Facility Information Summary	
AER Reporting Year	2015
Licence Register Number	W0184-01
Name of site	Enva Ireland Limited
Site Location	Clonminan Industrial Estate, Portlaoise, Co. Loias
NACE Code	3832
Class/Classes of Activity	**Fourth Schedule** - Class 6, Class 7, Class 12, Class 13.
National Grid Reference (6E, 6 N)	2461 E, 1978 N

A description of the activities/processes at the site for the reporting year. This should include information such as production increases or decreases on site, any infrastructural changes, environmental

Site Performance: The processing activities onsite include waste oil re-processing, treatment of contaminated soil, repacking of oily contaminated wastes, and paint wastes. The site also stores wastes in packages (barrels, ASPs, IBCs, etc.) prior to transfer off site for recovery or disposal. The company continues to demonstrate its commitment towards HSE management standards - the site maintains ISO14001 and OHSAS 18001. This ensures a standard approach is taking to managing activities from an environmental and safety aspect. There were no issues raised during the reporting period regarding maintenance to the standard.

Infrastructure / EMP progress: The site is currently undergoing a licence review. Yard integrity is monitored regularly and repaired as required. The EMP has been updated to include programme of works devised for

performance which was measured during the reporting year **and an overview of compliance with your licence** listing all exceedances of licence limits (where applicable) and what they relate to e.g. air, water, noise.	and repaired as required. The EMP has been updated to include programme of works devised for reductionin odour generation from the site. **Environmental Performance:** There were 28 complaints received by Enva during the reporting period. Compliance Investigation (CI001037) remains open. Control measures have been implemented as per correspondance uploaded to EDEN and as set out in the EMP attached. Fluctuations in waste quantities accepted onsite was subject to availability from customers rather than an intentional increase/decrease in waste volumes. The licence review process is currently on-going.

Declaration:

All the data and information presented in this report has been checked and certified as being accurate. The quality of the information is assured to meet licence requirements.

Donal Conroy	31.03.16
Signature Group/Facility manager (or nominated, suitably qualified and experienced deputy)	Date

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Answer all questions and complete all tables where relevant

			Additional information
1	Does your site have licensed air emissions? If yes please complete table A1 and A2 below for the current reporting year and answer further questions. If you do not have licenced emissions and do not complete a solvent management plan (table A4 and A5) you do not need to complete the tables	Yes	Dust monitoring results are detailed on the table below however they are not emission points.

Periodic/Non-Continuous Monitoring

2	Are there any results in breach of licence requirements? If yes please provide brief details in the comment section of TableA1 below	No	
3	Was all monitoring carried out in accordance with EPA guidance note AG2 and using the basic air monitoring checklist? Basic air monitoring checklist AGN2	Yes	

Table A1: Licensed Mass Emissions/Ambient data-periodic monitoring (non-continuous)

Emission reference no:	Parameter/ Substance	Frequency of Monitoring	ELV in licence or any revision therof	Licence Compliance criteria	Measured value	Unit of measurement	Compliant with licence limit	Method of analysis	Annual mass load (kg)	Comments - reason for change in % mass load from previous year if applicable
A-01	Carbon monoxide (CO)	Annually	N/A	No 30min mean can exceed the ELV	1.7	mg/Nm3	yes	EN 15058:2004	5.45	N/A
A-01	Nitrogen oxides (NOx/NO2)	Annually	N/A	No 30min mean can exceed the ELV	164.4	mg/Nm3	SELECT	EN 14792:2005	526.77	N/A
A-01	Sulphur oxides (SOx/SO2)	Annually	N/A	No 30min mean can exceed the ELV	6.1	mg/Nm3	SELECT	OTH	19.55	N/A
A-01	Combustion Efficiency	Annually	N/A	No 30min mean can exceed the ELV	92.36	%	SELECT	OTH	N/A	N/A
DP1	LICENCED	Quarter 1	Yes - 350 mg/m2	Monitoring to occur 4 times a year	92.86	mg/m2/day	yes	Standard Method	N/A	N/A
DP2	LICENCED	Quarter 1	Yes - 350 mg/m2	Monitoring to occur 4 times a year	60.94	mg/m2/day	yes	Standard Method	N/A	N/A
DP3	LICENCED	Quarter 1	Yes - 350 mg/m2	Monitoring to occur 4 times a year	89.96	mg/m2/day	yes	Standard Method	N/A	N/A
DP1	LICENCED	Quarter 2	Yes - 350 mg/m2	Monitoring to occur 4 times a year	31.34	mg/m2/day	yes	Standard Method	N/A	N/A
DP2	LICENCED	Quarter 2	Yes - 350 mg/m2	Monitoring to occur 4 times a year	35.98	mg/m2/day	yes	Standard Method	N/A	N/A
DP3	LICENCED	Quarter 2	Yes - 350 mg/m2	Monitoring to occur 4 times a year	12.19	mg/m2/day	yes	Standard Method	N/A	N/A
DP1	LICENCED	Quarter 3	Yes - 350 mg/m2	Monitoring to occur 4 times a year	73.7	mg/m2/day	yes	Standard Method	N/A	N/A
DP2	LICENCED	Quarter 3	Yes - 350 mg/m2	Monitoring to occur 4 times a year	41.4	mg/m2/day	yes	Standard Method	N/A	N/A
DP3	LICENCED	Quarter 3	Yes - 350 mg/m2	Monitoring to occur 4 times a year	17.8	mg/m2/day	yes	Standard Method	N/A	N/A
DP1	LICENCED	Quarter 4	Yes - 350 mg/m2	Monitoring to occur 4 times a year	8.49	mg/m2/day	yes	Standard Method	N/A	N/A
DP2	LICENCED	Quareter 4	Yes - 350 mg/m2	Monitoring to occur 4 times a year	27.5	mg/m2/day	yes	Standard Method	N/A	N/A

AIR-summary template					Lic No:	W0184-01		Year	2015	
DP3	LICENCED	Quareter 4	Yes - 350 mg/m2	Monitoring to occur 4 times a year	17.19	mg/m2/day	yes	Standard Method	N/A	N/A

Note 1: Volumetric flow shall be included as a reportable parameter

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Continuous Monitoring

4	Does your site carry out continuous air emissions monitoring?	No	
	If yes please review your continuous monitoring data and report the required fields below in Table A2 and compare it to its relevant Emission Limit Value (ELV)		
5	Did continuous monitoring equipment experience downtime? If yes please record downtime in table A2 below	No	
6	Do you have a proactive service agreement for each piece of continuous monitoring equipment?	No	
7	Did your site experience any abatement system bypasses? If yes please detail them in table A3 below	No	

Table A2: Summary of average emissions -continuous monitoring

Emission reference no:	Parameter/ Substance	ELV in licence or any revision therof	Averaging Period	Compliance Criteria	Units of measurement	Annual Emission	Annual maximum	Monitoring Equipment downtime (hours)	Number of ELV exceedences in current reporting year	Comments
	SELECT			SELECT	SELECT					
	SELECT				SELECT					
	SELECT				SELECT					
	SELECT				SELECT					
	SELECT				SELECT					

note 1: Volumetric flow shall be included as a reportable parameter.

Table A3: Abatement system bypass reporting table

Bypass protocol

Date*	Duration** (hours)	Location	Reason for bypass	Impact magnitude	Corrective action

* this should include all dates that an abatement system bypass occurred

** an accurate record of time bypass beginning and end should be logged on site and maintained for future Agency inspections please refer to bypass protocol link

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Solvent use and management on site

8 Do you have a total Emission Limit Value of direct and fugitive emissions on site? if yes please fill out tables A4 and A5

SELECT	

Table A4: Solvent Management Plan Summary
Total VOC Emission limit value

Solvent regulations — Please refer to linked solvent regulations to complete table 5 and 6

Reporting year	Total solvent input on site (kg)	Total VOC emissions to Air from entire site (direct and fugitive)	Total VOC emissions as %of solvent input	Total Emission Limit Value (ELV) in licence or any revision therof	Compliance
					SELECT
					SELECT

Table A5: Solvent Mass Balance summary

	(I) Inputs (kg)	(O) Outputs (kg)						
Solvent	(I) Inputs (kg)	Organic solvent emission in waste	Solvents lost in water (kg)	Collected waste solvent (kg)	Fugitive Organic Solvent (kg)	Solvent released in other ways e.g. by-	Solvents destroyed onsite through	Total emission of Solvent to air (kg)
							Total	

AER Monitoring returns summary template-WATER/WASTEWATER(SEWER) Lic No: W0164-01 Year 2015

Additional information	
Yes	
No	

Does your site have licensed emissions direct to surface water or direct to sewer? If yes please complete table W2 and W3 below for the current reporting year and answer further questions. If you do not have licenced emissions you only need to complete table W1 and or W2 for storm water analysis and visual inspections

Was it a requirement of your licence to carry out visual inspections on any surface water discharges or watercourses on or near your site? If yes please complete table W2 below summarising only any evidence of contamination noted during visual inspections

Table W1 Storm water monitoring

Location reference	Location relative to site activities	PRTR Parameter	Licenced Parameter	Monitoring date	ELV or trigger level in licence or any revision thereof*	Licence Compliance criteria	Measured value	Unit of measurement	Compliant with licence	Comments
SW01	onsite	not applicable	Fats, Oils and Greases	05/05/2015	15 mg/L	All values < ELV	0.29	mg/L	yes	The highest result for the reporting year is recorded in this table.
SW01	onsite	not applicable	pH	27/04/2015	N/A	All values < ELV	8.21	pH units	yes	The highest result for the reporting year is recorded in this table.
SW01	onsite	not applicable	COD	06/07/2015	250 mg/L	All values < ELV	204	mg/L	yes	The highest result for the reporting year is recorded in this table.
SW01	onsite	not applicable	Suspended Solids	16/03/2015	60 mg/L	All values < ELV	54	mg/L	yes	The highest result for the reporting year is recorded in this table.
SW01	onsite	not applicable	Mineral oils	02/12/2015	5 mg/L	All values < ELV	0.78	mg/L	yes	The highest result for the reporting year is recorded in this table.
SW02	onsite	not applicable	Fats, Oils and Greases	N/A	N/A	All values < ELV	N/A	N/A	N/A	The highest result for the reporting year is recorded in this table.
SW02	onsite	not applicable	pH	26/01/2015	N/A	All values < ELV	8.32	pH units	yes	The highest result for the reporting year is recorded in this table.
SW02	onsite	not applicable	COD	12/10/2015	250 mg/L	All values < ELV	106	mg/L	yes	The highest result for the reporting year is recorded in this table.
SW02	onsite	not applicable	Suspended Solids	21/09/2015	60 mg/L	All values < ELV	57	mg/L	yes	The highest result for the reporting year is recorded in this table.
SW02	onsite	not applicable	Mineral oils	01/12/2015	5 mg/L	All values < ELV	0.11	mg/L	yes	The highest result for the reporting year is recorded in this table.

*trigger values may be agreed by the Agency outside of licence conditions

Table W2 Visual Inspections-Please only enter details where contamination was observed.

Location Reference	Date of Inspection	Description of contamination	Source of contamination	Corrective action	Comments
		not applicable	SELECT		
			SELECT		

Licensed Emissions to water and /or wastewater(sewer)-periodic monitoring (non-continuous)

Was there any result in breach of licence requirements? If yes please provide brief details in the comment section of Table W3 below

Was all monitoring carried out in accordance with EPA guidance and checklists for Quality of Aqueous Monitoring Data Reported to the EPA? If no please detail what areas require improvement in additional information box (External/Internal Lab Quality checklist; Assessment of results sheet etc)

	Additional information
No	
Yes	

Table W3: Licensed Emissions to water and /or wastewater (sewer)-periodic monitoring (non-continuous)

Emission reference no:	Emission released to	Parameter/ Substance Note 1	Type of sample	Frequency of monitoring	Averaging period	ELV or trigger values in licence or any revision thereof Note 2	Licence Compliance criteria	Measured value	Unit of measurement	Compliant with licence	Method of analysis	Procedural reference source	Procedural reference standard number	Annual mass load (kg)	Comments
FS1	Wastewater/Sewer	pH	composite	Daily	24 hour	6 - 8.5	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	8.43	pH units	no (if no please enter details in comments box)	pH Meter (Electrode)	As per manufacturers guide	SOP 1134		-
FS1	Wastewater/Sewer	Temperature	composite	Daily	24 hour	43	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	42.93	degrees C	yes	Temperature Probe	SCADA	SCADA		
FS1	Wastewater/Sewer	Suspended Solids	composite	Daily	24 hour	400 mg/L	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	658.58	mg/L	yes	Gravimetric analysis	APHA / AWWA "Standard Methods"	SOP 1291	633.5972	This was the maximum release. This release was compliant according to licence condition 6.10
FS1	Wastewater/Sewer	Ammonia (as N)	composite	Weekly	24 hour	80 mg/L	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	82.5	mg/L	yes	Spectrophotometry (Colorimetry)	APHA / AWWA "Standard Methods"	SOP 1243	320.57	This was the maximum release. This release was compliant according to licence condition 6.10
FS1	Wastewater/Sewer	Chlorides (as Cl)	composite	Weekly	24 hour	6000 mg/L	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	4070	mg/L	yes	Titration	APHA / AWWA "Standard Methods"	SOP 1028	18953.14	
FS1	Wastewater/Sewer	Copper and compounds (as Cu)	composite	Weekly	24 hour	1 mg/L	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	0.01	mg/L	yes	ICP	TM30 - Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	TM30/PM14	0.0014	
FS1	Wastewater/Sewer	Lead and compounds (as Pb)	composite	Weekly	24 hour	0.5 mg/L	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	0.01	mg/L	yes	ICP	TM30 - Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.8	TM30/PM14	0.0042	
FS1	Wastewater/Sewer	Zinc and compounds (as Zn)	composite	Weekly	24 hour	1 mg/L	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	0.52	mg/L	yes	ICP	TM30 - Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	TM30/PM14	0.38	
FS1	Wastewater/Sewer	Cadmium and compounds (as Cd)	composite	Weekly	24 hour	0.15 mg/L	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	0.01	mg/L	yes	ICP	TM30 - Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.10	TM30/PM14	0.00	
FS1	Wastewater/Sewer	COD	composite	Daily	24 hour	280Kg/day	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	4810.0	mg/L	yes	Spectrophotometry (Colorimetry)	APHA / AWWA "Standard Methods"	SOP 1241	23727.13	
FS1	Wastewater/Sewer	Phenols (as total C)	composite	Weekly	24 hour	50 mg/L	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	16.2	mg/L	yes	Spectrophotometry (Colorimetry)	APHA / AWWA "Standard Methods"	SOP 1289	79.96	
FS1	Wastewater/Sewer	Sulphate	composite	Weekly	24 hour	1000 mg/L	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	489	mg/L	yes	Spectrophotometry (Colorimetry)	APHA / AWWA "Standard Methods"	SOP 1032	1035.01	
FS1	Wastewater/Sewer	Fats, Oils and Greases	composite	Weekly	24 hour	100 mg/L	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	12.9	mg/L	yes	EPH with GC-FID	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	TM5/PM30	28.98	
FS1	Wastewater/Sewer	Total phosphorus	composite	Weekly	24 hour	150 mg/L	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	129	mg/L	yes	Spectrophotometry (Colorimetry)	APHA / AWWA "Standard Methods"	SOP 1246	616.84	
FS1	Wastewater/Sewer	volumetric flow	composite	Daily	24 hour	50 m3/day	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	40.09	m3/day	yes	SCADA	SCADA	SCADA	789820	

Note 1: Volumetric flow shall be included as a reportable parameter
Note 2: Where Emission Limit Values (ELV) do not apply to your licence please compare results against EQS for Surface water or relevant receptor quality standards

Continuous monitoring

Does your site carry out continuous emissions to water/sewer monitoring?

If yes please summarise your continuous monitoring data below in Table W4 and compare it to its relevant Emission Limit Value (ELV)

Did continuous monitoring equipment experience downtime? If yes please record downtime in table W4 below

Do you have a proactive service contract for each piece of continuous monitoring equipment on site?

Did abatement system bypass occur during the reporting year? If yes please complete table W5 below

Additional information	
No	
No	We do not have continuous monitoring equipment
No	We do not have continuous monitoring equipment
No	

Table W4: Summary of average emissions -continuous monitoring

Emission reference no:	Emission released to	Parameter/ Substance	ELV or trigger values in licence or any revision thereof	Averaging Period	Compliance Criteria	Units of measurement	Annual Emission for current reporting year (kg)	% change +/- from previous reporting year	Monitoring Equipment downtime (hours)	Number of ELV exceedances in reporting year	Comments
	SELECT	SELECT		SELECT	SELECT	SELECT					
	SELECT	SELECT		SELECT	SELECT	SELECT					

note 1: Volumetric flow shall be included as a reportable parameter.

Table W5: Abatement system bypass reporting table

Date	Duration (hours)	Location	Resultant emissions	Reason for bypass	Corrective action*	Was a report submitted to the EPA?	When was this report submitted?
						SELECT	

*Measures taken or proposed to reduce or limit bypass frequency

Bund/Pipeline testing template	Lic No:	W0184-01	Year	2015	

Bund testing — dropdown menu click to see options

			Additional information
1	Are you required by your licence to undertake integrity testing on bunds and containment structures ? If yes please fill out table B1 below listing all new bunds and containment structures on site, in addition to all bunds which failed the integrity test-all bunding structures which failed including mobile bunds must be listed in the table below, please include all bunds outside the licenced testing period (mobile bunds and chemstore included)	Yes	
2	Please provide integrity testing frequency period	3 years	
3	Does the site maintain a register of bunds, underground pipelines (including stormwater and foul), Tanks, sumps and containers? (containers refers to "Chemstore" type units and mobile bunds)	Yes	
4	How many bunds are on site?	10	
5	How many of these bunds have been tested within the required test schedule?	10	They are due in be tested in 2018
6	How many mobile bunds are on site?	18	
7	Are the mobile bunds included in the bund test schedule?	Yes	
8	How many of these mobile bunds have been tested within the required test schedule?	18	Two new added to list from 2015.
9	How many sumps on site are included in the integrity test schedule?	12	
10	How many of these sumps are integrity tested within the test schedule?	12	
	Please list any sump integrity failures in table B1		
11	Do all sumps and chambers have high level liquid alarms?	No	
12	If yes to Q11 are these failsafe systems included in a maintenance and testing programme?	SELECT	
13	Is the Fire Water Retention Pond included in your integrity test programme?	No	

Table B1: Summary details of bund /containment structure integrity test

Bund/Containment structure ID	Type	Specify Other type	Product containment	Actual capacity	Capacity required*	Type of integrity test	Other test type	Test date	Integrity reports maintained on site?	Results of test	Integrity test failure explanation <50 words	Corrective action taken	Scheduled date for retest	Results of retest(if in current reporting year)
	SELECT					SELECT			SELECT	SELECT		SELECT		

* Capacity required should comply with 25% or 110% containment rule as detailed in your licence

			Commentary
15	Has integrity testing been carried out in accordance with licence requirements and are all structures tested in line with BS8007/EPA Guidance? bunding and storage guidelines	Yes	
16	Are channels/transfer systems to remote containment systems tested?	No	N/A
17	Are channels/transfer systems compliant in both integrity and available volume?	SELECT	N/A

Pipeline/underground structure testing

1	Are you required by your licence to undertake integrity testing* on underground structures e.g. pipelines or sumps etc ? If yes please fill out table 2 below listing all underground structures and pipelines on site which failed the integrity test and all which have not been tested withing the integrity test period as specified	Yes	Due in 2017
2	Please provide integrity testing frequency period	3 years	

*please note integrity testing means water tightness testing for process and foul pipelines (as required under your licence)

Table B2: Summary details of pipeline/underground structures integrity test

Structure ID	Type system	Material of construction:	Does this structure have Secondary containment?	Type of secondary containment	Type integrity testing	Integrity reports maintained on site?	Results of test	Integrity test failure explanation <50 words	Corrective action taken	Scheduled date for retest	Results of retest(if in current reporting year)
	SELECT	SELECT	SELECT	SELECT	SELECT	SELECT	SELECT				SELECT

Please use commentary for additional details not answered by tables/ questions above

	Environmental Liabilities template	Lic No:	W0184-01	Year	2015

Click here to access EPA guidance on Environmental Liabilities and Financial provision

			Commentary
1	ELRA initial agreement status	Submitted and agreed by EPA	
2	ELRA review status	Review required and completed	
3	Amount of Financial Provision cover required as determined by the latest ELRA	4,133,343	
4	Financial Provision for ELRA status	Submitted and agreed by EPA	
5	Financial Provision for ELRA - amount of cover	4,133,343	
6	Financial Provision for ELRA - type	Other please specify	Insurance and Bond
7	Financial provision for ELRA expiry date	Insurance (11.10.17) & Bond (11.10.19)	
8	Closure plan initial agreement status	Closure plan submitted and agreed by EPA	
9	Closure plan review status	Review required and completed	
10	Financial Provision for Closure status	Submitted and agreed by EPA	
11	Financial Provision for Closure - amount of cover	2,255,641.34	
12	Financial Provision for Closure - type	bond	
13	Financial provision for Closure expiry date	01/05/2019	

Environmental Management Programme/Continuous Improvement Programme template		Lic No:	W0184-01	Year	2015
Highlighted cells contain dropdown menu click to view		Additional Information			
1	Do you maintain an Environmental Mangement System (EMS) for the site. If yes, please detail in additional information	Yes			
2	Does the EMS reference the most significant environmental aspects and associated impacts on-site	Yes			
3	Does the EMS maintain an Environmental Management Programme (EMP) as required in accordance with the licence requirements	Yes			
4	Do you maintain an environmental documentation/communication system to inform the public on environmental performance of the facility, as required by the licence	Yes	EHS management system in place (ISO 14001 & OHSAS 18001)		

Environmental Management Programme (EMP) report

Objective Category	Target	Status (% completed)	How target was progressed	Responsibility	Intermediate outcomes
Overspill protection	Reduction in risk of overspill from tanks	70%	All Enva tanks are fitted with high level controls linked back to the scada system which close off the valves and pumps on the activation of an alarm. Additional controls are being installed to protect against overfill due to gravity feed.	Operations	Increase safety to prevent damage and loss of containment.
Review quality of self-monitoring compliance data	Determine key tests for validation	80%	Light elements calibration on WDXRF needed. This is not a standard method and will not be validated as it it used for process samples and not for passing batches of oil. A re -validation is required for the New Karl Fischer Unit and a validation is required on a Dean and Stark Method. . Validation is completed internally for waste water testing.	Laboratory & HSE	Increased compliance with licence conditions
Improve tank, pipeline, bund integrity, yard and expansion gap assessments.	Replace damaged concrete to upgrade yard integrity and reseal expansion gaps joints as required.	Complete	Surface integrities and expansion gaps will be monitored on a regular basis. A log is in place to document any repairs that have taken place. A site map will be updated to include all crack/expansion repairs. - A monitoring programme has been developed to identify and repair surface integrity as an ongoing matter. This is a system that will be rolling each year.	HSE & Operations	Remediation of contamination on site
Improve tank, pipeline, bund integrity, yard and expansion gap assessments.	Review the site with regards to tanks and pipelines, in order to draft a register of current bunds, sumps, mobile bunds and pipelines, with their inclusion/exclusion (if required) in the three yearly bund integrity assessment.	90%	90 % completed. There is one remaining line and a programme is in place to replace the remaining line that requires testing.	HSE & Operations	Remediation of contamination on site
Improve tank, pipeline, bund integrity, yard and expansion gap assessments.	Review the assessment of bunds to meet standard reporting requirements.	Complete	All bunds passed integrity test in 2015. Due again in 2018.	HSE & Operations	Remediation of contamination on site
Energy Efficiency/Utility conservation	Review lighting onsite in order to determine where motion sensors can be installed in order to reduce energy consumption.	On-going	Bulbs which have come to their end of life have been replaced with Low wattage LED lights both inside and outside. Motion sensors have been installed in areas/rooms where deemed safe to do so. This is an ongoing project as there are numerous lights in the facility, replacements will occur as they come to end of life.	HSE & Operations	Improved Environmental Management Practices
Odour Reduction Programme	Reduce odour emissions from site	Pending licence review	Review and determine suitable odour abatement equipment for drying tanks and submit for approval to the Agency. Drying ooperations for oil processing have ceased until the implementation of the RTO system epected to be completed April 2018	HSE & Operations	Increased compliance with licence conditions
		Complete	Cease Air Sparaging on drying tanks until suitable odour abatement equipment is installed	HSE & Operations	Increased compliance with licence conditions
		Complete	Reduce potential odours arising from the tank farm by sealing lids and ducting the vents from the tanks to ground level odour abatement filters	Operations	Increased compliance with licence conditions
		On-going	Increased odour assessments daily	HSE	Increased compliance with licence conditions
		Complete	The existing separator in the tank farm used to prevent oil being transfered to the effluent treatment area is over 20 years old and becoming past its serviceable life. Replace the separator in tank farm with improved model with sealed lids. The replacement separator will also see the recommissioning of the existing pump to facilitate a more controlled dosing of odour abatement chemical. This system has been upgraded to include the continuous dosing of effluen with Hydrogen Peroxide. The installation of an extraction system through a scrubber system and carbon filter has also been completed.	Operations	Increased compliance with licence conditions
		Complete	An odour abatement system to be installed in the Oil Filter and Centrifuge room. The existing extraction system will be redeployed. The extraction system employs an electrostatic precipitation filter to remove oil fume present from the extracted airstream therefore removing odour. Treatment options were reviewed, the electrostatic filter did not prove to be as effective as a carbon filter. This carbon filter is now in place. This action is complete however will be checked continuously.	Operations	Increased compliance with licence conditions
		Complete	The engagement of external consultants to carry out odour assessments has been in place since January 16. This is an interim while improvement programmes are being implemented.	HSE	Increased compliance with licence conditions
		60%	Cladding of soil bay to reduce fugitive emissions from the site. The back (adjacent to CIE) and side (adjacent to Rockview) are closed off. The front of the soil bay will be enclosed with panels and cladding with two roller doors. This will also reduce noise and dust levels from the soil operation.	Operations	Increased compliance with licence conditions
		Complete	Implementation of odour abatement mobile unit with odour abatement chemical during soil operations.	Operations	Increased compliance with licence conditions
		NEW	Complete tank air tight testing.	Operations	Increased compliance with licence conditions

Noise monitoring summary report

Lic No: W0184-01 Year 2015

1	Was noise monitoring a licence requirement for the AER period? If yes please fill in table N1 noise summary below	Yes
2	Was noise monitoring carried out using the EPA Guidance note, including completion of the "Checklist for noise measurement report" included in the guidance note as table 6?	Yes
3	Does your site have a noise reduction plan	No
4	When was the noise reduction plan last updated?	Enter date
5	Have there been changes relevant to site noise emissions (e.g. plant or operational changes) since the last noise survey?	No

Noise Guidance note NG4

Table N1: Noise monitoring summary

Date of monitoring	Time period	Noise location (on site)	Noise sensitive location -NSL (if applicable)	LA_{eq}	LA_{90}	LA_{10}	LA_{max}	Tonal or impulsive noise* (Y/N)	If tonal /impulsive noise was identified was 5dB penalty applied?	Comments (ex. main noise sources on site, & extraneous noise ex. road traffic)	Is site compliant with noise limits (day/evening/night)?
24.11.16	17.05	N1	No	55	49	57	61	No		Enva activity included: vehicle movement. Offsite Noise: 3 trains and 3 cars pass nearby, distant traffic noise	Yes
24.11.16	17.35	N1	No	54	48	55	62	No		Enva activity included: vehicle movement. Offsite Noise: 2 trains and 2 cars pass nearby, distant traffic noise	Yes
24.11.16	18.05	N1	No	52	48	54	59	No		Enva activity included: vehicle movement. Offsite Noise: 2 trains and 2 cars pass nearby, distant traffic noise	Yes
24.11.16	23.26	N1	No	43	40	44	49	No		Enva activity included: vehicle movement. Offsite Noise: 1 train passes	Yes
24.11.16	23.56	N1	No	44	41	46	51	No		Enva activity included: vehicle movement. Offsite Noise: 1 train passes. HGV idle at Emo oil	Yes
24.11.16	12.56	N2	No	56	52	58	64	No		Dominant Noise: vehicle movement onsite and from neighbouring facility, onsite boiler Onsite Noise: forklift, vehicle movement, boiler Offsite Noise: vehicle movement next door, distant traffic noise, construction noise from neighbours (west)	Yes
24.11.16	13.29	N2	No	55	51	58	63	No		Dominant Noise: vehicle movement onsite and from neighbouring facility, onsite boiler Onsite Noise: forklift, vehicle movement, boiler Offsite Noise: vehicle movement next door, distant traffic noise, construction noise from neighbours (west)	Yes
24.11.16	14.05	N2	No	54	51	57	61	No		Dominant Noise: vehicle movement onsite and from neighbouring facility, onsite boiler Onsite Noise: forklift, vehicle movement, boiler Offsite Noise: vehicle movement next door, distant traffic noise, construction noise from neighbours (west)	Yes
24.11.16	22	N2	No	49	47	51	53	No		Dominant Noise: fan noise in neighbouring facility, distant traffic Onsite Noise: No noise audible from Enva Offsite Noise: fan noise in neighbouring facility, distant traffic.	Yes
24.11.16	22.3	N2	No	48	47	50	52	No		Dominant Noise: fan noise in neighbouring facility, distant traffic Onsite Noise: No noise audible from Enva Offsite Noise: fan noise in neighbouring facility, distant traffic, distant train	Yes
24.11.16	13.12	N3	No	52	46	54	59	No		Dominant Noise: vehicle maintenance in train yard (engine noise) Onsite Noise: forklift, vehicle movement (distant) Offsite Noise: vehicle maintenance in train yard (engine noise), 2 trains pass, distant traffic	Yes

24.11.16	13.42	N3	No	52	45	53	58	No		Dominant noise: vehicle maintenance in train yard (engine noise) Onsite Noise: forklift, vehicle movement (distent), talking/people	Yes
24.11.16	14.14	N3	No	50	44	53	58	No		Dominant noise: vehicle maintenance in train yard (engine noise) Onsite Noise: forklift, vehicle movement (distant) Offsite Noise: vehicle	Yes
24.11.16	22.10	N3	No	41	38	44	47	No		Dominant noise: Distant traffic noise. Onsite Noise: no noise audible from Enva. Offsite Noise: Distant traffic noise	Yes
24.11.16	22.40	N3	No	40	37	42	44	No		Dominant noise: Distant traffic noise. Onsite Noise: no noise audible from Enva. Offsite Noise: Distant traffic noise	Yes
24.11.16	18.51	N4	No	54	46	57	63	No		Dominant Noise: passing traffic and distant traffic Onsite Noise: No noise audible from Enva Offsite Noise: approximately 35 cars pass, distant traffic	Yes
24.11.16	19.21	N4	No	53	44	56	62	No		Dominant Noise: passing traffic and distant traffic Onsite Noise: No noise audible from Enva Offsite Noise: approximately 30 cars pass, distant traffic	Yes
24.11.16	19.51	N4	No	50	42	54	60	No		Dominant Noise: passing traffic and distant traffic Onsite Noise: No noise audible from Enva Offsite Noise: approximately 28 cars pass, distant traffic	Yes
24.11.16	0.4	N4	No	40	36	41	44	No		Dominant Noise: Industrial noise to south and distant traffic Onsite Noise: No noise audible from Enva Offsite Noise: approximately 4 cars	Yes
24.11.16	1.1	N4	No	39	35	40	44	No		Dominant Noise: Industrial noise to south and distant traffic Onsite Noise: No noise audible from Enva Offsite Noise: approximately 2 cars	Yes
24.11.16	17.05	N5	No	54	47	56	60	No		Dominant Noise: distant traffic (particularly from the S/SW), vehicle movement onsite and in/out Enva Onsite Noise: forklift, 2 HGV in/out vehicle movement, low hum Offsite Noise: 3 trains and 3 cars pass nearby, distant traffic noise	Yes
24.11.16	17.35	N5	No	53	46	56	60	No		Dominant Noise: distant traffic (particularly from the S/SW), vehicle movement onsite Onsite Noise: forklift, low hum Offsite Noise: 2 trains and 2 cars pass nearby, distant traffic noise	Yes
24.11.16	18.05	N5	No	52	46	54	59	Yes		Dominant Noise: distant traffic (particularly from the S/SW) Onsite Noise: occationa Offsite Noise: 2 trains and 2 cars pass nearby, distant traffic noise	Yes
24.11.16	23.26	N5	No	42	40	43	48	No		Dominant Noise: distant traffic (particularly from the S/SW) Onsite Noise: occasional hum from the compressor near	Yes
24.11.16	23.56	N5	No	43	40	45	49	No		Dominant Noise: distant traffic (particularly from the S/SW) Onsite Noise: occasional hum from the compressor near	Yes

*Please ensure that a tonal analysis has been carried out as per guidance note NG4. These records must be maintained onsite for future inspection

If noise limits exceeded as a result of noise attributed to site activities, please choose the corrective action from the following options? SELECT

** please explain the reason for not taking action/resolution of noise issues?
Any additional comments? (less than 200 words)

Resource Usage/Energy efficiency summary

Lic No: W0184-01 Year 2015

			Additional information
1	When did the site carry out the most recent energy efficiency audit? Please list the recommendations in table 3 below	Jan-07	
2	Is the site a member of any accredited programmes for reducing energy usage/water conservation such as the SEAI programme linked to the right? If yes please list them in additional information	SEAI - Large Industry Energy Network (LIEN)	No
3	Where Fuel Oil is used in boilers on site is the sulphur content compliant with licence conditions? Please state percentage in additional information	Yes	

Table R1 Energy usage on site

Energy Use	Previous year	Current year	Production +/- % compared to previous reporting year**	Energy Consumption +/- % vs overall site production*
Total Energy Used (MWHrs)	6117.914	3903.408	-36.19707632	
Total Energy Generated (MWHrs)				
Total Renewable Energy Generated (MWHrs)				
Electricity Consumption (MWHrs)	477.312	368.569	-22.78237296	
Fossil Fuels Consumption:				
Heavy Fuel Oil (m3)				
Light Fuel Oil (m3)	41	0		
Natural gas (m3)	471955.3	334843.046	-29.05195767	
Coal/Solid fuel (metric tonnes)				
Peat (metric tonnes)				
Renewable Biomass				
Renewable energy generated on site				

* where consumption of energy can be compared to overall site production please enter this information as percentage increase or decrease compared to the previous reporting year.

** where site production information is available please enter percentage increase or decrease compared to previous year

Table R2 Water usage on site

					Water Emissions	Water Consumption	
Water use	Water extracted Previous year m3/yr.	Water extracted Current year m3/yr.	Production +/- % compared to previous reporting year**	Energy Consumption +/- % vs overall site production*	Volume Discharged back to environment(m^3/yr):	Volume used i.e not discharged to environment e.g. released as steam m3/yr	Unaccounted for Water:
Groundwater							
Surface water							
Public supply	15458	16185	4.703066373				
Recycled water							
Total							

* where consumption of water can be compared to overall site production please enter this information as percentage increase or decrease compared to the previous reporting year.

** where site production information is available please enter percentage increase or decrease compared to previous year

Table R3 Waste Stream Summary

	Total	Landfill	Incineration	Recycled	Other
Hazardous (Tonnes)					
Non-Hazardous (Tonnes)					

Resource Usage/Energy efficiency summary Lic No: W0184-01 Year 2015

Table R4: Energy Audit finding recommendations

Date of audit	Recommendations	Description of Measures proposed	Origin of measures	Predicted energy savings %	Implementation date	Responsibility	Completion date	Status and comments

Table R5: Power Generation: Where power is generated onsite (e.g. power generation facilities/food and drink industry)please complete the following information

	Unit ID	Unit ID	Unit ID	Unit ID	Station Total
Technology					
Primary Fuel					
Thermal Efficiency					
Unit Date of Commission					
Total Starts for year					
Total Running Time					
Total Electricity Generated (GWH)					
House Load (GWH)					
KWH per Litre of Process Water					
KWH per Litre of Total Water used on Site					

Complaints and Incidents summary template	Lic No:	W0184-01	Year	2015

Complaints

		Additional information
Have you received any environmental complaints in the current reporting year? If yes please complete summary details of complaints received on site in table 1 below	Yes	

Table 1 Complaints summary

Date	Category	Other type (please specify)	Brief description of complaint (Free txt <20 words)	Corrective action< 20 words	Resolution status	Resolution date	Further information
07.01.16 to 09.12.16	Odour		Odour complaints received.	The Agency opened Compliance Investigation CI001037 in relation to odours emitting from Enva Ireland Portlaoise. Enva have indentified odour sources on site and have implemented controls to mitigate odour nuisances. Information in relation to corrective actions have been uploaded to EDEN under CI001037	Ongoing	Ongoing, Licence under review to improve site performance	
	SELECT				SELECT		
	SELECT				SELECT		
	SELECT				SELECT		
	SELECT				SELECT		

Total complaints open at start of reporting year	47
Total new complaints received during reporting year	28
Total complaints closed during reporting year	All complaints remain open as part of CI001037
Balance of complaints end of reporting year	All complaints remain open as part of CI001037

Incidents

		Additional information
Have any incidents occurred on site in the current reporting year? Please list all incidents for current reporting year in Table 2 below	No	For details on Non conformances please refer to Eden.

*For information on how to report and what constitutes an incident	What is an incident

Table 2 Incidents summary

Date of occurrence	Incident nature	Location of occurrence	Incident category*please refer to guidance	Receptor	Cause of incident	Other cause(please specify)	Activity in progress at time of incident	Communication	Occurrence	Corrective action<20 words	Preventative action <20 words	Resolution status	Resolution date	Likelihood of reoccurence

Complaints and Incidents summary template					Lic No:	W0184-01		Year	2015					
	SELECT	SELECT	SELECT	SELECT	SELECT		SELECT	SELECT	SELECT			SELECT		SELECT
	SELECT	SELECT	SELECT	SELECT	SELECT		SELECT	SELECT	SELECT			SELECT		SELECT

Total number of incidents current year	3
Total number of incidents previous year	3
% reduction/ increase	0

WASTE SUMMARY	Lic No:	W0184-01	Year	2015
SECTION A-PRTR ON SITE WASTE TREATMENT AND WASTE TRANSFERS TAB- TO BE COMPLETED BY ALL IPPC AND WASTE FACILITIES	PRTR facility logon		dropdown list click to see options	

SECTION B- WASTE ACCEPTED ONTO SITE-TO BE COMPLETED BY ALL IPPC AND WASTE FACILITIES

			Additional Information
1	Were any wastes accepted onto your site for recovery or disposal or treatment prior to recovery or disposal within the boundaries of your facility ?; (waste generated within your boundaries is to be captured through PRTR reporting)	Yes	
	If yes please enter details in table 1 below		
2	Did your site have any rejected consignments of waste in the current reporting year? If yes please give a brief explanation in the additional information	No	
3	Was waste accepted onto your site that was generated outside the Republic of Ireland? If yes please state the quantity in tonnes in additional information	Yes	

Table 1 Details of waste accepted onto your site for recovery, disposal or treatment (do not include wastes generated at your site, as these will have been reported in your PRTR workbook)

Licenced annual tonnage limit for your site (total tonnes/annum)	EWC code European Waste Catalogue EWC codes	Source of waste accepted	Description of waste accepted Please enter an accurate and detailed description - which applies to relevant EWC code European Waste Catalogue EWC codes	Quantity of waste accepted in current reporting year (tonnes)	Quantity of waste accepted in previous reporting year (tonnes)	Reduction/ increase over previous year +/ - %	Reason for reduction/ increase from previous reporting year	Packaging Content (%)- only applies if the waste has a packaging component	Disposal/Recovery or treatment operation carried out at your site and the description of this operation	Quantity of waste remaining on site at the end of reporting year (tonnes)	Comments -
110,000 tons	*13 02 08*	*13- OIL WASTES AND WASTES OF LIQUID FUELS (except edible oils, and those in chapters 05, 12 and 19)*	*Waste oil*	*14269.867*	*17852.46*	-20.06778338	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	*N/A*	*R9-Oil re-refining or other reuses*	*30*	*Enva Ireland does not currently record the packaging content of waste as it arrives on-site*
	13 07 01	*13- OIL WASTES AND WASTES OF LIQUID FUELS (except edible oils, and those in chapters 05, 12 and 19)*	*Diesel and Fuel oil*	214.11	*72.124*	196.8637347	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	*N/A*	*R9-Oil re-refining or other reuses of oil*		*Enva Ireland does not currently record the packaging content of waste as it arrives on-site*

WASTE SUMMARY				Lic No:		W0184-01		Year	2015		
				335.05			Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.				
	13 05 03	*13- OIL WASTES AND WASTES OF LIQUID FUELS (except edible oils, and those in chapters 05, 12 and 19)*	*Interceptor sludges*		*398.52*	-15.92595102		*N/A*	*R9-Oil re-refining or other reuses of oil*		*Enva Ireland does not currently record the packaging content of waste as it arrives on-site*
				434.70			Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.				
	13 08 02	*13- OIL WASTES AND WASTES OF LIQUID FUELS (except edible oils, and those in chapters 05, 12 and 19)*	*Other emulsions*		*234.76*	85.16783098		*N/A*	*R9-Oil re-refining or other reuses*	*37*	*Enva Ireland does not currently record the packaging content of waste as it arrives on-site*
				258.98			Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.				
	13 05 01	*13- OIL WASTES AND WASTES OF LIQUID FUELS (except edible oils, and those in chapters 05, 12 and 19)*	*Solids from grit chambers and oil/water separators*		*366.8*	-29.39476554		*N/A*	*R5-Recycling/reclamation or other inorganic materi*		*Enva Ireland does not currently record the packaging content of waste as it arrives on-site*

WASTE SUMMARY					Lic No:	W0184-01		Year	2015	
	13 08 99	13- OIL WASTES AND WASTES OF LIQUID FUELS (except edible oils, and those in chapters 05, 12 and 19)	Waste not otherwise specified	13.27	11.259	17.87903011	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending any of the operations	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	13 01 13	13- OIL WASTES AND WASTES OF LIQUID FUELS (except edible oils, and those in chapters 05, 12 and 19)	Other hydraulic oils	0.00	5.426	-100	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R9-Oil re-refining or other reuses of oil	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	13 05 08	13- OIL WASTES AND WASTES OF LIQUID FUELS (except edible oils, and those in chapters 05, 12 and 19)	Mixtures of waste from grit chambers and oil / water separators	279.03	75.91	267.5826637	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R9-Oil re-refining or other reuses of oil	Enva Ireland does not currently record the packaging content of waste as it arrives on-site

WASTE SUMMARY				Lic No:		W0184-01	Year		2015	
	13 02 05	13- OIL WASTES AND WASTES OF LIQUID FUELS (except edible oils, and those in chapters 05, 12 and 19)	Mineral based non-chlorinated engine, gear and lubricating oils	0	0	#DIV/0!	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R9-Oil re-refining or other reuses of oil	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	08 01 13	08- WASTES FORM THE MANUFACTURE, FORMULATION, SUPPLY AND USE (MFSU) OF COATINGS (PAINTS, VARNISHES AND VITREOUS ENAMELS,) ADHESIVES, SEALANTS AND PRINTING INKS	Sludges from paint or varnish containing organic solvents or other dangerous substances	14.66	18.15	-19.22865014	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending any of the operations	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	08 04 13	08- WASTES FORM THE MANUFACTURE, FORMULATION, SUPPLY AND USE (MFSU) OF COATINGS (PAINTS, VARNISHES AND VITREOUS ENAMELS,) ADHESIVES, SEALANTS AND PRINTING INKS	Aqueous sludges containing adhesive or sealants containing organic solvents or other dangerous substances	0	0	#DIV/0!	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending any of the operations	Enva Ireland does not currently record the packaging content of waste as it arrives on-site

WASTE SUMMARY					Lic No:	W0184-01		Year	2015		
	20 01 21	20- MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS	Fluorescent tubes	2.685	2.52	6.547619048	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending an	0.25	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	16 01 07	16- WASTES NOT OTHERWISE SPECIFIED IN THE LIST	Oil filters	697.631	696.82	0.116385867	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending an	14.5	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	17 05 03	17- CONSTRUCTION AND DEMOLITION WASTES (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)	Soil and stone containng dangerous substances	4,076.70	5745.003	-29.03920155	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R5-Recycling/reclamation or othe	5804	Enva Ireland does not currently record the packaging content of waste as it arrives on-site

WASTE SUMMARY					Lic No:	W0184-01		Year	2015		
				726.41			Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.				Enva Ireland does not currently record the packaging content of waste as it arrives on-site
16 06 01	*16- WASTES NOT OTHERWISE SPECIFIED IN THE LIST*	*Lead batteries*		*686.75*	*5.774299236*		*N/A*	*R13-Storage of waste pending an*	*36.05*	
				437.618			Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.				Enva Ireland does not currently record the packaging content of waste as it arrives on-site
15 02 02	*15- WASTE PACKAGING; ABSORBENTS, WIPING CLOTHS, FILTER MATERIALS AND PROTECTIVE CLOTHING NOT OTHERWISE SPECIFIED*	*Absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by dangerous substances*		*436.179*	*0.329910427*		*N/A*	*R13-Storage of waste pending an*	*55.3*	
				32.311			Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.				Enva Ireland does not currently record the packaging content of waste as it arrives on-site
16 07 08	*16- WASTES NOT OTHERWISE SPECIFIED IN THE LIST*	*Waste containing oil*		*34.568*	*-6.529159917*		*N/A*	*R13-Storage of waste pending any of the operations*		

WASTE SUMMARY					Lic No:	W0184-01		Year	2015		
	16 01 13	16- WASTES NOT OTHERWISE SPECIFIED IN THE LIST	Brake fluids	9.69	8.907	8.779611541	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending any of the operations		Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	13 07 03	13- OIL WASTES AND WASTES OF LIQUID FUELS (except edible oils, and those in chapters 05, 12 and 19)	Other fuels (including mixtures)	233.66	127.501	83.25738622	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending an	26.75	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	13 07 02	13- OIL WASTES AND WASTES OF LIQUID FUELS (except edible oils, and those in chapters 05, 12 and 19)	Petrol	10.22	19.68	-48.08943089	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending an	6	Enva Ireland does not currently record the packaging content of waste as it arrives on-site

WASTE SUMMARY					Lic No:	W0184-01		Year	2015		
				44.55			Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.				
	16 05 04	*16- WASTES NOT OTHERWISE SPECIFIED IN THE LIST*	*Gases in pressure containers (including halons) containing dangerous substances*		*31.118*	43.16794138		*N/A*	*R13-Storage of waste pending an*	*2.8*	*Enva Ireland does not currently record the packaging content of waste as it arrives on-site*
				1,008.47			Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.				
	08 01 11	*08- WASTES FORM THE MANUFACTURE, FORMULATION, SUPPLY AND USE (MFSU) OF COATINGS (PAINTS, VARNISHES AND VITREOUS ENAMELS,) ADHESIVES, SEALANTS AND PRINTING INKS*	*Waste paint and varnish containing organic solvents or other dangerous substances*		*657.835*	52.99748417		*N/A*	*R5-Recycling/reclamation or othe*	*150.7*	*Enva Ireland does not currently record the packaging content of waste as it arrives on-site*
				8.41			Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.				
	09 01 02	*09- WASTES FROM THE PHOTOGRAPHIC INDUSTRY*	*Water-based offset plate developer solutions*		*1.71*	391.6374269		*N/A*	*D15-Storage pending any of the operations number*		*Enva Ireland does not currently record the packaging content of waste as it arrives on-site*

WASTE SUMMARY					Lic No:	W0184-01		Year	2015		
				182.67			Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.				
	15 01 10	*15- WASTE PACKAGING; ABSORBENTS, WIPING CLOTHS, FILTER MATERIALS AND PROTECTIVE CLOTHING NOT OTHERWISE SPECIFIED*	*Packaging containing residues of or containing dangerous substances*		*128.679*	41.95789523		*N/A*	*R13-Storage of waste pending an*	*43*	*Enva Ireland does not currently record the packaging content of waste as it arrives on-site*
				18.42			Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.				
	20 01 27	*20- MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS*	*Paint, inks, adhesives and resins containing dangerous substances*		*20.353*	-9.477718272		*N/A*	*R13-Storage of waste pending an*	*4*	*Enva Ireland does not currently record the packaging content of waste as it arrives on-site*
							Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.				
	08 04 09	*08- WASTES FORM THE MANUFACTURE, FORMULATION, SUPPLY AND USE (MFSU) OF COATINGS (PAINTS, VARNISHES AND VITREOUS ENAMELS,) ADHESIVES, SEALANTS AND PRINTING INKS*	*Waste adhesives and sealants containing organic solvents or other dangerous substances*	0.21	*0.199*	5.527638191		*N/A*	*R13-Storage of waste pending any of the operations*		*Enva Ireland does not currently record the packaging content of waste as it arrives on-site*

WASTE SUMMARY					Lic No:	W0184-01		Year	2015		
	16 05 06	16- WASTES NOT OTHERWISE SPECIFIED IN THE LIST	Laboratory chemicals, consisting of or containing dangerous substances, including mixtures of dangerous chemicals	21.96	11.817	85.79165609	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending an	6.5	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	16 05 08	16- WASTES NOT OTHERWISE SPECIFIED IN THE LIST	Discarded organic chemicals consisting of or containing dangerous substances	10.22	22.62	-54.81874447	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending an	6	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	17 02 04	17- CONSTRUCTION AND DEMOLITION WASTES (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)	Glass, plastic and wood containing or contaminated with dangerous substances	0	0	#DIV/0!	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending any of the operations		Enva Ireland does not currently record the packaging content of waste as it arrives on-site

WASTE SUMMARY				Lic No:		W0184-01		Year	2015	
	08 03 12	08- WASTES FORM THE MANUFACTURE, FORMULATION, SUPPLY AND USE (MFSU) OF COATINGS (PAINTS, VARNISHES AND VITREOUS ENAMELS,) ADHESIVES, SEALANTS AND PRINTING INKS	Waste ink containing dangerous substances	16.595	17.924	-7.414639589	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending any of the operations	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	06 02 04	06- WASTES FROM INORGANIC CHEMICAL PROCESSES	Sodium and potassium hydroxide	0	0.66	-100	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	D15-Storage pending any of the operations number	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	20 01 19	20- MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS	Pesticides	0.914	0.73	25.20547945	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending any of the operations	Enva Ireland does not currently record the packaging content of waste as it arrives on-site

WASTE SUMMARY					Lic No:	W0184-01		Year	2015		
	10 01 04	10- WASTES FROM THERMAL PROCESSES	Oil fly ash and boiler dust	0	0.37	-100	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R5-Recycling/reclamation or other inorganic materi		Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	06 03 15	06- WASTES FROM INORGANIC CHEMICAL PROCESSES	Metal oxides containing heavy metal	0		#DIV/0!	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending any of the operation-		Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	16 01 14	16- WASTES NOT OTHERWISE SPECIFIED IN THE LIST	Antifreeze fluids containing dangerous fluids	9.2	10.26	-10.33138402	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending an	20	Enva Ireland does not currently record the packaging content of waste as it arrives on-site

WASTE SUMMARY					Lic No:	W0184-01		Year	2015	
	20 01 14	20- MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS	Acids	0	6.61	-100	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending any of the operations	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	13 01 10	13- OIL WASTES AND WASTES OF LIQUID FUELS (except edible oils, and those in chapters 05, 12 and 19)	Mineral based non-chlorinated hydraulic oils	6.28	2.75	128.3636364	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R9-Oil re-refining or other reuses of oil	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	19 11 05	19- WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTE WATER TREATMENT PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION AND WATER FOR INDUSTRIAL USE	Sludges from onsite effluent treatment containing dangerous substances	0	0	#DIV/0!	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending any of the operations	Enva Ireland does not currently record the packaging content of waste as it arrives on-site

WASTE SUMMARY				Lic No:		W0184-01		Year	2015	
	08 03 13	08- WASTES FORM THE MANUFACTURE, FORMULATION, SUPPLY AND USE (MFSU) OF COATINGS (PAINTS, VARNISHES AND VITREOUS ENAMELS,) ADHESIVES, SEALANTS AND PRINTING INKS	Waste ink other than those mentioned in 08.03.12	19.36	13.529	43.10000739	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending any of the operations	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	08 03 08	08- WASTES FORM THE MANUFACTURE, FORMULATION, SUPPLY AND USE (MFSU) OF COATINGS (PAINTS, VARNISHES AND VITREOUS ENAMELS,) ADHESIVES, SEALANTS AND PRINTING INKS	Aqueous liquid waste containing ink	19.57	11.369	72.15234409	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending any of the operations	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	16 01 12	16- WASTES NOT OTHERWISE SPECIFIED IN THE LIST	Brake pads other than those mentioned in 16.01.11	4.895	17.983	-72.77984763	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending any of the operations	Enva Ireland does not currently record the packaging content of waste as it arrives on-site

WASTE SUMMARY				Lic No:	W0184-01		Year	2015	
				13.795		Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.			Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	20 01 25	20- MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS	edible oil and fat		62.077	-77.77759879	N/A	R13-Storage of waste pending any of the operations	
				27.14		Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.			Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	16 10 02	16- WASTES NOT OTHERWISE SPECIFIED IN THE LIST	aqueous liquid wastes other than those mentioned in 16 10 01		3.96	585.2525253	N/A	R13-Storage of waste pending any of the operations	
				12.41		Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.			Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	08 01 12	08- WASTES FORM THE MANUFACTURE, FORMULATION, SUPPLY AND USE (MFSU) OF COATINGS (PAINTS, VARNISHES AND VITREOUS ENAMELS,) ADHESIVES, SEALANTS AND PRINTING INKS	waste paint and varnish other than those mentioned in 08 01 11		20.63	-39.82549685	N/A	R13-Storage of waste pending any of the operations	

WASTE SUMMARY				Lic No:		W0184-01		Year	2015	
	16 01 15	16- WASTES NOT OTHERWISE SPECIFIED IN THE LIST	antifreeze fluids other than those mentioned in 16 01 14	185.68	184.276	0.75972997	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending any of the operations	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	16 05 05	16- WASTES NOT OTHERWISE SPECIFIED IN THE LIST	gases in pressure containers other than those mentioned in 16 05 04	0	0	#DIV/0!	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending any of the operations	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	16 06 05	16- WASTES NOT OTHERWISE SPECIFIED IN THE LIST	other batteries and accumulators	1.2	0.425	182.3529412	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending any of the operations	Enva Ireland does not currently record the packaging content of waste as it arrives on-site

WASTE SUMMARY					Lic No:	W0184-01		Year	2015		
	16 05 09	16- WASTES NOT OTHERWISE SPECIFIED IN THE LIST	discarded chemicals other than those mentioned in 16 05 06, 16 05 07 or 16 05 08	0	0.04	-100	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending any of the operations		Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	20 01 40	20- MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS	Metals	157.622	161.823	-2.596046297	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending an	321	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	17 05 04	17- CONSTRUCTION AND DEMOLITION WASTES (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)	soil and stones other than those mentioned in 17 05 03	63.94	0	#DIV/0!	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R5-Recycling/reclamation or other inorganic materi		Enva Ireland does not currently record the packaging content of waste as it arrives on-site

WASTE SUMMARY				Lic No:		W0184-01		Year	2015	
	16 01 22	16- WASTES NOT OTHERWISE SPECIFIED IN THE LIST	components not otherwise specified	0.285	0.22	29.54545455	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending any of the operations	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	19 09 04	19- WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTE WATER TREATMENT PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION AND WATER FOR INDUSTRIAL USE	spent activated carbon	10.26	25.28	-59.41455696	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending any of the operations	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	13 03 10	13- OIL WASTES AND WASTES OF LIQUID FUELS (except edible oils, and those in chapters 05, 12 and 19)	other insulating and heat transmission oils	0	0	#DIV/0!	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R9-Oil re-refining or other reuses of oil	Enva Ireland does not currently record the packaging content of waste as it arrives on-site

WASTE SUMMARY					Lic No:	W0184-01		Year	2015	
	13 05 02	13- OIL WASTES AND WASTES OF LIQUID FUELS (except edible oils, and those in chapters 05, 12 and 19)	sludges from oil/water separators	24.86	22.36	11.18067979	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R5-Recycling/reclamation or other inorganic materi	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	13 05 07	13- OIL WASTES AND WASTES OF LIQUID FUELS (except edible oils, and those in chapters 05, 12 and 19)	oily water from oil/water separators	506.0733	0.05	1012046.6	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R9-Oil re-refining or other reuses of oil	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	13 03 07	13- OIL WASTES AND WASTES OF LIQUID FUELS (except edible oils, and those in chapters 05, 12 and 19)	mineral-based non-chlorinated insulating and heat transmission oil	49.414	2.04	2322.254902	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R9-Oil re-refining or other reuses of oil	Enva Ireland does not currently record the packaging content of waste as it arrives on-site

WASTE SUMMARY				Lic No:	W0184-01		Year	2015		
	13 01 11	13- OIL WASTES AND WASTES OF LIQUID FUELS (except edible oils, and those in chapters 05, 12 and 19)	synthetic hydraulic oils	0.955	0.73	30.82191781	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending any of the operations	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	08 01 17	08- WASTES FORM THE MANUFACTURE, FORMULATION, SUPPLY AND USE (MFSU) OF COATINGS (PAINTS, VARNISHES AND VITREOUS ENAMELS,) ADHESIVES, SEALANTS AND PRINTING INKS	waste from paint or varnish removal containing organic solvents or other dangerous substances	0	1.45	-100	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending any of the operations	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	07 05 11	07- WASTES FROM ORGANIC CHEMICAL PROCESSES	sludges from onsite effluent treatment containing dangerous substances	0	3.96	-100	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending any of the operations	Enva Ireland does not currently record the packaging content of waste as it arrives on-site

WASTE SUMMARY					Lic No:	W0184-01		Year	2015	
	16 06 04	16- WASTES NOT OTHERWISE SPECIFIED IN THE LIST	alkaline batteries (except 16 06 03)	0.294	0.1	194	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending any of the operations	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	18 01 09	18- WASTES FROM HUMAN OR ANIMAL HEALTH CARE AND/OR RELATED RESEARCH (except kitchen and restaurant wastes not arising from immediate RESEARCH (except kitchen and restaurant wastes not arising from immediate health care)	medicines other than those mentioned in 18 01 08	0.342	0.3	14	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending any of the operations	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	20 01 28	20- MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS	paint, inks, adhesives and resins other than those mentioned in 20 01 27	0	0.28	-100	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R13-Storage of waste pending any of the operations	Enva Ireland does not currently record the packaging content of waste as it arrives on-site

WASTE SUMMARY				Lic No:		W0184-01		Year	2015	
	20 03 03	20- MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS	Street cleaning residues	0	15.14	-100	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R5-Recycling/reclamation or other inorganic materi	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	02 01 08	02-WASTES FROM AGRICULTURE, HORTICULTURE, AQUACULTURE, FORESTRY, HUNTING AND FISHING, FOOD PREPARATION AND PROCESSING	Agrochemical containing dangerous substanvces	0.04	0	#DIV/0!	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some		R13-Storage of waste pending any of the operations	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	07 02 01	07- WASTES FROM ORGANIC CHEMICAL PROCESSES	Aqueous washing liquids	0.8	0	#DIV/0!	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some		R13-Storage of waste pending any of the operations	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	07 05 99	07- WASTES FROM ORGANIC CHEMICAL PROCESSES	Waste not other wise specified	0.04	0	#DIV/0!	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some		R13-Storage of waste pending any of the operations	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	10 01 26	03- WASTES FROM WOOD PROCESSING AND THE PRODUCTION OF PANELS AND FURNITURE, PULP, PAPER AND CARDBOARD	Waste from cooling water treatment	3	0	#DIV/0!	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some		R13-Storage of waste pending any of the operations	Enva Ireland does not currently record the packaging content of waste as it arrives on-site

WASTE SUMMARY					Lic No:	W0184-01	Year	2015			
	13 04 03	13- OIL WASTES AND WASTES OF LIQUID FUELS (except edible oils, and those in chapters 05, 12 and 19)	Bilge oil	3858.531	0	#DIV/0!	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some		R9-Oil re-refining or other reuses of oil		Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	15 01 06	15- WASTE PACKAGING; ABSORBENTS, WIPING CLOTHS, FILTER MATERIALS AND PROTECTIVE CLOTHING NOT OTHERWISE SPECIFIED	Mixed Packaging	0.935	0	#DIV/0!	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some		R13-Storage of waste pending any of the operations		Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	19 08 05	19- WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTE WATER TREATMENT PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION AND WATER FOR INDUSTRIAL USE	Sludges from treatmet of urban wastewater	6.2	0	#DIV/0!	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some		R13-Storage of waste pending an	5	Enva Ireland does not currently record the packaging content of waste as it arrives on-site
	19 09 02	19- WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTE WATER TREATMENT PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION AND WATER FOR INDUSTRIAL USE	Sludges from treatmet of urban wastewater	16.08	0	#DIV/0!	Increase/decrease in the tonnages of waste accepted in 2015 compared to 2014, was subject to the quantity of waste made available to Enva Ireland. In some instances some wastes were		R13-Storage of waste pending any of the operations		Enva Ireland does not currently record the packaging content of waste as it arrives on-site

SECTION C-TO BE COMPLETED BY ALL WASTE FACILITIES (waste transfer stations, Composters, Material recovery facilities etc) EXCEPT LANDFILL SITES

4 Is all waste processing infrastructure as required by your licence and approved by the Agency in place? If no please list waste processing infrastructure required onsite	Yes	
5 Is all waste storage infrastructure as required by your licence and approved by the Agency in place? If no please list waste storage infrastructure required on site	Yes	
6 Does your facility have relevant nuisance controls in place?	Yes	
7 Do you have an odour management system in place for your facility? If no why?	Yes	
8 Do you maintain a sludge register on site?	No	

SECTION D-TO BE COMPLETED BY LANDFILL SITES ONLY

Table 2 Waste type and tonnage-landfill only

Waste types permitted for disposal	Authorised/licenced annual intake for disposal (tpa)	Actual intake for disposal in reporting year (tpa)	Remaining licensed capacity at end of reporting year (m3)	Comments

Table 3 General information-Landfill only

Area ID	Date landfilling commenced	Date landfilling ceased	Currently landfilling	Private or Public Operated	Inert or non-hazardous	Predicted date to cease landfilling	Licence permits asbestos	Is there a separate cell for asbestos?	Accepted asbestos in reporting year	Total disposal area occupied by waste	Lined disposal area occupied by waste	Unlined area
										SELECT UNIT	SELECT UNIT	SELECT UNIT

WASTE SUMMARY					Lic No:	W0184-01		Year	2015			
Cell 8												

WASTE SUMMARY	Lic No:	W0184-01	Year	2015

Table 4 Environmental monitoring-landfill only

Landfill Manual-Monitoring Standards

Was meterological monitoring in compliance with Landfill Directive (LD) standard in reporting year +	Was leachate monitored in compliance with LD standard in reporting year	Was Landfill Gas monitored in compliance with LD standard in reporting year	Was SW monitored in compliance with LD standard in reporting year	Have GW trigger levels been established	Were emission limit values agreed with the Agency (ELVs)	Was topography of the site surveyed in reporting year	Has the statement under S53(A)(5) of WMA been submitted in reporting year	Comments

.+ please refer to Landfill Manual linked above for relevant Landfill Directive monitoring standards

Table 5 Capping-Landfill only

Area uncapped*	Area with temporary cap	Area with final cap to LD Standard m2 ha, a	Area capped other	Area with waste that should be permanently capped to date under licence	What materials are used in the cap	Comments
SELECT UNIT	SELECT UNIT					

*please note this includes daily cover area

Table 6 Leachate-Landfill only

9	Is leachate from your site treated in a Waste Water Treatment Plant?	SELECT
10	Is leachate released to surface water? If yes please complete leachate mass load information below	SELECT

Volume of leachate in reporting year(m3)	Leachate (BOD) mass load (kg/annum)	Leachate (COD) mass load (kg/annum)	Leachate (NH4) mass load (kg/annum)	Leachate (Chloride) mass load kg/annum	Leachate treatment on-site	Specify type of leachate treatment	Comments

Please ensure that all information reported in the landfill gas section is consistent with the Landfill Gas Survey submitted in conjunction with PRTR returns

Table 7 Landfill Gas-Landfill only

Gas Captured&Treated by LFG System m3	Power generated (MW / KWh)	Used on-site or to national grid	Was surface emissions monitoring performed during the reporting year?	Comments
			SELECT	

Appendix 1

Environmental Protection Agency

Guidance to completing the PRTR workbook

PRTR Returns Workbook

Version 1.1.19

REFERENCE YEAR	2016

1. FACILITY IDENTIFICATION

Parent Company Name	Enva Ireland Limited
Facility Name	Enva Ireland Limited (Portlaoise)
PRTR Identification Number	W0184
Licence Number	W0184-01

Classes of Activity

No.	class_name
-	Refer to PRTR class activities below

Address 1	Clonminam Industrial Estate
Address 2	Portlaoise
Address 3	
Address 4	
	Laois
Country	Ireland
Coordinates of Location	-7.31391 53.0294
River Basin District	IESE
NACE Code	3832
Main Economic Activity	Recovery of sorted materials
AER Returns Contact Name	Kevin Coll
AER Returns Contact Email Address	kevin.coll@enva.com
AER Returns Contact Position	HSE Coordinator
AER Returns Contact Telephone Number	0578678617
AER Returns Contact Mobile Phone Number	0860280038
AER Returns Contact Fax Number	0578678699
Production Volume	0.0
Production Volume Units	
Number of Installations	0
Number of Operating Hours in Year	0
Number of Employees	90
User Feedback/Comments	
Web Address	

2. PRTR CLASS ACTIVITIES

Activity Number	Activity Name
5(a)	Installations for the recovery or disposal of hazardous waste
5(c)	Installations for the disposal of non-hazardous waste
50.1	General

3. SOLVENTS REGULATIONS (S.I. No. 543 of 2002)

Is it applicable?	
Have you been granted an exemption ?	
If applicable which activity class applies (as per Schedule 2 of the regulations) ?	
Is the reduction scheme compliance route being used ?	

4. WASTE IMPORTED/ACCEPTED ONTO SITE	Guidance on waste imported/accepted onto site
Do you import/accept waste onto your site for on-site treatment (either recovery or disposal activities) ?	

4.1 RELEASES TO AIR Link to previous years emissions data

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD				QUANTITY		
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
02	Carbon monoxide (CO)	C	EN 15058:2004	Non Dispersive Infra Red Chemiluminescence NDIR	5.45	5.45	0.0	0.0
08	Nitrogen oxides (NOx/NO2)	C	EN 14792:2005	AG2 Non Dispersive	526.77	526.77	0.0	0.0
11	Sulphur oxides (SOx/SO2)	C	OTH	Infra Red	19.55	19.55	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION B : REMAINING PRTR POLLUTANTS

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD				QUANTITY		
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION C : REMAINING POLLUTANT EMISSIONS (As required in your Licence)

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD				QUANTITY		
			Method Used					
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

Additional Data Requested from Landfill operators

For the purposes of the National Inventory on Greenhouse Gases, landfill operators are requested to provide summary data on landfill gas (Methane) flared or utilised on their facilities to accompany the figures for total methane generated. Operators should only report their Net methane (CH4) emission to the environment under T(total) KG/yr for Section A: Sector specific PRTR pollutants above. Please complete the table below:

Landfill: Enva Ireland Limited (Portlaoise)

Please enter summary data on the quantities of methane flared and / or utilised	T (Total) kg/Year	M/C/E	Method Used: Method Code	Method Used: Designation or Description	Facility Total Capacity m3 per hour	
Total estimated methane generation (as per site model)	0.0				N/A	
Methane flared	0.0				0.0	(Total Flaring Capacity)
Methane utilised in engine/s	0.0				0.0	(Total Utilising Capacity)
Net methane emission (as reported in Section A above)	0.0				N/A	

4.3 RELEASES TO WASTEWATER OR SEWER

Link to previous years emissions data

SECTION A : PRTR POLLUTANTS

OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD			QUANTITY			
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
06	Ammonia (NH3)	C	OTH	APHA /AWWA Standard Methods	320.5719	320.5719	0.0	0.0
79	Chlorides (as Cl)	C	OTH	APHA /AWWA Standard Methods	18953.142	18953.142	0.0	0.0
71	Phenols (as total C)	C	OTH	APHA /AWWA Standard Methods	78.36	78.36	0.0	0.0
13	Total phosphorus	C	OTH	APHA /AWWA Standard Methods	616.85	616.85	0.0	0.0
20	Copper and compounds (as Cu)	C	OTH	TM30 - Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	0.0042	0.0042	0.0	0.0
18	Cadmium and compounds (as Cd)	C	OTH	TM30 - Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.10	0.002	0.002	0.0	0.0
24	Zinc and compounds (as Zn)	C	OTH	TM30 - Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.9	0.378	0.378	0.0	0.0
23	Lead and compounds (as Pb)	C	OTH	TM30 - Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.8	0.004	0.004	0.0	0.0
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD			QUANTITY			
			Method Used					
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
314	Fats, Oils and Greases	C	OTH	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	28.984	28.984	0.0	0.0
240	Suspended Solids	C	OTH	APHA /AWWA Standard Methods	633.592	633.592	0.0	0.0
343	Sulphate	C	OTH	APHA /AWWA Standard Methods	1035.01	1035.01	0.0	0.0
306	COD	C	OTH	APHA /AWWA Standard Methods	23727.13	23727.13	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE

Please enter all quantities on this sheet in Tonnes

Transfer Destination	European Waste Code	Hazardous	Quantity (Tonnes per Year)	Description of Waste	Waste Treatment Operation	Method Used		Location of Treatment	Haz Waste : Name and Licence/Permit No of Next Destination Facility Non Haz Waste: Name and Licence/Permit No of Recover/Disposer	Haz Waste : Address of Next Destination Facility Non Haz Waste: Address of Recover/Disposer	Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY)	Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY)
						M/C/E	Method Used					
Within the Country	08 01 11	Yes	6.92	waste paint and varnish containing organic solvents or other dangerous substances	R2	M	Weighed	Offsite in Ireland	Soltec Ltd,W0041-01	Mullingar business park,Mullingar,.,Westmeath,Ireland	Soltec Ltd,W0041-01	Mullingar business park,Mullingar,.,Westmeath,Ireland
To Other Countries	08 01 11	Yes	85.42	waste paint and varnish containing organic solvents or other dangerous substances	R1	M	Weighed	Abroad	Geocycle ,38.152/BP	Rue de Courriere 49 Zoning Industrial de Feluy ,.,B 7181 Seneffe ,Belgium	Geocycle ,38.152/BP, Rue de Courriere 49 Zoning Industrial de Feluy ,.,.,B 7181 Seneffe ,Belgium	Rue de Courriere 49 Zoning Industrial de Feluy ,.,.,B 7181 Seneffe ,Belgium
To Other Countries	08 01 11	Yes	280.07	waste paint and varnish containing organic solvents or other dangerous substances	R1	M	Weighed	Abroad	Recyfuel S.A.,3200/61080/RGPED/2008/2/AP-PU	Noning Industriel d'Ehein,B-4480 Engis,.,.,Belgium	Lindenschmidt , 04 714 98089	Krombacher Strasse 42-46 ,.,Kreutzal,D57223 ,Germany
To Other Countries	08 01 12	No	168.14	waste paint and varnish other than those mentioned in 08 01 11	R1	M	Weighed	Abroad	Recyfuel S.A.,3200/61080/RGPED/2008/2/AP-PU	Noning Industriel d'Ehein,B-4480 Engis,.,.,Belgium		
To Other Countries	09 01 04	Yes	0.55	fixed solutions	D9	M	Weighed	Abroad	Enva ,W041-1	Smithstown Industrial estate ,.,Shannon ,Co. Clare,Ireland	Lindenschmidt , 04 714 98089,Krombacher Strasse 42-46 ,.,Kreutzal,D57223 ,Germany	Krombacher Strasse 42-46 ,.,Kreutzal,D57223 ,Germany
To Other Countries	19 02 11	Yes	699.44	other wastes containing dangerous substances	D10	M	Weighed	Abroad	Mc Quillans,P0187/07A	Caulside Drive,Greystone Road,Newpark Industrial Estate,Antrim,Ireland	Mc Quillans,P0187/07A/V1,Caulside Drive,Greystone Road,Antrim,Antrim,United Kingdom	Caulside Drive,Greystone Road,Antrim,Antrim,United Kingdom
Within the Country	13 05 07	Yes	6.58	oily water from oil/water separators	D9	M	Weighed	Offsite in Ireland	Enva,W0196-1	JFK Road Naas Road,.,Dublin,Dublin 12,Ireland	Enva,W0196-01,JFK Road Naas Road,.,Dublin,Dublin 12,Ireland	JFK Road Naas Road,.,Dublin,Dublin 12,Ireland
To Other Countries	13 07 03	Yes	102.36	other fuels (including mixtures)	R1	M	Weighed	Abroad	KS Recycling ,12 150 13984/01TMS	Raiffeisenstraße 38 ,.,., D-47665 Sonsbeck ,Germany	KS Recycling ,12 150 13984/01TMS	Raiffeisenstraße 38 ,.,., D-47665 Sonsbeck ,Germany
To Other Countries	13 07 03	Yes	11.83	other fuels (including mixtures)	R1	M	Weighed	Abroad	Geocycle ,38.152/BP	Rue de Courriere 49 Zoning Industrial de Feluy ,.,B 7181 Seneffe ,Belgium	Geocycle ,38.152/BP, Rue de Courriere 49 Zoning Industrial de Feluy ,.,.,B 7181 Seneffe ,Belgium	Rue de Courriere 49 Zoning Industrial de Feluy ,.,.,B 7181 Seneffe ,Belgium
To Other Countries	15 01 10	Yes	137.26	packaging containing residues of or contaminated by dangerous substances	R1	M	Weighed	Abroad	Recyfuel S.A.,3200/61080/RGPED/2008/2/AP-PU	Noning Industriel d'Ehein,B-4480 Engis,.,.,Belgium	Nehlsen GmbH & Co.kg, A-4187 HH,Louis-Krages-Strabe ,.,Bremen., D-28237 ,Germany	Louis-Krages-Strabe ,.,Bremen., D-28237 ,Germany
To Other Countries	15 02 02	Yes	0.07	absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by dangerous substances	R13	M	Weighed	Abroad	Enva ,W041-1	Smithstown Industrial estate ,.,Shannon ,Co. Clare,Ireland	Lindenschmidt , 04 714 98089,Krombacher Strasse 42-46 ,.,Kreutzal,D57223 ,Germany	Krombacher Strasse 42-46 ,.,Kreutzal,D57223 ,Germany
To Other Countries	15 02 02	Yes	234.49	absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by dangerous substances	R1	M	Weighed	Abroad	Recyfuel S.A.,3200/61080/RGPED/2008/2/AP-PU	Noning Industriel d'Ehein,B-4480 Engis,.,.,Belgium	Recyfuel SA,3200/61080/RGPED/2008/2/AP-PU,Noning Inustrial d'Ehein,B-4480 Engis,.,.,Belgium	Noning Inustrial d'Ehein,B-4480 Engis,.,.,Belgium
To Other Countries	16 01 07	Yes	697.36	oil filters	R12	M	Weighed	Abroad	RD Recycling ,Ovam approved	Centrum Zuid 3017 ,.,.,3530,Belgium.	RD Recycling ,Ovam approved,Centrum Zuid 3017 ,.,.,3530,Belgium.	Centrum Zuid 3017 ,.,.,3530,Belgium.
To Other Countries	16 01 15	No	262.58	antifreeze fluids other than those mentioned in 16 01 14	R3	M	Weighed	Abroad	KS Recycling ,12 150 13984/01TMS	Raiffeisenstraße 38 ,.,., D-47665 Sonsbeck ,Germany		

Transfer Destination	European Waste Code	Hazardous	Quantity (Tonnes per Year)	Description of Waste	Waste Treatment Operation	Method Used		Location of Treatment	Haz Waste : Name and Licence/Permit No of Next Destination Facility Non Haz Waste: Name and Licence/Permit No of Recover/Disposer	Haz Waste : Address of Next Destination Facility Non Haz Waste: Address of Recover/Disposer	Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY)	Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY)
						M/C/E	Method Used					
To Other Countries	16 05 04	Yes	40.26	gases in pressure containers (including halons) containing dangerous substances	R4	M	Weighed	Abroad	SBH ,121296753	Austrabe 5 ,,.,.D74238 Krautheim,Germany	SBH ,121296753,Austrabe 5 ,,.,.D74238 Krautheim,Germany	Austrabe 5 ,,.,.D74238 Krautheim,Germany
To Other Countries	16 05 06	Yes	5.585	laboratory chemicals, consisting of or containing dangerous substances, including mixtures of laboratory chemicals	D9	M	Weighed	Abroad	Enva ,W041-1	Smithstown Industrial estate ,,Shannon ,Co. Clare,Ireland	Lindenschmidt , 04 714 98089	Krombacher Strasse 42-46 ,,Kreutzal,D57223 ,Germany
To Other Countries	16 05 08	Yes	2.0	discarded organic chemicals consisting of or containing dangerous substances	R13	M	Weighed	Abroad	Enva ,W041-1	Smithstown Industrial estate ,,Shannon ,Co. Clare,Ireland	Lindenschmidt , 04 714 98089,Krombacher Strasse 42-46 ,,Kreutzal,D57223 ,Germany	Krombacher Strasse 42-46 ,,Kreutzal,D57223 ,Germany
To Other Countries	16 06 01	Yes	720.02	lead batteries	R4	M	Weighed	Abroad	Campine,Ovam Approved	Niljverheidsstraat 2 Belgium.,,.,B- 2340 Beerse ,Belgium	Campine,Ovam Approved, Niljverheidsstraat 2 Belgium.,,.,B- 2340 Beerse ,Belgium	Niljverheidsstraat 2 Belgium.,,.,B- 2340 Beerse ,Belgium
Within the Country	16 06 04	No	2.313	alkaline batteries (except 16 06 03)	R13	M	Weighed	Offsite in Ireland	KNK Metals Recycling Limited,W0113-04	Cappincur Industrial Estate ,Daingean Road,Tullamore,Co. Offaly,Ireland		
To Other Countries	16 07 08	Yes	25.8	wastes containing oil	R1	M	Weighed	Abroad	Geocycle ,38.152/BP	Rue de Courriere 49 Zoning Industrial de Feluy ,, ,B 7181 Seneffe ,Belgium	Geocycle ,38.152/BP, Rue de Courriere 49 Zoning Industrial de Feluy ,,.,B 7181 Seneffe ,Belgium	Rue de Courriere 49 Zoning Industrial de Feluy ,,.,B 7181 Seneffe ,Belgium
Within the Country	17 05 04	No	1327.44	soil and stones other than those mentioned in 17 05 03	R5	M	Weighed	Offsite in Ireland	Hinch Plant hire ,WFP-LS-09-0002-01	Straboe ,, , Portlaoise ,Co Laois ,Ireland	Hinch Plant hire ,WFP-LS-09-0002-01	Straboe ,, , Portlaoise ,Co Laois ,Ireland
To Other Countries	19 02 05	Yes	262.156	sludges from physico/chemical treatment containing dangerous substances	R1	M	Weighed	Abroad	Geocycle ,38.152/BP	Rue de Courriere 49 Zoning Industrial de Feluy ,, ,B 7181 Seneffe ,Belgium	Geocycle ,38.152/BP, Rue de Courriere 49 Zoning Industrial de Feluy ,,.,B 7181 Seneffe ,Belgium	Rue de Courriere 49 Zoning Industrial de Feluy ,,.,B 7181 Seneffe ,Belgium
To Other Countries	19 02 08	Yes	264.12	liquid combustible wastes containing dangerous substances	R1	M	Weighed	Abroad	Recyfuel S.A.,3200/61080/RGPED/2008/2/AP-PU	Noning Industriel d'Ehein,B-4480 Engis,,.,.Belgium	Lindenschmidt , 04 714 98089,Krombacher Strasse 42-46 ,,Kreutzal,D57223 ,Germany	Krombacher Strasse 42-46 ,,Kreutzal,D57223 ,Germany
To Other Countries	19 02 09	Yes	279.14	solid combustible wastes containing dangerous substances	R1	M	Weighed	Abroad	Recyfuel S.A.,3200/61080/RGPED/2008/2/AP-PU	Noning Industriel d'Ehein,B-4480 Engis,,.,.Belgium	Recyfuel S.A.,3200/61080/RGPED/2008/2/AP-PU	Noning Industriel d'Ehein,B-4480 Engis,,.,.Belgium
To Other Countries	19 12 11	Yes	176.58	other wastes (including mixtures of materials) from mechanical treatment of waste containing dangerous substances	D10	M	Weighed	Abroad	KWA,E17012100	Graftstr. 25 ,,.,.47475 Kamp-Lintfort ,Germany	KWA,E17012100	Graftstr. 25 ,,.,.47475 Kamp-Lintfort ,Germany
To Other Countries	19 12 11	Yes	259.25	other wastes (including mixtures of materials) from mechanical treatment of waste containing dangerous substances	R1	M	Weighed	Abroad	Lindenschmidt , 04 714 98089	Krombacher Strasse 42-46 ,,Kreutzal,D57223 ,Germany	Lindenschmidt , 04 714 98089	Krombacher Strasse 42-46 ,,Kreutzal,D57223 ,Germany

Transfer Destination	European Waste Code	Hazardous	Quantity (Tonnes per Year)	Description of Waste	Waste Treatment Operation	Method Used M/C/E	Method Used	Location of Treatment	Haz Waste : Name and Licence/Permit No of Next Destination Facility Non Haz Waste: Name and Licence/Permit No of Recover/Disposer	Haz Waste : Address of Next Destination Facility Non Haz Waste: Address of Recover/Disposer	Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY)	Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY)
To Other Countries	19 12 11	Yes	58.304	other wastes (including mixtures of materials) from mechanical treatment of waste containing dangerous substances	R1	M	Weighed	Abroad	Geocycle ,38.152/BP	Rue de Courriere 49 Zoning Industrial de Feluy ,. ,. ,B 7181 Seneffe ,Belgium	Geocycle ,38.152/BP, Rue de Courriere 49 Zoning Industrial de Feluy ,.,.,B 7181 Seneffe ,Belgium	Rue de Courriere 49 Zoning Industrial de Feluy ,.,.,B 7181 Seneffe ,Belgium
Within the Country	20 01 21	Yes	1.24	fluorescent tubes and other mercury-containing waste	R4	M	Weighed	Offsite in Ireland	Irish Lamp Recycling ,WFP-KE-08-0348-01	Woodstock Industrial Estate ,.,Athy ,Co. Kildare. ,Ireland	Irish Lamp Recycling ,WFP-KE-08-0348-01	Woodstock Industrial Estate ,.,Athy ,Co. Kildare. ,Ireland
Within the Country	20 01 25	No	0.595	edible oil and fat	R3	M	Weighed	Offsite in Ireland	Frylite ,WFP-DS-10-0009-01	Ballymount Drive Ballymount Industrial Estate,Unit J1 ,Dublin,Dublin 12,Ireland		
To Other Countries	20 01 27	Yes	21.62	paint, inks, adhesives and resins containing dangerous substances	R13	M	Weighed	Abroad	Recyfuel S.A.,3200/61080/RGPED/2008/2/AP-PU	Noning Industriel d'Ehein,B-4480 Engis,.,.,Belgium	Lindenschmidt , 04 714 98089	Krombacher Strasse 42-46 ,.,Kreutzal,D57223 ,Germany
To Other Countries	20 01 28	No	4.35	paint, inks, adhesives and resins other than those mentioned in 20 01 27	R1	M	Weighed	Abroad	Recyfuel S.A.,3200/61080/RGPED/2008/2/AP-PU	Noning Industriel d'Ehein,B-4480 Engis,.,.,Belgium		
Within the Country	20 01 40	No	239.1	metals	R4	M	Weighed	Offsite in Ireland	MSM Recycling,WFP-TN-11-0003-02	Annagh,.,Birr,Co. Tipperary,Ireland		
Within the Country	09 01 02	Yes	0.824	water-based offset plate developer solutions	D9	M	Weighed	Offsite in Ireland	Enva Dublin,W0196-01	JFK Road,Naas Road,Dublin,Dublin12,Ireland	Enva,W0196-01,JFK Road Naas Road,.,Dublin,Dublin 12,Ireland	JFK Road Naas Road,.,Dublin,Dublin 12,Ireland
To Other Countries	17 05 03	Yes	3530.66	soil and stones containing dangerous substances	R5	M	Weighed	Abroad	Afvalstoffen Terminal Moerdijk BV,NB501809XXHB	Vlasweg 12,4782 PW Moerdijk, , ,Netherlands	Afvalstoffen Terminal Moerdijk,NB501809XXHB,Vlasweg 12,4782 PW Moerdijk,Holland,Holland,Netherlands	Vlasweg 12,4782 PW Moerdijk,Holland,Holland,Netherlands
Within the Country	18 01 09	No	0.64	medicines other than those mentioned in 18 01 08	D9	M	Weighed	Offsite in Ireland	SRCl Eco Safe Systems Limted,W054-02	Unit 1A ,Allied Industrial Estate Kylemore Road ,Ballyfermot,Dublin 10,Ireland		
Within the Country	18 02 02	Yes	7.327	wastes whose collection and disposal is subject to special requirements in order to prevent infection	D9	M	Weighed	Offsite in Ireland	SRCl Eco Safe Systems Limted,W054-02	Unit 1A ,Allied Industrial Estate Kylemore Road ,Ballyfermot,Dublin 10,Ireland	SRCL Eco Safe Systems,W0154-02,Unit 1A,Allied Industrial Estate,Kylemore Road,Ballyfermot ,Ireland	Unit 1A,Allied Industrial Estate,Kylemore Road,Ballyfermot ,Ireland
Within the Country	07 05 11	Yes	3.7	sludges from on-site effluent treatment containing dangerous substances	R13	M	Weighed	Offsite in Ireland	Enva ,W041-1	Smithstown Industrial estate ,.,Shannon ,Co. Clare,Ireland	Lindenschmidt , 04 714 98089,Krombacher Strasse 42-46 ,.,Kreutzal,D57223 ,Germany	Krombacher Strasse 42-46 ,.,Kreutzal,D57223 ,Germany
To Other Countries	**15 02 02**	**Yes**	300.0	absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by dangerous substances	R1	M	Weighed	Abroad	Geocycle ,38.152/BP	Rue de Courriere 49 Zoning Industrial de Feluy ,. ,. ,B 7181 Seneffe ,Belgium	Geocycle ,38.152/BP, Rue de Courriere 49 Zoning Industrial de Feluy ,.,.,B 7181 Seneffe ,Belgium	Rue de Courriere 49 Zoning Industrial de Feluy ,.,.,B 7181 Seneffe ,Belgium
To Other Countries	19 02 09	Yes	127.25	solid combustible wastes containing dangerous substances	R1	M	Weighed	Abroad	Lindenschmidt , 04 714 98089	Krombacher Strasse 42-46 ,.,Kreutzal,D57223 ,Germany	Lindenschmidt , 04 714 98089,Krombacher Strasse 42-46 ,.,Kreutzal,D57223 ,Germany	Krombacher Strasse 42-46 ,.,Kreutzal,D57223 ,Germany

Transfer Destination	European Waste Code	Hazardous	Quantity (Tonnes per Year)	Description of Waste	Waste Treatment Operation	Method Used		Location of Treatment	Haz Waste : Name and Licence/Permit No of Next Destination Facility Non Haz Waste: Name and Licence/Permit No of Recover/Disposer	Haz Waste : Address of Next Destination Facility Non Haz Waste: Address of Recover/Disposer	Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY)	Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY)
						M/C/E	Method Used					
To Other Countries	08 03 12	Yes	12.05	waste ink containing dangerous substances	R1	M	Weighed	Abroad	Recyfuel S.A.,3200/61080/RGPED/2008/2/AP-PU	Noning Industriel d'Ehein,B-4480 Engis,.,.,Belgium	Recyfuel SA,3200/61080/RGPED/2008/2/AP-PU,Noning Inustrial d'Ehein,B-4480 Engis,.,.,Belgium	Noning Inustrial d'Ehein,B-4480 Engis,.,.,Belgium

* Select a row by double-clicking the Description of Waste then click the details button

Appendix 2

WRIGHT ENVIRONMENTAL SERVICES

CONFIDENTIAL REPORT

Client

Enva Ireland Ltd

Clonminam Industrial Estate

Portlaoise

Co. Laois

Attn. Mr. Kevin Coll

Title

Annual Environmental Noise Survey 2016

Enva Ireland Ltd. – Portlaoise

EPA Waste Licence Reg. No. 184-1

Report Ref:	1659	Survey and Report by:	Frances Wright *LFOH, BSc, PgDip Env, Dip SHWW*
Date recd:		Approved by:	Paddy Wright *BSc, PgDip ChemEng, CertOH*
Copies to:		Date:	26th January 2017

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1. INTRODUCTION:

Enva Ireland Ltd. (Enva) operate a waste recovery facility at Clonminam Industrial Estate, Portlaoise which is licensed under the EPA Waste Licence (Reg. No. 184-1). Schedule D of the company's licence requires an annual Environmental Noise Survey to be undertaken.

At the request of Mr. Kevin Coll of Enva Ireland Ltd., Wright Environmental Services carried out this Noise Survey on the 24th November 2016.

This report presents and interprets the results of the survey with reference to the company's Waste Licence noise criteria. The methodology used for the survey is described in Appendix I. Instrumentation and calibration is described in Appendix II. Monitoring locations are shown in the site map in Appendix III.

2. SUMMARY

Enva are required by their EPA Waste Licence (Reg. No. 184-1) to have an annual Environmental Noise Survey undertaken. Wright Environmental Services carried out this survey on the 24th November 2016. Table 1 outlines the monitoring plan. Table 2 summarises the noise levels measured at each location and exams the results in relation to the noise criteria set the company's EPA Waste Licence.

The results for each sampling location passed the licence criteria. It is therefore concluded that Enva Ireland Ltd. are in compliance with the noise criteria set out in their EPA Waste Licence (Reg. No. 184-1).

Table 1

	N1 *boundary location*	**N2** *boundary location*	**N3** *boundary location*	**N4** *noise sensitive location*	**N5** *abandoned noise sensitive location*
Day Time Survey	**3 sampling periods**	**3 sampling periods**	**3 sampling periods**	**3 sampling periods**	**3 sampling periods**
Night Time Survey	**2 sampling periods**	**2 sampling periods**	**2 sampling periods**	**2 sampling periods**	**2 sampling periods**

Table 2 – Summary of noise monitoring results

Location	Leq Range Day	Leq Range Night	Dominant Noise Sources	Pass/Fail	Rational Licence criteria: 57dB(A) Daytime and 47dB(A) at Noise Sensitive Locations (NSL)
N1	52-55	43-44	Distant traffic, vehicle movement onsite (day)	**Pass**	Below the criteria noise levels
N2	54-56	48-49	Distant traffic, fan noise from neighbouring facility (night), vehicle movement onsite (day) and from neighbouring facility (day), onsite boiler (day)	**Pass**	Noise levels were below the criteria levels during the day. Examining the night levels, noise levels were above 47dB(A). However this limit is set for NSL (nearest NSL >250m). Using the inverse square law, noise levels (if attributable to onsite activity) would be reduced well below the limit over this distance. There was no noise audible from Enva at this point during the night survey.
N3	50-52	40-41	vehicle maintenance in train yard (day), distant traffic	**Pass**	Below the criteria noise levels
N4	50-54	39-40	Passing and distant traffic, industrial noise	**Pass**	Below the criteria noise levels. Enva not audible at this location
N5	52-54	42-43	Distant traffic, vehicle movement onsite (day)	**Pass**	Below the criteria noise levels

3. MONITORING RESULTS AND DISCUSSION:

Wright Environmental Services carried out the day and night Environmental Noise Survey. The monitoring locations are described below and are shown in the site map in Appendix III.

Location **N1**:Along the mid western site boundary.
Location **N2**: In the corner of the site, along the south eastern boundary
Location **N3**:In the corner of the site, along the north eastern boundary.
Location **N4**:Nearby residential area, east/south east of Enva, on the corner of Knockmay Road and Marian Avenue. The railway yard is the main land use between Enva in this monitoring location.
Location **N5**:North west of Enva site, on the corner with access road for Rowan halting site (currently deserted). Note access to this point is now restricted, therefore monitoring was carried out at the barrier, blocking access to this point (see map in Appendix III).

The following "A-Weighted" data was determined for each discrete sampling period.

L_{eq} : The equivalent continuous noise level for the measurement period. (This is defined as the sound level of a steady sound having the same energy as a fluctuating sound over the specified measuring period).

L_{1} : The noise level exceeded for 1% of the measurement period. (This parameter gives a good indication of typical maximum levels.)

L_{10} : The noise level exceeded for 10% of the measurement period.

L_{90} : The noise level exceeded for 90% of the measurement period. (This is taken to represent the background noise level).

Detailed results are presented in the Tables below along with appropriate comments regarding noise in the monitoring environment.

Table 3

N1 - Monitoring Location

Start Time t = 30mins	L_{eq} (dBA)	L_1 (dBA)	L_{10} (dBA)	L_{90} (dBA)	Comments	
17.05	**55**	61	57	49	Dominant Noise: distant traffic (particularly from the S/SW), vehicle movement onsite and in/out Enva Onsite Noise: forklift, 2 HGV in/out vehicle movement, low hum Offsite Noise: 3 trains and 3 cars pass nearby, distant traffic noise	DAY
17.35	**54**	62	55	48	Dominant Noise: distant traffic (particularly from the S/SW), vehicle movement onsite Onsite Noise: forklift, low hum Offsite Noise: 2 trains and 2 cars pass nearby, distant traffic noise	
18.05	**52**	59	54	48	Dominant Noise: distant traffic (particularly from the S/SW) Onsite Noise: forklift, low hum Offsite Noise: 2 trains and 2 cars pass nearby, distant traffic noise	
23:26	**43**	49	44	40	Dominant Noise: distant traffic (particularly from the S/SW) Onsite Noise: occasional hum from the compressor near cardboard compactor Offsite Noise: 1 train passes (slowly)	NIGHT
23:56	**44**	51	46	41	Dominant Noise: distant traffic (particularly from the S/SW) Onsite Noise: occasional hum from the compressor near cardboard compactor Offsite Noise: 1 train passes, HGV on idle beyond Emo Oil (approx. 5 mins)	

Table 4

N2 - Monitoring Location

Start Time t = 30mins	L_{eq} (dBA)	L_1 (dBA)	L_{10} (dBA)	L_{19} (dBA)	Comments	
12:56	**56**	64	58	52	Dominant Noise: vehicle movement onsite and from neighbouring facility, onsite boiler Onsite Noise: forklift, vehicle movement, boiler Offsite Noise: vehicle movement next door, distant traffic noise, construction noise from neighbours (west)	DAY
13:29	**55**	63	58	51	Dominant Noise: vehicle movement onsite and from neighbouring facility, onsite boiler Onsite Noise: forklift, vehicle movement, boiler Offsite Noise: vehicle movement next door, distant traffic noise, construction noise from neighbours (west)	
14:05	**54**	61	57	51	Dominant Noise: vehicle movement onsite and from neighbouring facility, onsite boiler Onsite Noise: forklift, vehicle movement, boiler Offsite Noise: vehicle movement next door, distant traffic noise, construction noise from neighbours (west)	
22:00	**49**	53	51	47	Dominant Noise: fan noise in neighbouring facility, distant traffic Onsite Noise: No noise audible from Enva Offsite Noise: fan noise in neighbouring facility, distant traffic	NIGHT
22:30	**48**	52	50	47	Dominant Noise: fan noise in neighbouring facility, distant traffic Onsite Noise: No noise audible from Enva Offsite Noise: fan noise in neighbouring facility, distant traffic, distant train	

Table 5

N3 - Monitoring Location

Start Time t = 30mins	L_{eq} (dBA)	L_1 (dBA)	L_{10} (dBA)	L_{90} (dBA)	Comments	
13:12	**52**	59	54	46	Dominant Noise: vehicle maintenance in train yard (engine noise) Onsite Noise: forklift, vehicle movement (distant) Offsite Noise: vehicle maintenance in train yard (engine noise), 2 trains pass, distant traffic	DAY
13:42	**52**	58	53	45	Dominant Noise: vehicle maintenance in train yard (engine noise) Onsite Noise: forklift, vehicle movement (distant), talking/people movement Offsite Noise: vehicle maintenance in train yard (engine noise), 1 trains pass, distant traffic, plane passes overhead	
14:14	**50**	58	53	44	Dominant Noise: vehicle maintenance in train yard (engine noise) Onsite Noise: forklift, vehicle movement (distant) Offsite Noise: vehicle maintenance in train yard (engine noise), distant traffic	
22:10	**41**	47	44	38	Dominant noise: Distant traffic noise. Onsite Noise: no noise audible from Enva. Offsite Noise: Distant traffic noise	NIGHT
22:40	**40**	44	42	37	Dominant noise: Distant traffic noise. Onsite Noise: no noise audible from Enva. Offsite Noise: Distant traffic noise	

Table 6

N4 - Monitoring Location

Start Time t = 30mins	L_{eq} (dBA)	L_1 (dBA)	L_{10} (dBA)	L_{90} (dBA)	Comments	
18:51	**54**	63	57	46	Dominant Noise: passing traffic and distant traffic Onsite Noise: No noise audible from Enva Offsite Noise: approximately 35 cars pass, distant traffic	DAY
19:21	**53**	62	56	44	Dominant Noise: passing traffic and distant traffic Onsite Noise: No noise audible from Enva Offsite Noise: approximately 30 cars pass, distant traffic	
19:51	**50**	60	54	42	Dominant Noise: passing traffic and distant traffic Onsite Noise: No noise audible from Enva Offsite Noise: approximately 28 cars pass, distant traffic	
00:40	**40**	44	41	36	Dominant Noise: industrial noise to south and distant traffic Onsite Noise: No noise audible from Enva Offsite Noise: approximately 4 cars pass, distant traffic	NIGHT
01:10	**39**	44	40	35	Dominant Noise: industrial noise to south and distant traffic Onsite Noise: No noise audible from Enva Offsite Noise: approximately 2 cars pass, distant traffic	

Table 7

N5 - Monitoring Location

Start Time t = 30mins	L_{eq} (dBA)	L_1 (dBA)	L_{10} (dBA)	L_{90} (dBA)	Comments	
17.05	**54**	60	56	47	Dominant Noise: distant traffic (particularly from the S/SW), vehicle movement onsite and in/out Enva Onsite Noise: forklift, 2 HGV in/out vehicle movement, low hum Offsite Noise: 3 trains and 3 cars pass nearby, distant traffic noise	DAY
17.35	**53**	60	56	46	Dominant Noise: distant traffic (particularly from the S/SW), vehicle movement onsite Onsite Noise: forklift, low hum Offsite Noise: 2 trains and 2 cars pass nearby, distant traffic noise	
18.05	**52**	59	54	46	Dominant Noise: distant traffic (particularly from the S/SW) Onsite Noise: occationa Offsite Noise: 2 trains and 2 cars pass nearby, distant traffic noise	
23:26	**42**	48	43	40	Dominant Noise: distant traffic (particularly from the S/SW) Onsite Noise: occasional hum from the compressor near cardboard compactor Offsite Noise: 1 train passes (slowly)	NIGHT
23:56	**43**	49	45	40	Dominant Noise: distant traffic (particularly from the S/SW) Onsite Noise: occasional hum from the compressor near cardboard compactor Offsite Noise: 1 train passes, HGV on idle beyond Emo Oil (approx. 5 mins)	

In accordance with their waste licence, Enva are required to comply with maximum noise limit values. Criterion noise levels are set for day and night time, for noise measured at Noise Sensitive Locations (NSLs). The criterion noise levels are presented in Schedule C of the licence as follows:

Day	*55*	*dB(A) LAeq(30 minutes)*
Night	*45*	*dB(A) LAeq(30 minutes)*

Section 7.7.1 states that noise from the facility should not exceed this level by more than 2dB(A).

> *7.1.1 Noise from the activity shall not give rise to sound pressure levels (LAeq 30min) measured at noise sensitive locations which exceed the limit value(s) by more than 2dB(A).*

Noise levels were below the limit values at N1,N3,N4 and N5. Noise levels were above the 47dB(A) during the night time survey at N4. This limit is set for noise sensitive location, the nearest of which is greater than 250m. Using the inverse square law (see Appendix I), noise levels (if attributable to onsite activity) would be reduced well below the limit over this distance. However there was no noise audible from Enva at this location during the night time survey. Therefor it is concluded that that noise levels measured at this location are in compliance with licence criteria.

Section 6.7 of the company's licence states that

> *"There shall be no clearly audible tonal component or impulsive component in the noise emissions from the activity at the noise sensitive locations."*

The noise was examined at each of the monitoring locations to investigate the presence of tones. No tones were identified from Enva.

It is therefore concluded that Enva Ireland Ltd. are in compliance with the noise criteria set out in their EPA Waste Licence (Reg. No. 184-1).

APPENDIX I

Methodology

METHODOLOGY

The methodology of the survey was based upon procedures set out in the International Standard, ISO 1996-2:2007 (Acoustics – description, measurement and assessment of environmental noise Part 2: Determination of Environmental Noise Levels.). The survey was carried out in accordance with EPA published document *(NG4) Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities.*

Environmental noise levels were determined by using a Pulsar Model 33 , Type 1 Real Time Sound Level Meter, with half inch condenser microphone and B&K Type 2250 Light, Type 1 Real Time Sound Level Meter, with half inch condenser microphone. The instrumentation was calibrated directly before and after the noise measurements. Details of the instrumentation and external calibration are presented in Appendix II of this report.

Results reported were determined using the fast response, A-Weighting (ref. 20 μPa) and are rounded off to the nearest whole decibel. Monitoring was conducted in relatively calm, dry weather conditions during the day (08:00 – 22:00) and night (22:00 – 08:00). Throughout the monitoring, the microphone was situated 1.5 m above ground level, away from any reflective surfaces. The monitoring equipment was manned throughout the sampling intervals and comments were recorded in order to aid the interpretation of the results.

During the survey air temperature and humidity measurements were undertaken using a Delta Ohm Hygrometer HD 8501 H. Wind speed measurements were taken using a TSI VelociCalc and the wind direction was noted using a compass. Details of the weather conditions are presented in the Table below.

Summary of Weather Conditions

Date/Time	Air Temperature ºC	Relative Humidity %	Wind Direction	Wind Speed m/s	General Conditions
24th November 2017 15:00	8	63	NE	4.2	Dry – no precipitation.
24th November 2017 23:30	6	76	ENE	4.1	Dry – no precipitation.

The Inverse Square Law can be used to calculate the expected reduction in noise levels as one moves away from a given noise source, which is assumed to radiate uniformly in all directions. The Inverse Square Law states that as one doubles the distance from a source, a reduction of 6 dB is achieved as follows:

$$L_{p2} = L_{p1} - 20 \text{ Log } (R2/R1)$$

where:

- L_{p1} is the measured reference Sound Pressure Level (SPL) at a distance of R1 metres from the source.
- L_{p2} is the calculated SPL at a distance of R2 metres from the source.

APPENDIX II

Instrumentation and External Calibration Details

Certificate of Calibration

pulsar Instruments Plc

Equipment Details

Instrument Manufacturer	Pulsar Instruments plc
Instrument Type	Model 100B
Description	Acoustic Calibrator
Serial Number	42171

Calibration Procedure

The acoustic calibrator detailed above has been calibrated to the published data as described in the operating manual. The procedures and techniques used to follow the recommendations of the IEC standard Electroacoustics – Sound Calibrators IEC 60942:2003, IEC 60942:1997, BS EN 60942:1998 and BS EN 60942:2003 where applicable.. The calibrator's main output is 94.00 dB (1 Pa) and this was set within the 0.01 dB resolution of the test system, i.e. one hundredth of a decibel. Numbers in {parenthesis} refer to the paragraph in IEC 60942.

Calibration Traceability

The calibrator above was calibrated against the calibration laboratory standards held by Cirrus Research plc. These are traceable to International Standards {A.0.6}. The standards are:

Microphone Type	B&K 4192	Serial Number	19207921	Calibration Ref.	S6450
Pistonphone Type	B&K 4220	Serial Number	613843	Calibration Ref.	S6388

Calibration Climate Conditions

The climatic test conditions were all maintained within the permitted limits of IEC 60942:1997.

Temperature	{B.3.2}	Permitted band 15°C to 25°C
Humidity	{B.3.2}	Permitted band 30% to 90% RH
Static Pressure	{B.3.2}	Permitted band 85 kPa to 105 kPa
Ambient Noise Level	{B.3.3.6}	Max permitted level 64 dB(Z)

Measurement Results

The figures below are the Calibration Laboratory test limits for this model calibrator and have a smaller tolerance than those permitted in IEC 60942.

94 dB Output	94.02 dB	Permitted band	93.95 to 94.05dB
104 dB Output	103.98 dB	Permitted band	103.80 to 104.30dB
Frequency	995.1 Hz	Permitted band	990 to 1010Hz

Uncertainty

With an uncertainty coefficient of k=2, i.e. a 95% confidence level, the uncertainty of each measure is

94 dB Output	± 0.13 dB	104 dB Output	± 0.14 dB
Frequency	± 0.1 Hz	Level Stability	± 0.04 dB

Calibrated by M. BERRY

Calibration Date 10 February 2015

Calibration Certificate Number 225813

This Calibration Certificate is valid for 24 months from the date above.

Pulsar Instruments plc, The Evron Centre, John Street, Filey, North Yorkshire, YO14 9DW

Certificate of Calibration

pulsar Instruments Plc

Equipment Details

Instrument Manufacturer	Pulsar Instruments plc
Instrument Type	Model 33
Description	Sound Level Meter
Serial Number	T223417

Calibration Procedure

The instrument detailed above has been calibrated to the publish test and calibration data as detailed in the instrument hand book, using the techniques recommended in the latest revisions of the International Standards IEC 61672-1:2002, IEC 60651:1979, IEC 60804:2001,IEC 61260:1995, IEC 60942:1997, IEC 61252:1993, ANSI S1.4-1983, ANSI S1.11-1986 and ANSI S1.43-1997 where applicable.
Sound Level Meters: All Calibration procedures were carried out by subsitituting the microphone capsule with a suitable electrical signal, apart from the final acoustic calibration.

Calibration Traceability

The equipment detailed above was calibrated against the calibration laboratory standards held by Cirrus Research plc. These are traceable to International Standards {A.0.6}. The standards are:

Microphone Type	B&K 4192	Serial Number	19207921	Calibration Ref.	S6450
Pistonphone Type	B&K 4220	Serial Number	613843	Calibration Ref.	S6388

Calibrated by M. BERRY

Calibration Date	10 February 2015
Calibration Certificate Number	225812

This Calibration Certificate is valid for 24 months from the date above.

Pulsar Instruments plc, The Evron Centre, John Street, Filey, North Yorkshire, YO14 9DW
Telephone: +44 (0) 1723 518011 Fax: +44 (0) 1723 518043
Email: sales@pulsarinstruments.com

Brüel & Kjær

The Calibration Laboratory
Skodsborgvej 307, DK-2850 Nærum, Denmark

ilac-MRA DANAK CAL Reg.nr. 307

CERTIFICATE OF CALIBRATION

No: CDK1331010 Page 1 of 10

Sound Level Meter:	Brüel & Kjær Type 2250 Light	No: 3001350	Id: -
Microphone:	Brüel & Kjær Type 4950	No: 2778447	
Preamplifier:	Brüel & Kjær Type ZC-0032	No: 16741	
Supplied Calibrator:	None		
Software version:	BZ7130 Version 3.5.1	Pattern Approval:	PENDING
Instruction manual:	BE-1774-14		

CUSTOMER

Enfonic Ltd
Tecpro House, IDA Business & Technology Park, Clonshaugh
Clonshaugh
Dublin 17
Ireland

CALIBRATION CONDITIONS

Preconditioning: 4 hours at 23°C ± 3°C
Environment conditions: *See actual values in **Environmental conditions** sections.*

SPECIFICATIONS

The Sound Level Meter Brüel & Kjær Type 2250 Light has been calibrated in accordance with the requirements as specified in IEC61672-1:2002 class 1. Procedures from IEC 61672-3:2006 were used to perform the periodic tests. The accreditation assures the traceability to the international units system SI.

PROCEDURE

The measurements have been performed with the assistance of Brüel & Kjær Sound Level Meter Calibration System 3630 with application software type 7763 (version 4.9 - DB: 4.90) by using procedure 2250-L-4950.

RESULTS

Calibration Mode: **Calibration after repair/adjustment.**

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ providing a level of confidence of approximately 95 %. The uncertainty evaluation has been carried out in accordance with EA-4/02 from elements originating from the standards, calibration method, effect of environmental conditions and any short time contribution from the device under calibration.

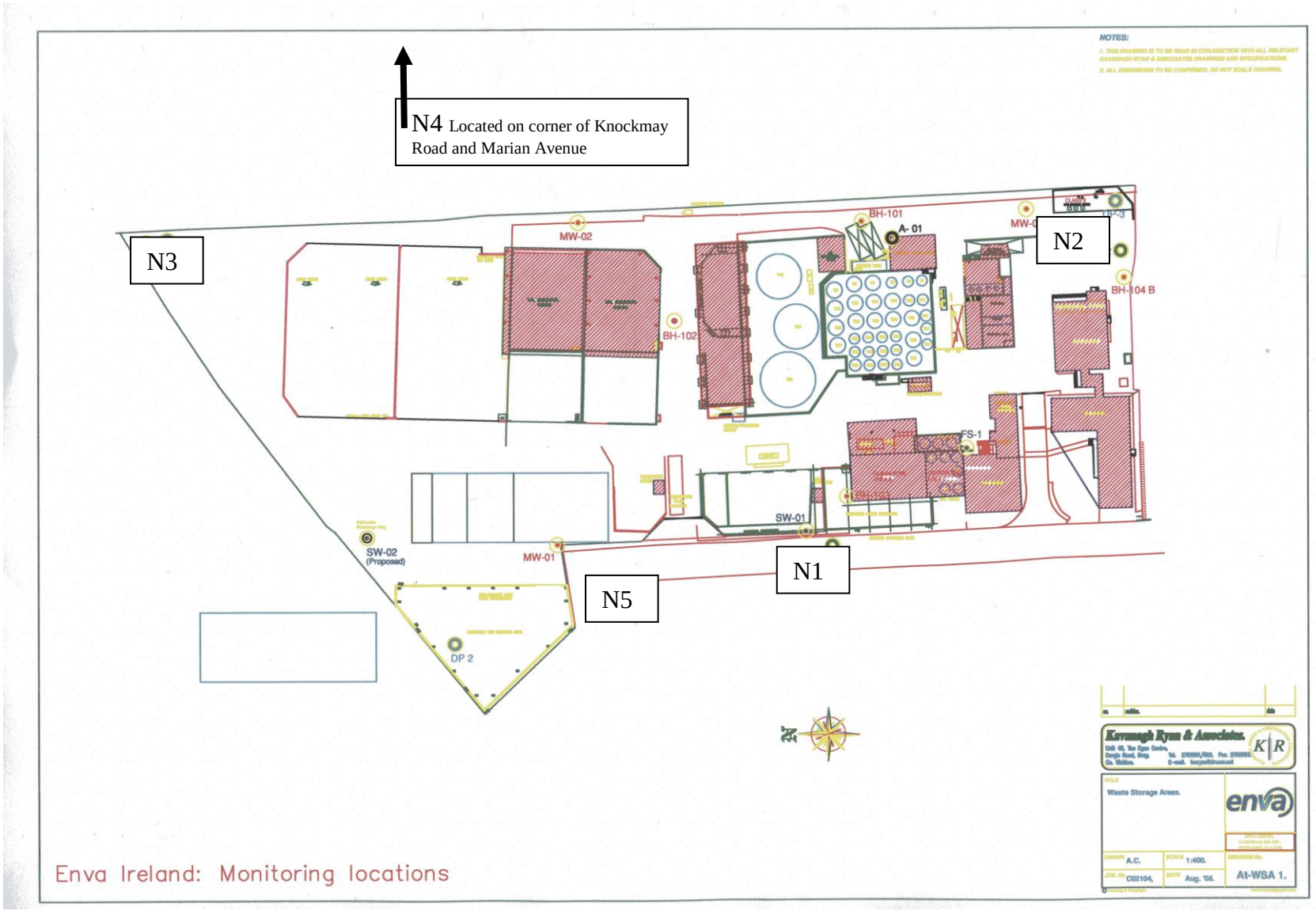
Date of calibration: 2014-10-10 Date of issue: 2014-10-10

M. Önder
Mikail Önder
Calibration Technician

Jonas Johannessen
Approved Signatory

APPENDIX III

Site Plan showing Noise Monitoring Positions


N4 Located on corner of Knockmay Road and Marian Avenue
N3
N2
N1
N5
MW-02
BH-101
A- 01
BH-102
BH-104 B
FS-1
SW-01
SW-02
(Proposed)
MW-01
DP 2
Waste Storage Areas.
A.C.
1:400.
C02104.
Aug. '08.
At-WSA 1.
Enva Ireland: Monitoring locations

Appendix 3

Air I Noise I Water I Soil I Environmental
Consultancy www.axisenv.ie

Unit 5 Caherdavin Business Centre,
Ennis Road,
Limerick.

Enva (Ireland) Limited

Clonminam Industrial Estate, Portlaoise, County Laois, Laois.

Bund Integrity Report 2015

Waste Licence Number: W0184-01

Report Reference Number:	**3520-15-01**
Version:	**2**
Date of Issue:	**03-09-2015**
Report Compiled by:	**Mark McGarry**

1.0 Introduction

Enva (Ireland) Limited, Clonminam Industrial Estate, Portlaoise, Co. Laois are required as part of Waste Licence number W0184-01, Condition 3.13.5 and Schedule E to have their bunds tested for the protection of ground and surface water.

The bunds were tested in accordance with BS 8007: Design of Concrete Structures for Retaining Aqueous Liquids and documented guidance from the EPA entitled Storage and Transfer of Materials for Scheduled Activities.

The test was carried out in two stages, firstly to inspect the bund visually for cracks, weak spots or if the bund required any remedial work. The integrity of the bund was then tested for water tightness over a 72 hour period. The reduced timeframe from the BS 8007 standard for testing was applied as the bunds were in use and were required for the operation of the site.

2.0 Licence Conditions

The following conditions have been taken from the current licence applicable to this site:

3.12.5 The drainage system, bunds, silt traps and oil separators shall be inspected weekly, desludged as necessary and properly maintained at all times. All sludge and drainage from these operations shall be collected for safe disposal. A written record shall be kept of the inspections, desludging, cleaning, disposal of associated waste products, maintenance and performance of the interceptors, bunds and drains.

3.13.2 All tank and drum storage areas shall, as a minimum, be bunded, either locally or remotely, to a volume not less than the greater of the following:

a) 110% of the capacity of the largest tank or drum within the bunded area; or
b) 25% of the total volume of substance which could be stored within the bunded area

3.13.5 The integrity and water tightness of all the bunds and their resistance to penetration by water or other materials stored therein shall be confirmed by the licensee and shall be reported to the Agency within 12 months of the date of grant of this licence. This confirmation shall be repeated at least once every three years thereafter and reported to the Agency on each occasion

3.0 Summary of Methodology

A visual inspection was carried out on the bund to determine if there were any cracks, fissures or unacceptable surface continuity between the bund walls.

The hydrostatic test was completed by filling the bund to a fill level using clean water, in line with the procedure outlined in BS8007:1987. Liquid levels were allowed to stabilise for 24 hours. After stabilisation a depth reading was recorded and marked at a preset suitable location. The water level was re-recorded after remaining in the bund for 72 hours.

A water level meter was placed in situ to determine the impact of rainfall and evaporation in the bund. When this statistic was accounted for the bund was verified as passed or failed in line with the criteria set out in the standard.

4.0 Summary of Results

Bund Identity	Pass / Fail	Comments
Bund 1 Section A	Pass	This storage area is too large to complete a hydrostatic test. The building was split into 3 sections to allow for movement of material in order to complete visual assessments thoroughly. The bund was deemed to pass the visual inspection.
Bund 2		This bund passed the Hydrostatic Integrity test and had sufficient storage volume to meet the licence requirements
Bund 5 Section 1		This bund passed the Hydrostatic Integrity test and had sufficient storage volume to meet the licence requirements
Bund 6		This bund passed the Hydrostatic Integrity test and had sufficient storage volume to meet the licence requirements
Bund 8		This bund passed the Hydrostatic Integrity test and had sufficient storage volume to meet the licence requirements

Project Manager		Date of Report	07-07-2015
Client	Enva Ireland Limited	Contact	Kevin Coll

Bund Number 5 Section 1

Company	ENVA Ireland	**Waste Reference No**	W0184-01
Site	Clonminam Industrial Estate Portlaoise	**Waste Category**	Hazardous Waste Facility
Bund Reference No	Bund 5 (Section 1)	**Bund Type: Local/ Remote / Combined**	Local
Bund Location	Storage Area	**Bund Risk Classification: 0, 1, 2, 3**	2
Bund Dimensions	4210 x 8280 x 220mm	**Primary Vessel Material**	Steel Tanks
Bund Materials of Construction	Reinforced Concrete	**Primary Vessel Storage Volume**	c. 13m^3 full
Bund Lining materials	N.a	**Primary Vessel 110% Largest Vessel**	14.3 m^3
Bund Retention Volume (local/ Remote)	76 m^3 (Local)	**Primary Vessel 25% Total Volume**	-
Practical to Conduct Hydrostatic Test	Yes	**Date of Visual Inspection**	11-06-2015

Visual Description:

Visual inspection was carried out on the walls, joints and floor both internally and externally. The walls and floors were deemed acceptable and therefore the bund passed through to the hydrostatic test. Water was filled to a height of 125mm from the floor of the bund – this bund could not be filled much higher due to the risk of damage to in line equipment and damage to the storage vessel controls. A visual inspection was completed on the remainder of the bund walls which has not been submerged for the test. There were no cracks, fissures or weak spots identified above the water line with the exception of a pipe connected through the wall. The seals around the pipe are finished and deemed appropriate to retain water. This pipe is above the level of water in the tank and therefore did not form part of the hydrostatic test but has been deemed to pass the visual inspection.

Date Bunds Filled	11-06-2015	**Date of Hydrostatic Test**	12 to 15-06-15
Start Time	10:00	**End Time**	11:00
Start Level of Water	125 mm	**End of Test Level of Water**	124 mm

Status & Recommendations:

- Bund Passes Hydrostatic Test to the level of water filled.
- Hydrostatic retest required in 2018 unless bund is damaged or repaired in the meantime.

Notes:

Low Risk - WGK 0 or 1
High Risk – WGK 2 or 3 R45, R46, R50, R51, R52, R53, R54, R55, R56, R58, R61, R63

Signed:	**Date: 07-07-2015**	**Title: Project Manager**
Signed: *Noel Harrington*	**Date: 07-07-2015**	**Title: Chartered Engineer**

Bund Number 6

Company	ENVA Ireland	**Waste Reference No**	W0184-01
Site	Clonminam Industrial Estate Portlaoise	**Waste Category**	Hazardous Waste Facility
Bund Reference No	Bund 6	**Bund Type: Local/ Remote / Combined**	Local
Bund Location	Effluent Discharge Tank	**Bund Risk Classification: 0, 1, 2, 3**	1
Bund Dimensions	1200 x 410 x 144mm	**Primary Vessel Material**	Steel Tanks
Bund Materials of Construction	Reinforced Concrete	**Primary Vessel Storage Volume**	c. 130 m^3 full
Bund Lining materials	N.a	**Primary Vessel 110% Largest Vessel**	55 m^3
Bund Retention Volume (local/ Remote)	71 m^3 (Local)	**Primary Vessel 25% Total Volume**	32.5 m^3
Practical to Conduct Hydrostatic Test	Yes	**Date of Visual Inspection**	11-06-2015

Visual Description:

Visual inspection was carried out on the walls, joints and floor both internally and externally. The walls, joints and floors were deemed acceptable and therefore the bund passed through to the hydrostatic test. Water was filled to a height of 92 mm from the floor of the bund – this bund could not be filled higher due to the risk of damage to electrical equipment.

A visual inspection was completed on the remainder of the bund walls which has not been submerged for the test. There were no cracks, fissures or weak spots identified above the water line with the exception of a pipe connected through the wall. The seals around the pipe are finished and deemed appropriate to retain water. This pipe is above the level of water in the tank and therefore did not form part of the hydrostatic test but has been deemed to pass the visual inspection.

The bund is fitted with a screw cork to allow for emptying purpose – this connection was included in the hydrostatic test.

Date Bunds Filled	11-06-2015	**Date of Hydrostatic Test**	12 to 15-06-15
Start Time	10:35	**End Time**	11:05
Start Level of Water	92 mm	**End of Test Level of Water**	91 mm

Status & Recommendations:

- Bund Passes Hydrostatic Test to the level of water filled.
- Hydrostatic retest required in 2018 unless bund is damaged or repaired in the meantime.

Notes:

Low Risk - WGK 0 or 1
High Risk – WGK 2 or 3 R45, R46, R50, R51, R52, R53, R54, R55, R56, R58, R61, R63

Signed: 	**Date: 07-07-2015**	**Title: Project Manager**
Signed: *Noel Harrington*	**Date: 07-07-2015**	**Title: Chartered Engineer**

Bund Number 1 Section 1 of 3

Note: This store was sectioned into 3 parts for this visual inspection. The reason for only completing 1/3rd of the building was to allow for stored materials to be moved into the other sections leaving one completely free for visual observation. There were no materials in this section for the visual observation therefore allowing a complete and comprehensive assessment of the section. This store is far too large of floor area to be deemed suitable for a hydrostatic test.

Company	ENVA Ireland	**Waste Reference No**	W0184-01
Site	Clonminam Industrial Estate Portlaoise	**Waste Category**	Hazardous Waste Facility
Bund Reference No	Bund 1 Section 1	**Bund Type: Local/ Remote / Combined**	Local
Bund Location	Export Storage	**Bund Risk Classification: 0, 1, 2, 3**	2
Bund Dimensions	c. 322 m^2 for Section 1	**Primary Vessel Material**	IBC's, Plastic and Metal Barrells
Bund Materials of Construction	Reinforced Concrete	**Primary Vessel Storage Volume**	Variable – max 100 m^3
Bund Lining materials	N.a	**Primary Vessel 110% Largest Vessel**	1.1 m^3
Bund Retention Volume (local/ Remote)	Total c. 57 m^3 (Local)	**Primary Vessel 25% Total Volume**	25 m^3
Practical to Conduct Hydrostatic Test	No	**Date of Visual Inspection**	11-06-2015

Visual Description:

Visual inspection was carried out on the walls and floor both internally and externally. The maximum retention height with this section would be 22mm. Above this level liquid would overflow the bund lip. Therefore the total retention volume of this export store was calculated at c. 40 m^3.

A visual inspection was completed on section 1 of the store floor, joints and walls. There were no significant cracks, fissures or weak spots identified. There was evidence of weak surface concrete in places however this did not constitute a failure of visual inspection as they were very minor.

Date Bunds Filled	N/a	**Date of Hydrostatic Test**	N/a
Start Time	N/a	**End Time**	N/a
Start Level of Water	N/a	**End of Test Level of Water**	N/a

Status & Recommendations:

- Bund Section 1 passed the visual inspection.
- This should be inspected every three years or in the event of damage caused as per the licence requirement.

Notes:

Low Risk - WGK 0 or 1
High Risk – WGK 2 or 3 R45, R46, R50, R51, R52, R53, R54, R55, R56, R58, R61, R63

Signed:	**Date: 07-07-2015**	**Title: Project Manager**
Signed: *Noel Harrington*	**Date: 07-07-2015**	**Title: Chartered Engineer**

Bund Number 2

Company	ENVA Ireland	**Waste Reference No**	W0184-01
Site	Clonminam Industrial Estate Portlaoise	**Waste Category**	Hazardous Waste Facility
Bund Reference No	Bund 2	**Bund Type: Local/ Remote / Combined**	Local & Remote
Bund Location	Mixed Fuels Bay	**Bund Risk Classification: 0, 1, 2, 3**	3
Bund Dimensions	8680 x 8260 x avg 220mm	**Primary Vessel Material**	IBC, Plastic and Steel Barrels
Bund Materials of Construction	Reinforced Concrete	**Primary Vessel Storage Volume**	Variable max 50 m^3 full
Bund Lining materials	N.a	**Primary Vessel 110% Largest Vessel**	1.1 m^3
Bund Retention Volume (local/ Remote)	15 m^3 (Local)	**Primary Vessel 25% Total Volume**	12 m^3
Practical to Conduct Hydrostatic Test	Yes	**Date of Visual Inspection**	11-06-2015

Visual Description:

Visual inspection was carried out on the walls and floor both internally and externally of the bund. The walls, joints and floors were deemed acceptable and therefore the bund passed through to the hydrostatic test. Water was filled to a height of 161 mm from the floor of the bund.

A visual inspection was completed on the remainder of the bund walls which has not been submerged for the test. There were no cracks, fissures or weak spots identified above the water line with the exception of a bung connected through the wall to another bund. This bung was below the level of water in the bund and therefore did form part of the hydrostatic test.

Date Bunds Filled	11-06-2015	**Date of Hydrostatic Test**	12 to 15-06-15
Start Time	10:55	**End Time**	11:10
Start Level of Water	161 mm	**End of Test Level of Water**	159 mm

Status & Recommendations:

- Bund Passes Hydrostatic Test to the level of water filled.
- Hydrostatic retest required in 2018 unless bund is damaged or repaired in the meantime.

Notes:

Low Risk - WGK 0 or 1
High Risk – WGK 2 or 3 R45, R46, R50, R51, R52, R53, R54, R55, R56, R58, R61, R63

Signed: 	**Date: 07-07-2015**	**Title: Project Manager**
Signed: *Noel Harrington*	**Date: 07-07-2015**	**Title: Chartered Engineer**

Bund Number 8

Company	ENVA Ireland	**Waste Reference No**	W0184-01
Site	Clonminam Industrial Estate Portlaoise	**Waste Category**	Hazardous Waste Facility
Bund Reference No	Bund 8	**Bund Type: Local/ Remote / Combined**	Local
Bund Location	Chemical Dosing Area	**Bund Risk Classification: 0, 1, 2, 3**	2
Bund Dimensions	6260 x 5190 x 1020mm	**Primary Vessel Material**	Steel Tanks
Bund Materials of Construction	Reinforced Concrete	**Primary Vessel Storage Volume**	20 m^3 full
Bund Lining materials	N.a	**Primary Vessel 110% Largest Vessel**	11 m^3
Bund Retention Volume (local/ Remote)	33 m^3 (Local)	**Primary Vessel 25% Total Volume**	5 m^3
Practical to Conduct Hydrostatic Test	Yes	**Date of Visual Inspection**	11-06-2015

Visual Description:

Visual inspection was carried out on the walls, joints and floor both internally and externally of the bund. The walls, joints and floors were deemed acceptable and therefore the bund passed through to the hydrostatic test. Water was filled to a height of 64 mm from the floor of the bund. There was electrical equipment in the bund restricting the height of the hydrostatic test to this level.

A visual inspection was completed on the reminder or the wall which was not submerged. There were no cracks, fissures or weak spots identified above the water line. The hydrostatic test was completed and passed.

Date Bunds Filled	11-06-2015	**Date of Hydrostatic Test**	12 to 15-06-15
Start Time	11:20	**End Time**	11:20
Start Level of Water	64 mm	**End of Test Level of Water**	64 mm

Status & Recommendations:

- Bund Passes Hydrostatic Test to the level of water filled.
- Hydrostatic retest required in 2018 unless bund is damaged or repaired in the meantime.

Notes:

Low Risk - WGK 0 or 1
High Risk – WGK 2 or 3 R45, R46, R50, R51, R52, R53, R54, R55, R56, R58, R61, R63

Signed: 	**Date: 07-07-2015**	**Title: Project Manager**
Signed: *Noel Harrington*	**Date: 07-07-2015**	**Title: Chartered Engineer**

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Unit 5 Caherdavin Business Centre,
Ennis Road,
Limerick.

Enva (Ireland) Limited

Clonminam Industrial Estate, Portlaoise, County Laois, Laois.

Bund Integrity Report 2015

Waste Licence Number: W0184-01

Report Reference Number:	**3520-15-02**
Version:	**4**
Date of Issue:	**03-09-2015**
Report Compiled by:	**Mark McGarry**

1.0 Introduction

Enva (Ireland) Limited, Clonminam Industrial Estate, Portlaoise, Co. Laois are required as part of Waste Licence number W0184-01, Condition 3.13.5 and Schedule E to have their bunds tested for the protection of ground and surface water.

The bunds were tested in accordance with BS 8007: Design of Concrete Structures for Retaining Aqueous Liquids and documented guidance from the EPA entitled Storage and Transfer of Materials for Scheduled Activities.

The test was carried out in two stages, firstly to inspect the bund visually for cracks, weak spots or if the bund required any remedial work. The integrity of the bund was then tested for water tightness over a 24 hour period. The reduced timeframe from the BS 8007 standard for testing was applied as the bunds were in use and were required for the operation of the site.

2.0 Licence Conditions

The following conditions have been taken from the current licence applicable to this site:

3.12.5 The drainage system, bunds, silt traps and oil separators shall be inspected weekly, desludged as necessary and properly maintained at all times. All sludge and drainage from these operations shall be collected for safe disposal. A written record shall be kept of the inspections, desludging, cleaning, disposal of associated waste products, maintenance and performance of the interceptors, bunds and drains.

3.13.2 All tank and drum storage areas shall, as a minimum, be bunded, either locally or remotely, to a volume not less than the greater of the following:

a) 110% of the capacity of the largest tank or drum within the bunded area; or
b) 25% of the total volume of substance which could be stored within the bunded area

3.13.5 The integrity and water tightness of all the bunds and their resistance to penetration by water or other materials stored therein shall be confirmed by the licensee and shall be reported to the Agency within 12 months of the date of grant of this licence. This confirmation shall be repeated at least once every three years thereafter and reported to the Agency on each occasion

3.0 Summary of Methodology

A visual inspection was carried out on the bund to determine if there were any cracks, fissures or unacceptable surface continuity between the bund walls.

The hydrostatic test was completed by filling the bund to a fill level using clean water, in line with the procedure outlined in BS8007:1987. Liquid levels were allowed to stabilise for 24 hours. After stabilisation a depth reading was recorded and marked at a preset suitable location. The water level was re-recorded after remaining in the bund for 24 hours.

A water level meter was placed in situ to determine the impact of rainfall and evaporation in the bund. When this statistic was accounted for the bund was verified as passed or failed in line with the criteria set out in the standard.

4.0 Summary of Results

Bund Identity	Pass / Fail	Comments
Area 7 – Water Treatment	Pass	This bund passed the Hydrostatic Integrity test and had sufficient storage volume to meet the licence requirements
Bund 4 Sump	Pass	This sump passed the Hydrostatic Integrity test.
Bund 4	Pass	This bund passed the visual inspection. It was not deemed practical to complete a hydrostatic test in this bund due to the size of floor area that needed to be covered and large volumes of water required.

Project Manager		Date of Report	12-08-2015
Client	Enva Ireland Limited	Contact	Kevin Coll

Water Treatment Area 7

Company	ENVA Ireland	**Waste Reference No**	W0184-01
Site	Clonminam Industrial Estate Portlaoise	**Waste Category**	Hazardous Waste Facility
Bund Reference No	Area 7	**Bund Type: Local/ Remote / Combined**	Local
Bund Location	Wastewater treatment area	**Bund Risk Classification: 0, 1, 2, 3**	2
Bund Dimensions	1112 x 1153 x 220mm	**Primary Vessel Material**	Steel Tanks
Bund Materials of Construction	Reinforced Concrete	**Primary Vessel Storage Volume**	c. 20m^3 full
Bund Lining materials	N.a	**Primary Vessel 110% Largest Vessel**	22 m^3
Bund Retention Volume (local/ Remote)	28 m^3 (Local)	**Primary Vessel 25% Total Volume**	5 m^3
Practical to Conduct Hydrostatic Test	Yes	**Date of Visual Inspection**	20-07-2015

Visual Description:

Visual inspection was carried out on the walls, joints and floor both internally and externally. The walls and floors were deemed acceptable and therefore the bund passed through to the hydrostatic test. Water was filled to a height of 99mm from the floor of the bund – this bund could not be filled much higher due to the risk of damage to in line equipment and damage to the storage vessel controls. A visual inspection was completed on the remainder of the bund floor and walls which has not been submerged for the test. There were no cracks, fissures or weak spots identified above the water line with the exception of a pipe connected through the wall. The seals around the pipe are finished and deemed appropriate to retain water. This pipe is above the level of water in the tank and therefore did not form part of the hydrostatic test but has been deemed to pass the visual inspection. The bund floor is sloped and raised in the middle – numerous measurements were made across the bund to get an overview of the entire structure.

Date Bunds Filled	17-07-2015	**Date of Hydrostatic Test**	20 - 21-07-15
Start Time	10:30	**End Time**	11:00
Start Level of Water	Side 1 99 mm Side 2 104 mm	**End of Test Level of Water**	Side 1 98 mm Side 2 104 mm

Status & Recommendations:

- Bund Passes Hydrostatic Test to the level of water filled.
- Hydrostatic retest required in 2018 unless bund is damaged or repaired in the meantime.

Notes:

Low Risk - WGK 0 or 1
High Risk – WGK 2 or 3 R45, R46, R50, R51, R52, R53, R54, R55, R56, R58, R61, R63

Signed:	**Date: 12-08-2015**	**Title: Project Manager**
Signed: *Noel Harrington*	**Date: 12-08-2015**	**Title: Chartered Engineer**

Bund Number 4 – Sump under Filter Press

Company	ENVA Ireland	**Waste Reference No**	W0184-01
Site	Clonminam Industrial Estate Portlaoise	**Waste Category**	Hazardous Waste Facility
Bund Reference No	Bund 4 – Sump under Filter Press	**Bund Type: Local/ Remote / Combined**	Local
Bund Location	Filter Press	**Bund Risk Classification: 0, 1, 2, 3**	1
Bund Dimensions	1840 x 6060 x 1790mm	**Primary Vessel Material**	Filter Press
Bund Materials of Construction	Reinforced Concrete	**Primary Vessel Storage Volume**	-
Bund Lining materials	N.a	**Primary Vessel 110% Largest Vessel**	-
Bund Retention Volume (local/ Remote)	20 m^3 (Local)	**Primary Vessel 25% Total Volume**	-
Practical to Conduct Hydrostatic Test	Yes	**Date of Visual Inspection**	20-07-2015

Visual Description:

Visual inspection was carried out on the walls where possible – the sump is located below the filter press so there is limited visual inspection that could be carried out. The sump passed through to the hydrostatic test. Water was filled to a height of 1570 mm from the floor of the sump.

Date Bunds Filled	17-07-2015	**Date of Hydrostatic Test**	20 - 21-07-15
Start Time	10:00	**End Time**	11:10
Start Level of Water	1570 mm	**End of Test Level of Water**	1569 mm

Status & Recommendations:

- Sump Passes Hydrostatic Test to the level of water filled.
- Hydrostatic retest required in 2018 unless bund is damaged or repaired in the meantime.

Notes:

Low Risk - WGK 0 or 1
High Risk – WGK 2 or 3 R45, R46, R50, R51, R52, R53, R54, R55, R56, R58, R61, R63

Signed:	**Date: 12-08-2015**	**Title: Project Manager**
Signed: *Noel Harrington*	**Date: 12-08-2015**	**Title: Chartered Engineer**

Bund Number 4 – Filter Press

Company	ENVA Ireland	**Waste Reference No**	W0184-01
Site	Clonminam Industrial Estate Portlaoise	**Waste Category**	Hazardous Waste Facility
Bund Reference No	Bund 4 – Bund Surrounding Filter Press	**Bund Type: Local/ Remote / Combined**	Local
Bund Location	Filter Press	**Bund Risk Classification: 0, 1, 2, 3**	2
Bund Dimensions	18180 x 8540 x 250mm	**Primary Vessel Material**	Filter Press
Bund Materials of Construction	Reinforced Concrete	**Primary Vessel Storage Volume**	-
Bund Lining materials	N.a	**Primary Vessel 110% Largest Vessel**	-
Bund Retention Volume (local/ Remote)	38.8 m^3 (Local)	**Primary Vessel 25% Total Volume**	-
Practical to Conduct Hydrostatic Test	No	**Date of Visual Inspection**	20-07-2015

Visual Description:

Visual inspection was carried out on the walls and floor both internally and externally. The maximum retention height with this section would be 250mm. Above this level liquid would overflow the bund lip. The bund was so large (c. 155m^2) that is was not deemed practical to conduct a hydrostatic test due to the volumes of water required, the limited means of emptying and disposal of this liquid afterwards and the size of floor space that would need to be covered and put out of commission while the test was underway.

A visual inspection was completed on of the bund floor, joints and walls. There were no significant cracks, fissures or weak spots identified. There was a hole in one wall which was plugged and deemed watertight.

Date Bunds Filled	-	**Date of Hydrostatic Test**	-
Start Time	-	**End Time**	-
Start Level of Water	-	**End of Test Level of Water**	-

Status & Recommendations:

- Bund passed the visual inspection.
- This should be inspected every three years or in the event of damage caused as per the licence requirement.

Notes:

Low Risk - WGK 0 or 1
High Risk – WGK 2 or 3 R45, R46, R50, R51, R52, R53, R54, R55, R56, R58, R61, R63

Signed:	**Date: 12-08-2015**	**Title: Project Manager**
Signed: *Noel Harrington*	**Date: 12-08-2015**	**Title: Chartered Engineer**

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Unit 5 Caherdavin Business Centre,
Ennis Road,
Limerick.

Enva (Ireland) Limited

Clonminam Industrial Estate, Portlaoise, County Laois, Laois.

Bund Integrity Report 2015

Waste Licence Number: W0184-01

Report Reference Number:	**3520-15-03**
Version:	**1**
Date of Issue:	**02-10-2015**
Report Compiled by:	**Mark McGarry**

1.0 Introduction

Enva (Ireland) Limited, Clonminam Industrial Estate, Portlaoise, Co. Laois are required as part of Waste Licence number W0184-01, Condition 3.13.5 and Schedule E to have their bunds tested for the protection of ground and surface water.

The bunds were tested in accordance with BS 8007: Design of Concrete Structures for Retaining Aqueous Liquids and documented guidance from the EPA entitled Storage and Transfer of Materials for Scheduled Activities.

The test was carried out in two stages, firstly to inspect the bund visually for cracks, weak spots or if the bund required any remedial work. The integrity of the bund was then tested for water tightness over a 24 hour period. The reduced timeframe from the BS 8007 standard for testing was applied as the bunds were in use and were required for the operation of the site.

Bunds which could not be tested hydrostatically were visually inspected.

2.0 Licence Conditions

The following conditions have been taken from the current licence applicable to this site:

3.12.5 The drainage system, bunds, silt traps and oil separators shall be inspected weekly, desludged as necessary and properly maintained at all times. All sludge and drainage from these operations shall be collected for safe disposal. A written record shall be kept of the inspections, desludging, cleaning, disposal of associated waste products, maintenance and performance of the interceptors, bunds and drains.

3.13.2 All tank and drum storage areas shall, as a minimum, be bunded, either locally or remotely, to a volume not less than the greater of the following:

a) 110% of the capacity of the largest tank or drum within the bunded area; or
b) 25% of the total volume of substance which could be stored within the bunded area

3.13.5 The integrity and water tightness of all the bunds and their resistance to penetration by water or other materials stored therein shall be confirmed by the licensee and shall be reported to the Agency within 12 months of the date of grant of this licence. This confirmation shall be repeated at least once every three years thereafter and reported to the Agency on each occasion

3.0 Summary of Methodology

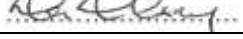
A visual inspection was carried out on the bund to determine if there were any cracks, fissures or unacceptable surface continuity between the bund walls.

Where applicable the hydrostatic test was completed by filling the bund to a fill level using clean water, in line with the procedure outlined in BS8007:1987. Liquid levels were allowed to stabilise for 24 hours. After stabilisation a depth reading was recorded and marked at a preset suitable location. The water level was re-recorded after remaining in the bund for 24 hours.

A water level meter was placed in situ to determine the impact of rainfall and evaporation in the bund. When this statistic was accounted for the bund was verified as passed or failed in line with the criteria set out in the standard.

4.0 Summary of Results

Bund Identity	Pass / Fail	Comments
Stores Area Section 2 (Bund No 5)	Pass	This bund passed the visual inspection. This bund also passed the Hydrostatic Integrity test and had sufficient storage volume to meet the licence requirements
Export Section 2 (Bund No 1)	Pass	This bund passed the visual inspection. It was not deemed practical to complete a hydrostatic test in this bund due to the size of floor area that needed to be covered and large volumes of water required.
Export Section 3 (Bund No 1)	Pass	This bund passed the visual inspection. It was not deemed practical to complete a hydrostatic test in this bund due to the size of floor area that needed to be covered and large volumes of water required.
Main Tank Farm (Bund No 3)	Pass	This bund passed the visual inspection. It was not deemed practical to complete a hydrostatic test in this bund due to the size of floor area that needed to be covered and large volumes of water required.

Project Manager		Date of Report	02-10-2015
Client	Enva Ireland Limited	Contact	Kevin Coll

Stores Area Section 2 – Bund No. 5

Company	ENVA Ireland	**Waste Reference No**	W0184-01
Site	Clonminam Industrial Estate Portlaoise	**Waste Category**	Hazardous Waste Facility
Bund Reference No	Bund No 5	**Bund Type: Local/ Remote / Combined**	Local
Bund Location	Stores Area	**Bund Risk Classification: 0, 1, 2, 3**	2
Bund Dimensions	1600 x 700 x 170mm	**Primary Vessel Material**	IBC / 200 L steel barrels
Bund Materials of Construction	Reinforced Concrete walls, concrete floor	**Primary Vessel Storage Volume**	Total storage c. 64m^3
Bund Lining materials	N.a	**Primary Vessel 110% Largest Vessel**	1.1 m^3 IBC's
Bund Retention Volume (local/ Remote)	19 m^3 (Local)	**25% Total Volume**	c. 12 m^3
Practical to Conduct Hydrostatic Test	Yes	**Date of Visual Inspection**	20-09-2015

Visual Description:

Visual inspection was carried out on the walls, joints and floor both internally and externally. The walls and floors were deemed acceptable and therefore the bund passed through to the hydrostatic test. Water was filled to a height of 35 and 47mm from the floor of the bund at 2 separate locations – this bund could not be filled much higher due to the room being used by employees for access to the stores. A visual inspection was completed on the remainder of the bund floor and walls which had not been submerged for the test. There were no cracks, fissures or weak spots identified above the water line. The bund floor is sloped and raised in the middle – numerous measurements were made across the bund to get an overview of the entire structure.

Date Bunds Filled	20-09-2015	**Date of Hydrostatic Test**	21/22-09-2015
Start Time	14:20	**End Time**	15:00
Start Level of Water	Side 1 35 mm Side 2 47 mm	**End of Test Level of Water**	Side 1 35 mm Side 2 47 mm

Status & Recommendations:

- Bund Passes Hydrostatic Test to the level of water filled.
- Hydrostatic retest required in 2018 unless bund is damaged or repaired in the meantime.

Notes:

Low Risk - WGK 0 or 1
High Risk – WGK 2 or 3 R45, R46, R50, R51, R52, R53, R54, R55, R56, R58, R61, R63

Signed:	**Date: 02-10-2015**	**Title: Project Manager**
Signed: *Noel Harrington*	**Date: 02-10-2015**	**Title: Chartered Engineer**

Export Storage – Bund No. 1 Section 2

Note: This store was sectioned into 3 parts for this visual inspection. The reason for only completing 1/3rd of the building was to allow for stored materials to be moved into the other sections leaving one completely free for visual observation. There were no materials in this section for the visual observation therefore allowing a complete and comprehensive assessment of the section. This store is far too large of floor area to be deemed suitable for a hydrostatic test.

Company	ENVA Ireland	**Waste Reference No**	W0184-01
Site	Clonminam Industrial Estate Portlaoise	**Waste Category**	Hazardous Waste Facility
Bund Reference No	Bund 1 Section 2	**Bund Type: Local/ Remote / Combined**	Local
Bund Location	Export Storage	**Bund Risk Classification: 0, 1, 2, 3**	2
Bund Dimensions	c. 320 m^2 for Section 2	**Primary Vessel Material**	IBC's, Plastic and Metal Barrels
Bund Materials of Construction	Reinforced Concrete walls and concrete floors	**Primary Vessel Storage Volume**	1.0 m^3 IBC
Bund Lining materials	N.a	**Primary Vessel 110% Largest Vessel**	1.1 m^3
Bund Retention Volume (local/ Remote)	Total c. 57 m^3 (Local)	**25% Total Volume**	25 m^3
Practical to Conduct Hydrostatic Test	No	**Date of Visual Inspection**	21-09-2015

Visual Description:

Visual inspection was carried out on the walls and floor both internally and externally. The maximum retention height with this section would be 22mm. Above this level liquid would overflow the bund lip. Therefore the total retention volume of this export store was calculated at c. 57 m^3.

A visual inspection was completed on section 2 of the store floor, joints and walls. There were no significant cracks, fissures or weak spots identified. There was evidence of weak surface concrete in places however this did not constitute a failure of visual inspection as they were very minor. There were 2 sumps in this bay which have been previously tested and passed hydrostatically by Kavanagh Ryan & Associates.

Date Bunds Filled	N/a	**Date of Hydrostatic Test**	N/a
Start Time	N/a	**End Time**	N/a
Start Level of Water	N/a	**End of Test Level of Water**	N/a

Status & Recommendations:

- Bund Section 2 passed the visual inspection.
- This should be inspected every three years or in the event of damage caused as per the licence requirement.

Notes:

Low Risk - WGK 0 or 1
High Risk – WGK 2 or 3 R45, R46, R50, R51, R52, R53, R54, R55, R56, R58, R61, R63

Signed:	**Date: 02-10-2015**	**Title: Project Manager**
Signed: Noel Harrington	**Date: 02-10-2015**	**Title: Chartered Engineer**

Export Storage – Bund No. 1 Section 3

Note: This store was sectioned into 3 parts for this visual inspection. The reason for only completing 1/3rd of the building was to allow for stored materials to be moved into the other sections leaving one completely free for visual observation. There were no materials in this section for the visual observation therefore allowing a complete and comprehensive assessment of the section. This store is far too large of floor area to be deemed suitable for a hydrostatic test.

Company	ENVA Ireland	**Waste Reference No**	W0184-01
Site	Clonminam Industrial Estate Portlaoise	**Waste Category**	Hazardous Waste Facility
Bund Reference No	Bund 1 Section 3	**Bund Type: Local/ Remote / Combined**	Local
Bund Location	Export Storage	**Bund Risk Classification: 0, 1, 2, 3**	2
Bund Dimensions	c. 280 m^2 for Section 3	**Primary Vessel Material**	IBC's, Plastic and Metal Barrels
Bund Materials of Construction	Reinforced Concrete walls and concrete floors	**Primary Vessel Storage Volume**	1.0 m^3
Bund Lining materials	N.a	**Primary Vessel 110% Largest Vessel**	1.1 m^3
Bund Retention Volume (local/ Remote)	Total c. 57 m^3 (Local)	**25% Total Volume**	25 m^3
Practical to Conduct Hydrostatic Test	No	**Date of Visual Inspection**	02-10-2015

Visual Description:

Visual inspection was carried out on the walls and floor both internally and externally. The maximum retention height with this section would be 22mm. Above this level liquid would overflow the bund lip. Therefore the total retention volume of this export store was calculated at c. 57 m^3.

A visual inspection was completed on section 3 of the store floor, joints and walls. There were no significant cracks, fissures or weak spots identified. There was evidence of weak surface concrete in places however this did not constitute a failure of visual inspection as they were very minor. There was 1 sump in this bay which have been previously tested and passed hydrostatically by Kavanagh Ryan & Associates.

Date Bunds Filled	N/a	**Date of Hydrostatic Test**	N/a
Start Time	N/a	**End Time**	N/a
Start Level of Water	N/a	**End of Test Level of Water**	N/a

Status & Recommendations:

- Bund Section 3 passed the visual inspection.
- This should be inspected every three years or in the event of damage caused as per the licence requirement.

Notes:

Low Risk - WGK 0 or 1
High Risk – WGK 2 or 3 R45, R46, R50, R51, R52, R53, R54, R55, R56, R58, R61, R63

Signed:	**Date: 02-10-2015**	**Title: Project Manager**
Signed: *Noel Harrington*	**Date: 02-10-2015**	**Title: Chartered Engineer**

Tank Farm – Bund No. 3

Company	ENVA Ireland	**Waste Reference No**	W0184-01
Site	Clonminam Industrial Estate Portlaoise	**Waste Category**	Hazardous Waste Facility
Bund Reference No	Bund 3	**Bund Type: Local/ Remote / Combined**	Local
Bund Location	Tank Farm	**Bund Risk Classification: 0, 1, 2, 3**	2
Bund Dimensions	c. 1880 m^2 x 2 m high	**Primary Vessel Material**	Large Steel Tanks
Bund Materials of Construction	Reinforced Concrete walls and concrete floors	**Primary Vessel Storage Volume**	180 m^3
Bund Lining materials	N.a	**Primary Vessel 110% Largest Vessel**	200 m^3
Bund Retention Volume (local/ Remote)	Total c. 4066 m^3 (Local)	**25% Total Volume**	1,850 m^3
Practical to Conduct Hydrostatic Test	No	**Date of Visual Inspection**	21-09-2015

Visual Description:

Visual inspection was carried out on the walls and floor both internally and externally. The maximum retention height with this section would be 2000mm. Above this level liquid would overflow the bund at its lowest point. A visual inspection was completed on floor, joints and walls. There were no significant cracks, fissures or weak spots identified. There was evidence of weak surface concrete in places however this did not constitute a failure of visual inspection as they were very minor. The bund consists of 45 tanks totalling 7,400 m^3. Boiler condensate is discharged into the bund through permanent pipes which could not be ceased without shutting down production. This fact rendered a hydrostatic test impractical to complete on top of the excessive volumes of water that would be required to cover the base of the bund.

Date Bunds Filled	N/a	**Date of Hydrostatic Test**	N/a
Start Time	N/a	**End Time**	N/a
Start Level of Water	N/a	**End of Test Level of Water**	N/a

Status & Recommendations:

- Bund 3 passed the visual inspection.
- This should be inspected every three years or in the event of damage caused as per the licence requirement.

Notes:

Low Risk - WGK 0 or 1
High Risk – WGK 2 or 3 R45, R46, R50, R51, R52, R53, R54, R55, R56, R58, R61, R63

Signed:	**Date: 02-10-2015**	**Title: Project Manager**
Signed: *Noel Harrington*	**Date: 02-10-2015**	**Title: Chartered Engineer**

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Sump Exfiltration Test.

Job No.:	**C14022**		
By:	**K. Ryan**		
Date of Test:	**10.03.14**		
Company:	**Enva Ireland limited.**	*Category:*	**Waste**
Site:	**Clonminham Industrial Estate, Portlaoise, Co. Laois.**	*Ref Number:*	**W0184-1**

Sump Ref.	Sump Dimensions (mm)	Initial Dip		Second Dip		Difference		Comments/Recommendations
		Height (mm)	Time	Height (mm)	Time	Height (mm)	Time (mins)	
8	650 x 1470 x 875(Dp)	875	10.04	875	10.42	0	38	Passed
9	640 x 1500 x 735(Dp)	735	10.06	735	10.43	0	37	Passed
10	900 x 2700 x 1040(Dp)	1040	10.15	1040	10.46	0	31	Passed
7	670 x 1430 x 555(Dp)	555	10.18	555	10.50	0	32	Passed
6	760 x 1880 x 680(Dp)	680	10.20	680	10.52	0	32	Passed

Signed:----------
Kevin Ryan BEng MIEI APEA

Note: Exfiltration Test based on recommended methodology given in EPA Guidance Note on storage and transfer of materials for scheduled activities section 2.3.5.2. This test involves filling the chamber with clean water to the required test level. The test level for shallow (less than 1.5m depth) manholes and inspection chambers shall be underside of cover level.
The chamber shall be filled with clean water and allowed to stand for an absorption period, topping up as necessary. The absorption period shall be determined by the supervising engineer and will depend on the condition of the manhole. After the absorption period, the drop in water level shall be measured over a 30 minute period and if the drop is less than 5mm, the chamber shall be deemed to have passed the leak tightness test.

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Sump Exfiltration Test.

Job No.:	**C14013**		
By:	**K. Ryan**		
Date of Test:	**10.02.14**		
Company:	**Enva Ireland limited.**	*Category:*	**Waste**
Site:	**Clonminham Industrial Estate, Portlaoise, Co. Laois.**	*Ref Number:*	**W0184-1**

Sump Ref.	Sump Dimensions (mm)	Initial Dip		Second Dip		Difference		Comments/Recommendations
		Height (mm)	Time	Height (mm)	Time	Height (mm)	Time (mins)	
1	1060 x 1400 x 1440(Dp)	1140	10.27	1135	11.25	-5	58	Passed
2	1050 x 1400 x 1410(Dp)	1170	10.27	1165	11.25	-5	58	Passed
3	1290 x 1270 x 1710(Dp)	1710	10.43	1710	11.15	0	32	Passed
4	1300 x 1270 x 1820(Dp)	1820	10.43	1820	11.15	0	32	Passed
5	4900 x 1200 x 830(Dp)	725	10.31	725	11.18	0	47	Passed
11	660 x 660 x 460(Dp)	440	10.35	440	11.20	0	45	Passed
12	560 x 570 x 440(Dp)	360	10.35	360	11.20	0	45	Passed

Signed:----------
Kevin Ryan BEng MIEI APEA

Note: Exfiltration Test based on recommended methodology given in EPA Guidance Note on storage and transfer of materials for scheduled activities section 2.3.5.2. This test involves filling the chamber with clean water to the required test level. The test level for shallow (less than 1.5m depth) manholes and inspection chambers shall be underside of cover level.
The chamber shall be filled with clean water and allowed to stand for an absorption period, topping up as necessary. The absorption period shall be determined by the supervising engineer and will depend on the condition of the manhole. After the absorption period, the drop in water level shall be measured over a 30 minute period and if the drop is less than 5mm, the chamber shall be deemed to have passed the leak tightness test.

Appendix 4

Enva Portlaoise

2016 Groundwater Compliance Monitoring Quarter 1 (Jan – Mar 2016)

Document Control Sheet

Client:	Enva Ireland Ltd.
Project Title:	Enva Portlaoise 2016 Groundwater Compliance Monitoring
Document Title:	Quarter 1 (Jan – Mar 2016)
Document No:	MDE0973Rp0027

Text Pages:	35	Appendices:	-

Rev.	Status	Date	Author(s)		Reviewed By		Approved By	
A01	Client Approval	27th June 2016	DC		CR		CR	
F01	Final	27th June 2016	DC		CR		CR	

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1 INTRODUCTION

1.1 BACKGROUND

RPS has been commissioned by Enva Ireland Ltd (Enva) to carry out groundwater quality monitoring for environmental compliance, at their facility in the Clonminam Industrial Estate, Portlaoise, Co Laois. Groundwater monitoring has being carried out in strict accordance with criteria set out in Schedule 4(ii) of the site's Industrial Emissions Licence, Register No. W0184-01.

Enva Ireland has been operating under Waste Licence Register No. W0184-01 since January 2004. The licence was amended by the Environmental Protection Agency in December 2013 to conform to the provisions and requirements of the Council Directive 2010/75/EU (Industrial Emissions Directive) and as such is deemed an Industrial Emissions Licence. Enva is required to submit a report to the EPA on a quarterly basis, outlining the existing groundwater quality underlying the site.

A suitably qualified environmental consultant from RPS, collected groundwater samples from a series of 8 monitoring wells (BH101, BH102, BH103, BH104B, MW01, MW02, MW03, MW04) within the site boundary on the 24th of February 2016. The samples underwent laboratory analysis for the suite of parameters specified in Schedule 4(ii) of Industrial Emissions Licence W0184-01. This report outlines the results of the Quarter 1 monitoring for 2016 and reviews historical data recorded at the site.

1.2 OBJECTIVES & SCOPE OF WORK

The specific objectives and scope of work are as follows:

- Review of previous data as provided by Enva Portlaoise;
- Graphical presentation of key compounds and trends; and
- Discussion of results for Quarter 1 2016 within the context of previous results and available guideline concentrations.

2 REVIEW OF PREVIOUS DATA

2.1 INFORMATION SOURCES

The following documents were reviewed as part of this project:

- Industrial Emissions Licence W0184-01 and any available EPA documents from the EPA website;
- Quarterly Groundwater Monitoring Reports (Quarter 1 2004 to Quarter 4 2005), URS;
- Quarterly Groundwater Monitoring Reports (Quarter 1 2006 to Quarter 4 2015), RPS;
- Summary Report on Trend of Contaminant Levels at Enva Ireland Ltd since 2005, Ref: MDE0647RP0001, RPS (2007);
- Groundwater Risk Assessment, Ref: MDE0788Rp0001, RPS (2008);
- Hydrogeological Review and Assessment Report, Ref MDE0973Rp0017F01, RPS (2014); and
- Baseline Environment Report, Ref: MDE0973Rp0104.

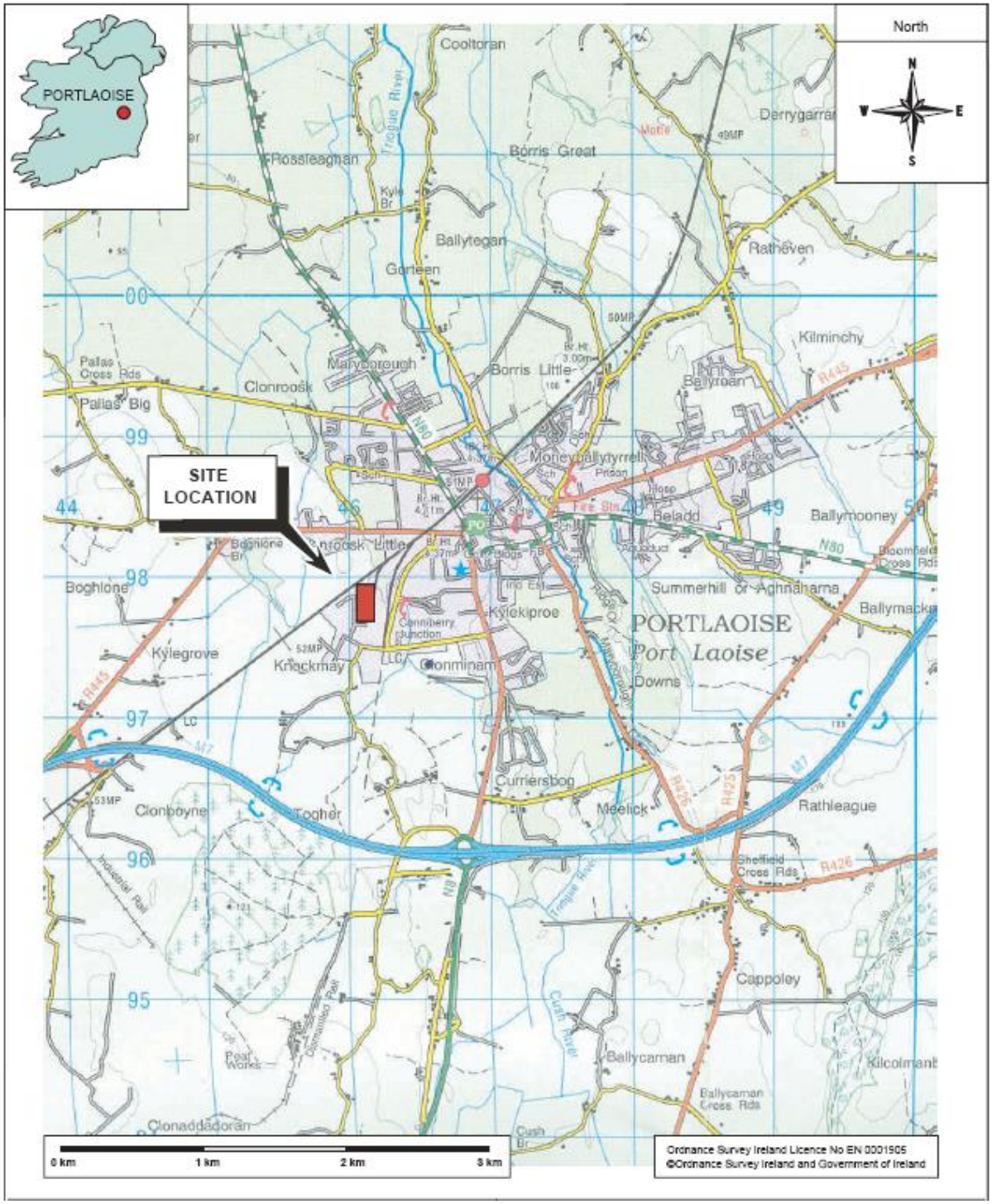
2.2 SITE SETTING

The site is located to the southwest of the town of Portlaoise immediately to the south of the Dublin to Cork railway line. The general area is gently undulating. The site slopes gently to the southwest but to the east of the site the ground slopes gently towards the River Triogue, which is located approximately 1.5 km to the east. The site occupies an area of approximately 1.5 hectares and comprises of an operational waste oil and contaminated soil treatment plant.

The site is located on the outskirts of Portlaoise in an area of agricultural and light industrial development. The site is bounded to the north and east by land belonging to Irish rail, comprising sidings and general storage areas. To the south is a vehicle repair garage, which is elevated above the level of the site by approximately 1.5 m. To the west the site is adjoined by further industrial land, as well as residential land. The site location is presented on **Figure 2.1**.

The site has been in operation since 1978, and the layout has remained relatively consistent. The site layout is presented on **Figure 3.1**. The site is largely covered in hardstanding with some open areas in the far north and northeast of the site. All oil and soil storage areas are suitably bunded and the general standard of housekeeping is good.

Figure 2.1 – Site Location



2.3 REGIONAL SETTING

2.3.1 Geology

The Geological Survey of Ireland indicates that the regional geology of Portlaoise is typified by Carboniferous Limestone. In the vicinity of the site itself the solid geology comprises the Ballysteen Formation, a micaceous-bioclastic limestone. This well-bedded limestone, with interbeds of shale, is extensively folded, with axes trending north-east to south-west, and becomes increasingly muddy towards the top of the formation. North-east to south-west trending faults are found in the region, with one located approximately 500m to the east of the site. The subsoils in the region comprise mainly Made Ground, around the industrial area, and Limestone Till in the surrounding regions.

2.3.2 Hydrogeology

The limestone is classified by the Geological Survey of Ireland (GSI) as a Locally Important Karstified Aquifer (Ll). Porosity is predominantly in the form of fractures, in this aquifer, however the muddy nature of this formation greatly reduces permeability. Vulnerability of this aquifer beneath the site is classified as high, with moderate vulnerability to the east of the site.

The public water supply for Portlaoise is derived from groundwater, utilising three groundwater abstraction well fields comprising of two abstraction wells in each well field. This supply currently comes from the Straboe area, approximately 5.5 km to the north-east of the site. The source protection zone for this water supply extends to within 3.2 km of the Enva site but does not encompass the Enva site.

The GSI record a number of other dug wells and boreholes within the Portlaoise area, including the boreholes installed on the site. The accuracy of the locations of these wells varies. One well, which was drilled in 1899 is recorded as being located immediately to the south of the Enva site. The use of this well is not known and its location is only accurate to 1 km. A second borehole, drilled in 1973 is recorded 1.5 km to the north of the site at Clonroosk; the accuracy of this location is also 1 km so it could be closer or further from the site. The use of this well is not known but its yield is recorded as being poor. There are no other wells recorded within 1 km of the site.

Enva is not aware of any abstraction boreholes within the immediate vicinity of their site.

2.4 SITE GROUND CONDITIONS

A total of eight boreholes have been drilled at the site and the general sequence of ground conditions is presented in **Table 2.1**.

Table 2.1 – Ground Conditions

Strata	Extent	Thickness	Description
Made Ground	BH104	0-3.5 m	Predominantly concrete, with hardcore fill, and clay.
Boulder Clay	All boreholes	<8.5 m	Includes fine to medium, well rounded gravels.
Sand and Gravel	Confined to south east corner of site (BH101, BH104 and MW03)	0-2 m	In general the transition from boulder clay to sand is gradual with changes from gravel, to sandy gravel, to sand.
Limestone Bedrock	Encountered in MW01, MW02 and MW03	Top of limestone ranges from 7.7m to 9m below ground level.	Pale grey, fine-grained bedrock, differentiated from boulders by its un-weathered nature.

The logs for each of the boreholes were previously presented as Appendix B in the RPS Groundwater Risk Assessment Report (Ref: MDE0788Rp0001).

2.4.1 Licence Conditions

The Industrial Emissions Licence requires the regular monitoring and sampling of boreholes BH101, BH102, BH103, BH104B, MW01, MW02, MW03 and MW04. The parameters requiring measurement or analysis are presented in **Table 2.2**.

Table 2.2 – Licence Parameters

Group	Parameters requiring Quarterly Measurement	Parameters requiring Annual Measurement
Field Parameters	Groundwater Level pH Temperature Dissolved Oxygen Electrical Conductivity Visual Inspection	Groundwater Level pH Temperature Dissolved Oxygen Electrical Conductivity Visual Inspection
Organics	Mineral Oil BTEX & MTBE PAHs Phenols VOCs SVOCs	Mineral Oil BTEX & MTBE PAHs Phenols VOCs SVOCs
Inorganics	-	Total Alkalinity, Calcium, Manganese, Sulphate, Cyanide (Total), Chloride, Sodium,

3 METHODOLOGY

Groundwater samples were collected from 8 no. on-site groundwater monitoring wells (BH101, BH102, BH103, BH104B, MW01, MW02, MW03, MW04), (**Figure 3.1**) using dedicated Waterra tubing, in accordance with RPS's standard sampling protocol. A non-return foot valve was fixed to the bottom of the tubing and inserted into the well, close to the base of the borehole. Separate tubing and foot valves were used at each monitoring well to eliminate the possibility of cross contamination.

Groundwater in the well casing is not considered representative of the groundwater quality at a given location. For this reason, three well volumes were purged from each well prior to collection of the groundwater sample. By the time purging was complete all field test water parameters (namely pH, Temperature, Electrical Conductivity and Dissolved Oxygen) were within 10% variance in three consecutive measurements. This ensured that the groundwater sample extracted from the monitoring borehole was representative of the water held in the subsurface strata and not water held stagnant in the borehole casing. The purged volumes were calculated on-site from the measured static water levels and total well depths using an electronic dip meter.

Groundwater samples were collected in laboratory supplied containers and stored in chilled cool boxes following sampling and during transit to the laboratory. A rigorous chain of custody procedure was used during the sample round.

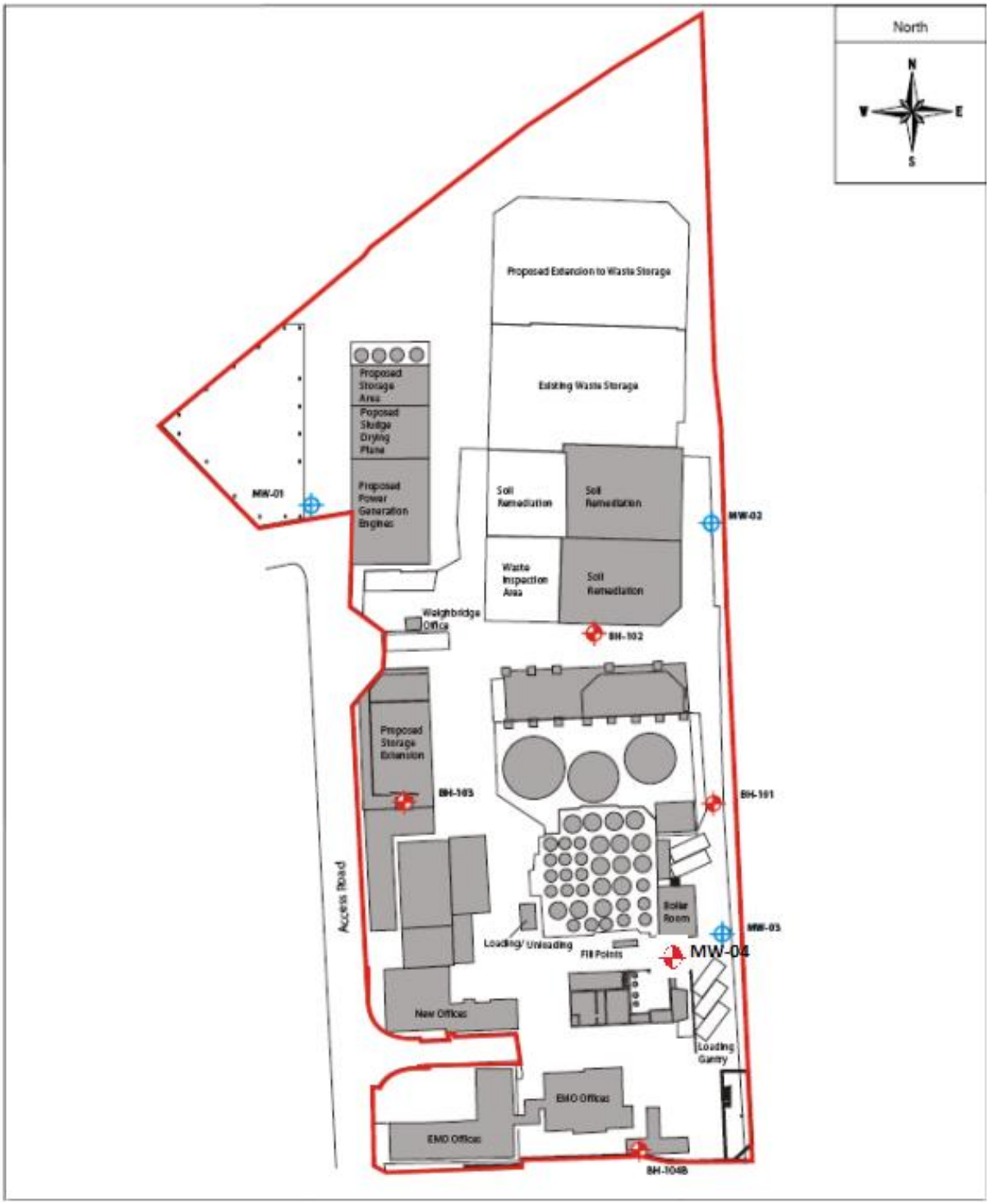
3.1 LABORATORY ANALYSIS

All groundwater samples were analysed at a UKAS accredited laboratory, ALS Environmental for the suite of analyses listed in **Table 3.1**. **Table 3.1** also indicates the analytical techniques used by the laboratory.

Table 3.1 – Analytical Methodologies – ALS Environmental

Parameter	Analytical Methodology
Phenols	GC-MS
Speciated PAHs	GC-MS
BTEX & MTBE	Headspace GC-MS
Petroleum Hydrocarbons	Headspace GC-MS
Volatile Organic compounds & Tentatively Identified Organic Compounds (VOCs & TICs)	Headspace GC-MS
Semi-Volatile Organic compounds & Tentatively Identified Organic Compounds (SVOCs & TICs)	GC-MS

Figure 3.1 – Site Layout Plan with Groundwater Monitoring Locations



Shallow Monitoring Well locations

Deep Monitoring Well locations

Source: *URS Environmental Consultants (Ref: 45078497 Issue No. 1)*

3.2 PRESENTATION & INTERPRETATION OF RESULTS

The Quarter 1 2016 results are tabulated in **Section 4** and discussed with respect to previous results in **Section 5**. Results are compared against Groundwater Threshold Values (GTVs) outlined in the European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No 9 of 2010), where available. Where GTVs are not available for parameters, results are compared against the Interim Guideline Values (IGVs) set out in the Environmental Protection Agency interim report, 'Towards Setting Guideline Values for the Protection of Groundwater in Ireland'.

Previous monitoring reports (as listed in **Section 2.1**) provide details of contaminant concentrations since 2004. The data available within these reports has been reviewed and time series plots of key parameters have been compiled. Trends for chlorinated solvents, petroleum hydrocarbons and phenol parameters have been plotted.

Time series plots are presented in **Section 6** and include the results of this Quarter 1 2016 monitoring round. As the monitoring continues in accordance with the Industrial Emissions licence requirements, the plots will be updated with the results of subsequent rounds used to illustrate the results.

Time series plots are also provided for manual water levels where available from previous reports.

4 QUARTER 1 RESULTS FEBRUARY 2016

The results of all field measurements and laboratory analysis are presented in this section. This resulted in a lack of field measurements. Results are primarily compared against Groundwater Threshold Values (GTVs) outlined in the European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No 9 of 2010), where available. Where GTVs are not available for parameters, results are compared against the Interim Guideline Values (IGVs) set out in the Environmental Protection Agency interim report, 'Towards Setting Guideline Values for the Protection of Groundwater in Ireland'.

The results are discussed in relation to appropriate guideline values in **Section 5**. Results that are shown to be above the relevant threshold or guideline values are highlighted in bold and shaded. Results that are shown to be above the relevant laboratory detection limits are highlighted in italics.

Site-specific field parameter measurements were collected during the site visit as per RPS Water sampling protocol.

Table 4.1 – Groundwater Levels (Quarter 1, 2016)

Monitoring Well	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04
Depth (mbgl)	6.64	6.41	4.45	4.72	22.12	30.88	14.64	6.46
Static Water Level (mbgl)	3.98	2.50	1.62	0.41	2.21	3.48	3.89	3.69
Ground Level (mAOD)	103.06	102.55	101.16	101.52	102.10	103.12	102.77	-
Water Level (mAOD)	99.08	100.05	99.54	101.11	99.89	99.64	98.88	-
Free Phase Oil (mm)	No detection	No detection	No detection	No detection	No detection	No detection	No detection	No detection

mbgl = metres below ground level

Table 4.2 – Results of Field Parameters Measured at each Groundwater Monitoring Well (Quarter 1, 2016)

Monitoring Well	pH (pH Units)	Temperature (°C)	Conductivity (µS/cm)	Dissolved O_2 (ppm)	Observations
BH101	7.71	11.3	**1137**	2.44	Light cloudy colour, some suspended solids, little sediment
BH102	8.56	10.4	731	3.12	Clear/yellow colour on purging, very little suspended solids, slight H_2S odour
BH103	8.44	9.9	863	2.89	Slightly cloudy on purging with a very minor H_2S odour, little sediment
BH104B	7.30	7.6	595	1.76	Slightly brown colour, clearer after 10L, slight H_2S odour, very little suspended solids or sediment
MW01	7.73	9.7	638	3.37	Cloudy grey on purging, no odour, some sediment and very little suspended solids
MW02	8.21	11.9	746	2.22	Grey on purging, clear after 10L, very slight H_2S odour, very little sediment or suspended solids
MW03	7.41	12.5	**1568**	3.78	Dark grey colour on purging, H_2S odour, some suspended solids, slight oil sheen
MW04	7.59	11.0	**1571**	1.59	Light cloudy brown in colour, high amount of suspended solids
Groundwater Threshold Value	-	-	1875	-	-
Interim EPA Guideline Values (Units as indicated)	>6.5 & <9.5	25°C	1000	No abnormal change	-

Note: Results above the relevant IGV are highlighted in bold.
Note: Results above the GTV are highlighted in bold and shaded.

Table 4.3 – Results of BTEX and MTBE

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Benzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.75	1.0
Toluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
Ethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
p & m-xylene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	***1.1***	<1.0	-	10 Note 1
o-xylene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10 Note 1
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1.0	<1.0	<1.0	***1.4***	<1.0	<1.0	<1.0	***2.2***	***2.1***	-	30

Note: No specific IGV for parameter. IGV for Total Xylenes is used as guideline.
Note: Results above the relevant laboratory limit of detection are highlighted in bold italics.

Table 4.4 – Results of Speciated PAHs

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Naphthalene	µg/l	0.01	<0.10	<0.01	<0.12	***0.034***	<0.01	<0.01	<0.01	***0.153***	-	1.0
Acenaphthylene	µg/l	0.01	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	-	-
Acenaphthene	µg/l	0.01	<0.10	<0.01	***0.087***	***0.034***	<0.01	<0.01	<0.01	<0.10	-	-
Fluorene	µg/l	0.01	<0.10	<0.01	***0.025***	***0.051***	<0.01	<0.01	<0.01	<0.10	-	-
Phenanthrene	µg/l	0.01	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	-	-
Anthracene	µg/l	0.01	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	-	10,000
Fluoranthene	µg/l	0.01	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	-	1.0
Pyrene	µg/l	0.01	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	-	-
Benzo(a)anthracene	µg/l	0.01	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	-	-
Chrysene	µg/l	0.01	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	-	-
Benzo(b)fluoranthene	µg/l	0.01	<0.10	<0.01	***0.011***	<0.01	<0.01	<0.01	<0.01	<0.10	-	0.5

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Benzo(k)fluoranthene	µg/l	0.01	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	-	0.05
Benzo(a)pyrene	µg/l	0.01	<0.10	<0.01	<0.04	<0.01	<0.01	<0.01	<0.01	<0.10	-	0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	-	0.05
Dibenz(a,h)anthracene	µg/l	0.01	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	-	-
Benzo(g,h,i)perylene	µg/l	0.01	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	-	0.05
Total EPA-16 PAHs	µg/l	0.1	<0.10	<0.01	**0.123**	**0.159**	<0.01	<0.01	<0.01	**0.153**	0.075	0.1

Note: Results above the relevant IGV are highlighted in bold.
Note: Results above the GTV are highlighted in bold and shaded.
Note: Results above the relevant laboratory limit of detection are highlighted in bold italics.

Table 4.5 – Results of Speciated Phenols

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Phenol	µg/l	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	-	0.5
2,4,6-Trichlorophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	200
2,4-Dichlorophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2,4-Dimethylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Chlorophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	200
2-Methylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Nitrophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
4-Chloro-3-methylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
4-Methylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-

Note: Results above the relevant laboratory limit of detection are highlighted in bold italics.

Table 4.6 – Results of Semi-Volatile Organic Compounds (SVOCs)

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Phenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.5
2-Chlorophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	200
Bis(2-chloroethyl)ether	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,3-Dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,2-Dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
1,4-Dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Bis(2-chloroisopropyl)ether	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Methylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Hexachloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Nitrobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
4-Methylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Isophorone	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Nitrophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2,4-Dimethylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Bis(2-chloroethoxy)methane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,2,4-trichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.40
Naphthalene	µg/l	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	1.0
2,4-Dichlorophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Hexachlorobutadiene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.10
4-Chloro-3-methylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2,4,6-Trichlorophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	200
2,4,5-Trichlorophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Methylnaphthalene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Chloronaphthalene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Dimethylphthalate	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
2,6-Dinitrotoluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Acenaphthylene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Acenaphthene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2,4-Dinitrotoluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Dibenzofuran	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
4-Chlorophenyl phenyl ether	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Diethyl phthalate	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Fluorene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Bromophenyl phenyl ether	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Hexachlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.03
Phenanthrene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Anthracene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10,000
Pyrene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Butyl benzyl phthalate	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Benzo(a)anthracene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Chrysene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Benzo(b)fluoranthene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.5
Benzo(k)fluoranthene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.05
Benzo(a)pyrene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.01
Indeno(1,2,3-cd)pyrene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.05
Dibenz(a,h)anthracene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Benzo(g,h,i)perylene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	

Note: Results above the relevant IGV are highlighted in bold.
Note: Results above the GTV are highlighted in bold and shaded.

Table 4.7 – Results of Volatile Organic Compounds (VOCs)

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Chloromethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Chloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Bromomethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Vinyl Chloride	µg/l	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**1.1**	0.375	-
Trichlorofluoromethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,1-dichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	30
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Cis-1,2-dichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	30
2,2-Dichloropropane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Trichloromethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	12
1,1,1-Trichloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	500
1,2-dichloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.25	-
1,1-Dichloropropene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Trans-1,2-dichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Benzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	1.0
1,2-dichloropropane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Trichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	70
Dibromomethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Bromodichloromethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Cis-1,3-dichloropropene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Trans-1,3-dichloropropene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Toluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
1,1,2-Trichloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,3-Dichloropropane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Dibromochloromethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Tetrachloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	40
1,2-Dibromoethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Chlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	1.0
1,1,1,2-Tetrachloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Ethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
p & m-xylene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	***1.1***	<1.0	-	10
Styrene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Tribromomethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
o-xylene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
Isopropylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Bromobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
N-Propylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Chlorotoluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
4-Chlorotoluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,3,5-Trimethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Tert-Butylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,2,4-Trimethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	***1.1***	<1.0	-	-
Sec-Butylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,3-dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
P-Isopropyltoluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,2-dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
1,4-dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Butylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
1,2-Dibromo-3-chloropropane	µg/l	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	-
1,2,4-Trichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.40
Hexachlorobutadiene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.10
1,2,3-Trichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-

Note: Results above the relevant IGV are highlighted in bold.
Note: Results above the GTV are highlighted in bold and shaded.
Note: Results above the relevant laboratory limit of detection are highlighted in bold italics.

Table 4.8 – Results of Total Petroleum Hydrocarbons (Aliphatic/Aromatic)

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Aliphatic > C10-C12	µg/l	10	<10	<10	<40	<200	<10	<10	<10	<10	-	-
Aliphatic > C12-C16	µg/l	10	<10	<10	<40	<200	<10	<10	<10	<10	-	-
Aliphatic > C16-C35	µg/l	10	<10	<10	***132***	<200	<10	<10	<10	<10	-	-
Aliphatic > C35-C44	µg/l	10	<10	<10	<40	<200	<10	<10	<10	<10	-	-
Aliphatic > C10-C44	µg/l	10	<10	<10	**132**	<200	<10	<10	<10	<10	-	10
Aromatic > C10-C12	µg/l	10	<10	<10	<40	<200	<10	<10	<10	<10	-	-
Aromatic > C12-C16	µg/l	10	<10	<10	<40	<200	<10	<10	<10	***15***	-	-
Aromatic > C16-C21	µg/l	10	<10	<10	<40	<200	<10	<10	<10	<10	-	-
Aromatic > C21-C35	µg/l	10	<10	<10	<40	<200	<10	<10	<10	<10	-	-
Aromatic > C35-C44	µg/l	10	<10	<10	<40	<200	<10	<10	<10	<10	-	-
Aromatic > C10-C44	µg/l	10	<10	<10	<40	<200	<10	<10	<10	**15**	-	10

Note: Results above the relevant IGV are highlighted in bold.
Note: Results above the GTV are highlighted in bold and shaded.
Note: Results above the relevant laboratory limit of detection are highlighted in bold italics.

5 DISCUSSION OF QUARTER 1 RESULTS

The results of the Quarter 1 monitoring event for 2016 are presented in **Table 4.1** to **4.8** of this report. For the purpose of this report, the results are compared against the Groundwater Threshold Values (GTVs) outlined in the European Communities Environmental Objectives (Groundwater) Regulations (S.I. No. 9 of 2010) where available. Where GTVs are not available results are compared against the EPA Interim Guideline Values (IGV) as set out in the Interim Report *'Towards Setting Guideline Values for the Protection of Groundwater in Ireland' 2004.* A discussion of the results and their significance is included below.

5.1 FIELD PARAMETERS

The results of the field parameters measured at each groundwater monitoring well are presented in **Table 4.2**. Groundwater samples recorded pH levels ranging between 7.30 and 8.56, all within the EPA Interim guideline range of ≥6.5 to ≤9.5. Temperature measurements ranged from 7.6°C to 12.5°C and were below the EPA IGV of 25°C.

Field measurements of Electrical Conductivity levels ranged between 595 µS/cm and 1571 µS/cm. Three measurements of Electrical Conductivity were above the IGV of 1000 µS/cm at BH101 (1137 µS/cm), MW03 (1568 µS/cm) and MW04 (1571 µS/cm), but all however were below the GTV limit of 1875 µS/cm.

Dissolved oxygen levels ranged between 1.59 and 3.78 ppm. Factors such as climate, nutrients in the water, suspended solids; organic wastes and groundwater inflow can all influence the dissolved oxygen values.

Observations relating to colour and odour varied from well to well as detailed in **Table 4.2**.

5.2 RESULTS OF BTEX & MTBE

The results of the **BTEX** and **MTBE** analysis are presented in **Table 4.3**. BTEX concentrations are below the associated GTVs and IGVs at all locations. BTEX concentrations are also below the laboratory of limit of detection at all locations, with the exception of p & m-xylene at MW03 (1.1 µg/l). MTBE was detected at BH103 (1.4 µg/l), MW03 (2.2 µg/l) and MW04 (2.1 µg/l), however these are all below the IGV of 30 µg/l. MTBE was also below the laboratory limit of detection and IGV at all other locations.

The previous detection of MTBE was in the Quarter 3 monitoring event of 2015 and recorded a concentration above the laboratory limit of detection of 3.1 µg/l at BH103. This is still well below the IGV limit. Prior to this there was a detection of MTBE at BH104B in the Quarter 1 monitoring event of 2012 with a recorded concentration of 280 µg/l which is above the laboratory limit of detection. This was the only recorded exceedance in Quarter 1 2012.

Monitoring during Quarter 1 and Quarter 2 of 2010 detected exceedances of MTBE at BH103 at a concentration of 16 µg/l. Subsequent monitoring in 2010 recorded concentrations below the laboratory limit of detection. Prior to these 2010 monitoring events, concentrations of MTBE at BH103 were recorded at 63 µg/l in December 2009.

5.3 RESULTS OF SPECIATED POLYAROMATIC HYDROCARBONS (PAHS)

The results of the Speciated PAH analysis during this monitoring period are presented in **Table 4.4.**

The laboratory limit of detection for Total EPA-16 PAHs is 0.1 µg/l and has been lowered for comparison with the EPA IGV of 0.1 µg/l; however this is not accredited. This laboratory limit of detection is above the EPA GTV of 0.075 µg/l. To identify the compounds, which attributed to these concentrations, speciated PAH analysis was carried out, which reduces the limit of detection for individual parameters to 0.01 µg/l.

Total Polyaromatic Hydrocarbons were above the IGV limit of 0.1 µg/l at BH103 (0.123 µg/l), BH104B (0.159 µg/l) and MW04 (0.153 µg/l). Total PAHs were below the IGV of 0.1 µg/l and the GTV of 0.075 µg/l at all other locations. Total PAHs were also above the IGV at BH103 (0.21 µg/l) and MW03 (0.986 µg/l) during the previous Quarter 4 2015 monitoring event.

The results of the speciated polycyclic aromatic hydrocarbon analysis detected a number of different compounds in BH103, BH104B and MW04 above the laboratory limit of detection. However none of these compounds were above their respective IGV limits at any location.

5.4 RESULTS OF SPECIATED PHENOLS

During previous quarterly monitoring events and sample analysis, total monohydric phenol was determined and historically has been below the laboratory limit of detection of 10 µg/l since December 2008. It should be noted that the laboratory limit of detection was however above the IGV of 0.5 µg/l for phenols.

For this reason, samples were analysed for phenols to include chlorophenols. The results of the speciated phenols analysis are presented in **Table 4.5**. The speciated phenol analysis reduces the laboratory limit of detection to 1.0 µg/l for individual parameters.

The results of the current Quarter 1 2016 speciated phenol analysis confirm concentrations of phenols were below the laboratory limit of detection of 1.0 µg/l at all locations.

4-Chloro-3-methylphenol was detected at BH104B (1.37 µg/l) above the laboratory limit of detection during the Quarter 1 2015 analysis. With the exception of this, all other results are consistent with results since the 2012 quarterly monitoring events.

5.5 RESULTS OF SEMI-VOLATILE ORGANIC COMPOUNDS

The results of the Semi-Volatile Organic Compound analysis are presented in **Table 4.6**.

There are no GTVs for individual SVOC parameters. No SVOCs were detected above the relevant IGVs during this monitoring period, consistent with the results from the 2015 and 2014 monitoring periods.

The Quarter 3 2013 monitoring event detected two SVOC compounds, Acenaphthene (1.1 µg/l) and Fluorene (1.5 µg/l) in MW03. Prior to this detection the Quarter 2 monitoring event of 2012 detected concentrations of Naphthalene and Acenaphthylene in MW03 at concentrations of 2.4 µg/l and 0.12 µ/l respectively.

5.6 RESULTS OF VOLATILE ORGANIC COMPOUNDS

The results of the Volatile Organic Compound analysis are presented in **Table 4.7**. The results of the current Quarter 1 2016 monitoring event indicate that Vinyl Chloride was detected above the GTV of 0.375 µg/l at MW04 (1.1 µg/l). 1,2,4-Trimethylbenzene (1.1 µg/l) and p & m-xylene (1.1 µg/l) were also detected in monitoring well MW03. However, the results are below the IGV for p & m-xylene (10 µg/l) and there is no GTV or IGV limit for 1,2,4-Trimethylbenzene. All other compounds were below their respective laboratory limits of detection.

Historic groundwater monitoring events detected some parameters above the laboratory limit of detection in November 2009, corresponding to Quarter 4 of 2009. 1,1-Dichloroethane, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, MTBE, n-butylbenzene, n-propylbenzene, o-xylene, p-isopropyltoluene, sec-butylbenzene and tert-butylbenzene were detected above the laboratory limits of detection. No VOCs were detected above the relevant GTVs or IGVs.

The results of the Quarter 3 and Quarter 4 monitoring events of 2009 and all subsequent monitoring events indicate that there were no exceedances of the GTVs or IGVs for specific parameters.

5.7 RESULTS OF TOTAL PETROLEUM HYDROCARBONS

In order to provide a more accurate profile of TPH within the groundwater, speciated hydrocarbon analysis using the Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG) method was carried out on samples taken at all boreholes. The results of the TPH analysis are presented in **Table 4.8**.

The EPA IGV of 10 µg/l for the Total Hydrocarbons is deemed comparable with the results for Total Petroleum Hydrocarbons. Some detections of TPH in both the aliphatic and aromatic range were observed during the current Quarter 1 2016 monitoring event. Detections in samples from the well BH103 were in the aliphatic range C16-C35 (132 µg/l) and from well MW04 in the aromatic range C12-C16 (15 µg/l).

The previous Quarter 4 monitoring event of 2015 detected TPH in the aromatic ranges C12-C16 (879 µg/l), C16-C21 (1380 µg/l) and C21-C35 (694 µg/l) at BH104B, C21-C35 at BH103 (60 µg/l) and C10-C12 (13 µg/l) and C12-C16 (21 µg/l) at MW04. TPH concentrations were detected in the aliphatic ranges C10-C12 (495 µg/l), C12-C16 (3080 µg/l) and C16-C35 (3360 µg/l) at BH104B and C16-C35 (231 µg/l) and C35-C44 (14 µg/l).

The Quarter 3 monitoring event of 2015 detected TPH in the aromatic ranges C12-C16 (39 µg/l), C16-C21 (37 µg/l) and C21-C35 (28 µg/l) at BH104B, C21-C35 at BH103 (17 µg/l) and C10-C12 (18 µg/l) and C12-C16 (29 µg/l) at MW04. TPH concentrations were detected in the aliphatic ranges C10-C12 (13 µg/l), C12-C16 (40 µg/l) and C16-C35 (62 µg/l) at BH104B and C16-C35 at BH103 (72 µg/l) and MW03 (14 µg/l).

The Quarter 2 monitoring event of 2015 detected TPH in the aromatic range C21-C35 at BH03 (509 µg/l). TPH concentrations were detected in the aliphatic ranges C16-C35 at BH103 (1760 µg/l) and BH104B (337 µg/l), and C12-C16 at BH104B (225 µg/l).

The Quarter 1 monitoring event of 2015 detected TPH in the aromatic ranges C12-C16 at wells MW03 (14 µg/l), MW04 (15 µg/l) and BH104B (27 µg/l), C16-C21 at BH104B (15 µg/l), and C21-C35 (14 µg/l) at BH103. TPH concentrations were detected in the aliphatic ranges C16-C35 and C35-C44 at MW03 (46 µg/l and 12 µg/l respectively), BH103 (54 µg/l) and BH104B (11 µg/l.

No detections of TPH in the aliphatic or aromatic range were observed in any shallow or deep monitoring well locations during the Quarter 4 monitoring event of 2014.

The Quarter 3 monitoring event of 2014 detected TPH concentrations in the aliphatic range at the shallow groundwater well BH104B. The TPH concentration detected was 410 µg/l. The speciated TPH ranges that contributed to the value of 410 µg/l were C12-C16 (150 µg/l), C16-C21 (250 µg/l) and C31-C35 (10 µg/l).

The Quarter 3, 2013 monitoring event detected TPH in the aliphatic range in one deep groundwater well, MW03. TPH of the range C10-C12 and C12-C16 were detected at concentrations of 200 µg/l and 190 µg/l respectively.

The Quarter 1, 2013 monitoring event detected aliphatic TPH of the range C12-C16, C16-C21 and C21-C35. TPH in the mid to high aromatic ranges were detected in BH103, BH104B and MW04 during the previous Quarter 1 2013 monitoring event. Aromatic TPH of the ranges C12-C16, C16-C21 and C21-C35 were detected in BH103, the ranges C10-C12, C12-C16 and C16-C21 were detected in BH104B and aromatic TPH of the ranges C10-C12 and C12-C16 were detected in MW04.

The Quarter 2 monitoring event of 2012 detected elevated TPH of the aliphatic range C12-C16, C16-C21 and C21-C25 in BH103. Hydrocarbons have been detected in borehole MW03 during Quarter 1 2010, in borehole BH104B during the Quarter 2 2010 monitoring event and in borehole BH104B and MW03 during the Quarter 3 2010 monitoring events. Hydrocarbons have also been detected in BH103, BH104B and MW03 in the Quarter 2 2011 monitoring event and in MW03 in the Quarter 3 and Quarter 4 2011. These detections are discussed further in **Section 6.2.3**.

6 HISTORICAL RESULTS & TRENDS

Time series plots are presented in this section and include the results of the Quarter 1 2016 monitoring round. As the monitoring continues in accordance with the Industrial Emissions Licence requirements, the plots will be updated with the results of subsequent rounds and used to illustrate the results.

6.1 GROUNDWATER LEVELS OVER TIME

Figure 6.1 to **Figure 6.3** below illustrates the manually recorded water levels using an electronic probe. The graphs show that groundwater levels can vary considerably between monitoring rounds.

Figure 6.2 illustrates groundwater elevations (mAOD) in shallow groundwater wells (BH101 to BH104B) ranging between approximately 98 mAOD and 102 mAOD.

Figure 6.3 illustrates groundwater elevation (mAOD) in the deeper groundwater wells (MW01 to MW03). The groundwater elevation (mAOD) for these deeper groundwater wells ranges from approximately 97.5 mAOD to approximately 100 mAOD.

Figure 6.1 – Ground Elevation (mAOD) in all Monitoring Wells

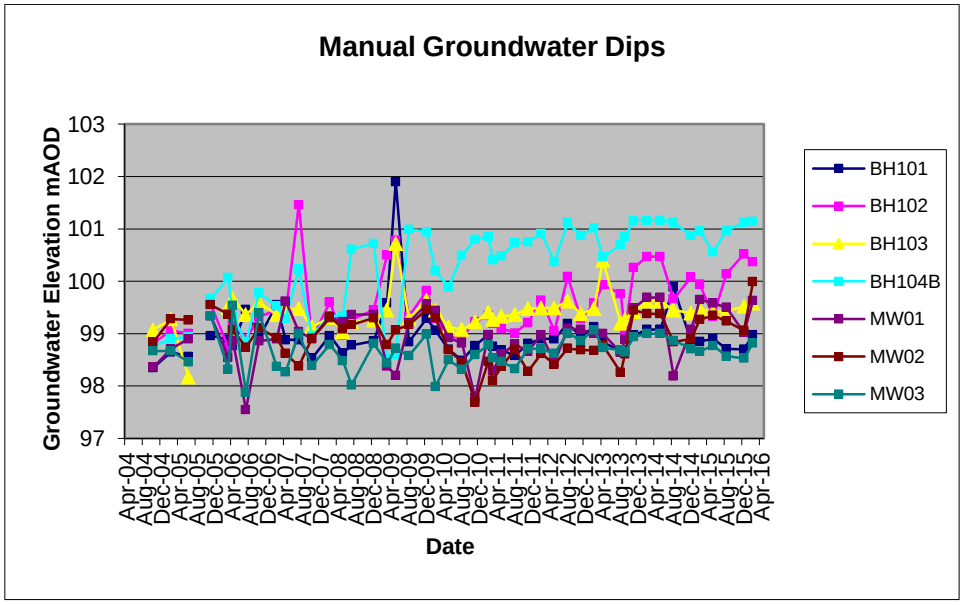


Figure 6.2 – Ground Elevation (mAOD) in Shallow Groundwater Monitoring Wells

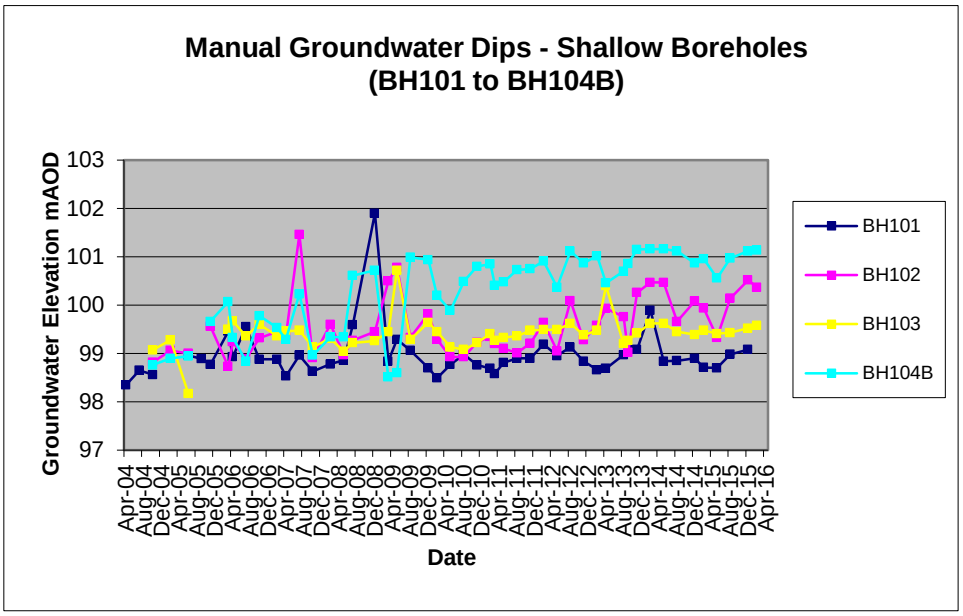
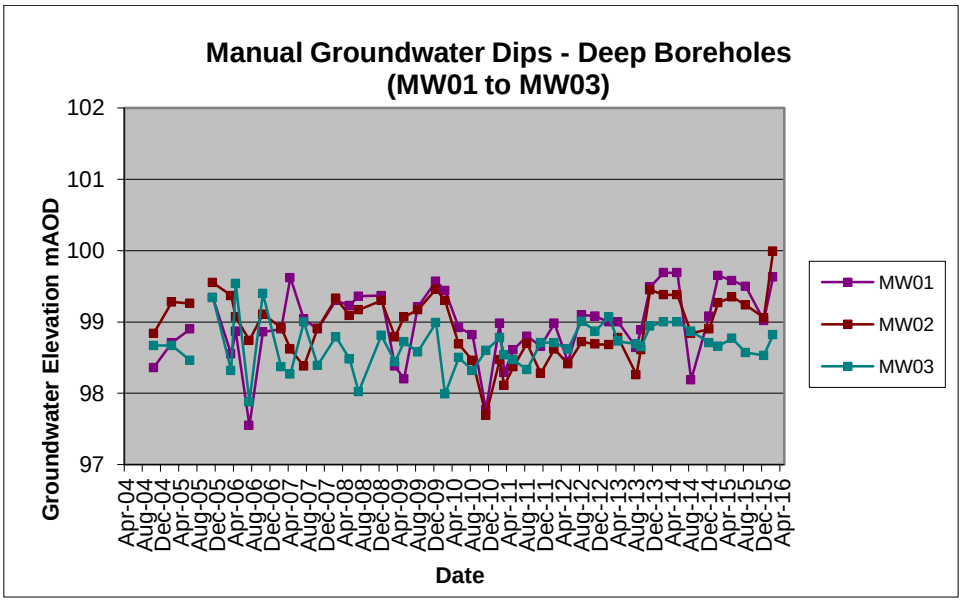


Figure 6.3 – Ground Elevation (mAOD) in Deep Groundwater Monitoring Wells



The groundwater levels generally show a similar pattern of fluctuation over time indicating a degree of connection between boreholes. The graphs demonstrate that groundwater levels can vary considerably between monitoring rounds; the general direction of flow in the shallow and deeper groundwater bearing unit is in an easterly or north easterly direction however there have been some occasional historic cases of groundwater flowing in a south-easterly direction.

In addition, monthly rainfall data for Oak Park, Carlow have been tabulated from Met Éireann to examine the relationship between compounds and rainfall events. The data from Oak Park was chosen as the weather station at Birr, Co. Offaly closed in October 2009. A summary of the rainfall data is in **Tables 6.1** to **6.5**.

Table 6.1 – Monthly Rainfall Data for Year 2012 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	70.8	24.5	18.0	56.3	50.2	155.8	76.2	127.7	37.9	63.4	80.9	68.1

Table 6.2 – Monthly Rainfall Data for Year 2013 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	76.2	35.8	57.6	44.4	35.6	37.5	32.3	85.6	24.4	170.0	27.7	136.6

Table 6.3 – Monthly Rainfall Data for Year 2014 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	147.2	176.7	65.0	52.6	78.6	61.9	24.6	122.1	18.2	138.2	165.6	47.7

Table 6.4 – Monthly Rainfall Data for Year 2015 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Rainfall (mm)	66.0	36.3	53.5	26.3	89.4	29.7	79.4	83.0	17.9	56.8	110.0	270.9

Table 6.5 – Monthly Rainfall Data for Year 2016 for Oak Park, Carlow

Month	Jan	Feb	Mar
Rainfall (mm)	110.9	95.7	40.6

6.2 GROUNDWATER CONCENTRATIONS OVER TIME

Groundwater quality trends have previously been examined in two reports (URS 2005 and RPS 2007). In addition, RPS carried out a groundwater risk assessment (Ref: MDE0788RP0001, dated November 2008) in which the general trend of contaminant concentrations over time was observed to be erratic with compounds rarely being detected in the same borehole on two consecutive monitoring rounds.

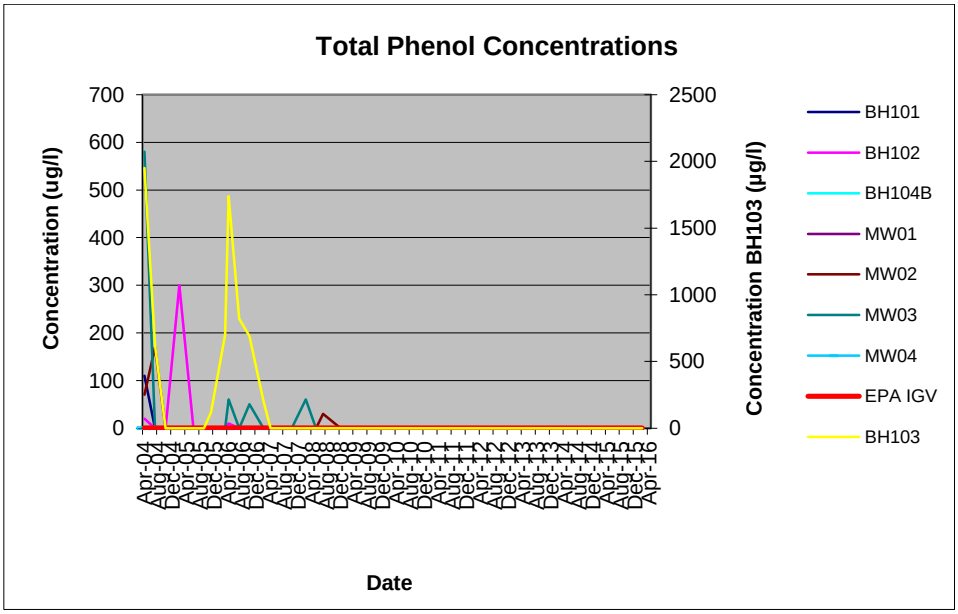
The data available within these reports has been reviewed and time series plots of key parameters have been compiled based on notable trends. Trends for phenols, petroleum hydrocarbons and chlorinated solvents have been plotted as outlined in the following sections.

6.2.1 Phenols

Phenols have been detected historically in all boreholes with the highest concentrations recorded in BH103. However concentrations in BH103 have declined since April 2007. Phenol concentrations have since been recorded below the IGV of 0.5 µg/l in all monitoring wells since December 2008 indicating natural attenuating conditions within the groundwater.

2,4-Dimethylphenol was detected at a concentration of 0.12 µg/l during the Quarter 1, 2010 monitoring event. There is no recommended IGV for this parameter. Subsequent to the Quarter 1 2010 monitoring event no detections of phenols have been noted at any monitoring location up to and including the current Quarter 1 2016 monitoring event.

Figure 6.4 – Phenol Concentrations in all Monitoring Wells



6.2.2 Polyclyclic Aromatic Hydrocarbons

Figure 6.5 below illustrates that PAHs (Polycyclic Aromatic Hydrocarbons) have previously been detected within all monitoring wells above the recommended EPA IGV of 0.1 µg/l. Historically the highest concentrations have been detected within MW03 and BH104B, with the highest concentration detected in March 2006 (107 µg/l) and in October 2007 (19.72 µg/l) respectively. In addition, a range of PAHs including Benzo(a)pyrene, Benzo(g,h,i)perylene, Indeno(1,2,3)cd pyrene, Fluoranthene and Naphthalene have previously been detected in MW03 with **Figures 6.6** to **6.10** illustrating some of the PAH compounds which were detected above their respective IGVs.

Since 2007 concentrations of PAH have shown a marked decrease and since 2010 detections of PAH have been confined to MW03, MW02 and BH104B. Concentrations of Total PAH above the IGV in 2010 were detected during the Quarter 1 monitoring event in MW03 (0.3 µg/l), Quarter 2 monitoring event in BH104B (1.2 µg/l) and Quarter 3 monitoring event in MW02 (2.0 µgl) and BH104B (0.2 µgl). There were no elevated concentrations of Total PAH during the Quarter 4 2010 monitoring event.

No Total PAH detections were recorded throughout 2011 and in Q1 of 2012. Total PAH was detected above the IGV in MW03 in the Q2 2012 monitoring event. No Total PAH exceedances were detected from Quarter 3 2012 to Quarter 4 2013 inclusive. Total PAHs were detected at a concentration of 2.62 µg/l in MW03 during the Q3 2013 monitoring event however; no detections above the laboratory limit were noted during the subsequent monitoring events up to and including the Quarter 2 2015 monitoring event. Total PAHs were also above the GTV at BH103 (0.093 µg/l), BH104B (0.159 µg/l) and MW03 (0.586 µg/l) during the Quarter 3 2015 monitoring event, as well as at BH103 (0.21 µg/l), MW03 (0.986 µg/l) and MW04 (0.079 µg/l) during previous Quarter 4 2015 monitoring event. Similarly, during the current Quarter 1 2016 monitoring event Total Polyaromatic Hydrocarbons were above the IGV limit of 0.1 µg/l at BH103 (0.123 µg/l), BH104B (0.159 µg/l) and MW04 (0.153 µg/l).

Figure 6.5 – PAH (Total) Concentrations in all Monitoring Wells

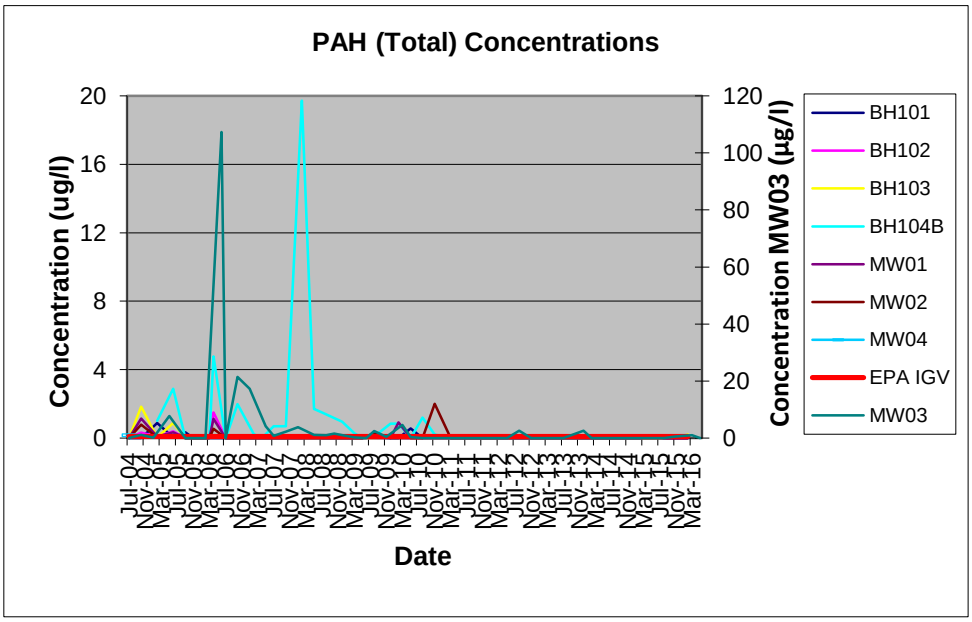


Figure 6.6 – Fluoroanthene Concentrations in all Monitoring Wells

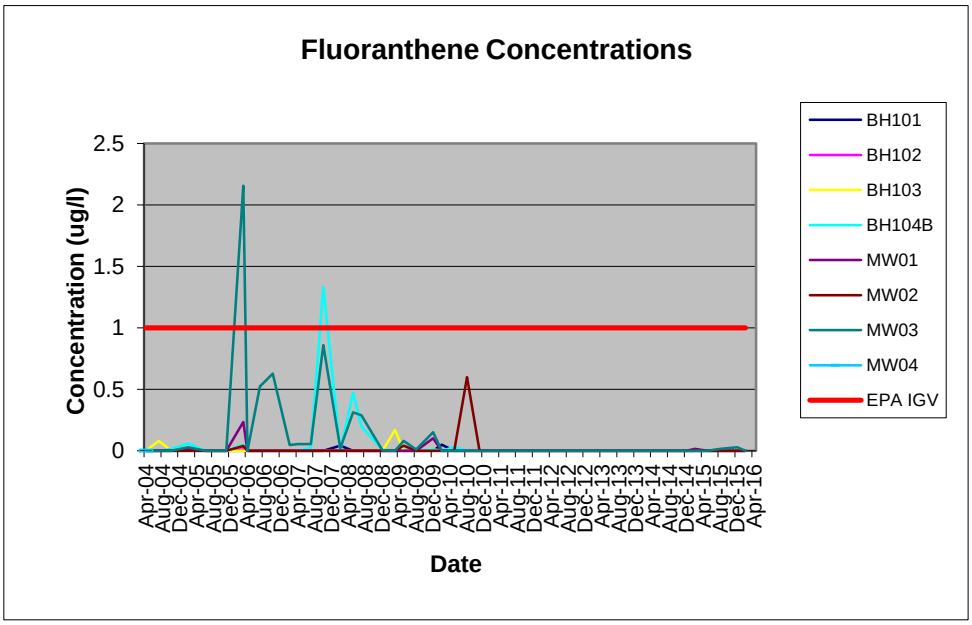
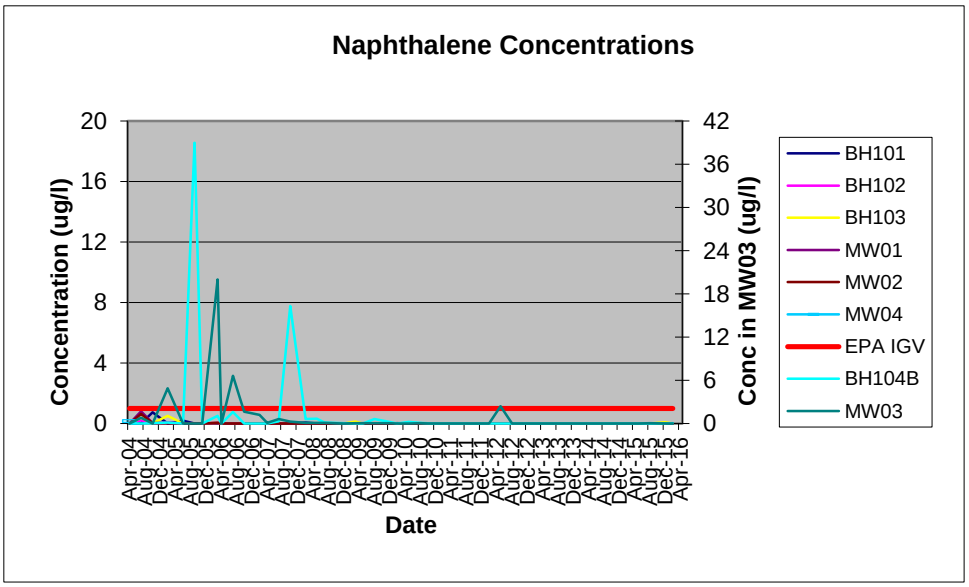


Figure 6.6 illustrates that **Fluoranthene** was previously detected above the IGV of 1.0 µg/l in groundwater monitoring wells BH104B (October 2007, 1.33 µg/l) and MW03 (March 2006, 2.158 µg/l) only. The remaining monitoring wells recorded concentrations below the IGV of 1.0 µg/l.

Figure 6.7 – Naphthalene Concentrations in all Monitoring Wells



A similar trend to Fluoroanthene has been noted in **Figure 6.7**, with concentrations of **Naphthalene** recorded above the IGV of 1.0 µg/l in BH104B and MW03 only. 4 no. exceedances of the IGV were noted in BH104B in September 2005 (39 µg/l), March 2006 (1.069 µg/l), July 2006 (1.594 µg/l) and October 2007 (16.31 µg/l). Since October 2007, the concentrations in BH104B have decreased below the IGV. There have been 6 exceedances of the IGV of 1.0 µg/l in MW03, with the highest concentration detected in March 2006 (19.986 µg/l) and the most recent being the detected in the Quarter 2 2012 monitoring event (2.4 µg/l). The concentrations detected in August 2010 were slightly above the laboratory limit of detection of 0.01 µg/l at BH104B (0.08 µg/l) and MW03 (0.05

µg/l); however these levels are deemed low. Concentrations of Naphthalene were below the EPA IGV limit of detection of 1.0 µg/l at all locations during the Quarter 4 2010, the 2011 and 2012 quarterly monitoring events and the Quarter 1 to Quarter 3 2014 monitoring periods, inclusive. No detections of Naphthalene were noted from the Quarter 4 2014 monitoring event to the Quarter 2 2015 monitoring event. Naphthalene was detected at BH101 (0.011 µg/l) and MW03 (0.031 µg/l) during Quarter 3 2015, and at BH103 (0.095 µg/l) and at MW04 (0.067 µg/l) during Quarter 4 2015. These detections, however, were below the IGV limit of detection of 1.0 µg/l. Naphthalene was also detected during the current Quarter 1 2016 monitoring event at BH104B (0.034 µg/l) and MW04 (0.153 µg/l). These detections were also below the IGV limit.

Figure 6.8 – Benzo (g,h,i) perylene Concentrations

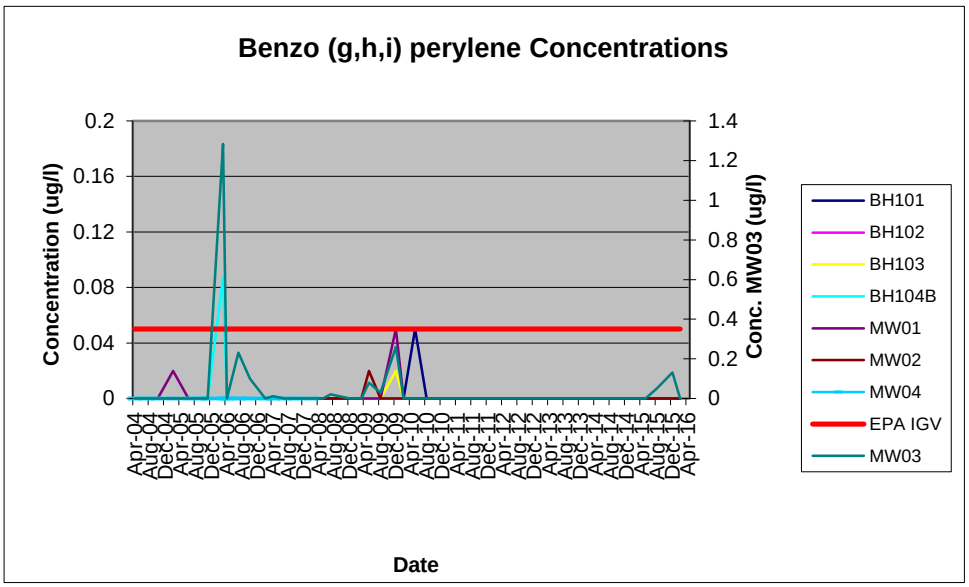


Figure 6.8 illustrates the concentrations of **Benzo(g,h,i)perylene** in all monitoring wells over time. Elevated concentrations above the IGV were recorded at BH104B (0.087 µg/l) on one occasion in March 2006.

Figure 6.9 illustrates elevated concentrations above the IGV recorded at MW03 on 6 no. occasions with the most recent elevated concentration recorded during the Quarter 4 2015 monitoring event (0.053 µg/l). The previous elevated concentration detected was in Quarter 3 2015 (0.053 µg/l). The results of all monitoring events from 2010 to the Quarter 2 2015 monitoring event recorded concentrations below the laboratory limit of detection of 0.01 µg/l at all locations. Concentrations were also below the laboratory limit of detection at all locations during the current Quarter 1 2016 monitoring event.

Figure 6.9 – Benzo (g,h,i) perylene in Monitoring Wells BH104B & MW03

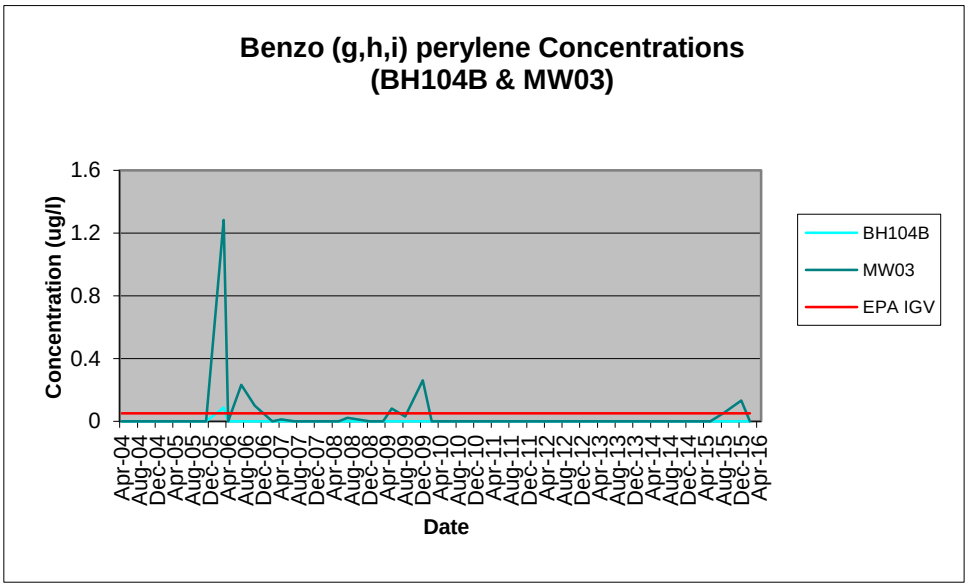
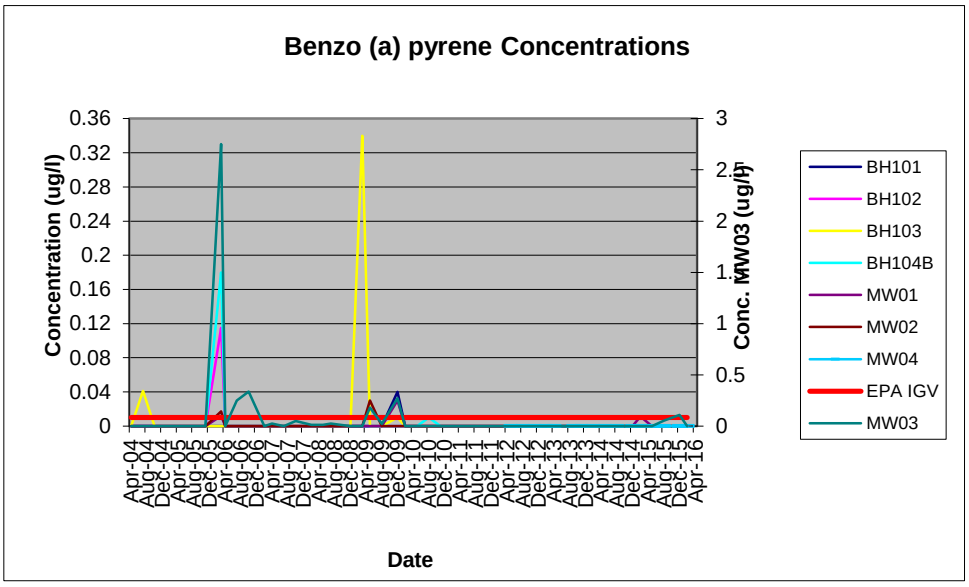


Figure 6.10 illustrates the concentrations of **Benzo(a)pyrene** in all groundwater monitoring wells and indicates that Benzo(a)pyrene has been detected historically in all boreholes above the IGV of 0.01 µg/l. Similarly with the above mentioned trends, the highest concentrations have been detected in MW03 and BH104B. Concentrations have markedly decreased since March 2006 when an elevated concentration of 2.751 µg/l was detected in MW03, however there have been a number of detections above the IGV, with the most recent elevated level detected in December 2009. Elevated concentrations above the IGV were recorded in BH101, BH103 and MW01 during this same period.

The slightly higher concentrations of Benzo(g,h,i)perylene and Benzo(a)pyrene detected in Quarter 4, 2009 may be attributed to heavy rainfall, which occurred in November of 2009 and as a result possibly mobilized traces of these compounds from the soil. The static water levels for December 2009 ranged between 0.58 and 3.78 mbgl. Since December 2009, concentrations of compounds have notably decreased to below the IGVs.

Benzo(a)pyrene was detected above the IGV limit of 0.01 µg/l at MW03 (0.108 µg/l) during the previous Quarter 4 2015 monitoring event. Benzo(a)pyrene was also detected above the IGV at MW03 (0.052 µg/l) during the Quarter 3 2015 monitoring event. All other results of all monitoring events from 2010 to the current Quarter 1 2016 monitoring event did not detect other concentrations above the IGV.

Figure 6.10 – Benzo (a) pyrene Concentrations in all Monitoring Wells

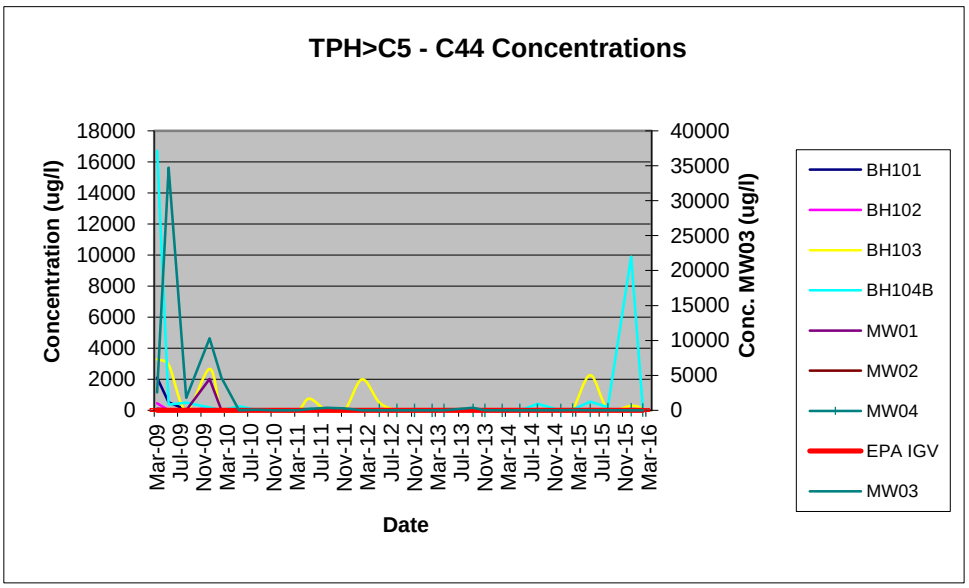


6.2.3 Petroleum Hydrocarbons (TPH)

Historically **Total Petroleum Hydrocarbons (TPH)** including mineral oil, petrol range organics (PRO) and diesel range organics (DRO) have been detected within BH103, BH104B and MW03. Since 2009, speciated hydrocarbon analysis using the Total Hydrocarbon Criteria Working Group (TPHCWG) method has been carried out on all samples to obtain a more accurate profile of TPH within groundwater.

The results of the TPHCWG analysis has indicated that the predominant hydrocarbons detected are in the heavier chain carbon fractions, most notably in the carbon range C12 – C16, C16 – C21 and C21 – C35. **Figure 6.11** illustrates the TPH analysis for the total TPH analysis from C5 – C44 in all monitoring wells since 2009. The highest concentrations detected historically are at monitoring wells MW03, BH104B and BH103 respectively.

Figure 6.11 – TPH (Carbon Range C5-C44) in all Monitoring Wells



Previous quarterly monitoring reports have outlined the hydrocarbon trends recorded in each well since 2010. This report outlines the trends from 2012 up to and including the current monitoring report.

During the Quarter 1, 2012 monitoring event, hydrocarbons were detected in borehole BH103 only. The predominant aliphatic carbon range comprised C10-C12 (13 µg/l), C12-C16 (270 µg/l), C16-C21 (690 µg/l) and C21-C35 (980 µg/l). The predominant aromatic carbon range comprised of C16-C21 (250 µg/l) and C21-C25 (680 µg/l).

During the Quarter 2, 2012 monitoring event, hydrocarbons were detected in BH103 only. The detected aliphatic carbon range comprised C12-C16 (98 µg/l), C16-C21 (230 µg/l) and C21-C25 (170 µg/l). No detections of aromatic carbons were measured during the Quarter 2 2012 monitoring event.

No hydrocarbons were detected at any location during the Quarter 3 and Quarter 4, 2012 monitoring events.

During the Quarter 1, 2013 monitoring event aromatic hydrocarbons were detected in BH103, BH104B and MW04. The predominant aromatic carbon range comprised C12-C16 (30 µg/l), C16-C21 (280 µg/l) and C21-C35 (100 µg/l) in BH103, C10-C12 (30 µg/l), C12-C16 (110 µg/l) and C16-C21 (80 µg/l) in BH104B and C10-C12 (20 µg/l) and C12-C16 (80 µg/l) in MW04. Aliphatic hydrocarbons were detected in BH103 in the ranges C12-C16 (70 µg/l), C16-C21 (100 µg/l) and C21-C35 (90 µg/l).

During the Quarter 2, 2013 monitoring event no aliphatic or aromatic hydrocarbons were detected at any location.

During the Quarter 3, 2013 monitoring event, hydrocarbons of the aliphatic range were detected in MW03 only. The detected aliphatic carbon range comprised C10-C16 (290 µg/l) and C12-C16 (190 µg/l). No detections of aromatic carbons were measured during the Quarter 3 2013 monitoring event.

Total Petroleum Hydrocarbons were not detected at any monitoring location during the Quarter 4, 2014 monitoring event. During the monitoring event for Quarter 3 2014 following ranges of the aliphatic hydrocarbons were recorded for BH104B; C12-C16 (150 µg/l), C16-C21 (250 µg/l) and C21-C35 (10 µg/l).

During the Quarter 1 2015 monitoring event, hydrocarbons were detected in MW03, MW04, BH103 and BH104B. The predominant aromatic carbon range comprised C21-C35 (14 µg/l) in BH103, C12-C16 (27 µg/l) and C16-C21 (15 µg/l) in BH104B, C12-C16 (14 µg/l) in MW03 and C12-C16 (15 µg/l) in MW04. Aliphatic hydrocarbons were detected in the ranges C16-C35 (54 µg/l) in BH103, C16-C35 (11 µg/l) in BH104B and C16-C35 (46 µg/l) and C35-C44 (12 µg/l) in MW03.

During the Quarter 2 2015 monitoring event, the TPH concentration in the aromatic C21-C35 range was detected at one shallow groundwater wells BH103 (509 µg/l). The TPH concentration in the aliphatic range was detected at C16-C35 (1760 µg/l) in BH103 and C12-C16 (225 µg/l) and C16-C35 (11 µg/l) in BH104B.

The Quarter 3 monitoring event of 2015 detected TPH in the aromatic ranges C12-C16 (39 µg/l), C16-C21 (37 µg/l) and C21-C35 (28 µg/l) at BH104B, C21-C35 at BH103 (17 µg/l) and C10-C12 (18 µg/l) and C12-C16 (29 µg/l) at MW04. TPH concentrations were detected in the aliphatic ranges C10-C12 (13 µg/l), C12-C16 (40 µg/l) and C16-C35 (62 µg/l) at BH104B and C16-C35 at BH103 (72 µg/l) and MW03 (14 µg/l).

The previous Quarter 4 monitoring event of 2015 detected TPH in the aromatic ranges C12-C16 (879 µg/l), C16-C21 (1380 µg/l) and C21-C35 (694 µg/l) at BH104B, C21-C35 at BH103 (60 µg/l) and C10-C12 (13 µg/l) and C12-C16 (21 µg/l) at MW04. TPH concentrations were detected in the aliphatic ranges C10-C12 (495 µg/l), C12-C16 (3080 µg/l) and C16-C35 (3360 µg/l) at BH104B and C16-C35 (231 µg/l) and C35-C44 (14 µg/l) at BH103.

For the current Quarter 1 2016 monitoring event, detections in samples from the well BH103 were in the aliphatic range C16-C35 (132 µg/l) and from well MW04 in the aromatic range C12-C16 (15 µg/l).

7 CONCLUSIONS

- In accordance with the criteria set out in Schedule 4(ii) of the site's Industrial Emissions Licence Register No. W0184-01, groundwater monitoring was carried out at the ENVA Ireland site on the 24th February 2016 corresponding to Quarter 1 of 2016. Samples were collected at 8 groundwater monitoring wells during this event.
- The results presented have been referenced against Groundwater Threshold Values (GTVs) outlined in the European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. no 9 of 2010), where available. Where GTVs are not available for parameters, results are compared against the Interim Guideline Values (IGVs) set out in the Environmental Protection Agency interim report, 'Towards Setting Guideline Values for the Protection of Groundwater in Ireland'.
- Results of the BTEX and MTBE demonstrate that the levels of Toluene, Ethylbenzene and Xylene, Benzene and MTBE were all below the recommended EPA IGVs.
- The Quarter 1 2016 results of the speciated polycyclic aromatic hydrocarbons indicate that Total PAHs were below the EPA IGV of 0.1 µg/l at all monitoring wells with the exception of BH103 (0.123 µg/l), BH104B (0.159 µg/l) and MW04 (0.153 µg/l).
- Vinyl Chloride was detected above the GTV of 0.375 µg/l at MW04 (1.1 µg/l). 1,2,4-Trimethylbenzene (1.1 µg/l) and p & m-xylene (1.1 µg/l) were also detected in monitoring well MW03. However, the results are below their respective limits. All other VOCs and SVOCs were below their respective laboratory limits of detection
- Samples were analysed for speciated phenols to include chlorophenols and the results indicate that there were no detections above the laboratory limits of detection.
- For the current Quarter 1 2016 monitoring event, TPH detections in samples from the well BH103 were in the aliphatic range C16-C35 (132 µg/l) and from well MW04 in the aromatic range C12-C16 (15 µg/l).
- Hydrocarbons in the aliphatic range C16-C35 (132 µg/l) at BH103 and the aromatic range C12-C16 (15 µg/l) at MW04 were observed during the current Quarter 1 2016 monitoring event. Concentrations in the aliphatic ranges C10-C12 (495 µg/l), C12-C16 (3080 µg/l) and C16-C35 (3360 µg/l) as well as in the aromatic ranges C12-C16 (879 µg/l), C16-C21 (1380 µg/l) and C21-C35 (694 µg/l) were detected at BH104B during the previous Quarter 4 2015 monitoring event. Also in Quarter 4 2015, TPH concentrations were recorded in the aliphatic ranges C16-C35 (231 µg/l) and C35-C44 (14 µg/l) at BH103 and aromatic ranges C21-C35 (60 µg/l) at BH103 and C10-C12 (13 µg/l) and C12-C16 (21 µg/l) at MW04. During Quarter 3 2015, TPH concentrations were also recorded in the aromatic ranges at BH103, BH104B and MW04, as well as in the aliphatic ranges at BH103, BH104B and MW03. Hydrocarbons were detected at BH104B in the aliphatic range and BH103 in both the aromatic and aliphatic ranges during the Quarter 2 2015 monitoring event, as well as MW04 in the aromatic range and BH103, BH104B and MW03 in both the aromatic and aliphatic ranges during Quarter 1 2015. Hydrocarbons were not detected in any monitoring location during the Quarter 4 2014 monitoring event.
- The general trend of contaminant concentrations over time continues to be somewhat variable with compounds not being continually detected in the same borehole on two or three consecutive monitoring rounds. In general, the contaminant levels detected at the Enva facility appear to indicate reducing contaminant concentrations over time with infrequent elevations in some parameters. Further monitoring is recommended to confirm these reductions.

Enva Portlaoise

2016 Groundwater Compliance Monitoring Quarter 2 (Apr – Jun 2016)

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1 INTRODUCTION

1.1 BACKGROUND

RPS has been commissioned by Enva Ireland Ltd (Enva) to carry out groundwater quality monitoring for environmental compliance, at their facility in the Clonminam Industrial Estate, Portlaoise, Co Laois. Groundwater monitoring has being carried out in strict accordance with criteria set out in Schedule 4(ii) of the site's Industrial Emissions Licence, Register No. W0184-01.

Enva Ireland has been operating under Waste Licence Register No. W0184-01 since January 2004. The licence was amended by the Environmental Protection Agency in December 2013 to conform to the provisions and requirements of the Council Directive 2010/75/EU (Industrial Emissions Directive) and as such is deemed an Industrial Emissions Licence. Enva is required to submit a report to the EPA on a quarterly basis, outlining the existing groundwater quality underlying the site.

A suitably qualified environmental consultant from RPS, collected groundwater samples from a series of 8 monitoring wells (BH101, BH102, BH103, BH104B, MW01, MW02, MW03, MW04) within the site boundary on the 25th of May 2016. The samples underwent laboratory analysis for the suite of parameters specified in Schedule 4(ii) of Industrial Emissions Licence W0184-01. This report outlines the results of the Quarter 2 monitoring for 2016 and reviews historical data recorded at the site.

1.2 OBJECTIVES & SCOPE OF WORK

The specific objectives and scope of work are as follows:

- Review of previous data as provided by Enva Portlaoise;
- Graphical presentation of key compounds and trends; and
- Discussion of results for Quarter 2 2016 within the context of previous results and available guideline concentrations.

2 REVIEW OF PREVIOUS DATA

2.1 INFORMATION SOURCES

The following documents were reviewed as part of this project:

- Industrial Emissions Licence W0184-01 and any available EPA documents from the EPA website;
- Quarterly Groundwater Monitoring Reports (Quarter 1 2004 to Quarter 4 2005), URS;
- Quarterly Groundwater Monitoring Reports (Quarter 1 2006 to Quarter 4 2015), RPS;
- Summary Report on Trend of Contaminant Levels at Enva Ireland Ltd since 2005, Ref: MDE0647RP0001, RPS (2007);
- Groundwater Risk Assessment, Ref: MDE0788Rp0001, RPS (2008);
- Hydrogeological Review and Assessment Report, Ref MDE0973Rp0017F01, RPS (2014);
- Baseline Environment Report, Ref: MDE0973Rp0104; and
- Quarter 1 Groundwater Monitoring Report, RPS (2016).

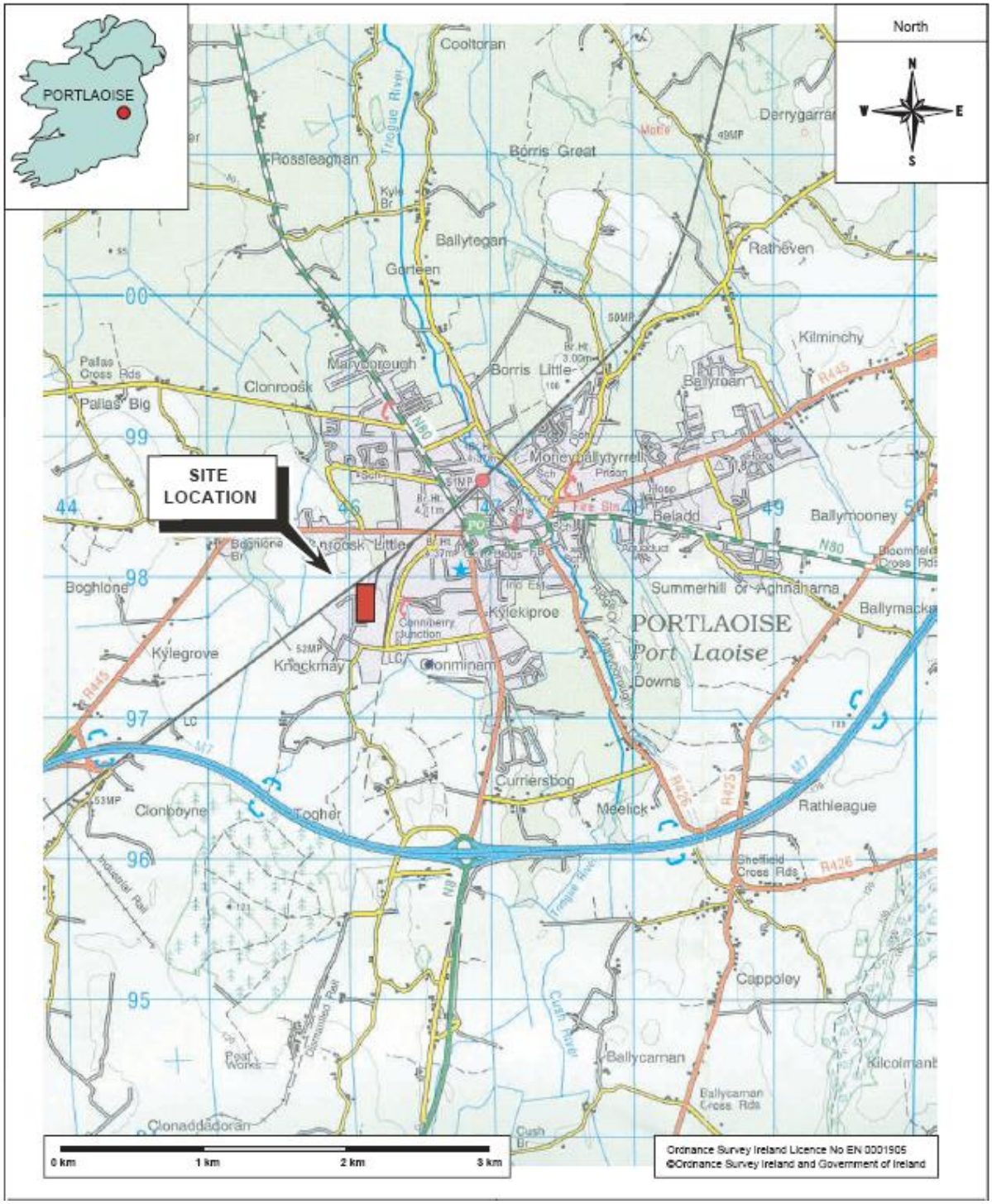
2.2 SITE SETTING

The site is located to the southwest of the town of Portlaoise immediately to the south of the Dublin to Cork railway line. The general area is gently undulating. The site slopes gently to the southwest but to the east of the site the ground slopes gently towards the River Triogue, which is located approximately 1.5 km to the east. The site occupies an area of approximately 1.5 hectares and comprises of an operational waste oil and contaminated soil treatment plant.

The site is located on the outskirts of Portlaoise in an area of agricultural and light industrial development. The site is bounded to the north and east by land belonging to Irish rail, comprising sidings and general storage areas. To the south is a vehicle repair garage, which is elevated above the level of the site by approximately 1.5 m. To the west the site is adjoined by further industrial land, as well as residential land. The site location is presented on **Figure 2.1**.

The site has been in operation since 1978, and the layout has remained relatively consistent. The site layout is presented on **Figure 3.1**. The site is largely covered in hardstanding with some open areas in the far north and northeast of the site. All oil and soil storage areas are suitably bunded and the general standard of housekeeping is good.

Figure 2.1 – Site Location



2.3 REGIONAL SETTING

2.3.1 Geology

The Geological Survey of Ireland indicates that the regional geology of Portlaoise is typified by Carboniferous Limestone. In the vicinity of the site itself the solid geology comprises the Ballysteen Formation, a micaceous-bioclastic limestone. This well-bedded limestone, with interbeds of shale, is extensively folded, with axes trending north-east to south-west, and becomes increasingly muddy towards the top of the formation. North-east to south-west trending faults are found in the region, with one located approximately 500m to the east of the site. The subsoils in the region comprise mainly Made Ground, around the industrial area, and Limestone Till in the surrounding regions.

2.3.2 Hydrogeology

The limestone is classified by the Geological Survey of Ireland (GSI) as a Locally Important Karstified Aquifer (Ll). Porosity is predominantly in the form of fractures, in this aquifer, however the muddy nature of this formation greatly reduces permeability. Vulnerability of this aquifer beneath the site is classified as high, with moderate vulnerability to the east of the site.

The public water supply for Portlaoise is derived from groundwater, utilising three groundwater abstraction well fields comprising of two abstraction wells in each well field. This supply currently comes from the Straboe area, approximately 5.5 km to the north-east of the site. The source protection zone for this water supply extends to within 3.2 km of the Enva site but does not encompass the Enva site.

The GSI record a number of other dug wells and boreholes within the Portlaoise area, including the boreholes installed on the site. The accuracy of the locations of these wells varies. One well, which was drilled in 1899 is recorded as being located immediately to the south of the Enva site. The use of this well is not known and its location is only accurate to 1 km. A second borehole, drilled in 1973 is recorded 1.5 km to the north of the site at Clonroosk; the accuracy of this location is also 1 km so it could be closer or further from the site. The use of this well is not known but its yield is recorded as being poor. There are no other wells recorded within 1 km of the site.

Enva is not aware of any abstraction boreholes within the immediate vicinity of their site.

2.4 SITE GROUND CONDITIONS

A total of eight boreholes have been drilled at the site and the general sequence of ground conditions is presented in **Table 2.1**.

Table 2.1 – Ground Conditions

Strata	Extent	Thickness	Description
Made Ground	BH104	0-3.5 m	Predominantly concrete, with hardcore fill, and clay.
Boulder Clay	All boreholes	<8.5 m	Includes fine to medium, well rounded gravels.
Sand and Gravel	Confined to south east corner of site (BH101, BH104 and MW03)	0-2 m	In general the transition from boulder clay to sand is gradual with changes from gravel, to sandy gravel, to sand.
Limestone Bedrock	Encountered in MW01, MW02 and MW03	Top of limestone ranges from 7.7m to 9m below ground level.	Pale grey, fine-grained bedrock, differentiated from boulders by its un-weathered nature.

The logs for each of the boreholes were previously presented as Appendix B in the RPS Groundwater Risk Assessment Report (Ref: MDE0788Rp0001).

2.4.1 Licence Conditions

The Industrial Emissions Licence requires the regular monitoring and sampling of boreholes BH101, BH102, BH103, BH104B, MW01, MW02, MW03 and MW04. The parameters requiring measurement or analysis are presented in **Table 2.2**.

Table 2.2 – Licence Parameters

Group	Parameters requiring Quarterly Measurement	Parameters requiring Annual Measurement
Field Parameters	Groundwater Level pH Temperature Dissolved Oxygen Electrical Conductivity Visual Inspection	Groundwater Level pH Temperature Dissolved Oxygen Electrical Conductivity Visual Inspection
Organics	Mineral Oil BTEX & MTBE PAHs Phenols VOCs SVOCs	Mineral Oil BTEX & MTBE PAHs Phenols VOCs SVOCs
Inorganics	-	Total Alkalinity, Calcium, Manganese, Sulphate, Cyanide (Total), Chloride, Sodium,

3 METHODOLOGY

Groundwater samples were collected from 8 no. on-site groundwater monitoring wells (BH101, BH102, BH103, BH104B, MW01, MW02, MW03, MW04) (**Figure 3.1**) using dedicated Waterra tubing, in accordance with RPS's standard sampling protocol. A non-return foot valve was fixed to the bottom of the tubing and inserted into the well, close to the base of the borehole. Separate tubing and foot valves were used at each monitoring well to eliminate the possibility of cross contamination.

Groundwater in the well casing is not considered representative of the groundwater quality at a given location. For this reason, three well volumes were purged from each well prior to collection of the groundwater sample. By the time purging was complete all field test water parameters (namely pH, Temperature, Electrical Conductivity and Dissolved Oxygen) were within 10% variance in three consecutive measurements. This ensured that the groundwater sample extracted from the monitoring borehole was representative of the water held in the subsurface strata and not water held stagnant in the borehole casing. The purged volumes were calculated on-site from the measured static water levels and total well depths using an electronic dip meter.

Groundwater samples were collected in laboratory supplied containers and stored in chilled cool boxes following sampling and during transit to the laboratory. A rigorous chain of custody procedure was used during the sample round.

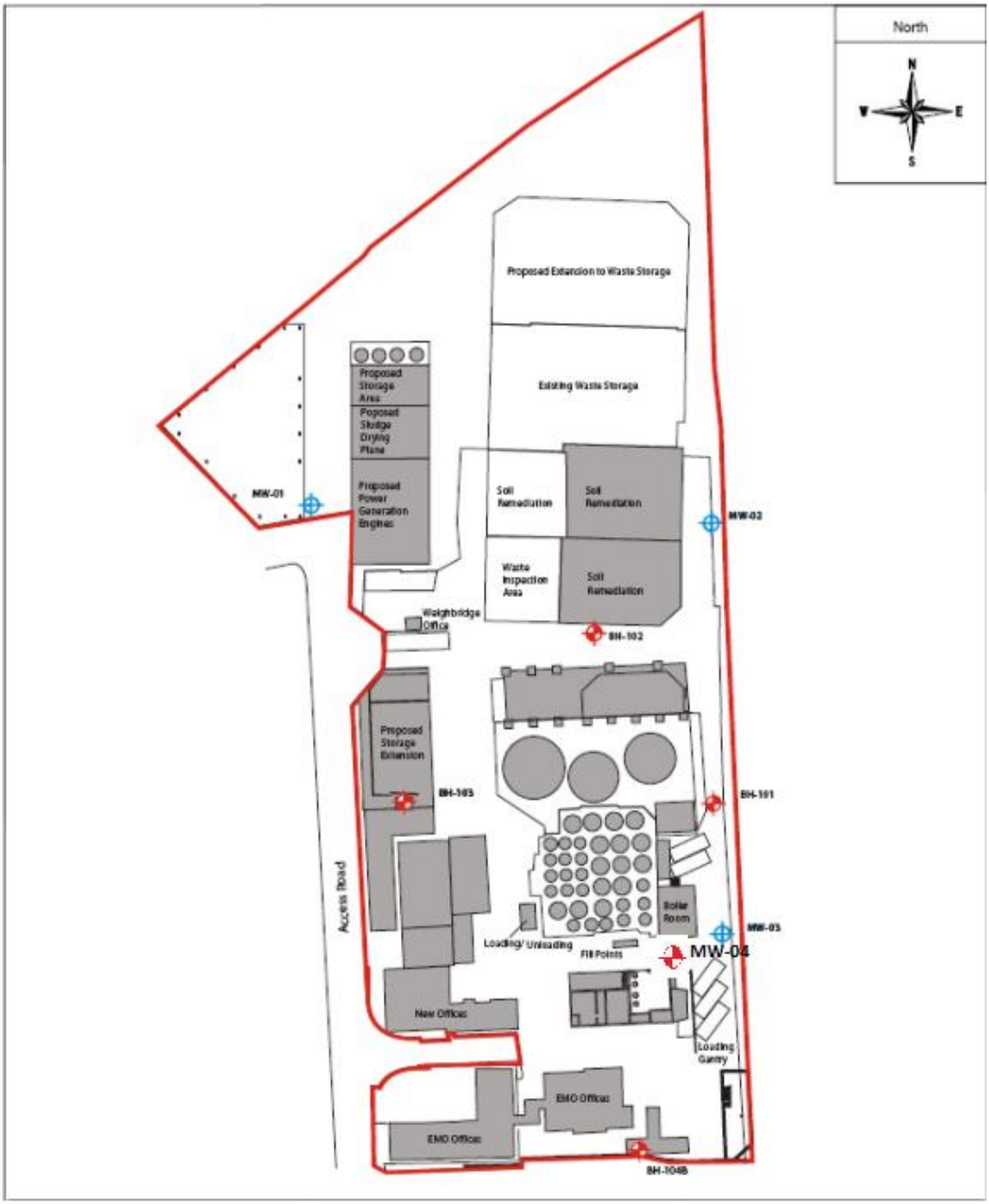
3.1 LABORATORY ANALYSIS

All groundwater samples were analysed at a UKAS accredited laboratory, ALS Environmental for the suite of analyses listed in **Table 3.1**. **Table 3.1** also indicates the analytical techniques used by the laboratory.

Table 3.1 – Analytical Methodologies – ALS Environmental

Parameter	Analytical Methodology
Phenols	GC-MS
Speciated PAHs	GC-MS
BTEX & MTBE	Headspace GC-MS
Petroleum Hydrocarbons	Headspace GC-MS
Volatile Organic compounds & Tentatively Identified Organic Compounds (VOCs & TICs)	Headspace GC-MS
Semi-Volatile Organic compounds & Tentatively Identified Organic Compounds (SVOCs & TICs)	GC-MS

Figure 3.1 – Site Layout Plan with Groundwater Monitoring Locations



Shallow Monitoring Well locations

Deep Monitoring Well locations

Source: *URS Environmental Consultants (Ref: 45078497 Issue No. 1)*

3.2 PRESENTATION & INTERPRETATION OF RESULTS

The Quarter 2 2016 results are tabulated in **Section 4** and discussed with respect to previous results in **Section 5**. Results are compared against Groundwater Threshold Values (GTVs) outlined in the European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No 9 of 2010), where available. Where GTVs are not available for parameters, results are compared against the Interim Guideline Values (IGVs) set out in the Environmental Protection Agency interim report, 'Towards Setting Guideline Values for the Protection of Groundwater in Ireland'.

Previous monitoring reports (as listed in **Section 2.1**) provide details of contaminant concentrations since 2004. The data available within these reports has been reviewed and time series plots of key parameters have been compiled. Trends for chlorinated solvents, petroleum hydrocarbons and phenol parameters have been plotted.

Time series plots are presented in **Section 6** and include the results of this Quarter 2 2016 monitoring round. As the monitoring continues in accordance with the Industrial Emissions licence requirements, the plots will be updated with the results of subsequent rounds used to illustrate the results.

Time series plots are also provided for manual water levels where available from previous reports.

4 QUARTER 2 RESULTS MAY 2016

The results of all field measurements and laboratory analysis are presented in this section. This resulted in a lack of field measurements. Results are primarily compared against Groundwater Threshold Values (GTVs) outlined in the European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No 9 of 2010), where available. Where GTVs are not available for parameters, results are compared against the Interim Guideline Values (IGVs) set out in the Environmental Protection Agency interim report, 'Towards Setting Guideline Values for the Protection of Groundwater in Ireland'.

The results are discussed in relation to appropriate guideline values in **Section 5**. Results that are shown to be above the relevant threshold or guideline values are highlighted in bold and shaded. Results that are shown to be above the relevant laboratory detection limits are highlighted in italics.

Site-specific field parameter measurements were collected during the site visit as per RPS Water sampling protocol.

Table 4.1 – Groundwater Levels (Quarter 2, 2016)

Monitoring Well	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04
Depth (mbgl)	6.78	6.40	4.39	4.72	21.98	30.88	14.17	6.48
Static Water Level (mbgl)	4.22	3.21	1.73	0.54	2.44	3.87	4.11	3.94
Ground Level (mAOD)	103.06	102.55	101.16	101.52	102.10	103.12	102.77	-
Water Level (mAOD)	98.84	99.34	99.43	100.98	99.66	99.25	98.66	-
Free Phase Oil (mm)	No detection	No detection	No detection	No detection	No detection	No detection	No detection	No detection

mbgl = metres below ground level

Table 4.2 – Results of Field Parameters Measured at each Groundwater Monitoring Well (Quarter 2, 2016)

Monitoring Well	pH (pH Units)	Temperature (°C)	Conductivity (µS/cm)	Dissolved O_2 (ppm)	Observations
BH101	8.23	11.9	**1147**	2.78	Light cloudy colour, some sediment
BH102	7.91	11.0	653	3.55	Clear on purging, very little suspended solids
BH103	8.07	11.2	866	2.91	Slightly white cloudy colour, little sediment
BH104B	8.08	10.3	547	1.63	Slightly brown colour, slight H_2S odour, very little suspended solids or sediment
MW01	7.85	13.3	757	3.69	Slightly cloudy, very little sediment and suspended solids
MW02	8.60	12.2	712	2.48	Dark grey colour, slight odour, very little sediment
MW03	7.29	14.7	**1588**	3.90	Cloudy colour on purging, very little sediment & suspended solids, very slight oil sheen
MW04	7.11	14.3	**1538**	1.85	Light cloudy colour, some suspended solids, very little sediment, very faint H_2S odour
Groundwater Threshold Value	-	-	1875	-	-
Interim EPA Guideline Values (Units as indicated)	>6.5 & <9.5	25°C	1000	No abnormal change	-

Note: Results above the relevant IGV are highlighted in bold.
Note: Results above the GTV are highlighted in bold and shaded.

Table 4.3 – Results of BTEX and MTBE

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Benzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.75	1.0
Toluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
Ethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
p & m-xylene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10 Note 1
o-xylene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10 Note 1
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1.0	<1.0	<1.0	***1.2***	<1.0	<1.0	<1.0	***1.8***	***1.7***	-	30

Note: No specific IGV for parameter. IGV for Total Xylenes is used as guideline.
Note: Results above the relevant laboratory limit of detection are highlighted in bold italics.

Table 4.4 – Results of Speciated PAHs

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Naphthalene	µg/l	0.01	<0.01	<0.01	<0.12	<0.10	<0.01	<0.01	<0.01	<0.16	-	1.0
Acenaphthylene	µg/l	0.01	<0.01	<0.01	<0.01	<0.10	<0.01	<0.01	<0.10	<0.01	-	-
Acenaphthene	µg/l	0.01	<0.01	<0.01	***0.073***	<0.10	<0.01	<0.01	<0.10	***0.01***	-	-
Fluorene	µg/l	0.01	<0.01	<0.01	***0.027***	<0.10	<0.01	<0.01	<0.10	***0.013***	-	-
Phenanthrene	µg/l	0.01	<0.01	<0.01	***0.011***	<0.10	<0.01	***0.01***	<0.10	<0.01	-	-
Anthracene	µg/l	0.01	<0.01	<0.01	<0.01	<0.10	<0.01	<0.01	<0.10	<0.01	-	10,000
Fluoranthene	µg/l	0.01	<0.01	<0.01	<0.01	<0.10	<0.01	***0.012***	<0.10	<0.01	-	1.0
Pyrene	µg/l	0.01	<0.01	<0.01	<0.01	<0.10	***0.011***	<0.01	<0.10	<0.01	-	-
Benzo(a)anthracene	µg/l	0.01	<0.01	<0.01	<0.01	<0.10	<0.01	<0.01	<0.10	<0.01	-	-
Chrysene	µg/l	0.01	<0.01	<0.01	<0.01	<0.10	<0.01	<0.01	<0.10	<0.01	-	-
Benzo(b)fluoranthene	µg/l	0.01	<0.01	<0.01	***0.011***	<0.10	<0.01	***0.01***	<0.10	<0.01	-	0.5

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Benzo(k)fluoranthene	µg/l	0.01	<0.01	<0.01	<0.01	<0.10	<0.01	<0.01	<0.10	<0.01	-	0.05
Benzo(a)pyrene	µg/l	0.01	<0.01	<0.01	<0.05	<0.10	<0.01	***0.01***	<0.10	<0.01	-	0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	<0.01	<0.01	<0.01	<0.10	<0.01	<0.01	<0.10	<0.01	-	0.05
Dibenz(a,h)anthracene	µg/l	0.01	<0.01	<0.01	<0.01	<0.10	<0.01	<0.01	<0.10	<0.01	-	-
Benzo(g,h,i)perylene	µg/l	0.01	<0.01	<0.01	<0.01	<0.10	<0.01	***0.011***	<0.10	<0.01	-	0.05
Total EPA-16 PAHs	µg/l	0.1	<0.01	<0.01	**0.111**	<0.10	***0.011***	***0.069***	<0.10	***0.023***	0.075	0.1

Note: Results above the relevant IGV are highlighted in bold.
Note: Results above the GTV are highlighted in bold and shaded.
Note: Results above the relevant laboratory limit of detection are highlighted in bold italics.

Table 4.5 – Results of Speciated Phenols

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Phenol	µg/l	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	-	0.5
2,4,6-Trichlorophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	200
2,4-Dichlorophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2,4-Dimethylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Chlorophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	200
2-Methylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Nitrophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
4-Chloro-3-methylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
4-Methylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-

Note: Results above the relevant laboratory limit of detection are highlighted in bold italics.

Table 4.6 – Results of Semi-Volatile Organic Compounds (SVOCs)

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Phenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.5
2-Chlorophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	200
Bis(2-chloroethyl)ether	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,3-Dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,2-Dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
1,4-Dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Bis(2-chloroisopropyl)ether	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Methylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Hexachloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Nitrobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
4-Methylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Isophorone	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Nitrophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2,4-Dimethylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Bis(2-chloroethoxy)methane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,2,4-trichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.40
Naphthalene	µg/l	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	1.0
2,4-Dichlorophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Hexachlorobutadiene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.10
4-Chloro-3-methylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2,4,6-Trichlorophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	200
2,4,5-Trichlorophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Methylnaphthalene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Chloronaphthalene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Dimethylphthalate	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
2,6-Dinitrotoluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Acenaphthylene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Acenaphthene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2,4-Dinitrotoluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Dibenzofuran	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
4-Chlorophenyl phenyl ether	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Diethyl phthalate	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Fluorene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Bromophenyl phenyl ether	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Hexachlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.03
Phenanthrene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Anthracene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10,000
Pyrene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Butyl benzyl phthalate	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Benzo(a)anthracene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Chrysene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Benzo(b)fluoranthene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.5
Benzo(k)fluoranthene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.05
Benzo(a)pyrene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.01
Indeno(1,2,3-cd)pyrene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.05
Dibenz(a,h)anthracene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Benzo(g,h,i)perylene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	

Note: Results above the relevant IGV are highlighted in bold.
Note: Results above the GTV are highlighted in bold and shaded.

Table 4.7 – Results of Volatile Organic Compounds (VOCs)

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Chloromethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Chloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	***1.1***	<1.0	1.4	9.2	-	-
Bromomethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Vinyl Chloride	µg/l	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.6**	**0.9**	0.375	-
Trichlorofluoromethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,1-dichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	***1.7***	***3.6***	-	30
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Cis-1,2-dichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1.0	<1.0	<1.0	***1.2***	<1.0	<1.0	<1.0	***1.8***	***1.7***	-	30
2,2-Dichloropropane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Trichloromethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	12
1,1,1-Trichloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	500
1,2-dichloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.25	-
1,1-Dichloropropene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Trans-1,2-dichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Benzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	1.0
1,2-dichloropropane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Trichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	70
Dibromomethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Bromodichloromethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Cis-1,3-dichloropropene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Trans-1,3-dichloropropene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Toluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
1,1,2-Trichloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,3-Dichloropropane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Dibromochloromethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Tetrachloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	40
1,2-Dibromoethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Chlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	1.0
1,1,1,2-Tetrachloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Ethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
p & m-xylene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
Styrene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Tribromomethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
o-xylene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
Isopropylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Bromobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
N-Propylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Chlorotoluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
4-Chlorotoluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,3,5-Trimethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Tert-Butylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,2,4-Trimethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Sec-Butylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,3-dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
P-Isopropyltoluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,2-dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
1,4-dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Butylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
1,2-Dibromo-3-chloropropane	µg/l	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	-
1,2,4-Trichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.40
Hexachlorobutadiene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.10
1,2,3-Trichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-

Note: Results above the relevant IGV are highlighted in bold.
Note: Results above the GTV are highlighted in bold and shaded.
Note: Results above the relevant laboratory limit of detection are highlighted in bold italics.

Table 4.8 – Results of Total Petroleum Hydrocarbons (Aliphatic/Aromatic)

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Aliphatic > C10-C12	µg/l	10	<10	<10	<10	<10	<10	<10	<10	<10	-	-
Aliphatic > C12-C16	µg/l	10	<10	<10	<10	<10	<10	<10	<10	<10	-	-
Aliphatic > C16-C35	µg/l	10	<10	<10	***150***	<10	<10	<10	<10	<10	-	-
Aliphatic > C35-C44	µg/l	10	<10	<10	<10	<10	<10	<10	<10	<10	-	-
Aliphatic > C10-C44	µg/l	10	<10	<10	**150**	<10	<10	<10	<10	<10	-	10
Aromatic > C10-C12	µg/l	10	<10	<10	<10	<10	<10	<10	<10	<10	-	-
Aromatic > C12-C16	µg/l	10	<10	<10	<10	<10	<10	<10	<10	***20***	-	-
Aromatic > C16-C21	µg/l	10	<10	<10	<10	<10	<10	<10	<10	<10	-	-
Aromatic > C21-C35	µg/l	10	<10	<10	***57***	<10	<10	<10	<10	<10	-	-
Aromatic > C35-C44	µg/l	10	<10	<10	<10	<10	<10	<10	<10	<10	-	-
Aromatic > C10-C44	µg/l	10	<10	<10	**57**	<10	<10	<10	<10	**20**	-	10

Note: Results above the relevant IGV are highlighted in bold.
Note: Results above the relevant laboratory limit of detection are highlighted in bold italics.

5 DISCUSSION OF QUARTER 1 RESULTS

The results of the Quarter 2 monitoring event for 2016 are presented in **Table 4.1** to **4.8** of this report. For the purpose of this report, the results are compared against the Groundwater Threshold Values (GTVs) outlined in the European Communities Environmental Objectives (Groundwater) Regulations (S.I. No. 9 of 2010) where available. Where GTVs are not available results are compared against the EPA Interim Guideline Values (IGV) as set out in the Interim Report *'Towards Setting Guideline Values for the Protection of Groundwater in Ireland' 2004.* A discussion of the results and their significance is included below.

5.1 FIELD PARAMETERS

The results of the field parameters measured at each groundwater monitoring well are presented in **Table 4.2**. Groundwater samples recorded pH levels ranging between 7.11 and 8.60, all within the EPA Interim guideline range of ≥6.5 to ≤9.5. Temperature measurements ranged from 10.3°C to 14.7°C and were below the EPA IGV of 25°C.

Field measurements of Electrical Conductivity levels ranged between 547 µS/cm and 1588 µS/cm. Three measurements of Electrical Conductivity were above the IGV of 1000 µS/cm at BH101 (1147 µS/cm), MW03 (1588 µS/cm) and MW04 (1538 µS/cm), but all however were below the GTV limit of 1875 µS/cm.

Dissolved oxygen levels ranged between 1.63 and 3.90 ppm. Factors such as climate, nutrients in the water, suspended solids; organic wastes and groundwater inflow can all influence the dissolved oxygen values.

Observations relating to colour and odour varied from well to well as detailed in **Table 4.2**.

5.2 RESULTS OF BTEX & MTBE

The results of the **BTEX** and **MTBE** analysis are presented in **Table 4.3**. BTEX concentrations are below the associated GTVs and IGVs at all locations. BTEX concentrations are also below the laboratory of limit of detection at all locations. MTBE was detected at BH103 (1.2 µg/l), MW03 (1.8 µg/l) and MW04 (1.7 µg/l), however these are all below the IGV of 30 µg/l. MTBE was also below the laboratory limit of detection and IGV at all other locations.

The previous detection of MTBE was in the Quarter 1 monitoring event of 2016 and recorded concentrations above the laboratory limit of detection at BH103 (1.4 µg/l), MW03 (2.2 µg/l) and MW04 (2.1 µg/l). These detections are still below the IGV limit however. Prior to this there was a detection of MTBE at BH104B in the Quarter 1 monitoring event of 2012 with a recorded concentration of 280 µg/l which is above the laboratory limit of detection. This was the only recorded exceedance in Quarter 1 2012.

Monitoring during Quarter 1 and Quarter 2 of 2010 detected exceedances of MTBE at BH103 at a concentration of 16 µg/l. Subsequent monitoring in 2010 recorded concentrations below the laboratory limit of detection. Prior to these 2010 monitoring events, concentrations of MTBE at BH103 were recorded at 63 µg/l in December 2009.

5.3 RESULTS OF SPECIATED POLYAROMATIC HYDROCARBONS (PAHS)

The results of the Speciated PAH analysis during this monitoring period are presented in **Table 4.4.**

The laboratory limit of detection for Total EPA-16 PAHs is 0.1 µg/l and has been lowered for comparison with the EPA IGV of 0.1 µg/l; however this is not accredited. This laboratory limit of detection is above the EPA GTV of 0.075 µg/l. To identify the compounds, which attributed to these concentrations, speciated PAH analysis was carried out, which reduces the limit of detection for individual parameters to 0.01 µg/l.

Total Polyaromatic Hydrocarbons were above the IGV limit of 0.1 µg/l at BH103 (0.111 µg/l). Total PAHs were below the IGV of 0.1 µg/l and the GTV of 0.075 µg/l at all other locations. Total PAHs were also above the IGV BH103 (0.123 µg/l), BH104B (0.159 µg/l) and MW04 (0.153 µg/l) during the previous Quarter 1 2016 monitoring event.

The results of the speciated polycyclic aromatic hydrocarbon analysis detected a number of different compounds in BH103, MW01, MW) and MW04 above the laboratory limit of detection. However none of these compounds were above their respective IGV limits at any location.

5.4 RESULTS OF SPECIATED PHENOLS

During previous quarterly monitoring events and sample analysis, total monohydric phenol was determined and historically has been below the laboratory limit of detection of 10 µg/l since December 2008. It should be noted that the laboratory limit of detection was however above the IGV of 0.5 µg/l for phenols.

For this reason, samples were analysed for phenols to include chlorophenols. The results of the speciated phenols analysis are presented in **Table 4.5**. The speciated phenol analysis reduces the laboratory limit of detection to 1.0 µg/l for individual parameters.

The results of the current Quarter 1 2016 speciated phenol analysis confirm concentrations of phenols were below the laboratory limit of detection of 1.0 µg/l at all locations.

4-Chloro-3-methylphenol was detected at BH104B (1.37 µg/l) above the laboratory limit of detection during the Quarter 1 2015 analysis. With the exception of this, all other results are consistent with results since the 2012 quarterly monitoring events.

5.5 RESULTS OF SEMI-VOLATILE ORGANIC COMPOUNDS

The results of the Semi-Volatile Organic Compound analysis are presented in **Table 4.6**.

There are no GTVs for individual SVOC parameters. No SVOCs were detected above the relevant IGVs during this monitoring period, consistent with the results from the 2015 and 2014 monitoring periods.

The Quarter 3 2013 monitoring event detected two SVOC compounds, Acenaphthene (1.1 µg/l) and Fluorene (1.5 µg/l) in MW03. Prior to this detection the Quarter 2 monitoring event of 2012 detected concentrations of Naphthalene and Acenaphthylene in MW03 at concentrations of 2.4 µg/l and 0.12 µ/l respectively.

5.6 RESULTS OF VOLATILE ORGANIC COMPOUNDS

The results of the Volatile Organic Compound analysis are presented in **Table 4.7**. The results of the current Quarter 2 2016 monitoring event indicate that Vinyl Chloride was detected above the GTV of 0.375 µg/l at MW03 (0.6 µg/l) and MW04 (0.9 µg/l). Chloroethane in MW01 (1.1 µg/l) and 1,1-dichloroethene in MW03 (1.7 µg/l) and MW04 (3.6 µg/l) were also detected. However, the results are below the IGV for 1,1-dichloroethene (30 µg/l) and there is no GTV or IGV limit for Chloroethane. All other compounds were below their respective laboratory limits of detection.

Historic groundwater monitoring events detected some parameters above the laboratory limit of detection in November 2009, corresponding to Quarter 4 of 2009. Historically 1,1-Dichloroethane, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, MTBE, n-butylbenzene, n-propylbenzene, o-xylene, p-isopropyltoluene, sec-butylbenzene and tert-butylbenzene were detected above the laboratory limits of detection.

The results of the Quarter 3 and Quarter 4 monitoring events of 2009 and all subsequent monitoring events indicate that there were no exceedances of the GTVs or IGVs for specific parameters.

5.7 RESULTS OF TOTAL PETROLEUM HYDROCARBONS

In order to provide a more accurate profile of TPH within the groundwater, speciated hydrocarbon analysis using the Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG) method was carried out on samples taken at all boreholes. The results of the TPH analysis are presented in **Table 4.8**.

The EPA IGV of 10 µg/l for the Total Hydrocarbons is deemed comparable with the results for Total Petroleum Hydrocarbons. Some detections of TPH in both the aliphatic and aromatic range were observed during the current Quarter 2 2016 monitoring event. Detections in samples from the well BH103 were in the aliphatic range C16-C35 (150 µg/l) and in the aromatic range C21-C35 (57 µg/l) and from well MW04 in the aromatic range C12-C16 (20 µg/l).

The previous Quarter 1 monitoring event of 2016 detected TPH in the aliphatic range C16-C35 (132 µg/l) at BH103 and in the aliphatic range C12-C16 (15 µg/l) at MW04.

The Quarter 4 monitoring event of 2015 detected TPH in the aromatic ranges C12-C16 (879 µg/l), C16-C21 (1380 µg/l) and C21-C35 (694 µg/l) at BH104B, C21-C35 at BH103 (60 µg/l) and C10-C12 (13 µg/l) and C12-C16 (21 µg/l) at MW04. TPH concentrations were detected in the aliphatic ranges C10-C12 (495 µg/l), C12-C16 (3080 µg/l) and C16-C35 (3360 µg/l) at BH104B and C16-C35 (231 µg/l) and C35-C44 (14 µg/l).

The Quarter 3 monitoring event of 2015 detected TPH in the aromatic ranges C12-C16 (39 µg/l), C16-C21 (37 µg/l) and C21-C35 (28 µg/l) at BH104B, C21-C35 at BH103 (17 µg/l) and C10-C12 (18 µg/l) and C12-C16 (29 µg/l) at MW04. TPH concentrations were detected in the aliphatic ranges C10-C12

(13 µg/l), C12-C16 (40 µg/l) and C16-C35 (62 µg/l) at BH104B and C16-C35 at BH103 (72 µg/l) and MW03 (14 µg/l).

The Quarter 2 monitoring event of 2015 detected TPH in the aromatic range C21-C35 at BH03 (509 µg/l). TPH concentrations were detected in the aliphatic ranges C16-C35 at BH103 (1760 µg/l) and BH104B (337 µg/l), and C12-C16 at BH104B (225 µg/l).

The Quarter 1 monitoring event of 2015 detected TPH in the aromatic ranges C12-C16 at wells MW03 (14 µg/l), MW04 (15 µg/l) and BH104B (27 µg/l), C16-C21 at BH104B (15 µg/l), and C21-C35 (14 µg/l) at BH103. TPH concentrations were detected in the aliphatic ranges C16-C35 and C35-C44 at MW03 (46 µg/l and 12 µg/l respectively), BH103 (54 µg/l) and BH104B (11 µg/l.

No detections of TPH in the aliphatic or aromatic range were observed in any shallow or deep monitoring well locations during the Quarter 4 monitoring event of 2014.

The Quarter 3 monitoring event of 2014 detected TPH concentrations in the aliphatic range at the shallow groundwater well BH104B. The TPH concentration detected was 410 µg/l. The speciated TPH ranges that contributed to the value of 410 µg/l were C12-C16 (150 µg/l), C16-C21 (250 µg/l) and C31-C35 (10 µg/l).

The Quarter 3, 2013 monitoring event detected TPH in the aliphatic range in one deep groundwater well, MW03. TPH of the range C10-C12 and C12-C16 were detected at concentrations of 200 µg/l and 190 µg/l respectively.

The Quarter 1, 2013 monitoring event detected aliphatic TPH of the range C12-C16, C16-C21 and C21-C35. TPH in the mid to high aromatic ranges were detected in BH103, BH104B and MW04 during the previous Quarter 1 2013 monitoring event. Aromatic TPH of the ranges C12-C16, C16-C21 and C21-C35 were detected in BH103, the ranges C10-C12, C12-C16 and C16-C21 were detected in BH104B and aromatic TPH of the ranges C10-C12 and C12-C16 were detected in MW04.

The Quarter 2 monitoring event of 2012 detected elevated TPH of the aliphatic range C12-C16, C16-C21 and C21-C25 in BH103. Hydrocarbons have been detected in borehole MW03 during Quarter 1 2010, in borehole BH104B during the Quarter 2 2010 monitoring event and in borehole BH104B and MW03 during the Quarter 3 2010 monitoring events. Hydrocarbons have also been detected in BH103, BH104B and MW03 in the Quarter 2 2011 monitoring event and in MW03 in the Quarter 3 and Quarter 4 2011. These detections are discussed further in **Section 6.2.3**.

6 HISTORICAL RESULTS & TRENDS

Time series plots are presented in this section and include the results of the Quarter 2 2016 monitoring round. As the monitoring continues in accordance with the Industrial Emissions Licence requirements, the plots will be updated with the results of subsequent rounds and used to illustrate the results.

6.1 GROUNDWATER LEVELS OVER TIME

Figure 6.1 to **Figure 6.3** below illustrates the manually recorded water levels using an electronic probe. The graphs show that groundwater levels can vary considerably between monitoring rounds.

Figure 6.2 illustrates groundwater elevations (mAOD) in shallow groundwater wells (BH101 to BH104B) ranging between approximately 98 mAOD and 102 mAOD.

Figure 6.3 illustrates groundwater elevation (mAOD) in the deeper groundwater wells (MW01 to MW03). The groundwater elevation (mAOD) for these deeper groundwater wells ranges from approximately 97.5 mAOD to approximately 100 mAOD.

Figure 6.1 – Ground Elevation (mAOD) in all Monitoring Wells

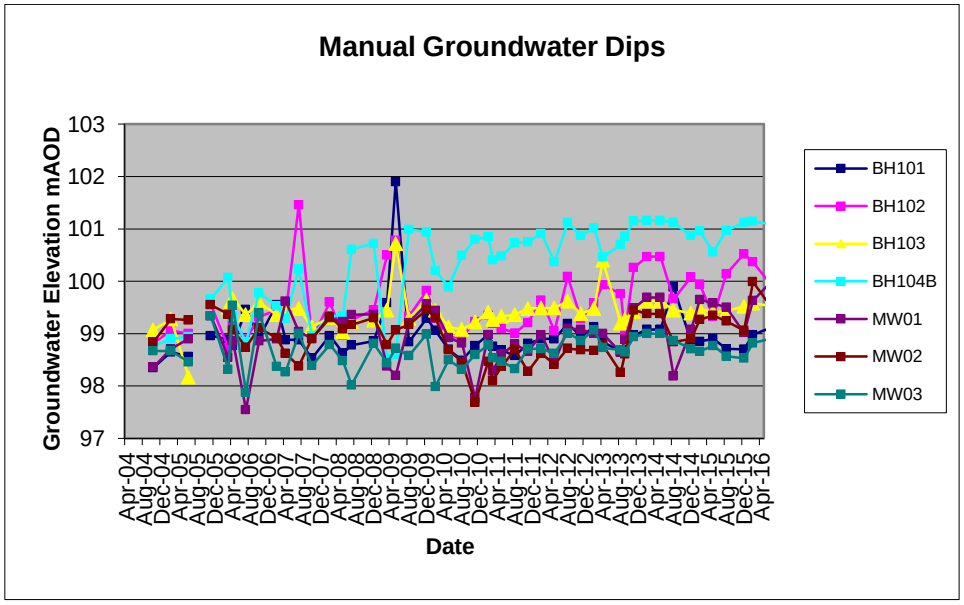


Figure 6.2 – Ground Elevation (mAOD) in Shallow Groundwater Monitoring Wells

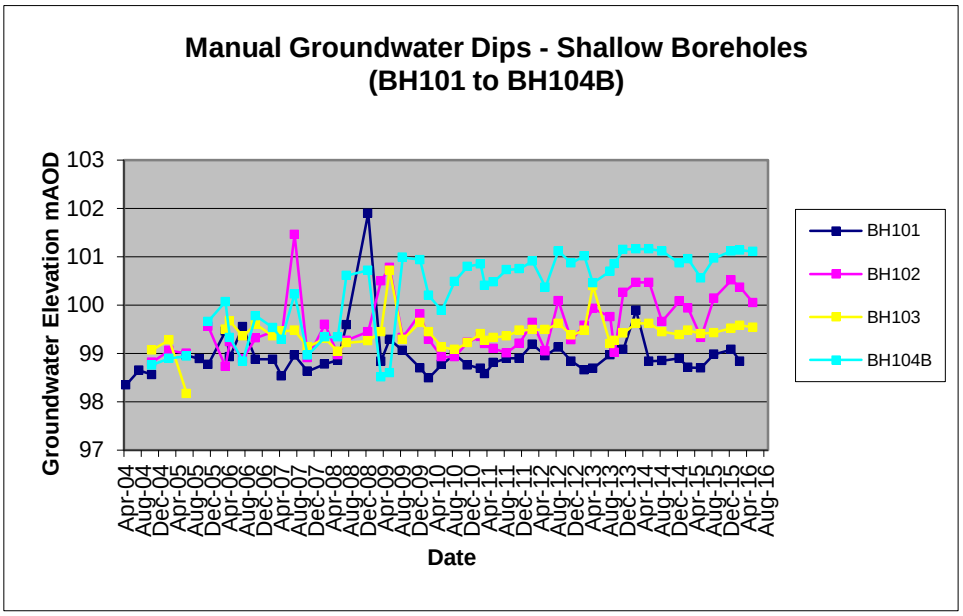
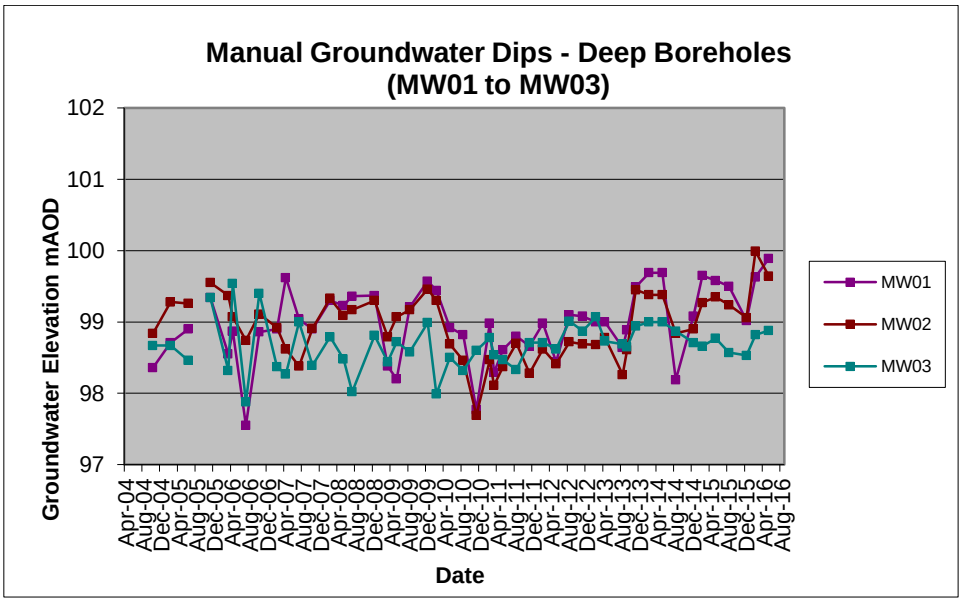


Figure 6.3 – Ground Elevation (mAOD) in Deep Groundwater Monitoring Wells



The groundwater levels generally show a similar pattern of fluctuation over time indicating a degree of connection between boreholes. The graphs demonstrate that groundwater levels can vary considerably between monitoring rounds; the general direction of flow in the shallow and deeper groundwater bearing unit is in an easterly or north easterly direction however there have been some occasional historic cases of groundwater flowing in a south-easterly direction.

In addition, monthly rainfall data for Oak Park, Carlow have been tabulated from Met Éireann to examine the relationship between compounds and rainfall events. The data from Oak Park was chosen as the weather station at Birr, Co. Offaly closed in October 2009. A summary of the rainfall data is in **Tables 6.1** to **6.5**.

Table 6.1 – Monthly Rainfall Data for Year 2012 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	70.8	24.5	18.0	56.3	50.2	155.8	76.2	127.7	37.9	63.4	80.9	68.1

Table 6.2 – Monthly Rainfall Data for Year 2013 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	76.2	35.8	57.6	44.4	35.6	37.5	32.3	85.6	24.4	170.0	27.7	136.6

Table 6.3 – Monthly Rainfall Data for Year 2014 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	147.2	176.7	65.0	52.6	78.6	61.9	24.6	122.1	18.2	138.2	165.6	47.7

Table 6.4 – Monthly Rainfall Data for Year 2015 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Rainfall (mm)	66.0	36.3	53.5	26.3	89.4	29.7	79.4	83.0	17.9	56.8	110.0	270.9

Table 6.5 – Monthly Rainfall Data for Year 2016 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	Jun
Rainfall (mm)	110.9	95.7	40.6	64.3	61.6	61.7

6.2 GROUNDWATER CONCENTRATIONS OVER TIME

Groundwater quality trends have previously been examined in two reports (URS 2005 and RPS 2007). In addition, RPS carried out a groundwater risk assessment (Ref: MDE0788RP0001, dated November 2008) in which the general trend of contaminant concentrations over time was observed to be erratic with compounds rarely being detected in the same borehole on two consecutive monitoring rounds.

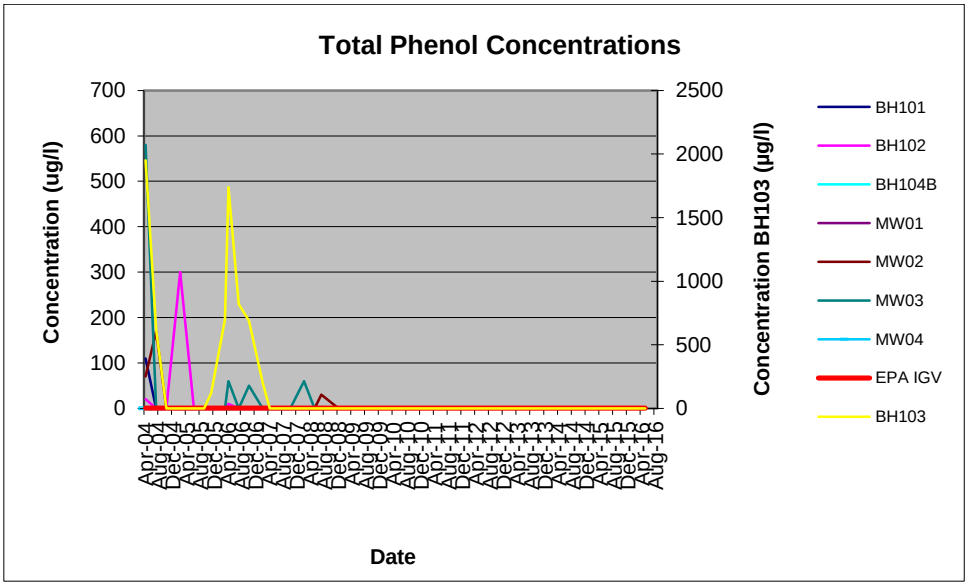
The data available within these reports has been reviewed and time series plots of key parameters have been compiled based on notable trends. Trends for phenols, petroleum hydrocarbons and chlorinated solvents have been plotted as outlined in the following sections.

6.2.1 Phenols

Phenols have been detected historically in all boreholes with the highest concentrations recorded in BH103. However concentrations in BH103 have declined since April 2007. Phenol concentrations have since been recorded below the IGV of 0.5 µg/l in all monitoring wells since December 2008 indicating natural attenuating conditions within the groundwater.

2,4-Dimethylphenol was detected at a concentration of 0.12 µg/l during the Quarter 1, 2010 monitoring event. There is no recommended IGV for this parameter. Subsequent to the Quarter 1 2010 monitoring event no detections of phenols have been noted at any monitoring location up to and including the current Quarter 1 2016 monitoring event.

Figure 6.4 – Phenol Concentrations in all Monitoring Wells



6.2.2 Polyclyclic Aromatic Hydrocarbons

Figure 6.5 below illustrates that PAHs (Polycyclic Aromatic Hydrocarbons) have previously been detected within all monitoring wells above the recommended EPA IGV of 0.1 µg/l. Historically the highest concentrations have been detected within MW03 and BH104B, with the highest concentration detected in March 2006 (107 µg/l) and in October 2007 (19.72 µg/l) respectively. In addition, a range of PAHs including Benzo(a)pyrene, Benzo(g,h,i)perylene, Indeno(1,2,3)cd pyrene, Fluoranthene and Naphthalene have previously been detected in MW03 with **Figures 6.6** to **6.10** illustrating some of the PAH compounds which were detected above their respective IGVs.

Since 2007 concentrations of PAH have shown a marked decrease and since 2010 detections of PAH have been confined to MW03, MW02 and BH104B. Concentrations of Total PAH above the IGV in 2010 were detected during the Quarter 1 monitoring event in MW03 (0.3 µg/l), Quarter 2 monitoring event in BH104B (1.2 µg/l) and Quarter 3 monitoring event in MW02 (2.0 µgl) and BH104B (0.2 µgl). There were no elevated concentrations of Total PAH during the Quarter 4 2010 monitoring event.

No Total PAH detections were recorded throughout 2011 and in Q1 of 2012. Total PAH was detected above the IGV in MW03 in the Q2 2012 monitoring event. No Total PAH exceedances were detected from Quarter 3 2012 to Quarter 4 2013 inclusive. Total PAHs were detected at a concentration of 2.62 µg/l in MW03 during the Q3 2013 monitoring event however; no detections above the laboratory limit were noted during the subsequent monitoring events up to and including the Quarter 2 2015 monitoring event. Total PAHs were also above the GTV at BH103 (0.093 µg/l), BH104B (0.159 µg/l) and MW03 (0.586 µg/l) during Quarter 3 2015, at BH103 (0.21 µg/l), MW03 (0.986 µg/l) and MW04 (0.079 µg/l) during Quarter 4 2015, and at BH103 (0.123 µg/l), BH104B (0.159 µg/l) and MW04 (0.153 µg/l) during the previous Quarter 1 2016 monitoring event. Similarly during the Quarter 2 2016 monitoring event, Total Polyaromatic Hydrocarbons were above the IGV limit of 0.1 µg/l at BH103 (0.111 µg/l).

Figure 6.5 – PAH (Total) Concentrations in all Monitoring Wells

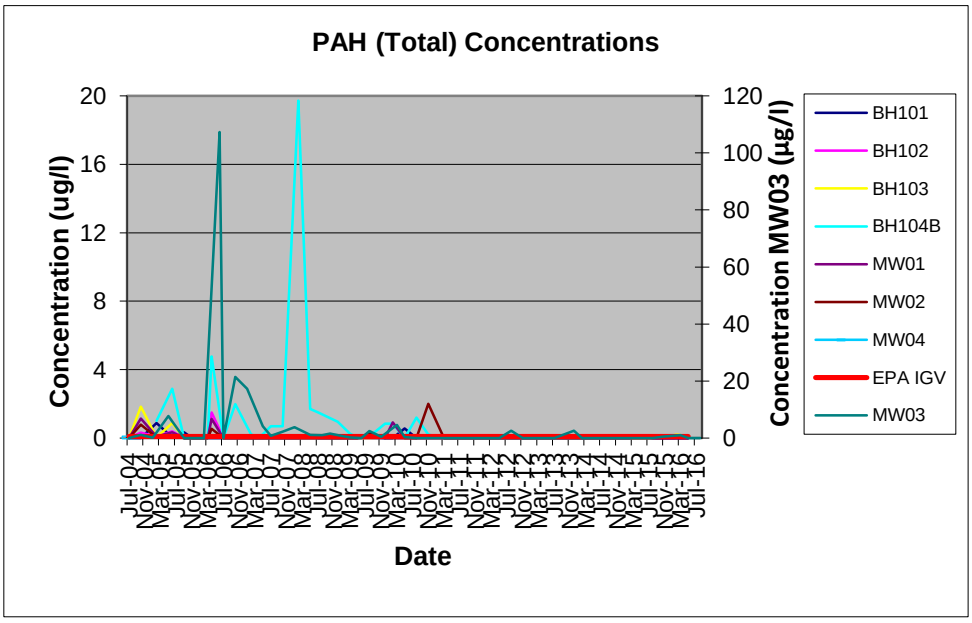


Figure 6.6 – Fluoroanthene Concentrations in all Monitoring Wells

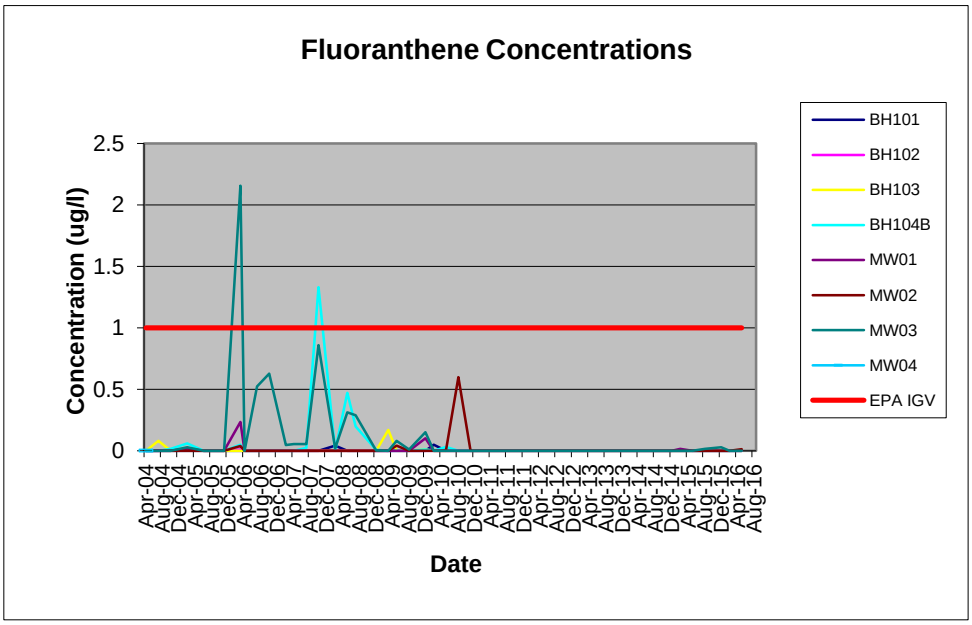
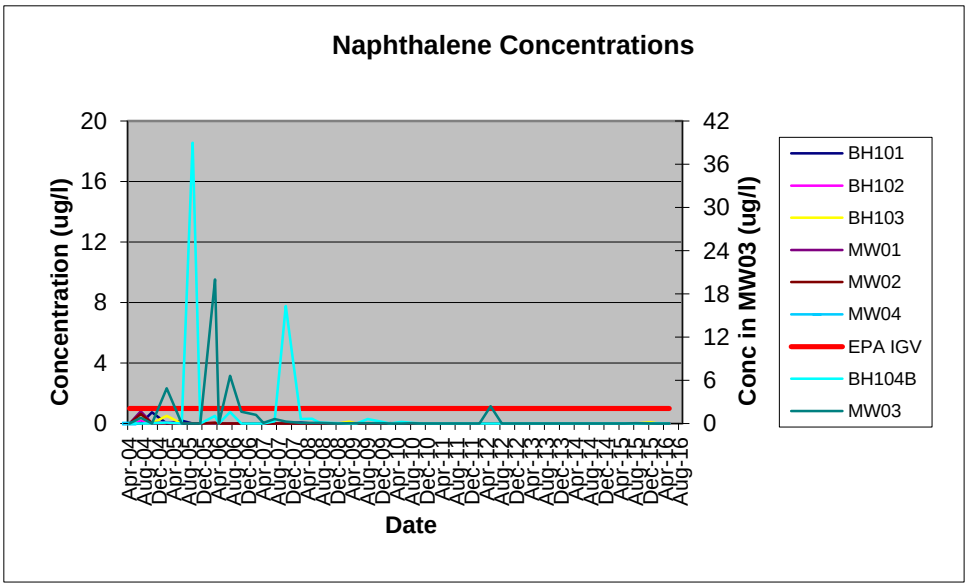


Figure 6.6 illustrates that **Fluoranthene** was previously detected above the IGV of 1.0 µg/l in groundwater monitoring wells BH104B (October 2007, 1.33 µg/l) and MW03 (March 2006, 2.158 µg/l) only. The remaining monitoring wells recorded concentrations below the IGV of 1.0 µg/l.

Figure 6.7 – Naphthalene Concentrations in all Monitoring Wells



A similar trend to Fluoroanthene has been noted in **Figure 6.7**, with concentrations of **Naphthalene** recorded above the IGV of 1.0 µg/l in BH104B and MW03 only. 4 no. exceedances of the IGV were noted in BH104B in September 2005 (39 µg/l), March 2006 (1.069 µg/l), July 2006 (1.594 µg/l) and October 2007 (16.31 µg/l). Since October 2007, the concentrations in BH104B have decreased below the IGV. There have been 6 exceedances of the IGV of 1.0 µg/l in MW03, with the highest concentration detected in March 2006 (19.986 µg/l) and the most recent being the detected in the Quarter 2 2012 monitoring event (2.4 µg/l). The concentrations detected in August 2010 were slightly above the laboratory limit of detection of 0.01 µg/l at BH104B (0.08 µg/l) and MW03 (0.05

µg/l); however these levels are deemed low. Concentrations of Naphthalene were below the EPA IGV limit of detection of 1.0 µg/l at all locations during the Quarter 4 2010, the 2011 and 2012 quarterly monitoring events and the Quarter 1 to Quarter 3 2014 monitoring periods, inclusive. No detections of Naphthalene were noted from the Quarter 4 2014 monitoring event to the Quarter 2 2015 monitoring event. Naphthalene was detected at BH101 (0.011 µg/l) and MW03 (0.031 µg/l) during Quarter 3 2015, and at BH103 (0.095 µg/l) and at MW04 (0.067 µg/l) during Quarter 4 2015. Naphthalene was also detected during the previous Quarter 1 2016 monitoring event at BH104B (0.034 µg/l) and MW04 (0.153 µg/l). These detections, however, were all below the IGV limit of detection of 1.0 µg/l. Concentrations of Naphthalene were below the laboratory limit of detection at all locations during the current Quarter 2 2016 monitoring event.

Figure 6.8 – Benzo (g,h,i) perylene Concentrations

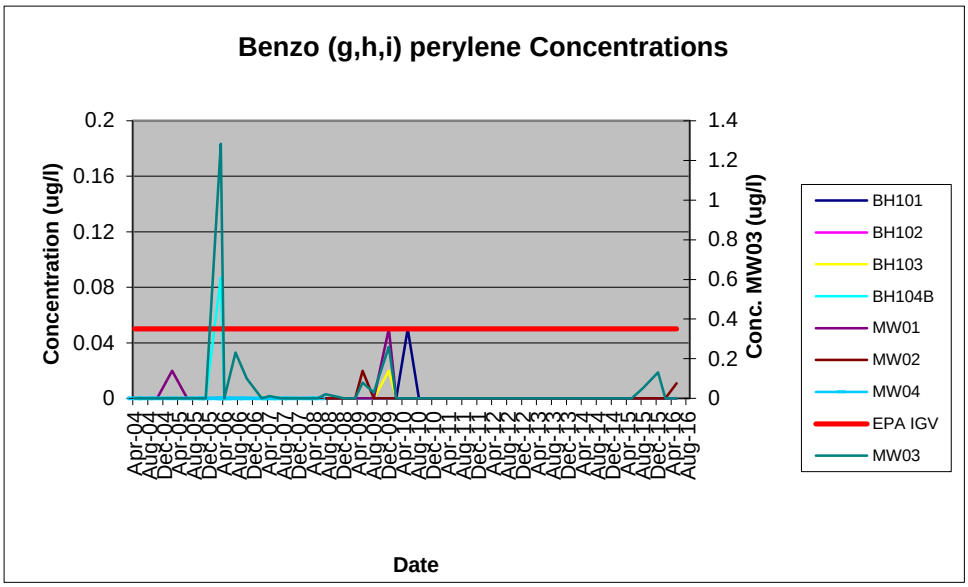


Figure 6.8 illustrates the concentrations of **Benzo(g,h,i)perylene** in all monitoring wells over time. Elevated concentrations above the IGV were recorded at BH104B (0.087 µg/l) on one occasion in March 2006.

Figure 6.9 illustrates elevated concentrations above the IGV recorded at MW03 on 6 no. occasions with the most recent elevated concentration recorded during the Quarter 4 2015 monitoring event (0.053 µg/l). The previous elevated concentration detected was in Quarter 3 2015 (0.053 µg/l). The results of all monitoring events from 2010 to the Quarter 2 2015 monitoring event recorded concentrations below the laboratory limit of detection of 0.01 µg/l at all locations. Concentrations were also below the laboratory limit of detection at all locations during the previous Quarter 1 2016 monitoring event.

Figure 6.9 – Benzo (g,h,i) perylene in Monitoring Wells BH104B & MW03

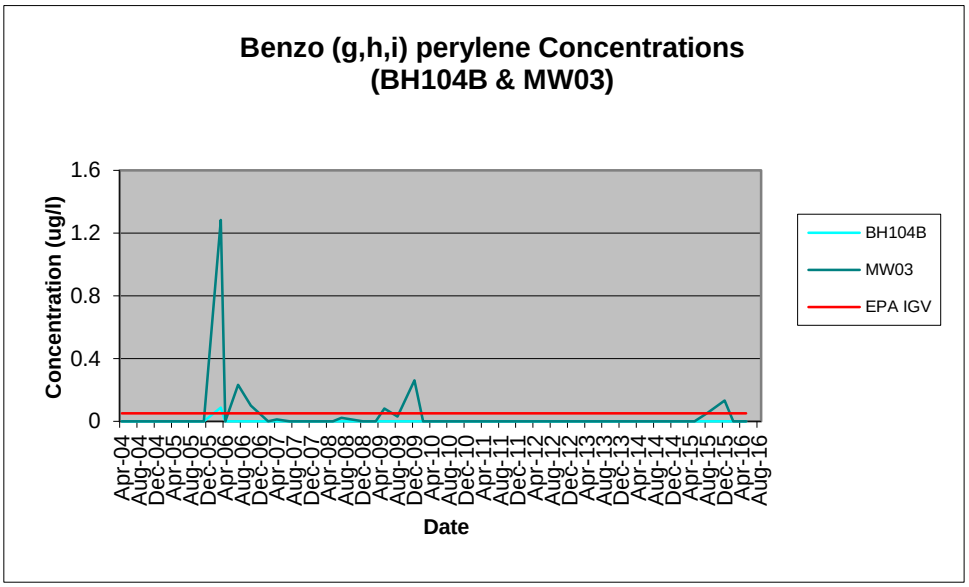
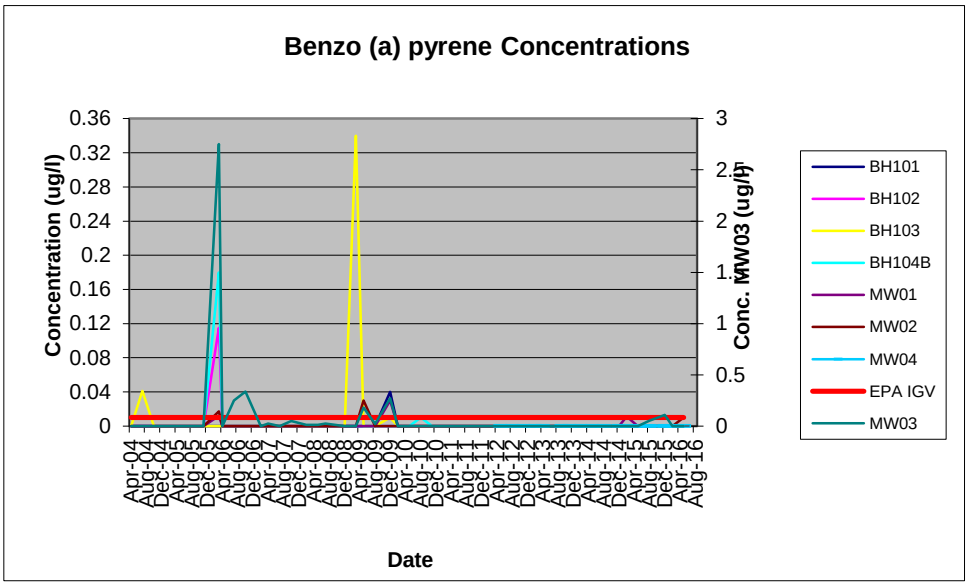


Figure 6.10 illustrates the concentrations of **Benzo(a)pyrene** in all groundwater monitoring wells and indicates that Benzo(a)pyrene has been detected historically in all boreholes above the IGV of 0.01 µg/l. Similarly with the above mentioned trends, the highest concentrations have been detected in MW03 and BH104B. Concentrations have markedly decreased since March 2006 when an elevated concentration of 2.751 µg/l was detected in MW03, however there have been a number of detections above the IGV, with the most recent elevated level detected in December 2009. Elevated concentrations above the IGV were recorded in BH101, BH103 and MW01 during this same period.

The slightly higher concentrations of Benzo(g,h,i)perylene and Benzo(a)pyrene detected in Quarter 4, 2009 may be attributed to heavy rainfall, which occurred in November of 2009 and as a result possibly mobilized traces of these compounds from the soil. The static water levels for December 2009 ranged between 0.58 and 3.78 mbgl. Since December 2009, concentrations of compounds have notably decreased to below the IGVs.

Benzo(a)pyrene was detected above the IGV limit of 0.01 µg/l at MW03 (0.108 µg/l) during the Quarter 4 2015 monitoring event. Benzo(a)pyrene was also detected above the IGV at MW03 (0.052 µg/l) during the Quarter 3 2015 monitoring event. All other results of all monitoring events from 2010 to the current Quarter 2 2016 monitoring event did not detect other concentrations above the IGV.

Figure 6.10 – Benzo (a) pyrene Concentrations in all Monitoring Wells

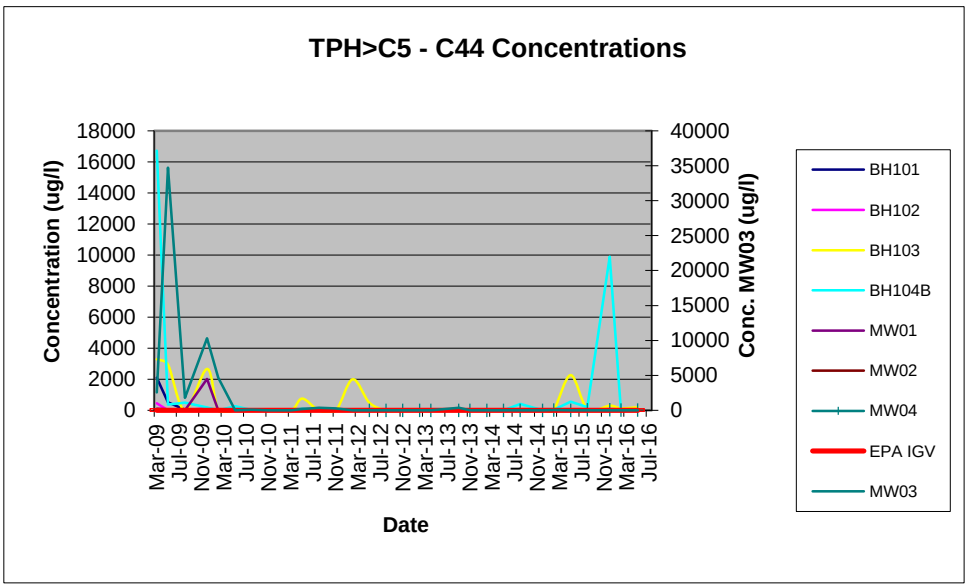


6.2.3 Petroleum Hydrocarbons (TPH)

Historically **Total Petroleum Hydrocarbons (TPH)** including mineral oil, petrol range organics (PRO) and diesel range organics (DRO) have been detected within BH103, BH104B and MW03. Since 2009, speciated hydrocarbon analysis using the Total Hydrocarbon Criteria Working Group (TPHCWG) method has been carried out on all samples to obtain a more accurate profile of TPH within groundwater.

The results of the TPHCWG analysis has indicated that the predominant hydrocarbons detected are in the heavier chain carbon fractions, most notably in the carbon range C12-C16, C16-C21 and C21-C35. **Figure 6.11** illustrates the TPH analysis for the total TPH analysis from C5-C44 in all monitoring wells since 2009. The highest concentrations detected historically are at monitoring wells MW03, BH104B and BH103 respectively.

Figure 6.11 – TPH (Carbon Range C5-C44) in all Monitoring Wells



Previous quarterly monitoring reports have outlined the hydrocarbon trends recorded in each well since 2010. This report outlines the trends from 2012 up to and including the current monitoring report.

During the Quarter 1, 2012 monitoring event, hydrocarbons were detected in borehole BH103 only. The predominant aliphatic carbon range comprised C10-C12 (13 µg/l), C12-C16 (270 µg/l), C16-C21 (690 µg/l) and C21-C35 (980 µg/l). The predominant aromatic carbon range comprised of C16-C21 (250 µg/l) and C21-C25 (680 µg/l).

During the Quarter 2, 2012 monitoring event, hydrocarbons were detected in BH103 only. The detected aliphatic carbon range comprised C12-C16 (98 µg/l), C16-C21 (230 µg/l) and C21-C25 (170 µg/l). No detections of aromatic carbons were measured during the Quarter 2 2012 monitoring event.

No hydrocarbons were detected at any location during the Quarter 3 and Quarter 4, 2012 monitoring events.

During the Quarter 1, 2013 monitoring event aromatic hydrocarbons were detected in BH103, BH104B and MW04. The predominant aromatic carbon range comprised C12-C16 (30 µg/l), C16-C21 (280 µg/l) and C21-C35 (100 µg/l) in BH103, C10-C12 (30 µg/l), C12-C16 (110 µg/l) and C16-C21 (80 µg/l) in BH104B and C10-C12 (20 µg/l) and C12-C16 (80 µg/l) in MW04. Aliphatic hydrocarbons were detected in BH103 in the ranges C12-C16 (70 µg/l), C16-C21 (100 µg/l) and C21-C35 (90 µg/l).

During the Quarter 2, 2013 monitoring event no aliphatic or aromatic hydrocarbons were detected at any location.

During the Quarter 3, 2013 monitoring event, hydrocarbons of the aliphatic range were detected in MW03 only. The detected aliphatic carbon range comprised C10-C16 (290 µg/l) and C12-C16 (190 µg/l). No detections of aromatic carbons were measured during the Quarter 3 2013 monitoring event.

Total Petroleum Hydrocarbons were not detected at any monitoring location during the Quarter 4, 2014 monitoring event. During the monitoring event for Quarter 3 2014 following ranges of the aliphatic hydrocarbons were recorded for BH104B; C12-C16 (150 µg/l), C16-C21 (250 µg/l) and C21-C35 (10 µg/l).

During the Quarter 1 2015 monitoring event, hydrocarbons were detected in MW03, MW04, BH103 and BH104B. The predominant aromatic carbon range comprised C21-C35 (14 µg/l) in BH103, C12-C16 (27 µg/l) and C16-C21 (15 µg/l) in BH104B, C12-C16 (14 µg/l) in MW03 and C12-C16 (15 µg/l) in MW04. Aliphatic hydrocarbons were detected in the ranges C16-C35 (54 µg/l) in BH103, C16-C35 (11 µg/l) in BH104B and C16-C35 (46 µg/l) and C35-C44 (12 µg/l) in MW03.

During the Quarter 2 2015 monitoring event, the TPH concentration in the aromatic C21-C35 range was detected at one shallow groundwater wells BH103 (509 µg/l). The TPH concentration in the aliphatic range was detected at C16-C35 (1760 µg/l) in BH103 and C12-C16 (225 µg/l) and C16-C35 (11 µg/l) in BH104B.

The Quarter 3 monitoring event of 2015 detected TPH in the aromatic ranges C12-C16 (39 µg/l), C16-C21 (37 µg/l) and C21-C35 (28 µg/l) at BH104B, C21-C35 at BH103 (17 µg/l) and C10-C12 (18 µg/l) and C12-C16 (29 µg/l) at MW04. TPH concentrations were detected in the aliphatic ranges C10-C12 (13 µg/l), C12-C16 (40 µg/l) and C16-C35 (62 µg/l) at BH104B and C16-C35 at BH103 (72 µg/l) and MW03 (14 µg/l).

The Quarter 4 monitoring event of 2015 detected TPH in the aromatic ranges C12-C16 (879 µg/l), C16-C21 (1380 µg/l) and C21-C35 (694 µg/l) at BH104B, C21-C35 at BH103 (60 µg/l) and C10-C12 (13 µg/l) and C12-C16 (21 µg/l) at MW04. TPH concentrations were detected in the aliphatic ranges C10-C12 (495 µg/l), C12-C16 (3080 µg/l) and C16-C35 (3360 µg/l) at BH104B and C16-C35 (231 µg/l) and C35-C44 (14 µg/l) at BH103.

For the previous Quarter 1 2016 monitoring event, TPH was detected in samples from the well BH103 were in the aliphatic range C16-C35 (132 µg/l) and from well MW04 in the aromatic range C12-C16 (15 µg/l).

During the current Quarter 2 2016 monitoring event, TPH was detected in samples from the well BH103 were in the aliphatic range C16-C35 (150 µg/l) and in the aromatic range C21-C35 (57 µg/l) and from well MW04 in the aromatic range C12-C16 (20 µg/l).

7 CONCLUSIONS

- In accordance with the criteria set out in Schedule 4(ii) of the site's Industrial Emissions Licence Register No. W0184-01, groundwater monitoring was carried out at the ENVA Ireland site on the 25th May 2016 corresponding to Quarter 2 of 2016. Samples were collected at 8 groundwater monitoring wells during this event.
- The results presented have been referenced against Groundwater Threshold Values (GTVs) outlined in the European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. no 9 of 2010), where available. Where GTVs are not available for parameters, results are compared against the Interim Guideline Values (IGVs) set out in the Environmental Protection Agency interim report, 'Towards Setting Guideline Values for the Protection of Groundwater in Ireland'.
- Results of the BTEX and MTBE demonstrate that the levels of Toluene, Ethylbenzene and Xylene, Benzene and MTBE were all below the recommended EPA IGVs.
- The Quarter 1 2016 results of the speciated polycyclic aromatic hydrocarbons indicate that Total PAHs were below the EPA IGV of 0.1 µg/l at all monitoring wells with the exception of BH103 (0.111 µg/l).
- Vinyl Chloride was detected above the GTV of 0.375 µg/l at MW03 (0.6 µg/l) and MW04 (0.9 µg/l). Chloroethane in MW01 (1.1 µg/l) and 1,1-dichloroethene in MW03 (1.7 µg/l) and MW04 (3.6 µg/l) were also detected. However, the results are below their respective limits. All other VOCs and SVOCs were below their respective laboratory limits of detection
- Samples were analysed for speciated phenols to include chlorophenols and the results indicate that there were no detections above the laboratory limits of detection.
- For the current Quarter 2 2016 monitoring event, TPH detections in samples from the well BH103 were in the aliphatic range C16-C35 (150 µg/l) and in the aromatic range C21-C35 (57 µg/l), and from well MW04 in the aromatic range C12-C16 (20 µg/l). Hydrocarbons in the aliphatic range C16-C35 (132 µg/l) at BH103 and the aromatic range C12-C16 (15 µg/l) at MW04 were observed during previous Quarter 1 2016 monitoring event. Concentrations in the aliphatic ranges C10-C12 (495 µg/l), C12-C16 (3080 µg/l) and C16-C35 (3360 µg/l) as well as in the aromatic ranges C12-C16 (879 µg/l), C16-C21 (1380 µg/l) and C21-C35 (694 µg/l) were detected at BH104B during the Quarter 4 2015 monitoring event. Also in Quarter 4 2015, TPH concentrations were recorded in the aliphatic ranges C16-C35 (231 µg/l) and C35-C44 (14 µg/l) at BH103 and aromatic ranges C21-C35 (60 µg/l) at BH103 and C10-C12 (13 µg/l) and C12-C16 (21 µg/l) at MW04. During Quarter 3 2015, TPH concentrations were also recorded in the aromatic ranges at BH103, BH104B and MW04, as well as in the aliphatic ranges at BH103, BH104B and MW03. Hydrocarbons were detected at BH104B in the aliphatic range and BH103 in both the aromatic and aliphatic ranges during the Quarter 2 2015 monitoring event, as well as MW04 in the aromatic range and BH103, BH104B and MW03 in both the aromatic and aliphatic ranges during Quarter 1 2015. Hydrocarbons were not detected in any monitoring location during the Quarter 4 2014 monitoring event.
- The general trend of contaminant concentrations over time continues to be somewhat variable with compounds not being continually detected in the same borehole on two or three consecutive monitoring rounds. In general, the contaminant levels detected at the Enva facility appear to indicate reducing contaminant concentrations over time with infrequent elevations in some parameters. Further monitoring is recommended to confirm these reductions.

Enva Portlaoise

2016 Groundwater Compliance Monitoring Quarter 3 (July – Sept 2016)

Document Control Sheet

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1 INTRODUCTION

1.1 BACKGROUND

RPS has been commissioned by Enva Ireland Ltd (Enva) to carry out groundwater quality monitoring for environmental compliance, at their facility in the Clonminam Industrial Estate, Portlaoise, Co Laois. Groundwater monitoring has being carried out in strict accordance with criteria set out in Schedule 4(ii) of the site's Industrial Emissions Licence, Register No. W0184-01.

Enva Ireland has been operating under Waste Licence Register No. W0184-01 since January 2004. The licence was amended by the Environmental Protection Agency in December 2013 to conform to the provisions and requirements of the Council Directive 2010/75/EU (Industrial Emissions Directive) and as such is deemed an Industrial Emissions Licence. Enva is required to submit a report to the EPA on a quarterly basis, outlining the existing groundwater quality underlying the site.

A suitably qualified environmental consultant from RPS, collected groundwater samples from a series of 8 monitoring wells (BH101, BH102, BH103, BH104B, MW01, MW02, MW03, MW04) within the site boundary on the 31st of August 2016. The samples underwent laboratory analysis for the suite of parameters specified in Schedule 4(ii) of Industrial Emissions Licence W0184-01. This report outlines the results of the Quarter 3 monitoring for 2016 and reviews historical data recorded at the site.

1.2 OBJECTIVES & SCOPE OF WORK

The specific objectives and scope of work are as follows:

- Review of previous data as provided by Enva Portlaoise;
- Graphical presentation of key compounds and trends; and
- Discussion of results for Quarter 3 2016 within the context of previous results and available guideline concentrations.

2 REVIEW OF PREVIOUS DATA

2.1 INFORMATION SOURCES

The following documents were reviewed as part of this project:

- Industrial Emissions Licence W0184-01 and any available EPA documents from the EPA website;
- Quarterly Groundwater Monitoring Reports (Quarter 1 2004 to Quarter 4 2005), URS;
- Quarterly Groundwater Monitoring Reports (Quarter 1 2006 to Quarter 4 2015), RPS;
- Summary Report on Trend of Contaminant Levels at Enva Ireland Ltd since 2005, Ref: MDE0647RP0001, RPS (2007);
- Groundwater Risk Assessment, Ref: MDE0788Rp0001, RPS (2008);
- Hydrogeological Review and Assessment Report, Ref MDE0973Rp0017F01, RPS (2014);
- Baseline Environment Report, Ref: MDE0973Rp0104; and
- Quarter 1 Groundwater Monitoring Report, RPS (2016).
- Quarter 2 Groundwater Monitoring Report, RPS (2016).

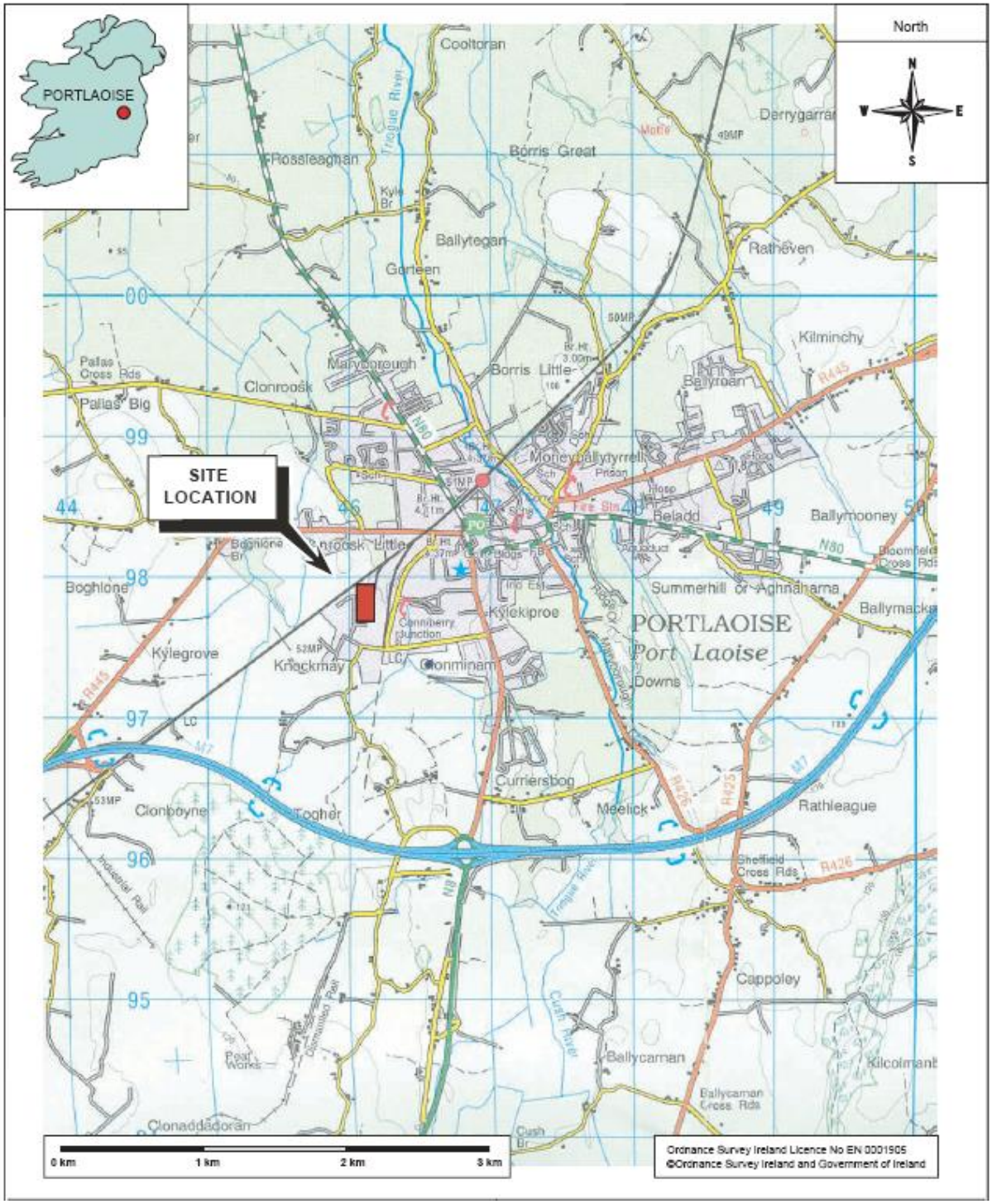
2.2 SITE SETTING

The site is located to the southwest of the town of Portlaoise immediately to the south of the Dublin to Cork railway line. The general area is gently undulating. The site slopes gently to the southwest but to the east of the site the ground slopes gently towards the River Triogue, which is located approximately 1.5 km to the east. The site occupies an area of approximately 1.5 hectares and comprises of an operational waste oil and contaminated soil treatment plant.

The site is located on the outskirts of Portlaoise in an area of agricultural and light industrial development. The site is bounded to the north and east by land belonging to Irish rail, comprising sidings and general storage areas. To the south is a vehicle repair garage, which is elevated above the level of the site by approximately 1.5 m. To the west the site is adjoined by further industrial land, as well as residential land. The site location is presented on **Figure 2.1**.

The site has been in operation since 1978, and the layout has remained relatively consistent. The site layout is presented on **Figure 3.1**. The site is largely covered in hardstanding with some open areas in the far north and northeast of the site. All oil and soil storage areas are suitably bunded and the general standard of housekeeping is good.

Figure 2.1 – Site Location



2.3 REGIONAL SETTING

2.3.1 Geology

The Geological Survey of Ireland indicates that the regional geology of Portlaoise is typified by Carboniferous Limestone. In the vicinity of the site itself the solid geology comprises the Ballysteen Formation, a micaceous-bioclastic limestone. This well-bedded limestone, with interbeds of shale, is extensively folded, with axes trending north-east to south-west, and becomes increasingly muddy towards the top of the formation. North-east to south-west trending faults are found in the region, with one located approximately 500m to the east of the site. The subsoils in the region comprise mainly Made Ground, around the industrial area, and Limestone Till in the surrounding regions.

2.3.2 Hydrogeology

The limestone is classified by the Geological Survey of Ireland (GSI) as a Locally Important Karstified Aquifer (Ll). Porosity is predominantly in the form of fractures, in this aquifer, however the muddy nature of this formation greatly reduces permeability. Vulnerability of this aquifer beneath the site is classified as high, with moderate vulnerability to the east of the site.

The public water supply for Portlaoise is derived from groundwater, utilising three groundwater abstraction well fields comprising of two abstraction wells in each well field. This supply currently comes from the Straboe area, approximately 5.5 km to the north-east of the site. The source protection zone for this water supply extends to within 3.2 km of the Enva site but does not encompass the Enva site.

The GSI record a number of other dug wells and boreholes within the Portlaoise area, including the boreholes installed on the site. The accuracy of the locations of these wells varies. One well, which was drilled in 1899 is recorded as being located immediately to the south of the Enva site. The use of this well is not known and its location is only accurate to 1 km. A second borehole, drilled in 1973 is recorded 1.5 km to the north of the site at Clonroosk; the accuracy of this location is also 1 km so it could be closer or further from the site. The use of this well is not known but its yield is recorded as being poor. There are no other wells recorded within 1 km of the site.

Enva is not aware of any abstraction boreholes within the immediate vicinity of their site.

2.4 SITE GROUND CONDITIONS

A total of eight boreholes have been drilled at the site and the general sequence of ground conditions is presented in **Table 2.1**.

Table 2.1 – Ground Conditions

Strata	Extent	Thickness	Description
Made Ground	BH104	0-3.5 m	Predominantly concrete, with hardcore fill, and clay.
Boulder Clay	All boreholes	<8.5 m	Includes fine to medium, well rounded gravels.
Sand and Gravel	Confined to south east corner of site (BH101, BH104 and MW03)	0-2 m	In general the transition from boulder clay to sand is gradual with changes from gravel, to sandy gravel, to sand.
Limestone Bedrock	Encountered in MW01, MW02 and MW03	Top of limestone ranges from 7.7m to 9m below ground level.	Pale grey, fine-grained bedrock, differentiated from boulders by its un-weathered nature.

The logs for each of the boreholes were previously presented as Appendix B in the RPS Groundwater Risk Assessment Report (Ref: MDE0788Rp0001).

2.4.1 Licence Conditions

The Industrial Emissions Licence requires the regular monitoring and sampling of boreholes BH101, BH102, BH103, BH104B, MW01, MW02, MW03 and MW04. The parameters requiring measurement or analysis are presented in **Table 2.2**.

Table 2.2 – Licence Parameters

Group	Parameters requiring Quarterly Measurement	Parameters requiring Annual Measurement
Field Parameters	Groundwater Level pH Temperature Dissolved Oxygen Electrical Conductivity Visual Inspection	Groundwater Level pH Temperature Dissolved Oxygen Electrical Conductivity Visual Inspection
Organics	Mineral Oil BTEX & MTBE PAHs Phenols VOCs SVOCs	Mineral Oil BTEX & MTBE PAHs Phenols VOCs SVOCs
Inorganics	-	Total Alkalinity, Calcium, Manganese, Sulphate, Cyanide (Total), Chloride, Sodium,

3 METHODOLOGY

Groundwater samples were collected from 8 no. on-site groundwater monitoring wells (BH101, BH102, BH103, BH104B, MW01, MW02, MW03, MW04) (**Figure 3.1**) using dedicated Waterra tubing, in accordance with RPS's standard sampling protocol. A non-return foot valve was fixed to the bottom of the tubing and inserted into the well, close to the base of the borehole. Separate tubing and foot valves were used at each monitoring well to eliminate the possibility of cross contamination.

Groundwater in the well casing is not considered representative of the groundwater quality at a given location. For this reason, three well volumes were purged from each well prior to collection of the groundwater sample. By the time purging was complete all field test water parameters (namely pH, Temperature, Electrical Conductivity and Dissolved Oxygen) were within 10% variance in three consecutive measurements. This ensured that the groundwater sample extracted from the monitoring borehole was representative of the water held in the subsurface strata and not water held stagnant in the borehole casing. The purged volumes were calculated on-site from the measured static water levels and total well depths using an electronic dip meter.

Groundwater samples were collected in laboratory supplied containers and stored in chilled cool boxes following sampling and during transit to the laboratory. A rigorous chain of custody procedure was used during the sample round.

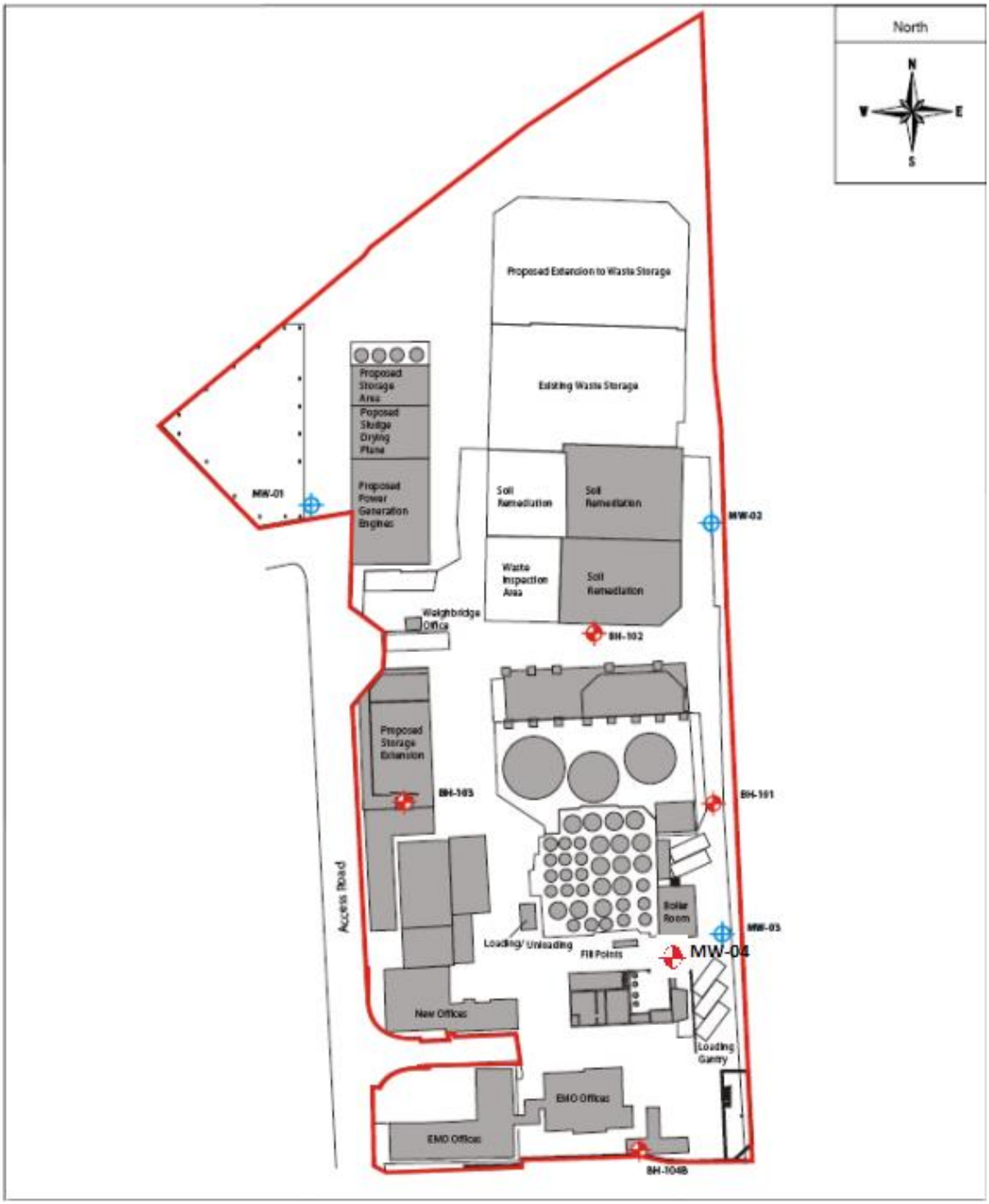
3.1 LABORATORY ANALYSIS

All groundwater samples were analysed at a UKAS accredited laboratory, ALS Environmental for the suite of analyses listed in **Table 3.1**. **Table 3.1** also indicates the analytical techniques used by the laboratory.

Table 3.1 – Analytical Methodologies – ALS Environmental

Parameter	Analytical Methodology
Phenols	GC-MS
Speciated PAHs	GC-MS
BTEX & MTBE	Headspace GC-MS
Petroleum Hydrocarbons	Headspace GC-MS
Volatile Organic compounds & Tentatively Identified Organic Compounds (VOCs & TICs)	Headspace GC-MS
Semi-Volatile Organic compounds & Tentatively Identified Organic Compounds (SVOCs & TICs)	GC-MS

Figure 3.1 – Site Layout Plan with Groundwater Monitoring Locations



Shallow Monitoring Well locations

Deep Monitoring Well locations

Source: *URS Environmental Consultants (Ref: 45078497 Issue No. 1)*

3.2 PRESENTATION & INTERPRETATION OF RESULTS

The Quarter 3 2016 results are tabulated in **Section 4** and discussed with respect to previous results in **Section 5**. Results are compared against Groundwater Threshold Values (GTVs) outlined in the European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No 9 of 2010), where available. Where GTVs are not available for parameters, results are compared against the Interim Guideline Values (IGVs) set out in the Environmental Protection Agency interim report, 'Towards Setting Guideline Values for the Protection of Groundwater in Ireland'.

Previous monitoring reports (as listed in **Section 2.1**) provide details of contaminant concentrations since 2004. The data available within these reports has been reviewed and time series plots of key parameters have been compiled. Trends for chlorinated solvents, petroleum hydrocarbons and phenol parameters have been plotted.

Time series plots are presented in **Section 6** and include the results of this Quarter 3 2016 monitoring round. As the monitoring continues in accordance with the Industrial Emissions licence requirements, the plots will be updated with the results of subsequent rounds used to illustrate the results.

Time series plots are also provided for manual water levels where available from previous reports.

4 QUARTER 3 RESULTS AUGUST 2016

The results of all field measurements and laboratory analysis are presented in this section. Results are primarily compared against Groundwater Threshold Values (GTVs) outlined in the European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No 9 of 2010), where available. Where GTVs are not available for parameters, results are compared against the Interim Guideline Values (IGVs) set out in the Environmental Protection Agency interim report, 'Towards Setting Guideline Values for the Protection of Groundwater in Ireland'.

The results are discussed in relation to appropriate guideline values in **Section 5**. Results that are shown to be above the relevant threshold or guideline values are highlighted in bold and shaded. Results that are shown to be above the relevant laboratory detection limits are highlighted in italics.

Site-specific field parameter measurements were collected during the site visit as per RPS Water sampling protocol.

Table 4.1 – Groundwater Levels (Quarter 3, 2016)

Monitoring Well	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04
Depth (mbgl)	6.79	6.47	4.43	4.58	22.74	30.88	14.78	6.51
Static Water Level (mbgl)	4.37	2.87	1.85	0.55	2.83	3.82	4.32	4.02
Ground Level (mAOD)	103.06	102.55	101.16	101.52	102.10	103.12	102.77	-
Water Level (mAOD)	98.69	99.68	99.31	100.97	99.27	99.3	98.45	-
Free Phase Oil (mm)	No detection	No detection	No detection	No detection	No detection	No detection	No detection	No detection

mbgl = metres below ground level

Table 4.2 – Results of Field Parameters Measured at each Groundwater Monitoring Well (Quarter 3, 2016)

Monitoring Well	pH (pH Units)	Temperature (°C)	Conductivity (µS/cm)	Dissolved O_2 (ppm)	Observations
BH101	7.83	14.4	**1085**	3.07	Light grey cloudy colour, some sediment
BH102	7.80	13.5	730	3.41	Clear on purging, slight H_2S odour, some suspended solids
BH103	7.55	14.2	844	3.32	Dark grey in colour, very little sediment
BH104B	8.36	14.4	553	2.04	Grey colour on purging, slight H_2S odour, very little suspended solids or sediment
MW01	7.43	13.1	739	4.13	Slight H_2S odour, grey in colour and very slight oil sheen
MW02	7.66	13.5	717	2.97	Clear with a slight sheen
MW03	7.55	13.5	**1594**	3.68	Clear/grey colour on purging, very little suspended solids, very slight oil sheen. Samples slightly cloudy
MW04	7.33	14.4	**1419**	3.22	Light grey/brown colour, very little sediment and suspended solids
Groundwater Threshold Value	-	-	1875	-	-
Interim EPA Guideline Values (Units as indicated)	>6.5 & <9.5	25°C	1000	No abnormal change	-

Note: Results above the relevant IGV are highlighted in bold.
Note: Results above the GTV are highlighted in bold and shaded.

Table 4.3 – Results of BTEX and MTBE

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Benzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.75	1.0
Toluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	***1.2***	<1.0	<1.0	-	10
Ethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
m & p-xylene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10 Note 1
o-xylene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10 Note 1
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	***1.2***	<1.0	-	30

Note: No specific IGV for parameter. IGV for Total Xylenes is used as guideline.
Note: Results above the relevant laboratory limit of detection are highlighted in bold italics.

Table 4.4 – Results of Speciated PAHs

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Naphthalene	µg/l	0.01	<0.01	<0.01	***<0.13***	***0.039***	<0.01	<0.01	***0.028***	***0.12***	-	1.0
Acenaphthylene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-
Acenaphthene	µg/l	0.01	<0.01	<0.01	***0.075***	***0.037***	<0.01	<0.01	***0.096***	0.013	-	-
Fluorene	µg/l	0.01	<0.01	<0.01	***0.025***	***0.047***	<0.01	<0.01	***0.137***	***0.019***	-	-
Phenanthrene	µg/l	0.01	<0.01	***0.014***	***0.013***	<0.01	<0.01	<0.01	<0.01	<0.01	-	-
Anthracene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	***0.018***	<0.01	-	10,000
Fluoranthene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	***0.026***	<0.01	-	1.0
Pyrene	µg/l	0.01	***0.011***	***0.019***	<0.01	***0.035***	***0.011***	<0.01	***0.09***	<0.01	-	-
Benzo(a)anthracene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	***0.026***	<0.01	-	-
Chrysene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	***0.028***	<0.01	-	-
Benzo(b)fluoranthene	µg/l	0.01	<0.01	<0.01	***0.013***	<0.01	<0.01	<0.01	***0.019***	<0.01	-	0.5

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Benzo(k)fluoranthene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	0.05
Benzo(a)pyrene	µg/l	0.01	<0.01	<0.01	**0.04**	<0.01	<0.01	<0.01	**0.037**	<0.01	-	0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	***0.011***	<0.01	-	0.05
Dibenz(a,h)anthracene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	***0.011***	<0.01	-	-
Benzo(g,h,i)perylene	µg/l	0.01	<0.01	<0.01	***0.015***	<0.01	<0.01	<0.01	***0.035***	<0.01	-	0.05
Total EPA-16 PAHs	µg/l	0.1	***0.011***	***0.033***	**0.181**	**0.158**	***0.011***	<0.01	**0.562**	**0.151**	0.075	0.1

Note: Results above the relevant IGV are highlighted in bold.
Note: Results above the GTV are highlighted in bold and shaded.
Note: Results above the relevant laboratory limit of detection are highlighted in bold italics.

Table 4.5 – Results of Speciated Phenols

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Phenol	µg/l	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	-	0.5
2,4,6-Trichlorophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	200
2,4-Dichlorophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2,4-Dimethylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Chlorophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	200
2-Methylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Nitrophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
4-Chloro-3-methylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
3+4-Methylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-

Note: Results above the relevant laboratory limit of detection are highlighted in bold italics.

Table 4.6 – Results of Semi-Volatile Organic Compounds (SVOCs)

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Phenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.5
2-Chlorophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	200
Bis(2-chloroethyl)ether	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,3-Dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,2-Dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
1,4-Dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Bis(2-chloroisopropyl)ether	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Methylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Hexachloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Nitrobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
3&4-Methylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Isophorone	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Nitrophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2,4-Dimethylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Bis(2-chloroethoxy)methane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,2,4-trichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.40
Naphthalene	µg/l	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	1.0
2,4-Dichlorophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Hexachlorobutadiene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.10
4-Chloro-3-methylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2,4,6-Trichlorophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	200
2,4,5-Trichlorophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Methylnaphthalene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Chloronaphthalene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Dimethylphthalate	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
2,6-Dinitrotoluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Acenaphthylene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Acenaphthene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2,4-Dinitrotoluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Dibenzofuran	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
4-Chlorophenyl phenyl ether	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Diethylphthalate	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Fluorene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
4-Bromophenyl phenyl ether	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Hexachlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.03
Phenanthrene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Anthracene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10,000
Pyrene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Benzyl Butyl Phthalate	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Benzo(a)anthracene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Chrysene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Benzo(b)fluoranthene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.5
Benzo(k)fluoranthene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.05
Benzo(a)pyrene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.01
Indeno(1,2,3-c,d)pyrene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.05
Dibenz(a,h)anthracene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Benzo(g,h,i)perylene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	

Note: Results above the relevant IGV are highlighted in bold.
Note: Results above the GTV are highlighted in bold and shaded.

Table 4.7 – Results of Volatile Organic Compounds (VOCs)

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Chloromethane	µg/l	1.0	<1.0	<1.0	<1.0	***1.5***	<1.0	<1.0	<1.0	<1.0	-	-
Chloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	***8.4***	-	-
Bromomethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Vinyl Chloride	µg/l	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.6**	0.375	-
Trichlorofluoromethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,1-dichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	30
1,1-dichloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	***1.9***	***3.1***	-	-
Cis-1,2-dichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	***1.2***	<1.0	-	30
2,2-Dichloropropane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,1,1-Trichloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	500
1,2-dichloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.25	-
1,1-Dichloropropene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Trans-1,2-dichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Benzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	1.0
1,2-dichloropropane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Trichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	70
Dibromomethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Bromodichloromethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Cis-1,3-dichloropropene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Trans-1,3-dichloropropene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Toluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	***1.2***	<1.0	<1.0	-	10
1,1,2-Trichloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,3-Dichloropropane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Dibromochloromethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Tetrachloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	40
1,2-Dibromoethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Chlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	1.0
1,1,1,2-Tetrachloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Ethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
m&p-Xylene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
Styrene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
o-xylene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
Isopropylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Bromobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
N-Propylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Chlorotoluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
4-Chlorotoluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,3,5-Trimethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Tert-Butylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,2,4-Trimethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Sec-Butylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,3-dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
P-Isopropyltoluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,2-dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
1,4-dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
n-Butylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,2-Dibromo-3-chloropropane	µg/l	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	-
1,2,4-Trichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.40
Hexachlorobutadiene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.10

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
1,2,3-Trichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-

Note: Results above the relevant IGV are highlighted in bold.
Note: Results above the GTV are highlighted in bold and shaded.
Note: Results above the relevant laboratory limit of detection are highlighted in bold italics.

Table 4.8 – Results of Total Petroleum Hydrocarbons (Aliphatic/Aromatic)

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Aliphatic > C10-C12	µg/l	10	<10	<10	<10	<10	<10	<10	<10	<10	-	-
Aliphatic > C12-C16	µg/l	10	<10	<10	<10	<10	<10	<10	<10	<10	-	-
Aliphatic > C16-C35	µg/l	10	<10	<10	***35***	<10	<10	<10	<10	<10	-	-
Aliphatic > C35-C44	µg/l	10	<10	<10	***10***	<10	<10	<10	<10	<10	-	-
Aliphatic > C10-C44	µg/l	10	<10	<10	**46**	<10	<10	<10	<10	<10	-	10
Aromatic > C10-C12	µg/l	10	<10	<10	<10	<10	<10	<10	<10	<10	-	-
Aromatic > C12-C16	µg/l	10	<10	<10	<10	***25***	<10	<10	<10	***23***	-	-
Aromatic > C16-C21	µg/l	10	<10	<10	<10	***12***	<10	<10	<10	<10	-	-
Aromatic > C21-C35	µg/l	10	<10	<10	***11***	<10	<10	<10	<10	<10	-	-
Aromatic > C35-C44	µg/l	10	<10	<10	<10	<10	<10	<10	<10	<10	-	-
Aromatic > C10-C44	µg/l	10	<10	<10	**11**	**37**	<10	<10	<10	**23**	-	10

Note: Results above the relevant IGV are highlighted in bold.
Note: Results above the relevant laboratory limit of detection are highlighted in bold italics.

Table 4.9 – Results of Inorganic Analysis

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Total Alkalinity	mg/l	10	343	313	356	188	324	301	384	348	-	No abnormal change
Calcium	mg/l	0.2	129	120	130	75.3	59.4	54.8	125	119	-	200
Manganese	mg/l	0.007	0.0395	**0.724**	**1.01**	**0.45**	**0.0503**	0.0102	**0.293**	**1.22**	-	0.05
Sulphate	mg/l	0.1	46.5	28.9	25.3	37.8	16.6	22.4	23.3	<4.4	187.5	200
Cyanide (Total)	mg/l	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.009	0.375	0.01
Chloride	mg/l	4	**77**	5.9	27.7	9.8	11	11.6	**213**	**212**	187.5	30
Sodium	mg/l	0.1	51	6.81	12.1	16.7	19.8	18.3	110	121	150	150

Note: Results above the relevant IGV are highlighted in bold.
Note: Results above the GTV are highlighted in bold and shaded.

5 DISCUSSION OF QUARTER 3 RESULTS

The results of the Quarter 3 monitoring event for 2016 are presented in **Table 4.1** to **4.9** of this report. For the purpose of this report, the results are compared against the Groundwater Threshold Values (GTVs) outlined in the European Communities Environmental Objectives (Groundwater) Regulations (S.I. No. 9 of 2010) where available. Where GTVs are not available results are compared against the EPA Interim Guideline Values (IGV) as set out in the Interim Report *'Towards Setting Guideline Values for the Protection of Groundwater in Ireland' 2004.* A discussion of the results and their significance is included below.

5.1 FIELD PARAMETERS

The results of the field parameters measured at each groundwater monitoring well are presented in **Table 4.2**. Groundwater samples recorded pH levels ranging between 7.33 and 8.36, all within the EPA Interim guideline range of ≥6.5 to ≤9.5. Temperature measurements ranged from 13.3°C to 14.4°C and were below the EPA IGV of 25°C.

Field measurements of Electrical Conductivity levels ranged between 717 µS/cm and 1594 µS/cm. Three measurements of Electrical Conductivity were above the IGV of 1000 µS/cm at BH101 (1085 µS/cm), MW03 (1594 µS/cm) and MW04 (1419 µS/cm), but all however were below the GTV limit of 1875 µS/cm.

Dissolved oxygen levels ranged between 2.04 and 4.13 ppm. Factors such as climate, nutrients in the water, suspended solids; organic wastes and groundwater inflow can all influence the dissolved oxygen values.

Observations relating to colour and odour varied from well to well as detailed in **Table 4.2**.

5.2 RESULTS OF BTEX & MTBE

The results of the **BTEX** and **MTBE** analysis are presented in **Table 4.3**. BTEX concentrations are below the associated GTVs and IGVs at all locations. All but one of the BTEX concentrations are below the laboratory of limit of detection at all locations. Toluene was detected at MW102 (1.2 µg/l), however this is below the IGV of 10 µg/l. MTBE was detected at MW03 (1.2 µg/l), however this is below the IGV of 30 µg/l. MTBE was also below the laboratory limit of detection and IGV at all other locations.

The previous detection of MTBE was in the Quarter 2 monitoring event of 2016 and recorded concentrations above the laboratory limit of detection at BH103 (1.2 µg/l), MW03 (1.8 µg/l) and MW04 (1.7 µg/l). MTBE was also above the laboratory limit of detection at BH103 (1.4 µg/l), MW03 (2.2 µg/l) and MW04 (2.1 µg/) during Quarter 1 2016. These detections are still below the IGV limit however. Prior to this there was a detection of MTBE at BH104B in the Quarter 1 monitoring event of 2012 with a recorded concentration of 280 µg/l which is above the laboratory limit of detection. This was the only recorded exceedance in Quarter 1 2012.

Monitoring during Quarter 1 and Quarter 2 of 2010 detected exceedances of MTBE at BH103 at a concentration of 16 µg/l. Subsequent monitoring in 2010 recorded concentrations below the

laboratory limit of detection. Prior to these 2010 monitoring events, concentrations of MTBE at BH103 were recorded at 63 µg/l in December 2009.

5.3 RESULTS OF SPECIATED POLYAROMATIC HYDROCARBONS (PAHS)

The results of the Speciated PAH analysis during this monitoring period are presented in **Table 4.4.**

The laboratory limit of detection for Total EPA-16 PAHs is 0.1 µg/l and has been lowered for comparison with the EPA IGV of 0.1 µg/l; however this is not accredited. This laboratory limit of detection is above the EPA GTV of 0.075 µg/l. To identify the compounds, which attributed to these concentrations, speciated PAH analysis was carried out, which reduces the limit of detection for individual parameters to 0.01 µg/l.

Total Polyaromatic Hydrocarbons were above the IGV limit of 0.1 µg/l at BH103 (0.181 µg/l), BH104B (0.158 µg/l), MW104 (0.562 µg/l) and MW104 (0.151 µg/l). Total PAHs were below the IGV of 0.1 µg/l and the GTV of 0.075 µg/l at all other locations.

Total PAHs were previously detected above the IGV at BH103 (0.123 µg/l), BH104B (0.159 µg/l) and MW04 (0.153 µg/l) during the Quarter 1 2016 monitoring event and were also above the IGV at BH103 (0.111 µg/l) during the Quarter 2 2016 monitoring event.

The results of the speciated polycyclic aromatic hydrocarbon analysis detected a number of different compounds in BH101, BH102, BH103, BH104B, MW01, MW03 and MW04 above the laboratory limit of detection. However, with the exception of Benzo (a) pyrene at BH103 (0.04 µg/l) and MW103 (0.037 µg/l), none of these compounds were above their respective IGV limits at any location.

5.4 RESULTS OF SPECIATED PHENOLS

During previous quarterly monitoring events and sample analysis, total monohydric phenol was determined and historically has been below the laboratory limit of detection of 10 µg/l since December 2008. It should be noted that the laboratory limit of detection was however above the IGV of 0.5 µg/l for phenols.

For this reason, samples were analysed for phenols to include chlorophenols. The results of the speciated phenols analysis are presented in **Table 4.5**. The speciated phenol analysis reduces the laboratory limit of detection to 1.0 µg/l for individual parameters.

The results of the current Quarter 3 2016 speciated phenol analysis confirm concentrations of phenols were below the laboratory limit of detection of 1.0 µg/l at all locations.

4-Chloro-3-methylphenol was detected at BH104B (1.37 µg/l) above the laboratory limit of detection during the Quarter 1 2015 analysis. With the exception of this, all other results are consistent with results since the 2012 quarterly monitoring events.

5.5 RESULTS OF SEMI-VOLATILE ORGANIC COMPOUNDS

The results of the Semi-Volatile Organic Compound analysis are presented in **Table 4.6**.

There are no GTVs for individual SVOC parameters. No SVOCs were detected above the relevant IGVs during this monitoring period, consistent with the results from the 2015 and 2014 monitoring periods. It should be noted that the laboratory limit of detection was however above the IGVs for some SVOCs, for example the result for 1,2,4-Trichlorobenzene was <1.0 µg/l but the IGV for this parameter is 0.40 µg/l, but testing at this limit is not accredited.

The Quarter 3 2013 monitoring event detected two SVOC compounds, Acenaphthene (1.1 µg/l) and Fluorene (1.5 µg/l) in MW03. Prior to this detection the Quarter 2 monitoring event of 2012 detected concentrations of Naphthalene and Acenaphthylene in MW03 at concentrations of 2.4 µg/l and 0.12 µ/l respectively.

5.6 RESULTS OF VOLATILE ORGANIC COMPOUNDS

The results of the Volatile Organic Compound analysis are presented in **Table 4.7**. The results of the current Quarter 3 2016 monitoring event indicate that Vinyl Chloride was detected above the GTV of 0.375 µg/l at MW04 (0.6 µg/l). The results of the Quarter 2 2016 monitoring event detected that Vinyl Chloride was above the GTV of 0.375 µg/l at MW03 (0.6 µg/l) and MW04 (0.9 µg/l).

Chloroethane at MW04 (8.4 µg/l) was detected above the limit of detection (1.0 µg/l), however there is no GTV or IGV limit for Chloroethane. The results of the Quarter 2 monitoring event previously detected Chloroethane in MW01 (1.1 µg/l).

Chloromethane at BH104B (1.5 µg/l), MTBE at MW03 (1.2 µg/l) and Toluene at MW02 (1.2 µg/l) were also detected. However, the results are below the IGV for MTBE (30 µg/l) and Toluene (10 µg/l) and there is no GTV or IGV limit for Chloromethane. All other compounds were below their respective laboratory limits of detection.

Historic groundwater monitoring events detected some parameters above the laboratory limit of detection in November 2009, corresponding to Quarter 4 of 2009. Historically 1,1-Dichloroethane, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, MTBE, n-butylbenzene, n-propylbenzene, o-xylene, p-isopropyltoluene, sec-butylbenzene and tert-butylbenzene were detected above the laboratory limits of detection.

The results of the Quarter 3 and Quarter 4 monitoring events of 2009 and all subsequent monitoring events indicate that there were no exceedances of the GTVs or IGVs for specific parameters.

5.7 RESULTS OF TOTAL PETROLEUM HYDROCARBONS

In order to provide a more accurate profile of TPH within the groundwater, speciated hydrocarbon analysis using the Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG) method was carried out on samples taken at all boreholes. The results of the TPH analysis are presented in **Table 4.8**.

The EPA IGV of 10 µg/l for the Total Hydrocarbons is deemed comparable with the results for Total Petroleum Hydrocarbons. Some detections of TPH in both the aliphatic and aromatic range were observed during the current Quarter 3 2016 monitoring event. Detections were found in samples from the following wells; at BH103 detections were in the aliphatic range C16-C35 (35 µg/l), C35-C44 (10 µg/l) and in the aromatic range C21-C35 (11 µg/l), at BH104B detections were in the Aromatic range C12-C16 (25 µg/l), C16-C21 (12 µg/l) and at well MW04 detections were in the aromatic range C12-C16 (23 µg/l). Each of these is over both the limit of detection and the IGV for Total Hydrocarbons, which is 10 µg/l.

The previous Quarter 2 monitoring event detected TPH in the well BH103 were in the aliphatic range C16-C35 (150 µg/l) and in the aromatic range C21-C35 (57 µg/l) and from well MW04 in the aromatic range C12-C16 (20 µg/l).

The Quarter 1 monitoring event of 2016 detected TPH in the aliphatic range C16-C35 (132 µg/l) at BH103 and in the aliphatic range C12-C16 (15 µg/l) at MW04.

The Quarter 4 monitoring event of 2015 detected TPH in the aromatic ranges C12-C16 (879 µg/l), C16-C21 (1380 µg/l) and C21-C35 (694 µg/l) at BH104B, C21-C35 at BH103 (60 µg/l) and C10-C12 (13 µg/l) and C12-C16 (21 µg/l) at MW04. TPH concentrations were detected in the aliphatic ranges C10-C12 (495 µg/l), C12-C16 (3080 µg/l) and C16-C35 (3360 µg/l) at BH104B and C16-C35 (231 µg/l) and C35-C44 (14 µg/l).

The Quarter 3 monitoring event of 2015 detected TPH in the aromatic ranges C12-C16 (39 µg/l), C16-C21 (37 µg/l) and C21-C35 (28 µg/l) at BH104B, C21-C35 at BH103 (17 µg/l) and C10-C12 (18 µg/l) and C12-C16 (29 µg/l) at MW04. TPH concentrations were detected in the aliphatic ranges C10-C12 (13 µg/l), C12-C16 (40 µg/l) and C16-C35 (62 µg/l) at BH104B and C16-C35 at BH103 (72 µg/l) and MW03 (14 µg/l).

The Quarter 2 monitoring event of 2015 detected TPH in the aromatic range C21-C35 at BH03 (509 µg/l). TPH concentrations were detected in the aliphatic ranges C16-C35 at BH103 (1760 µg/l) and BH104B (337 µg/l), and C12-C16 at BH104B (225 µg/l).

The Quarter 1 monitoring event of 2015 detected TPH in the aromatic ranges C12-C16 at wells MW03 (14 µg/l), MW04 (15 µg/l) and BH104B (27 µg/l), C16-C21 at BH104B (15 µg/l), and C21-C35 (14 µg/l) at BH103. TPH concentrations were detected in the aliphatic ranges C16-C35 and C35-C44 at MW03 (46 µg/l and 12 µg/l respectively), BH103 (54 µg/l) and BH104B (11 µg/l.

No detections of TPH in the aliphatic or aromatic range were observed in any shallow or deep monitoring well locations during the Quarter 4 monitoring event of 2014.

The Quarter 3 monitoring event of 2014 detected TPH concentrations in the aliphatic range at the shallow groundwater well BH104B. The TPH concentration detected was 410 µg/l. The speciated TPH ranges that contributed to the value of 410 µg/l were C12-C16 (150 µg/l), C16-C21 (250 µg/l) and C31-C35 (10 µg/l).

The Quarter 3, 2013 monitoring event detected TPH in the aliphatic range in one deep groundwater well, MW03. TPH of the range C10-C12 and C12-C16 were detected at concentrations of 200 µg/l and 190 µg/l respectively.

The Quarter 1, 2013 monitoring event detected aliphatic TPH of the range C12-C16, C16-C21 and C21-C35. TPH in the mid to high aromatic ranges were detected in BH103, BH104B and MW04 during the previous Quarter 1 2013 monitoring event. Aromatic TPH of the ranges C12-C16, C16-C21 and C21-C35 were detected in BH103, the ranges C10-C12, C12-C16 and C16-C21 were detected in BH104B and aromatic TPH of the ranges C10-C12 and C12-C16 were detected in MW04.

The Quarter 2 monitoring event of 2012 detected elevated TPH of the aliphatic range C12-C16, C16-C21 and C21-C25 in BH103. Hydrocarbons have been detected in borehole MW03 during Quarter 1 2010, in borehole BH104B during the Quarter 2 2010 monitoring event and in borehole BH104B and MW03 during the Quarter 3 2010 monitoring events. Hydrocarbons have also been detected in BH103, BH104B and MW03 in the Quarter 2 2011 monitoring event and in MW03 in the Quarter 3 and Quarter 4 2011. These detections are discussed further in **Section 6.2.3**.

5.8 RESULTS OF INORGANIC ANALYSIS

The results of the inorganic analysis are presented in **Table 4.9**. The following inorganic parameters are required to be analysed on an annual basis in accordance with Schedule D of the Industrial Emissions Licence W0184-01; Total Alkalinity, Calcium, Manganese, Sulphate, Cyanide (Total), Chloride and Sodium.

The results of the inorganic analysis for this monitoring event indicate that Manganese and Chloride were recorded above their respective recommended GTVs or IGV's. The remaining parameters were below their GTV's and IGV's at all locations.

Concentrations of Manganese exceeded the IGV of 0.05 mg/l at 6 no. locations (BH102, BH103, BH104B, MW01, MW03 and MW04) ranging between 0.293 mg/l and 1.22 mg/l. Manganese is a naturally occurring metal and the levels of Manganese detected during the Quarter 3 2015 monitoring event are likely to be naturally occurring.

Concentrations of Chloride were recorded above the GTV limit of 187.5 mg/l at 2 no. locations (MW03 and MW04) ranging between 212 mg/l and 213 mg/l. Chloride concentrations were detected at MW03 and MW04 in Quarter 3 2015 at levels of 241 mg/l and 267 mg/l. Chloride concentrations at these locations are not suspected to be related to current activities. Chloride concentrations will continue to be measured to verify the consistency of these results.

6 HISTORICAL RESULTS & TRENDS

Time series plots are presented in this section and include the results of the Quarter 3 2016 monitoring round. As the monitoring continues in accordance with the Industrial Emissions Licence requirements, the plots will be updated with the results of subsequent rounds and used to illustrate the results.

6.1 GROUNDWATER LEVELS OVER TIME

Figure 6.1 to **Figure 6.3** below illustrates the manually recorded water levels using an electronic probe. The graphs show that groundwater levels can vary considerably between monitoring rounds.

Figure 6.2 illustrates groundwater elevations (mAOD) in shallow groundwater wells (BH101 to BH104B) ranging between approximately 98 mAOD and 102 mAOD.

Figure 6.3 illustrates groundwater elevation (mAOD) in the deeper groundwater wells (MW01 to MW03). The groundwater elevation (mAOD) for these deeper groundwater wells ranges from approximately 97.5 mAOD to approximately 100 mAOD.

Figure 6.1 – Ground Elevation (mAOD) in all Monitoring Wells

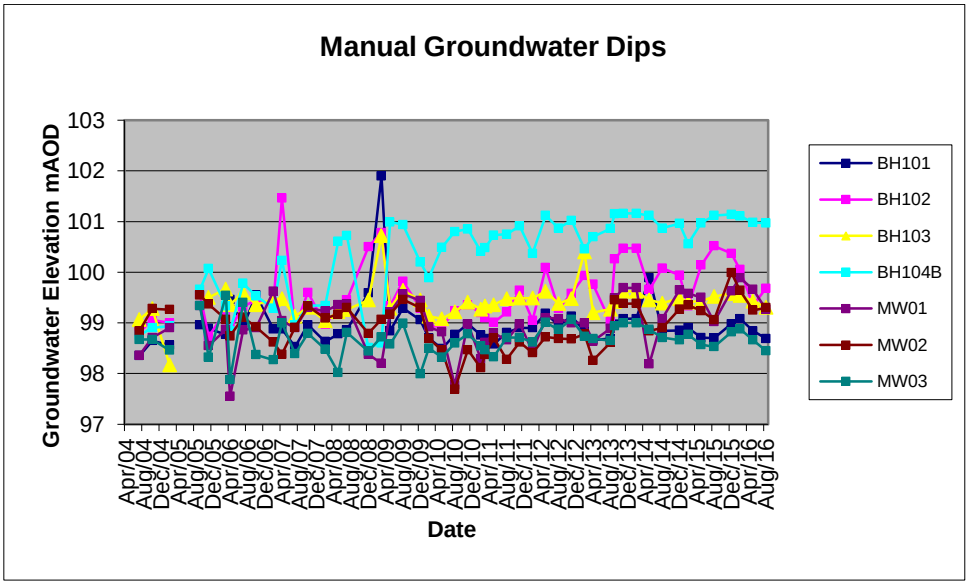


Figure 6.2 – Ground Elevation (mAOD) in Shallow Groundwater Monitoring Wells

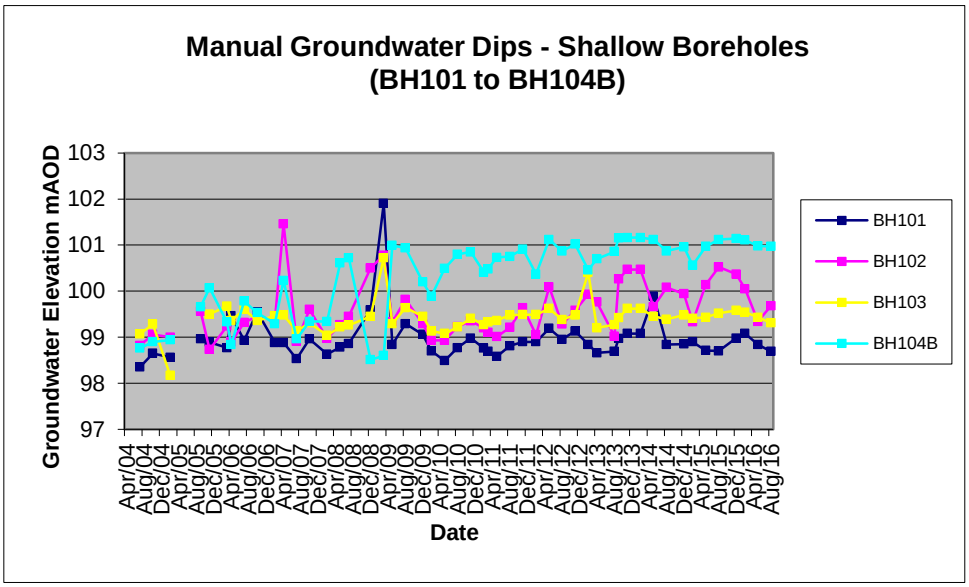
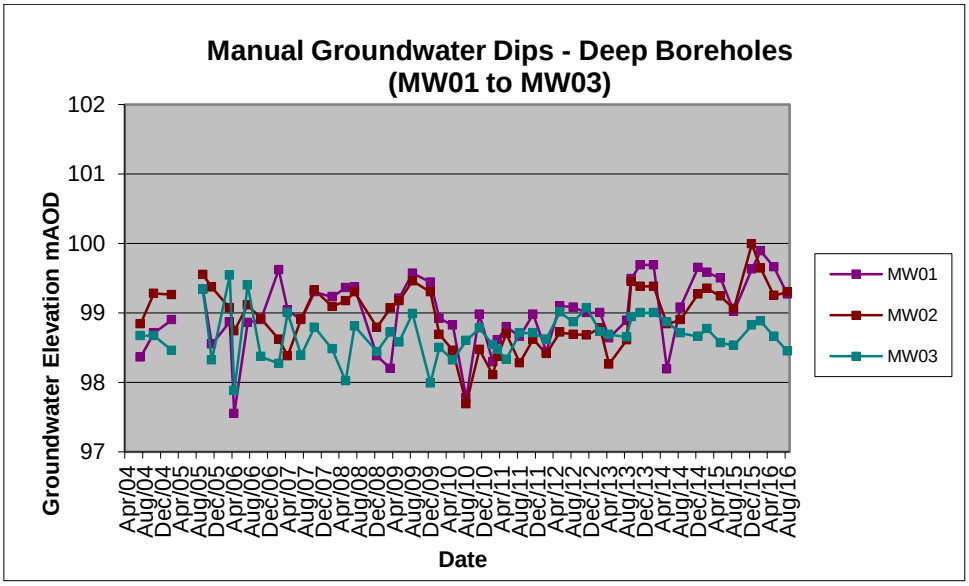


Figure 6.3 – Ground Elevation (mAOD) in Deep Groundwater Monitoring Wells



The groundwater levels generally show a similar pattern of fluctuation over time indicating a degree of connection between boreholes. The graphs demonstrate that groundwater levels can vary considerably between monitoring rounds; the general direction of flow in the shallow and deeper groundwater bearing unit is in an easterly or north easterly direction however there have been some occasional historic cases of groundwater flowing in a south-easterly direction.

In addition, monthly rainfall data for Oak Park, Carlow have been tabulated from Met Éireann to examine the relationship between compounds and rainfall events. The data from Oak Park was chosen as the weather station at Birr, Co. Offaly closed in October 2009. A summary of the rainfall data is in **Tables 6.1** to **6.5**.

Table 6.1 – Monthly Rainfall Data for Year 2012 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	70.8	24.5	18.0	56.3	50.2	155.8	76.2	127.7	37.9	63.4	80.9	68.1

Table 6.2 – Monthly Rainfall Data for Year 2013 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	76.2	35.8	57.6	44.4	35.6	37.5	32.3	85.6	24.4	170.0	27.7	136.6

Table 6.3 – Monthly Rainfall Data for Year 2014 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	147.2	176.7	65.0	52.6	78.6	61.9	24.6	122.1	18.2	138.2	165.6	47.7

Table 6.4 – Monthly Rainfall Data for Year 2015 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Rainfall (mm)	66.0	36.3	53.5	26.3	89.4	29.7	79.4	83.0	17.9	56.8	110.0	270.9

Table 6.5 – Monthly Rainfall Data for Year 2016 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Rainfall (mm)	110.9	95.7	40.6	64.3	61.6	61.7	29.6	46.0	97.4

6.2 GROUNDWATER CONCENTRATIONS OVER TIME

Groundwater quality trends have previously been examined in two reports (URS 2005 and RPS 2007). In addition, RPS carried out a groundwater risk assessment (Ref: MDE0788RP0001, dated November 2008) in which the general trend of contaminant concentrations over time was observed to be erratic with compounds rarely being detected in the same borehole on two consecutive monitoring rounds.

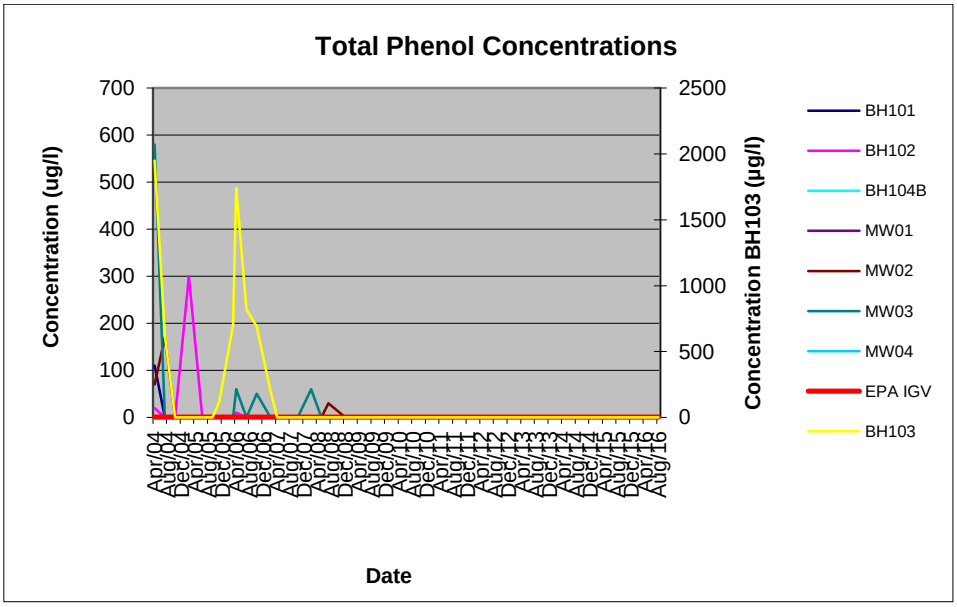
The data available within these reports has been reviewed and time series plots of key parameters have been compiled based on notable trends. Trends for phenols, petroleum hydrocarbons and chlorinated solvents have been plotted as outlined in the following sections.

6.2.1 Phenols

Phenols have been detected historically in all boreholes with the highest concentrations recorded in BH103. However concentrations in BH103 have declined since April 2007. Phenol concentrations have since been recorded below the IGV of 0.5 µg/l in all monitoring wells since December 2008 indicating natural attenuating conditions within the groundwater.

2,4-Dimethylphenol was detected at a concentration of 0.12 µg/l during the Quarter 1, 2010 monitoring event. There is no recommended IGV for this parameter. Subsequent to the Quarter 1 2010 monitoring event no detections of phenols have been noted at any monitoring location up to and including the current Quarter 3 2016 monitoring event.

Figure 6.4 – Phenol Concentrations in all Monitoring Wells



6.2.2 Polyclyclic Aromatic Hydrocarbons

Figure 6.5 below illustrates that PAHs (Polycyclic Aromatic Hydrocarbons) have previously been detected within all monitoring wells above the recommended EPA IGV of 0.1 µg/l. Historically the highest concentrations have been detected within MW03 and BH104B, with the highest concentration detected in March 2006 (107 µg/l) and in October 2007 (19.72 µg/l) respectively. In addition, a range of PAHs including Benzo(a)pyrene, Benzo(g,h,i)perylene, Indeno(1,2,3)cd pyrene, Fluoranthene and Naphthalene have previously been detected in MW03 with **Figures 6.6** to **6.10** illustrating some of the PAH compounds which were detected above their respective IGVs.

Since 2007 concentrations of PAH have shown a marked decrease and since 2010 detections of PAH have been confined to MW03, MW02 and BH104B. Concentrations of Total PAH above the IGV in 2010 were detected during the Quarter 1 monitoring event in MW03 (0.3 µg/l), Quarter 2 monitoring event in BH104B (1.2 µg/l) and Quarter 3 monitoring event in MW02 (2.0 µgl) and BH104B (0.2 µgl). There were no elevated concentrations of Total PAH during the Quarter 4 2010 monitoring event.

No Total PAH detections were recorded throughout 2011 and in Q1 of 2012. Total PAH was detected above the IGV in MW03 in the Q2 2012 monitoring event. No Total PAH exceedances were detected from Quarter 3 2012 to Quarter 4 2013 inclusive. Total PAHs were detected at a concentration of 2.62 µg/l in MW03 during the Q3 2013 monitoring event however; no detections above the laboratory limit were noted during the subsequent monitoring events up to and including the Quarter 2 2015 monitoring event.

Total PAHs were also above the GTV at BH103 (0.093 µg/l), BH104B (0.159 µg/l) and MW03 (0.586 µg/l) during Quarter 3 2015, at BH103 (0.21 µg/l), MW03 (0.986 µg/l) and MW04 (0.079 µg/l) during Quarter 4 2015, and at BH103 (0.123 µg/l), BH104B (0.159 µg/l) and MW04 (0.153 µg/l) during the previous Quarter 1 2016 monitoring event.

During the Quarter 2 2016 monitoring event, Total Polyaromatic Hydrocarbons were detected above the IGV limit of 0.1 µg/l at BH103 (0.111 µg/l). Similarly during the current Quarter 3 monitoring event total PAHs were detected above the IGV at BH103 (0.181 µg/l), BH104B (0.158 µg/l), MW103 (0.562 µg/l) and MW104 (0.151 µg/l).

Figure 6.5 – PAH (Total) Concentrations in all Monitoring Wells

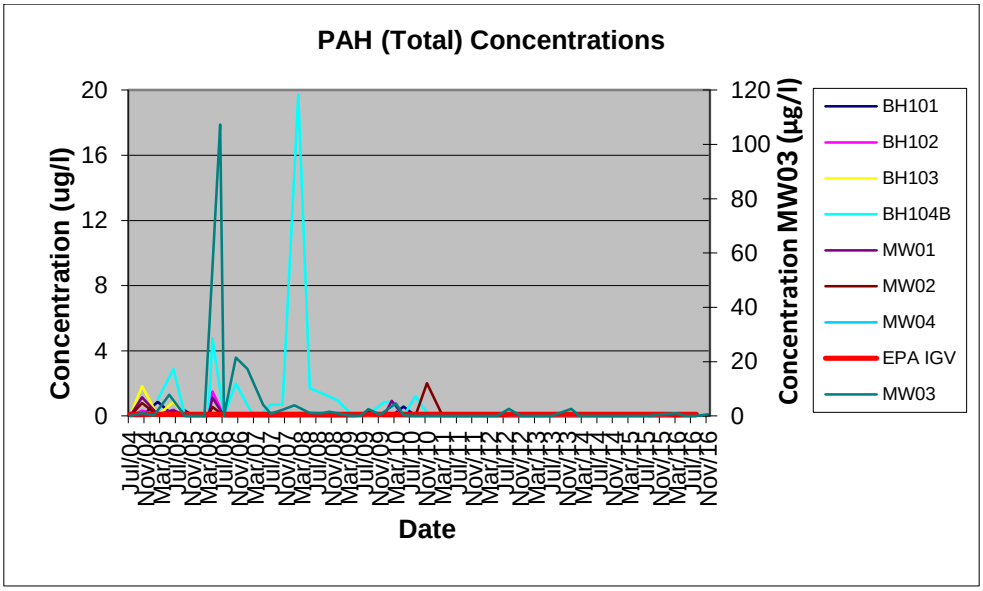


Figure 6.6 – Fluoroanthene Concentrations in all Monitoring Wells

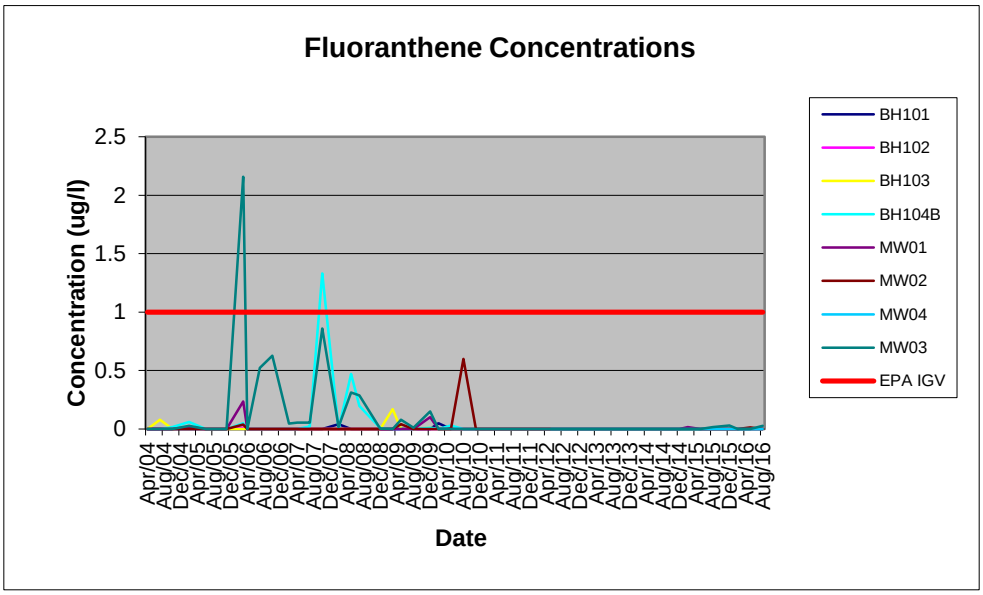
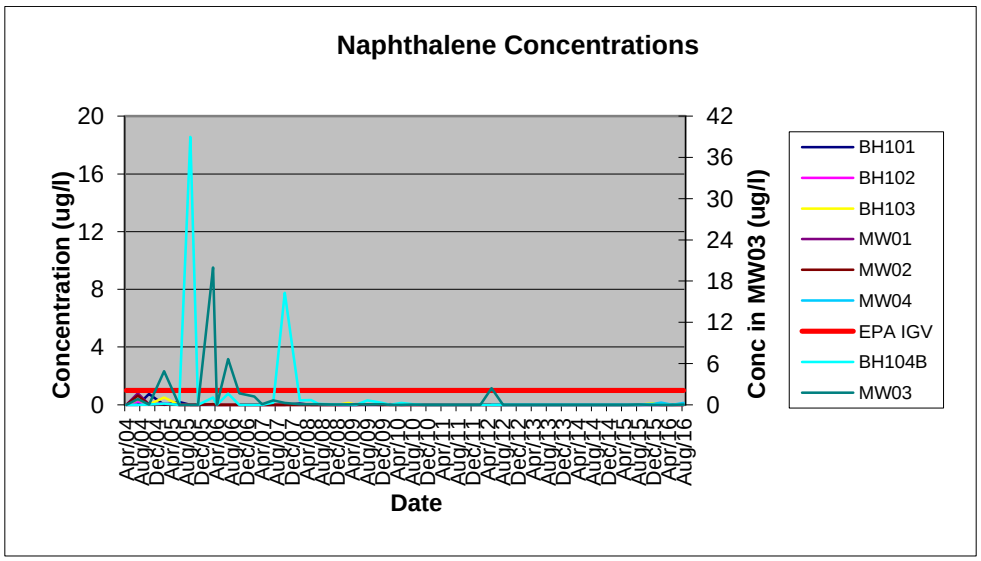


Figure 6.6 illustrates that **Fluoranthene** was previously detected above the IGV of 1.0 µg/l in groundwater monitoring wells BH104B (October 2007, 1.33 µg/l) and MW03 (March 2006, 2.158 µg/l) only. The remaining monitoring wells recorded concentrations below the IGV of 1.0 µg/l. During the Quarter 3 2016 monitoring event Fluoranthene was detected above the limit of detection at MW03 (0.026 µg/l) only, this does not exceed the IGV of 1.0 µg/l.

Figure 6.7 – Naphthalene Concentrations in all Monitoring Wells



A similar trend to Fluoroanthene has been noted in **Figure 6.7**, with concentrations of **Naphthalene** recorded above the IGV of 1.0 µg/l in BH104B and MW03 only. 4 no. exceedances of the IGV were noted in BH104B in September 2005 (39 µg/l), March 2006 (1.069 µg/l), July 2006 (1.594 µg/l) and October 2007 (16.31 µg/l). Since October 2007, the concentrations in BH104B have decreased below the IGV. There have been 6 exceedances of the IGV of 1.0 µg/l in MW03, with the highest concentration detected in March 2006 (19.986 µg/l) and the most recent being the detected in the Quarter 2 2012 monitoring event (2.4 µg/l). The concentrations detected in August 2010 were

slightly above the laboratory limit of detection of 0.01 µg/l at BH104B (0.08 µg/l) and MW03 (0.05 µg/l); however these levels are deemed low. Concentrations of Naphthalene were below the EPA IGV limit of detection of 1.0 µg/l at all locations during the Quarter 4 2010, the 2011 and 2012 quarterly monitoring events and the Quarter 1 to Quarter 3 2014 monitoring periods, inclusive. No detections of Naphthalene were noted from the Quarter 4 2014 monitoring event to the Quarter 2 2015 monitoring event. Naphthalene was detected at BH101 (0.011 µg/l) and MW03 (0.031 µg/l) during Quarter 3 2015, and at BH103 (0.095 µg/l) and at MW04 (0.067 µg/l) during Quarter 4 2015.

Naphthalene was detected during the Quarter 1 2016 monitoring event at BH104B (0.034 µg/l) and MW04 (0.153 µg/l)These detections, however, were all below the IGV limit of detection of 1.0 µg/l. Concentrations of Naphthalene were below the laboratory limit of detection at all locations during the Quarter 22016 monitoring event. During the Quarter 3 2016 monitoring event Naphthalene was detected above the limit of detection at BH103 (0.13 µg/l), BH104B (0.039 µg/l), MW03 (0.028 µg/l) and MW04 (0.12 µg/l), however these were all below the IGV limit of 1.0 µg/l.

Figure 6.8 – Benzo (g,h,i) perylene Concentrations

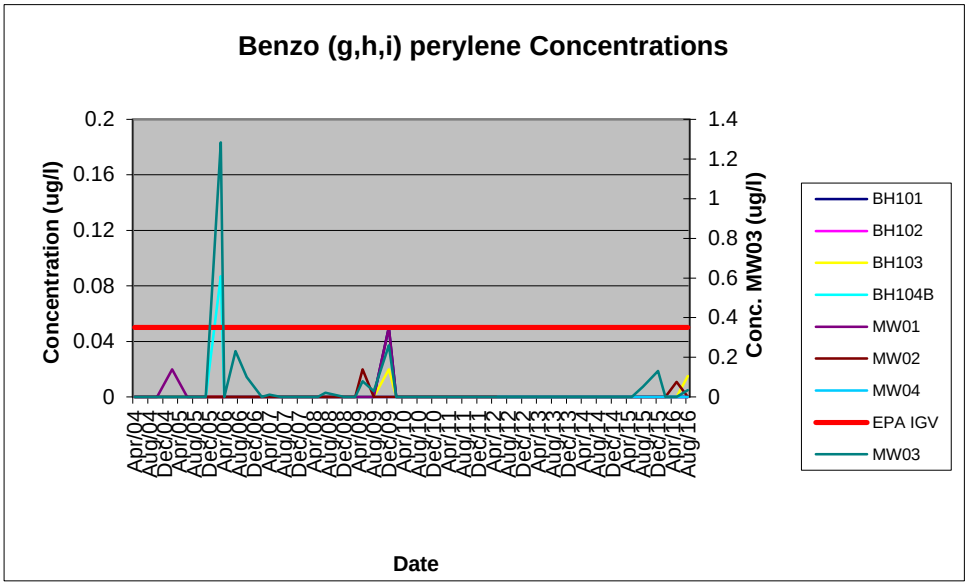


Figure 6.8 illustrates the concentrations of **Benzo(g,h,i)perylene** in all monitoring wells over time. Elevated concentrations above the IGV were recorded at BH104B (0.087 µg/l) on one occasion in March 2006.

Figure 6.9 illustrates elevated concentrations above the IGV recorded at MW03 on 6 no. occasions with the most recent elevated concentration recorded during the Quarter 4 2015 monitoring event (0.053 µg/l). The previous elevated concentration detected was in Quarter 3 2015 (0.053 µg/l). The results of all monitoring events from 2010 to the Quarter 2 2015 monitoring event recorded concentrations below the laboratory limit of detection of 0.01 µg/l at all locations. Concentrations were also below the laboratory limit of detection at all locations during the Quarter 1 2016 monitoring event. Benzo(g,h,i)perylene was recorded in MW02 (0.011 µg/l) during the Quarter 2 2016 monitoring event, however, this is below the IGV of 0.05 µg/l. During the current Quarter 3 2016 monitoring event, Benzo(g,h,i)perylene was recorded at BH103 (0.015 µg/l) and MW03 (0.035 µg/l). However, this is still below the IGV of 0.05 µg/l.

Figure 6.9 – Benzo (g,h,i) perylene in Monitoring Wells BH104B & MW03

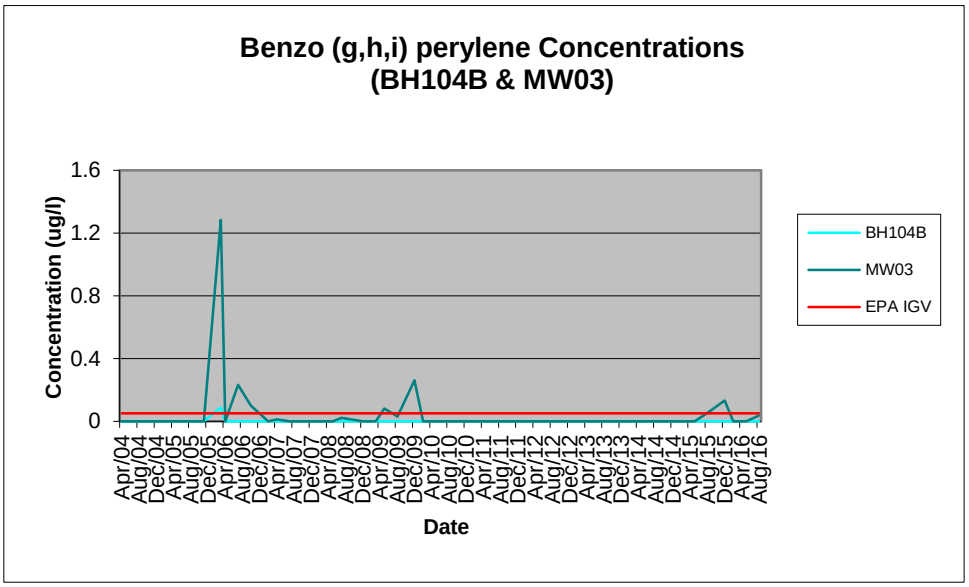
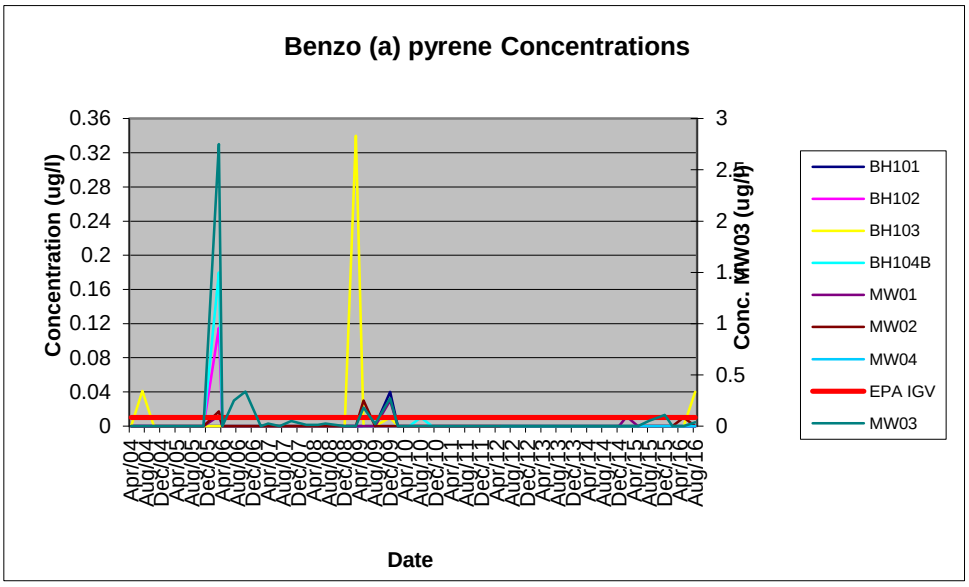


Figure 6.10 illustrates the concentrations of **Benzo(a)pyrene** in all groundwater monitoring wells and indicates that Benzo(a)pyrene has been detected historically in all boreholes above the IGV of 0.01 µg/l. Similarly with the above mentioned trends, the highest concentrations have been detected in MW03 and BH104B. Concentrations have markedly decreased since March 2006 when an elevated concentration of 2.751 µg/l was detected in MW03, however there have been a number of detections above the IGV, with the most recent elevated level detected in December 2009. Elevated concentrations above the IGV were recorded in BH101, BH103 and MW01 during this same period.

The slightly higher concentrations of Benzo(g,h,i)perylene and Benzo(a)pyrene detected in Quarter 4, 2009 may be attributed to heavy rainfall, which occurred in November of 2009 and as a result possibly mobilized traces of these compounds from the soil. The static water levels for December 2009 ranged between 0.58 and 3.78 mbgl. Since December 2009, concentrations of compounds have notably decreased to below the IGVs.

Benzo(a)pyrene was detected above the IGV limit of 0.01 µg/l at MW03 (0.108 µg/l) during the Quarter 4 2015 monitoring event. Benzo(a)pyrene was also detected above the IGV at MW03 (0.052 µg/l) during the Quarter 3 2015 monitoring event. All other results of all monitoring events from 2010 to Quarter 2 2016 monitoring event did not detect other concentrations above the IGV. During the current Quarter 3 2016 monitoring event Benzo(a)pyrene was detected above the limit of detection (0.01 µg/l) at BH103 (0.04 µg/l) and MW03 (0.037 µg/l), these concentrations are also over the IGV of 0.01 µg/l.

Figure 6.10 – Benzo (a) pyrene Concentrations in all Monitoring Wells

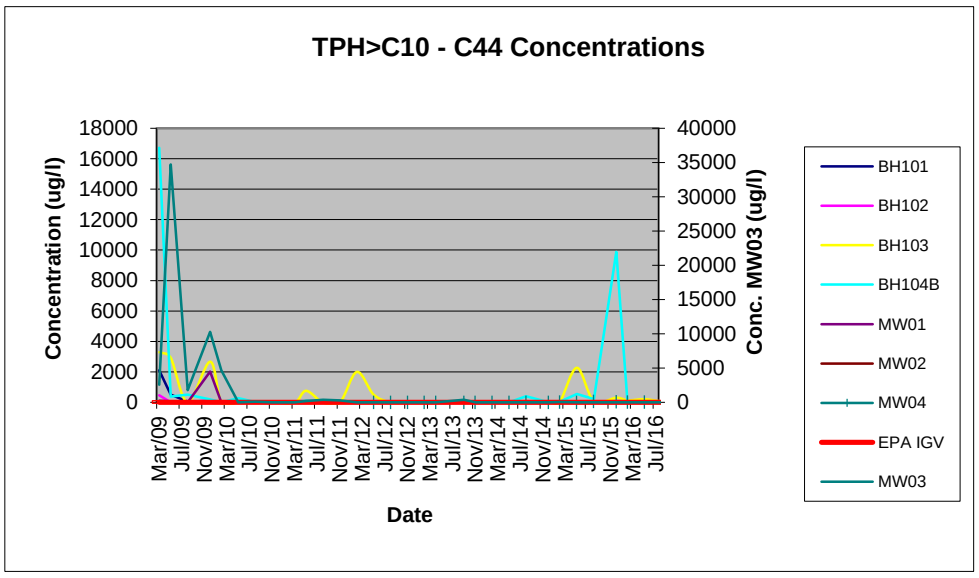


6.2.3 Petroleum Hydrocarbons (TPH)

Historically **Total Petroleum Hydrocarbons (TPH)** including mineral oil, petrol range organics (PRO) and diesel range organics (DRO) have been detected within BH103, BH104B and MW03. Since 2009, speciated hydrocarbon analysis using the Total Hydrocarbon Criteria Working Group (TPHCWG) method has been carried out on all samples to obtain a more accurate profile of TPH within groundwater.

The results of the TPHCWG analysis has indicated that the predominant hydrocarbons detected are in the heavier chain carbon fractions, most notably in the carbon range C12-C16, C16-C21 and C21-C35. **Figure 6.11** illustrates the TPH analysis for the total TPH analysis from C10-C44 in all monitoring wells since 2009. The highest concentrations detected historically are at monitoring wells MW03, BH104B and BH103 respectively.

Figure 6.11 – TPH (Carbon Range C10-C44) in all Monitoring Wells



Previous quarterly monitoring reports have outlined the hydrocarbon trends recorded in each well since 2010. This report outlines the trends from 2012 up to and including the current monitoring report.

During the Quarter 1, 2012 monitoring event, hydrocarbons were detected in borehole BH103 only. The predominant aliphatic carbon range comprised C10-C12 (13 µg/l), C12-C16 (270 µg/l), C16-C21 (690 µg/l) and C21-C35 (980 µg/l). The predominant aromatic carbon range comprised of C16-C21 (250 µg/l) and C21-C25 (680 µg/l).

During the Quarter 2, 2012 monitoring event, hydrocarbons were detected in BH103 only. The detected aliphatic carbon range comprised C12-C16 (98 µg/l), C16-C21 (230 µg/l) and C21-C25 (170 µg/l). No detections of aromatic carbons were measured during the Quarter 2 2012 monitoring event.

No hydrocarbons were detected at any location during the Quarter 3 and Quarter 4, 2012 monitoring events.

During the Quarter 1, 2013 monitoring event aromatic hydrocarbons were detected in BH103, BH104B and MW04. The predominant aromatic carbon range comprised C12-C16 (30 µg/l), C16-C21 (280 µg/l) and C21-C35 (100 µg/l) in BH103, C10-C12 (30 µg/l), C12-C16 (110 µg/l) and C16-C21 (80 µg/l) in BH104B and C10-C12 (20 µg/l) and C12-C16 (80 µg/l) in MW04. Aliphatic hydrocarbons were detected in BH103 in the ranges C12-C16 (70 µg/l), C16-C21 (100 µg/l) and C21-C35 (90 µg/l).

During the Quarter 2, 2013 monitoring event no aliphatic or aromatic hydrocarbons were detected at any location.

During the Quarter 3, 2013 monitoring event, hydrocarbons of the aliphatic range were detected in MW03 only. The detected aliphatic carbon range comprised C10-C16 (290 µg/l) and C12-C16 (190 µg/l). No detections of aromatic carbons were measured during the Quarter 3 2013 monitoring event.

Total Petroleum Hydrocarbons were not detected at any monitoring location during the Quarter 4, 2014 monitoring event. During the monitoring event for Quarter 3 2014 following ranges of the aliphatic hydrocarbons were recorded for BH104B; C12-C16 (150 µg/l), C16-C21 (250 µg/l) and C21-C35 (10 µg/l).

During the Quarter 1 2015 monitoring event, hydrocarbons were detected in MW03, MW04, BH103 and BH104B. The predominant aromatic carbon range comprised C21-C35 (14 µg/l) in BH103, C12-C16 (27 µg/l) and C16-C21 (15 µg/l) in BH104B, C12-C16 (14 µg/l) in MW03 and C12-C16 (15 µg/l) in MW04. Aliphatic hydrocarbons were detected in the ranges C16-C35 (54 µg/l) in BH103, C16-C35 (11 µg/l) in BH104B and C16-C35 (46 µg/l) and C35-C44 (12 µg/l) in MW03.

During the Quarter 2 2015 monitoring event, the TPH concentration in the aromatic C21-C35 range was detected at one shallow groundwater wells BH103 (509 µg/l). The TPH concentration in the aliphatic range was detected at C16-C35 (1760 µg/l) in BH103 and C12-C16 (225 µg/l) and C16-C35 (11 µg/l) in BH104B.

The Quarter 3 monitoring event of 2015 detected TPH in the aromatic ranges C12-C16 (39 µg/l), C16-C21 (37 µg/l) and C21-C35 (28 µg/l) at BH104B, C21-C35 at BH103 (17 µg/l) and C10-C12 (18 µg/l) and C12-C16 (29 µg/l) at MW04. TPH concentrations were detected in the aliphatic ranges C10-C12 (13 µg/l), C12-C16 (40 µg/l) and C16-C35 (62 µg/l) at BH104B and C16-C35 at BH103 (72 µg/l) and MW03 (14 µg/l).

The Quarter 4 monitoring event of 2015 detected TPH in the aromatic ranges C12-C16 (879 µg/l), C16-C21 (1380 µg/l) and C21-C35 (694 µg/l) at BH104B, C21-C35 at BH103 (60 µg/l) and C10-C12 (13 µg/l) and C12-C16 (21 µg/l) at MW04. TPH concentrations were detected in the aliphatic ranges C10-C12 (495 µg/l), C12-C16 (3080 µg/l) and C16-C35 (3360 µg/l) at BH104B and C16-C35 (231 µg/l) and C35-C44 (14 µg/l) at BH103.

The Quarter 1 2016 monitoring event, detected TPH in samples from the well BH103 were in the aliphatic range C16-C35 (132 µg/l) and from well MW04 in the aromatic range C12-C16 (15 µg/l).

For the previous Quarter 2 2016 monitoring event, TPH was detected in samples from the well BH103 and were in the aliphatic range C16-C35 (150 µg/l) and in the aromatic range C21-C35 (57 µg/l) and from well MW04 in the aromatic range C12-C16 (20 µg/l).

During the current Quarter 3 2016 monitoring event, TPH was detected in samples from the well BH103 in the aliphatic ranges C16-C35 (35 µg/l), C35-C44 (10 µg/l) and in the aromatic range C21-C35 (11 µg/l), well BH104B in the aromatic ranges C12-C16 (25 µg/l) and C16-C21 (12 µg/l) and from well MW04 in the aromatic range C12-C16 (23 µg/l).

7 CONCLUSIONS

- In accordance with the criteria set out in Schedule 4(ii) of the site's Industrial Emissions Licence Register No. W0184-01, groundwater monitoring was carried out at the ENVA Ireland site on the 31st August 2016 corresponding to Quarter 3 of 2016. Samples were collected at 8 groundwater monitoring wells during this event.
- The results presented have been referenced against Groundwater Threshold Values (GTVs) outlined in the European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. no 9 of 2010), where available. Where GTVs are not available for parameters, results are compared against the Interim Guideline Values (IGVs) set out in the Environmental Protection Agency interim report, 'Towards Setting Guideline Values for the Protection of Groundwater in Ireland'.
- Results of the BTEX and MTBE demonstrate that the levels of Benzene, Toluene, Ethylbenzene, m&p Xylene, o-xylene and MTBE were all below the recommended EPA IGVs.
- The Quarter 3 2016 results of the speciated polycyclic aromatic hydrocarbons indicate that Total PAHs were above the EPA IGV of 0.1 µg/l at four out of eight monitoring wells, BH103 (0.181 µg/l), BH104B (0.158 µg/l), MW103 (0.562 µg/l) and MW104 (0.151 µg/l).
- Vinyl Chloride was detected above the GTV of 0.375 µg/l at MW04 (0.6 µg/l). Chloroethane in MW04 (8.4 µg/l) and Chloromethane in BH104B (1.5 µg/l) were also detected. These results are above the laboratory limit of detection, however, there is no GTV or IGV limit for these parameters. All other VOCs and SVOCs were below their respective laboratory limits of detection.
- Samples were analysed for speciated phenols to include chlorophenols and the results indicate that there were no detections above the laboratory limits of detection.
- For the current Quarter 3 2016 monitoring event, TPH detections in samples from the well BH103 were in the aliphatic range C16-C35 (35 µg/l) and C35-C44 (10 µg/l) and in the aromatic range C21-C35 (11 µg/l), at BH104B were in the Aromatic range C12-C16 (25 µg/l) and C16-C21 (12 µg/l) and at well MW04 were in the aromatic range C12-C16 (23 µg/l). Each of these is therefore over the limit of detection which is 10 µg/l. During the previous Quarter 2 monitoring event, TPH detections in samples from the well BH103 were in the aliphatic range C16-C35 (150 µg/l) and in the aromatic range C21-C35 (57 µg/l), and from well MW04 in the aromatic range C12-C16 (20 µg/l). Hydrocarbons in the aliphatic range C16-C35 (132 µg/l) at BH103 and the aromatic range C12-C16 (15 µg/l) at MW04 were observed during the Quarter 1 2016 monitoring event. Concentrations in the aliphatic ranges C10-C12 (495 µg/l), C12-C16 (3080 µg/l) and C16-C35 (3360 µg/l) as well as in the aromatic ranges C12-C16 (879 µg/l), C16-C21 (1380 µg/l) and C21-C35 (694 µg/l) were detected at BH104B during the Quarter 4 2015 monitoring event. Also in Quarter 4 2015, TPH concentrations were recorded in the aliphatic ranges C16-C35 (231 µg/l) and C35-C44 (14 µg/l) at BH103 and aromatic ranges C21-C35 (60 µg/l) at BH103 and C10-C12 (13 µg/l) and C12-C16 (21 µg/l) at MW04. During Quarter 3 2015, TPH concentrations were also recorded in the aromatic ranges at BH103, BH104B and MW04, as well as in the aliphatic ranges at BH103, BH104B and MW03. Hydrocarbons were detected at BH104B in the aliphatic range and BH103 in both the aromatic and aliphatic ranges during the Quarter 2 2015 monitoring event.
- The general trend of contaminant concentrations over time continues to be somewhat variable with compounds not being continually detected in the same borehole on two or three consecutive monitoring rounds. In general, the contaminant levels detected at the Enva facility appear to indicate reducing contaminant concentrations over time with infrequent elevations in some parameters. Further monitoring is recommended to confirm these reductions.

Enva Portlaoise

2016 Groundwater Compliance Monitoring Quarter 4 (Oct – Dec 2016)

Document Control Sheet

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1 INTRODUCTION

1.1 BACKGROUND

RPS has been commissioned by Enva Ireland Ltd (Enva) to carry out groundwater quality monitoring for environmental compliance, at their facility in the Clonminam Industrial Estate, Portlaoise, Co Laois. Groundwater monitoring has being carried out in strict accordance with criteria set out in Schedule 4(ii) of the site's Industrial Emissions Licence, Register No. W0184-01.

Enva Ireland has been operating under Waste Licence Register No. W0184-01 since January 2004. The licence was amended by the Environmental Protection Agency in December 2013 to conform to the provisions and requirements of the Council Directive 2010/75/EU (Industrial Emissions Directive) and as such is deemed an Industrial Emissions Licence. Enva is required to submit a report to the EPA on a quarterly basis, outlining the existing groundwater quality underlying the site.

A suitably qualified environmental consultant from RPS, collected groundwater samples from a series of 8 monitoring wells (BH101, BH102, BH103, BH104B, MW01, MW02, MW03, MW04) within the site boundary on the 6th of December 2016. The samples underwent laboratory analysis for the suite of parameters specified in Schedule 4(ii) of Industrial Emissions Licence W0184-01. This report outlines the results of the Quarter 4 monitoring for 2016 and reviews historical data recorded at the site.

1.2 OBJECTIVES & SCOPE OF WORK

The specific objectives and scope of work are as follows:

- Review of previous data as provided by Enva Portlaoise;
- Graphical presentation of key compounds and trends; and
- Discussion of results for Quarter 4 2016 within the context of previous results and available guideline concentrations.

2 REVIEW OF PREVIOUS DATA

2.1 INFORMATION SOURCES

The following documents were reviewed as part of this project:

- Industrial Emissions Licence W0184-01 and any available EPA documents from the EPA website;
- Quarterly Groundwater Monitoring Reports (Quarter 1 2004 to Quarter 4 2005), URS;
- Quarterly Groundwater Monitoring Reports (Quarter 1 2006 to Quarter 4 2015), RPS;
- Summary Report on Trend of Contaminant Levels at Enva Ireland Ltd since 2005, Ref: MDE0647RP0001, RPS (2007);
- Groundwater Risk Assessment, Ref: MDE0788Rp0001, RPS (2008);
- Hydrogeological Review and Assessment Report, Ref MDE0973Rp0017F01, RPS (2014);
- Baseline Environment Report, Ref: MDE0973Rp0104;
- Quarter 1 Groundwater Monitoring Report, RPS (2016);
- Quarter 2 Groundwater Monitoring Report, RPS (2016); and
- Quarter 3 Groundwater Monitoring Report, RPS (2016).

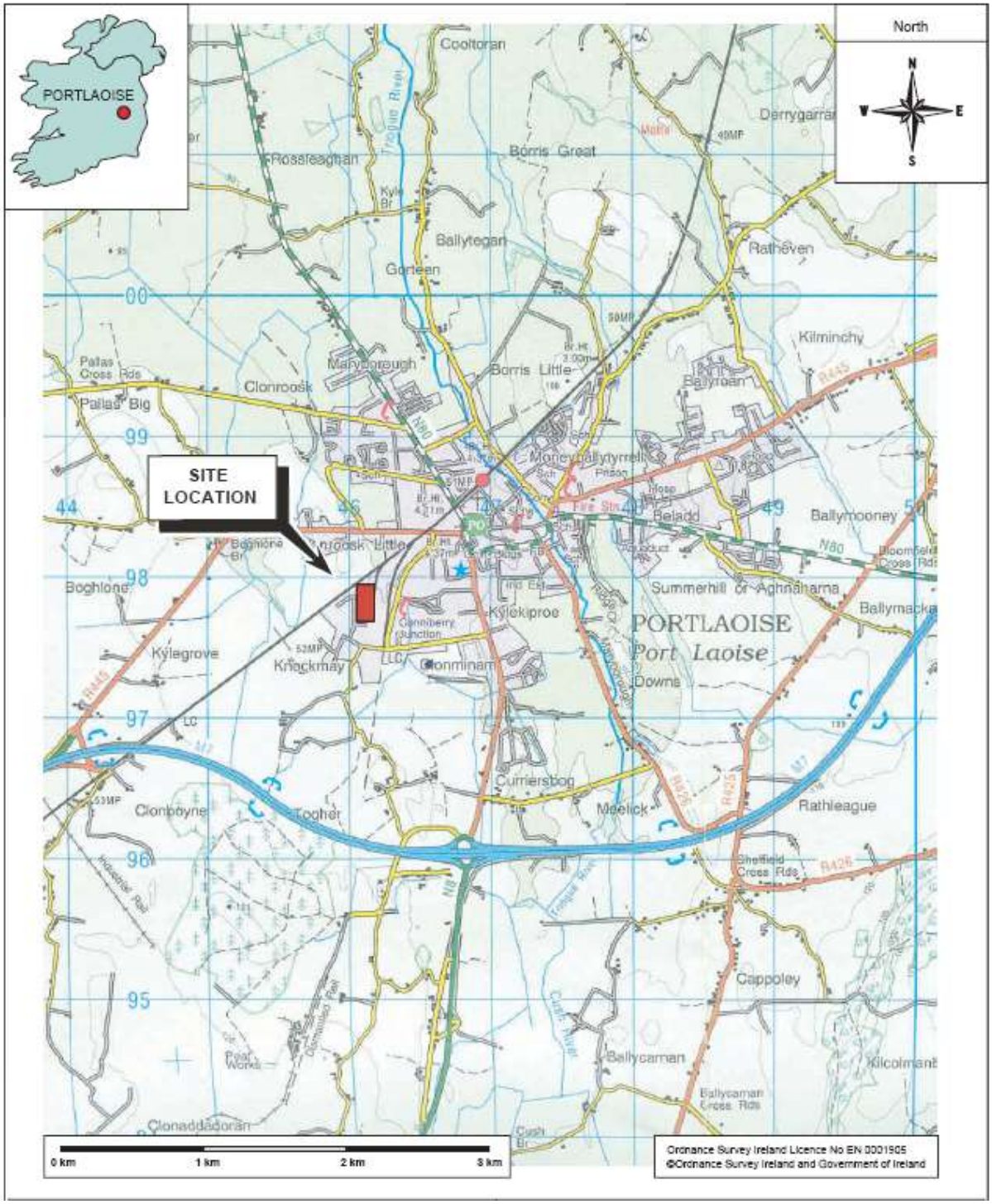
2.2 SITE SETTING

The site is located to the southwest of the town of Portlaoise immediately to the south of the Dublin to Cork railway line. The general area is gently undulating. The site slopes gently to the southwest but to the east of the site the ground slopes gently towards the River Triogue, which is located approximately 1.5 km to the east. The site occupies an area of approximately 1.5 hectares and comprises of an operational waste oil and contaminated soil treatment plant.

The site is located on the outskirts of Portlaoise in an area of agricultural and light industrial development. The site is bounded to the north and east by land belonging to Irish rail, comprising sidings and general storage areas. To the south is a vehicle repair garage, which is elevated above the level of the site by approximately 1.5 m. To the west the site is adjoined by further industrial land, as well as residential land. The site location is presented on **Figure 2.1**.

The site has been in operation since 1978, and the layout has remained relatively consistent. The site layout is presented on **Figure 3.1**. The site is largely covered in hardstanding with some open areas in the far north and northeast of the site. All oil and soil storage areas are suitably bunded and the general standard of housekeeping is good.

Figure 2.1 – Site Location



2.3 REGIONAL SETTING

2.3.1 Geology

The Geological Survey of Ireland indicates that the regional geology of Portlaoise is typified by Carboniferous Limestone. In the vicinity of the site itself the solid geology comprises the Ballysteen Formation, a micaceous-bioclastic limestone. This well-bedded limestone, with interbeds of shale, is extensively folded, with axes trending north-east to south-west, and becomes increasingly muddy towards the top of the formation. North-east to south-west trending faults are found in the region, with one located approximately 500m to the east of the site. The subsoils in the region comprise mainly Made Ground, around the industrial area, and Limestone Till in the surrounding regions.

2.3.2 Hydrogeology

The limestone is classified by the Geological Survey of Ireland (GSI) as a Locally Important Karstified Aquifer (Ll). Porosity is predominantly in the form of fractures, in this aquifer, however the muddy nature of this formation greatly reduces permeability. Vulnerability of this aquifer beneath the site is classified as high, with moderate vulnerability to the east of the site.

The public water supply for Portlaoise is derived from groundwater, utilising three groundwater abstraction well fields comprising of two abstraction wells in each well field. This supply currently comes from the Straboe area, approximately 5.5 km to the north-east of the site. The source protection zone for this water supply extends to within 3.2 km of the Enva site but does not encompass the Enva site.

The GSI record a number of other dug wells and boreholes within the Portlaoise area, including the boreholes installed on the site. The accuracy of the locations of these wells varies. One well, which was drilled in 1899 is recorded as being located immediately to the south of the Enva site. The use of this well is not known and its location is only accurate to 1 km. A second borehole, drilled in 1973 is recorded 1.5 km to the north of the site at Clonroosk; the accuracy of this location is also 1 km so it could be closer or further from the site. The use of this well is not known but its yield is recorded as being poor. There are no other wells recorded within 1 km of the site.

Enva is not aware of any abstraction boreholes within the immediate vicinity of their site.

2.4 SITE GROUND CONDITIONS

A total of eight boreholes have been drilled at the site and the general sequence of ground conditions is presented in **Table 2.1**.

Table 2.1 – Ground Conditions

Strata	Extent	Thickness	Description
Made Ground	BH104	0-3.5 m	Predominantly concrete, with hardcore fill, and clay.
Boulder Clay	All boreholes	<8.5 m	Includes fine to medium, well rounded gravels.
Sand and Gravel	Confined to south east corner of site (BH101, BH104 and MW03)	0-2 m	In general the transition from boulder clay to sand is gradual with changes from gravel, to sandy gravel, to sand.
Limestone Bedrock	Encountered in MW01, MW02 and MW03	Top of limestone ranges from 7.7m to 9m below ground level.	Pale grey, fine-grained bedrock, differentiated from boulders by its un-weathered nature.

The logs for each of the boreholes were previously presented as Appendix B in the RPS Groundwater Risk Assessment Report (Ref: MDE0788Rp0001).

2.4.1 Licence Conditions

The Industrial Emissions Licence requires the regular monitoring and sampling of boreholes BH101, BH102, BH103, BH104B, MW01, MW02, MW03 and MW04. The parameters requiring measurement or analysis are presented in **Table 2.2**.

Table 2.2 – Licence Parameters

Group	Parameters requiring Quarterly Measurement	Parameters requiring Annual Measurement
Field Parameters	Groundwater Level pH Temperature Dissolved Oxygen Electrical Conductivity Visual Inspection	Groundwater Level pH Temperature Dissolved Oxygen Electrical Conductivity Visual Inspection
Organics	Mineral Oil BTEX & MTBE PAHs Phenols VOCs SVOCs	Mineral Oil BTEX & MTBE PAHs Phenols VOCs SVOCs
Inorganics	-	Total Alkalinity, Calcium, Manganese, Sulphate, Cyanide (Total), Chloride, Sodium,

3 METHODOLOGY

Groundwater samples were collected from 8 no. on-site groundwater monitoring wells (BH101, BH102, BH103, BH104B, MW01, MW02, MW03, MW04) (**Figure 3.1**) using dedicated Waterra tubing, in accordance with RPS's standard sampling protocol. A non-return foot valve was fixed to the bottom of the tubing and inserted into the well, close to the base of the borehole. Separate tubing and foot valves were used at each monitoring well to eliminate the possibility of cross contamination.

Groundwater in the well casing is not considered representative of the groundwater quality at a given location. For this reason, three well volumes were purged from each well prior to collection of the groundwater sample. By the time purging was complete all field test water parameters (namely pH, Temperature, Electrical Conductivity and Dissolved Oxygen) were within 10% variance in three consecutive measurements. This ensured that the groundwater sample extracted from the monitoring borehole was representative of the water held in the subsurface strata and not water held stagnant in the borehole casing. The purged volumes were calculated on-site from the measured static water levels and total well depths using an electronic dip meter.

Groundwater samples were collected in laboratory supplied containers and stored in chilled cool boxes following sampling and during transit to the laboratory. A rigorous chain of custody procedure was used during the sample round.

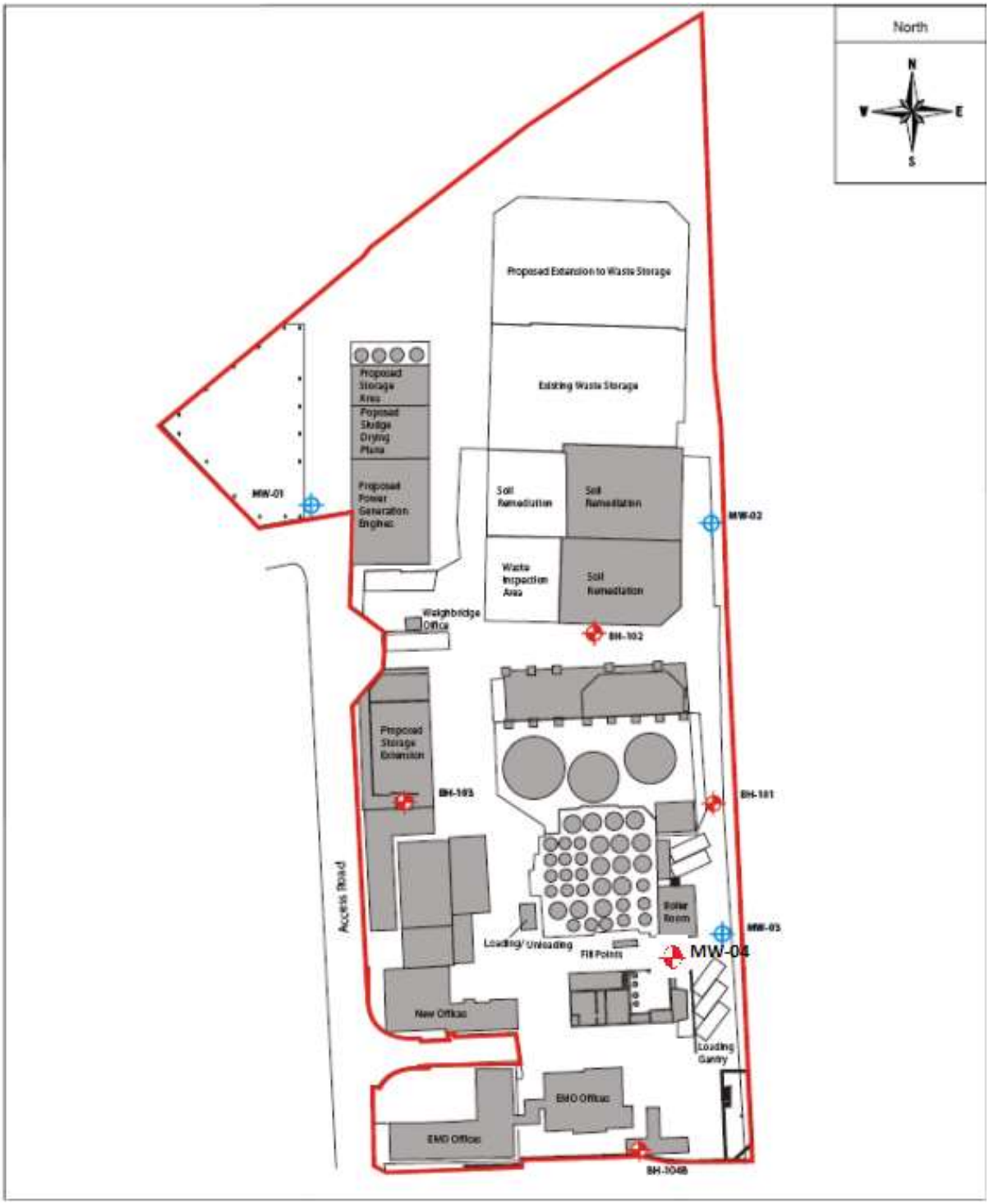
3.1 LABORATORY ANALYSIS

All groundwater samples were analysed at a UKAS accredited laboratory, ALS Environmental for the suite of analyses listed in **Table 3.1**. **Table 3.1** also indicates the analytical techniques used by the laboratory.

Table 3.1 – Analytical Methodologies – ALS Environmental

Parameter	Analytical Methodology
Phenols	GC-MS
Speciated PAHs	GC-MS
BTEX & MTBE	Headspace GC-MS
Petroleum Hydrocarbons	Headspace GC-MS
Volatile Organic compounds & Tentatively Identified Organic Compounds (VOCs & TICs)	Headspace GC-MS
Semi-Volatile Organic compounds & Tentatively Identified Organic Compounds (SVOCs & TICs)	GC-MS

Figure 3.1 – Site Layout Plan with Groundwater Monitoring Locations



Shallow Monitoring Well locations

Deep Monitoring Well locations

Source: *URS Environmental Consultants (Ref: 45078497 Issue No. 1)*

3.2 PRESENTATION & INTERPRETATION OF RESULTS

The Quarter 4 2016 results are tabulated in **Section 4** and discussed with respect to previous results in **Section 5**. Results are compared against Groundwater Threshold Values (GTVs) outlined in the European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No 9 of 2010), where available. Where GTVs are not available for parameters, results are compared against the Interim Guideline Values (IGVs) set out in the Environmental Protection Agency interim report, 'Towards Setting Guideline Values for the Protection of Groundwater in Ireland'.

Previous monitoring reports (as listed in **Section 2.1**) provide details of contaminant concentrations since 2004. The data available within these reports has been reviewed and time series plots of key parameters have been compiled. Trends for chlorinated solvents, petroleum hydrocarbons and phenol parameters have been plotted.

Time series plots are presented in **Section 6** and include the results of this Quarter 4 2016 monitoring round. As the monitoring continues in accordance with the Industrial Emissions licence requirements, the plots will be updated with the results of subsequent rounds used to illustrate the results.

Time series plots are also provided for manual water levels where available from previous reports.

4 QUARTER 4 RESULTS DECEMBER 2016

The results of all field measurements and laboratory analysis are presented in this section. Results are primarily compared against Groundwater Threshold Values (GTVs) outlined in the European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No 9 of 2010), where available. Where GTVs are not available for parameters, results are compared against the Interim Guideline Values (IGVs) set out in the Environmental Protection Agency interim report, 'Towards Setting Guideline Values for the Protection of Groundwater in Ireland'.

The results are discussed in relation to appropriate guideline values in **Section 5**. Results that are shown to be above the relevant threshold or guideline values are highlighted in bold and shaded. Results that are shown to be above the relevant laboratory detection limits are highlighted in italics.

Site-specific field parameter measurements were collected during the site visit as per RPS Water sampling protocol.

Groundwater samples from the 8 monitoring wells (BH101, BH102, BH103, BH104B, MW01, MW02, MW03, MW04) were collected within the site boundary on the 6th of December 2016 following the methodology outlined in Section 3. The samples were sent to ALS Environmental for laboratory analysis. ALS noted on receipt of analysis that the SVOC bottle for BH101 and LL phenol bottle for MW03 were empty on arrival. As such, the SVOC analysis for BH101 and phenol analysis for MW03 was unable to be carried out.

An additional sample for these two locations was undertaken on the 19th of December, following the methodology outlined in Section 3. The samples were submitted to the lab for SVOC analysis for BH101 and phenol analysis for MW03.

Table 4.1 – Groundwater Levels (Quarter 4, 2016)

Monitoring Well	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04
Depth (mbgl)	6.74	6.44	4.41	4.51	22.59	30.87	14.76	6.49
Static Water Level (mbgl)	4.45	3.52	1.95	1.14	2.46	3.74	4.24	4.12
Ground Level (mAOD)	103.06	102.55	101.16	101.52	102.10	103.12	102.77	-
Water Level (mAOD)	98.61	99.03	99.21	100.38	99.64	99.38	98.53	-
Free Phase Oil (mm)	No detection	No detection	No detection	No detection	No detection	No detection	No detection	No detection

mbgl = metres below ground level

Table 4.2 – Results of Field Parameters Measured at each Groundwater Monitoring Well (Quarter 4, 2016)

Monitoring Well	pH (pH Units)	Temperature (°C)	Conductivity (µS/cm)	Dissolved O_2 (ppm)	Observations
BH101	7.47	9.8	**1076**	4.92	Light grey cloudy colour, some sediment
BH102	7.51	9.5	749	4.31	Clear on purging, some suspended solids
BH103	7.23	8.1	821	3.93	Grey in colour and very little sediment
BH104B	8.11	10.0	675	4.67	Dark grey colour on purging, some suspended solids and slight oil sheen
MW01	7.57	9.3	712	5.15	Clear/slight grey colour
MW02	7.92	8.6	769	3.86	Clear with very little suspended solids or sediment
MW03	7.50	9.7	**1411**	4.83	Grey colour on purging, very little suspended solids
MW04	6.96	8.8	**1323**	3.52	Cloudy brown colour, little sediment and suspended solids
Groundwater Threshold Value	-	-	1875	-	-
Interim EPA Guideline Values (Units as indicated)	>6.5 & <9.5	25°C	1000	No abnormal change	-

Note: Results above the relevant IGV are highlighted in bold.
Note: Results above the GTV are highlighted in bold and shaded.

Table 4.3 – Results of BTEX and MTBE

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Benzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.75	1.0
Toluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
Ethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
m & p-xylene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10 Note 1
o-xylene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10 Note 1
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	***1.5***	***1.2***	-	30

Note: No specific IGV for parameter. IGV for Total Xylenes is used as guideline.
Note: Results above the relevant laboratory limit of detection are highlighted in bold italics.

Table 4.4 – Results of Speciated PAHs

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Naphthalene	µg/l	0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	***0.036***	<0.17	-	1.0
Acenaphthylene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	***0.013***	<0.01	-	-
Acenaphthene	µg/l	0.01	<0.01	<0.01	***0.027***	<0.01	<0.01	<0.01	***0.097***	<0.01	-	-
Fluorene	µg/l	0.01	<0.01	***0.011***	<0.01	***0.014***	<0.01	<0.01	***0.161***	***0.015***	-	-
Phenanthrene	µg/l	0.01	<0.01	***0.039***	<0.01	<0.01	<0.01	<0.01	***0.019***	<0.01	-	-
Anthracene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	***0.013***	<0.01	-	10,000
Fluoranthene	µg/l	0.01	<0.01	***0.026***	<0.01	<0.01	***0.01***	<0.01	***0.019***	<0.01	-	1.0
Pyrene	µg/l	0.01	<0.01	***0.027***	<0.01	***0.022***	***0.014***	<0.01	***0.097***	<0.01	-	-
Benzo(a)anthracene	µg/l	0.01	<0.01	***0.01***	<0.01	<0.01	<0.01	<0.01	***0.027***	<0.01	-	-
Chrysene	µg/l	0.01	<0.01	***0.012***	<0.01	<0.01	<0.01	<0.01	***0.03***	<0.01	-	-
Benzo(b)fluoranthene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	***0.018***	<0.01	-	0.5

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Benzo(k)fluoranthene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	0.05
Benzo(a)pyrene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.032**	<0.01	-	0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	0.05
Dibenz(a,h)anthracene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-
Benzo(g,h,i)perylene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	***0.036***	<0.01	-	0.05
Total EPA-16 PAHs	µg/l	0.1	<0.01	**0.124**	***0.027***	***0.037***	***0.024***	<0.01	**0.596**	***0.015***	0.075	0.1

Note: Results above the relevant IGV are highlighted in bold.
Note: Results above the GTV are highlighted in bold and shaded.
Note: Results above the relevant laboratory limit of detection are highlighted in bold italics.

Table 4.5 – Results of Speciated Phenols

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Phenol	µg/l	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	-	0.5
2,4,6-Trichlorophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	200
2,4-Dichlorophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2,4-Dimethylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Chlorophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	200
2-Methylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Nitrophenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
4-Chloro-3-methylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
3+4-Methylphenol	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-

Note: Results above the relevant laboratory limit of detection are highlighted in bold italics.

Table 4.6 – Results of Semi-Volatile Organic Compounds (SVOCs)

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Phenol	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.5
2-Chlorophenol	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	200
Bis(2-chloroethyl)ether	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,3-Dichlorobenzene	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,2-Dichlorobenzene	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
1,4-Dichlorobenzene	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Bis(2-chloroisopropyl)ether	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Methylphenol	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Hexachloroethane	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Nitrobenzene	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
3&4-Methylphenol	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Isophorone	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Nitrophenol	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2,4-Dimethylphenol	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Bis(2-chloroethoxy)methane	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,2,4-trichlorobenzene	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.40
Naphthalene	µg/l	2.0	<400	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	1.0
2,4-Dichlorophenol	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Hexachlorobutadiene	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.10
4-Chloro-3-methylphenol	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2,4,6-Trichlorophenol	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	200
2,4,5-Trichlorophenol	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Methylnaphthalene	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Chloronaphthalene	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Dimethylphthalate	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
2,6-Dinitrotoluene	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Acenaphthylene	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Acenaphthene	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2,4-Dinitrotoluene	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Dibenzofuran	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
4-Chlorophenyl phenyl ether	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Diethylphthalate	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Fluorene	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
4-Bromophenyl phenyl ether	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Hexachlorobenzene	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.03
Phenanthrene	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Anthracene	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10,000
Pyrene	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Benzyl Butyl Phthalate	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Benzo(a)anthracene	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Chrysene	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Benzo(b)fluoranthene	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.5
Benzo(k)fluoranthene	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.05
Benzo(a)pyrene	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.01
Indeno(1,2,3-c,d)pyrene	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.05
Dibenz(a,h)anthracene	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Benzo(g,h,i)perylene	µg/l	1.0	<200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Bis(2-ethylhexyl)phthalate	µg/l	5.0	<1000	7.6	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	-	-

Note: Results above the relevant IGV are highlighted in bold.
Note: Results above the GTV are highlighted in bold and shaded.

Table 4.7 – Results of Volatile Organic Compounds (VOCs)

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Chloromethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Chloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	***1***	***3.9***	-	-
Bromomethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	***1.2***	<1.0	<1.0	<1.0	-	-
Vinyl Chloride	µg/l	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.375	-
Trichlorofluoromethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,1-dichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	30
1,1-dichloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	***1.6***	***1.9***	-	-
Cis-1,2-dichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	***1.5***	***1.2***	-	30
2,2-Dichloropropane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,1,1-Trichloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	500
1,2-dichloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2.25	-
1,1-Dichloropropene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Trans-1,2-dichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Benzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	1.0
1,2-dichloropropane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Trichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	70
Dibromomethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Bromodichloromethane	µg/l	1.0	-	-	-	-	-	-	-	-	-	-
Cis-1,3-dichloropropene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Trans-1,3-dichloropropene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Toluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
1,1,2-Trichloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,3-Dichloropropane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Dibromochloromethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Tetrachloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	40
1,2-Dibromoethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Chlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	1.0
1,1,1,2-Tetrachloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Ethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
m&p-Xylene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
Styrene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
o-xylene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
Isopropylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Bromobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
N-Propylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
2-Chlorotoluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
4-Chlorotoluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,3,5-Trimethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Tert-Butylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,2,4-Trimethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Sec-Butylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,3-dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
P-Isopropyltoluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,2-dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	10
1,4-dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
n-Butylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
1,2-Dibromo-3-chloropropane	µg/l	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	-	-
1,2,4-Trichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.40
Hexachlorobutadiene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	0.10

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
1,2,3-Trichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-

Note: Results above the relevant IGV are highlighted in bold.
Note: Results above the GTV are highlighted in bold and shaded.
Note: Results above the relevant laboratory limit of detection are highlighted in bold italics.

Table 4.8 – Results of Total Petroleum Hydrocarbons (Aliphatic/Aromatic)

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Aliphatic > C10-C12	µg/l	10	<10	<10	<10	<10	<10	<10	<10	<10	-	-
Aliphatic > C12-C16	µg/l	10	<10	<10	<10	<10	<10	<10	<10	<10	-	-
Aliphatic > C16-C35	µg/l	10	<10	***13***	***160***	<10	<10	<10	***14***	<10	-	-
Aliphatic > C35-C44	µg/l	10	<10	<10	***14***	<10	<10	<10	<10	<10	-	-
Aliphatic > C10-C44	µg/l	10	<10	**13**	**174**	<10	<10	<10	**14**	<10	-	10
Aromatic > C10-C12	µg/l	10	<10	<10	<10	<10	<10	<10	<10	***13***	-	-
Aromatic > C12-C16	µg/l	10	<10	<10	<10	***12***	<10	<10	<10	***23***	-	-
Aromatic > C16-C21	µg/l	10	<10	<10	<10	<10	<10	<10	<10	<10	-	-
Aromatic > C21-C35	µg/l	10	<10	<10	***47***	<10	<10	<10	<10	<10	-	-
Aromatic > C35-C44	µg/l	10	<10	<10	<10	<10	<10	<10	<10	<10	-	-
Aromatic > C10-C44	µg/l	10	<10	<10	**47**	**12**	<10	<10	<10	**35**	-	10

Note: Results above the relevant IGV are highlighted in bold.
Note: Results above the relevant laboratory limit of detection are highlighted in bold italics.

5 DISCUSSION OF QUARTER 4 RESULTS

The results of the Quarter 4 monitoring event for 2016 are presented in **Table 4.1** to **4.9** of this report. For the purpose of this report, the results are compared against the Groundwater Threshold Values (GTVs) outlined in the European Communities Environmental Objectives (Groundwater) Regulations (S.I. No. 9 of 2010) where available. Where GTVs are not available results are compared against the EPA Interim Guideline Values (IGV) as set out in the Interim Report *'Towards Setting Guideline Values for the Protection of Groundwater in Ireland' 2004.* A discussion of the results and their significance is included below.

5.1 FIELD PARAMETERS

The results of the field parameters measured at each groundwater monitoring well are presented in Table 4.2. Groundwater samples recorded pH levels ranging between 6.96 and 8.11, all within the EPA Interim guideline range of ≥6.5 to ≤9.5. Temperature measurements ranged from 8.1°C to 10.0°C and were below the EPA IGV of 25°C.

Field measurements of Electrical Conductivity levels ranged between 675 µS/cm and 1411 µS/cm. Three measurements of Electrical Conductivity were above the IGV of 1000 µS/cm at BH101 (1085 µS/cm), MW03 (1594 µS/cm) and MW04 (1419 µS/cm), but all however were below the GTV limit of 1875 µS/cm.

Dissolved oxygen levels ranged between 3.52 and 5.15 ppm. Factors such as climate, nutrients in the water, suspended solids; organic wastes and groundwater inflow can all influence the dissolved oxygen values.

Observations relating to colour and odour varied from well to well as detailed in **Table 4.2**.

5.2 RESULTS OF BTEX & MTBE

The results of the **BTEX** and **MTBE** analysis are presented in **Table 4.3**. BTEX concentrations are below the associated GTVs and IGVs at all locations. All BTEX concentrations are also all below the laboratory of limit of detection at all locations. MTBE was detected at MW03 (1.5 µg/l) and MW04 (1.2 µg/l), however these concentrations below the IGV of 30 µg/l. MTBE was below the laboratory limit of detection and IGV at all other locations.

The previous detection of MTBE was in the Quarter 3 monitoring event of 2016 and recorded concentrations above the laboratory limit of detection at (1.2 µg/l). MTBE was also above the laboratory limit of detection at BH103 (1.2 µg/l), MW03 (1.8 µg/l) and MW04 (1.7 µg/) during Quarter 2 2016. These detections are still below the IGV limit however. Prior to this there was a detection of MTBE at BH104B in the Quarter 1 monitoring event of 2012 with a recorded concentration of 280 µg/l which is above the laboratory limit of detection. This was the only recorded exceedance in Quarter 1 2012.

Monitoring during Quarter 1 and Quarter 2 of 2010 detected exceedances of MTBE at BH103 at a concentration of 16 µg/l. Subsequent monitoring in 2010 recorded concentrations below the

laboratory limit of detection. Prior to these 2010 monitoring events, concentrations of MTBE at BH103 were recorded at 63 µg/l in December 2009.

5.3 RESULTS OF SPECIATED POLYAROMATIC HYDROCARBONS (PAHS)

The results of the Speciated PAH analysis during this monitoring period are presented in **Table 4.4.**

The laboratory limit of detection for Total EPA-16 PAHs is 0.1 µg/l and has been lowered for comparison with the EPA IGV of 0.1 µg/l; however this is not accredited. This laboratory limit of detection is above the EPA GTV of 0.075 µg/l. To identify the compounds, which attributed to these concentrations, speciated PAH analysis was carried out, which reduces the limit of detection for individual parameters to 0.01 µg/l.

Total Polyaromatic Hydrocarbons were above the IGV limit of 0.1 µg/l at BH102 (0.124 µg/l) and MW103 (0.596 µg/l). Total PAHs were below the IGV of 0.1 µg/l and the GTV of 0.075 µg/l at all other locations.

Total PAHs were previously detected above the IGV at BH103 (0.181 µg/l), BH104B (0.158 µg/l), MW104 (0.562 µg/l) and MW104 (0.151 µg/l) during the Quarter 3 2016 monitoring event and were also above the IGV at BH103 (0.111 µg/l) during the Quarter 2 2016 monitoring event.

The results of the speciated polycyclic aromatic hydrocarbon analysis detected a number of different compounds in BH101, BH102, BH103, BH104B, MW01, MW03 and MW04 above the laboratory limit of detection. However, with the exception of Benzo (a) pyrene at MW103 (0.032 µg/l), none of these compounds were above their respective IGV limits at any location.

5.4 RESULTS OF SPECIATED PHENOLS

During previous quarterly monitoring events and sample analysis, total monohydric phenol was determined and historically has been below the laboratory limit of detection of 10 µg/l since December 2008. It should be noted that the laboratory limit of detection was however above the IGV of 0.5 µg/l for phenols.

For this reason, samples were analysed for phenols to include chlorophenols. The results of the speciated phenols analysis are presented in **Table 4.5**. The speciated phenol analysis reduces the laboratory limit of detection to 1.0 µg/l for individual parameters.

The results of the current Quarter 4 2016 speciated phenol analysis confirm concentrations of phenols were below the laboratory limit of detection of 1.0 µg/l at all locations.

4-Chloro-3-methylphenol was detected at BH104B (1.37 µg/l) above the laboratory limit of detection during the Quarter 1 2015 analysis. With the exception of this, all other results are consistent with results since the 2012 quarterly monitoring events.

5.5 RESULTS OF SEMI-VOLATILE ORGANIC COMPOUNDS

The results of the Semi-Volatile Organic Compound analysis are presented in **Table 4.6**.

There are no GTVs for individual SVOC parameters. No SVOCs were detected above the relevant IGVs during this monitoring period, consistent with the results from the 2015 and 2014 monitoring periods. It should be noted that the laboratory limit of detection was however above the IGVs for some SVOCs, for example the result for 1,2,4-Trichlorobenzene was <1.0 µg/l but the IGV for this parameter is 0.40 µg/l, but testing at this limit is not accredited.

The Quarter 3 2013 monitoring event detected two SVOC compounds, Acenaphthene (1.1 µg/l) and Fluorene (1.5 µg/l) in MW03. Prior to this detection the Quarter 2 monitoring event of 2012 detected concentrations of Naphthalene and Acenaphthylene in MW03 at concentrations of 2.4 µg/l and 0.12 µ/l respectively.

5.6 RESULTS OF VOLATILE ORGANIC COMPOUNDS

The results of the Volatile Organic Compound analysis are presented in **Table 4.7**. Chloroethane at MW04 (3.9 µg/l) was detected above the limit of detection (1.0 µg/l), however there is no GTV or IGV limit for Chloroethane. The results of the Quarter 3 monitoring event previously detected Chloroethane in MW04 (8.9 µg/l).

at MW03 (1.6 µg/l) and MW04 (1.9 µg/l), and MTBE at MW03 (1.5 µg/l) and MW04 (1.2 µg/l) were also detected. However, the results are below the IGV for MTBE (30 µg/l) and there is no GTV or IGV limit for 1,1-dichloroethane. All other compounds were below their respective laboratory limits of detection.

Historic groundwater monitoring events detected some parameters above the laboratory limit of detection in November 2009, corresponding to Quarter 4 of 2009. Historically 1,1-Dichloroethane, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, MTBE, n-butylbenzene, n-propylbenzene, o-xylene, p-isopropyltoluene, sec-butylbenzene and tert-butylbenzene were detected above the laboratory limits of detection.

The results of the Quarter 3 and Quarter 4 monitoring events of 2009 and all subsequent monitoring events indicate that there were no exceedances of the GTVs or IGVs for specific parameters.

5.7 RESULTS OF TOTAL PETROLEUM HYDROCARBONS

In order to provide a more accurate profile of TPH within the groundwater, speciated hydrocarbon analysis using the Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG) method was carried out on samples taken at all boreholes. The results of the TPH analysis are presented in **Table 4.8**.

The EPA IGV of 10 µg/l for Total Hydrocarbons is deemed comparable with the results for Total Petroleum Hydrocarbons. Some detections of TPH in both the aliphatic and aromatic range were observed during the current Quarter 4 2016 monitoring event. Detections were found in samples from the following wells; at BH102 detections in the aliphatic range C16-C35 (13 µg/l), at BH103

detections were in the aliphatic range C16-C35 (160 µg/l), C35-C44 (14 µg/l) and in the aromatic range C21-C35 (47 µg/l), at BH104B detections were in the aromatic range C12-C16 (12µg/l), at MW03 detections in the aliphatic range C16-C35 (14 µg/l), and at well MW04 detections were in the aromatic ranges C10-C12 (13 µg/l) and C12-C16 (23 µg/l).

The previous Quarter 3 monitoring event detected TPH in the well BH103 in the aliphatic range C16-C35 (35 µg/l), C35-C44 (10 µg/l) and in the aromatic range C21-C35 (11 µg/l), at BH104B detections were in the aromatic range C12-C16 (25 µg/l), C16-C21 (12 µg/l) and at well MW04 detections were in the aromatic range C12-C16 (23 µg/l).

The Quarter 2 monitoring event of 2016 detected TPH in the well BH103 were in the aliphatic range C16-C35 (150 µg/l) and in the aromatic range C21-C35 (57 µg/l) and from well MW04 in the aromatic range C12-C16 (20 µg/l).

The Quarter 1 monitoring event of 2016 detected TPH in the aliphatic range C16-C35 (132 µg/l) at BH103 and in the aliphatic range C12-C16 (15 µg/l) at MW04.

The Quarter 4 monitoring event of 2015 detected TPH in the aromatic ranges C12-C16 (879 µg/l), C16-C21 (1380 µg/l) and C21-C35 (694 µg/l) at BH104B, C21-C35 at BH103 (60 µg/l) and C10-C12 (13 µg/l) and C12-C16 (21 µg/l) at MW04. TPH concentrations were detected in the aliphatic ranges C10-C12 (495 µg/l), C12-C16 (3080 µg/l) and C16-C35 (3360 µg/l) at BH104B and C16-C35 (231 µg/l) and C35-C44 (14 µg/l).

The Quarter 3 monitoring event of 2015 detected TPH in the aromatic ranges C12-C16 (39 µg/l), C16-C21 (37 µg/l) and C21-C35 (28 µg/l) at BH104B, C21-C35 at BH103 (17 µg/l) and C10-C12 (18 µg/l) and C12-C16 (29 µg/l) at MW04. TPH concentrations were detected in the aliphatic ranges C10-C12 (13 µg/l), C12-C16 (40 µg/l) and C16-C35 (62 µg/l) at BH104B and C16-C35 at BH103 (72 µg/l) and MW03 (14 µg/l).

The Quarter 2 monitoring event of 2015 detected TPH in the aromatic range C21-C35 at BH03 (509 µg/l). TPH concentrations were detected in the aliphatic ranges C16-C35 at BH103 (1760 µg/l) and BH104B (337 µg/l), and C12-C16 at BH104B (225 µg/l).

The Quarter 1 monitoring event of 2015 detected TPH in the aromatic ranges C12-C16 at wells MW03 (14 µg/l), MW04 (15 µg/l) and BH104B (27 µg/l), C16-C21 at BH104B (15 µg/l), and C21-C35 (14 µg/l) at BH103. TPH concentrations were detected in the aliphatic ranges C16-C35 and C35-C44 at MW03 (46 µg/l and 12 µg/l respectively), BH103 (54 µg/l) and BH104B (11 µg/l.

No detections of TPH in the aliphatic or aromatic range were observed in any shallow or deep monitoring well locations during the Quarter 4 monitoring event of 2014.

The Quarter 3 monitoring event of 2014 detected TPH concentrations in the aliphatic range at the shallow groundwater well BH104B. The TPH concentration detected was 410 µg/l. The speciated TPH ranges that contributed to the value of 410 µg/l were C12-C16 (150 µg/l), C16-C21 (250 µg/l) and C31-C35 (10 µg/l).

The Quarter 3, 2013 monitoring event detected TPH in the aliphatic range in one deep groundwater well, MW03. TPH of the range C10-C12 and C12-C16 were detected at concentrations of 200 µg/l and 190 µg/l respectively.

The Quarter 1, 2013 monitoring event detected aliphatic TPH of the range C12-C16, C16-C21 and C21-C35. TPH in the mid to high aromatic ranges were detected in BH103, BH104B and MW04 during the previous Quarter 1 2013 monitoring event. Aromatic TPH of the ranges C12-C16, C16-C21 and C21-C35 were detected in BH103, the ranges C10-C12, C12-C16 and C16-C21 were detected in BH104B and aromatic TPH of the ranges C10-C12 and C12-C16 were detected in MW04.

The Quarter 2 monitoring event of 2012 detected elevated TPH of the aliphatic range C12-C16, C16-C21 and C21-C25 in BH103. Hydrocarbons have been detected in borehole MW03 during Quarter 1 2010, in borehole BH104B during the Quarter 2 2010 monitoring event and in borehole BH104B and MW03 during the Quarter 3 2010 monitoring events. Hydrocarbons have also been detected in BH103, BH104B and MW03 in the Quarter 2 2011 monitoring event and in MW03 in the Quarter 3 and Quarter 4 2011. These detections are discussed further in **Section 6.2.3**.

6 HISTORICAL RESULTS & TRENDS

Time series plots are presented in this section and include the results of the Quarter 4 2016 monitoring round. As the monitoring continues in accordance with the Industrial Emissions Licence requirements, the plots will be updated with the results of subsequent rounds and used to illustrate the results.

6.1 GROUNDWATER LEVELS OVER TIME

Figure 6.1 to **Figure 6.3** below illustrates the manually recorded water levels using an electronic probe. The graphs show that groundwater levels can vary considerably between monitoring rounds.

Figure 6.2 illustrates groundwater elevations (mAOD) in shallow groundwater wells (BH101 to BH104B) ranging between approximately 98 mAOD and 102 mAOD.

Figure 6.3 illustrates groundwater elevation (mAOD) in the deeper groundwater wells (MW01 to MW03). The groundwater elevation (mAOD) for these deeper groundwater wells ranges from approximately 97.5 mAOD to approximately 100 mAOD.

Figure 6.1 – Ground Elevation (mAOD) in all Monitoring Wells

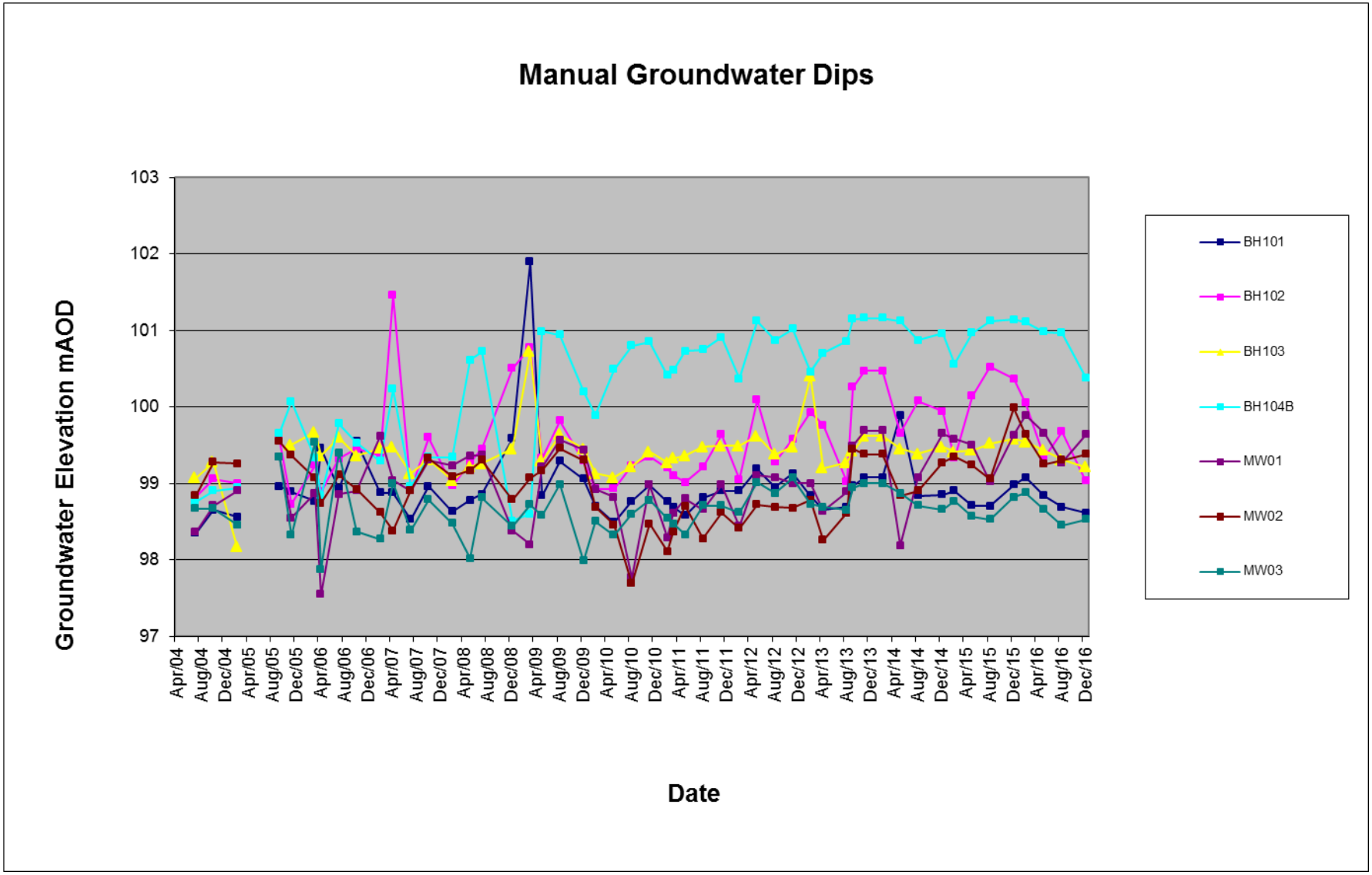


Figure 6.2 – Ground Elevation (mAOD) in Shallow Groundwater Monitoring Wells

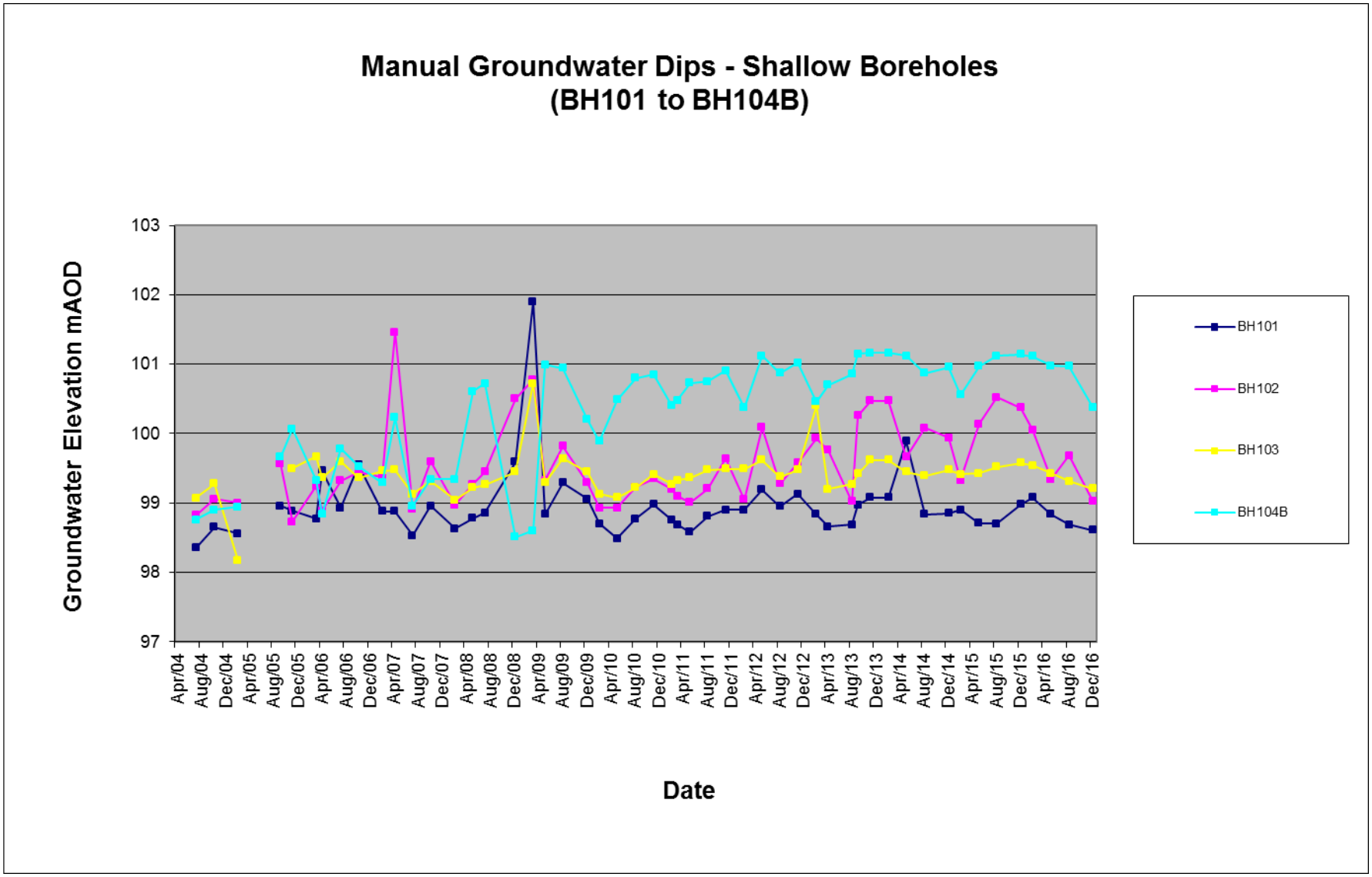
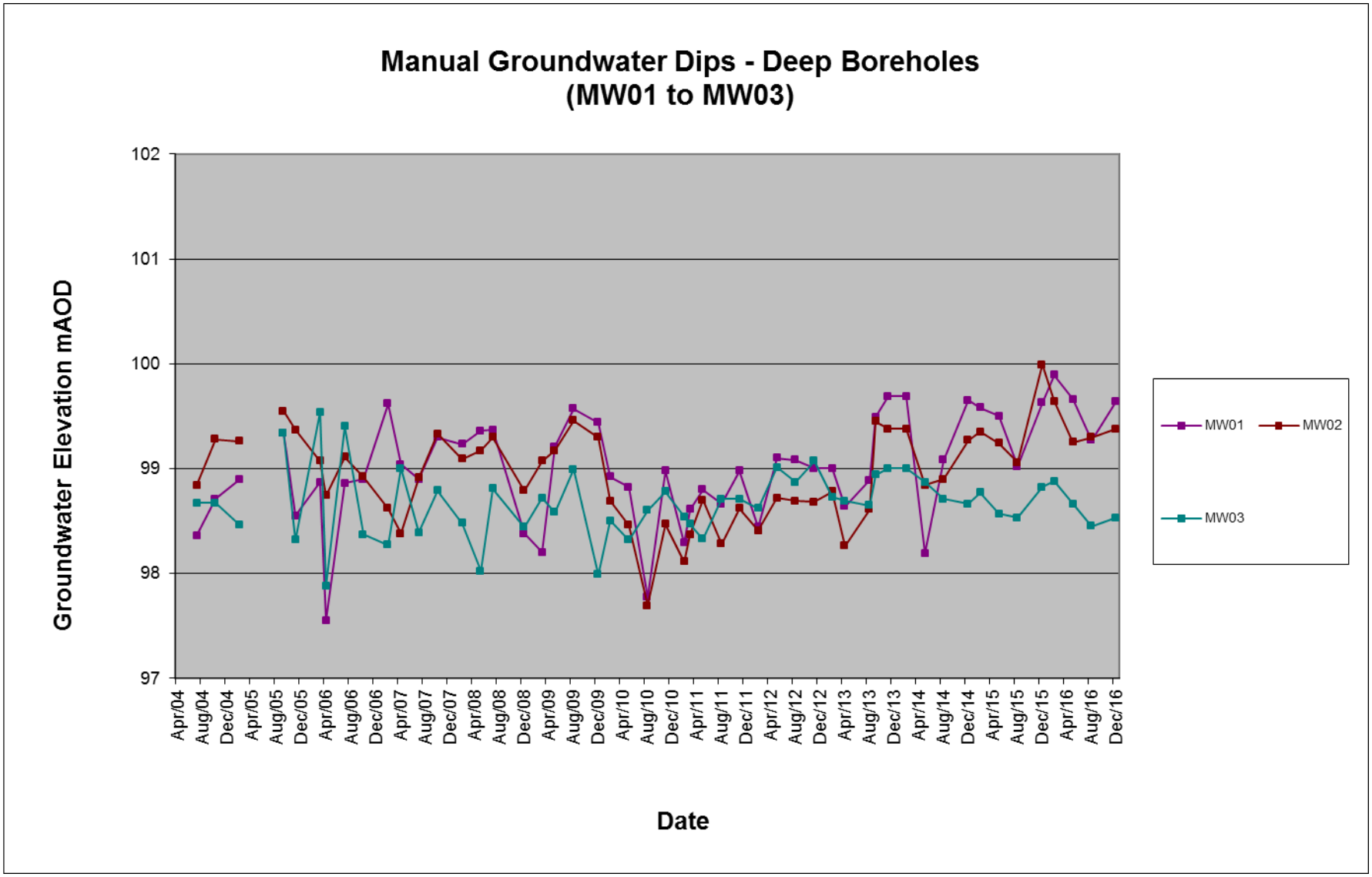


Figure 6.3 – Ground Elevation (mAOD) in Deep Groundwater Monitoring Wells



The groundwater levels generally show a similar pattern of fluctuation over time indicating a degree of connection between boreholes. The graphs demonstrate that groundwater levels can vary considerably between monitoring rounds; the general direction of flow in the shallow and deeper groundwater bearing unit is in an easterly or north easterly direction however there have been some occasional historic cases of groundwater flowing in a south-easterly direction.

In addition, monthly rainfall data for Oak Park, Carlow have been tabulated from Met Éireann to examine the relationship between compounds and rainfall events. The data from Oak Park was chosen as the weather station at Birr, Co. Offaly closed in October 2009. A summary of the rainfall data is in **Tables 6.1** to **6.5**.

Table 6.1 – Monthly Rainfall Data for Year 2012 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	70.8	24.5	18.0	56.3	50.2	155.8	76.2	127.7	37.9	63.4	80.9	68.1

Table 6.2 – Monthly Rainfall Data for Year 2013 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	76.2	35.8	57.6	44.4	35.6	37.5	32.3	85.6	24.4	170.0	27.7	136.6

Table 6.3 – Monthly Rainfall Data for Year 2014 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	147.2	176.7	65.0	52.6	78.6	61.9	24.6	122.1	18.2	138.2	165.6	47.7

Table 6.4 – Monthly Rainfall Data for Year 2015 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Rainfall (mm)	66.0	36.3	53.5	26.3	89.4	29.7	79.4	83.0	17.9	56.8	110.0	270.9

Table 6.5 – Monthly Rainfall Data for Year 2016 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall (mm)	110.9	95.7	40.6	64.3	61.6	61.7	29.6	46.0	97.4	32.3	26.3	80.2

6.2 GROUNDWATER CONCENTRATIONS OVER TIME

Groundwater quality trends have previously been examined in two reports (URS 2005 and RPS 2007). In addition, RPS carried out a groundwater risk assessment (Ref: MDE0788RP0001, dated November 2008) in which the general trend of contaminant concentrations over time was observed to be erratic with compounds rarely being detected in the same borehole on two consecutive monitoring rounds.

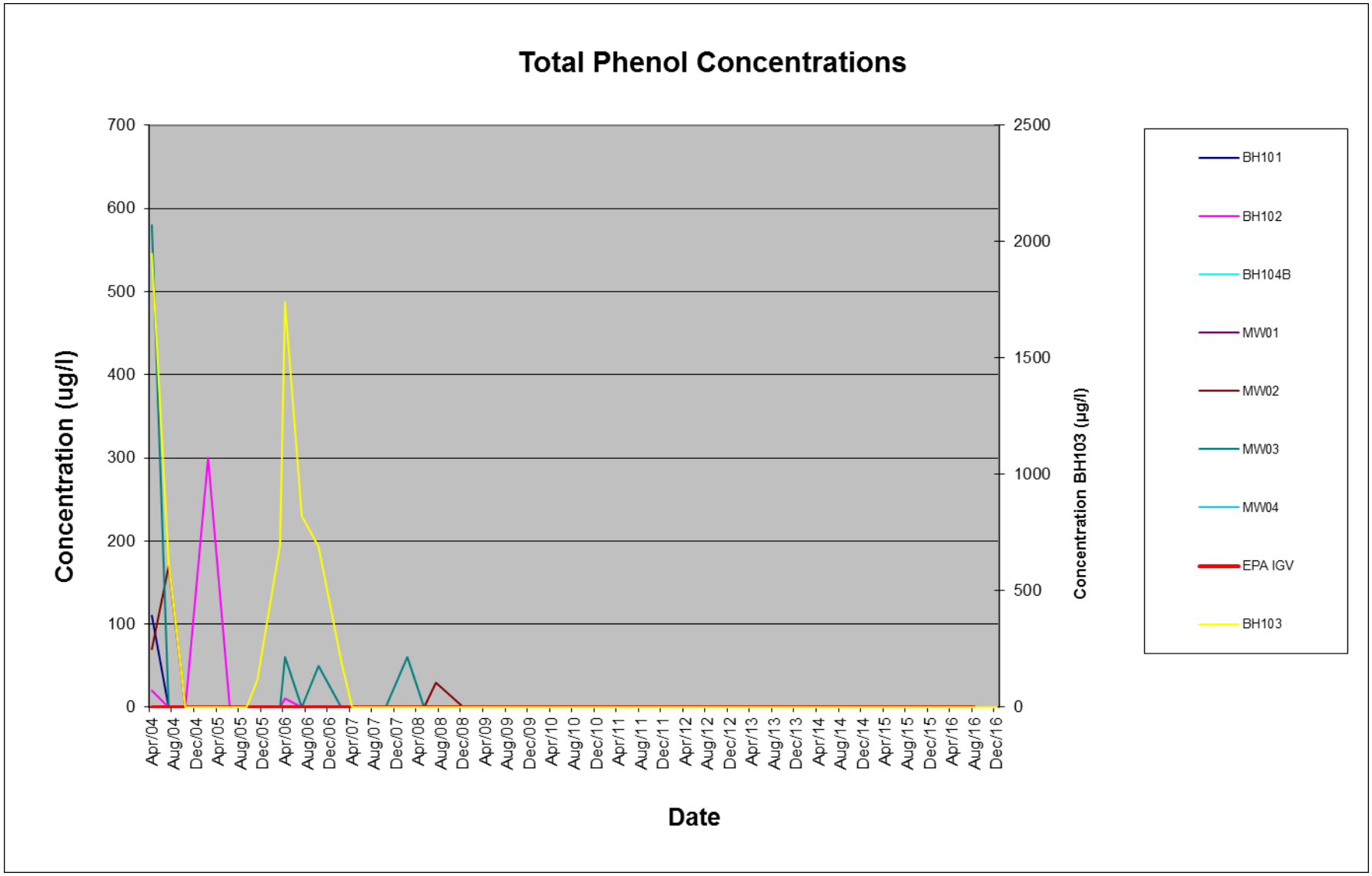
The data available within these reports has been reviewed and time series plots of key parameters have been compiled based on notable trends. Trends for phenols, petroleum hydrocarbons and chlorinated solvents have been plotted as outlined in the following sections.

6.2.1 Phenols

Phenols have been detected historically in all boreholes with the highest concentrations recorded in BH103. However concentrations in BH103 have declined since April 2007. Phenol concentrations have since been recorded below the IGV of 0.5 µg/l in all monitoring wells since December 2008 indicating natural attenuating conditions within the groundwater.

2,4-Dimethylphenol was detected at a concentration of 0.12 µg/l during the Quarter 1, 2010 monitoring event. There is no recommended IGV for this parameter. Subsequent to the Quarter 1 2010 monitoring event no detections of phenols have been noted at any monitoring location up to and including the current Quarter 4 2016 monitoring event.

Figure 6.4 – Phenol Concentrations in all Monitoring Wells



6.2.2 Polyclyclic Aromatic Hydrocarbons

Figure 6.5 below illustrates that PAHs (Polycyclic Aromatic Hydrocarbons) have previously been detected within all monitoring wells above the recommended EPA IGV of 0.1 µg/l. Historically the highest concentrations have been detected within MW03 and BH104B, with the highest concentration detected in March 2006 (107 µg/l) and in October 2007 (19.72 µg/l) respectively. In addition, a range of PAHs including Benzo(a)pyrene, Benzo(g,h,i)perylene, Indeno(1,2,3)cd pyrene, Fluoranthene and Naphthalene have previously been detected in MW03 with **Figures 6.6** to **6.10** illustrating some of the PAH compounds which were detected above their respective IGVs.

Since 2007 concentrations of PAH have shown a marked decrease and since 2010 detections of PAH have been confined to MW03, MW02 and BH104B. Concentrations of Total PAH above the IGV in 2010 were detected during the Quarter 1 monitoring event in MW03 (0.3 µg/l), Quarter 2 monitoring event in BH104B (1.2 µg/l) and Quarter 3 monitoring event in MW02 (2.0 µgl) and BH104B (0.2 µgl). There were no elevated concentrations of Total PAH during the Quarter 4 2010 monitoring event.

No Total PAH detections were recorded throughout 2011 and in Q1 of 2012. Total PAH was detected above the IGV in MW03 in the Q2 2012 monitoring event. No Total PAH exceedances were detected from Quarter 3 2012 to Quarter 4 2013 inclusive. Total PAHs were detected at a concentration of 2.62 µg/l in MW03 during the Q3 2013 monitoring event however; no detections above the laboratory limit were noted during the subsequent monitoring events up to and including the Quarter 2 2015 monitoring event.

Total PAHs were also above the GTV at BH103 (0.093 µg/l), BH104B (0.159 µg/l) and MW03 (0.586 µg/l) during Quarter 3 2015, at BH103 (0.21 µg/l), MW03 (0.986 µg/l) and MW04 (0.079 µg/l) during Quarter 4 2015, and at BH103 (0.123 µg/l), BH104B (0.159 µg/l) and MW04 (0.153 µg/l) during the *previous* Quarter 1 2016 monitoring event.

During the Quarter 3 2016 monitoring event, Total Polyaromatic Hydrocarbons were detected above the IGV limit of 0.1 µg/l at BH103 (0.181 µg/l), BH104B (0.158 µg/l), MW103 (0.562 µg/l) and MW104 (0.151 µg/l). Similarly during the current Quarter 4 monitoring event total PAHs were detected above the IGV at BH102 (0.124 µg/l) and at MW03 90.596 µg/l).

Figure 6.6 illustrates that **Fluoranthene** was previously detected above the IGV of 1.0 µg/l in groundwater monitoring wells BH104B (October 2007, 1.33 µg/l) and MW03 (March 2006, 2.158 µg/l) only. The remaining monitoring wells recorded concentrations below the IGV of 1.0 µg/l. During the Quarter 4 2016 monitoring event Fluoranthene was detected above the limit of detection at BH102 (0.026 µg/l) and MW03 (0.019 µg/l), however these detections do not exceed the IGV of 1.0 µg/l.

A similar trend to Fluoroanthene has been noted in **Figure 6.7**, with concentrations of **Naphthalene** recorded above the IGV of 1.0 µg/l in BH104B and MW03 only. 4 no. exceedances of the IGV were noted in BH104B in September 2005 (39 µg/l), March 2006 (1.069 µg/l), July 2006 (1.594 µg/l) and October 2007 (16.31 µg/l). Since October 2007, the concentrations in BH104B have decreased below the IGV. There have been 6 exceedances of the IGV of 1.0 µg/l in MW03, with the highest concentration detected in March 2006 (19.986 µg/l) and the most recent being the detected in the Quarter 2 2012 monitoring event (2.4 µg/l). The concentrations detected in August 2010 were slightly above the laboratory limit of detection of 0.01 µg/l at BH104B (0.08 µg/l) and MW03 (0.05

µg/l); however these levels are deemed low. Concentrations of Naphthalene were below the EPA IGV limit of detection of 1.0 µg/l at all locations during the Quarter 4 2010, the 2011 and 2012 quarterly monitoring events and the Quarter 1 to Quarter 3 2014 monitoring periods, inclusive. No detections of Naphthalene were noted from the Quarter 4 2014 monitoring event to the Quarter 2 2015 monitoring event. Naphthalene was detected at BH101 (0.011 µg/l) and MW03 (0.031 µg/l) during Quarter 3 2015, and at BH103 (0.095 µg/l) and at MW04 (0.067 µg/l) during Quarter 4 2015.

Naphthalene was detected during the Quarter 1 2016 monitoring event at BH104B (0.034 µg/l) and MW04 (0.153 µg/l)These detections, however, were all below the IGV limit of detection of 1.0 µg/l. Concentrations of Naphthalene were below the laboratory limit of detection at all locations during the Quarter 2 2016 monitoring event but detected at BH103 (0.13 µg/l), BH104B (0.039 µg/l), MW03 (0.028 µg/l) and MW04 (0.12 µg/l) during the Quarter 3 2016 monitoring event. During the current Quarter 4 2016 monitoring event, Naphthalene was detected above the laboratory limit of detection at MW03 (0.036 µg/) only. However, this is still below the IGV of 1.0 µg/l.

Figure 6.8 illustrates the concentrations of **Benzo(g,h,i)perylene** in all monitoring wells over time. Elevated concentrations above the IGV were recorded at BH104B (0.087 µg/l) on one occasion in March 2006.

Figure 6.9 illustrates elevated concentrations above the IGV recorded at MW03 on 6 no. occasions with the most recent elevated concentration recorded during the Quarter 4 2015 monitoring event (0.053 µg/l). The previous elevated concentration detected was in Quarter 3 2015 (0.053 µg/l). The results of all monitoring events from 2010 to the Quarter 2 2015 monitoring event recorded concentrations below the laboratory limit of detection of 0.01 µg/l at all locations. Concentrations were also below the laboratory limit of detection at all locations during the Quarter 1 2016 monitoring event. Benzo(g,h,i)perylene was recorded in MW02 (0.011 µg/l) during Quarter 2 2016 and in BH103 (0.015 µg/l) and MW03 (0.035 µg/l) during Quarter 3 2016, however, these are below the IGV of 0.05 µg/l. During the current Quarter 4 2016 monitoring event, Benzo(g,h,i)perylene was recorded at MW03 (0.036 µg/l). However, this is still below the IGV of 0.05 µg/l.

Figure 6.10 illustrates the concentrations of **Benzo(a)pyrene** in all groundwater monitoring wells and indicates that Benzo(a)pyrene has been detected historically in all boreholes above the IGV of 0.01 µg/l. Similarly with the above mentioned trends, the highest concentrations have been detected in MW03 and BH104B. Concentrations have markedly decreased since March 2006 when an elevated concentration of 2.751 µg/l was detected in MW03, however there have been a number of detections above the IGV, with the most recent elevated level detected in December 2009. Elevated concentrations above the IGV were recorded in BH101, BH103 and MW01 during this same period.

The slightly higher concentrations of Benzo(g,h,i)perylene and Benzo(a)pyrene detected in Quarter 4, 2009 may be attributed to heavy rainfall, which occurred in November of 2009 and as a result possibly mobilized traces of these compounds from the soil. The static water levels for December 2009 ranged between 0.58 and 3.78 mbgl. Since December 2009, concentrations of compounds have notably decreased to below the IGVs.

Benzo(a)pyrene was detected above the IGV limit of 0.01 µg/l at MW03 (0.108 µg/l) during the Quarter 4 2015 monitoring event. Benzo(a)pyrene was also detected above the IGV at MW03 (0.052 µg/l) during the Quarter 3 2015 monitoring event. All other results of all monitoring events from 2010 to Quarter 2 2016 monitoring event did not detect other concentrations above the IGV. During the previous Quarter 3 2016 monitoring event Benzo(a)pyrene was detected at BH103 (0.04 µg/l)

and MW03 (0.037 µg/l). During the current Quarter 4 2016 monitoring event Benzo(a)pyrene was detected above the limit of detection (0.01 µg/l) at MW03 (0.032 µg/l), these concentrations are also over the IGV of 0.01 µg/l.

Figure 6.5 – PAH (Total) Concentrations in all Monitoring Wells

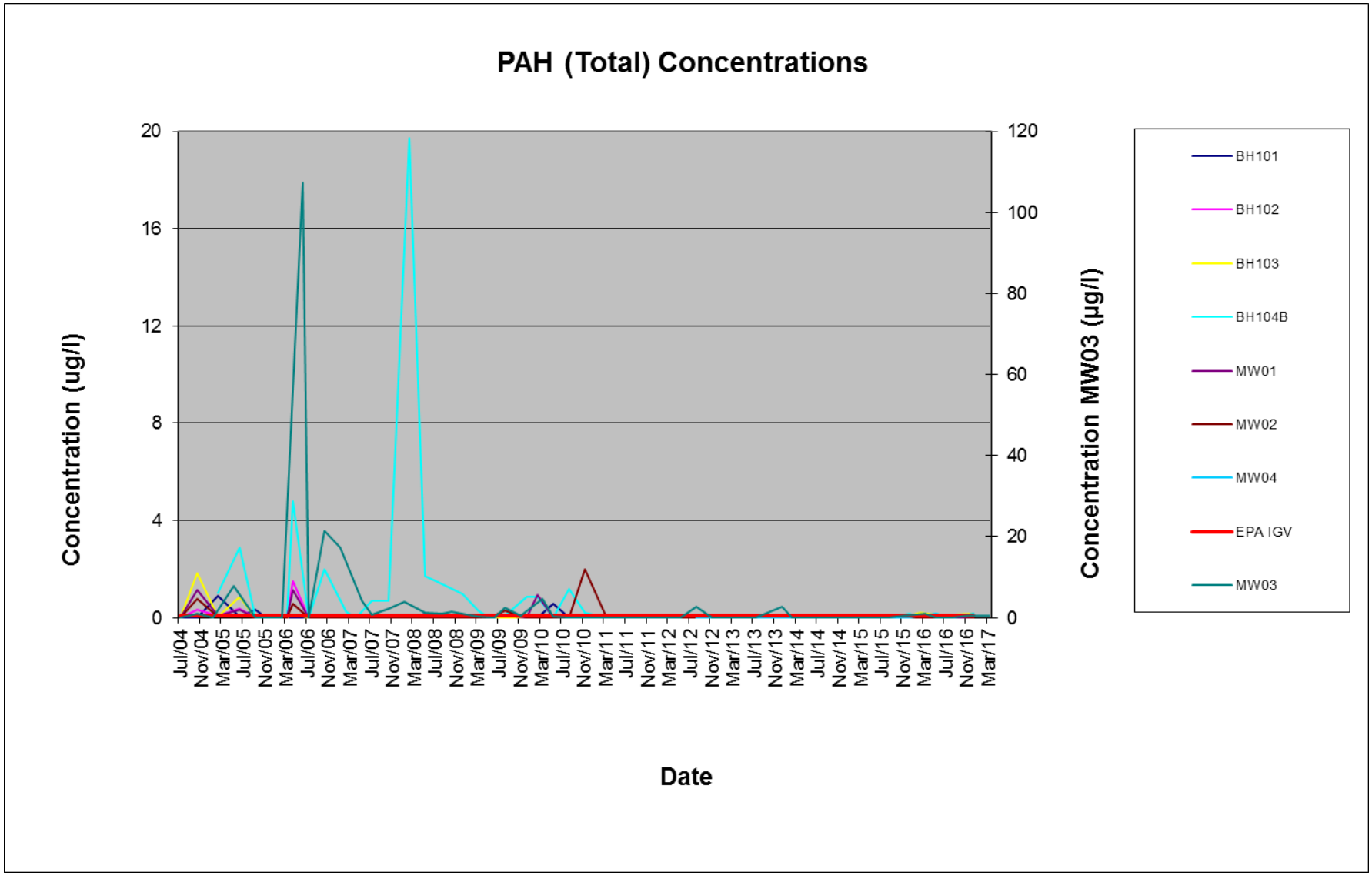


Figure 6.6 – Fluoroanthene Concentrations in all Monitoring Wells

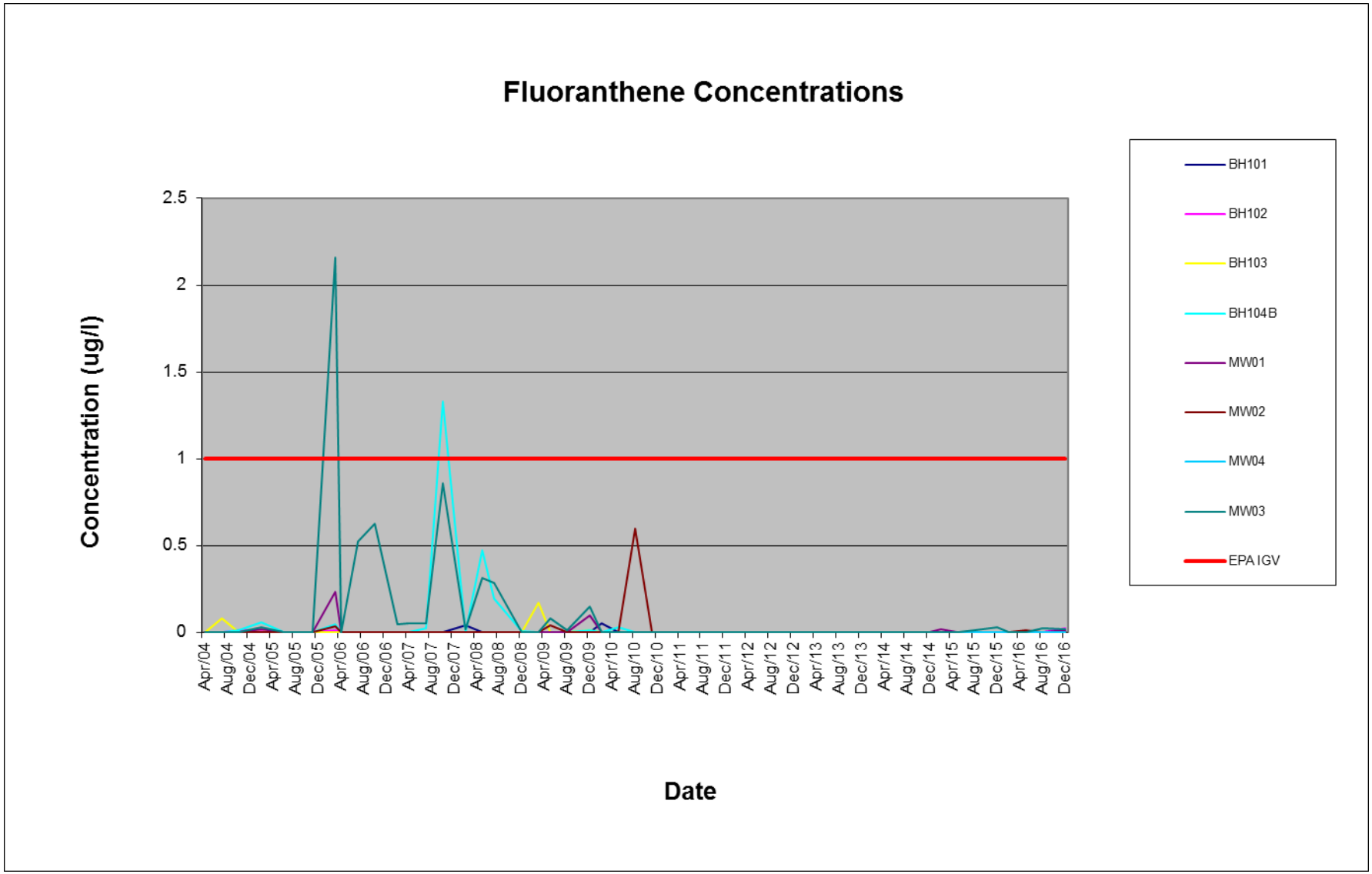


Figure 6.7 – Naphthalene Concentrations in all Monitoring Wells

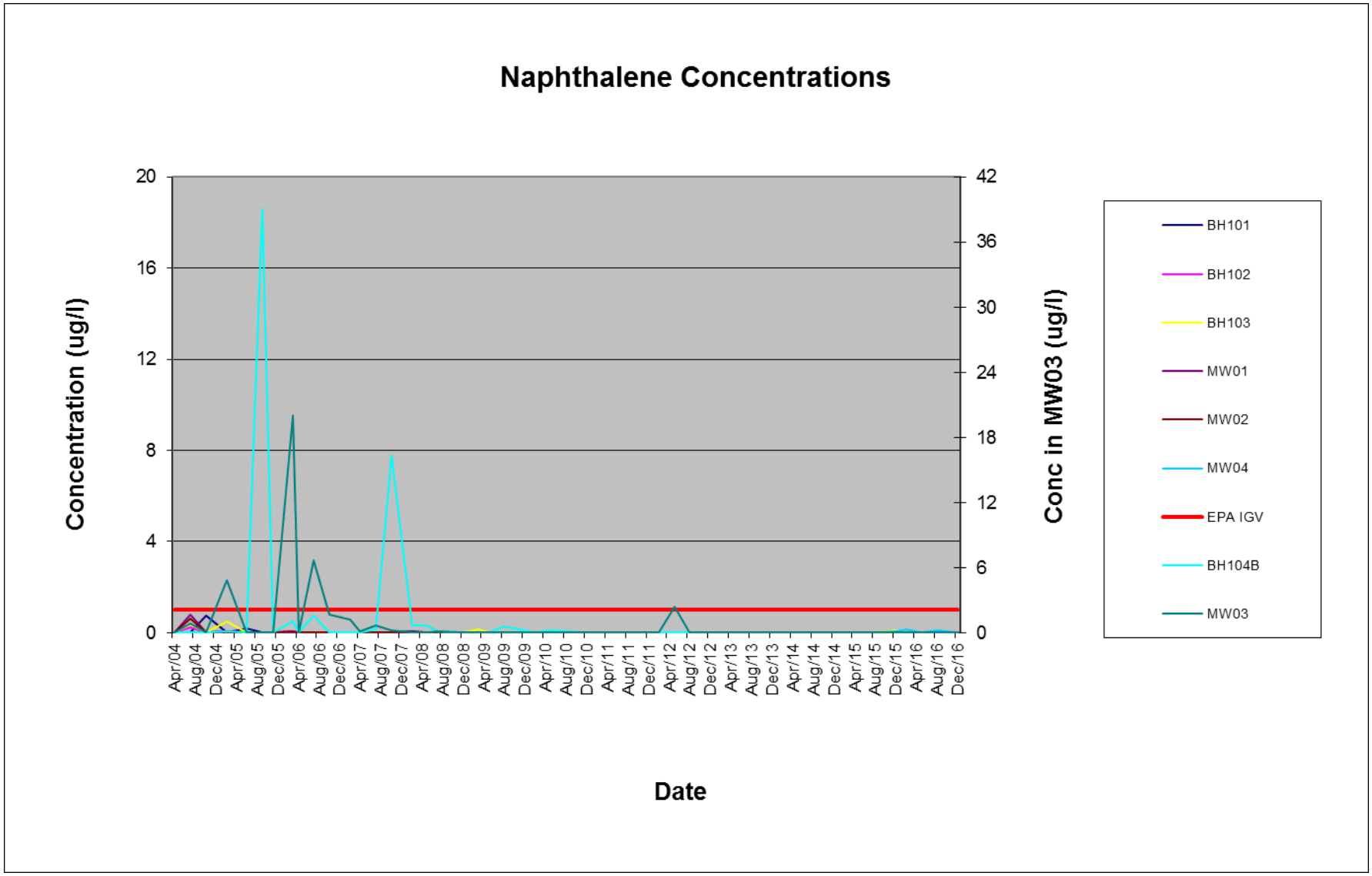


Figure 6.8 – Benzo (g,h,i) perylene Concentrations

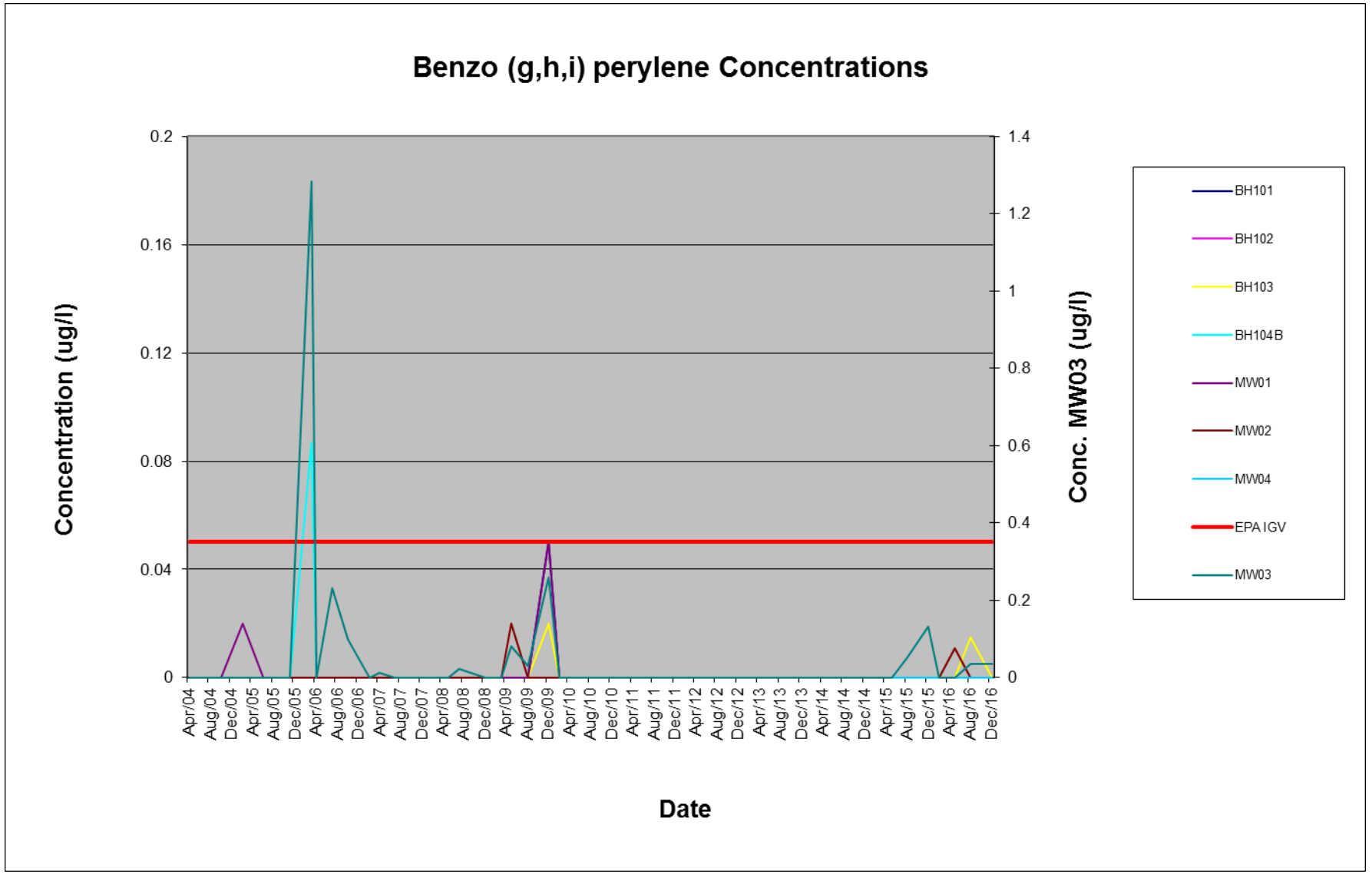


Figure 6.9 – Benzo (g,h,i) perylene in Monitoring Wells BH104B & MW03

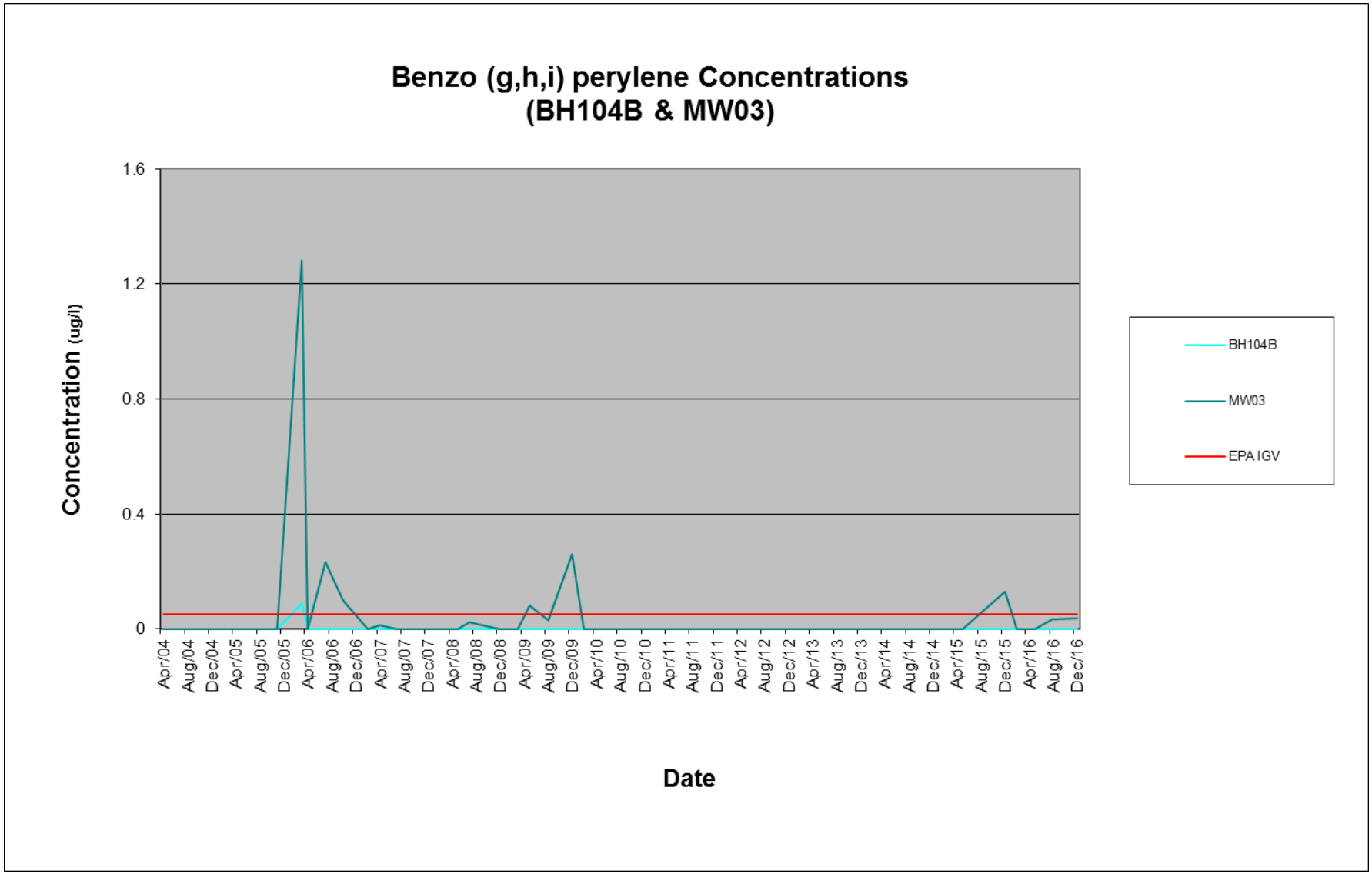
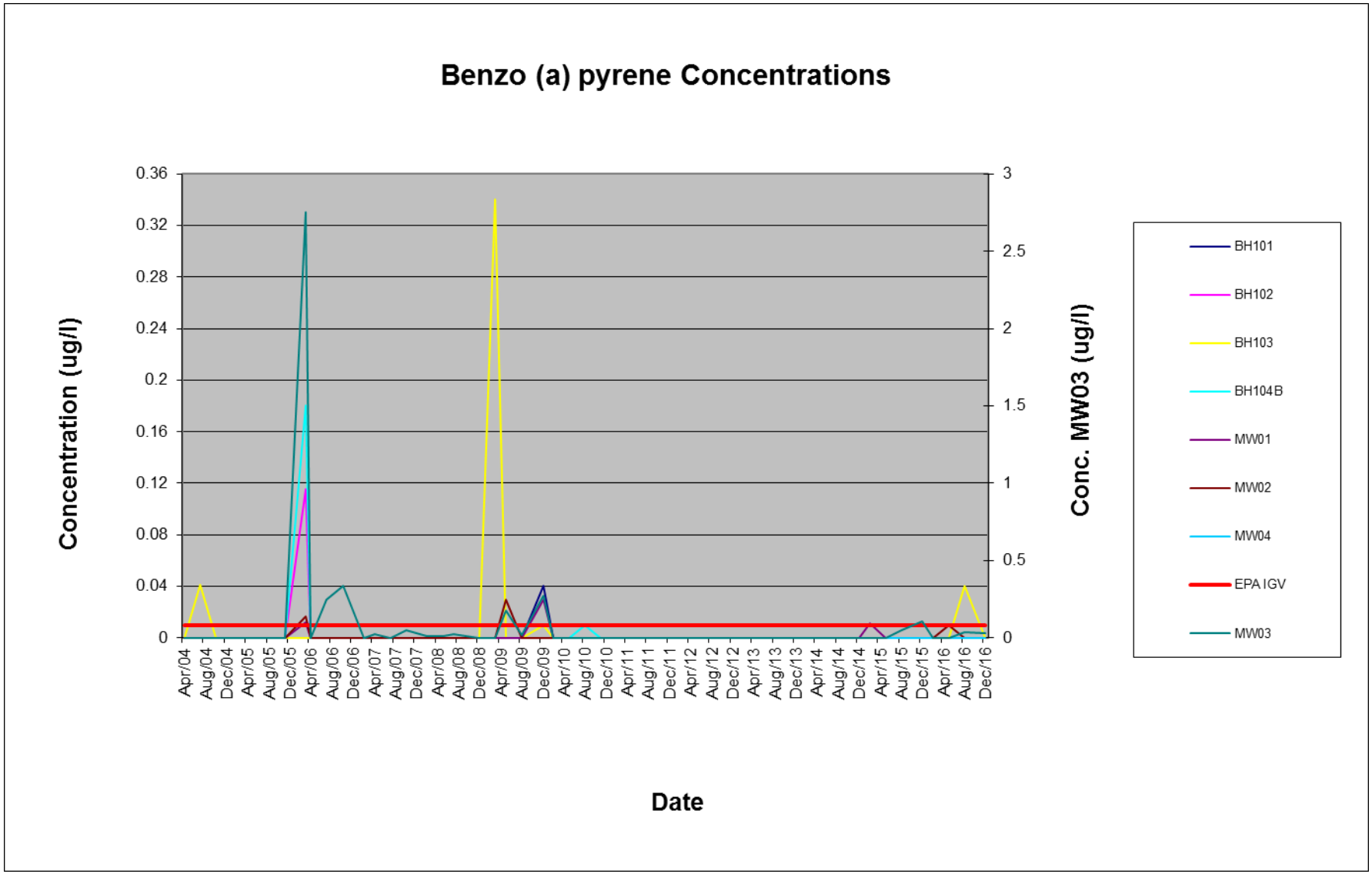


Figure 6.10 – Benzo (a) pyrene Concentrations in all Monitoring Wells



6.2.3 Petroleum Hydrocarbons (TPH)

Historically **Total Petroleum Hydrocarbons (TPH)** including mineral oil, petrol range organics (PRO) and diesel range organics (DRO) have been detected within BH103, BH104B and MW03. Since 2009, speciated hydrocarbon analysis using the Total Hydrocarbon Criteria Working Group (TPHCWG) method has been carried out on all samples to obtain a more accurate profile of TPH within groundwater.

The results of the TPHCWG analysis has indicated that the predominant hydrocarbons detected are in the heavier chain carbon fractions, most notably in the carbon range C12-C16, C16-C21 and C21-C35. **Figure 6.11** illustrates the TPH analysis for the total TPH analysis from C10-C44 in all monitoring wells since 2009. The highest concentrations detected historically are at monitoring wells MW03, BH104B and BH103 respectively.

Previous quarterly monitoring reports have outlined the hydrocarbon trends recorded in each well since 2010. This report outlines the trends from 2012 up to and including the current monitoring report.

During the Quarter 1, 2012 monitoring event, hydrocarbons were detected in borehole BH103 only. The predominant aliphatic carbon range comprised C10-C12 (13 µg/l), C12-C16 (270 µg/l), C16-C21 (690 µg/l) and C21-C35 (980 µg/l). The predominant aromatic carbon range comprised of C16-C21 (250 µg/l) and C21-C25 (680 µg/l).

During the Quarter 2, 2012 monitoring event, hydrocarbons were detected in BH103 only. The detected aliphatic carbon range comprised C12-C16 (98 µg/l), C16-C21 (230 µg/l) and C21-C25 (170 µg/l). No detections of aromatic carbons were measured during the Quarter 2 2012 monitoring event.

No hydrocarbons were detected at any location during the Quarter 3 and Quarter 4, 2012 monitoring events.

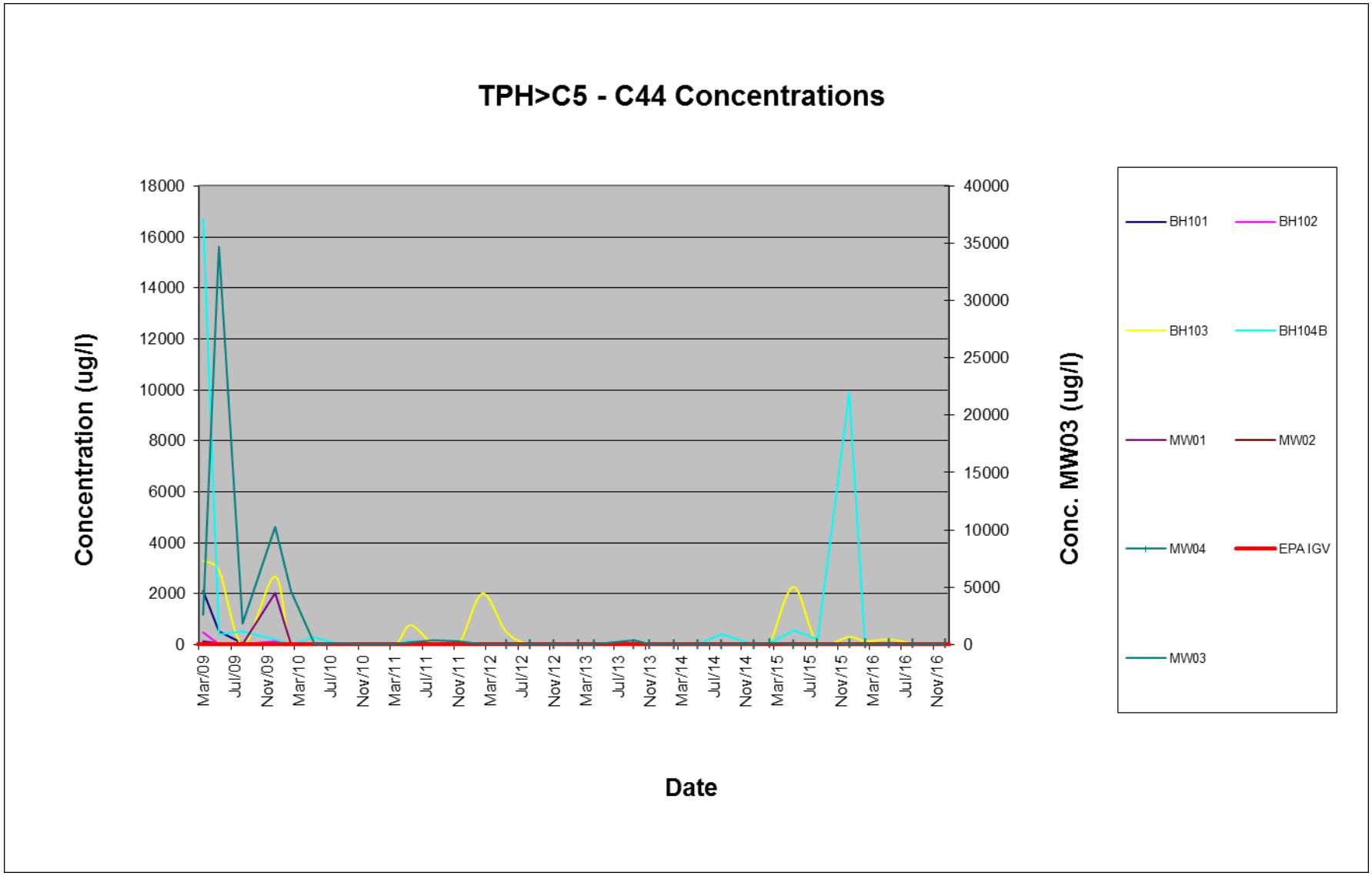
During the Quarter 1, 2013 monitoring event aromatic hydrocarbons were detected in BH103, BH104B and MW04. The predominant aromatic carbon range comprised C12-C16 (30 µg/l), C16-C21 (280 µg/l) and C21-C35 (100 µg/l) in BH103, C10-C12 (30 µg/l), C12-C16 (110 µg/l) and C16-C21 (80 µg/l) in BH104B and C10-C12 (20 µg/l) and C12-C16 (80 µg/l) in MW04. Aliphatic hydrocarbons were detected in BH103 in the ranges C12-C16 (70 µg/l), C16-C21 (100 µg/l) and C21-C35 (90 µg/l).

During the Quarter 2, 2013 monitoring event no aliphatic or aromatic hydrocarbons were detected at any location.

During the Quarter 3, 2013 monitoring event, hydrocarbons of the aliphatic range were detected in MW03 only. The detected aliphatic carbon range comprised C10-C16 (290 µg/l) and C12-C16 (190 µg/l). No detections of aromatic carbons were measured during the Quarter 3 2013 monitoring event.

Total Petroleum Hydrocarbons were not detected at any monitoring location during the Quarter 4, 2014 monitoring event. During the monitoring event for Quarter 3 2014 following ranges of the aliphatic hydrocarbons were recorded for BH104B; C12-C16 (150 µg/l), C16-C21 (250 µg/l) and C21-C35 (10 µg/l).

Figure 6.11 – TPH (Carbon Range C10-C44) in all Monitoring Wells



During the Quarter 1 2015 monitoring event, hydrocarbons were detected in MW03, MW04, BH103 and BH104B. The predominant aromatic carbon range comprised C21-C35 (14 µg/l) in BH103, C12-C16 (27 µg/l) and C16-C21 (15 µg/l) in BH104B, C12-C16 (14 µg/l) in MW03 and C12-C16 (15 µg/l) in MW04. Aliphatic hydrocarbons were detected in the ranges C16-C35 (54 µg/l) in BH103, C16-C35 (11 µg/l) in BH104B and C16-C35 (46 µg/l) and C35-C44 (12 µg/l) in MW03.

During the Quarter 2 2015 monitoring event, the TPH concentration in the aromatic C21-C35 range was detected at one shallow groundwater wells BH103 (509 µg/l). The TPH concentration in the aliphatic range was detected at C16-C35 (1760 µg/l) in BH103 and C12-C16 (225 µg/l) and C16-C35 (11 µg/l) in BH104B.

The Quarter 3 monitoring event of 2015 detected TPH in the aromatic ranges C12-C16 (39 µg/l), C16-C21 (37 µg/l) and C21-C35 (28 µg/l) at BH104B, C21-C35 at BH103 (17 µg/l) and C10-C12 (18 µg/l) and C12-C16 (29 µg/l) at MW04. TPH concentrations were detected in the aliphatic ranges C10-C12 (13 µg/l), C12-C16 (40 µg/l) and C16-C35 (62 µg/l) at BH104B and C16-C35 at BH103 (72 µg/l) and MW03 (14 µg/l).

The Quarter 4 monitoring event of 2015 detected TPH in the aromatic ranges C12-C16 (879 µg/l), C16-C21 (1380 µg/l) and C21-C35 (694 µg/l) at BH104B, C21-C35 at BH103 (60 µg/l) and C10-C12 (13 µg/l) and C12-C16 (21 µg/l) at MW04. TPH concentrations were detected in the aliphatic ranges C10-C12 (495 µg/l), C12-C16 (3080 µg/l) and C16-C35 (3360 µg/l) at BH104B and C16-C35 (231 µg/l) and C35-C44 (14 µg/l) at BH103.

The Quarter 1 2016 monitoring event detected TPH in samples from the well BH103 were in the aliphatic range C16-C35 (132 µg/l) and from well MW04 in the aromatic range C12-C16 (15 µg/l).

The Quarter 2 2016 monitoring event detected TPH in samples from the well BH103 and were in the aliphatic range C16-C35 (150 µg/l) and in the aromatic range C21-C35 (57 µg/l) and from well MW04 in the aromatic range C12-C16 (20 µg/l).

During the previous Quarter 3 2016 monitoring event, TPH was detected in samples from the well BH103 in the aliphatic ranges C16-C35 (35 µg/l), C35-C44 (10 µg/l) and in the aromatic range C21-C35 (11 µg/l), well BH104B in the aromatic ranges C12-C16 (25 µg/l) and C16-C21 (12 µg/l) and from well MW04 in the aromatic range C12-C16 (23 µg/l).

During the current Quarter 4 2016 monitoring event, TPH was detected in samples from the well BH102 in the aliphatic range C16-C35 (13 µg/l), well BH103 in the aliphatic ranges C16-C35 (160 µg/l), C35-C44 (14 µg/l) and in the aromatic range C21-C35 (47 µg/l), well BH104B in the aromatic ranges C12-C16 (12 µg/l), well MW03 in the aliphatic range C16-C35 (14 µg/l) and from well MW04 in the aromatic ranges the aromatic ranges C10-C12 (13 µg/l) and C12-C16 (23 µg/l).

7 CONCLUSIONS

- In accordance with the criteria set out in Schedule 4(ii) of the site's Industrial Emissions Licence Register No. W0184-01, groundwater monitoring was carried out at the ENVA Ireland site on the 6th December 2016 corresponding to Quarter 4 of 2016. Samples were collected at 8 groundwater monitoring wells during this event.
- The results presented have been referenced against Groundwater Threshold Values (GTVs) outlined in the European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. no 9 of 2010), where available. Where GTVs are not available for parameters, results are compared against the Interim Guideline Values (IGVs) set out in the Environmental Protection Agency interim report, 'Towards Setting Guideline Values for the Protection of Groundwater in Ireland'.
- Results of the BTEX and MTBE demonstrate that the levels of Benzene, Toluene, Ethylbenzene, m&p Xylene, o-xylene and MTBE were all below the recommended EPA IGVs.
- The Quarter 4 2016 results of the speciated polycyclic aromatic hydrocarbons indicate that Total PAHs were above the EPA IGV of 0.1 µg/l at two monitoring wells, BH102 (0.124 µg/l) and MW103 (0.596 µg/l).
- 1,1-dichloroethane in MW03 (1.6 µg/l) and MW04 (1.9 µg/l) were also detected. These results are above the laboratory limit of detection, however, there is no GTV or IGV limit for 1,1-dichloroethane. All other VOCs and SVOCs were below their respective laboratory limits of detection.
- Samples were analysed for speciated phenols to include chlorophenols and the results indicate that there were no detections above the laboratory limits of detection.
- For the current Quarter 4 2016 monitoring event, TPH detections in samples from the well BH102 in the aliphatic range C16-C35 (13 µg/l), well BH103 in the aliphatic ranges C16-C35 (160 µg/l), C35-C44 (14 µg/l) and in the aromatic range C21-C35 (47 µg/l), well BH104B in the aromatic ranges C12-C16 (12 µg/l), well MW03 in the aliphatic range C16-C35 (14 µg/l) and from well MW04 in the aromatic ranges the aromatic ranges C10-C12 (13 µg/l) and C12-C16 (23 µg/l). Each of these is therefore over the limit of detection which is 10 µg/l. During the previous Quarter 3 monitoring event, TPH detections in samples from the well BH103 were in the aliphatic range C16-C35 (35 µg/l) and C35-C44 (10 µg/l) and in the aromatic range C21-C35 (11 µg/l), at BH104B were in the aromatic range C12-C16 (25 µg/l) and C16-C21 (12 µg/l) and at well MW04 were in the aromatic range C12-C16 (23 µg/l). Quarter 2 2016, TPH detections in samples from the well BH103 were in the aliphatic range C16-C35 (150 µg/l) and in the aromatic range C21-C35 (57 µg/l), and from well MW04 in the aromatic range C12-C16 (20 µg/l). Hydrocarbons in the aliphatic range C16-C35 (132 µg/l) at BH103 and the aromatic range C12-C16 (15 µg/l) at MW04 were observed during the Quarter 1 2016 monitoring event.
- The general trend of contaminant concentrations over time continues to be somewhat variable with compounds not being continually detected in the same borehole on two or three consecutive monitoring rounds. In general, the contaminant levels detected at the Enva facility appear to indicate reducing contaminant concentrations over time with infrequent elevations in some parameters. Further monitoring is recommended to confirm these reductions.

Appendix 5

Quarterly Effluent Metal Screen

The metal screen for Q1 2016 is shown in the table below.

	Detection Method		ICP OES	ICP OES	ICP OES	ICP OES	ICP OES	ICP OES	ICP OES	ICP OES	ICP OES	ICP OES	ICP OES
	Method Detection Limit		<0.2	<0.1	<0.5	<1.5	<7	<20	<2	<2	<3	<1	<5
	ISO 17025 Accredited		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Jones Environmental Reference No	Sample Identity	Other ID	Dissolved Calcium	Dissolved Magnesium	Dissolved Cadmium	Dissolved Chromium	Dissolved Copper	Total Dissolved Iron	Dissolved Manganese	Dissolved Nickel	Dissolved Zinc	Dissolved Mercury	Dissolved Lead
			mg/l	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Report No: 16/5168	Quarterly Effluent	Effluent Screen 17/02/2016	517.4	94.3	<0.5	10.5	<7	532	465	35	6	<1	<5

Quarterly Effluent Metal Screen

The metal screen for Q2 2016 is shown in the table below.

	Detection Method		ICP OES	ICP OES	ICP OES	ICP OES	ICP OES	ICP OES	ICP OES	ICP OES	ICP OES	ICP OES	ICP OES
	Method Detection Limit		<0.2	<0.1	<0.5	<1.5	<7	<20	<2	<2	<3	<1	<5
	ISO 17025 Accredited		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Jones Environmental Reference No	Sample Identity	Other ID	Dissolved Calcium	Dissolved Magnesium	Dissolved Cadmium	Dissolved Chromium	Dissolved Copper	Total Dissolved Iron	Dissolved Manganese	Dissolved Nickel	Dissolved Zinc	Dissolved Mercury	Dissolved Lead
			mg/l	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Report No: 16/8523	Quarterly Effluent	Effluent Screen 05/05/2016	344.0	73.5	<0.5	3.9	<7	225	589	49	73	<1	6

Quarterly Effluent Metal Screen

The metal screen for Q3 2016 is shown in the table below.

	Detection Method		ICP OES	ICP OES	ICP OES	ICP OES	ICP OES	ICP OES	ICP OES	ICP OES	ICP OES	ICP OES	ICP OES
	Method Detection Limit		<0.2	<0.1	<0.5	<1.5	<7	<20	<2	<2	<3	<1	<5
	ISO 17025 Accredited		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Jones Environmental Reference No	Sample Identity	Other ID	Dissolved Calcium	Dissolved Magnesium	Dissolved Cadmium	Dissolved Chromium	Dissolved Copper	Total Dissolved Iron	Dissolved Manganese	Dissolved Nickel	Dissolved Zinc	Dissolved Mercury	Dissolved Lead
			mg/l	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
16/11466	Weekly Effluent	PO 2892	383.1	289.2	<0.5	9.7	<7	535	431	41	<3	<1	<5

Quarterly Effluent Metal Screen

The metal screen for Q4 2016 is shown in the table below.

	Detection Method		ICP OES	ICP OES	ICP OES	ICP OES	ICP OES	ICP OES	ICP OES	ICP OES	ICP OES	ICP OES	ICP OES
	Method Detection Limit		<0.2	<0.1	<0.5	<1.5	<7	<20	<2	<2	<3	<1	<5
	ISO 17025 Accredited		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Jones Environmental Reference No	Sample Identity	Other ID	Dissolved Calcium	Dissolved Magnesium	Dissolved Cadmium	Dissolved Chromium	Dissolved Copper	Total Dissolved Iron	Dissolved Manganese	Dissolved Nickel	Dissolved Zinc	Dissolved Mercury	Dissolved Lead
			mg/l	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
16/16281	Weekly Effluent	Weekly Effluent 26/10/2016	430.5	189.6	<0.5	19.9	<7	708	365	39	16	<1	<5

Appendix 6

Enva Ireland Ltd
Raffeen Ind Est, Ringaskiddy, Co.Cork

Tel: 021 438 7200
Fax: 021 438 7299
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Web: www.enva.ie

nqa. ISO 9001 Registered

RESPIROMETRY REPORT

ENVA PORTLAOISE

One sample was received on the 07.12.16 for evaluation of their effect on activated sludge micro organisms at given dilutions. The methodology for this is by respirometry, which assesses the oxygen uptake of a standard activated sludge versus sludge containing the samples for evaluation, over a 30 minute period. The samples submitted were as follows:

Effluent 06.12.16	Enva Portlaoise

The results were as follows: (all results mg/l 0_2)

Sample		
Time/Mins.	Control	1/5 Dilution
0	9.3	9.0
1	8.6	8.3
2	7.8	7.2
3	6.1	6.3
4	5.5	5.4
5	4.2	4.5
10	3.5	4.3
15	2.6	3.7
20	2.1	2.9
25	1.6	2.1
30	1.1	1.5
% Inhibition		9 %

Only samples showing +30% or greater inhibition are considered to have a negative effect on the activated sludge.

As we can see all of the samples proved lower than this in inhibition terms. This indicates that there was no inhibition of the activity of the activated sludge micro organisms from the samples at their respective dilutions.

Signed:  Date: 13/12/16

Enva Ireland Ltd
Raffeen Ind Est, Ringaskiddy, Co.Cork

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nqa. ISO 9001 Registered

RESPIROMETRY REPORT

ENVA PORTLAOISE

One sample was received on 29.06.16 the for evaluation of their effect on activated sludge micro organisms at given dilutions. The methodology for this is by respirometry, which assesses the oxygen uptake of a standard activated sludge versus sludge containing the samples for evaluation, over a 30 minute period. The samples submitted were as follows:

Effluent 28.06.16	Enva Portlaoise

The results were as follows: (all results mg/l 0_2)

Sample Time/Mins.	***Control***	***$^1/_5$ Dilution***
0	9.0	9.1
1	8.6	8.4
2	7.4	7.5
3	6.1	6.3
4	5.5	5.6
5	4.7	4.8
10	3.9	4.1
15	3.0	3.2
20	2.5	2.5
25	1.9	2.1
30	1.6	1.8
% Inhibition		1 %

Only samples showing +30% or greater inhibition are considered to have a negative effect on the activated sludge.

As we can see all of the samples proved lower than this in inhibition terms. This indicates that there was no inhibition of the activity of the activated sludge micro organisms from the samples at their respective dilutions.

Signed:  Date: 8/7/16

Appendix 7

Report Title	Air Emissions Compliance Monitoring Emissions Report
Company address	Air Scientific Ltd., Unit 5, Caherdavin Business Centre, Caherdavin, Park, Ennis Road, Limerick V94 NT63.
Stack Emissions Testing Report Commissioned by	ENVA Portlaoise
Facility Name	ENVA Ireland Ltd, Clonminam Industrial Estate, Portlaoise
Contact Person	Frances Wright
EPA Licence Number	W0184-01
Licence Holder	ENVA Ireland Limited
Stack Reference Number	Boiler 1
Dates of the Monitoring Campaign	24-11-2016
Job Reference Number	ENVATL3241116
Report Written By	Ms. Shannon Larkin
Report Approved by	Mr. Gregory Dempsey
Stack Testing Team	Mr. Mark Mc Garry
Report Date	23-01-2017
Report Type	Test Report Compliance Monitoring
Version	1
Signature of Approver	Gregory Dempsey **Team Leader**

Opinions and interpretations expresses herein will be outside the scope of Air Scientific Limited INAB accreditation.
This test report shall not be reproduced, without the written approval of Air Scientific Limited.
All sampling and reporting is completed in accordance with Environmental Protection Agency Air Guidance Note 2 requirements.

Executive Summary

Monitoring Objectives

Overall Aim of the monitoring Campaign

The aim of the monitoring campaign was to establish emission concentrations.

Special Requirements

There were no special requirements.

Target Parameters

Carbon Monoxide (CO)
Oxides of Nitrogen (NOx) as NO_2
Sulphur Dioxide (SO_2)
Stack Gas Temperature
Boiler Efficiency

Emission Limit Values

Boiler 1	$mg.m^{-3}$
CO	-
NOx as NO_2	-
SO_2	-
Stack Gas Temperature	-
Boiler Efficiency	-

Reference Conditions

Reference Conditions	Value
Oxygen Reference %	3
Temperature K	273.15
Total Pressure kPa	101.3
Moisture %	Dry

Executive Summary

Overall Results

Boiler 1	Concentration				
Parameter	**Units**	**Result**	**MU +/-**	**Limit**	**Compliant**
Carbon Monoxide (CO)	$mg.m^{-3}$	<1.7	2.2	-	N/a
Oxides of Nitrogen (NOx) as NO_2	$mg.m^{-3}$	164.4	12.2	-	N/a
Sulphur Dioxide (SO_2)	$mg.m^{-3}$	<6.1	16.9	-	N/a
Combustion Efficiency	%	92.36	-	-	N/a

Accreditation details

Air Scientific Limited	INAB Number: 319T

Executive Summary

Process details

Stack Name	Boiler 1
Process status	Normal
Capacity (per/hour) (if applicable)	Variable
Continuous or Batch Process	Continuous
Feedstock	Natural Gas
Abatement System	No
Abatement Systems Running Status	N/a
Fuel	Natural Gas
Plume Appearance	No
Other information	None

Executive Summary

Monitoring, Equipment & Analytical Methods

Parameter	Standard	Technical Procedure	Accredited Testing	Analytical Technique	Equipment / Media	Equipment ID Used on Site
Carbon Monoxide (CO)	EN15058:2006	2004	Yes	Non Dispersive Infra Red	Horiba	ASLLK12EQ526 ASLLK12EQ527 ASLLK14EQ501
Oxides of Nitrogen (NOx) as NO_2	EN14792:2006	2002	Yes	Chemiluminescence	Horiba	
Sulphur Dioxide (SO2)	NDIR AG2	2003	Yes	Non Dispersive Infra Red	Horiba	
Oxygen (%)	EN14789	2008	Yes	Paramagnetic/ Zirconia	Horiba	
Stack Gas Temperature	EN 16911:2013	2005	Yes	Thermocouple	Thermocouple	
Combustion Efficiency	Calculation	-	-	-	-	

Sampling Deviations

Parameter: Boiler 1	Deviation
EN15058:2006	None
EN14792:2006	None
NDIR AG2	None
EN14789	None

Reference Documents

Risk Assessment (RA)	SOP 1011
Site Review (SR)	SOP 1015
Site Specific Protocol (SSP)	SOP 1015

Suitability of Sample Location

General Information	Boiler 1
Permanent/Temporary	Permanent
Inside/ Outside	Inside

Platform Details		
Irish EPA Technical Guidance Note AG1 / BS EN 15259 Platform Requirements	**Value**	**Comment**
Sufficient Working area to manipulate probe and measuring instruments	Yes	-
Platform has 2 handrails (approx. 0.5m & 1.0 m high)	N/a	-
Platform has vertical base boards (approx. 0.25 m high)	N/a	-
Platform has chains / self-closing gates at top of ladders	N/a	-
There are no obstructions present which hamper insertion of sampling equipment	No	-
Safe Access Available	Yes	-
Easy Access Available	Yes	-

Sampling Location / Platform Improvement Recommendations
None

BSEN 15259 Homogeneity Test Requirements
1.

Select Option :

1: There is no requirement to perform a BSEN15259 Homogeneity Test on this stack
2: Test results were obtained from previous Homogeneity test carried out by ASL
3: Test results were obtained from previous Homogeneity test carried out by Alternative contractor
4: Homogeneity Test is required on this stack and the client has been informed of this requirement.

Stack Diagram

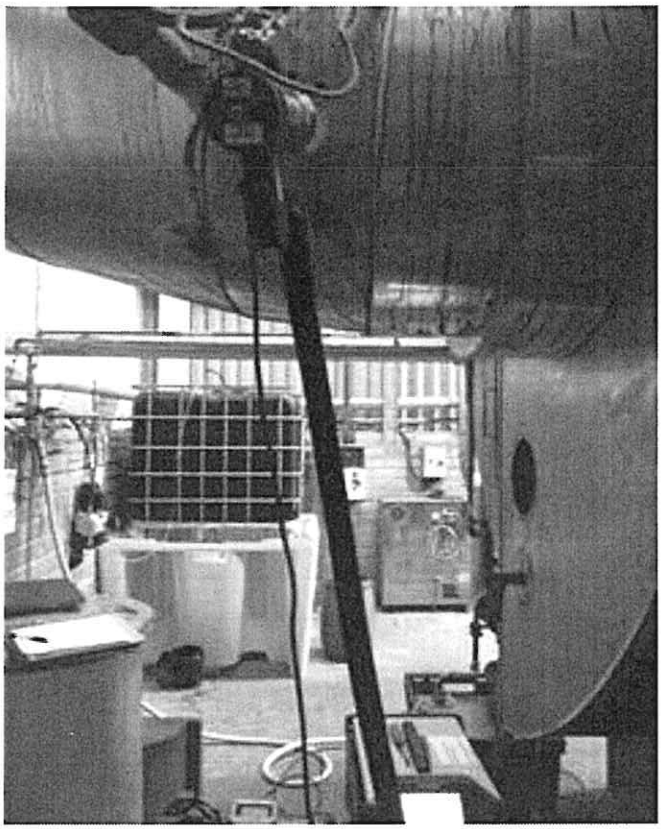


Figure 1: Boiler 1

1. APPENDICES

Appendix I Monitoring Personnel & Equipment

Stack Emissions Monitoring Personnel

Team Leader	**Name**	Mark McGarry
	System approval	ASL Team Leader Approved

Appendix II **Stack Raw Data**

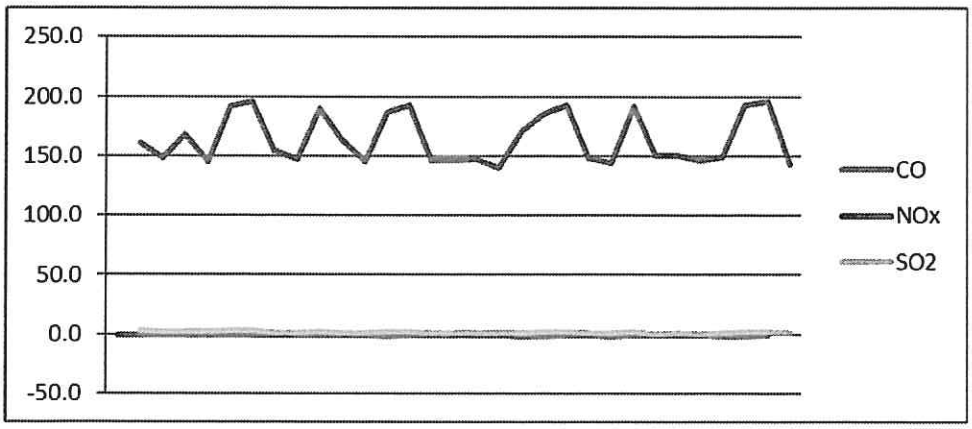
Title:	***Determination of Combustion Flue Gases***					
Method:	EN 14792 / EN 14789 / EN 12039 / TGN M21					
Test Date:	24/11/2016					
Stack Name	Boiler 1					
Reference Conditions						
Measured Oxygen		5.6	%			
Reference Oxygen		3	%			
Parameter			CO	NO	SO_2	O_2
Emission Limit Values	$mg.m^{-3}$ ref					
Instrument Range	ppm		200	500	1000	25
Span Gas Value	ppm		147	294	638	20.9
Acceptable Gas Range	-		Yes	Yes	Yes	Yes
Calibration Gas Uncertainty	%		1.2	0.6	0.8	0.5
Quality Assurance	Units					
Conditioning Unit Temperature	C		2	2	2	2
Average Temperature	< C		2	2	2	2
Allowable Temperature	-		4	4	4	4
Temperature Acceptable	-		Yes	Yes	Yes	Yes
Pump flow rate	l/min.		0.5	0.5	0.5	0.5
Zero Drift	Units					
Zero (Pre)	ppm		-0.1	0.4	6	0.04
Zero (Post)	ppm		0.4	0.1	2	0.06
Zero drift	ppm		0.5	-0.3	-4	0.02
Allowable Zero Drift (Less than)	ppm		2.94	5.88	12.76	0.418
Adjustable Zero Drift (Less than)	ppm		7.35	14.7	31.9	1.045
Zero Drift Failure (Greater than)	ppm		7.35	14.7	31.9	1.045
Zero Drift Acceptable	-		Yes	Yes	Yes	Yes
Span Drift	Units					
Span Down (Pre)	ppm		146	293	634	20.9
Span Down (Post)	ppm		144	291	630	20.8
Span Drift	ppm		-2	-2	-4	-0.1
Allowable Span Drift (less than)	ppm		2.94	5.88	12.76	0.418
Adjustable Span Drift (Less than)	ppm		7.35	14.7	31.9	1.045
Span Drift Failure (Greater than)	ppm		7.35	14.7	31.9	1.045
Span Drift Acceptable (Y/N)	-		Yes	Yes	Yes	Yes
Leak Check						
Span Gas Conc.	ppm		147	294	638	20.9
Recorded Conc. down Line	ppm		146	293	634	20.9
Leak Detected	ppm		-1	-1	-4	0
Leak check acceptable (< 2%)	ppm		2.94	5.88	12.76	0.418
Pass	(Y/N)		Yes	Yes	Yes	Yes
Test Conditions	Units					
Run Ambient Temperature Range	C		9.7	9.7	9.7	9.7

Raw Data

Date/Time	*Data source*	*CO*	*CO_2*	*NOx*	*O_2*	*SO_2*
		ppm	*vol%*	*ppm*	*vol%*	*ppm*
24/11/2016 12:57		-0.4	9.6	69.1	5.1	1.1
24/11/2016 12:58		-0.4	9.9	67.4	4.2	0.8
24/11/2016 12:59		-0.4	9.7	69.2	5.7	0.6
24/11/2016 13:00		-1.0	9.9	67.0	4.0	0.6
24/11/2016 13:01		-0.6	8.0	69.7	7.5	0.8
24/11/2016 13:02		-0.4	7.7	68.2	8.1	0.7
24/11/2016 13:03		-0.9	9.8	67.6	4.8	0.5
24/11/2016 13:04		-0.8	9.8	66.4	4.3	0.5
24/11/2016 13:05		-0.5	7.9	68.9	7.6	0.7
24/11/2016 13:06		-0.8	9.5	68.2	5.6	0.4
24/11/2016 13:07		-0.7	9.4	66.4	4.1	0.5
24/11/2016 13:08		-0.7	8.2	69.7	7.2	0.6
24/11/2016 13:09		-0.9	7.9	68.7	7.8	0.7
24/11/2016 13:10		-0.8	9.9	66.2	4.3	0.5
24/11/2016 13:11		-0.9	9.2	66.0	4.3	0.4
24/11/2016 13:12		-0.9	9.9	66.0	4.4	0.4
24/11/2016 13:13		-1.0	10.5	67.7	3.2	0.3
24/11/2016 13:14		-0.7	8.7	69.4	6.0	0.4
24/11/2016 13:15		-1.0	8.1	69.1	7.2	0.5
24/11/2016 13:16		-1.3	7.9	68.5	7.9	0.6
24/11/2016 13:17		-0.9	9.8	66.2	4.5	0.4
24/11/2016 13:18		-0.9	9.8	66.2	4.1	0.4
24/11/2016 13:19		-1.0	7.8	68.0	7.9	0.5
24/11/2016 13:20		-0.4	9.7	66.5	4.7	0.1
24/11/2016 13:21		-0.8	9.7	66.5	4.7	0.3
24/11/2016 13:22		-0.9	9.9	66.0	4.3	0.2
24/11/2016 13:23		-0.7	9.1	66.5	4.5	0.3
24/11/2016 13:24		-1.2	7.6	67.2	8.1	0.7
24/11/2016 13:25		-1.2	8.8	70.1	7.7	0.5
24/11/2016 13:26		-0.9	8.7	65.8	4.0	0.3
Average		**-0.8**	**9.1**	**67.6**	**5.6**	**0.5**

Referenced Data

	CO	*NOx*	*SO_2*
	mg/Nm³ Reference O_2		
24/11/2016 12:57	<1.7	161.1	<6.1
24/11/2016 12:58	<1.7	148.2	<6.1
24/11/2016 12:59	<1.7	167.6	<6.1
24/11/2016 13:00	<1.7	145.4	<6.1
24/11/2016 13:01	<1.7	191.3	<6.1
24/11/2016 13:02	<1.7	196.5	<6.1
24/11/2016 13:03	<1.7	154.6	<6.1
24/11/2016 13:04	<1.7	147.0	<6.1
24/11/2016 13:05	<1.7	190.2	<6.1
24/11/2016 13:06	<1.7	163.7	<6.1
24/11/2016 13:07	<1.7	145.5	<6.1
24/11/2016 13:08	<1.7	186.4	<6.1
24/11/2016 13:09	<1.7	192.4	<6.1
24/11/2016 13:10	<1.7	146.3	<6.1
24/11/2016 13:11	<1.7	145.9	<6.1
24/11/2016 13:12	<1.7	147.3	<6.1
24/11/2016 13:13	<1.7	140.5	<6.1
24/11/2016 13:14	<1.7	170.9	<6.1
24/11/2016 13:15	<1.7	185.8	<6.1
24/11/2016 13:16	<1.7	193.0	<6.1
24/11/2016 13:17	<1.7	148.3	<6.1
24/11/2016 13:18	<1.7	144.6	<6.1
24/11/2016 13:19	<1.7	192.2	<6.1
24/11/2016 13:20	<1.7	150.7	<6.1
24/11/2016 13:21	<1.7	150.7	<6.1
24/11/2016 13:22	<1.7	146.0	<6.1
24/11/2016 13:23	<1.7	148.9	<6.1
24/11/2016 13:24	<1.7	193.2	<6.1
24/11/2016 13:25	<1.7	195.5	<6.1
24/11/2016 13:26	<1.7	142.9	<6.1
Average	**<1.7**	**164.4**	**<6.1**
Uncertainty of Measurement	**2.2**	**12.2**	**16.9**
Uncertainty as % of ELV	**-**	**-**	**-**
Standard Requirement	**<6%**	**<10%**	**<10%**



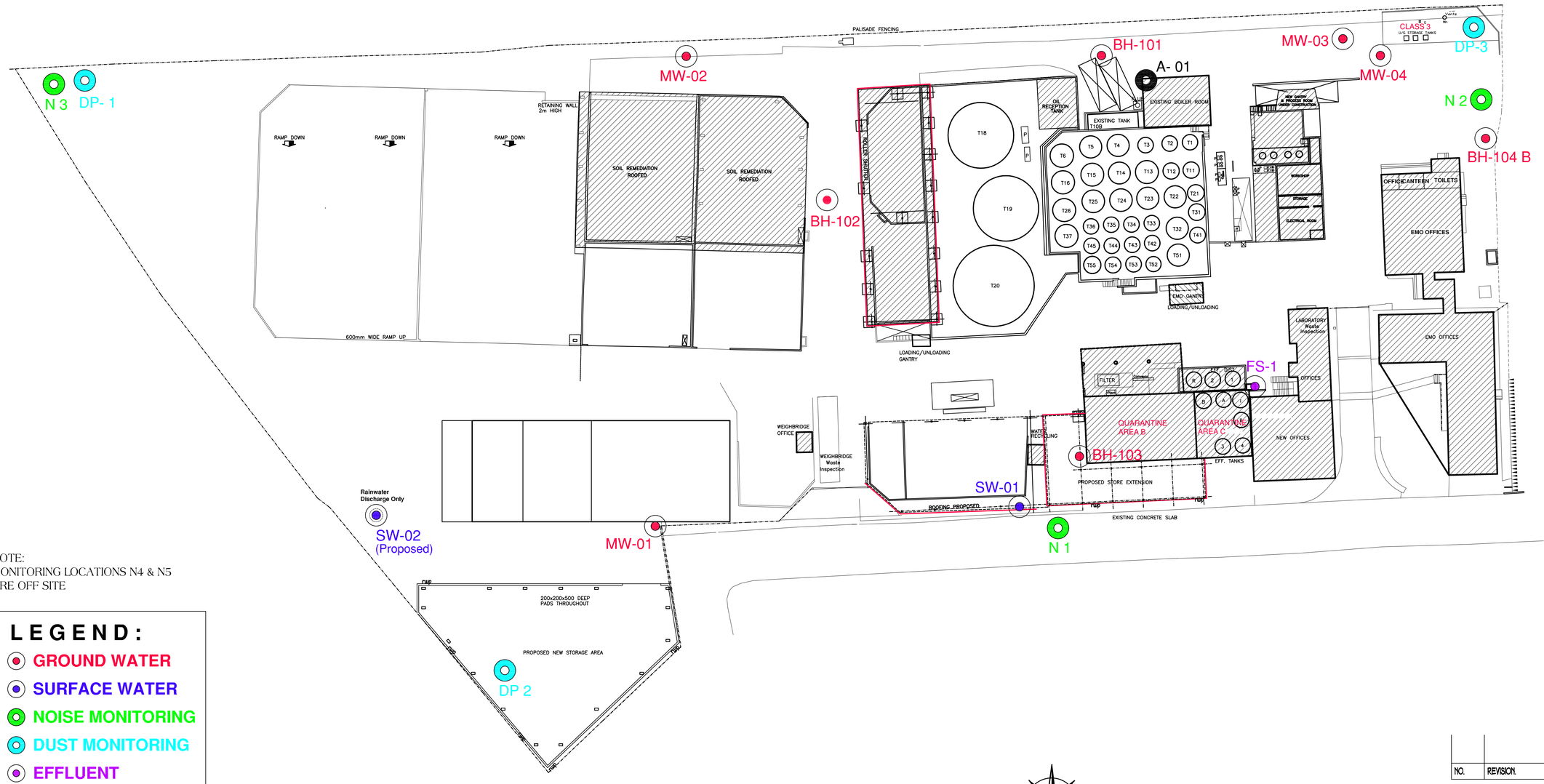
Combustion Efficiency

Parameter	Value
FT	186.3
Ambient Temp	9.4
A2 (Fuel Specific Factors)	0.66
Oxygen level in air	20.9
Measured oxygen	5.6
FT - AT	176.9
A2 / 20.9- O2	0.043137
plus B fuel specific factors	0.009
Calculation of efficiency qA	7.64
%	**92.36**

Appendix 8

NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT KAVANAGH RYAN & ASSOCIATES DRAWINGS AND SPECIFICATIONS.
2. ALL DIMENSIONS TO BE CONFIRMED. DO NOT SCALE DRAWING.



NOTE:
MONITORING LOCATIONS N4 & N5
ARE OFF SITE

LEGEND:

- GROUND WATER
- SURFACE WATER
- NOISE MONITORING
- DUST MONITORING
- EFFLUENT
- AIR EMISSIONS

NO.	REVISION.	DATE

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E-mail. kmryan@eircom.net

CLIENT: Waste Storage Areas.		enva
TITLE:		ENVA LIMITED, CLONMINAM IND. EST., PORTLAOISE, Co. LAOIS.
DRAWN: A.C.	SCALE: 1:400.	DRAWING No. At-WSA 1.
JOB. No. C02104,	DATE: Aug. '08.	

www.kavanaghryan.com

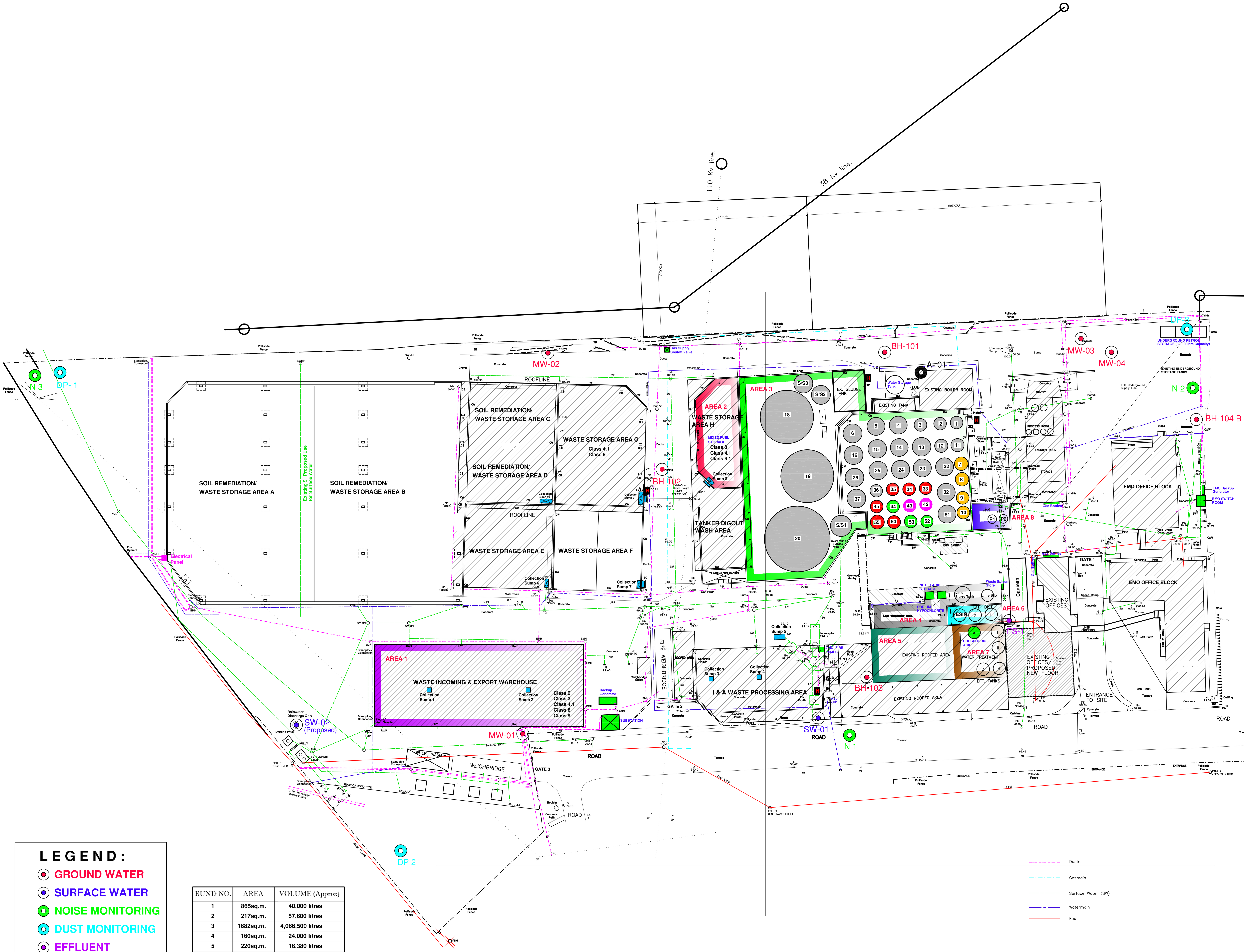
Enva Ireland: Monitoring locations

Appendix 9

NOTES:

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT KAVANAGH RYAN & ASSOCIATES DRAWINGS AND SPECIFICATIONS.

2. ALL DIMENSIONS TO BE CONFIRMED. DO NOT SCALE DRAWING.



LEGEND:

- GROUND WATER
- SURFACE WATER
- NOISE MONITORING
- DUST MONITORING
- EFFLUENT
- AIR EMISSIONS

BUND NO.	AREA	VOLUME (Approx)
1	865sq.m.	40,000 litres
2	217sq.m.	57,600 litres
3	1882sq.m.	4,066,500 litres
4	160sq.m.	24,000 litres
5	220sq.m.	16,380 litres
6	49sq.m.	21,400 litres
7	140sq.m.	11,400 litres
8	43sq.m.	43,263 litres

OIL TANK REGISTER

TANK NO.	GRADE	CAPACITY	FLASH POINT
1	11 LS	50,000 Ltr.	Above 38°
2	11 LS	50,000 Ltr.	Above 38°
3	11 LS	50,000 Ltr.	Above 38°
4	11 LS	100,000 Ltr.	Above 38°
5	11 LS	100,000 Ltr.	Above 38°
6	11 LS	140,000 Ltr.	Above 38°
7	Waste Oil	60,000 Ltr.	Above 36°
8	Waste Oil	60,000 Ltr.	Above 36°
9	Waste Oil	60,000 Ltr.	Above 36°
10	Waste Oil	60,000 Ltr.	Above 36°
11	Waste Oil	50,000 Ltr.	Above 36°
12	Waste Oil	50,000 Ltr.	Above 36°
13	Waste Oil	100,000 Ltr.	Above 36°
14	Waste Oil	100,000 Ltr.	Above 36°
15	Waste Oil	100,000 Ltr.	Above 36°
16	Waste Oil	140,000 Ltr.	Above 36°
18	Waste Oil	1,000,000 Ltr.	Above 36°
19	Waste Oil	1,000,000 Ltr.	Above 36°
20	11 LS	2,000,000 Ltr.	Above 38°
22	Waste Oil	100,000 Ltr.	Above 36°
23	Waste Oil	100,000 Ltr.	Above 36°
24	Waste Oil	100,000 Ltr.	Above 36°
25	Waste Oil	100,000 Ltr.	Above 36°
26	Waste Oil	140,000 Ltr.	Above 36°
32	Waste Oil	100,000 Ltr.	Above 36°
33	Kero	50,000 Ltr.	Above 36°
34	Kero	48,000 Ltr.	Above 36°
35	Kero	50,000 Ltr.	Above 36°
36	Waste Oil	50,000 Ltr.	Above 36°
37	Waste Oil	140,000 Ltr.	Above 36°
42	Derv	50,000 Ltr.	Above 56°
43	Derv	50,000 Ltr.	Above 56°
44	Gas Oil	50,000 Ltr.	Above 56°
45	Kero	50,000 Ltr.	Above 36°
51	14 LS	100,000 Ltr.	Above 56°
52	Gas Oil	50,000 Ltr.	Above 36°
53	Gas Oil	50,000 Ltr.	Above 56°
54	Kero	50,000 Ltr.	Above 36°
55	Kero	50,000 Ltr.	Above 36°
S/S1	Waste Oil	200,000 Ltr.	Above 36°
S/S2	Waste Oil	200,000 Ltr.	Above 36°
S/S3	Waste Oil	200,000 Ltr.	Above 36°
UGST	Petrol	30,000 Ltr.	Above -40°
P1	Waste Oil	10,000 Ltr.	Above 36°
P2	Waste Oil	10,000 Ltr.	Above 36°

NO.	REVISION	DATE
I.	MW-04 ADDED.	16/03/'12.
H.	TANK LAYOUT & GENERAL ADDITIONS.	09/03/'11.
G.	DRAINAGE UPDATED.	19/06/'09.
F.	TK. 10 added, 21, 31 & 41 renamed	11/12/'07.
E.	DUCTING ADDED	23/10/'07.
D.	TANK TABLE AND NOTES ADDED	16/08/'06.
C.	DRAINAGE&ROOFED AREAS ADDED	23/05/'06.
B.	DRAINAGE ADDED	23/11/'05.
A.	DRAWING REVISED TO LATEST LAYOUT	15/08/'05.

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CLIENT

Enva Ltd.,
Clonminam Ind. Est.,
Portlaoise,
Co. Laois.

enva

ENVA LIMITED, CLONMINAM IND. EST., PORTLAOISE, Co. LAOIS.

TITLE

DRAWN	A.C.	SCALE	1:400.
JOB. No.	C05015.	DATE	Sept. '03.

DRAWING No. Site-NR01.

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