

Petroleum geochemistry of extracts from cuttings of the following northern Alaska exploratory wells:

Husky Oil NPRA Operations (U. S. Navy) East Teshekpuk No. 1 (7,090'-7,180'), and

Husky Oil NPRA Operations (U. S. Navy) West Fish Creek No. 1 (5,520'-5,780'; and 7,460'-7,580').



Received 29 March 2002

Total of 49 pages in report

Alaska Geologic Materials Center Data Report No. 302



Petroleum Geochemistry

PF-99-061

June 1999



***EAST TESHEKPUK AND
WEST FISH CREEK EXTRACTS***

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Prepared for BP-Amoco (Alaska), Inc.
W.O.#: D10369D000

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June 14, 1999

Mr. Gary Pelka
BP-Amoco (Alaska), Inc.
900 E. Benson Blvd.
Anchorage, AK 99519-6612

Subject: Issue of East Teshekpuk and West Fish Creek Extracts

Dear Gary:

Enclosed are two (2) copies of the subject report; one copy has also been sent to Stephan directly. All three samples were heavily contaminated with what appears to be drilling mud base oil. The chromatograms illustrate this directly, as do the normal alkane distributions for each oil (Figures 1 and 2). The high level of contamination makes comparisons of the oils difficult, not only because the whole sample chromatogram is impacted, but also because the additive may have picked up biomarkers from other intervals in the well. This could be a larger consideration with the Teshekpuk well sample, because biomarker yields were lower. However, the normal alkane distributions above N-C25 are roughly similar for all three samples, particularly the Fish Creek extracts. Biomarkers show that the Teshekpuk sample has a different compound distribution, particularly in the tricyclics, than the Fish Creek extracts.

Thank you for the opportunity to be of service to BP-Amoco (Alaska), Inc. If you should have any questions, please call me at (713) 479-8454.

Sincerely,


John Scholten

JS/pd

cc: Mr. Gary Pelka (2)
Mr. Stephan Duppenbecker, BP-Amoco (Houston) - (1)
Files (2)

Table 1. Summary Data

Client ID Depth (ft) Lab ID	E. Teshekpuk #1 7090-7180 WF9759	W. Fish Creek #1 5520-5780 WF9760	W. Fish Creek #1 7460-7580 WF9761
TSE Wt. (mgs)	12.4	32.6	25.1
%TSE	0.36	0.27	0.21
KG/Ton TSE	3.60	2.71	2.15
Saturate %	14.2	47.7	33.4
Aromatic %	<0.2	1.0	1.3
Polar %	85.8	51.3	65.3
Asphaltene %	0	0	0
$\delta^{13}\text{C}$ (‰) Saturate	-29.56	-29.48	-29.69
$\delta^{13}\text{C}$ (‰) Aromatic	-26.93	-27.16	-26.96

Normal Alkane Distribution

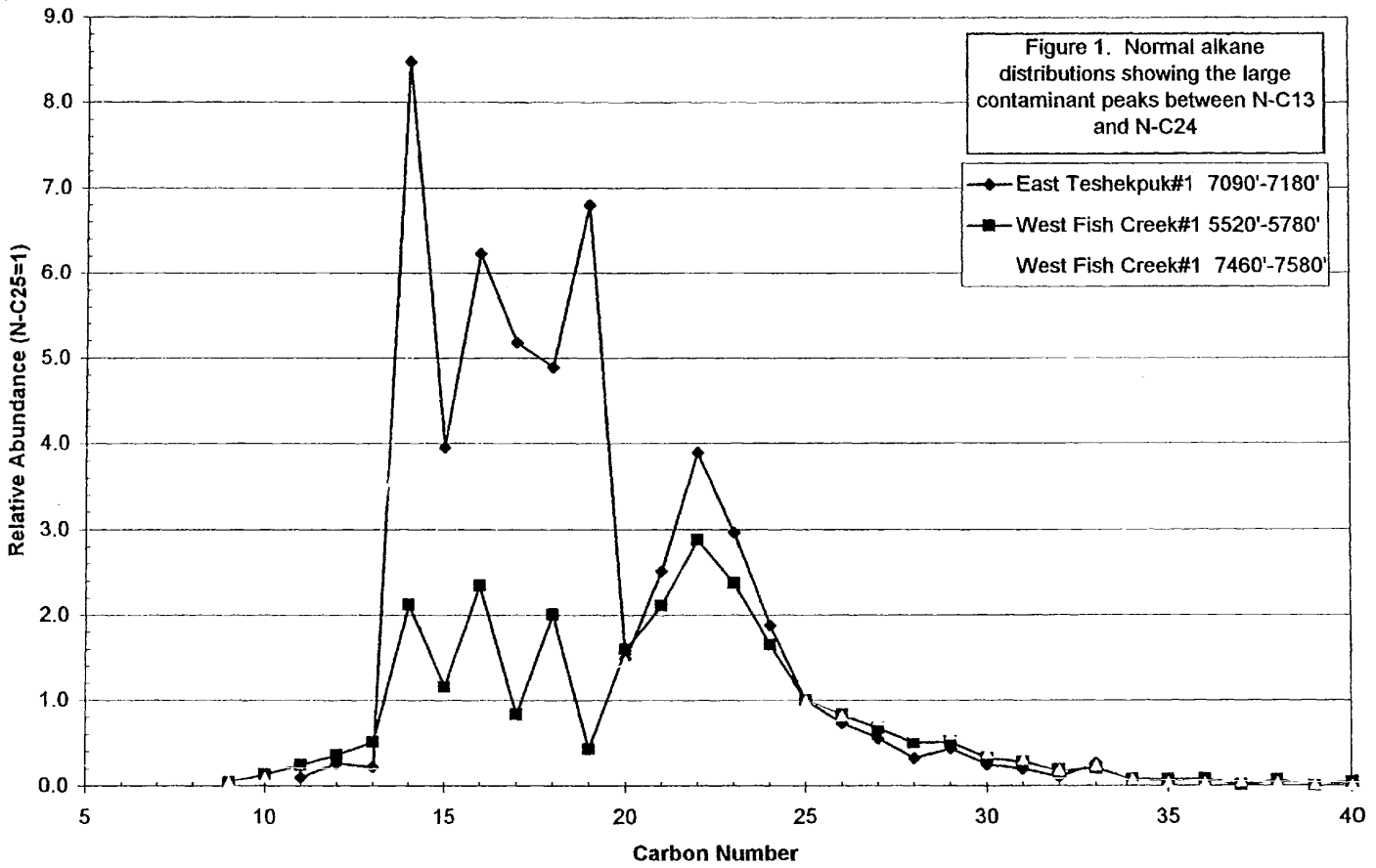
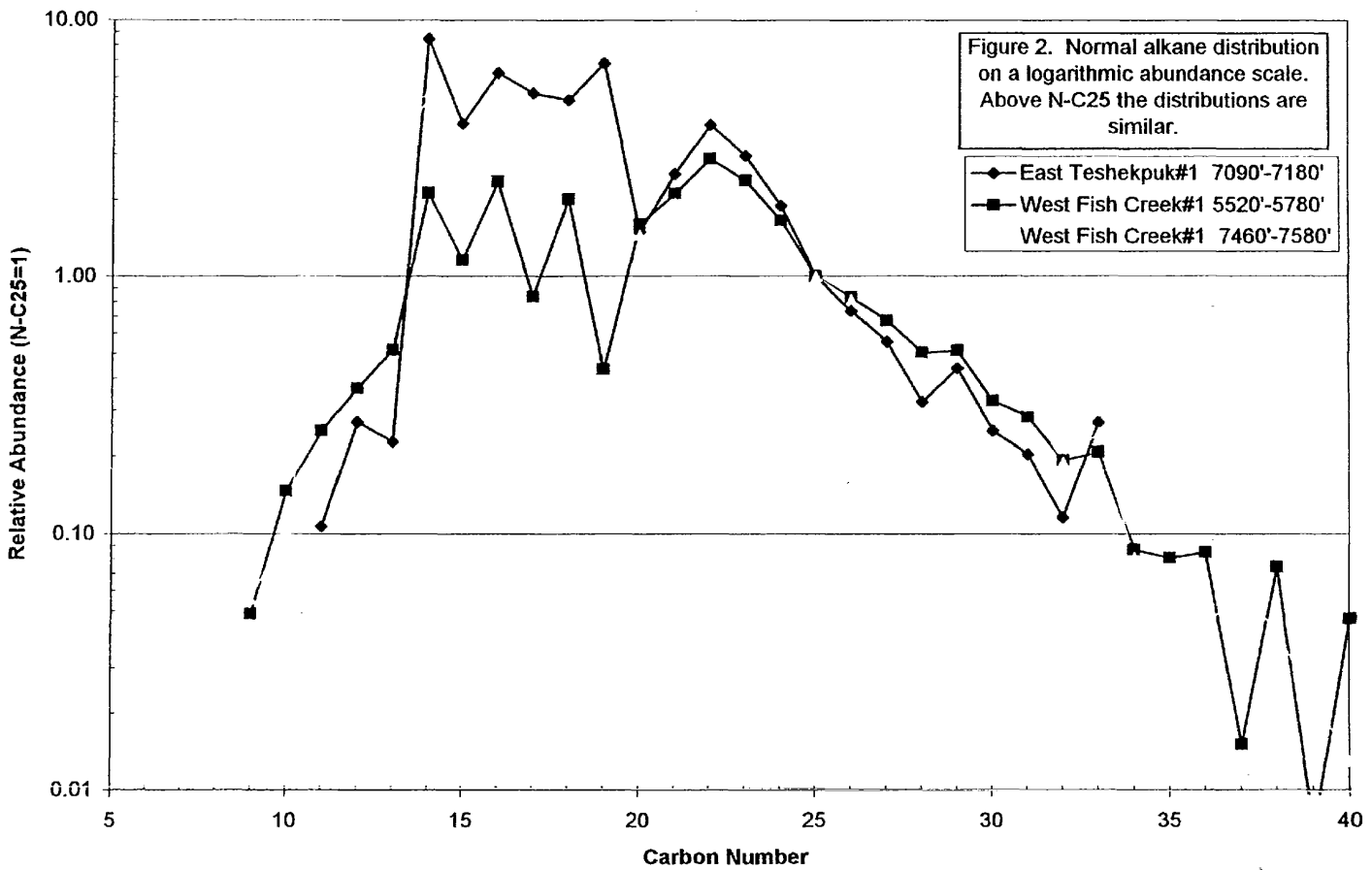


Figure 1. Normal alkane distributions showing the large contaminant peaks between N-C13 and N-C24

- East Teshekpuk#1 7090'-7180'
- West Fish Creek#1 5520'-5780'
- West Fish Creek#1 7460'-7580'

Normal Alkane Distribution



***WHOLE SAMPLE
CHROMATOGRAPHY***

WHOLE OIL GAS CHROMATOGRAPHY - N-ALKANES AND ISOPRENOIDS

SAMPLE: East Teshekpuk#1 7090'-7180'

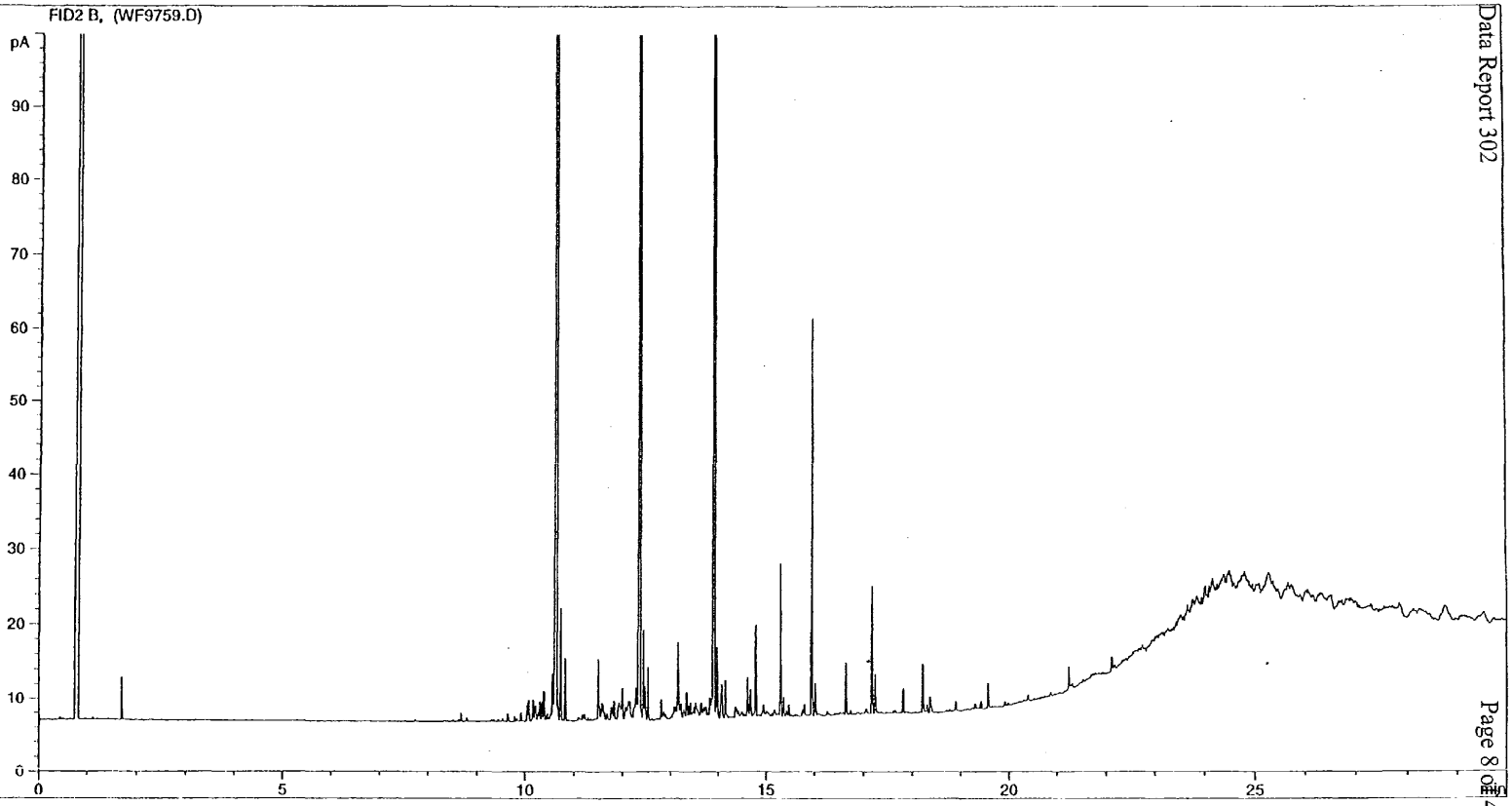
DATA FILE: WF9759.D

CPI VALUE	1.41	PRISTANE/PHYTANE	2.24
N-C9/N-C19	0.00	PRISTANE/N-C17	0.10
N-C15/N-C25	3.88	PHYTANE/N-C18	0.05

<u>COMPOUND</u>	<u>RETENTION</u> <u>TIME</u>	<u>PEAK AREA</u>	<u>AREA</u> <u>N-C15=1</u>	<u>PEAK</u> <u>HEIGHT</u>	<u>HEIGHT</u> <u>N-C15=1</u>
N-C4	0.00	0.00	0.000	0.00	0.000
N-C5	0.00	0.00	0.000	0.00	0.000
N-C6	0.00	0.00	0.000	0.00	0.000
N-C7	0.00	0.00	0.000	0.00	0.000
N-C8	0.00	0.00	0.000	0.00	0.000
N-C9	0.00	0.00	0.000	0.00	0.000
N-C10	0.00	0.00	0.000	0.00	0.000
N-C11	7.73	0.21	0.028	0.19	0.027
N-C12	8.79	0.57	0.076	0.49	0.069
N-C13	9.83	0.54	0.072	0.41	0.057
N-C14	10.73	19.06	2.548	15.25	2.143
N-C15	11.50	7.48	1.000	7.12	1.000
N-C16	12.44	12.90	1.725	11.21	1.576
N-C17	13.16	13.03	1.742	9.32	1.310
N-C18	13.97	10.79	1.443	8.80	1.236
N-C19	14.78	15.60	2.086	12.24	1.720
N-C20	15.36	3.38	0.452	2.69	0.378
N-C21	16.01	6.32	0.845	4.53	0.637
N-C22	16.64	8.56	1.144	7.01	0.985
N-C23	17.24	6.88	0.920	5.33	0.749
N-C24	17.81	4.31	0.576	3.40	0.477
N-C25	18.37	1.93	0.258	1.80	0.253
N-C26	18.90	1.82	0.243	1.32	0.186
N-C27	19.42	1.23	0.164	1.00	0.141
N-C28	19.91	0.75	0.100	0.58	0.082
N-C29	20.39	1.00	0.134	0.79	0.111
N-C30	20.86	0.55	0.074	0.45	0.063
N-C31	21.31	0.42	0.056	0.37	0.052
N-C32	21.75	0.22	0.029	0.21	0.029
N-C33	22.17	0.84	0.112	0.49	0.068
N-C34	0.00	0.00	0.000	0.00	0.000
N-C35	0.00	0.00	0.000	0.00	0.000
N-C36	0.00	0.00	0.000	0.00	0.000
N-C37	0.00	0.00	0.000	0.00	0.000
N-C38	0.00	0.00	0.000	0.00	0.000
N-C39	0.00	0.00	0.000	0.00	0.000
N-C40	0.00	0.00	0.000	0.00	0.000
N-C41	0.00	0.00	0.000	0.00	0.000
N-C42	0.00	0.00	0.000	0.00	0.000
N-C43	0.00	0.00	0.000	0.00	0.000
N-C44	0.00	0.00	0.000	0.00	0.000
Pristane	13.22	1.30		1.19	
Phytane	14.05	0.58		0.61	

East Teshekpuk #1 7090-7180'

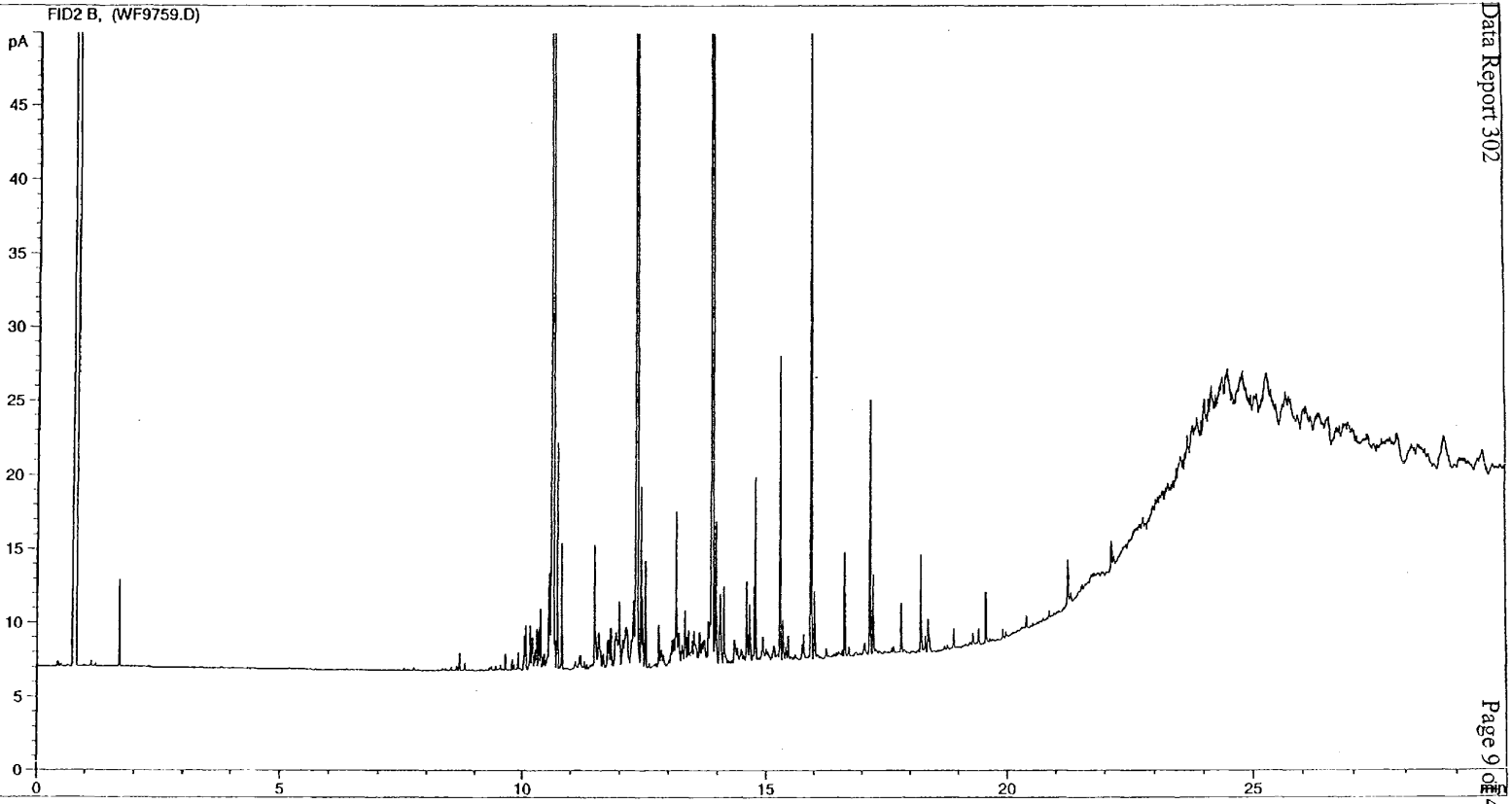
GMC Data Report 302



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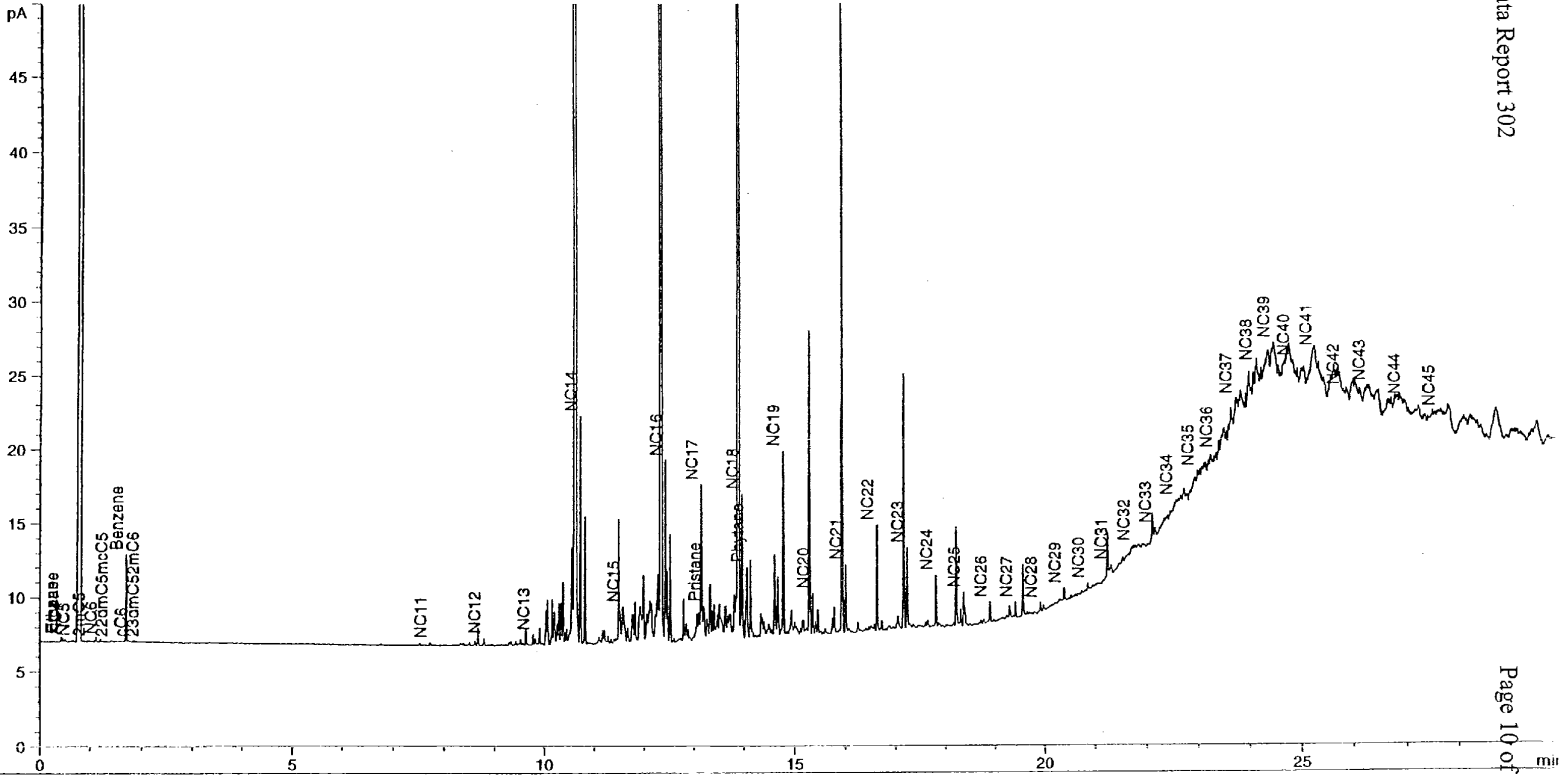
WESTPORT TECHNOLOGY CENTER INTERNATIONAL

East Teshekpuk #1 7090-7180'



East Teshekpuk#1 7090'-7180'

FID2 B, (I:\GEOCHEM\HPCHEM\6890\WF9759.D)



WHOLE OIL GAS CHROMATOGRAPHY - N-ALKANES AND ISOPRENOIDS

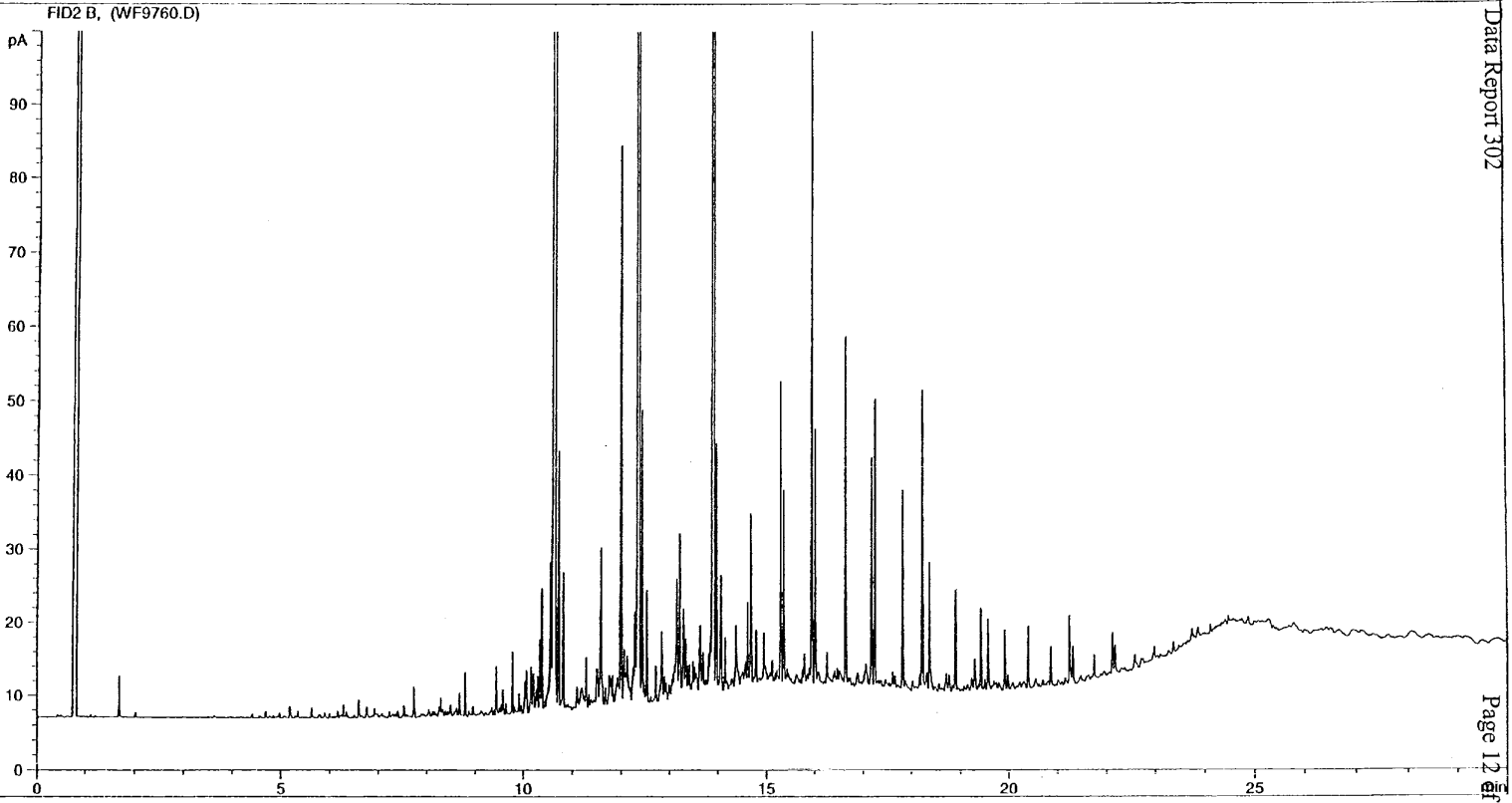
SAMPLE: West Fish Creek#1 5520'-5780'

DATA FILE: WF9760.D

CPI VALUE	0.85	PRISTANE/PHYTANE	1.18
N-C9/N-C19	0.10	PRISTANE/N-C17	1.34
N-C15/N-C25	1.22	PHYTANE/N-C18	0.54

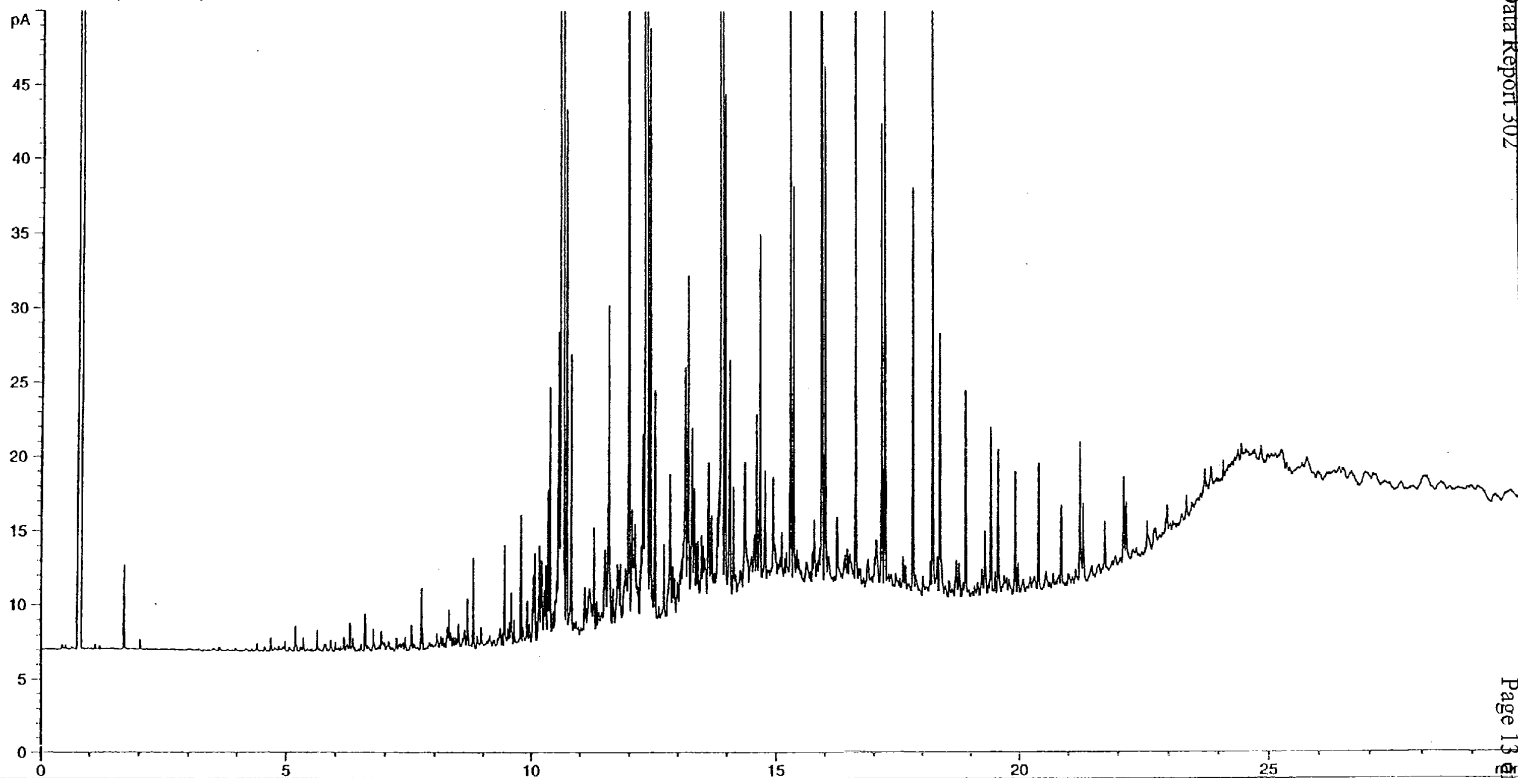
<u>COMPOUND</u>	<u>RETENTION</u> <u>TIME</u>	<u>PEAK AREA</u>	<u>AREA</u> <u>N-C15=1</u>	<u>PEAK</u> <u>HEIGHT</u>	<u>HEIGHT</u> <u>N-C15=1</u>
N-C4	0.49	0.13	0.005	0.16	0.009
N-C5	0.66	0.03	0.001	0.06	0.003
N-C6	1.19	0.02	0.001	0.07	0.004
N-C7	2.48	0.04	0.002	0.07	0.004
N-C8	3.97	0.22	0.009	0.17	0.009
N-C9	5.35	0.89	0.036	0.79	0.042
N-C10	6.59	3.43	0.139	2.39	0.127
N-C11	7.73	6.06	0.246	4.07	0.216
N-C12	8.79	6.87	0.279	5.97	0.316
N-C13	9.78	9.61	0.390	8.40	0.445
N-C14	10.73	48.84	1.981	34.51	1.830
N-C15	11.59	24.66	1.000	18.86	1.000
N-C16	12.43	48.03	1.948	38.16	2.023
N-C17	13.16	20.12	0.816	13.62	0.722
N-C18	13.97	42.24	1.713	32.67	1.733
N-C19	14.78	9.27	0.376	7.07	0.375
N-C20	15.36	32.87	1.333	26.10	1.384
N-C21	16.01	44.45	1.803	34.38	1.823
N-C22	16.64	58.39	2.368	46.89	2.486
N-C23	17.24	49.21	1.996	38.60	2.047
N-C24	17.82	32.91	1.335	26.96	1.430
N-C25	18.37	20.20	0.819	16.25	0.862
N-C26	18.90	16.82	0.682	13.51	0.716
N-C27	19.42	13.52	0.548	10.97	0.582
N-C28	19.91	11.59	0.470	8.22	0.436
N-C29	20.39	10.95	0.444	8.38	0.445
N-C30	20.86	7.42	0.301	5.31	0.282
N-C31	21.31	6.54	0.265	4.63	0.245
N-C32	21.74	4.25	0.172	3.14	0.167
N-C33	22.17	4.69	0.190	3.37	0.179
N-C34	22.58	1.87	0.076	1.41	0.075
N-C35	22.98	1.58	0.064	1.31	0.070
N-C36	23.36	1.74	0.071	1.38	0.073
N-C37	23.77	0.23	0.009	0.25	0.013
N-C38	24.10	1.60	0.065	1.21	0.064
N-C39	24.50	0.03	0.001	0.11	0.006
N-C40	24.87	1.06	0.043	0.76	0.040
N-C41	0.00	0.00	0.000	0.00	0.000
N-C42	0.00	0.00	0.000	0.00	0.000
N-C43	0.00	0.00	0.000	0.00	0.000
N-C44	0.00	0.00	0.000	0.00	0.000
Pristane	13.21	26.95		20.68	
Phytane	14.07	22.90		15.46	

West Fish Creek 5520-5780'

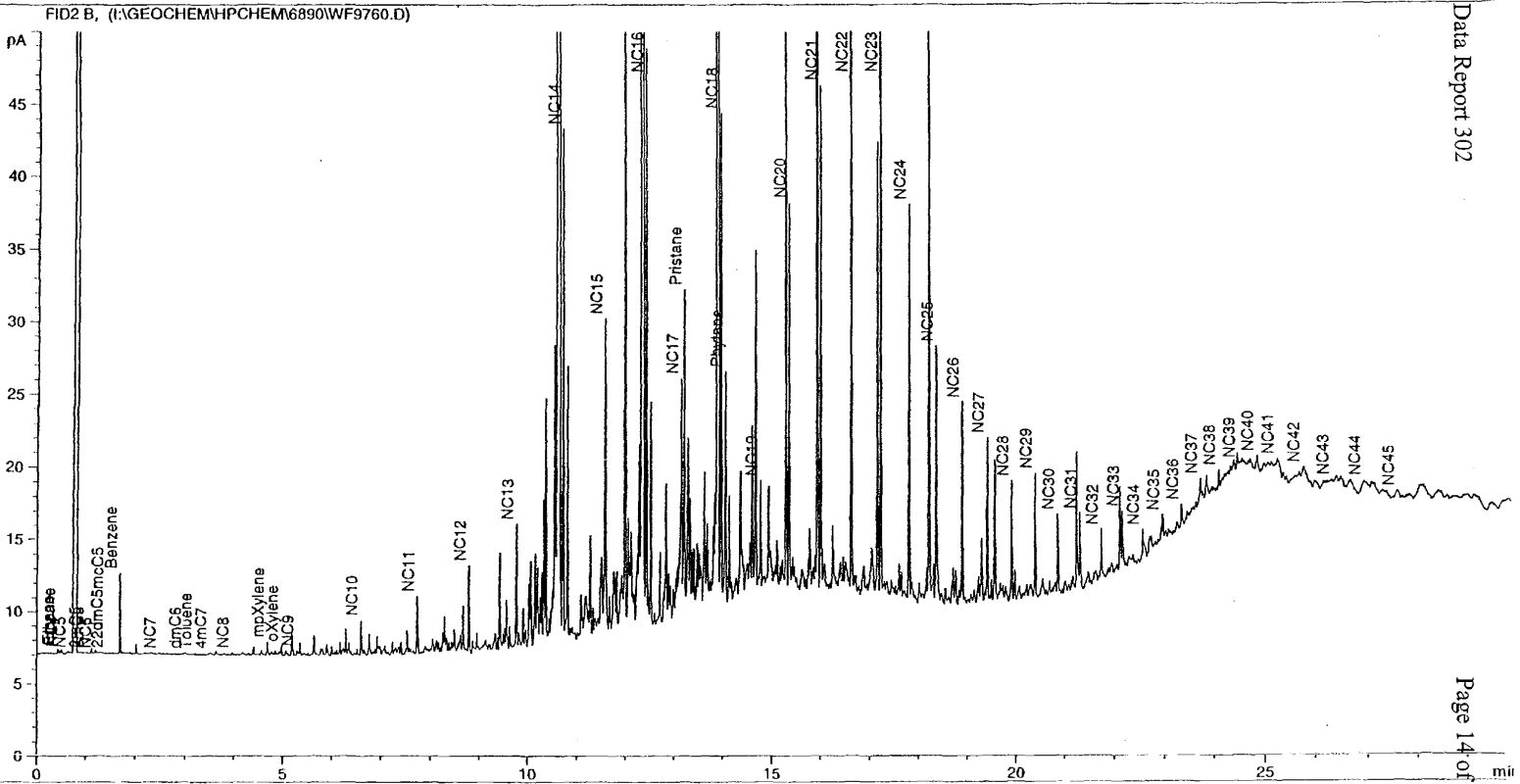


West Fish Creek 5520-5780'

FID2 B, (WF9760.D)



West Fish Creek#1 5520'-5780'



WESTPORT TECHNOLOGY CENTER INTERNATIONAL

WHOLE OIL GAS CHROMATOGRAPHY - N-ALKANES AND ISOPRENOIDS

SAMPLE: West Fish Creek#1 7460'-7580'

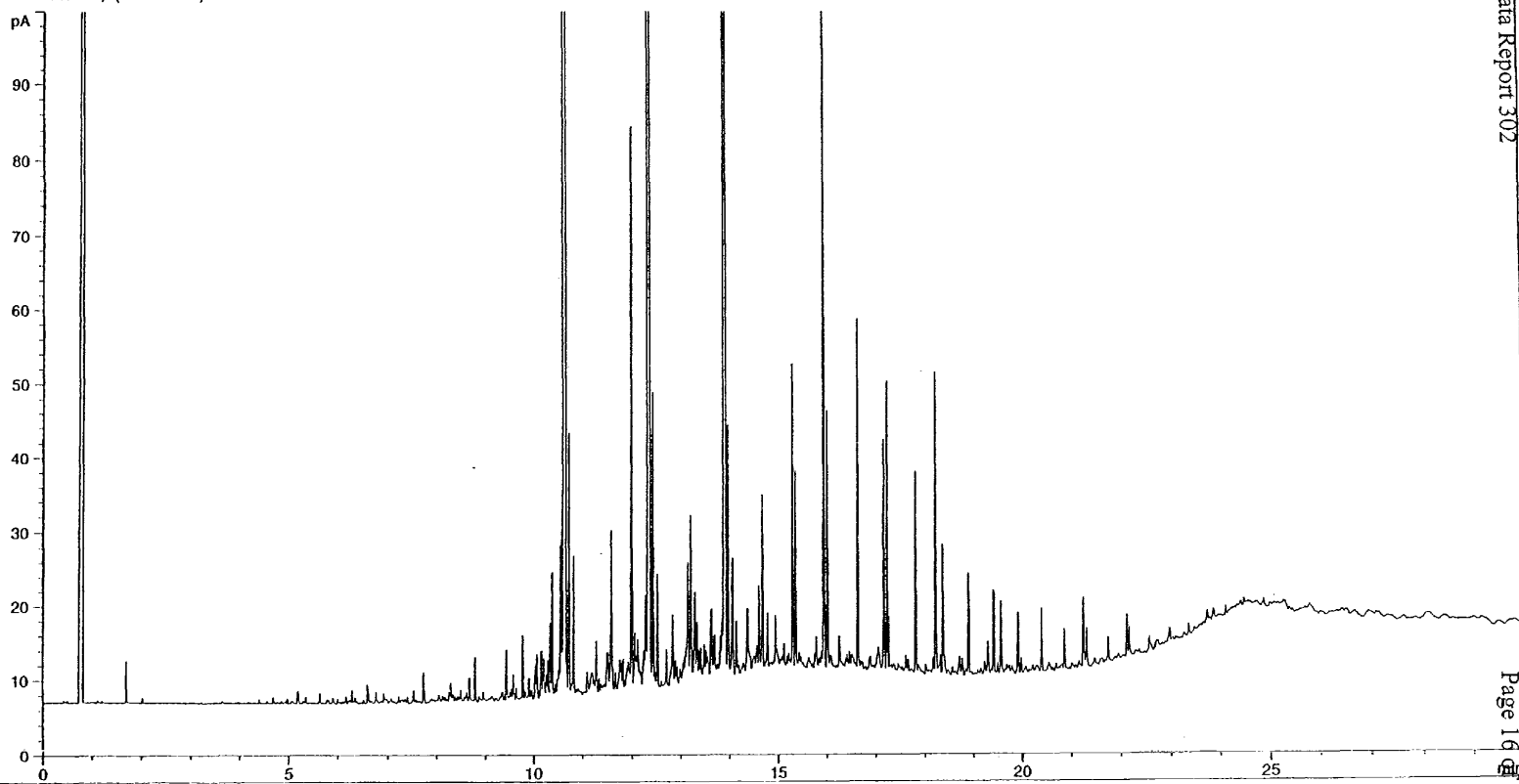
DATA FILE: WF9761.D

CPI VALUE	0.97	PRISTANE/PHYTANE	1.18
N-C9/N-C19	0.04	PRISTANE/N-C17	0.64
N-C15/N-C25	2.59	PHYTANE/N-C18	0.37

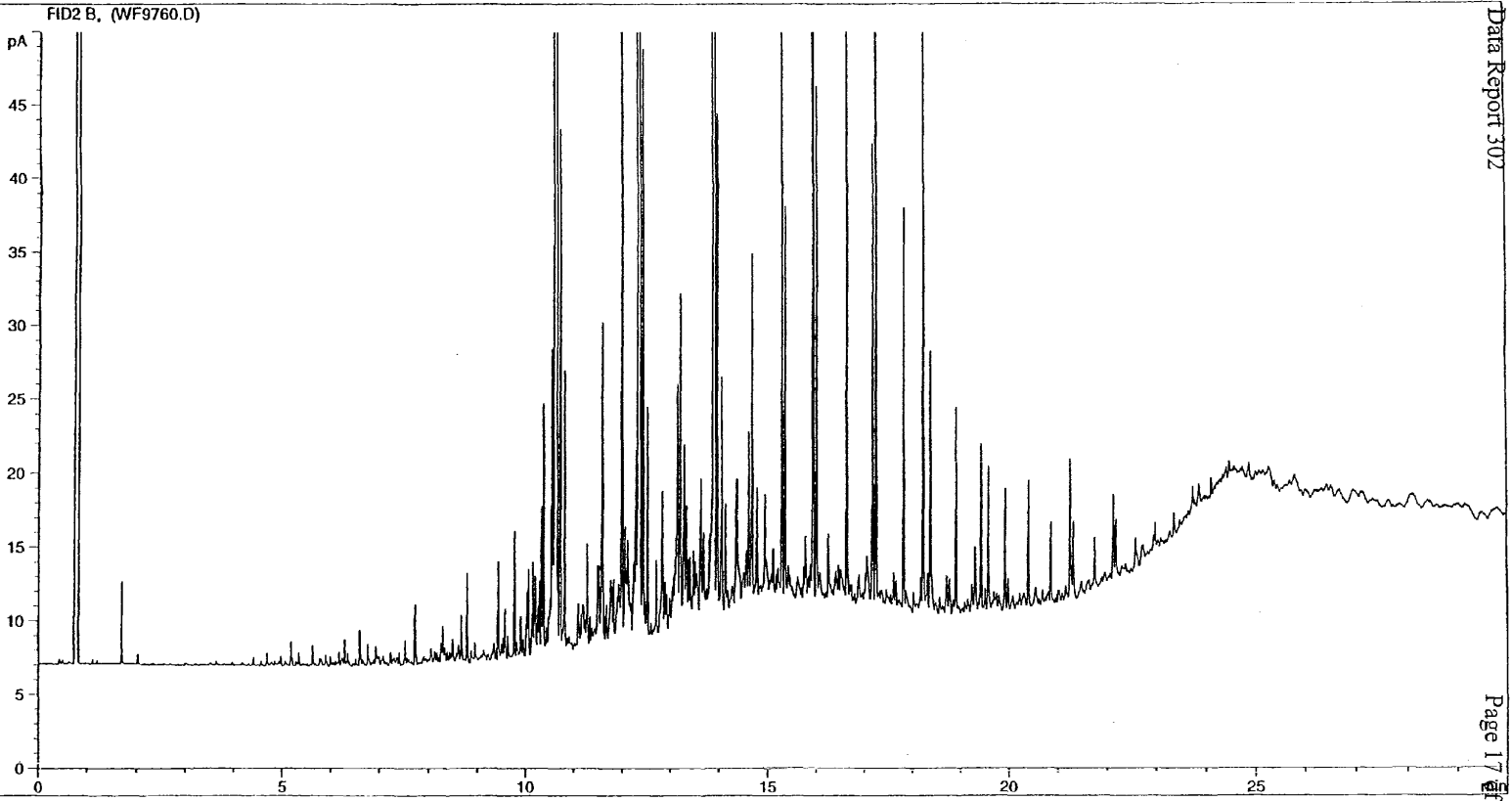
COMPOUND	RETENTION	PEAK AREA	AREA	PEAK	HEIGHT
	TIME		N-C15=1	HEIGHT	N-C15=1
N-C4	0.49	0.10	0.004	0.19	0.010
N-C5	0.66	0.10	0.004	0.16	0.008
N-C6	1.20	0.19	0.008	0.23	0.011
N-C7	2.49	0.05	0.002	0.08	0.004
N-C8	0.00	0.00	0.000	0.00	0.000
N-C9	5.29	0.50	0.020	0.47	0.024
N-C10	6.59	1.09	0.043	0.88	0.044
N-C11	7.73	8.52	0.338	6.72	0.339
N-C12	8.79	14.65	0.581	12.59	0.636
N-C13	9.78	22.02	0.873	20.00	1.011
N-C14	10.73	64.90	2.574	44.18	2.232
N-C15	11.59	25.21	1.000	19.79	1.000
N-C16	12.44	44.81	1.777	35.00	1.769
N-C17	13.16	19.92	0.790	14.15	0.715
N-C18	13.97	28.95	1.148	24.59	1.242
N-C19	14.78	12.28	0.487	9.89	0.500
N-C20	15.36	14.25	0.565	12.25	0.619
N-C21	16.01	20.68	0.820	16.29	0.823
N-C22	16.64	20.44	0.811	16.27	0.822
N-C23	17.24	17.69	0.702	13.67	0.691
N-C24	17.81	13.91	0.552	10.36	0.524
N-C25	18.37	9.72	0.386	8.42	0.425
N-C26	18.90	9.00	0.357	6.89	0.348
N-C27	19.42	8.37	0.332	6.55	0.331
N-C28	19.91	6.78	0.269	5.28	0.267
N-C29	20.39	6.82	0.271	5.13	0.259
N-C30	20.86	4.30	0.171	3.23	0.163
N-C31	21.31	3.68	0.146	2.64	0.133
N-C32	21.74	1.93	0.077	1.60	0.081
N-C33	22.17	3.13	0.124	2.08	0.105
N-C34	22.58	0.80	0.032	0.68	0.035
N-C35	22.97	0.31	0.012	0.33	0.017
N-C36	23.36	0.58	0.023	0.36	0.018
N-C37	23.73	0.69	0.027	0.53	0.027
N-C38	24.11	0.64	0.025	0.35	0.018
N-C39	24.48	0.18	0.007	0.19	0.010
N-C40	24.87	0.11	0.004	0.11	0.006
N-C41	0.00	0.00	0.000	0.00	0.000
N-C42	0.00	0.00	0.000	0.00	0.000
N-C43	0.00	0.00	0.000	0.00	0.000
N-C44	0.00	0.00	0.000	0.00	0.000
Pristane	13.21	12.75		11.29	
Phytane	14.07	10.84		9.73	

West Fish Creek7460-7580'

FID2 B, (WF9760.D)

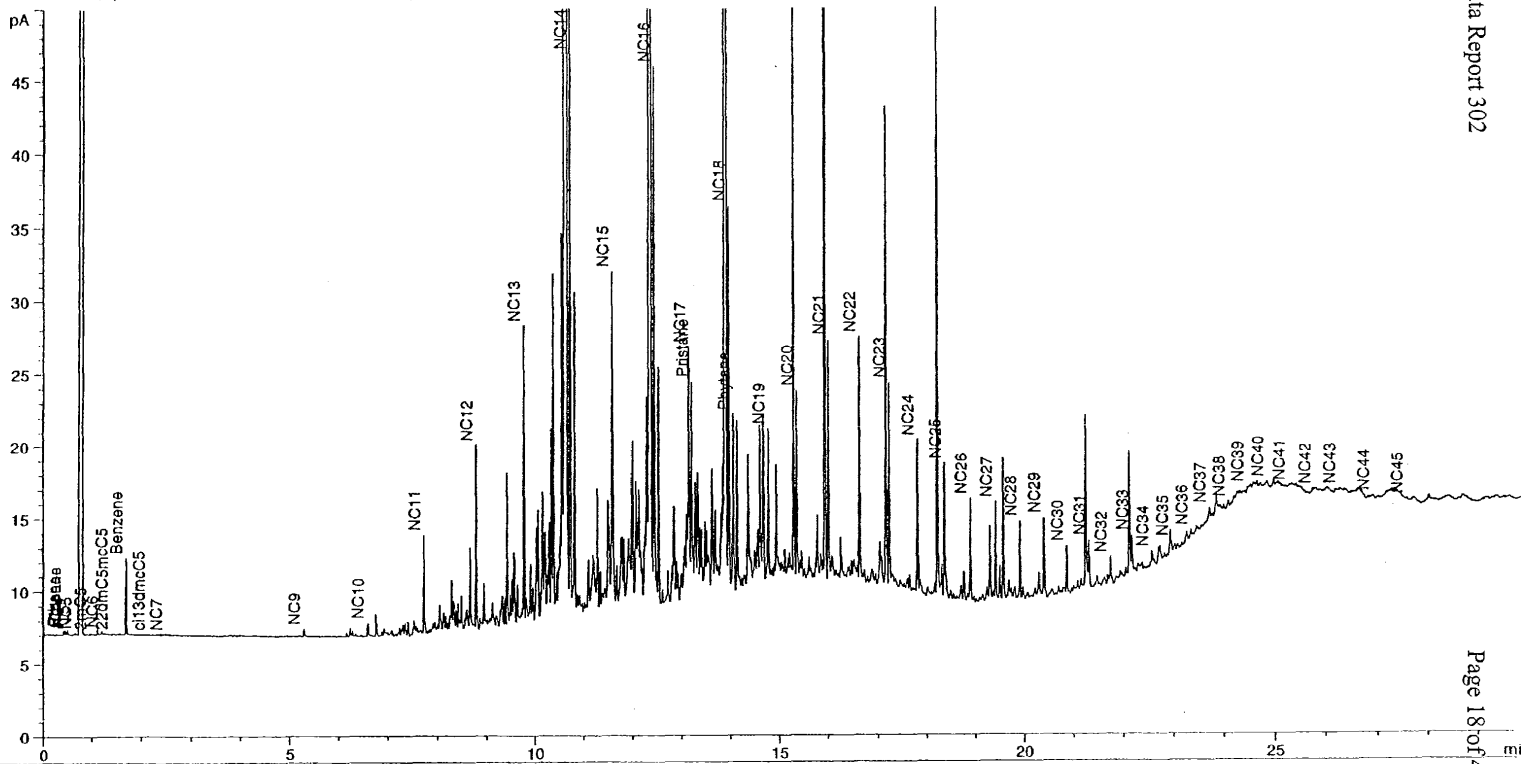


West Fish Creek7460-7580'



West Fish Creek#1 7460'-7580'

FID2 B, (I:\GEOCHEM\HPCHEM\6890\WF9761.D)



***SATURATE FRACTION
BIOMARKERS***

WF9759

Saturate Biomarker Report

DATA FILE: WF9759.D
 DATE ACQUIRED: 7 Apr 1999 10:34
 MISC. INFO: E. Teshekpuuk #1 7090-7180'

PEAK #	RET TIME	AMU	COMPOUND NAME	AREA
1	27.62	191	C19 Tricyclic (Cheilanthane)	6755
2	29.27	191	C20 Tricyclic (Cheilanthane)	10792
3	31.07	191	C21 Tricyclic (Cheilanthane)	12662
4	32.78	191	C22 Tricyclic (Cheilanthane)	6487
5	34.83	191	C23 Tricyclic (Cheilanthane)	33381
6	35.97	191	C24 Tricyclic (Cheilanthane)	22705
7	38.28	191	C25 Tricyclic (Cheilanthane)	21483
8	39.87	191	C24 Tetracyclic	12515
9	40.01	191	C26 Tricyclic R (Cheilanthane)	6898
10	40.16	191	C26 Tricyclic S (Cheilanthane)	6746
11	43.96	191	C28 Tricyclic R (Cheilanthane)	7147
12	44.23	191	C28 Tricyclic S (Cheilanthane)	4914
13	45.08	191	C29 Tricyclic R (Cheilanthane)	4392
14	45.41	191	C29 Tricyclic S (Cheilanthane)	4408
15	46.26	191	Ts (22,29,30-Trisnorhopane-II)	16930
16	46.87	191	C26 Tetracyclic	3621
17	47.00	191	Tm (22,29,30-Trisnorhopane)	17681
18	47.26	191	C30 Tricyclic R	2206
19	47.65	191	C30 Tricyclic S	1707
20	48.72	191	28,30 Bisnorhopane	5336
21	49.51	191	17a,21b(H)-30-norhopane(C29 Nor)	39590
22	49.63	191	18a(H)-30-norneohopane (C29 Ts)	11516
23	49.93	191	17a(H)-diahopane	4914
24	50.39	191	Normoretane	4544
25	50.82	191	Oleanane	1916
26	51.05	191	17a,21b(H)-hopane (C30 Hopane)	44744
27	51.13	191	17a(H)-30-nor-29-homohopane	5284
28	51.73	191	17b,21a(H)-hopane (Moretane)	5833
29	52.81	191	17a,21b(H)-homohopane 22S (C31)	17625
30	53.04	191	17a,21b(H)-homohopane 22R (C31)	14505
31	53.23	191	Gammacerane	1130
32	54.21	191	17a,21b(H)-bishomohopane S	8118
33	54.51	191	17a,21b(H)-bishomohopane R	6869
34	55.82	191	17a,21b(H)-trishomohopane S	5285
35	56.24	191	17a,21b(H)-trishomohopane R	5033
36	57.53	191	17a,21b(H)-tetrakishomohopane S	3415
37	58.04	191	17a,21b(H)-tetrakishomohopane R	1941
38	59.38	191	17a,21b(H)pentakishomohopane S	2017
39	60.16	191	17a,21b(H)pentakishomohopane R	1321
40	31.52	217	C21 Diapregnane	5213

WF9759

Saturate Biomarker Report

41	31.94	217	LMW Sterane	3225
42	32.45	217	LMW Steran	2157
43	33.08	217	C21 Pregnane	8217
44	33.19	217	C22 Dihomopregnane	4853
45	35.16	217	LMW Sterane	2251
46	35.39	217	C22 Homopregnane	6035
47	41.98	217	C27S ba Diasterane	11504
48	42.66	217	C27R ba Diasterane	6399
49	43.16	217	Peak 10	3659
50	43.54	217	Peak 11	4014
51	43.67	217	Peak 12	5069
52	43.78	217	Peak 13	6051
53	44.11	217	Peak 14	2809
54	44.50	217	Peak 15	3493
55	45.04	217	C27S aaa Sterane	10052
56	45.21	217	C27R abb Ster +C29S Diasterane	11060
57	45.37	217	C27S abb Sterane	5178
58	45.80	217	C27R aaa Sterane	11115
59	46.01	217	C29 ba Diasterane	8676
60	46.80	217	C28S aaa Sterane	1794
61	47.11	217	C28R abb Sterane	3129
62	47.29	217	C28S abb Sterane	3659
63	47.45	217	Diasterane	1476
64	47.81	217	C28R aaa Sterane	5448
65	48.37	217	C29S aaa Sterane	3903
66	48.70	217	C29R abb Sterane	6232
67	48.81	217	C29S abb Sterane	2686
68	49.48	217	C29R aaa Sterane	7515
69	49.59	217	C30S aaa Sterane	797
70	50.02	217	C30R abb Sterane	386
71	50.06	217	C30S abb Sterane	379
72	50.82	217	C30R aaa Sterane	647
73	45.21	218	C27R abb Sterane	8846
74	45.37	218	C27S abb Sterane	6458
75	47.13	218	C28R abb Sterane	4228
76	47.29	218	C28S abb Sterane	4295
77	48.70	218	C29R abb Sterane	5577
78	48.82	218	C29S abb Sterane	4814

Westport Biomarker Ratios

Saturate Biomarker Report

Homohopane Profile:		Value
C31=(Peaks 29 +30)/(Peaks 29 +30 +32 through 39)		0.486
C32=(Peaks 32 +33)/(Peaks 29 +30 +32 through 39)		0.227
C33=(Peaks 34 +35)/(Peaks 29 +30 +32 through 39)		0.156
C34=(Peaks 36 +37)/(Peaks 29 +30 +32 through 39)		0.081
C35=(Peaks 38 +39)/(Peaks 29 +30 +32 through 39)		0.050
Oleanane Ratio=	Peak 25/Peak 26	0.043
Gammacerane Ratio 1=	Peak 31/Peak 26	0.025
Gammacerane Ratio 2=	Peak 31/Peak30	0.078
Bisnorhopane Ratio=	Peak 20/Peak 26	0.119
30-nor-29-homo+2α-methyl Ratio	Peak 27/Peak 26	0.118
C29 Ts/(C29 Norhopane + C29 Ts=	Peak 22/(Peaks 21 + 22)	0.225
C30 to Norhopane & Homopane Indices:		
Norhopane/Hopane = Peak 21/Peak 21+26		0.469
Hopane/Hopane+Hopane		0.500
C31/Hopane = Peaks 29 + 30/Peaks 29 + 30 + 26		0.418
C32/Hopane = Peaks 32 + 33/Peaks 32 + 33 + 26		0.251
C33/Hopane = Peaks 34 + 35/Peaks 34 + 35 + 26		0.187
C34/Hopane = Peaks 36 + 37/Peaks 36 + 37 + 26		0.107
C35/Hopane = Peaks 38 + 39/Peaks 38 + 39 + 26		0.069
Ts/Tm=	Peak 15/Peak 17	0.958
C23 Tricyclic/Hopane Ratio=	Peak 5/Peak 26	0.746
C23 Tricyclic/C24 Tricyclic Ratio=	Peak 5/Peak 6	1.470
C24 Tetracyclic/C25 Tricyclic Ratio=	Peak 8/Peak 7	0.583
C24 Tetracyclic/C26 Tricyclic Ratio=	Peak 8/Peaks 9+10	0.917
Moretane Index=	Peak 28/Peaks 26+28	0.115
Normoretane Index=	Peak 24/Peaks 24+26	0.092
Tricyclic/Hopane Ratio=		0.456

BP Sunbury Traditional Biomarker Ratios

Saturate Biomarker Report

S1	C29S/C29S+C29R Sterane			0.342
S2	C29R&S abb/C29S&R aaa + C29R&S abb			0.476
S3	aaa 20R Steranes	C27 46.16%	C28 22.63%	C29 31.21%
S4	abb 20S&20R Steranes	44.72%	24.91%	30.37%
S5	Dia ba/(Dia+Non-Diasteranes) (Calculated)			40.39%
M4	C27-35 Hopanes/(Hopanes + Steranes C27-29)			71.56%
H1	C32S/C32s + R Hopane			0.542
H2	C31S/C31S + R Hopane			0.549
H3	C30 Hopane/Hopane + Moretane			0.885
H6	18A/18A + 17A Hopane			0.489

BPX Source Indicators

1920Tri23 Index ((C19+20 Tris)/(C19+20+23 Tris))	0.345
23TriHo Index (C23 Tri/(C23 Tri + Hopane))	0.427
24TetHo Index (C24 Tetra/(C24 Tetra + Hopane))	0.219
TmTs Index (Tm/(Tm+Ts))	0.511
Bis Index (Bisnorhopane/(Bisnorhopane + Hopane))	0.107
Moretane Index (Moretane/(Moretane + Hopane))	0.115
Ol30Ho Index (Oleanane/(Oleanane + Hopane))	0.041
BP G2 Index (G2/(G2 + Hopane))	0.106
G2 = coelution of 17a(H)-30-nor-29-homohopane and 2a-methyl-17a(H),21b(H)-hopane	
Ga30Ho Index (Gammacerane/(Gammacerane+Hopane))	0.025
35Ho34 Index (C35 Homohopane/(C35 +C34 Homohopanes))	0.384
HoSt Index (M4/100)	0.716

Saturate Biomarker Report

29S/27 Index (C29 Steranes/(C27+29 steranes from S3))	0.403
DiaSt Index (C27 Diasteranes/(C27 Dias + C27 Steranes))	0.404
DMH Index (Demethylated Hopane/(Dem. Hopane + Hopane))	nm
Hopane Profile Indices (N hopane or homohopane/(Sum C29-C35 Hopanes))	
C29=	0.263
C30=	0.297
C31=	0.214
C32=	0.100
C33=	0.069
C34=	0.036
C35=	0.022

BPX Maturity Indicators

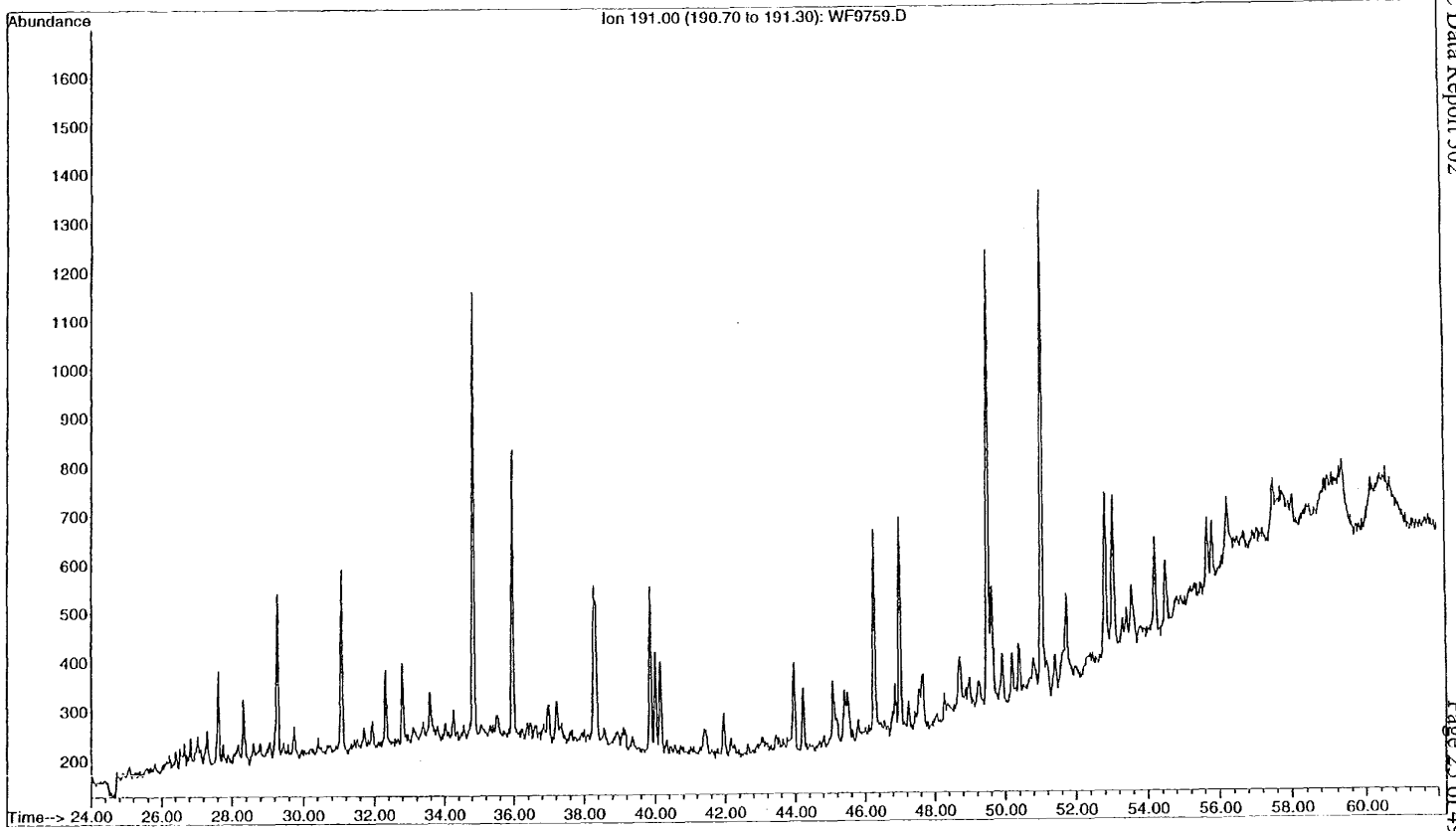
S1	C29S/C29S+C29R Sterane	0.342
S2	C29R&S abb/C29S&R aaa +C29R&S abb	0.476
H1	C32S/C32s + R Hopane	0.542
H2	C31S/C31S + R Hopane	0.549

pnf = peak not found

*** = no value due to missing peaks

WESTPORT LABORATORY

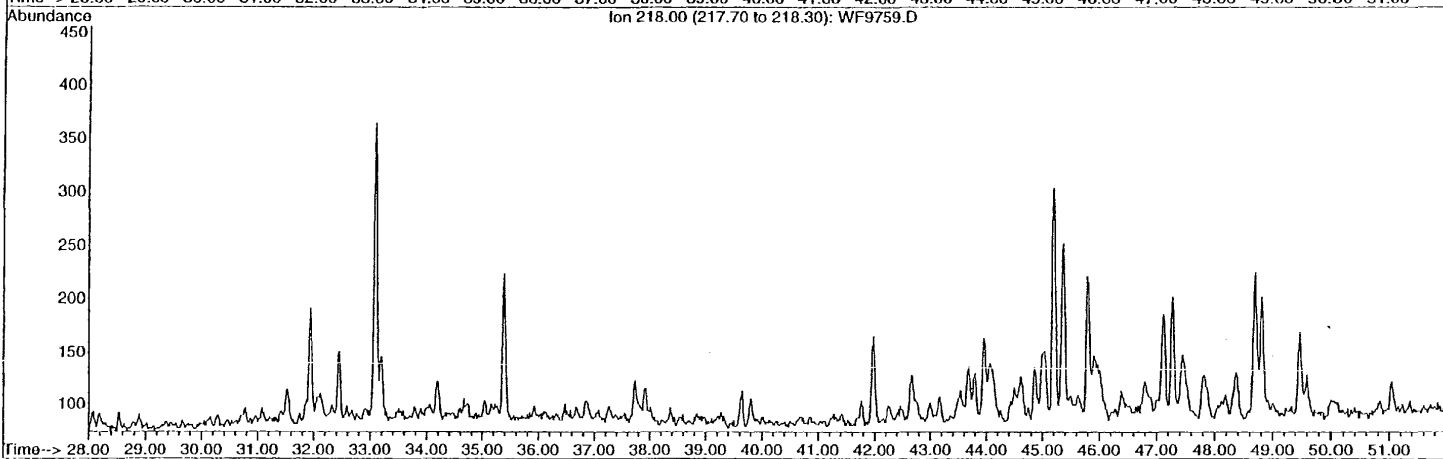
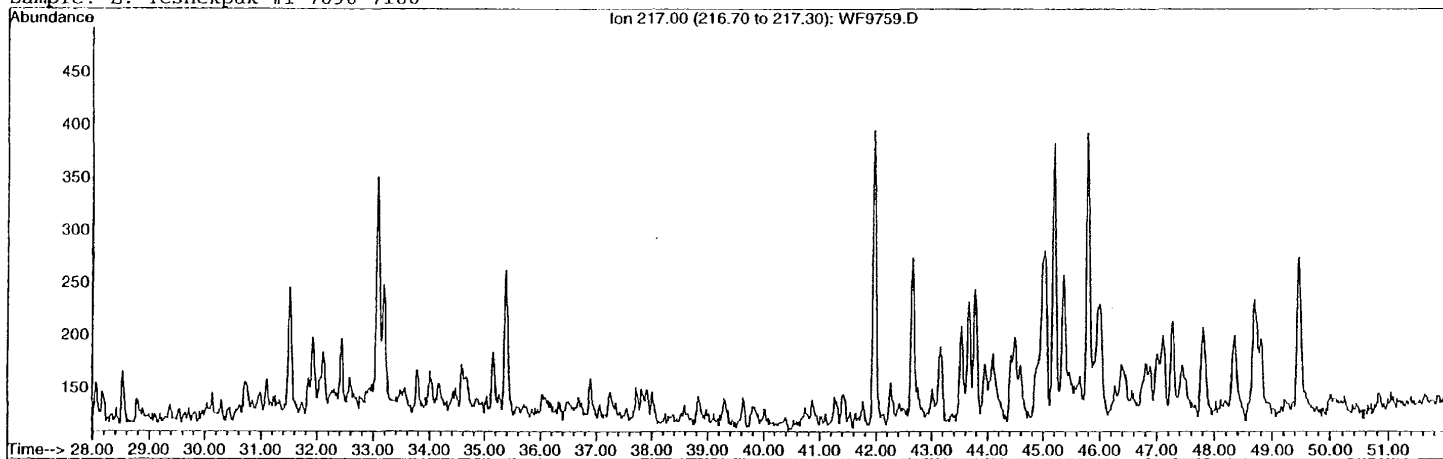
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Sample: E. Teshekpuk #1 7090-7180'



WESTPORT LABORATORY

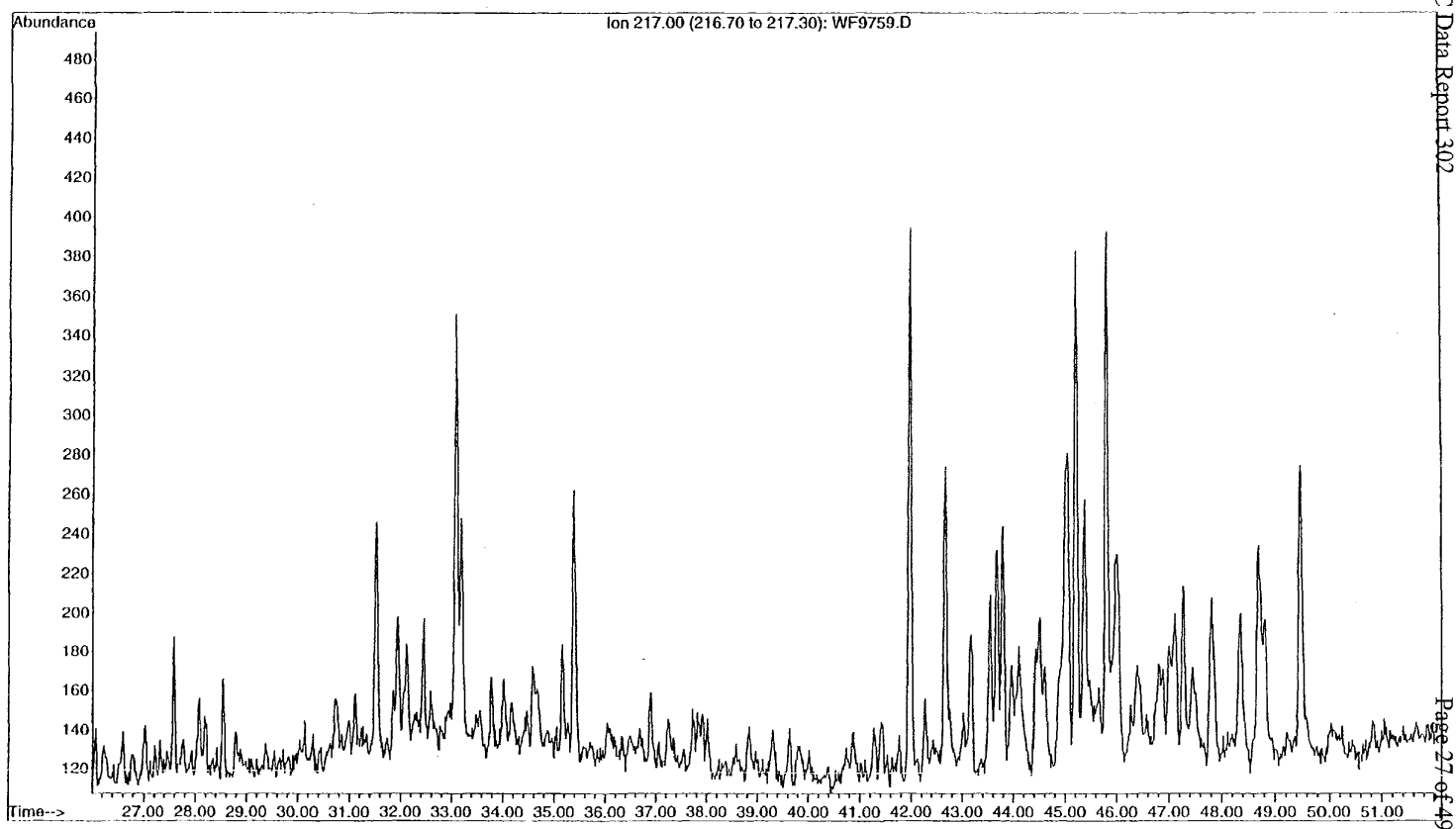
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Sample: E. Teshekpuk #1 7090-7180'



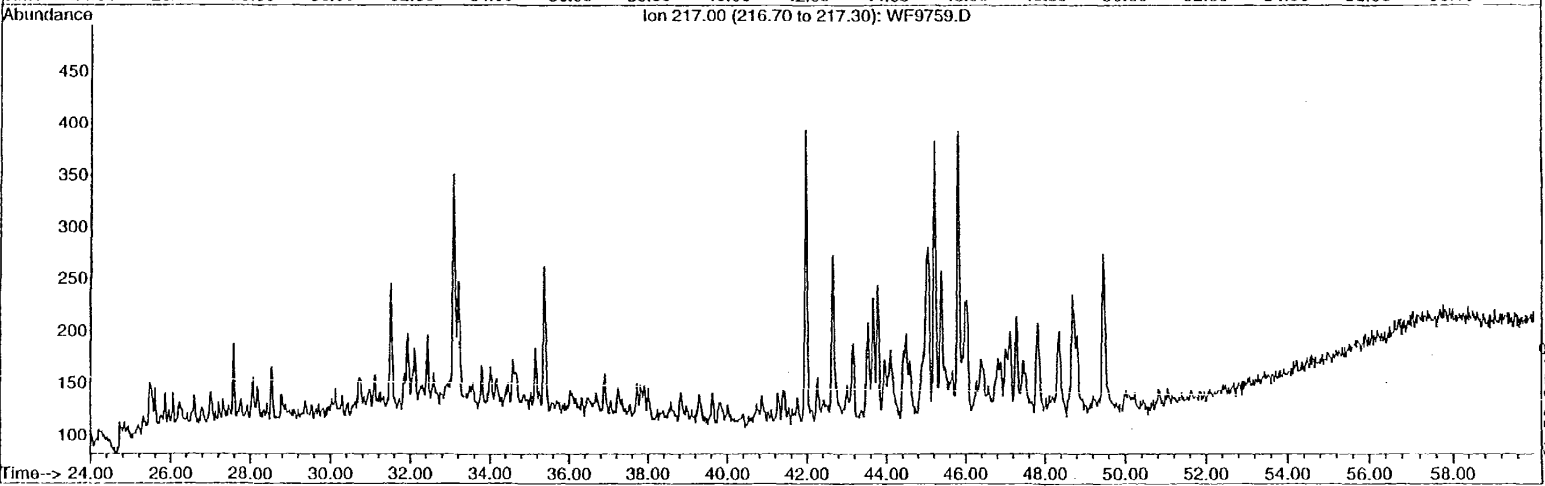
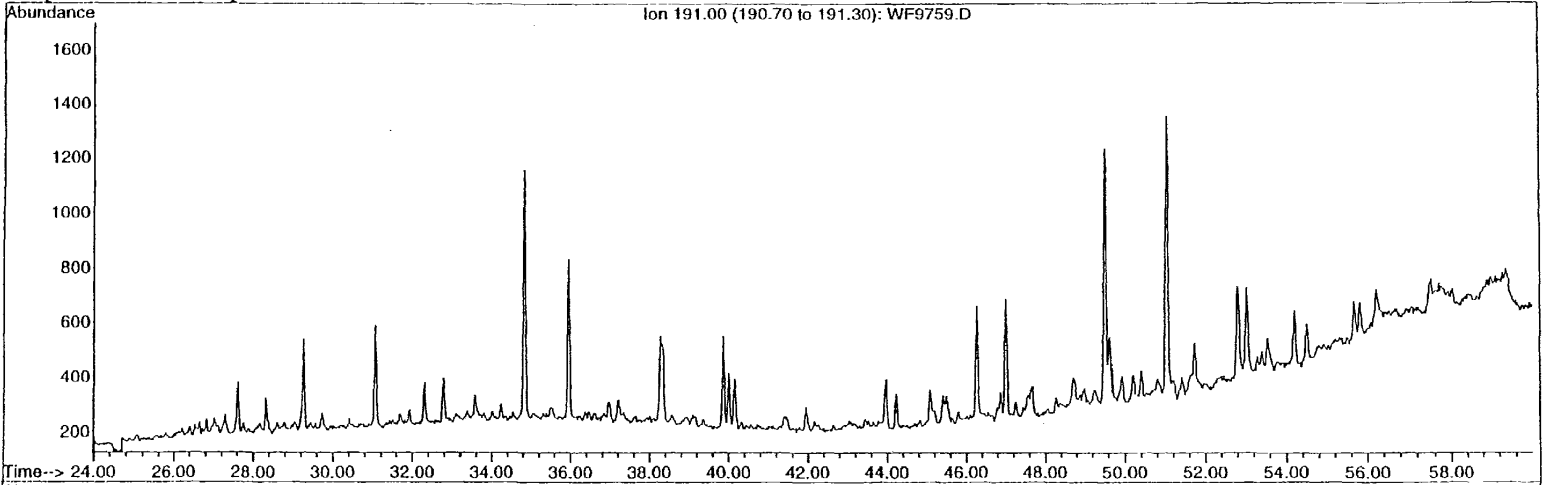
WESTPORT LABORATORY

Data File: WF9759.D
Sample: E. Teshekpuk #1 7090-7180'



WESTPORT LABORATORY

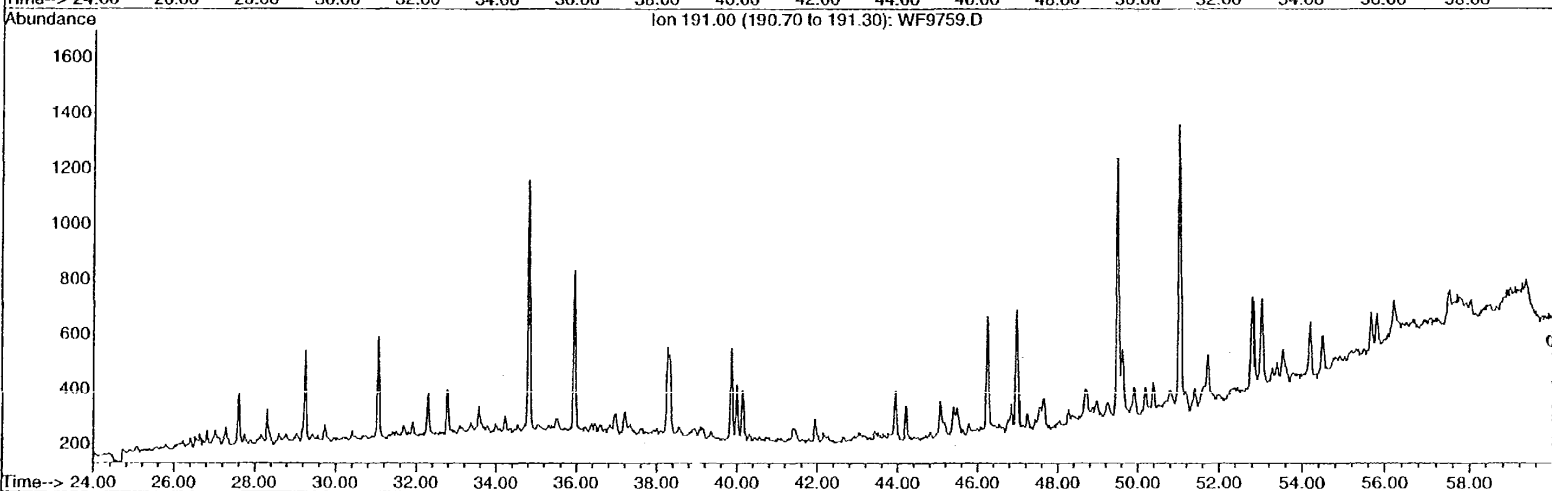
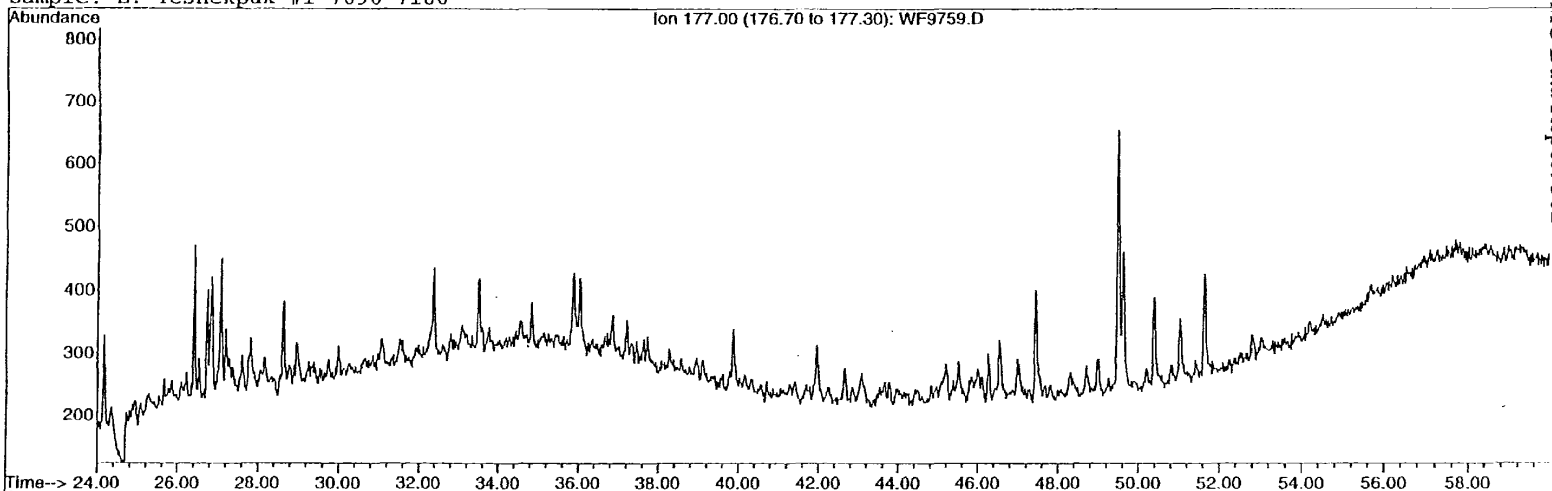
Data File: WF9759.D
Sample: E. Teshekpuk #1 7090-7180'



WESTPORT LABORATORY

Data File: WF9759.D

Sample: E. Teshekpuk #1 7090-7180'



WF9760

Saturate Biomarker Report

DATA FILE: WF9760.D
 DATE ACQUIRED: 7 Apr 1999 11:49
 MISC. INFO: West Fish Creek #1 5520-5780'

PEAK #	RET TIME	AMU	COMPOUND NAME	AREA
1	27.64	191	C19 Tricyclic (Cheilanthane)	63819
2	29.28	191	C20 Tricyclic (Cheilanthane)	66992
3	31.09	191	C21 Tricyclic (Cheilanthane)	77297
4	32.81	191	C22 Tricyclic (Cheilanthane)	25736
5	34.86	191	C23 Tricyclic (Cheilanthane)	95959
6	35.98	191	C24 Tricyclic (Cheilanthane)	78322
7	38.35	191	C25 Tricyclic (Cheilanthane)	56679
8	39.89	191	C24 Tetracyclic	50699
9	40.02	191	C26 Tricyclic R (Cheilanthane)	19043
10	40.17	191	C26 Tricyclic S (Cheilanthane)	20163
11	43.97	191	C28 Tricyclic R (Cheilanthane)	31268
12	44.24	191	C28 Tricyclic S (Cheilanthane)	20404
13	45.10	191	C29 Tricyclic R (Cheilanthane)	26229
14	45.43	191	C29 Tricyclic S (Cheilanthane)	20976
15	46.29	191	Ts (22,29,30-Trisnorhopane-II)	85259
16	46.80	191	C26 Tetracyclic	11695
17	47.02	191	Tm (22,29,30-Trisnorhopane)	78213
18	47.27	191	C30 Tricyclic R	17409
19	47.66	191	C30 Tricyclic S	23708
20	48.74	191	28,30 Bisnorhopane	21535
21	49.52	191	17a,21b(H)-30-norhopane(C29 Nor)	198734
22	49.66	191	18a(H)-30-norhopane (C29 Ts)	65420
23	49.94	191	17a(H)-diahopane	51695
24	50.41	191	Normoretane	33546
25	50.84	191	Oleanane	2073
26	51.06	191	17a,21b(H)-hopane (C30 Hopane)	392982
27	51.15	191	17a(H)-30-nor-29-homohopane	21652
28	51.75	191	17b,21a(H)-hopane (Moretane)	62086
29	52.83	191	17a,21b(H)-homohopane 22S (C31)	163757
30	53.05	191	17a,21b(H)-homohopane 22R (C31)	123217
31	53.31	191	Gamma-cerane	13132
32	54.21	191	17a,21b(H)-bishomohopane S	84241
33	54.51	191	17a,21b(H)-bishomohopane R	66438
34	55.83	191	17a,21b(H)-trishomohopane S	58518
35	56.24	191	17a,21b(H)-trishomohopane R	39849
36	57.52	191	17a,21b(H)-tetrakishomohopane S	38379
37	58.05	191	17a,21b(H)-tetrakishomohopane R	27036
38	59.40	191	17a,21b(H)pentakishomohopane S	18986
39	60.16	191	17a,21b(H)pentakishomohopane R	17852
40	31.53	217	C21 Diapregnane	36051

Saturate Biomarker Report

41	31.96	217	LMW Sterane	20526
42	32.46	217	LMW Steran	13374
43	33.11	217	C21 Pregnane	56405
44	33.22	217	C22 Diahomopregnane	34174
45	35.18	217	LMW Sterane	14021
46	35.40	217	C22 Homopregnane	32707
47	41.98	217	C27S ba Diasterane	65833
48	42.68	217	C27R ba Diasterane	38879
49	43.18	217	Peak 10	19072
50	43.54	217	Peak 11	25865
51	43.69	217	Peak 12	25456
52	43.81	217	Peak 13	33055
53	44.12	217	Peak 14	13592
54	44.51	217	Peak 15	21526
55	45.06	217	C27S aaa Sterane	34108
56	45.22	217	C27R abb Ster +C29S Diasterane	79557
57	45.39	217	C27S abb Sterane	25927
58	45.82	217	C27R aaa Sterane	32035
59	46.01	217	C29 ba Diasterane	70225
60	46.81	217	C28S aaa Sterane	6424
61	47.12	217	C28R abb Sterane	19247
62	47.30	217	C28S abb Sterane	28581
63	47.50	217	Diasterane	20698
64	47.84	217	C28R aaa Sterane	21108
65	48.36	217	C29S aaa Sterane	34901
66	48.71	217	C29R abb Sterane	50269
67	48.82	217	C29S abb Sterane	25095
68	49.50	217	C29R aaa Sterane	72218
69	49.62	217	C30S aaa Sterane	6308
70	50.02	217	C30R abb Sterane	8487
71	50.09	217	C30S abb Sterane	6255
72	50.86	217	C30R aaa Sterane	7609
73	45.22	218	C27R abb Sterane	48852
74	45.39	218	C27S abb Sterane	28802
75	47.14	218	C28R abb Sterane	24050
76	47.30	218	C28S abb Sterane	29623
77	48.71	218	C29R abb Sterane	48036
78	48.82	218	C29S abb Sterane	40918
				4814

Westport Biomarker Ratios

WF9760

Saturate Biomarker Report

Homohopane Profile:		Value
C31=(Peaks 29 +30)/(Peaks 29 +30 +32 through 39)		0.450
C32=(Peaks 32 +33)/(Peaks 29 +30 +32 through 39)		0.236
C33=(Peaks 34 +35)/(Peaks 29 +30 +32 through 39)		0.154
C34=(Peaks 36 +37)/(Peaks 29 +30 +32 through 39)		0.102
C35=(Peaks 38 +39)/(Peaks 29 +30 +32 through 39)		0.058
Oleanane Ratio=	Peak 25/Peak 26	0.005
Gammacerane Ratio 1=	Peak 31/Peak 26	0.033
Gammacerane Ratio 2=	Peak 31/Peak30	0.107
Bisnorhopane Ratio=	Peak 20/Peak 26	0.055
30-nor-29-homo+2a-methyl Ratio	Peak 27/Peak 26	0.055
C29 Ts/(C29 Norhopane + C29 Ts=	Peak 22/(Peaks 21 + 22)	0.248
C30 to Norhopane & Homopane Indices:		
Norhopane/Hopane = Peak 21/Peak 21+26		0.336
Hopane/Hopane+Hopane		0.500
C31/Hopane = Peaks 29 + 30/Peaks 29 + 30 + 26		0.422
C32/Hopane = Peaks 32 + 33/Peaks 32 + 33 + 26		0.277
C33/Hopane = Peaks 34 + 35/Peaks 34 + 35 + 26		0.200
C34/Hopane = Peaks 36 + 37/Peaks 36 + 37 + 26		0.143
C35/Hopane = Peaks 38 + 39/Peaks 38 + 39 + 26		0.086
Ts/Tm=	Peak 15/Peak 17	1.090
C23 Tricyclic/Hopane Ratio=	Peak 5/Peak 26	0.244
C23 Tricyclic/C24 Tricyclic Ratio=	Peak 5/Peak 6	1.225
C24 Tetracyclic/C25 Tricyclic Ratio=	Peak 8/Peak 7	0.894
C24 Tetracyclic/C26 Tricyclic Ratio=	Peak 8/Peaks 9+10	1.293
Moretane Index=	Peak 28/Peaks 26+28	0.136
Normoretane Index=	Peak 24/Peaks 24+26	0.079
Tricyclic/Hopane Ratio=		0.319

BP Sunbury Traditional Biomarker Ratios

Saturate Biomarker Report

S1	C29S/C29S+C29R Sterane			0.326
S2	C29R&S abb/C29S&R aaa + C29R&S abb			0.454
		C27	C28	C29
S3	aaa 20R Steranes	25.55%	16.84%	57.61%
S4	abb 20S&20R Steranes	35.25%	24.37%	40.38%
S5	Dia ba/(Dia+Non-Diasteranes) (Calculated)			48.84%
M4	C27-35 Hopanes/(Hopanes + Steranes C27-29)			75.69%
H1	C32S/C32s + R Hopane			0.559
H2	C31S/C31s + R Hopane			0.571
H3	C30 Hopane/Hopane + Moretane			0.864
H6	18A/18A + 17A Hopane			0.522

BPX Source Indicators

1920Tri23 Index ((C19+20 Tris)/(C19+20+23 Tris))	0.577
23TriHo Index (C23 Tri/(C23 Tri + Hopane))	0.196
24TetHo Index (C24 Tetra/(C24 Tetra + Hopane))	0.114
TmTs Index (Tm/(Tm+Ts))	0.478
Bis Index (Bisnorhopane/(Bisnorhopane + Hopane))	0.052
Moretane Index (Moretane/(Moretane + Hopane))	0.136
Ol30Ho Index (Oleanane/(Oleanane + Hopane))	0.005
BP G2 Index (G2/(G2 + Hopane))	0.052
G2 = coelution of 17a(H)-30-nor-29-homohopane and 2a-methyl-17a(H),21b(H)-hopane	
Ga30Ho Index (Gammacerane/(Gammacerane+Hopane))	0.032
35Ho34 Index (C35 Homohopane/(C35 +C34 Homohopanes))	0.360
HoSt Index (M4/100)	0.757

WF9760

Saturate Biomarker Report

29S/27 Index (C29 Steranes/(C27+29 steranes from S3))	0.693
DiaSt Index (C27 Diasteranes/(C27 Dias + C27 Steranes))	0.488
DMH Index (Demethylated Hopane/(Dem. Hopane + Hopane))	nm
Hopane Profile Indices (N hopane or homohopane/(Sum C29-C35 Hopanes))	
C29=	0.162
C30=	0.320
C31=	0.233
C32=	0.123
C33=	0.080
C34=	0.053
C35=	0.030

BPX Maturity Indicators

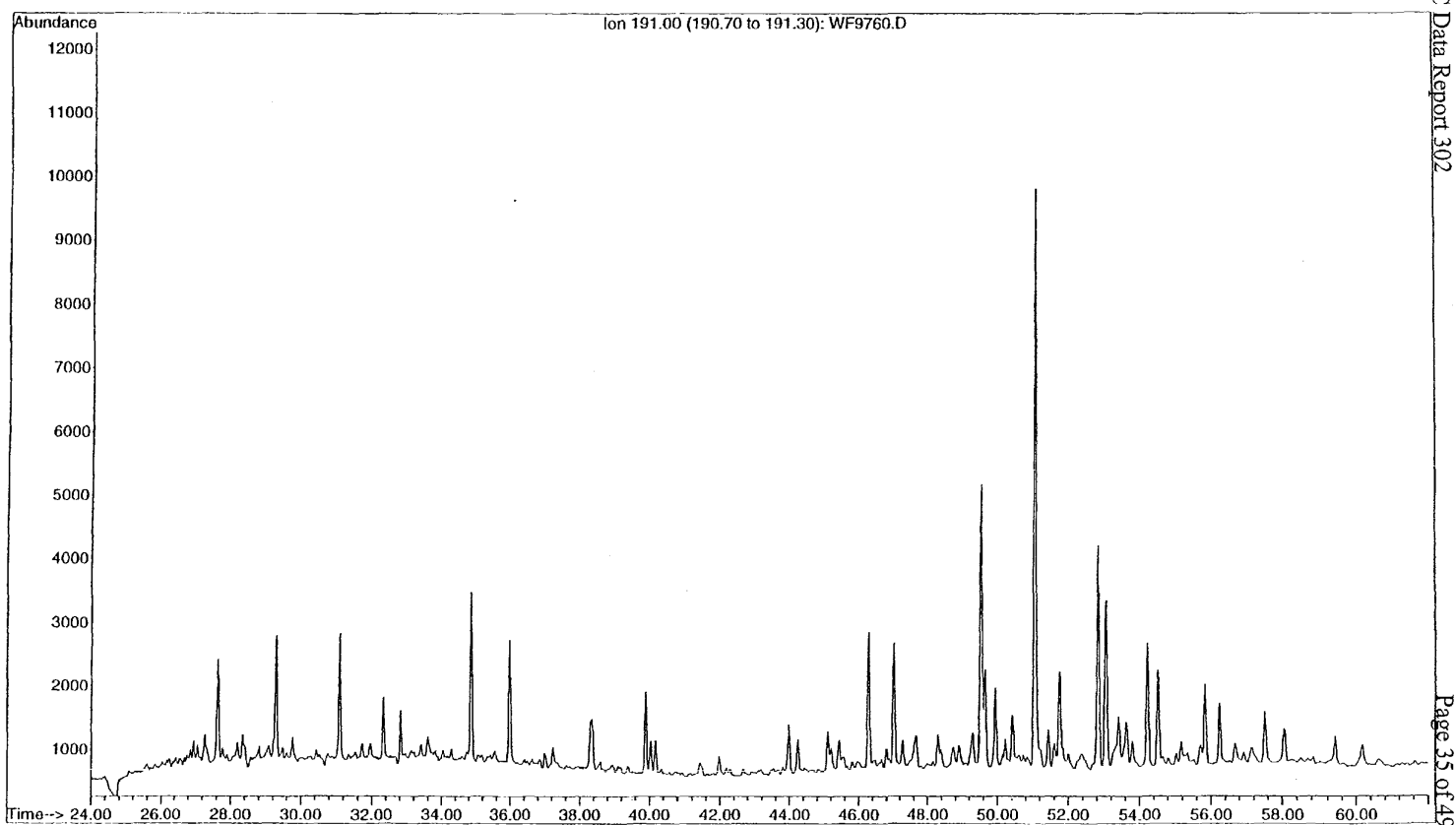
S1	C29S/C29S+C29R Sterane	0.326
S2	C29R&S abb/C29S&R aaa +C29R&S abb	0.454
H1	C32S/C32s + R Hopane	0.559
H2	C31S/C31S + R Hopane	0.571

pnf = peak not found

*** = no value due to missing peaks

WESTPORT LABORATORY

Data File: WF9760.D
Sample: West Fish Creek #1 5520-5780'

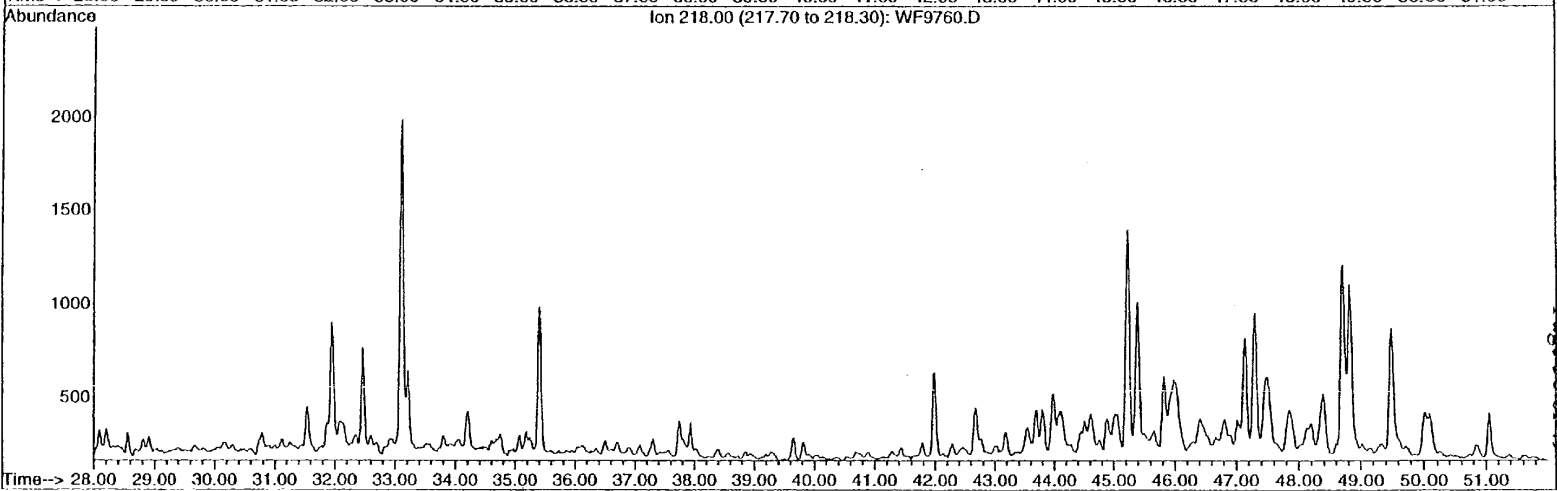
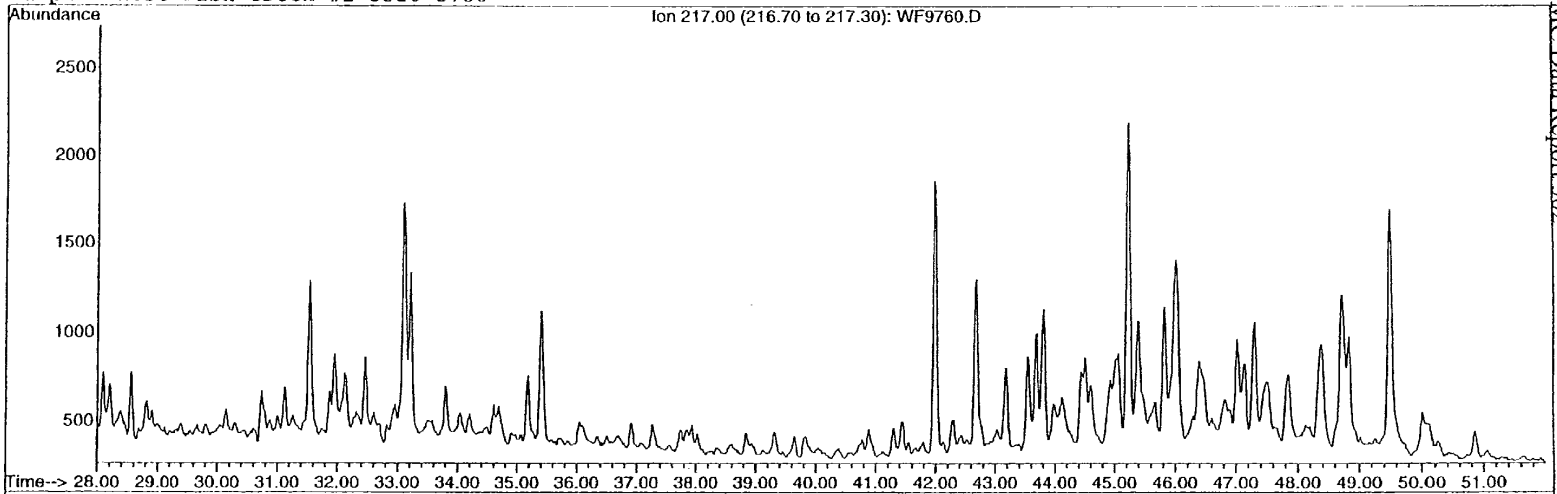


WESTPORT LABORATORY

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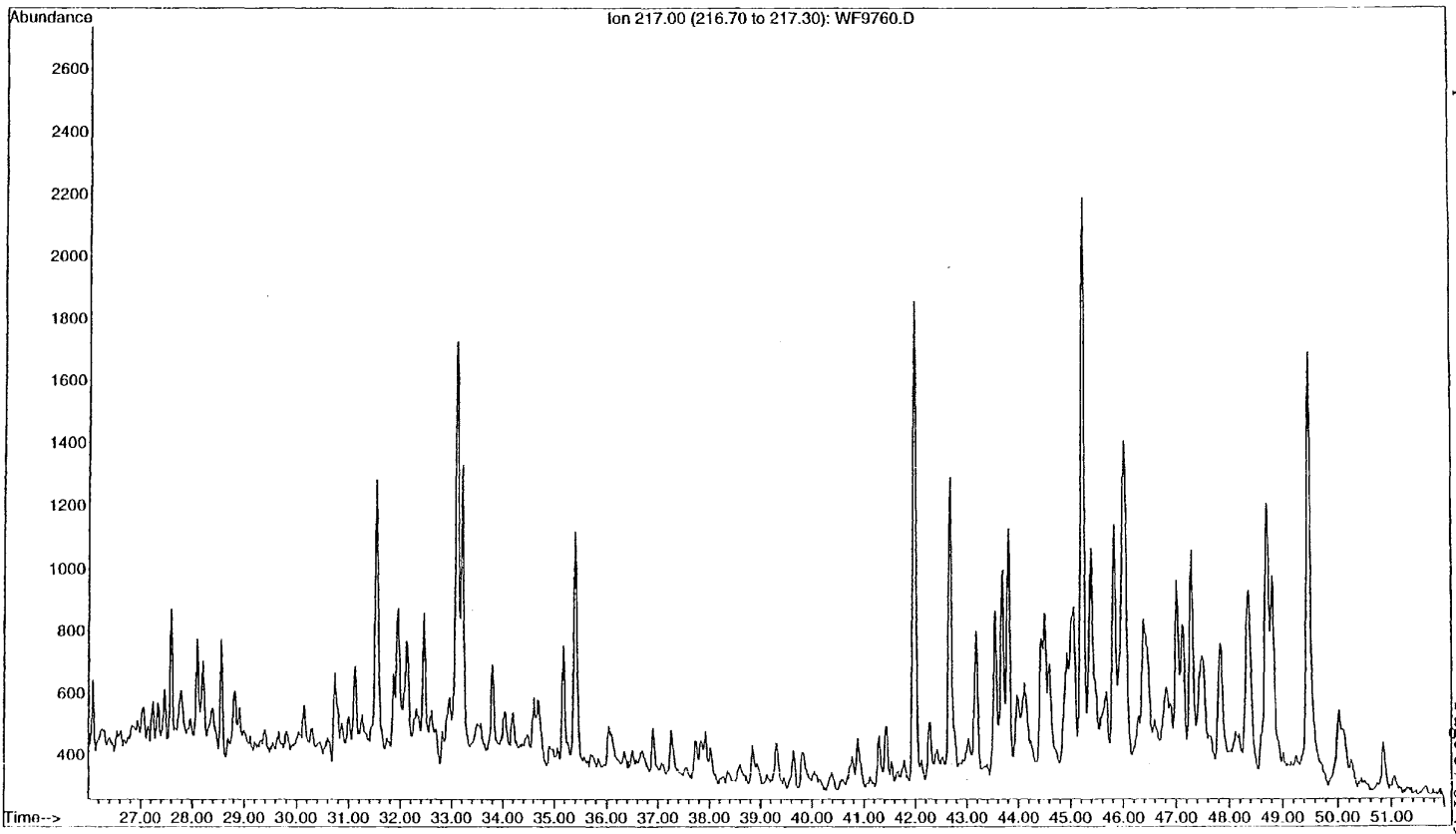
GMC Data Report 302



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WESTPORT LABORATORY

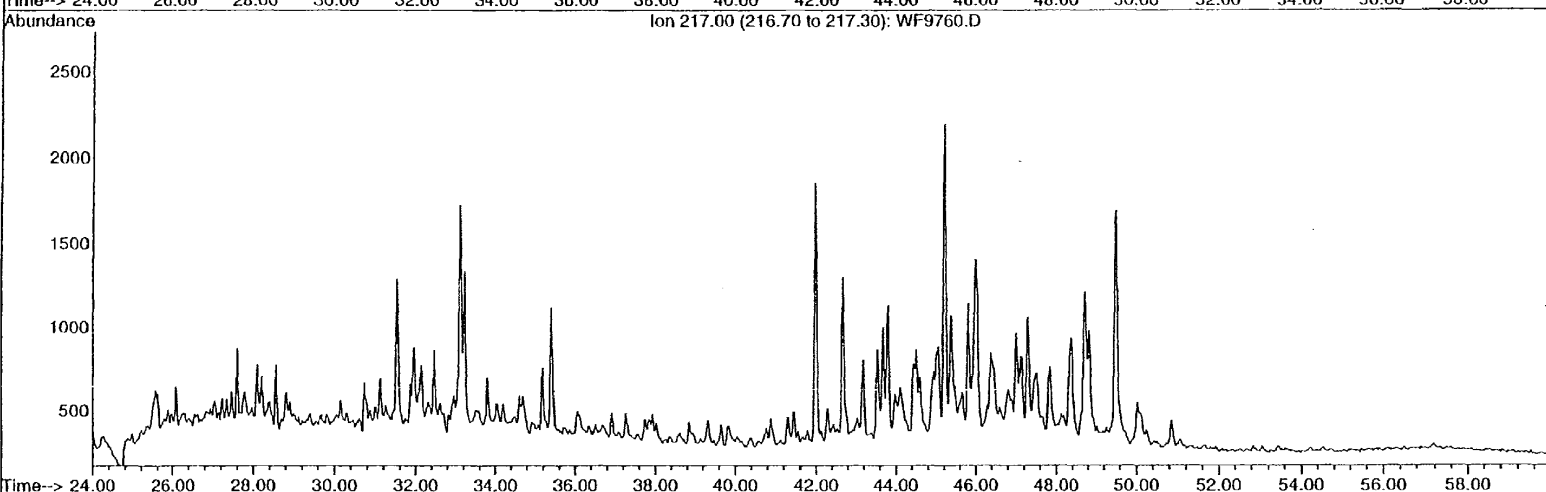
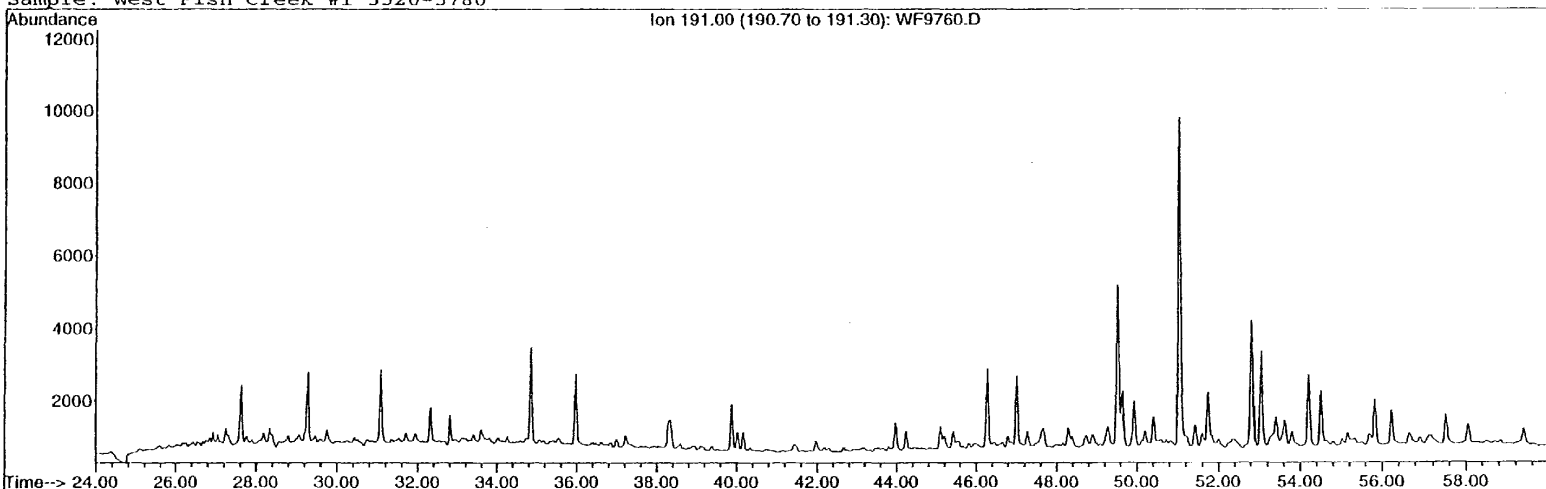
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Sample: West Fish Creek #1 5520-5780'



WESTPORT LABORATORY

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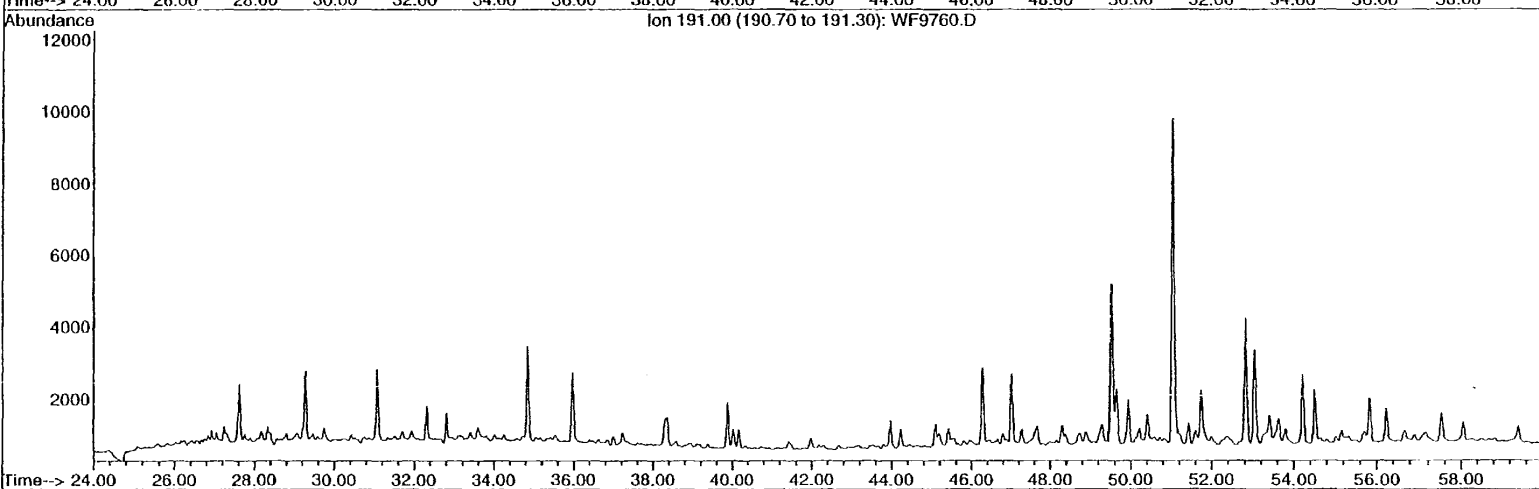
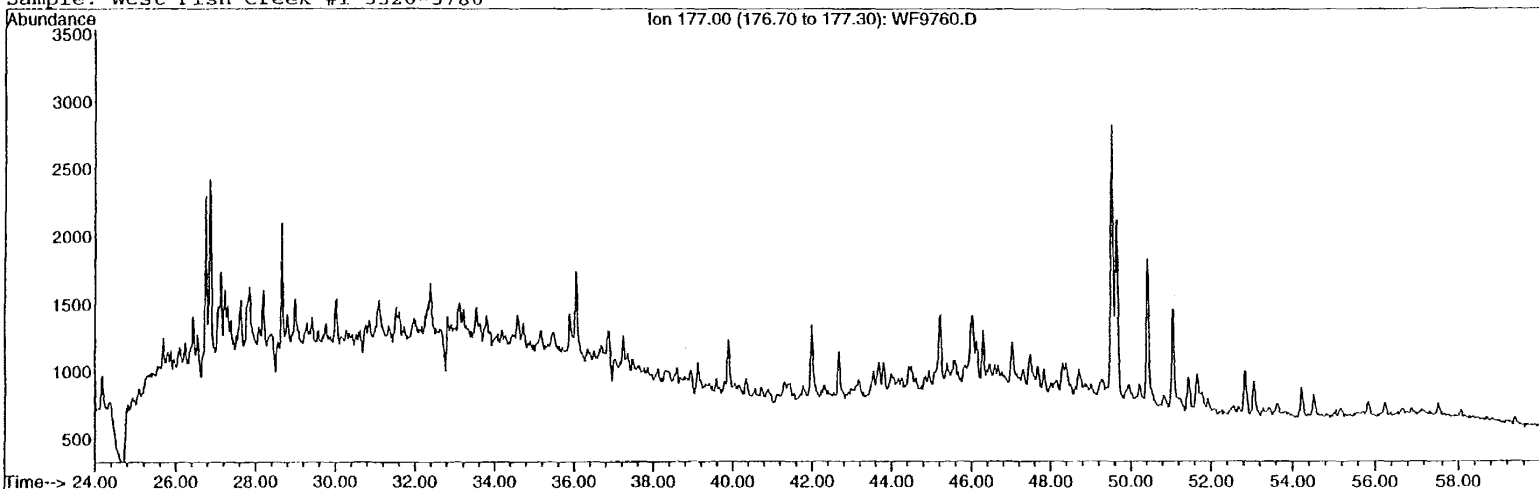
Sample: West Fish Creek #1 5520-5780'



WESTPORT LABORATORY

Data File: WF9760.D

Sample: West Fish Creek #1 5520-5780'



WF9761

Saturate Biomarker Report

DATA FILE: WF9761.D
 DATE ACQUIRED: 7 Apr 1999 13:04
 MISC. INFO: West Fish Creek #1 7460-7580'

PEAK #	RET TIME	AMU	COMPOUND NAME	AREA
1	27.66	191	C19 Tricyclic (Cheilanthane)	93600
2	29.29	191	C20 Tricyclic (Cheilanthane)	130637
3	31.09	191	C21 Tricyclic (Cheilanthane)	120094
4	32.81	191	C22 Tricyclic (Cheilanthane)	39777
5	34.86	191	C23 Tricyclic (Cheilanthane)	145827
6	35.98	191	C24 Tricyclic (Cheilanthane)	98184
7	38.30	191	C25 Tricyclic (Cheilanthane)	57294
8	39.89	191	C24 Tetracyclic	110287
9	40.02	191	C26 Tricyclic R (Cheilanthane)	15077
10	40.17	191	C26 Tricyclic S (Cheilanthane)	17674
11	43.97	191	C28 Tricyclic R (Cheilanthane)	42080
12	44.23	191	C28 Tricyclic S (Cheilanthane)	10830
13	45.10	191	C29 Tricyclic R (Cheilanthane)	18642
14	45.43	191	C29 Tricyclic S (Cheilanthane)	11304
15	46.27	191	Ts (22,29,30-Trisnorhopane-II)	90989
16	46.80	191	C26 Tetracyclic	30058
17	47.02	191	Tm (22,29,30-Trisnorhopane)	230304
18	47.27	191	C30 Tricyclic R	10308
19	47.68	191	C30 Tricyclic S	27899
20	48.75	191	28,30 Bisnorhopane	23286
21	49.52	191	17a,21b(H)-30-norhopane(C29 Nor)	559311
22	49.64	191	18a(H)-30-norhopane (C29 Ts)	98152
23	49.94	191	17a(H)-diahopane	67837
24	50.41	191	Normoretane	110467
25	50.83	191	Oleanane	3233
26	51.05	191	17a,21b(H)-hopane (C30 Hopane)	804096
27	51.15	191	17a(H)-30-nor-29-homohopane	36701
28	51.75	191	17b,21a(H)-hopane (Moretane)	195344
29	52.82	191	17a,21b(H)-homohopane 22S (C31)	369472
30	53.04	191	17a,21b(H)-homohopane 22R (C31)	265222
31	53.27	191	Gamma-cerane	30357
32	54.21	191	17a,21b(H)-bishomohopane S	194466
33	54.52	191	17a,21b(H)-bishomohopane R	133401
34	55.83	191	17a,21b(H)-trishomohopane S	125116
35	56.23	191	17a,21b(H)-trishomohopane R	86303
36	57.52	191	17a,21b(H)-tetrakishomohopane S	72140
37	58.05	191	17a,21b(H)-tetrakishomohopane R	43270
38	59.39	191	17a,21b(H)-pentakishomohopane S	30186
39	60.16	191	17a,21b(H)-pentakishomohopane R	25061
40	31.54	217	C21 Diapregnane	46097

Saturate Biomarker Report

41	31.96	217	LMW Sterane	22840
42	32.46	217	LMW Steran	17403
43	33.11	217	C21 Pregnane	74399
44	33.21	217	C22 Diahomopregnane	40452
45	35.17	217	LMW Sterane	14074
46	35.40	217	C22 Homopregnane	35907
47	41.98	217	C27S ba Diasterane	42717
48	42.66	217	C27R ba Diasterane	22965
49	43.17	217	Peak 10	11281
50	43.54	217	Peak 11	14451
51	43.67	217	Peak 12	15254
52	43.79	217	Peak 13	19582
53	44.12	217	Peak 14	8803
54	44.51	217	Peak 15	12206
55	45.06	217	C27S aaa Sterane	27597
56	45.21	217	C27R abb Ster +C29S Diasterane	42079
57	45.39	217	C27S abb Sterane	13829
58	45.82	217	C27R aaa Sterane	42803
59	46.02	217	C29 ba Diasterane	39498
60	46.81	217	C28S aaa Sterane	9381
61	47.12	217	C28R abb Sterane	16178
62	47.29	217	C28S abb Sterane	14855
63	47.47	217	Diasterane	10523
64	47.82	217	C28R aaa Sterane	39854
65	48.36	217	C29S aaa Sterane	43231
66	48.71	217	C29R abb Sterane	34053
67	48.81	217	C29S abb Sterane	13559
68	49.48	217	C29R aaa Sterane	74888
69	49.64	217	C30S aaa Sterane	4373
70	50.02	217	C30R abb Sterane	3131
71	50.10	217	C30S abb Sterane	4296
72	50.86	217	C30R aaa Sterane	4262
73	45.21	218	C27R abb Sterane	27941
74	45.39	218	C27S abb Sterane	17335
75	47.14	218	C28R abb Sterane	16588
76	47.30	218	C28S abb Sterane	16998
77	48.71	218	C29R abb Sterane	28493
78	48.82	218	C29S abb Sterane	24904
				4814

Westport Biomarker Ratios

Saturate Biomarker Report

Homohopane Profile:		Value
C31=(Peaks 29 +30)/(Peaks 29 +30 +32 through 39)		0.472
C32=(Peaks 32 +33)/(Peaks 29 +30 +32 through 39)		0.244
C33=(Peaks 34 +35)/(Peaks 29 +30 +32 through 39)		0.157
C34=(Peaks 36 +37)/(Peaks 29 +30 +32 through 39)		0.086
C35=(Peaks 38 +39)/(Peaks 29 +30 +32 through 39)		0.041
Oleanane Ratio=	Peak 25/Peak 26	0.004
Gammacerane Ratio 1=	Peak 31/Peak 26	0.038
Gammacerane Ratio 2=	Peak 31/Peak30	0.114
Bisnorhopane Ratio=	Peak 20/Peak 26	0.029
30-nor-29-homo+2α-methyl Ratio	Peak 27/Peak 26	0.046
C29 Ts/(C29 Norhopane + C29 Ts=	Peak 22/(Peaks 21 + 22)	0.149
C30 to Norhopane & Hopane Indices:		
Norhopane/Hopane =	Peak 21/Peak 21+26	0.410
Hopane/Hopane+Hopane		0.500
C31/Hopane =	Peaks 29 + 30/Peaks 29 + 30 + 26	0.441
C32/Hopane =	Peaks 32 + 33/Peaks 32 + 33 + 26	0.290
C33/Hopane =	Peaks 34 + 35/Peaks 34 + 35 + 26	0.208
C34/Hopane =	Peaks 36 + 37/Peaks 36 + 37 + 26	0.126
C35/Hopane =	Peaks 38 + 39/Peaks 38 + 39 + 26	0.064
Ts/Tm=	Peak 15/Peak 17	0.395
C23 Tricyclic/Hopane Ratio=	Peak 5/Peak 26	0.181
C23 Tricyclic/C24 Tricyclic Ratio=	Peak 5/Peak 6	1.485
C24 Tetracyclic/C25 Tricyclic Ratio=	Peak 8/Peak 7	1.925
C24 Tetracyclic/C26 Tricyclic Ratio=	Peak 8/Peaks 9+10	3.367
Moretane Index=	Peak 28/Peaks 26+28	0.195
Normoretane Index=	Peak 24/Peaks 24+26	0.121
Tricyclic/Hopane Ratio=		0.235

BP Sunbury Traditional Biomarker Ratios

Saturate Biomarker Report

S1	C29S/C29S+C29R Sterane			0.366
S2	C29R&S abb/C29S&R aaa + C29R&S abb			0.311
		C27	C28	C29
S3	aaa 20R Steranes	27.17%	25.30%	47.53%
S4	abb 20S&20R Steranes	34.23%	25.39%	40.37%
S5	Dia ba/(Dia+Non-Diasteranes) (Calculated)			42.72%
M4	C27-35 Hopanes/(Hopanes + Steranes C27-29)			88.91%
H1	C32S/C32s + R Hopane			0.593
H2	C31S/C31S + R Hopane			0.582
H3	C30 Hopane/Hopane + Moretane			0.805
H6	18A/18A + 17A Hopane			0.283

BPX Source Indicators

1920Tri23 Index ((C19+20 Tris)/(C19+20+23 Tris))	0.606
23TriHo Index (C23 Tri/(C23 Tri + Hopane))	0.154
24TetHo Index (C24 Tetra/(C24 Tetra + Hopane))	0.121
TmTs Index (Tm/(Tm+Ts))	0.717
Bis Index (Bisnorhopane/(Bisnorhopane + Hopane))	0.028
Moretane Index (Moretane/(Moretane + Hopane))	0.195
Ol30Ho Index (Oleanane/(Oleanane + Hopane))	0.004
BP G2 Index (G2/(G2 + Hopane))	0.044
G2 = coelution of 17a(H)-30-nor-29-homohopane and 2a-methyl-17a(H),21b(H)-hopane	
Ga30Ho Index (Gammacerane/(Gammacerane+Hopane))	0.036
35Ho34 Index (C35 Homohopane/(C35 +C34 Homohopanes))	0.324
HoSt Index (M4/100)	0.889

Saturate Biomarker Report

29S/27 Index (C29 Steranes/(C27+29 steranes from S3))	0.636
DiaSt Index (C27 Diasteranes/(C27 Dias + C27 Steranes))	0.427
DMH Index (Demethylated Hopane/(Dem. Hopane + Hopane))	nm
Hopane Profile Indices (N hopane or homohopane/(Sum C29-C35 Hopanes))	
C29=	0.207
C30=	0.297
C31=	0.234
C32=	0.121
C33=	0.078
C34=	0.043
C35=	0.020

BPX Maturity Indicators

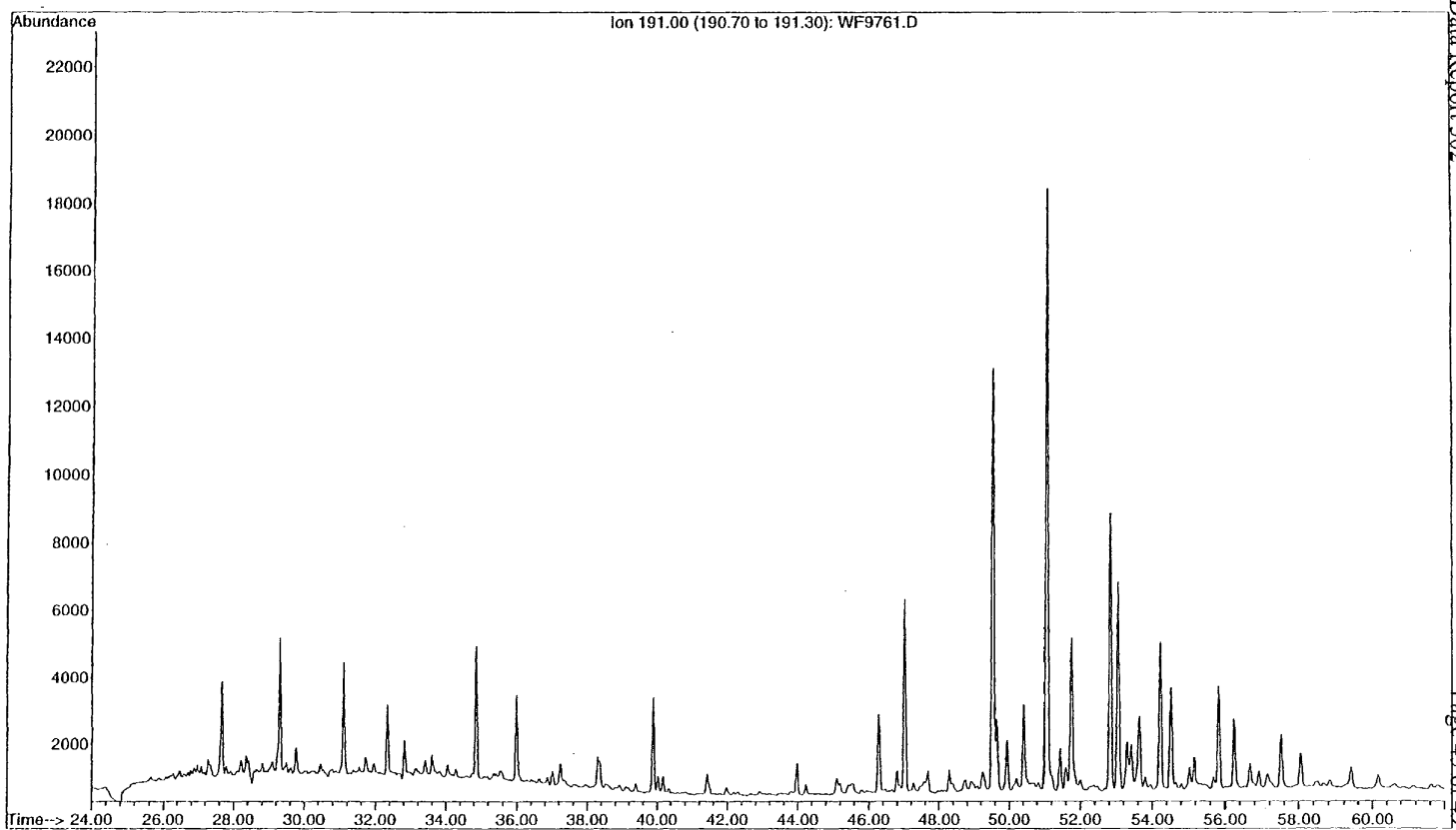
S1	C29S/C29S+C29R Sterane	0.366
S2	C29R&S abb/C29S&R aaa +C29R&S abb	0.311
H1	C32S/C32s + R Hopane	0.593
H2	C31S/C31S + R Hopane	0.582

pnf = peak not found

*** = no value due to missing peaks

WESTPORT LABORATORY

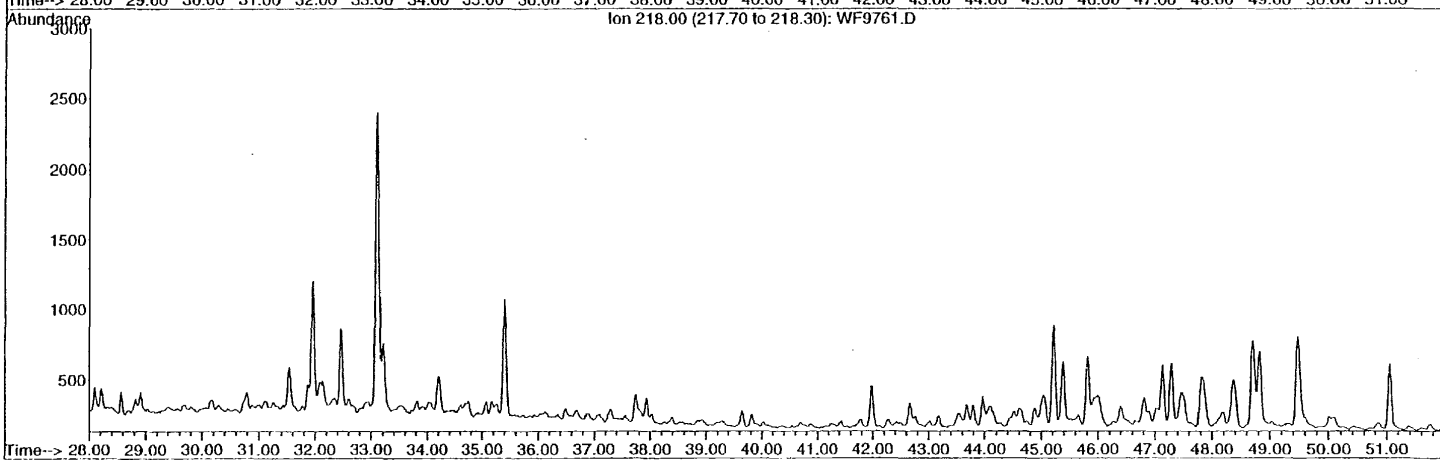
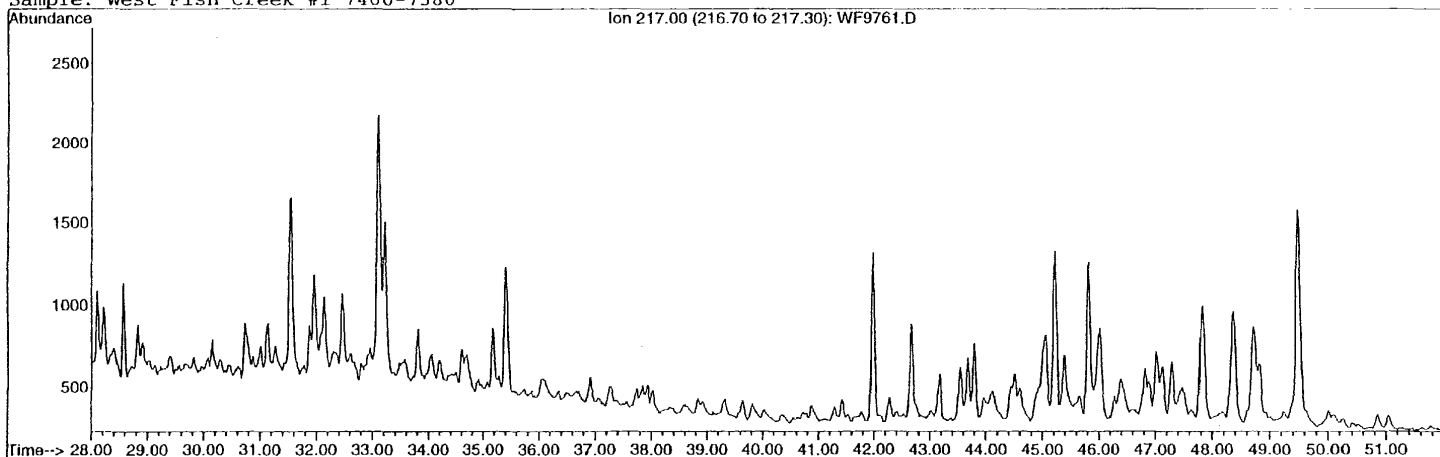
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WESTPORT LABORATORY

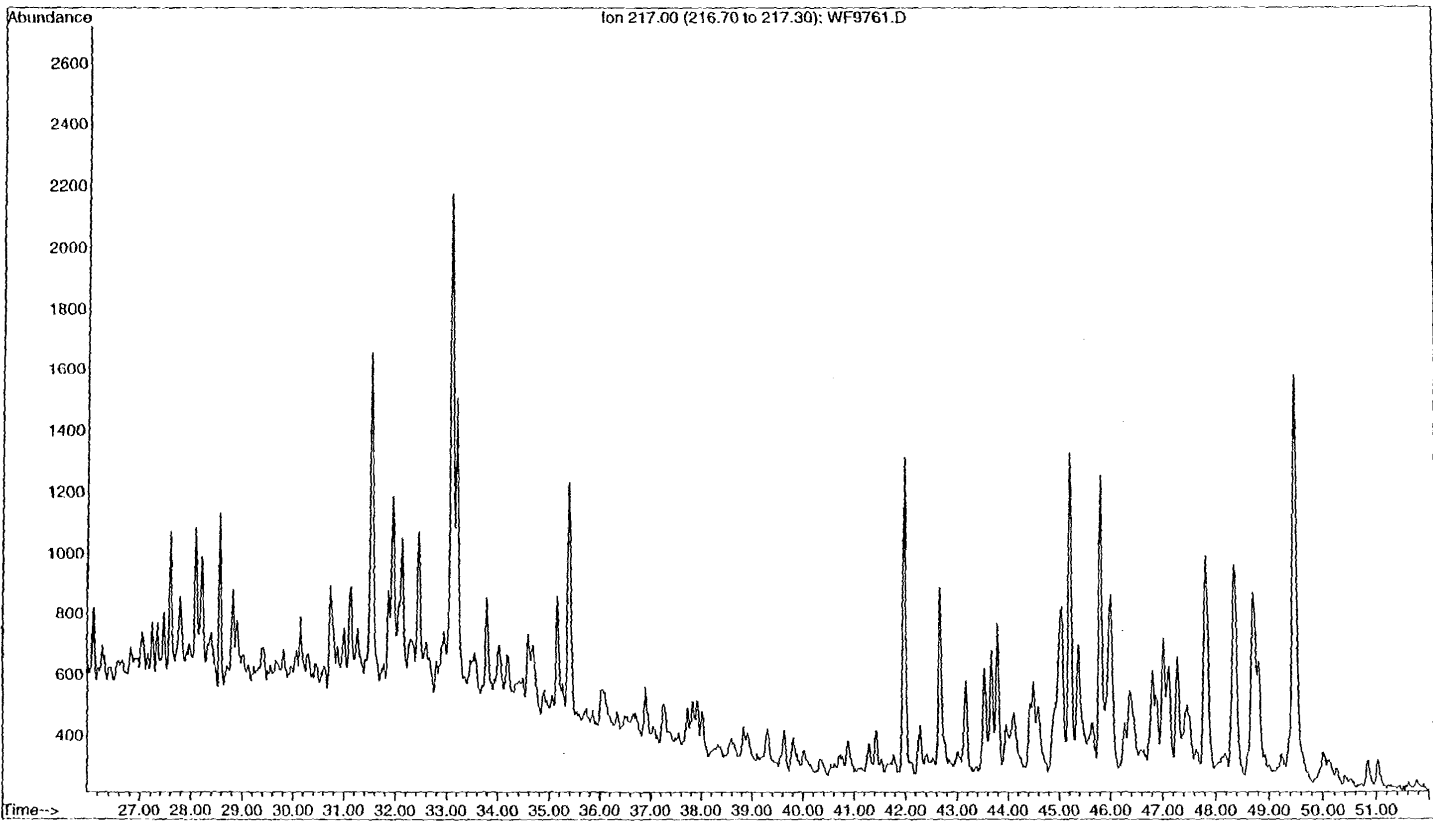
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Sample: West Fish Creek #1 7460-7580'



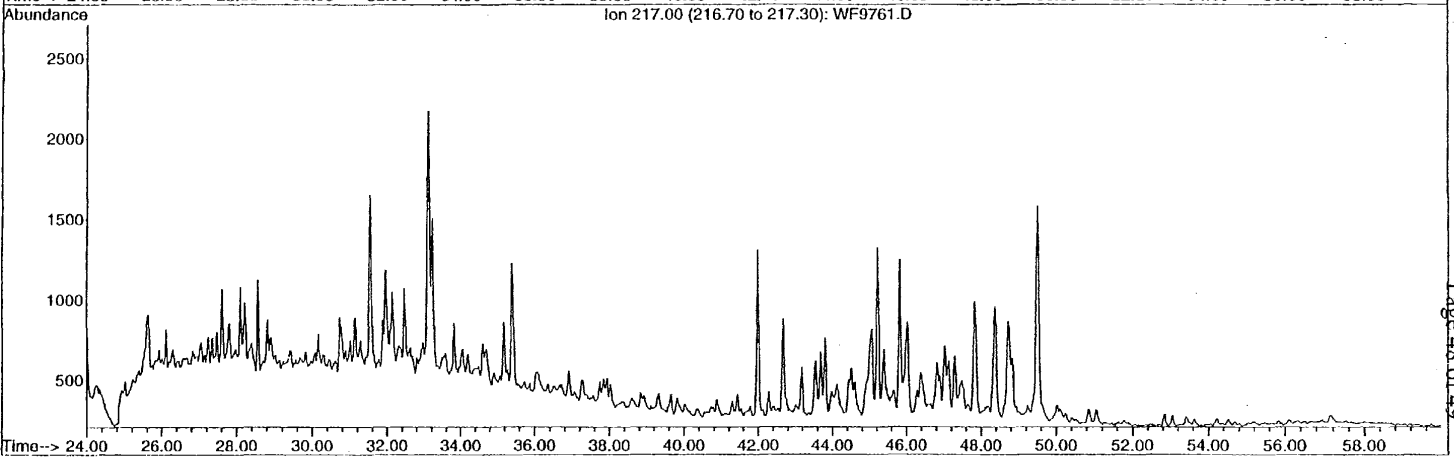
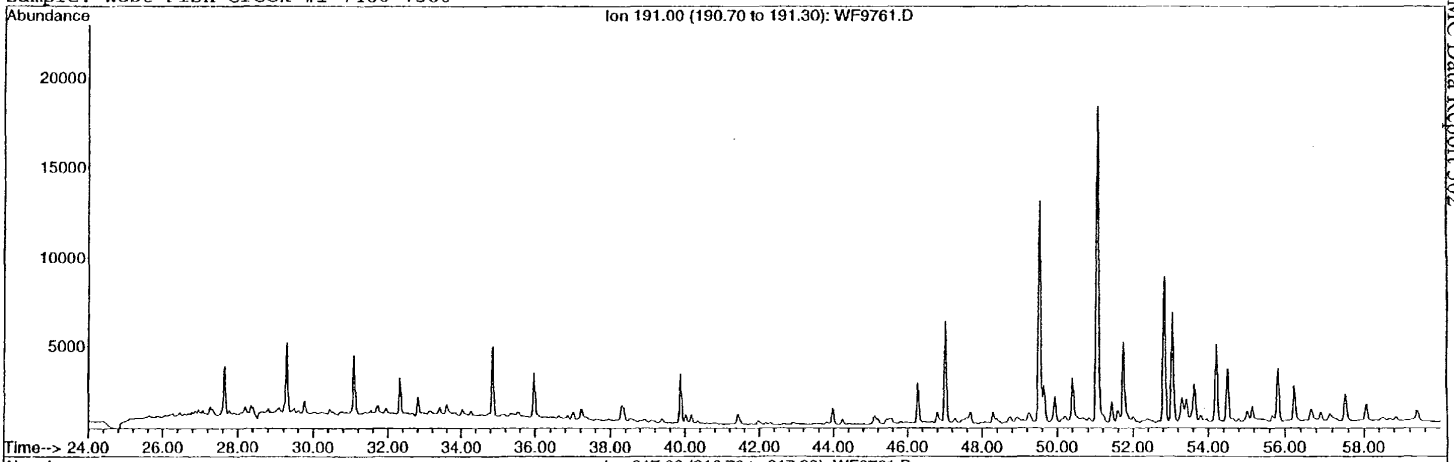
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