



ANNUAL ENVIRONMENTAL REPORT 2008
SUBMITTED TO ENVIRONMENTAL PROTECTION AGENCY
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ENVA
CLONMINAM INDUSTRIAL ESTATE
PORTLAOISE
CO. LAOIS

WASTE LICENCE NUMBER W0184-1

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ENVIRONMENTAL, HEALTH, SAFETY & QUALITY POLICY



Health, Safety & Environmental Policy

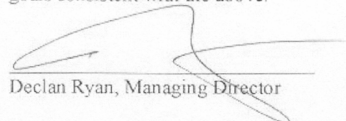
ENVA is a leading supplier of specialist waste & wastewater related products/services in Ireland and the UK. Our capabilities include waste treatment within our own sites, waste handling, emergency response services, the production and supply of chemical products for water treatment and other purposes, the design/installation of water treatment systems at customer sites, the provision of analytical services as well as other products and services associated with the above.

ENVA operates to OHSAS 18001 and ISO 14001 standards for occupational health and safety and environmental management. Compliance with all applicable legal and other HSE requirements are only a minimum starting point as we are committed to continually improving our performance in relation to health, safety and the environment.

We seek to do this by:

- Consulting our HSE committee (selected by our employees) on HSE matters.
- Identifying safety hazards including chemical hazards, assessing and managing these so as to minimise risk as far as practicable.
- Minimising the potential for occupational injury especially those arising from occupational exposure, manual handling, use of equipment/tools, slips, trips and falls.
- Minimising the need for and risks associated with confined space entry and hazardous materials.
- Providing safe places of work and healthy working conditions for employees and visitors.
- Promoting the provision of recovery options for waste in preference to direct disposal.
- Preventing pollution to any environmental media and minimising the environmental impact of emissions to water, land and air.
- Communicating with customers to ensure necessary information is provided and precautions are taken when collecting and handling waste, providing treatment or other services for customers.
- Being prepared for reasonably foreseeable emergency situations.
- Assessing and considering the performance of third parties used by us who may have potential for significant environmental impact.
- Using energy and natural resources efficiently.
- Communicating appropriately with our employees in relation to HSE matters and providing appropriate information and training.
- Expecting the cooperation of our employees in relation to HSE management.

We will set improvement objectives and targets on a regular basis in order to achieve goals consistent with the above.


Declan Ryan, Managing Director

6/6/08
Date.

1.0 INTRODUCTION

1.1. General Description

Enva is located in an industrial estate, south of Portlaoise town. Businesses in the immediate vicinity of the plant are mainly light industries of a commercial nature such as vehicle repair and panel beating, light engineering, cable production and food wholesalers.

Since the granting of the waste management licence on the 16th of January 2004 activities on site have increased with an increase in the volume of packaged type wastes being accepted on site for export. The processing activities on site include waste oil re-processing, treatment of contaminated soil, repackaging of oily contaminated wastes and the crushing of fluorescent tubes.

1.2 Waste Management Activities carried out at the Facility.

Third Schedule

Class 6. Biological treatment not referred to elsewhere in this Schedule which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1. to 10. of this Schedule.

Class 7. Physico-chemical treatment not referred to elsewhere in this Schedule (including evaporation, drying and calcination) which results in final compounds or mixtures which are disposed of by means of any activity

referred to in paragraphs 1. to 10. of this Schedule (including evaporation, drying and calcination).



Class 12. Repackaging prior to submission to any activity referred to in a preceding paragraph of this Schedule.

Class 13. Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced.

Fourth Schedule

Class 2. Recycling or reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes).

Class 4. Recycling or reclamation of other inorganic materials.

Class 5 Regeneration of acids or bases:



Class 8. Oil re-refining or other re-uses of oil. **(P)**

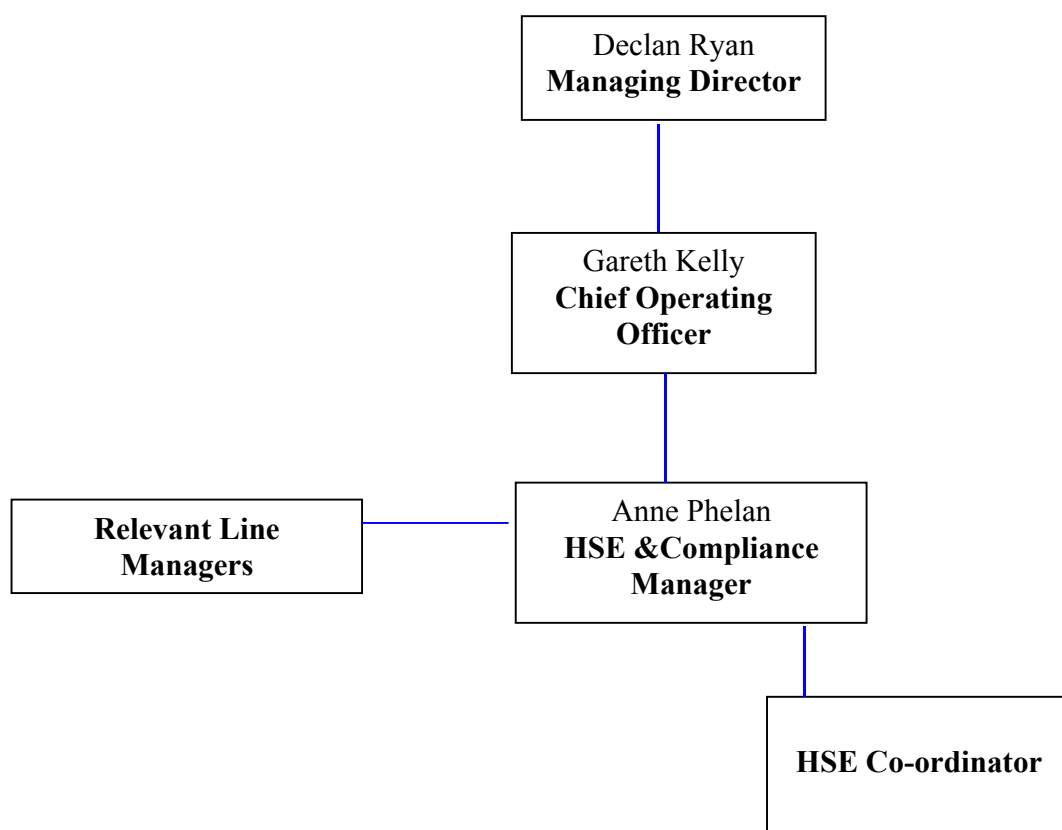
Class 9 Use of any waste principally as a fuel or other means to generate energy

Class 11. Use of waste obtained from any activity referred to in a preceding paragraph of this Schedule.

Class 12. Exchange of waste for submission to any activity referred to in a preceding paragraph of this Schedule.

13. Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced.

1.3 Management Structure



2.0 WASTE ACTIVITIES

Quantities of waste to be accepted on site as detailed in Schedule A of waste licence 184-1.
Table 1

Waste Type	Quantity (tonnes per annum) Schedule A of 184-1	Quantity (tonnes per annum) 2008
Hazardous		
Waste oil and sludge's	35,000	26953.31
Contaminated soils	60,000	43530.52
Oil filters	1,000	991.84
Other hazardous wastes	5,000	3196.172
Total Hazardous	101,000	74,671
Non-Hazardous		
Industrial sludges, Treated Sewage sludge, Waste water treatment sludge ^{Note a}	0	0
Other non-hazardous & non putresible waste.	9,000	1030.348
Total Non-Hazardous	9,000	1030.348
Total	110,000	75701.34

In 2008, 74,671 tonnes of hazardous waste were accepted on site for treatment or for onward export. An additional 1030.348 tonnes of non-hazardous waste was accepted on site for onward movement. Please see Section 2 for further details of wastes accepted, processed and exported off site.

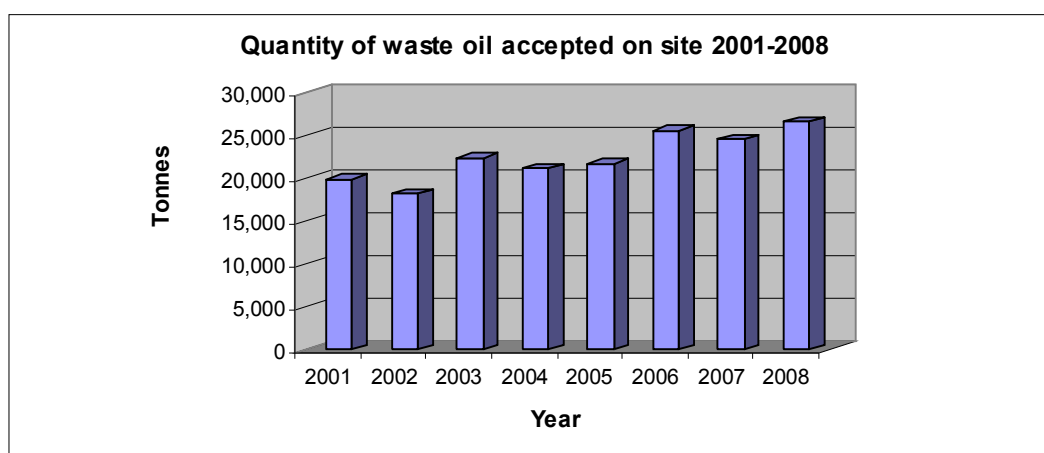
2.1 Waste Volumes Received

During 2008 there were 5 waste streams which were processed on site; these were waste oils, solid oily wastes, contaminated soils, used metal filters contaminated metals, fluorescent tubes and used cooking oil. Other waste streams were bulked up on site, stored and removed off site by TFS. Figures 1 to 4 detail the volumes of wastes processed on site for the years 2001 to 2008 for each waste stream.

2.1.1 Waste Oils

Collection levels have remained consistent with previous years, with 26953.07 tonnes of gross volume of waste oils collected.

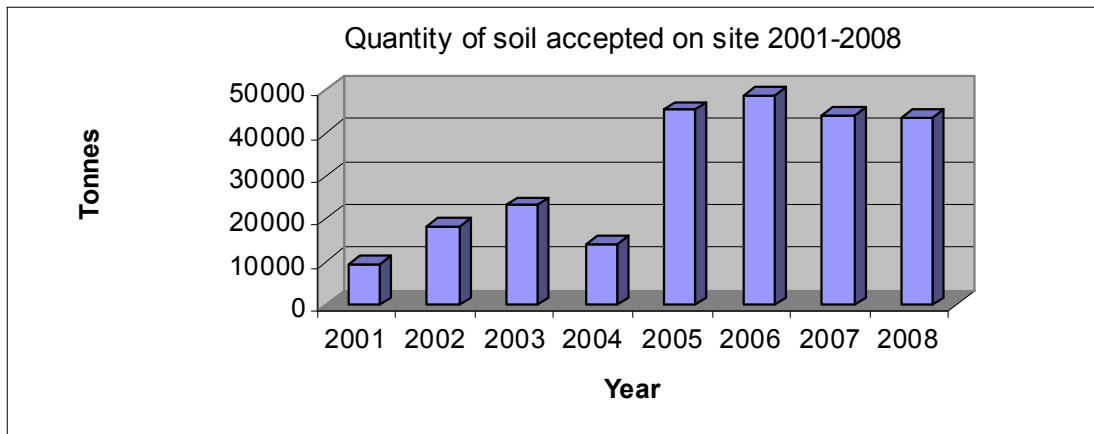
Figure 1: Quantity of waste oil received on site 2001-2008



2.1.2 Contaminated soil.

Enva accepts contaminated soils on site for treatment and onward export. 2005 saw a significant increase in the volume of soil accepted on site which has been maintained over the last three years. All soils accepted on site are graded, sorted and treated/exported. The soils which are not treated on site are exported under TFS and treated to levels where they can be reused.

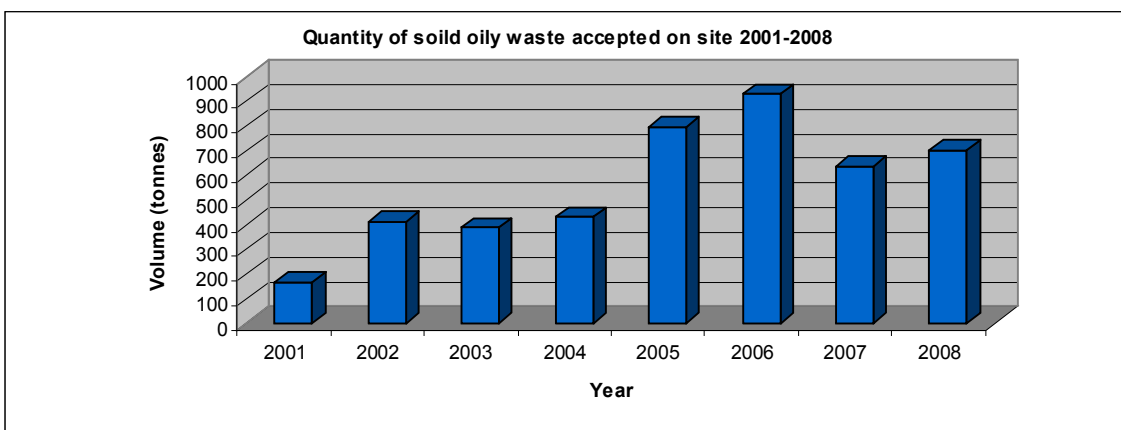
Figure 2: Quantity of soil accepted on site between 2001-2008.



2.1.3 Solid Oily Wastes

Solid oily wastes are accepted on site, where they are bulked up and re-packaged and exported off site. During 2007 there was a decrease in the volume of solid oily waste being exported off site due to a re-direction of whole metal filters. The figures being exported in 2008 have increased slightly from those of 2007.

Figure 3: Quantity of solid oily waste accepted on site in 2008.

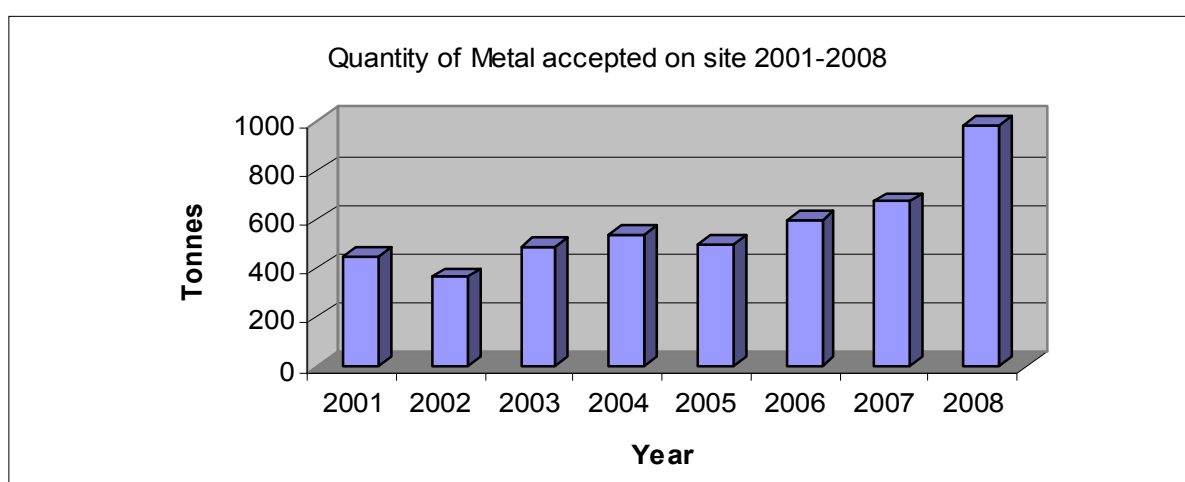




2.1.4 Used metal filters

Metal filters are currently bulked up on site for export under TFS to RD recycling for metal recovery. The general increasing trend in filter volumes has been maintained in 2008 with 991.84 tonnes accepted on site in 2008. Due to the increasing volume of filters being accepted on site, Enva intend to seek approval from the Agency for an increase in this tonnage allowance.

Figure 4: Volume of oil filters accepted on site in 2008.





2.1.5 Other wastes accepted onsite

Table 2: Other waste streams accepted on site

Waste Type	EWCode	Quantities accepted 2008
Lead acid batteries	16 06 01*	2008.55
Ni-Cd batteries*	16 06 02*	31.86
Other batteries and accumulators	16 06 05	45.97
Fluorescent tubes*	20 01 21*	89.9
Hoses	13 08 99*	29.58
Antifreeze	16 01 15	18.47
Aerosols	16 05 05	15.72
Waste Paint mixtures	08 01 11*	68.084
Mixed Fuels	13 07 03*	67.133
Brake fluid	16 01 13*	5.28
Packaging contaminated with residues*	15 01 10*	152.83
Vegetable Oil	20 02 25	1011.588
Glycol oil mixture	16 01 15	2
Hydrochloric acid	06 01 02*	0.84
Silver	09 01 01*	3.175
Non Liquid solvent waste	14 06 05*	0.2

* **Note:** Waste figures submitted in quarterly reports for these waste streams vary as a result of accounts not being fully reconciled at the time of quarterly report submissions.

2. 2 Waste Volumes Sent Off Site For 2008

Waste	EWC Codes	Destination Used in 2008	Quantities transferred off – site 2008
Sludges	13 05 02*	Geocycle, Belgium	154.010
Solid flammable waste	15 02 02*	Lindenschmidt, Germany.	690.22
Batteries (lead acid)	16 06 01*	Campine	1835.63
Filters	16 01 07*	RD Recycling	1084.36
Fluorescent tubes	20 01 21*	Dela	55.57
Hoses	13 08 99	Hegarty Metal Recycling	29.58
Antifreeze	16 01 15	Enva, Smithstown, Shannon, Co.Clare	17.85
Aerosols	16 05 05	SBH	8.42
Paint thinners	08 01 11*	Enva NI, Drumaness, Co. Down.	41.25
Mixed Fuels	13 07 03*	KS Recycling	109.52
Brake fluid	16 01 13*	Enva, Smithstown, Shannon, Co.Clare	Included in figure for mixed fuels
Soil	17 05 04	KTK	631.86
	17 05 04	Hinch	12925.36
	17 05 03*	Sita Holland	12500.16
Stone	17 05 04	Re-use as fill material.	7424.48
Veg oil	20 01 25	BIP	856.38
NiCad batteries	16 06 02*	Accurec	15.02
Packaging Contaminated with dangerous residues	15 01 10*	Hegarty Metal	100.19
Packaging Contaminated with dangerous residues	15 01 10*	Enva, Smithstown, Shannon, Co.Clare	11.73
Empty Packaging	15 01 02	Leinster Environmental	11.58
Non Liquid Solvent Waste	14 06 05*	Enva, Smithstown, Shannon, Co.Clare	0.2
Hydrochloric Acid	06 01 02*	Enva, Smithstown, Shannon, Co.Clare	1.43
Other batteries and accumulators	16 06 05	Accurec	46.96
Silver	09 01 01*	Enva, Smithstown, Shannon, Co.Clare	3.85

2.3 Waste Facilities Off Site

A current list of all Enva third party waste treatment/disposal sites.

Facility Name	Facility Address	Waste streams
1. Midland Scrap Metal Recycling	Harbour St., Mountmellick, Co. Laois.	Used oily filter and oil contaminated metal.
2. Shannon Environmental Services	Smithstown Industrial estate, Shannon, Co. Clare.	Existing and proposed waste streams include solvent, photographic, packaging, organic and inorganic chemicals wastes.
3. Lindenschmidt KG	Krombacher Strasse 42-46, D57223 Kreutzel Germany.	Solid Oily wastes.
4. H.J. Enthoven.	Darley Dale Smelter, South Darley, Matlock, Derbyshire DE4 2LP. England	Used Batteries
5. HIM GmbH	Order Straße 65, 60386 Frankfurt am Main, Germany.	Not determined.
6. HIM GmbH	SAV Biebesheim, Otto-Hahn-Straße 1 64584 Biebesheim, Germany.	Solid Oily wastes
7. DELA-LVG GmbH	Alte Landstraße 4, D-45329, Essen, Germany.	Use fluorescent tubes
8. Terracon GmbH	Hovestraße 74-76, 20539 Hamburg, Germany.	Contaminated soil
9. Valdi Le Palais	Avenue Maryse Bastie, 87410 Le Palais Sur Vienne, France.	Used batteries
10. Hegarty Metals	Ballysimon Road, Limerick.	Waste metal
11. Campine Recycling N.V.,	Niljverheidsstraat 2, B- 2340 Beerse, Belgium.	Used lead acid batteries
12. Zimmerman	3334, Gutersloh, Gottlieb-Daimler.	Waste oil sludges

	Strabe 3-11 U22 Germany.	
13. KS Recycling.	Raiffeisenstraße 38, D-47665 Sonsbeck, Germany	Waste mixed fuels
14. Sita	Toronto street 23197 KN Rotterdam – Botlek, Holland	Contaminated soils
15. Ashworths, Products Limited	Brdige Street, Church, Accrington, Lancashire, BB5 4 HU	Waste Cooking Oil
16. Eurobiodiesel Ltd.	Unit 5, Mead Park, Riverway, Harlow, Essex CM20	Waste Cooking Oil
17. Argent Energy Ltd.	Biggar Road, Newarthill, Motherwell ML1 5LY UK.	Waste Cooking oil
18. KTK Landfill.	Brownstown and Carnalway, Kilcullen, Co. Kildare.	Filtercake
19. Murphy Landfill	Hollywood Great, Nags Head, The Naul, Co. Dublin.	Non-hazardous fractions.
20. Hinch	Derrygarran, Portlaoise, Co. Laois	Non-hazardous fractions.
21. KMK Metals	Cappincur Industrial Estate, Daingean Rd., Tullamore, Co. Offaly.	Used Lead Acid batteries
22. Lenviron Ltd. T/a Leinster Environmentals,	Clermont Park, Haggardstown, Dundalk Co. Louth	Used Non hazardous plastics
23. Scoribel	Rue de Courriere 49, Zoning Industrial de Feluy, B 7181 Seneffe, Belgium	Solid Oily wastes
24. Accurec	Wiehagen 12-14 45472 Mulheim an der Ruhr, Germany	Mixed batteries
25. Mr. Patrick O Toole	Rathbawn, Tullow, Co. Carlow	Organic waste
26. Premier Proteins	Pollboy, Ballinasloe, Co. Galway	Organic Waste
27. Concrete Recycling Specialist Ltd.	Barnan, Rhode, Co. Offaly	Non-hazardous C&D fractions
28. RD Recycling	Centrum Zuid 3017, 3530	16 01 07*
29. BIP	PO Box 3180, Tat Bank Road, Oldbury, West Midlands, B69 4PG, United Kingdom.	Edible oil and fats
30. Beofs	Camphill Community, Ballytobin,	Edible oil and fats EWC 19 08 09

	Callan, Co. Kilkenny	EWC 20 01 08
31. SBH	Austrabe 5, D74238 Krautheim Germany	EWC 16 05 04 EWC 08 01 11
32. Enva N.I.	Unit 1, No. 11 Comber Rd, Carryduff, Co Down	EWC 08 01 11* 08 01 15*, 08 01 17*, 08 11 19*
33Uniqema	Pool Lane, Bromborough The Wirral, CH62 4UF, United Kingdom.	EWC 20 01 25
34. Enva Dublin	John F Kennedy Ind. Estate, JFK Rd., Naas Rd, Dublin 12	02 06 99*, 02 07 01 08 01 20, 08 03 08, 13 01 04*, 13 01 05*, 13 01 09*, 13 01 10*, 13 11*, 13 01 12*, 13 01 13*, 13 02 04*, 13 02 05*, 13 02 06*, 13 02 07*, 13 02 08*, 13 03 01*, 13 03 06*, 13 03 07*, 13 03 08*, 13 03 09*, 13 03 10*, 13 04 01*, 13 04 02*, 13 04 03*, 13 05 01*, 13 05 02*, 13 05 03*, 13 05 06*, 13 05 07*, 13 05 08*, 13 07 01*, 13 07 02*, 13 07 03*, 13 08 01*, 13 08 02*, 13 08 99* 16 07 08*, 16 07 09*, 16 08 99, 17 02 04* 19 02 07*, 20 01 08, 20 01 25, 20 03 03, 20 03 06.
35. Midland Scrap Metal Company Ltd. (MSM Recycling)	Belview Bulk Terminal, Gurteens, Slieverue, Co. Kilkenny.	12 01 01, 16 02 14, 17 04 01, 17 04 02, 17 04 03, 17 04 05, 17 04 07, 17 04 11, 19 12 03, 20 01 36
36. Kreis Weseler Abfall- GesellschaftmbH &Co. KG (KWA)	Graftstr. 25, 47475 Kamp-Lintfort,	15 02 02*



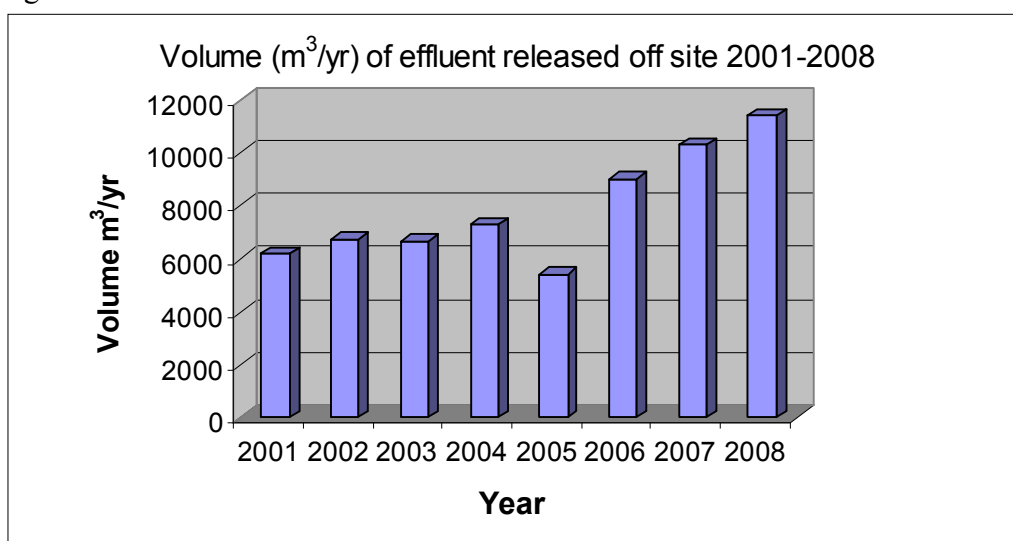
37. Crumb Rubber	Mooretown, Dundalk, Co Louth	16 01 03
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3.0 EMISSIONS

3.1 Effluent Emissions monitoring (Monitoring location FS 1)

Over the last three years the volume of effluent generated on site has increased slightly.

Figure 5: Volume of effluent released offsite



Figures 6 to 10 detail the parameters recorded during 2008.

Figure 6: Copper, lead, Zinc and Cadmium levels in effluent for 2008.

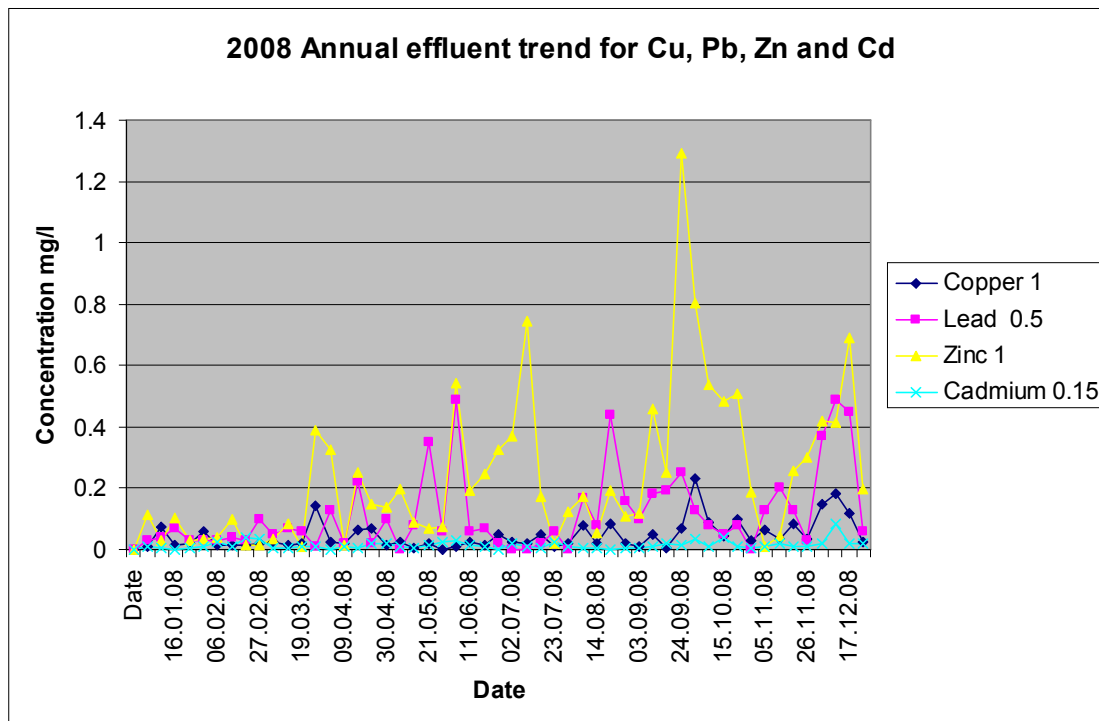


Figure 7: Effluent COD levels for 2008. See section 5 for non conformance details

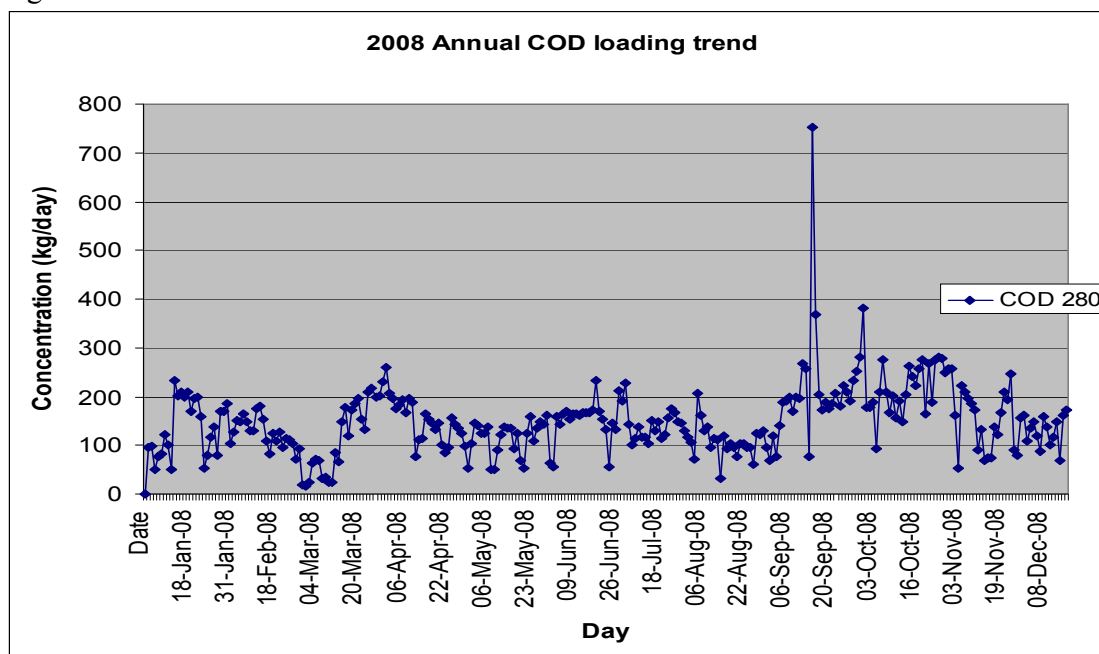


Figure 8: Sulphate and Ammonia levels for 2008

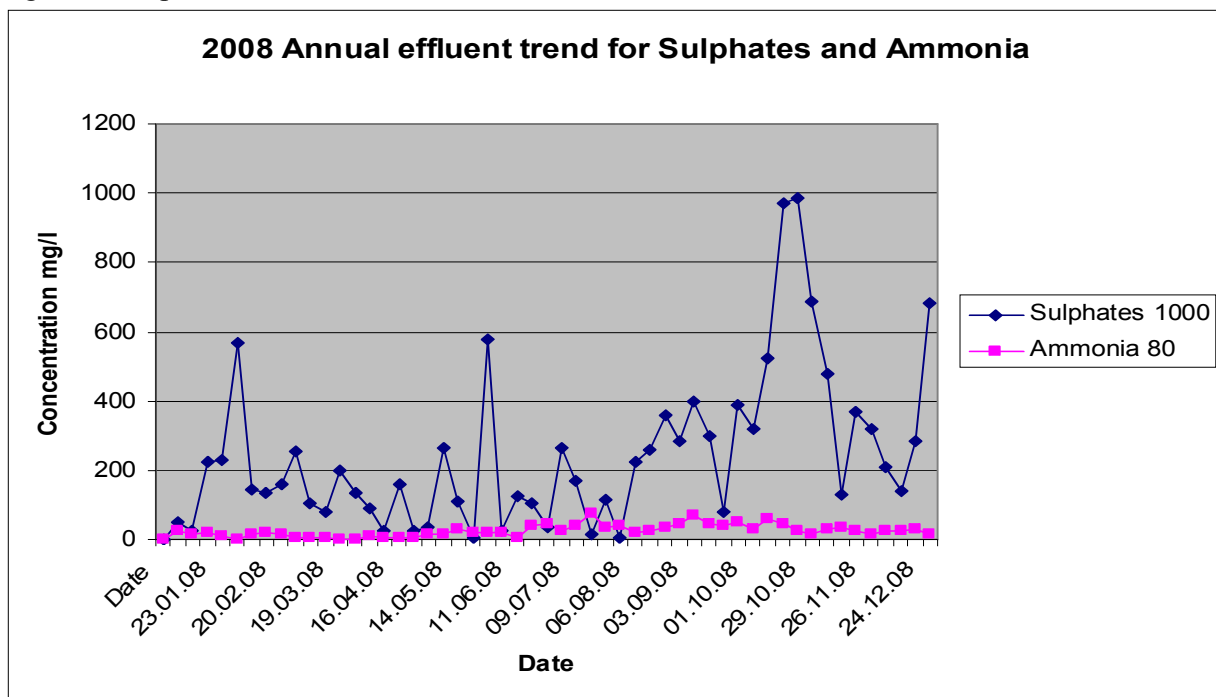


Figure 9: Phenol levels in effluent for 2008

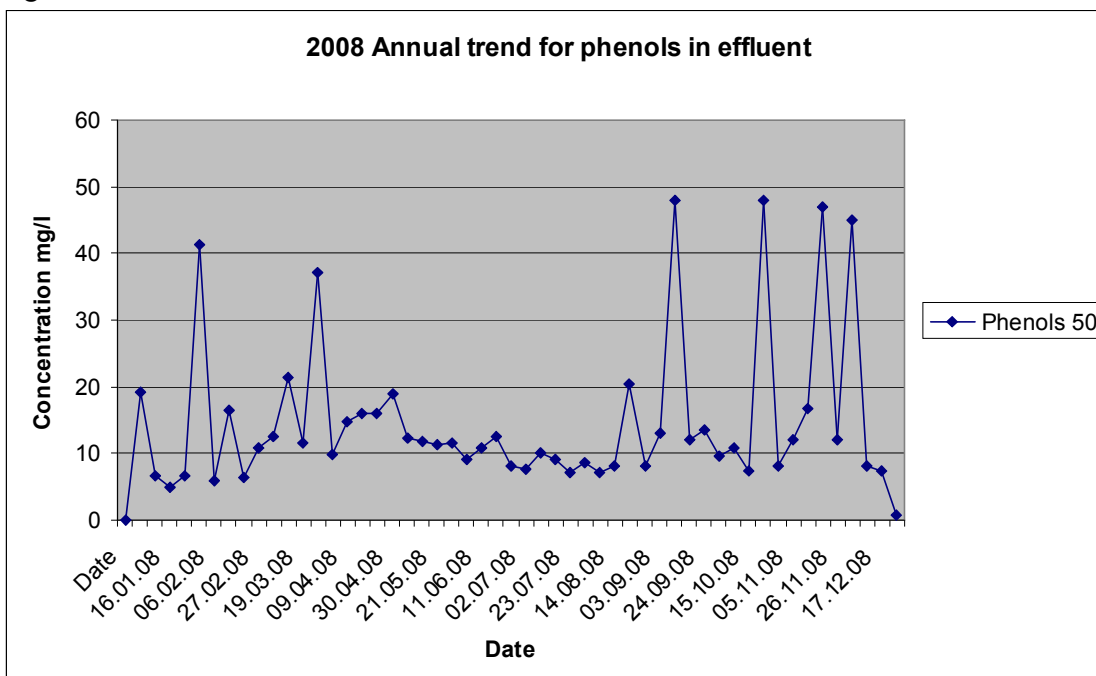
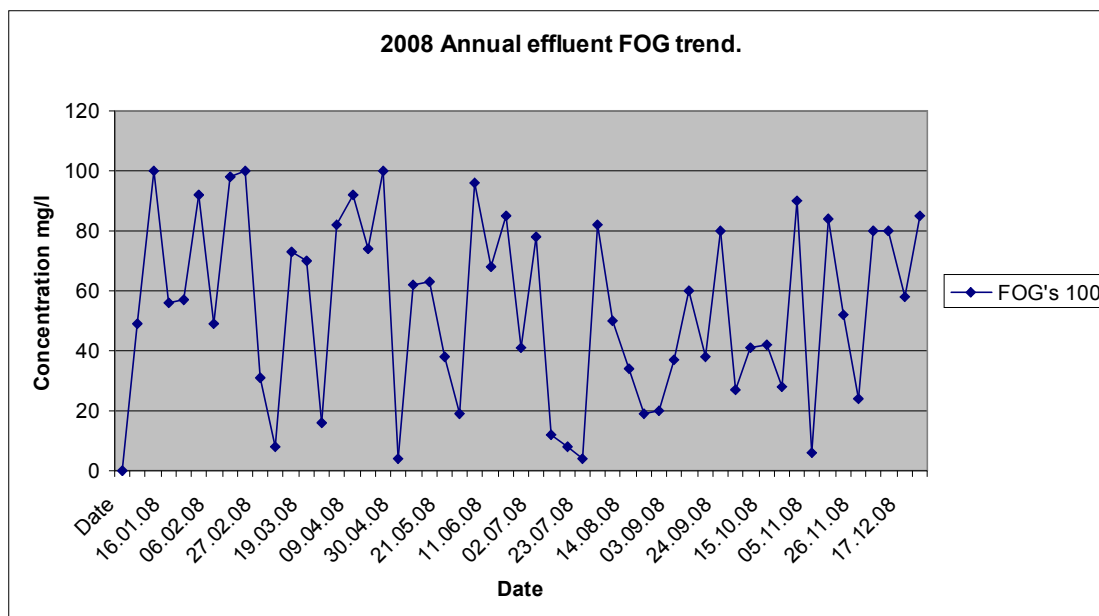


Figure 10: FOG levels in effluent for 2008



3.2 Groundwater monitoring

3.2.1 Summary of groundwater investigations for 2008.

Enva currently have seven groundwater monitoring wells on site, three of which are deep water wells with the remaining four being shallow. Each borehole is sampled by baling the monitoring well or by pumping the well depending on the depth to groundwater. Groundwater quality reports are included in Appendix 1. A groundwater risk assessment was carried out and submitted to the agency on the 08/12/08. This report reviews the groundwater monitoring and data recorded to date and assesses the risk of potential groundwater contamination on site. This report is included in Appendix 2.

3.3 Dust Monitoring

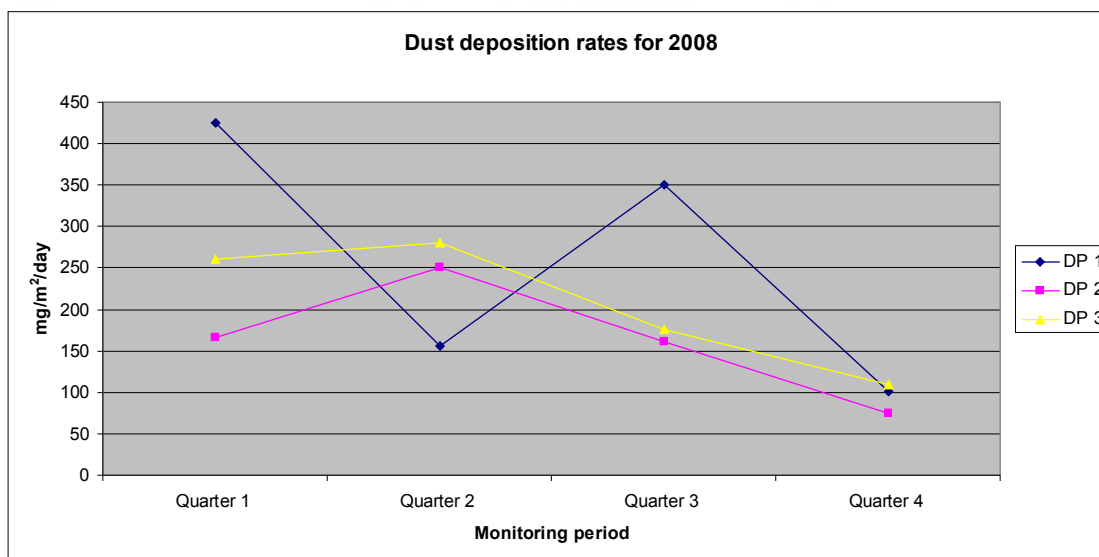
In accordance with Schedule D.1.2. of the WML 184-1 three monitoring locations were established on site in order to determine the ambient dust deposition from site activities. There was one non compliance with regard to dust levels in the first quarter.

Table 4: Dust Deposition monitoring

	Dust Position	Daily Dust deposition rate mg/m²/day	Daily Dust deposition rate mg/m²/day	Daily Dust deposition rate mg/m²/day
	1 st Quarter	2 nd Quarter	3 rd Quarter	4 th Quarter
DP 1	425	156	349.7	102.06
DP 2	166	250	161.5	75.46
DP 3	260	280	176.2	109.12

The graph below demonstrates the levels of dust recorded at the monitoring locations.

Figure 11: Levels of dust recorded on site during 2008.



3.4 Surface water monitoring

Surface water monitoring was carried out as per Schedule C3 and Table D.4.1 of the waste licence. There were no exceedances of surface water released from the site in 2008. See Appendix 3 for surface water monitoring.

3.5 Boiler Monitoring

Boiler monitoring report was carried out on the 22nd of October 2008 by ANV technologies. The boiler used by Enva is a dual fuel boiler which is largely fuelled by Natural gas. A copy of the boiler monitoring report is included in Appendix 4.

3.6 Noise monitoring

Noise monitoring was carried out on site during 2008. See Appendix 5 attached for the full noise monitoring report.

Summary of noise report.

An environmental noise survey was conducted at the Enva Ireland site in Portlaoise on 14th of August 2008. It was found that no impulsive or tonal noise directly attributable to the sites activities was detected at the noise sensitive locations. It must be noted that the weather on the day was calm and dry.

3.7 Monitoring locations

Appendix 6 attached details the monitoring locations on site. Please note this drawing is not to scale.



4.0 ENVIRONMENTAL MANAGEMENT

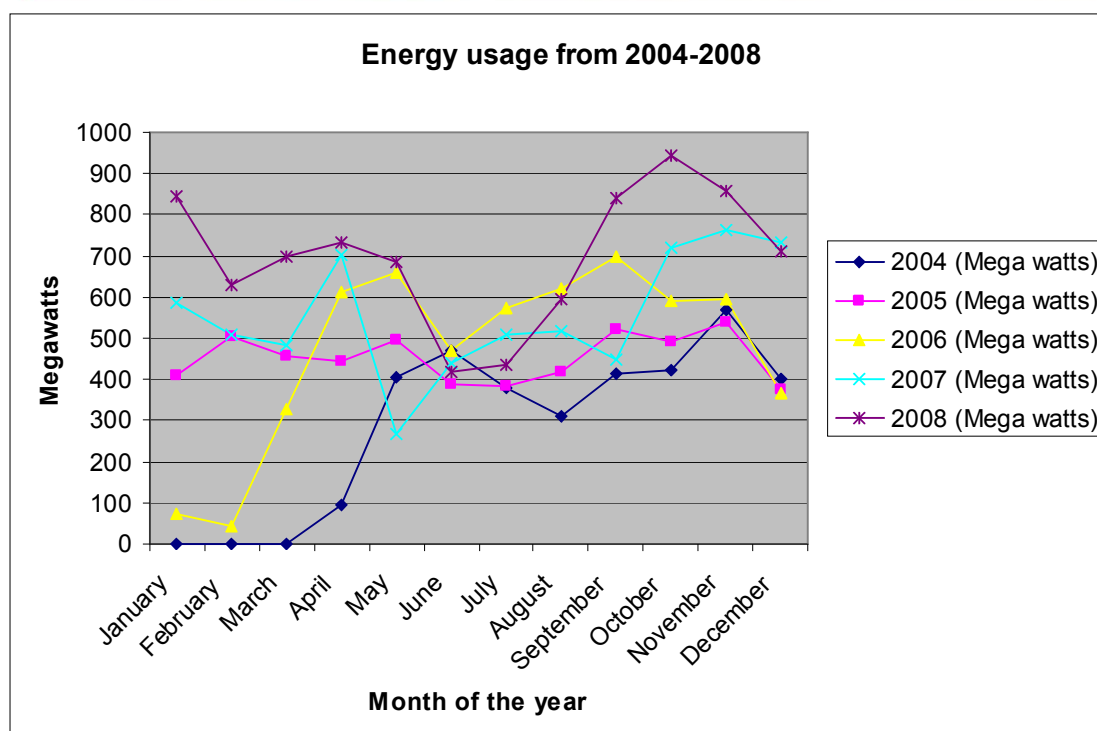
4.1 Resource and Energy Depletion

The main energy source required on site is for the main boiler. This boiler is a dual fuel boiler which can be run on either natural gas or gas oil. Table 5 and Fig. 12 show natural gas and gas oil consumption in 2004, 2005, 2006, 2007 and 2008.

4.1.1 Natural Gas and Gas oil usage.

Table 5: Natural gas and Gas oil usage.

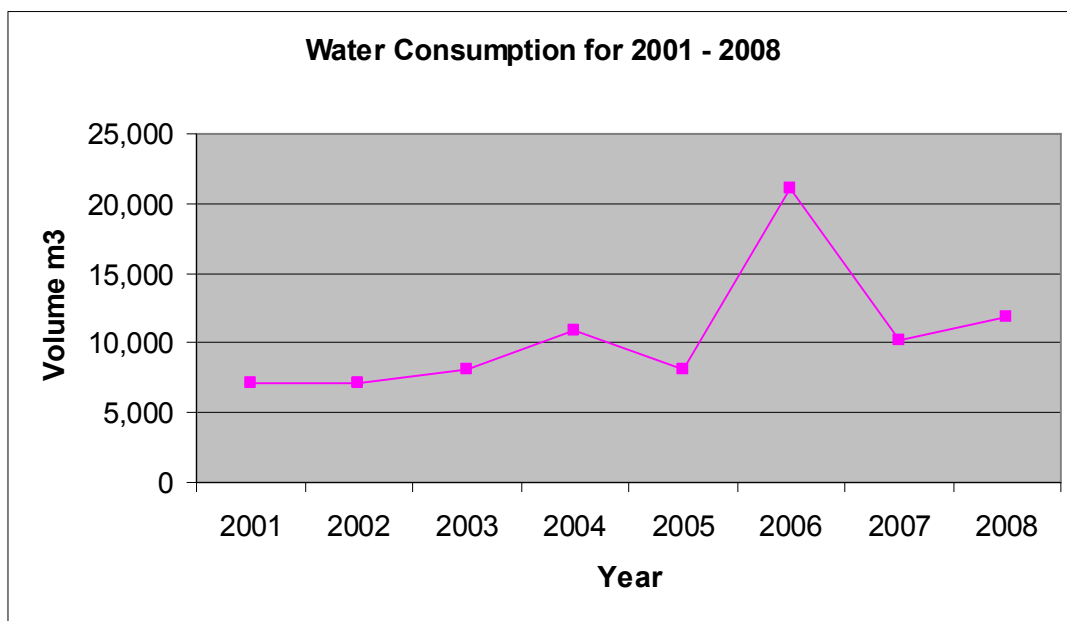
Month	2004 (Mega watts)	2005 (Mega watts)	2006 (Mega watts)	2007 (Mega watts)	2008 (Mega watts)
January	0.6352764	407.97	71.23	588.32	842.90
February	0.507996	505.8681	43.55	508.74	629.21
March	0.912296	458.5869	326.5042	483.57	699.30
April	96.1819529	443.9167	611.556	700.89	731.03
May	404.4674598	495.1561	659.8816	267.12	684.24
June	471.1438655	388.0386	470.7509	440.49	420.20
July	381.0774429	383.847	572.1502	510.55	434.72
August	309.020475	417.9265	621.6765	518.47	596.30
September	413.583625	520.7338	698.1947	449.93	839.50
October	420.7177296	489.2539	589.797	719.05	945.38
November	570.3241663	540.248	596.8486	763.88	857.01
December	402.661176	374.2346	365.1749	732.18	711.52



4.1.2 Water Usage

Water usage on site over the last four years has exhibited a slight increase which was mainly due to the increase of activities and personnel on site in this time period. A dramatic increase in water consumption was experienced in 2006 due to a leaking pipe underground. After a leak was detected in 2006, it can be seen that water consumption in 2007 reduced significantly back to levels of normal consumption for the sites activities. This normal range of consumption has been maintained with a slight increase in water usage during 2008.

Figure 14: Water usage on site between 2001 and 2008





4.2 Environmental Management programme.

Appendix 9 outlines the progress on current objectives and targets.

4.3 Development and Infrastructural works for 2009/10.

Construction of further hard-standing area at north end of site including installation of pre-settlement tank and class 1 interceptor with silt trap and discharge chamber is currently being completed on site.

There are no plans currently to construct further infrastructure.

4.4 Process Critical equipment

The following table details the critical processing equipment

Waste Process	Critical Equipment	Function	Back up measures
Waste Oil Processing	Boiler	Provides heat for the waste oil re-processing	Boiler is a dual fuel which can be alternatively run on kerosene or natural gas. In the event of one form of the fuel not being available. In the event of a breakdown the process can be run on a portable boiler which can be sourced from Concord boilers.
	Compressors	Provides air for valves on process equipment also used for dewatering oil.	Replacements can be hired in from Laois Hire
	Flanges and valves on over-ground pipe lines	Direction of product	Repaired by on site fitter.
	Steam Traps	Part of oil heating system	Replacements on site
	Motor Screen	Filter waste oil	Motors can be purchased locally from Portlaoise Rewinds Spare screens are stored on site.
	Airlines	Provision of air to process equipment and storage tanks	Repaired by on site fitters or replaced as necessary
	Oil pumps including Blackmer and	Pumps are used in loading, unloading, at sump and moving oil	Spares on site

	Mono pumps Wording Simpson and submersible pumps.	during process	
	Cat & Mouse gauge	Used to visually determine the volume of oil in tanks	Spare on site, or repaired as necessary by plant fitter.
	Scada	Electronic control of the waste oil processing	Process can be
Soil Processing	Power Screen logwash Power Screen Trommel	Washing and screening of soil to segregate soil and larger fractions into different streams.	Breakdowns can be repaired by on site fitter. Log wash and Trommel can both be hired in the event of a breakdown.
Solid Oily waste re- packaging	Conveyor	Carriage of solid oily waste into drum.	Repaired by on site fitter.
Weighing of waste	Weighbridge	Weighing of waste	Mobile weighbridge can be sourced if required.
Metal Shredder	Shredder comprising of motors, conveyors and jaws.	Essential parts required for shredding of material can be repaired by plant fitter i.e. conveyor and motor	Plant would be repaired asap. In the event of shredder being down for a period of time used filters can be sent straight to MSM metal recycling, Mountmellick.
Surface water Run off	Interceptor	Discharge of on site surface water and separation of oil and water prior to discharge	Pumps can be replaced by plant fitter.
Forklift		Movement of waste around the facility	Forklifts can be hired in where necessary.
Loading shovel		Movement of soil on soil pads	Loading shovel can be hired from Hinch plant hire.
Lime Treatment Plant	Filter press	Pressing of filter cake	Mobile filter press
	Acid dosing pump	Neutralization of eluate	Sourced from supplier
	pH probe	Monitoring of pH	Flash mixer
	Flash mixer (pH	Monitoring of pH	Effluent stored in Final



	adjustment after filter press)		Discharge tank
	Lime silo	dust filter	Spare dust filter kept on site
	Scada	Automatic control of process	Manual controls and bunding in place.
	Filter Press	Separating solids from effluent	Cloths kept in sourced.
	Cloth		
	Plates		Plate can be removed or spare plate sourced
Fluorescent Tube Crusher	Carbon filter	Removal of contaminants dust.	Replacement carbon sourced from supplier.

4.5 Summary of Procedures

Summary of Standard Operating Procedures created since January 2008. A new procedure has been created for the operation of the odour neutralisation unit, filter hopper and yard shunter.

4.6 Review of Nuisance Controls

Condition 7 “Nuisances”, of the waste management license 184-1 requires all nuisances to be controlled.

SOPN 74 Site HSE Inspections SOP - This procedure is to provide for the maintenance and upkeep of the Enva site and its surroundings to prevent any nuisance at the facility or the immediate area arising. A weekly checklist to inspect the site for the presence of noise, odour, vermin, dust or mud is integral to this procedure. This procedure was called SOP 70 Nuisance control however during 2008 the procedure was reviewed and altered.

A list of likely nuisances to arise from the activities undertaken on the Enva Ireland site and their controls are detailed below.

Vermin

Vermin control is in place, “Rent a Kill” inspect and bate the site approximately every three months.

No vermin have been detected on site from the weekly site inspections since checks commenced in November 2004.

Odours



No significant odours have been detected on the site from the weekly site inspections, however odour complaints have been received from a neighbouring facility for further information please see section 5.

Dust

Dust monitoring is undertaken on a quarterly basis by Enva laboratory personnel in accordance with VDI 2119 Part 2, "*Measurement of particulate Precipitations, Determination of Dust Precipitation with Collecting Pots Made of Glass (Bergerhoff Method) or Plastic*"

Enva use a roadsweeper to remove any soil or particles from the site which when dried could generate a dust nuisance.

Noise

Noise monitoring is carried out on an annual basis as per Condition D3. of the waste licence W0 184-1. Please see Appendix 5 on Noise Monitoring.

4.7 Bund Integrity testing.

Bund integrity inspection report was carried out on the 4th of July 2007 by Kavanagh Ryan and associates.

4.8 Calibration of temperature probes

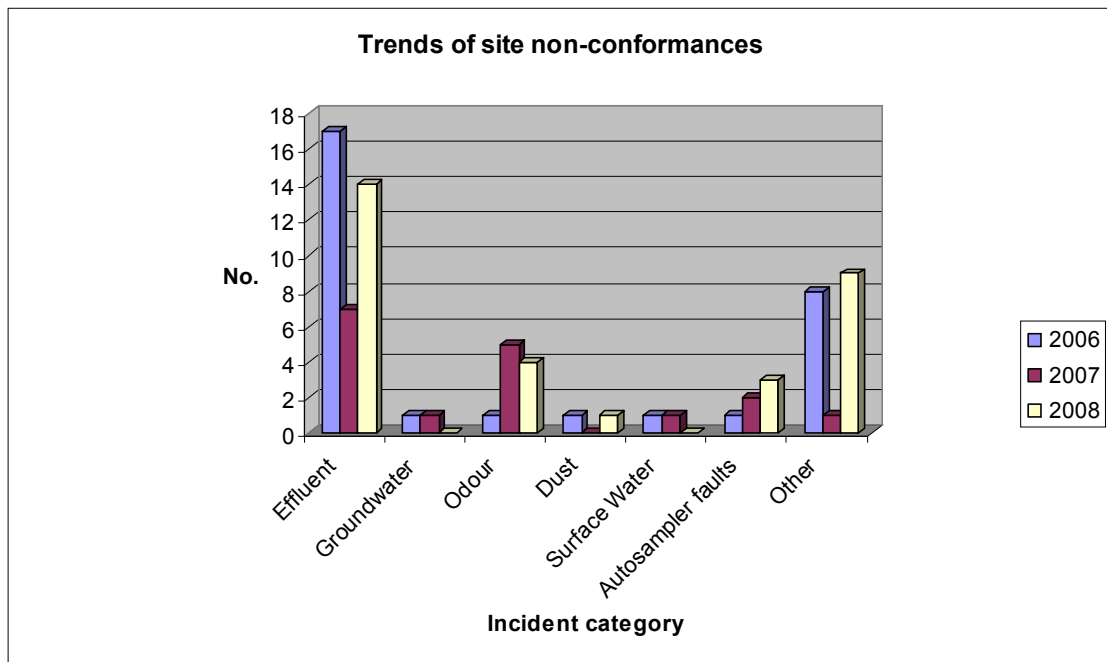
See Appendix 12 for calibration certificates for relevant temperature probes

5.0 NON-CONFORMANCES

Table 7: Summary of non-conformances reported to the EPA 2008

Environmental Incidents	2008
Effluent	14
Groundwater	0
Odour	4
Dust	1
Surface Water	0
Autosampler faults	3
Other	9
Total	31

The graph below indicated the trend in incidents between 2006 and 2008.



5.1 Effluent Exceedence

There were fourteen exceedences reported in 2008. The exceedences of suspended solid limit values reported for the 16th, 17th and 18th of September in addition to the exceedences reported for COD limit values on 15th, 16th and 30th of September were upon investigation not exceedences of the limit values. These incidents were due to a build up of residues of effluent solids in the effluent line where the composite sample was taken. This build up resulted in a distortion of effluent quality as samples were being taken. All batches were pre-approved for release as per standard operating procedure. Therefore the actual number of limit value exceedences during 2008 was eight.

Of these eight exceedences five were due to elevated ammonia levels. Enva has carried out trials on reducing ammonia in effluent. A copy of the findings of these trials is included in Appendix 11, use of this method to reduce ammonia within the wastewater will be investigated further by Enva. In addition to this common customer sources that potentially generate ammonia have been identified and these are automatically identified upon customer order. The waste oil acceptance procedure is currently being revised to identify possible ammonia sources from waste oils.

The remaining three exceedences in limit values were as follows;

- Suspended solids 19/04/08: The source of the suspended solid exceedence was investigated by carrying out suspended solids analysis on the effluent process line. No cause could be determined for this exceedence as all results were low in suspended solid content.
- Zinc 25/09/08: The zinc exceedence was investigated and found to be due to operator error.

- Chloride 01/10/08: This isolated chloride exceedence is thought to be due to the processing of waste ship oils in which chloride is inherent.

5.2 Surface Water

There were no exceedences against licence parameters in 2008.

5.3 Odour Complaint

There were four odour complaints received from the facility located to the eastern boundary of the Enva site during 2008. Enva have put in place an odour neutralisation unit to reduce potential odour experienced by the adjacent facility.

5.4 Dust

There was one non-conformance against the site licence with regard to dust measurements. The dust pot at the monitoring location had been set in concrete to ensure its stability. Due to the topography of the yard in this location, the dust pot caught heavier dust deposits that may not have been reflective of ambient dust. The dust pot was subsequently heightened to bring it in line with the height of the yard allowing a more reflective sample of dust from the site rather than ground level dust.

5.5 Other

The nine non conformances in the other category were as follows:

5.5.1 Effluent Non Conformances

There were three non conformances in relation to the release of effluent

- The first incident occurred when an operator omitted to retain a discharge sample for the 17/05/08 before arranging collection for the next nights discharge (18/05/08). The operator was re-trained in the processing of waste oil procedure and the effluent discharge procedure.
- The second incident occurred in September where the effluent line was cleaned by the operations team. An omission was made by an operative to turn back on the air on this line when returning the line to normal activity. This resulted in no air being present in the valve to allow it to open and take the effluent sample into the bucket.
- A build up of residue in the effluent line resulted in a series of effluent non conformances being incorrectly reported. The details of this non conformance are outlined in the effluent exceedence section 5.1 above.

5.5.2 Non Conformances identified during EPA site visits in 2008

Two non conformances were identified in an EPA visit in December. The first related to the monitoring of reprocessed waste oil where a non compliance with condition 5.3.4 of the Enva waste licence was identified. Since this non compliance was identified analysis has been performed on all retain samples of batches which were previously untested for



PCBs. The results of the analysis were found to be within the specification provided in Schedule G of the Enva licence. An auto sampler was sourced for the GC-ECD and installed thereby allowing more efficient turn around time of results. The second non conformance related to the release of reprocessed oil, in particular with condition 5.3.5 of the Enva waste licence. The corrective action implemented for this was a complete revision of the release procedures for 11LS from site, thus ensuring control of the release of recycled oil from the site.

Four non conformances were identified in an EPA visit in April. The first non compliance related to bunding on site and was a non compliance with section 3.13.2 and 3.13.3. An access route has been created to allow the operator to access the bund so that it can be pumped out. The second non conformance related to facility security, section 3.5.1 of the Enva waste licence. Following identification of this non compliance, the fencing was corrected and made secure. The third non compliance was with regard to section 3.12.5 of the licence and related to site drainage. The issues highlighted with regard to drainage have been resolved, the blocked drainage areas were desludged and excess silt removed. The Agency's report also recommended that further works be carried out in the UCO reception area. Enva no longer operate a UCO division within the company and therefore further works were not required in this area. The final non conformance identified was in relation to the unroofed soil treatment area. Enva currently do not use this area for soil treatment.

6.0 PUBLIC INFORMATION

All queries with regard to public information are dealt with as per SOP-N10 HSE Communications Procedure. See Appendix 8.

7.0 CLOSURE, RESTORATION, AFTERCARE MANAGEMENT PLAN

The Closure, Restoration, Aftercare Management Plan has not been altered since its submission in 2008. See Appendix 13 for a copy of the Closure, Restoration, Aftercare Management Plan

8.0 ENVIRONMENTAL LIABILITY RISK ASSESSMENT

The Environmental Liability Risk Assessment has not been altered since its submission in 2008. See Appendix 14 for a copy of the Environmental Liability Risk Assessment

9.0 OEE METHODOLOGY FOR DETERMINING ENFORCEMENT CATEGORY OF LICENCES

The enforcement category summary page of the OEE Methodology is included in Appendix 10.

10.0 WASTE RECOVERY REPORT

See Appendix 7 for waste recovery report for 2008

11.0 PRTR returns

Appendix 15 includes a copy of the PRTR returns.

Appendix 1



**Groundwater Quality Monitoring
Enva Ireland Ltd
Quarter 1 2008**

DOCUMENT CONTROL SHEET

Client	Enva Ireland Ltd					
Project Title	Enva Groundwater Monitoring, Quarter 1 2008					
Document Title	Quarterly Groundwater Analysis					
Document No.	MDE0498Rp0014F01					
This Document Comprises	DCS	TOC	Text	List of Tables	List of Figures	No. of Appendices
	1	1	19	1	1	1

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
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1 INTRODUCTION

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

Enva Ireland has been operating under Waste Licence Register No. W0184-01 since December 2005, and is required to submit a report to the Environmental Protection Agency (EPA) on a monthly basis, outlining the existing groundwater quality underlying the site.

Suitably qualified environmental consultants from RPS Group, collected groundwater samples from a series of monitoring wells (BH101, BH102, BH103, BH104B, MW01, MW02, MW03) within the site boundaries. The samples underwent laboratory analysis for the suite of parameters specified in Schedule 4(ii) of Waste Licence W0184-01. This report outlines the results of the monitoring round conducted on the 13th February 2008, which corresponds to the first quarter of 2008.

2 METHODOLOGY

Groundwater samples were collected from seven on-site groundwater-monitoring wells (BH101, BH102, BH103, BH104B, MW01, MW02, MW03), using dedicated Waterra tubing, in accordance with RPS Group's standard sampling protocol. A non-return foot valve was fixed to the bottom of the tubing and inserted into the well, reaching the base of the bore. 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, four well volumes were purged from each well prior to collecting 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.

In order to ensure optimal evaluation, the pH, conductivity and temperature of the extracted water were continually monitored using a field meter, which was calibrated on the day of use. 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.

All groundwater samples were analysed at a UKAS accredited laboratory, *Alcontrol Geochem*, for the suite of analyses listed in Table 1. Table 1 also indicates the analytical techniques used by the laboratory.

Table: 1 Analytical Methodologies – Alcontrol Geochem Laboratories Dublin

Parameter	Analytical Methodology
List 1 & 2 Organics	GCMS
DRP/Mineral Oil	C10-C40 by GC-FID (headspace)
PRO/BTEX	C5-C9, C10+ BTEX by GC-FID (headspace)
Speciated PAHs	GC-MS following extraction with DCM
Total Phenols	HPLC following dilution with Methanol

3 GEOLOGY, HYDROLOGY AND HYDROGEOLOGY

The Enva Ireland site is located 1km to the west of the River Triogue, sloping to the East and Southeast. The site is low-lying and well drained (Figure 1). According to the Geological Survey of Ireland the underlying bedrock consists of Argillaceous Bioclastic Limestone (*Geological Map Sheet No.15*).

There is an aquifer in the limestone bedrock, which is overlain by a perched aquifer in sandy boulder clay. The groundwater in the bedrock aquifer is used regionally as a potable water supply. However, no abstraction wells have been identified within a 1 km radius of the site.

The groundwater vulnerability in the region is classified as 'extreme' due to the high permeability of the subsoil and the shallow groundwater depths (*GSI classification: Groundwater Monitoring Round Report, 2002*)

Figure 1: Site Location

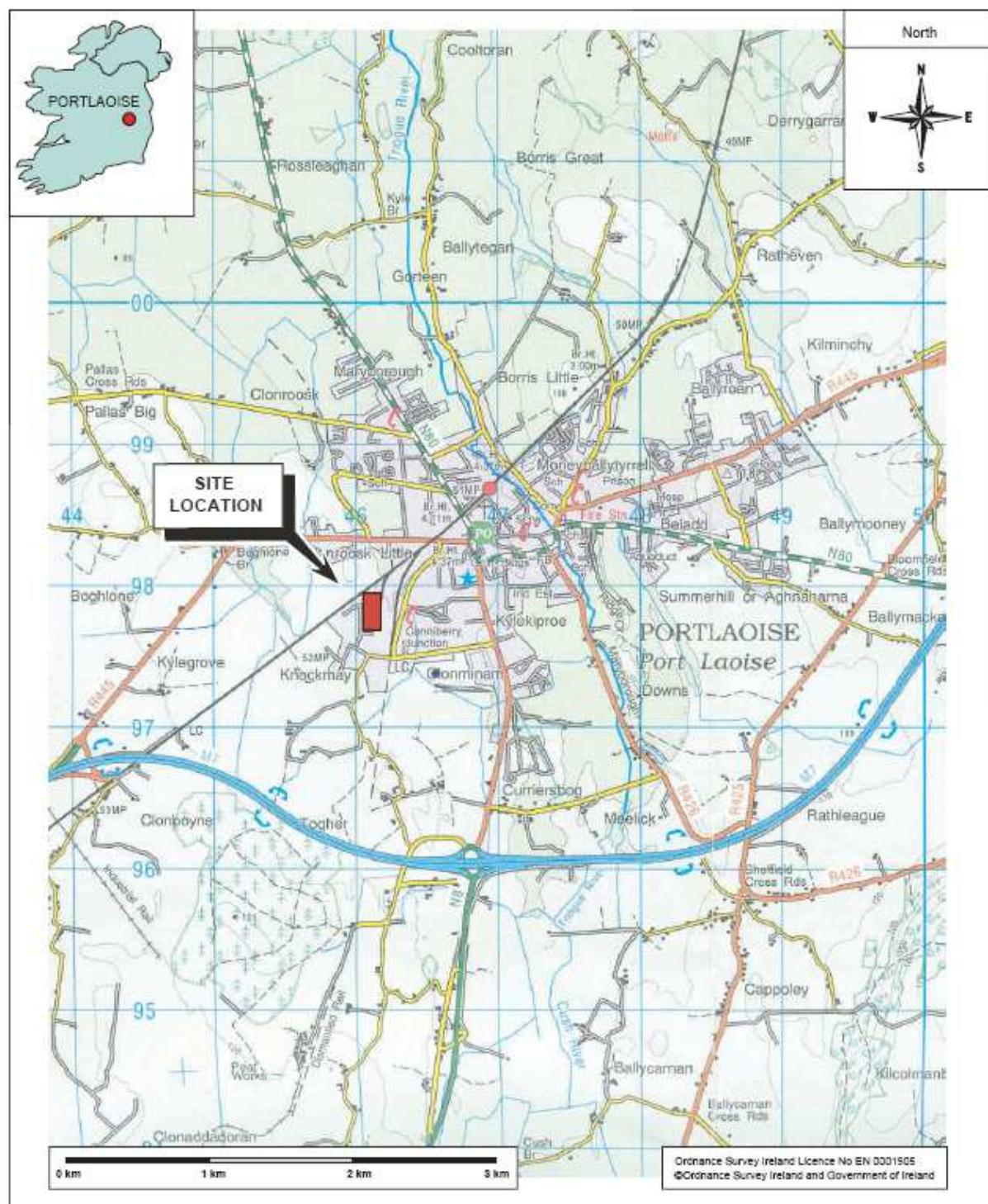
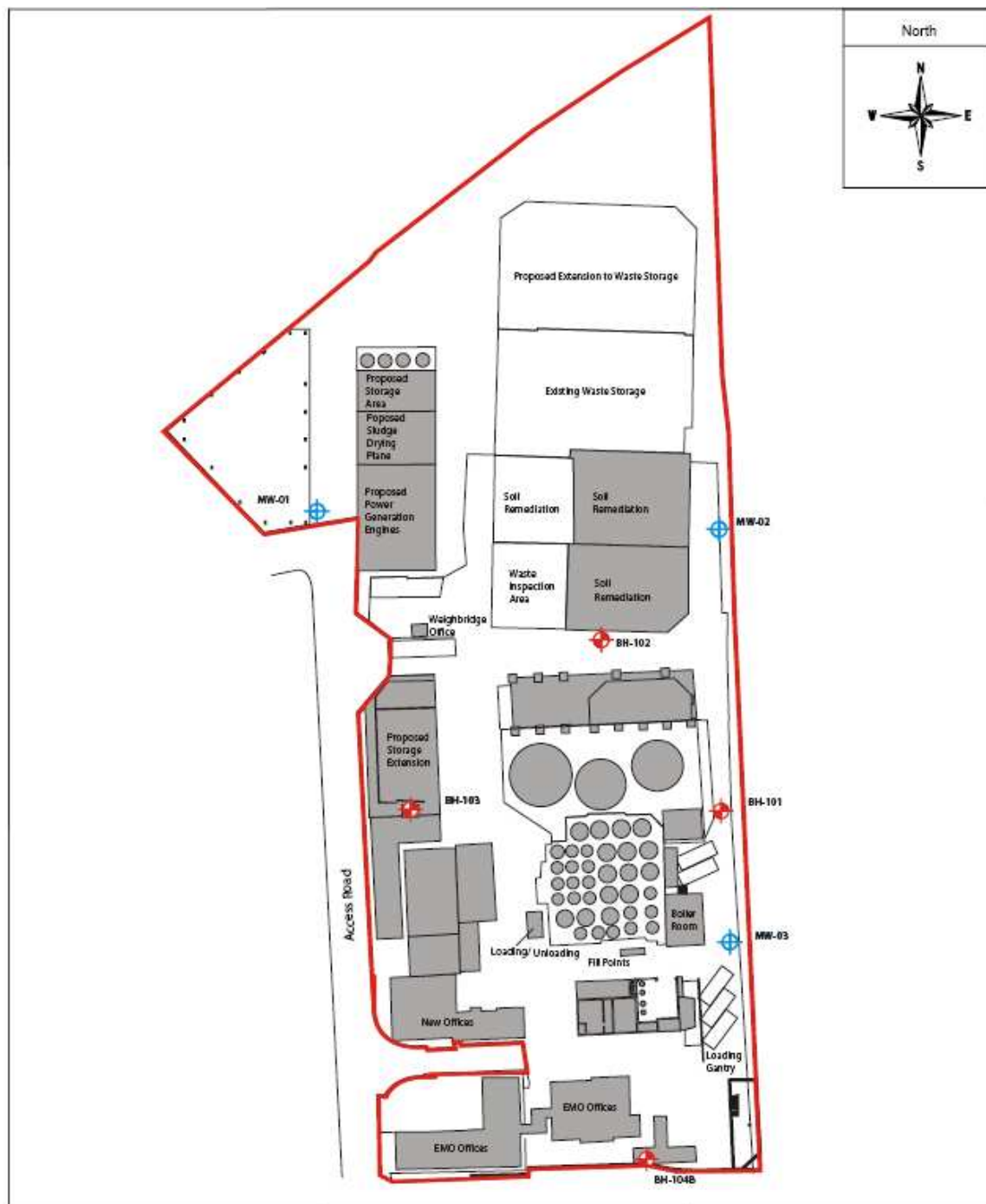




Figure 2: Site Layout Plan

Source: URS Environmental Consultants

Shallow Monitoring Well locations 
 Deep Monitoring Well locations 

4 RESULTS

The results of all field measurements and laboratory analysis are discussed in this section.

4.1 FIELD OBSERVATIONS

Field observations are summarised in Table: 2.

Groundwater was encountered in all of the 7 monitoring boreholes installed at the site. The depth to the water table varied from 1.85 m to 4.10 m below ground level (mbgl) at the time of sampling. Measured field parameters were generally found to be within the required range, with the exception of a marginally low pH of 6.43 and an elevated conductivity of 1462 in samples collected from monitoring well BH102.

Observations relating to colour and odour varied from well to well. Similar to the previous monitoring round, samples collected from wells BH104B and MW03 displayed characteristics indicative of some level of contamination. This included the presence of an oily surface film and a distinct organic odour. Observations made during sampling from the remaining 5 wells, were largely indicative of unpolluted waters.

4.2 ANALYTICAL RESULTS

The results of laboratory analysis are presented in Tables 3 to 6 and are discussed hereunder.

Benzene, Toluene, Ethylbenzene, and Xylene (BTEX)

BTEX was analysed in the laboratory using gas chromatography (GC). The Method Detection Limit (MDL) is 10 µg/l. No BTEX parameters were detected in any of the wells. The results of laboratory analysis for BTEX are presented in Table 3.

Mineral Oil & Diesel Range Organics (DRO)

The samples were analysed for mineral oil in the laboratory using gas chromatography (GC). The Method Detection Limit (MDL) is 10 µg/l. Elevated levels of Mineral Oil were identified in monitoring wells BH104B (at 0.746 mg/l) and MW03 (0.109 mg/l), the interim guideline value for this parameter is 0.01 mg/l. Concentrations in all other monitoring wells were found to be below the limit of detection of the laboratory.

Diesel range organics were detected in three of the monitoring wells. Elevated levels were detected in samples extracted from BH104B (994 µg/l), MW01 (41 µg/l) and MW03 (at 546 µg/l), although no IGTV has been specified for these compounds. The results of laboratory analysis for Mineral Oil and DRO are shown in Table 3.

Polycyclic Aromatic Hydrocarbons (PAHs)

A total of 16 PAH's were measured in the seven groundwater samples taken for laboratory analysis. The results of laboratory analysis for PAHs are shown in Table 4.

Currently, there are only 6 EPA guideline values available for concentrations of specific PAHs in groundwater. There is however a general interim guideline value (IGV) of 0.1 µg/l, which can be used for the interpretation of the groundwater contamination.

Results from groundwater monitoring at the site show that elevated concentrations of total PAH's (EPA 16) were identified in BH104B (1.701 µg/l) and MW03 at (1.146 µg/l). Both of these results exceed the Interim EPA Guideline Value of 0.1µg/l. The remaining six wells were below the laboratory detection limit of 0.01 µg/l for EPA 16 PAH or total PAH.

Phenol Concentration

Phenols were detected at MW03 at a concentration of 60 µg/l. Both the laboratory limit of detection and the EPA interim guideline value is 0.5 µg/l. All other wells displayed concentrations below this. Results of Phenol monitoring are illustrated in Table 5.

Semi Volatile Organic Compounds (SVOC's)

SVOCs were detected in one of the wells at the site. Analysis of samples was carried out using gas chromatography mass spectrometry (GCMS). Results of SVOC monitoring are illustrated in Table: 6.

Volatile Organic Compounds (VOC's)

VOCs were detected in 2 of the wells at the site. Analysis for VOC's was preformed using GCMS. The results of VOC monitoring are presented in Table 7.

Table: 2 Results of Field Parameters Measured at Each Groundwater Monitoring Well

Field Parameters								
Monitoring Well	Depth (m)	Static water Level (m)	Volume Extracted (l)	Temp (oC)	pH (pH units)	Dissolved O2 (ppm)	Conductivity (µs/cm)	Observations
BH101	6.83	4.10	20	11.5	7.16	5.31	667	Very cloudy (High SS content), Slight stale odour. No evidence of oil
BH102	7.68	2.95	20	11.2	6.43	3.91	1462	Yellow/brown tinge. Stale odour. No evidence of oil
BH103	4.80	1.85	15	11.02	7.41	3.06	781	Brown in colour. No evidence of oil. No odour
BH104B	4.87	2.18	10	9.1	7.11	3.11	457	Oily surface film. Slight Oily odour. Generally clear on sampling
MW01	22.84	2.80	80	11.02	7.30	3.07	703	Clear. No odour. No evidence of oil.
MW02	30.00	3.79	105	11.4	7.39	4.08	602	Slight orange/brown tinge. Cloudy. No evidence of oil
MW03	14.92	3.98	45	12.1	7.06	4.08	754	Oily surface film & oily odour
Interim Guideline Value	-	-	-	25OC	>6.5 & <9.5	-	1000	

Table: 3 Results of BTEX, Inorganics, Mineral Oil and Organics in Groundwater Samples

Parameter	Units	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values (units as indicated)
BTEX									
Benzene	µg/l	<10	<10	<10	<10	<10	<10	<10	1.0
Ethylbenzene	µg/l	<10	<10	<10	<10	<10	<10	<10	10
Toluene	µg/l	<10	<10	<10	<10	<10	<10	<10	10
Xylene	µg/l	<10	<10	<10	<10	<10	<10	<10	10
Mineral Oil									
Mineral Oil by GC	mg/l	<0.01	<0.01	<0.01	0.746	<0.01	<0.01	0.109	0.01
Organics									
DRO	µg/l	<10	<10	<10	994	41	<10	546	-1

¹ No IGV specified for certain parameters

Table: 4 Results of PAHs in Groundwater Samples

PAHs										
Parameter	Units	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values	
Acenaphthene	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.353	-	
Acenaphthylene	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.045	-	
Anthracene	µg/l	<0.01	<0.01	<0.01	0.035	<0.01	<0.01	0.054	10000	
Benzo(a)anthracene	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.020	-	
Benzo(a)pyrene	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.010	0.01	
Benzo(b)+benzo(k) fluoranthene	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.013	-	
Benzo(g,h,i)perylene	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	
Chrysene	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.042	-	
Dibenzo(ah)anthracene	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	
Flourene	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.307	-	
Fluoranthene	µg/l	<0.01	<0.01	<0.01	0.010	<0.01	<0.01	0.019	1	
Indeno(123cd)pyrene	µg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	
Napthalene	µg/l	<0.01	<0.01	<0.01	0.639	<0.01	<0.01	0.067	1	
Phenanthrene	µg/l	<0.01	<0.01	<0.01	0.041	<0.01	<0.01	0.145	-	
Pyrene	µg/l	<0.01	<0.01	<0.01	0.024	<0.01	<0.01	0.071	-	
Total 16 EPA PAHs	µg/l	<0.01	<0.01	<0.01	1.701	<0.01	<0.01	1.146	0.1	

Table: 5 Phenol Concentrations in Groundwater Samples

Phenols									
Parameter	Units	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values
2-Chlorophenol**	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5
2-Nitrophenol**	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5
2,4-Dimethylphenol**	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5
2,4-Dichlorophenol**	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5
4-Chloro-3-methylphenol**	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5
2,4,6-Trichlorophenol**	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5
4-Nitrophenol**	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5
Pentachlorophenol**	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5
Total Phenol**	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	60	0.5

Table: 6 Results of SVOC's in Groundwater Samples

SVOC's									
Parameter	Method Detection Limits (µg/l)	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values for Groundwater (µg/l)
1,2,4-Trichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	0.4
1,2-Dichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	10
1,3-Dichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	-
1,4-Dichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	-
2,4,5-Trichlorophenol	1	<1	<1	<1	<1	<1	<1	<1	-
2,4,6-Trichlorophenol	1	<1	<1	<1	<1	<1	<1	<1	200
2,4-Dichlorophenol	1	<1	<1	<1	<1	<1	<1	<1	-
2,4-Dimethylphenol	1	<1	<1	<1	<1	<1	<1	<1	-
2,4-Dinitrotoluene	1	<1	<1	<1	<1	<1	<1	<1	-
2,6-Dinitrotoluene	1	<1	<1	<1	<1	<1	<1	<1	-
2-Chloronaphthalene	1	<1	<1	<1	<1	<1	<1	<1	-
2-Chlorophenol	1	<1	<1	<1	<1	<1	<1	<1	200
2-Methylnaphthalene	1	<1	<1	<1	<1	<1	<1	<1	-
2-Methylphenol	1	<1	<1	<1	<1	<1	<1	<1	-
2-Nitroaniline	1	<1	<1	<1	<1	<1	<1	<1	-
2-Nitrophenol	1	<1	<1	<1	<1	<1	<1	<1	-
3-Nitroaniline	1	<1	<1	<1	<1	<1	<1	<1	-
4-Bromophenylphenylether	1	<1	<1	<1	<1	<1	<1	<1	-
4-Chloro-3-methylphenol	1	<1	<1	<1	<1	<1	<1	<1	-
4-Chloroaniline	1	<1	<1	<1	<1	<1	<1	<1	-

SVOC's									
Parameter	Method Detection Limits (µg/l)	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values for Groundwater (µg/l)
4-Chlorophenylphenylether	1	<1	<1	<1	<1	<1	<1	<1	-
4-Methylphenol	1	<1	<1	<1	<1	<1	<1	<1	-
4-Nitroaniline	1	<1	<1	<1	<1	<1	<1	<1	-
4-Nitrophenol	1	<1	<1	<1	<1	<1	<1	<1	-
Acenaphthene	1	<1	<1	<1	0.386	<1	<1	<1	-
Acenaphthylene	1	<1	<1	<1	0.081	<1	<1	<1	-
Anthracene	1	<1	<1	<1	<1	<1	<1	<1	10000
Azobenzene	1	<1	<1	<1	<1	<1	<1	<1	-
Benzo(a)anthracene	1	<1	<1	<1	<1	<1	<1	<1	-
Benzo(a)pyrene	1	<1	<1	<1	<1	<1	<1	<1	0.01
Benzo(b)fluoranthrene	1	<1	<1	<1	<1	<1	<1	<1	0.5
Benzo(ghi)perylene	1	<1	<1	<1	<1	<1	<1	<1	0.05
Benzo(k)fluoranthrene	1	<1	<1	<1	<1	<1	<1	<1	0.05
Bis(2-chloroethoxy)methane	1	<1	<1	<1	<1	<1	<1	<1	-
Bis(2-chloroethyl)ether	1	<1	<1	<1	<1	<1	<1	<1	-
Bis(2-ethylhexyl)phthalate	1	<1	<1	<1	<1	<1	<1	<1	-
Butylbenzylphthalate	1	<1	<1	<1	<1	<1	<1	<1	-
Carbazole	1	<1	<1	<1	<1	<1	<1	<1	-
Chrysene	1	<1	<1	<1	<1	<1	<1	<1	-
Dibenzo(a,h)anthracene	1	<1	<1	<1	<1	<1	<1	<1	-
Dibenzofuran	1	<1	<1	<1	<1	<1	<1	<1	-
Diethyl phthalate	1	<1	<1	<1	<1	<1	<1	<1	-
Dimethyl phthalate	1	<1	<1	<1	<1	<1	<1	<1	-
Di-n-butylphthalate	1	<1	<1	<1	<1	<1	<1	<1	2

SVOC's									
Parameter	Method Detection Limits (µg/l)	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values for Groundwater (µg/l)
Di-n-octylphthalate	1	<1	<1	<1	<1	<1	<1	<1	-
Fluoranthene	1	<1	<1	<1	<1	<1	<1	<1	1
Fluorene	1	<1	<1	<1	0.485	<1	<1	<1	-
Hexachlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	0.03
Hexachlorobutadiene	1	<1	<1	<1	<1	<1	<1	<1	0.1
Hexachloroethane	1	<1	<1	<1	<1	<1	<1	<1	-
Hexchlorocyclopentadiene	1	<1	<1	<1	<1	<1	<1	<1	-
Indeno(1,2,3-cd)pyrene	1	<1	<1	<1	<1	<1	<1	<1	0.05
Isophorone	1	<1	<1	<1	<1	<1	<1	<1	-
Naphthalene	1	<1	<1	<1	<1	<1	<1	<1	1
Nitrobenzene	1	<1	<1	<1	<1	<1	<1	<1	10
N-nitrosodi-n-propylamine	1	<1	<1	<1	<1	<1	<1	<1	-
Pentachlorophenol	1	<1	<1	<1	<1	<1	<1	<1	2
Phenanthrene	1	<1	<1	<1	<1	<1	<1	<1	-
Phenol	1	<1	<1	<1	<1	<1	<1	<1	0.5
Pyrene	1	<1	<1	<1	<1	<1	<1	<1	-

Table: 7 Results of VOC's in Groundwater Samples

VOC's									
Parameter	Method Detection Limits (µg/l)	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values for Groundwater (µg/l)
1,1,1,2-Tetrachloroethane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,1,1-Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	500
1,1,2,2-Tetrachloroethane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,1,2-Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,1-Dichloroethane	<1	<1	<1	<1	<1	<1	<1	8.0	-
1,1-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	-
1,1-Dichloropropene	<1	<1	<1	<1	<1	<1	<1	<1	-
1,2,3-Trichlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
1,2,3-Trichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,2,4-Trichlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	0.4
1,2,4-Trimethylbenzene	<1	<1	<1	<1	23	<1	<1	<1	-
1,2-Dibromo-3-chloropropane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,2-Dibromoethane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,2-Dichlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	10
1,2-Dichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	3
1,2-Dichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,3,5-Trimethylbenzene	<1	<1	<1	<1	5	<1	<1	<1	-
1,3-Dichlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
1,3-Dichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,4-Dichlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	-

VOC's									
Parameter	Method Detection Limits (µg/l)	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values for Groundwater (µg/l)
2,2-Dichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	-
2-Chlorotoluene	<1	<1	<1	<1	<1	<1	<1	<1	-
4-Chlorotoluene	<1	<1	<1	<1	<1	<1	<1	<1	-
4-Isopropyltoluene	<1	<1	<1	<1	<1	<1	<1	<1	-
Benzene	<1	<1	<1	<1	<1	<1	<1	<1	1
Bromobenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
Bromochloromethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Bromodichloromethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Bromoform	<1	<1	<1	<1	<1	<1	<1	<1	-
Bromomethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Carbon disulphide	<1	<1	<1	<1	<1	<1	<1	<1	-
Carbontetrachloride	<1	<1	<1	<1	<1	<1	<1	<1	-
Chlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	1
Chloroethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Chloroform	<1	<1	<1	<1	<1	<1	<1	<1	12
Chloromethane	<1	<1	<1	<1	<1	<1	<1	<1	-
cis-1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	-
cis-1,3-Dichloropropene	<1	<1	<1	<1	<1	<1	<1	<1	-
Dibromochloromethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Dibromomethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Dichlorodifluoromethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Dichloromethane	<1	<1	<1	<1	<1	<1	<1	<1	10

VOC's									
Parameter	Method Detection Limits (µg/l)	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values for Groundwater (µg/l)
Ethylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	10
Hexachlorobutadiene	<1	<1	<1	<1	<1	<1	<1	<1	0.1
Isopropylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
Naphthalene	<1	<1	<1	<1	<1	<1	<1	<1	1
n-Butylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
o-Xylene	<1	<1	<1	<1	6	<1	<1	<1	10
p/m-Xylene	<1	<1	<1	<1	<1	<1	<1	<1	10
Propylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
sec-Butylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
Styrene	<1	<1	<1	<1	<1	<1	<1	<1	-
tert-butyl methyl ether	<1	<1	<1	<1	<1	<1	<1	<1	-
tert-Butylbenzene	<1	<1	<1	<1	5	<1	<1	<1	-
Tetrachloroethene	<1	<1	<1	<1	<1	<1	<1	<1	40
Toluene	<1	<1	<1	<1	<1	<1	<1	<1	10
trans-1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	-
trans-1,3-Dichloropropene	<1	<1	<1	<1	<1	<1	<1	<1	-
Trichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	70
Trichlorofluoromethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Vinyl Chloride	<1	<1	<1	<1	<1	<1	<1	<1	-

5 DISCUSSION

The results of the 1st quarterly monitoring round of 2008 are included in Tables 1 to 7 of the report. For the purpose of the report, the results are compared to 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 in the subsections below.

With regards to field parameters measured during the 1st quarterly groundwater monitoring of 2008, it was observed that with the exception of results of water samples obtained from well BH102 (at 6.43), values for pH were within the EPA interim guideline range of 6.5 – 9.5 in all of the monitoring wells. Electrical conductivity was observed as being above the guideline value at wells BH102 (at 1462 µs/cm), which is a slight increase from the measurements taken during quarter of 2007 (1172 µs/cm).

Measurements taken for Dissolved Oxygen concentrations, ranged from 3.06 ppm – 5.31 ppm. Factors such as climate, nutrients in the water, suspended solids; organic wastes and groundwater inflow can all influence the DO value. Observations at the time of sampling varied from well to well, a description of the colour and odour is described in table 2. It was observed that BH104B and MW03 contained also contained an oily residue and a slight odour.

Elevated levels of Mineral Oil were identified in well MW03 (at 0.109 mg/l); the interim guideline value for this parameter is 0.01 mg/l. All other wells were below the laboratory detection limit. Elevated levels of diesel range organics (DRO) were also present in samples extracted from wells BH104B (at 994 µg/l), MW03 (at 546 µg/l) and MW01 (at 41µg/l), although no IGV has been specified for these compounds.

Similar to the results of quarter 4, 2007, the results from quarter 1, 2008, show that concentrations of total PAH's (EPA 16) were in excess of the relevant interim guideline values (IGVs) at BH104B and MW03. During this quarter, BH104B displayed concentrations of total PAHs (US EPA 16) at 1.701 µg/l, which is a decrease from a concentration 19.72 µg/l recorded during the 4th quarter of 2007. Concentrations of total PAHs (US EPA 16) at well MW03 decreased from 3.86 µg/l in Q4 of 2007 to 1.146 µg/l during the 1st quarter of 2008. The remaining six wells were below the laboratory detection limit <0.01 µg/l for total PAHs (US EPA 16). It must be noted that a number of other PAH compounds displayed elevated concentrations during monitoring for this quarter, whilst most were below the relevant interim guideline values (IGV) some IGV do not exist for certain compounds.

Phenol concentrations were in excess of the relevant interim guideline values (IGVs) at MW03 (at 60 µg/l). Phenol concentrations in all remaining wells were found to below the limit of detection of 0.5 µg/l. The results are presented in table 5.

The results of monitoring for semi-volatile organic (SVOCs) and volatile organic (VOCs) compounds show a decrease in the number of wells displaying concentrations above the lower limit of detection for these substances. No wells displayed concentrations of these substances in excess of the relevant EPA interim guideline values.

6 CONCLUSIONS

In accordance with the criteria set out in Schedule 4(ii) of the site's Waste Licence Register No. W0184-01, groundwater monitoring was carried out at the ENVA Ireland site on the 13th February 2008 corresponding to the 1st quarter of 2008. Suitably qualified consultants from RPS collected groundwater samples from 7 on-site monitoring wells and submitted these samples to an accredited laboratory for analysis.

In general, when compared with results of the previous monitoring round (Q4 of 2007), a decrease in concentrations of various substances (Mineral Oil, DRO, BTEX, PAH, VOCS and SVOCS) was observed.

Wells BH104B and MW03 displayed concentrations of mineral oil (MRO) and diesel range organics (DRO) in excess of the interim guideline values for these parameters. The concentrations detected are however regarded as background and the contamination remains localised, neither moving downgradient nor off-site.

APPENDIX A

SAMPLING AND ANALYSIS - METHODS AND DETAILS

A.1.1 Location of Sampling

Enva Ireland Limited

Clonminam Industrial Estate

Portlaoise

Co Laois

A.1.2 Date & Time of Sampling

13th February 2008, Sampling started at 11.55am

A.1.3 Personnel Present During Sampling

Joe Hunter, Senior Environmental Consultant, RPS Group, Dublin

A.1.4 Instrumentation

Honda Purge Pump

Waterra Tubing and ball valves

Dip Meter

Environmental Monitoring Kit – pH, EC, DO and temperature



**Groundwater Quality Monitoring
Enva Ireland Ltd
Quarter 2 2008**

DOCUMENT CONTROL SHEET

Client	Enva Ireland Ltd					
Project Title	Enva Groundwater Monitoring, Quarter 2 2008					
Document Title	Quarterly Groundwater Analysis					
Document No.	MDE0498Rp0016F01					
This Document Comprises	DCS	TOC	Text	List of Tables	List of Figures	No. of Appendices
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1 INTRODUCTION

RPS Group have been commissioned by Enva Ireland Ltd 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 Waste Licence Register No. W0184-01.

Enva Ireland has been operating under Waste Licence Register No. W0184-01 since December 2005, and is required to submit a report to the Environmental Protection Agency (EPA) on a monthly basis, outlining the existing groundwater quality underlying the site.

Suitably qualified environmental consultants from RPS Group, collected groundwater samples from a series of monitoring wells (BH101, BH102, BH103, BH104B, MW01, MW02, MW03) within the site boundaries. The samples underwent laboratory analysis for the suite of parameters specified in Schedule 4(ii) of Waste Licence W0184-01. This report outlines the results of the monitoring round conducted on the 7th May 2008, which corresponds to the second quarter of 2008.

2 METHODOLOGY

Groundwater samples were collected from seven on-site groundwater-monitoring wells (BH101, BH102, BH103, BH104B, MW01, MW02, MW03), using dedicated Waterra tubing, in accordance with RPS Group's standard sampling protocol. A non-return foot valve was fixed to the bottom of the tubing and inserted into the well, reaching the base of the bore. 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, four well volumes were purged from each well prior to collecting 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.

In order to ensure optimal evaluation, the pH, conductivity and temperature of the extracted water were continually monitored using a field meter, which was calibrated on the day of use. 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.

All groundwater samples were analysed at a UKAS accredited laboratory, *Alcontrol Geochem*, for the suite of analyses listed in Table 1. Table 1 also indicates the analytical techniques used by the laboratory.

Table: 1 Analytical Methodologies – Alcontrol Geochem Laboratories Dublin

Parameter	Analytical Methodology
List 1 & 2 Organics	GCMS
DRP/Mineral Oil	C10-C40 by GC-FID (headspace)
PRO/BTEX	C5-C9, C10+ BTEX by GC-FID (headspace)
Speciated PAHs	GC-MS following extraction with DCM
Total Phenols	HPLC following dilution with Methanol

3 GEOLOGY, HYDROLOGY AND HYDROGEOLOGY

The Enva Ireland site is located 1km to the west of the River Triogue, sloping to the East and Southeast. The site is low-lying and well drained (Figure 1). According to the Geological Survey of Ireland (GSI) the underlying bedrock consists of Argillaceous Bioclastic Limestone (*Geological Map Sheet No.15*).

The limestone bedrock is classified by the GSI as a locally important aquifer. Perched water is present within the overlying sandy boulder clay. The groundwater in the bedrock aquifer is used regionally as a potable water supply. However, no abstraction wells have been identified within a 1 km radius of the site.

The groundwater vulnerability in the region is classified as 'extreme' due to the high permeability of the subsoil and the shallow groundwater depths (*GSI classification: Groundwater Monitoring Round Report, 2002*).

Figure 1: Site Location

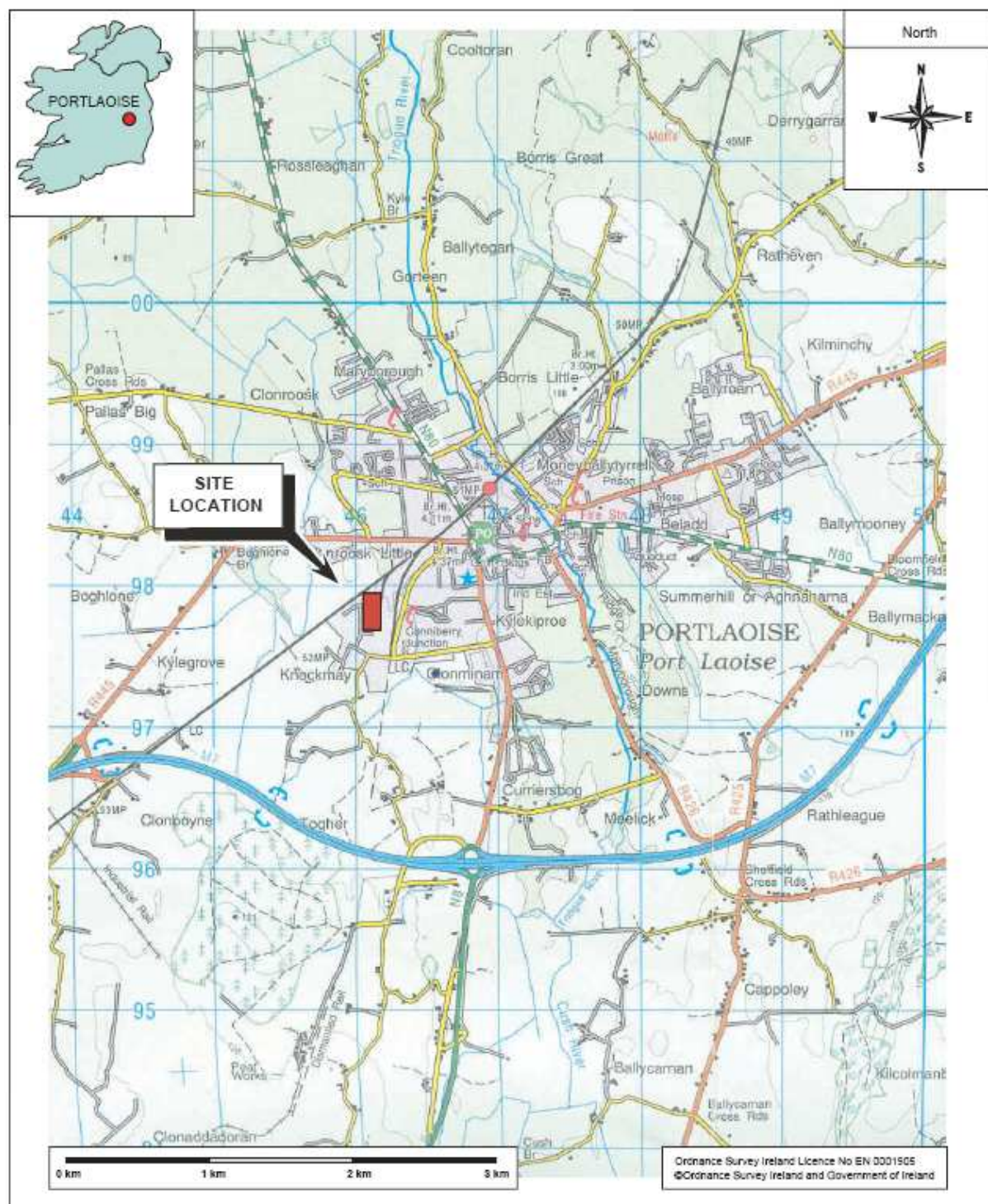
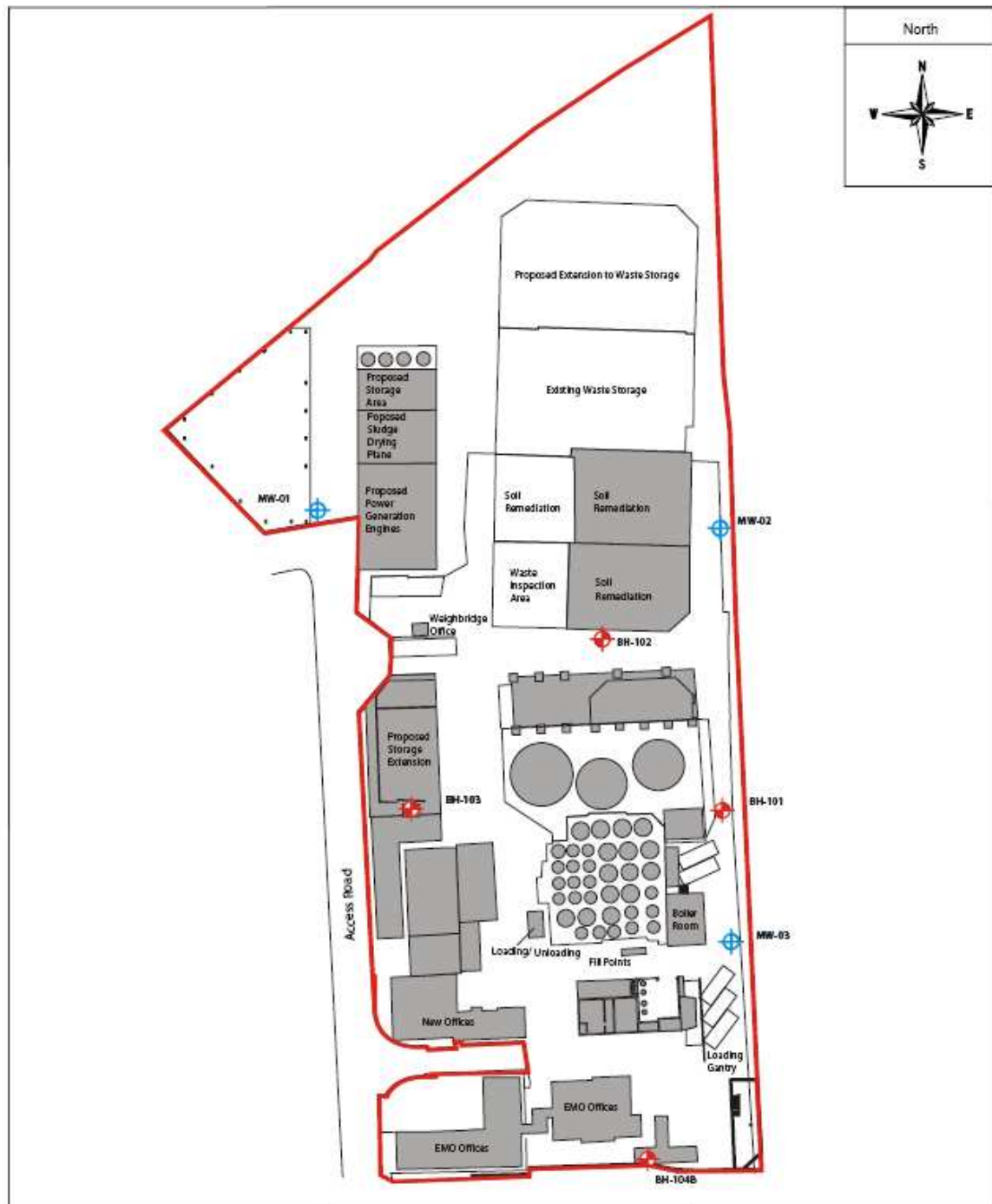




Figure 2: Site Layout Plan



Source: URS Environmental Consultants

Shallow Monitoring Well locations 

Deep Monitoring Well locations 

4 RESULTS

The results of all field measurements and laboratory analysis are discussed in this section.

4.1 FIELD OBSERVATIONS

Field observations are summarised in Table: 2.

Groundwater was encountered in all of the 7 monitoring boreholes installed at the site. The depth to the water table varied from 2.12 m to 4.43 m below ground level (mbgl) at the time of sampling. Measured field parameters were generally found to be within the required range, with the exception of a marginally low pH level of 6.19 at MW01 and marginally elevated level of 6.37 in Bh102. Elevated conductivity at BH 102 at 1462 ($\mu\text{S}/\text{cm}$) was also detected at BH102.

Observations relating to colour and odour varied from well to well. Similar to the previous monitoring round, samples collected from wells BH104B and MW03 displayed characteristics indicative of some level of contamination. This included the presence of an oily surface film and a distinct organic odour. Observations made during sampling from the remaining 5 wells, were largely indicative of unpolluted waters.

4.2 ANALYTICAL RESULTS

The results of laboratory analysis are presented in Tables 3 to 6 and are discussed hereunder.

Benzene, Toluene, Ethylbenzene, and Xylene (BTEX)

BTEX was analysed in the laboratory using gas chromatography (GC). The Method Detection Limit (MDL) is 10 $\mu\text{g}/\text{l}$. No BTEX parameters were detected in any of the wells. The results of laboratory analysis for BTEX are presented in Table 3.

Mineral Oil & Diesel Range Organics (DRO)

The samples were analysed for mineral oil in the laboratory using gas chromatography (GC). The Method Detection Limit (MDL) is 10 $\mu\text{g}/\text{l}$. Elevated levels of Mineral Oil were identified in monitoring wells BH104B (at 115 $\mu\text{g}/\text{l}$) and MW03 (at 57 $\mu\text{g}/\text{l}$), the interim guideline value for this parameter is 10 $\mu\text{g}/\text{l}$. Concentrations in all other monitoring wells were found to be below the limit of detection of the laboratory.

Diesel range organics were detected in three of the monitoring wells. Elevated levels were detected in samples extracted from BH104B (575 µg/l), MW01 (41 µg/l) and MW03 (286 µg/l), although no IGTV has been specified for these compounds. The results of laboratory analysis for Mineral Oil and DRO are shown in Table 3.

Polycyclic Aromatic Hydrocarbons (PAHs)

A total of 16 PAH's were measured in the seven groundwater samples taken for laboratory analysis. The results of laboratory analysis for PAHs are shown in Table 4.

Phenol Concentration

Phenols were not detected at any of the wells with concentrations remaining below the laboratory limit of detection and the EPA interim guideline value is 0.5 µg/l. All other wells displayed concentrations below this. Results of Phenol monitoring are illustrated in Table 5.

Semi Volatile Organic Compounds (SVOC's)

SVOCs were detected in one of the wells at the site. Analysis of samples was carried out using gas chromatography mass spectrometry (GCMS). Results of SVOC monitoring are illustrated in Table: 6.

Volatile Organic Compounds (VOC's)

VOCs were not detected in any of the wells at the site. Analysis for VOC's was performed using chromatography mass spectrometry (GCMS). The results of VOC monitoring are presented in Table 7.

Table: 2 Results of Field Parameters Measured at Each Groundwater Monitoring Well

Field Parameters								
Monitoring Well	Depth (m)	Static water Level (m)	Volume Extracted (l)	Dissolved O2 (ppm)	Conductivity (µs/cm)	pH (pH units)	Temp (°C)	Observations
BH101	6.87	4.43	12	2.44	739	7.49	13.3	Heavily clouded, odourless
BH102	6.58	3.58	18	1.46	1254	6.37	11.3	Crystal clear, odourless
BH103	4.75	2.12	15	2.3	932	7.14	15	Heavily clouded, odourless
BH104B	4.84	2.18	16	1.2	680	7.4	11.7	Hydrocarbon Odour, Oil slick on surface, black colour.
MW01	22.99	2.87	40	2.09	1006	6.19	16.4	Water clouded, Odourless
MW02	30.35	4.03	150	2.81	603	7.63	11.3	Water Clear, Odourless
MW03	14.95	4.29	60	4.28	788	7.36	17.1	Hydrocarbon/Diesel Odour, Suspended Oil Particles, Oil slick on surface, black colour.
Interim Guideline Value	-	-	-	-	1000	>6.5 & <9.5	25°C	

Table: 3 Results of BTEX, Inorganics, Mineral Oil and Organics in Groundwater Samples

Parameter	Units	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values (units as indicated)
BTEX									
Benzene	µg/l	<10	<10	<10	<10	<10	<10	<10	1.0
Ethylbenzene	µg/l	<10	<10	<10	<10	<10	<10	<10	10
Toluene	µg/l	<10	<10	<10	<10	<10	<10	<10	10
Xylene	µg/l	<10	<10	<10	<10	<10	<10	<10	10
Mineral Oil									
Mineral Oil by GC	µg/l	<10	<10	<10	115	<10	<10	57	10
Organics									
DRO	µg/l	<10	<10	<10	575	41	<10	286	-1

¹ No IGV specified for certain parameters

Table: 4 Results of PAHs in Groundwater Samples

PAHs										
Parameter	Units	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values	
Acenaphthene	µg/l	<10	<10	<10	0.396	<10	<10	0.389	-	
Acenaphthylene	µg/l	<10	<10	<10	0.075	<10	<10	0.051	-	
Anthracene	µg/l	<10	<10	<10	0.037	<10	<10	0.048	10000	
Benzo(a)anthracene	µg/l	<10	<10	<10	<10	<10	<10	0.01	-	
Benzo(a)pyrene	µg/l	<10	<10	<10	<10	<10	<10	0.01	0.01	
Benzo(b)+benzo(k) fluoranthene	µg/l	<10	<10	<10	<10	<10	<10	0.011	-	
Benzo(g,h,i)perylene	µg/l	<10	<10	<10	<10	<10	<10	<10	0.05	
Chrysene	µg/l	<10	<10	<10	<10	<10	<10	0.045	-	
Dibenzo(ah)anthracene	µg/l	<10	<10	<10	<10	<10	<10	<10	-	
Flourene	µg/l	<10	<10	<10	0.016	<10	<10	0.011	-	
Fluoranthene	µg/l	<10	<10	<10	0.472	<10	<10	0.312	1	
Indeno(123cd)pyrene	µg/l	<10	<10	<10	<10	<10	<10	<10	0.05	
Napthalene	µg/l	<10	<10	<10	0.681	<10	<10	0.075	1	
Phenanthrene	µg/l	<10	<10	<10	0.012	<10	<10	0.101	-	
Pyrene	µg/l	<10	<10	<10	0.038	<10	<10	0.046	-	
Total 16 EPA PAHs	µg/l	<10	<10	<10	1.501	<10	<10	1.003	-	

Table: 5 Phenol Concentrations in Groundwater Samples

Phenols									
Parameter	Units	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values
Total Phenol**	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5

Table: 6 Results of SVOC's in Groundwater Samples

SVOC's									
Parameter	Method Detection Limits (µg/l)	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values for Groundwater (µg/l)
1,2,4-Trichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	0.4
1,2-Dichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	10
1,3-Dichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	-
1,4-Dichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	-
2,4,5-Trichlorophenol	1	<1	<1	<1	<1	<1	<1	<1	-
2,4,6-Trichlorophenol	1	<1	<1	<1	<1	<1	<1	<1	200
2,4-Dichlorophenol	1	<1	<1	<1	<1	<1	<1	<1	-
2,4-Dimethylphenol	1	<1	<1	<1	<1	<1	<1	<1	-
2,4-Dinitrotoluene	1	<1	<1	<1	<1	<1	<1	<1	-
2,6-Dinitrotoluene	1	<1	<1	<1	<1	<1	<1	<1	-
2-Chloronaphthalene	1	<1	<1	<1	<1	<1	<1	<1	-
2-Chlorophenol	1	<1	<1	<1	<1	<1	<1	<1	200
2-Methylnaphthalene	1	<1	<1	<1	<1	<1	<1	<1	-
2-Methylphenol	1	<1	<1	<1	<1	<1	<1	<1	-

SVOC's									
Parameter	Method Detection Limits (µg/l)	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values for Groundwater (µg/l)
2-Nitroaniline	1	<1	<1	<1	<1	<1	<1	<1	-
2-Nitrophenol	1	<1	<1	<1	<1	<1	<1	<1	-
3-Nitroaniline	1	<1	<1	<1	<1	<1	<1	<1	-
4-Bromophenylphenylether	1	<1	<1	<1	<1	<1	<1	<1	-
4-Chloro-3-methylphenol	1	<1	<1	<1	<1	<1	<1	<1	-
4-Chloroaniline	1	<1	<1	<1	<1	<1	<1	<1	-
4-Chlorophenylphenylether	1	<1	<1	<1	<1	<1	<1	<1	-
4-Methylphenol	1	<1	<1	<1	<1	<1	<1	<1	-
4-Nitroaniline	1	<1	<1	<1	<1	<1	<1	<1	-
4-Nitrophenol	1	<1	<1	<1	<1	<1	<1	<1	-
Acenaphthene	1	<1	<1	<1	<1	<1	<1	<1	-
Acenaphthylene	1	<1	<1	<1	<1	<1	<1	<1	-
Anthracene	1	<1	<1	<1	<1	<1	<1	<1	10000
Azobenzene	1	<1	<1	<1	<1	<1	<1	<1	-
Benzo(a)anthracene	1	<1	<1	<1	<1	<1	<1	<1	-
Benzo(a)pyrene	1	<1	<1	<1	<1	<1	<1	<1	0.01
Benzo(b)fluoranthrene	1	<1	<1	<1	<1	<1	<1	<1	0.5
Benzo(ghi)perylene	1	<1	<1	<1	<1	<1	<1	<1	0.05
Benzo(k)fluoranthrene	1	<1	<1	<1	<1	<1	<1	<1	0.05
Bis(2-chloroethoxy)methane	1	<1	<1	<1	<1	<1	<1	<1	-
Bis(2-chloroethyl)ether	1	<1	<1	<1	<1	<1	<1	<1	-
Bis(2-ethylhexyl)phthalate	1	<1	<1	<1	<1	<1	<1	<1	-
Butylbenzylphthalate	1	<1	<1	<1	<1	<1	<1	<1	-
Carbazole	1	<1	<1	<1	<1	<1	<1	<1	-

SVOC's									
Parameter	Method Detection Limits (µg/l)	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values for Groundwater (µg/l)
Chrysene	1	<1	<1	<1	<1	<1	<1	<1	-
Dibenzo(a,h)anthracene	1	<1	<1	<1	<1	<1	<1	<1	-
Dibenzofuran	1	<1	<1	<1	<1	<1	<1	<1	-
Diethyl phthalate	1	<1	<1	<1	<1	<1	<1	<1	-
Dimethyl phthalate	1	<1	<1	<1	<1	<1	<1	<1	-
Di-n-butylphthalate	1	<1	<1	<1	<1	<1	<1	<1	2
Di-n-octylphthalate	1	<1	<1	<1	<1	<1	<1	<1	-
Fluoranthene	1	<1	<1	<1	<1	<1	<1	<1	1
Fluorene	1	<1	<1	2	<1	<1	<1	<1	-
Hexachlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	0.03
Hexachlorobutadiene	1	<1	<1	<1	<1	<1	<1	<1	0.1
Hexachloroethane	1	<1	<1	<1	<1	<1	<1	<1	-
Hexchlorocyclopentadiene	1	<1	<1	<1	<1	<1	<1	<1	-
Indeno(1,2,3-cd)pyrene	1	<1	<1	<1	<1	<1	<1	<1	0.05
Isophorone	1	<1	<1	<1	<1	<1	<1	<1	-
Naphthalene	1	<1	<1	<1	<1	<1	<1	<1	1
Nitrobenzene	1	<1	<1	<1	<1	<1	<1	<1	10
N-nitrosodi-n-propylamine	1	<1	<1	<1	<1	<1	<1	<1	-
Pentachlorophenol	1	<1	<1	<1	<1	<1	<1	<1	2
Phenanthrene	1	<1	<1	<1	<1	<1	<1	<1	-
Phenol	1	<1	<1	<1	<1	<1	<1	<1	0.5
Pyrene	1	<1	<1	2	<1	<1	<1	<1	-

Table: 7 Results of VOC's in Groundwater Samples

VOC's									
Parameter	Method Detection Limits (µg/l)	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values for Groundwater (µg/l)
1,1,1,2-Tetrachloroethane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,1,1-Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	500
1,1,2,2-Tetrachloroethane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,1,2-Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,1-Dichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,1-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	-
1,1-Dichloropropene	<1	<1	<1	<1	<1	<1	<1	<1	-
1,2,3-Trichlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
1,2,3-Trichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,2,4-Trichlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	0.4
1,2,4-Trimethylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
1,2-Dibromo-3-chloropropane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,2-Dibromoethane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,2-Dichlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	10
1,2-Dichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	3
1,2-Dichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,3,5-Trimethylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
1,3-Dichlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
1,3-Dichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,4-Dichlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	-

VOC's									
Parameter	Method Detection Limits (µg/l)	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values for Groundwater (µg/l)
2,2-Dichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	-
2-Chlorotoluene	<1	<1	<1	<1	<1	<1	<1	<1	-
4-Chlorotoluene	<1	<1	<1	<1	<1	<1	<1	<1	-
4-Isopropyltoluene	<1	<1	<1	<1	<1	<1	<1	<1	-
Benzene	<1	<1	<1	<1	<1	<1	<1	<1	1
Bromobenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
Bromochloromethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Bromodichloromethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Bromoform	<1	<1	<1	<1	<1	<1	<1	<1	-
Bromomethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Carbon disulphide	<1	<1	<1	<1	<1	<1	<1	<1	-
Carbontetrachloride	<1	<1	<1	<1	<1	<1	<1	<1	-
Chlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	1
Chloroethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Chloroform	<1	<1	<1	<1	<1	<1	<1	<1	12
Chloromethane	<1	<1	<1	<1	<1	<1	<1	<1	-
cis-1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	-
cis-1,3-Dichloropropene	<1	<1	<1	<1	<1	<1	<1	<1	-
Dibromochloromethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Dibromomethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Dichlorodifluoromethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Dichloromethane	<1	<1	<1	<1	<1	<1	<1	<1	10

VOC's									
Parameter	Method Detection Limits (µg/l)	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values for Groundwater (µg/l)
Ethylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	10
Hexachlorobutadiene	<1	<1	<1	<1	<1	<1	<1	<1	0.1
Isopropylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
Naphthalene	<1	<1	<1	<1	<1	<1	<1	<1	1
n-Butylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
o-Xylene	<1	<1	<1	<1	<1	<1	<1	<1	10
p/m-Xylene	<1	<1	<1	<1	<1	<1	<1	<1	10
Propylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
sec-Butylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
Styrene	<1	<1	<1	<1	<1	<1	<1	<1	-
tert-butyl methyl ether	<1	<1	<1	<1	<1	<1	<1	<1	-
tert-Butylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
Tetrachloroethene	<1	<1	<1	<1	<1	<1	<1	<1	40
Toluene	<1	<1	<1	<1	<1	<1	<1	<1	10
trans-1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	-
trans-1,3-Dichloropropene	<1	<1	<1	<1	<1	<1	<1	<1	-
Trichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	70
Trichlorofluoromethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Vinyl Chloride	<1	<1	<1	<1	<1	<1	<1	<1	-

5 DISCUSSION

The results of the 2nd quarterly monitoring round of 2008 are included in Tables 1 to 7 of the report. For the purpose of the report, the results are compared to 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 in the subsections below.

The results suggest that with the exception of samples obtained from well BH102 (at 6.37) and MW01 (at 6.19), values for pH were within the EPA interim guideline range of 6.5 – 9.5. Electrical conductivity was above the guideline value at well BH102 (at 1254 $\mu\text{S}/\text{cm}$).

Measurements taken for Dissolved Oxygen concentrations, ranged from 1.2 ppm – 4.28 ppm. Factors such as climate, nutrients in the water, suspended solids; organic wastes and groundwater inflow can all influence the DO value. Field observations made at the time of sampling varied from well to well, and a description of colour and odour is presented in Table 2. It was observed that BH104B and MW03 also contained an oily residue and a slight odour.

Elevated levels of Mineral Oil were identified in wells BH104B (at 115 $\mu\text{g}/\text{l}$) and MW03 (at 57 $\mu\text{g}/\text{l}$). The interim guideline value for this parameter is 10 $\mu\text{g}/\text{l}$. All other wells were below the laboratory detection limit. Levels of diesel range organics (DRO) were detected in samples extracted from wells BH104B (575 $\mu\text{g}/\text{l}$), MW01 (41 $\mu\text{g}/\text{l}$) and MW03 (286 $\mu\text{g}/\text{l}$), although no IGV has been specified for these compounds.

During this quarter, BH104B displayed total PAHs (US EPA 16) at a concentration of 1.501 $\mu\text{g}/\text{l}$. A number of individual PAH compounds displayed elevated concentrations.

The results of monitoring from the 2nd quarter 2008, suggest that Phenol concentrations were below the limit of detection of 0.5 $\mu\text{g}/\text{l}$. The results are presented in table 5.

The results of monitoring for semi-volatile organic (SVOCs) and volatile organic (VOCs) compounds show that only two SVOCs (fluorene and pyrene) were detected in well BH103. However no guideline value currently exceeds for these compounds. No wells displayed concentrations of these substances in excess of the relevant EPA interim guideline values.

6 CONCLUSIONS

In accordance with the criteria set out in Schedule 4(ii) of the site's Waste Licence Register No. W0184-01, groundwater monitoring was carried out at the ENVA Ireland site on the 7th May 2008 corresponding to the 2nd quarter of 2008. Suitably qualified consultants from RPS collected groundwater samples from 7 on-site monitoring wells and submitted these samples to an accredited laboratory for analysis.

In general, when compared with results of the previous monitoring round (Q1 of 2008), a decrease in concentrations of various substances was observed. Wells BH104B and MW03 did however display concentrations of mineral oil (MRO) and diesel range organics (DRO) in excess of the interim guideline values for these parameters.

APPENDIX A

SAMPLING AND ANALYSIS - METHODS AND DETAILS

A.1.1 Location of Sampling

Envia Ireland Limited

Clonminam Industrial Estate

Portlaoise

Co Laois

A.1.2 Date & Time of Sampling

7th May 2008, Sampling started at 10.30 am

A.1.3 Personnel Present During Sampling

Ronan Murphy, Environmental Consultant, RPS Group, Dublin

A.1.4 Instrumentation

Honda Purge Pump

Waterra Tubing and ball valves

Dip Meter

Environmental Monitoring Kit – pH, EC, DO and temperature



**Groundwater Quality Monitoring
Enva Ireland Ltd
Quarter 3 2008**

DOCUMENT CONTROL SHEET

Client	Enva Ireland Ltd					
Project Title	Enva Groundwater Monitoring, Quarter 3 2008					
Document Title	Quarterly Groundwater Analysis					
Document No.	MDE0498Rp0017A01					
This Document Comprises	DCS	TOC	Text	List of Tables	List of Figures	No. of Appendices
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1 INTRODUCTION

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

Enva Ireland has been operating under Waste Licence Register No. W0184-01 since December 2005, and is required to submit a report to the Environmental Protection Agency (EPA) on a monthly basis, outlining the existing groundwater quality underlying the site.

Suitably qualified environmental consultants from RPS Group, collected groundwater samples from a series of monitoring wells (BH101, BH102, BH103, BH104B, MW01, MW02, MW03) within the site boundaries. The samples underwent laboratory analysis for the suite of parameters specified in Schedule 4(ii) of Waste Licence W0184-01. This report outlines the results of the monitoring round conducted on the 16th July 2008, which corresponds to the third quarter of 2008.

2 METHODOLOGY

Groundwater samples were collected from seven on-site groundwater-monitoring wells (BH101, BH102, BH103, BH104B, MW01, MW02, MW03), using dedicated Waterra tubing, in accordance with RPS Group's standard sampling protocol. A non-return foot valve was fixed to the bottom of the tubing and inserted into the well, reaching the base of the bore. 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, four well volumes were purged from each well prior to collecting 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.

In order to ensure optimal evaluation, the pH, conductivity and temperature of the extracted water were continually monitored using a field meter, which was calibrated on the day of use. 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.

All groundwater samples were analysed at a UKAS accredited laboratory, *Alcontrol Geochem*, for the suite of analyses listed in Table 1. Table 1 also indicates the analytical techniques used by the laboratory.

Table: 1 Analytical Methodologies – Alcontrol Geochem Laboratories Dublin

Parameter	Analytical Methodology
List 1 & 2 Organics	GCMS
DRP/Mineral Oil	C10-C40 by GC-FID (headspace)
PRO/BTEX	C5-C9, C10+ BTEX by GC-FID (headspace)
Speciated PAHs	GC-MS following extraction with DCM
Total Phenols	HPLC following dilution with Methanol

3 GEOLOGY, HYDROLOGY AND HYDROGEOLOGY

The Enva Ireland site is located 1km to the west of the River Triogue, sloping to the East and Southeast. The site is low-lying and well drained (Figure 1). According to the Geological Survey of Ireland (GSI) the underlying bedrock consists of Argillaceous Bioclastic Limestone (*Geological Map Sheet No.15*).

The limestone bedrock is classified by the GSI as a locally important aquifer. Perched water is present within the overlying sandy boulder clay. The groundwater in the bedrock aquifer is used regionally as a potable water supply. However, no abstraction wells have been identified within a 1 km radius of the site.

The groundwater vulnerability in the region is classified as 'extreme' due to the high permeability of the subsoil and the shallow groundwater depths (*GSI classification: Groundwater Monitoring Round Report, 2002*).

Figure 1: Site Location

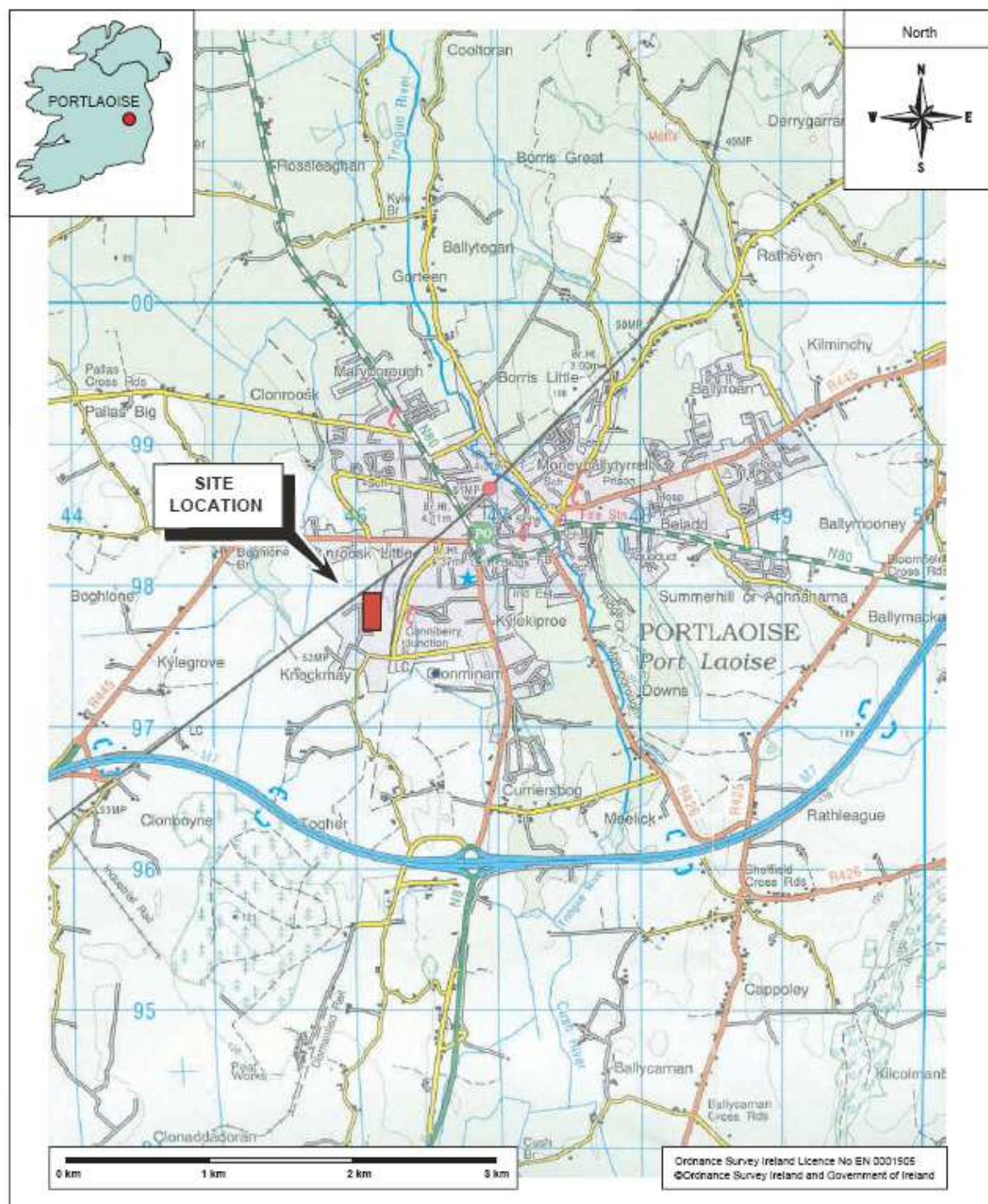
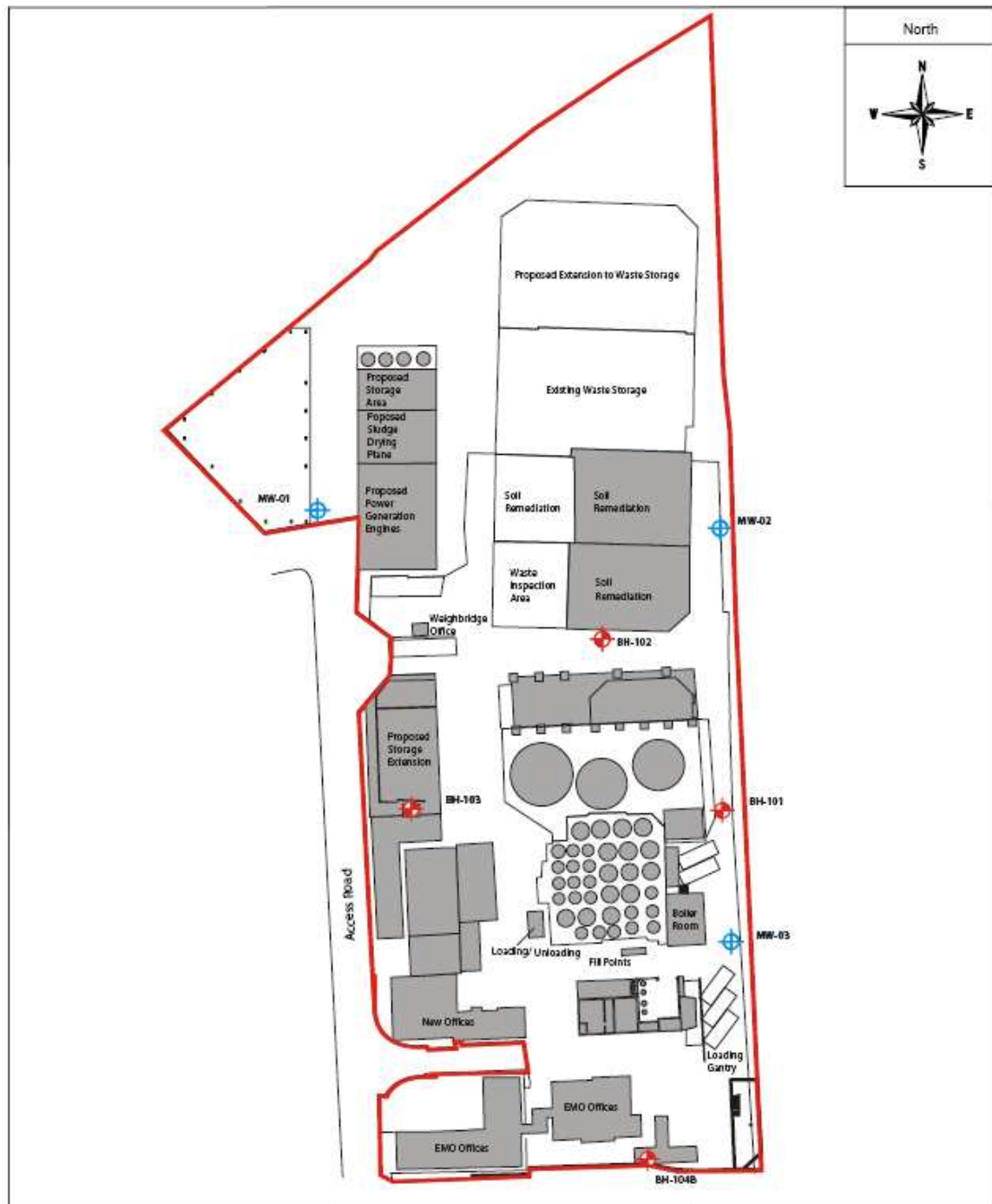




Figure 2: Site Layout Plan



Source: *URS Environmental Consultants*

Shallow Monitoring Well locations 
Deep Monitoring Well locations 

4 RESULTS

The results of all field measurements and laboratory analysis are discussed in this section.

4.1 FIELD OBSERVATIONS

Field observations are summarised in Table: 2.

Groundwater was encountered in all of the 7 monitoring boreholes installed at the site. The depth to the water table varied from 0.91 to 4.75 metres below ground level (mbgl) at the time of sampling. Measured field parameters were generally found to be within the required range, with the exception of a marginally low pH level of 5.91 at MW01. Elevated conductivity was recorded at wells BH102, BH103 and MW01 at 1577 $\mu\text{S}/\text{cm}$, 1029 $\mu\text{S}/\text{cm}$ and 1096 $\mu\text{S}/\text{cm}$ respectively.

Observations relating to colour and odour varied from well to well. Similar to the previous monitoring round, samples collected from wells BH104B and MW03 displayed characteristics indicative of some level of contamination. This included the presence of an oily surface film and a distinct organic odour. During this quarter, the presence of a very slight oily film was also observed in water abstracted from well number MW01. Observations made during sampling from the remaining 4 wells, were largely indicative of unpolluted waters.

4.2 ANALYTICAL RESULTS

The results of laboratory analysis are presented in Tables 3 to 6 and are discussed hereunder.

Benzene, Toluene, Ethylbenzene, and Xylene (BTEX)

BTEX was analysed in the laboratory using gas chromatography (GC). The Method Detection Limit (MDL) is 10 $\mu\text{g}/\text{l}$. No BTEX parameters were detected in any of the wells. The results of laboratory analysis for BTEX are presented in Table 3.

Mineral Oil & Diesel Range Organics (DRO)

The samples were analysed for mineral oil in the laboratory using gas chromatography (GC). The Method Detection Limit (MDL) is 10 $\mu\text{g}/\text{l}$. Elevated levels of Mineral Oil were identified in monitoring wells BH104B (at 631 $\mu\text{g}/\text{l}$) and MW03 (at 1452 $\mu\text{g}/\text{l}$), the interim guideline value for this parameter is 10 $\mu\text{g}/\text{l}$. Concentrations in all other monitoring wells were found to be below the limit of detection of the laboratory.

Diesel range organics were detected in three of the monitoring wells. Elevated levels were detected in samples extracted from BH103 (499 µg/l), BH104B (3154 µg/l), MW03 (2903 µg/l), although no IGTV has been specified for these compounds. The results of laboratory analysis for Mineral Oil and DRO are shown in Table 3.

Polycyclic Aromatic Hydrocarbons (PAHs)

A total of 16 PAH's were measured in the seven groundwater samples taken for laboratory analysis. Elevated levels were detected in well MW03. The results of laboratory analysis for PAHs are shown in Table 4.

Phenol Concentration

Phenols were not detected at any of the wells with concentrations remaining below the laboratory limit of detection and the EPA interim guideline value is 0.5 µg/l. All other wells displayed concentrations below this. Results of Phenol monitoring are illustrated in Table 5.

Semi Volatile Organic Compounds (SVOC's)

SVOCs were not detected in any of the wells at the site. Analysis of samples was carried out using gas chromatography mass spectrometry (GCMS). Results of SVOC monitoring are illustrated in Table: 6.

Volatile Organic Compounds (VOC's)

VOCs were detected in one of the wells at the site. Analysis for VOC's was performed using chromatography mass spectrometry (GCMS). The results of VOC monitoring are presented in Table 7.

Table: 2 Results of Field Parameters Measured at Each Groundwater Monitoring Well

Field Parameters								
Monitoring Well	Depth (m)	Static water Level (m)	Volume Extracted (l)	Dissolved O2 (ppm)	Conductivity (µs/cm)	pH (pH units)	Temp (°C)	Observations
BH101	6.82	4.28	10	4.43	547	7.56	13.2	slight cloudy, odourless
BH102	6.59	3.28	20	2.84	1577	6.24	12.9	silt present, slightly cloudy, odourless
BH103	4.70	1.94	20	3.72	1029	6.97	13.6	slight cloudy, suspended and floating particulate, odourless
BH104B	4.84	0.91	20	5.7	741	7.55	14.5	clear, oil film on surface, slight hydrocarbon odour
MW01	22.72	2.74	120	5.39	1096	5.91	14.1	slight cloudy, oily surface film on water, strong H2S odour
MW02	30.09	3.95	130	5.6	644	7.43	12.7	slight cloudy, odourless
MW03	14.95	4.75	60	5.7	791	7.55	14.5	slight cloudy, film of hydrocarbon/product on surface
Interim Guideline Value	-	-	-	-	1000	>6.5 & <9.5	25°C	

Table: 3 Results of BTEX, Inorganics, Mineral Oil and Organics in Groundwater Samples

Parameter	Units	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values (units as indicated)
BTEX									
Benzene	µg/l	<10	<10	<10	<10	<10	<10	<10	1.0
Ethylbenzene	µg/l	<10	<10	<10	<10	<10	<10	<10	10
Toluene	µg/l	<10	<10	<10	<10	<10	<10	<10	10
Xylene	µg/l	<10	<10	<10	<10	<10	<10	<10	10
Mineral Oil									
Mineral Oil by GC	µg/l	<10	<10	<10	631	<10	<10	1452	10
Organics									
DRO	µg/l	<10	<10	499	3154	<10	<10	2903	- ¹
Petrol Range Organics									
PRO C5-C9	µg/l	<10	<10	<10	29	<10	<10	<10	- ¹
PRO C10-C12	µg/l	<10	<10	<10	199	<10	<10	<10	- ¹

¹ No IGV specified for certain parameters

Table: 4 Results of PAHs in Groundwater Samples

PAHs										
Parameter	Units	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values	
Acenaphthene	µg/l	<10	<10	<10	0.044	<10	<10	0.258	-	
Acenaphthylene	µg/l	<10	<10	<10	0.117	<10	<10	0.044	-	
Anthracene	µg/l	<10	<10	<10	0.069	<10	<10	0.076	10000	
Benzo(a)anthracene	µg/l	<10	<10	<10	0.011	<10	<10	0.103	-	
Benzo(a)pyrene	µg/l	<10	<10	<10	<10	<10	<10	0.023	0.01	
Benzo(b)+benzo(k) fluoranthene	µg/l	<10	<10	<10	<10	<10	<10	0.019	-	
Benzo(g,h,i)perylene	µg/l	<10	<10	<10	<10	<10	<10	0.022	0.05	
Chrysene	µg/l	<10	<10	<10	0.014	<10	<10	0.084	-	
Dibenzo(ah)anthracene	µg/l	<10	<10	<10	<10	<10	<10	0.013	-	
Flourene	µg/l	<10	<10	<10	0.026	<10	<10	0.05	-	
Fluoranthene	µg/l	<10	<10	<10	0.197	<10	<10	0.288	1	
Indeno(123cd)pyrene	µg/l	<10	<10	<10	<10	<10	<10	0.02	0.05	
Napthalene	µg/l	<10	<10	<10	0.134	<10	<10	0.084	1	
Phenanthrene	µg/l	<10	<10	<10	0.289	<10	<10	0.35	-	
Pyrene	µg/l	<10	<10	<10	0.062	<10	<10	0.13	-	
Total 16 EPA PAHs	µg/l	<10	<10	<10	0.963	<10	<10	1.564	-	

Table: 5 Phenol Concentrations in Groundwater Samples

Phenols									
Parameter	Units	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values
Total Phenol**	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5

Table: 6 Results of SVOC's in Groundwater Samples

SVOC's									
Parameter	Method Detection Limits (µg/l)	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values for Groundwater (µg/l)
1,2,4-Trichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	0.4
1,2-Dichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	10
1,3-Dichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	-
1,4-Dichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	-
2,4,5-Trichlorophenol	1	<1	<1	<1	<1	<1	<1	<1	-
2,4,6-Trichlorophenol	1	<1	<1	<1	<1	<1	<1	<1	200
2,4-Dichlorophenol	1	<1	<1	<1	<1	<1	<1	<1	-
2,4-Dimethylphenol	1	<1	<1	<1	<1	<1	<1	<1	-
2,4-Dinitrotoluene	1	<1	<1	<1	<1	<1	<1	<1	-
2,6-Dinitrotoluene	1	<1	<1	<1	<1	<1	<1	<1	-
2-Chloronaphthalene	1	<1	<1	<1	<1	<1	<1	<1	-
2-Chlorophenol	1	<1	<1	<1	<1	<1	<1	<1	200
2-Methylnaphthalene	1	<1	<1	<1	<1	<1	<1	<1	-
2-Methylphenol	1	<1	<1	<1	<1	<1	<1	<1	-

SVOC's									
Parameter	Method Detection Limits (µg/l)	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values for Groundwater (µg/l)
2-Nitroaniline	1	<1	<1	<1	<1	<1	<1	<1	-
2-Nitrophenol	1	<1	<1	<1	<1	<1	<1	<1	-
3-Nitroaniline	1	<1	<1	<1	<1	<1	<1	<1	-
4-Bromophenylphenylether	1	<1	<1	<1	<1	<1	<1	<1	-
4-Chloro-3-methylphenol	1	<1	<1	<1	<1	<1	<1	<1	-
4-Chloroaniline	1	<1	<1	<1	<1	<1	<1	<1	-
4-Chlorophenylphenylether	1	<1	<1	<1	<1	<1	<1	<1	-
4-Methylphenol	1	<1	<1	<1	<1	<1	<1	<1	-
4-Nitroaniline	1	<1	<1	<1	<1	<1	<1	<1	-
4-Nitrophenol	1	<1	<1	<1	<1	<1	<1	<1	-
Acenaphthene	1	<1	<1	<1	<1	<1	<1	<1	-
Acenaphthylene	1	<1	<1	<1	<1	<1	<1	<1	-
Anthracene	1	<1	<1	<1	<1	<1	<1	<1	10000
Azobenzene	1	<1	<1	<1	<1	<1	<1	<1	-
Benzo(a)anthracene	1	<1	<1	<1	<1	<1	<1	<1	-
Benzo(a)pyrene	1	<1	<1	<1	<1	<1	<1	<1	0.01
Benzo(b)fluoranthrene	1	<1	<1	<1	<1	<1	<1	<1	0.5
Benzo(ghi)perylene	1	<1	<1	<1	<1	<1	<1	<1	0.05
Benzo(k)fluoranthrene	1	<1	<1	<1	<1	<1	<1	<1	0.05
Bis(2-chloroethoxy)methane	1	<1	<1	<1	<1	<1	<1	<1	-
Bis(2-chloroethyl)ether	1	<1	<1	<1	<1	<1	<1	<1	-
Bis(2-ethylhexyl)phthalate	1	<1	<1	<1	<1	<1	<1	<1	-
Butylbenzylphthalate	1	<1	<1	<1	<1	<1	<1	<1	-
Carbazole	1	<1	<1	<1	<1	<1	<1	<1	-

SVOC's									
Parameter	Method Detection Limits (µg/l)	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values for Groundwater (µg/l)
Chrysene	1	<1	<1	<1	<1	<1	<1	<1	-
Dibenzo(a,h)anthracene	1	<1	<1	<1	<1	<1	<1	<1	-
Dibenzofuran	1	<1	<1	<1	<1	<1	<1	<1	-
Diethyl phthalate	1	<1	<1	<1	<1	<1	<1	<1	-
Dimethyl phthalate	1	<1	<1	<1	<1	<1	<1	<1	-
Di-n-butylphthalate	1	<1	<1	<1	<1	<1	<1	<1	2
Di-n-octylphthalate	1	<1	<1	<1	<1	<1	<1	<1	-
Fluoranthene	1	<1	<1	<1	<1	<1	<1	<1	1
Fluorene	1	<1	<1	<1	<1	<1	<1	<1	-
Hexachlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	0.03
Hexachlorobutadiene	1	<1	<1	<1	<1	<1	<1	<1	0.1
Hexachloroethane	1	<1	<1	<1	<1	<1	<1	<1	-
Hexchlorocyclopentadiene	1	<1	<1	<1	<1	<1	<1	<1	-
Indeno(1,2,3-cd)pyrene	1	<1	<1	<1	<1	<1	<1	<1	0.05
Isophorone	1	<1	<1	<1	<1	<1	<1	<1	-
Naphthalene	1	<1	<1	<1	<1	<1	<1	<1	1
Nitrobenzene	1	<1	<1	<1	<1	<1	<1	<1	10
N-nitrosodi-n-propylamine	1	<1	<1	<1	<1	<1	<1	<1	-
Pentachlorophenol	1	<1	<1	<1	<1	<1	<1	<1	2
Phenanthrene	1	<1	<1	<1	<1	<1	<1	<1	-
Phenol	1	<1	<1	<1	<1	<1	<1	<1	0.5
Pyrene	1	<1	<1	<1	<1	<1	<1	<1	-

Table: 7 Results of VOC's in Groundwater Samples

VOC's									
Parameter	Method Detection Limits (µg/l)	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values for Groundwater (µg/l)
1,1,1,2-Tetrachloroethane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,1,1-Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	500
1,1,2,2-Tetrachloroethane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,1,2-Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,1-Dichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,1-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	6	-
1,1-Dichloropropene	<1	<1	<1	<1	<1	<1	<1	<1	-
1,2,3-Trichlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
1,2,3-Trichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,2,4-Trichlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	0.4
1,2,4-Trimethylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
1,2-Dibromo-3-chloropropane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,2-Dibromoethane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,2-Dichlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	10
1,2-Dichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	3
1,2-Dichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,3,5-Trimethylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
1,3-Dichlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
1,3-Dichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,4-Dichlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	-

VOC's									
Parameter	Method Detection Limits (µg/l)	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values for Groundwater (µg/l)
2,2-Dichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	-
2-Chlorotoluene	<1	<1	<1	<1	<1	<1	<1	<1	-
4-Chlorotoluene	<1	<1	<1	<1	<1	<1	<1	<1	-
4-Isopropyltoluene	<1	<1	<1	<1	<1	<1	<1	<1	-
Benzene	<1	<1	<1	<1	<1	<1	<1	<1	1
Bromobenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
Bromochloromethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Bromodichloromethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Bromoform	<1	<1	<1	<1	<1	<1	<1	<1	-
Bromomethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Carbon disulphide	<1	<1	<1	<1	<1	<1	<1	<1	-
Carbontetrachloride	<1	<1	<1	<1	<1	<1	<1	<1	-
Chlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	1
Chloroethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Chloroform	<1	<1	<1	<1	<1	<1	<1	<1	12
Chloromethane	<1	<1	<1	<1	<1	<1	<1	<1	-
cis-1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	-
cis-1,3-Dichloropropene	<1	<1	<1	<1	<1	<1	<1	<1	-
Dibromochloromethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Dibromomethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Dichlorodifluoromethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Dichloromethane	<1	<1	<1	<1	<1	<1	<1	<1	10

VOC's									
Parameter	Method Detection Limits (µg/l)	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values for Groundwater (µg/l)
Ethylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	10
Hexachlorobutadiene	<1	<1	<1	<1	<1	<1	<1	<1	0.1
Isopropylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
Naphthalene	<1	<1	<1	<1	<1	<1	<1	2	1
n-Butylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
o-Xylene	<1	<1	<1	<1	<1	<1	<1	<1	10
p/m-Xylene	<1	<1	<1	<1	<1	<1	<1	<1	10
Propylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
sec-Butylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
Styrene	<1	<1	<1	<1	<1	<1	<1	<1	-
tert-butyl methyl ether	<1	<1	<1	<1	<1	<1	<1	<1	-
tert-Butylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
Tetrachloroethene	<1	<1	<1	<1	<1	<1	<1	<1	40
Toluene	<1	<1	<1	<1	<1	<1	<1	<1	10
trans-1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	-
trans-1,3-Dichloropropene	<1	<1	<1	<1	<1	<1	<1	<1	-
Trichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	70
Trichlorofluoromethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Vinyl Chloride	<1	<1	<1	<1	<1	<1	<1	<1	-

5 DISCUSSION

The results of the 3rd quarterly monitoring round of 2008 are included in Tables 1 to 7 of the report. For the purpose of the report, the results are compared to 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 in the subsections below.

The results suggest that with the exception of samples obtained from well MW01 (at 5.19) and BH102 (at 6.24), values for pH were within the EPA interim guideline range of 6.5 – 9.5. Electrical conductivity was above the guideline value at wells BH102, BH103 and MW01 at 1577 µs/cm, 1029 µs/cm and 1096 µs/cm respectively.

Measurements taken for Dissolved Oxygen concentrations, ranged from 2.84 ppm – 5.70 ppm. Factors such as climate, nutrients in the water, suspended solids; organic wastes and groundwater inflow can all influence the DO value. Field observations made at the time of sampling varied from well to well, and a description of colour and odour is presented in Table 2. It was observed that BH104B, MW03 and to a lesser extent MW01 also contained an oily residue and a slight odour.

Elevated levels of Mineral Oil were identified in wells BH104B (at 631 µg/l) and MW03 (at 1452 µg/l). The interim guideline value for this parameter is 10 µg/l. All other wells were below the laboratory detection limit. Levels of diesel range organics (DRO) were detected in samples extracted from wells BH103 (499 µg/l), BH104B (3154 µg/l), MW03 (2903 µg/l), although no IGV has been specified for these compounds.

During this quarter, BH104B displayed total PAHs (US EPA 16) at a concentration of 1.565 µg/l. A Concentrations of Benzo(a)pyrene at well MW03 were in excess of the interim guideline value. Although both Bh104b and MW03 displayed concentrations of PAH above the laboratory limit of detection, no interim guideline values for these compounds currently exist.

The results of monitoring from the 3rd Quarter 3008, suggest that Phenol concentrations were below the limit of detection of 0.5 µg/l. The results are presented in table 5.

The results of monitoring for semi-volatile organic (SVOCs) and volatile organic (VOCs) compounds show that only two VOCs (1,1-Dichloroethene and Naphthalene) were detected in well MW03. However although no guideline value currently exceeds for 1,1-Dichloroethene, it can be seen that Naphthalene was above the relevant interim guideline value of 1µg/l. No other wells displayed concentrations above the laboratory limit of detection and are consequently below any relevant interim guideline values.

6 CONCLUSIONS

In accordance with the criteria set out in Schedule 4(ii) of the site's Waste Licence Register No. W0184-01, groundwater monitoring was carried out at the ENVA Ireland site on the 16th July 2008 corresponding to the 3rd quarter of 2008. Suitably qualified consultants from RPS collected groundwater samples from 7 on-site monitoring wells and submitted these samples to an accredited laboratory for analysis.

In general, when compared with results of the previous monitoring round (Q2 of 2008), a decrease in concentrations of various substances was observed. Wells BH104B and MW03 did however display concentrations of mineral oil (MRO) in excess of the interim guideline values for these parameters. Concentrations of the naphthalene were also observed to be in excess of the interim guideline value at this well.

APPENDIX A

SAMPLING AND ANALYSIS - METHODS AND DETAILS

A.1.1 Location of Sampling

Enva Ireland Limited

Clonminam Industrial Estate

Portlaoise

Co Laois

A.1.2 Date & Time of Sampling

16th July 2008, Sampling started at 11.30 am

A.1.3 Personnel Present During Sampling

Ronan Murphy, Environmental Consultant, RPS Group, Dublin

Louise Burden, Hydrogeological Consultant, RPS Group, Dublin

A.1.4 Instrumentation

Honda Purge Pump

Waterra Tubing and ball valves

Dip Meter

Environmental Monitoring Kit – pH, EC, DO and temperature



**Groundwater Quality Monitoring
Enva Ireland Ltd
Quarter 4 2008**

DOCUMENT CONTROL SHEET

Client	Enva Ireland Ltd					
Project Title	Enva Groundwater Monitoring, Quarter 4 2008					
Document Title	Quarterly Groundwater Analysis					
Document No.	MDE0498Rp0018					
This Document Comprises	DCS	TOC	Text	List of Tables	List of Figures	No. of Appendices
	1	1	18	1	1	1

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1 INTRODUCTION

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

Enva Ireland has been operating under Waste Licence Register No. W0184-01 since December 2005, and is required to submit a report to the Environmental Protection Agency (EPA) on a monthly basis, outlining the existing groundwater quality underlying the site.

Suitably qualified environmental consultants from RPS Group, collected groundwater samples from a series of monitoring wells (BH101, BH102, BH103, BH104B, MW01, MW02, MW03) within the site boundaries. The samples underwent laboratory analysis for the suite of parameters specified in Schedule 4(ii) of Waste Licence W0184-01. This report outlines the results of the monitoring round conducted on the 15th December 2008, which corresponds to the fourth quarter of 2008.

2 METHODOLOGY

Groundwater samples were collected from seven on-site groundwater-monitoring wells (BH101, BH102, BH103, BH104B, MW01, MW02, MW03), using dedicated Waterra tubing, in accordance with RPS Group's standard sampling protocol. A non-return foot valve was fixed to the bottom of the tubing and inserted into the well, reaching the base of the bore. 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, four well volumes were purged from each well prior to collecting 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.

In order to ensure optimal evaluation, the pH, conductivity and temperature of the extracted water were continually monitored using a field meter, which was calibrated on the day of use. 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.

All groundwater samples were analysed at a UKAS accredited laboratory, *Alcontrol Geochem*, for the suite of analyses listed in Table 1. Table 1 also indicates the analytical techniques used by the laboratory.

Table: 1 Analytical Methodologies – Alcontrol Geochem Laboratories Dublin

Parameter	Analytical Methodology
List 1 & 2 Organics	GCMS
DRP/Mineral Oil	C10-C40 by GC-FID (headspace)
PRO/BTEX	C5-C9, C10+ BTEX by GC-FID (headspace)
Speciated PAHs	GC-MS following extraction with DCM
Total Phenols	HPLC following dilution with Methanol

3 GEOLOGY, HYDROLOGY AND HYDROGEOLOGY

The Enva Ireland site is located 1km to the west of the River Triogue, sloping to the East and Southeast. The site is low-lying and well drained (Figure 1). According to the Geological Survey of Ireland (GSI) the underlying bedrock consists of Argillaceous Bioclastic Limestone (*Geological Map Sheet No.15*).

The limestone bedrock is classified by the GSI as a locally important aquifer. Perched water is present within the overlying sandy boulder clay. The groundwater in the bedrock aquifer is used regionally as a potable water supply. However, no abstraction wells have been identified within a 1 km radius of the site.

The groundwater vulnerability in the region is classified as 'extreme' due to the high permeability of the subsoil and the shallow groundwater depths (*GSI classification: Groundwater Monitoring Round Report, 2002*).

Figure 1: Site Location

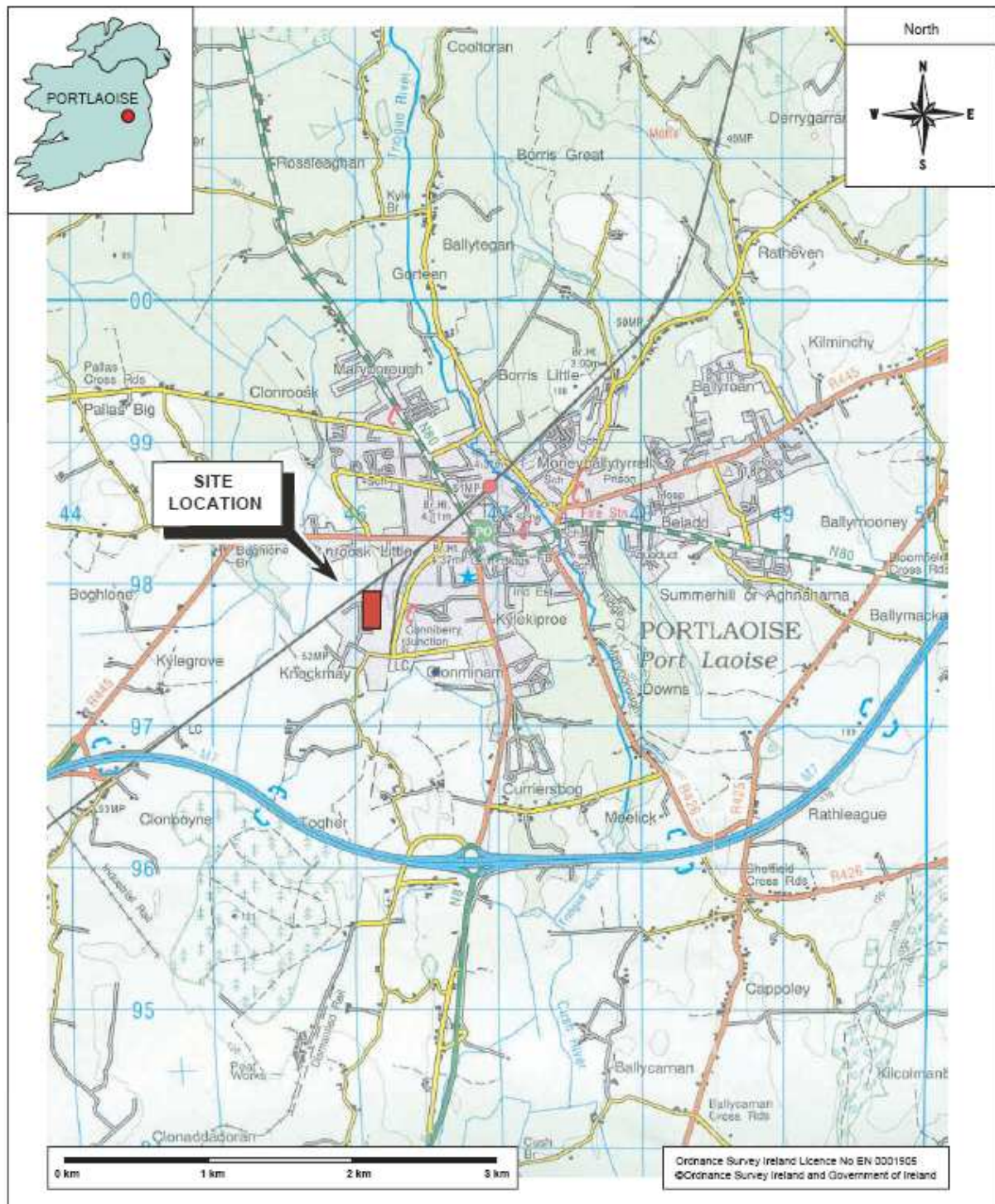
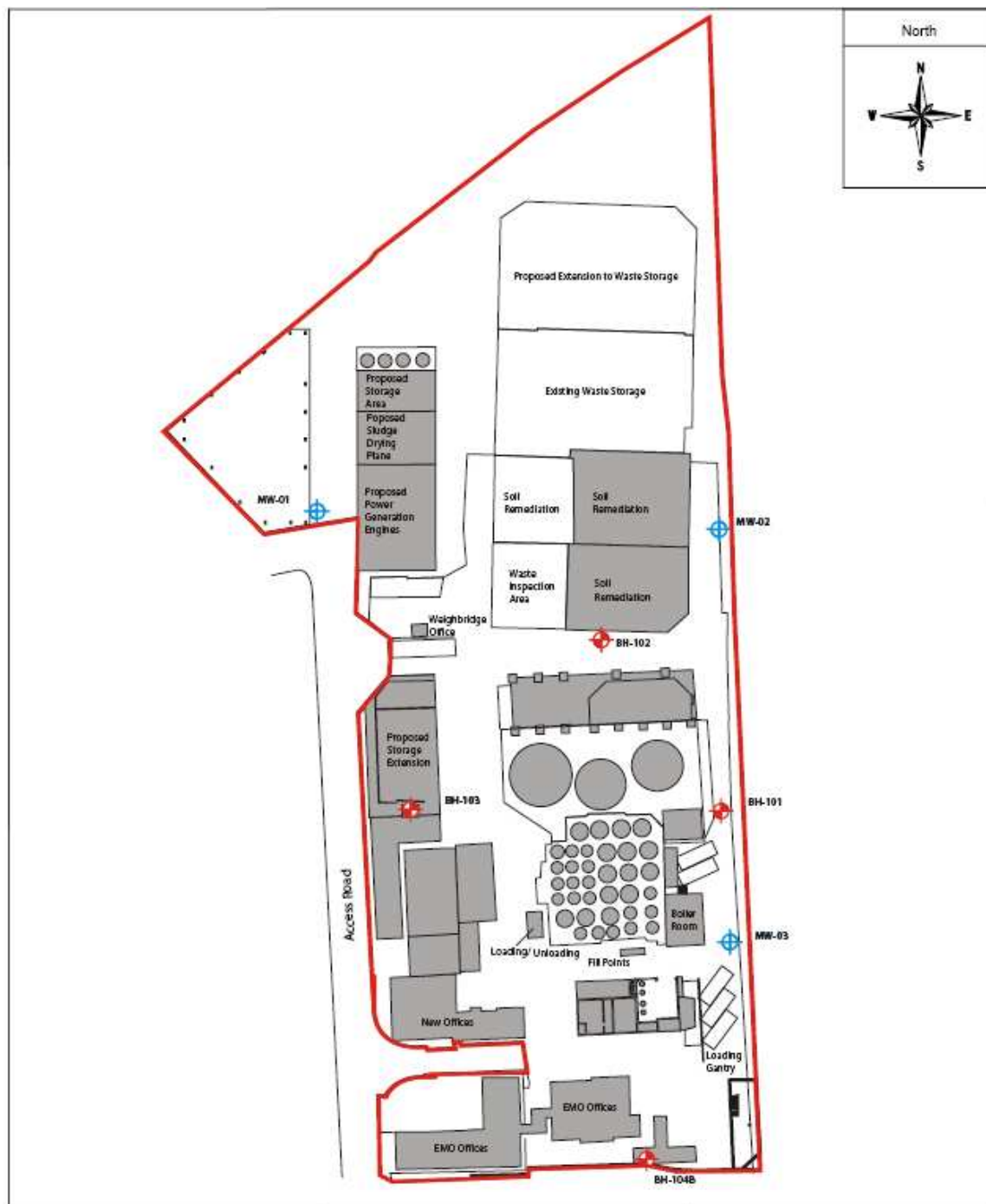




Figure 2: Site Layout Plan

Source: URS Environmental Consultants

Shallow Monitoring Well locations 
 Deep Monitoring Well locations 

4 RESULTS

The results of all field measurements and laboratory analysis are discussed in this section.

4.1 FIELD OBSERVATIONS

Field observations are summarised in Table: 2.

Groundwater was encountered in all of the 7 monitoring boreholes installed at the site. The depth to the water table varied from 0.80 to 4.20 metres below ground level (mbgl) at the time of sampling. Measured field parameters were generally found to be within the required range. Elevated conductivity was recorded at wells BH102, BH103 and MW01 at 1247 $\mu\text{S}/\text{cm}$, 1098 $\mu\text{S}/\text{cm}$ and 1200 $\mu\text{S}/\text{cm}$ respectively.

Observations relating to colour and odour varied from well to well. Similar to the previous monitoring round, samples collected from wells BH104B and MW03 displayed characteristics indicative of some level of contamination. This included the presence of an oily surface film and a distinct organic odour. During this quarter, the presence of a very slight oily film was also observed in water abstracted from well number MW01. Observations made during sampling from the remaining 4 wells, were largely indicative of unpolluted waters.

4.2 ANALYTICAL RESULTS

The results of laboratory analysis are presented in Tables 3 to 6 and are discussed hereunder.

Benzene, Toluene, Ethylbenzene, and Xylene (BTEX)

BTEX was analysed in the laboratory using gas chromatography (GC). The Method Detection Limit (MDL) is 10 $\mu\text{g}/\text{l}$. No BTEX parameters were detected in any of the wells. The results of laboratory analysis for BTEX are presented in Table 3.

Mineral Oil & Diesel Range Organics (DRO)

The samples were analysed for mineral oil in the laboratory using gas chromatography (GC). The Method Detection Limit (MDL) is 10 $\mu\text{g}/\text{l}$. Elevated levels of Mineral Oil were identified in wells BH104B (at 2813 $\mu\text{g}/\text{l}$) and MW03 (at 209 $\mu\text{g}/\text{l}$). The interim guideline value for this parameter is 10 $\mu\text{g}/\text{l}$. Concentrations in all other monitoring wells were found to be below the limit of detection of the laboratory.

Diesel range organics were detected in three of the monitoring wells. Elevated levels were detected in samples extracted from wells BH104B (3750 µg/l) and MW03 (596 µg/l), although no IGV has been specified for these compounds. The results of laboratory analysis for Mineral Oil and DRO are shown in Table 3.

Polycyclic Aromatic Hydrocarbons (PAHs)

A total of 16 PAH's were measured in the seven groundwater samples taken for laboratory analysis. Levels above the relevant limit of detection were not detected. The results of laboratory analysis for PAHs are shown in Table 4.

Phenol Concentration

Phenols were not detected at any wells. All other wells displayed concentrations below this. Results of Phenol monitoring are illustrated in Table 5.

Semi Volatile Organic Compounds (SVOC's)

SVOCs. Analysis of samples was carried out using gas chromatography mass spectrometry (GCMS). Results of SVOC monitoring are illustrated in Table: 6.

Volatile Organic Compounds (VOC's)

VOCs were not detected in any of the wells at the. Analysis for VOC's was preformed using chromatography mass spectrometry (GCMS). The results of VOC monitoring are presented in Table 7.

Table: 2 Results of Field Parameters Measured at Each Groundwater Monitoring Well

Field Parameters								
Monitoring Well	Depth (m)	Static water Level (m)	Volume Extracted (l)	Dissolved O2 (ppm)	Conductivity (µs/cm)	pH (pH units)	Temp (°C)	Observations
BH101	6.87	4.20	12	4.32	754	6.53	10.5	slight cloudy, slight hydrocarbon/petrochemical odour
BH102	5.07	3.10	15	2.73	1247	6.72	9.8	slightly cloudy, odourless
BH103	4.47	1.90	20	5.32	1098	6.23	10.8	slight cloudy, suspended and floating particulate, stale odour
BH104B	4.79	0.80	18	3.22	547	7.23	11.2	Cloudy, Oily film on surface, slight hydrocarbon odour
MW01	22.73	2.73	120	5.66	1200	7.01	9.0	slight cloudy, stale odour
MW02	30.07	3.82	150	7.86	717	7.45	9.7	slight cloudy, odourless
MW03	14.70	3.96	60	6.03	759	8.01	10.1	clear, film of hydrocarbon/product on surface, odourless
Interim Guideline Value	-	-	-	-	1000	>6.5 & <9.5	25°C	

Table: 3 Results of BTEX, Inorganics, Mineral Oil and Organics in Groundwater Samples

Parameter	Units	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values (units as indicated)
BTEX									
Benzene	µg/l	<10	<10	<10	<10	<10	<10	<10	1.0
Ethylbenzene	µg/l	<10	<10	<10	24	<10	<10	13	10
Toluene	µg/l	<10	<10	<10	<10	<10	<10	<10	10
Xylene	µg/l	<10	<10	<10	20	<10	<10	19	10
Mineral Oil									
Mineral Oil by GC	µg/l	<10	<10	<10	2813	<10	<10	209	10
Organics									
DRO	µg/l	<10	<10	<10	3750	<10	<10	596	- ¹

Table: 4 Results of PAHs in Groundwater Samples

PAHs										
Parameter	Units	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values	
Acenaphthene	µg/l	<10	<10	<10	0.0332	<10	<10	0.0473	-	
Acenaphthylene	µg/l	<10	<10	<10	0.0412	<10	<10	0.0098	-	
Anthracene	µg/l	<10	<10	<10	0.0083	<10	<10	0.0059	10000	
Benzo(a)anthracene	µg/l	<10	<10	<10	0.0016	<10	<10	0.0024	-	
Benzo(a)pyrene	µg/l	<10	<10	<10	<10	<10	<10	<10	0.01	
Benzo(b)+Benzo(k) fluoranthene	µg/l	<10	<10	<10	<10	<10	<10	<10	-	

¹ No IGV specified for certain parameters

PAHs										
Parameter	Units	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values	
Benzo(ghi)perylene	µg/l	<10	<10	<10	<10	<10	<10	<10	0.05	
Chrysene	µg/l	<10	<10	<10	0.0014	<10	<10	0.0034	-	
Dibenzo(ah)anthracene	µg/l	<10	<10	<10	<10	<10	<10	<10	-	
Fluoranthene	µg/l	<10	<10	<10	0.0078	<10	<10	0.0024	-	
Fluorene	µg/l	<10	<10	<10	0.0833	<10	<10	0.0551	1	
Indeno(123cd)pyrene	µg/l	<10	<10	<10	<10	<10	<10	<10	0.05	
Naphthalene	µg/l	<10	<10	<10	0.038	<10	<10	0.0116	1	
Phenanthrene	µg/l	<10	<10	<10	0.063	<10	<10	0.0379	-	
Pyrene	µg/l	<10	<10	<10	0.0087	<10	<10	0.0082	-	
Total 16 EPA PAHs	µg/l	<10	<10	<10	0.2865	<10	<10	0.184	-	

Table: 5 Phenol Concentrations in Groundwater Samples

Phenols									
Parameter	Units	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values
Total Phenol**	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5

Table: 6 Results of SVOC's in Groundwater Samples

SVOC's									
Parameter	Method Detection Limits (µg/l)	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values for Groundwater (µg/l)
1,2,4-Trichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	0.4

SVOC's									
Parameter	Method Detection Limits (µg/l)	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values for Groundwater (µg/l)
1,2-Dichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	10
1,3-Dichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	-
1,4-Dichlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	-
2,4,5-Trichlorophenol	1	<1	<1	<1	<1	<1	<1	<1	-
2,4,6-Trichlorophenol	1	<1	<1	<1	<1	<1	<1	<1	200
2,4-Dichlorophenol	1	<1	<1	<1	<1	<1	<1	<1	-
2,4-Dimethylphenol	1	<1	<1	<1	<1	<1	<1	<1	-
2,4-Dinitrotoluene	1	<1	<1	<1	<1	<1	<1	<1	-
2,6-Dinitrotoluene	1	<1	<1	<1	<1	<1	<1	<1	-
2-Chloronaphthalene	1	<1	<1	<1	<1	<1	<1	<1	-
2-Chlorophenol	1	<1	<1	<1	<1	<1	<1	<1	200
2-Methylnaphthalene	1	<1	<1	<1	<1	<1	<1	<1	-
2-Methylphenol	1	<1	<1	<1	<1	<1	<1	<1	-
2-Nitroaniline	1	<1	<1	<1	<1	<1	<1	<1	-
2-Nitrophenol	1	<1	<1	<1	<1	<1	<1	<1	-
3-Nitroaniline	1	<1	<1	<1	<1	<1	<1	<1	-
4-Bromophenylphenylether	1	<1	<1	<1	<1	<1	<1	<1	-
4-Chloro-3-methylphenol	1	<1	<1	<1	<1	<1	<1	<1	-
4-Chloroaniline	1	<1	<1	<1	<1	<1	<1	<1	-
4-Chlorophenylphenylether	1	<1	<1	<1	<1	<1	<1	<1	-
4-Methylphenol	1	<1	<1	<1	<1	<1	<1	<1	-
4-Nitroaniline	1	<1	<1	<1	<1	<1	<1	<1	-
4-Nitrophenol	1	<1	<1	<1	<1	<1	<1	<1	-
Acenaphthene	1	<1	<1	<1	<1	<1	<1	<1	-

SVOC's									
Parameter	Method Detection Limits (µg/l)	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values for Groundwater (µg/l)
Acenaphthylene	1	<1	<1	<1	<1	<1	<1	<1	-
Anthracene	1	<1	<1	<1	<1	<1	<1	<1	10000
Azobenzene	1	<1	<1	<1	<1	<1	<1	<1	-
Benzo(a)anthracene	1	<1	<1	<1	<1	<1	<1	<1	-
Benzo(a)pyrene	1	<1	<1	<1	<1	<1	<1	<1	0.01
Benzo(b)fluoranthrene	1	<1	<1	<1	<1	<1	<1	<1	0.5
Benzo(ghi)perylene	1	<1	<1	<1	<1	<1	<1	<1	0.05
Benzo(k)fluoranthrene	1	<1	<1	<1	<1	<1	<1	<1	0.05
Bis(2-chloroethoxy)methane	1	<1	<1	<1	<1	<1	<1	<1	-
Bis(2-chloroethyl)ether	1	<1	<1	<1	<1	<1	<1	<1	-
Bis(2-ethylhexyl)phthalate	1	<1	<1	<1	<1	<1	<1	<1	-
Butylbenzylphthalate	1	<1	<1	<1	<1	<1	<1	<1	-
Carbazole	1	<1	<1	<1	<1	<1	<1	<1	-
Chrysene	1	<1	<1	<1	<1	<1	<1	<1	-
Dibenzo(a,h)anthracene	1	<1	<1	<1	<1	<1	<1	<1	-
Dibenzofuran	1	<1	<1	<1	<1	<1	<1	<1	-
Diethyl phthalate	1	<1	<1	<1	<1	<1	<1	<1	-
Dimethyl phthalate	1	<1	<1	<1	<1	<1	<1	<1	-
Di-n-butylphthalate	1	<1	<1	<1	<1	<1	<1	<1	2
Di-n-octylphthalate	1	<1	<1	<1	<1	<1	<1	<1	-
Fluoranthene	1	<1	<1	<1	<1	<1	<1	<1	1
Fluorene	1	<1	<1	<1	<1	<1	<1	<1	-
Hexachlorobenzene	1	<1	<1	<1	<1	<1	<1	<1	0.03
Hexachlorobutadiene	1	<1	<1	<1	<1	<1	<1	<1	0.1

SVOC's									
Parameter	Method Detection Limits (µg/l)	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values for Groundwater (µg/l)
Hexachloroethane	1	<1	<1	<1	<1	<1	<1	<1	-
Hexchlorocyclopentadiene	1	<1	<1	<1	<1	<1	<1	<1	-
Indeno(1,2,3-cd)pyrene	1	<1	<1	<1	<1	<1	<1	<1	0.05
Isophorone	1	<1	<1	<1	<1	<1	<1	<1	-
Naphthalene	1	<1	<1	<1	<1	<1	<1	<1	1
Nitrobenzene	1	<1	<1	<1	<1	<1	<1	<1	10
N-nitrosodi-n-propylamine	1	<1	<1	<1	<1	<1	<1	<1	-
Pentachlorophenol	1	<1	<1	<1	<1	<1	<1	<1	2
Phenanthrene	1	<1	<1	<1	<1	<1	<1	<1	-
Phenol	1	<1	<1	<1	<1	<1	<1	<1	0.5
Pyrene	1	<1	<1	<1	<1	<1	<1	<1	-

Table: 7 Results of VOC's in Groundwater Samples

VOC's									
Parameter	Method Detection Limits (µg/l)	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values for Groundwater (µg/l)
1,1,1,2-Tetrachloroethane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,1,1-Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	500

VOC's									
Parameter	Method Detection Limits (µg/l)	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values for Groundwater (µg/l)
1,1,2,2-Tetrachloroethane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,1,2-Trichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,1-Dichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,1-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	6	-
1,1-Dichloropropene	<1	<1	<1	<1	<1	<1	<1	<1	-
1,2,3-Trichlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
1,2,3-Trichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,2,4-Trichlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	0.4
1,2,4-Trimethylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
1,2-Dibromo-3-chloropropane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,2-Dibromoethane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,2-Dichlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	10
1,2-Dichloroethane	<1	<1	<1	<1	<1	<1	<1	<1	3
1,2-Dichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,3,5-Trimethylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
1,3-Dichlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
1,3-Dichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	-
1,4-Dichlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
2,2-Dichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	-
2-Chlorotoluene	<1	<1	<1	<1	<1	<1	<1	<1	-
4-Chlorotoluene	<1	<1	<1	<1	<1	<1	<1	<1	-
4-Isopropyltoluene	<1	<1	<1	<1	<1	<1	<1	<1	-

VOC's									
Parameter	Method Detection Limits (µg/l)	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values for Groundwater (µg/l)
Benzene	<1	<1	<1	<1	<1	<1	<1	<1	1
Bromobenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
Bromochloromethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Bromodichloromethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Bromoform	<1	<1	<1	<1	<1	<1	<1	<1	-
Bromomethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Carbon disulphide	<1	<1	<1	<1	<1	<1	<1	<1	-
Carbontetrachloride	<1	<1	<1	<1	<1	<1	<1	<1	-
Chlorobenzene	<1	<1	<1	<1	<1	<1	<1	<1	1
Chloroethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Chloroform	<1	<1	<1	<1	<1	<1	<1	<1	12
Chloromethane	<1	<1	<1	<1	<1	<1	<1	<1	-
cis-1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	-
cis-1,3-Dichloropropene	<1	<1	<1	<1	<1	<1	<1	<1	-
Dibromochloromethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Dibromomethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Dichlorodifluoromethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Dichloromethane	<1	<1	<1	<1	<1	<1	<1	<1	10
Ethylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	10
Hexachlorobutadiene	<1	<1	<1	<1	<1	<1	<1	<1	0.1
Isopropylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
Naphthalene	<1	<1	<1	<1	<1	<1	<1	2	1

VOC's									
Parameter	Method Detection Limits (µg/l)	BH101	BH102	BH103	BH104B	MW01	MW02	MW03	Interim EPA Guideline Values for Groundwater (µg/l)
n-Butylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
o-Xylene	<1	<1	<1	<1	<1	<1	<1	<1	10
p/m-Xylene	<1	<1	<1	<1	<1	<1	<1	<1	10
Propylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
sec-Butylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
Styrene	<1	<1	<1	<1	<1	<1	<1	<1	-
tert-butyl methyl ether	<1	<1	<1	<1	<1	<1	<1	<1	-
tert-Butylbenzene	<1	<1	<1	<1	<1	<1	<1	<1	-
Tetrachloroethene	<1	<1	<1	<1	<1	<1	<1	<1	40
Toluene	<1	<1	<1	<1	<1	<1	<1	<1	10
trans-1,2-Dichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	-
trans-1,3-Dichloropropene	<1	<1	<1	<1	<1	<1	<1	<1	-
Trichloroethene	<1	<1	<1	<1	<1	<1	<1	<1	70
Trichlorofluoromethane	<1	<1	<1	<1	<1	<1	<1	<1	-
Vinyl Chloride	<1	<1	<1	<1	<1	<1	<1	<1	-

5 DISCUSSION

The results of the 4th quarterly monitoring round of 2008 are included in Tables 1 to 7 of the report. For the purpose of the report, the results are compared to 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 in the subsections below.

The results show that samples obtained from all wells for pH were within the EPA interim guideline range of 6.5 – 9.5. Electrical conductivity was above the guideline value at wells BH102, BH103 and MW01 at 1247 µs/cm, 1098 µs/cm and 1200 µs/cm respectively.

Measurements taken for Dissolved Oxygen concentrations, ranged from 2.73 ppm – 7.86 ppm. Factors such as climate, nutrients in the water, suspended solids; organic wastes and groundwater inflow can all influence the DO value. Field observations made at the time of sampling varied from well to well, and a description of colour and odour is presented in Table 2. It was observed that BH104B, MW03 and to a lesser extent MW01 and BH101 also contained an oily residue and a slight odour.

Elevated levels of Mineral Oil were identified in wells BH104B (at 2813 µg/l) and MW03 (at 209 µg/l). The interim guideline value for this parameter is 10 µg/l. All other wells were below the laboratory detection limit. Levels of diesel range organics (DRO) were detected in samples extracted from wells BH104B (3750 µg/l) and MW03 (596 µg/l), although no IGV has been specified for these compounds.

During this quarter, both BH104b and MW03 displayed concentrations of PAH above the laboratory limit of detection, no interim guideline values for these compounds currently exist.

The results of monitoring from the 4th Quarter 2008, suggest that Phenol concentrations were below the limit of detection of 0.5 µg/l. The results are presented in table 5.

The results of monitoring for semi-volatile organic (SVOCs) and volatile organic (VOCs) compounds show that no compounds were detected in well MW03. However although no guideline value currently exceeds for 1,1-Dichloroethene, it can be seen that Naphthalene was above the relevant interim guideline value of 1µg/l. No other wells displayed concentrations above the laboratory limit of detection and are consequently below any relevant interim guideline values.

6 CONCLUSIONS

In accordance with the criteria set out in Schedule 4(ii) of the site's Waste Licence Register No. W0184-01, groundwater monitoring was carried out at the ENVA Ireland site on the 15th December 2008 corresponding to the 4th Quarter of 2008. Suitably qualified consultants from RPS collected groundwater samples from 7 on-site monitoring wells and submitted these samples to an accredited laboratory for analysis.

In general, when compared with results of the previous monitoring round (Q3 of 2008), a decrease in concentrations of various substances was observed. Wells BH104B and MW03 did however display concentrations of mineral oil (MRO) in excess of the interim guideline values for these parameters.

APPENDIX A

SAMPLING AND ANALYSIS - METHODS AND DETAILS

A.1.1 Location of Sampling

Enva Ireland Limited

Clonminam Industrial Estate

Portlaoise

Co Laois

A.1.2 Date & Time of Sampling

15th December 2008, Sampling started at 11.30 am

A.1.3 Personnel Present During Sampling

Ronan Murphy, Environmental Consultant, RPS Group, Dublin

A.1.4 Instrumentation

Honda Purge Pump

Waterra Tubing and ball valves

Dip Meter

Environmental Monitoring Kit – pH, EC, DO and temperature

Appendix 2



Enva Ireland

Groundwater Risk Assessment

DOCUMENT CONTROL SHEET

Client	Enva Ireland					
Project Title	Groundwater Risk Assessment					
Document Title	Groundwater Risk Assessment Report					
Document No.	MDE0788Rp0001					
This Document Comprises	DCS	TOC	Text	List of Tables	List of Figures	No. of Appendices
	1	1	22	1	1	5

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
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A01	Draft for client comment	L Burden	S. Herlihy	S. Herlihy	West Pier	10/11/2008
F01	Final Report	L burden	S. Herlihy	S. Herlihy	West Pier	20/11/2008

EXECUTIVE SUMMARY

Site Setting	The Enva Ireland site is located on the outskirts of Portlaoise and comprises a soil and waste oil treatment facility. Monitoring of groundwater levels and groundwater quality has been ongoing since 2004. There have been a number of observations of visual and olfactory evidence of contamination some of which have been reflected in chemical analysis results
Geology and Hydrogeology	The site is underlain by Glacial Deposits, comprising Boulder Clay and Sand and Gravel, over fractured Limestone bedrock. Groundwater flow within the Limestone bedrock is within fractures. The boreholes on the site (MW01-MW03) intersect different fracture zones, the connection between which is unknown. Therefore it has not been possible to determine groundwater flow direction, in the bedrock. Groundwater flow within the Glacial Deposits is predominantly to the east towards the River Triogue although the flow direction does change over time.
Groundwater Quality	Free product has been observed within MW03 in the east of the site and BH104 in the south of the site. The product in BH104 comprises a thin (<1mm) layer of light non-aqueous phase liquid that was previously identified as diesel. The product in MW03 comprises a viscous sticky non aqueous phase liquid that is present within the borehole casing and as a sheen on groundwater but does not form a continuous layer of measurable thickness. BH104 has recorded concentrations of petroleum hydrocarbons and polycyclic aromatic hydrocarbons (PAH). MW03 has recorded concentrations of mineral oil, PAH and chlorinated solvents
Potential Sources of Contamination	The most likely sources of observed contamination at the site are: <ul style="list-style-type: none"> • Historical soil contamination from former oil receptor sump • An off site automotive repair workshop to the south of the site • Irish rail site, also off site, to the east of the site
Risk Assessment	A risk assessment was carried out using the UK Remedial Target Methodology and concluded that the free product observed in MW03 and BH104 was comprised of largely immobile compounds and as such was not generating a significant dissolved phase plume that could present a risk to the wider hydrogeological environment. However, the free product will remain as a residual source of contamination.
Recommendations	It is recommended that natural attenuation of contamination continue and product recovery should not be attempted. The boreholes should continue to be monitored using an interface probe to monitor the extent and potential migration of free phase product. The quarterly analysis suite should be extended to include analysis for hydrocarbons using the TPHCWG method.

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APPENDIX C Hydrographs for Individual Dataloggers

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APPENDIX E Input Parameters for Assessment

1 INTRODUCTION

1.1 TERMS OF REFERENCE

In 2007 the Environmental Protection Agency (EPA) prepared an Audit Report in respect of the Enva Waste Licence No WO184-01 for the Enva site. The report contained an eleven point corrective action plan to include a detailed hydrogeological risk assessment and further site investigation. RPS addressed some of the points raised in their Summary Report on the Trend of Contaminant Levels at Enva Ireland Ltd since 2005 (MDE0647RP001), dated April 2007. The report identified some discrepancies in inferred groundwater flow directions between monitoring data collected by RPS and URS.

The EPA responded to the RPS Summary Report in a letter (W0184-01/CL01JF) dated 21st January 2008 and asked a number of questions with respect to the assessment of the hydrocarbon contamination identified at the Enva site. RPS were subsequently requested by Enva to prepare a scope of work in order to address the letter of 21st January 2008, from the EPA, which are provided in our proposal letter (MDE0498Lt0002), dated 10th April 2008.

This scope of work was verbally accepted by Enva in May 2008 and work commenced immediately. The EPA produced a formal response to this proposal in their letter (W0184-01/AP19JF), dated 8th August and requested that monitoring of groundwater levels be sufficient to account for seasonal fluctuations

1.2 OBJECTIVES

The overall objective of the work was to address the EPA letter of 21st January 2007 in which they request a more detailed and scientific assessment of the following aspects relating to the observed contamination.

- Groundwater flow direction within subsoils and bedrock, in particular the differences between the RPS and previous URS reports;
- The thickness and nature of the free phase product noted in BH104B and MW03;
- Fluctuations in contaminant concentrations over time;
- Conceptual site model detailing sources pathways and receptors;
- The potential for natural attenuation within the aquifer;
- The potential for off-site contaminant migration.

1.3 SCOPE OF WORK

In order to achieve the objectives detailed above, the following scope of work was undertaken.

- **Review of Previous Information.** All previous data relating to soil and groundwater contamination or groundwater levels have been reviewed and interpreted with respect to changes in groundwater level and contaminant concentration over time.
- **Review of site Environmental Setting:** The environmental setting of the site including geology, hydrogeology and aquifer use has been reviewed based on publically available information.
- **Product Monitoring.** Boreholes have been monitored on three occasions since May 2008 with an interface probe to measure thickness and potential extent of free product within boreholes
- **Sampling and analysis of groundwater.** Samples of groundwater were collected using dedicated double valve bailers from all boreholes on 31st May 2008 and 16th July 2008. The samples were analysed for TPH (using TPHCWG methodology), speciated PAH and phenol in order to determine the dissolved phase concentration of contaminants within the groundwater and establish the potential mobility of contaminants within the free product. In addition the groundwater was analysed for natural attenuation parameters (dissolved oxygen, ferric and ferrous iron, sulphate and nitrate) on 31st May 2008.
- **Groundwater Level Monitoring.** Automated data loggers were installed in all boreholes on the 31st May 2008 in order to monitor fluctuations in groundwater levels. Manual monitoring of water levels has taken place on two occasions (16th July 2008 and 9th October 2008) since the loggers were installed.
- **Update of Conceptual Model.** The conceptual model has been updated based on data available to date to identify all sources, pathway receptor linkages.
- **Risk Assessment.** The results of the additional monitoring, together with previous data, have been considered within the context of the UK Remedial Targets Methodology in order to assess the migration potential of contaminants within groundwater.

1.4 RISK ASSESSMENT APPROACH

In the absence of specific guidance for the Republic of Ireland, the risk assessment approach adopted is the UK Remedial Target Methodology (formerly known as "P20/R&D20"). The Environment Agency, England, the Scottish Environment Protection Agency (SEPA) and the Environment and Heritage Service (EHS), Northern Ireland have derived this methodology in order to comply with their obligations under the Water Framework Directive and specific UK legislation with respect to contaminated land.

This approach is consistent with the UK Model Procedures for the Assessment of Land Affected by Contamination (CLR11)¹ which is a tiered approach based on the development of a conceptual model to identify potential source pathway and receptor linkages. The conceptual model should be updated at each successive Tier of assessment as new information becomes available.

The Tiers of assessment are as follows:

¹ UK Environment Agency and Defra, 2002

Tier 1:Preliminary Risk Assessment: *The Preliminary Risk Assessment is the minimum requirement for all risk assessments and is based upon the development of a conceptual model which identifies all potentially significant pollutant linkages and allows a qualitative assessment of whether a potentially unacceptable risk exists. In the event that such a risk is identified it may be necessary to undertake risk management action which can include further data collection and risk assessment at subsequent tiers. The Preliminary Risk Assessment generally relies on desk-based study data.*

Tier 2:Generic Quantitative Risk Assessment: *Involves the collection of quantitative analytical data that can be assessed against appropriate Generic Assessment Criteria (GAC), which may have been developed by various statutory and non-statutory bodies for a defined set of generic assumptions with respect to contaminant behaviour, exposure pathways and critical receptors. This tier may not be necessary or applicable based on the outcome of the Preliminary Risk Assessment and the availability of appropriate generic assessment criteria.*

Tier 3:Detailed Quantitative Risk Assessment: *Makes use of analytical and numerical modelling techniques to further quantify and evaluate risks to receptors. This tier makes use of site-specific data relating to contaminant fate and transport, exposure pathways and critical receptors.*

The Remedial Target Methodology allows for detailed quantitative assessment of contaminant transport where appropriate and where sufficient information is available. The approach is discussed in more detail in Section 6.

1.5 REPORT FORMAT

- Section 1 Provides an introduction to the project and defines the project objectives and risk assessment approach
- Section 2 Describes the site, previous investigations carried out and general observations made with respect to contamination.
- Section 3 Uses the findings of the previous investigations to describe site ground conditions including groundwater levels and chemistry.
- Section 4 Discusses potential on-site and off-site sources of contamination in the context of observations made on the site.
- Section 5 Presents an updated conceptual model and identifies sources pathways and receptors that have been considered within the assessment.
- Section 6 Presents the risk assessment
- Section 7 Provides summary and recommendations

2 BACKGROUND

2.1 SITE LOCATION AND DESCRIPTION

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 south west but to the east of the site the ground slopes gently towards the River Triogue, which is located approximately 1 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 shown on **Figure 1**.

The site has been in operation since 1978, and the layout has remained relatively consistent. The site layout is shown on **Figure 2**. The site is largely covered in hardstanding with some open areas in the far north and northwest of the site. All oil and soil storage areas are suitably bunded and the general standard of housekeeping is good.

2.2 PREVIOUS INVESTIGATIONS AND SITE DEVELOPMENT

Since 2001, two intrusive investigations have been undertaken at the site. In addition to this extensive groundwater monitoring has been carried out at the site and a number of interpretative and factual reports have been produced to present and discuss trends in groundwater levels and groundwater chemistry. The work carried out to date is summarised in **Table 1**. This information has formed the basis of the risk assessment.

Table 1 Work Relating to Soil and Groundwater Contamination

Date	Work Carried Out By	Scope of Work
March 2001	URS	<ul style="list-style-type: none"> • Drilling and installation of four shallow groundwater monitoring wells (BH101 to BH104) • Collection and analysis of soil and groundwater samples
June 2003	Enva/URS	<ul style="list-style-type: none"> • Removal of sump on eastern side of site • Collection and analysis of soil and groundwater samples
April 2004	URS	<ul style="list-style-type: none"> • Drilling and installation of three deep groundwater monitoring wells (MW01-MW03) • Collection and analysis of groundwater samples from MW01-MW03 and BH101 to BH103 (BH104 not accessible)
July 2004	URS	<ul style="list-style-type: none"> • Quarterly monitoring of shallow and deep groundwater wells • Surveying of groundwater monitoring wells to ordnance datum • Manual measurement of groundwater levels • Collection and analysis of groundwater samples • Whole oil analysis of light non-aqueous phase liquid from BH104 • Excavation of area in vicinity of BH104 • Conversion of BH104 to ground sump • Drilling of BH104B to replace BH104

Date	Work Carried Out By	Scope of Work
September 2004	Enva/URS	<ul style="list-style-type: none"> Excavation of trial pit beneath sludge bay Collection and analysis of soil sample
October 2004	URS	<ul style="list-style-type: none"> Quarterly monitoring of shallow and deep groundwater wells Manual measurement of groundwater levels Collection and analysis of groundwater samples
February, June & October 2005	URS	<ul style="list-style-type: none"> Quarterly monitoring of shallow and deep groundwater wells Manual measurement of groundwater levels Collection and analysis of groundwater samples
July 2005	URS	<ul style="list-style-type: none"> Summary report of groundwater monitoring up to June 2005
March, April & July 2006	RPS	<ul style="list-style-type: none"> Quarterly monitoring of shallow and deep groundwater wells to comply with IPC Licence conditions Manual measurement of groundwater levels Collection and analysis of groundwater samples
April 2007	RPS	<ul style="list-style-type: none"> Summary report of groundwater monitoring since 2005
February to October 2007	RPS	<ul style="list-style-type: none"> Monthly monitoring of shallow and deep groundwater wells to comply with IPC Licence conditions Manual measurement of groundwater levels Collection and analysis of groundwater samples
February & May 2008	RPS	<ul style="list-style-type: none"> Quarterly monitoring of shallow and deep groundwater wells to comply with IPC Licence conditions Manual measurement of groundwater levels Measurement of free product using interface probe (May only) Collection and analysis of groundwater samples
June 2008	RPS	<ul style="list-style-type: none"> Monitoring of deep and shallow boreholes as part of current assessment Installation of automated dataloggers in four shallow and three deep groundwater monitoring wells Manual measurement of groundwater level and free product using interface probe Collection and analysis of grab samples (non purged samples) from monitoring wells
July 2008	RPS	<ul style="list-style-type: none"> Quarterly monitoring of shallow and deep groundwater wells to comply with IPC Licence conditions Manual measurement of groundwater level and free product using interface probe Collection and analysis of samples from groundwater monitoring wells and BH104 sump Down load of automated data loggers
August 2008	RPS	<ul style="list-style-type: none"> Collection of sample from BH104 sump as part of current assessment
October 2008	RPS	<ul style="list-style-type: none"> Manual measurement of groundwater level and free product using interface probe Down load of automated data loggers

2.3 OBSERVATIONS OF CONTAMINATION

2.3.1 Observations in Soil

A hydrocarbon type odour and sheen were noted on Made Ground soils during the drilling of BH104 in 2001. A hydrocarbon odour was also noted in BH103 however there was no visual or olfactory evidence of contamination within groundwater. Hydrocarbons were detected in soil samples from all boreholes.

In 2003 the oil reception sump in the eastern area of the site was removed. The sump comprised a steel tank enclosed within a concrete mass tank and surrounded by a block wall. Visual and olfactory evidence of localised soil contamination was observed in the immediate vicinity of the block wall. All visually contaminated material was removed. Samples of remaining soil were analysed and recorded low concentrations (<10 mg/kg) of hydrocarbons including Petrol Range Organics (PRO) and Polycyclic Aromatic Hydrocarbons. Benzene was not detected. Toluene, ethylbenzene and xylene recorded concentrations of less than 1 mg/kg.

2.3.2 Free Product in BH104

In July 2004 approximately 25 cm of light non-aqueous phase liquid (LNAPL) was encountered on groundwater in BH104 during a routine quarterly monitoring round. Prior to this BH104 was last sampled in 2001 as access was restricted, at the time that the deep boreholes were drilled, in April 2004 by the presence of a port-a-cabin. The LNAPL was removed together with surrounding soils which did not show visual evidence of contamination. Whole oil analysis of the product recovered indicated that it comprised 'Unweathered diesel'. BH104 was converted into a sump constructed of perforated concrete rings and was replaced by BH104B which was drilled immediately next to it.

Observations made during groundwater monitoring rounds occasionally record an oily sheen on water. Measurement with an interface probe was undertaken in May 2008, June 2008 and July 2008 but did not detect any measurable thickness of product within BH104B. However, during the July 2008 quarterly monitoring round, the BH104 sump was inspected for the first time since its installation in 2004 and approximately 1mm of product was present on the water surface. The odour and appearance of the product was consistent with diesel. Upon disturbance of the water column within the sump the product separated into globules and became emulsified with the aqueous phase. When extracted for sampling, ground water initially appears black, sometimes with a sulphurous odour, but quickly runs clear.

Due to the minimal thickness of LNAPL within the sump and BH104B it has not been possible to obtain a sample for characterisation analysis.

2.3.3 Free Product in MW03

Free product has been consistently observed in MW03 since RPS began routine monitoring in 2006. Prior to this occasional observations of product were made.

The product in MW03 has a different character to that observed in BH104B and comprises a viscous black sticky liquid which appears to have smeared up the casing of the borehole. It has not been possible to record a reliable measurable thickness of product in this borehole or to obtain a sample of the product and it is therefore not conclusive as to whether this product is a light or dense non-aqueous phase liquid (LNAPL or DNAPL). When extracted for sampling, groundwater initially records an oily sheen but quickly runs clear.

2.3.4 General Observations in Groundwater

An oily surface film and hydrocarbon odour has been sporadically recorded in the remaining boreholes across the site. No measurable thickness of product has been recorded with an interface probe in any of these boreholes and is also not reflected in the groundwater analysis. A more detailed summary of observations made during monthly and quarterly monitoring round, undertaken by RPS between 2006 and 2008 are presented as Appendix A

3 GROUND CONDITIONS

3.1 REGIONAL SETTING

3.1.1 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 subsoil's in the region comprise mainly Made Ground, around the industrial area, and Limestone Till in the surrounding regions.

3.1.2 Hydrogeology

The limestones are classified by the Geological survey of Ireland (GSI) as a locally important karstified aquifer. 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 five extraction wells in total. 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 north-west south-east with the boundary of the outer protection zone at least 4 km to the north-east of the site. A further public abstraction well-field is currently being developed to the north-west of the current area in the townland of Eyne, approximately 6 km to the north of the site, and will comprise a further five abstraction wells. The Source Protection Zone for these wells has not yet been defined but it is not anticipated to affect 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 in the location 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 that 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.

3.2 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**.

Table 2 Ground Conditions

Strata	Extent	Thickness	Description
Made Ground	BH104	0-3.5 m	Dominantly concrete, with hardcore fill, and clay.
Boulder Clay	All boreholes	<8.5 m	Includes fine to medium, well rounded gravels.
Sand and Gravel	Confined to south east corner of site (BH101, BH104 and MW03)	0-2 m	In general the transition from boulder clay to sand is gradual with changes from gravel, to sandy gravel, to sand.
Limestone Bedrock	Encountered in MW01, MW02 and MW03	Not penetrated. 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 are presented as **Appendix B**. Schematic cross sections of ground conditions across the site are presented as **Figure 3a** and **Figure 3b**.

3.3 SITE GROUNDWATER CONDITIONS

3.3.1 Groundwater Levels

Groundwater levels have been measured manually using an electronic probe since 2004. In June 2008 automated dataloggers were installed in all seven boreholes on the site. These were initially down loaded in July 2008, however the loggers in MW02 and BH101 were both missing and there is therefore no automated data for these holes. The loggers were downloaded for a second time in October 2008 and the logger in BH103 was found to be missing. The automated data for this hole is therefore limited to six weeks between June and July 2008.

Groundwater was encountered, during drilling, within fractures within the limestone bedrock in boreholes MW01, MW02 and MW03 at depths of 22mbgl (80.1mAOD), 29mbgl (74.12mAOD) and 7.8mbgl (94.97mAOD) respectively. Stabilised groundwater levels within the limestone range from approximately 98 to 100 m AOD indicating that the groundwater is confined by the relatively low permeability rock matrix and overlying drift deposits.

Shallow groundwater was also encountered during within the drift deposits at depths of between 1.5mbgl (99.66mAOD) and 4.5mbgl (98.27mAOD) stabilised levels in the drift deposits also range from approximately 89 m to 100 m AOD. This water is believed to be perched upon the relatively low permeability bedrock although there is potential for connection with deeper groundwater through vertical or sub-vertical fractures.

The installation details for each of the boreholes are provided on the borehole logs in Appendix B.

The manually recorded water levels are presented as **Figures 4a-c** with rainfall data provided. Groundwater levels monitored using the automated dataloggers is presented as **Figure 5**. Hydrographs for the individual boreholes are presented as **Appendix C**.

The graphs show that groundwater levels vary significantly between monitoring rounds and that the location of the up-gradient and down gradient holes also vary meaning that groundwater changes direction. As part of the data analysis a number of contour plots were constructed for both the deep groundwater within the bedrock and the shallow groundwater within the drift deposits to further investigate the changes in flow direction and calculate hydraulic gradient².

3.3.1.1 Deep Groundwater within Limestone

Deep groundwater flow direction, in the limestone, has most frequently been towards the southwest but also appears to flow to the north, northwest, south and southeast on more than one occasion. Such significant variations in groundwater flow direction are likely to be due to the fact that the monitoring boreholes are screened within three different fracture zones with a vertical separation of up to 15 m between screened horizons. A vertical connection between these fracture zones is likely but has not been proven and as such the assumption of a linear variation in groundwater level between these holes (such as assumed when drawing contour plots) is not appropriate as the water is potentially being transmitted on three different planes. Any connection between these fracture zones will be greatly influenced by the nature and orientation of fracturing within the bedrock and external factors such as changes to recharge patterns (influenced by changes in land use and geological morphology) and abstraction of water.

The automated data loggers recorded instant and significant changes in the groundwater level within the bedrock in response to purging of the well for sampling. This response illustrates that the bedrock aquifer is characterised by low permeability matrix and low storage potential with flow occurring within fractures. The automated groundwater monitoring data has also shown that groundwater within the bedrock records a response in relation to rainfall, which indicates that recharge to the deeper bedrock aquifer is occurring. This recharge is likely to be occurring over open-ground surrounding the site, particularly to the west (within 1km of the site) where bedrock is known to be close to surface. Based on the low permeability nature of the bedrock matrix this response indicates that vertical or sub-vertical fractures are present within the bedrock and provide preferential pathways for vertical migration of ground water within the bedrock.

3.3.1.2 Shallow Groundwater within Drift Deposits

Groundwater flow within the drift deposits is generally to the east towards the River Triogue indicating potential hydraulic continuity between the river and the drift deposits and in particular the sand and gravel. However, the groundwater contours within the drift deposits, based on manual measurements show changes in flow direction. For the majority of the time, BH101 is the most down gradient borehole however occasionally it changes level with BH103 to become the most up-gradient borehole causing groundwater to flow to the west.

The manual dip levels indicate the presence of a flow divide running in a line between BH101 (in the east) to BH103 in the west. To the north of this line groundwater flow (from BH102) appears to be towards the southwest or southeast and to the south of the line flow (from BH104b) is to the northeast or northwest towards either BH103 or BH101. There is no regular seasonal trend to the fluctuation in groundwater flow direction and it is likely to be due to preferential recharge in particular areas and may also be influenced by upward flow of groundwater with the deeper bedrock. The information from the

² these plots are not presented as part of this report as the variation in flow direction is adequately demonstrated by the time variant hydrographs.

automated dataloggers show BH104B to be the up-gradient borehole, however as the loggers from BH101 have been lost prior to downloading of data and the logger from BH103 after only six weeks, it has not been possible to examine the connection between BH101 and BH103.

The automated data loggers have recorded an almost instantaneous response to rainfall in the shallow boreholes indicating high recharge potential within the area. The majority of the site is covered with hard-standing however the Irish rail site to the east is not covered and will allow infiltration of rainfall.

The hydraulic gradient within the shallow groundwater has been estimated as ranging between 0.005 and 0.06. However, for the majority of cases it is in the region of 0.01.

3.3.2 Groundwater Chemistry

Information on groundwater quality dates back to 2001 when the shallow boreholes were installed on the site. The trend of groundwater quality has previously been examined in two reports (URS 2005 and RPS 2007). Graphs showing trends of selected contaminants over time are presented in **Appendix D**.

In general the trend of contaminant concentrations over time is erratic with compounds rarely being detected in the same borehole on two consecutive monitoring rounds. These sporadic occurrences may be influenced by a number of factors including:

- Groundwater flow patterns which have been shown to be irregular;
- Presence of suspended solids or free phase product within sample; or
- Cross contamination within the laboratory.

There are however a number of notable trends which are discussed below.

3.3.2.1 Chlorinated solvents within MW03

Chlorinated solvents, 1,1,1, trichloroethane (TCA), and 1,1 dichloroethane (DCA) have repeatedly been detected within deep groundwater in MW03 and dichloromethane (DCM) has been detected in all boreholes on a number of occasions during both RPS and URS monitoring rounds. These contaminants are associated with degreasers used in automotive manufacture and repair.

DCM is currently the most commonly used chlorinated solvent. However it is also a known laboratory contaminant and on occasions it has been recorded on the site it also has been detected within the laboratory blank samples and therefore, is not considered to be representative of contamination from the site.

TCA degrades by the process of reductive dehalogenation to give daughter products, which include DCA. TCA and DCA have only been detected in MW03. TCA has not been detected since April 2004 and DCA concentrations are in decline. This suggests that degradation of chlorinated solvents is occurring.

3.3.2.2 Petroleum Hydrocarbons within MW03 and BH104B

Petroleum hydrocarbons (TPH), including mineral oil, petrol range organics (PRO), diesel range organics (DRO), ethylbenzene, toluene, xylene and polycyclic aromatic hydrocarbons (PAH) have been detected within MW03, BH103 and BH104B on at least one occasion. Hydrocarbons have generally not been detected within the other boreholes.

Mineral oils comprise predominantly aliphatic (straight chain) hydrocarbons with carbon numbers ranging from 15 to 40. PRO and DRO include both aliphatic and aromatic (ringed) hydrocarbons in the carbon ranges C5-12 and C8-21 respectively. Aliphatic compounds are generally more volatile and preferentially partition to the vapour phase, whilst aromatic compounds are more soluble and preferentially enter the dissolved phase. Both aromatic and aliphatic compounds become less mobile with increasing numbers of carbon atoms. Therefore, mineral oil does not partition readily to the dissolved phase and is relatively immobile in groundwater and will instead remain within its non aqueous phase or partition to organic matter attached to mineral grains within the aquifer. The concentrations detected may, therefore not be representative of the dissolved phase and may be due instead to the presence of non-aqueous phase liquid (NAPL) or suspended solids within the groundwater sample. The recorded concentrations of mineral oil have declined over the four years of monitoring data available indicating degradation of the source term and or contaminants within groundwater.

In order to obtain a more accurate profile of TPH within groundwater, speciated hydrocarbon analysis using the Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG) method was carried out on samples from all boreholes on two separate occasions (31st May and 16th July 2008) a further sample was retrieved from the BH104 sump on 5th August 2008. This method distinguishes between discrete bands of aliphatic and aromatic hydrocarbons based on their equivalent carbon number (which is related to boiling point). This analysis only detected hydrocarbons within BH104B and the BH104 sump and showed that the majority of compounds present were within the C12 to C16 carbon range, although some heavier compounds were detected.

With respect to the aliphatic bands all of the measured concentrations exceeded the respective pure phase solubility for that band, the same was also true for some of the aromatic bands. This indicates that the concentrations measured are not representative of dissolved phase concentrations and instead are a result of NAPL being present within the sample, despite efforts having been taken to obtain representative dissolved phase concentrations. This is supported by the fact that the proportion of aliphatic to aromatic compounds varied between samples and monitoring visits indicating differences in the nature of the sample collected, which probably relate to the amount of NAPL captured within the sample.

The recorded concentrations of ethylbenzene, toluene and xylene are also close to their respective pure phase solubility's and the fact that their detection is sporadic indicates that the recorded concentrations are not representative of the dissolved phase. The concentrations of hydrocarbons within BH104 and MW03 are therefore considered to be directly connected with the presence of NAPL within these boreholes.

A range of PAHs have been detected in both BH104B and MW03, naphthalene is generally the most abundant compound which is to be expected as it is the most soluble however, heavier less mobile compounds such as benzo(a)pyrene have also been detected. PAHs in particular can be present in low concentrations within fuels. PAHs, in particular naphthalene and benzo(a)pyrene are also a constituent of creosote.

3.3.2.3 Phenols

Phenols have historically been detected within all boreholes with the highest concentration recorded within BH103. These concentrations have steadily declined over the four years that monitoring data is available and phenol concentrations have been below 0.5 µg/l since 2007. This indicates natural attenuation within the groundwater.

3.3.2.4 Natural Attenuation Parameters

Dissolved oxygen generally ranges from 2 to 8 ppm indicating that groundwater is slightly depleted in oxygen. Changes in concentration of dissolved oxygen correspond reasonably well with changes in water level and indicate recharge by oxygen rich rainwater. The results indicate that the aquifer may be capable of supporting aerobic degradation. BH104B generally has a lower recorded dissolved oxygen content relative to the other boreholes and this may be due to the higher concentrations of organic contaminants and an indication of biodegradation occurring in this area.

Groundwater samples were analysed for sulphate, nitrate and ferric and ferrous iron in May 2008. These compounds can act as alternative electron acceptors in the absence of oxygen to facilitate anaerobic degradation. Ferric and ferrous iron were not detected in any of the samples. Nitrate was only detected within BH101 and BH102. Sulphate was detected in all samples with the exception of MW01 with the highest concentrations recorded in BH101 and BH102. These results indicate that the groundwater is slightly reduced (i.e oxygen depleted) in areas where organic compounds have been detected.

4 POTENTIAL SOURCES OF CONTAMINATION

4.1 ON-SITE

Contaminants observed within groundwater are most likely to be sourced from the presence of free product (NAPL) within shallow groundwater in the vicinity of BH104 and deeper groundwater in MW03. The potential activities associated with the current and historical operation of the site, most likely to give rise to the observed free product are discussed below:

Soil remediation and storage area in the north of the site. This area is covered with hard-standing. No soil contamination was noted in BH102, MW02 or MW01 during drilling and observations of contamination in groundwater are generally within the south of the site. This area is therefore not considered to be a source.

Tank farm area and fill points in the centre of the site. The tank farm area is appropriately bunded and located on hard-standing. This area is therefore not considered a source.

Sludge bay to the north of the tank farm. A trial pit was excavated beneath the sludge bay in September 2004 and did not detect any evidence of contamination. This area is therefore not considered to be a source.

Mixed fuel tank in the southeast corner of the site. This tank has only been in frequent use since 2006. The tank is fitted with a leak detection system and was last pressure tested in February 2007. The mixed fuel tank is therefore not considered to be a source.

Surface water Drainage System, Oil interceptors. These are located at the northern end of the site, one beside the waste oil processing plant, and the other just north of BH102, and are regularly maintained. These are not considered to be a source.

Former vehicle repair workshop in the south of the site in the vicinity of BH104B. This operation was closed in 1990. An oily sheen and odour was detected in soils whilst drilling BH104 but no free product was recorded until 2004. The analysis of the product recovered indicated that it was unweathered diesel which is not consistent with the closure of the garage over 10 years prior to this. The presence of chlorinated solvents in the groundwater in this area suggest that the garage could be a potential source although it is not consistent with the chronology of observed contamination in BH104.

Former oil reception sump in the east of the site in the vicinity of MW03. Some localised remediation of soils was undertaken in this area but a residual source may remain. Contaminants detected within MW03 could be consistent with the contents of waste oil tanks.

Accidental spillage. There have been no recorded incidents of spillages since boreholes were first installed on the site in 2001.

LNAPL within BH104. It is possible that the contamination observed in groundwater observed in MW03 could be a result of vertical migration of contaminants along preferential pathways created by fractures within the limestone bedrock. Although both MW03 and BH104 have recorded the presence of hydrocarbons their detailed chemical signatures vary.

Given the observed distribution of contamination over time, given the engineering containment measures and current site practices it is considered unlikely that current activities on the site are the primary source of the free product observed within the monitoring wells and which is more likely to be the result of an historical activity or incident. However, the nature and location of the LNAPL observed in BH104 is not consistent with any known past incidents, such as a fuel spill or leakage of a tank, on the site and may therefore be the result of an off-site source.

4.2 OFF-SITE SOURCES

An automotive repair business is present immediately to the south of the site, and immediately adjacent to BH104B. The adjoining site is elevated by approximately 1.5 m relative to the Enva site and at the time of the monitoring round in July 2008, drums of unknown liquids were being stored in an unbunded area immediately adjacent to the site boundary, although no evidence of leakage was observed on the retaining wall.

Land immediately to the north and east of the site is occupied by Irish Rail and used for the storage of railway sleepers. These are stored uncovered on open ground. Railway land can be a potential source of metal, TPH and PAH contamination. Railway sleepers are commonly treated with creosote which is a source of PAH contamination.

4.3 SUMMARY

The primary source of the NAPL contamination film within MW03 and BH104B is unknown. Due to the differences in the physical appearance of the product and the profile of contamination observed it is likely that there are two separate sources. The consistent presence of chlorinated solvents in groundwater in MW03 would suggest a source area associated with vehicle maintenance and repair activities.

A plan summarising the potential sources of contamination is presented as **Figure 6**.

5 CONCEPTUAL MODEL

5.1 INTRODUCTION

The conceptual site model represents the characteristics of the site and shows the relationship between sources, pathways and receptors. These relationships are termed pollutant linkages and in order for a risk to be realised all three components, as described below, must be present.

Source An entity or action, which releases contaminants to the environment.

Pathway A mechanism by which receptors can become exposed to contaminants.

Receptor An entity at risk of experiencing an adverse response following exposure to a contaminant.

Defining the conceptual model requires identification of all potential sources, pathways and receptors of contamination and identifying plausible combinations of these three components. These potentially significant pollutant linkages can then be qualitatively or quantitatively assessed to identify potential risks.

The conceptual model is presented in **Figure 7** and discussed below.

5.2 SOURCE

The film of free product observed within BH104 and MW03 represent secondary sources of contamination. The primary sources are unknown and could be derived from historical activities at the site or off-site sources. There are considered to be two secondary sources of contamination:

- **LNAPL in vicinity of BH104.** The film of product (<2mm thick) in BH104 has been identified as diesel. Diesel is comprised of approximately 98% Aliphatic (straight chain) hydrocarbons and 2% Aromatic (ringed) hydrocarbons. Aromatic compounds are more mobile in groundwater than aliphatic compounds and therefore, dissolved phase contaminants derived from the free phase diesel are likely to comprise predominantly aromatic compounds. Being more mobile these compounds generally present a greater risk to groundwater and surface water receptors. Polycyclic aromatic hydrocarbons (PAHs) have been detected within groundwater.
- **Free product in MW03.** The product in MW03 is unidentified and its exact positioning in relation to the water table is unknown as it appears to be smeared up the borehole casing and does not form a measurable layer on groundwater surface. The groundwater analysis does not record any hydrocarbons in this area suggesting that this product is immobile and does not mix readily with water. DCA and PAHs have been detected within groundwater.

5.3 PATHWAY

Contaminants may enter the groundwater via dissolution from NAPL and migrate in the direction of groundwater flow.

In the case of the LNAPL film within BH104, groundwater flow is assumed to be taking place predominantly within the glacial deposits in the direction of BH101, which is located adjacent to the eastern site boundary.

In the case of product film within MW03, groundwater flow is occurring within a discrete fracture zone at a depth of approximately 15 mbgl. The direction of flow and the degree of connectivity with other fracture zones within the bedrock is not known. There is a potential for vertical dissolved phase migration of contaminants along preferential pathways created by vertical fractures within the limestone.

Along the lateral migration pathway contaminants will be subject to the following attenuation processes:

- Dispersion, which is the spreading of the dissolved phase plume as it moves through the porous aquifer.
- Adsorption, which is the process by which contaminant molecules temporarily partition to the surface of mineral grains and thus travel more slowly in the aquifer with respect to groundwater.
- Biodegradation, which is the decay of organic contaminants in biological reactions catalysed by micro-organisms within the aquifer.
- Restriction of floating, free phase (LNAPL) product migration within vertically/steeply inclined, fractured limestone, caused by the orientation of fractures and floating nature of the product.

5.4 RECEPTOR

For the purpose of this assessment the receptors are considered to be;

- Shallow groundwater within the glacial deposits immediately beneath the site ;
- Deeper groundwater within limestone bedrock immediately beneath the site;
- The wider limestone aquifer which is used for the abstraction of drinking water from an abstraction point 6 km distant from the site; and
- The River Triogue 1km to the east of the site.

6 RISK ASSESSMENT

6.1 METHODOLOGY

The risk assessment approach used is based on the UK Remedial Target Methodology for Hydrogeological Assessment of Land Contamination (EA, 2007). This is a tiered approach with the objective of deriving site specific Remedial Target Concentrations that can be used at the source to determine the need for remediation and derive clean-up criteria.

The methodology considers soil and groundwater sources separately and has a number of levels of assessment for each source type. In relation to a soil source:

- Level 1 examines the potential for contaminants to leach from the soil zone.
- Level 2 examines the significance of attenuation within the unsaturated zone and dilution at the water table reducing leached contaminant concentrations.
- Level 3 considers attenuation within the aquifer along the contaminant flow path to the receptor.
- Level 4 considers dilution at the receptor.

With respect to a groundwater source:

- Level 1 is not considered as the contaminant is already within groundwater.
- Level 2 compares measured groundwater concentrations with water quality target concentrations.
- Level 3 and Level 4 are the same as for the soil source.

The methodology can be applied in two ways.

- **Forwards Assessment:** Takes a source concentration and predicts the concentration at a given compliance point which can then be compared to appropriate water quality guidelines (i.e. drinking water standards, interim groundwater guideline values) at that point to determine whether the source represents a potential risk to the receptor.
- **Backwards Assessment:** Calculates the Remedial Target Concentration (RTC) that must be applied at the source in order to achieve particular water quality guidelines at a particular compliance point. The RTC is then compared to observed concentrations to determine whether the source represents a potential risk to the receptor.

The following assessment has used both a forwards and backwards assessment. The approach has been implemented using the spreadsheet, which has been published by the UK Environment Agency and accompanies the target methodology. The results have been used to evaluate the potential risks to receptors and are discussed in Section 6.4.

6.2 LEVEL 2

At Level 2 the measured concentrations of organic contaminants within groundwater samples from BH104B, the BH104 sump and MW03 have been compared to water quality target concentrations (WQT).

Where available the EPA interim guideline values (IGV's) for groundwater have been adopted as the WQT. For the banded hydrocarbons a value of 0.01 mg/l (equal to the value for total hydrocarbons) has been used in the absence of specific criteria.

Aliphatic and aromatic hydrocarbons have been detected in the vicinity of BH104. All of the aliphatic bands present and some of the aromatic bands present exceed their respective pure phase solubility and are therefore not representative of dissolved phase concentrations and cannot be directly compared with WQT.

In order to calculate the maximum dissolved phase concentration within water in contact with diesel the effective solubility of the individual hydrocarbon fractions has been calculated using an extrapolation of Raoult's Law, which states that the pure phase solubility of a contaminant will be reduced in proportion to its abundance within a mixture. Effective solubility's have also been calculated for the PAH compounds within BH104B and the BH104 sump. This calculation is presented in Appendix E.

The maximum dissolved phase concentration for Aliphatic hydrocarbons in the carbon ranges C8-C10 and C10-12 exceed the WQT of 0.01 mg/l. All of the aromatic bands in the carbon range C8 and above, exceed the WQT. There was therefore a need to consider TPH further at Level 3.

Within BH104 sump, naphthalene is the only PAH for which the maximum dissolved phase concentration does not exceed the respective WQT (where available). The recorded concentration of naphthalene within the BH104 sump is below the maximum dissolved phase concentration but still exceeds the WQT of 1 µg/l. Within MW03 benzo(a)pyrene is the only PAH compound to record a measured concentration in excess of its WQT of 0.01 µg/l. Naphthalene and Benzo(a)pyrene will therefore be considered further at Level 3.

1,1 Dichloroethane (DCA) recorded a concentration of 6 µg/l in MW03 in July 2008 in excess of the WQT of 3 µg/l. DCA will therefore be considered further at Level 3.

6.3 LEVEL 3

6.3.1 Assumptions

Level 3 considers the fate and transport of the contaminants within the aquifer. The analytical solutions used within the Environment Agency Spreadsheet Tool are based on the Ogata-Banks Equation for 3 dimensional contaminant transport.

This solution relies upon a number of assumptions which include that the aquifer is intergranular, homogenous and isotropic and that groundwater flow is in steady state. These assumptions are considered to reasonable with respect to shallow groundwater within the Glacial deposits but are not appropriate for the deeper groundwater within the limestone bedrock. Therefore the contaminants within MW03 will be considered separately.

6.3.2 Source Term

Four hydrocarbon bands and naphthalene have been selected to represent a worse case dissolved phase plume of TPH from the LNAPL within BH104.

Aliphatic Hydrocarbons make up 98% (by weight) of diesel. The **C8-10** band represents the most mobile band of the aliphatic bands detected whilst the **C10-12** band recorded the highest concentrations, and is considered to be the most abundant species within the source product.

Aromatic Hydrocarbons make up only 2% (by weight) of diesel but are more likely to partition to the dissolved phase than aliphatic compounds. The **C8-10** band represents the most mobile band of the aromatic bands detected whilst the **C10-12** band recorded the highest concentrations

Naphthalene is the most mobile of the PAH compounds and has been recorded within the BH104 sump at a concentration below its effective solubility for diesel but in excess of the WQT

The fate and transport of organic contaminants is largely controlled by their organic carbon partition coefficient (Koc) and their biodegradation half-life. Both of these parameters have been derived from literature values. Literature values of Koc do vary but are reasonably well defined for the contaminants considered. However, literature values of half-life vary considerably and can be difficult to obtain for particular contaminants including speciated hydrocarbons. A conservative assumption of half-life has been made based on the observed conditions within the aquifer however there is a high degree of uncertainty associated with this parameter. The ranges and selected representative value of Koc and half-life are presented in **Appendix E**.

6.3.3 Aquifer Properties

The hydraulic conductivity has been calculated from site measurements. All other parameters have been estimated from observations and or literature values. The ranges and justifications for individual parameters are presented in **Appendix E**.

6.3.4 Compliance Point

The compliance point for this assessment has been taken as BH101, which is located adjacent to the eastern site boundary and is generally down gradient of BH104B.

6.3.5 Travel Times

As an initial assessment, travel times from BH104B to the site boundary (BH101). within the overburden, were calculated for each of the contaminants. The theoretical time taken for groundwater to reach the site boundary, assuming the representative hydraulic properties, outlined in Appendix F, and a distance of 60 m, has been calculated as 5 years. However, the travel times for contaminants will be longer since contaminants will adsorb to mineral grains within the soil matrix, which retards their transport in groundwater and thus increases the time needed to migrate. The retarded travel times for the contaminants of concern are presented in **Table 3**. The calculations are presented in **Appendix E**.

Table 3 Travel Times (Years) from BH104 to BH101

Contaminant	Hydraulic Gradient of 0.005	Hydraulic Gradient of 0.01	Hydraulic Gradient of 0.06
TPH Aliphatics >EC-8-10	1023	512	85
TPH Aliphatics >EC-10-12	8062	4031	672
TPH Aromatics >EC8-10	61	30	5
TPH Aromatics >EC10-12	90	45	8
Naphthalene	51	26	4
Benzo(a)pyrene	32065	16032	2672

Based on observations and monitoring carried out at the site, the product in BH104B is believed to have accumulated sometime between 2001 and 2004. The travel times show that since 2004 only naphthalene and Aliphatic hydrocarbons C8-10 could have reached BH101, assuming the maximum hydraulic gradient. The travel times for the aliphatic compounds and benzo(a)pyrene indicate that these parameters are highly immobile and are unlikely to migrate away from the source zone.

6.3.6 Risk Assessment Results

The Level 3 remedial target concentration and steady state concentration at the site boundary have been calculated using the selected input parameters. The worksheets are presented in Appendix F and show that none of the contaminants of concern record concentrations at the receptor greater than their respective WQT. The remedial target concentrations are in excess of the observed or calculated maximum dissolved phase concentrations, indicating that any dissolved phase plume resulting from the presence of the LNAPL in BH104B is unlikely to present a risk to down gradient receptors.

6.3.7 Uncertainty within Risk Assessment

A number of the parameter used within the risk assessment including half life, hydraulic conductivity and fraction of organic content have been estimated from literature values and therefore there is a high level of uncertainty associated with these parameters and as such the predicted concentrations and remedial target concentrations can only be taken as an indication of the potential mobility of the contaminants considered.

The parameters mentioned above affect the potential mobility of the contaminant. The effect of increased hydraulic gradient has already been demonstrated in the calculation of travel times. The hydraulic conductivity, fraction of organic carbon and half-life were all independently increased by an order of magnitude to investigate the sensitivity of these parameters. Since the relationship between these parameters is linear they all had a similar effect on the results. By increasing any one of these parameters by a factor of 10 resulted in steady state concentrations of aromatic hydrocarbons and naphthalene, at the site boundary slightly in excess of the WQT. This is still not considered to represent a significant risk as the model assumes a constant source term, when in reality the source is slowly depleting. Given the travel time in the aquifer and the potential for degradation this is still a conservative estimate with respect to the Glacial deposits.

6.3.8 DCA and Benzo(a)pyrene within MW03

Benzo(a)pyrene exceeded the WQT in MW03 in July 2008 by a factor of 2. The travel times estimated for the Glacial Deposits demonstrates how immobile benzo(a)pyrene is in water and it is unlikely to migrate a significant distance within the limestone aquifer. Because of the fractured nature of the aquifer, dilution is likely to occur as the contaminant moves through the fracture system, a dilution factor of two, between MW03 and a hypothetical offsite abstraction borehole is all that is required to reduce the concentration to below the WQT.

1,1-Dichloroethane recorded a concentration twice the WQT in MW03 in July 2008. DCA is more mobile within groundwater than benzo(a)pyrene but the same potential for dilution exists. Historical monitoring data has shown that the concentration of DCA is reducing and as DCA is itself a breakdown product of trichloroethane, reductive dehalogenation is likely to be taking place within the aquifer and acting to reduce concentrations. However, one of the breakdown products of DCA is vinyl chloride, which is considerably toxic. Vinyl chloride has not yet been detected within the aquifer and it is likely that it will never be present in sufficient concentration to be detected.

6.4 CONCLUSIONS OF RISK ASSESSMENT

The thin LNAPL film within BH104B and the unidentified product within MW03 represent a source of dissolved phase concentrations within groundwater. However, the compounds that comprise the product are generally hydrophobic and will not preferentially partition to the dissolved phase and as such significant off-site migration is very unlikely and these contaminants are not considered to present a risk to the wider shallow or deeper groundwater. This has been confirmed by the quantitative risk assessment.

6.5 MIGRATION OF FREE PRODUCT

The risk assessment methodology used above does not allow for the assessment of multiphase transport. The product within BH104B is lighter than water and as such will spread out like a pancake across the surface of the water. Its migration will be controlled by physical features within the aquifer as much as the direction of groundwater flow. The only measurable thickness (<2mm) of product to date has been recorded in the BH104 sump. The other boreholes have occasionally shown a hydrocarbon sheen during sampling and it is possible that the product is forming an undetectable film across the wider site. The observance of the sheen may equally be due to ingress of surface water when the borehole is opened which is immediately removed during purging. However, the groundwater analysis results and the risk assessment demonstrate that contaminants within the product are not entering the dissolved phase.

The product within MW03 is different in character and may be denser than water, which would explain why it has not been possible to record a measurable thickness. Dense non-aqueous phase liquid is generally immobile, as it will sink to the base of the water column. Within a fractured aquifer such as the limestone it may collect in pockets within fractures. The risk assessment and groundwater analysis has demonstrated that the product within MW03 is not giving rise to a significant dissolved phase plume.

Although, the product recorded in MW03 and BH104B is not giving rise to a significant dissolved phase plume and is not presenting a risk to the wider aquifer, the primary source and full extent of the product is still largely unknown. Given the minimal thickness of the LNAPL and the complexity of the bedrock aquifer, complete removal of product would be impossible to achieve and will provide little overall benefit to groundwater quality. Without knowing the primary source of the product there is also a risk that attempts to extract product by pumping may result in drawing in an off-site plume.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS

A detailed review of previous data relating to groundwater levels and contaminant concentrations and a quantitative risk assessment has been undertaken in order to establish the potential for migration of dissolved phase contaminants and the potential risks to the wider hydrogeological setting. The assessment reached the following conclusions:

- The site is underlain by Glacial Deposits comprising Boulder Clay and Sand and Gravel over a limestone aquifer. The groundwater flow regime is complicated and differs between the Glacial Deposits and the bedrock.
- Groundwater flow within limestone bedrock occurs within fractures. The boreholes at the site are intersecting different fracture zones and the connection between them is unknown.
- Shallow groundwater flow within the glacial deposits is generally towards the east with BH101 as the down gradient borehole although flow directions do change over time.
- A thin film of free product (non aqueous phase liquid) is present within BH104 and the BH104 sump. Viscous, black product is present within borehole MW03 with an oily sheen present on groundwater. The presence of this product is the likely source of localised elevated concentrations within groundwater samples retrieved from the site over a period of four years.
- The primary source of the product is likely to be the result of historic soil contamination in the vicinity of the former oil reception sump and or off-site sources.
- The risk assessment and historical monitoring data indicated that detected concentrations of organic contaminants within groundwater samples are likely to be due to the presence of non-aqueous phase liquids within the sample and that the contaminants are not significantly mobile within the dissolved phase and as such do not represent a risk to the wider hydrogeological environment.

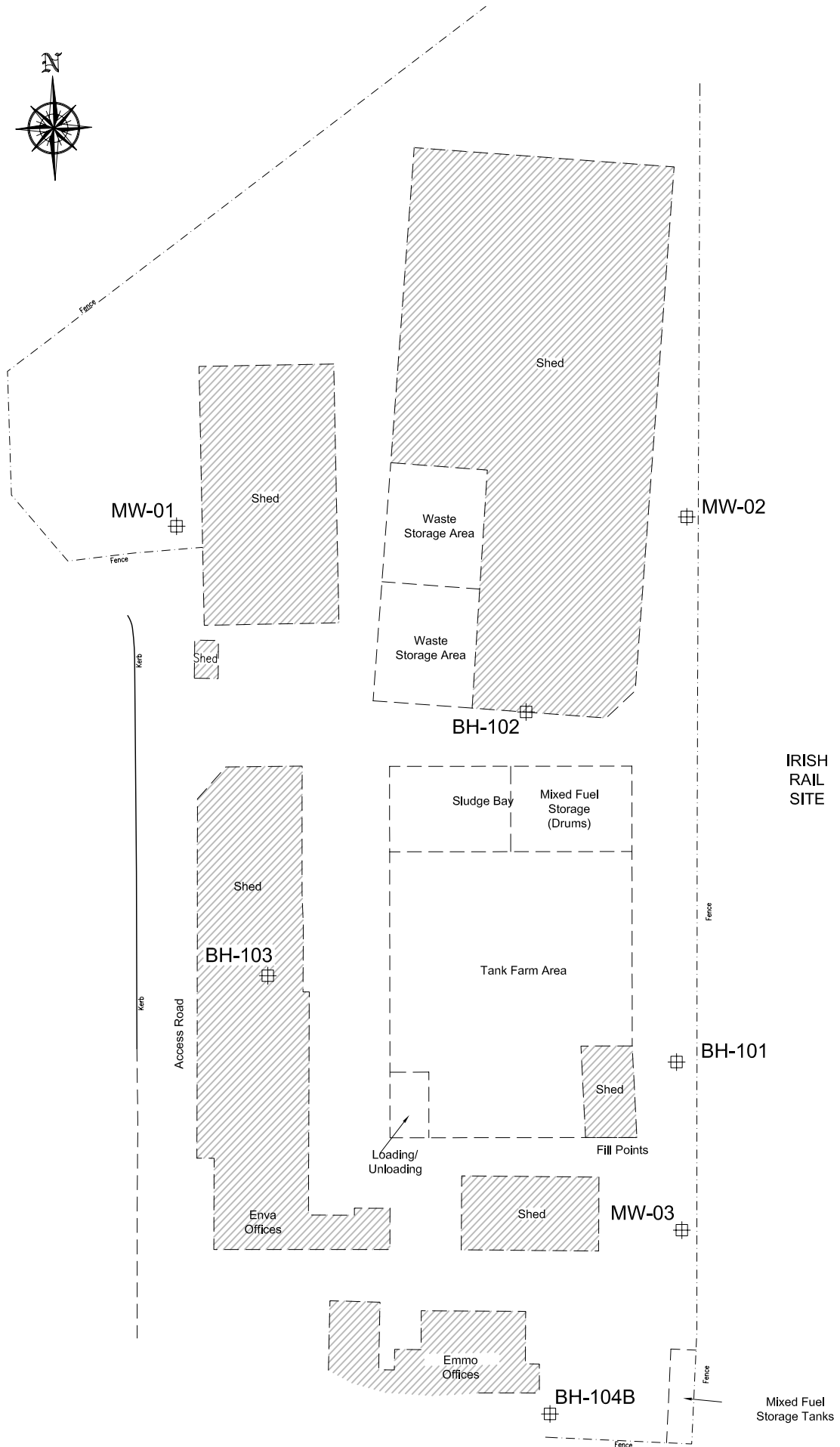
7.2 RECOMMENDATIONS


- The automated dataloggers within the boreholes have only been in place for three months. They are providing useful data on groundwater levels and should remain in place for another six months to allow for seasonal change. If possible the misplaced loggers from MW02, BH101 and BH103 should be recovered or replaced.
- Although it is not considered to be causing a risk to the wider hydrogeological environment, the film of free product within BH104 and MW03 does represent a residual source of contamination and as such should continue to be monitored using an interface probe.
- Extraction of the product is not recommended due to the very small quantity (<2mm in a localised area), and the complexity of trying to achieve this in fractured rock. Instead natural attenuation should be allowed to continue as the quantitative risk assessment has demonstrated that the presence of contaminants within groundwater does not present a risk to receptors.

- Speciated hydrocarbon analysis using the TPH CWG method provides a more accurate profile of groundwater contamination. This analysis has only been carried out across the site on two occasions and should be included within the quarterly monitoring suite for the next year in order to confirm the findings of the risk assessment and to confirm that natural attenuation is taking place within the groundwater.
- It is also recommended that a meeting be arranged with the EPA to discuss the findings of this report and develop a suitable management strategy.

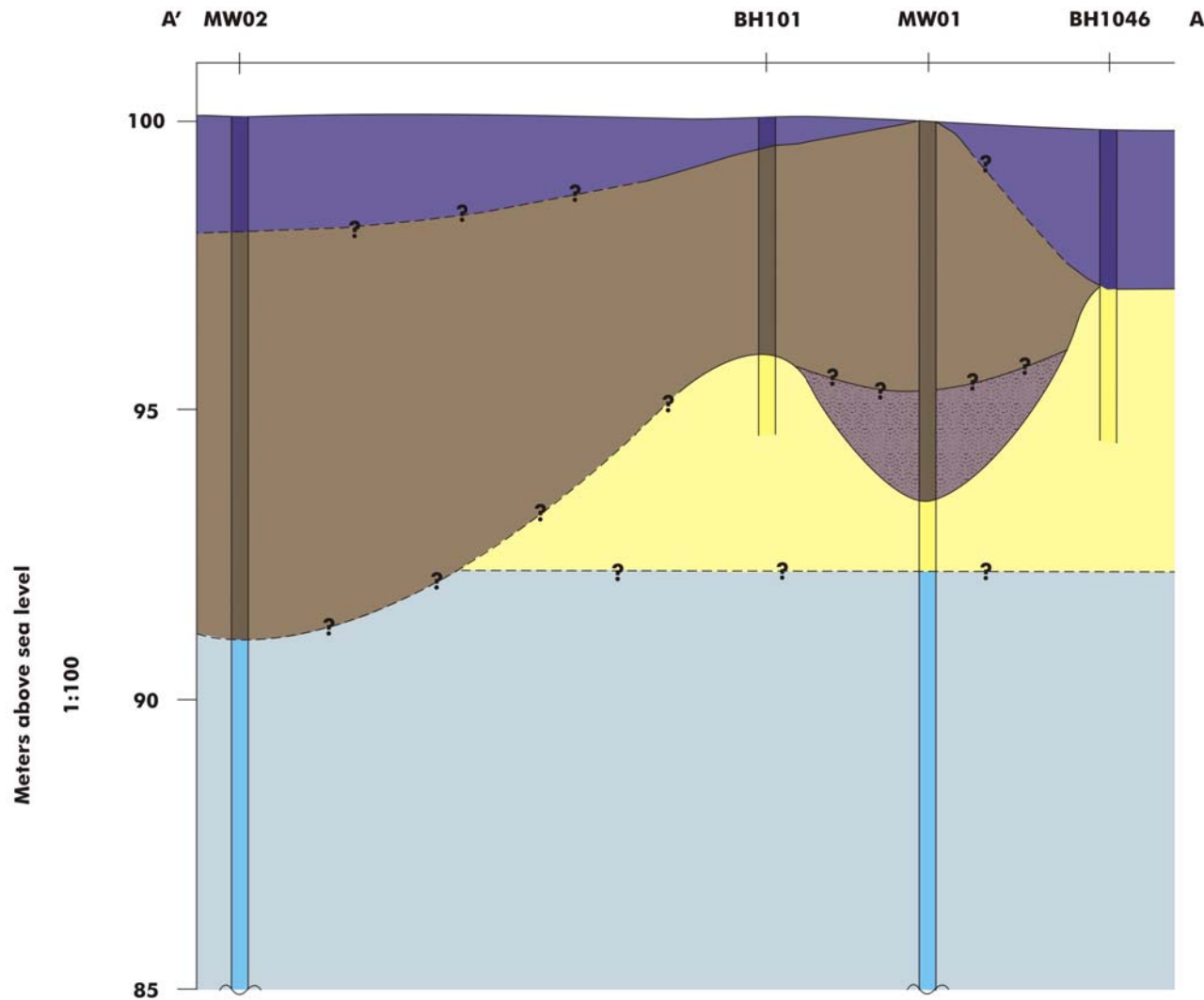
FIGURES

Figure 1	Site Location Plan
Figure 2	Site Layout
Figure 3a	Schematic Cross Section A-A'
Figure 3b	Schematic Cross Section B-B'
Figure 4a	Manual Dips: All boreholes with rainfall
Figure 4b	Manual Dips: Deep boreholes only
Figure 4c	Manual Dips: Shallow boreholes only
Figure 5	Automated data-logger levels
Figure 6	Plan of Potential Contamination Sources
Figure 7	Conceptual Model



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		Enva Groundwater Trend Analysis	Drawn:	TD	Job No.	MDE0788	
			Checked:	YMcG	File Ref.	MDE0788-Figure2	
			Approved:	JQ	Fig No.	Figure 2	Rev. A
			Scale:	1/1000			
			Date:	30/10/08			
Title:	Site Layout Plan						

- Made Ground
- Boulder Clay
- Sand
- Bedrock
- Clayey Sand
- Indefinite Boundary



Scale:
1:1,000

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NOTES

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No.	Date	Amendment / Issue	RPS

Client: **ENVA Ireland**

Project: **Groundwater Risk Assessment**

Title: **Figure 3A
ENVA - Cross Section
A' - A**

Drawn by: CMC	Job No: MDE0788
Checked by: YMcG	File No: R:\MDE0788\Gr
Approved by: YMcG	Dwg. No: MDE0788Gr1
Scale: NTS	Rev: D01
Date: 05/11/08	

Figure 4a

Manual Groundwater Dips - All Boreholes

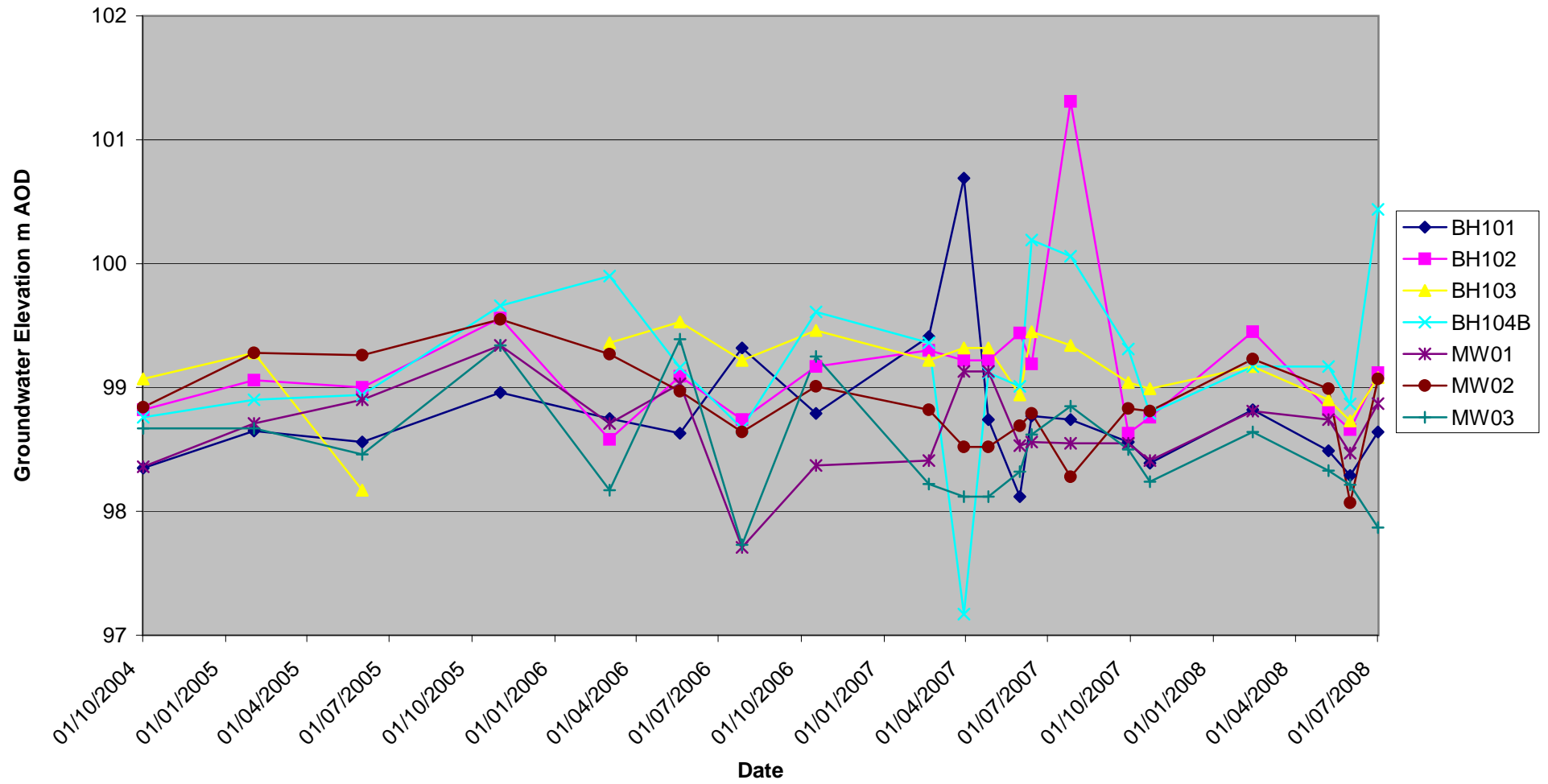


Figure 4b

Manual Groundwater Dips - Deep Boreholes

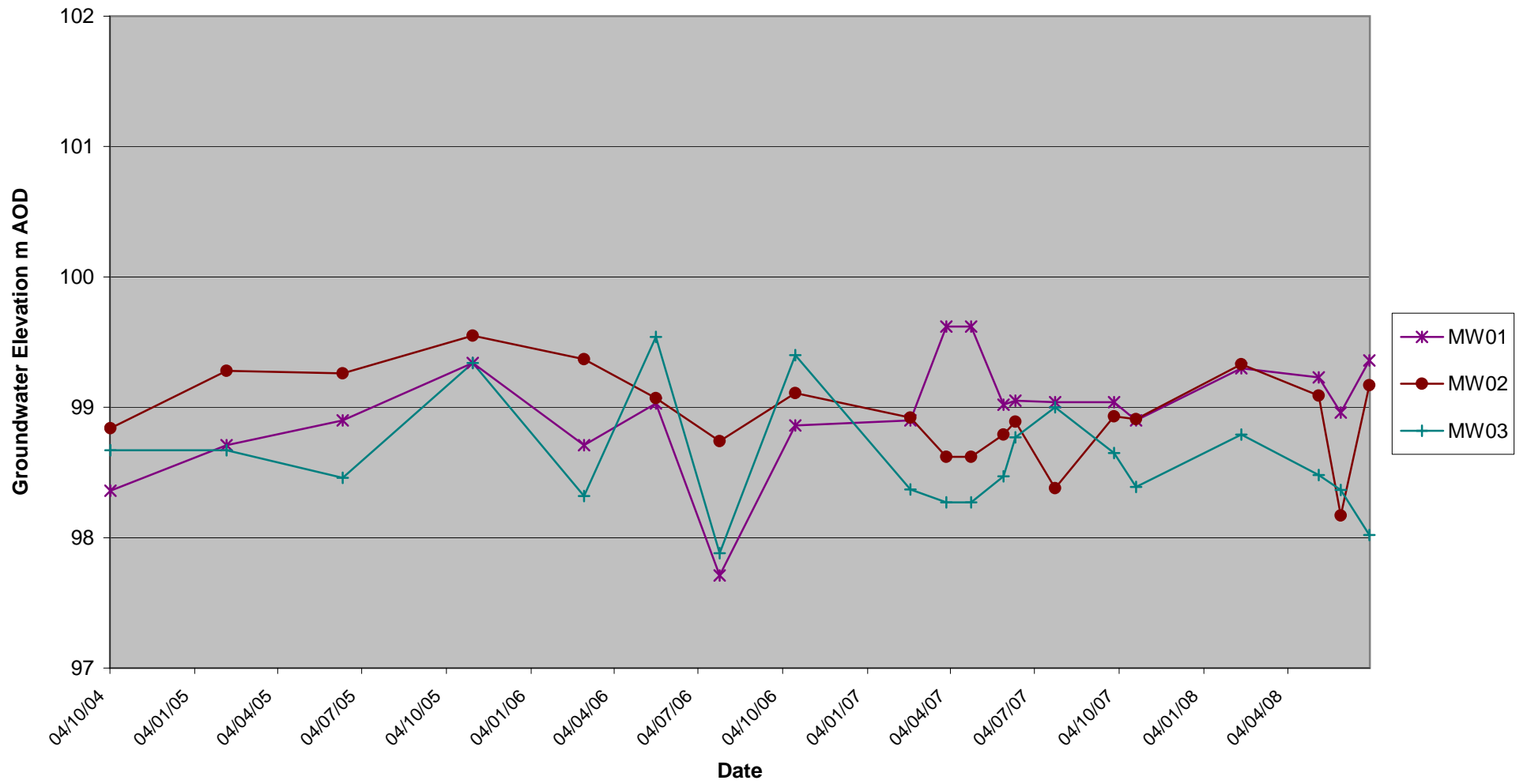


Figure 4c

Manual Groundwater Dips - Shallow Boreholes

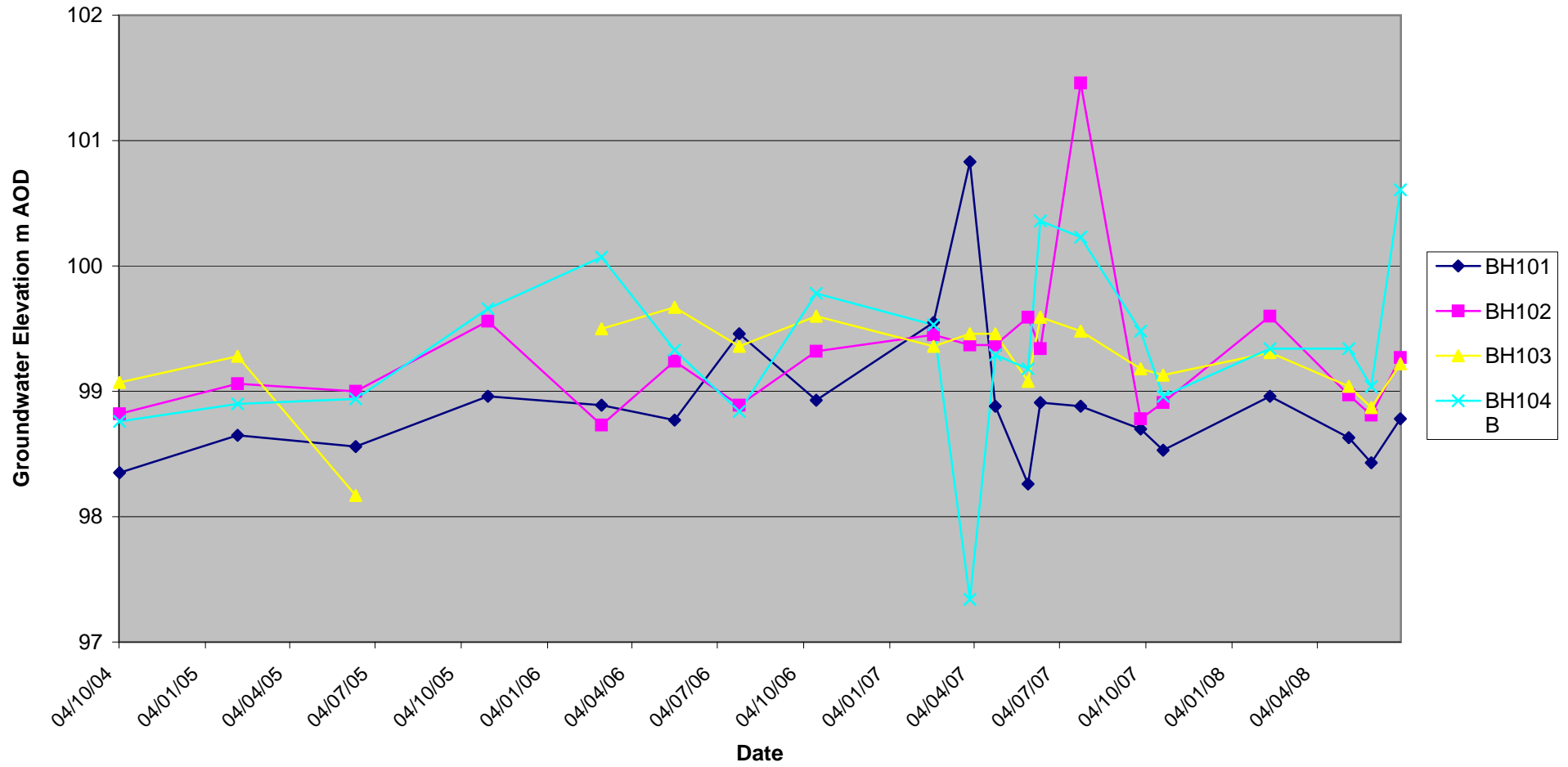
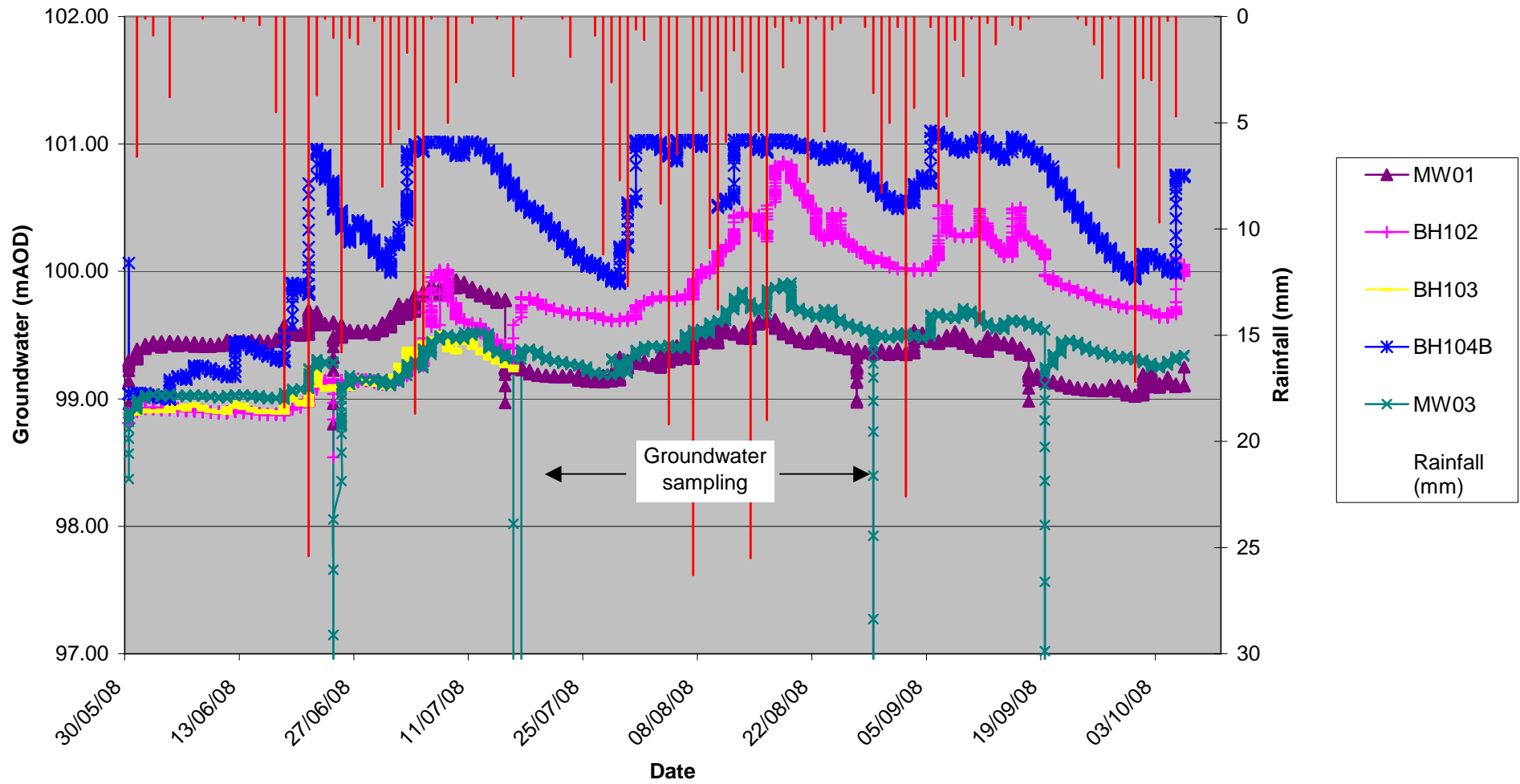
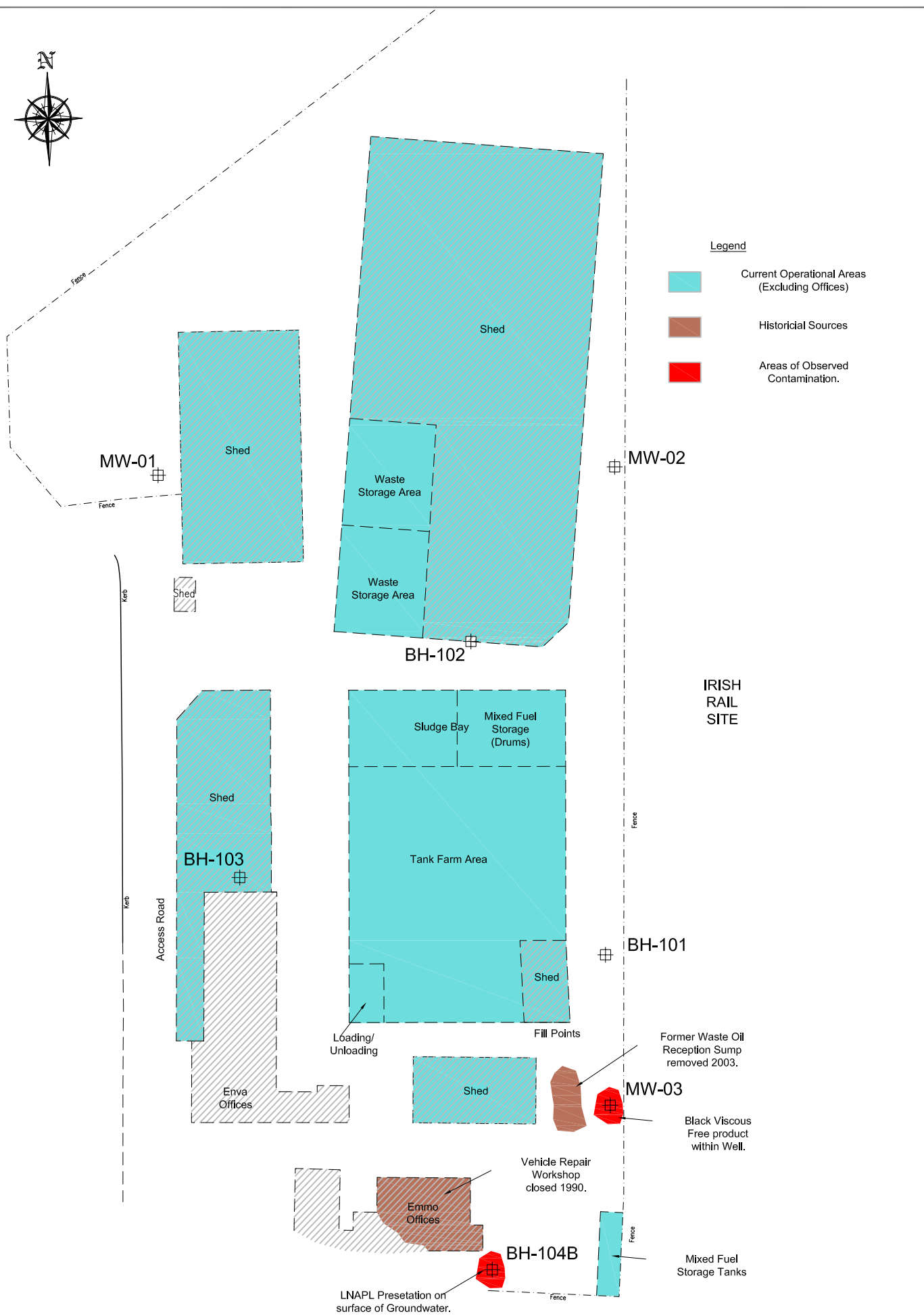



Figure 5

Summary Hydrograph - All boreholes



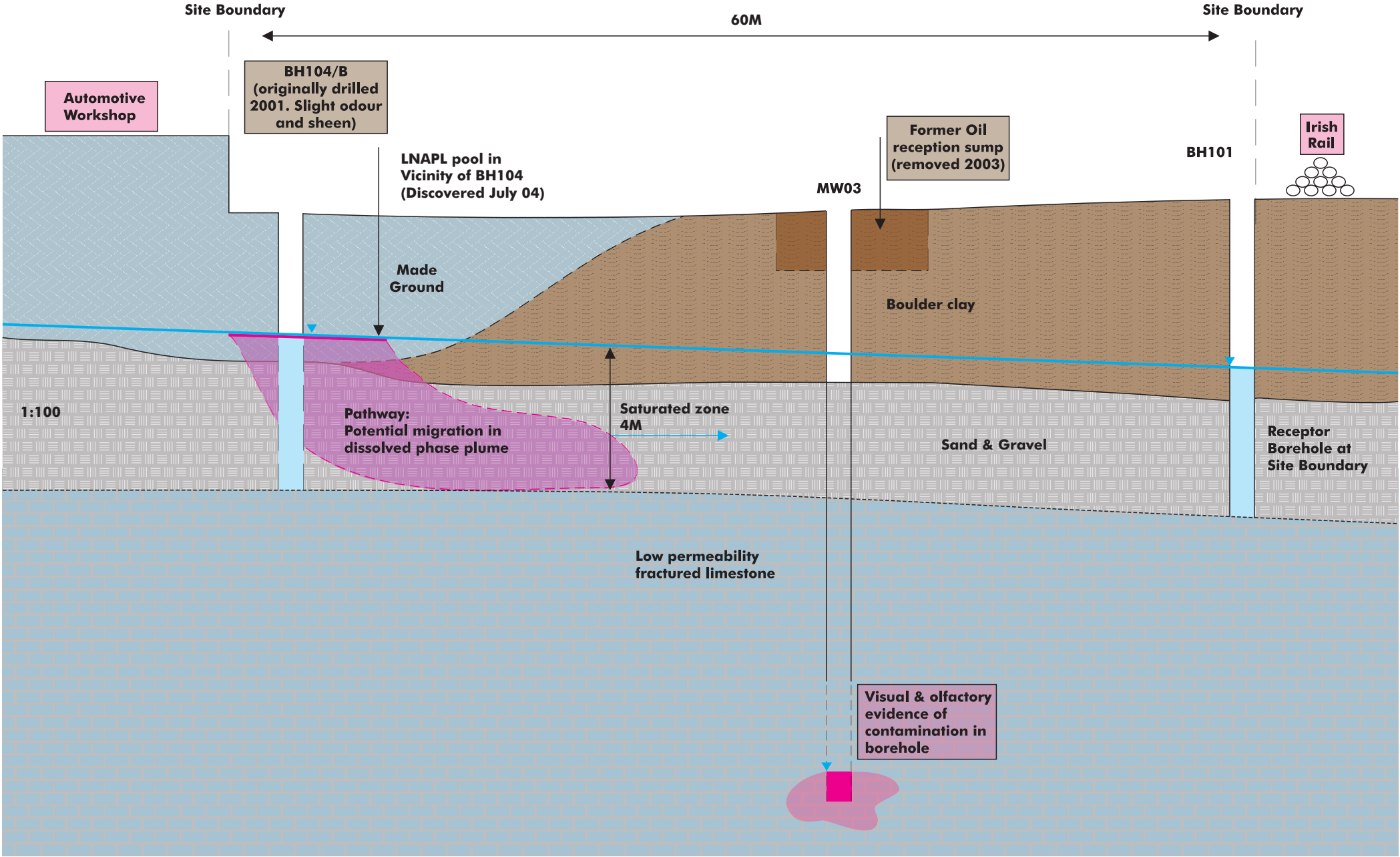


<div>Client:</div> <div>Enva Ireland Ltd</div>	<div><div>RPS Consulting Engineers</div><div>RPS Consulting Engineers, West Pier Business Campus, Dun Laoghaire, Co. Dublin, Ireland. T: +353 1 288 4499 - F: +353 1 283 5676 E: Ireland@rpsgroup.com W: www.rpsgroup.com/Ireland</div></div>	<div>Project:</div> <div>Enva Groundwater Trend Analysis</div>	<div>Issue Details</div> <div>Drawn: TD</div> <div>Checked: YMcG</div> <div>Approved: JQ</div> <div>Scale: 1/1000</div> <div>Date: 30/10/08</div>	<div>Office Use Only</div> <div>Job No. MDE0788</div> <div>File Ref. MDE0788-Figure6</div> <div>Fig No.</div> <div>Rev.</div>	
		<div>Title:</div> <div>Plan of Contamination Sources</div>	<div>Figure 6</div> <div>A</div>		

Current Potential Sources

Historical Sources

Scale:
1:250



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NOTES

1. This drawing is the property of RPS Consulting Engineers, it is a confidential document and must not be copied, used, or its content divulged without prior written consent.

No.	Date	Drn/Iss	Amendment / Issue	App.

Client:	ENVA Ireland
Project:	Groundwater Risk Assessment

Title:	Figure 7
--------	----------

Drawn by:	CMC	Job No:	MDE0788
Checked by:	YMcG	File No:	R:/MDE0788/Gr
Approved by:	YMcG	Drg. No:	MDE0788Gr3
Scale:	NTS	Rev:	D01
Date:	06/11/08		

APPENDIX A

Observations of Visual and Olfactory Evidence

Summary of Observations of Visual and Olfactory Evidence

Observations

Date	BH101	BH102	BH103	BH104b	MW01	MW02	MW03
Q1 2006	Clear & odourless	Clear & odourless	Clear & odourless	Black oily hydrocarbon	Clear & odourless	Clear & odourless	Oily surface film initially
Q2 2006	Brownish colour indicating suspended solids	brownish colour indicating suspended solids	Clear & odourless	Black oily hydrocarbon	Clear & odourless	Clear & odourless	Oily surface film initially
Q3 2006	Clear & odourless	Clear & odourless	Clear & odourless	Black oily hydrocarbon slight odour for first 10 litres	Clear & odourless	Clear & odourless	Oily surface film initially
Q4 2006	Suspended solids	Clear & odourless	Clear & odourless	Black oily hydrocarbon slight odour for first 10 litres	Clear & odourless	Oily surface film initially	Oily surface film initially
Q1 2007	Clear & odourless	Clear & odourless	Clear & odourless	Black oily hydrocarbon slight odour for first 10 litres	Clear & odourless	Clear & odourless	Oily surface film initially, clear on sampling
March 2007	Oily film, strong odour	Suspended solids, black colour (oily), odour	Odourless, sediment	Slight oily surface film, odour, brown	Clear, odourless	Clear, odourless	Extremely dirty and oily, strong hydrocarbon odour

				orange colour			
Q2 2007	Brown/orange colour, slight oily film, H ₂ S odour	Dirty when first pumping, sewage type odour, remaining cloudy on sampling	Greyish colour, no odour	Slight oily surface film & oily odour, generally clear with a slight oily film on sampling	Clear, odourless	Clear, odourless	Dirty oily content. Dark black colour, hydrocarbon odour on sampling
May 2007	Sediment, no odour, clearer on sampling	Sediment first 10 litres, clear and odourless on sampling	Sediment at start then ran cloudy, odour and slight oily film	Odour (not an oily odour), suspended solids first few litres, running clear, oily surface film	Well blocked	Clear, odourless	Oily and contained oily odour
June 2007	Water Cloud (Suspended solids), odourless	Cloudy (Suspended solids), Odourless	Cloudy (Suspended solids), petrochemical odour and oily film	Clear, Odourless	Heavily clouded, oily slick on surface, lumps of rust colour floating on surface.	Cloudy (Suspended solids)	Heavily loaded with oil, strong petrochemical odour
July 2007	Suspended	Some	Suspended	Water Clear	Suspended	Clear to	Very oily

	Solids Present	Suspended solids, odourless	Solids in water, stale petrol odour, oily film	and Odourless, Slightly oily film	Solids, odourless	cloudy, some suspended solids, slightly oily slick	appearance, oily slick/film on surface of water, strong smell of fuel
Q3 2007	Suspended Solids Present	Some Suspended solids, odourless	Suspended Solids in water, stale petrol odour, oily film	Water Clear and Odourless, Slightly oily film	Suspended Solids, odourless	Clear to cloudy, some suspended solids, slightly oily film	Very oily appearance, oily film on surface of water, strong smell of fuel
Sept 2007	SS, Oily Film	SS, Strong Sulphur Odour	Water cloudy, oily film, slight odour	Some SS, Oily film on Water, Petrol Odour Present	Grey cloudy (SS), Stale metallic odour present	Some SS, odourless	Oily film on surface, Strong petrol odour
Q4 2007	Cloudy (Suspended Solids), Odourless	Cloudy (Suspended Solids), Odourless	Very Cloudy (Suspended Solids), Large Black Particulate Matter Floating in Water	Oily Film, very strong H ₂ S odour, Black Colour	Cloudy, Oily film	Clear, Odourless	Water Cloudy, Black, oil film and smell of fuel/petrol
Q1 2008	Very cloudy (High SS content), Slight stale odour. No evidence of	Yellow/brown tinge. Stale odour. No evidence of oil	Brown in colour. No evidence of oil. No odour	Oily surface film. Slight Oily odour. Generally clear on sampling	Clear. No odour. No evidence of oil.	Slight orange/brown tinge. Cloudy. No evidence of oil	Oily surface film & oily odour

	oil						
Q2 2008	Heavily clouded, odourless	Crystal clear, odourless	Heavily clouded, odourless	Hydrocarbon Odour, Oil slick on surface, black colour.	Water clouded, Odourless	Water Clear, Odourless	Hydrocarbon/Diesel Odour, Suspended Oil Particles, Oil slick on surface, black colour

APPENDIX B

Borehole Logs

BOREHOLE NO.: BH 101

TOTAL DEPTH: 6.8m bgl

PROJECT INFORMATION

CLIENT: Atlas Oil
SITE NAME: Portlaois
SITE LOCATION: Portlaois, Co Laois
JOB NO.: 46605-002
LOGGED BY: Nicola O'Hara
CHECKED BY:
DATES DRILLED: 05/03/01-08/03/01

DRILLING INFORMATION

DRILLING CO.: Glovers
DRILLER: John Sheppard
DRILLING METHOD/DIAMETER: Shell and Auger
SCREEN TYPE/DIAMETER: HDPE/ 50mm
SCREEN SLOT SIZE: 1mm
SAMPLING METHODS: Grab

NOTES:

- ✓ Water level during drilling
- ✓ Water level in completed well

BOREHOLE COMPLETION	SAMP. #	PID ppm	WATER LEVEL	DEPTH m	GEOLOGY	DESCRIPTION	COMMENTS	DEPTH m
------------------------	---------	------------	----------------	------------	---------	-------------	----------	------------

BH101.1

CONCRETE

0								0
-1						CLAY: light-medium brown/grey, sandy, gravelly, significant cobbles and boulders.	no odour	-1
-2						CLAY: light brown, dry, sandy gravelly, significant angular and subangular cobbles.		-2
-3						CLAY: very stiff, light brown, boulder clay, gravelly, sandy,	no odour	-3
-4							moist, no sheen, no odour	-4
-5						CLAY: very stiff, compacted, sandy, dry, some subangular, medium-coarse gravel,		-5
-6						CLAY: very stiff, compacted, sandy, dry, some subangular, medium-coarse gravel,		-6
						GRAVEL: subangular and subrounded, cobbles and boulders, some sand,	no sheen, no odour	

BH101.2

URSDames & Moore
O'Brien Kreitzberg
Thorburn ColquhounDames & Moore
Iveagh Court, 4th Floor
6-8 Harcourt Road
Dublin 2
Ireland**BOREHOLE LOG**

Page 1 of 1

BOREHOLE NO.: BH 102

TOTAL DEPTH: 6.8m bgl

PROJECT INFORMATIONCLIENT: Atlas Oil
SITE NAME: Portlaois
SITE LOCATION: Portlaois, Co Laois
JOB NO.: 46605-002
LOGGED BY: Caroline Enright
CHECKED BY:
DATES DRILLED: 01/03/01-03/03/01**DRILLING INFORMATION**DRILLING CO.: Glovers
DRILLER: John Sheppard
DRILLING METHOD/DIAMETER: Shell and Auger
SCREEN TYPE/DIAMETER: HDPE/ 50mm
SCREEN SLOT SIZE: 1mm
SAMPLING METHODS: Grab**NOTES:**

- ☒ Water level during drilling
☒ Water level in completed well

BOREHOLE COMPLETION	SAMP. #	PID ppm	WATER LEVEL	DEPTH m	GEOLOGY	DESCRIPTION	COMMENTS	DEPTH m
------------------------	---------	------------	----------------	------------	---------	-------------	----------	------------

BH102.1	1			0	CONCRETE			0
				-1	CLAY: soft-firm, mid-brown, friable, some peat, some small-medium subangular gravel,	slightly damp		-1
				-2	CLAY: soft-firm, mid-brown with grey/green mottling, friable, some peat, some small-medium subangular and subrounded gravel,			-2
				-3	CLAY: soft, green grey, slightly plastic, some large cobbles,	slightly damp, no odour		-3
				-4	CLAY: firm to stiff, light grey with green mottling, plastic, large gravel and cobbles	slightly damp, no odour		-4
				-5	CLAY: soft, brown, plastic, marley, large gravel and cobbles			-5
				-6	CLAY: soft, light brown, plastic, marley, fine-coarse gravel, some cobbles	slightly damp, no odour		-6
				-7	CLAY: soft, light brown, plastic, marley, fine-coarse gravel, some cobbles			-7
				-8	BOULDERS: very hard ground			-8
				-9	BOULDERS: large cobbles gravel and boulders, some clay			-9
BH102.2	1			-10	BOULDERS: some firm clay with fine-coarse gravel, large cobbles			-10
				-11				-11

BOREHOLE NO.: BH 103

TOTAL DEPTH: 5.7m bgl

PROJECT INFORMATION

CLIENT: Atlas Oil
SITE NAME: Portlaois
SITE LOCATION: Portlaois, Co Laois
JOB NO.: 46605-002
LOGGED BY: Caroline Enright
CHECKED BY:
DATES DRILLED: 01/03/01-03/03/01

DRILLING INFORMATION

DRILLING CO.: Glovers
DRILLER: John Sheppard
DRILLING METHOD/DIAMETER: Shell and Auger
SCREEN TYPE/DIAMETER: HDPE/ 50mm
SCREEN SLOT SIZE: 1mm
SAMPLING METHODS: Grab

NOTES:

Water level during drilling

Water level in completed well

BOREHOLE COMPLETION	SAMP. #	PID ppm	WATER LEVEL	DEPTH m	GEOLOGY	DESCRIPTION	COMMENTS	DEPTH m
------------------------	---------	------------	----------------	------------	---------	-------------	----------	------------

				0		CONCRETE		0
						GRAVEL: dense, grey, clayey, some sand, fine-medium subangular gravel,	slightly damp, slight HC odour	
						GRAVEL: firm, light grey, sandy, clayey, cobbles,	damp, slight HC odour	
				-1		CLAY: firm, light-medium grey, some brown and yellow mottling, sandy gravelly, fine-medium gravel, sub angular and sub rounded, large cobbles	slightly damp, slight HC odour	-1
						CLAY: soft, medium grey, plastic, some gravel fine-coarse, some sand, cobbles	damp, no odour	
				-2				-2
	BH103.1	4				CLAY: firm, brown/grey, slightly plastic, some sand, some gravel fine-coarse, cobbles	damp, no odour	
				-3				-3
						CLAY: soft-firm, brown-grey, gravelly fine-coarse, slightly plastic	damp, no odour	
	BH103.2	1		-4				-4
						CLAY: soft, brown-grey, gravelly fine-coarse, slightly plastic, some cobbles		
				-5				-5
						BOULDERS: black/grey, very hard ground		

BOREHOLE NO.: BH 104

TOTAL DEPTH: 6.8m bgl

PROJECT INFORMATION

DRILLING INFORMATION

CLIENT: Atlas Oil
SITE NAME: Portlaois
SITE LOCATION: Portlaois, Co Laois
JOB NO.: 46605-002
LOGGED BY: Nicola O'Hara
CHECKED BY:
DATES DRILLED: 05/03/01-08/03/01

DRILLING CO.: Glovers
DRILLER: John Sheppard
DRILLING METHOD/DIAMETER: Shell and Auger
SCREEN TYPE/DIAMETER: HDPE/ 50mm
SCREEN SLOT SIZE: 1mm
SAMPLING METHODS: Grab

NOTES:

Water level during drilling
Water level in completed well

BOREHOLE COMPLETION	SAMP. #	PID ppm	WATER LEVEL	DEPTH m	GEOLOGY	DESCRIPTION	COMMENTS	DEPTH m
---------------------	---------	---------	-------------	---------	---------	-------------	----------	---------

BH104.1				0	CONCRETE			0
				-1	FILL: dense, hardcore some clay,		HC odour, sheen	-1
				-2				-2
				-3			no odour, no sheen	-3
BH104.2				-4	GRAVEL & SAND: medium grained gravel,		no odour, wet	-4
				-5	SAND: medium-coarse grained, medium to coarse gravel angular and subangular, angular and subangular cobbles,		no odour	-5
				-6	SAND: as above, except more gravel content			-6

BOREHOLE CONSTRUCTION	SAMPLE		PID READING (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MW01		PAGE 1 of 1	
	ANALYTES	TYPE					DRILLING DATES: 14 April 2003		DRILLING METHODS : Air Rotary	
							DRILLER : Glover Site Investigations		BOREHOLE DIAMETER :	
							LOGGED BY : SES		SCREEN TYPE & DIAM:	
		CHECKED BY : CG		SCREEN SLOT SIZE:						
					0.0		DESCRIPTION		COMMENTS	0.0
					1.0		Grey brown, Sandy Boulder Clay with abundant fine to medium rounded gravels. Moist.		NEC	1.0
					2.0					2.0
					3.0					3.0
					4.0					4.0
					5.0					5.0
					6.0					6.0
					7.0					7.0
					8.0					8.0
					9.0		Limestone, light grey, unweathered. Dry to 21m.		NEC	9.0
					10.0					10.0
					11.0					11.0
					12.0					12.0
					13.0					13.0
					14.0					14.0
					15.0					15.0
					16.0					16.0
					17.0					17.0
					18.0					18.0
					19.0					19.0
					20.0					20.0
					21.0					21.0
					22.0					22.0
					23.0					23.0
					24.0					24.0
				25.0		End of Borehole			25.0	

LOCATION / NOTES:
NEC= No Evidence of Contamination

LEGEND

- Disturbed Sample
- Undisturbed Sample
- PID Headspace Analysis
- Down Borehole Analysis
- Groundwater Table
- Perched Water Table

BOREHOLE LOG

Job Title: Groundwater Investigation

Location: Portlaoise, Co Laois

Client: Atlas Ireland Ltd

App'd:	Date: 14-4-04
Drawn : SES	Ref: SS/CG/GW
Scale:	Job No: 46605-009-447
Drg. Size: A4	BOREHOLE LOG

BOREHOLE CONSTRUCTION	SAMPLE		PID READING (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MW02		PAGE 1 of 1	
	ANALYTES	TYPE					DRILLING DATES: 14-15 April 2003		DRILLING METHODS : Air Rotary	
							DRILLER : Glover Site Investigations		BOREHOLE DIAMETER :	
							LOGGED BY : SES		SCREEN TYPE & DIAM:	
							CHECKED BY : CG		SCREEN SLOT SIZE:	
DESCRIPTION							COMMENTS			
Made Ground: Loose Sand and Gravel hardcore with some silt. Dry.							NEC	0.0		
Light brown, Sandy Boulder Clay, with abundant fine to medium rounded gravels. Dry.							NEC	1.0		
Limestone, pale grey, fine grained, unweathered. Dry to 29m.							NEC	2.0		
								3.0		
								4.0		
								5.0		
								6.0		
								7.0		
								8.0		
								9.0		
								10.0		
								11.0		
								12.0		
								13.0		
								14.0		
								15.0		
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								24.0		
								25.0		
								26.0		
								27.0		
								28.0		
								29.0		
								30.0		
								31.0		
								32.0		
								33.0		
End of Borehole										

LOCATION / NOTES: NEC= No Evidence of Contamination		LEGEND Disturbed Sample Undisturbed Sample PID Headspace Analysis Down Borehole Analysis Groundwater Table Perched Water Table		BOREHOLE LOG Job Title: Groundwater Investigation Location: Portlaoise, Co Laois Client: Atlas Ireland Ltd App'd: _____ Date: 15-4-04 Drawn : SES Ref: SS/CG/GW Scale: _____ Job No: 46605-009-447 Drg. Size: A4 BOREHOLE LOG	
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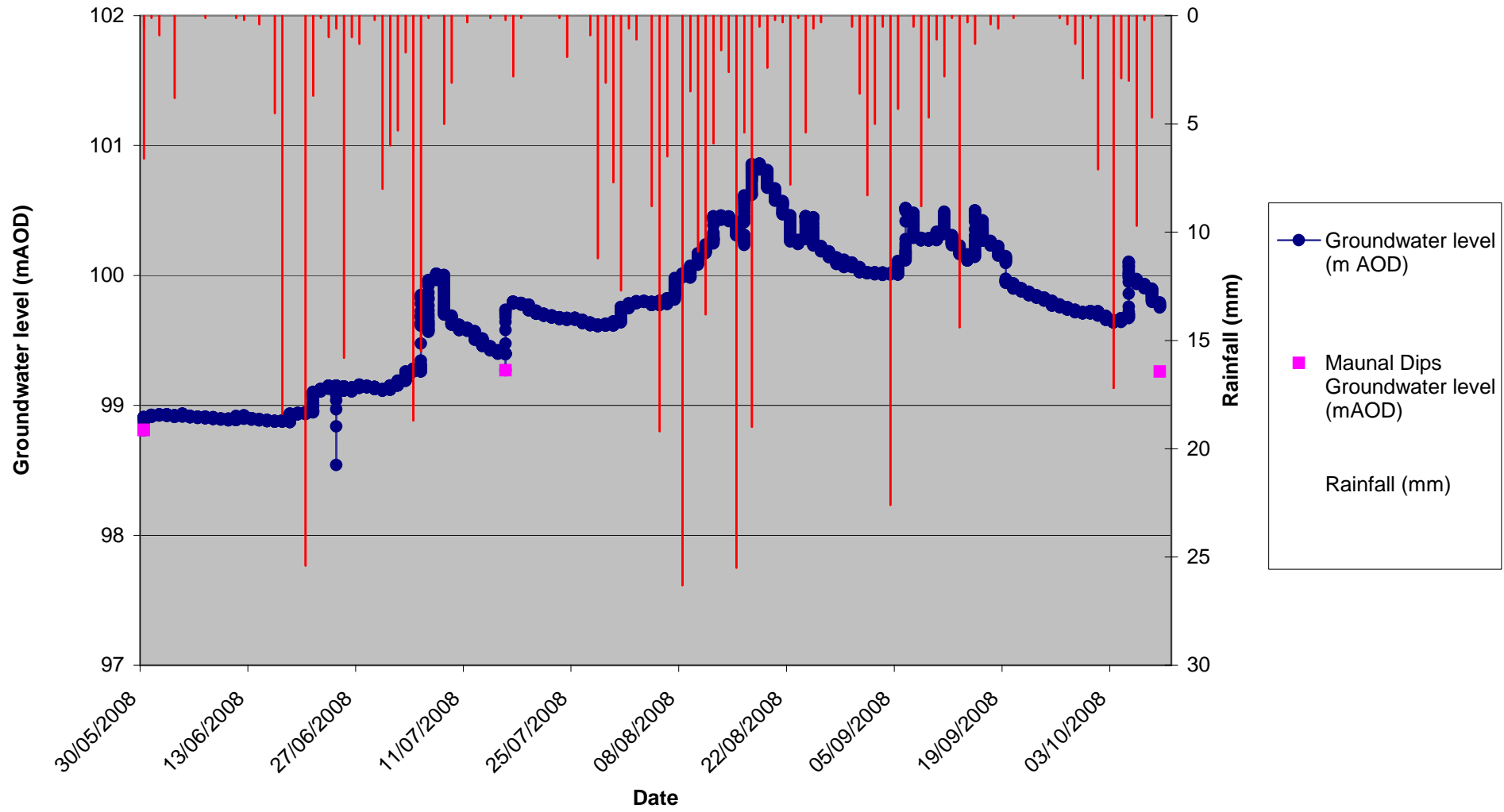
BOREHOLE CONSTRUCTION	SAMPLE		PID READING (ppm)	GROUNDWATER	DEPTH (m)	GEOLOGY	BOREHOLE NUMBER: MW03		PAGE 1 of 1	
	ANALYTES	TYPE					DRILLING DATES: 14 April 2003		DRILLING METHODS : Air Rotary	
							DRILLER : Glover Site Investigations		BOREHOLE DIAMETER :	
							LOGGED BY : SES		SCREEN TYPE & DIAM:	
				CHECKED BY : CG		SCREEN SLOT SIZE:				
					0.0		DESCRIPTION		COMMENTS	0.0
					1.0		Light brown, Sandy Boulder Clay with abundant fine to medium rounded gravels. Moist.		Slight Hydrocarbon Odour	1.0
					2.0					2.0
					3.0					3.0
					4.0					4.0
					5.0		Slightly loose, light brown Clayey Sand , with fine to medium grained gravel, slightly moist.		Slight Hydrocarbon Odour	5.0
					6.0					6.0
					7.0		Grey brown Sand with fine to medium subrounded to rounded gravels. Moist, becoming wet at 7.5m.		Slight Hydrocarbon Odour	7.0
					8.0		Limestone, pale grey, unweathered. Wet.		NEC	8.0
					9.0					9.0
					10.0					10.0
					11.0					11.0
					12.0					12.0
					13.0					13.0
					14.0					14.0
					15.0					15.0
					16.0		End of Borehole			16.0

LOCATION / NOTES: NEC= No Evidence of Contamination		LEGEND Disturbed Sample Undisturbed Sample PID Headspace Analysis Down Borehole Analysis Groundwater Table Perched Water Table		BOREHOLE LOG Job Title: Groundwater Investigation Location: Portlaoise, Co Laois Client: Atlas Ireland Ltd 		App'd: _____ Date: 14-4-04 Drawn : SES Ref: SS/CG/GW Scale: _____ Job No: 46605-009-447 Drg. Size: A4 BOREHOLE LOG	
---	--	---	--	--	--	---	--

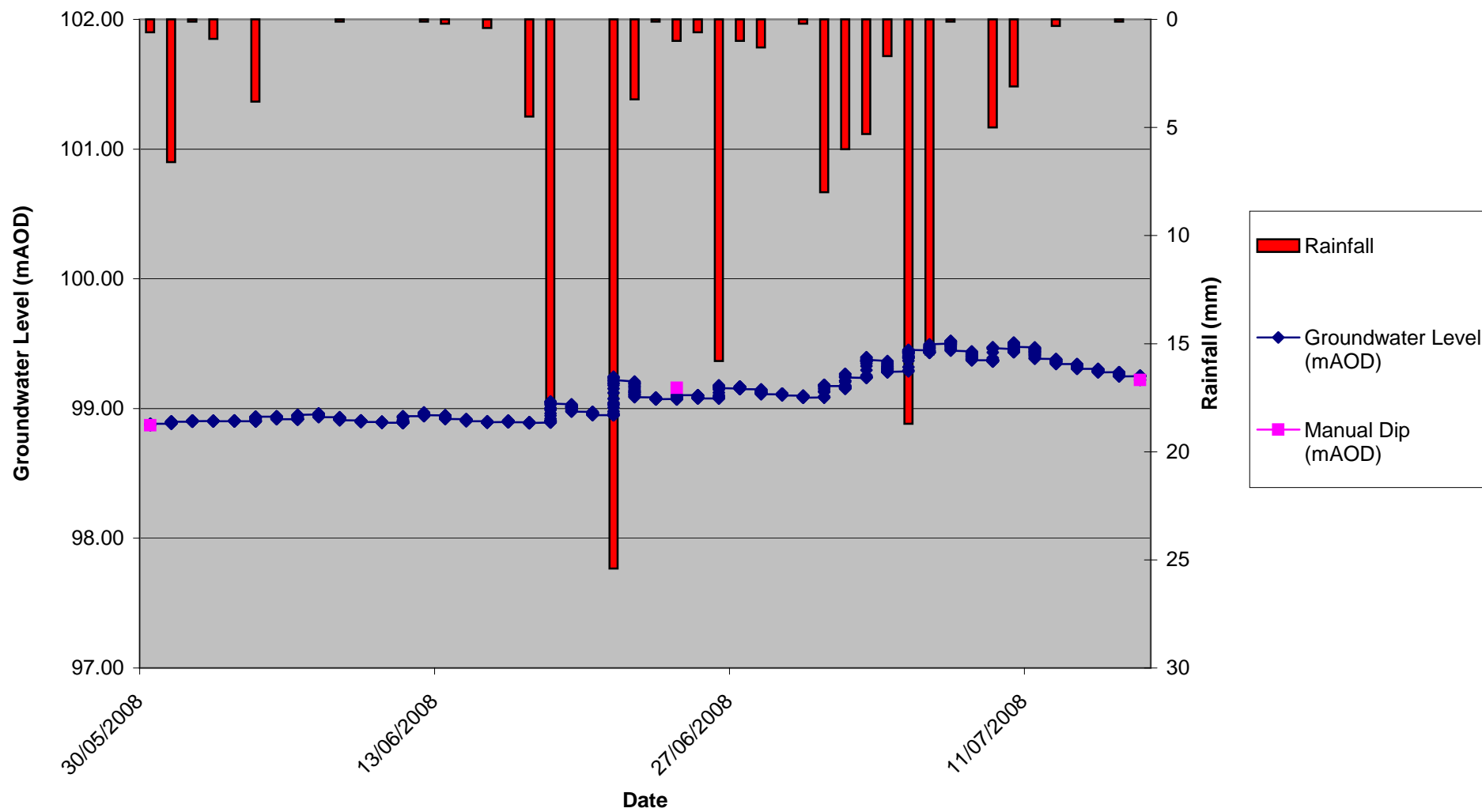
APPENDIX C

Hydrographs for Individual Data Loggers

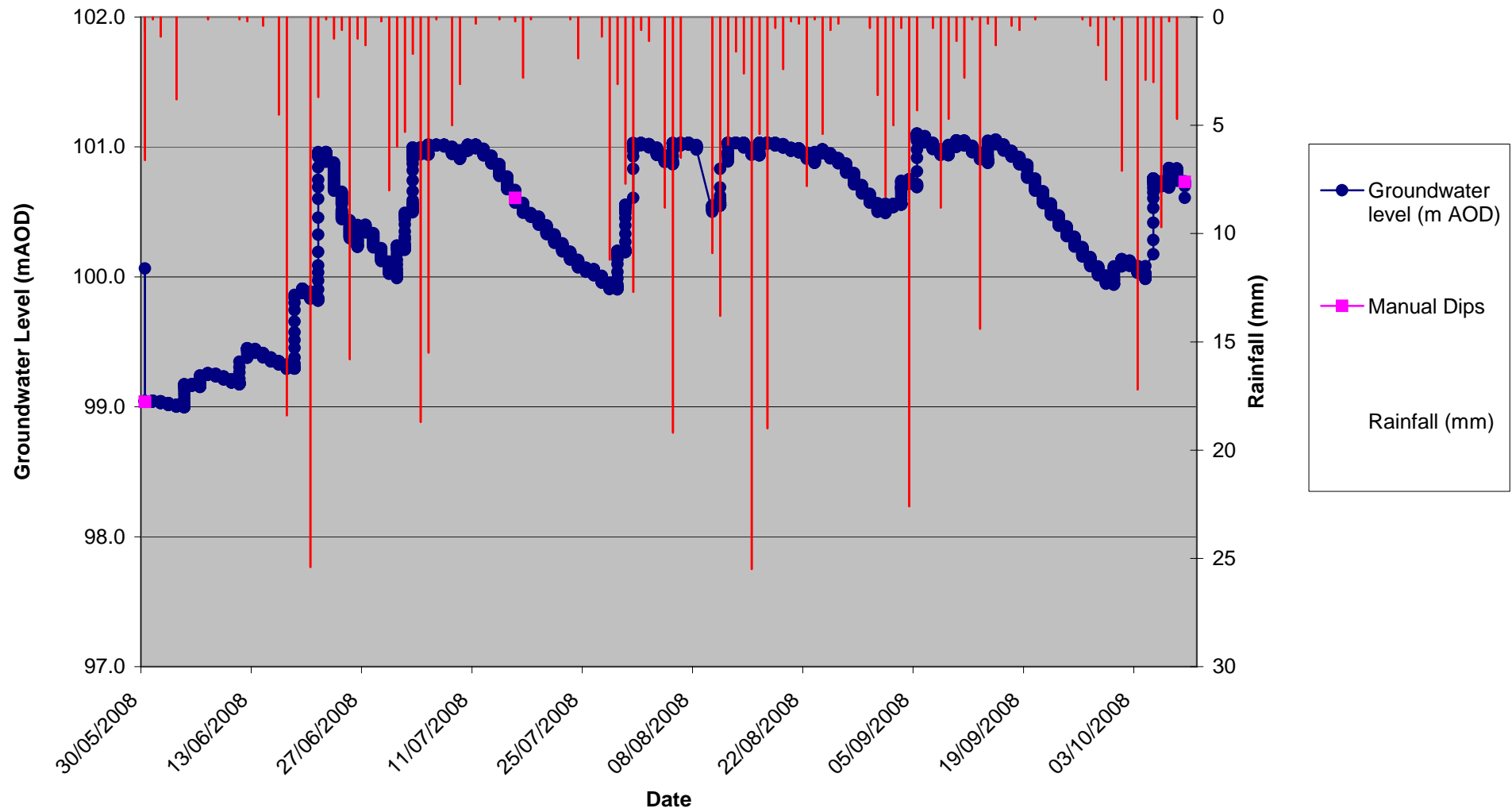
Groundwater Levels as at BH102



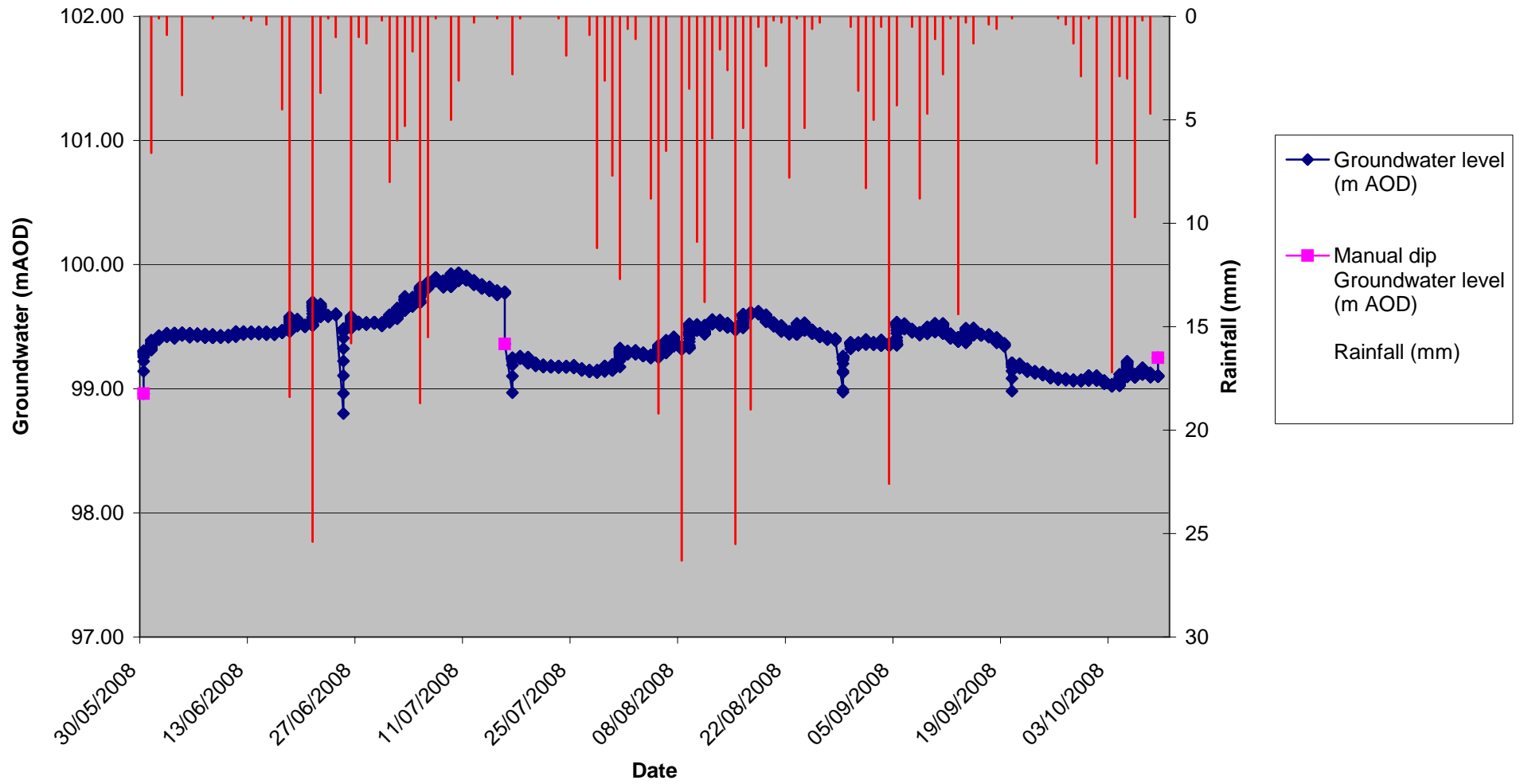
Groundwater Level at BH103



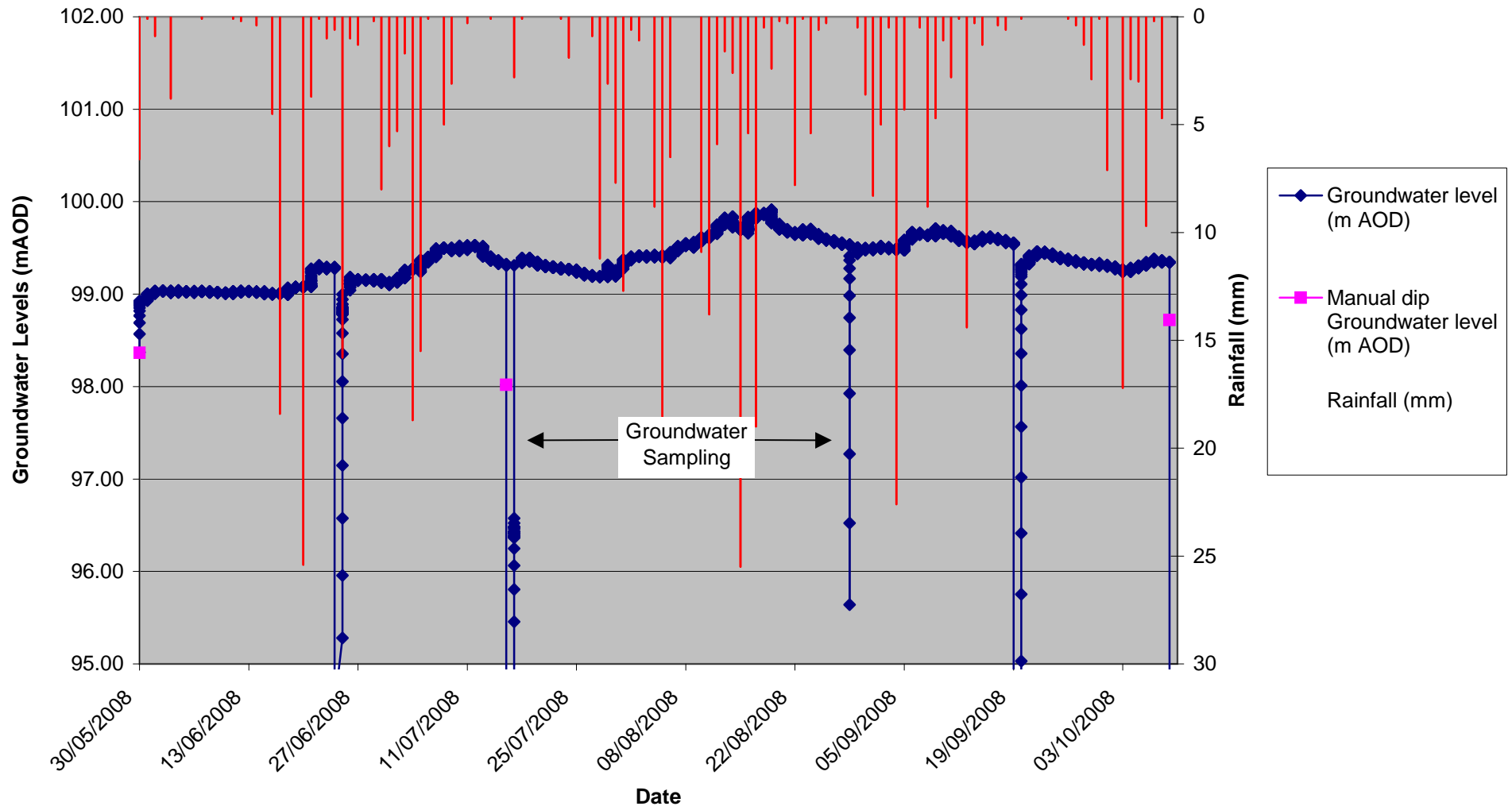
Groundwater Levels as at BH104b



Groundwater as at MW01

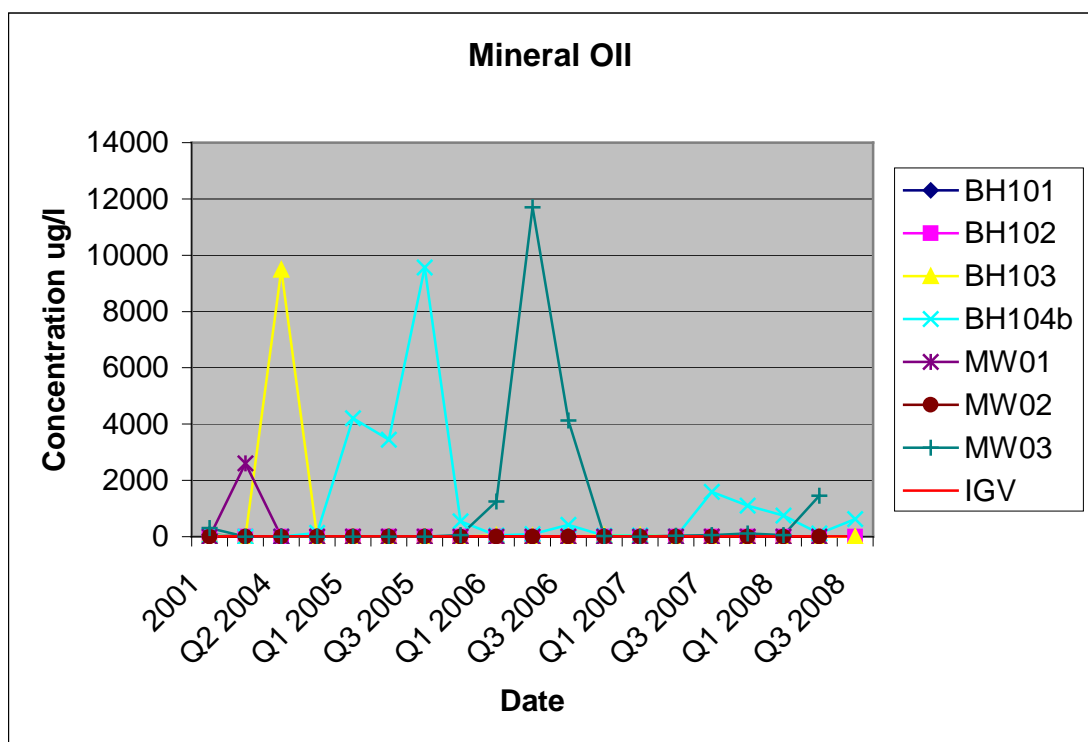
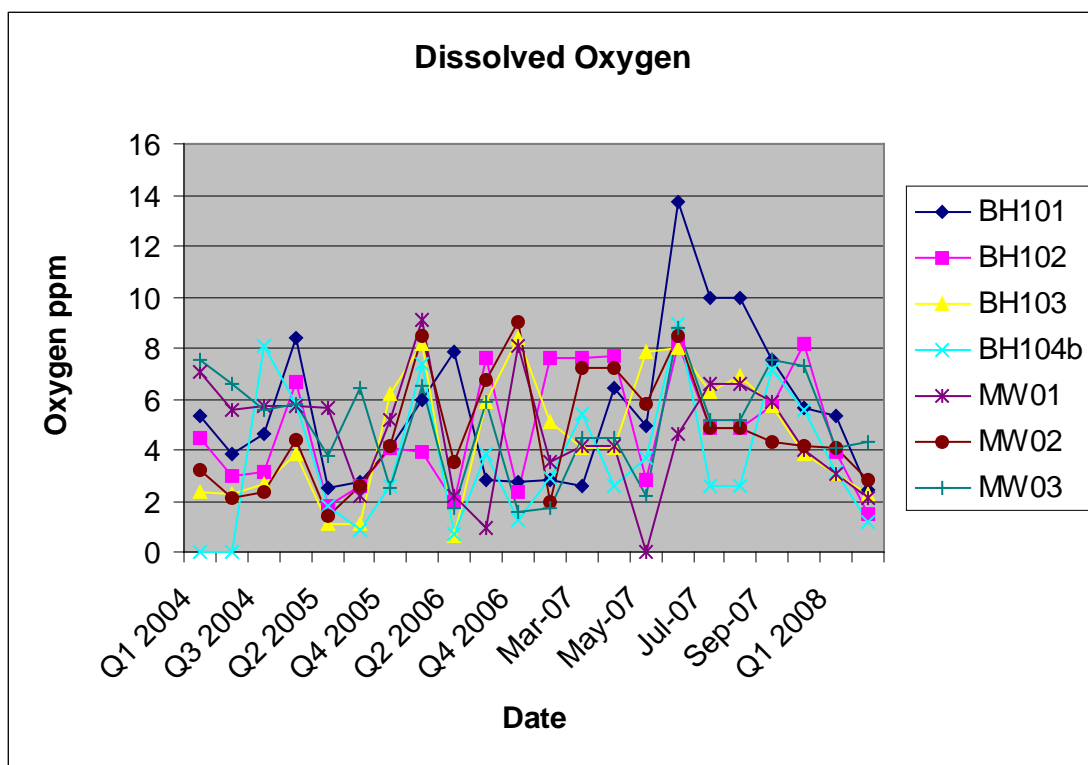


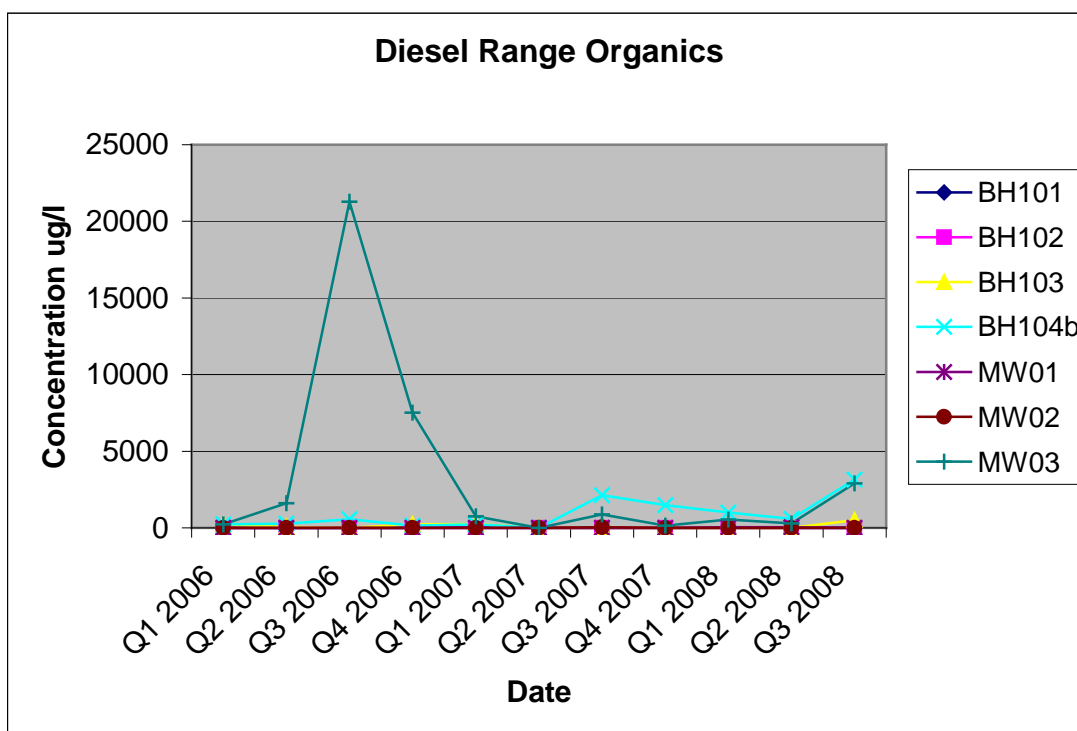
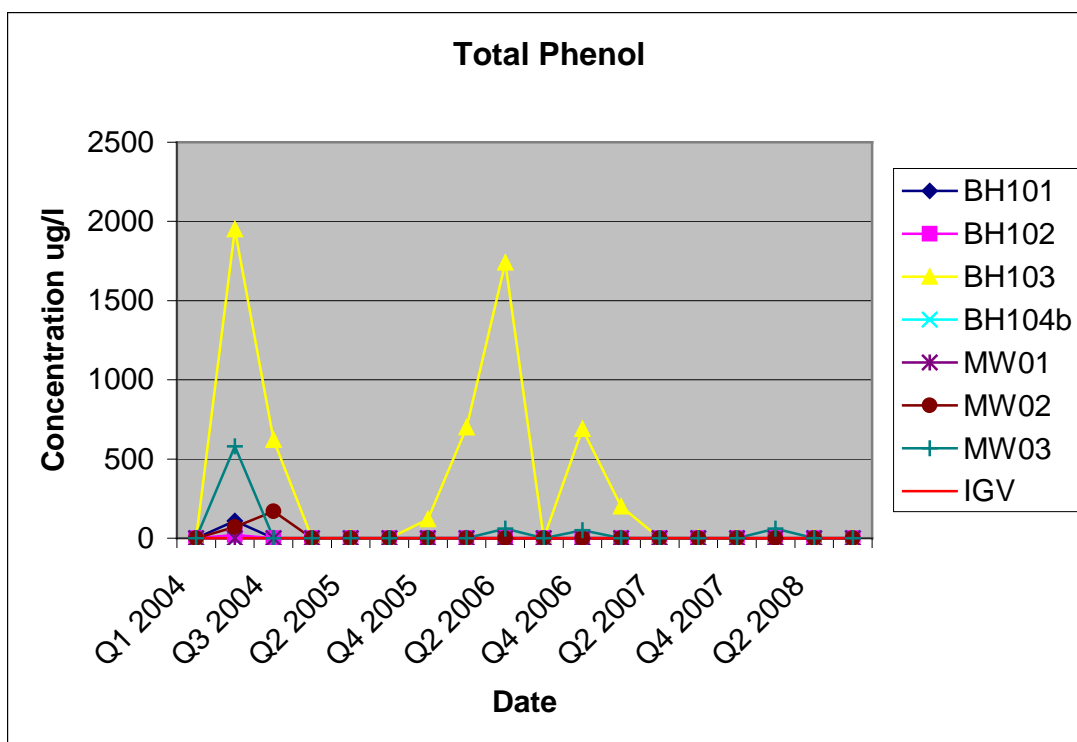
Groundwater Levels as at MW03

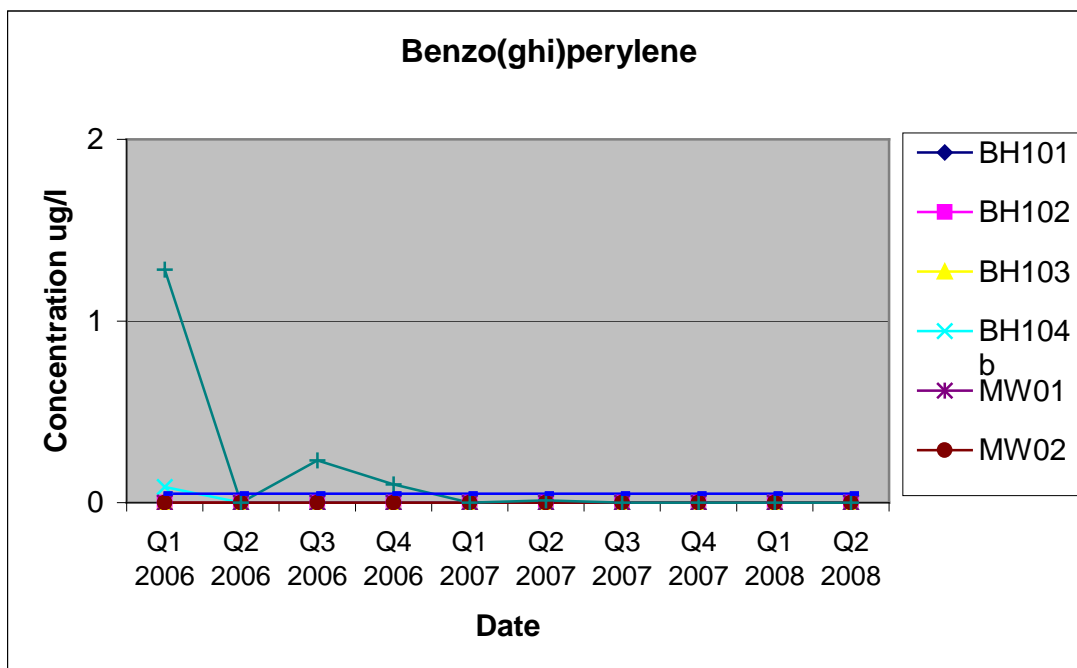
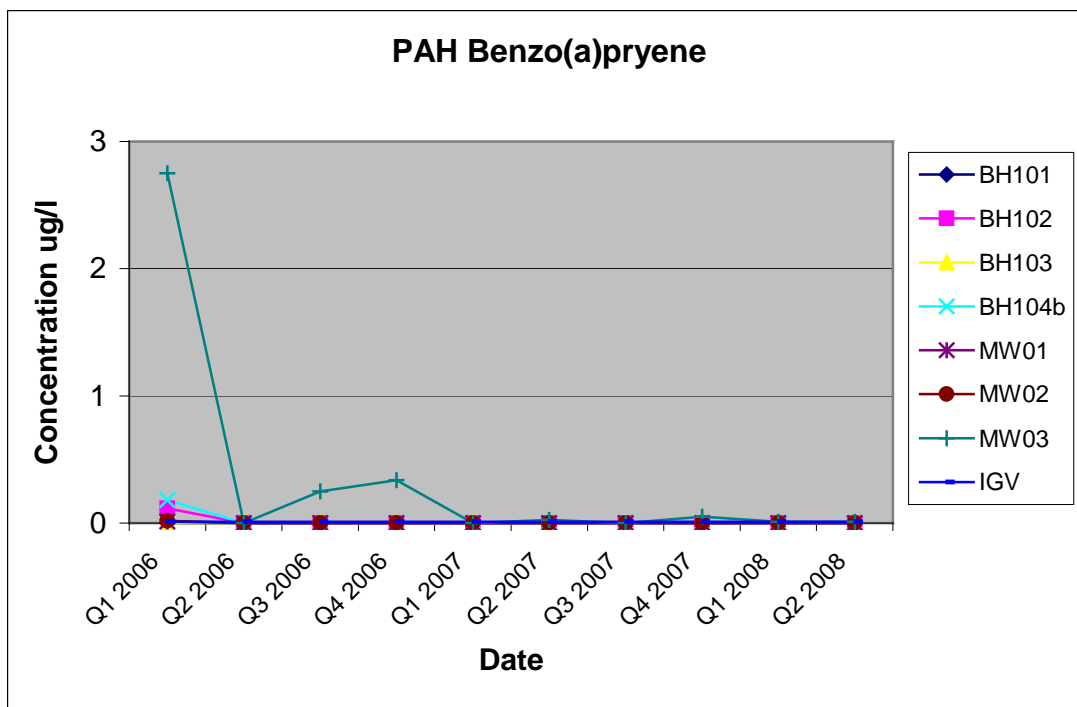


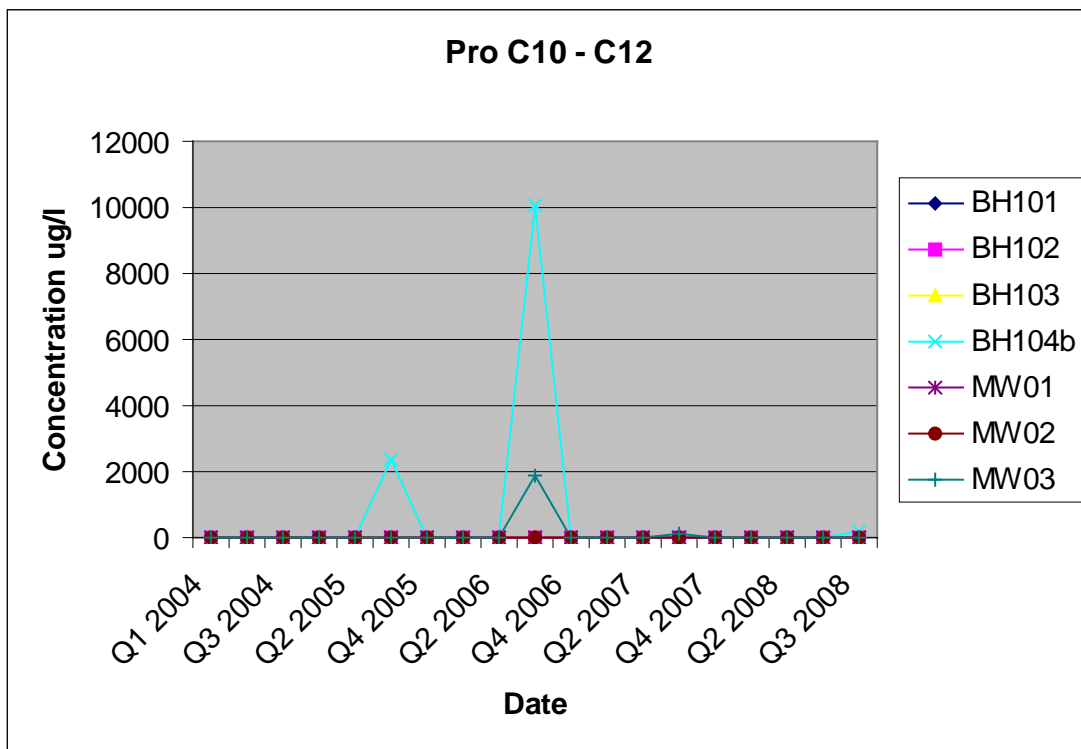
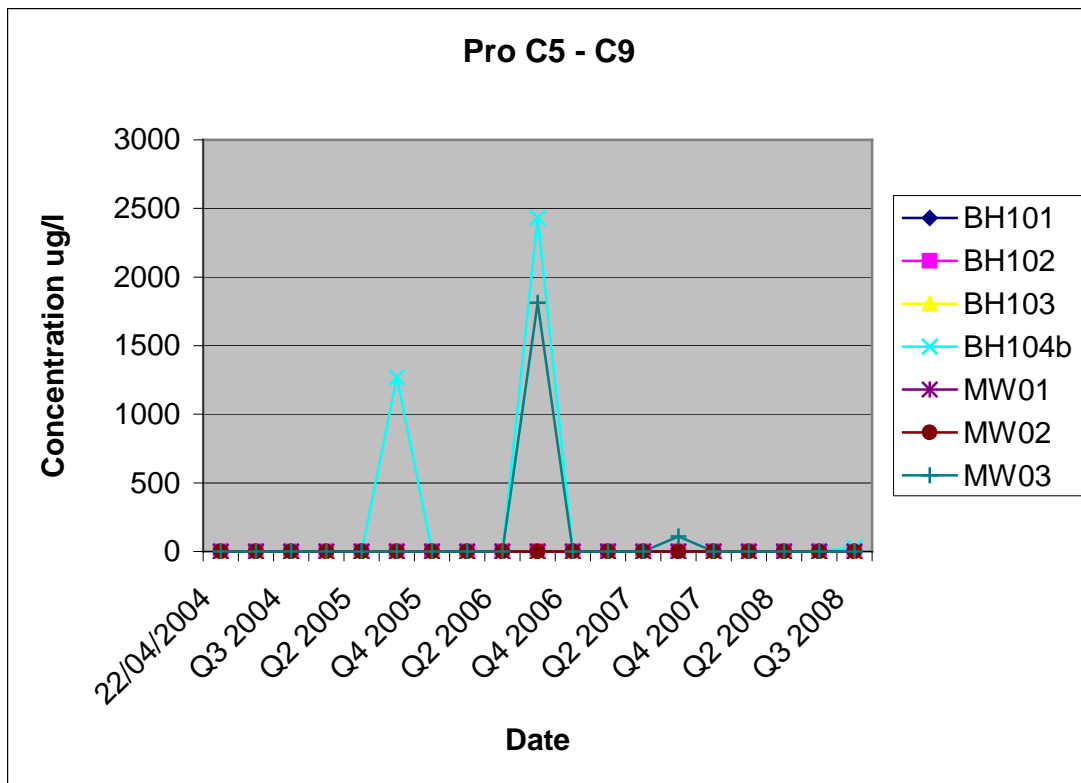
APPENDIX D

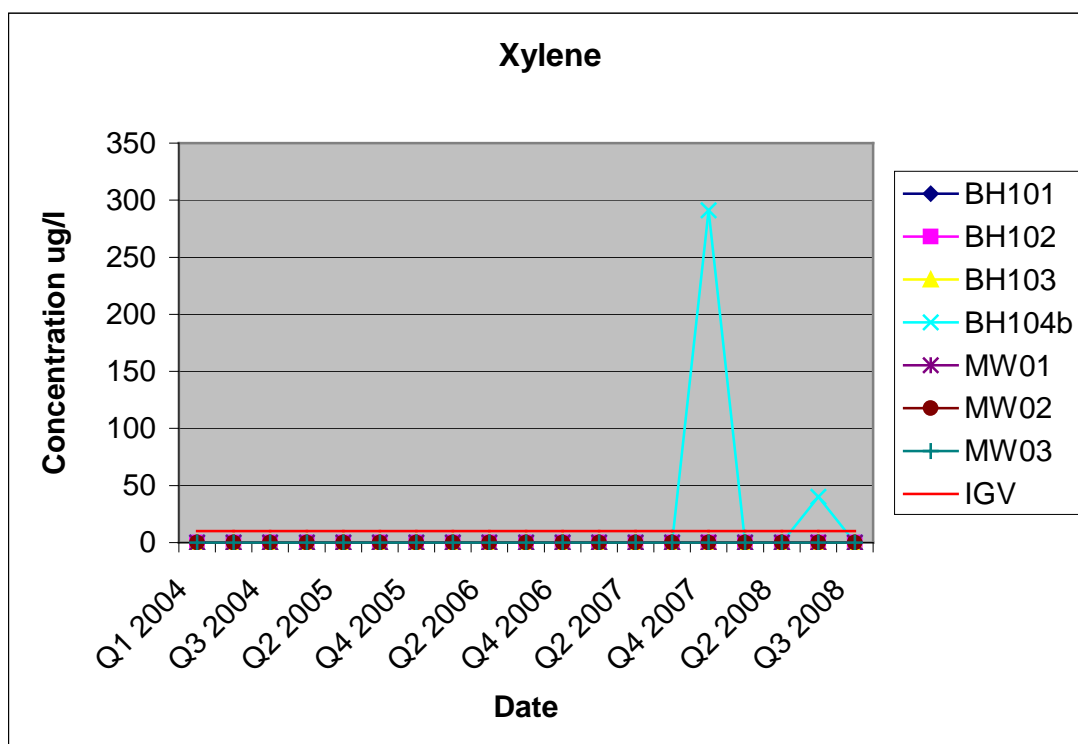
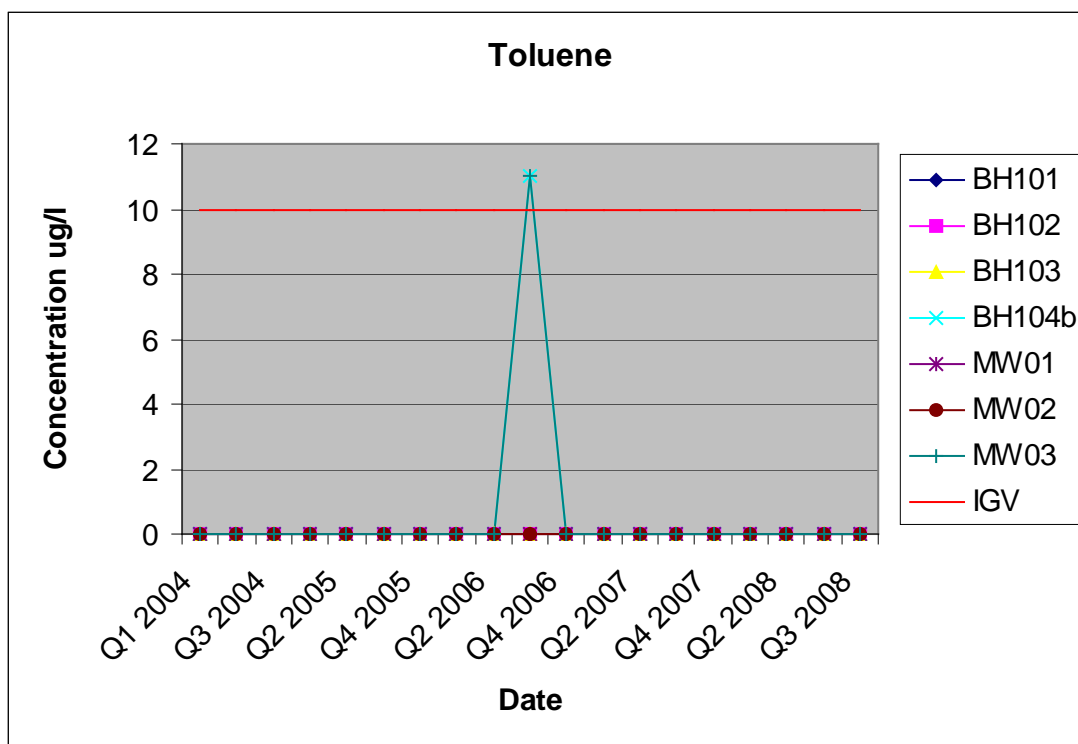
Plots of Contaminant concentration Over Time

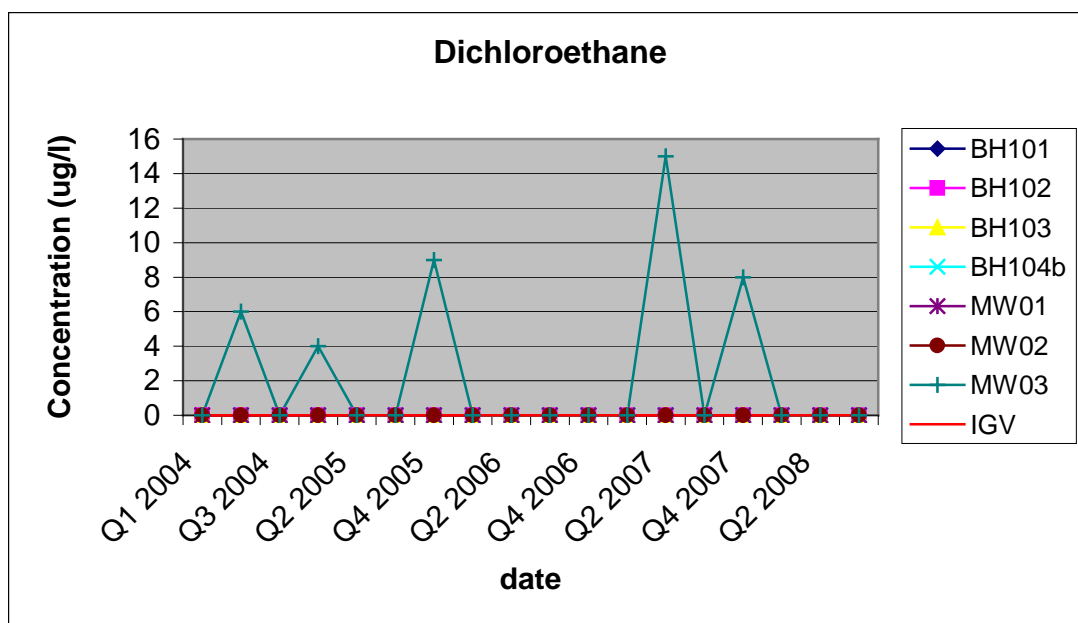












APPENDIX E

Input Parameters For Assessment

Source Term for BH104

Methodology

In the absence of measured data the effective solubility can be used to estimate a likely maximum concentration in dissolved phase

The effective solubility can be determined by using an extrapolation of Raoult's Law which assumes that the solubility of a single component will be reduced in proportion to its abundance within a mixture.

Raoult's Law is given as.

$$C_d = S \times X$$

Where

C_d = Effective Solubility (dissolved phase concentration in groundwater) mg/l

S = Pure Phase Solubility mg/l

X = Mole Fraction within mixture

Mole Fraction

TPHCWG give breakdown of diesel as 98% Total Aliphatics and 2% Total Aromatics. Of that approximately 0.073% is diaromatics which includes naphthalene. These fractions have been used as an approximation of mole fractions. As a worse case it has been assumed that all diaromatics are either naphthalene or benzo(a)pyrene and all aromatics and aliphatics are comprised of the individual fractions.

TPH in BH104 mg/l

WQT	Pure phase	Effective	May-08		Jul-08		Aug-08	
0.01 mg/l	Solubility ¹	solubility	BH104B	BH104 Sump	BH104B	BH104 Sump	BH104B	BH104 Sump
Aliphatic C5-6	36	35.28	<0.01	NS	<0.01	<0.01	NS	<0.01
Aliphatic >C6-8	5.4	5.292	<0.01	NS	<0.01	<0.01	NS	<0.01
Aliphatic >C8-10	0.43	0.4214	<0.01	NS	1.06	3.51	NS	2.4
Aliphatic >C10-12	0.034	0.03332	24.78	NS	3.81	23.06	NS	9.6
Aliphatic >C12-16	7.60E-04	0.0007448	<0.01	NS	2.38	1.05	NS	66
Aliphatic >C16-21	2.50E-06	0.00000245	<0.01	NS	1.01	0.22	NS	38
Aliphatic >C21-35	-	-	<0.01	NS	0.42	0.3	NS	17
Total Aliphatics	-	-	24.78	NS	8.69	28.14	NS	130
Aromatic C5-6	1800	36	<0.01	NS	<0.01	<0.01	NS	<0.01
Aromatic >C6-8	520	10.4	<0.01	NS	<0.01	<0.01	NS	<0.01
Aromatic >C8-10	65	1.3	20.06	NS	1.61	5.38	NS	3.6
Aromatic >C10-12	25	0.5	37.17	NS	5.72	34.59	NS	14
Aromatic >C12-16	5.8	0.116	<0.01	NS	<0.01	2.2	NS	4.9
Aromatic >C16-21	0.65	0.013	<0.01	NS	<0.01	<0.01	NS	5.1
Aromatic >C21-35	0.0066	0.000132	<0.01	NS	<0.01	<0.01	NS	4.2
Total Aromatics	-	-	57.23	NS	7.32	42.17	NS	32

All values mg/l

Concentration exceeds WQT

Concentration exceeds effective solubility

Concentration exceeds pure phase solubility

¹ TPHCWG Volume 3, 1997

PAH µg/l

	Pure phase Solubility ¹	Effective Solubility from diesel (BH104 only)	WQT ²	May-08			Jul-08			Aug-08		
				BH104B	Sump	MW03	BH104B	Sump	MW03	BH104B	Sump	MW03
Naphthalene	31000	22.63	1	<0.01	NS	<0.01	0.134	0.121	0.084	NS	7.7	NS
Acenaphtylene	16100	11.75	-	<0.01	NS	<0.01	0.117	0.296	0.044	NS	3.8	NS
Acenapthene	3800	2.77	-	<0.01	NS	<0.01	0.044	0.234	0.258	NS	5.3	NS
Flourene	1900	1.39	-	<0.01	NS	<0.01	0.197	0.588	0.288	NS	6.4	NS
Phenanthrene	1100	0.80	-	<0.01	NS	<0.01	0.289	0.785	0.35	NS	5.8	NS
Anthracene	45	3.29E-02	10000	<0.01	NS	<0.01	0.069	0.092	0.076	NS	5.8	NS
Flouranthene	260	1.90E-01	1	<0.01	NS	<0.01	0.026	0.052	0.05	NS	0.426	NS
Pyrene	130	9.49E-02	-	<0.01	NS	<0.01	0.062	0.151	0.13	NS	1.915	NS
Benzo(a)anthracene	11	8.03E-03	-	<0.01	NS	<0.01	0.011	<0.01	0.103	NS	0.211	NS
Chrysene	1.6	1.17E-03	-	<0.01	NS	<0.01	0.014	<0.01	0.084	NS	0.229	NS
Benzo(b&K)flouranthene	2.3	1.68E-03	0.05	<0.01	NS	<0.01	<0.01	<0.01	0.019	NS	0.019	NS
Benzo(a)pyrene	3.8	2.77E-03	0.01	<0.01	NS	<0.01	<0.01	<0.01	0.023	NS	0.085	NS
Indeno(123cd)pyrene	0.025	1.83E-05	0.05	<0.01	NS	<0.01	<0.01	<0.01	0.02	NS	<0.01	NS
Dibenzo(ah)anthracene	0.6	4.38E-04	-	<0.01	NS	<0.01	<0.01	<0.01	0.013	NS	<0.01	NS
Benzo(ghi)perylene	0.26	1.90E-04	-	<0.01	NS	<0.01	<0.01	<0.01	0.022	NS	<0.01	NS
All concentrations in µg/l												

Concentration exceeds WQT

Concentration exceeds Effective Solubility from Diesel

Concentration exceeds Pure Phase Solubility

¹ Review of Fate and Transport of Contaminants in Soil Enviroment UK Environment Agency Draft Technical Report P5-079/TR1, 2003

² Interim Guideline Value for Groundwater EPA 2002

Input Parameters Used In Groundwater Risk Assessment

Aquifer Characteristics

Parameter	Unit	Range	Representative Value	Justification
Width of plume perpendicular to flow	m	-	10	Assumed to confined to the immediate vicinity of BH104B
Depth of plume	m	-	4	Assumed to extend full thickness of aquifer
Saturated Thicknes of Aquifer	m	-	4	Taken from groundwater in glacial deposits to top of limestone
Distance to Receptor	m	-	100	Nominal distance. Included in sensitivity analysis
Effective Porosity	-	0.1-0.35 & 0.31-0.6	0.3	Based on values for glacial till and sand and gravel. Fetter, 1994 & Domenico and Schwartz, 1990
Fraction of Organic Carbon	-	0.0002-0.0019	0.0005	Based on values for Boulder clay and glacio-fluvial sand and gravel, Landsim database 2001
Hydraulic conductivity	m/day	0.0864-8.64	1	Full range will be used in sensitivity analysis
Hydraulic Gradient	-	0.005 - 0.06	0.01	Measured from manual dips and dataloggers
Bulk Density	g/cm ³	-	1.95	Calculated from porosity

Partition Coefficients (Kd)

For organic contaminants the Kd is based on the Fraction of Organic carbon in the aquifer and is calculated using:

$$Kd = Koc \times f_{oc}$$

Where

- Kd = Soil-Water Partition Coefficient (cm³/g)
 f_{oc} = fraction of organic carbon (as fraction of total soil mass)
 Koc = Organic carbon partion Coefficient (cm³/g)

Contaminant of Concern	<i>Koc</i> (cm ³ /g) Range	<i>Koc</i> (cm ³ /g) Representative Value	<i>Kd</i> (cm ³ /g)	Data source
TPH Aliphatics >EC-8-10	31622	31622	15.811	TPHCWG Volume 3, 1997
TPH Aliphatics >EC-10-12	251188	251188	125.594	TPHCWG Volume 3, 1997
TPH Aromatics >EC8-10	1584	1584	0.792	TPHCWG Volume 3, 1997
TPH Aromatics >EC10-12	2511	2511	1.2555	TPHCWG Volume 3, 1997
Naphthalene	457-8121	1288	0.644	Consim Database, Golders 1999 USEPA & EA Review of Fate and Transport
Benzo(a)pyrene	1000-5500000	1000000	500	Consim Database, Golders 1999 USEPA & EA Review of Fate and Transport
1,1 Dichloroethane	62	62	0.031	EA Review of Fate and Transport

Half lifes	Range	Representative value	Data source
Benzene	24-2108	100	Estimate from literature values * Lower value in range
TPH Aliphatics >EC-8-10	-	1000	No information available.estimated based on data for benzene and and naphthalene, straight chains likely to be more susceptible than rings
TPH Aliphatics >EC-10-12	-	1000	As above
TPH Aromatics >EC8-10	-	1000	As above
TPH Aromatics >EC10-12	-	1000	As above
Naphthalene	27-2108	1000	Estimate from literature values *
Benzo(a)pyrene	-	1000	No data available assumed to be similar to Naphthalene
1,1 Dichloroethane	-	-	Reductive dechlorination to vinyl chloride rather than mass removal through biodegradation

*Note:

Literature values for half lives have been taken from:

- | | |
|--------------------------------|---|
| Howard and Aronson, 1997 (API) | Based on a range of studies in America |
| Consim Database, Golders 1999 | Largely based on Aerobic conditions |
| Lewandowski and Mortimer, 2004 | Based on MGP sites which generally have lower degradation rates (higher half lifes) |

Water Quality Targets	mg/l	Guidelines	Notes
TPH Aliphatics >EC-8-10	0.01	EPA IGW	Based on value for Total Hydrocarbons
TPH Aliphatics >EC-10-12	0.01	EPA IGW	Based on value for Total Hydrocarbons
TPH Aromatics >EC8-10	0.01	EPA IGW	Based on value for Total Hydrocarbons
TPH Aromatics >EC10-12	0.01	EPA IGW	Based on value for Total Hydrocarbons
Naphthalene	0.001	EPA IGW	
Benzo(a)pyrene	0.00001	EPA IGW	
1,1 Dichloroethane	0.003	EPA IGW	

Pure Phase Solubility

	S mg/l	Data Source
TPH Aliphatics >EC-8-10	0.43	TPHCWG Volume 3, 1997
TPH Aliphatics >EC-10-12	0.034	TPHCWG Volume 3, 1997
TPH Aromatics >EC8-10	65	TPHCWG Volume 3, 1997
TPH Aromatics >EC10-12	25	TPHCWG Volume 3, 1997
Naphthalene	31	EA, 2003 (Review of Fate and Transport)
Benzo(a)pyrene	0.0038	EA, 2003 (Review of Fate and Transport)

Estimated Concentration in Groundwater

	X	C _d mg/l
TPH Aliphatics >EC-8-10	0.98	0.4214
TPH Aliphatics >EC-10-12	0.98	0.03332
TPH Aromatics >EC8-10	0.02	1.3
TPH Aromatics >EC10-12	0.02	0.5
Naphthalene	0.00073	0.02263
Benzo(a)pyrene	0.00073	0.00002774

Travel time within Aquifer

Ground water velocity is calculated using:

$$v = \frac{ki}{n}$$

Where

- v = Groundwater Velocity m/day
 k = Hydraulic Conductivity in Aquifer m/day
 i = Hydraulic Gradient in Aquifer
 n = Effective Porosity within saturated Zone (taken to be equal to saturated moisture content)

k	=	1	m/day
i	=	0.06	
n	=	0.3	
v	=	0.200	m/day

Unretarded travel time (i.e time taken for groundwater to reach receptor) is calculated using

$$T = \frac{d}{v}$$

Where

- T = Time taken for groundwater to reach receptor (days)
 d = Distance to receptor (m)

d	=	60	m
T	=	300	days
	=	0.82	Years

The transport of contaminants within the aquifer can be retarded by adsorption to mineral grains. The velocity of the contaminant is the groundwater velocity divided by a retardation factor. The retardation factor is calculated using.

$$R = 1 + \frac{\rho_b Kd}{\theta} \quad \text{and} \quad T_R = \frac{dR}{v}$$

Where

- R = Retardation Coefficient
 ρ_b = Bulk density of aquifer material (g/m³)
 Kd = Soil-water Partition Coefficient (m³/g)
 θ = Saturated Moisture Content (taken to be same as porosity in saturated zone)
 T_R = Retarded Travel Time (days)

ρ_b	=	1.95	g/m ³
f_{oc}	=	0.0005	

	Kd (m ³ /g)	R	T_R (Days)	T_R (Years)
Benzene	0.031	1.20	360.45	1
TPH Aliphatics >EC-8-10	15.811	103.77	31131.45	85
TPH Aliphatics >EC-10-	125.594	817.36	245208.3	672
TPH Aromatics >EC8-10	0.792	6.15	1844.4	5
TPH Aromatics >EC10-	1.256	9.16	2748.225	8
Naphthalene	0.644	5.19	1555.8	4
Benzo(a)pyrene	500.000	3251.00	975300	2672



Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.1

Date of Workbook Issue: October 2006

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions)

Details to be completed for each assessment

Site Name:	Enva		
Site Address:	Portlaoise		
Completed by:	Louise Burden		
Date:	25-Oct-08	Version:	1
Contaminant	TPH Aliphatics C8-10		
Target Concentration (C_T)	0.01	mg/l	Origin of C_T: EPA IGV

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparison with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).

Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.

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The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

R&D Publication 20 Remedial Targets Worksheet, Release 3.1

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)	Variable	Value	Unit	Source
Contaminant		TPH Aliphatics C10-12		from Level 1
Target Concentration	C _T	1.00E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks	Equations in HRA publication
-------------	------------------------------

Approach for simulating vertical dispersion:

Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants:

Apply degradation rate to pollutants in all phases (e.g. field derived value)

Initial contaminant concentration in groundwater at plume core	C ₀	3.40E-02	mg/l	Assumed, see input sheet
Half life for degradation of contaminant in water	t _{1/2}	5.00E+03	days	None assumed as worse case
Calculated decay rate	λ	1.39E-04	days ⁻¹	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.00E+01	m	Assumed, see input sheet
Plume thickness at source	Sy	4.00E+00	m	Assumed, see input sheet
Saturated aquifer thickness	da	4.00E+00	m	Measured, see input sheet
Bulk density of aquifer materials	ρ	1.95E+00	g/cm ³	Calculated from porosity
Effective porosity of aquifer	n	3.00E-01	fraction	Assumed, see input sheet
Hydraulic gradient	i	1.00E-02	fraction	Measured, see input sheet
Hydraulic conductivity of aquifer	K	1.00E+00	m/d	Assumed, see input sheet
Distance to compliance point	x	6.00E+01	m	Distance to BH101
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	1.00E+100	days	time variant options only
Parameters values determined from options				
Partition coefficient	Kd	1.26E+02	l/kg	see options
Longitudinal dispersivity	ax	6.00E+00	m	see options
Transverse dispersivity	az	6.00E-01	m	see options
Vertical dispersivity	ay	1.00E-07	m	see options

Calculated Parameters

Groundwater flow velocity	v	3.33E-02	m/d
Retardation factor	Rf	8.17E+02	fraction
Decay rate used	λ	1.39E-04	d ⁻¹
Rate of contaminant flow due to retardation	u	4.08E-05	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C _{ED}	4.14E-20	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	AF	8.21E+17	

Remedial Targets

Remedial Target	8.21E+15	mg/l	For comparison with measured groundwater concentration.
Ogata Banks			
Distance to compliance point	60	m	
Concentration of contaminant at compliance point after	C _{ED} /C ₀	4.14E-20	mg/l
		1.0E+100	days

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target. The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

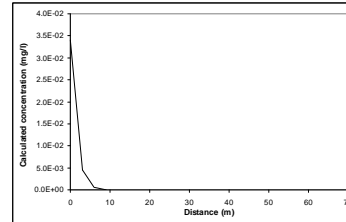
Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)		
Soil water partition coefficient	Kd	
Entry for non-polar organic chemicals (option)		
Fraction of organic carbon in aquifer	foc	5.00E-04
Organic carbon partition coefficient	Koc	2.51E+05
Entry for ionic organic chemicals (option)		
Sorption coefficient for related species	K _{oc,ln}	
Sorption coefficient for ionised species	K _{oc,i}	
pH value	pH	
acid dissociation constant	pKa	
Fraction of organic carbon in aquifer	foc	
Soil water partition coefficient	Kd	1.26E+02

Define dispersivity (click brown cell and use pull down list)

User defined values for dispersivity

	Enter value	Calc value Xu & Eckstein	m
Longitudinal dispersivity	ax	6.00E+00	6.00E+00
Transverse dispersivity	az	6.00E-01	6.00E-01
Vertical dispersivity	ay	1.00E-07	1.00E-07
Note values of dispersivity must be > 0			
For calculated value, assumes ax = 0.1 * x, az = 0.01 * x, ay = 0.001 * x			
Xu & Eckstein (1995) report ax = 0.83(log ₁₀ x) ^{1.414} ; az = ax/10, ay = ax/100 are assumed			



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source. Three solution methods are included; the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared

with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best described by an electron limited degradation such as oxidation by O₂, NO₃, SO₄ etc than an alternative solution should be used

Site being assessed:	Enva
Completed by:	Louise Burden
Date:	#####
Version:	1

Calculated concentrations for distance-concentration graph

Ogata Banks	From calculation sheet
Distance	Concentration

Distance	Concentration
0	3.4E-02
3.0	4.46E-03
6.0	5.59E-04
9.0	6.88E-05
12.0	8.49E-06
15.0	1.05E-06
18.0	1.31E-07
21.0	1.65E-08
24.0	2.08E-09
27.0	2.64E-10
30.0	3.35E-11
33.0	4.27E-12
36.0	5.46E-13
39.0	6.99E-14
42.0	8.97E-15
45.0	1.15E-15
48.0	1.49E-16
51.0	1.92E-17
54.0	2.47E-18
57.0	3.20E-19
60.0	4.14E-20



Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.1

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Details to be completed for each assessment

Site Name:	Enva		
Site Address:	Portlaoise		
Completed by:	Louise Burden		
Date:	25-Oct-08	Version:	1
Contaminant	TPH Aromatics C8-10		
Target Concentration (C_T)	0.01	mg/l	Origin of C_T: EPA IGV

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparison with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).

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The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

R&D Publication 20 Remedial Targets Worksheet, Release 3.1

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)	Variable	Value	Unit	Source
Contaminant		TPH Aliphatics C8-10		from Level 1
Target Concentration	C _T	1.00E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Approach for simulating vertical dispersion:

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants:

Initial contaminant concentration in groundwater at plume core	C ₀	4.20E-01	mg/l	Assumed, see input sheet
Half life for degradation of contaminant in water	t _{1/2}	5.00E+03	days	None assumed as worse case
Calculated decay rate	λ	1.39E-04	days ⁻¹	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.00E+01	m	Assumed, see input sheet
Plume thickness at source	Sy	4.00E+00	m	Assumed, see input sheet
Saturated aquifer thickness	da	4.00E+00	m	Measured, see input sheet
Bulk density of aquifer materials	ρ	1.95E+00	g/cm ³	Calculated from porosity
Effective porosity of aquifer	n	3.00E-01	fraction	Assumed, see input sheet
Hydraulic gradient	i	1.00E-02	fraction	Measured, see input sheet
Hydraulic conductivity of aquifer	K	1.00E+00	m/d	Assumed, see input sheet
Distance to compliance point	x	6.00E+01	m	Distance to BH101
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	1.00E+100	days	time variant options only
Parameters values determined from options				
Partition coefficient	Kd	1.58E+01	l/kg	see options
Longitudinal dispersivity	ax	6.00E+00	m	see options
Transverse dispersivity	az	6.00E-01	m	see options
Vertical dispersivity	ay	1.00E-07	m	see options

Calculated Parameters

Groundwater flow velocity	v	3.33E-02	m/d
Retardation factor	Rf	1.04E+02	fraction
Decay rate used	λ	1.39E-04	d ⁻¹
Rate of contaminant flow due to retardation	u	3.21E-04	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C _{EO}	1.33E-06	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	AF	3.16E+05	

Remedial Targets

Remedial Target	3.16E+03	mg/l	For comparison with measured groundwater concentration.
Ogata Banks			
Distance to compliance point	60	m	
Concentration of contaminant at compliance point after	C _{EO} /C _p	1.33E-06	mg/l
		1.0E+100	days
			Ogata Banks

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target. The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

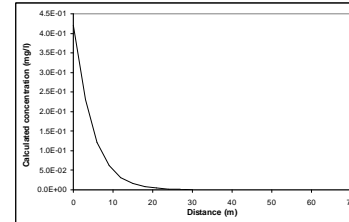
Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)		
Soil water partition coefficient	Kd	1.58E+01 l/kg
Entry for non-polar organic chemicals (option)		
Fraction of organic carbon in aquifer	foc	5.00E-04 fraction
Organic carbon partition coefficient	Koc	3.16E+04 l/kg
Entry for ionic organic chemicals (option)		
Sorption coefficient for related species	K _{ow}	1.00E+01 l/kg
Sorption coefficient for ionised species	K _{ow}	1.00E+01 l/kg
pH value	pH	
acid dissociation constant	pKa	
Fraction of organic carbon in aquifer	foc	
Soil water partition coefficient	Kd	1.58E+01 l/kg

Define dispersivity (click brown cell and use pull down list)

User defined values for dispersivity

Longitudinal dispersivity	ax	6.00E+00	6.00E+00	6.00E+00	m
Transverse dispersivity	az	6.00E-01	6.00E-01	6.00E-01	m
Vertical dispersivity	ay	1.00E-07	1.00E-07	1.00E-07	m
Note values of dispersivity must be > 0					
For calculated value, assumes ax = 0.1 * x, az = 0.01 * x, ay = 0.001 * x					
Xu & Eckstein (1995) report ax = 0.83(log ₁₀ X) ^{1.41} ; az = ax/10, ay = ax/100 are assumed					



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source. Three solution methods are included; the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action. Note if contaminant is not subject to first order degradation, then set half life as 9.9E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best described by an electron limited degradation such as oxidation by O₂, NO₃, SO₄ etc than an alternative solution should be used

Site being assessed:	Enva
Completed by:	Louise Burden
Date:	#####
Version:	1

R&D Publication 20 Remedial Targets Worksheet, Release 3.1

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)	Variable	Value	Unit	Source
Contaminant		TPH Aliphatics C8-10		from Level 1
Target Concentration	C _T	1.00E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Approach for simulating vertical dispersion:

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants:

Initial contaminant concentration in groundwater at plume core	C ₀	4.20E-01	mg/l	Assumed, see input sheet
Half life for degradation of contaminant in water	t _{1/2}	5.00E+03	days	None assumed as worse case
Calculated decay rate	λ	1.39E-04	days ⁻¹	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.00E+01	m	Assumed, see input sheet
Plume thickness at source	Sy	4.00E+00	m	Assumed, see input sheet
Saturated aquifer thickness	da	4.00E+00	m	Measured, see input sheet
Bulk density of aquifer materials	ρ	1.95E+00	g/cm ³	Calculated from porosity
Effective porosity of aquifer	n	3.00E-01	fraction	Assumed, see input sheet
Hydraulic gradient	i	1.00E-02	fraction	Measured, see input sheet
Hydraulic conductivity of aquifer	K	1.00E+00	m/d	Assumed, see input sheet
Distance to compliance point	x	6.00E+01	m	Distance to BH101
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	1.00E+100	days	time variant options only
Parameters values determined from options				
Partition coefficient	Kd	1.58E+01	l/kg	see options
Longitudinal dispersivity	ax	6.00E+00	m	see options
Transverse dispersivity	az	6.00E-01	m	see options
Vertical dispersivity	ay	1.00E-07	m	see options

Calculated Parameters

Groundwater flow velocity	v	3.33E-02	m/d
Retardation factor	Rf	1.04E+02	fraction
Decay rate used	λ	1.39E-04	d ⁻¹
Rate of contaminant flow due to retardation	u	3.21E-04	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C _{EO}	1.33E-06	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	AF	3.16E+05	

Remedial Targets

Remedial Target	3.16E+03	mg/l	For comparison with measured groundwater concentration.
Ogata Banks			
Distance to compliance point	60	m	
Concentration of contaminant at compliance point after	C _{EO} /C ₀ 1.33E-06 1.0E+100	mg/l days	Ogata Banks

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target. The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

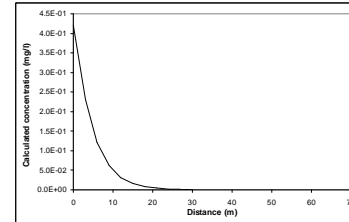
Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)		
Soil water partition coefficient	Kd	1.58E+01 l/kg
Entry for non-polar organic chemicals (option)		
Fraction of organic carbon in aquifer	foc	5.00E-04 fraction
Organic carbon partition coefficient	Koc	3.16E+04 l/kg
Entry for ionic organic chemicals (option)		
Sorption coefficient for related species	K _{ow,n}	l/kg
Sorption coefficient for ionised species	K _{ow,i}	l/kg
pH value	pH	
acid dissociation constant	pKa	
Fraction of organic carbon in aquifer	foc	fraction
Soil water partition coefficient	Kd	1.58E+01 l/kg

Define dispersivity (click brown cell and use pull down list)

User defined values for dispersivity

Longitudinal dispersivity	ax	Enter value	Calc value Xu & Eckstein	m
Transverse dispersivity	az	6.00E-01	6.00E-01	6.00E-01 m
Vertical dispersivity	ay	1.00E-07	1.00E-07	1.00E-07 m
Note values of dispersivity must be > 0				
For calculated value, assumes ax = 0.1 * x, az = 0.01 * x, ay = 0.001 * x				
Xu & Eckstein (1995) report ax = 0.83(log ₁₀ X) ^{1.414} ; az = ax/10, ay = ax/100 are assumed				



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source. Three solution methods are included; the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action. Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best described by an electron limited degradation such as oxidation by O₂, NO₃, SO₄ etc than an alternative solution should be used

Site being assessed:	Enva
Completed by:	Louise Burden
Date:	#####
Version:	1



Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.1

Date of Workbook Issue: October 2006

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions)

Details to be completed for each assessment

Site Name:	Enva		
Site Address:	Portlaoise		
Completed by:	Louise Burden		
Date:	25-Oct-08	Version:	1
Contaminant	TPH Aromatics C10-12		
Target Concentration (C_T)	0.01	mg/l	Origin of C_T: EPA IGV

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparison with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).

Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.

Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.

Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.

Data carried forward from an earlier worksheet are identified by a light green background

It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

R&D Publication 20 Remedial Targets Worksheet, Release 3.1

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)	Variable	Value	Unit	Source
Contaminant		TPH Aliphatics C10-12		from Level 1
Target Concentration	C _T	1.00E-02	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Ogata Banks	Equations in HRA publication
-------------	------------------------------

Approach for simulating vertical dispersion:

Simulate vertical dispersion in 1 direction

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants:

Apply degradation rate to pollutants in all phases (e.g. field derived value)

Initial contaminant concentration in groundwater at plume core	C ₀	3.40E-02	mg/l	Assumed, see input sheet
Half life for degradation of contaminant in water	t _{1/2}	5.00E+03	days	None assumed as worse case
Calculated decay rate	λ	1.39E-04	days ⁻¹	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.00E+01	m	Assumed, see input sheet
Plume thickness at source	Sy	4.00E+00	m	Assumed, see input sheet
Saturated aquifer thickness	da	4.00E+00	m	Measured, see input sheet
Bulk density of aquifer materials	p	1.95E+00	g/cm ³	Calculated from porosity
Effective porosity of aquifer	n	3.00E-01	fraction	Assumed, see input sheet
Hydraulic gradient	i	1.00E-02	fraction	Measured, see input sheet
Hydraulic conductivity of aquifer	K	1.00E+00	m/d	Assumed, see input sheet
Distance to compliance point	x	6.00E+01	m	Distance to BH101
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	1.00E+100	days	time variant options only
Parameters values determined from options				
Partition coefficient	Kd	1.26E+02	l/kg	see options
Longitudinal dispersivity	ax	6.00E+00	m	see options
Transverse dispersivity	az	6.00E-01	m	see options
Vertical dispersivity	ay	1.00E-07	m	see options

Calculated Parameters

Groundwater flow velocity	v	3.33E-02	m/d
Retardation factor	Rf	8.17E+02	fraction
Decay rate used	λ	1.39E-04	d ⁻¹
Rate of contaminant flow due to retardation	u	4.08E-05	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C _{EO}	4.14E-20	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	AF	8.21E+17	

Remedial Targets

Remedial Target	8.21E+15	mg/l	For comparison with measured groundwater concentration.
Ogata Banks			
Distance to compliance point	60	m	
Concentration of contaminant at compliance point after	C _{EO} /C ₀	4.14E-20	mg/l
		1.0E+100	days

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target. The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

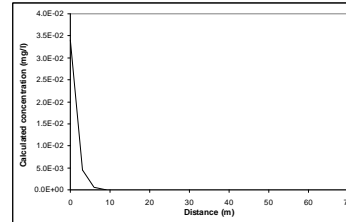
Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)		
Soil water partition coefficient	Kd	
Entry for non-polar organic chemicals (option)		
Fraction of organic carbon in aquifer	foc	5.00E-04
Organic carbon partition coefficient	Koc	2.51E+05
Entry for ionic organic chemicals (option)		
Sorption coefficient for related species	K _{oc,ln}	
Sorption coefficient for ionised species	K _{oc,i}	
pH value	pH	
acid dissociation constant	pKa	
Fraction of organic carbon in aquifer	foc	
Soil water partition coefficient	Kd	1.26E+02

Define dispersivity (click brown cell and use pull down list)

User defined values for dispersivity

	Enter value	Calc value Xu & Eckstein	m
Longitudinal dispersivity	ax	6.00E+00	6.00E+00
Transverse dispersivity	az	6.00E-01	6.00E-01
Vertical dispersivity	ay	1.00E-07	1.00E-07
Note values of dispersivity must be > 0			
For calculated value, assumes ax = 0.1 * x, az = 0.01 * x, ay = 0.001 * x			
Xu & Eckstein (1995) report ax = 0.83(log ₁₀ x) ^{1.41} ; az = ax/10, ay = ax/100 are assumed			



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source. Three solution methods are included; the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared with the Level 3 remedial target to determine the need for further action. Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best described by an electron limited degradation such as oxidation by O₂, NO₃, SO₄ etc than an alternative solution should be used

Site being assessed:	Enva
Completed by:	Louise Burden
Date:	#####
Version:	1

Calculated concentrations for distance-concentration graph

Ogata Banks	Distance	Concentration
-------------	----------	---------------

		mg/l
0	3.4E-02	
3.0	4.46E-03	
6.0	5.59E-04	
9.0	6.88E-05	
12.0	8.49E-06	
15.0	1.05E-06	
18.0	1.31E-07	
21.0	1.65E-08	
24.0	2.08E-09	
27.0	2.64E-10	
30.0	3.35E-11	
33.0	4.27E-12	
36.0	5.46E-13	
39.0	6.99E-14	
42.0	8.97E-15	
45.0	1.15E-15	
48.0	1.49E-16	
51.0	1.92E-17	
54.0	2.47E-18	
57.0	3.20E-19	
60.0	4.14E-20	



Hydrogeological risk assessment for land contamination

Remedial Targets Worksheet , Release 3.1

Date of Workbook Issue: October 2006

This worksheet has been produced in combination with the document 'Remedial Targets Methodology: Hydrogeological risk assessment for land contamination (Environment Agency 2006).

Users of this worksheet should always refer to the User Manual to the Remedial Targets Methodology and to relevant guidance on UK legislation and policy, in order to understand how this procedure should be applied in an appropriate context.

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The calculation of equations in this worksheet has been independently checked by Entec (UK) Ltd on behalf of the Environment Agency.

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IMPORTANT: To enable MS Excel worksheet, click Tools, Add -Ins, Analysis Tool Pak and Analysis Tool Pak-VBA (to calculate error functions)

Details to be completed for each assessment

Site Name:	Enva		
Site Address:	Portlaoise		
Completed by:	Louise Burden		
Date:	25-Oct-08	Version:	1
Contaminant	Naphthalene		
Target Concentration (C_T)	0.001	mg/l	Origin of C_T: EPA IGV

This worksheet can be used to determine remedial targets for soils (Worksheets Level 1 Soil, Level 2 and Level 3 Soil) or to determine remedial targets for groundwater (Level 3 Groundwater). For Level 3, parameter values must be entered separately dependent on whether the assessment is for soil or groundwater. For soil, remedial targets are calculated as either mg/kg (for comparison with soil measurements) or mg/l (for comparison with leaching tests or pore water concentrations).

Site details entered on this page are automatically copied to Level 1, 2 and 3 Worksheets.

Worksheet options are identified by brown background and employ a pull-down menus. Data entry are identified as blue background.

Data origin / justification should be noted in cells coloured yellow and fully documented in subsequent reports.

Data carried forward from an earlier worksheet are identified by a light green background

It is recommended that a copy of the original worksheet is saved (all data fields in the original copy are blank).

The spreadsheet also includes a porosity calculation worksheet, a soil impact calculation worksheet and a worksheet that performs some simple hydrogeological calculations.

R&D Publication 20 Remedial Targets Worksheet, Release 3.1

Level 3 - Groundwater

See Note

Input Parameters (using pull down menu)	Variable	Value	Unit	Source
Contaminant	Naphthalene			from Level 1
Target Concentration	C _T	1.00E-03	mg/l	from Level 1

Select analytical solution (click on brown cell below, then on pull-down menu)

Approach for simulating vertical dispersion:

Select nature of decay rate (click on brown cell below, then on pull-down menu)

Approach for simulating degradation of pollutants:

Initial contaminant concentration in groundwater at plume core	C ₀	2.30E-02	mg/l	Assumed, see input sheet
Half life for degradation of contaminant in water	t _{1/2}	1.00E+03	days	None assumed as worse case
Calculated decay rate	λ	6.93E-04	days ⁻¹	
Width of plume in aquifer at source (perpendicular to flow)	Sz	1.00E+01	m	Assumed, see input sheet
Plume thickness at source	Sy	4.00E+00	m	Assumed, see input sheet
Saturated aquifer thickness	da	4.00E+00	m	Measured, see input sheet
Bulk density of aquifer materials	ρ	1.95E+00	g/cm ³	Calculated from porosity
Effective porosity of aquifer	n	3.00E-01	fraction	Assumed, see input sheet
Hydraulic gradient	i	1.00E-02	fraction	Measured, see input sheet
Hydraulic conductivity of aquifer	K	1.00E+00	m/d	Assumed, see input sheet
Distance to compliance point	x	6.00E+01	m	Distance to BH101
Distance (lateral) to compliance point perpendicular to flow direction	z	0.00E+00	m	
Distance (depth) to compliance point perpendicular to flow direction	y	0.00E+00	m	
Time since pollutant entered groundwater	t	1.00E+100	days	time variant options only
Parameters values determined from options				
Partition coefficient	Kd	6.44E-01	l/kg	see options
Longitudinal dispersivity	ax	6.00E+00	m	see options
Transverse dispersivity	az	6.00E-01	m	see options
Vertical dispersivity	ay	1.00E-07	m	see options

Calculated Parameters

Groundwater flow velocity	v	3.33E-02	m/d
Retardation factor	Rf	5.19E+00	fraction
Decay rate used	λ	6.93E-04	d ⁻¹
Rate of contaminant flow due to retardation	u	6.43E-03	m/d
Contaminant concentration at distance x, assuming one-way vertical dispersion	C _{EO}	1.17E-04	mg/l
Attenuation factor (one way vertical dispersion, CO/CED)	AF	1.97E+02	

Remedial Targets

Remedial Target	1.97E-01	mg/l	For comparison with measured groundwater concentration.
Ogata Banks			
Distance to compliance point	60	m	
Concentration of contaminant at compliance point after	C _{EO} /C ₀	1.17E-04	mg/l
		1.0E+100	days
			Ogata Banks

Care should be used when calculating remedial targets using the time variant options as this may result in an overestimate of the remedial target. The recommended value for time when calculating the remedial target is 9.9E+99.

Select Method for deriving Partition Co-efficient (using pull down menu)

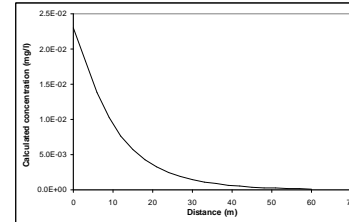
Calculate for non-polar organic chemicals

Entry if specify partition coefficient (option)		
Soil water partition coefficient	Kd	
Entry for non-polar organic chemicals (option)		
Fraction of organic carbon in aquifer	foc	5.00E-04
Organic carbon partition coefficient	Koc	1.29E+03
Entry for ionic organic chemicals (option)		
Sorption coefficient for related species	K _{oc,n}	
Sorption coefficient for ionised species	K _{ow,n}	
pH value	pH	
acid dissociation constant	pKa	
Fraction of organic carbon in aquifer	foc	
Soil water partition coefficient	Kd	6.44E-01

Define dispersivity (click brown cell and use pull down list)

User defined values for dispersivity

Longitudinal dispersivity	ax	Enter value	Calc value Xu & Eckstein	m
Transverse dispersivity	az	6.00E-01	6.00E-01	6.33E-01
Vertical dispersivity	ay	1.00E-07	1.00E-07	1.34E-06
Note values of dispersivity must be > 0				
For calculated value, assumes ax = 0.1 * x, az = 0.01 * x, ay = 0.001 * x				
Xu & Eckstein (1995) report ax = 0.83(log ₁₀ x) ^{1.41} ; az = ax/10, ay = ax/100 are assumed				



Note graph assumes plume disperses vertically in one direction only. An alternative solution assuming the centre of the plume is located at the mid-depth of the aquifer is presented in the calculation sheets.

Note

This sheet calculates the Level 3 remedial target for groundwater, based on the distance to the receptor or compliance located down hydraulic gradient of the source. Three solution methods are included; the preferred option is Ogata Banks.

By setting a long travel time it will give the steady state solution, which should be used to calculate remedial targets.

The measured groundwater concentration should be compared

with the Level 3 remedial target to determine the need for further action.

Note if contaminant is not subject to first order degradation, then set half life as 9.0E+99.

This worksheet should be used if pollutant transport and degradation is best described by a first order reaction. If degradation is best described by an electron limited degradation such as oxidation by O₂, NO₃, SO₄ etc than an alternative solution should be used

Site being assessed: Enva
Completed by: Louise Burden
Date: #####
Version: 1

Calculated concentrations for distance-concentration graph

Ogata Banks
From calculation sheet
Distance Concentration

Distance	Concentration
0	2.3E-02
3.0	1.82E-02
6.0	1.38E-02
9.0	1.03E-02
12.0	7.64E-03
15.0	5.73E-03
18.0	4.32E-03
21.0	3.27E-03
24.0	2.49E-03
27.0	1.91E-03
30.0	1.46E-03
33.0	1.13E-03
36.0	8.70E-04
39.0	6.73E-04
42.0	5.22E-04
45.0	4.05E-04
48.0	3.15E-04
51.0	2.45E-04
54.0	1.91E-04
57.0	1.49E-04
60.0	1.17E-04

Appendix 3

Surface Water Monitoring 2008

January 1st – March 31st

Sample Identity	Oils, Fats & Greases	Mineral Oil by GC	pH	COD Settle
	ug/l	ug/l	pH Units	mg/l
Limit	15000	5000	n/a	250
Interceptor 10.01.08 (Enva)	N/A	N/A	7.99	99
Interceptor 18.01.08 (Enva)	N/A	N/A	8.11	137
Interceptor 23.01.08 (Enva)	N/A	N/A	7.07	147
Interceptor 28.01.08 (Enva)	N/A	N/A	7.47	137
Interceptor 15.01.08 (Geochem)	2000	<10	7.12	70
Interceptor 01.02.08(Enva)	N/A	N/A	7.29	176
Interceptor 07.02.08 (Enva)	N/A	N/A	6.42	116
Interceptor 11.02.08 (Enva)	N/A	N/A	7.55	144
Interceptor 19.02.08 (Enva)	N/A	N/A	7.96	13
Interceptor 26.02.08 (Enva)	N/A	N/A	7.37	247
Interceptor 19.02.08 (Geochem)	<1000	<10	7.77	<15
Interceptor 04.03.08 (Enva)	N/A	N/A	8.14	50
Interceptor 14.03.08 (Enva)	N/A	N/A	7.08	92
Interceptor 18.03.08 (Enva)	N/A	N/A	8.03	35
Interceptor 26.03.08 (Enva)	N/A	N/A	7.75	82
Interceptor 19.03.08 (Geochem)	<1	<10	7.77	<15

April 1st – June 30th

Sample Identity	Oils, Fats & Greases	Mineral Oil by GC	pH	COD Settled
	ug/l	ug/l	pH Units	mg/l
Limit	15000	5000	n/a	250
Interceptor 03.04.08 (Envva)	N/A	N/A	8.66	100
Interceptor 11.04.08 (Envva)	N/A	N/A	7.10	160
Interceptor 17.04.08 (Envva)	N/A	N/A	7.66	37
Interceptor 25.04.08 (Envva)	N/A	N/A	8.21	145
Interceptor 29.04.08 (Envva)	N/A	N/A	7.29	40
Interceptor 16.04.08 (Geochem)	2000	<10	7.47	24
Interceptor 01.05.08 (Envva)	N/A	N/A	7.61	150
Interceptor 09.05.08 (Envva)	N/A	N/A	6.87	175
Interceptor 15.05.08 (Envva)	N/A	N/A	7.53	77
Interceptor 21.05.08 (Envva)	N/A	N/A	7.53	90
Interceptor 29.05.08 (Envva)	N/A	N/A	7.21	50
Interceptor 05.06.08 (Envva)	N/A	N/A	7.08	23
Interceptor (13.06.08 Envva)	N/A	N/A	7.33	17
Interceptor (19.06.08 Envva)	N/A	N/A	7.46	73
Interceptor (23.06.08 Envva)	N/A	N/A	7.32	53
Interceptor (19.06.08 Geochem)	1000	<10	7.47	35

July 1st – September 30th

Sample Identity	Obs, Fats & Greases	Mineral Oil by GC	pH	Suspended Solids	COD Settled
	ug/l	ug/l	pH Units	mg/l	mg/l
Limit	15000	5000	n/a	60	250
Interceptor 07.07.08 (Envva)	N/A	N/A	7.58	58	81
Interceptor 15.07.08 (Envva)	N/A	N/A	7.93	7	40
Interceptor 21.07.08 (Envva)	N/A	N/A	7.75	24	137
Interceptor 28.07.08 (Envva)	N/A	N/A	7.47	31	81
Interceptor 17.07.08 (Geochem)	<1	<10	7.91	16	34
Interceptor 08.08.08 (Envva)	N/A	N/A	7.60	60	138
Interceptor 15.08.08 (Envva)	N/A	N/A	7.32	42	49
Interceptor 20.08.08 (Envva)	N/A	N/A	6.94	5	76
Interceptor 26.08.08 (Envva)	N/A	N/A	8.46	58	158
Interceptor 14.08.08 (Geochem)	<1	<10	7.84	<10	<15
Interceptor 05.09.08 (Envva)	N/A	N/A	7.93	24	81
Interceptor 08.09.08 (Envva)	N/A	N/A	7.44	34	110
Interceptor 18.09.08 (Envva)	N/A	N/A	6.99	11	71
Interceptor 25.09.08 (Envva)	N/A	N/A	7.63	58	215
Interceptor 25.09.08 (Geochem)	1	155	7.14	13	52

1st October to 31st December

Sample Identity	Obs. Fats & Greases	Mineral Oil by GC	pH	COD Settled
	ug/l	ug/l	pH Units	mg/l
Limit	15000	5000	n/a	250
Interceptor 01.10.08 (Envva)	N/A	N/A	7.37	186
Interceptor 10.10.08 (Envva)	N/A	N/A	7.20	101
Interceptor 14.10.08 (Envva)	N/A	N/A	8.47	86
Interceptor 23.10.08 (Envva)	N/A	N/A	7.58	50
Interceptor 31.10.08 (Envva)	N/A	N/A	7.50	61
Interceptor 29.10.08 (Geochem)	<1	<10	7.70	21
Interceptor 05.11.08 (Envva)	N/A	N/A	7.98	84
Interceptor 11.11.08 (Envva)	N/A	N/A	7.60	48
Interceptor 17.11.08 (Envva)	N/A	N/A	7.39	83
Interceptor 24.11.08 (Envva)	N/A	N/A	8.00	109
Interceptor 28.11.08 (Envva)	N/A	N/A	7.69	89
Interceptor 04.11.08 (Geochem)	<1	<10	8.52	25
Interceptor 03.12.08 (Envva)	N/A	N/A	7.38	107
Interceptor 10.12.08 (Envva)	N/A	N/A	8.41	36
Interceptor 15.12.08 (Envva)	N/A	N/A	8.19	95
Interceptor 22.12.08 (Envva)	N/A	N/A	7.94	84
Interceptor 03.11.08 (Geochem)	1	<10	7.62	43

Appendix 4



ENVA Ireland Ltd.

Waste Emissions to Atmosphere

Compliance Survey Report

- October 2008

DOCUMENT CONTROL SHEET

Client	Envva Ireland Ltd					
Project Title	ENVA Ireland Ltd. Boiler Compliance Monitoring 2008					
Document Title	Waste Licence Emissions to Atmosphere Compliance Survey Report - October 2008					
Document No.	MDE0498Rp0019D02					
This Document Comprises	DCS	TOC	Text	List of Tables	List of Figures	No. of Appendices
	1	1	6	1	0	3

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
F01	Draft	Ronan Murphy	Martin Doherty	Paul Chadwick	West Pier	13/11/2008
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APPENDICES

Appendix A - Sampling And Analysis - Methods And Details

Appendix B – Site Layout Plan

Appendix C – Flue Gas Analyser Calibration Certificate

1 INTRODUCTION

RPS was requested to carry out monitoring of emissions to atmosphere from a dual fired boiler on behalf of Enva Ireland Ltd at their facility located at the Clonminam Industrial Estate, Portlaoise, Co Laois, in order to comply with Condition 8.1 and Schedule D.8 of the Environmental Protection Agency Waste Licence for the site (Waste Licence Register No. W0184-01).

The monitoring was conducted on the 22nd October 2008 in order to fulfil the annual monitoring requirement laid down for emissions to atmosphere from the boiler located at the ENVA site. The following report details the methodology and equipment used to complete the survey.

2 METHODOLOGY

RPS carried out a survey of boiler emissions to atmosphere at the ENVA site in accordance with Condition 8.1 and Schedule D8 of the Environmental Protection Agency (EPA) waste licence (EPA Licence Number W0184-01). Sampling was carried out over a 30-minute period in order to obtain an accurate representation of the gas exiting to atmosphere from the boiler.

2.1 MONITORING LOCATION

Monitoring location A-01 is located in south east of the site. The boiler flue is an enclosed insulated structure located externally to the main boiler house at an estimated height of 30m above ground. The sampling port is located at an estimated 15 metres above ground level. The sampling platform was provided in the form of a mobile elevated working platform (MEWP), specifically a 40 metre articulated boom. A site layout plan detailing the location of the monitoring position A-01, can be found in Appendix B, to the rear of this report.

2.2 EQUIPMENT

Monitoring of emissions to atmosphere at location A-01 was carried out using a *Testo 350 XL flue gas analyser*. This is a specialised flue gas analysis system equipped with electrochemical sensors that conform to the German TÜV Bayern RgG 211 standard and DIN EN 50379 Part 2. Details and calibration information for RPS monitoring equipment used for this survey can be found in Appendix C, located to the rear of this report.

2.3 FLUE GAS ANALYSIS PARAMETERS

The waste licence for the site requires that a number of parameters be measured. Therefore the following parameters were measured using the flue gas analyser:

- **Nitrogen Oxides (NO_x)** –
 - The principal mechanism of NO_x formation in natural gas combustion is thermal NO_x. The thermal NO_x mechanism occurs through the thermal dissociation and subsequent reaction of nitrogen (N₂) and oxygen (O₂) molecules in the combustion air. Most NO_x formed through the thermal NO_x mechanism occurs in the high temperature flame zone near the burners.

- **Sulphur Dioxides (SO_x)**

- The combustion of fuels containing sulphur results in pollutants occurring in the forms of SO₂ (sulphur dioxide) and SO₃ (sulphur trioxide), together referred to as SO_x (sulphur oxides). The level of SO_x emitted depends directly on the sulphur content of the fuel. The level of SO_x emissions is not dependent on boiler size or burner design but rather the sulphur content in the fuel. Emissions of SO₂ from natural gas-fired boilers are low because pipeline quality natural gas typically has sulphur levels of 2,000 grains per million cubic feet. However, sulphur-containing odorants are added to natural gas for detecting leaks, leading to small amounts of SO₂ emissions. Boilers combusting unprocessed natural gas may have higher SO₂ emissions due to higher levels of sulphur in the natural gas.

- **Carbon Monoxide (CO)**

- The rate of CO emissions from boilers depends on the efficiency of natural gas combustion. Improperly tuned boilers and boilers operating at off-design levels decrease combustion efficiency resulting in increased CO emissions.

- **Combustion Efficiency (EffN and EffG)**

- Net efficiency (EffN) is the calculated efficiency in flue gas analysis when no water vapour and thus only the sensible heat (or potential energy in the form of heat) is contained in the flue gas. For calculation therefore the net calorific value of the fuel is used.
- Gross efficiency is the calculated efficiency in flue gas analysis when the latent heat of the water vapour is contained in the flue gas. Therefore in the calculation of the flue gas loss the gross calorific value of the fuel is used.

- **Temperature °C**

4 RESULTS

The results of the 2008 emissions to atmosphere monitoring are presented in table 1.

Table 1: Boiler Monitoring Results at A-01 – 22nd October 2008.

Parameter	Unit	2008 Results (mg/Nm ³) ¹
Nitrogen Oxides (NO _x)	mg/Nm ³	125.75
Sulphur Oxides (SO _x)	mg/Nm ³	0
Carbon Monoxide (CO)	mg/Nm ³	1.11
Combustion Efficiency (EffN – Net Efficiency)	%	56.7
Combustion Efficiency (EffG – Gross Efficiency)	%	51.8
Temperature	°C	246.7

¹ Results presented for NO_x, SO_x and CO are normalised to 273K, 101.3 kPa and %O₂ reference of 3%

5 DISCUSSION

RPS carried out a survey of boiler emissions to atmosphere at the ENVA site in accordance with Condition 8.1 and Schedule D8 of the Environmental Protection Agency (EPA) waste licence (EPA Licence Number W0184-01).

No emission limit values are prescribed in the waste licence for site (EPA Licence Number W0184-01).

6 CONCLUSIONS

In accordance with the criteria set out in Condition 8.1 and Schedule D8 of the sites' Environmental Protection Agency (EPA) waste licence (EPA Licence Number W0184-01) flue gas monitoring of boiler emissions to atmosphere was carried out on October 22nd, 2008.

No emission limits values for emissions to atmosphere from monitoring location A-01 are specified in the licence.

APPENDIX A

SAMPLING AND ANALYSIS - METHODS AND DETAILS

A.1.1 Location of Sampling

Envia Ireland Limited

Clonminam Industrial Estate

Portlaoise

Co Laois

A.1.2 Date & Time of Sampling

22nd October 2008, Sampling started at 12.30 am

A.1.3 Personnel Present During Sampling

Ronan Murphy, Environmental Consultant, RPS Group, Dublin

A.1.4 Instrumentation

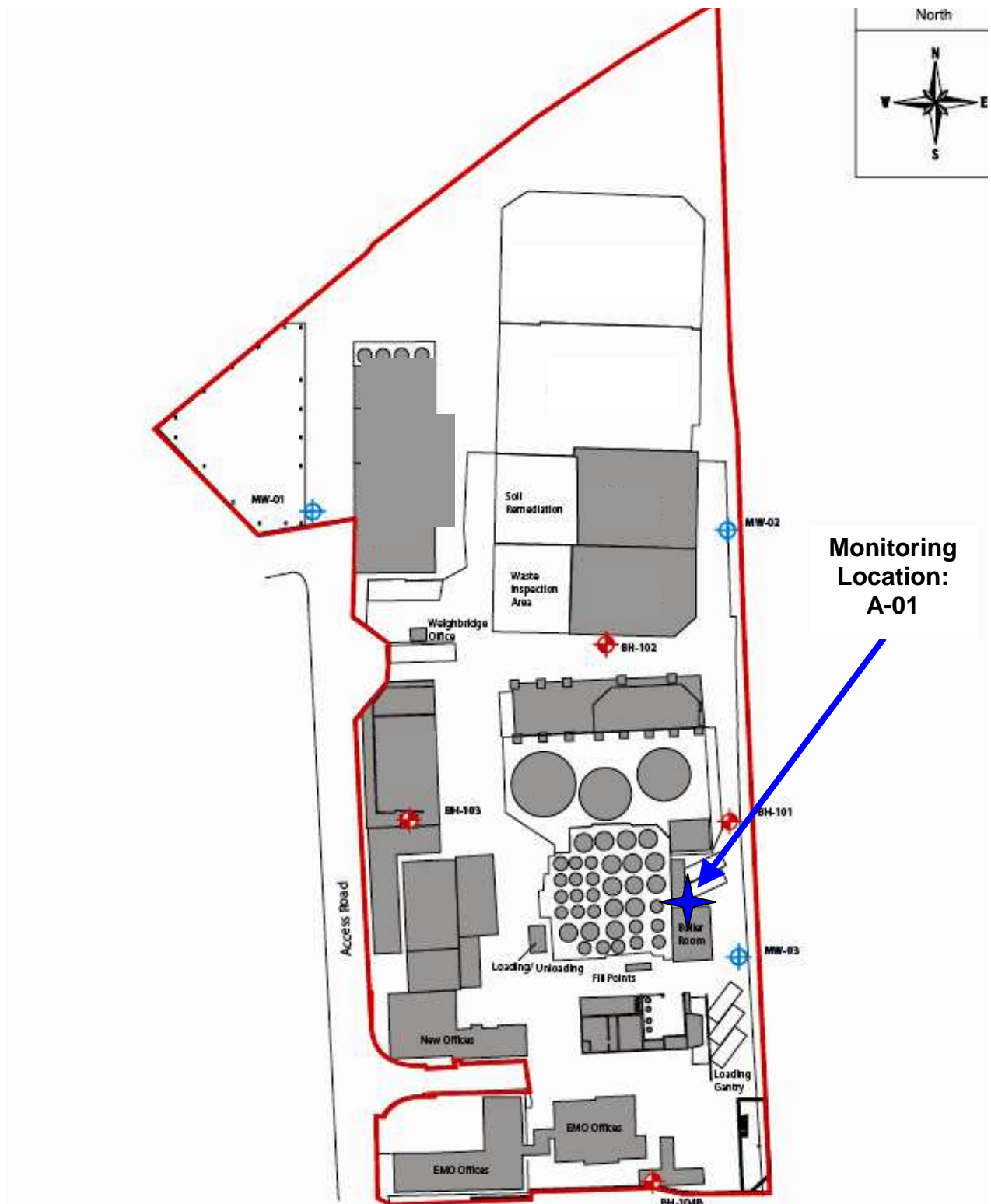
TESTO 350XL Flue Gas Analyser

L-Type Pitot Tube

Testo 512 Digital Micromanometer

APPENDIX B

SITE LAYOUT PLAN



APPENDIX B

FLUE GAS ANALYSER CALIBRATION CERTIFICATE



Kalibrier-Protokoll

Certificate of conformity • Protocole d'étalonnage
Protocollo di collaudo • Informe de calibración

Gerät / Module type / Type de modèle / Prodotto / Modelo: t350 XL
Serien-Nummer / Serial No. / No. de série / No. Serie strumento / n° de serie: 1204530

Temperaturmessung Temperature measurement Mesure de température Misura della temperatura Medición de temperatura	Sollwert Reference Référence Valore campione Referencia	Istwert Actual value Valeur effect. Valore misurato Valor medido	zulässige Abweichung Permissible deviation Différence admissible Scostamento ammesso Desviación permitida
--	---	--	---

Verbrennungslufttemp. / Ambient air temp. Température d'air de combustion Temperatura aria comburente Temperatura ambiente	100.0 °C	100.1 °C	+ - 0.5 °C
---	----------	----------	------------

Abgastemperatur / Flue gas temperature Température des fumées Temperatura fumi Temperatura gases	100.0 °C	99.9 °C	+ - 0.5 °C
---	----------	---------	------------

Zug-/Druckmessung Draught/pressure measurement Mesure de tirage/de pression Misura della pressione/ tiraggio Medición de tiro/presión	Sollwert Reference Référence Valore campione Referencia	Istwert Actual value Valeur effective Valore misurato Valor medido	zulässige Abweichung Permissible deviation Différence admissible Scostamento ammesso Desviación permitida
---	---	--	---

Gasmeßwerte / Gas values / Valeurs de gaz mesurées / Parametri di misura dei gas / Gases patrón

Reg. Nr. Reg. No. Reg. No. Num.reg. n° certi	Gas Gas Gaz Gas Gas	Sollwert Reference Référence Valore campione Referencia	Istwert Actual value Valeur effective Valore misurato Valor medido	zulässige Abweichung Permissible deviation Différence admissible Scostamento ammesso Desviación permitida
D173636	O2	0.0 %	0.0 %	+ - 0.2 %
7427B	O2	1.4 %	1.4 %	+ - 0.2 %
3655A	O2	5.0 %	5.0 %	+ - 0.2 %
D173636	CO	102 ppm	101 ppm	+ - 10 ppm
3655A	CO	415 ppm	409 ppm	+ - 21 ppm
7427B	CO	1030 ppm	1021 ppm	+ - 52 ppm
D173636	NO	151 ppm	150 ppm	+ - 8 ppm
1797C	SO2	97 ppm	97 ppm	+ - 5 ppm
0474C	NO2	102.5 ppm	102.5 ppm	+ - 5.0 ppm

Datum/Date/Date/Data/Fecha: 26.03.2008 Prüfer/Inspector/Vérificateur/Verificatore/Verificador: 84

Kalibrier-Protokoll

Certificate of conformity • Protocole d'étalonnage
Protocollo di collaudo • Informe de calibración

Wir bestätigen, dass dieses Testo-Produkt unter Beachtung eines zertifizierten Qualitätssicherungssystems nach **DIN EN ISO 9001:2000** abgeglichen wurde.

Die dafür verwendeten Messeinrichtungen werden regelmäßig kalibriert und sind rückführbar auf die nationalen Normale der Physikalisch Technischen Bundesanstalt (PTB) Deutschlands oder auf andere nationale Normale. Wo keine nationalen Normale existieren, entspricht das Messverfahren den derzeit gültigen technischen Regeln und Normen.

Dieses Kalibrier-Protokoll belegt die Einhaltung der von uns zugesagten Toleranzen.

Sehr gerne informieren wir Sie über **Kalibrier-Zertifikate**, die die Toleranzen **des gesamten Messsystems** (Messgerät und Fühler) beinhalten.

Dieses Zertifikat benötigen Sie, wenn das Meßsystem in qualitäts-relevanten Prozessen innerhalb eines nach **DIN EN ISO 9001:2000** zertifizierten Unternehmens eingesetzt wird.

Unsere Kalibrierlabors für Temperatur, Druck, Feuchte, Strömung und elektrische Messgrößen sind vom Deutschen Kalibrierdienst (DKD) akkreditierte Kalibrierlabors. DKD-Kalibrierscheine werden für Messungen gefordert, bei denen die Genauigkeit eine entscheidende Rolle spielt.

*We confirm that this Testo product was calibrated under the observation of a **DIN EN ISO 9001:2000** certified quality assurance system.*

The measuring installations used for this calibration are calibrated regularly and can be traced back to the national standards of the German Federal Physical and Technical Institution (PTB), or to other national standards. Should no national standards exist, the measuring procedure corresponds with the currently valid technical regulations and standards.

This calibration protocol is proof of adherence to the tolerances as confirmed by us.

*We would be delighted to inform you about **certificates of conformities** which cover the tolerances for the **complete measuring system** (measuring instrument and probes).*

*This certificate is required only if the measuring system is to be used in processes relevant to quality in a company certified to **DIN EN ISO 9001:2000**.*

Our calibration laboratories for temperature, pressure, humidity, velocity and electrical parameters are calibration laboratories accredited by the German Calibration Service (DKD).

DKD calibration certificates are required for measurements where accuracy plays a decisive role.

Nous confirmons par la présente que ce produit testo a été étalonné sous la surveillance d'un système d'assurance qualité selon la norme **DIN EN ISO 9001:2000**.

Les installations de mesure utilisées pour cet étalonnage sont étalonnées de façon régulière et s'appliquent aux normes nationales de l'Institut Fédéral de Techniques Physiques d'Allemagne (PTB) ou aux autres normes nationales. S'il n'existe aucune norme nationale, le processus de mesure est conforme aux règles et normes techniques actuellement valables.

Ce protocole d'étalonnage vous indique que cet appareil respecte bien les tolérances constructeurs annoncées dans nos documentations.

Un **certificat d'étalonnage** est nécessaire pour la

vérification de la **chaîne complète** (appareils et sonde). N'hésitez pas à nous contacter pour de plus amples renseignements.

Ce certificat vous sera utile si vous vous trouvez être certifié ou en cours de certification **DIN EN ISO 9001:2000**.

Notre laboratoire d'étalonnage en température, pression, humidité, vitesse d'air et paramètres électriques a été accrédité par le DKD - équivalent BNM/COFRAC -, Bureau de Métrologie Allemand.

Les certificats d'étalonnage DKD/COFRAC sont indispensables lorsque les mesures effectuées doivent être précises.

*Vi confermiamo che questo prodotto è stato collaudato seguendo il sistema di certificazione di qualità **DIN EN ISO 9001:2000**.*

Gli strumenti di misura elettronici utilizzati per la calibrazione sono a loro volta regolarmente verificati e possono essere ricondotti agli standard nazionali del PTB (Physikalisch Technische Bundesanstalt), l'istituto ufficiale tedesco per la determinazione degli standard tecnici.

Questo protocollo di collaudo documenta l'osservanza delle tolleranze da noi indicate.

*Siamo a Vs. disposizione per fornire informazioni sui **Certificati di Taratura** che comprendono le tolleranze del **sistema di misura completo** (strumento e sonda).*

*Questo documento Vi sarà utile se già siete certificati o siete in corso di certificazione **DIN EN ISO 9001:2000**.*

I nostri laboratori di taratura per temperatura, pressione, umidità, velocità dell'aria e parametri elettrici sono stati accreditati dal PTB e sono in grado di rilasciare certificati ufficiali DKD indispensabili quando le misure effettuate devono essere precise o riferibili.

Queste regole, riconosciute in tutta Europa, sono equivalenti a quelle SIT italiane ed alle procedure tecniche standard utilizzate in tutto il mondo.

Confirmamos que este producto Testo se calibró de acuerdo con el sistema de garantía de calidad **DIN EN ISO 9001:2000**.

Las instalaciones de medición utilizadas para esta calibración se calibran con regularidad y pueden tracearse a los estándares nacionales del Instituto Federal de Técnicas Físicas Alemán (PTB), o a otros estándares nacionales. Si no existe una norma nacional, el procedimiento de medición corresponde con las regulaciones técnicas y normas válidas en la actualidad.

Este informe de calibración es una prueba de las tolerancias que nosotros confirmamos.

Estaremos encantados de informales sobre **certificados de calibración** que cubran las tolerancias para el **sistema de medición completo** (instrumento de medición y sondas).

Nuestros laboratorios de calibración para temperatura, presión, humedad, velocidad y parámetros eléctricos son laboratorios de calibración acreditados por el Servicio de calibración alemán (DKD).

Los certificados de calibración DKD son necesarios para las mediciones donde la precisión sea muy importante.

Appendix 5



Enva Ireland Ltd

Annual Noise Survey 2008

DOCUMENT CONTROL SHEET

Client	Enva Ireland Ltd					
Project Title	Annual Noise Survey 2008					
Document Title	Annual Noise Survey Report					
Document No.	MDE0498Rp0018					
This Document Comprises	DCS	TOC	Text	List of Tables	List of Figures	No. of Appendices
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APPENDIX B	Acoustical Parameters
APPENDIX C	Frequency Analysis Charts
APPENDIX D	Noise Monitoring Locations
APPENDIX E	Equipment Calibration Certificates

1 INTRODUCTION

RPS Group was commissioned by Enva Ireland Limited to measure existing noise levels on the boundary of their facility and at the nearest noise sensitive location in order to assess compliance with the noise related conditions of the Environmental Protection Agency (EPA) waste management licence for the site (Licence Register Number W0184-01). The Enva facility is located in the Clonminam Industrial Estate, Portlaoise, Co. Laois

1.1 SUMMARY

A detailed environmental noise survey was carried out at various locations in and around the Enva site boundary and at the nearest residential location on August 14th, 2008.

It was found that the noise climate around these locations was comprised of a number of noise sources including on-site operations at Enva, in addition to rail and road traffic. Noise from the Enva site was inaudible at the nearest noise sensitive location, which was dominated by traffic noise from the nearby Knock May road. No impulsive or tonal noise attributable to activities at the Enva site was detected at noise sensitive locations during the survey period. Meteorological conditions were calm and dry throughout the survey.

1.2 SITE DESCRIPTION

The Enva Ireland site is located within the Clonminam Industrial Estate, Portlaoise, Co. Laois. The surrounding area is comprised of neighbouring industrial and warehouse units within the industrial estate (to the south), the Dublin - Cork railway line borders (northern site boundary) and an Iarnród Éireann railway depot (eastern boundary).

Condition 1.5 of the Environmental Protection Agency licence for the site (Licence Register Number W0184-01) specifies waste acceptance and general operating hours of 07:30 – 21:00 and 07:00 – 23:00 respectively. In practice however ENVA no longer operates during evening or nighttime hours and the site can be deemed to be inactive from around 17:30.

2 SURVEY DETAILS

2.1 SURVEY LOCATIONS

A noise survey was conducted both along both the site boundary and the nearest noise sensitive location (Monitoring locations are illustrated in Appendix D). Four of the five monitoring locations are positioned along the site boundary (N1, N2, N3 and N4), while the remaining monitoring location N5 is located in the vicinity of an nearby residential area.

Noise Monitoring Location	Description
N1	Along the mid western site boundary at entrance gates to weighbridge
N2	South eastern boundary opposite port-a cabins.
N3	North eastern boundary –behind waste oil storage shed at boundary fence.
N4	Nearby residential area, south east of Enva and railway yard.
N5	North west of Enva site, on the corner with access road for Rowan park halting site (currently deserted).

Table 1: Description of noise monitoring locations

2.2 SURVEY METHODOLOGY

Noise measurements were made during and outside of the typical operational hours at the Enva site as previously discussed in section 1.2. Measurements were performed at a total of five locations, four at the boundary of the site, and one at the nearby residential estate. 30 minute measurements were made of the L_{Aeq} , L_{A10} , L_{A90} , L_{Amax} and L_{Amin} noise parameters as well as 1/3 octave band filtered data. A description of these measurement parameters is included in Appendix B. Noise levels were recorded using a Type 1 Brüel and Kjær 2250 Integrating Averaging Sound Level Meter with real time analysis (Details and Serial Number can be found in Appendix E to the rear of this report). All measurements made were performed in accordance with the international standard ISO1996-1:2003 “Acoustics - Description, measurement and assessment of environmental noise - Part 1: Basic quantities and assessment procedures”. All measurements were taken free field, at least 3 m away from any reflective surface or structure and at a height of 1.2m to 1.5m. Measurements were made for a period of 30 minutes during both the day and night time part of the survey.

The sound level meter was calibrated by a Brüel & Kjær Type 4231 Sound Level Calibrator (94dB @ 1kHz) prior to carrying out the survey. The meter was subsequently checked after the survey, to ensure that there was no difference in the instrument’s readings. Calibration details for these instruments have been included as an attachment in Appendix E of this Report.

During the day and night time part of the survey, the weather was generally dry and calm, a light north easterly breeze was also present at various times during the survey. Full survey details have been

included in Appendix A, whilst a description of weather details present during each measurement has also been provided in tables 2 and 3.

2.3 WASTE LICENCE NOISE CONDITIONS

The noise related requirements of the licence are included in conditions 6.7 and 7.1.

Condition 7.7.1 of the Enva Ireland Waste Management Licence (Licence Register Number W0184-01), stipulates that:

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

Noise Criteria as Schedule D specifies a daytime (08:00 – 22:00) noise limit of 55dB L_{Aeq} and a night time (22:00 – 08:00) limit of 45dB L_{Aeq} .

Condition 6.7 of the licence requires that:

'There shall be no clearly audible tonal or impulsive components in the noise emissions from the activity at the nearest noise sensitive locations'.

3 SURVEY RESULTS

The various noise parameters measured at each location are included in Tables 2 and 3. Please note that all values are presented in A-weighted decibels (dB (A) re 2x10⁻⁵ Pa). A description of the acoustical parameters referred to is provided in Appendix B. The results of the 1/3 Octave Band Analysis are presented graphically in Appendix C. A description of the noise climate observed during monitoring at each location has been described below.

3.1 SITE BOUNDARY LOCATIONS

Location	Start time	Sound Pressure [dB]					Comments
		L _{Aeq}	L _{AMax}	L _{AMin}	L _{A10}	L _{A90}	
N1	16:35	63.0	89.5	48.8	60.0	50.7	(Onsite) Fine/Dry Light Breeze NE direction – ENVA Site Activity audible (HGV traffic around site, site plant/compressors/pumps operating), gate opening, offsite noise passing traffic from industrial estate audible swallows calling nearby.
	23:43	45.5	57.7	38.6	48.0	41.1	(Onsite) Fine/Dry Light Air Direction unidentifiable – ENVA Site inaudible, offsite noise passing traffic from industrial estate.
N2	15:58	58.8	77.0	53.9	59.8	55.3	(Onsite) Slight Drizzle/Light Breeze NE Direction – ENVA Site Activity audible (HGV movement and idling at nearby liquid waste reception building, compressors/pumps audible from site building to the north), some offsite noise audible (reversing beacons, traffic).
	23:10	45.5	61.9	38.5	47.2	41.5	(Onsite) Fine/Dry Light Air Direction unidentifiable – ENVA Site audible at low levels (some plant noise audible), offsite traffic noise from industrial estate (dominant noise source).
N3	15:17	57.6	76.3	36.8	61.6	41.4	(Onsite) Fine/dry light breeze NE direction - ENVA Site Activity audible, metals machine parts being dropped in nearby shed, plant/compressors/pumps audible from buildings @ south end of site, HGV traffic in and out of nearby soil remediation shed (reversing beacon audible, amplified by shed, train passing (@ 15:28), caterpillar loader and trommel screen in operation @ 15:35 (dominant noise source).

	22:37	48.8	64.6	39.3	48.8	42.5	(Onsite) Fine/dry light breeze NE direction - ENVA Site inaudible, some offsite traffic noise audible at low levels, train passing on adjacent track.
N5	17:13	50.9	73.8	38.9	51.6	43.6	(Offsite) Fine/dry light breeze NE direction - ENVA Site audible (reversing sirens, stone/rubble movement also audible, HGV traffic idling at weigh bridge on entering and exiting site), train passing @ 17:23.
	22:05	44.7	65.4	37.7	47.0	40.8	(Offsite) Fine/dry light breeze NE direction - ENVA Site inaudible, some offsite traffic noise audible at low levels, train passing on adjacent track.

Table 2: Noise Survey Results from on and offsite boundary locations

3.2 NOISE SENSITIVE LOCATION

Location	Start time	Sound Pressure [dB]					Comments
		L _{Aeq}	L _{AMax}	L _{AMin}	L _{A10}	L _{A90}	
N4	17:49	55.9	71.0	38.2	60.6	41.8	(Offsite) Fine/dry light breeze Direction Unidentifiable - ENVA Site inaudible, road traffic dominant noise source, some localised road traffic within housing estate, train passing along main track to north, some industrial noise audible to north (source unidentifiable).
	00:18	47.1	66.0	36.9	49.9	39.8	(Offsite) Fine/dry light breeze Direction Unidentifiable - ENVA Site inaudible, infrequent road traffic dominant noise source.

Levels exceeding Licence Emission Limit Values (including 2 dBA allowance as specified in condition 7.1.1 of the site waste licence) are highlighted in Bold

Table 3: Noise Survey Results from the nearest noise sensitive location

3.3 FREQUENCY ANALYSIS RESULTS

Condition 6.7 of the licence states that:

‘There shall be no clearly audible tonal or impulsive components in the noise emissions from the activity at the nearest noise sensitive locations’.

Tonal assessment of noise measurements was carried out on measurements taken during monitoring in order to identify the presence of tonal components ($1/3^{\text{rd}}$ octave band) in the measured noise. Graphic representations of this frequency analysis have been displayed in Appendix C. Although no tonal or impulsive was detected aurally during the survey, post monitoring analysis of the noise data suggests that a tone in frequency range of 6300-8000 hertz was present during the night time monitoring period at N4. However an examination of the frequency analysis data for the noise monitoring locations at the boundary of the site shows that no corresponding tone was present either during the day or night time periods at any of these locations. It can be deduced therefore that the tonal noise present at N4 was not due to activities at ENVA site.

4 DISCUSSION

The noise survey was carried out to obtain a profile of the noise climate in the vicinity of the Enva site, and to ascertain whether activities at the site were serving to elevate noise levels in the existing climate. The survey was carried out on a typical working day at the facility in order to assess noise levels arising from normal operational activities. Although the site is no longer active during the night time period, the survey was carried during the day and night period in order to satisfy the monitoring requirement specified in the waste licence. The main noise sources during the operational hours of the site were generated from the trafficking and idling of heavy goods vehicles including tankers and dump trucks, as well as the movement of loaders and forklifts around the site. Other noise from the general handling of waste including the loading and unloading of waste materials and plant machinery noise (hydraulics, pumps, generators) was also audible.

4.1 BOUNDARY LOCATIONS

During the daytime monitoring period, noise from the operation of the Enva plant was the main noise source at the boundary noise monitoring locations. Plant operations (pumps, hydraulics, generators) as well as the movement and idling of loaders, forklifts and HGVs attributed to the majority of audible noise. Occasional noise from reverse warning alarms on delivery vehicles and loaders was audible from within the Enva site. Offsite noise from vehicular traffic within the industrial estate, passing train traffic and noise from adjacent industrial sites was also audible intermittently.

During the daytime period, noise levels at locations N1, N2 and N3 were dominated by machinery operating in Enva and off-site noise from vehicular traffic within the industrial and passing train traffic. During the night time periods, the noise climate at locations N1, N2 and N3 was dominated by vehicular traffic in and around the industrial estate as well as passing train traffic. In general no activities from the ENVA site were audible during night time monitoring, however some pumps and compressors were audible at low levels at monitoring location N2.

4.2 NOISE SENSITIVE LOCATION

The noise climate at noise monitoring point N4 was dominated by vehicular traffic along the adjacent Knock May road during the day and night time periods. The ENVA site was inaudible from this location during both the day and night time measurement periods.

Daytime and nighttime measurements at the nearest noise sensitive location to the ENVA site were within the 2 dBA allowance for levels in excess of specified limits of 55dB L_{Aeq} and 45 L_{Aeq} for day and night time noise respectively. Activities at the Enva site are therefore in compliance with the noise related condition 7.1 of the waste licence for the site.

4.3 FREQUENCY ANALYSIS

One-third octave band data was measured at each of the noise sensitive locations during the noise survey, a graphical representation of the 1/3 octave band data at each location has been included in appendix C to the rear of this report. It was found that a tone in frequency range of 6300-8000 hertz was present during the night time monitoring period at N4. However an examination of the frequency analysis data for the noise monitoring locations of the boundary of the site shows that no corresponding tone was present either during the day or night time periods at any of these locations and it can be deduced therefore that the tonal noise present at N4 was not due to activities at Enva site. The Enva site is therefore in compliance with the noise related condition 6.7 of the waste licence for the site.

5 CONCLUSIONS

An environmental noise survey was conducted at the Enva Ireland site in Portlaoise on 14th August 2008. The results and observations of the surveys indicates that operations at the Enva Ireland site are in compliance with the noise related conditions of the environmental protection agency licence for the site and are not creating any impact on the surrounding noise environment. Overall, the results of the 2008 noise survey for Enva site show that

- Noise levels at the nearest noise sensitive location were compliant with condition 7.7.1 of the waste licence concerning limits for noise levels at any noise sensitive location.
- No tonal or impulsive components attributable to activities at the Enva site were detected from measurements recorded at the nearest noise sensitive location, this shows compliance with condition 6.7 of the waste licence concerning the presence of tonal or impulsive noise at any noise sensitive location.

APPENDIX A

Survey Details

A1 - Location of Survey

Enva Ireland Ltd
Clonminam Industrial estate
Portlaoise
Co Laois

A2 - Date & Time of Survey

Thursday, 15th August 2008
15:15 to 18:20 – Daytime Survey
22.00 to 00.50 – Night time Survey

A3 – Weather Conditions

Daytime Conditions – Dry and calm – light breeze – North East direction.

Night time Conditions – Dry and calm – light breeze – North East direction.

A.4 Personnel Present During Survey

Ronan Murphy Environmental Consultant RPS Group

A.5 Instrumentation

Brüel & Kjær Type 2250 Mediator Sound Level Meter
Brüel & Kjær Type 4231 Sound Level Calibrator

A.6 Procedure

Before and after the survey the measurement apparatus was check calibrated to an accuracy of ± 0.2 dB using the relevant calibrators. All measurements were made in accordance with ISO 1996: Acoustics: *Description and measurement of environmental noise*.

APPENDIX B

Summary of Terms

L_{Aeq} The continuous equivalent A-weighted sound pressure level. This is an “average” of the sound pressure level.

L_{Amax} is the maximum A-weighted sound level measured during the sample period.

L_{Amin} is the minimum A-weighted sound level measured during the sample period.

L_{A90} The noise level exceeded for 90% of the measurement period. This is normally used to measure background noise.

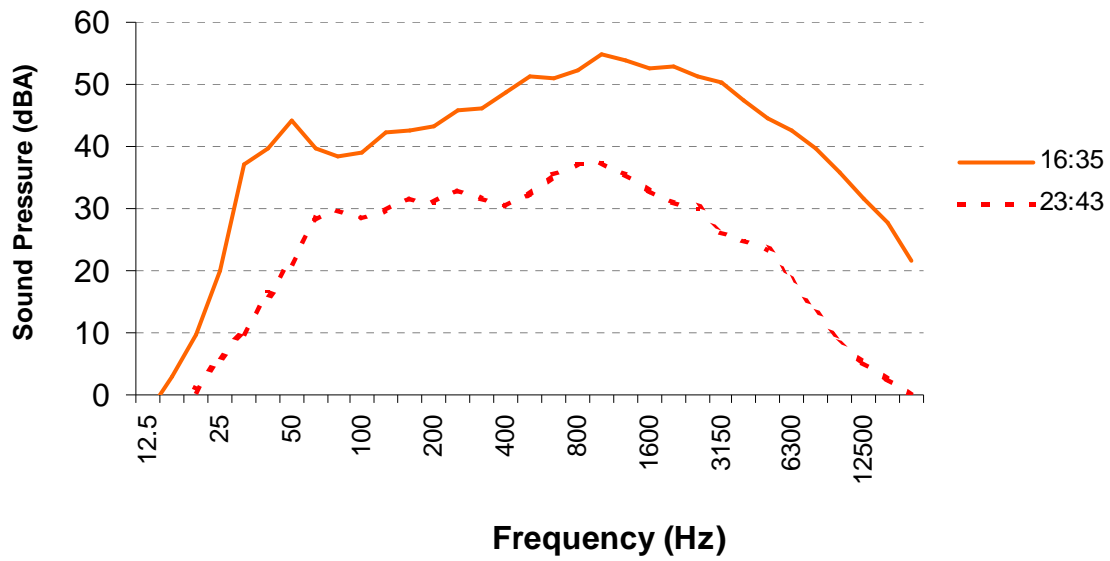
L_{A10} The noise level exceeded for 10% of the measurement period. This is normally used to measure road traffic noise.

L_A Denotes, measurements were made using the A-weighting network. The A-weighting represents the response of human ear to sound.

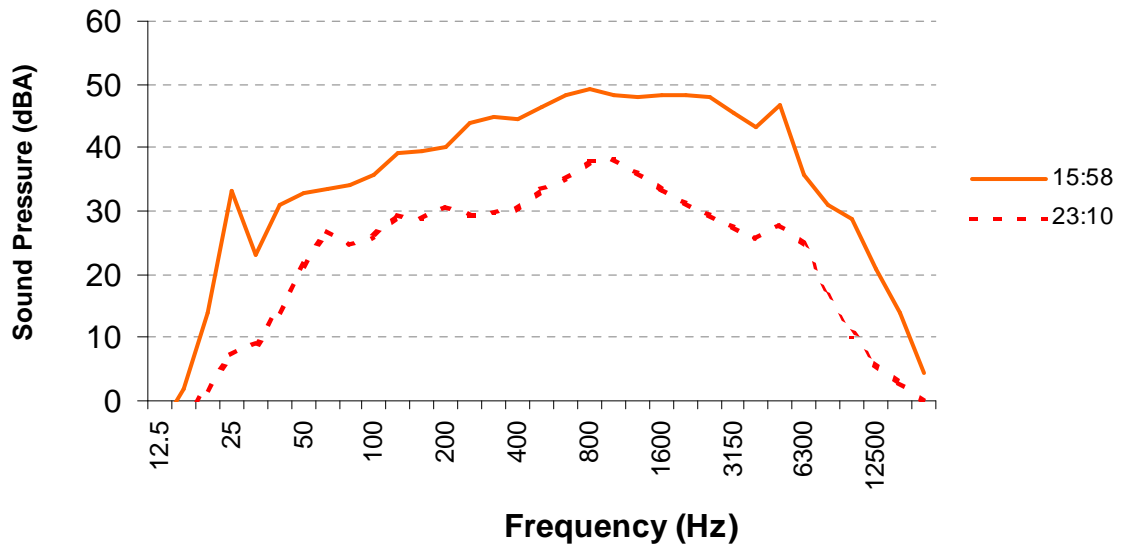
APPENDIX C

Frequency Analysis - 1/3 Octave Band Analysis Measured During Noise Survey

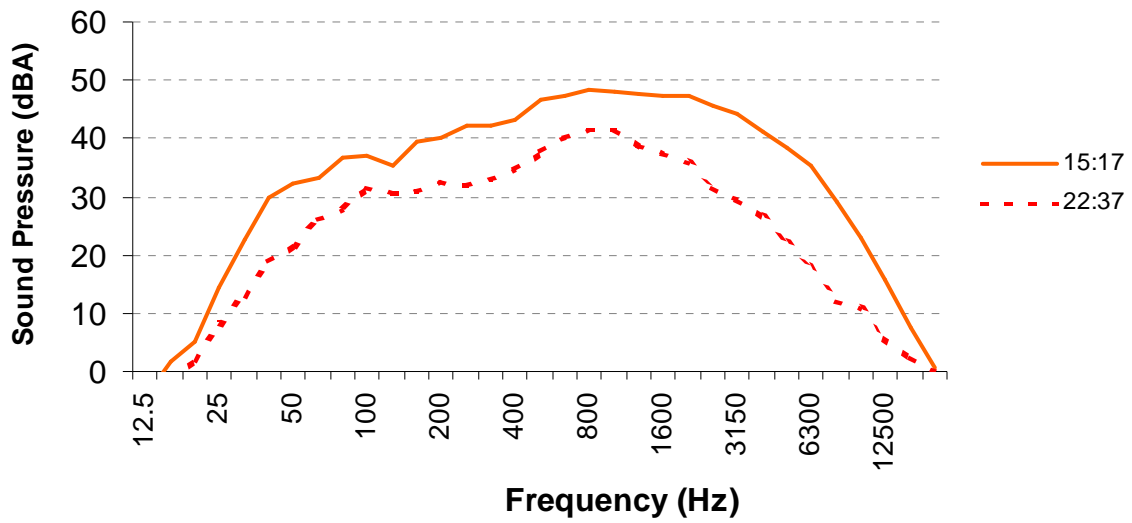
N1 1/3 Octave Band Frequency Analysis



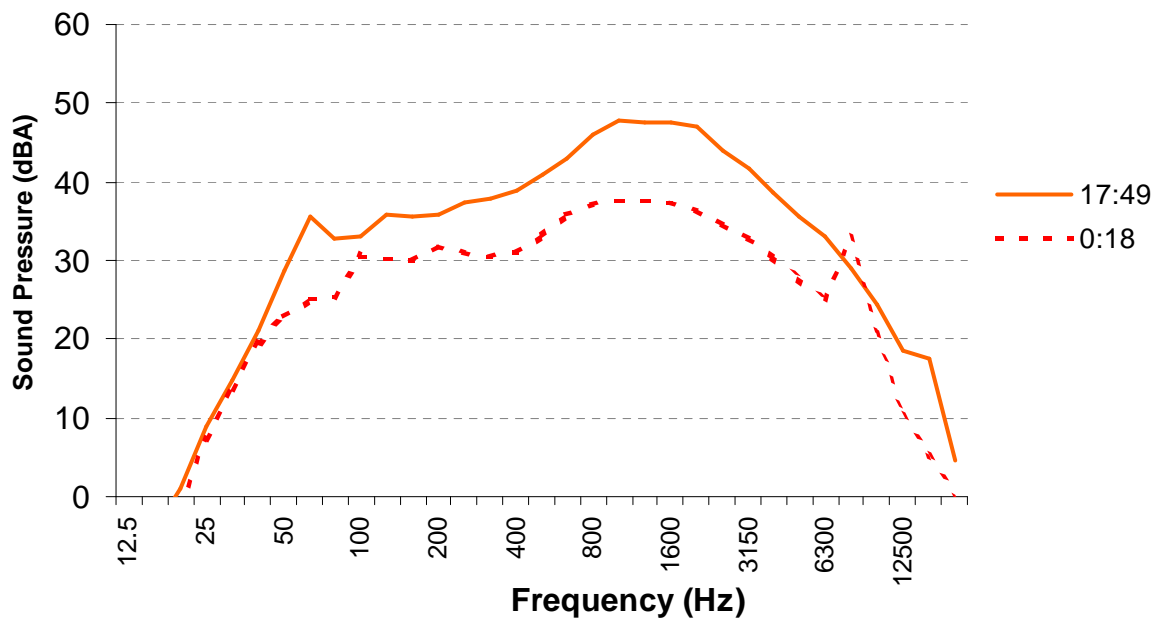
N2 1/3 Octave Band Frequency Analysis



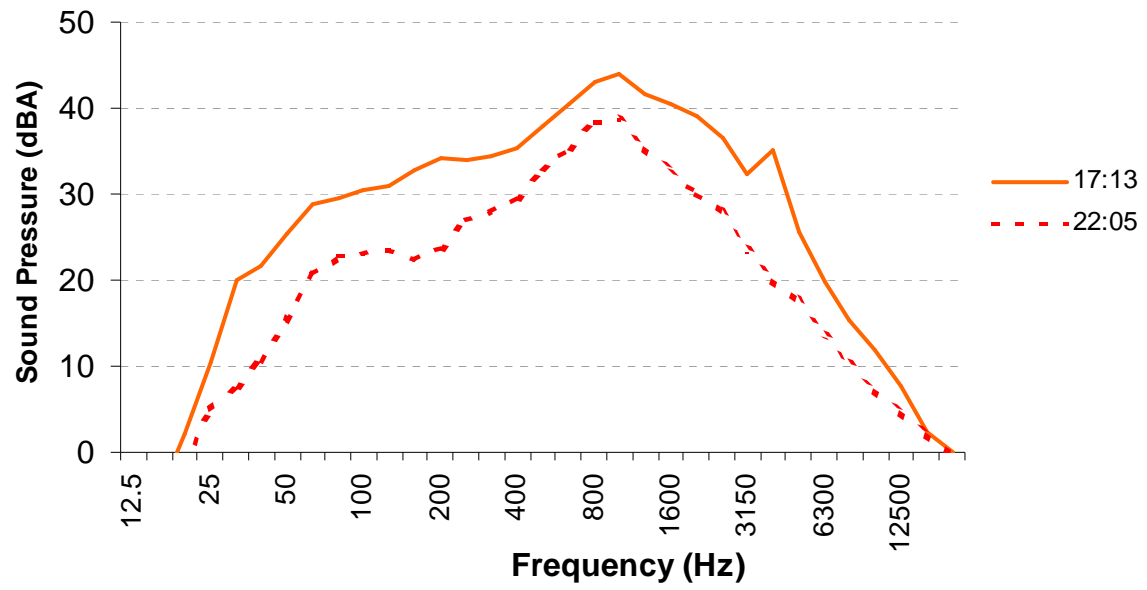
N3 1/3 Octave Band Frequency Analysis



N4 1/3 Octave Band Frequency Analysis



N5 1/3 Octave Band Frequency Analysis



APPENDIX D

Noise Monitoring Locations

APPENDIX E

Equipment Calibration Certificates

CERTIFICATE OF CALIBRATION

No: C0801024

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CALIBRATION OF:

Sound Level Meter:	2250	No: 2505990
Microphone:	4189	No: 2353091
Identification:		
Date of receipt:	01. Feb. 2008	

CUSTOMER:

RPS Group Ltd
West Pier Business Campus
Dun Laoghaire
Co Dublin
Ireland

CALIBRATION CONDITIONS:

Preconditioning:	4 hours at 23 °C	
Environment conditions:	Air temperature:	23.0 °C ± 3°C
	Air pressure:	101.3 kPa ± 3 kPa
	Relative Humidity:	50.0 %RH ± 25 %RH

SPECIFICATIONS:

The Sound Level Meter has been calibrated in accordance with the requirements as specified in IEC60651 and 60804 type 1.

PROCEDURE:

The measurements have been performed with the assistance of Brüel & Kjær Sound Level Meter Calibration System B&K 3630 with application software type 7763 and test collection 2250-4189

RESULTS:

Initial calibration

Calibration prior to repair/adjustment

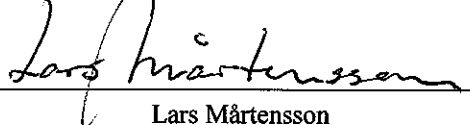
Calibration without repair/adjustment

X Calibration after repair/adjustment

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

Date of Calibration: 19. Feb. 2008

Certificate issued: 20. Feb. 2008



Lars Mårtensson
Calibration Technician



Peter Gaardsdal
Approved signatory

CERTIFICATE OF CALIBRATION

Issued by: **Brüel & Kjær Sound & Vibration A/S.**

Date of Issue: 03 Jul. 2008 Certificate Number C0804692



0174


Brüel & Kjær 

Skodsborgvej 307. DK-2850 Nærum, Denmark
The calibration laboratory.
Telephone : +45 45 800 500 Fax : +45 45 801 40
E-Mail : ukservice@bksv.com

Page 1 of 2 pages

Approved signatory

Name: *Nils Johansen*

Signature: 

CALIBRATION OF CALIBRATOR TYPE 4231

Client: RPS Group Ltd
West Pier Business Campus
Dun Laoghaire
Co Dublin
Ireland

Calibrator Type 4231:	S/No:	1914452
Client Inventory Number:		DE019
Manufacturer:		Brüel & Kjær
Equipment Received on:		01 Jul. 2008
Calibration Date:		03 Jul. 2008
Brüel & Kjær Reference No:		

Measurement Method

The Calibration was performed to Laboratory Procedure TWI-104-DK.

Sound pressure level in the coupler of this calibrator was measured with a calibrated, laboratory grade condenser microphone specified in the certificate. In the case of 1/2 inch microphone, the 1/2 inch adaptor supplied with the calibrator was used. Choice of 1 or 1/2 inch microphone is specified in the customers order.

Sound pressure level measured was compared with sound pressure level generated in the coupler of a working standard pistonphone calibrated by the National Physical Laboratory using the same microphone and at the same ambient conditions.

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to recognised national standards, and to units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

CERTIFICATE OF CALIBRATION

Certificate Number

C0804692

UKAS Accredited Calibration Laboratory Number 0174

Page 2 of 2 pages

Appropriate corrections for atmospheric pressure during calibration and for measurement system frequency and level response were taken into account.

Sound pressure level results given in the certificate are the mean of 5 measurements.

Calibration results apply at ambient conditions during the process of calibration, which are given in the certificate.

CALIBRATION RESULTS

Coupler Configuration	Microphone Type (without grid)	Output Level dB re 20µPa At ambient Testconditions	+20dB Level Step in dB	Frequency Hz (Not UKAS Accredited)	Total Harmonic Distortion in % (Not UKAS Accredited)
1/2"	4180	93,98	19,95	999,9	0,70
1"	4160				

The expanded uncertainties are as follows:

Output Level: ± 0.15 dB.

Level Step: ± 0.04 dB

Frequency: \pm (last reported digit).

Total Harmonic Distortion: $\pm 0.3\%$ Distortion.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Ambient conditions during calibration were:

Atmospheric Pressure: 101,04 kPa

Temperature: 24,5 °C

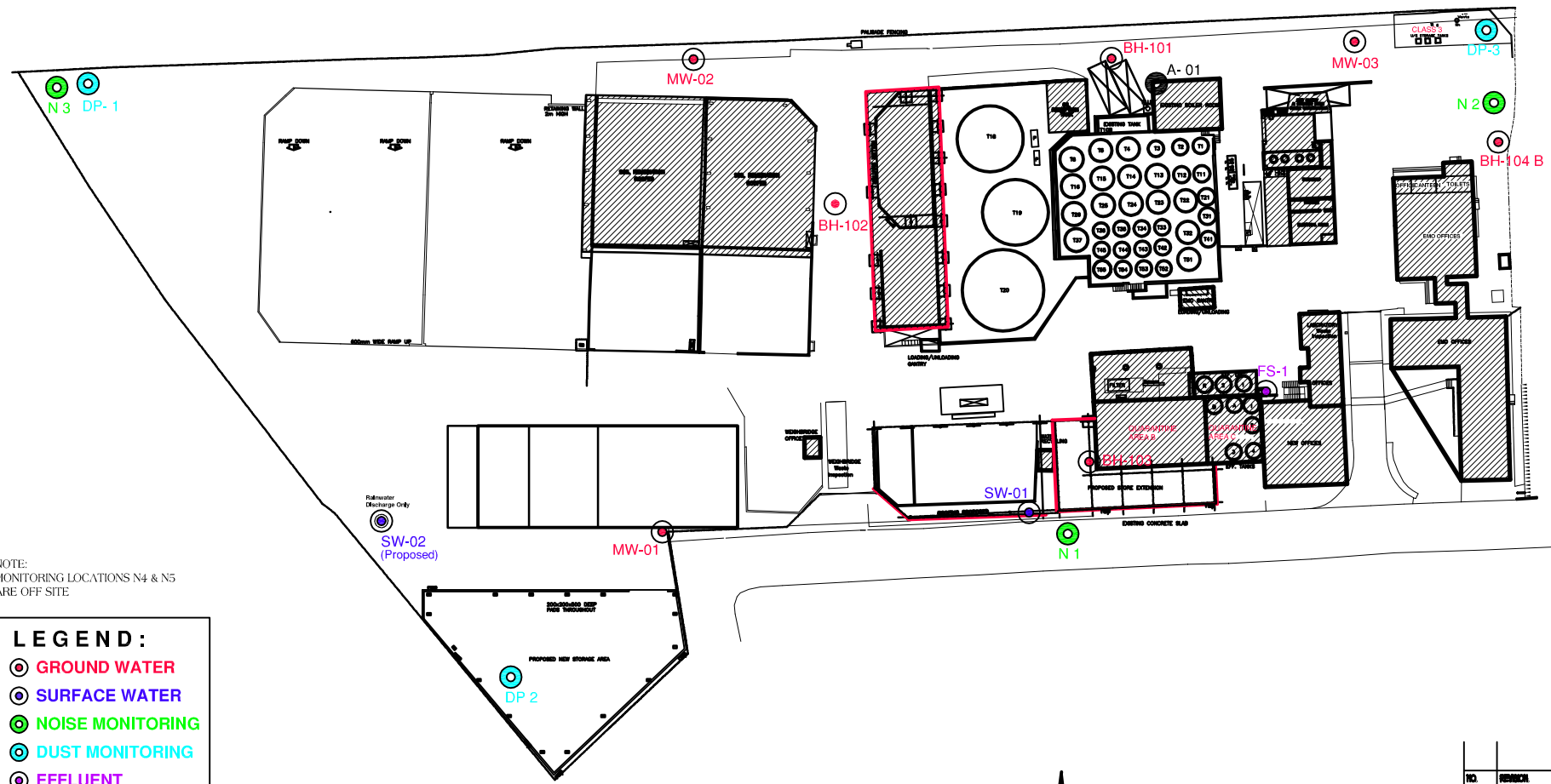
Relative Humidity: 53 %

Note: Manufacturers manual should be consulted when the calibrator is used with free field microphones which are normally supplied with sound level meters.

Checked By : Peter Gaardsdal

Appendix 6

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. Unit 48, The Egan Centre, Dingle Road, Bray, Co. Wicklow. Tel: 2765661962, Fax: 2765663, Email: kryan@krc.com.net		
enva ENVIRONMENTAL CONSULTANTS & CONSTRUCTION MANAGEMENT		enva ENVIRONMENTAL CONSULTANTS & CONSTRUCTION MANAGEMENT
TITLE Waste Storage Areas.		
DRAWN A.C.	SCALE 1:400.	DRAWING No. At-WSA 1.
JOB. No. C02104,	DATE Aug. '08.	

Appendix 7

Waste Recovery Report 2008

Enva

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ENVA WASTE RECOVERY WASTE STREAMS

1.0 INTRODUCTION

This report was carried out as per Condition 11.3 of the Enva waste management Licence and follow up correspondence received on the 15/04/2005. This report outlines the waste streams which are handled by Enva and the current methods employed to handle these wastes.

Reports consulted while compiling this report include the National Waste Report 2004, other EPA publications such as "Taking stock and Moving Forward ", proposed waste management plan 2008-2012 and other EU guidance notes on various waste streams. Enva aim to provide to our customers a fully integrated solution to waste management as our site and our sister company sites develop.

2.0 WASTE STREAMS

2.1 WASTE OILS, OILY WATERS, OILY SLUDGES AND SOLID OILY WASTES

Enva collects a considerable volume of waste oils, oily waters and waste fuels which are accepted at the Portlaoise facility and consequently recovered into a fuel for re-use. Volumes collected of waste oils, oily waters are currently in the region of 26,953 tonnes per year of waste oils and oily waters.

- Lubricant oil comprises of approximately 75 % of the waste oil. This oil is collected mainly from garages and industry.
- Waste ship oils are oily waters generated from ships are collected when in port. The actual content of oil collected from these sources is approximately 25% of the total volume of waste oil

The Waste Oil Directive implemented the requirement for each member state to give priority to the regeneration of waste oil and then to combustion. The regeneration of waste lubricating oils within Ireland into re-usable oils (or base oils) are uneconomic due to the limited market size (a much greater volume would be required to sustain such a project. However under the new Waste frame work Directive, the Waste oil Directive has been repealed and the priority for regeneration is no longer be applicable across the EU. Enva's recovery of waste oils to a fuel represents the best environmental option for this waste stream within Ireland as supported in the National hazardous waste management plan 2008-2012.

The processing of used hydrocarbons also leads to the production of a tank bottom sludge fraction in the processing tanks. This sludge comprises of grit, silt

contaminated by heavy fraction hydrocarbons. This fraction is also sent for recovery into a secondary fuel.

Fractions of solid oily wastes which comprise of contaminated rags, protective clothing etc are also collected. These wastes are bulked and compacted into UN approved containers for export. These wastes are then processed into a secondary fuel for use within cement kilns and other suitable industrial processes.

2.2 SOIL TREATMENT

Since 2002 Enva have operated a contaminated treatment facility. This has enabled Enva to treat soils contaminated with hydrocarbon fractions on site. The waste stream has developed considerably since the process began.

Since mid 2004 Enva can now segregate the re-usable fractions of stone from the contaminated soil and re-use it. This allows us to recycle an additional waste stream from the soil process. In general we may be able to extract 10-15 % of aggregate material from the soil waste stream for re-use which was previously going to landfill. The segregation of the waste stream has also increased the efficiency with which soil can be handled on site including additional aeration while being screened and tromelled and improving the soil particle size for aeration.

Currently there is a very limited market for bioremediating soils within Ireland due to the limited outlets for bioremediated material. Bioremediated material is still largely dependent on landfill (inert or non-hazardous) for use. However the prices charged at these outlets in addition to the treatment costs are uncompetitive within the market. The majority of hydrocarbon contaminated soils available are currently exported either for direct landfill or remediation followed by reuse in landfill. Enva are offering stabilisation of soil as an alternative to export for treatment as an option to customers dependent on the waste stream. Currently Enva are carrying out as much recovery as is feasible.

Enva processed 43,530 tonnes of soil in 2008 and with a target set for the recycling of up to 85% of construction and demolition waste in 2013 it is envisaged that Enva should be able to contribute to this.

2.3 USED METAL FILTERS.

Enva are currently directly exporting metal filters for recovery. This is due to the current market and limitation in outlets for recycling of this waste in Ireland. Enva accepted on site 991 tonnes per annum.

2.4 FLUORESCENT TUBES

The hazardous waste management plan found that there were over 2267 tonnes of fluorescent tubes unaccounted for in Ireland in 2006. In the same year only 408 tonnes of fluorescent tubes were collected for recycling. Enva collected and crushed approximately 89 tonnes of spent fluorescent tubes in 2008.

2.5 BATTERIES

Currently in Ireland there is no method for recycling batteries back into a recovered metal. Waste lead acid batteries are transported to the continent by Enva for recovery where the battery is re-smelted for metal recovery. Enva currently process approximately 2000 tonnes of lead acid batteries annually for export.

By further increasing the ease of service availability to Enva's existing customer database there has been a considerable increase in the collection of batteries. In the Hazardous waste management plan 2008-12, a significant increase in the recycling of batteries has been reported with 98 % of used lead acid batteries reported to be recycled in 2006.

In 2008 the battery directive was brought into force in Ireland (S.I. 268 of 2008) which required Irish producers to set up a take back of spent batteries and accumulators free of charge with a view to recycling the raw materials for use in the manufacture of new products.

2.6 END OF LIFE VEHICLES AND TYRES

Currently Enva do not process any end of life vehicles on site. However, Enva do accept wastes on site such as batteries, oils, filters etc which are derived from ELV waste streams. Enva continue to actively pursue new recycling/recovery options for ELV derived wastes which already complement existing waste collections as mentioned above.

2.7 WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT.

It is currently not feasible for Enva to handle large volumes of WEEE. Although capable of handling these materials current market conditions mean it is not likely that Enva will be carrying out any significant storage or processing of WEEE in the near future.

2.8 NON-HAZARDOUS SLUDGE

The treatment of Waste water treatment plant sludge's by drying is currently not feasible, Enva will continue to review this as changes occur within the industry.

2.9 USED COOKING OILS

The demand for the supplementation of natural resources for alternative options has lead over the last few years to an increase in demand for the use of bio-diesels as alternative sources of energy for vehicles. Enva have promoted this through the collection and onward export of used cooking oils since 2005 for bio-diesel production. In 2008 approximately 1000 tonnes of used cooking oil was processed through the site for onward movement. However Enva have ceased its existing collection service since mid 2008 due to market forces.

3.0 CONCLUSION

Activities on the Enva site activities have grown considerably since the granting of the waste licence early in January 2004. In 2008 74,284.84 tonnes of hazardous waste was processed through the site.

REFERENCE MATERIAL

1. www.europa.eu.int
2. National Hazardous waste Management Plan 2008-20012
3. Waste management (batteries and accumulators) Regulations 2008 (S.I. 268 of 2008)

Appendix 8

1.0 PURPOSE

The purpose of this procedure is to ensure that environmental, health & safety information is communicated effectively to all external bodies and other parties and to ensure that environmental, health & safety concerns are effectively communicated and appropriately dealt with.

2.0 SCOPE

This procedure relates to any external environmental, health & safety communication with members of the public or with regulatory authorities or any requests for information regarding the environmental, health & safety performance of site operations within any of the Enva facilities.

It does not cover reporting of incidents/accidents/emergencies or training. These are dealt with under separate procedures. Customer complaints or dealing with customer requests is outside the scope of this procedure also.

3.0 RESPONSIBILITIES

It shall be the responsibility of the HSE Department to;

- Communicate environmental, health and safety information to all members of the public and regulatory authorities as necessary.
- Retain logs and records of external communications.
- Address requests for information from the public.
- Address and report complaints which relate to HSE performance.

4.0 PROCEDURE

4.1 The following documents are used to communicate environmental health and safety information to external parties

- HSE policy
- HSE manual
- EPA Annual Environmental Report
- Waste Collection Permit Reports
- DGSA report
- EPA waste licence
- Waste Collection Permits
- Contractor inductions
- External audits

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4.2. Communications with Regulatory Authorities

All communications with regulatory authorities such as the HSA, EPA, etc shall be entered into a communications log. This shall record the dates of the communication, persons involved, topic covered and close out of the communication. Copies of communications sent or received shall also be filed by the HSE Department.

4.3 Communications with other Interested External Parties

4.3.1 All enquiries regarding the environmental, health & safety performance of the site operations are to be directed to the HSE department.

4.3.2 Requests for information from the general public shall be directed to the HSE Department who shall deal with each request or enquiry as appropriate. Copies of information shall only be given to the public on the authority of the HSE Director or Managing Director of Enva.

4.3.3 Any complaints relating to HSE matters (e.g. related to public safety, nuisances, environmental emissions etc) received by Enva shall be directed to the HSE department. The HSE Department shall record details of the complaint and initiate corrective action. As appropriate the complaint shall be reported to the relevant regulatory authorities (e.g. EPA/HSA). The HSE Department shall ensure an investigation takes place and shall respond (generally in writing) within one week of the complaint being received. A Corrective Action Requirement (CAR) shall be raised in relation to any complaint. The person/persons who have submitted the complaint shall be kept informed of any progress made in resolving the issue that gave rise to the complaint.

4.3.4 All enquiries regarding environmental, health & safety information shall be dealt with by the HSE department. Written requests shall be filed with the response attached.

4.3.5 If the request for information cannot be fulfilled over the telephone the HSE department may invite the enquirer to the site to review any appropriate documentation or records available on the public file.

4.3.6 Enva has decided not to communicate its significant environmental aspects externally. The register of environmental aspects is available for public viewing and inspection during working hours as are public environmental, health & safety files.

4.3.6 All site tours associated with an enquiry should be scheduled where possible within one working week of receipt of request. In exceptional circumstances it may be arranged at shorter notice.

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5.0 RELATED DOCUMENTS

Correspondence Logs
Records of complaints

6.0 REFERENCE

ISO14001:2004 Clause 4.4.3
OHSAS 18001 Clause 4.4.3

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Appendix 9

ENVA Ireland Ltd GROUP OBJECTIVES TARGETS

OBJECTIVE:				ACHIEVE BY:
GP-01-2008	Provide a high level of Emergency Preparedness on the Enva site.			31/12/2011
RATIONALE:	While there is a high level of strong HSE management throughout Enva more focus is now possible for potential emergency situations.			
TARGET:				ACHIEVE BY:
GP-01-T1	Develop Site Specific Emergency Procedures and create appropriate awareness			31/12/2008
STEP	IMPLEMENTATION PROGRAMME	RESP.	Target Date	STATUS
1	All sites to review/develop an appropriate and consistent site specific emergency preparedness plan.	HSE & Operations	31/12/2008	Enva Portlaoise are currently reviewing the site emergency response plan in conjunction with the local fire brigade and to ensure that adequate fire fighting capability is in place for the site. This objective is there fore being moved to to 31/06/09
2	Carry out training and emergency drills for all staff.	HSE & Operations	30/12/2008	Fire drills have been carried out on site. Specific emergency response scenarios will be drafted once the emergency response plan has been completed.
TARGET:				ACHIEVE BY:
GP-T01-2	Fire risk assessment are to be carried out for each site and all high risk areas to have fire detection/alarms and ensure appropriate segregation/compartmentalisation.			31/06/10
STEP	IMPLEMENTATION PROGRAMME	RESP.	Target Date	STATUS
1	Fire risk assessment to be completed.	HSE	31/10/2008	Fire risk assessment has been carried out.
2	Install fire detectors in all area identified in relevant fire risk assessments if required.	HSE & Operations	31/06/09	Fire detectors have been put in place to cover the tank farm area. Additional fire detectors are proposed for process areas e.g. filter processing, export bay etc The target date has been moved forward to allow for the installation of further detection..
TARGET:				ACHIEVE BY:
GP-T01-3	Install spill/level alarms in all bunds greater than 50,000 litres capacity.			31/08/2009
STEP	IMPLEMENTATION PROGRAMME	RESP.	Target Date	STATUS
1	Identify relevant bunds greater than 100,000 lt capacity and install level alarms.	HSE & Operations	31/12/2011	A bund alarm for the main tank farm bund has been purchased
2	Identify relevant bunds greater than 50,000 lt capacity and install level alarms.	HSE & Operations	31/12/2011	

OBJECTIVE:				ACHIEVE BY:
GP-02-2008	Increase our adherence to relevant International Standards of operation & Best Practice.			01/03/2010
RATIONALE:	To ensure Enva's activities are operated to an appropriate standard providing confidence to our customers and senior management.			
TARGET:				ACHIEVE BY:
GP-T02-4	Operate the Portlaoise laboratory to a recognised standard.			01/03/2010
STEP	IMPLEMENTATION PROGRAMME	RESP.	Target Date	STATUS
1	Perform gap analysis against accreditation criteria for ISO 17025 and develop implementation programme.	HSE / LAB	31/10/2009	Gap analysis completed in July 2008. Recommendations to be implemented.
2	Implement the programme	HSE / LAB	01/03/2010	

OBJECTIVE:				ACHIEVE BY:
GP-03-2008	Improve the management of waste arisings from both commercial and internal activities in line with the revised 5 step waste hierarchy.			30/12/2010
RATIONALE:	Improved waste management is one of the aims stated on the group HSE Policy document. Management of internal waste is highly visible to employees and can therefore help reinforce the strong environmental culture within Enva.			
TARGET:				ACHIEVE BY:
GP-T03-1	Establish the baseline of waste production and set measurable improvement targets for landfill diversion/disposal and increased recovery/recycling.			30/12/2010
STEP	IMPLEMENTATION PROGRAMME	RESP.	Target Date	STATUS
1	Gather baseline data on types and volumes of wastes arising from commercial and internal sources and the costs associated with these.	HSE	31/09/2008	Baseline data is currently being gathered
2	Identify priority target wastes based on volume arising, cost to Enva, ease of recovery/recycling.	HSE	30/12/2008	Target date to be moved 30.06.09
3	Perform preliminary investigation into feasibility of landfill diversion / improved recovery.	HSE	30/12/2008	Target date to be moved 30.06.09
4	Establish targets based on estimated approximate improvement achievable.	Operations	31/03/2009	Target date to be moved 30.06.09 Report to be compiled by HSE
5	Implement measures to achieve targets	ALL	30/12/2010	

OBJECTIVE:				ACHIEVE BY:
GP-04-2008	Ensure we are efficient in our use of energy & resource consumption.			31/03/2011
RATIONALE:	As an environmental service company we need to demonstrate good practice in this regard to our customers and also to our employees so as to assist in promoting a strong HSE conscience and culture.			
TARGET:				ACHIEVE BY:
GP-T04-1	Increase awareness towards the efficient use of resources & energy.			31/12/2010
STEP	IMPLEMENTATION PROGRAMME	RESP.	Target Date	STATUS
1	Develop an internal awareness campaign including erecting posters/reminders across all sites.	HSE	31/12/2008	Energy awareness posters have been put in place on site
2	Establish on each site an energy team to lead the Energy reduction programme.	HSE	31/12/2008	An energy team has been established on site.
3	Develop operations and office based initiatives relating to energy & resource use to promote efficiency culture.	Energy team	31/12/2010	Ongoing
TARGET:				ACHIEVE BY:
GP-T04-2	Identification and Assessment of Energy consumption on each Enva site.			31/03/2011
STEP	IMPLEMENTATION PROGRAMME	RESP.	Target Date	STATUS
1	Establish current energy sources and assess the annual spend on energy.	Energy team	30/01/2008	There was an administrative error in this target date in last years report as it should have read as 30/01/09. Energy sources used on site are currently being monitored and usage figures being collated.
2	Develop a register of energy aspects which can be used to develop an energy management programme and assess the critical users of energy	Energy team	30/06/2009	A register of energy aspects is currently being drafted in line IS 393.
3	Review of existing tariffs in use through out all sites.	Energy team	30/06/2009	
4	Establish Energy performance indicators applicable for use in Enva to allow for monitoring of annual consumption	Energy team	30/06/2009	
5	Establish an Energy reduction target.	Energy team	30/06/2009	
6	Implement energy reduction measures to achieve 40% of target	Energy team	31/12/2009	
7	Implement energy reduction measures to achieve 80% of target	Energy team	30/09/2010	
8	Implement energy reduction measures to achieve 100% of target	Energy team	31/03/2011	
TARGET:				ACHIEVE BY:
GP-T04-2	Identification and Reduction in water consumption			31/12/2010
STEP	IMPLEMENTATION PROGRAMME	RESP.	Target Date	STATUS
1	Establish the water usage for each site	Energy team	31/09/2008	Annual water usage has been established currently use 11865.06 m ³ was used in 2008
2	Establish a register of water uses on site and identify the high demand users of water.	Energy team	21/12/2008	Register of water users is currently not established this has been moved to 30/04/09 for completion
3	Develop targets for reduction in water usage	Energy team	31/03/2009	Reduction in water usage will be established once all users have been established, completion 30/04/09
4	Implement water use reduction measures to achieve 50% of target	Energy team	31/12/2009	
5	Implement water use reduction measures to achieve 100% of target	Energy team	31/12/2010	

OBJECTIVE:				ACHIEVE BY:
GP-05-2008	Develop a positive environmental & safety competent culture within Enva			31/12/2010
RATIONALE:	A strong environmental & safety culture benefits staff, the organisation and the environment.			
TARGET:				ACHIEVE BY:
GP-05 -T01	Development of a robust training programme for Enva activities			31/12/2009
STEP	IMPLEMENTATION PROGRAMME	RESP.	Target Date	STATUS
	Establish roles and task specific training requirements for Enva, PL personnel	HSE	21/09/2008	Training roles and tasks have been identified for Enva Portlaoise staff.
	Develop existing Logix training software to implement all identified training requirements for each department.	HSE	31/09/2008	Logix software has been put in place and all core roles within each department and the training requirements for these personnel assigned.
	Develop roles and training requirements on remaining Enva sites and populate training software.	HSE	31/12/2008	Not applicable
	Develop common training courses for use across Enva.	HSE	31/06/2009	
	Consider accrediting training through FAS training programme.	HSE	31/12/2009	
TARGET:				ACHIEVE BY:
GP- 05-T02	Increase the HSE awareness and participation of senior members of staff.			31/03/2010
STEP	IMPLEMENTATION PROGRAMME	RESP.	Target Date	STATUS
	Identify HSE training requirements for Supervisors and Managers	HSE	31/03/2009	Training courses for Supervisors and Managers have been identified and courses are currently being drafted.
	Develop training for senior staff to improve competency	HSE	31/07/2009	
	All senior members of staff to receive general HSE training	HSE	31/03/2010	
	All Directors to conduct two HSE site inspections per year and produce a brief report on the inspection.	Directors	31/03/2010	
TARGET:				ACHIEVE BY:
GP- 05-T03	Assessment of safety culture within Enva			31/12/2010
STEP	IMPLEMENTATION PROGRAMME	RESP.	Target Date	STATUS
	Develop appropriate HSE KPIs to monitor the trends in HSE performance across Enva and on individual facilities.	AP,DB	31/12/2008	This Objective has been moved to the 31/12/10
	Investigate methods of good safety culture measurement	AP,DB	31/03/2010	
	Implement preferred safety culture assessment methodology to assess each Enva site.	AP,DB	31/12/2010	

OBJECTIVE:				ACHIEVE BY:
PL 06-2008	Improvement in environmental performance and compliance.			31/12/2010
RATIONALE:	To ensure that activities from the site do not impact on the environment.			
TARGET:				ACHIEVE BY:
PL 06 T01	Improvement of the quality of effluent release from the site			31/12/2010
STEP	IMPLEMENTATION PROGRAMME	RESP.	Target Date	STATUS
	Continue to monitor effluent and ensure parameters are met. Investigate treatment options for parameters not in compliance with the site licence.	HSE & Operations	Ongoing	Enva have identified a number of customer which generate oil which contains levels of ammonia which if not managed correctly when accepted on site can affect the effluent quality. A notification has been put on to the customer database to highlight this waste to drivers and operational staff thus ensuring that ammonia oil is handled appropriately i.e. not mixed with oils with high content of water. Trials have also been carried out by the Enva laboratory to determine the reduction of ammonia in water using sodium hypochlorite. (Appendix 11)
TARGET:				ACHIEVE BY:
PL 6 T02	Investigate groundwater contamination on site.			01/09/2008
STEP	IMPLEMENTATION PROGRAMME	RESP.	Target Date	STATUS
	1 Submit proposal to the Agency for approval.	HSE	01/05/2008	Proposal submitted to the Agency and approved
	2 Put in place measures outlined in proposal	HSE & Operations	01/09/2008	Report carried out and submitted to the Agency for review.
TARGET:				ACHIEVE BY:
PL6 T02	Improve site infrastructure			31/12/2010
STEP	IMPLEMENTATION PROGRAMME	RESP.	Target Date	STATUS
	1 Install Interceptor No. 3 at north end of the site	HSE & Operations	31/12/2010	Installation of the third interceptor is nearing completion.
	2 Extend hardstanding area on site and install associated drainage.	HSE & Operations	31/12/2010	Installation of the hardstanding area and associated drainage is nearing completion.
	3 Repair old cracked concrete adjacent to the filter press to improve integrity of the 3 yard.	Operations	30.09.09	
	4 Improve site security by automating the weighbridge gate	Operations	30.09.09	
	5 Put in place more robust mechanism of marking site drains with blue triangles.	Operations	30.07.09	
TARGET:				ACHIEVE BY:
PL6 T03	Improve odour emissions from the site			01/07/2008
STEP	IMPLEMENTATION PROGRAMME	RESP.	Target Date	STATUS
	1 Submit SEW to EPA for approval	HSE	01/05/2008	Approved by Agency
	2 Install odour abatement technology	HSE & Operations	01/07/2008	Odour abatement technology installed.
TARGET:				ACHIEVE BY:
PL6 T04	Improve segregation of of hazardous and non-hazardous wastes			01/09/2008
STEP	IMPLEMENTATION PROGRAMME	RESP.	Target Date	STATUS
	1 Install washer unit to separate hazardous from non-hazardous waste	HSE & Operations	01/09/2008	This target is closed due to the cessation of used cooking oil collections.
PL6 T05	Gain more accurate waste weights			31/03/2010
STEP	IMPLEMENTATION PROGRAMME	RESP.	Target Date	STATUS 30/12/10
	1 Identify ways in which to gain more accurate stock weights on site For EPA reporting purposes.	HSE & Operations	30/06/2009	
	2 Implement steps identified to ensure that stock figures are available for reporting to EPA on a quarterly and annual basis.	HSE & Operations	31/03/2010	
TARGET:				ACHIEVE BY:
PL6 T06	Review quality of self monitoring compliance data			31/03/2010
	Review of existing documented procedures to ensure that correct methodologies are being used	Laboratory &HSE	30.08.09	
	Ensure condition of Enva PL licence to ensure monitoring and the interpretation of the monitoring is correct	Laboratory &HSE	30.10.09	
	Ensure all personnel carrying out Laboratory duties and external are trained and competent.	Laboratory &HSE	30.09.09	
	Review to be carried out of quality control procedures.	Laboratory &HSE	30.09.09	
	Review to be carried out of methods used for their suitability and the relevant sample matrix.	Laboratory &HSE	30/12/2009	
	Identify where require performance characteristics for each method in use	Laboratory &HSE	30/03/2010	
	Put in place management system for Laboratory operations as per objective No. 2	Laboratory &HSE	31/03/2010	

Appendix 10

Enforcement Category Summary



Organisation Name	Enva Ireland Ltd
Case Number	W0184-01

Fixed Attributes	Enforcement Category
Complexity	High
Location	Low

Enforcement Category due to Fixed Attributes	C1
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Sheet Reference	Enforcement Category
Complexity	High
Emissions	High
Location	Low
Operator Management	High
Enforcement Record	Mid

OVERALL ENFORCEMENT CATEGORY	A2
	A1



Appendix 11



REPORT: LABORATORY AMMONIA TRIALS ON WATER

1.0 Introduction

Trials were performed in the laboratory on water containing ammonia to demonstrate that by using bleach and sodium hypochlorite (14%) solutions in diluted concentrations, the ammonia level in a water system could be reduced.

2.0 Apparatus

- Sodium Hypochlorite Solution – 14%
- Household Bleach Solution
- De-ionised Water
- HACH spectrophotometer DR2010
- 100ml or 25 ml Volumetric flasks.
- 100ul Pipette or 0.1ml to 1.0ml pipette and pipette tips
- High Range Nitrogen Ammonia Test-N-Tube Kit 0-50mg/lN which includes:
- Salicylate Powder Pillows
- Cyranurate Powder Pillows

3.0 Procedure

3.1 Household Bleach

- 3.1.1 Trials were performed using household bleach on a tank 2 sample.
- 3.1.2 A 1:50 and a 1:100 dilutions were used.
- 3.1.3 Results are recorded in results section 4.0 (Table 1).

3.2 Ammonia Standard (10mg/l)

- 3.2.1 Trials were performed using the standard for ammonia (10mg/l) on tank 2 water.
- 3.2.2 A 1:50 and 1:100 dilutions were performed.
- 3.2.3 Results are recorded in results section 4.0 (Table 2).

3.3 Sodium Hypochlorite

- 3.3.1 Sample reference numbers 14 and 19 and the ammonia standard (10mg/l) were used for this trial.
- 3.3.2 Dilutions of 1:100, 0.5:100 and 1:50 were performed.
- 3.3.3 Results are recorded in results section 4.0 (Table 3 and 4).



REPORT: LABORATORY AMMONIA TRIALS ON WATER

4.0 Results

Table 1: Household Bleach – 5% Chlorine

	Tank 2	1/50 Dilution	1/100 Dilution
Ammonia (mg/l)	25.6	5.8	3.5
Chloride (mg/l)	N/A	2490	420

Table

2:

Standard (10mg/l)

	1/50 Dilution	1/100 Dilution
Ammonia (mg/l)	0.1	7.9
Chloride (mg/l)	15	1

Table 3: 19.03.2009

Sample Reference No.	Ammonia (mg/l)	Ammonia 1:5 Dilution	Dilution 1:100	Dilution 0.5:100
19	44.0	N/A	0.9	N/A
14	OR	75.0	N/A	7.5
	OR	N/A	4.0	N/A

Table 4: 20.03.2009

	Dilution	Ammonia (mg/l)	Chloride (mg/l)
Sample Reference No.19	N/A	40.7	120
	1:50	0.6	>4800
	1:100	0.5	1590
Standard (10mg/l)	1:50	6.8	>2500
	1:100	8.1	>2500

5.0 Discussion

For the first trial, household bleach with a chloride level of 5% was used on a tank sample (original ammonia level of 25.6mg/l) using two dilutions. It was deduced that both dilutions resulted in a reduction of ammonia but with an increase in chloride as can be seen from Table 1 in the results section 4.0.

Household bleach was then used on an ammonia standard using two dilutions. The original level of ammonia was 10mg/l and while the ammonia level increased with the increase of dilution, the chloride level was reduced with the increase of the



REPORT: LABORATORY AMMONIA TRIALS ON WATER

dilution. These results are inconclusive and so it can be deduced that the original level of ammonia in the sample was not at a sufficient level to demonstrate the reduction in ammonia levels.

For the second trial (Table 3), two types of effluent water were used (sample reference numbers 14 and 19). As sample reference number 14 was over-range for ammonia, a dilution was performed using deionised water (1:5 dilution). Two dilutions were then performed using a 1:100 dilution (10mls of sodium hypochlorite in 1 litre of sample water) and a 0.5:100 dilution (5mls of sodium hypochlorite in 1 litre of sample water). From this trial it can be deduced that the ammonia levels were reduced significantly.

Sodium hypochlorite was then used again (Table 4) on sample reference number 19 and on the ammonia standard (10mg/l). Two types of dilutions were performed (1:50 and 1:100), and while the ammonia level again was reduced, the chloride levels increased with increasing dilutions. The limit for chloride as per Envas' EPA Waste Licence WO-184-1 is 6000mg/l. Therefore due to the amount of sodium hypochlorite required to reduce the level of ammonia in a water sample / system, the chloride levels could be an area of concern.

6.0 Conclusion

While these trials have deemed that sodium hypochlorite is effective in the reduction of Ammonia, the possibility of the generating higher chlorine levels in effluent needs to be investigated further.

Appendix 12

CERTIFICATE OF CALIBRATION

Customer	Enva Portlaoise	Contract	183101
Customer Instrument ID	V11 Temp	Location	Tank Farm
Device Description	PT100 Temperature Probe	Calibration Range	0 – 150 Deg C
Calibration Date	29 th July 2008	Interval	12 month
Instrument Accuracy	+ or - 0.1 Dec C	Calibration Due Date	July 2009

Loop Calibration Results

INPUT	AS FOUND	AS LEFT	DEVIATION
0.0	- 0.2	- 0.2	- 0.2
25.0	24.7	24.7	- 0.3
50.0	49.7	49.7	- 0.3
75.0	74.8	74.8	- 0.2
100.0	99.8	99.8	- 0.2
150.0	149.9	149.9	- 0.1

Instrument Calibration Results



75.0	75.2	75.2	+ 0.2
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Comment: High Level Sounder Alarm & SCADA screen Alarm found working OK

Calibration Equipment

Manufacturer	Model	Serial Number	Calibration Date	Certificate No.
Eurolec	PC Temp PT2	84/PT2/100	11 th Jan 2008	7118
Time Electronics	1042 Resistance	1203B2	14 th Jan 2008	7119

DECLARATION: The calibration references used can be traced back to recognised national standards.

Tested By: Signature		Date	29/7/08	Accepted By: Signature		Date	29/7/08
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SCADA IRELAND LTD

Valentia Place, Newcastle, Co Down
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CERTIFICATE OF CALIBRATION

Customer	Enva Portlaoise	Contract	183101
Customer Instrument ID	V12 Temp	Location	Tank Farm
Device Description	PT100 Temperature Probe	Calibration Range	0 – 150 Deg C
Calibration Date	29 th July 2008	Interval	12 month
Instrument Accuracy	+ or - 0.1 Dec C	Calibration Due Date	July 2009

Loop Calibration Results

INPUT	AS FOUND	AS LEFT	DEVIATION
0.0	0.0	0.0	0
25.0	24.9	24.9	- 0.1
50.0	50.0	50.0	0
75.0	75.0	75.0	0
100.0	100.0	100.0	0
150.0	150.0	150.0	0

Instrument Calibration Results


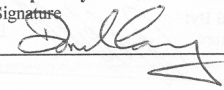
75.0	75.0	75.0	0
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Comment: High Level Sounder Alarm & SCADA screen Alarm found working OK

Calibration Equipment

Manufacturer	Model	Serial Number	Calibration Date	Certificate No.
Eurolec	PC Temp PT2	84/PT2/100	11 th Jan 2008	7118
Time Electronics	1042 Resistance	1203B2	14 th Jan 2008	7119

DECLARATION: The calibration references used can be traced back to recognised national standards.

Tested By: Signature		Date	29/7/08	Accepted By: Signature		Date	29/7/08
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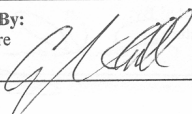
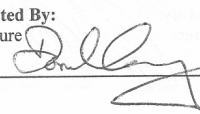
CERTIFICATE OF CALIBRATION

Customer	Enva Portlaoise	Contract	183101
Customer Instrument ID	V13 Temp	Location	Tank Farm
Device Description	PT100 Temperature Probe	Calibration Range	0 – 150 Deg C
Calibration Date	29 th July 2008	Interval	12 month
Instrument Accuracy	+ or – 0.1 Dec C	Calibration Due Date	July 2009

Loop Calibration Results			
INPUT	AS FOUND	AS LEFT	DEVIATION
0.0	- 0.1	- 0.1	- 0.1
25.0	24.8	24.8	- 0.2
50.0	49.8	49.8	- 0.2
75.0	75.0	75.0	0
100.0	99.9	99.9	- 0.1
150.0	149.9	149.9	- 0.1
Instrument Calibration Results			
75.0	75.3	75.3	+ 0.3
Comment: High Level Sounder Alarm & SCADA screen Alarm found working OK			

Calibration Equipment				
Manufacturer	Model	Serial Number	Calibration Date	Certificate No.
Eurolec	PC Temp PT2	84/PT2/100	11 th Jan 2008	7118
Time Electronics	1042 Resistance	1203B2	14 th Jan 2008	7119

DECLARATION: The calibration references used can be traced back to recognised national standards.

Tested By: Signature	Date	Accepted By: Signature	Date
	29/7/08		29/7/08

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CERTIFICATE OF CALIBRATION

Customer	Enva Portlaoise	Contract	183101
Customer Instrument ID	V14 Temp	Location	Tank Farm
Device Description	PT100 Temperature Probe	Calibration Range	0 – 150 Deg C
Calibration Date	29 th July 2008	Interval	12 month
Instrument Accuracy	+ or – 0.1 Dec C	Calibration Due Date	July 2009

Loop Calibration Results

INPUT	AS FOUND	AS LEFT	DEVIATION
0.0	- 0.1	- 0.1	- 0.1
25.0	24.8	24.8	- 0.2
50.0	50.0	50.0	0
75.0	75.1	75.1	+ 0.1
100.0	100.0	100.0	0
150.0	150.0	150.0	0

Instrument Calibration Results

75.0	75.0	75.0	0
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Comment: High Level Sounder Alarm & SCADA screen Alarm found working OK

Calibration Equipment

Manufacturer	Model	Serial Number	Calibration Date	Certificate No.
Eurolec	PC Temp PT2	84/PT2/100	11 th Jan 2008	7118
Time Electronics	1042 Resistance	1203B2	14 th Jan 2008	7119

DECLARATION: The calibration references used can be traced back to recognised national standards.

Tested By: Signature	Date 29/7/08	Accepted By: Signature	Date 29/7/08
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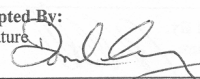
CERTIFICATE OF CALIBRATION

Customer	Enva Portlaoise	Contract	I83101
Customer Instrument ID	V15 Temp	Location	Tank Farm
Device Description	PT100 Temperature Probe	Calibration Range	0 – 150 Deg C
Calibration Date	29 th July 2008	Interval	12 month
Instrument Accuracy	+ or – 0.1 Dec C	Calibration Due Date	July 2009

Loop Calibration Results			
INPUT	AS FOUND	AS LEFT	DEVIATION
0.0	- 0.2	- 0.2	- 0.2
25.0	24.8	24.8	- 0.2
50.0	49.7	49.7	- 0.3
75.0	74.9	74.9	- 0.1
100.0	99.8	99.8	- 0.2
150.0	149.8	149.8	- 0.2
Instrument Calibration Results			
75.0	75.4	75.4	+ 0.4
Comment: High Level Sounder Alarm & SCADA screen Alarm found working OK			

Calibration Equipment				
Manufacturer	Model	Serial Number	Calibration Date	Certificate No.
Eurolec	PC Temp PT2	84/PT2/100	11 th Jan 2008	7118
Time Electronics	1042 Resistance	1203B2	14 th Jan 2008	7119

DECLARATION: The calibration references used can be traced back to recognised national standards.

Tested By: Signature		Date	29/7/08	Accepted By: Signature		Date	29/7/08
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CERTIFICATE OF CALIBRATION

Customer	Envia Portlaoise	Contract	183101
Customer Instrument ID	V16 Temp	Location	Tank Farm
Device Description	PT100 Temperature Probe	Calibration Range	0 – 150 Deg C
Calibration Date	29 th July 2008	Interval	12 month
Instrument Accuracy	+ or – 0.1 Dec C	Calibration Due Date	July 2009

Loop Calibration Results

INPUT	AS FOUND	AS LEFT	DEVIATION
0.0	- 0.1	- 0.1	- 0.1
25.0	24.9	24.9	- 0.1
50.0	49.9	49.9	- 0.1
75.0	75.0	75.0	0
100.0	99.9	99.9	- 0.1
150.0	150.0	150.0	0

Instrument Calibration Results

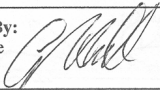
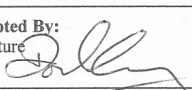
75.0	75.6	75.6	+ 0.6
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Comment: Found instrument 'fails low'. Reprogrammed TX head to 'fail high'. High level sounder and SCADA screen Alarm found working OK

Calibration Equipment

Manufacturer	Model	Serial Number	Calibration Date	Certificate No.
Eurolec	PC Temp PT2	84/PT2/100	11 th Jan 2008	7118
Time Electronics	1042 Resistance	1203B2	14 th Jan 2008	7119

DECLARATION: The calibration references used can be traced back to recognised national standards.

Tested By: Signature	Date	Accepted By: Signature	Date
	29/7/08		29/7/08

SCADA IRELAND LTD

Valentia Place, Newcastle, Co Down

Tel: 028 43725970 Fax: 028 43725846 email: scadaireland@aolcom

CERTIFICATE OF CALIBRATION



Customer	Enva Portlaoise	Contract	183101
Customer Instrument ID	V18 Top Temp	Location	Tank Farm
Device Description	PT100 Temperature Probe	Calibration Range	0 – 150 Deg C
Calibration Date	29 th July 2008	Interval	12 month
Instrument Accuracy	+ or – 0.1 Dec C	Calibration Due Date	July 2009

Loop Calibration Results			
INPUT	AS FOUND	AS LEFT	DEVIATION
0.0			
25.0			
50.0			
75.0			
100.0			
150.0			
Instrument Calibration Results			
75.0	N/A	N/A	N/A
Comments: Instrument & Loop calibration not possible. Instrument not accessible due to height of fitting on tank. Historical trend readings compared to bottom probe & found comparable.			

Calibration Equipment

Manufacturer	Model	Serial Number	Calibration Date	Certificate No.
Eurolec	PC Temp PT2	84/PT2/100	11 th Jan 2008	7118
Time Electronics	1042 Resistance	1203B2	14 th Jan 2008	7119

DECLARATION: The calibration references used can be traced back to recognised national standards.

Tested By: Signature		Date	29/7/08	Accepted By: Signature		Date	29/7/08
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SCADA IRELAND LTD

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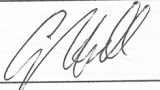

CERTIFICATE OF CALIBRATION

Customer	Enva Portlaoise	Contract	183101
Customer Instrument ID	V18 Bottom	Location	Tank Farm
Device Description	PT100 Temperature Probe	Calibration Range	0 – 150 Deg C
Calibration Date	29 th July 2008	Interval	12 month
Instrument Accuracy	+ or – 0.1 Dec C	Calibration Due Date	July 2009

Loop Calibration Results			
INPUT	AS FOUND	AS LEFT	DEVIATION
0.0	- 0.3	- 0.3	- 0.3
25.0	24.9	24.9	- 0.1
50.0	49.7	49.7	- 0.3
75.0	74.8	74.8	- 0.2
100.0	99.4	99.4	- 0.6
150.0	149.7	149.7	- 0.3
Instrument Calibration Results			
75.0	75.0	75.0	0
Comment: High level sounder and SCADA screen Alarm found working OK			

Calibration Equipment				
Manufacturer	Model	Serial Number	Calibration Date	Certificate No.
Eurolec	PC Temp PT2	84/PT2/100	11 th Jan 2008	7118
Time Electronics	1042 Resistance	1203B2	14 th Jan 2008	7119

DECLARATION: The calibration references used can be traced back to recognised national standards.

Tested By: Signature		Date	29/7/08	Accepted By: Signature		Date	29/7/08
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CERTIFICATE OF CALIBRATION

Customer	Enva Portlaoise	Contract	183101
Customer Instrument ID	V19 Bottom Temp	Location	Tank Farm
Device Description	PT100 Temperature Probe	Calibration Range	0 – 150 Deg C
Calibration Date	29 th July 2008	Interval	12 month
Instrument Accuracy	+ or – 0.1 Dec C	Calibration Due Date	July 2009

Loop Calibration Results

INPUT	AS FOUND	AS LEFT	DEVIATION
0.0	- 0.5	- 0.5	- 0.5
25.0	24.5	24.5	- 0.5
50.0	49.8	49.8	- 0.2
75.0	74.5	74.5	- 0.5
100.0	99.3	99.3	- 0.7
150.0	149.5	149.5	- 0.5

Instrument Calibration Results

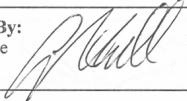

75.0	N/A	N/A	N/A
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Comments: Instrument calibration not possible. Unable to remove instrument due to no pocket being fitted in tank and tank full of oil

Calibration Equipment

Manufacturer	Model	Serial Number	Calibration Date	Certificate No.
Eurolec	PC Temp PT2	84/PT2/100	11 th Jan 2008	7118
Time Electronics	1042 Resistance	1203B2	14 th Jan 2008	7119

DECLARATION: The calibration references used can be traced back to recognised national standards.

Tested By: Signature		Date	29/7/08	Accepted By: Signature		Date	29/7/08
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CERTIFICATE OF CALIBRATION

Customer	Enva Portlaoise	Contract	183101
Customer Instrument ID	V26 Temp	Location	Tank Farm
Device Description	PT100 Temperature Probe	Calibration Range	0 – 150 Deg C
Calibration Date	29 th July 2008	Interval	12 month
Instrument Accuracy	+ or - 0.1 Dec C	Calibration Due Date	July 2009

Loop Calibration Results

INPUT	AS FOUND	AS LEFT	DEVIATION
0.0	- 0.1	- 0.1	- 0.1
25.0	25.1	25.1	+ 0.1
50.0	50.0	50.0	0
75.0	75.1	75.1	+ 0.1
100.0	100.1	100.1	+ 0.1
150.0	150.2	150.2	+ 0.2

Instrument Calibration Results


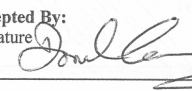
75.0	75.2	75.2	+ 0.2
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Comment: Found instrument 'fails low'. Reprogrammed TX head to 'fail high'. High level sounder and SCADA screen Alarm found working OK

Calibration Equipment

Manufacturer	Model	Serial Number	Calibration Date	Certificate No.
Eurolec	PC Temp PT2	84/PT2/100	11 th Jan 2008	7118
Time Electronics	1042 Resistance	1203B2	14 th Jan 2008	7119

DECLARATION: The calibration references used can be traced back to recognised national standards.

Tested By: Signature		Date	29/7/08	Accepted By: Signature		Date	29/7/08
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CERTIFICATE OF CALIBRATION



Customer	Enva Portlaoise	Contract	183101
Customer Instrument ID	UCO 7	Location	Tank Farm
Device Description	PT100 Temperature Probe	Calibration Range	0 – 150 Deg C
Calibration Date	29 th July 2008	Interval	12 month
Instrument Accuracy	+ or – 0.1 Dec C	Calibration Due Date	July 2009

Loop Calibration Results			
INPUT	AS FOUND	AS LEFT	DEVIATION
0.0	- 0.1	- 0.1	- 0.1
25.0	25.0	25.0	0
50.0	50.2	50.2	+ 0.2
75.0	75.4	75.4	+ 0.4
100.0	100.4	100.4	+ 0.4
150.0	150.7	150.7	+ 0.7
Instrument Calibration Results			
75.0	N/A	N/A	N/A
Comment: Instrument Calibration not possible. Unable to remove instrument due to no pocket being fitted in tank and tank full of oil			

Calibration Equipment

Manufacturer	Model	Serial Number	Calibration Date	Certificate No.
Eurolec	PC Temp PT2	84/PT2/100	11 th Jan 2008	7118
Time Electronics	1042 Resistance	1203B2	14 th Jan 2008	7119

DECLARATION: The calibration references used can be traced back to recognised national standards.

Tested By: Signature		Date	29/7/08	Accepted By: Signature		Date	29/7/08
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CERTIFICATE OF CALIBRATION

Customer	Enva Portlaoise	Contract	183101
Customer Instrument ID	UCO 8	Location	Tank Farm
Device Description	PT100 Temperature Probe	Calibration Range	0 – 150 Deg C
Calibration Date	29 th July 2008	Interval	12 month
Instrument Accuracy	+ or – 0.1 Dec C	Calibration Due Date	July 2009

Loop Calibration Results

INPUT	AS FOUND	AS LEFT	DEVIATION
0.0	0	0	0
25.0	25.0	25.0	0
50.0	50.0	50.0	0
75.0	75.3	75.3	+ 0.3
100.0	100.3	100.3	+ 0.3
150.0	150.4	150.4	+ 0.4

Instrument Calibration Results



75.0	N/A	N/A	N/A
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Comment: Instrument Calibration not possible. Unable to remove instrument due to no pocket being fitted in tank and tank full of oil.

Calibration Equipment

Manufacturer	Model	Serial Number	Calibration Date	Certificate No.
Eurolec	PC Temp PT2	84/PT2/100	11 th Jan 2008	7118
Time Electronics	1042 Resistance	1203B2	14 th Jan 2008	7119

DECLARATION: The calibration references used can be traced back to recognised national standards.

Tested By: Signature		Date	29/7/08	Accepted By: Signature		Date	29/7/08
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CERTIFICATE OF CALIBRATION

Customer	Enva Portlaoise	Contract	183101
Customer Instrument ID	UCO 9 Bottom	Location	Tank Farm
Device Description	PT100 Temperature Probe	Calibration Range	0 – 150 Deg C
Calibration Date	29 th July 2008	Interval	12 month
Instrument Accuracy	+ or – 0.1 Dec C	Calibration Due Date	July 2009

Loop Calibration Results

INPUT	AS FOUND	AS LEFT	DEVIATION
0.0	- 0.1	- 0.1	- 0.1
25.0	24.9	24.9	- 0.1
50.0	50.0	50.0	0
75.0	75.2	75.2	+ 0.2
100.0	100.2	100.2	+ 0.2
150.0	150.3	150.3	+ 0.3

Instrument Calibration Results



75.0	75.1	75.1	+ 0.1
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Comment: High Level Sounder and SCADA Screen Alarm found working OK.

Calibration Equipment

Manufacturer	Model	Serial Number	Calibration Date	Certificate No.
Eurolec	PC Temp PT2	84/PT2/100	11 th Jan 2008	7118
Time Electronics	1042 Resistance	1203B2	14 th Jan 2008	7119

DECLARATION: The calibration references used can be traced back to recognised national standards.

Tested By: Signature		Date	29/7/08	Accepted By: Signature		Date	29/7/08
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CERTIFICATE OF CALIBRATION

Customer	Enva Portlaoise	Contract	183101
Customer Instrument ID	UCO 9 Top	Location	Tank Farm
Device Description	PT100 Temperature Probe	Calibration Range	0 – 150 Deg C
Calibration Date	29 th July 2008	Interval	12 month
Instrument Accuracy	+ or – 0.1 Dec C	Calibration Due Date	July 2009

Loop Calibration Results

INPUT	AS FOUND	AS LEFT	DEVIATION
0.0	- 0.1	- 0.1	- 0.1
25.0	25.0	25.0	0
50.0	50.2	50.2	+ 0.2
75.0	75.2	75.2	+ 0.2
100.0	100.3	100.3	+ 0.3
150.0	150.5	150.5	+ 0.5

Instrument Calibration Results

75.0	74.8	74.8	- 0.2
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Comment: Instrument not fitted to tank .. no socket in place.

Calibration Equipment

Manufacturer	Model	Serial Number	Calibration Date	Certificate No.
Eurolec	PC Temp PT2	84/PT2/100	11 th Jan 2008	7118
Time Electronics	1042 Resistance	1203B2	14 th Jan 2008	7119

DECLARATION: The calibration references used can be traced back to recognised national standards.

Tested By: Signature	Date	29/7/08	Accepted By: Signature	Date	29/7/08
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CERTIFICATE OF CALIBRATION

Customer	Enva Portlaoise	Contract	183101
Customer Instrument ID	UCO 10 Bottom	Location	Tank Farm
Device Description	PT100 Temperature Probe	Calibration Range	0 – 150 Deg C
Calibration Date	29 th July 2008	Interval	12 month
Instrument Accuracy	+ or – 0.1 Dec C	Calibration Due Date	July 2009

Loop Calibration Results			
INPUT	AS FOUND	AS LEFT	DEVIATION
0.0	- 0.1	- 0.1	- 0.1
25.0	24.8	24.8	- 0.2
50.0	49.8	49.8	- 0.2
75.0	75.0	75.0	0
100.0	100.0	100.0	0
150.0	150.2	150.2	+ 0.2
Instrument Calibration Results			
75.0	75.3	75.3	+ 0.3
Comment: Higher Level sounder Alarm & SCADA screen alarm found working OK			

Calibration Equipment

Manufacturer	Model	Serial Number	Calibration Date	Certificate No.
Eurolec	PC Temp PT2	84/PT2/100	11 th Jan 2008	7118
Time Electronics	1042 Resistance	1203B2	14 th Jan 2008	7119

DECLARATION: The calibration references used can be traced back to recognised national standards.

Tested By: Signature	Date 29/7/08	Accepted By: Signature	Date 29/7/08
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CERTIFICATE OF CALIBRATION

Customer	Enva Portlaoise	Contract	183101
Customer Instrument ID	UCO 10 Top	Location	Tank Farm
Device Description	PT100 Temperature Probe	Calibration Range	0 – 150 Deg C
Calibration Date	29 th July 2008	Interval	12 month
Instrument Accuracy	+ or – 0.1 Dec C	Calibration Due Date	July 2009

Loop Calibration Results

INPUT	AS FOUND	AS LEFT	DEVIATION
0.0	- 0.3	- 0.3	- 0.3
25.0	24.8	24.8	- 0.2
50.0	49.9	49.9	- 0.1
75.0	74.9	74.9	- 0.1
100.0	100.0	100.0	0
150.0	150.1	150.1	+ 0.1

Instrument Calibration Results

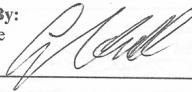

75.0	75.2	75.2	+ 0.2
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Comment: Higher Level sounder Alarm & SCADA screen alarm found working OK

Calibration Equipment

Manufacturer	Model	Serial Number	Calibration Date	Certificate No.
Eurolec	PC Temp PT2	84/PT2/100	11 th Jan 2008	7118
Time Electronics	1042 Resistance	1203B2	14 th Jan 2008	7119

DECLARATION: The calibration references used can be traced back to recognised national standards.

Tested By: Signature		Date	29/7/08	Accepted By: Signature		Date	29/7/08
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CERTIFICATE OF CALIBRATION

Customer	Enva Portlaoise	Contract	183101
Customer Instrument ID	V32 Temp	Location	Tank Farm
Device Description	PT100 Temperature Probe	Calibration Range	0 – 150 Deg C
Calibration Date	29 th July 2008	Interval	12 month
Instrument Accuracy	+ or – 0.1 Dec C	Calibration Due Date	July 2009

Loop Calibration Results

INPUT	AS FOUND	AS LEFT	DEVIATION
0.0	- 0.4	- 0.4	- 0.6
25.0	24.9	24.9	- 0.1
50.0	49.9	49.9	- 0.1
75.0	74.9	74.9	- 0.1
100.0	99.6	99.6	- 0.4
150.0	149.9	149.9	- 0.1

Instrument Calibration Results

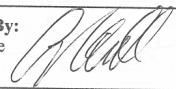

75.0	87.0	75.1	+ 0.1
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Comment: Instrument calibration failed. Rewired to use secondary sensor within head& found OK

Calibration Equipment

Manufacturer	Model	Serial Number	Calibration Date	Certificate No.
Eurolec	PC Temp PT2	84/PT2/100	11 th Jan 2008	7118
Time Electronics	1042 Resistance	1203B2	14 th Jan 2008	7119

DECLARATION: The calibration references used can be traced back to recognised national standards.

Tested By: Signature		Date	29/7/08	Accepted By: Signature		Date	29/7/08
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CERTIFICATE OF CALIBRATION

Customer	Enva Portlaoise	Contract	183101
Customer Instrument ID	V37 Temp	Location	Tank Farm
Device Description	PT100 Temperature Probe	Calibration Range	0 – 150 Deg C
Calibration Date	29 th July 2008	Interval	12 month
Instrument Accuracy	+ or – 0.1 Dec C	Calibration Due Date	July 2009

Loop Calibration Results

INPUT	AS FOUND	AS LEFT	DEVIATION
0.0	- 0.2	- 0.2	- 0.2
25.0	24.9	24.9	- 0.1
50.0	49.9	49.9	- 0.1
75.0	74.9	74.9	- 0.1
100.0	99.9	99.9	- 0.1
150.0	149.9	149.9	- 0.1

Instrument Calibration Results

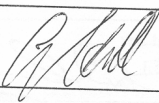
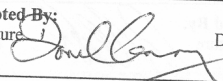
75.0	75.4	75.4	+ 0.4
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Comment: High level sounder and SCADA screen Alarm found working OK

Calibration Equipment

Manufacturer	Model	Serial Number	Calibration Date	Certificate No.
Eurolec	PC Temp PT2	84/PT2/100	11 th Jan 2008	7118
Time Electronics	1042 Resistance	1203B2	14 th Jan 2008	7119

DECLARATION: The calibration references used can be traced back to recognised national standards.

Tested By: Signature		Date	29/7/08	Accepted By: Signature		Date	29/7/08
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CERTIFICATE OF CALIBRATION

Customer	Enva Portlaoise	Contract	183101
Customer Instrument ID	V25 Temp	Location	Tank Farm
Device Description	PT100 Temperature Probe	Calibration Range	0 – 150 Deg C
Calibration Date	29 th July 2008	Interval	12 month
Instrument Accuracy	+ or – 0.1 Dec C	Calibration Due Date	July 2009

Loop Calibration Results

INPUT	AS FOUND	AS LEFT	DEVIATION
0.0	- 0.5	- 0.5	- 0.5
25.0	24.6	24.6	- 0.4
50.0	49.6	49.6	- 0.4
75.0	74.2	74.2	- 0.8
100.0	99.2	99.2	- 0.8
150.0	149.7	149.7	- 0.3

Instrument Calibration Results



75.0	75.1	75.1	+ 0.1
------	------	------	-------

Comment: Failed to sound alarm or display alarm on SCADA screen. Software modified to correct this problem.

Calibration Equipment

Manufacturer	Model	Serial Number	Calibration Date	Certificate No.
Eurolec	PC Temp PT2	84/PT2/100	11 th Jan 2008	7118
Time Electronics	1042 Resistance	1203B2	14 th Jan 2008	7119

DECLARATION: The calibration references used can be traced back to recognised national standards.

Tested By: Signature		Date	29/7/08	Accepted By: Signature		Date	29/7/08
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CERTIFICATE OF CALIBRATION

Customer	Enva Portlaoise	Contract	183101
Customer Instrument ID	V24 Temp	Location	Tank Farm
Device Description	PT100 Temperature Probe	Calibration Range	0 – 150 Deg C
Calibration Date	29 th July 2008	Interval	12 month
Instrument Accuracy	+ or – 0.1 Dec C	Calibration Due Date	July 2009

Loop Calibration Results

INPUT	AS FOUND	AS LEFT	DEVIATION
0.0	- 0.4	- 0.4	- 0.6
25.0	24.3	24.3	- 0.7
50.0	49.0	49.0	- 1.0
75.0	74.3	74.3	- 0.7
100.0	99.3	99.3	- 0.7
150.0	149.3	149.3	- 0.7

Instrument Calibration Results

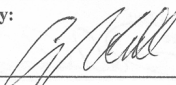
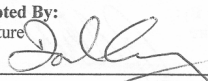
75.0	75.1	75.1	+ 0.1
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Comment: Failed to sound alarm or display alarm on SCADA screen. Software modified to correct this problem.

Calibration Equipment

Manufacturer	Model	Serial Number	Calibration Date	Certificate No.
Eurolec	PC Temp PT2	84/PT2/100	11 th Jan 2008	7118
Time Electronics	1042 Resistance	1203B2	14 th Jan 2008	7119

DECLARATION: The calibration references used can be traced back to recognised national standards.

Tested By: Signature		Date	29/7/08	Accepted By: Signature		Date	29/7/08
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CERTIFICATE OF CALIBRATION

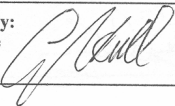
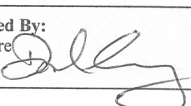
Customer	Enva Portlaoise	Contract	183101
Customer Instrument ID	V22 Temp	Location	Tank Farm
Device Description	PT100 Temperature Probe	Calibration Range	0 – 150 Deg C
Calibration Date	29 th July 2008	Interval	12 month
Instrument Accuracy	+ or – 0.1 Dec C	Calibration Due Date	July 2009

Loop Calibration Results			
INPUT	AS FOUND	AS LEFT	DEVIATION
0.0	+ 0.2	+ 0.2	+ 0.2
25.0	25.1	25.1	+ 0.1
50.0	50.2	50.2	+ 0.2
75.0	75.3	75.3	+ 0.3
100.0	100.3	100.3	+ 0.3
150.0	150.4	150.4	+ 0.4
Instrument Calibration Results			
75.0	75.0	75.0	0
Comment: High Level Sounder Alarm & SCADA screen Alarm found not working. Reprogrammed SCADA to activate as a 'Blowing Tanks Alarm'			

Calibration Equipment

Manufacturer	Model	Serial Number	Calibration Date	Certificate No.
Eurolec	PC Temp PT2	84/PT2/100	11 th Jan 2008	7118
Time Electronics	1042 Resistance	1203B2	14 th Jan 2008	7119

DECLARATION: The calibration references used can be traced back to recognised national standards.

Tested By: Signature		Date	29/7/08	Accepted By: Signature		Date	29/7/08
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CERTIFICATE OF CALIBRATION

Customer	Enva Portlaoise	Contract	183101
Customer Instrument ID	V19 Top Temp	Location	Tank Farm
Device Description	PT100 Temperature Probe	Calibration Range	0 – 150 Deg C
Calibration Date	29 th July 2008	Interval	12 month
Instrument Accuracy	+ or – 0.1 Dec C	Calibration Due Date	July 2009

Loop Calibration Results

INPUT	AS FOUND	AS LEFT	DEVIATION
0.0			
25.0			
50.0			
75.0			
100.0			
150.0			

Instrument Calibration Results

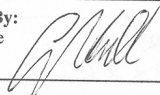
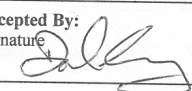
75.0	N/A	N/A	N/A
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Comments: Instrument & Loop calibration not possible. Instrument not accessible due to height of fitting on tank. Historical trend readings compared to bottom probe & found comparable.

Calibration Equipment

Manufacturer	Model	Serial Number	Calibration Date	Certificate No.
Eurolec	PC Temp PT2	84/PT2/100	11 th Jan 2008	7118
Time Electronics	1042 Resistance	1203B2	14 th Jan 2008	7119

DECLARATION: The calibration references used can be traced back to recognised national standards.

Tested By: Signature		Date	29/7/08	Accepted By: Signature		Date	29/7/08
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Appendix 13



CLOSURE, RESTORATION, AFTERCARE MANAGEMENT PLAN

**Enva Ireland Ltd,
Clonminam Industrial Estate,
Portlaoise,
Co. Laois.**

License no: W0184-01

April.2009



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CLOSURE, RESTORATION, AFTERCARE MANAGEMENT PLAN

Waste License W0184-01

1.0 INTRODUCTION & SCOPE STATEMENT

This Closure, Restoration, Aftercare Management Plan (CRAMP) has been prepared by Enva Ireland Ltd in respect of its facility in Portlaoise, Co. Laois in fulfilment of Condition 12.2 of Waste License number W0184-01.

An Initial Screening & Operational Risk Assessment has been carried out in accordance with the EPA guidance document on “Environmental Liability Risk Assessment, Residuals Management Plans and Financial Provision (2006)”. On the basis of the initial screening and operational risk assessment the Enva facility is classified as a Category 3 facility. As such this indicates that the full requirements for a Closure, Restoration and Aftercare Management Plan must be considered.

The scope of this risk assessment is the licensed activities covered under W0184-01 excluding those activities associated with operation of the sludge drying unit and associated CHP plant. This plan shall be reviewed annually and any necessary inclusions to the scope will be accommodated accordingly.

1.1 Closure Scenarios

As the facility has only recently commenced operations no site closure is envisioned in the near future. In the event of ceasing waste license activities (due to site closure or otherwise) it is envisioned that this would involve clean closure of all site infrastructure associated with the waste activities.



2.0 SITE EVALUATION

A detailed description of site activities, site location etc is set out in the Waste License Application of the waste licence granted for the site in January 2004.

2.1 Facility Description & History

Enva operates a waste acceptance, processing and transfer station located on a 5.65 acre site in Clonminam Industrial Estate, Portlaoise, Co. Laois. Enva operates a 12 hour day for 5 days a week. Enva currently employs approximately 85 employees at the Portlaoise facility

A sister company of Enva, Emo Oil Services Ltd. maintains 9 storage tanks and a gantry on the site. It is assumed that in the event of Enva ceasing business and closing the facility that Emo will continue to maintain their current use of the site.

Enva accepts the following wastes on site as per Schedule A of its waste licence ref. W0184-01; waste oils, sludge's, oily absorbents, oil filters, soils contaminated with hydrocarbons, mixed fuels, antifreeze, brake fluid, fluorescent tubes, batteries, acids and bases. Enva also collects used cooking oils which is the predominant non-hazardous waste stream on site.

The facility's license also provides for activities related to a sludge drying facility. This activity has not commenced and is not envisioned to do so in the foreseeable future.

Enva have a dedicated processing plant for the recovery of waste oils. The Portlaoise facility also has analytical capability provided by an in-house laboratory, which includes waste oil and effluent analysis. Enva has a bunded tank farm which comprises of 18 waste oil storage tanks, 3 UCO tanks and 7 storage tank for final fuel oil product.

The facility also has 4 soil bays dedicated to the treatment of contaminated soil. Enva provide bio-remediation and soil stabilisation treatment options.

Enva's 865m² waste storage building is dedicated to the segregation of incoming wastes and preparation of wastes prior to export. Enva also accept fluorescent tubes which it processes on site to allow separation of the main components for export.

Enva also provides warehousing for a range of waste storage and spill clean up products.

There are two surface water collection systems on site. In the first system, the main area of the site, i.e. the central and southern areas of the site, surface water



CLOSURE, RESTORATION, AFTERCARE MANAGEMENT PLAN

Waste License W0184-01

is collected by yard gullies and drains to a four chamber interceptor. In this unit, separation of traces of oil takes place and the oil free water is pumped under level control from a post separation pump chamber to a second interceptor located near the west border of the site.

In the second system surface water from the north end of the site is collected and fed to the second separator mentioned above. The second separator is also fitted with a sensor that upon a large influx of oil entering the interceptor, the release valve will shut down automatically. The water from the interceptors leaves the site and enters the municipal surface water system.

Effluent from the processing of waste oil is treated in the on site lime treatment plant prior to release to Portlaoise wastewater treatment plant via the town sewer.

Minor contamination of groundwater was identified in quarterly groundwater reports undertaken in accordance with waste licence conditions. The following two reports, the first entitled "An Environmental Site Investigations Report" by URS in July 2005 and the second entitled "A Summary Report on the Trend of Contaminant Levels at Enva Ireland Since 2005" by RPS in 2007 have deemed contamination to be localised and is due to historic activities undertaken at the site, prior to the acceptance of waste on site. The report also states that the groundwater contamination is not moving down gradient or off-site and that natural processes in the groundwater are attenuating the contamination on site.

2.2 Facility Compliance Status

Enva have been operating under the conditions of its waste licence W0184-1 since it was issued the licence on the 16th of January 2004. Enva, Portlaoise have never been convicted under the Environmental Protection Act or any other environmental legislation. Enva, Portlaoise are largely compliant with their waste licence reference W0 184-01.

Historically, Enva experienced zinc exceedences in its wastewater emissions; to prevent reoccurrence of these exceedences Enva invested significant resources in the installation of a lime wastewater treatment plant which removes the metal content of the waste water and as a result have improved the quality of the effluent off site.

Seventeen non-compliances relating to emissions from the site were reported within the last twelve month period. Five of these emissions related to odour complaints with the remaining two relating to administrative issues. The aforementioned odour complaints were investigated and mitigation measures were promptly implemented.



CLOSURE, RESTORATION, AFTERCARE MANAGEMENT PLAN

Waste License W0184-01

Further to the EPA guidance document on “Environmental Liability Risk Assessment, Residuals Management Plans and Financial Provision (2006)” a compliance record score of 4 is judged to be appropriate for Enva.

2.3 Facility Processes and Activities

Enva has nationwide collection service for waste oils. Waste oils are collected from customers by tanker and delivery to the facility. The tanker weighs in on site, connects to the unloading gantry and has its contents transferred to bulk storage tanks within the bunded tank farm on site. All operations thus take place within a bunded area. Tanks are controlled by a SCADA system and fitted with level alarms which sound at three stages these are high, high-high and high-high-high. All relevant records are retained as required by legislation and by the license.

Enva process the waste oils on site to form a final fuel oil product known as 11ls. 11ls must meet the specified limits for parameters as listed in Schedule G of Envas waste licence prior to transport off site.

Mixed fuels are collected by tanker and in suitable UN approved drums. Mixed fuels are bulk stored on site in an underground storage tank prior to being transported off site to an approved facility.

Packaged waste (e.g. filters, batteries, fluorescent light bulbs, etc) are collected from customer sites and delivered to Enva and unloaded into the waste storage bay. Packaged containers will be given a tracking code and entered into a database / recording system. The packages will be stored in local bunds within the waste handling area and segregated according to procedures based on UK HSE Guidelines for storage and warehousing of packaged dangerous goods, HSG 71. Packaged wastes are bulked and dispatched to an approved recovery / disposal outlets via TFS.

Enva also provides a used cooking oil collection service. This service is undertaken by the collection of cooking oil both by bulk tanker and in individual drums or containers. Used cooking oil is delivered to the facility in Portlaoise where it is stored in bulk tankers following primary screening for the removal of solids. Where hardened cooking oils are received on site they are returned to liquid state prior to initial screening and bulking.

The license allows for acceptance of non-hazardous sludge and associated on-site treatment by means of sludge drying. This activity will not commence in the foreseeable future and is therefore outside the scope of this CRAMP until such time as the situation changes.

Other activities at the site include the storage of waste storage and spill treatment products. These activities are outside the scope of the license.

2.4 Inventory of Site Buildings, Plant, Raw Materials and Wastes

In the event of closure the following inventory would have to be considered:

- Office and Laboratory with associated welfare facilities
- Lockers and Showers for operatives and drivers
- Workshop
- Electrics room
- Dry Cleaning area
- Process room
- UST of 30,000 litre capacity for the storage of Petrol
- Boiler House
- Loading/Unloading Gantries x 3
- Oil transfer pumps and valves;
- A bunded tank farm consists of 40 tanks that range in capacity from 50,000litres, 140,000, 200,000, 1,000,000 and 2,000,000 litres. The following substances are contained within these tanks are; waste oil, LS tanks, cooking oil, kerosene tanks, Gas Oil and Derv
- Bunded flammable waste storage area 217m²
- Sludge bay for tanker dig out
- A bunded storage unit for the receiving and storage of hazardous waste materials
- Soil Sheds
- Weighbridge;
- Enclosed Process Building – Oil Filters and Oily Rags
- 360m² building used for general storage of equipment etc. The floors of each section are fully bunded. The exterior of the building is clad with fire resistant cladding;
- Enclosed area for used cooking oil melting bath
- Bunded effluent lime treatment plant area 210m²
- Surface water drainage network with two oil interceptors of 58 and 30 tonnes in capacity fitted with coalescence filter.
- Concrete surfacing



3.0 CLOSURE CONSIDERATIONS

3.1 Clean or Non Clean Closure Declaration

In the event of permanently ceasing all waste activities at the site or in the event of full site closure, Enva would envision a clean closure. No wastes are buried on site and according to independent analysis of groundwater monitoring results; there is localised contamination of groundwater detected onsite and that natural processes in the groundwater are attenuating the contamination on site.

Therefore it is expected that there would be no significant remaining environmental liabilities following full or part closure.

3.2 Plant or Equipment Decontamination Requirements

Following removal of remaining waste (liquid and packaged waste) all waste oil tanks, bunds, associated pipelines, pumps, spill trays and the oil interceptor would be decontaminated.

All bulk storage and associated pipelines, pumps, valves, spill trays, with the exception of the EMO tanks will be empty and cleaned to a gas free standard. The process equipment will be oil free and electrically isolated.

At this point the only operational area will be the boiler room with the associated LPG supply, the treatment plant, the laboratory and some of the administration area. There will be temporary designated storage area with adequate secondary containment to facilitate any miscellaneous or unanticipated waste or chemical arising during latter stages of decommissioning.

All non-process related material will be removed for use to local business or sent to an approved facility for recovery or disposal.

The waste water treatment plant is only to be decommissioned at the penultimate stage in the decommissioning plan as it will be treating liquid residues from other decommissioning activities.

Surface water interceptors will be de-sludged and steam cleaned and the resulting sludge removed for treatment off site.

It is assumed at this stage no further liquid effluent will be generated on site. The treatment plant will be isolated but not physically disconnected from incoming flow. A connection will be maintained for emergency purposes. Any remaining untreated effluent will be treated as normal.

Treatment tanks and equipment will then be de-sludged and the resulting sludge disposed of as a hazardous waste. The tanks will be steam cleaned and the resulting washings disposed of as hazardous waste.

Once all areas of the site are considered adequately clean, the boiler will be decommissioned. The LPG supply boiler may be isolated but this will depend on the need for the boiler by Emo Oil. The boiler house floors and fuel pipework will be cleaned and the washings treated on site.

All remaining packaged wastes would be sent to approved facilities for final disposal/recovery.

All bunded areas and the floor of the waste handling area would be inspected for any signs of surface contamination and if necessary this would be washed from the surfaces as above.

A CCTV inspection of stormwater drains and gullies would be carried out and any residues washed to the oil interceptors as appropriate. Following this the oil interceptor would be desludged and washed out to remove any residual traces of oil. The interceptors would be inspected for signs of contamination or presence of residue and cleaned out with clean water.

All drains associated with the foul sewer system would also be flushed with clean water.

Lab equipment used for on-site environmental analysis would be cleaned / wiped down if necessary.

Any hazardous residuals such as the following:

- Asbestos cement tiles in the warehouse roof – a survey of the roof will be undertaken at the decommissioning stage and its recommendations followed where practicable.
- Fire-fighting foam and other extinguishers will remain assuming EMO assume operation of the site.
- Lab chemicals and workshop will be disposed of in an appropriate manner to a licenced facility.
- Lab GC instrument containing radioactive material – There is a radioactive source on-site, in the form of a Ni63, 555 MBq unit located in the laboratory Gas Chromatography (GC) machine. However, it is anticipated that the GC instrument would most likely be sold on as an asset.
- Emergency generator fuel – since Emo Oil would presumably remain on site, the emergency generator will not be decommissioned and the diesel oil supply maintained locally for the generator.
- Boiler treatment chemicals
- Fluorescent tubes, batteries and toner cartridges will be sent via existing disposal/recovery routes.

3.3 Plant Disposal or Recovery



All plant items have inherent value for reuse within Enva Ireland Ltd or for sale to a third party as appropriate. Infrastructure such as the building, bunds, diversion tank, stormwater drains, groundwater monitoring wells, weighbridge, foul sewer network would remain in situ as they form part of the inherent capital value of the site and do not themselves present potential for environmental pollution.

Tanks, pumps, spill trays, laboratory equipment etc may either be removed for use on another Enva Ireland Ltd site or sale to third party or they may remain in place for use on-site (i.e. for non-waste activities).

3.4 Waste Disposal or Recovery

All wastes including those listed below will be dispatched to approved third party waste contractors. Recovery/reuse options for wastes will be sought in preference to treatment/disposal where this is possible and appropriate.

- Packaged wastes.
- Waste oil from bulk oil tanks.
- Sludge / residue from the interceptor.
- Washings from tanks, bunds, floors, equipment, and diversion tank.
- General refuse.
- Lab wastes.

Unused absorbent material for spillage control may be reused within Enva Ireland Ltd or sold to a third party.

3.5 Soil Removal

There is no on-site landfilling at the Enva facility. Contaminated soil accepted from customers prior to the cessation of waste acceptance activities will be removed to existing approved treatment routes and where required via TFS.



4.0 CRITERIA FOR SUCCESSFUL CLOSURE

4.1 Addressing of Site Environmental Liabilities at Closure

Successful clean closure will be expected to be achieved when it can be demonstrated that there are no remaining environmental liabilities at the site. In practice this will require demonstration that the following criteria have been met:

- There are no residues which could pose an environmental hazard remaining on or within plant and equipment associated with waste activities.
- All wastes associated with licensed waste activities and with the cleaning and decontamination of plant and equipment as part of the closure have been removed off site to appropriately licensed facilities and carried by hauliers who have appropriate waste collection permits.
- Groundwater monitoring carried out following plant decontamination and waste removal indicates that no residual contamination exists within the soils or groundwater as a result of site activities.
- All relevant records relating to the closure have been retained on file.

5.0 CLOSURE PLAN COSTING

5.1 Decontamination Costs

Costs associated with decontamination of tanks, bunds, floors, drains, interceptors and would include detergent/caustic wash, labour, use of tanker / IBCs, hire of power washer unit. Labour would be supplied from within Enva's own existing resources. Hire of a tanker and power washer would also be from within Enva's existing resources. Water and energy is supplied to the site and is not expected to present a significant cost over and above normal operating costs.

Desludging of the two oil interceptors would cost approximately €5,000.

Washing of floors with detergent / caustic would cost approximately €3,000.

5.2 Plant & Waste Disposal Costs

As indicated earlier plant and equipment would have inherent value and in many cases would in fact add to the capital value of the site following closure. There are therefore no net costs associated with plant and equipment.

Waste oil and packaged wastes from customers are accepted to the facility on a commercial basis. Thus costs of disposal are directly charged to the customer therefore there would be no net cost associated with disposal of these wastes.

The principal wastes for disposal would therefore be the waste washings from the decontamination activities. It is anticipated that there could be up to 50 tonnes of washings for disposal which would be treated and discharged from the facility. Sludge's from the cleaning out of tanks is estimated to create up to 250 tonnes of oily sludge's. These would have to be exported for disposal/recovery, the estimated cost of disposal/recovery is €400/tonne amounting to €100,000.

The cleaning and decontamination of all the tanks on site is estimated to be approximately €241,250. This is based on 96 days required to carry out the cleaning of each tank at a cost of €2, 500 for each days activities.

Other wastes may include a small quantity of lab waste as well as general refuse. Estimated costs for these would be expected at less than €10,000.

5.3 On-going monitoring

It is not envisioned that any on-going monitoring would be required at the site. However, prior to closure the following monitoring and reports would be required to finalise the closure:



CLOSURE, RESTORATION, AFTERCARE MANAGEMENT PLAN

Waste License W0184-01

- CCTV of stormwater drains.
- One round of groundwater monitoring.
- Validation audit.

It is estimated that the costs of the CCTV would be of the order of €3,000 and the groundwater monitoring and report would be of the order of €10,000. €35,000 is allowed for the remediation of any possible soil contamination present on site. The use of an excavator is also allowed should any it be required.

An independent audit will be carried out by external competent specialists in order to validate the implementation of the CRAMP. Costs of this are expected to be in the order €4,000.

5.4 Facility Security and Staffing

During closure facility security would be provided in the normal way and would not be expected to constitute additional costs. The site is surrounded with an 8 foot high palisade fence with two entrance gates which are operated by a fob system. The gates can additionally be padlocked if required.

Staffing would be provided from within Enva's own resources for the purposes of decontamination and cleanup. No additional costs are envisioned in respect of this.

5.5 Summary of Costs

The total costs associated with this CRAMP are estimated as follows;

DESCRIPTION	COST
Desludging of oil interceptors	€5,000
Cost of floor washing	€3,000
Desludging/cleaning of storage tanks	€241,250
Disposal of oily sludge's	€100,000
Disposal of other wastes	€10,000
CCTV of stormwater drains	€3,000
One round of soil and groundwater monitoring report	€10,000
Remediation of soil	€35,000
Excavator for ground investigations	€2,352
Validation audit and report	€4,000
TOTAL	€413,602



6.0 CLOSURE PLAN UPDATE AND REVIEW

6.1 Proposed Frequency of Review

As per the waste license condition 4.3.1 it is proposed to review this CRAMP annually and to revise it whenever this is warranted due to significant changes to costs, site conditions, plant, infrastructure or waste activities.

6.2 Proposed Scope of Review

The annual review of the CRAMP referred to above will include the entire document.



7.0 CLOSURE PLAN IMPLEMENTATION

7.1 EPA Notification

In the event that closure is planned. Enva will notify the Agency in writing as soon as is feasible in advance of the closure. Enva would aim to ensure that this notification takes place at least one week in advance of implementing the CRAMP.

7.2 Local or other Statutory Authority notifications

The closure of waste activities at Enva Ireland Ltd in Portlaoise would not be likely to concern any other agencies or authorities. It is therefore not envisioned that any notification other than that mentioned in Section 7.1 above would be required.

7.3 Test Programme

There are no test programmes relevant to the closure.

7.4 Full or Partial Closure considerations

It is conceivable that a part of Enva's waste activities could be closed while others continue. In this event the plant, equipment, raw materials and wastes relating only to the part of the waste activities which are closed will be closed in accordance with this plan. For partial closure the specific components which are within the scope of the closure will be listed within the notification referred to in Section 7.1 above and validation against successful closure criteria will be carried out in respect of the listed items only.



8.0 CLOSURE PLAN VALIDATION

8.1 Closure Validation Audit

As part of the closure, Enva would employ an independent environmental specialist with experience and recognised qualifications as an environmental auditor (e.g. membership of IEMA or similar) to conduct a validation audit against the requirements of this CRAMP particularly the criteria set out in Section 4.1. The scope of the audit shall be the same as the scope of the closure.

8.2 Closure Validation Audit Report

An audit report would be prepared by the independent auditor clearly setting out the overall conclusions of the audit and specifying whether the audit criteria had been achieved.

8.3 Closure Validation Certificate

The closure will be deemed to be complete if all criteria set out in Section 4.1 have been deemed to be achieved in the auditor's report. This shall be regarded as certification of completion of the closure in accordance with this plan. The auditor's report will then be submitted to the Agency.



9.0 RESTORATION AND AFTERCARE MANAGEMENT PLAN (RAMP)

As indicated in Section 1, Enva is classified as a Category 3 risk site by default and therefore must consider the need for a Restoration and Aftercare Management Plan (RAMP). The EPA guidance document recognises that the majority, but not all, Category 3 facilities will require a restoration and aftercare management plan. In particular, the guidance document states that RAMP is needed for non-clean closure.

Enva Ireland Ltd would envision a clean closure for its Portlaoise waste activities and therefore would not envision the need for restoration or any aftercare. Part of the site closure plan includes verification that no significant contamination remains with soils/groundwater following closure. In the event that there are any remaining residues which could pose a hazard to the environment or that soil / groundwater contamination is discovered this situation will be reviewed.

9.1 Site Restoration and Aftercare Management Costs

In view of the above there are no anticipated costs associated with site restoration and aftercare management post closure.

Appendix 14



Environmental Liability Risk assessment.

**Enva Ireland Ltd,
Clonminam Industrial. Estate,
Portlaoise,
Co. Laois.**

License no: W0184-01

April.2009

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1. INTRODUCTION

1.1. General

Envva Ireland Limited (Envva) operates a waste licensed facility in Clonminam industrial estate, Portlaoise, Co. Laois comprising of the following:

- Office and Laboratory with associated welfare facilities
- Lockers and Showers for operatives and drivers
- Workshop
- Electrics room
- Dry Cleaning area
- Process room
- UST of 30,000 litre capacity for the storage of Petrol
- Boiler House
- Loading/Unloading Gantries x 3
- Oil transfer pumps and valves;
- A bunded tank farm consists of 40 tanks that range in capacity from 50,000litres, 140,000, 200,000, 1,000,000 and 2,000,000 litres. The following substances are contained within these tanks are; waste oil, 11LS , cooking oil, kero tanks, Gas Oil and Derv
- Bunded flammable waste storage area 217m²
- Sludge bay for tanker dig out
- A bunded storage unit for the receiving and storage of hazardous waste materials
- Soil Sheds
- Weighbridge;
- Enclosed Process Building – Oil Filters and Oily Rags
- 360m² building used for general storage of equipment etc. The floors of each section are fully bunded. The exterior of the building is cladded with fire resistant cladding;
- Enclosed area for used cooking oil melting bath
- Bunded effluent lime treatment plant area 210m²
- Surface water drainage network with two oil interceptors of 58 and 30 tonnes in capacity fitted with coalescence filter.
- General stores area.
- Concrete surfacing

Environmental management of the site is regulated by the conditions prescribed in the sites Waste Management Licence Register No. W0184-01 issued on the 16th of January 2004 by the Environmental Protection Agency (Agency).

Clause 12.2 of the Waste Licence requires the preparation and submittal to the Agency of an Environmental Liabilities Risk Assessment (ELRA). The specific requirements are as follows:

12.2.2 The licensee shall arrange for the completion by an independent and appropriately qualified consultant, of a comprehensive and fully costed Environmental Liabilities Risk Assessment (ELRA), which addresses the liabilities from past and present activities. A report on this assessment shall be submitted to the Agency for agreement within twelve months of date of grant of this licence. The ELRA shall be reviewed as necessary to reflect any significant

change on site, and in any case every three years following initial agreement: review results are to be notified as part of the AER.

12.2.3 As part of the measures identified in Condition 12.2.1, the licensee shall, to the satisfaction of the Agency, make financial provision to cover any liabilities identified in Condition 12.2.2. The amount of indemnity held shall be reviewed and revised as necessary, but at least annually. Proof of renewal or revision of such financial indemnity shall be included in the annual 'statement of measures' report identified in Condition 12.2.1.

The most recent EPA Guidance Document entitled “*Guidance on Environmental Liabilities Risk Assessment, Residuals Management Plans and Financial Provision, copyright 2006*” – (hereafter referred to the EPA ELRA Guidance Document 2006) was used in the preparation of this Environmental Liabilities Risk Assessment.

Enva Ireland Ltd – Portlaoise - Environmental Liabilities Risk Assessment

Enva Ireland, Clonminam Industrial Estate, Portlaoise, Co. Laois was granted a Waste Licence (Register Number 184-1) on the 16th of January 2004. Included in this licence was the provision to install a sludge drying facility and associated CHP plant. However Enva has not as yet installed a sludge drying facility and associated CHP plant and therefore it has not been considered within the ELRA.

1.2. Environmental Liabilities Risk Assessments

Any industrial site has the potential to generate environmental liabilities, i.e. damage to the environment, which must be remedied, such remediation being associated with a quantifiable financial cost.

Environmental liabilities may arise from *anticipated* or *foreseeable* events, i.e. known and quantifiable releases to the environment, which arise due to the day-to-day operation of the facility.

For a site subject to Waste Licensing, regular emissions to air, water and land have typically been the subject of detailed quantification and consequence analysis, i.e. assessment of the impact of emissions, during the licence application process. The resulting Waste Licence either establishes emission limits and other conditions at a level which prevents the arising of new liabilities, or which may require bonding or other secure funding mechanism to cover any expected liability. The latter case applies usually to, for example, on-site land filling activities.

Environmental liabilities may also arise from unanticipated or unforeseen events. Such events may be generally classified under the following headings:

- Events which are *sudden*, and which are identifiable as an incident or a series of related incidents, which give rise to an environmental liability concurrent with the incident or shortly thereafter;
- Events, which develop gradually or go unnoticed for a long period of time, which gradually gives rise to an environmental liability.

Examples of the former would include explosion/fire or accidental release of chemicals from a storage tank to a watercourse.

An example of the latter would be leaks in underground storage tanks or transfer lines, which would result in the gradual build-up of soil and/or groundwater contamination.

The costs of dealing with unanticipated or unforeseen events are usually issues which are addressed in the insurance cover for the industrial site in question. The degree to which existing insurance policies cover environmental liabilities depends on many factors including the specific wording of the policies and legal precedence. Most Public Liability insurance policies will contain some element of cover for environmental liabilities.

However, the extent and applicability of coverage is dependent on analysis of and professional judgement on the particular insurance policy.

Environmental liability risk assessment (ELRA) considers the risk of unplanned events occurring during the operation of a facility that could result in unknown liabilities materialising. Based on an initial risk categorisation of the activity into Low, Medium or High risk, different approaches are recommended according to the risk category. Simple approaches are proposed for low risk facilities to more detailed site-specific approaches involving detailed environmental liability risk assessment for higher risk facilities.

1.3. Basis for the ELRA

This report has been provided for the sole use of Enva and for submission to the EPA in accordance with the EPA guidance document entitled "Guidance on Environmental Liability Risk Assessment, Residuals Management Plans and Financial Provision".

The basis of this ELRA is as follows:

- A review of the activities carried out at the site, including process and services;
- A review of the following documentation:
 - Waste Licence Application Files;
 - Environmental Aspects and Impacts Register;
 - Environmental Management Programme;
 - HSE Management System Manual
 - Emergency Response Plan
 - Risk Assessments Register
 - Closure, Restoration, Aftercare Management Plan
 - Bund Integrity Report; and,
 - Operational Procedures.
- Identification of existing and potential hazards, including evaluation of materials and wastes generated; and,
- Consideration of historic environmental incidents and remediation works undertaken.

Based on the desk-based study research and a site inspection, a thorough assessment was made of potential environmental liabilities requiring remediation to which costs could be assigned. Remedial actions are described for these and remediation or corrective costs are identified.

1.4. Key Considerations

There is a reasonable degree of subjectivity and uncertainty involved in Environmental Liabilities Risk Assessment so it is important to identify at an early stage that the following was taken into account:

Envia maintains site conditions in accordance with their Waste License No. W0184-01 and has an Environmental Management System (EMS) accredited to ISO 14001. No provision has been made for costs associated with any criminal proceedings that could arise, as firstly, it is understood that there is goodwill and a strong desire by Enva to remain compliant with relevant legislation and EPA requirements, and secondly, such costs are uninsurable and therefore cannot be underwritten by any third party or insurance organisation.

The ELRA has been based upon historic and current operational activities. It does not consider potential environmental liabilities associated with significant changes in use of the site, such as redevelopment for other commercial or industrial purposes by Enva or any other party, as these would require a separate risk assessment exercise should they arise. Furthermore, the ELRA does not include a costing of the decommissioning and oversight of the facility in the event of a full site closure.

1.5. Structure of the ELRA

The ELRA report is structured as follows:

Section 2 provides an overview of the Enva facility including details of existing processes, buildings and structures present on the site at the time this report was prepared.

Section 3 describes the initial screening and operational risk assessment carried out for the facility.

Section 4 provides an overview of the historical environmental liabilities at the facility.

Section 5 provides an overview of the existing measures in place at the site to minimise possible environmental liabilities associated with the facility.

Section 6 described the site specific risk assessment, which was carried out for the facility. It includes section on Risk Identification, Occurrence Likelihood, Severity Assessment, Risk Evaluation and Prevention/Mitigation

Section 7 describes the financial provisions in place to deal with any unknown liabilities and identifies possible gaps between the level of cover provided and the level of risk associated with the facility.

Section 8 provides a summary and conclusion.

2. OVERVIEW OF ENVA

2.1. Site Location & Site History

Enva operates a waste acceptance, processing and transfer station located in Clonminam Industrial Estate, Portlaoise, Co. Laois. A site location map is shown in **Figure 1** Attached in Appendix 1

Prior to Enva Ireland Ltd. acquiring the site it is understood that the site was developed from a greenfield site

2.2. History of Enva

Enva can trace its history back to 1972, when Enva Waste Oil was set up to collect waste oil primarily from the automotive industry, making it the longest standing hazardous waste management company in Ireland. The original waste facility was established in Portlaoise in 1978 initially to process waste oil.

In 1987, the company was purchased by Irish sales marketing and business support services group DCC plc, and between 1988 and 2000, services grew to include; Industrial and Automotive Services; Field Services; Environmental Products and Emergency Response. In 1999 Atlas Oil was issued an IPPC licence. In 2000, the facility in Portlaoise was awarded the first and only license for off-site treatment of petroleum contaminated soil by the EPA. In 1994 the Portlaoise facility was issued a Waste Licence ref 184-01 under which it currently operates

As part of DCC's ongoing expansion of DCC Environmental, Cork based water and effluent treatment firm Envirotech, was purchased in 2001. In January 2003, DCC acquired Shannon Environmental Services. This company based in Shannon provides key hazardous waste infrastructure in Ireland. The Shannon facility offers a range of Physico-Chemical and Biological treatment & disposal options.

In May 2005 Atlas purchased a waste licensed facility in Dublin. The facility currently acts as a base for their Underground Services division. A major upgrade of the facility is currently in operation, which will provide additional services and waste related activities

As the original business has grown significantly through a series of acquisitions, in June 2006, the decision was taken to re-brand all businesses under one new name and logo – Enva.

2.3. Site and Process Description

Enva operates a waste acceptance, processing and transfer station located in Clonminam Industrial Estate, Portlaoise, Co.Laois. It operates a 12 hour day for 5 days a week with a half day Saturday. Enva currently employs approximately 180 employees at the Portlaoise facility.

Enva accepts the following wastes on site as per Schedule A of its waste licence ref. 184-01; waste oils, sludge's, oily absorbents, oil filters, soils contaminated with hydrocarbons, mixed fuels, antifreeze brakefluid, fluorescent tubes, batteries, acids and bases. Enva also collects non-hazardous wastes from the use of cooking oils.

Enva applied to accept non-hazardous sludges under its waste licence however have yet to commence this activity with prior approval from the EPA.

Enva also provides warehousing for a range of waste storage and spill clean up products. The Portlaoise facility also has analytical capability provided by an in-house laboratory, which includes effluent and waste oil analysis.

The main features of this facility are summarised as follows:

- Office and Laboratory with associated welfare facilities
- Lockers and Showers for operatives and drivers
- Workshop
- Electrics room
- Dry Cleaning area
- Process room
- UST of 30,000 litre capacity for the storage of Petrol
- Boiler House
- Loading/Unloading Gantries x 3
- Oil transfer pumps and valves;
- A bunded tank farm consists of 40 tanks that range in capacity from 50,000litres, 140,000, 200,000, 1,000,000 and 2,000,000 litres. The following substances are contained within these tanks are; waste oil, LS tanks, cooking oil, kero tanks, Gas Oil and Derv
- Bunded flammable waste storage area 217m²
- Sludge bay for tanker dig out
- A bunded storage unit for the receiving and storage of hazardous waste materials
- Soil Sheds
- Weighbridge;
- Enclosed Process Building – Oil Filters and Oily Rags
- 360m² building used for general storage of equipment etc. The floors of each section are fully bunded. The exterior of the building is cladded with fire resistant cladding;
- Enclosed area for used cooking oil melting bath
- Bunded effluent lime treatment plant area 210m²
- Surface water drainage network with two oil interceptors of 58 and 30 tonnes in capacity fitted with coalescence filter.
- Concrete surfacing

3. SCREENING AND OPERATIONAL RISK ASSESSMENT

3.1. General

As a starting point in the process, a relatively simple risk assessment decision matrix can be used to classify sites into Risk Categories (1-3) and thereby select the specific ELRA and Financial Provision (FP) requirements that will be needed. The risk assessment decision matrix outlined in the EPA ELRA Guidance Document 2006 was used.

The risk category assigned to the facility depends on the complexity of operations at the site, the environmental sensitivity of the receiving environment and the compliance record of the facility.

- **Complexity** – the extent and magnitude of potential hazards present due to the operation of the facility (e.g. a function of the nature of the activity, the volumes of hazardous materials stored on site etc.). A Complexity Band (G1 least complex to G5 most complex) for each class of activity has been assigned and included in a Look-Up Table (Appendix B of the EPA ELRA Guidance Document 2006).
- **Environmental Sensitivity** – the sensitivity of the receiving environment in the vicinity of the facility, with more sensitive locations given a higher score (e.g. the presence of aquifers below the site, groundwater vulnerability, the proximity to surface water bodies and their status, the proximity to sensitive human receptors, etc). The Environmental Sensitivity is calculated on a site-specific basis using a sub-matrix (Table 3.1).
- **Compliance Record** – the compliance history of the facility.
Each aspect is multiplied to give the **Total Score** for the facility, and this can be used to place the facility into an appropriate Risk Category as follows:
Risk Category 1 = Score < 5
Risk Category 2 = Score 5-23
Risk Category 3 = Score > 23.
Once this has been completed, the licensee proceeds through the relevant steps of ELRA and FP that are considered appropriate for the Risk Category.

3.2. Complexity

Significant work has been done by the Environment Agency (England and Wales) in the development of the Environmental Protection Operator and Pollution Risk Appraisal (EPOPRA) methodology for classifying activities, and a similar but shortened version of this methodology has been developed for this process. Complexity Bands have where available, been derived from similar classification in the EP OPRA Complexity Score. A look up table for Irish activities has been included in Appendix B of the EPA's ELRA Guidance Document 2006.

The Complexity Band is used to determine the value used in the Operational Risk Assessments as follows: G1 = 1, G2 = 2, G3 = 3, G4 = 4 and G5 = 5

In January 2004, Enva were granted a revised Waste License Registration No. W0184-01, under Classes 6, 7, 12 and 13 in accordance with the Third Schedule of the Waste Management Acts 1996 to 2005 and Classes 2, 4, 5, 8, 9, 11, 12 and 13 in accordance with the Fourth Schedule of the Waste Management Acts 1996 to 2005.

The relevant complexity band for Enva according to the EPA's ELRA Guidance Document 2006 is based on the following:

The following are activities that Enva are licensed to undertake under the following classes;

Class 6 (third schedule) and Class 2 (fourth schedule):

Class 6: Biological treatment not referred to elsewhere in this Schedule which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1 to 10 of this Schedule.

Class 2: Recycling or reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes):

Under Class 6 and 2 Enva accepts soils contaminated with hydrocarbons on site for biological treatment and remediation. Where soils cannot be fully remediated on the Portlaoise site they are sent to hazardous landfill.

Enva have a ** m2 of covered treatment bays dedicated to the acceptance, storage and treatment of contaminated soil.

Class 8 (fourth schedule) and Class 9 (fourth schedule):

Class 8(fourth): Oil re-refining or other re-uses of oil:

This activity is limited to the recycling and treatment of waste oil and waste fuel, and the separation of hydrocarbon sludges, into oil, water and sludge fractions, and the subsequent recovery of segregated fractions, and the re-refining of other oils subject to the agreement of the Agency.

Class 9 (fourth): Use of any waste principally as a fuel or other means to generate energy: This activity is limited to the use of recovered oil as a fuel for the generation of power or steam.

Class 11 (fourth schedule):

Use of waste obtained from any activity referred to in a preceding paragraph of this Schedule: This activity is limited to the use of wastes obtained from any activity referred to in a preceding (paragraph of this Schedule for onward recovery, on or offsite, subject to the agreement of the Agency.

Class 12 (third and fourth scheduled)

Repacking prior to submission to any activity referred to in a preceding paragraph of this Schedule. This activity is limited to the recovery of oily solid wastes and used filters for onward recovery. Enva currently repackages oily absorbents, oil filters and batteries prior to disposal off site.

Class 13 (third and fourth schedule):

Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced (third & fourth schedule).

The acceptance of waste oils in bulk tankers is currently undertaken at the Enva site in Portlaoise. Enva has 18 waste oil storage tanks varying in capacity from 50,000 to 1,000,000 litres. These tanks are located in the tank farm where all the waste oil is stored. Waste oil is classified as a hazardous waste and this site processes approximately 24,000 tonnes per annum.

The following activities have as yet to be undertaken on the Enva Portlaoise site-

Enva is also licensed to undertake activities under Class 4 (fourth schedule), Class 5 (fourth schedule) and Class 7 (third schedule) however Enva have not undertaken activities assigned to these classes to date.

Class 4 (fourth schedule): Recycling or reclamation of other inorganic materials:

Class 5 (fourth schedule): Regeneration of acids or bases:
This activity is limited to the reconditioning of acids or bases for reuse.

Class 7 (third schedule): Physio-chemical treatment not referred to elsewhere in this Schedule (including evaporation, drying and calcinations) which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraph 1 to 10 of this Schedule.

Based on the information above and the EPA's ELRA Guidance Document 2006, the relevant complexity band for Enva according to this activity is G5. More than one scheduled activity is located at Enva Portlaoise therefore in accordance with the EPA's ELRA Guidance Document 2006 the highest Complexity Band was chosen.

Enva stores >10, 000 tpa of hazardous waste destined for recovery. This is deemed to be a Class 13 activity as listed in the third and fourth schedules. Based on this information, Appendix B of the EPA's ELRA Guidance Document 2006 places Enva in the G5 complexity band in accordance with guidance document the G5 complexity band gets a score of 5.

3.3. Environmental Sensitivity

A sub-matrix for environmental sensitivity for the Enva site is presented in Table 3.2. This considers 6 key potential environmental receptors and assigns individual scores that are added together to arrive at a total environmental attribute score. The scoring system used is outlined in EPA ELRA Guidance Document 2006. The total environmental attribute score is used to look up the environmental sensitivity classification in Table 3.1 below.

The environmental sensitivity sub matrix has been developed based on professional judgment and with reference to the system designed in the EP OPRA Scheme by the

Environment Agency (UK). The environmental sensitivity classification is used in the operational risk assessment to calculate the total score. The relevant scores are highlighted and underlined in Table 3.2.

The key receptors include:

- Human Beings
- Groundwater
- Surface Water
- Air Quality
- Protected Ecological Sites
- Sensitive Agricultural Receptors

Table 3.1 - Environmental Sensitivity Sub-Matrix

Environmental Attribute	Environmental	Attribute Score (Notes 1,2)
Human Occupation		
<50m		5
<u>50m-250m</u>		<u>3</u>
250m–1,000m		1
>1km		0
Groundwater Protection		
<u>Regionally Important Aquifer</u>		<u>2</u>
Locally Important Aquifer		1
Poor Aquifer		0
Vulnerability Rating – Extreme		3
Vulnerability Rating – High		2
Vulnerability Rating – Moderate		1
Vulnerability Rating - Low		0
Sensitivity of Receiving Water		N/A
Class A		3
Class B		2
Class C		1
<u>Class D</u>		<u>0</u>
Designated Coastal & Estuarine Waters		2
Potentially Eutrophic Coastal & Estuarine Waters		1
Air Quality & Topography		
Complex Terrain		2
Intermediate Terrain		1
<u>Simple Terrain</u>		<u>0</u>
Protected Ecological Sites		
Within or directly bordering protected site		2
<1km to protected site		1
<u>>1km to protected site</u>		<u>0</u>
Sensitive Agricultural Receptors		
<50m from site boundary		2
50m-150m from site boundary		1
<u>>150m from site boundary</u>		<u>0</u>

Note 1 – The environmental attribute which is relevant to the Enva facility is underlined and bold.

Note 2 – The scoring system used is taken from the EPA ELRA Guidance Document 2006.

Based on the above Environmental Sensitivity Sub-Matrix, the total environmental attribute score for Enva is calculated as follows

Table 3.2

Environmental Attribute	Attribute Score
Human Beings	3
Groundwater	2
Surface Water	0
Air Quality	0
Protected Ecological Sites	0
Sensitive Agricultural Receptors	0
TOTAL SCORE	5

Based on the above Environmental Sensitivity Sub-Matrix, the total environmental attribute score for Enva Portlaoise site is 5. Using Table 3.1 from the EPAs ELRA Guidance Document.

Table 3.3 Environmental Sensitivity Classification

Total Environmental Attribute Score	Environmental Sensitivity Classification
Low	<7
Moderate	7-12
High	>12

Table 3.1 above indicates that the Total Environmental Attribute Score for the Enva Portlaoise site is 5. Based on Table 3.3 the Environmental Sensitivity Classification for a site that has a Total Environmental Attribute Score less than 7 is low. Therefore Enva has low Environmental Sensitivity Classification.

3.4. Compliance Record

The compliance record score is derived from the compliance history of the facility and whether the activities carried on resulted in contamination or pollution.

For newly licensed facilities and those operating without non-compliance of emission limits, then these are classified as **Compliant/New Facility** and have a score of 1.

Licensed facilities with administrative non-compliances only are classified as administrative non-compliant and have a score of 2.

Licensed facilities with minor non-compliances (< 5 non-compliances in 12 month period) are classified as being **Minor Non-Compliant** and have a score of 3. Facilities with minor soil and groundwater contamination (i.e. those with concentrations above background but not posing risk to the environment) are also considered in the class.

Licensed facilities with major non-compliance history (≥ 5 non-compliances in a 12 month period) and/or those with significant soil and groundwater contamination (i.e. requiring remediation and/or long-term monitoring requirements) are classified as **Major Non-Compliant/Significant Ground Contamination** and have a score of 4.

Those facilities with repeated non-compliances (>10 Total) during a 12 month period are classified as **Repeat Non-Compliance** and have a score of 5.

As part of the preparation of this ELRA a review of soil or groundwater assessments for the Portlaoise site and of the compliance status for Enva Portlaoise in relation to their Waste Licence was examined.

In relation to the sites soil and groundwater, minor contamination of groundwater was identified in quarterly groundwater reports. However the following reports undertaken by URS and RPS respectively have identified that this contamination is localised and is due to historic activities undertaken at the site prior to the acceptance of waste on site.

“An Environmental Site Investigations Report” (July 2005) and “A Summary Report on the Trend of Contaminant Levels at Enva Ireland Ltd. Since 2005” (2007) which states that the groundwater contamination is not moving down gradient or off-site and that natural processes in the groundwater are attenuating the contamination on site.

Enva, Portlaoise have never been convicted under the Environmental Protection Act or any other environmental legislation. Enva, Portlaoise are largely compliant with their waste licence reference W0 184-01. However, seven non-compliances were identified within the last twelve month period that related to emissions from the site. Five of these emissions related to odour complaints. These odour complaints were investigated and mitigation measures were promptly implemented.

From the compliance review as detailed above a compliance record score of 4 is judged to be appropriate for Enva.

3.5. Risk Category

The preceding subsection of this report has determined the:

Complexity Score (G5) = 5

Environmental Sensitivity Score = 5

Compliance Record Score = 4

The product of these scores is used to calculate a total score, which is then used to assign the site specific risk category (Table 3.3). The product of the above scores is 14, which according to table 3.3 below indicates that Risk Category 2 would be applicable to the Enva Site.

Table 3.3 – Risk Category

Risk Category Total Score	
Category 1	<5
Category 2	5-23
Category 3	>23

Based on the calculations above the Enva site would be classified in Risk Category 2. However, based on guidance provided in the EPA ELRA Guidance Document 2006 for activities with complexity of G4 or G5 these facilities are automatically classified as Risk Category 3.

4. HISTORICAL ENVIRONMENTAL LIABILITIES

4.1. Releases to Air

With regard to sudden and accidental releases to air, there is no history of:

- Major fires or explosions at the site;
- Run-away reactions resulting in significant discharge to atmosphere;
- Significant accidental releases of hazardous gases.

Licensed emissions to atmosphere arise from the on-site boiler and have been the subject of a comprehensive monitoring programme, the results of which are forwarded to the Agency on an annual basis.

There is an emission point which relates to a sludge drying facility that was part of the licence application but which has not as yet been installed.

Therefore this emission point can be considered outside the scope of this ELRA. The fluorescent tube crusher has a built in abatement system to prevent the release of mercury dust from the crushing process. Enva requested ANV consultancy to undertake environmental measurements at the crushers exhaust the report showed there were emissions from the fluorescent tube crusher unit to be negligible. This report was submitted to the EPA.

Based on a review of the sites activities there is no evidence to suggest that site operations have resulted in the development of any off-site environmental liability with respect to air emissions.

4.2. Process Water

Process effluent consists of water removal from the waste oil processing system. The process effluent is then released to the effluent lime treatment plant to remove the heavy metal content. The effluent is sampled prior to and following release. Envas in house laboratory determines the COD loading of the effluent and sets the Scada system on site to release accordingly. The Scada system is an electronic system that alerts staff of the levels within tanks and releases tank contents as programmed. The Scada is linked to the auto sampler which takes an effluent sample every 2m³ on release. The final effluent from the wastewater treatment system is discharged to Portlaoise Waste Water Treatment Plant.

In the past Enva incurred exceedences of its effluent limits as set out in Schedule C.4 of its waste licence W0 184-1 in respect of zinc. However the installation and use of the lime treatment plant eliminated the occurrence of these exceedences.

There is no evidence to suggest that process wastewater releases from the site have had any significant impact or resulted in an environmental liability.

4.3. Surface Water Discharges

All Envas waste storage areas are bunded and all Envas main operational activities undertaken within the bunded area of the site. Surface water run-off from the external yard pavement, landscaped areas and roof run-off is collected in the surface water drainage system and runs through a two stage oil interceptor equipped with coalescence filters for improved separation of solids and water prior to discharge.

There are two surface water collection systems on site. In the first system, the main area of the site, i.e. the central and south areas of the site surface water is collected by yard gullies and drains to a 58 tonne capacity, four chamber interceptor located between the process building and the main tank farm. In this unit, separation of traces of oil takes place and the oil free water is pumped under level control from a post separation pump chamber to a second 30 tonne interceptor located on the west boundary of the site.

In the second system surface water from the north end of the site is collected and fed to the second separator mentioned above. The second separator is also fitted with a sensor that upon a large influx of oil entering the interceptor the release valve will shut down automatically. The water from the interceptors leaves the site and enters the municipal surface water system. In the event of large volumes of contaminated firewater being generated the interceptor release valves will be manually shut down and fire water pumps used to pump the contaminated firewater back into the bunded tank farm.

Envas waste licence Schedules C.3. and D.4. sets out emission limit values and monitoring requirements in relation to surface water. Enva are compliant with these licence limits.

With regard to sudden and accidental discharges, there is no history of:

- Major fires or explosions at the site resulting in significant discharges of firewater;
- There is no evidence to suggest that surface water releases from the site have had any significant impact or resulted in an environmental liability.

4.4. Releases to Ground/Groundwater

4.4.1. Background

The bedrock below the site is considered to be locally important fractured aquifer by the Geological Survey of Ireland (GSI). Regional groundwater flow is expected to be in an easterly direction towards the Triogue River, which is a tributary of the River Barrow. The Triogue River is located 1.5km to the east of the site. It would be expected that the groundwater will discharge to the Triogue and possibly its tributaries as base flow in the rivers.

Groundwater was encountered in the sand and gravel during borehole drilling on the site as part of the URS investigation, and groundwater level measurements have indicated that groundwater flows in an east-south-easterly direction in the sand and gravel below the site. This will be confirmed with further works to be

carried out by RPS in the summer of 2008. Groundwater within the sands and gravels appears to be confined by over lying clays as static groundwater levels have been measured at between 1.5m to 4.0m below ground level.

Public water supply for Portlaoise is obtained from two groundwater supplies in the area. The primary source is located at Ballydavis, which is approximately 4km to the northeast of Portlaoise, and the second location is located along R426 to the south east of Portlaoise. The Ballydavis site is located at considerable distance from the site and on the opposite side of the Triogue River and would therefore not be a risk from any groundwater contamination present on the site.

4.4.2 Prevention of Groundwater Contamination

All process operations and storage of wastes are within bunded areas. Stormwater drains are provided with oil interceptors fitted with coalescence filters. These containment measures ensure that accidental release of these compounds do not impact soil and groundwater quality below the site. An extensive programme of groundwater monitoring is required as part of Enva's waste licence ref. 184-01. Enva is required under its licence to monitor parameters as listed in Schedule D.6 of the licence on an annual, quarterly and monthly basis.

Envas groundwater monitoring programme includes the monitoring of four shallow boreholes (BH101, BH102, BH 103 and BH 104) which were drilled to depths of 6 to 7 metres below ground level (mbgl) and three deep boreholes (MW01, MW02 and MW03) which were drilled to depths of up to 30mbgl. Groundwater monitoring is undertaken on a quarterly basis by external consultants. During each round of monitoring both deep and shallow ground water wells were sampled and the results presented in a groundwater monitoring which is submitted to the EPA as part of the EPA quarterly report.

4.4.3 Previous Soil and Groundwater Investigations

In 2005 Enva requested URS to summarise all soil investigations and groundwater monitoring carried out by URS at the site up until 2005. This report was entitled "The Environmental Site Investigations Summary Report" and stated that ongoing monitoring indicated that there is some localised residual hydrocarbon contamination of BH104b. The laboratory also reported low levels of tentatively identified compounds in MW03 as possible alkenes. However the report also stated that at the monitoring round for June 2005 indicated concentrations of hydrocarbon contaminants are decreasing over time.

In 2007 Enva made a formal response to issues raised in the EPAs audit report of the February 2007. This formal response took the form of a study undertaken by RPS consultants entitled "Summary report on the Trend of Contaminant Levels at Enva Ireland Ltd. Since 2005". This report determines that following from the risk assessment and trend analysis undertaken by RPS that there are no unacceptable risks and that the observed contaminants in BH104b, BH103 and MW03 are in reality at trace levels typical of other waste handling facilities. The report goes on to state that "Under the philosophy of UK EA R&D 20 no action is required as the observed concentrations do not represent a risk to

water quality down gradient on-site and particularly off-site. A response has been received from the Agency with regard to this response and a proposal will be forwarded to the Agency when reviewed by Enva.

5. EXISTING ENVIRONMENTAL CONTROLS AT ENVA

5.1. General

The Enva waste facility at Portlaoise is equipped with a high level of environmental protection systems. Ongoing care for the environment is demonstrated by the efficient operation and maintenance of environmental protection systems/practices, and their upgrade where necessary, together with ongoing efforts aimed at the continuous minimisation of emissions. The site has a programme of continuous improvement, through for example the training of people to maintain good environmental practices, and replacement, upgrading, retro-fitting, as needed, of instrumentation and equipment.

Enva, have a Health, Safety and Environmental Policy that covers all it's facilities in Ireland. The policy aims to instil high environmental values in all employees, utilising the best environmental practices in processing and contributing to global sustainable developments.

The Enva facility in Portlaoise has invested in infrastructure designed to assure a high level of environmental compliance and protection. Examples of this include the following:

- Office and Laboratory with associated welfare facilities
- Lockers and Showers for operatives and drivers
- Workshop
- Electrics room
- Dry Cleaning area
- Process room
- UST of 30,000 litre capacity for the storage of Petrol
- Boiler House
- Loading/Unloading Gantries x 3
- Oil transfer pumps and valves;
- A bunded tank farm consists of 40 tanks that range in capacity from 50,000litres, 140,000, 200,000, 1,000,000 and 2,000,000 litres. The following substances are contained within these tanks are; waste oil, LS tanks, cooking oil, kero tanks, Gas Oil and Derv
- Bunded flammable waste storage area 217m²
- Sludge bay for tanker dig out
- A bunded storage unit for the receiving and storage of hazardous waste materials
- Soil Sheds
- Weighbridge;
- Enclosed Process Building – Oil Filters and Oily Rags
- 360m² building used for general storage of equipment etc. The floors of each section are fully bunded. The exterior of the building is cladded with fire resistant cladding;
- Enclosed area for used cooking oil melting bath
- Bunded effluent lime treatment plant area 210m²

- Surface water drainage network with two oil interceptors of 58 and 30 tonnes in capacity fitted with coalescence filter.
- Concrete surfacing

Environmental protection and compliance is integrated into the sites decision-making process through the management of change mechanisms defined in the site's certified ISO14001 Environmental Management System (EMS).

5.2. Environmental Management

Enva operates an integrated approach to the management of environmental aspects of the site, and environmental protection and compliance has always been a key consideration. Since January 2004, the site has operated under the waste licensing system. The site was audited for accreditation to ISO 14001 and OHSAS 18001 and was certified in August 2007.

The environmental management system is based on a combination of technical measures, documented environmental management programmes and documented procedures, whose objectives include:

- Complying with all the requirements of the site waste licence,
- Eliminating the risk of accidental events which could give rise to significant releases to the environment, and
- Ongoing continuous improvement of site environmental performance.

5.3. Releases to Atmosphere

There are no process emissions to atmosphere. Licensed emissions to atmosphere arise from the on-site boiler and have been the subject of a comprehensive monitoring programme, the results of which are forwarded to the Agency on an annual basis.

Minor emissions may result from laboratory fume hoods or from machinery/plant (e.g. vehicles). Pipeline inspection as required by the license and preventive maintenance will also minimise potential for fugitive loss.

Regular maintenance of vehicles and plant will minimise unnecessary atmospheric releases.

The waste licence includes a process (sludge drying facility), which it not intended to be carried out within the foreseeable future. In the event that this changes the evaluation of this aspect will be revised accordingly.

5.4. Releases to Surface Water and Groundwater

5.4.1. General

All storm water runs to the site drainage system and is discharged to municipal surface water system having first passed through a two-stage oil interceptor fitted with coalescence filters. In the event of large volumes of contaminated firewater being generated the interceptor release valves will be manually shut down and fire water pumps used to pump the contaminated firewater back into the bunded tank farm.

Storm drains are monitored on a weekly basis as per license requirements.

Wastewater generated from the processing of waste oil is treated in Envas onsite lime treatment plant prior to release to Portlaoise waste water treatment plant.

All process operations and storage of wastes are within bunded areas. Studies undertaken on the analysis and trends of groundwater monitoring results to date show any contamination of hydrocarbons noted are decreasing overtime. Envas waste licence requires extensive ongoing monitoring of surface, wastewater and groundwater.

5.5. Emergency Planning/Preparedness

The site has a detailed and documented Emergency Response Plan (ERP). The ERP describes the emergency response system onsite and also contains specific action plans in the event of particular incidents such as fire/explosions, chemical spillage or medical emergency. The priority in the event of any emergency situation will be to ensure the safety of all people potentially affected by the incident, whether they are on-site or outside the site boundary. After this, the aim will be to prevent releases of pollutants and prevent damage to property or the environment.

The primary front line of defence against most emergency situations (such as fires and some major spills) will be the local Fire Services. No Enva Portlaoise personnel are expected to carry out front line defence in major emergency situations.

An Emergency Core Team set up internally at the site, will coordinate an emergency response, which will aim to support the Fire Services' front line response. The Emergency Core Team will carry out specific duties but will not include direct front line (e.g. fire fighting) duties.

A permit to work system is in place on site and all staff have received fire extinguisher training. Full evacuation drills are held periodically to familiarise employees with evacuation requirements and to ensure head counts are completed effectively.

The fire- fighting services have been brought on site and made fully aware of the available on-site fire fighting and detection systems.

5.6. Prevention of Fire

5.6.1. Procedures

The plant ERP specifies the actions taken on discovering a fire or other emergency. The ERP includes the activation of fire alarms, the intruder alarm, evacuation and assembly requirements. Fire prevention is emphasised by engineering design, work permit restrictions, work practices, and ongoing audits of process taking into consideration fire risk and safety awareness. Standard operational procedures (SOPs) and Safety Data Sheets (SDSs) specify emergency response requirements for various materials being used.

5.6.2. Training

All employees and contractors working on site are provided with induction training. The contents of the induction course include the following;

- HSE Manual and Policy
- Enva audit for ISO 14001 and OHSAS 18001
- Environmental requirements
- HSE requirements
- Emergency Response Plan

Only employees and contractors trained in the equipment, plant or machinery that they intend to operate are permitted to use it. Training must also be received in the procedures and risk assessments to which these items and activities relate before being permitted to use them. A training programme is in place to ensure each employee is made aware of HSE requirements related to their work activities. Job specific HSE training is also provided within each Department. This consists of training on appropriate risk assessments, standard operating procedures (SOPs), external task specific training and awareness training relating to our business.

Employees also receive training on the permit to work system in place on site and all staff has received fire extinguisher training. Envas emergency response team members are trained as fire wardens with training. Full evacuation drills are held periodically to familiarise employees with evacuation requirements and to ensure head counts are completed effectively.

Considerable time and resources are utilised in the provision of training across the company. An annual training needs assessment is carried out and covers all personnel within the company. This is carried out by the HSE Department in conjunction with Line Managers and supervisors. A training plan is then drafted for the year ahead and courses organized accordingly. The extent to which training is provided and the importance placed on it is reflected in the number of training hours per employee for the reporting period 2005/2006. This figure was recorded at 20 training hours per employee.

The delivery of training involves both external training using training contractors in providing industrial task related training and internal training focusing on company specific procedures.

5.6.3. Equipment

The plant fire protection system includes smoke detector fire alarms, which are installed in appropriate areas around the site. There is a fire hydrant inside the site boundary near the entrance of the site and a number of fire extinguishers available on site. All fire protection systems are subject to weekly, monthly 6 monthly and annual maintenance inspections.

Enva have a security monitoring system in place that operates after hours on site. The gate at the main entrance to the site operates using a secure key system provided to authorised members of staff.

5.6.4. Storage and Handling of Flammable Materials

The Enva Portlaoise site has a designated bunded storage area for flammable materials.

An underground storage tank (UST) containing three chambers with a capacity of 30,000 litres is used specifically for the storage of petrol. This UST is linked to the Scada system to ensure that any leaks are communicated to operational staff.

The movement of waste oils is through direct pumping from tankers into one of the storage tanks on site. These storage tanks are bunded and the bunds have passed bund integrity testing. Transfer to and from the tanks by tankers is done within the bunded area of the site. Tanks have high level alarms and are controlled by a computer system. Waste Oils have a flash point $>220^{\circ}\text{C}$. Operational procedures are in place to ensure that all waste oils are pumped to a designated tank as approved by the yard operative.

Enva employed the services of PM consultancy to undertake an ATEX report which included; "Risk Assessment of Hazardous Areas", "Explosion Protection Document" and "Hazardous Area Classification Report". This reports details the existing controls in place and has identified zoned areas on site.

5.6.5. Firewater Retention

Further to a firewater risk assessment undertaken by URS Dames & Moore, the Enva, Portlaoise site was deemed to have a medium risk rating. This overall risk rating is dominated by the environmental risk of a migration of oil contaminated fire water from the site. In this regard the largest volume calculated is that for a tank fire in the 2,300 tonne storage tank of final product in the tank farm. The total volume estimated is 842m^3 to include a simultaneous major rainfall event. This volume coupled with a medium risk of a fire occurring in the EMO Oil storage tanks which are located in the same area. However, there is adequate retention volume in the bund surrounding the tank farm to take estimated volume of fire water runoff.

In the event of large volumes of contaminated firewater being generated from fire fighting from areas such as the process room, unloading gantry and warehouse, the interceptor release valves will be manually shut down and fire water pumps used to pump the contaminated firewater back into the bunded tank farm.

5.7. Hazard Studies

Enva have a register of risk assessments for this site. The register of risk assessments includes environmental risk assessments such as this ELRA and firewater retention. The register lists actions to be taken on identified risks and outlines progress made to date.

6. SITE SPECIFIC ELRA ASSESSMENT

6.1. General

Enva Portlaoise is classified as a Risk Category 3 facility. The objectives of the ELRA are:

- To identify and quantify environmental liabilities at the facility focusing on: unplanned, but possible and plausible events occurring during the operational phase;
- To calculate the value of financial provisions required to cover unknown liabilities;
- To identify suitable financial instruments to cover the identified financial provisions; and
- To provide a mechanism to encourage continuous environmental improvement through the management of potential environmental risks.

The methodology presented in the EPA, ELRA Guidance Document, 2006 will be outlined in the proceeding section of this report. It includes a Risk Management Programme for the mitigation and management of any environmental liabilities identified at Enva. This programme is not required for the calculation or implementation of a financial provision at a facility. However, such a programme would encourage continuous environmental improvement and the reduction of environmental liabilities.

The ELRA will cover environmental risks leading to a potential or anticipated liability.

Environmental risks will be deemed to cover all risks to surface water, groundwater, atmosphere, land and human health.

6.2. Methodology – Risk Identification, Likelihood and Consequence

The following steps were undertaken as part of the site-specific ELRA;

- Risk Identification
- Risk Classification (includes an Occurrence Assessment and a Severity Assessment)
- Risk Evaluation
- Risk Prevention/Mitigation

6.2.1. Risk Identification

Risks were identified on the site through a combination of:

1. What-if analysis - A suggested method of carrying out this process is to initially identify all the 'processes' on site, list the hazards associated with each process, identify potential causes of failure of the processes and analyse the potential impacts on the environment.

Table 6.1 Example Hazard Identification Table

Risk ID	Potential Hazard	Environmental Effect
1	Describe scenario for occurrence of potential liability e.g. spill of solvent from solvent storage tank	Describe consequence of proposed scenario e.g. spill of solvent goes to surface water.

6.2.2. Risk Classification-Occurrence Analysis

Having identified the potential risk, the likelihood of its occurrence needs to be assessed.

An analysis of historical data and existing environmental controls, as outlined in previous actions of this report, was utilised when estimating *likelihood* of identified potential risks occurring at Enva. The following table defines various likelihoods of occurrence:

Table 6.2 Risk Classification Table - Occurrence

<i>Rating/ Score</i>	<i>Category</i>	<i>Description</i>	<i>Likelihood of Occurrence (%)</i>
1	Very Low	Very low chance of hazard occurring in 30 yr period	0-5
2	Low	Low chance of hazard occurring in 30 yr period	5-10
3	Medium	Medium chance of hazard occurring in 30 yr period	10-20
4	High	High chance of hazard occurring in 30 yr period	20-50
5	Very High	Greater than 50% chance of occurring in 30 yr period	>50

6.2.3. Risk Classification-Severity Assessment

Once the environmental impact had been identified one of the following consequences is assigned.

Table 6.3 Risk Classification Table - Severity Criteria

<i>Rating/ Score</i>	<i>Category</i>	<i>Description</i>	<i>Cost of Remediation (€)Note 1</i>
1	Trivial	No damage or negligible change to the environment	<10,000
2	Minor	Minor impact/localised or nuisance	10,000-100,000
3	Moderate	Moderate damage to the environment	100,000-500,000
4	Major	Severe damage to the environment	500,000-1,000,000
5	Massive	Massive damage to a large area, irreversible in medium term	>1,000,000

Note 1 – Costs specific to Enva

6.2.4. Risk Evaluation

Having identified the hazard and decided on its likelihood and severity, the significance of the risk is assigned. A risk score is determined by multiplying the occurrence score by the severity score. The risk scores can be tabulated in a risk matrix.

Occurrence	V. High	5						
	High	4						
	Medium	3						
	Low	2						
	V. Low	1						
			1	2	3	4	5	
			Trivial	Minor	Moderate	Major	Massive	
			Severity					

Where:

- **Red** – These are considered to be high-level risks requiring priority attention.
These risks have the potential to be catastrophic and as such should be addressed quickly.
- **Amber / Yellow** – These are medium-level risks requiring action, but are not as critical as a red coded risk.
- **Green (light and dark green)** – These are lowest-level risks and indicate a need for continuing awareness and monitoring on a regular basis. Whilst there are currently low or minor risks, some have the potential to increase to medium or even high-level risks and must therefore be regularly monitored and if cost effective mitigation can be carried out to reduce the risk even further this should be pursued.

For all identified risks appropriate financial provision must be made to address any associated liabilities. With regard to 'medium' and 'high' risks the ELRA must detail how these risks will be minimised to acceptable levels.

6.2.5. Risk Prevention/Mitigation

Mitigation measures are assigned to each risks and each Risk Score is revised using post-mitigation severity and occurrence rankings. The risks are then re-ranked and tabulated in the risk matrix to illustrate the overall degree of risk reduction resulting from the risk mitigation measures. Where appropriate, the mitigation measures are accepted or implementation. A Risk Management Programme is then prepared for the ongoing management of risks and the implementation of risk mitigation measures. Target timeframes are also allocated for the implementation of each risk mitigation measure.

6.3. Identification of Risks at Enva

'Processes' on the Enva, Portlaoise site were identified, the hazards associated with each process listed along with the identification of any potential causes of process failures. If any effect to the environment could be identified from the failure, the effect was analysed and this was listed as a risk. A Risk Register was then developed which contained all of the Risks identified on site.

The costs associated with the known environmental liabilities (e.g. closure and aftercare costs) for the Enva facilities were calculated through the preparation and costing of the Closure, Restoration and Aftercare Management Plan (refer to Site Specific CRAMP).

Each process was considered separately and a 'what if' analysis was utilised to identify all risks associated with the process in question. A list of risks was developed and these were entered into a Risk Register. Table 6.4 illustrates the Risk Register.

Table 6.4 Enva Risk Register Risk

Risk ID	Potential Failure Mode
1	A spill occurring during the loading/unloading of waste on-site.
2	A failure of one of the bulk storage tanks resulting in a spill of waste oil.
3	Loss of integrity within bunded areas.
4	Improper disposal of hazardous waste.
5	Failure of underground drainage network or wastewater treatment system resulting in significant release to ground and groundwater
6.	An on-site fire/explosion
7	Failure of on-site environmental control and monitoring systems.

These risks were assessed against the risk classification tables (RCTs) as provided in Table 6.2 and 6.3. The risk classification table was designed to reflect the critical levels of risk appropriate to the Enva site. Ratings, taken from the relevant risk classification table, were applied to the severity and likelihood of occurrence of each risk

Table 6.5 below illustrates the assessment carried out for each risk in terms of its severity and likelihood of occurrence.

Table 6.5 Enva site Risk Assessment

Risk ID	Process	Potential Hazard	Environmental Effect	Occurrence Rating	Basis of Occurrence	Severity Rating	Basis of Severity
1	Loading/ Unloading of wastes	Spill of waste oil, or packaged waste, which could migrate to surface water or ground.	Contamination of Surface Water Groundwater or Soil Contamination.	1	<p>Waste oils are delivered to site on a daily basis. Loading and unloading of waste oil takes place in designated bunded areas.</p> <p>Packaged waste are delivered to site in suitable receptacles following documented procedures and stored in designated bunded areas.</p> <p>Large storage areas are covered reducing run off from storage areas</p> <p>Enva staffs are trained in the procedures and risk assessments on the acceptance, collection and transport as well as processing of hazardous wastes.</p> <p>Unknown wastes are sampled and analysed prior to acceptance.</p> <p>Enva has trained Dangerous Goods Safety Advisors on site.</p> <p>Enva only permits the transport of dangerous goods by ADR licensed drivers.</p> <p>Site surface water passes through a two stage oil interceptor with fitted coalescence filter prior to discharge.</p>	2	Based on the systems in place to control surface water contamination. There should be minor impact of any spilled waste.

Risk ID	Process	Potential Hazard	Environmental Effect	Occurrence Rating	Basis of Occurrence	Severity Rating	Basis of Severity
2	Storage of waste oil and used cooking oil in bulk storage tanks.	Bulk storage tank failure.	Contamination of Surface Water, Groundwater or Soil Contamination.	1	<p>All bulk storage tanks are located within the bunded tank farm; retention capacity is at least 110% of the largest tank.</p> <p>Bund, tank and container integrity assessments are undertaken every three years and reported to the EPA.</p> <p>Envas Scada system monitors the levels within each tank electronically. Level alarms sound at high, high-high and high-high-high levels and as a result will alert staff to the potential for overflow.</p> <p>The system can be operated manually if required.</p> <p>The UST is fitted with a leak detection system which is also linked to the Scada system.</p>	2	<p>Large volume bulk storage tanks on-site.</p> <p>Materials therein have the capacity to cause environmental damage if failure was to occur resulting in ground and /or surface water contamination.</p> <p>Any impact on soil, groundwater or surface water would be localised.</p>

Risk ID	Process	Potential Hazard	Environmental Effect	Occurrence Rating	Basis of Occurrence	Severity Rating	Basis of Severity
3	Storage of waste oil and used cooking oil in bulk storage tanks. Mixed Fuels in UST and packaged waste in bunded incoming bay.	Loss of integrity of bunded areas	Surface Water, Groundwater or Soil Contamination.	1	<p>Bund, tank and container integrity assessments are undertaken every three years and reported to the EPA.</p> <p>It is very unlikely that all bunded areas will fail at the same time.</p> <p>The yard surface where general operational activities take place is concreted and bunded.</p> <p>Comprehensive Emergency Response Plan in place at the site that includes dealing with spills.</p> <p>Operational personnel are trained in spill response. Operational staff are directed to stop spill at source and to place covers on site drains in the event of a spill.</p> <p>Envia has a dedicated spill response service.</p> <p>Spill kits are located on site.</p> <p>Any spillage observed within the bunds would be promptly detected and cleaned up.</p>	3	Large volume bulk storage tanks on-site. Different categories of hazardous waste storage on-site. Certain materials therein have the capacity to cause significant environmental damage if failure was to occur resulting in ground and/or surface water contamination. However spilled material will be caught in the interceptor Any impact on soil, groundwater or surface water would be localised.

Risk ID	Process	Potential Hazard	Environmental Effect	Occurrence Rating	Basis of Occurrence	Severity Rating	Basis of Severity
3 cont'd	As above	As above	As above	As above	<p>The UST is fitted with a leak detection system.</p> <p>The incoming bay on-site is a purpose built bunded building with the capacity for segregation of waste types.</p> <p>All surface water runoff enters the sites drainage system and is discharged to municipal surface water system having first passed through a two-stage oil interceptor fitted with coalescence filters. The second interceptor is also fitted with a sensor that in the event of a large influx of oil entering the interceptor the release valve shuts down automatically to prevent any release of oil. An alarm sounds to notify staff when this occurs.</p>	As above	As above

Risk ID	Process	Potential Hazard	Environmental Effect	Occurrence Rating	Basis of Occurrence	Severity Rating	Basis of Severity
4	Disposal of Hazardous / Non Hazardous Wastes	Improper classification / disposal of waste.	Contamination of Surface Water Groundwater or Soil Contamination. Public Health Risk if hazardous waste is disposed of in an appropriate manner.	1	<p>Waste oils are collected nationally and brought to the Enva facility in Portlaoise to be stored in tanks prior to processing into a fuel oil product known as 11ls which is the end product and therefore will not be transported to another site as a waste.</p> <p>Packaged wastes are accepted on site and sent to appropriately licensed facilities for ultimate disposal. These facilities must first be approved by the EPA for use, as per waste licence requirements.</p> <p>Enva tracks the movement of hazardous waste through the use of C1 forms and TFS documents. Enva also uses a bar-code system to track the waste from the customer's site to the final point of destination.</p> <p>Envas primary non-haz waste stream is used cooking oil which is bulked on site. It is not envisaged that this waste stream would not pose a significant risk to the environment.</p>	2	In the event of hazardous waste being treated as a non-hazardous waste it would not pose a threat to the environment as all wastes with the exception of waste oil, which is processed on site, are sent to licensed facilities whose acceptance criteria must be fulfilled.

Risk ID	Process	Potential Hazard	Environmental Effect	Occurrence Rating	Basis of Occurrence	Severity Rating	Basis of Severity
4 cont'd	As above	As above	As above		<p>With enva's standard operating procedure and the considerable experience in managing hazardous waste, it is very unlikely that hazardous waste would be incorrectly managed.</p> <p>Enva organise the collection and transport of waste from the Enva site. Enva staff are responsible for loading waste and therefore have additional control.</p> <p>Enva staff are trained in the procedures and risk assessments on the acceptance, collection and transport as well as processing of wastes.</p> <p>Enva customer service representatives and sales personnel are trained in the hazards of dangerous goods. Unknown wastes are sampled and analysed prior to acceptance. Enva has trained Dangerous Goods Safety Advisors on site. Enva only permits the transport of dangerous goods by ADR licensed drivers.</p>		As above

Risk ID	Process	Potential Hazard	Environmental Effect	Occurrence Rating	Basis of Occurrence	Severity Rating	Basis of Severity
5	Disposal of Wastewater	Failure of drainage network or wastewater treatment system resulting in significant release to ground and groundwater .	Contamination of Surface Water Groundwater or Soil Contamination.	1	<p>Envas process effluent is pumped across the site in pipelines above ground. Only treated effluent is released to sewer via an underground pipeline.</p> <p>Enva's process effluent is released to the effluent lime treatment plant to remove the heavy metal content.</p> <p>The effluent is sampled prior to and following release. Enva's laboratory determines the COD loading of the effluent and sets the Scada system on site to release accordingly.</p> <p>Effluent tanks are on a cleaning schedule to remove build up of residues which could contaminate the effluent for discharge off site.</p> <p>A leaks inspection is carried out as part of the sites preventative maintenance schedule.</p> <p>Enva's effluent must meet the limits for the parameters as set out in Enva's waste licence reg no. W0 184-01.</p>	2	Severity is based mainly on potential need for soil remediation should leak occur.

Risk ID	Process	Potential Hazard	Environmental Effect	Occurrence Rating	Basis of Occurrence	Severity Rating	Basis of Severity
5 cont'd	As above	As above	As above		<p>The final effluent from the wastewater treatment system is discharged to Portlaoise Waste Water Treatment Plant via the towns sewer.</p> <p>Effluent from canteen, toilet and shower areas are discharged directly to the Portlaoise town sewer which is directed to the Portlaoise waste water treatment plant.</p> <p>Liquid wastes from the laboratory are collected in containers and treated/disposed of through approved waste treatment/recovery outlets.</p> <p>The underground drainage networks are inspected every three years and repaired as necessary as per Envas waste licence conditions.</p>		As above

Risk ID	Process	Potential Hazard	Environmental Effect	Occurrence Rating	Basis of Occurrence	Severity Rating	Basis of Severity
6	Any	Major on-site fire or explosion.	Release of toxic and hazardous material to atmosphere, surface water, groundwater or soil	1	<p>Enva requested PM Consultancy to complete an ATEX report for the site. This included a risk assessment of hazardous areas. The areas identified as hazardous around the Enva Portlaoise site were assessed and zoned accordingly.</p> <p>Waste oil accepted on site has a flash point > 220°C</p> <p>No credible scenarios have been identified which would result in the formation of a flammable atmosphere or the creation of mist droplets from either the tanks that store kerosene or diesel or from the heating of oils.</p> <p>UST leak detection system is in place and linked to Scada.</p> <p>There is a flame arrestor on the vent line to prevent propagation of flame from the vent back into the tank.</p> <p>Very low likelihood of tank being open at same time as un-noticed fire in adjacent premises.</p> <p>Manhole cover is made of non-sparking fibrolite polymer.</p> <p>Procedures require that all</p>	4	In the unlikely event of an explosion that resulted in contaminated firewater entering the local surface water it is likely that there would be severe damage to the local environment. All fire water run off can be prevented from leaving the site by turning off the valve on the final interceptor.

Risk ID	Process	Potential Hazard	Environmental Effect	Occurrence Rating	Basis of Occurrence	Severity Rating	Basis of Severity
6 cont'd	As above	As above	As above		<p>equipment is earthed and bonded Permit to work procedure regulates hot work activities. All fixed electrical equipment in the area is rated for use in hazardous areas. Comprehensive control systems and maintenance programme in place to minimise the risk of fire.</p> <p>Flammable liquids are only accepted in UN approved containers. ADR trained drivers are only permitted to accept drums of flammable liquid that are in good condition. Envia have trained DGSA staff on site to identify non-conforming containers and re-package as necessary.</p> <p>Envia staff have received ATEX awareness training.</p> <p>Envia have a fully addressable fire alarm system in place. Envia also have a site security alarm that is linked to a 24hour monitoring service. A comprehensive Emergency Response plan is in place at the</p>		As above

Risk ID	Process	Potential Hazard	Environmental Effect	Occurrence Rating	Basis of Occurrence	Severity Rating	Basis of Severity
6 cont'd	As above	As above	As above		<p>site.</p> <p>An internal Emergency Response Team are in place if fire does occur.</p> <p>Emergency response drills are undertaken. Suitable personnel have been designated and trained as fire wardens. All staff have received fire safety awareness and extinguisher training</p> <p>All bulk storage tanks are located within bunded tank farm; retention capacity is at least 110% of the largest tanks.</p> <p>Following from a report undertaken by URS Dames & Moore there is deemed to be adequate retention volume in the bund surrounding the tank farm to take an estimated volume of 842m³ fire water runoff.</p> <p>This estimated volume of firewater runoff is based on the following events occurring; a large volume of contaminated firewater being generated from fighting a fire in the 2300t storage tank of</p>		As above

Risk ID	Process	Potential Hazard	Environmental Effect	Occurrence Rating	Basis of Occurrence	Severity Rating	Basis of Severity
6 cont'd	As above	As above	As above		<p>final product (11ls) and a medium risk fire in an EMO oil storage tank while simultaneously a major rainfall event occurs.</p> <p>The retention of fire water from fighting fires in areas such as the process room, unloading gantry and warehouse, will be managed by the manual shut down of the interceptor release valves and while the fire water pumps will be used to pump the contaminated firewater from the interceptors back into the bunded tank farm.</p>		As above
7	Monitoring and Control Systems	Failure of on-site procedures	Release of hazardous material to atmosphere, surface water, groundwater	1	<p>The site has developed procedures for environmental monitoring and control such as loading and unloading of waste oil tankers, bund inspections and drainage system inspections. Internal process audits are undertaken annually.</p> <p>Enva are certified by SGS to both ISO 14001 and OHSAS 18001 and are audited by their holding company DCC. The EPA undertaken un-notified compliance audits against the sites waste licence. Annual reports are also submitted</p>	2	Minor impact/localised or nuisance

Risk ID	Process	Potential Hazard	Environmental Effect	Occurrence Rating	Basis of Occurrence	Severity Rating	Basis of Severity
7					to both Envas holding company, DCC and the EPA.		

6.4. Assessment of Risks at Enva

6.4.1. Risk Register

The risk register below ranks the risks in order to prioritise mitigation and management measures.

Table 6.6 Risk Register ranked by Risk Score

Risk ID	Description	Occurrence Rating	Severity Rating	Risk Score
6	Major Fire/Explosion	1	4	4
3	Bund Integrity Failure	1	3	3
5	Failure of underground drainage network.	1	2	2
1	Loading/unloading operations.	1	2	2
2	Bulk Storage tank failure.	1	2	2
4	Improper disposal of hazardous waste.	1	2	2
7	Failure of on-site environmental control procedures.	1	2	2

6.4.2. Risk Matrix

The risk matrix below indicates the critical nature of each risk. (Risk ID's from the Risk

Register have been used to complete this matrix.)

Table 6.7 – Risk Matrix

OCCURRENCE	V.High	5					
	High	4					
	Medium	3					
	Low	2	Risk ID 5				
	V.Low	1		Risk ID 1, 2, 4 and 7	Risk ID 3	Risk ID 6	
			1	2	3	4	5
			Trivial	Minor	Moderate	Major	Massive
SEVERITY							

Where:

Red is a high level risk.

Yellow is a medium level risk.

Green (light and dark) is a low level risk.

Table 6.7 above indicates that there are currently no risks identified in the red zones or yellow zones requiring priority attention. This is as a result of existing environmental controls in place at the site. All risks identified are located in the (dark and light) green zone indicating that these are currently low risk. However, it is important to note that these risks are considered low risk as a result of existing control measures employed at the site aimed at reducing/eliminating both the occurrence and where this is not possible the severity of these risks. There is a need for continuing awareness and monitoring of these risks on a regular basis.

6.5. Risk Prevention, Mitigation and Management

The risk assessment and categorisation phase identified no red or yellow zone risk, which requires immediate action. All risks were classified in the (dark and light) green zone risks and require monitoring on a regular basis.

However, the (dark and light) green zone risks may have the potential to increase to yellow or red zone risks, and where additional risk management measures are available to manage them at their current levels or reduce them further, these may be implemented if considered cost-effective.

Table 6.8 illustrates the risk mitigation measures, which have been identified or are currently in use at the site. This table provides the risks in descending order of risk score with the proposed mitigation measure.

Table 6.8 Risk Mitigation Form

Risk ID	Process	Potential Hazard	Risk Score before Mitigation	Existing/Possible Mitigation measures	Risk Manager	Time to Complete	Revised Risk Score
6	Any	Major Fire/Explosion	4	<p>Enva requested PM Consultancy to complete an ATEX report for the site. This included a risk assessment of hazardous areas. The areas identified as hazardous around the Enva Portlaoise site were assessed and zoned accordingly.</p> <p>Waste oil accepted on site has a flash point > 220°C</p> <p>No credible scenarios have been identified which would result in the formation of a flammable atmosphere or the creation of mist droplets from either the tanks that store kerosene or diesel or from the heating of coils in tanks containing waste oils.</p> <p>UST leak detection system is in place and linked to Scada.</p> <p>There is a flame arrestor on the vent line to prevent propagation of flame from the vent back into the tank.</p> <p>Very low likelihood of tank being open at same time as un-noticed fire in adjacent premises.</p>	HSE & Compliance Manager	Ongoing / Existing Practice	4

<p>6 cont'd</p>				<p>Manhole cover is made of non-sparking fibrolite polymer. Procedures require that all equipment is earthed and bonded Permit to work procedure regulates hot work activities. All fixed electrical equipment in the area is rated for use in hazardous areas. Comprehensive control systems and maintenance programme in place to minimise the risk of fire.</p> <p>Flammable liquids are only accepted in UN approved containers. ADR trained drivers are only permitted to accept drums of flammable liquid that are in good condition. Enva have trained DGSA staff on site to identify non-conforming containers.</p> <p>Enva staff have received ATEX awareness training.</p> <p>Enva have a fully addressable fire alarm system in place. Enva also have a site security alarm that is linked to a 24hour monitoring service.</p> <p>Comprehensive Emergency Response Plan is in place at the site.</p>			
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<p>6 cont'd</p>				<p>An internal Emergency Response Team are in place if fire does occur. Emergency response drills are undertaken. Suitable personnel have been designated and trained as fire wardens. All staff have received fire safety awareness and extinguisher training</p> <p>All bulk storage tanks are located within bunded tank farm; retention capacity is at least 110% of the largest tanks.</p> <p>Following from a report undertaken by URS Dames & Moore there is deemed to be adequate retention volume in the bund surrounding the tank farm to take an estimated volume of 842m³ fire water runoff. This estimated volume of firewater runoff is based on the following events occurring; a large volume of contaminated firewater being generated from fighting a fire in the 2300t storage tank of final product (11ls) and a medium risk fire in an EMO oil storage tank while simultaneously a major rainfall event occurs.</p> <p>The retention of fire water from fighting fires in areas such as the process room, unloading gantry and warehouse, will be</p>			
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6 cont'd				<p>managed by the manual shut down of the interceptor release valves and while the fire water pumps will be used to pump the contaminated firewater from the interceptors back into the bunded tank farm.</p> <p><i>Further mitigation measures: Additional fire detection units to be put in place to detect a fire within the tank farm area.</i></p>		May 08	
3	<p>Storage of waste oil and used cooking oil in bulk storage tanks.</p> <p>Mixed Fuels in UST and packaged waste in bunded incoming bay.</p>	Bund Integrity Failure	3	<p>Bund, tank and container integrity assessments are undertaken every three years and reported to the EPA.</p> <p>It is very unlikely that all bunded areas will fail at the same time.</p> <p>The yard surface where general operational activities take place is concreted and bunded.</p> <p>Comprehensive Emergency Response Plan in place at the site that includes dealing with spills.</p> <p>Operational personnel are trained in spill response. Operational staff are directed to stop spill at source and to place covers on site drains in the event of a spill.</p>	HSE & Compliance Manager	Ongoing / Existing Practice	3

3 cont'd				<p>Enva has a dedicated spill response service.</p> <p>Any spillage observed within the bunds would be promptly detected and cleaned up.</p> <p>The UST is fitted with a leak detection system.</p> <p>The incoming bay on-site is a purpose built bunded building with the capacity for segregation of waste types.</p> <p>All surface water runoff enters the sites drainage system and is discharged to municipal surface water system having first passed through a two-stage oil interceptor fitted with coalescence filters. The second interceptor is also fitted with a sensor that in the event of a large influx of oil entering the interceptor the release valve shuts down automatically to prevent any release of oil. An alarm sounds to notify staff when this occurs.</p>			
5	Disposal of wastewater	Failure of underground drainage network.	2	<p>Envas process effluent is pumped across the site in pipelines above ground. Only treated effluent is released to sewer via an underground pipeline.</p> <p>Enva's process effluent is released to the</p>	HSE & Compliance Manager	Ongoing / Existing Practice	2

<p>5 cont'd</p>				<p>effluent lime treatment plant to remove the heavy metal content.</p> <p>The effluent is sampled prior to and following release. Enva's laboratory determines the COD loading of the effluent and sets the Scada system on site to release accordingly. Effluent tanks are on a cleaning schedule to remove build up of residues contaminate the effluent for discharge off site.</p> <p>Enva's effluent must meet the limits for the parameters as set out in Enva's waste licence reg no. W0 184-01.</p> <p>The final effluent from the wastewater treatment system is discharged to Portlaoise Waste Water Treatment Plant via the towns sewer.</p> <p>Effluent from canteen, toilet and shower areas are discharged directly to the Portlaoise town sewer which is directed to the Portlaoise waste water treatment plant.</p> <p>Liquid wastes from the laboratory are collected in containers and treated/disposed of through approved waste treatment/recovery outlets.</p> <p>The underground drainage networks are tested every three years and repaired as necessary as per Envas waste licence conditions.</p>			
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1	Loading/and unloading of wastes	Spill from loading/unloading operations.	2	<p>Waste oils are delivered to site on a daily basis. Loading and unloading of waste oil takes place in designated bunded areas.</p> <p>Packaged waste are delivered to site in suitable receptacles following documented procedures and stored in designated bunded areas.</p> <p>Large storage areas are covered reducing run off from storage areas</p> <p>Enva staffs are trained in the procedures and risk assessments on the acceptance, collection and transport as well as processing of hazardous wastes.</p> <p>Enva customer service representatives and sales personnel are trained in the hazards of dangerous goods. Unknown wastes are sampled and analysed prior to acceptance.</p> <p>Enva has trained Dangerous Goods Safety Advisors on site. Enva only permits the transport of dangerous goods by ADR licensed drivers.</p> <p>Site surface water passes through a two stage oil interceptor with fitted coalescence filter prior to discharge.</p>	HSE & Compliance Manager	Ongoing / Existing Practice	2
---	---------------------------------	--	---	---	--------------------------	-----------------------------	---

2	Storage of waste oil and cooking oil in bulk storage tanks.	Bulk Storage tank failure.	2	<p>All bulk storage tanks are located within the bunded tank farm; retention capacity is at least 110% of the largest tank.</p> <p>Bund, tank and container integrity assessments are undertaken every three years and reported to the EPA.</p> <p>Envas Scada system monitors the levels within each tank electronically. Level alarms sound at high, high-high and high-high-high levels and as a result will alert staff to the potential for overflow.</p> <p>The UST is fitted with a leak detection system which is also linked to the Scada system.</p>	HSE & Compliance Manager	Ongoing / Existing Practice / Regular reviews	2
4	Disposal of Hazardous / Non Hazardous Wastes	Improper disposal of hazardous waste.	2	<p>Waste oils are collected nationally and brought to the Enva facility in Portlaoise to be stored in tanks prior to processing into a fuel oil product known as 11ls which is the end product and therefore will not be transported to another site as a waste.</p> <p>Packaged wastes are accepted on site and sent to appropriately licensed facilities for ultimate disposal. These facilities must first be approved by the EPA for use, as per waste licence requirements.</p>	HSE & Compliance Manager	Ongoing / Existing Practice	2

<p>4 cont'd</p>				<p>Enva tracks the movement of hazardous waste through the use of C1 forms and TFS documents. Enva also uses a bar-code system to track the waste from the customers site to the final point of destination.</p> <p>Envas primary non-haz waste stream is used cooking oil which is bulked on site. It is not envisaged that this waste stream would pose a significant risk to the environment.</p> <p>Enva's standard operating procedure and the considerable experience Enva have in managing hazardous waste; it is very unlikely that hazardous waste would be incorrectly managed.</p> <p>Enva organise the collection and transport of waste from the Enva site. Enva staff are responsible for loading waste and therefore have additional control.</p> <p>Enva staff are trained in the procedures and risk assessments on the acceptance, collection and transport as well as processing of wastes.</p> <p>Enva customer service representatives and sales personnel are trained in the hazards of</p>			
---------------------	--	--	--	---	--	--	--

4 cont'd				dangerous goods. Unknown wastes are sampled and analysed prior to acceptance. Enva has trained Dangerous Goods Safety Advisors on site. Enva only permits the transport of dangerous goods by ADR licensed drivers.			
7	Monitoring and Control Systems	Failure of on-site environmental control procedures.	2	<p>The site has developed procedures for environmental monitoring and control such as loading and unloading of waste oil tankers, bund inspections and drainage system inspections.</p> <p>Internal process audits are undertaken annually.</p> <p>Enva are certified by SGS to both ISO 14001 and OHSAS 18001 and are audited by their holding company DCC. The EPA undertaken un-notified compliance audits against the sites waste licence.</p> <p>Annual reports are also submitted to both Envas holding company, DCC and the EPA.</p>	HSE & Compliance Manager	Ongoing / Existing Practice	2

The risk matrix below remains unchanged from that presented in figure 6.7.

Table 6.8 – Risk Matrix

OCCURRENCE	V.High	5						
	High	4						
	Medium	3						
	Low	2	Risk ID 5					
	V.Low	1		Risk ID 1, 2, 4 and 7	Risk ID 3	Risk ID 6		
			1	2	3	4	5	
			Trivial	Minor	Moderate	Major	Massive	
SEVERITY								

Where:

Red is a high level risk

Yellow is a medium level risk

Green (light and dark) is a low level risk

The control measures and monitoring techniques employed at the site to deal with the risks identified were deemed adequate and these risks remain unchanged, however, this does not take away the need for continuing awareness and monitoring on a regular basis of these risks.

6.5.1. Quantification of Unknown Environmental Liabilities

The costs associated with the known environmental liabilities (e.g. closure and aftercare costs) for the Enva facility were calculated through the preparation and costing of the

Closure, Restoration, Aftercare Management Plan (refer to Site Specific CRAMP prepared for Enva).

For the unknown liabilities identified in this report a financial model is necessary to estimate the environmental liability associated with these risks.

Each Risk has two characteristics that are derived from the Risk Classification Tables

(See tables 6.2 and 6.3) that is used in the financial models:

- The range in probability (X-Y%) of the risk occurring
- The range in cost implications (€A-B) if the risk occurs

The requirements of the financial model must first be defined in terms of worst, most likely or best case scenarios. If the model is for the worst case scenario, then the higher end of each range is used in the calculations, if the model is for the most likely case then the median of each range is used and similarly if the best case scenario is required then the lower end of each range is used resulting in the lowest cost.

The simplest form of financial model can be based on simply multiplying the minimum, median or maximum value of each range for each Risk (depending on the scenario considered) and totalling the values for each Risk in the Register.

For the Enva facility the worst case scenario was calculated. Table 6.10 illustrates how the financial output for the worst case scenario is calculated.

From this, financial instruments for unknown liabilities can be selected as outlined in

Section 7 of this report.

Table 6.10 - Worst Case Scenario Financial Model

Risk ID	Potential Hazard	Occurrence Rating	Likelihood of Occurrence Range	Severity Rating	Cost Range (€)	Worst Case Probability	Worst Case Severity (€)	Worst Case Cost (€) Note 1
6	Major Fire/Explosion	1	0-5%	4	50,000-1,000,000	5%	1,000,000	50,000
3	Bund Integrity Failure	1	0-5%	3	50,000 -500,000	5%	500,000	25,000
5	Failure of underground drainage network.	1	5-10%	2	100,000- 250,000	10%	250,000	25,000
1	Spill from loading/unloading operations.	1	0-5%	2	10,000 – 50,000	5%	50,000	2,500
2	Bulk Storage tank failure.	1	0-5%	2	10,000-50,000	5%	50,000	2,500
4	Improper disposal of hazardous waste.	1	0-5%	2	100,000 – 500,000	5%	500,000	25,000
7	Failure of on-site environmental control procedures.	1	0-5%	2	100,000 - 500,000	5%	500,000	25,000
Total worst-case cost of unknown liabilities								155,000

Note 1: The financial provision was estimated using the guidance document provided by the EPA. It is noted that this is an estimated cost potential based on estimated probability of a risk occurring and estimated magnitude of any resulting environmental liability. It is the opinion of Enva that liabilities in excess of the total shown on the table above could conceivably occur and that consequently financial provision in excess of this figure will be maintained by the site.

7. FINANCIAL PROVISIONS

In the preceding sections the site sensitivity, known historic environmental liabilities and the measures, both technical and managerial, currently in place to eliminate/reduce the risk of new environmental liabilities arising have been summarised.

It can be concluded that the site environmental and safety management system are robust in terms of preventing the development of any new significant off-site environmental liability.

In the these sections, we will discuss the financial provisions at the site and whether these provisions are adequate to satisfactorily address the liabilities identified in section 6.

7.1. Current Financial Provisions

Enva is a wholly owned subsidiary of the DCC. DCC was founded in 1976 by Jim Flavin, Executive Chairman, and listed on the Irish and London stock exchanges in 1994. DCC is headquartered in Ireland and currently employs approximately 6,000 people. Revenues from DCC existing activities exceeded 4000 million in 2006 and DCC maintained an operating profit of over 120 million in 2006.

DCC maintain various insurance policies, which provide a range of cover subject to certain exclusions, excess and warranties. These insurance policies provide a range cover for all DCC sites, subsidiaries or associated companies. There are a number of policies which provide cover for the following risks:

- Employers liability
- Public/Products Liability;
- Motor Insurance;
- Engineering Combined.

The public/products liability provides indemnity in respect of legal liability for accidental bodily injury to any person or accidental loss or damage to property arising from the performance of the contract work (i.e. activities undertaken by Enva as defined in the Insurance policy). The policy has a limit of indemnity of €13,000,000. The policy is subject to an excess of €15,000 each and every claim.

The policy provides limited cover in respect of pollution or contamination risks in that cover is only provided where same has been caused by a sudden identifiable unintended and unexpected incident which takes place in its entirety at a specific time and place during the period of insurance. The liability of the underwriter for all damages and compensation payable in respect of all Pollution or Contamination which is deemed to have occurred during the period of insurance shall not exceed €13,000,000.

7.2. Assessment of Enva Financial Provision

The environmental liabilities identified and assessed in this report (refer to Section 6) are in the main unforeseen or unanticipated events that could occur suddenly as a result of an accident or failure of control systems. Other liabilities identified are the result of gradual and unforeseen discharge consequent upon

failure of control systems, which may result in a discharge to the environment such as leaking drains or undetected leaks in drainage systems.

Having consideration for the worst-case costs calculated in Table 6.10, a comparison of existing financial provisions presented in Section 7.1 above may be made with the type of unknown liabilities identified at the site.

Risk Type	Existing Enva Financial Provision	Comment
Immediate, sudden and unforeseen discharge consequent upon an accident.	DCC UK and Ireland Insurance policies Insurance - Public/Products Liability	Each claim has an excess of €15,000 which must be paid by Enva.
Gradual unforeseen discharge consequent upon failure of control systems.	Financed internally by DCC and/or Enva funds.	Unlikely that these are included within the current insurance cover for the site. Potential liabilities which arise that are not covered under existing insurance policies would be paid for with Enva based funds.
Closure Restoration and Aftercare Liabilities	Financed internally by DCC and/or Enva funds.	Enva have completed a Closure, Restoration, Aftercare Management Plan for the site with a specified total cost of €413,602 for effective site closure and aftercare. This document will be reviewed annually by enva

Table 7.1 – Assessment of Enva Financial Provision annually by Enva.

Based on a review of the current level of insurance maintained by the site, it appears that environmental liabilities resulting from Risk IDs 1,2,6 and 7 as shown in table 6.10 above would be covered under the existing insurance policies. Indemnity in respect of Risk IDs 3 and 4 would depend on the circumstances, which lead to any potential liability. Liabilities associated with Risk ID 5 would appear to be excluded from the existing cover and therefore any financial liabilities associated with this would need to be financed by Enva.

Appendix 1

Environmental Site Location Map

The map displays the Portlaoise region, with the 'SITE' location highlighted by a red dot and a blue box labeled 'SITE LOCATION'. The site is situated near the town of Portlaoise, close to the Rye River and the N11 road. The map shows a network of roads, including the N1, N11, R426, and R427, and various towns and villages such as Portlaoise, Rathfriland, and Rathfriland. The map also shows the Rye River and the Suir River, and the location of the site is marked with a red dot and a blue box labeled 'SITE LOCATION'.

Appendix 15

AER Returns Worksheet

Version 1.1.03

REFERENCE YEAR	2008
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1. FACILITY IDENTIFICATION

Parent Company Name	ENVA Ireland Ltd
Facility Name	ENVA Ireland Ltd
PRTR Identification Number	W0184
Licence Number	W0184-01

Waste or IPPC Classes of Activity

No.	class_name
4.8	Oil re-refining or other re-uses of oil.
4.9	Use of any waste principally as a fuel or other means to generate energy.
4.11	Use of waste obtained from any activity referred to in a preceding paragraph of this Schedule.
4.12	Exchange of waste for submission to any activity referred to in a preceding paragraph of this Schedule.
4.13	Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced.
3.6	Biological treatment not referred to elsewhere in this Schedule which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1. to 10. of this Schedule.
3.7	Physico-chemical treatment not referred to elsewhere in this Schedule (including evaporation, drying and calcination) which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1. to 10. of t...
3.12	Repackaging prior to submission to any activity referred to in a preceding paragraph of this Schedule.
3.13	Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced.
4.2	Recycling or reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes).
4.4	Recycling or reclamation of other inorganic materials.
4.5	Regeneration of acids or bases.

Address 1	Clonminam Industrial Estate
Address 2	Portlaoise
Address 3	County Laois
Address 4	
Country	Ireland
Coordinates of Location	0.000
River Basin District	IE-South Eastern
NACE Code	3832
Main Economic Activity	Recovery of sorted materials
AER Returns Contact Name	Anna O'Brien
AER Returns Contact Email Address	aobrien@enva.ie
AER Returns Contact Position	Health, Safety & Environmental Coordinator
AER Returns Contact Telephone Number	0578678600
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	158400
Number of Employees	78
User Feedback/Comments	
Web Address	

2. PRTR CLASS ACTIVITIES

Activity Number	Activity Name
5c	Installations for the disposal of non-hazardous waste

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

Is it applicable?	No
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 ?	

4.1 RELEASES TO AIR

[PRTR# : W0184 | Facility Name : ENVA Ireland Ltd | Filename : W0184_2008(1) PRTR.xls | Return Year : 2008]

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SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

RELEASES TO AIR								
POLLUTANT		METHOD			QUANTITY			
No. Annex II	Name	M/C/E	Method Used		Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
			Method Code	Designation or Description				
08	Nitrogen oxides (NOx/NO2)	M	ALT	BS ISO 9096:2003 & EPA Stack monitoring guidance	73.5	73.5	0.0	0.0
					0.0	0.0	0.0	0.0

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

SECTION B : REMAINING PRTR POLLUTANTS

RELEASES TO AIR								
POLLUTANT		METHOD					QUANTITY	
No. Annex II	Name	M/C/E	Method Code	Method Used Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
02	Carbon monoxide (CO)	M	ALT	BS ISO 9096:2003 &EPA Stack monitoring guidance	0.649	0.649	0.0	0.0
11	Sulphur oxides (SOx/SO2)	M	ALT	BS ISO 9096:2003 &EPA Stack monitoring guidance	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								
POLLUTANT		METHOD			QUANTITY			
Pollutant No.	Name	M/C/E	Method Used	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
			Method Code					
						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 Ltd				
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	

4.2 RELEASES TO WATERS

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

RELEASES TO WATERS	
POLLUTANT	
No. Annex II	Name

* Select a row by double-clicking on the Pollutant Name (Column B) th

SECTION B : REMAINING PRTR POLLUTANTS

RELEASES TO WATERS	
POLLUTANT	
No. Annex II	Name

* Select a row by double-clicking on the Pollutant Name (Column B) th

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

RELEASES TO WATERS	
POLLUTANT	
Pollutant No.	Name

* Select a row by double-clicking on the Pollutant Name (Column B) th

Data on ambient monitoring of storm/surface water or groundwater, conducted as part of your licence requirements, should NOT

M/C/E	Method Used		Emission Point 1	T (Total) KG/Year
	Method Code	Designation or Description		
			0.0	0.0

then click the delete button

M/C/E	Method Used		Emission Point 1	T (Total) KG/Year
	Method Code	Designation or Description		
			0.0	0.0

then click the delete button

M/C/E	Method Used		Emission Point 1	T (Total) KG/Year
	Method Code	Designation or Description		
			0.0	0.0

then click the delete button

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be submitted under AER / PRTR Reporting as this only concerns Releases from your facility

QUANTITY	
A (Accidental) KG/Year	F (Fugitive) KG/Year
0.0	0.0

QUANTITY	
A (Accidental) KG/Year	F (Fugitive) KG/Year
0.0	0.0

QUANTITY	
A (Accidental) KG/Year	F (Fugitive) KG/Year
0.0	0.0

SECTION A : PRTR POLLUTANTS

OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER								
POLLUTANT		METHOD			QUANTITY			
No. Annex II	Name	M/C/E	Method Code	Method Used	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
06	Ammonia (NH3)	M	PER	Standard methods	287.45	287.45	0.0	0.0
79	Chlorides (as Cl)	M	PER	Standard methods	20179.8	20179.8	0.0	0.0
71	Phenols (as total C)	M	PER	Standard methods	169.09	169.09	0.0	0.0
13	Total phosphorus	M	PER	Standard methods	487.54	487.54	0.0	0.0
20	Copper and compounds (as Cu)	M	PER	Standard methods	0.537	0.537	0.0	0.0
18	Cadmium and compounds (as Cd)	M	PER	Standard methods	0.17	0.17	0.0	0.0
23	Lead and compounds (as Pb)	M	PER	Standard methods	1.33	1.33	0.0	0.0
24	Zinc and compounds (as Zn)	M	PER	Standard methods	2.76	2.76	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								
POLLUTANT		METHOD			QUANTITY			
Pollutant No.	Name	M/C/E	Method Code	Method Used	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
314	Fats, Oils and Greases	M	PER	Standard methods	624.4	624.4	0.0	0.0
343	Sulphate	M	PER	Standard methods	2819.22	2819.22	0.0	0.0
306	COD	M	PER	Standard methods	41629.4	41629.4	0.0	0.0
238	Ammonia (as N)	M	PER	Standard methods	287.45	287.45	0.0	0.0
240	Suspended Solids	M	PER	Standard methods	1099.39	1099.39	0.0	0.0

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

4.4 RELEASES TO LAND

SECTION A : PRTR POLLUTANTS

RELEASES TO LAND	
POLLUTANT	
No. Annex II	Name

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

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

RELEASES TO LAND	
POLLUTANT	
Pollutant No.	Name

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

METHOD			
M/C/E	Method Used		
	Method Code	Designation or Description	Emission Point 1
			0.0

) then click the delete button

METHOD			
M/C/E	Method Used		
	Method Code	Designation or Description	Emission Point 1
			0.0

) then click the delete button

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QUANTITY	
T (Total) KG/Year	A (Accidental) KG/Year
0.0	0.0

QUANTITY	
T (Total) KG/Year	A (Accidental) KG/Year
0.0	0.0

5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE

| PRTR#: W0184 | Facility Name: ENVA Ireland Ltd | Filename: W0184_2008(1) PRTR.xls | Return Year: 2008 |

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Transfer Destination	European Waste Code	Hazardous	Quantity T/Year	Description of Waste	Waste Treatment Operation	Method Used		Location of Treatment	Name and Licence / Permit No. of Recoverer / Disposer / Broker	Address of Recoverer / Disposer / Broker	Name and Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY)	Licence / Permit No. of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY)
						M/C/E	Method Used					
To Other Countries	20 01 25	No	856.38	Edible oil and Fat	R1	C	Volume Calculation	Abroad	BIP. ZP39358G	PO Box 3180, Tat Bank Rd., Oldbury, West Midlands, B69 4PG, United Kingdom.		
To Other Countries	13 07 03	Yes	109.52	Mixed fuels	R1	M	Volume Calculation	Abroad	KS Recycling. 12 150 13987/01 TMS	KS Recycling, Raiffeisenstrabe 38, D-47665, Sonsbeck, Germany.	KS Recycling, Raiffeisenstrabe 38, D-47665, Sonsbeck, Germany.	12 150 13987/01 TMS
To Other Countries	16 01 07	Yes	1084.36	oil filters	R4	M	Weighed	Abroad	RD Recycling. OVAM authorised	RD Recycling, Centrum Zuid 3017,3530, Belgium	RD Recycling, Centrum Zuid 3017,3530, Belgium	OVAM authorised
To Other Countries	16 06 01	Yes	1835.63	Lead acid batteries	R4	M	Weighed	Abroad	Campine Recycling. Licence. OVAM authorised.	Campine Recycling, Nijlverheidsstraat 2, B-2340 Beerse, Belgium	Campine Recycling, Nijlverheidsstraat 2, B-2340 Beerse, Belgium	OVAM authorised
To Other Countries	16 06 02	Yes	15.02	Ni-Cd Batteries	R4	M	Weighed	Abroad	Accurec. ZUUM-054-0499-45-40-1103	Accurec. Wiehagen 12-14, 45472, Mulheim an der Ruhr, Germany	Accurec. Wiehagen 12-14, 45472, Mulheim an der Ruhr, Germany	ZUUM-054-0499-45-40-1103
To Other Countries	20 01 21	Yes	55.57	Fluorescent tubes	R5	M	Weighed	Abroad	Dela GmbH. 312/220704	Dela GmbH, Alte Landstr.4, Essen, Germany	Dela GmbH, Alte Landstr.4, Essen, Germany	312/220704
Within the Country	13 08 99	Yes	29.58	Hoses	R4	M	Weighed	Offsite in Ireland	Hegarty Metals. WP 05-04	Hegarty Metals, Ballysimon Road, Limerick	Hegarty Metals, Ballysimon Road, Limerick	WP 05-04
To Other Countries	15 02 03	No	690.22	Solid Flammable waste	R1	M	Weighed	Abroad	Lindenschmidt. 04 714 98089	Lindenschmidt, Krombacher Strasse 42-46, D57223, Kreutzal, Germany	Lindenschmidt, Krombacher Strasse 42-46, D57223, Kreutzal, Germany	
Within the Country	15 01 10	Yes	100.9	Packaging Contaminated with dangerous residues	R4	M	Weighed	Offsite in Ireland	Hegarty Metals. WP 05-04	Hegarty Metals, Ballysimon Road, Limerick	Hegarty Metals, Ballysimon Road, Limerick	WP 05-04
Within the Country	15 01 10	Yes	11.73	Packaging Contaminated with dangerous residues	D9	M	Weighed	Offsite in Ireland	Enva Ireland. W041/1	Enva Ireland, Smithstown Road, Limerick	Enva Ireland, Smithstown Road, Limerick	W041/1
To Other Countries	16 01 13	Yes	109.52	Brakefluid	R1	M	Weighed	Abroad	KS Recycling. 12 150 13987/01 TMS	KS Recycling, Raiffeisenstrabe 38, D-47665, Sonsbeck, Germany.	KS Recycling, Raiffeisenstrabe 38, D-47665, Sonsbeck, Germany.	12 150 13987/01 TMS
To Other Countries	16 06 05	No	8.42	Aerosols	R4	M	Weighed	Abroad	SBH. 121296753	SBH, Austrabe 5, D74238 Krautheim Germany		
Within the Country	06 01 02	Yes	1.43	Hydrochloric acid	D9	M	Weighed	Offsite in Ireland	Enva Ireland. W041/1	Enva Ireland, Smithstown Industrial Estate, Shannon, Co. Clare.	Enva Ireland, Smithstown Industrial Estate, Shannon, Co. Clare.	W041/1
Within the Country	14 06 05	Yes	0.2	Non liquid solvent waste	R13	M	Weighed	Offsite in Ireland	Enva Ireland. W041/1	Enva Ireland, Smithstown Industrial Estate, Shannon, Co. Clare.	Enva Ireland, Smithstown Industrial Estate, Shannon, Co. Clare.	W041/1
Within the Country	16 01 15	No	17.85	Antifreeze	D9	M	Weighed	Offsite in Ireland	Enva Ireland. W041/1	Enva Ireland, Smithstown Industrial Estate, Shannon, Co. Clare.	Enva Ireland, Smithstown Industrial Estate, Shannon, Co. Clare.	
To Other Countries	16 06 05	No	46.96	other batteries and accumulators	R4	M	Weighed	Abroad	Accurec. ZUUM-054-0499-45-40-1103	Accurec. Wiehagen 12-14, 45472, Mulheim an der Ruhr, Germany		
To Other Countries	08 01 11	Yes	41.25	Paint and thinners	R1	M	Weighed	Abroad	Enva Northern Ireland. P0108/05A	Enva N.I. Unit 1 No. 11 Comber Rd, Carryduff, Co Down BT8 8AN, Northern Ireland.	Enva N.I. Unit 1 No. 11 Comber Rd, Carryduff, Co Down BT8 8AN, Northern Ireland.	LN/05/08B
Within the Country	09 01 01	Yes	3.85	Silver	D9	M	Weighed	Onsite in Ireland	Enva Ireland. W041/1	Enva Ireland, Smithstown Industrial Estate, Shannon, Co. Clare.	Enva Ireland, Smithstown Industrial Estate, Shannon, Co. Clare.	W041/1
To Other Countries	13 05 02	Yes	154.01	Sludges	R1	M	Weighed	Offsite in Ireland	Geocycle	Geocycle. Rue de Courriere 49.Z.I.B. de Feluy, B7181 Seneffe, Belgium	Geocycle. Rue de Courriere 49.Z.I.B. de Feluy, B7181 Seneffe, Belgium	38.152/BP
To Other Countries	17 05 03	Yes	12500.16	Soil	R5	M	Weighed	Abroad	Sita. Certificate number 650700	Toronto street 23197 KN Rotterdam – Botlek, Holland	Sita.Toronto street 23197 KN Rotterdam – Botlek, Holland	650700
Within the Country	17 05 04	No	631.86	Soil	D1	M	Weighed	Offsite in Ireland	GTK Landfill. W081-2	Brownstown and Carnalway, Kilkullen, Co. Kildare.		
Within the Country	17 05 04	No	12925.36	Soil	D1	M	Weighed	Offsite in Ireland	Hinches. WMP 027	Derrygarran, Portlaoise, Co. Laois		
Within the Country	15 01 02	No	11.58	Plastic Packaging	R3	M	Weighed	Offsite in Ireland	Leinster Environmental. WP 2008/06	Leinster Environmental, 16 Francis Street, Dundalk, Co. Louth		

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