

Ken



**TESORO**

Tesoro Hawaii Corporation  
733 Bishop Street Suite 2700  
P.O. Box 3379  
Honolulu, Hawaii 96842-0001  
808 547 3111  
808 547 3145 Fax

January 14, 1999

HAND DELIVERED

Mr. Don Palawski  
U.S. Fish and Wildlife Service  
Pacific Islands Ecoregion  
300 Ala Moana Boulevard, Room 3-122  
Honolulu, Hawaii 96850

Dear Don:

Attached for your information is a copy of the draft data analysis from Arthur D. Little, Inc. for the feather samples taken at Laysan Island and Marine Corps Base Hawaii (Mokapu). The sample labeled "Item 5" is a feather sample from Laysan Island. I will forward you a copy of the final report when it is completed.

Very truly yours,

R. Chris Jansen  
Manager  
Environmental Compliance

RCJ:ds  
Attachment  
cc: Ms. Judy Nedoff, Entrix, Inc.

Environmental  
Monitoring and Analysis Unit  
Arthur D. Little, Inc.  
Acorn Park  
Cambridge, Massachusetts  
02140-2390 USA

Direct Number (1) 617.498.5387  
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**Fax Transmittal**

<b>To:</b>	Chris Jansen	<b>Company:</b>	Tesoro, Hawaii
<b>Date:</b>	January 12, 1999	<b>Fax Number:</b>	808-547-3689
<b>From:</b>	John S. Brown	<b>Location:</b>	15W/311
<b>Total number of pages (including cover):</b>		32	

Chris:

Attached are Draft data for the feather samples analyzed by Arthur D. Little, Inc. as part of the Tesoro No. 6 fuel oil spill project. These Draft data include data tables for saturated hydrocarbons (including GC/FID chromatograms), PAH, and steranes and triterpanes (including GC/MS extracted ion chromatograms).

A preliminary evaluation of these feather data versus the Tesoro source oil indicate the following:

- Only one to the feather samples (Item 5) is contaminated with a measurable pattern and/or distribution of petroleum hydrocarbons (i.e., SHC & PAH)
- The Item 5 hydrocarbons likely represent a severely weathered/degraded mid -- heavy range petroleum product (see GC/FID chromatogram)
- A comparison of the Item 5 feather data to the Tesoro spilled oil indicates that the spilled Tesoro No. 6 fuel oil (SPM Hose 001) is not the source of petroleum hydrocarbons found on the Item 5 feather sample. Note the differences in the sterane and triterpane chromatograms, i.e., the presence of oleanane (T18) in the feather and the difference in the Ts/Tm ratio (T11/T12).

Please call me at 617-498-5387 if you require additional information concerning these samples.

Regards,



John S. Brown

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Arthur D. Little  
Environmental Monitoring and Analysis Unit

**DRAFT**

Project Title : Tesoro - Feathers  
Data Package: 1512  
Data Table: PAH - Main - Surrogate Corrected

Field ID	SRM 1491	North Slope Crude	Item 5	Item 4
Lab ID	BO19	BN14	98D4904	98D4903
Lab Batch	B0247	B0247	B0247	B0247
File	DZ5836.D	DZ5837.D	DZ5836.D	DZ5836.D
Sample Type	QC	QC	3AMP	3AMP
Weight Basis	VOLUME	OIL	OIL	OIL
Matrix	SRM	OIL	FEATHER	FEATHER
Sample Size	0.1 mL	5 mg	4.05 mg	0.16 mg
Associated Blank	NA	NA	BY-9-57PB	BY-9-57PB
Field Date	NA	NA	10/04/98	09/27/98
Extract Date	NA	NA	11/18/98	11/18/98
Analysis Date	01/05/99	01/05/99	01/05/99	01/05/99
Min Reporting Limit	250	5	6.2	160
Units	ug/L	mg/Kg	mg/Kg	mg/Kg
Naphthalene	6600	770 E	1.1 J	ND
C1-Naphthalenes	ND	1800	ND	ND
C2-Naphthalenes	ND	2400	ND	ND
C3-Naphthalenes	ND	2000	ND	ND
C4-Naphthalenes	ND	1200	ND	ND
Acenaphthylene	6900	ND	5.3 J	ND
Acenaphthene	6900	ND	ND	ND
Biphenyl	7200	220	0.39 J	ND
Fluorene	6700	95	ND	ND
C1-Fluorenes	ND	250	ND	ND
C2-Fluorenes	ND	380	ND	ND
C3-Fluorenes	ND	380	ND	ND
Anthracene	8300	ND	ND	ND
Phenanthrene	7000	290	ND	ND
C1-Phenanthrenes/anthracenes	ND	680	16	ND
C2-Phenanthrenes/anthracenes	ND	760	110	ND
C3-Phenanthrenes/anthracenes	ND	580	180	ND
C4-Phenanthrenes/anthracenes	ND	420	150	ND
Dibenzothiophene	ND	240	ND	ND
C1-Dibenzothiophenes	ND	510	ND	ND
C2-Dibenzothiophenes	ND	890	ND	ND
C3-Dibenzothiophenes	ND	650	16	ND
Fluoranthene	6000	ND	ND	ND
Pyrene	6100	11	3.4 J	ND
C1-Fluoranthenes/pyrenes	ND	89	39	ND
C2-Fluoranthenes/pyrenes	ND	160	84	ND
C3-Fluoranthenes/pyrenes	ND	180	84	ND
Benzo[a]anthracene	4000	ND	6.5	ND
Chrysene	6700	44	13	ND
C1-Chrysenes	ND	81	48	ND
C2-Chrysenes	ND	99	93	ND
C3-Chrysenes	ND	93	100	ND
C4-Chrysenes	ND	83	45	ND
Benzo[b]fluoranthene	5200	7.1	2.7 J	ND
Benzo[k]fluoranthene	5600	ND	ND	ND
Benzo[e]pyrene	5700	14	ND	ND
Benzo[a]pyrene	7400	ND	ND	ND
Perylene	7300	ND	ND	ND
Indeno[1,2,3,-c,d]pyrene	6100	ND	ND	ND
Dibenzo[a,h]anthracene	5100	1.5 J	1.7 J	ND
Benzo[g,h,i]perylene	5200	3.5 J	2.1 J	ND
Total PAH	120000	15000	1000	0
%d8-Naphthalene	93	101	109	103
%d10-Acenaphthene	88	100	105	101
%d10-Phenanthrene	90	97	103	99
%d12-Benzo[a]pyrene	98	113	115	113

Arthur D. Little  
Environmental Monitoring and Analysis Unit

**DRAFT**

Project Title : Tesoro - Feathers  
Data Package: 1512  
Data Table: PAH - Main - Surrogate Corrected

	OA 1010-1	OA 1010-2
Field ID	98D3503	98D3504
Lab ID	B0247	B0247
Lab Batch	DZ5840.D	DZ5841.D
File	SAMP	SAMP
Sample Type	OIL	OIL
Weight Basis	FEATHER	FEATHER
Matrix	3.8 mg	1.43 mg
Sample Size	BY-S-67PB	BY-S-67PB
Associated Blank	10/10/98	10/10/98
Field Date	11/16/98	11/16/98
Extract Date	01/05/99	01/05/99
Analysis Date	8.6	17
Min Reporting Limit	mg/Kg	mg/Kg
Units		
<b>Naphthalene</b>	1.3 J	2.4 J
C1-Naphthalenes	ND	ND
C2-Naphthalenes	ND	ND
C3-Naphthalenes	ND	ND
C4-Naphthalenes	ND	ND
Acenaphthylene	1 J	ND
Acenaphthene	ND	ND
Biphenyl	0.81 J	1.4 J
Fluorene	ND	ND
C1-Fluorenes	ND	ND
C2-Fluorenes	ND	ND
C3-Fluorenes	ND	ND
Anthracene	ND	ND
Phenanthrene	1.3 J	ND
C1-Phenanthrenes/anthracenes	ND	ND
C2-Phenanthrenes/anthracenes	ND	ND
C3-Phenanthrenes/anthracenes	ND	ND
C4-Phenanthrenes/anthracenes	ND	ND
Dibenzothiophene	ND	ND
C1-Dibenzothiophenes	ND	ND
C2-Dibenzothiophenes	ND	ND
C3-Dibenzothiophenes	ND	ND
Fluoranthene	ND	2.7 J
Pyrene	ND	2.4 J
C1-Fluoranthenes/pyrenes	ND	ND
C2-Fluoranthenes/pyrenes	ND	ND
C3-Fluoranthenes/pyrenes	ND	ND
Benzo[a]anthracene	ND	ND
Chrysene	ND	ND
C1-Chrysenes	ND	ND
C2-Chrysenes	ND	ND
C3-Chrysenes	ND	ND
C4-Chrysenes	ND	ND
Benzo[b]fluoranthene	ND	ND
Benzo[k]fluoranthene	ND	ND
Benzo[e]pyrene	ND	ND
Benzo[a]pyrene	ND	ND
Perylene	ND	ND
Indeno[1,2,3-c,d]pyrene	ND	ND
Dibenzo[a,h]anthracene	ND	ND
Benzo[g,h,i]perylene	0.89 J	2.6 J
Total PAH	5.3	12
%d8-Naphthalene	94	83
%d10-Acenaphthene	97	92
%d10-Phenanthrene	95	98
%d12-Benzo[a]pyrene	107	106

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Project Title : Tesoro - Feathers  
Data Package: 1512  
Data Table: PAH - IRM - Surrogate Corrected

Field ID	SRM 1491			
Lab ID	BC19			
Lab Batch	B0247			
File	DZ5838.D			
Sample Type	QC			
Weight Basis	VOLUME			
Matrix	SRM			
Sample Size	0.1 mL			
Associated Blank	NA			
Field Date	NA			
Extract Date	NA			
Analysis Date	01/05/99			
Min Reporting Limit	250			
Units	ug/L	T	%D	Q
Naphthalene	6800	6890	-4.2	
C1-Naphthalenes	ND			
C2-Naphthalenes	ND			
C3-Naphthalenes	ND			
C4-Naphthalenes	ND			
Acenaphthylene	6900	6960	-0.9	
Acenaphthene	6900	7280	-5.2	
Biphenyl	7200	7000	2.8	
Fluorene	6700	7270	-7.8	
C1-Fluorenes	ND			
C2-Fluorenes	ND			
C3-Fluorenes	ND			
Anthracene	8300	7820	6.1	
Phenanthrene	7000	7010	-0.1	
C1-Phenanthrenes/anthracenes	ND			
C2-Phenanthrenes/anthracenes	ND			
C3-Phenanthrenes/anthracenes	ND			
C4-Phenanthrenes/anthracenes	ND			
Dibenzothiophene	ND			
C1-Dibenzothiophenes	ND			
C2-Dibenzothiophenes	ND			
C3-Dibenzothiophenes	ND			
Fluoranthene	6000	5910	1.5	
Pyrene	6100	5880	3.6	
C1-Fluoranthenes/pyrenes	ND			
C2-Fluoranthenes/pyrenes	ND			
C3-Fluoranthenes/pyrenes	ND			
Benzo[a]anthracene	4000	3590	11	
Chrysene	6700	7030	-4.7	
C1-Chrysenes	ND			
C2-Chrysenes	ND			
C3-Chrysenes	ND			
C4-Chrysenes	ND			
Benzo[b]fluoranthene	5200	5250	-1	
Benzo[k]fluoranthene	5800	6570	0.64	
Benzo[e]pyrene	5700	5620	1.4	
Benzo[a]pyrene	7400	8790	9	
Perylene	7300	7120	2.5	
Indeno[1,2,3-c,d]pyrene	6100	6200	-3	
Dibenzo[a,h]anthracene	5100	5180	-1.5	
Benzo[g,h,i]perylene	5200	5290	-1.7	
%d8-Naphthalene	93			
%d10-Acenaphthene	88			
%d10-Phenanthrene	90			
%d12-Benzo[a]pyrene	98			

**DRAFT**

Project Title : Tesoro - Feathers  
Data Package: 1512  
Data Table: PAH - NSC - Surrogate Corrected

Field ID	North Slope Crude			
Lab ID	BN14			
Lab Batch	B0247			
File	DZ5837.D			
Sample Type	QC			
Weight Basis	OIL			
Matrix	OIL			
Sample Size	5 mg			
Associated Blank	NA			
Field Date	NA			
Extract Date	NA			
Analysis Date	01/05/99			
Min Reporting Limit	5			
Units	mg/Kg	T	%D	Q
Naphthalene	770 E	750	2.7	
C1-Naphthalenes	1800	1700	5.9	
C2-Naphthalenes	2400	2400	0	
C3-Naphthalenes	2000	2000	0	
C4-Naphthalenes	1200	1200	0	
Acenaphthylene	ND			
Acenaphthene	ND			
Biphenyl	220	220	0	
Fluorene	95	94	1.1	
C1-Fluorenes	250	240	4.2	
C2-Fluorenes	380	350	8.6	
C3-Fluorenes	380	400	-5	
Anthracene	NC			
Phenanthrene	290	260	12	
C1-Phenanthrenes/anthracenes	660	600	10	
C2-Phenanthrenes/anthracenes	760	740	2.7	
C3-Phenanthrenes/anthracenes	580	540	7.4	
C4-Phenanthrenes/anthracenes	420	330	27	
Dibenzothiophene	240	240	0	
C1-Dibenzothiophenes	510	500	2	
C2-Dibenzothiophenes	690	740	-6.8	
C3-Dibenzothiophenes	650	660	-1.5	
Fluoranthene	NC			
Pyrene	11	14	-21	
C1-Fluoranthenes/pyrenes	89	83	7.2	
C2-Fluoranthenes/pyrenes	160	150	6.7	
C3-Fluoranthenes/pyrenes	180	170	5.9	
Benzo[a]anthracene	ND			
Chrysene	44	43	-10	
C1-Chrysenes	81	84	-3.6	
C2-Chrysenes	99	110	-10	
C3-Chrysenes	93	92	1.1	
C4-Chrysenes	88	75	17	
Benzo[b]fluoranthene	7.1 J	6.6	7.6	
Benzo[k]fluoranthene	ND			
Benzo[e]pyrene	14	12	17	
Benzo[a]pyrene	ND			
Perylene	ND			
Indeno[1,2,3,-c,d]pyrene	ND			
Dibenzo[a,h]anthracene	1.5 J			
Benzo[g,h,i]perylene	3.5 J			
%d8-Naphthalene	101			
%d10-Acenaphthene	100			
%d10-Phenanthrene	97			
%d12-Benzo[a]pyrene	113			

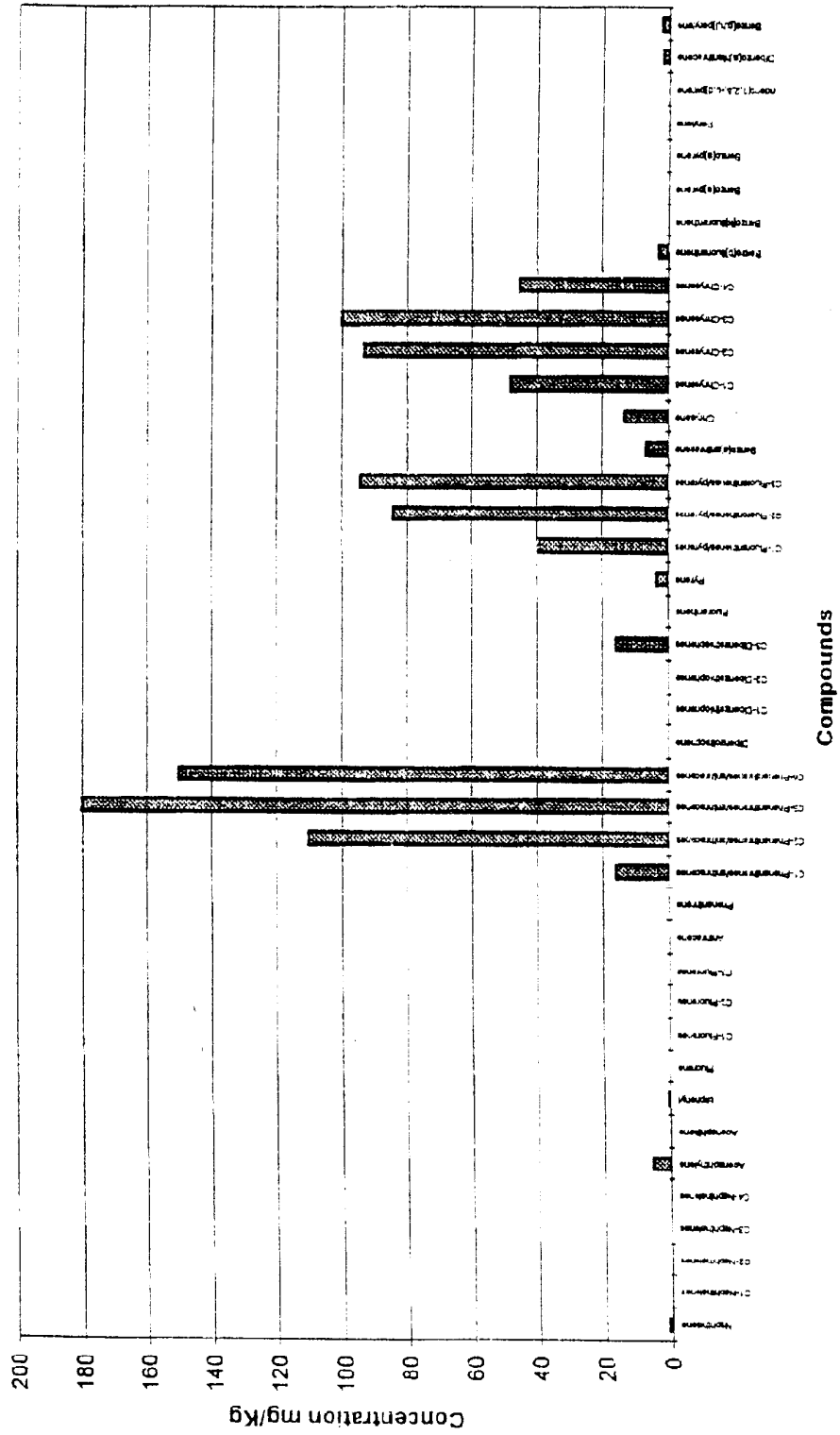






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Analyte Profile Histogram  
"98D4904: Item 5 FEATHER"









Arthur D. Little  
Environmental Monitoring and Analysis Unit

# DRAFT

Project Title : Tesoro - Feathers  
Data Package: 1512  
Data Table: S/T - Main - Surrogate Corrected

Field ID	NSC	OA 1010-1	OA 1010-2	Item 4
Lab ID	BK31	98D3503	98D3504	98D4903
Lab Batch	B0247	B0247	B0247	B0247
File	DZ5813.D	DZ5827.D	DZ5828.D	DZ5825.D
Sample Type	QC	SAMP	SAMP	SAMP
Weight Basis	OIL	OIL	OIL	OIL
Matrix	OIL	FEATHER	FEATHER	FEATHER
Sample Size	5.04 mg	3.8 mg	2.98 mg	0.16 mg
Associated Blank	NA	BY-S-57PB	BY-S-57PB	BY-S-57PB
Field Date	NA	10/10/98	10/10/98	09/27/98
Extract Date	NA	11/16/98	11/16/98	12/02/98
Analysis Date	01/03/99	01/04/99	01/04/99	01/04/99
Min Reporting Limit	5	6.6	8.4	160
Units	mg/Kg	mg/Kg	mg/Kg	mg/Kg
T4-C23Diterpane	33	ND	ND	220
S4-Diacholestane	39	ND	ND	ND
S5-Diacholestane	26	ND	ND	ND
T9-C29Tricyclictriterpane	16	ND	ND	ND
T10-C29Tricyclictriterpane	14	ND	ND	ND
T11-Trisnorhopane(TS)	19	2.5 J	4.2 J	ND
T12-Trisnorhopane(TM)	24	ND	ND	ND
S24-Methylcholestane	38	ND	ND	ND
S25-Ethylcholestane	59	ND	ND	ND
S28-Ethylcholestane	40	ND	ND	ND
T15-Norhopane	74	ND	ND	ND
T18-Oleanane	ND	ND	ND	ND
T19-Hopane	104	ND	ND	ND
T21-Homohopane	47	ND	ND	ND
T22-Homohopane	32	ND	ND	ND
%35(H)-Cholane	111	115	116	72

Arthur D. Little  
Environmental Monitoring and Analysis Unit

**DRAFT**

Project Title : Tesoro - Feathers  
Data Package: 1512  
Data Table: S/T - Main - Surrogate Corrected

Field ID	Item 5
Lab ID	9804904
Lab Batch	80247
File	DZ5824.D
Sample Type	SAMP
Weight Basis	OIL
Matrix	FEATHER
Sample Size	4.05 mg
Associated Blank	BY-S-37PB
Field Date	10/04/98
Extract Date	12/02/98
Analysis Date	01/04/99
Min Reporting Limit	6.2
Units	mg/Kg

T4-C23Diterpane	6.1 J
S4-Diacholestane	9.2
S5-Diacholestane	2.1 J
T9-C29Tricyclitriterpane	2.3 J
T10-C29Tricyclitriterpane	3.3 J
T11-Trisnorhopane(TS)	18
T12-Trisnorhopane(TM)	11
S24-Methylcholestane	ND
S25-Ethylcholestane	5.3 J
S28-Ethylcholestane	3.1
T15-Norhopane	63
T16-Oleanane	26
T19-Hopane	110
T21-Homohopane	25
T22-Homohopane	20
%SB(H)-Cholane	72

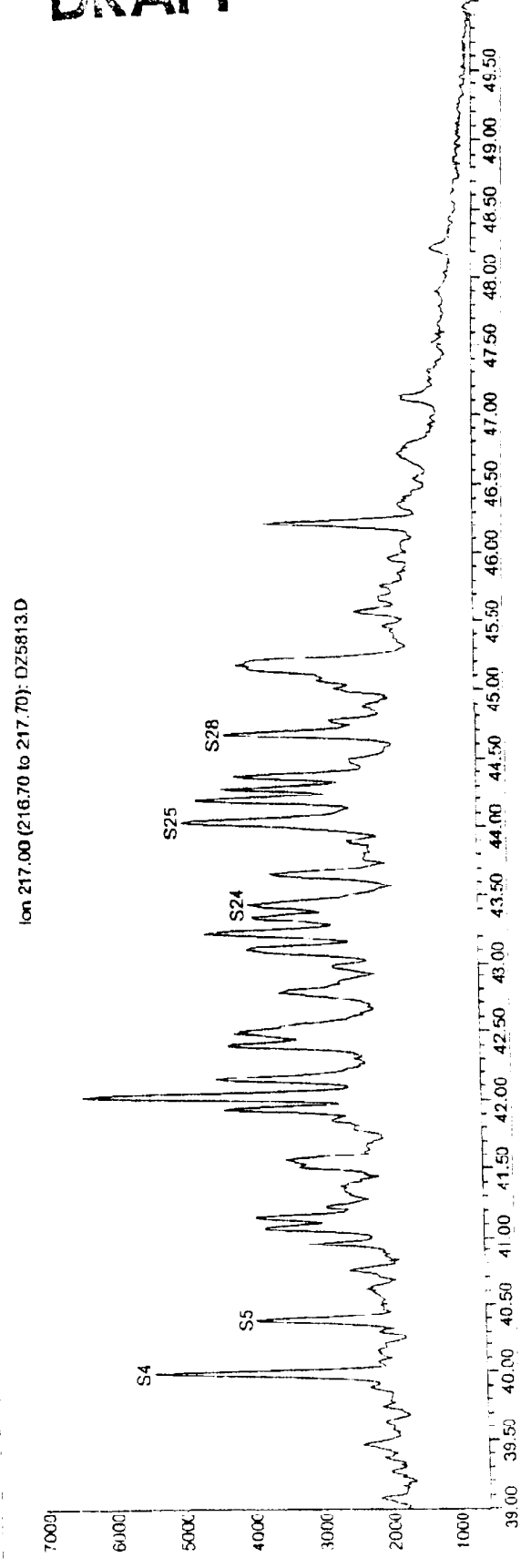
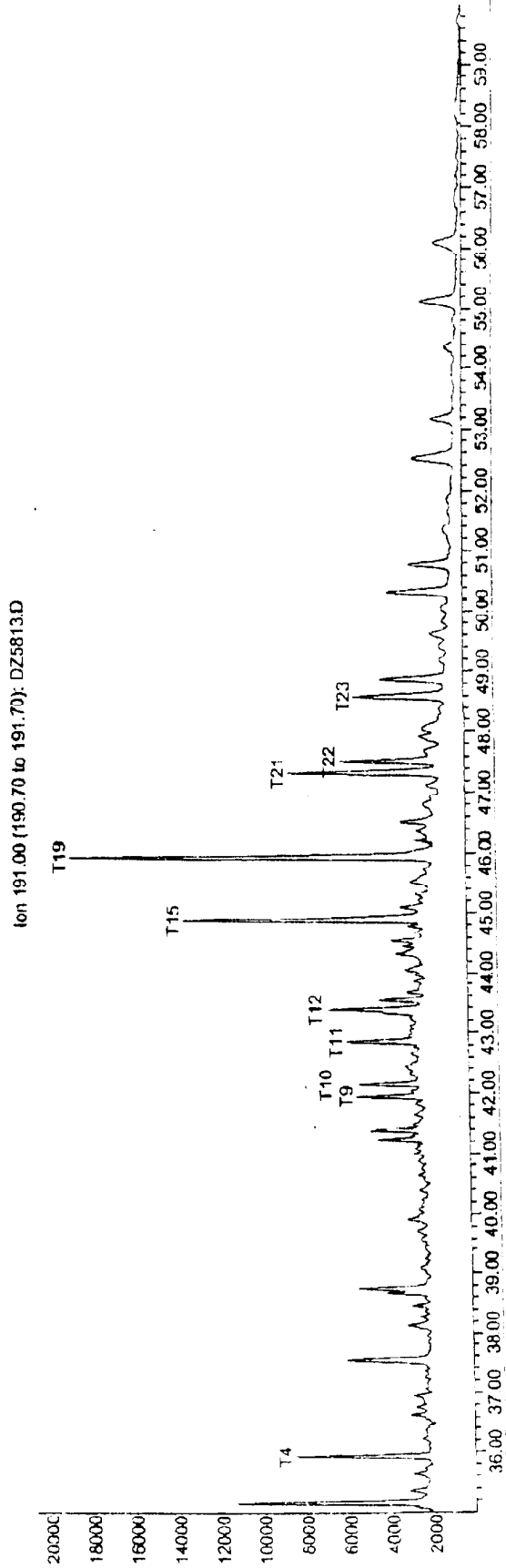
Arthur D. Little  
Environmental Monitoring and Analysis Unit

Project Title : Tesoro - Feathers  
Data Package: 1512  
Data Table: S/T - NSC - Surrogate Corrected

# DRAFT

Field ID	NSC			
Lab ID	BK81			
Lab Batch	NA			
File	DZ5813.D			
Sample Type	QC			
Weight Basis	DRY			
Matrix	NA			
Sample Size	5.04 mg			
Associated Blank	NA			
Field Date	NA			
Extract Date	NA			
Analysis Date	01/03/99			
Min Reporting Limit	5			
Units	mg/Kg	T	%D	Q
T4-C23Diterpane	33	48	-28	
S4-Diacholestane	39	50	-22	
S5-Diacholestane	26	29	-10	
T9-C29Tricyclitriterpane	16	16	0	
T10-C29Tricyclitriterpane	14	18	-22	
T11-Triarhopane(TS)	19	26	-27	
T12-Triarhopane(TM)	24	32	-25	
S24-Methylcholestane	38			
S25-Ethylcholestane	59	53	11	
S28-Ethylcholestane	40	40	0	
T15-Norhopane	74	96	-23	
T18-Cleanane	ND			
T19-Hopane	104	128	-19	
T21-Homohopane	47	53	-11	
T22-Homohopane	32	38	-16	
%5B(H)-Cholane	111			

File : C:\HPCHEM\1\SQZ531\DZ5813.D  
Operator : SLR  
Acquired : 3 Jan 1999 9:42 pm using AcqMethod RTE method: STER3  
Instrument : MS #3  
Sample Name : BK81  
Misc Info : HSC  
Vial Number: 4294934535



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