Waste Licensing

Waste Disposal Activities
(Landfill Sites)

Application by
Waterford County Council
for Review of Waste Licence Application W0032-02
for Dungarvan Landfill, Co. Waterford

EPA Reg. No.: (Office use only)	**W0032-03**

Waterford County Council
Comhairle Chontae Phortlairge

Replies to Request for further information in accordance with Article 14(2)(b)(ii) of the Waste Management Regulations

July 2010

Dungarvan Landfill Waste Licence Application Article 14 Response

DOCUMENT CONTROL SHEET

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APPENDICES

1 INTRODUCTION

This report has been compiled to supply additional information in response to a Notice in accordance with Article 14 (2) (b) (ii) of the Waste Management (Licensing) Regulations from the Environmental Protection Agency dated March 5th 2010.

A revised non technical summary to reflect the information supplied in compliance with the notice in accordance with Article 14 (2) (b) (ii) of the Waste Management (Licensing) Regulations is included in Appendix 1.

A register of drawings submitted in response to the Notice in accordance with Article 14(2)(b)(ii) is presented in Appendix 3. This register details drawing titles, numbers and titles and revision status.

2 ARTICLE 12 COMPLIANCE REQUIREMENTS

2.1 ITEM 1

The Agency recognises that a fee of €5,000 has been paid for a review of the existing licence. However I note that your application documentation refers to a fee of €11,000. please clarify the anomaly.

2.1.1 Response to Request

In accordance with Waste Activity 4 as detailed in Part 1 of the Second Schedule of Waste Management (Licensing) Regulations 2004 (S.I. No. 395 of 2004), the applicable fee is €5,000.

Section B.7.3 of the application for a waste licence review makes reference to two fees as follows;

- Disposal of Waste (Waste activity 1.4) € 6,000
- Recovery of Waste (Waste activity 4) € 5,000

Waste Activity 1.4 of the Second Schedule relates to '*The disposal of waste at a landfill facility where the annual intake is likely to exceed 5,000 tonnes but be less than 20,000 tonnes*'.

As the disposal of municipal waste to landfill ceased in 2003, waste activity 1.4 of the Second Schedule is no longer applicable.

To clarify the fee of €5,000 as paid is the correct fee for the review of waste licence W032-2.

2.2 ITEM 2

Having regard to the fact that the unlined landfill at the facility could give rise to emissions into an aquifer containing the List I and List II substances specified in the Annex to Council Directive 80/68/EEC of 17th December 1979, please describe the existing and proposed arrangements necessary to give affect to Articles 3 to 10 of this Directive.

2.2.1 Response to Request

The landfill located at the facility is an unlined landfill i.e. it does not contain any engineered liner material underneath the waste. However a thick layer of continuous low permeability clay underlies the site which will mitigate leachate ingression into the underlying groundwater.

The facility was first issued a Waste Licence (W032-01) in 2001, which was reviewed in 2005 (W032-02). The facility currently continues to operate under W032-02. The Agency's licensing requirements for the facility included the design and development of leachate management and trade effluent infrastructure as well as the installation of effective groundwater management infrastructure during all works to be conducted at the facility.

A closure, restoration and aftercare management plan (CRAMP) has also been completed and submitted to the EPA in accordance with the requirements of W032-02.

In accordance with Waste Licence W032-02 and in accordance with the CRAMP, capping works were completed at the landfill facility in 2008. The final capping layer on the landfill was designed in accordance with the requirements set in the Landfill Directive Annex 1 (3.3).The final capping system comprises a 1mm thick smooth LLDPE Liner, except on the steeper slopes where the LLDPE is double-sided textured.

The capping layers provide protection from the ingress of rain into the landfill site and thus minimise leachate generation. As part of the capping system a leachate abstraction system was also installed. This abstraction system will ensure that the leachate reservoir that exists within the landfill body is continuously reduced.

In accordance with Waste Licence W032-02 and in accordance with the CRAMP issued to the Agency, it is intended to develop a series of Integrated Constructed Wetlands (ICW) at the site to treat the leachate and provide a public local amenity area. Full details of the ICW and proposed leachate treatment system are presented in the report entitled '*Response to EPA Request for Information on Leachate Treatment*' (August 2008) previously submitted to the Agency. For information purposes an overview of the process is presented below.

The ICW will consist of a series of six wetland ponds through which the leachate is passed sequentially where it will be treated by means of various plants within the ponds before being discharged to the Colligan River. Two leachate storage tanks, leachate collection pipework and monitoring equipment will be operated in tandem with the wetlands themselves to ensure that the system operates as designed.

Leachate abstracted from the site via the leachate abstraction boreholes will be pumped to Storage Tank 1. Monitoring equipment in this tank will analyse the leachate and determine the concentration of ammonium and therefore whether dilution of the leachate is required or not. The maximum concentration of ammonium allowable within the leachate is 100mg/l, this is to prevent shock loading of the wetland plants at the inlet point.

If dilution of the leachate is required water from the river will be used to dilute the leachate to the required concentration in Storage Tank 1 before being pumped to the wetland system. If no dilution is required the leachate will be pumped directly from Storage Tank 1 to the wetland system.

Once leachate is discharged to the wetland system it flows sequentially through Ponds 1-5 before being discharged to Storage Tank 2. Once in this tank the leachate is again monitored and based on the results of this monitoring the leachate will either be discharged to the Colligan River or it will be pumped back into the wetland system for further treatment.

It is proposed that continuous monitoring will be carried out on the treated effluent for pH and ammonia. A 24 hour composite sample will be taken from the effluent each day and stored on site. Once a week one of the composite samples will be chosen at random and monitored for BOD, suspended solids and Orthophosphate.

Grab samples will be taken annually and will be monitored for the following:

- BOD
- COD
- Chloride
- Ammoniacal Nitrogen
- Electrical Conductivity
- pH
- Metals / non-metals[1]
- Cyanide (total)
- Fluoride

- List I/II organic substances
- Mercury
- Sulphate
- Orthophosphate
- Total Oxidised Nitrogen

Note 1: to include boron, carbon, cadmium, chromium (total), calcium, copper, iron, lead, magnesium, manganese, nickel, potassium, sodium and zinc

The combination of the thick layer of low permeability clay beneath the site, the fully engineered landfill capping system and the leachate abstraction and treatment system will ensure that potential leachate infiltration into the groundwater is minimised.

2.3 ITEM 3

Provide the expected start date of the landfill gas flare and clarify the number of gas extraction and combined leachate extraction / gas extraction wells. Provide a new drawing showing the location of all wells. Also, in the context of your application for Class 9, please elaborate on what work has been done to date on the potential for utilising landfill gas as an energy source.

2.3.1 Response to Request

The landfill gas flare is to be installed and commissioned in July 2010.

A pumping trial was carried out in May-June 2009 to identify the sustainable yield of landfill gas from the existing waste and to provide empirical data for the rate of generation and quality of the gas available from the site. It was also carried out to support the theoretical model predictions by confirming the accuracy of the model at a specific time, hence showing correlation between the predicted and actual results of landfill gas yield. The pumping trial was conducted on the complete gas collection system and represents the whole of the existing site.

The estimated sustainable landfill gas flaring capacity at the site for the duration of the gas producing life span of the site is estimated to be 500 m^3/hr at 25-60% methane. The pumping trial was carried out across the whole site which covered some 23 gas wells. Gas levels in 22% of these wells depleted very quickly and never recovered. Methane levels ranged between 25-35% in 52% of the wells and averaged between 35-40% in the other 26% wells.

The flow rate at the flare when the pumping trial started was 300 m^3/hr, this reduced to 70 m^3/hr at the end of the trial.

The results of the pumping trial gave lower results than predicted during project planning, when a flow rate of at least 250 m^3/hr was estimated. However, the exact composition and history of waste placement was unknown. The option to drill additional boreholes was considered, but was not deemed necessary as the current boreholes provide a good distribution and both vertically and horizontally throughout the site.

It was therefore decided to install a smaller permanent flare with a capacity of 100 m^3/hr, as the sustainable flow rate was 70m^3/hr during the trial, and production of gas will invariably decrease with time.

The high temperature ground flare has a turn down ratio of 5:1, enabling good flaring and gas control down to 20m3/hr (expected to reduce to this figure in 2018). This flare has the capacity to extract gases from the entire site. The flare would require a minimum methane quality of 23% to light, and a quality of over 25% to maintain 1000^{o}C.

The site has shown that the gas quality and quantity monitored at the flare is not sufficient for any form of major power generation.

Gas Collection System

23 no. boreholes were drilled at the site in 2008, including 14 no. gas wells, and 9 no. combined wells. The wells and gas & leachate collection systems are illustrated on drawings DG0606 and DG0607 attached.

2.4 ITEM 4

Provide details on proposed methods and frequency for removal of heavy metals in the detritus and necromass of the wetland system.

2.4.1 Response to Request

Heavy metals associated with all biological material and typically a focus of landfill sites was considered at the outset when considering the Integrated Constructed Wetlands (ICW) at Dungarvan Landfill. Excessive or challenging concentrations were not identified. The water-vectored through-flowing of 'heavy metal' content will be incorporated into the accumulating detritus and necromass of the system.

On the basis of experience from the functioning of ICW systems over the past 14 years this detritus may be allowed to accumulate for 28 years or even indefinitely as it is determined by the height of the containing embankment/berm. The composition and the concentration of this detritus/necromass will be analysed and compared with similar material from other ICW systems treating other sources of water-vectored material such as sewage, farmyard dirty water, storm water etc.

Removal of accumulated detritus/necromass will only occur after dewatering and in situ composting and will thus be assessed before further required management/use. Various possibilities with regard to this material include thermal recovery of the metals, micro-nutrient supplementation of soils and growing media.

A key factor relating to ICW systems is that they provide a range of ecosystem services through their integrated design.

2.5 ITEM 5

Clarify the proposed maximum annual tonnage and type of waste to be handled at the facility.

2.5.1 Response to Request

It is not proposed to alter the quantity and nature of waste currently licensed for acceptance at the facility under W0032-02. Therefore in order to clarify the maximum quantity and nature of waste in accordance with the EPA's request, all relevant tables from the application for a review have been amended and are reproduced below.

TABLE B.7.2 MAXIMUM ANNUAL TONNAGE

Maximum Annual Tonnage (tpa)	11,520
Year	2010 onwards

TABLE H.1(A). QUANTITIES OF WASTE IN RELATION TO EACH CLASS OF ACTIVITY APPLIED FOR

Waste Management Act 3rd Schedule (Disposal) Activities			Waste Management Act 4th Schedule (Recovery) Activities		
Class of Activity Applied For		Quantity (tpa)	Class of Activity Applied For		Quantity (tpa)
Class 1			Class 1		
Class 2			Class 2		1,120
Class 3			Class 3		Note 2
Class 4			Class 4		Note 2
Class 5			Class 5		
Class 6			Class 6		
Class 7			Class 7		
Class 8			Class 8		
Class 9			Class 9		
Class 10			Class 10		
Class 11			Class 11		252 Note 3
Class 12			Class 12		
Class 13		Note 1	Class 13		Note 1

Note 1 – The proportions of waste to be stored on site pending off site disposal and recovery will vary but will be subject to the existing municipal waste limit as outlined in Schedule A.2 of W0032-2 (10,000 tonnes per annum)

Note 2 – Individual tonnages for Classes 3 & 4 of the Fourth Schedule are included in total stored pending off site recovery under Class 13 of the Third and Fourth Schedules of the Waste Management Acts 1996 to 2010.

Note 3- Class 11 refers to the use of C&D waste such as clay which will be used in the restoration of the main landfill site and for landscaping around the civic amenity as required. This is included within the 20,000 tpa maximum inert waste limit over the lifetime of the facility

TABLE H.1(B) ANNUAL QUANTITIES AND NATURE OF WASTE

Year	Non-hazardous waste (tonnes per annum)	Hazardous waste (tonnes per annum)	Total annual quantity of waste (tonnes per annum)
2010 onwards	11,120	400*	11,520

*Hazardous waste accepted as per Waste Licence W0032-02 Condition 8.4

TABLE H.1 (C) WASTE TYPES AND QUANTITIES

WASTE TYPE	TONNES PER ANNUM (existing)	TONNES PER ANNUM (proposed)	TOTAL (over life of site**) tonnes
Household	5,227	10,000	200,000
Commercial			
Sewage Sludge			
Construction and Demolition	252	252*	5,040*
Industrial Non-Hazardous Sludges			
Industrial Non-Hazardous Solids			
Hazardous *(Specify detail in Table H 1.2)	60	400	8,000
Inert Waste imported for restoration purposes	48,990	20,000	20,000

* Class 11 refers to the use of C&D waste such as clay which will be used in the restoration of the main landfill site and for landscaping around the civic amenity as required. This is included within the 20,000 tpa maximum limit over the lifetime of the facility

** Based on a 20-year life span, however it is anticipated that the facility will operate over an open-ended time span

*** TABLE H.1.2 HAZARDOUS WASTE TYPES AND QUANTITIES**

HAZARDOUS WASTE	DETAILED DESCRIPTION * REFERENCE SHOULD BE MADE TO THE RELEVANT EUROPEAN WASTE CATALOGUE CODES AS PRESENTED BY COMMISSION DECISION 2000/532/EC	Tonnes Per Annum (Existing)	(Tonnes Per Annum Proposed)
Waste Oil	20 01 25*	0.98	2
Oil filters	15 02 03*	0.4	1
Asbestos	Not Applicable		
Paint and Ink	20 01 28*	1.14	1.8
Batteries	20 01 33*	3.6	4
Fluorescent Light Bulbs	20 01 21*	0.62	1
Contaminated Soils			
OTHER HAZARDOUS WASTE (APPLICANT TO SPECIFY)			
Aerosols	20 01 23*	0.11	0.2
Fridges	20 01 23*	31.5	100
Other Electrical Equipment	20 01 35*	21.2	290

2.6 ITEM 6

Provide a drawing showing the location of the proposed discharge point from the leachate treatment system to the Colligan River and the location of the proposed abstraction of water for diluting landfill leachate. State the maximum rate of this abstraction and provide details on any environmental impacts that might be caused by this development.

2.6.1 Response to Request

A drawing illustrating the proposed leachate collection and treatment system is provided on DG0606 attached. This is updated from previous information sent to the EPA following detailed design in 2009. It is noted that certain elements of this system are not yet completed, as illustrated on the drawing.

The design information and environmental impact analysis for the proposed leachate extraction and treatment system was provided in "*Response to EPA Request for Information on Leachate Treatment*" (RPS, Aug-08). Since this time, the design of the proposed system has been progressed to 'detailed design' stage for tendering purposes. The detailed design remains in line with the original design concept developed previously submitted to the EPA. No significant changes have been made.

The proposed locations of the dilution and discharge points designed are detailed on DG0606 and DG0709. It is proposed to extract dilution water from the Colligan River as shown. The projected volumes of dilution and discharge water were discussed in the above report. The following key tables are reproduced for illustration and discussion purposes.

Table 2.1: Leachate Mass Balance

Leachate Abstracted (m^3)	Plus Dilution Water[1] (m^3)	Plus Precipitation[2] (m^3)	Less P.E.[3] (m^3)	Discharge (m^3/day)
5	25	49.2	32.9	46.3
10	50	49.2	32.9	76.3
12	60	49.2	32.9	88.3
15	75	49.2	32.9	106.3
20	100	49.2	32.9	136.3
25	125	49.2	32.9	166.3
30	150	49.2	32.9	196.3

Note 1: A dilution factor of 5 has been assumed using an average NH_4 level of 500mg/l in the raw leachate based on analysis of the leachate within the landfill.

Note 2: Precipitation has been taken from Rosslare weather station. The annual total has been distributed evenly throughout the year.

Note 3: Potential evapotranspiration has been taken from Casement Aerodrome and has been distributed evenly throughout the year.

Table 2.2 Maximum allowable concentrations of P, NH_4, BOD and Suspended Solids

Daily Discharge	Actual Discharge*	Allowable Maximum Concentrations in Discharge			
(m^3/day)	(L/s)	O-Phosphate (mg/l P)	NH4 (mg/l)	BOD (mg/l O2)	Suspended Solids (mg/l)
40	0.46	16.62	664.55	2,955.73	13,157.80
60	0.69	11.09	443.36	1,972.16	8,780.20
80	0.93	8.32	332.77	1,480.37	6,591.40
100	1.16	6.67	266.42	1,185.29	5,278.12
120	1.39	5.56	222.18	988.58	4,402.60
140	1.62	4.77	190.58	848.07	3,777.20
160	1.85	4.18	166.88	742.68	3,308.20
180	2.08	3.72	148.45	660.72	2,943.20

*Actual discharge based on daily volume to be discharged.

Table 2.3: Proposed Emission Limits

Parameter	Emission Limit (all units in mg/l except pH)
PH	6 - 9
BOD	45
Suspended Solids	50
Orthophosphate (mg/l P)	2
Total Ammonia (as N)	5

Table 2.4: Downstream Concentration of Emission Parameters

	BOD (mg/l)	Suspended Solids (mg/l)	Orthophosphate (mg/l)	Total Ammonia (mg/l)
Conc. Downstream	1.215	7.21	0.016	0.069
Statutory Limits	5	25	0.03	1

Regarding the environmental effects of discharging treated leachate to the river Colligan, the following summarises the analysis presented in the report. Tables 2.3 and 2.4 are based on a proposed maximum abstraction rate of 20m^3 of leachate from the landfill per day. Based on the discharge volumes illustrated in Table 2.1 this will result in an average discharge rate of 136.3m^3 per day. Full details can be found in the report.

Regarding Table 2.2, assimilative capacity in the river for all parameters considered are numerous orders of magnitude above the proposed discharge limits shown in Table 2.3, except for orthophosphate limit which is nonetheless 2-3 times less than the assimilative capacity.

Pumping tests on three of the nine combined gas-leachate extraction wells in April 2010 indicates that the lower end of the projected leachate extraction volumes can be expected, in the range 5-10 m^3/d. However, it is prudent to retain the analysis used, based on 20 m^3/d leachate, as conservative. In any case, the assimilative capacity of the river is significantly in excess of the proposed discharge, and no environmental impacts are predicted, as detailed fully in the report.

Regarding the proposed dilution water abstraction from the river, 25-150 m^3/d was expected as required (0.0003 to 0.0017 m3/s). Based on a 95%ile flow of 0.5 m^3/s, and a DWF of 0.32 m^3/s, the proposed abstraction represents less than 0.5% of the DWF. This is not considered significant and is not considered to pose any environmental impact. The abstraction is also returned to the river through discharge within the site.

2.7 ITEM 7

State if the surface water arising from the green waste reception area, the compost area and the waste transfer station will be diverted to the leachate treatment system. Provide details on methods of dealing with the surface water arising from these areas until the connection to the leachate treatment

system is in place. Also, provide a drawing showing the location of the surface water drainage system, including the oil/petrol interceptor(s), and all surface water discharge points from the facility. Include symbols for these discharge locations.

2.7.1 Response to Request

Surface water arising from the green waste reception area, composting area, and waste transfer station is collected as shown on Drawing DG007, except this pipeline now discharges to the leachate collection system and into the leachate treatment system (wetland ponds) as from June 2010 (via the old leachate collector sump and new leachate collector pump sump shown on DG0607) . Drawing DG007 and DG0607 will be updated shortly following as-built surveys and will be issued to the Agency for their files.

Similarly, the surface water drainage from the civic reception area is shown on Drawing DG007. Such water discharges via a 'first flush' valve and oil/petrol interceptor to the Colligan River as shown. The surface water drainage system at the landfill was completed in May 2010 and a revised drawing will be completed following as-built surveys which will be issued to the Agency for their files.

2.8 ITEM 8

Provide a new drawing showing all proposed monitoring locations at the site together with their descriptions and symbols. Please note that the extent of the civil waste facility shown in Figure 2 of the licence application should include the monitoring points for dust and odour.

2.8.1 Response to Request

Please find Drawing No. DG0505 (Rev F02) attached showing all proposed monitoring locations together with their descriptions and symbols. Monitoring locations for dust and odour have been included within the extent of the civic waste facility as requested by the Agency.

It is proposed to carry out monthly dust monitoring at monitoring locations B1-B4 and locations D2,D2A,D3 and D4 as indicated on DG0505 (Rev F02). In addition, it is proposed to conduct monthly odour monitoring at locations OM1 – OM2 and daily odour inspections at locations Oi1 – Oi4.

As the prevailing wind direction is from a north/ north-easterly direction, it is suggested that potential dust emissions arising from the civic amenity area and transfer facility will be detected at monitoring locations D1 and D3, while potential odour emissions arising will be detected at monitoring locations OM1 and OM2.

In such instances, up-gradient monitoring location D4 is considered a control location for dust monitoring. In addition it is proposed to use up-gradient location Oi4 as a control location for odour monitoring. It is proposed to carry out daily odour inspections at this location.

2.9 ITEM 9

Provide information on how the septic tank which collects the water from the washing area/toilet has been assessed and complies with the Agency's 'Code of Practice Wastewater Treatment and Disposal Systems Serving Single Houses (p.e. ≤10)'. Also, provide a drawing showing the location of this tank.

2.9.1 Response to Request

The septic tank serving the 'washing area / toilet' in the civic amenity area is located as shown on Drawing DG007. This drawing will be updated following as-built surveys.

The expected load is less than 2 PE. The septic tank is a standard pre-cast unit with two internal sections, inlet and outlet 'tees', has an effective volume of 3.6 m^3, and is thus sized for 10 PE. The tank discharges to the 'leachate line' shown in DG007. Previously, this leachate line discharged to the pond system adjacent the river Colligan as shown in DG007, but has now been connected to the leachate collection and treatment system (wetland ponds) as from June 2010, as detailed in Item 7 above.

It is concluded that the septic tank and treatment system meets or exceeds the requirements of the EPA Code of Practice Wastewater Treatment and Disposal Systems Serving Single Houses (p.e. ≤10). The septic tank has ample capacity for the expected load, and discharges to the wetlands treatment system, which is significantly over-sized for the expected volumes/loadings from leachate and the septic tank.

2.10 ITEM 10

Provide the final version, if any, of the draft report "Ecological Survey of Dungarvan Landfill and Environs" submitted as part of this licence application.

2.10.1 Response to Request

The final version the report "*Ecological Survey of Dungarvan Landfill and Environs*" is attached in Appendix 2.

APPENDIX 1

REVISED NON TECHNICAL SUMMARY

Attachment A.1 – Non-Technical Summary

A.1.1 Background & Nature of the Facility

Dungarvan Landfill is located in Ballynamuck Middle Co. Waterford approximately 2km north west of Dungarvan, off the N25 road on the Southern Bank of the Colligan River. The landfill site is located on a meander of the Colligan River, immediately to the west of Ballyneety Bridge. Adjacent to the site the Colligan River becomes tidal, with an extensive area of mudflats located further to the east of Ballyneety Bridge extending into Dungarvan Harbour. Dungarvan Harbour itself is designated as a Special Protection area (SPA) which extends from Helvic Head to Ballyneety Bridge. A National Heritage Area (NHA) covers most of the bay and touches the western boundary of the landfill site.

The topography of the area is a gentle south facing slope and is bounded by a low ridge running east-west to the north of the Waterford-Cappoquin Road. The general character of the landscape is one of good quality agriculture with a relatively high level of visual amenity. Land use in the vicinity of the site is primarily agricultural pastureland with some isolated patches of cropland. There is urbanisation in the form of ribbon development on the county roads around the site. There is also an "angler's path" running along the boundary of the site adjacent to the river on which there is a public right of way.

The site contains the following:

- A closed landfill
- A green waste composting area
- A Waste Transfer Station
- A Civic Amenity Area

Landfill

The site itself consists of a landfill that has ceased accepting waste since 2003. The landfill covers an area of approximately 6.5 hectares. It is thought that filling on the site commenced in the late 1960's. Ownership of the landfill was passed to Waterford County Council in 1985. The landfill is an unlined landfill i.e. it does not contain any engineered liner material underneath the waste. It does however contain a thick layer of low permeable clay which would prevent a significant amount of leachate ingression into the groundwater.

The landfill site has recently been capped completely and now progresses to non-clean closure status as defined in the Agency's ELRA, Residuals Management and Financial Provision Guidance Document. In accordance with Waste Licence W32-02 and in accordance with the Closure, Restoration and Aftercare Management Plan (CRAMP) issued to the Agency, it is intended to develop a series of Integrated Constructed Wetlands (ICW) at the site to treat the leachate and provide a public local amenity area.

While the primary objective of the constructed wetlands is for leachate treatment, the development and conservation of wildlife habitats is compatible as an afteruse. The layout, structure and composition of the wetlands will be entirely compatible with the surrounding ecology and will greatly increase the restored landfill's visual and wildlife amenity. Wetlands are important as habitats for invertebrates, marginal and aquatic vegetation, amphibians, fish and a range of breeding and wintering wildfowl as an area for nesting and feeding. The restored site will play an important role as a wildlife corridor in the area.

Capping works were completed in mid 2008. The final capping system generally comprises of a gas collection layer, LLDPE liner, drainage layer, subsoil layer and topsoil layer as follows:

- 150-300mm layer of topsoil; underlain by
- Subsoil such that thickness of topsoil and subsoil is at least 1m thick; underlain by
- A surface water geocomposite layer; underlain by
- 1mm LLDPE liner (a low permeability geomembrane material).
- Geocomposite gas collection layer.

The capping layers will provide protection from the ingress of rain into the site and thus minimise leachate generation. In addition to the capping detail as required by the licence it is proposed that wetland ponds be constructed for the purpose of treating leachate. The drainage geocomposite layer is placed on the side slopes only as the constructed wetlands will effectively control surface water drainage; in addition the depth of subsoil/topsoil will be decreased from 1m to 0.3m in areas where the ponds are located. Approximately 5,500m^2 of the side slopes on the Southern side of Dungarvan landfill were capped in 2002 using a GCL as the low permeability layer. Geogrid was also placed on the side slopes as required for slope stability. The drainage geocomposite layer is placed on the side slopes only as the constructed wetlands effectively control surface water drainage on the flat areas. Leachate extraction wells are located strategically across the site in order to maximise collection efficiency. Furthermore, rainwater will assist in the dilution of leachate within the constructed wetlands. The surface water drainage from the side slopes will run-off towards the surface water carrier drain, which runs along the northern boundary.

The landfill gases generated within the landfill body itself will be collected by the landfill gas management system and flared off.

Green Waste Composting Area

Waterford County Council ceased the acceptance of source segregated organic waste at the composting facility in 2007 due to odour concerns. In early 2008, the two enclosed in-vessel composting units were decommissioned and removed from site as they were no longer required.

Currently the composting area on site only accepts green waste in the form of bushes, trees, grass etc. A mobile shredder is brought onto site once a month at a minimum or whenever a sufficient amount of green waste is to be shredded. Following shredding, the material is placed in a curing bunker where it is allowed to decompose with the aid of aeration slots and a biofilter.

Waste Transfer Station

The waste transfer station is licensed to accept 10,000 tonnes per annum. The building is 10m x 35m in size and is fully enclosed. An air handling unit of three overhead pipes is connected to three extractor fans to ventilate the building.

All waste accepted is unloaded within the transfer building itself. All waste remains in the building for a maximum of 48 hours prior to being loaded and transported to either Powerstown Landfill in County Carlow or the composting facilities at Veolia in Waterford City or Milltown Composting, Fethard, Co. Tipperary. The facility is washed down and cleaned after compostable material is transferred. This is collected on a three week cycle together with municipal waste and dry recyclables.

Civic Amenity Area

The civic amenity area is open to the public and subject to a pricing structure depending on the amount of waste or type of vehicle or size of trailer. The facility accepts waste from 9.000am to 17.00pm Monday to Friday and 9.00am to 1.00pm on Saturday. All waste coming into the civic amenity area is inspected by staff prior to disposal. The civic amenity area accepts the following waste;

- Glass
- Paper & Cardboard
- Newspapers/magazines
- Plastics
- Garden Waste
- Construction & Demolition waste
- Wood
- Waste cooking oils
- Batteries
- Oil Filters
- Waste paint

- Mixed residual waste
- Bulky waste (furniture, mattresses etc.)
- WEEE
- Mixed dry recyclables including tetra-pak
- Textiles
- Scrap metal
- Aluminium & tin cans

A.1.2 Classes of Activities

Dungarvan Landfill is currently licensed to carry out activities under Classes 4 and 13 in accordance with the Third Schedule of the Waste Management Acts 1996 as amended.

Under this waste license review Waterford County Council are applying to carry out activities under the following classes in accordance with the Third Schedule of the Waste Management Acts 1996 to 2005:

- Class 4. Surface impoundment, including placement of liquid or sludge discards into pits, ponds or lagoons.
- Class 11. Blending or mixture prior to submission to any activity referred to in 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.

Class 4 activities relates to the storage of leachate within the six wetland ponds that are currently being constructed as part of the capping works.

Class 11 activities relates to the mixture of water with the abstracted leachate. This is necessary to dilute the leachate before it is pumped into the wetland system.

Class 13 relates to the storage of waste in the waste transfer station prior to this waste being transferred to either composting facilities for recovery or Powerstown Landfill for disposal.

Dungarvan Landfill is currently licensed to carry out activities under Classes 2, 3, 4, 9, 11 and 13 in accordance with the Fourth Schedule of the Waste Management Acts 1996 to 2005.

Under this waste license review Waterford County Council are applying to continue carrying out activities under the above classes as per Waste License W032-02.

The principal activity at the site is Class 13 of the Third Schedule as detailed above.

A.1.3 Quantity and Nature of Waste Handled

The main types of waste handled at the facility are household (mixed residual waste and mixed dry recyclables), green waste and construction & demolition waste and commercial waste. The quantities and nature of waste that the facility is currently licensed to accept are shown in the table below.

WASTE TYPE	TONNES PER ANNUM
Municipal Waste	10,000
Hazardous Municipal Waste (including WEEE)	400
Inert C & D	20,000 over the lifetime of the facility
Garden Waste	1,120
Total	**11,520**

A.1.3 Raw and Ancillary Materials

The main raw material used on site is water for cleaning the hard standing areas namely the civic amenity area, the composting area and the waste transfer station. Diesel is used to run the shredder however this is not permanently on site. Electricity is used in the site lighting, weighbridge, and in the office and garage buildings.

A.1.4 Site Operating Procedures

Waste is delivered to the site mainly by Waterford County Council (WCC) and Dungarvan Urban District Council refuse collection trucks. This waste is domestic household waste. All trucks must pass over the weighbridge prior to admission to the waste transfer station where it is unloaded within the building itself. This mitigates odour, noise and dust emissions to the atmosphere. The waste is then inspected and is transported off site to either composting facilities for recovery or Powerstown landfill in County Carlow for disposal within 48 hours.

All waste accepted by the compost area (green waste only) and civic amenity area is inspected prior to admission. In the past the facility accepted source segregated organic waste and to facilitate the composting of this material, two enclosed in-vessel units were commissioned to allow a 14 day maturation period. As the facility ceased accepting source segregated organic waste for composting, the two in-vessel units were decommissioned and removed from site in 2008. Every month or sooner as required, a mobile shredder is brought to site to shred the green waste into chips. This is then transferred to one of the concrete curing bunkers of that contain aeration slots and biofilters that facilitate decomposition and odour control. The civic amenity area is open to the public free of charge. Waste is inspected by staff prior to admission and if the material is accepted, the public are directed to the required container(s).

A.1.6 Nature & Impacts of Emissions at the facility

Emissions to Air

The potential emissions to air that arise from the operation of the facility are noise, dust and odour. The majority of these emissions result from waste coming into and leaving the transfer station. These emissions are mitigated by ensuring that all incoming waste is unloaded within the building itself thus reducing the emissions to the atmosphere. In addition, all biodegradable waste coming into the facility is removed within 48 hours.

Dust levels at the facility established during monitoring undertaken indicate that dust generation at the facility are significantly below the EPA recommended level of 350mg/m^2/day.

The main source of odour nuisance is potentially generated from the composting area. Because the compost area no longer accepts kitchen waste, odour nuisance is minimal.

Emissions to Groundwater
As mentioned previously, the landfill body itself is unlined resulting in the threat of leachate ingression into the groundwater. Although this is a potential issue, a thick layer of low permeability clay exists underneath the landfill which reduces the potential for leachate migration. In addition to this the fully engineered landfill cap that is being constructed in accordance with Waste Licence 032-2 will prevent the ingression of moisture into the waste body of the landfill, thus mitigating against future leachate generation. Because the landfill is now closed and recently capped, the amount of leachate generated on an annual basis will deplete over time.

Emissions to Surface Water
Surface water generated from the slopes of the landfill will be collected via a series of stone filled carrier drains that will discharge into the River Colligan.

Surface water from the civic amenity area is collected and passed through a petrol interceptor before being discharged to the Colligan River.

Wastewater from the composting area and the waste transfer station will be directed to the leachate treatment system.

Noise Emissions
The primary source of noise emissions coming from the facility relate to activities concerning the waste transfer station. These emissions are minimised by carrying out all loading and unloading of vehicles within the main building. Another source of noise emissions would be the auger that shreds the green waste, however due to the fact that this runs approximately once a month, it is perceived that this is not an issue.

A.1.7 Provision of Information related to Section 40(4) of the Waste Management Act

Compliance with Emission Standards
Waterford County Council will operate the facility so as to comply with all emission standards and limits set out by the Environmental Protection Agency in the Waste Licence.

Avoidance of Environmental Pollution
The facility is designed and operated to ensure that the operation of the facility will not cause environmental pollution; some of the design features and operational practices that ensure this are outlined below:

Avoidance of Emissions to Air
- All waste related to the waste transfer station is transferred in enclosed or covered vehicles.
- All waste-handling is restricted to inside the waste transfer station.
- All waste disposed of at the waste transfer station is removed off site within 48 hours of delivery.
- Water-spraying of hardstanding areas is carried out in periods of dry weather.
- Only green waste is accepted at the compost area.

Avoidance of Emissions to Water
- The civic amenity area, the waste transfer station and the compost area are paved allowing collection of all surface water generated.
- All surface water from the civic amenity area is passed through a petrol/oil interceptor before being discharged to the Colligan River.
- Wastewater from the composting area and waste transfer station will be directed to the leachate treatment system.

Avoidance of Other Environmental Nuisances
- The site is cleaned regularly to prevent wind blown litter.

- Municipal waste collected by WCC is stored within the main waste building and is not exposed.
- A vermin control plan was developed by a pest-control specialist and is being implemented and the site is regularly inspected.
- Regular monitoring of agreed parameters as set out in the existing Waste Licence will ensure that environmental controls are monitored for performance.

Best Available Technology (BAT)
Waterford County Council adheres to BAT principles to avoid any environmental pollution and prevent and mitigate any nuisance emissions from the facility.

Fit and Proper Person
Mr. David Regan has responsibility for the day to day operations at the site. Mr. Regan has completed the course and obtained the FAS Waste Management Certificate.

No employee of the applicant, Waterford County Council, has been convicted of an offence under the Waste Management Act 1996.

Technical Competence & Site Management
Waterford County Council is required as a local Authority to follow instructions set out by the EPA and has extensive experience in waste management. Waterford County Council has also extensive experience and in operating licensed facilities and will operate the facility in strict accordance with the Waste Licence. The table and organisational chart in Attachment C.1 sets out the staff structure for the management of the facility.

Financial Provision
Waterford County Council, as a Local Authority, are fully aware of their responsibilities to make financial provision in respect to the operation of a waste recovery facility as set out in Section 53 of the Act.

A.1.8 Monitoring and Sampling Arrangements

It is proposed to continue the monitoring programme as set out by the EPA for the facility in the previous Waste Licence W32-02. In addition it is proposed to carry out monthly dust monitoring at monitoring locations B1-B4 and D2, D2A, D3 and D4. It is also proposed to conduct monthly odour monitoring at locations OM1 – OM2 and daily odour inspections at locations Oi1 – Oi4.

It is proposed that monitoring at such locations will allow emissions generated from the landfill, civic amenity area, composting area and waste transfer facility to be detected.

Monitoring locations are specified on drawing number MDR0350DG0505 (Rev F02).

A.1.9 Off-site Treatment of Waste

All outgoing waste from the Waste Transfer Station is sent to either composting facilities or Powerstown Landfill in County Carlow (Waste Licence W0025-02). All waste from the civic amenity area is sent to appropriate waste recovery facilities. Mixed dry recyclables are sent to the Materials Recovery Facility at Shandon, Dungarvan which is nearby and is also owned by the Applicant. All vehicles involved in the transportation of these wastes are fully enclosed and are in possession of the appropriate collection permits.

It is not proposed to treat any liquid waste, i.e. leachate from the landfill off-site.

A.1.10 Emergency Procedures

A set of emergency procedures have been developed for the facility to implement appropriate measures to prevent environmental pollution in the event of any emergency situation. Under these emergency procedures specific staff members have designated responsibilities. Events that would constitute and emergency would include:

- Spills
- General fire/Explosion
- Internal/External Flooding
- Malicious Damage
- Other Unforeseen Emergencies

A.1.11 Closure, Restoration & Aftercare of the Site

It is envisaged that the site (with the exception of the landfill) will operate in the long-term. A Closure, Restoration and Aftercare Management Plan (CRAMP) has been submitted to the Agency and was drawn up in accordance with Waste Licence W0032-02. The facility will continue to be monitored in the aftercare period until it is fully decommissioned and until there is no potential for emissions to the environment

APPENDIX 2

ECOLOGICAL SURVEY OF DUNGARVAN LANDFILL AND ENVIRONS

LIMOSA ENVIRONMENTAL
ECOLOGICAL AND ENVIRONMENTAL CONSULTANCY

Ecological Survey of Dungarvan Landfill and Environs 2009

Report for

Waterford County Council

Waterford County Local Authorities
Údaráis Áitiúla Chontae Phort Láirge

November 2009

Report Reference:	RP09-GW069-09
Draft:	Final Report
Prepared By:	P. J. Dansie
Checked By:	L. J. Lewis
Date:	November 2009
Signature:	

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EXECUTIVE SUMMARY

Dungarvan Landfill site is located at Ballynamuck Middle, Dungarvan, Co Waterford. It is predominantly surrounded by agricultural land, although wetland habitats occur in association with the River Colligan which flows in a west to east direction along the northern perimeter of the site before flowing down the River Colligan Estuary into Dungarvan Harbour.

Dungarvan landfill was closed and capped in 2003 after 30 years of operation; the site now operates as an integrated waste management facility under EPA Licence Reg. No. 32-2. As part of the licence requirements, as amended in 2009, annual biological quality Q rating monitoring is to be undertaken at three locations, two on the River Colligan and one in a drainage ditch which runs along the southern boundary of the site.

The results of the 2009 biological assessment of the River Colligan indicated good water quality status at both sampling sites following analysis of the surface water quality and biological water quality data recorded. As in previous years the diversity of invertebrates decreased moving downstream in the brackish water reaches of the river from sites SW2 to SW1. An increase in the macroinvertebrate diversity was noted at site SW2 compared with 2008, whereas a slight decrease in the species diversity was recorded at site SW1 compared to 2008. However, this decrease is due to the absence of two species found in 2008, that of eels and stickleback. Other than this the macro-invertebrates recorded in the current survey remained very similar to those recorded in 2008 and thus it is considered that there has been no change in water quality. These findings coupled with the review of water quality measurements taken on site and EPA chemical water quality data between 2008 and 2009, show continued good water quality indicating that Dungarvan Landfill site is not negatively impacting the River Colligan.

Although the European Eel was not recorded within in the current survey it as been recorded previously and it is likely that they are still present in the river in the tidal reaches of the River Colligan.

Site SW4 (pond site) is a new sampling location that has been added in 2009. The pond had an average diversity of invertebrates and contained both mayfly and damselflies that are indicators of better water quality. The water quality of the pond is considered fair to good but there is some evidence that it is being enriched by nutrients which should be monitored to ensure that the water quality does not become further enriched.

1.0 INTRODUCTION

1.1 Background

Limosa Environmental was commissioned by Waterford County Council to conduct a biological monitoring survey of the River Colligan in close proximity to the now closed Dungarvan Landfill, as part of on-going monitoring requirements of the Dungarvan Waste Disposal Site waste licence.

Dungarvan landfill was closed and capped in 2003 after 30 years of operation; the site now operates as an integrated waste management facility under EPA Licence Reg. No. 32-2. The licence requirements for ecological / biological monitoring were amended in 2009 from the former broader monitoring requirements to that of aquatic biological quality Q rating at three locations, two on the River Colligan and one in a drainage ditch which runs along the southern boundary of the site.

1.2 Study Area and Site Overview

Dungarvan Landfill site is located at Ballynamuck Middle, Dungarvan, Co Waterford (grid ref X 245 948; Figure 1), north-east of the main settlement of Dungarvan. The principal land use around the landfill site is agricultural in natural.

Figure 1.1 Goggle Earth © image of Dungarvan Harbour, red arrow points to Dungarvan Landfill site.

The River Colligan flows in a west to east direction along the northern perimeter of the site before flowing beneath the Ballyneety Bridge down the River Colligan Estuary into Dungarvan Harbour (Figure 2). The Colligan is the largest of three rivers that enters Dungarvan Harbour (Crowe, 2005). Upstream of the landfill site the River Colligan is freshwater in nature but as it progresses downstream towards Ballyneety Bridge it becomes increasingly brackish as it enters an estuarine habitat.

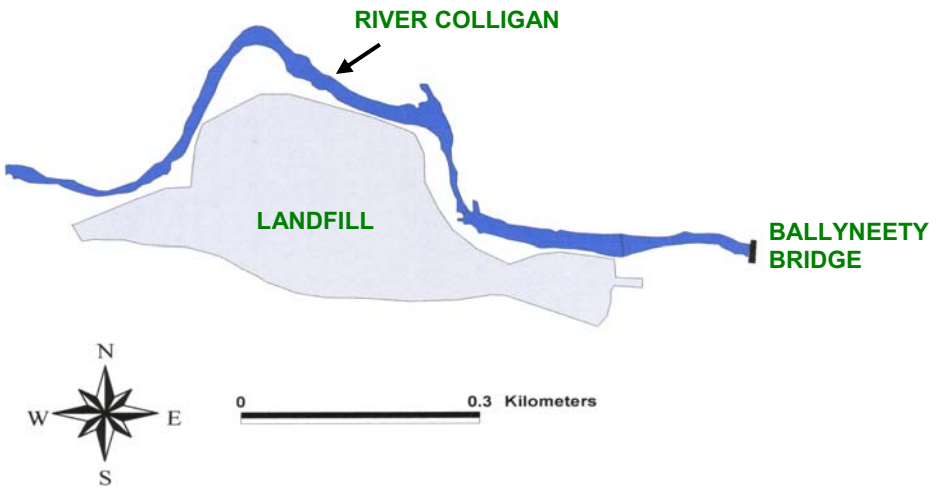

Figure 1.2 Location of Dungarvan Landfill in relation to the River Colligan and Ballyneety Bridge.

1.3 Designated sites for nature conservation

The River Colligan and estuary are acknowledged as sites of considerable wildlife interest and as a valuable fisheries resource (Dungarvan Town Council, 2006). The former Dungarvan Landfill Site lies in close proximity to areas that are designated for their ecological and conservation importance. Designated sites for conservation are areas designated under national and/or European laws in order to conserve habitats and species of national or international importance. These include the following examples:

- **Natural Heritage Areas** (NHA): a national designation given legal status by the Wildlife (Amendment) Act, 2000.
- **Special Areas of Conservation** (SAC): areas considered of international and national importance whose legal basis is the EU Habitats Directive (92/43/EEC), transposed into Irish law through the European Union (Natural Habitats) Regulations, 1997.
- **Special Protection Areas** (SPA): sites of international conservation importance for birds whose legal basis is the EU Birds Directive (79/409/EEC).

- Dungarvan Harbour is a designated proposed Natural Heritage Area (NHA). The NHA site boundary extends above Ballyneety Bridge, and therefore adjacent to the landfill site boundary. The NHA site synopsis is presented in Appendix 1.1.

- Dungarvan Harbour is a designated Special Protection Area (SPA) under the terms of the EU 'Birds Directive'. The designated area (Code 4032) covers an area of 1,041 hectares, and extends along the River Colligan estuary as far upstream as Ballyneety Bridge. A similar area to the SPA is a designated Ramsar Site (Site Code 835). The SPA site synopsis is presented in Appendix 1.1.

2.0 BIOLOGICAL ASSESSMENT OF THE RIVER COLLIGAN

2.1 General Overview of Survey Site Walk over

EPA waste license 32-2 states that *'the licensee must manage and operate the facility to ensure that the activities do not cause environmental pollution. The licensee is required to carry out regular environmental monitoring and submit all monitoring results, and a wide range of reports on the operation and management of the facility, to the Agency'.*

More specifically under condition 11 (Notifications, Records and Reports) and under clause 11.7; *'The licensee shall submit to the Agency, by the 31st March of each year, an AER covering the previous calendar year. This report, which shall be to the satisfaction of the Agency, shall include as a minimum the information specified in Schedule D: Annual Environmental Report, of this licence and shall be prepared in accordance with any relevant guidelines issued by the Agency'.*

Under the conditions of the amended license agreement there is a requirement that a biological assessment of the River Colligan is undertaken as part of the annual environmental report. This includes a biological quality Q Rating be carried out at site SW1, SW2 and SW4 (Appendix 2.1).

In order to meet these requirements Limosa Environmental was commissioned by Waterford County Council to carry out a biological assessment on these surface water sites. As part of the assessment an initial site walkover was undertaken of a section of the River Colligan and the area indicated as the site of a drainage ditch (SW4).

In previous year sampling was undertaken at 5 no. sites along the River Colligan. In the current survey as per the amended waste license requirements only two of these sites were monitored. One of the two sites on the River Colligan (SW2) previously form part of the Environmental Protection Agency's (EPA) River Quality Monitoring Programme (*station 280[1] disused railway bridge upstream of the landfill*).

During this site walkover no evidence of a drainage ditch was noted; however, a small constructed pond/wetland was identified within the location of the indicated drainage ditch. Although not specifically required, due to the lack of evidence of a drainage ditch, it was decided that sampling would be undertaken within the pond/wetland (Figure 2.1).

[1] While EPA station 280 previously formed part of the EPA sampling satations it was replaced by EPA monitoring station 250 located upstream of station 280 at a bridge crossing near Killadangan.

2.2 Methods

Sampling of the River Colligan was undertaken on October 22nd 2009 at three sites; two along a proportion of the River Colligan and one within a constructed pond/wetland adjacent to the landfill site (Figure 2.1).

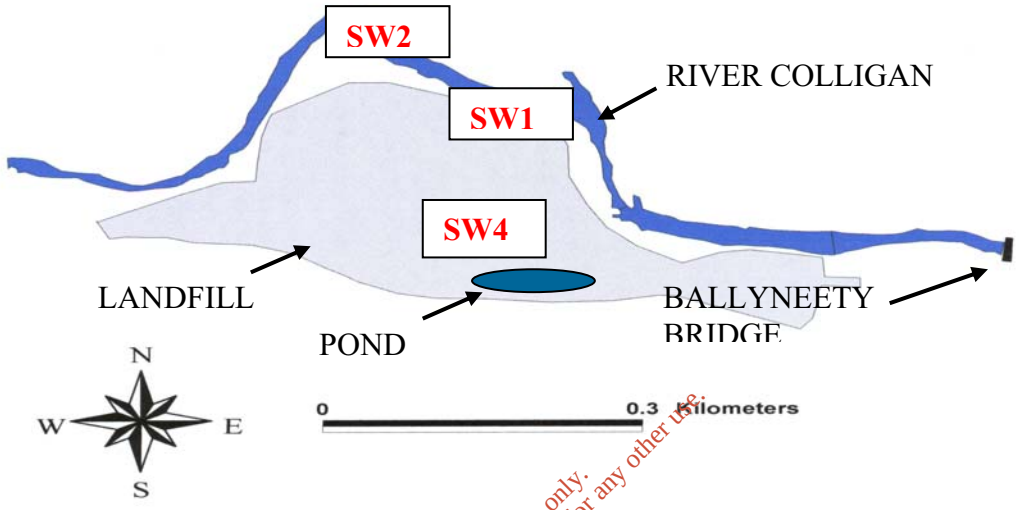

Figure 2.1 Locations of Biological Q Sampling Sites

The biological assessment of the River Colligan and constructed pond/wetland included the following components;

- A river and pond habitat characteristics to assess in-stream microhabitat types and aquatic biota;
- A macro-invertebrate assessment to establish the biological water quality of the stream and to assess the species composition;
- Physiochemical water quality analysis using calibrated hand held meters.

River and Pond Habitat Characteristics

At each sampling location the following characteristics were recorded in order to assess in-stream microhabitat types and aquatic biota

- Grid Reference (hand-held GPS).
- Width of river.
- Depth of the river (an average of three depths measured with a metre stick).
- Colour (recorded as coloured or uncoloured).
- Odour (recorded as absent or present).
- Currents (strength) and river profile where applicable.
- Predominant Substrate type: (e.g. boulders, large stones, small stones, gravel/silt).
- Presence of filamentous algae, emergent and/or submerged plants – recorded using the DAFOR Scale:

Scale	% Cover	Abundance
5	> 75	Dominant
4	51 – 75	Abundant
3	26 – 50	Frequent
2	11 – 25	Occasional
1	1 - 10	Rare

Macroinvertebrate Sampling and Assessment

The macroinvertebrate communities at the two sites on the Colligan (SW1 & SW2) were sampled using the standard method of kick-sampling (IEA, 1995) using a D-net of 0.3-m diameter with 500 micron mesh. Each kick-sample lasted 2 minutes (McGarrigle *et al.,* 2002). Three replicate samples were taken at each sampling sites and later pooled to give one collective sample per site. The relative proportions of taxonomic groups were recorded based on the EPA categories (i.e. 8 categories ranging from present to excessive) (Appendix I of Toner *et al*., 2005). The sampling methodology applied at the pond/wetland site (SW4) follows the guidelines outlined in the UK National Pond Survey Methodology (Pond Action, 2002).

After collection, each sample was elutriated[2] in the field using a 0.5mm mesh sieve to remove any large stones and organic debris such as leaves. The samples were then transported back to the laboratory for sample identification and analysis. Each sample was then sorted and the macro-invertebrate fauna retained by preserving them in alcohol. Macroinvertebrate identification was carried out using identification keys developed by the Freshwater Biological Association.

Biological water quality rating (Q-value) is assigned based on the composition of the macro invertebrate community recorded at freshwater river sampling sites as an indicator of water quality. Biological Q-values range along a scale of 1 to 5, with Q1 representing very poor water quality and Q5 a healthy stream and good water quality (Toner *et al*., 2005). However, biological Q-ratings are only applicable to samples taken in the freshwater reaches of a river. In previous years sampling of the Colligan only one site was found to be within the fresh range. As this site is no longer required to be monitored the Biological Q-value rating system could not be directly applied to the current survey sites due to the brackish nature of the sites. However, the reference system within the Q-assessment methodology that classes invertebrate groups according to their tolerance to pollution could be used to infer water quality based on species presence and tolerance. Therefore as in previous years this method was used to provide an indication of the water quality status for the current survey.

In addition to macro-invertebrate sampling water samples from each of the three sites were analysed for a range of physiochemical parameters[3] listed below:

- Temperature (ºC)
- Conductivity (µs/cm)
- pH
- Dissolved solids
- Dissolved Oxygen

All samples were taken low tide to limit the influence of saltwater incursion and to prevent bias between years due to variability in the tidal state.

[2] Elutriation is a method commonly used to separate macro-invertebrates from debris in the sample to increase efficiency of sorting samples in the laboratory and to aid identification

[3] Water meter and measurement specifications are given in Appendix 2.2.

2.3 Results

Physical Characteristics of Sampling Locations		
SW2 Downstream of Disused Railway bridge		
GPS	624297, 594952 ITM	
Average River Width (m)	8	
Average River depth (cm)	75 (deep channel >1.5m opposite bank)	
Currents	Moderate flow (50% pool, 10% riffle, 40% glide)	
Colour	none	
Odour	none	
Reducing Conditions	none	
Substratum	20% Boulders, 60% cobble, 10% sand and gravel	
Channel modifications	Evidence of recent bankside erosion on opposite bank	
Vegetation Instream	Type	Abundance
	Enteromorpha	Frequent
	Fontanalis	Frequent
	Ranunculus	Rare
Vegetation Emergent	Type	Abundance
	Apium nodiflorum	Occasional
	Phragmites australis	Occasional

SW1 Opposite drain from Landfill		
GPS	624391, 594673 ITM	
Average River Width (m)	12	
Average River depth (cm)	60	
Currents	Moderate flow (5% pool, 20% riffle, 60% glide)	
Colour	none	
Odour	none	
Reducing Conditions	none	
Substratum	40% cobble, 20% boulder, 30% pebbles	
Channel modifications	none	
Vegetation Instream	Type	Abundance
	Enteromporpha	Frequent
	Fontanalis	Rare
Vegetation Emergent	Type	Abundance
	None	-

Physical Characteristics of Sampling Locations		
SW4 Large Pond (Southern Boundary of Landfill)		
GPS	624391, 594673 ITM	
Pond Area	Approx 1 acre	
Marginal Complexity	Simple	
Zooplankton	Abundant Daphnia present	
Water Clarity	Clear	
Odour	Smell of H_2S	
Substratum	Soft mud	
Notes	Artificial pond with constructed wetland	
Vegetation fully aquatic	Type	Abundance
	Elodea Canadensis	Frequent
	Myriophyllum spicatum	Frequent
Vegetation Emergent	Type	Abundance
	Typha latifolia	Frequent

2.3.1 Freshwater Macroinvertebrates

The macroinvertebrate composition of the River Colligan and the constructed pond and wetland habitat is summarised in Table 2.1 below. It was noted that the salinity increases downstream from site SW2 to SW1 and both site were found to be within the brackish range. Increasing salinity is evident from the water quality data; reflected by increasing conductivity measurements (see section 2.3.3 below). It is clearly evident, as with previous years, that macro-invertebrate diversity on the River Colligan decreases as the salinity gradient increases between the two sampling sites.

Both sites SW2 and SW1 were found to be within the brackish range at high tide, with site SW2 being slightly less brackish than site SW1. While the Q-Value system cannot be directly applied in brackish waters the reference system within the Q-assessment methodology that classes invertebrate groups according to their tolerance to pollution, can be used to infer water quality at SW2. Macroinvertebrate taxa at the sampling site were therefore classified according to their tolerance to organic pollution (Toner *et al.* 2005).

Species diversity at site SW2 was found to be higher that at SW1 with 11 species of marcoinvertebrate record. This along with the presence of Class A invertebrate species such as flattened mayfly family Heptageniidae and the presence of 2 cased caddis families (Class B) would indicate a good water quality (Table 2.1). Clean water invertebrate taxa such as these require well oxygenated water and low levels of organic pollution and are generally the first taxa to disappear following a pollution incident or a change in the physicochemical nature of the water.

As the salinity increases downstream of site SW2 the macroinvertebrate species composition changes. This is noted by a decrease in species diversity, the absence of Class A species and a significant increase in saltwater tolerant gammarus[4] species recorded at site SW1. The findings of the current survey are consistent with finding of previous years for the two sites. Fluctuations in invertebrate diversity between sites SW2 and SW1 showed an increased diversity at site SW2 between 2009 and 2008 while it decreased at site SW1 between both years. These fluctuations may relate to slight changes in the salinity gradient between years which due to the dynamic nature of estuarine and brackish system would not be consisted unusual.

The European Eel was recorded at SW1 (named site 3) in 2008 but was not present in the current survey in any of the kick samples. Two other brackish water sampling sites further downstream of SW1, that formed part of the 2008 sampling programme, but have been omitted from the current requirements, also recorded eels. The European Eel is an important catadromous migratory species that has declined to levels that have required EU member states to formulate National Eel management plans whose primary objective is to prevent further decline of the species (DCENR, 2008) in that they aim; *'to reduce anthropogenic mortalities so as to permit with high probability the escapement to the sea of at least 40% of the biomass of silver eel relative to the best estimate of escapement that would have existed if no anthropogenic influences had impacted the stock'*.

Although the European Eel was not recorded within in the current survey it as been recorded previously and it is likely based on the available habitat continued good quality of the river that they are still present in the river and in the tidal reaches of the River Colligan.

Juvenile flounder were present in both kick samples at sites SW2 and SW1 in 2009. Flounder are not regionally or nationally uncommon and they favour brackish water but often enter freshwater reaches of rivers.

The pond invertebrate sample contained a typically average diversity of aquatic invertebrates for this type of habitat. While damselflies and mayflies that are good indicators of lake or pond water quality were present, beetles were absent in the sample collected. There was a very high abundance of cladocera in the water column which is most likely due to the absence of fish predators that would graze on these freshwater invertebrates. It was also noted that there was a very high abundance of lymnaeid snails that are often associated with eutrophic environments (Costil and Clement 1996).

[4] *Gammarus zaddachi* are estuarine amphipods and thus where the salinity gradient in the River Colligan increased this gammarid species also increased.

Table 2.1 Macroinvertebrate species composition and relative abundance at the sampling locations along the River Colligan[5]

Order	Family	Tolerance	SW2	SW1	SW4 Pond
Ephemeroptera (Mayflies)	Heptageniidae	*A*	1		
	Baetidae	*C*	4		
Trichoptera (Cased caddis)	Seracostomatidae	*B*	2	[6]	
	Goeridae	*B*	4		
Trichoptera (Uncased caddis)	Linephilidae	*B*	1		
	Polycentropodidae	*C*			4
Coleoptera (Beetles)	Elmidae	*C*	7	3	
Crustacea (Crustaceans)	Gammaridae	*C*	60	120	
Odonata (Damselflies)	Coenagrioniidae	-			4
Diptera (Flies)	Chironomidae	*C*	1		
	Ceratopogonidae	*C*			1
	Chaoboridae	*C*			2
Gastropoda (Snails)	Lymnaeidae	*D*	2		59
	Hydrobiidae	*C*	20	11	
Fish	Pleuronectidae	-	3	4	
	Corixidae	-			11
Freshwater Worms	Oligochaeta	-			9
Cladocera (Water Flea)	Daphniidae	-			>500
Taxon Richness			11	5	8

[5] Q Ratings are not applicable in the River Colligan Sites SW2 (upstream) and SW1 (downstream) because of saline influence.
[6] Only cased caddis shells were uncovered at site SW1 but no animals were present

2.3.2 Macroalgae

It was noted that during the 2009 survey that *(Ranunculus aquatalis)* was present in low densities (rare on Dafor scale) at site SW2. The species was also previously recorded at low densities in 2008 at site SW2. This is a common water crowsfoot species that occurs in semi-oligotrophic to mesotrophic calcareous rivers (Haslam, 2006).

As in previous years the green alga *Enteromorpha* sp. was recorded at both sites 2-5.

2.3.3 Water Quality Parameters

Table 2.3 Water quality parameters measured at sampling sites SW1, SW2 and SW4

Parameter	Units	SW2	SW1	SW4 Pond	Salmonid Regs.
pH	pH	8.39	8.33	7.96	>6 <9
Temperature	C	9.8	9.9	10.1	-
Conductivity	µS/cm	115	141	210	-
Total Dissolved Solids	ppm	58	69	107	-
Dissolved Oxygen*	mg/l	10.4	10.9	8.1	>9

The results for the water chemistry data taken on site are presented in Table 2.3. Dissolved oxygen levels at sites SW2 and SW1 were in compliance with levels required for salmonid fish under the Salmonid Water Regulations, 1988 (S.I. No. 293, 1988), implementing the Freshwater Fish Directive (78/659/EEC). While the Colligan River is not designated a salmonid water, these regulations provide an indication of water quality objectives for salmonid presence in a watercourse. As salmonids occur both in the freshwater and estuarine reaches of river systems the standards set in the legislation are broadly applicable to the sampling sites on the Colligan River. The same regulations state that where dissolved oxygen drops below 6mg/l the local authority must prove that there is no harmful consequences for the balanced development of fish populations.

The pH readings at sites SW2 and SW1 on the River Colligan are also within the defined thresholds set in the legislation (>6 <9). The pH readings recorded indicate alkaline water.

Conductivity measurements can broadly infer salinity. Increasing salinity can be reflected by a parallel increase in conductivity and dissolved solids (Alcorlo *et al*., 1996, Chael *et al*. 2000). The results obtained reflect increasing conductivity moving downstream from site SW2 to SW1 with values ranging between 115 µS and 136µS. This reflects as found in previous years the changing nature of the Colligan River system from more freshwater to brackish water. Table 2.4 below provides an indicative relationship between conductivity and the salinity of water bodies to illustrate the increase in conductivity moving from freshwater to saline water.

Water temperature fluctuates seasonally and is an important component in determining the amount of dissolved oxygen in water which is essential for the survival of aquatic organisms. Thermal discharges can impact aquatic life and species such as salmonids, which need cold water for spawning. The salmonid regulations specify that the temperature must not exceed the unaffected temperature of the river by more than 1.5 degrees centigrade. The temperatures recorded at sites SW2 and SW1 are consistent with this requirement and do not exhibit any point sources of thermal pollution.

The pond at site (SW4) had a moderate conductivity reading of 210us and a pH of 7.96 that is indicative of neutral alkalinity. Conductivity does not provide an indication of lake or pond trophy but the lush macrophyte

growth and abundance of cladocera[7] observed would indicate water that is at least partially enriched. Although the levels are below the salmonid regulations limit the dissolved oxygen levels are still considered sufficient to support a healthy invertebrate or fish community. It was noted that a smell of hydrogen sulphide was present when stepping on the pond substrate.

Table 2.4 Relationship between Conductivity and Salinity

Water Class	Conductivity
Deionised water	0.5-3
Pure Rainwater	<15
Freshwater Rivers	0-800
Brackish water	1600-4800
Saline water	>4800

2.4 Discussions and Conclusions

2.3.3 Comparison of 2009 results with previous surveys

As noted in 2008 the diversity of aquatic macro-invertebrates has fluctuated over the past 10 years. The diversity of invertebrates in the current survey is at it highest since 2004 at site SW2 which would indicate good water quality. While the diversity has decreased slightly at site SW1 between 2008 and 2009 this relates to the absence of eels and stickleback that were present in the sample taken in 2008. However the macro-invertebrates recorded in 2009 remained very similar to those recorded in 2008 and thus it is considered that there has been no change in water quality.

The diversity of invertebrates decreased moving downstream in the brackish water reaches of the river from sites SW2 to SW1. The higher diversity recorded at site SW2 would indicate a slightly less brackish nature to the water, also evident by the lower conductivity readings. Large fluctuations in conductivity have been recorded by Limosa Environmental between successive sampling years (i.e. 2006 and 2008) which may relate to the internal dynamics or the system and related weather condition prior to site sample, as may be the cased with the wet weather in late October in the current survey period. It is likely that these factors would influence the diversity of species recorded at site SW1 and may relate to greater fluctuations in salinity between high and low tide as it is located in the mixing zone where fluctuations in salinity would be greatest. This is because neither saline tolerant nor saline intolerant species can establish themselves and only those species with a wide salinity tolerance range can survive (i.e. *Gammarus zaddachi*).

Overall the results of the 2009 biological assessment of the River Colligan indicate good water quality status at site SW2 and SW1, based on the analysis of both the surface water quality and biological water quality data recorded. Based on current legislative requirements the overarching objective for water quality set out in Water Framework Directive (2000/60/EC) aims to maintain the “high status” of waters where it exists, preventing any deterioration in the existing status of waters and achieving at least “good status” in relation to all waters by 2015. Thus all local authorities have a primary role in improving the status of watercourses to achieve such status where it does not currently exist. The consist increase in the diversity of species over the last number of years at site SW2 indicates and improving and good water quality, while there was a slight reduction in diversity at site SW1 in the current survey the site would not be considered to have deteriorated over recent years. The current survey finding are considered most likely relates to slight fluctuations in salinity as a result of the dynamic nature of brackish/mixing systems and freshwater inputs from upstream.

Site SW4 (pond site) is a new sampling location that has been added in 2009. The pond had an average diversity of invertebrates and contained both mayfly and damselflies that are indicators of better water quality. The water quality of the pond is considered fair to good but there is some evidence that it is being enriched by nutrients which should be monitored to ensure that the water quality does not become further enriched.

[7] Cladocera feed on phytoplankton that are generally in higher abundance where surface waters are enriched with nutrients

Table 2.5 Comparative results for macro-invertebrate analysis 1998 to present[8]

	Time of Survey	SW2	SW1	SW4
Number of Taxa	October 2009	11	5	8
	November 2008	6	8	-
	August 2006	3	6	-
	September 2005	2	6	-
	August 2004	16	10	-
	August 2003	11	10	-

2.3.4 Review of water quality of the River Colligan

Up until 2008 the EPA routinely monitored two sampling stations along the section of the Colligan associated with the monitoring sites (sampling station Nos. 280 and 300)[9]. However the EPA no longer monitors station 280, which was located at the location of the current survey site SW2. This EPA station as now been replaced by station 250 which is located upstream at a bridge near Killadangan.

The presence of the EPA stations (250 and 300) upstream and downstream of the Dungarvan landfill site act as upstream and downstream control sites to monitor any spikes in pollutants at station 300 at Ballyneety Bridge relative to station 250 near Killadnagan which effectively acts as an upstream control site.

Based on the data provided by the EPA for the two sites (January 2008 – July 2009) it can be seen that overall both sites recorded unpolluted water. Upstream at station 250 the Median ortho-phosphate was below 0.02 mg/l, BOD was at less than 2.0mg/l and un-ionized ammonia was less than 0.04 mg/l on all sampling occasions. A Q rating of 4 [as per the Water Quality Standards for Phosphorus Regulations (SI No 258 of 1998)] as been assigned to the site indicating unpolluted water (see Appendix 2.1).

Downstream at Ballyneety Bridge station 300 a similar pattern was recorded with Median ortho-phosphate being below 0.02 mg/l and BOD was less than 2.0mg/l on all sampling occasions. Un-ionized ammonia was less than 0.04 mg/l on three of the 8 sampling occasions and less than 0.2 mg/l on 7 of the 8 occasion with one sample in May 2008 recorded at 0.24 mg/l (see Appendix 3.3). Due to the brackish nature of the downstream site no Q rating was assigned. However, based purely on the Water Quality Standards for Phosphorus Regulations (SI No 258 of 1998)] the site would be considered Q4 indicating unpolluted water.

The results obtained by the EPA for stations 250 and 300 are broadly comparable to the 2008 results in that the water quality status is also good. As in 2008 there were relatively high chloride readings at Ballyneety bridge (station 300) reflect the brackish water nature of the site identified in previous reports (e.g. Limosa Environmental, 2006 & 2008).

As detailed in section 2.3.1 based on the survey macroinvertebrate findings and the physicochemical sampling results both site were considered to have unpolluted water quality recorded. Due to the brackish nature of the sites it was not possible to assign biological quality ratings (Q-index). These finding would be consistent with previous years surveying and with the EPA biological water quality data. EPA data for upstream of Dungarvan Landfill illustrate consistently good water quality; Q4 being assigned to Station 0250 (Killandangan Bridge between 1991 and 2007) and Q4-5 assigned to Station 0180 (Colligan Bridge) between 1987 and 2004 (Clabby *et al.,* 2005).

[8] Q Index scores for the current survey (2008) together with those recorded in previous years. Also shows the total number of taxa recorded at sites (kick-sampling only). (Previous surveys from Limosa Environmental, 2006, 2005, 2004; Lyons, 2003; Aquatic Services Unit, 1998).

[9] Station 280 located at a disused railway bridge upstream of the landfill and station 300 at Ballyneety Bridge downstream of the landfill.

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Appendix 1.1

NHA SITE SYNOPSIS - Dungarvan Harbour (Site Code 0663).

In landscape terms Dungarvan Harbour lies at the eastern end of the Blackwater valley, though this river now turns south at Cappoquin, vacating its more obvious (and former) course. All that remains to the Harbour is the small Colligan River, running south from the Comeragh Mountains to enter the bay by Dungarvan itself. The absence of the larger river means that the bay is essentially a marine habitat though it dries out at low tide to give extensive mud and sand flats. It is extremely sheltered, the linear Cunnigar spit (which almost closes the bay on the east) adding to the effect of hills in the south and south-west.

The rock type of most of the area is limestone though this is only exposed on flat rocks at Ballynacourty. Elsewhere saltmarsh, glacial drift and sand form the shore with a narrow stony beach in places. The most natural saltmarsh occurs at Kilminnin on the north shore and west of the Cunnigar on the south. It is a community in which Sea Purslane (*Atriplex portulacoides*), Sea Lavender (*Limonium humile*), rushes (*Juncus gerardii, J.maritimus*) and sedges (Carex distans, C.otrubae) are prominent along with other typical species like Sea Spurrey (*Spergularia* spp.), Sea Arrowgrass (*Triglochin maritimum*) and, in the upper parts, Parsley Water Dropwort (*Oenanthe lachenalii*). In several places the saltmarshes, having been reclaimed for a period, have been flooded again and are reverting to their natural vegetation. There is an abundance of Sea Rush (*Juncus maritimus*) in such places often mixed with grasses, with Reed (*Phragmites australis*) or Sea Clubrush (*Bolboschoenus maritimus*) in drains. Sometimes this community gradually blends with a freshwater marsh including Tufted Hair Grass (*Deschampsia maritimus*) in drains. Sometimes this community gradually blends with a freshwater marsh including Tufted Hair Grass (*Deschampsia cespitosa*), Soft rush *(J.effusus*), Brown Sedge (*Carex disticha*) and Fleabane (*Pulicaria dysenterica*). Eelgrass (*Zostera* sp.) has been recorded in the area.

There are two beach and dune systems in the area, a tiny one where the old railway line crosses the bay at Skehacrine, and the major (2.6km) Cunnigar running north from the southern shore. The latter consists of narrow and low ridges separated at the southern end to give marshy `slacks' between them but running together to the north. The beach plants include such species as Yellow Horned Poppy (*Glaucium flavum*), Sea Holly (*Eryngium maritimum*), Sea Radish (*Raphanus raphanistrum*) and Sand Sedge (*Carex arenaria*) while the large Sharp Rush (*Juncus acutus*) as well as Knotted Pearlwort (*Sagina nodosa*) occur in wetter sites.

A major part of the ecological importance of the bay is the wintering birdlife which is present in large numbers. Surveys in the winters I984/85 - 86/87 showed that Brent Goose (694), Black-tailed Godwit (I329) and Bar-tailed Godwit (I029) occurred in numbers of international importance, while thirteen other species were nationally important. These are Shelduck (I72I), Wigeon (I0I5), Red-breasted Merganser (50), Grey Plover (359), Golden Plover (I095), Lapwing (2748), Knot (705), Sanderling (83), Dunlin (4559), Redshank (930) and Turnstone (254). All figures are average peak populations. A further ten species were found in numbers of regional or local importance emphasising that Dungarvan supports a greater diversity of species than any other site on the south coast except for Wexford Harbour. It is now a Special Protection Area under the E.U. Birds Directive.

The sand flats to the east of the Cunnigar support an extensive oyster farming operation so there are clearly possible grounds for impact between these shellfish and the invertebrates on which some of the bird species depend. There is also concern that displacement of waterfowl and disturbance may be a problem on the shellfish farming area. At present the bird numbers are higher than in the previous survey (I97I-75)

National Parks and Wildlife Service (formerly Dúchas)
13 February 1995.

SPA Site Synopsis - DUNGARVAN HARBOUR SPA (SITE CODE: 004032)

In landscape terms Dungarvan Harbour lies at the eastern end of the River Blackwater valley, though this river now turns south at Cappoquin, vacating its more obvious (and former) course. The Colligan River, running south from the Comeragh Mountains, enters the bay by Dungarvan itself. The River Brickey flows from the west while the Glendine River flows into the harbour from the north. The absence of a large river means that the bay is essentially a marine habitat though it dries out at low tide to give extensive mud and sand flats. The inner bay is extremely sheltered, the linear Cunnigar spit (which almost closes the bay on the east) adding to the effect of hills in the south and south-west.

The rock type of most of the area is limestone though this is only exposed on flat rocks at Ballynacourty. Elsewhere saltmarsh, glacial drift and sand form the shore with a narrow stony beach in places. The most natural saltmarsh occurs at Kilminnin on the north shore and west of the Cunnigar on the south. In several places the saltmarshes, having been reclaimed for a period, have been flooded again and are reverting to their natural vegetation. There is an abundance of Sea Rush (*Juncus maritimus*) in such places often mixed with grasses, with Reed (*Phragmites australis*) or Sea Club-rush (*Scirpus maritimus*) in drains. Sometimes this community gradually blends with a freshwater marsh including Tufted Hair Grass (*Deschampsia cespitosa*), Soft rush (*Juncus effusus*), Brown Sedge (*Carex disticha*) and Fleabane (*Pulicaria dysenterica*). Eelgrass (*Zostera* sp.) has been recorded in the area.

A major part of the ecological importance of the bay is the wintering birdlife which is present in large numbers. Surveys in the winters l984/85 - 1986/87 and from 1994/95 onwards showed that Brent Goose (616 in 1995), Black-tailed Godwit (l329 [952 in 1996]) and Bar-tailed Godwit (1593 in 1996) occurred in numbers of international importance, while thirteen other species were nationally important. These are Shelduck (l72l [995 in 1995]), Wigeon (l0l5), Red-breasted Merganser (50), Grey Plover (359), Golden Plover (6100 in 1996), Lapwing (3775 in 1996), Knot (996 in 1996), Sanderling (83), Dunlin (6100 in 1996), Redshank (930 [910 in 1996]) and Turnstone (254). A further ten species were found in numbers of regional or local importance emphasising that Dungarvan supports a greater diversity of species than any other site on the south coast except for Wexford Harbour.

The sand flats to the east of the Cunnigar support an extensive oyster farming operation. There is concern that displacement of waterfowl and disturbance may be a problem in the shellfish farming area.

Appendix 2.1

Biological Assessment of Water quality using the Q-Value Biotic Index.

The Q-Index scheme works on the basis of 'Indicator Groups'. Macroinvertebrates are assigned to groups depending on their sensitivity to organic pollution:

Group A Sensitive forms.
Group B Less sensitive forms.
Group C Tolerant forms.
Group D Very tolerant forms
Group E Most tolerant forms.

The macroinvertebrate groups are given in **Table 3.1a.**

Based on the macroinvertebrate community found within a water sample, a biotic index (Q value) can then be assigned. These are listed below:
(condition refers to the likelihood of interference with beneficial or potential beneficial uses).

Q5	High community diversity	Good water quality	Satisfactory condition.
Q4	Reduced community diversity	Fair water quality	Satisfactory condition.
Q3	Low community diversity	Doubtful quality	Unsatisfactory condition.
Q2	Very low community diversity	Poor quality	Unsatisfactory condition.
Q1	Little/No community diversity	Bad condition	Unsatisfactory condition.

The macroinvertebrate groupings and associated Q values are given in **Table 3.1b.**

Table 3.1a

Macroinvertebrate Groupings according to their sensitivity to organic pollution. (McGarrigle *et al*., 2002).

Taxa	Group A	Group B	Group C	Group D	Group E
	Sensitive	**Less sensitive**	**Tolerant**	**Very tolerant**	**Most tolerant**
Plecoptera	All except *Leuctra* spp.	*Leuctra* spp.			
Ephemeroptera	Heptageniidae Siphlonuriidae *Ephemera danica*	Baetidae (exc. *Baetis rhodani*) Leptophelbidae	*Baetis rhodani* Caenidae Ephemerellidae		
Trichoptera		Cased spp.	Uncased spp.		
Odonata		All taxa			
Megaloptera				Sialidae	
Hemiptera		*Aphelocheirus aestivalis*	All except *A. aestivalis*		
Coleoptera			Coleoptera		
Diptera			Chironomidae (exc. *Chironomus* spp). Simuliidae Tipulidae		*Chironomus* spp *Eristalis* spp.
Hydracarina			Hydracarina		
Crustacea			*Gammarus* spp. *Austropotamobius pallipes*	*Asellus* spp. *Crangonyx* spp.	
Gastropoda			Gastropoda (exc. *Lymaea peregra* & *Physa* spp.)	*Lymnaea peregra* *Physa* spp.	
Lamellibrachiata	*Margaritifera margaritifera*				
Hirudinea			*Piscicola* spp.	All exc. *Piscicola* spp.	
Oligochaeta					Tubificidae
Platyhelminthes			All		

Table 3.1b.

Biological Assessment of water quality in eroding reaches (riffles & glides) of rivers and streams.
Biotic Indices (Q values) and associated macroinvertebrate community structure. (McGarrigle *et al.*, 2002).

(Occurrence/abundance of groups refers to some but not necessarily all constituents of the group. Additional qualifying criteria apply in nearly all circumstances).
Intermediate values (e.g. Q1 –2 or Q2-3) may also be used and denote transitional conditions.

Macroinvertebrate Faunal Groups	Q5	Q4	Q4 - 3	Q3	Q2	Q1
Group A	At least 3 taxa well represented	At least 1 taxon in reasonable numbers	At least 1 taxon few - common	Absent	Absent	Absent
Group B	Few - numerous	Few - numerous	Few/Absent - numerous	Few/Absent	Absent	Absent
Group C	Few	Common to numerous *Baetis rhodani* often abundant. Others never excessive.	Common to excessive (usually dominant or excessive).	Dominant to excessive	Few or Absent	Absent
Group D	Few or Absent	Few or absent	Few/Absent to common	Few/Absent to common	Dominant to excessive	Few or Absent
Group E	Few or Absent	Few or Absent	Few or Absent	Few or Absent	Few/Absent to common	Dominant

Additional Qualifying Criteria:

Cladophera spp. abundance	Trace only or none	Moderate growths if present	Abundant to excessive growths	May be excessive growths	Few or absent	None
Macrophytes (typical abundance)	Normal growths or absent	Enhanced growths	May be luxuriant growths	May be excessive growths	Absent to abundant	Present/absent
Slime growths (Sewage fungus)	Never	Never	Trace or None	May be abundant	May be abundant	None
Dissolved Oxygen Saturation	Close to 100% at all times	80% - 120%	<80% - 120%	Very unstable. Potential fish kills	Low (but > 20%)	Very low, sometimes 0.
Substratum siltation	None	May be light	May be light	May be considerable	Usually heavy	Usually very heavy and anaerobic.

The EPA further simplify the Q-value biotic index by assigning rivers to one of 4 quality classes shown below:

Biotic Index	Quality Status	Quality Class
Q5, Q4-5, Q4	Unpolluted	**Class A**
Q3-4	Slightly Polluted	**Class B**
Q3, Q2-Q3	Moderately Polluted	**Class C**
Q2, Q1-Q2, Q1	Seriously Polluted	**Class D**

Class A waters are therefore characterised by high biological community diversity, a good and unpolluted water quality and a satisfactory condition, i.e. there are unlikely to be any problems with the use of the water for e.g. amenity or fisheries purposes.

Class B and C waters are considered slightly polluted with a potential for eutrophication. This may lead to problems with the use of the water (e.g. for amenity use) and therefore the condition may be classed as unsatisfactory.

Class D waters have little or no biological diversity and are considered seriously polluted. Excessive organic loading may lead to serious deoxygenation of the waters together with other factors such as the growth of sewage fungus. Beneficial uses of the water will be severely constrained.

Appendix 2.2

Measurements of water quality

Hand-held meters (Hanna Instruments) were calibrated the day before the fieldwork was undertaken.

Instrument and measurement specifications are given below:

Parameter	Range	Resolution	Accuracy
pH	0.0 – 14.00	0.01 pH	± 0.01
Temperature	0.0 – 60 ^{0}C	0.1 ^{0}C	± 0.5 ^{0}C
Conductivity	0.0 – 3999 µS	1 µS	± 2% f.s.
Total Dissolved Solids	0.0 – 2000 ppm	1 ppm	± 2% f.s.
Dissolved Oxygen	0.0 – 19.9 mg/L	0.1 mg/L	± 1.5% f.s.

Appendix 2.3

River Colligan – Water monitoring data (Data kindly supplied by the EPA)

Environmental Protection Agency, Regional Water Laboratory, Kilkenny - River Monitoring Data.

River Colligan **Code 17C01** ***Tributary of:***

Station No. 0250 Br near Killadangan

New in 2007 - for the WFD
Latest Biological Quality Rating (2007) = Q4 Grid Ref:

SAMPLE NO	Date	Time	Temp ºC	D O %Sat	DO mg/l O2	B O D mg/l O2	Colour Hazen	pH	Cond µS/cm	Salinity o/oo	o-Phos mg/l P	Ammonia mg/l N	Un-Ion-Amm mg/l NH3	Nitrite mg/l N	Nitrate mg/l N	Chloride mg/l Cl	T-Coli /100ml	F-Coli /100ml	Flow m3/se
2800266	15/01/2008	11:45	8.5	99	11.6	1.0	30	7.2	133		0.02	0.02	0.0001	0.001	2.9	15			
2801452	18/03/2008	11:35	6.9	112	13.6	1.5	5	7.5	152		0.08	<0.01		0.001	3.2	15			
2802435	14/05/2008	13:20	16.5	109	10.6	0.5	20	8.0	153		0.01	0.04	0.0014	0.004	2.9	16			
2803501	10/07/2008	13:00	14.0	99	10.2	1.2	30	7.3	125		<0.01	0.01	0.0001	0.001	1.9	13			
2804445	02/09/2008	12:05	12.6	104	11.1	0.5	24	7.7	145		0.01	0.02	0.0002	0.001	2.8	14			
2900190	13/01/2009	11:40	6.5	101	12.4	0.7	32	8.0	131		0.05	0.01	0.0001	0.001	2.6	14			
2901490	19/03/2009	12:55	9.4	115	13.2	0.6	7	8.2	150		0.01	0.00	0.0001	0.002	3.1	14			
2902271	07/05/2009	12:10	9.5	105	12.0	0.5	9	7.8	176		<0.01	0.01	0.0001	0.001	2.6	13			
2903827	22/07/2009	12:50	14.5	103	10.5	0.9	**110**	7.4	95		0.01	0.02	0.0001	<0.001	1.1	10			

Station No. 0300 Ballyneety Br - d/s Dungarvan Landfill - tidal

Latest Biological Quality Rating ( ) = Grid Ref: X 247 947

SAMPLE NO	Date	Time	Temp ºC	D O %Sat	DO mg/l O2	B O D mg/l O2	Colour Hazen	pH	Cond µS/cm	Salinity o/oo	o-Phos mg/l P	Ammonia mg/l N	Un-Ion-Amm mg/l NH3	Nitrite mg/l N	Nitrate mg/l N	Chloride mg/l Cl	T-Coli /100ml	F-Coli /100ml	Flow m3/se
2800267	15/01/2008	11:55	8.4	95	11.1	0.6	30	7.2		1.2	0.02	0.03	0.0001	0.002	2.8	**351**			
2801453	18/03/2008	11:40	7.0	120	14.6	1.9	5	7.5	306		0.07	0.16	0.0009	0.003	3.5	**48**			
2802436	14/05/2008	13:30	18.1	108	10.2	0.7	30	8.1	**4920**		0.02	**0.24**	0.0121	0.013	2.8				
2803502	10/07/2008	13:10	14.2	100	10.3	1.6	30	7.4	**3380**		<0.01	0.02	0.0002	0.002	1.9	**382**			
2804446	02/09/2008	12:15	12.9	107	11.3	0.4	24	7.8	888		0.01	0.13	0.0023	0.002	2.8	**184**			
2900191	13/01/2009	11:50	6.6	101	12.3	0.9	34	7.9		0.6	0.04			0.002	2.7				
2901491	19/03/2009	13:05	9.6	125	14.2	0.5	8	8.5	295		0.02	0.04	0.0025	0.003	3.6	**43**			
2902272	07/05/2009	12:20	10.1	111	12.5	0.5	13	8.0	283		<0.01	0.09	0.0019	0.002		**44**			
2903828	22/07/2009	13:00	14.7	106	10.8	0.9	**114**	7.5	183		0.02	0.05	0.0005	<0.001	1.2	29			

APPENDIX 3

REGISTER OF DRAWINGS

Drawing Number	Revision Number	Drawing Title
MDR0350DG0606	R01	Gas collection system
MDR0350DG0607	R01	Leachate collection system
DG0505	F02	Monitoring Locations
DG0007	A01	Drainage Layout for Civic Amenity and Green Waste Area
MDR0350DG0709	B01	River Water Intake and Sump/Leachate Collector Drain Sump

REMAINING WORKS:

1. Award and construction / installation of the M&E-SCADA contract. This includes the site control hut, borehole pumps, all necessary M&E-SCADA equipment, connections at 2 No. leachate tanks, power supply.

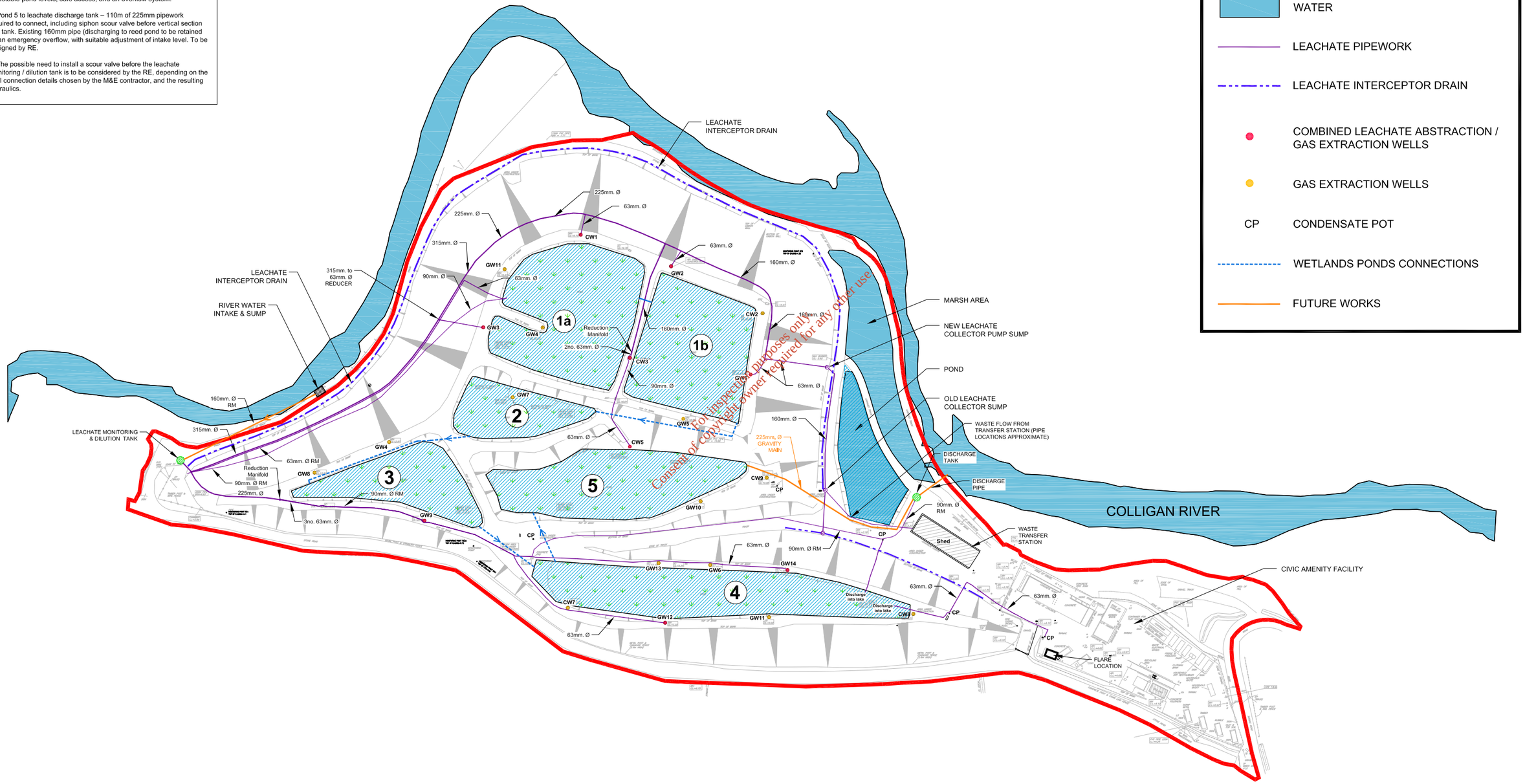
2. River water intake sump – this forms part of the leachate treatment system and provides dilution water from the river to the dilution tank. The details are shown in Drawing DG0709. The penstock is purchased and onsite.

3. 90m of twin ducts and 160mm pump main from the future river water intake sump to the dilution tank; connection between old leachate collector MH and new sump, minor pipework and ducting surrounding IIT tanks.

4. Ponds level control works – chambers and level control. The current temporary arrangement for adjusting pond levels is difficult and unsafe. A system of level control is to be designed by the RE, including for adjustable pond levels, safe access, and an overflow system.

5. Pond 5 to leachate discharge tank – 110m of 225mm pipework required to connect, including siphon scour valve before vertical section into tank. Existing 160mm pipe (discharging to reed pond to be retained as an emergency overflow, with suitable adjustment of intake level. To be designed by RE.

6. The possible need to install a scour valve before the leachate monitoring / dilution tank is to be considered by the RE, depending on the final connection details chosen by the M&E contractor, and the resulting hydraulics.



LEGEND

- EXTENT OF SITE
- CONSTRUCTED WETLANDS
- WATER
- LEACHATE PIPEWORK
- LEACHATE INTERCEPTOR DRAIN
- COMBINED LEACHATE ABSTRACTION / GAS EXTRACTION WELLS
- GAS EXTRACTION WELLS
- CP — CONDENSATE POT
- WETLANDS PONDS CONNECTIONS
- FUTURE WORKS

R:\MDR0350\Dg\600 Series - Construction Aug08\As-Built Drgs Feb 2010\mdr0350DG0606R01 - LEACHATE LAYOUT.dwg

NOTES

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3. DO NOT SCALE, use figured dimensions only, if in doubt ask.

No.	Date	Dm. Chk.	Amendment / Issue	App
R01	June '10	RH BO'K	As Built Issue	JB
C01	Aug '08	RH BO'K	Issue for Construction	PM

Client: WATERFORD COUNTY COUNCIL
Comhairle Chontae Phort Láirge
Civic Offices, Dungarvan, Co. Waterford
Phone: 058 22000 Fax: 058 42911

Drawn By	Checked By	Approved By	Date
RH	BO'K	PM	Aug 2008

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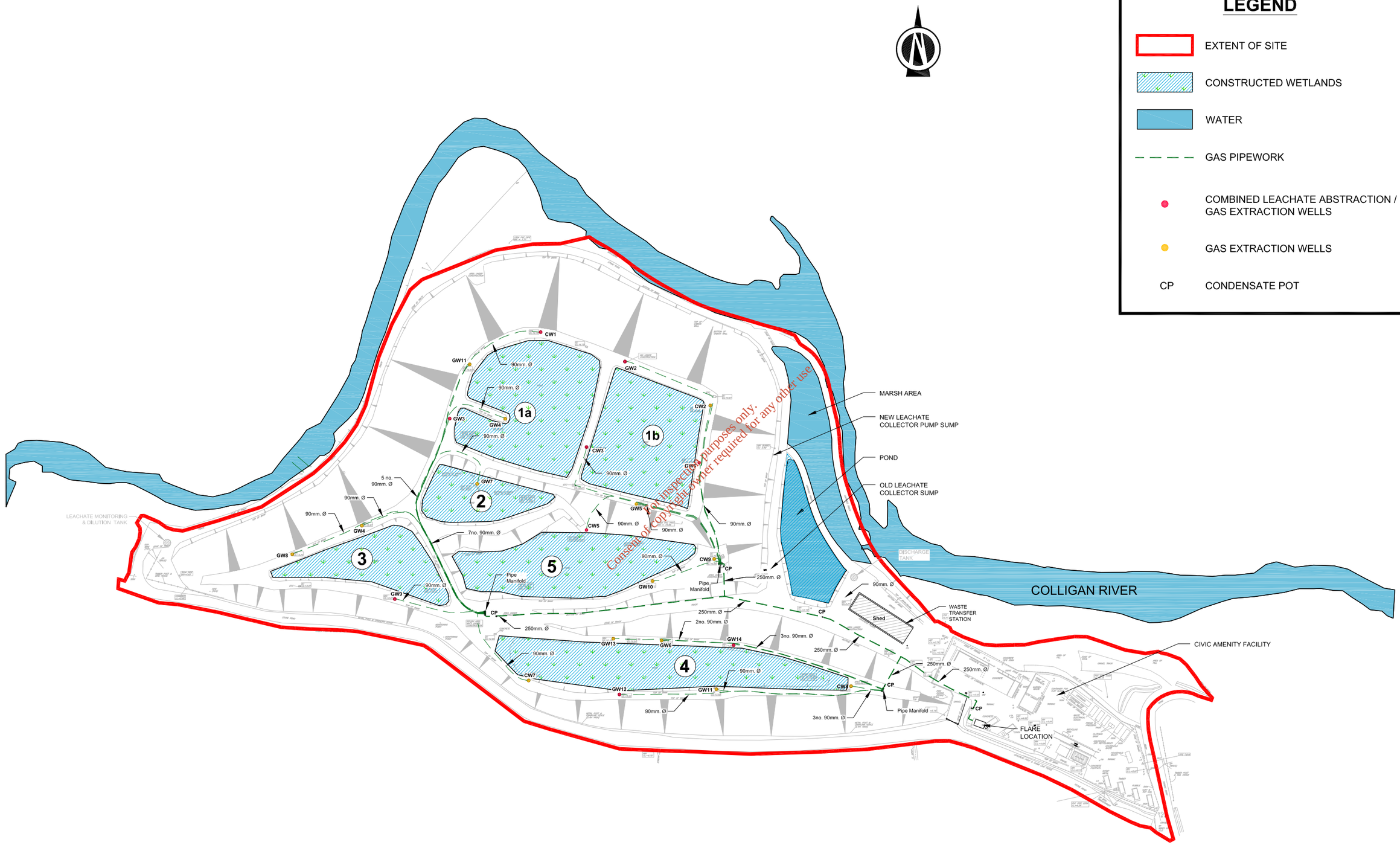
Project: DUNGARVAN LANDFILL

Drawing Status: As Built
Scale / Sheet Size: 1:1000 @ A1 | 1:2000 @ A3

Drawing Number: MDR0350/DG0606
Rev: R01

Title: LEACHATE ABSTRACTION & TREATMENT SYSTEM



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NOTES

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No.	Date	Dft. / Chk.	Amendment / Issue	App
R01	June '10	RH / JB	As Built Issue	JB
C01	Aug '08	RH / BO'K	Issue for Construction	PM

Client: **WATERFORD COUNTY COUNCIL**
Comhairle Chontae Phort Láirge
Civic Offices, Dungarvan, Co. Waterford
Phone: 058 22000 Fax: 058 42911

Drawn By	Checked By	Approved By	Date
RH	BO'K	PM	Aug 2008

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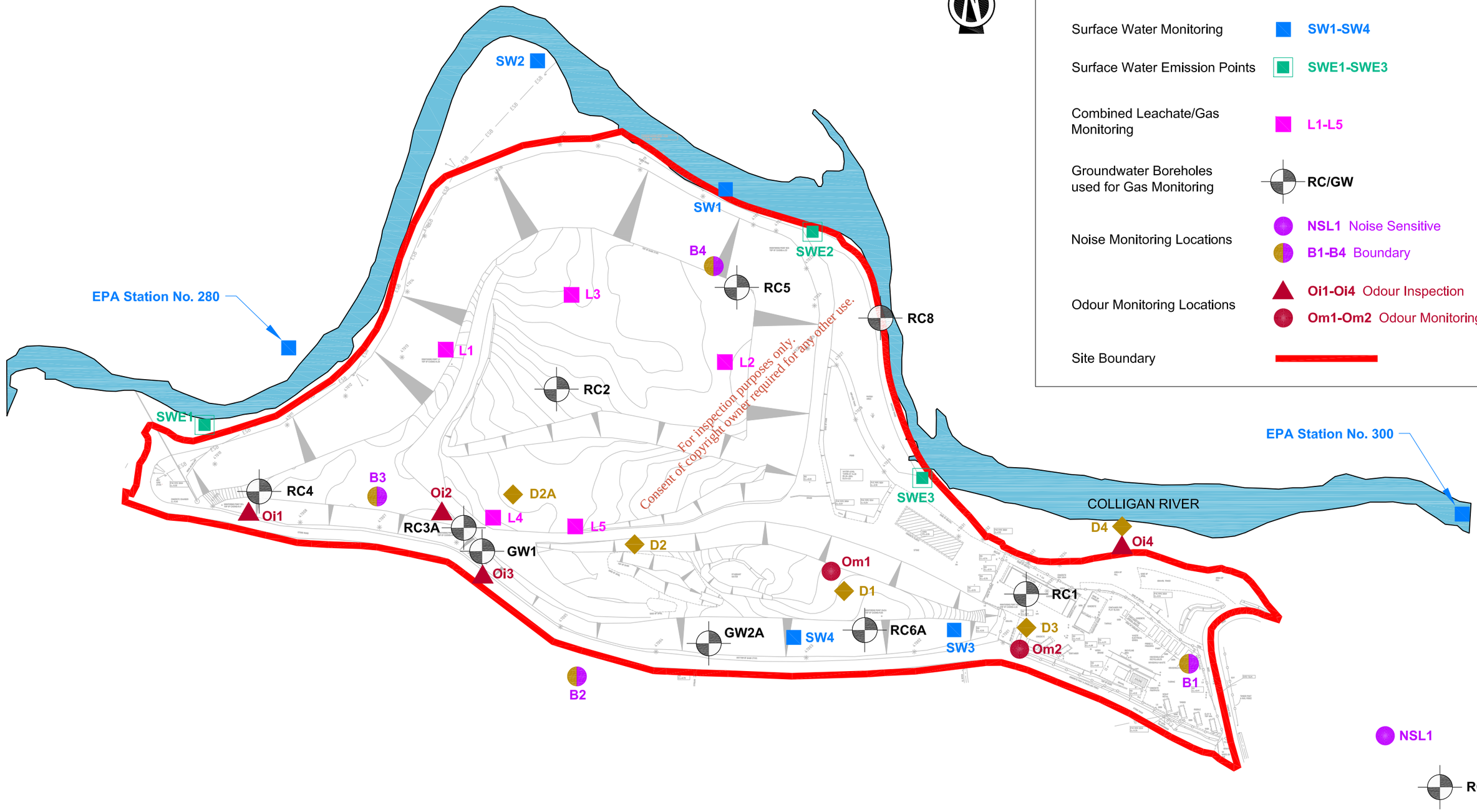
Drawing Number: MDR0350/DG0607
Rev: R01

Project: DUNGARVAN LANDFILL

Title: LANDFILL GAS COLLECTION SYSTEM

Drawing Status	Scale / Sheet Size	
As Built	1:1000 @ A1	1:2000 @ A3



LEGEND

Dust Monitoring Locations	D1-D2-D2A-D3-D4 B1-B4
Surface Water Monitoring	SW1-SW4
Surface Water Emission Points	SWE1-SWE3
Combined Leachate/Gas Monitoring	L1-L5
Groundwater Boreholes used for Gas Monitoring	RC/GW
Noise Monitoring Locations	NSL1 Noise Sensitive B1-B4 Boundary
Odour Monitoring Locations	Oi1-Oi4 Odour Inspection Om1-Om2 Odour Monitoring
Site Boundary	

NOTES

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No.	Date	Dn. Chk.	Amendment / Issue	App
F02	July '10	RH ER	Final Issue	ER
F01	Dec '08	RH EB	Final Issue	EB
D01	Apr.08	RH BO'K	Draft Issue	MS

Client: WATERFORD COUNTY COUNCIL
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Drawn By	Checked By	Approved By	Date
RH	BO'K	MS	April 2008

Drawing Number: MDR0350/DG0505
Rev: F02
Project: DUNGARVAN LANDFILL WASTE LICENCE APPLICATION
Title: MONITORING LOCATIONS
Drawing Status: Final
Scale / Sheet Size: 1:1000 @ A1 1:2000 @ A3

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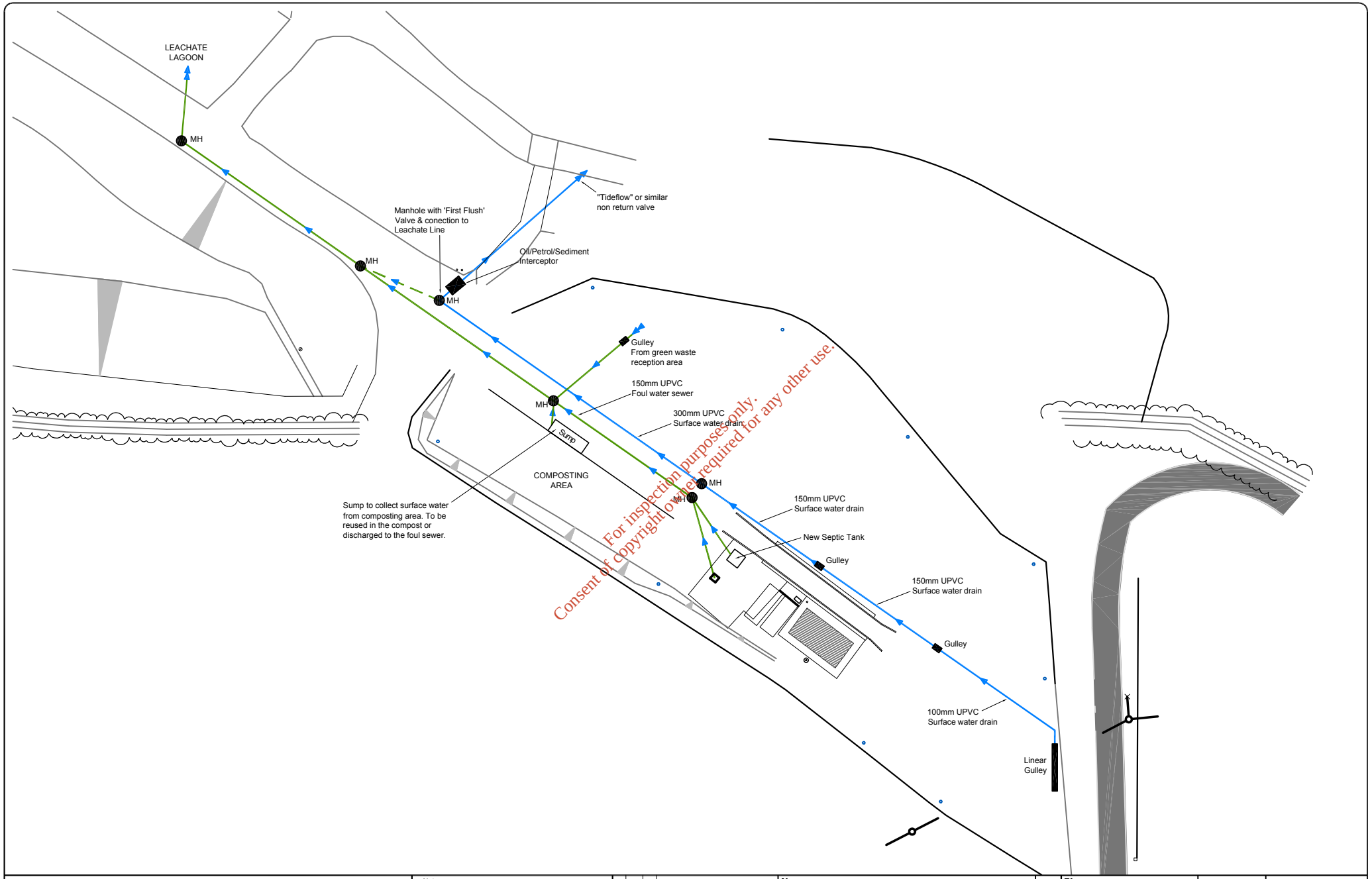

WATERFORD COUNTY COUNCIL
Arus Brugha, Dungarvan.
DENIS McCARTY
DOS, Environment, Planning and Emergency Services.
Phone: (058) 42822 Fax: (058) 42911

mcos
Carnegie House, Library Road, Dun Laoghaire, Co. Dublin
Phone: 01- 2020870 Fax: 01- 2020707

Notes
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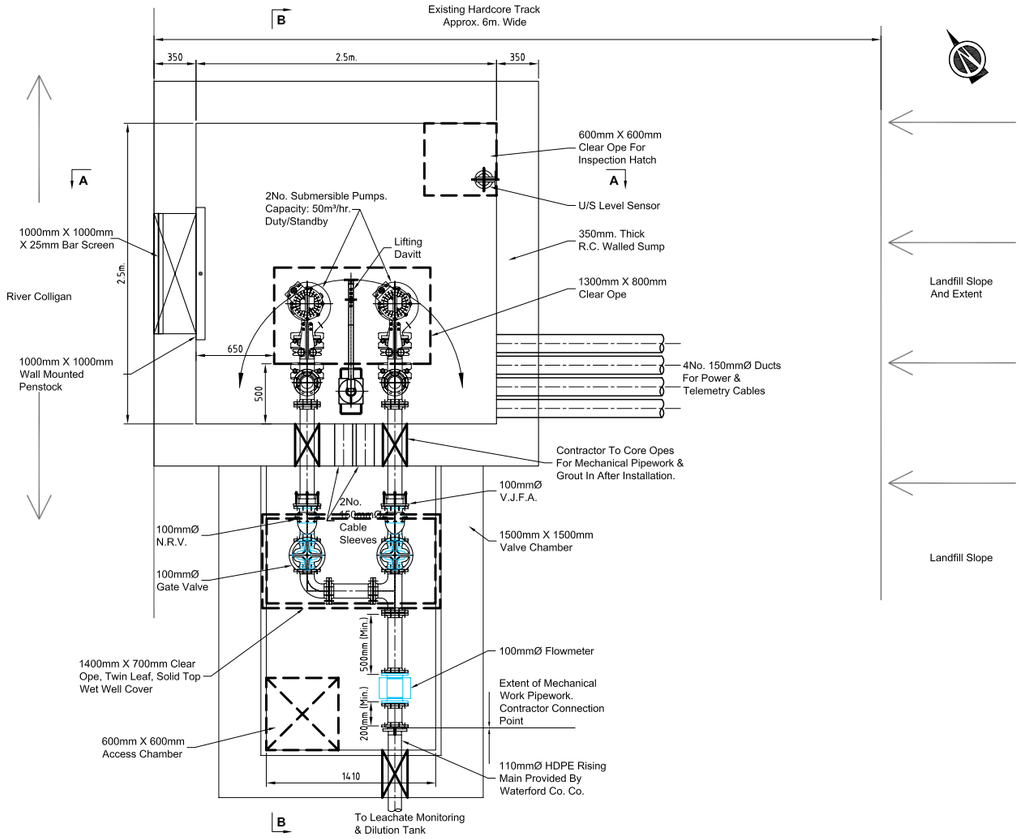
No.	Date	By	Amendments
A02	Mar'03	GDB	ISSUE FOR APPROVAL
A01	Jan'03	GDB	DRAFT ISSUE

Job.
DUNGARVAN LANDFILL
WASTE LICENCE COMPLIANCE

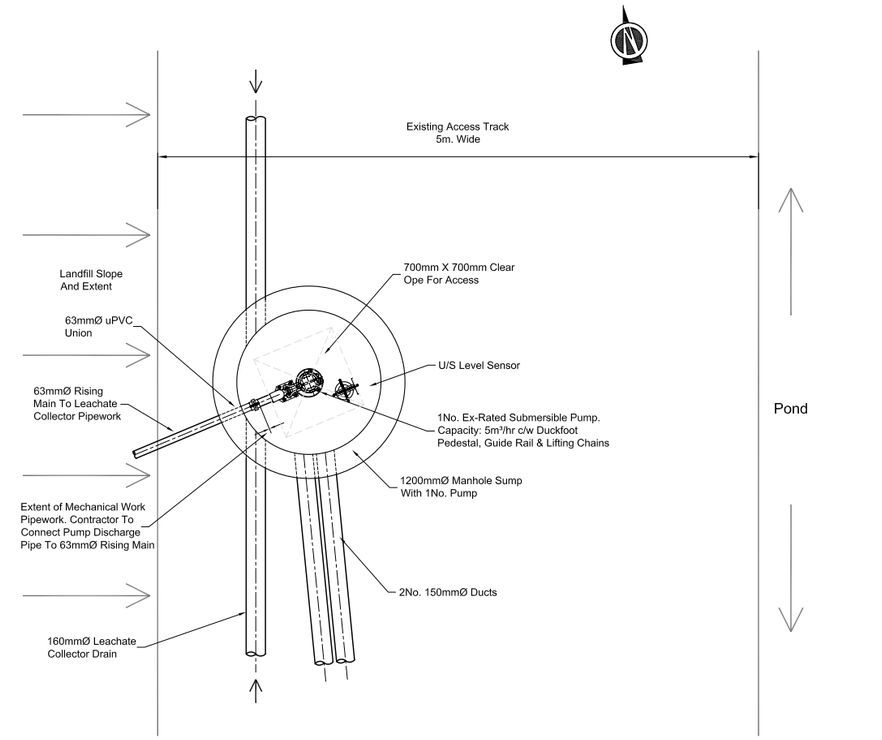
Title.
DRAINAGE LAYOUT
FOR CIVIC AMENITY
& GREEN WASTE AREA

Issue Details		Office Use Only	
Drawn.	GDB	File Ref.	065/509/001/DG0007
Checked.	PN	Job No.	065/509/001
Approved.	LOT	Drawing No.	DG0007
Scale.	1:250 (A1)	Rev.	A02
Date.	Jan'03		

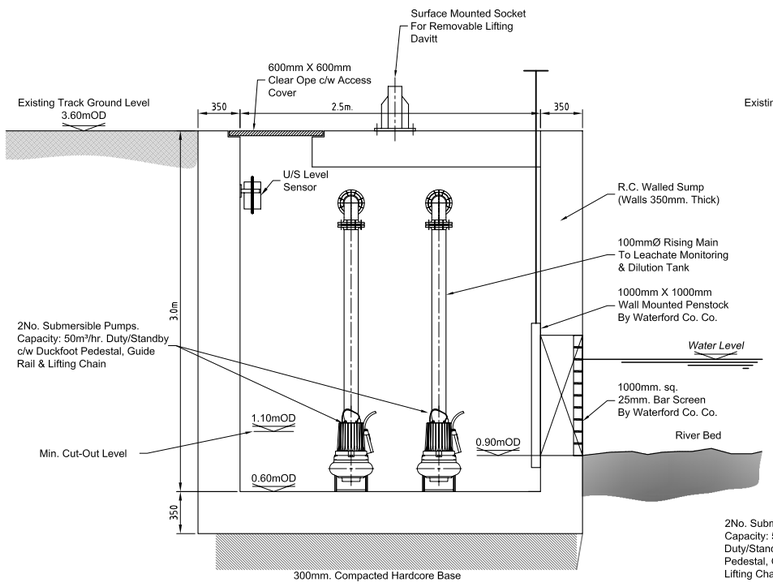


Plan Layout

Note:
Pump sump, valve chamber, intake screen, penstock & chamber covers will be provided by Waterford Co. Co.
Contractor to verify all dimensions & levels on site prior to construction.

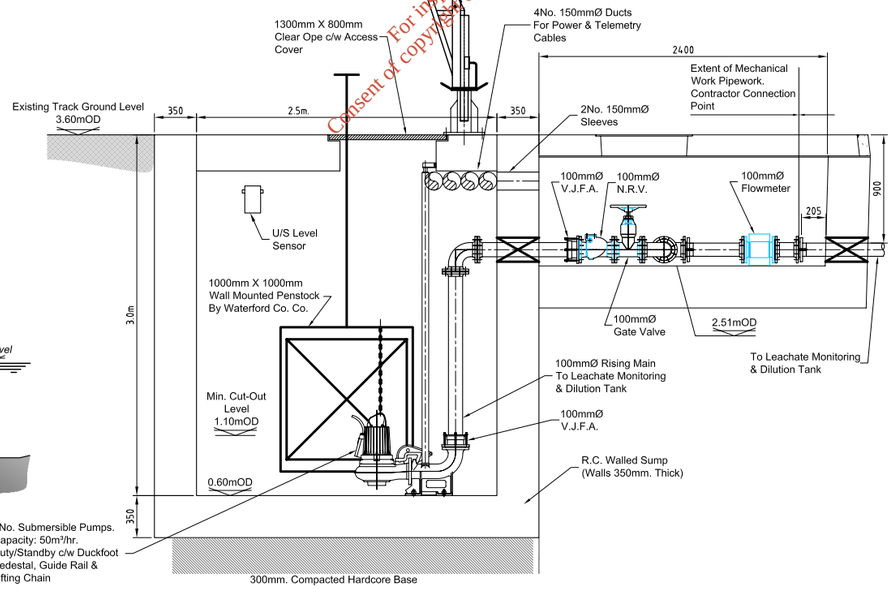


Plan Layout

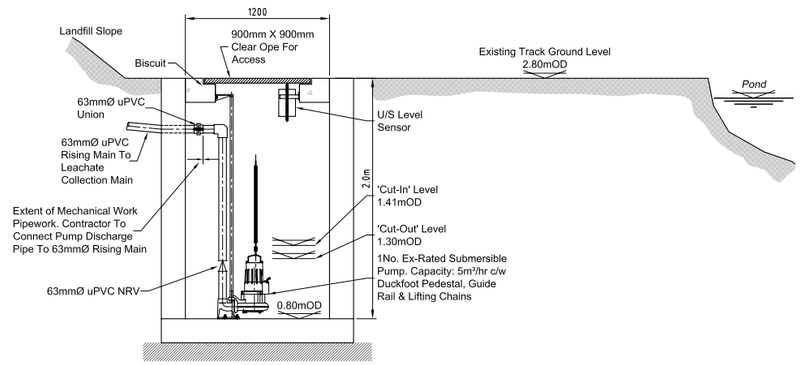


Section A-A

River Water Intake And Sump



Section B-B



Section

Leachate Collector Drain Sump

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No.	Date	Chk'd	Amendment / Issue	App
B01	27/04/09	RH / JB	Issue for Tender	JB
A01	Mar '09	RH / JB	Issue for Approval	JB

Client: **WATERFORD COUNTY COUNCIL**
Comhairle Chontae Phort Láirge
Civic Offices, Dungarvan, Co. Waterford
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Drawn By	Checked By	Approved By	Date
RH	JB	JB	Mar 2009

Drawing Number: MDR0350/DG0709
Rev: B01

Project: DUNGARVAN LANDFILL
M & E SCADA CONTRACT

Drawing Status: Tender
Scale / Sheet Size: 1:25 @ A1 | NTS @ A3

Title: RIVER WATER INTAKE AND SUMP / LEACHATE COLLECTOR DRAIN SUMP

MDR0350DG0709B01.dwg

APPENDIX 4

CORRESPONDENCE FROM EPA

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

Headquarters, PO Box 3000
Johnstown Castle Estate
County Wexford, Ireland

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LoCall: 1890 33 55 99

Mr Gabriel Hynes
Senior Engineer
Waterford County Council
Environment Section
Civic Offices
Dungarvan
County Waterford

9th April 2010

Reg. No. W0032-03

re: Waste Licence Application in respect of Dungarvan Waste Disposal Site at Ballynamuck Middle, Dungarvan, County Waterford.

Dear Mr Hynes

I am to refer to the Agency's notice of the 5th March 2010 which requested additional information in respect of the waste licence application, reference number W0032-03, which was to be supplied within four weeks of the date of that notice.

It is noted that you have not responded to this notice issued in accordance with Article 14(2)(b)(ii) of the relevant Waste Management (Licensing) Regulations. Therefore, your immediate attention to this matter is required.

Yours sincerely,

Ewa Babiarczyk
Inspector
Office of Climate, Licensing & Resource Use

fwd to David
Please response
7/4/10

Copy to David Regan. ✓ mf
Copy to File (Create file).

9 4

18/3/2010

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

Headquarters, PO Box 3000
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LoCall: 1890 33 55 99

Mr Gabriel Hynes
Senior Engineer
Environment Section
Civic Offices
Dungarvan
County Waterford

MAR 2010

5th March 2010

Reg. No. W0032-03

re: Notice in accordance with Article 14(2)(b)(ii) of the Waste Management (Licensing) Regulations

Dear Mr Hynes

I am to refer to the above referenced application for a review of a waste licence relating to a facility at Dungarvan Waste Disposal Site, Ballynamuck Middle, Dungarvan, County Waterford. Having examined the documentation submitted, I am to advise that the Agency is of the view that the documentation does not comply with Article 12 of the Waste Management (Licensing) Regulations.

You are therefore requested, in accordance with Article 14(2)(b)(ii) of the regulations, to take the steps and supply the information detailed below:

ARTICLE 12 COMPLIANCE REQUIREMENTS

1. The Agency recognises that a fee of €5,000 has been paid for a review of the existing licence. However I note that your application documentation refers to a fee of €11,000. Please clarify the anomaly.

2. Having regard to the fact that the unlined landfill at the facility could give rise to emissions into an aquifer containing the List I and II substances specified in the Annex to Council Directive 80/68/EEC of 17 December 1979, please describe the existing and proposed arrangements necessary to give effect to Articles 3 to 10 of this Directive.

3. Provide the expected start date of the operation of the landfill gas flare and clarify the number of gas extraction and combined leachate abstraction/gas extraction wells. Provide a new drawing showing the location of all wells. Also, in the context of your application for Class 9, please elaborate on what work has been done to date on the potential for utilising landfill gas as an energy source.

4. Provide details on proposed methods and frequency for removal of heavy metals contained in the detritus and necromass of the wetland system.

5. Clarify the proposed maximum annual tonnage and the type of waste to be handled at the facility.

6. Provide a drawing showing the location of the proposed discharge point from the leachate treatment system to the Colligan River and the location of the proposed abstraction of water for diluting landfill leachate. State the maximum rate of this abstraction and provide details on any environmental impacts that might be caused by this development.

7. State if the surface water arising from the green waste reception area, the compost area and the waste transfer station will be diverted to the leachate treatment system. Provide details on methods of dealing with the surface water arising from these areas until the connection to the leachate treatment system is in place. Also, provide a drawing showing the location of the surface water drainage system, including the oil/petrol interceptor(s), and all surface water discharge points from the facility. Include symbols for these discharge locations.

8. Provide a new drawing showing all proposed monitoring locations at the site together with their descriptions and symbols. Please note that the extent of the civic waste facility shown in *Figure 2* of the licence application should include the monitoring points for dust and odour.

9. Provide information on how the septic tank which collects the water from the washing area/toilet has been assessed and complies with the Agency's '*Code of Practice, Wastewater Treatment and Disposal Systems serving Single Houses (p.e. ≤10)*'. Also, provide a drawing showing the location of this tank.

10. Provide a final version, if any, of the draft report *'Ecological Survey of Dungarvan Landfill and Environs'* submitted as part of this licence application.

Your reply to this notice should include a **revised non-technical summary** which reflects the information you supply in compliance with the notice, insofar as that information impinges on the non-technical summary.

In the case where any drawings already submitted are subject to revision consequent on this request, a revised drawing should be prepared in each case. It is not sufficient to annotate the original drawing with a textual correction. Where such revised drawings are submitted, provide a list of drawing titles, drawing numbers and revision status, which correlates the revised drawings with the superseded versions.

Please supply the information in the form of a one (1) original plus one (1) copy in hardcopy format within **four weeks** of the date of this notice. In addition please submit two (2) copies of the requested information in electronic searchable PDF format on a CD-ROM to the Agency. Please note that all maps/drawings should not exceed A3 in size.

Please note that the application's register number is W0032-03. Please direct all correspondence in relation to this matter to Administration, *Licensing Unit, Office of Climate, Licensing & Resource Use, Environmental Protection Agency, Headquarters, PO Box 3000, Johnstown Castle Estate, County Wexford* quoting the register number.

Yours sincerely,

Ewa Babiarczyk
Inspector
Office of Climate, Licensing & Resource Use