Kefner

HARTCROWSER

Earth and Environmental Technologies

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J-4617

January 29, 1998

U.S. Army Corps of Engineers
Seattle District
P.O. Box 3755
Seattle, Washington 98124-3755

Re: Results of December 1997 Groundwater Sampling and Analysis
Lake Washington Ship Canal
Contract No. DACA67-96-M-0671

Dear Ms. Coffey:

This letter presents the December 1997 groundwater sampling and analysis results for the Lake Washington Ship Canal (Chittenden Locks) site. Approximately 64 tons of near-surface petroleum-contaminated soils were excavated and removed from this site in August/September 1996, following earlier soil investigations which had identified the presence of petroleum hydrocarbons, polychlorinated biphenyls (PCBs), and trace concentrations of other constituents. Following the removal action, three groundwater monitoring wells were installed, and an initial monitoring round was conducted in September 1996. This letter documents the second round of groundwater monitoring at this site.

The three monitoring wells (HC-MW-1 through HC-MW-3), the locations of which are shown on Figure 1, were sampled on December 11 and 13, 1997. Field methods for collecting the groundwater samples and details of the chemical testing and data analysis program are documented in the Sampling and Analysis Plan (dated September 6, 1996), and in two letter revisions to that plan (dated May 30 and November 17, 1997). The groundwater samples were transported under chain of custody protocols to MultiChem Analytical Services of Renton, Washington, for the following analyses:

- Total petroleum hydrocarbon (TPH) using Washington State Method WTPH-D;
- PCBs using EPA Method 8081;
- Polycyclic aromatic hydrocarbons (PAHs) using EPA Method 8270 SIM;
- Volatile organic compounds (VOCs) using EPA Method 8021; and
- Total suspended solids (TSS) using EPA Method 160.2.

Two sets of duplicate samples were collected from well HC-MW-2 for quality assurance (QA) purposes. One set was labeled HC-MW-10 and submitted to MultiChem along with the primary samples. The other was submitted to the Corps' Missouri River District Laboratory for an independent QA review. (The results of the analysis of this sample have not been received as of the date of this report.)

MONITORING RESULTS

Depth to water was measured in each well to assess groundwater flow direction, and TSS was determined in each groundwater sample as an indicator of whether a significant portion of any detected chemical constituent may be associated with suspended solids (versus dissolved in the groundwater). Groundwater elevations and TSS for both the current and previous (September 1996) monitoring rounds are provided in Table 1. As shown on Figure 1, the groundwater flow direction inferred from the current groundwater elevation data is approximately toward the east-southeast.

TPH analytical results from the current round are compared with previous round results in Table 2. Analytical results for individual chemical constituents detected in the current round are summarized in Table 3. The corresponding Washington State Model Toxics Control Act (MTCA) Method B cleanup levels are also listed in Table 3 for comparative purposes. Hart Crowser's analytical data quality review is documented in Attachment A. Copies of the laboratory certificates of analysis are provided in Attachment B.

Results of the current sampling round indicate the following:

- Diesel-range TPH concentrations detected in wells HC-MW-2 and HC-MW-3 are higher than those measured during the previous monitoring round, but are below the corresponding MTCA Method A cleanup level.

- Benzene and 1,4-dichlorobenzene concentrations in well HC-MW-2 marginally exceed the MTCA Method B cleanup levels for those constituents. Chlorobenzene, 1,2-dichlorobenzene, and 1,3-dichlorobenzene were also detected in well HC-MW-2, but at concentrations below MTCA Method B cleanup levels. No VOCs were detected in wells HC-MW-1 and HC-MW-3.

- Trace concentrations of several PAHs were detected in the three monitoring well samples. However, the PAH detections are far below the corresponding MTCA Method B cleanup levels.

- No PCBs were detected in any of the monitoring wells.

LIMITATIONS

Work for this project was performed, and this letter report prepared, in accordance with generally accepted professional practices for the nature and conditions of the work completed in the same or similar localities, at the time the work was performed. It is intended for the exclusive use of the U.S. Army Corps of Engineers for specific application to the referenced property. This report is not meant to represent a legal opinion. No other warranty, express or implied, is made.

Any questions regarding our work and this letter report, the presentation of the information, and the interpretation of the data are welcome and should be referred to the undersigned.

Sincerely,

HART CROWSER, INC.

David A. Heffner

DAVID A. HEFFNER, P.E.
Project Manager

4617/LocksGW.doc

Attachments:
Table 1 - Groundwater Elevations and TSS in Groundwater Samples
Table 2 - Summary of TPH Analytical Results
Table 3 - Summary of Chemical Constituent Analytical Results for Current Sampling Round
Figure 1 - Groundwater Elevation Contour Map
Attachment A - Data Validation Report for Groundwater Samples
Attachment B - Laboratory Certificates of Analysis
MultiChem Analytical Services

Table 1 - Groundwater Elevations and TSS in Groundwater Samples

Well ID	Top of Well PVC Casing in Feet(1)	Groundwater Elevation in Feet(1)		TSS in mg/L(2)	
		Round 1 (Sept. 1996)	Round 2 (Dec. 1997)	Round 1 (Sept. 1996)	Round 2 (Dec. 1997)
HC-MW-1	100.47	95.43	94.99	130	<10
HC-MW-2	100.00	95.15	94.14	44	45
HC-MW-3	103.68	95.88	95.80	72	20

TSS - Total suspended solids

(1) Elevations are relative to arbitrary datum (top of HC-MW-2 PVC casing = 100.00 feet).

(2) Certificates of analysis are provided in Attachment B.

4617/LocksGW.xls - Table 1

Table 2 - Summary of TPH Analytical Results

Analyte	Sampling Round (Date)	Concentration in mg/L			
		HC-MW-1	HC-MW-2	HC-MW-2 Dup	HC-MW-3
TPH as Diesel	Round 1 (9/96)	0.25 U	0.25 U	0.25 U	0.33
	Round 2 (12/97)	0.24 U	0.34	0.35	0.68
TPH as Oil	Round 1 (9/96)	0.75 U	0.75 U	0.75 U	0.75 U
	Round 2 (12/97)	0.71 U	0.71 U	0.71 U	0.71 U

U - Not detected at indicated detection limit.

(1) Certificates of analysis are provided in Attachment B.

(2) The Washington State Model Toxics Control Act (MTCA) Method A cleanup level for TPH in groundwater is 1.0 mg/L.

4617/LocksGW.xls - Table 2

Table 3 - Summary of Chemical Constituent Analytical Results for Current Sampling Round(1)

Analytical Method/Analyte	MTCA Method B Cleanup Level	Concentration in µg/L			
		HC-MW-1	HC-MW-2	HC-MW-2 Dup	HC-MW-3
Volatile Organics by EPA Method 8021					
Benzene	1.51	0.50 U	3.9	3.9	0.50 U
Chlorobenzene	160	0.50 U	100	98	0.50 U
1,2-Dichlorobenzene	720	0.50 U	1.3	1.3	0.50 U
1,3-Dichlorobenzene	-	0.50 U	4.6	4.7	0.50 U
1,4-Dichlorobenzene	1.82	0.50 U	6.0	5.9	0.50 U
PAHs by EPA Method 8270 SIM					
Naphthalene(2)	320	0.30	3.0	3.4	0.12 U
Acenaphthene	960	0.60	1.0	1.0	0.079
Fluorene	640	0.027	0.34	0.33	0.049
Phenanthrene	-	0.015 U	0.23	0.24	0.036
Anthracene	4,800	0.013 U	0.032	0.028	0.013 U
Fluoranthene	640	0.011 U	0.079	0.077	0.026
Pyrene	480	0.014 U	0.053	0.050	0.032

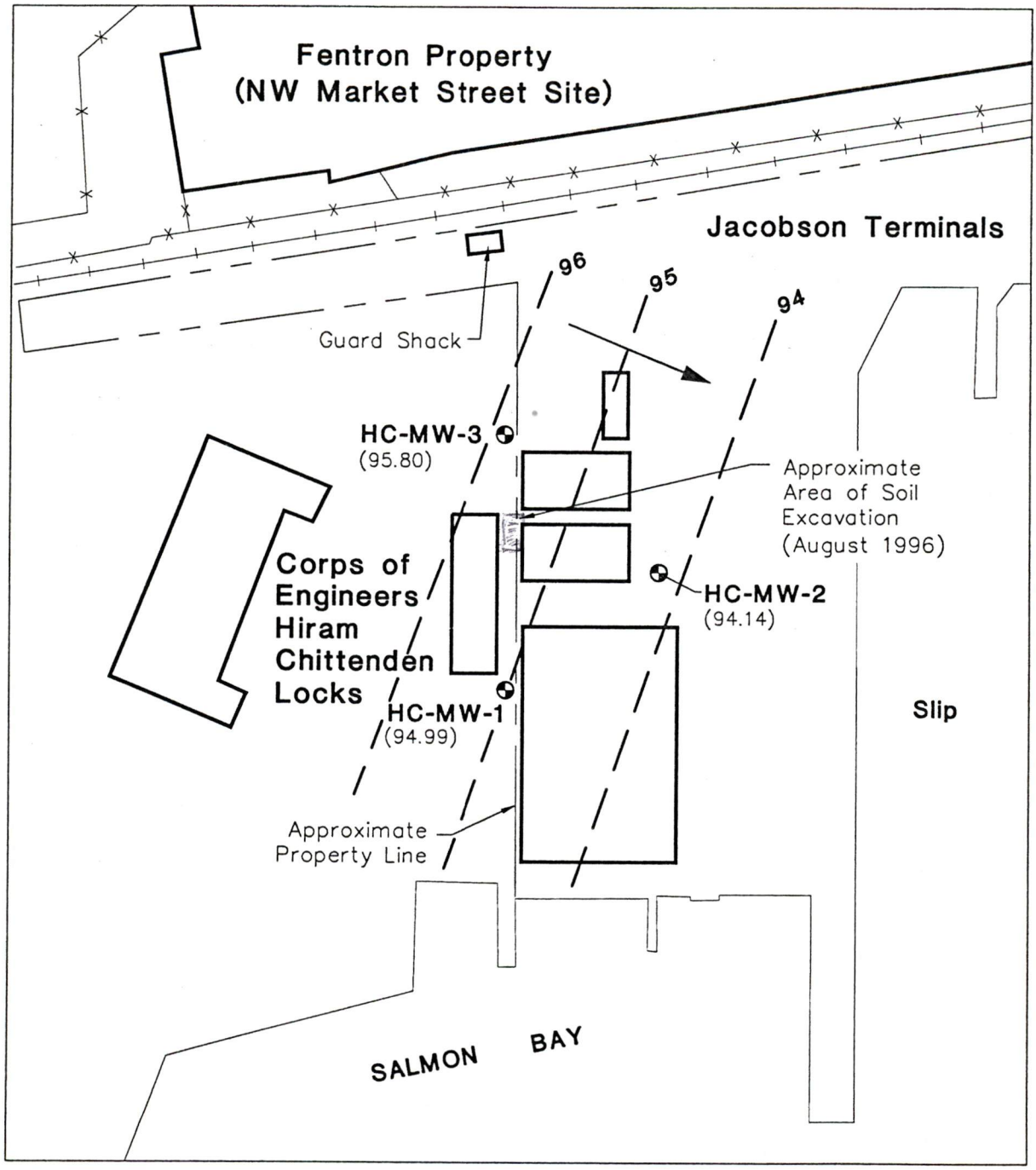
U - Not detected at indicated detection limit.

(1) Certificates of analysis are provided in Attachment B. Only analytes detected in one or more of the groundwater samples are listed in this summary table.

(2) Blank spike and MS/MSD recoveries of naphthalene analyzed by SIM (solid phase extraction) were below control limits. The samples were reextracted via liquid/liquid extractors and reanalyzed by high performance liquid chromatography (EPA Method 8310).

4617/LocksGW.xls - Table 3

Groundwater Elevation Contour Map



0 100 200

Scale in Feet

HC-MW-1 Groundwater Monitoring Well Location and Number

(94.99) Groundwater Elevation in Feet (Measured on December 9, 1997)

—94— Groundwater Elevation Contour in Feet

→ Inferred Groundwater Flow Direction

Notes:
1. Base map prepared from 1977 aerial photograph by Walker and Associates and figure prepared by EMCON entitled "Northwest Market Street Site", dated June 1995.
2. Building locations and dimensions are approximate.
3. Elevations are relative to arbitrary datum (top of HC-MW-2 PVC casing = 100.00 feet)

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Figure 1

CVD 12/30/97 1=100 wdstk.pcp
46170004

ATTACHMENT A
DATA VALIDATION REPORT
FOR GROUNDWATER SAMPLES

ATTACHMENT A
DATA VALIDATION REPORT
FOR GROUNDWATER SAMPLES

Four groundwater samples were collected on December 9 and 11, 1997. These samples plus one trip blank were submitted to MultiChem Analytical Services of Renton, Washington, for analysis of the following:

- Volatile Organics (EPA Method 8021);
- Semivolatile Organics (EPA Method 8270SIM, 8310);
- Polychlorinated Biphenyls (EPA Method 8081);
- Total Petroleum Hydrocarbons: Diesel (WA DOE WTPH-D); and
- Total Suspended Solids (EPA Method 160.2)

The following criteria were evaluated in the standard data quality review process for the results:

- Holding Times;
- Method Blanks;
- Blank Spike Recoveries;
- Surrogate Recoveries;
- Matrix Spike/Matrix Spike Duplicate Relative Percent Differences (RPDs);
- Laboratory and Field Duplicate Relative Percent Difference (RPDs); and
- Reporting Limits.

The QC criteria sited in Management Plan Addendum - Revision No. 2 (Hart Crowser, 1997) were used to evaluate the data. No QC criteria were provided in Revision No. 2 for semivolatile organics using EPA method 8270 SIM or EPA method 8310. Advisory laboratory control limits provided in the data package were used to evaluate the data.

Volatile Organics

The required holding time for volatile organics was incorrectly reported in the Table 2 of the Management Plan Addendum - Revision No. 2. The holding time of 14 days was applied. All required holding times were met. No method blank or trip blank contamination was detected. Blank spike, surrogate, and MS/MSD recoveries were within control limits. HC-MW-10 was a field duplicate of HC-MW-2, and the RPDs ranged from 0 to 2% for detected results. Some RPDs could not be calculated since sample results were not detected. Reporting limits met those established in the Management Plan Addendum - Revision No. 2.

Semivolatile Organics

All required holding times were met. No method blank contamination was detected. Surrogate recoveries of 2-fluorobiphenyl were below laboratory control limits for method blank, blank spike, blank spike duplicate, matrix spike, and matrix spike duplicate. No qualifiers were assigned since the remaining surrogate recoveries were within control limits. Blank spike and MS/MSD recoveries of eight compounds analyzed by SIM (solid phase extraction) were below control limits. The samples were reextracted via liquid/liquid extractors and reanalyzed by high performance liquid chromatography (EPA method 8310). The results for compounds that fell outside control limits for SIM analysis were reported from the HPLC analysis. The RPDs from HPLC for MS/MSD samples were slightly above the control limits for four compounds. No qualifiers were assigned since these RPD values were slightly above control limits and all other RPDs were acceptable. HC-MW-10 was a field duplicate of HC-MW-2; the RPDs ranged from 0 to 13.3% for detected results. Some RPDs could not be calculated since sample results were not detected. Reporting limits met those established in the Management Plan Addendum - Revision No. 2.

PCBs

All required holding times were met. No method blank contamination was detected. Blank spike recoveries were within control limits. Surrogate recovery of tetrachloro-m-xylene fell below control limits in sample HC-MW-1. No qualifiers were assigned since the other associated surrogate recovery was acceptable. The RPD for MS/MSD samples was above the control limit. No qualifiers were assigned based on MS/MSD alone. HC-MW-10 was a field duplicate of HC-MW-2, but the RPDs could not be calculated since sample results were not detected. Reporting limits met those established in the Management Plan Addendum - Revision No. 2.

WTPH-D

All required holding times were met. No method blank contamination was detected. Blank spike, surrogate, and MS/MSD recoveries were within control limits. HC-MW-10 was a field duplicate of HC-MW-2; the RPD for diesel was 2.9%. The RPD for oil could not be calculated since sample results were not detected. Reporting limits met those established in the Management Plan Addendum - Revision No. 2.

TSS

All required holding times were met. No method blank contamination was detected. Blank spike recovery was within control limits. Laboratory duplicate RPD could not be calculated since sample results were not detected. HC-MW-10 was a field duplicate of HC-MW-2; the RPD was 9.3%. Reporting limits met those established in the Management Plan Addendum - Revision No. 2.

The data are acceptable as reported.

4617/LocksGW.doc

ATTACHMENT B
LABORATORY CERTIFICATES OF ANALYSIS
MULTICHEM ANALYTICAL SERVICES

MultiChem
ANALYTICAL SERVICES

MAS I.D. # 712017

January 12, 1998

Hart Crowser, Inc.
1910 Fairview Avenue East
Seattle WA 98102-3699

Attention : Dave Heffner

Project Number : 4617

Project Name : Lake WA Ship Canal

Dear Mr. Heffner:

On December 10, 1997, MultiChem Analytical Services received one sample for analysis. On December 12, 1997, MultiChem received an additional volume for polynuclear aromatic hydrocarbon analysis. The sample was analyzed with EPA methodology or equivalent methods as specified in the attached analytical schedule. The results, sample cross reference, and quality control data are enclosed.

Sincerely,

Kim M. Lofgren
Project Manager

KML/hal/trm

Enclosure

560 Naches Avenue SW, Suite 101, Renton, Washington 98055-2200 • **425-228-8335** • FAX 425-228-8336 • 1-800-609-0580 • info@multichem.com

MAS I.D. # 712017

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SAMPLE CROSS REFERENCE SHEET

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

MAS #	CLIENT DESCRIPTION	DATE SAMPLED	MATRIX
712017-1	HC-MW-1	12/09/97	WATER
712017-1	HC-MW-1	12/11/97	WATER

----- TOTALS -----

MATRIX	# SAMPLES
WATER	1

MAS STANDARD DISPOSAL PRACTICE

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

MAS I.D. # 712017

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ANALYTICAL SCHEDULE

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

ANALYSIS	TECHNIQUE	REFERENCE	LAB
AROMATIC VOLATILE ORGANICS	GC/PID	EPA 8021	R
HALOGENATED VOLATILE ORGANICS	GC/FID	EPA 8021	R
SEMIVOLATILE ORGANICS ANALYSIS	GCMS	EPA 8270A	R
POLYCHLORINATED BIPHENYLS	GC/ECD	EPA 8081	R
POLYNUCLEAR AROMATIC HYDROCARBONS	HPLC/UV/FL	EPA 8310	R
TOTAL PETROLEUM HYDROCARBONS: DIESEL	GC/FID	WA DOE WTPH-D	R
TOTAL SUSPENDED SOLIDS	GRAVIMETRIC	EPA 160.2	R

R = MAS - Renton
ANC = MAS - Anchorage
SUB = Subcontract

MAS I.D. # 712017

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CASE NARRATIVE

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

CASE NARRATIVE: HALOGENATED & AROMATIC VOLATILE ORGANICS ANALYSIS

The following anomalies were associated with the preparation and/or analysis of the sample in this accession:

The continuing calibration verification (CCV) standard analyzed prior to the samples in this accession exceeded the upper recovery limit of 115% for chloroethane. The high recovery indicates a potential high bias for chloroethane. Since this compound was not detected in the samples in this accession, no further corrective action was performed.

The CCV analyzed following the samples in this accession exceeded the upper recovery limit of 115% for methylene chloride and trans-1,3-dichloropropene and fell below the lower recovery limit of 85% for chloromethane, chloroethane, 1,1-dichloroethene and 1,1,1-trichloroethane. The high recoveries indicate potential high biases for methylene chloride and trans-1,3-dichloropropene. Since these analytes were not detected in the samples in this accession, no further corrective action was performed. All the samples in this accession were reanalyzed with passing CCVs for chloromethane, chloroethane, 1,1-dichloroethene and 1,1,1-trichloroethane. None of these compounds were detected in either analysis.

The CCV analyzed following the associated matrix spike/matrix spike duplicate (MS/MSD) for this accession fell below the lower recovery limit of 85% for 1,1-dichloroethene. Since this CCV bracketed only the associated MS/MSD and the recoveries of 1,1-dichloroethene were within control limits, no further corrective action was performed.

All other associated quality assurance/quality control (QA/QC) parameters were within established MultiChem control limits.

MAS I.D. # 712017

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VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 4617	DATE RECEIVED	: N/A
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: N/A
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 12/18/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8021	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	<0.50
BROMODICHLOROMETHANE	<0.20
BROMOFORM	<0.50
BROMOMETHANE	<2.0
CARBON TETRACHLORIDE	<0.20
CHLOROBENZENE	<0.50
CHLOROETHANE	<2.0
CHLOROFORM	<0.20
CHLOROMETHANE	<1.0
1,2-DIBROMOETHANE (EDB)	<0.50
1,2-DICHLOROBENZENE	<0.50
1,3-DICHLOROBENZENE	<0.50
1,4-DICHLOROBENZENE	<0.50
DIBROMOCHLOROMETHANE	<0.20
1,1-DICHLOROETHANE	<0.20
1,2-DICHLOROETHANE (EDC)	<0.20
1,1-DICHLOROETHENE	<0.20
CIS-1,2-DICHLOROETHENE	<0.20
TRANS-1,2-DICHLOROETHENE	<0.20
1,2-DICHLOROPROPANE	<0.20
CIS-1,3-DICHLOROPROPENE	<0.20
TRANS-1,3-DICHLOROPROPENE	<0.20
ETHYLBENZENE	<0.50
METHYLENE CHLORIDE	<5.0
1,1,2,2-TETRACHLOROETHANE	<0.20
TETRACHLOROETHENE	<0.20
TOLUENE	<0.50
1,1,1-TRICHLOROETHANE	<0.50
1,1,2-TRICHLOROETHANE	<0.20
TRICHLOROETHENE	<0.20
TRICHLOROFLUOROMETHANE	<0.50
VINYL CHLORIDE	<1.0
TOTAL XYLENES	<0.50

SURROGATE PERCENT RECOVERY		LIMITS
BROMOCHLOROMETHANE	84	58 - 126
BROMOFLUOROBENZENE	92	76 - 136

MAS I.D. # 712017-1

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VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 12/09/97
PROJECT #	: 4617	DATE RECEIVED	: 12/10/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: N/A
CLIENT I.D.	: HC-MW-1	DATE ANALYZED	: 12/18/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8021	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	<0.50
BROMODICHLOROMETHANE	<0.20
BROMOFORM	<0.50
BROMOMETHANE	<2.0
CARBON TETRACHLORIDE	<0.20
CHLOROBENZENE	<0.50
CHLOROETHANE	<2.0
CHLOROFORM	<0.20
CHLOROMETHANE	<1.0
1,2-DIBROMOETHANE (EDB)	<0.50
1,2-DICHLOROBENZENE	<0.50
1,3-DICHLOROBENZENE	<0.50
1,4-DICHLOROBENZENE	<0.50
DIBROMOCHLOROMETHANE	<0.20
1,1-DICHLOROETHANE	<0.20
1,2-DICHLOROETHANE (EDC)	<0.20
1,1-DICHLOROETHENE	<0.20
CIS-1,2-DICHLOROETHENE	<0.20
TRANS-1,2-DICHLOROETHENE	<0.20
1,2-DICHLOROPROPANE	<0.20
CIS-1,3-DICHLOROPROPENE	<0.20
TRANS-1,3-DICHLOROPROPENE	<0.20
ETHYLBENZENE	<0.50
METHYLENE CHLORIDE	<5.0
1,1,2,2-TETRACHLOROETHANE	<0.20
TETRACHLOROETHENE	<0.20
TOLUENE	<0.50
1,1,1-TRICHLOROETHANE	<0.50
1,1,2-TRICHLOROETHANE	<0.20
TRICHLOROETHENE	<0.20
TRICHLOROFLUOROMETHANE	<0.50
VINYL CHLORIDE	<1.0
TOTAL XYLENES	<0.50

SURROGATE PERCENT RECOVERY		LIMITS
BROMOCHLOROMETHANE	87	58 - 126
BROMOFLUOROBENZENE	91	76 - 136

MAS I.D. # 712017

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VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT	: HART CROWSER, INC.	SAMPLE I.D. #	: BLANK
PROJECT #	: 4617	DATE EXTRACTED	: N/A
PROJECT NAME	: LAKE WA SHIP CANAL	DATE ANALYZED	: 12/18/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8021		

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
BENZENE	<0.500	10.0	9.89	99	N/A	N/A	N/A
CHLOROBENZENE	<0.500	10.0	9.91	99	N/A	N/A	N/A
1,1-DICHLOROETHENE	<0.200	10.0	9.78	98	N/A	N/A	N/A
TOLUENE	<0.500	10.0	9.32	93	N/A	N/A	N/A
TRICHLOROETHENE	<0.200	10.0	10.4	104	N/A	N/A	N/A

CONTROL LIMITS	% REC.	RPD
BENZENE	73 - 134	20
CHLOROBENZENE	79 - 141	33
1,1-DICHLOROETHENE	56 - 158	22
TOLUENE	83 - 136	29
TRICHLOROETHENE	72 - 138	21

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
BROMOCHLOROMETHANE	101	N/A	58 - 126
BROMOFLUOROBENZENE	95	N/A	76 - 136

MAS I.D. # 712017

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VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
EPA METHOD : 8021

SAMPLE I.D. # : 712018-1
DATE EXTRACTED : N/A
DATE ANALYZED : 12/18/97
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
BENZENE	3.85	10.0	13.1	93	13.2	94	1
CHLOROBENZENE	104	100	208	104	198	94	5
1,1-DICHLOROETHENE	<0.200	10.0	6.49	65	6.53	65	1
TOLUENE	<0.500	10.0	9.11	91	9.10	91	0
TRICHLOROETHENE	<0.200	10.0	9.01	90	8.21	82	9

CONTROL LIMITS	% REC.	RPD
BENZENE	55 - 148	20
CHLOROBENZENE	61 - 160	33
1,1-DICHLOROETHENE	37 - 182	22
TOLUENE	60 - 158	29
TRICHLOROETHENE	61 - 149	21

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
BROMOCHLOROMETHANE	93	97	58 - 126
BROMOFLUOROBENZENE	96	95	76 - 136

MAS I.D. # 712017

MultiChem
ANALYTICAL SERVICES

CASE NARRATIVE

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

CASE NARRATIVE: SEMIVOLATILE ORGANICS ANALYSIS

The following anomalies were associated with the preparation and/or analysis of the sample in this accession using EPA method 8270 for semivolatile organics:

The recovery of surrogate 2-fluorobiphenyl fell below advisory control limits of 40-120% in the analysis of the blank, blank spike/blank spike duplicate (BS/BSD) and the matrix spike/matrix spike duplicate (MS/MSD). Since an insufficient number of data points have been collected to statistically determine control limits, the results were flagged "H" to denote that they were outside advisory limits.

The recovery of all target analytes with the exception of naphthalene were within control limits in the analysis of the BS/BSD. The recoveries of naphthalene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3cd)pyrene, dibenzo(a,h)anthracene and benzo(g,h,i)perylene fell below advisory control limits in the MS/MSD associated with this accession. Because of the low recovery of the less volatile polynuclear aromatic hydrocarbons (PAHs) in the MS, it became apparent that the samples were not amenable to solid phase extraction. The samples were reextracted via liquid/liquid extractors and reanalyzed by high performance liquid chromatography (HPLC). The results for compounds that fell outside control limits for SIM GCMS analysis were reported from the HPLC analysis.

The following anomalies were associated with the preparation and/or analysis of the samples in this accession using EPA method 8310 for polynuclear aromatic hydrocarbons:

The relative percent difference (RPD) between recoveries of several compounds from the MS/MSD samples exceeded MultiChem control limits. Since all MS/MSD recoveries, BS/BSD recoveries, and BS/BSD RPD values were in control, no further action was performed.

All other associated quality assurance/quality control (QA/QC) parameters were within established MultiChem control limits.

MAS I.D. # 712017

MultiChem
ANALYTICAL SERVICES

SEMIVOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 4617	DATE RECEIVED	: N/A
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/16/97
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 12/18/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8270A (MODIFIED)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
NAPHTHALENE	<0.092
ACENAPHTHYLENE	<0.016
ACENAPHTHENE	<0.028
FLUORENE	<0.018
PHENANTHRENE	<0.015
ANTHRACENE	<0.013
FLUORANTHENE	<0.011
PYRENE	<0.014
BENZO(A)ANTHRACENE	<0.013
CHRYSENE	<0.012
BENZO(B)FLUORANTHENE	<0.0090
BENZO(K)FLUORANTHENE	<0.0090
BENZO(A)PYRENE	<0.010
INDENO(1,2,3-CD)PYRENE	<0.012
DIBENZO(A,H)ANTHRACENE	<0.012
BENZO(G,H,I)PERYLENE	<0.011

SURROGATE PERCENT RECOVERY		LIMITS
TERPHENYL-D14	61	40 - 160
2-FLUOROBIPHENYL	16 H	40 - 160

H = Out of limits.

MAS I.D. # 712017

MultiChem
ANALYTICAL SERVICES

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 4617	DATE RECEIVED	: N/A
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/18/97
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 12/23/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8310 (LOW LEVEL)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
NAPHTHALENE	<0.11
ACENAPHTHYLENE	<0.23
ACENAPHTHENE	<0.11
FLUORENE	<0.023
PHENANTHRENE	<0.011
ANTHRACENE	<0.011
FLUORANTHENE	<0.023
PYRENE	<0.011
BENZO(A)ANTHRACENE	<0.011
CHRYSENE	<0.011
BENZO(B)FLUORANTHENE	<0.023
BENZO(K)FLUORANTHENE	<0.011
BENZO(A)PYRENE	<0.011
DIBENZO(A,H)ANTHRACENE	<0.032
BENZO(G,H,I)PERYLENE	<0.023
INDENO(1,2,3-CD)PYRENE	<0.011

SURROGATE PERCENT RECOVERY		LIMITS
2-CHLOROANTHRACENE	92	23 - 120

MAS I.D. # 712017-1

MultiChem
ANALYTICAL SERVICES

SEMIVOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 12/11/97
PROJECT #	: 4617	DATE RECEIVED	: 12/12/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/16/97
CLIENT I.D.	: HC-MW-1	DATE ANALYZED	: 12/18/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8270A (MODIFIED)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS	
NAPHTHALENE	0.30	X
ACENAPHTHYLENE	<0.016	
ACENAPHTHENE	0.60	
FLUORENE	0.027	
PHENANTHRENE	<0.015	
ANTHRACENE	<0.013	
FLUORANTHENE	<0.011	
PYRENE	<0.014	
BENZO(A)ANTHRACENE	<0.013	
CHRYSENE	<0.012	X
BENZO(B)FLUORANTHENE	<0.024	X
BENZO(K)FLUORANTHENE	<0.012	X
BENZO(A)PYRENE	<0.012	X
INDENO(1,2,3-CD)PYRENE	<0.034	X
DIBENZO(A,H)ANTHRACENE	<0.024	X
BENZO(G,H,I)PERYLENE	<0.012	X

SURROGATE PERCENT RECOVERY			LIMITS
TERPHENYL-D14	43		40 - 160
2-FLUOROBIPHENYL	40		40 - 160
2-CHLOROANTHRACENE	95	X	23 - 120

X = Value reported from EPA 8310 analysis.

MAS I.D. # 712017

MultiChem
ANALYTICAL SERVICES

SEMIVOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
EPA METHOD : 8270A (MODIFIED)

SAMPLE I.D. # : BLANK
DATE EXTRACTED : 12/16/97
DATE ANALYZED : 12/18/97
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
NAPHTHALENE	<0.0920	2.50	0.625	25H	0.748	30H	18
ACENAPHTHYLENE	<0.0160	2.50	1.84	74	2.01	80	9
ACENAPHTHENE	<0.0280	2.50	1.51	60	1.68	67	11
FLUORENE	<0.0180	2.50	1.92	77	2.09	84	8
PHENANTHRENE	<0.0150	2.50	2.14	86	2.23	89	4
ANTHRACENE	<0.0130	2.50	2.17	87	2.26	90	4
FLUORANTHENE	<0.0110	2.50	2.22	89	2.34	94	5
PYRENE	<0.0140	2.50	2.27	91	2.35	94	3
BENZO(A)ANTHRACENE	<0.0130	2.50	2.11	84	2.15	86	2
CHRYSENE	<0.0120	2.50	1.93	77	1.96	78	2
BENZO(B)FLUORANTHENE	<0.00900	2.50	1.97	79	2.02	81	3
BENZO(K)FLUORANTHENE	<0.00900	2.50	1.72	69	1.81	72	5
BENZO(A)PYRENE	<0.0100	2.50	1.90	76	1.94	78	2
INDENO(1,2,3-CD)PYRENE	<0.0120	2.50	1.65	66	1.77	71	7
DIBENZO(A,H)ANTHRACENE	<0.0120	2.50	1.43	57	1.53	61	7
BENZO(G,H,I)PERYLENE	<0.0110	2.50	1.48	59	1.67	67	12

CONTROL LIMITS	% REC.	RPD
NAPHTHALENE	40 - 160	20
ACENAPHTHYLENE	40 - 160	20
ACENAPHTHENE	40 - 160	20
FLUORENE	40 - 160	20
PHENANTHRENE	40 - 160	20
ANTHRACENE	40 - 160	20
FLUORANTHENE	40 - 160	20
PYRENE	40 - 160	20
BENZO(A)ANTHRACENE	40 - 160	20
CHRYSENE	40 - 160	20
BENZO(B)FLUORANTHENE	40 - 160	20
BENZO(K)FLUORANTHENE	40 - 160	20
BENZO(A)PYRENE	40 - 160	20
INDENO(1,2,3-CD)PYRENE	40 - 160	20
DIBENZO(A,H)ANTHRACENE	40 - 160	20
BENZO(G,H,I)PERYLENE	40 - 160	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
TERPHENYL-D14	63	62	40 - 160
2-FLUOROBIPHENYL	18H	21H	40 - 160

H = Out of limits.

MAS I.D. # 712017

MultiChem
ANALYTICAL SERVICES

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
EPA METHOD : 8310 (LOW LEVEL)

SAMPLE I.D. # : BLANK
DATE EXTRACTED : 12/18/97
DATE ANALYZED : 12/23/97
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
ACENAPHTHYLENE	<0.227	9.09	6.70	74	7.36	81	9
PHENANTHRENE	<0.0114	0.455	0.366	80	0.386	85	5
PYRENE	<0.0114	0.455	0.396	87	0.403	89	2
BENZO(K)FLUORANTHENE	<0.0114	0.455	0.378	83	0.385	85	2
DIBENZO(A,H)ANTHRACENE	<0.0318	0.909	0.486	53	0.594	65	20

CONTROL LIMITS	% REC.	RPD
ACENAPHTHYLENE	43 - 106	23
PHENANTHRENE	42 - 113	21
PYRENE	48 - 124	20
BENZO(K)FLUORANTHENE	52 - 119	20
DIBENZO(A,H)ANTHRACENE	29 - 142	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
2-CHLOROANTHRACENE	92	92	23 - 120

MAS I.D. # 712017

MultiChem
ANALYTICAL SERVICES

SEMIVOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
EPA METHOD : 8270A (MODIFIED)

SAMPLE I.D. # : 712018-1
DATE EXTRACTED : 12/16/97
DATE ANALYZED : 12/18/97
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
NAPHTHALENE	1.74	2.50	2.40	26H	3.06	53	24H
ACENAPHTHYLENE	<0.0160	2.50	2.14	86	2.26	90	5
ACENAPHTHENE	1.03	2.50	2.69	66	2.88	74	7
FLUORENE	0.343	2.50	2.38	81	2.47	85	4
PHENANTHRENE	0.230	2.50	2.30	83	2.32	84	1
ANTHRACENE	0.0320	2.50	2.03	80	2.06	81	1
FLUORANTHENE	0.0788	2.50	2.12	82	2.09	80	1
PYRENE	0.0530	2.50	1.95	76	2.16	84	10
BENZO(A)ANTHRACENE	<0.0130	2.50	1.05	42	1.11	44	6
CHRYSENE	<0.0120	2.50	0.813	33H	0.817	33H	0
BENZO(B)FLUORANTHENE	<0.00900	2.50	0.400	16H	0.432	17H	8
BENZO(K)FLUORANTHENE	<0.00900	2.50	0.275	11H	0.270	11H	2
BENZO(A)PYRENE	<0.0100	2.50	0.297	12H	0.313	13H	5
INDENO(1,2,3-CD)PYRENE	<0.0120	2.50	0.0478	2H	0.0673	3H	33H
DIBENZO(A,H)ANTHRACENE	<0.0120	2.50	0.0285	1H	0.0385	2H	29H
BENZO(G,H,I)PERYLENE	<0.0110	2.50	0.0448	2H	0.0588	2H	27H

CONTROL LIMITS	% REC.	RPD
NAPHTHALENE	40 - 160	20
2-METHYLNAPHTHALENE	40 - 160	20
ACENAPHTHYLENE	40 - 160	20
ACENAPHTHENE	40 - 160	20
FLUORENE	40 - 160	20
PHENANTHRENE	40 - 160	20
ANTHRACENE	40 - 160	20
FLUORANTHENE	40 - 160	20
PYRENE	40 - 160	20
BENZO(A)ANTHRACENE	40 - 160	20
CHRYSENE	40 - 160	20
BENZO(B)FLUORANTHENE	40 - 160	20
BENZO(K)FLUORANTHENE	40 - 160	20
BENZO(A)PYRENE	40 - 160	20
INDENO(1,2,3-CD)PYRENE	40 - 160	20
DIBENZO(A,H)ANTHRACENE	40 - 160	20
BENZO(G,H,I)PERYLENE	40 - 160	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
TERPHENYL-D14	48	49	40 - 160
2-FLUOROBIPHENYL	30H	36H	40 - 160

H = Out of limits.

MAS I.D. # 712017

MultiChem
ANALYTICAL SERVICES

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
EPA METHOD : 8310 (LOW LEVEL)

SAMPLE I.D. # : 712018-1
DATE EXTRACTED : 12/18/97
DATE ANALYZED : 12/23/97
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
ACENAPHTHYLENE	<0.238	9.52	6.39	67	7.82	82	20
PHENANTHRENE	0.374	0.476	0.663	61	0.836	97	23H
PYRENE	0.0545	0.476	0.382	69	0.480	89	23H
BENZO(K)FLUORANTHENE	<0.0119	0.476	0.254	53	0.329	69	26H
DIBENZO(A,H)ANTHRACENE	<0.0333	0.952	0.210	22	0.317	33	41H

CONTROL LIMITS	% REC.	RPD
ACENAPHTHYLENE	20 - 163	23
PHENANTHRENE	20 - 168	21
PYRENE	36 - 125	20
BENZO(K)FLUORANTHENE	20 - 104	20
DIBENZO(A,H)ANTHRACENE	20 - 74	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
2-CHLOROANTHRACENE	72	91	23 - 120

H = Out of limits.

MAS I.D. # 712017

CASE NARRATIVE

MultiChem
ANALYTICAL SERVICES

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

CASE NARRATIVE: POLYCHLORINATED BIPHENYLS ANALYSIS

The following anomalies were associated with the preparation and/or analysis of the sample in this accession:

The percent difference (D%) of the surrogate, decachlorobiphenyl (DCBP), from the continuing calibration verification (CCV) standards which bracketed the qualtiy control (QC) samples exceeded the control limits (±15%). Since the D% of the other surrogate, tetrachloro-m-xylene (TCMX), from these CCVs were in control and the spiked recoveries of TCMX were in control from all QC samples, no further corrective action was performed.

The recovery of the surrogate, tetrachloro-m-xylene (TCMX), from sample 712017-1 (HC-MW-1) fell below the MultiChem established control limits of 40-123%. Since the recovery of the other surrogate, decachlorobiphenyl (DCBP), was in control, no further corrective action was performed.

The relative percent difference (RPD) between sample matrix spike (MS) recovery and matrix spike duplicate (MSD) recovery exceeded MultiChem's established control limits. Since the MS/MSD recoveries and the associated blank spike (BS) recoveries were all in control, no further corrective action was performed for this sample set.

All other associated quality assurance/quality control (QA/QC) parameters were within established MultiChem control limits.

MAS I.D. # 712017

MultiChem
ANALYTICAL SERVICES

PCB ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 4617	DATE RECEIVED	: N/A
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/11/97
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 12/16/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8081 (ULTRA LOW LEVEL)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
AROCLOR 1016	<0.0052
AROCLOR 1221	<0.013
AROCLOR 1232	<0.013
AROCLOR 1242	<0.0052
AROCLOR 1248	<0.0052
AROCLOR 1254	<0.0052
AROCLOR 1260	<0.0052

SURROGATE PERCENT RECOVERY		LIMITS
DECACHLOROBIPHENYL	89	25 - 137
TETRACHLORO-M-XYLENE	58	40 - 123

MAS I.D. # 712017-1

MultiChem
ANALYTICAL SERVICES

PCB ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 12/09/97
PROJECT #	: 4617	DATE RECEIVED	: 12/10/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/11/97
CLIENT I.D.	: HC-MW-1	DATE ANALYZED	: 12/17/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8081 (ULTRA LOW LEVEL)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
AROCLOR 1016	<0.0052
AROCLOR 1221	<0.013
AROCLOR 1232	<0.013
AROCLOR 1242	<0.0052
AROCLOR 1248	<0.0052
AROCLOR 1254	<0.0052
AROCLOR 1260	<0.0052

SURROGATE PERCENT RECOVERY		LIMITS
DECACHLOROBIPHENYL	36	25 - 137
TETRACHLORO-M-XYLENE	34 H	40 - 123

H = Out of limits.

MAS I.D. # 712017

MultiChem
ANALYTICAL SERVICES

PCB ANALYSIS
QUALITY CONTROL DATA

CLIENT	: HART CROWSER, INC.	SAMPLE I.D. #	: BLANK
PROJECT #	: 4617	DATE EXTRACTED	: 12/11/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE ANALYZED	: 12/16/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8081 (ULTRA LOW LEVEL)		

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
AROCLOR 1260	<0.00524	0.0298	0.0329	110	N/A	N/A	N/A

CONTROL LIMITS	% REC.	RPD
AROCLOR 1260	72 - 144	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
DECACHLOROBIPHENYL	97	N/A	25 - 137
TETRACHLORO-M-XYLENE	73	N/A	40 - 123

MAS I.D. # 712017

MultiChem
ANALYTICAL SERVICES

PCB ANALYSIS
QUALITY CONTROL DATA

CLIENT	: HART CROWSER, INC.	SAMPLE I.D. #	: 712018-1
PROJECT #	: 4617	DATE EXTRACTED	: 12/11/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE ANALYZED	: 12/16/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8081 (ULTRA LOW LEVEL)		

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
AROCLOR 1260	<0.00524	0.0298	0.0255	86	0.0187	63	31H

CONTROL LIMITS	% REC.	RPD
AROCLOR 1260	32 - 163	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
DECACHLOROBIPHENYL	57	44	25 - 137
TETRACHLORO-M-XYLENE	62	51	40 - 123

H = Out of limits.

MAS I.D. # 712017

MultiChem
ANALYTICAL SERVICES

CASE NARRATIVE

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

CASE NARRATIVE: TOTAL PETROLEUM HYDROCARBONS ANALYSIS - DIESEL

There were no anomalies associated with the preparation and/or analysis of the sample in this accession.

MAS I.D. # 712017

MultiChem
ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 4617	DATE RECEIVED	: N/A
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/12/97
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 12/13/97
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	<0.25
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<0.75
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
O-TERPHENYL	96	65 - 134

MAS I.D. # 712017-1

MultiChem
ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 12/09/97
PROJECT #	: 4617	DATE RECEIVED	: 12/10/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/12/97
CLIENT I.D.	: HC-MW-1	DATE ANALYZED	: 12/14/97
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	<0.24
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<0.71
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
O-TERPHENYL	95	65 - 134

MAS I.D. # 712017

MultiChem
ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
METHOD : WA DOE WTPH-D

SAMPLE I.D. # : BLANK
DATE EXTRACTED : 12/12/97
DATE ANALYZED : 12/13/97
UNITS : mg/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
DIESEL	<0.250	2.50	2.45	98	2.45	98	0

CONTROL LIMITS	% REC.	RPD
DIESEL	76 - 115	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
O-TERPHENYL	95	97	65 - 134

MAS I.D. # 712017

MultiChem
ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
METHOD : WA DOE WTPH-D

SAMPLE I.D. # : 712018-1
DATE EXTRACTED : 12/12/97
DATE ANALYZED : 12/14/97
UNITS : mg/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
DIESEL	0.346	2.38	2.50	91	2.55	93	2

CONTROL LIMITS	% REC.	RPD
DIESEL	73 - 130	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
O-TERPHENYL	96	95	65 - 134

MAS I.D. # 712017

MultiChem
ANALYTICAL SERVICES

CASE NARRATIVE

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

CASE NARRATIVE: GENERAL CHEMISTRY ANALYSIS

There were no anomalies associated with the preparation and/or analysis of the sample in this accession.

MAS I.D. # 712017

MultiChem
ANALYTICAL SERVICES

GENERAL CHEMISTRY ANALYSIS

CLIENT : HART CROWSER, INC. MATRIX : WATER
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

PARAMETER	DATE PREPARED	DATE ANALYZED
TOTAL SUSPENDED SOLIDS	12/11/97	12/12/97

MAS I.D. # 712017

MultiChem
ANALYTICAL SERVICES

GENERAL CHEMISTRY ANALYSIS
DATA SUMMARY

CLIENT : HART CROWSER, INC. MATRIX : WATER
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL UNITS : mg/L

MAS I.D. #	CLIENT I.D.	TOTAL SUSPENDED SOLIDS
712017-1	HC-MW-1	<10
BLANK	-	<10

MAS I.D. # 712017

MultiChem
ANALYTICAL SERVICES

GENERAL CHEMISTRY ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC. MATRIX : WATER
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL UNITS : mg/L

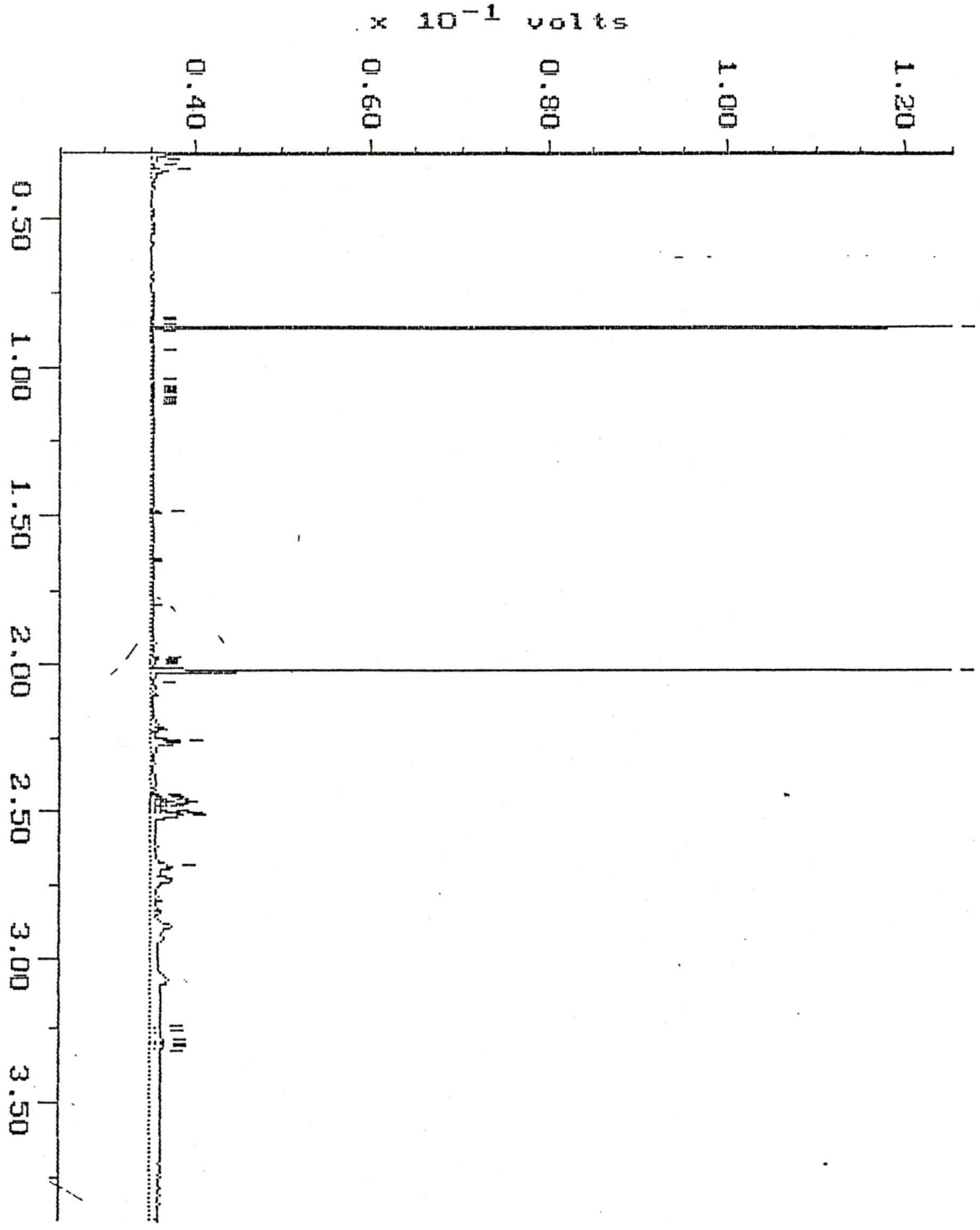
PARAMETER	MAS I.D.	SAMPLE RESULT	DUP RESULT	RPD	SPIKED RESULT	SPIKE ADDED	% REC.
TOTAL SUSPENDED SOLIDS	BLANK	<10.0	N/A	N/A	47.0	56.0	84
TOTAL SUSPENDED SOLIDS	712017-1	<10.0	<10.0	NC	N/A	N/A	N/A

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

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

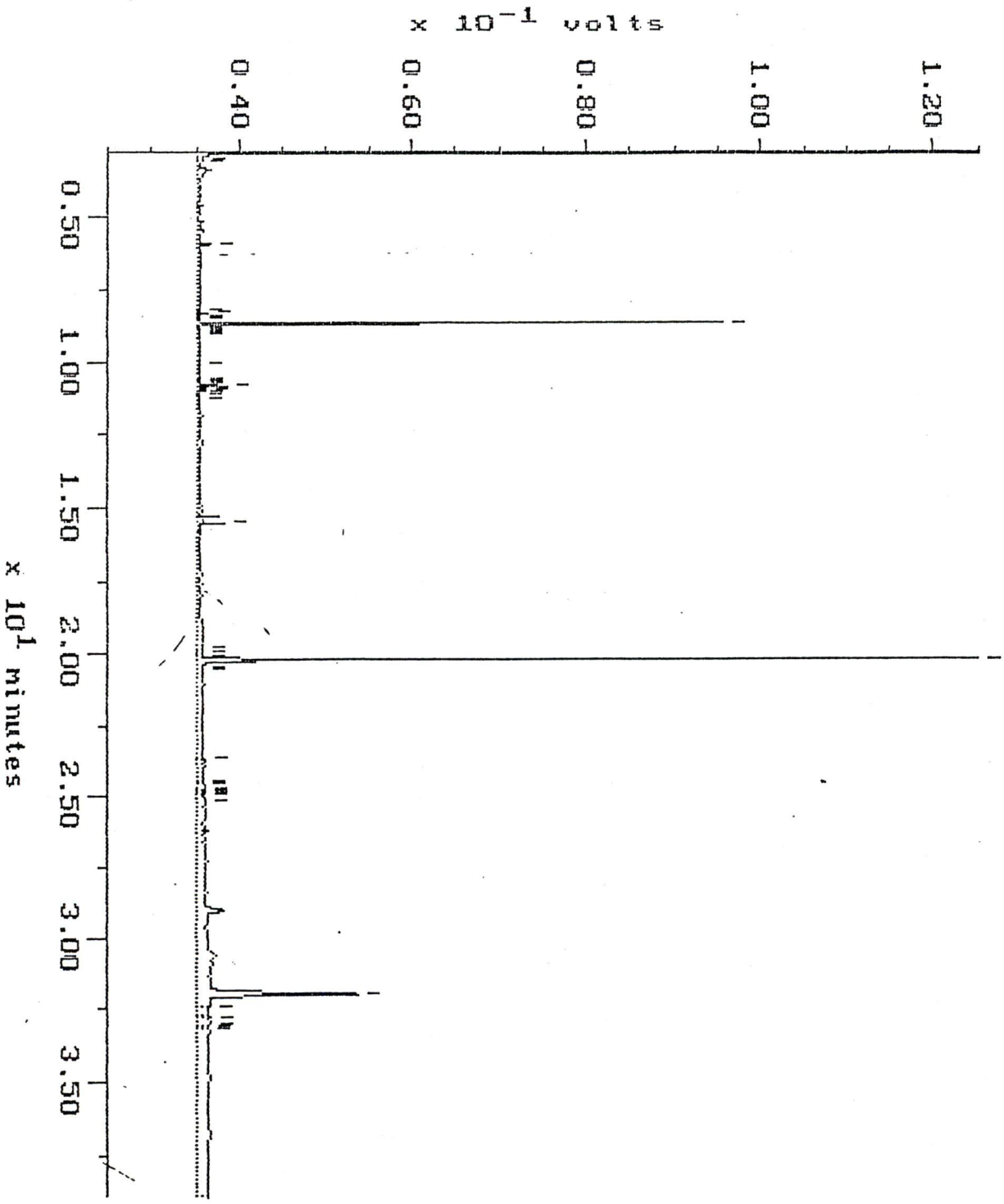
BLANK

Sample: A1212 TPHD BLK Channel: ANN Filename: RC128A21
Acquired: 13-DEC-97 17:50 Method: X:\MAXDATA\ANN\FUEL1212 Operator: ANN
Comments: WA DOE TPH D



WA DOE WTPH-D

Sample: 712017-1 Channel: ANN Filename: RC128A39
Acquired: 14-DEC-97 8:36 Method: X:\MAXDATA\ANN\FUEL1212 Operator: ANN
Comments: WA DOE TPH D

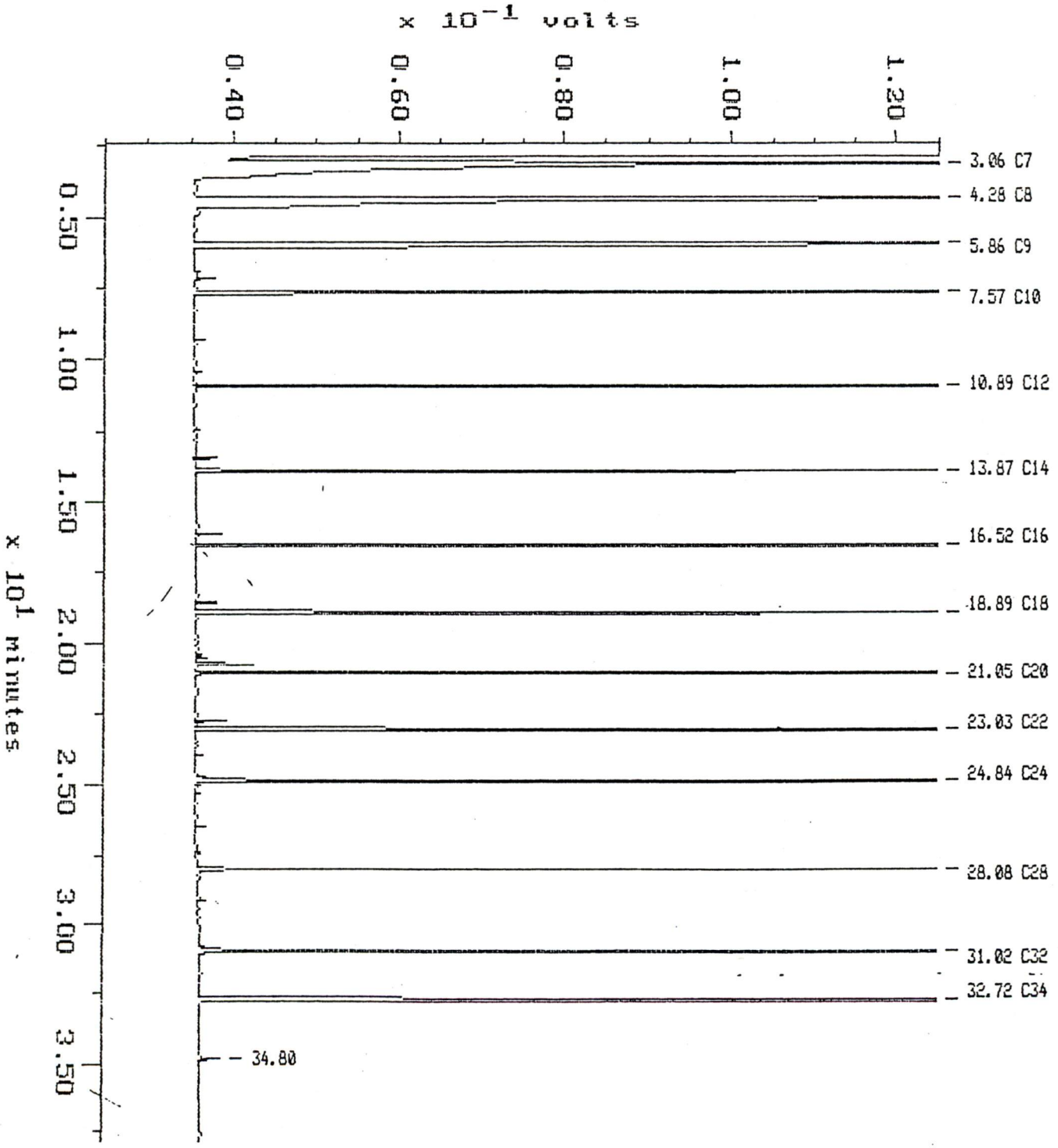


Alkane

Sample: ALKANE ANN
Acquired: 10-DEC-97 11:15
Inj Vol: 1.00
Comments: ALKANE STANDARD

Channel: ANN
Method: X:\MAXDATA\ANN\FUEL1210

Filename: RC108A02
Operator: ANN

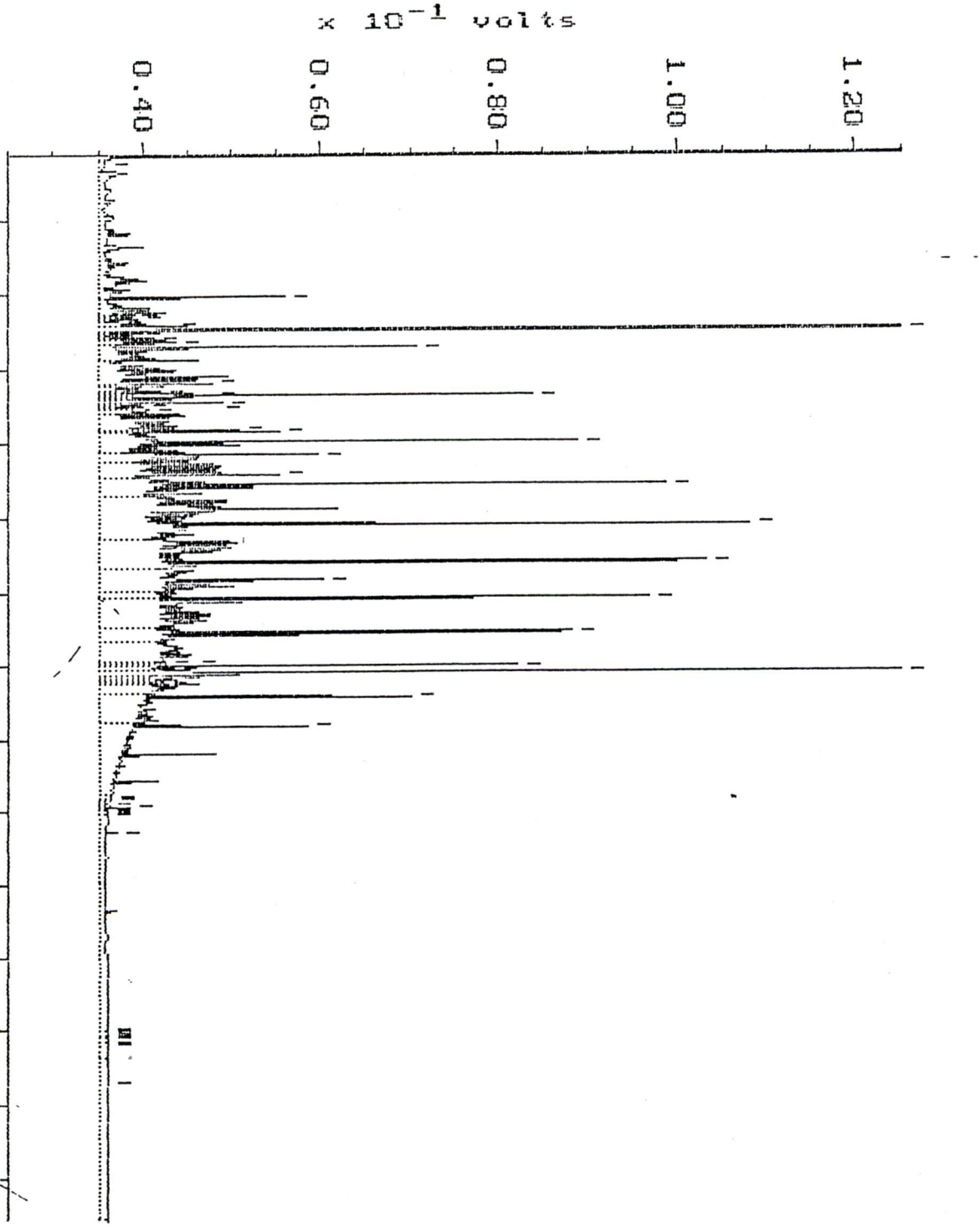


CONTINUING CALIBRATION

Sample: D500_CCV
Acquired: 12-DEC-97 23:40
Comments:

Channel: ANN
Method: X:\MAXDATA\ANN\FUEL1211
WA DOE TPH D

Filename: RC118A39
Operator: ANN

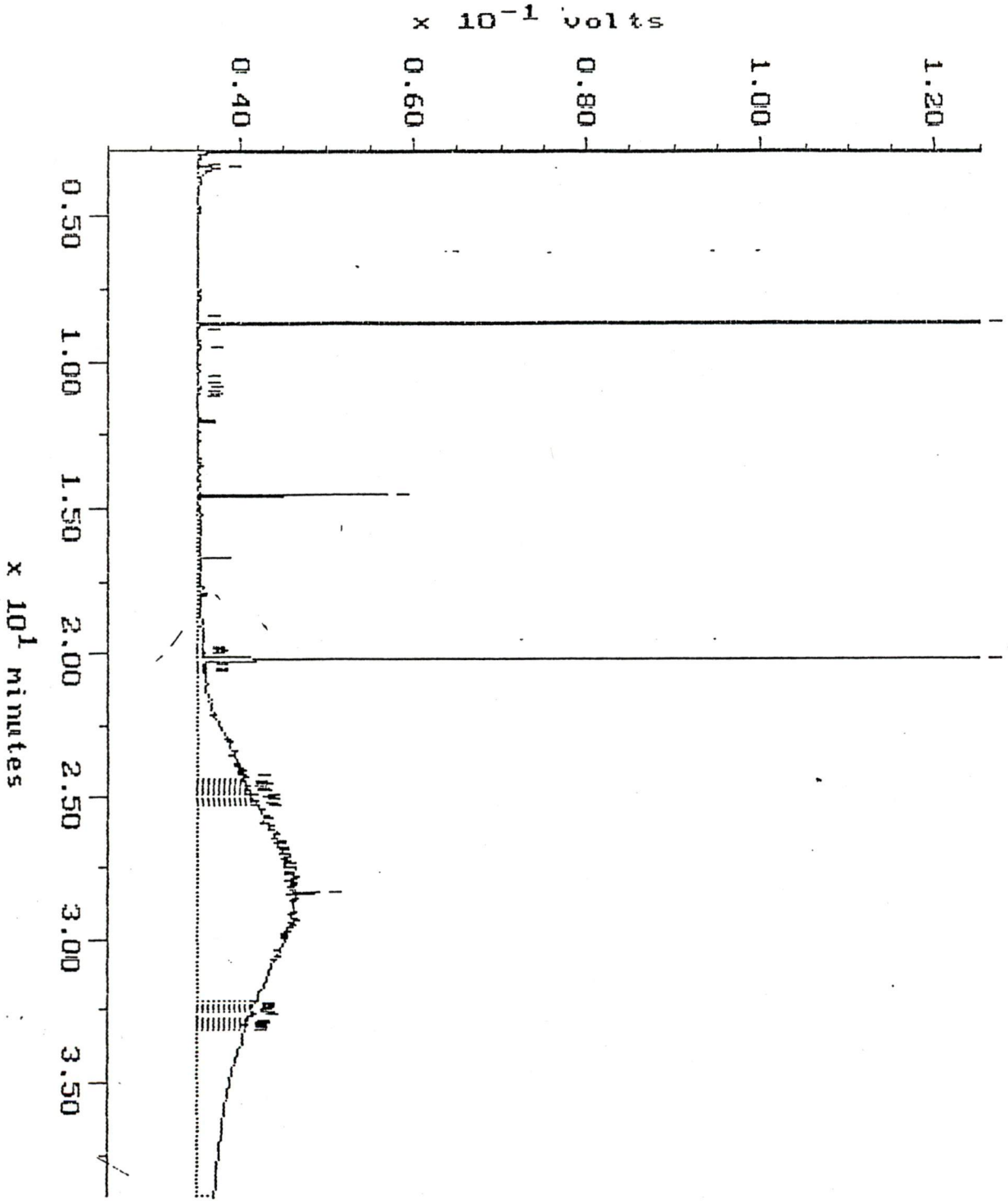


CONTINUING CALIBRATION

Sample: M0500 CCV
Acquired: 13-DEC-97 0:29
Comments:

Channel: ANN
Method: X:\MAXDATA\ANN\FUEL1211
WA DOE TPH D

Filename: RC118A40
Operator: ANN



Analytical Technologies, Inc.
560 Naches Avenue, S.W., Suite 101, Renton, WA 98055 (206) 228-8335

DATE: 12/11/97 Page 1 of ___ ATI ACCESSION # 712017

COMPANY: HART CROWSER
REPORT TO: DAVE HEFFNER
ADDRESS: 1910 FAIRVIEW AVE E
SEATTLE, WA 98102
PHONE: ( ) - FAX: ( ) -
PROJECT MANAGER: D. HEFFNER
PROJECT NUMBER: 4617
PROJECT NAME: LK. WA SHIP CANAL
ATI will DISPOSE / RETURN samples (circle one)

Sample ID	Date	Time	Matrix	LabID	FUELS: TPH-HCID WA/OR	BETX/TPH-G combo WA/OR	BETX (by 8020)	TPH-G WA/OR	TPH-D WA/OR	8015 modified WA/OR	418.1	413.2	AK-GRO	AK-DRO	ORGANIC COMPOUNDS: 8240 GCMS Volatiles	8270 GCMS Semivolatiles SIM	8080 Pesticides/PCBs 8081	PCB only (by 8080) STD/lo level	8010 Halogenated VOCs	8020 Aromatic VOCs	8310 HPLC PAHs	8040 Phenols	8140 OP Pesticides	8150 OC Herbicides	METALS: Metals (Indicate below *)	Total Lead	Priority Pollutant Metals (13)	TAL Metals (23)	TCLP: TCLP-Volatiles (ZHE-8240)	TCLP-Semivolatiles (8270)	TCLP-Pesticides (8080)	TCLP-Herbicides (8150)	TCLP-Metals (8 metals)	OTHER: % Moisture (please indicate)	Total # of Containers/sample
HC-MW-1	12/11/97	14:30	H_2O	1					X						X	X	X																	4
~~HC-MW-10~~	~~12/11/97~~	~~12:45~~	~~H_2O~~						X						X	X	X																	4

Turnaround Time		Sample Receipt	
STANDARD TAT	✓	TOTAL # CONTAINERS RECVD	1
1 WEEK TAT		COC SEALS PRESENT?	Y
4 WORK DAY TAT		COC SEALS INTACT?	Y
3 WORK DAY TAT		RECEIVED COLD?	Y
2 WORK DAY TAT		RECEIVED INTACT?	Y
24 HOUR TAT		RECEIVED VIA: COURIER	

Special Instructions:
some analysis may have been performed. Check w/ Kim L.
* Metals needed:

Relinquished By:	Relinquished By:	Relinquished By:
Date: 12/11/97	Date:	Date:
Time: 17:00	Time:	Time:
Received By:	Received By:	Received By:
Date: 12/12/97	Date:	Date:
Time: 1200	Time:	Time:
JONATHAN VAN DE VEL MAS-K		

12/12/97

MultiChem ANALYTICAL SERVICES

550 Naches Ave. SW Suite 101 Renton, WA 98055
(800) 609-0580 ◆ (425) 228-8335 ◆ FAX (425) 228-8336

B NL R: 712017

DATE: 12/10/97
PAGE: 1 of 1

COMPANY: HC
ADDRESS: 1910 Fairview Ave East
Seattle WA 98102

PHONE: (206) 324-9530 FAX ( )
PROJ. MGR / CONTACT: D. Hartmer.
PROJECT NUMBER: 467
PROJECT NAME: LK WA SHIP CANAL
DISPOSAL: ☐ MAS ☐ HOLD ☐ RETURN

SAMPLE ID	DATE	TIME	MATRIX	LAB ID
HC-MW-1	12/9/97	1030	H_2O	1

	FUELS										ORGANIC COMPOUNDS									METALS					TCLP					OTHER					
	TPH-HCID	BETX / TPH-G BETX / AK101	BETX (by 8021)	TPH-G	TPH-D TPHD-extended	8015 modified	418.1	413.2	AK-GRO AK101	AK-DRO AK102 / 103	8240 / 8260 GCMS Volatiles	8270 GCMS Semivolatiles SIM in the low level	8081 Pesticides PCBs	PCB only (by 8081) SIM / II	8021 Halogenated VOCs	8021 Aromatic VOCs	8310 HPLC PAHs	8041 Phenols	8151 DC Herbicides	Metals indicate below*	Total / Dissolved Lead	RCRA Metals (8)	PP Metals (13)	TAL Metals (23)	TCLP 8240 (VOL)	TCLP 8270 Semivolatiles	TCLP 8081 Pesticides	TCLP 8151 Herbicides	TCLP Metals	755 1602					Total # of Containers
HC-MW-1					X						X	X	X																X				(2)

SAMPLE RECEIPT			TAT:
TOTAL # OF CONTAINERS	☐ YES	☐ NO	☐ 24 HOURS
COC SEALS PRESENT?	☐ YES	☐ NO	☐ 48 HOURS
COC SEALS INTACT?	☐ YES	☐ NO	☐ 72 HOURS
RECEIVED COLD?	☐ YES	☐ NO	☐ 7 DAYS
RECEIVED INTACT?	☐ YES	☐ NO	☐ SP
RECEIVED VIA:			☒ STANDARD

SPECIAL INSTRUCTIONS/COMMENTS:
cooler #169

*METALS NEEDED:

RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:
SIGNATURE: Jut Lee	SIGNATURE:	SIGNATURE:
PRINT NAME: Jut Lee	PRINT NAME:	PRINT NAME:
DATE: 12/10/97 TIME: 1215	DATE: TIME:	DATE: TIME:
COMPANY: HC	COMPANY:	COMPANY:
RECEIVED BY:	**RECEIVED BY:**	**RECEIVED BY:**
SIGNATURE: Jonathan van Dyk	SIGNATURE:	SIGNATURE:
PRINT NAME: JONATHAN VAN DYK	PRINT NAME:	PRINT NAME:
DATE: 12/10/97 TIME: 1405	DATE: TIME:	DATE: TIME:
COMPANY: MAS-R	COMPANY:	COMPANY:

MAS USE ONLY: SUBCONTRACT LAB: PO #:

Cooler Receipt Form

Project: LAKE WASHINGTON SHIP CANAL

Cooler received on 12/10/97 and opened on 12/10/97 by JONATHAN VAN DYK

Jonathan van Dyk
(Signature)

1. Were custody seals on outside of cooler? ..... (YES) NO
   if YES, how many and where? 2 FRONT
   Were Signature and date correct? ..... (YES) NO
2. Were custody papers taped to lid inside cooler? ..... (YES) NO
3. Were custody papers properly filled out (ink, signed, etc.)..... (YES) NO
4. Did you sign custody papers in the appropriate place? ..... (YES) NO
5. Did you attach shipper's packing slip to this form? ..... (YES) NO
6. What kind of packing material was used? BUBBLE BAGS
7. Was sufficient ice used (if appropriate)? ..... (YES) NO
8. Were all bottles sealed in separate plastic bags? ..... (YES) NO
9. Did all bottles arrive in good condition (unbroken)? ..... (YES) NO
10. Were all bottle labels complete (No., date, signed, anal, pres, etc.)? ..... (YES) NO
11. Did all bottle labels and tags agree with custody papers? ..... (YES) NO
12. Were correct bottles used for the test indicated? ..... (YES) NO
13. Were VOA vials checked for absence of air bubbles and noted if found? ..... (YES) NO
14. Was sufficient amount of sample sent in each bottle? ..... (YES) NO

Explain any discrepancies

HARTCROWSER

J-4617 9/96

Figure 8

Cond_6\forms\cooler

NON-CONFORMANCES?
(Y) N #1
(if Y see other side)

MultiChem Analytical Services
SAMPLE LOG-IN CHECKLIST

DATE: 12/10/97
TIME: 1410
INITIALS: JVD

ACCESSION NO. 712017
CLIENT: HCI
PROJECT: LAKE WASH. SHIP CANAL

Shipping:

Type:
- X Cooler
- ____ Box
- ____ Other

COC Seals:
- X Ship. Cont.
- ____ On Bottles
- ____ None

Intact?
- (Y) N
- Y N

Packing Material:
- ____ Styrofoam
- X Bubble Bags
- ____ Foam Vial Packs
- ____ Other ____

Refrigerant:
- X Gel Ice Pack
- ____ Loose Ice
- ____ Other
- ____ None

Frozen?
- (Y) N
- Y N
- Y N

Received Via:
- ____ Hand Delivery
- ____ Federal Express
- ____ Airborne
- ____ Other: ____
- X Courier
- ____ UPS
- ____ Taxi
- ____ Goldstreak

Sample Information:

Samp. #	Bottle #
1	9

Type
- Soil
- Water
- Product
- Other

Soil VOAs
Water VOAs

0 headspace Y N N ____
0 headspace (Y) N N ____
Preserved? (Y) N ____
Trip blanks? Y (N) #1

Condition of Samples:
Containers:
Intact? (Bottle/Lid) (Y) N
Correct Type? (Y) N

CA # ____
CA # ____

Waters Preserved? (Y) N N ____
(if needed)

ID's Match C.O.C. (Y) N N ____

Temperature: 3.5 C ____ CA NO.
(See corrective action on reverse side for explanation if temperature is outside of the MAS recommended range.)

LAB USE ONLY ☐ NO NOTICE ☐ SENDOUTS NEEDED BY ____
☐ COC/TAT DOES NOT MATCH NOTICE ☐ NEED TEST(S) VERIFIED BY CLIENT

COMMENTS: ____

NON-CONFORMANCES?
(Y) N #1
(if Y see other side)

MultiChem Analytical Services
Corrective Action Sheet

ACCESSION # 712017

CORRECTIVE ACTION AREA

EXPLAIN CORRECTIVE ACTION:

CA NO.	CA NO.	CA NO.
_____Salvaged Sample	_____Replaced Bottle	_____Verified Id w/Client
_____Replaced Lid	_____Notified P.M.	_____Notified Client
_____Preserved Sample w/_____		

Comments:

#1 NO TRIP BLANKS WERE RECEIVED

Temperature:_____ C _____ CA NO.

_____**Comments:** Samples were received outside of the MAS recommended temperature range (4 C+/- 2 C) Samples were received within 5 hours of collection and may not have had sufficient time to equilibrate with coolant. A temperature range from 2 to 15 degrees Celsius is considered acceptable. The samples will be analyzed as scheduled unless directed otherwise by client.

_____**Comments:** Samples were received outside of the MAS recommended temperature range (4 C+/- 2 C) The samples will be analyzed as scheduled unless directed otherwise by client.

Tech.Signature/Date: Jonathan van Dyk 12/10/17 P.M. Signature/Date:_____

CORRECTIVE ACTION TAKEN:

Explain Action Taken:

MultiChem
ANALYTICAL SERVICES

MAS I.D. # 712018

January 12, 1998

Hart Crowser, Inc.
1910 Fairview Avenue East
Seattle WA 98102-3699

Attention : Dave Heffner

Project Number : 4617

Project Name : Lake WA Ship Canal

Dear Mr. Heffner:

On December 10, 1997, MultiChem Analytical Services received one sample for analysis. On December 12, 1997 MultiChem received additional volume for polynuclear aromatic hydrocarbon analysis. The sample was analyzed with EPA methodology or equivalent methods as specified in the attached analytical schedule. The results, sample cross reference, and quality control data are enclosed.

Sincerely,

Kim M. Lofgren
Project Manager

KML/hal/trm

Enclosure

560 Naches Avenue SW, Suite 101, Renton, Washington 98055-2200 • 425-228-8335 • FAX 425-228-8336 • 1-800-609-0580 • info@multichem.com

MAS I.D. # 712018

MultiChem
ANALYTICAL SERVICES

SAMPLE CROSS REFERENCE SHEET

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

MAS #	CLIENT DESCRIPTION	DATE SAMPLED	MATRIX
712018-1	HC-MW-2	12/09/97	WATER
712018-1	HC-MW-2	12/11/97	WATER

----- TOTALS -----

MATRIX	# SAMPLES
WATER	1

MAS STANDARD DISPOSAL PRACTICE

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

MAS I.D. # 712018

MultiChem
ANALYTICAL SERVICES

ANALYTICAL SCHEDULE

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

ANALYSIS	TECHNIQUE	REFERENCE	LAB
AROMATIC VOLATILE ORGANICS	GC/PID	EPA 8021	R
HALOGENATED VOLATILE ORGANICS	GC/FID	EPA 8021	R
SEMIVOLATILE ORGANICS ANALYSIS	GCMS	EPA 8270A	R
POLYCHLORINATED BIPHENYLS	GC/ECD	EPA 8081	R
POLYNUCLEAR AROMATIC HYDROCARBONS	HPLC/UV/FL	EPA 8310	R
TOTAL PETROLEUM HYDROCARBONS: DIESEL	GC/FID	WA DOE WTPH-D	R
TOTAL SUSPENDED SOLIDS	GRAVIMETRIC	EPA 160.2	R

R = MAS - Renton
ANC = MAS - Anchorage
SUB = Subcontract

MAS I.D. # 712018

MultiChem
ANALYTICAL SERVICES

CASE NARRATIVE

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

CASE NARRATIVE: HALOGENATED & AROMATIC VOLATILE ORGANICS ANALYSIS

The following anomalies were associated with the preparation and/or analysis of the sample in this accession:

The continuing calibration verification (CCV) standard analyzed prior to the samples in this accession exceeded the upper recovery limit of 115% for chloroethane. The high recovery indicates a potential high bias for chloroethane. Since this compound was not detected in the samples in this accession, no further corrective action was performed.

The CCV analyzed following the samples in this accession exceeded the upper recovery limit of 115% for methylene chloride and trans-1,3-dichloropropene and fell below the lower recovery limit of 85% for chloromethane, chloroethane, 1,1-dichloroethene and 1,1,1-trichloroethane. The high recoveries indicate potential high biases for methylene chloride and trans-1,3-dichloropropene. Since these analytes were not detected in the samples in this accession, no further corrective action was performed. All the samples in this accession were reanalyzed with passing CCVs for chloromethane, chloroethane, 1,1-dichloroethene and 1,1,1-trichloroethane. None of these compounds were detected in either analysis.

The CCV analyzed following the associated matrix spike/matrix spike duplicate (MS/MSD) for this accession fell below the lower recovery limit of 85% for 1,1-dichloroethene. Since this CCV bracketed only the associated MS/MSD and the recoveries of 1,1-dichloroethene were within control limits, no further corrective action was performed.

All other associated quality assurance/quality control (QA/QC) parameters were within established MultiChem control limits.

MAS I.D. # 712018

MultiChem
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 4617	DATE RECEIVED	: N/A
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: N/A
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 12/18/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8021	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	<0.50
BROMODICHLOROMETHANE	<0.20
BROMOFORM	<0.50
BROMOMETHANE	<2.0
CARBON TETRACHLORIDE	<0.20
CHLOROBENZENE	<0.50
CHLOROETHANE	<2.0
CHLOROFORM	<0.20
CHLOROMETHANE	<1.0
1,2-DIBROMOETHANE (EDB)	<0.50
1,2-DICHLOROBENZENE	<0.50
1,3-DICHLOROBENZENE	<0.50
1,4-DICHLOROBENZENE	<0.50
DIBROMOCHLOROMETHANE	<0.20
1,1-DICHLOROETHANE	<0.20
1,2-DICHLOROETHANE (EDC)	<0.20
1,1-DICHLOROETHENE	<0.20
CIS-1,2-DICHLOROETHENE	<0.20
TRANS-1,2-DICHLOROETHENE	<0.20
1,2-DICHLOROPROPANE	<0.20
CIS-1,3-DICHLOROPROPENE	<0.20
TRANS-1,3-DICHLOROPROPENE	<0.20
ETHYLBENZENE	<0.50
METHYLENE CHLORIDE	<5.0
1,1,2,2-TETRACHLOROETHANE	<0.20
TETRACHLOROETHENE	<0.20
TOLUENE	<0.50
1,1,1-TRICHLOROETHANE	<0.50
1,1,2-TRICHLOROETHANE	<0.20
TRICHLOROETHENE	<0.20
TRICHLOROFLUOROMETHANE	<0.50
VINYL CHLORIDE	<1.0
TOTAL XYLENES	<0.50

SURROGATE PERCENT RECOVERY		LIMITS
BROMOCHLOROMETHANE	84	58 - 126
BROMOFLUOROBENZENE	92	76 - 136

MAS I.D. # 712018-1

MultiChem
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 12/09/97
PROJECT #	: 4617	DATE RECEIVED	: 12/10/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: N/A
CLIENT I.D.	: HC-MW-2	DATE ANALYZED	: 12/18/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8021	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS	
BENZENE	3.9	
BROMODICHLOROMETHANE	<0.20	
BROMOFORM	<0.50	
BROMOMETHANE	<2.0	
CARBON TETRACHLORIDE	<0.20	
CHLOROBENZENE	100	D4
CHLOROETHANE	<2.0	
CHLOROFORM	<0.20	
CHLOROMETHANE	<1.0	
1,2-DIBROMOETHANE (EDB)	<0.50	
1,2-DICHLOROBENZENE	1.3	
1,3-DICHLOROBENZENE	4.6	
1,4-DICHLOROBENZENE	6.0	
DIBROMOCHLOROMETHANE	<0.20	
1,1-DICHLOROETHANE	<0.20	
1,2-DICHLOROETHANE (EDC)	<0.20	
1,1-DICHLOROETHENE	<0.20	
CIS-1,2-DICHLOROETHENE	<0.20	
TRANS-1,2-DICHLOROETHENE	<0.20	
1,2-DICHLOROPROPANE	<0.20	
CIS-1,3-DICHLOROPROPENE	<0.20	
TRANS-1,3-DICHLOROPROPENE	<0.20	
ETHYLBENZENE	<0.50	
METHYLENE CHLORIDE	<5.0	
1,1,2,2-TETRACHLOROETHANE	<0.20	
TETRACHLOROETHENE	<0.20	
TOLUENE	<0.50	
1,1,1-TRICHLOROETHANE	<0.50	
1,1,2-TRICHLOROETHANE	<0.20	
TRICHLOROETHENE	<0.20	
TRICHLOROFLUOROMETHANE	<0.50	
VINYL CHLORIDE	<1.0	
TOTAL XYLENES	<0.50	

SURROGATE PERCENT RECOVERY		LIMITS
BROMOCHLOROMETHANE	84	58 - 126
BROMOFLUOROBENZENE	91	76 - 136

D4 = Value from a ten fold diluted analysis.

MAS I.D. # 712018

MultiChem
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
EPA METHOD : 8021

SAMPLE I.D. # : BLANK
DATE EXTRACTED : N/A
DATE ANALYZED : 12/18/97
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
BENZENE	<0.500	10.0	9.89	99	N/A	N/A	N/A
CHLOROBENZENE	<0.500	10.0	9.91	99	N/A	N/A	N/A
1,1-DICHLOROETHENE	<0.200	10.0	9.78	98	N/A	N/A	N/A
TOLUENE	<0.500	10.0	9.32	93	N/A	N/A	N/A
TRICHLOROETHENE	<0.200	10.0	10.4	104	N/A	N/A	N/A

CONTROL LIMITS	% REC.	RPD
BENZENE	73 - 134	20
CHLOROBENZENE	79 - 141	33
1,1-DICHLOROETHENE	56 - 158	22
TOLUENE	83 - 136	29
TRICHLOROETHENE	72 - 138	21

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
BROMOCHLOROMETHANE	101	N/A	58 - 126
BROMOFLUOROBENZENE	95	N/A	76 - 136

MAS I.D. # 712018

MultiChem
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT	: HART CROWSER, INC.	SAMPLE I.D. #	: 712018-1
PROJECT #	: 4617	DATE EXTRACTED	: N/A
PROJECT NAME	: LAKE WA SHIP CANAL	DATE ANALYZED	: 12/18/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8021		

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
BENZENE	3.85	10.0	13.1	93	13.2	94	1
CHLOROBENZENE	104	100	208	104	198	94	5
1,1-DICHLOROETHENE	<0.200	10.0	6.49	65	6.53	65	1
TOLUENE	<0.500	10.0	9.11	91	9.10	91	0
TRICHLOROETHENE	<0.200	10.0	9.01	90	8.21	82	9

CONTROL LIMITS	% REC.	RPD
BENZENE	55 - 148	20
CHLOROBENZENE	61 - 160	33
1,1-DICHLOROETHENE	37 - 182	22
TOLUENE	60 - 158	29
TRICHLOROETHENE	61 - 149	21

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
BROMOCHLOROMETHANE	93	97	58 - 126
BROMOFLUOROBENZENE	96	95	76 - 136

MAS I.D. # 712018

MultiChem
ANALYTICAL SERVICES

CASE NARRATIVE

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

CASE NARRATIVE: SEMIVOLATILE ORGANICS ANALYSIS

The following anomalies were associated with the preparation and/or analysis of the sample in this accession using EPA method 8270 for semivolatile organics:

The recovery of surrogate 2-fluorobiphenyl fell below advisory control limits of 40-120% in the analysis of 712018-1 (HC-MW-2) the blank, blank spike/blank spike duplicate (BS/BSD) and the matrix spike/matrix spike duplicate (MS/MSD) performed on 712018-1 (HC-MW-2). Since an insufficient number of data points have been collected to statistically determine control limits, the results were flagged "H" to denote that they were outside advisory limits.

The recovery of all target analytes with the exception of naphthalene were within control limits in the analysis of the BS/BSD. The recoveries of naphthalene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3cd)pyrene, dibenzo(a,h)anthracene and benzo(g,h,i)perylene fell below advisory control limits in the MS/MSD associated with this accession. Because of the low recovery of the less volatile polynuclear aromatic hydrocarbons (PAHs) in the MS, it became apparent that the samples were not amenable to solid phase extraction. The samples were reextracted via liquid/liquid extractors and reanalyzed by high performance liquid chromatography (HPLC). The results for compounds that fell outside control limits for SIM GCMS analysis were reported from the HPLC analysis.

The following anomalies were associated with the preparation and/or analysis of the samples in this accession using EPA method 8310 for polynuclear aromatic hydrocarbons:

The relative percent difference (RPD) between recoveries of several compounds from the MS/MSD samples exceeded MultiChem control limits. Since all MS/MSD recoveries, BS/BSD recoveries, and BS/BSD RPD values were in control, no further action was performed.

All other associated quality assurance/quality control (QA/QC) parameters were within established MultiChem control limits.

MAS I.D. # 712018

MultiChem
ANALYTICAL SERVICES

SEMIVOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 4617	DATE RECEIVED	: N/A
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/16/97
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 12/18/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8270A (MODIFIED)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
NAPHTHALENE	<0.092
ACENAPHTHYLENE	<0.016
ACENAPHTHENE	<0.028
FLUORENE	<0.018
PHENANTHRENE	<0.015
ANTHRACENE	<0.013
FLUORANTHENE	<0.011
PYRENE	<0.014
BENZO(A)ANTHRACENE	<0.013
CHRYSENE	<0.012
BENZO(B)FLUORANTHENE	<0.0090
BENZO(K)FLUORANTHENE	<0.0090
BENZO(A)PYRENE	<0.010
INDENO(1,2,3-CD)PYRENE	<0.012
DIBENZO(A,H)ANTHRACENE	<0.012
BENZO(G,H,I)PERYLENE	<0.011

SURROGATE PERCENT RECOVERY		LIMITS
TERPHENYL-D14	61	40 - 160
2-FLUOROBIPHENYL	16 H	40 - 160

H = Out of limits.

MAS I.D. # 712018

MultiChem
ANALYTICAL SERVICES

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 4617	DATE RECEIVED	: N/A
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/18/97
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 12/23/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8310 (LOW LEVEL)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
NAPHTHALENE	<0.11
ACENAPHTHYLENE	<0.23
ACENAPHTHENE	<0.11
FLUORENE	<0.023
PHENANTHRENE	<0.011
ANTHRACENE	<0.011
FLUORANTHENE	<0.023
PYRENE	<0.011
BENZO(A)ANTHRACENE	<0.011
CHRYSENE	<0.011
BENZO(B)FLUORANTHENE	<0.023
BENZO(K)FLUORANTHENE	<0.011
BENZO(A)PYRENE	<0.011
DIBENZO(A,H)ANTHRACENE	<0.032
BENZO(G,H,I)PERYLENE	<0.023
INDENO(1,2,3-CD)PYRENE	<0.011

SURROGATE PERCENT RECOVERY		LIMITS
2-CHLOROANTHRACENE	92	23 - 120

MAS I.D. # 712018-1

MultiChem
ANALYTICAL SERVICES

SEMIVOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 12/11/97
PROJECT #	: 4617	DATE RECEIVED	: 12/12/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/16/97
CLIENT I.D.	: HC-MW-2	DATE ANALYZED	: 12/18/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8270A (MODIFIED)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS	
NAPHTHALENE	3.0	X
ACENAPHTHYLENE	<0.016	
ACENAPHTHENE	1.0	
FLUORENE	0.34	
PHENANTHRENE	0.23	
ANTHRACENE	0.032	
FLUORANTHENE	0.079	
PYRENE	0.053	
BENZO(A)ANTHRACENE	<0.013	
CHRYSENE	<0.012	X
BENZO(B)FLUORANTHENE	<0.024	X
BENZO(K)FLUORANTHENE	<0.012	X
BENZO(A)PYRENE	<0.012	X
INDENO(1,2,3-CD)PYRENE	<0.033	X
DIBENZO(A,H)ANTHRACENE	<0.024	X
BENZO(G,H,I)PERYLENE	<0.012	X

SURROGATE PERCENT RECOVERY			LIMITS
TERPHENYL-D14	44		40 - 160
2-FLUOROBIPHENYL	37	H	40 - 160
2-CHLOROANTHRACENE	84	X	23 - 120

H = Out of limits.
X = Value reported from EPA 8310 analysis.

MAS I.D. # 712018

MultiChem
ANALYTICAL SERVICES

SEMIVOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
EPA METHOD : 8270A (MODIFIED)

SAMPLE I.D. # : BLANK
DATE EXTRACTED : 12/16/97
DATE ANALYZED : 12/18/97
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
NAPHTHALENE	<0.0920	2.50	0.625	25H	0.748	30H	18
ACENAPHTHYLENE	<0.0160	2.50	1.84	74	2.01	80	9
ACENAPHTHENE	<0.0280	2.50	1.51	60	1.68	67	11
FLUORENE	<0.0180	2.50	1.92	77	2.09	84	8
PHENANTHRENE	<0.0150	2.50	2.14	86	2.23	89	4
ANTHRACENE	<0.0130	2.50	2.17	87	2.26	90	4
FLUORANTHENE	<0.0110	2.50	2.22	89	2.34	94	5
PYRENE	<0.0140	2.50	2.27	91	2.35	94	3
BENZO(A)ANTHRACENE	<0.0130	2.50	2.11	84	2.15	86	2
CHRYSENE	<0.0120	2.50	1.93	77	1.96	78	2
BENZO(B)FLUORANTHENE	<0.00900	2.50	1.97	79	2.02	81	3
BENZO(K)FLUORANTHENE	<0.00900	2.50	1.72	69	1.81	72	5
BENZO(A)PYRENE	<0.0100	2.50	1.90	76	1.94	78	2
INDENO(1,2,3-CD)PYRENE	<0.0120	2.50	1.65	66	1.77	71	7
DIBENZO(A,H)ANTHRACENE	<0.0120	2.50	1.43	57	1.53	61	7
BENZO(G,H,I)PERYLENE	<0.0110	2.50	1.48	59	1.67	67	12

CONTROL LIMITS	% REC.	RPD
NAPHTHALENE	40 - 160	20
ACENAPHTHYLENE	40 - 160	20
ACENAPHTHENE	40 - 160	20
FLUORENE	40 - 160	20
PHENANTHRENE	40 - 160	20
ANTHRACENE	40 - 160	20
FLUORANTHENE	40 - 160	20
PYRENE	40 - 160	20
BENZO(A)ANTHRACENE	40 - 160	20
CHRYSENE	40 - 160	20
BENZO(B)FLUORANTHENE	40 - 160	20
BENZO(K)FLUORANTHENE	40 - 160	20
BENZO(A)PYRENE	40 - 160	20
INDENO(1,2,3-CD)PYRENE	40 - 160	20
DIBENZO(A,H)ANTHRACENE	40 - 160	20
BENZO(G,H,I)PERYLENE	40 - 160	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
TERPHENYL-D14	63	62	40 - 160
2-FLUOROBIPHENYL	18H	21H	40 - 160

H = Out of limits.

MAS I.D. # 712018

MultiChem
ANALYTICAL SERVICES

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
EPA METHOD : 8310 (LOW LEVEL)

SAMPLE I.D. # : BLANK
DATE EXTRACTED : 12/18/97
DATE ANALYZED : 12/23/97
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
ACENAPHTHYLENE	<0.227	9.09	6.70	74	7.36	81	9
PHENANTHRENE	<0.0114	0.455	0.366	80	0.386	85	5
PYRENE	<0.0114	0.455	0.396	87	0.403	89	2
BENZO(K)FLUORANTHENE	<0.0114	0.455	0.378	83	0.385	85	2
DIBENZO(A,H)ANTHRACENE	<0.0318	0.909	0.486	53	0.594	65	20

CONTROL LIMITS	% REC.	RPD
ACENAPHTHYLENE	43 - 106	23
PHENANTHRENE	42 - 113	21
PYRENE	48 - 124	20
BENZO(K)FLUORANTHENE	52 - 119	20
DIBENZO(A,H)ANTHRACENE	29 - 142	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
2-CHLOROANTHRACENE	92	92	23 - 120

MAS I.D. # 712018

MultiChem
ANALYTICAL SERVICES

SEMIVOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
EPA METHOD : 8270A (MODIFIED)

SAMPLE I.D. # : 712018-1
DATE EXTRACTED : 12/16/97
DATE ANALYZED : 12/18/97
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
NAPHTHALENE	1.74	2.50	2.40	26H	3.06	53	24H
ACENAPHTHYLENE	<0.0160	2.50	2.14	86	2.26	90	5
ACENAPHTHENE	1.03	2.50	2.69	66	2.88	74	7
FLUORENE	0.343	2.50	2.38	81	2.47	85	4
PHENANTHRENE	0.230	2.50	2.30	83	2.32	84	1
ANTHRACENE	0.0320	2.50	2.03	80	2.06	81	1
FLUORANTHENE	0.0788	2.50	2.12	82	2.09	80	1
PYRENE	0.0530	2.50	1.95	76	2.16	84	10
BENZO(A)ANTHRACENE	<0.0130	2.50	1.05	42	1.11	44	6
CHRYSENE	<0.0120	2.50	0.813	33H	0.817	33H	0
BENZO(B)FLUORANTHENE	<0.00900	2.50	0.400	16H	0.432	17H	8
BENZO(K)FLUORANTHENE	<0.00900	2.50	0.275	11H	0.270	11H	2
BENZO(A)PYRENE	<0.0100	2.50	0.297	12H	0.313	13H	5
INDENO(1,2,3-CD)PYRENE	<0.0120	2.50	0.0478	2H	0.0673	3H	33H
DIBENZO(A,H)ANTHRACENE	<0.0120	2.50	0.0285	1H	0.0385	2H	29H
BENZO(G,H,I)PERYLENE	<0.0110	2.50	0.0448	2H	0.0588	2H	27H

CONTROL LIMITS	% REC.	RPD
NAPHTHALENE	40 - 160	20
2-METHYLNAPHTHALENE	40 - 160	20
ACENAPHTHYLENE	40 - 160	20
ACENAPHTHENE	40 - 160	20
FLUORENE	40 - 160	20
PHENANTHRENE	40 - 160	20
ANTHRACENE	40 - 160	20
FLUORANTHENE	40 - 160	20
PYRENE	40 - 160	20
BENZO(A)ANTHRACENE	40 - 160	20
CHRYSENE	40 - 160	20
BENZO(B)FLUORANTHENE	40 - 160	20
BENZO(K)FLUORANTHENE	40 - 160	20
BENZO(A)PYRENE	40 - 160	20
INDENO(1,2,3-CD)PYRENE	40 - 160	20
DIBENZO(A,H)ANTHRACENE	40 - 160	20
BENZO(G,H,I)PERYLENE	40 - 160	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
TERPHENYL-D14	48	49	40 - 160
2-FLUOROBIPHENYL	30H	36H	40 - 160

H = Out of limits.

MAS I.D. # 712018

MultiChem
ANALYTICAL SERVICES

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
EPA METHOD : 8310 (LOW LEVEL)

SAMPLE I.D. # : 712018-1
DATE EXTRACTED : 12/18/97
DATE ANALYZED : 12/23/97
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
ACENAPHTHYLENE	<0.238	9.52	6.39	67	7.82	82	20
PHENANTHRENE	0.374	0.476	0.663	61	0.836	97	23H
PYRENE	0.0545	0.476	0.382	69	0.480	89	23H
BENZO(K)FLUORANTHENE	<0.0119	0.476	0.254	53	0.329	69	26H
DIBENZO(A,H)ANTHRACENE	<0.0333	0.952	0.210	22	0.317	33	41H

CONTROL LIMITS	% REC.	RPD
ACENAPHTHYLENE	20 - 163	23
PHENANTHRENE	20 - 168	21
PYRENE	36 - 125	20
BENZO(K)FLUORANTHENE	20 - 104	20
DIBENZO(A,H)ANTHRACENE	20 - 74	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
2-CHLOROANTHRACENE	72	91	23 - 120

H = Out of limits.

MAS I.D. # 712018

CASE NARRATIVE

MultiChem
ANALYTICAL SERVICES

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

CASE NARRATIVE: POLYCHLORINATED BIPHENYLS ANALYSIS

The following anomalies were associated with the preparation and/or analysis of the sample in this accession:

The percent difference (D%) of the surrogate, decachlorobiphenyl (DCBP), from the continuing calibration verification (CCV) standards which bracketed the sample and its associated quality control (QC) samples exceeded the control limits (±15%). Since the D% of the other surrogate, tetrachloro-m-xylene (TCMX), from these CCVs were in control and the spiked recoveries of TCMX were in control from all samples, no further corrective action was performed.

The relative percent difference (RPD) between sample matrix spike (MS) recovery and matrix spike duplicate (MSD) recovery exceeded MultiChem's established control limits. Since the MS/MSD recoveries and the associated blank spike (BS) recoveries were all in control, no further corrective action was performed for this sample set.

All other associated quality assurance/quality control (QA/QC) parameters were within established MultiChem control limits.

MAS I.D. # 712018

MultiChem
ANALYTICAL SERVICES

PCB ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 4617	DATE RECEIVED	: N/A
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/11/97
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 12/16/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8081 (ULTRA LOW LEVEL)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
AROCLOR 1016	<0.0052
AROCLOR 1221	<0.013
AROCLOR 1232	<0.013
AROCLOR 1242	<0.0052
AROCLOR 1248	<0.0052
AROCLOR 1254	<0.0052
AROCLOR 1260	<0.0052

SURROGATE PERCENT RECOVERY		LIMITS
DECACHLOROBIPHENYL	89	25 - 137
TETRACHLORO-M-XYLENE	58	40 - 123

MAS I.D. # 712018-1

MultiChem
ANALYTICAL SERVICES

PCB ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 12/09/97
PROJECT #	: 4617	DATE RECEIVED	: 12/10/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/11/97
CLIENT I.D.	: HC-MW-2	DATE ANALYZED	: 12/16/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8081 (ULTRA LOW LEVEL)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
AROCLOR 1016	<0.0052
AROCLOR 1221	<0.013
AROCLOR 1232	<0.013
AROCLOR 1242	<0.0052
AROCLOR 1248	<0.0052
AROCLOR 1254	<0.0052
AROCLOR 1260	<0.0052

SURROGATE PERCENT RECOVERY		LIMITS
DECACHLOROBIPHENYL	56	25 - 137
TETRACHLORO-M-XYLENE	59	40 - 123

MAS I.D. # 712018

MultiChem
ANALYTICAL SERVICES

PCB ANALYSIS
QUALITY CONTROL DATA

CLIENT	: HART CROWSER, INC.	SAMPLE I.D. #	: BLANK
PROJECT #	: 4617	DATE EXTRACTED	: 12/11/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE ANALYZED	: 12/16/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8081 (ULTRA LOW LEVEL)		

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
AROCLOR 1260	<0.00524	0.0298	0.0329	110	N/A	N/A	N/A

CONTROL LIMITS	% REC.	RPD
AROCLOR 1260	72 - 144	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
DECACHLOROBIPHENYL	97	N/A	25 - 137
TETRACHLORO-M-XYLENE	73	N/A	40 - 123

MAS I.D. # 712018

MultiChem
ANALYTICAL SERVICES

PCB ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
EPA METHOD : 8081 (ULTRA LOW LEVEL)

SAMPLE I.D. # : 712018-1
DATE EXTRACTED : 12/11/97
DATE ANALYZED : 12/16/97
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
AROCLOR 1260	<0.00524	0.0298	0.0255	86	0.0187	63	31H

CONTROL LIMITS	% REC.	RPD
AROCLOR 1260	32 - 163	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
DECACHLOROBIPHENYL	57	44	25 - 137
TETRACHLORO-M-XYLENE	62	51	40 - 123

H = Out of limits.

MAS I.D. # 712018

MultiChem
ANALYTICAL SERVICES

CASE NARRATIVE

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

CASE NARRATIVE: TOTAL PETROLEUM HYDROCARBONS ANALYSIS - DIESEL

There were no anomalies associated with the preparation and/or analysis of the sample in this accession.

MAS I.D. # 712018

MultiChem
ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 4617	DATE RECEIVED	: N/A
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/12/97
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 12/13/97
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	<0.25
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<0.75
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
O-TERPHENYL	96	65 - 134

MAS I.D. # 712018-1

MultiChem
ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 12/09/97
PROJECT #	: 4617	DATE RECEIVED	: 12/10/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/12/97
CLIENT I.D.	: HC-MW-2	DATE ANALYZED	: 12/14/97
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	0.35
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<0.71
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
O-TERPHENYL	95	65 - 134

MAS I.D. # 712018

MultiChem
ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
METHOD : WA DOE WTPH-D

SAMPLE I.D. # : BLANK
DATE EXTRACTED : 12/12/97
DATE ANALYZED : 12/13/97
UNITS : mg/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
DIESEL	<0.250	2.50	2.45	98	2.45	98	0

CONTROL LIMITS	% REC.	RPD
DIESEL	76 - 115	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
O-TERPHENYL	95	97	65 - 134

MAS I.D. # 712018

MultiChem
ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT	: HART CROWSER, INC.	SAMPLE I.D. #	: 712018-1
PROJECT #	: 4617	DATE EXTRACTED	: 12/12/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE ANALYZED	: 12/14/97
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: WA DOE WTPH-D		

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
DIESEL	0.346	2.38	2.50	91	2.55	93	2

CONTROL LIMITS	% REC.	RPD
DIESEL	73 - 130	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
O-TERPHENYL	96	95	65 - 134

MAS I.D. # 712018

MultiChem
ANALYTICAL SERVICES

CASE NARRATIVE

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

CASE NARRATIVE: GENERAL CHEMISTRY ANALYSIS

There were no anomalies associated with the preparation and/or analysis of the sample in this accession.

MAS I.D. # 712018

MultiChem
ANALYTICAL SERVICES

GENERAL CHEMISTRY ANALYSIS

CLIENT : HART CROWSER, INC. MATRIX : WATER
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

PARAMETER	DATE PREPARED	DATE ANALYZED
TOTAL SUSPENDED SOLIDS	12/11/97	12/12/97

MAS I.D. # 712018

MultiChem
ANALYTICAL SERVICES

GENERAL CHEMISTRY ANALYSIS
DATA SUMMARY

CLIENT : HART CROWSER, INC. MATRIX : WATER
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL UNITS : mg/L

MAS I.D. #	CLIENT I.D.	TOTAL SUSPENDED SOLIDS
712018-1	HC-MW-2	45
BLANK	-	<10

MAS I.D. # 712018

MultiChem
ANALYTICAL SERVICES

GENERAL CHEMISTRY ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC. MATRIX : WATER
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL UNITS : mg/L

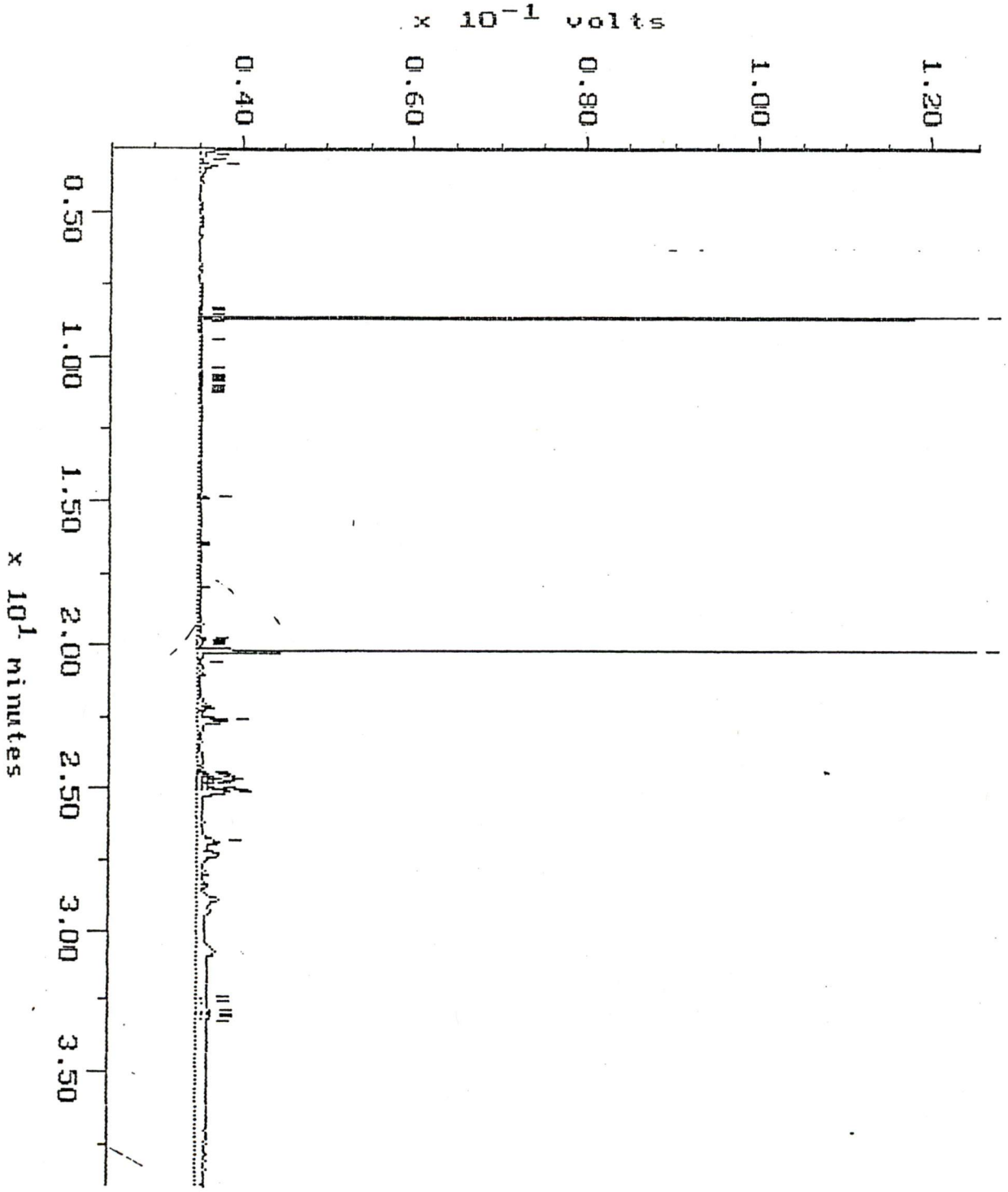
PARAMETER	MAS I.D.	SAMPLE RESULT	DUP RESULT	RPD	SPIKED RESULT	SPIKE ADDED	% REC.
TOTAL SUSPENDED SOLIDS	BLANK	<10.0	N/A	N/A	47.0	56.0	84
TOTAL SUSPENDED SOLIDS	712017-1	<10.0	<10.0	NC	N/A	N/A	N/A

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

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

BLANK

Sample: A1212 TPHD BLK Channel: ANN Filename: RC128A21
Acquired: 13-DEC-97 17:50 Method: X:\MAXDATA\ANN\FUEL1212 Operator: ANN
Comments: WA DOE TPH D

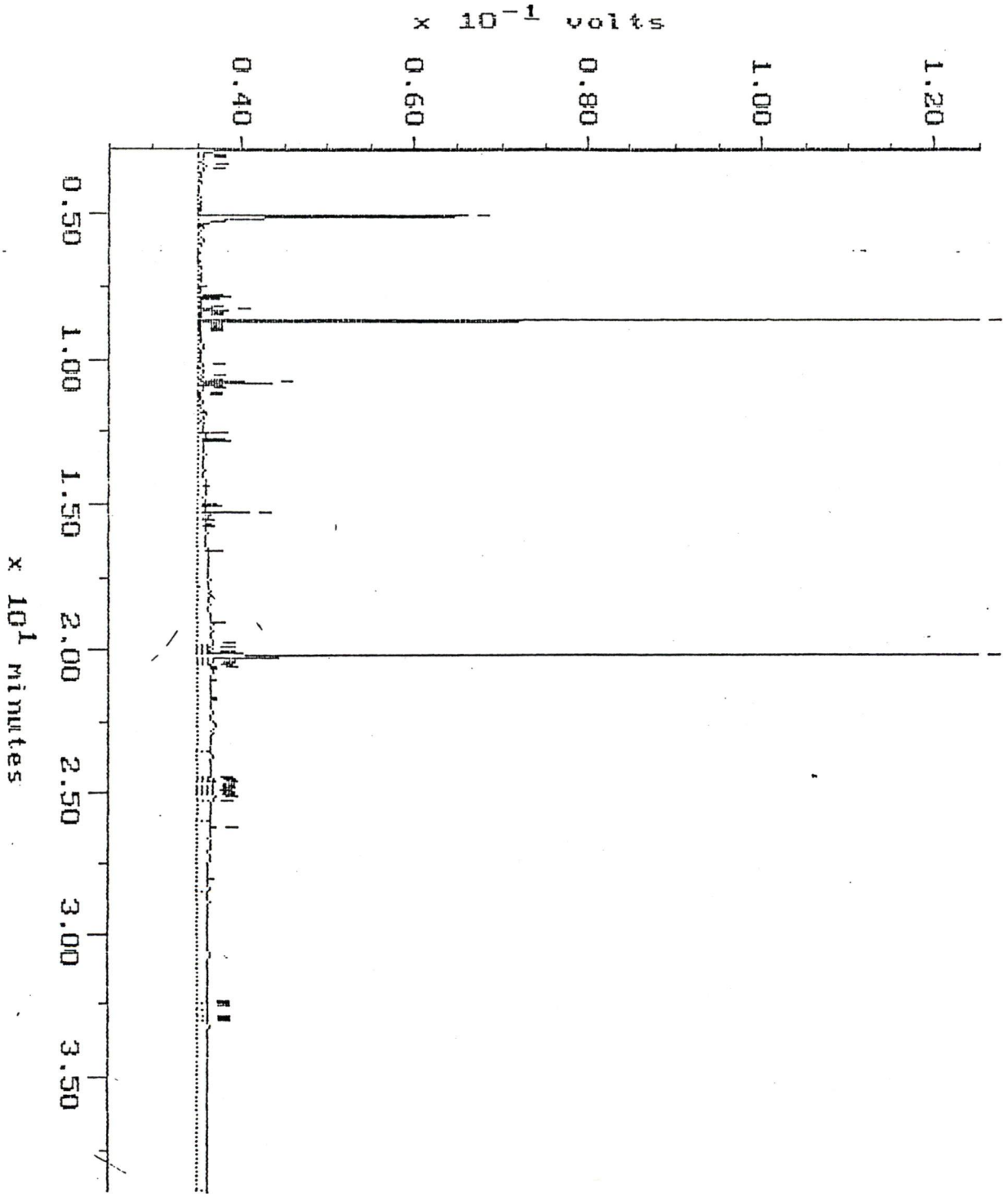


WA DOE WTPH-D

Sample: 712018-1
Acquired: 14-DEC-97 9:25
Comments:

Channel: ANN
Method: X:\MAXDATA\ANN\FUEL1212
WA DOE TPH D

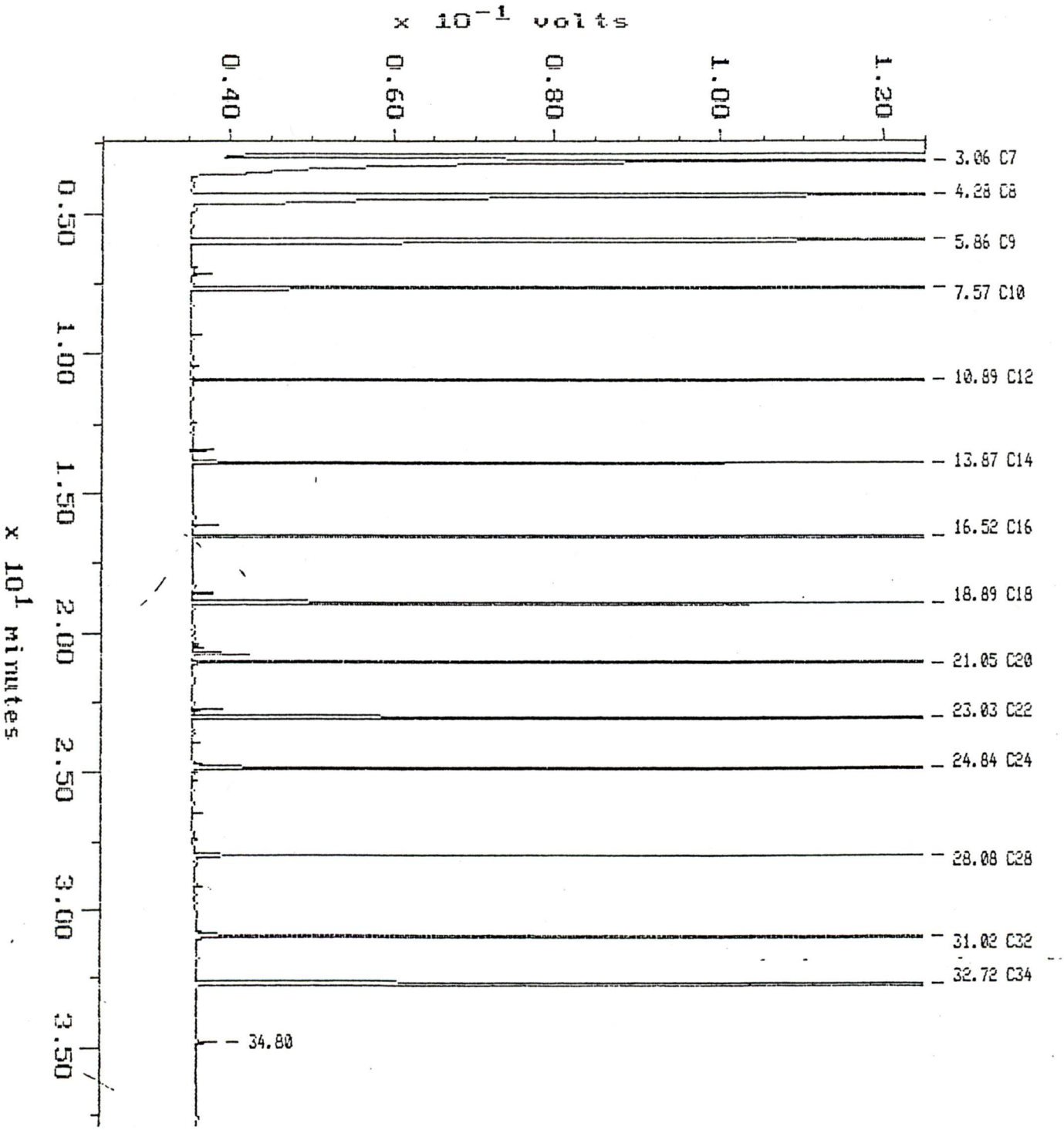
Filename: RC128A40
Operator: ANN



Sample: ALKANE ANN
Acquired: 10-DEC-97 11:15
Inj Vol: 1.00
Comments: ALKANE STANDARD

Channel: ANN
Method: X:\MAXDATA\ANN\FUEL1210

Filename: RC108A02
Operator: ANN

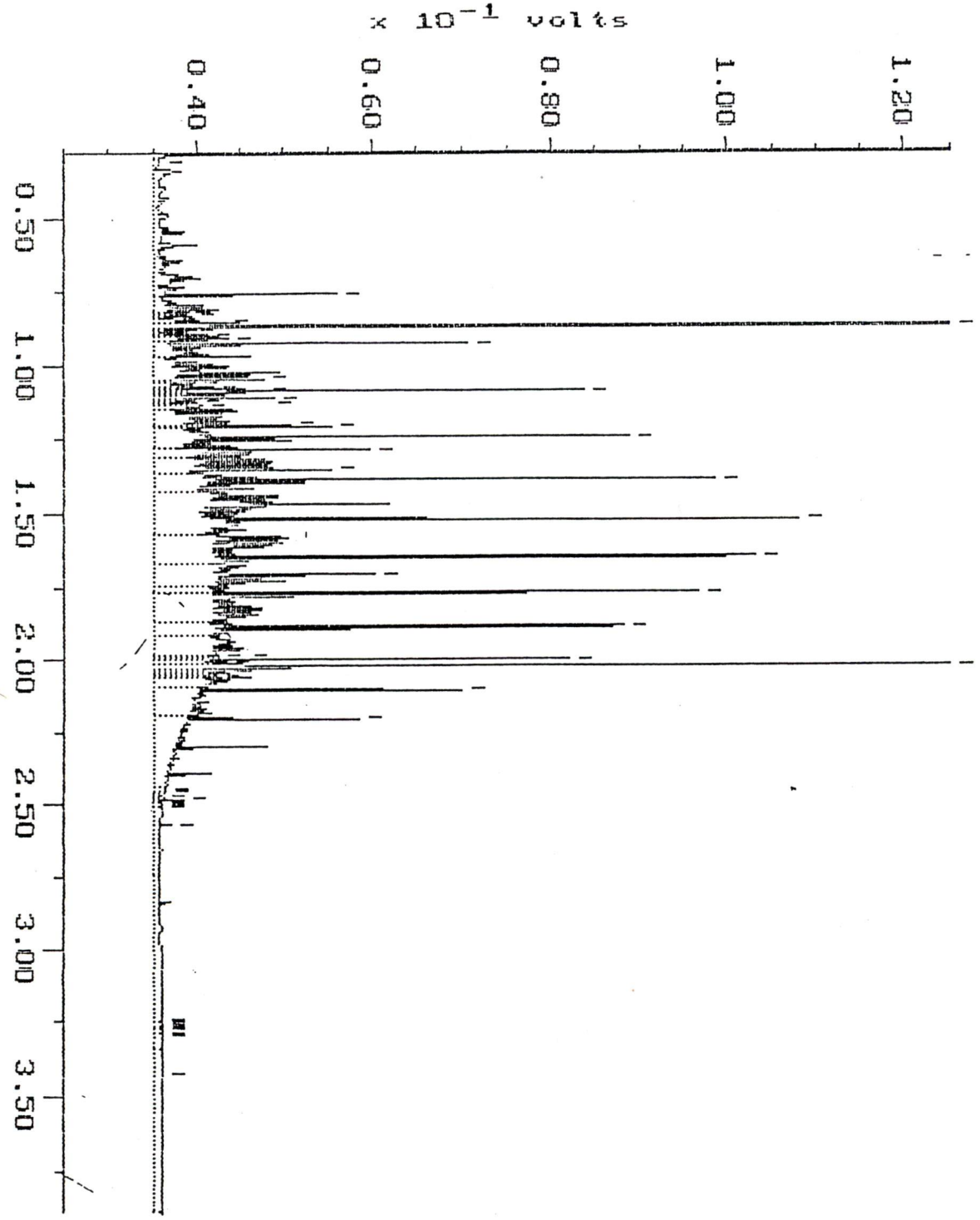


CONTINUING CALIBRATION

Sample: D500 CCV
Acquired: 12-DEC-97 23:40
Comments:

Channel: ANN
Method: X:\CHAXDATA\ANN\FUEL1211
WA DOE TPH D

Filename: RC118A39
Operator: ANN

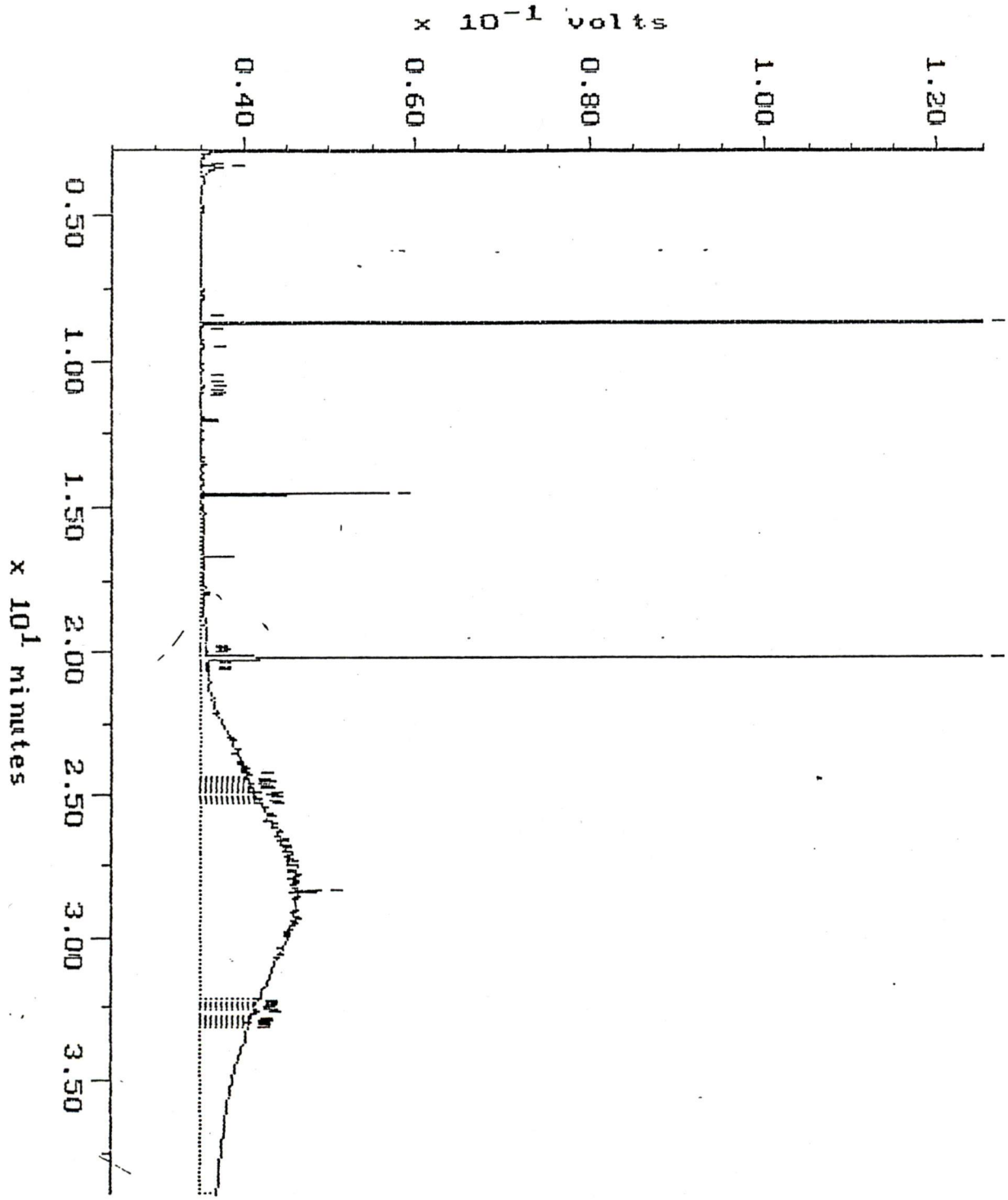


CONTINUING CALIBRATION

Sample: MD500 CCV
Acquired: 13-DEC-97 0:29
Comments:

Channel: ANN
Method: X:\MAXDATA\ANN\FUEL1211
WA DOE TPH D

Filename: RC118A40
Operator: ANN



MultiChem Analytical Services 560 Naches Avenue S.W. Suite 101, Renton, WA 98055
(800) 609-0580 ◇ (206) 228-8335 ◇ Fax (206) 353-1742 DATE: 12/9/97 PAGE: 1 OF: 1

LABORATORY NUMBER: 712018

COMPANY: HART CROWSER
ADDRESS: 1910 FAIRVIEW AVE E
SEATTLE, WA 98102
PHONE: ( ) - FAX: ( ) -
PROJ. MNGR. / REPORT TO: HEFFNER, D
PROJECT NUMBER: 4617
PROJECT NAME: LK WA SHIP CANAL
☐ MAS DISPOSAL ☐ RETURN

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	FUELS: TPH-HCID	BETX/TPH-G	BETX (BY 8020)	TPH-G	TPH-D EXT	8015 modified	418.1	413.2	AK-GRO	AK-DRO	ORGANIC COMPOUNDS: 8240 / 8260 GCMS Volatiles	8270 ~~GCMS~~ Semivolatiles SIM	~~8080~~ Pesticides/PCBs 8081	PCB only (by 8080) STD/low level	~~8010~~ Halogenated VOCs 8021	~~8020~~ Aromatic VOCs 8021B	8310 HPLC PAHs	8040 Phenols	8140 OP Pesticides	8150 OC Herbicides	METALS: Metals indicate below*	Total Lead	PP Metals (13)	TAL Metals (23)	TCLP: TCLP 8240 (ZHE)	TCLP 8270 Semivolatiles	TCLP 8080 Pesticide	OTHER: % MOISTURE	TSS 160.2				Total # of Containers
HC-MW-2 MS/MSD	12/9/97	12:20	H2O	1					X						X	X		X															X				15

17 JH

SAMPLE RECEIPT		TAT	
TOTAL # OF CONTAINERS		1 WORK DAY TAT	
COC SEALS PRESENT?		2 WORK DAY TAT	
COC SEALS INTACT?		3 WORK DAY TAT	
RECEIVED COLD?		4 WORK DAY TAT	
RECEIVED INTACT?		1 WEEK TAT	
RECEIVED VIA:		STANDARD TAT	X

SPECIAL INSTRUCTIONS:
cooler #83

*Metals needed

MAS USE ONLY:
SUBCONTRACT INFO:
PO #
VERBALS:
H.C. DUE:

Relinquished By:	Relinquished By:	Relinquished By:
	12/9/97	
STEDER	17:02	
Company: HC SEA	Company: HC	Company:
Received By:	Received By:	Received By:
Jonathan van Dyk	DATE:	DATE:
DATE: 12/10/97		
TIME:	TIME:	TIME:
JONATHAN VAN DYK 1425		
Company: MAS-R	Company:	Company:

FOR MULTICHEM ONLY: SUBCONTRACT LAB:

17 JH

12/11/97

AnalyticalTechnologies, Inc.
560 Naches Avenue, S.W., Suite 101, Renton, WA 98055 (206) 228-8335

DATE: 12/11/97 Page 1 of 1 ATI ACCESSION # 712018

COMPANY: HART CROWSER
REPORT TO:
ADDRESS: (on file)
PHONE: ( ) - FAX: ( ) -
PROJECT MANAGER: D. HEFFNER
PROJECT NUMBER: 4617
PROJECT NAME: LK WA SHIP - COE
ATI will DISPOSE / RETURN samples (circle one)

Sample ID	Date	Time	Matrix	labID
~~HK-MW-3~~	~~12/11/97~~	~~15:30~~	H_2O	
HK-MW-2	12/11/97	13:45	H_2O	1

	FUELS									ORGANIC COMPOUNDS									METALS			TCLP				OTHER	
	TPH-HCID WA/OR	BETX/TPH-G combo WA/OR	BETX (by 8020) WA/OR	TPH-G WA/OR	TPH-D WA/OR	8015 modified WA/OR	418.1	413.2	AK-GRO	AK-DRO	8240 GCMS Volatiles	8270 ~~GCMS~~ Semivolatiles SIM	~~8080~~ Pesticides/PCBs 8081	PCB only (by 8080) STD/lo level	8010 Halogenated VOCs	8020 Aromatic VOCs	8310 HPLC PAHs	8040 Phenols	8140 OP Pesticides	8150 OC Herbicides	Metals (Indicate below *)	Total Lead -	Priority Pollutant Metals (13)	TAL Metals (23)	TCLP-Volatiles (ZHE-8240)	TCLP-Semivolatiles (8270)	TCLP-Pesticides (8080)	TCLP-Herbicides (8150)	TCLP-Metals (8 metals)	% Moisture (please indicate)	Total # of Containers/sample
~~HK-MW-3~~					X							X	X																
HK-MW-2					X							X	X																1

Turnaround Time		Sample Receipt	
STANDARD TAT	✓	TOTAL # CONTAINERS RECVD	1
1 WEEK TAT		COC SEALS PRESENT?	Y
4 WORK DAY TAT		COC SEALS INTACT?	Y
3 WORK DAY TAT		RECEIVED COLD?	Y
2 WORK DAY TAT		RECEIVED INTACT?	Y
24 HOUR TAT		RECEIVED VIA: COURIER	

Special Instructions:
Some analyses may have been performed.
Check & Kim.
* Metals needed:

Relinquished By:	Relinquished By:	Relinquished By:
Date: 12/11/97	Date:	Date:
Time: 15:15	Time:	Time:
Received By:	**Received By:**	**Received By:**
Jonathan van Dyke Date: 12/12/97	Date:	Date:
Time: JONATHAN VAN DYKE 1200 MAS K	Time:	Time:

Cooler Receipt Form

Project: LAKE WASHINGTON SHIP CANAL

Cooler received on 12/10/97 and opened on 12/10/97 by JONATHAN VAN DYCK

Jonathan van Dyck
(Signature)

1. Were custody seals on outside of cooler? ..... (YES) NO
   if YES, how many and where? 1 FRONT
   Were Signature and date correct? ..... (YES) NO
2. Were custody papers taped to lid inside cooler? ..... (YES) NO
3. Were custody papers properly filled out (ink, signed, etc.)..... (YES) NO
4. Did you sign custody papers in the appropriate place? ..... (YES) NO
5. Did you attach shipper's packing slip to this form? ..... (YES) NO
6. What kind of packing material was used? BUBBLE BAGS
7. Was sufficient ice used (if appropriate)? ..... (YES) NO
8. Were all bottles sealed in separate plastic bags? ..... (YES) NO
9. Did all bottles arrive in good condition (unbroken)? ..... (YES) NO
10. Were all bottle labels complete (No., date, signed, anal, pres, etc.)? ..... (YES) NO
11. Did all bottle labels and tags agree with custody papers? ..... (YES) NO
12. Were correct bottles used for the test indicated? ..... (YES) NO
13. Were VOA vials checked for absence of air bubbles and noted if found? ..... (YES) NO
14. Was sufficient amount of sample sent in each bottle? ..... (YES) NO

Explain any discrepancies

HARTCROWSER

J-4617 9/96

Figure 8

Conl_6\forms\cooler

NON-CONFORMANCES?
(Y) N #1, 2
(if Y see other side)

MultiChem Analytical Services
SAMPLE LOG-IN CHECKLIST

DATE: 12/10/97
TIME: ~~0900~~ 1425
INITIALS: JVD

ACCESSION NO. 712018
CLIENT: HCI
PROJECT: LK. WASH. SHIP CANAL

Shipping:

Type:
- X Cooler
- ____ Box
- ____ Other

COC Seals:
- X Ship. Cont.
- ____ On Bottles
- ____ None

Intact?
- (Y) N
- Y N

Packing Material:
- ____ Styrofoam
- X Bubble Bags
- ____ Foam Vial Packs
- ____ Other ____

Refrigerant:
- X Gel Ice Pack
- ____ Loose Ice
- ____ Other
- ____ None

Frozen?
- (Y) N
- Y N
- Y N

Received Via:
- ____ Hand Delivery
- ____ Federal Express
- ____ Airborne
- ____ Other: ____
- X Courier
- ____ UPS
- ____ Taxi
- ____ Goldstreak

Sample Information:

Samp. #	Bottle #
1	17

Type
- Soil
- Water
- Product
- Other

Soil VOAs
Water VOAs

0 headspace Y N N ____
0 headspace Y (N) N #1
Preserved? (Y) N ____
Trip blanks? Y (N) #2

Condition of Samples:
Containers:
Intact? (Bottle/Lid) (Y) N
Correct Type? (Y) N

CA # ____
CA # ____

Waters Preserved? (Y) N N ____
(if needed)

ID's Match C.O.C. (Y) N N ____

Temperature: 6.0 C ____ CA NO.
(See corrective action on reverse side for explanation if temperature is outside of the MAS recommended range.)

LAB USE ONLY ☐ NO NOTICE ☐ SENDOUTS, NEEDED BY
☐ COC/TAT DOES NOT MATCH NOTICE ☐ NEED TEST(S) VERIFIED BY CLIENT

COMMENTS: ____

NON-CONFORMANCES?
(Y) N #1,2
(if Y see other side)

MultiChem Analytical Services
Corrective Action Sheet

ACCESSION # 712018

CORRECTIVE ACTION AREA

EXPLAIN CORRECTIVE ACTION:

CA NO.	CA NO.	CA NO.
_____Salvaged Sample	_____Replaced Bottle	_____Verified Id w/Client
_____Replaced Lid	_____Notified P.M.	_____Notified Client
_____Preserved Sample w/_____		

Comments:

#1 1 OF 6 VOAs HAS HEADSPACE

#2 NO TRIP BLANKS WERE RECEIVED

Temperature:_____ C _____ CA NO.

_____Comments: Samples were received outside of the MAS recommended temperature range (4 C+/- 2 C) Samples were received within 5 hours of collection and may not have had sufficient time to equilibrate with coolant. A temperature range from 2 to 15 degrees Celsius is considered acceptable. The samples will be analyzed as scheduled unless directed otherwise by client.

_____Comments: Samples were received outside of the MAS recommended temperature range (4 C+/- 2 C) The samples will be analyzed as scheduled unless directed otherwise by client.

Tech.Signature/Date: Jonathan van Dyk 12/10/17 P.M. Signature/Date:_____

CORRECTIVE ACTION TAKEN:

Explain Action Taken:

GOLDSTAR
PACKAGE EXPRESS
CELL: 999-2236 PGR: 583-9048

DATE: 12/8/97

ACCT. NAME: Hart Crowser

FROM:

TO: Multi Chem Analytical Serv.
560 Naches Ave SW
Renton 98055

SERVICE: ☐ 1 HR. ☒ 2 HR. ☐ 4 HR. ☐ ROUND TRIP

JOB #: 4617 — — # Faider

SPECIAL INST:

TIME: PICK-UP _____ RECIEVED 0935

X Elaine Walker
RECEIVED BY(PLS.PRINT)

TOTAL $

MultiChem
ANALYTICAL SERVICES

MAS I.D. # 712019

January 12, 1998

Hart Crowser, Inc.
1910 Fairview Avenue East
Seattle WA 98102-3699

Attention : Dave Heffner

Project Number : 4617

Project Name : Lake WA Ship Canal

Dear Mr. Heffner:

On December 10, 1997, MultiChem Analytical Services received one sample for analysis. On December 12, 1997 MultiChem received additonal volume for polynuclear aromatic hydrocarbon (PAH) analysis. The sample was analyzed with EPA methodology or equivalent methods as specified in the attached analytical schedule. The results, sample cross reference, and quality control data are enclosed.

Sincerely,

Kim M. Lofgren
Project Manager

KML/hal/trm

Enclosure

560 Naches Avenue SW, Suite 101, Renton, Washington 98055-2200 • **425-228-8335** • FAX 425-228-8336 • 1-800-609-0580 • info@multichem.com

MAS I.D. # 712019

MultiChem
ANALYTICAL SERVICES

SAMPLE CROSS REFERENCE SHEET

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

MAS #	CLIENT DESCRIPTION	DATE SAMPLED	MATRIX
712019-1	HC-MW-10	12/09/97	WATER
712019-1	HC-MW-10	12/11/97	WATER

----- TOTALS -----

MATRIX	# SAMPLES
WATER	1

MAS STANDARD DISPOSAL PRACTICE

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

MAS I.D. # 712019

MultiChem
ANALYTICAL SERVICES

ANALYTICAL SCHEDULE

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

ANALYSIS	TECHNIQUE	REFERENCE	LAB
AROMATIC VOLATILE ORGANICS	GC/PID	EPA 8021	R
HALOGENATED VOLATILE ORGANICS	GC/FID	EPA 8021	R
SEMIVOLATILE ORGANICS ANALYSIS	GCMS	EPA 8270A	R
POLYCHLORINATED BIPHENYLS	GC/ECD	EPA 8081	R
POLYNUCLEAR AROMATIC HYDROCARBONS	HPLC/UV/FL	EPA 8310	R
TOTAL PETROLEUM HYDROCARBONS: DIESEL	GC/FID	WA DOE WTPH-D	R
TOTAL SUSPENDED SOLIDS	GRAVIMETRIC	EPA 160.2	R

R = MAS - Renton
ANC = MAS - Anchorage
SUB = Subcontract

MAS I.D. # 712019

MultiChem
ANALYTICAL SERVICES

CASE NARRATIVE

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

CASE NARRATIVE: HALOGENATED & AROMATIC VOLATILE ORGANICS ANALYSIS

The following anomalies were associated with the preparation and/or analysis of the sample in this accession:

The continuing calibration verification (CCV) standard analyzed prior to the samples in this accession exceeded the upper recovery limit of 115% for chloroethane. The high recovery indicates a potential high bias for chloroethane. Since this compound was not detected in the samples in this accession, no further corrective action was performed.

The CCV analyzed following the samples in this accession exceeded the upper recovery limit of 115% for methylene chloride and trans-1,3-dichloropropene and fell below the lower recovery limit of 85% for chloromethane, chloroethane, 1,1-dichloroethene and 1,1,1-trichloroethane. The high recoveries indicate potential high biases for methylene chloride and trans-1,3-dichloropropene. Since these analytes were not detected in the samples in this accession, no further corrective action was performed. All the samples in this accession were reanalyzed with passing CCVs for chloromethane, chloroethane, 1,1-dichloroethene and 1,1,1-trichloroethane. These compounds were not detected in either analysis.

The CCV analyzed following the associated matrix spike/matrix spike duplicate (MS/MSD) for this accession fell below the lower recovery limit of 85% for 1,1-dichloroethene. Since this CCV bracketed only the associated MS/MSD and the recoveries of 1,1-dichloroethene were within control limits, no further corrective action was performed.

All other associated quality assurance/quality control (QA/QC) parameters were within established MultiChem control limits.

MAS I.D. # 712019

MultiChem
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 4617	DATE RECEIVED	: N/A
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: N/A
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 12/18/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8021	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	<0.50
BROMODICHLOROMETHANE	<0.20
BROMOFORM	<0.50
BROMOMETHANE	<2.0
CARBON TETRACHLORIDE	<0.20
CHLOROBENZENE	<0.50
CHLOROETHANE	<2.0
CHLOROFORM	<0.20
CHLOROMETHANE	<1.0
1,2-DIBROMOETHANE (EDB)	<0.50
1,2-DICHLOROBENZENE	<0.50
1,3-DICHLOROBENZENE	<0.50
1,4-DICHLOROBENZENE	<0.50
DIBROMOCHLOROMETHANE	<0.20
1,1-DICHLOROETHANE	<0.20
1,2-DICHLOROETHANE (EDC)	<0.20
1,1-DICHLOROETHENE	<0.20
CIS-1,2-DICHLOROETHENE	<0.20
TRANS-1,2-DICHLOROETHENE	<0.20
1,2-DICHLOROPROPANE	<0.20
CIS-1,3-DICHLOROPROPENE	<0.20
TRANS-1,3-DICHLOROPROPENE	<0.20
ETHYLBENZENE	<0.50
METHYLENE CHLORIDE	<5.0
1,1,2,2-TETRACHLOROETHANE	<0.20
TETRACHLOROETHENE	<0.20
TOLUENE	<0.50
1,1,1-TRICHLOROETHANE	<0.50
1,1,2-TRICHLOROETHANE	<0.20
TRICHLOROETHENE	<0.20
TRICHLOROFLUOROMETHANE	<0.50
VINYL CHLORIDE	<1.0
TOTAL XYLENES	<0.50

SURROGATE PERCENT RECOVERY		LIMITS
BROMOCHLOROMETHANE	84	58 - 126
BROMOFLUOROBENZENE	92	76 - 136

MAS I.D. # 712019-1

MultiChem
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 12/09/97
PROJECT #	: 4617	DATE RECEIVED	: 12/10/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: N/A
CLIENT I.D.	: HC-MW-10	DATE ANALYZED	: 12/18/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8021	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS	
BENZENE	3.9	
BROMODICHLOROMETHANE	<0.20	
BROMOFORM	<0.50	
BROMOMETHANE	<2.0	
CARBON TETRACHLORIDE	<0.20	
CHLOROBENZENE	98	D4
CHLOROETHANE	<2.0	
CHLOROFORM	<0.20	
CHLOROMETHANE	<1.0	
1,2-DIBROMOETHANE (EDB)	<0.50	
1,2-DICHLOROBENZENE	1.3	
1,3-DICHLOROBENZENE	4.7	
1,4-DICHLOROBENZENE	5.9	
DIBROMOCHLOROMETHANE	<0.20	
1,1-DICHLOROETHANE	<0.20	
1,2-DICHLOROETHANE (EDC)	<0.20	
1,1-DICHLOROETHENE	<0.20	
CIS-1,2-DICHLOROETHENE	<0.20	
TRANS-1,2-DICHLOROETHENE	<0.20	
1,2-DICHLOROPROPANE	<0.20	
CIS-1,3-DICHLOROPROPENE	<0.20	
TRANS-1,3-DICHLOROPROPENE	<0.20	
ETHYLBENZENE	<0.50	
METHYLENE CHLORIDE	<5.0	
1,1,2,2-TETRACHLOROETHANE	<0.20	
TETRACHLOROETHENE	<0.20	
TOLUENE	<0.50	
1,1,1-TRICHLOROETHANE	<0.50	
1,1,2-TRICHLOROETHANE	<0.20	
TRICHLOROETHENE	<0.20	
TRICHLOROFLUOROMETHANE	<0.50	
VINYL CHLORIDE	<1.0	
TOTAL XYLENES	<0.50	

SURROGATE PERCENT RECOVERY		LIMITS
BROMOCHLOROMETHANE	82	58 - 126
BROMOFLUOROBENZENE	90	76 - 136

D4 = Value from a ten fold diluted analysis.

MAS I.D. # 712019

MultiChem
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
EPA METHOD : 8021

SAMPLE I.D. # : BLANK
DATE EXTRACTED : N/A
DATE ANALYZED : 12/18/97
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
BENZENE	<0.500	10.0	9.89	99	N/A	N/A	N/A
CHLOROBENZENE	<0.500	10.0	9.91	99	N/A	N/A	N/A
1,1-DICHLOROETHENE	<0.200	10.0	9.78	98	N/A	N/A	N/A
TOLUENE	<0.500	10.0	9.32	93	N/A	N/A	N/A
TRICHLOROETHENE	<0.200	10.0	10.4	104	N/A	N/A	N/A

CONTROL LIMITS	% REC.	RPD
BENZENE	73 - 134	20
CHLOROBENZENE	79 - 141	33
1,1-DICHLOROETHENE	56 - 158	22
TOLUENE	83 - 136	29
TRICHLOROETHENE	72 - 138	21

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
BROMOCHLOROMETHANE	101	N/A	58 - 126
BROMOFLUOROBENZENE	95	N/A	76 - 136

MAS I.D. # 712019

MultiChem
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT	: HART CROWSER, INC.	SAMPLE I.D. #	: 712018-1
PROJECT #	: 4617	DATE EXTRACTED	: N/A
PROJECT NAME	: LAKE WA SHIP CANAL	DATE ANALYZED	: 12/18/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8021		

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
BENZENE	3.85	10.0	13.1	93	13.2	94	1
CHLOROBENZENE	104	100	208	104	198	94	5
1,1-DICHLOROETHENE	<0.200	10.0	6.49	65	6.53	65	1
TOLUENE	<0.500	10.0	9.11	91	9.10	91	0
TRICHLOROETHENE	<0.200	10.0	9.01	90	8.21	82	9

CONTROL LIMITS	% REC.	RPD
BENZENE	55 - 148	20
CHLOROBENZENE	61 - 160	33
1,1-DICHLOROETHENE	37 - 182	22
TOLUENE	60 - 158	29
TRICHLOROETHENE	61 - 149	21

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
BROMOCHLOROMETHANE	93	97	58 - 126
BROMOFLUOROBENZENE	96	95	76 - 136

MAS I.D. # 712019

MultiChem
ANALYTICAL SERVICES

CASE NARRATIVE

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

CASE NARRATIVE: SEMIVOLATILE ORGANICS ANALYSIS

The following anomalies were associated with the preparation and/or analysis of the sample in this accession using EPA method 8270 for semivolatile organics:

The recovery of surrogate 2-fluorobiphenyl fell below advisory control limits of 40-120% in the analysis of 712019-1 (HC-MW-10) the blank, blank spike/blank spike duplicate (BS/BSD) and the matrix spike/matrix spike duplicate (MS/MSD). Since an insufficient number of data points have been collected to statistically determine control limits, the results were flagged "H" to denote that they were outside advisory limits.

The recovery of all target analytes with the exception of naphthalene were within control limits in the analysis of the BS/BSD. The recoveries of naphthalene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3cd)pyrene, dibenzo(a,h)anthracene and benzo(g,h,i)perylene fell below advisory control limits in the MS/MSD associated with this accession. Because of the low recovery of the less volatile polynuclear aromatic hydrocarbons (PAHs) in the MS, it became apparent that the samples were not amenable to solid phase extraction. The samples were reextracted via liquid/liquid extractors and reanalyzed by high performance liquid chromatography (HPLC). The results for compounds that fell outside control limits for SIM GCMS analysis were reported from the HPLC analysis.

The following anomalies were associated with the preparation and/or analysis of the samples in this accession using EPA method 8310 for polynuclear aromatic hydrocarbons:

The relative percent difference (RPD) between recoveries of several compounds from the MS/MSD samples exceeded MultiChem control limits. Since all MS/MSD recoveries, BS/BSD recoveries, and BS/BSD RPD values were in control, no further action was performed.

All other associated quality assurance/quality control (QA/QC) parameters were within established MultiChem control limits.

MAS I.D. # 712019

MultiChem
ANALYTICAL SERVICES

SEMIVOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 4617	DATE RECEIVED	: N/A
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/16/97
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 12/18/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8270A (MODIFIED)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
NAPHTHALENE	<0.092
ACENAPHTHYLENE	<0.016
ACENAPHTHENE	<0.028
FLUORENE	<0.018
PHENANTHRENE	<0.015
ANTHRACENE	<0.013
FLUORANTHENE	<0.011
PYRENE	<0.014
BENZO(A)ANTHRACENE	<0.013
CHRYSENE	<0.012
BENZO(B)FLUORANTHENE	<0.0090
BENZO(K)FLUORANTHENE	<0.0090
BENZO(A)PYRENE	<0.010
INDENO(1,2,3-CD)PYRENE	<0.012
DIBENZO(A,H)ANTHRACENE	<0.012
BENZO(G,H,I)PERYLENE	<0.011

SURROGATE PERCENT RECOVERY		LIMITS
TERPHENYL-D14	61	40 - 160
2-FLUOROBIPHENYL	16 H	40 - 160

H = Out of limits.

MAS I.D. # 712019

MultiChem
ANALYTICAL SERVICES

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 4617	DATE RECEIVED	: N/A
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/18/97
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 12/23/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8310 (LOW LEVEL)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
NAPHTHALENE	<0.11
ACENAPHTHYLENE	<0.23
ACENAPHTHENE	<0.11
FLUORENE	<0.023
PHENANTHRENE	<0.011
ANTHRACENE	<0.011
FLUORANTHENE	<0.023
PYRENE	<0.011
BENZO(A)ANTHRACENE	<0.011
CHRYSENE	<0.011
BENZO(B)FLUORANTHENE	<0.023
BENZO(K)FLUORANTHENE	<0.011
BENZO(A)PYRENE	<0.011
DIBENZO(A,H)ANTHRACENE	<0.032
BENZO(G,H,I)PERYLENE	<0.023
INDENO(1,2,3-CD)PYRENE	<0.011

SURROGATE PERCENT RECOVERY		LIMITS
2-CHLOROANTHRACENE	92	23 - 120

MAS I.D. # 712019-1

MultiChem
ANALYTICAL SERVICES

SEMIVOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 12/11/97
PROJECT #	: 4617	DATE RECEIVED	: 12/12/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/16/97
CLIENT I.D.	: HC-MW-10	DATE ANALYZED	: 12/18/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8270A (MODIFIED)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS	
NAPHTHALENE	3.4	X
ACENAPHTHYLENE	<0.016	
ACENAPHTHENE	1.0	
FLUORENE	0.33	
PHENANTHRENE	0.24	
ANTHRACENE	0.028	
FLUORANTHENE	0.077	
PYRENE	0.050	
BENZO(A)ANTHRACENE	<0.013	
CHRYSENE	<0.012	X
BENZO(B)FLUORANTHENE	<0.012	X
BENZO(K)FLUORANTHENE	<0.024	X
BENZO(A)PYRENE	<0.012	X
INDENO(1,2,3-CD)PYRENE	<0.033	X
DIBENZO(A,H)ANTHRACENE	<0.024	X
BENZO(G,H,I)PERYLENE	<0.012	X

SURROGATE PERCENT RECOVERY			LIMITS
TERPHENYL-D14	48		40 - 160
2-FLUOROBIPHENYL	37	H	40 - 160
2-CHLRORANTHRACENE	81	X	23 - 120

H = Out of limits.
X = Value reported from EPA 8310 analysis.

MAS I.D. # 712019

MultiChem
ANALYTICAL SERVICES

SEMIVOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
EPA METHOD : 8270A (MODIFIED)

SAMPLE I.D. # : BLANK
DATE EXTRACTED : 12/16/97
DATE ANALYZED : 12/18/97
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
NAPHTHALENE	<0.0920	2.50	0.625	25H	0.748	30H	18
ACENAPHTHYLENE	<0.0160	2.50	1.84	74	2.01	80	9
ACENAPHTHENE	<0.0280	2.50	1.51	60	1.68	67	11
FLUORENE	<0.0180	2.50	1.92	77	2.09	84	8
PHENANTHRENE	<0.0150	2.50	2.14	86	2.23	89	4
ANTHRACENE	<0.0130	2.50	2.17	87	2.26	90	4
FLUORANTHENE	<0.0110	2.50	2.22	89	2.34	94	5
PYRENE	<0.0140	2.50	2.27	91	2.35	94	3
BENZO(A)ANTHRACENE	<0.0130	2.50	2.11	84	2.15	86	2
CHRYSENE	<0.0120	2.50	1.93	77	1.96	78	2
BENZO(B)FLUORANTHENE	<0.00900	2.50	1.97	79	2.02	81	3
BENZO(K)FLUORANTHENE	<0.00900	2.50	1.72	69	1.81	72	5
BENZO(A)PYRENE	<0.0100	2.50	1.90	76	1.94	78	2
INDENO(1,2,3-CD)PYRENE	<0.0120	2.50	1.65	66	1.77	71	7
DIBENZO(A,H)ANTHRACENE	<0.0120	2.50	1.43	57	1.53	61	7
BENZO(G,H,I)PERYLENE	<0.0110	2.50	1.48	59	1.67	67	12

CONTROL LIMITS	% REC.	RPD
NAPHTHALENE	40 - 160	20
ACENAPHTHYLENE	40 - 160	20
ACENAPHTHENE	40 - 160	20
FLUORENE	40 - 160	20
PHENANTHRENE	40 - 160	20
ANTHRACENE	40 - 160	20
FLUORANTHENE	40 - 160	20
PYRENE	40 - 160	20
BENZO(A)ANTHRACENE	40 - 160	20
CHRYSENE	40 - 160	20
BENZO(B)FLUORANTHENE	40 - 160	20
BENZO(K)FLUORANTHENE	40 - 160	20
BENZO(A)PYRENE	40 - 160	20
INDENO(1,2,3-CD)PYRENE	40 - 160	20
DIBENZO(A,H)ANTHRACENE	40 - 160	20
BENZO(G,H,I)PERYLENE	40 - 160	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
TERPHENYL-D14	63	62	40 - 160
2-FLUOROBIPHENYL	18H	21H	40 - 160

H = Out of limits.

MAS I.D. # 712019

MultiChem
ANALYTICAL SERVICES

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
EPA METHOD : 8310 (LOW LEVEL)

SAMPLE I.D. # : BLANK
DATE EXTRACTED : 12/18/97
DATE ANALYZED : 12/23/97
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
ACENAPHTHYLENE	<0.227	9.09	6.70	74	7.36	81	9
PHENANTHRENE	<0.0114	0.455	0.366	80	0.386	85	5
PYRENE	<0.0114	0.455	0.396	87	0.403	89	2
BENZO(K)FLUORANTHENE	<0.0114	0.455	0.378	83	0.385	85	2
DIBENZO(A,H)ANTHRACENE	<0.0318	0.909	0.486	53	0.594	65	20

CONTROL LIMITS	% REC.	RPD
ACENAPHTHYLENE	43 - 106	23
PHENANTHRENE	42 - 113	21
PYRENE	48 - 124	20
BENZO(K)FLUORANTHENE	52 - 119	20
DIBENZO(A,H)ANTHRACENE	29 - 142	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
2-CHLOROANTHRACENE	92	92	23 - 120

MAS I.D. # 712019

MultiChem
ANALYTICAL SERVICES

SEMIVOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
EPA METHOD : 8270A (MODIFIED)

SAMPLE I.D. # : 712018-1
DATE EXTRACTED : 12/16/97
DATE ANALYZED : 12/18/97
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
NAPHTHALENE	1.74	2.50	2.40	26H	3.06	53	24H
ACENAPHTHYLENE	<0.0160	2.50	2.14	86	2.26	90	5
ACENAPHTHENE	1.03	2.50	2.69	66	2.88	74	7
FLUORENE	0.343	2.50	2.38	81	2.47	85	4
PHENANTHRENE	0.230	2.50	2.30	83	2.32	84	1
ANTHRACENE	0.0320	2.50	2.03	80	2.06	81	1
FLUORANTHENE	0.0788	2.50	2.12	82	2.09	80	1
PYRENE	0.0530	2.50	1.95	76	2.16	84	10
BENZO(A)ANTHRACENE	<0.0130	2.50	1.05	42	1.11	44	6
CHRYSENE	<0.0120	2.50	0.813	33H	0.817	33H	0
BENZO(B)FLUORANTHENE	<0.00900	2.50	0.400	16H	0.432	17H	8
BENZO(K)FLUORANTHENE	<0.00900	2.50	0.275	11H	0.270	11H	2
BENZO(A)PYRENE	<0.0100	2.50	0.297	12H	0.313	13H	5
INDENO(1,2,3-CD)PYRENE	<0.0120	2.50	0.0478	2H	0.0673	3H	33H
DIBENZO(A,H)ANTHRACENE	<0.0120	2.50	0.0285	1H	0.0385	2H	29H
BENZO(G,H,I)PERYLENE	<0.0110	2.50	0.0448	2H	0.0588	2H	27H

CONTROL LIMITS	% REC.	RPD
NAPHTHALENE	40 - 160	20
ACENAPHTHYLENE	40 - 160	20
ACENAPHTHENE	40 - 160	20
FLUORENE	40 - 160	20
PHENANTHRENE	40 - 160	20
ANTHRACENE	40 - 160	20
FLUORANTHENE	40 - 160	20
PYRENE	40 - 160	20
BENZO(A)ANTHRACENE	40 - 160	20
CHRYSENE	40 - 160	20
BENZO(B)FLUORANTHENE	40 - 160	20
BENZO(K)FLUORANTHENE	40 - 160	20
BENZO(A)PYRENE	40 - 160	20
INDENO(1,2,3-CD)PYRENE	40 - 160	20
DIBENZO(A,H)ANTHRACENE	40 - 160	20
BENZO(G,H,I)PERYLENE	40 - 160	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
TERPHENYL-D14	48	49	40 - 160
2-FLUOROBIPHENYL	30H	36H	40 - 160

H = Out of limits.

MAS I.D. # 712019

MultiChem
ANALYTICAL SERVICES

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
QUALITY CONTROL DATA

CLIENT	: HART CROWSER, INC.	SAMPLE I.D. #	: 712018-1
PROJECT #	: 4617	DATE EXTRACTED	: 12/18/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE ANALYZED	: 12/23/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8310 (LOW LEVEL)		

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
ACENAPHTHYLENE	<0.238	9.52	6.39	67	7.82	82	20
PHENANTHRENE	0.374	0.476	0.663	61	0.836	97	23H
PYRENE	0.0545	0.476	0.382	69	0.480	89	23H
BENZO(K)FLUORANTHENE	<0.0119	0.476	0.254	53	0.329	69	26H
DIBENZO(A,H)ANTHRACENE	<0.0333	0.952	0.210	22	0.317	33	41H

CONTROL LIMITS	% REC.	RPD
ACENAPHTHYLENE	20 - 163	23
PHENANTHRENE	20 - 168	21
PYRENE	36 - 125	20
BENZO(K)FLUORANTHENE	20 - 104	20
DIBENZO(A,H)ANTHRACENE	20 - 74	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
2-CHLOROANTHRACENE	72	91	23 - 120

H = Out of limits.

MAS I.D. # 712019

CASE NARRATIVE

MultiChem
ANALYTICAL SERVICES

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

CASE NARRATIVE: POLYCHLORINATED BIPHENYLS ANALYSIS

The following anomalies were associated with the preparation and/or analysis of the sample in this accession:

The percent difference (D%) of the surrogate, decachlorobiphenyl (DCBP), from the continuing calibration verification (CCV) standards which bracketed the sample and its associated qualtiy control (QC) samples exceeded the control limits (±15%). Since the D% of the other surrogate, tetrachloro-m-xylene (TCMX), from these CCVs were in control and the spiked recoveries of TCMX were in control from all samples, no further corrective action was performed.

The relative percent difference (RPD) between sample matrix spike (MS) recovery and matrix spike duplicate (MSD) recovery exceeded MultiChem's established control limits. Since the MS/MSD recoveries and the associated blank spike (BS) recoveries were all in control, no further corrective action was performed for this sample set.

All other associated quality assurance/quality control (QA/QC) parameters were within established MultiChem control limits.

MAS I.D. # 712019

MultiChem
ANALYTICAL SERVICES

PCB ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 4617	DATE RECEIVED	: N/A
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/11/97
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 12/16/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8081 (ULTRA LOW LEVEL)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
AROCLOR 1016	<0.0052
AROCLOR 1221	<0.013
AROCLOR 1232	<0.013
AROCLOR 1242	<0.0052
AROCLOR 1248	<0.0052
AROCLOR 1254	<0.0052
AROCLOR 1260	<0.0052

SURROGATE PERCENT RECOVERY		LIMITS
DECACHLOROBIPHENYL	89	25 - 137
TETRACHLORO-M-XYLENE	58	40 - 123

MAS I.D. # 712019-1

MultiChem
ANALYTICAL SERVICES

PCB ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 12/09/97
PROJECT #	: 4617	DATE RECEIVED	: 12/10/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/11/97
CLIENT I.D.	: HC-MW-10	DATE ANALYZED	: 12/16/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8081 (ULTRA LOW LEVEL)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
AROCLOR 1016	<0.0052
AROCLOR 1221	<0.013
AROCLOR 1232	<0.013
AROCLOR 1242	<0.0052
AROCLOR 1248	<0.0052
AROCLOR 1254	<0.0052
AROCLOR 1260	<0.0052

SURROGATE PERCENT RECOVERY		LIMITS
DECACHLOROBIPHENYL	43	25 - 137
TETRACHLORO-M-XYLENE	44	40 - 123

MAS I.D. # 712019

MultiChem
ANALYTICAL SERVICES

PCB ANALYSIS
QUALITY CONTROL DATA

CLIENT	: HART CROWSER, INC.	SAMPLE I.D. #	: BLANK
PROJECT #	: 4617	DATE EXTRACTED	: 12/11/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE ANALYZED	: 12/16/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8081 (ULTRA LOW LEVEL)		

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
AROCLOR 1260	<0.00524	0.0298	0.0329	110	N/A	N/A	N/A

CONTROL LIMITS	% REC.	RPD
AROCLOR 1260	72 - 144	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
DECACHLOROBIPHENYL	97	N/A	25 - 137
TETRACHLORO-M-XYLENE	73	N/A	40 - 123

MAS I.D. # 712019

MultiChem
ANALYTICAL SERVICES

PCB ANALYSIS
QUALITY CONTROL DATA

CLIENT	: HART CROWSER, INC.	SAMPLE I.D. #	: 712018-1
PROJECT #	: 4617	DATE EXTRACTED	: 12/11/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE ANALYZED	: 12/16/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8081 (ULTRA LOW LEVEL)		

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
AROCLOR 1260	<0.00524	0.0298	0.0255	86	0.0187	63	31H

CONTROL LIMITS	% REC.	RPD
AROCLOR 1260	32 - 163	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
DECACHLOROBIPHENYL	57	44	25 - 137
TETRACHLORO-M-XYLENE	62	51	40 - 123

H = Out of limits.

MAS I.D. # 712019

MultiChem
ANALYTICAL SERVICES

CASE NARRATIVE

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

CASE NARRATIVE: TOTAL PETROLEUM HYDROCARBONS ANALYSIS - DIESEL

The following anomalies were associated with the preparation and/or analysis of the sample in this accession:

Sample 712019-1 (HC-MW-2) was spiked twice during the extraction process. The reported surrogate percent recovery was calculated taking this fact into account.

All other associated quality assurance/quality control (QA/QC) parameters were within established MultiChem control limits.

MAS I.D. # 712019

MultiChem
ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 4617	DATE RECEIVED	: N/A
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/12/97
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 12/13/97
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	<0.25
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<0.75
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
O-TERPHENYL	96	65 - 134

MAS I.D. # 712019-1

MultiChem
ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 12/09/97
PROJECT #	: 4617	DATE RECEIVED	: 12/10/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/12/97
CLIENT I.D.	: HC-MW-2	DATE ANALYZED	: 12/14/97
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	0.34
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<0.71
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
O-TERPHENYL	81	65 - 134

MAS I.D. # 712019

MultiChem
ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT	: HART CROWSER, INC.	SAMPLE I.D. #	: BLANK
PROJECT #	: 4617	DATE EXTRACTED	: 12/12/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE ANALYZED	: 12/13/97
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: WA DOE WTPH-D		

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
DIESEL	<0.250	2.50	2.45	98	2.45	98	0

CONTROL LIMITS	% REC.	RPD
DIESEL	76 - 115	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
O-TERPHENYL	95	97	65 - 134

MAS I.D. # 712019

MultiChem
ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT	: HART CROWSER, INC.	SAMPLE I.D. #	: 712018-1
PROJECT #	: 4617	DATE EXTRACTED	: 12/12/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE ANALYZED	: 12/14/97
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: WA DOE WTPH-D		

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
DIESEL	0.346	2.38	2.50	91	2.55	93	2

CONTROL LIMITS	% REC.	RPD
DIESEL	73 - 130	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
O-TERPHENYL	96	95	65 - 134

MAS I.D. # 712019

MultiChem
ANALYTICAL SERVICES

CASE NARRATIVE

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

CASE NARRATIVE: GENERAL CHEMISTRY ANALYSIS

There were no anomalies associated with the preparation and/or analysis of the sample in this accession.

MAS I.D. # 712019

MultiChem
ANALYTICAL SERVICES

GENERAL CHEMISTRY ANALYSIS

CLIENT : HART CROWSER, INC. MATRIX : WATER
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

PARAMETER	DATE PREPARED	DATE ANALYZED
TOTAL SUSPENDED SOLIDS	12/11/97	12/15/97

MAS I.D. # 712019

MultiChem
ANALYTICAL SERVICES

GENERAL CHEMISTRY ANALYSIS
DATA SUMMARY

CLIENT : HART CROWSER, INC. MATRIX : WATER
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL UNITS : mg/L

MAS I.D. #	CLIENT I.D.	TOTAL SUSPENDED SOLIDS
712019-1	HC-MW-10	41
BLANK	-	<10

MAS I.D. # 712019

MultiChem
ANALYTICAL SERVICES

GENERAL CHEMISTRY ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC. MATRIX : WATER
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL UNITS : mg/L

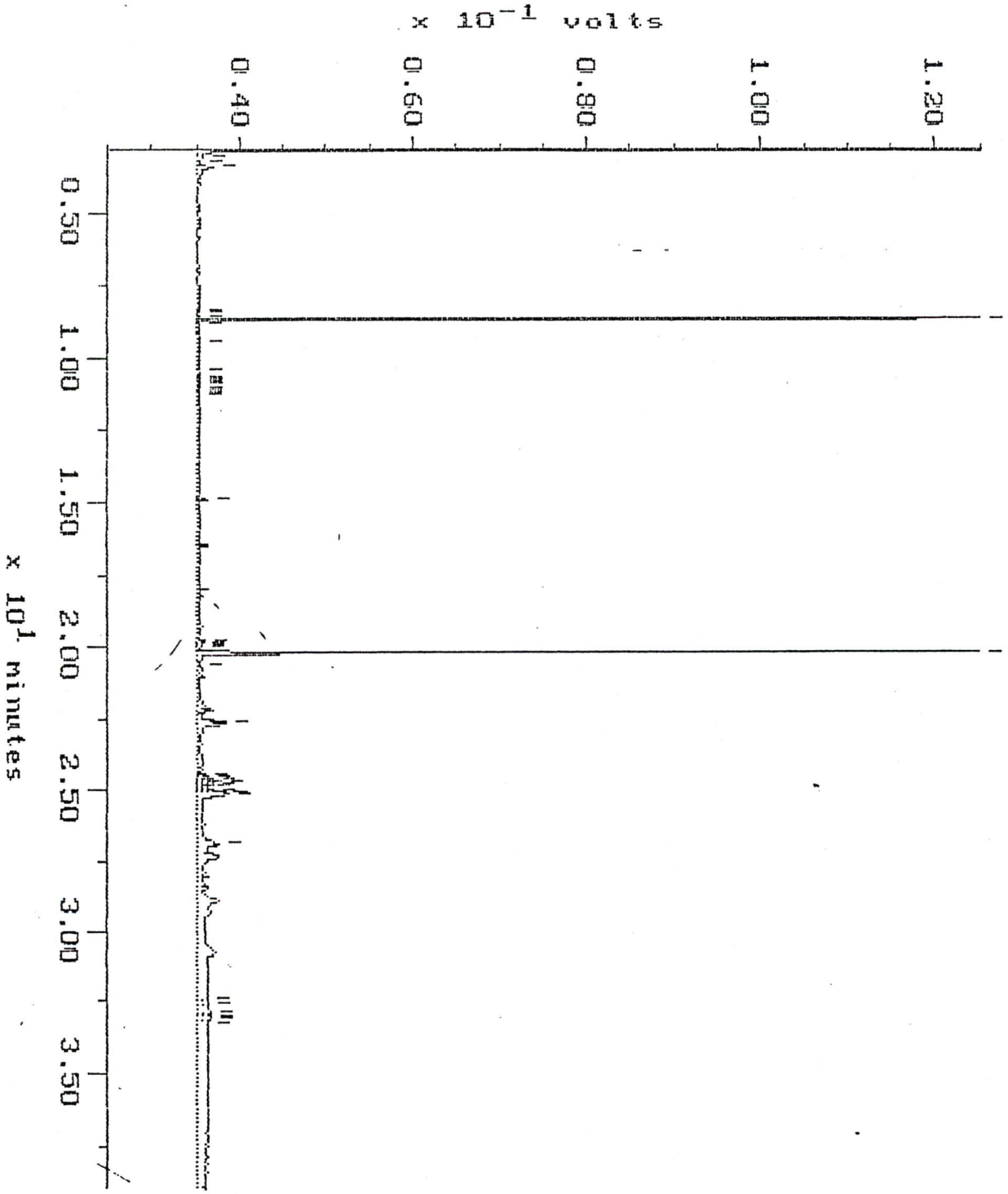
PARAMETER	MAS I.D.	SAMPLE RESULT	DUP RESULT	RPD	SPIKED RESULT	SPIKE ADDED	% REC.
TOTAL SUSPENDED SOLIDS	BLANK	<10.0	N/A	N/A	47.0	56.0	84
TOTAL SUSPENDED SOLIDS	712017-1	<10.0	<10.0	NC	N/A	N/A	N/A

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

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

BLANK

Sample: A1212 TPHD BLK Channel: ANN Filename: RC128A21
Acquired: 13-DEC-97 17:50 Method: X:\MAXDATA\ANN\FUEL1212 Operator: ANN
Comments: WA DOE TPH D

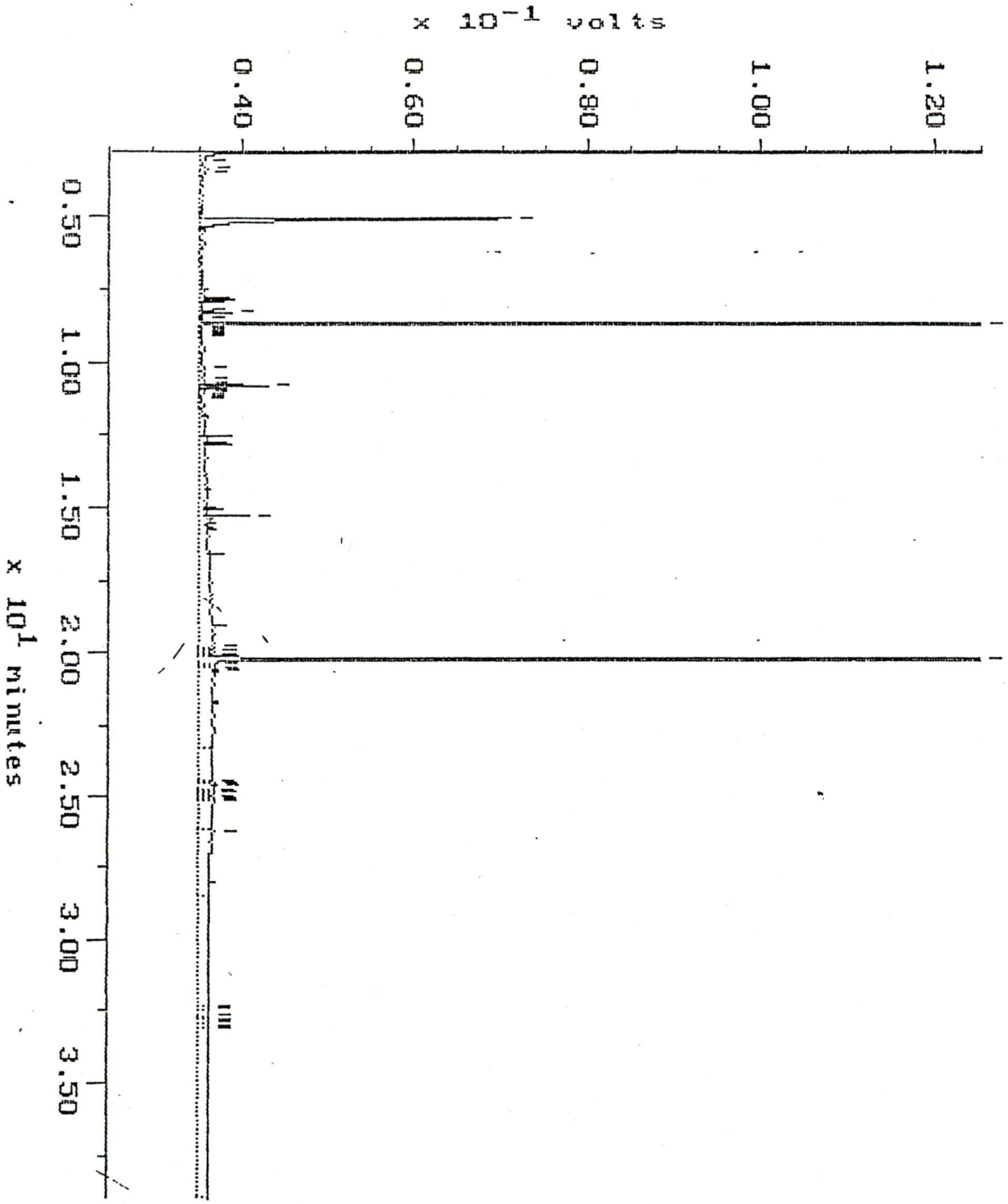


WA DOE WTPH-D

Sample: 712019-1
Acquired: 14-DEC-97 11:52
Comments:

Channel: ANN
Method: X:\MAXDATA\ANN\FUEL1212
WA DOE TPH D

Filename: RC128A43
Operator: ANN

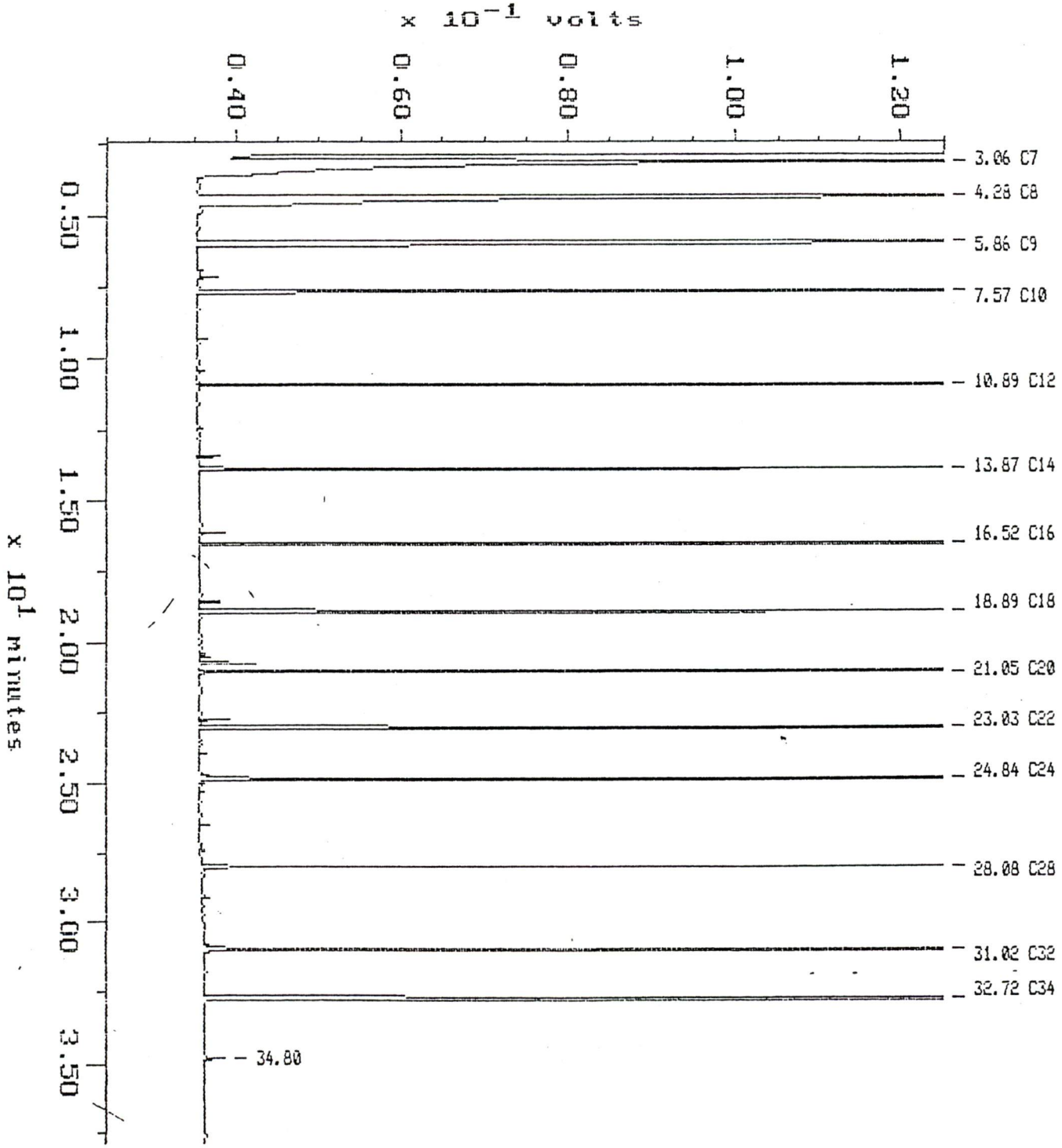


Alkane

Sample: ALKANE ANN
Acquired: 10-DEC-97 11:15
Inj Vol: 1.00
Comments: ALKANE STANDARD

Channel: ANN
Method: X:\MAXDATA\ANN\FUEL1210

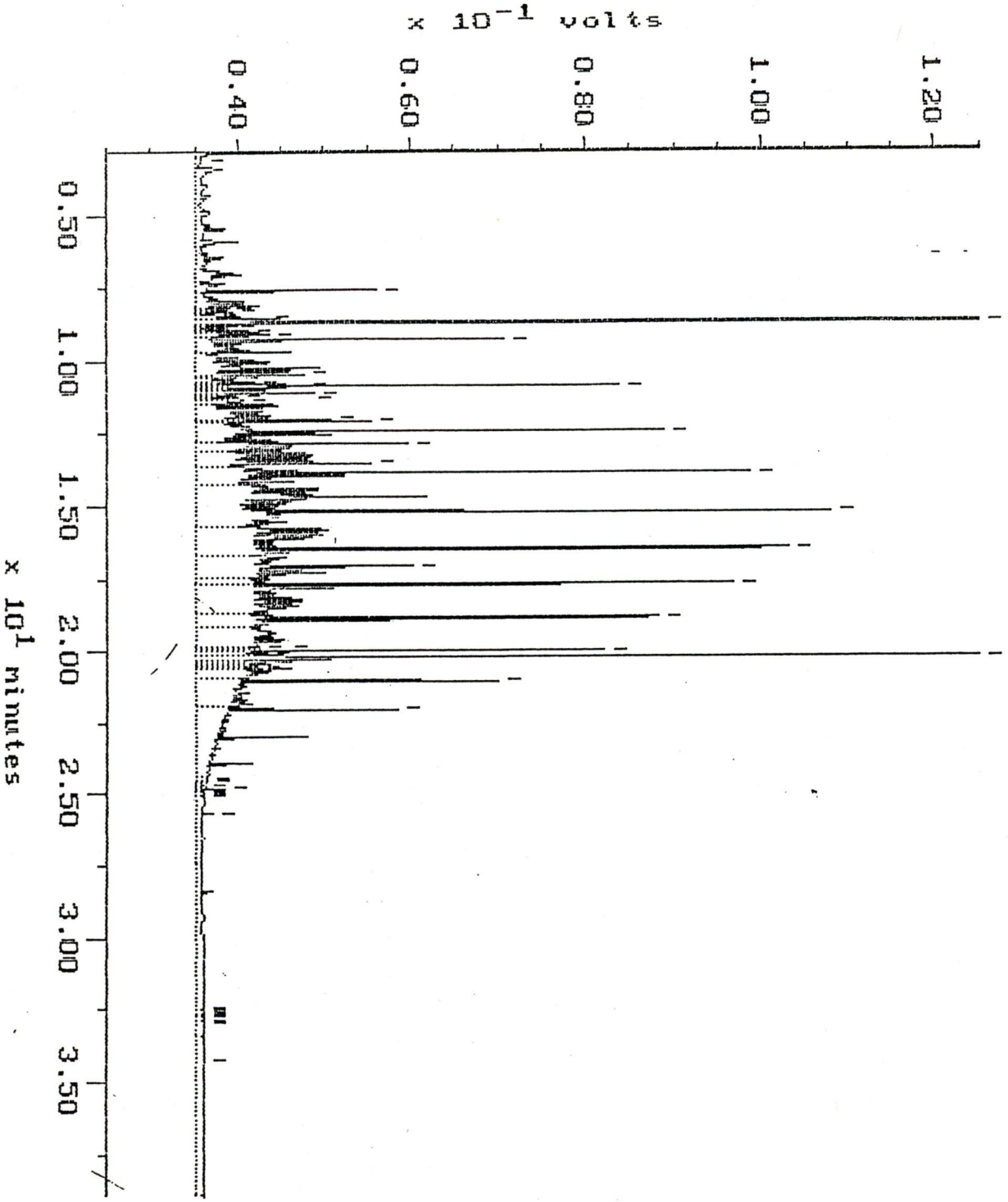
Filename: RC108A02
Operator: ANN



Sample: D500 CCV
Acquired: 12-DEC-97 23:40
Comments:

Channel: ANN
Method: X:\MAXDATA\ANN\FUEL1211
WA DOE TPH D

Filename: RC118A39
Operator: ANN

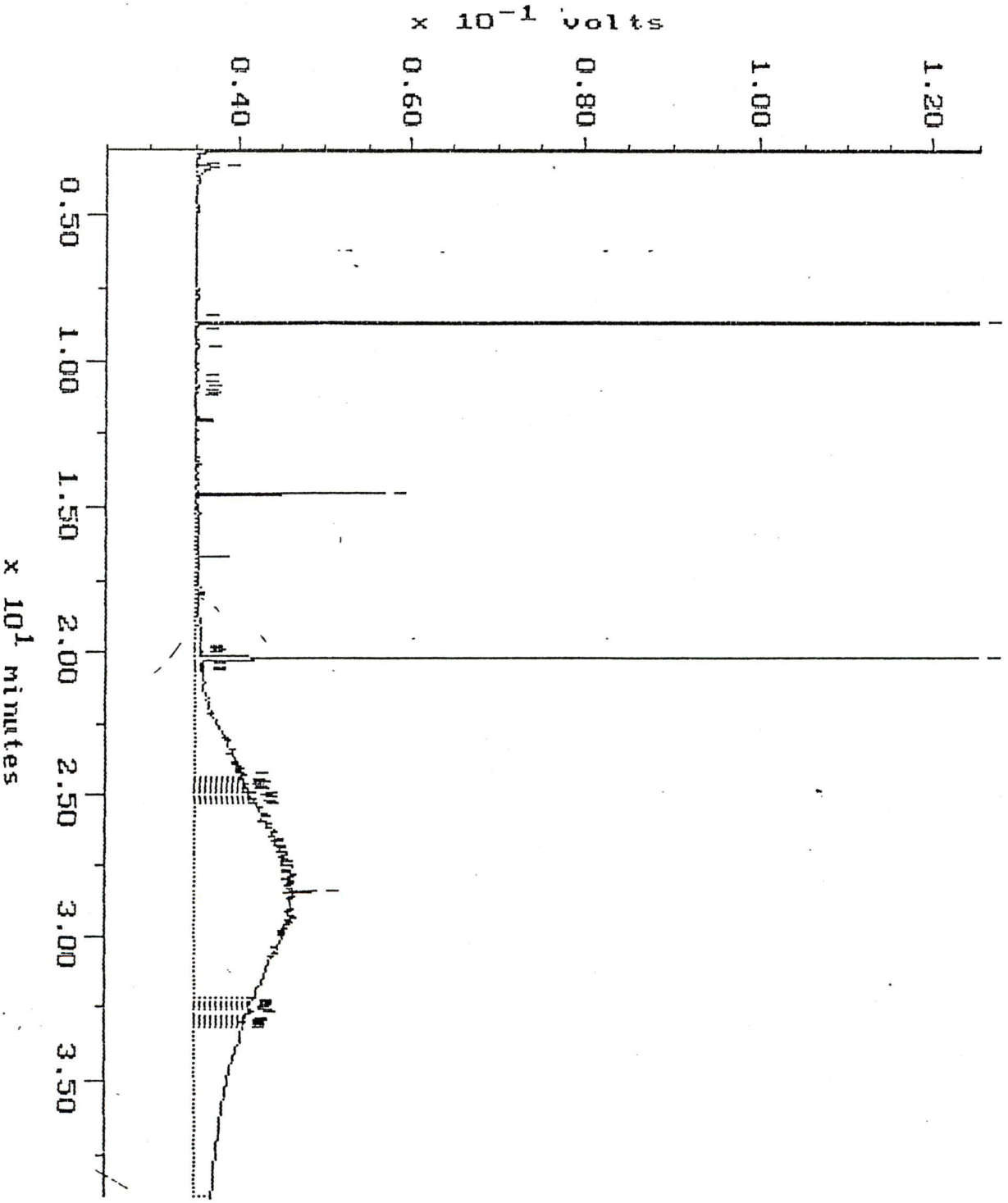


CONTINUING CALIBRATION

Sample: M0500 CCV
Acquired: 13-DEC-97 0:29
Comments:

Channel: ANN
Method: X:\MAXDATA\ANN\FUEL1211
WA DOE TPH D

Filename: RC118A40
Operator: ANN



Analytical Technologies, Inc
560 Naches Avenue, S.W., Suite 101, Renton, WA 98055 (206) 228-8335

DATE: 12/11/97 Page 1 of 1 ATI ACCESSION # 712019

COMPANY: HART CROWSER
REPORT TO: DAVE HEFFNER
ADDRESS: 1910 FAIRVIEW AVE E
SEATTLE, WA 98102
PHONE:( ) - FAX:( ) -
PROJECT MANAGER: D. HEFFNER
PROJECT NUMBER: 4617
PROJECT NAME: LK. WA SHIP CANAL
ATI will DISPOSE / RETURN samples (circle one)

Sample ID	Date	Time	Matrix	LabID	FUELS: TPH-HCID WA/OR	BETX/TPH-G combo WA/OR	BETX (by 8020) WA/OR	TPH-G WA/OR	TPH-D WA/OR	8015 modified WA/OR	418.1	413.2	AK-GRO	AK-DRO	ORGANIC COMPOUNDS: 8240 GCMS Volatiles	8270 GCMS Semivolatiles SIM	~~8080~~ Pesticides/PCBs 608	PCB only (by 8080) STD/lo level	8010 Halogenated VOCs	8020 Aromatic VOCs	8310 HPLC PAHs	8040 Phenols	8140 OP Pesticides	8150 OC Herbicides	METALS: Metals (Indicate below *)	Total Lead	Priority Pollutant Metals (13)	TAL Metals (23)	TCLP: TCLP-Volatiles (ZHE-8240)	TCLP-Semivolatiles (8270)	TCLP-Pesticides (8080)	TCLP-Herbicides (8150)	TCLP-Metals (8 metals)	OTHER: % Moisture (please indicate)					Total # of Containers/sample
~~HC MW-1~~	12/11/97	14:30	~~H2O~~						X						X	X																					4
HC-MW-10	12/11/97	12:45	H2O	1					X						X	X																					4

Turnaround Time		Sample Receipt	
STANDARD TAT	✓	TOTAL # CONTAINERS RECVD	1
1 WEEK TAT		COC SEALS PRESENT?	Y
4 WORK DAY TAT		COC SEALS INTACT?	Y
3 WORK DAY TAT		RECEIVED COLD?	Y
2 WORK DAY TAT		RECEIVED INTACT?	Y
24 HOUR TAT		RECEIVED VIA: COURIER	

Special Instructions:
some analysis may have been performed. Check w/ Kim L.
* Metals needed:

Relinquished By:	Relinquished By:	Relinquished By:
Date: 12/11/97	Date:	Date:
Time: 17:00	Time:	Time:
Received By:	Received By:	Received By:
Date: 12/12/97	Date:	Date:
Time: 1100	Time:	Time:
JONATHAN VAN DYK MAS-K		

MultiChem Analytical Services
(800) 609-0580 ◇ (206) 228-8335 ◇ Fax (206) 363-1742

560 Naches Avenue S.W., Suite 101, Renton, WA 98055
DATE: 12/10/97 PAGE: ____ OF: ____

LABORATORY NUMBER: 712019

COMPANY: Hart Crowser
ADDRESS: 1910 Fairview Ave East
Seattle WA 98102
PHONE: (206) 324-9530 FAX: ( )
PROJ. MNGR. / REPORT TO:
PROJECT NUMBER: 4617
PROJECT NAME:
☐ MAS DISPOSAL ☐ RETURN

SAMPLE ID	DATE	TIME	MATRIX	LAB ID
~~HC-MW-2~~	~~12/9/97~~	~~1200~~	~~H2O~~	~~1~~
HC-MW-10	12/9/97	1200	H2O	21
See 712018				

FUELS										
TPH-HCID	BETX/TPH-G	BETX (BY 8020)	TPH-G	TPH-D extended	8015 modified	418.1	413.2	AK-GRO	AK-DRO
				X					
				X					

ORGANIC COMPOUNDS												
8240 / 8260 GCMS Volatiles	8270 GCMS Semivolatiles SIM	8080 Pesticides/PCBs 8081 W Hg	PCB only (by 8080) STD/low level	~~8010~~ Halogenated VOCs 8021	8020 Aromatic VOCs	8310 HPLC PAHs	8040 Phenols	8140 OP Pesticides	8150 OC Herbicides
	X	X		X					
	X	V		X					

METALS				
Metals indicate below*	Total Lead	PP Metals (13)	TAL Metals (23)

TCLP		
TCLP 8240 (ZHE)	TCLP 8270 Semivolatiles	TCLP 8080 Pesticide

OTHER					
% MOISTURE	7551 160.2				Total # of Containers
	X				9
	X				9

SAMPLE RECEIPT		TAT	
TOTAL # OF CONTAINERS		1 WORK DAY TAT	
COC SEALS PRESENT?		2 WORK DAY TAT	
COC SEALS INTACT?		3 WORK DAY TAT	
RECEIVED COLD?		4 WORK DAY TAT	
RECEIVED INTACT?		1 WEEK TAT	
RECEIVED VIA:		STANDARD TAT	

SPECIAL INSTRUCTIONS:
Cooler #48

*Metals needed

MAS USE ONLY:
SUBCONTRACT INFO:
PO #
VERBALS:
H.C. DUE:

Relinquished By:	Relinquished By:	Relinquished By:
DATE: 12/10/97	DATE:	DATE:
TIME: 1215	TIME:	TIME:
Jac Lee HC		
Company:	Company:	Company:
Received By:	**Received By:**	**Received By:**
DATE: 12/10/97	DATE:	DATE:
TIME: 1935	TIME:	TIME:
Jonathan van Dyke		
Company: MAS-R	Company:	Company:

FOR MULTICHEM ONLY — CONTR — B:

(18)

Cooler Receipt Form

Project: LAKE WASH. SHIP CANAL

Cooler received on 12/10/97 and opened on 12/10/97 by JONATHAN VAN DYK

Jonathan van Dyk
(Signature)

1. Were custody seals on outside of cooler? ..... (YES) NO
   if YES, how many and where? 1 FRONT
   Were Signature and date correct? ..... (YES) NO
2. Were custody papers taped to lid inside cooler? ..... (YES) NO
3. Were custody papers properly filled out (ink, signed, etc.)..... (YES) NO
4. Did you sign custody papers in the appropriate place? ..... (YES) NO
5. Did you attach shipper's packing slip to this form? ..... (YES) NO
6. What kind of packing material was used? BUBBLE BAGS
7. Was sufficient ice used (if appropriate)? ..... (YES) NO
8. Were all bottles sealed in separate plastic bags? ..... (YES) NO
9. Did all bottles arrive in good condition (unbroken)? ..... (YES) NO
10. Were all bottle labels complete (No., date, signed, anal, pres, etc.)? ..... (YES) NO
11. Did all bottle labels and tags agree with custody papers? ..... (YES) NO
12. Were correct bottles used for the test indicated? ..... (YES) NO
13. Were VOA vials checked for absence of air bubbles and noted if found? ..... (YES) NO
14. Was sufficient amount of sample sent in each bottle? ..... (YES) NO

Explain any discrepancies

HARTCROWSER

J-4617 9/96

Figure 8

Cond_6\forms\cooler

NON-CONFORMANCES?
(Y) N #1,2
(if Y see other side)

MultiChem Analytical Services
SAMPLE LOG-IN CHECKLIST

DATE: 12/10/97
TIME: 1435
INITIALS: JVP

ACCESSION NO. 712019
CLIENT: HCI
PROJECT: LK. WASH. SHIP CANAL

Shipping:

Type:
X Cooler
___ Box
___ Other

COC Seals:
X Ship. Cont.
___ On Bottles
___ None

Intact?
(Y) N
Y N

Packing Material:
___ Styrofoam
X Bubble Bags
___ Foam Vial Packs
___ Other___

Refrigerant:
X Gel Ice Pack
___ Loose Ice
___ Other
___ None

Frozen?
(Y) N
Y N
Y N

Received Via:
___ Hand Delivery
___ Federal Express
___ Airborne
___ Other:___
X Courier
___ UPS
___ Taxi
___ Goldstreak

Sample Information:

Samp. #	Bottle #	Type
___	___	Soil
2	18	Water
___	___	Product
___	___	Other

Soil VOAs
Water VOAs

0 headspace Y N N ___
0 headspace (Y) N N ___
Preserved? (Y) N ___
Trip blanks? Y (N) #2

Condition of Samples:
Containers:
Intact? (Bottle/Lid) (Y) N
Correct Type? (Y) N

CA # ___
CA # ___

Waters Preserved? (if needed) (Y) N N ___

ID's Match C.O.C. (Y) N N ___

Temperature: 7.0 C #1 CA NO.
(See corrective action on reverse side for explanation if temperature is outside of the MAS recommended range.)

LAB USE ONLY ☐ NO NOTICE ☐ SENDOUTS NEEDED BY ___
☐ COC/TAT DOES NOT MATCH NOTICE ☐ NEED TEST(S) VERIFIED BY CLIENT

COMMENTS:

NON-CONFORMANCES?
(Y) N #1, 2
(if Y see other side)

MultiChem Analytical Services
Corrective Action Sheet

ACCESSION # 712019

CORRECTIVE ACTION AREA

EXPLAIN CORRECTIVE ACTION:

CA NO.	CA NO.	CA NO.
_____Salvaged Sample	_____Replaced Bottle	_____Verified Id w/Client
_____Replaced Lid	_____Notified P.M.	_____Notified Client
_____Preserved Sample w/_____		

Comments:

#2 NO TRIP BLANKS WERE RECEIVED

Temperature: 7.0 C #1 CA NO.

_____Comments: Samples were received outside of the MAS recommended temperature range (4 C+/- 2 C) Samples were received within 5 hours of collection and may not have had sufficient time to equilibrate with coolant. A temperature range from 2 to 15 degrees Celsius is considered acceptable. The samples will be analyzed as scheduled unless directed otherwise by client.

_____Comments: Samples were received outside of the MAS recommended temperature range (4 C+/- 2 C) The samples will be analyzed as scheduled unless directed otherwise by client.

Tech.Signature/Date: Jonathan Van Dyk 12/10/97 P.M. Signature/Date:_____

CORRECTIVE ACTION TAKEN:

Explain Action Taken:

GOLDSTAR
PACKAGE EXPRESS
CELL: 999-2236 PGR: 583-9048

DATE: 12/8/97

ACCT. NAME: Hart Crowser

FROM:

TO: Multi Chem Analytical Serv.
560 Naches Ave SW
Renton 98055

SERVICE: ☐ 1 HR. ☒ 2 HR. ☐ 4 HR. ☐ ROUND TRIP

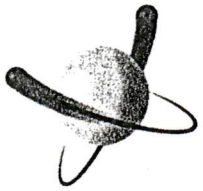
JOB # : 4617 — — # Faider

SPECIAL INST:

TIME: PICK-UP _____ RECIEVED 0935

X Elaine Walker
RECEIVED BY(PLS.PRINT)

TOTAL $



MultiChem
ANALYTICAL SERVICES

MAS I.D. # 712020

January 12, 1998

Hart Crowser, Inc.
1910 Fairview Avenue East
Seattle WA 98102-3699

Attention : Dave Heffner

Project Number : 4617

Project Name : Lake WA Ship Canal

Dear Mr. Heffner:

On December 10, 1997, MultiChem Analytical Services received two samples for analysis. On December 12, 1997, MultiChem received additional volume for polynuclear aromatic hydrocarbon analysis. The samples were analyzed with EPA methodology or equivalent methods as specified in the attached analytical schedule. The results, sample cross reference, and quality control data are enclosed.

Sincerely,

Kim M. Lofgren
Project Manager

KML/hal/trm

Enclosure

560 Naches Avenue SW, Suite 101, Renton, Washington 98055-2200 • **425-228-8335** • FAX 425-228-8336 • 1-800-609-0580 • info@multichem.com

MAS I.D. # 712020

MultiChem
ANALYTICAL SERVICES

SAMPLE CROSS REFERENCE SHEET

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

MAS #	CLIENT DESCRIPTION	DATE SAMPLED	MATRIX
712020-1	HC-MW-3	12/09/97	WATER
712020-1	HC-MW-3	12/11/97	WATER
712020-2	TB	N/A	WATER

----- TOTALS -----

MATRIX	# SAMPLES
WATER	2

MAS STANDARD DISPOSAL PRACTICE

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

MAS I.D. # 712020

MultiChem
ANALYTICAL SERVICES

ANALYTICAL SCHEDULE

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

ANALYSIS	TECHNIQUE	REFERENCE	LAB
AROMATIC VOLATILE ORGANICS	GC/PID	EPA 8021	R
HALOGENATED VOLATILE ORGANICS	GC/FID	EPA 8021	R
SEMIVOLATILE ORGANICS ANALYSIS	GCMS	EPA 8270	R
POLYCHLORINATED BIPHENYLS	GC/ECD	EPA 8081	R
POLYNUCLEAR AROMATIC HYDROCARBONS	HPLC/UV/FL	EPA 8310	R
TOTAL PETROLEUM HYDROCARBONS: DIESEL	GC/FID	WA DOE WTPH-D	R
TOTAL SUSPENDED SOLIDS	GRAVIMETRIC	EPA 160.2	R

R = MAS - Renton
ANC = MAS - Anchorage
SUB = Subcontract

MAS I.D. # 712020

MultiChem
ANALYTICAL SERVICES

CASE NARRATIVE

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

CASE NARRATIVE: HALOGENATED & AROMATIC VOLATILE ORGANICS ANALYSIS

The following anomalies were associated with the preparation and/or analysis of the samples in this accession:

The continuing calibration verification (CCV) standard analyzed prior to the samples in this accession exceeded the upper recovery limit of 115% for chloroethane. The high recovery indicates a potential high bias for chloroethane. Since this compound was not detected in the samples in this accession, no further corrective action was performed.

The CCV analyzed following the samples in this accession exceeded the upper recovery limit of 115% for methylene chloride and trans-1,3-dichloropropene and fell below the lower recovery limit of 85% for chloromethane, chloroethane, 1,1-dichloroethene and 1,1,1-trichloroethane. The high recoveries indicate potential high biases for methylene chloride and trans-1,3-dichloropropene. Since these analytes were not detected in the samples in this accession, no further corrective action was performed. All the samples in this accession were reanalyzed with passing CCVs for chloromethane, chloroethane, 1,1-dichloroethene and 1,1,1-trichloroethane. None of these compounds were detected in either analysis.

The CCV analyzed following the associated matrix spike/matrix spike duplicate (MS/MSD) for this accession fell below the lower recovery limit of 85% for 1,1-dichloroethene. Since this CCV bracketed only the associated MS/MSD and the recoveries of 1,1-dichloroethene were within control limits, no further corrective action was performed.

All other associated quality assurance/quality control (QA/QC) parameters were within established MultiChem control limits.

MAS I.D. # 712020

MultiChem
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 4617	DATE RECEIVED	: N/A
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: N/A
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 12/18/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8021	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	<0.50
BROMODICHLOROMETHANE	<0.20
BROMOFORM	<0.50
BROMOMETHANE	<2.0
CARBON TETRACHLORIDE	<0.20
CHLOROBENZENE	<0.50
CHLOROETHANE	<2.0
CHLOROFORM	<0.20
CHLOROMETHANE	<1.0
1,2-DIBROMOETHANE (EDB)	<0.50
1,2-DICHLOROBENZENE	<0.50
1,3-DICHLOROBENZENE	<0.50
1,4-DICHLOROBENZENE	<0.50
DIBROMOCHLOROMETHANE	<0.20
1,1-DICHLOROETHANE	<0.20
1,2-DICHLOROETHANE (EDC)	<0.20
1,1-DICHLOROETHENE	<0.20
CIS-1,2-DICHLOROETHENE	<0.20
TRANS-1,2-DICHLOROETHENE	<0.20
1,2-DICHLOROPROPANE	<0.20
CIS-1,3-DICHLOROPROPENE	<0.20
TRANS-1,3-DICHLOROPROPENE	<0.20
ETHYLBENZENE	<0.50
METHYLENE CHLORIDE	<5.0
1,1,2,2-TETRACHLOROETHANE	<0.20
TETRACHLOROETHENE	<0.20
TOLUENE	<0.50
1,1,1-TRICHLOROETHANE	<0.50
1,1,2-TRICHLOROETHANE	<0.20
TRICHLOROETHENE	<0.20
TRICHLOROFLUOROMETHANE	<0.50
VINYL CHLORIDE	<1.0
TOTAL XYLENES	<0.50

SURROGATE PERCENT RECOVERY		LIMITS
BROMOCHLOROMETHANE	84	58 - 126
BROMOFLUOROBENZENE	92	76 - 136

MAS I.D. # 712020-1

MultiChem
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 12/09/97
PROJECT #	: 4617	DATE RECEIVED	: 12/10/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: N/A
CLIENT I.D.	: HC-MW-3	DATE ANALYZED	: 12/18/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8021	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	<0.50
BROMODICHLOROMETHANE	<0.20
BROMOFORM	<0.50
BROMOMETHANE	<2.0
CARBON TETRACHLORIDE	<0.20
CHLOROBENZENE	<0.50
CHLOROETHANE	<2.0
CHLOROFORM	<0.20
CHLOROMETHANE	<1.0
1,2-DIBROMOETHANE (EDB)	<0.50
1,2-DICHLOROBENZENE	<0.50
1,3-DICHLOROBENZENE	<0.50
1,4-DICHLOROBENZENE	<0.50
DIBROMOCHLOROMETHANE	<0.20
1,1-DICHLOROETHANE	<0.20
1,2-DICHLOROETHANE (EDC)	<0.20
1,1-DICHLOROETHENE	<0.20
CIS-1,2-DICHLOROETHENE	<0.20
TRANS-1,2-DICHLOROETHENE	<0.20
1,2-DICHLOROPROPANE	<0.20
CIS-1,3-DICHLOROPROPENE	<0.20
TRANS-1,3-DICHLOROPROPENE	<0.20
ETHYLBENZENE	<0.50
METHYLENE CHLORIDE	<5.0
1,1,2,2-TETRACHLOROETHANE	<0.20
TETRACHLOROETHENE	<0.20
TOLUENE	<0.50
1,1,1-TRICHLOROETHANE	<0.50
1,1,2-TRICHLOROETHANE	<0.20
TRICHLOROETHENE	<0.20
TRICHLOROFLUOROMETHANE	<0.50
VINYL CHLORIDE	<1.0
TOTAL XYLENES	<0.50

SURROGATE PERCENT RECOVERY		LIMITS
BROMOCHLOROMETHANE	81	58 - 126
BROMOFLUOROBENZENE	87	76 - 136

MAS I.D. # 712020-2

MultiChem
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 4617	DATE RECEIVED	: 12/10/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: N/A
CLIENT I.D.	: TB	DATE ANALYZED	: 12/18/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8021	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	<0.50
BROMODICHLOROMETHANE	<0.20
BROMOFORM	<0.50
BROMOMETHANE	<2.0
CARBON TETRACHLORIDE	<0.20
CHLOROBENZENE	<0.50
CHLOROETHANE	<2.0
CHLOROFORM	<0.20
CHLOROMETHANE	<1.0
1,2-DIBROMOETHANE (EDB)	<0.50
1,2-DICHLOROBENZENE	<0.50
1,3-DICHLOROBENZENE	<0.50
1,4-DICHLOROBENZENE	<0.50
DIBROMOCHLOROMETHANE	<0.20
1,1-DICHLOROETHANE	<0.20
1,2-DICHLOROETHANE (EDC)	<0.20
1,1-DICHLOROETHENE	<0.20
CIS-1,2-DICHLOROETHENE	<0.20
TRANS-1,2-DICHLOROETHENE	<0.20
1,2-DICHLOROPROPANE	<0.20
CIS-1,3-DICHLOROPROPENE	<0.20
TRANS-1,3-DICHLOROPROPENE	<0.20
ETHYLBENZENE	<0.50
METHYLENE CHLORIDE	<5.0
1,1,2,2-TETRACHLOROETHANE	<0.20
TETRACHLOROETHENE	<0.20
TOLUENE	<0.50
1,1,1-TRICHLOROETHANE	<0.50
1,1,2-TRICHLOROETHANE	<0.20
TRICHLOROETHENE	<0.20
TRICHLOROFLUOROMETHANE	<0.50
VINYL CHLORIDE	<1.0
TOTAL XYLENES	<0.50

SURROGATE PERCENT RECOVERY		LIMITS
BROMOCHLOROMETHANE	88	58 - 126
BROMOFLUOROBENZENE	89	76 - 136

MAS I.D. # 712020

MultiChem
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
EPA METHOD : 8021

SAMPLE I.D. # : BLANK
DATE EXTRACTED : N/A
DATE ANALYZED : 12/18/97
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
BENZENE	<0.500	10.0	9.89	99	N/A	N/A	N/A
CHLOROBENZENE	<0.500	10.0	9.91	99	N/A	N/A	N/A
1,1-DICHLOROETHENE	<0.200	10.0	9.78	98	N/A	N/A	N/A
TOLUENE	<0.500	10.0	9.32	93	N/A	N/A	N/A
TRICHLOROETHENE	<0.200	10.0	10.4	104	N/A	N/A	N/A

CONTROL LIMITS	% REC.	RPD
BENZENE	73 - 134	20
CHLOROBENZENE	79 - 141	33
1,1-DICHLOROETHENE	56 - 158	22
TOLUENE	83 - 136	29
TRICHLOROETHENE	72 - 138	21

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
BROMOCHLOROMETHANE	101	N/A	58 - 126
BROMOFLUOROBENZENE	95	N/A	76 - 136

MAS I.D. # 712020

MultiChem
ANALYTICAL SERVICES

VOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
EPA METHOD : 8021

SAMPLE I.D. # : 712018-1
DATE EXTRACTED : N/A
DATE ANALYZED : 12/18/97
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
BENZENE	3.85	10.0	13.1	93	13.2	94	1
CHLOROBENZENE	104	100	208	104	198	94	5
1,1-DICHLOROETHENE	<0.200	10.0	6.49	65	6.53	65	1
TOLUENE	<0.500	10.0	9.11	91	9.10	91	0
TRICHLOROETHENE	<0.200	10.0	9.01	90	8.21	82	9

CONTROL LIMITS	% REC.	RPD
BENZENE	55 - 148	20
CHLOROBENZENE	61 - 160	33
1,1-DICHLOROETHENE	37 - 182	22
TOLUENE	60 - 158	29
TRICHLOROETHENE	61 - 149	21

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
BROMOCHLOROMETHANE	93	97	58 - 126
BROMOFLUOROBENZENE	96	95	76 - 136

MAS I.D. # 712020

CASE NARRATIVE

MultiChem
ANALYTICAL SERVICES

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

CASE NARRATIVE: SEMIVOLATILE ORGANICS ANALYSIS

The following anomalies were associated with the preparation and/or analysis of the samples in this accession using EPA method 8270 for semivolatile organics:

The recovery of surrogate 2-fluorobiphenyl fell below advisory control limits of 40-120% in the analysis of 712020-1 (HC-MW-3), the blank, blank spike/blank spike duplicate (BS/BSD) and the matrix spike/matrix spike duplicate (MS/MSD). Since an insufficient number of data points have been collected to statistically determine control limits, the results were flagged "H" to denote that they were outside advisory limits.

The recovery of all target analytes with the exception of naphthalene were within control limits in the analysis of the BS/BSD. The recoveries of naphthalene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3cd)pyrene, dibenzo(a,h)anthracene and benzo(g,h,i)perylene fell below advisory control limits in the MS/MSD associated with this accession. Because of the low recovery of the less volatile polynuclear aromatic hydrocarbons (PAHs) in the MS, it became apparent that the samples were not amenable to solid phase extraction. The samples were reextracted via liquid/liquid extractors and reanalyzed by high performance liquid chromatography (HPLC). The results for compounds that fell outside control limits for SIM GCMS analysis were reported from the HPLC analysis.

The following anomalies were associated with the preparation and/or analysis of the samples in this accession using EPA method 8310 for polynuclear aromatic hydrocarbons:

The relative percent difference (RPD) between recoveries of several compounds from the MS/MSD samples exceeded MultiChem control limits. Since all MS/MSD recoveries, BS/BSD recoveries, and BS/BSD RPD values were in control, no further action was performed.

All other associated quality assurance/quality control (QA/QC) parameters were within established MultiChem control limits.

MAS I.D. # 712020

MultiChem
ANALYTICAL SERVICES

SEMIVOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 4617	DATE RECEIVED	: N/A
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/16/97
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 12/18/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8270A (MODIFIED)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
NAPHTHALENE	<0.092
ACENAPHTHYLENE	<0.016
ACENAPHTHENE	<0.028
FLUORENE	<0.018
PHENANTHRENE	<0.015
ANTHRACENE	<0.013
FLUORANTHENE	<0.011
PYRENE	<0.014
BENZO(A)ANTHRACENE	<0.013
CHRYSENE	<0.012
BENZO(B)FLUORANTHENE	<0.0090
BENZO(K)FLUORANTHENE	<0.0090
BENZO(A)PYRENE	<0.010
INDENO(1,2,3-CD)PYRENE	<0.012
DIBENZO(A,H)ANTHRACENE	<0.012
BENZO(G,H,I)PERYLENE	<0.011

SURROGATE PERCENT RECOVERY		LIMITS
TERPHENYL-D14	61	40 - 160
2-FLUOROBIPHENYL	16 H	40 - 160

H = Out of limits.

MAS I.D. # 712020

MultiChem
ANALYTICAL SERVICES

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 4617	DATE RECEIVED	: N/A
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/18/97
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 12/23/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8310 (LOW LEVEL)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
NAPHTHALENE	<0.11
ACENAPHTHYLENE	<0.23
ACENAPHTHENE	<0.11
FLUORENE	<0.023
PHENANTHRENE	<0.011
ANTHRACENE	<0.011
FLUORANTHENE	<0.023
PYRENE	<0.011
BENZO(A)ANTHRACENE	<0.011
CHRYSENE	<0.011
BENZO(B)FLUORANTHENE	<0.023
BENZO(K)FLUORANTHENE	<0.011
BENZO(A)PYRENE	<0.011
DIBENZO(A,H)ANTHRACENE	<0.032
BENZO(G,H,I)PERYLENE	<0.023
INDENO(1,2,3-CD)PYRENE	<0.011

SURROGATE PERCENT RECOVERY		LIMITS
2-CHLOROANTHRACENE	92	23 - 120

MAS I.D. # 712020-1

MultiChem
ANALYTICAL SERVICES

SEMIVOLATILE ORGANICS ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 12/11/97
PROJECT #	: 4617	DATE RECEIVED	: 12/12/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/16/97
CLIENT I.D.	: HC-MW-3	DATE ANALYZED	: 12/18/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8270A (MODIFIED)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS	
NAPHTHALENE	<0.12	X
ACENAPHTHYLENE	<0.016	
ACENAPHTHENE	0.079	
FLUORENE	0.049	
PHENANTHRENE	0.036	
ANTHRACENE	<0.013	
FLUORANTHENE	0.026	
PYRENE	0.032	
BENZO(A)ANTHRACENE	<0.013	
CHRYSENE	<0.012	X
BENZO(B)FLUORANTHENE	<0.024	X
BENZO(K)FLUORANTHENE	<0.012	X
BENZO(A)PYRENE	<0.012	X
INDENO(1,2,3-CD)PYRENE	<0.033	X
DIBENZO(A,H)ANTHRACENE	<0.024	X
BENZO(G,H,I)PERYLENE	<0.012	X

SURROGATE PERCENT RECOVERY			LIMITS
TERPHENYL-D14	44		40 - 160
2-FLUOROBIPHENYL	39	H	40 - 160
2-CHLOROANTHRACENE	94	X	23 - 120

H = Out of limits.
X = Value reported from EPA 8310 analysis.

MAS I.D. # 712020

MultiChem
ANALYTICAL SERVICES

SEMIVOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
EPA METHOD : 8270A (MODIFIED)

SAMPLE I.D. # : BLANK
DATE EXTRACTED : 12/16/97
DATE ANALYZED : 12/18/97
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
NAPHTHALENE	<0.0920	2.50	0.625	25H	0.748	30H	18
ACENAPHTHYLENE	<0.0160	2.50	1.84	74	2.01	80	9
ACENAPHTHENE	<0.0280	2.50	1.51	60	1.68	67	11
FLUORENE	<0.0180	2.50	1.92	77	2.09	84	8
PHENANTHRENE	<0.0150	2.50	2.14	86	2.23	89	4
ANTHRACENE	<0.0130	2.50	2.17	87	2.26	90	4
FLUORANTHENE	<0.0110	2.50	2.22	89	2.34	94	5
PYRENE	<0.0140	2.50	2.27	91	2.35	94	3
BENZO(A)ANTHRACENE	<0.0130	2.50	2.11	84	2.15	86	2
CHRYSENE	<0.0120	2.50	1.93	77	1.96	78	2
BENZO(B)FLUORANTHENE	<0.00900	2.50	1.97	79	2.02	81	3
BENZO(K)FLUORANTHENE	<0.00900	2.50	1.72	69	1.81	72	5
BENZO(A)PYRENE	<0.0100	2.50	1.90	76	1.94	78	2
INDENO(1,2,3-CD)PYRENE	<0.0120	2.50	1.65	66	1.77	71	7
DIBENZO(A,H)ANTHRACENE	<0.0120	2.50	1.43	57	1.53	61	7
BENZO(G,H,I)PERYLENE	<0.0110	2.50	1.48	59	1.67	67	12

CONTROL LIMITS	% REC.	RPD
NAPHTHALENE	40 - 160	20
ACENAPHTHYLENE	40 - 160	20
ACENAPHTHENE	40 - 160	20
FLUORENE	40 - 160	20
PHENANTHRENE	40 - 160	20
ANTHRACENE	40 - 160	20
FLUORANTHENE	40 - 160	20
PYRENE	40 - 160	20
BENZO(A)ANTHRACENE	40 - 160	20
CHRYSENE	40 - 160	20
BENZO(B)FLUORANTHENE	40 - 160	20
BENZO(K)FLUORANTHENE	40 - 160	20
BENZO(A)PYRENE	40 - 160	20
INDENO(1,2,3-CD)PYRENE	40 - 160	20
DIBENZO(A,H)ANTHRACENE	40 - 160	20
BENZO(G,H,I)PERYLENE	40 - 160	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
TERPHENYL-D14	63	62	40 - 160
2-FLUOROBIPHENYL	18H	21H	40 - 160

H = Out of limits.

MAS I.D. # 712020

MultiChem
ANALYTICAL SERVICES

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
EPA METHOD : 8310 (LOW LEVEL)

SAMPLE I.D. # : BLANK
DATE EXTRACTED : 12/18/97
DATE ANALYZED : 12/23/97
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
ACENAPHTHYLENE	<0.227	9.09	6.70	74	7.36	81	9
PHENANTHRENE	<0.0114	0.455	0.366	80	0.386	85	5
PYRENE	<0.0114	0.455	0.396	87	0.403	89	2
BENZO(K)FLUORANTHENE	<0.0114	0.455	0.378	83	0.385	85	2
DIBENZO(A,H)ANTHRACENE	<0.0318	0.909	0.486	53	0.594	65	20

CONTROL LIMITS	% REC.	RPD
ACENAPHTHYLENE	43 - 106	23
PHENANTHRENE	42 - 113	21
PYRENE	48 - 124	20
BENZO(K)FLUORANTHENE	52 - 119	20
DIBENZO(A,H)ANTHRACENE	29 - 142	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
2-CHLOROANTHRACENE	92	92	23 - 120

MAS I.D. # 712020

MultiChem
ANALYTICAL SERVICES

SEMIVOLATILE ORGANICS ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
EPA METHOD : 8270A (MODIFIED)

SAMPLE I.D. # : 712018-1
DATE EXTRACTED : 12/16/97
DATE ANALYZED : 12/18/97
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
NAPHTHALENE	1.74	2.50	2.40	26H	3.06	53	24H
ACENAPHTHYLENE	<0.0160	2.50	2.14	86	2.26	90	5
ACENAPHTHENE	1.03	2.50	2.69	66	2.88	74	7
FLUORENE	0.343	2.50	2.38	81	2.47	85	4
PHENANTHRENE	0.230	2.50	2.30	83	2.32	84	1
ANTHRACENE	0.0320	2.50	2.03	80	2.06	81	1
FLUORANTHENE	0.0788	2.50	2.12	82	2.09	80	1
PYRENE	0.0530	2.50	1.95	76	2.16	84	10
BENZO(A)ANTHRACENE	<0.0130	2.50	1.05	42	1.11	44	6
CHRYSENE	<0.0120	2.50	0.813	33H	0.817	33H	0
BENZO(B)FLUORANTHENE	<0.00900	2.50	0.400	16H	0.432	17H	8
BENZO(K)FLUORANTHENE	<0.00900	2.50	0.275	11H	0.270	11H	2
BENZO(A)PYRENE	<0.0100	2.50	0.297	12H	0.313	13H	5
INDENO(1,2,3-CD)PYRENE	<0.0120	2.50	0.0478	2H	0.0673	3H	33H
DIBENZO(A,H)ANTHRACENE	<0.0120	2.50	0.0285	1H	0.0385	2H	29H
BENZO(G,H,I)PERYLENE	<0.0110	2.50	0.0448	2H	0.0588	2H	27H

CONTROL LIMITS	% REC.	RPD
NAPHTHALENE	40 - 160	20
ACENAPHTHYLENE	40 - 160	20
ACENAPHTHENE	40 - 160	20
FLUORENE	40 - 160	20
PHENANTHRENE	40 - 160	20
ANTHRACENE	40 - 160	20
FLUORANTHENE	40 - 160	20
PYRENE	40 - 160	20
BENZO(A)ANTHRACENE	40 - 160	20
CHRYSENE	40 - 160	20
BENZO(B)FLUORANTHENE	40 - 160	20
BENZO(K)FLUORANTHENE	40 - 160	20
BENZO(A)PYRENE	40 - 160	20
INDENO(1,2,3-CD)PYRENE	40 - 160	20
DIBENZO(A,H)ANTHRACENE	40 - 160	20
BENZO(G,H,I)PERYLENE	40 - 160	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
TERPHENYL-D14	48	49	40 - 160
2-FLUOROBIPHENYL	30H	36H	40 - 160

H = Out of limits.

MAS I.D. # 712020

MultiChem
ANALYTICAL SERVICES

POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
EPA METHOD : 8310 (LOW LEVEL)

SAMPLE I.D. # : 712018-1
DATE EXTRACTED : 12/18/97
DATE ANALYZED : 12/23/97
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
ACENAPHTHYLENE	<0.238	9.52	6.39	67	7.82	82	20
PHENANTHRENE	0.374	0.476	0.663	61	0.836	97	23H
PYRENE	0.0545	0.476	0.382	69	0.480	89	23H
BENZO(K)FLUORANTHENE	<0.0119	0.476	0.254	53	0.329	69	26H
DIBENZO(A,H)ANTHRACENE	<0.0333	0.952	0.210	22	0.317	33	41H

CONTROL LIMITS	% REC.	RPD
ACENAPHTHYLENE	20 - 163	23
PHENANTHRENE	20 - 168	21
PYRENE	36 - 125	20
BENZO(K)FLUORANTHENE	20 - 104	20
DIBENZO(A,H)ANTHRACENE	20 - 74	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
2-CHLOROANTHRACENE	72	91	23 - 120

H = Out of limits.

MAS I.D. # 712020

CASE NARRATIVE

MultiChem
ANALYTICAL SERVICES

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

CASE NARRATIVE: POLYCHLORINATED BIPHENYLS ANALYSIS

The following anomalies were associated with the preparation and/or analysis of the sample in this accession:

The percent difference (D%) of the surrogate, decachlorobiphenyl (DCBP), from the continuing calibration verification standards (CCVs) which bracketed the sample and its associated quality control (QC) samples exceeded the control limits (±15%). Since the D% of the other surrogate, tetrachloro-m-xylene (TCMX), from these CCVs were in control and the spiked recoveries of TCMX were in control from all samples, no further corrective action was performed.

The relative percent difference (RPD) between sample matrix spike (MS) recovery and matrix spike duplicate (MSD) recovery exceeded MultiChem's established control limits. Since the MS/MSD recoveries and the associated blank spike (BS) recoveries were all in control, no further corrective action was performed for this sample set.

All other associated quality assurance/quality control (QA/QC) parameters were within established MultiChem control limits.

MAS I.D. # 712020

MultiChem
ANALYTICAL SERVICES

PCB ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 4617	DATE RECEIVED	: N/A
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/11/97
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 12/16/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8081 (ULTRA LOW LEVEL)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
AROCLOR 1016	<0.0052
AROCLOR 1221	<0.013
AROCLOR 1232	<0.013
AROCLOR 1242	<0.0052
AROCLOR 1248	<0.0052
AROCLOR 1254	<0.0052
AROCLOR 1260	<0.0052

SURROGATE PERCENT RECOVERY		LIMITS
DECACHLOROBIPHENYL	89	25 - 137
TETRACHLORO-M-XYLENE	58	40 - 123

MAS I.D. # 712020-1

MultiChem
ANALYTICAL SERVICES

PCB ANALYSIS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 12/09/97
PROJECT #	: 4617	DATE RECEIVED	: 12/10/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/11/97
CLIENT I.D.	: HC-MW-3	DATE ANALYZED	: 12/16/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8081 (ULTRA LOW LEVEL)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
AROCLOR 1016	<0.0052
AROCLOR 1221	<0.013
AROCLOR 1232	<0.013
AROCLOR 1242	<0.0052
AROCLOR 1248	<0.0052
AROCLOR 1254	<0.0052
AROCLOR 1260	<0.0052

SURROGATE PERCENT RECOVERY		LIMITS
DECACHLOROBIPHENYL	65	25 - 137
TETRACHLORO-M-XYLENE	51	40 - 123

MAS I.D. # 712020

MultiChem
ANALYTICAL SERVICES

PCB ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
EPA METHOD : 8081 (ULTRA LOW LEVEL)

SAMPLE I.D. # : BLANK
DATE EXTRACTED : 12/11/97
DATE ANALYZED : 12/16/97
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
AROCLOR 1260	<0.00524	0.0298	0.0329	110	N/A	N/A	N/A
CONTROL LIMITS				% REC.			RPD
AROCLOR 1260				72 - 144			20
SURROGATE RECOVERIES		SPIKE		DUP. SPIKE		LIMITS	
DECACHLOROBIPHENYL		97		N/A		25 - 137	
TETRACHLORO-M-XYLENE		73		N/A		40 - 123	

MAS I.D. # 712020

MultiChem
ANALYTICAL SERVICES

PCB ANALYSIS
QUALITY CONTROL DATA

CLIENT	: HART CROWSER, INC.	SAMPLE I.D. #	: 712018-1
PROJECT #	: 4617	DATE EXTRACTED	: 12/11/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE ANALYZED	: 12/16/97
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8081 (ULTRA LOW LEVEL)		

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
AROCLOR 1260	<0.00524	0.0298	0.0255	86	0.0187	63	31H

CONTROL LIMITS	% REC.	RPD
AROCLOR 1260	32 - 163	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
DECACHLOROBIPHENYL	57	44	25 - 137
TETRACHLORO-M-XYLENE	62	51	40 - 123

H = Out of limits.

MAS I.D. # 712020

MultiChem
ANALYTICAL SERVICES

CASE NARRATIVE

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

CASE NARRATIVE: TOTAL PETROLEUM HYDROCARBONS ANALYSIS - DIESEL

The following anomalies were associated with the preparation and/or analysis of the sample in this accession:

Sample 712020-1 (HC-MW-3) was spiked twice during the extraction process. The reported surrogate percent recovery was calculated taking this fact into account.

All other associated quality assurance/quality control (QA/QC) parameters were within established MultiChem control limits.

MAS I.D. # 712020

MultiChem
ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: N/A
PROJECT #	: 4617	DATE RECEIVED	: N/A
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/12/97
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 12/13/97
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	<0.25
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<0.75
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
O-TERPHENYL	96	65 - 134

MAS I.D. # 712020-1

MultiChem
ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: HART CROWSER, INC.	DATE SAMPLED	: 12/09/97
PROJECT #	: 4617	DATE RECEIVED	: 12/10/97
PROJECT NAME	: LAKE WA SHIP CANAL	DATE EXTRACTED	: 12/12/97
CLIENT I.D.	: HC-MW-3	DATE ANALYZED	: 12/14/97
SAMPLE MATRIX	: WATER	UNITS	: mg/L
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	0.68
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL
FUEL HYDROCARBONS	<0.71
HYDROCARBON RANGE	C24 - C34
HYDROCARBON QUANTITATION USING	MOTOR OIL

SURROGATE PERCENT RECOVERY		LIMITS
O-TERPHENYL	82	65 - 134

MAS I.D. # 712020

MultiChem
ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
METHOD : WA DOE WTPH-D

SAMPLE I.D. # : BLANK
DATE EXTRACTED : 12/12/97
DATE ANALYZED : 12/13/97
UNITS : mg/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
DIESEL	<0.250	2.50	2.45	98	2.45	98	0

CONTROL LIMITS	% REC.	RPD
DIESEL	76 - 115	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
O-TERPHENYL	95	97	65 - 134

MAS I.D. # 712020

MultiChem
ANALYTICAL SERVICES

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL
SAMPLE MATRIX : WATER
METHOD : WA DOE WTPH-D

SAMPLE I.D. # : 712018-1
DATE EXTRACTED : 12/12/97
DATE ANALYZED : 12/14/97
UNITS : mg/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
DIESEL	0.346	2.38	2.50	91	2.55	93	2

CONTROL LIMITS	% REC.	RPD
DIESEL	73 - 130	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
O-TERPHENYL	96	95	65 - 134

MAS I.D. # 712020

MultiChem
ANALYTICAL SERVICES

CASE NARRATIVE

CLIENT : HART CROWSER, INC.
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

CASE NARRATIVE: GENERAL CHEMISTRY ANALYSIS

There were no anomalies associated with the preparation and/or analysis of the sample in this accession.

MAS I.D. # 712020

MultiChem
ANALYTICAL SERVICES

GENERAL CHEMISTRY ANALYSIS

CLIENT : HART CROWSER, INC. MATRIX : WATER
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL

PARAMETER	DATE PREPARED	DATE ANALYZED
TOTAL SUSPENDED SOLIDS	12/11/97	12/12/97

MAS I.D. # 712020

MultiChem
ANALYTICAL SERVICES

GENERAL CHEMISTRY ANALYSIS
DATA SUMMARY

CLIENT : HART CROWSER, INC. MATRIX : WATER
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL UNITS : mg/L

MAS I.D. #	CLIENT I.D.	TOTAL SUSPENDED SOLIDS
712020-1	HC-MW-3	20
BLANK	-	<10

MAS I.D. # 712020

MultiChem
ANALYTICAL SERVICES

GENERAL CHEMISTRY ANALYSIS
QUALITY CONTROL DATA

CLIENT : HART CROWSER, INC. MATRIX : WATER
PROJECT # : 4617
PROJECT NAME : LAKE WA SHIP CANAL UNITS : mg/L

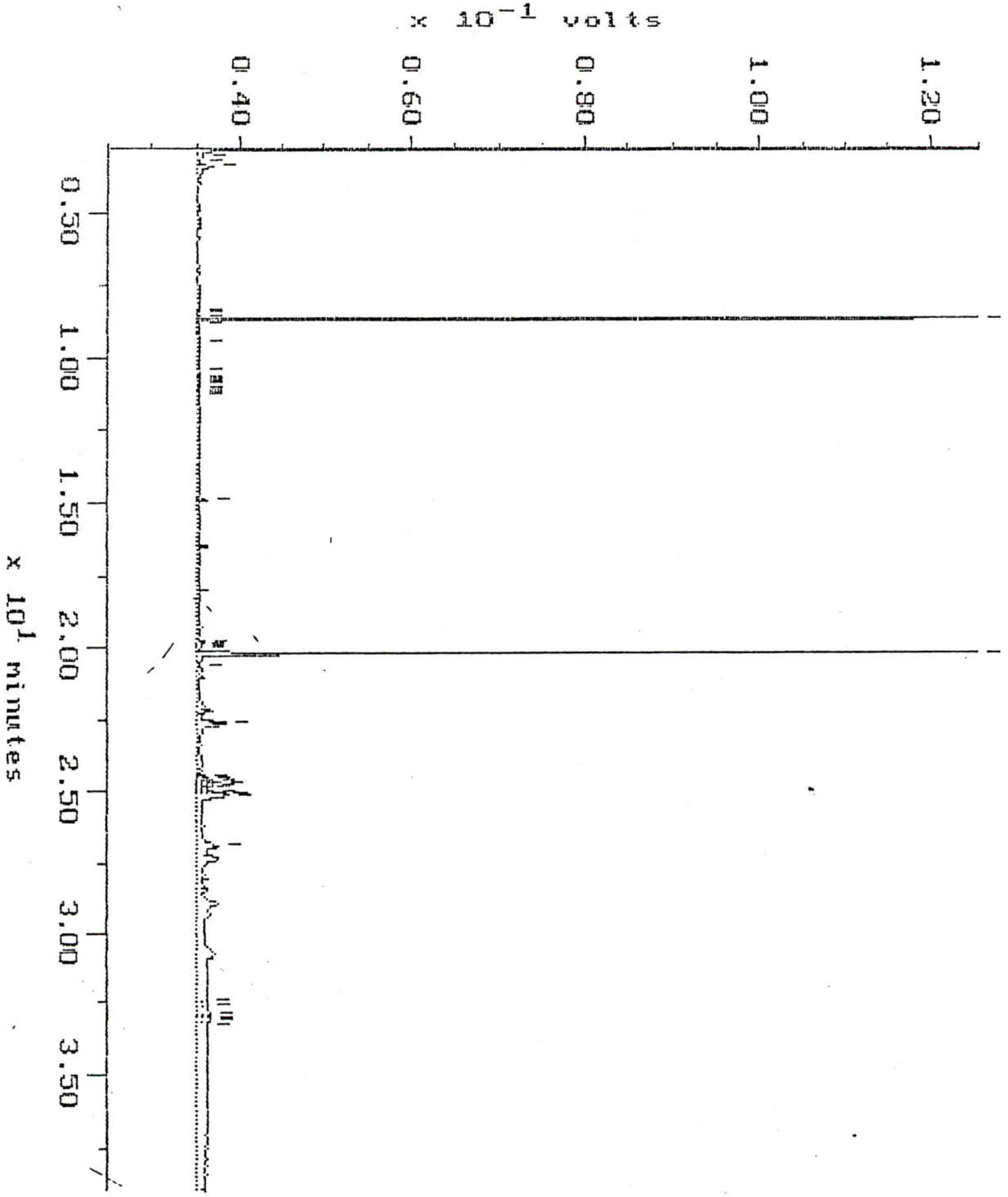
PARAMETER	MAS I.D.	SAMPLE RESULT	DUP RESULT	RPD	SPIKED RESULT	SPIKE ADDED	% REC.
TOTAL SUSPENDED SOLIDS	BLANK	<10.0	N/A	N/A	47.0	56.0	84
TOTAL SUSPENDED SOLIDS	712017-1	<10.0	<10.0	NC	N/A	N/A	N/A

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

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

Blank

Sample: A1212 TPHD BLK Channel: ANN Filename: RC128A21
Acquired: 13-DEC-97 17:50 Method: X:\MAXDATA\ANN\FUEL1212 Operator: ANN
Comments: WA DOE TPH D

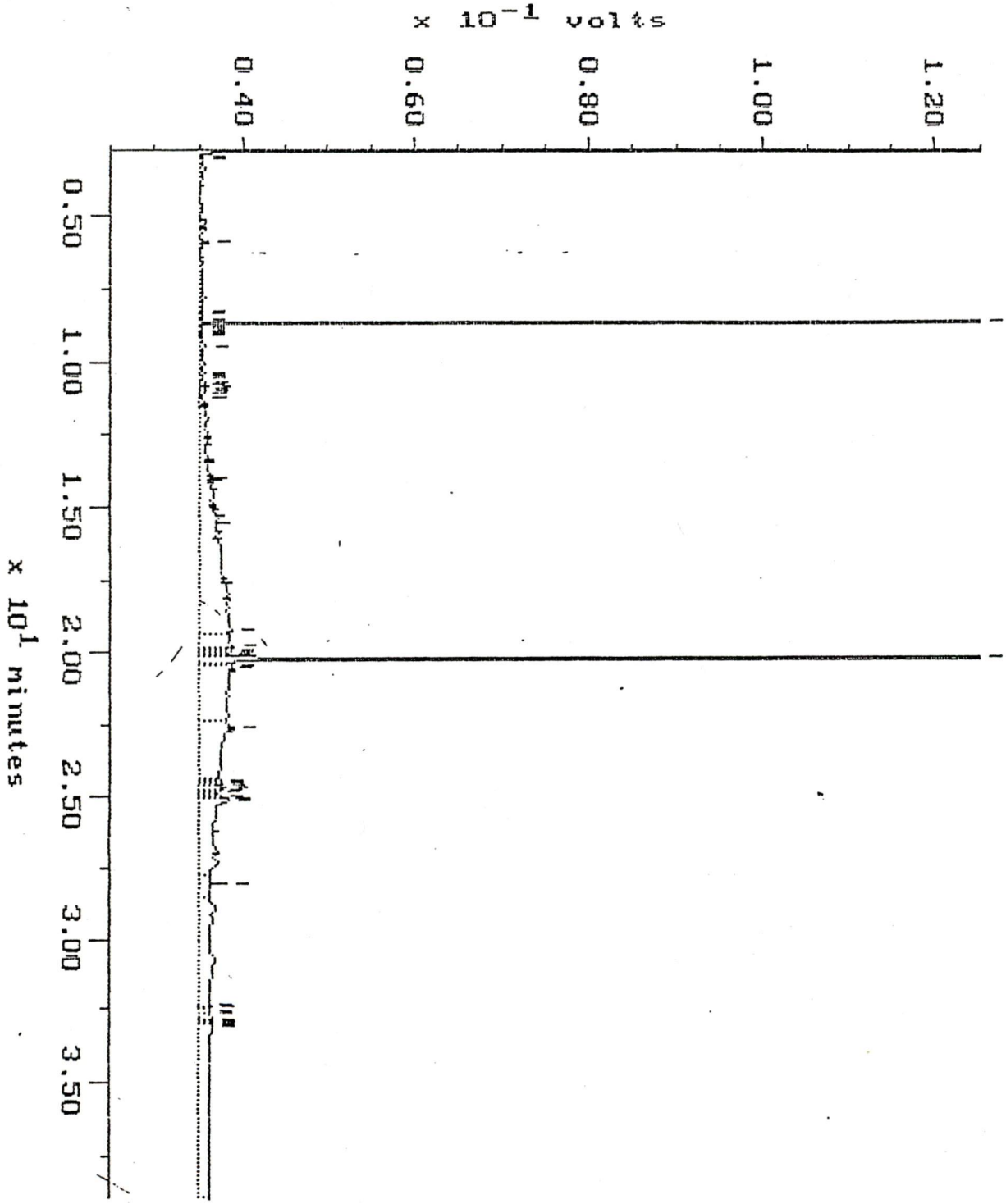


WA DOE WTPH-D

Sample: 712020-1
Acquired: 14-DEC-97 12:41
Comments:

Channel: ANN
Method: X:\MAXDATA\ANN\FUEL1212
WA DOE TPH D

Filename: RC128A44
Operator: ANN

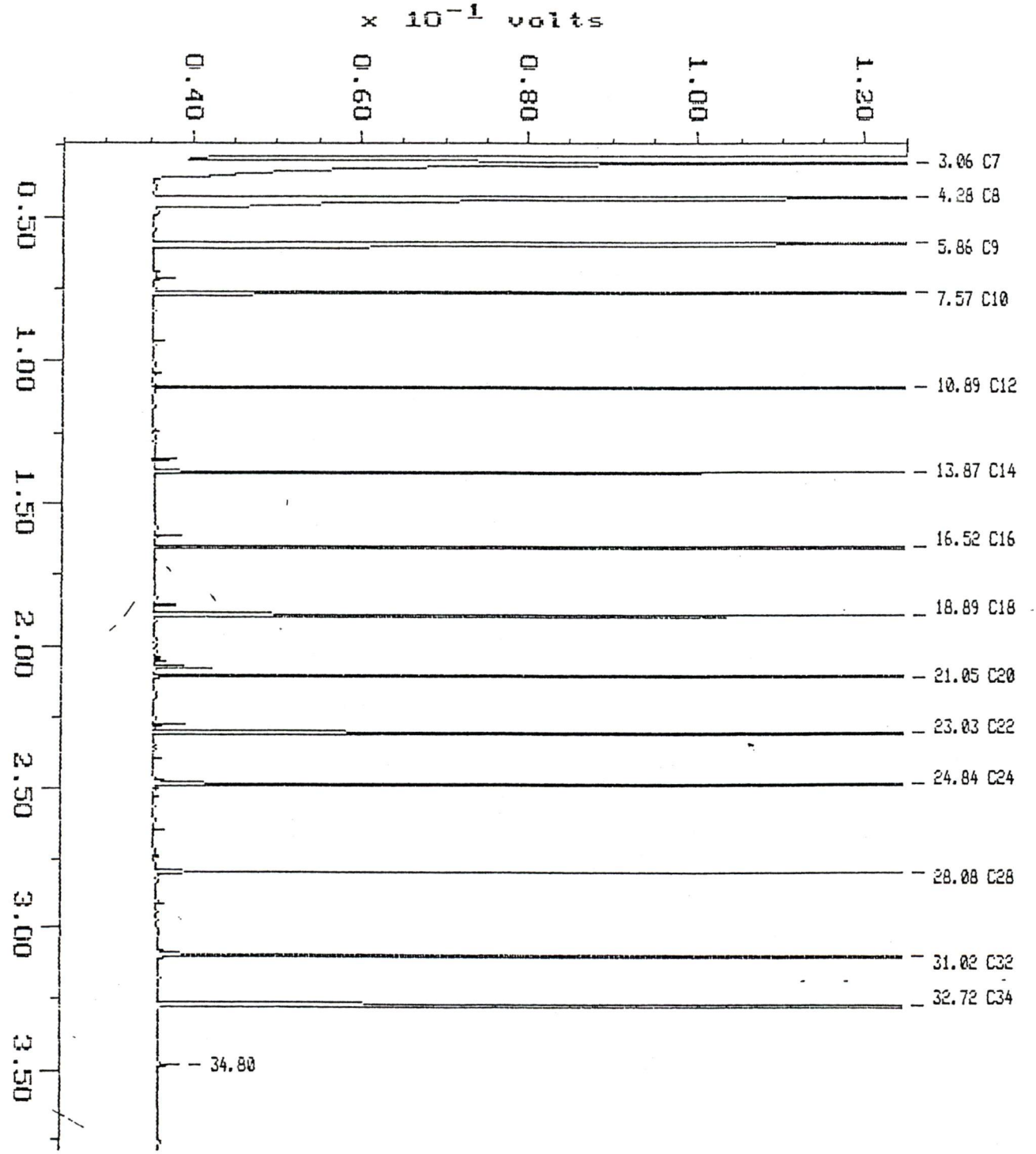


Alkane

Sample: ALKANE ANN
Acquired: 10-DEC-97 11:15
Inj Vol: 1.00
Comments: ALKANE STANDARD

Channel: ANN
Method: X:\MAXDATA\ANN\FUEL1210

Filename: RC108A02
Operator: ANN

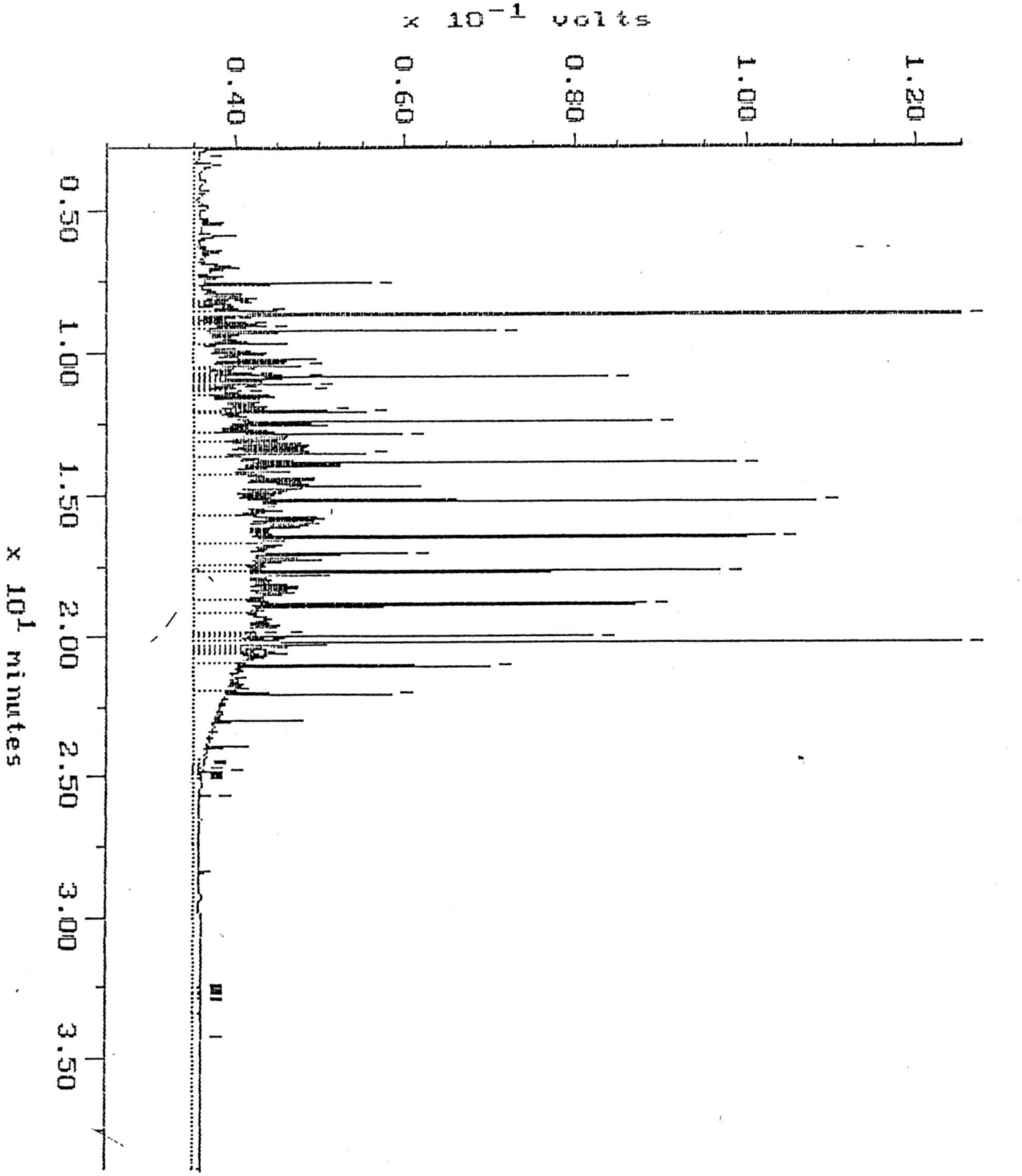


CONTINUING CALIBRATION

Sample: D500 CCV
Acquired: 12-DEC-97 23:40
Comments:

Channel: ANN
Method: X:\MAXDATA\ANN\FUEL1211
WA DOE TPH D

Filename: RC118A39
Operator: ANN

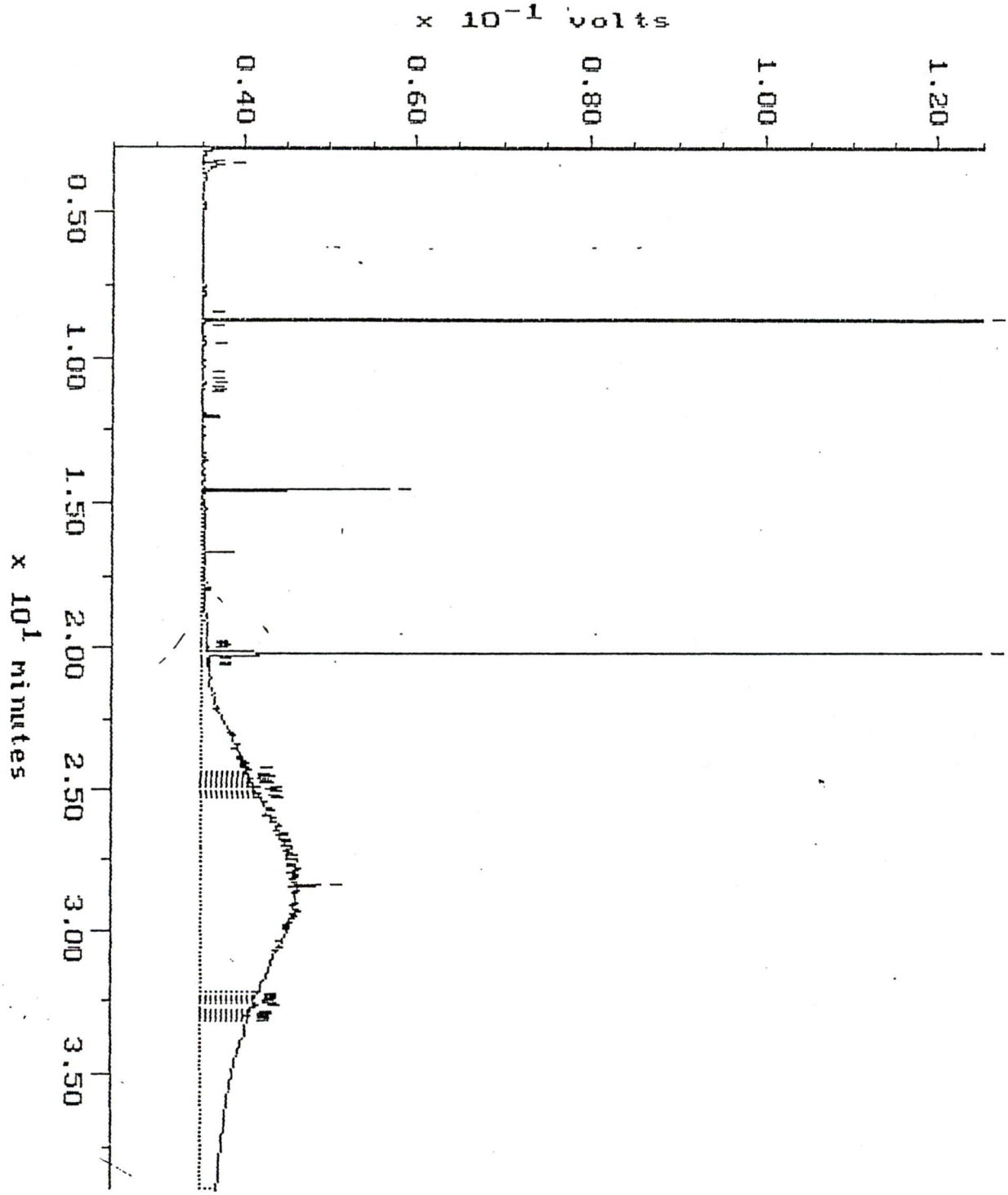


CONTINUING CALIBRATION

Sample: MD500 CCV
Acquired: 13-DEC-97 0:29
Comments:

Channel: ANN
Method: X:\MAXDATA\ANN\FUEL1211
WA DOE TPH D

Filename: RC118A40
Operator: ANN



AnalyticalTechnologies, Inc.
560 Naches Avenue, S.W., Suite 101, Renton, WA 98055 (206) 228-8335

DATE: 12/11/97 Page 1 of 1 ATI ACCESSION # 712020

COMPANY: HART CROWSER
REPORT TO:
ADDRESS: (ON FILE)
PHONE: ( ) - FAX: ( ) -
PROJECT MANAGER: D. HEFFNER
PROJECT NUMBER: 4617
PROJECT NAME: LK WA SHIP - COE

ATI will DISPOSE / RETURN samples (circle one)

Sample ID	Date	Time	Matrix	LabID	FUELS: TPH-HCID WA/OR	BETX/TPH-G combo WA/OR	BETX (by 8020) WA/OR	TPH-G WA/OR	TPH-D WA/OR	8015 modified WA/OR	418.1	413.2	AK-GRO	AK-DRO	ORGANIC COMPOUNDS: 8240 GCMS Volatiles	8270 ~~GCMS~~ Semivolatiles SIM	8080 ~~8080~~ Pesticides/PCBs 8081	PCB only (by 8080) STD/lo level	8010 Halogenated VOCs	8020 Aromatic VOCs	8310 HPLC PAHs	8040 Phenols	8140 OP Pesticides	8150 OC Herbicides	METALS: Metals (Indicate below *)	Total Lead	Priority Pollutant Metals (13)	TAL Metals (23)	TCLP: TCLP-Volatiles (ZHE-8240)	TCLP-Semivolatiles (8270)	TCLP-Pesticides (8080)	TCLP-Herbicides (8150)	TCLP+Metals (8 metals)	OTHER: % Moisture (please indicate)	Total # of Containers/sample
LK-MW-3	12/11/97	15:30	H_2O	1					X						X	X																		
LK-MW-2	12/11/97	15:45	H_2O	2					X						X	X																		

Turnaround Time		Sample Receipt	
STANDARD TAT	✓	TOTAL # CONTAINERS RECVD	1
1 WEEK TAT		COC SEALS PRESENT?	Y
4 WORK DAY TAT		COC SEALS INTACT?	Y
3 WORK DAY TAT		RECEIVED COLD?	Y
2 WORK DAY TAT		RECEIVED INTACT?	Y
24 HOUR TAT		RECEIVED VIA: COURIER	

Special Instructions:
Some analyses may have been performed. Check & Kimb:
* Metals needed:

Relinquished By:	Relinquished By:	Relinquished By:
Date: 12/11/97	Date:	Date:
Time: 15:15	Time:	Time:
Received By:	**Received By:**	**Received By:**
Date: 12/12/97	Date:	Date:
Time: JONATHAN VAN LAAR 1000	Time:	Time:
MAS-R		

MultiChem ANALYTICAL SERVICES

530 Naches Ave. SW Suite 101 Renton, WA 98055
(800) 609-0580 ◆ (425) 228-8335 ◆ FAX (425) 228-8336

BNI R: 712020

DATE: 12/10/97
PAGE: 1 of 1

COMPANY: Hart Crowser
ADDRESS: 1910 Fairview Ave East
Seattle WA 98102
PHONE: (206) 324-9530 FAX ( )
PROJ. MGR / CONTACT: D. Heffner
PROJECT NUMBER: 4617
PROJECT NAME: LL WA Slip Canal
DISPOSAL: ☐ MAS ☐ HOLD ☐ RETURN

SAMPLE ID	DATE	TIME	MATRIX	LAB ID
HC-MW-3	12/9/97	0800	H_2O	1
TB	"			2

FUELS											ORGANIC COMPOUNDS										METALS					TCLP					OTHER					
TPH-HCID	BETX / TPH-G BETX / AK101	BETX (by 8021)	TPH-G	TPH-D (TPHD-extended)	8015 modified	418.1	413.2	AK-GRO AK101	AK-DRO AK102 / 103	8240 / 8260 GCMS Volatiles	8270 GCMS Semivolatiles SIM	8081 Pesticides (PCBs) ultra low	PCB only (by 8081) S1D / 11	8021 Halogenated VOCs	8021 Aromatic VOCs	8310 HPLC PAHs	8041 Phenols	8151 DC Herbicides	Metals indicate below*	Total / Dissolved Lead	RCRA Metals (8)	PP Metals (13)	TAL Metals (23)	TCLP 8240 (/VIII)	TCLP 8270 Semivolatiles	TCLP 8081 Pesticides	TCLP 8151 Herbicides	TCLP Metals	755 1602					Total # of Containers
				X						X	X			X																			2
														X																			

SAMPLE RECEIPT			TAT:
TOTAL # OF CONTAINERS	☐ YES	☐ NO	☐ 24 HOURS
COC SEALS PRESENT?	☐ YES	☐ NO	☐ 48 HOURS
COC SEALS INTACT?	☐ YES	☐ NO	☐ 72 HOURS
RECEIVED COLD?	☐ YES	☐ NO	☐ 7 DAYS
RECEIVED INTACT?	☐ YES	☐ NO	☐ SP
RECEIVED VIA:			☒ STANDARD

SPECIAL INSTRUCTIONS/COMMENTS:

Coolers #1 1.4

*METALS NEEDED:

RELINQUISHED BY:	RELINQUISHED BY:	RELINQUISHED BY:
SIGNATURE:	SIGNATURE:	SIGNATURE:
PRINT NAME: Jae Lee	PRINT NAME:	PRINT NAME:
DATE: 12/10/97 TIME: 1215	DATE: TIME:	DATE: TIME:
COMPANY: HC	COMPANY:	COMPANY:
RECEIVED BY:	**RECEIVED BY:**	**RECEIVED BY:**
SIGNATURE:	SIGNATURE:	SIGNATURE:
PRINT NAME: JONATHAN VAN DYK	PRINT NAME:	PRINT NAME:
DATE: 12/10/97 TIME: 1450	DATE: TIME:	DATE: TIME:
COMPANY: MAS-R	COMPANY:	COMPANY:
MAS USE ONLY:	SUBCONTRACT LAB:	PO #:

Cooler Receipt Form

Project: LAKE WASH. SHIP CANAL

Cooler received on 12/10/97 and opened on 12/10/97 by JONATHAN VAN PELT

Jonathan van Pelt
(Signature)

1. Were custody seals on outside of cooler? ..... (YES) NO
   if YES, how many and where? 1 FRONT
   Were Signature and date correct? ..... (YES) NO
2. Were custody papers taped to lid inside cooler? ..... (YES) NO
3. Were custody papers properly filled out (ink, signed, etc.)..... (YES) NO
4. Did you sign custody papers in the appropriate place? ..... (YES) NO
5. Did you attach shipper's packing slip to this form? ..... (YES) NO
6. What kind of packing material was used? BUBBLE BAGS
7. Was sufficient ice used (if appropriate)? ..... (YES) NO
8. Were all bottles sealed in separate plastic bags? ..... (YES) NO
9. Did all bottles arrive in good condition (unbroken)? ..... (YES) NO
10. Were all bottle labels complete (No., date, signed, anal, pres, etc.)? ..... (YES) NO
11. Did all bottle labels and tags agree with custody papers? ..... (YES) NO
12. Were correct bottles used for the test indicated? ..... (YES) NO
13. Were VOA vials checked for absence of air bubbles and noted if found? ..... (YES) NO
14. Was sufficient amount of sample sent in each bottle? ..... (YES) NO

Explain any discrepancies

HARTCROWSER

J-4617 9/96

Figure 8

Cond_6\forms\cooler

NON-CONFORMANCES?
Y (N)
(if Y see other side)

MultiChem Analytical Services

SAMPLE LOG-IN CHECKLIST

DATE: 12/10/97
TIME: 1450
INITIALS: JVD

ACCESSION NO. 712020
CLIENT: HCI
PROJECT: LK. WASH. SHIP CANAL

Shipping:

Type:
- X Cooler
- ____ Box
- ____ Other

COC Seals:
- X Ship. Cont.
- ____ On Bottles
- ____ None

Intact?
- (Y) N
- Y N

Packing Material:
- ____ Styrofoam
- X Bubble Bags
- ____ Foam Vial Packs
- ____ Other ____

Refrigerant:
- X Gel Ice Pack
- ____ Loose Ice
- ____ Other
- ____ None

Frozen?
- (Y) N
- Y N
- Y N

Received Via:
- ____ Hand Delivery
- ____ Federal Express
- ____ Airborne
- ____ Other: ____
- X Courier
- ____ UPS
- ____ Taxi
- ____ Goldstreak

Sample Information:

Samp. #	Bottle #
____	____
2	13
____	____
____	____

Type: Soil / Water / Product / Other

Soil VOAs / Water VOAs

0 headspace Y N N ____
0 headspace (Y) N N ____
Preserved? (Y) N ____
Trip blanks? (Y) N ____

Condition of Samples:

Containers:
Intact? (Bottle/Lid) (Y) N
Correct Type? (Y) N

CA # ____

Waters Preserved? (if needed) (Y) N N ____

ID's Match C.O.C. (Y) N N ____

Temperature: 2.2 C ____ CA NO.
(See corrective action on reverse side for explanation if temperature is outside of the MAS recommended range.)

LAB USE ONLY ☐ NO NOTICE ☐ SENDOUTS NEEDED BY ____
☐ COC/TAT DOES NOT MATCH NOTICE ☐ NEED TEST(S) VERIFIED BY CLIENT

COMMENTS: ____

GOLDSTAR
PACKAGE EXPRESS

CELL: 999-2236 PGR: 583-9048

DATE: 12/8/97

ACCT. NAME: Hart Crowser

FROM:

TO: Multi Chem Analytical Serv.
560 Naches Ave SW
Renton 98055

SERVICE: ☐ 1 HR. ☒ 2 HR. ☐ 4 HR. ☐ ROUND TRIP

JOB #: 4617 — — Faider

SPECIAL INST:

TIME: PICK-UP _____ RECIEVED 0935

X Elaine Walker
RECEIVED BY(PLS.PRINT)

TOTAL $