89-e30

Segment No: 02-03-02

WA-03-0020

WASHINGTON STATE DEPARTMENT OF ECOLOGY
ENVIRONMENTAL INVESTIGATIONS AND LABORATORY SERVICES

M E M O R A N D U M

TO: Kevin Fitzpatrick

THROUGH: Bill Yake

FROM: Art Johnson AJ

SUBJECT: Analysis of Padilla Bay Intertidal Sediments for Cresylic Acid

DATE: January 5, 1989

On September 23, 1988, in response to your request, I conducted a brief survey to assess the possible contamination of Padilla Bay intertidal sediments with cresylic acid (2-methylphenol), the principal ground water contaminant at the Northwest Petrochemical facility on the southwest shore of the bay. Two samples each were collected off Northwest Petrochemical and in the lagoon off the Whitmarsh Landfill, which was known to have received wastes from Northwest Petrochemical (see Figure 1). The landfill samples were also analyzed for PCB's.

At each site, 10 grab samples of the top 2-cm layer of the sediments were collected with a stainless steel spoon, homogenized in a stainless steel beaker, and placed in a priority pollutant-cleaned glass jar with teflon-lined lid (I-CHEM, Hayward, CA). The samples were held on ice until shipped to the Ecology/EPA Manchester Environmental Laboratory on September 26. Spoons and beakers had been cleaned prior to sampling by washing with LiquiNox detergent followed by sequential rinses with deionized water and pesticide-grade acetone, then wrapped in aluminum foil.

The samples were analyzed by Analytical Resources Inc., Seattle. Results are summarized in Table 1. Appendix A contains the complete raw data including analytical methods, supporting quality assurance data, and a review of data quality by Manchester. No significant problems were encountered in the analysis of these samples.

Cresylic acid was not detected in any of the sediment samples; detection limits ranged from 17 to 35 ug/Kg, dry (ppb). PCB's were also not detected in the sediments collected off the landfill (20 ppb detection limits). The detection limits achieved for these compounds are consistent with concentrations reported for Puget Sound sediments in reference areas removed from urban bays (Tetra Tech, 1988).

As shown in Table 1, two non-target compounds were detected in the acid extractable analysis employed for cresylic acid. Phenol and 4-methylphenol concentrations of 230 ppb and 150 ppb, respectively, were measured in one of the two samples collected off Northwest Petrochemical; 4-methylphenol was also detected in one of the landfill samples (25 ppb). These findings are not indicative of significant sediment contamination. Both compounds are routinely detectable in Puget Sound sediments. 4-methylphenol concentrations up to 290 ppb have been reported for Puget Sound reference areas. The phenol concentration observed off Northwest Petrochemical is moderately elevated above concentrations in Puget Sound reference areas (up to 62 ppb), but does not approach apparent effects thresholds (AET*) values for phenol in Puget Sound sediments which range from 420 to 1,200 ppb (PTI Environmental Services, 1988).

Based on results of this survey, it is unlikely that Padilla Bay nearshore sediments off Northwest Petrochemical or off the Whitmarsh Landfill have been contaminated by cresylic acid.

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* An AET is the sediment concentration of a chemical above which a statistically significant biological effect (relative to reference area sediments) is always observed. The biological indicators used in deriving effects thresholds are depressions in benthic infauna, and results of amphipod (Rhepoxynius abronius), oyster larvae (Crassostrea gigas) and Microtox bioassays.

References:

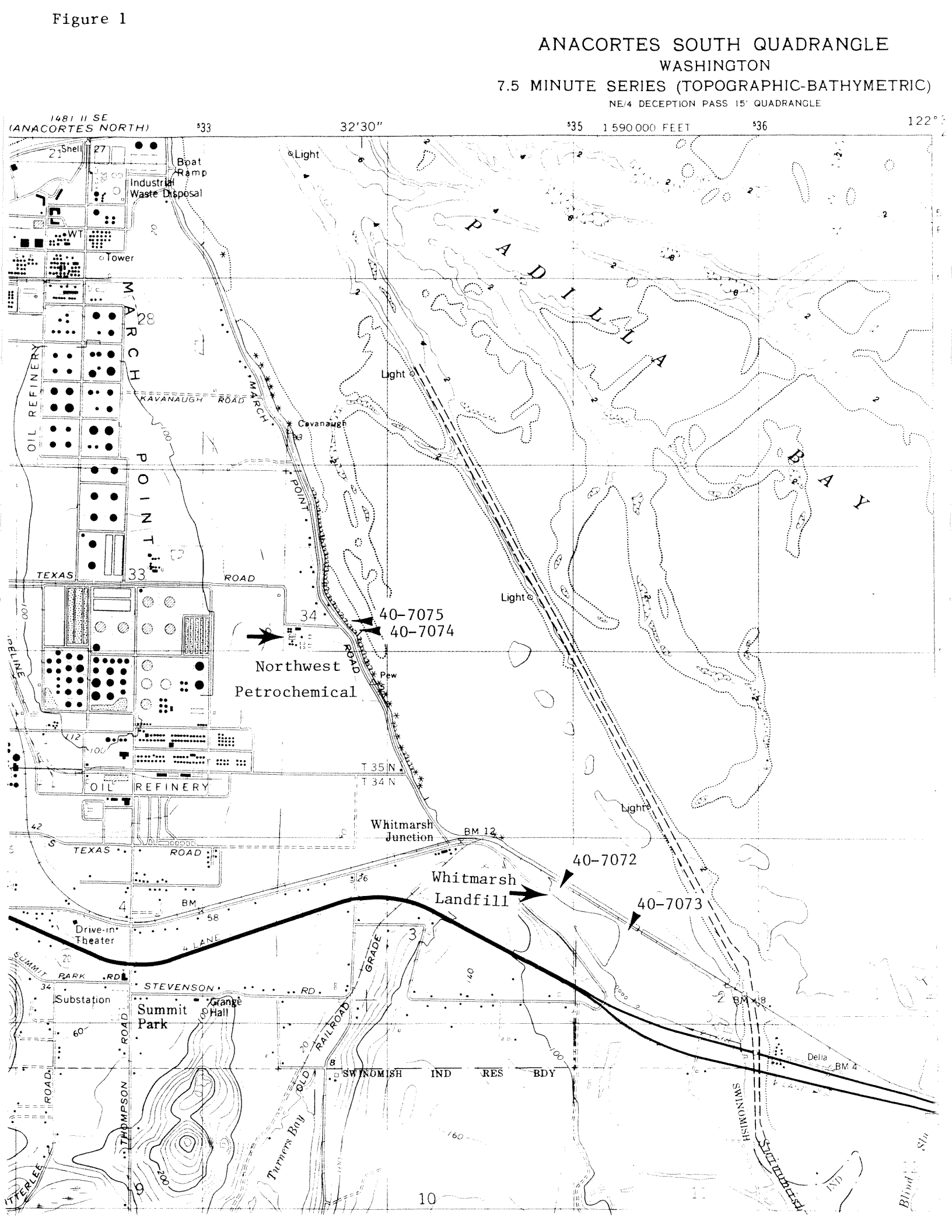
PTI Environmental Services. 1988 (draft). Sediment Quality Values Refinement: Tasks 3 and 5 -1988 Update and Evaluation of Puget Sound AET. prepared for EPA Region X, Office of Puget Sound, Seattle, WA.

Tetra Tech. 1988. Elliott Bay Action Program: Storm Drain Monitoring Approach. prepared for EPA Region X, Office of Puget Sound, Seattle, WA.

BY:AJ:sk

cc: Terry Stevens, Padilla Bay National Estuarine Research Reserve
Don Kane, U.S. Fish and Wildlife Service
John Thayer, Skagit County Health Department
Mike Foster, City of Anacortes

Figure 1


ANACORTES SOUTH QUADRANGLE
WASHINGTON
7.5 MINUTE SERIES (TOPOGRAPHIC-BATHYMETRIC)
NE/4 DECEPTION PASS 15' QUADRANGLE
1481 II SE
(ANACORTES NORTH)
32'30"
1 590 000 FEET
122°
PADILLA BAY
MARCH POINT
OIL REFINERY
Shell
Boat Ramp
Industrial Waste Disposal
WT
Tower
Light
Cavanaugh
KAVANAUGH ROAD
MARCH POINT ROAD
TEXAS ROAD
Northwest Petrochemical
40-7075
40-7074
Pew
T 35 N
T 34 N
OIL REFINERY
Whitmarsh Junction
BM 12
40-7072
Whitmarsh Landfill
40-7073
Drive-in Theater
4 LANE
BM 58
SUMMIT PARK RD
STEVENSON RD
Substation
Summit Park
Grange Hall
GRADE ROAD
OLD RAILROAD
SWINOMISH IND RES BDY
THOMPSON ROAD
Turners Bay
Della
BM 4
SWINOMISH
Swinomish
IND
10

Data Review

November 2, 1988

Project : NWRM

Samples : 407072-75

Laboratory: Analytical Resources Inc. 2047

By: Stuart Magoon

Through: Roy Araki

PCB Fraction (soil)

Holding Times:

Sample	Date Collect	Date Man Lab Rec'd	Date Cont.Lab Rec'd	Date Extrtd	Date Anlyz	#Days from Collct	#Days from Cntrec
407072	09/23	09/26	10/03	10/10	10/11	18ofNE	8of10
407073	09/23	09/26	10/03	10/10	10/11	18ofNE	8of10
407074	09/23	09/26	10/03	10/10	10/11	18ofNE	8of10
407075	09/23	09/26	10/03	10/10	10/11	18ofNE	8of10

NE = None Established

These samples have met the CLP holding time requirements.

Surrogates: Surrogate recoveries for these samples, matrix spikes, and the method blank are within the CLP recovery limits.

Matrix Spike & Matrix Spike Duplicate: Matrix spike/spike duplicate recoveries and precision data are acceptable and within CLP limits.

Sample Data This PCB data package is acceptable.

ACID Fraction (soil)

Holding Times:

Sample	Date Collect	Date Man Lab Rec'd	Date Cont.Lab VTSR	Date Extrtd	Date Anlyz	#Days from Collct	#Days from VSTR
407072	09/23	09/26	10/03	10/04	10/17	12of NE	1of10
407073	09/23	09/26	10/03	10/04	10/17	12of NE	1of10
407074	09/23	09/26	10/03	10/04	10/17	12of NE	1of10
407075	09/23	09/26	10/03	10/04	10/17	12of NE	1of10

VTSR = Validated Time of Sample Receipt.
NE = None Established.

ARI has met their contract required holding times. There is no established CLP holding time criteria for extraction within a given time from sample collection for soils. Twelve days between collection and extraction is a reasonable amount of time.

Surrogates: Surrogate recoveries for these samples, matrix spikes, and the method blank are within the CLP recovery limits.

Matrix Spike & Matrix Spike Duplicate: Recoveries of all spiking compounds in the spike duplicate were slightly high. These values are still reasonable; no corrective action necessary.

Sample Data These samples were high in moisture content, therefore, detection limits are higher than requested because calculations are preformed on the dry weight of sample extracted. This data is acceptable.

Table 1. Results of analysis of Padilla Bay intertidal sediments collected off Northwest Petrochemical and off Whitmarsh Landfill, September 23, 1988 (µg/Kg, dry; ppb).

Location	Off Northwest Petrochemical		Off Whitmarsh Landfill	
Sampling Site	Below North Texas Road	At Old Wood Dock	NW Corner of Lagoon	Lagoon Outlet
Ecology Sample Number (40-)	7075	7074	7072	7073
Percent Solids:	36.8	36.8	39.8	32.7
Acid Compounds:				
phenol	**230**	35U	20U	17U
2-chlorophenol	18U	35U	20U	17U
2-methylphenol*	18U	35U	20U	17U
4-methylphenol	**150**	35U	20U	**25**
2-nitrophenol	90U	180U	100U	80U
2,4-dimethylphenol	40U	70U	40U	30U
benzoic acid	180U	350U	200U	170U
2,4-dichlorophenol	54U	106U	61U	50U
4-chloro-3-methylphenol	40U	70U	40U	30U
2,4,6-trichlorophenol	90U	180U	100U	80U
2,4,5-trichlorophenol	90U	180U	100U	80U
2,4-dinitrophenol	180U	350U	200U	170U
4-nitrophenol	90U	180U	100U	80U
4,6-dinitro-2-methylphenol	180U	350U	200U	170U
pentachlorophenol	90U	180U	100U	80U
Acid Surrogate Recoveries:				
d5-phenol	81.8%	73.8%	84.4%	91.1%
2-fluorophenol	71.2%	93.6%	120%	115%
2,4,6-tribromophenol	121%	103%	104%	121%
Polychlorinated Biphenyls:				
PCB-1016/1242	NA	NA	20U	20U
PCB-1248	NA	NA	20U	20U
PCB-1254	NA	NA	20U	20U
PCB-1260	NA	NA	20U	20U
PCB Surrogate Recoveries:				
dibutylchlorendate	--	--	106%	95%

U = compound was analyzed for but not detected at the given detection limit
NA = not analyzed
* = cresylic acid

ANALYTICAL RESOURCES INCORPORATED

Analytical
Chemists &
Consultants

333 Ninth Ave. North
Seattle, Wa 98109-5187
(206)621-6490

26 October 1988

Roy Araki
Washington Dept. of Ecology
Manchester Laboratory
7411 Beach Drive East
Port Orchard, WA 98366

RE: ARI Project No. 02047

Dear Roy:

Please find enclosed the results of various analyses as part of the above referenced project.

If you need additional information or have further questions, please feel free to call any time.

Sincerely,

ANALYTICAL RESOURCES, INC.

David R Mitchell

David R. Mitchell
Project Manager

DRM/ml

enclosures

cc: file*02047

Recd 10-28-88
Ryu

SAMPLE	Collected	MMN rec'd	ARC rec'd	ACID ext	PCB ext	A ANAL	PCB ANAL
407072	9/23	9/26	10/3	10/4	10/10	10/17	10/11
73	↓	↓	↓	↓	↓	↓	↓
74							
75							

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METHOD 8080 ANALYSIS

DATA REPORT

PROJECT: NW Petro

Date Received: 10/03/88
Matrix: Soil

GPC Cleanup: NO
Alumina Cleanup: YES

ARI Job No.: 2047
QC Report: 2047-WD0E

Data Release Authorized _____

Reported in ppb (µg/Kg)

DATA PREPARED: MACE-M.L. (10/19/88)

CLIENT #	METHOD BLANK	407072	407073	407073MS*
ARI #	2047 MB	2047 A	2047 B	2074 BMS
Date Extracted	10/10/88	10/10/88	10/10/88	10/10/88
Date Analyzed	10/11/88	10/11/88	10/11/88	10/11/88
Dry Weight Analyzed	NA	5.82 g	4.80 g	5.85 g
Dilution	1:1	1:1	1:1	1:1
1016/1242	20 U	20 U	20 U	-
1248	20 U	20 U	20 U	20 U
1254	20 U	20 U	20 U	20 U
1260	20 U	20 U	20 U	20 U
DBC Surrogate %	**85%**	**106%**	**95%**	**98%**

CLIENT #	407073 MSD*			
ARI #	2047 BMSD			
Date Extracted	10/10/88			
Date Analyzed	10/11/88			
Dry Weight Analyzed	6.42 g			
Dilution	1:1			
1016/1242	-			
1248	20 U			
1254	20 U			
1260	20 U			
DBC Surrogate %	**86%**			

DATA QUALIFIERS

U Indicates compound was analyzed for but not detected at the given detection limit.

* **MATRIX SPIKE/MATRIX SPIKE DUPLICATE**

PCB MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

ANALYTICAL RESOURCES, INC.

PROJECT: NW Petro

QC REPORT NO: 2047-WDOE
MATRIX: Soil

Dry Weight Analyzed: 4.80 g
Conc/Dilution: 1:1

CLIENT SAMPLE NO: 407073
ARI LAB ID: 2047 B

Date Received: 10/03/88
Date Analyzed: 10/11/88

COMPOUND	CONC. SPIKE ADDED (µg/Kg)	SAMPLE RESULT	MS CONC.	% REC.	MSD CONC.	% REC.	RPD
Aroclor 1242	208	0	168	**81**	177	**85**	4.8

DATA RELEASE AUTHORIZED: Peter M. Kuyle

COMMENTS:

DATA PREPARED: MAC:E - M.L. (10/19/88)

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ORGANICS ANALYSIS DATA SHEET - METHOD 8270

Sample No: Method Blank

Lab Sample ID: 2047MB
Sample Matrix: Soil/Sediments

QC Report No: 2047 - WDOE
Project: NW Petro
Date Received: 10/03/88

Date Release Authorized: Susan N. Baker
Report Prepared: 10/18/88 MAC: A

Dry weight extracted (gm): 100.00
Percent Solids: NR
Percent Moisture: NR
pH: NR
Conc/Dilution Factor: 1 to 1
Total Dilution: 1 to 1
Final volume: 1ml 5m

Date Extracted: 10/04/88
Date Analyzed: 10/17/88
GPC Clean-up: No

CAS Number		µg/Kg
108-95-2	Phenol	10 U
95-57-8	2-Chlorophenol	10 U
95-48-7	2-Methylphenol	10 U
106-44-5	4-Methylphenol	10 U
88-75-5	2-Nitrophenol	50 U
105-67-9	2,4-Dimethylphenol	20 U
65-85-0	Benzoic Acid	100 U
120-83-2	2,4-Dichlorophenol	30 U

CAS Number		µg/Kg
59-50-7	4-Chloro-3-Methylphenol	20 U
88-06-2	2,4,6-Trichlorophenol	50 U
95-95-4	2,4,5-Trichlorophenol	50 U
51-28-5	2,4-Dinitrophenol	100 U
100-02-7	4-Nitrophenol	50 U
534-52-1	4,6-Dinitro-2-Methylphenol	100 U
87-86-5	Pentachlorophenol	50 U

***Acid surrogate recoveries**

d5-Phenol	92.1%
2-Fluorophenol	50.4%
2,4,6-Tribromophenol	98.4%

Data Reporting Qualifiers

Value	If the result is a value greater than or equal to the detection limit, report the value.
U	Indicates compound was analyzed for but not detected at the given detection limit.
J	Indicates an estimated value when result is less than specified detection limit.
NR	Analysis not required
B	This flag is used when the analyte is found in the blank as well as a sample. Indicates possible/probable blank contamination.
K	This flag is used when quantitated value falls above the limit of the calibration curve and dilution should be run.
M	Indicates an estimated value of analyte found and confirmed by analyst but with low spectral match parameters.

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ORGANICS ANALYSIS DATA SHEET - METHOD 8270

Sample No: 407072

Lab Sample ID: 2047A
Sample Matrix: Soil/Sediments

QC Report No: 2047 - WDOE
Project Name: NW Petro
Date Received: 10/03/88

Date Release Authorized: Brian N. Beben
Report Prepared: 10/18/88 MAC: A

Dry weight extracted (gm): 49.18
Percent Solids: 32.74%
Percent Moisture: 67.26%
pH: 6.83
Conc/Dilution Factor: 1 to 1
Total Dilution: 1 to 1
Final volume : 1ml

Date Extracted: 10/04/88
Date Analyzed: 10/17/88
GPC Clean-up: No

CAS Number		µg/Kg
108-95-2	Phenol	20 U
95-57-8	2-Chlorophenol	20 U
95-48-7	2-Methylphenol	20 U
106-44-5	4-Methylphenol	20 U
88-75-5	2-Nitrophenol	100 U
105-67-9	2,4-Dimethylphenol	40 U
65-85-0	Benzoic Acid	200 U
120-83-2	2,4-Dichlorophenol	61 U

CAS Number		µg/Kg
59-50-7	4-Chloro-3-Methylphenol	40 U
88-06-2	2,4,6-Trichlorophenol	100 U
95-95-4	2,4,5-Trichlorophenol	100 U
51-28-5	2,4-Dinitrophenol	200 U
100-02-7	4-Nitrophenol	100 U
534-52-1	4,6-Dinitro-2-Methylphenol	200 U
87-86-5	Pentachlorophenol	100 U

***Acid surrogate recoveries**

d5-Phenol	84.4%
2-Fluorophenol	120%
2,4,6-Tribromophenol	104%

Data Reporting Qualifiers

Value	If the result is a value greater than or equal to the detection limit, report the value.
U	Indicates compound was analyzed for but not detected at the given detection limit.
J	Indicates an estimated value when result is less than specified detection limit.
NR	Analysis not required
B	This flag is used when the analyte is found in the blank as well as a sample. Indicates possible/probable blank contamination.
K	This flag is used when quantitated value falls above the limit of the calibration curve and dilution should be run.
M	Indicates an estimated value of analyte found and confirmed by analyst but with low spectral match parameters.

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ORGANICS ANALYSIS DATA SHEET - METHOD 8270

Sample No: 407073

Lab Sample ID: 2047B
Sample Matrix: Soil/Sediments

QC Report No: 2047 - WDOE
Project Name: NW Petro
Date Received: 10/03/88

Date Release Authorized: Ryan N. Blee
Report Prepared: 10/18/88 MAC: A

Dry weight extracted (gm): 59.69
Percent Solids: 39.78%
Percent Moisture: 60.22%
pH: 6.33
Conc/Dilution Factor: 1 to 1
Total Dilution: 1 to 1

Date Extracted: 10/04/88
Date Analyzed: 10/17/88
GPC Clean-up: No

Final Volume 1ml SM

CAS Number		µg/Kg
108-95-2	Phenol	17 U
95-57-8	2-Chlorophenol	17 U
95-48-7	2-Methylphenol	17 U
106-44-5	**4-Methylphenol**	**25**
88-75-5	2-Nitrophenol	80 U
105-67-9	2,4-Dimethylphenol	30 U
65-85-0	Benzoic Acid	170 U
120-83-2	2,4-Dichlorophenol	50 U

CAS Number		µg/Kg
59-50-7	4-Chloro-3-Methylphenol	30 U
88-06-2	2,4,6-Trichlorophenol	80 U
95-95-4	2,4,5-Trichlorophenol	80 U
51-28-5	2,4-Dinitrophenol	170 U
100-02-7	4-Nitrophenol	80 U
534-52-1	4,6-Dinitro-2-Methylphenol	170 U
87-86-5	Pentachlorophenol	80 U

***Acid surrogate recoveries**

d5-Phenol	91.1%
2-Fluorophenol	115%
2,4,6-Tribromophenol	121%

Data Reporting Qualifiers

Value	If the result is a value greater than or equal to the detection limit, report the value.
U	Indicates compound was analyzed for but not detected at the given detection limit.
J	Indicates an estimated value when result is less than specified detection limit.
NR	Analysis not required
B	This flag is used when the analyte is found in the blank as well as a sample. Indicates possible/probable blank contamination.
K	This flag is used when quantitated value falls above the limit of the calibration curve and dilution should be run.
M	Indicates an estimated value of analyte found and confirmed by analyst but with low spectral match parameters.

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ORGANICS ANALYSIS DATA SHEET - METHOD 8270

Sample No: 407074

Lab Sample ID: 2047C
Sample Matrix: Soil/Sediments

QC Report No: 2047 - WDOE
Project Name: NW Petro
Date Received: 10/03/88

Date Release Authorized: Barry M. Sahler
Report Prepared: 10/18/88 MAC: A

Dry weight extracted (gm): 28.29
Percent Solids: 36.56%
Percent Moisture: 63.44%
pH: 6.93
Conc/Dilution Factor: 1 to 1
Total Dilution: 1 to 1
Final Volume: 1ml 8m

Date Extracted: 10/04/88
Date Analyzed: 10/17/88
GPC Clean-up: No

CAS Number		µg/Kg
108-95-2	Phenol	35 U
95-57-8	2-Chlorophenol	35 U
95-48-7	2-Methylphenol	35 U
106-44-5	4-Methylphenol	35 U
88-75-5	2-Nitrophenol	180 U
105-67-9	2,4-Dimethylphenol	70 U
65-85-0	Benzoic Acid	350 U
120-83-2	2,4-Dichlorophenol	106 U

CAS Number		µg/Kg
59-50-7	4-Chloro-3-Methylphenol	70 U
88-06-2	2,4,6-Trichlorophenol	180 U
95-95-4	2,4,5-Trichlorophenol	180 U
51-28-5	2,4-Dinitrophenol	350 U
100-02-7	4-Nitrophenol	180 U
534-52-1	4,6-Dinitro-2-Methylphenol	350 U
87-86-5	Pentachlorophenol	180 U

***Acid surrogate recoveries**

d5-Phenol	73.8%
2-Fluorophenol	93.6%
2,4,6-Tribromophenol	103%

Data Reporting Qualifiers

Value	If the result is a value greater than or equal to the detection limit, report the value.
U	Indicates compound was analyzed for but not detected at the given detection limit.
J	Indicates an estimated value when result is less than specified detection limit.
NR	Analysis not required
B	This flag is used when the analyte is found in the blank as well as a sample. Indicates possible/probable blank contamination.
K	This flag is used when quantitated value falls above the limit of the calibration curve and dilution should be run.
M	Indicates an estimated value of analyte found and confirmed by analyst but with low spectral match parameters.

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SOIL SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

ARI Job No: 2047

Client: WDOE
Project: NW Petro

Sample No: 407074

COMPOUND	SPIKE ADDED (µg/Kg)	SAMPLE CONCENTRATION (µg/Kg)	MS CONCENTRATION (µg/Kg)	MS % REC	QC LIMITS REC
Phenol	7100	0.0	4800	67.6	26-90
2-Chlorophenol	7100	0.0	5600	78.9	25-102
4-Chloro-3-Methylphenol	7100	0.0	5700	80.3	26-103
4-Nitrophenol	7100	0.0	7000	98.6	11-114
Pentachlorophenol	7100	0.0	6600	93.0	17-109

COMPOUND	SPIKE ADDED (µg/Kg)	MSD CONCENTRATION (µg/Kg)	MSD % REC	% RPD	QC LIMITS RPD	QC LIMITS REC
Phenol	7100	6600	*93.0	-32	35	26-90
2-Chlorophenol	7100	7700	*108	-31	50	25-102
4-Chloro-3-Methylphenol	7100	7800	*110	-31	33	26-103
4-Nitrophenol	7100	9700	*137	-33	50	11-114
Pentachlorophenol	7100	8100	*114	-20	47	17-109

RPD: 0 out of 5 outside limits
Spike Recovery: 5 out of 10 outside limits

Asterisked values outside QC Limits

Comments: 28.03 gram dry weight sample size.

FORM III SV-2

10-19-89 al

ANALYTICAL RESOURCES INCORPORATED

Analytical Chemists & Consultants

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(206) 621-6490

ORGANICS ANALYSIS DATA SHEET - METHOD 8270

Sample No: 407074 MS

Lab Sample ID: 2047CMS
Sample Matrix: Soil/Sediments

QC Report No: 2047 - WDOE
Project Name: NW Petro
Date Received: 10/03/88

Date Release Authorized: Susan N. Baker
Report Prepared: 10/18/88 MAC A

Dry weight extracted (gm): 27.47
Percent Solids: 36.56%
Percent Moisture: 63.44%
pH: 6.93
Conc/Dilution Factor: 1 to 1
Total Dilution: 1 to 1
Final Volume: 1 ml

Date Extracted: 10/04/88
Date Analyzed: 10/17/88
GPC Clean-up: No

CAS Number		µg/Kg
108-95-2	Phenol	-
95-57-8	2-Chlorophenol	-
95-48-7	2-Methylphenol	36 U
106-44-5	4-Methylphenol	36 U
88-75-5	2-Nitrophenol	180 U
105-67-9	2,4-Dimethylphenol	70 U
65-85-0	Benzoic Acid	360 U
120-83-2	2,4-Dichlorophenol	109 U

CAS Number		µg/Kg
59-50-7	4-Chloro-3-Methylphenol	-
88-06-2	2,4,6-Trichlorophenol	180 U
95-95-4	2,4,5-Trichlorophenol	180 U
51-28-5	2,4-Dinitrophenol	360 U
100-02-7	4-Nitrophenol	~~180 U~~
534-52-1	4,6-Dinitro-2-Methylphenol	360 U
87-86-5	Pentachlorophenol	-

***Acid surrogate recoveries**

d5-Phenol	70.0%
2-Fluorophenol	71.4%
2,4,6-Tribromophenol	92.5%

Data Reporting Qualifiers

Value	If the result is a value greater than or equal to the detection limit, report the value.
U	Indicates compound was analyzed for but not detected at the given detection limit.
J	Indicates an estimated value when result is less than specified detection limit.
NR	Analysis not required
B	This flag is used when the analyte is found in the blank as well as a sample. Indicates possible/probable blank contamination.
K	This flag is used when quantitated value falls above the limit of the calibration curve and dilution should be run.
M	Indicates an estimated value of analyte found and confirmed by analyst but with low spectral match parameters.

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ORGANICS ANALYSIS DATA SHEET - METHOD 8270

Sample No: 407074 MSD

Lab Sample ID: 2047CMSD
Sample Matrix: Soil/Sediments

QC Report No: 2047 - WDOE
Project Name: NW Petro
Date Received: 10/03/88

Date Release Authorized: Ryan N. Gebert
Report Prepared: 10/18/88 MAC: A

Dry weight extracted (gm): 28.58
Percent Solids: 36.56%
Percent Moisture: 63.44%
pH: 6.93
Conc/Dilution Factor: 1 to 1
Total Dilution: 1 to 1
Final volume: 1 ml

Date Extracted: 10/04/88
Date Analyzed: 10/17/88
GPC Clean-up: No

CAS Number		µg/Kg
108-95-2	Phenol	-
95-57-8	2-Chlorophenol	-
95-48-7	2-Methylphenol	35 U
106-44-5	4-Methylphenol	35 U
88-75-5	2-Nitrophenol	170 U
105-67-9	2,4-Dimethylphenol	70 U
65-85-0	Benzoic Acid	350 U
120-83-2	2,4-Dichlorophenol	105 U

CAS Number		µg/Kg
59-50-7	4-Chloro-3-Methylphenol	-
88-06-2	2,4,6-Trichlorophenol	170 U
95-95-4	2,4,5-Trichlorophenol	170 U
51-28-5	2,4-Dinitrophenol	350 U
100-02-7	4-Nitrophenol	~~170 U~~
534-52-1	4,6-Dinitro-2-Methylphenol	350 U
87-86-5	Pentachlorophenol	-

***Acid surrogate recoveries**

d5-Phenol	92.7%
2-Fluorophenol	98.0%
2,4,6-Tribromophenol	119%

Data Reporting Qualifiers

Value	If the result is a value greater than or equal to the detection limit, report the value.
U	Indicates compound was analyzed for but not detected at the given detection limit.
J	Indicates an estimated value when result is less than specified detection limit.
NR	Analysis not required
B	This flag is used when the analyte is found in the blank as well as a sample. Indicates possible/probable blank contamination.
K	This flag is used when quantitated value falls above the limit of the calibration curve and dilution should be run.
M	Indicates an estimated value of analyte found and confirmed by analyst but with low spectral match parameters.

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ORGANICS ANALYSIS DATA SHEET - METHOD 8270

Sample No: 407075

Lab Sample ID: 2047D
Sample Matrix: Soil/Sediments

QC Report No: 2047 - WD0E
Project Name: NW Petro
Date Received: 10/03/88

Date Release Authorized: Brian N. Bahr
Report Prepared: 10/18/88 MAC: A

Dry weight extracted (gm): 55.48
Percent Solids: 36.81%
Percent Moisture: 63.19%
pH: 7.06
Conc/Dilution Factor: 1 to 1
Total Dilution: 1 to 1

Date Extracted: 10/04/88
Date Analyzed: 10/17/88
GPC Clean-up: No

CAS Number		µg/Kg
108-95-2	**Phenol**	**230**
95-57-8	2-Chlorophenol	18 U
95-48-7	2-Methylphenol	18 U
106-44-5	**4-Methylphenol**	**150**
88-75-5	2-Nitrophenol	90 U
105-67-9	2,4-Dimethylphenol	40 U
65-85-0	Benzoic Acid	180 U
120-83-2	2,4-Dichlorophenol	54 U

CAS Number		µg/Kg
59-50-7	4-Chloro-3-Methylphenol	40 U
88-06-2	2,4,6-Trichlorophenol	90 U
95-95-4	2,4,5-Trichlorophenol	90 U
51-28-5	2,4-Dinitrophenol	180 U
100-02-7	4-Nitrophenol	90 U
534-52-1	4,6-Dinitro-2-Methylphenol	180 U
87-86-5	Pentachlorophenol	90 U

***Acid surrogate recoveries**

d5-Phenol	81.8%
2-Fluorophenol	71.2%
2,4,6-Tribromophenol	121%

Data Reporting Qualifiers

Value	If the result is a value greater than or equal to the detection limit, report the value.
U	Indicates compound was analyzed for but not detected at the given detection limit.
J	Indicates an estimated value when result is less than specified detection limit.
NR	Analysis not required
B	*This flag is used when the analyte is found* in the blank as well as a sample. Indicates possible/probable blank contamination.
K	This flag is used when quantitated value falls above the limit of the calibration curve and dilution should be run.
M	Indicates an estimated value of analyte found and confirmed by analyst but with low spectral match parameters.

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SOIL SEMIVOLATILE SURROGATE RECOVERY

ARI Job No: 2047
Level: Low

Client: WDOE
Project: NW Petro

Client Sample ID	S1 (NBZ)	S2 (FBP)	S3 (TPH)	S4 (PHL)	S5 (2FP)	S6 (TBP)	Other	TOT OUT
Method Blank	NR	NR	NR	92.1	50.4	98.4	NR	0
407072	NR	NR	NR	84.4	120	104	NR	0
407073	NR	NR	NR	91.1	115	121	NR	0
407074	NR	NR	NR	78.8	93.6	103	NR	0
407074MS	NR	NR	NR	70.0	71.4	92.5	NR	0
407074MSD	NR	NR	NR	92.7	98.0	119	NR	0
407075	NR	NR	NR	81.8	71.2	121	NR	0

	QC LIMITS
S1 (NBZ)=Nitrobenzene-d5	(23-120)
S2 (FBP)=2-Fluorobiphenyl	(30-115)
S3 (TPH)=Terphenyl-d14	(18-137)
S4 (PHL)=Phenol-d6	(24-113)
S5 (2FP)=2-Fluorophenol	(25-121)
S6 (TBP)=2,4,6-Tribromophenol	(19-122)

Asterisked values outside QC Limits

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SEMIVOLATILE METHOD BLANK SUMMARY

ARI Job No: 2047

Client: WDOE
Project: NW Petro

Lab Sample ID: 2047MB
Matrix: Soil
Level: Low
Instrument ID: FINN II

Extraction: Sonc
Date Extracted: 10/04/88
Date Analyzed: 10/17/88
Time Analyzed: 10:35

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS,MSD:

Client Sample ID	Lab Sample ID	Lab File ID	Time Analyzed
407072	20474A	F22047A	11:24
407073	2047B	F22047B	12:12
407074	2047C	F22047C	13:02
407074MS	2047CMS	F22047CMS	13:53
407074MSD	2047CMSD	F22047CMSD	14:41
407075	2047D	F22047D	15:49

Comments:

FORM IV SV

10-17-88

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SEMIVOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab File ID: F2501017B
Instrument ID: FINN II
Matrix: Soil
Level: Low

Client: WDOE
DFTPP Injection Date: 10/17/88
DFTPP Injection Time: 08:53

m/e	Ion Abundance Criteria	% Relative Abundance	
51	30.0-60.0% of mass 198	52.6	
68	Less than 2.0% of mass 69	0.0	(0.0)1
69	Mass 69 relative abundance	44.8	
70	Less than 2.0% of mass 69	0.0	(0.0)1
127	40.0-60.0% of mass 198	53.2	
197	Less than 1.0% of mass 198	0.0	
198	Base peak, 100% relative abundance	100	
199	5.0-9.0% of mass 198	6.2	
275	10.0-30.0% of mass 198	26.9	
365	Greater than 1.00% of mass 198	1.4	
441	Present, but less than mass 443	10.3	
442	Greater than 40.0% of mass 198	75.6	
443	17.0-23.0% of mass 442	14.3	(18.9)2

1-Value is % mass 69 2-Value is % mass 442

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

Client Sample ID	ARI Sample ID	Lab File ID	Date Analyzed	Time Analyzed
-	50ng Call STD	F2501017B	10/17/88	08:53
Method Blank	2047MB	F22047MB	10/17/88	10:35
407072	20474A	F22047A	10/17/88	11:24
407073	2047B	F22047B	10/17/88	12:12
407074	2047C	F22047C	10/17/88	13:02
407074MS	2047CMS	F22047CMS	10/17/88	13:53
407074MSD	2047CMSD	F22047CMSD	10/17/88	14:41
407075	2047D	F22047D	10/17/88	15:49

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Continuing Calibration Check
Semivolatile HSL Compounds
(Page 1)

ARI Job Number: 2047
Instrument: FINN II
Clinet: WDOE
Project: NW Petro

Calibration Date: 10/17/88
Time: 0853 hrs
Laboratory ID: F2501017B
Initial Calibration Date: 09/22/88

Minimum RF(avg) for SPCC is 0.050

Maximum %D for CCC is 25%

Compound	RF Avg	RF50	%D	CCC	SPCC
Phenol	1.245	1.176	5.5	*	
bis(-2-Chloroethyl)Ether	1.156	1.074	7.1		
2-Chlorophenol	1.093	1.031	5.7		
1,3-Dichlorobenzene	1.144	1.215	-6.2		
1,4-Dichlorobenzene	1.199	1.267	-5.7	*	
Benzyl Alcohol	0.785	0.766	2.4		
1,2-Dichlorobenzene	1.141	1.163	-1.9		
2-Methylphenol	1.052	1.000	4.9		
bis(2-chloroisopropyl)Ether	1.459	1.250	14.3		
4-Methylphenol	1.087	1.066	1.9		
N-Nitroso-Di-n-Propylamine	0.741	0.760	-2.6		**
Hexachloroethane	0.508	0.526	-3.5		
Nitrobenzene	0.285	0.395	-38.6		
Isophorone	0.597	0.584	2.2		
2-Nitrophenol	0.168	0.152	9.5	*	
2,4-Dimethylphenol	0.259	0.249	3.9		
Benzoic Acid	0.107	0.140	-30.8		
bis(-2-Chloroethoxy)Methane	0.388	0.356	8.2		
2,4-Dichlorophenol	0.216	0.204	5.6	*	
1,2,4-Trichlorobenzene	0.290	0.314	-8.3		
Naphthalene	0.755	0.839	-11.1		
4-Chloroaniline	0.257	0.322	-25.3		
Hexachlorobutadiene	0.152	0.185	-21.7	*	
4-Chloro-3-Methylphenol	0.215	0.206	4.2	*	
2-Methylnaphthalene	0.725	0.583	19.6		
Hexachlorocyclopentadiene	0.361	0.352	2.5		**
2,4,6-Trichlorophenol	0.407	0.353	13.3	*	
2,4,5-Trichlorophenol	0.285	0.295	-3.5		
2-Chloronaphthalene	1.090	1.059	2.8		
2-Nitroaniline	0.290	0.289	0.3		
Dimethyl Phthalate	1.202	0.995	17.2		
Acenaphthylene	1.627	1.619	0.5		
3-Nitroaniline	0.284	0.275	3.2		

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Continuing Calibration Check
Semivolatile HSL Compounds
(Page 2)

ARI Job Number: 2047
Instrument ID: FINN II
Client: WDOE
Project: NW Petro

Calibration Date: 10/17/88
Time: 0853 hrs
Laboratory ID: F2501017B
Initial Calibration Date: 09/22/88

Minimum RF(avg) for SPCC is 0.050

Maximum %D for CCC is 25%

Compound	RF Avg	RF50	%D	CCC	SPCC
Acenaphthene	0.948	0.970	-2.3	*	
2,4-Dinitrophenol	0.160	0.103	35.6		**
4-Nitrophenol	0.233	0.174	25.3		**
Dibenzofuran	1.760	1.816	-3.2		
2,4-Dinitrotoluene	0.240	0.206	14.2		
2,6-Dinitrotoluene	0.256	0.264	-3.1		
Diethylphthalate	1.136	1.092	3.9		
4-Chlorophenyl-phenylether	0.648	0.704	-8.6		
Fluorene	1.066	1.115	-4.6		
4-Nitroaniline	0.235	0.243	-3.4		
4,6-Dinitro-2-Methylphenol	0.105	0.071	32.4		
N-Nitrosodiphenylamine	0.541	0.548	-1.3	*	
4-Bromophenyl-phenylether	0.222	0.209	5.9		
Hexachlorobenzene	0.238	0.242	-1.7		
Pentachlorophenol	0.142	0.118	16.9	*	
Phenanthrene	0.876	0.770	12.1		
Anthracene	0.738	0.733	0.7		
Di-N-Butylphthalate	1.134	1.193	-5.2		
Fluoranthene	0.854	0.929	-8.8	*	
Pyrene	1.175	1.009	14.1		
Butylbenzylphthalate	0.777	0.592	23.8		
3,3'-Dichlorobenzidine	0.137	0.153	-11.7		
Benzo(a)Anthracene	1.087	1.059	2.6		
bis(2-Ethylhexyl)Phthalate	1.038	1.026	1.2		
Chrysene	1.021	1.001	2.0		
Di-n-Octyl Phthalate	2.204	1.871	15.1	*	
Benzo(b)Fluoranthene	1.352	1.356	-0.3		
Benzo(k)Fluoranthene	1.381	1.459	-5.6		
Benzo(a)Pyrene	1.273	1.375	-8.0	*	
Indeno(1,2,3-cd)Pyrene	1.101	1.122	-1.9		
Dibenz(a,h)Anthracene	1.163	1.155	0.7		
Benzo(g,h,i)Perylene	1.179	1.070	9.2		

10-18-88 KW