | MCAWW 200.7 | 07/15-07/19/96 | 6197182 |
| | | Dilution Factor: 1 | | | | | |
| Lead | 108 | (82-127) | | | MCAWW 239.2 | 07/15-07/16/96 | 6197182 |
| | 106 | (82-127) | 1.7 | (0-19) | MCAWW 239.2 | 07/15-07/16/96 | 6197182 |
| | | Dilution Factor: 1 | | | | | |
| Silver | 101 | (80-120) | | | MCAWW 200.7 | 07/15-07/19/96 | 6197182 |
| | 101 | (80-120) | 0.03 | (0-20) | MCAWW 200.7 | 07/15-07/19/96 | 6197182 |
| | | Dilution Factor: 1 | | | | | |
| Chromium | 101 | (80-120) | | | MCAWW 200.7 | 07/15-07/19/96 | 6197182 |
| | 103 | (80-120) | 1.3 | (0-20) | MCAWW 200.7 | 07/15-07/19/96 | 6197182 |
| | | Dilution Factor: 1 | | | | | |
| Barium | 99 | (80-120) | | | SW846 6010A | 07/15-07/19/96 | 6197182 |
| | 100 | (80-120) | 1.4 | (0-20) | SW846 6010A | 07/15-07/19/96 | 6197182 |
| | | Dilution Factor: 1 | | | | | |
| Arsenic | 103 | (80-120) | | | SW846 6010A | 07/15-07/19/96 | 6197182 |
| | 105 | (80-120) | 1.2 | (0-20) | SW846 6010A | 07/15-07/19/96 | 6197182 |
| | | Dilution Factor: 1 | | | | | |
| Selenium | 104 | (80-120) | | | SW846 6010A | 07/15-07/19/96 | 6197182 |
| | 105 | (80-120) | 0.92 | (0-20) | SW846 6010A | 07/15-07/19/96 | 6197182 |
| | | Dilution Factor: 1 | | | | | |
| Mercury | 87 | (81-120) | | | MCAWW 245.1 | 07/15/96 | 6197166 |
| | 87 | (81-120) | 0.04 | (0-21) | MCAWW 245.1 | 07/15/96 | 6197166 |
| | | Dilution Factor: 1 | | | | | |

**NOTE(S):**

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quanterra
Environmental Services

# LABORATORY CONTROL SAMPLE EVALUATION REPORT

## General Chemistry

**Client Lot #:** I6G120107 **Matrix:** WATER

| PARAMETER | PERCENT RECOVERY | RECOVERY LIMITS | RPD | RPD LIMITS | METHOD | PREPARATION-ANALYSIS DATE | BATCH # |
|---|---|---|---|---|---|---|---|
| pH (liquid) | | | C4RTH101-MS/C4RTH102-MSD | | | | |
| | 98 | (90-110) | | | MCAWW 150.1 | 07/12/96 | 6197132 |
| | 98 | (90-110) | 0.56 | (0-20) | MCAWW 150.1 | 07/12/96 | 6197132 |
| | | Dilution Factor: 1 | | | | | |
| Total Solids (Residue) | | | C4TA6102-MS/C4TA6103-MSD | | | | |
| | 101 | (87-113) | | | MCAWW 160.3 | 07/15/96 | 6198195 |
| | 102 | (87-113) | 1.4 | (0-20) | MCAWW 160.3 | 07/15/96 | 6198195 |
| | | Dilution Factor: 1 | | | | | |
| Reactive Cyanide | | | C4T39102-MS/C4T39103-MSD | | | | |
| | 8.4 | (1.0-64) | | | SW846 7.3.3 | 07/16/96 | 6198108 |
| | 4.5 | (1.0-64) | 60 | (0-213) | SW846 7.3.3 | 07/16/96 | 6198108 |
| | | Dilution Factor: 1 | | | | | |

**NOTE(S):**

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quanterra Environmental Services

CONOCO INC.

## Sample Duplicate Evaluation Report

### General Chemistry

**Lot-Sample #.:** I6G120107 - 001 **Work Order #.:** C4R4P-SMP C4R4P-DUP **Matrix.......:** WATER

**Date Sampled.:** 07/08/96 **Date Received:** 07/10/96

**Percent Moist:**

| PARAM RESULT | DUPLICATE RESULT | UNITS | RPD | RPD LIMIT | METHOD | PREPARATION-ANALYSIS DATE | PREP BATCH # |
|---|---|---|---|---|---|---|---|
| Reactive Sulfide | | | | | | | |
| ND | ND | mg/L | 0 | (0-20) | SW846 7.3.4 | 07/16/96 | 6198110 |
| | | Dilution Fact: 1 | | | | | |
| | | MS Run #.....: 6198004 | | | | | |
| Flashpoint | | | | | | | |
| >150 | >150 | deg F | 0.0 | (0-20) | SW846 1010 | 07/17/96 | 6200111 |
| | | Dilution Fact: 1 | | | | | |
| | | MS Run #.....: 6200005 | | | | | |
| pH (liquid) | | | | | | | |
| 4.1 | 4.1 | No Units | 0.73 | (0-20) | MCAWW 150.1 | 07/12/96 | 6197132 |
| | | Dilution Fact: 1 | | | | | |
| | | MS Run #.....: 6197016 | | | | | |
| Total Solids (Residue) | | | | | | | |
| 75000 | 75000 | mg/L | 0.40 | (0-0.0) | MCAWW 160.3 | 07/15/96 | 6198195 |
| | | Dilution Fact: 1 | | | | | |
| | | MS Run #.....: 6198056 | | | | | |

**NOTE(S):**

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quanterra
Environmental Services

# METHOD BLANK REPORT

## Metals

**Client Lot #:** I6G120107 **Matrix:** WATER

**Work Order #:** C4T12 **Prep Date:** 07/15/96 **Prep Batch #:** 6197166

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | ANALYSIS DATE | DIL FACT |
|---|---|---|---|---|---|---|
| Mercury | ND | 0.00020 | mg/L | SW846 7470 | 07/15/96 | 1 |

**Work Order #:** C4T1J **Prep Date:** 07/15/96 **Prep Batch #:** 6197182

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | ANALYSIS DATE | DIL FACT |
|---|---|---|---|---|---|---|
| Arsenic | ND | 0.30 | mg/L | SW846 6010A | 07/19/96 | 1 |
| Barium | ND | 0.20 | mg/L | SW846 6010A | 07/19/96 | 1 |
| Cadmium | ND | 0.0050 | mg/L | SW846 6010A | 07/19/96 | 1 |
| Chromium | ND | 0.010 | mg/L | SW846 6010A | 07/19/96 | 1 |
| Lead | ND | 0.10 | mg/L | SW846 6010A | 07/19/96 | 1 |
| Selenium | ND | 0.25 | mg/L | SW846 6010A | 07/19/96 | 1 |
| Silver | ND | 0.010 | mg/L | SW846 6010A | 07/19/96 | 1 |

**NOTE(S):**

Calculations are performed before rounding to avoid round-off errors in calculated results.

ND Parameter was not detected at or above the stated reporting limit.

Quanterra
Environmental Services

# METHOD BLANK REPORT

## General Chemistry

**Client Lot #:** I6G120107 **Matrix:** WATER

**Work Order #:** C4T39 **Prep Date:** 07/16/96 **Prep Batch #:** 6198108
**Analysis Date:** 07/16/96
**Dilution Factor:** 1

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD |
|---|---|---|---|---|
| Reactive Cyanide | ND | 200 | mg/L | SW846 7.3.3 |

**Work Order #:** C4T3E **Prep Date:** 07/16/96 **Prep Batch #:** 6198110
**Analysis Date:** 07/16/96
**Dilution Factor:** 1

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD |
|---|---|---|---|---|
| Reactive Sulfide | ND | 200 | mg/L | SW846 7.3.4 |

**Work Order #:** C4TA6 **Prep Date:** 07/15/96 **Prep Batch #:** 6198195
**Analysis Date:** 07/15/96
**Dilution Factor:** 1

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD |
|---|---|---|---|---|
| Total Solids (Residue) | ND | 10 | mg/L | MCAWW 160.3 |

**NOTE(S):**

Calculations are performed before rounding to avoid round-off errors in calculated results.

ND Parameter was not detected at or above the stated reporting limit.

Quanterra
Environmental Services

# METHOD BLANK REPORT

## GC/MS Volatiles

| | | | | | |
|---|---|---|---|---|---|
| **Client Lot #:** | I6G120107 | **Work Order #:** | C4V4H101 | **Matrix:** | WATER |
| **Prep Date:** | 07/17/96 | **Analysis Date:** | 07/22/96 | | |
| **Dilution Factor:** | 1 | **Prep Batch #:** | 6200138 | | |

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD |
|---|---|---|---|---|
| Benzene | ND | 0.050 | mg/L | SW846 8240A |
| Carbon tetrachloride | ND | 0.050 | mg/L | SW846 8240A |
| Chlorobenzene | ND | 0.050 | mg/L | SW846 8240A |
| Chloroform | ND | 0.050 | mg/L | SW846 8240A |
| 1,2-Dichloroethane | ND | 0.050 | mg/L | SW846 8240A |
| 1,1-Dichloroethylene | ND | 0.050 | mg/L | SW846 8240A |
| Methyl ethyl ketone | ND | 0.20 | mg/L | SW846 8240A |
| Tetrachloroethylene | ND | 0.050 | mg/L | SW846 8240A |
| Trichloroethylene | ND | 0.050 | mg/L | SW846 8240A |
| Vinyl chloride | ND | 0.10 | mg/L | SW846 8240A |

| SURROGATE | PERCENT RECOVERY | RECOVERY LIMITS |
|---|---|---|
| 4-Bromofluorobenzene | 97 | (86-115) |
| 1,2-Dichloroethane-d4 | 95 | (76-114) |
| Toluene-d8 | 97 | (88-110) |

**NOTE(S):**

Calculations are performed before rounding to avoid round-off errors in calculated results.

ND Parameter was not detected at or above the stated reporting limit.

# Chain of Custody Record

QUA 4149

I66120107

**Quanterra** Environmental Services

| Client | Project Manager | Date | Chain Of Custody Number |
|---|---|---|---|
| CONOCO, INC. | CHRIS HANSEN | 7/10/96 | 14226 |

| Address | Telephone Number (Area Code)/Fax Number | Lab Number | Page ___ of ___ |
|---|---|---|---|
| 600 NORTH DAIRY ASHFORD | 713-293-1124 FAX 713-293-1214 | C6-06-040 | |

| City | State | Zip Code | Site Contact |
|---|---|---|---|
| HOUSTON | TX | 77252 | DAVID BOTTOMS |

| Project Name | Carrier/Waybill Number |
|---|---|
| AMINE WASHER WATER | FED X |

Contract/Purchase Order/Quote No.: QUOTE #

PACK IN WET ICE/SHIP TO: QUANTERRA AUSTIN

| Sample I.D. No. and Description | Date | Time | Sample Type | Total Volume | Containers Type | Containers No. | Preservative | Condition on Receipt | Analysis: METALS | RCI | TCLP-V | WATER | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SAN JUAN AMINE WASHER WATER | 7/8/96 | | WATER | 40ML | GLASS | 2 | 4 C | Good 4°C | | | X | | | | | | | | |
| SAN JUAN AMINE WASHER WATER | | | WATER | 500ML | PLAST | 1 | HNO3 | 7-10-96 | X | | | | | | | | | | |
| SAN JUAN AMINE WASHER WATER | | | WATER | 1L | PLAST | 1 | 4 C | | | X | | | | | | | | | |
| SAN JUAN AMINE WASHER WATER | | | WATER | 125ML | PLAST | 1 | 4 C | | | | | X | | | | | | | |

Special Instructions: METALS= 8 RCRA METALS. WATER=% SOLID/DRY WT

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☐ Disposal By Lab ☐ Archive For ______ Months

Turn Around Time Required: ☐ Normal ☐ Rush

QC Level: ☐ I. ☐ II. ☐ III.

Project Specific (Specify)

| | Date | Time | | Date | Time |
|---|---|---|---|---|---|
| 1. Relinquished By: [illegible] | 7-8-96 | 12:45PM | 1. Received By: [illegible] | 7.10.96 | 0918 |
| 2. Relinquished By | | | 2. Received By | | |
| 3. Relinquished By | | | 3. Received By | | |

Comments

**DISTRIBUTION:** WHITE - Stays with Sample; CANARY - Returned to Client with Report; PINK - Field Copy

CONOCO

Conoco Inc.
Rocky Mountain District
P.O. Box 217
Bloomfield, NM 87413

January 26, 1994

Denny Foust
OCD
1000 Rio Brazos Road
Aztec, NM 87410

Denny,

The remediation project at the Conoco San Juan Gas Plant has been completed. This letter and attachments serve to document the scope and procedures that were utilized for the successful completion of the remediation project.

The Conoco-retained engineering firms of Steffen Robertson and Kirsten (SRK) and Envirotech, Inc., along with El Paso Natural Gas (EPNG) have provided the necessary documentation required for final submission of the remediation report. Copies of their final reports are included and comprise the bulk of our final remediation report.

The SRK report presents a comprehensive documentation of the entire project whereas the EPNG and Envirotech reports contain detailed analytical results. Envirotech sampled the contaminant at the point of initial discovery and EPNG provided comprehensive analysis during the actual remediation process. The aforementioned reports contain the following major subsections:

SRK Report:

| | |
|---|---|
| 1.0 | Introduction |
| 2.0 | Remediation Process<br>2.1 Contractor's Equipment<br>2.2 Excavation/Backfill Chronology<br>2.3 Ultimate Configuration of Excavation/Backfill Area |
| 3.0 | Sampling and Analytical Testing (By Others) |
| 4.0 | State Approval of Remediation |
| 5.0 | Summary |

Envirotech Report

| | |
|---|---|
| Section 1 | Summary |
| Section 2 | Site Assessment |
| Section 3 | Test Results |

EPNG Report

| | |
|---|---|
| Section 1 | Summary of TPH and BETX results with Map of Sample Locations |
| Section 2 | TPH Results - Samples C-1 to C-9 |
| Section 3 | TPH Results - Samples #1 to #13<br>BETX Results - Sample #1, #2, #3, #7, #10, #11, #12 |
| Section 4 | TPH Results - Sample #14 to #22, Sample W1 to W12, Sample B1 to B17 |
| Section 5 | Modified 8015 TPH Analysis on Sample #18 and W7<br>BETX Results - Samples B2, B5, B7, B8, B9, B11, B12, B13, B14, B15, B17 |
| Section 6 | Groundwater Analysis Results of Sample taken on March 15, 1993 |

Denny, Conoco, and especially myself, wish to express its sincerest gratitude to you and the OCD staff for its invaluable guidance and assistance that was afforded to Conoco during all aspects of this remediation project.

If I can be of any further assistance, please call me at (505) 632-4900.

Sincerely,

Jonathon I. Bowerbank
Administrative Coordinator
Rocky Mountain Operating Center

JIB/dlg

Att.

# CONOCO SAN JUAN GAS PLANT
# EVAPORATION POND AREA REMEDIATION
# EXCAVATION SUMMARY

Prepared For:

Conoco, Inc.
San Juan Gas Plant
61 Road 4900
P.O. Box 217
Bloomfield, N.M. 87413

Prepared by:

Steffen Robertson and Kirsten (U.S.), Inc.
3232 South Vance Street
Lakewood, Colorado 80227

October 1993

SRK Project No. 58201.1

## TABLE OF CONTENTS

## 1.0 INTRODUCTION

Steffen Robertson and Kirsten (U.S.), Inc. (SRK) was contracted by Conoco to design and provide quality assurance (QA) services for the construction of two evaporation ponds at its San Juan Gas Plant, in Bloomfield, New Mexico. The property is owned by El Paso Natural Gas Company and leased to Conoco. CDK Contracting Company (CDK) was contracted by Conoco to perform the earthwork associated with the construction of the two ponds. SRK provided a Senior Engineering Field Technician, Mr. Glenn Guyer, to monitor the construction. Mr. Guyer arrived on site February 4, 1993 for the start of pond construction

The two ponds are situated adjacent to one another south of the plant, with Pond #1 located to the west of Pond #2. The ponds are approximately the same size and roughly square, having a bottom dimension of approximately 180 feet and a depth of 8 feet. The ponds each have different bottom elevations; Pond #1 was designed with a bottom elevation of 89.35 feet and Pond #2 at 101.90 feet. Earthwork for Pond #2 was done first, followed by the earthwork for Pond #1.

The earthwork for Pond #2 was completed on February 23, 1993. Very minor levels of soil contamination were encountered in the extreme northwest corner of Pond #2 during its construction. However, on February 24, during the excavation of the bottom of Pond #1, and area of oil- soaked soil was uncovered. Work in this area was temporarily halted, and the owner was notified. At this point, under the direction of Conoco's Mr. Mike Luchetti, all work was stopped. The following day the contractor arrived on site and, under the direction of the owner, excavated materials around the areas of previously discovered contaminated soils, in an attempt to locate the extents of contamination. At this point, Mr. Denny Foust with the Oil Conservation Division of New Mexico Energy, Minerals, and Natural Resources Department (OCD) and Ms. Anu Pundari of El Paso Natural Gas Company (EPNG) were on site to observe the investigation work. Remediation procedures to remove the contaminated soils and finish the pond construction were discussed with Mr. Foust at this time.

## 2.0 REMEDIATION PROCESS

The site remediation action plan is documented in a letter from Conoco's Jon Bowerbank, to Mr. Denny Foust, dated March 5, 1993. The plan was cooperatively developed by representatives from the State OCD, Conoco, EPNG, SRK, and CDK. The plan states that "REMEDIATION will consist of excavation of contaminated materials to the appropriate OCD determined depth below the initial water interface. However, on-site inspection by OCD personnel will make the final determination as to the depth of the require excavation." "The contaminated soils will be transported by CDK from the Conoco leases site to Envirotech for El Paso's account." "Fill dirt will be hauled back from Envirotech to replace the excavated material." Actual remediation work began on March 8, 1993.

## 2.1 Contractor's Equipment

The contractor, CDK, used the following equipment during the remediation process: a Cat 225 Trackhoe, John Deere Front End Loader (JD 644-B), and six (6) bottom dump semi-tractor trailer rigs with lined beds.

## 2.2 Excavation/Backfill Chronology

On March 8, 1993, upon acceptance of the site remediation plan, the remediation process began. At this time, contaminated soils were excavated from the pond and hauled to Envirotech, with some intermittent stockpiling on site. Trailers then returned from Envirotech with a load of uncontaminated soil which was stockpiled in a separate area on site.

The approximate weekly material balance for the excavation and backfill process, based on truck count, is shown below:

| Week Ending | Excavation | Backfill Material | Balance |
|---|---|---|---|
| March 12 | 2,820 cu. yds | 2,610 cu. yds | -210 cu. yds |
| March 19 | 525 cu. yds | 465 cu. yds | -270 cu. yds |
| March 26 | 975 cu. yds | 930 cu. yds | -315 cu. yds |
| April 2 | 330 cu. yds | 210 cu. yds | -435 cu. yds |
| April 9 | 950 cu. yds | 2183 cu. yds | +798 cu. yds |
| April 16 | 0 cu. yds | 1092 cu. yds | +1890 cu. yds |

Excavation of contaminated soil and importing of clean backfill ceased on April 14, 1993. A total of 5,600 cubic yards of contaminated soil was removed for the site, while 7, 490 cubic yards of clean soil were returned to the site to restore the original ground surface.

## 2.3 Ultimate Configuration of Excavation/Backfill Area

Because the extents of the contamination were not known beforehand, the contaminated soil was removed as it was encountered. Excavation continued until all of the soil considered to be "contaminated" by the State inspector was removed. The final configuration of the excavated are is shown in Figure 1. The figure shows the excavation within the framework of the ultimate pond construction, in both plan and cross section. Figures 2 and 3 show three dimensional perspective views of the excavation within the ultimate pond configuration.

The overall extent of contamination covered most of the pond bottom area and extended from the northeast corner of Pond #1 to the west and southwest. The deepest area of excavation was located on the western side of the pond continued down to an elevation of approximately 74 feet (17 feet below ground surface). The contaminated area in the northern part of the pond extended down to a sandstone shelf located at an elevation of approximately 86 feet (5 feet below the ground surface). The contamination extended below a perched ground water surface, which required seepage control measures during much of the excavation process.

## 3.0 SAMPLING AND ANALYTICAL TESTING (BY OTHERS)

On March 15, 1993, a representative from EPNG was present during the excavation of contaminated materials, set up a grid, and took water and soil samples for water quality testing. The results of the water quality testing were compiled by EPNG and later forwarded to Conoco.

A total of 52 samples of seepage or contaminated soil was retrieved by EPNG for laboratory testing. Samples were analyzed for fuel hydrocarbons (TPH) using either modified EPA Method 418.1 or 8015. Selected samples were also analyzed for benzene, toluene, ethyl benzene and total xylenes (BTEX) using EPA Method 8020. Recorded sampling depths went as deep as approximately 20 ft below ground surface.

## 4.0 STATE APPROVAL OF REMEDIATION

Upon the discovery of the oil-soaked soils in the bottom of Pond #1, the State OCD was notified. Mr. Denny G. Foust, Deputy Oil and Gas Inspector, visited the site during the exploration for the extents of the contamination, and was a part of the group that formulated the site remediation action plan. Mr. Foust then visited the site during the remediation to inspect progress and to verbally approve final extents of excavation as they were reached throughout the bottom of the pond.

According to EPNG test results and on-site feedback from the State, the final limits of excavation were acceptable.

## 5.0 SUMMARY

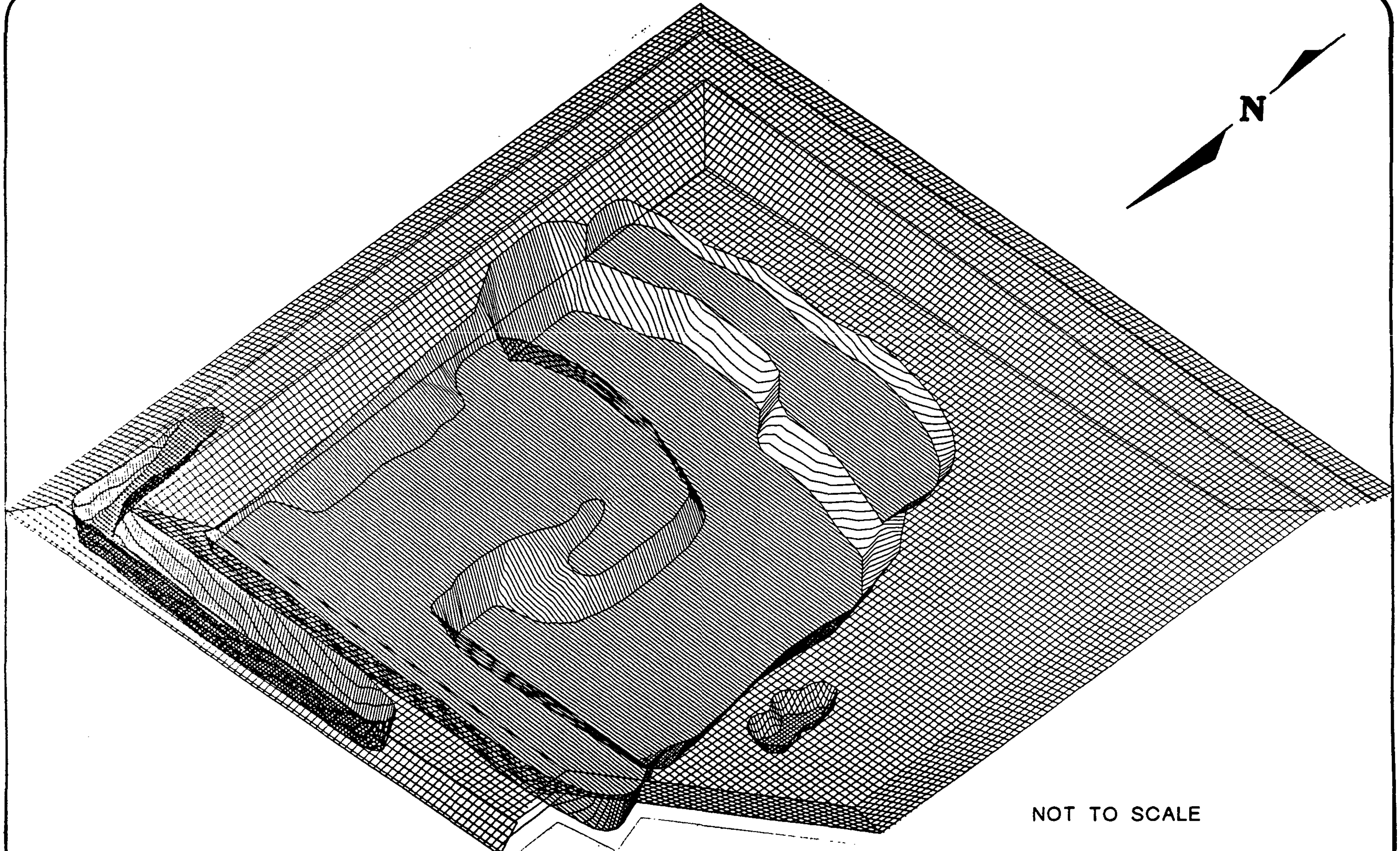
On February 24, 1993, during excavation in the bottom of Pond #1, an area of oil-soaked soil was discovered. Upon further exploration, additional quantities of contaminated soil were found in the Pond #1 area. After consulting the owner of the property and the appropriate State agencies, it was decided that the best approach to remedy the situation would be to excavate all of the contaminated soil and backfill the excavation with clean soil borrowed from off-site.

A total of 5,600 cubic yards of material was then removed from the pond bottom. Using six bottom dump semi-tractor trailer rigs, all of this material was hauled to the Envirotech facility for remediation.

A total of 7,490 cubic yards of clean soil was brought back on site for the backfilling procedure. This soil was placed and compacted in the areas of excavation to bring the ground surface back up to the original level prior to excavation.

Periodic visits by the State Inspector and sampling and testing by EPNG ensured the proper completion of the remediation work.

The remediation work took a total of 28 working days to complete. Normal pond construction procedures were then resumed to complete the construction and lining of both ponds.

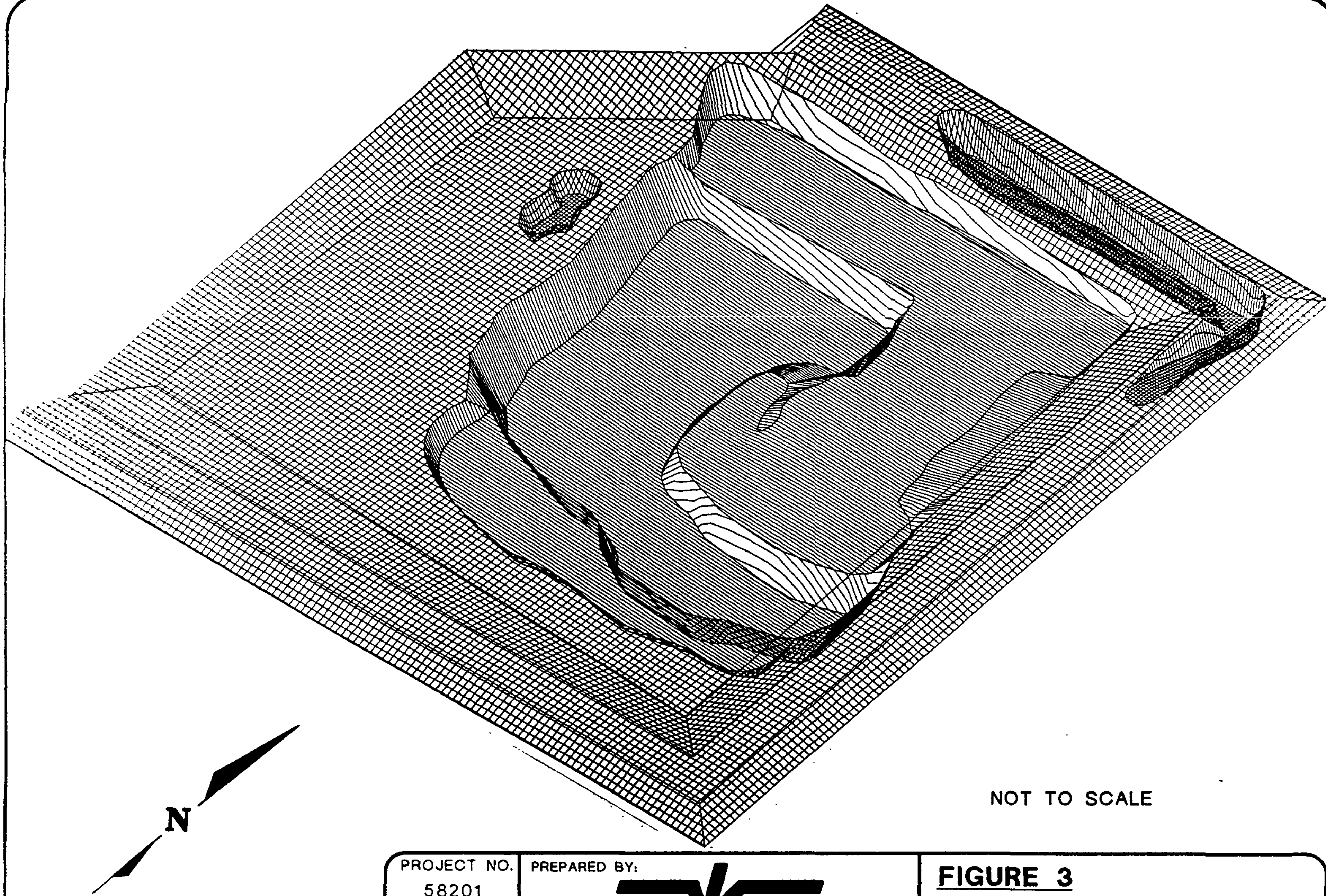



NOT TO SCALE

| PROJECT NO. | PREPARED BY: | |
|---|---|---|
| 58201 | | |
| DATE | | |
| 09/93 | | |
| REVISION | STEFFEN ROBERTSON & KIRSTEN (U.S.) | |
| 0 | Consulting Engineers & Scientists | |

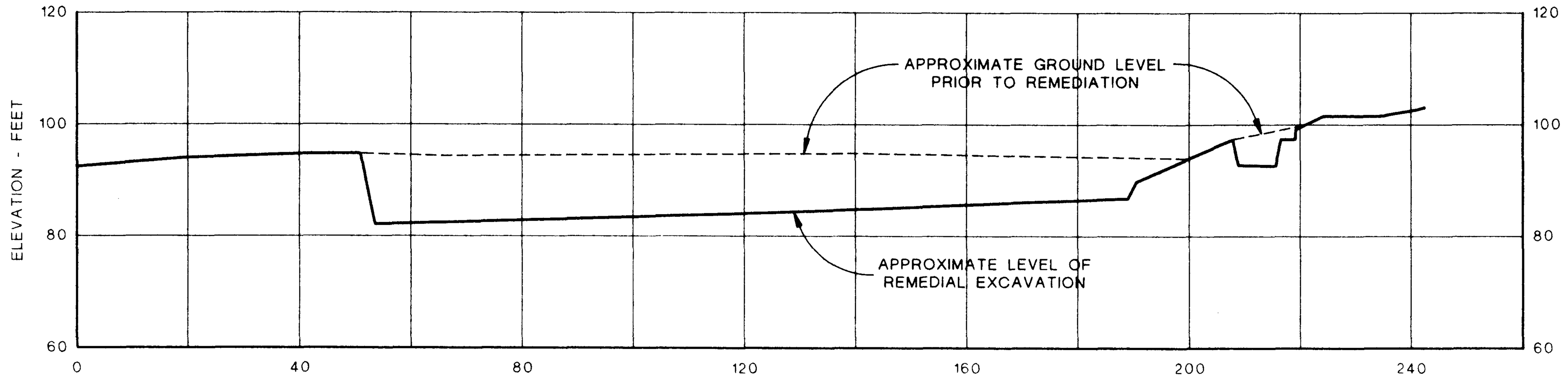
**FIGURE 2**

**PERSPECTIVE RENDITION OF POND 1 REMEDIATION LOOKING TO THE SE (45° ABOVE THE HORIZONTAL)**

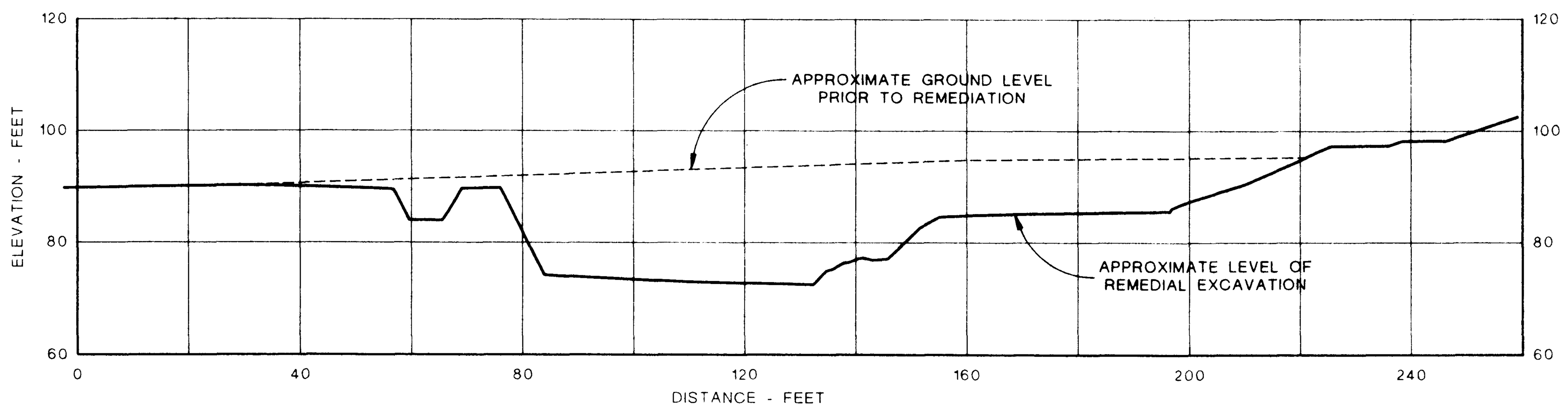



NOT TO SCALE

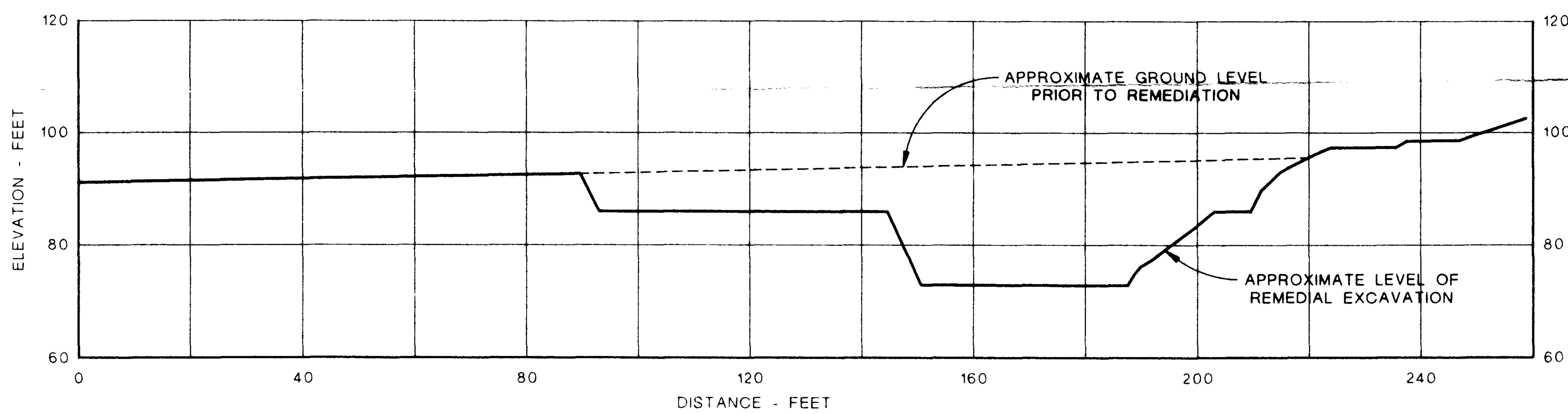
| PROJECT NO. | PREPARED BY: | **FIGURE 3** |
| --- | --- | --- |
| 58201 | STEFFEN ROBERTSON & KIRSTEN (U.S.) Consulting Engineers & Scientists | **PERSPECTIVE RENDITION OF POND 1 REMEDIATION LOOKING TO THE NW (45° ABOVE THE HORIZONTAL** |
| DATE | | |
| 09/93 | | |
| REVISION | | |
| 0 | | |



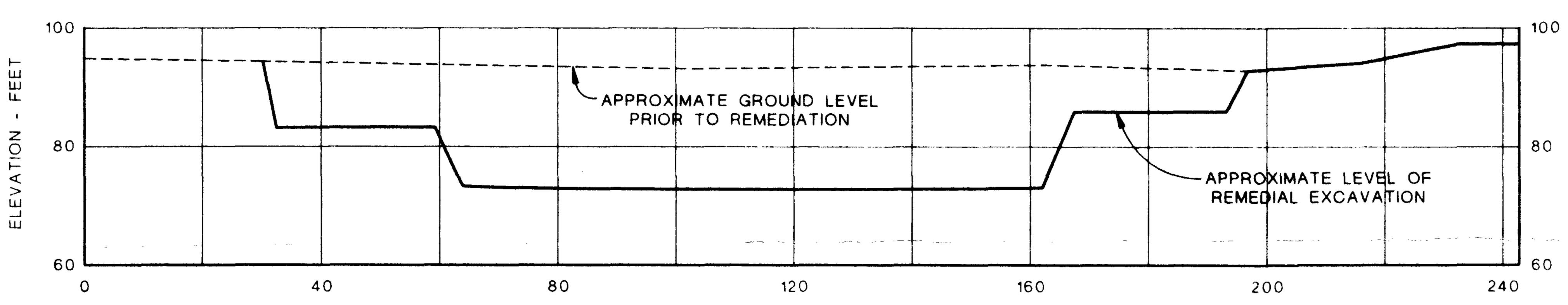

**SECTION A-A'**



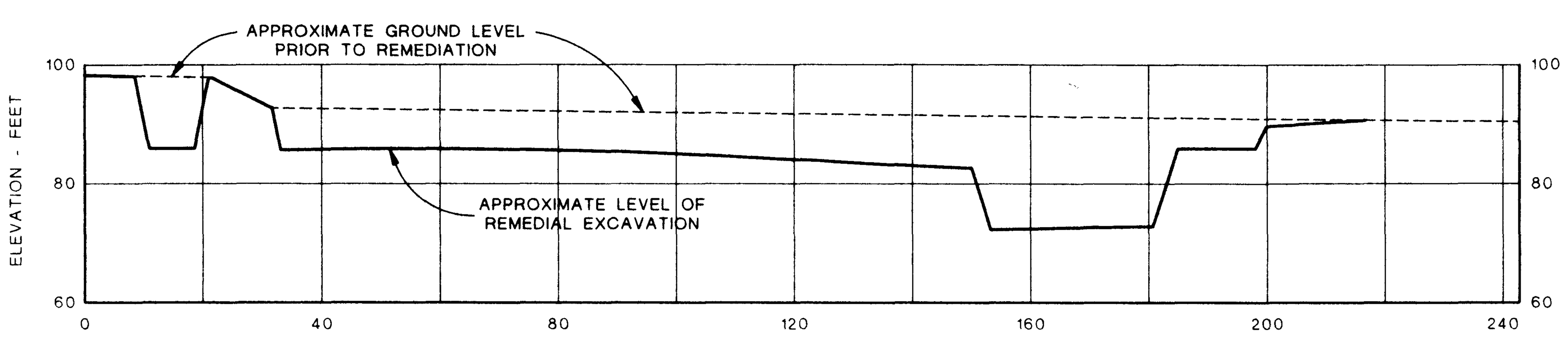

**SECTION B-B'**



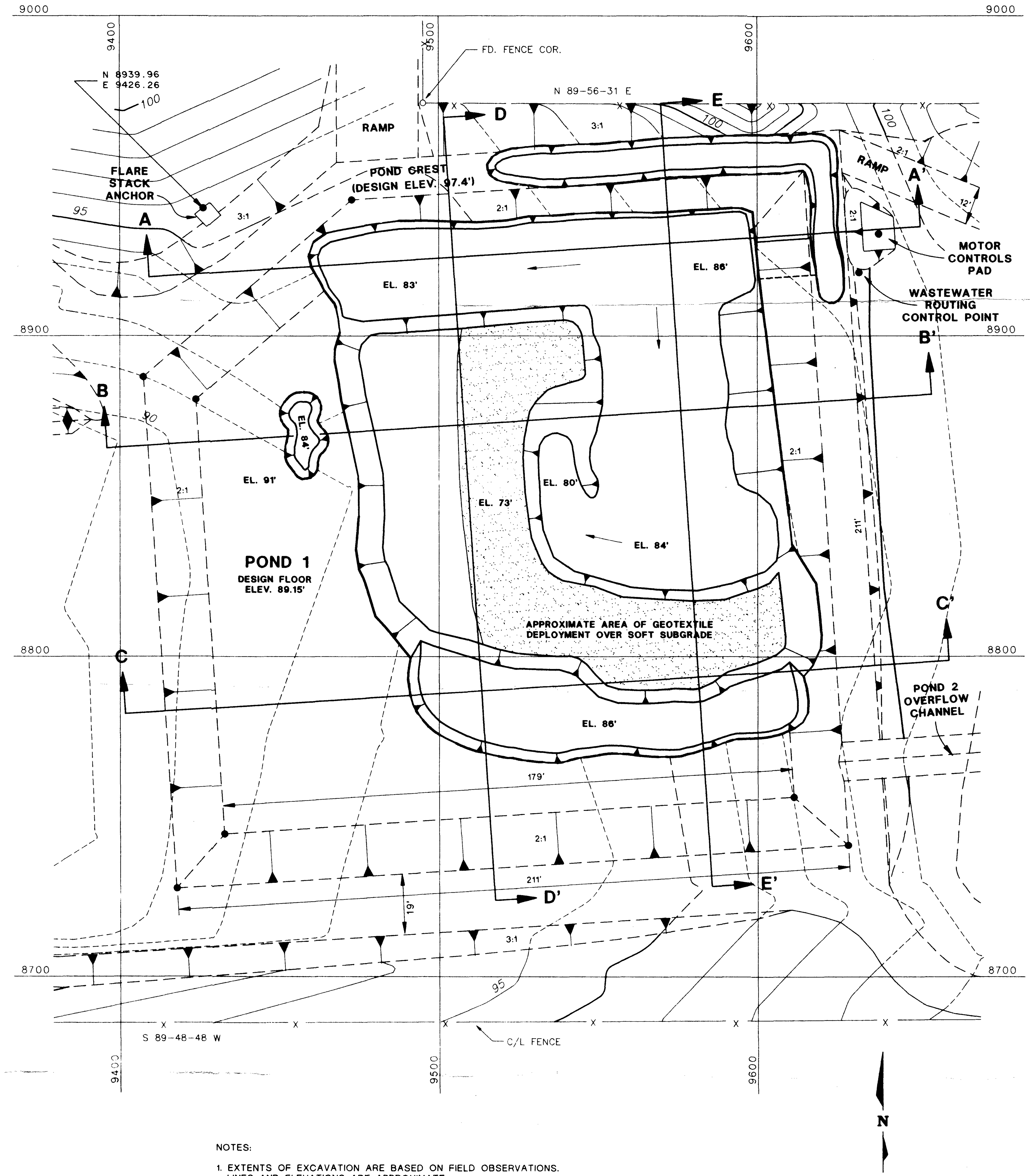

**SECTION C-C'**




**SECTION D-D'**




**SECTION E-E'**




NOTES:

1. EXTENTS OF EXCAVATION ARE BASED ON FIELD OBSERVATIONS. LINES AND ELEVATIONS ARE APPROXIMATE.
2. POND 1 OVERLAY IS BASED ON THE AS-BUILT PLAN CONFIGURATION.

SCALE IN FEET

| | | | |
|---|---|---|---|
| ENGINEER | DESIGNED | GG | 9/93 |
| | DRAWN | DB | 9/93 |
| | CHECKED | RF | 9/93 |
| | APPROVED | RF | 9/93 |
| | APPROVED | | |

| No. | DESCRIPTION | BY | DATE |
|---|---|---|---|
| A | ISSUED FOR CLIENT REVIEW | RF | 9/93 |

PREPARED FOR: CONOCO'S SAN JUAN GAS PLANT

PREPARED BY: STEFFEN ROBERTSON & KIRSTEN (U.S.) Consulting Engineers & Scientists

TITLE: POND 1 REMEDIATION, CONTAMINATED SOIL EXCAVATION LIMITS, PLAN AND SECTIONS

SCALE: AS SHOWN

DRAWING No. FIGURE 1

REVISION: A

**SITE REMEDIATION**

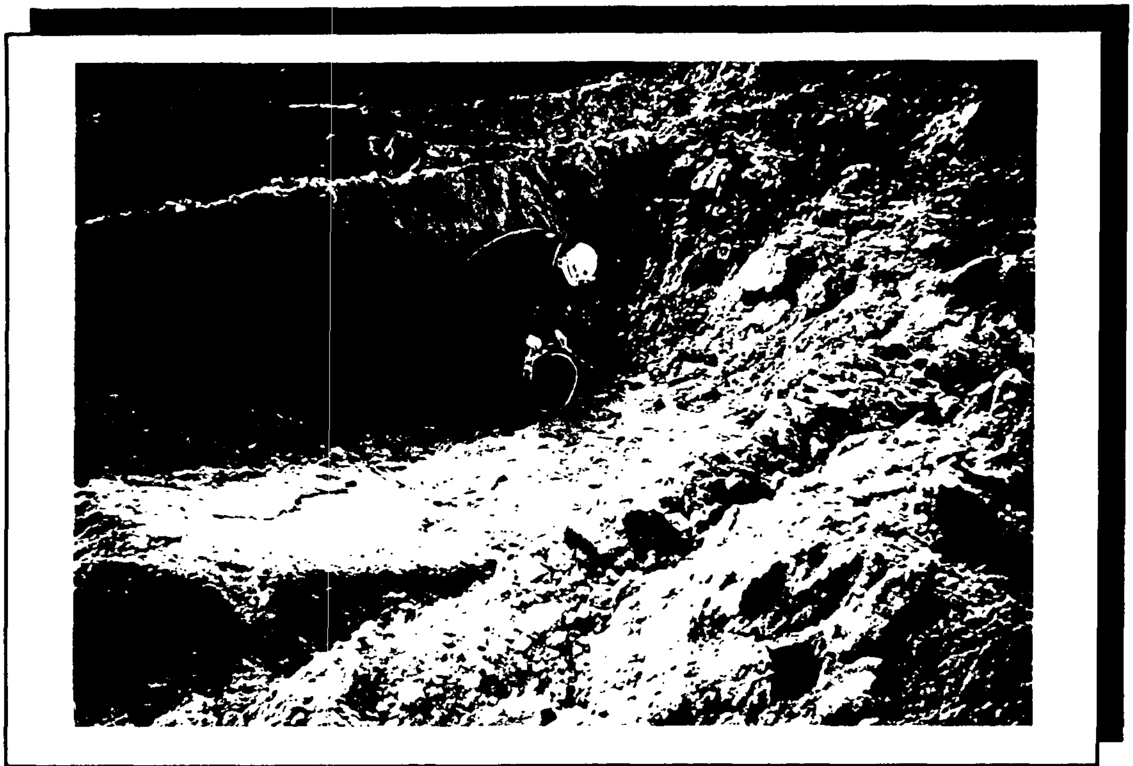


*Plate 1- Sampling/Testing*

*Plate 2 - Excavation*

**SITE REMEDIATION (cont'd)**

*Plate 3 - Backfill Process*

*Plate 4 - Backfill Process*

**SITE REMEDIATION (cont'd)**

*Plate 5 - Backfill Process*

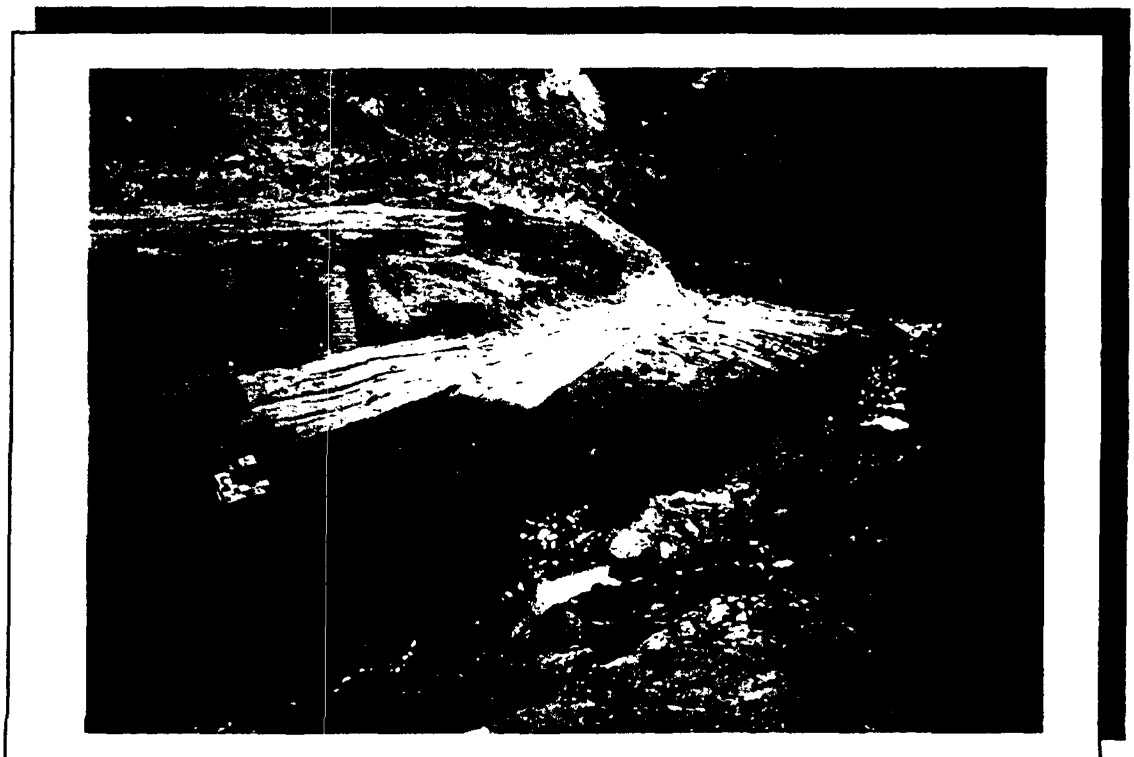


*Plate 6 - Backfill Process*

# ENVIROTECH INC.

*UNDERGROUND TANK TESTING • SITE ASSESSMENT • SITE REMEDIATION*

796 U.S. HIGHWAY 64 - 3014
FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615

March 1, 1993

Mr. Mike Luchetti
Plant Engineer
Conoco Inc.
P.O. Box 217
Bloomfield, New Mexico 87413

RE: Evaporation Pit Test Results
San Juan Gas Plant
Bloomfield, New Mexico

Project No: 93115

Dear Mr. Luchetti:

This letter summarizes and documents the field testing performed at the subject evaporation basin excavation on February 26, 1993. Please find attached a field assessment form, site plan with test hole locations, and laboratory analysis results for total petroleum hydrocarbons as performed in the field.

Ms. Vicki Wood, of Conoco Environmental Support Services in Houston contacted Envirotech Inc. to provide environmental field sampling and testing. Ms. Wood indicated that soil hydrocarbon contamination was encountered during construction of the new evaporation basins at the Conoco plant. She requested Envirotech perform soil sampling to assist Conoco in evaluating the situation.

Under the direction of Mr. Jonathon Bowerbank of Conoco, three test holes were dug with a track excavator and grab soil samples were taken for analysis of hydrocarbon contamination. The attached site diagram shows the locations of these test holes.

Field screening for total aromatic hydrocarbon content was done using an Organic Vapor Meter (OVM) of the photoionization type (PID) manufactured by Thermo Environmental Instruments Inc. Field Headspace Analysis was performed per New Mexico Oil Conservation Division (NMOCD) guidelines (February 1993). Total petroleum hydrocarbon content (TPH) was also tested for by use of a General Analysis Corporation (GAC) TPH-PLUS Petroleum Hydrocarbon Analyzer. This instrument performs a field modified EPA Method 418.1 analysis.

Table 1 is a summary of field test results.

TABLE 1 - FIELD TEST RESULTS

| LOCATION | OVM (ppm) | TPH (ppm) |
|---|---|---|
| T1 - ELEV. = 86.5' | 2256 | 2260 |
| T2 - ELEV. = 91.0' | 1926 | 250 |
| T3A - ELEV. = 91.0' | 810 | 3230 |
| T3B - ELEV. = 85.0' | 767 | 3520 |

Split samples were collected for each sample location and sent to the Conoco lab at Ponca City, Oklahoma as per instructions by Tracy Goodman and Vicki Wood. The samples were collected in clean 4 oz. glass laboratory jars, labeled, cooled on ice, and shipped by Federal Express for overnight delivery (Saturday A.M. delivery).

As we discussed on Friday, Envirotech operates a New Mexico Oil Conservation Division (NMOCD) approved landfarm facility for disposal and remediation of hydrocarbon contaminated soils. Conoco Inc. has audited and approved this facility for acceptance of Conoco generated soils.

We appreciate the opportunity to serve you. If you have any additional questions or require additional services, please contact us.

Thanks again.

Respectfully submitted,
**ENVIROTECH INC.**

Robert E. O'Neill

Robert E. O'Neill
Environmental Engineer
Project Field Engineer

Reviewed by:

Michael K. Lane, P.E.
Principal Engineer

Attachments: Field Assessment Report
Site Diagram
Field Lab Analysis Reports (4)

cc: Vicki Wood - Conoco Houston Environmental

REO/reo

93115.LET

ENVIROTECH Inc.

5796 US HWY. 64, FARMINGTON, NM 87401
(505) 632-0615

# FIELD REPORT: SITE ASSESSMENT

JOB No: 93115
PAGE No: 1 of 1

PROJECT: PIT ASSESSMENTS & CLOSURE
CLIENT: CONOCO SAN JUAN GAS PLANT
CONTRACTOR: ENVIROTECH, INC.
EQUIPMENT USED: TRACKHOE OVM # 38491 (T1+2) - # 37454 (T3)

DATE STARTED: 2-26-93
DATE FINISHED: 2-26-93
ENVIRO. SPCLT: REO
OPERATOR:
ASSISTANT: SN

LOCATION: LSE: WELL: QD:
SEC: TWP: RNG: PM: CNTY: SJ ST: NM PIT: EVAP. POND
LAND USE: GAS PLANT LOCATION - EVAPORATION POND CONSTRUCTION SITE
SURFACE CONDITIONS: AREA OF FRESH EXCAVATION - UNEVEN GRADE

FIELD NOTES & REMARKS: T1- APPROX. 2-3' MEDIUM BROWN WELL GRADED SAND OVERLYING 2-3' OF MOIST → SATURATED DARK GRAY → BLACK SILTY SAND. DEFINITE ODOR. DARK GRAY SANDSTONE BOTTOM.

T2- APPROX 2' OF MEDIUM BROWN, WELL GRADED SAND OVERLYING 1' OF MOIST, DARK GRAY FINE SAND. MEDIUM BROWN SANDSTONE BOTTOM.

T3- APPROX. 1' OF MEDIUM BROWN SAND OVERLYING APPROX. 1' OF DARK GRAY → BLACK WELL GRADED SAND. MEDIUM GRAY SAND CONTINUES TO BOTTOM OF APPROX. 15' HOLE, DEFINITE ODOR.

SAMPLE INVENTORY:

| SMPL ID: | SMPL TYPE: | LABORATORY ANALYSIS: |
|---|---|---|
| T1 | SOIL | 2260 PPM |
| T2 | SOIL | 250 PPM |
| T3A | SOIL | 3230 PPM |
| T3B | SOIL | 3520 PPM |
| | | |
| FIELD | TPH | RESULTS ↑ |
| LAB SAMPLES | COLLECTED | |
| AT EACH | LOCATION | |

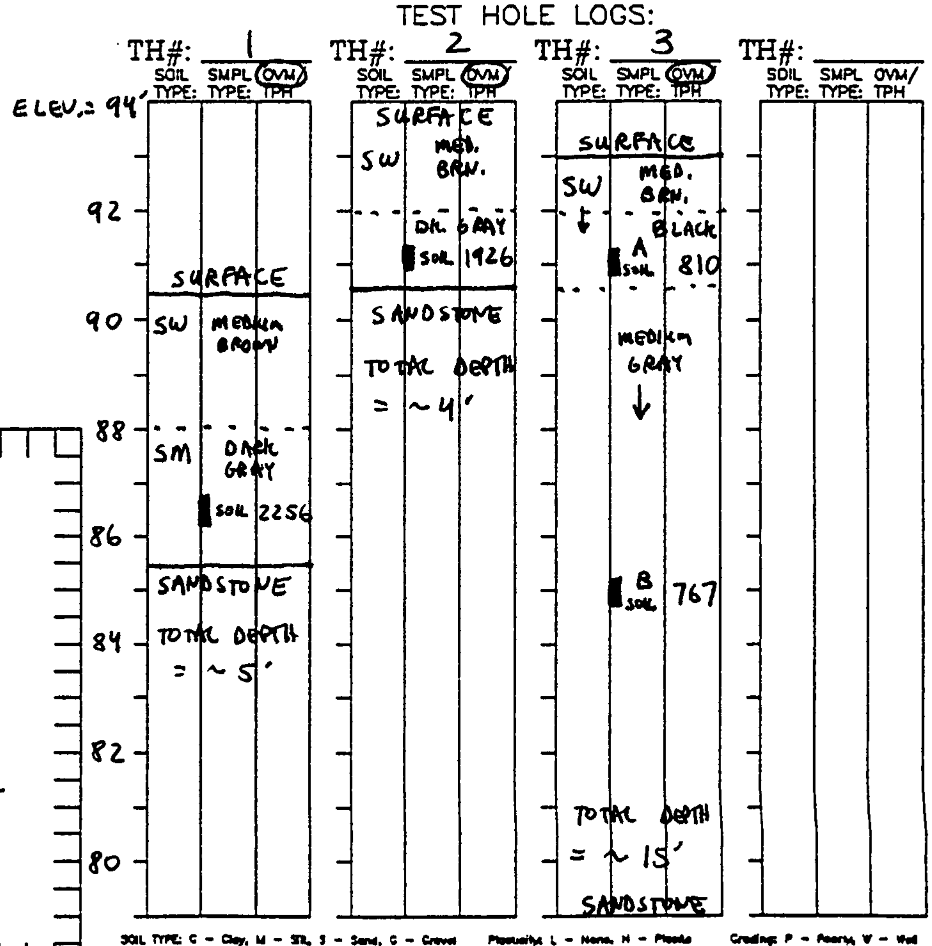
SCALE

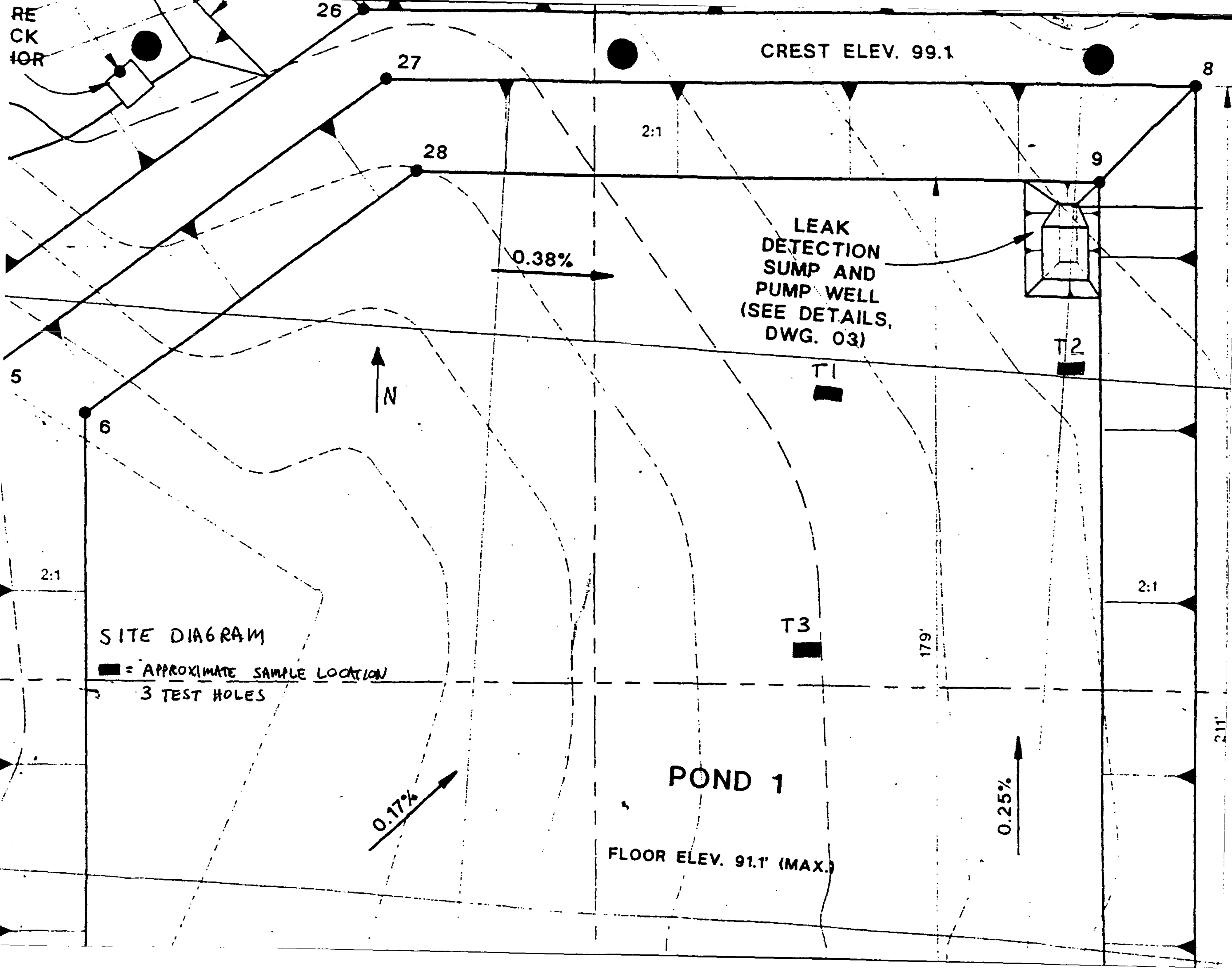
0 FEET

## SITE DIAGRAM

SEE POND CONSTRUCTION SITE PLAN FOR TEST HOLE LOCATIONS + RELATIVE ELEVATIONS.

TEST HOLE LOGS:




CREST ELEV. 99.1
26
27
28
8
9
2:1
LEAK DETECTION SUMP AND PUMP WELL (SEE DETAILS, DWG. 03)
0.38%
N
T1
T2
T3
5
6
2:1
2:1
SITE DIAGRAM
= APPROXIMATE SAMPLE LOCATION
3 TEST HOLES
179'
211'
POND 1
0.17%
0.25%
FLOOR ELEV. 91.1' (MAX.)

# ENVIROTECH LABS

5796 US HIGHWAY 64-3014 • FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615 • FAX: (505) 632-1865

## FIELD MODIFIED EPA METHOD 418.1
## TOTAL PETROLEUM HYDROCARBONS

| | | | |
|---|---|---|---|
| Client: | Conoco San Juan Gas Plant | Project #: | 93115 |
| Sample ID: | Test Hole #1, 87' | Date Analyzed: | 02-26-93 |
| Laboratory Number: | FTPA0226 | Date Reported: | 03-01-93 |
| Sample Matrix: | Soil | | |

| Parameter | Result, mg/kg | Detection Limit, mg/kg |
|---|---|---|
| Petroleum Hydrocarbons | 2,260 | 25 |

Method: Modified Method 418.1, Petroleum Hydrocarbons, Total Recoverable, Chemical Analysis of Water and Waste, USEPA Storet No.4551, 1978

ND = Parameter not detected at the stated detection limit.

Comments: Samples from Evaporation Pond

Field Analysis Results using
GAC TPH-Plus Petroleum Hydrocarbon Analyzer

Analyst

Review

# ENVIROTECH LABS

5796 US HIGHWAY 64-3014 • FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615 • FAX: (505) 632-1865

## FIELD MODIFIED EPA METHOD 418.1
## TOTAL PETROLEUM HYDROCARBONS

| | | | |
|---|---|---|---|
| Client: | Conoco San Juan Gas Plant | Project #: | 93115 |
| Sample ID: | Test Hole #2, 91' | Date Analyzed: | 02-26-93 |
| Laboratory Number: | FTPB0226 | Date Reported: | 03-01-93 |
| Sample Matrix: | Soil | | |

| Parameter | Result, mg/kg | Detection Limit, mg/kg |
|---|---|---|
| Petroleum Hydrocarbons | 250 | 5 |

Method: Modified Method 418.1, Petroleum Hydrocarbons, Total Recoverable, Chemical Analysis of Water and Waste, USEPA Storet No.4551, 1978

ND = Parameter not detected at the stated detection limit.

Comments: Samples from Evaporation Pond

Field Analysis Results using
GAC TPH-Plus Petroleum Hydrocarbon Analyzer

Heila Feltman
Analyst

Morris D Young
Review

# ENVIROTECH LABS

5796 US HIGHWAY 64-3014 • FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615 • FAX: (505) 632-1865


## FIELD MODIFIED EPA METHOD 418.1
## TOTAL PETROLEUM HYDROCARBONS

| | | | |
|---|---|---|---|
| Client: | Conoco San Juan Gas Plant | Project #: | 93115 |
| Sample ID: | Test Hole #3(A), 91' | Date Analyzed: | 02-26-93 |
| Laboratory Number: | FTPC0226 | Date Reported: | 03-01-93 |
| Sample Matrix: | Soil | | |

| Parameter | Result, mg/kg | Detection Limit, mg/kg |
|---|---|---|
| Petroleum Hydrocarbons | 3,230 | 50 |

Method: Modified Method 418.1, Petroleum Hydrocarbons, Total Recoverable, Chemical Analysis of Water and Waste, USEPA Storet No.4551, 1978

ND = Parameter not detected at the stated detection limit.

Comments: Samples from Evaporation Pond

Field Analysis Results using
GAC TPH-Plus Petroleum Hydrocarbon Analyzer

Analyst

Review

# ENVIROTECH LABS

5796 US HIGHWAY 64-3014 • FARMINGTON, NEW MEXICO 87401
PHONE: (505) 632-0615 • FAX: (505) 632-1865


## FIELD MODIFIED EPA METHOD 418.1
## TOTAL PETROLEUM HYDROCARBONS

| | | | |
|---|---|---|---|
| Client: | Conoco San Juan Gas Plant | Project #: | 93115 |
| Sample ID: | Test Hole #3(B), 85' | Date Analyzed: | 02-26-93 |
| Laboratory Number: | FTPD0226 | Date Reported: | 03-01-93 |
| Sample Matrix: | Soil | | |

| Parameter | Result, mg/kg | Detection Limit, mg/kg |
|---|---|---|
| Petroleum Hydrocarbons | 3,520 | 50 |

Method: Modified Method 418.1, Petroleum Hydrocarbons, Total Recoverable, Chemical Analysis of Water and Waste, USEPA Storet No.4551, 1978

ND = Parameter not detected at the stated detection limit.

Comments: Samples from Evaporation Pond

Field Analysis Results using
GAC TPH-Plus Petroleum Hydrocarbon Analyzer

Sheila Fellman
Analyst

Morris D Young
Review

**El Paso**
**Natural Gas Company**

P. O. BOX 4990
FARMINGTON, NEW MEXICO 87499

August 13, 1993

AUG 1 3 1993

Mr. Jon Bowerbank
Conoco
P.O. Box 217
Bloomfield, N.M. 87413

Subject : Analysis Results from Conoco Evaporation Pit Excavation Project

Dear Mr. Bowerbank:

El Paso Natural Gas Company (EPNG) obtained verification samples from the excavated area in March 1993 and April 1993. Attached is a summary of the TPH and BETX results with a diagram of the sample locations. Please note that the sample locations are approximate since EPNG did not survey the sample points but only obtained rough measurements relative to Testpoint #9 .

Tab 1 : Summary of TPH and BETX results with Map of Sample Locations.

Tab 2 : TPH Results - Samples C-1 to C-9
BETX was Not Run.

Tab 3 : TPH Results - Samples #1 to #13
BETX Results - Sample #1, #2, #3, #7, #10, #11, #12
BETX was run on a randomly selected number of samples.

Tab 4 : TPH Results - Sample #14 to #22 , Sample W1 to W12, Sample B1 to B17
BETX was Not Run on Sample #14 to #22
BETX was Not Run on Sample W1 to W12

Tab 5 : Modified 8015 TPH Analysis on Sample #18 and W7
BETX Results - Samples B2, B5, B7, B8, B9, B11, B12, B13, B14, B15, B17
BETX was run only on samples in the area of ponding water.

Tab 6 : Groundwater Analysis Results of Sample taken on March 15, 1993

If you have any questions, or if you need additional information, please call me at 599-2176.

Anu Pundari

Anu Pundari
Sr. Compliance Engineer

cc: Mr. David Hall ( w attachment )
Mr. Lyle Tinker ( w/o attachment)

( with attachment )
cc: S.Miller/K.Sinclair/File 5200 - Conoco Excavation

El Paso N[illegible]l Gas Company
Field Se[illegible]aboratory
CONOCO/[illegible]NG Pit Excavation

| Sample Number | Sample Location | Sample Depth (Feet) | Matrix | Time | Date | | IR TPH Mod. 418.1 (MG/KG) | B | T | E | X |
|---|---|---|---|---|---|---|---|---|---|---|---|
| N30352 | South Wall Top Point #1 | 5.89 | Soil | 1430 | 03/29/93 | | <10 | <0.125 | <0.125 | <0.125 | <0.125 |
| N30353 | South Wall Bottom Point #2 | 6.59 | Soil | 1431 | 03/29/93 | | <10 | <0.125 | <0.125 | <0.125 | <0.125 |
| N30354 | South Wall Bottom Point #3 | 15.64 | Soil | 1432 | 03/29/93 | | <10 | <0.125 | <0.125 | <0.125 | <0.125 |
| N30355 | South Wall Top Point #4 | 6.59 | Soil | 1433 | 03/29/93 | | <10 | NR | NR | NR | NR |
| N30356 | South Wall Top Point #5 | 7.04 | Soil | 1434 | 03/29/93 | | <10 | NR | NR | NR | NR |
| N30357 | South Wall Bottom Point #6 | 14.29 | Soil | 1445 | 03/29/93 | | <10 | NR | NR | NR | NR |
| N30358 | South Wall Bottom Point #7 | 14.94 | Soil | 1446 | 03/29/93 | | <10 | <0.125 | <0.125 | <0.125 | <0.125 |
| N30359 | South Wall Top Point #8 | 5.04 | Soil | 1447 | 03/29/93 | | <10 | NR | NR | NR | NR |
| N30360 | South Wall Top Point #9 | 10.09 | Soil | 1448 | 03/29/93 | | <10 | NR | NR | NR | NR |
| N30361 | West Wall Top Point #10 | 14.29 | Soil | 1449 | 03/29/93 | | <10 | <0.125 | <0.125 | <0.125 | <0.125 |
| N30362 | West Wall Bottom Point #11 | 16.19 | Soil | 1450 | 03/29/93 | | <10 | <0.125 | <0.125 | <0.125 | <0.125 |
| N30363 | West Wall Bottom Point #12 | 14.49 | Soil | 1451 | 03/29/93 | | <10 | <0.125 | <0.125 | <0.125 | <0.125 |
| N30364 | West Wall Top Point #13 | 9.49 | Soil | 1452 | 03/29/93 | | <10 | NR | NR | NR | NR |
| N30365 | Backfill Soil Check Sample | | Soil | 1455 | 03/29/93 | | <10 | NR | NR | NR | NR |

**Notes:**
The result followed by a "D" is the data qualifier indicating that the sample result exceeded the calibration curve limit for this test.
NA = Not Applicable
NR = Test Not Run
Sample Depth - Relative to Benchmark at Corner of Conoco Fence Line

aso Natural Gas Company
id Services Laboratory
CONOCO/EPNG Excavation

| Sample Number | Sample Location | Sample Depth (Feet) | Matrix | Time | Date | IR TPH Mod. 418.1 (MG/KG) | TPH Mod. 8015 (MG/KG) | EPA 8020 - BTEX (MG/KG) B | T | E | X |
|---|---|---|---|---|---|---|---|---|---|---|---|
| N30384 | #14 | 6.94 | Soil | 855 | 04/01/93 | <10/<10 | NR | NR | NR | NR | NR |
| N30385 | #15 | 10.49 | Soil | 857 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30386 | #16 | 10.74 | Soil | 859 | 04/01/93 | 30 | NR | NR | NR | NR | NR |
| N30387 | #17 | 14.94 | Soil | 900 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30388 | #18 | 13.34 | Soil | 901 | 04/01/93 | 304 | 47 | NR | NR | NR | NR |
| N30389 | #19 | 7.94 | Soil | 902 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30390 | #20 | 5.14 | Soil | 905 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30391 | #21 | 11.64 | Soil | 903 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30392 | #22 | 9.94 | Soil | 904 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30393 | W1 | N/A ( Surface Sample ) | Soil | 935 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30394 | W2 | N/A ( Surface Sample ) | Soil | 937 | 04/01/93 | <10/<10 | NR | NR | NR | NR | NR |
| N30395 | W3 | N/A ( Surface Sample ) | Soil | 938 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30396 | W4 | N/A ( Surface Sample ) | Soil | 940 | 04/01/93 | 12 | NR | NR | NR | NR | NR |
| N30397 | W5 | N/A ( Surface Sample ) | Soil | 941 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30398 | W6 | N/A ( Surface Sample ) | Soil | 947 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30399 | W7 | N/A ( Surface Sample ) | Soil | 943 | 04/01/93 | 586 | 240 | NR | NR | NR | NR |
| N30400 | W8 | N/A ( Surface Sample ) | Soil | 945 | 04/01/93 | 27 | NR | NR | NR | NR | NR |
| N30401 | W9 | N/A ( Surface Sample ) | Soil | 946 | 04/01/93 | <10 | NR | NR | NR | NR | NR |

**Notes:**

The result followed by a "D" is the data qualifier indicating that the sample result exceeded the calibration curve limit for this test.
NA = Not Applicable
NR = Test Not Run or Not Requested
/ indicates duplicate run on this sample with the associated result shown
Sample Depth - Relative to Benchmark at Corner of Conoco Fence Line
( Surface Sample ) - Approximately 1 to 2 feet of clean overburden was removed prior to obtaining the surface sample.
Hydrocarbon contaminated soil was found near W7 . The contaminated soil was removed.
On 3/31/93 the PID reading in the area near W7 was 682 ppm. On 4/1/93, the PID reading was 6 ppm.

El Paso Natural Gas Company
l Services Laboratory
CONOCO/EPNG Pit Excavation

| Sample Number | Sample Location | Sample Depth (Feet) | Matrix | Time | Date | IR TPH Mod. 418.1 (MG/KG) | TPH Mod. 8015 (MG/KG) | EPA 8020 - BTEX (MG/KG) B | T | E | X |
|---|---|---|---|---|---|---|---|---|---|---|---|
| N30402 | W10 | N/A ( Surface Sample ) | Soil | 948 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30403 | W11 | N/A ( Surface Sample ) | Soil | 943 | 04/01/93 | 16 | NR | NR | NR | NR | NR |
| N30404 | W12 | N/A ( Surface Sample ) | Soil | 942 | 04/01/93 | 84 | NR | NR | NR | NR | NR |
| N30405 | B1 | 8.51 | Soil | 1143 | 04/01/93 | <10/<10 | NR | NR | NR | NR | NR |
| N30406 | B2 | 9.49 | Soil | 1145 | 04/01/93 | <10 | NR | <0.025 | <0.025 | <0.025 | <0.025 |
| N30407 | B3 | 9.5 | Soil | 1147 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30408 | B4 | 10.39 | Soil | 1148 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30409 | B5 | 9.84 | Soil | 1150 | 04/01/93 | <10 | NR | <0.025 | <0.025 | <0.025 | <0.025 |
| N30410 | B6 | 9.14 | Soil | 1151 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30411 | B7 | 8.54 | Soil | 1156 | 04/01/93 | 57 | NR | <0.025 | <0.025 | <0.025 | <0.025 |
| N30412 | B8 | 19.21 | Soil | 1424 | 04/01/93 | 82 | NR | <0.025 | <0.025 | <0.025 | <0.025 |
| N30413 | B9 | 19.21 | Soil | 1425 | 04/01/93 | <10 | NR | <0.025 | <0.025 | <0.025 | 0.07 |
| N30414 | B10 | 16.31 | Soil | 1427 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30415 | B11 | 17.61 | Soil | 1429 | 04/01/93 | <10/<10 | NR | <0.025 | <0.025 | <0.025 | <0.025 |
| N30416 | B12 | 18.12 | Soil | 1430 | 04/01/93 | 14 | NR | <0.025 | <0.025 | <0.025 | 0.16 |
| N30417 | B13 | 18.21 | Soil | 1432 | 04/01/93 | 80 | NR | <0.025 | <0.025 | <0.025 | <0.025 |
| N30418 | B14 | 16.61 | Soil | 1434 | 04/01/93 | <10 | NR | <0.025 | <0.025 | <0.025 | <0.025 |
| N30419 | B15 | 17.16 | Soil | 1435 | 04/01/93 | <10 | NR | <0.025 | <0.025 | <0.025 | <0.025 |
| N30420 | B16 | 15.11 | Soil | 1436 | 04/01/93 | 15 | NR | NR | NR | NR | NR |
| N30421 | B17 | 17.16 | Soil | 1437 | 04/01/93 | <10 | NR | <0.025 | <0.025 | <0.025 | <0.025 |

**Notes:**

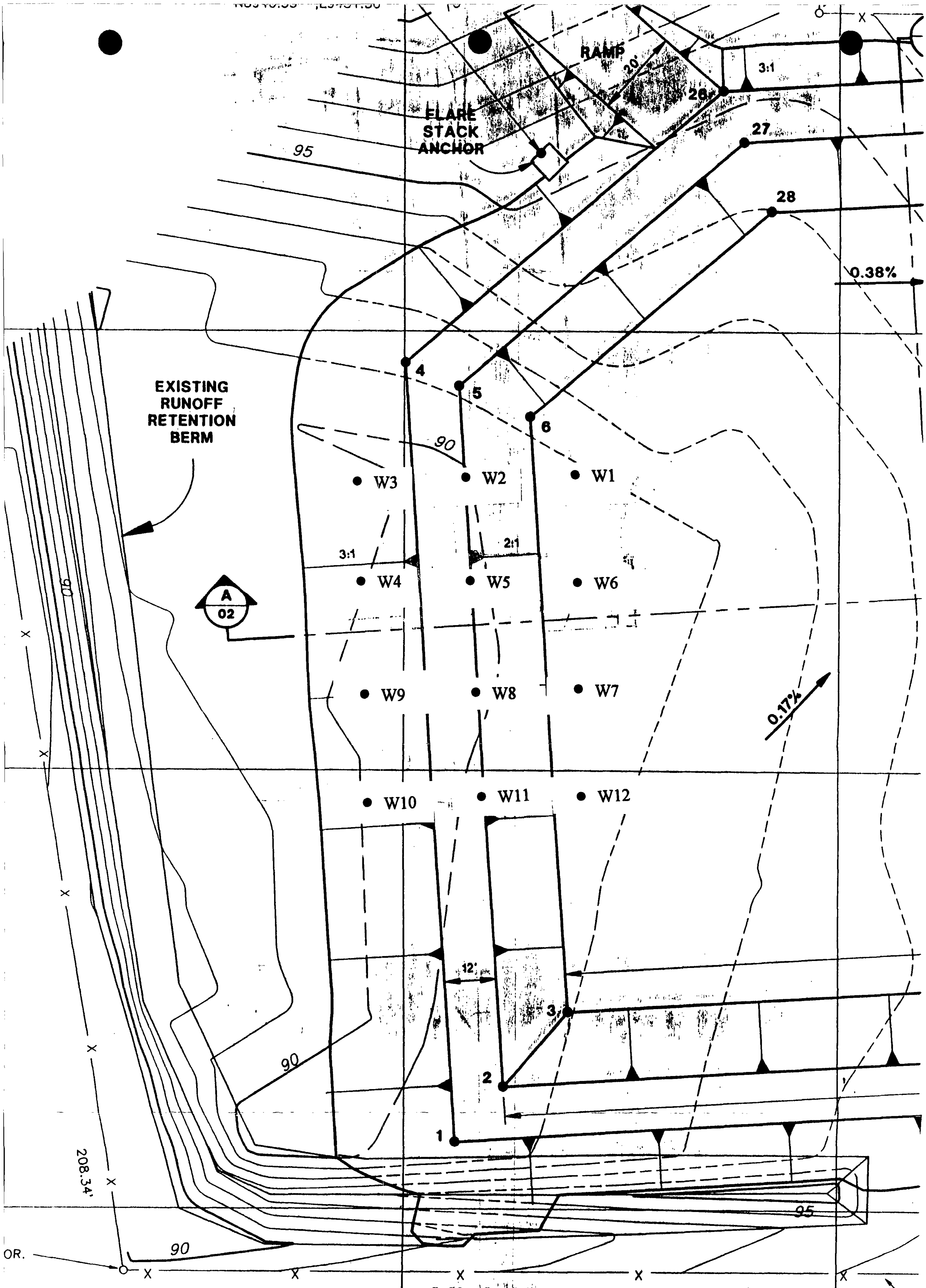
The result followed by a "D" is the data qualifier indicating that the sample result exceeded the calibration curve limit for this test.

NA = Not Applicable

NR = Test Not Run or Not Requested

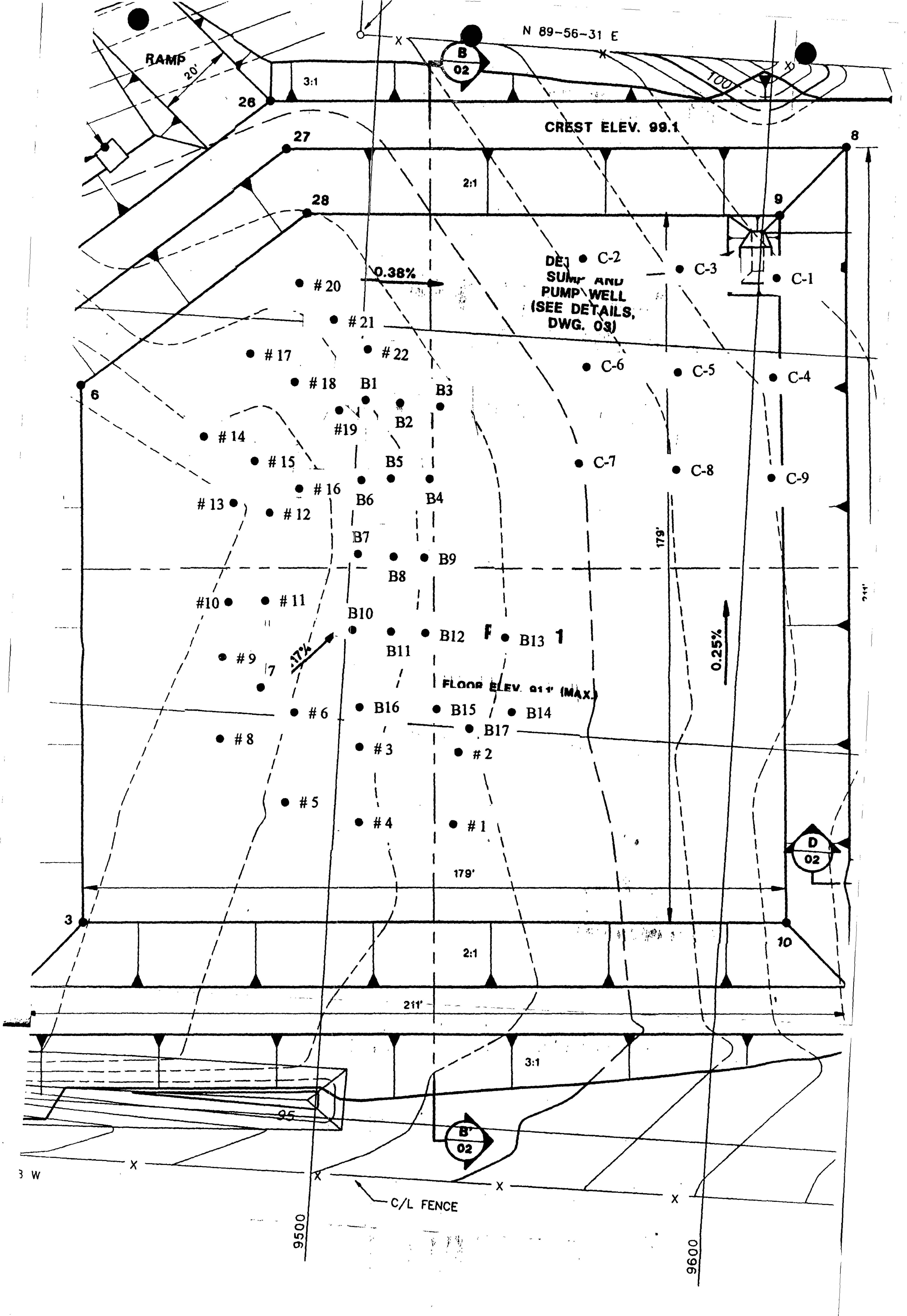
Sample Depth - Relative to Benchmark at Corner of Conoco Fence Line

( Surface Sample ) - Approximately 1 to 2 feet of clean overburden was removed prior to obtaining the surface sample.




POND COORDINATES

| PT. NO. | NORTHING | EASTING | ELEV. |
|---|---|---|---|
| 1 | 8715.19 | 9411.79 | 99.1 |
| 2 | 8727.94 | 9422.99 | 99.1 |
| 3 | 8744.94 | 9437.92 | 91.1 |
| 4 | 8892.96 | 9400.28 | 99.1 |
| 5 | 8887.69 | 9412.64 | 99.1 |
| 6 | 8880.68 | 9429.13 | 91.1 |
| 7 | 8964.89 | 9631.11 | 99.1 |



RAMP
20'
N 89-56-31 E
B
02
3:1
26
100
CREST ELEV. 99.1
27
8
2:1
28
9
DET SUMP AND PUMP WELL (SEE DETAILS, DWG. 03)
C-2
C-3
C-1
0.38%
# 20
# 21
# 22
# 17
C-6
C-5
C-4
# 18
B1
B3
6
B2
#19
# 14
# 15
B5
C-7
C-8
C-9
# 16
B6
B4
# 13
# 12
179'
B7
B9
B8
#10
# 11
B10
B12
B13
B11
0.25%
# 9
FLOOR ELEV.
# 6
B16
B15
B14
B17
# 8
# 3
# 2
# 5
# 4
# 1
D
02
179'
3
10
2:1
211'
3:1
95
B'
02
C/L FENCE
9500
9600

**El Paso Natural Gas Company**
**Field Services Laboratory**
**Method 418.1 TPH Analytical Results**
**CONOCO/EPNG Pit Investigation**

**Date Collected: March 15, 1993**
**Date Extracted: March 16, 1993**
**Date Analyzed: March 16, 1993**
**Holding Time Status: Acceptable!**

| Sample Number | Sample Location | Time | Data Qualifier | Regulatory Limit 100 Mg/Kg<br>IR TPH Mod. 418.1 (MG/KG) |
|---|---|---|---|---|
| N30313 | Conoco C-1 Grid Point, Sludge Pit | 1330 | | 27 |
| N30314 | Conoco C-2 Grid Point, Sludge Pit | 1340 | | 937 |
| N30315 | Conoco C-3 Grid Point, Sludge Pit | 1344 | | <10 |
| N30316 | Conoco C-4 Grid Point, Sludge Pit | 1347 | | 288 |
| N30317 | Conoco C-5 Grid Point, Sludge Pit | 1338 | | 2,513 |
| N30318 | Conoco C-6 Grid Point, Sludge Pit | 1332 | | <10 |
| N30319 | Conoco C-7 Grid Point, Sludge Pit | 1334 | | <10 |
| N30320 | Conoco C-8 Grid Point, Sludge Pit | 1336 | | 352 |
| N30321 | Conoco C-9 Grid Point, Sludge Pit | 1350 | | 193 |

**NOTES:** The "D" qualifier indicates that the sample result exceeded the limit of the calibration curve.

Approved By: [signature] 3/18/93
Date

# QUALITY CONTROL REPORT
TPH by Modified 418.1 by Infrared
Samples N30313 to N30321

**LABORATORY CONTROL SAMPLES: CALIBRATION CHECKS**

| SAMPLE ID | SOURCE | TRUE VALUE (PPM) | FOUND (MG/KG) | %R | ACCEPTABLE RANGE 75-125 %R YES | NO |
|---|---|---|---|---|---|---|
| INITIAL CALIBRATION VERIF. "B" Heavy Oil (Lot MOR9480) | HORIBA | 200.0 | 215.8 | 107.9 | X | |

**LABORATORY AND FIELD DUPLICATES:**

| SAMPLE NUMBER | TYPE | SAMPLE RESULT (S)MG/KG | DUPLICATE RESULT (D)MG/KG | RPD | ACCEPTABLE RANGE + / - 35% YES | NO |
|---|---|---|---|---|---|---|
| N30317/N30317D | 2nd Extract | 2513 | 2851 | 13 | X | |

**LABORATORY SPIKES:**

| SAMPLE NUMBER | SPIKE ADDED (SA)MG/KG | SAMPLE RESULT (S)MG/KG | SPIKE SAMPLE RESULT (SR)MG/KG | %R | ACCEPTABLE RANGE 75-125 %R YES | NO |
|---|---|---|---|---|---|---|
| N30317/N30317S | 3350 | 2513 | 5238 | 81 | X | |

**REFERENCE SOIL (Laboratory Control Sample):**

| SAMPLE ID | SOURCE | KNOWN VALUE (MG/KG) | SAMPLE RESULT FOUND (MG/KG) | RPD | ACCEPTABLE RANGE + / - 35% YES | NO |
|---|---|---|---|---|---|---|
| ERA TPH STANDARD #1 LOT # 91016 | ENVIRONMENTA RESOURCE ASS. | 2350 | 2381 | 1.3 | X | |
| ERA TPH STANDARD #2 w/int LOT # 91016 | ENVIRONMENTA RESOURCE ASS. | 1450 | 1843 | 23.9 | X | |

**LABORATORY REAGENT BLANK:**

| SAMPLE ID | SOURCE | TPH LEVEL (MG/KG) | STATUS |
|---|---|---|---|
| Freon Solvent | HORIBA | <10.0 | ACCEPTABLE |
| Reagent Blank | EPNG Lab | <10.0 | ACCEPTABLE |

Approved By: Jan Lolli 3/18/97
Date

El Paso Natural Gas Company
Field Services Laboratory
CONO[illegible]NG Pit Excavation

| Sample Number | Sample Location | Sample Depth (Feet) | Matrix | Time | Date | | IR TPH Mod. 418.1 (MG/KG) | B | T | E | X |
|---|---|---|---|---|---|---|---|---|---|---|---|
| N30352 | South Wall Top Point #1 | 5.89 | Soil | 1430 | 03/29/93 | | <10 | <0.125 | <0.125 | <0.125 | <0.125 |
| N30353 | South Wall Bottom Point #2 | 6.59 | Soil | 1431 | 03/29/93 | | <10 | <0.125 | <0.125 | <0.125 | <0.125 |
| N30354 | South Wall Bottom Point #3 | 15.64 | Soil | 1432 | 03/29/93 | | <10 | <0.125 | <0.125 | <0.125 | <0.125 |
| N30355 | South Wall Top Point #4 | 6.59 | Soil | 1433 | 03/29/93 | | <10 | NR | NR | NR | NR |
| N30356 | South Wall Top Point #5 | 7.04 | Soil | 1434 | 03/29/93 | | <10 | NR | NR | NR | NR |
| N30357 | South Wall Bottom Point #6 | 14.29 | Soil | 1445 | 03/29/93 | | <10 | NR | NR | NR | NR |
| N30358 | South Wall Bottom Point #7 | 14.94 | Soil | 1446 | 03/29/93 | | <10 | <0.125 | <0.125 | <0.125 | <0.125 |
| N30359 | South Wall Top Point #8 | 5.04 | Soil | 1447 | 03/29/93 | | <10 | NR | NR | NR | NR |
| N30360 | South Wall Top Point #9 | 10.09 | Soil | 1448 | 03/29/93 | | <10 | NR | NR | NR | NR |
| N30361 | West Wall Top Point #10 | 14.29 | Soil | 1449 | 03/29/93 | | <10 | <0.125 | <0.125 | <0.125 | <0.125 |
| N30362 | West Wall Bottom Point #11 | 16.19 | Soil | 1450 | 03/29/93 | | <10 | <0.125 | <0.125 | <0.125 | <0.125 |
| N30363 | West Wall Bottom Point #12 | 14.49 | Soil | 1451 | 03/29/93 | | <10 | <0.125 | <0.125 | <0.125 | <0.125 |
| N30364 | West Wall Top Point #13 | 9.49 | Soil | 1452 | 03/29/93 | | <10 | NR | NR | NR | NR |
| N30365 | Backfill Soil Check Sample | | Soil | 1455 | 03/29/93 | | <10 | NR | NR | NR | NR |

Notes:
The result followed by a "D" is the data qualifier indicating that the sample result exceeded the calibration curve limit for this test.
NA = Not Applicable
NR = Test Not Run
Sample Depth - Relative to Benchmark at Corner of Conoco Fence Line

QUALITY CONTROL REPORT
TPH by Modified 418.1 by Infrared
Samples N30352 to N30365 run on 3/30/93

**LABORATORY CONTROL SAMPLES: CALIBRATION CHECKS**

| SAMPLE ID | SOURCE | TRUE VALUE (PPM) | FOUND (MG/KG) | %R | ACCEPTABLE RANGE 75-125 %R YES | NO |
|---|---|---|---|---|---|---|
| INITIAL CALIBRATION VERIF. "B" Heavy Oil (Lot MOR9480) | HORIBA | 200.0 | 216.6 | 108.3 | X | |

**LABORATORY AND FIELD DUPLICATES:**

| SAMPLE NUMBER | TYPE | SAMPLE RESULT (S)MG/KG | DUPLICATE RESULT (D)MG/KG | RPD | ACCEPTABLE RANGE + / - 35% YES | NO |
|---|---|---|---|---|---|---|
| N30352/N30352D | 2nd Extract | <10 | <10 | 0 | X | |

Narrative : Acceptable.

**LABORATORY SPIKES:**

| SAMPLE NUMBER | SPIKE ADDED (SA)MG/KG | SAMPLE RESULT (S)MG/KG | SPIKE SAMPLE RESULT (SR)MG/KG | %R | ACCEPTABLE RANGE 75-125 %R YES | NO |
|---|---|---|---|---|---|---|
| [illegible]30352/N30352S | 3350 | 0 | 3614 | 108 | X | |

**REFERENCE SOIL (Laboratory Control Sample):**

| SAMPLE ID | SOURCE | KNOWN VALUE (MG/KG) | SAMPLE RESULT FOUND (MG/KG) | RPD | ACCEPTABLE RANGE + / - 35% YES | NO |
|---|---|---|---|---|---|---|
| ERA TPH STANDARD #1 LOT # 91016 | ENVIRONMENTA RESOURCE ASS. | 2350 | 2414 | 2.7 | X | |
| ERA TPH STANDARD #2 w/int LOT # 91016 | ENVIRONMENTA RESOURCE ASS. | 1450 | 1356 | 6.7 | X | |

**LABORATORY REAGENT BLANK:**

| SAMPLE ID | SOURCE | TPH LEVEL (MG/KG) | STATUS |
|---|---|---|---|
| Freon Solvent | HORIBA | <10.0 | ACCEPTABLE |
| Reagent Blank | EPNG Lab | <10.0 | ACCEPTABLE |

Approved By: [illegible signature] 4/2/93
Date

# QUALITY CONTROL REPORT

## EPA METHOD 8020 - BETX

**Samples: N30352 to N30365**

### LABORATORY DUPLICATES:

| SAMPLE NUMBER N30352 | TYPE | SAMPLE RESULT (S) (PPB) | DUPLICATE RESULT (D) (PPB) | RPD | ACCEPTABLE RANGE +/- 35% YES | NO |
|---|---|---|---|---|---|---|
| Benzene | 2nd Run | <5 | <5 | 0.0 | X | |
| Toluene | 2nd Run | <5 | <5 | 0.0 | X | |
| Ethylbenzene | 2nd Run | <5 | <5 | 0.0 | X | |
| Total Xylenes | 2nd Run | <5 | <5 | 0.0 | X | |

Narrative: Acceptable!

### LABORATORY CONTROL, CALIBRATION CHECK:

| SAMPLE NUMBER 100 PPB Standard | TYPE | KNOWN RESULT (PPB) | FOUND RESULT (PPB) | %R | ACCEPTABLE RANGE 75 - 125 % YES | NO |
|---|---|---|---|---|---|---|
| Benzene | Standard | 100.0 | 78.8 | 78.8 | X | |
| Toluene | Standard | 100.0 | 81.7 | 81.7 | X | |
| Ethylbenzene | Standard | 100.0 | 81.1 | 81.1 | X | |
| Total Xylenes | Standard | 200.0 | 171.3 | 85.7 | X | |

Narrative: Acceptable.

### LABORATORY SPIKES:

| SAMPLE NUMBER | SPIKE ADDED (SA) PPB | SAMPLE RESULT (S) (PPB) | SPIKE SAMPLE RESULT (SR) (PPB) | %R | ACCEPTABLE RANGE 65-135 %R YES | NO |
|---|---|---|---|---|---|---|
| Benzene | 60.0 | 0.0 | 0.0 | 0 | | |
| Toluene | 60.0 | 0.0 | 0.0 | 0 | | |
| Ethylbenzene | 60.0 | 0.0 | 0.0 | 0 | | |
| Total Xylenes | 120.0 | 0.0 | 0.0 | 0 | | |

Narrative: None With This Set.

### LABORATORY AND TRIP BLANKS:

| SAMPLE ID | SOURCE | Component (PPB) | STATUS |
|---|---|---|---|
| Benzene | EPNG Water | <5 | ACCEPTABLE |
| Toluene | EPNG Water | <5 | ACCEPTABLE |
| Ethylbenzene | EPNG Water | <5 | ACCEPTABLE |
| Total Xylenes | EPNG Water | <5 | ACCEPTABLE |

Narrative: Acceptable!

Approved By: John Lardi 4/2/93

Date

El Paso Natural Gas Company
ld Services Laboratory
NOCO/EPNG Pit Excavation

| Sample Number | Sample Location | Sample Depth (Feet) | Matrix | Time | Date | IR TPH Mod. 418.1 (MG/KG) | TPH Mod. 8015 (MG/KG) | EPA 8020 - BTEX (MG/KG) B | T | E | X |
|---|---|---|---|---|---|---|---|---|---|---|---|
| N30402 | W10 | N/A ( Surface Sample ) | Soil | 948 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30403 | W11 | N/A ( Surface Sample ) | Soil | 943 | 04/01/93 | 16 | NR | NR | NR | NR | NR |
| N30404 | W12 | N/A ( Surface Sample ) | Soil | 942 | 04/01/93 | 84 | NR | NR | NR | NR | NR |
| N30405 | B1 | 8.51 | Soil | 1143 | 04/01/93 | <10/<10 | NR | NR | NR | NR | NR |
| N30406 | B2 | 9.49 | Soil | 1145 | 04/01/93 | <10 | NR | <0.025 | <0.025 | <0.025 | <0.025 |
| N30407 | B3 | 9.5 | Soil | 1147 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30408 | B4 | 10.39 | Soil | 1148 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30409 | B5 | 9.84 | Soil | 1150 | 04/01/93 | <10 | NR | <0.025 | <0.025 | <0.025 | <0.025 |
| N30410 | B6 | 9.14 | Soil | 1151 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30411 | B7 | 8.54 | Soil | 1156 | 04/01/93 | 57 | NR | <0.025 | <0.025 | <0.025 | <0.025 |
| N30412 | B8 | 19.21 | Soil | 1424 | 04/01/93 | 82 | NR | <0.025 | <0.025 | <0.025 | <0.025 |
| N30413 | B9 | 19.21 | Soil | 1425 | 04/01/93 | <10 | NR | <0.025 | <0.025 | <0.025 | 0.07 |
| N30414 | B10 | 16.31 | Soil | 1427 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30415 | B11 | 17.61 | Soil | 1429 | 04/01/93 | <10/<10 | NR | <0.025 | <0.025 | <0.025 | <0.025 |
| N30416 | B12 | 18.12 | Soil | 1430 | 04/01/93 | 14 | NR | <0.025 | <0.025 | <0.025 | 0.16 |
| N30417 | B13 | 18.21 | Soil | 1432 | 04/01/93 | 80 | NR | <0.025 | <0.025 | <0.025 | <0.025 |
| N30418 | B14 | 16.61 | Soil | 1434 | 04/01/93 | <10 | NR | <0.025 | <0.025 | <0.025 | <0.025 |
| N30419 | B15 | 17.16 | Soil | 1435 | 04/01/93 | <10 | NR | <0.025 | <0.025 | <0.025 | <0.025 |
| N30420 | B16 | 15.11 | Soil | 1436 | 04/01/93 | 15 | NR | NR | NR | NR | NR |
| N30421 | B17 | 17.16 | Soil | 1437 | 04/01/93 | <10 | NR | <0.025 | <0.025 | <0.025 | <0.025 |

**Notes:**
The result followed by a "D" is the data qualifier indicating that the sample result exceeded the calibration curve limit for this test.
NA = Not Applicable
NR = Test Not Run or Not Requested
Sample Depth - Relative to Benchmark at Corner of Conoco Fence Line
( Surface Sample ) - Approximately 1 to 2 feet of clean overburden was removed prior to obtaining the surface sample.

Paso Natural Gas Company
ld Services Laboratory
CONOCO/EPNG Excavation

| Sample Number | Sample Location | Sample Depth (Feet) | Matrix | Time | Date | IR TPH Mod. 418.1 (MG/KG) | TPH Mod. 8015 (MG/KG) | EPA 8020 - BTEX (MG/KG) B | T | E | X |
|---|---|---|---|---|---|---|---|---|---|---|---|
| N30384 | #14 | 6.94 | Soil | 855 | 04/01/93 | <10/<10 | NR | NR | NR | NR | NR |
| N30385 | #15 | 10.49 | Soil | 857 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30386 | #16 | 10.74 | Soil | 859 | 04/01/93 | 30 | NR | NR | NR | NR | NR |
| N30387 | #17 | 14.94 | Soil | 900 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30388 | #18 | 13.34 | Soil | 901 | 04/01/93 | 304 | 47 | NR | NR | NR | NR |
| N30389 | #19 | 7.94 | Soil | 902 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30390 | #20 | 5.14 | Soil | 905 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30391 | #21 | 11.64 | Soil | 903 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30392 | #22 | 9.94 | Soil | 904 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30393 | W1 | N/A ( Surface Sample ) | Soil | 935 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30394 | W2 | N/A ( Surface Sample ) | Soil | 937 | 04/01/93 | <10/<10 | NR | NR | NR | NR | NR |
| N30395 | W3 | N/A ( Surface Sample ) | Soil | 938 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30396 | W4 | N/A ( Surface Sample ) | Soil | 940 | 04/01/93 | 12 | NR | NR | NR | NR | NR |
| N30397 | W5 | N/A ( Surface Sample ) | Soil | 941 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30398 | W6 | N/A ( Surface Sample ) | Soil | 947 | 04/01/93 | <10 | NR | NR | NR | NR | NR |
| N30399 | W7 | N/A ( Surface Sample ) | Soil | 943 | 04/01/93 | 586 | 240 | NR | NR | NR | NR |
| N30400 | W8 | N/A ( Surface Sample ) | Soil | 945 | 04/01/93 | 27 | NR | NR | NR | NR | NR |
| N30401 | W9 | N/A ( Surface Sample ) | Soil | 946 | 04/01/93 | <10 | NR | NR | NR | NR | NR |

**Notes:**
The result followed by a "D" is the data qualifier indicating that the sample result exceeded the calibration curve limit for this test.
NA = Not Applicable
NR = Test Not Run or Not Requested
/ indicates duplicate run on this sample with the associated result shown
Sample Depth - Relative to Benchmark at Corner of Conoco Fence Line
( Surface Sample ) - Approximately 1 to 2 feet of clean overburden was removed prior to obtaining the surface sample.
Hydrocarbon contaminated soil was found near W7 . The contaminated soil was removed.
On 3/31/93 the PID reading in the area near W7 was 682 ppm. On 4/1/93, the PID reading was 6 ppm.

Analytical **Technologies,** Inc.

2709-D Pan American Freeway, NE Albuquerque, NM 87107
Phone (505) 344-3777 FAX (505) 344-4413

ATI I.D. **304318**

APR 1993
RECEIVED

April 16, 1993

El Paso Natural Gas Co.
P.O. Box 4990
Farmington, NM 87499

Project Name/Number: CONOCO PIT

Attention: John Lambdin

On **04/06/93**, Analytical Technologies, Inc. received a request to analyze **non-aqueous** samples. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

If you have any questions or comments, please do not hesitate to contact us at (505) 344-3777.

Letitia Krakowski
Assistant Project Manager

Adela M Carter for
Elizabeth Proffitt
Laboratory Manager

EP:td
Enclosure

Analytical Technologies, Inc.

CLIENT : EL PASO NATURAL GAS CO.
PROJECT # : (NONE)
PROJECT NAME: CONOCO PIT

DATE RECEIVED: 04/06/93
REPORT DATE : 04/16/93

ATI I.D.: 304318

| ATI # | CLIENT DESCRIPTION | MATRIX | DATE COLLECTED |
|---|---|---|---|
| 01 | N30399 -W7 | NON-AQ | 04/01/93 |
| 02 | N30406 - B2 | NON-AQ | 04/01/93 |
| 03 | N30409 - B5 | NON-AQ | 04/01/93 |
| 04 | N30411 — B7 | NON-AQ | 04/01/93 |
| 05 | N30412-B8 | NON-AQ | 04/01/93 |
| 06 | N30413-B9 | NON-AQ | 04/01/93 |
| 07 | N30415-B11 | NON-AQ | 04/01/93 |
| 08 | N30416 — B12 | NON-AQ | 04/01/93 |
| 09 | N30417-B13 | NON-AQ | 04/01/93 |
| 10 | N30418 — B14 | NON-AQ | 04/01/93 |
| 11 | N30419 — B15 | NON-AQ | 04/01/93 |
| 12 | N30421 — B17 | NON-AQ | 04/01/93 |

APR 1993
RECEIVED

----TOTALS----

| MATRIX | # SAMPLES |
|---|---|
| NON-AQ | 12 |

ATI STANDARD DISPOSAL PRACTICE

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

Analytical Technologies, Inc.

## GAS CHROMATOGRAPHY - RESULTS

TEST : EPA 8015 MODIFIED
CLIENT : EL PASO NATURAL GAS CO. ATI I.D.: 304318
PROJECT # : (NONE)
PROJECT NAME: CONOCO PIT

| SAMPLE I.D. # | CLIENT I.D. | MATRIX | DATE SAMPLED | DATE EXTRACTED | DATE ANALYZED | DIL. FACTOR |
|---|---|---|---|---|---|---|
| 01 | N30399 | NON-AQ | 04/01/93 | 04/08/93 | 04/09/93 | 1 |

| PARAMETER | UNITS | 01 |
|---|---|---|
| FUEL HYDROCARBONS | MG/KG | 240 |
| HYDROCARBON RANGE | | C14-C32 |
| HYDROCARBONS QUANTITATED USING | | DIESEL |
| O-TERPHENYL (%) | | 92 |

Analytical Technologies, Inc.

# GAS CHROMATOGRAPHY - RESULTS BLANK

| | | | |
|---|---|---|---|
| TEST : | EPA 8015 MODIFIED | ATI I.D. : | 304318 |
| BLANK I.D. : | 040893 | DATE EXTRACTED : | 04/08/93 |
| CLIENT : | EL PASO NATURAL GAS CO. | DATE ANALYZED : | 04/09/93 |
| PROJECT # : | (NONE) | DILUTION FACTOR: | 1 |
| PROJECT NAME: | CONOCO PIT | | |

| PARAMETER | UNITS | |
|---|---|---|
| FUEL HYDROCARBONS | MG/KG | <5 |
| HYDROCARBON RANGE | | - |
| HYDROCARBONS QUANTITATED USING | | - |
| O-TERPHENYL (%) | | 96 |

Acceptable [illegible] 4/19/93

Analytical Technologies, Inc.

# GAS CHROMATOGRAPHY - QUALITY CONTROL

| | | | |
|---|---|---|---|
| TEST | : EPA 8015 MODIFIED | ATI I.D. | : 304318 |
| MSMSD # | : 040893 | DATE EXTRACTED | : 04/08/93 |
| CLIENT | : EL PASO NATURAL GAS CO. | DATE ANALYZED | : 04/09/93 |
| | | SAMPLE MATRIX | : NON-AQ |
| PROJECT # | : (NONE) | REF. I.D. | : 040893 |
| PROJECT NAME | : CONOCO PIT | UNITS | : MG/KG |

| PARAMETERS | SAMPLE RESULT | CONC SPIKE | SPIKED SAMPLE | % REC | DUP SPIKE | DUP % REC | RPD |
|---|---|---|---|---|---|---|---|
| FUEL HYDROCARBONS | <5 | 100 | 98 | 98 | 100 | 100 | 2 |

Acceptable
4/19/93

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical **Technologies**, Inc.

# GAS CHROMATOGRAPHY - RESULTS

TEST : BTEX (EPA 8020)
CLIENT : EL PASO NATURAL GAS CO. ATI I.D.: 304318
PROJECT # : (NONE)
PROJECT NAME: CONOCO PIT

| SAMPLE I.D. # | CLIENT I.D. | MATRIX | DATE SAMPLED | DATE EXTRACTED | DATE ANALYZED | DIL. FACTOR |
|---|---|---|---|---|---|---|
| 02 | N30406 | NON-AQ | 04/01/93 | 04/07/93 | 04/09/93 | 1 |
| 03 | N30409 | NON-AQ | 04/01/93 | 04/07/93 | 04/09/93 | 1 |
| 04 | N30411 | NON-AQ | 04/01/93 | 04/07/93 | 04/09/93 | 1 |
| 05 | N30412 | NON-AQ | 04/01/93 | 04/07/93 | 04/09/93 | 1 |

| PARAMETER | UNITS | 02 | 03 | 04 | 05 |
|---|---|---|---|---|---|
| BENZENE | MG/KG | <0.025 | <0.025 | <0.025 | <0.025 |
| TOLUENE | MG/KG | <0.025 | <0.025 | <0.025 | <0.025 |
| ETHYLBENZENE | MG/KG | <0.025 | <0.025 | <0.025 | <0.025 |
| TOTAL XYLENES | MG/KG | <0.025 | <0.025 | <0.025 | <0.025 |
| BROMOFLUOROBENZENE (%) | | 76 | 74 | 77 | 73 |

Analytical Technologies, Inc.

## GAS CHROMATOGRAPHY - RESULTS

TEST : BTEX (EPA 8020)
CLIENT : EL PASO NATURAL GAS CO. ATI I.D.: 304318
PROJECT # : (NONE)
PROJECT NAME: CONOCO PIT

| SAMPLE I.D. # | CLIENT I.D. | MATRIX | DATE SAMPLED | DATE EXTRACTED | DATE ANALYZED | DIL. FACTOR |
|---|---|---|---|---|---|---|
| 06 | N30413 | NON-AQ | 04/01/93 | 04/07/93 | 04/09/93 | 1 |
| 07 | N30415 | NON-AQ | 04/01/93 | 04/07/93 | 04/09/93 | 1 |
| 08 | N30416 | NON-AQ | 04/01/93 | 04/07/93 | 04/08/93 | 1 |
| 09 | N30417 | NON-AQ | 04/01/93 | 04/07/93 | 04/09/93 | 1 |

| PARAMETER | UNITS | 06 | 07 | 08 | 09 |
|---|---|---|---|---|---|
| BENZENE | MG/KG | <0.025 | <0.025 | <0.025 | <0.025 |
| TOLUENE | MG/KG | <0.025 | <0.025 | <0.025 | <0.025 |
| ETHYLBENZENE | MG/KG | <0.025 | <0.025 | <0.025 | <0.025 |
| TOTAL XYLENES | MG/KG | 0.07 | <0.025 | 0.16 | <0.025 |
| BROMOFLUOROBENZENE (%) | | 74 | 81 | 71 | 81 |

Analytical Technologies, Inc.

# GAS CHROMATOGRAPHY - RESULTS

TEST : BTEX (EPA 8020)
CLIENT : EL PASO NATURAL GAS CO. ATI I.D.: 304318
PROJECT # : (NONE)
PROJECT NAME: CONOCO PIT

| SAMPLE I.D. # | CLIENT I.D. | MATRIX | DATE SAMPLED | DATE EXTRACTED | DATE ANALYZED | DIL. FACTOR |
|---|---|---|---|---|---|---|
| 10 | N30418 | NON-AQ | 04/01/93 | 04/07/93 | 04/09/93 | 1 |
| 11 | N30419 | NON-AQ | 04/01/93 | 04/07/93 | 04/08/93 | 1 |
| 12 | N30421 | NON-AQ | 04/01/93 | 04/08/93 | 04/09/93 | 1 |

| PARAMETER | UNITS | 10 | 11 | 12 |
|---|---|---|---|---|
| BENZENE | MG/KG | <0.025 | <0.025 | <0.025 |
| TOLUENE | MG/KG | <0.025 | <0.025 | <0.025 |
| ETHYLBENZENE | MG/KG | <0.025 | <0.025 | <0.025 |
| TOTAL XYLENES | MG/KG | <0.025 | <0.025 | <0.025 |
| BROMOFLUOROBENZENE (%) | | 80 | 72 | 78 |

Analytical **Technologies,** Inc.

# GAS CHROMATOGRAPHY - REAGENT BLANK

| | | | |
|---|---|---|---|
| TEST : | BTEX (EPA 8020) | ATI I.D. : | 304318 |
| BLANK I.D. : | 040793 | DATE EXTRACTED : | 04/07/93 |
| CLIENT : | EL PASO NATURAL GAS CO. | DATE ANALYZED : | 04/08/93 |
| PROJECT # : | (NONE) | DILUTION FACTOR: | 1 |
| PROJECT NAME: | CONOCO PIT | | |

| PARAMETER | UNITS | |
|---|---|---|
| BENZENE | MG/KG | <0.025 |
| TOLUENE | MG/KG | <0.025 |
| ETHYLBENZENE | MG/KG | <0.025 |
| TOTAL XYLENES | MG/KG | <0.025 |
| BROMOFLUOROBENZENE (%) | | 75 |

Acceptable.
SS
4/14/93

Analytical Technologies, Inc.

# GAS CHROMATOGRAPHY - REAGENT BLANK

| | | | |
|---|---|---|---|
| TEST : | BTEX (EPA 8020) | ATI I.D. : | 304318 |
| BLANK I.D. : | 040893 | DATE EXTRACTED : | 04/08/93 |
| CLIENT : | EL PASO NATURAL GAS CO. | DATE ANALYZED : | 04/09/93 |
| PROJECT # : | (NONE) | DILUTION FACTOR: | 1 |
| PROJECT NAME: | CONOCO PIT | | |

| PARAMETER | UNITS | |
|---|---|---|
| BENZENE | MG/KG | <0.025 |
| TOLUENE | MG/KG | <0.025 |
| ETHYLBENZENE | MG/KG | <0.025 |
| TOTAL XYLENES | MG/KG | <0.025 |
| BROMOFLUOROBENZENE (%) | | 88 |

Acceptable.
JS
4/19/93

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY - QUALITY CONTROL

TEST : BTEX (EPA 8020)
MSMSD # : 30431811
CLIENT : EL PASO NATURAL GAS CO.

PROJECT # : (NONE)
PROJECT NAME: CONOCO PIT

ATI I.D. : 304318
DATE EXTRACTED: 04/07/93
DATE ANALYZED : 04/08/93
SAMPLE MATRIX : NON-AQ
REF. I.D. : 30431811
UNITS : MG/KG

| PARAMETERS | SAMPLE RESULT | CONC SPIKE | SPIKED SAMPLE | % REC | DUP SPIKE | DUP % REC | RPD |
|---|---|---|---|---|---|---|---|
| BENZENE | <0.025 | 1.0 | 0.76 | 76 | 0.78 | 78 | 3 |
| TOLUENE | <0.025 | 1.0 | 0.78 | 78 | 0.80 | 80 | 3 |
| ETHYL BENZENE | <0.025 | 1.0 | 0.80 | 80 | 0.82 | 82 | 2 |
| TOTAL XYLENES | <0.025 | 3.0 | 2.4 | 80 | 2.5 | 83 | 4 |

Acceptable
8
4/19/93

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc.

# GAS CHROMATOGRAPHY - QUALITY CONTROL

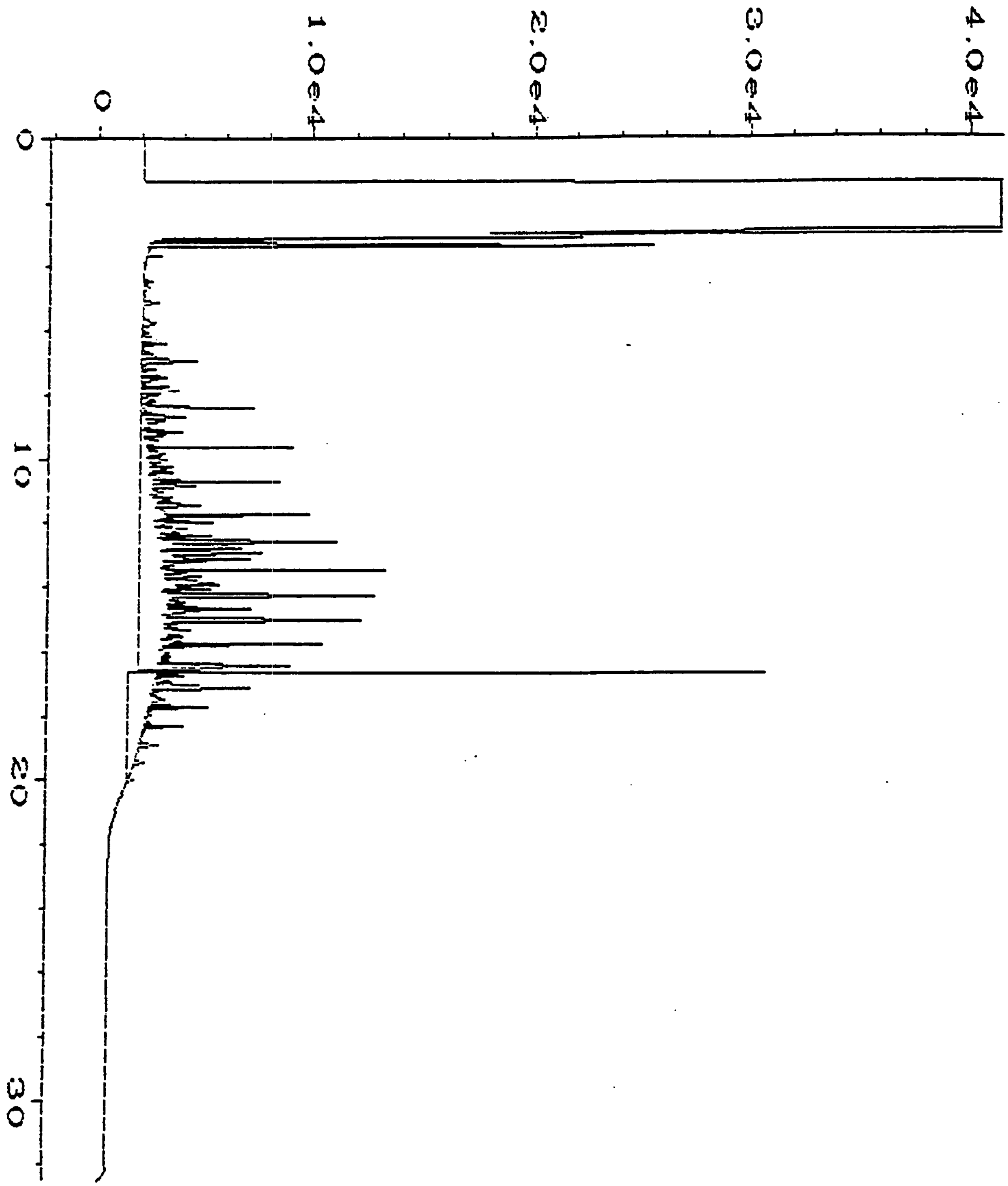
| | | | | | |
|---|---|---|---|---|---|
| TEST | : | BTEX (EPA 8020) | ATI I.D. | : | 304318 |
| MSMSD # | : | 30431905 | DATE EXTRACTED | : | 04/08/93 |
| CLIENT | : | EL PASO NATURAL GAS CO. | DATE ANALYZED | : | 04/10/93 |
| | | | SAMPLE MATRIX | : | NON-AQ |
| PROJECT # | : | (NONE) | REF. I.D. | : | 30431905 |
| PROJECT NAME | : | CONOCO PIT | UNITS | : | MG/KG |

| PARAMETERS | SAMPLE RESULT | CONC SPIKE | SPIKED SAMPLE | % REC | DUP SPIKE | DUP % REC | RPD |
|---|---|---|---|---|---|---|---|
| BENZENE | 0.045 | 1.0 | 0.78 | 74 | 0.76 | 72 | 3 |
| TOLUENE | 0.055 | 1.0 | 0.80 | 74 | 0.78 | 72 | 3 |
| ETHYL BENZENE | <0.025 | 1.0 | 0.78 | 78 | 0.78 | 78 | 0 |
| TOTAL XYLENES | 0.044 | 3.0 | 2.4 | 79 | 2.4 | 79 | 0 |

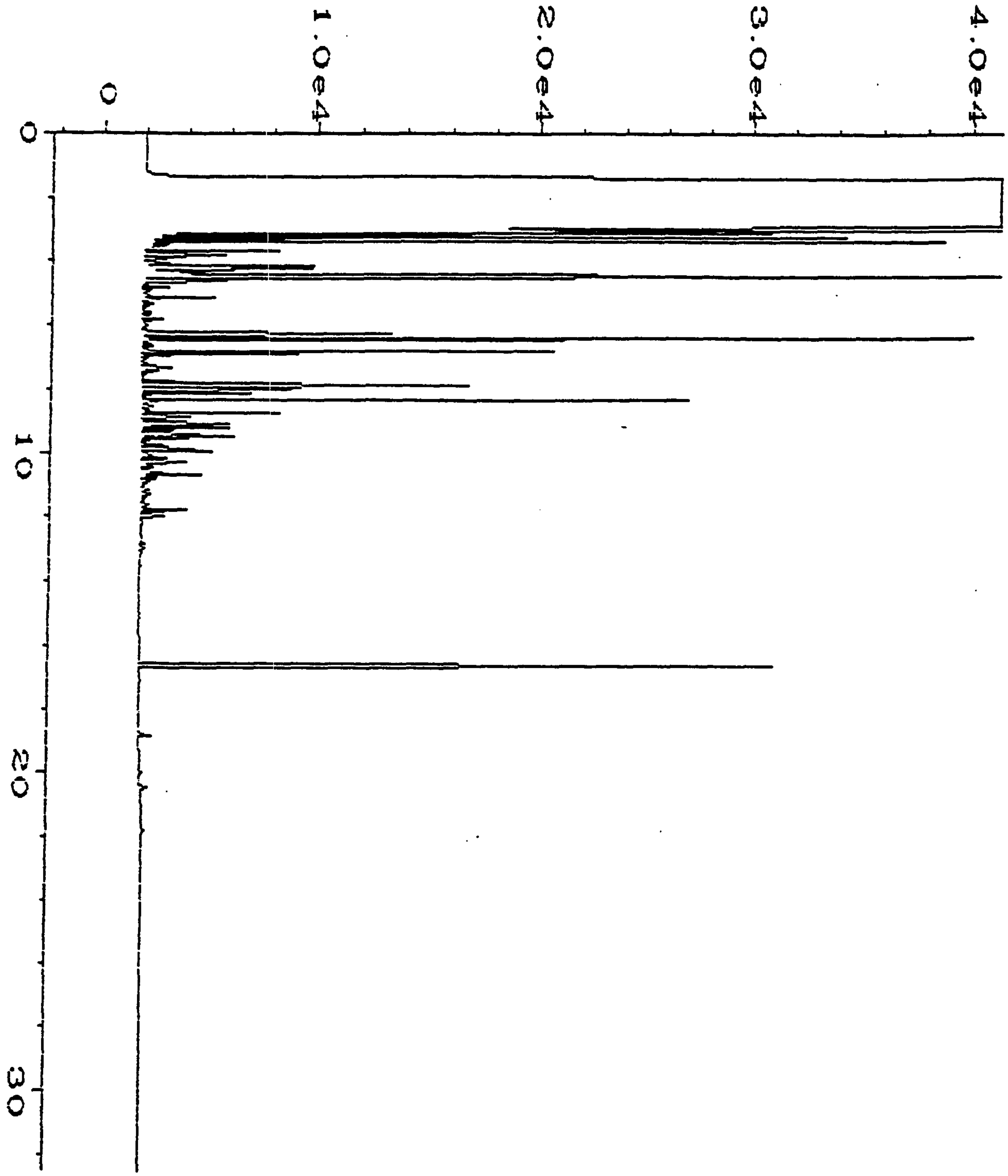
Acceptable
8
4/19/93

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

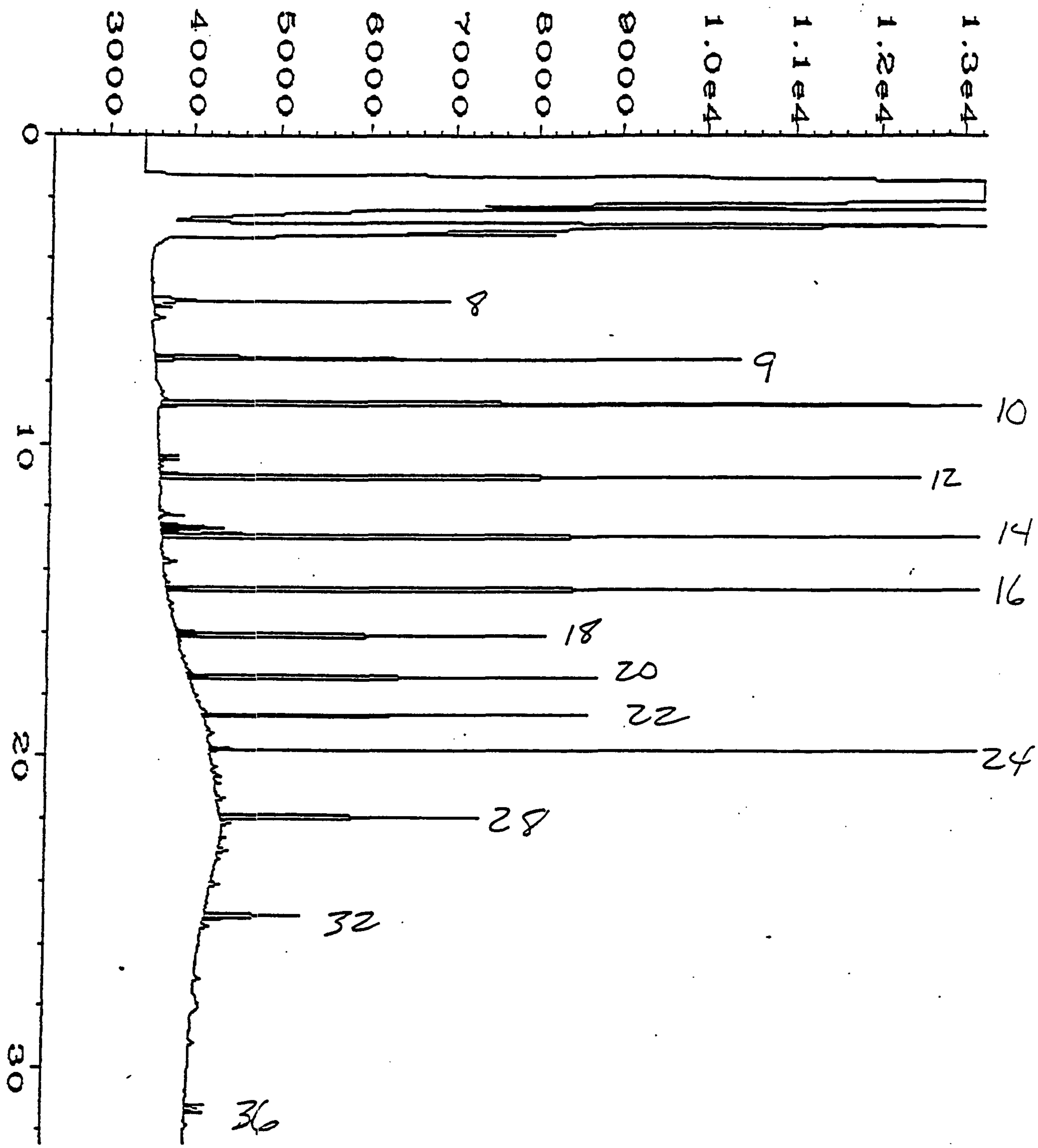



| | |
|---|---|
| Data File Name : C:\HPCHEM\1\DATA\19MAR93\062R0701.D | |
| Operator : CFF | Page Number : 1 |
| Instrument : GC#1 5890 | Vial Number : 62 |
| Sample Name : DSL STD 122PPB | Injection Number : 1 |
| Run Time Bar Code: | Sequence Line : 7 |
| Acquired on : 19 Mar 93 03:12 PM | Instrument Method: SDRZ0108.MTH |
| Report Created on: 19 Mar 93 03:59 PM | Analysis Method : SDRZ0108.MTH |



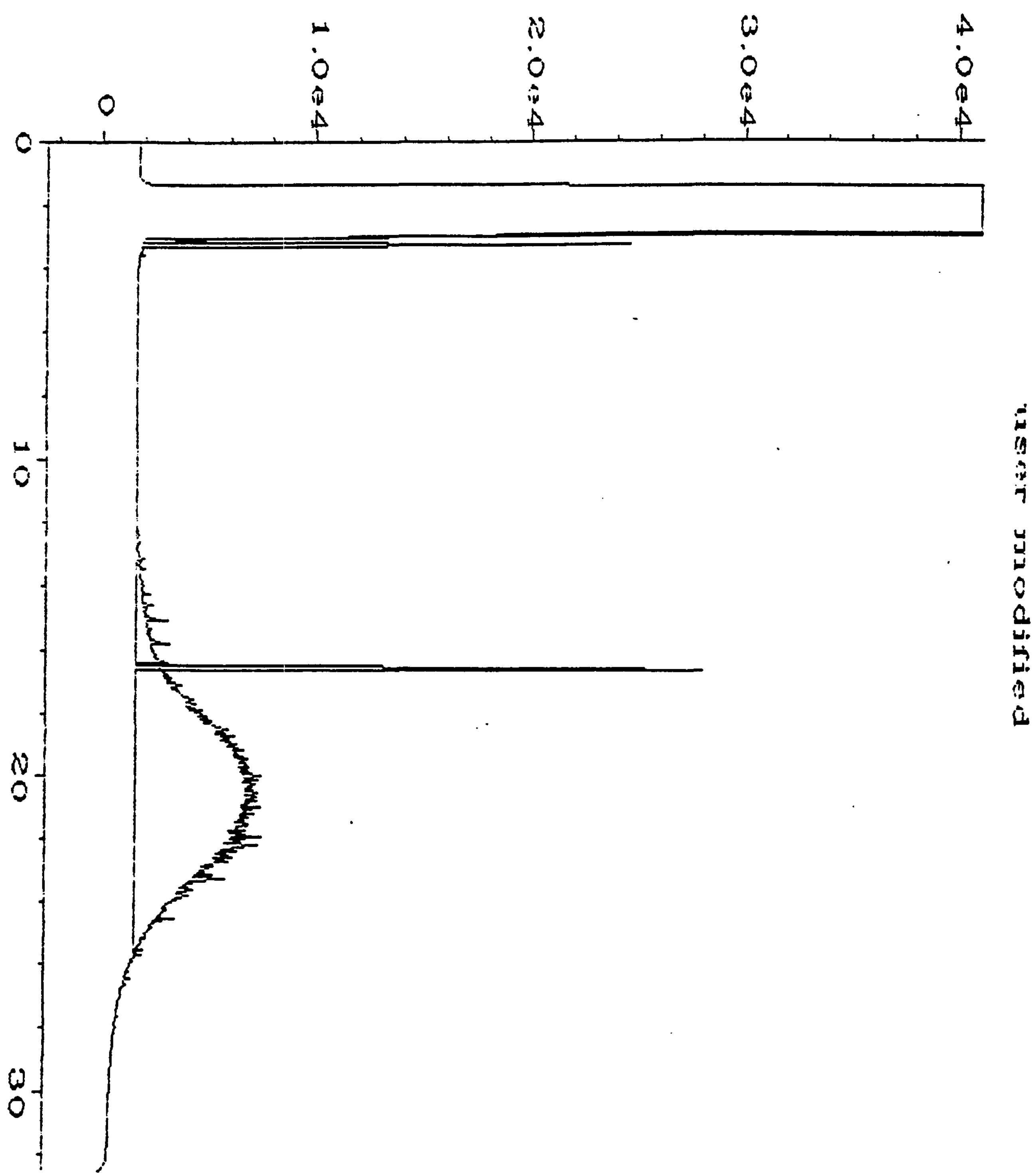

Data File Name : C:\HPCHEM\1\DATA\19MAR93\051R0101.D
Operator : CFF
Instrument : GC#1 5890
Sample Name : GASSTD 122 ug/ml
Run Time Bar Code:
Acquired on : 19 Mar 93 06:46 AM
Report Created on: 19 Mar 93 07:26 AM

Page Number : 1
Vial Number : 51
Injection Number : 1
Sequence Line : 1
Instrument Method: SGR0218.MTH
Analysis Method : SGR0218.MTH




Data File Name : C:\HPCHEM\1\DATA\16AUG92\051R0101.D
Operator : AMC
Instrument : GC#1 5890
Sample Name : COMBO
Run Time Bar Code:
Acquired on : 16 Aug 92 10:36 AM
Report Created on: 01 Feb 93 04:08 PM

Page Number : 1
Vial Number : 51
Injection Number : 1
Sequence Line : 1
Instrument Method: PARAFFIN.MTH
Analysis Method : SGF0126.MTH




Data File Name : C:\HPCHEM\1\DATA\09APR93\053R0201.D
Operator : CFF
Instrument : GC#1 5890
Sample Name : 304318-01
Run Time Bar Code:
Acquired on : 09 Apr 93 08:41 AM
Report Created on: 09 Apr 93 10:18 AM

Page Number : 1
Vial Number : 53
Injection Number : 1
Sequence Line : 2
Instrument Method: SDRZ0108.MTH
Analysis Method : SDRZ0108.MTH

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# CHAIN OF CUSTODY

DATE: 04-05-93 PAGE 1 OF 2

ATI LAB I.D. 304318

PROJECT MANAGER: JOHN LAMBDIN

COMPANY: EL PASO NATURAL GAS CO.
ADDRESS: P.O. BOX 4990
FARMINGTON NM
87419
PHONE: 505-599-2144
FAX: 505-599-2261

BILL TO: SAME AS ABOVE
COMPANY:
ADDRESS:

## ANALYSIS REQUEST

| SAMPLE ID | DATE | TIME | MATRIX | LAB ID | Petroleum Hydrocarbons (418.1) | (MOD 8015) Gas/Diesel | Diesel/Gasoline/BTXE/MTBE (MOD 8015/8020) | BTXE/MTBE (8020) | Chlorinated Hydrocarbons (601/8010) | Aromatic Hydrocarbons (602/8020) | SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg. | Pesticides/PCB (608/8080) | Herbicides (615/8150) | Base/Neutral/Acid Compounds GC/MS (625/8270) | Volatile Organics GC/MS (624/8240) | Polynuclear Aromatics (610/8310) | SDWA Primary Standards - Arizona | SDWA Secondary Standards - Arizona | SDWA Primary Standards - Federal | SDWA Secondary Standards - Federal | The 13 Priority Pollutant Metals | RCRA Metals by Total Digestion | RCRA Metals by TCLP (1311) | NUMBER OF CONTAINERS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N30399 | 04-01-93 | 0943 | SOIL | 01 | | X | | | | | | | | | | | | | | | | | | 1 |
| N30406 | 04-01-93 | 1145 | SOIL | 02 | | | | X | | | | | | | | | | | | | | | | 1 |
| N30409 | 04-01-93 | 1150 | SOIL | 03 | | | | X | | | | | | | | | | | | | | | | 1 |
| N30411 | 04-01-93 | 1156 | SOIL | 04 | | | | X | | | | | | | | | | | | | | | | 1 |
| N30412 | 04-01-93 | 1424 | SOIL | 05 | | | | X | | | | | | | | | | | | | | | | 1 |
| N30413 | 04-01-93 | 1425 | SOIL | 06 | | | | X | | | | | | | | | | | | | | | | 1 |
| N30415 | 04-01-93 | 1429 | SOIL | 07 | | | | X | | | | | | | | | | | | | | | | 1 |
| N30416 | 04-01-93 | 1430 | SOIL | 08 | | | | X | | | | | | | | | | | | | | | | 1 |
| N30417 | 04-01-93 | 1432 | SOIL | 09 | | | | X | | | | | | | | | | | | | | | | 1 |

### PROJECT INFORMATION

PROJ. NO.:
PROJ. NAME: Conoco Pit
P.O. NO.:
SHIPPED VIA:

### SAMPLE RECEIPT

| | |
|---|---|
| NO. CONTAINERS | 9 |
| CUSTODY SEALS | Y / N / NA |
| RECEIVED INTACT | Y |
| RECEIVED COLD | Y |

### PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) ☐24hr ☐48hr ☐72hr ☐1 WEEK (NORMAL) ☒2 WEEK

Comments:

~~108-47990-64-0001-51-2010~~

### SAMPLED & RELINQUISHED BY: 1.

Signature: [signature] Time: 1500
Printed Name: RICHARD BENSO Date: 04-05-93
Company: Phone:

### RELINQUISHED BY: 2.

Signature: Time:
Printed Name: Date:
Company:

### RELINQUISHED BY: 3.

Signature: Time:
Printed Name: Date:
Company:

### RECEIVED BY: 1.

Signature: Time:
Printed Name: Date:
Company:

### RECEIVED BY: 2.

Signature: Time:
Printed Name: Date:
Company:

### RECEIVED BY: (LAB) 3.

Signature: [signature] Time: 0955
Printed Name: Tom Deane Date: 4/6/93
Analytical Technologies, Inc.



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[redacted] AnalyticalTechnologies,Inc., Albuquerque, NM
[redacted]iego • Phoenix • Seattle • Pensacola • Ft. Collins • Portland • Albuquerque

# CHAIN OF CUSTODY

D[redacted] 04-05-93 PAGE 2 OF 2

ATI LAB I.D. 304[redacted]

PROJECT MANAGER: JOHN LAMBDIN

COMPANY: EL PASO NATURAL GAS CO
ADDRESS: P.O. BOX 4990
FARMINGTON NM 87419

PHONE: 505-599-2144
FAX: 505-599-2261

BILL TO: SAME AS ABOVE
COMPANY:
ADDRESS:

## ANALYSIS REQUEST

| SAMPLE ID | DATE | TIME | MATRIX | LAB ID | Petroleum Hydrocarbons (418.1) | (MOD 8015) Gas/Diesel | Diesel/Gasoline/BTXE/MTBE (MOD 8015/8020) | BTXE/MTBE (8020) | Chlorinated Hydrocarbons (601/8010) | Aromatic Hydrocarbons (602/8020) | SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg. | Pesticides/PCB (608/8080) | Herbicides (615/8150) | Base/Neutral/Acid Compounds GC/MS (625/8270) | Volatile Organics GC/MS (624/8240) | Polynuclear Aromatics (610/8310) | SDWA Primary Standards - Arizona | SDWA Secondary Standards - Arizona | SDWA Primary Standards - Federal | SDWA Secondary Standards - Federal | The 13 Priority Pollutant Metals | RCRA Metals by Total Digestion | RCRA Metals by TCLP (1311) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N30418 | 04-01-93 | 1434 | SOIL | 10 | | | | X | | | | | | | | | | | | | | | |
| N30419 | 04-01-93 | 1435 | SOIL | 11 | | | | X | | | | | | | | | | | | | | | |
| N30421 | 04-01-93 | 1437 | SOIL | 12 | | | | X | | | | | | | | | | | | | | | |

## PROJECT INFORMATION

PROJ. NO.:
PROJ. NAME: Conoco Pit
P.O. NO.:
SHIPPED VIA:

## SAMPLE RECEIPT

| | |
|---|---|
| NO. CONTAINERS | 3 |
| CUSTODY SEALS | Y / N / NA |
| RECEIVED INTACT | Y |
| RECEIVED COLD | Y |

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) ☐24hr ☐48hr ☐72hr ☐1 WEEK (NORMAL) ☒2 WEEK

Comments:

108-47990-64-0001-51-2010

| SAMPLED & RELINQUISHED BY: 1. | RELINQUISHED BY: 2. | RELINQUISHED BY: 3. |
|---|---|---|
| Signature: Richard Benson Time: 1500 | Signature: Time: | Signature: Time: |
| Printed Name: RICHARD BENSON Date: 04-05-93 | Printed Name: Date: | Printed Name: Date: |
| Company: Phone: | Company: | Company: |

| RECEIVED BY: 1. | RECEIVED BY: 2. | RECEIVED BY: (LAB) 3. |
|---|---|---|
| Signature: Time: | Signature: Time: | Signature: [illegible] Time: [illegible] |
| Printed Name: Date: | Printed Name: Date: | Printed Name: [illegible] Date: [illegible] |
| Company: | Company: | Analytical Technologies, Inc. |

PLEASE FILL THIS FORM IN COMPLETELY. SHADED AREAS ARE FOR LAB USE ONLY.

Analytical **Technologies,** Inc.

2709-D Pan American Freeway, NE Albuquerque, NM 87107
Phone (505) 344-3777 FAX (505) 344-4413

ATI I.D. **304372**

April 22, 1993

APR 1993

El Paso Natural Gas Company
P.O. Box 4990
Farmington, NM 87499

Project Name/Number: CONOCO-EPNG PIT

Attention: John Lambdin

On **04/15/93**, Analytical Technologies, Inc. received a request to analyze a **non-aqueous** sample. The sample was analyzed with EPA methodology or equivalent methods. The results of this analysis and the quality control data, which follow each set of analyses, are enclosed.

EPA 8015, Modified analysis was performed by ATI, Phoenix.

Sample N30388 was received at ATI past EPA holding time for Method 8015, Modified.

If you have any questions or comments, please do not hesitate to contact us at (505) 344-3777.

Letitia Krakowski
Assistant Project Manager

Elizabeth Proffitt
Laboratory Manager

EP:td
Enclosure

Analytical Technologies, Inc.

CLIENT : EL PASO NATURAL GAS CO.
PROJECT # : (NONE)
PROJECT NAME : CONOCO

DATE RECEIVED : 04/15/93
REPORT DATE : 04/22/93

ATI I.D. : 304372

| ATI # | CLIENT DESCRIPTION | MATRIX | DATE COLLECTED |
|---|---|---|---|
| 01 | N30388 Sample Point #18 | SOIL | 04/01/93 |

APR 1993

----- TOTALS -----

| MATRIX | # SAMPLES |
|---|---|
| SOIL | 1 |

ATI STANDARD DISPOSAL PRACTICE

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

Analytical Technologies, Inc.

# GAS CHROMATOGRAPHY - RESULTS

ATI I.D. : 30437201

TEST : FUEL HYDROCARBONS (MOD. EPA 8015, BLS-191)

| | | | |
|---|---|---|---|
| CLIENT | : EL PASO NATURAL GAS CO. | DATE SAMPLED | : 04/01/93 |
| PROJECT # | : (NONE) | DATE RECEIVED | : 04/15/93 |
| PROJECT NAME | : CONOCO | DATE EXTRACTED | : 04/15/93 |
| CLIENT I.D. | : N30388 | DATE ANALYZED | : 04/16/93 |
| SAMPLE MATRIX | : SOIL | UNITS | : MG/KG |
| | | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| FUEL HYDROCARBONS, C6-C10 | <5 |
| FUEL HYDROCARBONS, C10-C22(BLS-191) | 20 |
| FUEL HYDROCARBONS, C22-C36 | 27 |
| FUEL HYDROCARBONS (CALCULATED SUM) | 47 |

SURROGATE PERCENT RECOVERIES

| | |
|---|---|
| O-TERPHENYL (%) | 99 |

AnalyticalTechnologies, Inc.

# GAS CHROMATOGRAPHY - RESULTS

## REAGENT BLANK

TEST : FUEL HYDROCARBONS (MOD. EPA 8015, BLS-191)

| | | | |
|---|---|---|---|
| CLIENT | : EL PASO NATURAL GAS CO. | ATI I.D. | : 304372 |
| PROJECT # | : (NONE) | DATE EXTRACTED | : 04/15/93 |
| PROJECT NAME | : CONOCO | DATE ANALYZED | : 04/16/93 |
| CLIENT I.D. | : REAGENT BLANK | UNITS | : MG/KG |
| | | DILUTION FACTOR | : N/A |

| COMPOUNDS | RESULTS |
|---|---|
| FUEL HYDROCARBONS, C6-C10 | <5 |
| FUEL HYDROCARBONS, C10-C22(BLS-191) | <5 |
| FUEL HYDROCARBONS, C22-C36 | <5 |
| FUEL HYDROCARBONS (CALCULATED SUM) | <5 |

SURROGATE PERCENT RECOVERIES

| | |
|---|---|
| O-TERPHENYL (%) | 81 |

Acceptable
F
4/27/93

Analytical Technologies, Inc.

QUALITY CONTROL DATA

ATI I.D. : 304372

TEST : FUEL HYDROCARBONS (MOD. EPA 8015, BLS-191)

CLIENT : EL PASO NATURAL GAS CO.
PROJECT # : (NONE)
PROJECT NAME : CONOCO
REF I.D. : 30437201

DATE ANALYZED : 04/17/93
SAMPLE MATRIX : SOIL
UNITS : MG/KG

| COMPOUNDS | SAMPLE RESULT | CONC. SPIKED | SPIKED SAMPLE | % REC. | DUP. SPIKED SAMPLE | DUP. % REC. | RPD |
|---|---|---|---|---|---|---|---|
| FUEL HYDROCARBONS (C10-C22) | 20 | 51 | 83 | 124 | 76 | 110 | 9 |

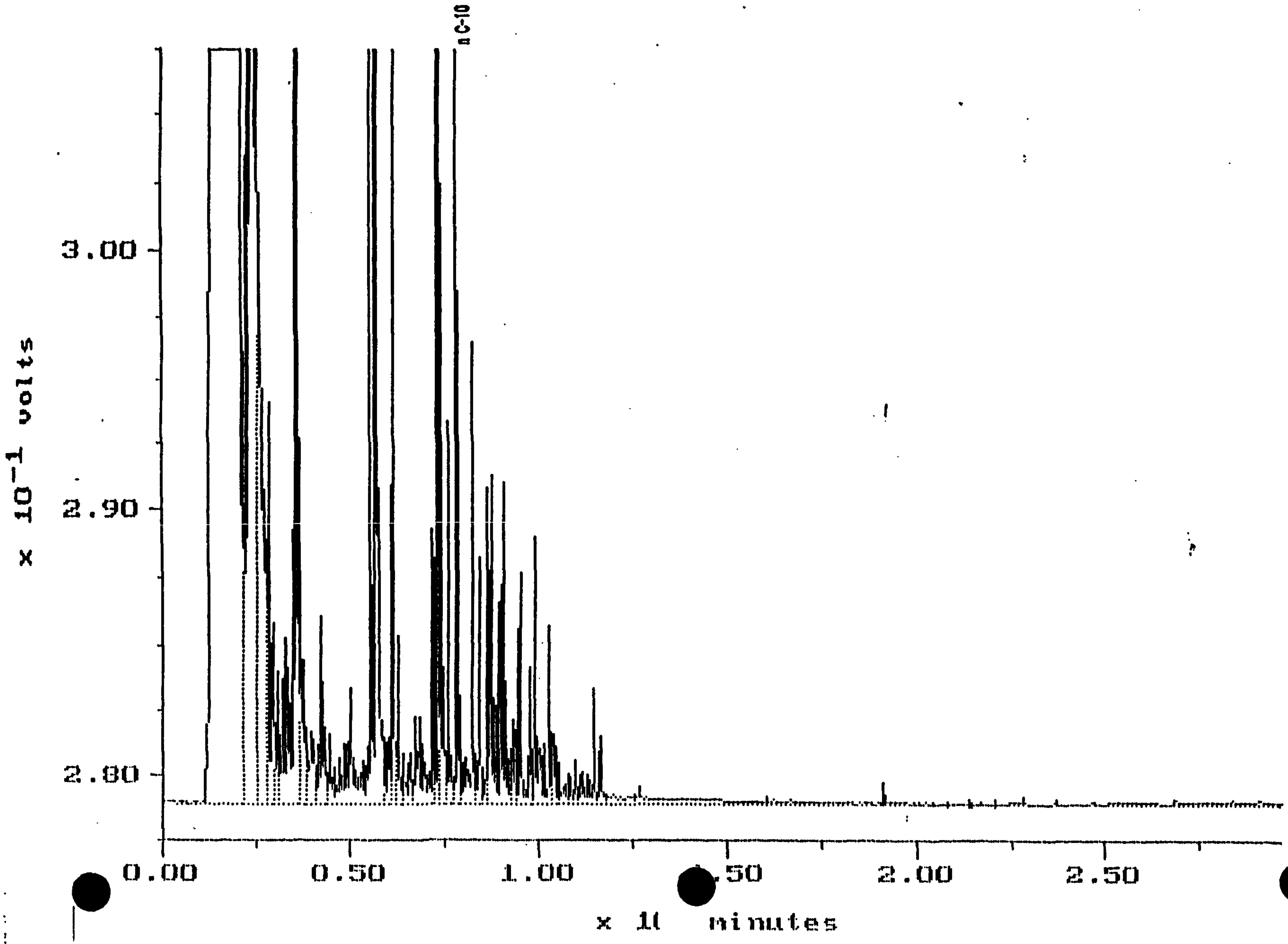
Acceptable
4/27/93

% Recovery = (Spike Sample Result - Sample Result) / Spike Concentration X 100

RPD (Relative % Difference) = (Spiked Sample Result - Duplicate Spike Sample Result) / Average of Spiked Sample X 100

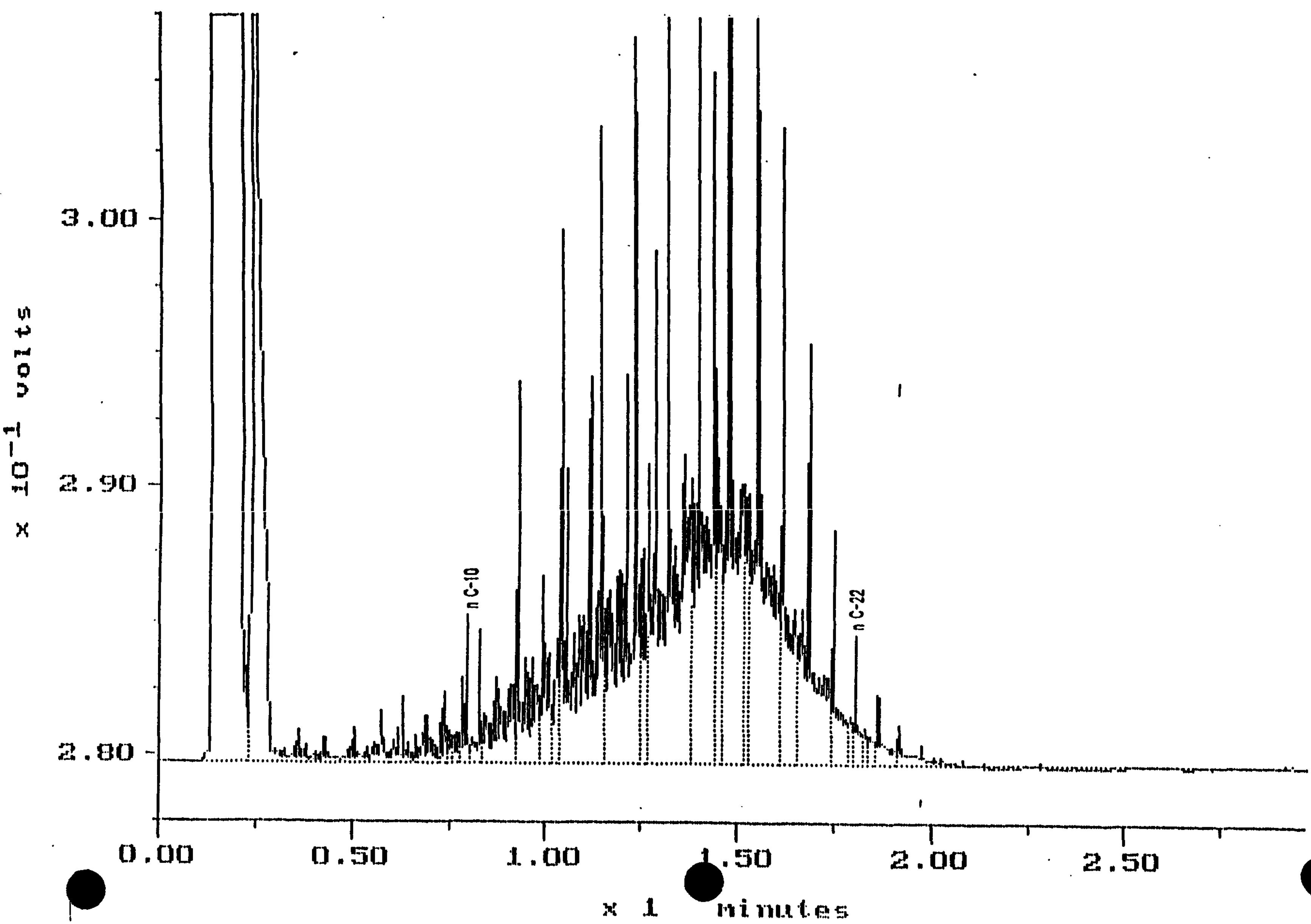
AnalyticalTechnologies,Inc.

# UNLEADED GASOLINE

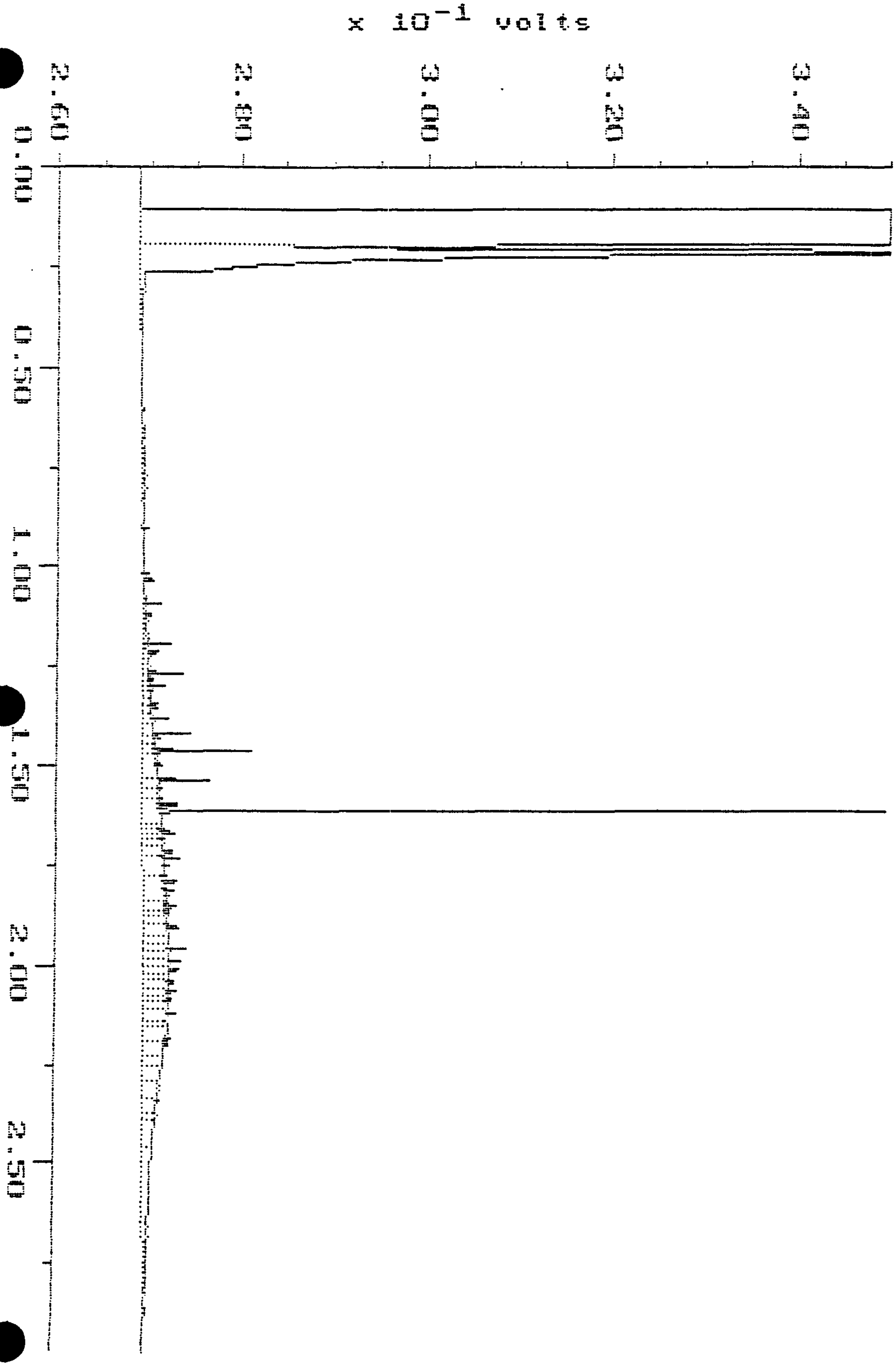


AnalyticalTechnologies,Inc.

# DIESEL FUEL



Sample: PAPN 304372-1 Channel: FID-GC7C Filename: 041615
Acquired: 16-APR-93 17:59 Method: G:\MAX\FUELS\DATA3\APR-16 Operator: CAP



Analytical Technologies, Inc., Albuquerque, NM
San Diego • Phoenix • Seattle • Pensacola • Ft. Collins • Portland • Albuquerque

# CHAIN OF CUSTODY

DATE: 04 - 93 PAGE 1 OF 1

ATI LAB I.D. 30437

PLEASE FILL THIS FORM IN COMPLETELY. SHADED AREAS ARE FOR LAB USE ONLY.

PROJECT MANAGER: John Lambdin

COMPANY: El Paso Natural Gas Company
ADDRESS: P.O. Box 4990
Farmington, NM 87499
PHONE:
FAX: 505-599-2261

BILL TO:
COMPANY: SAME AS ABOVE
ADDRESS:

| SAMPLE ID | DATE | TIME | MATRIX | LAB ID | NUMBER OF CONTAINERS |
|---|---|---|---|---|---|
| N30388 | 04-1-93 | 0961 | Soil | 1 | 1 |

## ANALYSIS REQUEST

| Analysis | N30388 |
|---|---|
| Petroleum Hydrocarbons (418.1) | |
| (MOD 8015) Gas/Diesel | X |
| Diesel/Gasoline/BTXE/MTBE (MOD 8015/8020) | |
| BTXE/MTBE (8020) | |
| Chlorinated Hydrocarbons (601/8010) | |
| Aromatic Hydrocarbons (602/8020) | |
| SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg. | |
| Pesticides/PCB (608/8080) | |
| Herbicides (615/8150) | |
| Base/Neutral/Acid Compounds GC/MS (625/8270) | |
| Volatile Organics GC/MS (624/8240) | |
| Polynuclear Aromatics (610/8310) | |
| SDWA Primary Standards - Arizona | |
| SDWA Secondary Standards - Arizona | |
| SDWA Primary Standards - Federal | |
| SDWA Secondary Standards - Federal | |
| The 13 Priority Pollutant Metals | |
| RCRA Metals by Total Digestion | |
| RCRA Metals by TCLP (1311) | |

## PROJECT INFORMATION

PROJ. NO.:
PROJ. NAME: Conoco - EPNG - Pit
P.O. NO.:
SHIPPED VIA:

## SAMPLE RECEIPT

| | |
|---|---|
| NO. CONTAINERS | 1 |
| CUSTODY SEALS | Y / (N) / NA |
| RECEIVED INTACT | ✓ |
| RECEIVED COLD | ✓ |

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) ☐24hr ☐48hr ☐72hr ☐1 WEEK (NORMAL) ☐2 WEEK

Comments:
108-52549-64-0001-0012-51-2010
~~108-47990-64-0001~~ - 51-2010

| SAMPLED & RELINQUISHED BY: 1. | RELINQUISHED BY: 2. | RELINQUISHED BY: 3. |
|---|---|---|
| Signature: Richard Benson Time: 1500 | Signature: Time: | Signature: Time: |
| Printed Name: Richard Benson Date: 04-14-93 | Printed Name: Date: | Printed Name: Date: |
| Company: EPNG Phone: 505-599-2144 | Company: | Company: |

| RECEIVED BY: 1. | RECEIVED BY: 2. | RECEIVED BY: (LAB) 3. |
|---|---|---|
| Signature: Time: | Signature: Time: | Signature: [signature] Time: 947 |
| Printed Name: Date: | Printed Name: Date: | Printed Name: Marguerite Russell Date: 4/16/93 |
| Company: | Company: | Analytical Technologies, Inc. |

ATI Labs: San Diego (619) 458-9141 • Phoenix (602) 496-4400 • Seattle (206) 228-8335 • Pensacola (904) 474-1001 • Portland (503) 684-0447 • Albuquerque (505) 344-3777 DISTRIBUTION: White, Canary - ATI • Pink - ORIGINATOR

Analytical Technologies, Inc.

2709-D Pan American Freeway, NE Albuquerque, NM 87107
Phone (505) 344-3777 FAX (505) 344-4413

ATI I.D. 303372

April 7, 1993

El Paso Natural Gas Co.
P.O. Box 4990
Farmington, NM 87499

Project Name/Number: CONOCO/EPNG PIT

Attention: John Lambdin

On 03/17/93, Analytical Technologies, Inc. received a request to analyze soil and aqueous sample(s). The sample(s) were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

PCB's, PNA's, Metals, and General Chemistry analyses were performed by ATI, Phoenix.

By Method 8015, Modified, low surrogate recovery for sample N30320 was confirmed by re-extraction and re-analysis.

If you have any questions or comments, please do not hesitate to contact us at (505) 344-3777.

Letitia Krakowski
Letitia Krakowski
Assistant Project Manager

Elizabeth Proffitt
Elizabeth Proffitt
Laboratory Manager

EP:td
Enclosure

APR 1993

Analytical **Technologies,** Inc.

CLIENT : EL PASO NATURAL GAS COMPANY
PROJECT # : (NONE)
PROJECT NAME: CONOCO/EPNG PIT

DATE RECEIVED: 03/17/93
REPORT DATE : 04/07/93

ATI I.D.: 303372

| ATI # | CLIENT DESCRIPTION | MATRIX | DATE COLLECTED |
|---|---|---|---|
| 01 | N30313 | SOIL | 03/15/93 |
| 02 | N30314 | SOIL | 03/15/93 |
| 03 | N30315 | SOIL | 03/15/93 |
| 04 | N30316 | SOIL | 03/15/93 |
| 05 | N30317 | SOIL | 03/15/93 |
| 06 | N30318 | SOIL | 03/15/93 |
| 07 | N30319 | SOIL | 03/15/93 |
| 08 | N30320 | SOIL | 03/15/93 |
| 09 | N30321 | SOIL | 03/15/93 |
| 10 | N30322 | SOIL | 03/15/93 |
| 11 | N30324 | AQUEOUS | 03/15/93 |

APR 1993

----TOTALS----

| MATRIX | # SAMPLES |
|---|---|
| SOIL | 10 |
| AQUEOUS | 1 |

ATI STANDARD DISPOSAL PRACTICE

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

AnalyticalTechnologies, Inc.

# GENERAL CHEMISTRY RESULTS

ATI I.D. : 303372

CLIENT : EL PASO NATURAL GAS CO.
PROJECT # : (NONE)
PROJECT NAME : CONOCO/EPNG PIT

DATE RECEIVED : 03/17/93
REPORT DATE : 04/07/93

| PARAMETER | UNITS | 11 |
|---|---|---|
| CARBONATE (CACO3) | MG/L | <1 |
| BICARBONATE (CACO3) | MG/L | 546 |
| HYDROXIDE (CACO3) | MG/L | <1 |
| TOTAL ALKALINITY (AS CACO3) | MG/L | 546 |
| CHLORIDE (EPA 325.2) | MG/L | 34 |
| CONDUCTIVITY, (UMHOS/CM) | | 3800 |
| PH (EPA 150.1) | UNITS | 7.4 |
| SULFATE (EPA 375.2) | MG/L | 2300 |
| T. DISSOLVED SOLIDS (160.1) | MG/L | 3700 |

Analytical Technologies, Inc.

# GENERAL CHEMISTRY - QUALITY CONTROL

CLIENT : EL PASO NATURAL GAS CO.
PROJECT # : (NONE)
PROJECT NAME : CONOCO/EPNG PIT

ATI I.D. : 303372

| PARAMETER | UNITS | ATI I.D. | SAMPLE RESULT | DUP. RESULT | RPD | SPIKED SAMPLE | SPIKE CONC | % REC |
|---|---|---|---|---|---|---|---|---|
| CARBONATE | MG/L | 30336401 | <1 | <1 | NA | NA | NA | NA |
| BICARBONATE | MG/L | | 229 | 229 | 0 | NA | NA | NA |
| HYDROXIDE | MG/L | | <1 | <1 | NA | NA | NA | NA |
| TOTAL ALKALINITY | MG/L | | 229 | 229 | 0 | NA | NA | NA |
| CHLORIDE | MG/L | 30336201 | 16 | 16 | 0 | 36 | 20 | 100 |
| CONDUCTIVITY(UMHOS/CM) | | 30337211 | 3800 | 3870 | 2 | NA | NA | NA |
| PH | UNITS | 30336401 | 8.0 | 7.8 | 3 | NA | NA | NA |
| SULFATE | MG/L | 30336203 | 65 | 65 | 0 | 130 | 65 | 100 |
| TOTAL DISSOLVED SOLIDS | MG/L | 30336401 | 970 | 970 | 0 | NA | NA | NA |

Acceptable
JG
4/12/93

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc.

# METALS RESULTS

ATI I.D. : 303372

CLIENT : EL PASO NATURAL GAS CO.
PROJECT # : (NONE)
PROJECT NAME : CONOCO/EPNG PIT

DATE RECEIVED : 03/17/93
REPORT DATE : 04/07/93

| PARAMETER | UNITS | 11 |
|---|---|---|
| SILVER (EPA 200.7/6010) | MG/L | <0.010 |
| ARSENIC (EPA 206.2/7060) | MG/L | <0.005 |
| BARIUM (EPA 200.7/6010) | MG/L | 0.053 |
| CALCIUM (EPA 200.7/6010) | MG/L | 564 |
| CADMIUM (EPA 213.2/7131) | MG/L | <0.0005 |
| CHROMIUM (EPA 200.7/6010) | MG/L | <0.010 |
| MERCURY (EPA 245.1/7470) | MG/L | <0.0002 |
| POTASSIUM (EPA 200.7/6010) | MG/L | <1.0 |
| MAGNESIUM (EPA 200.7/6010) | MG/L | 54.0 |
| SODIUM (EPA 200.7/6010) | MG/L | 439 |
| LEAD (EPA 239.2/7421) | MG/L | <0.002 |
| SELENIUM (EPA 270.2/7740) | MG/L | <0.005 |

Analytical Technologies, Inc.

# METALS RESULTS

ATI I.D. : 303372

CLIENT : EL PASO NATURAL GAS CO.
PROJECT # : (NONE)
PROJECT NAME : CONOCO/EPNG PIT

DATE RECEIVED : 03/17/93
REPORT DATE : 04/07/93

| PARAMETER | UNITS | 10 |
|---|---|---|
| SILVER (TCLP 1311/6010) | MG/L | <0.010 |
| ARSENIC (TCLP 1311/6010) | MG/L | <0.1 |
| BARIUM (TCLP 1311/6010) | MG/L | 0.229 |
| CADMIUM (TCLP 1311/6010) | MG/L | <0.005 |
| CHROMIUM (TCLP 1311/6010) | MG/L | <0.010 |
| MERCURY (TCLP 1311/7470) | MG/L | <0.0002 |
| LEAD (TCLP 1311/6010) | MG/L | <0.10 |
| SELENIUM (TCLP 1311/6010) | MG/L | <0.1 |

Analytical Technologies, Inc.

# METALS - QUALITY CONTROL

CLIENT : EL PASO NATURAL GAS CO.
PROJECT # : (NONE)
PROJECT NAME : CONOCO/EPNG PIT
ATI I.D. : 303372

| PARAMETER | UNITS | ATI I.D. | SAMPLE RESULT | DUP. RESULT | RPD | SPIKED SAMPLE | SPIKE CONC | % REC |
|---|---|---|---|---|---|---|---|---|
| SILVER | MG/L | 30337501 | <0.010 | <0.010 | NA | 0.087 | 0.100 | 87 |
| SILVER (IN TCLP) | MG/L | 30337903 | <0.010 | <0.010 | NA | 0.910 | 1.00 | 91 |
| ARSENIC | MG/L | 30378301 | <0.005 | <0.005 | NA | 0.050 | 0.050 | 100 |
| ARSENIC (IN TCLP) | MG/L | 30337903 | <0.1 | <0.1 | NA | 1.0 | 1.0 | 100 |
| BARIUM | MG/L | 30337501 | 0.026 | 0.024 | 8 | 0.112 | 0.100 | 86 |
| BARIUM (IN TCLP) | MG/L | 30337903 | 0.668 | 0.686 | 3 | 1.63 | 1.00 | 96 |
| CALCIUM | MG/L | 30336401 | 159 | 158 | 0.6 | 245 | 100 | 86 |
| CADMIUM | MG/L | 30337401 | <0.0025 | <0.0025 | NA | MSA | CC= | .999 |
| CADMIUM (IN TCLP) | MG/L | 30337903 | <0.005 | <0.005 | NA | 0.922 | 1.00 | 92 |
| CHROMIUM | MG/L | 30379205 | <0.010 | <0.010 | NA | 0.900 | 1.00 | 90 |
| CHROMIUM (IN TCLP) | MG/L | 30337903 | <0.010 | <0.010 | NA | 0.879 | 1.00 | 88 |
| MERCURY | MG/L | 30374502 | <0.0002 | <0.0002 | NA | 0.0051 | 0.0050 | 102 |
| MERCURY (IN TCLP) | MG/L | 30336004 | 0.0002 | <0.0002 | NA | 0.0050 | 0.0050 | 96 |
| POTASSIUM | MG/L | 30336401 | 4.4 | 4.4 | 0 | 52.5 | 50.0 | 96 |
| MAGNESIUM | MG/L | 30336401 | 47.0 | 46.5 | 1 | 90.4 | 50.0 | 87 |
| SODIUM | MG/L | 30336401 | 90.3 | 91.3 | 1 | 136 | 50.0 | 91 |
| LEAD | MG/L | 30374512 | <0.002 | <0.002 | NA | 0.030 | 0.050 | 60 |
| LEAD (IN TCLP) | MG/L | 30337903 | <0.10 | <0.10 | NA | 0.90 | 1.00 | 90 |
| SELENIUM | MG/L | 30337401 | <0.005 | <0.005 | NA | 0.047 | 0.050 | 94 |
| SELENIUM (IN TCLP) | MG/L | 30337903 | <0.1 | <0.1 | NA | 1.1 | 1.0 | 110 |

Acceptable.
4/12/93

$$\% \text{ Recovery} = \frac{\text{(Spike Sample Result - Sample Result)}}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{\text{(Sample Result - Duplicate Result)}}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc.

# GAS CHROMATOGRAPHY - RESULTS

TEST : AROMATIC HYDROCARBONS (EPA 602)
CLIENT : EL PASO NATURAL GAS COMPANY    ATI I.D.: 303372
PROJECT # : (NONE)
PROJECT NAME: CONOCO/EPNG PIT

| SAMPLE I.D. # | CLIENT I.D. | MATRIX | DATE SAMPLED | DATE EXTRACTED | DATE ANALYZED | DIL. FACTOR |
|---|---|---|---|---|---|---|
| 11 | N30324 | AQUEOUS | 03/15/93 | NA | 03/19/93 | 10 |

| PARAMETER | UNITS | 11 |
|---|---|---|
| BENZENE | UG/L | 35 |
| TOLUENE | UG/L | 68 |
| CHLOROBENZENE | UG/L | <5 |
| 1,2-DICHLOROBENZENE | UG/L | <5 |
| 1,3-DICHLOROBENZENE | UG/L | <5 |
| 1,4-DICHLOROBENZENE | UG/L | <5 |
| ETHYLBENZENE | UG/L | 15 |
| TOTAL XYLENES | UG/L | 89 |
| | | |
| BROMOFLUOROBENZENE (%) | | 102 |

Analytical Technologies, Inc.

# GAS CHROMATOGRAPHY - REAGENT BLANK

| | | | | |
|---|---|---|---|---|
| TEST | : AROMATIC HYDROCARBONS (EPA 602) | ATI I.D. | : | 303372 |
| BLANK I.D. | : 031893 | DATE EXTRACTED | : | NA |
| CLIENT | : EL PASO NATURAL GAS COMPANY | DATE ANALYZED | : | 03/18/93 |
| PROJECT # | : *(NONE)* | DILUTION FACTOR: | | 1 |
| PROJECT NAME: | CONOCO/EPNG PIT | | | |

| PARAMETER | UNITS | |
|---|---|---|
| BENZENE | UG/L | <0.5 |
| TOLUENE | UG/L | <0.5 |
| CHLOROBENZENE | UG/L | <0.5 |
| 1,2-DICHLOROBENZENE | UG/L | <0.5 |
| 1,3-DICHLOROBENZENE | UG/L | <0.5 |
| 1,4-DICHLOROBENZENE | UG/L | <0.5 |
| ETHYLBENZENE | UG/L | <0.5 |
| TOTAL XYLENES | UG/L | <0.5 |
| BROMOFLUOROBENZENE (%) | | 105 |

Acceptable
JS
4/12/93

Analytical**Technologies**, Inc.

## GAS CHROMATOGRAPHY - QUALITY CONTROL

| | | | | | |
|---|---|---|---|---|---|
| TEST | : | AROMATIC HYDROCARBONS (EPA 602) | ATI I.D. | : | 303372 |
| MSMSD # | : | 031893 | DATE EXTRACTED | : | NA |
| CLIENT | : | EL PASO NATURAL GAS COMPANY | DATE ANALYZED | : | 03/18/93 |
| | | | SAMPLE MATRIX | : | AQUEOUS |
| PROJECT # | : | (NONE) | REF. I.D. | : | 031893 |
| PROJECT NAME | : | CONOCO/EPNG PIT | UNITS | : | MG/KG |

| PARAMETERS | SAMPLE RESULT | CONC SPIKE | SPIKED SAMPLE | % REC | DUP SPIKE | DUP % REC | RPD |
|---|---|---|---|---|---|---|---|
| BENZENE | <0.5 | 10 | 11 | 110 | 11 | 110 | 0 |
| TOLUENE | <0.5 | 10 | 11 | 110 | 11 | 110 | 0 |
| ETHYL BENZENE | <0.5 | 10 | 11 | 110 | 11 | 110 | 0 |
| TOTAL XYLENES | <0.5 | 30 | 32 | 107 | 33 | 110 | 3 |

Acceptable.
4/12/93

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc.

# GAS CHROMATOGRAPHY - RESULTS

ATI I.D. : 30337211

TEST : POLYNUCLEAR AROMATICS (EPA METHOD 8310)

| | | | |
|---|---|---|---|
| CLIENT | : EL PASO NATURAL GAS CO. | DATE SAMPLED | : 03/15/93 |
| PROJECT # | : (NONE) | DATE RECEIVED | : 03/17/93 |
| PROJECT NAME | : CONOCO/EPNG PIT | DATE EXTRACTED | : 03/18/93 |
| CLIENT I.D. | : N30324 | DATE ANALYZED | : 03/25/93 |
| SAMPLE MATRIX | : AQUEOUS | UNITS | : UG/L |
| | | DILUTION FACTOR | : 1 |

| COMPOUNDS | RESULTS |
|---|---|
| NAPHTHALENE | <5 D |
| ACENAPHTHYLENE | <10 D |
| ACENAPHTHENE | <5 D |
| FLUORENE | 0.42 |
| PHENANTHRENE | 1.0 D |
| ANTHRACENE | <0.05 |
| FLUORANTHENE | 1.2 |
| PYRENE | <0.10 |
| BENZO(A)ANTHRACENE | <0.10 |
| CHRYSENE | 0.16 |
| BENZO(B)FLUORANTHENE | <0.10 |
| BENZO(K)FLUORANTHENE | <0.10 |
| BENZO(A)PYRENE | <0.10 |
| DIBENZO(a,h)ANTHRACENE | <0.20 |
| BENZO(g,h,i)PERYLENE | <0.10 |
| INDENO(1,2,3-CD)PYRENE | <0.10 |
| 1-METHYLNAPHTHALENE | <3.0 D |
| 2-METHYLNAPHTHALENE | <3.0 D |

SURROGATE PERCENT RECOVERIES

| | |
|---|---|
| 2-CHLOROANTHRACENE (%) | 69 |

D indicates the compound was analyzed at a greater dilution.

Analytical Technologies, Inc.

# GAS CHROMATOGRAPHY - RESULTS

## REAGENT BLANK

TEST : POLYNUCLEAR AROMATICS (EPA METHOD 8310)

| | | | |
|---|---|---|---|
| CLIENT | : EL PASO NATURAL GAS CO. | ATI I.D. | : 303372 |
| PROJECT # | : (NONE) | DATE EXTRACTED | : 03/18/93 |
| PROJECT NAME | : CONOCO/EPNG PIT | DATE ANALYZED | : 03/24/93 |
| CLIENT I.D. | : REAGENT BLANK | UNITS | : UG/L |
| | | DILUTION FACTOR | : N/A |

| COMPOUNDS | RESULTS |
|---|---|
| NAPHTHALENE | <0.50 |
| ACENAPHTHYLENE | <1.0 |
| ACENAPHTHENE | <0.50 |
| FLUORENE | <0.10 |
| PHENANTHRENE | <0.05 |
| ANTHRACENE | <0.05 |
| FLUORANTHENE | <0.10 |
| PYRENE | <0.10 |
| BENZO(A)ANTHRACENE | <0.10 |
| CHRYSENE | <0.10 |
| BENZO(B)FLUORANTHENE | <0.10 |
| BENZO(K)FLUORANTHENE | <0.10 |
| BENZO(A)PYRENE | <0.10 |
| DIBENZO(a,h)ANTHRACENE | <0.20 |
| BENZO(g,h,i)PERYLENE | <0.10 |
| INDENO(1,2,3-CD)PYRENE | <0.10 |
| 1-METHYLNAPHTHALENE | <0.30 |
| 2-METHYLNAPHTHALENE | <0.30 |

## SURROGATE PERCENT RECOVERIES

| | |
|---|---|
| 2-CHLOROANTHRACENE (%) | 84 |

Acceptable
4/12/97

STEFFEN ROBERTSON AND KIRSTEN
Consulting Engineers and Scientists



December 22, 1993
SRK Project No. 58201

State of New Mexico
Oil Conservation Division
P.O. Box 2088
Land Office Building
Santa Fe, New Mexico 87504-2088

Attention: Mr. Roger Anderson

**RE: CONOCO SAN JUAN PLANT, EVAPORATION POND CONSTRUCTION - FINAL DOCUMENTATION**

Dear Mr. Anderson:

This transmittal accompanies one copy of the final report entitled, "Conoco San Juan Gas Plant, Evaporation Ponds 1 and 2 Design and Construction." Included in the document are the as-built construction drawings. Please do not hesitate to call if you have any questions.

Sincerely,

STEFFEN ROBERTSON AND KIRSTEN (U.S.), INC.

Richard J Frechette

Rick Frechette
Department Head, Engineering Services

/rf

Steffen Robertson and Kirsten (U.S.), Inc.
3232 South Vance Street, Lakewood, Colorado 80227, U.S.A.
Tel. (303) 985-1333 Facsimile (303) 985-9947
Other offices in: U.S.A., Canada, United Kingdom and Africa

The report "Conoco San Juan Gas Plant, Evaporation Ponds 1 and 2, Design and Construction", and associated drawings have been prepared by Steffen Robertson and Kirsten (U.S.), Inc. (SRK), under the direct supervision of Richard J. Frechette, New Mexico Registered P.E. No. 11961. The associated construction work has been reviewed by same and found to be in compliance with the design drawings and specifications.

Richard J. Frechette

RECEIVED
DEC 27 1993
OIL CONSERVATION DIV.
SANTA FE

# CONOCO SAN JUAN GAS PLANT
# EVAPORATION PONDS 1 AND 2
# DESIGN AND CONSTRUCTION

Prepared For:

Conoco, Inc.
San Juan Gas Plant
61 Road 4900
P.O. Box 217
Bloomfield, N.M. 87413

Prepared by:

Steffen Robertson and Kirsten (U.S.), Inc.
3232 South Vance Street
Lakewood, Colorado 80227

December 1993

SRK Project No. 58201

## 1.0 INTRODUCTION

This report summarizes the design and construction activities performed related to the earthwork construction and liner installation for two evaporation ponds for Conoco Inc. The installation site is located in San Juan County, approximately one mile north of Bloomfield, New Mexico.

The design work was completed in January, 1993 and involved the development of construction specifications for the pond embankments, liner and leak detection system, and spray circulation system. The earthwork was planned to limit the maximum embankment height to less than 10 ft while maintaining a site material balance, i.e., no import of fill materials. The liner and leak detection system was designed to satisfy State criteria for containment, leak detection response, and collection and removal capabilities. Beneath the secondary liner, a venting medium was provided to allow an outlet for potential subsurface vapors that could otherwise pressurize the liner system.

Construction commenced on February 4, 1993 and was completed on May 14, 1993. The construction activities consisted of:

- stripping the topsoil and vegetation;
- excavation of two adjacent pond areas;
- fill placement in the construction of pond berms where specified;
- placement and seaming of 12-oz./yd$^2$ non-woven geotextile material within each pond for vapor transmission;
- deployment and seaming of a 30-mil Polyvinyl Chloride (PVC) secondary liner;
- placement of a leak detection system consisting of geosynthetic drain net between the primary and secondary liners to route potential leakage to a collection sump in the bottom of each pond;
- placement and seaming of a 36-mil Chlorosulfonated Polyethylene (CSPE) primary liner (Hypalon); and

completed subsequently in order to quantify the anticipated solution losses over time and under and various seasonal extreme climate conditions.

Prior to completion of pond construction, Conoco disposed of its wastewater off-site via an independent party. Through the use of the new ponds, the quantities required for off-site disposal will be reduced. Therefore, the apparent inability of the new ponds to maintain a site solution balance is not only an anticipated scenario, but it is not critical in terms of the containment requirement. Excess solution disposal will continue to be carried out at an off-site facility as necessary. Operation of the ponds will be maintained with sufficient freeboard to achieve complete containment during adverse weather conditions. In this manner, a minimum of 1.5 ft of operational freeboard is anticipated throughout the life of the ponds.

For the purposes of internal projections, a series of solution balance calculations has been completed to assess the rate of solution loss and possible time frame for filling the ponds to the freeboard limits. Based on various operating and climatic assumptions, the ponds will accumulate solution at a rate somewhere between one and three million gallons per year. At an allowable combined storage capacity of approximately 3.5 million gallons, the ponds will require supplemental disposal measures within approximately 14 months to 3.5 years. Some of the calculations and climatology data are included in Appendix A.

## 2.3 System Component Design

### 2.3.1 General

The design of the specific components involved in the pond construction is illustrated in the as-built construction drawings and described in the technical specifications, each of which is attached to this report. However, a brief summary of the system components is provided in this Section to give a concise overview of the project.

### 2.3.2 Pond Subgrade and Venting Medium

After excavation of the ponds and construction of the berms, the design specifications require the finished subgrade to be compact, smooth and free from particles in excess of ¾ inch. The venting medium installed thereupon is specified as a non-woven, 12 oz/sq yd needle-punched polypropylene geotextile. This fabric has the capability to transmit vapors which might originate beneath the pond to the ground surface and through the liners at the pond crest. A series of liner penetrations, spaced at approximately 25 ft intervals, is provided near the inside crest of the ponds above the freeboard level to allow transmission of vapors to the atmosphere.

### 2.3.3 Liner and Leak Detection Systems

The liner design includes a 40 mil PVC secondary liner and a 36 mil Hypalon liner. The PVC liner is installed directly over the venting geotextile in factory seamed panels. A minimal amount of field seaming is required. The Hypalon liner is installed after the leak detection system is deployed over the PVC liner. Similar to the PVC liner, the Hypalon liner requires minimal field seaming.

The leak detection system consists of a polyethylene strand geonet which covers the entire pond surface between the liners. The geonet follows the pond floor gradient to the sump area in the lowest pond corner. At the sump, several layers of geonet are placed to fill the sump area, a one ft deep basin between the pond liners. A monitor pipe is installed into the sump and runs along the pond slope to the crest where it protrudes from the liners. The monitor pipe provides the means to detect primary liner leakage and facilitates the removal of accumulated leakage via a submersible pump which can be lowered into the monitor pipe to the bottom of the sump.

### 2.3.4 Solution Circulating System

Within the ponds, a circulation system is installed to allow the solution to be sprayed within the lined area to facilitate enhanced evaporation losses. The system consists of a grid of HDPE pipes fitted with spray nozzles and supported by floats to allow the system flexibility and mobility. The system is driven by a stainless steel submersible pump located in a pump well above the leak detection sump. The pumps, one in each pond, are sized to circulate over 100 gpm on a continuous basis through the spray system in each pond. They may also be used to transfer solution from one pond to the other. The floating spray systems are mobile, thus allowing the flexibility to move within the pond to avoid solution drift due to unfavorable winds. By adjusting the locations of the spray grid and the speed of the pump, Conoco can maximize the usefulness of the system during changing wind and pond storage level conditions.

A control panel allows the pre-setting of desired pumping rates at either pond or the interfacing of anemometer controlled pumping rates based on wind speeds and drifting potential. Use of the spray system will be governed largely by experimental data obtained during ongoing facility operation.

# 3.0 CONSTRUCTION ACTIVITIES

## 3.1 General

In addition to completing the design, SRK was contracted to provide construction quality assurance services. The pond construction was completed under Discharge Plan GW-35 submitted to the State Oil Conservation Division by Conoco. Pond construction details are shown on the Drawings found within Appendix B of this report.

Periodic site inspections were performed by the Design Engineer. Site inspections were normally one day in duration, with site inspection observations and recommendations noted in the field inspection reports submitted to Conoco's project representative.

In addition to the periodic site inspections, SRK's onsite representative prepared Daily Construction Activity Reports. A total of 73 daily and 14 weekly reports were submitted directly to Conoco with copies of the weekly reports sent to the Design Engineer. These reports documented construction activities by the contractors.

### 3.1.1 Site Preparation

On February 4,1993, the earthwork contractor began site preparation work. After clearing and grubbing were completed, excavation of contaminated foundation soils was performed using a John Deere Motor Grader 770 B-H, a Caterpillar (Cat) D-8 Dozer, a Cat 225 Trackhoe, an I.H. Front End Loader and a John Deere Backhoe. Prior to construction of the ponds, the pre-excavation site contours were re-established by placing imported backfill material. The pond area excavation and remediation are documented in a separate report contained in Appendix C.

### 3.1.2 Embankment Construction

During the excavation and backfill process, CDK placed, moisture conditioned and compacted imported fill material in one foot lifts to replace the contaminated soils removed from the site. The following procedure was employed to construct the pond embankments above the reconstructed ground surface:

- Rock and oversized materials were removed prior to the placement of one foot lifts.

- Fill material was spread uniformly in 12 inch layers over the lift section and moisture conditioned to within plus or minus 2% of optimum moisture by either the use of a water truck, or mixing with the motor grader to allow natural air dry-back.

- A Sakai Vibrating Sheepsfoot Compactor was used to compact the fill material by making 4 to 6 passes over the entire lift, prior to testing by nuclear density method, to meet a minimum of 95 percent of the standard proctor maximum dry density (ASTM D-698) value specified (Appendix D).

### 3.1.3 Subgrade Preparation

Once finish grade elevations were met at the embankment and bottom of the pond, the following procedures were employed to facilitated liner installation:

- After final grading and compaction a smooth drum vibratory compactor was used to produce a smooth surface.

- Final embankment slope grading to 2:1 (H:V) inside and 3:1 outside was performed using a motor grader.

- Laborers hand picked the finished surface, removing small rock and organics, prior to the deployment of the geotextile vapor transmission material.

Laboratory analysis and nuclear density compaction tests were performed by SRK. All test results are presented in Appendix E. Prior to the placement of liner, the soil material surface was inspected by SRK and Palco, and accepted as documented in Appendix F. Final as-built sketches were made from measurements done by SRK's field representative.

## 3.2 Synthetic Liner

On April 29,1993, Palco mobilized to the job site to commence synthetic liner installation operations. Quality Control reports were submitted by Palco for each roll and pallet of liner material delivered, to document that material met the job specifications. Reports received are included as Appendix G.

A trench, a minimum of 2-ft deep, was excavated at the crest of the pond embankment for anchoring the liner system.

### 3.2.1 Synthetic Material Installation Activities

The installation of the geotextile material consisted of deploying the material north to south across the surface of the ponds, from anchor trench to anchor trench, and securing the end of the material with sandbags. Adjacent panels were seamed together either by heat seaming with a Lyster heater (Pond No. 2) or sewing the panels with thread (Pond No. 1), thus forming one continuous geotextile vapor transmission layer.

The installation of the PVC secondary liner consisted of deploying the material from north to south across the surface of the underlying geotextile. Adjacent liner panels were bonded together, thus forming one continuous liner layer. The glued seams were tested by the air lance method according to specification. After each panel was deployed, sandbags were placed for temporary ballast over the liner in the anchor trench, and at each seam until seam closure was completed.

The installation of the leak detection system geonet consisted of deploying the material, generally from north to south, across the surface of the underlying PVC liner. Adjacent geonet panels were joined by the use of snap ties on two foot centers after allowing adequate overlap of the preceding panel. After each panel was deployed, sandbags were used for ballast on the geonet at the anchor trenches.

The installation of the Hypalon primary liner consisted of deploying the factory seamed panels from north to south across the surface of the underlying geonet. Liner panels were cleaned and glued to the adjacent panel, thus forming one continuous liner layer. The glued and cured seams were tested for leaks by the use of the air lance method according to specification. Any leaks detected were patched and retested until air tight. After each panel was deployed sandbags were placed on the liner for temporary ballast at the anchor trench, and at each seam until seam closure was completed.

Destructive samples of both PVC and Hypalon liner were taken for approximately every 500 linear feet of field seam. The laboratory results of the destructive seam testing are included in Appendix H.

The Quantities of primary and secondary liners were calculated after field measurements were taken. The calculations for each panel area are included in Appendix I. The cumulative measured surface area for both ponds was approximately 94,000 sq. ft. The final as-built panel diagrams are included in the construction drawings in Appendix B.

### 3.2.2 Quality Assurance/ Quality Control (QC/QA)

Quality Control (QC) activities performed during installation by Palco personnel consisted of:

- inspecting the liner panel after deployment;
- identifying and marking each panel with the defect found;
- the removal and delivery of destructive samples to SRK's field representative; and
- the air lance testing of each seam and patch.

Quality Assurance (QA) activities performed during installation by SRK personnel consisted of:

- inspecting the liner panel after deployment;
- identifying and marking each panel for defects;
- marking of destructive sample locations;
- receipt, shipment and testing of the destructive samples;
- observation of the seaming procedures;
- observation of the testing for watertight integrity;
- observation of repairs and retests;
- rough field as-built sketches;
- measurement of the final accepted in-place panels; and
- all final calculations and as-built drawings.

A series of photographs which summarize the synthetics installation activities is included as Appendix J.

### 3.2.3 Final Inspection

Upon completion of secondary and primary liner installation in each pond including seaming and repair work, a final visual inspection of each panel, all seams, and all repair work was performed by SRK's field representative.

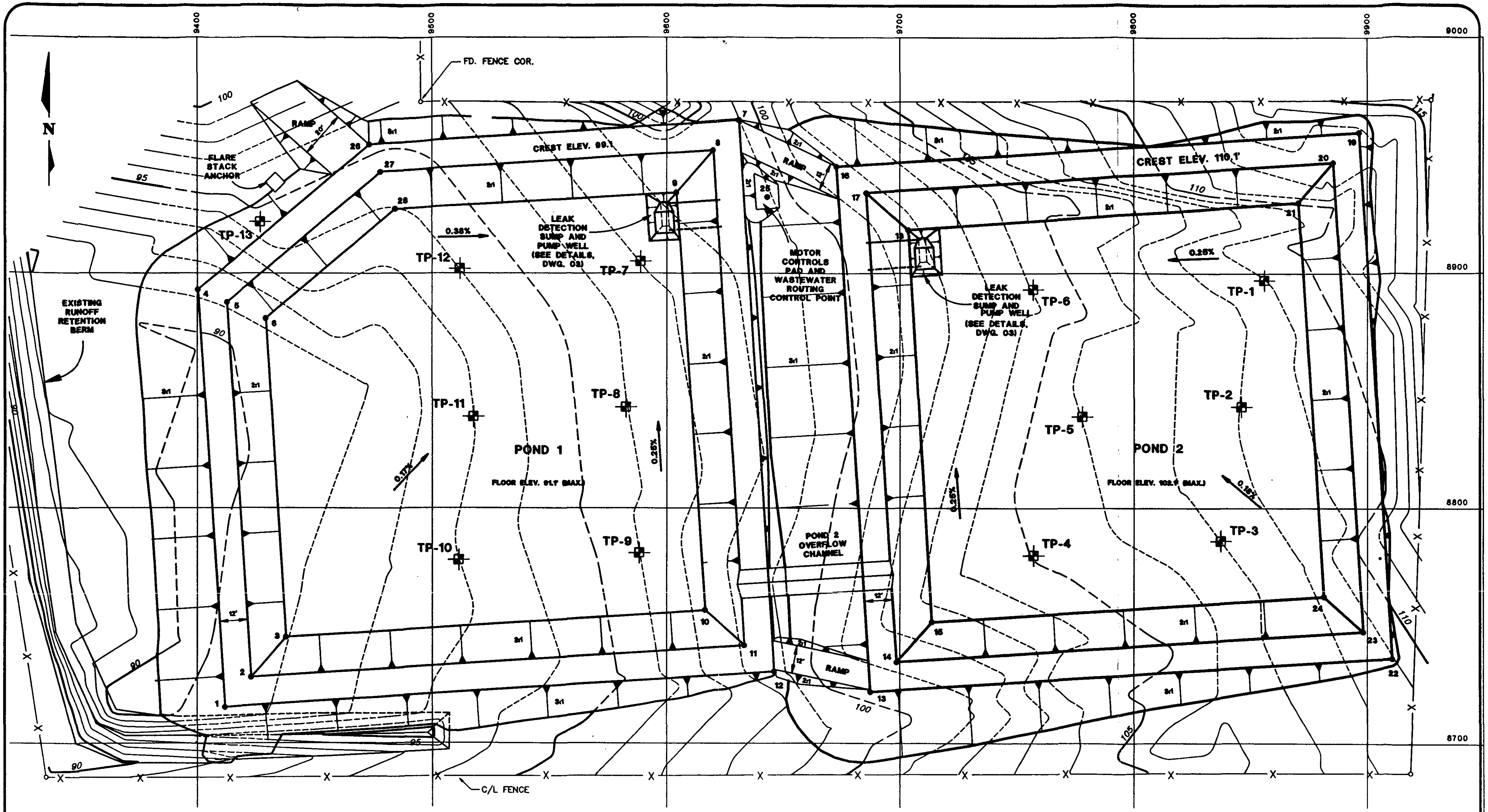
Palco's certificates of completion of liner installation are contained in Appendix K.

## APPENDIX A.1

## Geotechnical

# APPENDIX A

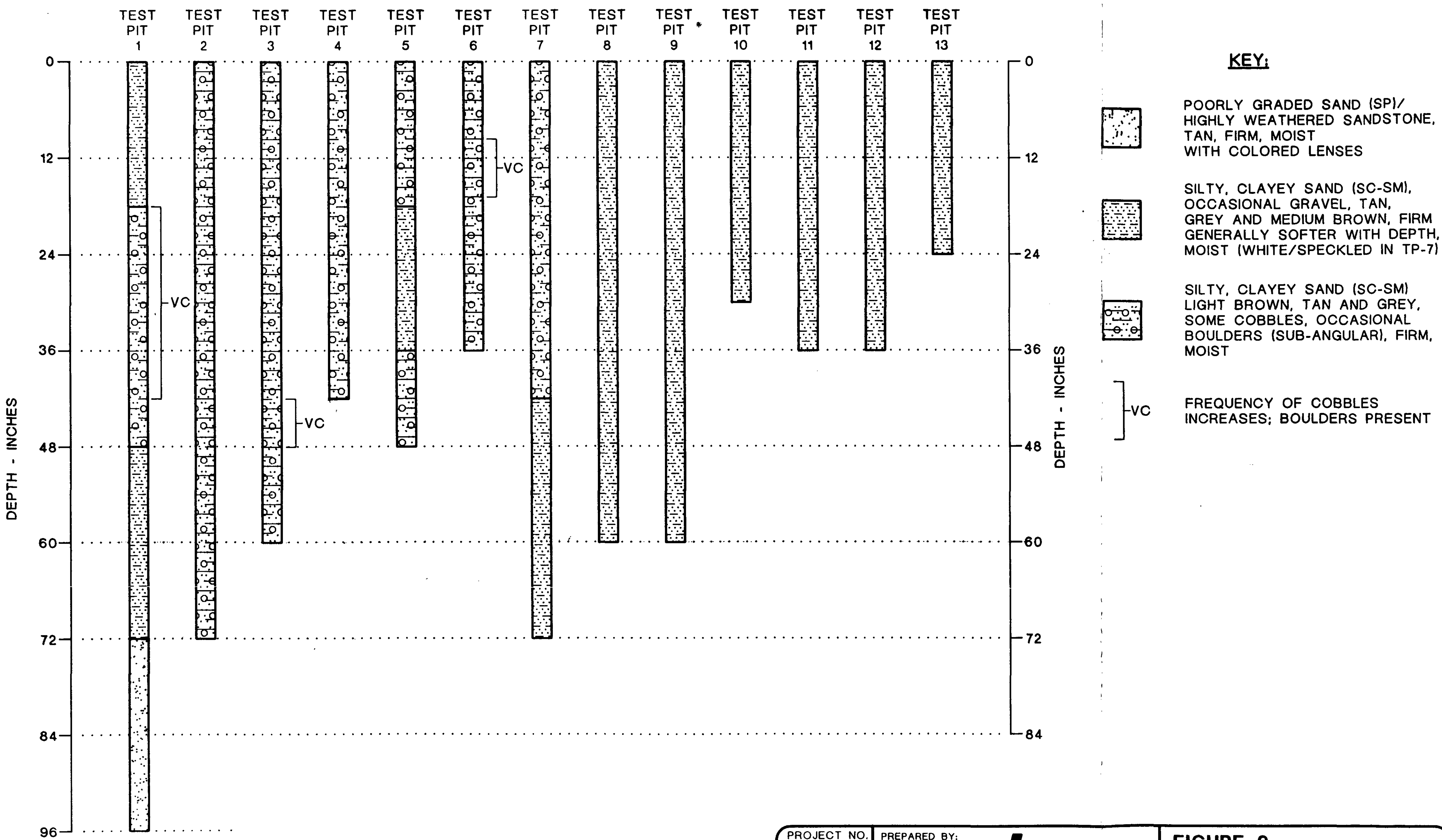
## Design Data




TP-4 TEST PIT

40 20 0 40
SCALE IN FEET

| PROJECT NO. | PREPARED BY: | FIGURE 1 |
|---|---|---|
| 58201 | | |
| DATE | | BACKHOE TEST PIT LOCATIONS |
| 1/93 | | |
| REVISION | STEFFEN ROBERTSON & KIRSTEN (U.S.) | |
| 0 | Consulting Engineers & Scientists | |

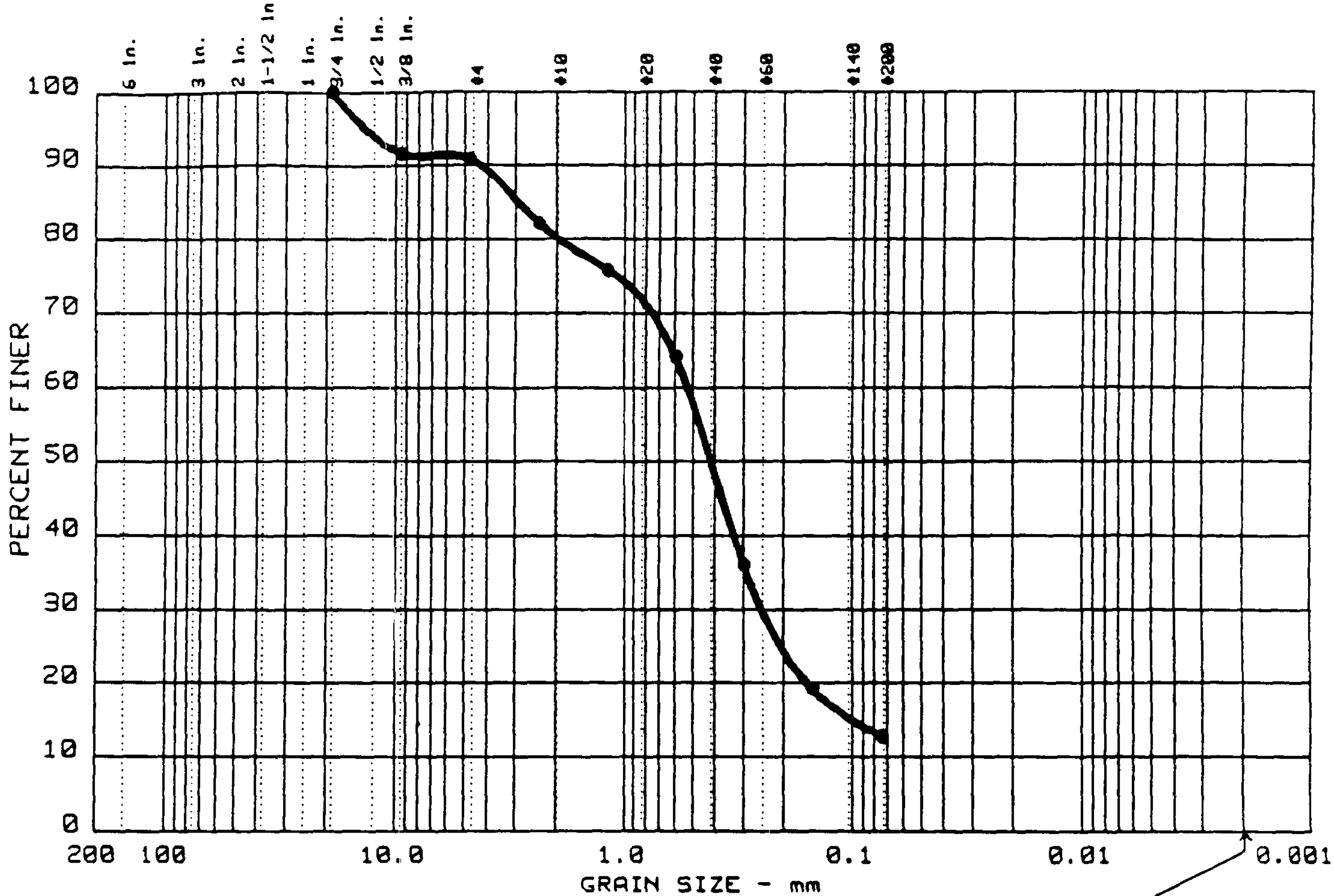



| PROJECT NO. | PREPARED BY: | **FIGURE 2** |
|---|---|---|
| 58201 | | |
| DATE | | **FIELD EXPLORATION TEST PIT LOGS** |
| 1/93 | | |
| REVISION | STEFFEN ROBERTSON & KIRSTEN (U.S.) | |
| 0 | Consulting Engineers & Scientists | |

PROJECT: CONOCO - SAN JUAN SRK #58201
LAB NO.: L461.0
SUMMARY OF LABORATORY TESTING RESULTS

| SAMPLE | % PASSING #4 SIEVE | % PASSING #200 SIEVE | MAX. DRY DENSITY (PCF) | OPTIMUM MOISTURE CONTENT (%) | VISUAL DESCRIPTION |
|---|---|---|---|---|---|
| TP-1 (3'-4') | 90.7 | 12.8 | ---------- | ---------- | SILTY, CLAYEY SAND (SC-SM) |
| TP-1 (5'-6') | 100.0 | 28.1 | ---------- | ---------- | SILTY, CLAYEY SAND (SC-SM) |
| TP-1 (6'-7') | 100.0 | 1.3 | ---------- | ---------- | POORLY GRADED SAND (SP) |
| TP-2 (COMPOSITE) | 96.4 | 19.2 | 118.5 | 11.5 | SILTY, CLAYEY SAND (SC-SM) |
| TP-3 (0'-3.5') | 93.0 | 18.4 | ---------- | ---------- | SILTY, CLAYEY SAND (SC-SM) |
| TP-3 (3.5'-6') | 96.5 | 17.1 | ---------- | ---------- | SILTY, CLAYEY SAND (SC-SM) |
| TP-4,5,6 (COMPOSITE) | 94.3 | 18.2 | 116.4 | 11.9 | SILTY, CLAYEY SAND (SC-SM) |
| TP-7,8,9 (COMPOSITE) | 99.8 | 26.9 | ---------- | ---------- | SILTY, CLAYEY SAND (SC-SM) |
| TP-7 (4'-6') | 100.0 | 17.0 | ---------- | ---------- | SILTY, CLAYEY SAND (SC-SM) |
| TP-10,11,12 (COMPOSITE) | 100.0 | 36.0 | ---------- | ---------- | SILTY, CLAYEY SAND (SC-SM) |
| TP-7-12 (COMPOSITE) | ---------- | ---------- | 117.3 | 11.6 | SILTY, CLAYEY SAND (SC-SM) |

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 7 | 0.0 | 9.3 | 77.9 | 12.8 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | 2.92 | 0.52 | 0.41 | 0.248 | 0.1012 | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● SILTY SAND WITH CLAY | SC-SM | |

Project No.: 58201
Project: CONOCO - SAN JUAN
● Location: TP-1 (3-4 FT.)

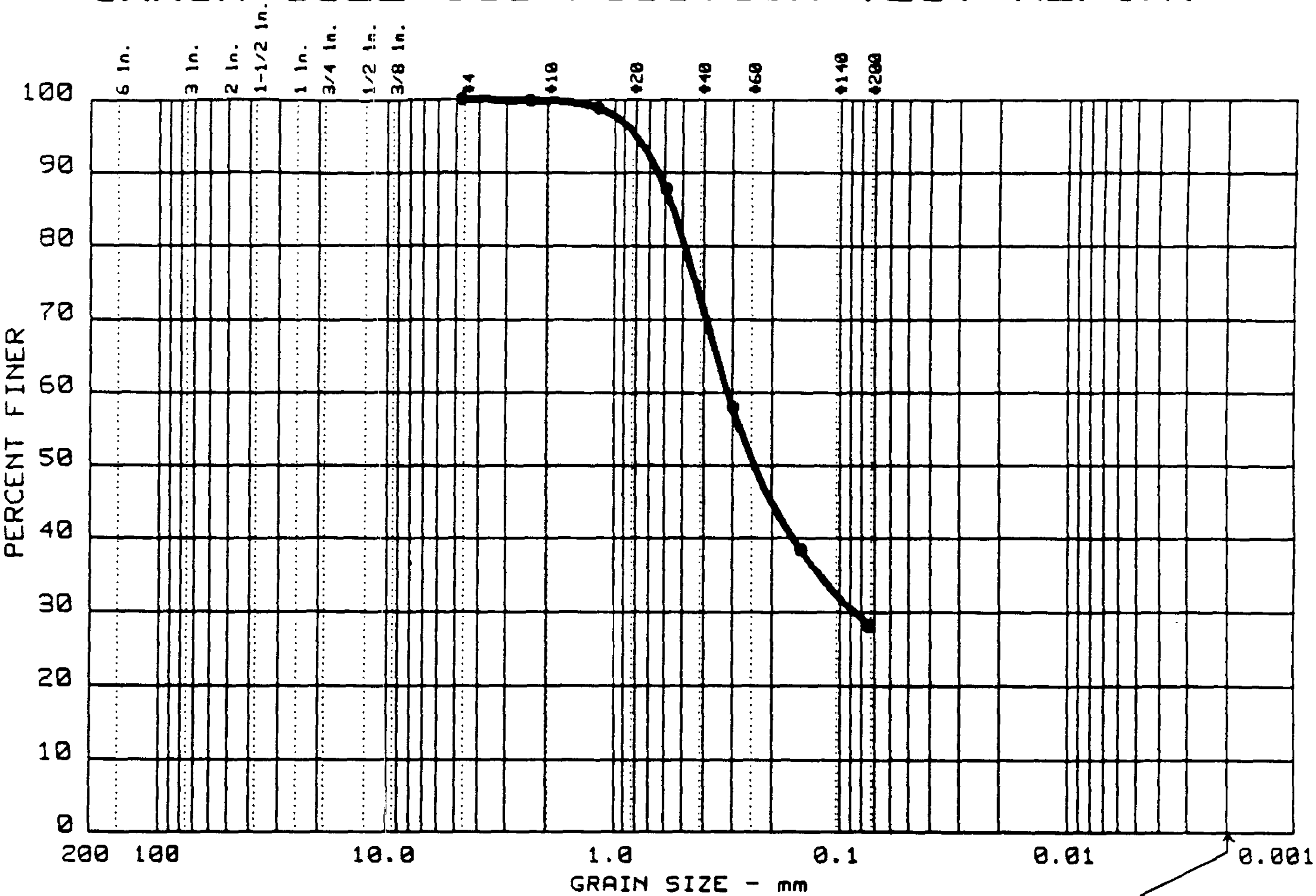
Date: 1-21-93

Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

Figure No. ______

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 17 | 0.0 | 0.0 | 71.9 | 28.1 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | 0.55 | 0.31 | 0.24 | 0.085 | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● SILTY SAND WITH CLAY | SC-SM | |

Project No.: 58201
Project: CONOCO - SAN JUAN
● Location: TP-1 (5-6 FT.)

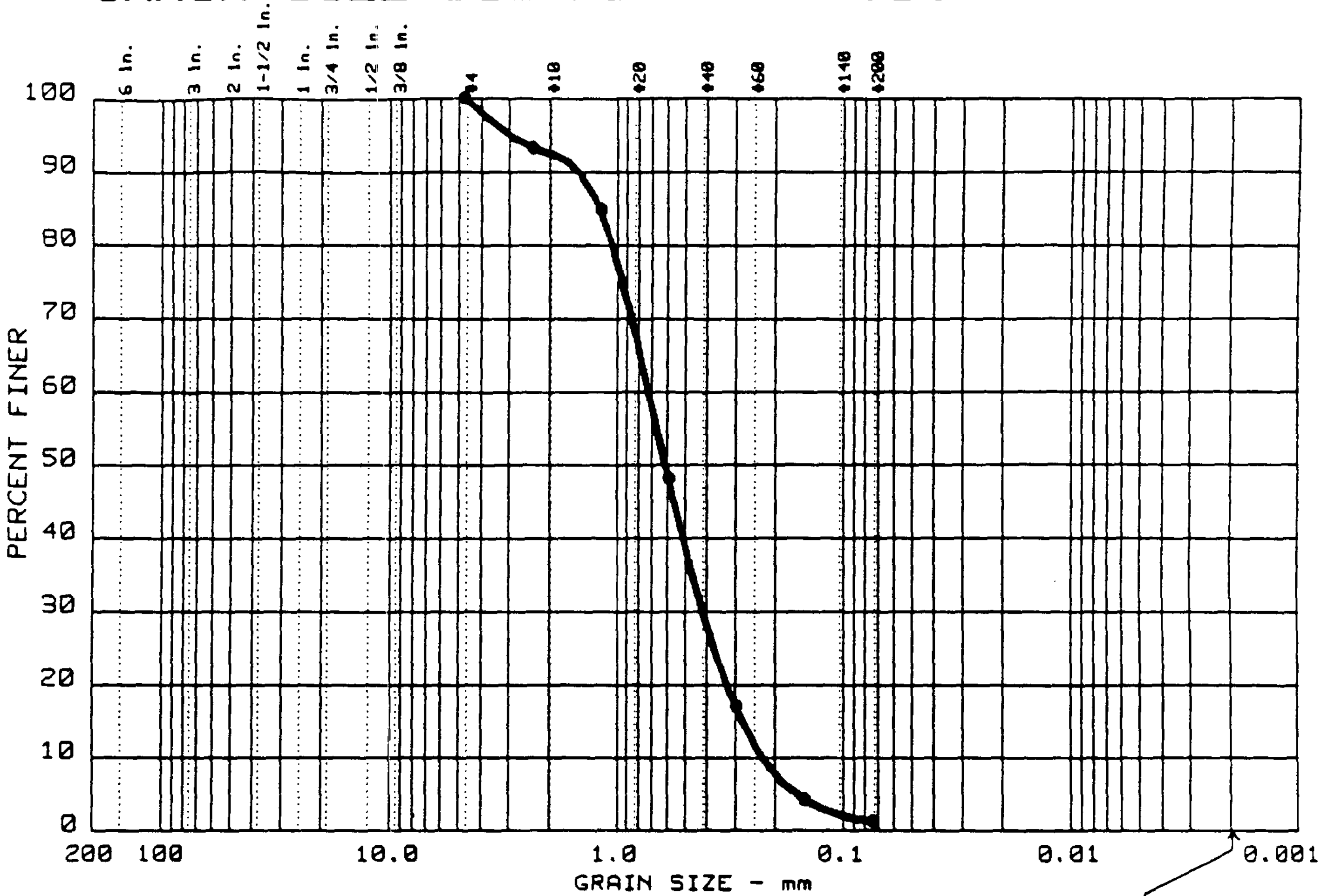
Date: 1-21-93

GRAIN SIZE DISTRIBUTION TEST REPORT

Remarks:

Figure No. ______

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 18 | 0.0 | 0.0 | 98.7 | 1.3 | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | 1.19 | 0.72 | 0.61 | 0.414 | 0.2767 | 0.2247 | 1.06 | 3.2 |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● POORLY GRADED SAND | SP | |

Project No.: 58201
Project: CONOCO - SAN JUAN
● Location: TP-1 (6-7 FT.)

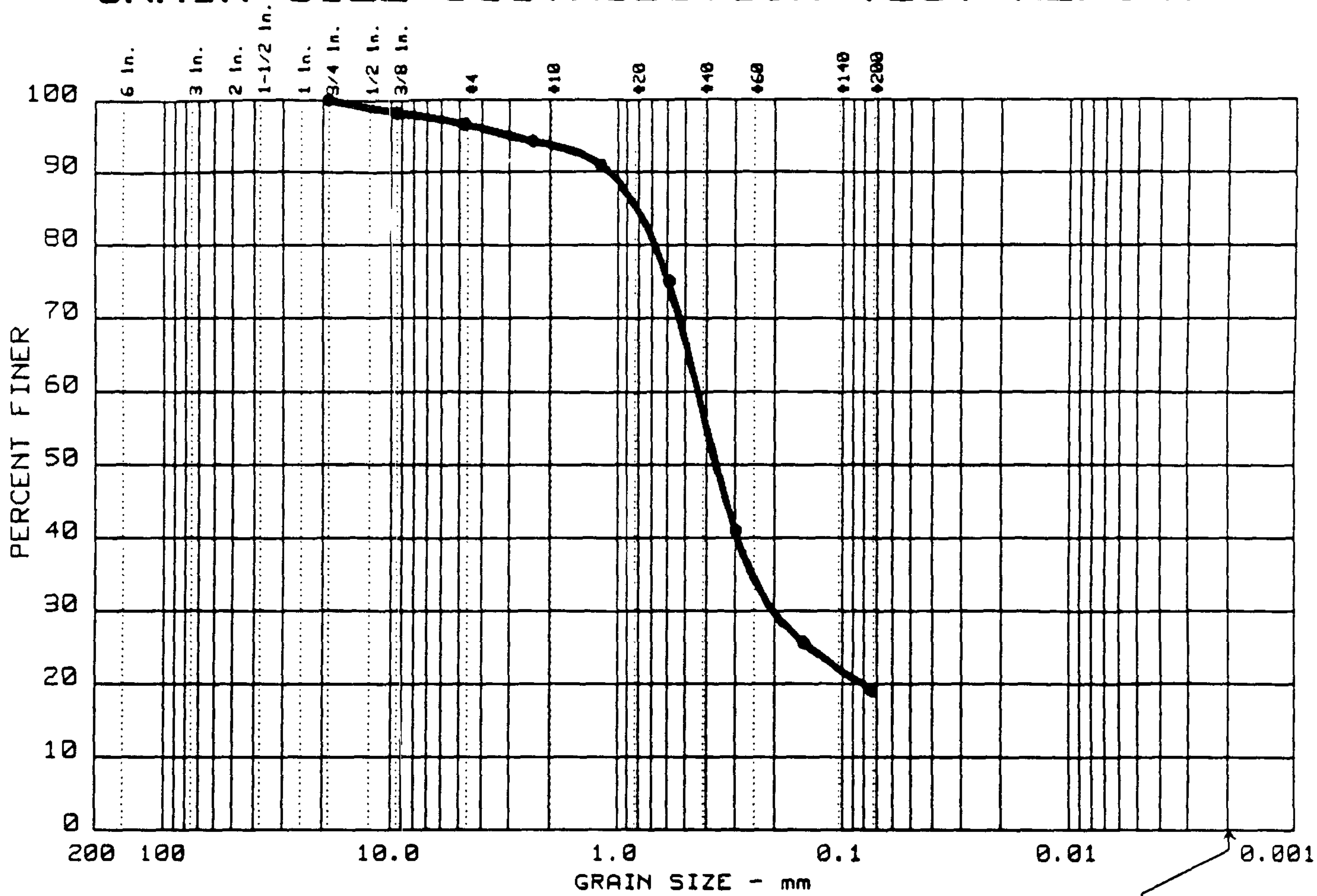
Date: 1-21-93

GRAIN SIZE DISTRIBUTION TEST REPORT

Remarks:

Figure No. ______

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 15 | 0.0 | 3.6 | 77.2 | 19.2 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | 0.80 | 0.44 | 0.36 | 0.203 | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● SILTY SAND WITH CLAY | SC-SM | |

Project No.: 58201
Project: CONOCO - SAN JUAN
● Location: TP-2 (COMPOSITE)

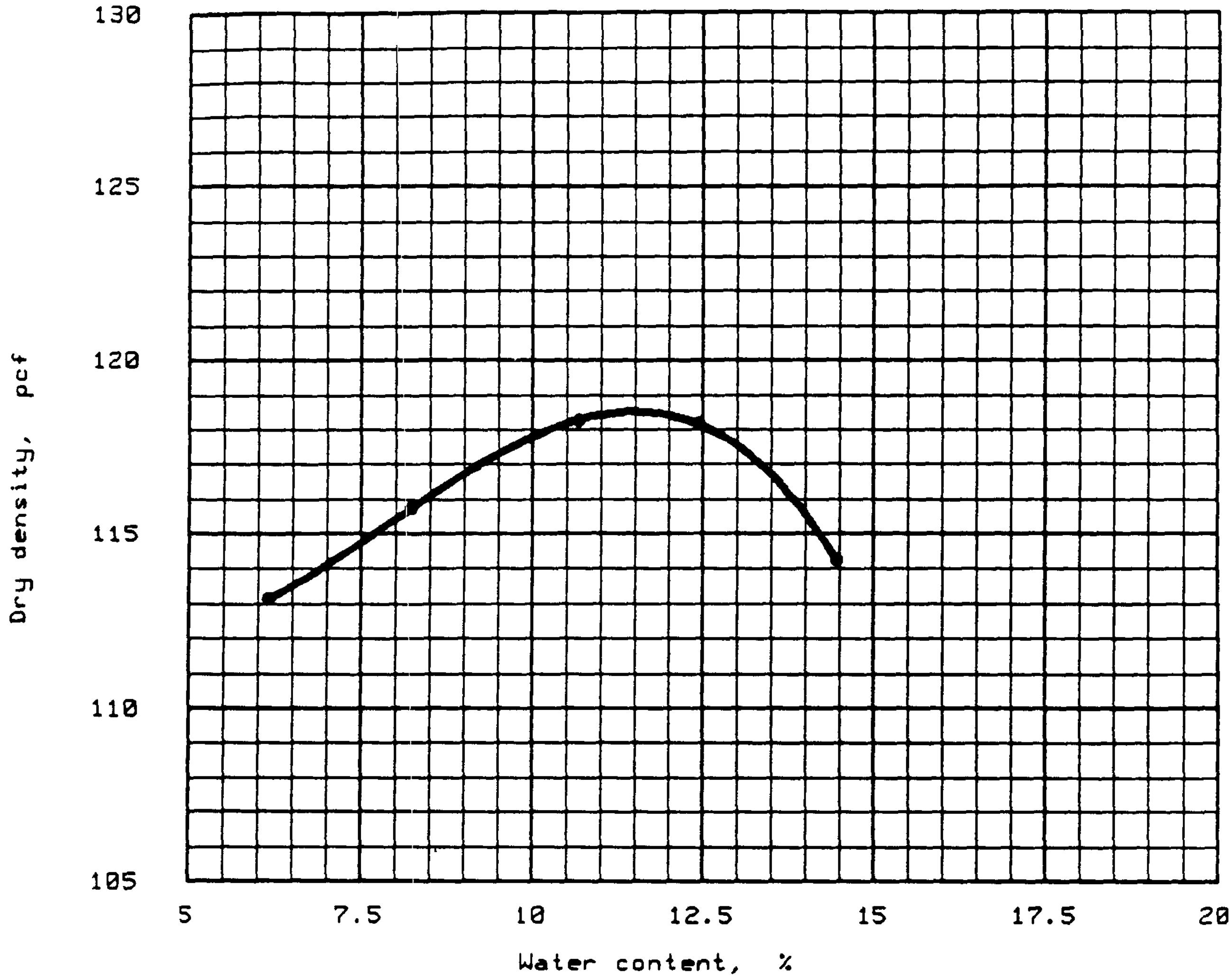
Date: 1-21-93

GRAIN SIZE DISTRIBUTION TEST REPORT

Remarks:

Figure No. ______

# PROCTOR TEST REPORT




"Standard" Proctor, ASTM D 698, Method C

| Elev/ Depth | Classification | | Nat. Moist. | Sp.G. | LL | PI | % > 3/4 in | % < No. 200 |
|---|---|---|---|---|---|---|---|---|
| | USCS | AASHTO | | | | | | |
| | SM | | | | | | | |

| TEST RESULTS | MATERIAL DESCRIPTION |
|---|---|
| Optimum moisture = 11.5 %<br>Maximum dry density = 118.5 pcf | SILTY SAND WITH CLAY<br>(SC-SM) |

Project No.: 58201
Project: CONOCO - SAN JUAN
Location: TP-2

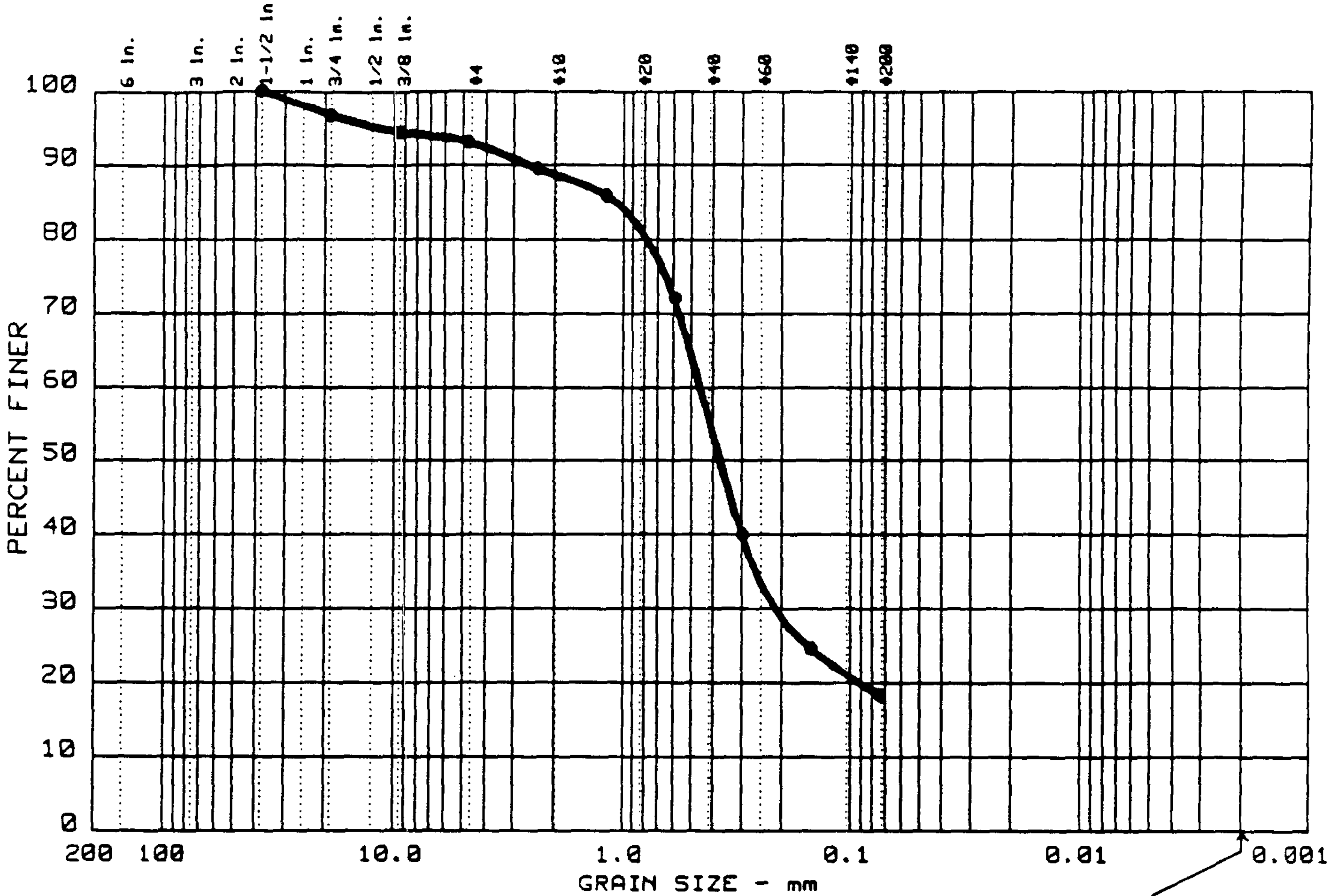
Date: 1-22-1993

PROCTOR TEST REPORT

Remarks:

Figure No. ______

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 9 | 0.0 | 7.0 | 74.6 | 18.4 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | 1.07 | 0.45 | 0.37 | 0.211 | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● SILTY SAND WITH CLAY | SC-SM | |

Project No.: 58201
Project: CONOCO - SAN JUAN
● Location: TP-3 (0-3.5 FT.)

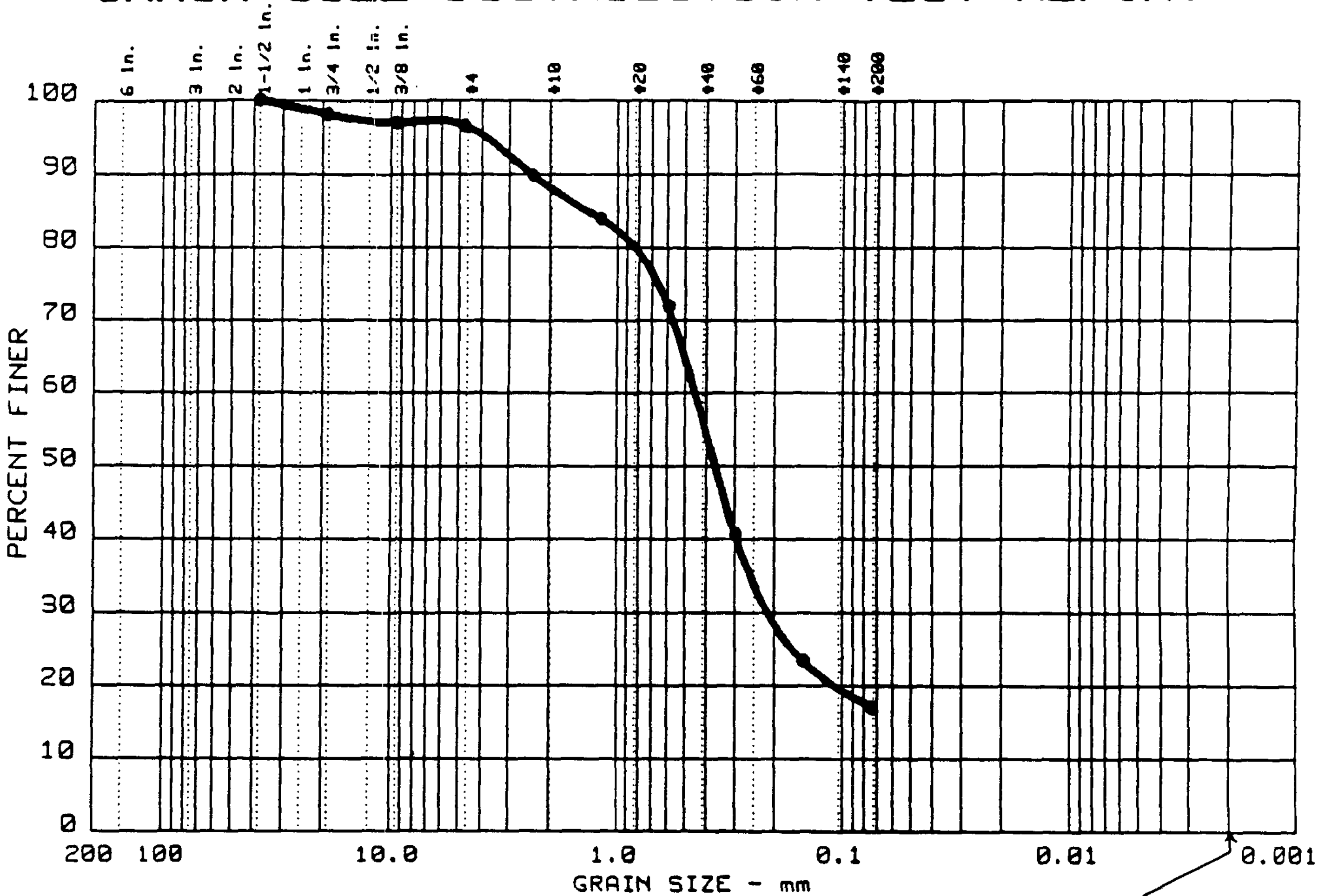
Date: 1-21-93

GRAIN SIZE DISTRIBUTION TEST REPORT

Remarks:

Figure No. ______

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 11 | 0.0 | 3.5 | 79.4 | 17.1 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | 1.38 | 0.45 | 0.36 | 0.211 | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● SILTY SAND WITH CLAY | SC-SM | |

Project No.: 58201
Project: CONOCO - SAN JUAN
● Location: TP-3 (3.5-6 FT.)

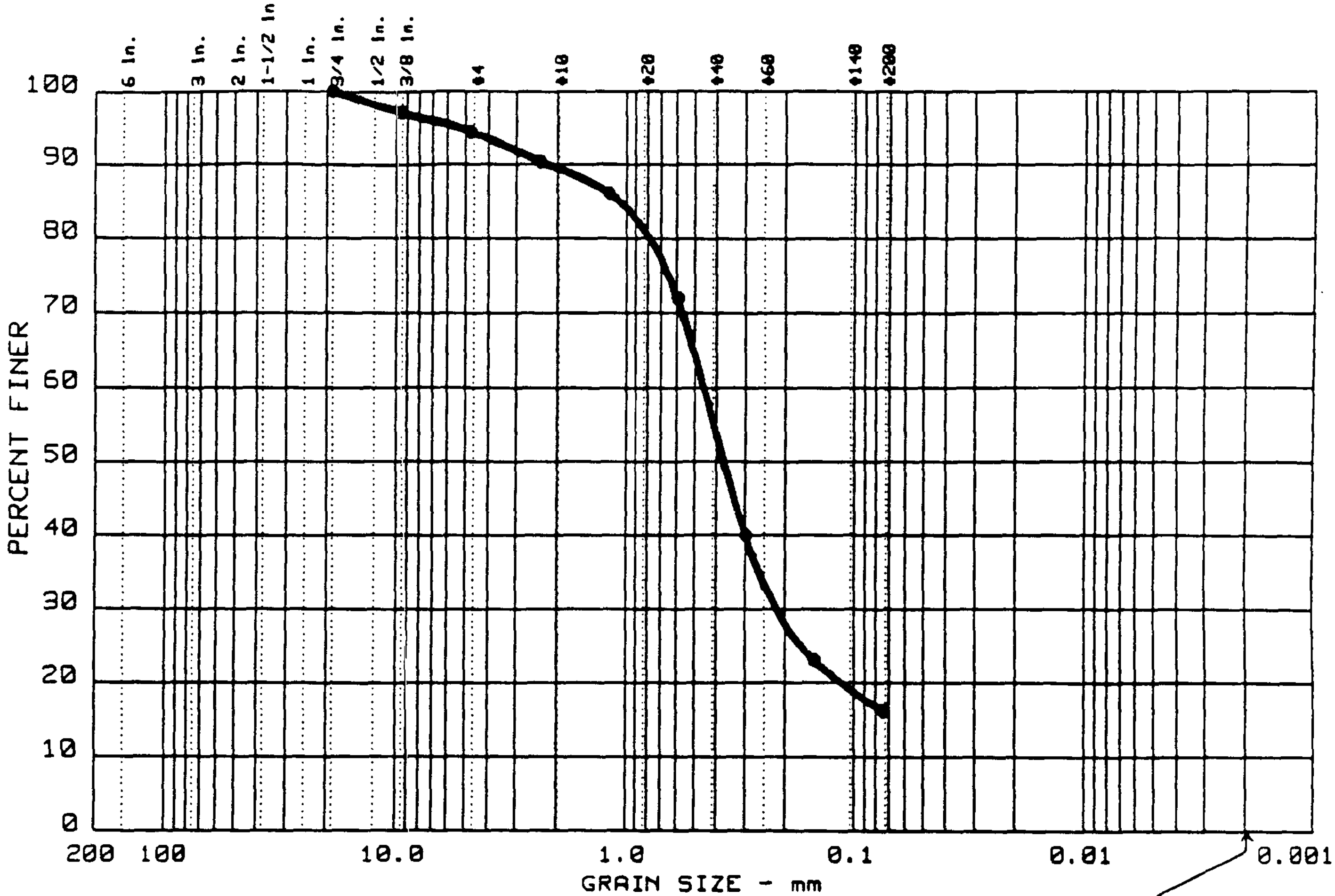
Date: 1-21-93

GRAIN SIZE DISTRIBUTION TEST REPORT

Remarks:

Figure No. ______

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 8 | 0.0 | 5.7 | 78.1 | 16.2 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | 1.06 | 0.45 | 0.37 | 0.217 | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● SILTY SAND WITH CLAY | SC-SM | |

Project No.: 58201
Project: CONOCO - SAN JUAN
● Location: TP-4,5,6

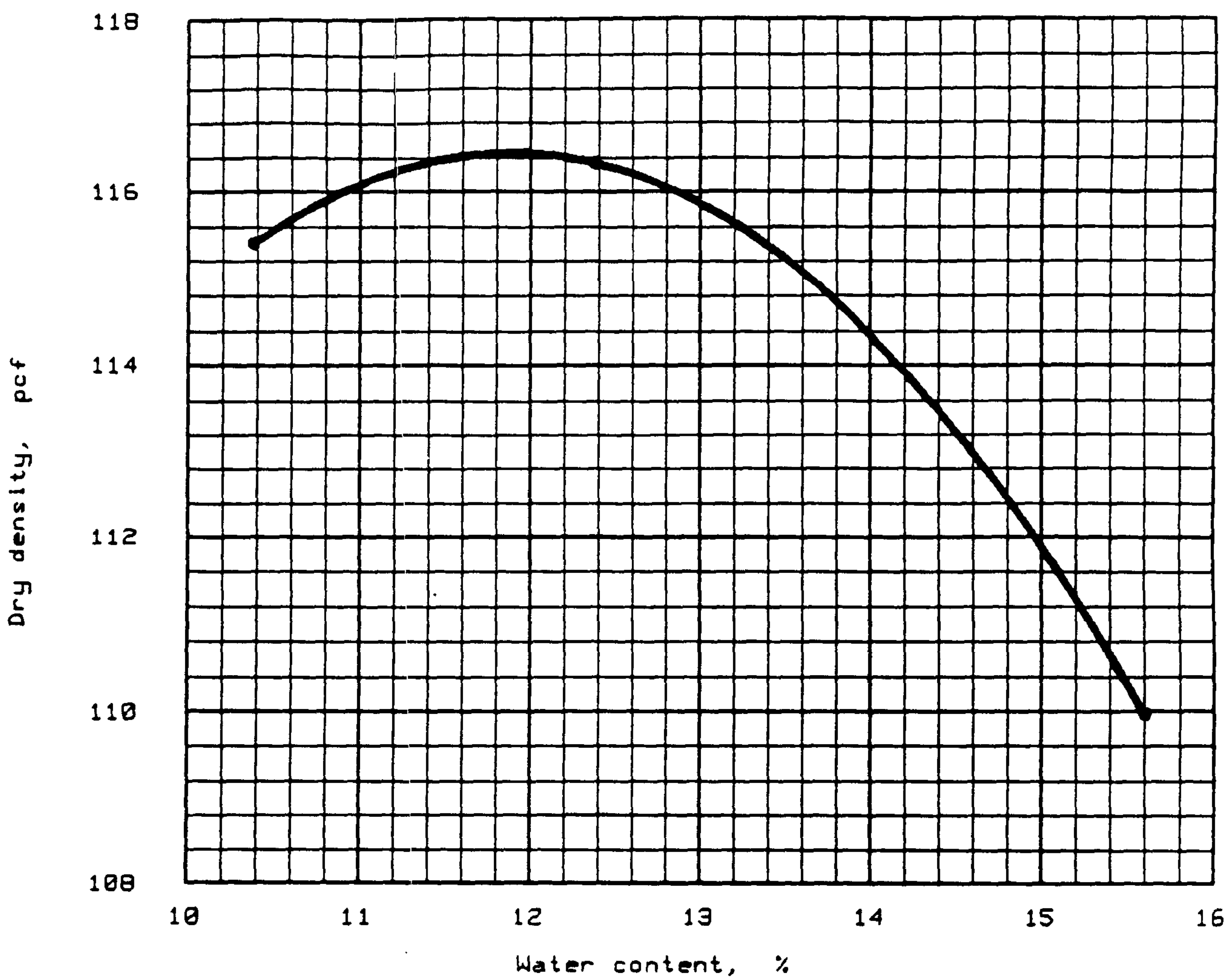
Date: 1-21-93

GRAIN SIZE DISTRIBUTION TEST REPORT

Remarks:

Figure No. ______

# PROCTOR TEST REPORT




"Standard" Proctor, ASTM D 698, Method C

| Elev/ Depth | Classification | | Nat. Moist. | Sp.G. | LL | PI | % > 3/4 in | % < No. 200 |
|---|---|---|---|---|---|---|---|---|
| | USCS | AASHTO | | | | | | |
| | | | | | | | | |

| TEST RESULTS | MATERIAL DESCRIPTION |
|---|---|
| Optimum moisture = 11.9 %<br>Maximum dry density = 116.4 pcf | |

Project No.: 58201
Project: CONOCO - SAN JUAN
Location: TP-4,5,6

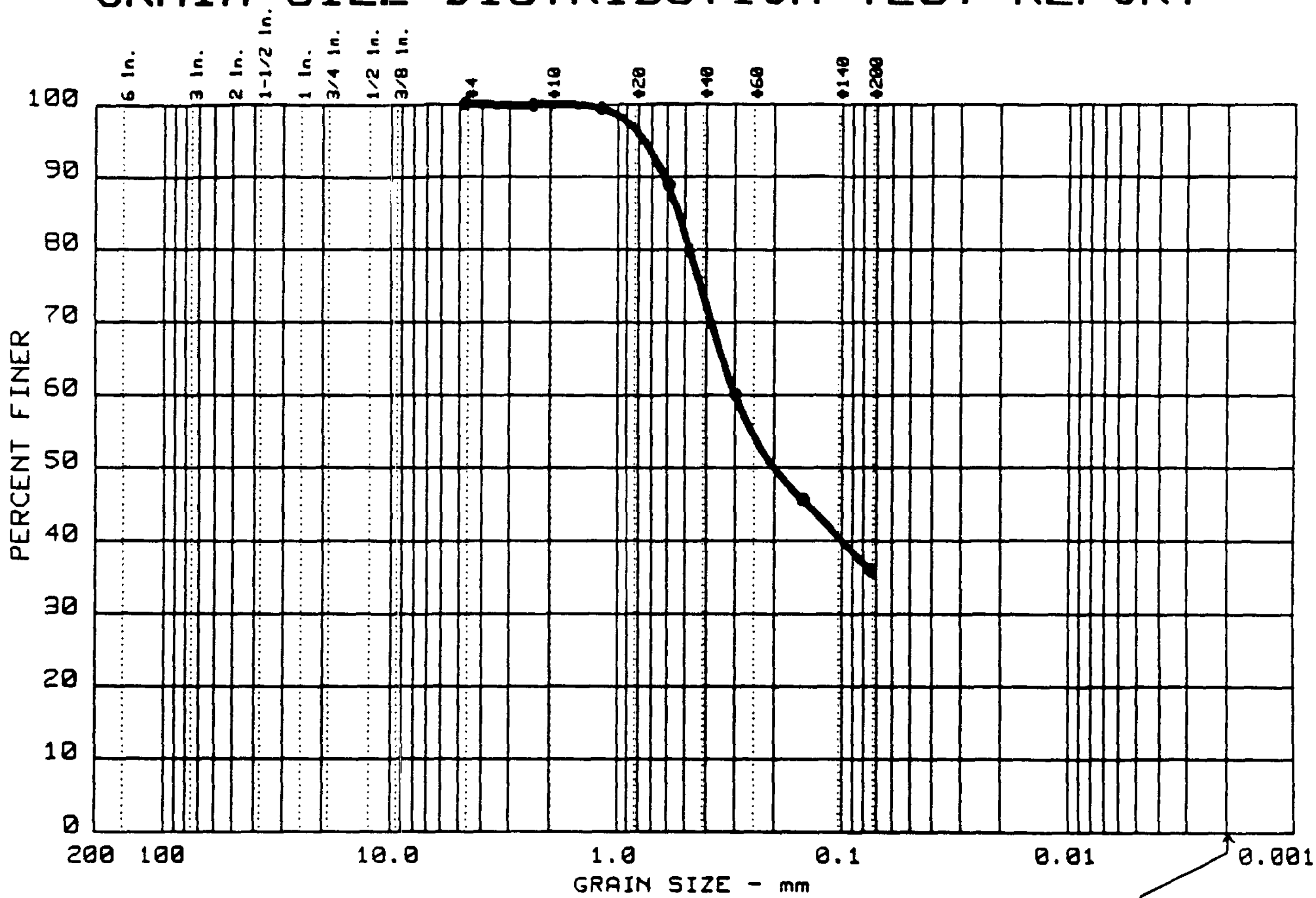
Date: 1-15-1993

PROCTOR TEST REPORT

Remarks:

Figure No. ______

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 19 | 0.0 | 0.0 | 64.0 | 36.0 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | 0.53 | 0.30 | 0.20 | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● SILTY SAND WITH CLAY | SC- SM | |

Project No.: 58201
Project: CONOCO - SAN JUAN
● Location: TP-10,11,12 (COMPOSITE)

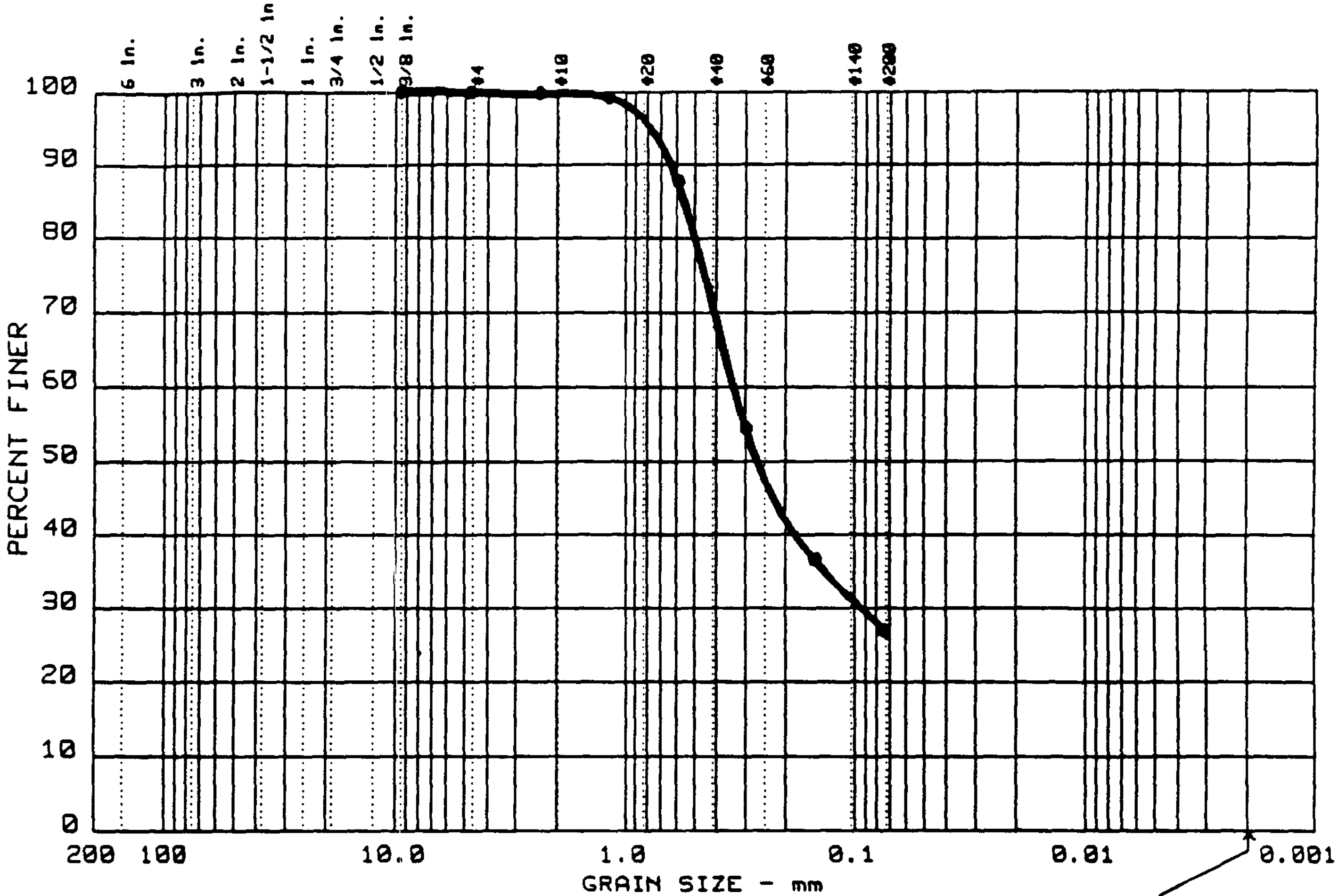
Date: 1-21-93

GRAIN SIZE DISTRIBUTION TEST REPORT

Remarks:

Figure No. ______

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 20 | 0.0 | 0.2 | 72.9 | 26.9 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | 0.55 | 0.33 | 0.27 | 0.093 | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● SILTY SAND WITH CLAY | SC-SM | |

Project No.: 58201
Project: CONOCO - SAN JUAN
● Location: TP-7,8,9 (COMPOSITE)

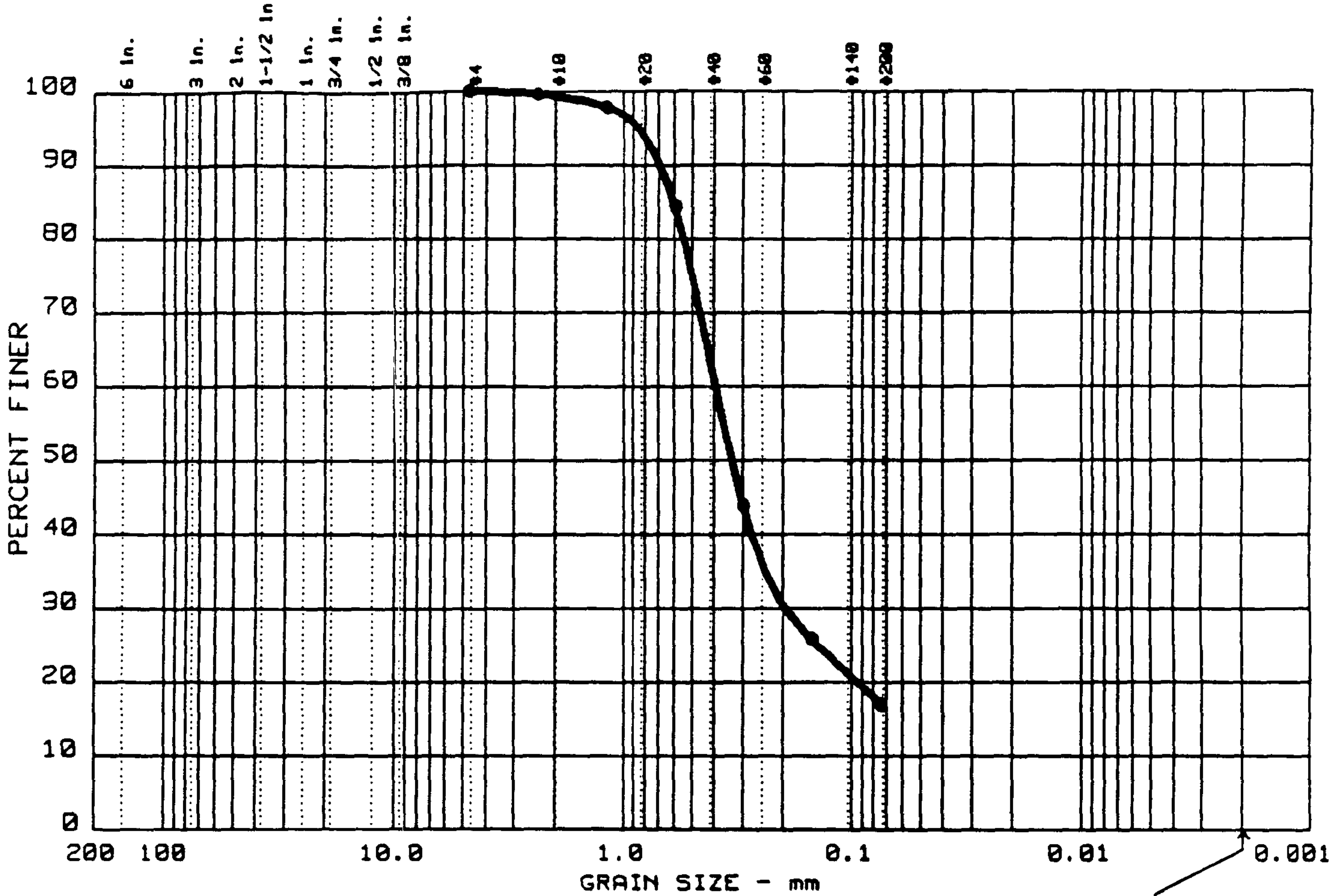
Date: 1-21-93

GRAIN SIZE DISTRIBUTION TEST REPORT

Remarks:

Figure No. ______

# GRAIN SIZE DISTRIBUTION TEST REPORT




| | Test | % +3" | % GRAVEL | % SAND | % SILT | % CLAY |
|---|---|---|---|---|---|---|
| ● | 6 | 0.0 | 0.0 | 83.0 | 17.0 | |
| | | | | | | |
| | | | | | | |

| | LL | PI | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | 0.60 | 0.39 | 0.33 | 0.191 | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

| MATERIAL DESCRIPTION | USCS | AASHTO |
|---|---|---|
| ● SILTY SAND | SC-SM | |

Project No.: 58201
Project: CONOCO - SAN JUAN
● Location: TP-7 (4-6 FT.)

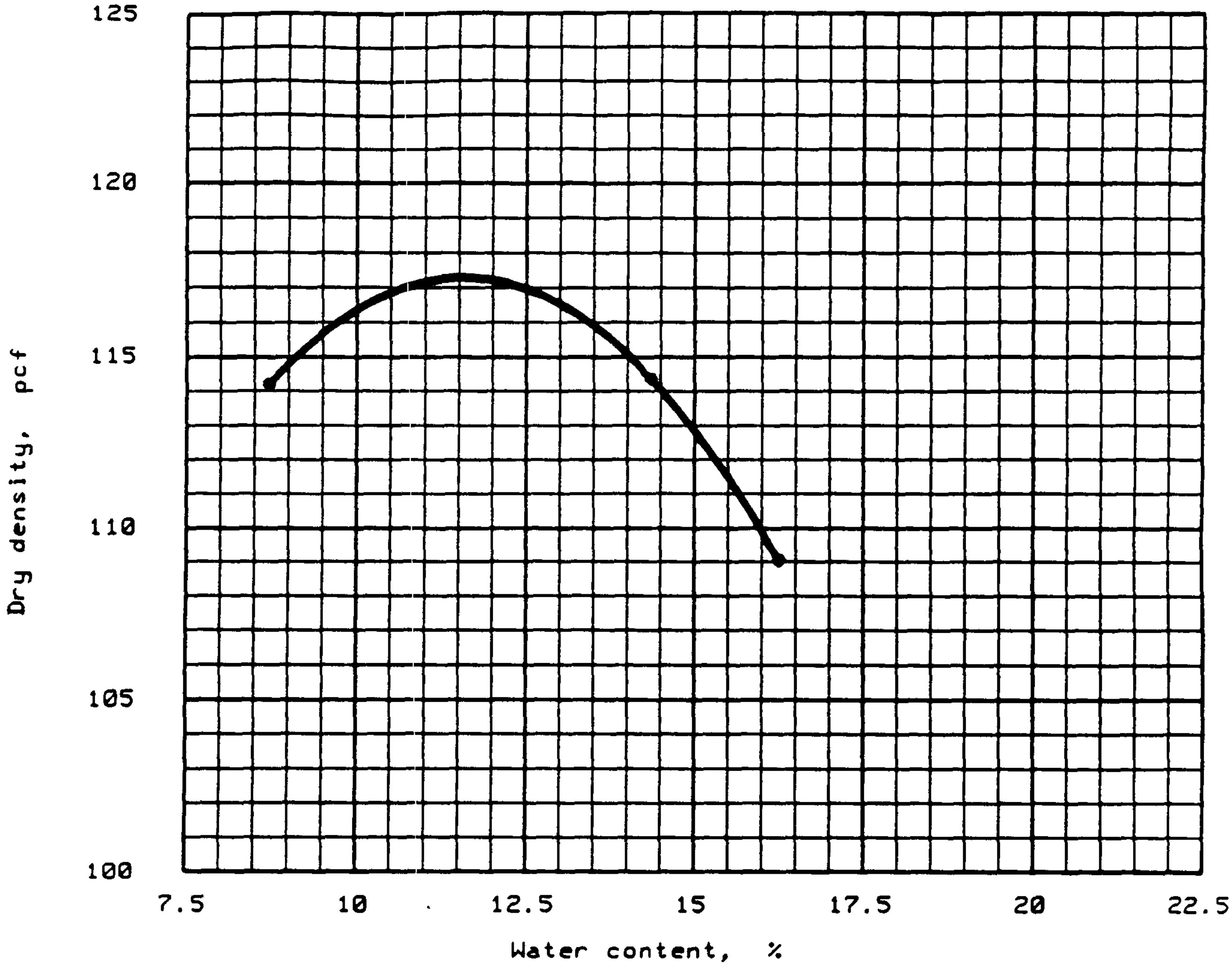
Date: 1-22-93

GRAIN SIZE DISTRIBUTION TEST REPORT

Remarks:

Figure No. ______

# PROCTOR TEST REPORT




"Standard" Proctor, ASTM D 698, Method C

| Elev/ Depth | Classification | | Nat. Moist. | Sp.G. | LL | PI | % > 3/4 in | % < No. 200 |
|---|---|---|---|---|---|---|---|---|
| | USCS | AASHTO | | | | | | |
| | | | | | | | | |

| TEST RESULTS | MATERIAL DESCRIPTION |
|---|---|
| Optimum moisture = 11.6 %<br>Maximum dry density = 117.3 pcf | |

Project No.: 58201

Project: CONOCO - SAN JUAN

Location: TP 7-12 COMPOSITE SAMPLE

Date: 1-20-1993

PROCTOR TEST REPORT

Remarks:

Figure No. ______

CONOCO SAN JUAN GAS PLANT
EVAPORATION POND LEAK DETECTION SYSTEM
PERFORMANCE COMPARISON

| GEOMETRY | | |
|---|---|---|
| A) GEONET | | |
| THICKNESS | 0.25 | in. |
| TRANSMISSIVITY | 6E-04 | sq m/sec |
| | | |
| B) SAND BLANKET | | |
| THICKNES | 12 | in. |
| PERMEABILITY | 1E-05 | m/sec |

| RESPONSE TIME | | |
|---|---|---|
| I. LEAK IN CENTER OF POND(BETWEEN PIPES FOR SAND ALT) | | |
| i. LOW WATER LEVEL (1 FT DEEP) | | |
| A) GEONET | | |
| TRAVEL DISTANCE | 100 | ft |
| GRADIENT | 0.01 | |
| TRAVEL,t TO SUMP | 2.7 | hrs |
| B) SAND/PIPE (PIPE @ 20' SPACING) | | |
| TRAVEL DISTANCE | | |
| a) SAND | 11 | ft |
| b) PIPE | 100 | ft |
| GRADIENT | | |
| a) SAND | 0.09 | |
| b) PIPE | 0.01 | |
| TRAVEL,t TO PIPE | 1024.5 | hrs |
| TRAVEL,t TO SUMP | 0.0 | hrs |
| t TOTAL | 1024.5 | hrs |
| I. LEAK IN CENTER OF POND(BETWEEN PIPES FOR SAND ALT) | | |
| ii. HIGH WATER LEVEL (8 FT DEEP) | | |
| A) GEONET | | |
| TRAVEL DISTANCE | 100 | ft |
| GRADIENT | 0.08 | |
| TRAVEL,t TO SUMP | 0.3 | hrs |
| B) SAND/PIPE (PIPE @ 20' SPACING) | | |
| TRAVEL DISTANCE | | |
| a) SAND | 11 | ft |
| b) PIPE | 100 | ft |
| GRADIENT | | |
| a) SAND | 0.73 | |
| b) PIPE | 0.01 | |
| TRAVEL,t TO PIPE | 128.1 | hrs |
| TRAVEL,t TO SUMP | 0.0 | hrs |
| t TOTAL | 128.1 | hrs |

| MOISTURE RETENTION | | |
|---|---|---|
| SHORT TERM | | |
| A) GEONET | | |
| POROSITY | 80 | % |
| UNIT STORAGE | 0.016667 | cu ft/sq ft |
| TOTAL/POND | 5,430 | gals |
| B) SAND | | |
| POROSITY | 40 | % |
| UNIT STORAGE | 0.4 | cu ft/sq ft |
| TOTAL/POND | 130,332 | gals |
| LONG TERM | | |
| A) GEONET | NIL | |
| B) SAND | | |
| POROSITY | 40 | % |
| HOLDING CAPACITY | 5 | % BY WEIGHT |
| TOTAL/POND | 23,497 | gals |

# APPENDIX A.2

## Hydrological

# REGIONAL PAN EVAPORATION & LAKE EVAPORATION ESTIMATE

| | Record Mntly. Pan Evap Santa Fe | Calc. Santa Fe % Annual | Pan Evap Farmington | Calc Lake Evap - Site |
|---|---|---|---|---|
| Jan | 1.49 | 2.2 | 1.53* | 1.12 |
| Feb | 2.13 | 3.2 | 2.22* | 1.62 |
| Mar | 3.91 | 5.8 | 4.03* | 2.94 |
| Apr | 6.39 | 9.5 | 7.33 | 5.35 |
| May | 8.98 | 13.4 | 8.37 | 6.11 |
| Jun | 10.75 | 16.0 | 10.42 | 7.61 |
| Jul | 9.52 | 14.2 | 10.01 | 7.31 |
| Aug | 8.09 | 12.1 | 8.89 | 6.49 |
| Sept | 6.97 | 10.4 | 6.62 | 4.83 |
| Oct | 4.89 | 7.3 | 5.07* | 3.70 |
| Nov | 2.51 | 3.7 | 2.57* | 1.88 |
| Dec | 1.39 | 2.1 | 1.46* | 1.07 |
| Annual | 67.02 | 100% | 68.52 | 50.03 |

* Note

- For Santa Fe, lake evaporation @ 74% of pan = 49.6"
- Assuming approx. 50" for annual lake evaporation and a pan coeff. of 72% yields 69.44" pan evap. for Santa Fe. Therefore, for the months indicated use the % annual distribution of Santa Fe and 69.44" to estimate monthly pan evap. for Farmington.

# CLIMATOLOGICAL SUMMARY

## BLOOMFIELD, NM (# 291063) 1951-80 36° 40' N 107° 58' W 5794 FT.

| | Temperature (F) Means Daily Maximum * | Daily Minimum * | Monthly * | Extremes Record Highest | Year | Day | Record Lowest | Year | Day | Mean Number of Days Max 90 and Above | Max 32 and Below | Min 32 and Below | Min 0 and Below | Degree Days Heating Base 65 * | Cooling Base 65 * | Precipitation Totals (Inches) Mean # | Greatest Monthly # | Year | Greatest Daily | Year | Day | Snow Mean | Maximum Monthly | Year | Mean Number of Days .10 or More | .50 or More | 1.00 or More |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | 40.7 | 17.8 | 29.3 | 63+ | 56 | 12 | -20 | 63 | 13 | 0 | 5 | 30 | 2 | 1107 | 0 | .59 | 2.07 | 79 | .45 | 54 | 20 | 4.3 | 18.0 | 79 | 2 | 0 | 0 |
| FEB | 48.1 | 23.0 | 35.6 | 69+ | 58 | 21 | -8+ | 51 | 2 | 0 | 1 | 26 | 0 | 823 | 0 | .44 | 1.50 | 75 | .50 | 78 | 11 | 2.1 | 9.5 | 75 | 2 | 0 | 0 |
| MAR | 56.3 | 28.4 | 42.4 | 79+ | 71 | 26 | 5+ | 71 | 3 | 0 | 0 | 22 | 0 | 701 | 0 | .66 | 2.97 | 79 | .90 | 57 | 01 | 1.7 | 6.5 | 73 | 2 | 0 | 0 |
| APR | 66.6 | 35.5 | 51.[illegible] | 87+ | 62 | 19 | 16 | 80 | 1 | 0 | 0 | 10 | 0 | 417 | 0 | .55 | 1.81 | 75 | 1.28 | 75 | 12 | .5 | 4.0 | 73 | 2 | 0 | 0 |
| MAY | 77.0 | 44.5 | 60.8 | 96+ | 51 | 27 | 22 | 67 | 2 | 1 | 0 | 1 | 0 | 164 | 34 | .41 | 1.43 | 78 | .58 | 78 | 02 | 0 | 0 | | 1 | 0 | 0 |
| JUN | 88.5 | 53.5 | 71.0 | 104+ | 57 | 28 | 34+ | 79 | 1 | 15 | 0 | 0 | 0 | 11 | 191 | .28 | 1.03 | 65 | .86 | 66 | 29 | 0 | 0 | | 1 | 0 | 0 |
| JUL | 92.7 | 60.[illegible] | 76.4 | 103+ | 71 | 13 | 48+ | 79 | 4 | 25 | 0 | 0 | 0 | 0 | 353 | .93 | 2.74 | 65 | 1.30 | 65 | 25 | 0 | 0 | | 3 | 0 | 0 |
| AUG | 89.3 | 58.3 | 73.8 | 103+ | 58 | 3 | 44+ | 68 | 24 | 16 | 0 | 0 | 0 | 0 | 273 | 1.27 | 3.01 | 59 | 2.18 | 69 | 23 | 0 | 0 | | 3 | 1 | 0 |
| SEP | 82.3 | 50.6 | 66.5 | 97+ | 55 | 6 | 30 | 78 | 21 | 4 | 0 | 0 | 0 | 39 | 84 | .83 | 2.55 | 69 | 1.76 | 69 | 20 | 0 | 0 | | 2 | 0 | 0 |
| OCT | 70.0 | 39.3 | 54.6 | 88+ | 63 | 2 | 20+ | 70 | 28 | 0 | 0 | 5 | 0 | 326 | 0 | 1.16 | 4.63 | 72 | 1.17 | 60 | 15 | 0 | 0 | | 3 | 1 | 0 |
| NOV | 53.8 | 27.5 | 40.7 | 74+ | 77 | 4 | -5+ | 76 | 28 | 0 | 1 | 23 | 0 | 729 | 0 | .64 | 2.48 | 78 | 1.37 | 79 | 07 | 1.0 | 6.0 | 64 | 2 | 0 | 0 |
| DEC | 42.7 | 18.8 | 30.8 | 67+ | 80 | 4 | -18 | 51 | 12 | 0 | 4 | 29 | 1 | 1060 | 0 | .61 | 1.86 | 66 | .72 | 66 | 07 | 4.6 | 13.5 | 78 | 2 | 0 | 0 |
| YEAR | 67.3 | 38.1 | 52.8 | 104 | JUN 57 | 28 | -20 | JAN 63 | 13 | 61 | 11 | 146 | 3 | 5377 | 935 | 8.37 | 4.63 | OCT 72 | 2.18 | AUG 69 | 23 | 14.2 | 18.0 | JAN 79 | 25 | 2 | 0 |

## BOSQUE DEL APACHE, NM (# 291138) 1951-80 33° 46' N 106° 54' W 4520 FT.

| | Temperature (F) Means Daily Maximum * | Daily Minimum * | Monthly * | Extremes Record Highest | Year | Day | Record Lowest | Year | Day | Mean Number of Days Max 90 and Above | Max 32 and Below | Min 32 and Below | Min 0 and Below | Degree Days Heating Base 65 * | Cooling Base 65 * | Precipitation Totals (Inches) Mean # | Greatest Monthly # | Year | Greatest Daily | Year | Day | Snow Mean | Maximum Monthly | Year | Mean Number of Days .10 or More | .50 or More | 1.00 or More |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | 54.4 | 20.7 | 37.6 | 76+ | 69 | 8 | -19+ | 62 | 11 | 0 | 0 | 28 | 0 | 849 | 0 | .25 | .89 | 78 | .66 | 78 | 31 | 1.3 | 8.4 | 78 | 1 | 0 | 0 |
| FEB | 60.4 | 24.2 | 42.3 | 79+ | 63 | 1 | -4 | 51 | 1 | 0 | 0 | 23 | 0 | 636 | 0 | .28 | .92 | 68 | .80 | 64 | 03 | 1.1 | 8.0 | 64 | 1 | 0 | 0 |
| MAR | 67.4 | 30.3 | 48.9 | 90+ | 71 | 28 | 4 | 65 | 4 | 0 | 0 | 19 | 0 | 499 | 0 | .34 | 1.78 | 58 | .85 | 68 | 10 | .4 | 3.9 | 58 | 1 | 0 | 0 |
| APR | 76.6 | 37.4 | 57.0 | 96+ | 65 | 22 | 17+ | 80 | 1 | 1 | 0 | 8 | 0 | 251 | 11 | .28 | 1.41 | 53 | .90 | 58 | 16 | .0 | .0 | | 1 | 0 | 0 |
| MAY | 85.1 | 45.5 | 65.3 | 102+ | 51 | 27 | 21 | 67 | 2 | 9 | 0 | 1 | 0 | 69 | 78 | .46 | 1.84 | 58 | 1.73 | 58 | 16 | .0 | .0 | | 1 | 0 | 0 |
| JUN | 94.1 | 54.2 | 74.2 | 106+ | 73 | 30 | 31+ | 71 | 2 | 24 | 0 | 0 | 0 | 0 | 276 | .65 | 4.05 | 67 | 1.65 | 67 | 18 | .0 | .0 | | 1 | 0 | 0 |
| JUL | 95.2 | 61.3 | 78.3 | 107+ | 57 | 3 | 43+ | 73 | 24 | 27 | 0 | 0 | 0 | 0 | 412 | 1.31 | 3.48 | 62 | 1.66 | 66 | 07 | .0 | .0 | | 3 | 1 | 0 |
| AUG | 92.4 | 59.3 | 75.9 | 105+ | 72 | 1 | 43+ | 68 | 24 | 24 | 0 | 0 | 0 | 0 | 338 | 1.63 | 4.30 | 61 | 1.63 | 61 | 12 | .0 | 0 | | 4 | 1 | 0 |
| SEP | 86.8 | 50.9 | 68.9 | 101+ | 52 | 4 | 34+ | 53 | 29 | 11 | 0 | 0 | 0 | 17 | 134 | 1.32 | 3.95 | 65 | 1.90 | 72 | 03 | .0 | .0 | | 3 | 1 | 0 |
| OCT | 77.5 | 39.1 | 58.3 | 94+ | 53 | 10 | 19+ | 80 | 29 | 1 | 0 | 6 | 0 | 216 | 8 | .99 | 5.41 | 72 | 1.60 | 72 | 13 | .1 | 4.0 | 76 | 2 | 1 | 0 |
| NOV | 64.3 | 27.1 | 45.7 | 83+ | 73 | 14 | -10+ | 76 | 29 | 0 | 0 | 23 | 0 | 579 | 0 | .32 | 1.84 | 78 | .60 | 78 | 01 | .6 | 5.9 | 76 | 1 | 0 | 0 |
| DEC | 54.2 | 21.0 | 37.6 | 78+ | 58 | 4 | -2+ | 53 | 24 | 0 | 0 | 29 | 0 | 849 | 0 | .45 | 2.05 | 65 | 1.14 | 62 | 01 | 2.3 | 19.6 | 60 | 1 | 0 | 0 |
| YEAR | 75.7 | 39.3 | 57.5 | 107 | JUL 57 | 3 | -19 | JAN 62 | 11 | 97 | 0 | 137 | 0 | 3965 | 1257 | 8.28 | 5.41 | OCT 72 | 1.90 | SEP 72 | 03 | 5.8 | 19.6 | DEC 60 | 20 | 4 | 0 |

## CARLSBAD (FAA AP), NM (# 291475) 1951-80 32° 20' N 104° 16' W 3232 FT.

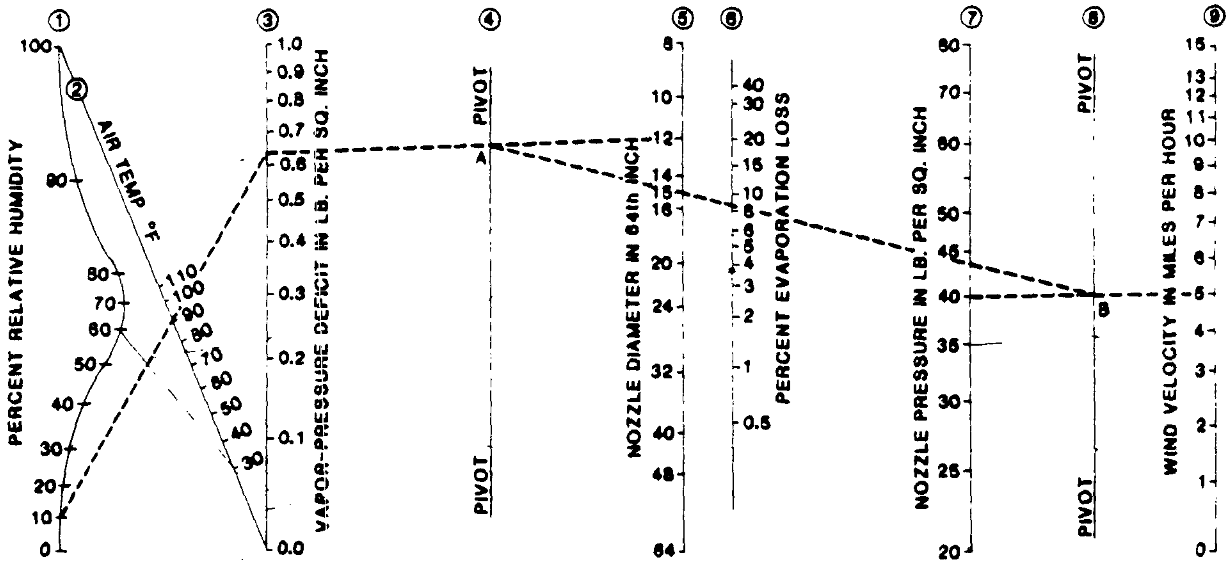
| | Temperature (F) Means Daily Maximum * | Daily Minimum * | Monthly * | Extremes Record Highest | Year | Day | Record Lowest | Year | Day | Mean Number of Days Max 90 and Above | Max 32 and Below | Min 32 and Below | Min 0 and Below | Degree Days Heating Base 65 * | Cooling Base 65 * | Precipitation Totals (Inches) Mean * # | Greatest Monthly # | Year | Greatest Daily | Year | Day | Snow Mean | Maximum Monthly | Year | Mean Number of Days .10 or More | .50 or More | 1.00 or More |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| JAN | 57.1 | 29.2 | 43.2 | 84+ | 74 | 17 | -18 | 62 | 11 | 0 | 1 | 20 | 0 | 676 | 0 | .34 | 1.63 | 58 | .93 | 68 | 21 | 1.1 | 6.0 | 62 | 1 | 0 | 0 |
| FEB | 61.9 | 32.8 | 47.4 | 84+ | 80 | 28 | -4 | 51 | 1 | 0 | 0 | 14 | 0 | 493 | 0 | .35 | 1.77 | 73 | .69 | 56 | 02 | 1.8 | 15.2 | 56 | 1 | 0 | 0 |
| MAR | 69.4 | 39.1 | 54.3 | 95+ | 71 | 26 | 11+ | 71 | 3 | 0 | 0 | 8 | 0 | 346 | 15 | .33 | 1.31 | 51 | .88 | 51 | 28 | .7 | 4.5 | 77 | 1 | 0 | 0 |
| APR | 79.1 | 48.2 | 63.7 | 101+ | 65 | 21 | 22+ | 73 | 9 | 4 | 0 | 1 | 0 | 118 | 79 | .40 | 2.18 | 77 | 1.91 | 77 | 14 | .1 | 3.0 | 80 | 1 | 0 | 0 |
| MAY | 87.4 | 57.0 | 72.2 | 105+ | 58 | 30 | 34+ | 70 | 1 | 14 | 0 | 0 | 0 | 8 | 231 | .93 | 3.45 | 59 | 1.59 | 59 | 07 | .0 | .0 | | 2 | 1 | 0 |
| JUN | 95.5 | 65.6 | 80.6 | 110+ | 78 | 23 | 45 | 70 | 2 | 25 | 0 | 0 | 0 | 0 | 468 | .71 | 2.33 | 78 | 1.26 | 72 | 12 | .0 | .0 | | 2 | 0 | 0 |
| JUL | 95.6 | 69.3 | 82.5 | 111 | 58 | 14 | 53 | 55 | 17 | 27 | 0 | 0 | 0 | 0 | 543 | 1.70 | 5.06 | 60 | 2.85 | 68 | 04 | .0 | .0 | | 3 | 1 | 0 |
| AUG | 93.6 | 67.6 | 80.6 | 107+ | 69 | 17 | 56+ | 70 | 29 | 24 | 0 | 0 | 0 | 0 | 484 | 1.88 | 8.02 | 66 | 2.57 | 66 | 23 | .0 | .0 | | 3 | 1 | 0 |
| SEP | 86.9 | 60.9 | 73.9 | 102+ | 77 | 29 | 40+ | 71 | 20 | 14 | 0 | 0 | 0 | 8 | 275 | 2.16 | 9.23 | 74 | 3.27 | 78 | 25 | .0 | .0 | | 3 | 1 | 1 |
| OCT | 77.5 | 48.8 | 63.2 | 99+ | 79 | 7 | 26+ | 80 | 29 | 3 | 0 | 1 | 0 | 116 | 60 | 1.16 | 3.99 | 69 | 2.20 | 69 | 20 | .0 | 1.0 | 76 | 2 | | 0 |
| NOV | 64.8 | 36.7 | 50.8 | 89 | 52 | 1 | -1 | 76 | 29 | 0 | 0 | 9 | 0 | 426 | 0 | .44 | 3.42 | 78 | 1.52 | 78 | 04 | 1.0 | 8.3 | 76 | 1 | 0 | 0 |
| DEC | 58.3 | 30.3 | 44.3 | 83+ | 70 | 8 | -2+ | 53 | 24 | 0 | 1 | 21 | 0 | 642 | 0 | .26 | 1.58 | 60 | .67 | 60 | 09 | .8 | 6.9 | 60 | 1 | 0 | 0 |
| YEAR | 77.3 | 48.8 | 63.1 | 111 | JUL 58 | 14 | -18 | JAN 62 | 11 | 111 | 2 | 74 | 0 | 2833 | 2155 | 10.66 | 9.23 | SEP 74 | 3.27 | SEP 78 | 25 | 5.5 | 15.2 | FEB 56 | 21 | 5 | [illegible] |

*FROM 1951-80 NORMALS

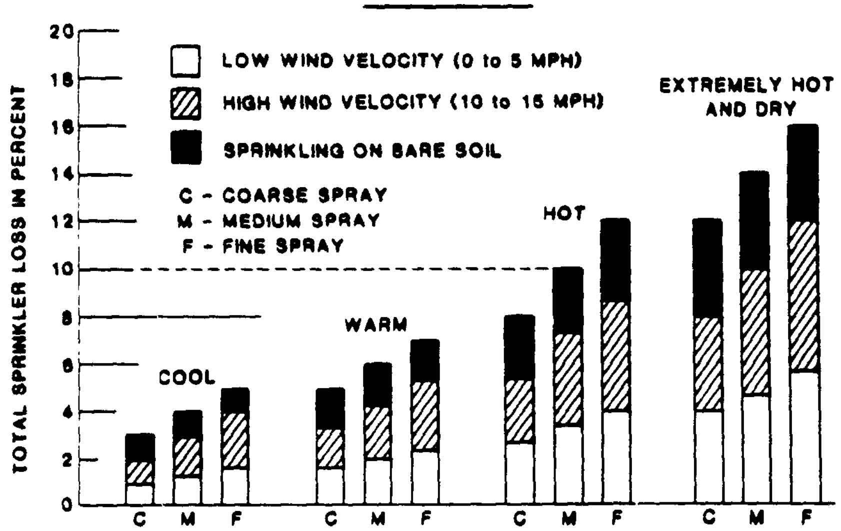
# ESTIMATED VALUE BASED ON DATA FROM SURROUNDING STATIONS

+ ALSO ON EARLIER DATES

BELOW, NOMOGRAPH used in estimating spray losses at known climatic and operating conditions. Average daytime conditions for the operating period should be used. Night operation losses can be disregarded unless wind velocities are high. Example shown by the dotted line gives the losses for 10% relative humidity and 90°F air temperature, resulting in vapor pressure deficit of 0.73 psi. Line drawn from 0.73 psi to the nozzle size 12/64" determines point A on line 4. Line drawn from the wind velocity 5 m.p.h. to the nozzle pressure of 40 psi determines point B on line 8. A line drawn from A to B intersects line 6 at the percent spray loss.




BAR GRAPH for estimating total losses when conditions are estimated. This graph is useful to learn both spray losses and losses occurring after the spray reaches the soil surface. Total loss sprinkling on bare soil at high wind velocities, in hot weather and using a medium spray, is shown by the broken line at about 10%.




## FIGURE 12.5

### EVAPORATION LOSSES FROM SPRAY SYSTEMS

K.R. Frost and H.C. Schwalen (1955). Sprinkler evaporation losses. Agricultural Engineering 36 (8) pp. 526-528.

CONOCO - SAN JUAN (SRK #58201)
DETERMINATION OF SPRAY EVAPORATION LOSSES
2/11/93

CASE 1: USING DAILY AVERAGE RELATIVE HUMIDITY

| MONTH | AVG DAILY TEMP (deg F) | Rh (%) | WIND VELOCITY (MPH) | SPRAY LOSS (%) |
|---|---|---|---|---|
| JAN | 29.3 | 60.0% | 8.0 | 0.65% |
| FEB | 35.6 | 60.0% | 8.8 | 0.75% |
| MAR | 42.4 | 55.0% | 10.2 | 0.85% |
| APR | 51.1 | 55.0% | 11.0 | 0.95% |
| MAY | 60.8 | 55.0% | 10.5 | 1.10% |
| JUN | 71.0 | 50.0% | 10.0 | 1.30% |
| JUL | 76.4 | 50.0% | 9.1 | 1.30% |
| AUG | 73.8 | 50.0% | 8.2 | 1.10% |
| SEP | 66.5 | 50.0% | 8.6 | 1.00% |
| OCT | 54.6 | 55.0% | 8.3 | 0.85% |
| NOV | 40.7 | 60.0% | 7.8 | 0.85% |
| DEC | 30.8 | 60.0% | 7.7 | 0.60% |

CONOCO - SAN JUAN (SRK #58201)
EVAPORATION PONDS - WATER BALANCE
2/9/93

| CLIMATOLOGICAL DATA FOR BLOOMFIELD, NEW MEXICO | | |
|---|---|---|
| AVG ANNUAL TEMPERATURE | 52.8 | DEG. FAHRENHEIT |
| AVG ANNUAL PRECIP | 8.37 | INCHES |
| AVG ANNUAL POND EVAP | 50.0 | INCHES |

| | | |
|---|---|---|
| MAXIMUM POND AREA (AT CREST) | 82,805 | FT^2 |
| MAXIMUM WASTEWATER FLOW | 15 | GPM |
| MAXIMUM SPRAY RATE (EACH POND) | 100 | GPM |
| MAXIMUM SPRAY EVAP COEFF | 1.30% | |

| MONTH | PRECIP (inches) | POND EVAP (inches) | SPRAY EVAP COEFFICIENT (%) | SPRAY RATE (gpm) | SPRAY OPERATION (%) | SYSTEM INFLOWS | | SYSTEM LOSSES | | STORAGE VOL. (gals) | EQUIVALENT POND DEPTH (FT) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | PRECIP (gals) | WASTEWATER (gals) | SPRAY EVAP (gals) | POND EVAP (gals) | | |
| MARCH | 0.66 | 2.94 | 0.85% | 100 | 50.0% | 34,066 | 446,400 | 37,944 | 55,112 | 387,410 | 0.73 |
| APRIL | 0.55 | 5.35 | 0.95% | 100 | 50.0% | 28,388 | 432,000 | 41,040 | 127,342 | 679,416 | 1.29 |
| MAY | 0.41 | 6.11 | 1.10% | 100 | 50.0% | 21,162 | 446,400 | 49,104 | 168,840 | 929,034 | 1.76 |
| JUNE | 0.28 | 7.61 | 1.30% | 100 | 50.0% | 14,452 | 648,000 | 56,160 | 236,470 | 1,298,856 | 2.46 |
| JULY | 0.93 | 7.31 | 1.30% | 100 | 50.0% | 48,002 | 669,600 | 58,032 | 262,911 | 1,695,516 | 3.21 |
| AUGUST | 1.27 | 6.49 | 1.10% | 100 | 50.0% | 65,551 | 669,600 | 49,104 | 267,238 | 2,114,325 | 4.00 |
| SEPTEMBER | 0.83 | 4.83 | 1.00% | 100 | 50.0% | 42,841 | 648,000 | 43,200 | 225,193 | 2,536,773 | 4.80 |
| OCTOBER | 1.16 | 3.70 | 0.85% | 100 | 50.0% | 59,874 | 223,200 | 37,944 | 191,660 | 2,590,242 | 4.90 |
| NOVEMBER | 0.64 | 1.88 | 0.85% | 100 | 50.0% | 33,034 | 216,000 | 36,720 | 98,645 | 2,703,911 | 5.12 |
| DECEMBER | 0.61 | 1.07 | 0.60% | 100 | 50.0% | 31,485 | 223,200 | 26,784 | 57,742 | 2,874,070 | 5.44 |
| JANUARY | 0.59 | 1.12 | 0.65% | 100 | 50.0% | 30,453 | 223,200 | 29,016 | 62,935 | 3,035,772 | 5.74 |
| FEBRUARY | 0.44 | 1.62 | 0.75% | 100 | 50.0% | 22,711 | 403,200 | 30,240 | 94,707 | 3,336,735 | 6.31 |
| ANNUAL TOTAL | 8.37 | 50.0 | | | | 432,019 | 5,248,800 | 495,288 | 1,848,795 | | |

CONOCO - SAN JUAN (SRK #58201)
DETERMINATION OF SPRAY EVAPORATION LOSSES
2/11/93

CASE 2: USING DAYTIME AVERAGE RELATIVE HUMIDITY

| MONTH | MAX DAILY TEMP (deg F) | Rh (%) | WIND VELOCITY (MPH) | SPRAY LOSS (%) |
|---|---|---|---|---|
| JAN | 40.7 | 46.9% | 8.0 | 0.75% |
| FEB | 48.1 | 46.9% | 8.8 | 0.85% |
| MAR | 56.3 | 44.4% | 10.2 | 1.00% |
| APR | 66.6 | 44.4% | 11.0 | 1.30% |
| MAY | 77.0 | 44.4% | 10.5 | 1.60% |
| JUN | 88.5 | 41.9% | 10.0 | 1.90% |
| JUL | 92.7 | 41.9% | 9.1 | 1.95% |
| AUG | 89.3 | 41.9% | 8.2 | 1.75% |
| SEP | 82.3 | 41.9% | 8.6 | 1.50% |
| OCT | 70.0 | 44.4% | 8.3 | 1.05% |
| NOV | 53.8 | 46.9% | 7.8 | 0.85% |
| DEC | 42.7 | 46.9% | 7.7 | 0.70% |

CONOCO - SAN JUAN (SRK #58201)
EVAPORATION PONDS - WATER BALANCE
2/9/93

| CLIMATOLOGICAL DATA FOR BLOOMFIELD, NEW MEXICO | | |
|---|---|---|
| AVG ANNUAL TEMPERATURE | 52.8 | DEG. FAHRENHEIT |
| AVG ANNUAL PRECIP | 8.37 | INCHES |
| AVG ANNUAL POND EVAP | 50.0 | INCHES |

| | | |
|---|---|---|
| MAXIMUM POND AREA (AT CREST) | 82,805 | FT^2 |
| MAXIMUM WASTEWATER FLOW | 15 | GPM |
| MAXIMUM SPRAY RATE (EACH POND) | 100 | GPM |
| MAXIMUM SPRAY EVAP COEFF | 1.95% | |

| MONTH | PRECIP (inches) | POND EVAP (inches) | SPRAY EVAP COEFFICIENT (%) | SPRAY RATE (gpm) | SPRAY OPERATION (%) | SYSTEM INFLOWS PRECIP (gals) | SYSTEM INFLOWS WASTEWATER (gals) | SYSTEM LOSSES SPRAY EVAP (gals) | SYSTEM LOSSES POND EVAP (gals) | STORAGE VOL. (gals) | EQUIVALENT POND DEPTH (FT) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MARCH | 0.66 | 2.94 | 1.00% | 100 | 50.0% | 34,066 | 446,400 | 44,640 | 55,112 | 380,714 | 0.72 |
| APRIL | 0.55 | 5.35 | 1.30% | 100 | 50.0% | 28,388 | 432,000 | 56,160 | 126,873 | 658,069 | 1.25 |
| MAY | 0.41 | 6.11 | 1.60% | 100 | 50.0% | 21,162 | 446,400 | 71,424 | 167,132 | 887,076 | 1.68 |
| JUNE | 0.28 | 7.61 | 1.90% | 100 | 50.0% | 14,452 | 648,000 | 82,080 | 232,288 | 1,235,160 | 2.34 |
| JULY | 0.93 | 7.31 | 1.95% | 100 | 50.0% | 48,002 | 669,600 | 87,048 | 256,812 | 1,608,902 | 3.04 |
| AUGUST | 1.27 | 6.49 | 1.75% | 100 | 50.0% | 65,551 | 669,600 | 78,120 | 259,875 | 2,006,059 | 3.80 |
| SEPTEMBER | 0.83 | 4.83 | 1.50% | 100 | 50.0% | 42,841 | 648,000 | 64,800 | 218,343 | 2,413,756 | 4.57 |
| OCTOBER | 1.16 | 3.70 | 1.05% | 100 | 50.0% | 59,874 | 223,200 | 46,872 | 165,698 | 2,464,259 | 4.66 |
| NOVEMBER | 0.64 | 1.88 | 0.85% | 100 | 50.0% | 33,034 | 216,000 | 36,720 | 95,542 | 2,561,030 | 4.88 |
| DECEMBER | 0.61 | 1.07 | 0.70% | 100 | 50.0% | 31,485 | 223,200 | 31,248 | 56,020 | 2,748,448 | 5.20 |
| JANUARY | 0.59 | 1.12 | 0.75% | 100 | 50.0% | 30,453 | 223,200 | 33,480 | 61,093 | 2,907,528 | 5.50 |
| FEBRUARY | 0.44 | 1.62 | 0.85% | 100 | 50.0% | 22,711 | 403,200 | 34,272 | 91,986 | 3,207,181 | 6.07 |
| ANNUAL TOTAL | 8.37 | 50.0 | | | | 432,019 | 5,248,800 | 666,664 | 1,806,774 | | |

CONOCO - SAN JUAN (SRK #58201)
DETERMINATION OF SPRAY EVAPORATION LOSSES
2/11/93

CASE 3: USING LOWEST DAYTIME RELATIVE HUMIDITY

| MONTH | MAX DAILY TEMP (deg F) | Rh (%) | WIND VELOCITY (MPH) | SPRAY LOSS (%) |
|---|---|---|---|---|
| JAN | 40.7 | 50.0% | 8.0 | 0.75% |
| FEB | 48.1 | 50.0% | 8.8 | 0.85% |
| MAR | 56.3 | 40.0% | 10.2 | 1.10% |
| APR | 66.6 | 40.0% | 11.0 | 1.35% |
| MAY | 77.0 | 40.0% | 10.5 | 1.65% |
| JUN | 88.5 | 30.0% | 10.0 | 2.00% |
| JUL | 92.7 | 30.0% | 9.1 | 2.30% |
| AUG | 89.3 | 30.0% | 8.2 | 1.85% |
| SEP | 82.3 | 30.0% | 8.6 | 1.70% |
| OCT | 70.0 | 40.0% | 8.3 | 1.20% |
| NOV | 53.8 | 50.0% | 7.8 | 0.85% |
| DEC | 42.7 | 50.0% | 7.7 | 0.70% |

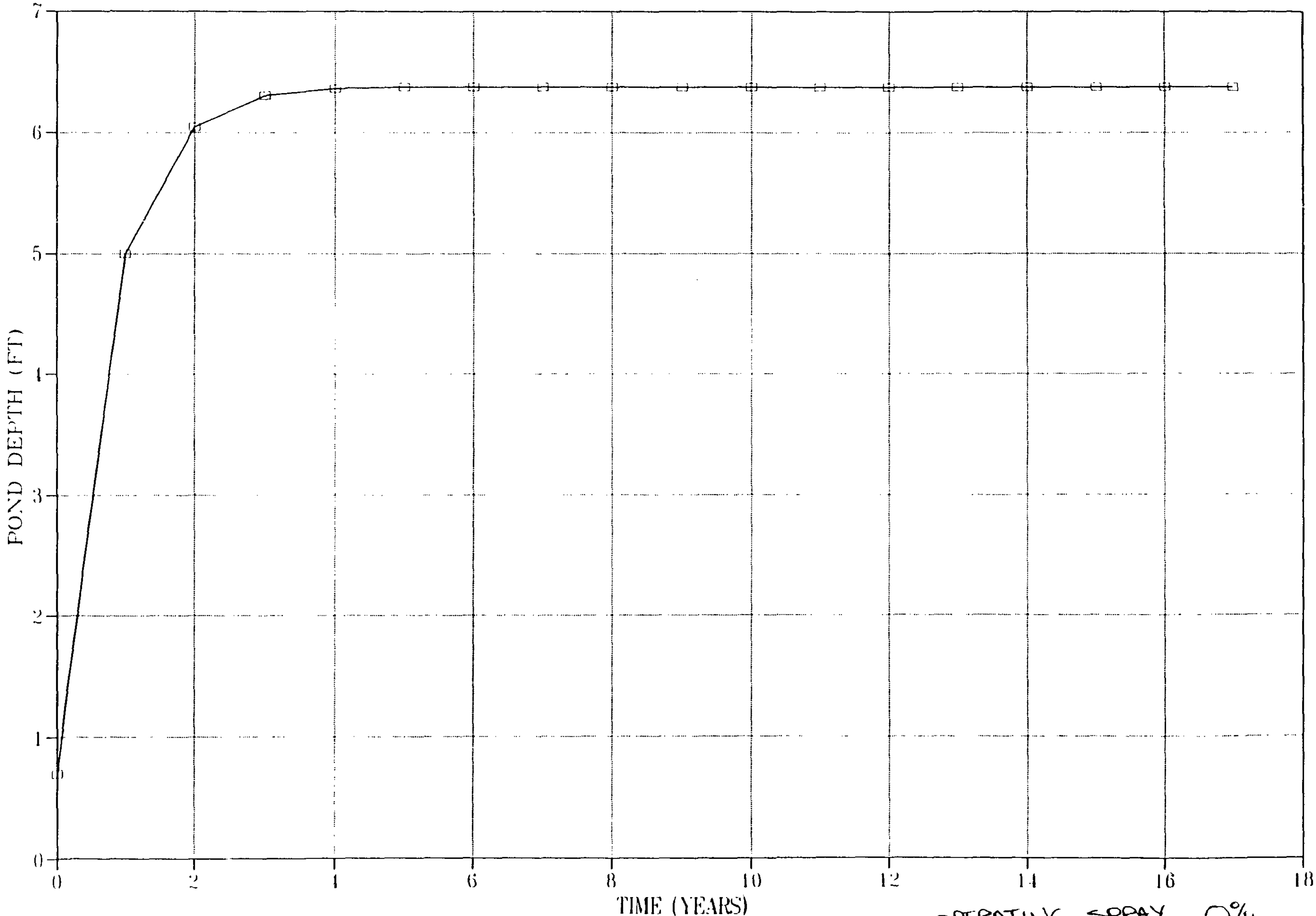
CONOCO - SAN JUAN (SRK #58201)
EVAPORATION PONDS - WATER BALANCE
2/9/93

| CLIMATOLOGICAL DATA FOR BLOOMFIELD, NEW MEXICO | | |
|---|---|---|
| AVG ANNUAL TEMPERATURE | 52.8 | DEG. FAHRENHEIT |
| AVG ANNUAL PRECIP | 8.37 | INCHES |
| AVG ANNUAL POND EVAP | 50.0 | INCHES |

| | | |
|---|---|---|
| MAXIMUM POND AREA (AT CREST) | 82,805 | FT^2 |
| MAXIMUM WASTEWATER FLOW | 15 | GPM |
| MAXIMUM SPRAY RATE (EACH POND) | 100 | GPM |
| MAXIMUM SPRAY EVAP COEFF | 2.30% | |

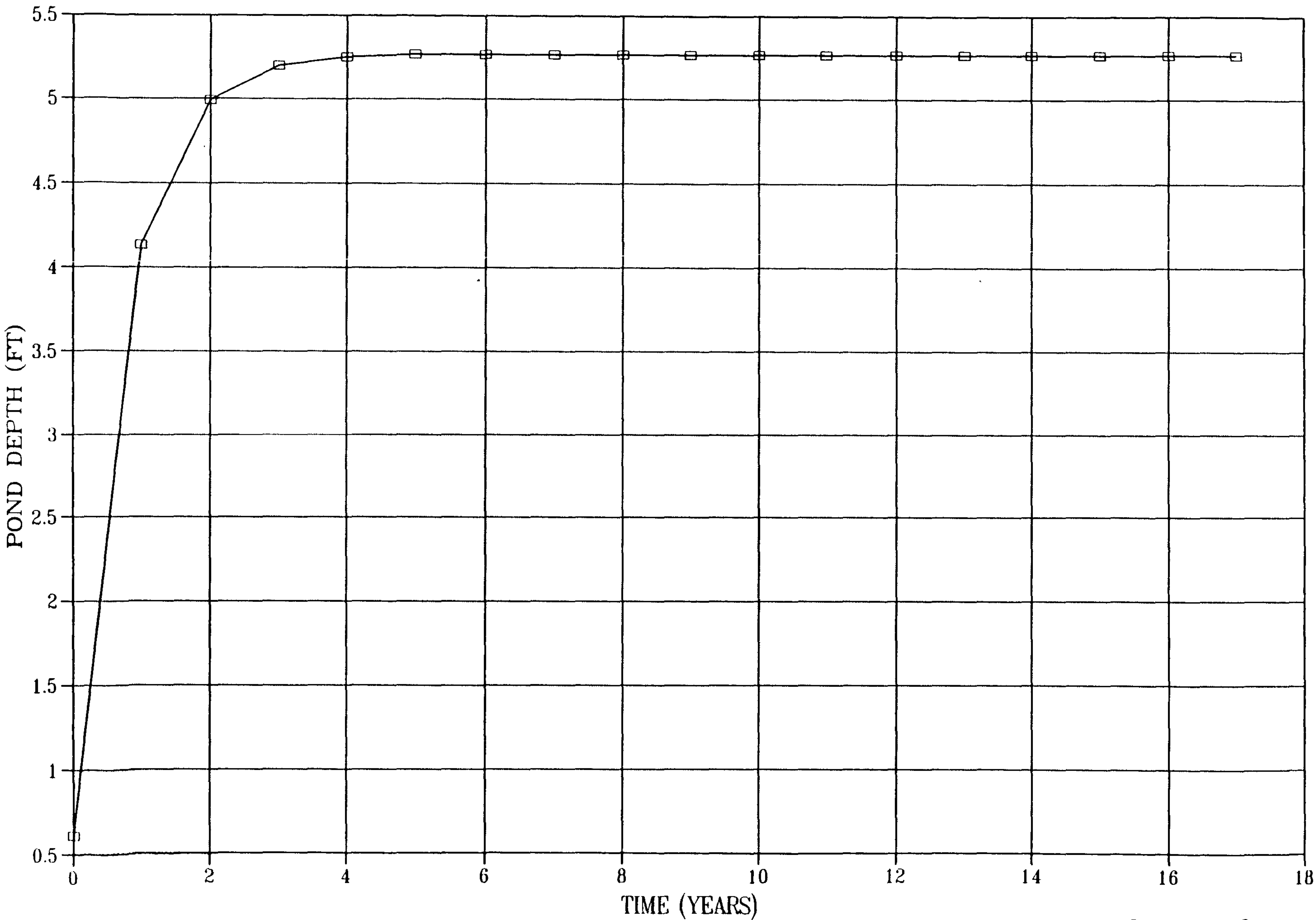
| MONTH | PRECIP (inches) | POND EVAP (inches) | SPRAY EVAP COEFFICIENT (%) | SPRAY RATE (gpm) | SPRAY OPERATION (%) | SYSTEM INFLOWS PRECIP (gals) | SYSTEM INFLOWS WASTEWATER (gals) | SYSTEM LOSSES SPRAY EVAP (gals) | SYSTEM LOSSES POND EVAP (gals) | STORAGE VOL. (gals) | EQUIVALENT POND DEPTH (FT) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MARCH | 0.66 | 2.94 | 1.10% | 100 | 50.0% | 34,066 | 446,400 | 49,104 | 55,112 | 376,250 | 0.71 |
| APRIL | 0.55 | 5.35 | 1.35% | 100 | 50.0% | 28,388 | 432,000 | 58,320 | 126,560 | 651,758 | 1.23 |
| MAY | 0.41 | 6.11 | 1.65% | 100 | 50.0% | 21,162 | 446,400 | 73,656 | 166,627 | 879,038 | 1.66 |
| JUNE | 0.28 | 7.61 | 2.00% | 100 | 50.0% | 14,452 | 648,000 | 86,400 | 231,487 | 1,223,604 | 2.31 |
| JULY | 0.93 | 7.31 | 2.30% | 100 | 50.0% | 48,002 | 669,600 | 102,672 | 255,706 | 1,582,828 | 2.99 |
| AUGUST | 1.27 | 6.49 | 1.65% | 100 | 50.0% | 65,551 | 669,600 | 82,584 | 257,658 | 1,977,737 | 3.74 |
| SEPTEMBER | 0.83 | 4.83 | 1.70% | 100 | 50.0% | 42,841 | 648,000 | 73,440 | 216,552 | 2,378,586 | 4.50 |
| OCTOBER | 1.16 | 3.70 | 1.20% | 100 | 50.0% | 59,874 | 223,200 | 53,568 | 163,994 | 2,424,097 | 4.59 |
| NOVEMBER | 0.64 | 1.86 | 0.85% | 100 | 50.0% | 33,034 | 216,000 | 36,720 | 94,554 | 2,541,858 | 4.81 |
| DECEMBER | 0.61 | 1.07 | 0.70% | 100 | 50.0% | 31,485 | 223,200 | 31,248 | 55,471 | 2,709,824 | 5.13 |
| JANUARY | 0.59 | 1.12 | 0.75% | 100 | 50.0% | 30,453 | 223,200 | 33,480 | 60,526 | 2,869,471 | 5.43 |
| FEBRUARY | 0.44 | 1.62 | 0.85% | 100 | 50.0% | 22,711 | 403,200 | 34,272 | 91,178 | 3,169,931 | 6.00 |
| ANNUAL TOTAL | 8.37 | 50.0 | | | | 432,019 | 5,248,800 | 715,464 | 1,795,423 | | |

CONOCO - SAN JUAN (SRK #58201)
POND DEPTH vs TIME



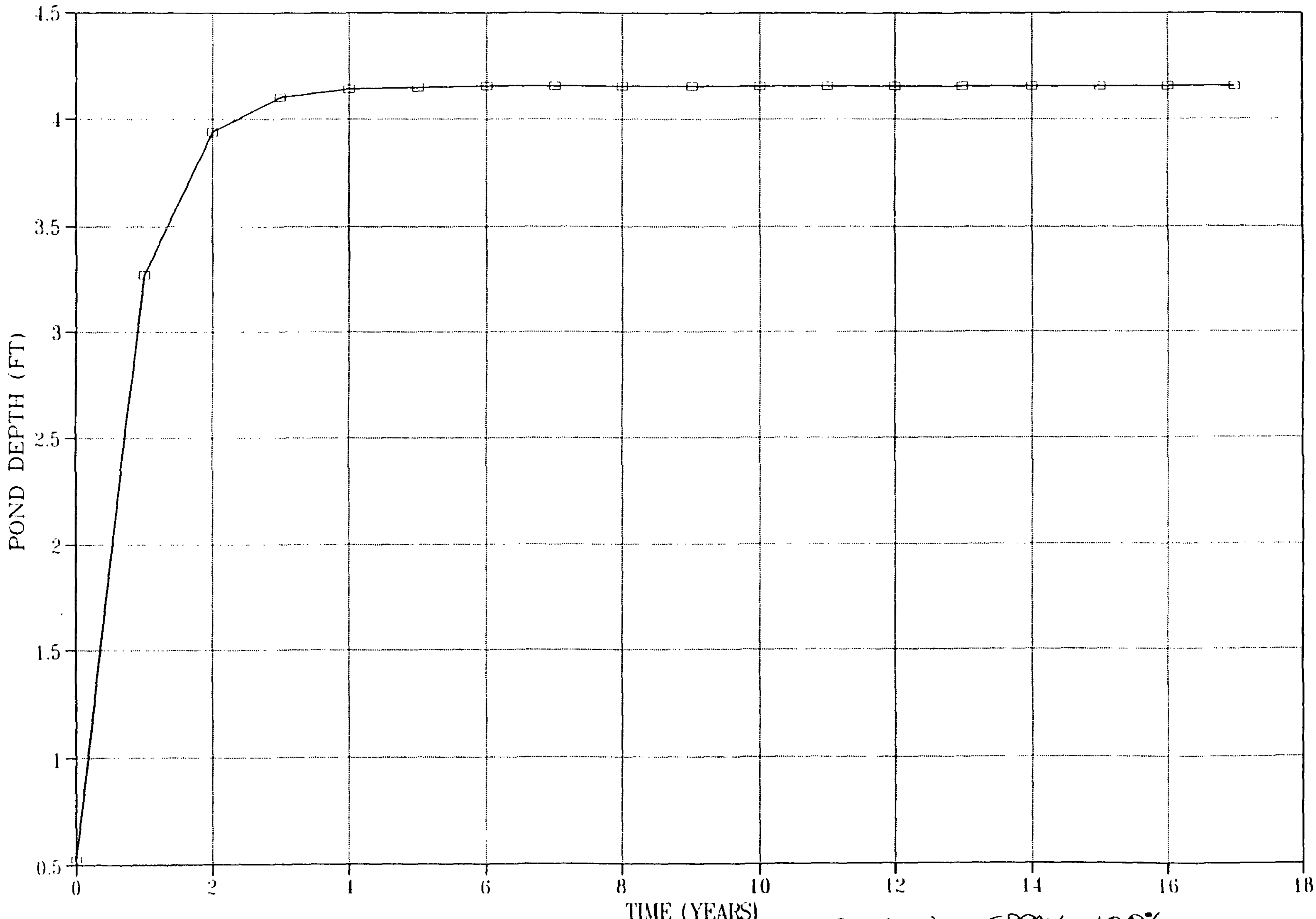

NORMAL PRECIP
OPERATING SPRAY 0%
TOTAL EVAP = 100% POND EVAP

CONOCO - SAN JUAN (SRK #58201)
POND DEPTH vs TIME



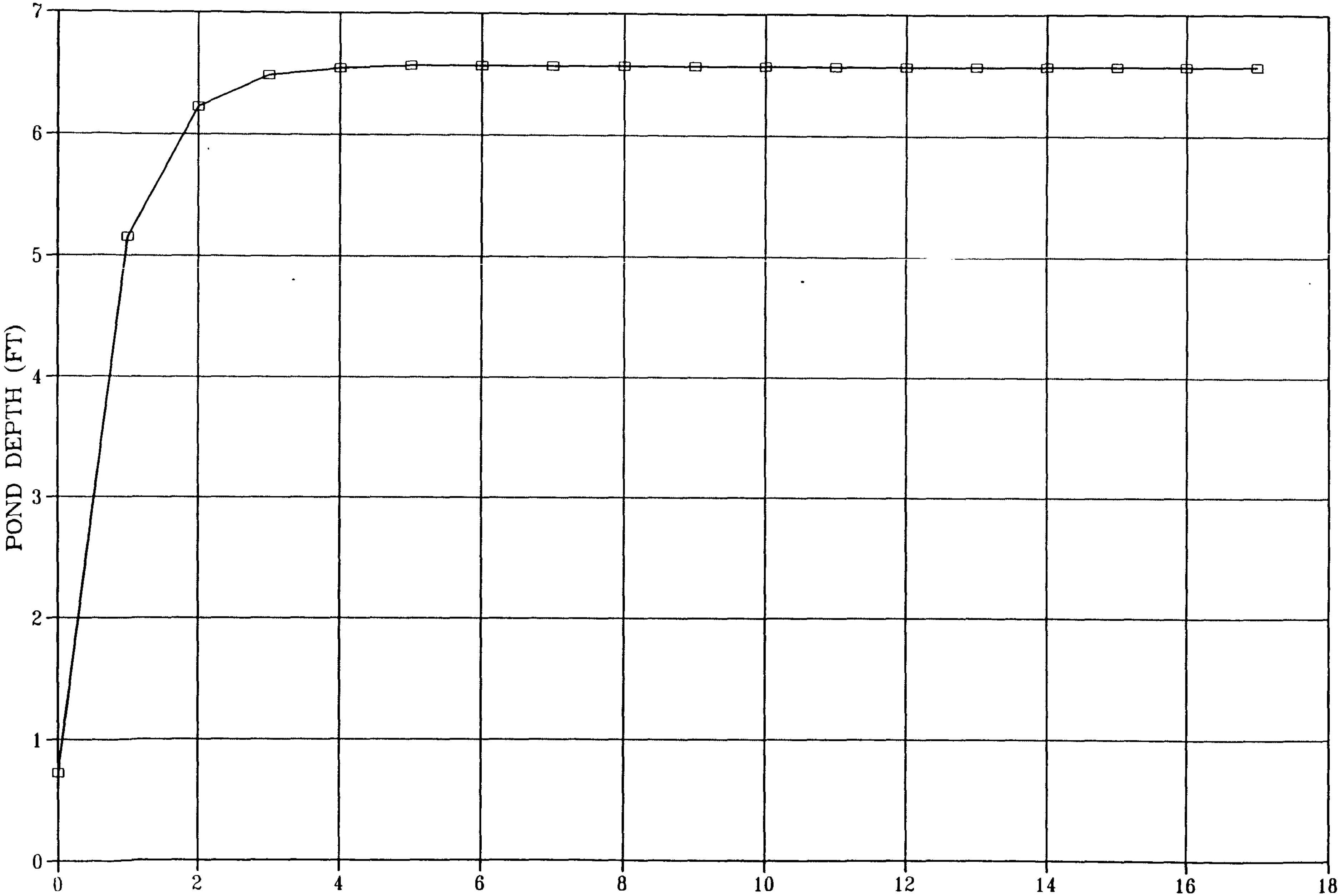

NORMAL PRECIP — OPERATING SPRAY 50%

CONOCO - SAN JUAN (SRK #58201)
POND DEPTH vs TIME

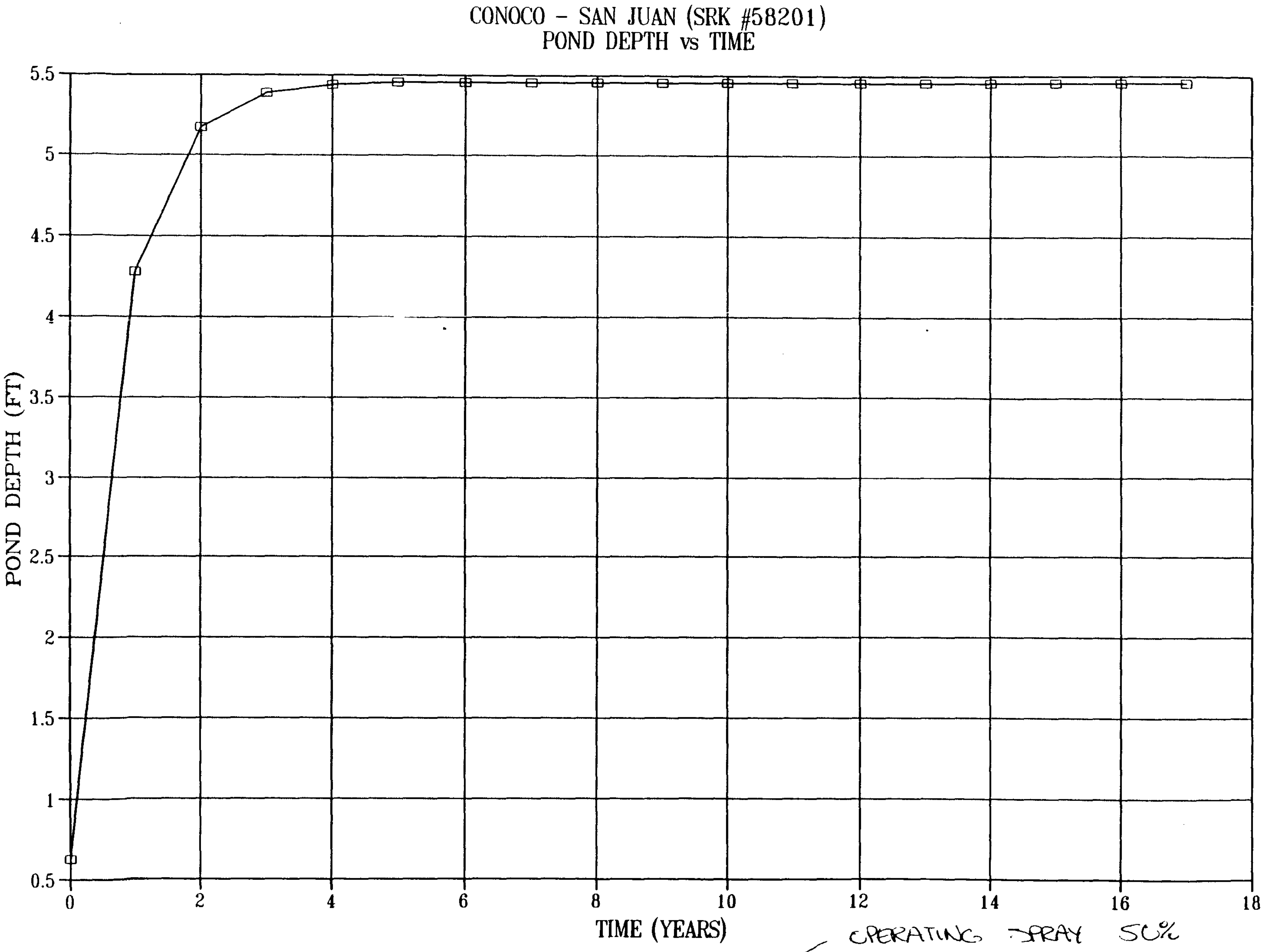



NORMAL PRECIP. — OPERATING SPRAY 100%
TOTAL EVAP = SPRAY EVAP + 100% POND EVAP

CONOCO – SAN JUAN (SRK #58201)
POND DEPTH vs TIME

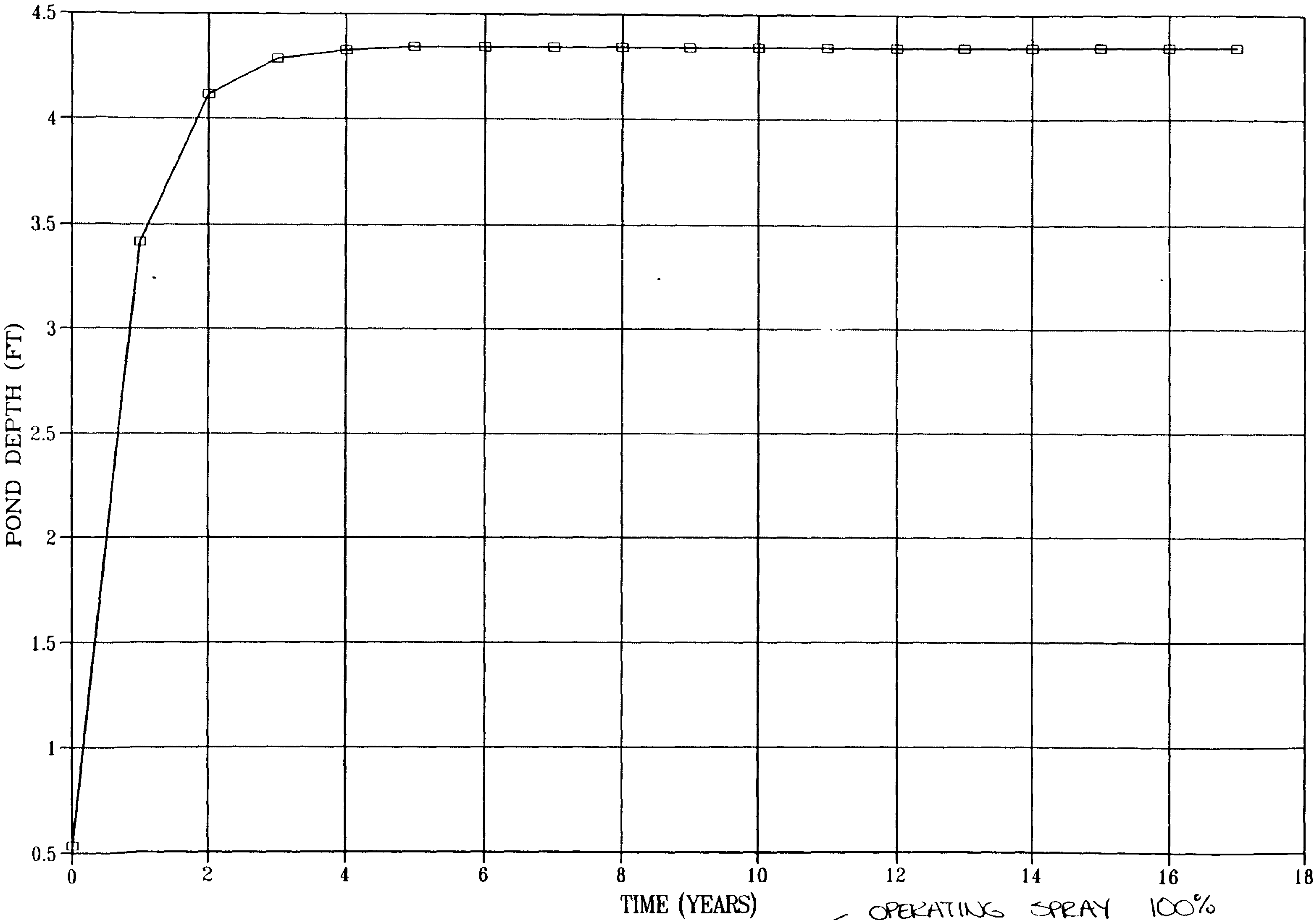



WET = 1.25 * NORMAL — OPERATING SPRAY 0%
— TOTAL EVAP = ~~[illegible]~~ 100% POND EVAP




WET < OPERATING SPRAY 50%
TOTAL EVAP = SPRAY EVAP + 100% POND EVAP

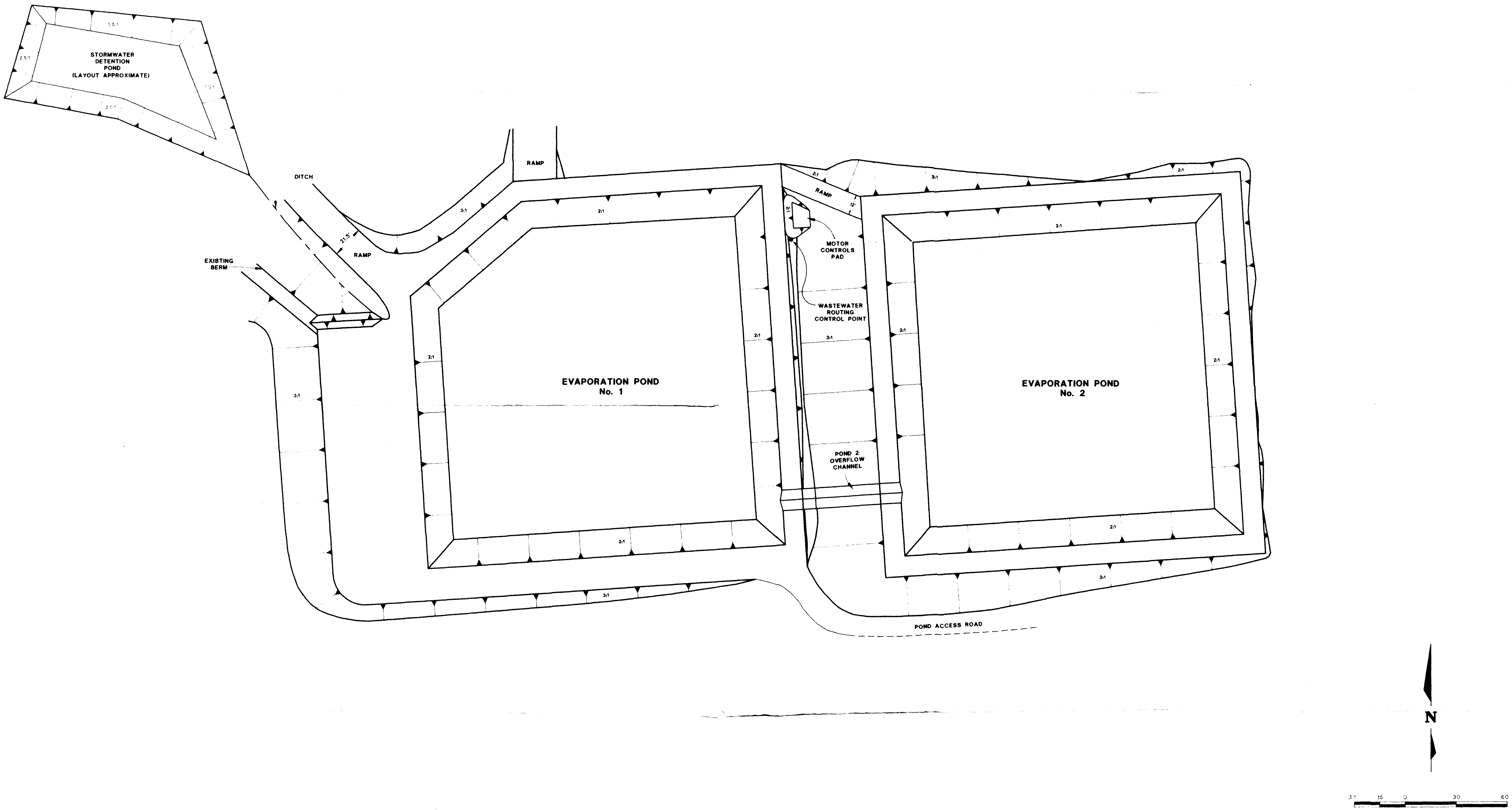
CONOCO - SAN JUAN (SRK #58201)
POND DEPTH vs TIME




WET < OPERATING SPRAY 100%
TOTAL EVAP = SPRAY EVAP + 100% POND EVAP

## APPENDIX B

**As-Built Drawings**




| | | |
|---|---|---|
| DESIGNED | GG | 6/93 |
| DRAWN | JM | 6/93 |
| CHECKED | RF | 6/93 |
| APPROVED | RF | 6/93 |
| APPROVED | | |

REVISIONS

| No. | DESCRIPTION | BY | DATE |
|---|---|---|---|
| 1 | AS-BUILT | RF | 6/93 |

ENGINEER

REFERENCE

PREPARED FOR:

CONOCO'S SAN JUAN GAS PLANT

PREPARED BY:

STEFFEN ROBERTSON & KIRSTEN (U.S.)
Consulting Engineers & Scientists

TITLE

GENERAL FACILITIES ARRANGEMENT

SCALE

DRAWING No.

58201-100

REVISION

1


POND COORDINATES

| NUMBER | NORTHING | EASTING | ELEVATION |
|---|---|---|---|
| 1 | 8727.57 | 9417.76 | 97.4 |
| 2 | 8744.58 | 9432.69 | 89.4 |
| 3 | 8887.33 | 9407.41 | 97.4 |
| 4 | 8880.32 | 9423.89 | 89.4 |
| 5 | 8942.58 | 9472.78 | 99.1 |
| 6 | 8926.97 | 9479.09 | 91.1 |
| 7 | 8951.77 | 9614.67 | 97.4 |
| 8 | 8933.82 | 9598.91 | 89.0 |
| 9 | 8741.22 | 9628.31 | 97.4 |
| 10 | 8756.15 | 9611.31 | 89.4 |
| 11 | 8734.52 | 9698.62 | 110.1 |
| 12 | 8751.52 | 9713.55 | 102.1 |
| 13 | 8934.10 | 9685.69 | 110.1 |
| 14 | 8918.39 | 9703.58 | 101.7 |
| 15 | 8947.03 | 9885.27 | 110.1 |
| 16 | 8930.03 | 9870.34 | 102.9 |
| 17 | 8747.45 | 9898.20 | 110.1 |
| 18 | 8762.38 | 9881.20 | 102.1 |
| 19 | 8931.97 | 9638.08 | 101.6 |
| 20 | 8920.00 | 9632.00 | -- |

NOTES:

1. SPOT ELEVATIONS USED TO DEVELOP CONTOURS WERE PROVIDED BY DAGGETT SURVEYING, INC.
2. EXISTING RUNOFF RETENTION BERM REMOVED WITHIN POND FOOTPRINT AND ULTIMATELY TIED INTO SOUTHWEST CORNER OF POND 1 EMBANKMENT.
3. POND FLOOR NOMINALLY GRADED TO DRAIN TO THE CORNER CONTAINING THE LEAK DETECTION SUMP.

N

20 10 0 20 40

SCALE IN FEET

ENGINEER

REFERENCE

| | | |
|---|---|---|
| DESIGNED | SH | 2/93 |
| DRAWN | DB | 2/93 |
| CHECKED | RF | 2/93 |
| APPROVED | RF | 2/93 |
| APPROVED | RF | 6/93 |

REVISIONS

| No. | DESCRIPTION | BY | DATE |
|---|---|---|---|
| 0 | ISSUED FOR CLIENT REVIEW | RF | 2/93 |
| 1 | AS - BUILT | RF | 6/93 |

PREPARED FOR:

CONOCO'S SAN JUAN GAS PLANT

PREPARED BY:

STEFFEN ROBERTSON & KIRSTEN (U.S.)
Consulting Engineers & Scientists

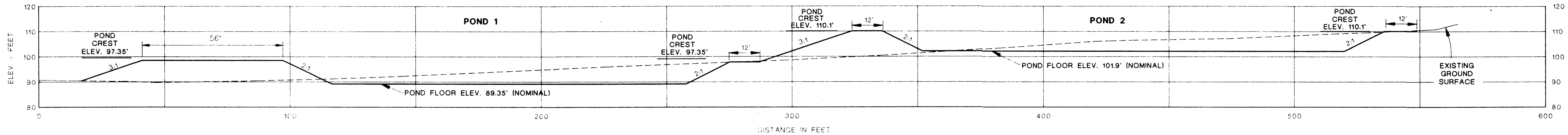
TITLE

PLAN VIEW -
AS BUILT
WASTEWATER EVAPORATION PONDS

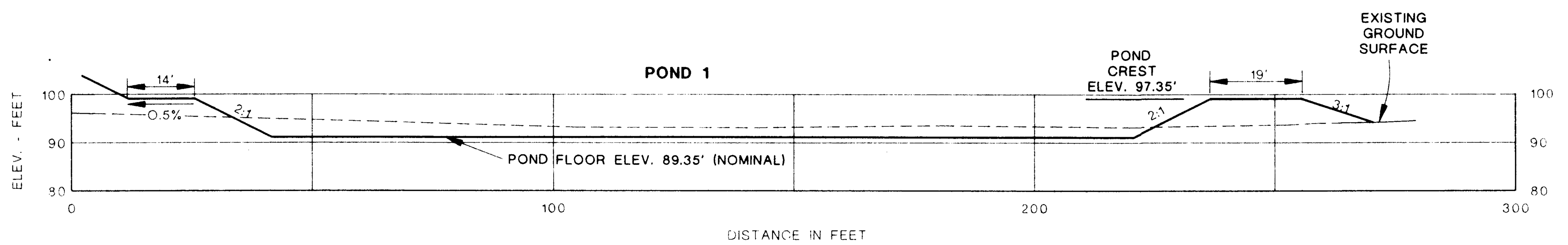
SCALE AS SHOWN

DRAWING No. 58201-101

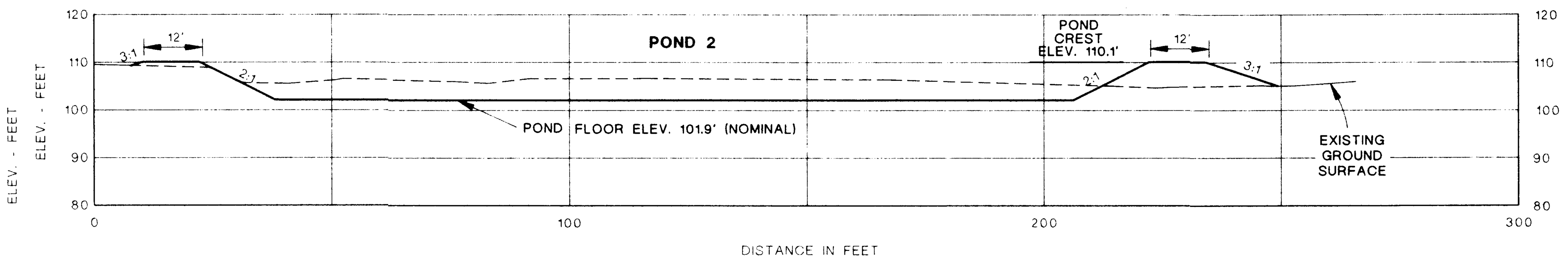
REVISION 1



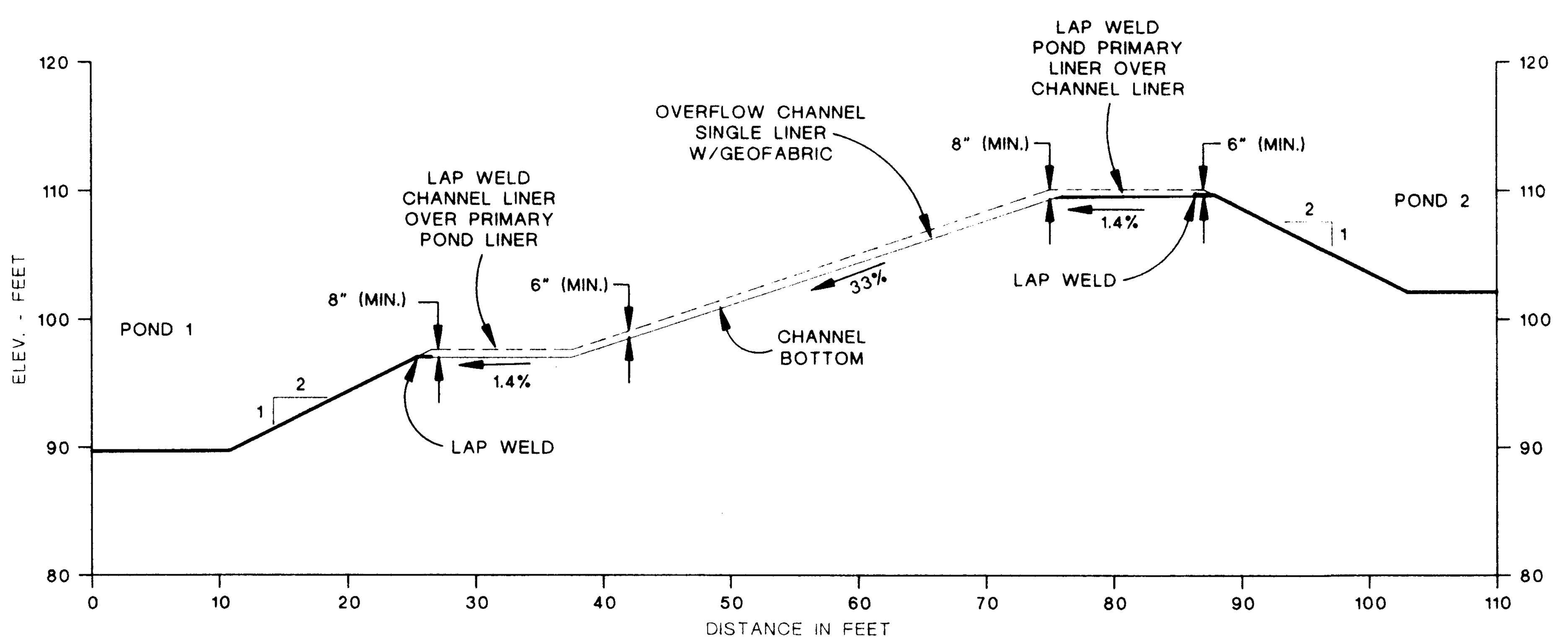

SECTION A-A'



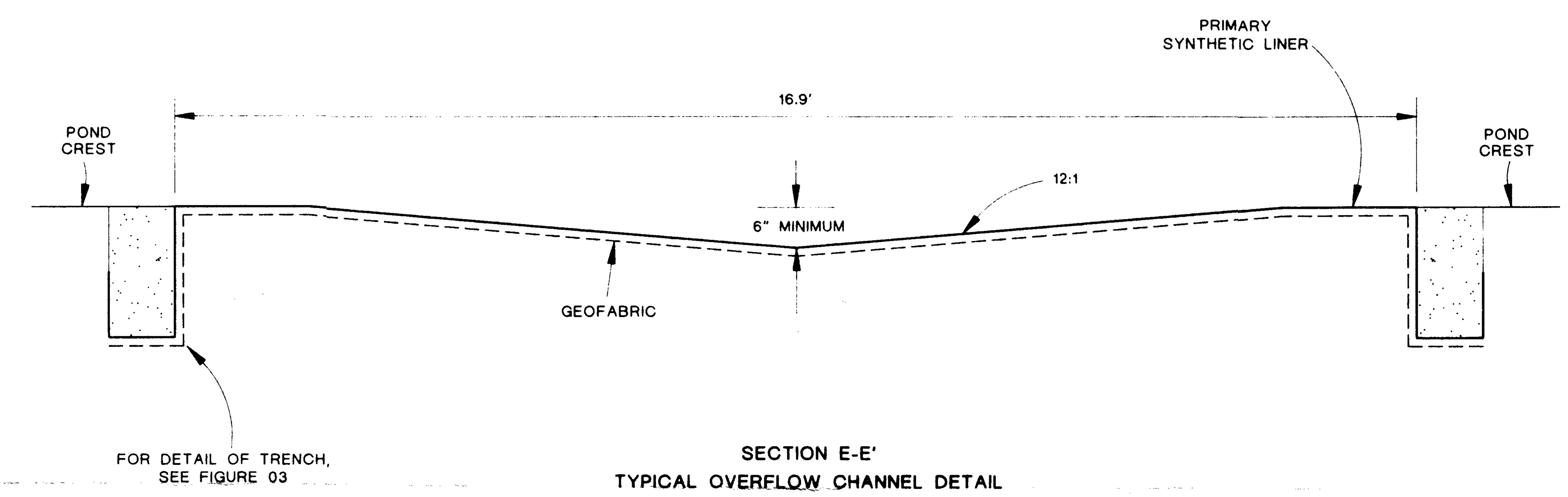

SECTION B-B'




SECTION C-C'




SECTION D-D'
PROFILE OF OVERFLOW CHANNEL
(NOT TO SCALE)




SECTION E-E'
TYPICAL OVERFLOW CHANNEL DETAIL
(NOT TO SCALE)

NOTES:

1. FOR LINER DETAILS, SEE DRAWING 58201-103
2. OVERFLOW CHANNEL DEPTH VARIES FROM 6 TO 8 INCHES.
3. POND FLOOR IS NOMINALLY GRADED TO DRAIN TO ONE CORNER.

ENGINEER

REFERENCE

| | | |
|---|---|---|
| DESIGNED | SH | 2/93 |
| DRAWN | DB | 2/93 |
| CHECKED | RF | 2/93 |
| APPROVED | RF | 2/93 |
| APPROVED | | |

REVISIONS

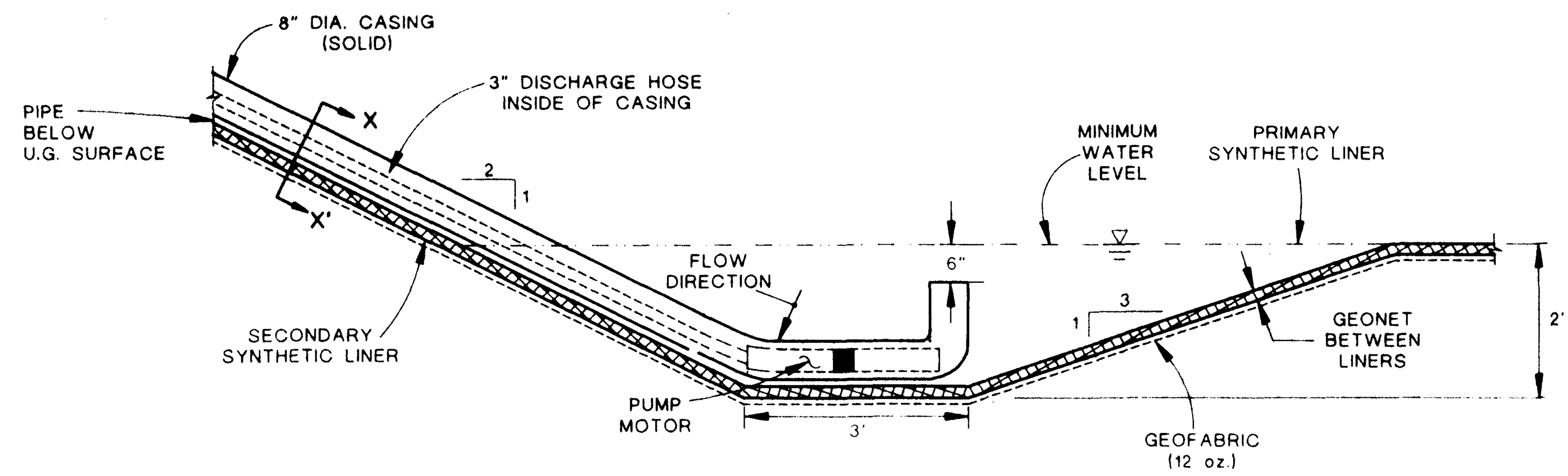
| No. | DESCRIPTION | BY | DATE |
|---|---|---|---|
| 0 | ISSUED FOR CLIENT REVIEW | RF | 2/93 |
| 1 | AS BUILT | RF | 6/93 |

PREPARED FOR:
CONOCO'S SAN JUAN GAS PLANT

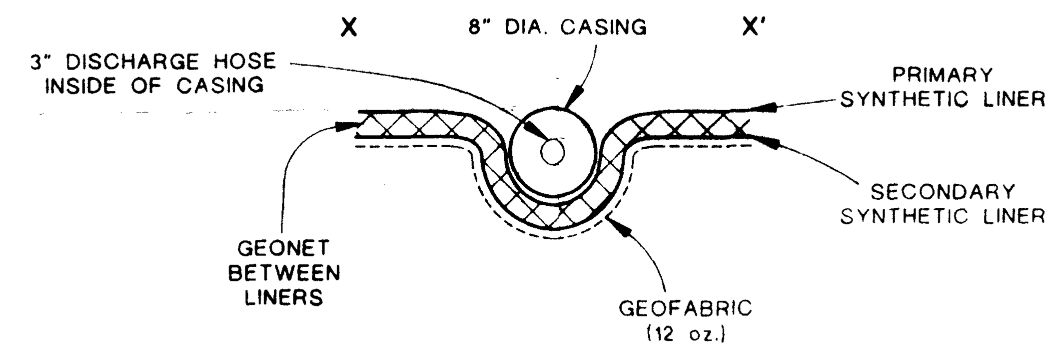
TITLE
WASTEWATER EVAPORATION PONDS
CROSS SECTIONS
AND DETAILS
(AS BUILT)

PREPARED BY:
STEFFEN ROBERTSON & KIRSTEN (U.S.)
Consulting Engineers & Scientists

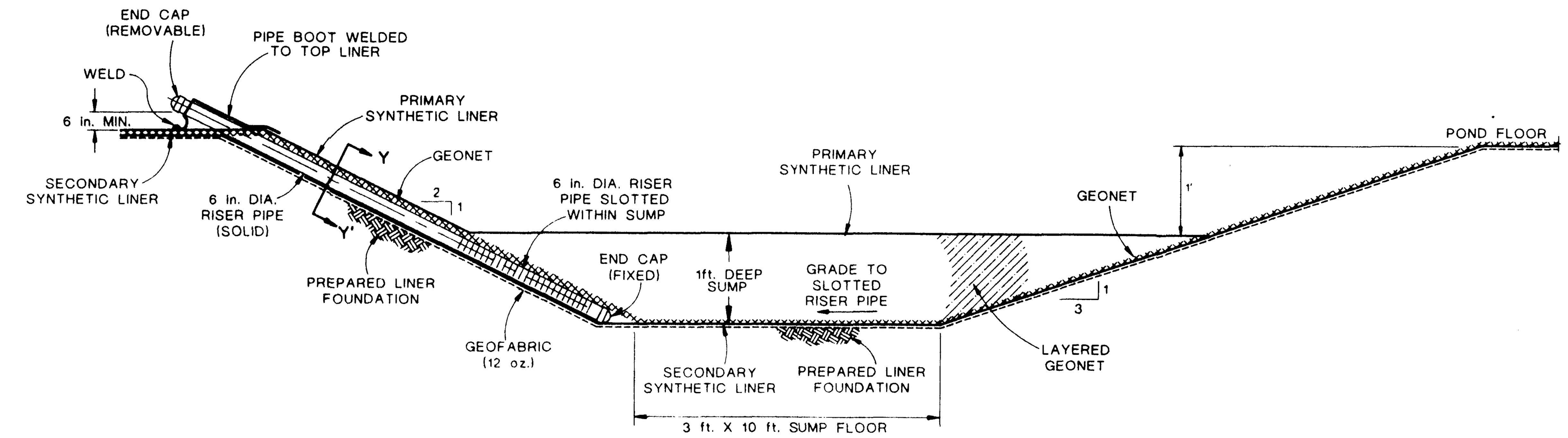
SCALE AS SHOWN
REVISION 1
DRAWING No. 58201-102



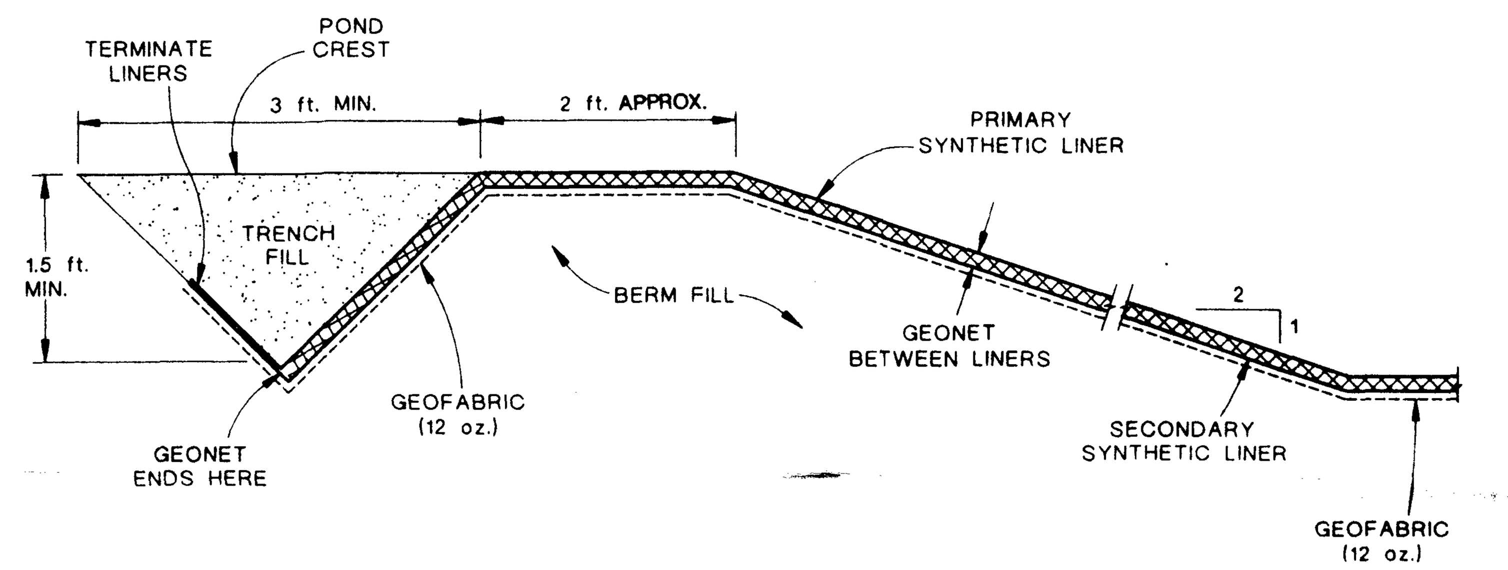

**SECTION THROUGH PUMP WELL CASING**
(NOT TO SCALE)



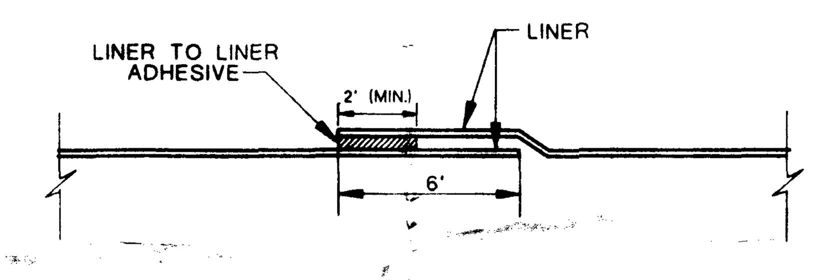

**SECTION THROUGH PUMP CASING AND LINER**
(NOT TO SCALE)



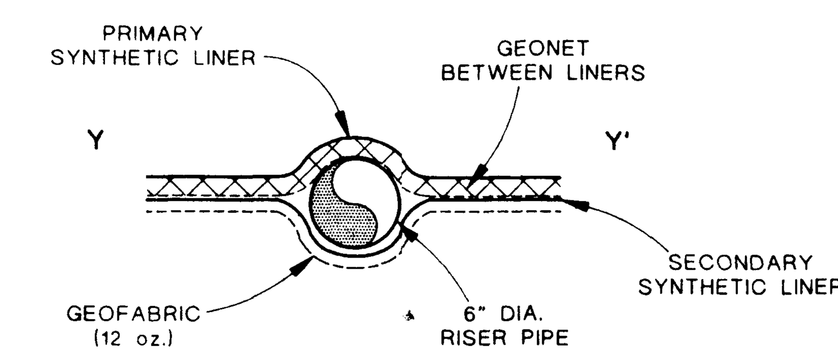

**SECTION THROUGH LEAK DETECTION SUMP MONITOR PIPE**
(NOT TO SCALE)



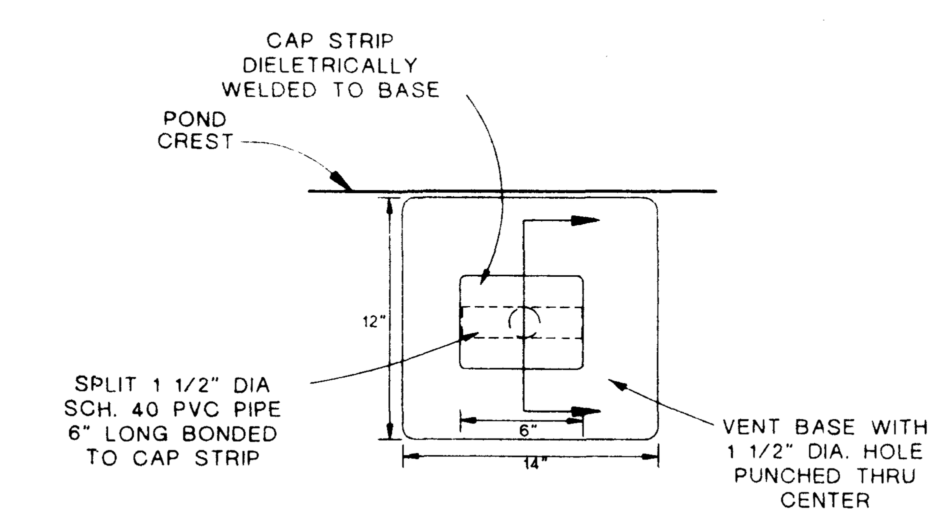

**TYPICAL POND DOUBLE LINER SYSTEM V-SHAPED ANCHOR TRENCH DETAIL**
(NOT TO SCALE)



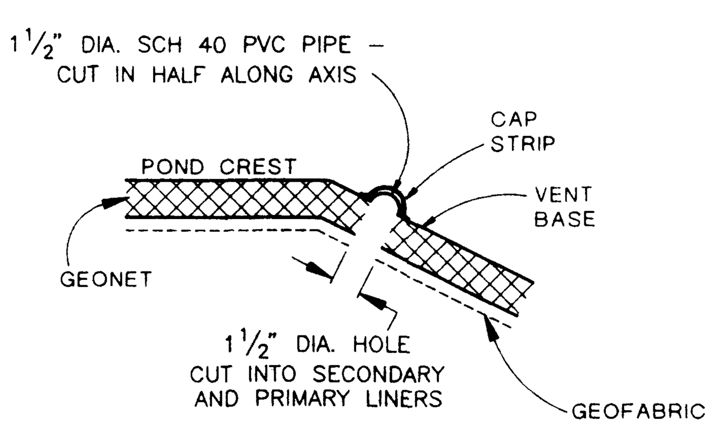

**FIELD SEAM DETAIL - PVC AND HYPALON**
(NOT TO SCALE)




**SECTION THROUGH MONITOR PIPE AND LINER**
(NOT TO SCALE)



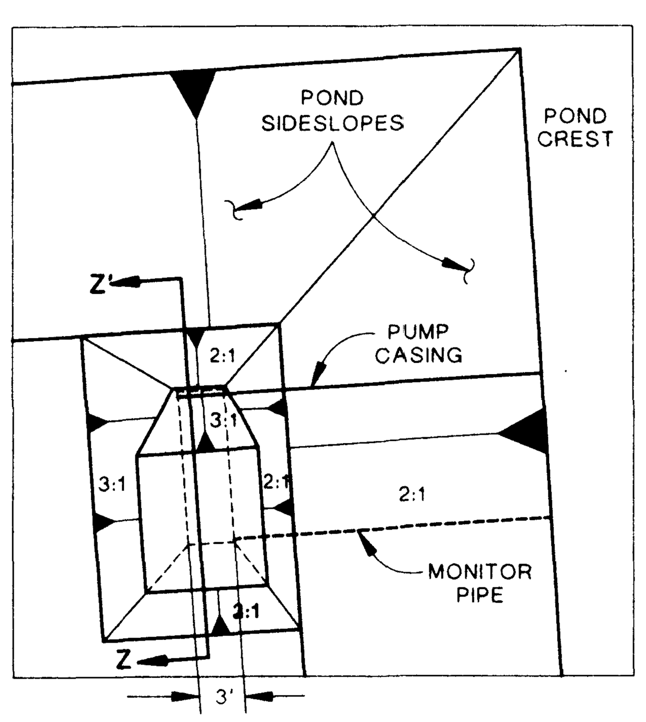

PLAN



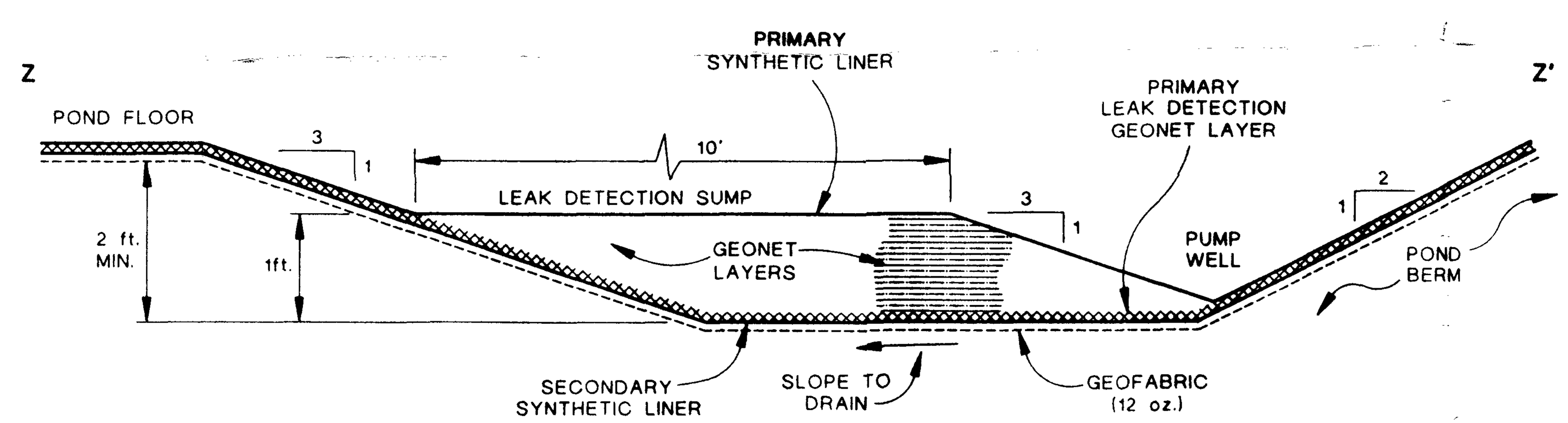

SECTION

MAX. VENT SPACING = 50ft. C-C

**GAS VENT DETAILS**
(NOT TO SCALE)




**PLAN OF LEAK DETECTION SUMP AND PUMP WELL IN POND 1**
(NOT TO SCALE)




**TYPICAL SECTION THROUGH LEAK DETECTION SUMP AND PUMP WELL**
(NOT TO SCALE)

NOTE:

GEONET SYSTEM BETWEEN POND LINERS CONSISTS OF A CROSS-STRAND GEODRAIN LAYER AND A NONWOVEN FILTER FABRIC.

| | | | |
|---|---|---|---|
| DESIGNED | SH | 2/93 | |
| DRAWN | RA | 2/93 | |
| CHECKED | RF | 2/93 | |
| APPROVED | RF | 2/93 | |
| APPROVED | | | |

ENGINEER

REFERENCE

REVISIONS

| No. | DESCRIPTION | BY | DATE |
|---|---|---|---|
| 0 | ISSUED FOR CLIENT REVIEW | RF | 2/93 |
| 1 | AS BUILT | RF | 6/93 |

PREPARED FOR: CONOCO'S SAN JUAN GAS PLANT

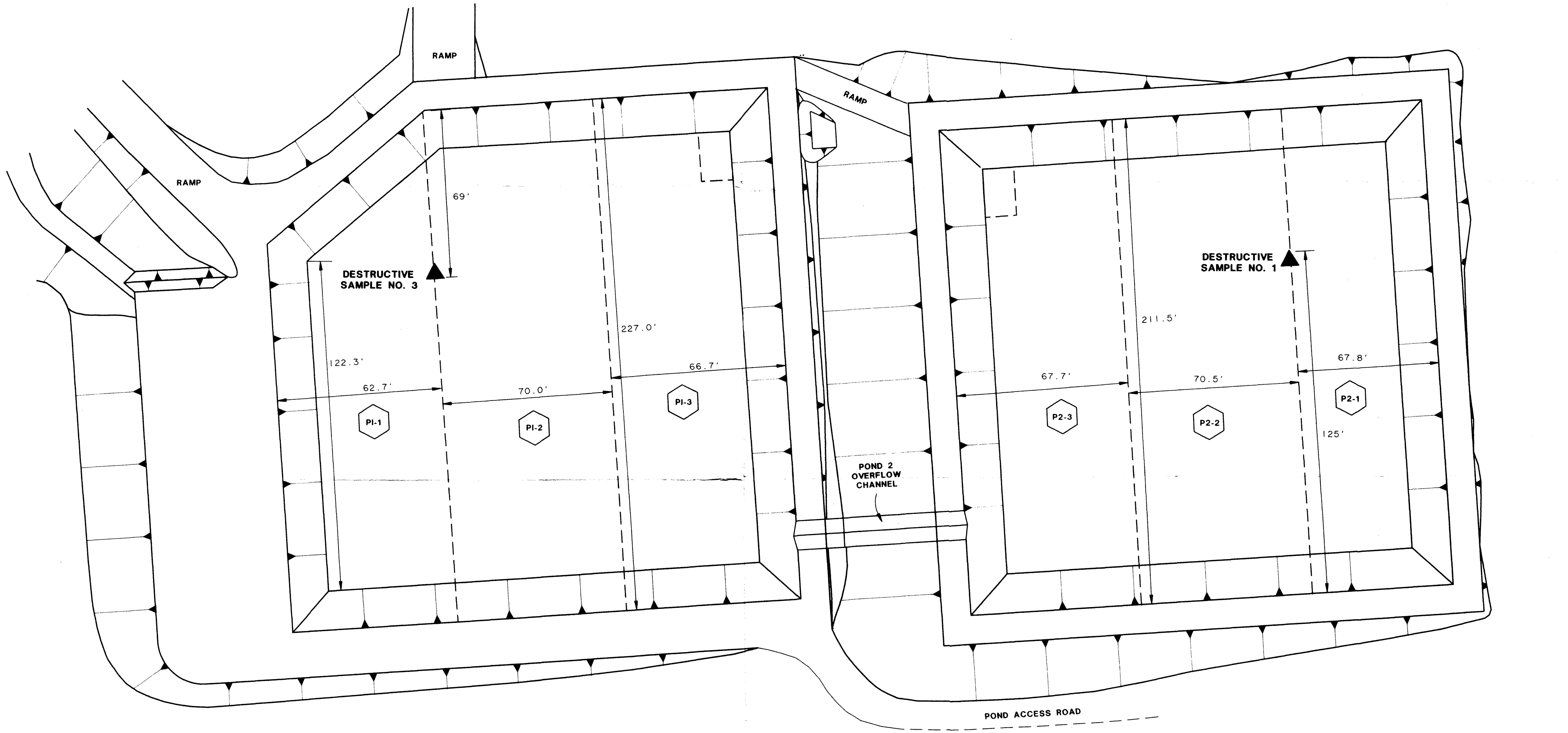
PREPARED BY: STEFFEN ROBERTSON & KIRSTEN (U.S.) Consulting Engineers & Scientists

TITLE: WASTEWATER EVAPORATION PONDS DETAILS (AS BUILT)

SCALE AS SHOWN

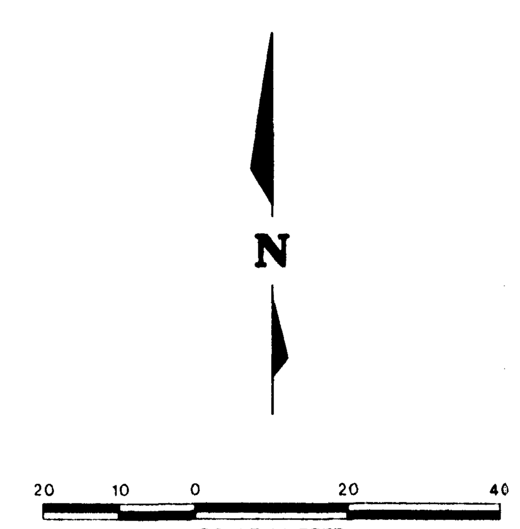
DRAWING No. 58201-103

REVISION 1




POND No. 1 PVC PANELS

POND No. 2 PVC PANELS




| ENGINEER | REFERENCE | | | |
|---|---|---|---|---|
| | | DESIGNED | SH | 6/93 |
| | | DRAWN | JM | 6/93 |
| | | CHECKED | RF | 6/93 |
| | | APPROVED | RF | 6/93 |
| | | APPROVED | | |

| REVISIONS No. | DESCRIPTION | BY | DATE |
|---|---|---|---|
| 1 | AS BUILT | RF | 6/93 |

PREPARED FOR: CONOCO'S SAN JUAN GAS PLANT

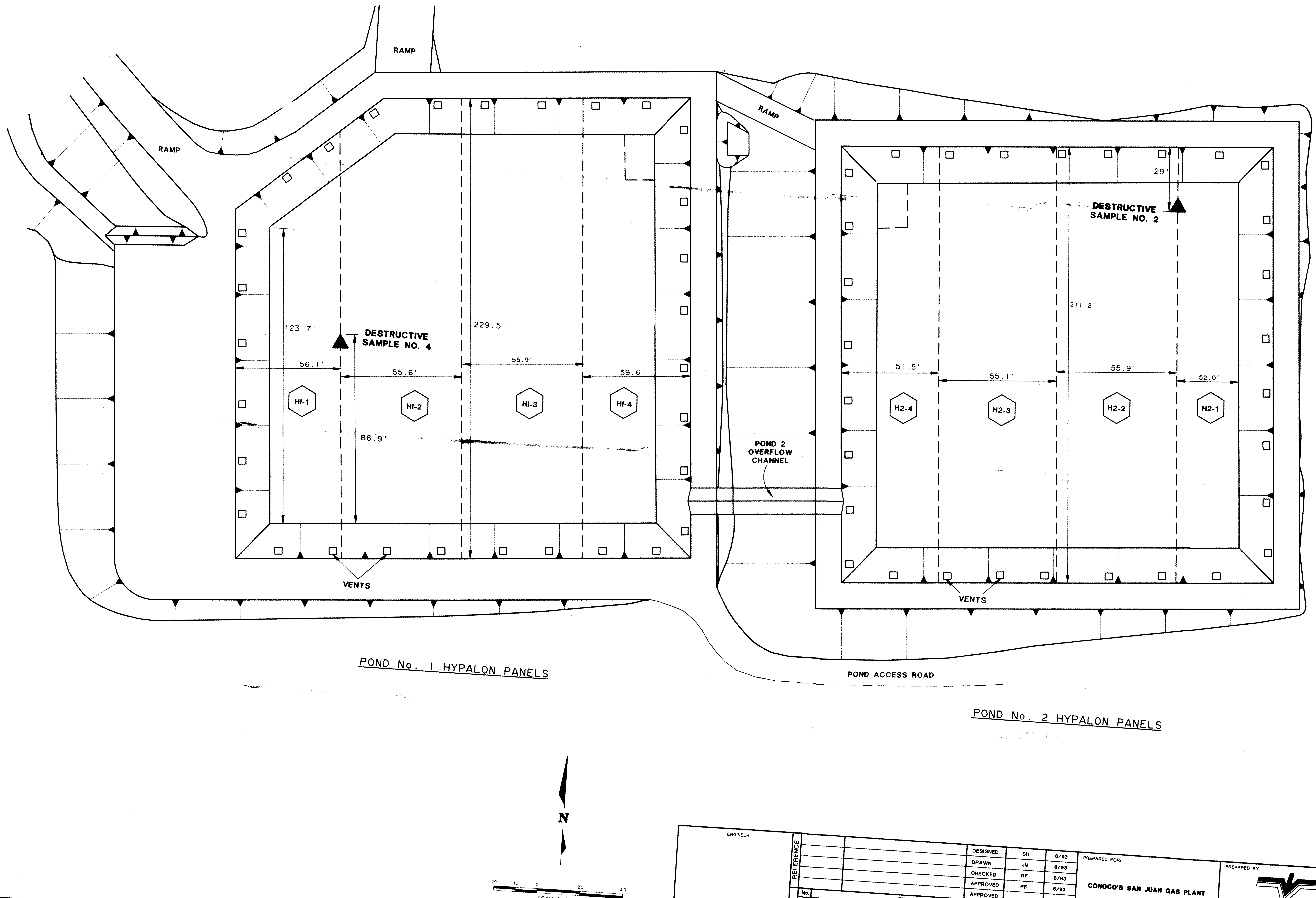
PREPARED BY: STEFFEN ROBERTSON & KIRSTEN (U.S.) Consulting Engineers & Scientists

TITLE: PVC LINER PANEL DIAGRAM

SCALE: AS SHOWN

DRAWING No. 58201-201

REVISION 1




| ENGINEER | REFERENCE | | DESIGNED | SH | 6/93 |
|---|---|---|---|---|---|
| | | | DRAWN | JM | 6/93 |
| | | | CHECKED | RF | 6/93 |
| | | | APPROVED | RF | 6/93 |
| | | | APPROVED | | |

| REVISIONS No. | DESCRIPTION | BY | DATE |
|---|---|---|---|
| 1 | AS BUILT | RF | 6/93 |

PREPARED FOR:
CONOCO'S SAN JUAN GAS PLANT

TITLE
HYPALON LINER PANEL DIAGRAM

PREPARED BY:
STEFFEN ROBERTSON & KIRSTEN (U.S.)
Consulting Engineers & Scientists

SCALE AS SHOWN
DRAWING No. 58201-202
REVISION 1

# APPENDIX C

## Pond Area Excavation and Remediation Summary

# CONOCO SAN JUAN GAS PLANT
# EVAPORATION POND AREA REMEDIATION
# EXCAVATION SUMMARY

Prepared For:

Conoco, Inc.
San Juan Gas Plant
61 Road 4900
P.O. Box 217
Bloomfield, N.M. 87413

Prepared by:

Steffen Robertson and Kirsten (U.S.), Inc.
3232 South Vance Street
Lakewood, Colorado 80227

October 1993

SRK Project No. 58201.1

## TABLE OF CONTENTS

## 1.0 INTRODUCTION

Steffen Robertson and Kirsten (U.S.), Inc. (SRK) was contracted by Conoco to design and provide quality assurance (QA) services for the construction of two evaporation ponds at its San Juan Gas Plant, in Bloomfield, New Mexico. The property is owned by El Paso Natural Gas Company and leased to Conoco. CDK Contracting Company (CDK) was contracted by Conoco to perform the earthwork associated with the construction of the two ponds. SRK provided a Senior Engineering Field Technician, Mr. Glenn Guyer, to monitor the construction. Mr. Guyer arrived on site February 4, 1993 for the start of pond construction

The two ponds are situated adjacent to one another south of the plant, with Pond #1 located to the west of Pond #2. The ponds are approximately the same size and roughly square, having a bottom dimension of approximately 180 feet and a depth of 8 feet. The ponds each have different bottom elevations; Pond #1 was designed with a bottom elevation of 89.35 feet and Pond #2 at 101.90 feet. Earthwork for Pond #2 was done first, followed by the earthwork for Pond #1.

The earthwork for Pond #2 was completed on February 23, 1993. Very minor levels of soil contamination were encountered in the extreme northwest corner of Pond #2 during its construction. However, on February 24, during the excavation of the bottom of Pond #1, and area of oil- soaked soil was uncovered. Work in this area was temporarily halted, and the owner was notified. At this point, under the direction of Conoco's Mr. Mike Luchetti, all work was stopped. The following day the contractor arrived on site and, under the direction of the owner, excavated materials around the areas of previously discovered contaminated soils, in an attempt to locate the extents of contamination. At this point, Mr. Denny Foust with the Oil Conservation Division of New Mexico Energy, Minerals, and Natural Resources Department (OCD) and Ms. Anu Pundari of El Paso Natural Gas Company (EPNG) were on site to observe the investigation work. Remediation procedures to remove the contaminated soils and finish the pond construction were discussed with Mr. Foust at this time.

## 2.0 REMEDIATION PROCESS

The site remediation action plan is documented in a letter from Conoco's Jon Bowerbank, to Mr. Denny Foust, dated March 5, 1993. The plan was cooperatively developed by representatives from the State OCD, Conoco, EPNG, SRK, and CDK. The plan states that "REMEDIATION will consist of excavation of contaminated materials to the appropriate OCD determined depth below the initial water interface. However, on-site inspection by OCD personnel will make the final determination as to the depth of the require excavation." "The contaminated soils will be transported by CDK from the Conoco leases site to Envirotech for El Paso's account." "Fill dirt will be hauled back from Envirotech to replace the excavated material." Actual remediation work began on March 8, 1993.

## 2.1 Contractor's Equipment

The contractor, CDK, used the following equipment during the remediation process: a Cat 225 Trackhoe, John Deere Front End Loader (JD 644-B), and six (6) bottom dump semi-tractor trailer rigs with lined beds.

## 2.2 Excavation/Backfill Chronology

On March 8, 1993, upon acceptance of the site remediation plan, the remediation process began. At this time, contaminated soils were excavated from the pond and hauled to Envirotech, with some intermittent stockpiling on site. Trailers then returned from Envirotech with a load of uncontaminated soil which was stockpiled in a separate area on site.

The approximate weekly material balance for the excavation and backfill process, based on truck count, is shown below:

| Week Ending | Excavation | Backfill Material | Balance |
|---|---|---|---|
| March 12 | 2,820 cu. yds | 2,610 cu. yds | -210 cu. yds |
| March 19 | 525 cu. yds | 465 cu. yds | -270 cu. yds |
| March 26 | 975 cu. yds | 930 cu. yds | -315 cu. yds |
| April 2 | 330 cu. yds | 210 cu. yds | -435 cu. yds |
| April 9 | 950 cu. yds | 2183 cu. yds | +798 cu. yds |
| April 16 | 0 cu. yds | 1092 cu. yds | +1890 cu. yds |

Excavation of contaminated soil and importing of clean backfill ceased on April 14, 1993. A total of 5,600 cubic yards of contaminated soil was removed for the site, while 7, 490 cubic yards of clean soil were returned to the site to restore the original ground surface.

## 2.3 Ultimate Configuration of Excavation/Backfill Area

Because the extents of the contamination were not known beforehand, the contaminated soil was removed as it was encountered. Excavation continued until all of the soil considered to be "contaminated" by the State inspector was removed. The final configuration of the excavated are is shown in Figure 1. The figure shows the excavation within the framework of the ultimate pond construction, in both plan and cross section. Figures 2 and 3 show three dimensional perspective views of the excavation within the ultimate pond configuration.

The overall extent of contamination covered most of the pond bottom area and extended from the northeast corner of Pond #1 to the west and southwest. The deepest area of excavation was located on the western side of the pond continued down to an elevation of approximately 74 feet (17 feet below ground surface). The contaminated area in the northern part of the pond extended down to a sandstone shelf located at an elevation of approximately 86 feet (5 feet below the ground surface). The contamination extended below a perched ground water surface, which required seepage control measures during much of the excavation process.

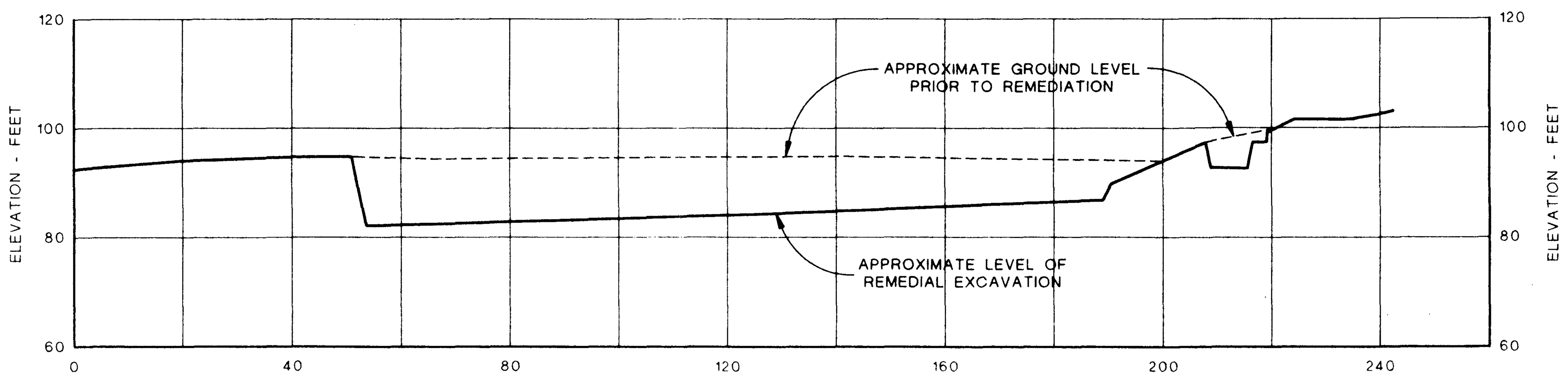
## 3.0 SAMPLING AND ANALYTICAL TESTING (BY OTHERS)

On March 15, 1993, a representative from EPNG was present during the excavation of contaminated materials, set up a grid, and took water and soil samples for water quality testing. The results of the water quality testing were compiled by EPNG and later forwarded to Conoco.

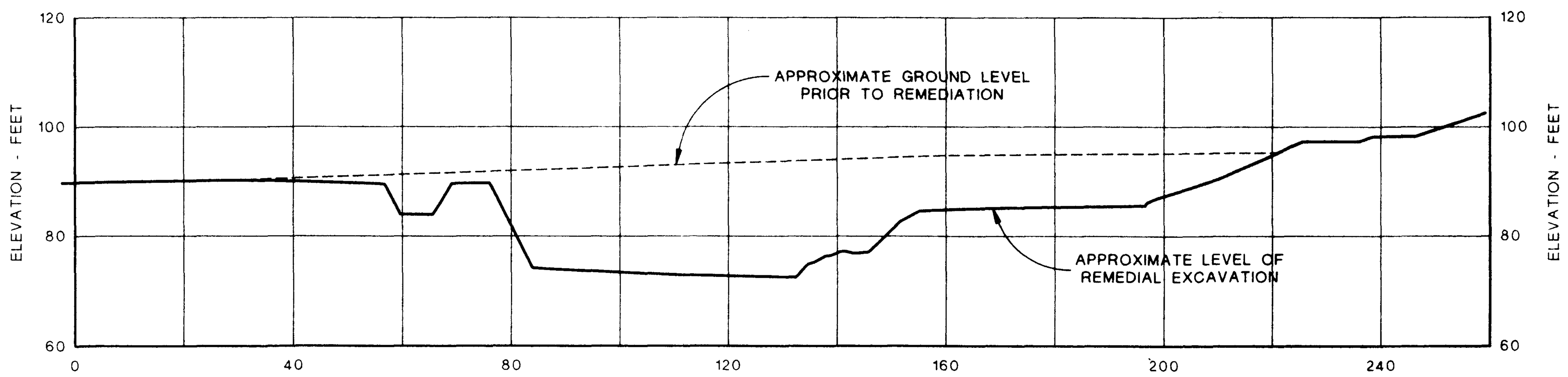
A total of 52 samples of seepage or contaminated soil was retrieved by EPNG for laboratory testing. Samples were analyzed for fuel hydrocarbons (TPH) using either modified EPA Method 418.1 or 8015. Selected samples were also analyzed for benzene, toluene, ethyl benzene and total xylenes (BTEX) using EPA Method 8020. Recorded sampling depths went as deep as approximately 20 ft below ground surface.

## 4.0 STATE APPROVAL OF REMEDIATION

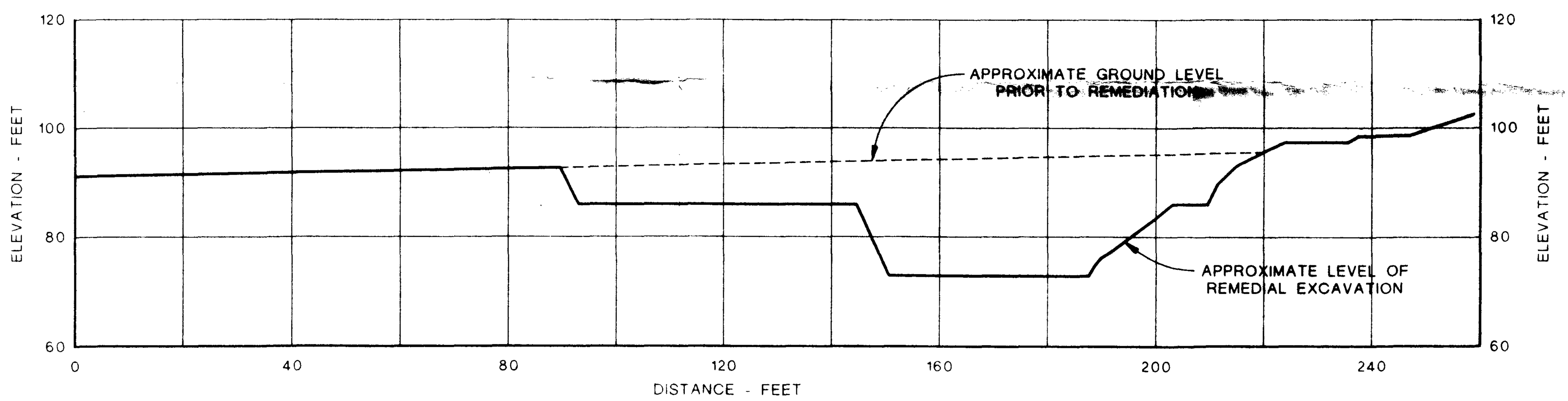
Upon the discovery of the oil-soaked soils in the bottom of Pond #1, the State OCD was notified. Mr. Denny G. Foust, Deputy Oil and Gas Inspector, visited the site during the exploration for the extents of the contamination, and was a part of the group that formulated the site remediation action plan. Mr. Foust then visited the site during the remediation to inspect



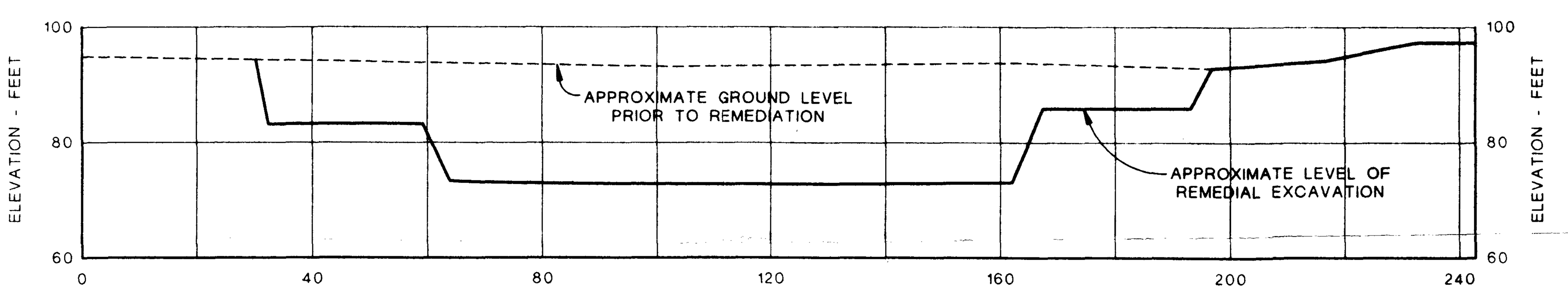

**SECTION A-A'**



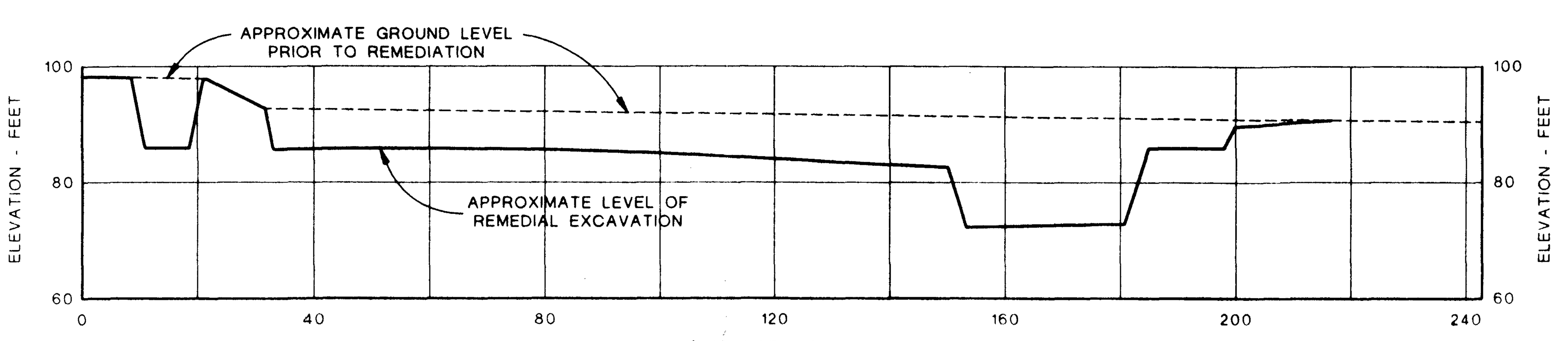

**SECTION B-B'**



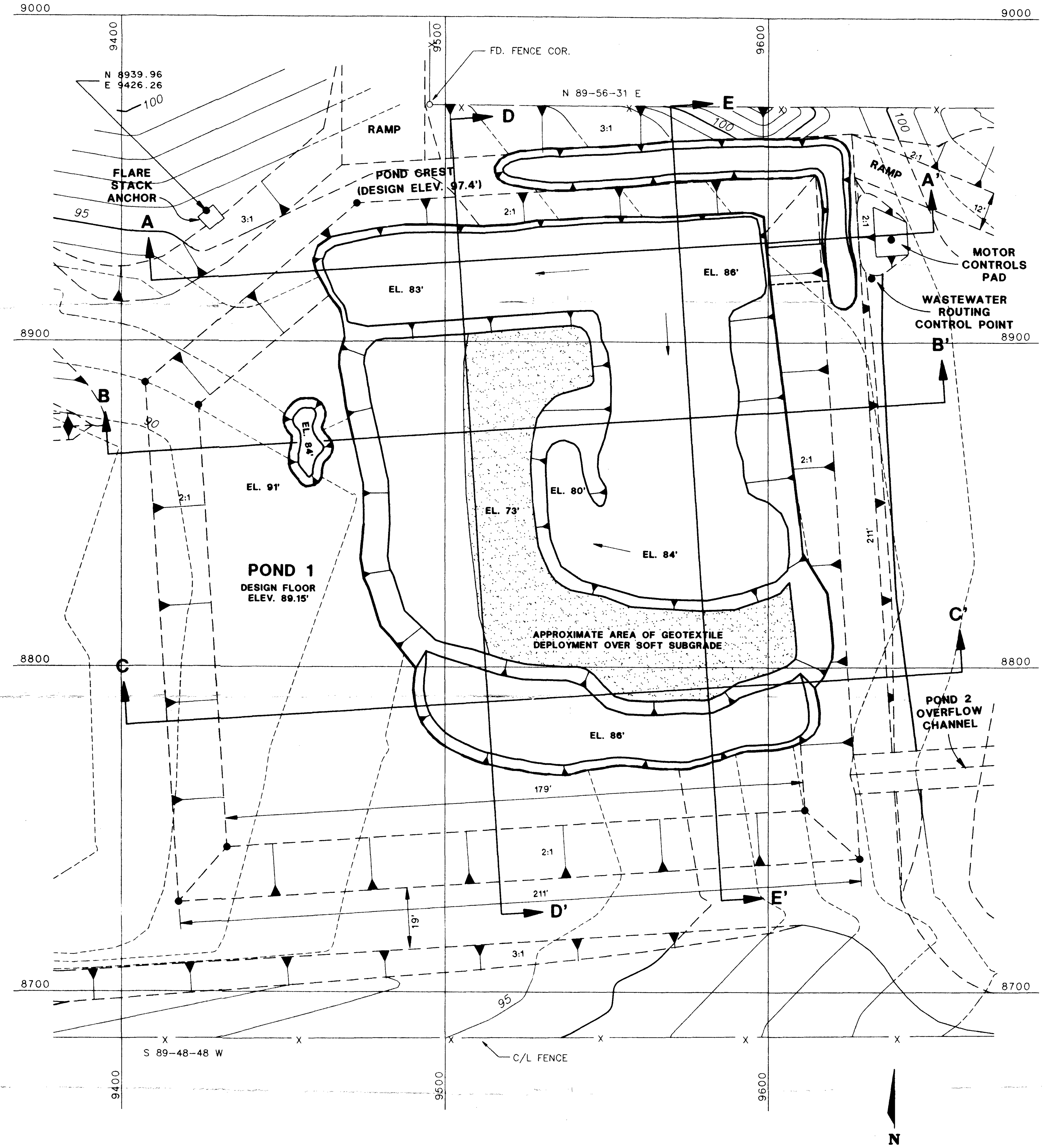

**SECTION C-C'**




**SECTION D-D'**




**SECTION E-E'**




NOTES:

1. EXTENTS OF EXCAVATION ARE BASED ON FIELD OBSERVATIONS. LINES AND ELEVATIONS ARE APPROXIMATE.
2. POND 1 OVERLAY IS BASED ON THE AS-BUILT PLAN CONFIGURATION.

SCALE IN FEET

| ENGINEER | | | |
|---|---|---|---|
| DESIGNED | GG | 9/93 | |
| DRAWN | DB | 9/93 | |
| CHECKED | RF | 9/93 | |
| APPROVED | RF | 9/93 | |
| APPROVED | | | |

| No. | DESCRIPTION | BY | DATE |
|---|---|---|---|
| A | ISSUED FOR CLIENT REVIEW | RF | 9/93 |

PREPARED FOR: CONOCO'S SAN JUAN GAS PLANT

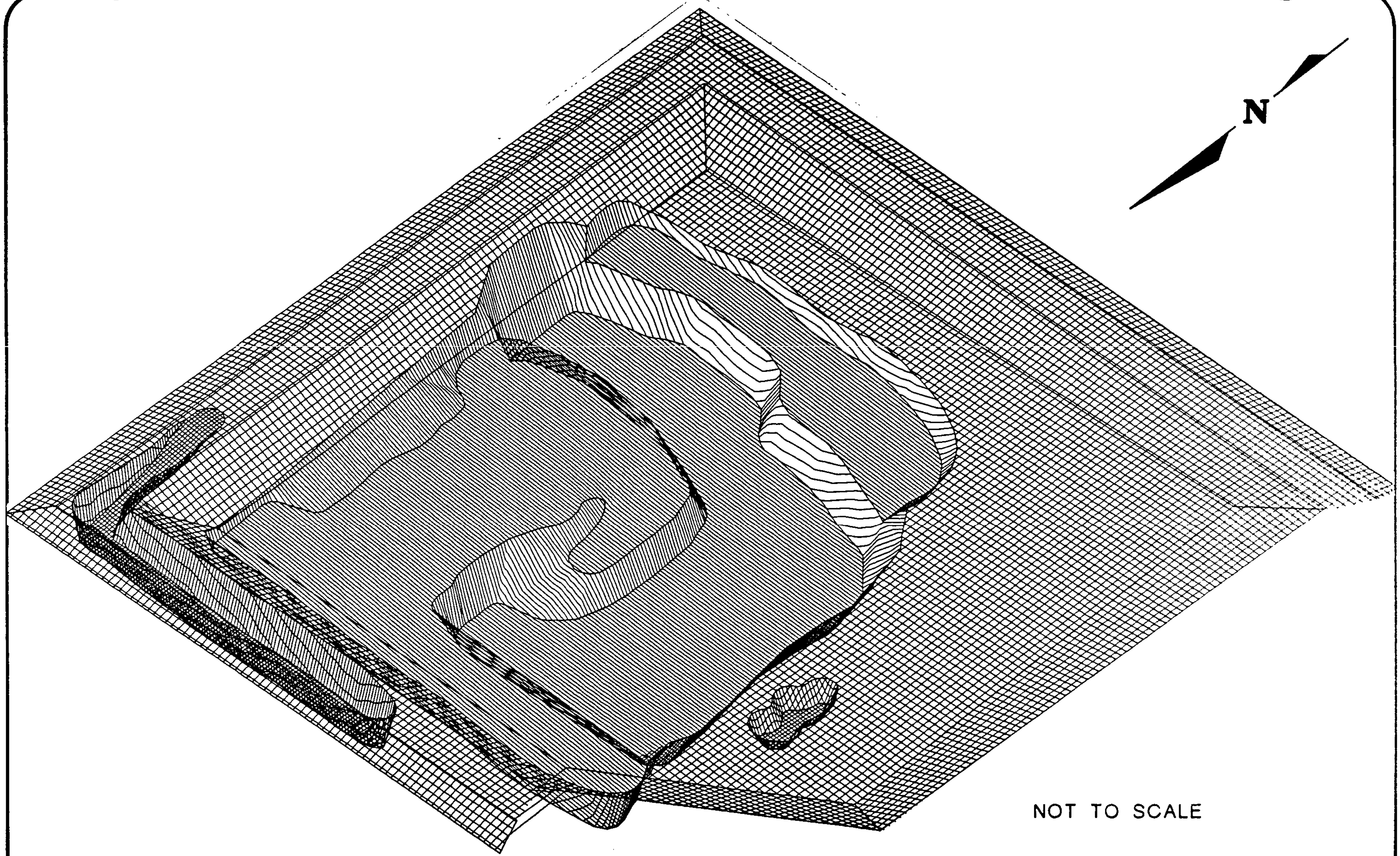
PREPARED BY: STEFFEN ROBERTSON & KIRSTEN (U.S.) Consulting Engineers & Scientists

TITLE: POND 1 REMEDIATION, CONTAMINATED SOIL EXCAVATION LIMITS, PLAN AND SECTIONS

SCALE: AS SHOWN

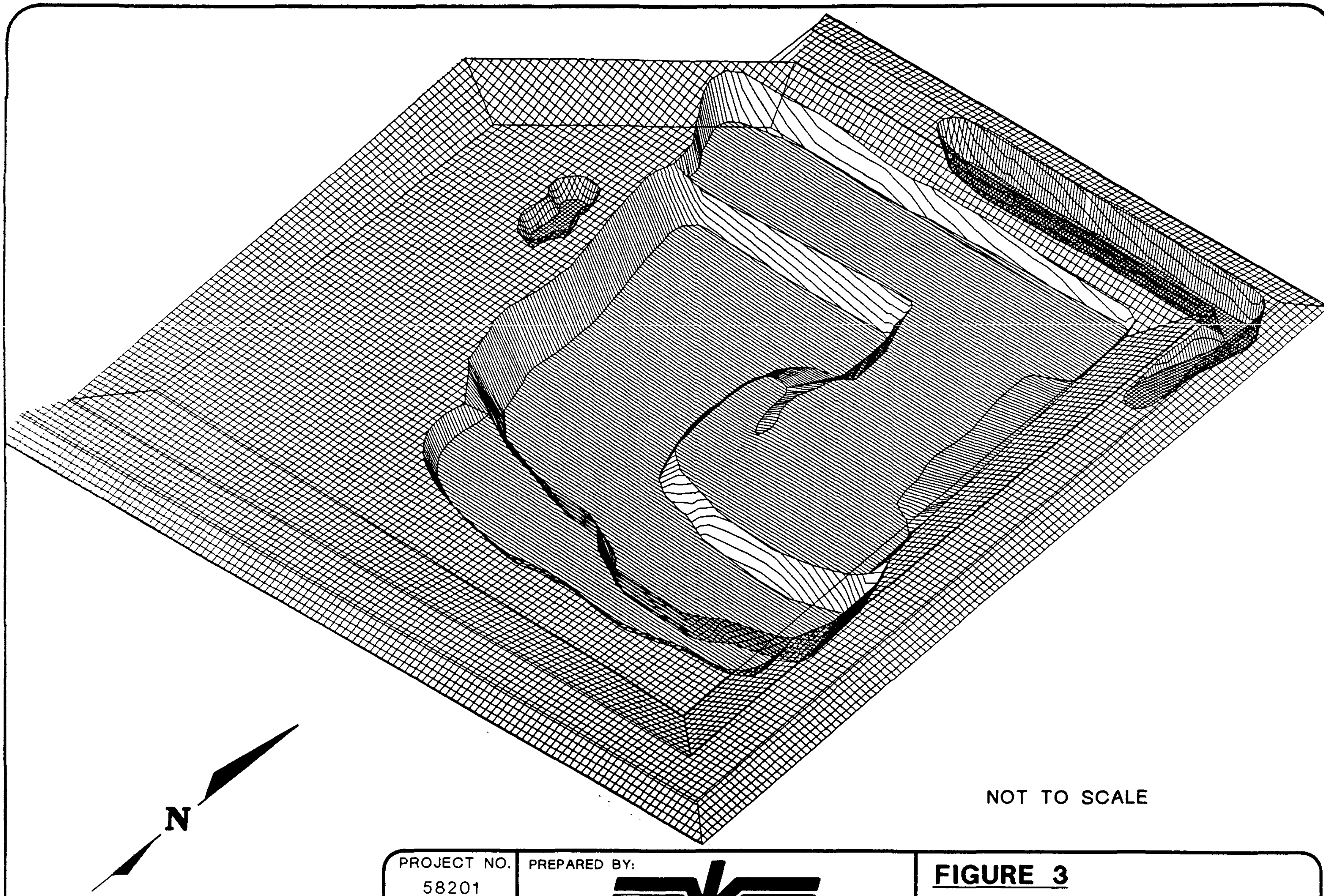
DRAWING No. FIGURE 1

REVISION: A




NOT TO SCALE

| PROJECT NO. | PREPARED BY: | FIGURE 2 |
| --- | --- | --- |
| 58201 | STEFFEN ROBERTSON & KIRSTEN (U.S.)<br>Consulting Engineers & Scientists | PERSPECTIVE RENDITION OF POND 1 REMEDIATION LOOKING TO THE SE (45° ABOVE THE HORIZONTAL) |
| DATE | | |
| 09/93 | | |
| REVISION | | |
| 0 | | |




| PROJECT NO. | PREPARED BY: | FIGURE 3 |
| --- | --- | --- |
| 58201 | | PERSPECTIVE RENDITION OF POND 1 REMEDIATION LOOKING TO THE NW (45° ABOVE THE HORIZONTAL |
| DATE | | |
| 09/93 | | |
| REVISION | STEFFEN ROBERTSON & KIRSTEN (U.S.) | |
| 0 | Consulting Engineers & Scientists | |

**SITE REMEDIATION**

*Plate 1- Sampling/Testing*

*Plate 2 - Excavation*

SITE REMEDIATION (cont'd)

*Plate 3 - Backfill Process*

*Plate 4 - Backfill Process*

**SITE REMEDIATION (cont'd)**

*Plate 5 - Backfill Process*

*Plate 6 - Backfill Process*

# APPENDIX D

## Technical Specifications

APPENDIX D.1

Earthwork Construction

**CONOCO**
**SAN JUAN GAS PLANT**
**EVAPORATION PONDS 1 AND 2**
**TECHNICAL SPECIFICATIONS**
**for**
**EARTHWORK**

Prepared for:
Conoco, Inc.
San Juan Gas Plant
61 Road 4900
P.O. Box 217
Bloomfield, N.M. 87413

Prepared by:
Steffen Robertson and Kirsten (U.S.), Inc.
3232 South Vance Street
Lakewood, Colorado 80227

February 1993
SRK Project No. 58201

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## 1.0 INTRODUCTION

### 1.1 General

The Specifications presented in these Technical Specifications are for the construction of two new evaporation ponds at Conoco's San Juan Gas Plant in Bloomfield, New Mexico.

### 1.2 Scope of Work

The scope of work for these Technical Specifications shall include all earthwork required for the construction of the two evaporation ponds for Conoco. Specific work items include, but are not limited to the following:

- Mobilization of all equipment and material required for the work;
- Installation of temporary and permanent surface water control;
- Stripping in required areas;
- Excavation in required areas;
- Development of borrow areas within the pond areas;
- Foundation preparation for fill placement;
- Pond embankment fill placement and compaction;
- Furnish and installing all material and constructing all items appurtenant and incidental to the above;
- Demobilizing, which includes removal of temporary structures and shaping, contouring, and grading final surfaces.

The Contractor shall familiarize himself with the relevant regional and site specific conditions which may have an impact upon the work. Data relevant to the overall project are contained in reports in the possession of the Owner, which are available for Contractor review. Of particular relevance to the work is the field investigation data collected by SRK to evaluate foundation conditions and construction materials. Drawings to be read in conjunction with these Specifications are included with this document as Attachment A and are in a series numbered 58201/01 through 58201/03.

In the case of discrepancy or ambiguity in the Specifications, Drawings, codes, standards, or regulations, it is the intent of these Specifications that the most restrictive interpretation shall apply unless interpreted otherwise by the Design Engineer.

## 1.3 Definitions

The following definitions apply to these Specifications.

a. "Owner" is defined as an authorized representative of Conoco Inc.;

b. "Construction Manager" is defined as an authorized representative of the Owner responsible for coordinating the activities of the Contractor;

c. "Quality Assurance Engineer" is defined as a qualified representative appointed and authorized by the Owner to monitor the quality of the completed construction product;

d. "Design Engineer" is defined as an authorized representative of the Owner who has designed the facilities to be constructed and prepared the plans and specifications;

e. "Contractor" is defined as the party or parties which have a contract agreement with the Owner or Construction Manager and perform the actual construction activities;

f. "Specifications" is defined as this document of technical specifications prepared by Steffen Robertson and Kirsten (U.S.), Inc. for Conoco's San Juan Gas Plant dated February 1993;

g. "Drawings" is defined as the drawings in conjunction with these Specifications and are in a series numbered 58201/01 through 58201/03;

h. "In-place material" is defined as soil or rock material obtained from within the construction area of a particular facility;

i. "Over-size Rock" is defined as rock obtained from the borrow area that is not suitable for placement within the earthen fills and applies to rock larger than 6 inches nominal size;

j. "Off-site material" is defined as material obtained from sources other than on-site;

k. All slopes are described in terms of horizontal distance: vertical distance; and

l. All sieve sizes refer to U.S. Standard sieve sizes.

## 1.4 Applicable Codes and Regulations

The work shall conform to applicable Federal, State, County, and local regulations. Test procedures shall conform to applicable ASTM standards, as documented in the edition of the standards in force at the start of work.

## 2.0 CONTRACTOR'S RESPONSIBILITY

The Contractor shall carefully examine all of the Technical Specifications and Drawings, and the site of the work. He shall fully inform himself as to the character of all conditions at the site, local and otherwise, affecting the execution of the work, including those conditions to which Federal, State, and local safety and/or health laws and regulations may be applicable. Failure to comply with the requirements of this section shall not relieve the Contractor of responsibility for complete performance of the work.

It shall be the sole responsibility of the Contractor to familiarize himself, by such means as he considers appropriate, with all matters pertaining to this work including, but not limited to:

- The location and nature of work;

- Climatic conditions;

- The nature and conditions of the terrain;
- Geologic conditions at the site;
- Transportation and communication facilities;
- Location and nature of construction materials available for use in the work;
- Other construction at the project site that may be underway simultaneously with the construction work for the two new evaporation ponds; and
- All other factors that may affect the cost, duration, and execution of the work.

Before accepting the work, the Contractor shall acknowledge in writing that he has inspected the site and determined the characteristics of the work and the conditions indicated above.

## 3.0 INSPECTION OF WORK

### 3.1 General

Unless otherwise specified, full-time inspection of all construction activities defined by the Specification will be provided by the Owner. Owner's inspection of all work shall be performed under the supervision and control of the Quality Assurance Engineer or his designated representative while such work is in progress. Said inspections are for the convenience, satisfaction, and benefit of the Owner in determining that the work is performed in strict accordance with the Specifications. It shall be the Contractor's sole responsibility to provide all required materials (both natural and manufactured) and to perform all work in conformance with the Specifications. The Quality Assurance Engineer will inspect, test and report all findings to the Construction Manager. The Construction Manager shall be responsible for enforcing the specifications or initiating variances or design changes through the Design Engineer. Owner's inspections shall not relieve the Contractor of responsibility for the acceptability of the finished work or portions thereof.

### 3.2 Access

The Quality Assurance Engineer and his representatives shall at all times have access to the work whenever it is in preparation or progress provided that they report their presence to the Construction Manager who is responsible for all activities onsite. The Contractor shall fully cooperate with the Quality Assurance Engineer, shall provide proper facilities for access, and shall furnish labor and equipment reasonably needed for safe and convenient inspection, including the excavation of test pits. The Contractor shall give the Quality Assurance Engineer ample notice of readiness of the work for inspection, and the Quality Assurance Engineer shall perform said inspection in such a manner as not to unnecessarily delay the work.

### 3.3 Examination

If any work should be covered up without prior approval or consent of the Quality Assurance Engineer, it must, if required by the Quality Assurance Engineer, be uncovered for examination at the Contractor's cost.

### 3.4 Samples and Tests

It is the intent of these Specifications that materials shall be inspected and tested by the Quality Assurance Engineer before final acceptance of the work. Any item of the work which is found not to meet or exceed the Specifications or which is improperly located or constructed shall be removed and replaced. The Quality Assurance Engineer's inspections and tests shall not relieve the Contractor from full responsibility to furnish and install materials in conformance with these Specifications.

### 3.5 Alteration to Drawings and Specifications

All alterations made to either the Specifications or Drawings shall be subject to the Design Engineer's approval and, where applicable, to the approval of regulatory government agencies. All alterations shall be issued under a covering work order signed by the Design Engineer.

## 4.0 ENVIRONMENTAL REQUIREMENTS

### 4.1 Control of Sediment

The Contractor shall design, furnish, install, maintain and operate such equipment and structures as are necessary to contain and precipitate suspended solids (sediment) appearing in surface water immediately downstream of each work area, irrespective of the source of said suspended solids. Surface water released form the Contractor's sediment control facilities shall have turbidities which are less than or equal to the maximum values permitted by State or Federal law.

The Contractor shall be fully responsible for sediment control and the attainment of effluent quality conforming to State and Federal laws.

### 4.2 Control of Fugitive Dust

During the performance of the work defined by these Specifications or any operations appurtenant thereto, whether on right-of-way privided by the Owner or elsewhere, the Contractor shall furnish all labor, equipment, materials, and means required, and shall perform proper and efficient measures wherever and as required to reduce the dust nuisance, and to prevent dust which has originated from the Contractor's operations from damaging land, vegetation, and dwellings, or causing a nuisance to persons. Dust shall be controlled to a degree acceptable to the appropriate State and Federal agencies, and acceptable to the Construction Manager.

### 4.3 Limits of Work

The Contractor shall confine his apparatus, the storage of materials, and the operation of workmen to limits indicated by law, ordinances, permits or selected by the Construction Manager, and shall not unreasonably encumber the premises with his materials. Extreme caution shall be exercised at all times to avoid blocking plant or other roads or in any other way interfering with the Owner's operations or presenting a hazard to the Owner's personnel and equipment, or to the public.

## 4.4 Surface Water Control

Prior to beginning construction, the Contractor shall submit for approval a plan showing his proposed methods for collection and disposition of surface waters that may affect the execution and completion of work. The plan may be placed in operation upon review and comment by the Construction Manager and Quality Assurance Engineer, but nothing in this section shall relieve the Contractor from full responsibility for the adequacy of the system.

Surface water control shall be accomplished in a manner that will result in all construction operations being performed free of excess moisture.

# 5.0 EXCAVATION

## 5.1 General

The excavations to be performed include, but are not limited to site preparation, removal of unsuitable materials located within the proposed construction limits, shaping, and excavation in pond areas, foundation areas and project borrow areas.

There shall be no classification of soil and rock excavations for these Specifications as to type, hardness, moisture condition or other characteristics for classification and payment purposes.

The Contractor shall be solely responsible for determing the excavatability of soil and rock materials, water table conditions and other pertinent subsurface information. The Contractor shall satisfy himself with additional subsurface information, if he so desires and at his own expense, for bidding purposes.

## 5.2 Handling of Material

Insofar as is practicable in the permanent construction, the Contractor shall use materials obtained from required excavations which meet applicable specifications. Such materials may be placed in the designated final locations direct from the excavation, or may be placed in temporary stockpiles and later placed in the final location as approved by the Construction Manager. The Contractor shall schedule excavation operations so as to avoid or minimize stockpiling and rehandling of excavated material.

## 5.3 Lines and Grades

All open-cut excavations shall be performed in accordance with the Specifications to the lines, grades, and dimensions shown on the Drawings or as established by the Design Engineer. Assumed excavation lines for the work are shown on the Drawings, but the final excavation may vary from the lines shown as approved by the Quality Assurance Engineer. The assumed final lines for excavation, shown on the Drawings, shall not be strictly interpreted as accurately indicating the final or actual lines of excavation. When unfavorable conditions are discovered, they shall be corrected by excavation to lines, depths, and dimensions prescribed by the Design Engineer.

Unless noted otherwise or specifically prescribed by the Design Engineer, the maximum permissible deviation from specified lines and grades shall be plus or minus 0.1 feet.

## 5.4 Cuts and Slopes

The Contractor shall inspect all temporary and permanent open-cut excavations on a regular basis for signs of instability. Should signs of instability be noted, the Contractor shall undertake remedial measures immediately and shall notify the Construction Manager as soon as possible. It will be the Contractor's responsibility to remove all loose material from the excavation slopes and to maintain the slopes in a safe and stable condition at all times during the progress of the work.

## 5.5 Excess Excavation

All necessary precautions shall be taken to preserve the material below and beyond the lines of excavation in the soundest possible condition. Where excess excavation has been performed to complete the work, such areas shall be refilled with materials furnished and placed to the satisfaction of the Quality Assurance Engineer at the Contractor's expense. Over-excavation required by the Quality Assurance Engineer due to unsuitable materials and subsequent backfilling shall be payable by the Owner on the basis of the Contractor's unit rates which will form a part of the contract.

### 5.6 Disposal of Excavated Materials

The design has been refined to a cut to fill balance. Excess material is not anticipated, however materials that are unsuitable for, or are in excess of, permanent construction requirements shall be wasted. Waste piles shall be located outside the limits of construction or as approved by the Construction Manager, where they will not interfere with the natural flow of streams, with the operation of the Owner's facilities and other structures, and where they will neither detract from the appearance of the completed project nor interfere with the accessibility of the various parts of the work. Waste piles shall be graded and trimmed to reasonably regular lines and stable slopes.

## 6.0 SITE PREPARATION

### 6.1 General

The Contractor shall strip from the foundation areas of the ponds or pond embankments, waste stockpile areas, borrow areas, and related structures, all material unsuitable for use as a foundation, as determined by the Quality Assurance Engineer.

### 6.2 Stripping

Stripping of the site has for the most part been performed and is not anticipated. If however some areas require stripping, the work shall follow this specification.

Stripping of the upper 6 inches (maximum) of soil shall be done within the stripping limits where required. Stripping shall not be done below 6 inches from the original ground surface unless otherwise directed by the Quality Assurance Engineer.

The stripped materials shall be removed from the stripped area and placed in a designated stockpile area. Placement of stripped soils outside of designated areas shall not be done unless otherwise directed by the Construction Manager.

Unsuitable materials to be removed by stripping shall include debris, topsoil, excessively wet or soft soil, and vegetation including roots. Other perishable and objectionable materials that are unsuitable for use in permanent construction and which might interfere with the proper bonding of fill with the foundations, or the proper compaction of the materials in embankments and other fill areas, or which are otherwise unsuitable as determined by the Quality Assurance Engineer, shall be removed.

### 6.3 Access Roads

Contractor's access roads shall be planned such that construction of said roads shall coincide as much as practicable with the construction of the permanent roads associated with the project and other required excavation. Prior to development of access roads, the Contractor shall submit a plan showing their location and size for the Construction Manager to issue for the Owner's and Design Engineer's approval.

### 6.4 Borrow Areas

The specified design provides for a material balance with regard to excavation and fill quantities. However, earthen materials required for the work defined by these Specifications which are not obtainable from required excavations shall be obtained from approved borrow areas designated by the Construction Manager. Materials not available from said borrow areas shall be furnished by the Contractor from a source proposed by the Contractor and approved by the Design Engineer.

The Contractor may select and use any borrow area approved by the Design Engineer for construction materials, provided the materials meet the specification requirements for the intended use.

## 7.0 FILL PLACEMENT

### 7.1 General

The work covered by this section of the Specifications shall include, but is not limited to, fill placement for the pond embankments and access roads, reworking in-place foundation materials in the pond areas and earthwork incident thereto. The embankments, pond areas, and other pertinent structures shall have fill materials categorized as follows:

- Type 1: Interior embankment fill;

- Type 2: Exterior embankment fill;

### 7.2 Lines and Grades

Earthwork shall be constructed to the lines, grades, and cross sections shown on the Drawings or as specified herein.

### 7.3 Foundation Preparation

Upon completion of the required foundation stripping/excavation operations and removal of unsuitable foundation material, the entire excavated surface which is to be constructed upon, and the proposed pond area shall be scarified to a minimum depth of six inches, moisture conditioned to near optimum moisture content, and recompacted to at least 95 percent of maximum density (ASTM D-698). No new fill shall be placed in the foundation areas until the foundation has been inspected and approved by the Quality Assurance Engineer.

### 7.4 Placement

The procedures for the construction of required fills shall be described to and approved by the Quality Assurance Engineer prior to fill placement.

No brush, roots, sod, frozen soil, ice or other deleterious or unsuitable materials shall be placed in the engineered fills. The suitability of all fill materials intended for use in the construction work shall be subject to approval by the Quality Assurance Engineer. Fill placement shall be temporarily stopped, due to unsuitable weather conditions, at the discretion of the Quality Assurance Engineer. Under marginal weather conditions, the Contractor may place fill provided the fill, when tested, meets Specifications.

The distribution of materials shall be such that the fill is free from lenses, pockets, streaks, or layers of material differing substantially in texture or gradation from the surrounding material. The combined borrow excavation and fill placement operation shall be such that the materials, when compacted in the fill, shall be blended sufficiently to secure the best practicable distribution of the material, subject to the approval of the Quality Assurance Engineer. Fill placement shall be in approximately horizontal lifts of the maximum thickness specified for that material type, leveled as needed in preparation for compaction.

If, in the opinion of the Quality Assurance Engineer, the surface of the prepared foundation or the surface of any layer of the fill is too dry or too smooth to bond properly with the layer of material to be placed thereon, it shall be moistened and/or worked with harrow, scarifier, or other equipment to provide a satisfactory bonding surface before the next layer of fill material is placed. If, in the opinion of the Quality Assurance Engineer, the surface of the prepared foundation or the rolled surface of any layer of the fill in place is too wet for proper compaction of the layer of fill material to be placed thereon, it shall be removed and allowed to dry or shall be worked with harrow, scarifier, or other equipment to reduce the moisture content to the required amount, and then compacted before the next layer of fill material is placed.

### 7.5 Moisture Control

During compaction operations, the borrow, prepared foundation, and in-place fill materials shall be maintained or conditioned within the moisture content range required to permit proper compaction to the specified density. The moisture content of the fill material prior to and during compaction shall be uniform throughout the material.

When material is too dry for proper compaction, the Contractor shall spray water on the fill and work the moisture into the fill by harrowing or other approved means until a uniform distribution of moisture is obtained. Material that is too wet for proper compaction shall be removed from the fill or the material may be spread and permitted to dry, assisted by disking and harrowing, if necessary, until the moisture content is reduced to an amount suitable for obtaining the specified degree of compaction.

### 7.6 Compaction

Wherever necessary, after fill material has been placed and spread, or reworked in-place and moisture conditioned as specified, the layer shall be compacted by passing compaction equipment over the entire surface of the layer a sufficient number of times to obtain the required density, as determined by the Quality Assurance Engineer on the basis of field density tests and his observations of the fill operations.

The frequency of field density tests performed on each type of material shall be as determined in the field by the Quality Assurance Engineer.

The Quality Assurance Engineer will continuousy evaluate the Contractor's equipment and methods. If such equipment or methods are found unsatisfactory for the intended use, the Contractor shall be required to replace the unsatisfactory equipment with other types or adjust methods until proper compaction is achieved.

Compaction shall be based on ASTM D-698 or compactive effort as approved by the Quality Assurance Engineer. In-place fill densities may be determined by the Sand Cone or Nuclear Gauge Methods. The Contractor shall construct test fills, as determined by the Quality Assurance Engineer, for fills outside the testing limits of ASTM D-698, for establishing compactive effort procedures.

### 7.7 Special Compaction Equipment

Only hand-guided mechanical tampers or hand-guided vibratory rollers shall be used for compaction of the backfill material adjacent to concrete or other appurtenant structures, or in areas where access restrictions require. In such areas, care shall be exercised to prevent damage to existing facilities.

### 7.8 Sequence of Fill Operations

The Contractor shall construct the fill areas such that the fill is approximately level at all times during construction. The fill surfaces shall be graded to prevent ponding of rainwater.

The Contractor shall leave the surface of compacted fill, at the end of each shift or day, in such a manner as to prevent an excessive increase in moisture content arising from precipitation. The Quality Assurance Engineer may require that the top layer be removed at the recommencement of fill placement if it has become too wet or is softened as a result of precipitation.

In areas of geotextile or geosynthetic liner placement, following such placement, no vehicular traffic and minimal installation labor traffic shall be permitted on the surface. Special access across installed liner, if required, shall be approved by the Quality Assurance Engineer and may require protective measures to be taken at the Contractor's expense.

## 7.9 Contamination

The Contractor shall route equipment and take all actions necessary to prevent material of one type from being deposited inadvertently, either by dumping or through travel of equipment, in or on material of another type. Such improperly deposited material shall be removed from the fill areas as required by the Quality Assurance Engineer. Said removed material shall be wasted in locations designated by the Construction Manager.

All stones of such dimensions that interfere with compaction in the layer thicknesses specified, as determined by the Quality Assurance Engineer, shall be removed prior to compaction.

## 7.10 Conduct of Work

The Contractor shall maintain and protect fills in a condition satisfactory to the Quality Assurance Engineer at all times until the final completion and acceptance of the work. Any approved fill material which becomes unsuitable for any reason whatsoever, after being placed in the fill and before final acceptance of the work, shall be removed and replaced by the Contractor in a manner satisfactory to the Quality Assurance Engineer.

## 7.11 Access Roads

Permanent access roads shall be constructed as approved by the Owner. Foundation preparation and fill placement for access roads within required fill areas shall be as specified for the fill areas. Fill placement for access roads outside of the required fill areas shall be as approved by the Owner.

Temporary access roads may be required by the Contractor to complete the specified work. The Contractor shall submit a plan showing the location and size of temporary access road fills for the Construction Manager to submit to the Owner for approval.

## 7.12 Type 1 - Interior Embankment Fill

Interior embankment fill shall be used in the construction of the evaporation ponds, as shown on the Drawings. Type 1 material shall consist of fine grained material, with a maximum particle size of 3/4 inch. It is intended that Type 1 material shall be entirely obtained from the required excavations within the pond area. The fill shall be moisture conditioned to near optimum moisture content (within plus or minus two percent of optimum), placed in 8-inch maximum loose lifts and compacted to a minimum of 95 percent of maximum density as determined by ASTM D-698. The final as-built, in-place thickness of Type 1 material, whether borrowed as fill or prepared in-place, shall be not less than 12 inches.

In areas where native materials exist at grade meeting this Specification, these in-place materials shall be ripped to a depth of 12 inches and reworked with harrow or scarifier to produce a uniform material free of blocks or clumps in excess of six inches in size. The material shall be moisture conditioned to within plus or minus two percent of optimum moisture content and compacted to a minimum of 95 percent of maximum density as determined by ASTM D-698.

Embankment fill on the interior face of the evaporation ponds shall be placed in horizontal lifts wide enough to accommodate placement and compaction with conventional construction equipment to meet Specifications.

Interior embankment fill shall conform to the following material specifications:

| U.S. Standard Sieve or Screen Opening | Percentage Passing by Weight |
|---|---|
| 3/4 inch | 100 |
| No. 4 | 75-100 |
| No. 40 | 20-100 |
| No. 200 | 0-40 |

### 7.13 Type 2 - Exterior Embankment Fill

Exterior embankment fill shall be placed on the outer slopes of the pond embankments. The material shall consist of well-graded soil and rock mixtures with a maximum 6-inch rock size, and shall be moisture conditioned as necessary to facilitate proper placement and compaction. Exterior embankment fill shall be placed in 12-inch maximum loose lifts and compacted to a minimum of 95 percent of maximum proctor density as determined by ASTM D-698 where materials are suitable for this test method. For materials meeting the requirements for this test, a plus or minus two percent of optimum moisture content requirement shall be observed.

For coarse fill which does not meet the criteria for ASTM D-698 testing, a method specification will be employed. The method specification will be based upon a specified number of coverages with a particular piece of equipment as approved by the Engineer. Definition of the method specification may be developed based upon the construction of test fills by the Contractor at the Contractor's own expense.

Exterior embankment fill shall conform to the following material specifications:

| U.S. Standard Sieve or Screen Opening | Percentage Passing by Weight |
|---|---|
| 6 inch | 100 |
| 3 inch | 70-100 |
| 3/4 inch | 40-100 |
| No. 4 | 50-100 |
| No. 40 | 10-80 |
| No. 200 | 0-30 |

# APPENDIX D.2

## Geosynthetic Installation

# CONOCO
# SAN JUAN GAS PLANT
# EVAPORATION PONDS 1 AND 2
# TECHNICAL SPECIFICATIONS
# for
# GEOSYNTHETICS

Prepared for:
Conoco, Inc.
San Juan Gas Plant
61 Road 4900
P.O. Box 217
Bloomfield, N.M. 87413


Prepared by:
Steffen Robertson and Kirsten (U.S.), Inc.
3232 South Vance Street
Lakewood, Colorado 80227



February 1993
SRK Project No. 58201

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## TABLE OF CONTENTS
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## 1.0 INTRODUCTION

### 1.1 General

The Specifications presented in these Technical Specifications are for the installation of geosynthetic materials within two new evaporation ponds at Conoco's San Juan Gas Plant in Bloomfield, New Mexico.

### 1.2 Scope of Work

The scope of work for these Technical Specifications shall include the installation of a geotextile vapor transmission layer and double synthetic liner with intervening leak detection system for the two new evaporation ponds located at Conoco's San Juan Gas Plant. Specific work items include, but are not limited to the following:

- Mobilization of all equipment and material required for the work;
- Placement of synthetic materials for vapor transmission, liner and leak detection systems on prepared surfaces;
- Furnishing and installing all material and constructing all items appurtenant and incidental to the above;
- Testing of completed facilities; and
- Demobilizing, which includes removal of temporary structures.

The Contractor shall familiarize himself with the relevant regional and site specific conditions which may have an impact upon the work. Data relevant to the overall project are contained in reports in the possession of the Owner, which are available for Contractor review. Of particular relevance to the work is the field investigation data collected by SRK to evaluate foundation conditions and construction materials. Drawings to be read in conjunction with these Specifications are included with this document as Attachment A and are in a series numbered 58201/01 through 58201/03.

In case of discrepancy or ambiguity in the Specifications, Drawings, codes, standards, or regulations, it is the intent of these Specifications that the most restrictive interpretation shall apply unless interpreted otherwise by the Design Engineer.

## 1.3 Definitions

The following definitions apply to these Specifications.

a. "Owner" is defined as an authorized representative of Conoco Inc.;

b. "Construction Manager" is defined as an authorized representative of the Owner responsible for coordinating the activities of the Contractor;

c. "Quality Assurance Engineer" is defined as a qualified representative appointed and authorized by the Owner to monitor the quality of the completed construction product;

d. "Design Engineer" is defined as an authorized representative of the Owner who has designed the facilities to be constructed and prepared the plans and specifications;

e. "Contractor" is defined as the party or parties which have a contract agreement with the Owner or Construction Manager and perform the actual construction activities;

f. "Specifications" is defined as this document of technical specifications prepared by Steffen Robertson and Kirsten (U.S.), Inc. for Conoco's San Juan Gas Plant Project dated February 1993;

g. "Drawings" is defined as the drawings in conjunction with these Specifications and are in a series numbered 58201/01 through 58201/03.

## 1.4 Applicable Codes and Regulations

The work shall conform to applicable Federal, State, County, and local regulations. Test procedures shall conform to applicable ASTM standards, as documented in the edition of the standards in force at the start of work. Liner material and installation shall, where not specifically covered in these Specifications, be to a minimum of that specified in National specifically covered in these Specifications, be to a minimum of that specified in National Sanitation Foundation Publication No. 54 (NSF54).

## 2.0 CONTRACTOR'S RESPONSIBILITY

The Contractor shall carefully examine all of the Technical Specifications and Drawings, and the site of the work. He shall fully inform himself as to the character of all conditions at the site, local and otherwise, affecting the execution of the work, including those conditions to which Federal, State, and local safety and/or health laws and regulations may be applicable. Failure to comply with the requirements of this section shall not relieve the Contractor of responsibility for complete performance of the work.

It shall be the sole responsibility of the Contractor to familiarize himself, by such means as he considers appropriate, with all matters pertaining to this work including, but not limited to:

- The location and nature of work;
- Climatic conditions;
- The nature and conditions of the terrain;
- Geologic conditions at the site;
- Transportation and communication facilities;
- Other construction at the project site that may be underway simultaneously with the construction work for the two new evaporation ponds; and
- All other factors that may affect the cost, duration, and execution of the work.

Before accepting the work, the Contractor shall acknowledge in writing that he has inspected the site and determined the characteristics of the work and the conditions indicated above.

## 3.0 INSPECTION OF WORK

### 3.1 General

Unless otherwise specified, full-time inspection of all construction activities defined by the Specification will be provided by the Owner. Owner's inspection of all work shall be performed under the supervision and control of the Quality Assurance Engineer or his designated representative while such work is in progress. Said inspections are for the convenience, satisfaction, and benefit of the Owner in determining that the work is performed in strict accordance with the Specifications. It shall be the Contractor's sole responsibility to provide all required materials (both natural and manufactured) and to perform all work in conformance with the Specifications. The Quality Assurance Engineer will inspect, test and report all findings to the Construction Manager. The Construction Manager shall be responsible for enforcing the specifications or initiating variances or design changes through the Design Engineer. Owner's inspections shall not relieve the Contractor of responsibility for the acceptability of the finished work or portions thereof.

### 3.2 Access

The Quality Assurance Engineer and his representatives shall at all times have access to the work whenever it is in preparation or progress provided that they report their presence to the Construction Manager who is responsible for all activities onsite. The Contractor shall fully cooperate with the Quality Assurance Engineer, shall provide proper facilities for access, and shall furnish labor and equipment reasonably needed for safe and convenient inspection, including the excavation of test pits. The Contractor shall give the Quality Assurance Engineer ample notice of readiness of the work for inspection, and the Quality Assurance Engineer shall perform said inspection in such a manner as not to unnecessarily delay the work.

### 3.3 Examination

If any work should be covered up without prior approval or consent of the Quality Assurance Engineer, it must, if required by the Quality Assurance Engineer, be uncovered for examination at the Contractor's cost.

### 3.4 Samples and Tests

It is the intent of these Specifications that materials shall be inspected and tested by the Quality Assurance Engineer before final acceptance of the work. Any item of the work which is found not to meet or exceed the Specifications or which is improperly located or constructed shall be removed and replaced at the Contractor's cost. The Quality Assurance Engineer's inspections and tests shall not relieve the Contractor from full responsibility to furnish and install materials in conformance with these Specifications.

### 3.5 Alteration to Drawings and Specifications

All alterations made to either the Specifications or Drawings shall be subject to the Design Engineer's approval and, where applicable, to the approval of regulatory government agencies. All alterations shall be issued under a covering work order signed by the Design Engineer.

## 4.0 ENVIRONMENTAL REQUIREMENTS

### 4.1 Control of Fugitive Dust

During the performance of the work defined by these Specifications or any operations appurtenant thereto, whether on right-of-way provided by the Owner or elsewhere, the Contractor shall furnish all labor, equipment, materials, and means required, and shall perform proper and efficient measures wherever and as required to reduce the dust nuisance, and to prevent dust which has originated from the Contractor's operations from damaging land, vegetation, and dwellings, or causing a nuisance to persons. Dust shall be controlled to a degree acceptable to the appropriate State and Federal agencies, and acceptable to the Construction Manager.

### 4.2 Limits of Work

The Contractor shall confine his apparatus, the storage of materials, and the operation of workmen to limits indicated by law, ordinances, permits or selected by the Construction Manager, and shall not unreasonably encumber the premises with his materials. Extreme caution shall be exercised at all times to avoid blocking plant or other roads or in any other way interfering with the Owner's operations or presenting a hazard to the Owner's personnel and equipment, or to the public.

## 5.0 GEOSYNTHETIC MATERIAL

### 5.1 General

The Contractor shall furnish and install geosynthetic materials including geotextile for vapor transmission, PVC, Hypalon, leak detection system materials and miscellaneous materials incidental thereto in accordance with the manufacturer's recommendations. Installation also includes backfilling of liner anchor trenches, as shown on the Drawings. Alignments, lengths, and areas are shown on or derived from the Drawings. Exact locations and lengths may be varied to suit conditions encountered in the field, as approved by the Quality Assurance Engineer.

Geosynthetic materials to be installed at the two new Evaporation Ponds shall consist of a 36-mil Chlorosulfonated Polyethylene (CSPE) primary liner (Hypalon) and a 30-mil Polyvinyl Chloride (PVC) secondary liner, separated by an intervening leak detection system and all overlying a single layer of 12-oz/yd$^2$ nonwoven geotextile. The leak detection system shall consist of geosynthetic drain media placed throughout the area between the primary and secondary liners to create drainage to a fugitive solution collection sump on the pond bottom. The solution collection sump shall be filled with layers of synthetic drain net and fitted with a riser pipe for monitoring and solution removal.

Prior to commencing installation of the flexible membrane linings the Contractor shall submit shop drawings to the Design Engineer for approval. The shop drawings shall show the proposed panel layout, direction of factory seams and panel sizes consistent with the material quantity requirements to cover the lined area as shown on the Drawings. Details shall be included to show the termination of the panels at the perimeter of lined areas and the methods of sealing around penetrations.

### 5.2 Geotextile

#### 5.2.1 General

The Contractor shall furnish and install 12-oz/yd$^2$ geotextile to protect the PVC liner and to act as a natural gas vapor transmission system. The geotextile shall be placed directly upon the prepared earthen interior surface of the ponds and extend into the anchor trenches as shown on the Drawings. Protecting the secondary liner against damage by pieces of drain net or by the coarse drain material in the leak detection sump shall also be done using the 12-oz/yd$^2$ geotextile. Geotextile shall be suitable and durable for the intended application and shall be 100 percent polyester, nonwoven, needle-punched materials.

#### 5.2.2 Physical Properties

Geotextile shall meet or exceed the following minimum roll values:

**TABLE 1**

| Physical Property | Test Method | Unit | Value |
|---|---|---|---|
| Mass Per Unit Area (nominal) | ASTM D-5199 | oz/yd$^2$ | 12 |
| Wide Strip Tensile | ASTM D-4595 | lb/in | 120 |
| Trapezoidal Tear | ASTM D-4533 | lbs | 95 |
| Puncture Resistance | ASTM D-4833 | lbs | 130 |
| Permittivity | ASTM D-4491 | sec$^{-1}$ | 1.0 |
| Mullen Burst Strength | ASTM D-3786 | psi | 425 |
| Grab Tensile | ASTM D-4632 | lbs | 250 |

ASTM - American Society for Testing and Materials

### 5.2.3 Shipping, Handling and Storage

The Contractor shall be completely responsible for shipping, handling and storage of all geotextile. Geotextile shall be shipped and stored in opaque and water resistant protective coverings. The Contractor shall notify the Quality Assurance Engineer at least 24 hours prior to scheduled delivery and no material shall be unloaded without the presence of the Quality Assurance Engineer. Geotextile delivered to the site shall be inspected for damage and unloaded and stored with minimal handling. Contractor shall assist the Quality Assurance Engineer in conducting inventory, handling and sampling (if required) of geotextile upon delivery to the site.

No hooks, tongs or other sharp tools or instruments shall be used for handling geotextile. The Contractor shall use slings or a pole which extends 1 foot minimum beyond each end to unload or handle geotextile unless otherwise approved by the Quality Assurance Engineer.

Geotextiles shall be protected from ultraviolet light exposure, precipitation or other inundation, soil, mud, dirt, debris, puncture, cutting or other damaging or deleterious conditions. Geotextiles shall not be stored directly on the ground.

### 5.2.4 Acceptance of Foundation

The Quality Assurance Engineer will conduct a walkthrough of the prepared interior earthen surface of the ponds at which time the Contractor shall verify in writing that the earthen surface is acceptable for installation of geotextiles. Also at that time the Contractor shall be responsible for maintenance of the earthen surface to the accepted condition until completion of the project.

### 5.2.5 Pre-Installation Inspection

No geotextile shall be installed until the supporting earthen surface has been inspected and approved for geotextile installation by the Quality Assurance Engineer. The Contractor shall correct all deficiencies in the earthen surface that have appeared since acceptance of the earthen surface at no additional cost.

### 5.2.6 Installation

Geotextiles shall be installed as shown on the Drawings and in accordance with these Specifications. No geotextile roll shall be installed without the approval of the Quality Assurance Engineer. All geotextile panels shall be of such lengths and widths and shall be placed in such a manner as to minimize field sewing.

The Contractor shall exercise extreme care during geotextile installation to prevent damage to the prepared earthen surface. The Contractor shall exercise care to prevent the entrapment of rocks, clods of earth or other matter which could damage the geotextile or the subsequent geosynthetic liner, clog the geotextile or hamper sewing. Any geotextile surface showing injury due to penetration by foreign objects or distress shall be replaced or repaired. All geotextile panels shall be adequately ballasted to prevent damage or loss of the geotextile due to wind.

No foot traffic shall be allowed on the geotextile except with approved footwear. No vehicular traffic shall be allowed on the geotextile nor shall the Contractor use the geotextile as a work area or storage area for tools and supplies.

### 5.2.7 Seaming

All geotextile seams shall be formed by mating the edges of the geotextile panels and sewing together with continuous stitches (locked-stitch) located a minimum of 3 inches from the mated edges. All seaming shall be accomplished by the use of hand operated sewing machines capable of producing a continuous locked-stitch. Sewing procedures shall conform to the latest procedures recommended by the geotextile manufacturer. Spot sewing shall not be allowed. The Contractor shall avoid, wherever possible, placement of horizontal seams on all slopes.

### 5.2.8 Repairs

Geotextile repairs shall be made with patches (unless otherwise approved by the Quality Assurance Engineer) of the same geotextile material, using approved sewing systems, equipment and techniques. The patch size shall be 24 inches larger in all directions than the area to be repaired. All corners shall be rounded. All stitches shall be located no closer than one inch from the edge of the patch.

### 5.2.9 Contractor's Quality Control

The Contractor shall institute and follow a quality control plan as recommended by the geotextile manufacturer throughout the duration of the project to ensure compliance with the Drawings and these Specifications. As geotextile panels are installed the Contractor shall identify each panel with the manufacturer's roll identification number and date panel was installed. Markings should be made with a waterproof marker which can be easily located and done legibly. All unused portions of geotextile rolls shall also be immediately marked with the roll identification number.

The Contractor shall also maintain as-built drawings which show geotextile panel layout with the identification numbers and date installed. The as-built drawings shall be submitted to the Quality Assurance Engineer on a regular basis throughout the installation process.

### 5.2.10 Acceptance

The Contractor shall retain ownership and responsibility for the geotextile until acceptance by the Owner. The Owner shall accept the geotextile installation when the installation is finished and the adequacy of field seams and repairs have been verified, and testing is complete. Also required are certifications, as-built drawings, and a final inspection carried out by the Quality Assurance Engineer. Any and all work required to facilitate the final inspection, such as cleaning of the geotextile shall be the responsibility of the Contractor. All findings and corrective actions, if required, shall be documented. In certain cases and with the Quality Assurance Engineer's approval, a section of installation may be released for inspection. No geosynthetic liner or other materials shall be installed over the geotextile prior to final acceptance by the Quality Assurance Engineer.

## 5.3 Secondary Liner

### 5.3.1 General

The Contractor shall furnish and install 30-mil Polyvinyl Chloride (PVC) flexible membrane liner over the 12-oz/yd$^2$ geotextile layer within the pond area as shown on the Drawings. The liner shall be installed in a relaxed condition and shall be free of tension or stress upon completion of the installation. Stretching of the liner to fit will not be allowed. The PVC liner shall be compounded from first quality virgin materials with no regrind or reprocessed materials added. The liner compound shall be specifically designed for hydraulic structure application and shall have been satisfactorily demonstrated by prior use to be suitable and durable for such purposes. The liner material shall be uniform in color, thickness and surface texture.

### 5.3.2 Physical Properties

Flexible Polyvinyl Chloride (PVC) membrane liner shall meet or exceed the following minimum average values:

**TABLE 2**

| Physical Property | Test Method | Unit | Value |
|---|---|---|---|
| Thickness | ASTM D-1593 Para 8.1.3 | mils | 28.5 |
| Specific Gravity | ASTM D-792 Method A | | 1.20 |
| Tensile Properties<br>1. Breaking Factor | ASTM D-882 Method A or B (1 inch wide) | lbs/inch width | 69 |
| 2. Elongation at Break | ASTM D-882 Method A or B | % | 300 |
| 3. Modulus at 100% Elongation | ASTM D-882 Method A or B | lbs/inch width | 27 |
| Tear Resistance | ASTM D-1004 Die C | lbs | 8 |
| Dimensional Stability (each direction) | ASTM D-1204 212 o F, 15 min. | max. % change | 5 |
| Water Extraction | ASTM D-3083 * | max. % loss | - 0.35 |
| Volatile Loss | ASTM D-1203 Method A | max. % loss | 0.7 |

| | | | |
|---|---|---|---|
| Hydrostatic Resistance | ASTM D-751 Method A | $lbs/in^2$ | 82 |
| Resistance to Soil Burial 1. Breaking Factor | ASTM D-3083 * | max. % change in original value | 5 |
| 2. Elongation at Break | ASTM D-3083 * | max. % change in original value | 20 |
| 3. Modulus at 100% Elongation | ASTM D-3083 * | max. % change in original value | 20 |
| ASTM - American Society for Testing and Materials<br>* As modified by NSF - National Sanitation Foundation - Standard No. 54 | | | |

### 5.3.3 Fabrication

The individual widths of calendared PVC shall be factory fabricated into large sheets custom designed for this project so as to minimize field seaming. All factory seams shall provide a bond between the sheets sufficiently strong to meet the test requirements of these specifications. The seaming shall be accomplished by the use of dielectric fusion welding. The dielectric weld shall be a nominal one-inch wide (1/2 inch minimum) continuous bond.

The fabricator shall perform 100% continuous visual inspection of each lineal foot of seam as it is produced. Should defects be discovered, the Fabricator shall stop production of panels to be used on this project and rectify the situation prior to continuing production. As evidence that the Fabricator has complied with the inspection requirement, a mark which identifies the Inspector by name or number shall be hand stamped with indelible ink no less frequently than five feet on center along each factory seam. A 48 inch sample shall be taken from each factory seam welding unit used in this work at the beginning of every work shift and every four hours of production thereafter. Samples shall be nondestructive, i.e., will not require patching of fabricated panels. Test specimens shall be cut at quarter points from each 48 inch seam sample (a total of three places) and tested for factory seam strength and peel adhesion as specified in the Table below. A log shall be maintained showing the date, time, panel number and test results. This log shall be submitted to the Design Engineer for review prior to the installation of the PVC panels on the project. In addition to the log, the Fabricator shall submit written certification reports that indicate the material meets all of the requirements for the project as specified in these Specifications to the Design Engineer.

The Fabricator's dielectric fusion welded seams shall meet or exceed the following minimum average values:

| TABLE 3 | | | |
|---|---|---|---|
| Physical Property | Test Method | Unit | Value |
| 1. Bonded Seam Strength (Shear) | ASTM D-3083 * | lbs/in width | 55.2 |
| 2. Peel Adhesion | ASTM D-413 * | lbs/in | 10 |
| Resistance to Soil Burial<br>1. Bonded Seam Strength (Shear) | ASTM D-3083 * | max. % change in original value | - 20 |
| 2. Peel Adhesion | | max. % change in original value | - 20 |
| ASTM - American Society for Testing and Materials<br>* As modified by NSF - National Sanitation Foundation - Standard No. 54 | | | |

### 5.3.4 Shipping, Handling and Storage

Factory fabricated PVC panels shall be accordion-folded onto a sturdy wooden pallet designed to be moved by a forklift or similar equipment. Each factory fabricated panel shall be prominently and indelibly marked with the panel size. Panels shall be fully enclosed in heavy, water resistant cardboard and protected to prevent damage to the panel during shipment and storage on site. The outside of each container shall also be prominently marked with the panel size.

Panels which have been delivered to the project site shall be stored in their original, unopened containers in a dry area and protected from the direct heat of the sun where possible, especially when stored for a long period of time. Pallets shall not be stacked.

The Contractor shall be completely responsible for shipping, handling and storage of all PVC liner material. The Contractor shall notify the Quality Assurance Engineer at least 24 hours prior to scheduled delivery and no material shall be unloaded without the presence of the Quality Assurance Engineer. Upon delivery to the project the PVC liner material shall be inspected for possible damage, unloaded and stored with minimal handling.

### 5.3.5 Installation

The PVC liner panels shall be installed as shown on the Drawings and in accordance with these Specifications. No PVC panels shall be installed without the approval of the Quality Assurance Engineer. The PVC panels shall be placed over the previously installed 12-oz/yd$^2$ geotextile in such a manner as to assure minimum handling of the PVC panels and to prevent damage to the geotextile. All panels shall be of such lengths and widths and shall be placed in such a manner as to minimize field seaming. Horizontal field seams on the slopes shall be kept to a minimum. Only those panels of liner material which can be anchored and sealed together that same day shall be unpackaged and placed in position.

The liner shall be secured at all times with an approved means of ballasting to protect against possible loss or damage to the material by winds. The Contractor shall exercise care to prevent the entrapment of rocks, clods of earth or other matter which could damage the liner or hamper seaming. Foot traffic shall be kept to a minimum and all parties walking or working upon the liner material shall have approved footwear.

The liner shall be installed in a relaxed condition and shall be free of tension or stress upon completion of the installation. Stretching of the liner to fit will not be allowed.

### 5.3.6 Field Seaming

All field seams shall be Bodied Solvent Bonded Seams as defined by ASTM D-4437. All seaming solvents, caulking and mastics shall be of a type or types recommended by the Manufacturer or Fabricator of the PVC panels and shall be delivered to the project in original containers each with an indelible label bearing the brand name and complete directions as to proper storage and use.

Field seaming shall be discontinued when ambient or sheet temperatures exceed the manufacturer's recommended range for installation. Field lap joints shall be formed by lapping the edges of panels a minimum of six (6) inches. The contact surfaces of panels to be seamed shall be wiped clean to remove all dirt, dust, moisture or other foreign materials which would impair the quality of the completed seam. Sufficient liner to liner bonding solvent shall be applied to the joint area so as to form a continuous solvent weld approximately 2 to 3 inches in width. In applying bonding solvent, care must be taken to tie-in to the end of the previously completed seamed area so that leak paths or weak points in the seam do not occur. The surfaces should be pressed together immediately and a roller or flat wooden paddle used to squeeze the adhesive toward the leading edge of the panel. Any wrinkles shall be smoothed out. A small amount of adhesive should extrude and appear at the edge of the seam to indicate that sufficient bonding solvent has been applied. Excess bonding solvent should be wiped off with a clean rag. Seams shall be inspected after the initial seal and any loose edges shall be resealed, using the same procedure, to eliminate all free edges.

Extreme care shall be taken to avoid fishmouths in the field seams. Where fishmouths do occur, they shall be slit out far enough from the seam to dissipate them, lapped, seamed together in the lapped area and patched. Any portion of the lining damaged during installation, by any cause, shall be removed or repaired by using an additional piece of PVC liner material as specified hereinafter.

### 5.3.7 Non-Destructive Testing

Upon completion of the liner installation, the Contractor shall fully test all solvent bonded seams and penetration seals using an air lance tester or other method approved by the Quality Assurance Engineer. Any doubtful areas shall be tested with a vacuum box tester or other device as directed by the Quality Assurance Engineer. All non-destructive testing shall be in accordance with ASTM D-4437 and shall be observed by the Quality Assurance Engineer. Once air lance and/or vacuum box testing of the seams and penetration seals is complete the Contractor and Quality Assurance Engineer shall together visually inspect the lining surface for possible damage due to scuffing, penetration by foreign objects, distress, or other conditions which may be detrimental to the intended performance of the lining system. Should any detrimental conditions be discovered the Contractor shall remedy such damage as directed by the Quality Assurance Engineer.

### 5.3.8 Destructive Testing

Destructive tests shall be performed in accordance with ASTM D-4437 to evaluate seam strength and to estimate long-term performance. Destructive seam testing shall be performed at selected intervals, at least one test per 500 lineal feet of field seam. Individual samples may be taken at greater or lesser intervals. If the number of failed destructive samples exceeds five percent of the tested samples, the testing frequency may be increased at the direction of the Quality Assurance Engineer. Test locations shall be determined at the Quality Assurance Engineer's discretion and specimens shall be removed by the Contractor while being observed by the Quality Assurance Engineer.

Destructive samples shall measure two feet along and parallel to the seam and shall be wide enough to accommodate peel and shear testing. Should results of either the shear or peel tests fall below the minimum requirements, additional destructive samples will be obtained and tested. The additional destructive samples shall be obtained 10 feet each direction along the field seam from the failing sample location. This procedure will be repeated until the limits of the poor quality seam has been determined. The Contractor may, however, elect to cap strip the entire length of seam at any time during the re-sampling and testing process to avoid further construction delays. Should destructive re-sampling be required the Contractor will repair the test sample locations by a single cap strip cut sufficient in length to extend a minimum of 12 inches beyond the outer sampled locations.

### 5.3.9 Repairs

Any repairs to the installed lining system shall be by patching. Patches shall consist of the same material type as that requiring repair. The patch shall have rounded corners and shall be of sufficient size in order that it extends a minimum of four inches in each direction from the limits of the damaged area. All patches shall be mated to the lining in the same manner used to construct the field seams. Non-destructive testing of the patch shall be accomplished in the same manner as that described above.

### 5.3.10 Contractor's Quality Control

The Contractor shall institute and follow a quality control plan as recommended by the PVC manufacturer throughout the duration of the project to ensure compliance with the Drawings and these Specifications. As PVC lining panels are installed the Contractor shall identify each panel with the manufacturer's identification number and date panel was installed. Markings should be made with a waterproof marker which can be easily located and done legibly.

The Contractor shall also maintain as-built drawings which show installed panel layouts with the identification numbers and date installed. The as-built drawings shall be submitted to the Quality Assurance Engineer on a regular basis throughout the installation process.

#### 5.3.11 Acceptance

The Contractor shall retain ownership and responsibility for the PVC lining until acceptance by the Owner. The Owner shall accept the PVC installation when the installation is finished and the adequacy of field seams and repairs have been verified, and testing is complete. Also required are certifications, as-built drawings and a final inspection carried out by the Quality Assurance Engineer. Any and all work required to facilitate the final inspection, such as cleaning of the installed lining shall be the responsibility of the Contractor. All findings and corrective actions, if required, shall be documented. In certain cases and with the Quality Assurance Engineer's approval, a section of installation may be released for inspection. Installation of drain net or other materials over the PVC lining prior to final acceptance by the Quality Assurance Engineer shall be at the sole risk of the Contractor. Removal and replacement of such material in the event of a reported failure of a destructive test result on the PVC will be at the Contractor's expense.

### 5.4 Leak Detection System

#### 5.4.1 General

The Contractor shall furnish and install drain net material and a 6-inch diameter PVC schedule 80 pipe at each of the two evaporation ponds as shown on the Drawings and as specified in these Specifications. Drain net material shall be installed within the ponds between the 30-mil Polyvinyl Chloride (PVC) secondary liner and the subsequent 36-mil Chlorosulfonated Polyethylene (CSPE) primary liner. The drain net shall be installed so as to transport collected fugitive solution to the leak detection sump in the bottom of each pond as shown on the Drawings. The PVC pipe shall be perforated along the portion within the leak detection sump and will penetrate the subsequent 36-mil (CSPE) primary liner as the pipe extends upward to the crest of the pond. Individual layers of the drain net material shall be cut to fit the configuration of the sump as they are stacked upon each other for the full depth of the sump as shown in the Drawings.

Drain net shall be made from medium density polyethylene and shall have a rhomboidal mesh configuration consisting of two sets of parallel strands. The intersecting strands shall form two overlaid sets of continuous deep channels which provide high flow capacity.

### 5.4.2 Physical Properties

Drain net material shall meet or exceed the following values:

| TABLE 4 | | | |
|---|---|---|---|
| Physical Property | Test Method | Unit | Value |
| Thickness | ASTM D-1777 (10 kPa loading) | mm | 5.2 |
| Crush Strength | ASTM D-1621 | lb/in$^2$ | 89 |
| Transmissivity | ASTM D-4716 (10 kPa) | m$^2$/s | .0046 |
| ASTM - American Society for Testing and Materials | | | |

### 5.4.3 Shipping, Handling and Storage

The Contractor shall be completely responsible for shipping, handling and storage of all drain net material. The Contractor shall notify the Quality Assurance Engineer at least 24 hours prior to scheduled delivery and no material shall be unloaded without the presence of the Quality Assurance Engineer. Upon delivery to the project the drain net material shall be inspected for possible damage, unloaded and stored with minimal handling.

### 5.4.4 Installation

During installation of the drain net material the Contractor shall exercise care to prevent the entrapment of rocks or other matter which could damage the liner materials or hamper the performance of its intended use in the leak detection system. The drain net material shall be stretched by hand to minimize wrinkle formation but shall be free of stress or tension upon completion of installation. Adequate ballasting to protect against possible wind damage during the installation process shall be maintained by the Contractor. Drain nets shall be overlapped by at least four inches and connected with approved plastic fasteners. Connections shall be a maximum of five feet on center along the sides and a maximum of two feet on center along the ends. During all installation steps, care shall be taken to keep the net as clean as possible and to minimize foot traffic.

### 5.4.5 Acceptance

A visual inspection of the drain net will be conducted by the Quality Assurance Engineer upon completion of the installation of the drain net material. The Quality Assurance Engineer shall verify the Contractor's installation of the drain net has been completed as per the Drawings and Specifications.

## 5.5 Primary Liner

### 5.5.1 General

The Contractor shall furnish and install 36-mil reinforced Chlorosulfonated Polyethylene (CSPE) flexible membrane liner over the drain net layer within the pond area as shown on the Drawings and as specified in these Specifications. The liner shall be installed in a relaxed condition and shall be free of tension or stress upon completion of the installation. Stretching of the liner to fit will not be allowed. The CSPE liner shall be compounded from first quality virgin materials with no regrind or reprocessed materials added. The lining material shall consist of two calendared plies of synthetic membrane laminated over one ply of polyester reinforcing fabric. The reinforcing fabric shall be a 10 x 10-1000 denier woven polyester. The liner compound shall be specifically designed for hydraulic structure application and shall have been satisfactorily demonstrated by prior use to be suitable and durable for such purposes. The finished lining shall be a sunlight and weather resistant membrane that is flexible, durable, watertight and free from pinholes, blisters, and contaminants. The membrane shall be manufactured by the calendaring process and shall be uniform in color, thickness and surface texture.

### 5.5.2 Physical Properties

Flexible Chlorosulfonated Polyethylene (CSPE) membrane liner shall meet or exceed the following minimum values:

**TABLE 5**

| Physical Property | Test Method | Unit | Value |
|---|---|---|---|
| Reinforcing Plies | | | 1 |
| Thickness<br>1. Overall | ASTM D-751 | mils | 34 |
| 2. Over Scrim | NSF<br>Optical Method | mils | 11 |
| Breaking Strength -Fabric | ASTM D-751<br>Method A | lbs | 200 |
| Tear Strength<br>1. Initial | ASTM D-751 * | lbs | 80 |
| 2. After Aging | ASTM D-751 *<br>30 days @ 212°F | lbs | 35 |
| Low Temperature | ASTM D-2136<br>1/8 in. mandrel,<br>4 hrs., Pass | °F | - 40 |
| Dimensional Stability<br>(each direction) | ASTM D-1204<br>212°F, 1 hr. | max. % change | 2 |
| Hydrostatic Resistance | ASTM D-751<br>Method A, Proc. 1 | lbs/in$^2$ | 250 |

| | | | |
|---|---|---|---|
| Ply Adhesion (each direction) | ASTM D-413 Machine Method Type A | lbs/in. width | 8 |
| ASTM - American Society for Testing and Materials<br>* As modified by NSF - National Sanitation Foundation - Standard 54 | | | |

### 5.5.3 Fabrication

The individual widths of calendared CSPE shall be factory fabricated into large sheets custom designed for this project so as to minimize field seaming. All factory seams shall provide a bond between the sheets sufficiently strong to meet the test requirements of these specifications. The seaming shall be accomplished by the use of dielectric fusion welding. The dielectric weld shall be a nominal one-inch wide (1/2 inch minimum) continuous bond.

The fabricator shall perform 100% continuous visual inspection of each lineal foot of seam as it is produced. Should defects be discovered, the Fabricator shall stop production of panels to be used on this project and rectify the situation prior to continuing production. As evidence that the Fabricator has complied with the inspection requirement, a mark which identifies the Inspector by name or number shall be hand stamped with indelible ink no less frequently than five feet on center along each factory seam. A 48 inch sample shall be taken from each factory seam welding unit used in this work at the beginning of every work shift and every four hours of production thereafter. Samples shall be nondestructive, i.e., they will not require patching of fabricated panels. Test specimens shall be cut at quarter points from each 48 inch seam sample (a total of three places) and tested for factory seam strength and peel adhesion as specified in the Table below. A log shall be maintained showing the date, time, panel number and test results. This log shall be submitted to the Design Engineer for review prior to the installation of the CSPE panels on the project. In addition to the log, the Fabricator shall submit written certification reports that indicate the material meets all of the requirements for the project as specified in these Specifications to the Design Engineer.

The Fabricator's dielectric fusion welded seams shall meet or exceed the following minimum average values:

| TABLE 6 | | | |
|---|---|---|---|
| Physical Property | Test Method | Unit | Value |
| Bonded Seam Strength (Shear) | ASTM D-751 * | lbs | 160 |
| Peel Adhesion | ASTM D-413 * | lbs/in | Ply separation in plane of scrim or 10 lb |
| ASTM - American Society for Testing and Materials<br>* As modified by NSF - National Sanitation Foundation - Standard 54 | | | |

### 5.5.4 Shipping, Handling and Storage

Factory fabricated CSPE panels shall be accordion-folded onto a sturdy wooden pallet designed to be moved by a forklift or similar equipment. Each factory fabricated panel shall be prominently and indelibly marked with the panel size. Panels shall be fully enclosed in heavy, water resistant cardboard and protected to prevent damage to the panel during shipment and storage on site. The outside of each container shall also be prominently marked with the panel size.

Panels which have been delivered to the project site shall be stored in their original, unopened containers in a dry area and protected from the direct heat of the sun where possible, especially when stored for a long period of time. Pallets shall not be stacked.

The Contractor shall be completely responsible for shipping, handling and storage of all CSPE liner material. The Contractor shall notify the Quality Assurance Engineer at least 24 hours prior to scheduled delivery and no material shall be unloaded without the presence of the Quality Assurance Engineer. Upon delivery to the project the CSPE liner material shall be inspected for possible damage, unloaded and stored with minimal handling.

### 5.5.5 Installation

The CSPE liner panels shall be installed as shown on the Drawings and in accordance with these Specifications. No CSPE panels shall be installed without the approval of the Quality Assurance

Engineer. The CSPE panels shall be placed over the previously installed drain net material in such a manner as to assure minimum handling of the CSPE panels and to prevent damage to the geosynthetic materials. All panels shall be of such lengths and widths and shall be placed in such a manner as to minimize field seaming. Horizontal field seams on the slopes shall be kept to a minimum. Only those panels of liner material which can be anchored and sealed together that same day shall be unpackaged and placed in position.

The liner shall be secured at all times with an approved means of ballasting to protect against possible loss or damage to the material by winds. The Contractor shall exercise care to prevent the entrapment of rocks, clods of earth or other matter which could damage the liner or hamper seaming. Foot traffic shall be kept to a minimum and all parties walking or working upon the liner material shall have approved footwear.

Lining sheets shall be closely fit and sealed around inlets, outlets and other projections through the lining. All piping, structures and other projections through the lining shall be sealed with approved sealing methods.

The liner shall be installed in a relaxed condition and shall be free of tension or stress upon completion of the installation. Stretching of the liner to fit will not be allowed.

### 5.5.6 Field Seaming

All seaming adhesives, mastics and sealants shall be of a type or types recommended by the manufacturer or fabricator of the CSPE panels and shall be delivered to the project in original containers each with an indelible label bearing the brand name and complete directions as to proper storage and use.

Field seaming shall be discontinued when ambient or sheet temperatures exceed the manufacturer's recommended range for installation. Field lap joints shall be formed by lapping the edges of panels a minimum of six (6) inches. The contact surfaces of panels to be seamed shall be wiped clean to remove all dirt, dust, moisture or other foreign materials which would impair the quality of the completed seam. A pre-wipe solution of a type recommended by the manufacturer or fabricator shall be used to remove the surface cure on the contact surfaces. Scrubbing of the membrane with the pre-wipe solution shall be completed not more than ten minutes prior to application of the sealing adhesive.

Sufficient liner to liner bonding adhesive shall be applied to the joint area so as to form a continuous weld. A minimum 3-inch width of reinforced fabric overlap shall be fully bonded. In applying adhesive, care must be taken to tie-in to the end of the previously completed seamed area so that leak paths or weak points in the seam do not occur. The surfaces should be pressed together immediately and a roller or flat wooden paddle used to squeeze the adhesive toward the leading edge of the panel. Any wrinkles shall be smoothed out. A small amount of adhesive should extrude and appear at the edge of the seam to indicate that sufficient bonding solvent has been applied. Excess adhesive should be wiped off with a clean rag. Seams shall be inspected after the initial seal and any loose edges shall be resealed, using the same procedure, to eliminate all free edges. Exposed scrim along all edges shall be caulked or flood coated with seaming adhesive.

Extreme care shall be taken to avoid fishmouths in the field seams. Where fishmouths do occur, they shall be slit out far enough from the seam to dissipate them, lapped, seamed together in the lapped area and patched. Any portion of the lining damaged during installation, by any cause, shall be removed or repaired by using an additional piece of CSPE liner material as specified hereinafter.

### 5.5.7 Non-Destructive Testing

Upon completion of the liner installation, the Contractor shall fully test all solvent bonded seams and penetration seals using an air lance tester or other method approved by the Quality Assurance Engineer. Any doubtful areas shall be tested with a vacuum box tester or other device as directed by the Quality Assurance Engineer. All non-destructive testing shall be in accordance with ASTM D-4437 and shall be observed by the Quality Assurance Engineer. Once air lance and/or vacuum box testing of the seams and penetration seals is complete the Contractor and Quality Assurance Engineer shall together visually inspect the lining surface for possible damage due to scuffing, penetration by foreign objects, distress, or other conditions which may be detrimental to the intended performance of the lining system. Should any detrimental conditions be discovered the Contractor shall remedy such damage as directed by the Quality Assurance Engineer.

### 5.5.8 Destructive Testing

Destructive tests shall be performed in accordance with ASTM D-4437 to evaluate seam strength and to estimate long-term performance. Destructive seam testing shall be performed at selected intervals, at least one test per 500 lineal feet of field seam. Individual samples may be taken at greater or lesser intervals. If the number of failed destructive samples exceeds five percent of the tested samples, the testing frequency may be increased at the direction of the Quality Assurance Engineer. Test locations shall be determined at the Quality Assurance Engineer's

discretion and specimens shall be removed by the Contractor while being observed by the Quality Assurance Engineer.

Destructive samples shall measure two feet along and parallel to the seam and shall be wide enough to accommodate peel and shear testing. Should results of either the shear or peel tests fall below the minimum requirements, additional destructive samples will be obtained and tested. The additional destructive samples shall be obtained 10 feet each direction along the field seam from the failing sample location. This procedure will be repeated until the limits of the poor quality seam has been determined. The Contractor may, however, elect to cap strip the entire length of seam at any time during the re-sampling and testing process to avoid further construction delays. Should destructive re-sampling be required the Contractor will repair the test sample locations by a single cap strip cut sufficient in length to extend a minimum of 12 inches beyond the outer sampled locations.

### 5.5.9 Repairs

Any repairs to the installed lining system shall be by patching. Patches shall consist of the same material type as that requiring repair. The patch shall have rounded corners and shall be of sufficient size in order that it extends a minimum of four inches in each direction from the limits of the damaged area. All patches shall be mated to the lining in the same manner used to construct the field seams. Exposed scrim at patch edges shall be caulked or flood coated with seaming adhesive. Non-destructive testing of the patch shall be accomplished in the same manner as that described above.

### 5.5.10 Contractor's Quality Control

The Contractor shall institute and follow a quality control plan as recommended by the CSPE manufacturer throughout the duration of the project to ensure compliance with the Drawings and these Specifications. As CSPE lining panels are installed the Contractor shall identify each panel with the manufacturer's identification number and date panel was installed. Markings should be made with a waterproof marker which can be easily located and done legibly.

The Contractor shall also maintain as-built drawings which show installed panel layouts with the identification numbers and date installed. The as-built drawings shall be submitted to the Quality Assurance Engineer on a regular basis throughout the installation process.

#### 5.5.11 Special Compaction Equipment

Only hand-guided mechanical tampers, hand-guided vibratory rollers, or a suitable smooth tired vehicle shall be used for compaction of the backfill material comprising the initial lift in the anchor trenches. Wheel rolling may be done on the final lift of anchor trench backfill material provided the rubber-tired equipment used is of sufficient size so as to obtain suitable compaction.

#### 5.5.12 Acceptance

The Contractor shall retain ownership and responsibility for the CSPE lining until acceptance by the Owner. The Owner shall accept the CSPE installation when the installation is finished and the adequacy of field seams and repairs have been verified, and testing is complete. Also required are certifications, as-built drawings and a final inspection carried out by the Quality Assurance Engineer. Any and all work required to facilitate the final inspection, such as cleaning of the installed lining shall be the responsibility of the Contractor. All findings and corrective actions, if required, shall be documented. In certain cases and with the Quality Assurance Engineer's approval, a section of installation may be released for inspection. No other materials shall be installed over the CSPE lining prior to final acceptance by the Quality Assurance Engineer.

## 5.6 Gas Venting

### 5.6.1 Installation

The Contractor shall install natural gas vents near the crest of each pond as shown on the drawings. Installation of the vents shall not commence until backfilling of the anchor trench has been completed and approved by the Quality Assurance Engineer.

## 6.0 FINAL ACCEPTANCE

### 6.1 Walkthrough Inspection

The Contractor shall retain ownership and responsibility for the installed geosynthetics until acceptance by the Owner. The Owner shall accept the geosynthetics installation when the installation is finished and the adequacy of field seams and repairs has been verified, and physical testing of the liner is complete. Also required are certifications, as-built drawings, and a final inspection carried out by the Quality Assurance Engineer. Any and all work required to facilitate the final inspection, such as cleaning of the liner shall be the responsibility of the Contractor. The construction area shall be cleaned of remnant pieces of liner, debris, and garbage before acceptance. The inspection procedures shall be as follows:

- The Quality Assurance Engineer shall be informed of readiness for final inspection when installation is finished;

- In certain cases and with the Quality Assurance Engineer's approval, a section of installation may be released for inspection;

- Seams, panel surfaces, and repairs shall be visually inspected during the inspection;

- Defects, suspicious looking welds, permanent wrinkles, and bridging shall be distinctively marked for repair;

- Findings and corrective actions shall be documented;

- Arrangements for subsequent final inspection shall be made after corrective actions have been completed; and

- The results of final inspection shall be documented.

### 6.2 Water Test

Upon completion of the pond installations and final inspection, a full capacity water test will be performed. The water test will be performed during the installer's warranty period covering workmanship. The pond will be filled by the Owner and Owner's equipment and the test shall be monitored and documented.

Test Procedure

The following items will be performed to conduct the water test:

- Any water which may have entered the sump, or accumulated between the liners due to rain or runoff, will be removed with a submersible pump;

- The volume of the sump will be calculated to indicate volume versus depth of water in the sump;

- A monitoring rod will be calibrated with the slope angle to indicate depth of water in the sump;

- Water level marks at 1-ft intervals will be painted on the slope of the pond;

- During the filling of the pond, monitoring of the sump will be performed. Owner will document the time of all readings, water level in the pond, and in the sump;

- The results will be plotted, and a report will be prepared by or for submission to the Design Engineer; and

- If any leak is detected in the system, the pond shall be pumped out by the Owner, the leak shall be located and repaired by the Contractor, and another water test shall be performed until no leaks are detected.

In the event that areas of the installation are accepted following the inspection, the Contractor shall have no access to or right-of-way through the accepted area. In any and all instances in which the Contractor, the Contractor's personnel, or Contractor's Subcontractors enter an accepted area, the said area will be subject to cancellation of acceptance and any subsequent inspection repair, and acceptance procedures shall be the responsibility of the Contractor.

# APPENDIX E

## Laboratory and Field Test Summary for Earthwork Construction

## POND EARTHWORK CONSTRUCTION


*Plate 1 - Pond 1 Construction*

*Plate 2 - Pond 1 Slope Grading*

## POND EARTHWORK CONSTRUCTION (Cont'd)


*Plate 3 - Pond 1*


*Plate 4 - Compaction*

## POND EARTHWORK CONSTRUCTION (Cont'd)

*Plate 5 - Pond 2 Construction*

*Plate 6 - Pond 2 Grading*

**STEFFEN ROBERTSON & KIRSTEN**
**Consulting Engineers & Scientists**

DAILY SUMMARY OF FIELD MOISTURE / DENSITY TESTING

JOB.: 58201 DATE: / 2/5/93 THRU 2/11/93 PAG PAGE 1

SUBJECT: : CONOCO SAN JUAN GAS PLANT

FEATURE: : EVAPORATION POND 2

| TEST NO. | LOCATION | DEPTH or ELEV. (FT.) | FIELD TEST RESULTS WET DEN. (PCF) | DRY DEN. (PCF) | MOISTURE % | LAB RESULTS MAX. DRY DEN.PCF | O.M.C. % | TYPE OF TEST * N or S | PASS or FAIL | COMPACTION SPEC. % | COMPACTION RCD. % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | WEST BERM | N.G. | 109.4 | 98.0 | 11.6 | 116.4 | 11.9 | N | FAIL | 95 | 84 |
| 1-A | WEST BERM | N.G. | 118.2 | 105.6 | 11.9 | 116.4 | 11.9 | N | FAIL | 95 | 91 |
| 1-B | WEST BERM | N.G. | 124.8 | 111.0 | 12.4 | 116.4 | 11.9 | N | PASS | 95 | 95 |
| 2 | SOUTH BERM | N.G. | 130.0 | 114.8 | 13.2 | 116.4 | 11.9 | N | PASS | 95 | 99 |
| 3 | WEST BERM | +1 | 123.6 | 112.1 | 10.3 | 116.4 | 11.9 | N | PASS | 95 | 96 |
| 4 | EAST BERM | N.G. | 126.6 | 112.0 | 13.0 | 117.3 | 11.6 | N | PASS | 95 | 96 |
| 5 | WEST BERM | +1.5 | 126.7 | 111.5 | 13.6 | 117.3 | 11.6 | N | PASS | 95 | 95 |
| 6 | SOUTH BERM | +.8 | 127.6 | 114.4 | 11.5 | 117.3 | 11.6 | N | PASS | 95 | 98 |
| 7 | SOUTH BERM | +1.5 | 131.4 | 116.7 | 12.6 | 117.3 | 11.6 | N | PASS | 95 | 99 |
| | NORTH BERM | +1.5 | 106.4 | 87.9 | 21.1 | 117.3 | 11.6 | N | FAIL | 95 | 75 |
| 6 | = Total number of tests | | | | | | | | AVERAGE = | | |

REM ARKS: TEST 1 AND RETEST 1-A FAILED. CONTRACTOR WAS NOTIFIED.
RETEST 1-B PASSED AFTER MORE COMPACTIVE EFFORT. TEST NUMBER 8 FAILED. CONTRAC RACTOR WAS NOTIFIED. ARE WAS
WAS RIPPED TO A DEPTH OF APPROXIMATELY ONE FOOT AND ALLOWED TO DRY BACK. SEE RETEST 8-A.

* N = Nuclear, S = Sand cone

**STEFFEN ROBERTSON & KIRSTEN**
**Consulting Engineers & Scientists**

DAILY SUMMARY OF FIELD MOISTURE / DENSITY TESTING

JOB.: 58201 DATE: / 2/11/93 THRU 2-12-93 

SUBJECT: : CONOCO SAN JUAN GAS PLANT

FEATURE: : EVAPORATION POND 2

| TEST NO. | LOCATION | DEPTH or ELEV. (FT.) | FIELD TEST RESULTS WET DEN. (PCF) | DRY DEN. (PCF) | MOISTURE % | LAB RESULTS MAX. DRY DEN.PCF | O.M.C. % | TYPE OF TEST * N or S | PASS or FAIL | COMPACTION SPEC. % | COMPACTION RCD. % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8-A | NORTH BERM | N.G. | 128.6 | 112.6 | 14.2 | 117.3 | 11.6 | N | PASS | 95 | 96 |
| 9 | WEST BERM | +2.3 | 121.5 | 107.7 | 12.8 | 117.3 | 11.6 | N | FAIL | 95 | 92 |
| 9-A | WEST BERM | +2.3 | 129.1 | 115.0 | 12.3 | 117.3 | 11.6 | N | PASS | 95 | 98 |
| 10 | EAST BERM | +0.8 | 124.3 | 107.4 | 12.3 | 117.3 | 11.6 | N | FAIL | 95 | 92 |
| 10A | EAST BERM | +0.8 | 129.7 | 116.0 | 1.8 | 117.3 | 11.6 | N | PASS | 95 | 99 |
| 11 | SOUTH BERM | +2.5 | 129.3 | 114.9 | 12.5 | 117.3 | 11.6 | N | PASS | 95 | 98 |
| 12 | WEST BERM | +4.0 | 123.8 | 111.0 | 11.6 | 117.3 | 11.6 | N | PASS | 95 | 95 |
| 13 | WEST BERM | +5.0 | 128.9 | 112.2 | 14.9 | 117.3 | 11.6 | N | PASS | 95 | 96 |
| 14 | WEST BERM | +6.0 | 128.4 | 112.3 | 14.3 | 117.3 | 11.6 | N | PASS | 95 | 96 |
| 15 | NORTH BERM | +0.8 | 129.6 | 114.8 | 12.9 | 117.3 | 11.6 | N | PASS | 95 | 98 |
| 10 | = Total number of tests | | | | | | | | | AVERAGE = | |

REM ARKS: ALL FAILING TESTS WERE REPORTED IMEDIATELY TO THE CONTRACTOR. THE CONTRACTOR CORRECTIVE ACTION AFTER WHICH RETESTS WERE TAKEN UNTIL THE AREA OR E ORIGINAL TESTED AREA PASSED SED THE SPECIFICATION.

* N = Nuclear, S = Sand cone

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**Consulting Engineers and Scientists**

DAILY SUMMARY OF FIELD MOISTURE / DENSITY TESTING

JOB.: 58201 DATE: / 2/12/93 THRU 2/13 PAGE 3

SUBJECT: : CONOCO SAN JUAN GAS PLANT

FEATURE: : EVAPORATION POND 2

| TEST NO. | LOCATION | DEPTH or ELEV. (FT.) | FIELD TEST RESULTS WET DEN. (PCF) | DRY DEN. (PCF) | MOISTURE % | LAB RESULTS MAX. DRY DEN.PCF | O.M.C. % | TYPE OF TEST * N or S | PASS or FAIL | COMPACTION SPEC. % | COMPACTION RCD. % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | NORTH BERM | +0.8 | 129.6 | 114.8 | 12.9 | 117.3 | 11.6 | N | PASS | 95 | 98 |
| 16 | SOUTH BERM | +2.5 | 124.9 | 111.3 | 12.2 | 117.3 | 11.6 | N | PASS | 95 | 95 |
| 17 | WEST BERM | +6.5 | 127.5 | 112.5 | 13.3 | 117.3 | 11.6 | N | PASS | 95 | 96 |
| 18 | WEST BERM | +7.0 | 130.3 | 115.7 | 12.6 | 117.3 | 11.6 | N | PASS | 95 | 99 |
| 19 | SOUTH BERM | +3.5 | 127.1 | 111.2 | 14.3 | 117.3 | 11.6 | N | PASS | 95 | 95 |
| 20 | WEST BERM | +7.5 | 124.4 | 113.1 | 9.9 | 117.3 | 11.6 | N | PASS | 95 | 96 |
| 21 | NORTH BERM | +1.8 | 127.8 | 112.1 | 14.0 | 117.3 | 11.6 | N | PASS | 95 | 96 |
| 22 | SOUTH BERM | +4.2 | 129.2 | 113.6 | 13.7 | 117.3 | 11.6 | N | PASS | 95 | 97 |
| 23 | SOUTH BERM | +5.0 | 126.1 | 111.8 | 14.3 | 117.3 | 11.6 | N | PASS | 95 | 95 |
| 24 | NORTH BERM | +3.0 | 128.2 | 112.6 | 13.8 | 117.3 | 11.6 | N | PASS | 95 | 96 |
| 10 | = Total number of tests | | | | | | | | | AVERAGE = | |

REM ARKS: ALL FAILING TESTS WERE REPORTED IMEDIATELY TO THE CONTRACTOR. THE CONTRACTOR CORRECTIVE ACTION AFTER WHICH RETESTS WERE TAKEN UNTIL THE AREA OR E ORIGINAL TESTED AREA PASSED SED THE SPECIFICATION.

* N = Nuclear, S = Sand cone

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**Consulting Engineers and Scientists**

DAILY SUMMARY OF FIELD MOISTURE / DENSITY TESTING

JOB.: 58201 DATE; 2/13/93 THRU 2/24/93 

SUBJECT: : CONOCO SAN JUAN GAS PLANT

FEATURE: : EVAPORATION POND 2 1 AND 2

| TEST NO. | LOCATION | DEPTH or ELEV. (FT.) | FIELD TEST WET DEN. (PCF) | DRY DEN. (PCF) | MOISTURE % | PROCTOR VALUES MAX. DRY DEN.PCF | O.M.C. % | TYPE OF TEST * N or S | PASS or FAIL | COMPACTION SPEC. % | COMPACTION RCD. % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 26 | NORTH BERM POND TWO | +4.0 | 126.7 | 113.2 | 11.9 | 117.3 | 11.6 | N | PASS | 95 | 97 |
| 27 | WEST BERM POND TWO | FINISH GRADE | 128.4 | 113.1 | 13.5 | 117.3 | 11.6 | N | PASS | 95 | 96 |
| 28 | NORTH BERM POND TWO | +5.0 | 127.9 | 110.2 | 16.1 | 117.3 | 11.6 | N | FAIL | 95 | 94 |
| 28-A | NORTH BERM POND TWO | +5.0 | 128.4 | 111.0 | 15.7 | 117.3 | 11.6 | N | PASS | 95 | 95 |
| 29 | SOUTH BERM POND TWO | +7.0 | 130.1 | 115.3 | 12.9 | 117.3 | 11.6 | N | PASS | 95 | 98 |
| 30 | NORTH BERM POND TWO | +6.0 | 130.3 | 114.7 | 13.7 | 117.3 | 11.6 | N | PASS | 95 | 98 |
| 31 | SOUTH BERM POND TWO | +7.5 | 129.0 | 113.5 | 13.6 | 117.3 | 11.6 | N | PASS | 95 | 97 |
| 32 | SOUTH BERM POND TWO | +8.0 | 130.0 | 114.4 | 13.6 | 117.3 | 11.6 | N | PASS | 95 | 98 |
| 33 | NORTH BERM POND TWO | +7.0 | 127.5 | 111.3 | 14.6 | 117.3 | 11.6 | N | PASS | 95 | 95 |
| 34 | SOUTH BERM POND ONE | N.G. | 122.3 | 112.0 | 9.2 | 117.3 | 11.6 | N | PASS | 95 | 96 |
| 10 | = Total number of tests | | | | | | | | | AVERAGE = | |

REM ARKS: ALL FAILING TESTS WERE REPORTED IMEDIATELY TO THE CONTRACTOR. THE CONTRACTOR CORRECTIVE ACTION AFTER WHICH RETESTS WERE TAKEN UNTIL THE AREA OR E ORIGINAL TESTED AREA PASSED SED THE SPECIFICATION.

* N = Nuclear, S = Sand cone

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**Consulting Engineers and Scientists**

# DAILY SUMMARY OF FIELD MOISTURE / DENSITY TESTING

JOB.: 58201 DATE; 2/24/93 THRU 

SUBJECT: : CONOCO SAN JUAN GAS PLANT

FEATURE: : EVAPORATION POND 2 1 AND 2

| TEST NO. | LOCATION | DEPTH or ELEV. (FT.) | FIELD TEST WET DEN. (PCF) | DRY DEN. (PCF) | MOISTURE % | PROCTOR VALUES MAX. DRY DEN.PCF | O.M.C. % | TYPE OF TEST * N or S | PASS or FAIL | COMPACTION SPEC. % | COMPACTION RCD. % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 35 | WEST BERM POND ONE | GRADE | 127.0 | 113.9 | 11.5 | 117.3 | 11.6 | N | PASS | 95 | 97 |
| 36 | EAST BERM POND ONE | N.G. | 129.9 | 115.3 | 12.6 | 117.3 | 11.6 | N | PASS | 95 | 98 |
| 37 | SOUTH RAMP POND 1 & 2 | N.G. | 131.4 | 116.6 | 12.7 | 117.3 | 11.6 | N | PASS | 95 | 99 |
| 38 | EAST BERM POND ONE | +0.8 | 126.4 | 112.0 | 12.9 | 117.3 | 11.6 | N | PASS | 95 | 95 |
| 39 | SOUTH BERM POND TWO | N.G. | 130.6 | 115.9 | 12.7 | 117.3 | 11.6 | N | PASS | 95 | 99 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | = Total number of tests | | | | | | | | AVERAGE = | | |

REM ARKS: ALL FAILING TESTS WERE REPORTED IMEDIATELY TO THE CONTRACTOR. THE CONTRACTOR CORRECTIVE ACTION AFTER WHICH RETESTS WERE TAKEN UNTIL THE AREA OR E ORIGINAL TESTED AREA PASSED SED THE SPECIFICATION.

* N = Nuclear, S = Sand cone

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# DAILY SUMMARY OF FIELD MOISTURE / DENSITY TESTING

JOB.: 58201 DATE; 3/18/93 THRU 3/19/93 PAGE 6

SUBJECT: : CONOCO SAN JUAN GAS PLANT

FEATURE: POND ONE AREA CON AMINATION REMEDIATION

| TEST NO. | LOCATION | ELEV. FROM ROCK (FT.) | FIELD TEST WET DEN. (PCF) | DRY DEN. (PCF) | MOISTURE % | PROCTOR VALUES MAX. DRY DEN.PCF | O.M.C. % | TYPE OF TEST * N or S | PASS or FAIL | COMPACTION SPEC. % | COMPACTION RCD. % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | POND ONE AREA N/E BACKFILL | 1.5 | 121.2 | 109.8 | 10.4 | 118.8 | 10.5 | N | PASS | 92 | 92 |
| 41 | " | 2.0 | 120.5 | 109.5 | 10.0 | 118.8 | 10.5 | N | PASS | 92 | 92 |
| 42 | " | 2.5 | 120.7 | 10.1 | 9.6 | 118.8 | 10.5 | N | PASS | 92 | 93 |
| 43 | " | 3.0 | 120.0 | 108.7 | 10.3 | 118.8 | 10.5 | N | PASS | 92 | 92 |
| 44 | " | 3.5 | 121.6 | 109.5 | 11.0 | 118.8 | 10.5 | N | PASS | 92 | 92 |
| 45 | " | 4.0 | 123.6 | 111.0 | 11.3 | 118.8 | 10.5 | N | PASS | 92 | 93 |
| 46 | " | 4.5 | 119.9 | 109.4 | 9.6 | 118.8 | 10.5 | N | PASS | 92 | 92 |
| 47 | " | 5.0 | 121.9 | 109.7 | 11.1 | 118.8 | 10.5 | N | PASS | 92 | 92 |
| 48 | " | 5.5 | 120.5 | 109.0 | 10.6 | 118.8 | 10.5 | N | PASS | 92 | 92 |
| 49 | " | 6.0 | 120.9 | 110.2 | 9.7 | 118.8 | 10.5 | N | PASS | 92 | 93 |
| | = Total number of tests | | | | | | | | | AVERAGE = | |

REM ARKS: ALL FAILING TESTS WERE REPORTED IMEDIATELY TO THE CONTRACTOR. THE CONTRACTOR CORRECTIVE ACTION AFTER WHICH RETESTS WERE TAKEN UNTIL THE AREA OR E ORIGINAL TESTED AREA PASSED SED THE SPECIFICATION.

* N = Nuclear, S = Sand cone

**STEFFEN ROBERTSON AND KIRSTEN**
**Consulting Engineers and Scientists**

DAILY SUMMARY OF FIELD MOISTURE / DENSITY TESTING

JOB.: 58201 DATE; 3/19/93 THRU 4/5/93 PAGE 7

SUBJECT: : CONOCO SAN JUAN GAS PLANT

FEATURE: POND ONE AREA CON AMINATION REMEDIATION

| TEST NO. | LOCATION | ELEV. FROM ROCK (FT.) | FIELD TEST WET DEN. (PCF) | DRY DEN. (PCF) | MOISTURE % | PROCTOR VALUES MAX. DRY DEN.PCF | O.M.C. % | TYPE OF TEST * N or S | PASS or FAIL | COMPACTION SPEC. % | COMPACTION RCD. % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | POND ONE AREA N/E BACKFILL | 6.5 | 119.2 | 109.6 | 8.7 | 118.8 | 10.5 | N | PASS | 92 | 92 |
| 51 | " | 7 | 120.2 | 109.3 | 10.9 | 118.8 | 10.5 | N | PASS | 92 | 92 |
| 52 | " | 8 | 123.8 | 110.1 | 12.5 | 118.8 | 10.5 | N | PASS | 92 | 93 |
| 53 | " | 9 | 124.1 | 113.9 | 8.9 | 118.8 | 10.5 | N | PASS | 92 | 96 |
| 54 | " | 10 | 121.0 | 110.9 | 9.1 | 118.8 | 10.5 | N | PASS | 92 | 93 |
| 55 | " | 11 | 123.7 | 110.2 | 12.2 | 118.8 | 10.5 | N | PASS | 92 | 93 |
| 56 | " | 12 | 111.8 | 109.7 | 7.4 | 118.8 | 10.5 | N | PASS | 92 | 92 |
| 57 | " | AT 93.5 | 121.8 | 112.4 | 8.4 | 118.8 | 10.5 | N | PASS | 92 | 95 |
| 58 | Nth CENTRAL & CENTRAL BKFL | 3 | 121.1 | 111.0 | 9.1 | 118.8 | 10.5 | N | PASS | 92 | 93 |
| 59 | " | 4 | 125.8 | 114.8 | 9.6 | 118.8 | 10.5 | N | PASS | 92 | 97 |

REM ARKS: ALL FAILING TESTS WERE REPORTED IMEDIATELY TO THE CONTRACTOR. THE CONTRACTOR CORRECTIVE ACTION AFTER WHICH RETESTS WERE TAKEN UNTIL T UNTIL THE ORIGINALL LY TESTED AREA P ASSED THE SPECIFICATION.

* N = Nuclear, S = Sand cone

**STEFFEN ROBERTSON AND KIRSTEN**
**Consulting Engineers and Scientists**

DAILY SUMMARY OF FIELD MOISTURE / DENSITY TESTING

JOB.: 58201 DATE; 4/5/93 THRU 4/7/93 PAGE 8

SUBJECT: : CONOCO SAN JUAN GAS PLANT

FEATURE: POND ONE AREA CON AMINATION REMEDIATION

| TEST NO. | LOCATION | ELEV. FROM ROCK (FT.) | FIELD TEST WET DEN. (PCF) | DRY DEN. (PCF) | MOISTURE % | PROCTOR VALUES MAX. DRY DEN.PCF | O.M.C. % | TYPE OF TEST * N or S | PASS or FAIL | COMPACTION SPEC. % | COMPACTION RCD. % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 60 | Nth CENTRAL & CENTRAL BKFL. | 5 | 124.2 | 113.9 | 9.0 | 118.8 | 10.5 | N | PASS | 92 | 96 |
| 61 | " | 6 | 122.5 | 114.4 | 7.2 | 118.8 | 10.5 | N | PASS | 92 | 96 |
| 62 | " | 7 | 125.0 | 113.0 | 10.7 | 118.8 | 10.5 | N | PASS | 92 | 95 |
| 63 | " | 8 | 121.0 | 109.3 | 10.7 | 118.8 | 10.5 | N | PASS | 92 | 92 |
| 64 | " | 9 | 121.2 | 110.1 | 10.1 | 118.8 | 10.5 | N | PASS | 92 | 93 |
| 65 | " | 10 | 117.4 | 108.9 | 7.8 | 118.8 | 10.5 | N | PASS | 92 | 92 |
| 66 | " | 11 | 121.0 | 110.7 | 9.3 | 118.8 | 10.5 | N | PASS | 92 | 93 |
| 67 | " | 12 | 115.9 | 109.2 | 6.1 | 118.8 | 10.5 | N | PASS | 92 | 92 |
| 68 | " | 13 | 116.8 | 109.3 | 6.8 | 118.8 | 10.5 | N | PASS | 92 | 92 |
| 69 | " | 4 | 125.8 | 114.8 | 9.6 | 118.8 | 10.5 | N | PASS | 92 | 97 |

REM ARKS: ALL FAILING TESTS WERE REPORTED IMEDIATELY TO THE CONTRACTOR. FOLLOWED BY CORRECTIVE ACTION AFTER WHICH RETESTS WERE TAKEN UNTIL T UNTIL THE ORIGINALL LY TESTED AREA P ASSED THE SPECIFICATION.

* N = Nuclear, S = Sand cone

**STEFFEN ROBERTSON AND KIRSTEN**
**Consulting Engineers and Scientists**

# DAILY SUMMARY OF FIELD MOISTURE / DENSITY TESTING

JOB.: 58201 DATE: 4/14/93 THRU 4/15/93 PAGE10

SUBJECT: : CONOCO SAN JUAN GAS PLANT

FEATURE: EVAPORATI ON POND 0.ONE

| TEST NO. | LOCATION | ELEV. FROM N.G. (FT.) | FIELD TEST WET DEN. (PCF) | DRY DEN. (PCF) | MOISTURE % | PROCTOR VALUES MAX. DRY DEN.PCF | O.M.C. % | TYPE OF TEST * N or S | PASS or FAIL | COMPACTION SPEC. % | COMPACTION RCD. % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 70 | NORTH BERM | N.G. | 122.7 | 113.3 | 8.2 | 118.8 | 10.5 | N | PASS | 95 | 95 |
| 71 | · | 1 | 121.7 | 112.6 | 8.0 | 118.8 | 10.5 | N | PASS | 95 | 95 |
| 72 | · | 2 | 122.3 | 112.3 | 8.9 | 118.8 | 10.5 | N | PASS | 95 | 95 |
| 73 | · | 2.5 | 123.4 | 112.8 | 9.4 | 118.8 | 10.5 | N | PASS | 95 | 95 |
| 74 | SOUTH BERM | N.G. | 120.3 | 113.1 | 6.4 | 117.3 | 11.6 | N | PASS | 95 | 96 |
| 75 | NORTH BERM | 3 | 124.7 | 114.1 | 9.3 | 118.8 | 10.5 | N | PASS | 95 | 96 |
| 76 | SOUTH BERM | 1 | 124.0 | 113.1 | 9.6 | 118.8 | 10.5 | N | PASS | 95 | 95 |
| 77 | SOUTH BERM | 2 | 123.5 | 113.1 | 9.2 | 118.8 | 10.5 | N | PASS | 95 | 95 |
| 78 | NORTH BERM | AT GRADE | 123.1 | 112.9 | 9.2 | 118.8 | 10.5 | N | PASS | 95 | 95 |
| 79 | NORTH BERM | 4 | 123.6 | 113.4 | 9.1 | 118.8 | 10.5 | N | PASS | 95 | 95 |

REM ARKS: ALL FAILING TESTS WERE REPORTED IMEDIATELY TO THE CONTRACTOR. FOLLOWED BY CORRECTIVE ACTION AFTER WHICH RETESTS WERE TAKEN UNTIL T UNTIL THE ORIGINALL LY TESTED AREA P ASSED THE SPECIFICATION. REMEDIATION WAS COMPLETED ON 4/8/93.

* N = Nuclear, S = Sand cone

**STEFFEN ROBERTSON AND KIRSTEN**
**Consulting Engineers and Scientists**

DAILY SUMMARY OF FIELD MOISTURE / DENSITY TESTING

JOB.: 58201 DATE: 4/16/93 THRU 4/16/93 PAGE 11

SUBJECT: : CONOCO SAN JUAN GAS PLANT

FEATURE: EVAPORATI ON POND 0.ONE

| TEST NO. | LOCATION | ELEV. FROM N.G. (FT.) | FIELD TEST WET DEN. (PCF) | FIELD TEST DRY DEN. (PCF) | FIELD TEST MOISTURE % | PROCTOR VALUES MAX. DRY DEN.PCF | PROCTOR VALUES O.M.C. % | TYPE OF TEST * N or S | PASS or FAIL | COMPACTION SPEC. % | COMPACTION RCD. % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 80 | SOUTH BERM | 3 | 123.8 | 116.0 | 6.8 | 118.8 | 10.5 | N | PASS | 95 | 97 |
| 81 | WEST BERM | 1 | 125.0 | 114.8 | 8.9 | 118.8 | 10.5 | N | PASS | 95 | 97 |
| 82 | WEST BERM | 2 | 123.4 | 113.6 | 8.6 | 118.8 | 10.5 | N | PASS | 95 | 96 |
| 83 | WEST BERM | 3 | 124.5 | 114.3 | 9.0 | 118.8 | 10.5 | N | PASS | 95 | 96 |
| 84 | WEST BERM | 4 | 124.0 | 114.3 | 8.5 | 118.8 | 10.5 | N | PASS | 95 | 96 |
| 85 | SOUTH BER,M | 4 | 123.6 | 115.5 | 7.1 | 118.8 | 10.5 | N | PASS | 95 | 97 |
| 86 | SOUTH BERM | 5 | 120.9 | 113.5 | 6.4 | 118.8 | 10.5 | N | PASS | 95 | 95 |
| 87 | NORTH BERM | 4 | 123.2 | 112.1 | 9.6 | 118.8 | 10.5 | N | PASS | 95 | 95 |
| 88 | NORTH BERM | 5 | 123.6 | 113.6 | 8.8 | 118.8 | 10.5 | N | PASS | 95 | 96 |
| 89 | NORTH BERM | 6 | 123.9 | 113.2 | 9.5 | 118.8 | 10.5 | N | PASS | 95 | 95 |

REM ARKS: ALL FAILING TESTS WERE REPORTED IMEDIATELY TO THE CONTRACTOR. FOLLOWED BY CORRECTIVE ACTION AFTER WHICH RETESTS WERE TAKEN UNTIL T UNTIL THE ORIGINALL LY TESTED AREA P ASSED THE SPECIFICATION. REMEDIATION WAS COMPLETED ON 4/8/93.

* N = Nuclear, S = Sand cone

**STEFFEN ROBERTSON AND KIRSTEN**
**Consulting Engineers and Scientists**

DAILY SUMMARY OF FIELD MOISTURE / DENSITY TESTING

JOB.: 58201 DATE: 4/19/93 THRU 4/20/93 

SUBJECT: : CONOCO SAN JUAN GAS PLANT

FEATURE: EVAPORATI ON PONDS ONE AND TWO

| TEST NO. | LOCATION | ELEV. FROM N.G. (FT.) | FIELD TEST WET DEN. (PCF) | FIELD TEST DRY DEN. (PCF) | FIELD TEST MOISTURE % | PROCTOR VALUES MAX. DRY DEN.PCF | PROCTOR VALUES O.M.C. % | TYPE OF TEST * N or S | PASS or FAIL | COMPACTION SPEC. % | COMPACTION RCD. % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 90 | POND ONE WEST BERM | 5 | 121.4 | 112.3 | 8.1 | 118.8 | 10.5 | N | PASS | 95 | 95 |
| 91 | POND ONE SOUTH BERM | 6 | 123.2 | 112.5 | 9.5 | 118.8 | 10.5 | N | PASS | 95 | 95 |
| 92 | POND ONE NORTH BERM | 7 | 121.1 | 113.0 | 7.1 | 118.8 | 10.5 | N | PASS | 95 | 95 |
| 93 | POND ONE WEST BERM | 6 | 124.4 | 112.6 | 10.4 | 118.8 | 10.5 | N | PASS | 95 | 95 |
| 94 | POND ONE WEST BERM | 7 | 126.1 | 113.2 | 11.4 | 118.8 | 10.5 | N | PASS | 95 | 95 |
| 95 | POND TWO BOTTOM S/E CORNER | AT GRADE | 131.8 | 117.9 | 11.8 | 117.3 | 11.6 | N | PASS | 95 | 100 |
| 96 | POND TWO BOTTOM S/W CORNER | AT GRADE | 130.5 | 115.5 | 13.0 | 117.3 | 11.6 | N | PASS | 95 | 98 |
| 97 | POND TWO BOTTOM N/W CORNER | AT GRADE | 134.1 | 120.2 | 11.6 | 117.3 | 11.6 | N | PASS | 95 | 100 |
| 98 | POND TWO BOTTOM CENTER | AT GRADE | 133.4 | 118.2 | 12.9 | 117.3 | 11.6 | N | PASS | 95 | 100 |
| 99 | POND TO BOTTOM N/E CORNER | AT GRADE | 133.5 | 118.8 | 12.3 | 117.3 | 11.6 | N | PASS | 95 | 100 |

REM ARKS: ALL FAILING TESTS WERE REPORTED IMEDIATELY TO THE CONTRACTOR. FOLLOWED BY CORRECTIV E ACTION AFTER WHICH RETESTS WERE TAKEN UNTIL T UNTIL THE ORIGINALL LY TESTED AREA P ASSED THE SPECIFICATION.

* N = Nuclear, S = Sand cone

**STEFFEN ROBERTSON AND KIRSTEN**
**Consulting Engineers and Scientists**

# DAILY SUMMARY OF FIELD MOISTURE / DENSITY TESTING

JOB.: 58201 DATE: 4/29/93 THRU 4/29/93 

SUBJECT: : CONOCO SAN JUAN GAS PLANT

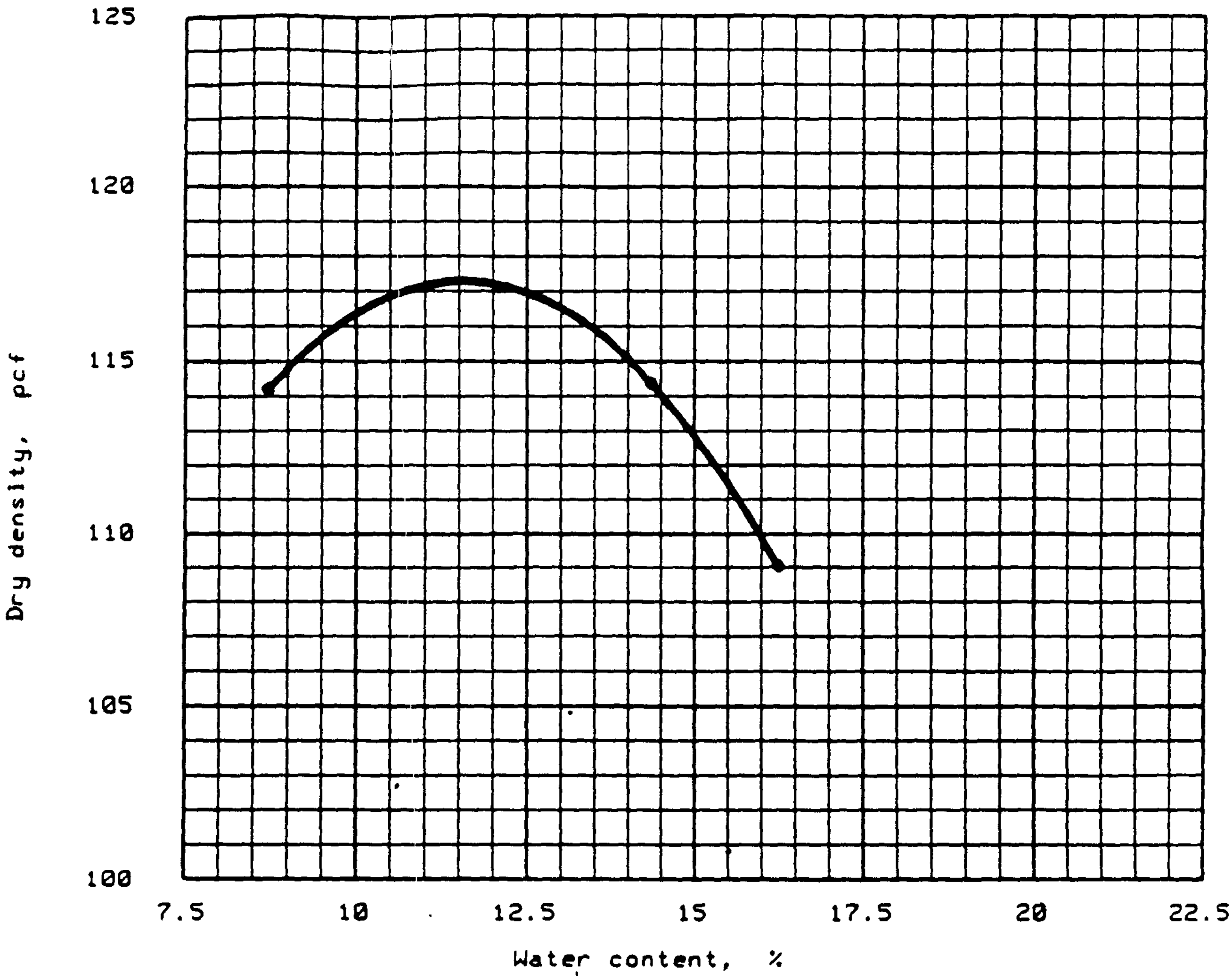
FEATURE: EVAPORATI ON PONDS ONE AND TWO

| TEST NO. | LOCATION | ELEV. FROM N.G. (FT.) | FIELD TEST WET DEN. (PCF) | DRY DEN. (PCF) | MOISTURE % | PROCTOR VALUES MAX. DRY DEN.PCF | O.M.C. % | TYPE OF TEST * N or S | PASS or FAIL | COMPACTION SPEC. % | COMPACTION RCD. % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 100 | POND ONE S/E QUADRANT BOTTOM | GRADE | 131.9 | 121.3 | 8.8 | 118.8 | 10.5 | N | PASS | 95 | 100 |
| 101 | POND ONE S/W QUADRANT BOTTOM | GRADE | 128.0 | 119.9 | 6.8 | 118.8 | 10.5 | N | PASS | 95 | 100 |
| 102 | POND ONE CENTER BOTTOM | GRADE | 117.8 | 111.5 | 5.6 | 117.3 | 11.6 | N | PASS | 95 | 95 |
| 103 | POND ONE N/W QUADRANT BOTTOM | GRADE | 125.3 | 117.9 | 6.3 | 118.8 | 10.5 | N | PASS | 95 | 99 |
| 104 | POND ONE N/E QUADRANT BOTTOM | GRADE | 124.8 | 117.1 | 6.6 | 118.8 | 10.5 | N | PASS | 95 | 99 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

REMARK

* N = Nuclear, S = Sand cone

# PROCTOR TEST REPORT




"Standard" Proctor, ASTM D 698, Method C

| Elev/ Depth | Classification | | Nat. Moist. | Sp.G. | LL | PI | % > 3/4 in | % < No. 200 |
|---|---|---|---|---|---|---|---|---|
| | USCS | AASHTO | | | | | | |
| | | | | | | | | |

| TEST RESULTS | MATERIAL DESCRIPTION |
|---|---|
| Optimum moisture = 11.6 %<br>Maximum dry density = 117.3 pcf | |

Project No.: 58201

Project: CONOCO - SAN JUAN

Location: TP 7-12 COMPOSITE SAMPLE

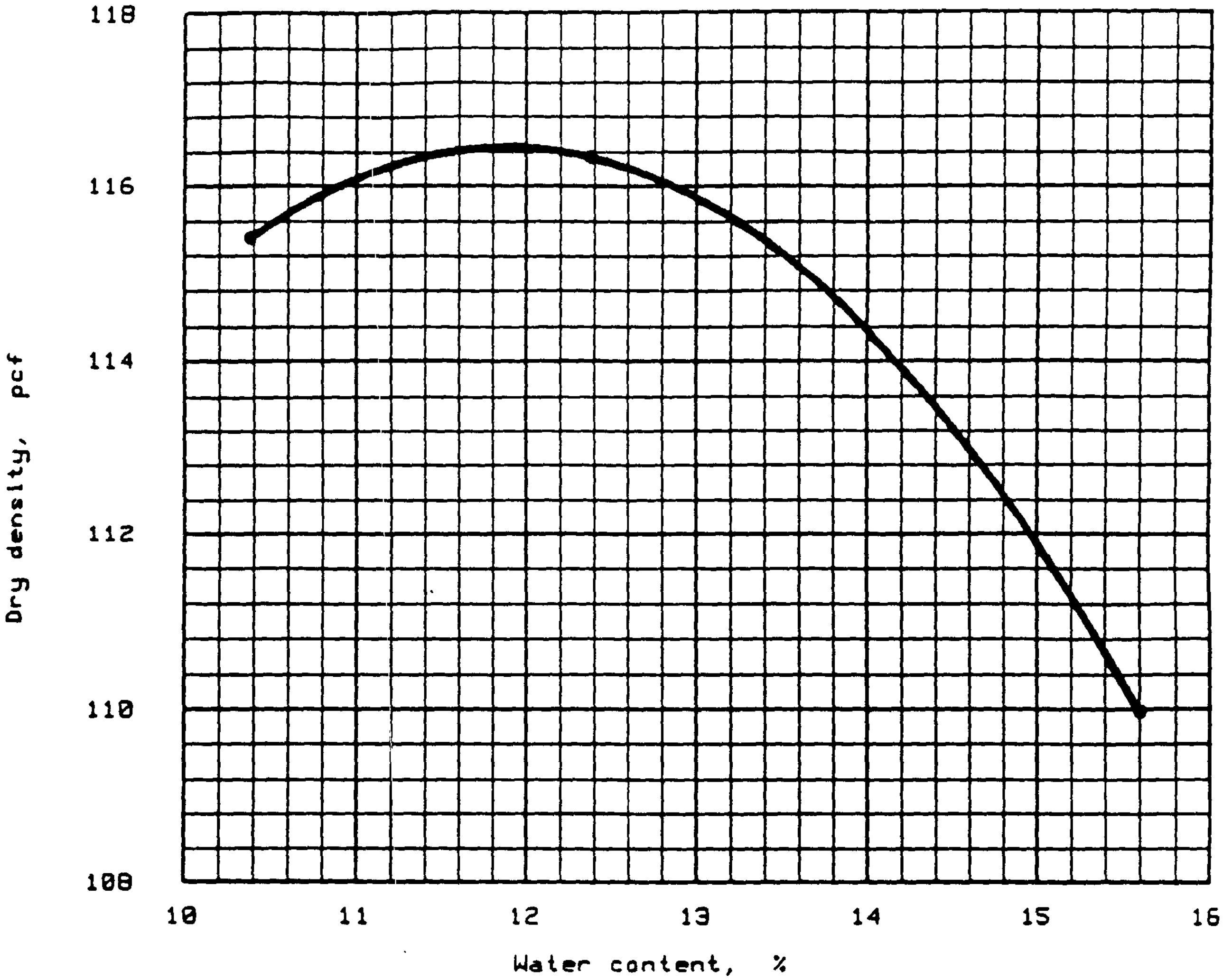
Date: 1-20-1993

PROCTOR TEST REPORT

Remarks:

Figure No. ______

# PROCTOR TEST REPORT




"Standard" Proctor, ASTM D 698, Method C

| Elev/ Depth | Classification USCS | Classification AASHTO | Nat. Moist. | Sp.G. | LL | PI | % > 3/4 in | % < No. 200 |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

| TEST RESULTS | MATERIAL DESCRIPTION |
|---|---|
| Optimum moisture = 11.9 %<br>Maximum dry density = 116.4 pcf | |

Project No.: 58201

Project: CONOCO - SAN JUAN

Location: TP-4,5,6

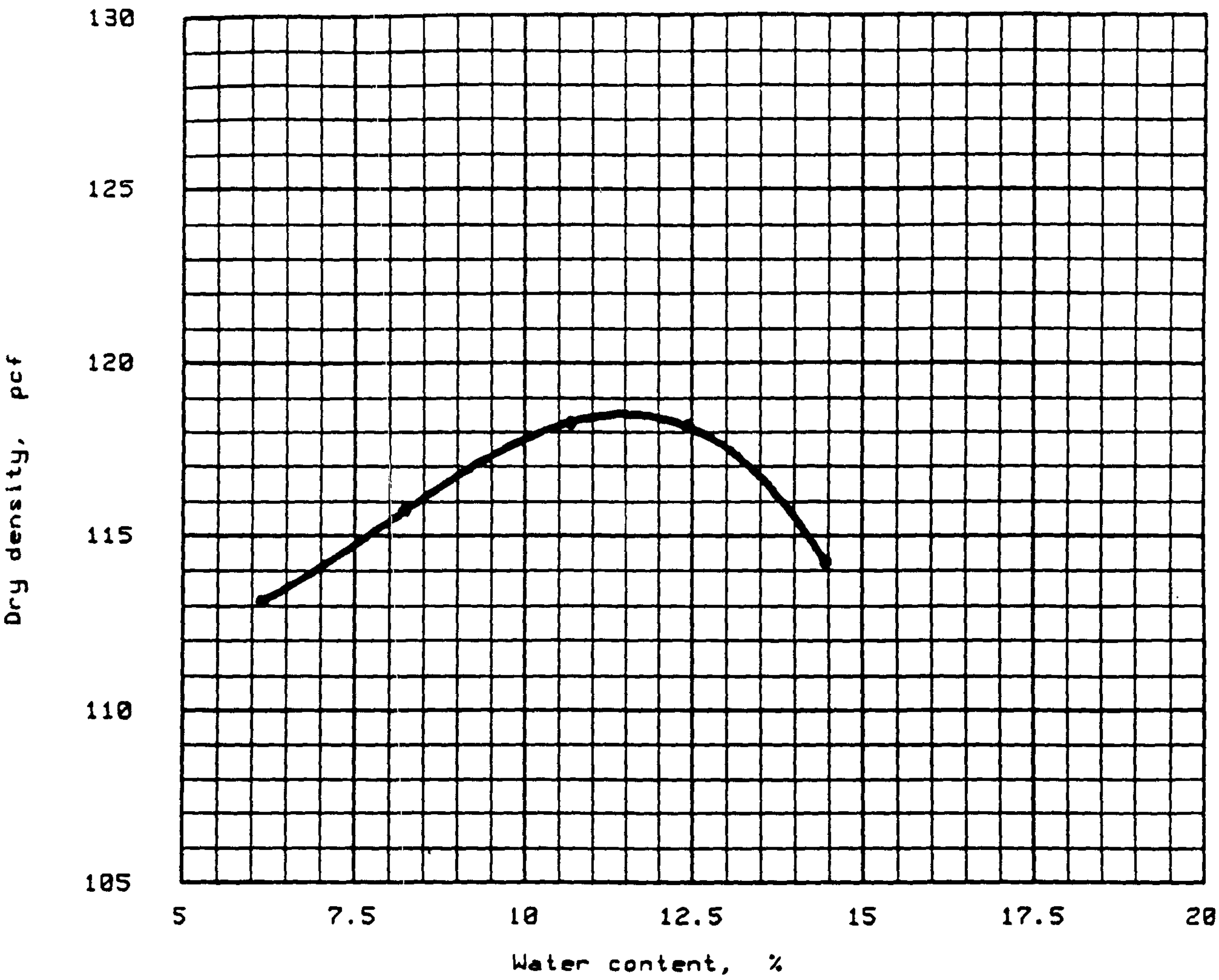
Date: 1-15-1993

PROCTOR TEST REPORT

Remarks:

Figure No. ______

# PROCTOR TEST REPORT




"Standard" Proctor, ASTM D 698, Method C

| Elev/ Depth | Classification | | Nat. Moist. | Sp.G. | LL | PI | % > 3/4 in | % < No. 200 |
|---|---|---|---|---|---|---|---|---|
| | USCS | AASHTO | | | | | | |
| | SM | | | | | | | |

| TEST RESULTS | MATERIAL DESCRIPTION |
|---|---|
| Optimum moisture = 11.5 %<br>Maximum dry density = 118.5 pcf | SILTY SAND WITH CLAY (SC-SM) |

Project No.: 58201

Project: CONOCO - SAN JUAN

Location: TP-2

Date: 1-22-1993

PROCTOR TEST REPORT

Remarks:

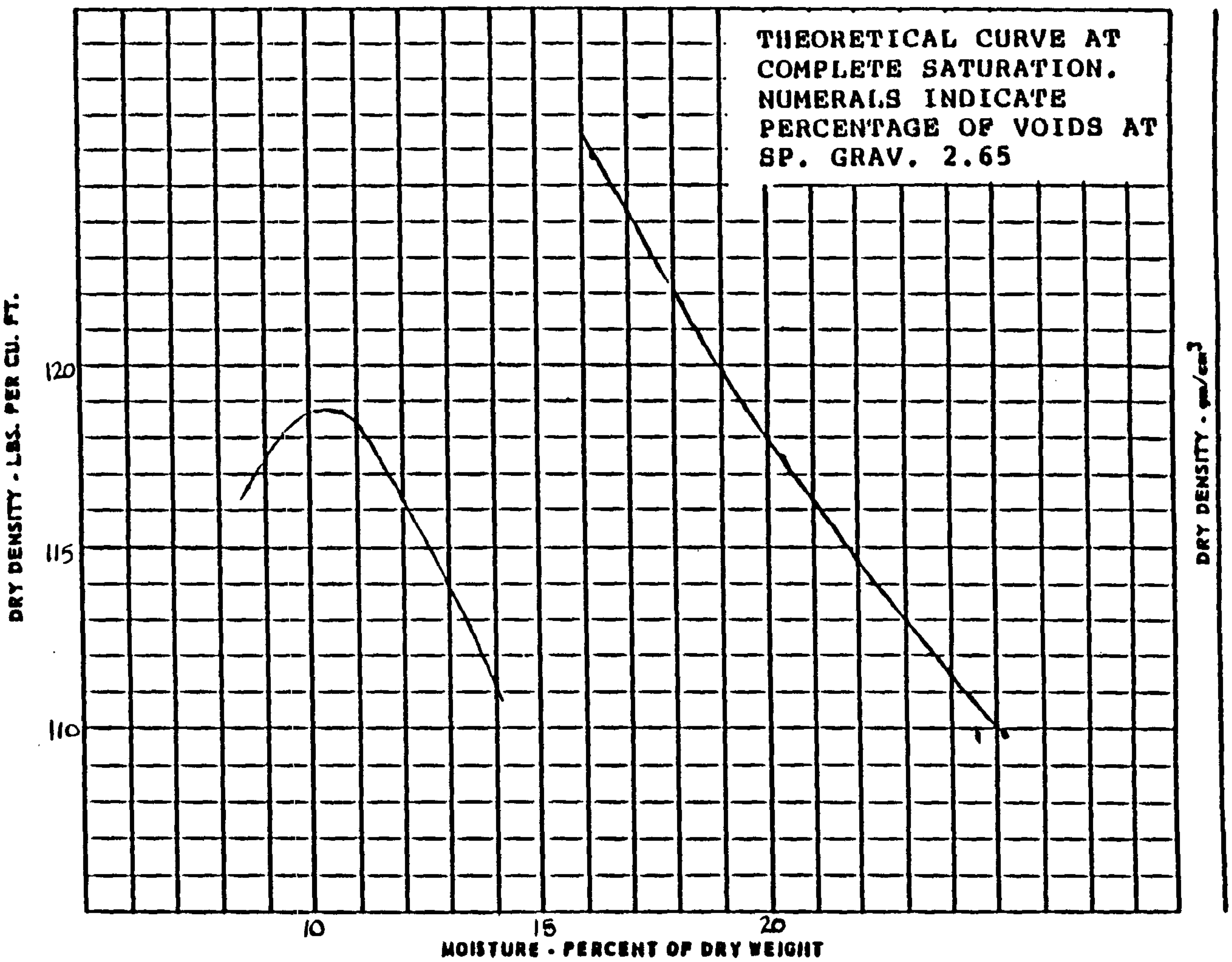
Figure No. ______

605 E. 7th Avenue
Durango, Colorado 81301
(303) 259-4192
(303) 259-5672

# Sundale Associates, Inc.

ENGINEERING AND TESTING

706 W. Apache
Farmington, N.M. 87401
(505) 325-0769




COMPACTION

_____ % Larger than Tested
118.8 Maximum Dry Density - pcf
(_____) Maximum Dry Density - gm/cm³
10.5 Optimum Water Content - %
_____ Penetration Resistance - psi
(_____) Penetration Resistance - kg/cm²

25 Blows per Layer
3 No. of Layers
5.5 Wt. of Hammer - Lb.
12 Ht. of Drop - In.

_____ Soil Classification
_____ Specific Gravity
Notes D698a
Conoco
S.R.K. Inc.
3-9-93

Sample No. 93746 Hole No. _____ Depth 9766 ft. (_____ m)

A WLC Associates, Inc. Company

# Sundale Associates

ENGINEERING AND TESTING

FHWA-278
Rev. 1-8-81

## WORKSHEET FOR MOISTURE-DENSITY RELATIONSHIP (COMPACTION TEST)

Project: Conoco - SRK Inc. Lot: ______ Sublot: ______

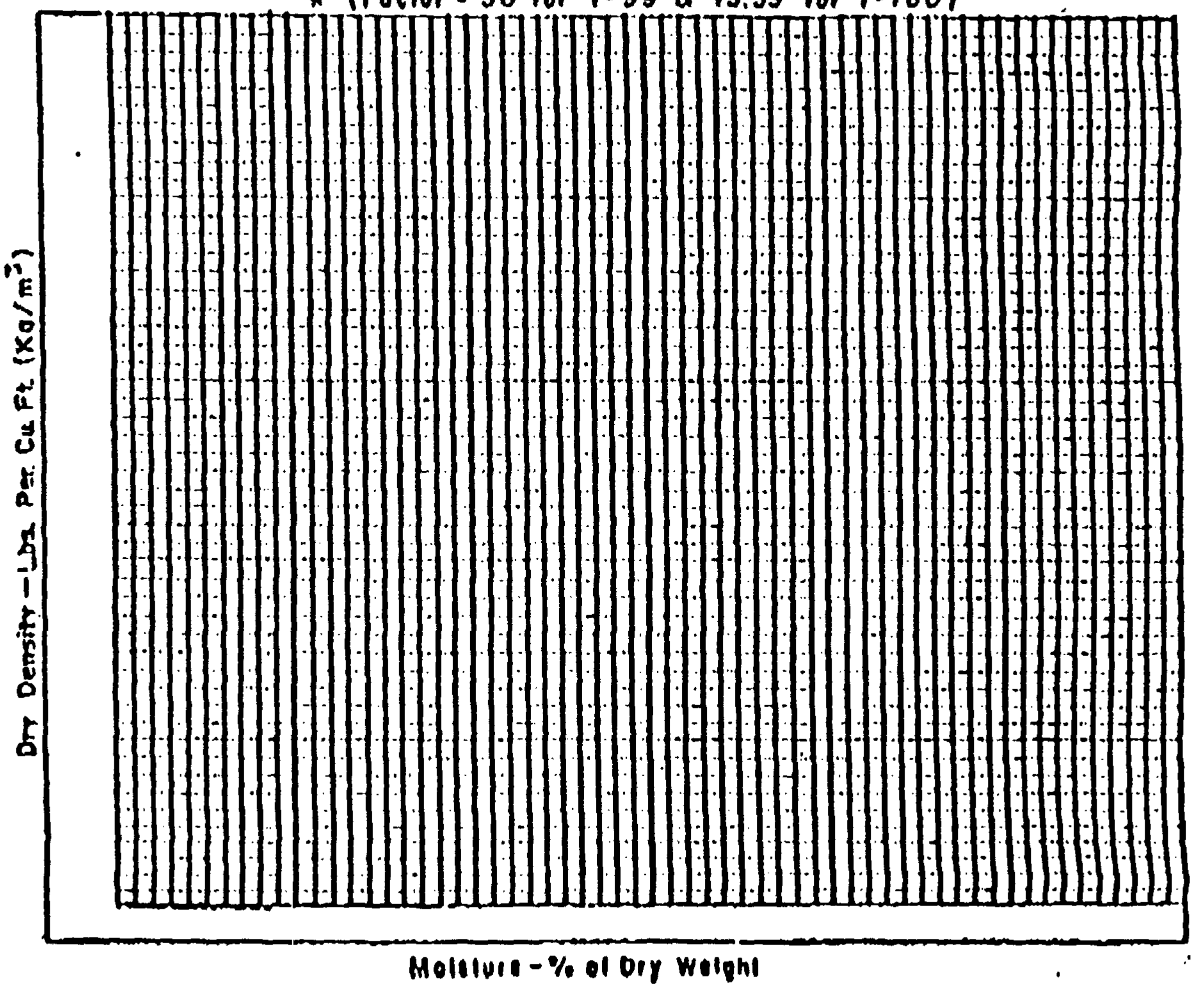
Lab. No.: 93746 Date: 3-9-93 Tested by: dGS Method: D698a

Max. Dry Dens.: 118.8 Optimum Moist.: 10.5 % Spec. Gravity: ______

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Density Determination** | | | | | | | |
| Test No. | 50ml | 100ml | 150ml | 200ml | | | |
| Wet Soil + Tare (a) | 13.25 | 13.41 | 13.37 | 13.25 | | | |
| Mold Tare (b) | 9.03 | 9.03 | 9.03 | 9.03 | | | |
| Wet Wt. (c) = a-b | 4.22 | 4.38 | 4.34 | 4.22 | | | |
| Remarks | .0333 | .0333 | .0333 | .0333 | | | |
| Wet Dens. (d) = c x factor* | 126.7 | 131.5 | 130.3 | 126.7 | | | |
| Dry Dens. (e) = d/(1 + k/100) | 116.7 | 118.8 | 116.3 | 111.2 | | | |
| **Moisture Determination** | | | | | | | |
| Pan No. | | | | | | | |
| Wet Soil Wt. + Tare (f) | 333.1 | 333.0 | 334.1 | 333.4 | | | |
| Dry Soil Wt. + Tare (g) | 306.7 | 300.9 | 298.2 | 292.8 | | | |
| Container Tare (h) | | | | | | | |
| Dry Soil Wt. (i) = g-h | | | | | | | |
| Water Wt. (j) = f-g | 26.4 | 32.1 | 35.9 | 40.6 | | | |
| % Moisture (k) = (j/i) x 100 | 8.6 | 10.7 | 12.0 | 13.9 | | | |

* (Factor = 30 for T-99 & 13.33 for T-180)

Figure 2



# APPENDIX F

## Subgrade Acceptance

STEFFEN ROBERTSON & KIRSTEN (U.S.)
Consulting Engineers & Scientists

PROJECT: CONOCO SAN JUAN GAS PLANT

PROJECT NO. 85201

DATE: 5/3/93 & 5/4/93

## ACCEPTANCE OF SUBGRADE FOR SYNTHETIC LINER INSTALLATION

LOCATION AND SQ. FT.: PANEL No. ALL GEO-CLOTH PANELS Thru No. Approximately: S.F.

POND NO. ONE

COMMENTS (S.R.K. FIELD REP.): Good surface conditions.

LINER INSTALLATION COMPANY: PALCO LINING INC.

LINER INSTALLATION COMPANY REPRESENTATIVE: [signature]

COMMENTS (INSTALLER'S REP.):

S.R.K. FIELD REPRESENTATIVE: [signature] GLENN G. GUYER

SRK FORM L-2

**STEFFEN ROBERTSON & KIRSTEN (U.S.)**
Consulting Engineers & Scientists

**PROJECT** CONOCO SAN JUAN GAS PLANT

**PROJECT NO.** 53-01

**DATE** 1/29/93

## ACCEPTANCE OF SUBGRADE FOR SYNTHETIC LINER INSTALLATION

**LOCATION AND SQ. FT.:** POND NO. 2
PANEL No. 1 Thru No. Approximately: 2500 S.F

**COMMENTS (S.R.K. FIELD REP.):** Material placed over subgrade was 12oz. Geotextile

**NER INSTALLATION COMPANY:** PALCO LININGS, INC.

**LINER INSTALLATION COMPANY REPRESENTATIVE:** [signature]

**COMMENTS (INSTALLER'S REP.):**

**R.K. FIELD REPRESENTATIVE:** [signature]
GLENN G. GUYER

SRK FORM L-2

# APPENDIX G

## Palco Quality Control Documents

**PALCO LININGS, INC.**

**F A C S I M I L E   T R A N S M I S S I O N**

**PALCO WEST FAX NUMBER (714) 891-4937**

TO: RICK FERRECHETTE   DATE: 4/27/93

COMPANY:

FAX NO: 1-303-985-9947

FROM: TIM PURCELL   REF: CONOCO (SRK)

NO. OF PAGES TO FOLLOW: 20

MESSAGE:

ITEMS FOR EVAP. PONDS
REQUESTED BY GLENN GYER

1.) FACTORY LOGS
2.) MAT'L CERTS

7571 Santa Rita Circle • P.O. Box 919 • Stanton, CA 90680 • (714) 898-0867 • FAX #(714) 891-4937
2624 Hamilton Blvd. • P.O. Box 526 • South Plainfield, NJ 07080 • (201) 753-6262 • FAX #(201) 753-5737

QUALITY CONTROL UNWIND LIST

| JOB NUMBER | CUSTOMER NAME | MATERIAL | DATE |
|---|---|---|---|
| 93042 | Conoco | 36-HyP-I G-7650 | 2-12-93 |

| | ROLL NUM | LOT NUM | WEIGHT | LISTED LENGTH | LIN. FEET UNWOUND | WASTE | THICKNESS START | THICKNESS MIDDLE | THICKNESS END | WIDTH |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 540 | 1418 | 1313 | 300 | 893 | 2 | 38 | 36 | 35 | 7600 |
| 2 | 548 | 1418 | 1401 | 300 | 900 | 4 | 38 | 36 | 37 | 75 7/8 |
| 3 | 547 | 1418 | 1384 | 300 | 899 | 2 | 36 | 36 | 36 | 75 3/4 |
| 4 | 553 | 1418 | 1390 | 300 | 912 | 2 | 35 | 38 | 37 | 75 7/8 |
| 5 | 552 | 1418 | 1344 | 300 | 897 | 4 | 35 | 35 | 34 | 75 3/4 |
| 6 | 842 | 2909 | 1288 | 300 | 882 | 8 | 34 | 36 | 36 | 75 1/2 |
| 7 | 188 | 2909 | 1330 | 300 | 890 | 10 | 35 | 34 | 34 | 7600 |
| 8 | 160 | 2909 | 1341 | 300 | 891 | 12 | 35 | 37 | 36 | 75 [illegible] |
| 9 | 175 | 2909 | 1322 | 300 | 869 | 38 | 35 | 34 | 34 | 76 |
| 10 | 174 | 2909 | 1308 | 300 | 899 | 10 | 34 | 34 | 34 | 75 3/4 |
| 11 | 141 | 2909 | 1326 | 300 | 895 | 4 | 35 | 35 | 35 | 76 |
| 12 | 161 | 2909 | 1320 | 300 | 817 | 6 | 34 | 34 | 34 | 75 3/4 |
| 13 | 159 | 2909 | 1348 | 300 | 901 | 2 | 34 | 36 | 36 | 75 7/8 |
| 14 | 171 | 2909 | 1335 | 300 | 903 | 4 | 34 | 35 | 36 | 75 1/2 |
| 15 | 192 | 2909 | 1329 | 300 | 897 | 8 | 35 | 35 | 34 | 75 [illegible] |
| 16 | 172 | 2909 | 1322 | 300 | 889 | 12 | 36 | 35 | 35 | 75 1/2 |
| 17 | 173 | [illegible] | 1331 | 300 | 899 | 4 | 36 | 36 | 36 | 75 |
| 18 | 829 | 2909 | [illegible] | 300 | 881 | 12 | 35 | 36 | 36 | 75 [illegible] |
| 19 | | | | | | | | | | |
| 20 | Lonts | 1806 | + | slice | 107' of | [illegible] | [illegible] | [illegible] | | |
| 21 | | | | | | | | | | |
| 22 | [illegible] | 16[illegible] | | | | | | | | |
| 23 | | | | | | | | | | |
| 24 | | | | | | | | | | |
| 25 | | | | | | | | | | |

Job No. 921106
November 4, 1992

# TABLE 1.
## PALCO WEST QUALITY CONTROL REPORT
## SUPPORTED ROLL GOODS

| 36 | I. G. HYPALON | 10x10 | 3015540 | JPS | 9-24-92 |
|---|---|---|---|---|---|
| Mil(Nom.) | Material | Scrim Type | Roll # | Manufacturer | Date Rec'd. In Inventory |
| 14363 | N/A | 1418 | | Juan | 76.50 |
| Palco PO | Shipment I.D. # | Lot # or Mfg. Date | Date Sent To Lab | Name of Person Sending Sample | Scrim Width |

| | SPECIMENS 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | MEAN | SD | STD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Roll #3015540 Lot #1418 / C #32606** | | | | | | | | | | | | | |
| **Thickness (mils)** | | | | | | | | | | | | | |
| | 36.7 | 36.8 | 36.5 | 37.0 | 36.9 | 36.5 | 36.6 | 36.5 | 36.7 | 36.5 | 36.7 | 0.2 | 34 |
| **Breaking Strength (lbs)** | | | | | | | | | | | | | |
| MD[1] | 255 | 259 | 255 | 274 | 264 | | | | | | 261 | 8 | 200 |
| TD[2] | 260 | 265 | 256 | 271 | 263 | | | | | | 263 | 6 | 200 |
| **Tear Strength- Tongue Method (lbs)** | | | | | | | | | | | | | |
| MD | 89 | 96 | 93 | 106 | 93 | | | | | | 95 | 6 | 60 |
| TD | 70 | 65 | 76 | 72 | 70 | | | | | | 71 | 4 | 60 |
| **Dimensional Stability (percent change)** ( 100°C, 1 hour ) | | | | | | | | | | | | | |
| MD | -0.9 | -0.7 | -0.5 | -0.4 | | | | | | | -0.6 | 0.2 | +/-2 |
| TD | 0.4 | 0.4 | 0.2 | 0.2 | | | | | | | 0.3 | 0.1 | +/-2 |
| **Ply Adhesion (ppi)** | | | | | | | | | | | | | |
| MD | 10.0 | 10.1 | 8.1 | | | | | | | | 9.4 | 1.1 | 7 |
| TD | 10.5 | 9.9 | 9.1 | | | | | | | | 9.8 | 0.7 | 7 |
| **Low Temperature Brittleness (percent passed)** ( -40°C, 4 hours ) | | | | | | | | | | | 60% | | 50 |
| **Mass Per Unit Area** ($lbs/ft^2$) | | | | | | | | | | | | | |
| | 0.239 | 0.238 | 0.233 | | | | | | | | 0.237 | 0.003 | |

1- MACHINE DIRECTION
2- TRANSVERSE DIRECTION

Precision Laboratories
ENVIRONMENTAL • GEOSYNTHETIC TESTING

Job No. 920908
September 29, 1992

# TABLE 1.
## PALCO WEST QUALITY CONTROL REPORT
## SUPPORTED ROLL GOODS

| | | | | | |
|---|---|---|---|---|---|
| 36 | HYPALON XG | 10x10 | 3015689 | IPS | 9-21-92 |
| Mil(Nom.) | Material | Scrim Type | Roll # | Manufacturer | Date Rec'd. in Inventory |
| 14363 | N/A | 1482 | | Juan | 76.50 |
| Palco PO | Shipment I.D. # | Lot # or Mfg. Date | Date Sent To Lab | Name of Person Sending Sample | Scrim Width |

| | SPECIMENS 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | MEAN | SD | STD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Roll #3015689 Lot #1482 / C #31900** | | | | | | | | | | | | | |
| **Thickness (mils)** | | | | | | | | | | | | | |
| | 36.7 | 35.8 | 37.8 | 37.5 | 36.8 | 36.5 | 38.0 | 37.7 | 35.2 | 35.3 | 36.7 | 1.0 | 34 |
| **Breaking Strength (lbs)** | | | | | | | | | | | | | |
| MD[1] | 280 | 301 | 294 | 285 | 300 | | | | | | 292 | 9 | 200 |
| TD[2] | 280 | 297 | 286 | 313 | 296 | | | | | | 294 | 13 | 200 |
| **Tear Strength- Tongue Method (lbs)** | | | | | | | | | | | | | |
| MD | 98 | 101 | 104 | 100 | 104 | | | | | | 101 | 3 | 60 |
| TD | 90 | 84 | 85 | 83 | 84 | | | | | | 85 | 3 | 60 |
| **Dimensional Stability (percent change)** ( 100°C, 1 hour ) | | | | | | | | | | | | | |
| MD | 0.5 | 0.0 | 0.3 | -0.1 | | | | | | | 0.2 | 0.3 | +/-2 |
| TD | 0.6 | 0.6 | 0.7 | 0.5 | | | | | | | 0.6 | 0.1 | +/-2 |
| **Ply Adhesion (ppi)** | | | | | | | | | | | | | |
| MD | 10.8 | 9.6 | 10.1 | | | | | | | | 10.2 | 0.6 | 7 |
| TD | 11.0 | 10.6 | 10.6 | | | | | | | | -10.7 | 0.2 | 7 |
| **Low Temperature Brittleness (percent passed)** ( -40°C, 4 hours ) | | | | | | | | | | | 100% | | 50 |
| **Mass Per Unit Area (lbs/ $ft^2$)** | | | | | | | | | | | | | |
| | 0.232 | 0.233 | 0.234 | | | | | | | | 0.233 | 0.001 | |

1- MACHINE DIRECTION
2- TRANSVERSE DIRECTION

Precision Laboratories
ENVIRONMENTAL • GEOSYNTHETIC TESTING

Job No. 930059
February 17, 1993

**TABLE 1.**
**PALCO WEST QUALITY CONTROL REPORT**
**SUPPORTED ROLL GOODS**

| Mil(Nom.) | Material | Scrim Type | Roll # | Manufacturer | Date Rec'd. In inventory |
|---|---|---|---|---|---|
| 36 | I.G. Hypalon | 10 x 10 | 4034160 | JPS | 2-12-93 |

| Palco PO | Shipment I.D. # | Lot # or Mfg. Date | Date Sent To Lab | Name of Person Sending Sample | Scrim Width |
|---|---|---|---|---|---|
| 14372 | N/A | 2909 | | JUAN | 76.50 |

| | SPECIMENS 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | MEAN | SD | STD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Roll #4034160 Lot #2909 / C #33437** | | | | | | | | | | | | | |
| **Thickness (mils)** | | | | | | | | | | | | | |
| | 36.8 | 36.9 | 35.9 | 36.3 | 36.7 | 37.1 | 37.9 | 37.2 | 37.3 | 37.8 | 37.0 | 0.6 | 34 |
| **Breaking Strength (lbs)** | | | | | | | | | | | | | |
| MD[1] | 273 | 316 | 300 | 312 | 308 | | | | | | 302 | 17 | 200 |
| TD[2] | 285 | 304 | 293 | 283 | 297 | | | | | | 292 | 9 | 200 |
| **Tear Strength- Tongue Method (lbs)** | | | | | | | | | | | | | |
| MD | 100 | 99 | 108 | 105 | 102 | | | | | | 103 | 4 | 60 |
| TD | 84 | 84 | 91 | 93 | 89 | | | | | | 88 | 4 | 60 |
| **Dimensional Stability (percent change) ( 100°C, 1 hour )** | | | | | | | | | | | | | |
| MD | -0.40 | -0.30 | -0.30 | -0.20 | | | | | | | -0.30 | 0.08 | +/-2 |
| TD | 0.40 | 0.30 | 0.40 | 0.30 | | | | | | | 0.35 | 0.06 | +/-2 |
| **Ply Adhesion (lbs/in-width)** | | | | | | | | | | | | | |
| MD | 8.0 | 9.0 | 8.0 | | | | | | | | 8.3 | 0.6 | 7 |
| TD | 12.5 | 9.6 | 9.8 | | | | | | | | 10.6 | 1.6 | 7 |
| **Low Temperature Brittleness (percent passed) ( -40°C, 4 hours )** | | | | | | | | | | | 100% | | 50 |
| **Mass Per Unit Area (lbs/ $ft^2$)** | | | | | | | | | | | | | |
| | 0.227 | 0.235 | 0.237 | | | | | | | | 0.233 | 0.005 | |

1- MACHINE DIRECTION
2- TRANSVERSE DIRECTION

Job No. 930059
February 17, 1993

**TABLE 2.**
**PALCO WEST QUALITY CONTROL REPORT**
**SUPPORTED ROLL GOODS**

| | | | | | |
|---|---|---|---|---|---|
| 36 | I.G. Hypalon | 10 x 10 | 4034188 | IPS | 2-12-93 |
| Mil(Nom.) | Material | Scrim Type | Roll # | Manufacturer | Date Rec'd. In Inventory |
| 14372 | N/A | 2909 | | JUAN | 76.50 |
| Palco PO | Shipment I.D. # | Lot # or Mfg. Date | Date Sent To Lab | Name of Person Sending Sample | Scrim Width |

| | SPECIMENS 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | MEAN | SD | STD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Roll #4034188 Lot #2909 / C #33438** | | | | | | | | | | | | | |
| **Thickness (mils)** | | | | | | | | | | | | | |
| | 38.0 | 37.3 | 37.7 | 37.4 | 37.3 | 37.1 | 36.8 | 37.2 | 38.1 | 37.4 | 37.4 | 0.4 | 34 |
| **Breaking Strength (lbs)** | | | | | | | | | | | | | |
| MD[1] | 301 | 292 | 301 | 278 | 296 | | | | | | 294 | 10 | 200 |
| TD[2] | 283 | 275 | 267 | 281 | 311 | | | | | | 283 | 17 | 200 |
| **Tear Strength- Tongue Method (lbs)** | | | | | | | | | | | | | |
| MD | 101 | 99 | 108 | 112 | 112 | | | | | | 106 | 6 | 60 |
| TD | 91 | 88 | 92 | 90 | 96 | | | | | | 91 | 3 | 60 |
| **Dimensional Stability (percent change) ( 100°C, 1 hour )** | | | | | | | | | | | | | |
| MD | -0.10 | -0.20 | -0.20 | -0.20 | | | | | | | -0.18 | 0.05 | +/-2 |
| TD | 0.40 | 0.30 | 0.40 | 0.60 | | | | | | | 0.42 | 0.12 | +/-2 |
| **Ply Adhesion (lbs/in-width)** | | | | | | | | | | | | | |
| MD | 7.9 | 8.1 | 7.0 | | | | | | | | 7.7 | 0.6 | 7 |
| TD | 8.8 | 8.2 | 9.0 | | | | | | | | 8.7 | 0.4 | 7 |
| **Low Temperature Brittleness (percent passed) ( -40°C, 4 hours )** | | | | | | | | | | | 100% | | 50 |
| **Mass Per Unit Area (lbs/ $ft^2$)** | | | | | | | | | | | | | |
| | 0.239 | 0.242 | 0.242 | | | | | | | | 0.241 | 0.002 | |

1- MACHINE DIRECTION
2- TRANSVERSE DIRECTION

Job No. 930059
February 17, 1993

# TABLE 3.
## PALCO WEST QUALITY CONTROL REPORT
## SUPPORTED ROLL GOODS

| | | | | | |
|---|---|---|---|---|---|
| 36 | I.G. Hypalon | 10 x 10 | 5032842 | JPS | 2-12-93 |
| Mil(Nom.) | Material | Scrim Type | Roll # | Manufacturer | Date Rec'd. in inventory |
| 14372 | N/A | 2909 | | JUAN | 76.80 |
| Palco PO | Shipment I.D. # | Lot # or Mfg. Date | Date Sent To Lab | Name of Person Sending Sample | Scrim Width |

| SPECIMENS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | MEAN | SD | STD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Roll #5032842 Lot #2909 / C #33439** | | | | | | | | | | | | | |
| **Thickness (mils)** | | | | | | | | | | | | | |
| | 37.2 | 37.3 | 37.2 | 37.1 | 37.5 | 36.5 | 37.0 | 36.2 | 36.6 | 36.8 | 36.9 | 0.4 | 34 |
| **Breaking Strength (lbs)** | | | | | | | | | | | | | |
| MD[1] | 272 | 288 | 296 | 291 | 253 | | | | | | 280 | 18 | 200 |
| TD[2] | 301 | 267 | 275 | 270 | 263 | | | | | | 275 | 15 | 200 |
| **Tear Strength- Tongue Method (lbs)** | | | | | | | | | | | | | |
| MD | 83 | 92 | 91 | 108 | 87 | | | | | | 92 | 10 | 60 |
| TD | 85 | 78 | 90 | 81 | 83 | | | | | | 83 | 5 | 60 |
| **Dimensional Stability (percent change)** ( 100°C, 1 hour ) | | | | | | | | | | | | | |
| MD | -0.20 | -0.30 | -0.10 | -0.20 | | | | | | | -0.20 | 0.08 | +/-2 |
| TD | 0.30 | 0.20 | 0.30 | 0.30 | | | | | | | 0.28 | 0.05 | +/-2 |
| **Ply Adhesion (lbs/in-width)** | | | | | | | | | | | | | |
| MD | 7.8 | 8.0 | 7.1 | | | | | | | | 7.6 | 0.5 | 7 |
| TD | 10.0 | 9.8 | 10.0 | | | | | | | | 9.9 | 0.1 | 7 |
| **Low Temperature Brittleness (percent passed)** ( -40°C, 4 hours ) | | | | | | | | | | | 100% | | 50 |
| **Mass Per Unit Area** ($lbs/ft^2$) | | | | | | | | | | | | | |
| | 0.232 | 0.237 | 0.234 | | | | | | | | 0.234 | 0.003 | |

1- MACHINE DIRECTION
2- TRANSVERSE DIRECTION

# TABLE 3.
# PALCO WEST QUALITY CONTROL REPORT
# SUPPORTED ROLL GOODS

| Mil(Nom.) | Material | Scrim Type | Roll # | Manufacturer | Date Rec'd. In Inventory |
|---|---|---|---|---|---|
| 36 | IND.HYP | 10x10 | 5016079 | IPS | 9-21-92 |

| Palco PO | Shipment I.D. # | Lot # or Mfg. Date | Date Sent To Lab | Name of Person Sending Sample | Scrim Width |
|---|---|---|---|---|---|
| 14363 | N/A | 1482 | | Juan | 76.50 |

| | SPECIMENS 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | MEAN | SD | STD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Roll #5016079 Lot #1482 / C #31902** | | | | | | | | | | | | | |
| **Thickness (mils)** | | | | | | | | | | | | | 3Y |
| | 36.0 | 35.8 | 36.0 | 36.0 | 36.2 | 35.5 | 34.0 | 34.6 | 34.5 | 35.4 | 35.4 | 0.8 | 41 |
| **Breaking Strength (lbs)** | | | | | | | | | | | | | |
| MD[1] | 294 | 292 | 269 | 278 | 273 | | | | | | 281 | 11 | 200 |
| TD[2] | 299 | 283 | 287 | 271 | 273 | | | | | | 283 | 11 | 200 |
| **Tear Strength- Tongue Method (lbs)** | | | | | | | | | | | | | |
| MD | 120 | 116 | 135 | 116 | 118 | | | | | | 121 | 8 | 60 |
| TD | 102 | 112 | 104 | 114 | 108 | | | | | | 108 | 5 | 60 |
| **Dimensional Stability (percent change)** ( 100°C, 1 hour ) | | | | | | | | | | | | | |
| MD | -0.1 | -0.1 | 0.0 | -0.1 | | | | | | | -0.1 | 0.1 | +/-2 |
| TD | 0.1 | 0.1 | 0.1 | 0.3 | | | | | | | 0.2 | 0.1 | +/-2 |
| **Ply Adhesion (ppi)** | | | | | | | | | | | | | |
| MD | 8.8 | 8.8 | 7.9 | | | | | | | | 8.5 | 0.5 | 7 |
| TD | 9.4 | 10.6 | 9.9 | | | | | | | | 10.0 | 0.6 | 7 |
| **Low Temperature Brittleness (percent passed)** ( -40°C, 4 hours ) | | | | | | | | | | | 80% | | 50 |
| **Mass Per Unit Area (lbs/ ft²)** | | | | | | | | | | | | | |
| | 0.233 | 0.228 | 0.232 | | | | | | | | 0.231 | 0.003 | |

1- MACHINE DIRECTION
2- TRANSVERSE DIRECTION

Precision Laboratories
ENVIRONMENTAL • GEOSYNTHETIC TESTING

Job No. 920908
September 29, 1992

## TABLE 2
## PALCO WEST QUALITY CONTROL REPORT
## SUPPORTED ROLL GOODS

| 36 | HYPALON 10 | 10x10 | 4018485 | JPS | 9-21-92 |
|---|---|---|---|---|---|
| Mil(Nom.) | Material | Scrim Type | Roll # | Manufacturer | Date Rec'd. in Inventory |
| 14363 | N/A | 1482 | | Juan | 76.50 |
| Palco PO | Shipment I.D. # | Lot # or Mfg. Date | Date Sent To Lab | Name of Person Sending Sample | Scrim Width |

| | SPECIMENS 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | MEAN | SD | STD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Roll #4018485 Lot #1482 / C #31901** | | | | | | | | | | | | | |
| **Thickness (mils)** | | | | | | | | | | | | | |
| | 35.8 | 35.6 | 35.2 | 35.6 | 35.1 | 35.8 | 35.0 | 34.8 | 35.7 | 35.4 | 35.4 | 0.4 | 34 |
| **Breaking Strength (lbs)** | | | | | | | | | | | | | |
| MD[1] | 292 | 272 | 292 | 271 | 291 | | | | | | 284 | 11 | 200 |
| TD[2] | 309 | 300 | 294 | 273 | 300 | | | | | | 295 | 14 | 200 |
| **Tear Strength- Tongue Method (lbs)** | | | | | | | | | | | | | |
| MD | 104 | 103 | 96 | 95 | 106 | | | | | | 101 | 5 | 60 |
| TD | 72 | 76 | 94 | 86 | 77 | | | | | | 81 | 9 | 60 |
| **Dimensional Stability (percent change)** (100°C, 1 hour) | | | | | | | | | | | | | |
| MD | -0.1 | -0.1 | 0.0 | -0.2 | | | | | | | -0.1 | 0.1 | +/-2 |
| TD | 0.2 | 0.4 | 0.7 | 0.5 | | | | | | | 0.5 | 0.2 | +/-2 |
| **Ply Adhesion (ppi)** | | | | | | | | | | | | | |
| MD | 9.0 | 8.7 | 10.0 | | | | | | | | 9.2 | 0.7 | 7 |
| TD | 10.9 | 11.3 | 10.4 | | | | | | | | 10.9 | 0.5 | 7 |
| **Low Temperature Brittleness (percent passed)** (-40°C, 4 hours) | | | | | | | | | | | 60% | | 50 |
| **Mass Per Unit Area (lbs/ $ft^2$)** | | | | | | | | | | | | | |
| | 0.223 | 0.224 | 0.225 | | | | | | | | 0.224 | 0.001 | |

1- MACHINE DIRECTION
2- TRANSVERSE DIRECTION

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**TABLE 1.**

**SAMPLE # 1**
**PALCO LININGS FACTORY SEAM TEST**
**SUPPORTED MATERIAL**

**Precision Reference: Job No. 930062**
**Material Control No. 33440**

**February 16, 1993**

Machine: 1

Operator: MT

Inspector: GG

Heat Time: 1-1/4

Cool Time: 1/2

Amps: 5

Bar Temp: --

Date: 2/15/93 Time: 9:00

Job No: W93042

Job Name: CONOCO (SRK)

Pass #: 6

Panel #: 2.5

Material: HYP LG

Thickness: 36

Lot #: --

**BONDED SEAM STRENGTH**
**ASTM D751**
**(As modified by NSF-54, 1991)**

| | LOAD (lbs) | BREAK TYPE |
|---|---|---|
| 1. | 308 | FTB |
| 2. | 317 | FTB |
| | 288 | FTB |
| 4. | 259 | FTB |
| 5. | 273 | FTB |
| AVG: | 289 | FTB |
| SD: | 24 | |

min. 160 lbs.

**SEAM PEEL ADHESION**
**ASTM D413**
**(As modified by NSF-54, 1991)**

| | LOAD (lbs/in-width) | BREAK TYPE |
|---|---|---|
| 1. | 33.0 | FTB |
| 2. | 27.5 | FTB |
| 3. | 28.0 | FTB |
| 4. | 31.5 | FTB |
| 5. | 27.2 | FTB |
| AVG: | 29.4 | FTB |
| SD: | 2.6 | |

SPEC. ~~10 min.~~
in plane of
scrim 10 lb./in.

**TABLE 1.**

**SAMPLE # 1**
**PALCO LININGS FACTORY SEAM TEST**
**SUPPORTED MATERIAL**

**Precision Reference: Job No. 930064** — **February 17, 1993**
**Material Control No. 33450**

Machine: 1
Operator: MT
Inspector: GG
Heat Time: 1-1/4
Cool Time: 1/2
Amps: 5
Bar Temp: --

Date: 2/16/93 Time: 10:30
Job No: W93042
Job Name: CONOCO (SRK)
Pass #: 9
Panel #: 6, 7
Material: HYP LG.
Thickness: 36
Lot #: --

**BONDED SEAM STRENGTH**
**ASTM D751**
**(As modified by NSF-54, 1991)**

| | LOAD (lbs) | BREAK TYPE |
|---|---|---|
| 1 | 312 | FTB |
| 2 | 292 | FTB |
| | 310 | FTB |
| 4 | 327 | FTB |
| 5 | 316 | FTB |
| AVG: | 311 | FTB |
| SD: | 13 | |

min 150 lbs.

**SEAM PEEL ADHESION**
**ASTM D413**
**(As modified by NSF-54, 1991)**

| | LOAD (lbs/in-width) | BREAK TYPE |
|---|---|---|
| 1 | 33.8 | FTB |
| 2 | 29.2 | FTB |
| 3 | 26.0 | FTB |
| 4 | 25.8 | PEEL |
| 5 | 28.0 | FTB |
| AVG: | 28.6 | FTB(4) |
| SD: | 3.3 | PEEL(1) |

min 10 lb./in.

**TABLE 2.**

**SAMPLE # 2**
**PALCO LININGS FACTORY SEAM TEST**
**SUPPORTED MATERIAL**

Precision Reference: Job No. 930062
Material Control No. 33441

February 16, 1993

| | | | |
|---|---|---|---|
| Machine: | 1 | Date: | 02/15/93 Time: 1:45 |
| Operator: | MT | Job No: | 93042 |
| Inspector: | GG | Job Name: | CONOCO |
| Heat Time: | 1-1/4 | Pass #: | 7 |
| Cool Time: | 1/2 | Panel #: | 3, 4 |
| Amps: | 5 | Material: | HYPALON |
| Bar Temp: | -- | Thickness: | 36 |
| | | Lot #: | -- |

**BONDED SEAM STRENGTH**
**ASTM D751**
**(As modified by NSF-54, 1991)**

| | LOAD (lbs) | BREAK TYPE |
|---|---|---|
| 1. | 308 | FTB |
| 2. | 309 | FTB |
| 3. | 284 | FTB |
| 4. | 254 | FTB |
| 5. | 290 | FTB |
| AVG: | 289 | FTB |
| SD: | 22 | |

min. 150 lbs.

**SEAM PEEL ADHESION**
**ASTM D413**
**(As modified by NSF-54, 1991)**

| | LOAD (lbs/in-width) | BREAK TYPE |
|---|---|---|
| 1. | 31.0 | FTB |
| 2. | 27.8 | FTB |
| 3. | 28.5 | FTB |
| 4. | 30.5 | FTB |
| 5. | 31.0 | FTB |
| AVG: | 29.8 | FTB |
| SD: | 1.5 | |

10 lb/in

**TABLE 2.**

**SAMPLE # 2**
**PALCO LININGS FACTORY SEAM TEST**
**SUPPORTED MATERIAL**

**Precision Reference: Job No. 930064** **February 17, 1993**
**Material Control No. 33451**

| | | | |
|---|---|---|---|
| Machine: | 1 | Date: 02/16/93 | Time: 1:00 |
| Operator: | MT | Job No: | W93042 |
| Inspector: | GG | Job Name: | CONOCO (SRK) |
| Heat Time: | 1-1/4 | Pass #: | 6 |
| Cool Time: | 1/2 | Panel #: | 8, 9 |
| Amps: | 5 | Material: | HYP LG. |
| Bar Temp: | -- | Thickness: | 36 |
| | | Lot #: | -- |

**BONDED SEAM STRENGTH**
**ASTM D751**
**(As modified by NSF-54, 1991)**

| | LOAD (lbs) | BREAK TYPE |
|---|---|---|
| 1. | 321 | FTB |
| 2. | 326 | FTB |
| 3. | 325 | FTB |
| 4. | 311 | FTB |
| 5. | 303 | FTB |
| AVG: | 317 | FTB |
| SD: | 10 | |

min. 160 lbs.

**SEAM PEEL ADHESION**
**ASTM D413**
**(As modified by NSF-54, 1991)**

| | LOAD (lbs/in-width) | BREAK TYPE |
|---|---|---|
| 1. | 25.1 | FTB |
| 2. | 25.0 | FTB |
| 3. | 24.0 | FTB |
| 4. | 24.0 | FTB |
| 5. | 24.0 | FTB |
| AVG: | 24.4 | FTB |
| SD: | 0.6 | |

min 19 lbs/in.

## QUALITY CONTROL UNWIND LIST

| JOB NUMBER | CUSTOMER NAME | MATERIAL | DATE |
|---|---|---|---|
| W93042 | CONOCO | 30 PVC N8500 | 2-11-93 |

| | ROLL NUM | LOT NUM | WEIGHT | LISTED LENGTH | LIN. FEET UNWOUND | WASTE | THICKNESS START | THICKNESS MIDDLE | THICKNESS END | WIDTH |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 8 | 94L | 1310 | | 984 | 5 | 28 | 28 | 28 | 85.25 |
| 2 | 18 | 94L | 1300 | | 982 | 2 | 28 | 28 | 28 | 85.25 |
| 3 | 29 | 94L | 1292 | | 980 | 4 | 28 | 28 | 28 | 85 1/8 |
| 4 | 4 | 94L | 1300 | | 972 | 13 | 28 | 28 | 28 | 85.1/8 |
| 5 | 16 | 94L | 1310 | | 984 | 2 | 28 | 28 | 28 | 85 1/4 |
| 6 | 31 | 94L | 1284 | | 982 | 2 | 28 | 28 | 28 | 85.1/8 |
| 7 | 7 | 94L | 1308 | | 982 | 2 | 28 | 28 | 28 | 85 1/4 |
| 8 | 24 | 94L | 1304 | | 980 | 2 | 28 | 28 | 28 | 85 1/4 |
| 9 | 14 | 94L | 1310 | | 956 | 32 | 28 | 28 | 28 | 85.00 |
| 10 | 23 | 94L | 1304 | | 978 | 5 | 28 | 28 | 28 | 85.00 |
| 11 | 33 | 94L | 1296 | | 980 | 2 | 28 | 28 | 28 | 85.00 |
| 12 | 28 | 94L | 1290 | | 979 | 2 | 28 | 28 | 28 | 85.1/4 |
| 13 | 15 | 94L | 1312 | | 980 | 2 | 28 | 28 | 28 | 85.00 |
| 14 | 9 | 94L | 1314 | | 984 | 2 | 28 | 28 | 28 | 85.00 |
| 15 | Lede | 1303 | + | slice | 108' | of | Roll stock in half | | | |
| 16 | 19 | 94 | 1306 | | 981 | 2 | 28 | 28 | 28 | 85 1/4 |
| 17 | | | | | | | | | | |
| 18 | | | | | | | | | | |
| 19 | | | | | | | | | | |
| 20 | | | | | | | | | | |
| 21 | | | | | | | | | | |
| 22 | | | | | | | | | | |
| 23 | | | | | | | | | | |
| 24 | | | | | | | | | | |
| | | | | | | | | | | |

# NAN YA PLASTICS CORPORATION, AMERICA

**SPEC:** 30 GA

**TEST REPORT**

**CUSTOMER:** ROCHEUX CA 02
**DESCRIPTION:** .762M/M X 85"
**ORDER:** F2A0063-1 **PVC SHEET FOR POND LINER** **DATE:** 10-21-92
**P.O. #:** W12494L

| PROPERTY | TEST METHOD | REQUIRED | | RESULTS ROLL NUMBERS #1 | #10 | #20 | #30 |
|---|---|---|---|---|---|---|---|
| Spec. Grav. | ASTM D792 | 1.20 & Up | | 1.25 | 1.25 | 1.24 | 1.25 |
| Thickness | ASTM D1592 | 28.5 & Up | | 28.8 | 29.0 | 30.1 | 29.5 |
| 100% MOD LB/IN | ASTM D882 (Method B) | 30 & Up | MD | 40.89 | 42.36 | 41.54 | 42.78 |
| | | 24 | CD | 38.44 | 39.71 | 39.12 | 40.01 |
| Tensile Strength LB/IN | ASTM D882 (Method B) | 69 & Up | MD | 90.61 | 92.54 | 92.81 | 95.33 |
| | | | CD | 83.64 | 86.72 | 87.49 | 85.28 |
| Elongation % | ASTM D882 (Method A) | 325 & Up | MD | 479.2 | 460.7 | 449.3 | 464.5 |
| | | 300 | CD | 500.1 | 512.5 | 506.9 | 498.2 |
| Graves Tear LB | ASTM D1004 | 8 & Up | MD | 10.00 | 10.33 | 10.21 | 10.55 |
| | | | CD | 9.753 | 9.441 | 10.07 | 9.882 |
| Water Extract % | ASTM D3083 | -0.25 & Down<br>-0.35 | | -0.19 | -0.22 | -0.21 | -0.21 |
| Volatility % | ASTM D1203 | -0.7 & Down | | -0.64 | -0.69 | -0.67 | -0.68 |
| Cold Crack °C | ASTM D1790 | -29 & Down | | PASS | PASS | PASS | PASS |
| Shrinkage % | ASTM D1204 | -5 & Down | | -2.8 | -2.62 | -2.54 | -2.60 |
| Resistance to Soil Burial | ASTM D3082 | | | )Formulation Used )Previously )Satisfactorily | | | |
| Alkali Resistance | CRD-C872-74 | | | | | | |

APPROVED BY Sunny Liao

Job No. 921079
October 30, 1992

# TABLE 1
## PALCO EAST QUALITY CONTROL REPORT
## UNSUPPORTED ROLL GOODS

| Mil (Nominal) | Material | Manufacturer | Roll # | Date Rec'd. In Inventory |
|---|---|---|---|---|
| 30 | PVC | Nanya | 1 | 10/19/92 |

| Palco PO | Shipment I.D. # | Lot # or Mfg. Date | Date Sent To Lab | Name of Person Sending Sample | Roll Width |
|---|---|---|---|---|---|
| 14367 | N/A | W12494L | | Juan | 85.00 |

| SPECIMENS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | MEAN | SD | STD | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Roll #1 Lot #W12494L / C #32512** | | | | | | | | | | | | | | |
| **Thickness (mils)** | | | | | | | | | | | | | | |
| | 28.9 | 29.0 | 28.6 | 28.4 | 28.7 | 28.5 | 28.3 | 28.6 | 28.8 | 29.1 | 28.7 | 0.3 | 28.5 | – |
| **Tensile Properties:** | | | | | | | | | | | | | | |
| **Breaking Strength (ppi)** | | | | | | | | | | | | | | |
| MD[1] | 88.7 | 95.1 | 85.5 | 89.2 | 81.0 | | | | | | 87.9 | 5.2 | 69 | min. |
| TD[2] | 85.1 | 79.4 | 85.0 | 84.9 | 85.0 | | | | | | 83.9 | 2.5 | 69 | |
| **Elongation at Break (percent)** | | | | | | | | | | | | | | |
| MD | 497 | 554 | 500 | 529 | 451 | | | | | | 506 | 39 | 300 | – |
| TD | 526 | 535 | 565 | 540 | 577 | | | | | | 549 | 21 | 300 | |
| **Modulus @ 100% Elongation (ppi)** | | | | | | | | | | | | | | |
| MD | 38.1 | 40.1 | 37.9 | 37.1 | 38.7 | | | | | | 38.4 | 1.1 | 27 | – |
| TD | 35.2 | 34.6 | 34.4 | 36.2 | 35.6 | | | | | | 35.2 | 0.7 | 27 | |
| **Tear Resistance (lbs)** | | | | | | | | | | | | | | |
| MD | 9.3 | 10.4 | 9.0 | 9.7 | 9.3 | 9.2 | 10.2 | 9.2 | 9.6 | 9.2 | 9.5 | 0.5 | 8 | – |
| TD | 9.1 | 8.4 | 9.4 | 9.1 | 9.3 | 9.3 | 8.8 | 9.0 | 8.7 | 8.4 | 9.0 | 0.4 | 8 | |
| **Dimensional Stability (percent)** | | | | | | | | | | | | | | |
| MD | -0.6 | -0.6 | -0.1 | -0.2 | | | | | | | -0.4 | 0.3 | +/-5 | 5% |
| TD | 0.8 | 0.5 | 0.5 | 0.5 | | | | | | | 0.6 | 0.2 | +/-5 | Max |
| **Low Temperature Brittleness (percent passed)** ( 10 specimens for 15 min. @ -29°C ) | | | | | | | | | | | 80% | | 50 | |
| **Mass Per Unit Area (lbs/ ft²)** | | | | | | | | | | | | | | |
| | 0.187 | 0.187 | 0.186 | | | | | | | | 0.187 | 0.001 | | |

1- MACHINE DIRECTION
2- TRANSVERSE DIRECTION

Precision Laboratories
ENVIRONMENTAL • GEOSYNTHETIC TESTING

Job No. 921079
October 30, 1992

# TABLE 2
# PALCO EAST QUALITY CONTROL REPORT
# UNSUPPORTED ROLL GOODS

| | | | | |
|---|---|---|---|---|
| 30 | PVC | Nanya | 10 | 10/19/92 |
| Mil (Nominal) | Material | Manufacturer | Roll # | Date Rec'd. In Inventory |

| | | | | | |
|---|---|---|---|---|---|
| 14367 | N/A | W12494L | | Juan | 85.00 |
| Palco PO | Shipment I.D. # | Lot # or Mfg. Date | Date Sent To Lab | Name of Person Sending Sample | Roll Width |

| | SPECIMENS | | | | | | | | | | MEAN | SD | STD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | | |
| **Roll #10 Lot #W12494L / C #32513** | | | | | | | | | | | | | |
| **Thickness (mils)** | | | | | | | | | | | | | |
| | 28.3 | 28.6 | 28.3 | 28.5 | 28.7 | 28.6 | 29.0 | 28.9 | 28.8 | 28.6 | 28.6 | 0.2 | 28.5 |
| **Tensile Properties:** | | | | | | | | | | | | | |
| **Breaking Strength (ppi)** | | | | | | | | | | | | | |
| MD[1] | 89.5 | 90.3 | 89.4 | 89.8 | 83.7 | | | | | | 88.5 | 2.7 | 69 |
| TD[2] | 82.7 | 86.2 | 91.0 | 78.5 | 77.7 | | | | | | 83.2 | 5.5 | 69 |
| **Elongation at Break (percent)** | | | | | | | | | | | | | |
| MD | 471 | 497 | 523 | 524 | 447 | | | | | | 492 | 33 | 300 |
| TD | 535 | 558 | 588 | 463 | 527 | | | | | | 534 | 46 | 300 |
| **Modulus @ 100% Elongation (ppi)** | | | | | | | | | | | | | |
| MD | 40.7 | 40.9 | 39.2 | 36.6 | 39.2 | | | | | | 39.3 | 1.7 | 27 |
| TD | 34.2 | 33.8 | 35.5 | 37.1 | 34.7 | | | | | | 35.1 | 1.3 | 27 |
| **Tear Resistance (lbs)** | | | | | | | | | | | | | |
| MD | 9.0 | 8.4 | 8.9 | 9.0 | 9.0 | 9.2 | 8.3 | 9.2 | 9.9 | 8.9 | 9.0 | 0.4 | 8 |
| TD | 9.8 | 8.7 | 9.8 | 9.4 | 8.6 | 9.0 | 10.3 | 8.8 | 10.2 | 9.3 | 9.4 | 0.6 | 8 |
| **Dimensional Stability (percent)** | | | | | | | | | | | | | |
| MD | -0.4 | -0.2 | -0.5 | -0.6 | | | | | | | -0.4 | 0.2 | +/-5 |
| TD | 0.2 | 0.2 | 0.1 | 0.2 | | | | | | | 0.2 | 0.1 | +/-5 |
| **Low Temperature Brittleness (percent passed)** ( 10 specimens for 15 min. @ -29°C ) | | | | | | | | | | | 90% | | 50 |
| **Mass Per Unit Area ($lbs/ft^2$)** | | | | | | | | | | | | | |
| | 0.188 | 0.187 | 0.186 | | | | | | | | 0.187 | 0.001 | |

1- MACHINE DIRECTION
2- TRANSVERSE DIRECTION

Precision Laboratories

Job No. 921079
October 30, 1992

# TABLE 3
## PALCO EAST QUALITY CONTROL REPORT
## UNSUPPORTED ROLL GOODS

| | | | | | |
|---|---|---|---|---|---|
| 30 | PVC | Nanya | 20 | 10/19/92 | |
| Mil (Nominal) | Material | Manufacturer | Roll # | Date Rec'd. In Inventory | |
| 14367 | N/A | W12494L | | Juan | 85.00 |
| Palco PO | Shipment I.D. # | Lot # or Mfg. Date | Date Sent To Lab | Name of Person Sending Sample | Roll Width |

| | SPECIMENS 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | MEAN | SD | STD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Roll #20 Lot #W12494L / C #32514** | | | | | | | | | | | | | |
| **Thickness (mils)** | | | | | | | | | | | | | |
| | 29.4 | 29.1 | 28.9 | 29.1 | 29.3 | 29.2 | 29.0 | 29.0 | 29.0 | 29.2 | 29.1 | 0.2 | 28.5 |
| **Tensile Properties:** | | | | | | | | | | | | | |
| **Breaking Strength (ppi)** | | | | | | | | | | | | | |
| MD[1] | 86.1 | 82.3 | 84.6 | 80.7 | 75.2 | | | | | | 81.8 | 4.2 | 69 |
| TD[2] | 73.7 | 83.0 | 81.6 | 85.3 | 78.0 | | | | | | 80.3 | 4.6 | 69 |
| **Elongation at Break (percent)** | | | | | | | | | | | | | |
| MD | 537 | 541 | 548 | 533 | 471 | | | | | | 526 | 31 | 300 |
| TD | 573 | 594 | 613 | 597 | 516 | | | | | | 579 | 38 | 300 |
| **Modulus @ 100% Elongation (ppi)** | | | | | | | | | | | | | |
| MD | 35.3 | 32.5 | 33.1 | 32.7 | 33.3 | | | | | | 33.4 | 1.1 | 27 |
| TD | 26.8 | 30.8 | 31.3 | 31.9 | 33.0 | | | | | | 30.8 | 2.4 | 27 |
| **Tear Resistance (lbs)** | | | | | | | | | | | | | |
| MD | 8.6 | 8.4 | 8.5 | 8.4 | 8.4 | 8.3 | 8.7 | 8.4 | 8.7 | 8.0 | 8.4 | 0.2 | 8 |
| TD | 8.0 | 7.6 | 9.2 | 8.6 | 7.7 | 7.7 | 8.1 | 8.3 | 8.1 | 7.9 | 8.1 | 0.5 | 8 |
| **Dimensional Stability (percent)** | | | | | | | | | | | | | |
| MD | -0.4 | -0.1 | -0.2 | -0.6 | | | | | | | -0.3 | 0.2 | +/-5 |
| TD | 0.2 | 0.2 | 0.4 | 0.1 | | | | | | | 0.2 | 0.1 | +/-5 |
| **Low Temperature Brittleness (percent passed)** ( 10 specimens for 15 min. @ -29°C ) | | | | | | | | | | | 90% | | 50 |
| **Mass Per Unit Area (lbs/ ft²)** | | | | | | | | | | | | | |
| | 0.186 | 0.190 | 0.189 | | | | | | | | 0.188 | 0.002 | |

1- MACHINE DIRECTION
2- TRANSVERSE DIRECTION

Precision Laboratories
ENVIRONMENTAL • GEOSYNTHETIC TESTING

Job No. 921079
October 30, 1992

# TABLE 4
## PALCO EAST QUALITY CONTROL REPORT
## UNSUPPORTED ROLL GOODS

| 30 | PVC | Nanya | 30 | 10/19/92 |
|---|---|---|---|---|
| Mil (Nominal) | Material | Manufacturer | Roll # | Date Rec'd. In Inventory |

| 14367 | N/A | W12494L | | Juan | 85.00 |
|---|---|---|---|---|---|
| Palco PO | Shipment I.D. # | Lot # or Mfg. Date | Date Sent To Lab | Name of Person Sending Sample | Roll Width |

| SPECIMENS | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | MEAN | SD | STD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Roll #30 Lot #W12494L / C #32515** | | | | | | | | | | | | | |
| **Thickness (mils)** | | | | | | | | | | | | | |
| | 29.0 | 28.8 | 28.8 | 28.9 | 29.0 | 29.1 | 29.0 | 28.9 | 28.8 | 29.0 | 28.9 | 0.1 | 28.5 |
| **Tensile Properties:** | | | | | | | | | | | | | |
| **Breaking Strength (ppi)** | | | | | | | | | | | | | |
| MD[1] | 86.5 | 82.6 | 88.1 | 83.8 | 75.0 | | | | | | 83.2 | 5.1 | 69 |
| TD[2] | 77.2 | 73.2 | 79.9 | 80.6 | 79.3 | | | | | | 78.0 | 3.0 | 69 |
| **Elongation at Break (percent)** | | | | | | | | | | | | | |
| MD | 552 | 521 | 554 | 499 | 456 | | | | | | 516 | 41 | 300 |
| TD | 586 | 542 | 576 | 588 | 568 | | | | | | 572 | 19 | 300 |
| **Modulus @ 100% Elongation (ppi)** | | | | | | | | | | | | | |
| MD | 33.6 | 34.4 | 36.1 | 35.5 | 33.3 | | | | | | 34.6 | 1.2 | 27 |
| TD | 29.1 | 29.3 | 32.2 | 30.7 | 31.5 | | | | | | 30.6 | 1.4 | 27 |
| **Tear Resistance (lbs)** | | | | | | | | | | | | | |
| MD | 8.0 | 8.1 | 8.9 | 8.1 | 8.5 | 8.0 | 8.2 | 8.6 | 7.7 | 8.1 | 8.2 | 0.3 | 8 |
| TD | 9.0 | 8.1 | 9.1 | 8.2 | 8.8 | 9.0 | 8.5 | 8.4 | 8.4 | 9.1 | 8.7 | 0.4 | 8 |
| **Dimensional Stability (percent)** | | | | | | | | | | | | | |
| MD | -0.4 | -0.3 | -0.2 | -0.3 | | | | | | | -0.3 | 0.1 | +/-5 |
| TD | 0.2 | 0.3 | 0.4 | 0.1 | | | | | | | 0.3 | 0.1 | +/-5 |
| **Low Temperature Brittleness (percent passed)** ( 10 specimens for 15 min. @ -29°C ) | | | | | | | | | | | 90% | | 50 |
| **Mass Per Unit Area (lbs/ ft²)** | | | | | | | | | | | | | |
| | 0.187 | 0.189 | 0.187 | | | | | | | | 0.188 | 0.001 | |

1- MACHINE DIRECTION
2- TRANSVERSE DIRECTION

Precision Laboratories
ENVIRONMENTAL • GEOSYNTHETIC TESTING

## TABLE 1.

**SAMPLE # 1**

**PALCO LININGS FACTORY SEAM TEST**

**UNSUPPORTED MATERIAL**

Precision Reference: Job No. 930060
Material Control No. 33440

February 16, 1993

| | | | |
|---|---|---|---|
| Machine: | 1 | Date: | 02/12/93 Time: 9:00 |
| Operator: | MT | Job No: | W93042 |
| Inspector: | GG | Job Name: | CONOCO (SRK) |
| Heat Time: | 3/4 | Pass #: | 9 |
| Cool Time: | 1/4 | Panel #: | 1, 2, 3 |
| Amps: | 5 | Material: | PVC |
| Bar Temp: | -- | Thickness: | 30 |
| | | Lot #: | -- |

**BONDED SEAM STRENGTH**
**ASTM D3083**
**(As modified by NSF-54, 1991)**

spec. Value 55.2

| | LOAD (lbs/in-width) | BREAK TYPE |
|---|---|---|
| 1. | 58 | FTB |
| 2. | 52 | FTB |
| 3. | 57 | FTB |
| 4. | 56 | FTB |
| 5. | 56 | FTB |
| AVG: | 56 | FTB |
| SD: | 2 | |

**SEAM PEEL ADHESION**
**ASTM D413**
**(As modified by NSF-54, 1991)**

spec. Value 10

| | LOAD (lbs/in-width) | BREAK TYPE |
|---|---|---|
| 1. | 36.5 | FTB |
| 2. | 35.0 | FTB |
| 3. | 33.5 | FTB |
| 4. | 36.0 | FTB |
| 5. | 34.1 | FTB |
| AVG: | 35.0 | FTB |
| SD: | 1.3 | |

# APPENDIX H

## Destructive Sample Test Results

**STEFFEN ROBERTSON AND KIRSTEN**
**Consulting Engineers and Scientists**

SUMMARY OF DESTRUCTIVE TEST RESULTS

JOB.: 58201 DATE: 5/7/93

SUBJECT: CONOCO'S SAN JUAN GAS PLANT

FEATURE: POND ONE AREA SOIL CONTAMINATION REMEDIATION EVAPORATION PONDS ONE AND TWO

| LAB. SAMPLE NO. | DESTRUCTIVE SAMPLE NO. | MATERIAL TYPE | PEEL | | | | SHEAR | |
|---|---|---|---|---|---|---|---|---|
| | | | MIL THICKNESS | AVG. LBS./INCH BREAK | PARALLEL WELD AVG. LBS./INCH BREAK | SPECIFIED LBS./INCH BREAK | AVG. LBS./INCH BREAK | SPECIFIED LBS./INCH BREAK |
| 1 | P1-1/2 | PVC | 29.0 | 25.4 | NA | 10.0 | 52.5 | 55.2 |
| 2 | P2-1/2 | PVC | 29.0 | 24.4 | NA | 10.0 | 57.8 | 55.2 |
| 3 | H1-1/2 | HYPALON | 34.0 | 22.3 | NA | 10.0 | 195.0 | 160.0 |
| 4 | H2-1/2 | HYPALON | 37.0 | 21.4 | NA | 10.0 | 260.6 | 160.0 |

REMARKS: ALL SAMPLES TESTE BROKE AT FILM TEAR BOND.

D

| STEFFEN ROBERTSON & KIRSTEN<br>Consulting Engineers & Scientists | Project: CONOCO<br>Job No.: SB201<br>Material Type: PVC |
|---|---|

## DESTRUCTIVE TEST RESULTS

Date Installed:
Date Tested: 5-3-93
Tested By: SJH

Destructive Sample No.: POND NO. 2
Sample NO. 1 P2-1/2

| | min. | 1 | 2 | 3 | 4 | 5 | MEAN | SD |
|---|---|---|---|---|---|---|---|---|
| **Thickness:** | | | | | | | | |
| Top (IN) | 0.0285 | 0.029 | 0.029 | 0.029 | 0.029 | 0.029 | 0.029 | |
| Bottom (IN) | | 0.029 | 0.028 | 0.029 | 0.029 | 0.029 | 0.029 | |
| **Bonded Seam Strength:** | min. | | | | | | | |
| Load (ppi) | 55.2 | 56.2 | 64.2 | 55.0 | 54.9 | 58.5 | 57.8 | |
| Break Type | | BRK FTB | BRK FTB | BRK FTB | BRK FTB | BRK FTB | | |
| **Seam Peel Adhesion:** | min. | | | | | | | |
| Load (ppi) | 10 | 24.8 | 22.3 | 25.2 | 19.8 | 30.0 | 24.4 | |
| Break Type | | AD-BRK FTB | AD NON-FTB | SE FTB | AD-BRK FTB | AD-BRK FTB | | |

Date Installed:
Date Tested:
Tested By:

Destructive Sample No.:

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| **Thickness:** | | | | | |
| Top | | | | | |
| Bottom | | | | | |
| **Bonded Seam Strength:** | | | | | |
| Load (ppi) | | | | | |
| Break Type | | | | | |
| **Seam Peel Adhesion:** | | | | | |
| Load (ppi) | | | | | |
| Break Type | | | | | |

25.- 15.4 16.7

23.4 21.6 11.-

**STEFFEN ROBERTSON & KIRSTEN**
**Consulting Engineers & Scientists**

Project: CODOCO
Job No.: 58201
Material Type: HYP-A-LON

## DESTRUCTIVE TEST RESULTS

Date Installed: 5/3/93
Date Tested: 5/5/93
Tested By: STEVE HERSEY

Destructive Sample No.: H2 - 1/2
SAMPLE NO. 2

| | | 1 | 2 | 3 | 4 | 5 | MEAN | SD |
|---|---|---|---|---|---|---|---|---|
| **Thickness:** | | | | | | | | |
| Top | min. 34 mil | 0.037 | | 0.037 | 0.037 | 0.037 | | |
| Bottom | | 0.035 | | 0.038 | 0.036 | 0.036 | | |
| **Bonded Seam Strength:** (SAMPLE WIDTH = 2") | | | | | | | | |
| Load (ppl) | min. 160 lbs. | 276.1 | 281.9 | 273.7 | 223.8 | 247.7 | 260.6 | 24.4 |
| Break Type | | FTB | FTB | FTB | FTB | FTB | | |
| **Seam Peel Adhesion:** | | | | | | | | |
| Load (ppl) | min. 10 lbs/in. | 18.1 | 18.2 | 25.4 | 19.1 | 26.1 | 21.4 | 4.0 |
| Break Type | | AD - NON FTB | AD NON-FTB | AD NON-FTB | AD NON-FTB | AD NON-FTB | | |

Date Installed:
Date Tested:
Tested By:

Destructive Sample No.:

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| **Thickness:** | | | | | |
| Top | | | | | |
| Bottom | | | | | |
| **Bonded Seam Strength:** | | | | | |
| Load (ppi) | | | | | |
| Break Type | | | | | |
| **Seam Peel Adhesion:** | | | | | |
| Load (ppl) | | | | | |
| Break Type | | | | | |

| STEFFEN ROBERTSON & KIRSTEN<br>Consulting Engineers & Scientists | Project: CONOCO<br>Job No.: 58201<br>Material Type: PVC |
|---|---|

## DESTRUCTIVE TEST RESULTS

Date Installed: 5/3/93
Date Tested: 5/7/93
Tested By: STEVE HERSEY

Destructive Sample No.: P1 - 1/2
SAMPLE NO. 3

| | min. | 1 | 2 | 3 | 4 | 5 | MEAN | SD |
|---|---|---|---|---|---|---|---|---|
| **Thickness:** | | | | | | | | |
| Top | 0.0285 | 0.029 | 0.029 | 0.029 | 0.029 | 0.029 | 0.029 | |
| Bottom | | 0.029 | 0.029 | 0.029 | 0.029 | 0.030 | 0.029 | |
| **Bonded Seam Strength:** | min. | | | | | | | |
| Load (ppi) | 55.2 | 50.2 | 53.1 | 51.2 | 52.1 | 55.7 | 52.5 | 2.1 |
| Break Type | | FTB | FTB | FTB | FTB | FTB | | |
| **Seam Peel Adhesion:** | min | | | | | | | |
| Load (ppi) | 10 | 23.2 | 24.0 | 24.5 | 25.7 | 27.5 | 25.4 | 1.8 |
| Break Type | | AD-BRK FTB | AD-BRK FTB | AD-BRK FTB | AD-BRK FTB | AD-BRK FTB | | |

Date Installed:
Date Tested:
Tested By:

Destructive Sample No.:

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| **Thickness:** | | | | | |
| Top | | | | | |
| Bottom | | | | | |
| **Bonded Seam Strength:** | | | | | |
| Load (ppi) | | | | | |
| Break Type | | | | | |
| **Seam Peel Adhesion:** | | | | | |
| Load (ppi) | | | | | |
| Break Type | | | | | |

**STEFFEN ROBERTSON & KIRSTEN**
**Consulting Engineers & Scientists**

Project: Conoco
Job No.: 58201
Material Type: HYP-A-LON

## DESTRUCTIVE TEST RESULTS

Date Installed: 5/7/93
Date Tested: 5/12/93
Tested By: SJH

Destructive Sample No.: H1 - 1/2
SAMPLE NO. 4

| | | 1 | 2 | 3 | 4 | 5 | MEAN | SD |
|---|---|---|---|---|---|---|---|---|
| Thickness: | min. | | | | | | | |
| Top | 0.034 | 0.034 | 0.034 | 0.034 | 0.035 | 0.035 | 0.0344 | |
| Bottom | | 0.034 | 0.034 | 0.034 | 0.034 | 0.034 | 0.034 | |
| Bonded Seam Strength: SAMPLE 2in WIDE, RATE 12in/min | | | | | | | | |
| Load (ppi) | min. 160 lbs | 221.6 | 196.7 | 194.5 | 186.6 | 175.7 | 195.0 | 17.0 |
| Break Type | | FTB | FTB | FTB | FTB | FTB | | |
| Seam Peel Adhesion: | | | | | | | | |
| Load (ppi) | min. 10 lbs/in. | 23.0 | 24.5 | 20.1 | 19.1 | 24.8 | 22.3 | 2.6 |
| Break Type | | AD-BRK FTB | AD-BRK FTB | AD-BRK FTB | AD-BRK FTB | AD-BRK FTB | | |

Date Installed:
Date Tested:
Tested By:

Destructive Sample No.:

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Thickness: | | | | | |
| Top | | | | | |
| Bottom | | | | | |
| Bonded Seam Strength: | | | | | |
| Load (ppi) | | | | | |
| Break Type | | | | | |
| Seam Peel Adhesion: | | | | | |
| Load (ppi) | | | | | |
| Break Type | | | | | |

# APPENDIX I

## Geomembrane Quantities

**STEFFEN ROBERTSON & KIRSTEN**
**Consulting Engineers & Scientists**

## GEOTEXTILE QUANTITY RECEIVED

JOB NO. 58201



SUBJECT: CONOCO'S SAN JUAN GAS PLANT

DATE RECEIVED: 2/22/93 & 4/1/93

GEOTEXTILE
Manufacturer: Quline

| NO. OF ROLLS | LOT OR BATCH NO. | ROLL WEIGHT | LENGTH (FEET) | WIDTH (FEET) | SQUARE FEET | DATE Q.C. DOC. RECEIVED | DATE Q.A. SAMPLE SENT | DATE Q.A. RESULTS RECEIVED |
|---|---|---|---|---|---|---|---|---|
| 17 | 0 | 0 | 300.0 | 20.0 | 102000.0 | NA | NA | NA |
| 2 | 0 | 0 | 300.0 | 20.0 | 6000.0 | | | |
| | | | | | | | | |
| | | | | | | | | |
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| | | | | | | | | |
| | | | | | | | | |

Checked By: GGG

Total Square Footage =108000

**STEFFEN ROBERTSON & KIRSTEN**
**Consulting Engineers & Scientists**

Quantity

GEONET RECEIVED



JOB NO. 58201
SUBJECT: CONOCO'S SAN JUAN GAS PLANT
DATE RECEIVED: 2/22/93

TENSAR GEONET
Manufacturer: PALCO LINGS INC.
Weight (oz/sq yd): NA

| NO. OF ROLLS | LOT OR BATCH NO. | ROLL WEIGHT | LENGTH (METERS) | WIDTH (METERS) | SQUARE METERS | DATE Q.C. DOC. RECEIVED | DATE Q.A. SAMPLE SENT | DATE Q.A. RESULTS RECEIVED |
|---|---|---|---|---|---|---|---|---|
| 161 | NS140590 | NA | 19.0 | 7.0 | 9321.9 | NA | NA | NA |
| | | | | | 100332.0 SQ. FT. | | | |
| | | | | | | | | |
| | | | | | | | | |
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| | | | | | | | | |
| | | | | | | | | |
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| | | | | | | | | |

Checked By: GGG    Total Square Footage :100332

Received

**STEFFEN ROBERTSON & KIRSTEN**
**Consulting Engineers & Scientists**

GEOMEMBRANE QUANTITIES ACCEPTED

JOB NO. 58201 PAGE 1 OF 1

SUBJECT: CONOCO'S SAN JUAN GAS PLANT

DATE RECEIVED: 2/22/93

PVC GEOMEMBRANE

| ROLL NUMBER | LOT OR BATCH NO. | ROLL WEIGHT | LENGTH (FEET) | WIDTH (FEET) | SQUARE FEET | DATE Q.C. DOC. RECEIVED | DATE Q.A. SAMPLE SENT | DATE Q.A. RESULTS RECEIVED |
|---|---|---|---|---|---|---|---|---|
| P 1-1 | NA | NA | 200.0 | 77.0 | 15400.0 | 04/29/93 | NA | NA |
| P 1-2 | NA | NA | 225.0 | 70.0 | 15750.0 | 04/28/93 | | |
| P 1-3 | NA | NA | 230.0 | 77.0 | 17710.0 | 04/28/93 | | |
| P 2-1 | NA | NA | 214.0 | 73.5 | 15729.0 | 04/28/93 | | |
| P 2-2 | NA | NA | 214.0 | 70.0 | 14980.0 | 04/28/93 | | |
| P 2-3 | NA | NA | 218.0 | 70.0 | 15260.0 | 04/28/93 | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

Checked By: GGG Total Square Footage =94829

Received

**STEFFEN ROBERTSON & KIRSTEN**
**Consulting Engineers & Scientists**

GEOMEMBRANE QUANTITIES DEPLOYED



JOB NO. 58201
SUBJECT: CONOCO' SAN JUAN GAS PLANT
DATE RECEIVED: 2/22/93

HYPALON GEOMEMBRANE

| ROLL NUMBER | LOT OR BATCH NO. | ROLL WEIGHT | LENGTH (FEET) | WIDTH (FEET) | SQUARE FEET | DATE Q.C. DOC. RECEIVED | DATE Q.A. SAMPLE SENT | DATE Q.A. RESULTS RECEIVED |
|---|---|---|---|---|---|---|---|---|
| H 1-1 | 93042 | NA | 198.0 | 56.1 | 11101.9 | 04/28/93 | NA | NA |
| H 1-2 | 93042 | NA | 224.0 | 56.1 | 12559.7 | 04/28/93 | | |
| H 1-3 | 93042 | NA | 224.0 | 56.1 | 12559.7 | 04/28/93 | | |
| H 1-4 | 93042 | NA | 227.0 | 56.1 | 12727.9 | 04/28/93 | | |
| H 2-1 | 93042 | NA | 213.0 | 56.1 | 11942.9 | 04/28/93 | | |
| H 2-2 | 93042 | NA | 213.0 | 53.0 | 11280.5 | 04/28/93 | | |
| H 2-3 | 93042 | NA | 213.0 | 49.8 | 10615.9 | 04/28/93 | | |
| H 2-4 | 93042 | NA | 216.0 | 56.1 | 12111.1 | 04/28/93 | | |
| H 3-1 | 93042 | NA | 76.0 | 21.8 | 1657.6 | 04/28/93 | | |
| | | | | | | | | |

Checked By: GGG

Total Squar re Footage =96557

STEFFEN ROBERTSON & KIRSTEN
Consulting Engineers & Scientists

# GEOMEMBRANE ACCEPTANCE QUANTITIES

JOB NO. 58201



SUBJECT: CONOCO'S SAN JUAN GAS PLANT

PVC GEOMEMBRANE
Thickness : 30 mil

HYPALON GEOSYNTHETIC
Thickness : 36 Mil

| PANEL NUMBER | DATE DEPLOYED | LENGTH (FEET) | WIDTH (FEET) | TOTAL SQ. FT. | CUMULATIVE SQ.FT. | TOTAL LENGTH OF SEAMS (FT.) | REMARKS |
|---|---|---|---|---|---|---|---|
| P1-1 | 05/05/93 | 191.5 | 78.7 | 15071.0 | 15071.0 | | |
| P1-2 | 05/05/93 | 227.0 | 70.0 | 15890.0 | 30961.0 | | |
| P1-3 | 05/05/93 | 227.0 | 80.2 | 18205.4 | 49166.4 | 420 | |
| | | | | | | | |
| P2-1 | 04/30/93 | 213.0 | 67.8 | 14441.4 | 14441.4 | | |
| P2-2 | 04/30/93 | 213.0 | 70.5 | 15016.5 | 29457.9 | | |
| P2-3 | 04/30/93 | 213.0 | 67.7 | 14421.1 | 43879.0 | 426 | |
| | | | | | | | |
| H1-1 | 05/06/93 | 154.9 | 56.1 | 8689.9 | 8689.9 | | |
| H1-2 | 05/06/93 | 224.5 | 55.6 | 12482.2 | 21172.1 | | |
| H1-3 | 05/06/93 | 224.5 | 55.9 | 12549.6 | 33721.7 | | |
| H1-4 | 05/08/93 | 223.0 | 59.6 | 13290.8 | 47012.5 | 604 | |
| | | | | | | | |
| H2-1 | 05/01/93 | 213.0 | 52.0 | 11076.0 | 11076.0 | | |
| H2-2 | 05/01/93 | 213.0 | 55.9 | 11906.7 | 22982.7 | | |
| H2-3 | 05/11/93 | 211.2 | 55.1 | 11637.1 | 34619.8 | | |
| H2-4 | 05/11/93 | 212.2 | 51.5 | 10928.3 | 45548.1 | 637 | |
| | | | | | | | |
| OVERFLOW | 05/10/93 | 69.1 | 20.9 | 1444.2 | 1444.2 | | |
| TOTAL | | | | | | 2087 | |

Checked By: GGG

Total Square Footage PVC= 93045
HYPALON= 94005

## APPENDIX J

**Pond Geosynthetics Installation**
**(Photographs)**

## SUBGRADE GEOTEXTILE/VENTING MEDIUM

*Plate 1 - Pond 2 Installation*

*Plate 2 - Pond 1 Installation*

**SECONDARY LINER (PVC) INSTALLATION**

*Plate 1 - Panel 1 Deployment*

*Plate 2 - Opening and Spreading Panel 2*

**LEAK DETECTION NETTING**

*Plate 1 - Net Deployment*

*Plate 2 - Net Installation*

**LEAK DETECTION NETTING (Cont'd)**


*Plate 3 - Leak Detection Sump*


*Plate 4 - Leak Detection Sump*

PRIMARY LINER (HYPALON) INSTALLATION

*Plate 1 - Pond 1 (Secondary Lining of Overflow)*

*Plate 2 - Pond 1 (Primary Lining of Overflow)*

MISCELLANEOUS PHOTOS

*Plate 1 - Stitching Subgrade Geotextile*

*Plate 2 - Pond Liner Seaming*

**MISCELLANEOUS PHOTOS (Cont'd)**

*Plate 3 - Vent Detail*

*Plate 4 - Well Riser and Submersible Pump*

MISCELLANEOUS PHOTOS (Cont'd)


*Plate 5 - Control Panel Pad*

## MISCELLANEOUS PHOTOS (Cont'd)

*Plate 6 - Wastewater Stub End*

## APPENDIX K

**Palco Certificate of Completion**

PALCO LININGS, INC.

PVC SEAMING / TESTING LOG

Score No. W93042 Report Date 5-14-93 Page 2 of 2

Service Material Used: Hypalon
Seaming Method: adhesive
Equipment Used: Heat guns and seaming paddles

| | | |
|---|---|---|
| Seam No. HZ-1/HZ-2 | Seam No. HZ-2/HZ-3 | Seam No. HZ-3/HZ-4 |
| Length (ft) 200+ | Length (ft) 200+ | Length (ft) 200+ |
| Date Seamed 5-1 and 5-3 | Date Seamed 5-11-93 | Date Seamed 5-11-93 |

Seaming Conditions:

| | | |
|---|---|---|
| Ambiant Temp. 60° to 78° | Ambiant Temp. 52° to 81° | Ambiant Temp. 52° to 81° |
| Surface Temp. 76° to 114° | Surface Temp. 68° to 145° | Surface Temp. 68 to 145° |
| Wind (mph) 0 to 15 | Wind (mph) 0 | Wind (mph) 0 |

Testing / Observation:

| | | |
|---|---|---|
| Lance/Visual/Vacuum | Lance/Visual/Vacuum | Lance/Visual/Vacuum |
| Date 5-12 / 5-13 | Date 5-12/5-13 | Date 5-12/5-~~15~~ 13 PH |

Patch Location: distance from top of seam (ft)

Remarks: Pond #1 primary liner is complete.

Date of Final Walk-Down (Approval): 5-14-93
By: Palco- Paul D. Harris SRK- [signature] Conoco [signature]

FM92002
9/30/92

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PALCO LININGS, INC.

PVC SEAMING / TESTING LOG

Score No. W93042 Report Date 5-1-93 Page 1 of 2

Service Material Used: PVC
Seaming Method: Adhesive
Equipment Used: Seaming Paddles

| | | |
|---|---|---|
| Seam No. P2-1/P2-2 | Seam No. P2-2/P2-3 | Seam No. — |
| Length (ft) 200+ | Length (ft) 200+ | Length (ft) ~~200+~~ |
| Date Seamed | Date Seamed | Date Seamed — |

Seaming Conditions:

| | | |
|---|---|---|
| Ambiant Temp. 56° to 73° | Ambiant Temp. 56° to 73° | Ambiant Temp. — |
| Surface Temp. 72 to 96 | Surface Temp. 72° to 96° | Surface Temp. — |
| Wind (mph) 10 to 20 | Wind (mph) 10 to 20 | Wind (mph) — |

Testing / Observation:

| | | |
|---|---|---|
| Lance/Visual/Vacuum | Lance/Visual/Vacuum | Lance/Visual/Vacuum |
| Date 4-30 and 5-1 | Date 4-30 and 5-1 | Date — |

Patch Location: distance from top of seam (ft)

Remarks: Pond #2 secondary liner is complete.

Date of Final Walk-Down (Approval): 5-1-93
By: Palco - Paul D. Harris SRK - Glen Gage CONOCO [signature]

FM92002
9/30/92

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**PALCO LININGS, INC.**

# PVC SEAMING / TESTING LOG

Score No. W93042 Report Date 5-10-93 Page 2 of 2

Service Material Used: Hypalon
Seaming Method: adhesive
Equipment Used: Heat guns and seaming paddles

| | | |
|---|---|---|
| Seam No. H1-1/H1-2 | Seam No. H1-2/H1-3 | Seam No. H13/H1-4 |
| Length (ft) 200+ | Length (ft) 200+ | Length (ft) 200+ |
| Date Seamed 5-6-93 | Date Seamed 5-6-93 | Date Seamed 5-8/5-10 |

Seaming Conditions:

| | | |
|---|---|---|
| Ambiant Temp. 41-70 | Ambiant Temp. 41-70 | Ambiant Temp. 41-81 |
| Surface Temp. 50-96 | Surface Temp. 50-96 | Surface Temp. 50-130 |
| Wind (mph) 0-20 | Wind (mph) 0-20 | Wind (mph) 0-5 |

Testing / Observation:

| | | |
|---|---|---|
| Lance/Visual/Vacuum | Lance/Visual/Vacuum | Lance/Visual/Vacuum |
| Date 5-7-93 | Date 5-7-93 | Date 5-10-93 |

Patch Location: distance from top of seam (ft)

Remarks: Pond # 1 primarl liner is complete.

Date of Final Walk-Down (Approval): 5-10-93
By: Palco - Paul D. Harris · SRK Glen Grigs Conoco - Jon Bowden

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PALCO LININGS, INC.

# PVC SEAMING / TESTING LOG

Score No. W93042 Report Date 5-5-93 Page 1 of 2

Service Material Used: PVC
Seaming Method: adhesive
Equipment Used: seaming paddles

| | | |
|---|---|---|
| Seam No. P1-1/P1-2 | Seam No. P1-2/P1-3 | Seam No. — |
| Length (ft) 200+ | Length (ft) 200+ | Length (ft) — |
| Date Seamed 5-5-93 | Date Seamed 5-5-93 | Date Seamed — |

Seaming Conditions:

| | | |
|---|---|---|
| Ambiant Temp. 44° to 78° | Ambiant Temp. 44° to 78° | Ambiant Temp. — |
| Surface Temp. 60° to 120° | Surface Temp. 60° to 120° | Surface Temp. — |
| Wind (mph) | Wind (mph) | Wind (mph) — |

Testing / Observation:

| | | |
|---|---|---|
| Lance/Visual/Vacuum | Lance/Visual/Vacuum | Lance/Visual/Vacuum |
| Date 5-5-93 | Date 5-5-93 | Date — |

Patch Location: distance from top of seam (ft)

Remarks: Pond #1 secondary complete

Date of Final Walk-Down (Approval): 5-5-93
By: Palco - Paul D. Harris SRK - [signature] CONOCO - [signature]

FM92002
9/30/92

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