

APPENDIX 17. ANALYTICAL PARAMETER LIST

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APPENDIX 17. LABORATORY ANALYTICAL PARAMETERS

Table 17.1. Parameters of laboratory analysis of sediment, water, shellfish and algae samples.

Parameter	Determined as:	Shellfish and seaweed tissue	LOD	Sediment	LOD	Water	LOD
Metals	As,Ba,Cd,Cr,Cu,Pb.Mn.Hg,Ni,Se,Ag,Zn,Sr,Fe	ICP- OES	0.1-1mg/kg	ICP- OES	0.1-1mg/kg	ICP- OES	5-30ug/litre
Major Cation	Na,K,Ca,Mg	ICP- OES	10mg/kg	ICP- OES	10mg/kg	ICP- OES	100ug/litre
Major Anions	Cl, SO ₄ ,NO ₃ ,F	Ion Chrom	1mg/kg	Ion Chrom	1mg/kg	Ion Chrom	10ug/litre
Semi Volatile organic compounds	US EPA list of 60 compounds	GC MS	100ug/kg	GC MS	100ug/kg	GC MS	10ug/lite
PCB, DDT, Dieldrin, Toxaphene	Total PCB's (WHO suite of 12)	HR GC MS	50ng/kg		50ng/kg	GC MS	5ng/litre
Organohalogenated substances (Chlorinated pesticides or Organochlorines)	see suite listed below in Table	HR GC MS	1-10ug/kg				
Petroleum Hydrocarbons / Diesel Range organics	C10-C20 aliphatics	HR GC MS	1mg/kg	GC FID	1mg/kg	GC FID	100ug/litre
Organotin compounds	tributyl and triphenyl tin	HR GC MS	1ug/kg	HR GC MS	1ug/kg	GC MS	0.1-10ug/litre
Endocrine disruptors	nonyl, octyl and related phenols	GC MS	10ug/kg	HR GC MS	10ug/kg	HR GC MS	10ug/kg
Faecal coliforms		MF		MF		MF	
total coliforms		Colilert		Colilert		Colilert	
E coli		Colilert		Colilert		Colilert	
Granulometry organic matter	as particle size distribution	NA	NA				
TOC		NA	NA			OX/IR	100,g/litre
Total P		NA	NA			Ion Chrom	25ug/litre
TON		NA	NA			Ion Chrom	10ug/litre
Polyaromatic hydrocarbons	US EPA list of 16	NA	NA	GC MS	1ug/kg	GC MS	0.1ug/litre
Alkalinity		NA	NA	NA	NA	titration	1mg/litre
Total suspended solids	gravimetric	NA	NA	NA	NA		10mg/litre
Sulphides	visible region spectrophotometry	NA	NA	NA	NA		1mg/litre
Ammoniacal nitrogen		NA	NA	NA	NA	Ion Chrom	10ug/litre
Colour		NA	NA	NA	NA		
BOD		NA	NA	NA	NA		
COD		NA	NA	NA	NA		
EC		NA	NA	NA	NA		

Ortho P		NA	NA	NA	NA	Ion Chrom	10ug/litre
Ammonia, unionised ammonia,		NA	NA	NA	NA	Ion Chrom	10ug/litre
Faecal strep		NA	NA	NA	NA	MF	
Salmonella		NA	NA	NA	NA	Tecra	
Enteroviruses		NA	NA	NA	NA	Tissue Culture	
Chlorophyll a		NA	NA	NA	NA		

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APPENDIX 18

Determinand	Concentration in Discharge of Leachate	Concentration in Receiving Waters Post Initial Mixing Zone (20 M x 20 M grid) Min. Dilutions 18.6	Irish Regulatory Standard	Reference	Name of Standard
GENERAL					
pH	7-9 pH units	-	7-9 pH units	S.I. No. 268 of 2006	EC (Quality of Shellfish Waters) Regulations, 2006
BOD	25 mg/l	1.34 mg/l	25 mg/l	S.I. No. 254 of 2001	Urban Waste Water Treatment Regulations, 2001
COD	125 mg/l	6.72 mg/l	125 mg/l	S.I. No. 254 of 2001	Urban Waste Water Treatment Regulations, 2001
Ammonia (as N)	5 mg/l	0.27 mg/l	-	-	Derived from the EC (Quality of Salmonid Waters) Regulations, 1988.
Suspended Solids	35 mg/l	1.88 mg/l	35 mg/l	S.I. No. 254 of 2001	Urban Waste Water Treatment Regulations, 2001
Faecal Coliforms	2,000 per 100 ml	-	-	-	Derived Standard
Phenol	0.5 ug/l	0.03 ug/l	-	-	Derived Standard
Colour	Deviation of <10 from background	Deviation of <10 from background	Deviation of <10 from background	S.I. No. 268 of 2006	EC (Quality of Shellfish Waters) Regulations, 2006
Salinity	<40 PSU	2.15 PSU	<40 PSU and less than 10% increase in background	S.I. No. 268 of 2006	EC (Quality of Shellfish Waters) Regulations, 2006
Dissolved Oxygen	Average Equal or Greater than 70% Min. 60%	-	Average Equal or Greater than 70% Min. 60%	S.I. No. 268 of 2006	EC (Quality of Shellfish Waters) Regulations, 2006
Total Petroleum Hydrocarbons	No visible film No harmful effects on shellfish	-	No visible film No harmful effects on shellfish	S.I. No. 268 of 2006	EC (Quality of Shellfish Waters) Regulations, 2006
Polychlorinated Biphenyls	0.30 microgrammes per litre	0.016 microgrammes per litre	0.30 microgrammes per litre	S.I. No. 268 of 2006	EC (Quality of Shellfish Waters) Regulations, 2006
DISSOLVED METALS					
Arsenic	40 (max.) microgrammes per litre 20 (avg.) microgrammes per litre	2.15 microgrammes per litre	40 microgrammes per litre 20 microgrammes per litre	S.I. No. 268 of 2006 S.I. No.12 of 2001	EC (Quality of Shellfish Waters) Regulations, 2006 Water Quality (Dangerous Substances) Regulations 2001
Cadmium	5 microgrammes per litre	0.27 microgrammes per litre	5 microgrammes per litre	S.I. No. 268 of 2006	EC (Quality of Shellfish Waters) Regulations, 2006

Table 2.5.1 Proposed Discharge Standards for Treated Leachate (continued)

Determinand	Concentration in Discharge of Leachate	Concentration in Receiving Waters Post Initial Mixing Zone (20 M x 20 M grid) Min. Dilutions 18.6	Irish Regulatory Standard	Reference	Name of Standard
DISSOLVED METALS (continued)					
Chromium	30 (max.) microgrammes per litre	1.61 microgrammes per litre	30 microgrammes per litre	S.I. No. 268 of 2006	EC (Quality of Shellfish Waters) Regulations, 2006
	15 (avg.) microgrammes per litre			S.I. No. 12 of 2001	Water Quality (Dangerous Substances) Regulations, 2001
Copper	10 (max.) microgrammes per litre	0.54 microgrammes per litre	10 microgrammes per litre	S.I. No. 268 of 2006	EC (Quality of Shellfish Waters) Regulations, 2006
	5 (avg.) microgrammes per litre			S.I. No. 12 of 2001	Water Quality (Dangerous Substances) Regulations, 2001
Lead	20 (max.) microgrammes per litre	1.08 microgrammes per litre	20 microgrammes per litre	S.I. No. 268 of 2006	EC (Quality of Shellfish Waters) Regulations, 2006
	5 (avg.) microgrammes per litre			S.I. No. 12 of 2001	Water Quality (Dangerous Substances) Regulations, 2001
Mercury	0.40 microgrammes per litre	0.02 microgrammes per litre	0.40 microgrammes per litre	S.I. No. 268 of 2006	EC (Quality of Shellfish Waters) Regulations, 2006
Nickel	50 (max.) microgrammes per litre	2.69 microgrammes per litre	50 microgrammes per litre	S.I. No. 268 of 2006	EC (Quality of Shellfish Waters) Regulations, 2006
	25 (avg.) microgrammes per litre			S.I. No. 12 of 2001	Water Quality (Dangerous Substances) Regulations, 2001
Silver	10 microgrammes per litre	0.54 microgrammes per litre	10 microgrammes per litre	S.I. No. 268 of 2006	EC (Quality of Shellfish Waters) Regulations, 2006
Zinc	200 (max.) microgrammes per litre	10.75 microgrammes per litre	200 microgrammes per litre	S.I. No. 268 of 2006	EC (Quality of Shellfish Waters) Regulations, 2006
	40 (avg.) microgrammes per litre			S.I. No. 12 of 2001	Water Quality (Dangerous Substances) Regulations, 2001
STANDARD IONS					
Cyanide	10 (avg.) microgrammes per litre	0.54 microgrammes per litre	10 microgrammes per litre	S.I. No. 12 of 2001	Water Quality (Dangerous Substances) Regulations, 2001
Fluoride	1500 (avg.) microgrammes per litre	80.65 microgrammes per litre	1500 microgrammes per litre	S.I. No. 12 of 2001	Water Quality (Dangerous Substances) Regulations, 2001
VOLATILE ORGANIC COMPOUNDS					
Dichloromethane	10 microgrammes per litre	0.54 microgrammes per litre	10 microgrammes per litre	S.I. No. 12 of 2001	Water Quality (Dangerous Substances) Regulations, 2001
Toluene (Methylbenzene)	10 microgrammes per litre	0.54 microgrammes per litre	10 microgrammes per litre	S.I. No. 12 of 2001	Water Quality (Dangerous Substances) Regulations, 2001
Xylene (Dimethylbenzene)	10 microgrammes per litre	0.54 microgrammes per litre	10 microgrammes per litre	S.I. No. 12 of 2001	Water Quality (Dangerous Substances) Regulations, 2001
TRIAZINE HERBICIDES					
Atrazine	1 microgramme per litre	0.054 microgrammes per litre	1 microgrammes per litre	S.I. No. 12 of 2001	Water Quality (Dangerous Substances) Regulations, 2001

Simazine	1 microgramme per litre	0.054 microgrammes per litre	1 microgrammes per litre	S.I. No. 12 of 2001	Water Quality (Dangerous Substances) Regulations, 2001
ORGANOTIN COMPOUNDS					
Tributyltin	0.001 microgrammes per litre	0.00005 microgrammes per litre	0.001 microgrammes per litre	S.I. No. 12 of 2001	Water Quality (Dangerous Substances) Regulations, 2001

In the table above where two standards are specified, e.g. the dissolved metal Arsenic, the requirement is that the limit value specified in European Communities (Quality of Shellfish Waters) Regulations, 2006 should be considered the maximum value and the limit value specified in the Water Quality (Dangerous Substances) Regulations, 2001 should be considered as the average value.

Compliance with discharge standards will be as per the detail of interpretation specified in the revised Waste Licence granted to Derrinnumera landfill by the Environmental Protection Agency.

This is indicative of conditions at low water Spring tide. Dilution at all other stages of the tidal cycle are greater than this and in fact the validatory hydrodynamic model identified much greater dilutions being available.

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Table 2.5.2 Proposed Screening Criteria for the Receiving Environment

Determinand	Screening Criteria for Receiving Waters	Source	Screening Limits for Shellfish Tissue (mg/kg)	Source
pH	7-9 pH units	S.I. No. 268 of 2006	Not applicable	Not applicable
Temperature	Differential from background levels less than 2 degrees Celsius	S.I. No. 268 of 2006	Not applicable	Not applicable
Colouration (after filtration)	Differential from background levels of less than 10 milligrammes per litre	S.I. No. 268 of 2006	Not applicable	Not applicable
Suspended Solids	Differential from background levels of less than 30%	S.I. No. 268 of 2006	Not applicable	Not applicable
Salinity	Mandatory Less than 40 practical salinity units and differential from background levels less than 10% Guide 12-38 practical salinity units	S.I. No. 268 of 2006	Not applicable	Not applicable
Dissolved Oxygen	80% (average value)	S.I. No. 268 of 2006	Not applicable	Not applicable
Total Petroleum Hydrocarbons	No visible film or deposit on shellfish or waters nor harmful effects on shellfish	S.I. No. 268 of 2006	Not applicable	Not applicable
Faecal Coliforms	100 faecal coliforms per 100 millilitres	S.I. No. 268 of 2006	Equal to or less than 300 in the shellfish flesh and intervalvular fluid	S.I. No. 268 of 2006
Organohalogenated Substances	0.30 microgrammes per litre Polychlorinated Bi-phenyls	S.I. No. 268 of 2006	Mandatory 300 microgrammes per kilogramme wet weight @ 1 per cent lipid Guide 100 microgrammes per kilogramme wet weight @ 1 per cent lipid	S.I. No. 268 of 2006
Tributyltin	0.001 microgrammes per litre	S.I. No. 12 of 2001	Not applicable	Not applicable
Atrazine	1 microgramme per litre	S.I. No. 12 of 2001	Not applicable	Not applicable
Simazine	1 microgramme per litre	S.I. No. 12 of 2001	Not applicable	Not applicable
Standard Ions				
Cyanide	10 microgrammes per litre	S.I. No. 12 of 2001	Not applicable	Not applicable
Fluoride	1500 microgrammes per litre	S.I. No. 12 of 2001	Not applicable	Not applicable
Volatile Organic Compounds				
Dichloromethane	10 microgrammes per litre	S.I. No. 12 of 2001	Not applicable	Not applicable
Toluene	10 microgrammes per litre	S.I. No. 12 of 2001	Not applicable	Not applicable
Xylene	10 microgrammes per litre	S.I. No. 12 of 2001	Not applicable	Not applicable
Dissolved Metals				
Arsenic	40 microgrammes per litre	S.I. No. 268 of 2006	30 mg per kg dryweight	S.I. No. 268 of 2006
Cadmium	5 microgrammes per litre	S.I. No. 268 of 2006	5 mg per kg dryweight	S.I. No. 268 of 2006
Chromium	30 microgrammes per litre	S.I. No. 268 of 2006	6 mg per kg dryweight	S.I. No. 268 of 2006
Copper	10 microgrammes per litre	S.I. No. 268 of 2006	400 mg per kg dryweight	S.I. No. 268 of 2006
Mercury	0.4 microgrammes per litre	S.I. No. 268 of 2006	1.0 mg per kg dryweight	S.I. No. 268 of 2006
Determinand	Screening Limit for Receiving Waters	Source	Screening Limits for Shellfish Tissue	Source

			(mg/kg)	
Nickel	50 microgrammes per litre	S.I. No. 268 of 2006	5 mg per kg dryweight	S.I. No. 268 of 2006
Lead	20 microgrammes per litre	S.I. No. 268 of 2006	7.5 mg per kg dryweight	S.I. No. 268 of 2006
Zinc	200 microgrammes per litre	S.I. No. 268 of 2006	4000 mg per kg dryweight	S.I. No. 268 of 2006
Silver	10 microgrammes per litre	S.I. No. 268 of 2006	15 mg per kg dryweight	S.I. No. 268 of 2006
Organoleptic Parameters				
Taste	No impairment of taste in shellfish flesh			

The above table has been specified with reference to the European Communities (Quality of Shellfish Waters) Regulations, 2006 (S.I. No. 268 of 2006) and the Water Quality (Dangerous Substances) Regulations, 2001 (S.I. No. 12 of 2001) and as such monitoring methods and compliance shall be considered to be as specified in the Regulations.

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MONITORING PROGRAMME OVERVIEW

The objective of the monitoring programme is to ascertain if the quality of waters and associated habitats in the receiving environment are being altered upon commencement of the proposed discharge of treated landfill leachate through a common marine outfall with the treated municipal waste water from the Newport Sewerage Scheme.

The proposed outfall location (Outfall Option A) is located at ordnance grid location reference 095 670E, 294210N.

SAMPLING STATIONS

Samples of seawater will be extracted at the following discharge points;

Station #1 Clew Bay North (Newport Bay)

within 50 metres of 094 556E, 293 589N (Latitude 53 52 52 N, Longitude 9 36 14.9 W).

The above sampling location is as specified in the Regulation 6 Action Programme for Clew Bay, County Mayo - the sampling of same which has been tasked to the Department of Communications, Marine and Natural Resources in conjunction with the Marine Institute.

Station #2 Burrishoole Channel

within 50 metres of 096 000E, 294 500N.

Station #3 Off Rosmore Peninsula

within 50 metres of 094 500E, 294 000N.

It is recommended that one additional sampling station be selected at a control point in consultation with the Environmental Protection Agency, the Marine Institute, the Department of Communications, Marine and Natural Resources, Mayo County Council with input from local stakeholders.

Samples of Shellfish Tissue (mussel or oyster) will be extracted from the most representative location in proximity to the identified sampling stations. The analytical suite shall reflect the screening limits applicable to shellfish as specified above in Table 2.5.2.

Samples of Sediment will be extracted from the most representative location in proximity to the identified sampling stations. The analytical suite shall reflect the screening limits applicable to shellfish as specified above in Table 2.5.2.

Seine Netting of Plaice/Flounder will be conducted at the most representative location in proximity to the identified sampling stations. The health of these representative fish samples obtained will be determined in accordance with an analytical approach developed in consultation with the Environmental Protection Agency, the Marine Institute, the Department of Communications, Marine and Natural Resources [including the Marine Institute], Department of the Environment, Heritage and Local Government [including National Parks and Wildlife Service], Mayo County Council with input from local stakeholders.

SAMPLING FREQUENCY

It is proposed as part of the monitoring programme which will be implemented for the Newport Sewerage Scheme that samples of sea water and shellfish tissue be obtained on a six monthly basis starting one six month period in advance of commencement of discharge. The frequency of the monitoring programme will be subject to review on completion of two years monitoring post commencement of treated leachate discharge.

APPENDIX 19. DEPARTMENT OF THE MARINE WATER QUALITY DATA FOR CLEW BAY 2005 - 2006

This water quality data was not collected or analysed by EcoServe and was supplied by Mr Dave O'Donoghue (Assistant Principal Officer in the Department of the Marine) as part of their ongoing commitment to monitor Irish Shellfish waters.

North Clew Bay (Newport Bay) station (approximate grid reference 945 936).

Parameter	2005										2006								
	Date	31/01	28/02	14/03	25/04	24/05	27/06	25/07	15/08	12/09	12/10	15/11	12/12	23/01	20/02	20/03	24/04	29/05	13/06
Silver (µg/l)	-	-	-	-	<1	-	-	-	-	-	<1	-	-	-	-	-	-	-	-
Arsenic (µg/l)	-	-	-	-	<1	-	-	-	-	-	1.19	-	-	-	-	-	-	-	-
Cadmium (µg/l)	-	-	-	-	<0.04	-	-	-	-	-	<0.04	-	-	-	-	-	-	-	-
Chromium (µg/l)	-	-	-	-	0.36	-	-	-	-	-	0.439	-	-	-	-	-	-	-	-
Copper (µg/l)	-	-	-	-	0.53	-	-	-	-	-	1.05	-	-	-	-	-	-	-	-
Mercury (µg/l)	-	-	-	-	<0.008	-	-	-	-	-	<0.008	-	-	-	-	-	-	-	-
Nickel (µg/l)	-	-	-	-	0.71	-	-	-	-	-	1.22	-	-	-	-	-	-	-	-
Lead (µg/l)	-	-	-	-	0.24	-	-	-	-	-	3.4	-	-	-	-	-	-	-	-
Zinc (µg/l)	-	-	-	-	13.9	-	-	-	-	-	30.2	-	-	-	-	-	-	-	-
PCB's (µg/l)																			
CB Conenger 28	-	-	-	-	<0.005	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-
CB Conenger 52	-	-	-	-	<0.005	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-
CB Conenger 101	-	-	-	-	<0.005	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-
CB Conenger 118	-	-	-	-	<0.005	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-
CB Conenger 138	-	-	-	-	<0.005	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-
CB Conenger 153	-	-	-	-	<0.005	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-
CB Conenger 180	-	-	-	-	<0.005	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-
DDE - op'	-	-	-	-	<0.005	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-
DDE - pp'	-	-	-	-	<0.005	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-

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**Baseline aquatic ecology and sediment and water quality
report for the proposed wastewater treatment plant and
landfill leachate discharges at Newport, Co. Mayo.**

GLOSSARY OF TERMS

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Abiotic Factor	The physical, chemical and other non-living components of the environment that an organism lives in. These factors include all aspects of climate, geology, and atmosphere that affect ecological systems.
Benthic	Refers to organisms that live on or in the ocean bed. Benthic epifauna are organisms that live on the ocean floor or upon bottom objects such as sea anemones and barnacles, whereas benthic infauna are organisms that live within the surface sediments such as clams and worms.
Bioaccumulation	The process whereby pollutants are taken up, retained and concentrated in the cells of plants and animals.
Biodiversity	The variation in life on Earth reflected at all levels, from various ecosystems and species, to the genetic variation within a species. See also ecosystem diversity, species diversity, genetic diversity.
Biotic Factor	A living component of the environment which arises from and affects living organisms (distinct from physical factors). For example, the interaction between predators and prey is a biotic interaction.
Ecosystem	A community of plants, animals and other organisms that are linked by energy and nutrient flows and that interact with each other and with the physical environment. Rain forests, deserts, coral reefs, and grasslands are examples of ecosystems.
Ecosystem Diversity	The diversity of biological communities and their physical environment. Diversity is determined by the species composition, physical structure and processes within an ecosystem. This is the highest level of biodiversity. See also biodiversity; compare species diversity, genetic diversity.
Epifauna	Animals living on the surface of the substrate.
Habitat	The immediate space where an animal or plant lives and has food, water and protection. Habitat loss, which includes the destruction, degradation, or fragmentation of habitats, is the primary cause of decreasing biodiversity.
Hypolimnion	The lowest layer in a thermally stratified lake or reservoir. This layer consists of colder, denser water, and has a constant temperature where no mixing occurs.

Infauna	Aquatic animals living within the matrix of bottom sediment.
Native Species	A species that occurs naturally in an area (i.e. is not introduced).
Pelagic	Refers to the plants and animals that live in the water column or in the open waters of the ocean rather than the ocean floor (see benthic). Life is found throughout the pelagic zone, however is more concentrated at shallower depths. Pelagic organisms can be further divided into the plankton and nekton.
Species Diversity	A measure of both species abundance and species richness. An area that has a large number of species and many representative individuals from each species is more diverse than an area that has only a single species.
Voucher collection	A representative collection of fauna and flora recorded during the survey.

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