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:** Lightning protection for the tank farm has been installed which further reduces the operational risk due to adverse weather. Yard integrity is monitored regularly 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 47

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.

from the site. **Environmental Performance:** There were 47 complaints received by Enva during the reporting period. As a result of this a Compliance Investigation (CI001037) was opened by the Agency . 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. In December 2015 in Portlaoise District Court, Enva Ireland Ltd pleaded guilty to 4 counts of a failure to comply with Condition 7.2 of IED Licence W0184-01 which condition requires that odours do not give rise to nuisance in the immediate area of its Portlaoise facility. A review of the licence is currently underview.

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

AIR-summary template	Lic No:	W0184-01	Year	2015

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	

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	2.8	mg/Nm3	yes	EN 15058:2004	13.18	N/A
A-01	Nitrogen oxides (NOx/NO2)	Annually	N/A	No 30min mean can exceed the ELV	110.5	mg/Nm3	SELECT	EN 14792:2005	520.05	N/A
A-01	Sulphur oxides (SOx/SO2)	Annually	N/A	No 30min mean can exceed the ELV	18.3	mg/Nm3	SELECT	OTH	86.13	N/A
A-01	Combustion Efficiency	Annually	N/A	No 30min mean can exceed the ELV	92	%	SELECT	OTH	N/A	N/A
DP1	LICENCED	Quarter 1	Yes - 350 mg/m2	Monitoring to occur 4 times a year	106.59	mg/m2/day	yes	Standard Method	0.3891	N/A
DP2	LICENCED	Quarter 1	Yes - 350 mg/m2	Monitoring to occur 4 times a year	56.1	mg/m2/day	yes	Standard Method	0.0205	N/A
DP3	LICENCED	Quarter 1	Yes - 350 mg/m2	Monitoring to occur 4 times a year	62.27	mg/m2/day	yes	Standard Method	0.0227	N/A
DP1	LICENCED	Quarter 2	Yes - 350 mg/m2	Monitoring to occur 4 times a year	11.5	mg/m2/day	yes	Standard Method	0.0042	N/A
DP2	LICENCED	Quarter 2	Yes - 350 mg/m2	Monitoring to occur 4 times a year	14	mg/m2/day	yes	Standard Method	0.0051	N/A
DP3	LICENCED	Quarter 2	Yes - 350 mg/m2	Monitoring to occur 4 times a year	62.3	mg/m2/day	yes	Standard Method	0.0227	N/A
DP1	LICENCED	Quarter 3	Yes - 350 mg/m2	Monitoring to occur 4 times a year	120.7	mg/m2/day	yes	Standard Method	0.0441	N/A
DP2	LICENCED	Quarter 3	Yes - 350 mg/m2	Monitoring to occur 4 times a year	34.2	mg/m2/day	yes	Standard Method	0.0124	N/A
DP3	LICENCED	Quarter 3	Yes - 350 mg/m2	Monitoring to occur 4 times a year	116.1	mg/m2/day	yes	Standard Method	0.0234	N/A
DP1	LICENCED	Quarter 4	Yes - 350 mg/m2	Monitoring to occur 4 times a year	7.55	mg/m2/day	yes	Standard Method	0.0028	N/A
DP2	LICENCED	Quareter 4	Yes - 350 mg/m2	Monitoring to occur 4 times a year	16.83	mg/m2/day	yes	Standard Method	0.0061	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	16.25	mg/m2/day	yes	Standard Method	0.0059	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: W0184-01 Year 2015

	Additional information
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 Yes	
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 No	

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	2830	µg/L	yes	During a site inspection with Enva's designated EPA inspector, Ms Joan Fogarty advised that it would be satisfactory to enter the highest result for each parameter required as per licence W0184-01, for the reporting 2013 year. The results have already been submitted on a quarterly basis and no breaches of ELV's occurred.
SW01	onsite	not applicable	pH	27/04/2015	N/A	All values < ELV	8.37	pH units	yes	During a site inspection with Enva's designated EPA inspector, Ms Joan Fogarty advised that it would be satisfactory to enter the highest result for each parameter required as per licence W0184-01, for the reporting 2013 year. The results have already been submitted on a quarterly basis and no breaches of ELV's occurred.
SW01	onsite	not applicable	COD	06/07/2015	250 mg/L	All values < ELV	227	mg/L	yes	During a site inspection with Enva's designated EPA inspector, Ms Joan Fogarty advised that it would be satisfactory to enter the highest result for each parameter required as per licence W0184-01, for the reporting 2013 year. The results have already been submitted on a quarterly basis and no breaches of ELV's occurred.
SW01	onsite	not applicable	Suspended Solids	16/03/2015	60 mg/L	All values < ELV	59	mg/L	yes	During a site inspection with Enva's designated EPA inspector, Ms Joan Fogarty advised that it would be satisfactory to enter the highest result for each parameter required as per licence W0184-01, for the reporting 2013 year. The results have already been submitted on a quarterly basis and no breaches of ELV's occurred.
SW01	onsite	not applicable	Mineral oils	02/12/2015	5 mg/L	All values < ELV	500	µg/L	yes	During a site inspection with Enva's designated EPA inspector, Ms Joan Fogarty advised that it would be satisfactory to enter the highest result for each parameter required as per licence W0184-01, for the reporting 2013 year. The results have already been submitted on a quarterly basis and no breaches of ELV's occurred.
SW02	onsite	not applicable	Fats, Oils and Greases	N/A	N/A	All values < ELV	N/A	N/A	N/A	During a site inspection with Enva's designated EPA inspector, Ms Joan Fogarty advised that it would be satisfactory to enter the highest result for each parameter required as per licence W0184-01, for the reporting 2013 year. The results have already been submitted on a quarterly basis and no breaches of ELV's occurred.
SW02	onsite	not applicable	pH	26/01/2015	N/A	All values < ELV	8.35	pH units	yes	During a site inspection with Enva's designated EPA inspector, Ms Joan Fogarty advised that it would be satisfactory to enter the highest result for each parameter required as per licence W0184-01, for the reporting 2013 year. The results have already been submitted on a quarterly basis and no breaches of ELV's occurred.
SW02	onsite	not applicable	COD	12/10/2015	250 mg/L	All values < ELV	168	mg/L	yes	During a site inspection with Enva's designated EPA inspector, Ms Joan Fogarty advised that it would be satisfactory to enter the highest result for each parameter required as per licence W0184-01, for the reporting 2013 year. The results have already been submitted on a quarterly basis and no breaches of ELV's occurred.

AER Monitoring returns summary template-WATER/WASTEWATER(SEWER)				Lic No:	W0184-01		Year	2015		
SW02	onsite	not applicable	Suspended Solids	21/09/2015	60 mg/L	All values < ELV	50	mg/L	yes	During a site inspection with Enva's designated EPA inspector, Ms Joan Fogarty advised that it would be satisfactory to enter the highest result for each parameter required as per licence W0184-01, for the reporting 2013 year. The results have already been submitted on a quarterly basis and no breaches of ELV's occurred.
SW02	onsite	not applicable	Mineral oils	01/12/2015	5 mg/L	All values < ELV	130	µg/L	yes	During a site inspection with Enva's designated EPA inspector, Ms Joan Fogarty advised that it would be satisfactory to enter the highest result for each parameter required as per licence W0184-01, for the reporting 2013 year. The results have already been submitted on a quarterly basis and no breaches of ELV's occurred.

*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		No	Additional information
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 checklist	Yes	

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

Emission reference no:	Emission released to	Parameter/ SubstanceNote 1	Type of sample	Frequency of monitoring	Averaging period	ELV or trigger values in licence or any revision therof[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/Sewe	pH	composite	15/05/2015	24 hour	6 - 8.5	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	8.41	pH units	no (if no please enter details in comments box)	pH Meter (Electrode)	As per manufacturers guide	SOP 1134		.
FS1	Wastewater/Sewe	Temperature	composite	19/03/2015	24 hour	43	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	44	degrees C	yes	Temperature Probe	SCADA	SCADA		

AER Monitoring returns summary template-WATER/WASTEWATER(SEWER)						Lic No:	W0184-01			Year	2015				
FS1	Wastewater/Sewe	Suspended Solids	composite	19/03/2015	24 hour	400 mg/L	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	341	mg/L	yes	Gravimetric analysis	APHA / AWWA "Standard Methods"	SOP 1291	383.8	
FS1	Wastewater/Sewe	Ammonia (as N)	composite	02/11/2015	24 hour	80 mg/L	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	66	mg/L	yes	Spectrophotometry (Colorimetry)	APHA / AWWA "Standard Methods"	SOP 1245	172.40	
FS1	Wastewater/Sewe	Chlorides (as Cl)	composite	04/11/2015	24 hour	6000 mg/L	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	2940	mg/L	yes	Titration	APHA / AWWA "Standard Methods"	SOP 1028	7417.00	
FS1	Wastewater/Sewe	Copper and compounds (as Cu)	composite	07/01/2015	24 hour	1 mg/L	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	0.007	mg/L	yes	ICP	TM30 - Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry)	TM30/PM14	0.0036	
FS1	Wastewater/Sewe	Lead and compounds (as Pb)	composite	30/09/2015	24 hour	0.5 mg/L	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	0.024	mg/L	yes	ICP	TM30 - Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry)	TM30/PM14	0.0608	

AER Monitoring returns summary template-WATER/WASTEWATER(SEWER)						Lic No:	W0184-01		Year	2015					
FS1	Wastewater/Sewe	Zinc and compounds (as Zn)	composite	03/06/2015	24 hour	1 mg/L	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	0.141	mg/L	yes	ICP	TM30 - Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry)	TM30/PM14	0.09	
FS1	Wastewater/Sewe	Cadmium and compounds (as Cd)	composite	28/10/2015	24 hour	0.15 mg/L	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	0.001	mg/L	yes	ICP	TM30 - Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry)	TM30/PM14	0.00	
FS1	Wastewater/Sewe	COD	composite	04/03/2015	24 hour	280Kg/day	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	5140.0	mg/L	yes	Spectrophotometry (Colorimetry)	APHA / AWWA "Standard Methods"	SOP 1241	17792.72	
FS1	Wastewater/Sewe	Phenols (as total C)	composite	11/02/2015	24 hour	50 mg/L	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	23.5	mg/L	yes	Spectrophotometry (Colorimetry)	APHA / AWWA "Standard Methods"	SOP 1289	60.69	
FS1	Wastewater/Sewe	Sulphate	composite	04/03/2015	24 hour	1000 mg/L	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	823	mg/L	yes	Spectrophotometry (Colorimetry)	APHA / AWWA "Standard Methods"	SOP 1032	551.08	

AER Monitoring returns summary template-WATER/WASTEWATER(SEWER)							Lic No: W0184-01			Year 2015					
FS1	Wastewater/Sewe	Fats, Oils and Greases	composite	11/02/2015	24 hour	100 mg/L	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	25	mg/L	yes	EPH with GC-FID	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon	TM5/PM30	10.81	
FS2	Wastewater/Sewe	Total phosphorus	composite	22/07/2015	24 hour	150 mg/L	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	108.5	mg/L	yes	Spectrophotometry (Colorimetry)	APHA / AWWA "Standard Methods"	SOP 1246	398.34	
FS2	Wastewater/Sewe	volumetric flow	composite	03/04/2014	24 hour	50 m3/day	All results < 1.2 times ELV, plus 8 from ten results must be < ELV	49.08	m3/day	yes	SCADA	SCADA	SCADA	5908900	

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

AER Monitoring returns summary template-WATER/WASTEWATER(SEWER)	Lic No:	W0184-01	Year	2015

Continuous monitoring

		Additional Information
Does your site carry out continuous emissions to water/sewer monitoring?	No	

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**	No	We do not have continuous monitoring equipment
Do you have a proactive service contract for each piece of continuous monitoring equipment on site?	No	We do not have continuous monitoring equipment
Did abatement system bypass occur during the reporting year? **If yes please complete table W5 below**	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 exceedences 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?	9	
5	How many of these bunds have been tested within the required test schedule?	9	They are due in be tested in 2018
6	How many mobile bunds are on site?	17	
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?	16	one of these are new
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)
MB 17	other (please specify)	Mobile Bund	Hydrogen Peroxide	300litres	220	Other (please specify)	New bund	Mar-19	No	Pass		SELECT		
	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 2016
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

Groundwater/Soil monitoring template	Lic No:	W0184-01	Year	2015

			Comments	
1	Are you required to carry out groundwater monitoring as part of your licence requirements?	yes		Please provide an interpretation of groundwater monitoring data in the interpretation box below or if you require additional space please include a groundwater/contaminated land monitoring results interpretaion as an additional section in this AER
2	Are you required to carry out soil monitoring as part of your licence requirements?	no		
3	Do you extract groundwater for use on site? If yes please specify use in comment section	no		
4	Do monitoring results show that groundwater generic assessment criteria such as GTVs or IGVs are exceeded or is there an upward trend in results for a substance? If yes, please complete the Groundwater Monitoring Guideline Template Report (link in cell G8) and submit separately through ALDER as a licensee return AND answer questions 5-12 below. Groundwater monitoring template	yes	See attached external groundwater monitoring. These are also submitted quarterly	
5	Is the contamination related to operations at the facility (either current and/or historic)	yes	Historic	
6	Have actions been taken to address contamination issues?If yes please summarise remediation strategies proposed/undertaken for the site	yes	Continuous Monitoring	
7	Please specify the proposed time frame for the remediation strategy	N/A	Continuous Monitoring	
8	Is there a licence condition to carry out/update ELRA for the site?	yes		
9	Has any type of risk assesment been carried out for the site?	yes	ELRA approved by Agency	
10	Has a Conceptual Site Model been developed for the site?	yes	Included in hydro geological review and assessment report submitted in May2014	
11	Have potential receptors been identified on and off site?	yes	Included in hydro geological review and assessment report submitted in May2014	Quarterly reports submitted as per licence and interpretation of data is included in these. Q 4 includes a summary of the ground water performance for the year The Hydro-geological assessment for the site was submitted in June 2014
12	Is there evidence that contamination is migrating offsite?	no		

Table 1: Upgradient Groundwater monitoring results

Date of sampling	Sample location reference	Parameter/ Substance	Methodology	Monitoring frequency	Maximum Concentration++	Average Concentration+	unit	GTV's*	SELECT**	Upward trend in pollutant concentration over last 5 years of monitoring data
							SELECT			SELECT
							SELECT			SELECT

.+ where average indicates arithmetic mean

.++ maximum concentration indicates the maximum measured concentration from all monitoring results produced during the reporting year

Table 2: Downgradient Groundwater monitoring results

Groundwater/Soil monitoring template Lic No: W0184-01 Year 2015

Date of sampling	Sample location reference	Parameter/ Substance	Methodology	Monitoring frequency	Maximum Concentration	Average Concentration	unit	GTV's*	SELECT**	Upward trend in yearly average pollutant concentration over last 5 years of monitoring data
							SELECT			SELECT
							SELECT			SELECT

*please note exceedance of generic assessment criteria (GAC) such as a Groundwater Threshold Value (GTV) or an Interim Guideline Value (IGV) or an upward trend in results for a substance indicates that further interpretation of monitoring results is required. In addition to completing the above table, please complete the Groundwater Monitoring Guideline Template Report at the link provided and submit separately through ALDER as a licensee return or as otherwise instructed by the EPA.

Groundwater monitoring template

More information on the use of soil and groundwater standards/ generic assessment criteria (GAC) and risk assessment tools is available in the EPA published guidance (see the link in G31)

Guidance on the Management of Contaminated Land and Groundwater at EPA Licensed Sites (EPA 2013).

**Depending on location of the site and proximity to other sensitive receptors alternative Receptor based Water Quality standards should be used in addition to the GTV e.g. if the site is close to surface water compare to Surface Water Environmental Quality Standards (SWEQS), If the site is close to a drinking water supply compare results to the Drinking Water Standards (DWS)

Surface water EQS | Groundwater regulations GTV's | Drinking water (private supply) standards | Drinking water (public supply) standards | Interim Guideline Values (IGV)

Groundwater/Soil monitoring template	Lic No:	W0184-01	Year	2015

Table 3: Soil results

Date of sampling	Sample location reference	Parameter/ Substance	Methodology	Monitoring frequency	Maximum Concentration	Average Concentration	unit
							SELECT
							SELECT

Where additional detail is required please enter it here in 200 words or less

	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	Final financial provision to be agreed with the Agency
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	nsurance with Environmental Impairment	Liability cover,
7	Financial provision for ELRA expiry date	Enter expiry date	Pending agreement of financial provision.
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	N/A	Pending agreement of bond.

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
Reduction of Fire/Explosion	Reduce risk of lightning strike of oil tanks	Complete	Installation of a system for channelling lightning strikes to ground safely thereby reducing risk.	Operations	Increase safety to prevent damage and loss of containment.
Overspill protection	Reduction in risk of overspill from tanks	30%	Installation of additional air actuated valves interlocked to the 'high high' level probes which shut on activation of a high level alarm to prevent the overflow of tanks. Equipment purchased, installation date deferred due to other projects ongoing at the site.	Operations	Increase safety to prevent damage and loss of containment.
Review quality of self-monitoring compliance data	Review outcome of data generated from EPA intercalibration scheme.	Completed	Performance against EPA intercalibration scheme is reviewed regularly. Currently, all such samples supplied in this scheme have passed with the Z(P) Score within the range -1 to 1. Ammonia has been removed from the Intercalibration scheme as the method ENVA use is within the range of 0.4-50 mg/l, whereas the EPA intercalibration samples are spiked in the lower range of 0.4 to 0.8mg/l, ie: the scheme spiked samples did not reflect the range of ENVA anlysis.	Laboratory &Operations	Increased compliance with licence conditions
Review quality of self-monitoring compliance data	Determine key tests for validation	70%	One procedure remains to be validated on the WDXRF unit, scheduled for 2016. A mini validation is required for the New Karl Fischer Unit and a validation is required on the 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. One line remains, there is a programme in place to replace the remaining line that has to be tested.	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	HSE & Operations	Remediation of contamination on site
Waste reduction/Raw material usage efficiency	Consider additional rain water harvesting/storage for additional use for Enva tankers.	Complete	Divert rain water from the roof of the export shed to the truck power washer.	HSE & Operations	Improved Environmental Management Practices
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 ome to their end of life have been replaced with Low wattage LED lights but 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 the drying tanks and submit for approval to the Agency	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 interceptor in the tank farm used to separate prevent oil being transferred to the effluent treatment area is over 20 years old and becoming past its serviceable life. Replace the interceptor in tank farm with improved model with sealed lids. The replacement interceptor will also see the recommissioning of the existing pump to facilitate a more controlled dosing of odour abatement chemical.	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
		Complete	Cladding of soil bay to reduce fugitive emissions from the site.	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? (Noise Guidance note NG4)	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

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)?
19.10.15	16.4	N1	No	53	45	55	62	No		Enva activity included: vehicle movement. Offsite Noise: 3 trains and 4 cars pass nearby, distant traffic noise and construction noise (drilling) in neighbouring facility are dominant noise (in absence of vehicle movement etc.)	Yes
21.10.16	11.38	N1	No	52	46	53	60	No		Enva activity included: vehicle movement (3 HGVs in/out), hand held tools being used. Offsite Noise: 1 trains pass nearby, distant traffic noise.	Yes
21.10.16	12.11	N1	No	50	46	52	55	No		Enva activity included: vehicle movement (1 HGV in/out), hand held tools being used. Offsite Noise: 1 trains pass nearby, distant traffic noise, construction noise (drilling) in neighbourine facility	Yes
19.10.15	23.33	N1	No	46	41	46	53	No		Traffic and industrial noise to the south is dominant. Enva activity: very low hum from sorting area	Yes
21.10.16	0.03	N1	No	44	41	45	49	No		Traffic and industrial noise to the south is dominant. Enva activity: very low hum from sorting area	Yes
19.10.15	13.14	N2	No	52	50	53	59	No		Onsite noise/activity: low hiss from tank farm, vehicle movements (1 HGV). Offsite noise/activity: HGV movement and hum from air handling unit in neighbouring facility. Distant traffic noise, train beeps in distance.	Yes
19.10.15	14.44	N2	No	55	50	58	64	No		Onsite noise/activity: vehicle movements (1 car, 2 vans, forklift). Offsite noise/activity: HGV and car movement and hum from air handling unit in neighbouring facility. Distant traffic noise.	Yes
19.10.15	14.35	N2	No	56	51	58	68	No		Onsite noise/activity: boiler, low hiss from tank farm, vehicle movements (2 HGV). Offsite noise/activity: HGV movement and hum from air handling unit in neighbouring facility. Distant traffic noise, helicopter overhead.	Yes
19.10.15	22.12	N2	No	52	50	52	58	No		Dominant noise industrial facility and distant traffic to the south, helicopter passes overhead. Boiler noise audible onsite occasionally.	Yes
19.10.15	22.42	N2	No	51	51	52	54	No		Dominant noise industrial facility and distant traffic to the south. Boiler noise audible onsite occasionally.	Yes
19.10.15	14.35	N3	No	45	39	46	58	No		Onsite noise/activity: activity in sorting area, forklift in distance.Distant traffic noise. 1 trains pass.	Yes
19.10.15	15.15	N3	No	49	34	43	54	No		Onsite noise/activity: activity in sorting area, forklift in distance. Distant traffic noise. 2 trains pass. train beeps.	Yes

19.10.15	15.46	N3	No	45	35	43	58	No		Onsite noise/activity: activity in sorting area, forklift in distance. Distant traffic noise. 2 trains pass.	Yes
19.10.15	22.20	N3	No	37	34	38	42	No		Dominant noise: Distant traffic noise and train passess. No noise audible from Enva.	Yes
19.10.15	22.50	N3	No	37	34	38	43	No		Dominant noise: Distant traffic noise and train passess. No noise audible from Enva.	Yes
21.10.16	13.40	N4	No	57	48	60	66	No		Dominant noise: crane movement and alarm in train yard, distant traffic is dominant is absence of passing traffic. Traffic: approximately 50 cars, 20 vans pass, 1 HGVs. Enva is not audible at this location.	Yes
21.10.16	14.1	N4	No	55	47	58	65	No		Dominant noise: crane movement and alarm in train yard, distant traffic is dominant is absence of passing traffic. Traffic: approximately 40 cars, 20 vans pass. Enva is not audible at this location.	Yes
21.10.16	14.41	N4	No	56	46	60	66	No		Dominant noise: crane movement and alarm in train yard, distant traffic is dominant is absence of passing traffic. Traffic: approximately 50 cars, 15 vans pass. Enva is not audible at this location.	Yes
19.10.15	0.15	N4	No	39	35	40	45	No		Dominant noise: distant traffic and industrial noise to the south. Enva is not audible at this location.	Yes
19.10.15	0.45	N4	No	38	34	39	44	No		Dominant noise: distant traffic and industrial noise to the south. Enva is not audible at this location.	Yes
19.10.15	16.25	N5	No	53	44	54	62	No		Distant traffic noise and drilling in neighbouring facility dominant noise. 4 cars and 3 trains pass nearby. Audible Enva activity onsite: vehicle movement (5 HGVs in/out).	Yes
21.10.16	10.52	N5	No	52	46	53	63	No		Distant traffic noise and drilling in neighbouring facility dominant noise.1 train passes nearby. Audible Enva activity onsite: forklift, sawing, vehicle movement (3 HGVs in/out).	Yes
21.10.16	11.24	N5	No	51	47	52	59	Yes		Distant traffic noise and drilling in neighbouring facility dominant noise. 1trains pass nearby. Audible Enva activity onsite: vehicle movement (1 HGVs in/out).	Yes
19.10.15	23.34	N5	No	44	40	46	55	No		Industrial noise to the south and traffic to the west dominant, 1 train passes. No noise audible from Enva.	Yes
19.10.15	0.04	N5	No	43	40	40	50	No		Industrial noise to the south and traffic to the west dominan. No noise audible from Enva.	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	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	

SEAI - Large Industry Energy Network (LIEN)

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)	5243.756	6117.914	16.6704553	
Total Energy Generated (MWHrs)				
Total Renewable Energy Generated (MWHrs)				
Electricity Consumption (MWHrs)	475.406	477.312	0.400920476	
Fossil Fuels Consumption:				
Heavy Fuel Oil (m3)				
Light Fuel Oil (m3)	0	41		
Natural gas (m3)	437348.069	471955.3	7.912972173	
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^3yr):	Volume used i.e not discharged to environment e.g. released as steam m3/yr	Unaccounted for Water:
Groundwater							
Surface water							
Public supply	19579	15458	-21.0480617				
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
Jan-07	Decrease MIC level.	Reduce the MIC to 200 KVA.	energy audit	N/A	Jan-07	Operations	Complete	Complete
Jan-07	Power Factor Correction.	Eliminate excess wattless charges.	energy audit	N/A	Jan-07	Operations	Complete	Complete
Jan-07	Optimise Compressed Air Systems.	Reduce Compressed Air.	energy audit	7	Jan-07	Operations	The compressed air was reduced, however this delayed the process and increased processing costs, i.e. more energy was required.	Obsolete
Jan-07	Relocation of new air compressor and air receiver.	Locate outside the building in order to reduce the temperature of the air, in order to increase the compressor efficiency.	energy audit	N/A	Jan-07	Operations	Complete	Complete
Jan-07	Lighting Controls.	Install PIR sensors through-out the site in order to reduce electricity usage.	energy audit	N/A	Jan-07	Operations	Complete	Complete
Jan-07	Good energy housekeeping.	Improve efficiency.	energy audit	N/A	Jan-07	Operations	Installed lagging, heat tracing on oil and on water lines.	Complete
Jan-07	Steam Pressure Reduction.	Reduce steam pressure form 10 bar to 6 bar.	energy audit	2	Jan-07	Operaions	Steam pressure was reduced to 6 bars, but due to the process inefficiency, the steam pressure was increased to 7.5 bars.	Complete

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					

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

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

Complaints

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	Additional information

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
04.06.15 to 31.12.15	Odour		Complaints have been received in relation to odurs emitting from Enva Ireland's Portlaoise facility. The first of these complaints was reveived on 04.06.15	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	This is priority	
	SELECT				SELECT		
	SELECT				SELECT		
	SELECT				SELECT		
	SELECT				SELECT		

Total complaints open at start of reporting year	0
Total new complaints received during reporting year	47
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

Have any incidents occurred on site in the current reporting year? Please list all incidents for current reporting year in Table 2 below	Yes	Additional information

*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					
05.05.15	Other(please specify)	SW-01	1. Minor	Water	Other (add details)	Trigger level breach not reported to Agency at time of incident.	Normal activities	EPA	New	The limit values are recorded on all worksheets to highlight exceedances of the limits	The limit values are recorded on all worksheets to highlight any exceedance of the limits and the procedure is updated for lab staff to report any exceedance to operations manager	Complete	12.01.16	Low
16.06.15	Other(please specify)	Other location (please specify here)	1. Minor	Ground	Other (add details)	A suspicious package was located in a wheelie bin brought on-site	Normal activities	Local Authorities	New	The site was evacuated and Gardai were called. Ordinace was called and the suspicious package was made safe. (This was investigate and the device was used for practice drills at the ship port)	The site was evacuated and Gardai were called. Ordinace was called and the suspicious package was made safe. (This was investigate and the device was used for practice drills at the ship port)	Complete	16.06.16	Low
	SELECT	SELECT	SELECT	SELECT	SELECT		SELECT	SELECT	SELECT			SELECT		SELECT

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	2
Total number of incidents previous year	2
% 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) If yes please enter details in table 1 below	Yes	
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	3027.38

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*	*17852.46*	*16047.13*	11.25017371	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*	*3359.35*	*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*	72.12	*663.68*	-89.13271456	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*	*0*	*Enva Ireland does not currently record the packaging content of waste as it arrives on-site*

WASTE SUMMARY					Lic No:	W0184-01		Year	2015		
				398.52			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*		*132.69*	200.3391363		*N/A*	*R9-Oil re-refining or other reuses*	*721.89*	*Enva Ireland does not currently record the packaging content of waste as it arrives on-site*
			234.76			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*		*33.64*	597.8596908		*N/A*	*R9-Oil re-refining or other reuses*	*0*	*Enva Ireland does not currently record the packaging content of waste as it arrives on-site*
			366.8			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*		*380.26*	-3.539683375		*N/A*	*R5-Recycling/reclamation or othe*	*0*	*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 oherwise specified	11.26	1.26	793.5714286	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	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	5.43	4.51	20.31042129	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	0	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	75.91	10.94	593.8756856	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	0	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	5.48	-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	0	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	18.15	18.28	-0.711159737	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	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		3.77	-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 an	0	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*	*2.52*	*1.82*	38.46153846	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*	*0.15*	*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*	*696.82*	*641.62*	8.603223092	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*	*27.16*	*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*	5,745.00	*1583.92*	262.7079019	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*	*6914.68*	*Enva Ireland does not currently record the packaging content of waste as it arrives on-site*

WASTE SUMMARY					Lic No:	W0184-01		Year	2015		
				686.75			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 06 01	*16- WASTES NOT OTHERWISE SPECIFIED IN THE LIST*	*Lead batteries*		*995.79*	-31.0346559		*N/A*	*R13-Storage of waste pending an*	*25.71*	*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.				
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	*420.452*	3.740498321		*N/A*	*R13-Storage of waste pending an*	*37.2*	*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.				
16 07 08	*16- WASTES NOT OTHERWISE SPECIFIED IN THE LIST*	*Waste containing oil*	34.568	*40.219*	-14.05057311		*N/A*	*R13-Storage of waste pending an*	*1*	*Enva Ireland does not currently record the packaging content of waste as it arrives on-site*

WASTE SUMMARY					Lic No:	W0184-01		Year	2015		
				8.91			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 01 13	*16- WASTES NOT OTHERWISE SPECIFIED IN THE LIST*	*Brake fluids*		*7.99*	11.47684606		*N/A*	*R13-Storage of waste pending an*	*0*	*Enva Ireland does not currently record the packaging content of waste as it arrives on-site*
				127.50			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 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)*		*166.79*	-23.55596858		*N/A*	*R13-Storage of waste pending an*	*38.5*	*Enva Ireland does not currently record the packaging content of waste as it arrives on-site*
				19.68			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 07 02	*13- OIL WASTES AND WASTES OF LIQUID FUELS (except edible oils, and those in chapters 05, 12 and 19)*	*Petrol*		*6.56*	200		*N/A*	*R13-Storage of waste pending an*	*0*	*Enva Ireland does not currently record the packaging content of waste as it arrives on-site*

WASTE SUMMARY					Lic No:	W0184-01		Year	2015		
				31.12			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*		*21.55*	44.39907193		*N/A*	*R13-Storage of waste pending an*	*0*	*Enva Ireland does not currently record the packaging content of waste as it arrives on-site*
			657.84			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*		*462.68*	42.17925996		*N/A*	*R5-Recycling/reclamation or othe*	*225.65*	*Enva Ireland does not currently record the packaging content of waste as it arrives on-site*
			1.71			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*		*1.65*	3.636363636		*N/A*	*D15-Storage pending any of the o*	*0*	*Enva Ireland does not currently record the packaging content of waste as it arrives on-site*

WASTE SUMMARY					Lic No:	W0184-01	Year	2015			
	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*	128.68	*109.13*	17.91349766	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*	*23.7*	*Enva Ireland does not currently record the packaging content of waste as it arrives on-site*
	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*	20.35	*0.82*	2382.073171	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*	*Enva Ireland does not currently record the packaging content of waste as it arrives on-site*
	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*	0.199	*3.01*	-93.38870432	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*	*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	11.82	12.6	-6.214285714	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	10	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	22.62	6.9	227.826087	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	8	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		0.13	-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 an	0	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	17.924	18.624	-3.758591065	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	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	0.66	0.029	2175.862069	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 d	0.66	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	0.73	7.35	-90.06802721	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	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	0.37	282	-99.86879433	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	0	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		6.35	-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 an	0	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	10.26	41.17	-75.07894098	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	Enva Ireland does not currently record the packaging content of waste as it arrives on-site

WASTE SUMMARY						Lic No:	W0184-01	Year	2015		
							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 14	*20- MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS*	*Acids*	*6.61*	*0.84*	686.9047619		*N/A*	*R13-Storage of waste pending an*	*0*	*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.				
	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*	*2.75*	*4.02*	-31.5920398		*N/A*	*R9-Oil re-refining or other reuses*	*0*	*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.				
	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*	*4*	-100		*N/A*	*R13-Storage of waste pending an*	*0*	*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	13.53	3.45	292.1449275	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	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	11.37	6.39	77.91862285	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	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	17.983	22.428	-19.81897628	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	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 25	20- MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS	edible oil and fat	62.077	69.47	-10.64200374	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	11	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	2.28	73.68421053	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	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	16.95	21.71091445	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	Enva Ireland does not currently record the packaging content of waste as it arrives on-site

WASTE SUMMARY					Lic No:	W0184-01		Year	2015		
				184.28			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 01 15	*16- WASTES NOT OTHERWISE SPECIFIED IN THE LIST*	*antifreeze fluids other than those mentioned in 16 01 14*		*167.62*	9.936761723		*N/A*	*R13-Storage of waste pending an*	*0*	*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.				
16 05 05	*16- WASTES NOT OTHERWISE SPECIFIED IN THE LIST*	*gases in pressure containers other than those mentioned in 16 05 04*		*0.04*	-100		*N/A*	*R13-Storage of waste pending an*	*0*	*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.				
16 06 05	*16- WASTES NOT OTHERWISE SPECIFIED IN THE LIST*	*other batteries and accumulators*	*0.425*	*0.388*	9.536082474		*N/A*	*R13-Storage of waste pending an*	*23.8*	*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	0.04	2.11	-98.1042654	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	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	161.823	164.508	-1.63213947	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	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		80.54	-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 othe	0	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	0.22	0.47	-53.19148936	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	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	25.28	16.36	54.52322738	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	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		3.92	-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	0	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	22.36	101.2	-77.90513834	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	0	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	0.05	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	0	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	2.04	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 instances some wastes were excepted onsite that were not accepted in previous years.	N/A	R9-Oil re-refining or other reuses	0	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	0.73	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 an	0	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	1.45	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 an	0	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	3.96	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 an	3.96	Enva Ireland does not currently record the packaging content of waste as it arrives on-site

WASTE SUMMARY				Lic No:		W0184-01	Year		2015		
							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 04	*16- WASTES NOT OTHERWISE SPECIFIED IN THE LIST*	*alkaline batteries (except 16 06 03)*	*0.1*	*0*	#DIV/0!		*N/A*	*R13-Storage of waste pending an*	*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.				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*	*0.3*	*0*	#DIV/0!		*N/A*	*R13-Storage of waste pending an*	*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.				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*	*0.28*	*0*	#DIV/0!		*N/A*	*R13-Storage of waste pending an*	*0*	

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	Streat cleaning residues	15.14	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 othe	0	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
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

Enva Portlaoise

2015 Groundwater Compliance Monitoring

Quarter 1 (Jan – Mar 2015)

Document Control Sheet

Client:	Enva Ireland Ltd.
Project Title:	Enva Portlaoise 2015 Groundwater Compliance Monitoring
Document Title:	Quarter 1 (Jan – Mar 2015)
Document No:	MDE0973Rp0022

Text Pages:	35	Appendices:	-

Rev.	Status	Date	Author(s)		Reviewed By		Approved By	
D01	Draft	12th March 2015	ZJ		MR		PC	
A01	Client Approval	8th April 2015	ZJ		CR		PC	

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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 with 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 12th February 2015. 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 2015 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 2015 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 2013), 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)
- Quarter 1 Groundwater Monitoring Report, RPS (2014)
- Quarter 2 Groundwater Monitoring Report, RPS (2014)
- Quarter 3 (Annual) Groundwater Monitoring Report, RPS (2014)
- Quarter 4 Groundwater Monitoring Report, RPS (2014)

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,

Strata	Extent	Thickness	Description
			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 PAH's Phenols VOC's SVOC's	Mineral Oil BTEX & MTBE PAH's Phenols VOC's SVOC's
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.

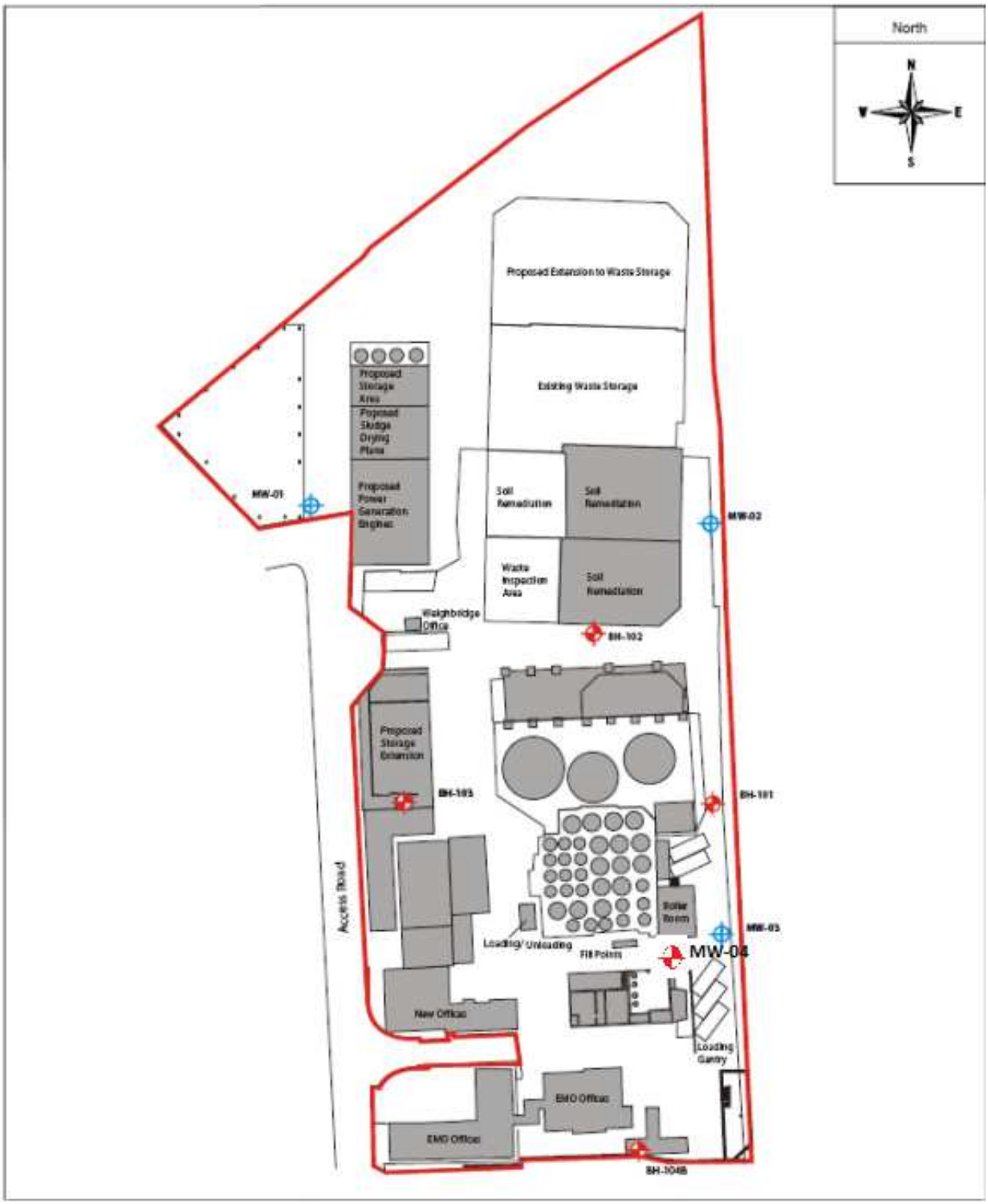
3.1 LABORATORY ANALYSIS

All groundwater samples were analysed at a UKAS accredited laboratory, I2 Analytical Ltd 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 - I2 Analytical

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 2015 results are tabulated in **Section 4** and discussed with respect to previous results. 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 2015 monitoring round. As the monitoring continues in accordance with the waste 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 MARCH 2015

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 1, 2015)

Monitoring Well	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04
Depth (mbgl)	6.69	6.45	4.43	4.62	22.9	31	14.82	6.3
Static Water Level (mbgl)	4.16	3.22	1.75	0.96	2.52	3.77	4	3.89
Ground Level (mAOD)	103.06	102.55	101.16	101.52	102.10	103.12	102.77	-
Water Level (mAOD)	98.9	99.33	99.41	100.56	99.58	99.35	98.77	-
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, 2015)

Monitoring Well	pH (pH Units)	Temperature (°C)	Conductivity (µS/cm)	Dissolved O_2 (ppm)	Observations
BH101	7.40	11.1	941	2.27	Cloudy white colour, odourless.
BH102	6.40	10.7	1088	3.22	Clear after purging, slight H2S odour detected on purging.
BH103	7.29	9.6	879	6.88	Very small sheen on surface, slightly cloudy, odourless.
BH104B	7.59	11.7	1174	2.32	Dark grey, cloudy, a lot of small fine sediment, strong sweet odour, sheen on surface.
MW01	-	-	-	-	Difficult to purge at this location, insufficient amount of water to record required values.
MW02	7.43	11.2	739	8.89	Clear, odourless.
MW03	7.40	11.1	1637	3.39	Clear, slight hydrocarbon sheen on surface, no odour.
MW04	7.16	11.8	1440	1.64	Grey/brown, cloudy, sediment in sample, no odour.
Groundwater Threshold Value	-	-	**>800 & <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	**2.9**	**2.7**	-	30

Note 1: No specific IGV for parameter. IGV for Total Xylenes is used as guideline.

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	***0.04***	***0.05***	<0.01	<0.01	<0.01	***0.18***	-	1.0
Acenaphthylene	µg/l	0.01	<0.01	<0.01	***0.022***	<0.01	<0.01	<0.01	<0.01	<0.01	-	-
Acenaphthene	µg/l	0.01	<0.01	<0.01	<0.01	***0.027***	<0.01	<0.01	***0.022***	<0.01	-	-
Fluorene	µg/l	0.01	<0.01	<0.01	<0.01	***0.041***	<0.01	<0.01	<0.01	<0.01	-	-
Phenanthrene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	***0.014***	<0.01	<0.01	<0.01	-	-
Anthracene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	10,000
Fluoranthene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	***0.016***	<0.01	<0.01	<0.01	-	1.0
Pyrene	µg/l	0.01	<0.01	<0.01	<0.01	***0.028***	***0.021***	<0.01	<0.01	<0.01	-	-
Benzo(a)anthracene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-
Chrysene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-
Benzo(b)fluoranthene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	***0.010***	<0.01	<0.01	<0.01	-	0.5
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

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Benzo(a)pyrene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	**0.011**	<0.01	<0.01	<0.01	-	0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	***0.011***	<0.01	<0.01	<0.01	-	0.05
Dibenz(a,h)anthracene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	***0.010***	<0.01	<0.01	<0.01	-	-
Benzo(g,h,i)perylene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	***0.010***	<0.01	<0.01	<0.01	-	0.05
Total EPA-16 PAH's	µg/l	0.1	< 0.01	< 0.01	0.022	**0.096**	**0.106**	< 0.01	<0.01	< 0.01	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 Total Phenols

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Total Phenols (monohydric)	µg/l	10	<10	<10	<10	<10	<10	<10	<10	<10	-	0.5
Total Phenols (GC-MS)	µg/l	5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	-	0.5

Table 4.6 - 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	***1.37***	<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 4.7 - Results of Semi-Volatile Organic Compounds (SVOCs)

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Aniline	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
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	-	-

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Dimethylphthalate	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
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 4.8 - 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	***9.6***	-	-
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	**0.8**	**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	***1.8***	***6.6***	-	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	***2.9***	***2.7***	-	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 4.9 - 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	***54***	***11***	<10	<10	***46***	<10	-	-
Aliphatic > C35-C44	µg/l	10	<10	<10	<10	<10	<10	<10	***12***	<10	-	-
Aliphatic > C10-C44	µg/l	10	<10	<10	**54**	**11**	<10	<10	**58**	<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	***27***	<10	<10	***14***	***15***	-	-
Aromatic > C16-C21	µg/l	10	<10	<10	<10	***15***	<10	<10	<10	<10	-	-
Aromatic > C21-C35	µg/l	10	<10	<10	***14***	<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	**14**	**42**	<10	<10	**14**	**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 2015 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 6.4 and 7.59. One pH measurement was outside the EPA Interim guideline range of ≥6.5 to ≤9.5 at BH102. Temperature measurements ranged from 9.6°C to 11.8°C and were within the EPA IGV of 25°C.

Field measurements of Electrical Conductivity levels ranged between 739 µS/cm and 1637 µS/cm. Four measurements of Electrical Conductivity were above the IGV of 1000 µS/cm at MH102 (1088 µS/cm), BH104B (1174 µS/cm), MW03 (1637 µS/cm) and MW04 (1440 µS/cm) however all measurement were within the GTV range of ≥800 to ≤1875 µS/cm. As the GTVs supersede the IGVs all Electrical Conductivity levels measured are compliant with the groundwater regulations.

Dissolved oxygen levels ranged between 1.64 and 8.89 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 laboratory limit of detections and associated IGV's at all locations. MTBE analysis detected exceedances of laboratory limit at BH103 (1.2 µg/l), MW03 (2.9 µg/l) and MW04 (2.7 µg/l), however values do not exceed the IGV limit of 30 µg/l.

The previous detection of MTBE was in the Quarter 1 monitoring event of 2012 and recorded a concentration above the laboratory limit of detection of 280 µg/l at BH104B. 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 (PAH'S)

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 PAH's is 0.2 µg/l. 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. The laboratory has confirmed that the detection limit for total EPA-16 PAH's can be lowered to 0.1 µg/l for comparison with the EPA IGV of 0.1 µg/l; however this will not be accredited.

Total Polyaromatic Hydrocarbons were detected above the GTV limits at MW01 (0.106 µg/l). There is no historic record of any PAH's detections at MW01. This is expected to be once off event and it will be verified in next quarter. The results of the speciated polycyclic aromatic hydrocarbon analysis detected a concentration of Benzo(a) pyrene in MW01 at a concentration of 0.011 µg/l which is above the IGV of 0.01 µg/l during the current monitoring event. Other compounds detected above the laboratory limit of detection were within their respective GTV and IGV's.

5.4 RESULTS OF SPECIATED PHENOLS

The results of Total Phenol analysis are presented in **Table 4.5**. All samples detected concentrations of monohydric phenol below the laboratory limit of detection of 10 µg/l. It should be noted that the laboratory limit of detection is 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 4.6**. 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 2015 speciated phenol analysis confirm concentrations of phenols were below the laboratory limit of detection of 1.0 µg/l at all locations, with the exception of 4-Chloro-3-methylphenol level being 1.37 µg/l at BH104B. Available guidelines do not specify a limit value for this substance. The results are consistent with the results from the previous 2013 quarterly monitoring events and the 2014 monitoring events with the exception of 4-Chloro-3-methylphenol.

5.5 RESULTS OF SEMI-VOLATILE ORGANIC COMPOUNDS

The results of the Semi-Volatile Organic Compound analysis are presented in **Table 4.7**.

There are no GTVs for individual SVOC parameters. No SVOC's were detected above the relevant IGV's during this monitoring period, same as in the Quarter 4 2014. 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 4.8**. The results of the current Quarter 1 2015 monitoring event indicate that there was an exceedance Vinyl Chloride at MW03 at 0.8 µg/l and MW04 at 0.9 µg/l, while the GTV limit is 0.375 µg/l.

Chloroethane was detected at MW04 with the value of 9.6 µg/l, however there is no GTV or IGV value specified for this substance.

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 VOC's were detected above the relevant GTVs or IGV's.

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 4.9**.

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 above the laboratory limit in both the aliphatic and aromatic range were observed during the current monitoring event Quarter 1 2015. The TPH concentration in the aromatic range was detected at two deep groundwater wells MW03 (14 µg/l) MW04 (15 µg/l) and two shallow groundwater wells BH103 (14 µg/l) and BH104B (42 µg/l). The TPH concentration in the aliphatic range was detected at MW03 (58 µg/l), 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 previous 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 2015 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 101 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 99 mAOD to approximately 100 mAOD.

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

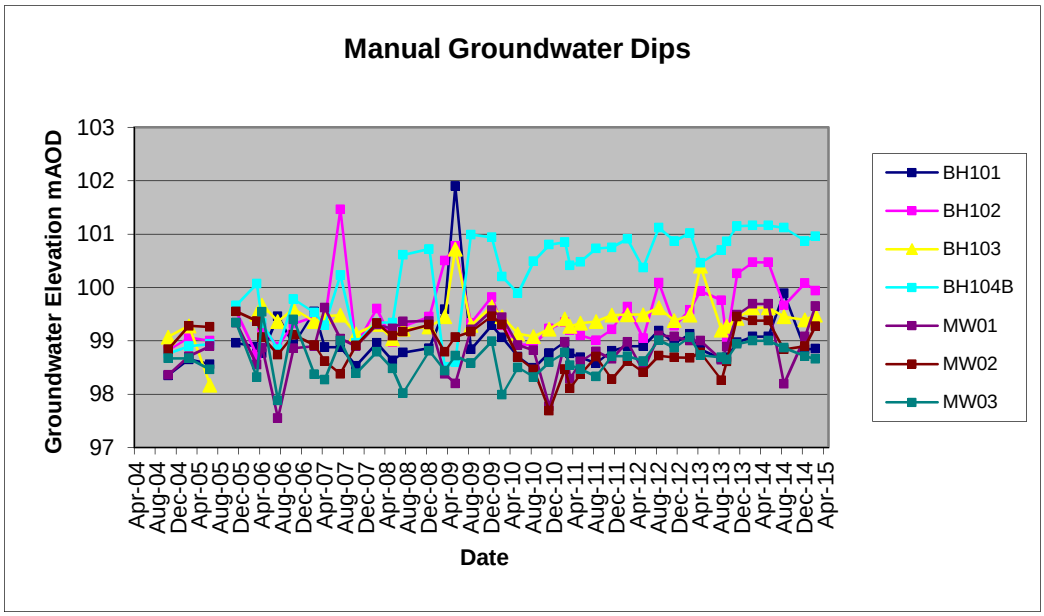


Figure 6.2 - Ground Elevation (mAOD) in Shallow Groundwater Monitoring Wells

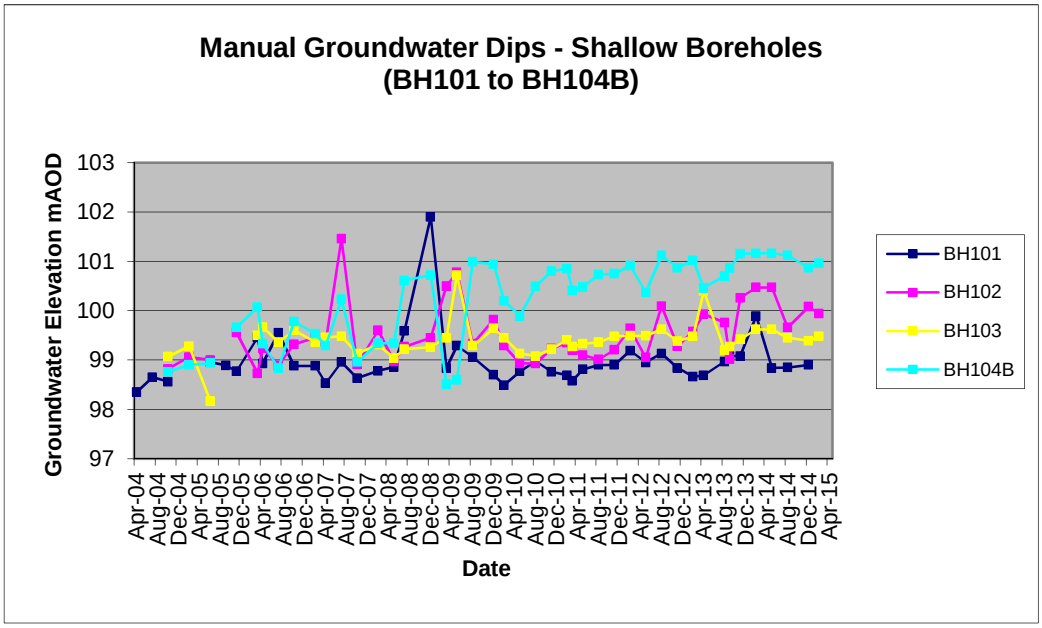
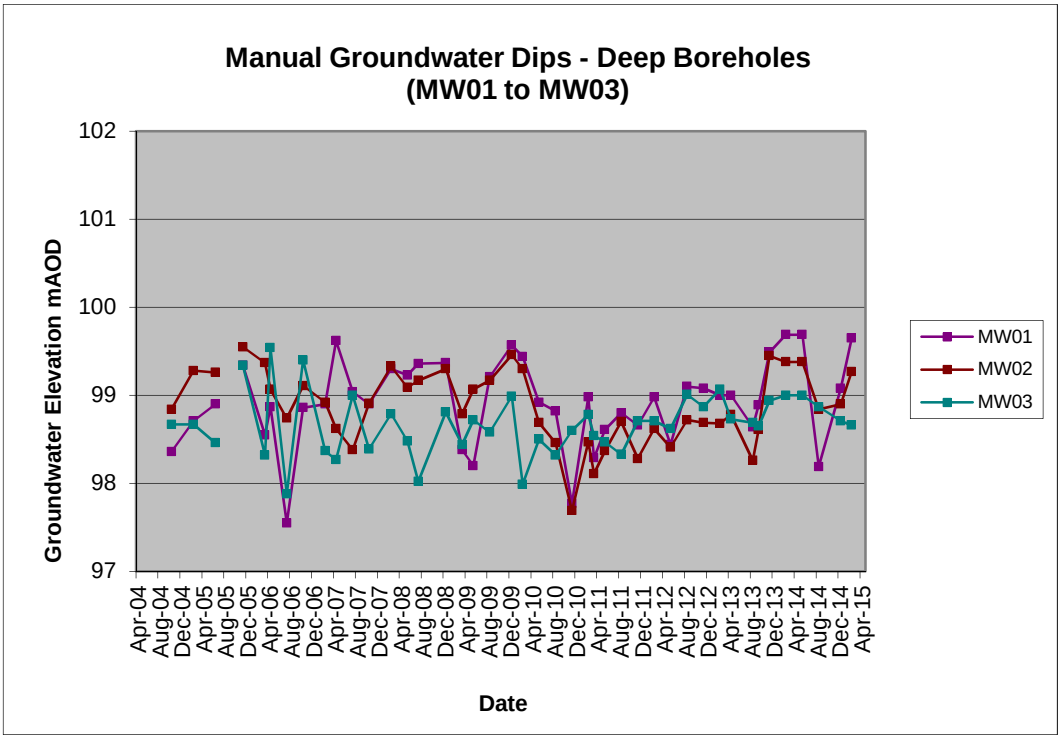


Figure 6.3 - Ground Elevation (mAOD) in Deep Groundwater Monitoring Wells



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; however, 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 **6.7**.

Table 6.1 - Monthly Rainfall Data for Year 2009 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	113.4	29.2	32.6	102.4	69.0	65.4	152.4	100.9	41.8	127.8	215.5	73.7

Table 6.2 - Monthly Rainfall Data for Year 2010 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	71.5	48.0	80.7	49.0	51.4	37.7	93.6	25.5	108.7	68.9	87.7	52.2

Table 6.3 - Monthly Rainfall Data for Year 2011 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	50.6	121.9	16.0	19.5	51.2	72.7	46.4	25.5	93.9	93.9	89.2	55.5

Table 6.4 - 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 6.5 - 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	0.9

Table 6.6 - 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 6.7 - Monthly Rainfall Data for Year 2015 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr
Rainfall (mm)	66.0	36.3	53.5	6.9

Note: Data for the most recent months are provisional.

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.

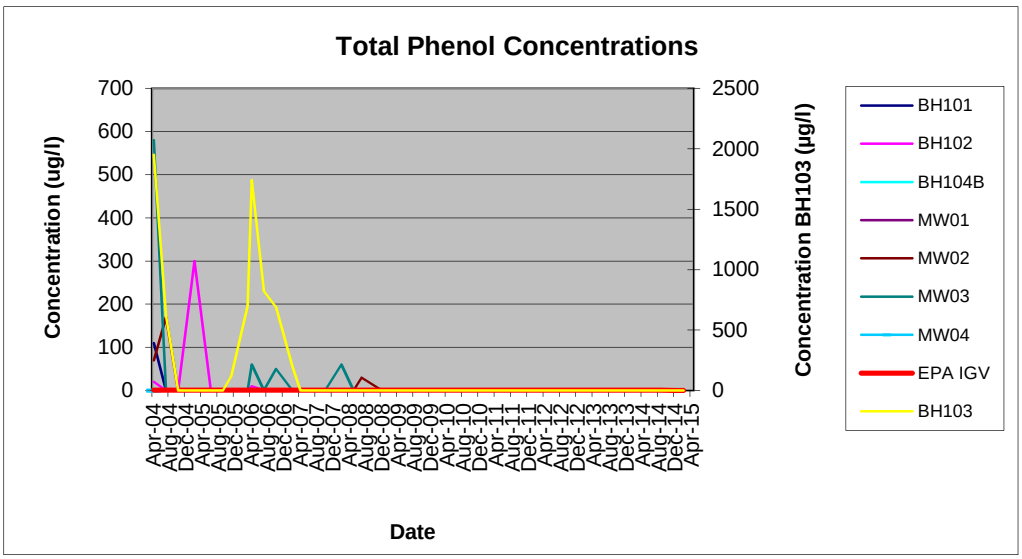
The data available within these reports has been reviewed and time series plots of key parameters have been compiled based on notable trends. Trends for phenols, petroleum hydrocarbons and chlorinated solvents have been plotted as outlined in the following sections.

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 2015 monitoring event.

Figure 6.4 - Phenol Concentrations in all Monitoring Wells



6.2.2 Polycyclic Aromatic Hydrocarbons (PAH's)

Figure 6.5 below illustrates that PAH's (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 PAH's including Benzo(a)pyrene, Benzo(g,h,i)perylene, Indeno(1,2,3)cd pyrene, Fluoranthene and Napthalene 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 IGV's.

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 PAH was 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 current monitoring event; with the only exception of Benzo(a) pyrene in well MW01 at 0.011 µg/l above the IGV limit of 0.01 µg/l during the Quarter 1 2015 monitoring event.

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

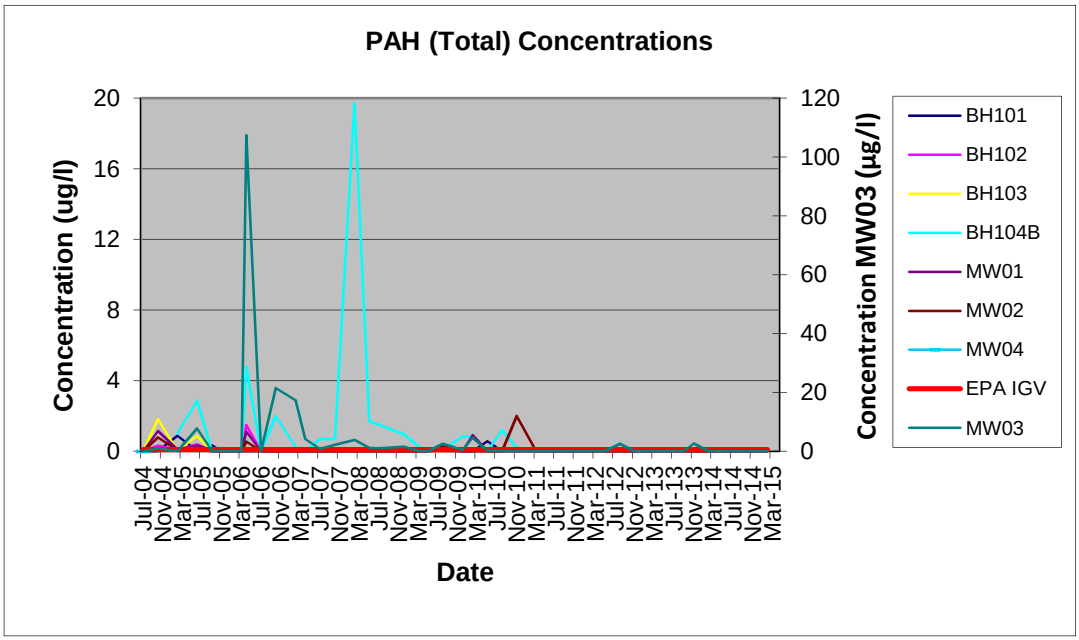


Figure 6.6 - Fluoroanthene Concentrations in all Monitoring Wells

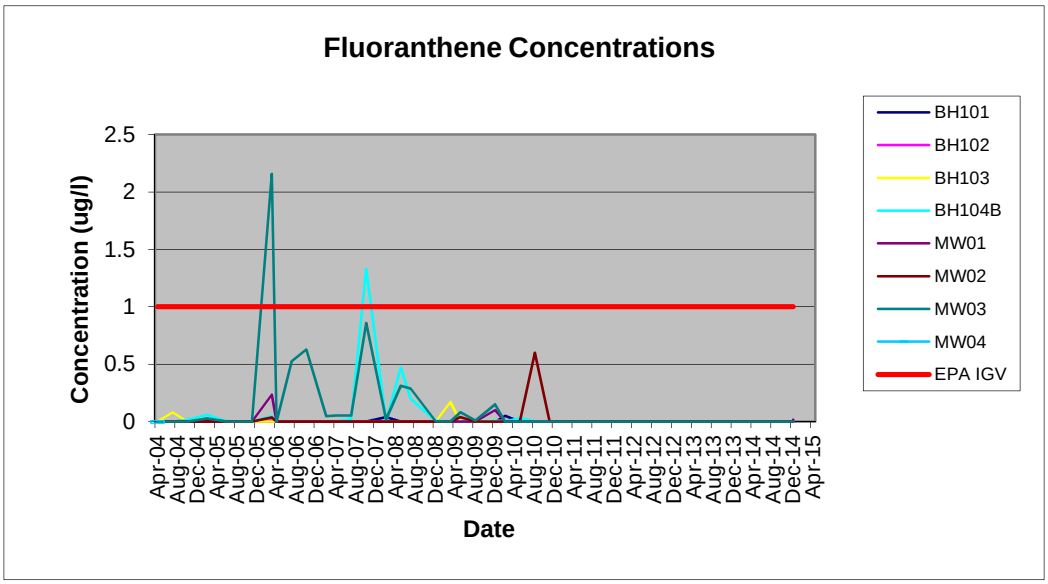
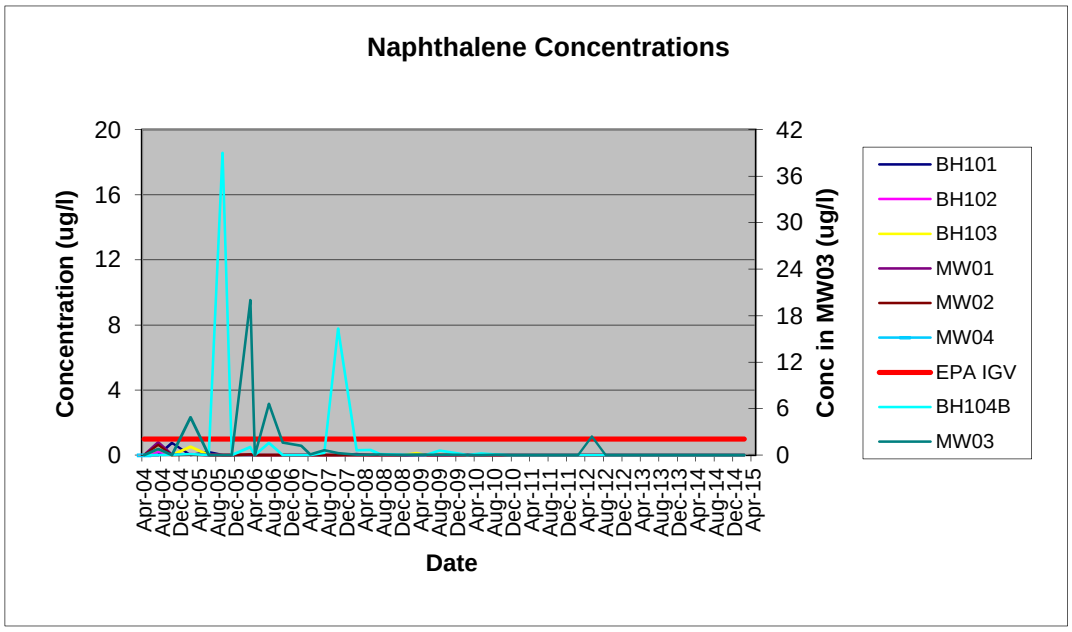


Figure 6.6 illustrates that **Fluoroanthene** was previously detected above the IGV of 1.0 µg/l in groundwater monitoring wells BH104B (October 2007, 1.33 µg/l) and MW03 (March 2006, 2.158 µg/l) only. The remaining monitoring wells recorded concentrations below the IGV of 1.0 µg/l.

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 in the Quarter 4 2014 monitoring event. Three detections of Naphthalene above the laboratory testing limit were noted during the current Quarter 1 2015 monitoring event, while all below the EPA IGV limit of detection (1.0 µg/l).

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

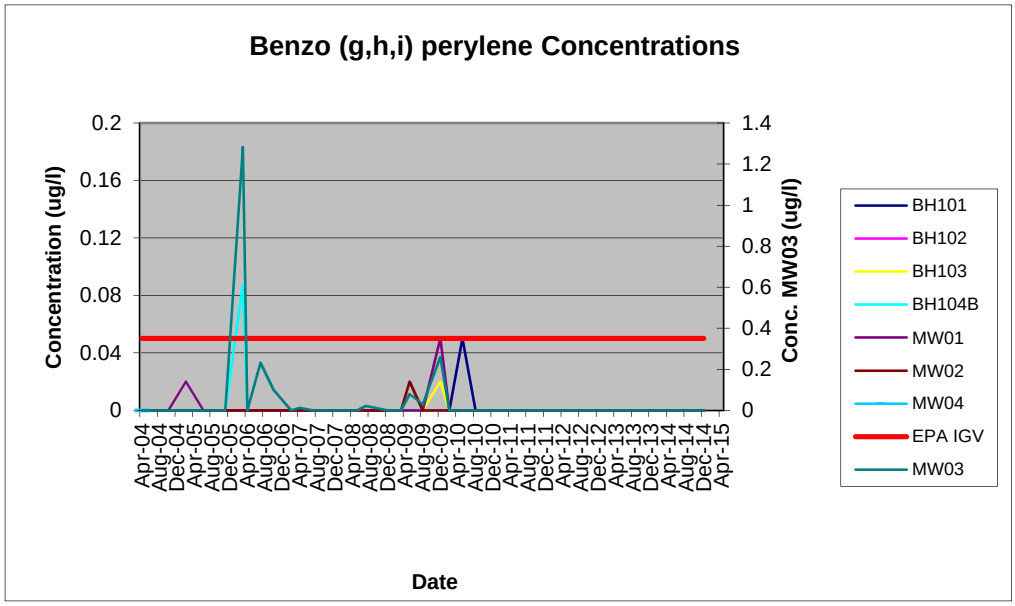


Figure 6.8 illustrates the concentrations of **Benzo(g,h,i)perylene** in all monitoring wells over time. Elevated concentrations above the IGV were recorded at BH104B (0.087 µg/l) on one occasion in March 2006.

Figure 6.9 illustrates elevated concentrations above the IGV recorded at MW03 on 5 no. occasions with the most recent elevated concentration detected in December 2009 (0.26 µg/l). The results of subsequent monitoring events from 2010 to the current Quarter 4 2014 events recorded concentrations below the laboratory limit of detection of 0.01 µg/l at all locations.

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

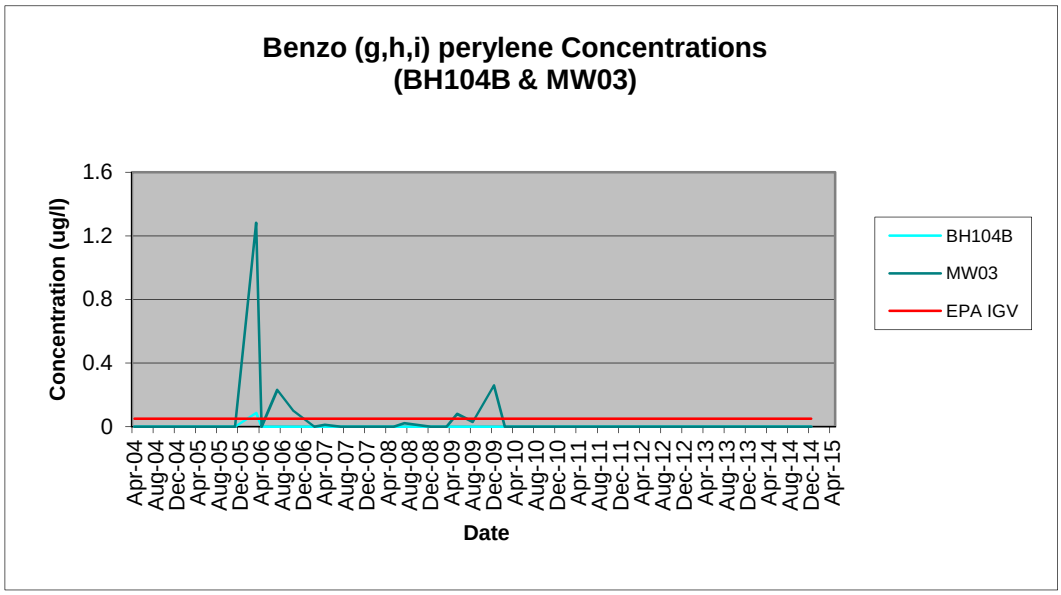
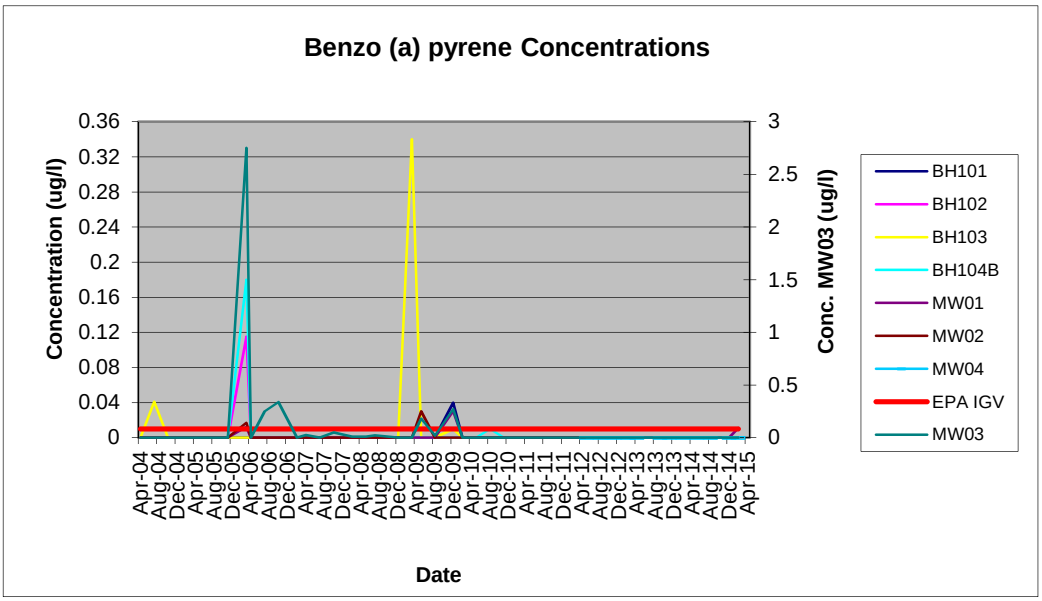


Figure 6.10 illustrates the concentrations of **Benzo(a)pyrene** in all groundwater monitoring wells and indicates that Benzo(a)pyrene has been detected historically in all boreholes above the IGV of 0.01 µg/l. Similarly with the above mentioned trends, the highest concentrations have been detected in 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 IGV's.

The results of all monitoring events from 2010 to the current Quarter 1 2015 monitoring event did not detect any concentrations above the GTV or IGV; with the only exception in current monitoring event where Benzo(a)pyrene was detected at 0.011 µg/l in MW01 which is slightly above the IGV of 0.01 µg/l.

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

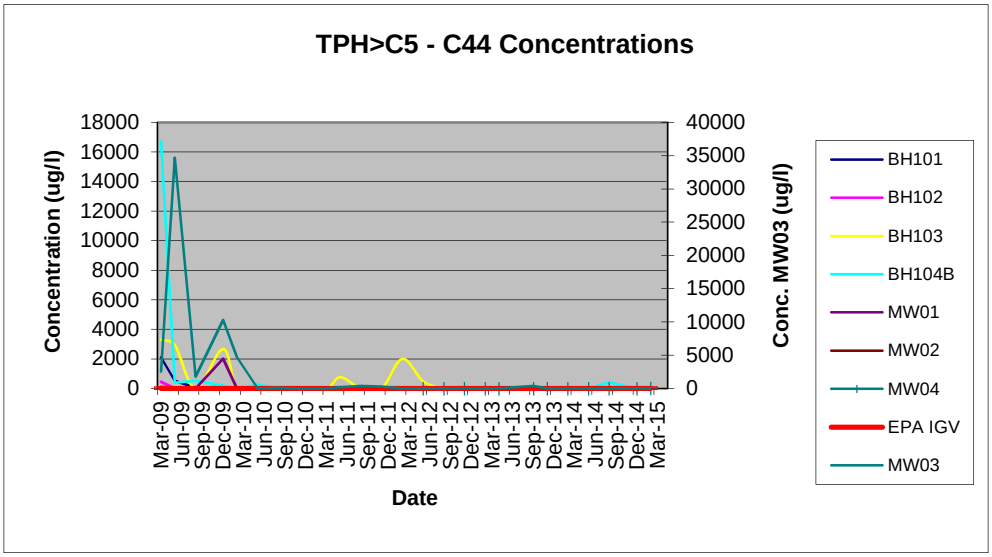


6.2.3 Petroleum Hydrocarbons (TPH)

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 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



During the Quarter 1, 2010 monitoring event, hydrocarbons were detected in borehole MW03. The predominant aliphatic carbon range in MW03 comprised of C16-C21 (1000 µg/l), C21-C35 (2300 µg/l) and C25-C44 (990 µg/l). The predominant aromatic carbon range in MW03 comprised of C16-C21 (220 µg/l) and C21-C35 (620 µg/l). No detections were observed at other locations.

During the Quarter 2 and Quarter 3, 2010 monitoring event, hydrocarbons were detected in borehole BH104B, with the predominant aliphatic carbon range comprising C12-C16 (130 µg/l and 12 µg/l) and C16-C21 (130 µg/l and 19 µg/l). The predominant aliphatic carbon range in MW03 during Quarter 3 2010 comprised of C16-C21 (35 µg/l) and C21-C34 (46 µg/l). The predominant aromatic carbon range detected during Quarter 2 2010 comprised of C12-C16 (21 µg/l) and C16-C21 (47 µg/l) at BH104B. No aromatic carbons were detected above the laboratory limit of detection at any wells in Quarter 3 2010.

During the Quarter 4, 2010 and Quarter 1, 2011 monitoring event, there were no detections of TPH concentrations above the laboratory limit of detection of 10 µg/l at any location. No aliphatic or aromatic carbons were detected above the laboratory limit of detection of 10 µg/l in all monitoring wells.

During the Quarter 2, 2011 monitoring event, hydrocarbons were detected in borehole BH103, BH104B and MW03. The predominant aliphatic carbon range comprised of C16-C21 (340 µg/l, 20 µg/l and 46 µg/l) and C21-C35 (420 µg/l, 96 µg/l and 150 µg/l in BH103, BH104B and MW03 respectively). The predominant aromatic carbon range also comprised of C16-C21 (78 µg/l, 52 µg/l and 50 µg/l) and C21-C35 (110 µg/l, 49 µg/l and 93 µg/l in BH103, BH104B and MW03 respectively).

During the Quarter 3 and Quarter 4 2011 monitoring event, hydrocarbons were detected in borehole MW03 only. The predominant aliphatic carbon range comprised of C10-C12 (18 µg/l and 22 µg/l), C12-C16 (57 µg/l and 51 µg/l), C16-C21 (35 µg/l and 85 µg/l) and C21-C35 (210 µg/l and 110 µg/l). The predominant aromatic carbon range comprised of C12-C16 (42 µg/l and 16 µg/l), C16-C21 (66 µg/l and 14 µg/l) and C21-C35 (45 µg/l and 91 µg/l).

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). No hydrocarbons were detected in MW03 during the current Quarter 1 monitoring event.

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).

Some detections of TPH in both the aliphatic and aromatic range were observed during the current Quarter 1 2015 monitoring event. The TPH concentration in the aromatic range was detected at two deep groundwater wells MW03 (14 µg/l) and MW04 (15 µg/l) and in two shallow groundwater wells BH103 (14 µg/l) and BH104B (42 µg/l). The TPH concentration in the aliphatic range was detected at BH103 (54 µg/l), BH104B (11 µg/l) and MW03 (58 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 12th February 2015 corresponding to Quarter 1 of 2015. 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 and Xylene were below the recommended EPA IGV's.

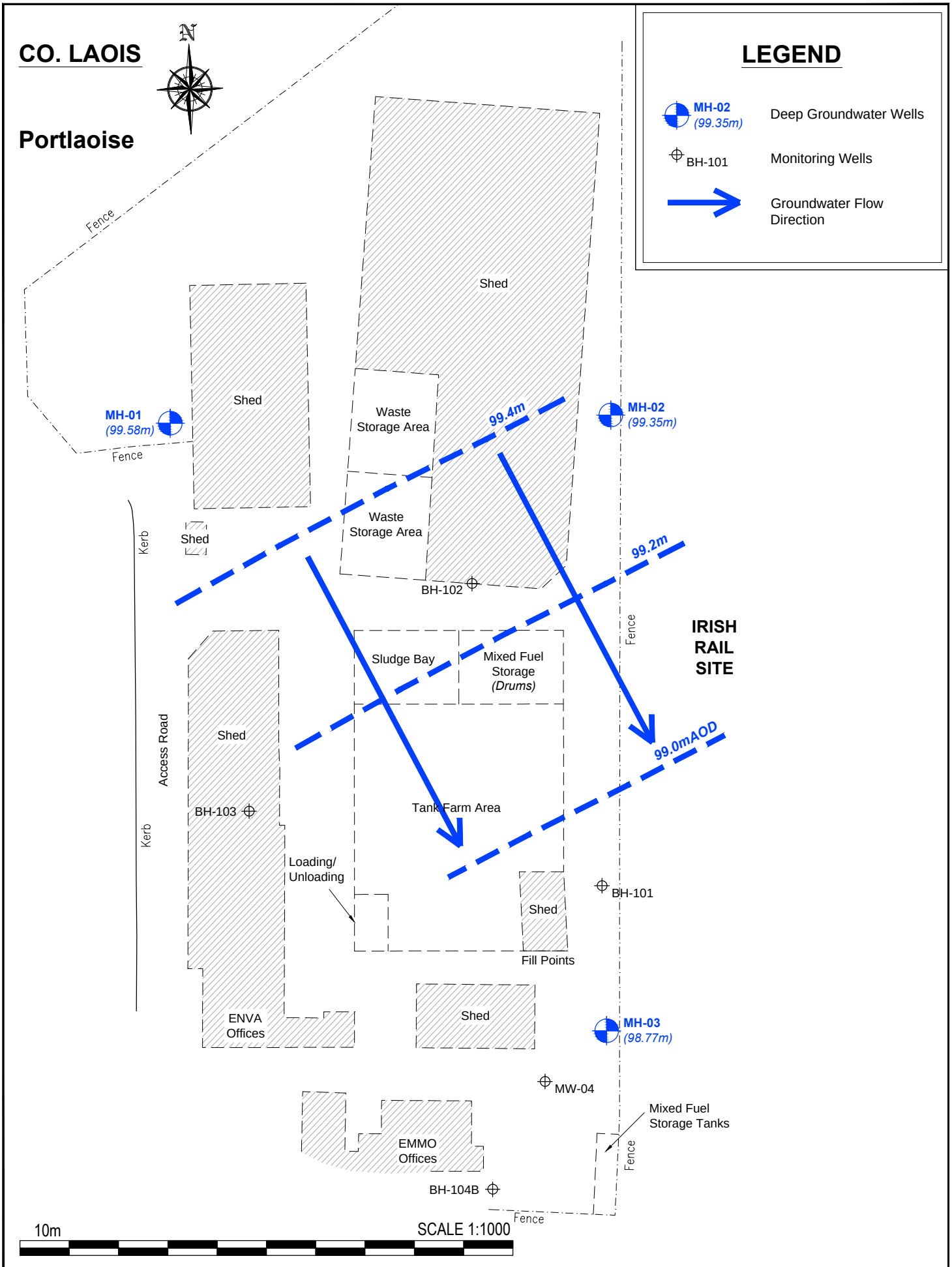
- The Quarter 1, 2015 results of the speciated polycyclic aromatic hydrocarbons indicate that Total PAH's has been detected above the EPA IGV of 0.1 µg/l in MW01 (0.106 µg/l).

- There were no exceedances of the GTV or IGV for VOC's or SVOC's in the current monitoring event with the exception of Vinyl Chloride which was detected in MW01 (0.8 µg/l) and in MW04 (0.9 µg/l) which is above the GTV of 0.375 µg/l.

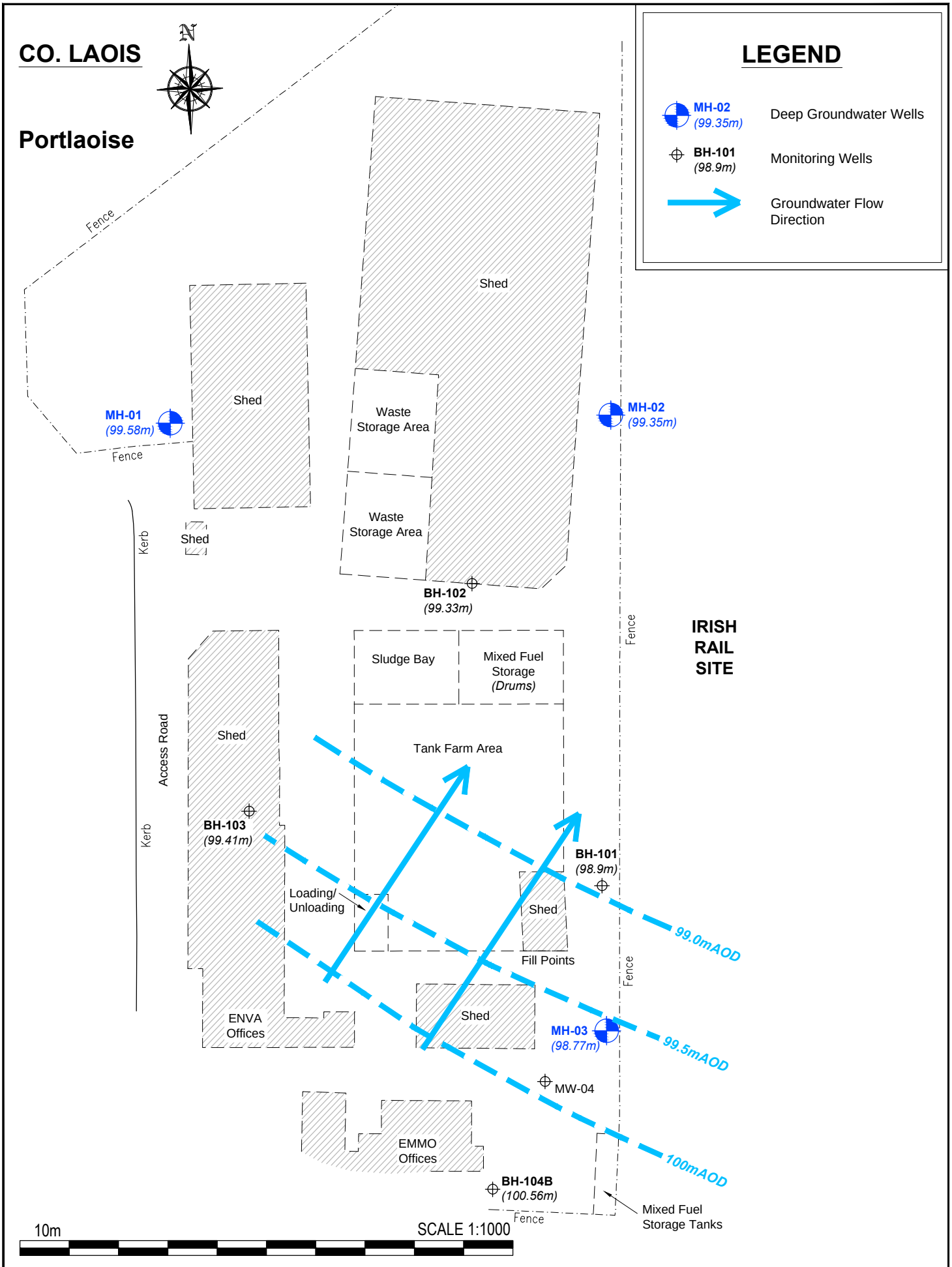
- The results of the phenol analysis detected concentrations below the laboratory limit of detection of 5.0 µg/l however the laboratory limit of detection is above the IGV of 0.5 µg/l for phenols. Samples were subsequently also analysed for phenols to include chlorophenols and the results indicate that there were no detections above the laboratory limit of detection with the exception of 4-Chloro-3-methylphenol which recorded a concentration of 1.37 µg/l in BH104B.

- Hydrocarbons in both aliphatic and aromatic range were observed during the current Quarter 1 2015 monitoring event. The TPH concentration in the aromatic range was detected at two deep groundwater wells MW03 (14 µg/l) and MW04 (15 µg/l) and in two shallow groundwater wells BH103 (14 µg/l) and BH104B (42 µg/l). The TPH concentration in the aliphatic range was detected at MW03 (58 µg/l), BH103 (54 µg/l) and BH104B (11 µg/l). Hydrocarbons were not detected in any monitoring location during the Quarter 4 2014 monitoring event. Hydrocarbons were detected in BH104B in the aliphatic carbon ranges C12-C16, C16-C21 and C21-C35 during the Quarter 3, 2014 event. Previous to these events hydrocarbons were detected in boreholes BH104B and MW03 in the aliphatic carbon ranges during the Quarter 3, 2010 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.



Client: Enva Ireland Ltd. *Portlaoise*	RPS, West Pier Business Campus, Dun Laoghaire, Co. Dublin, Ireland. T: +353 1 288 4499 - F: +353 1 283 5676 E: ireland@rpsgroup.com W: www.rpsgroup.com/ireland	Project: ENVA Monitoring	Issue Details: Drawn: RH; Checked: MR; Approved: PC; Scale: 1:1,000 (A4); Date: March 2015
		Title: Deep Groundwater Contours February 2015	Office Use Only: Job No. MDE0973; File Ref. MDE0973FG0001F01; Fig No. Figure 1; Rev. F01



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Enva Portlaoise

2015 Groundwater Compliance Monitoring

Quarter 2 (Apr – Jun 2015) 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 with 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 20th May 2015. 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 2015 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 2015 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 2013), 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)
- Quarter 1 Groundwater Monitoring Report, RPS (2014)
- Quarter 2 Groundwater Monitoring Report, RPS (2014)
- Quarter 3 (Annual) Groundwater Monitoring Report, RPS (2014)
- Quarter 4 Groundwater Monitoring Report, RPS (2014)
- Quarter 1 Groundwater Monitoring Report, RPS (2015)

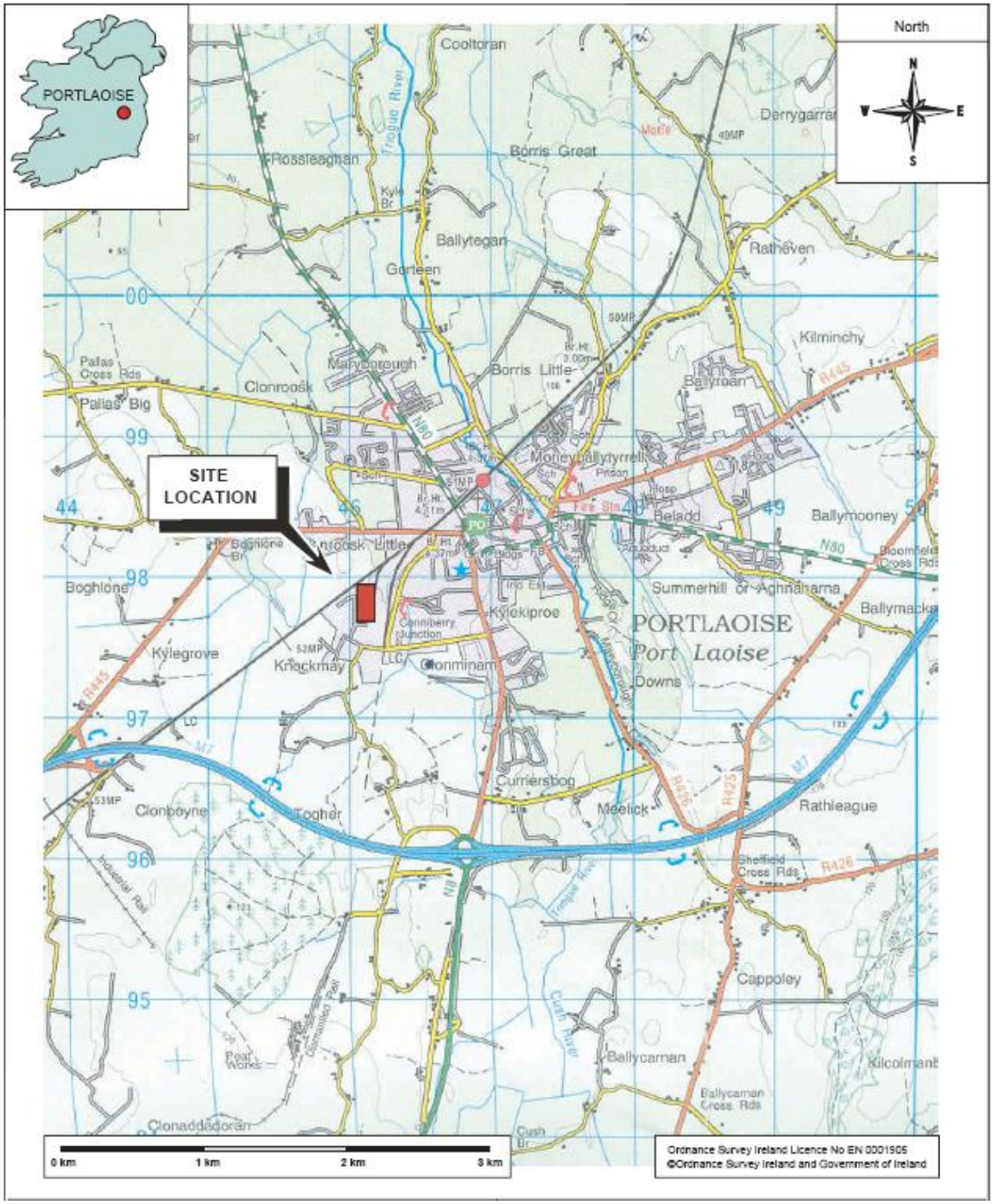
2.2 SITE SETTING

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,

Strata	Extent	Thickness	Description
			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 PAH's Phenols VOC's SVOC's	Mineral Oil BTEX & MTBE PAH's Phenols VOC's SVOC's
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.

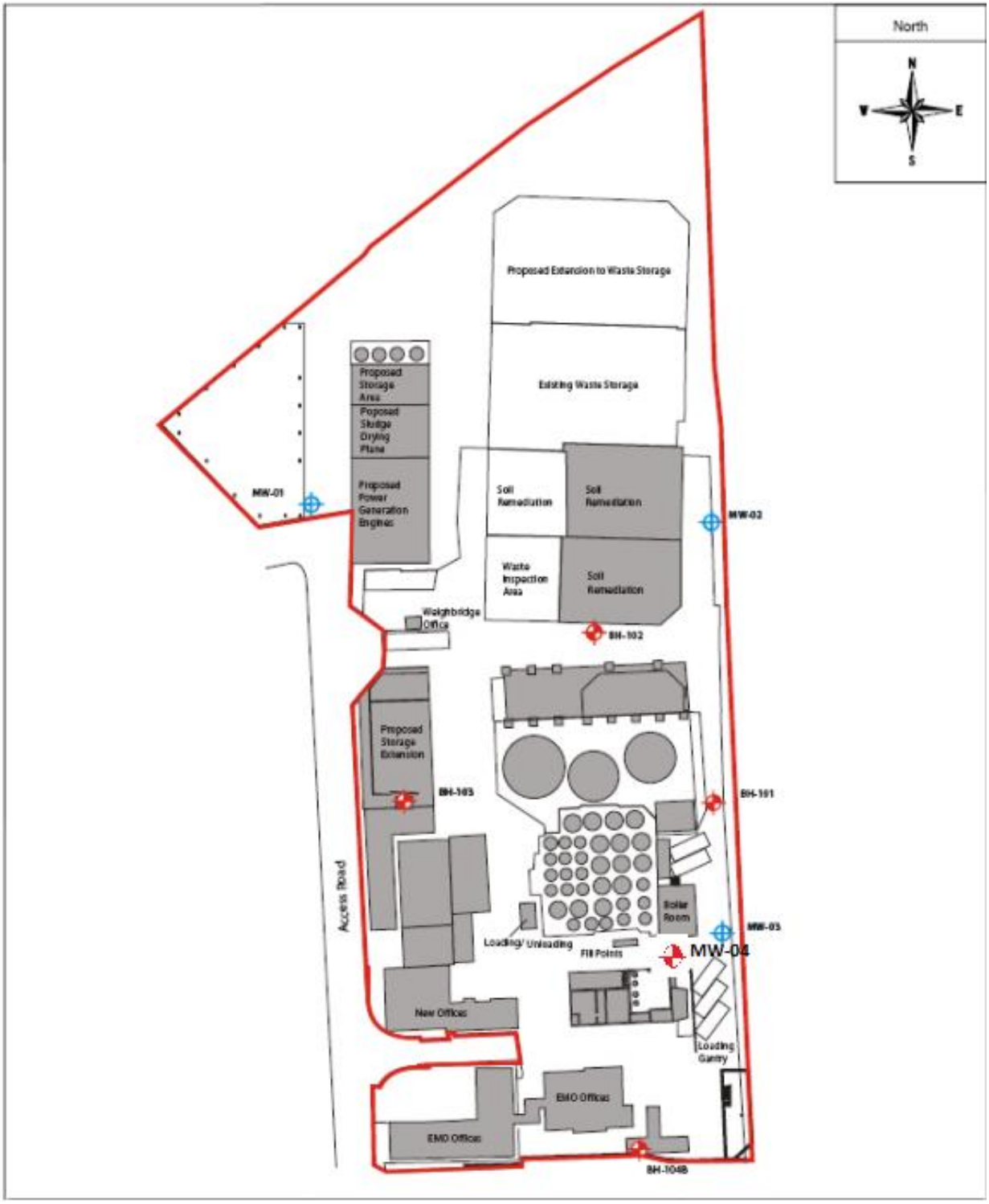
3.1 LABORATORY ANALYSIS

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



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

3.2 PRESENTATION & INTERPRETATION OF RESULTS

The Quarter 2 2015 results are tabulated in **Section 4** and discussed with respect to previous results. 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 2015 monitoring round. As the monitoring continues in accordance with the waste 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 2015

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 2, 2015)

Monitoring Well	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04
Depth (mbgl)	7.13	6.40	4.46	4.82	22.89	31.45	14.48	6.55
Static Water Level (mbgl)	4.35	2.41	1.73	0.55	2.60	3.88	4.20	3.91
Ground Level (mAOD)	103.06	102.55	101.16	101.52	102.10	103.12	102.77	-
Water Level (mAOD)	98.71	100.14	99.43	100.97	99.50	99.24	98.57	-
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, 2015)

Monitoring Well	pH (pH Units)	Temperature (°C)	Conductivity (µS/cm)	Dissolved O_2 (ppm)	Observations
BH101	7.10	11.5	864	8.87	Slight brown colour, some fine sediment, little suspended solids, no odour.
BH102	7.35	10.8	**491**	3.13	Clear on purging, no odour, very little sediment or suspended solids
BH103	7.19	10.6	**752**	4.89	Slightly dirty brown colour, H_2S odour detected.
BH104B	7.72	9.9	**700**	1.95	H_2S odour on purging, clear in colour, some very fine sediment.
MW01	7.40	12.3	**658**	6.60	H_2S odour on purging, dirty colour, small amount of sediment.
MW02	7.38	11.1	**633**	2.81	Clear on purging, slight H_2S odour, no sediment.
MW03	7.39	11.9	**1469**	3.16	Slight sheen on surface, H_2S odour, sandy sediment, clear colour.
MW04	7.24	11.7	**1509**	7.69	Dirty brown in colour, some suspended solids and sandy sediment, no odour.
Groundwater Threshold Value	-	-	**>800 & <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	<2.0	<1.0	<1.0	<2.0	<10.0	0.75	1.0
Toluene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	10
Ethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	10
p & m-xylene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	10 Note 1
o-xylene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	10 Note 1
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1.0	<1.0	<1.0	***1.2***	<2.0	<1.0	<1.0	<2.0	<10.0	-	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	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	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	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-
Fluorene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-
Phenanthrene	µg/l	0.01	<0.01	<0.01	<0.01	<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	<0.01	<0.01	-	10,000
Fluoranthene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	1.0
Pyrene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	***0.015***	<0.01	-	-
Benzo(a)anthracene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-
Chrysene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-
Benzo(b)fluoranthene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<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	<0.01	<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	<0.01	<0.01	-	0.05
Total EPA-16 PAH's	µg/l	0.1	< 0.01	< 0.01	<0.01	<0.01	<0.01	< 0.01	0.015	< 0.01	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
Aniline	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
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	-	-

Parameter	Units	Laboratory Limit of Detection	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04	GTV	IGV
Dimethylphthalate	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
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	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
Chloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
Bromomethane	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
Vinyl Chloride	µg/l	0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<1.0	<5.0	0.375	-
Trichlorofluoromethane	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
1,1-dichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	30
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
Cis-1,2-dichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1.0	<1.0	<1.0	***1.2***	<2.0	<1.0	<1.0	<2.0	<10.0	-	30
2,2-Dichloropropane	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
Trichloromethane	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	12
1,1,1-Trichloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	500
1,2-dichloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	2.25	-
1,1-Dichloropropene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
Trans-1,2-dichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
Benzene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	1.0
1,2-dichloropropane	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
Trichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	70
Dibromomethane	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
Bromodichloromethane	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
Cis-1,3-dichloropropene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
Trans-1,3-dichloropropene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
Toluene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	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	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
1,3-Dichloropropane	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
Dibromochloromethane	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
Tetrachloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	40
1,2-Dibromoethane	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
Chlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	1.0
1,1,1,2-Tetrachloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
Ethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	10
p & m-xylene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	10
Styrene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
Tribromomethane	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
o-xylene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	10
Isopropylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
Bromobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
N-Propylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
2-Chlorotoluene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
4-Chlorotoluene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
1,3,5-Trimethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
Tert-Butylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
1,2,4-Trimethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
Sec-Butylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
1,3-dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
P-Isopropyltoluene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
1,2-dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	10
1,4-dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-
Butylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-

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	<4.0	<2.0	<2.0	<4.0	<20.0	-	-
1,2,4-Trichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	0.40
Hexachlorobutadiene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	0.10
1,2,3-Trichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<2.0	<10.0	-	-

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	<200	<200	<10	<10	<20	<40	-	-
Aliphatic > C12-C16	µg/l	10	<10	<10	<200	***225***	<10	<10	<20	<40	-	-
Aliphatic > C16-C35	µg/l	10	<10	<10	***1760***	***332***	<10	<10	<20	<40	-	-
Aliphatic > C35-C44	µg/l	10	<10	<10	<200	<200	<10	<10	<20	<40	-	-
Aliphatic > C10-C44	µg/l	10	<10	<10	**1760**	**557**	<10	<10	<20	<40	-	10
Aromatic > C10-C12	µg/l	10	<10	<10	<200	<200	<10	<10	<20	<40	-	-
Aromatic > C12-C16	µg/l	10	<10	<10	<200	<200	<10	<10	<20	<40	-	-
Aromatic > C16-C21	µg/l	10	<10	<10	<200	<200	<10	<10	<20	<40	-	-
Aromatic > C21-C35	µg/l	10	<10	<10	***509***	<200	<10	<10	<20	<40	-	-
Aromatic > C35-C44	µg/l	10	<10	<10	<200	<200	<10	<10	<20	<40	-	-
Aromatic > C10-C44	µg/l	10	<10	<10	**509**	<200	<10	<10	<20	<40	-	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 2 monitoring event for 2015 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 7.10 and 7.72, all within the EPA Interim guideline range of ≥6.5 to ≤9.5. Temperature measurements ranged from 9.9°C to 12.3°C and were within the EPA IGV of 25°C.

Field measurements of Electrical Conductivity levels ranged between 491 µS/cm and 1509 µS/cm. Two measurements of Electrical Conductivity were above the IGV of 1000 µS/cm at MW03 (1469 µS/cm) and MW04 (1509 µS/cm), but were however within the GTV range of >800 & <1875 µS/cm.

Dissolved oxygen levels ranged between 1.95 and 8.87 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 laboratory limit of detections and associated IGV's at locations BH101, BH102, BH103, MW01 and MW02. The laboratory limits of detection were raised for analysis of samples at BH104B, MW03 and MW04 due to the nature of the sample matrix. However, the new limits of detection were still below the associated IGV's, with the exception of Benzene. MTBE analysis detected a concentration above the laboratory limit at BH103 (1.2 µg/l), however this value does not exceed the IGV limit of 30 µg/l.

The previous detection of MTBE was in the Quarter 1 monitoring event of 2012 and recorded a concentration above the laboratory limit of detection of 280 µg/l at BH104B. 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 (PAH'S)

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 PAH's 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 below the GTV limits at all locations. Total PAH's were detected above the GTV limit for MW01 in Quarter 1 2015 but are below the GTV limit for the current Quarter 2 2015 monitoring event and there is no historic record of any PAH's detections at MW01. The results of the speciated polycyclic aromatic hydrocarbon analysis detected Pyrene in MW03 at a concentration of 0.015 µg/l, which is above the laboratory limit of detection of 0.01 µg/l. However there are no GTV or IGV limits for Pyrene. No other compounds were detected above the laboratory limit of detection.

5.4 RESULTS OF SPECIATED PHENOLS

During previous quarterly monitoring events and sample analysis total monohydric phenol was determined and historically have 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 2 2015 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 above the laboratory limit of detection for the previous Quarter 1 2015 analysis. With the exception of this, all other results are consistent with the results from the previous 2013 quarterly monitoring events and the 2014 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 SVOC's were detected above the relevant IGV's during this monitoring period, same as in the Quarter 4 2014 and Quarter 1 2015 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 2015 monitoring event indicate that MTBE at BH103 was detected at 1.2 µg/l, which is above the laboratory limit of detection of 1.0 µg/l. There is no GTV for MTBE and it is below the IGV of 30 µg/l. All other compounds were below their respective laboratory limits of detection; however the limits of detection were raised for samples from BH104B, MW03 and MW04.

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 VOC's were detected above the relevant GTVs or IGV's.

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. Due to the nature of the sample matrix, the laboratory limits of detection were raised for samples from well locations BH103, BH104B, MW03 and MW04. Some detections of TPH above the laboratory limit in both the aliphatic and aromatic range were observed during the current monitoring event Quarter 2 2015. The TPH concentration in the aromatic range (C21-C35) was detected at one shallow groundwater wells BH103 (509 µg/l). The TPH concentration in the aliphatic range was detected at BH103 (1760 µg/l) and BH104B (557 µg/l). Aliphatic TPH of the range C16-C35 was detected at BH103 (1760 µg/l). BH104B detected aliphatic TPH in the ranges C12-C16 (225 µg/l) and C16-C35 (337 µg/l).

The previous 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). TPH concentrations were detected in the aliphatic ranges C16-C35 at MW03 (46 µg/l), BH103 (54 µg/l) and BH104B (11 µg/l), and C35-C44 at MW03 (46 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 2015 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 101 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 99 mAOD to approximately 100 mAOD.

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

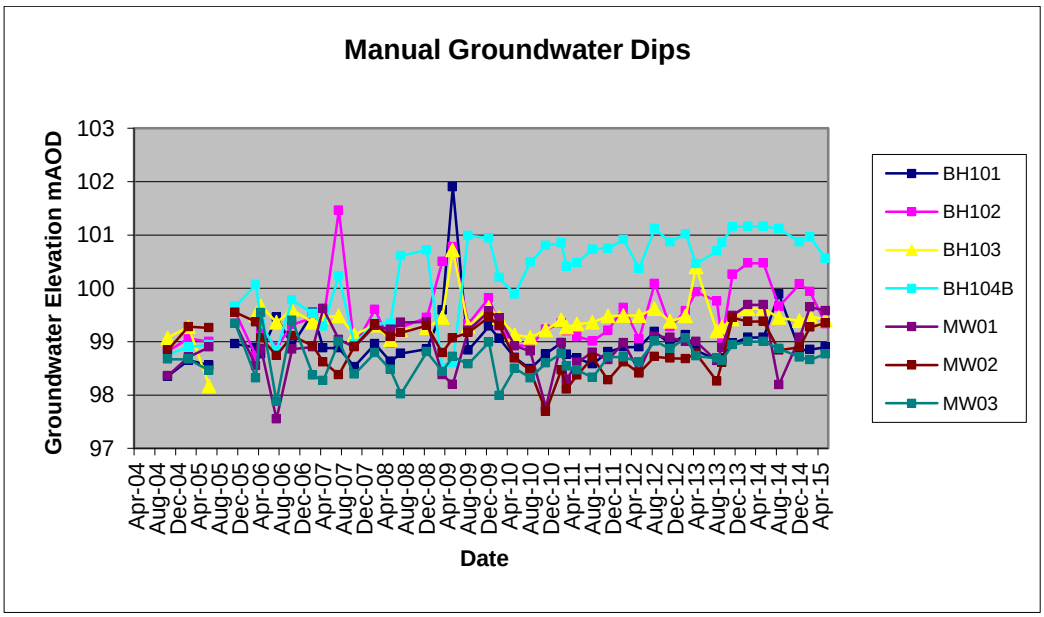


Figure 6.2 - Ground Elevation (mAOD) in Shallow Groundwater Monitoring Wells

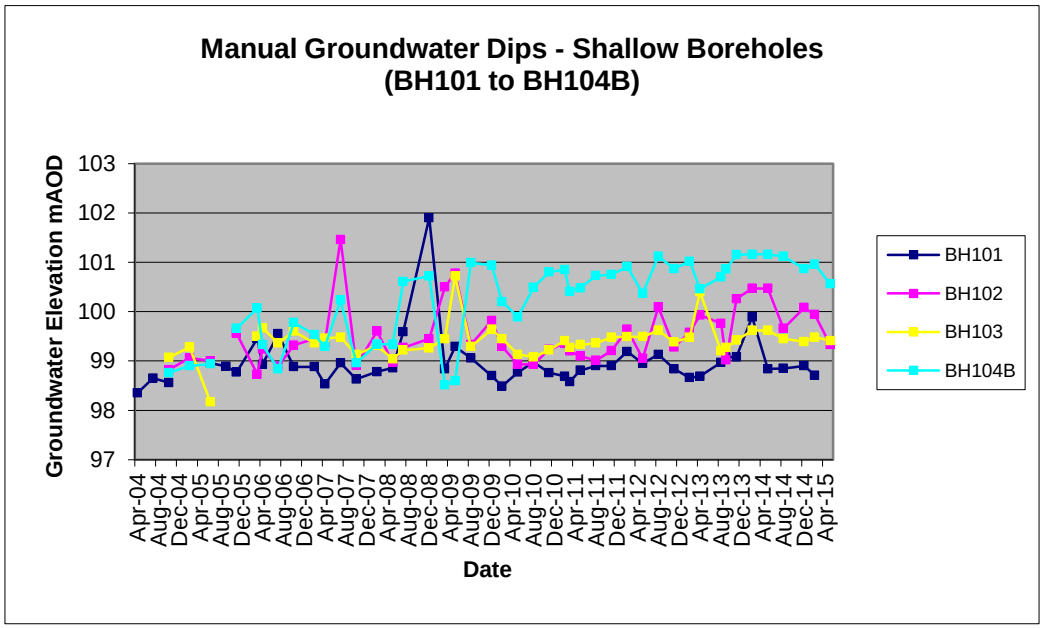
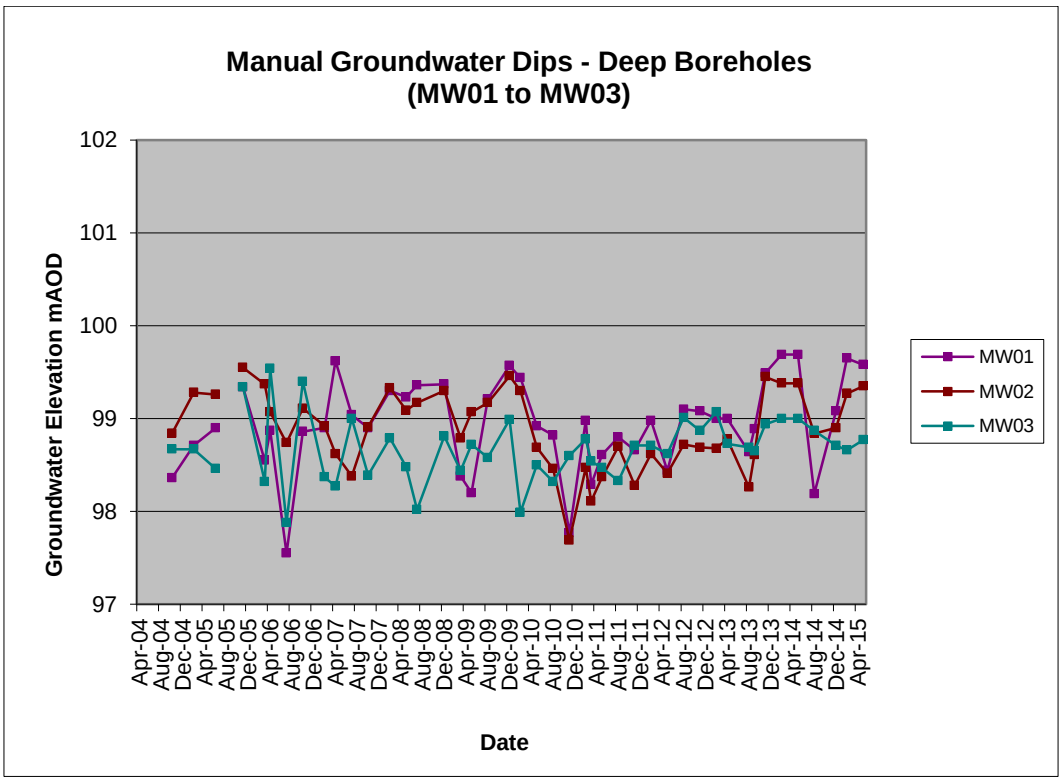


Figure 6.3 - Ground Elevation (mAOD) in Deep Groundwater Monitoring Wells



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 **6.7**.

Table 6.1 - Monthly Rainfall Data for Year 2009 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	113.4	29.2	32.6	102.4	69.0	65.4	152.4	100.9	41.8	127.8	215.5	73.7

Table 6.2 - Monthly Rainfall Data for Year 2010 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	71.5	48.0	80.7	49.0	51.4	37.7	93.6	25.5	108.7	68.9	87.7	52.2

Table 6.3 - Monthly Rainfall Data for Year 2011 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	50.6	121.9	16.0	19.5	51.2	72.7	46.4	25.5	93.9	93.9	89.2	55.5

Table 6.4 - 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 6.5 - 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	0.9

Table 6.6 - 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 6.7 - Monthly Rainfall Data for Year 2015 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	Jun
Rainfall (mm)	66.0	36.3	53.5	26.3	89.4	29.7

Note: Data for the most recent months are provisional.

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.

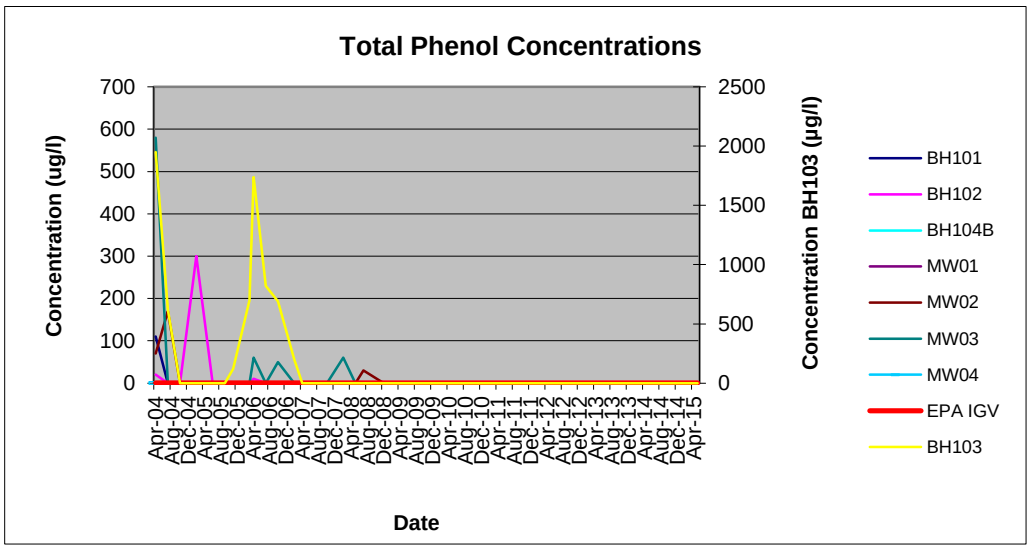
The data available within these reports has been reviewed and time series plots of key parameters have been compiled based on notable trends. Trends for phenols, petroleum hydrocarbons and chlorinated solvents have been plotted as outlined in the following sections.

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 2 2015 monitoring event.

Figure 6.4 - Phenol Concentrations in all Monitoring Wells



6.2.2 Polycyclic Aromatic Hydrocarbons (PAH's)

Figure 6.5 below illustrates that PAH's (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 PAH's 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 IGV's.

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 PAH was 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 current monitoring event.

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

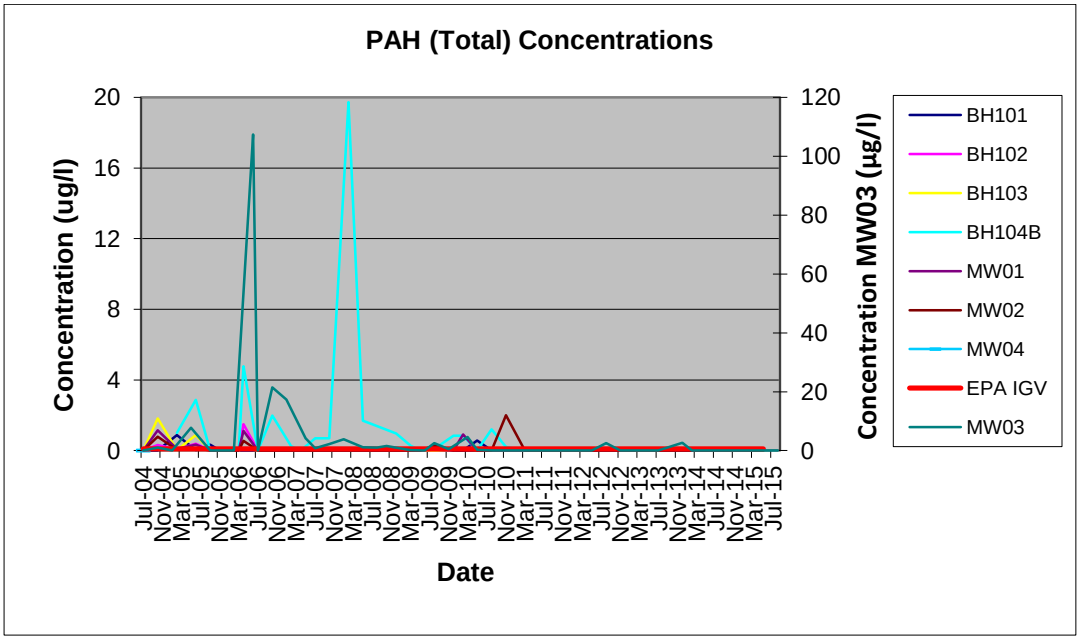


Figure 6.6 - Fluoroanthene Concentrations in all Monitoring Wells

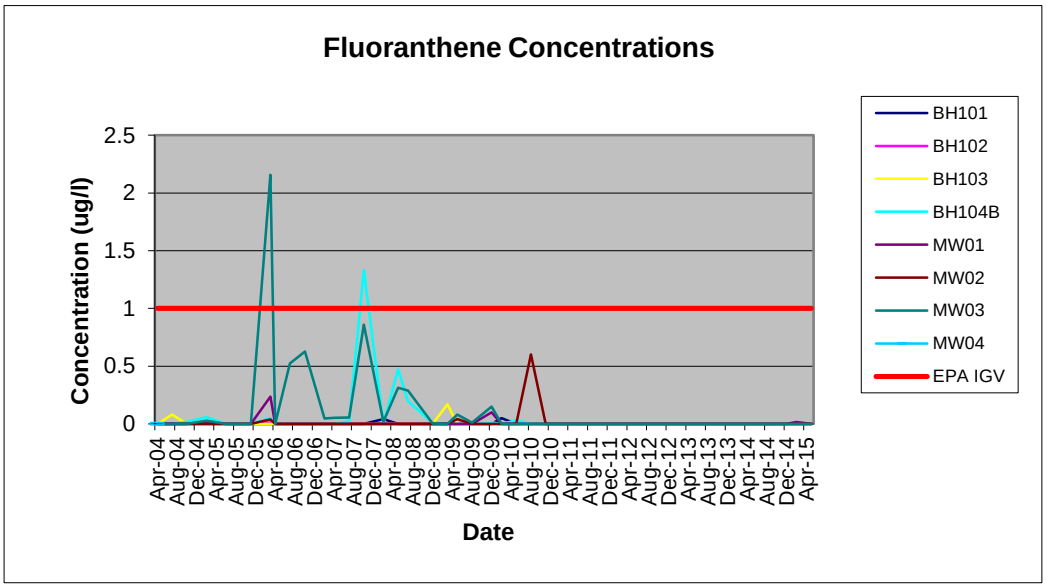
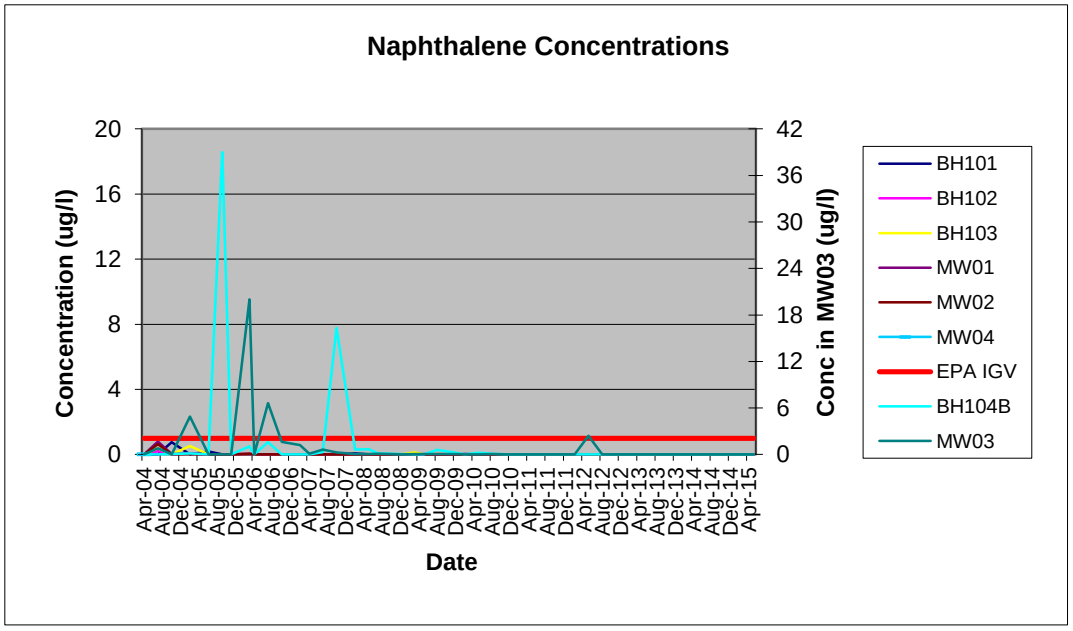


Figure 6.6 illustrates that **Fluoroanthene** was previously detected above the IGV of 1.0 µg/l in groundwater monitoring wells BH104B (October 2007, 1.33 µg/l) and MW03 (March 2006, 2.158 µg/l) only. The remaining monitoring wells recorded concentrations below the IGV of 1.0 µg/l.

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 in the Quarter 4 2014 monitoring event. No detections of Naphthalene were noted during the current Quarter 2 2015 monitoring event.

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

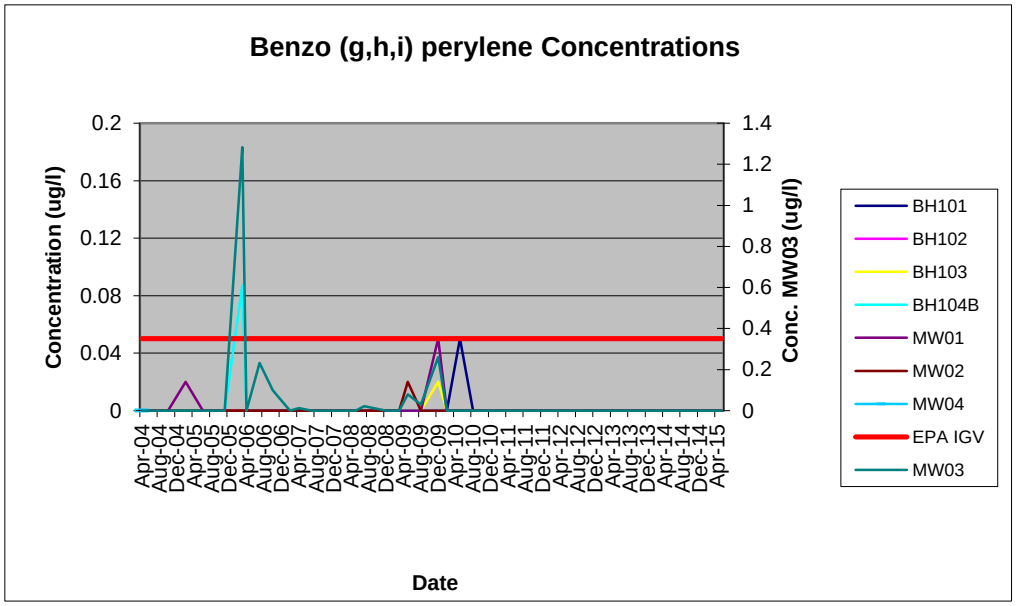


Figure 6.8 illustrates the concentrations of **Benzo(g,h,i)perylene** in all monitoring wells over time. Elevated concentrations above the IGV were recorded at BH104B (0.087 µg/l) on one occasion in March 2006.

Figure 6.9 illustrates elevated concentrations above the IGV recorded at MW03 on 5 no. occasions with the most recent elevated concentration detected in December 2009 (0.26 µg/l). The results of subsequent monitoring events from 2010 to the current Quarter 2 2015 monitoring event recorded concentrations below the laboratory limit of detection of 0.01 µg/l at all locations.

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

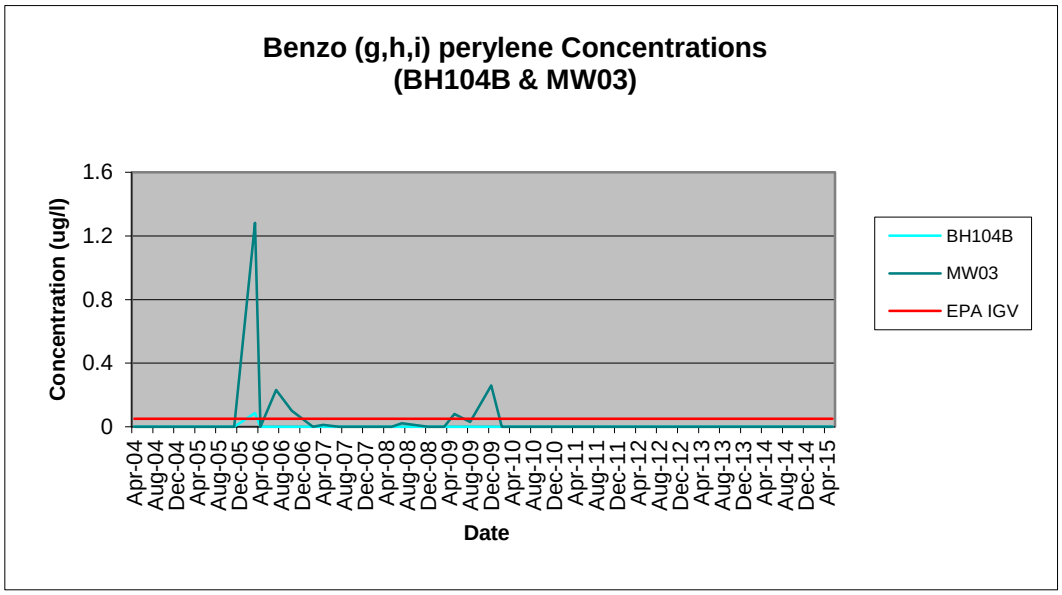
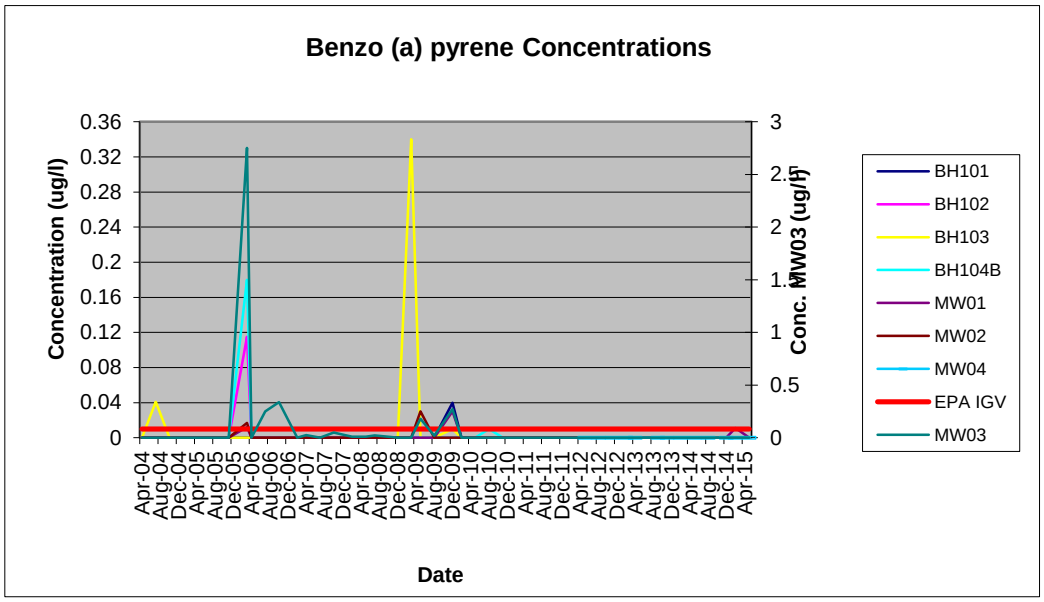


Figure 6.10 illustrates the concentrations of **Benzo(a)pyrene** in all groundwater monitoring wells and indicates that Benzo(a)pyrene has been detected historically in all boreholes above the IGV of 0.01 µg/l. Similarly with the above mentioned trends, the highest concentrations have been detected in 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 IGV's.

The results of all monitoring events from 2010 to the current Quarter 2 2015 monitoring event did not detect any concentrations above the GTV or IGV.

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

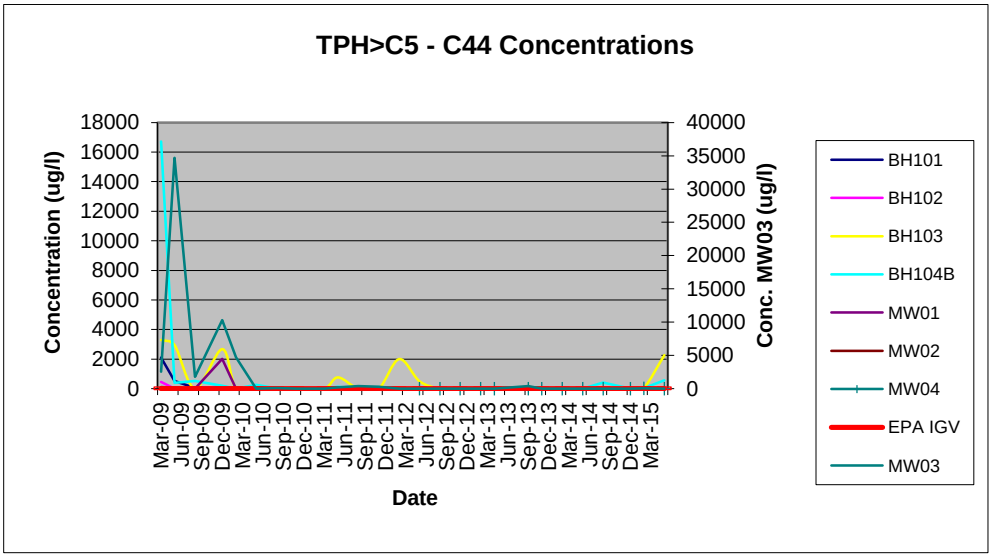


6.2.3 Petroleum Hydrocarbons (TPH)

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



During the Quarter 1, 2010 monitoring event, hydrocarbons were detected in borehole MW03. The predominant aliphatic carbon range in MW03 comprised of C16-C21 (1000 µg/l), C21-C35 (2300 µg/l) and C25-C44 (990 µg/l). The predominant aromatic carbon range in MW03 comprised of C16-C21 (220 µg/l) and C21-C35 (620 µg/l). No detections were observed at other locations.

During the Quarter 2 and Quarter 3, 2010 monitoring event, hydrocarbons were detected in borehole BH104B, with the predominant aliphatic carbon range comprising C12-C16 (130 µg/l and 12 µg/l) and C16-C21 (130 µg/l and 19 µg/l). The predominant aliphatic carbon range in MW03 during Quarter 3 2010 comprised of C16-C21 (35 µg/l) and C21-C34 (46 µg/l). The predominant aromatic carbon range detected during Quarter 2 2010 comprised of C12-C16 (21 µg/l) and C16-C21 (47 µg/l) at BH104B. No aromatic carbons were detected above the laboratory limit of detection at any wells in Quarter 3 2010.

During the Quarter 4, 2010 and Quarter 1, 2011 monitoring event, there were no detections of TPH concentrations above the laboratory limit of detection of 10 µg/l at any location. No aliphatic or aromatic carbons were detected above the laboratory limit of detection of 10 µg/l in all monitoring wells.

During the Quarter 2, 2011 monitoring event, hydrocarbons were detected in borehole BH103, BH104B and MW03. The predominant aliphatic carbon range comprised of C16-C21 (340 µg/l, 20 µg/l and 46 µg/l) and C21-C35 (420 µg/l, 96 µg/l and 150 µg/l in BH103, BH104B and MW03 respectively). The predominant aromatic carbon range also comprised of C16-C21 (78 µg/l, 52 µg/l and 50 µg/l) and C21-C35 (110 µg/l, 49 µg/l and 93 µg/l in BH103, BH104B and MW03 respectively).

During the Quarter 3 and Quarter 4 2011 monitoring event, hydrocarbons were detected in borehole MW03 only. The predominant aliphatic carbon range comprised of C10-C12 (18 µg/l and 22 µg/l), C12-C16 (57 µg/l and 51 µg/l), C16-C21 (35 µg/l and 85 µg/l) and C21-C35 (210 µg/l and 110 µg/l). The predominant aromatic carbon range comprised of C12-C16 (42 µg/l and 16 µg/l), C16-C21 (66 µg/l and 14 µg/l) and C21-C35 (45 µg/l and 91 µg/l).

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). No hydrocarbons were detected in MW03 during the current Quarter 1 monitoring event.

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.

Some detections of TPH in both the aliphatic and aromatic range were observed during the current 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.

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 20th May 2015 corresponding to Quarter 2 of 2015. 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 were below the recommended EPA IGV's. Benzene was also below the laboratory limit of detection at all locations; however this limit of detection was raised above the EPA IGV for samples from locations BH104B, MW03 and MW04

- The Quarter 2 2015 results of the speciated polycyclic aromatic hydrocarbons indicate that Total PAH's were below the EPA IGV of 0.1 µg/l all monitoring wells.

- There were no detections of VOC's or SVOC's in the current monitoring event above the laboratory limits of detection, with the exception of MTBE which was detected in BH103 (1.2 µg/l); however this is still below the GTV of 30 µg/l. The laboratory limits of detection were raised for samples from locations BH104B, MW03 and MW04 due to the nature of the sample matrix and all compounds analysed were below these new limits.

- Samples were analysed for speciated phenols to include chlorophenols and the results indicate that there were no detections above the laboratory limits of detection.

- Hydrocarbons in both aliphatic and aromatic range were observed during the current Quarter 2 2015 monitoring event. The TPH concentration in the aromatic range was detected in one shallow groundwater well, BH103 (509 µg/l). The TPH concentration in the aliphatic range was also detected at BH103 (1760 µg/l) and BH104B (557 µg/l). Hydrocarbons were detected at MW04 in the aromatic range and BH103, BH104B and MW03 in both the aromatic and aliphatic ranges during the Quarter 1 2015 monitoring event. Hydrocarbons were not detected in any monitoring location during the Quarter 4 2014 monitoring event. Hydrocarbons were detected in BH104B in the aliphatic carbon ranges C12-C16, C16-C21 and C21-C35 during the Quarter 3, 2014 event. Previous to these events hydrocarbons were detected in boreholes BH104B and MW03 in the aliphatic carbon ranges during the Quarter 3, 2010 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

2015 Groundwater Compliance Monitoring Quarter 3 (Jul – Sep 2015)

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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 26th August 2015. 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 2015 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 2015 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 2014), 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)
- Quarter 1 Groundwater Monitoring Report, RPS (2015)
- Quarter 2 Groundwater Monitoring Report, RPS (2015)

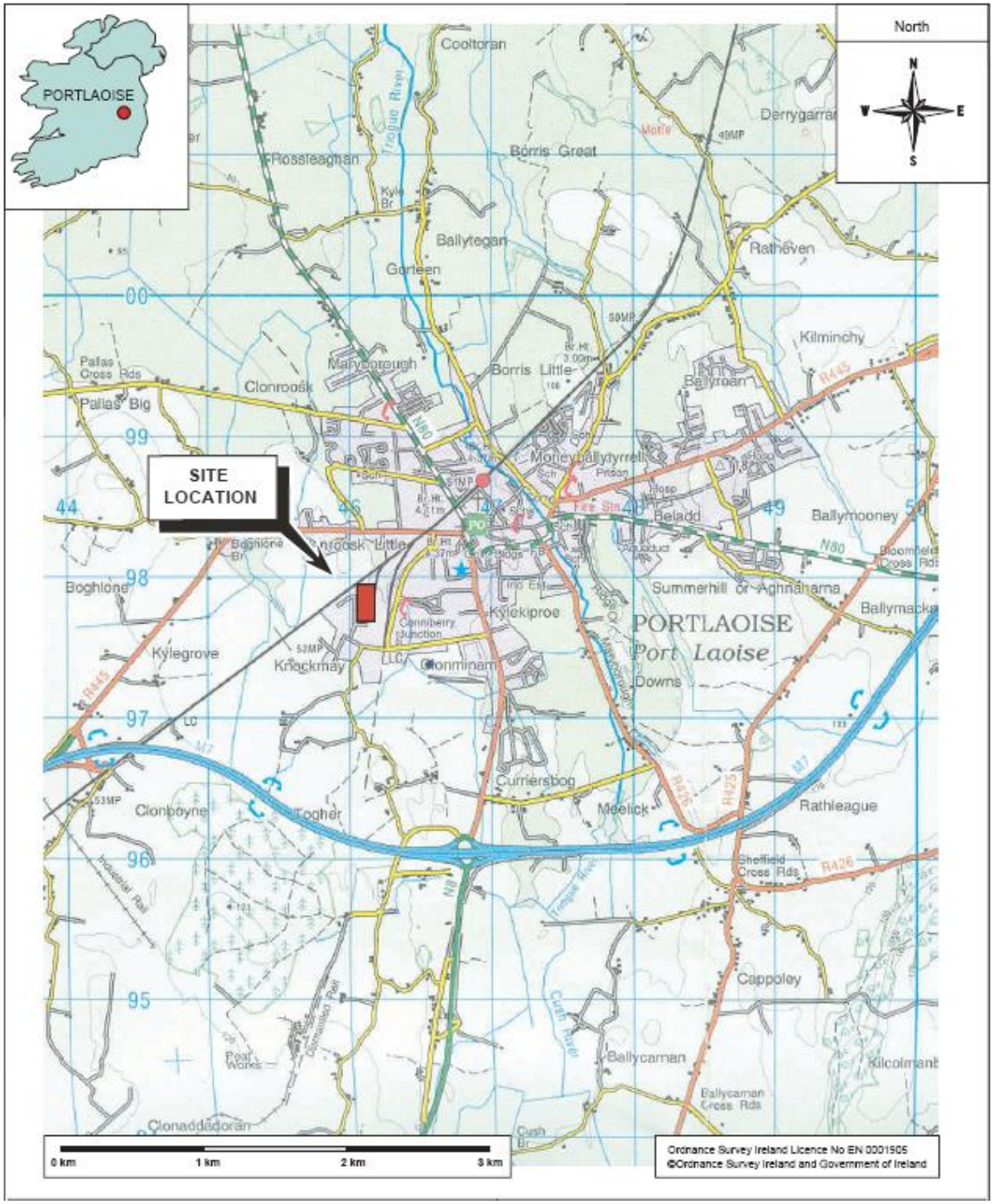
2.2 SITE SETTING

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,

Strata	Extent	Thickness	Description
			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 PAH's Phenols VOC's SVOC's	Mineral Oil BTEX & MTBE PAH's Phenols VOC's SVOC's
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.

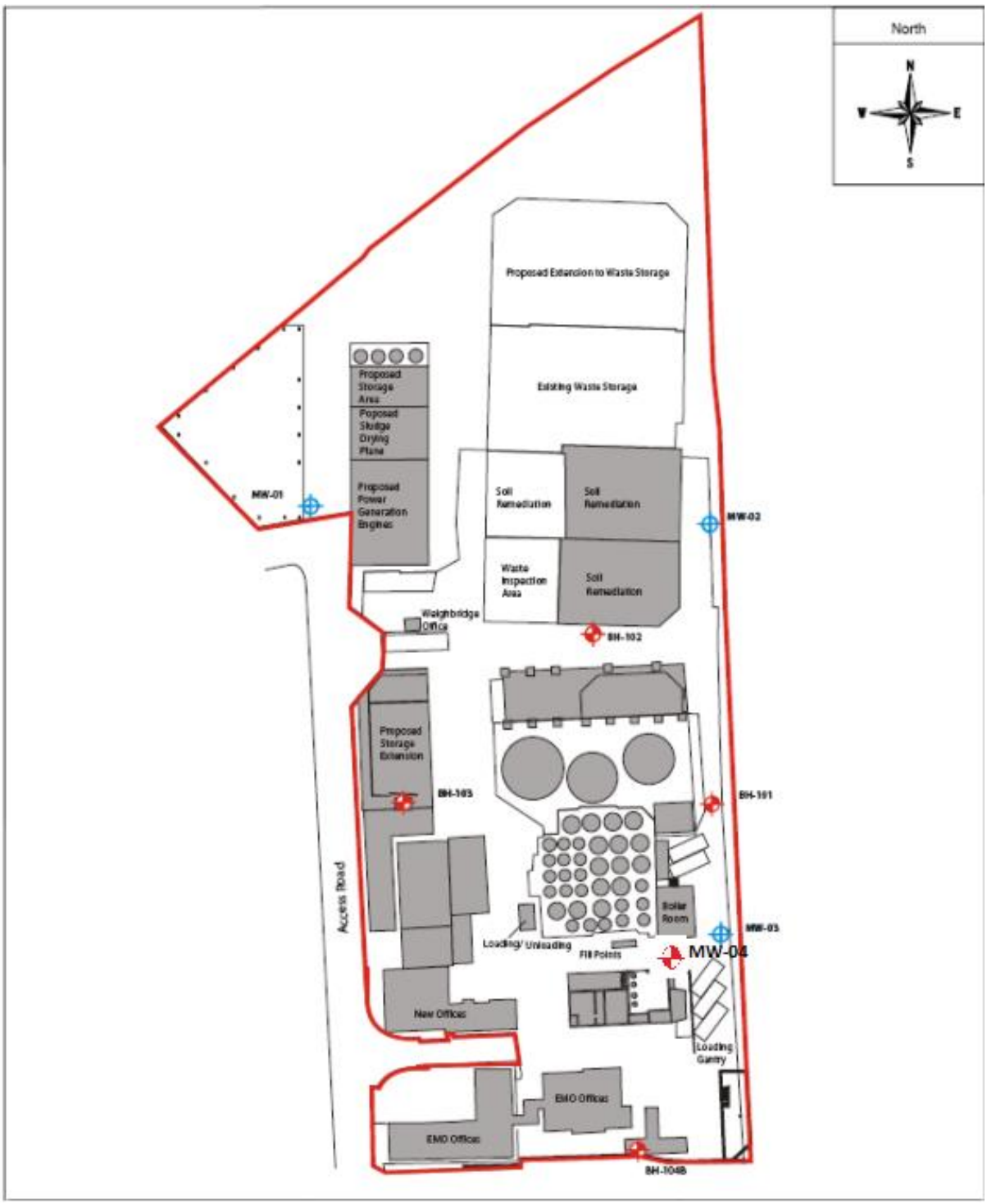
3.1 LABORATORY ANALYSIS

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 2015 results are tabulated in **Section 4** and discussed with respect to previous results. 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 2015 monitoring round. As the monitoring continues in accordance with the waste 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 2015

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, 2015)

Monitoring Well	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04
Depth (mbgl)	6.77	6.40	4.28	4.36	20.05	31.01	10.77	6.41
Static Water Level (mbgl)	4.36	2.03	1.64	0.40	3.08	4.06	4.24	3.96
Ground Level (mAOD)	103.06	102.55	101.16	101.52	102.10	103.12	102.77	-
Water Level (mAOD)	98.70	100.52	99.52	101.12	99.02	99.06	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 3, 2015)

Monitoring Well	pH (pH Units)	Temperature (°C)	Conductivity (µS/cm)	Dissolved O_2 (ppm)	Observations
BH101	7.27	13.5	897	4.55	Slight cloudy colour, clearer after 10L. Small amount of sediment and suspended solids
BH102	7.46	11.5	**713**	2.02	Clear on purging, no odour, some sediment and suspended solids
BH103	6.80	14.0	844	2.63	Dark, cloudy colour, H_2S odour detected, small amount of sediment
BH104B	7.70	13.4	**561**	2.55	Clear in colour, slight H_2S odour, some fine sediment
MW01	7.62	12.3	**732**	4.41	Slightly cloudy, some suspended solids, no odour, samples also cloudy
MW02	7.10	13.2	**595**	4.34	Cloudy in colour, clearer after 20L, some suspended solids and H_2S odour
MW03	7.11	12.2	**1623**	2.89	Clear but with slight sheen and H_2S odour
MW04	7.16	13.7	**1655**	5.19	Dirty brown in colour, no odour, some suspended solids and sediment. Samples also dirty in colour
Groundwater Threshold Value	-	-	**>800 & <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 outside the GTV are highlighted in bold and shaded.

Table 4.3 – 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	288	226	341	202	298	295	261	523	-	No abnormal change
Calcium	mg/l	0.2	89	89.5	130	66	67.4	58.9	132	153	-	200
Manganese	mg/l	0.007	<0.007	**0.876**	**1.03**	**0.0703**	**0.0685**	0.0115	**0.337**	**1.73**	-	0.05
Sulphate	mg/l	0.1	28.2	25.5	19.6	22.4	24.1	19.4	18.6	<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	**55.9**	7	28.8	20.1	16.2	13.8	**241**	**267**	24 -187.5	30
Sodium	mg/l	0.1	60.5	6.04	14.4	31.1	18.2	20.3	110	126	150	150

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

Table 4.4 - 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	<10.0	<1.0	<1.0	<10.0	<10.0	0.75	1.0
Toluene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	10
Ethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	10
p & m-xylene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	10 Note 1
o-xylene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	10 Note 1
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1.0	<1.0	<1.0	***3.1***	<10.0	<1.0	<1.0	<10.0	<10.0	-	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 4.5 - 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	***0.011***	<0.01	<0.14	<0.07	<0.01	<0.01	***0.031***	<0.10	-	1.0
Acenaphthylene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	-	-
Acenaphthene	µg/l	0.01	<0.01	<0.01	***0.071***	***0.042***	<0.01	<0.01	***0.095***	<0.10	-	-
Fluorene	µg/l	0.01	<0.01	<0.01	***0.022***	***0.07***	<0.01	<0.01	***0.125***	<0.10	-	-
Phenanthrene	µg/l	0.01	<0.01	<0.01	<0.01	***0.011***	<0.01	<0.01	<0.01	<0.10	-	-
Anthracene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	-	10,000
Fluoranthene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	***0.015***	<0.10	-	1.0
Pyrene	µg/l	0.01	<0.01	<0.01	<0.01	***0.036***	<0.01	<0.01	***0.1***	<0.10	-	-
Benzo(a)anthracene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	***0.038***	<0.10	-	-
Chrysene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	***0.025***	<0.10	-	-
Benzo(b)fluoranthene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	***0.025***	<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	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	-	0.05
Benzo(a)pyrene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.052**	<0.10	-	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	***0.012***	<0.10	-	-
Benzo(g,h,i)perylene	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.053**	<0.10	-	0.05
Total EPA-16 PAH's	µg/l	0.1	***0.011***	< 0.01	**0.093**	**0.159**	<0.01	< 0.01	**0.586**	< 0.10	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 4.6 - 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 4.7 - 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 4.8 - 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	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
Chloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	***12.6***	-	-
Bromomethane	µg/l	1.0	<2.0	<1.0	<2.0	<20.0	<2.0	<2.0	<20.0	<10.0	-	-
Vinyl Chloride	µg/l	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5.0	<5.0	0.375	-
Trichlorofluoromethane	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
1,1-dichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	30
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
Cis-1,2-dichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1.0	<1.0	<1.0	***3.1***	<10.0	<1.0	<1.0	<10.0	<10.0	-	30
2,2-Dichloropropane	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
Trichloromethane	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	12
1,1,1-Trichloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	500
1,2-dichloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	2.25	-
1,1-Dichloropropene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
Trans-1,2-dichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
Benzene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	1.0
1,2-dichloropropane	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
Trichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	70
Dibromomethane	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
Bromodichloromethane	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
Cis-1,3-dichloropropene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
Trans-1,3-dichloropropene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
Toluene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	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	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
1,3-Dichloropropane	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
Dibromochloromethane	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
Tetrachloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	40
1,2-Dibromoethane	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
Chlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	1.0
1,1,1,2-Tetrachloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
Ethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	10
p & m-xylene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	10
Styrene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
Tribromomethane	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
o-xylene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	10
Isopropylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
Bromobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
N-Propylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
2-Chlorotoluene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
4-Chlorotoluene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
1,3,5-Trimethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
Tert-Butylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
1,2,4-Trimethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
Sec-Butylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
1,3-dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
P-Isopropyltoluene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
1,2-dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	10
1,4-dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-
Butylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-

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	<20.0	<2.0	<2.0	<20.0	<20.0	-	-
1,2,4-Trichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	0.40
Hexachlorobutadiene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	0.10
1,2,3-Trichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<10.0	<10.0	-	-

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 4.9 - 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	***13***	<10	<10	<10	<10	-	-
Aliphatic > C12-C16	µg/l	10	<10	<10	<10	***40***	<10	<10	<10	<10	-	-
Aliphatic > C16-C35	µg/l	10	<10	<10	***72***	***62***	<10	<10	***14***	<10	-	-
Aliphatic > C35-C44	µg/l	10	<10	<10	<10	<10	<10	<10	<10	<10	-	-
Aliphatic > C10-C44	µg/l	10	<10	<10	**72**	**116**	<10	<10	**14**	<10	-	10
Aromatic > C10-C12	µg/l	10	<10	<10	<10	<10	<10	<10	<10	***18***	-	-
Aromatic > C12-C16	µg/l	10	<10	<10	<10	***39***	<10	<10	<10	***29***	-	-
Aromatic > C16-C21	µg/l	10	<10	<10	<10	***37***	<10	<10	<10	<10	-	-
Aromatic > C21-C35	µg/l	10	<10	<10	***17***	***28***	<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	**17**	**103**	<10	<10	<10	**47**	-	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 3 RESULTS

The results of the Quarter 3 monitoring event for 2015 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 6.80 and 7.70, all within the EPA Interim guideline range of ≥6.5 to ≤9.5. Temperature measurements ranged from 11.5°C to 14.0°C and were below the EPA IGV of 25°C.

Field measurements of Electrical Conductivity levels ranged between 561 µS/cm and 1655 µS/cm. Two measurements of Electrical Conductivity were above the IGV of 1000 µS/cm at MW03 (1623 µS/cm) and MW04 (1655 µS/cm), but were however within the GTV range of >800 & <1875 µS/cm.

Dissolved oxygen levels ranged between 2.02 and 5.19 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 INORGANIC ANALYSIS

The results of the inorganic analysis are presented in **Table 4.3**. 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 0.337 mg/l and 1.73 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 upper GTV limit of 187.5 mg/l at 2 no. locations (MW03 and MW04) ranging between 241 mg/l and 267 mg/l. Chloride concentrations were detected at MW03 and MW04 in Quarter 3 2014 at levels of 220 mg/l and 240 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.

5.3 RESULTS OF BTEX & MTBE

The results of the **BTEX** and **MTBE** analysis are presented in **Table 4.4**. BTEX concentrations are below the laboratory limit of detections and associated IGV's at locations BH101, BH102, BH103, MW01 and MW02. The laboratory limits of detection were raised for analysis of samples at BH104B, MW03 and MW04 due to the nature of the sample matrix. However, the new limits of detection were still below the associated IGV's, with the exception of Benzene. MTBE analysis detected a concentration above the laboratory limit at BH103 (3.1 µg/l), however this value does not exceed the IGV limit of 30 µg/l.

The previous detection of MTBE was in the Quarter 2 monitoring event of 2015 and recorded a concentration above the laboratory limit of detection of 1.2 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 at BH104B 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.

5.4 RESULTS OF SPECIATED POLYAROMATIC HYDROCARBONS (PAH'S)

The results of the Speciated PAH analysis during this monitoring period are presented in **Table 4.5.**

The laboratory limit of detection for Total EPA-16 PAH's 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 BH104B (0.159 µg/l) and MW03 (0.586 µg/l). Total PAH's were above the GTV of 0.075 µg/l at BH103 (0.093 µg/l) but below the IGV. Total PAH's were below the GTV limits at all locations during the previous Quarter 2 2015 monitoring event.

The results of the speciated polycyclic aromatic hydrocarbon analysis detected a number of different compounds in BH101, BH103, BH104B and MW03 above the laboratory limit of detection. However only Benzo(a)pyrene (0.052 µg/l) and Benzo(g,h,i)perylene (0.053 µg/l) in well MW03 were above their respective IGV limits of 0.01 µg/l and 0.05 µg/l.

5.5 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 4.6**. 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 2015 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 for the Quarter 1 2015 analysis. With the exception of this, all other results are consistent with results since the 2012 quarterly monitoring events.

5.6 RESULTS OF SEMI-VOLATILE ORGANIC COMPOUNDS

The results of the Semi-Volatile Organic Compound analysis are presented in **Table 4.7**.

There are no GTVs for individual SVOC parameters. No SVOC's were detected above the relevant IGV's during this monitoring period, consistent with the Quarter 1 and Quarter 2 2015 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.

5.7 RESULTS OF VOLATILE ORGANIC COMPOUNDS

The results of the Volatile Organic Compound analysis are presented in **Table 4.8**. The results of the current Quarter 3 2015 monitoring event indicate that MTBE at BH103 was detected at 3.1 µg/l, which is above the laboratory limit of detection of 1.0 µg/l. There is no GTV for MTBE and it is below the IGV of 30 µg/l. Chloroethane was also detected above the laboratory limit of detection in well MW04 at 12.6 µg/l. There is no GTV or IGV limit for Chloroethane.

All other compounds were below their respective laboratory limits of detection; however the limits of detection were raised for samples from BH104B, MW03 and MW04.

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 VOC's were detected above the relevant GTVs or IGV's.

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.

5.8 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 4.9**.

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 2015 monitoring event. Detections in samples from the well BH104B were in the aliphatic ranges C10-C12 (13 µg/l), C12-C16 (40 µg/l) and C16-C35 (62 µg/l), as well as in the aromatic ranges C12-C16 (39 µg/l), C16-C21 (37 µg/l) and C21-C35 (28 µg/l). TPH concentrations were also recorded in the aliphatic range C16-C35 at BH103 (72 µg/l) and MW03 (14 µg/l), and in the aromatic ranges C21-C35 at BH103 (17 µg/l) and C10-C12 (18 µg/l) and C12-C16 (29 µg/l) at MW04 .

The previous 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 3 2015 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

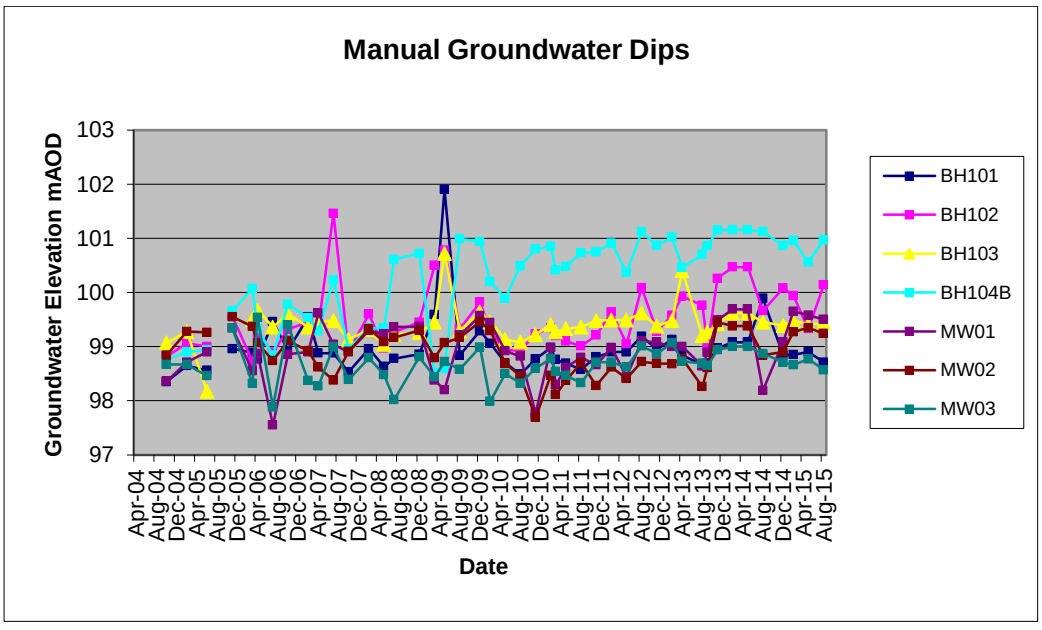


Figure 6.2 - Ground Elevation (mAOD) in Shallow Groundwater Monitoring Wells

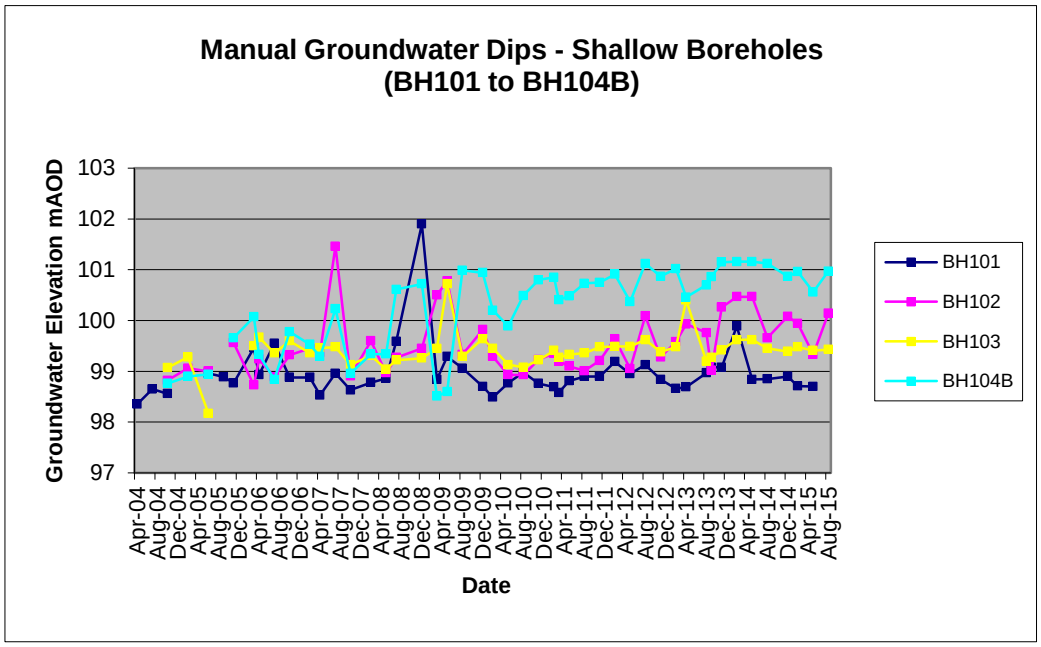
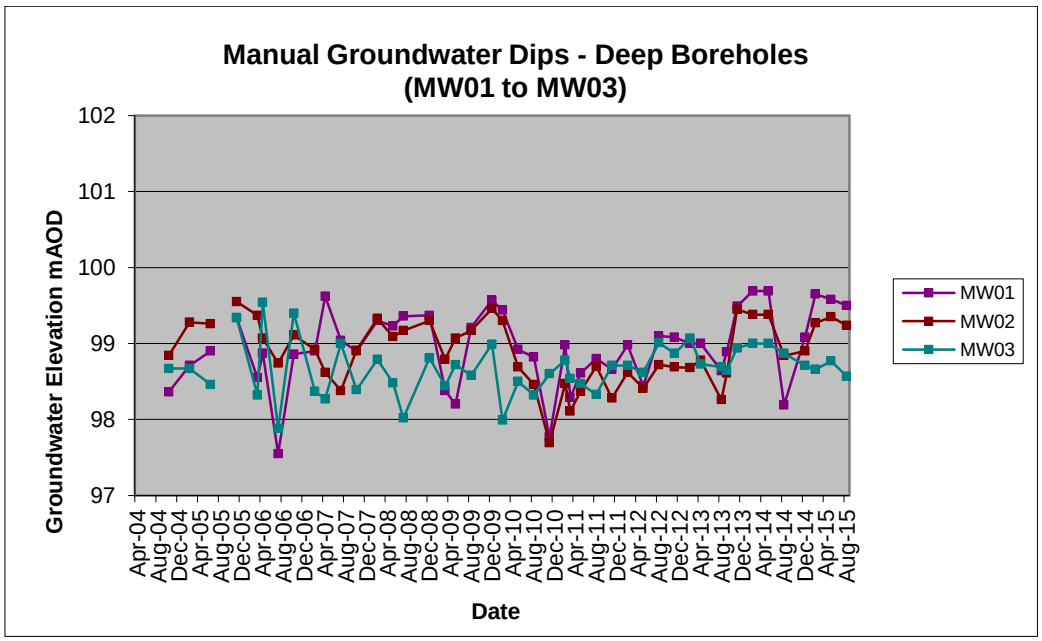


Figure 6.3 - Ground Elevation (mAOD) in Deep Groundwater Monitoring Wells



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 **6.7**.

Table 6.1 - Monthly Rainfall Data for Year 2009 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	113.4	29.2	32.6	102.4	69.0	65.4	152.4	100.9	41.8	127.8	215.5	73.7

Table 6.2 - Monthly Rainfall Data for Year 2010 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	71.5	48.0	80.7	49.0	51.4	37.7	93.6	25.5	108.7	68.9	87.7	52.2

Table 6.3 - Monthly Rainfall Data for Year 2011 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	50.6	121.9	16.0	19.5	51.2	72.7	46.4	25.5	93.9	93.9	89.2	55.5

Table 6.4 - 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 6.5 - 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	0.9

Table 6.6 - 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 6.7 - Monthly Rainfall Data for Year 2015 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep
Rainfall (mm)	66.0	36.3	53.5	26.3	89.4	29.7	79.4	83.0	17.9

Note: Data for the most recent months are provisional.

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.

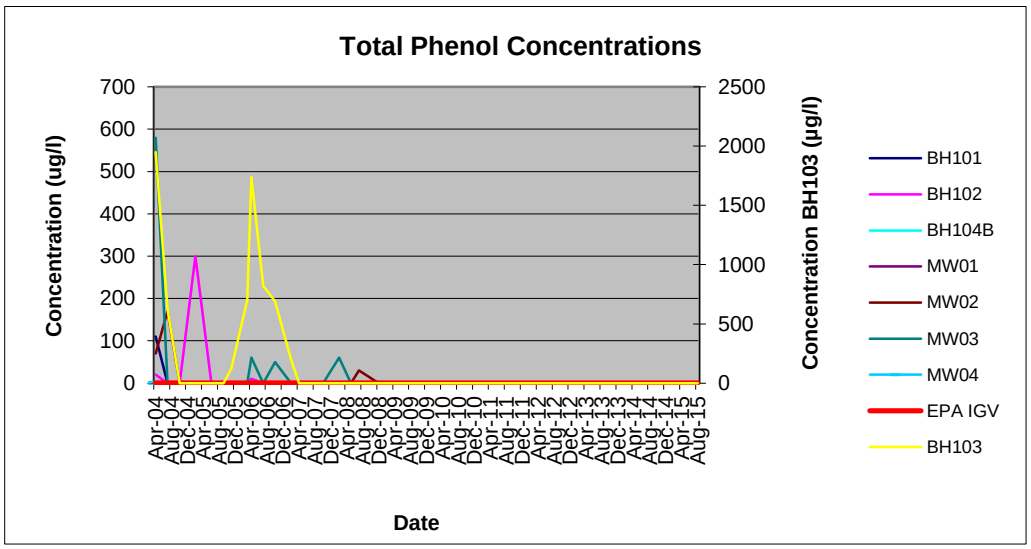
The data available within these reports has been reviewed and time series plots of key parameters have been compiled based on notable trends. Trends for phenols, petroleum hydrocarbons and chlorinated solvents have been plotted as outlined in the following sections.

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 2015 monitoring event.

Figure 6.4 - Phenol Concentrations in all Monitoring Wells



6.2.2 Polycyclic Aromatic Hydrocarbons (PAH's)

Figure 6.5 below illustrates that PAH's (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 PAH's 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 IGV's.

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 PAH was 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 previous Quarter 2 2015 monitoring event. For the current Quarter 3 2015 monitoring event, total PAH detections were above the IGV limit at BH104B (0.159 µg/l) and MW03 (0.586 µg/l) and were above the GTV of 0.075 µg/l at BH103 (0.093 µg/l) but below the IGV.

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

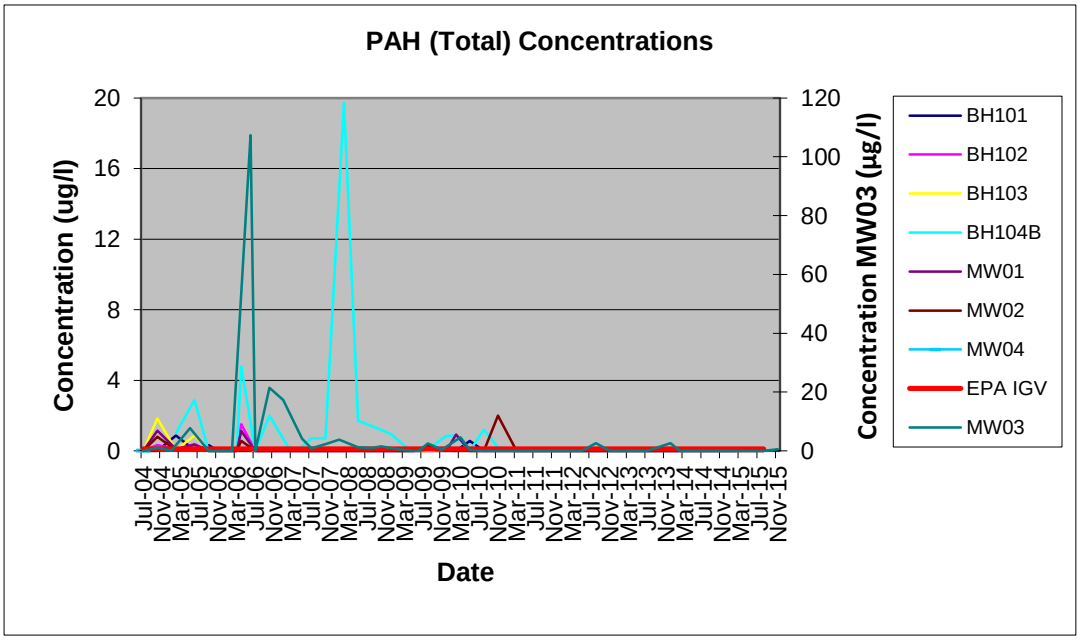


Figure 6.6 - Fluoroanthene Concentrations in all Monitoring Wells

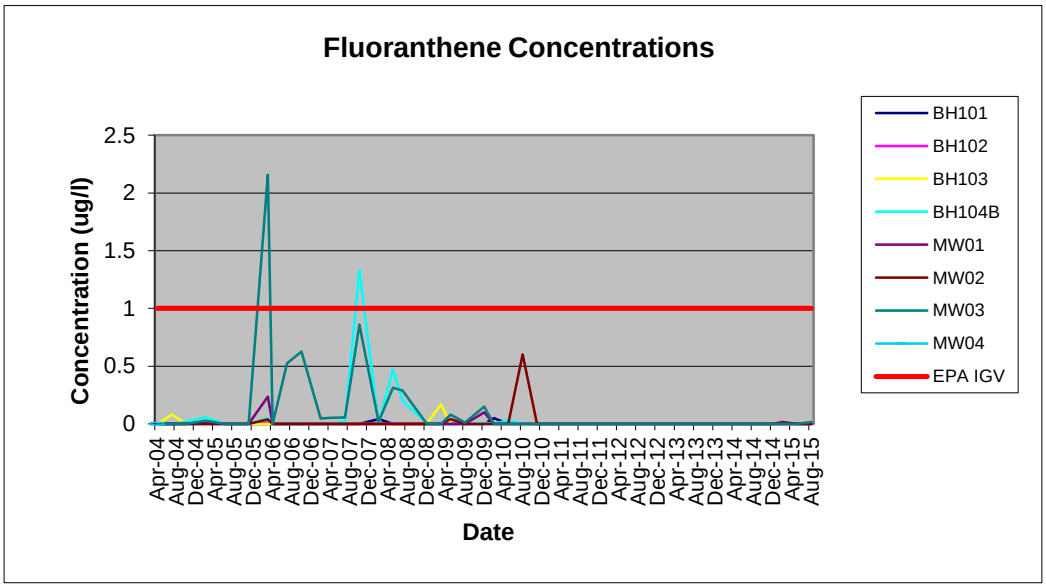
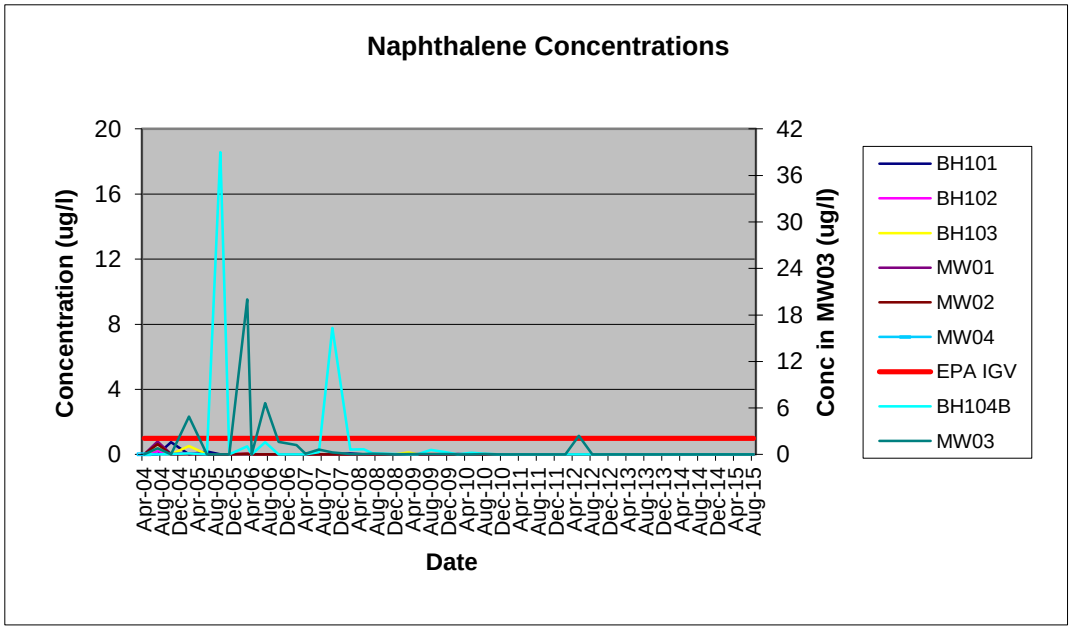


Figure 6.6 illustrates that **Fluoroanthene** was previously detected above the IGV of 1.0 µg/l in groundwater monitoring wells BH104B (October 2007, 1.33 µg/l) and MW03 (March 2006, 2.158 µg/l) only. The remaining monitoring wells recorded concentrations below the IGV of 1.0 µg/l.

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. During the current Quarter 3 monitoring event in 2015 Naphthalene was detected at BH101 (0.011 µg/l) and MW03 (0.031 µg/l), however both these detections were below the IGV limit of detection of 1.0 µg/l.

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

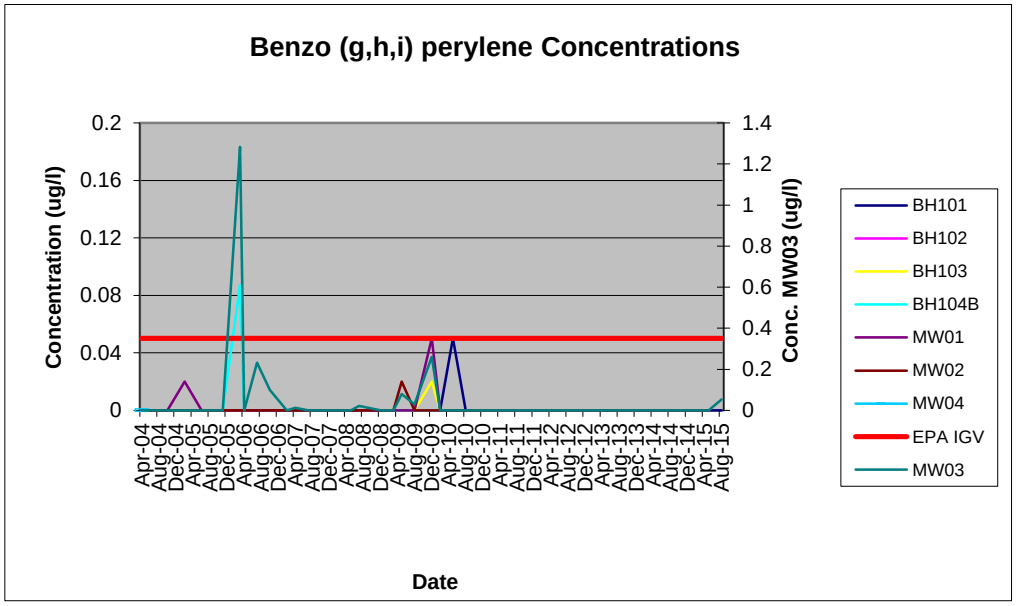


Figure 6.8 illustrates the concentrations of **Benzo(g,h,i)perylene** in all monitoring wells over time. Elevated concentrations above the IGV were recorded at BH104B (0.087 µg/l) on one occasion in March 2006.

Figure 6.9 illustrates elevated concentrations above the IGV recorded at MW03 on 5 no. occasions with the most recent elevated concentration recorded during the current Quarter 3 2015 monitoring event (0.053 µg/l). The previous elevated concentration detected was in December 2009 (0.26 µg/l). The results of subsequent monitoring events from 2010 to the current Quarter 3 2015 monitoring event recorded concentrations below the laboratory limit of detection of 0.01 µg/l at all locations.

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

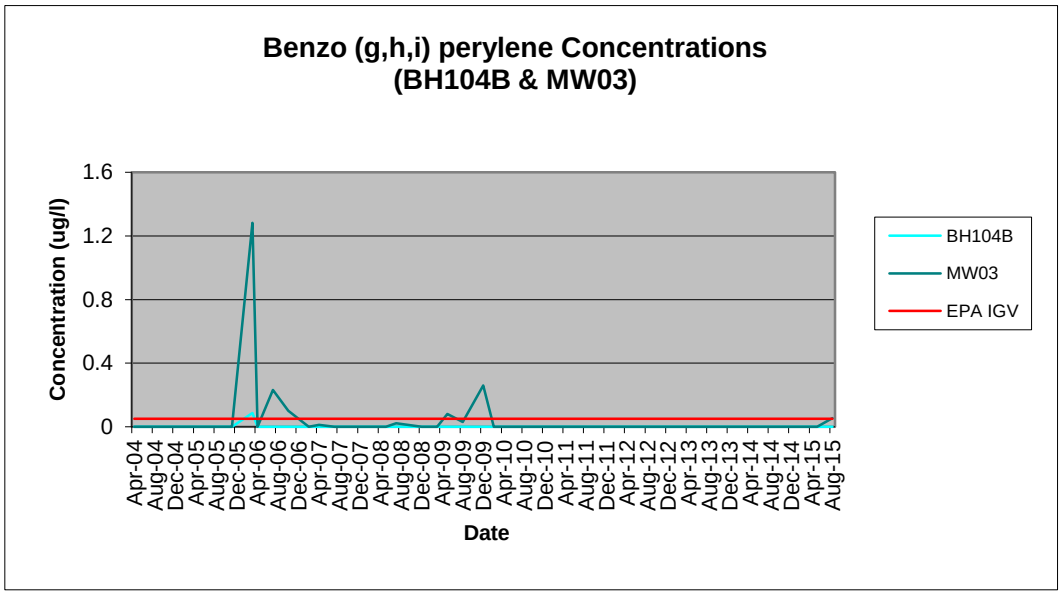
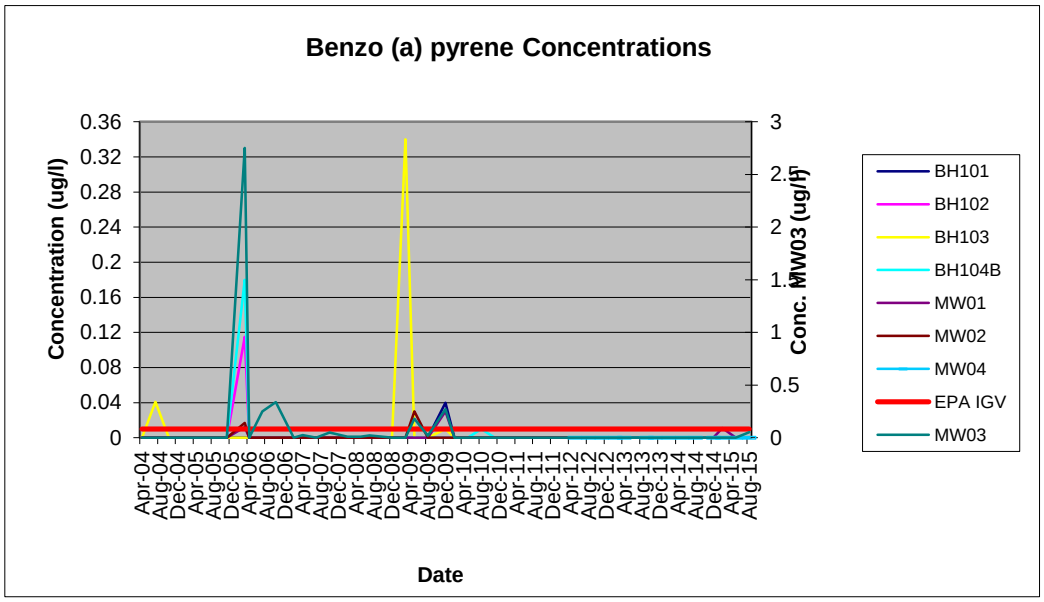


Figure 6.10 illustrates the concentrations of **Benzo(a)pyrene** in all groundwater monitoring wells and indicates that Benzo(a)pyrene has been detected historically in all boreholes above the IGV of 0.01 µg/l. Similarly with the above mentioned trends, the highest concentrations have been detected in 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 IGV's.

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

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

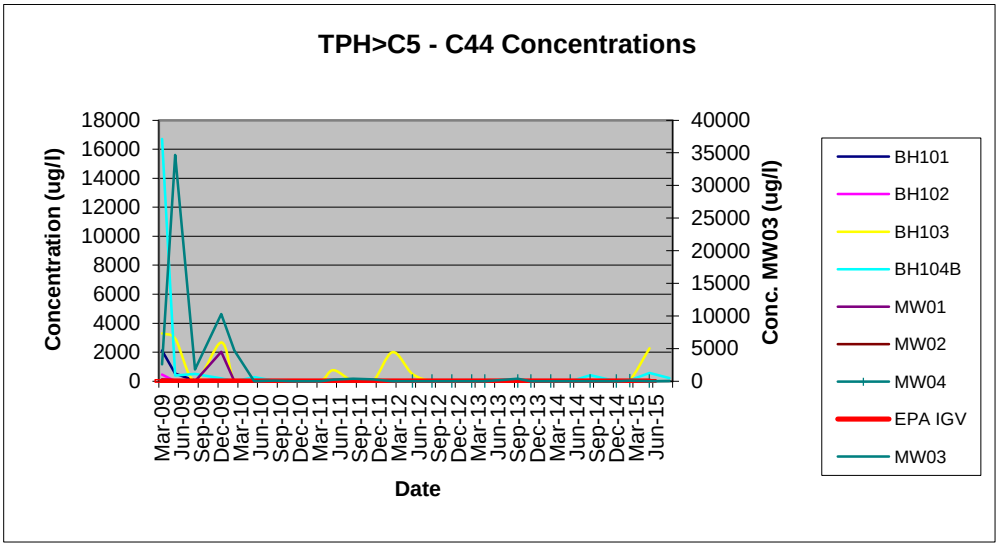


6.2.3 Petroleum Hydrocarbons (TPH)

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



During the Quarter 1, 2010 monitoring event, hydrocarbons were detected in borehole MW03. The predominant aliphatic carbon range in MW03 comprised of C16-C21 (1000 µg/l), C21-C35 (2300 µg/l) and C25-C44 (990 µg/l). The predominant aromatic carbon range in MW03 comprised of C16-C21 (220 µg/l) and C21-C35 (620 µg/l). No detections were observed at other locations.

During the Quarter 2 and Quarter 3, 2010 monitoring event, hydrocarbons were detected in borehole BH104B, with the predominant aliphatic carbon range comprising C12-C16 (130 µg/l and 12 µg/l) and C16-C21 (130 µg/l and 19 µg/l). The predominant aliphatic carbon range in MW03 during Quarter 3 2010 comprised of C16-C21 (35 µg/l) and C21-C34 (46 µg/l). The predominant aromatic carbon range detected during Quarter 2 2010 comprised of C12-C16 (21 µg/l) and C16-C21 (47 µg/l) at BH104B. No aromatic carbons were detected above the laboratory limit of detection at any wells in Quarter 3 2010.

During the Quarter 4, 2010 and Quarter 1, 2011 monitoring event, there were no detections of TPH concentrations above the laboratory limit of detection of 10 µg/l at any location. No aliphatic or aromatic carbons were detected above the laboratory limit of detection of 10 µg/l in all monitoring wells.

During the Quarter 2, 2011 monitoring event, hydrocarbons were detected in borehole BH103, BH104B and MW03. The predominant aliphatic carbon range comprised of C16-C21 (340 µg/l, 20 µg/l and 46 µg/l) and C21-C35 (420 µg/l, 96 µg/l and 150 µg/l in BH103, BH104B and MW03 respectively). The predominant aromatic carbon range also comprised of C16-C21 (78 µg/l, 52 µg/l and 50 µg/l) and C21-C35 (110 µg/l, 49 µg/l and 93 µg/l in BH103, BH104B and MW03 respectively).

During the Quarter 3 and Quarter 4 2011 monitoring event, hydrocarbons were detected in borehole MW03 only. The predominant aliphatic carbon range comprised of C10-C12 (18 µg/l and 22 µg/l), C12-C16 (57 µg/l and 51 µg/l), C16-C21 (35 µg/l and 85 µg/l) and C21-C35 (210 µg/l and 110 µg/l). The predominant aromatic carbon range comprised of C12-C16 (42 µg/l and 16 µg/l), C16-C21 (66 µg/l and 14 µg/l) and C21-C35 (45 µg/l and 91 µg/l).

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). No hydrocarbons were detected in MW03 during the current Quarter 1 monitoring event.

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.

Some detections of TPH in both the aliphatic and aromatic range were observed during the current Quarter 3 2015 monitoring event. Detections in samples from the well BH104B were in the aliphatic ranges C10-C12 (13 µg/l), C12-C16 (40 µg/l) and C16-C35 (62 µg/l), as well as in the aromatic ranges C12-C16 (39 µg/l), C16-C21 (37 µg/l) and C21-C35 (28 µg/l). TPH concentrations were also recorded in the aliphatic range C16-C35 at BH103 (72 µg/l) and MW03 (14 µg/l), and in the aromatic ranges C21-C35 at BH103 (17 µg/l) and C10-C12 (18 µg/l) and C12-C16 (29 µg/l) at MW04.

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 26th August 2015 corresponding to Quarter 3 of 2015. 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 were below the recommended EPA IGV's. Benzene was also below the laboratory limit of detection at all locations; however the laboratory limit of detection was raised above the EPA IGV for samples from locations BH104B, MW03 and MW04.
- The Quarter 3 2015 results of the speciated polycyclic aromatic hydrocarbons indicate that Total PAH's were below the EPA IGV of 0.1 µg/l at all monitoring wells with the exception of MW03 (0.586 µg/l) and BH104B (0.159 µg/l).
- There were no detections of VOC's or SVOC's in the current monitoring event above the laboratory limits of detection, with the exception of MTBE which was detected in BH103 (1.2 µg/l); however this is still below the GTV of 30 µg/l. The laboratory limits of detection were raised for samples from locations BH104B, MW03 and MW04 due to the nature of the sample matrix and all compounds analysed were below these new limits.
- Samples were analysed for speciated phenols to include chlorophenols and the results indicate that there were no detections above the laboratory limits of detection.
- Hydrocarbons in both aliphatic and aromatic range were observed during the current Quarter 3 2015 monitoring event. Detections in samples from the well BH104B were in the aliphatic ranges C10-C12 (13 µg/l), C12-C16 (40 µg/l) and C16-C35 (62 µg/l), as well as in the aromatic ranges C12-C16 (39 µg/l), C16-C21 (37 µg/l) and C21-C35 (28 µg/l). TPH concentrations were also recorded in the aliphatic range C16-C35 at BH103 (72 µg/l) and MW03 (14 µg/l), and in the aromatic ranges C21-C35 at BH103 (17 µg/l) and C10-C12 (18 µg/l) and C12-C16 (29 µg/l) at MW04 . 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. Hydrocarbons were not detected in any monitoring location during the Quarter 4 2014 monitoring event. Hydrocarbons were detected in BH104B in the aliphatic carbon ranges C12-C16, C16-C21 and C21-C35 during the Quarter 3, 2014 event. Previous to these events hydrocarbons were detected in boreholes BH104B and MW03 in the aliphatic carbon ranges during the Quarter 3, 2010 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

2015 Groundwater Compliance Monitoring Quarter 4 (Oct – Dec 2015)

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 8th December 2015. 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 2015 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 2015 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 2014), 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)
- Quarter 1 Groundwater Monitoring Report, RPS (2015)
- Quarter 2 Groundwater Monitoring Report, RPS (2015)
- Quarter 3 Groundwater Monitoring Report, RPS (2015)

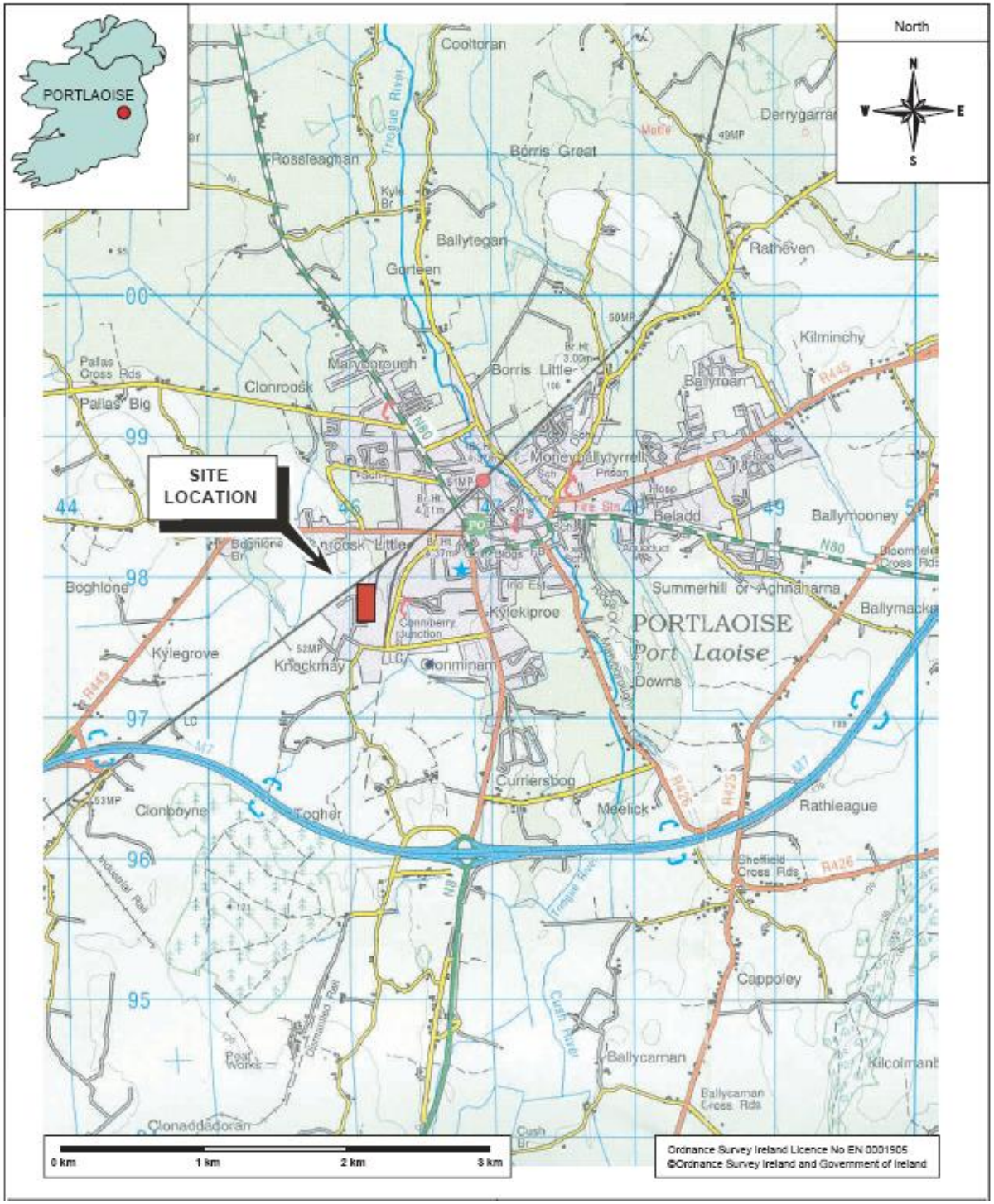
2.2 SITE SETTING

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,

Strata	Extent	Thickness	Description
			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.

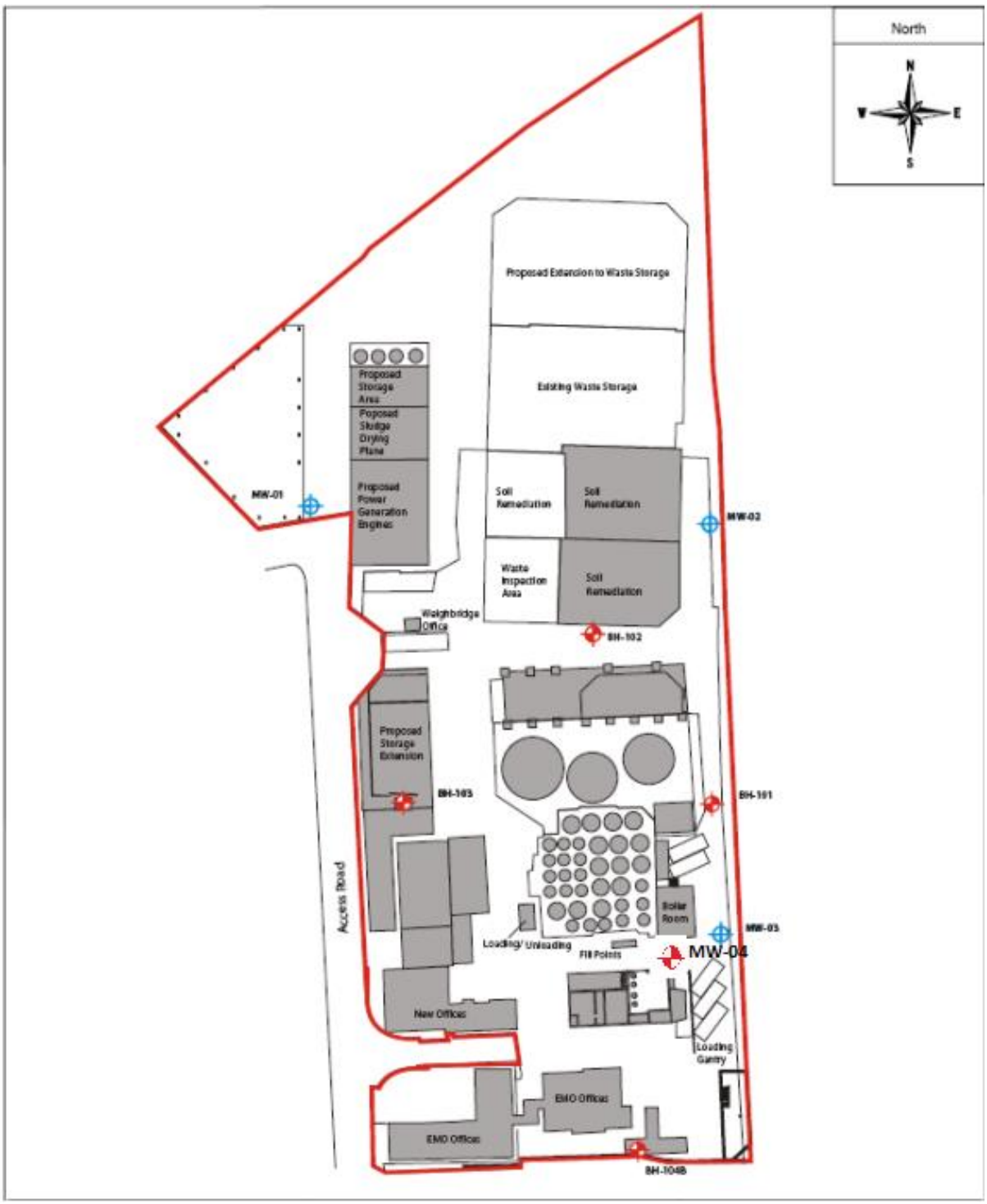
3.1 LABORATORY ANALYSIS

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 2015 results are tabulated in **Section 4** and discussed with respect to previous results. 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 2015 monitoring round. As the monitoring continues in accordance with the waste 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 2015

The results of all field measurements and laboratory analysis are presented in this section. Satisfactory calibration of the Dissolved Oxygen meter was unable to be achieved on the day of monitoring. 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 4, 2015)

Monitoring Well	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	MW04
Depth (mbgl)	7.10	6.33	4.33	4.59	22.60	30.94	9.43	6.42
Static Water Level (mbgl)	4.08	2.18	1.58	0.38	2.47	3.13	3.95	3.67
Ground Level (mAOD)	103.06	102.55	101.16	101.52	102.10	103.12	102.77	-
Water Level (mAOD)	98.98	100.37	99.58	101.14	99.63	99.99	98.82	-
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, 2015)

Monitoring Well	pH (pH Units)	Temperature (°C)	Conductivity (µS/cm)	Dissolved O_2 (ppm)	Observations
BH101	6.89	12.1	888	-	Samples cloudy, some suspended solids, little sediment
BH102	7.08	11.9	**558**	-	Slightly cloudy on purging, no suspended solids or sediment, slight H_2S odour, samples clear
BH103	7.68	11.6	741	-	Dark in colour on purging, some suspended solids and sediment, very slight sheen
BH104B	7.20	10.3	414	-	Slightly yellow colour, H_2S odour, very little suspended solids
MW01	7.73	9.7	638	-	Cloudy on purging, slightly clearer after 30L, very little sediment or suspended solids
MW02	7.59	12.1	623	-	Samples clear, very little sediment or suspended solids
MW03	6.94	12.6	**1457**	-	Strong H_2S smell, cloudy colour, lots of suspended solids, slight oil sheen
MW04	7.09	12.5	**1337**	-	Very cloudy in colour, high amount of 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	<4.0	<4.0	0.75	1.0
Toluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	10
Ethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	10
p & m-xylene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	10 Note 1
o-xylene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	10 Note 1
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	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	***0.095***	<0.10	<0.01	<0.01	<0.01	***0.067***	-	1.0
Acenaphthylene	µg/l	0.01	<0.01	<0.01	<0.01	<0.10	<0.01	<0.01	<0.01	<0.01	-	-
Acenaphthene	µg/l	0.01	<0.01	<0.01	***0.062***	<0.10	<0.01	<0.01	***0.052***	<0.01	-	-
Fluorene	µg/l	0.01	<0.01	<0.01	***0.022***	<0.10	<0.01	<0.01	***0.08***	***0.013***	-	-
Phenanthrene	µg/l	0.01	<0.01	<0.01	***0.014***	<0.10	<0.01	<0.01	<0.01	<0.01	-	-
Anthracene	µg/l	0.01	<0.01	<0.01	<0.01	<0.10	<0.01	<0.01	<0.03	<0.01	-	10,000
Fluoranthene	µg/l	0.01	<0.01	<0.01	<0.01	<0.10	<0.01	<0.01	***0.029***	<0.01	-	1.0
Pyrene	µg/l	0.01	<0.01	<0.01	***0.018***	<0.10	<0.01	<0.01	***0.226***	<0.01	-	-
Benzo(a)anthracene	µg/l	0.01	<0.01	<0.01	<0.01	<0.10	<0.01	<0.01	***0.084***	<0.01	-	-
Chrysene	µg/l	0.01	<0.01	<0.01	<0.01	<0.10	<0.01	<0.01	***0.147***	<0.01	-	-
Benzo(b)fluoranthene	µg/l	0.01	<0.01	<0.01	<0.01	<0.10	<0.01	<0.01	***0.065***	<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	***0.012***	<0.01	-	0.05
Benzo(a)pyrene	µg/l	0.01	<0.01	<0.01	<0.01	<0.10	<0.01	<0.01	**0.108**	<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	***0.026***	<0.01	-	0.05
Dibenz(a,h)anthracene	µg/l	0.01	<0.01	<0.01	<0.01	<0.10	<0.01	<0.01	***0.030***	<0.01	-	-
Benzo(g,h,i)perylene	µg/l	0.01	<0.01	<0.01	<0.01	<0.10	<0.01	<0.01	**0.131**	<0.01	-	0.05
Total EPA-16 PAHs	µg/l	0.1	***0.011***	< 0.01	**0.21**	<0.10	<0.01	< 0.01	**0.986**	**0.079**	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	<4.0	<4.0	-	-
Chloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	***7.8***	-	-
Bromomethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
Vinyl Chloride	µg/l	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	<1.0	0.375	-
Trichlorofluoromethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
1,1-dichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	***4.1***	-	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	<4.0	<4.0	-	-
Cis-1,2-dichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	30
2,2-Dichloropropane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
Trichloromethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	12
1,1,1-Trichloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	500
1,2-dichloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	2.25	-
1,1-Dichloropropene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
Trans-1,2-dichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
Benzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	1.0
1,2-dichloropropane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
Trichloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	70
Dibromomethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
Bromodichloromethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
Cis-1,3-dichloropropene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
Trans-1,3-dichloropropene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
Toluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	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	<4.0	<4.0	-	-
1,3-Dichloropropane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
Dibromochloromethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
Tetrachloroethene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	40
1,2-Dibromoethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
Chlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	1.0
1,1,1,2-Tetrachloroethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
Ethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	10
p & m-xylene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	10
Styrene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
Tribromomethane	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
o-xylene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	10
Isopropylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
Bromobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
N-Propylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
2-Chlorotoluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
4-Chlorotoluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
1,3,5-Trimethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
Tert-Butylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
1,2,4-Trimethylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
Sec-Butylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
1,3-dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
P-Isopropyltoluene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
1,2-dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	10
1,4-dichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-
Butylbenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	-

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	<8.0	<8.0	-	-
1,2,4-Trichlorobenzene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	0.40
Hexachlorobutadiene	µg/l	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<4.0	<4.0	-	0.10
1,2,3-Trichlorobenzene	µg/l	1.0	<1.0	<1.0	***1.0***	<1.0	<1.0	<1.0	<4.0	<4.0	-	-

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	***495***	<10	<10	<10	<10	-	-
Aliphatic > C12-C16	µg/l	10	<10	<10	<10	***3080***	<10	<10	<10	<10	-	-
Aliphatic > C16-C35	µg/l	10	<10	<10	***231***	***3360***	<10	<10	<10	<10	-	-
Aliphatic > C35-C44	µg/l	10	<10	<10	***14***	<200	<10	<10	<10	<10	-	-
Aliphatic > C10-C44	µg/l	10	<10	<10	**244**	**6930**	<10	<10	<10	<10	-	10
Aromatic > C10-C12	µg/l	10	<10	<10	<10	<200	<10	<10	<10	***13***	-	-
Aromatic > C12-C16	µg/l	10	<10	<10	<10	***879***	<10	<10	<10	***21***	-	-
Aromatic > C16-C21	µg/l	10	<10	<10	<10	***1380***	<10	<10	<10	<10	-	-
Aromatic > C21-C35	µg/l	10	<10	<10	***60***	***694***	<10	<10	<10	<10	-	-
Aromatic > C35-C44	µg/l	10	<10	<10	<10	<200	<10	<10	<10	<10	-	-
Aromatic > C10-C44	µg/l	10	<10	<10	**60**	**2960**	<10	<10	<10	**35**	-	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 4 RESULTS

The results of the Quarter 4 monitoring event for 2015 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 6.89 and 7.73, all within the EPA Interim guideline range of ≥6.5 to ≤9.5. Temperature measurements ranged from 9.7°C to 12.6°C and were below the EPA IGV of 25°C.

Field measurements of Electrical Conductivity levels ranged between 414 µS/cm and 1457 µS/cm. Two measurements of Electrical Conductivity were above the IGV of 1000 µS/cm at MW03 (1457 µS/cm) and MW04 (1357 µS/cm), but all however were below the upper GTV limit of 1875 µS/cm.

Satisfactory calibration of the Dissolved Oxygen meter was unable to be achieved on the day of monitoring. This resulted in a lack of field measurements.

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 laboratory limit of detections and associated GTVs and IGVs at all locations. MTBE was also below the laboratory limit of detection and IGV at all 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 at BH104B 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 (0.21 µg/l) and MW03 (0.986 µg/l). Total PAHs were above the GTV of 0.075 µg/l at MW04 (0.079 µg/l) but below the IGV. 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 previous Quarter 3 2015 monitoring event. However, PAHs were below the GTV limits at all locations during the previous Quarter 2 2015 monitoring event.

The results of the speciated polycyclic aromatic hydrocarbon analysis detected a number of different compounds in BH103, MW03 and MW04 above the laboratory limit of detection. However only Benzo(a)pyrene (0.108 µg/l) and Benzo(g,h,i)perylene (0.131 µg/l) in well MW03 were above their respective IGV limits of 0.01 µg/l and 0.05 µg/l.

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 2015 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 for 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 previous 2015 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 4 2015 monitoring event indicate that Chloroethane (7.8 µg/l) and 1,1-dichloroethene (4.1 µg/l) were detected in monitoring well MW04. 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. 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 4 2015 monitoring event. Detections in samples from the well BH104B were 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). TPH concentrations were also recorded in the aliphatic ranges C16-C35 (231 µg/l) and C35-C44 (14 µg/l) at BH103. TPH concentrations were also recorded in the aromatic ranges C21-C35 at BH103 (60 µg/l) and C10-C12 (13 µg/l) and C12-C16 (21 µg/l) at MW04.

The previous 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 2015 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

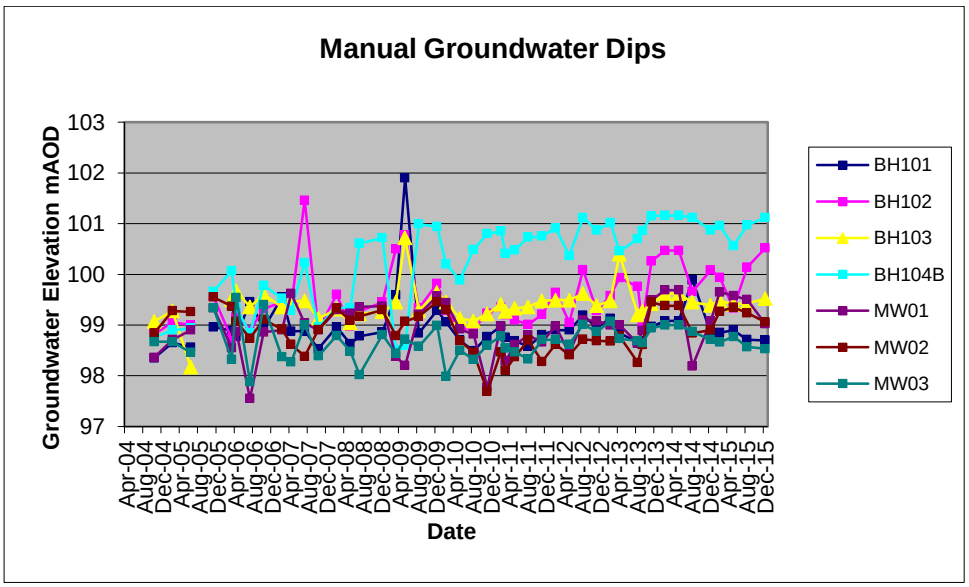


Figure 6.2 – Ground Elevation (mAOD) in Shallow Groundwater Monitoring Wells

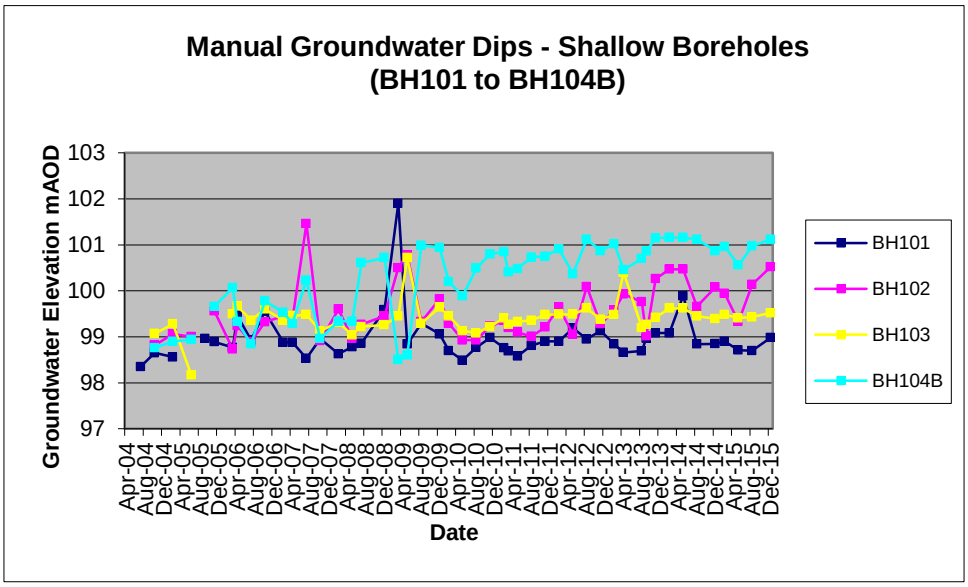
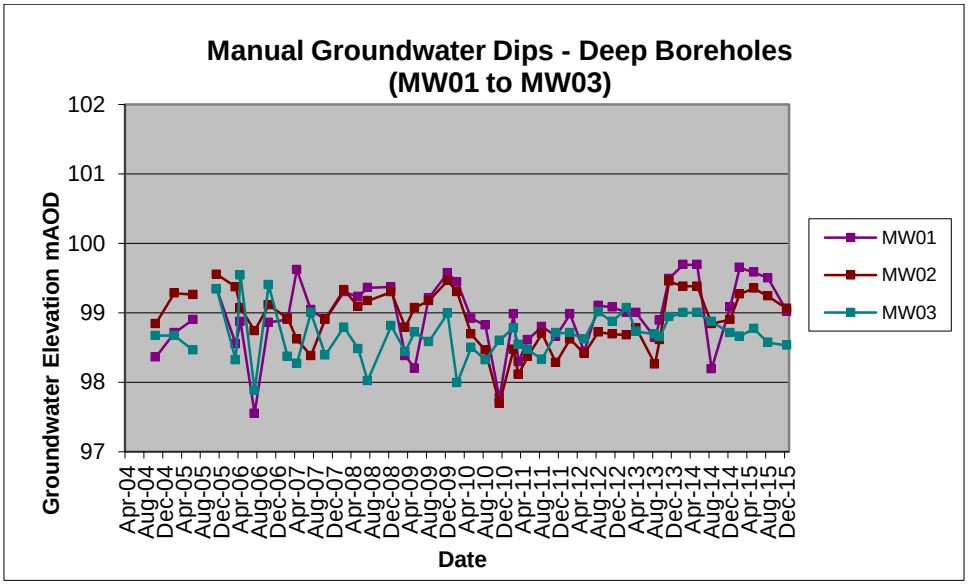


Figure 6.3 – Ground Elevation (mAOD) in Deep Groundwater Monitoring Wells



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 **6.7**.

Table 6.1 – Monthly Rainfall Data for Year 2009 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	113.4	29.2	32.6	102.4	69.0	65.4	152.4	100.9	41.8	127.8	215.5	73.7

Table 6.2 – Monthly Rainfall Data for Year 2010 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	71.5	48.0	80.7	49.0	51.4	37.7	93.6	25.5	108.7	68.9	87.7	52.2

Table 6.3 – Monthly Rainfall Data for Year 2011 for Oak Park, Carlow

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Rainfall (mm)	50.6	121.9	16.0	19.5	51.2	72.7	46.4	25.5	93.9	93.9	89.2	55.5

Table 6.4 – 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 6.5 – 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	0.9

Table 6.6 – 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 6.7 – 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

Note: Data for the most recent months are provisional.

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.

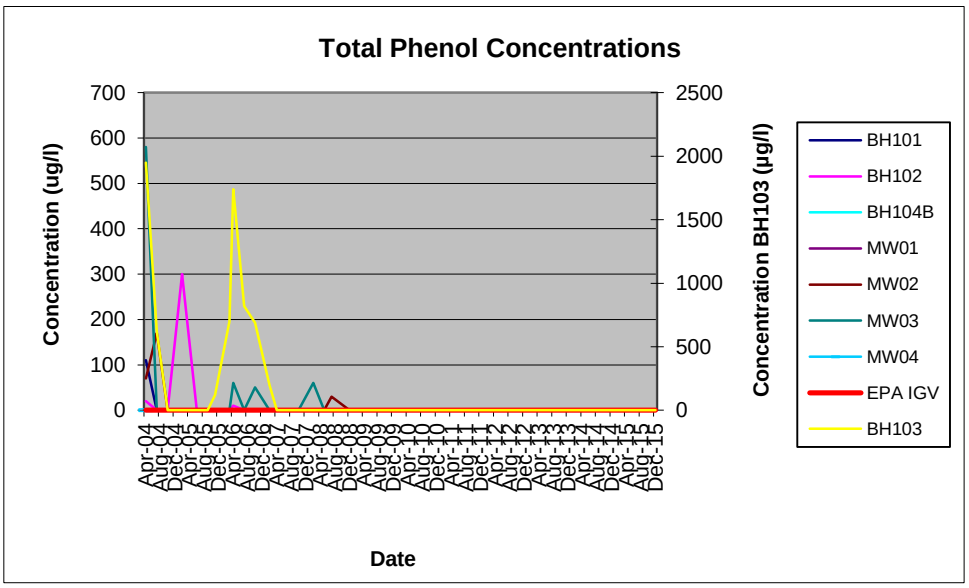
The data available within these reports has been reviewed and time series plots of key parameters have been compiled based on notable trends. Trends for phenols, petroleum hydrocarbons and chlorinated solvents have been plotted as outlined in the following sections.

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 2015 monitoring event.

Figure 6.4 – Phenol Concentrations in all Monitoring Wells



6.2.2 Polycyclic Aromatic Hydrocarbons (PAHs)

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 PAH was 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 previous Quarter 3 2015 monitoring event. Similarly, during the current Quarter 4 monitoring event, Total Polyaromatic Hydrocarbons were above the IGV limit of 0.1 µg/l at BH103 (0.21 µg/l) and MW03 (0.986 µg/l). Total PAHs were above the GTV of 0.075 µg/l at MW04 (0.079 µg/l) but below the IGV.

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

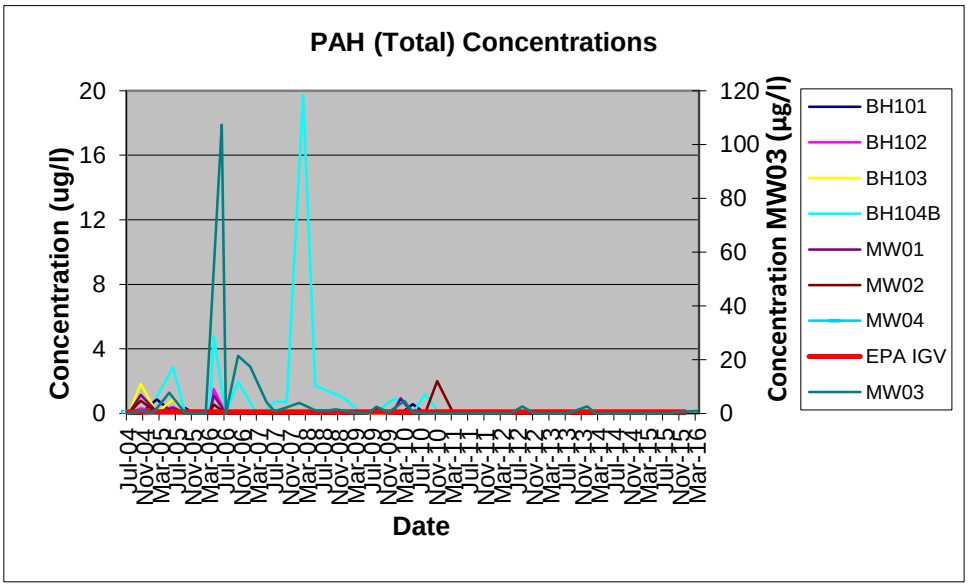


Figure 6.6 – Fluoroanthene Concentrations in all Monitoring Wells

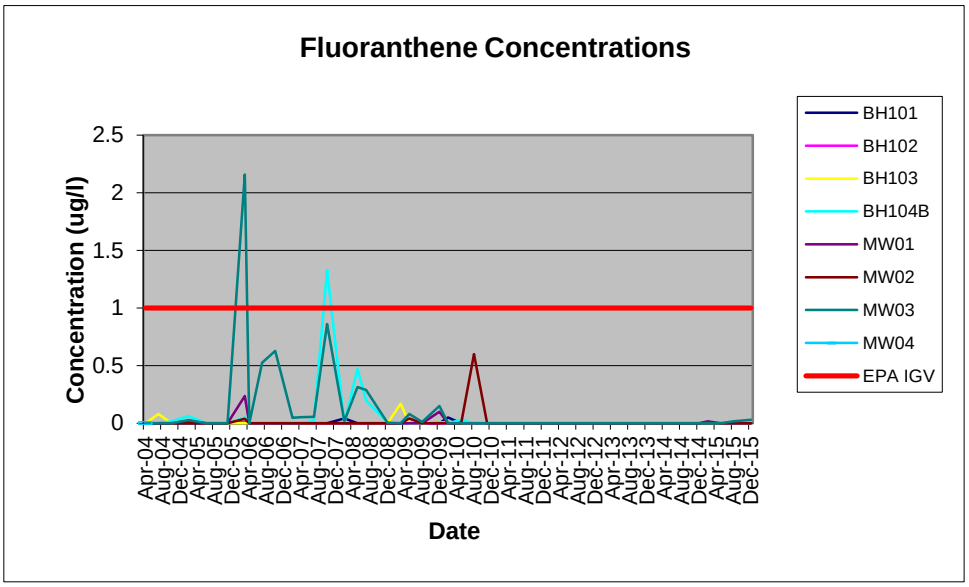
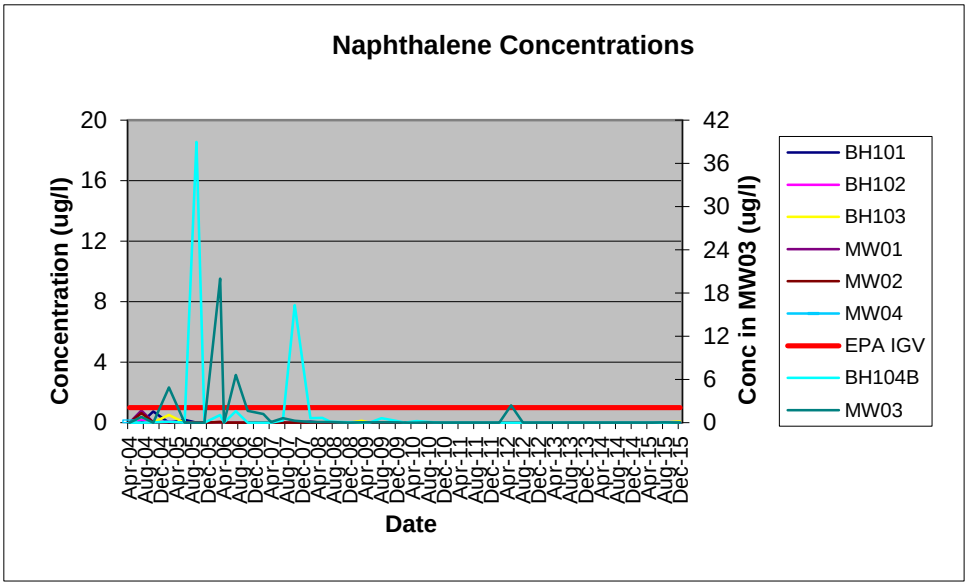


Figure 6.6 illustrates that **Fluoranthene** was previously detected above the IGV of 1.0 µg/l in groundwater monitoring wells BH104B (October 2007, 1.33 µg/l) and MW03 (March 2006, 2.158 µg/l) only. The remaining monitoring wells recorded concentrations below the IGV of 1.0 µg/l.

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. During the previous Quarter 3 monitoring event in 2015 Naphthalene was detected at BH101 (0.011 µg/l) and MW03 (0.031 µg/l), however both these detections were below the IGV limit of detection of 1.0 µg/l. Naphthalene was also detected during the current Quarter 4 2015 monitoring event at BH103 (0.095 µg/l) and at MW04 (0.067 µg/l). These detections were however also below the IGV limit.

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

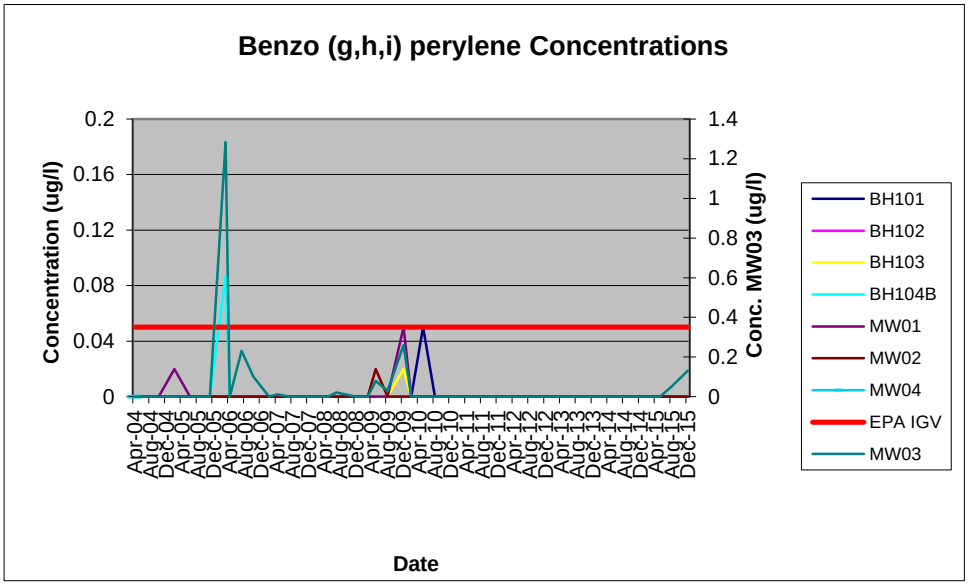


Figure 6.8 illustrates the concentrations of **Benzo(g,h,i)perylene** in all monitoring wells over time. Elevated concentrations above the IGV were recorded at BH104B (0.087 µg/l) on one occasion in March 2006.

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 current Quarter 4 2015 monitoring event (0.131 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.

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

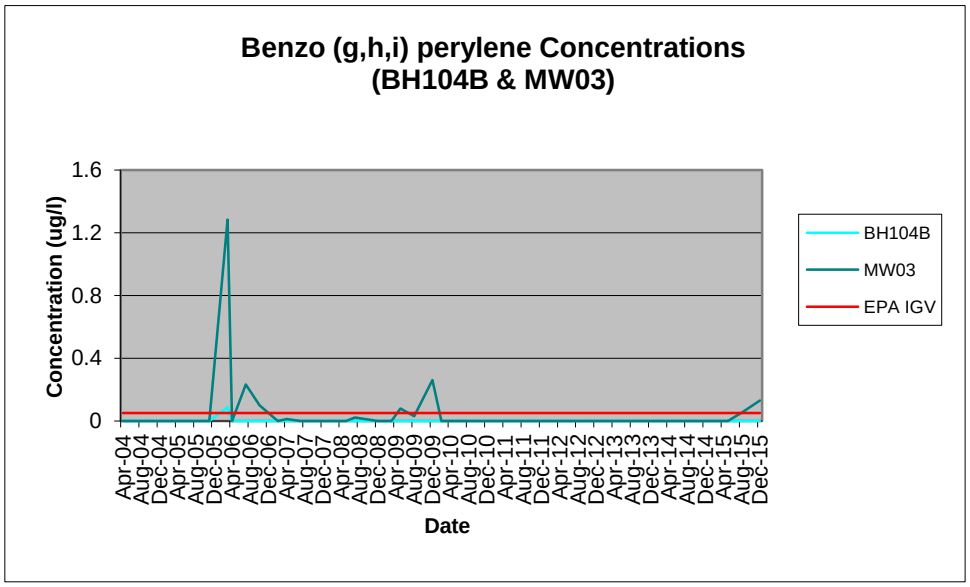
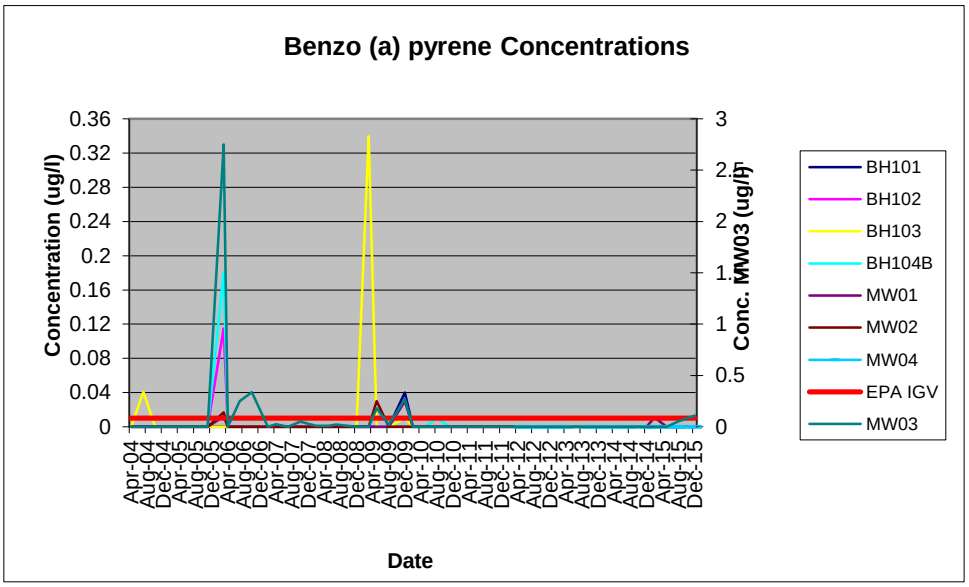


Figure 6.10 illustrates the concentrations of **Benzo(a)pyrene** in all groundwater monitoring wells and indicates that Benzo(a)pyrene has been detected historically in all boreholes above the IGV of 0.01 µg/l. Similarly with the above mentioned trends, the highest concentrations have been detected in 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 current Quarter 4 2015 monitoring event. Benzo(a)pyrene was also detected above the IGV at MW03 (0.052 µg/l) during the previous Quarter 3 2015 monitoring event. All other results of all monitoring events from 2010 to the current Quarter 4 2015 monitoring event did not detect other concentrations above the IGV.

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

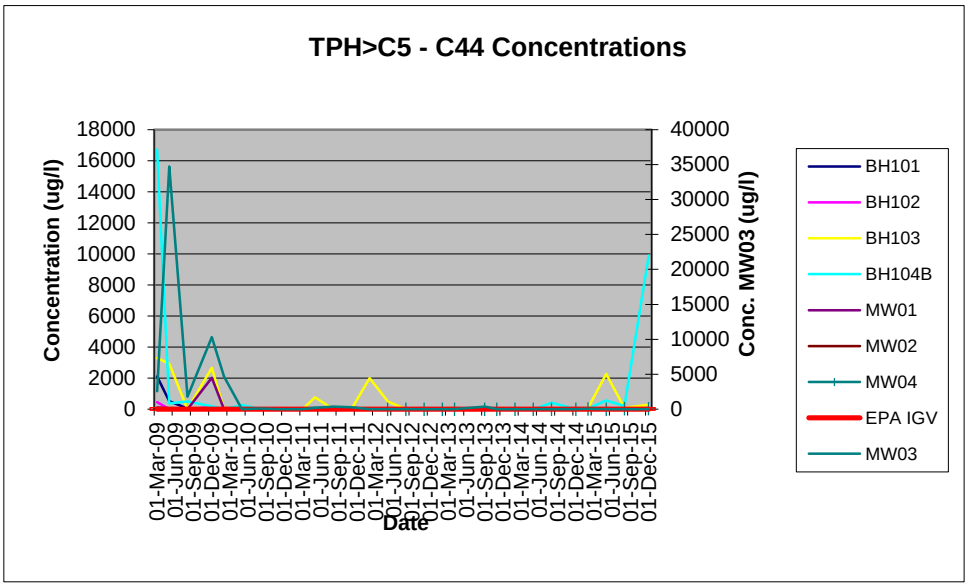


6.2.3 Petroleum Hydrocarbons (TPH)

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



During the Quarter 1, 2010 monitoring event, hydrocarbons were detected in borehole MW03. The predominant aliphatic carbon range in MW03 comprised of C16-C21 (1000 µg/l), C21-C35 (2300 µg/l) and C25-C44 (990 µg/l). The predominant aromatic carbon range in MW03 comprised of C16-C21 (220 µg/l) and C21-C35 (620 µg/l). No detections were observed at other locations.

During the Quarter 2 and Quarter 3, 2010 monitoring event, hydrocarbons were detected in borehole BH104B, with the predominant aliphatic carbon range comprising C12-C16 (130 µg/l and 12 µg/l) and C16-C21 (130 µg/l and 19 µg/l). The predominant aliphatic carbon range in MW03 during Quarter 3 2010 comprised of C16-C21 (35 µg/l) and C21-C34 (46 µg/l). The predominant aromatic carbon range detected during Quarter 2 2010 comprised of C12-C16 (21 µg/l) and C16-C21 (47 µg/l) at BH104B. No aromatic carbons were detected above the laboratory limit of detection at any wells in Quarter 3 2010.

During the Quarter 4, 2010 and Quarter 1, 2011 monitoring event, there were no detections of TPH concentrations above the laboratory limit of detection of 10 µg/l at any location. No aliphatic or aromatic carbons were detected above the laboratory limit of detection of 10 µg/l in all monitoring wells.

During the Quarter 2, 2011 monitoring event, hydrocarbons were detected in borehole BH103, BH104B and MW03. The predominant aliphatic carbon range comprised of C16-C21 (340 µg/l, 20 µg/l and 46 µg/l) and C21-C35 (420 µg/l, 96 µg/l and 150 µg/l in BH103, BH104B and MW03 respectively). The predominant aromatic carbon range also comprised of C16-C21 (78 µg/l, 52 µg/l and 50 µg/l) and C21-C35 (110 µg/l, 49 µg/l and 93 µg/l in BH103, BH104B and MW03 respectively).

During the Quarter 3 and Quarter 4 2011 monitoring event, hydrocarbons were detected in borehole MW03 only. The predominant aliphatic carbon range comprised of C10-C12 (18 µg/l and 22 µg/l), C12-C16 (57 µg/l and 51 µg/l), C16-C21 (35 µg/l and 85 µg/l) and C21-C35 (210 µg/l and 110 µg/l). The predominant aromatic carbon range comprised of C12-C16 (42 µg/l and 16 µg/l), C16-C21 (66 µg/l and 14 µg/l) and C21-C35 (45 µg/l and 91 µg/l).

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). No hydrocarbons were detected in MW03 during the current Quarter 1 monitoring event.

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 previous 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).

Some detections of TPH in both the aliphatic and aromatic range were observed during the current Quarter 4 2015 monitoring event. Detections in samples from the well BH104B were 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). TPH concentrations were also recorded in the aliphatic ranges C16-C35 (231 µg/l) and C35-C44 (14 µg/l) at BH103. TPH concentrations were also recorded in the aromatic ranges C21-C35 at BH103 (60 µg/l) and C10-C12 (13 µg/l) and C12-C16 (21 µg/l) at MW04.

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 8th December 2015 corresponding to Quarter 4 of 2015. 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 4 2015 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 (0.21 µg/l) and MW03 (0.986 µg/l).
- There were no detections of VOCs or SVOCs in the current monitoring event above the laboratory limits of detection, with the exception of Chloroethane (7.8 µg/l) and 1,1-dichloroethene (4.1 µg/l) which were detected in MW04; however this is still below the IGV of 30 µg/l for 1,1-dichloroethene and there is no GTV nor IGV for Chloroethane.
- Samples were analysed for speciated phenols to include chlorophenols and the results indicate that there were no detections above the laboratory limits of detection.
- Hydrocarbons in both aliphatic and aromatic range were observed during the current Quarter 4 2015 monitoring event. 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). TPH concentrations were also recorded in the aliphatic ranges C16-C35 (231 µg/l) and C35-C44 (14 µg/l) at BH103. TPH concentrations were also recorded in the aromatic ranges C21-C35 at BH103 (60 µg/l) and C10-C12 (13 µg/l) and C12-C16 (21 µg/l) at MW04. Hydrocarbons were detected at BH104B and BH103 in both the aliphatic and aromatic ranges, as well as in the aliphatic range at MW03 and aromatic range at MW04. 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. Hydrocarbons were not detected in any monitoring location during the Quarter 4 2014 monitoring event. Hydrocarbons were detected in BH104B in the aliphatic carbon ranges C12-C16, C16-C21 and C21-C35 during the Quarter 3, 2014 event. Previous to these events hydrocarbons were detected in boreholes BH104B and MW03 in the aliphatic carbon ranges during the Quarter 3, 2010 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 2

Environmental Protection Agency

Guidance to completing the PRTR workbook

PRTR Returns Workbook

Version 1.1.19

REFERENCE YEAR	2015

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	kcoll@enva.ie
AER Returns Contact Position	HSE Coordinator
AER Returns Contact Telephone Number	057867600
AER Returns Contact Mobile Phone Number	
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	0
User Feedback/Comments	
Web Address	www.enva.ie

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) ?	

This question is only applicable if you are an IPPC or Quarry site

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	13.18	13.18	0.0	0.0
08	Nitrogen oxides (NOx/NO2)	C	EN 14792:2005	Chemiluminescence	520.05	520.05	0.0	0.0
11	**Sulphur oxides (SOx/SO2)**	C	OTH	NDIR AG2 Non Dispersive Infra Red	86.13	86.13	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**		**Facility Total Capacity m3 per hour**	
			Method Code	**Designation or Description**		
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	172.4	172.4	0.0	0.0
79	Chlorides (as Cl)	C	OTH	APHA /AWWA Standard Methods	7417.0	7417.0	0.0	0.0
71	Phenols (as total C)	C	OTH	APHA /AWWA Standard Methods	60.69	60.69	0.0	0.0
13	Total phosphorus	C	OTH	APHA /AWWA Standard Methods	398.34	398.34	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	0.0036	0.0036	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	0.0	0.0	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	0.09	0.09	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	0.0608	0.0608	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.	10.81	10.81	0.0	0.0
240	Suspended Solids	C	OTH	APHA /AWWA Standard Methods	383.8	383.8	0.0	0.0
343	Sulphate	C	OTH	APHA /AWWA Standard Methods	551.08	551.08	0.0	0.0
306	**COD**	C	OTH	APHA /AWWA Standard Methods	17792.72	17792.72	0.0	0.0

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

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: M/C/E	Method Used: 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	08 01 11	Yes	114.16	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
Within the Country	08 01 11	Yes	0.83	waste paint and varnish containing organic solvents or other dangerous substances	D9	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
Within the Country	08 01 11	Yes	2.4	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 12	No	9.52	waste paint and varnish other than those mentioned in 08 01 11	R1	M	Weighed	Abroad	Geocycle ,38.152/BP	Rue de Courriere 49 Zoning Industrial de Feluy ,. ,. ,B 7181 Seneffe ,Belgium		
To Other Countries	08 01 12	No	37.71	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-RU	Noning Industriel d'Ehein,B-4480 Engis ,Belgium		
Within the Country	09 01 04	Yes	1.0	fixed solutions	D9	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	13 05 03	Yes	10.26	interceptor sludges	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 05	Yes	75.71	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	08 01 15	Yes	15.14	aqueous sludges containing paint or 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
Within the Country	13 05 07	Yes	20.12	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 05 07	Yes	98.16	oily water from oil/water separators	D10	M	Weighed	Abroad	Scori Lillebonne	Z1 Avenue de Port Jerome,76170 Lillebonne ,France	Scori Lillebonne,.,Z1 Avenue de Port Jerome,76170,Lillebonne,.,France	Z1 Avenue de Port Jerome,76170,Lillebonne,.,France
To Other Countries	13 07 03	Yes	180.34	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	6.9	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
Within the Country	13 08 02	Yes	14.81	other emulsions	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
Within the Country	06 13 02	Yes	2.0	spent activated carbon (except 06 07 02)	R1	M	Weighed	Offsite in Ireland	Enva ,W041-1	Smithstown Industrial estate ,.,Shannon ,Co. Clare,Ireland	Enva ,W041-1	Smithstown Industrial estate ,.,Shannon ,Co. Clare,Ireland
To Other Countries	15 01 10	Yes	62.4	packaging containing residues of or contaminated by dangerous substances	R1	M	Weighed	Abroad	Recyfuel S.A.,3200/61080/RGPED/2008/2/AP-RU	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
Within the Country	15 01 10	Yes	5.26	packaging containing residues of or contaminated by dangerous substances	D9	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
Within the Country	19 09 04	No	3.0	spent activated carbon	R13	M	Weighed	Offsite in Ireland	Enva ,W041-1	Smithstown Industrial estate ,.,Shannon ,Co. Clare,Ireland	Enva ,W041-1	Smithstown Industrial estate ,.,Shannon ,Co. Clare,Ireland
Within the Country	15 02 02	Yes	0.88	absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by 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	16 01 07	Yes	690.64	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
Within the Country	11 01 10	No	2.0	sludges and filter cakes other than those mentioned in 11 01 09	R13	M	Weighed	Offsite in Ireland	Enva ,W041-1	Smithstown Industrial estate ,.,Shannon ,Co. Clare,Ireland		
To Other Countries	16 01 15	No	149.3	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		
Within the Country	13 05 08	Yes	7.47	mixtures of wastes from grit chambers and oil/water separators	D9	M	Weighed	Offsite in Ireland	Enva W0196-1	JFK Road Naas Road,.,Dublin,Dublin 12,Ireland	Enva ,W041-1	Smithstown Industrial estate ,.,Shannon ,Co. Clare,Ireland
To Other Countries	16 05 04	Yes	25.98	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
Within the Country	13 07 03	Yes	7.82	other fuels (including mixtures)	D9	M	Weighed	Offsite in Ireland	Enva W0196-1	JFK Road Naas Road,.,Dublin,Dublin 12,Ireland	Enva ,W041-1	Smithstown Industrial estate ,.,Shannon ,Co. Clare,Ireland
Within the Country	16 05 06	Yes	7.0	laboratory chemicals, consisting of or containing dangerous substances, including mixtures of laboratory chemicals	D9	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
Within the Country	16 05 07	Yes	6.1	discarded inorganic chemicals consisting of or containing dangerous substances	D9	M	Weighed	Offsite in Ireland	Enva ,W041-1	Smithstown Industrial estate ,.,Shannon ,Co. Clare,Ireland	Enva ,W041-1	Smithstown Industrial estate ,.,Shannon ,Co. Clare,Ireland
Within the Country	16 05 08	Yes	14.9	discarded organic chemicals consisting of or 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	16 06 01	Yes	727.58	lead batteries	R4	M	Weighed	Abroad	Campine,Ovam Approved	Nijverheidsstraat 2 Belgium.,.,.,B- 2340 Beerse ,Belgium	Campine,Ovam Approved, Nijverheidsstraat 2 Belgium.,.,.,B- 2340 Beerse ,Belgium	Nijverheidsstraat 2 Belgium.,.,.,B- 2340 Beerse ,Belgium
Within the Country	16 06 04	No	1.68	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	146.02	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	16 10 01	Yes	12.66	aqueous liquid wastes containing dangerous substances	D9	M	Weighed	Offsite in Ireland	Enva W0196-1	JFK Road Naas Road,.,Dublin,Dublin 12,Ireland		
Within the Country	17 05 04	No	2974.28	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
Within the Country	20 01 13	Yes	6.18	solvents	R2	M	Weighed	Offsite in Ireland	Soltec Ltd,W0041-01	Mullingar business park,Mullingar,.,Westmeath,Ireland		
To Other Countries	19 02 08	Yes	69.89	liquid combustible wastes containing dangerous substances	R1	M	Weighed	Abroad	Recyfuel S.A.,3200/61080/RGPED/2008/2/AP-RU	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	366.74	solid combustible wastes containing dangerous substances	R1	M	Weighed	Abroad	Recyfuel S.A.,3200/61080/RGPED/2008/2/AP-RU	Noning Industriel d'Ehein,B-4480 Engis ,Belgium	Recyfuel S.A.,3200/61080/RGPED/2008/2/AP-RU	Noning Industriel d'Ehein,B-4480 Engis ,Belgium
To Other Countries	08 01 11	Yes	445.95	waste paint and varnish containing organic solvents or other dangerous substances	R1	M	Weighed	Abroad	Recyfuel S.A.,3200/61080/RGPED/2008/2/AP-RU	Noning Industriel d'Ehein,B-4480 Engis ,Belgium	Lindenschmidt , 04 714 98089	Krombacher Strasse 42-46 ,.,Kreutzal,D57223 ,Germany
To Other Countries	19 12 11	Yes	203.6	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	158.34	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
To Other Countries	19 12 11	Yes	14.88	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 14	Yes	1.44	acids	D9	M	Weighed	Offsite in Ireland	Enva ,W041-1	Smithstown Industrial estate ,.,Shannon ,Co. Clare,Ireland	Enva ,W041-1	Smithstown Industrial estate ,.,Shannon ,Co. Clare,Ireland
Within the Country	20 01 19	Yes	0.04	pesticides	R13	M	Weighed	Offsite in Ireland	Enva ,W041-1	Smithstown Industrial estate ,.,Shannon ,Co. Clare,Ireland	Enva ,W041-1	Smithstown Industrial estate ,.,Shannon ,Co. Clare,Ireland
Within the Country	20 01 21	Yes	2.36	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	5.82	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		
Within the Country	20 01 28	No	0.87	paint, inks, adhesives and resins other than those mentioned in 20 01 27	R13	M	Weighed	Offsite in Ireland	Enva ,W041-1	Smithstown Industrial estate ,.,Shannon ,Co. Clare,Ireland		
Within the Country	20 01 25	No	76.18	edible oil and fat	R13	M	Weighed	Offsite in Ireland	AOS,WCP-KK-12-583-01	Archerstown,Thurles,Tipperary ,Ireland		
To Other Countries	20 01 27	Yes	0.04	paint, inks, adhesives and resins containing dangerous substances	R13	M	Weighed	Abroad	Recyfuel S.A.,3200/61080/RGPED/2008/2/AP-RU	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	25.04	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-RU	Noning Industriel d'Ehein,B-4480 Engis ,Belgium		
Within the Country	**20 01 40**	**No**	326.26	metals	R4	M	Weighed	Offsite in Ireland	MSM Recycling,WFP-TN-11-0003-02	Annagh,.,Birr,Co. Tipperary,Ireland		
To Other Countries	15 02 02	Yes	41.96	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-RU	Noning Industriel d'Ehein,B-4480 Engis ,Belgium		
To Other Countries	19 12 11	Yes	2.31	other wastes (including mixtures of materials) from mechanical treatment of waste containing dangerous substances	R1	M	Weighed	Abroad	Recyfuel S.A.,3200/61080/RGPED/2008/2/AP-RU	Noning Industriel d'Ehein,B-4480 Engis ,Belgium		

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

Link to previous years waste data
Link to previous years waste summary data & percentage change
Link to Waste Guidance

Appendix 3

Air I Noise I Water I Soil I Environmental
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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:	**3520-15-01**
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

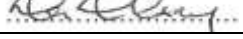
A visual inspection was carried out on the bund to determine if there were any cracks, fissures or unacceptable surface continuity between the bund walls.

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**

KAVANAGH RYAN & ASSOCIATES LIMITED.
Unit 48, The Egan Centre, Dargle Road, Bray, Co. Wicklow.
Tel: 01-2765661 E-mail: kmryan@eircom.net web site: www.kavanaghryan.com

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.

KAVANAGH RYAN & ASSOCIATES LIMITED.
Unit 48, The Egan Centre, Dargle Road, Bray, Co. Wicklow.
Tel: 01-2765661 E-mail: kmryan@eircom.net web site: www.kavanaghryan.com

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.

Appendix 4

WRIGHT ENVIRONMENTAL SERVICES

CONFIDENTIAL REPORT

Client

Enva Ireland Ltd

Clonminam Industrial Estate

Portlaoise

Co. Laois

Attn. Mr. Kevin Coll

Title

Annual Environmental Noise Survey 2015

Enva Ireland Ltd. – Portlaoise

EPA Waste Licence Reg. No. 184-1

Report Ref:	1530	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:	29th January 2016

CONTENTS PAGE

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 19th (day and night) and 21st October (day) 2015.

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. Appendix IV presents the 1/3 octave band analysis of the noise at monitoring locations.

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 19th (day and night) and 21st October (day) 2015. The following noise monitoring was carried out.

	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**

Noise levels were above the criterion levels at N2 (boundary location) during the night time survey. Neighbouring industrial noise and distant traffic were the dominant noise sources at this location during the survey. The Enva boiler came on occasionally however this was much quieter than the extraneous noise. It is therefore concluded that the elevated noise levels at this location was attributable to extraneous noise and not Enva.

The noise was perceived at each of the monitoring locations to investigate the presence of tones. No tones were subjectively identified from Enva. Using the sound level meter, one third octave band analysis of the noise was also carried out at the boundary locations. No tones were identified using the one third octave band analysis method.

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).

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 Table 1 to 5 below along with appropriate comments regarding noise in the monitoring environment.

Table 1

N1 - Monitoring Location

Date	Start Time t = 30mins	L_{eq} (dBA)	L_1 (dBA)	L_{10} (dBA)	L_{90} (dBA)	Comments	
19.10.2015	16:40	**53**	62	55	45	Enva activity included: vehicle movement. Offsite Noise: 3 trains and 4 cars pass nearby, distant traffic noise and construction noise (drilling) in neighbouring facility are dominant noise (in absence of vehicle movement etc).	DAY
21.10.2015	11:38	**52**	60	53	46	Enva activity included: vehicle movement (3 HGVs in/out), hand held tools being used. Offsite Noise: 1 trains pass nearby, distant traffic noise.	
21.10.2015	12:11	**50**	55	52	46	Enva activity included: vehicle movement (1 HGVs in/out), hand held tools being used. Offsite Noise: 1 trains pass nearby, distant traffic noise, construction noise (drilling) in neighbouring facility.	
19.10.2015	23:33	**44**	53	46	41	Traffic and industrial noise to the south is dominant. Enva activity: very low hum from sorting area	NIGHT
20.10.2015	00:03	**44**	49	45	41	Traffic and industrial noise to the south is dominant. Enva activity: very low hum from sorting area	

Table 2

N2 - Monitoring Location

Date	Start Time t = 30mins	L_{eq} (dBA)	L_1 (dBA)	L_{10} (dBA)	L_{19} (dBA)	Comments	
19.10.2015	13:14	**52**	59	53	50	Onsite noise/activity: low hiss from tank farm, vehicle movements (1 HGV). Offsite noise/activity: HGV movement and hum from air handling unit in neighbouring facility. Distant traffic noise, train beeps in distance.	
19.10.2015	13:44	**55**	64	58	50	Onsite noise/activity: vehicle movements (1 car, 2 vans, forklift). Offsite noise/activity: HGV and car movement and hum from air handling unit in neighbouring facility. Distant traffic noise.	DAY
19.10.2015	14:15	**56**	68	58	51	Onsite noise/activity: boiler, low hiss from tank farm, vehicle movements (2 HGV). Offsite noise/activity: HGV movement and hum from air handling unit in neighbouring facility. Distant traffic noise, helicopter overhead.	
19.10.2015	22:12	**52**	58	52	50	Dominant noise industrial facility and distant traffic to the south, helicopter passes overhead. Boiler noise audible onsite occasionally.	
19.10.2015	22:42	**51**	54	52	51	Dominant noise industrial facility and distant traffic to the south. Boiler noise audible onsite occasionally.	NIGHT

Table 3

N3 - Monitoring Location

Date	Start Time t = 30mins	L_{eq} (dBA)	L_1 (dBA)	L_{10} (dBA)	L_{90} (dBA)	Comments	
19.10.2015	14:35	**45**	58	46	36	Onsite noise/activity: activity in sorting area, forklift in distance. Distant traffic noise. 3 trains pass.	DAY
19.10.2015	15:15	**49**	54	43	34	Onsite noise/activity: activity in sorting area, forklift in distance. Distant traffic noise. 2 trains pass. train beeps.	
19.10.2015	15:46	**45**	58	43	35	Onsite noise/activity: activity in sorting area, forklift in distance. Distant traffic noise. 2 trains pass.	
19.10.2015	22:20	**37**	42	38	34	Dominant noise: Distant traffic noise and train passess. No noise audible from Enva.	NIGHT
19.10.2015	22:50	**37**	43	38	34	Dominant noise: Distant traffic noise and train passess. No noise audible from Enva.	

Table 4

N4 - Monitoring Location

Date	Start Time t = 30mins	L_{eq} (dBA)	L_1 (dBA)	L_{10} (dBA)	L_{90} (dBA)	Comments	
21.10.2015	13:40	**57**	66	60	48	Dominant noise: crane movement and alarm in train yard, distant traffic is dominant is absence of passing traffic. Traffic: approximately 50 cars, 20 vans pass, 1 HGVs. Enva is not audible at this location.	DAY
21.10.2015	14:10	**55**	65	58	47	Dominant noise: crane movement and alarm in train yard, distant traffic is dominant is absence of passing traffic. Traffic: approximately 40 cars, 20 vans pass. Enva is not audible at this location.	
21.10.2015	14:41	**56**	66	60	46	Dominant noise: crane movement and alarm in train yard, distant traffic is dominant is absence of passing traffic. Traffic: approximately 50 cars, 15 vans pass. Enva is not audible at this location.	
19.10.2015	00:15	**39**	45	40	35	Dominant noise: distant traffic and industrial noise to the south. Enva is not audible at this location.	NIGHT
19.10.2015	00:45	**38**	44	39	34	Dominant noise: distant traffic and industrial noise to the south. Enva is not audible at this location.	

Table 5

N5 - Monitoring Location

Date	Start Time t = 30mins	L_{eq} (dBA)	L_1 (dBA)	L_{10} (dBA)	L_{90} (dBA)	Comments	
19.10.2015	16:25	**53**	62	54	44	Distant traffic noise and drilling in neighbouring facility dominant noise. 4 cars and 3 trains pass nearby. Audible Enva activity onsite: vehicle movement (5 HGVs in/out).	DAY
21.10.2015	10:52	**52**	63	53	46	Distant traffic noise and drilling in neighbouring facility dominant noise.1 train passes nearby. Audible Enva activity onsite: forklift, sawing, vehicle movement (3 HGVs in/out).	
21.10.2015	11:24	**51**	59	52	47	Distant traffic noise and drilling in neighbouring facility dominant noise. 1trains pass nearby. Audible Enva activity onsite: vehicle movement (1 HGVs in/out).	
19.10.2015	23:34	**44**	55	46	40	Industrial noise to the south and traffic to the west dominant, 1 train passes. No noise audible from Enva.	NIGHT
19.10.2015	00:04	**43**	50	45	40	Industrial noise to the south and traffic to the west dominan. No noise audible from Enva.	

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 above the criterion levels at N2 (boundary location) during the night time survey. Neighbouring industrial noise and distant traffic were the dominant noise sources at this location during the survey. The Enva boiler came on occasionally however this was much quieter than the extraneous noise. It is therefore concluded that the elevated noise levels at this location was attributable to extraneous noise and not Enva.

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 perceived at each of the monitoring locations to investigate the presence of tones. No tones were subjectively identified from Enva. Using the sound level meter, one third octave band analysis of the noise was also carried out at the boundary locations. No tones were identified using the one third octave band analysis method. The one third octave band analysis is presented in Appendix IV.

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. 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. A series of 1/3 Octave Band level measurements were simultaneously taken using the Sound Level Analyser and this data was used to evaluate the presence of tones. This analysis is presented in Appendix IV.

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
19.10.2015 13:00	11	92	W	2.1	Dry – no precipitation.
19.10.2015 16:00	12	88	W	3.6	Dry – no precipitation.
19.10.2015 23:00	6	95	SW	3.6	Dry – no precipitation.
21.10.2015 12:30	14	94	W/SW	4.6	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:

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

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

INSTRUMENTATION AND EXTERNAL CALIBRATION DETAILS

Instrumentation:

Pulsar Model 33 , Type 1 Real Time Sound Level Meter, with half inch condenser microphone, Serial Number T223417. On-site calibrations were carried out before and after sampling with a Pulsar Calibrator – model 100B, Serial Number: 42171.

B&K Type 2250 Light, Type 1 Real Time Sound Level Meter, with half inch condenser microphone, Serial Number 2754170. On-site calibrations were carried out before and after sampling with a Pulsar Calibrator – model 100B, Serial Number: 42171.

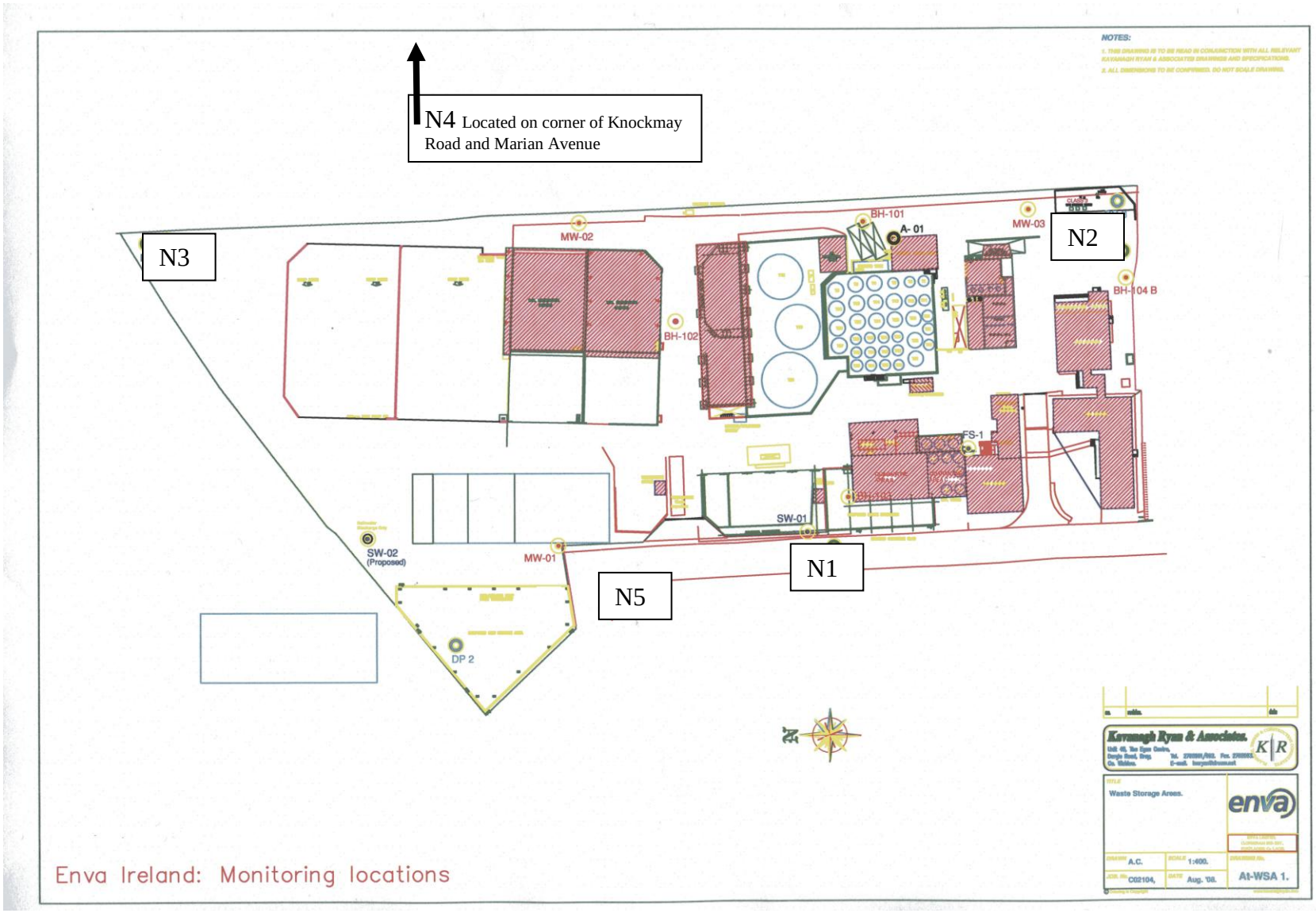
External Calibration:

External Calibration of instrumentation was undertaken by Pulsar Instruments Plc:

Unit	Calibration Date	Calibration Certificate Number
Pulsar Model 33 Sound Level Meter Serial No. T223417	10th February 2015	225812
B&K Type 2250 Light Sound Level Meter SLM - Serial No. 3001350 Microphone – Serial No. 2778447	10th October 2014	CDK1131010
Calibrator – Serial No. 42171	10th February 2015	225813

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
MW-03
BH-102
BH-104 B
FS-1
SW-01
SW-02
(Proposed)
MW-01
DP 2
Kavanagh Ryan & Associates.
Waste Storage Areas.
enva
A.C.
1:400.
C02104,
Aug. '08.
A1-WSA 1.
Enva Ireland: Monitoring locations

APPENDIX IV

1/3 Octave Band Analysis (OBA)

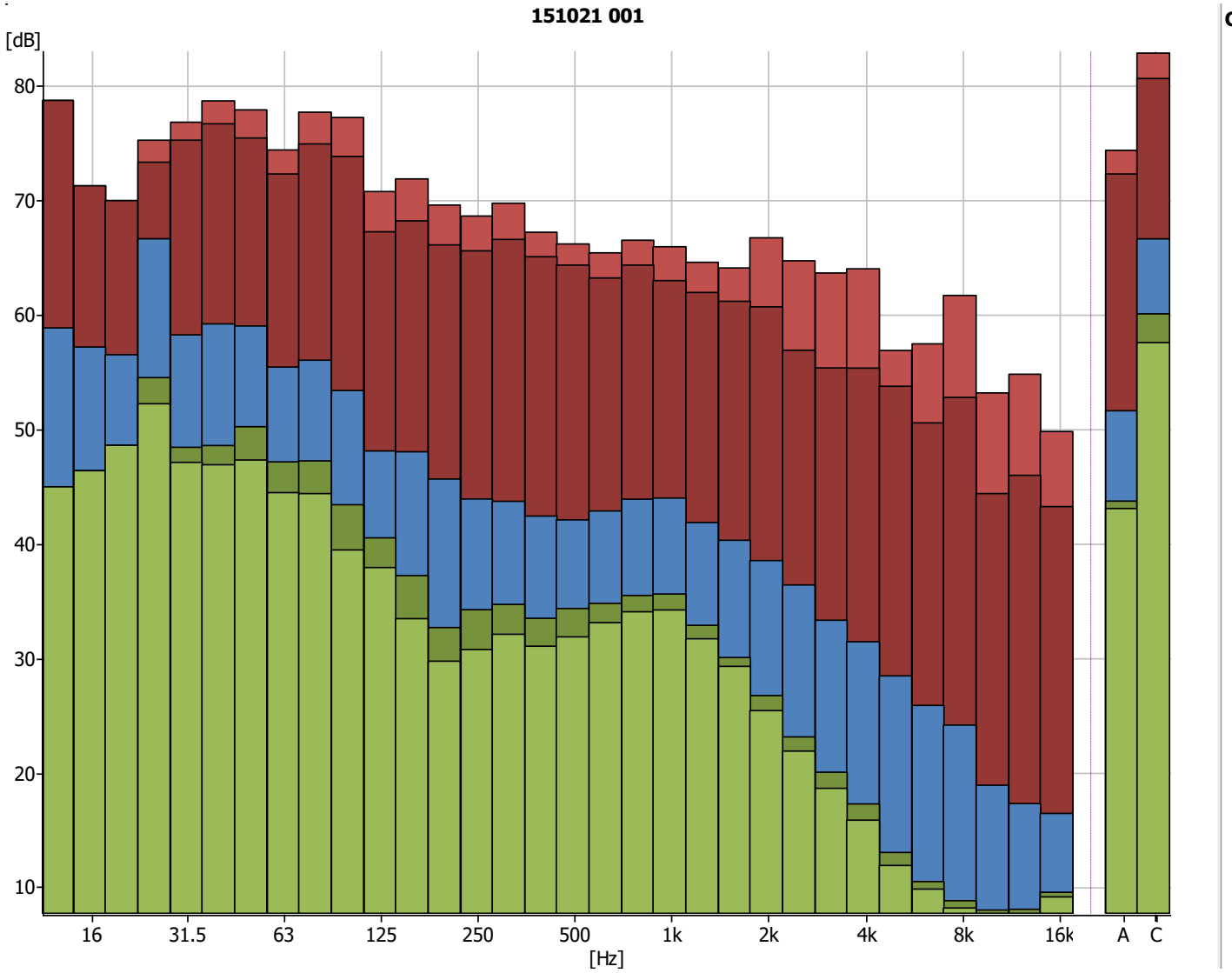


Figure 1: N 1 - Daytime

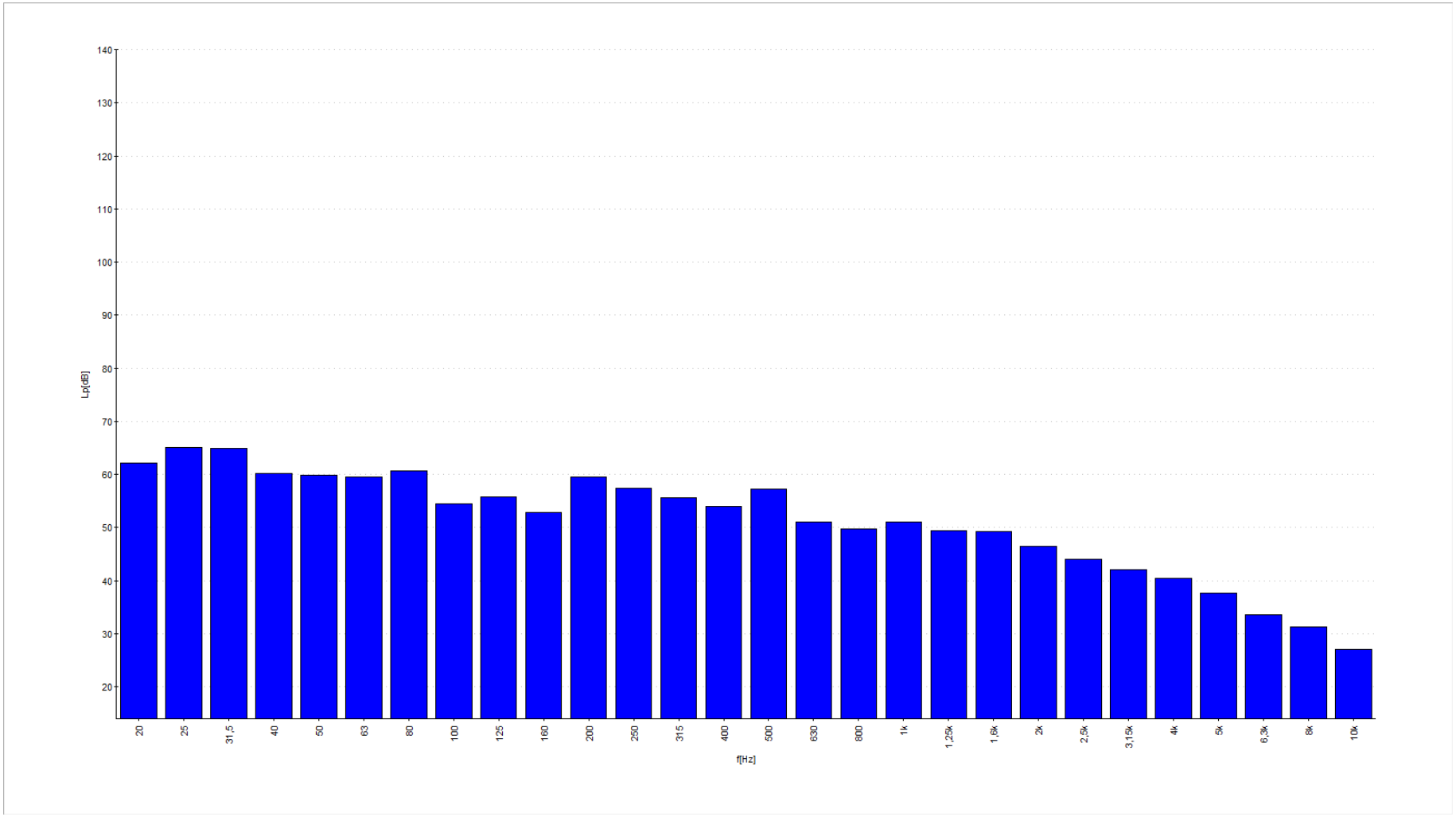


Figure 2: N 2 - Daytime

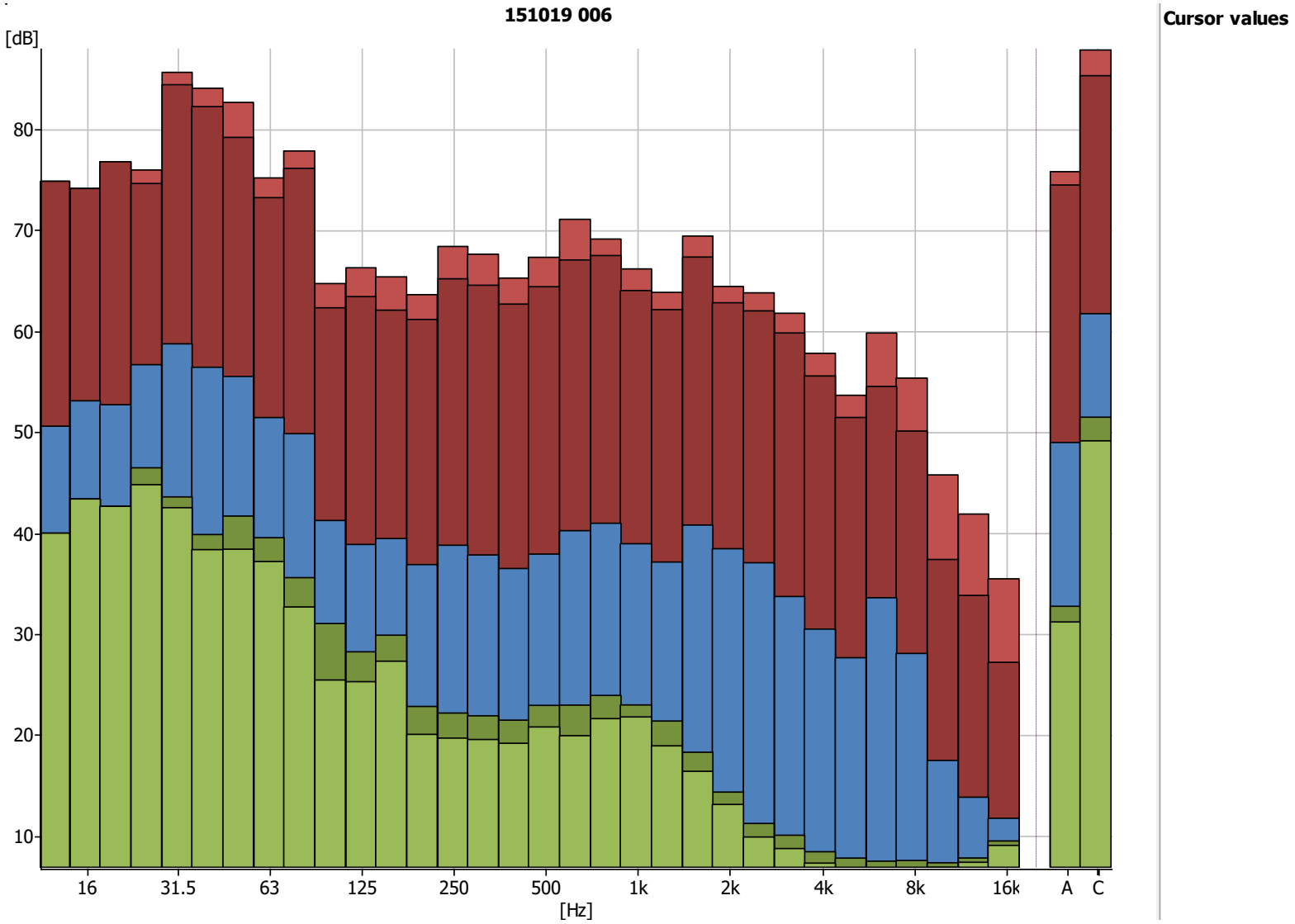


Figure 3: N 3 - Daytime

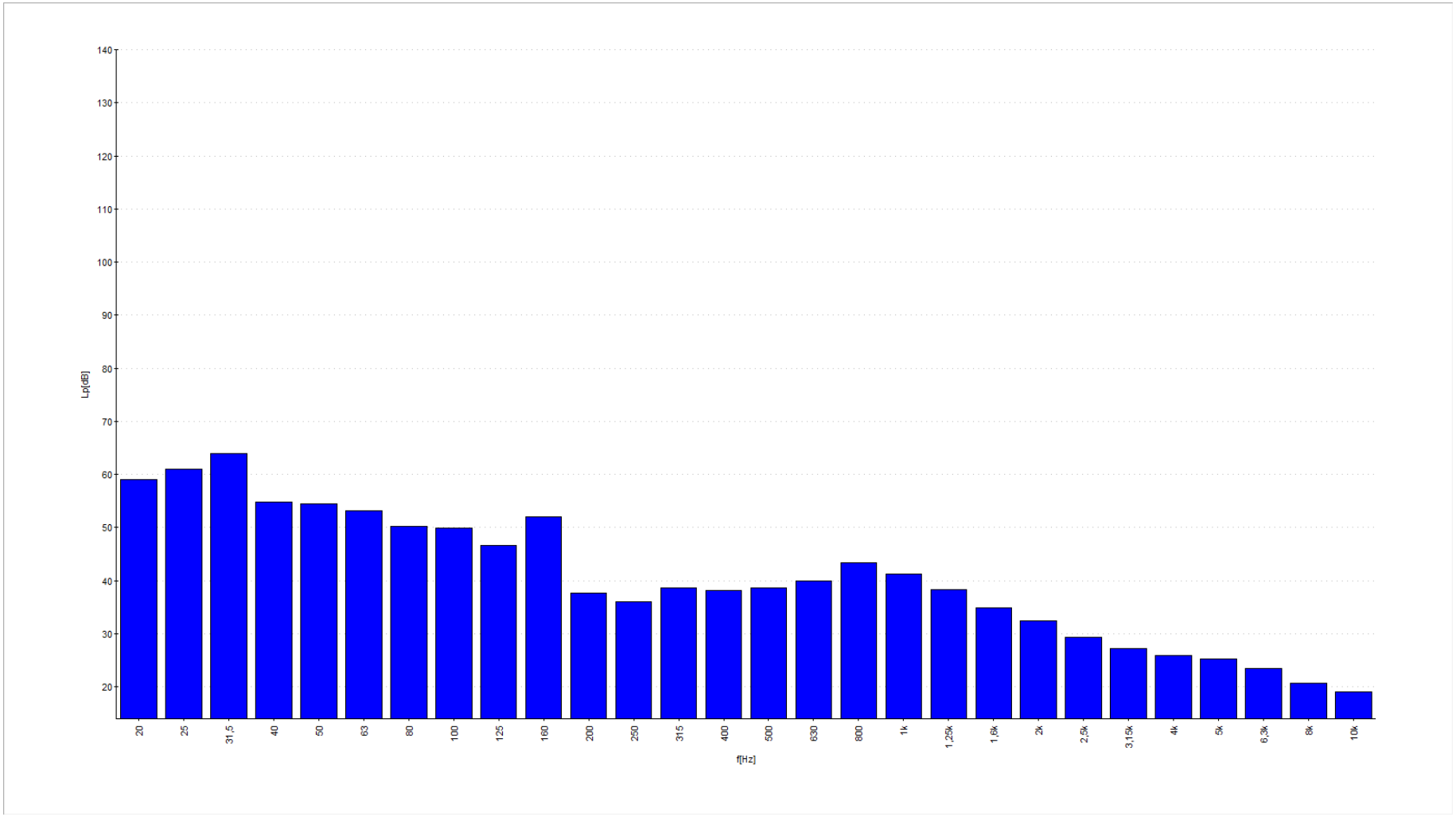


Figure 4: N 5 – Day time

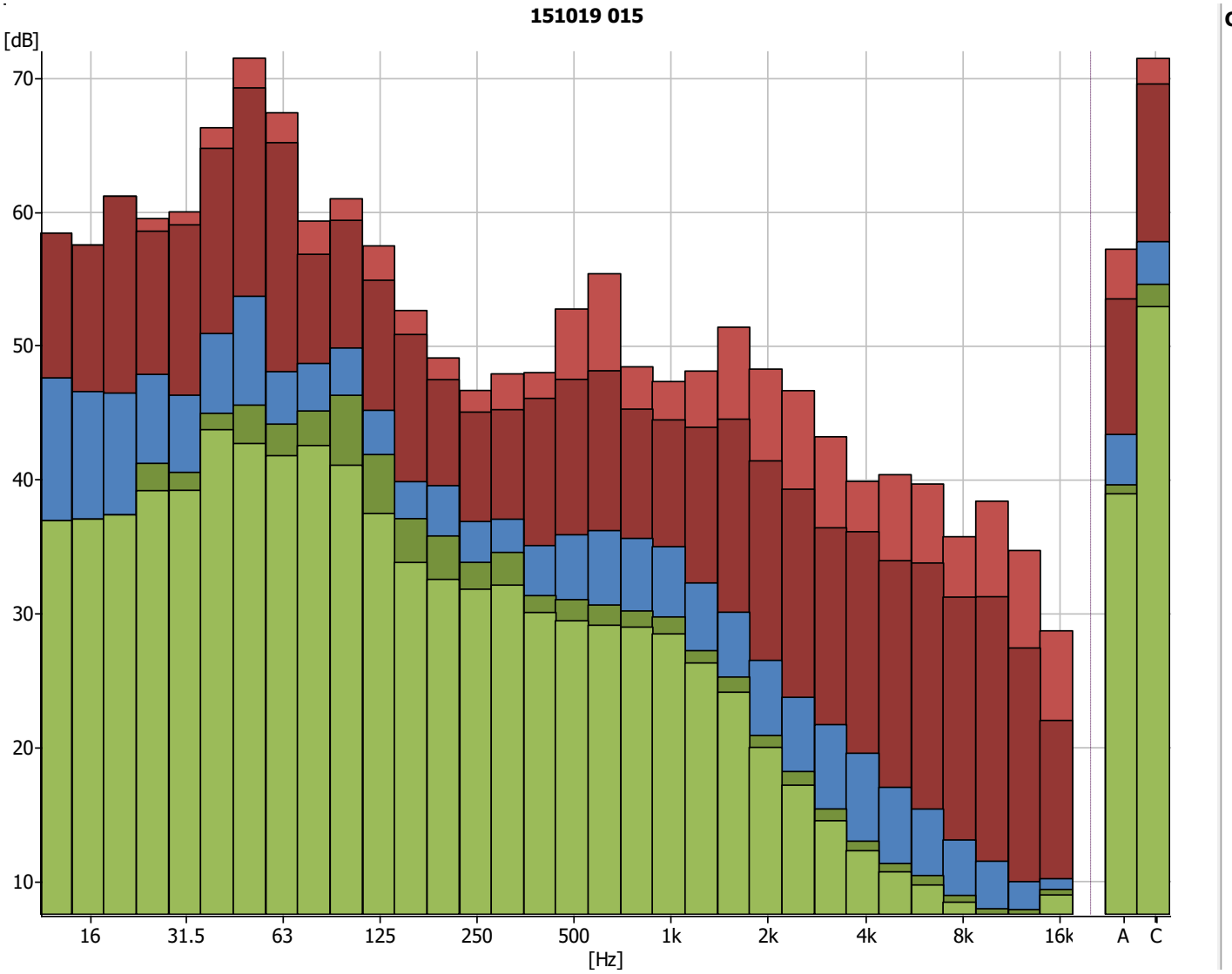


Figure 5: N 1 – Night time

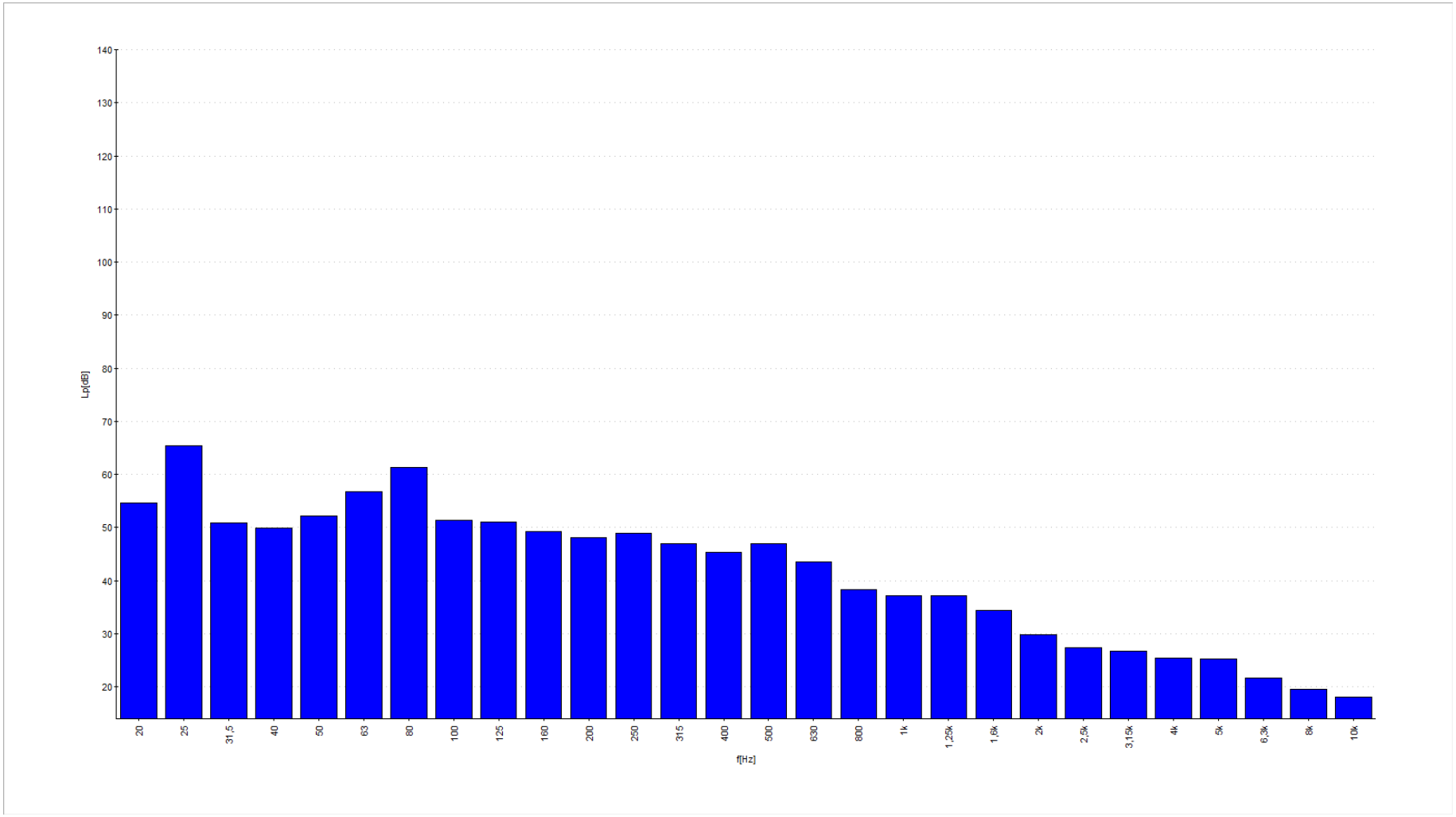


Figure 6: N 2 – Night time

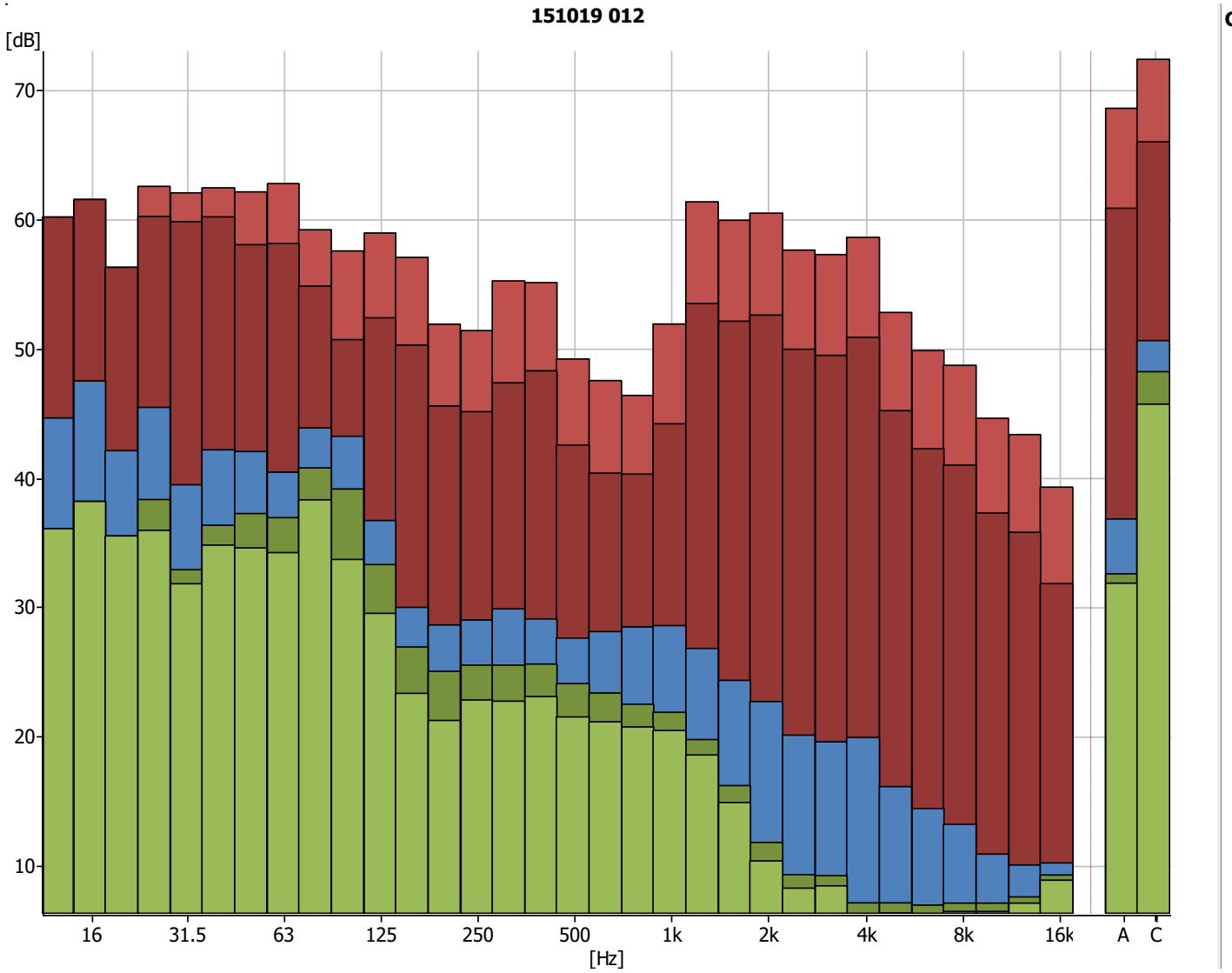


Figure 7: N 3 – Night time

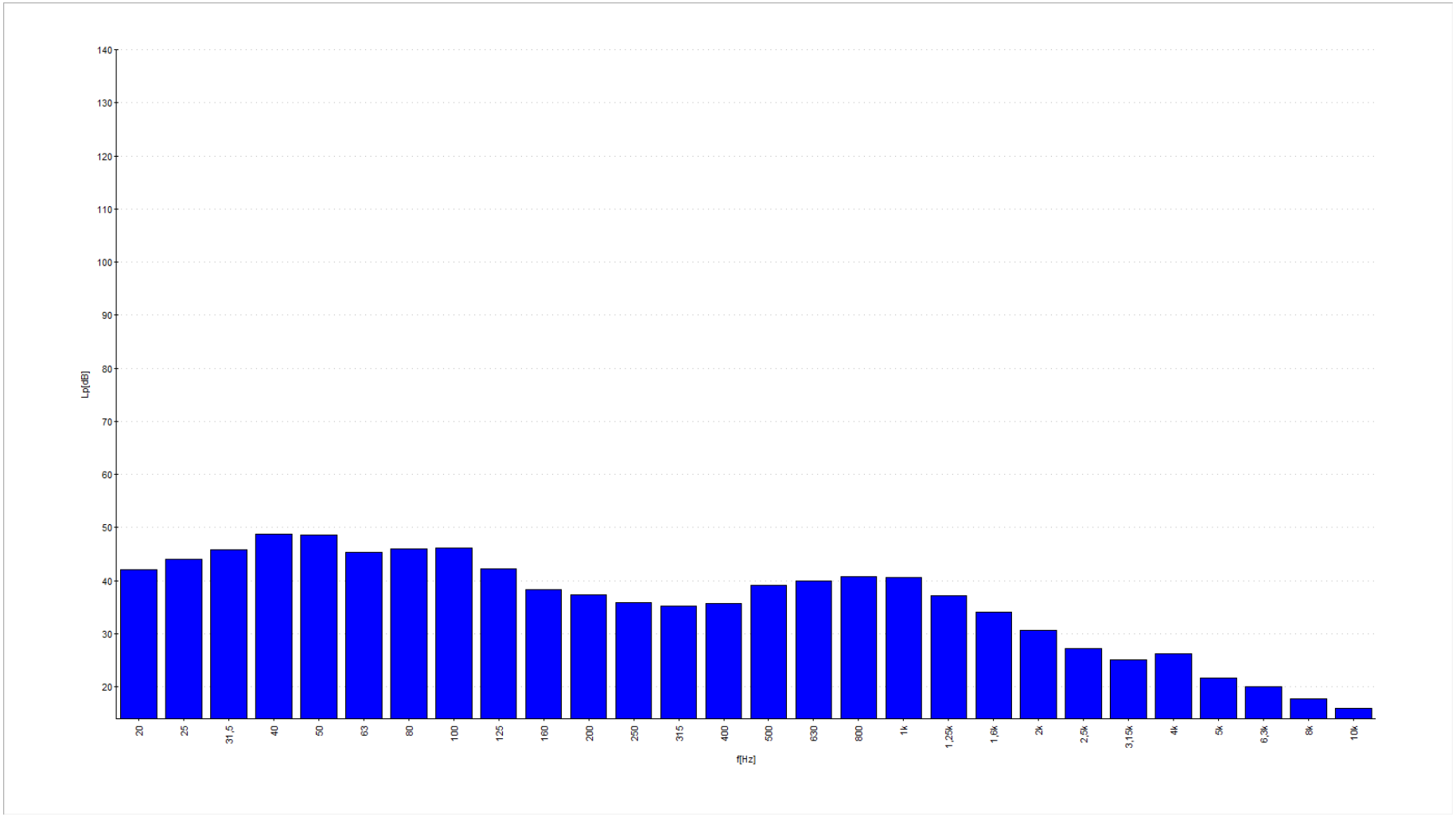


Figure 8: N 5 – Night time

Appendix 5

Report Title	Air Emissions Compliance Monitoring Emissions Report
Company address	Air Scientific Ltd., 40 Coolraine Heights, Old Cratloe Road, Limerick
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	19-10-215
Job Reference Number	ENVATL6191015
Report Written By	Mr Gregory Dempsey
Report Approved by	Mr Mark McGarry
Stack Testing Team	Danial Mullins
Report Date	24-11-2015
Report Type	Test Report Compliance Monitoring
Version	1
Signature of Approver	**Operations Manager**

Opinions and interpretations expresses herein will be outside the scope of Air Scientific Limited INAB accreditation.

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 determine emission concentrations from the boiler.

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

A01	$mg.m^{-3}$
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

A01	Concentration				
Parameter	**Units**	**Result**	**MU +/-**	**Limit**	**Compliant**
Carbon Monoxide (CO)	$mg.m^{-3}$	2.8	2.2	-	-
Oxides of Nitrogen (NOx) as NO_2	$mg.m^{-3}$	110.5	8.5	-	-
Sulphur Dioxide (SO_2)	$mg.m^{-3}$	18.3	9.9	-	-
Boiler Efficiency	%	92	-	-	-

Accreditation details

Air Scientific Limited	INAB Number: 319T

Executive Summary

Process details

Stack Name	Boiler 1
Process status	Normal
Capacity (per/hour) (if applicable)	90% Capacity
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	No

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 ASLLK12EQ536 ASLLK14EQ511 ASLLK14EQ514 ASLLK14EQ517
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	

Sampling Deviations

Parameter	Deviation
Carbon Monoxide (CO)	None
Oxides of Nitrogen (NOx) as NO_2	None
Sulphur Dioxide (SO2)	None
Oxygen (%)	None

Reference Documents

Risk Assessment (RA)	SOP 1011
Site Review (SR)	SOP 1015
Site Specific Protocol (SSP)	SOP 1015

Suitability of Sample Location

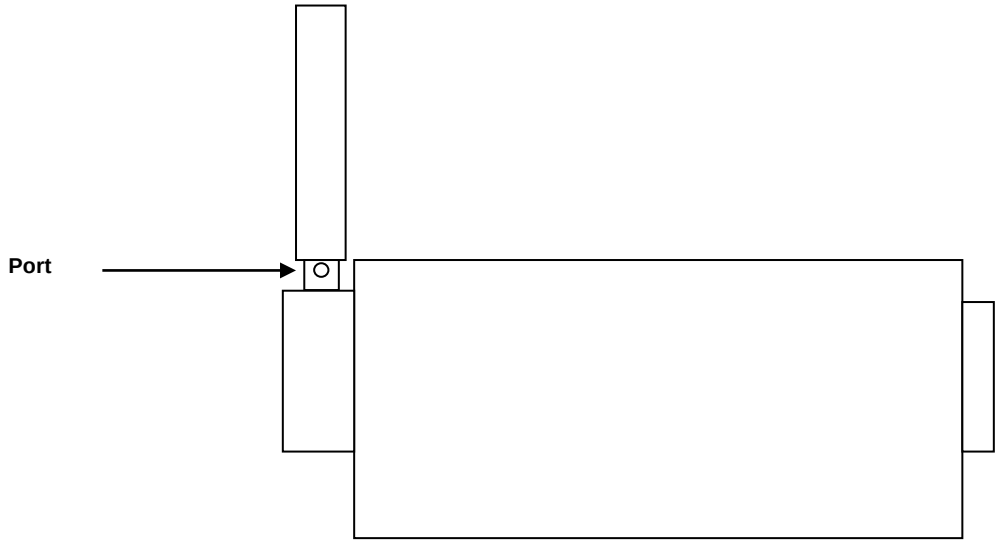
General Information	A01
Permanent/Temporary	Permanent
Inside/ Outside	Inside

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	Yes	-
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



1. APPENDICES

Appendix I Monitoring Personnel & Equipment

Stack Emissions Monitoring Personnel

Team Leader	**Name**	Daniel Mullins
	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
Client:	Enva
Test Date:	19/10/2015
Stack Name	A01

Reference Conditions

Measured Oxygen	5.1	%
Reference Oxygen	3	%

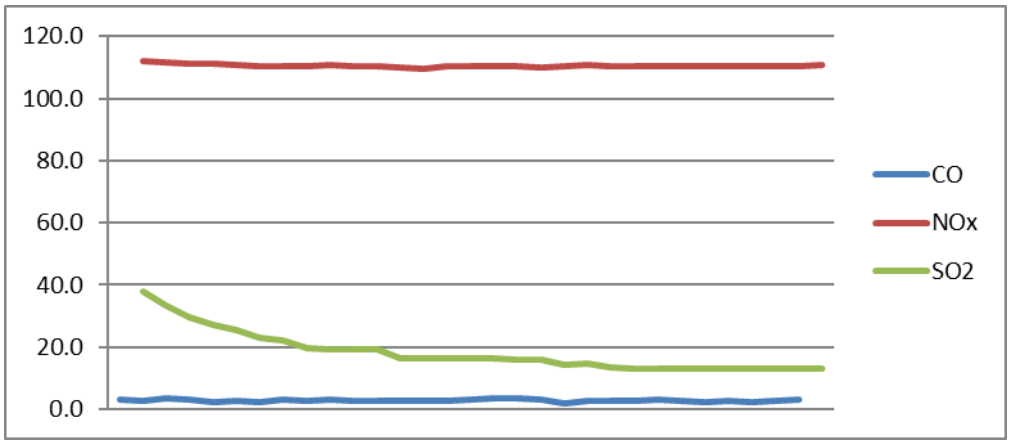
Parameter		CO	NO	SO_2	O_2
Emission Limit Values	$mg.m^{-3}$ ref				
Instrument Range	ppm	200	500	1000	25
Span Gas Value	ppm	157	361	666	20.9
Acceptable Gas Range	-	Yes	Yes	Yes	Yes
Calibration Gas Uncertainty	%	0.4	0.4	0.8	0.5
Quality Assurance	Units				
Conditioning Unit Temperature	C	2	2	2	2
Average 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	0	0	0
Zero (Post)	ppm	1	1.2	2	0.1
Zero drift	ppm	1	1.2	2	0.1
Allowable Zero Drift (Less than)	ppm	3.14	7.22	13.32	0.418
Adjustable Zero Drift (Less than)	ppm	7.85	18.05	33.3	1.045
Zero Drift Failure (Greater than)	ppm	7.85	18.05	33.3	1.045
Zero Drift Acceptable	-	Yes	Yes	Yes	Yes
Span Drift	Units				
Span Down (Pre)	ppm	155	358	663	20.7
Span Down (Post)	ppm	154	356	659	20.6
Span Drift	ppm	-1	-2	-4	-0.1
Allowable Span Drift (less than)	ppm	3.14	7.22	13.32	0.418
Adjustable Span Drift (Less than)	ppm	7.85	18.05	33.3	1.045
Span Drift Failure (Greater than)	ppm	7.85	18.05	33.3	1.045
Span Drift Acceptable (Y/N)	-	Yes	Yes	Yes	Yes
Leak Check					
Span Gas Conc.	ppm	157	361	666	20.7
Recorded Conc. down Line	ppm	155	358	663	20.6
Leak Detected	ppm	-2	-3	-3	-0.1
Leak check acceptable (< 2%)	ppm	3.14	7.22	13.32	0.418
Pass	(Y/N)	Yes			
Test Conditions	Units				
Run Ambient Temperature Range	C	10	10	10	10

Raw Data

Date/Time	*Data source*	*CO*	*CO_2*	*NOx*	*O_2*	*SO_2*
		ppm	*vol%*	*ppm*	*vol%*	*ppm*
19/10/2015 15:10		2.050	8.553	48.200	5.093	11.750
19/10/2015 15:11		2.017	8.577	47.925	5.101	10.333
19/10/2015 15:12		2.625	8.592	47.850	5.094	9.083
19/10/2015 15:13		2.183	8.595	47.850	5.088	8.417
19/10/2015 15:14		1.700	8.593	47.650	5.088	7.833
19/10/2015 15:15		1.958	8.608	47.525	5.093	7.083
19/10/2015 15:16		1.733	8.606	47.608	5.079	6.833
19/10/2015 15:17		2.142	8.600	47.583	5.080	6.083
19/10/2015 15:18		2.017	8.615	47.650	5.076	6.000
19/10/2015 15:19		2.083	8.612	47.475	5.077	6.000
19/10/2015 15:20		1.775	8.624	47.475	5.076	5.917
19/10/2015 15:21		1.783	8.619	47.292	5.078	5.083
19/10/2015 15:22		1.817	8.617	47.108	5.088	5.000
19/10/2015 15:23		1.900	8.618	47.475	5.078	5.000
19/10/2015 15:24		1.983	8.616	47.458	5.085	5.000
19/10/2015 15:25		2.200	8.627	47.483	5.081	5.000
19/10/2015 15:26		2.483	8.624	47.508	5.079	4.917
19/10/2015 15:27		2.392	8.624	47.358	5.087	4.917
19/10/2015 15:28		2.183	8.641	47.517	5.078	4.417
19/10/2015 15:29		1.300	8.617	47.617	5.088	4.500
19/10/2015 15:30		1.775	8.619	47.483	5.080	4.167
19/10/2015 15:31		1.833	8.628	47.475	5.088	4.083
19/10/2015 15:32		1.917	8.619	47.450	5.089	4.000
19/10/2015 15:33		2.083	8.627	47.483	5.082	4.000
19/10/2015 15:34		1.917	8.629	47.483	5.081	4.000
19/10/2015 15:35		1.583	8.630	47.525	5.085	4.000
19/10/2015 15:36		2.000	8.635	47.550	5.088	4.000
19/10/2015 15:37		1.500	8.618	47.525	5.088	4.000
19/10/2015 15:38		1.833	8.618	47.483	5.093	4.000
19/10/2015 15:39		2.250	8.630	47.675	5.085	4.000
Average		**1.967**	**8.614**	**47.558**	**5.085**	**5.647**

Referenced Data

	CO	*NOx*	*SO_2*
	mg/Nm³ Reference O_2		
19/10/2015 15:10	2.9	112.1	38.1
19/10/2015 15:11	2.9	111.5	33.5
19/10/2015 15:12	3.7	111.3	29.4
19/10/2015 15:13	3.1	111.2	27.3
19/10/2015 15:14	2.4	110.7	25.4
19/10/2015 15:15	2.8	110.5	22.9
19/10/2015 15:16	2.5	110.6	22.1
19/10/2015 15:17	3.0	110.5	19.7
19/10/2015 15:18	2.9	110.7	19.4
19/10/2015 15:19	2.9	110.3	19.4
19/10/2015 15:20	2.5	110.3	19.1
19/10/2015 15:21	2.5	109.8	16.4
19/10/2015 15:22	2.6	109.5	16.2
19/10/2015 15:23	2.7	110.3	16.2
19/10/2015 15:24	2.8	110.3	16.2
19/10/2015 15:25	3.1	110.3	16.2
19/10/2015 15:26	3.5	110.4	15.9
19/10/2015 15:27	3.4	110.1	15.9
19/10/2015 15:28	3.1	110.4	14.3
19/10/2015 15:29	1.8	110.7	14.6
19/10/2015 15:30	2.5	110.3	13.5
19/10/2015 15:31	2.6	110.3	13.2
19/10/2015 15:32	2.7	110.3	13.0
19/10/2015 15:33	2.9	110.3	12.9
19/10/2015 15:34	2.7	110.3	12.9
19/10/2015 15:35	2.2	110.4	12.9
19/10/2015 15:36	2.8	110.5	13.0
19/10/2015 15:37	2.1	110.5	13.0
19/10/2015 15:38	2.6	110.4	13.0
19/10/2015 15:39	3.2	110.8	12.9
Average	**2.8**	**110.5**	**18.3**
Uncertainty of Measurement	**2.2**	**8.5**	**9.9**
Uncertainty as % of ELV	**-**	**-**	**-**
Standard Requirement	**<6%**	**<10%**	**<10%**



Appendix 6

Quarterly Effluent Metal Screen

The metal screen for Q1 2015 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: 15/2451	Quarterly Effluent	PO: 19619	508.4	81.2	<0.5	2.2	<7	550	225	32	12	<1	11

Table 4: Quarterly Effluent Metal Screen

Quarterly Effluent Metal Screen

	Detection Method		ICP MS	ICP MS	ICP MS	ICP MS	ICP MS	ICP MS	ICP MS	ICP MS	ICP MS	ICP MS	ICP MS
	Method Detection Limit		<0.2mg/l	<0.1mg/l	<0.5ug/l	<1.5ug/l	<7ug/l	<20ug/l	<2ug/l	<2ug/l	<3ug/l	<1ug/l	<5ug/l
	ISO 17025 Accredited		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Jones Reference	Sample Identity	Other ID	Dissolved Calcium	Dissolved Magnesium	Dissolved Cadmium Low Level	Dissolved Chromium Low Level	Dissolved Copper Low Level	Dissolved Iron Low Level	Dissolved Manganese Low Level	Dissolved Nickel Low Level	Dissolved Zinc Low Level	Dissolved Mercury Low Level	Dissolved Lead Low Level
			mg/l	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Report No: 15/8647	Effluent Metal Screen	PO: 23022	346.5	59.7	0.6	8.2	<7	99	127	28	10	<1	16

Quarterly Effluent Metal Screen

The metal screen for Q3 2015 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:15/11568	Quarterly Effluent	PO: 23044	166.6	50.6	0.7	8.7	<7	203	42	27	8	<1	6

Quarterly Effluent Metal Screen

The metal screen for Q4 2015 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		<0.2mg/l	<0.1mg/l	<0.4ug/l	<0.5ug/l	<7ug/l	<20ug/l	<2ug/l	<2ug/l	<3ug/l	<1ug/l	<5ug/l
	UKAS Accredited		·	·	·	·	·	·	·	·	·	·	·
Jones Reference	Sample Identity	Other ID	Dissolved Calcium	Dissolved Magnesium	Dissolved Cadmium Low Level	Dissolved Chromium Low Level	Dissolved Copper Low Level	Dissolved Iron Low Level	Dissolved Manganese Low Level	Dissolved Nickel Low Level	Dissolved Zinc Low Level	Dissolved Mercury Low Level	Dissolved Lead Low Level
			mg/l	mg/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Report No: 15/15617	Quarterly Effluent	PO: 24773	383.3	76.5	1.0	9.9	<7	579	339	33	12	<1	9

Appendix 7

Enva Ireland Ltd
Raffeen Ind Est, Ringaskiddy, Co.Cork

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Web: www.enva.ie

RESPIROMETRY REPORT

ENVA PORTLAOISE

One sample was received on the 11/06/2015 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:

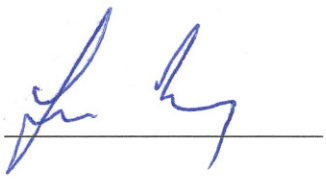
Effluent 10.06.14	Enva Portlaoise

The results were as follows: (all results mg/l 0_2)

Sample Time/Mins.	*Control*	*1/5 Dilution*	*1/10 Dilution*
0	9.2	9.1	9.3
1	8.7	8.5	8.7
2	7.6	7.5	7.7
3	6.3	6.4	6.4
4	5.7	5.8	5.6
5	4.4	4.6	4.8
10	3.7	4.0	4.1
15	2.7	3.3	3.3
20	2.3	2.9	2.7
25	1.8	2.4	2.3
30	1.4	1.9	1.7
% Inhibition		8 %	3 %

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: 26/6/15

Enva Ireland Ltd
Raffeen Ind Est, Ringaskiddy, Co.Cork

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RESPIROMETRY REPORT

ENVA PORTLAOISE

One sample was received on the 11/11/2015 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 10.11.15	Enva Portlaoise

The results were as follows: (all results mg/l 0_2)

Sample Time/Mins.	***Control***	***$^1/_5$ Dilution***	***$^1/_{10}$ Dilution***
0	9.1	9.2	9.1
1	8.3	8.6	8.6
2	7.5	7.3	7.5
3	6.0	6.4	6.3
4	5.2	5.4	5.8
5	4.0	4.7	4.7
10	3.3	4.5	4.1
15	2.5	3.8	3.0
20	2.0	3.1	2.2
25	1.5	2.4	1.6
30	0.9	1.7	1.2
% Inhibition		9 %	4 %

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.

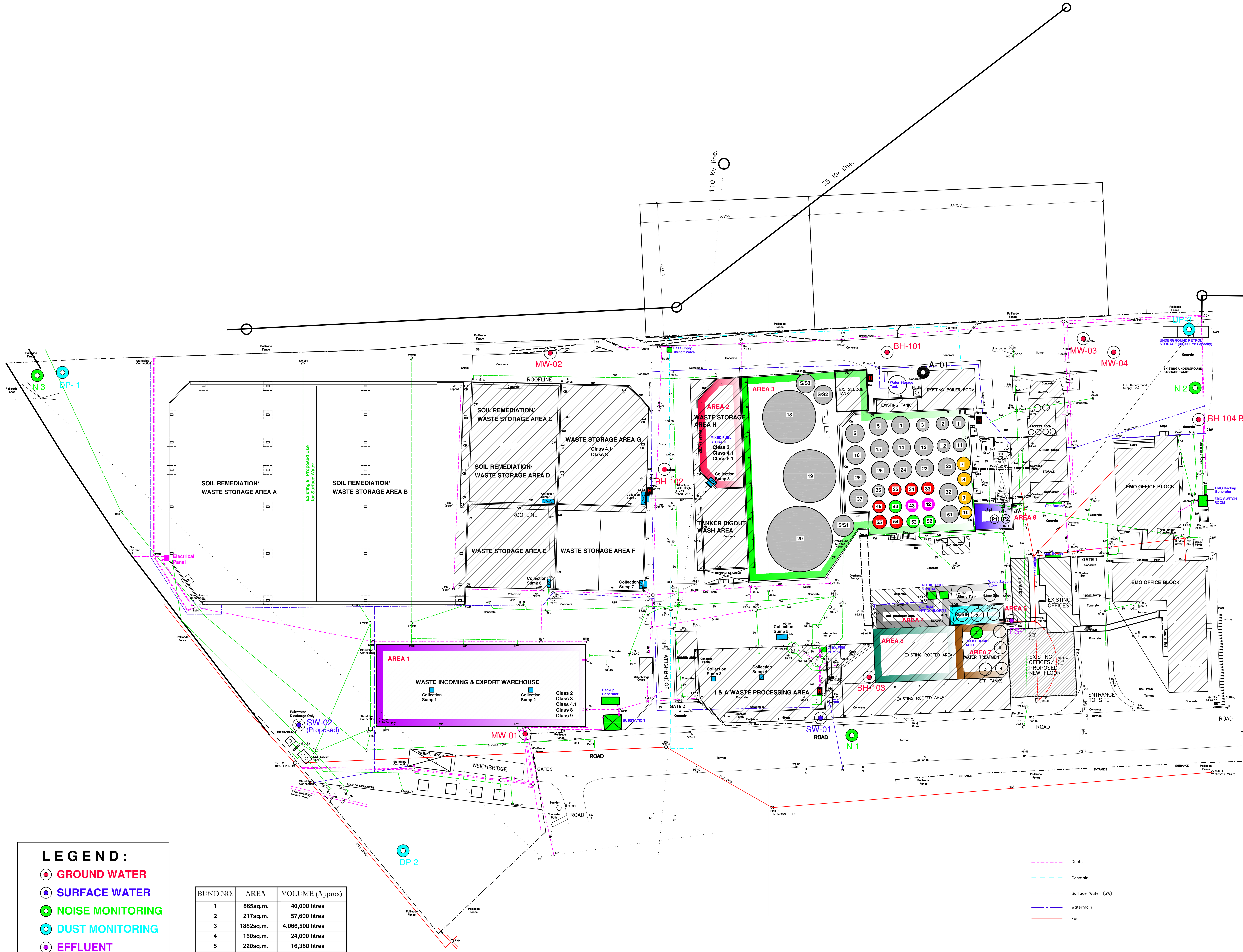
Signed: _____ Date: 23/11/15

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.



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.

Kavanagh Ryan & Associates.
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E-mail. kmryan@eircom.net
PLANNING, DESIGN & CONSTRUCTION CONSULTANTS

CLIENT
Enva Ltd.,
Clonminam Ind. Est.,
Portlaoise,
Co. Laois.

enva

TITLE

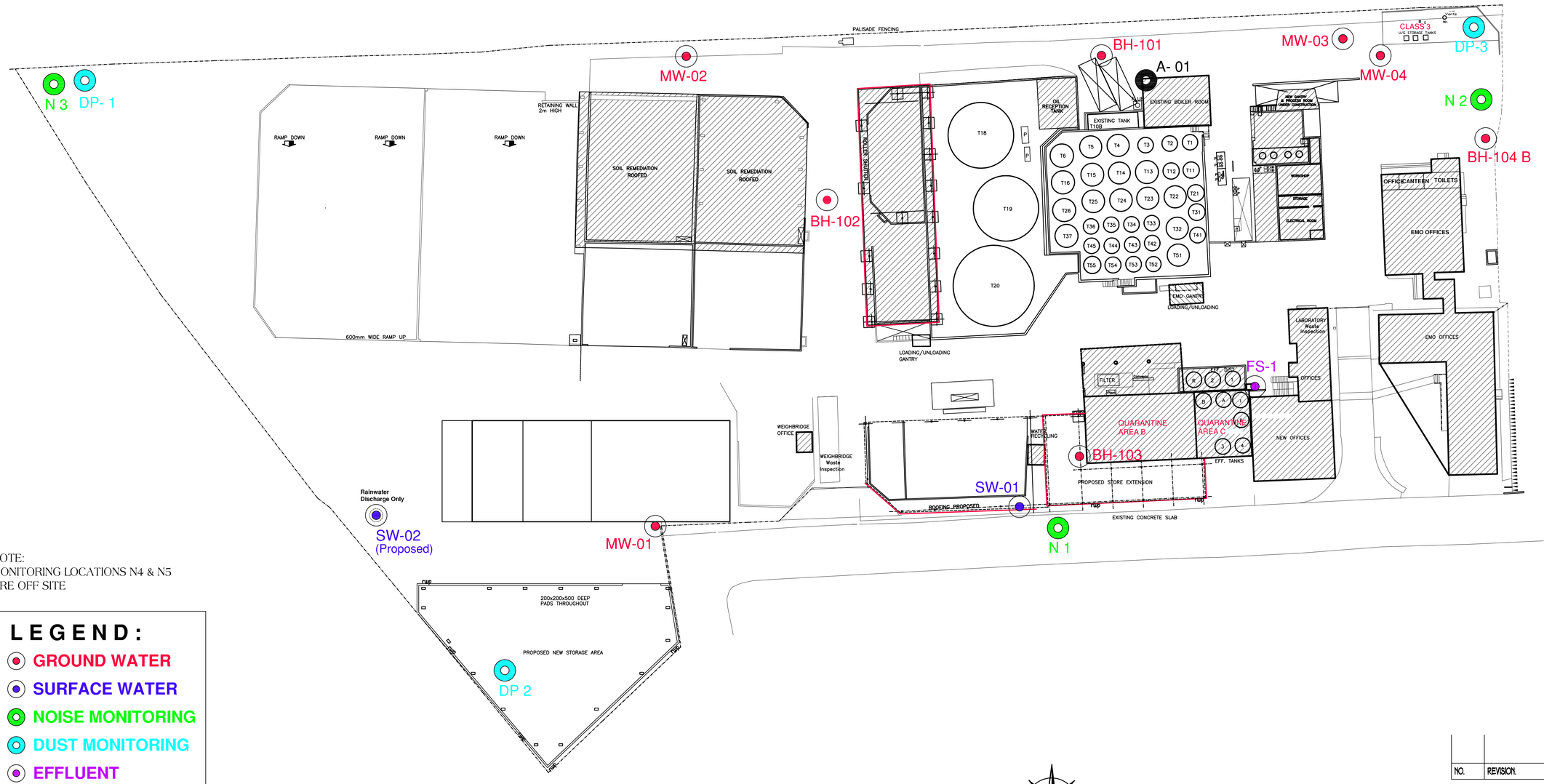
ENVA LIMITED,
CLONMINAM IND. EST.,
PORTLAOISE, Co. LAOIS.

DRAWN A.C.	*SCALE* 1:400.	*DRAWING No.*
JOB. No. C05015.	*DATE* Sept. '03.	Site-NR01.

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.



NOTE:
MONITORING LOCATIONS N4 & N5
ARE OFF SITE

LEGEND:

- GROUND WATER
- SURFACE WATER
- NOISE MONITORING
- DUST MONITORING
- EFFLUENT
- AIR EMISSIONS

NO.	REVISION.	DATE

Kavanagh Ryan & Associates.
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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