

JOHN SPELLMAN
Governor



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

7272 Cleanwater Lane, LU-11 • Olympia, Washington 98504 • (206) 753-2353

M E M O R A N D U M
July 2, 1984

To: Jim Krull
From: Dale Norton *D.N.*
Subject: Results of Organics Analysis on U.S. Oil Spill Samples

The following is a summary of organics data on samples I collected January 27-30, 1984 in connection with the U.S. Oil spill to the south Lincoln Avenue ditch and subsequently Blair Waterway, which occurred on January 24, 1984.

Sample collection sites are indicated in Figure 1. Sludge from the U.S. Oil pond was collected as a surface grab using a priority pollutant cleaned one-gallon glass jar. At each sediment site, the top 2 cm of surface sediment was sampled using a stainless steel cookie cutter rinsed with methylene chloride between stations. Samples were then packed on ice and shipped to EPA's Manchester laboratory. The sludge was analyzed for all organic priority pollutants, and the sediments were analyzed for acid/base-neutral and volatile fraction compounds only.

Analysis of the U.S. Oil sludge showed it primarily contained high concentrations of 2-3 ring PAH compounds as well as a number of tentatively identified single-ring aromatics (see attached raw data). Sediment collected below the U.S. Oil outfall in the south Lincoln Avenue ditch and the intertidal sample off the mouth of the ditch, however, contained low concentrations of a few PAH compounds only. Several tentatively identified single-ring aromatics were also present in this intertidal sample (see attached raw data). Intertidal sediment collected on the opposite shore of Blair Waterway at the mouth of north Lincoln Avenue ditch contained high concentrations of a variety of PAH compounds, predominated by 4-5 ring PAH. In addition to aromatics, bis(2-ethylhexyl) phthalate was present at elevated levels in all the U.S. Oil spill sediment samples.

The spacial distribution of PAH between sampling sites and the inconsistent fingerprint between U.S. Oil sludge and the north shore Lincoln Avenue ditch sample suggest that the source of the northshore compounds is something other than U.S. Oil sludge.

Memo to Jim Krull
 Results of Organics Analysis on U.S. Oil Spill Samples
 July 2, 1984
 Page Two

For perspective, selected PAH data on samples Art Johnson and I collected January 17, 1984 from the Blair dredge spoils crib and analyzed at Manchester as well as PAH data on sediments from Commencement Bay waterways collected between 1979 and 1981 by a number of investigators are summarized in Tables 2 and 3.

Total PAH in the north shore Lincoln Avenue ditch sample was 241,000 ppb, which is higher than any other sample previously collected from Blair Waterway, including samples from the dredge spoils crib. As shown below, this is one of the highest concentrations of PAH yet reported in a sediment sample from Commencement Bay waterways. Based on these results, it appears that this location warrants consideration as a PAH "hot spot."

Summary of total selected¹ PAH in Commencement Bay sediments and U.S. Oil sludge (ug/Kg dry weight).

Source	Sediment					Sludge
	Intertidal		Subtidal			
	Minimum	Maximum	Minimum	Maximum	Median	
Hylebos Waterway	--	420,000	--	20,300	620	
City Waterway	510	9,500	1,300	46,000	1,000	
Blair Waterway	--	3,200	--	5,700	140	
Other Waterways ²	--	6,500	--	6,500	390	
Blair Dredge Spoils*			3,490	203,000	108,000	
U.S. Oil Spill	710	241,000				583,000 [†]

-- = Not detected.

* = Cores from crib.

1 = See Table 1 for list of compounds.

2 = Sitcum, Puyallup, St. Paul, and Middle Waterways.

† = Single sample.

Since the data presented here were generated by a number of investigators employing varying collection techniques, extraction procedures, and analytical methods, caution should be exercised in comparing data sets.

On April 19, 1984, an additional intertidal sediment sample was collected at the north Lincoln Avenue ditch as part of our Superfund work. I will forward the results of this analysis to you as soon as we receive them.

DN:cp

Attachments

cc: Bill Yake
 Roger Stanley
 Dick Cunningham

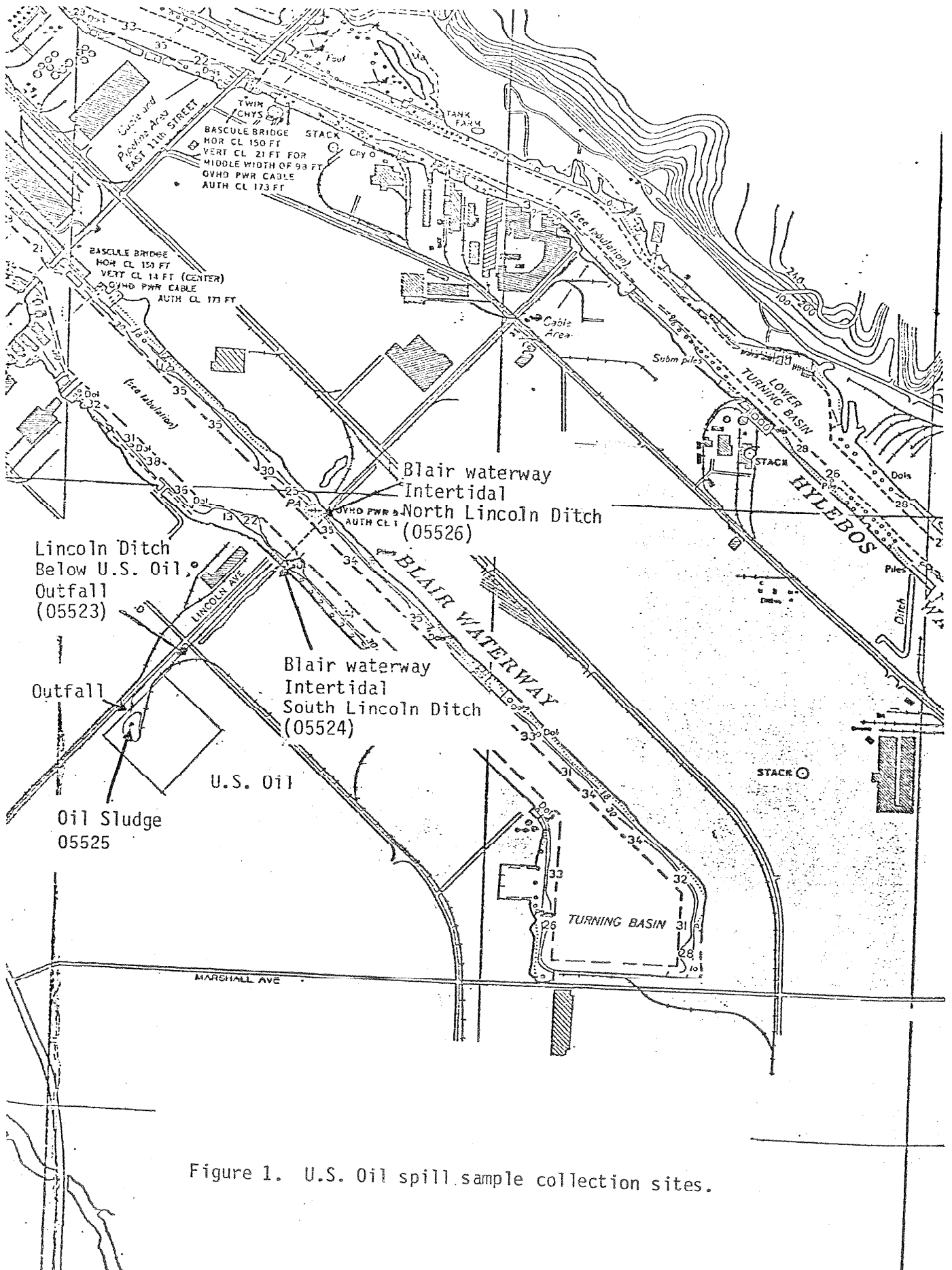


Figure 1. U.S. Oil spill sample collection sites.

Table 1. PAH concentrations in U.S. Oil spill-related samples collected January 27-30, 1984 by WDOE (ug/Kg dry weight).

Compound	05525		05523		05524		05526	
	Oil Sludge	Sediment	Lincoln Ditch b/w. U.S. Oil Outfall	Sediment	Blair Waterway Intertidal	Sediment	Blair Waterway Intertidal	Sediment
Site	U.S. Oil Pond		U.S. Oil Outfall		South Lincoln Ditch		North Lincoln Ditch	
Percent Solids	12.8	18.1	18.1	62.4	62.4	73.3		
naphthalene	260,000	600u	600u	710	22,000			
acenaphthene	1,200u	1,200u	1,200u	1,200u	11,000			
acenaphthylene	600u	600u	600u	600u	2,400u			
anthracene	270,000	2,200	2,200	600u	32,000			
phenanthrene	600u	600u	600u	600u	8,900			
fluorene	40,000	600u	600u	600u	4,900			
pyrene	900u	900u	900u	900u	51,000			
chrysene	2,400u	2,400u	2,400u	2,400u	30,000			
benzo(a)anthracene	11,000	1,800u	1,800u	1,800u	7,200u			
fluoranthene	900u	900u	900u	900u	51,000			
dibenzo(a,h)anthracene	6,000u	6,000u	6,000u	6,000u	24,000u			
benzo(a)pyrene	3,000u	3,000u	3,000u	3,000u	1,200u			
benzo(b)fluoranthene and/or	2,400	2,400u	2,400u	2,400u	30,000			
benzo(k)fluoranthene								
benzo(ghi)perylene	6,000u	6,000u	6,000u	700u	24,000u			
ideno(1,2,3-cd)pyrene	6,000u	6,000u	6,000u	6,000u	24,000u			
Sum PAH	583,000	2,200	2,200	710	241,000			

u = not detected at indicated limit.

Table 2. PAH concentrations in Blair Waterway dredge spoils crib samples collected January 17, 1984 by WDOE (ug/Kg dry weight).

Compound	EPA Lab. No. Sample	03501 Core #1	03502 Core #2	03503 Core #3	03504 Core #4	03505 Composite
naphthalene		60,500	570	20,000	52,000	35,000
acenaphthene		16,000	180	4,900	14,700	8,400
acenaphthylene		100u	25u	120u	200	140
anthracene		150u	50	1,700	5,700	2,000
phenanthrene		45,500	400	12,000	44,000	22,000
fluorene		10,400	130	3,000	9,100	5,200
pyrene		20,300	520	5,200	16,000	9,500
chrysene		7,300	300	2,100	6,100	3,900
benzo(a)anthracene		7,600	240	2,000	7,000	4,200
fluoranthene		28,100	680	6,100	21,000	13,000
dibenzo(a,h)anthracene		900u	200u	400u	400u	400u
benzo(a)pyrene		3,600	200	1,200	3,600	1,400
benzo(b)fluoranthene and/or benzo(k)fluoranthene		3,500	220	1,200	3,800	2,000
benzo(ghi)perylene		1,300u	300u	700u	1,500	770u
ideno(1,2,3-cd)pyrene		900u	200u	400u	1,700	1,600
Sum PAH		203,000	3,490	59,500	186,000	108,000

u = not detected at indicated limit.

Table 3. Summary of selected PAH data on Commencement Bay sediments from samples collected 1979 - September 1981.
(results in ug/kg dry weight)

Compound	Hylebos Waterway N = 14			City Waterway N = 7			Blair Waterway N = 7			Other Waterways N = 17			
	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	Minimum	Median	Maximum	
naphthalene	--	100	550	--	580	4,000	--	580	49	--	2,434	--	3,000
acenaphthene	--	(50)	69	--	170	710	--	170	--	--	90	--	190
acenaphthylene	--	(50)	90	--	(200)	310	--	(200)	--	--	30	--	210
anthracene/phenanthrene	--	620	2,690	260	1,700	7,000	--	1,700	390	--	874	--	963
fluorene	--	(80)	480	--	240	810	--	240	--	--	111	--	270
pyrene	--	1,300	6,100	T	2,800	<570	--	2,800	490	--	870	--	2,090
chrysene/benzo(a)anthracene	--	2,000	6,000	--	2,300	8,500	--	2,300	730	--	1,600	--	1,100
fluoranthene	--	1,000	4,700	250	1,800	6,100	--	1,800	650	--	1,150	--	1,200
dibenzo(a,h)anthracene	--	--	T	--	I	--	--	I	--	--	--	--	--
benzo(a)pyrene	--	680	5,500	--	1,000	2,600	--	1,000	98	--	525	--	1,200
benzo(b)fluoranthene and/or	--	1,300	2,900	--	1,300	6,600	--	1,300	650	--	720	--	14,000
benzo(k)fluoranthene	--	(100)	340	--	I	--	--	I	--	--	--	--	T
benzo(q,h,i)perylene	--	240	430	--	(359)	--	--	70	40	--	180	--	140
ideno(1,2,3-cd)pyrene	--	430	430	--	--	--	--	--	--	--	--	--	--
Sum PAH	--	620	20,300	510	9,500	46,000	--	1,000	3,200	--	5,700	96	6,500

1 Summarized from Johnson, A., B. Yake, and D. Norton, 1984, A Summary of Priority Pollutant Data for Point Sources and Sediment in Inner Commencement Bay: A Preliminary Assessment of Data and Considerations for Future Work. WDOE unpublished report. 134 pp.

T Sitcum, Puyallup, St. Paul, and Middle Waterways.

N = Number of samples
 -- = None detected
 T = Trace amount
 () = Estimated median
 I = Insufficient data



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

Mail Stop PV-11 - Olympia, Washington 98504 - (206) 459-6000

TO: Merley McCall
FROM: D. Huntamer - Chemist *DH*
SUBJECT: Organic Analysis of U.S. Oil Spill Samples,
Tacoma, WA
DATE: March 20, 1984

Four samples, collected January 27-30, 1984, were received at the EPA Region 10 Laboratory on January 31, 1984 for organic analysis. Acid/Base-Neutrals were requested on three samples and a priority pollutant scan on the sludge sample #05525. The results of the analyses are attached.

<u>EPA#</u>	<u>WDOE#</u>	<u>% Solids</u>	
05523	-	18.1	Lincoln ditch below U.S.Oil outfall
05524	-	12.8	South Lincoln ditch
05525	-	62.4	Sludge pond
05526	-	73.3	North Lincoln drain

BASE/NEUTRAL COMPOUNDS

PROJECT: US Oil WDOE COMPILED BY: Jm Blanech DATE: 3-19-84
 LABORATORY: EPA Region X - REVIEWED BY: [Signature] DATE: 3-20-84

DIFFER BLW
 outfall Industrial Sludge N. Lincoln
Industrial

SAMPLE #	UNITS	LOQ	05523	05524	05525	05526			
1. acenaphthene	ppm/Kg	Analysis Extract 3-13-84 3-2-84	1200µ	→	→	11000			
2. benzidine			1500µ	→	→	6000µ			
3. 1,2,4-trichlorobenzene			1800µ	→	→	7200µ			
4. hexachlorobenzene			3000µ	→	→	12000µ			
5. hexachloroethane			3000µ	→	→	12000µ			
6. bis(2-chloroethyl) ether			900µ	→	→	3600µ			
7. 2-chloronaphthalene			1200µ	→	→	4800µ			
8. 1,2-dichlorobenzene			1800µ	→	→	7200µ			
9. 1,3-dichlorobenzene			1800µ	→	→	7200µ			
10. 1,4-dichlorobenzene			1800µ	→	→	7200µ			
11. 3,3'-dichlorobenzidine			3000µ	→	→	12000µ			
12. 2,4-dinitrotoluene			6000µ	→	→	24000µ			
13. 2,6-dinitrotoluene			6000µ	→	→	24000µ			
14. 1,2-diphenylhydrazine (as 2Zobenzene)			3000µ	→	→	12000µ			
15. fluoroanthene			900µ	→	→	15000			
16. 4-chlorophenyl phenyl ether			3000µ	→	→	12000			

BASE/NEUTRAL COMPOUNDS (continued)

PROJECT: US Oil WDOE COMPILED BY: J. N. Blumrud DATE: 3-19-84
 LABORATORY: EPA Region X REVIEWED BY: A. R. [Signature] DATE: 3-20-84

SAMPLE #	UNITS	05523	05524	05525	05526
17. 4-bromophenyl phenyl ether	ug/kg	6000u	→	24000u	
18. bis(2-chloroisopropyl) ether		600u	→	2400u	
19. bis(2-chloroethoxy) methane		900u	→	3600u	
20. hexachlorobutadiene		3000u	→	12000u	
21. hexachlorocyclopentadiene		1500u	→	6000u	
22. isophorone		600u	→	2400u	
23. naphthalene		600u	→	2200u	
24. nitrobenzene		1200u	→	4800u	
25. n-nitrosodimethylamine		—	—	—	
26. N-nitrosodiphenylamine		1500u	→	6600u	
27. N-nitrosodi-n-propylamine		800u	→	3200u	
28. bis(2-ethyl hexyl) phthalate		1900u	→	2700u	
29. butyl benzyl phthalate		3000u	→	1200u	
30. di-n-butyl phthalate		600u	→	2400u	
31. di-n-octyl phthalate		1200u	→	4800u	
32. diethyl phthalate		600u	→	2400u	
33. dimethyl phthalate		900u	→	3600u	
34. benzo(a)anthracene		1800u	→	7200u	
35. benzo(a)pyrene		3000u	→	1200u	
36. 3,4-benzofluoranthene		—	—	—	
37. benzo(b)fluoranthene and/or benzo(k)fluoranthene		2100u	→	30,000	
38. chrysene		2700u	→	30,000	

BASE/NEUTRAL COMPOUNDS (continued)

PROJECT: US Oil WDOE COMPILED BY: JM Blawie DATE: 3-19-84
 LABORATORY: EPA Region X REVIEWED BY: apx DATE: 3-20-84

SAMPLE #	05523	05524	05525	05526			
UNITS	ug/kg →						
LOQ							
39. acenaphthylene	600u	→	2400u				
40. anthracene	(2200)	600u	(270000)	(32000)			
41. benzo(ghi)perylene	600u	(700)	6000u	24000u			
42. fluorene	600u	→	(40000)	(4900)			
43. phenanthrene	600u	→	(8900)				
44. dibenzo(a,h)anthracene	6000u	→	24000u				
45. ideno(1,2,3-cd)pyrene	6000u	→	24000u				
46. pyrene	900u	→	(51000)				
47. TCDD	ND	ND	ND	ND			

ACID COMPOUNDS

PROJECT: US Oil / WDOE COMPILED BY: JMB Legend DATE: 3-19-84
 LABORATORY: EPA Region X REVIEWED BY: apb DATE: 3-20-84

SAMPLE # :	05523	05524	05525	05526			
UNITS :	ug/kg	→	→	→			
LOO :							
1. 2,4,5-trichlorophenol	5000 _M	→	→	20000 _M			
2. p-chloro-m-cresol	3000 _M	→	→	2000 _M			
3. 2-chlorophenol	900 _M	→	→	3600 _M			
4. 2,4-dichlorophenol	2400 _M	→	→	9600 _M			
5. 2,4-dimethyl phenol	2400 _M	→	→	9600 _M			
6. 2-nitrophenol	6000 _M	→	→	6000 _M			
7. 4-nitrophenol	15000 _M	→	→	60000 _M			
8. 2,4-dinitrophenol	15000 _M	→	→	60000 _M			
9. 4,6-dinitro-c-cresol	9000 _M	→	→	36000 _M			
10. pentachlorophenol	8000 _M	→	→	32000 _M			
11. phenol	900 _M	→	→	3600 _M			

TENTATIVELY IDENTIFIED COMPOUNDS

PROJECT: MS Oil WDOE COMPILED BY: JM Blum DATE: 3-19-84
 LABORATORY: EPA Region X REVIEWED BY: _____ DATE: 3-20-84

*blw outfall
 South Lincoln
 bridge
 North Lincoln*

ACID / N° FRACTION	SAMPLE # :	05523	05524	05525	05526				
CAS #	NAME	2 13	9 38	6 44	1 8				
3910 1.-55-8	2,3-dihydro-1,3-tri- methyl-5-phenyl-1H- indene	estimate 15000 ug/Kg	estimate 11000 ug/Kg	ND	ND				
511 2.-15-9	4B,5G,7,8,8A,9,10-Octahydro- -4B,8D-trimethyl-1(5H)- 2-phenanthrene	estimate 35000 ug/Kg	ND						
108 3.-67-8	1,3,5-trimethyl benzene	ND	estimate 9600 ug/Kg						
2870 4.-04-4	2-ethyl-1,3-dimethyl benzene		estimate 1900 ug/Kg						
933 5.-98-2	1-ethyl-2,3-dimethyl benzene		estimate 4700 ug/Kg						
2049 6.-95-8	(1,1-dimethylpropyl) benzene		estimate 3000 ug/Kg						
2471 7.-85-2	1-ethylidene-1H- indene		estimate 8600 ug/Kg	estimate 1.8x10 ug/Kg					
4453 8.-90-1	1,4-dihydro-1,4- methanonaphthalene		estimate 7000 ug/Kg	ND					
939 9.-27-5	2-ethyl naphthalene		estimate 4300 ug/Kg	estimate 6x10 ⁵ ug/Kg					
10544 10.-50-0	sulfur		estimate 30000 ug/Kg	ND	estimate 2x10 ⁶ ug/Kg				

VOLATILES

PROJECT: US oil / WDOE COMPILED BY: Jim Blazewicz DATE: 3-19-84
 LABORATORY: EPA Region X REVIEWED BY: [Signature] DATE: 3-19-84

SAMPLE #	05523	05524	05525	05526				
UNITS	ug/Kg	ug/Kg	ug/Kg	ug/Kg				
LCQ	3-7-84	3-8-84	3-7-84	3-8-84				
1. acrolein	2700u	16u	3900u	14u				
2. acrylonitrile	1300u	8u	1900u	7u				
3. benzene	5300u	3.2u	2600u	2.7u				
4. carbon tetrachloride			7700u					
5. chlorobenzene								
6. 1,2-dichloroethane								
7. 1,1,1-trichloroethane			8700u					
8. 1,1-dichloroethane			7700u					
9. 1,1,2-trichloroethane								
10. 1,1,2,2-tetrachloroethane								
11. chloroethane								
12. 2-chloroethylvinyl ether								
13. chloroform								
14. 1,1-dichloroethylene								
15. 1,2-trans-dichloroethylene								
16. 1,2-dichloropropane								
17. 1,3-dichloropropylene	↓	↓	↓	↓				
18. ethylbenzene	5300u	1.2x10 ³	2.7u					
19. methylene chloride	5300u	7700u	2.7u					
20. methyl chloride								
21. methyl bromide								
22. bromoform	↓	↓	↓	↓				

* Results expressed in dry weight

m-TRACK

VOLATILES(Continued)

PROJECT: US-Oil/WDOE COMPILED BY: JM Blumenthal DATE: 3-19-84
 LABORATORY: EPA Region X REVIEWED BY: CRS DATE: 3-19-84

SAMPLE # :	05523	05524	05525	05526				
UNITS :	ug/Kg	—	—	→				
LOQ : % Solids =	18.1	62.4	12.8	73.3				
23. dichlorobromomethane	5300u	3.2u	7700u	2.7u				
24. trichlorofluoromethane	↓	↓	↓	↓				
25. dichlorodifluoromethane	↓	↓	↓	↓				
26. chlorodibromomethane	↓	↓	↓	↓				
27. tetrachloroethylene	↓	↓	↓	2.7u				
28. toluene	↓	↓	2.1x10 ⁵	2.7u				
29. trichloroethylene	↓	↓	7100u	↓				
30. vinyl chloride	↓	↓	7700u	↓				

NON-PRIORITY POLLUTANT HAZARDOUS SUBSTANCES LIST COMPOUNDS

PROJECT: US Oil WDOE

COMPILED BY:

JM Blazewich

DATE 3-19-84

LABORATORY: EPA Region X

REVIEWED BY:

[Signature]

DATE 3-19-84

SAMPLE # :	05523	05524	05525	05526				
UNITS :	ug/kg	→	→	→				
LOQ :								
1. benzoic acid								
2. 2-methylphenol								
3. 4-methylphenol								
4. 2,4,5-trichlorophenol								
5. aniline								
6. benzyl alcohol								
7. 4-chloroaniline								
8. dibenzofuran								
9. 2-methyl naphthalene								
10. 2-nitroaniline								
11. 3-nitroaniline								
12. 4-nitroaniline								
13. acetone	(16.6×10^5)	±	7700	±				
14. 2-butanone	5300	3,200	↓	2,700				
15. carbon disulfide	↓	↓	↓	↓				
16. 2-hexanone	↓	↓	↓	↓				
17. 4-methyl I-2-pentanone	↓	↓	↓	↓				
18. styrene	↓	↓	↓	↓				
19. vinyl acetate	ND	ND	ND	ND				
20. o-xylene	5300	3,200	(4.1×10^5)	2,700				

± = contamination media

TENTATIVELY IDENTIFIED COMPOUNDS

PROJECT: US Oil / WDOE COMPILED BY: JMB/Blair DATE: 3-19-84
 LABORATORY: EPA Region X REVIEWED BY: CRP DATE: 3-17-84

"Values are Estimated"

VOA FRACTION:	SAMPLE # :	05523	05524	05525	05526				
CAS #	NAME	4/36	5/25	16/61	0/7				
3073 1.-66-3	1,1,3-trimethyl-cyclohexane	2.6x10 ⁵ ug/kg	6.5x10 ⁵ ug/kg	7.3x10 ⁶ ug/kg	ND				
4926 2.-78-7	1-ethyl-4-methyl-cyclohexane (cis)	8.8x10 ⁵ ug/kg	7.8x10 ⁵ ug/kg	6.9x10 ⁶ ug/kg					
95 3.-57-6	2-methyl-naphthalene	8.6x10 ⁵ ug/kg	ND	ND					
95 4.-63-6	1,2,4-trimethylbenzene	5.8x10 ⁵ ug/kg	↓	↓					
75 5.-18-3	thiobis methane	ND	5.9x10 ⁵ ug/kg	↓					
638 6.-64-0	1,3-dimethyl-cyclohexane		3.3x10 ⁵ ug/kg	1.3x10 ⁶ ug/kg					
1678 7.-91-7	ethyl-cyclohexane		3.3x10 ⁵ ug/kg	7.2x10 ⁶ ug/kg					
96 8.-14-0	3-methyl-pentane		ND	2.9x10 ⁶ ug/kg					
110 9.-54-3	hexane			6.8x10 ⁵ ug/kg					
95 10.-37-7	methyl-cyclopentane	↓	↓	3.7x10 ⁵ ug/kg	↓				

PESTICIDES

PROJECT: U.S. Oil Spill COMPILED BY: M. SCHLENDER DATE: 3-22-84

LABORATORY: MANCHESTER WDOE REVIEWED BY: CRK DATE: 3-22-84
 EPA REGION X LAB

SAMPLE #	:	05525							
UNITS	:	ml/kg							
LOQ	:								
1.	aldrin	70.0							
2.	dieldrin								
3.	chlordan								
4.	4,4'-DDT								
5.	4,4'-DDE								
6.	4,4'-DDD								
7.	-endosulfan I								
8.	-endosulfan II								
9.	endosulfan sulfate								
10.	endrin								
11.	endrin aldehyde								
12.	heptachlor								
13.	heptachlor epoxide								
14.	- BHC A								
15.	- BHC B								
16.	- BHC G								
17.	- BHC D								
18.	PCB - 1242	15.00							