



**National Environment
and Planning Agency**

POLLUTION INCIDENT INVESTIGATION REPORT

**NOXIOUS FUMES POLLUTION INCIDENT,
PORTMORE TOLL PLAZA, ST. CATHERINE
28-30 JUNE 2012**

Prepared by National Environment and Planning Agency
27 November 2012

1.0 BACKGROUND AND INTRODUCTION

On June, 28 2012 at approximately 10:45 a.m. the National Environment and Planning Agency (NEPA) - herein referred to as 'the Agency' - received a report from the Jamaica Fire Brigade that a pungent petroleum-based odour was affecting the Portmore Toll Plaza and surrounding areas. Ten persons in the area were reportedly rushed for medical treatment. The incident led to the closure of the Toll Road by the police.

The incident report was quickly communicated to relevant Divisions and Branches within the Agency and the Agency's internal incident response mechanism triggered.

The Agency's response team immediately notified partner agencies and departments of the incident, these were namely: the Jamaica Defense Force (JDF) Coast Guard, Office of Disaster Preparedness and Emergency Management (ODPEM), the Marine Police, and the Jamaica Fire Brigade.

Specific industries within the zone of influence were contacted: the Kingston Container Terminal, Petrojam Limited, Petroleum Company of Jamaica, Cool Petroleum Limited, Total Jamaica Limited and Jamaica Public Service Company, to ascertain any occurrence of industrial accidents or spills. The response from each was in the negative.

At approximately 3:05 p.m. the JDF Coast Guard made a report that no spill had occurred within the Kingston Harbour. The Jamaica Constabulary Force also reported that there was no motor vehicle accident or incident reported in the area.

Reports received from key personnel at the Kingston Container Terminal, the Spanish Town Fire Brigade, Petrojam Limited, Hunts Bay Power Station, Jamaica Public Service Company (JPSCo), the Fort Augusta Prison and concerned members of the public allowed for mapping of the geographical area impacted, and provided the context and parameters for the investigation and the development of hypotheses to drive the investigation.

It should be noted that none of the reports or information received was definite as to the source, type of pollutant/s and level of impact the incident had on human health and the environment.

The Agency's response team was therefore challenged and a purposeful technical investigation into the reported incident was commenced to:

1. identify the pollutant responsible for the noxious fumes
2. identify the cause of the noxious fumes
3. identify the source of the pollutant, and
4. determine the geographical spread and the impact on receptors agents within the area and
5. prepare a report of the findings

2.0 METHODOLOGY

The following methodology was utilized for the investigation:

1. Desktop research was conducted along with an environmental assessment, ground-truthing, sampling and analytical activities.
2. Data requested as follows:
 - a. meteorological data from the Meteorological Office and private facilities,
 - b. satellite imagery and oceanic data
 - c. information on port handling activities (from the Port Authority of Jamaica),
 - d. bunkering and offloading activities from bunkering services providers
 - e. cargo handling and movement activities at the ports
 - f. on and offloading activities at the ports
 - g. aircraft activities into and out of the Norman Manley International Airport
3. Reconciliation data from petrol stations within the area reviewed along with data obtained from several other industries and developments along the rim of Kingston Harbour and Portmore. This second set of data was previously gathered from the Kingston Harbour Environmental Management Programme.
4. Mapping high-risk facilities for immediate site visits and assessment by the Incident Response Team for the following areas: Marcus Garvey Drive, Portmore Toll Plaza, Port Henderson Road, Petroleum Filling Stations in Portmore, Fun City Beach, Fort Augusta Prison, Kingston Container Terminal & New Port West and Petrojam Refinery Pier.
5. Engaging the support of the Member of Parliament for Southeast St Catherine to mobilize community members to assist in searching local premises.

7. Collection of environmental specimens: water, soil, air, sand, receptor plants, respirator filters, air condition filters.
8. Interviews of affected persons and investigations at the Portmore Toll Plaza to obtain basic epidemiology data.
9. Identification and engagement of analytical laboratories with specific competencies
10. Preparation, packaging and shipping of specimens to local and international laboratories
11. Review video footage of traffic movement through the Toll Plaza between the hours of 6:00 a.m. and 12:30pm on 2012-06-28
12. Review datasets and information provided by other regulatory agencies and departments.
13. Data analysis and scenario building

3.0 FINDINGS OF SITE VISITS AND ASSESSMENTS

The findings of the investigative work are enumerated below:

3.1 PORTMORE TOLL PLAZA

1. The first visit to the Portmore Toll Plaza was done on 28 June. Information gathered was that a high wind from the south-east coming from the area of the wharf occurred at the time of the incident; persons reported smelling an odour similar to that of diesel oil; ten persons were rushed to obtain medical attention earlier in the day.

It is noted that a similar wind direction was prevailing at time of the visit. But no odour was detected by the investigating team.

2. One of the persons interviewed reported that he started experiencing the odour at about 6:00 a.m. on the 28th. He described the odour as that like gas oil and almost like diesel. The odour was further described as similar to motor vehicle exhaust in the morning of which contact with the eyes caused a burning sensation. The odour, it was stated, increased during the day with the increase in wind speed. The wind was generally from the south..

3. A search of the Portmore Toll Plaza storage and garage areas revealed that detergents, motor oil, tools, spikes, spare parts and water tanks were stored on compound along with six water tanks, and a 4,400 litre diesel tank used to provide fuel for a standby generator. The relevant areas were satisfactorily bunded and no leaks were observed. The generator was reportedly last used on the 26th.
4. A meeting was convened on July 4 with National Road Operating & Construction Company Limited (NROCC) and Jamaica Infrastructure Operators (JIO). Information obtained revealed that on June 28 a total of 17 staff members were affected - 6 from the administrative office and 11 toll collectors. All affected sought medical attention but only five were treated. Medical services were provided by Faith Medical Centre in Portmore. On 29 June 6 persons were affected but only one person sought medical attention. On June 30 3 persons were affected but none sought medical attention.

Several toll booth staff on the premises at the time of the incident were interviewed. Video footage of traffic movement through the toll booth during the time of the incident was requested. In addition samples of air filters from the air condition units and the respirators worn on the days of the incident were secured for analysis.

Table 2 below gives a summary of the number of persons working at the toll booth that were affected, the days they were affected, how many sought medical attention and how many were treated.

Table 2: Matrix of Person Employed to JIO affected By Noxious Fumes

Date	Person on Premises	# of Person Affected	# of Persons Seeking Medical Attention	# of Persons Treated
2012-06-28	21	17	17	5
2012-06-29	23	6	1	0
2012-06-30	18	3	0	0

3.2 PORT HENDERSON ROAD

Port Henderson Road was visited and assessed on 28 June. At that time a strong odour similar to that of kerosene oil was detected on entering the road from the toll plaza side. After travelling about 30 metres along the road the odour dissipated.

McMaster's property and the areas around the bridge at the opening to Dawkins Pond were assessed. No odour was detected (see Picture 1).



Picture 1: Coastal Water Eastward along Port Henderson Road on 2012-06-28

3.3 FUN CITY BEACH (Port Henderson Road)

The high odour levels simulating kerosene and/or diesel that was present on entering Port Henderson Road was also evident at this site. No evidence of an oil spill (oily sheen) was observed on the surface of the seawater. The wind was blowing from the south east, that is, from the general location of Port Royal. The odour was emanating from the seaward side.

Fun City Beach was again visited on June 29. At that time a mild diesel oil odour was intermittently detected. Persons on the site reported being affected by a diesel type odour emanating from the sand. None of the persons affected reported that they had sought medical attention. Seawater and sand samples were collected.

Water and sand samples were collected near Fun City Beach on 2012-07-04 and submitted to the Pesticide Research Laboratory at the Chemistry Department, University of the West Indies and those related to oil and grease were sent the Agency's laboratory for analysis.

3.4 FORT AUGUSTA PRISON

The Fort Augusta Prison compound (see Picture 2) was assessed on June 28. At that time no kerosene oil scent was detected. The Liquefied Petroleum Gas (LPG) Storage and Diesel Oil Tank on the compound was found to be in a satisfactory condition. No oil sheen was observed on the water. The persons interviewed were not affected by any noxious fumes. Two persons reported irritation of the sinuses. No one sought medical attention.



Picture 2: Coastal Water at Fort Augusta Prison on 2012-06-29

3.5 PORTMORE - PETROLEUM FILLING STATIONS

The general Portmore area was assessed on the 28 June and a light petroleum odour was noticeable when the wind picked up in the vicinity of the Portmore Mall.

Five petrol stations in Portmore were assessed on the 28 June. There were no reports or observation of environmental pollution at these facilities. Leak detection monitoring data (tank reconciliation) was requested for submission by Monday, 2 July 2012.

3.6 KINGSTON CONTAINER TERMINAL (KCT) AND NEWPORT WEST

These areas were inspected on the June 29 and two isolated containers containing a pesticide and spilt chemicals were assessed. The containers were emanating odours dissimilar to that experienced at the Toll Plaza, Fun City Beach and the Portmore area. A puddle of oil - that was determined to be lubricating oil was observed at Newport West. There was no major spillage observed. No oil sheen was observed on around the coastal waters associated with Gordon Cay and along the Berths. These waters were of normal appearance (see Picture 3).



Picture 3: Coastal Water along Wharves on 2012-06-29

3.7 PETROJAM LIMITED (REFINERY) PIER

Petrojam Limited Pier and coastline were visited by boat on June 28. At that time no odour was detected and no oil sheen was noted. No pollution incident or spills were reported.

4.0 OBSERVATIONS

1. Supporting data and information were obtained from the UWI, petrol filling stations, the Meteorological Office, Petrojam Limited, bunkering services providers, Port Authority(port services) and the Norman Manley International Airport. Data included meteorological data, tank reconciliation, oceanic wave data, cargo handling, port, bunkering, aircraft landing, and off-loading (fuel dumping) activities.
2. Meteorological data obtained for June 28 reported the wind speed was 8 metres/second and was blowing from a south-easterly direction 80% of the time (see Figure 1). This occurred between the hours of 12:00 a.m. to 7:00 a.m. and 7:00 a.m. to 5:00 p.m.
3. Light diesel oil and motor gasoline was bunkered/offloaded on the morning of 28 June between the hours of 1:00a.m. and 8:30a.m. The service providers were Aegean Bunkering Jamaica Limited and Petrotec Bunkering (JA) Limited. No spill was reported. (see Figure 2).
4. Petrojam initial report to NEPA revealed that it had conducted offloading on the evening of June 26 and into the early morning of June 27. It did not report a spill or pollution incident.

Later intelligence data to NEPA revealed that the Refinery experienced challenges during the loading and a spill had occurred.

Petrojam when asked about a spill occurrence indicated that there was none.

A subsequent Petrojam letter dated July 10, reported the loss of 262 barrels of kerosene oil while loading the MT Royal at 4:15 a.m. on 27 June 2012. The Refinery also reported responding to a call from the Portmore Toll Plaza at 11:00 a.m. on June 27 of a strong petroleum type odour. Its report from the Toll Plaza also mentioned that persons had to seek medical attention and that the Toll Plaza was subsequently closed and reopened that evening.

NB: The information supplied by Petrojam incorrectly referenced date of the closure and opening of the Toll Plaza as the Toll Plaza was closed on June 28 and not the 27 as reported in Petrojam's letter.

5. The Fuel Delivery Statement submitted by Petrojam indicated that 262 barrels of Kerosene oil was lost on 28 June 2012 and that there was a hose rupture during the transfer activity.

It reported launching an investigation to ascertain if the oil loss was associated with a leak or was as a result of product pilferage.

6. The review of video file footage obtained 10 July 2012 did not show any cases of spillage from the heavy duty trailers through the Toll Plaza preceding the reported pollution incident.
7. The inspections did not identify evidence of a pollution incident at the facilities assessed.
8. The Pesticide Research Laboratory (Chemistry Department, University of the West Indies) and NEPA's Pollution and Assessment Laboratory analysed for the presence of, and the concentration, of fats, oils and grease on the samples collected.
9. The service of Technological and Environmental Management Network Limited (TEMS Ltd) was contracted. TEMS Ltd engaged the services of CALA Certified Laboratory AirZone One of Mississauga, Ontario, Canada to analyse passive sampling devices (psds) for a range of volatile organic compounds.
10. The samples of seawater, sand and receptor plants were screened for pesticides and petroleum hydrocarbons. The filters were all analyzed for volatile organic compounds (VOCs) while the sample collected at 100 meters east of Fun City Beach on 2012-07-04 was analysed for oil and grease.

Two sand samples were taken - one near the high water mark and one within the wash zone. The sand within the wash zone when tested contained long chain alkanes.

5.0 RESULTS AND ANALYSIS

The laboratory reports obtained from the Laboratories is presented in Appendix 1 & 2.

5.1 FATS, OIL AND GREASE

Result for sample collected was 29.3 mg/l. The returns suggest the presence of fats, oil and grease in the sample.

5.2 PESTICIDES

The presence of pesticides was not detected in the sand samples.

5.3 PETROCHEMICALS

Petrochemicals such as alkanes, xylenes, dimethylbenzene, and naphthalenes were present in water samples. Screening for volatile organic compounds in water samples showed the presence of straight chain and branched alkanes, cycloalkanes, alkenes and naphthalenes. A comparison of these findings with the profiles for diesel and kerosene oils indicated similarities with the seawater samples collected on the June 29, 2012. The seawater sample collected on July 4, 2012 indicated a profile similar to that of diesel.

Results of the sand samples showed the presence of petrochemicals (alkanes) in the sample collected on July 4, 2012. There was no similarity observed in the profiles for the sand samples with diesel and kerosene. No petrochemicals were found in the sand sample collected on June 29, 2012.

The returns from the respirators (air filters) analyses and the air conditioning unit (filters) showed the presence of long chain alkanes. Dichloromethane, toluene and dichlorobenzene were detected in the samples analyzed by AirZone One Limited in Ontario, Canada.

Results of air samples collected from Fun City Beach, Portmore Toll Plaza Offices and Portmore Toll Plaza (RO1) over the period 4th and 5th July detected significant concentrations of Benzene, Xylene, Toluene and Hexane. The presence of a wide range of organic compounds (VOCs) were detected (see Appendix 2).

Results from receptor plants for organic compound profile showed the presence of benzene compounds, phenols, octadecane and hexadecane. Of note is that the concentration of benzene compounds in the plant specimens obtained from the Portmore Toll Plaza was extremely high when compared with those obtained from locations used as controls. No direct link to the gas odour was gathered from the results.

5.4 REVIEW OF VIDEO FOOTAGE

No incident of spillage was observed from heavy duty vehicles moving through the toll plaza at the time of the incident. The review of the video footage showed that twenty-nine heavy duty vehicles traversed the toll

booth (eighteen oil tankers, two water trucks, one Gas Pro Tanker and the remainder were trailers and trucks).

6.0 SCENARIO ANALYSIS

Scenario 1 - Bunkering activities was the source of the pollution incident

The evidence is that both Providers serviced vessels in the Kingston Harbour on the morning of 28th. The fuel bunkered was light diesel and motor gasoline. Neither Provider reported a spill. The fuelling report and fuel inventory for both services were requested and reviewed. The documentation and site visit confirmed no spill took place as contained in the reports submitted by the Providers. Wave patterns correlated against the time of loading.

Scenario 2 – Activities on the Port was the source of the pollution incident

No spill was reported from the port. Inspection confirmed the absence of spills. Meteorological data, wind direction confirmed that at the time of the reported fumes wind was originating from an east and south easterly direction. This is counter to the ports position to the Toll Plaza.

Scenario 3 – Movement of traffic at the Toll Plaza was the source of the pollution incident

No visual evidence of a spill was observed at the Toll Plaza. Review of the twelve hours of video footage of east and west bound traffic through the Toll Plaza (cameras at two separate angles) did not confirm a spill.

Scenario 4 - Onsite storage at the Toll Plaza was the source of the pollution incident

The storage facilities at the Toll Plaza were searched. No chemicals were stored on the compound. The diesel generator had not operated during the period.

Scenario 5 – Industrial facilities and gas stations in Portmore were the source of the pollution incident

A sweep of the area encompassing the geographical area from Port Henderson Road, Portmore Plaza to Naggo's Head was completed. No spill or leak was detected. Review of data from all the fuelling stations did

not show any anomalous events (spills). The origin of the wind direction during the time of the incident (28 June) was opposite to the Portmore fuelling stations and abandoned facilities.

Scenario 6 - The activities at the NMIA Airport was the source of pollution incident

Review of data of airplane take-off and landing did not show a case of accident. There was no report from the AAJ of fuel dumping activities from air planes on the day. A sweep of the airport premises was done. No evidence of pollution observed.

Scenario 7 - Point sources along the Kingston Harbour was the source of the pollution incident

Review of data from gas stations along the harbour, stack data licensed facilities along the Harbour and on Marcus Garvey Drive returned negative for any anomalous events. The western section of the Harbour was surveyed by sea. No evidence of pollution was observed at the mouth of the gullies entering the Harbour. The wind direction at the time of the incident was counter to the position of the stacks along the harbour.

Scenario 8 – The Petrojam loading activities was the source of the pollution incident

On the morning of June 28 Petrojam Ltd commenced loading activities of the vessel **MT Royal at 4:15am**. Kerosene oil was identified as the fuel being loaded. Petrojam was forced to halt loading activities due a rupture in one of the submerged fuel loading lines. This resulted in the loss of 262 barrels (30,294 litres) of kerosene into the marine environment as confirmed by Petrojam's inventory of the loading activities.

A study of the tide and surface and sub-surface currents in the Kingston Harbour showed that a spill from the EKT Dock would eventually find its way to the western shoreline nearest to the Toll Plaza. The plot of the time of current movement using the average speed of the currents revealed that the spill had enough time to traverse the Harbour and found its way to the western shores of the Harbour.

Water samples taken at the points along this shoreline indicated the presence of petroleum-based products similar to that of kerosene. Sand samples taken on the shoreline also returned the presence of petrochemicals.

The hypothesis is that as the sun rose on the morning of the June 28, ambient temperatures increased by approximately 1 degree. This temperature would have resulted in evaporation of fractions of petroleum-based compounds. During the evaporation the wind direction was originating from the South East. The shoreline is upwind of the Toll Plaza and fumes evaporated at this point would be blown directly into the Toll Plaza and surrounding areas. Air conditioner and respirator filters obtained at the Toll Plaza showed the presence of long chain-alkanes similar to those found in petrochemical- based substances.

All samples - air, water, sand and flora - were positive for petrochemicals (but returned negative for pesticides). The presence of petroleum-based products matched the scent of the chemical indicated by employees at the Toll Plaza.

7.0 CONCLUSIONS

- The results of analyses identified the polluting substance as a volatile petroleum-based product - most likely kerosene – that was wind blown.
- The meteorological data confirmed that the source of the fumes would have originated from a south-easterly direction.
- The noxious fumes were not generated from a land-based point source or a pesticide source.
- There was a reported loss of 262 barrels of kerosene during loading activities by Petrojam in the early morning hours of June 28 at the Esso Kingston Terminal (EKT) dock which is operated by Petrojam.
- The kerosene loss on the day of the pollution incident correlates directly with the chemical identified as the pollutant that caused the noxious fumes.
- The spill of 262 barrels (30,294 litres) of volatile kerosene oil to the marine environment and its subsequent vaporisation to the atmosphere for dispersion by the wind is the likely method by which the pollutant was transmitted to the Toll Plaza on the day of the incident.
- The pollution incident had relatively significant impact on the marine and land environment, human health and the economy.

FIGURES

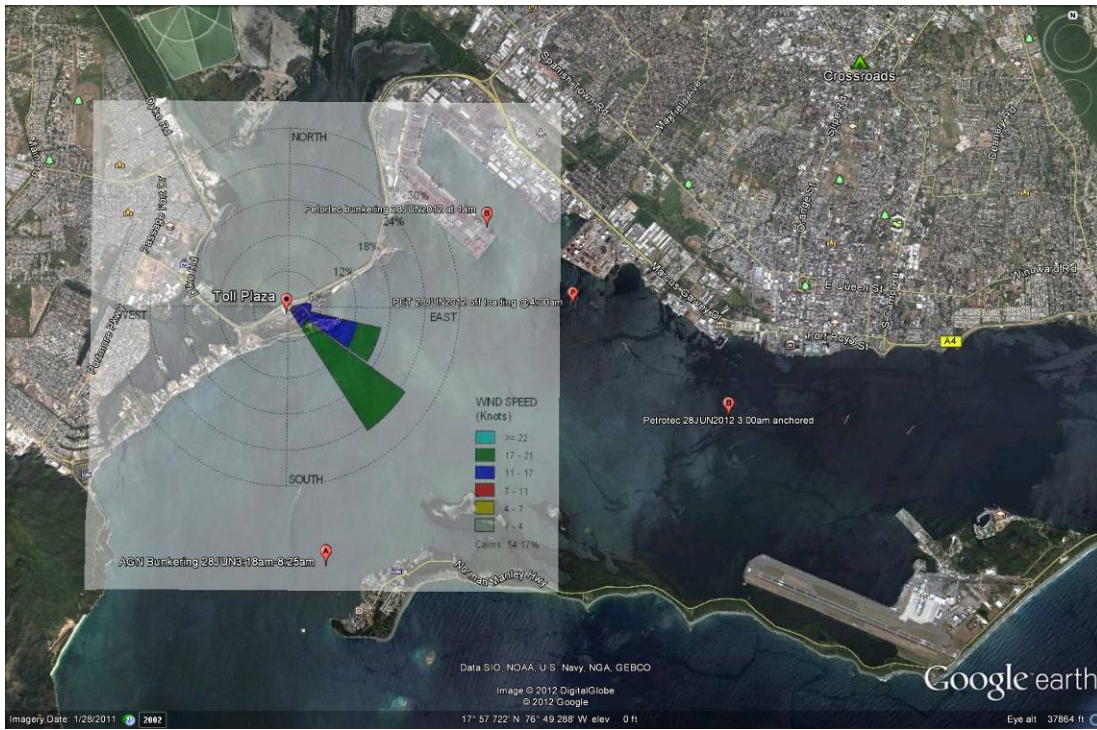


Figure 1: Map of Wind Direction Plot from 8:00am – 5:00pm on 2012-06-28

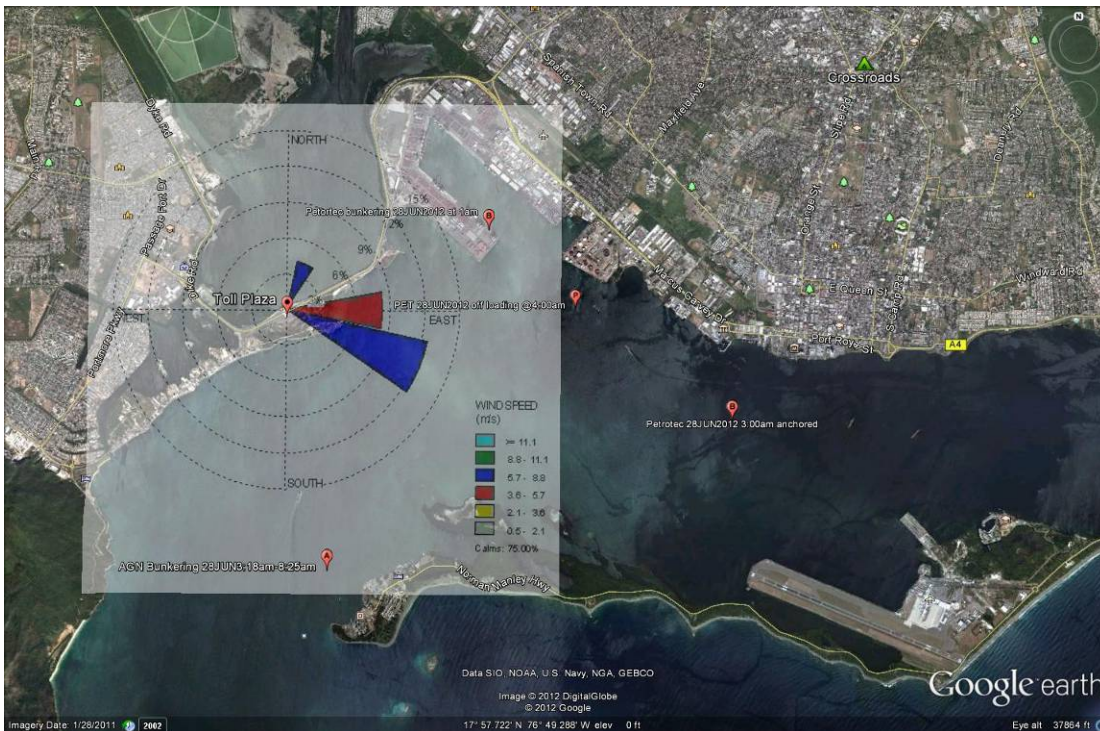


Figure 2: Map of Bunkering & Offloading Activities & Wind Direction Plot from 12:00am – 7:00am on 28 JUNE 2012

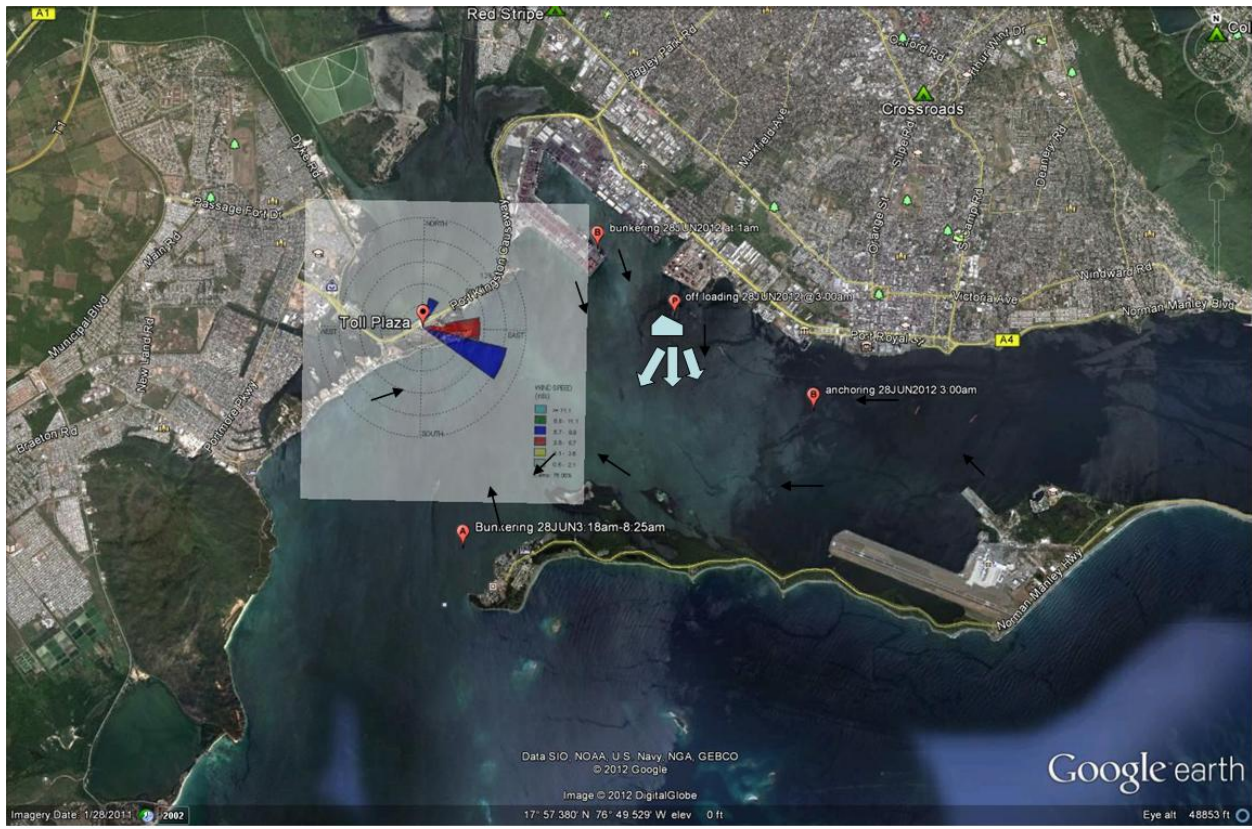


Figure 3: Harbour Current pattern study and scenario 8 model

Appendix 1

Results from Pesticide Research Laboratory



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Mona, Kingston 7
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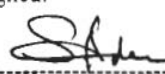
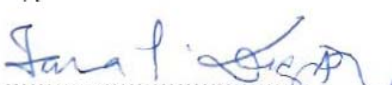
URL <http://wwwchem.uwimona.edu.jm:1104/>

OUR REFERENCE

PESTICIDE RESEARCH LABORATORY
Certificate of Analysis

This certificate/report is a correct record of the measurements and observations made. The certificate/report is intended for the private information of those for whom the work was done and must not be used in whole or part in any other way except with the written approval of the Head of the Chemistry Department, UWI. Misuse may lead to the penalties provided under law. The Chemistry Department or the University of the West Indies accepts no responsibility for any loss or damage, which may be sustained as a result of the use or reliance upon this certificate/report.		
Test: Pesticide Screen	Reference: NEPA1207A1	Page 1/1
	Date Submitted: July 3 & 4, 2012	
	Test Started: July 3, 2012	
Client: National Environmental & Planning Agency (NEPA)	Serial No./Batch No: n/a	
Product: Water and Sand	Specification:	
Test Method (Screening):	Conditions: room temperature	
1. EPA Method 3510C (1996), determination by GC/MS	Test Uncertainty:	
2. EPA Method 3540C, determination by GC/MS		

SAMPLE DESCRIPTION	TESTS	RESULTS
Water PI0729W	Pesticide Screen	The chromatogram indicated an absence of pesticides.
Water PI0628CW	Pesticide Screen	The chromatogram indicated an absence of pesticides.
Sand PI0728	Pesticide Screen	The chromatogram indicated an absence of pesticides.
Sand PI0628CS	Pesticide Screen	The chromatogram indicated an absence of pesticides.

Circulation: National Environment & Planning Agency Department of Chemistry, UWI, Mona	Remarks: The detection limit is 20 ppb for the pesticides in question.	Signed:
		 Sophia Haley (Analyst)
		Approved:
		 Prof. Tara Dasgupta (Head of Laboratory)
		Date: July 5, 2012



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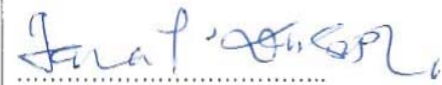
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Test: Petrochemicals Screen	Reference: NEPA1207A2	Page 1/1
	Date Submitted: July 3 & 4, 2012	
	Test Started: July 3, 2012	
Client: National Environmental & Planning Agency (NEPA)	Serial No./Batch No: n/a	
Product: Water and Sand	Specification:	
Test Method (Screening):	Conditions: room temperature	
3. EPA Method 3510C (1996), determination by GC/MS	Test Uncertainty:	
4. EPA Method 3540C, determination by GC/MS		

SAMPLE DESCRIPTION	TESTS	RESULTS
Water PI0729W	Petrochemicals Screen	The chromatogram indicated the presence of petrochemicals (xylene/dimethylbenzene, straight chain and branched alkanes, naphthalenes and substituted naphthalenes).
Water PI0628CW	Petrochemicals Screen	The chromatogram indicated the presence of petrochemicals (straight chain and branched alkanes, naphthalenes and substituted naphthalenes).
Sand PI0728	Petrochemicals Screen	The chromatogram indicated an absence of petrochemicals.
Sand PI0628CS	Petrochemicals Screen	The chromatogram indicated the presence of alkanes.

Circulation: National Environment & Planning Agency Department of Chemistry, UWI, Mona	Remarks:	Signed:
		 Sophia Haley (Analyst)
		Approved:  Prof. Tara Dasgupta (Head of Laboratory)
		Date: July 5, 2012



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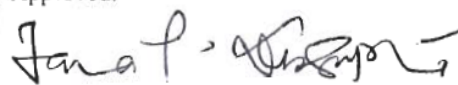
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Test: Volatile Organic Compounds (VOCs)	Reference: NEPA1207A3	Page 1/1
	Date Submitted: July 3 & 4, 2012	
	Test Started: July 3, 2012	
Client: National Environmental & Planning Agency (NEPA)	Serial No./Batch No: n/a	
Product: Water and Sand	Specification:	
Test Method (Screening):	Conditions: room temperature	
1. EPA Method 5030, determination by Purge and Trap GC/MS	Test Uncertainty:	
2. EPA Method 5035, determination by Purge and Trap GC/MS		

SAMPLE DESCRIPTION	TESTS	RESULTS
Water PI0729W	VOC Screening	The chromatogram indicated the presence of acetone and methylene chloride
Water PI0628CW	VOC Screening	The chromatogram indicated the presence of petrochemicals (straight chain and branched alkanes, alkenes, naphthalenes and substituted naphthalenes).
Water PI0728	VOC Screening	The chromatogram indicated the presence of VOCs (straight chain and branched alkanes, cycloalkanes naphthalenes and substituted naphthalenes).
Sand PI0728	VOC Screening	The chromatogram indicated the presence of acetone, methylene chloride and trimethylamine.
Sand PI0628CS	VOC Screening	The chromatogram indicated the presence of trimethylamine, dimethyl sulphide and methylene chloride.

Circulation: National Environment & Planning Agency Department of Chemistry, UWI, Mona	Remarks:	Signed:
		 Nykieta James (Analyst)
		Approved:
		 Prof. Tara Dasgupta (Head of Laboratory)
		Date: July 5, 2012



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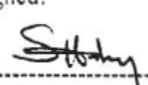

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Test: Diesel, Kerosene Profiles Comparison	Reference: NEPA1207A4	Page 1/1
	Date submitted: July 3 & 4, 2012 Test started: July 3, 2012	
Client: National Environmental & Planning Agency (NEPA)	Serial No./Batch No: n/a	
Product: Water and Sand	Specification:	
Test Method (Screening): Gas Chromatography/Mass Spectrometry	Conditions: room temperature Test Uncertainty:	

SAMPLE DESCRIPTION	TESTS	RESULTS
Water PI0729W	Diesel, Kerosene Profiles Comparison	The chromatogram indicated similarities to the profiles of diesel and kerosene. *
Water PI0628CW	Diesel, Kerosene Profiles Comparison	The chromatogram indicated similarities to the profile of diesel.*
Sand PI0728	Diesel, Kerosene Profiles Comparison	The chromatogram indicated no similarity to the profile of diesel or kerosene.
Sand PI0628CS	Diesel, Kerosene Profiles Comparison	The chromatogram indicated no similarity to the profile of diesel or kerosene.

Circulation: National Environment & Planning Agency Department of Chemistry, UWI, Mona	Remarks: *See attached chromatograms and instrument reports.	Signed:
		 ----- Sophia Haley (Analyst)
		Approved:  ----- Prof. Tara Dasgupta (Head of Laboratory)
		Date: July 5, 2012



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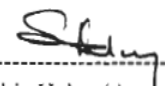
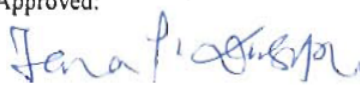
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This certificate/report is a correct record of the measurements and observations made. The certificate/report is intended for the private information of those for whom the work was done and must not be used in whole or part in any other way except with the written approval of the Head of the Chemistry Department, UWI. Misuse may lead to the penalties provided under law. The Chemistry Department or the University of the West Indies accepts no responsibility for any loss or damage, which may be sustained as a result of the use or reliance upon this certificate/report.

Test: Organic Compounds Screen	Reference: NEPA1207B1	Page 1/1
	Date submitted: July 5, 2012 Test started: July 5, 2012	
Client: National Environmental & Planning Agency (NEPA)	Serial No./Batch No: n/a	
Product: Air Filters	Specification:	
Test Method (Screening): 1. EPA Method 3540, determination by GC/MS	Conditions: Room Temperature Test Uncertainty:	

SAMPLE DESCRIPTION	TESTS	RESULTS
AC Filter (Control Office)	Organic Compounds Screen	The chromatogram indicated the presence of long-chain alkanes.
Sample # 3	Organic Compounds Screen	The chromatogram indicated the presence of long-chain alkanes.
Sample # 4	Organic Compounds Screen	The chromatogram indicated the presence of long-chain alkanes.
Sample # 5	Organic Compounds Screen	The chromatogram indicated the presence of long-chain alkanes.

Circulation: National Environment & Planning Agency Department of Chemistry, UWI, Mona	Remarks:	Signed:  Sophia Haley (Analyst)
		Approved:  Prof. Tara Dasgupta (Head of Laboratory) Date: July 9, 2012



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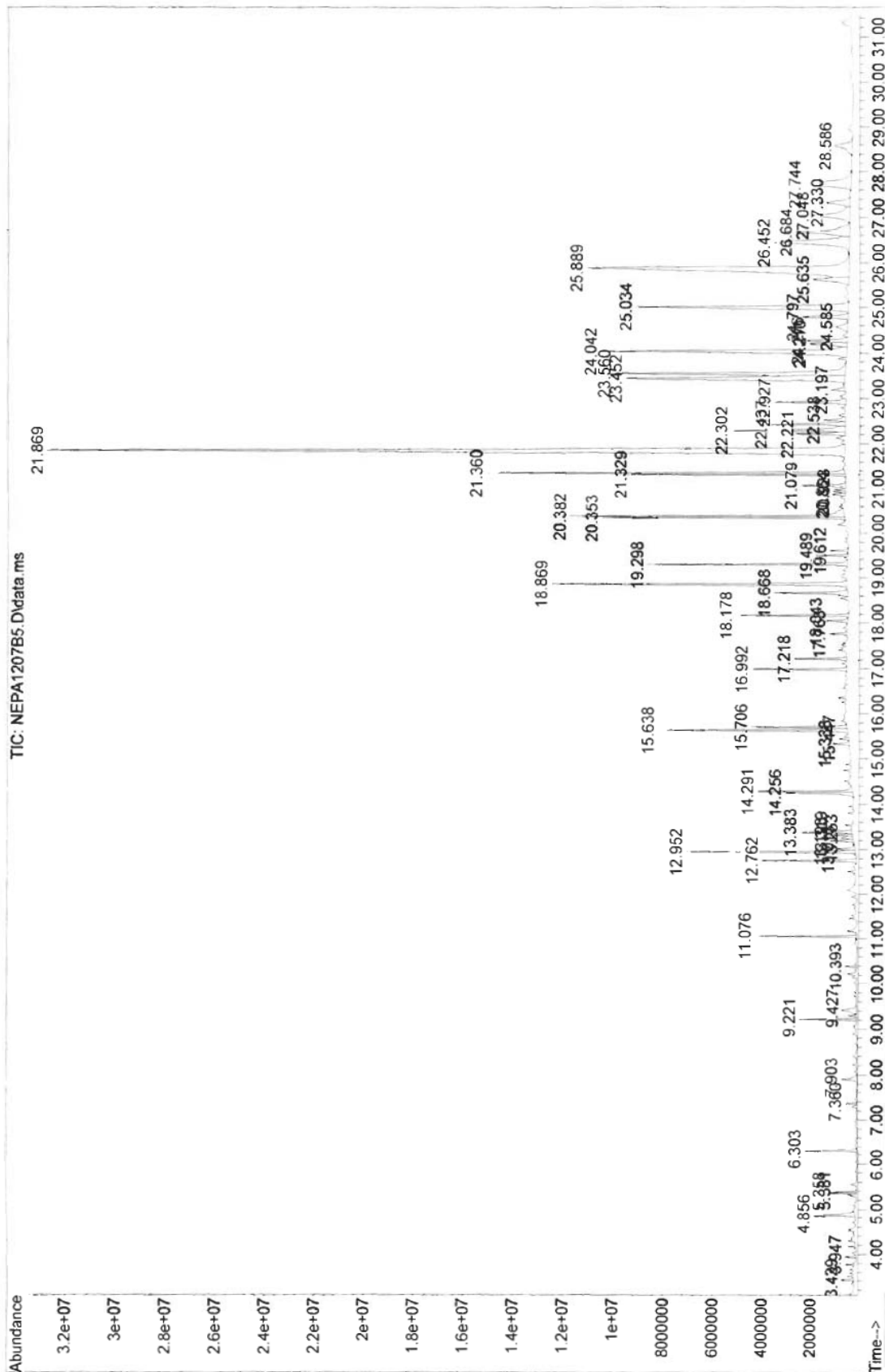
Test: Organic Compound Profile	Reference: NEPA1207B2	Page 1/1
	Date Submitted: July 5, 2012	
	Test Started: July 5, 2012	
Client: National Environmental & Planning Agency (NEPA)	Serial No./Batch No: n/a	
Product: Plant Material	Specification:	
Test Method (Screening): 2. EPA test method, determination by GC/MS	Conditions: Room Temperature	
	Test Uncertainty:	

SAMPLE DESCRIPTION	TESTS	RESULTS
Portmore Side of Toll Road (Control)	Organic Compound Profile	See attached GC/MS chromatogram and report.
Cranes on Port	Organic Compound Profile	See attached GC/MS chromatogram and report.
Portmore Toll Plaza	Organic Compound Profile	See attached GC/MS chromatogram and report.

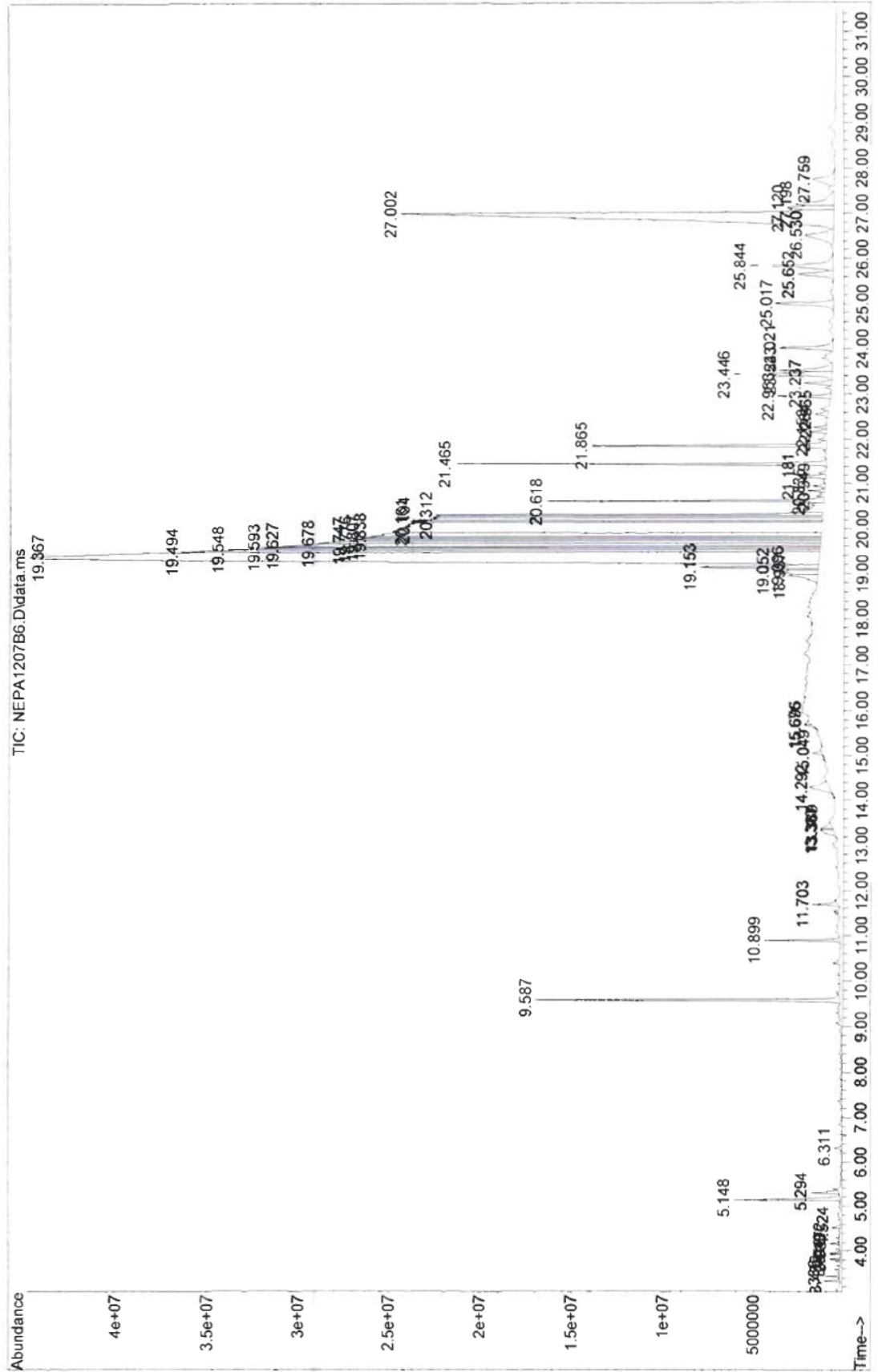
Circulation: National Environment & Planning Agency Department of Chemistry, UWI, Mona	Remarks:	Signed:  Sophia Haley (Analyst)
		Approved:  Prof. Tara Dasgupta (Head of Laboratory)
		Date: July 9, 2012



File : C:\msdchem\1\data\PRL\NEPA\NEPA1207B5.D
 Operator : SOPHIA
 Acquired : 7 Jul 2012 16:47 using AcqMethod COFFEE1.M
 Instrument : GCMSD1
 Sample Name : control plant material
 Misc Info : Port. side of toll rd
 Vial Number: 2

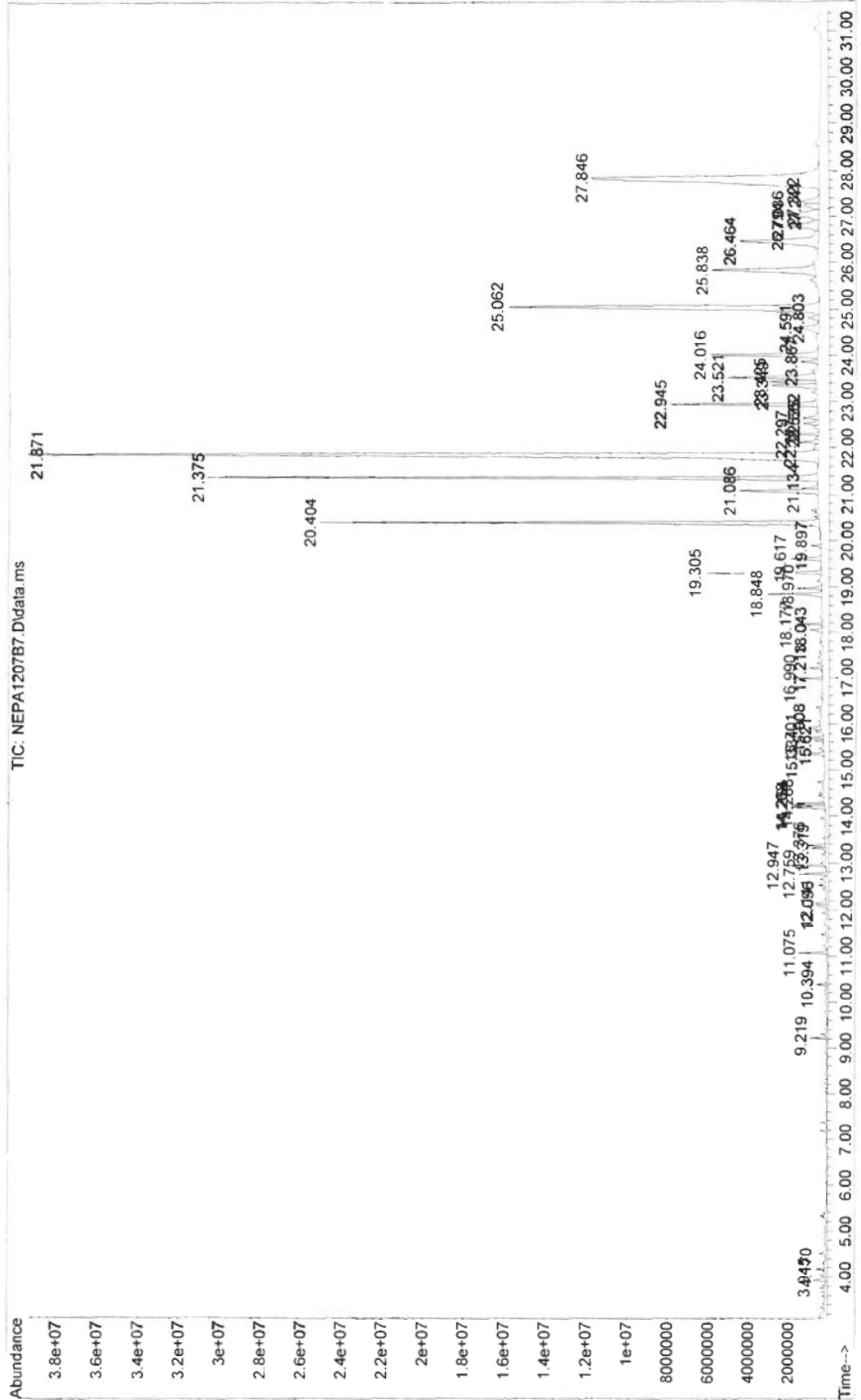


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 Operator : SOPHIA
 Acquired : 7 Jul 2012 17:26 using AcqMethod COFFEE1.M
 Instrument : GCMSD1
 Sample Name : port. toll plaza plant material
 Misc Info : oyster, mangrove plant
 Vial Number : 3





File : C:\msdchem\1\data\PRL\NEPA\NEPA1207B7.D
 Operator : SOPHIA
 Acquired : 7 Jul 2012 18:06 using AcqMethod COFFEE1.M
 Instrument : GCMSDI
 Sample Name: cranes on port. plant material
 Misc Info :
 Vial Number: 4



Appendix 2

Analytical Results from TEMN and AirZone One Limited Laboratory

SAMPLE ANALYSIS REPORT								
Project Number:	J12080-1 PSD VOC							
Report Date:	10-Jul-12							
Analysis Date:	6-Jul-12							
Sample received Date	6-Jul-12							
Analytical Method:	Gas Chromatography/ Mass Spectrometry (GC/MS)							
Sample Type:	PSD							
RESULTS	Unit : µg/m3							
Sample I.D.	CAS #	Lab Blank	5 Blank	2 FC	4 OFF	1 FC	3 R1	3 R1 Repeat
Dichloromethane	75-09-2	<0.2	<0.2	0.3	0.39	0.74	1.01	1.05
Hexane	110-54-3	<0.2	1.83	5.64	5.91	6.48	21	20.6
Chloroform	67663	<0.2	<0.2	<0.2	0.26	<0.2	0.5	0.49
1,2-Dichloroethane	107-06-2	<0.2	<0.2	<0.2	<0.2	0.44	1.02	0.92
Benzene	71432	<0.2	1.3	11.7	10.5	9.69	24.7	24.9
Trichloroethylene	79-01-6	<0.2	0.32	0.63	0.69	<0.2	0.92	0.97
Toluene	108-88-3	<0.2	1.22	6.48	6.97	6.17	38.2	38.3
Tetrachloroethylene	127184	<0.2	<0.2	<0.2	2.55	<0.2	0.31	0.2
Ethylbenzene	100414	<0.2	0.39	2.08	3.28	2.05	8.88	8.92
(m+p)-Xylene	108383 / 106423	<0.2	0.4	3.18	5.96	3.15	25.9	26.2
o-Xylene	95476	<0.2	0.22	1.18	1.95	1	9.74	9.63
Styrene	100425	<0.2	<0.2	<0.2	<0.2	<0.2	0.28	0.33
Cumene	98828	<0.2	<0.2	0.22	0.48	0.22	1.02	0.94
α-Pinene	80-56-8	<0.2	0.34	0.69	3.17	0.64	2.19	2.09
1,1,2,2-Tetrchloroethane	79345	<0.2	<0.2	4.63	0.27	0.67	6.54	6.75
n-Decane	124-18-5	<0.2	0.54	3.65	4.64	3.67	5.83	5.85
1,3,5-Trimethylbenzene	108-67-8	<0.2	<0.2	0.27	0.3	0.25	2.52	2.53
1,2,4-Trimethylbenzene	95-63-6	<0.2	0.65	4.49	5	2.73	10.4	12.9
Pentachloroethane	76-01-7	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
d-Limonene	5989-27-5	<0.2	<0.2	<0.2	1.92	<0.2	2.04	1.99
p-Cymene	99876	<0.2	<0.2	<0.2	0.47	<0.2	0.71	0.69
1,3-Dichlorobenzene	541-73-1	<0.2	0.41	0.89	0.8	0.57	0.81	0.87
1,4-Dichlorobenzene	106467	<0.2	0.33	0.85	34.6	0.73	1.25	1.22
Hexachloroethane	67-72-1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2,4-Trichlorobenzene	120821	<0.2	<0.2	<0.2	<0.2	<0.2	0.44	0.4
Naphthalene	91203	<0.2	0.83	1.19	1.63	1.12	1.99	2.11
Extra compound concentration as toluene equivalents								
Benzene, chloro-	000108-90-7	<0.2	82.2	57.5	92.7	46.1	51	48.5
Cyclohexanone	000108-94-1							
1-Hexanol, 2-ethyl-	000104-76-7	<0.2	81.5	80	74.8	71.3	73.2	69.3

Cyclotetradecane	000295-17-0	<0.2	33	40.9	44.3	44.9	46.4	41.8
Caprolactam	000105-60-2	<0.2	53.9	48.3	52.4	51.5	33	35
Comments	The samples were extracted with solvent. Compounds were determined by Gas Chromatography/ Mass Spectrometry (GC/MS). The method detection limit is 0.2 µg/m ³ .							
QA/QC	Multipoint calibration curve (linear regression = 0.999). These samples were spiked with deuterated internal standards. Results were corrected with internal standard, lab blank and recovery.							
Analyst	Henrik Li							
Reviewer	Phil Fellin							

Laboratory: AirZone one Ltd. - Ontario Canada

Requested By: TEMN Ltd. - Paul carroll

Client: NEPA - Gary Campbell

SAMPLING PROCEDURE:

Sampling location was at the Toll Plaza, Causeway and Fun City, Port Henderson Rd. Passive organic vapour monitors - 3M 3500 were placed at three sites affected by foul odour on Thursday July 28. shoe boxes that had a strong unpleasant odour. These were labelled 1FC, 2FC, 3R1 and 4OFF. Sample 5 was a quality control field blank.. Monitors were deployed on July 4 between 11:20 and 1:40PM and retrieved on July 5 between 1:40PM and 2:00PM.

KEY:

1FC - FUN CITY (UTILITY POLE)

2FC- FUN CITY UTILITY POLE

3R1- TOLL BOOTH (SOUTHERNMOST)

4OFF - OFFICE BUILDING - UPSTAIRS IN PASSAGE CEILING

SAMPLE ANALYSIS REPORT							
Project Number:	J12080	J12080-2 Face Mask Filter					
Report Date:	10-Jul-12						
Analysis Date:	6-Jul-12						
Sample received Date	6-Jul-12						
Analytical Method:	Gas Chromatography/ Mass Spectrometry (GC/MS)						
Sample Type:	Face Mask Filter						
RESULTS	Unit : µg/m ³						
Sample I.D.	CAS #	Lab Blank	Blank-1	Blank-2	Sample-1	Sample-2	Sample-2 Repeat
Dichloromethane	75-09-2	<0.2	<0.2	<0.2	<0.2	0.23	0.25
Hexane	110-54-3	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chloroform	67663	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-Dichloroethane	107-06-2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Benzene	71432	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Trichloroethylene	79-01-6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	<0.2	<0.2	<0.2	<0.2	0.31	0.3
Tetrachloroethylene	127184	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	100414	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
(m+p)-Xylene	108383 / 106423	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-Xylene	95476	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Styrene	100425	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cumene	98828	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
a-Pinene	80-56-8	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,1,2,2-Tetrachloroethane	79345	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
n-Decane	124-18-5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,3,5-Trimethylbenzene	108-67-8	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2,4-Trimethylbenzene	95-63-6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Pentachloroethane	76-01-7	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
d-Limonene	5989-27-5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
p-Cymene	99876	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,3-Dichlorobenzene	541-73-1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,4-Dichlorobenzene	106467	<0.2	<0.2	<0.2	<0.2	0.22	0.22
Hexachloroethane	67-72-1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2,4-Trichlorobenzene	120821	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Naphthalene	91203	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Comments	Chromatography/ Mass Spectrometry (GC/MS). The method detection limit is						
QA/QC	spiked with deuterated internal standards. Results were corrected with internal						
Analyst	Henrik Li						
Reviewer	Phil Fellin						

Laboratory: AirZone One Ltd
 Requested By: TEMN Ltd
 Client: NEPA - Gary Campbell

Appendix 3

Results of Water and Sand Samples Collected near Fun City Beach analyzed by Pesticides Research Laboratory

Summary of Results

Table 3: Results of Water and Sand Samples Collected near Fun City Beach analyzed by Pesticides Research Laboratory

Sample			Components			Comparisons with Kerosene & Diesel	Laboratory
Name	Date	Location	Pesticides	Petrochemicals	Volatile Organic Compounds		
Water PI0728	2012-06-28	120m East of Fun City Beach	Not tested	Not tested	Straight-chain and branched alkanes	Not tested	Pesticides Research Laboratory
					Cycloalkanes		
					Naphthalenes,		
					Substituted Naphthalenes		
Water PI0729W	2012-06-29	100m East of Fun City Beach	Absent	Xylene / di-methylbenzene	Acetone	Similar to both	Pesticides Research Laboratory
				Straight-chain and branched alkanes	Methylene Chloride		
				Naphthalenes,			
				Substituted Naphthalenes			
Water PI0628CW	2012-07-04	100m East of Fun City Beach	Absent	Straight chain and branched alkanes	Straight chain and branched alkanes	Similar to both	Pesticides Research Laboratory
				Naphthalenes	Alkenes		
				Substituted Naphthalenes	Naphthalenes		
					Substituted		

Sample			Components			Comparisons with Kerosene & Diesel	Laboratory
Name	Date	Location	Pesticides	Petrochemicals	Volatile Organic Compounds		
					Naphthalenes		
Sand PI0728	2012-06-29	100m East of Fun City Beach	Absent	Absent	Acetone	Not similar to both	Pesticides Research Laboratory
					Methylene Chloride		
					Tri-methylamine		
Sand PI0628CS	2012-07-04	100m East of Fun City Beach	Absent	Present	Tri-methylamine	Not similar to both	Pesticides Research Laboratory
					Di-methyl sulphide		
					Methylene Chloride		

Table 4: Results of Air Filter Samples Collected at Portmore Toll Plaza

Sample		Components	Laboratory
Name	Date Collected	Organic Compounds Screen	
AC Filter Control Office	2012-07-04	Presence of Long Chain Alkanes	Pesticides Research Laboratory
Toll Plaza Inside Office	2012-07-04	Presence of Long Chain Alkanes	Pesticides Research Laboratory
Worn in Toll Plaza	2012-07-04	Presence of Long Chain Alkanes	Pesticides Research Laboratory
Toll Plaza Thursday Evening	2012-07-04	Presence of Long Chain Alkanes	Pesticides Research Laboratory

Appendix 4

Definitions

1. **Kerosene** is a thin, clear liquid formed from hydrocarbons, with a density of 0.78 – 0.81 g/cm³, is obtained from the fractional distillation of petroleum between 150 °C and 275 °C, resulting in a mixture of carbon chains that typically contain between six and 16 carbon atoms per molecule. Major constituents of Kerosene include n-dodecane, alkyl benzenes, and naphthalene and its derivatives.
2. **Diesel fuel** in general is any liquid fuel used in diesel engines. The most common is a specific fractional distillate of petroleum fuel oil, but alternatives that are not derived from petroleum, such as biodiesel, biomass to liquid (BTL) or gas to liquid (GTL) diesel, are increasingly being developed and adopted. To distinguish these types, petroleum-derived diesel is increasingly called petrodiesel. Ultra-low sulfur diesel (ULSD) is a standard for defining diesel fuel with substantially lowered sulfur contents
3. **Gasoline** is a transparent petroleum-derived liquid that is primarily used as a fuel in internal combustion engines. It consists mostly of organic compounds obtained by the fractional distillation of petroleum, enhanced with a variety of additives. Some gasolines also contain ethanol as an alternative fuel. Gasoline is produced in oil refineries. Material that is separated from crude oil via distillation, called virgin or straight-run gasoline, does not meet the required specifications for modern engines (in particular octane rating; see below), but will form part of the blend. The bulk of a typical gasoline consists of hydrocarbons with between four and 12 carbon atoms per molecule (commonly referred to as C4-C12).