Hill Laboratories
BETTER TESTING BETTER RESULTS

R J Hill Laboratories Limited
1 Clyde Street
Private Bag 3205
Hamilton 3240, New Zealand

Tel +64 7 858 2000
Fax +64 7 858 2001
Email mail@hill-labs.co.nz
Web www.hill-labs.co.nz

ANALYSIS REPORT

Client:	NZ Refining Company	**Lab No:**	1177057	SPv1
Contact:	S Tyson	**Date Registered:**	07-Sep-2013	
	C/- NZ Refining Company	**Date Reported:**	18-Sep-2013	
	Private Bag 9024	**Quote No:**	56557	
	WHANGAREI 0140	**Order No:**		
		Client Reference:		
		Submitted By:	S Tyson	

Sample Type: Soil

Sample Name:		Remediation Batch Before 1 03-Sep-2013 11:25 am	Remediation Batch Before 2 03-Sep-2013 2:05 pm	Remediation Batch Before 3 04-Sep-2013 9:05 am	Remediation Batch Before 4 04-Sep-2013 11:20 am	Remediation Batch Before 5 04-Sep-2013 12:00 pm
Lab Number:		1177057.1	1177057.2	1177057.3	1177057.4	1177057.5
Individual Tests						
Dry Matter	g/100g as rcvd	87	87	88	89	88
Total Recoverable Barium	mg/kg dry wt	380	380	340	360	390
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	< 0.7	< 0.6	< 0.7	< 0.6	< 0.7
Heavy metals, screen As,Cd,Cr,Cu,Ni,Pb,Zn,Hg						
Total Recoverable Arsenic	mg/kg dry wt	5	5	5	6	7
Total Recoverable Cadmium	mg/kg dry wt	0.15	0.11	0.12	0.16	0.18
Total Recoverable Chromium	mg/kg dry wt	15	14	13	15	15
Total Recoverable Copper	mg/kg dry wt	51	40	45	46	48
Total Recoverable Lead	mg/kg dry wt	15.7	15.2	14.6	15.5	17.4
Total Recoverable Mercury	mg/kg dry wt	9.2	8.4	8.5	8.8	9.0
Total Recoverable Nickel	mg/kg dry wt	15	13	13	14	14
Total Recoverable Zinc	mg/kg dry wt	260	250	240	300	300
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	7.3	9.5	9.0	0.22	6.1
Toluene	mg/kg dry wt	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Ethylbenzene	mg/kg dry wt	12.3	11.2	12.0	0.09	9.8
m&p-Xylene	mg/kg dry wt	65	61	64	44	53
o-Xylene	mg/kg dry wt	0.79	0.86	0.64	0.72	1.30
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Acenaphthene	mg/kg dry wt	1.8	1.1	1.8	1.6	1.6
Acenaphthylene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	0.8	0.7
Anthracene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	0.3	0.4
Benzo[a]anthracene	mg/kg dry wt	0.4	0.3	0.5	0.5	0.4
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.4	0.3	0.4	0.4	0.4
Benzo[g,h,i]perylene	mg/kg dry wt	0.3	< 0.3	0.3	0.6	0.5
Benzo[k]fluoranthene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Chrysene	mg/kg dry wt	0.4	0.4	0.5	0.7	0.7
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Fluoranthene	mg/kg dry wt	0.9	0.6	0.9	1.1	1.1
Fluorene	mg/kg dry wt	5.5	3.2	5.0	5.8	5.9
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Naphthalene	mg/kg dry wt	28	16.9	26	18.3	28
Phenanthrene	mg/kg dry wt	9.4	5.6	9.1	12.1	12.3

Sample Type: Soil						
Sample Name:		Remediation Batch Before 1 03-Sep-2013 11:25 am	Remediation Batch Before 2 03-Sep-2013 2:05 pm	Remediation Batch Before 3 04-Sep-2013 9:05 am	Remediation Batch Before 4 04-Sep-2013 11:20 am	Remediation Batch Before 5 04-Sep-2013 12:00 pm
Lab Number:		1177057.1	1177057.2	1177057.3	1177057.4	1177057.5
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Pyrene	mg/kg dry wt	0.7	0.5	0.8	1.4	1.3
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	810	510	830	690	810
C10 - C14	mg/kg dry wt	3,800	2,400	3,700	4,300	4,100
C15 - C36	mg/kg dry wt	16,800	10,700	17,100	21,000	19,900
Total hydrocarbons (C7 - C36)	mg/kg dry wt	21,000	13,600	22,000	26,000	25,000

Sample Name:		Remediation After Batch 1 04-Sep-2013 12:10 pm	Remediation After Batch 2 04-Sep-2013 12:13 pm	Remediation After Batch 3 04-Sep-2013 12:15 pm	Remediation After Batch 4 04-Sep-2013 12:20 pm	Remediation After Batch 5 04-Sep-2013 2:30 pm
Lab Number:		1177057.6	1177057.7	1177057.8	1177057.9	1177057.10
Individual Tests						
Dry Matter	g/100g as rcvd	82	91	81	80	80
Total Recoverable Barium	mg/kg dry wt	370	98	68	45	39
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	< 0.7	0.07	< 0.07	< 0.07	< 0.07
Heavy metals, screen As,Cd,Cr,Cu,Ni,Pb,Zn,Hg						
Total Recoverable Arsenic	mg/kg dry wt	6	3	2	< 2	2
Total Recoverable Cadmium	mg/kg dry wt	0.14	< 0.10	< 0.10	< 0.10	< 0.10
Total Recoverable Chromium	mg/kg dry wt	13	10	7	7	6
Total Recoverable Copper	mg/kg dry wt	40	15	8	5	6
Total Recoverable Lead	mg/kg dry wt	15.8	7.2	4.7	4.1	3.9
Total Recoverable Mercury	mg/kg dry wt	8.8	2.2	1.59	0.73	0.63
Total Recoverable Nickel	mg/kg dry wt	13	6	5	4	4
Total Recoverable Zinc	mg/kg dry wt	220	137	64	49	52
BTEX in Soil by Headspace GC-MS						
Benzene	mg/kg dry wt	8.6	0.06	0.25	0.09	0.10
Toluene	mg/kg dry wt	0.09	< 0.05	0.22	< 0.06	0.05
Ethylbenzene	mg/kg dry wt	14.7	0.07	1.16	0.56	0.49
m&p-Xylene	mg/kg dry wt	79	0.30	7.2	4.4	3.2
o-Xylene	mg/kg dry wt	0.53	< 0.05	0.18	0.09	0.09
Polycyclic Aromatic Hydrocarbons Screening in Soil						
Acenaphthene	mg/kg dry wt	1.5	0.29	0.22	0.11	0.14
Acenaphthylene	mg/kg dry wt	0.7	< 0.03	< 0.03	< 0.03	< 0.03
Anthracene	mg/kg dry wt	0.3	< 0.03	< 0.03	< 0.03	< 0.03
Benzo[a]anthracene	mg/kg dry wt	0.4	0.09	0.07	< 0.03	0.03
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.3	0.05	0.04	< 0.03	< 0.03
Benzo[b]fluoranthene + Benzo[j] fluoranthene	mg/kg dry wt	0.4	0.08	0.06	< 0.03	0.03
Benzo[g,h,i]perylene	mg/kg dry wt	0.5	0.09	0.06	< 0.03	< 0.03
Benzo[k]fluoranthene	mg/kg dry wt	< 0.3	0.02	< 0.03	< 0.03	< 0.03
Chrysene	mg/kg dry wt	0.7	0.11	0.10	< 0.03	0.04
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.3	< 0.03	< 0.03	< 0.03	< 0.03
Fluoranthene	mg/kg dry wt	1.0	0.19	0.13	0.05	0.07
Fluorene	mg/kg dry wt	5.7	0.67	0.65	0.32	0.42
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.3	0.03	0.03	< 0.03	< 0.03
Naphthalene	mg/kg dry wt	35	< 0.12	2.3	1.06	1.11
Phenanthrene	mg/kg dry wt	11.4	1.17	1.19	0.56	0.78
Pyrene	mg/kg dry wt	1.2	0.17	0.12	0.05	0.06
Total Petroleum Hydrocarbons in Soil						
C7 - C9	mg/kg dry wt	1,210	19	48	22	26
C10 - C14	mg/kg dry wt	4,400	630	420	179	230
C15 - C36	mg/kg dry wt	17,600	4,200	2,300	730	1,100
Total hydrocarbons (C7 - C36)	mg/kg dry wt	23,000	4,800	2,700	930	1,360

Analyst's Comments

Appendix No.1 - Total Petroleum Hydrocarbon Chromatograms

Appendix No.2 - Total Petroleum Hydrocarbon Chromatograms

Appendix No.3 - Total Petroleum Hydrocarbon Chromatograms

Appendix No.4 - Total Petroleum Hydrocarbon Chromatograms

SUMMARY OF METHODS

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Soil

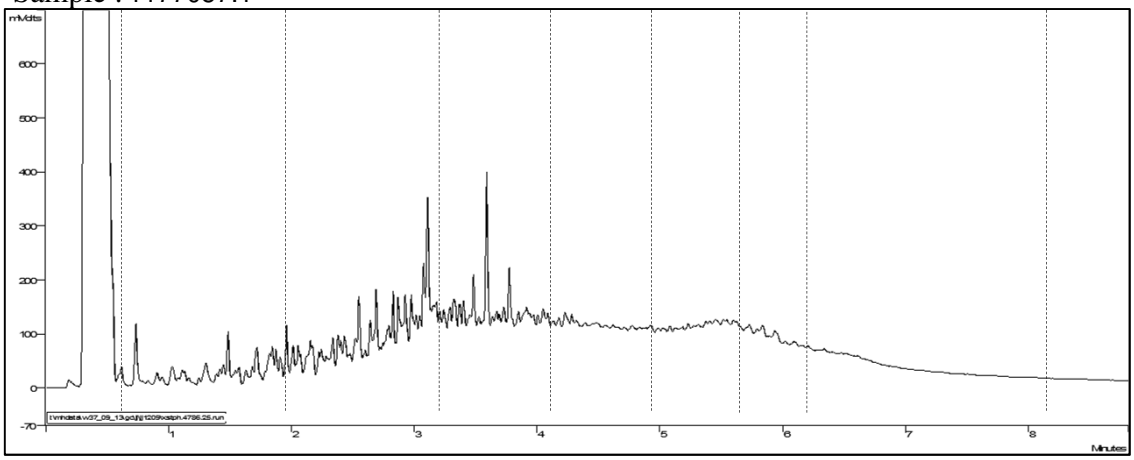
Test	Method Description	Default Detection Limit	Samples
Environmental Solids Sample Preparation	Air dried at 35°C and sieved, <2mm fraction. Used for sample preparation. May contain a residual moisture content of 2-5%.	-	1-10
Heavy metals, screen As,Cd,Cr,Cu,Ni,Pb,Zn,Hg	Dried sample, <2mm fraction. Nitric/Hydrochloric acid digestion, ICP-MS, screen level.	-	1-10
TPH + PAH + BTEX profile	Sonication extraction, SPE cleanup, GC & GC-MS analysis	-	1-10
Dry Matter (Env)	Dried at 103°C for 4-22hr (removes 3-5% more water than air dry) , gravimetry. US EPA 3550. (Free water removed before analysis).	0.10 g/100g as rcvd	1-10
Total Recoverable digestion	Nitric / hydrochloric acid digestion. US EPA 200.2.	-	1-10
Total Recoverable Barium	Dried sample, sieved as specified (if required). Nitric/Hydrochloric acid digestion, ICP-MS, screen level. US EPA 200.2.	0.4 mg/kg dry wt	1-10
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	BaP Toxic Equivalence calculated from Benz(a)anthracene x 0.1 + Benzo(b)fluoranthene x 0.1 + Benzo(j)fluoranthene x 0.1 + Benzo(k)fluoranthene x 0.1 + Benzo(a)pyrene x 1 + Chrysene x 0.01 + Dibenz(a,h)anthracene x 1 + Fluoranthene x 0.01 + Indeno(1,2,3-c,d)pyrene x 0.1 Ministry for the Environment. 2011. Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health. Wellington: Ministry for the Environment.	0.002 mg/kg dry wt	1-10

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

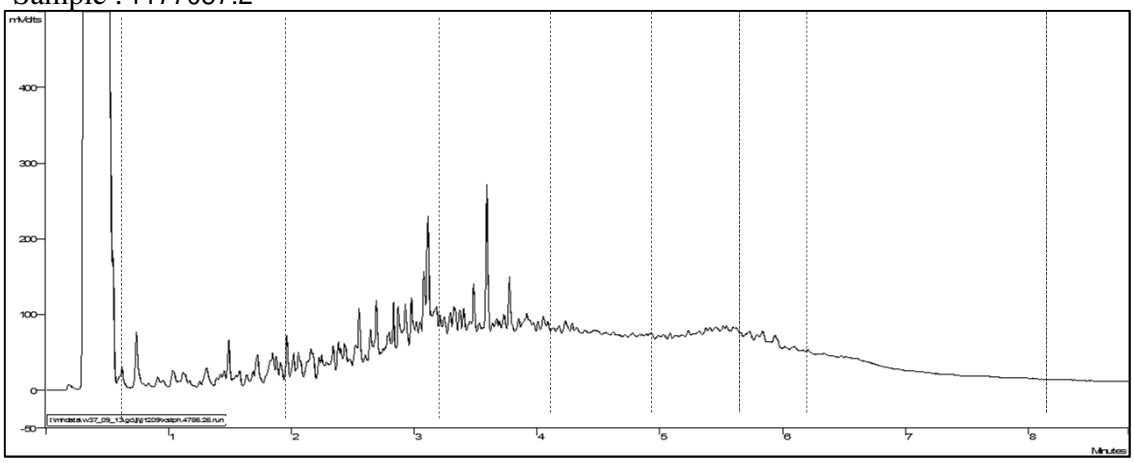
Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Carole Rodgers-Carroll BA, NZCS
Client Services Manager - Environmental Division

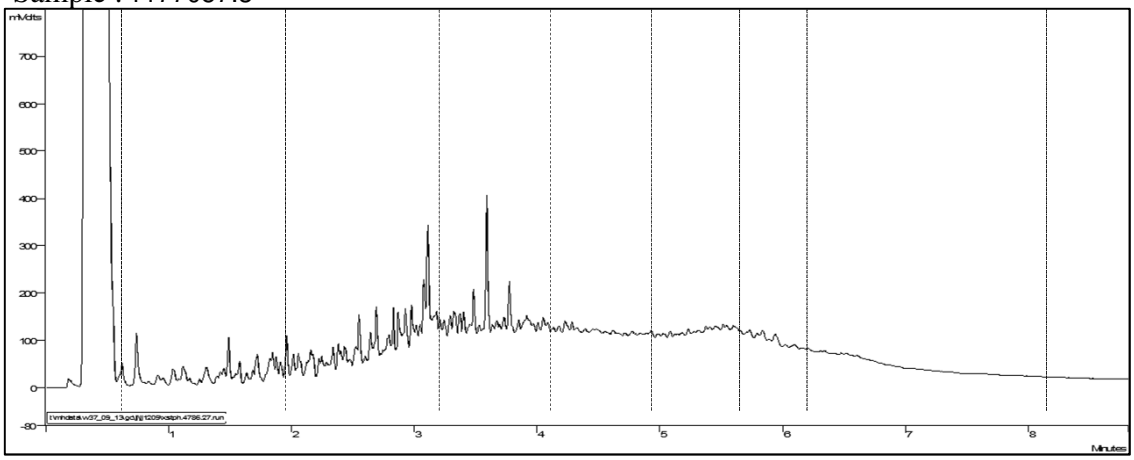
Sample : 1177057.1

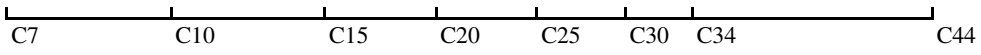


Sample : 1177057.2

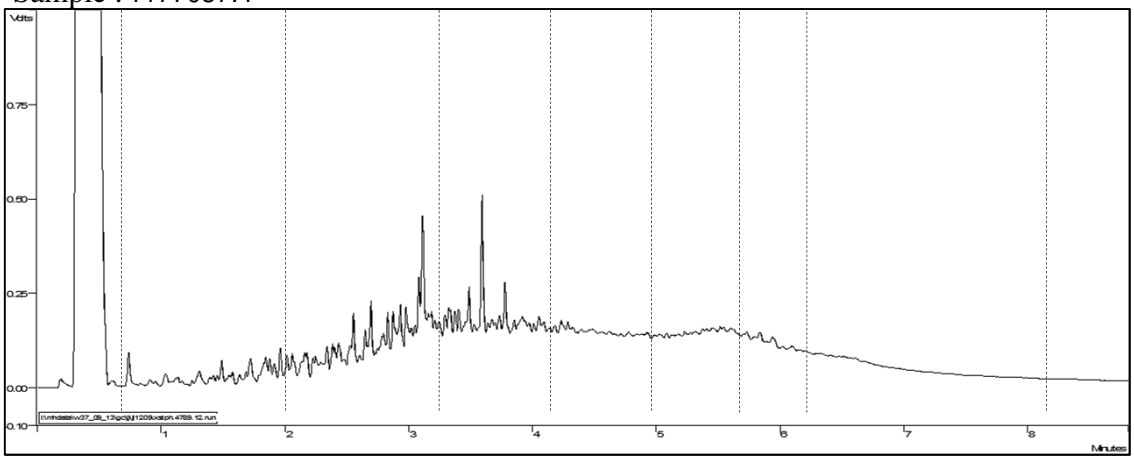


Sample : 1177057.3

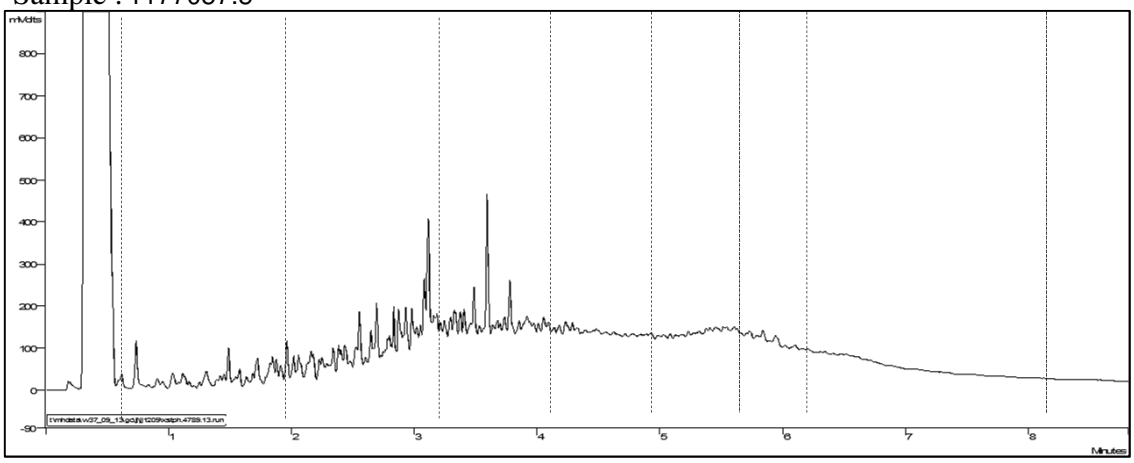




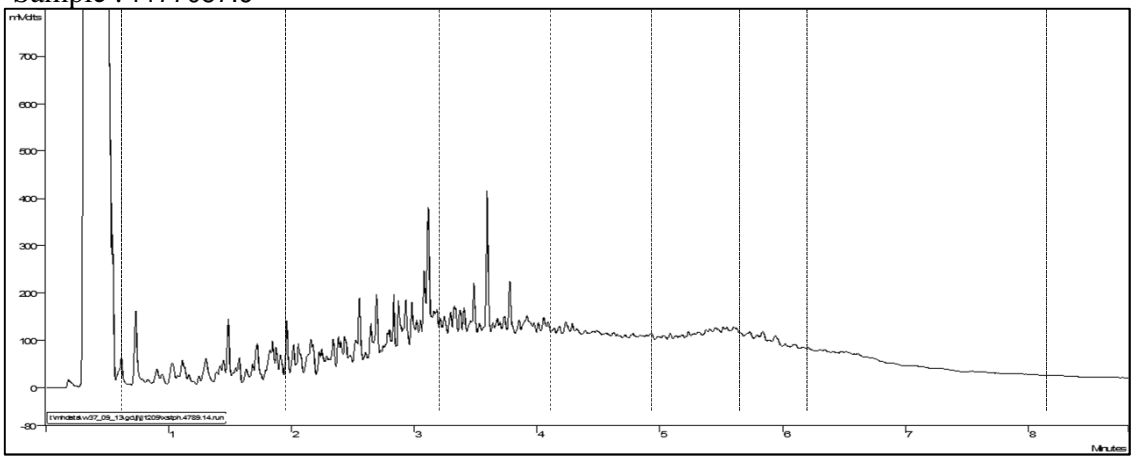
Sample : 1177057.4



Sample : 1177057.5

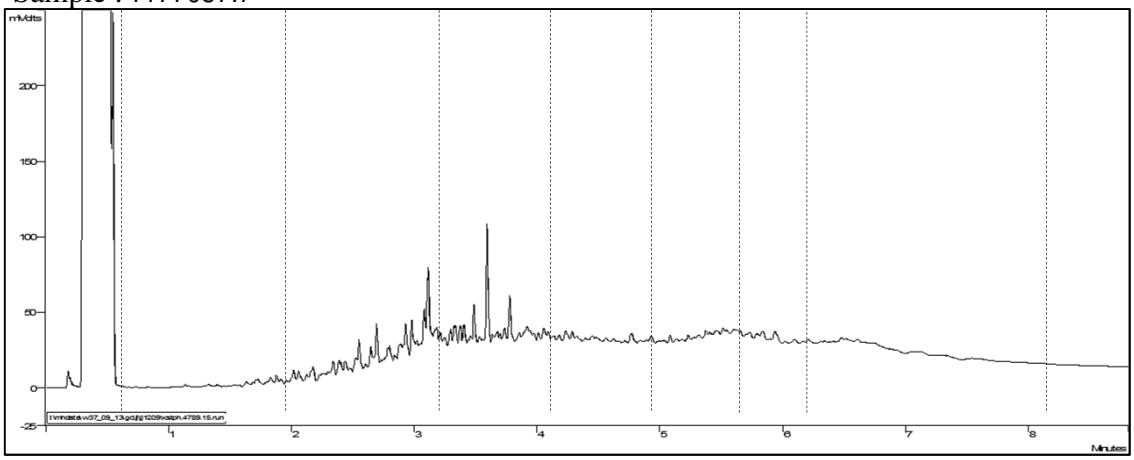


Sample : 1177057.6

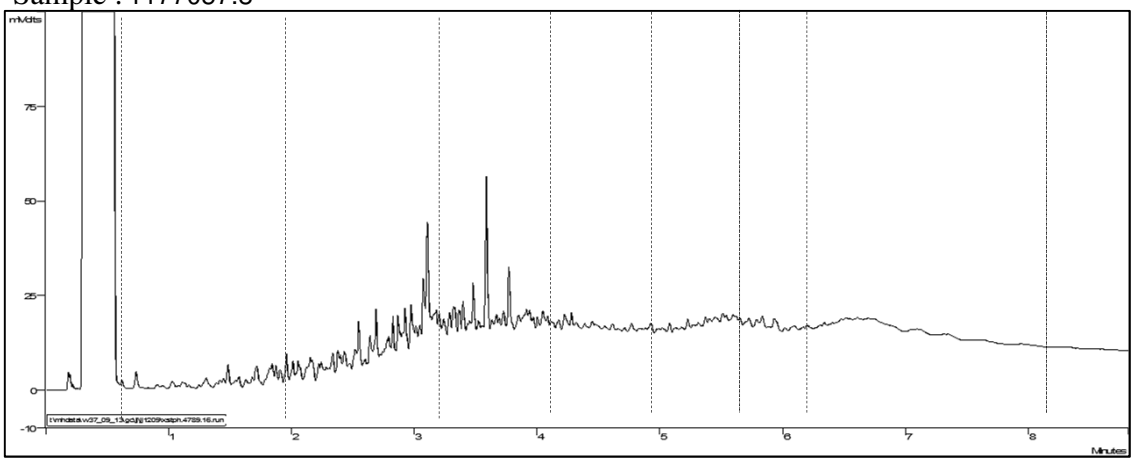


C7 C10 C15 C20 C25 C30 C34 C44

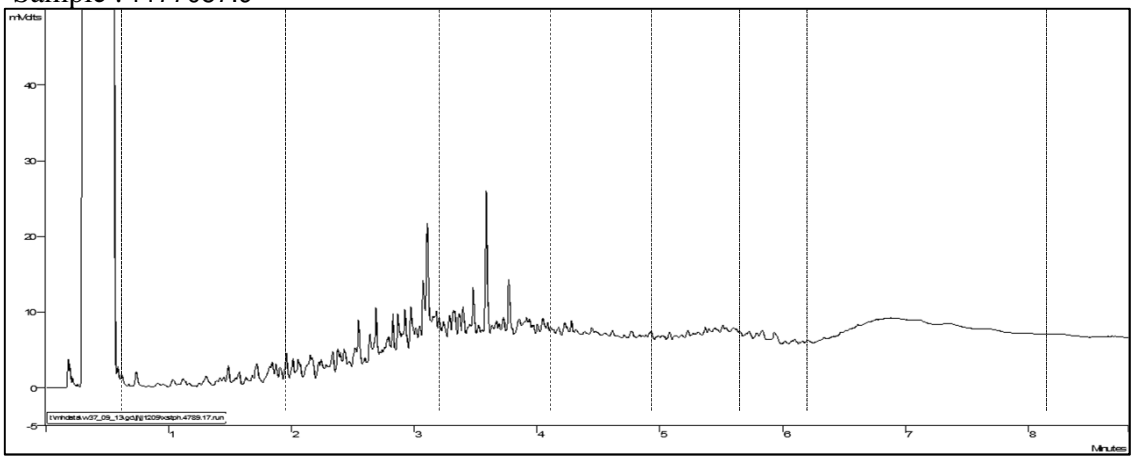
Sample : 1177057.7

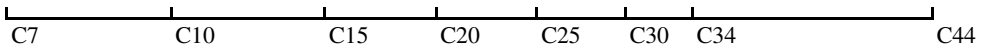


Sample : 1177057.8

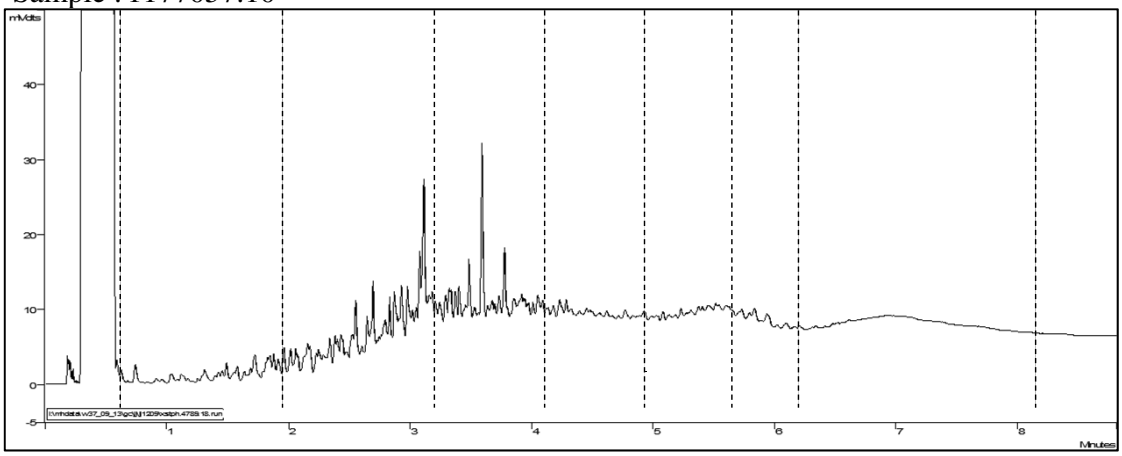


Sample : 1177057.9





Sample : 1177057.10



C7 C10 C15 C20 C25 C30 C34 C44