DAHL & ASSOCIATES, INC.
Environmental Consultants, Contractors & Engineers

4390 McMENEMY ROAD
SAINT PAUL, MINNESOTA 55127

ANNUAL PROJECT STATUS REPORT
July 7, 1995

CONOCO INCORPORATED
FORMER CONOCO STORE #23034
1126 South Robert St.
West St. Paul, Minnesota
LEAK #00000858
DAHL REPORT #0601-003

COPIES SUBMITTED TO:
Mr. Jeff Smail, Conoco Inc.
Ms. Cathy Malave, Minnesota Pollution Control Agency (MPCA)

DAHL
& ASSOCIATES, INC.
Environmental Compliance Management Systems

July 7, 1995

Ms. Cathy Malave
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, MN 55155

Dear Ms. Malave:

RE: Annual Project Status Report, Conoco Store #23034, 1126 South Robert, West St. Paul, Minnesota LEAK#00000858

On behalf of Conoco, enclosed is a copy of the Annual Project Status Report for the above referenced site. The data included in the report bring to date all data collected by DAHL at the site.

If you have any questions regarding the report contents, please contact me at our office

Sincerely,

DAHL & ASSOCIATES, INC.

Mike Watson
Project Manager

MPW

enclosure

cc: Mr. Jeff Smail, Conoco Inc.

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1.0 INTRODUCTION

Dahl & Associates, Inc. (DAHL) was retained by Conoco Inc. to manage ongoing remediation efforts at former Conoco Store #23034 (LEAK0000858), located at 1126 South Robert St., West St. Paul, Minnesota (Figure 1). This report brings to date all groundwater monitoring and analytical data from December 21, 1993, through May 11, 1995.

This report provides a brief discussion of the remedial systems operation and effectiveness. Also included are recommendations for future activities at the above referenced site. Previously reported data and specifications regarding the remediation system can be found in reports submitted to the Minnesota Pollution Control Agency (MPCA).

2.0 BACKGROUND

In October, 1992, DAHL completed the installation of a corrective action design (CAD) system as specified in DAHL's "Petroleum Hydrocarbon Release Investigation and Corrective Action Design Report" submitted to the MPCA on July 23, 1990. Specifications of the system and data collected previous to October, 1989, can be found in that report. MPCA Fact Sheet #7, Site Monitoring Worksheet and Fact Sheet #11, CAD System Monitoring Worksheet, has been submitted quarterly since April 1993.

The groundwater treatment system was initially started on January 28, 1994 after permission was granted from the Metropolitain Waste Control Commission (MWCC). The soil ventilation system was started on February 4, 1994, for a two week period. After start-up, review of the laboratory results indicated significant emission rates (SER's) were not exceeded and the system was restarted on March 21, 1994. On August 15, 1994, groundwater vent 1 (GWV-1) was turned on and soil vent effluent samples were collected at start-up and after 2 weeks, per MPCA direction.

Since system start-up DAHL personnel have conducted monthly site inspections. These inspections consist of collecting monthly water table elevations, dissolved oxygen concentrations, soil ventilation system data, air sparging system data, groundwater treatment system flow rates and effluent samples. Quarterly site visits also include groundwater samples from all monitoring wells, an influent water sample and an effluent sample from the soil vent system.

3.0 SAMPLING RESULTS

3.1 Groundwater Monitoring Results

Groundwater samples were analyzed for benzene, ethyl benzene, toluene, xylene (BETX), methyl-tertiary-butyl ether (MTBE), and gasoline range organics (GRO). Monitoring well (MW-3) contains BETX concentrations above Minnesota Department of Health (MDH) health risk limits (HRL's), and MW-2 contains benzene concentrations above HRL's.

Influent concentration of total petroleum hydrocarbons as gasoline (THG) has averaged 3,850 parts-per-billion (ppb) since start-up. The following tables and figures are enclosed. Graphs depicting groundwater elevation and analytical data accompany the corresponding tables.

Groundwater Analytical Data	-	Table 1
Groundwater Elevation Data	-	Table 2
Influent/Effluent Analytical Data	-	Table 3
Groundwater System Product Removal Data	-	Table 4
Monitoring Well Locations	-	Figure 2
Groundwater Gradient	-	Figure 3
Laboratory Reports (Groundwater samples)	-	Appendix A
MPCA Form 1: Air Stripper Screening Evaluation	-	Appendix B

3.2 Soil Vent System Results

The soil and air sparging systems have been monitored monthly since start-up. The monthly visits consist of collecting vacuum measurements and measuring organic vapor levels with an FID from each soil vapor vent and probe and pressure and flow readings from the sparge point. Vent stack emissions were sampled quarterly for BETX and GRO concentrations and dissolved oxygen concentrations were measured in the SVV's and MW's near GWV-1. The following tables, figures and appendices contain information regarding the system's performance to date.

Vacuum Measurements	-	Table 5
FID readings	-	Table 6
Vent System Effluent Data	-	Table 7
Vent System Product Removal	-	Table 8
Flow/Pressure Measurements at Sparge Point	-	Table 9

Dissolved Oxygen Data	-	Table 10
Remediation system Layout	-	Figure 4
Soil Vent System Effective area of Influence	-	Figure 5
Laboratory Reports (Air Samples)	-	Appendix C
MPCA Form 2: Off-gas Screening Evaluation	-	Appendix D
Product Removal Calculations	-	Appendix E
Soil Vent System Data/Calculations	-	Appendix F

4.0 DISCUSSION

The groundwater treatment system, which had been temporarily shut down for maintenance in September and October 1994, operated throughout the reporting period. Product removal to date has been calculated through March 9, 1995. The average influent concentration of THG since system start-up is 3,850 (ppb) and the system has pumped a total of 186,272 gallons of water. An estimated 4.08 gallons of petroleum hydrocarbons in dissolved form have been removed by the groundwater treatment system since start-up.

Upon system start-up, it was determined that most of the soil vapor vents were submerged by groundwater, thus the soil vent system remained non-operational until February 4, 1994, at which time the water table had dropped to elevations which allowed the system to be started. The soil venting system removed an estimated 308.66 gallons of petroleum hydrocarbons in vapor phase from start-up through December 27, 1994. This is an average removal rate of 0.94 gallons per day (GPD). A soil vent system effluent sample was not collected during the first quarterly site visit of 1995, as a blower was being replaced.

On August 15, 1994, when the groundwater vent was turned on line, all systems were operational. The remediation system has removed a total of approximately 312.74 gallons of gasoline from the soil and groundwater at the site since start-up.

5.0 RECOMMENDATIONS

DAHL recommends the continued operation of the pump and treat, air sparging and soil vapor extraction systems. In addition DAHL recommends that soil vapor probes (SVP's) 1, 2 and 3 be manifolded to SVV-2 below grade to enhance the removal of vapors from

the area near GWV-1.

Fact sheet #7 and #11 will continue to be submitted to the MPCA quarterly and a review of system performance will be submitted annually. DAHL will continue to monitor the site monthly and will make necessary adjustments to optimize system performance.

The recommendations and methodologies contained in this report represent DAHL's professional opinions and are based on accepted analytical practices and documented industry standards. Services performed on this project have been conducted in a manner consistent with standards of care practiced by members of this profession in this area, under similar time and budget restraints. Beyond this, no warranty is expressed or implied.

This report was prepared by:

Mark P. Smith
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7-7-95
Date

Michael P. Watson
Project Manager
Dahl & Associates, Inc.

7-7-95
Date

Daniel W. Wiberg
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Date

TABLES

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TABLE 1

GROUNDWATER ANALYTICAL DATA

Conoco Store # 23034

1126 South Robert St., W. St. Paul, Minnesota (24930601)

WELL #	DATE	B	E	T	X	THG/GRO	MTBE
MW-1	05/03/90	ND	ND	ND	ND	ND	ND
	09/10/90	ND	ND	ND	ND	ND	ND
	03/13/91	ND	ND	ND	ND	ND	ND
	09/09/91	ND	ND	ND	ND	ND	ND
	12/26/91	ND	ND	ND	ND	ND	ND
	03/13/92	ND	ND	ND	ND	ND	ND
	06/12/92	ND	ND	ND	ND	ND	ND
	09/10/92	ND	ND	ND	ND	ND	ND
	12/23/92	ND	ND	ND	ND	ND	ND
	03/09/93	ND	ND	ND	ND	ND	ND
	06/10/93	ND	ND	ND	ND	ND	ND
	09/17/93	ND	ND	ND	ND	ND	ND
	12/21/93	ND	ND	ND	ND	ND	ND
	03/21/94	ND	ND	ND	ND	ND	ND
	06/30/94	ND	ND	ND	ND	ND	ND
	08/31/94	ND	ND	ND	ND	ND	ND
	12/27/94	ND	ND	ND	ND	36	ND
	03/09/95	ND	ND	ND	ND	ND	ND
MW-2	05/03/90	6600	4	12	6900	27000	1600
	09/10/90	7300	950	17000	9600	48000	1600
	03/13/91	8200	1200	13000	10000	68000	3000
	09/09/91	8500	1300	9300	10000	48000	3000
	12/26/91	3800	1200	1100	4400	23000	ND
	03/13/92	2100	800	1200	2300	11000	ND
	06/12/92	2500	1100	1000	2600	17000	220
	09/10/92	4200	1300	1400	3100	19000	ND
	12/23/92	5800	1500	2800	4000	27000	ND
	03/09/93	5300	1300	3800	4500	21000	ND
	06/10/93	240	ND	120	230	1200	ND
	09/17/93	210	250	ND	370	3100	ND
	12/21/93	4100	1500	360	1900	15000	ND
	03/21/94	5300	1800	2800	4800	29000	270
	06/30/94	5700	1800	3700	6500	31000	200
	08/31/94	2700	630	1900	3400	15000	ND
	12/27/94	42	8	31	67	400	ND
	03/09/95	550	160	210	610	2700	ND
MW-3	05/03/90						
	09/10/90	9700	2000	23000	16000	82000	1500
	03/13/91	9200	3900	23000	26000	110000	2600
	09/09/91	11000	3000	22000	20000	79000	4900
	12/26/91	7700	2300	10000	14000	77000	1600
	03/13/92	10000	2800	17000	15000	64000	ND
	06/12/92	8100	2500	16000	14000	72000	290
	09/10/92	9800	ND	22000	17000	75000	ND
	12/23/92	8100	2700	16000	15000	82000	ND
	03/09/93	6500	3000	20000	17000	74000	ND
	06/10/93	6400	2700	11000	13000	52000	ND
	09/17/93	4300	2200	14000	11000	40000	ND
	12/21/93	5900	3100	20000	16000	64000	ND
	03/21/94	9700	3500	24000	18000	79000	ND

TABLE 1

GROUNDWATER ANALYTICAL DATA

Conoco Store # 23034

1126 South Robert St., W. St. Paul, Minnesota (24930601)

WELL #	DATE	B	E	T	X	THG/GRO	MTBE
MW-3	06/30/94 *	5600	2600	14000	14000	57000	ND
	08/31/94	3100	1800	3100	7900	28000	ND
	12/27/94	ND	ND	ND	ND	ND	ND
	03/09/95	3100	3000	1000	11000	53000	ND
MW-4	05/03/90	ND	ND	ND	2	41	ND
	09/10/90	ND	ND	ND	ND	19	ND
	03/13/91	ND	ND	ND	1	40	ND
	09/09/91	ND	ND	ND	ND	ND	16
	12/26/91	ND	ND	ND	ND	ND	ND
	03/13/92	ND	ND	ND	ND	ND	ND
	06/12/92	ND	ND	ND	ND	ND	ND
	09/10/92	ND	ND	ND	ND	ND	ND
	12/23/92	ND	ND	ND	ND	ND	ND
	03/09/93	ND	ND	ND	ND	ND	ND
	06/10/93	ND	ND	ND	ND	ND	ND
	09/17/93	ND	ND	ND	ND	ND	ND
	12/21/93	ND	ND	ND	ND	ND	ND
	03/21/94	ND	ND	ND	ND	ND	ND
	06/30/94	ND	ND	ND	ND	ND	ND
	08/31/94	ND	ND	ND	ND	ND	ND
	12/27/94	ND	ND	ND	ND	ND	ND
	03/09/95	ND	ND	ND	ND	ND	ND
MW-5	12/23/92	ND	ND	ND	ND	ND	ND
	03/09/93	ND	ND	ND	ND	ND	ND
	06/10/93	ND	ND	ND	ND	ND	ND
	09/17/93	ND	ND	ND	ND	ND	ND
	12/21/93	ND	ND	ND	ND	ND	ND
	03/21/94	ND	ND	ND	ND	60	ND
	06/30/94	ND	ND	ND	ND	47	ND
	08/31/94	ND	ND	ND	ND	ND	ND
	12/27/94	ND	ND	ND	ND	56	ND
	03/09/95	ND	ND	ND	ND	ND	ND

Explanation:

B=benzene
E=ethyl benzene
T=toluene
X=total xylenes
THG=total hydrocarbons as gasoline
MTBE=methyl-tert-butyl-ether
GRO=gasoline range organics
** = indicates sample contains higher boiling hydrocarbons*

TABLE 2

GROUNDWATER ELEVATION DATA

Conoco Store # 23034

1126 South Robert St., W. St. Paul, Minnesota (24930601)

WELL #	ELEVATION	DATE	D.T.P	D.T.W	P.T.	W.T.E.
MW-1	100.47	10/23/89	0.00	17.99	0.00	82.48
	100.47	12/15/89	0.00	18.89	0.00	81.58
	100.47	01/08/90	0.00	19.15	0.00	81.32
	100.47	02/05/90	0.00	19.61	0.00	80.86
	100.47	03/13/90	0.00	20.12	0.00	80.35
	100.47	03/29/90	0.00	19.81	0.00	80.66
	100.47	04/24/90	0.00	19.94	0.00	80.53
*Resurvey	100.45	05/03/90	0.00	20.07	0.00	80.38
	100.45	05/15/90	0.00	19.66	0.00	80.79
	100.45	06/06/90	0.00	19.40	0.00	81.05
	100.45	06/12/90	0.00	18.75	0.00	81.70
	100.45	06/15/90	0.00	18.66	0.00	81.79
	100.45	06/29/90	0.00	17.82	0.00	82.63
	100.45	07/06/90	0.00	17.52	0.00	82.93
	100.45	07/13/90	0.00	17.30	0.00	83.15
	100.45	07/20/90	0.00	17.04	0.00	83.41
	100.45	08/22/90	0.00	15.90	0.00	84.55
	100.45	09/10/90	0.00	15.90	0.00	84.55
	100.45	10/10/90	0.00	15.90	0.00	84.55
	100.45	11/06/90	0.00	16.64	0.00	83.81
	100.45	01/14/91	0.00	17.77	0.00	82.68
	100.45	02/05/91	0.00	18.29	0.00	82.16
	100.45	03/13/91	0.00	18.76	0.00	81.69
	100.45	04/04/91	0.00	18.51	0.00	81.94
	100.45	05/10/91	0.00	17.81	0.00	82.64
	100.45	06/16/91	0.00	16.32	0.00	84.13
	100.45	07/03/91	0.00	15.56	0.00	84.89
	100.45	08/06/91	0.00	15.22	0.00	85.23
	100.45	09/09/91	0.00	15.15	0.00	85.30
	100.45	09/10/91	0.00	15.30	0.00	85.15
	100.45	10/08/91	0.00	14.68	0.00	85.77
	100.45	11/19/91	0.00	15.32	0.00	85.13
	100.45	12/26/91	0.00	14.93	0.00	85.52
	100.45	01/13/92	0.00	14.79	0.00	85.66
	100.45	02/10/92	0.00	15.02	0.00	85.43
	100.45	03/13/92	0.00	14.56	0.00	85.89
	100.45	04/20/92	0.00	14.27	0.00	86.18
	100.45	05/11/92	0.00	13.94	0.00	86.51
	100.45	06/12/92	0.00	14.11	0.00	86.34
	100.45	09/10/92	0.00	13.72	0.00	86.73
*Resurvey	100.45	12/23/92	0.00	14.30	0.00	86.15
	100.45	03/09/93	0.00	15.87	0.00	84.58
	100.45	06/10/93	0.00	13.90	0.00	86.55
	100.45	07/19/93	0.00	11.99	0.00	88.46
	100.45	07/28/93	0.00	12.08	0.00	88.37
	100.45	09/17/93	0.00	12.55	0.00	87.90
12:00 hrs.	100.45	09/29/93	0.00	12.75	0.00	87.70
14:30 hrs.	100.45	09/29/93	0.00	12.72	0.00	87.73

TABLE 2

GROUNDWATER ELEVATION DATA

Conoco Store # 23034

1126 South Robert St., W. St. Paul, Minnesota (24930601)

WELL #	ELEVATION	DATE	D.T.P	D.T.W	P.T.	W.T.E.
MW-1	100.45	09/30/93	0.00	12.40	0.00	88.05
	100.45	10/07/93	0.00	12.79	0.00	87.66
	100.45	10/22/93	0.00	13.51	0.00	86.94
	100.45	12/21/93	0.00	14.59	0.00	85.86
	100.45	01/25/94	0.00	15.46	0.00	84.99
12:00 hrs.	100.45	01/28/94	0.00	15.38	0.00	85.07
2:00 hrs.	100.45	01/28/94	0.00	15.38	0.00	85.07
2:30 hrs.	100.45	01/28/94	0.00	15.38	0.00	85.07
	100.45	02/03/94	0.00	15.65	0.00	84.80
	100.45	02/04/94	0.00	15.70	0.00	84.75
	100.45	02/11/94	0.00	15.93	0.00	84.52
	100.45	02/18/94	0.00	15.87	0.00	84.58
	100.45	03/21/94	0.00	16.48	0.00	83.97
	100.45	04/15/94	0.00	16.54	0.00	83.91
	100.45	05/31/94	0.00	15.37	0.00	85.08
	100.45	06/30/94	0.00	14.78	0.00	85.67
	100.45	07/08/94	0.00	14.71	0.00	85.74
	100.45	07/19/94	0.00	14.62	0.00	85.83
09:30	100.45	08/15/94	0.00	14.92	0.00	85.53
11:50	100.45	08/15/94	0.00	14.92	0.00	85.53
	100.45	08/31/94	0.00	14.91	0.00	85.54
	100.45	10/31/94	0.00	13.92	0.00	86.53
	100.45	11/17/94	0.00	13.83	0.00	86.62
	100.45	12/27/94	0.00	14.94	0.00	85.51
	100.45	01/16/95	0.00	15.22	0.00	85.23
	100.45	02/09/95	0.00	17.74	0.00	82.71
	100.45	03/09/95	0.00	16.51	0.00	83.94
	100.45	04/06/95	0.00	16.24	0.00	84.21
	100.45	05/11/95	0.00	15.52	0.00	84.93
MW-2	100.77	10/23/89	0.00	19.23	0.00	81.54
	100.77	12/15/89	0.00	20.14	0.00	80.63
	100.77	01/08/90	0.00	20.40	0.00	80.37
	100.77	02/05/90	0.00	20.93	0.00	79.84
	100.77	03/13/90	0.00	21.30	0.00	79.47
	100.77	03/29/90	0.00	20.87	0.00	79.90
	100.77	04/24/90	0.00	21.18	0.00	79.59
*Resurvey	100.74	05/03/90	0.00	21.48	0.00	79.26
	100.74	05/15/90	0.00	20.89	0.00	79.85
	100.74	06/06/90	0.00	20.62	0.00	80.12
	100.74	06/12/90	0.00	19.92	0.00	80.82
	100.74	06/15/90	0.00	19.85	0.00	80.89
	100.74	06/29/90	0.00	18.93	0.00	81.81
	100.74	07/06/90	0.00	18.63	0.00	82.11
	100.74	07/13/90	0.00	18.39	0.00	82.35
	100.74	07/20/90	0.00	18.15	0.00	82.59
	100.74	08/22/90	0.00	16.93	0.00	83.81
	100.74	09/10/90	0.00	17.00	0.00	83.74

TABLE 2

GROUNDWATER ELEVATION DATA

Conoco Store # 23034

1126 South Robert St., W. St. Paul, Minnesota (24930601)

WELL #	ELEVATION	DATE	D.T.P	D.T.W	P.T.	W.T.E.
MW-2	100.74	10/10/90	0.00	17.13	0.00	83.61
	100.74	11/06/90	0.00	17.81	0.00	82.93
	100.74	01/14/91	0.00	19.00	0.00	81.74
	100.74	02/05/91	0.00	19.50	0.00	81.24
	100.74	03/13/91	0.00	19.92	0.00	80.82
	100.74	04/04/91	0.00	19.51	0.00	81.23
	100.74	05/10/91	0.00	19.30	0.00	81.44
	100.74	06/16/91	0.00	17.38	0.00	83.36
	100.74	07/03/91	0.00	16.55	0.00	84.19
	100.74	08/06/91	0.00	16.29	0.00	84.45
	100.74	09/09/91	0.00	16.23	0.00	84.51
	100.74	09/10/91	0.00	16.36	0.00	84.38
	100.74	10/08/91	0.00	15.68	0.00	85.06
	100.74	11/19/91	0.00	16.30	0.00	84.44
	100.74	12/26/91	0.00	16.03	0.00	84.71
	100.74	01/13/92	0.00	15.94	0.00	84.80
	100.74	02/10/92	0.00	16.20	0.00	84.54
	100.74	03/13/92	0.00	15.65	0.00	85.09
	100.74	04/20/92	0.00	15.30	0.00	85.44
	100.74	05/11/92	0.00	14.85	0.00	85.89
	100.74	06/12/92	0.00	15.00	0.00	85.74
	100.74	09/10/92	0.00	14.70	0.00	86.04
*Resurvey	100.77	12/23/92	0.00	15.40	0.00	85.37
	100.77	03/09/93	0.00	16.96	0.00	83.81
	100.77	06/10/93	0.00	14.90	0.00	85.87
	100.77	07/19/93	0.00	12.85	0.00	87.92
	100.77	07/28/93	0.00	12.99	0.00	87.78
	100.77	09/17/93	0.00	13.49	0.00	87.28
12:00 hrs.	100.77	09/29/93	0.00	13.73	0.00	87.04
14:30 hrs.	100.77	09/29/93	0.00	13.70	0.00	87.07
	100.77	09/30/93	0.00	13.37	0.00	87.40
	100.77	10/07/93	0.00	13.78	0.00	86.99
	100.77	10/22/93	0.00	14.69	0.00	86.08
	100.77	12/21/93	0.00	15.67	0.00	85.10
	100.77	01/25/94	0.00	16.61	0.00	84.16
12:00 hrs.	100.77	01/28/94	0.00	16.50	0.00	84.27
2:00 hrs.	100.77	01/28/94	0.00	16.50	0.00	84.27
2:30 hrs.	100.77	01/28/94	0.00	16.50	0.00	84.27
	100.77	02/03/94	0.00	16.86	0.00	83.91
	100.77	02/04/94	0.00	16.99	0.00	83.78
	100.77	02/11/94	0.00	17.17	0.00	83.60
	100.77	02/18/94	0.00	17.11	0.00	83.66
	100.77	03/21/94	0.00	17.74	0.00	83.03
	100.77	04/15/94	0.00	17.94	0.00	82.83
	100.77	05/31/94	0.00	16.53	0.00	84.24
	100.77	06/30/94	0.00	15.95	0.00	84.82
	100.77	07/08/94	0.00	15.86	0.00	84.91
	100.77	07/19/94	0.00	15.76	0.00	85.01

TABLE 2

GROUNDWATER ELEVATION DATA

Conoco Store # 23034

1126 South Robert St., W. St. Paul, Minnesota (24930601)

WELL #	ELEVATION	DATE	D.T.P	D.T.W	P.T.	W.T.E.
09:30	100.77	08/15/94	0.00	16.00	0.00	84.77
11:50	100.77	08/15/94	0.00	16.00	0.00	84.77
MW-2	100.77	08/31/94	0.00	14.92	0.00	85.85
	100.77	10/31/94	0.00	14.97	0.00	85.80
	100.77	11/17/94	0.00	13.75	0.00	87.02
	100.77	12/27/94	0.00	14.91	0.00	85.86
	100.77	01/16/95	0.00	15.56	0.00	85.21
	100.77	02/09/95	0.00	18.07	0.00	82.70
	100.77	03/09/95	0.00	17.88	0.00	82.89
	100.77	04/06/95	0.00	16.73	0.00	84.04
	100.77	05/11/95	0.00	15.64	0.00	85.13
MW-3	101.05	10/23/89	0.00	20.77	0.00	80.28
	101.05	12/15/89	21.54	22.35	0.81	78.70
	101.05	01/08/90	22.07	22.47	0.40	78.58
	101.05	02/05/90	22.53	22.91	0.38	78.14
	101.05	03/13/90	22.91	23.37	0.46	77.68
	101.05	03/29/90	22.82	23.14	0.32	77.91
	101.05	04/24/90	22.99	23.39	0.40	77.66
*Resurvey	101.05	05/03/90	22.99	23.30	0.31	77.75
	101.05	05/15/90	22.71	22.92	0.21	78.13
	101.05	06/06/90	21.33	22.60	1.27	78.45
	101.05	06/12/90 ^	22.22	23.00	0.78	78.05
	101.05	06/15/90 ^	21.20	21.74	0.54	79.31
	101.05	06/29/90 ^	19.39	20.08	0.69	80.97
	101.05	07/06/90	19.67	19.70	0.03	81.35
	101.05	07/13/90	0.00	19.41	0.00	81.64
	101.05	07/20/90	0.00	19.22	0.00	81.83
	101.05	08/22/90	0.00	18.04	0.00	83.01
	101.05	09/10/90	0.00	18.27	0.00	82.78
	101.05	10/10/90	0.00	18.49	0.00	82.56
	101.05	11/06/90	0.00	19.24	0.00	81.81
	101.05	01/14/91	20.50	20.58	0.08	80.47
	101.05	02/05/91	21.00	21.05	0.05	80.00
	101.05	03/13/91	21.66	21.68	0.02	79.37
	101.05	04/04/91	0.00	21.28	0.00	79.77
	101.05	05/10/91	0.00	20.42	0.00	80.63
	101.05	06/16/91	0.00	18.26	0.00	82.79
	101.05	07/03/91	0.00	17.62	0.00	83.43
	101.05	08/06/91	0.00	17.36	0.00	83.69
	101.05	09/09/91	0.00	17.51	0.00	83.54
	101.05	09/10/91	0.00	17.67	0.00	83.38
	101.05	10/08/91	0.00	16.96	0.00	84.09
	101.05	11/19/91	0.00	17.81	0.00	83.24
	101.05	12/26/91	0.00	17.38	0.00	83.67
	101.05	01/13/92	0.00	17.39	0.00	83.66
	101.05	02/10/92	0.00	17.65	0.00	83.40
	101.05	03/13/92	0.00	17.28	0.00	83.77

TABLE 2

GROUNDWATER ELEVATION DATA

Conoco Store # 23034

1126 South Robert St., W. St. Paul, Minnesota (24930601)

WELL #	ELEVATION	DATE	D.T.P	D.T.W	P.T.	W.T.E.
MW-3	101.05	04/20/92	0.00	16.57	0.00	84.48
	101.05	05/11/92	0.00	16.04	0.00	85.01
	101.05	06/12/92	0.00	16.42	0.00	84.63
	101.05	09/10/92	0.00	16.00	0.00	85.05
*Resurvey	101.04	12/23/92	0.00	16.61	0.00	84.43
	101.04	03/09/93	0.00	18.38	0.00	82.66
	101.04	06/10/93	0.00	16.02	0.00	85.02
	101.04	07/19/93	0.00	13.79	0.00	87.25
	101.04	07/28/93	0.00	14.12	0.00	86.92
	101.04	09/17/93	0.00	14.71	0.00	86.33
12:00 hrs.	101.04	09/29/93	0.00	14.97	0.00	86.07
14:30 hrs.	101.04	09/29/93	0.00	15.52	0.00	85.52
	101.04	09/30/93	0.00	15.48	0.00	85.56
	101.04	10/07/93	0.00	15.08	0.00	85.96
	101.04	10/22/93	0.00	16.86	0.00	84.18
	101.04	12/21/93	0.00	17.17	0.00	83.87
	101.04	01/25/94	0.00	18.04	0.00	83.00
12:00	101.04	01/28/94	0.00	17.94	0.00	83.10
02:00	101.04	01/28/94	0.00	18.28	0.00	82.76
02:30	101.04	01/28/94	0.00	18.30	0.00	82.74
	101.04	02/03/94	0.00	19.02	0.00	82.02
	101.04	02/04/94	0.00	19.15	0.00	81.89
	101.04	02/11/94	0.00	19.34	0.00	81.70
	101.04	02/18/94	0.00	19.37	0.00	81.67
	101.04	03/21/94	0.00	19.90	0.00	81.14
	101.04	04/15/94	0.00	20.43	0.00	80.61
	101.04	05/31/94	0.00	18.52	0.00	82.52
	101.04	06/30/94	0.00	17.88	0.00	83.16
	101.04	07/08/94	0.00	17.78	0.00	83.26
	101.04	07/19/94	0.00	17.70	0.00	83.34
09:30	101.04	08/15/94	0.00	17.34	0.00	83.70
11:50	101.04	08/15/94	0.00	17.35	0.00	83.69
	101.04	08/31/94	0.00	17.51	0.00	83.53
	101.04	10/31/94	0.00	16.66	0.00	84.38
	101.04	11/17/94	0.00	16.93	0.00	84.11
	101.04	12/27/94	0.00	18.04	0.00	83.00
	101.04	01/16/95	0.00	18.41	0.00	82.63
	101.04	02/09/95	0.00	18.84	0.00	82.20
	101.04	03/09/95	0.00	19.84	0.00	81.20
	101.04	04/06/95	0.00	19.81	0.00	81.23
	101.04	05/11/95	0.00	19.08	0.00	81.96
MW-4	100.68	10/23/89				
	100.68	12/15/89				
	100.68	01/08/90				
	100.68	02/05/90				
	100.68	03/13/90				
	100.68	03/29/90				

TABLE 2

GROUNDWATER ELEVATION DATA

Conoco Store # 23034

1126 South Robert St., W. St. Paul, Minnesota (24930601)

WELL #	ELEVATION	DATE	D.T.P	D.T.W	P.T.	W.T.E.
MW-4	100.68	04/24/90				
	100.68	05/03/90	0.00	23.93	0.00	76.75
	100.68	05/15/90				
	100.68	06/06/90				
	100.68	06/12/90				
	100.68	06/15/90				
	100.68	06/29/90				
	100.68	07/06/90				
	100.68	07/13/90	0.00	19.82	0.00	80.86
	100.68	07/20/90	0.00	19.65	0.00	81.03
	100.68	08/22/90	0.00	18.60	0.00	82.08
	100.68	09/10/90	0.00	18.94	0.00	81.74
	100.68	10/10/90	0.00	19.22	0.00	81.46
	100.68	11/06/90	0.00	19.99	0.00	80.69
	100.68	01/14/91	0.00	21.30	0.00	79.38
	100.68	02/05/91	0.00	21.83	0.00	78.85
	100.68	03/13/91	0.00	22.35	0.00	78.33
	100.68	04/04/91	0.00	22.21	0.00	78.47
	100.68	05/10/91	0.00	21.14	0.00	79.54
	100.68	06/16/91	0.00	18.53	0.00	82.15
	100.68	07/03/91	0.00	18.14	0.00	82.54
	100.68	08/06/91	0.00	18.10	0.00	82.58
	100.68	09/09/91	0.00	18.35	0.00	82.33
	100.68	09/10/91	0.00	18.40	0.00	82.28
	100.68	10/08/91	0.00	17.76	0.00	82.92
	100.68	11/19/91	0.00	17.70	0.00	82.98
	100.68	12/26/91	0.00	18.10	0.00	82.58
	100.68	01/13/92	0.00	18.18	0.00	82.50
	100.68	02/10/92	0.00	18.50	0.00	82.18
	100.68	03/13/92	0.00	17.88	0.00	82.80
	100.68	04/20/92	0.00	17.22	0.00	83.46
	100.68	05/11/92	0.00	16.63	0.00	84.05
	100.68	06/12/92	0.00	17.19	0.00	83.49
	100.68	09/10/92	0.00	16.84	0.00	83.84
*Resurvey	100.66	12/23/92	0.00	17.42	0.00	83.24
	100.66	03/09/93	0.00	19.19	0.00	81.47
	100.66	06/10/93	0.00	16.20	0.00	84.46
	100.66	07/19/93	0.00	14.42	0.00	86.24
	100.66	07/28/93	0.00	14.90	0.00	85.76
	100.66	09/17/93	0.00	15.57	0.00	85.09
12:00 hrs.	100.66	09/29/93	0.00	15.81	0.00	84.85
14:30 hrs.	100.66	09/29/93	0.00	15.78	0.00	84.88
	100.66	09/30/93	0.00	15.49	0.00	85.17
	100.66	10/07/93	0.00	15.96	0.00	84.70
	100.66	10/22/93	0.00	16.96	0.00	83.70
	100.66	12/21/93	0.00	18.07	0.00	82.59
	100.66	01/25/94	0.00	18.89	0.00	81.77
12:00 hrs.	100.66	01/28/94	0.00	18.80	0.00	81.86

TABLE 2

GROUNDWATER ELEVATION DATA

Conoco Store # 23034

1126 South Robert St., W. St. Paul, Minnesota (24930601)

WELL #	ELEVATION	DATE	D.T.P	D.T.W	P.T.	W.T.E.
2:00 hrs.	100.66	01/28/94	0.00	18.80	0.00	81.86
2:30 hrs.	100.66	01/28/94	0.00	18.80	0.00	81.86
MW-4	100.66	02/03/94	0.00	19.14	0.00	81.52
	100.66	02/04/94	0.00	19.15	0.00	81.51
	100.66	02/11/94	0.00	19.40	0.00	81.26
	100.66	02/18/94	0.00	19.40	0.00	81.26
	100.66	03/21/94	0.00	19.88	0.00	80.78
	100.66	04/15/94	0.00	20.15	0.00	80.51
	100.66	05/31/94	0.00	18.47	0.00	82.19
	100.66	06/30/94	0.00	19.93	0.00	80.73
	100.66	07/08/94	0.00	17.90	0.00	82.76
	100.66	07/19/94	0.00	17.79	0.00	82.87
09:30	100.66	08/15/94	0.00	18.17	0.00	82.49
11:50	100.66	08/15/94	0.00	18.17	0.00	82.49
	100.66	08/31/94	0.00	18.39	0.00	82.27
	100.66	10/31/94	0.00	16.56	0.00	84.10
	100.66	11/17/94	0.00	16.87	0.00	83.79
	100.66	12/27/94	0.00	18.23	0.00	82.43
	100.66	01/16/95	0.00	18.72	0.00	81.94
	100.66	02/09/95	0.00	19.15	0.00	81.51
	100.66	03/09/95	0.00	19.95	0.00	80.71
	100.66	04/06/95	0.00	19.61	0.00	81.05
	100.66	05/11/95	0.00	18.51	0.00	82.15
MW-5	102.13	12/23/92	0.00	17.03	0.00	85.10
	102.13	03/09/93	0.00	18.73	0.00	83.40
	102.13	06/10/93	0.00	16.53	0.00	85.60
	102.13	07/19/93	0.00	14.40	0.00	87.73
	102.13	07/28/93	0.00	14.62	0.00	87.51
	102.13	09/17/93	0.00	15.15	0.00	86.98
	102.13	09/20/93				
	102.13	09/27/93				
12:00 hrs.	102.13	09/29/93	0.00	15.41	0.00	86.72
14:30 hrs.	102.13	09/29/93	0.00	15.43	0.00	86.70
	102.13	09/30/93	0.00	15.28	0.00	86.85
	102.13	10/07/93	0.00	15.10	0.00	87.03
	102.13	10/22/93	0.00	16.67	0.00	85.46
	102.13	12/08/93				
	102.13	12/21/93	0.00	17.54	0.00	84.59
	102.13	01/25/94	0.00	18.45	0.00	83.68
12:00 hrs.	102.13	01/28/94	0.00	18.35	0.00	83.78
2:00 hrs.	102.13	01/28/94	0.00	18.37	0.00	83.76
2:30 hrs.	102.13	01/28/94	0.00	18.37	0.00	83.76
	102.13	02/03/94	0.00	18.91	0.00	83.22
	102.13	02/04/94	0.00	19.05	0.00	83.08
	102.13	02/11/94	0.00	19.25	0.00	82.88
	102.13	02/18/94	0.00	19.26	0.00	82.87
	102.13	03/21/94	0.00	19.81	0.00	82.32

TABLE 2

GROUNDWATER ELEVATION DATA

Conoco Store # 23034

1126 South Robert St., W. St. Paul, Minnesota (24930601)

WELL #	ELEVATION	DATE	D.T.P	D.T.W	P.T.	W.T.E.
MW-5	102.13	04/15/94	0.00	20.15	0.00	81.98
	102.13	05/31/94	0.00	18.61	0.00	83.52
	102.13	06/30/94	0.00	17.91	0.00	84.22
	102.13	07/08/94	0.00	17.72	0.00	84.41
	102.13	07/19/94	0.00	17.73	0.00	84.40
09:30	102.13	08/15/94	0.00	17.77	0.00	84.36
11:50	102.13	08/15/94	0.00	17.78	0.00	84.35
	102.13	08/31/94	0.00	17.78	0.00	84.35
	102.13	10/31/94	0.00	16.82	0.00	85.31
	102.13	11/17/94	0.00	16.87	0.00	85.26
	102.13	12/27/94	0.00	18.17	0.00	83.96
	102.13	01/16/95	0.00	18.44	0.00	83.69
	102.13	02/09/95	0.00	18.97	0.00	83.16
	102.13	03/09/95	0.00	19.88	0.00	82.25
	102.13	04/06/95	0.00	19.64	0.00	82.49
	102.13	05/11/95	0.00	18.85	0.00	83.28
RW-1	100.61	12/23/92	0.00	16.00	0.00	84.61
	100.61	03/09/93	0.00	17.92	0.00	82.69
	100.61	06/10/93	0.00	15.54	0.00	85.07
	100.61	07/19/93	0.00	13.82	0.00	86.79
	100.61	07/28/93	0.00	14.13	0.00	86.48
	100.61	09/17/93	0.00	14.74	0.00	85.87
	100.61	09/20/93	0.00	16.13	0.00	84.48
	100.61	09/27/93	0.00	14.12	0.00	86.49
12:00 hrs.	100.61	09/29/93	0.00	14.94	0.00	85.67
14:30 hrs.	100.61	09/29/93	0.00	25.40	0.00	75.21
	100.61	09/30/93	0.00	25.64	0.00	74.97
	100.61	10/07/93	0.00	15.10	0.00	85.51
	100.61	10/22/93	0.00	25.72	0.00	74.89
	100.61	12/08/93	0.00	16.65	0.00	83.96
	100.61	12/21/93	0.00	16.92	0.00	83.69
	100.61	01/25/94				
12:00 hrs.	100.61	01/28/94	0.00	17.71	0.00	82.90
2:00 hrs.	100.61	01/28/94	0.00	27.20	0.00	73.41
2:30 hrs.	100.61	01/28/94	0.00	27.35	0.00	73.26
	100.61	02/03/94	0.00	28.20	0.00	72.41
	100.61	02/04/94	0.00	27.05	0.00	73.56
	100.61	02/11/94	0.00	27.35	0.00	73.26
	100.61	02/18/94	0.00	28.35	0.00	72.26
	100.61	03/21/94	0.00	27.07	0.00	73.54
	100.61	04/15/94	0.00	28.62	0.00	71.99
	100.61	05/31/94	0.00	28.58	0.00	72.03
	100.61	06/30/94	0.00	26.96	0.00	73.65
	100.61	07/08/94	0.00	26.20	0.00	74.41
	100.61	07/19/94	0.00	25.98	0.00	74.63
	100.61	08/15/94				
	100.61	08/15/94	0.00	13.90	0.00	86.71

TABLE 2

GROUNDWATER ELEVATION DATA

Conoco Store # 23034
1126 South Robert St., W. St. Paul, Minnesota (24930601)

WELL #	ELEVATION	DATE	D.T.P	D.T.W	P.T.	W.T.E.
RW-1	100.61	08/31/94	0.00	17.39	0.00	83.22
	100.61	10/31/94	0.00	26.18	0.00	74.43
	100.61	11/17/94	0.00	26.80	0.00	73.81
	100.61	12/27/94	0.00	25.86	0.00	74.75
	100.61	01/16/95	0.00	16.22	0.00	84.39
	100.61	02/09/95	0.00	27.63	0.00	72.98
	100.61	03/09/95	0.00	26.58	0.00	74.03
	100.61	04/06/95	0.00	26.30	0.00	74.31
	100.61	05/11/95	0.00	27.31	0.00	73.30

Explanation:

All measurments are in feet (ft).
D.T.P - Depth-to-Product
D.T.W - Depth-to-Water
P.T. - Product Thickness
W.T.E - Water-Table-Elevation
^ - Data corrected for possible base measurement error.

DAHL

TABLE 3

INFLUENT/EFFLUENT ANALYTICAL DATA

Conoco Store # 23034

1126 South Robert St., W. St. Paul, Minnesota (24930601)

	DATE	B	E	T	X	THG/GRO	MTBE	COD (ppm)	TSS (ppm)
Influent	10/15/93	730	530	3700	3900	14000	ND		
	10/22/93	1100	440	4200	4600	16000	ND		
	02/04/94	120	14	270	600	2900	ND		
	03/21/94	56	ND	50	230	910	ND		
	06/30/94	ND	ND	ND	ND	190	ND		
	12/27/94	970	280	700	1200	7000	ND		
	03/09/95	510	170	740	1300	9200	ND		
Effluent	10/15/93	ND	ND	21	30	210	ND		
	10/22/93	8	ND	32	47	310	ND		
	02/04/94	ND	ND	ND	ND	ND	ND	7	21
	02/11/94	ND	ND	ND	5	ND	ND	ND	26
	03/21/94	ND	ND	ND	ND	ND	ND	31	ND
	04/15/94	ND	ND	ND	ND	63	ND	27	ND
	06/01/94	ND	ND	ND	ND	ND	ND	100	12
	06/30/94	ND	ND	ND	ND	ND	ND	68	10
	07/19/94	ND	ND	ND	ND	ND	ND	61	ND
	10/31/94	ND	ND	ND	6	60	ND	ND	6
	11/17/94	ND	ND	ND	7	50	ND	39	4
	12/27/94	ND	ND	ND	ND	35	ND	85	20
	01/16/95	ND	ND	1.7	ND	11	ND	50	10
	02/09/95	ND	ND	ND	8.4	92	ND	490	ND
	03/09/95	2.3	ND	ND	20	160	ND	ND	ND
	04/08/95	ND	ND	ND	2.8	ND	ND	74	ND

Explanation:

All values are expressed in ug/L which is equivilant to parts-per-billion (ppb) unless otherwise specified.

B = benzene

E = ethyl benzene

T = toluene

X = xylenes

THG = total hydrocarbons as gasoline

GRO = gasoline range organics

MTBE = methyl-tert-butyl ether

DAHL

TABLE 4

GROUNDWATER SYSTEM PRODUCT REMOVAL DATA

Conoco Store # 23034
1126 South Robert St., W. St. Paul, Minnesota (24930601)

DATE	Cinfluent Conc.(ug/L)	Days of Operation	Geffluent (gal)	COEF	Product Removed (gal)
01/28/94	0	0	0	1.400000E-09	0
02/04/94	2900	7	18892	1.400000E-09	0.07670152
02/11/94	2900	14	27493	1.400000E-09	0.1883231
03/21/94	910	45	58072	1.400000E-09	0.262306828
06/30/94	190	139	119173	1.400000E-09	0.294006846
12/27/94	7000	180	141103	1.400000E-09	1.676816246
03/09/95	9200	72	186272	1.400000E-09	4.075999606

TOTAL DAYS 457

AVERAGE PRODUCT REMOVED 0.00891904 GPD

TOTAL PRODUCT REMOVED **4.08 GALLONS**

Explanation:

gal = gallons
GPD = gallons per day

DAHL

TABLE 5

VACUUM DATA from SOIL VAPOR VENTS

Conoco Store # 23034

1126 South Robert St., W. St. Paul, Minnesota (24930601)

DATE	SVV-1	SVV-2	SVV-3	SVV-4	SVV-5	SVV-6	SVV-7	SVV-8	SVV-9	SVV-10	SVV-11	SVP-1(W)	SVP-1(E)	SVP-2(W)	SVP-2(E)	SVP-3(W)	SVP-3(E)	SVP-4(W)	SVP-4(E)
02/03/94	-23	-23	-24	-22	-19	-30	-21	-20	-24	-23	-23	-3.5	-6	-2.5	-0.7	-4	-4	-3.8	-3.6
02/04/94	-22	-20	-25	-23	-20	-19	-30	-19	-25	-24	-23	-4.6	-3.2	0	-2	-3.5	-3.5	-3.2	-3.2
02/11/94	-47	-47	-39	-46	-47	-18	-50	-51	-30	-24	-45	-1	-2.6	-0.6	0	-0.41	-0.85	-3.1	-2.9
02/18/94	-30	-40	-46	-20	-44	-24	-41	-22	-49	-21	-12	-0.07	12	-0.54	-0.52	*	*	*	*
03/21/94	-48	-48	-48	-48	-26	-10	-45	-48	-35	-20	-14	-1.2	-1.4	-0.62	-0.61	-0.66	-0.28	-2.9	-3.1
04/15/94	-10	-9	-15	-11	-22	-7	-30	-60	-19	-22	-14	-1.1	-1.2	0	-0.42	-0.22	-0.54	-2.5	-2.9
05/31/94	-46	-46	-39	-46	-50	-46	-40	-51	-39	-50	-42	-4.3	-4.8	-0.22	-3.1	-5.4	-3.4	-4	-4.1
06/30/94	-45	-47	-40	-49	-51	-46	-22	-52	-38	-51	-44	-3.8	-2.8	-2.7	0.03	-4.5	0	-2.2	-2.3
07/08/94	-43	-47	-20	-46	-28	-46	-19	-15	-48	-8	-43	-2.1	-2.2	-3	0	0	-4.6	-2.1	-2.1
08/15/94	-42	-48	-17	-44	-12	-44	-17	-31	-48	-14	-44	-3.9	-2.5	-2.4	0	-4.5	0	-2.4	-2.2
08/15/94	-42	-48	-17	-44	-12	-44	-17	-31	-48	-14	-44	-4	-2.8	-2.5	-0.1	-4.5	0	-2.4	-2.5
08/31/94	-20	-20	-20	-20	-20	-30	-20	-20	-20	-20	-20	-2.5	0	18	-1	-2.2	0	-1.8	-1.6
10/31/94	-21	-25	-24	-26	-25	-34	-41	-28	-29	-25	-19	-2.6	-0.05	-1.7	0	0	-2.4	0	-0.9
11/17/94	-22	-24	-22	-22	-38	-29	-44	-25	-20	-15	-15	-2	-0.02	-0.4	-0.02	-0.04	-1.6	-0.49	-0.48
12/27/94	-18	-24	-24	-18	-29	-34	-42	-11	-10	-12	-16	0	3.1	3.4	0	8.2	-2.2	-0.72	-0.74
01/16/95	-35	-39	-36	-20	-30	-13	-52	-4	-10	-16	-11	*	*	2.8	-1.6	-2.6	0	-0.08	-0.03
02/09/95	-30	-26	-36	-22	-32	-50	-50	-4	-7	-18	-8	*	*	*	*	*	*	*	*
03/09/95	SYSTEM SHUT DOWN																		
04/06/95	-26	-14	-26	-25	-27	-16	-16	-15	-20	-20	-19	-3.9	-4.5	-1.7	-1.5	-2.3	-1.8	-5	-4.4
05/11/95	-30	-15	-28	-28	-28	-26	-18	-16	-21	-22	-20	-3.8	-3.2	-1.4	-1.2	-1.8	-1	-4.8	-4

Readings are measured in Inches of Water Column (IWCG)

** - indicates measurement not taken*

TABLE 6

FID READINGS from SOIL VAPOR VENTS

Conoco Store # 23034

1126 South Robert St., W. St. Paul, Minnesota (24930601)

DATE	SVV-1	SVV-2	SVV-3	SVV-4	SVV-5	SVV-6	SVV-7	SVV-8	SVV-9	SVV-10	SVV-11	SVP-1(W)	SVP-1(E)	SVP-2(W)	SVP-2(E)	SVP-3(W)	SVP-3(E)	SVP-4(W)	SVP-4(E)
02/03/94	2800	10000	5000	1000	10000	180	290	150	800	10000	10000	10000	10000	10000	10000	10000	10000	30	50
02/04/94	400	10000	800	400	10000	290	250	110	330	10000	10000	8000	8500	10000	10000	10000	10000	20	35
02/11/94	325	3600	500	225	9500	250	240	65	130	2000	2000	3000	3200	10000	10000	7000	7500	38	42
02/18/94	300	10000	2000	175	10000	500	225	210	150	3000	9500	42	45	80	1250	*	*	*	*
03/21/94	120	1000	4200	900	10000	3500	700	16	190	10000	10000	125	600	10000	150	10000	10000	20	50
04/15/94	150	3200	400	45	4000	70	200	14	18	1200	1250	*	*	*	*	*	*	*	*
05/31/94	40	1100	55	35	475	12	75	125	16	175	200	10	25	7	8	8	7	5	5
06/30/94	50	1200	38	10	400	10	50	80	10	175	175	7	25	18	8	12	15	6	6
07/08/94	40	500	12	12	150	10	30	50	5	135	90	15	20	30	1000	20	0	5	6
08/15/94	40	450	20	10	350	20	33	19	25	58	60	15	40	30	12	15	20	10	10
08/15/94	40	450	20	10	350	20	33	19	25	58	60	10	35	30	10	15	18	6	6
08/31/94	80	1200	200	250	450	10	18	14	12	48	95	22	70	10000	80	40	28	14	20
10/31/94	45	550	45	50	200	15	30	25	22	50	65	14	14	24	260	24	10	9	10
11/17/94	25	230	50	42	100	4	10	3	6	15	25	60	140	5100	9000	1000	18	5	4
12/27/94	16	375	68	60	100	12	15	10	8	36	30	75	200	10000	10000	1750	280	12	15
01/16/95	60	490	90	90	160	10	50	80	10	60	60	*	*	*	*	*	*	*	*
02/09/95	40	600	60	45	280	75	48	40	50	50	65	*	*	*	*	*	*	*	*
03/09/95	SYSTEM SHUT DOWN																		
04/06/95	100	700	125	65	350	30	35	14	20	100	150	30	25	450	1000	32	55	16	21
05/11/95	100	400	100	70	210	18	30	11	20	32	75	25	20	400	850	26	40	12	20

EXPLANATION:

Readings are measured in parts-per-million (ppm)

** - indicates measurement not taken*

TABLE 7

SOIL VENT SYSTEM ANALYTICAL DATA

Conoco Store # 23034
1126 South Robert St., W. St. Paul, Minnesota (24930601)

DATE	B	E	T	X	THG/GRO
02/04/94	21	24	63	73	3900
02/04/94	21	24	63	73	3900
02/11/94	8.7	17	36	56	2000
02/18/94	7.7	23	46	77	2200
03/21/94	6.9	11	30	36	2400
06/30/94	9.6	26	68	120	1400
08/31/94	0.21	0.28	0.99	1.1	39
12/27/94	1.8	3.4	15	12	430

EXPLANATION:

B=benzene
E=ethyl benzene
T=toluene
X=xylene
THG/GRO=total hydrocarbons as gasoline/gasoline range organics
All values are in parts-per-billion (ppb) unless otherwise specified.

DAHL

TABLE 8

SOIL VENT SYSTEM OPERATION DATA

Conoco Store # 23034
1126 South Robert St., W. St. Paul, Minnesota (24930601)

DATE	Days of Operation	Stack Sample (THG)	Flow Rate (SCFM)	Product Removed (GPD)	Total Product Removed (gal)
02/03/94	0	0	0	0	
02/04/94	1	3900	103	6.066	3.032835
02/11/94	7	2000	83	2.507	33.03578
02/18/94	7	2200	47	1.561	47.27357
03/21/94	31	2400	51	1.848	100.12206
06/30/94	101	1400	57	1.205	254.30967
08/31/94	62	39	75	0.044	293.0332425
12/27/94	118	430	34	0.221	308.664083

TOTAL DAYS 327

AVE. PRODUCT REMOVED 0.94392686 GPD

TOTAL PRODUCT REMOVED **308.66 GALLONS**

Explanation:

THG=total hydrocarbons as gasoline in ug/L.
SCFM=standard cubic feet per minute
GPD=gallons per day
gal=gallons

DAHL

TABLE 9

FLOW / PRESSURE MEASUREMENTS AT SPARGE POINT

Conoco Store # 23034
1126 South Robert St., W. St. Paul, Minnesota (24930601)

DATE	SCFM	PSI
08/15/94	2	8.8
08/31/94	2	9
11/17/94	2.5	9.5
12/27/94	2.5	9
02/09/95	2.5	9.2
03/09/95	OFF	OFF
04/06/95	3.5	8.2
05/11/95	2.5	8.2

Explanation:

SCFM = standard cubic feet per minute
PSI = pounds per square inch

TABLE 10

DISSOLVED OXYGEN DATA

Conoco Store # 23034
1126 South Robert St., W. St. Paul, Minnesota (24930601)

DATE	TIME	MW-1	MW-2	MW-3	MW-4	MW-5	SVV-1	SVV-2	SVV-3	SVV-4	SVV-5	SVV-6	SVV-7	SVV-8	SVV-9	SVV-10	SVV-11
07/08/94		2	1.5	2.1	3	6.5	7.5	7.5	1.8	1.4	2.2	2.6	2	1.9	2	*	1.8
08/15/94	09:30	0.6	0.6	1	2.5	2.5	7	6.5	1	*	1.5	6.2	2	1	1.5	*	1.5
08/15/94	11:50	0.7	0.7	1	2.6	2.7	7.2	6.5	1	*	1.5	6.5	2.1	1	1.5	*	1.4
01/16/95		*	1	*	*	*	1	7.8	*	4	6.2	1.1	1	0.8	*	*	1
03/09/95		0.5	0.4	0.5	0.5	1.3	*	*	*	2.4	*	*	*	*	*	*	*
04/06/95		*	*	*	*	*	*	10	2.8	*	1.6	*	*	*	*	*	*
05/11/95		*	*	*	*	*	3.6	9.6	2.1	2.6	9.2	3.8	0.6	1.6	4.2	2.1	2.4

Explaination:
Measurements in mg/l

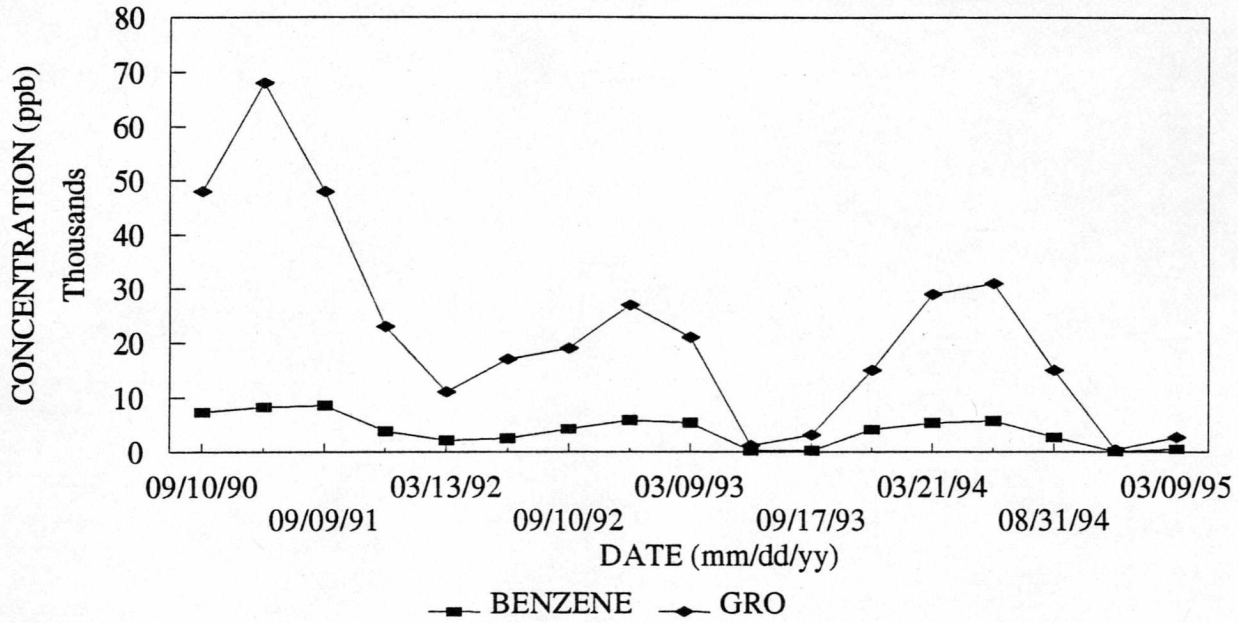
DAHL

GRAPHS

Graph A - Groundwater Quality
Graph B - Water Table Elevation Data

BENZENE/GRO CONCENTRATIONS MW-2

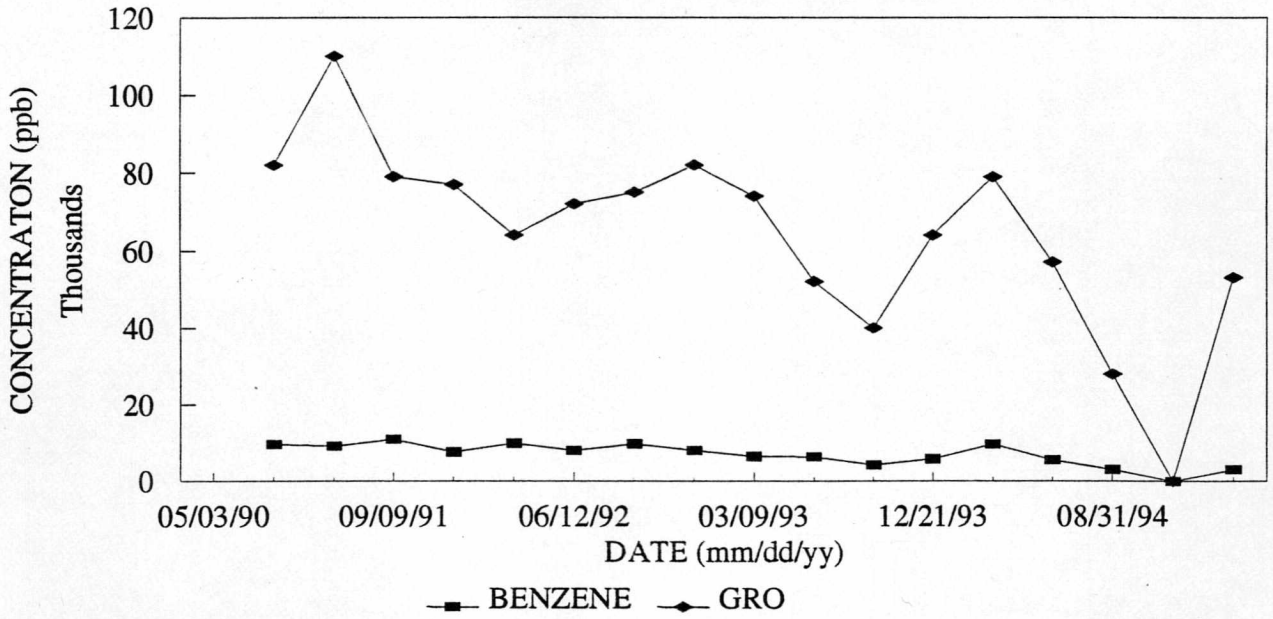
Conoco Store # 23034, W. St. Paul, MN (24930601)



0601LABANAL

BENZENE/GRO CONCENTRATIONS MW-3

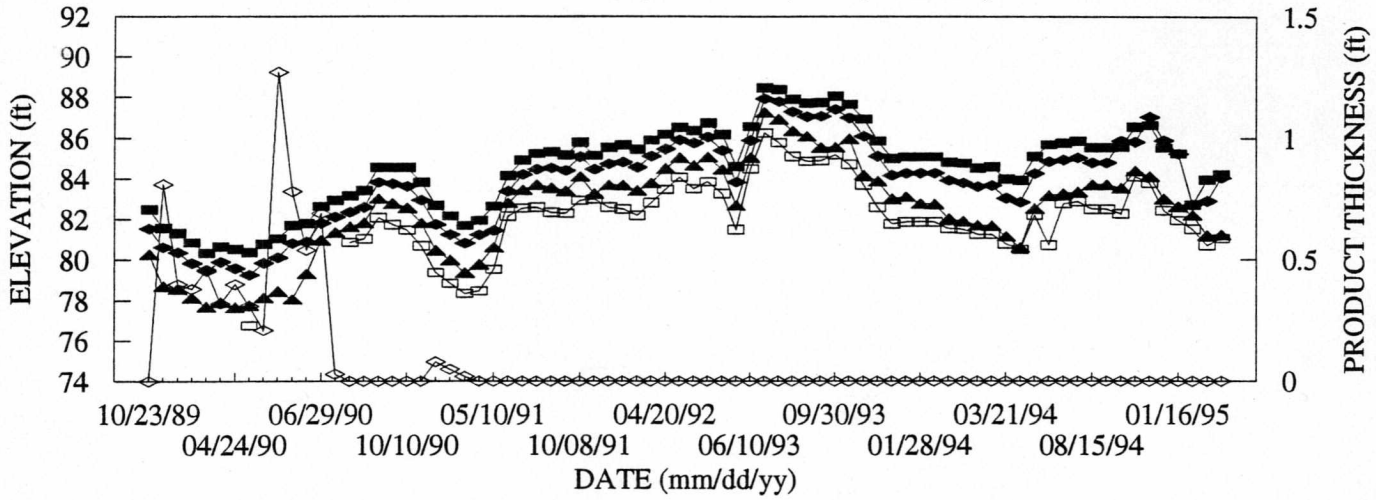
Conoco Store # 233034, W. St. Paul, MN (24930601)



0601LABANAL2

GROUNDWATER ELEVATIONS/PRODUCT THICKNESS

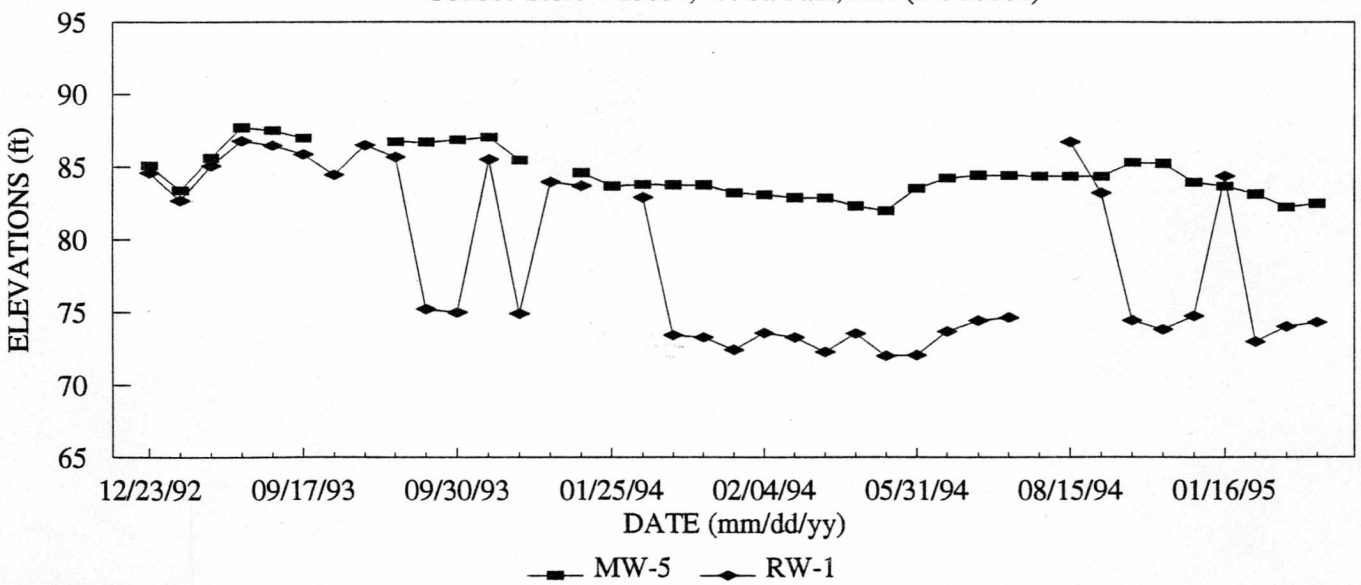
Conoco Store # 23034, W. St. Paul, MN (24930601)



0601WTE.ALL

GROUNDWATER ELEVATIONS, MW-5 & RW-1

Conoco Store # 23034, W. St. Paul, MN (24930601)



0601MW5.RW1

FIGURES

Figure 1 - Location Map
Figure 2 - Test Boring, Monitoring Well, and Recovery Well Locations
Figure 3 - Groundwater Gradient Map
Figure 4 - Remediation System Layout Map
Figure 5 - Soil Vent System Effective Area of Influence

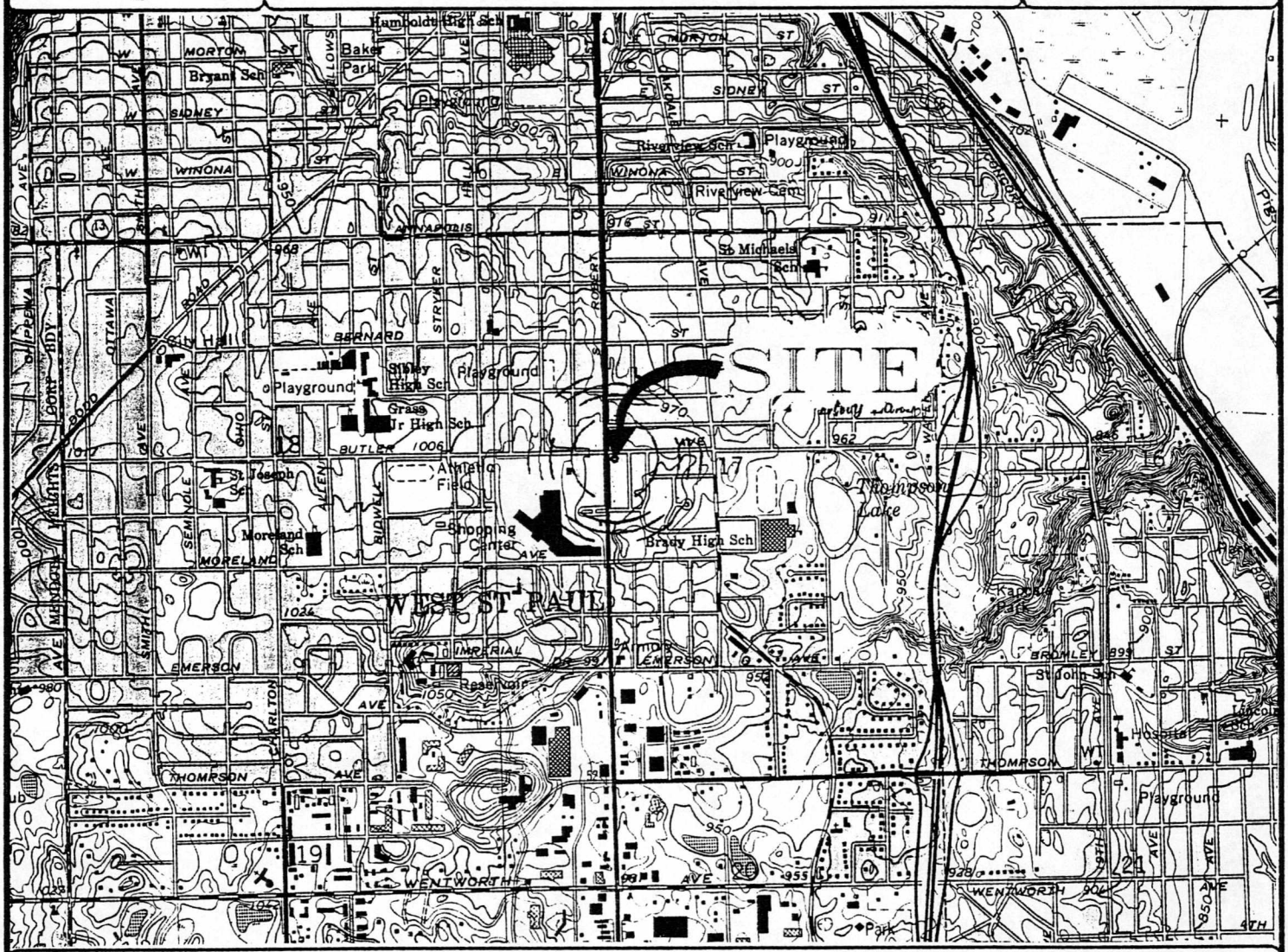
PROJECT SITE LOCATION

NORTH

LAT. N. 44° 54' 40"	T. 28N
LONG. W. 93° 04' 45"	R. 22W
	SEC. 17

U.S.G.S. STANDARD NAME
ST.PAUL EAST, MINN.

QUADRANGLE LOCATION



SCALE 1:24000

1000 0 1000 2000 3000 4000 5000 6000 FEET

1 5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET

Heavy duty ——— Light duty ———

Medium duty ——— Unimproved dirt = = = =

Interstate Route U.S. Route State Route

BASED ON U.S.G.S. 7.5 MINUTE SERIES (TOPOGRAPHIC) MAP

4390 McMenemy Road
Saint Paul, MN. 55127
Phone (612)490-2905
FAX (612)490-3777

DAHL
& ASSOCIATES, INC.
Environmental Consultants, Contractors & Engineers

LOCATION MAP
CONOCO INC.
1126 ROBERT STREET SOUTH
WEST ST.PAUL, MINNESOTA

DATE DRAWN	06/26/95	DRAWN BY	JACOB STALLCUP	APPR. BY	
PROJECT NUMBER	VEMN0601	DRAWING NUMBER	A- 01 -A	FIGURE NUMBER	1

PLOT DATE	06/26/95	AutoCAD FILE NAME	0601-01A	PLOT SCALE	1' = 2000'

DAIRY QUEEN

MW-4

NORTH

W E

S

BUTLER AVENUE

SOUTH ROBERT STREET

TRAFFIC LIGHT PANEL

BENCH

SIGN

MW-2

FORMER DISPENSER ISLAND

RW-1

MW-3

FORMER USTs

MW-5

FORMER DISPENSER ISLAND

BUILDING

MW-1

NANCY RADDATZ DANCE

STOFFEL'S CHIRO

EXPLANATION

NOTE :
This drawing (including property lines, structures, and locations of buried utilities) is not exact. For precise locations, consult a registered land surveyor and appropriate utility company.

⊙ MW- MONITORING WELL

⊡ RW- RECOVERY WELL

SCALE:

0 10' 20' 1"

4390 McMenemy Road
Saint Paul, MN. 55127
Phone (612)490-2905
FAX (612)490-3777

DAHL & ASSOCIATES, INC.
Environmental Consultants, Contractors & Engineers

DAHL STD NO: VEMN0601-B-00-B

MONITORING WELL\RECOVERY WELL LOCATIONS

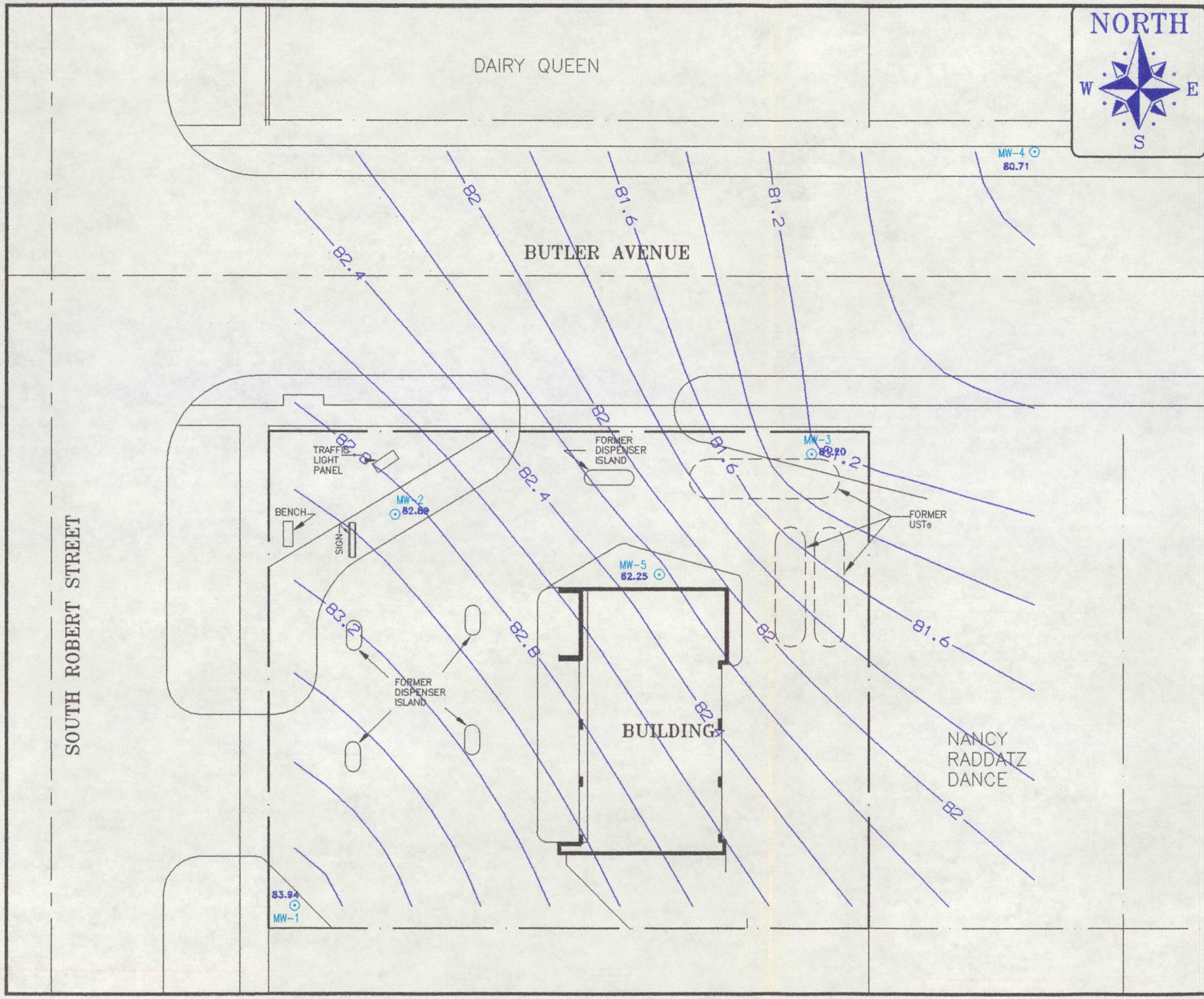
1126 ROBERT STREET SOUTH
WEST ST. PAUL, MINNESOTA

PLOT SCALE 1" = 20'

AutoCAD FILE NAME 0601-06A

PLOT DATE 06/02/95

DATE DRAWN	10/26/93
DRAWN BY	Jim N.
APPROVED BY	
DRAWING NUMBER	B-06A-A
PROJECT NUMBER	VEMN0601
FIGURE NUMBER	3



EXPLANATION

NOTE :
This drawing (including property lines, structures, and locations of buried utilities) is not exact. For precise locations, consult a registered land surveyor and appropriate utility company.

⊙ MW– MONITORING WELL

GROUNDWATER GRADIENT DATA:
* BASED ON DATA COLLECTED ON 03/09/95
AVERAGE GRADIENT=1.5 × 10^{-2} ft/ft

SCALE:
0 1"
0 10' 20'

4390 McMenemy Road
Saint Paul, MN. 55127
Phone (612)490-2905
FAX (612)490-3777

DAHL & ASSOCIATES, INC.
Environmental Consultants, Contractors & Engineers

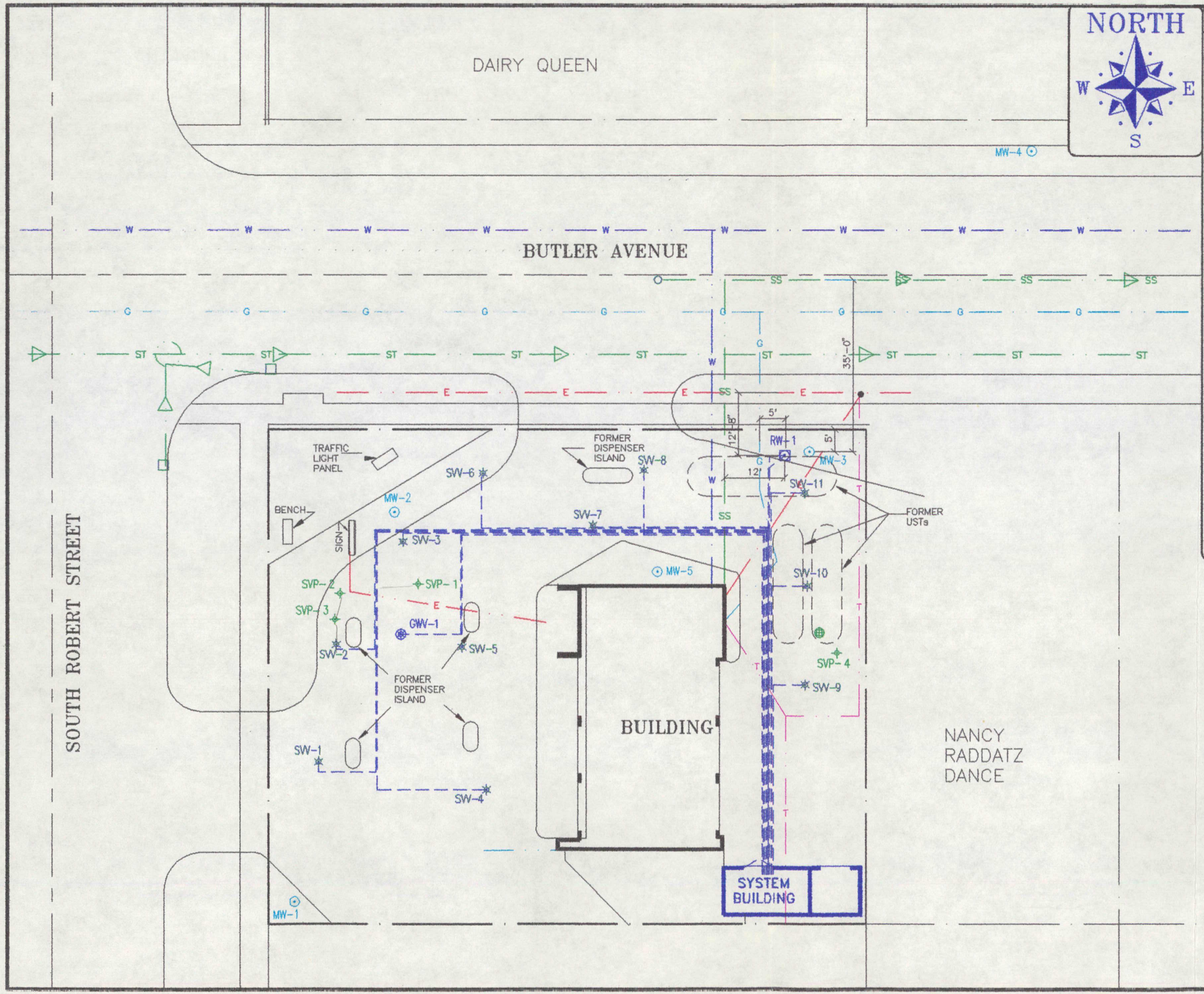
DAHL STD NO: B-00-B

GROUNDWATER GRDIENT 03/09/95

1126 ROBERT STREET SOUTH
WEST ST. PAUL , MINNESOTA

PLOT DATE 06/02/95
AutoCAD FILE NAME 0601-15G
PLOT SCALE 1" = 20'

DATE DRAWN	06/02/95
DRAWN BY	JACOB STALLONE
APPROVED BY	
DRAWING NUMBER	B- 15 -G
PROJECT NUMBER	VEMN0601
FIGURE NUMBER	



EXPLANATION

NOTE :
This drawing (including property lines, structures, and locations of buried utilities) is not exact. For precise locations, consult a registered land surveyor and appropriate utility company.

- MW– MONITORING WELL
- RW– RECOVERY WELL
- SW– SOIL VAPOR VENT
- SVP– SOIL VAPOR PROBE
- GWV– GROUND-WATER VENT
- UTILITY POLE
- E — ELECTRIC
- T — TELEPHONE LINE
- ST — STORM SEWER
- SS — SANITARY SEWER
- W — WATER
- G — GAS

SCALE:
0 10' 20' 1"

DAHL & ASSOCIATES, INC.
Environmental Consultants, Contractors & Engineers
4390 McMenemy Road
Saint Paul, MN. 55127
Phone (612)490-2905
FAX (612)490-3777

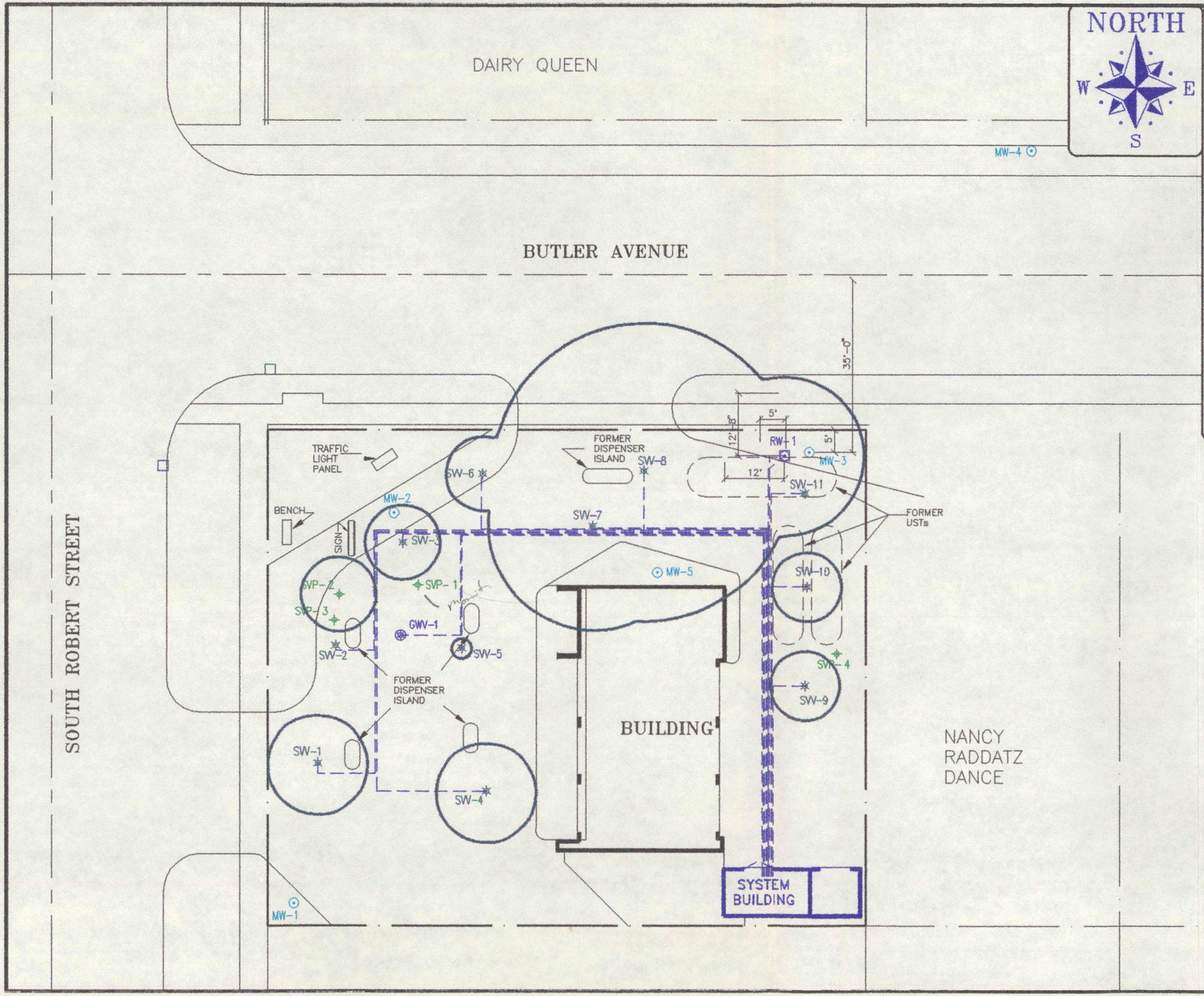
DAHL STD NO: VEMN0601-B-00-B

RECOVERY SYSTEM LAYOUT

S. ROBERT STREET
WEST ST. PAUL, MINNESOTA

PLOT SCALE 1" = 20'
AutoCAD FILE NAME 0601-16D
PLOT DATE 06/02/95

DATE DRAWN	02/15/93
DRAWN BY	Jim N.
APPROVED BY	
DRAWING NUMBER	B- 16 -D
PROJECT NUMBER	VEMN0601
FIGURE NUMBER	



EXPLANATION

NOTE :
This drawing (including property lines, structures, and locations of buried utilities) is not exact. For precise locations, consult a registered land surveyor and appropriate utility company.

MW-	MONITORING WELL
RW-	RECOVERY WELL
SW-	SOIL VAPOR VENT
SVP-	SOIL VAPOR PROBE
GWV-	GROUND-WATER VENT

SCALE:
0 10' 20' (1")

4390 McMenemy Road
Saint Paul, MN. 55127
Phone (612)490-2905
FAX (612)490-3777

DAHL & ASSOCIATES, INC.
Environmental Consultants, Contractors & Engineers

DAHL STD NO: B-00-B

RECOVERY SYSTEM AREA OF INFLUENCE

S. ROBERT STREET
WEST ST. PAUL, MINNESOTA

PLOT SCALE 1" = 20'
AutoCAD FILE NAME 0601-26A
PLOT DATE 06/02/95

DATE DRAWN	06/02/95
DRAWN BY	JACOB WILLIAMS
APPROVED BY	
DRAWING NUMBER	B- 26 -A
PROJECT NUMBER	VEMN0601
FIGURE NUMBER	

APPENDICES

Appendix A - Laboratory Reports and Chain of Custody Records (Groundwater)
Appendix B - MPCA: Form 1 - Air Stripper Screening Evaluation
Appendix C - Laboratory Reports and Chain of Custody Records (Air)
Appendix D - MPCA: Form 2 - Off Gas Screening Evaluation
Appendix E - Product Removal Calculations
Appendix F - Soil Vent System Data/Calculations

Huntingdon
Consulting Engineers Environmental Scientists

Twin City Testing Corporation
662 Cromwell Avenue
St. Paul, Minnesota 55114-1776
(612) 645-3601

REPORT OF: CHEMICAL ANALYSES

PROJECT: 2493 0601

DATE: February 18, 1994

REPORTED TO: Dahl & Associates
Attn: Mike Watson
4390 McMenemy Drive
St. Paul, MN 55127

Conoco - Robert

LABORATORY NO: 4413 94-2585
HPN: 2585

INTRODUCTION

This report presents the results of the analyses of two samples received on February 7, 1994, from a representative of Dahl & Associates. The scope of our services was limited to the parameters listed in the attached tables.

METHODOLOGY

Analyses are performed according to Twin City Testing Standard Operating Procedures. The procedures are based on the references stated in the analytical results tables.

RESULTS

The results are listed in the attached tables.

REMARKS

The samples were collected on February 4, 1994. If samples are not consumed in the analysis, they are held for two months from the date of sample receipt and then disposed, unless written instructions to the contrary are received.

TWIN CITY TESTING CORPORATION

Deneen Walker
Project Manager

Stephanie Kidder
Laboratory Manager

DW/SK/lml

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	Method Blank	Influent	Effluent	
TCT ID:		14433	14434	
Parameter:				**PQL**
Benzene	ND	120	ND	5
Toluene	ND	270	ND	5
Ethyl benzene	ND	14	ND	5
Total xylenes	ND	600	ND	5
Methyl-tert-Butyl Ether	ND	ND	ND	5
Surrogate Recovery:				
α,α,α-Trifluorotoluene	91%	93%	90%	
Total Hydrocarbons as Gasoline	ND	2,900	ND	30
Surrogate Recovery:				
α,α,α-Trifluorotoluene	90%	91%	87%	
Date Collected:		2/4/94	2/4/94	
Date Analyzed:	2/9/94	2/9/94	2/9-10/94	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

ANALYTICAL RESULTS

(All values are in mg/L which is equivalent to parts-per-million)

Client ID: **Effluent**

TCT ID: 14434

Parameter		PQL	Test Date	Test Method
Chemical Oxygen Demand	21	20	2/15/94	410.4
Total Suspended Solids	7	4	2/9/94	160.2

ND = Not Detected

PQL = Practical Quantitation Limit

Reference: Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March, 1983.

twin city testing corporation

737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

CHAIN-OF-CUSTODY RECORD

TCT NO. 48314

MW

D. Walker
TCT CONTACT

DAHL
PROJECT NAME

2453CX001
CLIENT P.O. # / PROJECT NO.

DAHL
BILL TO (CO. NAME, ADDRESS)

Mike Watson
REPORT TO

TCT USE ONLY

PROJ. MGR.	Deneen
PRIORITY	Norm
INVOICE #	
JOB NAME	HPN #2585
CUSTODY SEAL INTACT/NUMBER Y/N	
TEMPERATURE OF CONTAINER	10°C
SAMPLE CONDITION	

DAHL & Associates
CLIENT NAME

4390 McMenemy RD
CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.)

St Paul MN 55127
CLIENT ADDRESS (CITY, STATE, ZIP)

612-490-2905
CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE — PHONE

DAHL & Associates / [signature]
SAMPLED BY — PRINT NAME/SIGNATURE

POSSIBLE HAZARD: YES ____ UNKNOWN ✓ (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB ✓
(ADDITIONAL CHARGES MAY BE ASSESSED)

PREPAY Y/N	
CHECK NO.	
CHECK AMOUNT	

ANALYSES REQUEST

CODE A - NONE
B - HNO_3
C - H_2SO_4
D - NaOH
E - HCl
F - ____

ANALYSES	BETX	MTBE	TPH AS GAS	TSS	C.O.D
FILTERED (YES/NO)	N	N	N	N	N
PRESERVED (CODE)	E	E	E	A	C
REFRIGERATED (Y/N)	Y	Y	Y	Y	Y

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	BETX	MTBE	TPH AS GAS	TSS	C.O.D			NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
1	INFLUENT	H_2O	2-4-94	—	X	X	X					3 ✓	40ml PST	14433
2	EFFLUENT	H_2O	2-4-94	—	X	X	X	X	X			5 ✓	40ml PST, 250ml P1 (COD)	14434
3														
4														
5														
6														
7														
8														
9														
10														

Additional Comments

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
[signature]	2-4-94	3:00PM	[signature]	2 7	3:00
			Abby Walden	2/7/94	5:00

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twin city testing corporation

737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

CHAIN-OF-CUSTODY RECORD

TCT NO. 8__1

TCT USE ONLY	
PROJ. MGR.	
PRIORITY	
INVOICE #	
JOB NAME	
CUSTODY SEAL INTACT/NUMBER Y/N	
TEMPERATURE OF CONTAINER	
SAMPLE CONDITION	

PREPAY Y/N	
CHECK NO.	
CHECK AMOUNT	

CLIENT NAME: Dahl & Associates

CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.): 1390 McAlmerry Rd

CLIENT ADDRESS (CITY, STATE, ZIP): St Paul MN 55107

CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE — PHONE: 612-490-2705

SAMPLED BY PRINT NAME/SIGNATURE: [illegible]

TCT CONTACT: D. Waller

PROJECT NAME: DAHL

CLIENT P.O. # / PROJECT NO.: M53C001

BILL TO (CO. NAME, ADDRESS): DAHL

REPORT TO: [illegible]

ANALYSES REQUEST

FILTERED (YES/NO)

PRESERVED (CODE)

REFRIGERATED (Y/N)

CODE A - NONE
B - HNO3
C - H_2SO_4
D - NaOH
E - HCl
F - ______

POSSIBLE HAZARD: YES ____ UNKNOWN ✓ (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB ✓
(ADDITIONAL CHARGES MAY BE ASSESSED)

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	PAH	BTEX	VOC/AS/CU	TSS	F.O.G				NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
1	Influent	H_2O	1-7-94		X	X	X						2	[illegible]	
2	Effluent	H_2O	1-7-94		X	X	X	X	X				5	[illegible]	
3															
4															
5															
6															
7															
8															
9															
10															

Additional Comments

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
[illegible]			[illegible]	1-7	[illegible]

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* SEE REVERSE SIDE FOR INSTRUCTIONS

Huntingdon
Consulting Engineers Environmental Scientists

Twin City Testing Corporation
662 Cromwell Avenue
St. Paul, Minnesota 55114-1776
(612) 645-3601

REPORT OF: CHEMICAL ANALYSES

PROJECT: 2493 0601

DATE: February 23, 1994

REPORTED TO: Dahl & Associates
Attn: Mike Watson
4390 McMenemy Drive
St. Paul, MN 55127

Conoco Inc. - Robert

LABORATORY NO: 4413 94-2649
HPN: 2649

INTRODUCTION

This report presents the results of the analyses of one sample received on February 14, 1994, from a representative of Dahl & Associates. The scope of our services was limited to the parameters listed in the attached tables.

METHODOLOGY

Analyses are performed according to Twin City Testing Standard Operating Procedures. The procedures are based on the references stated in the analytical results tables.

RESULTS

The results are listed in the attached tables.

REMARKS

The sample was collected on February 11, 1994. If the sample is not consumed in the analysis, it is held for two months from the date of sample receipt and then disposed, unless written instructions to the contrary are received.

TWIN CITY TESTING CORPORATION

Deneen Walker
Project Manager

Stephanie Kidder
Laboratory Manager

DW/SK/lml

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	Method Blank	Effluent	
TCT ID:		14674	
Parameter:			**PQL**
Benzene	ND	ND	5
Toluene	ND	ND	5
Ethyl benzene	ND	ND	5
Total xylenes	ND	5	5
Methyl-tert-Butyl Ether	ND	ND	5
Surrogate Recovery:			
α,α,α-Trifluorotoluene	97%	96%	
Total Hydrocarbons as Gasoline	ND	ND	30
Surrogate Recovery:			
α,α,α-Trifluorotoluene	98%	93%	
Date Collected:		2/11/94	
Date Analyzed:	2/15/94	2/15/94	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

ANALYTICAL RESULTS

(All values are in mg/L which is equivalent to parts-per-million)

Client ID: **Effluent**

TCT ID: 14674

Parameter		PQL	Test Date	Test Method
Chemical Oxygen Demand	26	20	2/15/94	410.4
Total Suspended Solids	ND	4	2/16/94	160.2

ND = Not Detected

PQL = Practical Quantitation Limit

Reference: Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March, 1983.

twin city testing corporation

737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

CHAIN-OF-CUSTODY RECORD

TCT NO. 48321

D Walker
TCT CONTACT

PROJECT NAME 24930601

CLIENT P.O. # / PROJECT NO. Dahl

BILL TO (CO. NAME, ADDRESS) Mike Watson

REPORT TO

Dahl & Associates
CLIENT NAME

4390 McMenemy Rd
CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.)

St. Paul, MN 55127
CLIENT ADDRESS (CITY, STATE, ZIP)

490-2905
CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE PHONE

J. Howard
SAMPLED BY PRINT NAME/SIGNATURE

TCT USE ONLY	
PROJ. MGR.	Deneen
PRIORITY	NORM
INVOICE #	
JOB NAME	HPNF7649
CUSTODY SEAL INTACT/NUMBER Y/N	N/A
TEMPERATURE OF CONTAINER	8°C
SAMPLE CONDITION	OK

PREPAY Y/N	
CHECK NO.	
CHECK AMOUNT	

POSSIBLE HAZARD: YES ____ UNKNOWN ____ (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB ✓
(ADDITIONAL CHARGES MAY BE ASSESSED)

ANALYSES REQUEST

CODE A - NONE
B - HNO_3
C - H_2SO_4
D - NaOH
E - HCl
F - ____

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	FILTERED (YES/NO)	PRESERVED (CODE)	REFRIGERATED (Y/N)	BTEX	MTBE	TPH w Gas	COD	TSS	NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
1	EFFLUENT	H_2O	2-11-94	10:15	N	E	Y	X	X	X	X	X	5 ✓	pint, ½ l. amber 200 ml. pl.	14674
2					N	E	Y								
3					N	E	Y								
4					N	C	Y								
5					N	A	Y								
6															
7															
8															
9															
10															

Additional Comments

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
	2/11	1345		2/14	3:00
			[illegible] Walter	2/14	1540

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twin city testing corporation

737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

CHAIN-OF-CUSTODY RECORD

TCT NO. 48521

CLIENT NAME

CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.)

CLIENT ADDRESS (CITY, STATE, ZIP)

CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE PHONE

SAMPLED BY PRINT NAME/SIGNATURE

TCT CONTACT

PROJECT NAME

CLIENT P.O. # / PROJECT NO.

BILL TO (CO. NAME, ADDRESS)

REPORT TO

TCT USE ONLY
PROJ. MGR.
PRIORITY
INVOICE #
JOB NAME
CUSTODY SEAL INTACT/NUMBER Y/N
TEMPERATURE OF CONTAINER
SAMPLE CONDITION

PREPAY Y/N
CHECK NO.
CHECK AMOUNT

POSSIBLE HAZARD: YES ____ UNKNOWN ____ (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB ____
(ADDITIONAL CHARGES MAY BE ASSESSED)

ANALYSES REQUEST

FILTERED (YES/NO)
PRESERVED (CODE)
REFRIGERATED (Y/N)

CODE A - NONE
B - HNO_3
C - H_2SO_4
D - NaOH
E - HCl
F - ____

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED								NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														

Additional Comments	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME

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SEE REVERSE SIDE FOR INSTRUCTIONS

Huntingdon
Consulting Engineers Environmental Scientists

Twin City Testing Corporation
662 Cromwell Avenue
St. Paul, Minnesota 55114-1776
(612) 645-3601

REPORT OF: CHEMICAL ANALYSES

PROJECT: 2493 0601

DATE: April 5, 1994

REPORTED TO: Dahl & Associates
Attn: Mike Watson
4390 McMenemy Drive
St. Paul, MN 55127

Conoco Inc.

LABORATORY NO: 4413 94-3113
HPN: 3113

INTRODUCTION

This report presents the results of the analyses of seven samples received on March 23, 1994, from a representative of Dahl & Associates. The scope of our services was limited to the parameters listed in the attached tables.

METHODOLOGY

Analyses are performed according to Huntingdon Standard Operating Procedures. The procedures are based on the references stated in the analytical results tables.

RESULTS

The results are listed in the attached tables.

REMARKS

The samples were collected on March 21, 1994. If samples are not consumed in the analysis, they are held for two months from the date of sample receipt and then disposed, unless written instructions to the contrary are received.

HUNTINGDON ENGINEERING & ENVIRONMENTAL, INC.

Deneen Walker
Project Manager

Stephanie Kidder
Laboratory Manager

DW/SK/lml

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	**Method Blank**	**MW-1**	
TCT ID:		17137	
Parameter:			**PQL**
Benzene	ND	ND	5
Toluene	ND	ND	5
Ethyl benzene	ND	ND	5
Total xylenes	ND	ND	5
Methyl-tert-Butyl Ether	ND	ND	5
Surrogate Recovery:			
α,α,α-Trifluorotoluene	98%	98%	
Gasoline Range Organics	ND	ND	30
Surrogate Recovery:			
α,α,α-Trifluorotoluene	99%	100%	
Date Collected:		3/21/94	
Date Analyzed:	3/24/94	3/24-25/94	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	**MW-2**	
TCT ID:	17138	
Parameter:		**PQL**
Benzene	5,300	120
Toluene	2,800	120
Ethyl benzene	1,800	120
Total xylenes	4,800	120
Methyl-tert-Butyl Ether	270	120
Surrogate Recovery:		
α,α,α-Trifluorotoluene	98%	
Gasoline Range Organics	29,000	750
Surrogate Recovery:		
α,α,α-Trifluorotoluene	98%	
Date Collected:	3/21/94	
Date Analyzed:	3/24/94	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	**MW-3**	
TCT ID:	17139	
Parameter:		**PQL**
Benzene	9,700	1,200
Toluene	24,000	1,200
Ethyl benzene	3,500	1,200
Total xylenes	18,000	1,200
Methyl-tert-Butyl Ether	ND	1,200
Surrogate Recovery:		
α,α,α-Trifluorotoluene	98%	
Gasoline Range Organics	79,000	7,500
Surrogate Recovery:		
α,α,α-Trifluorotoluene	100%	
Date Collected:	3/21/94	
Date Analyzed:	3/24/94	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	**MW-4**	**MW-5**	
TCT ID:	17140	17141	
Parameter:			**PQL**
Benzene	ND	ND	5
Toluene	ND	ND	5
Ethyl benzene	ND	ND	5
Total xylenes	ND	ND	5
Methyl-tert-Butyl Ether	ND	ND	5
Surrogate Recovery:			
α,α,α-Trifluorotoluene	98%	97%	
Gasoline Range Organics	ND	60	30
Surrogate Recovery:			
α,α,α-Trifluorotoluene	99%	98%	
Date Collected:	3/21/94	3/21/94	
Date Analyzed:	3/24/94	3/24-25/94	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	Method Blank	Influent	Effluent	
TCT ID:		17142	17143	
Parameter:				**PQL**
Benzene	ND	56	ND	5
Toluene	ND	50	ND	5
Ethyl benzene	ND	ND	ND	5
Total xylenes	ND	230	ND	5
Methyl-tert-Butyl Ether	ND	ND	ND	5
Surrogate Recovery:				
α,α,α-Trifluorotoluene	92%	90%	91%	
Total Hydrocarbons as Gasoline	ND	910	ND	30
Surrogate Recovery:				
α,α,α-Trifluorotoluene	89%	86%	89%	
Date Collected:		3/21/94	3/21/94	
Date Analyzed:	3/24/94	3/24/94	3/24/94	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, November 1986, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, April 1992.

Huntingdon
Consulting Engineers Environmental Scientists

LABORATORY NO: 4413 94-3113

ANALYTICAL RESULTS

(All values are in mg/L which is equivalent to parts-per-million)

Client ID: **Effluent**

TCT ID: 17143

Parameter		PQL	Test Date	Test Method
Total Suspended Solids	ND	4	3/28/94	160.2
Chemical Oxygen Demand	31	20	4/1/94	410.4

ND = Not Detected

PQL = Practical Quantitation Limit

Reference: Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March, 1983.

twin city testing corporation

737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

CHAIN-OF-CUSTODY RECORD

MW

TCT NO. 46479

TCT CONTACT: D. Walker

PROJECT NAME:

CLIENT P.O. # / PROJECT NO.: 24930601

BILL TO (CO. NAME, ADDRESS): Dahl

REPORT TO: Mike Watson

CLIENT NAME: Dahl & Assoc.

CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.): 4390 McMenemy Rd.

CLIENT ADDRESS (CITY, STATE, ZIP): St. Paul, MN. 55127

CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE — PHONE: 490-2905

SAMPLED BY PRINT NAME/SIGNATURE: J. Howard / [signature]

TCT USE ONLY	
PROJ. MGR.	Deneen
PRIORITY	Norm
INVOICE #	
JOB NAME	HPN 313
CUSTODY SEAL INTACT/NUMBER Y/N	NA
TEMPERATURE OF CONTAINER	10°C
SAMPLE CONDITION	OK

PREPAY Y/N	
CHECK NO.	
CHECK AMOUNT	

POSSIBLE HAZARD: YES ____ UNKNOWN ____ (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB ✓
(ADDITIONAL CHARGES MAY BE ASSESSED)

ANALYSES REQUEST

CODE A - NONE
B - HNO3
C - H_2SO_4
D - NaOH
E - HCl
F - ____

ANALYSES REQUEST	BTEX	MTBE	GRO	TPH as Gas	COD	TSS
FILTERED (YES/NO)	N	N	N	N	N	N
PRESERVED (CODE)	E	E	E	E	C	A
REFRIGERATED (Y/N)	Y	Y	Y	Y	Y	Y

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	BTEX	MTBE	GRO	TPH as Gas	COD	TSS		NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
1	mw-1	H_2O	3/21/94	PM	X	X	X					3	pet	17137
2	mw-2	↓	↓	↓	X	X	X					↓	↓	17138
3	mw-3	↓	↓	↓	X	X	X					↓	↓	17139
4	mw-4	↓	↓	↓	X	X	X					↓	↓	17140
5	mw-5	↓	↓	↓	X	X	X					↓	↓	17141
6	INFLUENT	↓	↓	↓	X	X		X				↓	↓	17142
7	EFFLUENT	↓	↓	↓	X	X		X	X	X				17143
8														
9														
10														

Additional Comments

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
Jeffrey Howard	3/22	1500	[signature]	3/23	3:25
			Abby Walker / TCT	3/23/94	1630

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twin city testing corporation

737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

CHAIN-OF-CUSTODY RECORD

TCT NO. 46479

TCT USE ONLY
PROJ. MGR.
PRIORITY
INVOICE #
JOB NAME
CUSTODY SEAL INTACT/NUMBER Y/N
TEMPERATURE OF CONTAINER
SAMPLE CONDITION

TCT CONTACT

PROJECT NAME

CLIENT P.O. # / PROJECT NO.

BILL TO (CO. NAME, ADDRESS)

REPORT TO

CLIENT NAME: Dahl & Assoc.

CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.): 4390 McMenemy Rd

CLIENT ADDRESS (CITY, STATE, ZIP): St Paul, MN 55127

CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE: PHONE 770-2705

SAMPLED BY PRINT NAME/SIGNATURE: J Howard

POSSIBLE HAZARD: YES ____ UNKNOWN ____ (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB ✓
(ADDITIONAL CHARGES MAY BE ASSESSED)

PREPAY Y/N
CHECK NO.
CHECK AMOUNT

ANALYSES REQUEST

CODE A - NONE
B - HNO_3
C - H_2SO_4
D - NaOH
E - HCl
F - ____

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	FILTERED (YES/NO)	PRESERVED (CODE)	REFRIGERATED (Y/N)	NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
1	MW-1	GW			N	A	Y	3	1	
2	MW-2				N	A	Y			
3	MW-3				N	A	Y			
4	MW-4				N	A	Y			
5	MW-5				N	A	Y			
6	EQUIPMENT				N	B	Y			
7	EQUIPMENT				N	B	Y			
8										
9										
10										

Additional Comments	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
	J Howard	7/2	5:00	[illegible]	7/2	5:25

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Huntingdon
Consulting Engineers Environmental Scientists

Twin City Testing Corporation
662 Cromwell Avenue
St. Paul, Minnesota 55114-1776
(612) 645-3601

REPORT OF: CHEMICAL ANALYSES

PROJECT: 2493 0601

DATE: May 2, 1994

REPORTED TO: Dahl & Associates
Attn: Mike Watson
4390 McMenemy Drive
St. Paul, MN 55127

CONOCO INC.

LABORATORY NO: 4413 94-3421
HPN: 3421

INTRODUCTION

This report presents the results of the analyses of one sample received on April 18, 1994, from a representative of Dahl & Associates. The scope of our services was limited to the parameters listed in the attached tables.

METHODOLOGY

Analyses are performed according to Huntingdon Standard Operating Procedures. The procedures are based on the references stated in the analytical results tables.

RESULTS

The results are listed in the attached tables.

REMARKS

The sample was collected on April 15, 1994. If the sample is not consumed in the analysis, it is held for two months from the date of sample receipt and then disposed, unless written instructions to the contrary are received.

HUNTINGDON ENGINEERING & ENVIRONMENTAL, INC.

Deneen Walker
Project Manager

Stephanie Kidder
Laboratory Manager

DW/SK/lml

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	Method Blank	Effluent	
TCT ID:		18602	
Parameter:			**PQL**
Benzene	ND	ND	5
Toluene	ND	ND	5
Ethyl benzene	ND	ND	5
Total xylenes	ND	ND	5
Methyl-tert-Butyl Ether	ND	ND	5
Surrogate Recovery:			
α,α,α-Trifluorotoluene	94%	93%	
Total Hydrocarbons as Gasoline	ND	63	30
Surrogate Recovery:			
α,α,α-Trifluorotoluene	91%	90%	
Date Collected:		4/15/94	
Date Analyzed:	4/19/94	4/19-20/94	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, July 1992, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, July 1993.

ANALYTICAL RESULTS

(All values are in mg/L which is equivalent to parts-per-million)

Client ID: **Effluent**

TCT ID: 18602

Parameter		PQL	Test Date	Test Method
Total Suspended Solids	ND	4	4/18/94	160.2
Chemical Oxygen Demand	27	20	4/29/94	410.4

ND = Not Detected

PQL = Practical Quantitation Limit

Reference: Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March, 1983.

twin city test[redacted] corporation
737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

CHAIN-OF-CUSTODY RECORD

TC[redacted] NO. [redacted]6[redacted]2

TCT CONTACT: D. Walker

PROJECT NAME: 24930601

CLIENT P.O. # / PROJECT NO.: DAHL

BILL TO (CO. NAME, ADDRESS): M. WATSON

REPORT TO:

CLIENT NAME: DAHL & ASSOCIATES

CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.): 4390 McMENEMY RD

CLIENT ADDRESS (CITY, STATE, ZIP): ST. PAUL MN 55127

CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE — PHONE: 612-490-2805

SAMPLED BY PRINT NAME/SIGNATURE: MARK SMITH / Mark Smith

POSSIBLE HAZARD: YES ____ UNKNOWN X (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB X
(ADDITIONAL CHARGES MAY BE ASSESSED)

TCT USE ONLY

PROJ. MGR.	Deneen
PRIORITY	NORM
INVOICE #	
JOB NAME	HPN 3421
CUSTODY SEAL INTACT/NUMBER Y/N	NA
TEMPERATURE OF CONTAINER	18°C
SAMPLE CONDITION	OK

PREPAY Y/N	
CHECK NO.	
CHECK AMOUNT	

ANALYSES REQUEST

	BETX	MTBE	TPH/VSG-AS	TSS	COD			
FILTERED (YES/NO)	N	N	N	N	N			
PRESERVED (CODE)	E	E	E	A	C			
REFRIGERATED (Y/N)	Y	Y	Y	Y	Y			

CODE A - NONE
B - HNO3
C - H_2SO_4
D - NaOH
E - HCl
F - ______

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	BETX	MTBE	TPH/VSG-AS	TSS	COD				NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
1	EFFLUENT	H_2O	4/15/94	11:30	X	X	X	X	X				5	3-40ml P+T 1-1L CUBE 1-250 ml PLASTIC	18602
2															
3															
4															
5															
6															
7															
8															
9															
10															

Additional Comments

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
Mark Smith			[signature]	4/18	3:00
			A. Walden / TCT	4/18/94	1645

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twin city testing corporation
737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

CHAIN-OF-CUSTODY RECORD

TW

TCT No. 46702

TCT CONTACT: D. WALKER
PROJECT NAME:
CLIENT P.O. # / PROJECT NO.: 24930601
BILL TO (CO. NAME, ADDRESS): DAHL
REPORT TO: M. WATSON

CLIENT NAME: DAHL & ASSOCIATES
CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.): 4390 McMENEMY RD
CLIENT ADDRESS (CITY, STATE, ZIP): ST. PAUL MN 55127
CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE — PHONE: 612-490-2905
SAMPLED BY PRINT NAME/SIGNATURE: MARK SMITH / Mark Smith

TCT USE ONLY	
PROJ. MGR.	
PRIORITY	
INVOICE #	
JOB NAME	
CUSTODY SEAL INTACT/NUMBER Y/N	
TEMPERATURE OF CONTAINER	
SAMPLE CONDITION	

PREPAY Y/N	
CHECK NO.	
CHECK AMOUNT	

POSSIBLE HAZARD: YES ____ UNKNOWN X (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB X
(ADDITIONAL CHARGES MAY BE ASSESSED)

ANALYSES REQUEST

CODE A - NONE
B - HNO3
C - H_2SO_4
D - NaOH
E - HCl
F - ______

ANALYSES REQUEST	BTEX	MTBE	TPH/GAS	TSS	COD			
FILTERED (YES/NO)	N	N	N	N	N			
PRESERVED (CODE)	E	E	E	A	C			
REFRIGERATED (Y/N)	Y	Y	Y	Y	Y			

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	BTEX	MTBE	TPH/GAS	TSS	COD				NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
1	EFFLUENT	H_2O	4/15/94	11:30	X	X	X	X	X				5	3 40ml P+T 1-1L CUBE 1-250 ml PLASTIC	
2															
3															
4															
5															
6															
7															
8															
9															
10															

Additional Comments

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
Mark Smith			[illegible]	4/15	2:20

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Huntingdon

Huntingdon Engineering & Environmental, Inc.

737 Pelham Boulevard
St. Paul, Minnesota 55114-1739

(612) 659-7600
FAX (612) 659-7515

REPORT OF: CHEMICAL ANALYSES

PROJECT: 2493-0601

DATE: June 24, 1994

REPORTED TO: Dahl & Associates
Attn: Mike Watson
4390 McMenemy Drive
St. Paul, MN 55127

Conoco Inc.

LABORATORY NO: 4413 94-5104
HPN: 5104

INTRODUCTION

This report presents the results of the analyses of one sample received on June 3, 1994, from a representative of Dahl & Associates. The scope of our services was limited to the parameters listed in the attached tables.

METHODOLOGY

Analyses are performed according to Huntingdon Standard Operating Procedures. The procedures are based on the references stated in the analytical results tables.

RESULTS

The results are listed in the attached tables.

REMARKS

The sample was collected on June 1, 1994. If the sample is not consumed in the analysis, it is held for two months from the date of sample receipt and then disposed, unless written instructions to the contrary are received.

HUNTINGDON ENGINEERING & ENVIRONMENTAL, INC.

Deneen Walker
Project Manager

Stephanie Kidder
Laboratory Manager

DW/SK/lml

Huntingdon

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	Method Blank	Effluent	
TCT ID:		25468	
Parameter:			**PQL**
Benzene	ND	ND	5
Toluene	ND	ND	5
Ethyl benzene	ND	ND	5
Total xylenes	ND	ND	5
Methyl-tert-Butyl Ether	ND	ND	5
Surrogate Recovery:			
α,α,α-Trifluorotoluene	93%	91%	
Total Hydrocarbons as Gasoline	ND	ND	30
Surrogate Recovery:			
α,α,α-Trifluorotoluene	89%	89%	
Date Collected:		6/1/94	
Date Analyzed:	6/9/94	6/9/94	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, July 1992, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, July 1993.

LABORATORY NO: 4413 94-5104

Huntingdon

ANALYTICAL RESULTS

(All values are in mg/L which is equivalent to parts-per-million)

Client ID: **Effluent**

TCT ID: 25468

Parameter		PQL	Test Date	Test Method
Total Suspended Solids	12	4	6/6/94	160.2
Chemical Oxygen Demand	100	20	6/13/94	410.4

ND = Not Detected

PQL = Practical Quantitation Limit

Reference: Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March, 1983.

LABORATORY NO: 4413 94-5104

twin city testing corporation

737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

CHAIN-OF-CUSTODY RECORD

TCT NO. 49182

D. WHEELER
TCT CONTACT

PROJECT NAME 2493 0601

CLIENT P.O. # / PROJECT NO. DAHL + ASSOC.

BILL TO (CO. NAME, ADDRESS) MIKE WATSON

REPORT TO

DAHL + ASSOCIATES
CLIENT NAME

4390 MCKENEMY RD
CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.)

ST PAUL MN 55127
CLIENT ADDRESS (CITY, STATE, ZIP)

612-490-2805
CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE PHONE

MARK SMITH / Mark Smith
SAMPLED BY PRINT NAME/SIGNATURE

POSSIBLE HAZARD: YES ____ UNKNOWN ? (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB ____
(ADDITIONAL CHARGES MAY BE ASSESSED)

TCT USE ONLY	
PROJ. MGR.	DEW
PRIORITY	NORM
INVOICE #	—
JOB NAME	HPW 5104
CUSTODY SEAL INTACT/NUMBER Y/N	NA
TEMPERATURE OF CONTAINER	15°C
SAMPLE CONDITION	OK

PREPAY Y/N	
CHECK NO.	
CHECK AMOUNT	

ANALYSES REQUEST

CODE A - NONE
B - HNO3
C - H_2SO_4
D - NaOH
E - HCl
F - ____

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	FILTERED (YES/NO)	PRESERVED (CODE)	REFRIGERATED (Y/N)	BOD	METALS	TPH GAS/DRO	TSS	COD		NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
					W	N	N	N	N							
					E	E	E	A	C							
					Y	Y	Y	Y	Y							
1	EFFLUENT	H2O	6/1/94	2:00	X	X	X	X	X					5	5-40ml P&T 1-1LCUBE 1-250ml PLASTIC	25168
2																
3																
4																
5																
6																
7																
8																
9																
10																

Additional Comments

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
Mark Smith			2nd	6 3	3:15
			JENNIFER C HANLEY TCT	6/3/94	1545

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twin city testing corporation

737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

CHAIN-OF-CUSTODY RECORD

TCT NO. 49182

D. WARNER

TCT CONTACT

PROJECT NAME 24930601

CLIENT P.O. # / PROJECT NO.

BILL TO (CO. NAME, ADDRESS) DAHL + ASSOC.

REPORT TO MIKE WATSON

DAHL + ASSOCIATES

CLIENT NAME

1390 MCMENEMY RD

CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.)

ST PAUL MN 55127

CLIENT ADDRESS (CITY, STATE, ZIP)

612-490-7505

CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE PHONE

MIKE SMITH / Mike Smith

SAMPLED BY PRINT NAME/SIGNATURE

TCT USE ONLY
PROJ. MGR.
PRIORITY
INVOICE #
JOB NAME
CUSTODY SEAL INTACT/NUMBER Y/N
TEMPERATURE OF CONTAINER
SAMPLE CONDITION

PREPAY Y/N
CHECK NO.
CHECK AMOUNT

POSSIBLE HAZARD: YES ____ UNKNOWN ? (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB ~~X~~
(ADDITIONAL CHARGES MAY BE ASSESSED)

ANALYSES REQUEST

CODE A - NONE
B - HNO3
C - H_2SO_4
D - NaOH
E - HCl
F - ____

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	FILTERED (YES/NO)	PRESERVED (CODE)	REFRIGERATED (Y/N)	BETX	METALS	TPH/GRO	TSS	COD			NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
					N	E	Y	BETX	METALS	TPH/GRO	TSS	COD					
1	EFFLUENT	H2O	6/1/94	2:00	N	E	Y	X	X	X	X	X			5	3 40ml P/T 1 1L Cube 1 250ml Plastic	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Additional Comments	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
	Mike Smith			[illegible]	6/2	9:15

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Huntingdon

Huntingdon Engineering & Environmental, Inc.

737 Pelham Boulevard
St. Paul, Minnesota 55114-1739

(612) 659-7600
FAX (612) 659-7515

REPORT OF: CHEMICAL ANALYSES

PROJECT: 2493-0601

DATE: July 19, 1994

REPORTED TO: Dahl & Associates
Attn: Mike Watson
4390 McMenemy Drive
St. Paul, MN 55127

Conoco Inc.

LABORATORY NO: 4413 94-5496
HPN: 5496

INTRODUCTION

This report presents the results of the analyses of seven samples received on July 1, 1994, from a representative of Dahl & Associates. The scope of our services was limited to the parameters listed in the attached tables.

METHODOLOGY

Analyses are performed according to Huntingdon Standard Operating Procedures. The procedures are based on the references stated in the analytical results tables.

RESULTS

The results are listed in the attached tables.

REMARKS

The samples were collected on June 30, 1994. If samples are not consumed in the analysis, they are held for two months from the date of sample receipt and then disposed, unless written instructions to the contrary are received.

HUNTINGDON ENGINEERING & ENVIRONMENTAL, INC.

Deneen Walker
Project Manager

Stephanie Kidder
Laboratory Manager

DW/SK/lml

Huntingdon

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID: **Method Blank**

TCT ID:

Parameter:		**PQL**
Benzene	ND	5
Toluene	ND	5
Ethyl benzene	ND	5
Total xylenes	ND	5
Methyl-tert-Butyl Ether	ND	5
Surrogate Recovery:		
α,α,α-Trifluorotoluene	104%	
Gasoline Range Organics	ND	30
Surrogate Recovery:		
α,α,α-Trifluorotoluene	103%	
Date Analyzed:	7/11/94	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, July 1992, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, July 1993.

Huntingdon

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	**MW-1**	
TCT ID:	27678	
Parameter:		**PQL**
Benzene	ND	5
Toluene	ND	5
Ethyl benzene	ND	5
Total xylenes	ND	5
Methyl-tert-Butyl Ether	ND	5
Surrogate Recovery:		
α,α,α-Trifluorotoluene	104%	
Gasoline Range Organics	ND	30
Surrogate Recovery:		
α,α,α-Trifluorotoluene	103%	
Date Collected:	6/30/94	
Date Analyzed:	7/11/94	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, July 1992, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, July 1993.

LABORATORY NO: 4413 94-5496

Huntingdon

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	**MW-2**	
TCT ID:	27679	
Parameter:		**PQL**
Benzene	5,700	250
Toluene	3,700	120
Ethyl benzene	1,800	120
Total xylenes	6,500	250
Methyl-tert-Butyl Ether	200	120
Surrogate Recovery:		
α,α,α-Trifluorotoluene	103%	
Gasoline Range Organics	31,000	1,500
Surrogate Recovery:		
α,α,α-Trifluorotoluene	102%	
Date Collected:	6/30/94	
Date Analyzed:	7/11-12/94	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, July 1992, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, July 1993.

LABORATORY NO: 4413 94-5496

Huntingdon

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	**MW-3[1]**	
TCT ID:	27681	
Parameter:		**PQL**
Benzene	5,600	250
Toluene	14,000	500
Ethyl benzene	2,600	250
Total xylenes	14,000	500
Methyl-tert-Butyl Ether	ND	250
Surrogate Recovery:		
α,α,α-Trifluorotoluene	105%	
Gasoline Range Organics	57,000	3,000
Surrogate Recovery:		
α,α,α-Trifluorotoluene	105%	
Date Collected:	6/30/94	
Date Analyzed:	7/11-12/94	

[1] Chromatographic profile contains higher boiling hydrocarbons.

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, July 1992, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, July 1993.

LABORATORY NO: 4413 94-5496

Huntingdon

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	**MW-4**	**MW-5**	
TCT ID:	27683	27684	
Parameter:			**PQL**
Benzene	ND	ND	5
Toluene	ND	ND	5
Ethyl benzene	ND	ND	5
Total xylenes	ND	ND	5
Methyl-tert-Butyl Ether	ND	ND	5
Surrogate Recovery:			
α,α,α-Trifluorotoluene	103%	102%	
Gasoline Range Organics	ND	47	30
Surrogate Recovery:			
α,α,α-Trifluorotoluene	103%	102%	
Date Collected:	6/30/94	6/30/94	
Date Analyzed:	7/11/94	7/11/94	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, July 1992, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, July 1993.

LABORATORY NO: 4413 94-5496

Huntingdon

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	Method Blank	Influent	Effluent	
TCT ID:		27686	27688	
Parameter:				**PQL**
Benzene	ND	ND	ND	5
Toluene	ND	ND	ND	5
Ethyl benzene	ND	ND	ND	5
Total xylenes	ND	ND	ND	5
Methyl-tert-Butyl Ether	ND	ND	ND	5
Surrogate Recovery:				
α,α,α-Trifluorotoluene	94%	96%	95%	
Total Hydrocarbons as Gasoline	ND	190	62	30
Surrogate Recovery:				
α,α,α-Trifluorotoluene	91%	90%	92%	
Date Collected:		6/30/94	6/30/94	
Date Analyzed:	7/11/94	7/11-12/94	7/11-12/94	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, July 1992, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, July 1993.

LABORATORY NO: 4413 94-5496

Huntingdon

ANALYTICAL RESULTS

(All values are in mg/L which is equivalent to parts-per-million)

Client ID: **Effluent**

TCT ID: 27688

Parameter		PQL	Test Date	Test Method
Total Suspended Solids	10	4	7/6/94	160.2
Chemical Oxygen Demand	68	20	7/14/94	410.4

ND = Not Detected

PQL = Practical Quantitation Limit

Reference: Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March, 1983.

LABORATORY NO: 4413 94-5496

CHAIN-OF-CUSTODY RECORD

TCT NO. 48928

twin city testing corporation
737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

TCT CONTACT: D. WACKER

PROJECT NAME: 2493060.01

CLIENT NAME: BARR + ASSOCIATES

CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.): 4350 MC MENEMY RD

CLIENT ADDRESS (CITY, STATE, ZIP): ST. PAUL MN 55127

CLIENT P.O. # / PROJECT NO.: BARR

BILL TO (CO. NAME, ADDRESS): MIKE WATSON

REPORT TO

CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE: MARK SMITH PHONE: 612-490-2905

SAMPLED BY PRINT NAME/SIGNATURE: MARK SMITH / Mark Smith

TCT USE ONLY

PROJ. MGR.
PRIORITY
INVOICE #
JOB NAME
CUSTODY SEAL INTACT/NUMBER Y/N
TEMPERATURE OF CONTAINER
SAMPLE CONDITION

PREPAY Y/N
CHECK NO.
CHECK AMOUNT

POSSIBLE HAZARD: YES ____ UNKNOWN ✓ (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB ✓
(ADDITIONAL CHARGES MAY BE ASSESSED)

ANALYSES REQUEST

CODE A - NONE
B - HNO_3
C - H_2SO_4
D - NaOH
E - HCl
F - ____

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	FILTERED (YES/NO)							NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
								BTEX	METALS	GRO	TPH GRO/DRO	TSS	COD	
					PRESERVED (CODE)									
					REFRIGERATED (Y/N)									
					Y	N	W	N	W	N				
					L	C	E	E	A	C				
1	MW-1	H2O	6/30/01	1000	✓	✓	✓					3	40ml P+T	
2	MW-2				✓	✓	✓							
3	MW-3				✓	✓	✓							
4	MW-4				✓	✓	✓							
5	MW-5				✓	✓	✓							
6	INFLUENT				✓	✓		✓						
7	EFFLUENT				✓	✓		✓	✓	✓		5	3-40ml P+T 1-500ml PLASTIC 1 METAL	
8														
9														
10														

Additional Comments

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
Mark Smith				7/1	0900

C813 Rev. 10/91

* SEE REVERSE SIDE FOR INSTRUCTIONS

twin city testing corporation

CHAIN-OF-CUSTODY RECORD

TCT NO. 48926

737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

D. WACKER
TCT CONTACT

24930601
PROJECT NAME

PAUL + ASSOCIATES
CLIENT NAME

1330 MC MENEMY RD
CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.)

ST PAUL MN 55127
CLIENT ADDRESS (CITY, STATE, ZIP)

CLIENT P.O. # / PROJECT NO.

PAUL
BILL TO (CO. NAME, ADDRESS)

MIKE WATSON
REPORT TO

612-490-2905
CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE PHONE

MARK SMITH / Mark Smith
SAMPLED BY PRINT NAME/SIGNATURE

TCT USE ONLY
PROJ. MGR.
PRIORITY
INVOICE #
JOB NAME
CUSTODY SEAL INTACT/NUMBER Y/N
TEMPERATURE OF CONTAINER
SAMPLE CONDITION

PREPAY Y/N
CHECK NO.
CHECK AMOUNT

POSSIBLE HAZARD: YES ____ UNKNOWN ✓ (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB ✓
(ADDITIONAL CHARGES MAY BE ASSESSED)

ANALYSES REQUEST

CODE A - NONE
B - HNO_3
C - H_2SO_4
D - NaOH
E - HCl
F - ____

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	FILTERED (YES/NO)								NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
						N	N	N	N	N	N	N			
					PRESERVED (CODE)	C	C	E	E	A	C				
					REFRIGERATED (Y/N)	Y	Y	Y	Y	Y	Y				
						BETX	METALS	LEAD	TPH GAS/DRO	TSS	COD				
1	MW-1	H2O	6/30/94	1000	✓	✓	✓						3	40ml P+T	
2	MW-2				✓	✓	✓								
3	MW-3				✓	✓	✓								
4	MW-4				✓	✓	✓								
5	MW-5				✓	✓	✓								
6	INFLUENT				✓	✓		✓							
7	EFFLUENT				✓	✓		✓	✓	✓			5	3-40ml P+T 1-250ml PLASTIC 1-1L CUBE	
8															
9															
10															

Additional Comments

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
Mark Smith				7/1	1030

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* SEE REVERSE SIDE FOR INSTRUCTIONS

Huntingdon

Huntingdon Engineering & Environmental, Inc.

737 Pelham Boulevard
St. Paul, Minnesota 55114-1739

(612) 659-7600
FAX (612) 659-7515

REPORT OF: CHEMICAL ANALYSES

PROJECT: DAHL & ASSOCIATES, 2493-0601 **DATE:** August 12, 1994

REPORTED TO: DAHL & ASSOCIATES
Attn: MIKE WATSON
4390 McMENEMY ROAD
ST. PAUL, MN 55127

Conoco Inc.

LABORATORY NO: 4413-94-5696
HPN: 5696

INTRODUCTION

This report presents the results of the analyses of one sample received on July 20, 1994, from a representative of Dahl & Associates. The scope of our services was limited to the parameters listed in the attached tables.

METHODOLOGY

Analyses are performed according to Huntingdon Standard Operating Procedures. The procedures are based on the references stated in the analytical results tables.

RESULTS

The results are listed in the attached tables.

REMARKS

The sample was collected on July 19, 1994. If the sample is not consumed in the analysis, it is held for two months from the date of sample receipt and then disposed, unless written instructions to the contrary are received.

HUNTINGDON ENGINEERING & ENVIRONMENTAL, INC.

Deneen E. Walker
Project Manager

Stephanie A. Kidder
Laboratory Manager

DW\SK\sb

Huntingdon

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	Method Blank	Effluent	
TCT ID:		28971	
Parameter:			**PQL**
Benzene	ND	ND	5
Toluene	ND	ND	5
Ethyl benzene	ND	ND	5
Total xylenes	ND	ND	5
Methyl-tert-Butyl Ether	ND	ND	5
Surrogate Recovery:			
α,α,α-Trifluorotoluene	94%	95%	
Total Hydrocarbons as Gasoline	ND	ND	30
Surrogate Recovery:			
α,α,α-Trifluorotoluene	91%	92%	
Date Collected:	---	7-19-94	
Date Analyzed:	7-21-94	7-21-94	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, July 1992, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, July 1993.

LABORATORY NO: 4413-94-5696

Huntingdon

ANALYTICAL RESULTS

(All values are in mg/L which is equivalent to parts-per-million)

Client ID: **Effluent**

TCT ID: 28971

Parameter		PQL	Test Date	Test Method
Total Suspended Solids	ND	4	7-21-94	160.2
Chemical Oxygen Demand	61	20	7-28-94	410.4

ND = Not Detected

PQL = Practical Quantitation Limit

Reference: Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March, 1983.

LABORATORY NO: 4413-94-5696

twin city testing corporation

737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

CHAIN-OF-CUSTODY RECORD

TCT NO. 49023

D. Walker
TCT CONTACT

Dahl & Associates
CLIENT NAME

4390 McMenemy Rd.
CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.)

St. Paul, MN. 55127
CLIENT ADDRESS (CITY, STATE, ZIP)

490-2905
CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE PHONE

J. Howard / Jeffrey Howard
SAMPLED BY PRINT NAME/SIGNATURE

PROJECT NAME 24930601

CLIENT P.O. # / PROJECT NO. Dahl

BILL TO (CO. NAME, ADDRESS) Mike Watson

REPORT TO

TCT USE ONLY	
PROJ. MGR.	PEW
PRIORITY	Norm
INVOICE #	—
JOB NAME	IAAP 5696
CUSTODY SEAL INTACT/NUMBER Y/N	NA
TEMPERATURE OF CONTAINER	14° C
SAMPLE CONDITION	OK

PREPAY Y/N	
CHECK NO.	
CHECK AMOUNT	

POSSIBLE HAZARD: YES ____ UNKNOWN ____ (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB ✓
(ADDITIONAL CHARGES MAY BE ASSESSED)

ANALYSES REQUEST

CODE A - NONE
B - HNO_3
C - H_2SO_4
D - NaOH
E - HCl
F - ____

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	FILTERED (YES/NO)	PRESERVED (CODE)	REFRIGERATED (Y/N)	BTEX	MTBE	TPH as Gas	TSS	COD				NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
					N	E	Y											
1	EFFLUENT	H_2O	7-19-94	14:15	N	E	Y	X	X	X	X	X				5 (3)	pint, 1L cube 200 mL pl.	24971
2					N	E	Y											
3					N	E	Y											
4					N	A	Y											
5					N	C	Y											
6																		
7																		
8																		
9																		
10																		

Additional Comments

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
Jeffrey Howard	7/19	1515		7/20	8:00
			HTCT	7/20/94	15:40

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* SEE REVERSE SIDE FOR INSTRUCTIONS

twin city testing corporation

737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

CHAIN-OF-CUSTODY RECORD

TCT NO. 49023

TCT USE ONLY	
PROJ. MGR.	
PRIORITY	
INVOICE #	
JOB NAME	
CUSTODY SEAL INTACT/NUMBER Y/N	
TEMPERATURE OF CONTAINER	
SAMPLE CONDITION	

PREPAY Y/N	
CHECK NO.	
CHECK AMOUNT	

CLIENT NAME: Delta Associates
CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.): 4510 [illegible]
CLIENT ADDRESS (CITY, STATE, ZIP): [illegible] MN [illegible]
CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE — PHONE: 940-2905
SAMPLED BY PRINT NAME/SIGNATURE: J. Howard / Jeffrey Howard

TCT CONTACT: D. Walker
PROJECT NAME:
CLIENT P.O. # / PROJECT NO.: 2-1730001
BILL TO (CO. NAME, ADDRESS): Delta
REPORT TO: Mike Watson

POSSIBLE HAZARD: YES ____ UNKNOWN ____ (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB ✓
(ADDITIONAL CHARGES MAY BE ASSESSED)

ANALYSES REQUEST

CODE A - NONE
B - HNO3
C - H_2SO_4
D - NaOH
E - HCl
F - ____

ANALYSES	BTEX	MTBE	TPH as Gas	TSS	COD			
FILTERED (YES/NO)	N	N	N	N	N			
PRESERVED (CODE)	E	E	E	A	C			
REFRIGERATED (Y/N)	Y	Y	Y	Y	Y			

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	BTEX	MTBE	TPH as Gas	TSS	COD				NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
1	EFFLUENT	H_2O	7-19-94	14[illegible]	X	X	X	X	X				5	plastic, amber gl.	
2															
3															
4															
5															
6															
7															
8															
9															
10															

Additional Comments

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
Jeffrey Howard	7/19	1515	[signature]	7/20	[illegible]

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* SEE REVERSE SIDE FOR INSTRUCTIONS

Huntingdon

Huntingdon Engineering & Environmental, Inc.

737 Pelham Boulevard
St. Paul, Minnesota 55114-1739

(612) 659-7600
FAX (612) 659-7515

REPORT OF: CHEMICAL ANALYSES

PROJECT: 2493-0601 **DATE:** September 13, 1994

REPORTED TO: Dahl & Associates
Attn: Mike Watson
4390 McMenemy Drive
St. Paul, MN 55127

Conoco Inc.

LABORATORY NO: 4413 94-6184
HPN: 6184

INTRODUCTION

This report presents the results of the analyses of five samples received on September 2, 1994, from a representative of Dahl & Associates. The scope of our services was limited to the parameters listed in the attached tables.

METHODOLOGY

Analyses are performed according to Huntingdon Standard Operating Procedures. The procedures are based on the references stated in the analytical results tables.

RESULTS

The results are listed in the attached tables.

REMARKS

The samples were collected on August 31, 1994. If samples are not consumed in the analysis, they are held for two months from the date of sample receipt and then disposed, unless written instructions to the contrary are received.

HUNTINGDON ENGINEERING & ENVIRONMENTAL, INC.

Deneen Walker
Project Manager

Stephanie Kidder
Laboratory Manager

DW/SK/lml

Huntingdon

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	Method Blank	MW-1	
TCT ID:		32219	
Parameter:			**PQL**
Benzene	ND	ND	5
Toluene	ND	ND	5
Ethyl benzene	ND	ND	5
Total xylenes	ND	ND	5
Methyl-tert-Butyl Ether	ND	ND	5
Surrogate Recovery:			
α,α,α-Trifluorotoluene	104%	102%	
Gasoline Range Organics	ND	ND	30
Surrogate Recovery:			
α,α,α-Trifluorotoluene	103%	104%	
Date Collected:		8/31/94	
Date Analyzed:	9/6/94	9/8/94	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, July 1992, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, July 1993.

LABORATORY NO: 4413 94-6184

Huntingdon

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	**MW-2**	
TCT ID:	32220	
Parameter:		**PQL**
Benzene	2,700	120
Toluene	1,900	120
Ethyl benzene	630	120
Total xylenes	3,400	120
Methyl-tert-Butyl Ether	ND	120
Surrogate Recovery:		
α,α,α-Trifluorotoluene	103%	
Gasoline Range Organics	15,000	750
Surrogate Recovery:		
α,α,α-Trifluorotoluene	101%	
Date Collected:	8/31/94	
Date Analyzed:	9/8/94	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, July 1992, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, July 1993.

LABORATORY NO: 4413 94-6184

Huntingdon

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	**MW-3**	
TCT ID:	32221	
Parameter:		**PQL**
Benzene	3,100	500
Toluene	3,100	500
Ethyl benzene	1,800	500
Total xylenes	7,900	500
Methyl-tert-Butyl Ether	ND	500
Surrogate Recovery:		
α,α,α-Trifluorotoluene	101%	
Gasoline Range Organics	28,000	3,000
Surrogate Recovery:		
α,α,α-Trifluorotoluene	100%	
Date Collected:	8/31/94	
Date Analyzed:	9/6/94	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, July 1992, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, July 1993.

LABORATORY NO: 4413 94-6184

Huntingdon

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	MW-4	MW-5	
TCT ID:	32222	32223	
Parameter:			**PQL**
Benzene	ND	ND	5
Toluene	ND	ND	5
Ethyl benzene	ND	ND	5
Total xylenes	ND	ND	5
Methyl-tert-Butyl Ether	ND	ND	5
Surrogate Recovery:			
α,α,α-Trifluorotoluene	104%	102%	
Gasoline Range Organics	ND	ND	30
Surrogate Recovery:			
α,α,α-Trifluorotoluene	104%	102%	
Date Collected:	8/31/94	8/31/94	
Date Analyzed:	9/6/94	9/6/94	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, July 1992, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, July 1993.

LABORATORY NO: 4413 94-6184

twin city testing corporation

737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

CHAIN-OF-CUSTODY RECORD

TCT NO. 49785

D. WACKER
TCT CONTACT

PROJECT NAME 24930601

CLIENT P.O. # / PROJECT NO. DAHL

BILL TO (CO. NAME, ADDRESS) MIKE WATSON

REPORT TO

DAHL & ASSOCIATES
CLIENT NAME

4390 MCMENEMY RD
CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.)

ST PAUL MN 55127
CLIENT ADDRESS (CITY, STATE, ZIP)

612-490-2905
CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE PHONE

MARK SMITH / Mark Smith
SAMPLED BY PRINT NAME/SIGNATURE

POSSIBLE HAZARD: YES ____ UNKNOWN ✓ (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB ✓
(ADDITIONAL CHARGES MAY BE ASSESSED)

TCT USE ONLY	
PROJ. MGR.	DEN
PRIORITY	NORMAL
INVOICE #	—
JOB NAME	HAN 6/84
CUSTODY SEAL INTACT/NUMBER Y/N	NA
TEMPERATURE OF CONTAINER	ON ICE
SAMPLE CONDITION	OK

PREPAY Y/N	
CHECK NO.	
CHECK AMOUNT	

ANALYSES REQUEST

FILTERED (YES/NO) N N N
PRESERVED (CODE) E E E
REFRIGERATED (Y/N) Y Y Y

CODE A - NONE
B - HNO_3
C - H_2SO_4
D - NaOH
E - HCl
F - ____

BETX / MTBE / GRO

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
1	MW-1	H_2O	8/31/94*		3	40ml PVT	32219
2	MW-2						32220
3	MW-3						32221
4	MW-4						32222
5	MW-5						32223
6							
7							
8							
9							
10							

Additional Comments

* 9/7/94 Date sampled 8/31/94 per Mike 8:45 DAH

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
Mark Smith			[illegible]	9/2	2:45
			T. Foster	9/2/94	16:54

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twin city testing corporation

737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

CHAIN-OF-CUSTODY RECORD

TCT NO. 49785

TCT CONTACT: D. WALKER

PROJECT NAME: —

CLIENT P.O. # / PROJECT NO.: 2493060I

BILL TO (CO. NAME, ADDRESS): DAHL

REPORT TO: MIKE WATSON

CLIENT NAME: DAHL & ASSOCIATES

CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.): 4390 McMENEMY RD

CLIENT ADDRESS (CITY, STATE, ZIP): ST PAUL MN 55127

CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE — PHONE: 612-490-2905

SAMPLED BY PRINT NAME/SIGNATURE: MARK SMITH / Mark Smith

POSSIBLE HAZARD: YES ____ UNKNOWN ✓ (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB ✓
(ADDITIONAL CHARGES MAY BE ASSESSED)

TCT USE ONLY	
PROJ. MGR.	
PRIORITY	
INVOICE #	
JOB NAME	
CUSTODY SEAL INTACT/NUMBER Y/N	
TEMPERATURE OF CONTAINER	
SAMPLE CONDITION	

PREPAY Y/N	
CHECK NO.	
CHECK AMOUNT	

ANALYSES REQUEST

	BETX	MTBE	GRO
FILTERED (YES/NO)	N	N	N
PRESERVED (CODE)	E	E	E
REFRIGERATED (Y/N)	Y	Y	Y

CODE A - NONE
B - HNO3
C - H_2SO_4
D - NaOH
E - HCl
F - ______

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	BETX	MTBE	GRO					NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
1	MW-1	H_2O	8/30/94		X	X	X					3	40ml P&T	
2	MW-2	↓			X	X	X					↓	↓	
3	MW-3	↓			X	X	X					↓	↓	
4	MW-4	↓			X	X	X					↓	↓	
5	MW-5	↓			X	X	X					↓	↓	
6														
7														
8														
9														
10														

Additional Comments	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
	Mark Smith			[illegible]	[illegible]	[illegible]

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SEE REVERSE SIDE FOR INSTRUCTIONS

Huntingdon

Huntingdon Engineering & Environmental, Inc.

737 Pelham Boulevard
St. Paul, Minnesota 55114-1739

(612) 659-7600
FAX (612) 659-7515

REPORT OF: CHEMICAL ANALYSES

PROJECT: 2493-0601 **DATE:** November 22, 1994

REPORTED TO: Dahl & Associates
Attn: Mike Watson
4390 McMenemy Drive
St. Paul, MN 55127

Conoco-Robert

LABORATORY NO: 4411 95-10694
HPN: 10694

INTRODUCTION

This report presents the results of the analyses of one sample received on November 2, 1994, from a representative of Dahl & Associates. The scope of our services was limited to the parameters listed in the attached tables.

METHODOLOGY

Analyses are performed according to Huntingdon Standard Operating Procedures. The procedures are based on the references stated in the analytical results tables.

RESULTS

The results are listed in the attached tables.

REMARKS

The sample was collected on October 31, 1994. If the sample is not consumed in the analysis, it is held for two months from the date of sample receipt and then disposed, unless written instructions to the contrary are received.

HUNTINGDON ENGINEERING & ENVIRONMENTAL, INC.

Sharon Cenis
Project Manager

Stephanie Kidder
Laboratory Manager

SC/SK/lml

Huntingdon

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	Method Blank	Effluent	
TCT ID:		43999	
Parameter:			**PQL**
Benzene	ND	ND	5
Toluene	ND	ND	5
Ethyl benzene	ND	ND	5
Total xylenes	ND	6	5
Methyl-tert-Butyl Ether	ND	ND	5
Surrogate Recovery:			
α,α,α-Trifluorotoluene	107%	106%	QC Limit 80-120%
Total Hydrocarbons as Gasoline	ND	60	30
Surrogate Recovery:			
α,α,α-Trifluorotoluene	105%	104%	QC Limit 80-120%
Date Collected:		10/31/94	
Date Analyzed:	11/04/94	11/04/94	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, July 1992, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, July 1993.

Huntingdon

ANALYTICAL RESULTS

(All values are in mg/L which is equivalent to parts-per-million)

Client ID: **Effluent**

TCT ID: 43999

Parameter		PQL	Test Date	Test Method
Total Suspended Solids	6	4	11/04/94	160.2
Chemical Oxygen Demand	ND	20	11/15/94	410.4

ND = Not Detected

PQL = Practical Quantitation Limit

Reference: Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March, 1983.

twin city testing corporation

737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

CHAIN-OF-CUSTODY RECORD

TCT NO. 47197

S. Cenis
TCT CONTACT

PROJECT NAME 24930601

CLIENT P.O. # / PROJECT NO. Dahl

BILL TO (CO. NAME, ADDRESS) M. Watson

REPORT TO

Dahl & Associates
CLIENT NAME

4390 McMenemy St.
CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.)

St. Paul, MN. 55127
CLIENT ADDRESS (CITY, STATE, ZIP)

(612) 490-2905
CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE PHONE

J. Howard / [signature]
SAMPLED BY PRINT NAME/SIGNATURE

POSSIBLE HAZARD: YES ____ UNKNOWN ____ (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB ✓
(ADDITIONAL CHARGES MAY BE ASSESSED)

TCT USE ONLY

PROJ. MGR.	OK SBC 11/3/94
PRIORITY	
INVOICE #	
JOB NAME	HPN: 10694
CUSTODY SEAL INTACT/NUMBER Y/N	—
TEMPERATURE OF CONTAINER	7°C
SAMPLE CONDITION	ok

PREPAY Y/N	
CHECK NO.	
CHECK AMOUNT	

ANALYSES REQUEST

CODE A - NONE
B - HNO_3
C - H_2SO_4
D - NaOH
E - HCl
F - ____

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	FILTERED (YES/NO)	PRESERVED (CODE)	REFRIGERATED (Y/N)	BTEX	MTBE	TPH as Gas	TSS	COD	NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
1	EFFLUENT WW	H_2O	10-31-94		N	E	Y	X	X	X	X	X	5	P&T, 1 cube 500 ml pl.	43999
2					N	E	Y								
3					N	E	Y								
4					N	A	Y								
5					N	C	Y								
6															
7															
8															
9															
10															

Additional Comments

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
[signature]	10/31	1630	[signature]	11/2	300
			M. Roemhildt	11-2-94	16:00

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twin city testing corporation

737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

CHAIN-OF-CUSTODY RECORD

TCT NO. 47197

CLIENT NAME: Delta Associates
CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.): 2290 McMenemy St
CLIENT ADDRESS (CITY, STATE, ZIP): St Paul, MN 55117
CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE / PHONE: (612) 490-2900
SAMPLED BY PRINT NAME/SIGNATURE: [illegible signature]

TCT CONTACT:
PROJECT NAME: 1993060 1
CLIENT P.O. # / PROJECT NO.: [illegible]
BILL TO (CO. NAME, ADDRESS): [illegible]
REPORT TO:

TCT USE ONLY	
PROJ. MGR.	
PRIORITY	
INVOICE #	
JOB NAME	
CUSTODY SEAL INTACT/NUMBER Y/N	
TEMPERATURE OF CONTAINER	
SAMPLE CONDITION	

PREPAY Y/N	
CHECK NO.	
CHECK AMOUNT	

ANALYSES REQUEST

	BTEX	MTBE	Oil & Grease	TSS	COD
FILTERED (YES/NO)		N	N	N	N
PRESERVED (CODE)	E	E	C	A	C
REFRIGERATED (Y/N)	Y	Y	Y	Y	Y

CODE A - NONE
B - HNO3
C - H_2SO_4
D - NaOH
E - HCl
F - ______

POSSIBLE HAZARD: YES ______ UNKNOWN ______ (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ______ DISPOSAL BY LAB ✓
(ADDITIONAL CHARGES MAY BE ASSESSED)

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	BTEX	MTBE	Oil & Grease	TSS	COD			NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
1	EFFLUENT	H_2O	10-31-94		X	X	X	X	X			5	P.T. [illegible]	
2														
3														
4														
5														
6														
7														
8														
9														
10														

Additional Comments

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
[illegible signature]	10/31	16:30	[illegible signature]	11/2	8:00

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* SEE REVERSE SIDE FOR INSTRUCTIONS

Huntingdon

Huntingdon Engineering & Environmental, Inc.

737 Pelham Boulevard
St. Paul, Minnesota 55114-1739

(612) 659-7600
FAX (612) 659-7515

REPORT OF: CHEMICAL ANALYSES

PROJECT: 2493-0601

DATE: December 5, 1994

REPORTED TO: Dahl & Associates
Attn: Mike Watson
4390 McMenemy Drive
St. Paul, MN 55127

Conoco Inc.

LABORATORY NO: 4411 95-10876
HPN: 10876

INTRODUCTION

This report presents the results of the analyses of one sample received on November 18, 1994, from a representative of Dahl & Associates. The scope of our services was limited to the parameters listed in the attached tables.

METHODOLOGY

Analyses are performed according to Huntingdon Standard Operating Procedures. The procedures are based on the references stated in the analytical results tables.

RESULTS

The results are listed in the attached tables.

REMARKS

The sample was collected on November 17, 1994. If the sample is not consumed in the analysis, it is held for two months from the date of sample receipt and then disposed, unless written instructions to the contrary are received.

HUNTINGDON ENGINEERING & ENVIRONMENTAL, INC.

Sharon Cenis
Sharon Cenis
Project Manager

Stephanie Kidder
Stephanie Kidder
Laboratory Manager

SC/SK/lml

Huntingdon

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	**Method Blank**	**Effluent**	
TCT ID:		44982	
Parameter:			**PQL**
Benzene	ND	ND	5
Toluene	ND	ND	5
Ethyl benzene	ND	ND	5
Total xylenes	ND	7	5
Methyl-tert-Butyl Ether	ND	ND	5
Surrogate Recovery:			
α,α,α-Trifluorotoluene	103%	103%	QC Limit 80-120%
Total Hydrocabons as Gasoline	ND	50	30
Surrogate Recovery:			
α,α,α-Trifluorotoluene	102%	102%	QC Limit 80-120%
Date Collected:		11/17/94	
Date Analyzed:	11/22/94	11/22/94	

PQL = Practical Quantitation Limit
ND = Not Detected

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, July 1992, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, July 1993.

Huntingdon

ANALYTICAL RESULTS

(All values are in mg/L which is equivalent to parts-per-million)

Client ID: **Effluent**

TCT ID: 44982

Parameter		PQL	Test Date	Test Method
Total Suspended Solids	4	4	11/21/94	160.2
Chemical Oxygen Demand	39	2	12/01/94	410.4

ND = Not Detected

PQL = Practical Quantitation Limit

Reference: Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March, 1983.

twin city testing corporation

737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

CHAIN-OF-CUSTODY RECORD

TCT NO. 52565

S. Cenis
TCT CONTACT

PROJECT NAME 24930601

CLIENT P.O. # / PROJECT NO. Dahl

BILL TO (CO. NAME, ADDRESS) Mike Watson

REPORT TO

Dahl & Associates
CLIENT NAME

4390 McMenemy St.
CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.)

St. Paul, MN. 55127
CLIENT ADDRESS (CITY, STATE, ZIP)

(612) 490-2905
CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE PHONE

J. Howard / [signature]
SAMPLED BY PRINT NAME/SIGNATURE

TCT USE ONLY	
PROJ. MGR	SBC SBC 11/18/94
PRIORITY	NORMAL TOTALS 11/21/94
INVOICE #	—
JOB NAME	HPN: 10876
CUSTODY SEAL INTACT/NUMBER Y/N	NA
TEMPERATURE OF CONTAINER	7°C
SAMPLE CONDITION	GR

PREPAY Y/N	
CHECK NO.	
CHECK AMOUNT	

POSSIBLE HAZARD: YES ____ UNKNOWN ____ (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB ✓
(ADDITIONAL CHARGES MAY BE ASSESSED)

ANALYSES REQUEST

CODE A - NONE
B - HNO_3
C - H_2SO_4
D - NaOH
E - HCl
F - ____

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	FILTERED (YES/NO)	PRESERVED (CODE)	REFRIGERATED (Y/N)	BTEX	MTBE	TPH as Gas	TSS	COD	NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
1	Effluent ✓	H_2O	11-17-94	11:45	N	E	Y	X	X	X	X	X	5 (3)	P&T, 1L amb 200 ml gl.	44982
2					N	E	Y								
3					N	E	Y								
4					N	A	Y								
5					N	C	Y								
6															
7															
8															
9															
10															

Additional Comments

Diet VOA

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
[signature]	11/17	16:15	[signature]	11/18	325
			[signature]	11/18/94	16:20

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* SEE REVERSE SIDE FOR INSTRUCTIONS

CHAIN-OF-CUSTODY RECORD

TCT NO. 52365

twin city testing corporation

737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

S Ceris
TCT CONTACT

Dahl & Associates
CLIENT NAME

4390 McMenemy St.
CLIENT ADDRESS (STREET, NUMBER, SUITE, ETC.)

St Paul, MN 55126
CLIENT ADDRESS (CITY, STATE, ZIP)

(612) 490-2903
CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE PHONE

J Howard
SAMPLED BY PRINT NAME/SIGNATURE

PROJECT NAME 2493060

CLIENT P.O. # / PROJECT NO.

BILL TO (CO. NAME, ADDRESS)

REPORT TO

TCT USE ONLY
PROJ. MGR.
PRIORITY
INVOICE #
JOB NAME
CUSTODY SEAL INTACT/NUMBER Y/N
TEMPERATURE OF CONTAINER
SAMPLE CONDITION

PREPAY Y/N
CHECK NO.
CHECK AMOUNT

POSSIBLE HAZARD: YES ____ UNKNOWN ____ (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB ✓
(ADDITIONAL CHARGES MAY BE ASSESSED)

ANALYSES REQUEST

CODE A - NONE
B - HNO3
C - H_2SO_4
D - NaOH
E - HCl
F - ____

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	FILTERED (YES/NO)	PRESERVED (CODE)	REFRIGERATED (Y/N)	STEX	MTBE	TPH-GRO	TSS	COD	NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
					N	C	Y								
1	Effluent	H_2O	11-17-94	[illegible]				X	X	X	X	X	5	[illegible]	
2															
3															
4															
5															
6															
7															
8															
9															
10															

Additional Comments

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
J Howard	11/17	16:00	[signature]	11/18	9:25

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* SEE REVERSE SIDE FOR INSTRUCTIONS

Huntingdon

Huntingdon Engineering & Environmental, Inc.

737 Pelham Boulevard
St. Paul, Minnesota 55114-1739

(612) 659-7600
FAX (612) 659-7515

REPORT OF: CHEMICAL ANALYSES

PROJECT: 2493-0601 **DATE:** January 17, 1995

REPORTED TO: Dahl & Associates
Attn: Mike Watson
4390 McMenemy Drive
St. Paul, MN 55127

LABORATORY NO: 4411 95-11325
HPN: 11325

INTRODUCTION

This report presents the results of the analyses of seven samples received on December 30, 1994, from a representative of Dahl & Associates. The scope of our services was limited to the parameters listed in the attached tables.

METHODOLOGY

Analyses are performed according to Huntingdon Standard Operating Procedures. The procedures are based on the references stated in the analytical results tables.

RESULTS

The results are listed in the attached tables.

REMARKS

The samples were collected on December 27, 1994. If samples are not consumed in the analysis, they are held for two months from the date of sample receipt and then disposed, unless written instructions to the contrary are received.

HUNTINGDON ENGINEERING & ENVIRONMENTAL, INC.

Sharon Cenis
Sharon Cenis
Project Manager

Stephanie Kidder
Stephanie Kidder
Laboratory Manager

SC/SK/lml

Huntingdon

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	Method Blank	MW-1[1]	MW-2	
LAB ID:		47923	47924	
Parameter:				**PQL**
Benzene	ND	ND	42	5
Toluene	ND	ND	31	5
Ethyl benzene	ND	ND	8	5
Total xylenes	ND	ND	67	5
Methyl-tert-Butyl Ether	ND	ND	ND	5
Surrogate Recovery:				
α,α,α-Trifluorotoluene	105%	104%	105%	QC Limit 80-120%
Gasoline Range Organics	ND	36	400	30
Surrogate Recovery:				
α,α,α-Trifluorotoluene	104%	104%	102%	QC Limit 80-120%
Date Collected:		12/27/94	12/27/94	
Date Analyzed:	1/09/95	1/09/95	1/10/95	

[1] Chromatographic profile is not typical of gasoline and contains higher boiling hydrocarbons.

PQL = Practical Quantitation Limit
ND = Not Detected at or above PQL

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, July 1992, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, July 1993.

Huntingdon

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	MW-3	MW-4	MW-5	
LAB ID:	47925	47926	47927	
Parameter:				**PQL**
Benzene	ND	ND	ND	5
Toluene	ND	ND	ND	5
Ethyl benzene	ND	ND	ND	5
Total xylenes	ND	ND	ND	5
Methyl-tert-Butyl Ether	ND	ND	ND	5
Surrogate Recovery:				
α,α,α-Trifluorotoluene	107%	107%	104%	QC Limit 80-120%
Gasoline Range Organics	ND	ND	56	30
Surrogate Recovery:				
α,α,α-Trifluorotoluene	107%	107%	103%	QC Limit 80-120%
Date Collected:	12/27/94	12/27/94	12/27/94	
Date Analyzed:	1/10/95	1/09/95	1/09/95	

PQL = Practical Quantitation Limit
ND = Not Detected at or above PQL

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, July 1992, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, July 1993.

Huntingdon

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	Method Blank	Effluent[1]	
LAB ID:		47929	
Parameter:			**PQL**
Benzene	ND	ND	5
Toluene	ND	ND	5
Ethyl benzene	ND	ND	5
Total xylenes	ND	ND	5
Methyl-tert-Butyl Ether	ND	ND	5
Surrogate Recovery:			
α,α,α-Trifluorotoluene	105%	104%	QC Limit 80-120%
Total Hydrocarbons as Gasoline	ND	35	30
Surrogate Recovery:			
α,α,α-Trifluorotoluene	104%	103%	QC Limit 80-120%
Date Collected:		12/27/94	
Date Analyzed:	1/09/95	1/10/95	

[1] Chromatographic profile is not typical of gasoline and contains higher boiling hydrocarbons.

PQL = Practical Quantitation Limit
ND = Not Detected at or above PQL

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, July 1992, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, July 1993.

LABORATORY NO: 4411 95-11325

Huntingdon

PETROLEUM VOLATILE ORGANIC COMPOUND RESULTS
EPA METHOD 8020

(All values are in µg/L which is equivalent to parts-per-billion)

Client ID:	**Influent**	
LAB ID:	47928	
Parameter:		**PQL**
Benzene	970	50
Toluene	700	50
Ethyl benzene	280	50
Total xylenes	1,200	50
Methyl-tert-Butyl Ether	ND	50
Surrogate Recovery:		
α,α,α-Trifluorotoluene	103%	QC Limit 80-120%
Total Hydrocarbons as Gasoline	7,000	300
Surrogate Recovery:		
α,α,α-Trifluorotoluene	99%	QC Limit 80-120%
Date Collected:	12/27/94	
Date Analyzed:	1/09/95	

PQL = Practical Quantitation Limit
ND = Not Detected at or above PQL

Reference: EPA Test Methods for Evaluating Solid Waste, SW-846, July 1992, 3rd Edition.

Wisconsin Department of Natural Resources, PUBL-SW-140, July 1993.

Huntingdon

ANALYTICAL RESULTS

(All values are in mg/L which is equivalent to parts-per-million)

Client ID: **Effluent**

LAB ID: 47929

Parameter		PQL	Test Date	Test Method
Total Suspended Solids	ND	4	1/03/95	160.2
Chemical Oxygen Demand	85	20	1/11/95	410.4

ND = Not Detected at or above PQL

PQL = Practical Quantitation Limit

Reference: Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March, 1983.

twin city testing corporation

737 PELHAM AVENUE
DOCK 4
ST. PAUL, MN 55114
PHONE 612/659-7555

CHAIN-OF-CUSTODY RECORD

TCT NO. 54978

DAHL & ASSOCIATES — CLIENT NAME
4390 MCMENEMY RD — CLIENT ADDRESS (STREET NUMBER, SUITE, ETC.)
ST. PAUL MN 55127 — CLIENT ADDRESS (CITY, STATE, ZIP)
612-490-2905 — CLIENT CONTACT/ADDRESS IF DIFFERENT FROM ABOVE — PHONE
MARK SMITH / Mark Smith — SAMPLED BY PRINT NAME/SIGNATURE

SHARON CEMIS — TCT CONTACT
24830601 — PROJECT NAME
DAHL — CLIENT P.O. # / PROJECT NO.
M. WATSON — BILL TO (CO. NAME, ADDRESS)
REPORT TO

POSSIBLE HAZARD: YES ____ UNKNOWN ✓ (COMMENT BELOW)

SAMPLE DISPOSAL: RETURN TO CLIENT ____ DISPOSAL BY LAB ✓
(ADDITIONAL CHARGES MAY BE ASSESSED)

TCT USE ONLY

PROJ. MGR.	Sharon Cemis
PRIORITY	Close 2/30 to lab 1/3
INVOICE #	
JOB NAME	HPN 11325
CUSTODY SEAL INTACT/NUMBER Y/N	N/A
TEMPERATURE OF CONTAINER	ON ICE
SAMPLE CONDITION	OK
PREPAY Y/N	
CHECK NO.	
CHECK AMOUNT	

ANALYSES REQUEST

CODE A - NONE
B - HNO3
C - H_2SO_4
D - NaOH
E - HCl
F - ____

ITEM NO.	CLIENT SAMPLE ID.	MATRIX	DATE SAMPLED	TIME SAMPLED	FILTERED (YES/NO)	PRESERVED (CODE)	REFRIGERATED (Y/N)	BETX	MTBE	GRO	TPH/WS	TSS	COD	NO. OF CONTAINERS	CONTAINER TYPE	TCT NO.
					N	E	Y									
1	MW-1 ✓	H_2O	12/27/94	1:00				X	X	X				3	40ml PT	47923
2	MW-2 ✓			1:15				X	X	X						47924
3	MW-3 ✓			1:30				X	X	X						47925
4	MW-4 ✓			1:45				X	X	X						47926
5	MW-5 ✓			2:00				X	X	X						47927
6																
7	INFLUENT ✓			12:30				X	X		X	X	X			47928
8	EFFLUENT ✓			12:00				X	X		X	X	X	5	3-40ml PT ✓ 1-1L CWB ✓ 1-250ml PLASTIC ✓	47929
9																
10																

Additional Comments

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
Mark Smith	12/29			12/30	3:00

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* SEE REVERSE SIDE FOR INSTRUCTIONS

PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Dahl & Associates
4390 McMenemy
St. Paul, MN 55127

February 01, 1995
PACE Project Number: 950118519

Attn: Mr. Mike Watson

Client Reference: 2493 0601

PACE Sample Number:			10 0011274
Date Collected:			01/16/95
Time Collected:			15:30
Date Received:			01/18/95
			Treatment
Parameter	Units	PRL	Effluent
INORGANIC ANALYSIS			
INDIVIDUAL PARAMETERS			
Chemical Oxygen Demand	mg/L	50	50 (1)
Solids, Total Suspended	mg/L	10	ND
ORGANIC ANALYSIS			
VOLATILE PETROLEUM RELATED COMPOUNDS			
Date Analyzed			27JAN95 E
Benzene	ug/L	1.0	ND
Toluene	ug/L	1.0	1.7
Ethylbenzene	ug/L	1.0	ND
Xylenes	ug/L	2.0	ND
Total hydrocarbons as gasoline	ug/L	10	11
Methyl tert-butyl ether	ug/L	4.0	ND
Fluorobenzene (Surrogate)	%		105

These data have been reviewed and are approved for release.

Paul D. Ernst
Project Manager

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

REPORT OF LABORATORY ANALYSIS

FOOTNOTES
for page 1

Client Reference: 2493 0601

ND	Not detected at or above the PRL.
PRL	PACE Reporting Limit
(1)	No nutrient bottle was available, so the sample was analyzed from an unpreserved sample bottle.

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

REPORT OF LABORATORY ANALYSIS

QUALITY CONTROL DATA

Client Reference: 2493 0601

Chemical Oxygen Demand
Batch: 10 64203
Samples: 10 0011274

METHOD BLANK:

Parameter	Units	PRL	Method Blank
Chemical Oxygen Demand	mg/L	50	ND

SPIKE AND SPIKE DUPLICATE:

Parameter	Units	PRL	100018813	Spike	Spike Recv	Spike Dupl Recv	RPD
Chemical Oxygen Demand	mg/L	50	ND	250	93%	94%	1%

LABORATORY CONTROL SAMPLE:

Parameter	Units	PRL	Reference Value	Recv
Chemical Oxygen Demand	mg/L	50	300	107%

REPORT OF LABORATORY ANALYSIS

QUALITY CONTROL DATA

Client Reference: 2493 0601

Solids, Total Suspended
Batch: 10 63847
Samples: 10 0011274

METHOD BLANK AND SAMPLE DUPLICATE:

Parameter	Units	PRL	Method Blank	100008583	Duplicate of 10 0008583	RPD
Solids, Total Suspended	mg/L	10	ND	ND	10	NC

LABORATORY CONTROL SAMPLE:

Parameter	Units	PRL	Reference Value	Recv
Solids, Total Suspended	mg/L	10	40.3	105%

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

REPORT OF LABORATORY ANALYSIS

Mr. Mike Watson
Page 5

QUALITY CONTROL DATA

February 01, 1995
PACE Project Number: 950118519

Client Reference: 2493 0601

PVOC/GRO IN WATER-METHODS 8020/MOD. 8015
Batch: 10 64095
Samples: 10 0011274

METHOD BLANK:

Parameter	Units	PRL	Method Blank
Date Analyzed			27JAN95
Benzene	ug/L	1.0	ND
Toluene	ug/L	1.0	ND
Ethylbenzene	ug/L	1.0	ND
Xylenes	ug/L	2.0	ND
1,3,5-Trimethylbenzene	ug/L	1.0	ND
1,2,4-Trimethylbenzene	ug/L	1.0	ND
Methyl tert-butyl ether	ug/L	4.0	ND
Gasoline Range Organic Compounds	ug/L	50	ND
Fluorobenzene (Surrogate)	%		104

SPIKE AND SPIKE DUPLICATE:

Parameter	Units	PRL	100011312	Spike	Spike Recv	Spike Dupl Recv	RPD
Benzene	ug/L	1.0	ND	100	103%	104%	1%
Toluene	ug/L	1.0	ND	100	99%	100%	1%
Ethylbenzene	ug/L	1.0	ND	100	105%	106%	1%
Xylenes	ug/L	2.0	ND	300	99%	98%	1%
1,3,5-Trimethylbenzene	ug/L	1.0	ND	100	87%	86%	1%
1,2,4-Trimethylbenzene	ug/L	1.0	ND	100	83%	82%	1%

LABORATORY CONTROL SAMPLE:

Parameter	Units	PRL	Reference Value	Recv
Benzene	ug/L	1.0	100	101%
Toluene	ug/L	1.0	100	104%
Ethylbenzene	ug/L	1.0	100	104%
Xylenes	ug/L	2.0	300	103%
1,3,5-Trimethylbenzene	ug/L	1.0	100	102%
1,2,4-Trimethylbenzene	ug/L	1.0	100	97%
Methyl tert-butyl ether	ug/L	4.0	100	86%
Gasoline Range Organic Compounds	ug/L	50	1000	114%

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

REPORT OF LABORATORY ANALYSIS

FOOTNOTES
for pages 3 through 5

Client Reference: 2493 0601

NC	No calculation due to value below detection limit.
ND	Not detected at or above the PRL.
PRL	PACE Reporting Limit
RPD	Relative Percent Difference

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

February 01, 1995

Mr. Mike Watson
Dahl & Associates
4390 McMenemy
St. Paul, MN 55127

RE: PACE Project No. 950118.519
Client Reference: 2493 0601

Dear Mr. Watson:

Enclosed is the report of laboratory analyses for samples received January 18, 1995.

Footnotes are given at the end of the report.

If you have any questions concerning this report, please feel free to contact us.

Sincerely,

Paul D. Ernst
Project Manager

Enclosures

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

ENV[redacted]ENTAL LABORATORIES

Note: Use of this form is voluntary but is requested by the Department pursuant to ch. NR 149, NR 500-540, NR 158 and NR 419, Wis. Adm. Code. Personally identifiable information will be used for no other purpose.

CHAIN OF CUSTODY RECORD
LUST PROGRAM

950211.509

Sample Collector(s)	
Property Owner	Title/Work Station/Company
	Property Address
	Telephone Number (include area code)
	Telephone Number (include area code)

I hereby certify that I received, properly handled, and disposed of these samplesas noted below:

Relinquished By (Signature)	Date/Time	Received By (Signature) M. MacKenzie / Pace / 2/.../95	**Sample Condition on Receipt by Laboratory LABORATORY USE ONLY**
Relinquished By (Signature)	Date/Time	Received By (Signature)	Temperature of temperature blank: ________
Relinquished By (Signature)	Date/Time	Received for Laboratory By (Signature)	If samples were received on ice and there was ice remaining, you may report the temperature as "received on ice". If all of the ice was melted, the temperature of the melt may be substituted for a temperature blank.

Field ID Number [1]	Date Collected	Time Collected	Sample Type [2]	Sample Device [3]	Preserv. Type	Field Screening	Description	Analysis Type	Lab ID Number	No./Type of Containers	Cracked /Broken	Improperly Sealed	Good Condition	Other Comments
										3379.0				

[1]...ple description must clearly correlate the sample ID to the sampling location shown on a map. [3]Type of sampling device; split spoon, hand auger, metal spatula, soil syringe, etc.
...cify groundwater, surface water, soil, leachate, sludge, etc.

DEPARTMENT USE/OPTIONAL FOR SOIL SAMPLERS

...n of unused portion of sample

...oratory should: ☐ Dispose ☐ Retain for days
☐ Return ☐ Other

DEPARTMENT USE ONLY

Split samples: Offered? ☐ Yes ☐ No (Check one)
Accepted? ☐ Yes ☐ No (Check one)
Accepted By: ______________ Signat...

...-151 Rev. 8/94
...UPPLIED BY WIS. DNR WHITE: PACE FILE YELLOW: PRIME CONTRACTOR PROJECT MANAGER

P A C E
MINNESOTA REGION

2/11/95
12:33 PM

Sample and Analysis Data Entry Form - New Sample(s)

Client No : 011609 / 5
: Client Contact
: Address

Dahl & Associates
Mr. Jim Coletta Ms. Sharon Brian
4390 McMenemy St.
St. Paul, MN. 55127

: Telephone No

612-490-2905

Project No: 950211.509 Due Date: 2/24/95 Client P.O. No:
Project Manager: PDE Project Name: 24930601
Manager's Name: Paul D. Ernst
Project Type: B Report Style: S
QC Level:
Desc:

Sample No: 10 003379.0 Collected Date: 2/09/95 Collected By: CLIENT
Lab Rec'd Date: 2/10/95 Checked-In By: EWO Priority: 4
Due Date: 2/21/95 Sample Desc: Effluent
Bottle Types: GV GV GV GN GN Matrix: WATER
Comnt:

Analysis Abbr:	Name:
BTEXMTBEF	VOLATILE PETROLEUM RELATED COMPOUNDS
TSS	Solids, Total Suspended
COD	Chemical Oxygen Demand

PACE, Inc. reserves the right to return all samples at its discretion.

PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

March 24, 1995

Mr. Mike Watson
Dahl & Associates
4390 McMenemy
St. Paul, MN 55127

RE: PACE Project No. 950311.509
Client Reference: 2493 0601 CONOCO-ROBERT

Dear Mr. Watson:

Enclosed is the report of laboratory analyses for samples received March 10, 1995.

Footnotes are given at the end of the report.

If you have any questions concerning this report, please feel free to contact us.

Sincerely,

Paul D. Ernst
Project Manager

Enclosures

1710 Douglas Drive
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Dahl & Associates
4390 McMenemy
St. Paul, MN 55127

March 24, 1995
PACE Project Number: 950311509

Attn: Mr. Mike Watson

Client Reference: 2493 0601

PACE Sample Number:			10 0056880	
Date Collected:			03/09/95	
Time Collected:			12:45	
Date Received:			03/10/95	
			Effluent	
Parameter	Units	PRL		DATE ANALYZED
INORGANIC ANALYSIS				
INDIVIDUAL PARAMETERS				
Chemical Oxygen Demand	mg/L	50	ND	03/20/95
Solids, Total Suspended	mg/L	10	ND	03/15/95
ORGANIC ANALYSIS				
VOLATILE PETROLEUM RELATED COMPOUNDS				
Date Analyzed			14MAR95 H	03/14/95
Benzene	ug/L	1.0	2.3	03/14/95
Toluene	ug/L	1.0	ND	03/14/95
Ethylbenzene	ug/L	1.0	ND	03/14/95
Xylenes	ug/L	2.0	20	03/14/95
Total hydrocarbons as gasoline	ug/L	10	160	03/14/95
Methyl tert-butyl ether	ug/L	4.0	ND	03/14/95
Fluorobenzene (Surrogate)	%		93.4	03/14/95

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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Mr. Mike Watson
Page 2

March 24, 1995
PACE Project Number: 950311509

Client Reference: 2493 0601

PACE Sample Number:			10 0056898	
Date Collected:			03/09/95	
Time Collected:			12:30	
Date Received:			03/10/95	
Client Sample ID:			Influent	
Parameter	Units	PRL		DATE ANALYZED
ORGANIC ANALYSIS				
VOLATILE PETROLEUM RELATED COMPOUNDS				
Date Analyzed			16MAR95 I	03/16/95
Benzene	ug/L	5.0	510	03/16/95
Toluene	ug/L	5.0	740	03/16/95
Ethylbenzene	ug/L	1.0	170	03/16/95
Xylenes	ug/L	10	1300	03/16/95
Total hydrocarbons as gasoline	ug/L	50	9200	03/16/95
Methyl tert-butyl ether	ug/L	20	ND	03/16/95
Fluorobenzene (Surrogate)	%		93.1	03/16/95

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REPORT OF LABORATORY ANALYSIS

March 24, 1995
PACE Project Number: 950311509

Client Reference: 2493 0601

PACE Sample Number:			10 0056901	
Date Collected:			03/09/95	
Time Collected:			13:15	
Date Received:			03/10/95	
Client Sample ID:			MW#1	
Parameter	Units	PRL		DATE ANALYZED
ORGANIC ANALYSIS				
VOLATILE PETROLEUM RELATED COMPOUNDS				
Date Analyzed			15MAR95 E	03/15/95
Benzene	ug/L	1.0	ND	03/15/95
Toluene	ug/L	1.0	ND	03/15/95
Ethylbenzene	ug/L	1.0	ND	03/15/95
Xylenes	ug/L	2.0	ND	03/15/95
Gasoline Range Organic Compounds	ug/L	50	ND	03/15/95
Methyl tert-butyl ether	ug/L	4.0	ND	03/15/95
Fluorobenzene (Surrogate)	%		99.8	03/15/95

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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Mr. Mike Watson
Page 4

March 24, 1995
PACE Project Number: 950311509

Client Reference: 2493 0601

PACE Sample Number:			10 0056910	
Date Collected:			03/09/95	
Time Collected:			14:00	
Date Received:			03/10/95	
Client Sample ID:			MW#2	
Parameter	Units	PRL		DATE ANALYZED
ORGANIC ANALYSIS				
VOLATILE PETROLEUM RELATED COMPOUNDS				
Date Analyzed			16MAR95 I	03/16/95
Benzene	ug/L	2.0	550	03/16/95
Toluene	ug/L	2.0	210	03/16/95
Ethylbenzene	ug/L	2.0	160	03/16/95
Xylenes	ug/L	4.0	610	03/16/95
Gasoline Range Organic Compounds	ug/L	100	2700	03/16/95
Methyl tert-butyl ether	ug/L	8.0	ND	03/16/95
Fluorobenzene (Surrogate)	%		87.5	03/16/95

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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

March 24, 1995
PACE Project Number: 950311509

Client Reference: 2493 0601

PACE Sample Number:			10 0056928	
Date Collected:			03/09/95	
Time Collected:			14:15	
Date Received:			03/10/95	
Client Sample ID:			MW#3	
Parameter	Units	PRL		DATE ANALYZED
ORGANIC ANALYSIS				
VOLATILE PETROLEUM RELATED COMPOUNDS				
Date Analyzed			17MAR95 I	03/17/95
Benzene	ug/L	20	3100	03/17/95
Toluene	ug/L	20	1000	03/17/95
Ethylbenzene	ug/L	20	3000	03/17/95
Xylenes	ug/L	40	11000	03/17/95
Gasoline Range Organic Compounds	ug/L	1000	53000 HB	03/17/95
Methyl tert-butyl ether	ug/L	80	ND	03/17/95
Fluorobenzene (Surrogate)	%		94.8	03/17/95

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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Mr. Mike Watson
Page 6

March 24, 1995
PACE Project Number: 950311509

Client Reference: 2493 0601

PACE Sample Number:			10 0056936	
Date Collected:			03/09/95	
Time Collected:			14:30	
Date Received:			03/10/95	
Client Sample ID:			MW#4	
Parameter	Units	PRL		DATE ANALYZED
ORGANIC ANALYSIS				
VOLATILE PETROLEUM RELATED COMPOUNDS				
Date Analyzed			15MAR95 E	03/15/95
Benzene	ug/L	1.0	ND	03/15/95
Toluene	ug/L	1.0	ND	03/15/95
Ethylbenzene	ug/L	1.0	ND	03/15/95
Xylenes	ug/L	2.0	ND	03/15/95
Gasoline Range Organic Compounds	ug/L	50	ND	03/15/95
Methyl tert-butyl ether	ug/L	4.0	ND	03/15/95
Fluorobenzene (Surrogate)	%		103	03/15/95

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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

Mr. Mike Watson
Page 7

March 24, 1995
PACE Project Number: 950311509

Client Reference: 2493 0601

PACE Sample Number:			10 0056944	
Date Collected:			03/09/95	
Time Collected:			14:40	
Date Received:			03/10/95	
Client Sample ID:			MW#5	
Parameter	Units	PRL		DATE ANALYZED
ORGANIC ANALYSIS				
VOLATILE PETROLEUM RELATED COMPOUNDS				
Date Analyzed			15MAR95 E	03/15/95
Benzene	ug/L	1.0	ND	03/15/95
Toluene	ug/L	1.0	ND	03/15/95
Ethylbenzene	ug/L	1.0	ND	03/15/95
Xylenes	ug/L	2.0	ND	03/15/95
Gasoline Range Organic Compounds	ug/L	50	ND	03/15/95
Methyl tert-butyl ether	ug/L	4.0	ND	03/15/95
Fluorobenzene (Surrogate)	%		100	03/15/95

These data have been reviewed and are approved for release.

Paul D. Ernst
Project Manager

1710 Douglas Drive
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REPORT OF LABORATORY ANALYSIS

FOOTNOTES
for pages 1 through 7

March 24, 1995
PACE Project Number: 950311509

Client Reference: 2493 0601

HB	High boiling point hydrocarbons are present in sample.
ND	Not detected at or above the PRL.
PRL	PACE Reporting Limit

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REPORT OF LABORATORY ANALYSIS

Mr. Mike Watson
Page 9

QUALITY CONTROL DATA

March 24, 1995
PACE Project Number: 950311509

Client Reference: 2493 0601

Chemical Oxygen Demand
Batch: 10 65923
Samples: 10 0056880

METHOD BLANK:

Parameter	Units	PRL	Method Blank
Chemical Oxygen Demand	mg/L	50	ND

SPIKE AND SPIKE DUPLICATE:

Parameter	Units	PRL	100056880 Effluent	Spike	Spike Recv	Spike Dupl Recv	RPD
Chemical Oxygen Demand	mg/L	50	ND	250	114%	114%	0%

LABORATORY CONTROL SAMPLE:

Parameter	Units	PRL	Reference Value	Recv
Chemical Oxygen Demand	mg/L	50	300	107%

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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

QUALITY CONTROL DATA

March 24, 1995
PACE Project Number: 950311509

Client Reference: 2493 0601

Solids, Total Suspended
Batch: 10 65851
Samples: 10 0056880

METHOD BLANK AND SAMPLE DUPLICATE:

Parameter	Units	PRL	Method Blank	100056880 Effluent	Duplicate of 10 0056880	RPD
Solids, Total Suspended	mg/L	10	ND	ND	ND	NC

LABORATORY CONTROL SAMPLE:

Parameter	Units	PRL	Reference Value	Recv
Solids, Total Suspended	mg/L	10	87	100%

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REPORT OF LABORATORY ANALYSIS

Mr. Mike Watson
Page 11

QUALITY CONTROL DATA

March 24, 1995
PACE Project Number: 950311509

Client Reference: 2493 0601

PVOC/GRO IN WATER-METHODS 8020/MOD. 8015
Batch: 10 65787
Samples: 10 0056901, 10 0056936, 10 0056944

METHOD BLANK:

Parameter	Units	PRL	Method Blank
Date Analyzed			14MAR95
Benzene	ug/L	1.0	ND
Toluene	ug/L	1.0	ND
Ethylbenzene	ug/L	1.0	ND
Xylenes	ug/L	2.0	ND
1,3,5-Trimethylbenzene	ug/L	1.0	ND
1,2,4-Trimethylbenzene	ug/L	1.0	ND
Methyl tert-butyl ether	ug/L	4.0	ND
Gasoline Range Organic Compounds	ug/L	50	ND
Fluorobenzene (Surrogate)	%		106

SPIKE AND SPIKE DUPLICATE:

Parameter	Units	PRL	100056405	Spike	Spike Recv	Spike Dupl Recv	RPD
Benzene	ug/L	1.0	ND	100	101%	103%	2%
Toluene	ug/L	1.0	ND	100	98%	102%	4%
Ethylbenzene	ug/L	1.0	ND	100	99%	100%	1%
Xylenes	ug/L	2.0	ND	300	95%	96%	1%
1,3,5-Trimethylbenzene	ug/L	1.0	ND	100	84%	84%	0%
1,2,4-Trimethylbenzene	ug/L	1.0	ND	100	82%	82%	0%

LABORATORY CONTROL SAMPLE:

Parameter	Units	PRL	Reference Value	Recv
Benzene	ug/L	1.0	100	101%
Toluene	ug/L	1.0	100	100%
Ethylbenzene	ug/L	1.0	100	100%
Xylenes	ug/L	2.0	300	102%
1,3,5-Trimethylbenzene	ug/L	1.0	100	101%
1,2,4-Trimethylbenzene	ug/L	1.0	100	99%
Methyl tert-butyl ether	ug/L	4.0	100	92%
Gasoline Range Organic Compounds	ug/L	50	1000	102%

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PACE INCORPORATED
ENVIRONMENTAL LABORATORIES

REPORT OF LABORATORY ANALYSIS

QUALITY CONTROL DATA

March 24, 1995
PACE Project Number: 950311509

Client Reference: 2493 0601

PVOC/GRO IN WATER-METHODS 8020/MOD. 8015
Batch: 10 65803
Samples: 10 0056880

METHOD BLANK:

Parameter	Units	PRL	Method Blank
Date Analyzed			14MAR95
Benzene	ug/L	1.0	ND
Toluene	ug/L	1.0	ND
Ethylbenzene	ug/L	1.0	ND
Xylenes	ug/L	2.0	ND
1,3,5-Trimethylbenzene	ug/L	1.0	ND
1,2,4-Trimethylbenzene	ug/L	1.0	ND
Methyl tert-butyl ether	ug/L	4.0	ND
Gasoline Range Organic Compounds	ug/L	50	ND
Fluorobenzene (Surrogate)	%		82.7

SPIKE AND SPIKE DUPLICATE:

Parameter	Units	PRL	100055328	Spike	Spike Recv	Spike Dupl Recv	RPD
Benzene	ug/L	1.0	ND	100	94%	94%	0%
Toluene	ug/L	1.0	ND	100	95%	97%	2%
Ethylbenzene	ug/L	1.0	ND	100	95%	96%	1%
Xylenes	ug/L	2.0	ND	300	97%	98%	1%
1,3,5-Trimethylbenzene	ug/L	1.0	ND	100	98%	99%	1%
1,2,4-Trimethylbenzene	ug/L	1.0	ND	100	99%	99%	0%

LABORATORY CONTROL SAMPLE:

Parameter	Units	PRL	Reference Value	Recv
Benzene	ug/L	1.0	100	95%
Toluene	ug/L	1.0	100	96%
Ethylbenzene	ug/L	1.0	100	97%
Xylenes	ug/L	2.0	300	99%
1,3,5-Trimethylbenzene	ug/L	1.0	100	100%
1,2,4-Trimethylbenzene	ug/L	1.0	100	100%
Methyl tert-butyl ether	ug/L	4.0	100	101%
Gasoline Range Organic Compounds	ug/L	50	1000	90%

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REPORT OF LABORATORY ANALYSIS

QUALITY CONTROL DATA

March 24, 1995
PACE Project Number: 950311509

Client Reference: 2493 0601

PVOC/GRO IN WATER-METHODS 8020/MOD. 8015
Batch: 10 65861
Samples: 10 0056898, 10 0056910

METHOD BLANK:

Parameter	Units	PRL	Method Blank
Date Analyzed			16MAR95
Benzene	ug/L	1.0	ND
Toluene	ug/L	1.0	ND
Ethylbenzene	ug/L	1.0	ND
Xylenes	ug/L	2.0	ND
1,3,5-Trimethylbenzene	ug/L	1.0	ND
1,2,4-Trimethylbenzene	ug/L	1.0	ND
Methyl tert-butyl ether	ug/L	4.0	ND
Gasoline Range Organic Compounds	ug/L	50	ND
Fluorobenzene (Surrogate)	%		103

SPIKE AND SPIKE DUPLICATE:

Parameter	Units	PRL	100058149	Spike	Spike Recv	Spike Dupl Recv	RPD
Benzene	ug/L	1.0	ND	100	93%	103%	10%
Toluene	ug/L	1.0	ND	100	92%	102%	10%
Ethylbenzene	ug/L	1.0	ND	100	90%	101%	12%
Xylenes	ug/L	2.0	ND	300	93%	104%	11%
1,3,5-Trimethylbenzene	ug/L	1.0	ND	100	90%	100%	11%
1,2,4-Trimethylbenzene	ug/L	1.0	ND	100	88%	96%	9%

LABORATORY CONTROL SAMPLE:

Parameter	Units	PRL	Reference Value	Recv
Benzene	ug/L	1.0	100	91%
Toluene	ug/L	1.0	100	90%
Ethylbenzene	ug/L	1.0	100	89%
Xylenes	ug/L	2.0	300	92%
1,3,5-Trimethylbenzene	ug/L	1.0	100	91%
1,2,4-Trimethylbenzene	ug/L	1.0	100	87%
Methyl tert-butyl ether	ug/L	4.0	100	96%
Gasoline Range Organic Compounds	ug/L	50	1000	89%

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REPORT OF LABORATORY ANALYSIS

Mr. Mike Watson
Page 14

QUALITY CONTROL DATA

March 24, 1995
PACE Project Number: 950311509

Client Reference: 2493 0601

PVOC/GRO IN WATER-METHODS 8020/MOD. 8015
Batch: 10 65881
Samples: 10 0056928

METHOD BLANK:

Parameter	Units	PRL	Method Blank
Date Analyzed			17MAR95
Benzene	ug/L	1.0	ND
Toluene	ug/L	1.0	ND
Ethylbenzene	ug/L	1.0	ND
Xylenes	ug/L	2.0	ND
1,3,5-Trimethylbenzene	ug/L	1.0	ND
1,2,4-Trimethylbenzene	ug/L	1.0	ND
Methyl tert-butyl ether	ug/L	4.0	ND
Gasoline Range Organic Compounds	ug/L	50	ND
Fluorobenzene (Surrogate)	%		103

SPIKE AND SPIKE DUPLICATE:

Parameter	Units	PRL	100060020	Spike	Spike Recv	Spike Dupl Recv	RPD
Benzene	ug/L	1.0	ND	100	93%	101%	8%
Toluene	ug/L	1.0	ND	100	93%	101%	8%
Ethylbenzene	ug/L	1.0	ND	100	92%	98%	6%
Xylenes	ug/L	2.0	ND	300	95%	102%	7%
1,3,5-Trimethylbenzene	ug/L	1.0	ND	100	94%	101%	7%
1,2,4-Trimethylbenzene	ug/L	1.0	ND	100	90%	97%	7%

LABORATORY CONTROL SAMPLE:

Parameter	Units	PRL	Reference Value	Recv
Benzene	ug/L	1.0	100	100%
Toluene	ug/L	1.0	100	100%
Ethylbenzene	ug/L	1.0	100	100%
Xylenes	ug/L	2.0	300	105%
1,3,5-Trimethylbenzene	ug/L	1.0	100	100%
1,2,4-Trimethylbenzene	ug/L	1.0	100	102%
Methyl tert-butyl ether	ug/L	4.0	100	108%
Gasoline Range Organic Compounds	ug/L	50	1000	87%

Client Reference: 2493 0601

NC	No calculation due to value below detection limit.
ND	Not detected at or above the PRL.
PRL	PACE Reporting Limit
RPD	Relative Percent Difference

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206954

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: Dahl & Associates
Address: 4390 McMenemy Rd
St. Paul MN 55127
Phone: (612) 490-2905

Report To: Mike Watson
Bill To: Dahl & Assoc.
P.O. # / Billing Reference
Project Name / No.: 24930601

Pace Client No.: 011613
Pace Project Manager: PDG
Pace Project No.: 950311-504
*Requested Due Date:

Sampled By (PRINT): Dan Madsen
Sampler Signature: Dan Madsen
Date Sampled: 3/9/95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	PRESERVATIVES: UNPRESERVED	H_2SO_4	HNO_3	VOA	HCl	ANALYSES REQUEST: BTEX, MTBE, THC	BTEX, MTBE, GRO	T.S.S	C.O.D	REMARKS
1	Effluent	12:45	H_2O	5688.0	5	1	1			3	X		X	X	
2	Influent	12:30		5689.8	3					3	X				
3	MW #1	1:15		5690.1	3					3		X			
4	MW #2	2:00		5691.0	3					3		X			
5	MW #3	2:15		5692.8	3					3		X			
6	MW #4	2:20		5693.6	3					3		X			
7	MW #5	2:40		5694.4	3					3		X			
8															

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE

ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME
1-7	Dan Madsen DAHL	M. MacKeever / Pace	3/10/95	15:27

Additional Comments

ORIGINAL

SEE REVERSE SIDE FOR INSTRUCTIONS

Form 1 - Air Stripper Screening Evaluation

DRAFT 4/26/91

Site Name: South Robert	Responsible Party Contact		Form Completed By: MPS
Address: 1126 S. Robert St.	Name:	Jeff Smail	Dahl & Associates, Inc.
W. St. Paul, MN	Affiliation:	Conoco Inc.	Date Form Completed: 03/13/95
MPCA Leak #:0000858	Phone#:	(713) 293-3568	Sampling Date: 02/04/94

	A	B	C	D	E	
CONTAMINANT (CAS #)	Groundwater Concentration (ug/liter)	Stripper Influent Flow Rate (liters/sec)	Removal Factor	Emission Rate (ug/sec)	Significant Emission Rate (ug/sec)	Is ER > SER?
	GC	IFR	RF	ER	SER	(yes/no)
Benzene (71-43-2)	120	2.4	1	288	4,600	NO
Chloroform (67-66-3)					1,600	
Dichlorodifluoromethane (75-71-8)					767,200	
1,1-Dichloroethane (75-34-3)					1,918,000	
1,2-Dichloroethane (107-06-2)					1,500	
1,1-Dichloroethylene (75-35-4)					800	
1,2-Dichloroethylene (540-59-0)					2,083,900	
Dichlorofluoromethane (75-43-4)					105,300	
Ethylbenzene (100-41-4)	14	2.4	1	33.6	497,700	NO
Methylene Chloride (75-09-2)					80,600	
1,1,2,2-Tetrachloroethane (79-34-5)					700	
Tetrachloroethylene (127-18-4)					65,200	
1,1,1-Trichloroethane (71-55-6)					3,835,800	
1,1,2-Trichloroethane (79-00-5)					2400	
Trichloroethylene (79-01-6)					22600	
Trichlorofluoromethane (75-69-4)					2,685,100	
1,1,2-Trichlorotrifluoroethane (76-13-1)					20,048,000	
Toluene (108-88-3)	270	2.4	1	648	429,800	NO
Vinyl Chloride (75-01-4)					9,200	
Xylene (mixed) (1330-20-7)	600	2.4	1	1440	497,700	NO
Other 1						

1 Contact MPCA Division of Air Quality Staff (296-7757) regarding contaminants not on this list.

Form 1 - Air Stripper Screening Evaluation

DRAFT 4/26/91

Site Name: South Robert	Responsible Party Contact		Form Completed By:	MPS
Address: 1126 S. Robert St.	Name:	Jeff Smail	Dahl & Associates, Inc.	
W. St. Paul, MN	Affiliation:	Conoco Inc.	Date Form Completed:	03/13/95
MPCA Leak #:0000858	Phone#:	(713) 293-3568	Sampling Date:	03/21/94

	A	B	C	D	E	
CONTAMINANT (CAS #)	Groundwater Concentration (ug/liter)	Stripper Influent Flow Rate (liters/sec)	Removal Factor	Emission Rate (ug/sec)	Significant Emission Rate (ug/sec)	Is ER > SER?
	GC	IFR	RF	ER	SER	(yes/no)
Benzene (71-43-2)	56	2.4	1	134.4	4,600	NO
Chloroform (67-66-3)					1,600	
Dichlorodifluoromethane (75-71-8)					767,200	
1,1-Dichloroethane (75-34-3)					1,918,000	
1,2-Dichloroethane (107-06-2)					1,500	
1,1-Dichloroethylene (75-35-4)					800	
1,2-Dichloroethylene (540-59-0)					2,083,900	
Dichlorofluoromethane (75-43-4)					105,300	
Ethylbenzene (100-41-4)	0	2.4	1	0	497,700	NO
Methylene Chloride (75-09-2)					80,600	
1,1,2,2-Tetrachloroethane (79-34-5)					700	
Tetrachloroethylene (127-18-4)					65,200	
1,1,1-Trichloroethane (71-55-6)					3,835,800	
1,1,2-Trichloroethane (79-00-5)					2400	
Trichloroethylene (79-01-6)					22600	
Trichlorofluoromethane (75-69-4)					2,685,100	
1,1,2-Trichlorotrifluoroethane (76-13-1)					20,048,000	
Toluene (108-88-3)	50	2.4	1	120	429,800	NO
Vinyl Chloride (75-01-4)					9,200	
Xylene (mixed) (1330-20-7)	230	2.4	1	552	497,700	NO
Other 1						

1 Contact MPCA Division of Air Quality Staff (296-7757) regarding contaminants not on this list.

Form 1 - Air Stripper Screening Evaluation

DRAFT 4/26/91

Site Name: South Robert	Responsible Party Contact		Form Completed By:	MPS
Address: 1126 S. Robert St.	Name:	Jeff Smail	Dahl & Associates, Inc.	
W. St. Paul, MN	Affiliation:	Conoco Inc.	Date Form Completed:	03/13/95
MPCA Leak #:0000858	Phone#:	(713) 293-3568	Sampling Date:	06/30/94

	A	B	C	D	E	
CONTAMINANT (CAS #)	Groundwater Concentration (ug/liter)	Stripper Influent Flow Rate (liters/sec)	Removal Factor	Emission Rate (ug/sec)	Significant Emission Rate (ug/sec)	Is ER > SER?
	GC	IFR	RF	ER	SER	(yes/no)
Benzene (71-43-2)	0	1.9	1	0	4,600	NO
Chloroform (67-66-3)					1,600	
Dichlorodifluoromethane (75-71-8)					767,200	
1,1-Dichloroethane (75-34-3)					1,918,000	
1,2-Dichloroethane (107-06-2)					1,500	
1,1-Dichloroethylene (75-35-4)					800	
1,2-Dichloroethylene (540-59-0)					2,083,900	
Dichlorofluoromethane (75-43-4)					105,300	
Ethylbenzene (100-41-4)	0	1.9	1	0	497,700	NO
Methylene Chloride (75-09-2)					80,600	
1,1,2,2-Tetrachloroethane (79-34-5)					700	
Tetrachloroethylene (127-18-4)					65,200	
1,1,1-Trichloroethane (71-55-6)					3,835,800	
1,1,2-Trichloroethane (79-00-5)					2400	
Trichloroethylene (79-01-6)					22600	
Trichlorofluoromethane (75-69-4)					2,685,100	
1,1,2-Trichlorotrifluoroethane (76-13-1)					20,048,000	
Toluene (108-88-3)	0	1.9	1	0	429,800	NO
Vinyl Chloride (75-01-4)					9,200	
Xylene (mixed) (1330-20-7)	0	1.9	1	0	497,700	NO
Other 1						

1 Contact MPCA Division of Air Quality Staff (296-7757) regarding contaminants not on this list.

Form 1 - Air Stripper Screening Evaluation

DRAFT 4/26/91

Site Name: South Robert	Responsible Party Contact		Form Completed By: MPS
Address: 1126 S. Robert St.	Name:	Jeff Smail	Dahl & Associates, Inc.
W. St. Paul, MN	Affiliation:	Conoco Inc.	Date Form Completed: 03/13/95
MPCA Leak #:0000858	Phone#:	(713) 293-3568	Sampling Date: 08/31/94

	A	B	C	D	E	
CONTAMINANT (CAS #)	Groundwater Concentration (ug/liter)	Stripper Influent Flow Rate (liters/sec)	Removal Factor	Emission Rate (ug/sec)	Significant Emission Rate (ug/sec)	Is ER > SER?
	GC	IFR	RF	ER	SER	(yes/no)
Benzene (71-43-2)	SYSTEM DOWN	0	1	0	4,600	NO
Chloroform (67-66-3)					1,600	
Dichlorodifluoromethane (75-71-8)					767,200	
1,1-Dichloroethane (75-34-3)					1,918,000	
1,2-Dichloroethane (107-06-2)					1,500	
1,1-Dichloroethylene (75-35-4)					800	
1,2-Dichloroethylene (540-59-0)					2,083,900	
Dichlorofluoromethane (75-43-4)					105,300	
Ethylbenzene (100-41-4)	SYSTEM DOWN	0	1	0	497,700	NO
Methylene Chloride (75-09-2)					80,600	
1,1,2,2-Tetrachloroethane (79-34-5)					700	
Tetrachloroethylene (127-18-4)					65,200	
1,1,1-Trichloroethane (71-55-6)					3,835,800	
1,1,2-Trichloroethane (79-00-5)					2400	
Trichloroethylene (79-01-6)					22600	
Trichlorofluoromethane (75-69-4)					2,685,100	
1,1,2-Trichlorotrifluoroethane (76-13-1)					20,048,000	
Toluene (108-88-3)	SYSTEM DOWN	0	1	0	429,800	NO
Vinyl Chloride (75-01-4)					9,200	
Xylene (mixed) (1330-20-7)	SYSTEM DOWN	0	1	0	497,700	NO
Other 1						

1 Contact MPCA Division of Air Quality Staff (296-7757) regarding contaminants not on this list.

Form 1 - Air Stripper Screening Evaluation

DRAFT 4/26/91

Site Name: South Robert	Responsible Party Contact		Form Completed By: MPS
Address: 1126 S. Robert St.	Name:	Jeff Smail	Dahl & Associates, Inc.
W. St. Paul, MN	Affiliation:	Conoco Inc.	Date Form Completed: 03/13/95
MPCA Leak #:0000858	Phone#:	(713) 293-3568	Sampling Date: 12/27/94

	A	B	C	D	E	
CONTAMINANT (CAS #)	Groundwater Concentration (ug/liter)	Stripper Influent Flow Rate (liters/sec)	Removal Factor	Emission Rate (ug/sec)	Significant Emission Rate (ug/sec)	Is ER > SER?
	GC	IFR	RF	ER	SER	(yes/no)
Benzene (71-43-2)	970	1.57	1	1522.9	4,600	NO
Chloroform (67-66-3)					1,600	
Dichlorodifluoromethane (75-71-8)					767,200	
1,1-Dichloroethane (75-34-3)					1,918,000	
1,2-Dichloroethane (107-06-2)					1,500	
1,1-Dichloroethylene (75-35-4)					800	
1,2-Dichloroethylene (540-59-0)					2,083,900	
Dichlorofluoromethane (75-43-4)					105,300	
Ethylbenzene (100-41-4)	280	1.57	1	439.6	497,700	NO
Methylene Chloride (75-09-2)					80,600	
1,1,2,2-Tetrachloroethane (79-34-5)					700	
Tetrachloroethylene (127-18-4)					65,200	
1,1,1-Trichloroethane (71-55-6)					3,835,800	
1,1,2-Trichloroethane (79-00-5)					2400	
Trichloroethylene (79-01-6)					22600	
Trichlorofluoromethane (75-69-4)					2,685,100	
1,1,2-Trichlorotrifluoroethane (76-13-1)					20,048,000	
Toluene (108-88-3)	700	1.57	1	1099	429,800	NO
Vinyl Chloride (75-01-4)					9,200	
Xylene (mixed) (1330-20-7)	1200	1.57	1	1884	497,700	NO
Other 1						

1 Contact MPCA Division of Air Quality Staff (296-7757) regarding contaminants not on this list.

Form 1 - Air Stripper Screening Evaluation

DRAFT 4/26/91

Site Name: South Robert	Responsible Party Contact	Form Completed By: MPS
Address: 1126 S. Robert St.	Name: Jeff Smail	Dahl & Associates, Inc.
W. St. Paul, MN	Affiliation: Conoco Inc.	Date Form Completed: 05/03/95
MPCA Leak #:0000858	Phone#: (713) 293-3568	Sampling Date: 03/08/95

	A	B	C	D	E	
CONTAMINANT (CAS #)	Groundwater Concentration (ug/liter)	Stripper Influent Flow Rate (liters/sec)	Removal Factor	Emission Rate (ug/sec)	Significant Emission Rate (ug/sec)	Is ER > SER?
	GC	IFR	RF	ER	SER	(yes/no)
Benzene (71-43-2)	510	1.57	1	800.7	4,600	NO
Chloroform (67-66-3)					1,600	
Dichlorodifluoromethane (75-71-8)					767,200	
1,1-Dichloroethane (75-34-3)					1,918,000	
1,2-Dichloroethane (107-06-2)					1,500	
1,1-Dichloroethylene (75-35-4)					800	
1,2-Dichloroethylene (540-59-0)					2,083,900	
Dichlorofluoromethane (75-43-4)					105,300	
Ethylbenzene (100-41-4)	170	1.57	1	266.9	497,700	NO
Methylene Chloride (75-09-2)					80,600	
1,1,2,2-Tetrachloroethane (79-34-5)					700	
Tetrachloroethylene (127-18-4)					65,200	
1,1,1-Trichloroethane (71-55-6)					3,835,800	
1,1,2-Trichloroethane (79-00-5)					2400	
Trichloroethylene (79-01-6)					22600	
Trichlorofluoromethane (75-69-4)					2,685,100	
1,1,2-Trichlorotrifluoroethane (76-13-1)					20,048,000	
Toluene (108-88-3)	740	1.57	1	1161.8	429,800	NO
Vinyl Chloride (75-01-4)					9,200	
Xylene (mixed) (1330-20-7)	1300	1.57	1	2041	497,700	NO
Other 1						

1 Contact MPCA Division of Air Quality Staff (296-7757) regarding contaminants not on this list.

interpoll

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

February 25, 1994

Dahl & Associates
4390 McMenemy Road
Vadnais Heights, MN 55127
Attention: Mike Watson

LABORATORY REPORT: #2358
DAHL PROJECT: #24930601

CONOCO INC.

SAMPLES COLLECTED: February 18, 1994
SAMPLES RECEIVED: February 21, 1994

Sample Identification: Vent Stack
Sample Type: Charcoal Tube
Laboratory Log Number: #2358-01

Parameter	Detection Limit Total ug Front/Back	Total ug Front	Total ug Back	Total
NIOSH Method 1501:				
Benzene	2.1/0.61	77	< 0.61	77
Toluene	2.1/0.61	460	< 0.61	460
Ethylbenzene	2.1/0.61	230	< 0.61	230
Xylenes	2.1/0.61	770	< 0.61	770
Total hydrocarbons, as gasoline	90/27	22000[a]	< 27	22000[a]

Respectfully submitted,

for Wayne A. Olson, Manager
Organic Chemistry Group

WAO/bj
Invoice Enclosed
< = less than

[a]Sample extract was diluted by a factor of 5 to accommodate the analyte concentration. Reported value represents the concentration in the original undiluted sample, i.e., instrumental result was multiplied by the dilution factor prior to reporting. Achieved detection limit is given. The target detection limit applicable to the sample may be obtained by dividing the achieved detection limit by the dilution factor.

interpoll

007619

CHAIN-OF-CUSTODY RECORD
Analytical Request

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

Client DAIL + ASSOCIATES
Address 4390 MCMENAMY RD
ST PAUL MN 55127
Phone 612-490-2805

Route Report To: MIKE WATSON
Bill To: DAIL
P.O. SAME
Project Name/No. 2493 0601

SPECIAL HANDLING REQUEST
☒ RUSH 3-5 DAY
☐ OTHER Due 2/25/94 1.H.
☐ QUOTE NO.

Sampled By (Print): MARK SMITH
Sampler Signature: Mark Smith Date: 2/18/94

Item No.	Sample Description	Date/ Time	Matrix	Interpoll Log No.	Number of Containers of Each: Preservatives: None	HNO_3	H_2SO_4	NaOH	VOC			Total No. Cont.	PID/FID: Ambient	Sample	Analytical Request: BETX	GRO						COMMENTS
1	VENT STACK	2/18 12:00	AIR	2358 01	✓							1			X	X						10L DARCARTUBE

Additional Comments:

Item No.	Relinquished by/Affiliation	Accepted by/Affiliation	Date	Time
	Mark Smith	[illegible]	2/18/94	1330

Laboratory Comments Only:

White – Original/File Copy Yellow – Report Copy Pink – Client Copy

See Reverse Side For Instructions

LCI-117

interpoll

007619

CHAIN-OF-CUSTODY RECORD
Analytical Request

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

Client DAHL + ASSOCIATES
Address 4390 MCMENEMY RD
ST PAUL MN 55127
Phone 612-490-2505

Route Report To: MIKE WATSON
Bill To: DAHL
P.O. SAME
Project Name/No. 2493 0601

SPECIAL HANDLING REQUEST
☒ RUSH 3-5 DAY.
☐ OTHER
☐ QUOTE NO.

Sampled By (Print) MARK SMITH
Sampler Signature Mark Smith Date 2/18/94

Item No.	Sample Description	Date/ Time	Matrix	Interpoll Log No.	Number of Containers of Each Preservatives: None	HNO_3	H_2SO_4	NaOH	VOC			Total No. Cont.	PID/FID: Ambient	PID/FID: Sample	Analytical Request: BETX	GRO						COMMENTS
1	VENT STACK	2-18 1200	AIR		✓							1			X	X						LOG DRAGER TUBES

Additional Comments:

Laboratory Comments Only:

Item No.	Relinquished by/Affiliation	Accepted by/Affiliation	Date	Time
	Mark Smith	[illegible]	2/18/94	1730

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See Reverse Side For Instructions

LCI-117

interpoll

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

February 22, 1994

Dahl & Associates
4390 McMenemy Road
Vadnais Heights, MN 55127
Attention: Mike Watson

LABORATORY REPORT: #2316
DAHL PROJECT: #24930601 Conoco Inc.

SAMPLES COLLECTED: February 11, 1994
SAMPLES RECEIVED: February 15, 1994

Sample Identification: Soil Vent Stack
Sample Type: Charcoal Tube
Laboratory Log Number: 2316-01

Parameter	Detection Limit Total ug Front/Back	Total ug Front	Total ug Back	Total
NIOSH Method 1501:				
Benzene	2.1/0.61	87	< 0.61	87
Toluene	2.1/0.61	360	< 0.61	360
Ethylbenzene	2.1/0.61	170	< 0.61	170
Xylenes	2.1/0.61	560	< 0.61	560
Total hydrocarbons, as gasoline	90/27	20000[a]	< 27	20000[a]

Respectfully submitted,

Greg W. Hol

for Wayne A. Olson, Manager
Organic Chemistry Group

WAO/bj
Invoice Enclosed
< = less than

[a]Sample extract was diluted by a factor of 5 to accommodate the analyte concentration. Reported value represents the concentration in the original undiluted sample, i.e., instrumental result was multiplied by the dilution factor prior to reporting. Target detection limit is given. The detection limit applicable to the sample may be obtained by multiplying the target detection limit by the dilution factor.

All analyses were performed using EPA or other recognized methodologies.
All units are on an "as received" basis unless otherwise indicated.

interpoll

007617

CHAIN-OF-CUSTODY RECORD
Analytical Request

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

Client: Dahl + Assoc.
Address: 4390 McMenemy Rd
St. Paul MN. 55127
Phone: 490-2705

Route Report To: Mike Watson
Bill To: Dahl
P.O.:
Project Name/No.: 249306001

SPECIAL HANDLING REQUEST
☐ RUSH
☐ OTHER
☐ QUOTE NO.

Sampled By (Print): J. Howard
Sampler Signature: [signature] Date: 2/10/94

Item No.	Sample Description	Date/ Time	Matrix	Interpoll Log No.	Number of Containers of Each: Preservatives None	HNO_3	H_2SO_4	NaOH	VOC			Total No. Cont.	PID/FID Ambient	PID/FID Sample	Analytical Request STEX	GRO						COMMENTS
1	soil vent stack	2/11 1100	soil	7316-01											✓	✓						10L charcoal

Additional Comments:

Item No.	Relinquished by/Affiliation	Accepted by/Affiliation	Date	Time
1	[signature]	[signature], Interpoll	2/15/94	0900

Laboratory Comments Only:

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See Reverse Side For Instructions

LCI-117

interpoll

007617

CHAIN-OF-CUSTODY RECORD
Analytical Request

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

Client: Dahl Assoc.
Address: 4390 McMenemy Rd
St Paul MN 55127
Phone: 490-2905

Route Report To: Joe Watson
Bill To: Dahl
P.O.
Project Name/No.: 249306001

SPECIAL HANDLING REQUEST
☐ RUSH
☐ OTHER
☐ QUOTE NO.

Sampled By (Print): J Howard
Sampler Signature: J Howard
Date: 2/15/94

Item No.	Sample Description	Date/ Time	Matrix	Interpoll Log No.	Number of Containers of Each: Preservatives None	HNO_3	H_2SO_4	NaOH	VOC			Total No. Cont.	PID/FID Ambient	PID/FID Sample	Analytical Request: STEX	GRO	COMMENTS
1	solvent tank	2/15 1100	water												✓	✓	10L charcoal

Additional Comments:

Item No.	Relinquished by/Affiliation	Accepted by/Affiliation	Date	Time
1	J Howard	[illegible] Interpoll	2/15/94	0700

Laboratory Comments Only:

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LCI-117

interpoll

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

February 18, 1994

Dahl & Associates
4390 McMenemy Road
Vadnais Heights, MN 55127

Attention: Mike Watson

LABORATORY REPORT: #2264
DAHL PROJECT: #24930601 Conoco Inc.

SAMPLES COLLECTED: February 4, 1994
SAMPLES RECEIVED: February 7, 1994

Sample Identification: Vent Stack 1A
Sample Type: Charcoal Tube
Laboratory Log Number: 2264-01

Parameter	Detection Limit Total ug Front/Back	Total ug Front	Total ug Back	Total
NIOSH Method 1501:				
Benzene	2.1/0.61	210	< 0.61	210
Toluene	2.1/0.61	630	< 0.61	630
Ethylbenzene	2.1/0.61	240	< 0.61	240
Xylenes	2.1/0.61	730	< 0.61	730
Total hydrocarbons, as gasoline	90/27	39000[a]	< 27	39000[a]

Respectfully submitted,

Wayne A. Olson, Manager
Organic Chemistry Group

WAO/bj
Invoice Enclosed
< = less than

[a]Sample extract was diluted by a factor of 5 to accommodate the analyte concentration. Reported value represents the concentration in the original undiluted sample, i.e., instrumental result was multiplied by the dilution factor prior to reporting. Target detection limit is given. The detection limit applicable to the sample may be obtained by multiplying the target detection limit by the dilution factor.

All analyses were performed using EPA or other recognized methodologies.
All units are on an "as received" basis unless otherwise indicated.

interpoll

007615

CHAIN-OF-CUSTODY RECORD
Analytical Request

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

Client: DAHL & Associates
Address: 4340 McMenemy RD
St Paul MN 55127
Phone: (612) 490-0905

Route Report To: MIKE WATSON
Bill To: DAHL & Assocmtes
P.O. SAME
Project Name/No. 24930C001

SPECIAL HANDLING REQUEST
☐ RUSH
☐ OTHER
☐ QUOTE NO.

Sampled By (Print): DAHL & ASSOCIATES
Sampler Signature: SL TBL
Date: 2-4-94

Item No.	Sample Description	Date/ Time	Matrix	Interpoll Log No.	Number of Containers of Each: Preservatives None	HNO_3	H_2SO_4	NaOH	VOC			Total No. Cont.	PID/FID: Ambient	Sample	Analytical Request: BETX	ENO					COMMENTS
1	VENT STACK 1A	2-4-94 1000	AIR	2264-01	1							1			X	X					1-10 liter Drager
2	VENT STACK 1B	1	AIR	-02	1							1			X	X					1-10 Liter Drager.

Additional Comments: Sample 1B only if 1A has Breakthrough !!

Item No.	Relinquished by/Affiliation	Accepted by/Affiliation	Date	Time
1&2	SL TBL	Bob Barg, Interpoll	2/4/94	0900

Laboratory Comments Only:

White – Original/File Copy Yellow – Report Copy Pink – Client Copy

See Reverse Side For Instructions

LCI-117

interpoll

007615

CHAIN-OF-CUSTODY RECORD
Analytical Request

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

Client: DAHL & ASSOCIATES
Address: 4390 McMenemy RD
ST PAUL MN 55127
Phone: (612) 490-3905

Route Report To: MIKE WATSON
Bill To: DAHL & ASSOCIATES
P.O.: SAME
Project Name/No.: 24930001

SPECIAL HANDLING REQUEST
☐ RUSH
☐ OTHER
☐ QUOTE NO.

Sampled By (Print): DAHL & ASSOCIATES
Sampler Signature: SL ISL
Date: 2-4-94

Item No.	Sample Description	Date/ Time	Matrix	Interpoll Log No.	Number of Containers of Each Preservatives: None	HNO_3	H_2SO_4	NaOH	VOC			Total No. Cont.	PID/FID: Ambient	Sample	Analytical Request: BTX	ENO							COMMENTS
1	VENT STACK 1A	2-4-94 11:00	AIR		1							1			X	X							1-10 Liter Drager
2	VENT STACK 1B	1	AIR		1							1			X	X							1-10 Liter Drager.

Additional Comments: SAMPLE 1B ONLY IF 1A HAS BREAKTHROUGH !!

Laboratory Comments Only:

Item No.	Relinquished by/Affiliation	Accepted by/Affiliation	Date	Time
1&2	SL ISL	[illegible]	2/3/94	0900

White – Original/File Copy Yellow – Report Copy Pink – Client Copy

See Reverse Side For Instructions

LCI-117

interpoll

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

April 15, 1994

Dahl & Associates
4390 McMenemy Road
Vadnais Heights, MN 55127

Attention: Mike Watson

LABORATORY REPORT: #2576
DAHL PROJECT: #24930601 Conoco-Robert

SAMPLES COLLECTED: March 21 1994
SAMPLES RECEIVED: March 25, 1994

Sample Identification: Soil vent stack
Sample Type: Charcoal Tube
Laboratory Log Number: #2576-01

Parameter	Detection Limit Total ug Front/Back	Total ug Front	Total ug Back	Total
NIOSH Method 1501:				
Benzene	2.1/0.61	69	< 0.61	69
Toluene	2.1/0.61	300	< 0.61	300
Ethylbenzene	2.1/0.61	110	< 0.61	110
Xylenes	2.1/0.61	360	< 0.61	360
Total hydrocarbons, as gasoline	90/27	24000[a]	< 27	24000

Footnote:

[a]Sample extract was diluted by a factor of 5 to accommodate the analyte concentration. Reported value represents the concentration in the original undiluted sample, i.e., instrumental result was multiplied by the dilution factor prior to reporting. Target detection limit is given. The detection limit applicable to the sample may be obtained by multiplying the target detection limit by the dilution factor.

Respectfully submitted,

Wayne A. Olson, Manager
Organic Chemistry Group

WAO/bj
Invoice Enclosed
< = less than

All analyses were performed using EPA or other recognized methodologies.
All units are on an "as received" basis unless otherwise indicated.

interpoll

007634

CHAIN-OF-CUSTODY RECORD
Analytical Request

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

Client: Dahl + Associates
Address: 4390 McMenemy Rd.
St Paul, MN. 55127
Phone: (612) 490-2905

Route Report To: D. Ann Watson / Dahl
Bill To: Dahl
P.O.
Project Name/No.: 24430601

SPECIAL HANDLING REQUEST
☐ RUSH
☐ OTHER
☐ QUOTE NO.

Sampled By (Print): J. Howard
Sampler Signature: [signature]
Date: 3/21/94

Item No.	Sample Description	Date/ Time	Matrix	Interpoll Log No.	Number of Containers of Each: Preservatives None	HNO_3	H_2SO_4	NaOH	VOC			Total No. Cont.	PID/FID Ambient	PID/FID Sample	Analytical Request: BTEX	TPH as Gas						COMMENTS
1	SOIL VENT STACK	3/21 2:00	AIR												X	X						10L charcoal

Additional Comments:

Item No.	Relinquished by/Affiliation	Accepted by/Affiliation	Date	Time
1	[signature]	SCQ / Interpoll	3/25/94	1615

Laboratory Comments Only:

White – Original/File Copy Yellow – Report Copy Pink – Client Copy

See Reverse Side For Instructions

LCI-117

interpoll

007634

CHAIN-OF-CUSTODY RECORD
Analytical Request

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

Client: Dahl & Associates
Address: 4390 McMenemy Rd
St Paul, MN. 55127
Phone: (612) 490-2905

Route Report To: M. Joe Watson / Dahl
Bill To: Dahl
P.O.
Project Name/No.: 24930601

SPECIAL HANDLING REQUEST
☐ RUSH
☐ OTHER
☐ QUOTE NO.

Sampled By (Print): J. Howard
Sampler Signature: [signature] Date: 3/21/94

Item No.	Sample Description	Date/ Time	Matrix	Interpoll Log No.	Number of Containers of Each: Preservatives: None	HNO_3	H_2SO_4	NaOH	VOC			Total No. Cont.	PID/FID: Ambient	Sample	Analytical Request: BTEX	TPH as Gas						COMMENTS
1	SOIL VENT STACK	3/21 1:10	AIR	2576-01											X	X						10 L charcoal

Additional Comments:

Item No.	Relinquished by/Affiliation	Accepted by/Affiliation	Date	Time
1	[signature]	SCQ / Interpoll	3/25/94	1615

Laboratory Comments Only:

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interpoll

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

July 27, 1994

Dahl & Associates
4390 McMenemy Road
Vadnais Heights, MN 55127

Attention: Mike Watson

LABORATORY REPORT: #3333
DAHL PROJECT: #24930601

CONOCO INC.

SAMPLES COLLECTED: June 30, 1994
SAMPLES RECEIVED: July 6, 1994

Sample Identification: Vent Stack
Sample Type: Charcoal Tube
Laboratory Log Number: #3333-01

Parameter	Detection Limit Total ug Front/Back	Total ug Front	Total ug Back	Total
NIOSH Method 1501:				
Benzene	2.1/0.61	96	< 0.61	96
Toluene	2.1/0.61	680	< 0.61	680
Ethylbenzene	2.1/0.61	260	< 0.61	260
Xylenes	2.1/0.61	1200	< 0.61	1200
Total hydrocarbons, as gasoline	90/27	14000	< 27	14000

Respectfully submitted,

Wayne A. Olson, Manager
Organic Chemistry Group

WAO/bj
Invoice Enclosed
< = less than

All analyses were performed using EPA or other recognized methodologies.
All units are on an "as received" basis unless otherwise indicated.

J2

interpoll

010087

CHAIN-OF-CUSTODY RECORD
Analytical Request

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

Client DAHL & ASSOCIATES
Address 1590 MEMORY RD
ST. PAUL MN 55127
Phone 612-490-2905

Route Report To: MIKE WATSON
Bill To: DAHL
P.O. ——
Project Name/No. 24930601

SPECIAL HANDLING REQUEST
☐ RUSH
☐ OTHER
☐ QUOTE NO.

Sampled By (Print): MARK SMITH
Sampler Signature: Mark Smith Date: 6/30/94

Item No.	Sample Description	Date/ Time	Matrix	Interpoll Log No.	Number of Containers of Each Preservatives: None	HNO_3	H_2SO_4	NaOH	VOC			Total No. Cont.	PID/FID: Ambient	PID/FID: Sample	Analytical Request: BETX	GRO						COMMENTS
1	VENT STACK	6/30 12:00	AIR	3333-01	✓							1			X	X						10 L DRAGAR TUBE

Additional Comments:

Laboratory Comments Only:

Item No.	Relinquished by/Affiliation	Accepted by/Affiliation	Date	Time
1	Mark Smith	[illegible]	7/6/94	1020

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LCI-117

interpoll

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

September 27, 1994

Dahl & Associates
4390 McMenemy Road
Vadnais Heights, MN 55127

Attention: Mike Watson

LABORATORY REPORT: #3821 Conoco-Robert
DAHL PROJECT: #24930601

SAMPLES COLLECTED: August 31, 1994
SAMPLES RECEIVED: September 6, 1994

Sample Identification: Vent Stack
Sample Type: Charcoal Tube
Laboratory Log Number: #3821-01

Parameter	Detection Limit Total ug Front/Back	Total ug Front	Total ug Back	Total
NIOSH Method 1501:				
Benzene	2.1/0.61	2.1	< 0.61	2.1
Toluene	2.1/0.61	9.9	< 0.61	9.9
Ethylbenzene	2.1/0.61	2.8	< 0.61	2.8
Xylenes	2.1/0.61	11	< 0.61	11
Total hydrocarbons as gasoline	90/27	390	< 27	390

Respectfully submitted,

Wayne A. Olson, Manager
Organic Chemistry Group

WAO/bj
Invoice Enclosed
< = less than

All analyses were performed using EPA or other recognized methodologies.
All units are on an "as received" basis unless otherwise indicated.

RL

interpoll

010894

CHAIN-OF-CUSTODY RECORD
Analytical Request

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

Client DAHL & ASSOCIATES
Address 4390 NORTHERN PINE RD
ST. PAUL MN 55127
Phone

Route Report To: MIKE WATSON
Bill To: DAHL
P.O. —
Project Name/No. 24930601

SPECIAL HANDLING REQUEST
☐ RUSH
☐ OTHER
☐ QUOTE NO.

Sampled By (Print) MARK SMITH
Sampler Signature Mark Smith Date 8/31/94

Item No.	Sample Description	Date/ Time	Matrix	Interpoll Log No.	Number of Containers of Each — Preservatives: None	HNO_3	H_2SO_4	NaOH	VOC			Total No. Cont.	PID/FID: Ambient	Sample	Analytical Request: BTX	GRO						COMMENTS
1	VENT STACK	8/31 6:00	AIR		✓							1			X	X						10L DAAG AR TUBE

Additional Comments:

Item No.	Relinquished by/Affiliation	Accepted by/Affiliation	Date	Time
1	Mark Smith	Interpoll	9/6/94	0825

Laboratory Comments Only:

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LCI-117

interpoll

010894

CHAIN-OF-CUSTODY RECORD
Analytical Request

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

Client: DAHL & ASSOCIATES
Address: 4390 NEWPORT RD
ST. PAUL MN 55127
Phone:

Route Report To: MIKE WATSON
Bill To: DAHL
P.O. —
Project Name/No.: 24930601

SPECIAL HANDLING REQUEST
☐ RUSH
☐ OTHER
☐ QUOTE NO.

Sampled By (Print): MARK SMITH
Sampler Signature: Mark Smith Date: 8/31/94

Item No.	Sample Description	Date/ Time	Matrix	Interpoll Log No.	Number of Containers of Each — Preservatives: None	HNO_3	H_2SO_4	NaOH	VOC			Total No. Cont.	PID/FID: Ambient	Sample	Analytical Request: BCT	GRO						COMMENTS
1	VENT STACK	8/31 6:00	AIR	3821-01	✓							1			X	X						10L DRAG. AR-TUBE

Additional Comments:

Item No.	Relinquished by/Affiliation	Accepted by/Affiliation	Date	Time
1	Mark Smith	/Interpoll	9/6/94	0825

Laboratory Comments Only:

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LCI-117

interpoll

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

January 16, 1995

Dahl & Associates
4390 McMenemy Road
Vadnais Heights, MN 55127

Attention: Mike Watson

LABORATORY REPORT: #4645 Conoco-Robert
DAHL PROJECT: #24930601

SAMPLES COLLECTED December 27, 1994
SAMPLES RECEIVED: January 3, 1995

Sample Identification: Vent Stack
Sample Type: Charcoal Tube
Laboratory Log Number: #4645-01

Parameter	Detection Limit Total ug Front/Back	Total ug Front	Total ug Back	Total
NIOSH Method 1501:				
Benzene	2.1/0.61	18	< 0.61	18
Toluene	2.1/0.61	150	< 0.61	150
Ethylbenzene	2.1/0.61	34	< 0.61	34
Xylenes	2.1/0.61	120	< 0.61	120
Total hydrocarbons as gasoline	90/27	4300	< 27	4300

Respectfully submitted,

Wayne A. Olson, Manager
Organic Chemistry Group

WAO/cg
Invoice Enclosed
< = less than

All analyses were performed using EPA or other recognized methodologies.
All units are on an "as received" basis unless otherwise indicated.

interpoll

009444

CHAIN-OF-CUSTODY RECORD
Analytical Request

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

Client: DAHL ASSOCIATES
Address: 4390 MEMORIAL RD
ST. PAUL MN 55127
Phone: 612-490-2905

Route Report To: MIKE WATSON
Bill To: DAHL
P.O.:
Project Name/No.: 2493 0601

SPECIAL HANDLING REQUEST
☐ RUSH
☐ OTHER
☐ QUOTE NO.

Sampled By (Print): MARK SMITH
Sampler Signature: [signature] Date: 12/27/94

Item No.	Sample Description	Date/ Time	Matrix	Interpoll Log No.	Number of Containers of Each: Preservatives None	HNO_3	H_2SO_4	NaOH	VOC			Total No. Cont.	PID/FID Ambient	PID/FID Sample	Analytical Request: BTEX (8020)							COMMENTS
1	VENT STACK	12/27 11:00	AIR	4615-01	✓							1			X	X						10L DRAGER TUBE

Additional Comments:

Laboratory Comments Only:

Item No.	Relinquished by/Affiliation	Accepted by/Affiliation	Date	Time
1	[signature]	[signature]	1/3/95	0915

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LCI-117

interpoll

009444

CHAIN-OF-CUSTODY RECORD
Analytical Request

INTERPOLL LABORATORIES, INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

Client: DAHL & ASSOCIATES
Address: 4390 [illegible] RD
ST. PAUL MN 55127
Phone: 612-490-2905

Route Report To: MIKE WATSON
Bill To: DAHL
P.O.
Project Name/No.: 24930601

SPECIAL HANDLING REQUEST
☐ RUSH
☐ OTHER
☐ QUOTE NO.

Sampled By (Print): MARK SMITH
Sampler Signature: [signature] Date: 12/27/94

Item No.	Sample Description	Date/Time	Matrix	Interpoll Log No.	None	HNO_3	H_2SO_4	NaOH	VOC			Total No. Cont.	PID/FID Ambient	PID/FID Sample	Analytical Request: BTEX	GRO						COMMENTS
1	VENT STACK	12/27 11:00	AIR		✓							1			X	X						10L DRAGER TUBE

Additional Comments:

Laboratory Comments Only:

Item No.	Relinquished by/Affiliation	Accepted by/Affiliation	Date	Time
1	[signature]	[signature] / Interpoll	1/3/95	0915

White – Original/File Copy   Yellow – Report Copy   Pink – Client Copy

See Reverse Side For Instructions

LCI-117

Form 2 - Offgas Screening Evaluation

DRAFT 4/26/91

Site Name: South Robert	Responsible Party Contact		Form Completed By:
Address: 1126 S. Robert St.	Name:	Cindy Mueller	Dahl & Associates, Inc.
W. St. Paul, MN	Affiliation:	Conoco Inc.	Date Form Completed: 2/23/94
MPCA Leak #:0000858	Phone#:	(713) 293-3568	Sampling Date: 2/4/94

	A	B	C	D	E	
CONTAMINANT (CAS #)	Test Method	Emission Concentration (ug/m3)	Gas flow rate through vent stack (m3/sec)	Emission Rate (ug/sec)	Significant Emission Rate (ug/sec)	Is ER > SER?
		(EC) X	(GF)	(ER)	(SER)	(yes/no)
Benzene (71-43-2)	EPA Method 18	21000	0.05	1050	4,600	NO
Toluene (108-88-3)	EPA Method 18	63000	0.05	3150	429,800	NO
Xylene (mixed) (1330-20-7)	EPA Method 18	73000	0.05	3650	497,700	NO
Ethylbenzene (100-41-4)	EPA Method 18	24000	0.05	1200	497,700	NO
Chloroform (67-66-3)	see footnote 1				1,600	
Dichlorodifluoromethane (75-71-8)	see footnote 1				767,200	
1,1-Dichloroethane (75-34-3)	see footnote 1				1,918,000	
1,2-Dichloroethane (107-06-2)	see footnote 1				1,500	
1,1-Dichloroethylene (75-35-4)	see footnote 1				800	
1,2-Dichloroethylene (540-59-0)	see footnote 1				2,083,900	
Dichlorofluoromethane (75-43-4)	see footnote 1				105,300	
Methylene Chloride (75-09-2)	see footnote 1				80,600	
1,1,2,2-Tetrachloroethane (79-34-5)	see footnote 1				700	
Tetrachloroethylene (127-18-4)	see footnote 1				65,200	
1,1,1-Trichloroethane (71-55-6)	see footnote 1				3,835,800	
1,1,2-Trichloroethane (79-00-5)	see footnote 1				2,400	
Trichloroethylene (79-01-6)	see footnote 1				22,600	
Trichlorofluoromethane (75-69-4)	see footnote 1				2,685,100	
1,1,2-Trichlorotrifluoroethane (76-13-1)	see footnote 1				20,048,000	
Vinyl chloride (75-01-4)	see footnote 1				9,200	
Other 1						

1 Contact MPCA Division of Air Quality Staff (296-7757) regarding contaminants not on this list, or for test methods other than for BETX.

Form 2 - Offgas Screening Evaluation

DRAFT 4/26/91

Site Name: South Robert	Responsible Party Contact		Form Completed By:
Address: 1126 S. Robert St.	Name:	Cindy Mueller	Dahl & Associates, Inc.
W. St. Paul, MN	Affiliation:	Conoco Inc.	Date Form Completed: 2/23/94
MPCA Leak #:0000858	Phone#:	(713) 293-3568	Sampling Date: 2/11/94

	A	B	C	D	E	
CONTAMINANT (CAS #)	Test Method	Emission Concentration (ug/m3)	Gas flow rate through vent stack (m3/sec)	Emission Rate (ug/sec)	Significant Emission Rate (ug/sec)	Is ER > SER?
		(EC) X	(GF)	(ER)	(SER)	(yes/no)
Benzene (71-43-2)	EPA Method 18	8700	0.04	348	4,600	NO
Toluene (108-88-3)	EPA Method 18	36000	0.04	1440	429,800	NO
Xylene (mixed) (1330-20-7)	EPA Method 18	56000	0.04	2240	497,700	NO
Ethylbenzene (100-41-4)	EPA Method 18	17000	0.04	680	497,700	NO
Chloroform (67-66-3)	see footnote 1				1,600	
Dichlorodifluoromethane (75-71-8)	see footnote 1				767,200	
1,1-Dichloroethane (75-34-3)	see footnote 1				1,918,000	
1,2-Dichloroethane (107-06-2)	see footnote 1				1,500	
1,1-Dichloroethylene (75-35-4)	see footnote 1				800	
1,2-Dichloroethylene (540-59-0)	see footnote 1				2,083,900	
Dichlorofluoromethane (75-43-4)	see footnote 1				105,300	
Methylene Chloride (75-09-2)	see footnote 1				80,600	
1,1,2,2-Tetrachloroethane (79-34-5)	see footnote 1				700	
Tetrachloroethylene (127-18-4)	see footnote 1				65,200	
1,1,1-Trichloroethane (71-55-6)	see footnote 1				3,835,800	
1,1,2-Trichloroethane (79-00-5)	see footnote 1				2,400	
Trichloroethylene (79-01-6)	see footnote 1				22,600	
Trichlorofluoromethane (75-69-4)	see footnote 1				2,685,100	
1,1,2-Trichlorotrifluoroethane (76-13-1)	see footnote 1				20,048,000	
Vinyl chloride (75-01-4)	see footnote 1				9,200	
Other 1						

1 Contact MPCA Division of Air Quality Staff (296-7757) regarding contaminants not on this list, or for test methods other than for BETX.

Form 2 - Offgas Screening Evaluation

DRAFT 4/26/91

Site Name: South Robert	Responsible Party Contact		Form Completed By: MPS
Address: 1126 S. Robert St.	Name:	Jeff Smail	Dahl & Associates, Inc.
W. St. Paul, MN	Affiliation:	Conoco Inc.	Date Form Completed: 03/13/95
MPCA Leak #:0000858	Phone#:	(713) 293-3568	Sampling Date: 02/18/94

	A	B	C	D	E	
CONTAMINANT (CAS #)	Test Method	Emission Concentration (ug/m3)	Gas flow rate through vent stack (m3/sec)	Emission Rate (ug/sec)	Significant Emission Rate (ug/sec)	Is ER > SER?
		(EC) X	(GF)	(ER)	(SER)	(yes/no)
Benzene (71-43-2)	EPA Method 18	7700	0.02	154	4,600	NO
Toluene (108-88-3)	EPA Method 18	46000	0.02	920	429,800	NO
Xylene (mixed) (1330-20-7)	EPA Method 18	77000	0.02	1540	497,700	NO
Ethylbenzene (100-41-4)	EPA Method 18	23000	0.02	460	497,700	NO
Chloroform (67-66-3)	see footnote 1				1,600	
Dichlorodifluoromethane (75-71-8)	see footnote 1				767,200	
1,1-Dichloroethane (75-34-3)	see footnote 1				1,918,000	
1,2-Dichloroethane (107-06-2)	see footnote 1				1,500	
1,1-Dichloroethylene (75-35-4)	see footnote 1				800	
1,2-Dichloroethylene (540-59-0)	see footnote 1				2,083,900	
Dichlorofluoromethane (75-43-4)	see footnote 1				105,300	
Methylene Chloride (75-09-2)	see footnote 1				80,600	
1,1,2,2-Tetrachloroethane (79-34-5)	see footnote 1				700	
Tetrachloroethylene (127-18-4)	see footnote 1				65,200	
1,1,1-Trichloroethane (71-55-6)	see footnote 1				3,835,800	
1,1,2-Trichloroethane (79-00-5)	see footnote 1				2,400	
Trichloroethylene (79-01-6)	see footnote 1				22,600	
Trichlorofluoromethane (75-69-4)	see footnote 1				2,685,100	
1,1,2-Trichlorotrifluoroethane (76-13-1)	see footnote 1				20,048,000	
Vinyl chloride (75-01-4)	see footnote 1				9,200	
Other 1						

1 Contact MPCA Division of Air Quality Staff (296-7757) regarding contaminants not on this list, or for test methods other than for BETX.

Form 2 - Offgas Screening Evaluation

DRAFT 4/26/91

Site Name: South Robert	Responsible Party Contact		Form Completed By:	MPS
Address: 1126 S. Robert St.	Name:	Jeff Smail	Dahl & Associates, Inc.	
W. St. Paul, MN	Affiliation:	Conoco Inc.	Date Form Completed:	03/13/95
MPCA Leak #:0000858	Phone#:	(713) 293-3568	Sampling Date:	03/21/94

	A	B	C	D	E	
CONTAMINANT (CAS #)	Test Method	Emission Concentration (ug/m3)	Gas flow rate through vent stack (m3/sec)	Emission Rate (ug/sec)	Significant Emission Rate (ug/sec)	Is ER > SER?
		(EC) X	(GF)	(ER)	(SER)	(yes/no)
Benzene (71-43-2)	EPA Method 18	6900	0.0239	164.91	4,600	NO
Toluene (108-88-3)	EPA Method 18	30000	0.0239	717	429,800	NO
Xylene (mixed) (1330-20-7)	EPA Method 18	36000	0.0239	860.4	497,700	NO
Ethylbenzene (100-41-4)	EPA Method 18	11000	0.0239	262.9	497,700	NO
Chloroform (67-66-3)	see footnote 1				1,600	
Dichlorodifluoromethane (75-71-8)	see footnote 1				767,200	
1,1-Dichloroethane (75-34-3)	see footnote 1				1,918,000	
1,2-Dichloroethane (107-06-2)	see footnote 1				1,500	
1,1-Dichloroethylene (75-35-4)	see footnote 1				800	
1,2-Dichloroethylene (540-59-0)	see footnote 1				2,083,900	
Dichlorofluoromethane (75-43-4)	see footnote 1				105,300	
Methylene Chloride (75-09-2)	see footnote 1				80,600	
1,1,2,2-Tetrachloroethane (79-34-5)	see footnote 1				700	
Tetrachloroethylene (127-18-4)	see footnote 1				65,200	
1,1,1-Trichloroethane (71-55-6)	see footnote 1				3,835,800	
1,1,2-Trichloroethane (79-00-5)	see footnote 1				2,400	
Trichloroethylene (79-01-6)	see footnote 1				22,600	
Trichlorofluoromethane (75-69-4)	see footnote 1				2,685,100	
1,1,2-Trichlorotrifluoroethane (76-13-1)	see footnote 1				20,048,000	
Vinyl chloride (75-01-4)	see footnote 1				9,200	
Other 1						

1 Contact MPCA Division of Air Quality Staff (296-7757) regarding contaminants not on this list, or for test methods other than for BETX.

Form 2 - Offgas Screening Evaluation

DRAFT 4/26/91

Site Name: CONOCO CENTRAL	Responsible Party Contact	Form Completed By: MPS
Address: 8600 Central Ave.	Name: Mr. Jeff Smail	Dahl & Associates, Inc.
Blaine, MN	Affiliation: Conoco Inc.	Date Form Completed: 03/13/95
MPCA Leak #: 00000537	Phone#: (713) 293-3568	Sampling Date: 06/30/94

	A	B	C	D	E	
CONTAMINANT (CAS #)	Test Method	Emission Concentration (ug/m3)	Gas flow rate through vent stack (m3/sec)	Emission Rate (ug/sec)	Significant Emission Rate (ug/sec)	Is ER > SER?
		(EC) X	(GF)	(ER)	(SER)	(yes/no)
Benzene (71-43-2)	EPA Method 18	9686.4	0.03	259	4,600	NO
Toluene (108-88-3)	EPA Method 18	68612	0.03	1837	429,800	NO
Xylene (mixed) (1330-20-7)	EPA Method 18	26234	0.03	702	497,700	NO
Ethylbenzene (100-41-4)	EPA Method 18	26234	0.03	702	497,700	NO
Chloroform (67-66-3)	see footnote 1				1,600	
Dichlorodifluoromethane (75-71-8)	see footnote 1				767,200	
1,1-Dichloroethane (75-34-3)	see footnote 1				1,918,000	
1,2-Dichloroethane (107-06-2)	see footnote 1				1,500	
1,1-Dichloroethylene (75-35-4)	see footnote 1				800	
1,2-Dichloroethylene (540-59-0)	see footnote 1				2,083,900	
Dichlorofluoromethane (75-43-4)	see footnote 1				105,300	
Methylene Chloride (75-09-2)	see footnote 1				80,600	
1,1,2,2-Tetrachloroethane (79-34-5)	see footnote 1				700	
Tetrachloroethylene (127-18-4)	see footnote 1				65,200	
1,1,1-Trichloroethane (71-55-6)	see footnote 1				3,835,800	
1,1,2-Trichloroethane (79-00-5)	see footnote 1				2,400	
Trichloroethylene (79-01-6)	see footnote 1				22,600	
Trichlorofluoromethane (75-69-4)	see footnote 1				2,685,100	
1,1,2-Trichlorotrifluoroethane (76-13-1)	see footnote 1				20,048,000	
Vinyl chloride (75-01-4)	see footnote 1				9,200	
Other 1						

1 Contact MPCA Division of Air Quality Staff (296-7757) regarding contaminants not on this list, or for test methods other than for BETX.

Form 2 - Offgas Screening Evaluation

DRAFT 4/26/91

Site Name: CONOCO CENTRAL	Responsible Party Contact	Form Completed By:	MPS
Address: 8600 Central Ave.	Name: Mr. Jeff Smail	Dahl & Associates, Inc.	
Blaine, MN	Affiliation: Conoco Inc.	Date Form Completed:	03/13/95
MPCA Leak #: 00000537	Phone#: (713) 293-3568	Sampling Date:	08/31/94

	A	B	C	D	E	
CONTAMINANT (CAS #)	Test Method	Emission Concentration (ug/m3)	Gas flow rate through vent stack (m3/sec)	Emission Rate (ug/sec)	Significant Emission Rate (ug/sec)	Is ER > SER?
		(EC) X	(GF)	(ER)	(SER)	(yes/no)
Benzene (71-43-2)	EPA Method 18	211.26	0.04	7	4,600	NO
Toluene (108-88-3)	EPA Method 18	995.94	0.04	35	429,800	NO
Xylene (mixed) (1330-20-7)	EPA Method 18	1106.6	0.04	39	497,700	NO
Ethylbenzene (100-41-4)	EPA Method 18	281.68	0.04	10	497,700	NO
Chloroform (67-66-3)	see footnote 1				1,600	
Dichlorodifluoromethane (75-71-8)	see footnote 1				767,200	
1,1-Dichloroethane (75-34-3)	see footnote 1				1,918,000	
1,2-Dichloroethane (107-06-2)	see footnote 1				1,500	
1,1-Dichloroethylene (75-35-4)	see footnote 1				800	
1,2-Dichloroethylene (540-59-0)	see footnote 1				2,083,900	
Dichlorofluoromethane (75-43-4)	see footnote 1				105,300	
Methylene Chloride (75-09-2)	see footnote 1				80,600	
1,1,2,2-Tetrachloroethane (79-34-5)	see footnote 1				700	
Tetrachloroethylene (127-18-4)	see footnote 1				65,200	
1,1,1-Trichloroethane (71-55-6)	see footnote 1				3,835,800	
1,1,2-Trichloroethane (79-00-5)	see footnote 1				2,400	
Trichloroethylene (79-01-6)	see footnote 1				22,600	
Trichlorofluoromethane (75-69-4)	see footnote 1				2,685,100	
1,1,2-Trichlorotrifluoroethane (76-13-1)	see footnote 1				20,048,000	
Vinyl chloride (75-01-4)	see footnote 1				9,200	
Other 1						

1 Contact MPCA Division of Air Quality Staff (296-7757) regarding contaminants not on this list, or for test methods other than for BETX.

Form 2 - Offgas Screening Evaluation

DRAFT 4/26/91

Site Name: CONOCO CENTRAL	Responsible Party Contact	Form Completed By: MPS
Address: 8600 Central Ave.	Name: Mr. Jeff Smail	Dahl & Associates, Inc.
Blaine, MN	Affiliation: Conoco Inc.	Date Form Completed: 03/13/95
MPCA Leak #: 00000537	Phone#: (713) 293-3568	Sampling Date: 12/27/94

	A	B	C	D	E	
CONTAMINANT (CAS #)	Test Method	Emission Concentration (ug/m3)	Gas flow rate through vent stack (m3/sec)	Emission Rate (ug/sec)	Significant Emission Rate (ug/sec)	Is ER > SER?
		(EC) X	(GF)	(ER)	(SER)	(yes/no)
Benzene (71-43-2)	EPA Method 18	1800	0.02	29	4,600	NO
Toluene (108-88-3)	EPA Method 18	15000	0.02	241	429,800	NO
Xylene (mixed) (1330-20-7)	EPA Method 18	12000	0.02	193	497,700	NO
Ethylbenzene (100-41-4)	EPA Method 18	3400	0.02	55	497,700	NO
Chloroform (67-66-3)	see footnote 1				1,600	
Dichlorodifluoromethane (75-71-8)	see footnote 1				767,200	
1,1-Dichloroethane (75-34-3)	see footnote 1				1,918,000	
1,2-Dichloroethane (107-06-2)	see footnote 1				1,500	
1,1-Dichloroethylene (75-35-4)	see footnote 1				800	
1,2-Dichloroethylene (540-59-0)	see footnote 1				2,083,900	
Dichlorofluoromethane (75-43-4)	see footnote 1				105,300	
Methylene Chloride (75-09-2)	see footnote 1				80,600	
1,1,2,2-Tetrachloroethane (79-34-5)	see footnote 1				700	
Tetrachloroethylene (127-18-4)	see footnote 1				65,200	
1,1,1-Trichloroethane (71-55-6)	see footnote 1				3,835,800	
1,1,2-Trichloroethane (79-00-5)	see footnote 1				2,400	
Trichloroethylene (79-01-6)	see footnote 1				22,600	
Trichlorofluoromethane (75-69-4)	see footnote 1				2,685,100	
1,1,2-Trichlorotrifluoroethane (76-13-1)	see footnote 1				20,048,000	
Vinyl chloride (75-01-4)	see footnote 1				9,200	
Other 1						

1 Contact MPCA Division of Air Quality Staff (296-7757) regarding contaminants not on this list, or for test methods other than for BETX.

Soil Ventilation System Product Removal Calculations

$GPD = C_{VENT} \times Q_{VENT} \times Coef.$

Where:

GPD = Quantity of gasoline removed (gallons of gasoline per day)
C_{VENT} = Concentration of exhaust ($mg_{GASOLINE}/l_{AIR}$)
Q_{VENT} = Exhaust rate (standard cubic feet per minute SCFM)
Coef. = Conversion coefficient

C_{VENT} is determined from laboratory analysis of EPA Method 18 sample.

Q_{VENT} is determined from orifice plate measurements.

When units are as specified above, Coef. is calculated as follows:

Coef. = 28.32 l_{AIR}/cu.ft.$_{AIR}$) x 1440 (min/day) x 1g/1000mg x 1kg/1000 g x 0.37 gal/kg

= 0.0151

Therefore removal rate is:

GPD = C_{VENT} ($mg_{GASOLINE}/l_{AIR}$) x Q_{VENT}(SCFM) x 0.0151

Groundwater Treatment System Product Removal Calculations

Product Volume of Gasoline Removed = $C_{INFLUENT} \times G_{EFFLUENT} \times COEF.$

Where:

$C_{INFLUENT}$ = Average influent concentration of total hydrocarbons as gasoline during report period in µg/liter (ppb).

$G_{EFFLUENT}$ = Volume discharged from ground-water system during report period (gallons).

COEF. = Conversion coefficient

When units are specified as above, COEF. is calculated as follows:

$$COEF. = \frac{3.785(\text{liters/gallon})}{453.5924(\text{Lb/gm}) \times \text{Sp.Gr.GASOLINE}(0.660) \times 8.345(\text{Lb of } H_2O/\text{gallon}) \times 10^6(\mu\text{g/gm})}$$

Soil Vent Radius of Influance Calculations

The radius of influence (R_{inf}) for an individual soil vapor vent is defined as the radius at which an observed change in soil pressure can be observed. Although at this radius a pressure change can be observed, the pressure gradient may not be adequate to control or capture vapors nor provide sufficient exchange of pore volume for effective remediation. In order to assure that adequate capture and effective remediation is occurring, an effective radius is determined. The effective radius (R_{eff}) is defined as the outer edge of an annular volume of soil between R_{eff} and [R_{eff} - one (1) foot]. A desired minimum soil gas vapor exchange rate of this annular volume is assumed. Assuming uniform radial flow, R_{eff} of the soil vapor vents was calculated based on individual flow rates as calculated from orifice plate differential data collected in the field from individual soil vapor vents, assuming a soil porosity of 30% and a vapor gas exchange rate of 60 minutes. Calculations for R_{eff} are based on data collected during the Method 18 sampling events.

DAHL

& ASSOCIATES, INC TECHNICIAN: SS DATE: 04-Feb-94 TIME: 9:40 AM

FIELD DATA SHEET - SOIL VENTILATION & VACUUM ENHANCEMENT - OPERATIONAL

PROJECT NAME:	CONOCO - SOUTH ROBERT	24930601 PROJECT #	MW PROJECT MGR.

SYSTEM:

TEMPERATURES	DEGREES F	DEGREES C
BUILDING, AMBIENT	51.8	11
EXHAUST, WET BULB	59	15
EXHAUST, DRY BULB	96.8	36
MANIFOLD	46.4	8
FID EXHAUST	2000	
EPA METHOD 18:	YES	
CALIBRATION INITIAL (sec):	15.05	
CALIBRATION FINAL (sec):	15.10	
SAMPLE TIME (min):	50	
SAMPLE VOLUME (l):	9.95	

PRESSURES	DISTANCE	READING
STACK VP(1)	1	0.09
STACK VP(2)	3	0.09
STACK VP(3)	1	0.09
STACK VP(4)	3	0.09
STACK VP(CENTERLINE)	2	0.1
EXHAUST STACIC	N/A	0.02
BAROMETRIC	N/A	30.08
MANIFOLD	N/A	-30

ORIFICE PLATE / ROTOMETER:

	DATA UPON ARRIVAL					DATA REBALANCED	
		VACUUMS				DESIRED	REBALANCED
LOCATION	FID READING	@ MANHOLE	@ VENT SIDE	@ BLOWER SIDE	DIFFERENTIAL	DIFFERENTIAL	DIFFERENTIAL
RW-1	120		-4.8		10		10
SVV-1	400		-22		0.3		0.3
SVV-2	10000		-20		0.1		0.1
SVV-3	800		-25		0.1		0.1
SVV-4	400		-23		0.4		0.4
SVV-5	10000		-20		10		10
SVV-6	290		-19		0		0
SVV-7	250		-30		0.1		0.1
SVV-8	110		-19		10		10
SVV-9	330		-25		2.2		2.2
SVV-10	10000		-24		0.2		0.2
SVV-11	10000		-23		0.5		0.5
SVV-12							
SVV-13							
SVV-14							
SVV-15							
SVV-16							

PROBES:

LOCATION	FID	VACUUM
SVP-1(W)	8000	-4.6
SVP-2(W)	10000	0
SVP-3(W)	10000	-3.5
SVP-4(W)	20	-3.2
SVP-5(N)		
SVP-6(N)		
SVP-7(N)		

LOCATION	FID	VACUUM
SVP-1(E)	8500	-3.2
SVP-2(E)	10000	-2
SVP-3(E)	10000	-3.5
SVP-4(E)	35	-3.2
SVP-5(S)		
SVP-6(S)		
SVP-7(S)		

COMMENTS:

MANIFOLD PRESSURE READING ASSUMED

SPECIAL INSTRUCTIONS:

U:\USERS\PROJECTS\LOTFILES\0601SV02

SOIL VENTILATION PERFORMANCE PAGE 1
PROJECT NUMBER: 24930601.00
ANALYSIS PERFORMED BY: MW
DATE OF ANALYSIS: 03-Mar-94 04:21:29 PM

DESCRIPTION	UNITS	
SYSTEM DATA		
STACK DATA		
OUTSIDE DIAMETER	INCHES	4.5
INSIDE DIAMETER	INCHES	4.026
FLOW AREA	SQFT	0.0884
ALTITUDE	FMSL	900
NUMBER OF BLOWERS	DIMENSIONLESS	3
FIELD DATA		
DATE	DD/MM/YY	04-Feb-94
TECHNICIAN	INITIALS	SS
TEMPERATURES		
BUILDING, AMBIENT	DEGREES F.	51.8
EXHAUST, DRY BULB	DEGREES F.	96.8
EXHAUST, WET BULB	DEGREES F.	59
MANIFOLD	DEGREES F.	46.4
PRESSURES		
BAROMETRIC	IN. Hg	30.08
FLOWING GAS	IN. W.C. GAUGE	0.02
MANIFOLD	IN. W.C. GAUGE	-30
EPA METHOD 2		
NUMBER OF TRAVERSE POINTS	DIMENSIONLESS	4
VP (POINT 1)	IN. W.C. GAUGE	0.09
VP (POINT 2)	IN. W.C. GAUGE	0.09
VP (PQINT 3)	IN. W.C. GAUGE	0.09
VP (POINT 4)	IN. W.C. GAUGE	0.09
VP (CENTERLINE)	IN. W.C. GAUGE	0.1
CHEMICAL ANALYSIS		
FID	PPM (v/v)	2000
FID (converted to uG/L)	uG/L	7020
LABORATORY DATA (EPA METHOD 18)		
BENZENE	uG/L	21
ETHYL BENZENE	uG/L	24
TOLUENE	uG/L	63
XYLENES	uG/L	73
TOTAL HYDROCARBONS AS GASOLINE	uG/L	3900

NOTE: TO CONVERT uG/L TO uG/M^3 MULTIPLY BY 0.001

DATA REDUCTION				
GAS FLOW VELOCITY				
FIELD DATA, EPA METHOD 2				
AF = ALTITUDE FACTOR	DIMENSIONLESS	0.97		
W = HUMIDITY RATIO	LB H2O/LB AIR	0.001		
Vw = VOLUME WATER VAPOR (std)	CUFT/LB AIR	0.02135059602		
Vgas = VOLUME OF GAS (dry, std)	CUFT/LB AIR	13.3333333333		
Bws = WATER VAPOR IN GAS	VOL/VOL	0.00159873466		
HV = HUMID VOLUME	CUFT/LB	13.3546839294		
Ms = MOLECULAR WEIGHT OF STACK GAS	GAS DESITY	28.9824139188		
p(SL) = DENSITY @ SEA LEVEL	LB/CUFT	0.0750		
p(ACTUAL) = DENSITY ACTUAL	LB/CUFT	0.0732		
Kp = PITOT TUBE CONSTANT		85.49		
PTF = PITOT TUBE FACTOR	DIMENSIONLESS	0.99		
T = TEMPERATURE OF STACK GAS	DEGREE R	556.8		
Ps = PRESSURE OF STACK GAS	IN Hg (abs)	30.0814705882		
{(VP)^.5}ave	(IN H2O)^0.5	0.3000		
VS = VELOCITY OF STACK GAS	FT/SEC	20.2910523123		
GAS FLOW RATE				
EPA METHOD 2	SCFM	103	0.0484	M^3/SEC
BLOWER PERFORMANCE CURVE	SCFM	270	0.1274	M^3/SEC
TOTAL OF VENTS				
ORIFICE				
Qinit = GAS FLOW RATE, UPON ARRIVAL	SCFM	104.4577	0.0493	M^3/SEC
Qadj = GAS FLOW RATE, READJUSTED	SCFM	104.4577	0.0493	M^3/SEC
PRODUCT REMOVAL RATE				
EPA METHODS 2 & 18			SER	% OF SER
BENZENE	uG/SEC	1017	4600	22.11
ETHYLBENZENE	uG/SEC	1162	497700	0.23
TOLUENE	uG/SEC	3051	429800	0.71
XYLENES	uG/SEC	3536	497700	0.71
TOTAL HYDROCARBON AS GASOLINE	uG/SEC	188894		
TOTAL HYDROCARBON AS GASOLINE	GALLONS/DAY	6.0429		
EPA METHODS 2 & FID	GALLONS/DAY	10.8778		
BLOWER PERFORMANCE CURVE	GALLONS/DAY	15.9003		
TOTAL OF VENTS				
ORIFICE, INITIAL	GALLONS/DAY	20.1217		
ORIFICE ADJUSTED	GALLONS/DAY	20.1217		

SOIL VENTILATION PERFORMANCE
PROJECT NUMBER: 24930601.00
ANALYSIS PERFORMED BY: MW
DATE OF ANALYSIS: 03-Mar-94 04:21:29 PM

DESCRIPTION	UNITS													
SYSTEM DATA														
IDENTIFICATION	DIMENSIONLESS	SYSTEM	RW-1	SVV-1	SVV-2	SVV-3	SVV-4	SVV-5	SVV-6	SVV-7	SVV-8	SVV-9	SVV-10	SVV-11
D = DIAMETER, PIPE INSIDE	INCHES	4.026	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067
d = DIAMETER, ORIFICE	INCHES	N/A	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
B = BETA RATIO	DIMENSIONLESS	0.000	0.363	0.363	0.363	0.363	0.363	0.363	0.363	0.363	0.363	0.363	0.363	0.363
NUMBER OF BLOWERS	DIMENSIONLESS	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DESIGN SOIL THICKNESS	FEET	11	11	11	11	11	11	11	11	11	11	11	11	11
DESIGN GAS EXCHANGE RATE	MIN/EXCHANGE	60	60	60	60	60	60	60	60	60	60	60	60	60
DESIGN GAS FLOW RATE	SCFM	120	10	10	10	10	10	10	10	10	10	10	10	10
FIELD DATA														
DATE	DD/MM/YY	04-Feb-94	04-Feb-94	04-Feb-94	04-Feb-94	04-Feb-94	04-Feb-94	04-Feb-94	04-Feb-94	04-Feb-94	04-Feb-94	04-Feb-94	04-Feb-94	04-Feb-94
TECHNICIAN	INITIALS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS
PRESSURE														
@ MANHOLE	IN. W.C. GAUGE	NA	0	0	0	0	0	0	0	0	0	0	0	0
VENT SIDE (FLOWING GAS PRESSURE)	IN. W.C. GAUGE	NA	-4.8	-22	-20	-25	-23	-20	-19	-30	-19	-25	-24	-23
BLOWER SIDE	IN. W.C. GAUGE	NA	0	0	0	0	0	0	0	0	0	0	0	0
MANIFOLD	IN. W.C. GAUGE	-30	-30	-30	-30	-30	-30	-30	-30	-30	-30	-30	-30	-30
EXHAUST	IN. W.C. GAUGE	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ORIFICE PLATE														
DIFFERENTIAL, UPON ARRIVAL	IN. W.C. GAUGE	NA	10	0.3	0.1	0.1	0.4	10	0	0.1	10	2.2	0.2	0.5
DIFFERENTIAL, RE-ADJUSTED	IN. W.C. GAUGE	NA	10	0.3	0.1	0.1	0.4	10	0	0.1	10	2.2	0.2	0.5
TEMPERATURE, FLOWING GAS	DEGREE F	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4
COMMENTS	EXPLANATION													
FID	PPM (v/v)	NA	120	400	10000	800	400	10000	290	250	110	330	10000	10000
FID (converted to ug/L)	uG/L	NA	421	1404	35102	2808	1404	35102	1018	878	386	1158	35102	35102
DATA REDUCTION														
G = SPECIFIC GRAVITY, GAS	DIMENSIONLESS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Rd = REYNOLD'S #, DESIGN	DIMENSIONLESS	50409	8182	8182	8182	8182	8182	8182	8182	8182	8182	8182	8182	8182
K = ORIFICE COEFFICIENT	DIMENSIONLESS	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110
Fa = ORIFICE EXPANSION FACTOR	DIMENSIONLESS	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072
Tf = TEMPERATURE OF FLOWING GAS	DEG R	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4
Pf = PRESSURE OF FLOWING GAS	PSIA	14.7	14.526576	13.90514	13.9774	13.79675	13.86901	13.9774	14.01353	13.6161	14.01353	13.79675	13.83288	13.86901
Fpv = GAS COMPRESSIBILITY FACTOR	DIMENSIONLESS	1	1	1	1	1	1	1	1	1	1	1	1	1
Y = GAS EXPANSION FACTOR	DIMENSIONLESS	1	0.99173927841	0.99974110293	0.99991414712	0.99991302299	0.99965390464	0.99141471232	1	0.99991186904	0.9914368471	0.99808650588	0.99982650034	0.9995673808
ORIFICE														
Qinit = GAS FLOW RATE, UPON ARRIVAL	SCFM	104.457748234	23.50	4.01	2.32	2.31	4.63	23.05	0.00	2.29	23.08	10.81	3.27	5.18
Qadj = GAS FLOW RATE, READJUSTED	SCFM	104.457748234	23.50	4.01	2.32	2.31	4.63	23.05	0.00	2.29	23.08	10.81	3.27	5.18
PRODUCT REMOVAL RATE														
ORIFICE, INITIAL	GALLONS/DAY	20.1216586664	0.1608	0.0916	1.3251	0.1053	0.1056	13.1381	0.0000	0.0327	0.1447	0.2034	1.8641	2.9504
ORIFICE ADJUSTED	GALLONS/DAY	20.1216586664	0.1608	0.0916	1.3251	0.1053	0.1056	13.1381	0.0000	0.0327	0.1447	0.2034	1.8641	2.9504
EFFECTIVENESS														
RADIUS, ORIFICE, INITIAL	FEET	NA	68.51	12.12	7.23	7.18	13.90	67.19	0.50	7.14	67.28	31.79	9.96	15.48
RADIUS, ORIFICE, ADJUSTED	FEET	NA	68.51	12.12	7.23	7.18	13.90	67.19	0.50	7.14	67.28	31.79	9.96	15.48

DAHL

& ASSOCIATES, INC

TECHNICIAN: JLH DATE: 11-Feb-94 TIME: 9:15 AM

FIELD DATA SHEET - SOIL VENTILATION & VACUUM ENHANCEMENT - OPERATIONAL

PROJECT NAME:	CONOCO - SOUTH ROBERT	24930601 PROJECT #	MW PROJECT MGR.

SYSTEM:

TEMPERATURES	DEGREES F	DEGREES C
BUILDING, AMBIENT	50	10
EXHAUST, WET BULB	60.8	16
EXHAUST, DRY BULB	100.4	38
MANIFOLD	46.4	8
FID EXHAUST	500	
EPA METHOD 18:	YES	
CALIBRATION INITIAL (sec):	15.07	
CALIBRATION FINAL (sec):	15.10	
SAMPLE TIME (min):	50	
SAMPLE VOLUME (l):	9.94	

PRESSURES	DISTANCE	READING
STACK VP(1)	1	0.06
STACK VP(2)	3	0.06
STACK VP(3)	1	0.06
STACK VP(4)	3	0.06
STACK VP(CENTERLINE)	2	0.08
EXHAUST STACIC	N/A	0
BAROMETRIC	N/A	30.02
MANIFOLD	N/A	-50

ORIFICE PLATE / ROTOMETER:

	DATA UPON ARRIVAL					DATA REBALANCED	
LOCATION	FID READING	VACUUMS @ MANHOLE	@ VENT SIDE	@ BLOWER SIDE	DIFFERENTIAL	DESIRED DIFFERENTIAL	REBALANCED DIFFERENTIAL
RW-1	120		-6		10		10
SVV-1	325		-47		0		0
SVV-2	3600		-47		0		0
SVV-3	500		-39		0.1		0.1
SVV-4	225		-46		0.1		0.1
SVV-5	9500		-47		0.1		0.1
SVV-6	250		-18		0		0
SVV-7	240		-50		0.2		0.2
SVV-8	65		-51		0.1		0.1
SVV-9	130		-30		2.2		2.2
SVV-10	2000		-24		0.2		0.2
SVV-11	2000		-45		0.3		0.3
SVV-12							
SVV-13							
SVV-14							
SVV-15							
SVV-16							

PROBES:

LOCATION	FID	VACUUM
SVP-1(W)	3000	-1
SVP-2(W)	10000	-0.6
SVP-3(W)	7000	-0.41
SVP-4(W)	38	-3.1
SVP-5(N)		
SVP-6(N)		
SVP-7(N)		

LOCATION	FID	VACUUM
SVP-1(E)	3200	-2.6
SVP-2(E)	10000	0
SVP-3(E)	7500	-0.85
SVP-4(E)	42	-2.9
SVP-5(S)		
SVP-6(S)		
SVP-7(S)		

COMMENTS:

MANIFOLD & BAROMETRIC PRESSURE READINGS ASSUMED

SPECIAL INSTRUCTIONS:

U:\USERS\PROJECTS\LOTFILES\0601SV03

SOIL VENTILATION PERFORMANCE PAGE 1
PROJECT NUMBER: 24930601.00
ANALYSIS PERFORMED BY: MW
DATE OF ANALYSIS: 03-Mar-94 04:18:01 PM

DESCRIPTION	UNITS	
SYSTEM DATA		
STACK DATA		
OUTSIDE DIAMETER	INCHES	4.5
INSIDE DIAMETER	INCHES	4.026
FLOW AREA	SQFT	0.0884
ALTITUDE	FMSL	900
NUMBER OF BLOWERS	DIMENSIONLESS	3
FIELD DATA		
DATE	DD/MM/YY	11-Feb-94
TECHNICIAN	INITIALS	JLH
TEMPERATURES		
BUILDING, AMBIENT	DEGREES F.	50
EXHAUST, DRY BULB	DEGREES F.	100.4
EXHAUST, WET BULB	DEGREES F.	60.8
MANIFOLD	DEGREES F.	46.4
PRESSURES		
BAROMETRIC	IN. Hg	30.02
FLOWING GAS	IN. W.C. GAUGE	0
MANIFOLD	IN. W.C. GAUGE	-50
EPA METHOD 2		
NUMBER OF TRAVERSE POINTS	DIMENSIONLESS	4
VP (POINT 1)	IN. W.C. GAUGE	0.06
VP (POINT 2)	IN. W.C. GAUGE	0.06
VP (POINT 3)	IN. W.C. GAUGE	0.06
VP (POINT 4)	IN. W.C. GAUGE	0.06
VP (CENTERLINE)	IN. W.C. GAUGE	0.08
CHEMICAL ANALYSIS		
FID	PPM (v/v)	500
FID (converted to uG/L)	uG/L	1755
LABORATORY DATA (EPA METHOD 18)		
BENZENE	uG/L	8.7
ETHYL BENZENE	uG/L	17
TOLUENE	uG/L	36
XYLENES	uG/L	56
TOTAL HYDROCARBONS AS GASOLINE	uG/L	2000

NOTE: TO CONVERT uG/L TO uG/M^3 MULTIPLY BY 0.001

DATA REDUCTION				
GAS FLOW VELOCITY				
FIELD DATA, EPA METHOD 2				
AF = ALTITUDE FACTOR	DIMENSIONLESS	0.97		
W = HUMIDITY RATIO	LB H2O/LB AIR	0.0025		
Vw = VOLUME WATER VAPOR (std)	CUFT/LB AIR	0.05337649006		
Vgas = VOLUME OF GAS (dry, std)	CUFT/LB AIR	13.3333333333		
Bws = WATER VAPOR IN GAS	VOL/VOL	0.00398727475		
HV = HUMID VOLUME	CUFT/LB	13.3867098234		
Ms = MOLECULAR WEIGHT OF STACK GAS	GAS DESITY	28.9561399778		
p(SL) = DENSITY @ SEA LEVEL	LB/CUFT	0.0749		
p(ACTUAL) = DENSITY ACTUAL	LB/CUFT	0.0730		
Kp = PITOT TUBE CONSTANT		85.49		
PTF = PITOT TUBE FACTOR	DIMENSIONLESS	0.99		
T = TEMPERATURE OF STACK GAS	DEGREE R	560.4		
Ps = PRESSURE OF STACK GAS	IN Hg (abs)	30.02		
{(VP)^.5}ave	(IN H2O)^0.5	0.2449		
VS = VELOCITY OF STACK GAS	FT/SEC	16.6456026202		
GAS FLOW RATE				
EPA METHOD 2	SCFM	83	0.0394	M^3/SEC
BLOWER PERFORMANCE CURVE	SCFM	165	0.0779	M^3/SEC
TOTAL OF VENTS				
ORIFICE				
Qinit = GAS FLOW RATE, UPON ARRIVAL	SCFM	53.5111	0.0253	M^3/SEC
Qadj = GAS FLOW RATE, READJUSTED	SCFM	53.5111	0.0253	M^3/SEC
PRODUCT REMOVAL RATE				
EPA METHODS 2 & 18			SER	% OF SER
BENZENE	uG/SEC	343	4600	7.45
ETHYLBENZENE	uG/SEC	670	497700	0.13
TOLUENE	uG/SEC	1418	429800	0.33
XYLENES	uG/SEC	2206	497700	0.44
TOTAL HYDROCARBON AS GASOLINE	uG/SEC	78794		
TOTAL HYDROCARBON AS GASOLINE	GALLONS/DAY	2.5207		
EPA METHODS 2 & FID	GALLONS/DAY	2.2120		
BLOWER PERFORMANCE CURVE	GALLONS/DAY	4.9830		
TOTAL OF VENTS				
ORIFICE, INITIAL	GALLONS/DAY	2.4157		
ORIFICE ADJUSTED	GALLONS/DAY	2.4157		

SOIL VENTILATION PERFORMANCE

PROJECT NUMBER: 24930601.00
ANALYSIS PERFORMED BY: MW
DATE OF ANALYSIS: 03-Mar-94 04:18:01 PM

DESCRIPTION	UNITS													
SYSTEM DATA														
IDENTIFICATION	DIMENSIONLESS	SYSTEM	RW-1	SVV-1	SVV-2	SVV-3	SVV-4	SVV-5	SVV-6	SVV-7	SVV-8	SVV-9	SVV-10	SVV-11
D = DIAMETER, PIPE INSIDE	INCHES	4.026	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067
d = DIAMETER, ORIFICE	INCHES	N/A	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
B = BETA RATIO	DIMENSIONLESS	0.000	0.363	0.363	0.363	0.363	0.363	0.363	0.363	0.363	0.363	0.363	0.363	0.363
NUMBER OF BLOWERS	DIMENSIONLESS	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DESIGN SOIL THICKNESS	FEET	11	11	11	11	11	11	11	11	11	11	11	11	11
DESIGN GAS EXCHANGE RATE	MIN/EXCHANGE	60	60	60	60	60	60	60	60	60	60	60	60	60
DESIGN GAS FLOW RATE	SCFM	110	10	10	10	10	10	10	10	10	10	10	10	0
FIELD DATA														
DATE	DD/MM/YY	11-Feb-94	11-Feb-94	11-Feb-94	11-Feb-94	11-Feb-94	11-Feb-94	11-Feb-94	11-Feb-94	11-Feb-94	11-Feb-94	11-Feb-94	11-Feb-94	11-Feb-94
TECHNICIAN	INITIALS	JLH	JLH	JLH	JLH	JLH	JLH	JLH	JLH	JLH	JLH	JLH	JLH	JLH
PRESSURE														
@ MANHOLE	IN. W.C. GAUGE	NA	0	0	0	0	0	0	0	0	0	0	0	0
VENT SIDE (FLOWING GAS PRESSURE)	IN. W.C. GAUGE	NA	-6	-47	-47	-39	-46	-47	-18	-50	-51	-30	-24	-45
BLOWER SIDE	IN. W.C. GAUGE	NA	0	0	0	0	0	0	0	0	0	0	0	0
MANIFOLD	IN. W.C. GAUGE	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50	-50
EXHAUST	IN. W.C. GAUGE	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ORIFICE PLATE														
DIFFERENTIAL, UPON ARRIVAL	IN. W.C. GAUGE	NA	10	0	0	0.1	0.1	0.1	0	0.2	0.1	2.2	0.2	0.3
DIFFERENTIAL, RE-ADJUSTED	IN. W.C. GAUGE	NA	10	0	0	0.1	0.1	0.1	0	0.2	0.1	2.2	0.2	0.3
TEMPERATURE, FLOWING GAS	DEGREE F	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4
COMMENTS	EXPLANATION													
FID	PPM (v/v)	NA	120	325	3600	500	225	9500	250	240	65	130	2000	2000
FID (converted to ug/L)	uG/L	NA	421	1141	12637	1755	790	33347	878	842	228	456	7020	7020
DATA REDUCTION														
G = SPECIFIC GRAVITY, GAS	DIMENSIONLESS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Rd = REYNOLD'S #, DESIGN	DIMENSIONLESS	46208	8182	8182	8182	8182	8182	8182	8182	8182	8182	8182	8182	0
K = ORIFICE COEFFICIENT	DIMENSIONLESS	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110
Fa = ORIFICE EXPANSION FACTOR	DIMENSIONLESS	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072
Tf = TEMPERATURE OF FLOWING GAS	DEG R	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4
Pf = PRESSURE OF FLOWING GAS	PSIA	14.7	14.48322	13.00189	13.00189	13.29093	13.03802	13.00189	14.04966	12.6935	12.85737	13.6161	13.83288	13.07415
Fpv = GAS COMPRESSIBILITY FACTOR	DIMENSIONLESS	1	1	1	1	1	1	1	1	1	1	1	1	1
Y = GAS EXPANSION FACTOR	DIMENSIONLESS	1	0.99171454967	1	1	0.99990971286	0.99990796148	0.99990770573	1	0.9998136597	0.99990666832	0.99806111882	0.99982650034	0.99972464749
ORIFICE														
Qinit = GAS FLOW RATE, UPON ARRIVAL	SCFM	53.5110773011	23.47	0.00	0.00	2.27	2.24	2.24	0.00	3.16	2.23	10.74	3.27	3.89
Qadj = GAS FLOW RATE, READJUSTED	SCFM	53.5110773011	23.47	0.00	0.00	2.27	2.24	2.24	0.00	3.16	2.23	10.74	3.27	3.89
PRODUCT REMOVAL RATE														
ORIFICE, INITIAL	GALLONS/DAY	2.41573972322	0.1605	0.0000	0.0000	0.0646	0.0288	1.2141	0.0000	0.0432	0.0083	0.0796	0.3726	0.4439
ORIFICE ADJUSTED	GALLONS/DAY	2.41573972322	0.1605	0.0000	0.0000	0.0646	0.0288	1.2141	0.0000	0.0432	0.0083	0.0796	0.3726	0.4439
EFFECTIVENESS														
RADIUS, ORIFICE, INITIAL	FEET	NA	68.41	0.50	0.50	7.06	7.00	6.99	0.50	9.64	6.95	31.58	9.96	11.77
RADIUS, ORIFICE, ADJUSTED	FEET	NA	68.41	0.50	0.50	7.06	7.00	6.99	0.50	9.64	6.95	31.58	9.96	11.77

DAHL

& ASSOCIATES, INC TECHNICIAN: MS DATE: 18-Feb-94 TIME: 10:00 AM

FIELD DATA SHEET - SOIL VENTILATION & VACUUM ENHANCEMENT - OPERATIONAL

PROJECT NAME:	CONOCO - SOUTH ROBERT	24930601 PROJECT #	MW PROJECT MGR.

SYSTEM:

TEMPERATURES	DEGREES F	DEGREES C	PRESSURES	DISTANCE	READING
BUILDING, AMBIENT	58.1	14.5	STACK VP(1)	1	0.02
EXHAUST, WET BULB	62.6	17	STACK VP(2)	3	0.02
EXHAUST, DRY BULB	96.8	36	STACK VP(3)	1	0.02
MANIFOLD	46.4	8	STACK VP(4)	3	0.02
FID EXHAUST	950		STACK VP(CENTERLINE)	2	0.03
EPA METHOD 18:	YES		EXHAUST STACIC	N/A	0.1
CALIBRATION INITIAL (sec):	15.04		BAROMETRIC	N/A	28.73
CALIBRATION FINAL (sec):	14.92		MANIFOLD	N/A	-49
SAMPLE TIME (min):	50				
SAMPLE VOLUME (l):	10.01				

ORIFICE PLATE / ROTOMETER:

	DATA UPON ARRIVAL					DATA REBALANCED	
		VACUUMS				DESIRED	REBALANCED
LOCATION	FID READING	@ MANHOLE	@ VENT SIDE	@ BLOWER SIDI	DIFFERENTIAL	DIFFERENTIAL	DIFFERENTIAL
RW-1	60		-7		10		10
SVV-1	300		-30		0		0
SVV-2	10000		-40		0		0
SVV-3	2000		-46		0		0
SVV-4	175		-20		0		0
SVV-5	10000		-44		0		0
SVV-6	500		-24		0		0
SVV-7	225		-41		0.1		0.1
SVV-8	210		-22		0		0
SVV-9	150		-49		0.4		0.4
SVV-10	3000		-21		0.1		0.1
SVV-11	9500		-12		0.1		0.1
SVV-12							
SVV-13							
SVV-14							
SVV-15							
SVV-16							

PROBES:

LOCATION	FID	VACUUM
SVP-1(W)	42	-0.07
SVP-2(W)	10000	-0.66
SVP-3(W)	80	-0.54
SVP-4(W)	25	-0.84
SVP-5(N)		
SVP-6(N)		
SVP-7(N)		

LOCATION	FID	VACUUM
SVP-1(E)	45	0.12
SVP-2(E)	100	-0.66
SVP-3(E)	1250	-0.52
SVP-4(E)	32	-0.57
SVP-5(S)		
SVP-6(S)		
SVP-7(S)		

COMMENTS:

SPECIAL INSTRUCTIONS:

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SOIL VENTILATION PERFORMANCE PAGE 1
PROJECT NUMBER: 24930601.00
ANALYSIS PERFORMED BY: MW
DATE OF ANALYSIS: 15-Mar-95 08:51:29 AM

DESCRIPTION	UNITS	
SYSTEM DATA		
STACK DATA		
OUTSIDE DIAMETER	INCHES	4.5
INSIDE DIAMETER	INCHES	4.026
FLOW AREA	SQFT	0.0884
ALTITUDE	FMSL	900
NUMBER OF BLOWERS	DIMENSIONLESS	2
FIELD DATA		
DATE	DD/MM/YY	18-Feb-94
TECHNICIAN	INITIALS	MS
TEMPERATURES		
BUILDING, AMBIENT	DEGREES F.	58.1
EXHAUST, DRY BULB	DEGREES F.	96.8
EXHAUST, WET BULB	DEGREES F.	62.6
MANIFOLD	DEGREES F.	46.4
PRESSURES		
BAROMETRIC	IN. Hg	28.73
FLOWING GAS	IN. W.C. GAUGE	0.1
MANIFOLD	IN. W.C. GAUGE	-49
EPA METHOD 2		
NUMBER OF TRAVERSE POINTS	DIMENSIONLESS	4
VP (POINT 1)	IN. W.C. GAUGE	0.02
VP (POINT 2)	IN. W.C. GAUGE	0.02
VP (POINT 3)	IN. W.C. GAUGE	0.02
VP (POINT 4)	IN. W.C. GAUGE	0.02
VP (CENTERLINE)	IN. W.C. GAUGE	0.03
CHEMICAL ANALYSIS		
FID	PPM (v/v)	950
FID (converted to uG/L)	uG/L	3335
LABORATORY DATA (EPA METHOD 18)		
BENZENE	uG/L	7.7
ETHYL BENZENE	uG/L	23
TOLUENE	uG/L	46
XYLENES	uG/L	77
TOTAL HYDROCARBONS AS GASOLINE	uG/L	2200

NOTE: TO CONVERT uG/L TO uG/M^3 MULTIPLY BY 0.001

DATA REDUCTION				
GAS FLOW VELOCITY				
FIELD DATA, EPA METHOD 2				
AF = ALTITUDE FACTOR	DIMENSIONLESS	0.97		
W = HUMIDITY RATIO	LB H2O/LB AIR	0.0045		
Vw = VOLUME WATER VAPOR (std)	CUFT/LB AIR	0.09607768211		
Vgas = VOLUME OF GAS (dry, std)	CUFT/LB AIR	13.3333333333		
Bws = WATER VAPOR IN GAS	VOL/VOL	0.00715427371		
HV = HUMID VOLUME	CUFT/LB	13.4294110154		
Ms = MOLECULAR WEIGHT OF STACK GAS	GAS DESITY	28.9213029892		
p(SL) = DENSITY @ SEA LEVEL	LB/CUFT	0.0748		
p(ACTUAL) = DENSITY ACTUAL	LB/CUFT	0.0698		
Kp = PITOT TUBE CONSTANT		85.49		
PTF = PITOT TUBE FACTOR	DIMENSIONLESS	0.99		
T = TEMPERATURE OF STACK GAS	DEGREE R	556.8		
Ps = PRESSURE OF STACK GAS	IN Hg (abs)	28.7373529412		
{(VP)^.5}ave	(IN H2O)^0.5	0.1414		
VS = VELOCITY OF STACK GAS	FT/SEC	9.79676779056		
GAS FLOW RATE				
EPA METHOD 2	SCFM	47	0.0223	M^3/SEC
BLOWER PERFORMANCE CURVE	SCFM	114	0.0538	M^3/SEC
TOTAL OF VENTS				
ORIFICE				
Qinit = GAS FLOW RATE, UPON ARRIVAL	SCFM	34.8379	0.0164	M^3/SEC
Qadj = GAS FLOW RATE, READJUSTED	SCFM	34.8379	0.0164	M^3/SEC
PRODUCT REMOVAL RATE				
EPA METHODS 2 & 18			SER	% OF SER
BENZENE	uG/SEC	172	4600	3.74
ETHYLBENZENE	uG/SEC	514	497700	0.10
TOLUENE	uG/SEC	1028	429800	0.24
XYLENES	uG/SEC	1720	497700	0.35
TOTAL HYDROCARBON AS GASOLINE	uG/SEC	49148		
TOTAL HYDROCARBON AS GASOLINE	GALLONS/DAY	1.6910		
EPA METHODS 2 & FID	GALLONS/DAY	2.5631		
BLOWER PERFORMANCE CURVE	GALLONS/DAY	4.0730		
TOTAL OF VENTS				
ORIFICE, INITIAL	GALLONS/DAY	1.8162		
ORIFICE ADJUSTED	GALLONS/DAY	1.8162		

SOIL VENTILATION PERFORMANCE
PROJECT NUMBER: 24930601.00
ANALYSIS PERFORMED BY: MW
DATE OF ANALYSIS: 15-Mar-95 08:51:29 AM

DESCRIPTION	UNITS													
SYSTEM DATA														
IDENTIFICATION	DIMENSIONLESS	SYSTEM	RW-1	SVV-1	SVV-2	SVV-3	SVV-4	SVV-5	SVV-6	SVV-7	SVV-8	SVV-9	SVV-10	SVV-11
D = DIAMETER, PIPE INSIDE	INCHES	4.026	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067
d = DIAMETER, ORIFICE	INCHES	N/A	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
B = BETA RATIO	DIMENSIONLESS	0.000	0.363	0.363	0.363	0.363	0.363	0.363	0.363	0.363	0.363	0.363	0.363	0.363
NUMBER OF BLOWERS	DIMENSIONLESS	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DESIGN SOIL THICKNESS	FEET	11	11	11	11	11	11	11	11	11	11	11	11	11
DESIGN GAS EXCHANGE RATE	MIN/EXCHANGE	60	60	60	60	60	60	60	60	60	60	60	60	60
DESIGN GAS FLOW RATE	SCFM	110	10	10	10	10	10	10	10	10	10	10	10	0
FIELD DATA														
DATE	DD/MM/YY	18-Feb-94	18-Feb-94	18-Feb-94	18-Feb-94	18-Feb-94	18-Feb-94	18-Feb-94	18-Feb-94	18-Feb-94	18-Feb-94	18-Feb-94	18-Feb-94	18-Feb-94
TECHNICIAN	INITIALS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS
PRESSURE														
@ MANHOLE	IN. W.C. GAUGE	NA	0	0	0	0	0	0	0	0	0	0	0	0
VENT SIDE (FLOWING GAS PRESSURE)	IN. W.C. GAUGE	NA	-7	-30	-40	-46	-20	-44	-24	-41	-22	-49	-21	-12
BLOWER SIDE	IN. W.C. GAUGE	NA	0	0	0	0	0	0	0	0	0	0	0	0
MANIFOLD	IN. W.C. GAUGE	-49	-49	-49	-49	-49	-49	-49	-49	-49	-49	-49	-49	-49
EXHAUST	IN. W.C. GAUGE	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ORIFICE PLATE														
DIFFERENTIAL, UPON ARRIVAL	IN. W.C. GAUGE	NA	10	0	0	0	0	0	0	0.1	0	0.4	0.1	0.1
DIFFERENTIAL, RE-ADJUSTED	IN. W.C. GAUGE	NA	10	0	0	0	0	0	0	0.1	0	0.4	0.1	0.1
TEMPERATURE, FLOWING GAS	DEGREE F	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4
COMMENTS	EXPLANATION													
FID	PPM (v/v)	NA	60	300	10000	2000	175	10000	500	225	210	150	3000	9500
FID (converted to ug/L)	uG/L	NA	211	1053	35102	7020	614	35102	1755	790	737	527	10531	33347
DATA REDUCTION														
G = SPECIFIC GRAVITY, GAS	DIMENSIONLESS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Rd = REYNOLD'S #, DESIGN	DIMENSIONLESS	46208	8182	8182	8182	8182	8182	8182	8182	8182	8182	8182	8182	0
K = ORIFICE COEFFICIENT	DIMENSIONLESS	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110
Fa = ORIFICE EXPANSION FACTOR	DIMENSIONLESS	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072
Tf = TEMPERATURE OF FLOWING GAS	DEG R	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4
Pf = PRESSURE OF FLOWING GAS	PSIA	14.7	14.44709	13.6161	13.2548	13.03802	13.9774	13.11028	13.83288	13.21867	13.90514	12.92963	13.94127	14.26644
Fpv = GAS COMPRESSIBILITY FACTOR	DIMENSIONLESS	1	1	1	1	1	1	1	1	1	1	1	1	1
Y = GAS EXPANSION FACTOR	DIMENSIONLESS	1	0.991693829	1	1	1	1	1	1	0.99990921931	1	0.99962875968	0.99991392463	0.99991588651
ORIFICE														
Qinit = GAS FLOW RATE, UPON ARRIVAL	SCFM	34.8378960488	23.44	0.00	0.00	0.00	0.00	0.00	0.00	2.26	0.00	4.47	2.32	2.35
Qadj = GAS FLOW RATE, READJUSTED	SCFM	34.8378960488	23.44	0.00	0.00	0.00	0.00	0.00	0.00	2.26	0.00	4.47	2.32	2.35
PRODUCT REMOVAL RATE														
ORIFICE, INITIAL	GALLONS/DAY	1.81615836238	0.0802	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0290	0.0000	0.0382	0.3970	1.2718
ORIFICE ADJUSTED	GALLONS/DAY	1.81615836238	0.0802	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0290	0.0000	0.0382	0.3970	1.2718
EFFECTIVENESS														
RADIUS, ORIFICE, INITIAL	FEET	NA	68.32	0.50	0.50	0.50	0.50	0.50	0.50	7.04	0.50	13.43	7.22	7.30
RADIUS, ORIFICE, ADJUSTED	FEET	NA	68.32	0.50	0.50	0.50	0.50	0.50	0.50	7.04	0.50	13.43	7.22	7.30

DAHL

& ASSOCIATES, INC

TECHNICIAN: JLH DATE: 21-Mar-94 TIME: 9:30 AM

FIELD DATA SHEET - SOIL VENTILATION & VACUUM ENHANCEMENT - OPERATIONAL

PROJECT NAME:	CONOCO - SOUTH ROBERT	24930601 PROJECT #	MW PROJECT MGR.

SYSTEM:

TEMPERATURES	DEGREES F	DEGREES C
BUILDING, AMBIENT	60.8	16
EXHAUST, WET BULB	66.2	19
EXHAUST, DRY BULB	93.2	34
MANIFOLD	48.2	9
FID EXHAUST	4500	
EPA METHOD 18:	YES	
CALIBRATION INITIAL (sec):	15.11	
CALIBRATION FINAL (sec):	15.13	
SAMPLE TIME (min):	50	
SAMPLE VOLUME (l):	9.92	

PRESSURES	DISTANCE	READING
STACK VP(1)	1	0.02
STACK VP(2)	3	0.03
STACK VP(3)	1	0.02
STACK VP(4)	3	0.03
STACK VP(CENTERLINE)	2	0.03
EXHAUST STACIC	N/A	0
BAROMETRIC	N/A	26.4
MANIFOLD	N/A	-48

ORIFICE PLATE / ROTOMETER:

	DATA UPON ARRIVAL					DATA REBALANCED	
LOCATION	FID READING	VACUUMS @ MANHOLE	@ VENT SIDE	@ BLOWER SIDE	DIFFERENTIAL	DESIRED DIFFERENTIAL	REBALANCED DIFFERENTIAL
RW-1	150	NT	-44	-50	6.4		6.4
SVV-1	120	NT	-48	-48	0		0
SVV-2	1000	NT	-48	-48	0		0
SVV-3	4200	NT	-48	-48	0		0
SVV-4	900	NT	-48	-48	0		0
SVV-5	10000	NT	-26	-26	0		0
SVV-6	3500	NT	-10	-10	0		0
SVV-7	700	NT	-45	-45	0.1		0.1
SVV-8	16	NT	-48	-48	0		0
SVV-9	190	NT	-35	-36	0.8		0.8
SVV-10	10000	NT	-20	-20	0.2		0.2
SVV-11	10000	NT	-14	-14	0		0
SVV-12							
SVV-13							
SVV-14							
SVV-15							
SVV-16							

PROBES:

LOCATION	FID	VACUUM
SVP-1(N)	125	-1.2
SVP-2(N)	10000	-0.62
SVP-3(N)	10000	-0.66
SVP-4(N)	20	-2.9
SVP-5(N)		
SVP-6(N)		
SVP-7(N)		

LOCATION	FID	VACUUM
SVP-1(S)	600	-1.4
SVP-2(S)	150	-0.61
SVP-3(S)	10000	-0.28
SVP-4(S)	50	-3.1
SVP-5(S)		
SVP-6(S)		
SVP-7(S)		

COMMENTS:

SPECIAL INSTRUCTIONS:

U/USERS/PROJECTS/LOTFILES/0601SV05.

SOIL VENTILATION PERFORMANCE PAGE 1
PROJECT NUMBER: 24930601.00
ANALYSIS PERFORMED BY: MW
DATE OF ANALYSIS: 05-May-94 09:46:44 AM

DESCRIPTION	UNITS	
SYSTEM DATA		
STACK DATA		
OUTSIDE DIAMETER	INCHES	4.5
INSIDE DIAMETER	INCHES	4.026
FLOW AREA	SQFT	0.0884
ALTITUDE	FMSL	900
NUMBER OF BLOWERS	DIMENSIONLESS	2
FIELD DATA		
DATE	DD/MM/YY	21-Mar-94
TECHNICIAN	INITIALS	JLH
TEMPERATURES		
BUILDING, AMBIENT	DEGREES F.	60.8
EXHAUST, DRY BULB	DEGREES F.	93.2
EXHAUST, WET BULB	DEGREES F.	66.2
MANIFOLD	DEGREES F.	48.2
PRESSURES		
BAROMETRIC	IN. Hg	26.4
FLOWING GAS	IN. W.C. GAUGE	0
MANIFOLD	IN. W.C. GAUGE	-48
EPA METHOD 2		
NUMBER OF TRAVERSE POINTS	DIMENSIONLESS	4
VP (POINT 1)	IN. W.C. GAUGE	0.02
VP (POINT 2)	IN. W.C. GAUGE	0.03
VP (POINT 3)	IN. W.C. GAUGE	0.02
VP (POINT 4)	IN. W.C. GAUGE	0.03
VP (CENTERLINE)	IN. W.C. GAUGE	0.03
CHEMICAL ANALYSIS		
FID	PPM (v/v)	4500
FID (converted to uG/L)	uG/L	15796
LABORATORY DATA (EPA METHOD 18)		
BENZENE	uG/L	6.9
ETHYL BENZENE	uG/L	11
TOLUENE	uG/L	30
XYLENES	uG/L	36
TOTAL HYDROCARBONS AS GASOLINE	uG/L	2400

NOTE: TO CONVERT uG/L TO uG/M^3 MULTIPLY BY 0.001

DATA REDUCTION				
GAS FLOW VELOCITY				
FIELD DATA, EPA METHOD 2				
AF = ALTITUDE FACTOR	DIMENSIONLESS	0.97		
W = HUMIDITY RATIO	LB H2O/LB AIR	0.008		
Vw = VOLUME WATER VAPOR (std)	CUFT/LB AIR	0.17080476819		
Vgas = VOLUME OF GAS (dry, std)	CUFT/LB AIR	13.3333333333		
Bws = WATER VAPOR IN GAS	VOL/VOL	0.01264832801		
HV = HUMID VOLUME	CUFT/LB	13.5041381015		
Ms = MOLECULAR WEIGHT OF STACK GAS	GAS DESITY	28.8608683919		
p(SL) = DENSITY @ SEA LEVEL	LB/CUFT	0.0746		
p(ACTUAL) = DENSITY ACTUAL	LB/CUFT	0.0640		
Kp = PITOT TUBE CONSTANT		85.49		
PTF = PITOT TUBE FACTOR	DIMENSIONLESS	0.99		
T = TEMPERATURE OF STACK GAS	DEGREE R	553.2		
Ps = PRESSURE OF STACK GAS	IN Hg (abs)	26.4		
{(VP)^.5}ave	(IN H2O)^0.5	0.1573		
VS = VELOCITY OF STACK GAS	FT/SEC	11.3448864445		
GAS FLOW RATE				
EPA METHOD 2	SCFM	51	0.0239	M^3/SEC
BLOWER PERFORMANCE CURVE	SCFM	118	0.0557	M^3/SEC
TOTAL OF VENTS				
ORIFICE				
Qinit = GAS FLOW RATE, UPON ARRIVAL	SCFM	29.8306	0.0141	M^3/SEC
Qadj = GAS FLOW RATE, READJUSTED	SCFM	29.8306	0.0141	M^3/SEC
PRODUCT REMOVAL RATE				
EPA METHODS 2 & 18			SER	% OF SER
BENZENE	uG/SEC	165	4600	3.59
ETHYLBENZENE	uG/SEC	263	497700	0.05
TOLUENE	uG/SEC	718	429800	0.17
XYLENES	uG/SEC	861	497700	0.17
TOTAL HYDROCARBON AS GASOLINE	uG/SEC	57409		
TOTAL HYDROCARBON AS GASOLINE	GALLONS/DAY	1.9752		
EPA METHODS 2 & FID	GALLONS/DAY	13.0002		
BLOWER PERFORMANCE CURVE	GALLONS/DAY	4.5992		
TOTAL OF VENTS				
ORIFICE, INITIAL	GALLONS/DAY	2.1826		
ORIFICE ADJUSTED	GALLONS/DAY	2.1826		

SOIL VENTILATION PERFORMANCE
PROJECT NUMBER: 24930601.00
ANALYSIS PERFORMED BY: MW
DATE OF ANALYSIS: 05-May-94 09:46:44 AM

DESCRIPTION	UNITS													
SYSTEM DATA														
IDENTIFICATION	DIMENSIONLESS	SYSTEM	RW-1	SVV-1	SVV-2	SVV-3	SVV-4	SVV-5	SVV-6	SVV-7	SVV-8	SVV-9	SVV-10	SVV-11
D = DIAMETER, PIPE INSIDE	INCHES	4.026	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067	2.067
d = DIAMETER, ORIFICE	INCHES	N/A	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
B = BETA RATIO	DIMENSIONLESS	0.000	0.363	0.363	0.363	0.363	0.363	0.363	0.363	0.363	0.363	0.363	0.363	0.363
NUMBER OF BLOWERS	DIMENSIONLESS	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DESIGN SOIL THICKNESS	FEET	11	11	11	11	11	11	11	11	11	11	11	11	11
DESIGN GAS EXCHANGE RATE	MIN/EXCHANGE	120	120	120	120	120	120	120	120	120	120	120	120	120
DESIGN GAS FLOW RATE	SCFM	110	10	10	10	10	10	10	10	10	10	10	10	0
FIELD DATA														
DATE	DD/MM/YY	21-Mar-94	21-Mar-94	21-Mar-94	21-Mar-94	21-Mar-94	21-Mar-94	21-Mar-94	21-Mar-94	21-Mar-94	21-Mar-94	21-Mar-94	21-Mar-94	21-Mar-94
TECHNICIAN	INITIALS	JLH	JLH	JLH	JLH	JLH	JLH	JLH	JLH	JLH	JLH	JLH	JLH	JLH
PRESSURE														
@ MANHOLE	IN. W.C. GAUGE	NA	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
VENT SIDE (FLOWING GAS PRESSURE)	IN. W.C. GAUGE	NA	-44	-48	-48	-48	-48	-48	-26	-10	-45	-48	-35	-20	-14
BLOWER SIDE	IN. W.C. GAUGE	NA	-50	-48	-48	-48	-48	-48	-26	-10	-45	-48	-36	-20	-14
MANIFOLD	IN. W.C. GAUGE	-48	-48	-48	-48	-48	-48	-48	-48	-48	-48	-48	-48	-48	-48
EXHAUST	IN. W.C. GAUGE	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ORIFICE PLATE														
DIFFERENTIAL, UPON ARRIVAL	IN. W.C. GAUGE	NA	6.4	0	0	0	0	0	0	0.1	0	0.8	0.2	0
DIFFERENTIAL, RE-ADJUSTED	IN. W.C. GAUGE	NA	6.4	0	0	0	0	0	0	0.1	0	0.8	0.2	0
TEMPERATURE, FLOWING GAS	DEGREE F	48.2	48.2	48.2	48.2	48.2	48.2	48.2	48.2	48.2	48.2	48.2	48.2	48.2
COMMENTS	EXPLANATION													
FID	PPM (v/v)	NA	150	120	1000	4200	900	10000	3500	700	16	190	10000	10000
FID (converted to ug/L)	uG/L	NA	527	421	3510	14743	3159	35102	12286	2457	56	667	35102	35102
DATA REDUCTION														
G = SPECIFIC GRAVITY, GAS	DIMENSIONLESS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Rd = REYNOLD'S #, DESIGN	DIMENSIONLESS	46208	8182	8182	8182	8182	8182	8182	8182	8182	8182	8182	8182	0
K = ORIFICE COEFFICIENT	DIMENSIONLESS	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110
Fa = ORIFICE EXPANSION FACTOR	DIMENSIONLESS	0.999732911	0.999732911	0.999732911	0.999732911	0.999732911	0.999732911	0.999732911	0.999732911	0.999732911	0.999732911	0.999732911	0.999732911	0.999732911
Tf = TEMPERATURE OF FLOWING GAS	DEG R	508.2	508.2	508.2	508.2	508.2	508.2	508.2	508.2	508.2	508.2	508.2	508.2	508.2
Pf = PRESSURE OF FLOWING GAS	PSIA	14.7	13.11028	12.96576	12.96576	12.96576	12.96576	13.76062	14.3387	13.07415	12.96576	13.43545	13.9774	14.19418
Fpv = GAS COMPRESSIBILITY FACTOR	DIMENSIONLESS	1	1	1	1	1	1	1	1	1	1	1	1	1
Y = GAS EXPANSION FACTOR	DIMENSIONLESS	1	0.99414200154	1	1	1	1	1	1	0.99990821583	1	0.99926547239	0.99982829425	1
ORIFICE														
Qinit = GAS FLOW RATE, UPON ARRIVAL	SCFM	29.8305702601	17.87	0.00	0.00	0.00	0.00	0.00	0.00	2.24	0.00	6.43	3.28	0.00
Qadj = GAS FLOW RATE, READJUSTED	SCFM	29.8305702601	17.87	0.00	0.00	0.00	0.00	0.00	0.00	2.24	0.00	6.43	3.28	0.00
PRODUCT REMOVAL RATE														
ORIFICE, INITIAL	GALLONS/DAY	2.18256310315	0.1528	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0896	0.0000	0.0697	1.8705	0.0000
ORIFICE ADJUSTED	GALLONS/DAY	2.18256310315	0.1528	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0896	0.0000	0.0697	1.8705	0.0000
EFFECTIVENESS														
RADIUS, ORIFICE, INITIAL	FEET	NA	103.95	0.50	0.50	0.50	0.50	0.50	0.50	13.49	0.50	37.72	19.49	0.50
RADIUS, ORIFICE, ADJUSTED	FEET	NA	103.95	0.50	0.50	0.50	0.50	0.50	0.50	13.49	0.50	37.72	19.49	0.50

DAHL

& ASSOCIATES, INC

TECHNICIAN: MS DATE: 30-Jun-94 TIME: 10:30 AM

FIELD DATA SHEET - SOIL VENTILATION - OPERATIONAL

PROJECT NAME:	PROJECT #	PROJECT MGR.
CONOCO SOUTH ROBERT	24930601	MW

TEMPERATURES	deg F	deg C
BUILDING, AMBIENT	100	37.8
EXHAUST, WET BULB	89.6	32
EXHAUST, DRY BULB	135.5	57.5
MANIFOLD	46.4	8

ALTITUDE	937	FMSL

STACK GAS COMPOSITION		
FID EXHAUST	325	ppm (vol/vol)
LEL EXHAUST		% of LEL
STACK 02	20.8	% (vol/vol)
STACK CO2	0.5	% (vol/vol)
W = HUMIDITY RATIO		lb H2O/lb air

PRESSURES			
LOCATION	DISTANCE	READING	UNITS
STACK VP(1)	1 IN	0.03	in WCG
STACK VP(2)	3 IN	0.03	in WCG
STACK VP(3)	1 IN	0.03	in WCG
STACK VP(4)	3 IN	0.03	in WCG
VP(CENTER)	2 IN	0.04	in WCG
# OF TRAVERSE POINTS		4	unitless
EXHAUST STATIC		0.01	in WCG
BAROMETRIC		29.52	in Hg
MANIFOLD		NA	in Hg
MANIFOLD		0.00	in WCG

EPA METHOD 18: LABORATORY DATA		
BENZENE	uG	96
ETHYL BENZENE	uG	260
TOLUENE	uG	680
XYLENES	uG	260
TOTAL HYDROCARBONS AS GASOLINE	uG	14000

NOTES: A) GMW GASOLINE ASUMED AS 95

B) CONVERSION FACTOR, GASOLINE (gallons/kg) 0.37

EPA METHOD 18: SAMPLE COLLECTION	
PUMP CALIBRATION (INITIAL):	15.04
PUMP CALIBRATION (FINAL):	15.23
PUMP CALIBRATION (AVE):	15.135
SAMPLE START TIME	10:30:00 AM
SAMPLE STOP TIME	11:20:00 AM
SAMPLE TIME (minutes)	50
SAMPLE VOLUME (liters)	9.91

	DATA UPON ARRIVAL					REBALANCED	FLOW RATE	
	FID	PRESSURES (in WCG)				DIFFERENTIAL	INITIAL	REBALANCED
LOCATION	READING	@ MANHOLE	@ VENT SIDE	@ BLOWER SIDI	DIFFERENTIAL	in WCG	scfm	scfm
RW-1	12		-50		1.8	1.8	9.46	9.46
SVV-1	50		-45		0.5	0.5	5.03	5.03
SVV-2	1200		-47		0.5	0.5	5.01	5.01
SVV-3	38		-40		0.2	0.2	3.20	3.20
SVV-4	10		-49		0.3	0.3	3.87	3.87
SVV-5	400		-51		0.1	0.1	5.02	5.02
SVV-6	10		-46		0.5	0.5	13.68	13.68
SVV-7	50		-22		3.5	3.5	3.28	3.28
SVV-8	80		-52		0	0	3.86	3.86
SVV-9	10		-38		0.5	0.5	0.00	0.00
SVV-10	175		-51		0.2	0.2	0.00	0.00
SVV-11	175		-44		0.3	0.3	0.00	0.00
TOTAL							42.94	42.94

PROBES:

LOCATION	FID	Dissolved O2	PRESSURE
SVP-1(W)	7		-3.8
SVP-2(W)	18		-2.7
SVP-3(W)	12		-4.5
SVP-4(W)	6		-2.2
SVP-5(W)			
SVP-6(W)			

PROBES:

LOCATION	FID	Dissolved O2	PRESSURE
SVP-1(E)	25		-2.8
SVP-2(E)	8		0.03
SVP-3(E)	15		0
SVP-4(E)	6		-2.3
SVP-5(E)			
SVP-6(E)			

COMMENTS:

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SOIL VENTILATION PERFORMANCE PAGE 1
PROJECT NUMBER: 24930601.00
ANALYSIS PERFORMED BY: MW
DATE PRINTED: 17-Nov-94 09:48:02 AM

DESCRIPTION	UNITS	
SYSTEM DATA		
STACK DATA		
OUTSIDE DIAMETER	INCHES	4.5
INSIDE DIAMETER	INCHES	4.026
FLOW AREA	SQFT	0.0884
ALTITUDE	FMSL	937
NUMBER OF BLOWERS	DIMENSIONLESS	4
FIELD DATA		
DATE	DD/MM/YY	30-Jun-94
TECHNICIAN	INITIALS	MS
TEMPERATURES		
BUILDING, AMBIENT	DEGREES F.	100
EXHAUST, DRY BULB	DEGREES F.	135.5
EXHAUST, WET BULB	DEGREES F.	89.6
MANIFOLD	DEGREES F.	46.4
PRESSURES		
BAROMETRIC	IN. Hg	29.52
FLOWING GAS	IN. W.C. GAUGE	0.01
MANIFOLD	IN. W.C. GAUGE	0
EPA METHOD 2		
NUMBER OF TRAVERSE POINTS	DIMENSIONLESS	4
VP (POINT 1)	IN. W.C. GAUGE	0.03
VP (POINT 2)	IN. W.C. GAUGE	0.03
VP (PQINT 3)	IN. W.C. GAUGE	0.03
VP (POINT 4)	IN. W.C. GAUGE	0.03
VP (CENTERLINE)	IN. W.C. GAUGE	0.04
CHEMICAL ANALYSIS		
FID	PPM (v/v)	325
FID (converted to uG/L)	uG/L	1260
LABORATORY DATA (EPA METHOD 18)		
BENZENE	uG/L	9.6864
ETHYL BENZENE	uG/L	26.234
TOLUENE	uG/L	68.612
XYLENES	uG/L	26.234
TOTAL HYDROCARBONS AS GASOLINE	uG/L	1412.6

NOTES:
TO CONVERT uG/L TO uG/M^3 MULTIPLY BY 0.001

DATA REDUCTION				
GAS FLOW VELOCITY				
FIELD DATA, EPA METHOD 2				
AF = ALTITUDE FACTOR	DIMENSIONLESS	0.97		
W = HUMIDITY RATIO	LB H2O/LB AIR	0		
Vw = VOLUME WATER VAPOR (std)	CUFT/LB AIR	0		
Vgas = VOLUME OF GAS (dry, std)	CUFT/LB AIR	13.3333333333		
Bws = WATER VAPOR IN GAS	VOL/VOL	0		
HV = HUMID VOLUME	CUFT/LB	13.3333333333		
Ms = MOLECULAR WEIGHT OF STACK GAS	GAS DESITY	29		
p(SL) = DENSITY @ SEA LEVEL	LB/CUFT	0.0750		
p(ACTUAL) = DENSITY ACTUAL	LB/CUFT	0.0718		
Kp = PITOT TUBE CONSTANT		85.49		
PTF = PITOT TUBE FACTOR	DIMENSIONLESS	0.99		
T = TEMPERATURE OF STACK GAS	DEGREE R	595.5		
Ps = PRESSURE OF STACK GAS	IN Hg (abs)	29.5207352941		
{(VP)^.5}ave	(IN H2O)^0.5	0.1732		
VS = VELOCITY OF STACK GAS	FT/SEC	12.2261420601		
GAS FLOW RATE				
EPA METHOD 2	SCFM	57	0.02677782846	M^3/SEC
BLOWER PERFORMANCE CURVE	SCFM	440	0.20768	M^3/SEC
TOTAL OF VENTS				
ORIFICE				
Qinit = GAS FLOW RATE, UPON ARRIVAL	SCFM	59.6956	0.02817630167	M^3/SEC
Qadj = GAS FLOW RATE, READJUSTED	SCFM	59.6956	0.02817630167	M^3/SEC
PRODUCT REMOVAL RATE				
EPA METHODS 2 & 18 (USEPA REPORTING)			SER	% OF SER
BENZENE	uG/SEC	259	4600	5.64
ETHYLBENZENE	uG/SEC	703	497700	0.14
TOLUENE	uG/SEC	1837	429800	0.43
XYLENES	uG/SEC	703	497700	0.14
TOTAL HYDROCARBON AS GASOLINE	uG/SEC	37827	718065	5.27
STATE OF MINNESOTA REPORTING		OBSERVED	LIMIT	% OF LIMIT
BENZENE	gallons/day	0.01	0.87	0.95%
TOTAL HYDROCARBON AS GASOLINE	gallons/day	1.21	136.49	0.89%
EPA METHODS 2 & FID	gallons/day	1.08	136.49	0.79%
BLOWER PERFORMANCE CURVE & FID	gallons/day	8.37	136.49	6.13%
SUM OF VENTS (ORIFICE), INITIAL	gallons/day	0.55	136.49	0.41%
SUM OF VENTS (ORIFICE), ADJUSTED	gallons/day	0.55	136.49	0.41%

SOIL VENTILATION PERFORMANCE PAGE 1 PAGE 2
PROJECT NUMBER: 24930601.00
ANALYSIS PERFORMED BY: MW
DATE PRINTED: 14-Mar-95 01:40:59 PM

DESCRIPTION	UNITS																	
SYSTEM DATA																		
IDENTIFICATION	DIMENSIONLESS	SYSTEM	RW-1	SVV-1	SVV-2	SVV-3	SVV-4	SVV-5	SVV-6	SVV-7	SVV-8	SVV-9	SVV-10	SVV-11	TOTAL	0	PROBES:	
D = DIAMETER, PIPE INSIDE	INCHES	4.026	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
d = DIAMETER, ORIFICE	INCHES	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
B = BETA RATIO	DIMENSIONLESS	0.186	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375
NUMBER OF BLOWERS	DIMENSIONLESS	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DESIGN SOIL THICKNESS	FEET	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
DESIGN GAS EXCHANGE RATE	MIN/EXCHANGE	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
DESIGN GAS FLOW RATE	SCFM	150	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
FIELD DATA																		
DATE	DD/MM/YY	30-Jun-94	30-Jun-94	30-Jun-94	30-Jun-94	30-Jun-94	30-Jun-94	30-Jun-94	30-Jun-94	30-Jun-94	30-Jun-94	30-Jun-94	30-Jun-94	30-Jun-94	30-Jun-94	30-Jun-94	30-Jun-94	30-Jun-94
TECHNICIAN	INITIALS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS
PRESSURE																		
@ MANHOLE	IN. W.C. GAUGE	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VENT SIDE (FLOWING GAS PRESSURE)	IN. W.C. GAUGE	NA	-50	-45	-47	-40	-49	-51	-46	-22	-52	-38	-22	-52	-38	-51	-44	
BLOWER SIDE	IN. W.C. GAUGE	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MANIFOLD	IN. W.C. GAUGE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EXHAUST	IN. W.C. GAUGE	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ORIFICE PLATE																		
DIFFERENTIAL, UPON ARRIVAL	IN. W.C. GAUGE	NA	1.8	0.5	0.5	0.2	0.3	0.1	0.5	3.5	0	0.5	0.2	0.3	0	0	PROBES:	
DIFFERENTIAL, RE-ADJUSTED	IN. W.C. GAUGE	NA	1.8	0.5	0.5	0.2	0.3	0.1	0.5	3.5	0	0.5	0.2	0.3	0	0	0	
TEMPERATURE, FLOWING GAS	DEGREE F	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	
COMMENTS	EXPLANATION																	
FID	PPM (v/v)	325	12	50	1200	38	10	400	10	50	80	10	175	175	0	0	0	
FID (converted to ug/L)	uG/L	1260	47	194	4653	147	39	1551	39	194	310	39	679	679	0	0	0	
DATA REDUCTION																		
G = SPECIFIC GRAVITY, GAS	DIMENSIONLESS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Rd = REYNOLD'S #, DESIGN	DIMENSIONLESS	63011	8456	8456	8456	8456	8456	8456	8456	8456	8456	8456	8456	8456	8456	8456	8456	
K = ORIFICE COEFFICIENT	DIMENSIONLESS	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	
Fa = ORIFICE EXPANSION FACTOR	DIMENSIONLESS	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	
Tf = TEMPERATURE OF FLOWING GAS	DEG R	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	
Pf = PRESSURE OF FLOWING GAS	PSIA	14.7	12.8935	13.07415	13.00189	13.2548	12.92963	12.85737	13.03802	13.90514	12.82124	13.32706	13.90514	12.82124	13.32706	12.85737	13.11028	
Fpv = GAS COMPRESSIBILITY FACTOR	DIMENSIONLESS	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Y = GAS EXPANSION FACTOR	DIMENSIONLESS	1	0.99832473727	0.99954107915	0.99953852863	0.99981893352	0.99972156976	0.99990666832	0.99953980742	0.99697953419	1	0.99954978818	0.99982740195	0.99971921593	1	1	1	
ORIFICE																		
Qinit = GAS FLOW RATE, UPON ARRIVAL	SCFM	59.70	9.46	5.03	5.01	3.20	3.87	2.23	5.02	13.68	0.00	5.07	3.28	3.86	0.00	0.00	0.00	
Qadj = GAS FLOW RATE, READJUSTED	SCFM	59.70	9.46	5.03	5.01	3.20	3.87	2.23	5.02	13.68	0.00	5.07	3.28	3.86	0.00	0.00	0.00	
PRODUCT REMOVAL RATE																		
ORIFICE, INITIAL	POUNDS/HR	0.55	0.0066	0.0147	0.3518	0.0071	0.0023	0.0522	0.0029	0.0400	0.0000	0.0030	0.0336	0.0395	0.0000	0.0000	0.0000	
ORIFICE ADJUSTED	POUNDS/HR	0.55	0.0066	0.0147	0.3518	0.0071	0.0023	0.0522	0.0029	0.0400	0.0000	0.0030	0.0336	0.0395	0.0000	0.0000	0.0000	
EFFECTIVENESS																		
RADIUS, ORIFICE, INITIAL	FEET	NA	15.55	8.50	8.48	5.59	6.66	4.05	8.49	22.27	0.50	8.57	5.72	6.64	0.50	0.50	0.50	
RADIUS, ORIFICE, ADJUSTED	FEET	NA	15.55	8.50	8.48	5.59	6.66	4.05	8.49	22.27	0.50	8.57	5.72	6.64	0.50	0.50	0.50	

DAHL

& ASSOCIATES, INC

TECHNICIAN: MS DATE: 31-Aug-94 TIME: 5:00 PM

FIELD DATA SHEET - SOIL VENTILATION - OPERATIONAL

PROJECT NAME:	PROJECT #	PROJECT MGR.
CONOCO SOUTH ROBERT	24930601	MW

TEMPERATURES	deg F	deg C
BUILDING, AMBIENT	70	21.1
EXHAUST, WET BULB	80.6	27
EXHAUST, DRY BULB	118.4	48
MANIFOLD	46.4	8

ALTITUDE	937	FMSL

STACK GAS COMPOSITION		
FID EXHAUST	150	ppm (vol/vol)
LEL EXHAUST	NA	% of LEL
STACK 02	18.7	% (vol/vol)
STACK CO2	0.5	% (vol/vol)
W = HUMIDITY RATIO	0.014	lb H2O/lb air

PRESSURES			
LOCATION	DISTANCE	READING	UNITS
STACK VP(1)	1 IN	0.05	in WCG
STACK VP(2)	3 IN	0.05	in WCG
STACK VP(3)	1 IN	0.05	in WCG
STACK VP(4)	3 IN	0.05	in WCG
VP(CENTER)	2 IN	0.05	in WCG
# OF TRAVERSE POINTS		4	unitless
EXHAUST STATIC		0.02	in WCG
BAROMETRIC		29.82	in Hg
MANIFOLD		NA	in Hg
MANIFOLD		0.00	in WCG

EPA METHOD 18: LABORATORY DATA		
BENZENE	uG	2.1
ETHYL BENZENE	uG	2.8
TOLUENE	uG	9.9
XYLENES	uG	11
TOTAL HYDROCARBONS AS GASOLINE	uG	390

NOTES: A) GMW GASOLINE ASUMED AS 95

B) CONVERSION FACTOR, GASOLINE (gallons/kg) 0.37

EPA METHOD 18: SAMPLE COLLECTION	
PUMP CALIBRATION (INITIAL):	15.1
PUMP CALIBRATION (FINAL):	15.08
PUMP CALIBRATION (AVE):	15.09
SAMPLE START TIME	05:35:00 PM
SAMPLE STOP TIME	06:25:00 PM
SAMPLE TIME (minutes)	50
SAMPLE VOLUME (liters)	9.94

	DATA UPON ARRIVAL					REBALANCED	FLOW RATE	
	FID	PRESSURES (in WCG)				DIFFERENTIAL	INITIAL	REBALANCED
LOCATION	READING	@ MANHOLE	@ VENT SIDE	@ BLOWER SIDI	DIFFERENTIAL	in WCG	scfm	scfm
RW-1							0.00	0.00
SVV-1	80		-20		0.2	0.2	3.29	3.29
SVV-2	1200		-20		0.2	0.2	3.29	3.29
SVV-3	200		-20		0.2	0.2	3.29	3.29
SVV-4	250		-20		0.2	0.2	3.29	3.29
SVV-5	450		-20		0	0	3.97	3.97
SVV-6	10		-30		0.3	0.3	17.46	17.46
SVV-7	18		-20		5.7	5.7	3.29	3.29
SVV-8	14		-20		2.6	2.6	2.32	2.32
SVV-9	12		-20		0.3	0.3	0.00	0.00
SVV-10	48		-20		0.2	0.2	0.00	0.00
SVV-11	95		-20		0.1	0.1	0.00	0.00
TOTAL							40.20	40.20

PROBES:

LOCATION	FID	Dissolved O2	PRESSURE
SVP-1(W)	22		-2.5
SVP-2(W)	10000+		18
SVP-3(W)	40		-2.2
SVP-4(W)	14		-1.8
SVP-5(W)			
SVP-6(W)			

PROBES:

LOCATION	FID	Dissolved O2	PRESSURE
SVP-1(E)	70		0
SVP-2(E)	80		-1
SVP-3(E)	28		0
SVP-4(E)	20		-1.6
SVP-5(E)			
SVP-6(E)			

COMMENTS:

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SOIL VENTILATION PERFORMANCE PAGE 1
PROJECT NUMBER: 24930601.00
ANALYSIS PERFORMED BY: MW
DATE PRINTED: 17-Nov-94 10:12:31 AM

DESCRIPTION	UNITS	
SYSTEM DATA		
STACK DATA		
OUTSIDE DIAMETER	INCHES	4.5
INSIDE DIAMETER	INCHES	4.026
FLOW AREA	SQFT	0.0884
ALTITUDE	FMSL	937
NUMBER OF BLOWERS	DIMENSIONLESS	4
FIELD DATA		
DATE	DD/MM/YY	31-Aug-94
TECHNICIAN	INITIALS	MS
TEMPERATURES		
BUILDING, AMBIENT	DEGREES F.	70
EXHAUST, DRY BULB	DEGREES F.	118.4
EXHAUST, WET BULB	DEGREES F.	80.6
MANIFOLD	DEGREES F.	46.4
PRESSURES		
BAROMETRIC	IN. Hg	29.82
FLOWING GAS	IN. W.C. GAUGE	0.02
MANIFOLD	IN. W.C. GAUGE	0
EPA METHOD 2		
NUMBER OF TRAVERSE POINTS	DIMENSIONLESS	4
VP (POINT 1)	IN. W.C. GAUGE	0.05
VP (POINT 2)	IN. W.C. GAUGE	0.05
VP (PQINT 3)	IN. W.C. GAUGE	0.05
VP (POINT 4)	IN. W.C. GAUGE	0.05
VP (CENTERLINE)	IN. W.C. GAUGE	0.05
CHEMICAL ANALYSIS		
FID	PPM (v/v)	150
FID (converted to uG/L)	uG/L	582
LABORATORY DATA (EPA METHOD 18)		
BENZENE	uG/L	0.21126
ETHYL BENZENE	uG/L	0.28168
TOLUENE	uG/L	0.99594
XYLENES	uG/L	1.1066
TOTAL HYDROCARBONS AS GASOLINE	uG/L	39.234

DATA REDUCTION				
GAS FLOW VELOCITY				
FIELD DATA, EPA METHOD 2				
AF = ALTITUDE FACTOR	DIMENSIONLESS	0.97		
W = HUMIDITY RATIO	LB H2O/LB AIR	0.014		
Vw = VOLUME WATER VAPOR (std)	CUFT/LB AIR	0.29890834433		
Vgas = VOLUME OF GAS (dry, std)	CUFT/LB AIR	13.3333333333		
Bws = WATER VAPOR IN GAS	VOL/VOL	0.02192657315		
HV = HUMID VOLUME	CUFT/LB	13.6322416777		
Ms = MOLECULAR WEIGHT OF STACK GAS	GAS DESITY	28.7588076954		
p(SL) = DENSITY @ SEA LEVEL	LB/CUFT	0.0744		
p(ACTUAL) = DENSITY ACTUAL	LB/CUFT	0.0719		
Kp = PITOT TUBE CONSTANT		85.49		
PTF = PITOT TUBE FACTOR	DIMENSIONLESS	0.99		
T = TEMPERATURE OF STACK GAS	DEGREE R	578.4		
Ps = PRESSURE OF STACK GAS	IN Hg (abs)	29.8214705882		
{(VP)^.5}ave	(IN H2O)^0.5	0.2236		
VS = VELOCITY OF STACK GAS	FT/SEC	15.5417417991		
GAS FLOW RATE				
EPA METHOD 2	SCFM	75	0.0354030741	M^3/SEC
BLOWER PERFORMANCE CURVE	SCFM	440	0.20768	M^3/SEC
TOTAL OF VENTS				
ORIFICE				
Qinit = GAS FLOW RATE, UPON ARRIVAL	SCFM	56.0497	0.02645545251	M^3/SEC
Qadj = GAS FLOW RATE, READJUSTED	SCFM	56.0497	0.02645545251	M^3/SEC
PRODUCT REMOVAL RATE				
EPA METHODS 2 & 18 (USEPA REPORTING)			SER	% OF SER
BENZENE	uG/SEC	7	4600	0.16
ETHYLBENZENE	uG/SEC	10	497700	0.00
TOLUENE	uG/SEC	35	429800	0.01
XYLENES	uG/SEC	39	497700	0.01
TOTAL HYDROCARBON AS GASOLINE	uG/SEC	1389	718065	0.19
STATE OF MINNESOTA REPORTING		OBSERVED	LIMIT	% OF LIMIT
BENZENE	gallons/day	0.00	0.87	0.03%
TOTAL HYDROCARBON AS GASOLINE	gallons/day	0.04	136.49	0.03%
EPA METHODS 2 & FID	gallons/day	0.66	136.49	0.48%
BLOWER PERFORMANCE CURVE & FID	gallons/day	3.86	136.49	2.83%
SUM OF VENTS (ORIFICE), INITIAL	gallons/day	0.39	136.49	0.28%
SUM OF VENTS (ORIFICE), ADJUSTED	gallons/day	0.39	136.49	0.28%

NOTES:
TO CONVERT uG/L TO uG/M^3 MULTIPLY BY 0.001

SOIL VENTILATION PERFORMANCE PAGE 1 PAGE 2
PROJECT NUMBER: 24930601.00
ANALYSIS PERFORMED BY: MW
DATE PRINTED: 14-Mar-95 01:35:40 PM

DESCRIPTION	UNITS																
SYSTEM DATA																	
IDENTIFICATION	DIMENSIONLESS	SYSTEM	RW-1	SVV-1	SVV-2	SVV-3	SVV-4	SVV-5	SVV-6	SVV-7	SVV-8	SVV-9	SVV-10	SVV-11	TOTAL	0	PROBES:
D = DIAMETER, PIPE INSIDE	INCHES	4.026	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
d = DIAMETER, ORIFICE	INCHES	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
B = BETA RATIO	DIMENSIONLESS	0.186	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375
NUMBER OF BLOWERS	DIMENSIONLESS	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DESIGN SOIL THICKNESS	FEET	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
DESIGN GAS EXCHANGE RATE	MIN/EXCHANGE	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
DESIGN GAS FLOW RATE	SCFM	150	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
FIELD DATA																	
DATE	DD/MM/YY	31-Aug-94	31-Aug-94	31-Aug-94	31-Aug-94	31-Aug-94	31-Aug-94	31-Aug-94	31-Aug-94	31-Aug-94	31-Aug-94	31-Aug-94	31-Aug-94	31-Aug-94	31-Aug-94	31-Aug-94	31-Aug-94
TECHNICIAN	INITIALS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS
PRESSURE																	
@ MANHOLE	IN. W.C. GAUGE	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VENT SIDE (FLOWING GAS PRESSURE)	IN. W.C. GAUGE	NA	0	-20	-20	-20	-20	-20	-30	-20	-20	-20	-20	-20	0	0	0
BLOWER SIDE	IN. W.C. GAUGE	NA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MANIFOLD	IN. W.C. GAUGE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EXHAUST	IN. W.C. GAUGE	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ORIFICE PLATE																	
DIFFERENTIAL, UPON ARRIVAL	IN. W.C. GAUGE	NA	0	0.2	0.2	0.2	0.2	0	0.3	5.7	2.6	0.3	0.2	0.1	0	0	PROBES:
DIFFERENTIAL, RE-ADJUSTED	IN. W.C. GAUGE	NA	0	0.2	0.2	0.2	0.2	0	0.3	5.7	2.6	0.3	0.2	0.1	0	0	0
TEMPERATURE, FLOWING GAS	DEGREE F	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4
COMMENTS	EXPLANATION																
FID	PPM (v/v)	150	0	80	1200	200	250	450	10	18	14	12	48	95	0	0	0
FID (converted to ug/L)	ug/L	582	0	310	4653	776	969	1745	39	70	54	47	186	368	0	0	0
DATA REDUCTION																	
G = SPECIFIC GRAVITY, GAS	DIMENSIONLESS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Rd = REYNOLD'S #, DESIGN	DIMENSIONLESS	63011	8456	8456	8456	8456	8456	8456	8456	8456	8456	8456	8456	8456	8456	8456	8456
K = ORIFICE COEFFICIENT	DIMENSIONLESS	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110
Fa = ORIFICE EXPANSION FACTOR	DIMENSIONLESS	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072	0.999698072
Tf = TEMPERATURE OF FLOWING GAS	DEG R	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4	506.4
Pf = PRESSURE OF FLOWING GAS	PSIA	14.7	14.7	13.9774	13.9774	13.9774	13.9774	13.9774	13.6161	13.9774	13.9774	13.9774	13.9774	13.9774	14.7	14.7	14.7
Fpv = GAS COMPRESSIBILITY FACTOR	DIMENSIONLESS	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Y = GAS EXPANSION FACTOR	DIMENSIONLESS	1	1	0.99982829425	0.99982829425	0.99982829425	0.99982829425	1	0.99973560711	0.99510638602	0.9977678252	0.99974244137	0.99982829425	0.99991414712	1	1	1
ORIFICE																	
Qinit = GAS FLOW RATE, UPON ARRIVAL	SCFM	56.05	0.00	3.29	3.29	3.29	3.29	0.00	3.97	17.46	11.83	4.03	3.29	2.32	0.00	0.00	0.00
Qadj = GAS FLOW RATE, READJUSTED	SCFM	56.05	0.00	3.29	3.29	3.29	3.29	0.00	3.97	17.46	11.83	4.03	3.29	2.32	0.00	0.00	0.00
PRODUCT REMOVAL RATE																	
ORIFICE, INITIAL	POUNDS/HR	0.39	0.0000	0.0154	0.2308	0.0385	0.0481	0.0000	0.0023	0.0184	0.0097	0.0028	0.0092	0.0129	0.0000	0.0000	0.0000
ORIFICE ADJUSTED	POUNDS/HR	0.39	0.0000	0.0154	0.2308	0.0385	0.0481	0.0000	0.0023	0.0184	0.0097	0.0028	0.0092	0.0129	0.0000	0.0000	0.0000
EFFECTIVENESS																	
RADIUS, ORIFICE, INITIAL	FEET	NA	0.50	5.73	5.73	5.73	5.73	0.50	6.82	28.30	19.32	6.91	5.73	4.20	0.50	0.50	0.50
RADIUS, ORIFICE, ADJUSTED	FEET	NA	0.50	5.73	5.73	5.73	5.73	0.50	6.82	28.30	19.32	6.91	5.73	4.20	0.50	0.50	0.50

DAHL

& ASSOCIATES, INC

TECHNICIAN: MS DATE: 27-Dec-94 TIME: 11:00:00 AM

FIELD DATA SHEET - SOIL VENTILATION - OPERATIONAL

PROJECT NAME:	PROJECT #	PROJECT MGR.
CONOCO SOUTH ROBERT	**24930601**	**MW**

TEMPERATURES	deg F	deg C
BUILDING, AMBIENT	65	18.3
EXHAUST, WET BULB	57.2	14
EXHAUST, DRY BULB	80.6	27
MANIFOLD	48.2	9

ALTITUDE	937	FMSL

STACK GAS COMPOSITION		
FID EXHAUST	110	ppm (vol/vol)
LEL EXHAUST	NA	% of LEL
STACK 02	19.7	% (vol/vol)
STACK CO2	0.3	% (vol/vol)
W = HUMIDITY RATIO	0.007	lb H2O/lb air

PRESSURES			
LOCATION	DISTANCE	READING	UNITS
STACK VP(1)	1 IN	0.01	in WCG
STACK VP(2)	3 IN	0.01	in WCG
STACK VP(3)	1 IN	0.01	in WCG
STACK VP(4)	3 IN	0.01	in WCG
VP(CENTER)	2 IN	0.015	in WCG
# OF TRAVERSE POINTS		4	unitless
EXHAUST STATIC		0	in WCG
BAROMETRIC		28.91	in Hg
MANIFOLD		NA	in Hg
MANIFOLD		0.00	in WCG

EPA METHOD 18: LABORATORY DATA		
BENZENE	uG	18
ETHYL BENZENE	uG	34
TOLUENE	uG	150
XYLENES	uG	120
TOTAL HYDROCARBONS AS GASOLINE	uG	4300

NOTES: A) GMW GASOLINE ASUMED AS 95

B) CONVERSION FACTOR, GASOLINE (gallons/kg) 0.37

EPA METHOD 18: SAMPLE COLLECTION	
PUMP CALIBRATION (INITIAL):	
PUMP CALIBRATION (FINAL):	
PUMP CALIBRATION (AVE):	0
SAMPLE START TIME	12:00:00 AM
SAMPLE STOP TIME	12:00:00 AM
SAMPLE TIME (minutes)	0
SAMPLE VOLUME (liters)	ERR

	DATA UPON ARRIVAL					REBALANCED	FLOW RATE	
	FID	PRESSURES (in WCG)				DIFFERENTIAL	INITIAL	REBALANCED
LOCATION	READING	@ MANHOLE	@ VENT SIDE	@ BLOWER SIDE	DIFFERENTIAL	in WCG	scfm	scfm
RW-1	14		-7		0		0.00	0.00
SVV-1	16		-18		0.1	0.2	2.33	3.29
SVV-2	375		-24		0.2	0.2	3.26	3.26
SVV-3	68	-18	-24		0.1	0.3	2.31	4.00
SVV-4	60	-12	-18		0.2	0.4	3.29	4.65
SVV-5	100		-29		0	0.1	0.00	2.29
SVV-6	12		-34		0.2	0.2	3.22	3.22
SVV-7	15		-42	-42	0.9	0.2	6.76	3.18
SVV-8	10		-11	-13	2	1	10.48	7.41
SVV-9	8		-10		0	0.1	0.00	2.35
SVV-10	36		-12		0.1	0.2	2.34	3.32
SVV-11	30		-16		0.1	0.1	2.33	2.33
TOTAL							36.32	39.31

PROBES:

LOCATION	FID	Dissolved O2	PRESSURE
SVP-1(W)	75		0
SVP-2(W)	10000		3.4
SVP-3(W)	1750		8.2
SVP-4(W)	12		-0.72
SVP-5(W)			
SVP-6(W)			

PROBES:

LOCATION	FID	Dissolved O2	PRESSURE
SVP-1(E)	200		3.1
SVP-2(E)	10000		0
SVP-3(E)	280		-2.2
SVP-4(E)	15		-0.74
SVP-5(E)			
SVP-6(E)			

COMMENTS:

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SOIL VENTILATION PERFORMANCE
PROJECT NUMBER: 24930601.00
ANALYSIS PERFORMED BY: MW
DATE PRINTED: 14-Mar-95 02:26:50 PM

DESCRIPTION	UNITS	
SYSTEM DATA		
STACK DATA		
OUTSIDE DIAMETER	INCHES	4.5
INSIDE DIAMETER	INCHES	4.026
FLOW AREA	SQFT	0.0884
ALTITUDE	FMSL	937
NUMBER OF BLOWERS	DIMENSIONLESS	4
FIELD DATA		
DATE	DD/MM/YY	27-Dec-94
TECHNICIAN	INITIALS	MS
TEMPERATURES		
BUILDING, AMBIENT	DEGREES F.	65
EXHAUST, DRY BULB	DEGREES F.	80.6
EXHAUST, WET BULB	DEGREES F.	57.2
MANIFOLD	DEGREES F.	48.2
PRESSURES		
BAROMETRIC	IN. Hg	28.91
FLOWING GAS	IN. W.C. GAUGE	0
MANIFOLD	IN. W.C. GAUGE	0
EPA METHOD 2		
NUMBER OF TRAVERSE POINTS	DIMENSIONLESS	4
VP (POINT 1)	IN. W.C. GAUGE	0.01
VP (POINT 2)	IN. W.C. GAUGE	0.01
VP (POINT 3)	IN. W.C. GAUGE	0.01
VP (POINT 4)	IN. W.C. GAUGE	0.01
VP (CENTERLINE)	IN. W.C. GAUGE	0.02
CHEMICAL ANALYSIS		
FID	PPM (v/v)	110
FID (converted to uG/L)	uG/L	427
LABORATORY DATA (EPA METHOD 18)		
BENZENE	uG/L	1.8
ETHYL BENZENE	uG/L	3.4
TOLUENE	uG/L	15
XYLENES	uG/L	12
TOTAL HYDROCARBONS AS GASOLINE	uG/L	430

DATA REDUCTION				
GAS FLOW VELOCITY				
FIELD DATA, EPA METHOD 2				
AF = ALTITUDE FACTOR	DIMENSIONLESS	0.97		
W = HUMIDITY RATIO	LB H2O/LB AIR	0.007		
Vw = VOLUME WATER VAPOR (std)	CUFT/LB AIR	0.14945417217		
Vgas = VOLUME OF GAS (dry, std)	CUFT/LB AIR	13.3333333333		
Bws = WATER VAPOR IN GAS	VOL/VOL	0.01108481255		
HV = HUMID VOLUME	CUFT/LB	13.4827875055		
Ms = MOLECULAR WEIGHT OF STACK GAS	GAS DESITY	28.8780670619		
p(SL) = DENSITY @ SEA LEVEL	LB/CUFT	0.0747		
p(ACTUAL) = DENSITY ACTUAL	LB/CUFT	0.0700		
Kp = PITOT TUBE CONSTANT		85.49		
PTF = PITOT TUBE FACTOR	DIMENSIONLESS	0.99		
T = TEMPERATURE OF STACK GAS	DEGREE R	540.6		
Ps = PRESSURE OF STACK GAS	IN Hg (abs)	28.91		
{(VP)^.5}ave	(IN H2O)^0.5	0.1000		
VS = VELOCITY OF STACK GAS	FT/SEC	6.81052240859		
GAS FLOW RATE				
EPA METHOD 2	SCFM	34	0.01609136882	M^3/SEC
BLOWER PERFORMANCE CURVE	SCFM	440	0.20768	M^3/SEC
TOTAL OF VENTS				
ORIFICE				
Qinit = GAS FLOW RATE, UPON ARRIVAL	SCFM	ERR	ERR	M^3/SEC
Qadj = GAS FLOW RATE, READJUSTED	SCFM	ERR	ERR	M^3/SEC
PRODUCT REMOVAL RATE				
EPA METHODS 2 & 18 (USEPA REPORTING)			SER	% OF SER
BENZENE	uG/SEC	29	4600	0.63
ETHYLBENZENE	uG/SEC	55	497700	0.01
TOLUENE	uG/SEC	241	429800	0.06
XYLENES	uG/SEC	193	497700	0.04
TOTAL HYDROCARBON AS GASOLINE	uG/SEC	6919	718065	0.96
STATE OF MINNESOTA REPORTING		OBSERVED	LIMIT	% OF LIMIT
BENZENE	gallons/day	0.00	0.87	0.11%
TOTAL HYDROCARBON AS GASOLINE	gallons/day	0.22	136.49	0.16%
EPA METHODS 2 & FID	gallons/day	0.22	136.49	0.16%
BLOWER PERFORMANCE CURVE & FID	gallons/day	2.83	136.49	2.07%
SUM OF VENTS (ORIFICE), INITIAL	gallons/day	ERR	136.49	ERR
SUM OF VENTS (ORIFICE), ADJUSTED	gallons/day	ERR	136.49	ERR

NOTES:
TO CONVERT uG/L TO uG/M^3 MULTIPLY BY 0.001
TO CALCULATE uG/L DIVIDE ANALYSIS BY SAMPLED VOLUME IN LITERS
TO CALCULATE SAMPLE VOLUME MULTIPLY AVERAGE OF PUMP CALIBRATION BY SAMPLE TIME

SOIL VENTILATION PERFORMANCE
PROJECT NUMBER: 24930601.00
ANALYSIS PERFORMED BY: MW
DATE PRINTED: 14-Mar-95 01:24:33 PM

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DESCRIPTION	UNITS																	
SYSTEM DATA																		
IDENTIFICATION	DIMENSIONLESS	SYSTEM	RW-1	SVV-1	SVV-2	SVV-3	SVV-4	ERR	SVV-5	SVV-6	ERR	ERR	SVV-7	SVV-8	SVV-9	SVV-10	SVV-11	
D = DIAMETER, PIPE INSIDE	INCHES	4.026	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
d = DIAMETER, ORIFICE	INCHES	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
B = BETA RATIO	DIMENSIONLESS	0.186	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375
NUMBER OF BLOWERS	DIMENSIONLESS	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DESIGN SOIL THICKNESS	FEET	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
DESIGN GAS EXCHANGE RATE	MIN/EXCHANGE	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
DESIGN GAS FLOW RATE	SCFM	150	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
FIELD DATA																		
DATE	DD/MM/YY	27-Dec-94	27-Dec-94	27-Dec-94	27-Dec-94	27-Dec-94	27-Dec-94	27-Dec-94	27-Dec-94	27-Dec-94	27-Dec-94	27-Dec-94	27-Dec-94	27-Dec-94	27-Dec-94	27-Dec-94	27-Dec-94	27-Dec-94
TECHNICIAN	INITIALS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS
PRESSURE																		
@ MANHOLE	IN. W.C. GAUGE	NA	0	0	0	-18	-12	ERR	0	0	ERR	ERR	0	0	0	0	0	0
VENT SIDE (FLOWING GAS PRESSURE)	IN. W.C. GAUGE	NA	-7	-18	-24	-24	-18	ERR	-29	-34	ERR	ERR	-42	-11	-10	-12	-16	
BLOWER SIDE	IN. W.C. GAUGE	NA	0	0	0	0	0	ERR	0	0	ERR	ERR	-42	-13	0	0	0	
MANIFOLD	IN. W.C. GAUGE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
EXHAUST	IN. W.C. GAUGE	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
ORIFICE PLATE																		
DIFFERENTIAL, UPON ARRIVAL	IN. W.C. GAUGE	NA	0	0.1	0.2	0.1	0.2	ERR	0	0.2	ERR	ERR	0.9	2	0	0.1	0.1	
DIFFERENTIAL, RE-ADJUSTED	IN. W.C. GAUGE	NA	0	0.2	0.2	0.3	0.4	ERR	0.1	0.2	ERR	ERR	0.2	1	0.1	0.2	0.1	
TEMPERATURE, FLOWING GAS	DEGREE F	48.2	48.2	48.2	48.2	48.2	48.2	48.2	48.2	48.2	48.2	48.2	48.2	48.2	48.2	48.2	48.2	
COMMENTS	EXPLANATION																	
FID	PPM (v/v)	110	14	16	375	68	60	ERR	100	12	ERR	ERR	15	10	8	36	30	
FID (converted to ug/L)	uG/L	427	54	62	1454	264	233	ERR	388	47	ERR	ERR	58	39	31	140	116	
DATA REDUCTION																		
G = SPECIFIC GRAVITY, GAS	DIMENSIONLESS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Rd = REYNOLD'S #, DESIGN	DIMENSIONLESS	63011	8456	8456	8456	8456	8456	8456	8456	8456	8456	8456	8456	8456	8456	8456	8456	
K = ORIFICE COEFFICIENT	DIMENSIONLESS	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	0.6110	
Fa = ORIFICE EXPANSION FACTOR	DIMENSIONLESS	0.999732911	0.999732911	0.999732911	0.999732911	0.999732911	0.999732911	0.999732911	0.999732911	0.999732911	0.999732911	0.999732911	0.999732911	0.999732911	0.999732911	0.999732911	0.999732911	
Ti = TEMPERATURE OF FLOWING GAS	DEG R	508.2	508.2	508.2	508.2	508.2	508.2	508.2	508.2	508.2	508.2	508.2	508.2	508.2	508.2	508.2	508.2	
Pi = PRESSURE OF FLOWING GAS	PSIA	14.7	14.44709	14.04966	13.83288	13.83288	14.04966	ERR	13.65223	13.47158	ERR	ERR	13.18254	14.30257	14.3387	14.26644	14.12192	
Fpv = GAS COMPRESSIBILITY FACTOR	DIMENSIONLESS	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Y = GAS EXPANSION FACTOR	DIMENSIONLESS	1	1	0.99991458868	0.99982650034	0.99991325017	0.99982917736	ERR	1	0.99982184718	ERR	ERR	0.99918073452	0.9983219799	1	0.99991588651	0.99991502572	
ORIFICE																		
Qinit = GAS FLOW RATE, UPON ARRIVAL	SCFM	ERR	0.00	2.33	3.26	2.31	3.29	ERR	0.00	3.22	ERR	ERR	6.76	10.48	0.00	2.34	2.33	
Qadj = GAS FLOW RATE, READJUSTED	SCFM	ERR	0.00	3.29	3.26	4.00	4.65	ERR	2.29	3.22	ERR	ERR	3.18	7.41	2.35	3.32	2.33	
PRODUCT REMOVAL RATE																		
ORIFICE, INITIAL	POUNDS/HR	ERR	0.0000	0.0022	0.0716	0.0092	0.0115	ERR	0.0000	0.0023	ERR	ERR	0.0059	0.0061	0.0000	0.0049	0.0041	
ORIFICE ADJUSTED	POUNDS/HR	ERR	0.0000	0.0031	0.0716	0.0159	0.0163	ERR	0.0134	0.0023	ERR	ERR	0.0028	0.0043	0.0011	0.0070	0.0041	
EFFECTIVENESS																		
RADIUS, ORIFICE, INITIAL	FEET	NA	0.50	4.20	5.70	4.17	5.74	ERR	0.50	5.63	ERR	ERR	11.25	17.18	0.50	4.23	4.21	
RADIUS, ORIFICE, ADJUSTED	FEET	NA	0.50	5.74	5.70	6.86	7.90	ERR	4.15	5.63	ERR	ERR	5.57	12.29	4.24	5.78	4.21	