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Enclosed

DUNLOP

COMPLETION OF HYDROGEOLOGIC INVESTIGATION

- GROUNDWATER
- SURFACE WATER

Buffalo, New York Plant

COMPLETION OF HYDROGEOLOGIC INVESTIGATION

- GROUNDWATER
- SURFACE WATER

Buffalo, New York Plant

February 1986
Ref. No. 1135

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
CONESTOGA ROVERS & ASSOCIATES LIMITED

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1.0 INTRODUCTION

In October 1983, Advanced Environmental Systems Inc. and Conestoga-Rovers & Associates Limited submitted the results of their investigation at the Dunlop Tire & Rubber Corporation Plant in Buffalo, New York in the report entitled "Investigation of Inactive Waste Disposal Sites - Buffalo Plant - October 3, 1983". The results of this investigation identified no impact on the groundwater environment as a result of the inactive waste sites at the plant. The report recommended that the potential impact on the surface water environment be evaluated to finalize the investigation of the site.

The purpose of this report is to present the results of the investigation regarding the potential impact on surface water quality at the site as a result of the presence of the inactive waste disposal sites. The program developed for this investigation was submitted to the NYSDEC as "Phase II - Surface Water Investigation - Buffalo Plant - November 1984" and reviewed with State personnel on June 20, 1985. During the meeting, the plan was modified slightly and approved. A request to collect one additional round of groundwater samples from the existing monitoring wells was also agreed to in order to confirm the results of the previous hydrogeologic investigation.

2.0 GROUNDWATER PROGRAM

2.1 SAMPLING PROGRAM

On August 2, 1985, sampling personnel from Advanced Environmental Systems Inc., collected groundwater samples from the two bedrock wells and three of the four overburden wells at the site. The fourth overburden well (OMW-4) was dry and therefore sampling was not possible.

Each of the three overburden wells was purged to dryness, and the two bedrock wells were purged of four well volumes of groundwater prior to sample collection. The samples were collected with a stainless steel bailer which had been precleaned with rinses of acetone, hexane, acetone and distilled water prior to use at each well.

2.2 ANALYTICAL RESULTS

The collected samples were transported to the laboratory facilities of Advanced Environmental Systems Inc. where the analyses were performed. Each sample was analyzed for the set of site specific parameters established for the hydrogeologic investigation.

The results of the analyses including the quality control documentation is presented in Appendix A. A summary of these results is presented in Table 1.

TABLE 1

ANALYTICAL RESULTS - GROUNDWATER SAMPLING PROGRAM

AUGUST 2, 1985

Parameter	BMW-1	BMW-2	OMW-1	OMW-2	OMW-3	OMW-4
Phenols (ppm)	<0.1	<0.1	<0.1	<0.1	<0.1	Dry
Chloroform (ppb)	<1	<1	<1	3.43	<1	Dry
Carbon Tetrachloride (ppb)	<1	<1	<1	<1	<1	Dry
Trichloroethylene (ppb)	<1	<1	<1	<1	<1	Dry
Tetrachloroethylene (ppb)	<1	<1	<1	1.36	<1	Dry

2.3 DISCUSSION

As can be seen in Table 1, the analytical results from this confirmatory round of groundwater samples agree with the preliminary round collected in July 1983. As noted in the first round, the bedrock groundwater does not indicate the presence of any of the site specific parameters.

In addition, none of the site specific parameters were present~~ed~~ in either OWM-1 or OWM-3 at a detection level of 1 ppb. Trace concentrations of tetrachloroethylene (1.36 ppb) and chloroform (3.43 ppb) were detected at OWM-2. However, given the fact that the chemicals are present in trace concentrations and the low permeability of the overburden groundwater regime, the presence of these trace concentrations is not environmentally significant.

It is therefore concluded that the clayey soils underlying the plant site are effectively preventing the vertical migration of contaminants, thus protecting the groundwater of both the overburden and bedrock regimes.

3.0 SURFACE WATER INVESTIGATION

3.1 SAMPLING PROGRAM

As described in the sampling protocols for the Surface Water Investigation, surface water samples were collected on two occasions from the plant area. The first sampling event occurred on June 25, 1985 which was intended to fulfill the dry sampling period. The second sampling event occurred on November 4, 1985 during a stormy period. The precipitation recorded at the Buffalo Airport is as follows:

Date	Precipitation (inches)
June 19	0.00
June 20	0.34
June 21	0.00
June 22	0.28
June 23	0.00
June 24	0.00
June 25	0.00
October 29	0.00
October 30	0.00
October 31	0.00
November 1	0.00
November 2	0.14
November 3	1.56
November 4	1.68

During the June sampling event, it was not possible to collect surface water samples from seven of the proposed sampling stations because no water was available. In November, only one of the proposed sampling stations (SW8) was dry. The locations of all sampling stations are presented in Figure 1. In addition to the eight surface water sampling stations and four ditch locations, one sample was collected from the plant's storm sewer outfall.

Each sample was collected in the sample jar submitted to the laboratory for analysis.

3.2 ANALYTICAL RESULTS

Each sample was transported directly to the laboratory facilities of Advanced Environmental Systems Inc. for analysis. The results of these analyses are presented in Table 2.

Copies of the analytical reports including the quality assurance documentation is presented in Appendix B.

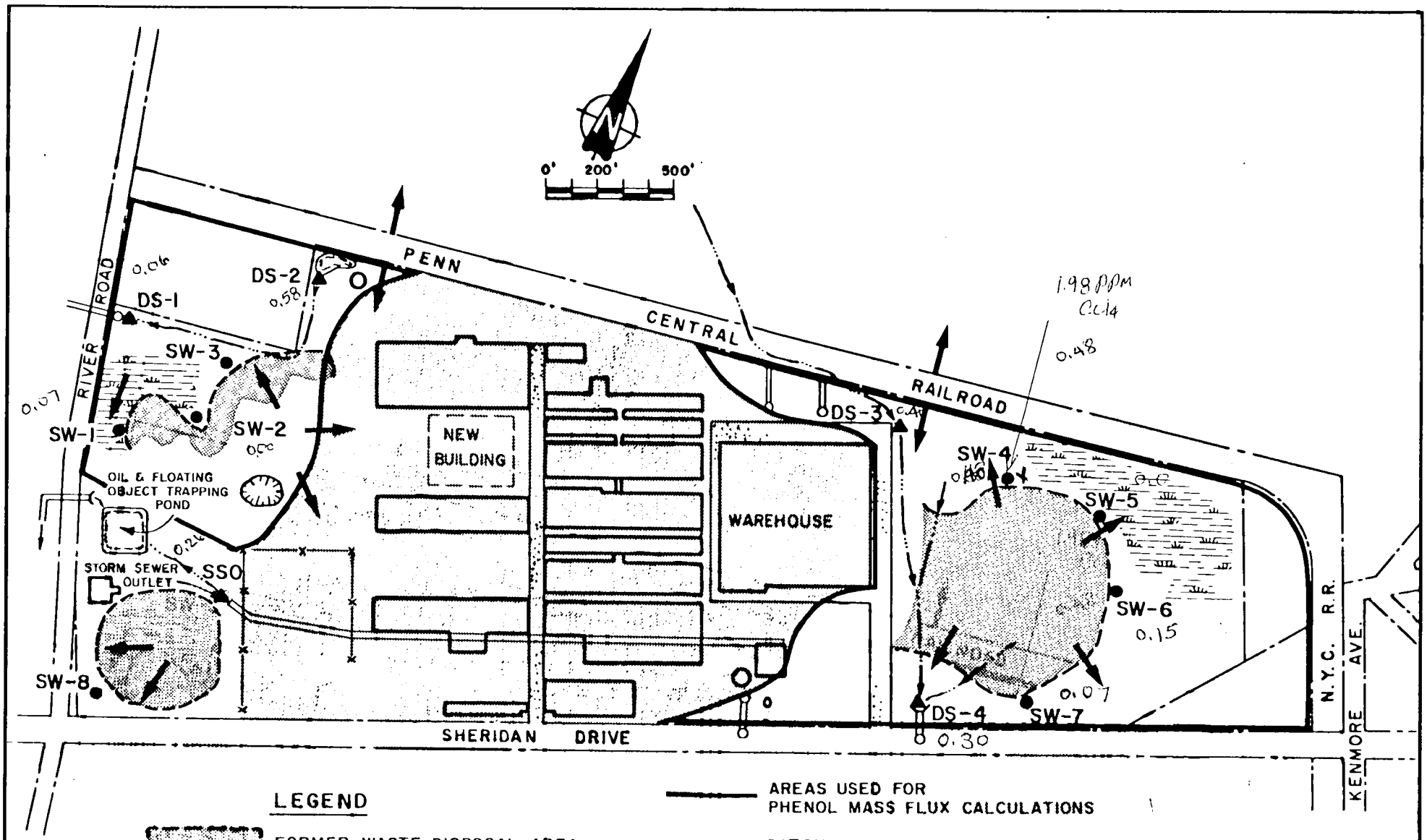

figure 1

SURFACE WATER SAMPLING LOCATIONS

Buffalo, New York

Dunlop Tire and Rubber Corporation

CRA

1135 - 20/02/86

TABLE 2

ANALYTICAL RESULTS - SURFACE WATER SAMPLING PROGRAM

JULY - NOVEMBER 1985

Parameter	DS-1 J	DS-1 N	DS-2 J	DS-2 N	DS-3 J	DS-3 N	DS-4 J	DS-4 N	SW1 J	SW1 N	SW2 J	SW2 N	SW3 J	SW3 N	SW4 J	SW4 N	SW5 J	SW5 N	SW6 J	SW6 N	SW7 J	SW7 N	SW8 J	SW8 N	Storm Sewer Outlet J	Storm Sewer Outlet N
1 — Phenol (ppm)	NA	.06	.58	<.02	.40	.05	.30	.08	NA	.07	NA	<.02	NA	<.02	.48	<.02	NA	<.02	.15	<.02	NA	.06	NA	NA	.26	<.02
2 — Chloroform (ppb)	NA	<1	<1	<1	<1	<1	<1	<1	NA	<1	NA	<1	NA	<1	1.98	<1	NA	<1	<1	<1	NA	<1	NA	NA	<1	<1
3 — Carbon Tetrachloride (ppb)	NA	<1	<1	<1	<1	<1	<1	<1	NA	<1	NA	<1	NA	<1	<1	<1	NA	<1	<1	<1	NA	<1	NA	NA	<1	<1
4 — Trichloroethylene (ppb)	NA	<1	<1	<1	<1	<1	<1	<1	NA	<1	NA	<1	NA	<1	<1	<1	NA	<1	<1	<1	NA	<1	NA	NA	<1	<1
5 — Tetrachloroethylene (ppb)	NA	<1	<1	<1	<1	<1	<1	<1	NA	<1	NA	<1	NA	<1	<1	<1	NA	<1	<1	<1	NA	<1	NA	NA	<1	<1

NA - sample not available
J - June 25, 1985 (dry sampling event)
N - November 4, 1985 (storm sampling event)

5 Indicator parameters

3.3 DISCUSSION

In all the surface water analyses performed, the presence of chloroform, carbon tetrachloride, trichloroethylene and tetrachloroethylene was not detected in any sample at a detection level of 1 ppb, except for 1.98 ppb of chloroform at SW4. The presence of chloroform was not detected under storm conditions but was detected during the dry sampling event when soil/water contact times are greater. The measured chloroform level is below the 100 ug/l New York State quality standards for Class GA groundwater, and therefore not of concern.

As noted in Table 2, phenols were present in several of the surface water samples collected around the site. No measured phenol concentration from any surface water sample exceeded 0.6 mg/l. Of the six locations for which analytical results are available for both the dry and wet sampling events, the measured phenol concentrations decreased considerably under the wet conditions. This indicates that while slightly elevated concentrations of phenols can be generated under prolonged contact with site soils, the impact of contact with the waste materials is generally negligible under flowing conditions.

The water quality in the two major ditches traversing the former waste sites do indicate slight increases in phenol ~~concentrations~~ (<20 to 60 ppb on west

area and from 50 to 80 ppb on east area) under flowing conditions. However, under dry conditions the eastern ditch (between ditch station DS3 and DS4) phenol concentration reduces (from 400 ppb at DS3 to 300 ppb at DS4) as it passes the waste area. The western ditch could not be sampled downstream of the waste area due to the unavailability of water at DS1 during the dry period.

Disposal site not impacting phenol contamination

In order to determine the significance of these phenol concentrations in the surface water regime, an assessment of the phenol loading leaving the site via the surface water ditches has been undertaken. This assessment uses the measured phenol concentrations in the ditches and estimates of the site runoff to calculate the mass flux of phenol discharging from the former disposal areas.

Estimates of annual water surplus available for runoff of 13 inches and 11.2 inches (Niagara Falls, Ontario data) were obtained from references 1 and 2, respectively. Using these estimates, the yearly quantity of water discharging from the entire area surrounding the west and east former disposal areas (as defined in Figure 1) are:

i) West Area R = 13 in/yr Q = 2,882 ft^3/day

R = 11.2 in/yr Q = 2,483 ft^3/day

ii) East Area R = 13 in/yr Q = 6,008 ft^3/day

R - 11.2 in/yr Q = 5,177 ft^3/day

Using the maximum measured phenol concentrations of 580 ppb and 400 ppb for the west and east areas, respectively, the mass flux of phenol from the site in surface waters is:

i) West Area R = 13 in/yr M = 0.104 lbs/day of phenol
R = 11.2 in/yr M = 0.090 lbs/day of phenol

ii) East Area R = 13 in/yr M = 0.150 lbs/day of phenol
R = 11.2 in/yr M = 0.130 lbs/day of phenol

This produces a total estimated maximum mass flux ranging from 0.220 to 0.254 lbs/day of phenols from the site via the surface water. As a further step in the assessment, an estimate has also been made to consider the mass flux of phenol discharging from the site under a storm event.

To estimate a storm related daily phenol mass flux from the Dunlop site, 24 hour average rainfall intensities were used. Reference 3 provided the following values.

i) for a two year return period, rainfall intensity is 0.085 in/hr,

ii) for a five year return period, rainfall intensity is 0.11 in/hr, and

iii) for a ten year return period, rainfall intensity is 0.13 in/hr.

To calculate a mass flux, the following assumptions were made:

i) The ponds are full and the ground is saturated.

ii) Contributions from the site increased phenol concentrations from:

a) - East Area - 50 ppb (DS-3) to 80 ppb (DS-4) during the storm event monitored in November 1985. Thus the east area of the site contributed 30 ppb of phenol to the surface water discharge

b) - West Area - less than 20 ppb (DS-2) to 60 (DS-1) for the same storm event. Since DS-2 does not receive off-site contributions, 60 ppb will be used as the concentration of phenol from the west area of the site.

The first assumption implies that all rainfall within the contributing areas indicated on Figure 1, will contribute to runoff. This is a conservative (worst case) assumption.

The estimated storm related phenol mass fluxes are presented in Table 3. Based on these assumptions, the amount of total phenol leaving the site is calculated to be:

TABLE 3

STORM EVENT PHENOL MASS FLUX
(lbs/day)

	West Area	East Area	Total
24-Hour Event Return Period			
Two Year	0.62	0.64	1.26
Five Year	0.80	0.84	1.64
Ten Year	0.95	0.99	1.94

i) 1.26 lb/day for a two year 24 hour storm,

ii) 1.64 lb/day for a five year 24 hour storm, and

iii) 1.94 lb/day for a ten year 24 hour storm.

While other shorter storm duration periods could be used for the mass flux calculations from a storm event, (intensities are greater for shorter duration periods), the total quantity of rainfall over a 24 hour period is less than that of a 24 hour duration storm. Therefore, use of a 24 hour duration storm is conservative.

The net result of the surface water investigation is that the volume of phenol estimated to be discharging from the areas surrounding the former east and west disposal areas is conservatively estimated to be less than two pounds per day even from a ten year 24 hour storm event. Under long term conditions, the average daily discharge is estimated to be less than 0.25 pounds per day. It is to be noted that the actual mass flux of phenol discharging from the former disposal areas would probably be considerably less than the figures indicated, due to all of the conservative assumptions made including:

- Use of highest phenol concentrations measured (580 and 400 ppb) in mass flux calculations for average daily discharge.

- Use of measured phenol concentrations under flowing conditions in two, five and ten year storm events loading calculations. Under such storm conditions, the phenol concentrations would have been diluted even further.

- Use of the entire areas discharging to the surface water outfalls rather than restricting the on-site flow contribution to that which would actually have been in contact with the former waste disposal areas.

Given all of the above, it can be seen that there is no significant environmental impact as a result of surface water contact with materials in the former waste disposal areas. However, it is noted that water in contact with the waste does exhibit the presence of phenol and therefore it is still recommended that Dunlop continue with their current program of dealing with the former disposal areas which includes:

1) Dunlop should continue with its program of covering the waste areas with low permeable material (i.e. clay).

2) All of the waste areas should be regraded according to a proper grading plan to promote surface water runoff.

3) The waste materials in direct contact with standing surface water should be addressed first.

- Specific plan is necessary to discuss as how this problem is to be addressed.

All of Which is Respectfully Submitted,

ADVANCED ENVIRONMENTAL SYSTEMS INC.

W. Joseph McDougall

W. Joseph McDougall, Ph.D.

CONESTOGA-ROVERS & ASSOCIATES LIMITED

James K. Kay / K.K.

James K. Kay, P. Eng.

REFERENCES

1. The Climate of Southern Ontario, Climatological Studies Number 5, D.M. Brown, G.A. McKay and L.J. Chapman, Department of Transport, Meteorological Branch, Toronto, 1968.

2. Average Annual Water Surplus in Canada, Climatological Studies Number 9, M.E. Sanderson and D.W. Philips, Department of Transport, Meteorological Branch, Toronto, 1967.

3. Storm Drainage Design Manual, Erie and Niagara Counties Regional Planning Board, Amherst, New York, 1981.

APPENDIX A

GROUNDWATER ANALYTICAL RESULTS

AUGUST 2, 1985

1135

PHASE I HYDROGEOLOGIC INVESTIGATION
SUPPLEMENTAL SAMPLING AND ANALYSIS OF GROUNDWATER

Report Prepared For

DUNLOP TIRE CORPORATION

By

ADVANCED ENVIRONMENTAL SYSTEMS, INC.

W. Joseph McDougall

W. Joseph McDougall, Ph.D.
Technical Evaluation

September 11, 1985
AES Report AAB

ANALYTICAL METHODOLOGIES

The method numbers for each procedure are listed in the second column of the tabulated results. The source for each method is listed as a reference number in the third column. The source(s) for the Analytical Methodologies are:

1 - EPA 600/D-80-021, "Guidelines Establishing Test Procedures for the Analysis of Pollutants; Proposed Regulations", Federal Register 44(233), December 3, 1979.

2 - EPA 600/D-80-022, "Guidelines Establishing Test Procedures for the Analysis of Pollutants; Proposed Regulations, Correction", Federal Register 44(244), December 18, 1979.

3 - EPA 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", (1983)

4 - EPA 600/4-79-057, "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater", (1982)

5 - EPA-SW-846, "Test Methods for Evaluating Solid Waste, Physical/ Chemical Methods", second edition (1982)

6 - "Standard Methods for the Examination of Water and Wastewater", 15th Edition, (1980)

7 - New York State Institute of Toxicology Analytical Handbook, October 1982

8 - NIOSH Manual of Analytical Methods, second edition 1977

9 - "The Analysis of Polychlorinated Biphenyls in Transformer Fluid and Waste Oil", EPA Environmental Monitoring and Support Laboratory, draft, June 24, 1980

10 - "Approved Analytical Procedures for Determining the Content of Constituents Banned from Landburial" (New York State D.E. C., Division of Solid and Hazardous Waste), Jan. 1985.

11 - EPA 600/4-81-055, "Interim Methods for the Sampling and Analysis of Priority Pollutants in Sediments and Fish Tissue", Revised Jan. 7, 1983

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: RESULTS - WET CHEMISTRY
UNITS OF MEASURE: MILLIGRAMS/LITER, OR PPM
CLIENT: DUNLOP A.E.S. JOB CODE 01AAB

ANALYSIS	METHOD	REF	DETERMINABLE LIMITS	SAMPLE IDENTIFICATION			
				2155 BMW-1 8/2/85	2156 BMW-2 8/2/85	2157 OMW-1 8/2/85	2158 OMW-2 8/2/85
PHENOLS	420.1	3	0.01	BDL *	BDL	BDL	BDL

*Below determinable limits.

MARLENE C. BOYER
WET CHEMISTRY DIVISION

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: RESULTS - WET CHEMISTRY
UNITS OF MEASURE: **MILLIGRAMS/LITER, OR PPM**
CLIENT: DUNLOP A.E.S. JOB CODE AAB

ANALYSIS	METHOD	REF	DETERMINABLE LIMITS	SAMPLE IDENTIFICATION
				2159 OMW-3 8/2/85
PHENOLS	420.1	3	0.01	BDL*

*Below determinable limits.

Marlene C. Moyer (JP)
MARLENE C. MOYER
WET CHEMISTRY DIVISION

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: WET CHEMISTRY DUPLICATE
UNITS OF MEASURE: MILLIGRAMS/LITER, OR PPM
CLIENT: DUNLOP A.E.S. JOB CODE AAB

ANALYSIS	SAMPLE	ORIGINAL CONC.	DUPL. CONC.	AVERAGE CONC.	RANGE	REL. % DIFF.
PHENOLS	2115	BDL *	BDL	BDL	N/AP**	N/AP
PHENOLS	2157	BDL	BDL	BDL	N/AP	N/AP

Relative Percent Difference =
Range/Average X 100

*Below determinable limits.
**Not applicable.

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: TEST CONTROL WET CHEMISTRY
UNITS OF MEASURE: MILLIGRAMS/LITER, OR PPM
CLIENT: DUNLOP A.E.S. JOB CODE AAB

ANALYSIS	TYPE	ORIGINAL CONC.	ADDED CONC.	EXPECTED CONC.	REPORTED CONC.	PERCENT RECOVERY	95% CONFIDENCE INTERVAL
PHENOLS	SPIKE	BDL	0.77	0.77	0.74	96.6	* N/A
PHENOLS	SPIKE	BDL	1.2	1.2	1.2	100	N/A

*Not available.

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: VOLATILE ORGANICS
UNITS OF MEASURE: MICROGRAMS/LITER, OR PPB
CLIENT: DUNLOP A.E.S. JOB CODE 01AAB

ANALYSIS	METHOD	REF	DETERMINABLE LIMITS	SAMPLE IDENTIFICATION			
				2155 BMW-1 8/2/85	2156 BMW-2 8/2/85	2157 OMW-1 8/2/85	2158 OMW-2 8/2/85
CHLOROFORM	601	1	1.00	BDL*	BDL	BDL	3.43
CARBON TETRACHLORIDE	601	1	1.00	BDL	BDL	BDL	BDL
TRICHLOROETHYLENE	601	1	1.00	BDL	BDL	BDL	BDL
TETERACHLOROETHYLENE	601	1	1.00	BDL	BDL	BDL	1.36

*Below determinable limits.

Susan C. Scrocchi

SUSAN C. SCROCCHI
G. C. SUPERVISOR

[redacted] LABORATORY REPORT

TYPE OF ANALYSIS: VOLATILE ORGANICS
UNITS OF MEASURE: MICROGRAMS/LITER, OR PPB
CLIENT: DUNLOP A.E.S. JOB CODE 02AAB

ANALYSIS	METHOD	REF	DETERMINABLE LIMITS	SAMPLE IDENTIFICATION 2159 OMW-3 8/2/85	2160 FLD BLK 8/2/85
CHLOROFORM	601	1	1.00	BDL*	BDL
CARBON TETRACHLORIDE	601	1	1.00	BDL	BDL
TRICHLOROETHYLENE	601	1	1.00	BDL	BDL
TETRACHLOROETHYLENE	601	1	1.00	BDL	BDL

*Below determinable limits.

Susan C. Scrocchi

SUSAN C. SCROCCHI
G. C. SUPERVISOR

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: GC - QUALITY CONTROL DUPLICATE
UNITS OF MEASURE: MICROGRAMS/LITER, OR PPB
CLIENT: DUNLOP A.E.S. JOB CODE 01AAB

ANALYSIS	SAMPLE	ORIGINAL CONC.	DUPL. CONC.	AVERAGE CONC.	RANGE	REL. % DIFF.
CHLOROFORM	2155	<1.00	<1.00	NA *	NA	NA
CARBON TETRACHLORIDE	2155	<1.00	<1.00	NA	NA	NA
TRICHLOROETHYLENE	2155	<1.00	<1.00	NA	NA	NA
TETRACHLOROETHYLENE	2155	<1.00	<1.00	NA	NA	NA
CHLOROFORM	2157	<1.00	<1.00	NA	NA	NA
CARBON TETRACHLORIDE	2157	<1.00	<1.00	NA	NA	NA
TRICHLOROETHYLENE	2157	<1.00	<1.00	NA	NA	NA
TETRACHLOROETHYLENE	2157	<1.00	<1.00	NA	NA	NA

Relative Percent Difference =
Range/Average X 100

*Not applicable.

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: GC - TEST CONTROLS
UNITS OF MEASURE: MICROGRAMS/LITER, OR PPB
CLIENT: DUNLOP A.E.S. JOB CODE 01AAB

ANALYSIS	TYPE	ORIGINAL CONC.	ADDED CONC.	EXPECTED CONC.	REPORTED CONC.	PERCENT RECOVERY	95% CONFIDENCE INTERVAL
CARBON TETRACHLOROIDE	2155	<1.00	14.04	14.04	14.75	105.0	*NA
TRICHLOROETHYLENE	2155	<1.00	11.52	11.52	15.35	133.3	NA
CHLOROFORM	2155	<1.00	11.37	11.37	9.58	84.3	8.6-14.8
CARBON TETRACHLOROIDE	2157	<1.00	14.04	14.04	17.89	127.4	NA
TETRACHLOROETHYLENE	2157	<1.00	13.79	13.79	17.24	125.0	11.5-16.5
CHLOROFORM	2157	<1.00	11.37	11.37	13.16	115.7	8.6-14.8

*Not available.

APPENDIX B

SURFACE WATER ANALYTICAL RESULTS

JUNE 25, 1985

NOVEMBER 4, 1985

PHASE II SURFACE WATER INVESTIGATION
SURFACE WATER SAMPLING ON JUNE 25, 1985
A) NO PRECIPITATION

Report Prepared For

DUNLOP TIRE CORPORATION

By

ADVANCED ENVIRONMENTAL SYSTEMS, INC.

W. Joseph McDougall, Ph.D.
Technical Evaluation

July 16, 1985
AES Report AAB

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: RESULTS - WET CHEMISTRY
UNITS OF MEASURE: MILLIGRAMS/LITER, OR PPM
CLIENT: DUNLOP A.E.S. JOB CODE 01AAB

ANALYSIS	METHOD	REF	DETERMINABLE LIMITS	SAMPLE IDENTIFICATION			
				1722 SS0 6/25/85	1723 DS2 6/25/85	1724 DS3 6/25/85	1725 DS4 6/25/85
PHENOLS	420.1	3	0.01	0.26	0.58	0.40	0.30

MARLENE C. MOYER
WET CHEMISTRY DIVISION

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: RESULTS - WET CHEMISTRY
UNITS OF MEASURE: MILLIGRAMS/LITER, OR PPM
CLIENT: A.E.S. JOB CODE 01AAB

ANALYSIS	METHOD	REF	DETERMINABLE LIMITS	SAMPLE IDENTIFICATION	
				1726	1727
				SW 4	SW 6
				6/25/85	6/25/85
PHENOLS	420.1	3	0.01	0.48	0.15

Marlene Chrystl Moyer

MARLENE C. MOYER
WET CHEMISTRY DIVISION

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: WET CHEMISTRY DUPLICATE
UNITS OF MEASURE: MILLIGRAMS/LITER, OR PPM
CLIENT: A.E.S. JOB CODE 01AAB

ANALYSIS	SAMPLE	ORIGINAL CONC.	DUPL. CONC.	AVERAGE CONC.	RANGE	REL. % DIFF.
PHENOLS	1722	0.15	0.26	0.17	0.22	84.6*
PHENOLS	1725	0.32	0.27	0.30	0.056	18.8
PHENOLS	1726	0.37	0.60	0.48	0.229	47.2 *

*Separate samples

Relative Percent Difference =
Range/Average X 100

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: TEST CONTROL WET CHEMISTRY
UNITS OF MEASURE: MILLIGRAMS/LITER, OR PPM
CLIENT: A.E.S. JOB CODE 01AAB

ANALYSIS	TYPE	ORIGINAL CONC.	ADDED CONC.	EXPECTED CONC.	REPORTED CONC.	PERCENT RECOVERY	95% CONFIDENCE INTERVAL
PHENOLS *	SPIKE	0.26	0.60	0.86	0.95	110.5	N/A
PHENOLS *	SPIKE	0.30	0.60	0.90	0.75	83.96	N/A

*The spikes and duplicates were performed on separate samples.

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: VOLATILE ORGANICS
UNITS OF MEASURE: MICROGRAMS/LITER, OR PPB
CLIENT: DUNLOP A.E.S. JOB CODE 01AAB

ANALYSIS	METHOD	REF	DETERMINABLE LIMITS	SAMPLE IDENTIFICATION 1722 SSO 6-25-85	1723 DS #2 6-25-85	1724 DS #3 6-25-85	1725 DS #4 6-25-85
CHLOROFORM	601	1	1.0	BDL*	BDL	BDL	BDL
CARBON TETRACHLORIDE	"	"	1.0	BDL	BDL	BDL	BDL
TRICHLOROETHYLENE	"	"	1.0	BDL	BDL	BDL	BDL
TETRACHLOROETHYLENE	"	"	1.0	BDL	BDL	BDL	BDL

*Below determinable limits.

Susan M. Cerquetti

SUSAN M. CERQUETTI
G. C. DIVISION

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: VOLATILE ORGANICS
UNITS OF MEASURE: MICROGRAMS/LITER, OR PPB
CLIENT: DUNLOP - A.E.S. JOB CODE 02AAB

ANALYSIS	METHOD	REF	DETERMINABLE LIMITS	SAMPLE IDENTIFICATION 1726 SW-4 6-25-85	1727 SW-6 6-25-85
CHLOROFORM	601	1	1.0	1.98	BDL*
CARBON TETRACHLORIDE	"	"	1.0	BDL	BDL
TRICHLOROETHYLENE	"	"	1.0	BDL	BDL
TETRACHLOROETHYLENE	"	"	1.0	BDL	BDL

*Below determinable limits.

Susan M Cerquetti

SUSAN M. CERQUETTI
G. C. DIVISION

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: GC - QUALITY CONTROL DUPLICATE
UNITS OF MEASURE: MICROGRAMS/LITER, OR PPB
CLIENT: DUNLOP A.E.S. JOB CODE 01AAB

ANALYSIS	SAMPLE	ORIGINAL CONC.	DUPL. CONC.	AVERAGE CONC.	RANGE	REL. % DIFF.
CHLOROFORM	1722	<1.0	<1.0	NA *	NA	NA
CHLOROFORM	1725	<1.0	<1.0	NA	NA	NA
CHLOROFORM	1726	1.95	2.01	1.98	0.03	1.5
CARBON TETRACHLORIDE	1722	<1.0	<1.0	NA	NA	NA
CARBON TETRACHLORIDE	1725	<1.0	<1.0	NA	NA	NA
CARBON TETRACHLORIDE	1726	<1.0	<1.0	NA	NA	NA
TRICHLOROETHYLENE	1722	<1.0	<1.0	NA	NA	NA
TRICHLOROETHYLENE	1725	<1.0	<1.0	NA	NA	NA
TRICHLOROETHYLENE	1726	<1.0	<1.0	NA	NA	NA
TETRACHLOROETHYLENE	1722	<1.0	<1.0	NA	NA	NA
TETRACHLOROETHYLENE	1725	<1.0	<1.0	NA	NA	NA
TETRACHLOROETHYLENE	1726	<1.0	<1.0	NA	NA	NA

Relative Percent Difference =
Range/Average X 100
*Not applicable.

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: GC - TEST CONTROLS
UNITS OF MEASURE: MICROGRAMS/LITER, OR PPB
CLIENT: DUNLOP A.E.S. JOB CODE 01AAB

ANALYSIS	TYPE	ORIGINAL CONC.	ADDED CONC.	EXPECTED CONC.	REPORTED CONC.	PERCENT RECOVERY	95% CONFIDENCE INTERVAL
CHLOROFORM (1722)	SPIKE	<1.0	9.90	9.90	10.25	103.6	7.5-12.9
CHLOROFORM (1726)	"	1.98	9.90	11.88	13.68	115.1	9.0-15.4
CARBON TETRACHLORIDE 1722	"	<1.0	8.68	8.68	8.51	98.1	NA *
CARBON TETRACHLORIDE 1725	"	<1.0	8.68	8.68	8.25	95.0	NA
TRICHLOROETHYENE (1722)	"	<1.0	9.07	9.07	9.00	99.2	7.5-10.5
TRICHLOROETHYLEN (1725)	"	<1.0	9.07	9.07	9.05	99.8	7.5-10.5
TETRACHLOROETHYLENE (1726)	"	<1.0	8.85	8.85	8.40	94.9	6.7-11.5
TETRACHLOROETHYLENE (1725)	"	<1.0	8.85	8.85	8.44	95.3	6.7-11.5

*Not available.

ANALYTICAL METHODOLOGIES REFERENCE LIST

Routine Analyses are Performed in Accordance with Protocols Found in the Following Numbered Sources. These Numbers Correspond to those Listed in the Laboratory Report Under the Reference ("REF") Column.

1 - EPA 600/D-80-021, "Guidelines Establishing Test Procedures for the Analysis of Pollutants; Proposed Regulations", Federal Register 44(233), December 3, 1979.

2 - EPA 600/D-80-022, "Guidelines Establishing Test Procedures for the Analysis of Pollutants; Proposed Regulations, Correction", Federal Register 44(244), December 18, 1979.

3 - EPA 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", (1983)

4 - EPA 600/4-79-057, "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater", (1982)

5 - EPA-SW-846, "Test Methods for Evaluating Solid Waste, Physical/ Chemical Methods", second edition (1982)

6 - "Standard Methods for the Examination of Water and Wastewater", 15th Edition, (1980)

7 - New York State Institute of Toxicology Analytical Handbook, October 1982

8 - NIOSH Manual of Analytical Methods, second edition 1977

9 - "The Analysis of Polychlorinated Biphenyls in Transformer Fluid and Waste Oil", EPA Environmental Monitoring and Support Laboratory, draft, June 24, 1980

PHASE II SURFACE WATER INVESTIGATION
SURFACE WATER SAMPLING ON NOVEMBER 4, 1985
B) DURING A STORM EVENT

Report Prepared For

DUNLOP TIRE CORPORATION

By

ADVANCED ENVIRONMENTAL SYSTEMS, INC.

W. Joseph McDougall, Ph.D.
Technical Evaluation

December 12, 1985
AES Report AAB

SCOPE OF WORK

This was an item of work listed in, "Phase II Surface Water Investigation, Buffalo Plant", November 1984. The work item was discussed June 20, 1985 at the New York State Department of Environemntal Conservation (DEC), Region 9, as well.

The results from drier conditions were reported July 16, 1985.

COLLECTION OF SAMPLES

There was nearly continuous rainfall starting Saturday noon, November 2 through (and beyond) Monday, November 4, 1985. The National Weather Service at the Buffalo Airport reported the following amounts of rainfall:

Date	Inches of Rainfall
November 2	0.14
November 3	1.56
November 4	1.68

The samples were collected from 1:30 to 4:30 p.m. on Monday, November 4, 1985. At each location, samples were collected for the DEC, as well.

Despite the heavy rainfall, no surface water was present at Sampling Location Number 8.

ANALYTICAL METHODOLOGIES

The method numbers for each procedure are listed in the second column of the tabulated results. The source for each method is listed as a reference number in the third column. The source(s) for the Analytical Methodologies are:

1 - EPA 600/D-80-021, "Guidelines Establishing Test Procedures for the Analysis of Pollutants; Proposed Regulations", Federal Register 44(233), December 3, 1979.

2 - EPA 600/D-80-022, "Guidelines Establishing Test Procedures for the Analysis of Pollutants; Proposed Regulations, Correction", Federal Register 44(244), December 18, 1979.

3 - EPA 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes", (1983)

4 - EPA 600/4-79-057, "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater", (1982)

5 - EPA-SW-846, "Test Methods for Evaluating Solid Waste, Physical/ Chemical Methods", second edition (1982)

6 - "Standard Methods for the Examination of Water and Wastewater", 15th Edition, (1980)

7 - New York State Institute of Toxicology Analytical Handbook, October 1982

8 - NIOSH Manual of Analytical Methods, second edition 1977

9 - "The Analysis of Polychlorinated Biphenyls in Transformer Fluid and Waste Oil", EPA Environmental Monitoring and Support Laboratory, draft, June 24, 1980.

10 - "Approved Analytical Procedures for Determining the Content of Constituents Banned from Landburial" (New York State D.E.C., Division of Solid and Hazardous Waste), Jan. 1985.

11 - EPA 600/4-81-055, "Interim Methods for the Sampling and Analysis of Priority Pollutants in Sediments and Fish Tissue", Revised Jan. 7, 1983.

12 - "Determination of Formaldehyde in the Atmosphere", Environmental Health Center, Div. of Laboratories and Research, N.Y.S. Dept. of Health APC-29.

13 - "Chemical Soil Tests", Cornell University Agricultural Experiment Station, N.Y.S. College of Agricultural, Ithaca, N.Y. Bulletin 960, Revised Oct. 1965.

14 - "Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter", American Society for Testing and Materials, Philadelphia, Pa., Designation: D 240-64 (Reapproved 1973).

15 - "Analyzing Trace Amounts of Solvents in Water" (Supelco Bulletin 816)

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: RESULTS - WET CHEMISTRY
UNITS OF MEASURE: MILLIGRAMS/LITER, OR PPM
CLIENT: DUNLOP A.E.S. JOB CODE AAB

ANALYSIS	METHOD	REF	DETERMINABLE LIMITS	SAMPLE IDENTIFICATION			
				3414 DS1 11/4/85	3415 DS2 11/4/85	3416 DS3 11/4/85	3417 DS4 11/4/85
TOTAL RECOVERABLE PHENOLS	420.2	3	0.02*	0.06	BDL **	0.05	0.08

*This automated EPA Method has slightly higher determinable limits than EPA Method 420.1 limits of 0.01 mg/l.
**Below determinable limits.

Margaret L. Skowron for
MARLENE C. MOYER
WET CHEMISTRY SUPERVISOR

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: RESULTS - WET CHEMISTRY
UNITS OF MEASURE: MILLIGRAMS/LITER, OR PPM
CLIENT: DUNLOP **A.E.S. JOB CODE AAB**

ANALYSIS	METHOD	REF	DETERMINABLE LIMITS	SAMPLE IDENTIFICATION			
				3418	3419	3420	3421
				SS0	SW1	SW2	SW3
				11/04/85	11/04/85	11/04/85	11/04/85
TOTAL RECOVERABLE PHENOLS	420.2	3	0.02	BDL *	0.07	BDL	BDL

*Below determinable limits.

Margaret L. Stevenson for
MARLENE C. MOYER
WET CHEMISTRY SUPERVISOR

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: RESULTS - WET CHEMISTRY
UNITS OF MEASURE: MILLIGRAMS/LITER, OR PPM
CLIENT: DUNLOP A.E.S. JOB CODE AAB

ANALYSIS	METHOD	REF	DETERMINABLE LIMITS	SAMPLE IDENTIFICATION			
				3422 SW4 11/04/85	3423 SW5 11/04/85	3424 SW6 11/04/85	2325 SW7 11/04/85
TOTAL RECOVERABLE PHENOLS	420.2	3	0.02	BDL *	BDL	BDL	0.06

*Below determinable limits.

Margaret L. Skowron for
MARLENE C. MOYER
WET CHEMISTRY SUPERVISOR

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: WET CHEMISTRY DUPLICATE
UNITS OF MEASURE: MILLIGRAMS/LITER, OR PPM
CLIENT: DUNLOP **A.E.S. JOB CODE AAB**

ANALYSIS		SAMPLE	ORIGINAL CONC.	DUPL. CONC.	AVERAGE CONC.	RANGE	REL. % DIFF.
PHENOLS	(LAB DUP)	3414	0.06	0.06	0.06	0	0
PHENOLS	(FIELD DUP)	3418	BDL *	BDL	N/AP *	N/AP	N/AP
PHENOLS	(LAB DUP)	3418	>0.05	0.05	BDL	N/AP	N/AP

Relative Percent Difference =
Range/Average X 100
*Below determinable limits.
**Not applicable.

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: TEST CONTROL WET CHEMISTRY
UNITS OF MEASURE: MILLIGRAMS/LITER, OR PPM
CLIENT: DUNLOP A.E.S. JOB CODE AAB

ANALYSIS	TYPE	ORIGINAL CONC.	ADDED CONC.	EXPECTED CONC.	REPORTED CONC.	PERCENT RECOVERY	95% CONFIDENCE INTERVAL
PHENOLS	SPK 3414	0.03	0.5	0.53	0.54	101.9	* N/AV
PHENOLS	DUP 3414	0.30	-	0.30	0.29	96.8	N/AV
PHENOLS	3418	BDL	0.2	0.2	0.22	110	N/AV

*Not available.

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: VOLATILE ORGANICS
UNITS OF MEASURE: MICROGRAMS/LITER, OR PPB
CLIENT: DUNLOP A.E.S. JOB CODE AAB

ANALYSIS	METHOD	REF	DETERMINABLE LIMITS	SAMPLE IDENTIFICATION 3414 DS1 11/4/85	3415 DS2 11/4/85	3416 DS3 11/4/85	3417 DS4 11/4/85
CHLOROFORM	601	1	1.00	BDL *	BDL	BDL	BDL
CARBON TETRACHLORIDE	"	1	1.00	BDL	BDL	BDL	BDL
TRICHLOROETHYLENE	"	1	1.00	BDL	BDL	BDL	BDL
TETRACHLOROETHYLENE	"	1	1.00	BDL	BDL	BDL	BDL

*Below determinable limits.

Susan C. Scrocchi

SUSAN C. SCROCCHI
G. C. SUPERVISOR

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: VOLATILE ORGANICS
UNITS OF MEASURE: MICROGRAMS/LITER, OR PPB
CLIENT: DUNLOP A.E.S. JOB CODE AAB

ANALYSIS	METHOD	REF	DETERMINABLE LIMITS	SAMPLE IDENTIFICATION			
				3418	3419	3420	3421
				SSO	SW1	SW2	SW3
				11/4/85	11/4/85	11/4/85	11/4/85
CHLOROFORM	601	1	1.00	BDL *	BDL	BDL	BDL
CARBON TETRACHLORIDE	"	1	1.00	BDL	BDL	BDL	BDL
TRICHLOROETHYLENE	"	1	1.00	BDL	BDL	BDL	BDL
TETRACHLOROETHYLENE	"	1	1.00	BDL	BDL	BDL	BDL

*Below determinable limits.

Susan C. Scrocchi

SUSAN C. SCROCCHI
G. C. SUPERVISOR

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: VOLATILE ORGANICS
UNITS OF MEASURE: MICROGRAMS/LITER, OR PPB
CLIENT: DUNLOP A.E.S. JOB CODE AAB

ANALYSIS	METHOD	REF	DETERMINABLE LIMITS	SAMPLE IDENTIFICATION			
				3422 SW4 11/4/85	3423 SW5 11/4/85	3424 SW6 11/4/85	3425 SW7 11/4/85
CHLOROFORM	601	1	1.00	BDL *	BDL	BDL	BDL
CARBON TETRACHLORIDE	"	1	1.00	BDL	BDL	BDL	BDL
TRICHLOROETHYLENE	"	1	1.00	BDL	BDL	BDL	BDL
TETRACHLOROETHYLENE	"	1	1.00	BDL	BDL	BDL	BDL

*Below determinable limits.

Susan C. Scrocchi

SUSAN C. SCROCCHI
G. C. SUPERVISOR

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: VOLATILE ORGANICS
UNITS OF MEASURE: MICROGRAMS/LITER, OR PPB
CLIENT: DUNLOP A.E.S. JOB CODE AAB

ANALYSIS	METHOD	REF	DETERMINABLE LIMITS	SAMPLE IDENTIFICATION
				3426 FIELD BLANK 11/4/85
CHLOROFORM	601	1	1.00	BDL *
CARBON TETRACHLORIDE	"	1	1.00	BDL
CHLOROETHYLENE	"	1	1.00	BDL
TETRACHLOROETHYLENE	"	1	1.00	BDL

*Below determinable limits.

Susan C. Scrocchi

SUSAN C. SCROCCHI
G. C. SUPERVISOR

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: DUPLICATES
UNITS OF MEASURE: MICROGRAMS PER LITER OR PPB
CLIENT: DUNLOP A.E.S. JOB CODE AAB

ANALYSIS	SAMPLE	ORIGINAL CONC.	DUPL. CONC.	AVERAGE CONC.	RANGE	REL. % DIFF.
CHLOROFORM	3416	<1.00	<1.00	NA*	NA	NA
CHLOROFORM	3417	<1.00	<1.00	NA	NA	NA
CHLOROFORM	3420	<1.00	<1.00	NA	NA	NA
CARBON TETRACHLORIDE	3416	<1.00	<1.00	NA	NA	NA
CARBON TETRACHLORIDE	3417	<1.00	<1.00	NA	NA	NA
CARBON TETRACHLORIDE	3420	<1.00	<1.00	NA	NA	NA
TRICHLOROETHYLENE	3416	<1.00	<1.00	NA	NA	NA
TRICHLOROETHYLENE	3417	<1.00	<1.00	NA	NA	NA
TRICHLOROETHYLENE	3420	<1.00	<1.00	NA	NA	NA
TETRACHLOROETHYLENE	3416	<1.00	<1.00	NA	NA	NA
TETRACHLOROETHYLENE	3417	<1.00	<1.00	NA	NA	NA
TETRACHLOROETHYLENE	3420	<1.00	<1.00	NA	NA	NA

Relative Percent Difference =
Range/Average X 100
*Not applicable.

ADVANCED ENVIRONMENTAL SYSTEMS, INC.
LABORATORY REPORT

TYPE OF ANALYSIS: TEST CONTROLS
UNITS OF MEASURE: MICROGRAMS PER LITER OR PPB
CLIENT: DUNLOP A.E.S. JOB CODE AAB

ANALYSIS	TYPE	ORIGINAL CONC.	ADDED CONC.	EXPECTED CONC.	REPORTED CONC.	PERCENT RECOVERY	95% CONFIDENCE INTERVAL
CHLOROFORM	3418-SPK	<1.00	12.9	12.9	13.0	100.8	10.8-16.6
CHLOROFORM	3416-SPK	<1.00	12.9	12.9	13.4	103.9	10.8-16.6
CARBON TETRACHLORIDE	3418-SPK	<1.00	12.0	12.0	12.3	102.5	NA*
CARBON TETRACHLORIDE	3416-SPK	<1.00	12.0	12.0	12.1	100.8	NA
TRICHLOROETHYLENE	3418-SPK	<1.00	10.2	10.2	10.8	105.9	8.3-13.2
TRICHLOROETHYLENE	3416-SPK	<1.00	10.2	10.2	10.5	102.9	8.3-13.2
TETRACHLOROETHYLENE	3418-SPK	<1.00	14.6	14.6	16.3	111.6	11.3-19.9
TETRACHLOROETHYLENE	3416-SPK	<1.00	14.6	14.6	15.5	106.2	11.3-19.9

*Not available.