

Appendix C.2

(Documents in support of Attachment C.2)

EMS

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Powerstown Landfill

Environmental Management System

August 2014

Friday, 15 August 2014

Industrial Emissions Licence Reg. No. W0025-03

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1.0 INTRODUCTION

The Environmental Protection Agency (EPA) issued Carlow County Council with a revised licence for their waste facility, Powerstown Landfill, at Powerstown, Co. Carlow on the 19th of October 2009 (Industrial Emissions Licence No. W0025-03). The licence is for the continued operation and development by Carlow County Council of a non-hazardous waste landfill. This report has been prepared in compliance with Condition 2.3 of the Waste Licence which requires that:

'The licensee shall maintain an Environmental Management System. The EMS shall be updated on an annual basis with amendments being submitted to the Agency for its agreement.'

The original Environmental Management System (EMS) for the site was prepared by Fehily Timoney & Co. in 2005. Malone O'Regan (MOR) updated the Environmental Management System (EMS) for 2008. Carlow County Council have updated the EMS in subsequent years. In accordance with Conditions 2.3 of the Waste Licence, the EMS contains the following information:

- Schedule of Environmental Objectives and Targets;
- Landfill Environmental Management Plan;
- Corrective Action Procedures;
- Awareness Training Programme;

The EMS has also taken account of Agency priority issues for the landfill sector in 2014, these are as follows:

1. **Odour, complaints & incidents management (complaints and incidents records)**
2. **Landfill Gas Management**
3. **Leachate Management**
4. **Other operational issues (including monitoring, cover, capping & restoration status, waste handling, waste records)**
5. **Gate Fee enforcement**
6. **BMW diversion from landfill**
7. **Groundwater and surface water impact from landfill**

2.0 SCHEDULE OF ENVIRONMENTAL OBJECTIVES AND TARGETS

Condition 2.3.2.1 of the Waste Licence requires a Schedule of Environmental Objectives and Targets to be set. The schedule should include timeframes for the achievement of set targets and shall address a five year period as a minimum.

Table 2.1 below presents the environmental objectives and targets set out for 2014 .

2.1 One Year Period

Table 2.1: Schedule of Environmental Objectives and Targets set for 2014

	Item	Target / Objective	Progress / Date of Completion
1	Provision of Services	Review tender for bird control	Tender process complete
2	Provision of Services	Review tender for pest control	Tender process underway
3	Gas collection	Extend gas collection system within Cell 17 active area, Install new pipe-work	On-going from late 2013
4	Monitoring	Refine LandGEM gas model	End 2014
5	Monitoring	Complete Tier 3 Risk Assessment for groundwater	Completed.
6	Odour Management	Review Odour Management Plan	Review in progress
7	Site Infrastructure	Inspect all gas collection well heads and seals as required	End 2014
8	Site Infrastructure	Complete temporary cap to cells 15-16	End 2014
9	Staff Training	Continue to provide training to staff in relevant fields	In progress
10	Monitoring	Complete all monitoring as required as per W0025-03	In progress
11	Site Infrastructure	Investigate alternative leachate treatment methods	End 2014
12	Capping	Provide temporary capping as required	Underway in active cells
13	Waste Activities	Contact Waste Operators with a view to increasing the amount of waste currently accepted at the landfill	Discussions underway
14	Waste acceptance	Review Waste Acceptance Procedures	Review in progress
15	Energy usage	Evaluation of practicable options for energy and resource efficiency	Review in progress

16	Odour Management	Include Action Report with OMI VOC surveys	Underway
17	Monitoring	Investigate alternatives to continuous TOC monitoring	End 2014
18	Site Management	Review ELRA and CRAMP documents	Completed

Review of Operations and Processes

In accordance with conditions 2.3.2.1 and 5.3 – 5.8 of Industrial Emissions Licence W0025-03 a review of operations and processes within Powerstown Landfill was undertaken during 2010 and as a result of this a revised Waste Acceptance Procedure for the site was submitted to the agency in February 2010. Section 6 of the waste acceptance procedure provides an evaluation of the beneficial recovery / recycling of waste in subsequent landfill engineering operations. This includes: the use of a separate collection vessel for gypsum waste to promote the recovery of this product and prevent it going to landfill, pre-treatment of street sweeping wastes and fly tipped material prior to acceptance at the landfill. It is proposed to carry out a review of the Waste Acceptance document during 2014.

Evaluation of practicable options for energy and resource efficiency

During 2011 a number of measures were undertaken to identify short-term practicable options for energy and resource efficiency at Powerstown Landfill. The measures undertaken during 2011 are outlined below:

- Water leaks on-site were detected, isolated and repaired,
- Regular servicing and maintenance of pumps is carried out to ensure optimum efficiency
- Regular balancing of the gas field is undertaken to ensure blower : flow ratio at flare is optimized to minimize the energy usage of the blower

A further review is now underway.

2.2 Five Year Period

In addition to the objectives and targets identified in Section 2.1, additional objectives and targets which reflect a five year strategy for the facility have also been identified. These objectives are outline below.

	Item	Target / Objective	Target Completion date
1	Gas Management	Install permanent gas management in cells 15/16	2016
2	Capping	Final capping of cells 15/16	2016
3	Capping	Final capping cells 17 and 18	2019

3.0 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

3.1 Details of Operator

The non-hazardous landfill located at Powerstown, Co. Carlow, is operated by Carlow County Council. The contact details are as follows:

Site: Powerstown Landfill Facility
Powerstown
Co. Carlow

EPA Industrial Emissions Licence: W0025-03

Landfill Operator: Carlow County Council
Athy Road,
Carlow.

Landfill Manager: Pat Connolly
Address: Powerstown Landfill Facility
Powerstown
Co. Carlow

Contact Number: 059 9172478

Deputy Landfill Manager: Mary Walsh
Address: Powerstown Landfill Facility
Powerstown
Co. Carlow

Contact Number: 059 9172402

3.2 Site Description

3.2.1 Boundaries and Topography

Powerstown Landfill is a municipal landfill and civic amenity site owned and operated by Carlow County Council. The site covers approximately 23.9 ha in the townland of Powerstown, located adjacent to the M9 motorway. The facility is approximately 4Km north of Leighlinbridge and approximately 6km south of Carlow Town. The site boundaries include the Powerstown Stream, a tributary of the River Barrow, to the north, the N9 roadway to the west, a third class road which is used to access the site to the south and agricultural lands to the east.

3.2.2 Geology, Hydrology & Hydrogeology

Site investigations indicate that sand and gravel deposits are laterally extensive beneath the site. It is estimated that over 15 m thick of sand and gravel lie directly on fresh, coarse limestone. The sand and gravel is fluvio-glacial in origin. Peaty silt, marl and boulder

sediments are present in small areas of Phase 2. The finer grained silts are generally confined to low points and hollows in the ground.

Powerstown landfill is located within the catchment area of the River Barrow which is located approximately 600m west of the site. The River Barrow rises in the Slieve Bloom Mountains in County Laois and flows for approximately 170 km through Counties Kildare, Carlow, and Wexford before entering the sea at Waterford Harbour. The Powerstown Stream, a tributary of the River Barrow, flows in a westerly direction along the northern boundary of the site towards the River Barrow.

The River Barrow forms part of the River Barrow and River Nore SAC. A Natura Impact Statement was prepared in 2011 as part of the planning process for continued operation of the landfill. The report stated that:

As no negative impacts on the Qualifying Interests of SAC 002162 were detected, it can be stated with full confidence that the Powerstown Landfill is not contributing to any significant cumulative impacts on Conservation Status of the Qualifying Interests of the SAC and is not affecting the sites Conservation Objectives and that no mitigation measures, additional to those already in place, are necessary.

The principal aquifer beneath the site and the surrounding Barrow Lowlands is dolomitised Lower Carboniferous limestone. Fluvio-glacial sand and gravel deposits are extensive and widespread throughout the River Barrow Valley and where sufficiently thick are classified as a locally important gravel aquifers. Groundwater is present at or near the surface in the peaty silts and marls, however these sediments are not considered as aquifers. Regionally groundwater flow direction beneath the site within the sand and gravel deposits is west towards the River Barrow; and local northern flow component beneath the site discharges to the Powerstown Stream. Regionally groundwater movement within the dolomitised limestone is dominated fissure flow and flow direction is generally to the west.

3.2.3 Meteorology

An automatic weather station was installed at the landfill in 2011. The data compiled includes rainfall, temperature, relative humidity, wind speed, wind direction, evapotranspiration and atmospheric pressure.

3.3 Types of Waste Accepted

Powerstown Landfill has a site specific Waste Acceptance Procedure that was updated in 2014. All staff should be familiar with this procedure and the specific requirements set out in W0025-03.

3.3.1 Waste Composition

The facility is licensed to accept 40,000 tonnes of waste per annum, the waste fractions permitted by the Waste Licence are outlined in Table 1. Hazardous liquid or asbestos wastes are not permitted to be disposed of at the landfill.

Table 1 Waste Permitted to be Accepted at Powerstown Landfill Facility

Waste Type	Maximum Quantity Permitted (Tonnes per annum)
Household	30,000
Commercial	7,000
Treated Sewage Sludge	500
Construction and Demolition	1,000
Industrial Non-Hazardous Solids	1,500
Total	40,000

3.3.2 Waste for Recovery

Carlow County Council operates a Civic Amenity Facility (CAF) at the Powerstown facility. Wastes accepted at the CAF include:

- Aluminium Cans
- Tin Cans
- Glass (plate/bottled)
- Timber
- Scrap Metal
- Oil Filters
- Ink Cartridges
- Cardboard
- Waste Oils (Engine & Cooking)
- Waste Electrical and Electronic Equipment (WEEE)
- Plastics (Bottles and Wrapping)
- Batteries (Car & Household)
- Newspaper and Magazines
- Paint Cans
- Fluorescent tubes
- CD's & DVD's
- Textiles
- Household Light Bulbs
- Mobile phones
- Tetrapac

A review of the number of receptacles and the frequency of collection at the CAF was carried out by the landfill manager during 2010. Additional receptacles for the receipt of timber and cardboard were installed. The aim of this was to divert additional material from landfill thus increasing the amount of material recycled at the facility. Green Waste and gypsum material are also accepted at Powerstown Landfill and this material is removed from site for further treatment.

3.3.3 Waste Acceptance Procedure

The Waste Acceptance Procedure for Powerstown Landfill was reviewed during 2014. A copy of the reviewed procedure is contained in Appendix 4.

3.4 Quantities of Waste Accepted for Disposal and Recovery at Powerstown Landfill and Civic Amenity Site.

The quantities of waste deposited and recovered at the landfill in 2013 are presented in Tables 2 and 3 below. These figures are from reported tonnages that were submitted to the EPA as part of the Annual Environmental Report for the site.

Table 2 Quantity of Waste Disposed to Powerstown Landfill Facility in 2013

Type	Total
Municipal Waste	16232.20
Kilkenny Co.Co.	12.02
Public Skips	1938.40
Unauthorised Site Clean Up	205.88
Clean Up Areas)	498.06
Clean Out (Housing)	86.60
Fly Tipping	467.20
Garden Park	571.54
Litterbins	310.48
Street Cleaning Residues	790.20
Filter Sand	5.56
Screenings	342.14
Treated Sludge	279.46
Drain Cleaning	70.90
Alum Sludge (KKCC)	503.64
Total Disposed	22314

Table 3 Waste Recovery at the Powerstown CAS in 2013

Batteries (Car)	8.26
Batteries (Household)	0.00
Bottle banks	75.14
Cardboard	74.18
Flat Glass	34.98
Flourescent Lights	0.60
Food Waste	29.86
Green Waste	269.02
Gypsum	7.74
Light Bulbs (Filament)	0.26
Oil Filters	0.82
Paint Cans	13.32
Paper / Mags	122.58
Plastic Bottles	51.48
Plastic Wrapping	11.00
Scrapmetal	112.54
Tetrapac	0.00
Textiles	6.90
Timber	125.16
Tyres	1.14
Waste Cooking Oil	2.46
Waste Engine Oil	5.04
WEEE	195.98
Total Recovered	1146

3.5 Capacity of Landfill

A licence was granted by the EPA on 11th April 2005 for an extension to the landfill that includes a further four cells with a capacity of 240,000 m³. The remaining capacity of Phase 3 is estimated at 100,000 m³ (July 2014).

3.6 Landfill Design and Engineering Details

3.6.1 Containment

The containment design of the landfill is different for the three phases. Phase 1 is capped and is an unlined landfill while Phases 2 and Phase 3 comprise of fully engineered contained cells. Cells 1 to 6 of Phase 2 are lined with 2.5 mm HDPE on a prepared sub-grade. Cells 7-13 are lined with a composite lining system. Phase 3 lining system comprises a double composite liner.

The final layer of waste deposited in each phase will be free from large objects. No material or object that is incompatible with the proposed restoration of the facility shall be present within one metre of the final soil surface levels.

Over the final layer of waste, an engineered restoration cap is placed in accordance with Condition 4.3 of the Waste Licence, consisting of:

- Top soil (150 – 300 mm).
- Subsoil, such that the total thickness of top and sub-soils is at least 1 m.
- Drainage layer of 0.5 m thickness having a minimum hydraulic conductivity of 1x10⁻⁴ m/s or an equivalent geosynthetic layer.
- Compacted mineral layer of a minimum 0.6 m thickness with a permeability of less than 1x10⁻⁹ m/s or a geosynthetic material (e.g. GCL) or similar that provides equivalent protection.
- Gas collection layer of natural material (minimum thickness 0.3 m) or a geosynthetic layer.

Filled landfill cells are permanently capped within 24 months of the cells having been filled to the required level.

The overall objectives of the capping layer are to:

- Effectively seal the top of the landfill in order to control rainwater infiltration.
- Assist with the control of landfill gas migration.
- Segregate surface water from leachate.
- Prevent ingress of air into the landfill mass which may result in difficulties in controlling landfill gas.
- Provide an effective barrier between the waste and the planned after use.

3.6.2 Leachate

In order to minimise the volume of leachate generated at the landfill, the landfill is operated in a phased manner with each phase being capped as soon as possible after completion of filling.

Phase 2 and Phase 3 of the landfill are engineered to prevent pollution of groundwater due to leachate migrating from the landfill. The engineered measures include the following:

- Construction of an engineered lining system in Phase 2 and Phase 3 of the landfill;
- Leachate collection by a combination of drainage gravel and pipework on the floor of the cells;
- Leachate removal by electric pumps positioned at the low points of the cells;
- A SCADA system in Phase 3 to monitor leachate levels in lined cells and leakage into the leak detection/collection layer. Leachate is stored in the leachate lagoon/leachate tanks pending removal off site; and
- Transport of leachate by enclosed road tankers to Bagenalstown and Mortarstown waste water treatment plants for safe treatment.

3.6.3 Landfill Gas

Landfill gas is generated as a result of the biodegradation of the organic component of the wastes. The composition of landfill gas varies depending upon the nature of the waste, age and landfill operations. Gaseous emissions at this landfill site consist primarily of methane (CH₄) and carbon dioxide (CO₂).

A network of landfill gas collection pipes have been incorporated as part of the final capping of cells 1-13 and Phase 1. The gas collection system consists of vertical gas extraction wells drilled into the existing waste mass at approximately 40 meter centres. The wells are actively abstracted and are directed to the flare.

3.6.4 Monitoring Locations

Monitoring infrastructures for landfill gas, leachate, groundwater and dust have been installed at a number of locations on the site. Additional monitoring locations for noise, surface water and odour have also been identified at the facility. Proposals for revised monitoring locations were submitted to the Agency in April 2008 and approval was received. The revised locations are presented on a map contained in Appendix 5 of this report.

3.6.5 Site Security

Site security consists of:

- a chain link perimeter fence; and
- closed circuit television (CCTV) network.

CCTV is provided at the site entrance and at selected points around the site perimeter and within the site. 24hr surveillance is carried out by an external monitoring company. The site office is equipped with an intruder alert alarm and is also monitored by an external monitoring company.

Monitoring, logging and supervision of all visitors is carried out. Every visitor to the site is required to log in at reception.

The existing chainlink fencing and gate are regularly maintained. A security gate is provided at the site entrance and is locked while the facility is closed. Site staff hold copies of all keys.

The site is open to the general public, local authority and permitted commercial waste contractors.

The perimeter fence is maintained and any observed damage repaired immediately. The fence will be inspected on a weekly basis.

3.6.6 Site Access & Internal Roads

The site entrance is located along third class road off the N9 south east of the old landfill.

General Public entering the site to dispose of waste proceed from the entrance to the weighbridge where access is controlled by a ticketing system.

Access to the CAS is controlled by a coin box at the entrance barrier.

All visitors to the site including monitoring personnel must report to the site office and sign a visitor's register at the time of entering and leaving the site. Waste disposal contractors do not have to report to the site office as their entry is controlled via the weighbridge system.

Access to the site outside of normal operational hours is not permitted unless specifically authorised and supervised by the Landfill Manager. Only persons depositing waste or recyclables, involved in monitoring or otherwise authorised by the Landfill Manager shall be permitted access to the site.

Internal access roads are maintained in a satisfactory condition at all times. In dry weather, site roads and any other areas used by vehicles are sprayed with water as and when required in order to minimise airborne dust nuisance. Site personnel shall remove any debris falling on the site roads or the public road network in the vicinity of the facility.

3.6.7 Site Facilities

Site facilities include the weighbridges at the entrance and exit of the facility, weighbridge office, Civic Amenity Site, administration building and waste quarantine/inspection areas. In addition, a leachate lagoon and leachate storage tank, a storm water settlement pond, green waste area and domestic waste area are located on site.

Services on site include ESB, water supply, sanitary facilities and first aid facilities. The site administrative office is equipped with computers, modem, telephone, fax machine. A sensed lighting system is provided on site.

The heating for the office is supplied from an aboveground oil tank which is located adjacent to the office.

3.6.8 Landscaping

Cells 1-13 and Phase 1 within the landfill have the final cap in place and the area has been seeded with grass to reflect the surrounding landscape. Due regard was given to the EPA publication 'Landfill manuals- landfill restoration and aftercare'. The main entrance to the site consists of tarmac driveways, grass / lawn areas, shrubberies and native trees. A significant number of elder trees were planted along the northern boundary of the site.

3.6.9 Wheel Cleaning Infrastructure, Site Weighbridge

Vehicles entering the landfill to dispose of waste enter via a twin weighbridge system. Vehicles are weighed upon entry to the landfill. They may then proceed to dispose of their

waste material. A wheel wash is in place at the site and all vehicles travelling from the active landfilling area must pass through the wheel wash before they exit the site. Vehicles exit the site via the weighbridge where the vehicle is weighed and a charge is applied for the material that has been disposed of.

3.6.10 Surface water

Surface water run-off at Powerstown landfill is collected by a series of engineered channels and drains. All surface water run off is directed to a surface water retention pond, whereby suspended solids present in the water are allowed to settle before the water is discharged via an overflow pipe to the nearby Powerstown Stream.

Continuous monitoring (Total Organic Carbon (TOC), pH, conductivity) is carried out in the stormwater retention pond and is connected to the SCADA.

3.7 Site Operations

3.7.1 Operational Hours & Description of the Operation

Waste is accepted at the facility for disposal at the landfill between the hours of 8.30am and 4.00pm, Wednesday to Friday inclusive and between 8.30am and 12.30pm on Saturdays. The site is closed on Mondays and Tuesdays.

Waste is not accepted at the landfill on Sundays and Bank Holidays.

Treated sewage sludge shall be accepted at the facility only between the hours of 8.30am and 2.00p.m. Wednesday to Friday inclusive.

Materials will be accepted at the CAS only between the hours of 8.30am – 4.00pm Wednesday to Friday inclusive (Bank Holidays exempted), 8.30am – 12.30pm on Saturdays .

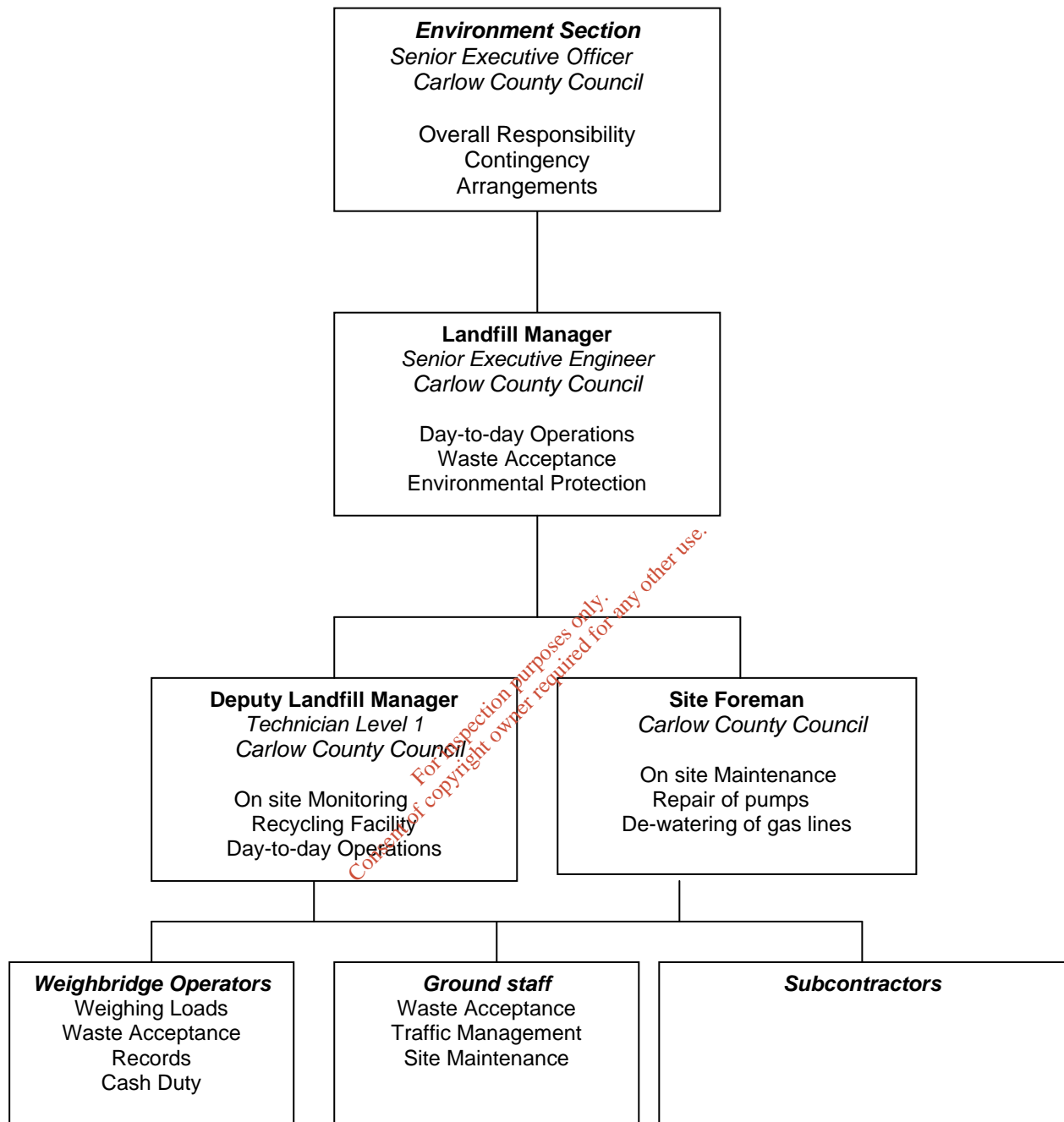
3.7.2 Staffing Levels

Carlow County Council has overall responsibility for the management and operation of the Powerstown facility. The Landfill Manager is responsible for the day-to-day site operation and implementation of the waste licence. The deputy manager is also involved in the day-to-day operation of the facility including the operation of the recycling facility and the weighbridge.

Other staff include a site foreman, two weighbridge staff, two ground staff and various subcontractors. The management structure for the facility is presented in Figure 2. Any proposed replacement in the management structure will be notified in advance in writing to the Agency. Details of the relevant education, training and experience held by management of the facility are provided in Appendix 1. Staff training records for all staff are maintained on site as part of the Health & Safety procedures for Powerstown Landfill.

Staff are present at all times at the site throughout the hours of operation to supervise the disposal of waste and the deposit of recyclable material, to deal with any emergency, site complaint or incident that may arise and to prevent unauthorised entry onto the facility.

Figure 1: Management Structure of Powerstown Landfill



3.7.3 Site Machinery

Site machinery at the facility includes heavy mechanical plant for site operation, two weighbridges and ancillary equipment for cleaning and maintenance purposes. All site machinery, pumps, generators and other electrical and mechanical equipment on site is maintained effectively to ensure safe site operations.

The following items of mobile and stationary plant are used at the facility:

- Landfill compactor;
- Track Machine;
- Dump truck;
- Road sweeper;
- Water Tanker;
- Weighbridge;
- Site tractor & trailers;
- Static compactors in CAS.

3.7.4 Filling Sequence

The site is being filled on a phased basis. The site has been divided into three phases:

- Phase 1 - is the old landfill which is capped.
- Phase 2 – Cells 1-13 which are fully lined and capped.
- Phase 3 – currently in operation, opened in 2006.

Phasing of landfill allows progressive use of the landfill area so that construction, operation and restoration can proceed in an orderly manner across the site. The phases are designed to enable

- Optimum utilisation of internal haul roads;
- Minimisation of double handling of materials on site;
- Use of cells for waste deposition to reduce leachate generation;
- The installation of appropriate leachate and landfill gas controls; and
- Management of surface water.

3.7.5 Control of Nuisance including waste placement and cover requirements

The facility and its immediate surrounds are inspected weekly for nuisances caused by litter, vermin, birds, flies, mud, dust and odours.

Vehicles

All traffic coming from the main landfill are pass through a wheel-wash prior to exiting the site. The wheel-wash consists of a combination of a dry shakeout and an underbody wheel-wash. All contaminated run-off arising from the wheel wash is collected and pumped to the leachate tank at the facility. In the event that mud and debris is carried from the site onto the public road, the landfill manager will arrange for the road to be cleaned. The wheel-wash is cleaned out and de-sludge as required.

Dust Control

During dry weather, the following measures are undertaken to ensure dust from the landfill and associated operations does not become a nuisance:

- water bowser used to spray roads;
- road sweeper machinery;
- wheelwash; and
- seeding of capped areas to establish vegetation cover.

The internal site roads are constructed of free draining material graded to a fall and maintained in a satisfactory condition at all times. The primary access road is cleaned at intervals consistent with preventing the deposition of mud on the local road network and minimising the generation of dust. Secondary internal access roads in the landfill area are constructed from suitable inert materials. Mud control on roads forms part of the routine site inspection programme.

In the event that mud and debris is carried off the site onto the public road due to inclement weather, the landfill manager shall arrange to have the road cleaned.

Litter Control

Routine litter patrols are carried out on a daily basis within the site and along the site access road. Any fly tipping, which occurs at the site entrance, is immediately collected. Every attempt is made to identify those responsible for such fly-tipping and undertake prosecutions under the Litter Pollution Act, 1997.

On windy days, the direction of tipping and compaction is influenced by the need to ensure protection from the prevailing wind direction. If conditions are exceptionally bad, a decision will be taken upon consultation with Senior Staff to close the landfill site.

All loads entering the site are required to be adequately covered to ensure that litter generation on site is kept to a minimum.

Careful management of the site, including rapid emplacement of the waste after deposition and the efficient use of cover material, will normally be sufficient to minimise the incidence of windblown litter. The active tipping area will be kept to the minimum area required to efficiently operate the site.

Any litter blown beyond the boundary of the site will be collected as soon as possible and disposed of on-site.

Odour Control

Waste is covered daily with granular material (generally clay). This allows the movement of gas and liquid through the waste. These measures reduce odorous emissions from putrescible waste.

Odours associated with landfill operations may be generated directly from the waste or from the emission of landfill gas. Control of odour is achieved by the placement, compaction and covering of waste in daily cells of restricted size and the extraction of gas from the active

area. Any waste with a significant odour problem will be refused entry to the site. Any waste identified as posing a potential odour problem will be covered immediately whilst general wastes will be covered with inert material at the end of each working day.

In the event that odorous wastes are required to be deposited at the site, this will be done in front of the working face and then covered immediately with other wastes or cover materials so that the noxious material is not within 1m of any operational surface by the end of the working day.

Effective landfill gas management practices and effective leachate management practices also help to reduce the problem of odour on site.

Pest Control

In general, landfills have the potential to attract vermin such as rats and flies and can lead to an increase in local populations of vermin in the vicinity of the landfill. These pests are controlled on site by the confinement of the active area within the landfill through the efficient placement and compaction of waste and the daily covering and phased capping of cells.

Specialist contractors, experienced in vermin control, are employed to control rat and fly populations at the facility.

Rodent infestations or flies are not currently a problem at the site.

Precaution is taken to avoid non-target species from coming in contact with vermin bait, e.g. Rodenticides. These precautions include:

- laying bait in areas not accessible to non-target species;
- strict control of the vermin population level; and
- where possible, the removal of any dead or dying vermin which may act as a food source for non-target species.

The current controls, on the whole, are effective and will be continued.

Scavenging Birds Control

Scavenging birds are a common source of nuisance at many landfills which accept household waste. They disturb compacted and partially covered waste whilst searching for food and may lead to complaints regarding food scraps, excreta and other waste dropped outside the facility boundary.

Good site management, including good compaction and efficient covering of the waste mass is considered the best method of minimising nuisance from birds. Carlow County Council employs good landfill practice in order to reduce nuisances as required by the Waste Licence.

Control of this nuisance is provided using the following control techniques:

- the application of daily cover in a restricted working area;
- the compaction of waste;
- the provision of netting around the working area restricts bird access, thereby discouraging scavenging; and
- the utilisation of birds of prey; falcons are used on a weekly basis.

-
- the utilisation of kites, a distress caller and a pistol on a daily basis

Where certain waste loads from particular companies attract an increased number of birds, these companies shall be requested to alter the waste composition where possible.

Noise Control

All machinery is maintained to good mechanical order. Machines that may be in intermittent use are shut down between work periods or are throttled down to a minimum. A speed restriction of 15 mph on the internal side roads minimises the noise generated by vehicles travelling within the site.

3.8 Complaints Register

Details of any complaints made by the public are recorded in a complaints register, which is held on site. The register includes the name of the complainant, the nature of the complaint, the date of the complaint and the actions taken to remedy the complaint. The Landfill Manager / Deputy Manager signs off the completed complaint form. The register is available for inspection, on site, by the general public. A sample report sheet is presented in Appendix 2.

3.9 Environmental Monitoring

Environmental monitoring is carried out in accordance with Condition 8 and Schedule D of the Waste Licence, to ensure that the activities at the site are not causing or likely to cause environmental pollution or harm to human health.

Site operations are monitored to assess compliance with the Waste Licence and the Environmental Management System and to measure any effect, the operating practice may have upon environmental control systems. Monitoring infrastructure which is damaged or proves to be unsuitable for its purpose will be replaced within three months of it being damaged or recognised as being unsuitable.

The following environmental parameters are monitored:

- Leachate;
- Landfill Gas;
- Ground water;
- Surface Water;
- Dust;
- Noise
- Meteorology.
- Odours
- Flare emissions
- Nuisance

Monitoring results are recorded and submitted to the Agency in accordance with Schedule E of the waste licence.

A Tier 3 Groundwater Risk Assessment was completed in 2014.

3.10 Procedures

The following procedures have been implemented as part of the EMP to ensure that the objectives of the environmental management system are achieved.

3.10.1 Awareness Training & Corrective Action Procedure

Carlow County Council has established and maintains a procedure regarding non-conformance, taking action to mitigate any impacts caused and initiating and completing corrective and preventative action.

Any corrective and preventative action taken to eliminate the causes of actual and potential non conformance shall be appropriate to the magnitude of the problems and commensurate with the environmental impact encountered. Changes to documented procedures arising from corrective and preventative action shall be implemented and recorded.

Condition 2.3.2.4 of the waste licence states that:

'The Awareness and training programme shall identify training needs, for personnel who work in or have responsibility for the licensed facility.'

Carlow County Council recognises the need to train employees to ensure that they have the appropriate knowledge and understanding of the potential impacts their work can have on the environment. Personnel within the Council performing specifically assigned tasks at the landfill shall be qualified on the basis of appropriate education and/or training as required.

An Awareness, Training & Corrective Action Procedure for the site has been established in 2011 and is presented in Appendix 3.

3.10.2 Emergency Response Procedure

The Emergency Response Procedure (ERP) for the facility was updated during 2014 and is included in the Safety Statement for the site which was submitted to the EPA. The procedure addresses any emergency situation which may originate on the site and includes provision for minimising negative impact to the environment as a result of any emergency situation.

The emergency response procedure will be reviewed where appropriate, particularly after occurrence of an accident or emergency situation on site, through the corrective action procedure. Training will be provided as deemed necessary.

3.10.3 Waste Acceptance Procedure

The Waste Acceptance Procedure re for Powerstown Landfill was revised during 2014. A copy of the revised procedure is presented in Appendix 4.

3.11 Closure Restoration and Aftercare Management Plan (CRAMP)

In accordance with condition 12.2.1 and 12.2.2 of the licence, Carlow County Council are required to establish, maintain and review a fund to assure the EPA they are financially capable of implementing the restoration and aftercare plan required by Condition 4. Carlow County Council, as a local authority, has made the necessary provisions, for the development, management, restoration and aftercare of Powerstown Waste Management Facility. Carlow County Council is committed to the ongoing provision of funding for all site development works, environmental monitoring costs and restoration and aftercare works at Powerstown Landfill for the duration of the waste licence.

The costs associated with the CRAMP are estimated and outlined in Table 4. These are best estimates based on current knowledge of existing site conditions and costs of such work at the present time. As capping of the old landfill (phase 1) and phase 2 are completed these costs are excluded from Table 4. A timescale of 30 years is used in developing aftercare costs. A contingency of 10% has also been included.

Table 4 Estimated Costs Associated with CRAMP

Operation	Total Cost
Closure	1,592,523
Restoration	51,000
Aftercare	4,765,990
Total	6,409,513

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APPENDICES

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APPENDIX 1

STAFF TRAINING

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Name: Pat Connolly

Position: Landfill Manager

Qualifications: Civil Engineering Degree

Courses:

- Requirements of Waste Licence
- FAS Waste Management Course
- Safety Statement for Site
- Safe Pass
- Use of Agresso Software System
- Landfill Gas Balancing
- Manual Handling
- Report Writing Skills

Name: Mary Walsh

Position: Deputy Landfill Manager

Qualifications: BSc. Hons. Industrial Environmental Science

Courses:

- Requirements of Waste Licence
- Safety Statement for Site
- FAS Waste Management Course
- Weils Disease and Issue of Cards
- Working At Heights
- Safe Pass
- Safe use of Bird Scaring Pistol
- Dignity at Work
- Electronic Preparation of AER
- Environmental Noise
- Workplace Safety Guidance Seminar
- Employee Induction
- Odour Assessment Practice
- Manual Handling

Name: John Nolan

Position: Acting Site Foreman

Qualifications: Leaving Certificate

Courses:

- FAS Waste Management Operatives Training
- Safety Statement for Site
- Landfill Gas Monitoring
- Weils Disease and Issue of Cards
- Outdoor Maintenance Work
- Manual Handling
- Working At Heights
- Safe Pass
- Dignity at Work
- Occupational First Aid and Use of Defibrillators
- FAS Waste Management Course
- Fire Safety Training
- Use of Gardening Equipment
- Landfill Gas Balancing

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APPENDIX 2
COMPLAINT RECORDING REPORT SHEET

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Environment Section

Facility Manager's Report Powerstown Landfill

C A R L O W
C O U N T Y C O U N C I L
COMHABLAIR CIONTAIE CHEATHARLOCHA



1. Subject:

Author:

Date:

Name of Complainant:

Address:

Weather Conditions;

Nature of Complaint:

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Response /Actions Required:

Signed on behalf of Carlow County Council

**Powerstown Landfill
Carlow**

APPENDIX 3
AWARENESS, TRAINING & CORRECTIVE ACTION PROCEDURE

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APPENDIX 4
WASTE ACCEPTANCE PROCEDURE

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Powerstown Landfill & Civic Amenity Site

Waste Acceptance Procedure

August 2014

Tuesday, 19 August 2014

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 2. Permitted waste types
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 8. Use of site weighbridge
 9. General Public Waste disposal Area
 10. Waste Disposal within the Active Area
 11. Load Rejection Procedure
 12. Civic Amenity Area
 13. Travelling on Site
 14. General Procedures
 15. Accidents and Breakdowns
- Appendix A: Waste Rejection Form
- Appendix B: Council Decision 2003/33/EC

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1. INTRODUCTION

The Environmental Protection Agency (The Agency) issued a waste licence, W0025-03, to Carlow County Council on 21-12-09 (now an Industrial Emissions Licence). Condition 5.2, on Waste Acceptance and Characterisation Procedures, requires that the following measures be put in place:

- Waste shall only be accepted at the facility from local authority waste collection or transport vehicles or holders of waste permits, unless exempted or excluded, issued under the Waste Management (Collection Permit) Regulations 2007. Copies of these waste collection permits must be maintained at the facility.
- Whole used tyres (other than bicycle tyres and tyres with an outside diameter greater than 1400mm) shall not be disposed of at the facility. Shredded tyres shall not be disposed of at the facility.
- No hazardous wastes, liquid wastes or asbestos wastes shall be disposed of at the facility.
- Within one month of the date of grant of this licence, the licensee shall submit to the Agency for its agreement updated written procedures for the acceptance and handling of all wastes. These procedures shall include details of the treatment of all waste to be carried out in advance of acceptance at the facility and shall also include methods for the characterisation, classification and coding of waste. The procedures shall have regard to Council Decision (2003/33/EC) establishing the criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 and Annex II to Directive (1999/31/ EC) on the landfill of waste. No waste which in the conditions of the landfill, is explosive, corrosive, oxidising, highly flammable or flammable as defined in EU Council Directive 91/689/EEC shall be accepted at the landfill.

In addition, conditions 5.3 – 5.8 require the following:

- Only waste that has been subject to treatment shall be accepted for disposal at the landfill facility.
- Treatment shall reflect published EPA technical guidance as set out in “**Municipal Solid Waste - Pre-treatment and Residuals Management**” (2009).
- With the agreement of the Agency, this condition shall not apply to inert wastes for which treatment is not technically feasible and other waste for which such treatment does not contribute to the objectives of the Landfill Directive as set out in Article 1 of the Directive by reducing the quantity of the waste or the hazards to human health or the environment.
- Gypsum wastes shall not be placed in any landfill cell accepting biodegradable waste.
- The dilution or mixture of waste solely in order to fulfil relevant waste acceptance criteria established under Condition 5.2.4 is prohibited,
- From 1 July 2010 to 30 June 2013 inclusive, a maximum of 47% by weight of municipal solid waste (MSW) accepted for disposal to the body of the landfill shall comprise biodegradable municipal waste (BMW), measured on a calendar year basis or, in 2010 and 2013, part thereof

- From 1 July 2013 to 30 June 2016 inclusive, a maximum of 30% by weight of MSW accepted for disposal to the body of the landfill shall comprise BMW, measured on a calendar year basis or, in 2013 and 2016, part thereof
- From 1 July 2016, a maximum of 15% by weight of MSW accepted for disposal to the body of the landfill shall comprise BMW, measured on a calendar year basis or, in 2016, part thereof unless an alternative has been agreed in writing by the Agency in accordance with Condition 5.6.2.
- The licensee shall determine the biodegradable municipal waste content of MSW accepted at the landfill. Waste that has been bio-stabilised in accordance with Condition 5.7.4 shall not be considered BMW.
- Bio-stabilised residual wastes meeting the requirements of Condition 5.7.4, or an alternative protocol as may be agreed with the Agency based on biological treatment process parameters (e.g. validated residence time and temperature parameters at the treatment facility), received at the landfill facility may be included in the determination of MSW quantities accepted at the facility for the purposes of Condition 5.6.1.
- In determining BMW content, the licensee shall use approved calculation factors for BMW content of municipal waste streams published by the EPA. With the agreement of the EPA, alternative factors can be used if they have been determined following waste characterisation carried out in accordance with EPA-approved characterisation protocols including, where appropriate, the use of EPA-approved contractors.
- In the case of bio-stabilised residual wastes, stabilisation means the reduction of the decomposition properties of the waste to such an extent that offensive odours are minimised and that the respiration activity after four days is <10 mg O₂/g DM until 1 January 2016 and <7mg O₂/g DM thereafter.
- The licensee is required to maintain on-site as part of their waste acceptance procedures and associated documentation, evidence to demonstrate compliance with Conditions 5.3.1

In order to assist in the waste characterisation process required by the above conditions the Agency has produced a report entitled “**Protocol for the Evaluation of Biodegradable Municipal Waste sent to Landfill by Pre-treatment Facilities**” (2011).

In addition, note should be taken of the following reports produced by the Agency:

- Municipal Waste Characterisation Manual 1996
- Municipal Waste Characterisation Reports 2005, 2009

The current licence requirement, as advised by the Agency on 2-8-2012 is for the following waste biodegradable contents:

Time period	Existing % BMW Limit	New % BMW limit specified
To 30 June 2013	47%	55%
1 July 2013 – 30 June 2016	30%	40%
From 1 July 2016	15%	15%

2. PERMITTED WASTE TYPES

Waste Licence W0025-03 allows for the following waste types and tonnages:

Waste Type	Maximum tonnes per annum
Household (residual)	30,000
Commercial	7,000
Treated Sewage Sludge	500
Construction & Demolition	1,000
Industrial Non-Hazardous Solids	1,500
Total	40,000

3. GENERAL WASTE ACCEPTANCE CRITERIA

Council Decision 2003/33/EC sets out procedures for the acceptance of waste at landfills in three stages:

- Basic characterisation
- Compliance testing
- On-site verification

Basic Characterisation

Basic characterisation is the first step in the acceptance procedure and constitutes a full characterisation of the waste by gathering all the necessary information for a safe disposal of the waste in the long term. Basic characterisation is required for each type of waste.

Functions of basic characterisation

- (a) Basic information on the waste (type and origin, composition, consistency, leachability and, where necessary and available, other characteristic properties)
- (b) Basic information for understanding the behaviour of waste in landfills and options for treatment as laid out in Article 6(a) of the Landfill Directive
- (c) Assessing waste against limit values
- (d) Detection of key variables (critical parameters) for compliance testing and options for simplification of compliance testing (leading to a significant decrease of constituents to be measured, but only after demonstration of relevant information). Characterisation may deliver ratios between

basic characterisation and results of simplified test procedures as well as frequency for compliance testing.

If the basic characterisation of waste shows that the waste fulfils the criteria for a landfill class as laid down in section 2 of this Annex, the waste is deemed to be acceptable at this landfill class. If this is not the case, the waste is not acceptable at this landfill class. The producer of the waste or, in default, the person responsible for its management, is responsible for ensuring that the characterisation information is correct. The operator shall keep records of the required information for a period to be defined by the Member State.

Fundamental requirements for basic characterisation of the waste

- (a) Source and origin of the waste
- (b) Information on the process producing the waste (description and characteristics of raw materials and products)
- (c) Description of the waste treatment applied in compliance with Article 6(a) of the Landfill Directive, or a statement of reasons why such treatment is not considered necessary
- (d) Data on the composition of the waste and the leaching behaviour, where relevant
- (e) Appearance of the waste (smell, colour, physical form)
- (f) Code according to the European waste list (Commission Decision 2001/118/EC)
- (g) For hazardous waste in case of mirror entries, the relevant hazard properties according to Annex III to Council Directive 91/689/EEC of 12 December 1991 on hazardous waste
- (h) Information to prove that the waste does not fall under the exclusions of Article 5(3) of the Landfill Directive
- (i) The landfill class at which the waste maybe accepted
- (j) If necessary, additional precautions to be taken at the landfill
- (k) Check if the waste can be recycled or recovered.

Testing

As a general rule waste must be tested to obtain the above information. In addition to the leaching behaviour, the composition of the waste must be known or determined by testing. The tests used for basic characterisation must always include those to be used for compliance testing.

The content of the characterisation, the extent of laboratory testing required and the relationship between basic characterisation and compliance checking depends on the type of waste. A differentiation can be made between:

- (a) wastes that are regularly generated in the same process;
- (b) wastes that are not regularly generated.

The characterisations outlined in points (a) and (b) will provide information that can be directly compared with acceptance criteria for the relevant class of landfill and, in addition, descriptive information can be supplied (e.g. the consequences of depositing with municipal waste).

(a) Wastes regularly generated in the same process

These are individual and consistent wastes regularly generated in the same process, where:

- the installation and the process generating the waste are well known and the input materials to the process and the process itself are well defined,
- the operator of the installation provides all necessary information and informs the operator of the landfill of changes to the process (especially changes to the input material). The process will often be at a single installation. The waste can also be from different installations, if it can be identified as single stream with common characteristics within known boundaries (e.g. bottom ash from the incineration of municipal waste).

For these wastes the basic characterisation will comprise the fundamental requirements listed above and especially the following:

- compositional range for the individual wastes,
- range and variability of characteristic properties,
- if required, the leachability of the wastes determined by a batch leaching test and/or a percolation test and/or a pH dependence test,
- key variables to be tested on a regular basis.

If the waste is produced in the same process in different installations, information must be given on the scope of the evaluation. Consequently, a sufficient number of measurements must be taken to show the range and variability of the characteristic properties of the waste. The waste can then be considered characterised and shall subsequently be subject to compliance testing only, unless significant change in the generation processes occur.

For wastes from the same process in the same installation, the results of the measurements may show only minor variations of the properties of the waste in comparison with the appropriate limit values. The waste can then be considered characterised, and shall subsequently be subject to compliance testing only, unless significant changes in the generation process occur.

Waste from facilities for the bulking or mixing of waste, from waste transfer stations or mixed waste streams.

Material submitted from waste collectors, can vary considerably in their properties. This must be taken into consideration in the basic characterisation. Such wastes may fall under case (b).

(b) Wastes that are not regularly generated

These wastes are not regularly generated in the same process in the same installation and are not part of a well-characterised waste stream. Each batch produced of such waste will need to be characterised. The basic characterisation shall include the fundamental requirements for basic characterisation. As each batch produced has to be characterised, no compliance testing is needed.

Cases where testing is not required

Testing for basic characterisation can be dispensed with in the following cases:

- (a) the waste is on a list of wastes not requiring testing as laid down in section 2 of this Annex;

(b) all the necessary information, for the basic characterisation, is known and duly justified to the full satisfaction of the competent authority;

(c) certain waste types where testing is impractical or where appropriate testing procedures and acceptance criteria are unavailable. This must be justified and documented, including the reasons why the waste is deemed acceptable at this landfill class.

Compliance testing

When waste has been deemed acceptable for a landfill class on the basis of a basic characterisation pursuant to section 1, it shall subsequently be subject to compliance testing to determine if it complies with the results of the basic characterisation and the relevant acceptance criteria as laid down in section 2.

The function of compliance testing is periodically to check regularly arising waste streams.

The relevant parameters to be tested are determined in the basic characterisation. Parameters should be related to basic characterisation information; only a check on critical parameters (key variables), as determined in the basic characterisation, is necessary. The check has to show that the waste meets the limit values for the critical parameters.

The tests used for compliance testing shall be one or more of those used in the basic characterisation. The testing shall consist at least of a batch leaching test. For this purpose the methods listed under section 3 shall be used.

Wastes that are exempted from the testing requirements for basic characterisation are also exempted from compliance testing. They will, however, need checking for compliance with basic characterisation information other than testing.

Compliance testing shall be carried out at least once a year and the operator must, in any event, ensure that compliance testing is carried out in the scope and frequency determined by basic characterisation.

Records of the test results shall be kept for a period that will be determined by the Member State.

On-site verification

Each load of waste delivered to a landfill shall be visually inspected before and after unloading. The required documentation shall be checked.

For waste deposited by the waste producer at a landfill in his control, this verification maybe made at the point of dispatch.

The waste maybe accepted at the landfill, if it is the same as that which has been subjected to basic characterisation and compliance testing and which is described in the accompanying documents. If this is not the case, the waste must not be accepted.

Member States shall determine the testing requirements for on-site verification, including where appropriate rapid test methods.

Upon delivery, samples shall be taken periodically. The samples taken shall be kept after acceptance of the waste for a period that will be determined by the Member State (not less than one month).

4. PRE-TREATMENT REQUIREMENTS

- The waste licence requires that all waste is pre-treated in advance of landfill disposal. The minimum acceptable requirement, as advised by the Agency, is for a source segregated collection system (2-bin or equivalent) for all waste. For urban areas greater than 1,500 populations, diversion or separate collection of biowaste is required. This is required in order to comply with the BMW targets in section 1.
- Biodegradable Municipal Waste (BMW) means the biodegradable component of municipal waste, and does not include bio-stabilised waste. Biodegradable municipal waste is typically composed of food and garden waste, wood, paper, cardboard and textiles.
- The biodegradable factor is the estimated percentage (wet weight) of organics, paper, cardboard and 50% of the estimated percentage (wet weight) of textiles, unclassified combustibles, wood and fines found in MSW.
- The Annual Environmental Report will contain a section on waste acceptance and audit policy to satisfy the Agency that only pre-treated waste has been accepted at the facility.
- In order to assist in the process the Agency has developed a protocol for the evaluation of biodegradable municipal waste sent to landfill by pre-treatment facilities. Facilities which send waste to Powerstown Landfill are required to report BMW content of waste in accordance with the requirements of the above document. Such facilities include Transfer Stations and MBT plants.
- Transfer Stations will be evaluated using pre-determined EPA BMW factors or results from approved waste characterisation studies.. Street cleaning waste should be included as “one-bin waste” with the same factor.
- MBT facilities are required to carry out quarterly waste characterisation surveys as described in the protocol.
- For Biological Treatment plants such as composting the Respiration Activity Test (AT4) will be required (or equivalent agreed by the Agency) in order to demonstrate that the material is a stabilised biowaste. Material which reaches the standard of 10 mg O²/g DM will not be considered BMW.
- For waste which is delivered directly to the landfill by the public (and small contractors) evidence will be required that the waste has been segregated into equivalent 3-bin components. It is felt that diversion of food waste, paper, cardboard, textiles and wood will be sufficient to meet the pre-treatment targets, this is based on the most recent Agency Waste Characterisation reports for household and commercial waste.
- For MSW waste delivered directly from kerbside collections to the landfill quarterly characterisation reports will be required as described in the protocol.

- At Powerstown Landfill the system to be operated will be the equivalent of a three-bin system and the above approved EPA factors will be used for reporting purposes.

5. ON-SITE CHARACTERISATION

- Where required, as detailed in Section 3, waste will be subject to compliance and verification tests. Two waste quarantine areas are provided for this work. The procedures shall have regard to Council Decision 2003/33/EC establishing the criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 and Annex II to Directive (1999/31/ EC) on the landfill of waste.
- Sampling will be carried out using updated Agency guidelines to be developed in 2010.
- Testing will primarily be carried out in order to:
 - Check on BMW contents of deliveries from the public, kerbside collections and treatment facilities
 - Check leaching limit values contained in section 2.2.2 of Council Decision 2003/33/EC where this is required for non-municipal waste
 - Check that the wastes are allowable under licence conditions
- Samples taken for on-site verification testing shall be retained on site for two months

6. PARTICULAR WASTE TYPES

- Whole used tyres (other than bicycle tyres and tyres with an outside diameter greater than 1400mm) shall not be disposed of at the facility. Shredded tyres shall not be disposed of at the facility.
- No hazardous wastes shall be disposed of at the facility.
- No asbestos wastes shall be disposed of at the facility.
- No liquid wastes shall be disposed of at the facility.
- Gypsum wastes shall not be placed in the landfill, a separate collection container has been provided
- Sewage and drinking water sludge shall be subject to treatment and must achieve a minimum solids content of 17% prior to acceptance at the facility. All sludge must be covered immediately with other waste. This waste is limited to 500 tonnes per annum for sewage sludge and 1,500 for other industrial sludges.
- Street sweeping wastes and other similar wastes generated by local authority activities shall be pre-treated prior to acceptance at the landfill. This pre-treatment will be the equivalent of a three-bin system.

- Wastes which originate from fly-tipping and which are collected by the local authority will not be pre-treated. This decision is based on health and safety advice, it is felt the segregation process would pose an unacceptable risk to workers.

- The following wastes are not subject to a charge at the landfill:

Fly-tipping wastes collected by Carlow County Council

Street-cleaning wastes and similar wastes generated by Carlow County Council

Cover material if deemed suitable for covering purposes (if deemed unsuitable the relevant gate fee will apply)

C&D materials used for road construction if deemed suitable for construction purposes (if deemed unsuitable the relevant gate fee will apply)

7. ENTRY TO SITE

- All vehicles entering the site should adhere to the speed limit of 15km/hr and approach the weighbridge taking due caution for other site users.
- All waste contractors shall be in possession of a current waste Collection permit and shall maintain a copy in the waste vehicle.
- Loads being delivered must be in a secure container with hard sides and, at a minimum, a net type cover. Vehicles not in compliance will be advised and not allowed access to the site.
- Unsafe vehicles, plant or equipment will not be allowed access to the landfill site.
- Drivers and visitors must follow site operators' directions or instructions whilst on the site area.
- All drivers/Contractors entering the active area, when outside the confines of their vehicle, must wear approved safety footwear, high visibility vests/jackets and safety helmets. This applies both at the tipping face and when off-loading or loading containers at designated storage areas.
- Access to the site outside of normal operational hours shall not be permitted unless specifically authorised and supervised by Carlow County Council.
- The entrance gates shall be locked at all times when the site is not in operation.
- Smoking is not permitted on the site.

8. USE OF THE SITE WEIGHBRIDGE

- Vehicles must approach the entry weighbridge with caution.
- The weighbridge operatives shall check waste documentation on receipt at the weighbridge
- For non pre-cleared customers a visual inspection of waste will be carried out at the waste disposal area

- The driver must stop at the ticket machine located at the entry barrier. Once the weighbridge is clear the driver should press the button to obtain an entry ticket. If the customer is a licensed haulier in possession of a valid swipe card the driver should swipe the card at the swipe card machine and follow the on screen instructions.
- When the entry barrier lifts the driver should drive carefully onto the weighbridge ensuring that the vehicle is safely positioned. The driver should then press the yellow button while on the weighbridge and the second barrier will lift to permit entry to the site. If the driver has used a swipe card at barrier #1 they should also swipe the card at the swipe card machine while on the weighbridge and follow the on screen instructions. When barrier #2 lifts the driver may should exit the weighbridge and proceed to the appropriate tipping area.

9. GENERAL PUBLIC WASTE DISPOSAL AREA

- Drivers must not enter or manoeuvre onto or around the disposal area until it is clear to do so.
- Loads may be discharged only where directed by site staff, taking care to use prepared areas. **IF IN DOUBT, ASK.**
- Waste should be directed into the biodegradable / paper, cardboard / residual skips as appropriate. Unsegregated waste will not be accepted.
- Periodic checks will be carried out on the waste composition by directing loads to the waste quarantine area for analysis. These checks will be documented for reporting to the Agency.
- Container / trailer doors must be secured open prior to unloading, then closed and re-secured immediately after the load is unloaded.
- A landfill operative will visually inspect the waste deposited and check that the waste load only consists of non-hazardous waste.
- If the landfill operative suspects that hazardous waste has been deposited he will contact the Facility Manager who will determine whether the load should be rejected, suspended or re-defined
- After off-loading, vehicles must clear the disposal area immediately and leave the site without unnecessary delay.
- All vehicles must return to the weighbridge to weigh out before leaving the site.

10. WASTE DISPOSAL WITHIN THE ACTIVE AREA

- Driver / hauliers unloading large quantities of waste and / or in possession of a trailer / container that may be tipped should proceed, after the weighbridge, directly with residual waste to the waste acceptance area within the active area of the landfill.
- Prior to this it will be a requirement that waste should be directed into the biodegradable / paper, cardboard / active cells as appropriate. Unsegregated waste will not be accepted.

- Periodic checks will be carried out on the waste composition by directing loads to the waste quarantine area for analysis. These checks will be documented for reporting to the Agency.
- Drivers must follow all instructions by plant operators and landfill employees while in the Active Area.
- Drivers must take care when reversing at the tip face, looking out for obstructions or unstable ground. Drivers should observe and take care in respect of the movement of landfill equipment and other personnel on site.
- Drivers must remain up-wind while the load is being discharged.
- Drivers/operators must take care when releasing jammed loads.
- Once the load has been discharged the driver must clean, if necessary, any excess mud from the vehicle tailgate within the operational area.
- Drivers must lower and secure the body of the vehicle before moving out of the tipping area.
- All vehicles should return to the weighbridge to weigh out, passing through the wheel wash before leaving the site.
- In the event that mud and debris is carried from the active site onto the asphalt roads due to inclement weather conditions, the Facility Manager shall arrange that the road be cleaned with a road sweeper.
- The compaction plant will level and compact the deposited waste over and down the flanks of the working face. The working face of the landfill shall be no more than 2.5 meters in height after compaction, no more than 25 meters wide and have a slope no greater than 1:3.
- The compaction plant will progressively cover the waste with suitable material as soon as is practicable and in any event at the end of the working day.
- Drivers/operators must maintain at least one vehicle's length between their vehicle and others using the site.
- Only one vehicle is allowed to use the cell access road at any time.
- If a vehicle becomes stuck, the landfill operatives will endeavour to free the vehicle using the landfill plant. The driver must attach the tow chain to the vehicle. Any vehicle, which is stuck, must not be pushed by any other vehicle or landfill plant.
- Drivers should report any breach of this procedure to the weighbridge clerk or the facility manager before departing the location.
- All waste shall be checked at the working face. Any waste deemed unsuitable for acceptance at the facility and/or in contravention of this licence shall be immediately separated and removed from the facility at the earliest possible time. Temporary storage of such wastes shall be in a designated Waste Quarantine Area. Waste shall be stored under appropriate conditions in the quarantine area

to avoid putrefaction, odour generation, the attraction of vermin and any other nuisance or objectionable condition.

- **Any hot or burning loads will be rejected and immediately removed from the landfill.**

11. LOAD REJECTION PROCEDURE

- When a problem is identified with a waste load the Facility Manager will be notified immediately.
- Problem loads may be identified at a number of points, with the measures to be implemented as follows:
 - (a) Within the public area:- the waste load will be isolated by the landfill operative, where necessary using a cordon.
 - (b) At the weighbridge: the weighbridge operator will direct the vehicle to the designated waiting area, or the container will have a “Quarantine waste” sign placed on it.
 - (c) At the active area: the waste should not be unloaded or disturbed. Site staff should report the issue to the manager and a visual inspection of the load should be carried out. The manager will then decide whether or not it is ok to proceed with the unloading of the material or whether the load should be removed to quarantine for further inspection.
- When a waste load is placed under quarantine and subsequently rejected the landfill manager will isolate and suitably sign the load. A waste rejection form will be completed and a copy of this form will be kept for weighbridge records.
- If after inspection, testing or paperwork check, it is decided that the waste can be accepted, the sign or cordon will be removed.
- Before rejecting a load the Facility Manager considers the following:
 - (a) At what point in the process has the waste been isolated, i.e. has the load just arrived on site, is the load in a designated waiting /holding area or has it been deposited.
 - (b) Is the basis for rejection because the waste description/analysis does not meet the existing description (non-conforming) and/or the waste does not comply with the sites waste licence application or a regulation (non-compliant).
 - (c) The safety and environmental implications of rejecting a load, rather than holding in quarantine at the site whilst the Environmental Protection Agency is informed.
- Deposited waste which is to be rejected will be loaded onto the transport vehicle under the supervision of the Facility Manager/Deputy Manager who will ensure that it is safe for transport.
- If the rejected waste is classified as hazardous, the Facility Manager will contact the Environmental Protection Agency.
- The Facility Manager may, at his/her discretion direct that a waste load be tipped in the waste inspection area. If the suspect load is considered to be a problem load then the procedures outlined above are carried out.

- All rejected loads of waste are recorded in a weighbridge record book and the report of the incident is sent to the waste enforcement section of Carlow County Council. This will be investigated under the Waste Management Act 1996 -2008 and followed up with a section 18 Notice. Findings from this notice are reported to the landfill manager who in turn notifies the EPA of the final destination of the load.

12. CIVIC AMENITY AREA

- Materials accepted at the Civic Amenity Area are as follows:
 - Paper
 - Cardboard
 - Glass bottles
 - Glass sheet
 - Timber
 - Textiles
 - Cans
 - WEEE
 - Scrap Metal
- The Civic Waste Facility shall be used only by private vehicles. The facility shall not be used as a transfer station for disposal of waste by commercial waste disposal contractors or local authority waste collection vehicles.
- All waste deposited in the Civic Waste Facility shall be either:- a) Into a skip; b) Into the hopper of a compactor for disposal; c) Into a receptacle for recovery; and d) In the case where inspection is required, into a designated inspection area.
- Each container at the Civic Waste Facility will be clearly labelled to indicate their contents.
- At the end of the working day the ground around the Civic Waste Facility shall be cleared of waste.
- Pets are not allowed out of the vehicle in the civic amenity area.
- Children are allowed to participate in the recycling of household waste in the Civic Amenity Area only under the supervision of a responsible adult (>18) and must be kept under such supervisions at all times in the Civil Amenity Area. All users of the civic amenity area should adhere to the designated pedestrian routes.
- The operatives will routinely check and clean the area of any debris, broken glass, metals etc. which may be scattered about the general area and not in the containers.
- Operatives will notify the relevant collection bodies when skips, containers and bottle banks are nearing their full capacity.

- The civic amenity area will be visually inspected on a daily basis and a documented inspection will be carried out on a weekly basis. These reports will be filed on site for inspection by staff of the Agency
- When skips are being changed, the area shall be cordoned off from the public.
- Due to the proximity of the civic amenity area to the weighbridge and site entrance drivers are to take care when travelling in the vicinity of the civic amenity area.

13. TRAVELLING ON SITE

- Drivers must follow all site routing instructions and direction signs, on entering and leaving the site.
- The speed limit for vehicles on site is restricted to 15 km/hr, however drivers must drive at a lower speed if prevailing conditions so demand.
- All vehicles, plant and equipment will be operated in a manner showing due care and attention to safety, having regard to all circumstances prevailing at the time.
- Drivers must travel on signposted and prepared site roads only and must not deviate from these routes unless under the direction of site staff.
- Drivers must take care of personnel, plant and other vehicles when reversing.
- All plant on site must have reversing beepers fitted.
- Drivers must not overtake another vehicle on the haul road unless it has broken down.
- In conditions of fog or darkness or poor visibility dipped headlights must be used.
- Site plant shall use flashing beacons.
- Drivers parking and leaving vehicles must ensure the brakes are full on, the engine is stopped and the vehicle is in gear.
- Any damage or accidents occurring on this site involving personnel or vehicles must be reported to the Facility Manager at the time of the incident.

14. GENERAL PROCEDURES

- Care should be taken when handling waste; as a minimum, gloves should be worn.
- In the interest of safety and hygiene, persons should wash their hands after leaving the site and before eating or drinking.
- Apart from those authorised to collect recovered recyclables, no person shall remove materials from the site.

- No vehicles or plant will be operated during the hours of darkness unless adequate artificial lighting is provided for operating conditions.
- Spot checks will be carried out on a random basis by authorised persons, in order to check and assess the integrity of loads, and to comply with the site waste licence conditions. Appropriate records of such checks will be maintained.
- No material will be burned on the site. In the event that fire breaks out it will be treated as an emergency and dealt with immediately.
- Internal site access roads will be maintained in a satisfactory condition at all times. The primary site access road shall be cleaned at intervals consistent with preventing the deposition of mud on the public highway and minimising the generation of dust.
- Routine litter patrols will be carried out as necessary around the site perimeter along the access road from the filling area to the site entrance off the public highway. Any fly tipping which occurs at the site entrance or on the access road shall be immediately cleaned up. Every attempt shall be made to identify those responsible for such fly tipping.
- Site rules will be reviewed annually.

15. ACCIDENTS AND BREAKDOWNS

- Any accident or incident must be reported to site staff and will be dealt with in accordance with the Emergency Response Procedure for the site.
- In the event of breakdown in the active fill area of the tip face, if possible, the vehicle should be moved to a safe area, where it does not obstruct other site users. The incident should be reported to site staff and arrangements should be made for the recovery/repair of the vehicle.
- If the vehicle is unable to move off the site under its own power the vehicle must not be pushed. Assistance should be requested from the site staff to recover the vehicle.
- It is the vehicle driver's responsibility to affix and detach from his vehicle any tow chain. Take care to ensure that any tow chain is fixed securely prior to being towed.

This form should be completed by the facility manager

Powerstown Landfill
Powerstown, Co. Carlow
Telephone 059 9172406 Fax 059 9146356
Waste Licence: W0025-03

WASTE REJECTION FORM

CUSTOMER	
Name	
Address	
Contact Name	
Telephone Number	Fax Number
WASTE CARRIER	
Name <i>As above</i> Yes <input type="checkbox"/> No <input type="checkbox"/>	
Address	
Waste Collection Permit Number	
<i>Please submit copy of collection permit</i>	
Contact Name	
Telephone Number	Fax Number
WASTE DETAILS	
Description of the Process from which Waste Arises	

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Physical Description of the Waste(Colour , Physical Form, Odour)

Chemical Composition of the Waste -

Description of Treatment of Waste

European Waste Catalogue Number (EWC) // (6 Digit)

Is the waste classified as Hazardous Waste under the EU Hazardous Waste List Yes No

Waste Quantity (Tonnage/No of bags etc)

Delivery Method (All vehicles must have automatic nettings if the nets are above 1.5 m high. Articulated tipping trucks are prohibited)

Does the Waste Contain any of the Following?

Hazardous Waste Yes No

Liquid Waste Yes No For Filtercakes please specify the % solids content and attach
Filtercakes Yes No analysis.

Additional Information / Reason for Rejecting Load

.....

.....

.....

AUTHORISED PERSONS

Signed on behalf of customer

Name: **Date:** / /

Position

Contact number:

Signed on behalf of Carlow County Council

Name: **Date:** / /

Position

Contact number:

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APPENDIX 5
MAP OF MONITORING LOCATIONS

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Appendix D.1

(Documents in support of Attachment D.1)

Leachate Management Plan

Leachate Handling Procedure

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ENVIRONMENTAL BALANCE IN DESIGN AND CONSTRUCTION

POWERSTOWN LANDFILL LEACHATE MANAGEMENT PLAN & PROCEDURES November 2014



POWERSTOWN LANDFILL

LEACHATE MANAGEMENT PLAN & PROCEDURES

User is Responsible for Checking the Revision Status of This Document

Rev. Nr.	Description of Changes	Prepared by:	Checked by:	Approved by:	Date:
0	Final Issue	TR/MG	NM	BG	19.11.2014

Client: Carlow County Council

Keywords: Landfill, lined, unlined, leachate, surface water, contamination, storage, treatment

Abstract: This is a plan to effectively manage the leachate generated at Powerstown landfill site. The plan establishes procedures to regulate the decisions taken, and to provide for greater efficiency and effectiveness, with regard to leachate management.

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1. INTRODUCTION

Powerstown landfill is owned and operated by Carlow County Council (CCC). The site is licensed by the Environmental Protection Agency (EPA), Industrial Emissions (IE) Licence Reg. No. W0025-03.

Powerstown Landfill commenced waste acceptance in 1975. There are both engineered lined cells (Phases 2 and 3) and older unlined landfill cells (Phase 1) at Powerstown. Leachate is collected from leachate extraction wells and is pumped to either a leachate lagoon or a leachate tank. The leachate is tankered off-site from the lagoon and the tank to a wastewater treatment plant (WWTP).

Leachate produced at the landfill has historically been transported off-site to one of two WWTPs (Mortarstown and Bagnelstown). It is currently tankered to Mortarstown WWTP. This plant was owned and operated by CCC until the establishment of Irish Water in 2014.

Discussions are currently underway with Irish Water regarding to agree pricing arrangements for leachate deliveries to Mortarstown WWTP. The plant has already been provided with a dedicated leachate storage tank which can pump to the main aeration tanks at a constant rate. Mortarstown WWTP currently has spare capacity (2013 AER).

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2. CURRENT LEACHATE MANAGEMENT

2.1 Capping Works & Cell Development

The landfill has been developed in three phases; Phase 1 is unlined and operated on the principal of dilute and disperse. It was operational from 1975 to 1990. Phase 2 is made up of Cells 1-13. Cells 1-6 are lined with a single HDPE liner and Cells 7-13 are lined with a single HDPE liner underlain by engineered clay. Phase 2 was operational from 1991 to 2006. Phase 3 (cells 15-18) is fully engineered in accordance with the requirements of the Landfill Directive (99/31/EC). It commenced waste acceptance in 2007 and remains active. (There is no Cell 14.)

The facility has been in operation since 1975 and is licensed (W0025-03) to accept 40,000 tonnes per annum of waste. Phases 1 and 2 of the landfill have been permanently capped, Cells 15 and 16 are filled and have an intermediate cap. Cell 17 is being filled and Cell 18 has been constructed but remains unfilled to-date. Drawing No. LW14-120-02-001 Rev A in this Attachment (D.1) shows the site layout and infrastructure.

2.2 Leachate Production Zones

The site has been divided into a number of leachate generation zones, see Table 2.1 below.

Table 2.1 Leachate production zones based on existing site layout

Location	Zone	Plan Area (m ²)
Phase 2 Cells 1 -13	1	35,000
Phase 3 Cells 15-16	2	17,000
Phase 3 Cells 17-18	3	15,000
Paved Areas	4	3,718

These zones are described as:

- Zone 1 - area that received an engineered cap in 2006. For leachate production 3% infiltration of rainfall was assumed.
- Zone 2 – to be capped in 2016. 3% Infiltration of rainfall was assumed.
- Zone 3 – active area, 30% infiltration was assumed.
- Zone 4 – paved areas, runoff co-efficient 100%

Leachate production for respective zones is presented in Table 2.2. The production is based on the existing site layout, plan area of each zone, rate of infiltration for leachate production and average annual rainfall at the site.

Table 2.2 Estimated Leachate Production for 2017 based on existing site layout

Zone	Plan Area (m ²)	Estimated Leachate Production* (m ³) 2017
1	35,000	735
2	17,000	357
3	15,000	3,360
4	3,718 (1,000 post 2019)	3,718
Total		8,170
Predicted Leachate production for 2024		2,428

*Annual average rainfall recorded is approximately 700mm

In 2013, CCC tankered 10,600 m³ of leachate from Powerstown landfill to Mortarstown WWTP.

As indicated in Table 2.2, the predicted volume of leachate production in 2017 and beyond will decrease as capping of Phase 3 progresses.

2.3 Leachate Infrastructure

2.3.1 Leachate Extraction pumps

There are 10 No. leachate extraction wells at Powerstown landfill. Cells 9-13 operate using pneumatic extraction pumps. The other cells operate via electrical pumps.

2.3.2 Leachate Level Monitoring

Leachate level monitoring is carried out at 12 locations which include the 10 well locations, the leachate lagoon and the leachate tank. The levels are recorded continuously in Cells 15 -17 by SCADA (to include Cell 18 once active) and manually on a weekly basis in Cells 1-13, in the lagoon and the tank.

Leachate levels are maintained so as not to exceed 1 m above the liner, as stated in the licence (W0025-03).

2.3.3 Leachate Extraction Monitoring

The SCADA records the volume of leachate that is extracted from the landfill by the pumps from cells 15-17. The SCADA records the volume of leachate that is stored in the leachate tank at any given time.

2.4 Transporting leachate off-site

CCC has retained a haulage contractor to tanker the leachate from Powerstown landfill to the Mortarstown WWTP.

Each tanker is capable of making 6 return trips to Mortarstown WWTP per day. The tanker usually operates 3 days a week.

Section 2

There are leachate handling procedures in place to ensure the safe handling and transportation of the leachate both at Powerstown Landfill and the WWTP.

Leachate quantities taken off site are monitored via the weighbridge.

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3. LEACHATE MANAGEMENT PROCEDURES

The following leachate management procedures are in place:

1. Management of Leachate Infrastructure;
2. Minimisation of Leachate Production;
3. Extraction of Leachate;
4. Leachate Handling Procedure

3.1 Procedure for the Management of Leachate Infrastructure

Leachate infrastructure at Powerstown landfill comprises:

- Leachate extraction wells;
- Leachate monitoring wells;
- Leachate level loggers connected to SCADA;
- Pneumatic leachate extraction pumps;
- Electrical leachate extraction pumps;
- Pipework;
- Sumps;
- Leachate lagoon; and
- Leachate tank

CCC conducts a weekly site walkover to check the status of the leachate infrastructure. These include:

1. Check and record the status of each leachate extraction well;
2. Check and record the operation of each leachate extraction pump;
3. Periodically walk the leachate management system pipework and check for damage;
4. Manually review the level of leachate in the leachate tank to confirm SCADA readings are accurate and to ensure that extraction is such that a minimum freeboard of 0.75 m is maintained at all times in accordance with Condition 5.11.4 of the waste licence.;
5. Manually review the level of leachate in the leachate lagoon to confirm SCADA readings are accurate and to ensure that extraction is such that a minimum freeboard of 0.75 m is maintained at all times in accordance with Condition 5.11.4 of the waste licence; and
6. Monitoring of the leachate quality on a quarterly basis in accordance with Table D.1.1 and Table D.5.1 of the licence.

There is a contract in place for the maintenance of the leachate extraction pumps.

3.2 Procedure for the Minimisation of Leachate Production

CCC minimises the volume of leachate production by:

- Installation of an intermediate cap on Cell 16 as soon as filled and is feasible to do so;
- Final cover completed at the unlined landfill and cells 1-13;
- Installation of daily cover on the active areas;
- Site design to separate clean and dirty water, ensuring all clean water goes to the surface water management system;
- Final capping of the site within licence timescales; and
- Reduction in paved areas receiving potential dirty water at site closure.

3.3 Procedure for the Extraction of Leachate

1. Maintain leachate levels at a maximum of 1 m above the liner;
2. Inspect the leachate extraction wells on a weekly basis;
3. Check the SCADA leachate levels daily; and
4. Maintain the pumps (maintenance contract in place)

The Leachate Handling Procedure is a separate stand alone document.

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C A R L O W
C O U N T Y C O U N C I L
COMHAIRLE CHONTAE CHEATHARLOCHA



Powerstown Landfill & Civic Amenity Site

Leachate Handling Procedure

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Prepared by: Mary Walsh
Reviewed by: Fergus Mulhare
Date of Issue: October 2009

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1.0 Introduction

This procedure has been prepared by Carlow County Council to identify the correct procedures involved while handling leachate on site at Powerstown Landfill & Civic Amenity Site and during the transportation of leachate off site.

Aim of procedure: To ensure that all relevant personnel are aware of the safe handling and transportation of leachate.

Personnel involved: Tanker driver, weighbridge operator, site supervisor, landfill manager, general operatives. Waste Water Treatment Plant operatives. This procedure is for circulation to all the above staff.

2.0 Description of tasks involved with this procedure:

Leachate Handling Procedures at Powerstown Landfill involve the following list of tasks and controls;

- i. the on site control of leachate using collection pipes, chambers and storage vessels,
- ii. on site monitoring procedures for inspection and sampling of leachate,
- iii. tankering of leachate off site and the corresponding loading and off loading procedure involved.

2.1 On site control of leachate

The leachate collection system comprises of a series of leachate collection pipes extending through and around the perimeter of cells within the Landfill site. Leachate is collected within a number of collection sumps located around the boundary of cells and from here leachate is pumped to either the Leachate Lagoon or the Leachate Holding Tank. The leachate collected within individual collection sumps is regulated to ensure that leachate does not rise above 1m leachate depth.

There are two permanent structures on site at Powerstown Landfill (Leachate Holding Tank (LT) and Leachate Lagoon (LG)) where leachate is held prior to removal from site. These structures are fully enclosed except for inlet and outlet piping.

The leachate holding tank is located in an enclosed concrete bund. It consists of a glass lined steel tank. The concrete bund was designed, constructed and tested in accordance with the requirements of BS8007: 1987 'Design of Concrete Structures for Retaining Aqueous Liquids'. The leachate lagoon is fully lined and covered using a floating cover. The floating cover consists of polymeric material which is waterproof, resistant to corrosion, wind and snow loading, ultraviolet degradation and chemical reaction with leachate and vapour transmission.

Leachate may also be recirculated under the cap in the fully lined cells only. This may be undertaken to maintain sufficient moisture in the cells for biodegradation to continue. A supervisory control and data acquisition system (SCADA) facilitates the remote monitoring of the depth of leachate within the

cells and the remote/automatic activation of leachate pumps. Leachate is removed on a regular basis, in fully enclosed tankers, for treatment in Mortarstown Wastewater Treatment Plant.

2.2 On-site inspection / sampling of leachate

PPE Required: Safety gloves, safety boots, high vis. vest / jacket, safety glasses.

Equipment Required: Dip Meter, Site sheets, Bottles, labels, temperature probe, sampling bailer, bucket.

List of Monitoring Locations: L1, L2, L3, L4, L7, L10, Cell 11, Cell 12, Cell 13, Leachate Lagoon, Leachate Tank.

Procedure:

The lid of the leachate chamber should be opened following correct manual handling procedures.

Care should be taken to avoid any expel of gas that may arise upon opening of the leachate chamber.

The dipmeter should be lowered slowly into the chamber and the corresponding reading recorded upon sounding of the signal from the meter.

Sampling using a bailer should be carried out at L1, L2, L3, L4, L7 and the leachate lagoon.

The sampling taps in place along the leachate lines should be used to obtain samples from L10, Cell 11, Cell 12 and Cell 13. The main control valve should be used to obtain a sample from the leachate tank.

All bottles should be filled carefully avoiding any spillages. Bottles should be labelled appropriately to enable accurate sample identification.

2.3 Tankering of leachate

PPE Required: Safety gloves, safety boots, disposable tyvek suit, high vis. vest / jacket, hearing protection, safety glasses

Checks to be conducted prior to site access

The driver of the leachate tanker must carry out an inspection on all tankering equipment to ensure there are no leaks in suction/delivery hoses, tanker valves etc.

Entry to the facility

Entry to the facility will be from 08.30 to 15.30 Wednesday to Friday.

The driver must have due regard for other vehicles entering and exiting the site. The driver must carefully approach weighbridge ensuring that the vehicle is correctly positioned prior to proceeding through the entrance barrier. Drivers must obey road signage on site and the directions or instructions of site staff while on the facility

Loading tanker from leachate lagoon/leachate holding tank

The driver shall position the tanker adjacent to the leachate lagoon/leachate holding tank on a hardstanding surface. The driver shall then uncouple the safety cap from the tanker inlet. If a hose is not already in position from the tank or lagoon, the driver shall connect one or more hoses to extend from the level of the liquid waste to the suction intake on the rear of the tanker and put a bucket under the hose/tanker connection(s) in order to catch any minor spills/ drips

After changing the pump control from neutral to suction, the driver shall turn the key to start the pump. The lever should be raised to open the valve and begin pumping.

The pump should be turned off when the tank is close to full (this is recognized by a change in the sound of the pump engine) by turning the key and moving the pump control level from suction to neutral. The valve at the rear of the tanker should be closed, the suction hose uncoupled and allowed to drain back into the lagoon or tank. The safety cap on the inlet should then be re coupled.

Exiting the Site

Exit from the facility shall be before 16.00hrs on the same day as arrival.

The following details will be recorded on the weighbridge system for each leachate load removed from site:

- a) The registration of the vehicle used,
- b) The name of the haulier;
- c) The source of the leachate (i.e leachate lagoon or leachate tank)
- d) The destination of the load,
- e) The EWC code for leachate,
- f) The date and time of entry to the facility and the corresponding weight;
- g) The date and time of exit from the facility and the corresponding weight,
- h) The net weight of the load (in kgs) based on the information provided at f and g above.

The tanker driver must exercise due care upon leaving the site as for entering the site.

Discharging From Tanker

The driver shall proceed to the Mortarstown waste water treatment plant and shall position the tanker adjacent to the marked discharge manhole. The manhole lid should be raised using appropriate lifters and one end of the hose should be dropped to the bottom of the manhole. The lid should be positioned so that the opening is covered, in so far as is practical, and a second extension should hose to the first if necessary. The driver shall position a bucket under the tanker outlet in order to catch minor spills/drips. After uncoupling the safety cap and coupling the second discharge hose in its place, he shall open the valve at the rear of the tanker and allow the liquid waste to drain by gravity to the manhole. When the tanker is empty, he shall close the valve,

uncouple the discharge hose, and recouple the safety cap. Finally, he shall empty the contents of the bucket, if any, into the manhole and reseal the manhole cover properly. **Emergency Procedures** In the event of an accident or spillage (other than a minor spillage due to a leaking valve), the driver shall notify the following: Carlow County Council Ph. 059 9170300 Carlow Gardai Ph. 059 9136620. The driver shall put out a red triangle at a sufficient distance from the rear of the truck to give warning of an accident or incident to other road users.

Expected results and actions in light of departure from this procedure: Failure to follow the procedure may give rise to complaints by members of the public, nuisances at the point of discharge, damage to the environment and / or ecosystems. .

Related Documentation: Emergency Response Procedures

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Appendix F.1

(Documents in support of Attachment F.1)

Odour Management Plan

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ODOUR MANAGEMENT PLAN

POWERSTOWN LANDFILL

Tuesday, 11 February 2014

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- 7. Management of Active Cell**
- 8. Permanent Landfill Gas Extraction System Maintenance**
- 9. Leachate Management Infrastructure**
- 10. Landfill Gas Monitoring**
- 8. Domestic Waste Acceptance**
- 9. Capping Works**
- 10. Auditing and Record Keeping**

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Appendix 1
Landfill Gas Management Infrastructure layout

Appendix 2
Landfill Gas Collection System Task Checklist

Appendix 3
Odour Record Sheet

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1. INTRODUCTION

This Odour Management Plan (OMP) has been prepared on behalf of Carlow County Council to ensure that best practice is implemented on a continued basis in the management of odour emissions at Powerstown Landfill. Implementation of best practice will ensure compliance with the conditions of waste licence W0025-03 and will endeavour to minimise nuisance odour emissions at the facility. Carlow County Council recognizes the concerns of local residents and is committed to working with them and the Environmental Protection Agency in the management of all possible nuisance emissions at Powerstown Landfill.

Scope

The scope of this OMP is to minimise odour emissions from all existing waste and all future imported waste at Powerstown Landfill. It should be noted that this odour management plan cannot aim to entirely eliminate odour emissions; any suggestion that this is possible would be misleading. The current waste management practice of fortnightly (and often longer) kerbside collection implies that waste is older and more pungent when it arrives at the tipping face than was the case historically. This waste is also more concentrated in terms of the odorous fraction given that non-odiferous constituents of waste such as plastic have been segregated at source. Carlow County Council cannot control fugitive odour emissions that occur during transfer of waste from vehicle to tip face. Once the waste is in place, implementation of the measures outlined in this plan will ensure that odour emissions at the facility are minimised.

Odour Sources

In theory, odours from landfills have the potential to arise due to:

- Fugitive landfill gas emission from active, intermediate and/or temporary cover on waste;
- Uncontrolled landfill gas leakages from side embankments and/or top surface within landfill;
- Uncontrolled landfill gas leakage from around leachate header pipe work along gravel layer,
- Uncontrolled landfill gas leakage from side of cell from gravel layer due to insufficient cover/capping,
- Uncontrolled landfill gas leakage from untapped landfill gas extraction wells,
- Insufficient gas abstraction from entire waste body,
- Uncontrolled landfill gas leakage from landfill gas flux hotspots within the intermediate and temporarily capped cells,
- Insufficient cover material upon active and intermediate capped cell,

- In correct material choice during intermediate and temporary capping (i.e. porous and high permeability),
- Fugitive gas emissions from active cell due to insufficient gas abstraction,
- Volatilisation and air flow stripping of odourous gases from active face/active cell;
- Puff odour emissions from tipping and spreading of waste,
- Uncontrolled emissions from landfill flaring system and leachate treatment facility, etc.

Over 300 compounds have been identified as contributors to landfill odours. These compounds are either components of waste placed in the landfills or are degradation products. Carbon dioxide and methane make up the main constituent percentage of landfill gas and are essentially non-odorous. Other odorous compounds include organic acids (acetic acid, butyric acid; hexanoic acid), terpenes (limonene, alpha Pinene, alpha Carene), mercaptans (methanethiol, ethanethiol, etc.), amines (ethanolamine, dimethylamine, trimethylamine, etc.) and Hydrogen sulphide (Sheridan, 2003). Most of these compounds have very low odour threshold concentrations, as illustrated in Table 1. Different concentrations and mixtures of these compounds can intensify or reduce odour threshold concentration, determined as synergism and antagonism, respectively.

Table 1. Odour threshold concentration of various odorous compounds commonly found in the air streams of landfill gas.

Compound name	Molecular Formula	Odour description	Odour threshold (ppm (v/v))
Mercaptans	-	-	-
Allyl mercaptan	CH ₂ CH=CH ₂ SH	Disagreeable, garlic	0.0001
Methyl mercaptan	CH ₃ SH	Rotten cabbage	0.0005
Propyl mercaptan	C ₃ H ₇ SH	Unpleasant	0.0005
Ethyl mercaptan	C ₂ H ₅ SH	Decayed cabbage	0.0003
Sulphides	-	-	-
Hydrogen sulphide	H ₂ S	Rotten eggs	0.0005
Dimethyl di sulphide	C ₂ H ₆ S ₂	Rotten cabbage/vegetables	0.0003- 0.0068
Carbon disulphide	CS ₂	Intense Rubber/skunk	0.006-0.010

Amines	-	-	-
Trimethyl amine	(CH ₃) ₃ N	Pungent, fishy	0.0004
n-Butyl amine	CH ₃ (CH ₂)NH ₂	Sour, ammonia	0.080
Organic acids	-	-	-
Acetic acid	CH ₃ COOH	Sour	1.0
Butyric acid	CH ₃ (CH ₂) ₂ COOH	Sweet rancid	0.0004
Valeric acid	CH ₃ (CH ₂) ₄ COOH	Rancid	0.0008

2. COMPLIANCE WITH THE LANDFILL DIRECTIVE

Article 5 of the Landfill Directive sets out a requirement for Member States to establish a national strategy for the reduction of biodegradable waste going to landfills. In addition this Article sets out specific pre treatment obligations for Biodegradable Municipal Waste (BMW). These BMW diversion obligations are a sub-set of the waste treatment requirements, and have specific limitations in respect of the tonnage of BMW that can be accepted at landfills. These limitations – which are tied to a 1995 statistical base year for waste production in Ireland – are staggered, with each iteration possessing a stricter obligation in relation to diversion. Ireland negotiated with the EU Commission a four-year extension to the first two compliance dates specified in Article 5 (2006 to 2010, and 2009 to 2013 respectively) (refer the DEHLG policy document National Biodegradable Waste Strategy, 2006). These obligations can be summarised as follows:

- By 1st January 2010 Ireland can only landfill a maximum 75% of the BMW generated in 1995, i.e. a national maximum of 967,443t BMW can be landfilled.
- By 1st January 2013 Ireland can only landfill a maximum 50% of the BMW generated in 1995, i.e. a national maximum of 644,956t BMW can be landfilled.
- By 1st January 2016 Ireland can only landfill a maximum 35% of the BMW generated in 1995, i.e. a national maximum of 451,469t BMW can be landfilled.

Measures to achieve these requirements are contained in the facility waste licence and, over time, will impact on the capacity of landfill to generate odour emissions. A primary source of odour, i.e. ‘fresh’ waste at the active tipping face, will have a reduced content of putrefying organic waste. Another primary source of odour, i.e. decomposing waste, will also have significantly reduced capacity to generate landfill gas. Details of the associated waste acceptance measures are contained in the revised Waste Acceptance Procedures document.

Three-Bin Collection System

In order to meet its obligations to divert BMW from landfill, Carlow County Council, in accordance with the Southeast Joint Waste Management Plan, will implement a three-bin collection system which will provide for source segregation of domestic waste. The third of these bins, the brown bin will take food and organic waste. The brown bin contents will be conveyed to a biological treatment plant (e.g. Mechanical Biological Treatment, Compost Facility) for treatment.

Waste Management (Food Waste) Regulations 2009

These regulations govern the disposal of food waste from commercial outlets and require that food waste be presented separately for collection and treatment at an approved facility. Commercial outlets which bring waste directly to the landfill will be required to present food waste separately.

European Union (Household Food Waste and Biowaste) Regulations 2013

The regulations require that separate collection of food waste and biowaste be implemented on a phased basis, in Carlow the relevant date is the end of 2014.

Pre-Treatment Requirements

Waste entering the landfill is required to be pre-treated in accordance with the guidelines contained in the Agency guidance document "Municipal Solid waste-Pre-treatment & Residuals Management". These measures will ensure that the BMW component of waste entering the landfill is not more than 47% of the total tonnage (until July 2013).

3. WASTE LICENCE W0025-03

A revised waste licence was issued by the Environmental Protection Agency on 21-12-2009. This licence contains additional requirements on odour control and monitoring as follows:

8.14 Odour Monitoring

8.14.1 The licensee shall inspect the facility and its environs daily for nuisances caused by odours. This inspection shall include monitoring at the relevant locations specified in Schedule D: Monitoring, Table D. 1. 1 Monitoring Locations, of this licence. This shall incorporate the use of a FID or alternative agreed by the Agency.

8.14.2 Within six months of the date of grant of this licence, the licensee shall submit to the Agency for agreement, an Odour Management Plan (OMP) for the facility.

8.14.3 The OMP referred to in Condition 8.14.2 shall include measures to control potential sources of odour nuisance, including inter alia, provisions regarding:

- Requirements of relevant conditions of this licence;
- Adequate resources and training on-site to provide for the maintenance, monitoring and operation of the landfill gas extraction system;
- Acceptance and management of odorous waste deliveries;
- Arrangements for the biannual preparation of an independent assessment and report on surface VOC emissions at the facility following completion of waste acceptance in any cell/sub-cell;
- Use of sacrificial gas extraction systems; phased capping of the waste body; and an interim capping system at inter-cell boundaries;
- Working face/active cell sizing and covering;
- Landfill gas collection:- locations of infrastructure including access / haul roads, well design and density, monitoring, condensate management, field balancing, flare/combustion plant operation;
- Identification of fugitive sources of landfill gas emissions (e.g. from leachate management infrastructure and/or from side slopes);
- Monitoring- VOC surface emissions from capped areas, odour checks off- and on-site, receipt and evaluation / verification of odour complaints received.

8.14.4 To meet the requirements of the OMP the licensee shall carry out a monthly review of control measures in place at the facility and maintain findings in a monthly report. This shall include:

- consideration of odour complaints received (including details and nature of the complaints, times and weather conditions, any unusual circumstances, problems, etc.);
- review of any monitoring, including ambient odour monitoring in accordance with Schedule **D.10** Ambient Odour Monitoring of this licence, carried out (including investigation of complaints and actions taken where relevant);
- an update on existing landfill gas control infrastructure (including operational status, number of wells and vents connected and unconnected to the landfill gas collection system, quantity of gas collected and flared/ utilised, estimated quantity of landfill gas being produced, details of any problems with equipment during period); and
- details of any remedial/corrective actions taken, where relevant, including actions taken on foot of recommendations from previous reports; and

- *recommendations and implementation of same.*

The licensee shall maintain these reports on site and forward them to the Agency on request.

8.14.5 The OMP shall be reviewed annually and any updates/amendments submitted to the Agency as part of the Annual Environmental Report.

8.14.6 In relation to surface emissions from the waste body and identified features, the following shall constitute a trigger level:

- *VOC greater than or equal to 50ppmv as methane average over capped area; or*
- *VOC greater than or equal to 100ppmv as methane instantaneous reading on open surfaces within the landfill footprint; or*
- *VOC greater than or equal to 500ppmv as methane around all identified features.*

8.14.7 Leachate holding tanks/lagoons shall be covered, and head gases vented to treatment as may be required by the Agency.

8.14.8 All odorous or odour-forming wastes shall be covered as soon as practicable and in any case at the end of the working day.

8.14.9 Where it is proposed to take biological sludges at the facility, these must be subject to appropriate pre-treatment in advance of acceptance at the facility.

8.14.10 When siting and operating landfill gas infrastructure, regard shall be had to the potential for, and mitigation of, odour nuisance.

4. ODOUR MONITORING AND REPORTING

Odour monitoring arrangements shall be as follows:

Daily Monitoring

Landfill staff will carry out daily monitoring at 3 fixed locations (which have been agreed with the Agency) and two locations which have been selected on the day. The results of this monitoring shall be entered in the Odour Record Sheets (Appendix 3) which will be retained on site. In addition the requirements detailed in “Daily Tasks” in Appendix 2 will be fulfilled. The fixed monitoring locations will be selected from the following:

- M9 Roundabout
- Landfill entrance

- Old landfill entrance
- Leachate storage tank
- Weighbridge

Where remedial action is identified in the daily check list this will be carried out on the same day.

Daily odour monitoring will be carried out in accordance with the procedures set out in the Agency document “Assessment of Odour Impact, Site Inspection Procedure” and the associated Field Record Sheet.

The following should be observed when carrying out observations:

- Monitoring will be carried out at the start of each working day
- Monitoring will commence at landfill upwind locations.
- Observers should be free from medical conditions such as sore throats
- Observers should abstain from smoking, scented toiletries etc for 30 minutes before observations
- Observations should be recorded in the Odour Record Sheet contained in Appendix 3

Monthly Reporting

A monthly report will be drawn up which will include the following:

- Consideration of odour complaints received (including details and nature of the complaints, times and weather conditions, any unusual circumstances, problems, etc.);
- Review of any monitoring, including ambient odour monitoring in accordance with *Schedule D.10 Ambient Odour Monitoring* of the licence, carried out (including investigation of complaints and actions taken where relevant);
- Update on existing landfill gas control infrastructure (including operational status, number of wells and vents connected and unconnected to the landfill gas collection system, quantity of gas collected and flared / utilised, estimated quantity of landfill gas being produced, details of any problems with equipment during period); and
- Details of any remedial/corrective actions taken, where relevant, including actions taken on foot of recommendations from previous reports; and
- Recommendations and implementation of same.

Bi-Annual Monitoring

An independent assessment and report on surface VOC emissions at the facility shall be carried out. This will include identification of fugitive sources of landfill gas emissions from leachate systems and side-slopes. The following trigger levels shall apply:

- VOC greater than or equal to 50ppmv as methane average over capped area; or
- VOC greater than or equal to 100ppmv as methane instantaneous reading on open surfaces within the landfill footprint; or
- VOC greater than or equal to 500ppmv as methane around all identified features.

The following tasks are carried out during the independent audit:

- Monitoring of all areas using kinematic VOC/GPS system to detect areas of potential landfill gas release/flux. The VOC analyser is a Photo Ionisation Detector which uses a UV light source to ionise a gas sample and detect its concentration. A PID detector does not respond to methane but is more suitable for odour detection than other detectors. This technique is useful for comparison in leakage area within the same landfill facility on different audits but is not for cross comparison of VOC leakage between landfills due to a number of factors including, mass flow of VOC on the day of measurement, relative odourous nature of the detected compounds within individual facilities, etc.
- Geo-referencing of detected landfill gas flux areas and plotting on a basemap for visual interpretation
- Monitoring will include the following areas: active cells, all gas extraction boreholes, capped areas.

5. STAFF TRAINING

The landfill staff structure is as follows:

Table 2

Pat Connolly	Landfill Manager	Senior Executive Engineer	FAS Waste Management Course
Mary Walsh	Deputy Landfill Manager	Technician I, degree in Environmental Science	FAS Waste Management Course
John Nolan	A/Foreman		FAS Waste Management Course
Pat Doyle	A/Foreman		
John Condrón	General Operative		

Landfill staff have been provided with a one-day training course by AFS, the gas flare supplier, in regard to the operation of the flare. In addition an Operation & Maintenance Manual is retained on site.

Landfill Staff have been provided with a 2-day training course on the operation of the gas collection system by the designer of the system, Fehily, Timoney & Co. This covered the following areas:

- Presentation on Best Practice
- Examples and exercises.
- Discussion with site staff.
- Demonstration of monitoring equipment.
- Examination of gas collection infrastructure.
- Discussion on collection infrastructure.
- Site audit.
- Interpretation of data.
- Site walkover to carry out changes.
- Management programme.

Appendix 2 contains the associated task checklists to be carried out while maintaining the gas collection system.

6. WASTE ACCEPTANCE

Waste Acceptance Procedures are contained in a separate document entitled “Waste Acceptance Procedures”.

7. MANAGEMENT OF ACTIVE CELLS

Cell Filling Sequence:

- Minimise area of active cell in order to reduce odour emissions.
- Complete filling of Cell 17 to final contour levels
- Complete filling of Cell 15 at the same time as cell 17, in order to achieve final contour levels

- Once Cell 17 is filled, commence landfilling in Cell 18

Active Face Management:

- Maintain working face to a maximum depth of 2.5m and plan dimensions 25 x 25 m.
- Cover all waste as soon as practicable with appropriate cover material. Leave no waste uncovered overnight.
- Use imported ash or clay as daily cover.
- Advance the waste front progressively to facilitate installation of odour management infrastructure

Odour Management Infrastructure:

- Place low permeability clay layer (c. 150mm thick) to outer flanks of active cells, in addition to temporary plastic cover. This clay layer shall be placed progressively in advance of the rising waste horizon. Clay shall be placed loosely at optimum moisture content and compacting using the back of an excavator bucket.
- Place a HDPE “liner flap” at the top of the Cell 17 side riser in order to collect landfill gas within the gas collection layer. Place gas collection pipework under the flap and connect to the gas collection system.
- Ensure air-tight seal is achieved at vertical stack penetrations using proprietary membrane ‘boot’ detail.
- Actively extract gas from vertical stacks in active, filled and partially filled cells. Fit solid well head sleeves over slotted stack riser pipes. Install clay plug at top of gabion blocks to prevent escape of gas to atmosphere. Connect well heads via valved solid pipe spurs (63/90mm diameter) to the facility gas main in Cells 15 and 16.
- Install horizontal odour management system in all active cells, as detailed below. This system will draw in odour emissions from the fresh waste and will also collect landfill gas generated by decomposing waste.

Cell 15

Connect the vertical gas vents as above

- Install horizontal odour management system at the final waste level prior to final temporary capping and connect the vertical vents ensuring that the pipework is self-draining
- Install additional vertical gas wells at 50m spacing.

- The horizontal odour management system shall consist of slotted 150mm HDPE pipes laid to slight falls for condensate drainage.
- Horizontal pipes shall be connected via valved solid pipe connections to the facility gas main, whence gas will be conveyed to the landfill gas flare for thermal treatment. The pipework shall be placed in a trench one-metre square and covered by a HDPE layer.
- Ensure suction from gas flare on horizontal pipes is controlled (by valve) to prevent excess oxygen being drawn into the main gas extraction system and potentially quenching the flare. The objective is to exert a slight negative pressure on the horizontal system.

Cell 16

Connect the vertical gas vents as above

- Install horizontal odour management system at the final waste level
- Install additional vertical gas wells at 50m spacing
- The horizontal odour management system shall consist of slotted HDPE pipes laid to slight falls for condensate drainage.
- Horizontal pipes shall be connected via valved solid pipe connections to the facility gas main, whence gas will be conveyed to the landfill gas flare for thermal treatment
- Ensure suction from gas flare on horizontal pipes is controlled (by valve) to prevent excess oxygen being drawn into the main gas extraction system and potentially quenching the flare. Due to the presence of the temporary cap, a relatively high suction will be possible in this area.
- Prior to exposing each horizontal pipe, the pipe should be isolated from the gas main by closing the valve. A waste lift (c. 2.5m deep) shall be placed over each slotted pipe once it is exposed. Once the slotted pipe is covered, the valve can be opened to allow active extraction.
- Install horizontal odour management system at the final waste level prior to final temporary capping and connect the vertical vents ensuring that the pipework is self-draining
- The horizontal odour management system shall consist of slotted 150mm HDPE pipes laid to slight falls for condensate drainage.

Cell 17 & 18

- Install horizontal odour management system at 2.5m above cell floor and at 5m lifts thereafter.

- The horizontal odour management system shall consist of slotted HDPE pipes laid to slight falls for condensate drainage.
- Horizontal pipes shall be connected via valved solid pipe connections to the facility gas main, whence gas will be conveyed to the landfill gas flare for thermal treatment
- Ensure suction from gas flare on horizontal pipes is controlled (by valve) to prevent excess oxygen being drawn into the main gas extraction system and potentially quenching the flare. The objective is to exert a slight negative pressure on the horizontal system.
- Horizontal gas pipes shall be installed in trenches progressively in advance of the waste front. A waste lift (c. 2.5m deep) shall be placed over each slotted pipe once it is in place. Once the slotted pipe is covered, the valve can be opened to allow active extraction.

The vertical gas vents will be connected to the horizontal gas collection system at regulator intervals with fixed connections. Flexible connections will not be used.

Active Extraction:

- Visually inspect well heads and pipe spurs daily for signs of damage (e.g. by plant)
- Regularly dewater condensate from pipe spurs to prevent pipes blocking. This may be required daily for some pipes, and less frequently for others. Frequency to be determined on a site specific basis.
- Monitor gas quality from horizontal pipes on a weekly basis, and throttle/open valves as appropriate

8. PERMANENT LANDFILL GAS EXTRACTION SYSTEM MAINTENANCE

The secondary source of odour (decomposing waste generating landfill gas) identified earlier in this plan occurs in filled capped cells as well as in active and recently filled open cells. Carlow County Council has a landfill gas extraction system in place to manage landfill gas generated in the capped old basally unlined cell and capped basally lined Cells 1 – 13. This system consists of:

- 1000 m³/hr landfill gas flare
- Approximately 46 bored vertical gas wells
- Seven control manifolds
- 90mm diameter HDPE pipe spurs
- 180mm diameter and 250mm diameter HDPE gas mains

- Condensate knockout pots

This system requires regular maintenance to ensure it continues to manage odour emissions from this portion of the landfill. This system also requires development and extension to incorporate newly filled and capped areas as landfilling develops at the facility.

Landfill Gas Flare:

- Establish/maintain maintenance contract for quarterly servicing of gas flare.
- Daily visual inspection of gas flare to ensure it is functioning and to check gas quality and quantity
- Weekly audit of SCADA data from gas flare to identify any anomalies
- Ensure that the gas flare is running continuously and always at $> 1000^{\circ}\text{C}$.

Landfill Gas Field Balancing:

- A landfill gas field balancing regime has been established at Powerstown Landfill by Fehily Timoney and Company, and training given to Carlow County Council personnel in how to balance the gas field periodically as required.
- As gas flows are ever changing in a landfill environment, gas field balancing shall be carried out initially on a weekly basis. Balancing can take place less frequently thereafter (monthly intervals) once it can be illustrated that the gas field has reached a steady state.
- Balancing will consist of measuring landfill gas concentrations (methane, carbon dioxide, oxygen) at each gas well. The well valve will then be adjusted in order to bring gas levels to optimum levels.
- Gas field balancing will ensure that the gas extraction system operates at maximum efficiency to manage the quantities of landfill gas generated

Landfill Gas System Audit:

- Fehily Timoney and Company will conduct a landfill gas system audit in advance of gas field balancing to assess and trouble shoot the existing gas extraction system
- Henceforth, Carlow County Council will commission an independent gas system audit on an annual basis

System Checks:

- Due to differential settlement of waste, pipe/well/manifold connections can be subjected to stress

- Carlow County Council will carry out visual checks on a monthly basis of connections at gas well heads and within manifolds and valve chambers

VOC inspections will be carried out twice per annum

- Any leaks or faulty connections will be repaired on the spot

Condensate Dewatering System Maintenance:

- Condensate knockout pots shall be inspected weekly by dipping to determine liquid levels
- Valves between manifold M2 and M3 shall periodically be opened as necessary to facilitate drain down of condensate to the knockout pot at the old flare compound.
- A maintenance contract shall be established and maintained for periodic inspection and maintenance of mechanical condensate system elements, including electric pump at the old flare compound, pneumatic pumps, compressor and dryer.

9. LEACHATE MANAGEMENT INFRASTRUCTURE

Leachate is a potential source of odour emission at landfill sites.

General:

- Leachate quantities in lined cells will be minimised in accordance with the waste licence requirements
- Waste will be filled to grade to ensure that no ponding of leachate forms on the active cell surface
- The leachate management system will be maintained in good repair through ongoing maintenance of pumps and periodic testing of pipes and fittings

The covers to the leachate dip pipes should be maintained in an airtight state.

Leachate Lagoon:

- The floating cover to the leachate lagoon (at the old reception area) will be maintained in good repair
- Quarterly inspections of the floating cover to inspect for tears, leakage or any other sign of damage, and will carry out repairs immediately
- The floating cover surface dewatering pump will be maintained in good repair to ensure that the capacity of the lagoon is not compromised
- The leachate lagoon will continue to be dewatered periodically by tanker as necessary. This will be closely monitored visually and by frequent reference to the site SCADA system

- Provision has been made to make connection from the floating cover to the gas extraction system. If the leachate lagoon ever becomes a source of odour emission, this connection will be made without delay.

Leachate Holding Tank:

- The leachate holding tank (new reception area) will be maintained in good repair.
- The tank will be tested on a three yearly basis for integrity in accordance with the waste licence, and visually inspected on a monthly basis in the interim.
- A carbon filter shall be fitted to the vent pipe on the roof of the tank. This will be replaced regularly in accordance with the manufacturer's recommendations, or as site observation deems necessary.

10. PERIMETER GAS WELL MONITORING

Landfill gas migration is a potential source of odour at landfill sites. The sandy gravelly soils at Powerstown make this a possibility. Landfill gas migration is tracked/gauged by regular monitoring of perimeter gas wells at 46 locations for methane, carbon dioxide and oxygen. Landfill gas wells are located around the perimeter of all cells at Powerstown. Carlow County Council will continue to monitor each perimeter well on a monthly basis in accordance with the waste licence. Data will be interrogated on each occasion to ascertain if landfill gas migration is implied.

11. DOMESTIC WASTE ACCEPTANCE

Waste is accepted from domestic customers at a designated location at the new reception area. Customers dispose to open trailers. This is a possible source of odour, albeit minor.

- Domestic waste trailers will be filled one at a time (except on Saturdays) and will be transported to the active face as soon as they are full.
- Waste will not be left lying uncovered in trailers overnight. Where not practical to dispose to the tip face, waste will be covered with a layer of compost/woodchip/clay
- Waste spillages on the pavement under trailers will be swept up as necessary each time a trailer is removed for disposal
- Waste trailers will be washed internally on a weekly basis
- The pavement under the waste trailers will be hosed down at least quarterly, or as the need arises

12. CAPPING WORKS

- Condition 4.4.1 of the waste licence requires that final capping is installed at all completed cells, within 24 months of completed waste operations, to the following specification:

- Top soil (150-300mm);
- Subsoils, such that total thickness of top soil and subsoil is at least 1 m;
- Drainage layer of 0.5 m thickness having a minimum hydraulic conductivity of 1×10^{-4} m/s or an equivalent geosynthetic layer;
- Compacted mineral layer of a minimum 0.6m thickness with a permeability of less than 1×10^{-9} m/s or a geosynthetic material (e.g. GCL) or similar that provides equivalent protection; and
- Gas collection layer of natural material (minimum 0.3 m) or a geosynthetic layer.
- In the case of the unlined landfill area, in addition to the above, the compacted mineral layer shall be augmented by a 1 mm flexible membrane layer, such as LLDPE.
- Capping works prevent the release of landfill gas and direct gas to the collection wells via the gas collection layer outlined above.

Capping works have now been completed at the following areas:

- Cells 1-5 (2002)
- The unlined portion of the landfill (2006)
- Cells 6-13 (2009)
- Cells 15-16, partial capping of sideslopes

13. AUDITING AND RECORD KEEPING

Odour Monitoring/Audits

Waste Licence W0025-03 requires Carlow County Council to carry out independent bi-annual odour monitoring. In addition weekly odour assessment will be carried out by landfill staff. Odour reports will be prepared on a monthly basis.

Landfill Gas Extraction System Audits

Carlow County Council will commission an independent annual audit of the gas extraction system to ensure it is in proper functioning order, and to ensure it is operating at maximum efficiency. Each gas extraction well will be checked weekly for landfill gas concentration. The landfill gas flare will be monitored as follows:

Table 3

Parameter	Monitoring Frequency
Inlet	
Methane	Continuous
Carbon Dioxide	Continuous
Oxygen	Continuous
Total Sulphur	Annually
Total Chlorine	Annually
Total Fluorine	Annually
Process	
Combustion temperature	Continuous
Outlet	
Carbon Monoxide	Continuous
Nitrogen Oxides	Annually
Sulphur Dioxide	Annually
Total Organic Carbon	Annually
Hydrochloric Acid	Annually
Hydrogen Fluoride	Annually

Odour Management Plan Compliance

Compliance with this odour management plan will be demonstrated by completion of task checklists as attached in Appendix 2 to this document. These checklists summarise the periodic tasks identified in the foregoing on a daily, weekly, monthly, quarterly and annual basis. Checklists will be completed as tasks are completed and will be retained on file on site in a designated folder titled 'Odour Management Plan Compliance Register'.

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Appendix 1

Landfill Gas Management Infrastructure layout

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Appendix 2

Landfill Gas Collection System Task Checklist

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Daily Tasks

Month:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Odour Monitoring																															
M9 Roundabout																															
Landfill Entrance																															
Old landfill Entrance																															
Leachate Tank																															
Weighbridge																															
Variable Location 1																															
Variable Location 2																															
Active Cell																															
Inspect size active cell																															
Inspect daily cover																															
Check temp. gas pipework																															
De-water pipework																															
Check sideslopes for leachate																															
Check cover material																															
Gas Collection System																															
Check flare gas content																															
Check flare temperature																															
Check gas flow																															
Leachate																															
Check pumps cells 15-18																															
Check levels cells 15-18																															
Domestic Area																															
Check trailers, skips																															
Check for spillages																															
Check green waste area																															

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Appendix 3

Odour Record Sheet

Week ended:

Location	Sensitivity	Wind Direction	Orientation	Wind Strength	Time	Persistence	Intensity
Monday							
Tuesday							
Wednesday							
Thursday							
Friday							

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Appendix G.2

(Documents in support of Attachment G.2)

Energy Efficiency Audit

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Public Sector Programme

Advice, Mentoring & Assessments

Site Visit Report for Powerstown Landfill

Prepared by Paul Kenny, Energy advisor to the Sustainable Energy Authority of Ireland.

17/01/14

SEAI Client ID: PS 2509

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Executive Summary

The Landfill and Civic Amenity in Powerstown was assessed for energy savings under the SEAI Advice, mentoring and assessment program on the 7th of January. It uses approximately 86,000 kWh of electric per annum at a cost of €16500. The site building is efficient but there are a number of key areas that should be addressed.



Key recommendations:

1. The Site MIC is 74 and should only be 29 or less.
2. There are two storage heated cabins out the rear of the building that are full of archive files being heated to keep them dry. They should be moved to a central facility ideally or a dehumidifier installed instead of a heater.
3. The site operator is located in a hut that needs the door open to view the customers, this is heated by a convector heater and should be replaced with a radiant heater with appropriate controls.
4. The PC's, lighting and weighbridge heating could be optimised slightly through improved housekeeping, although this is not identified as a large saving.

Together all these actions will save 25% or ~€4000 on energy costs.

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APPENDIX A – SITE TOUR CHECKLIST

1 Introduction

1.1 Site Visit

Organisation Name: Kilkenny Co Co

Site Name & Address: Powerstown Landfill, Powerstown, Co. Carlow

SEAI Client ID: 2509

Date of Visit: 07/01/14

Duration of Visit (h): 4 hours

SEAI Energy Advisor: Paul Kenny B.E. C.ENG MIEI
Tipperary Energy Agency, Church St, Cahir, Co. Tipperary.
0872905796/ 0527443090
pkenny@tea.ie

Visit Hosted By: Elizabeth Cosgrove, John (surname not recorded) and Mary Walsh

Paul Kenny undertook a site visit of the Powerstown landfill and Civic amenity centre under the Sustainable Energy Authority of Ireland's (SEAI) Advice, Mentoring & Assessments Programme for the Public Sector.

1.2 Scope of this Assessment

The assessment covered the building, the recycling centre, the office and the landfill. The landfill is a highly regulated facility that uses energy using appliances to closely manage the emissions from the facility and any energy savings changes should be carefully considered on how they impact these licenced emissions.

This report has been prepared with all reasonable skill, care and diligence and summarises the findings from the site visit. All values quoted in this Report are based on information provided by the Client. All values quoted for energy savings are estimates and may require additional detailed investigation to confirm their validity.

1.3 Description of Site

The 60 Acre site comprises of a civic amenity recycling centre at the entrance, a domestic/commercial weighbridge, a site office block and the main landfill. There is also a new salt barn external to the property that is connected to the second older electricity meter at the old entrance, now on the M9 motorway.

The report does not cover the salt barn.



Figure 1: Aerial shot of Powers town landfill site [source: Bing Maps]

The site has two primary functions, namely the civic amenity centre and the landfill. The landfill has an annual inflow of 22,000 tons of municipal waste and is regulated under the EPA waste facilities, licence number W0025-3.

1.4 Context

1.4.1 Drivers for Better Energy Performance

There are three key drivers for improving energy performance in the sector:

- **Cost:** The landfill is within the top 10 energy using sites for Carlow county council, once water has been removed. These results in the requirements for significant reduction at the facility over the 2014-2020 period to enable Carlow local authorities meet the 33% by 2020 targets.
- **Environment:** Energy consumption can have detrimental impacts on the environment, including through climate change. The Government is committed to a 20% reduction in greenhouse gas emissions from 1990 levels, from across the economy, by 2020. Recycling Centres are often a major point of interaction between the local authority

and the public, with the incentive to demonstrate leadership on environmental management being core to the activity of a recycling facility.

- *Security of supply:* Ireland imports 88% of its energy requirements, making it one of the most import dependent countries in Europe. Public bodies can lessen their exposure to energy security risk by improving energy management practices.

1.4.2 Obligations & Targets

There are several obligations and targets on the public sector with respect to energy efficiency arising from a range of legislation and initiatives. The key current obligations are summarised below.

European Communities (Energy End-use Efficiency and Energy Services) Regulations

The *European Communities (Energy End-use Efficiency and Energy Services) Regulations 2009* (SI 542 of 2009) set a 1,500 GWh savings target for the public sector by 2016 and introduced several obligations on public bodies with respect to their “exemplary role” for energy efficiency. These include obligations with regard to:

- Energy efficient procurement – see [Best Practice Procurement](#);
- Exemplar energy management practices – see section 2 of this report;
- Use of energy efficient buildings – public bodies may only purchase or lease buildings with Building Energy Ratings of B3 or higher (from 1st January 2012) and of A3 or higher (from 1st January 2015) – see Regulation 15 in [SI 542 of 2009](#).

Since 1st January 2011 Carlow County Council along with all other public sector bodies, is required to report annually on its energy usage and actions taken to reduce consumption – in accordance with SI 542 of 2009. There are two key obligations:

- Requirement to report the Carlow County Councils energy performance directly to SEAI each year – to track progress towards the 2020 target;
- Requirement to include a section on the organisation’s energy performance in the Carlow County Council’s own annual report. This section must describe “*the actions it is taking, or has taken, to improve its energy efficiency and an assessment of the energy savings arising from those actions*” (Regulation 12(2) of SI 542 of 2009).

Additional information on these reporting obligations is available from the [reporting section of the SEAI website](#).

Rehab care will need to submit energy use data in 2012.

National Energy Efficiency Action Plan

The *Second National Energy Efficiency Action Plan for Ireland (NEEAP)* re-affirms Government's commitment to a stretching 33% efficiency target for the sector:

“The public sector will improve its energy efficiency by 33% and will be seen to lead by example – showing all sectors what is possible through strong, committed action.”

The 33% target is an energy efficiency target and it applies to all public bodies, i.e. all public bodies must improve their energy efficiency by 33% by 2020, equivalent to 3,240 GWh¹.

Additional information on this target is [available here](#).

European Union (Energy Efficient Public Procurement) Regulations 2011

The *European Union (Energy Efficient Public Procurement) Regulations 2011* (SI No. 151 of 2011) oblige all public bodies to only purchase equipment and electric vehicles from the Triple E register or equivalent. This register is a benchmark list of products that all meet a minimum set of stringent energy efficiency criteria and are generally of a best in class efficiency standard. Typically, they are of higher quality, have longer operational lifetimes, are more expensive but can perform 10%-20% better from an energy perspective, when compared to standard alternatives. On a life cycle basis, they save money.

Additional information is available from the [Triple E Products Register](#).

Green Tenders - Green Public Procurement National Action Plan

The Departments of Environment, Community & Local Government and Public Expenditure & Report published [Green Tenders - An Action Plan on Green Public Procurement](#), which includes a three-part framework to help organisations to undertake energy efficient procurement by improving what they procure and how they procure. Each part of the framework addresses one of the following three broad categories of purchases:

- Energy using products, e.g. purchasing or leasing equipment, vehicles or buildings as new or as replacement for existing assets;
- Energy services – this is about procuring a service directly related to the use of energy within the organisation, e.g. design and implementation of energy efficiency retrofit works or an onsite power generation solution, provision of energy supplies in the form of fuel or power;
- Capital projects, e.g. constructing a new building or process plant.

¹ Primary energy equivalent

European Communities (Energy Performance of Buildings) Regulations 2006

Since January 2009, all public buildings with gross internal floor areas greater than 1,000 m² are required to have Display Energy Certificates in prominent places clearly visible to the public in accordance with *European Communities (Energy Performance of Buildings) Regulations 2006* (SI 666 of 2006). These certificates are operational energy ratings, which benchmark the actual energy consumed in the buildings against buildings of the same type.

The landfill site will not need a display energy certificate.

Regulations 5 and 6 of SI 666 of 2006 require that owners / designers of new buildings over 1,000 m² ensure “*that consideration is given to the technical, environmental and economic feasibility of installing alternative energy systems*” and that the use of such systems has been taken into account in the design.

Directive 2010/31/EU on the *Energy Performance of Buildings (Recast)* sets out additional and more onerous obligations on public bodies with respect to the energy performance of their buildings. Additional relevant obligations set out in this Directive include:

- Display Energy Certificates must be prominently displayed in all buildings with total useful floor areas over 500 m² that are occupied by public bodies and frequently visited by the public;
- From 9th July 2015, the above floor area threshold will be reduced to 250 m²;
- From 21st December 2018, all new buildings occupied or owned by public bodies must be “*nearly zero-energy buildings*”. A nearly zero-energy building is a building that has a very high energy performance, when determined in accordance with Annex I of Directive 2010/31/EU.

European Communities (Renewable Energy) Regulations 2011

The *European Communities (Renewable Energy) Regulations 2011* (SI No. 147 of 2011) require public bodies to fulfil an exemplary role (in the context of Directive 2009/28/EC) when constructing or renovating public buildings after 31st December 2011.

National Renewable Energy Action Plan (NREAP)

The *National Renewable Energy Action Plan* (July 2010) sets out Ireland’s national targets for the share of energy from renewable sources consumed in transport (10%), electricity (42.5%) and heating and cooling (12%) in 2020. It also describes an estimated trajectory of renewable energy penetration levels for every year up to 2020.

The latest updates on relevant policy and legislation are available from the [Obligations & Targets page on the SEAI website](#).

1.4.3 Client's Objectives

The site management together with the local authority management wish to ensure that energy is being used wisely and that any energy use is robustly controlled to ensure environmental emissions are minimised.

2 Energy Management

2.1 Exemplar Energy Management

Energy management is an all-encompassing process that should include every aspect of an organisation from finance, human resources and public relations to maintenance, purchasing and planning. SI 542 of 2009 requires that all public bodies fulfil an exemplary role with respect to energy management.

2.2 Current Energy Management Status

An Energy Management Diagnostic Questionnaire was not completed as part of this audit but should be completed bi-annually with the energy team. It was completed in 2013 as part of the energy MAP training course.

The site management had not completed an energy audit or engaged in any detailed energy management or energy management training.

2.3 Improving Energy Management Status

An annual energy management plan should be established for the site, with an appropriate set of actions to work on energy reduction. This should commence immediately with actions as outlined in the recommendations section of this report.

Through its [Partnership programme](#), SEAI offers a suite of services to help public bodies fulfil exemplary roles with respect to energy management – see section 4 for specific opportunities to improve energy management and section 5 for advice on how SEAI can help with the next steps.

3 Energy Consumption

3.1 Annual Consumption

The 2013 Annual Energy use was an Estimated 86000 kWh (11 bills available), costing €16,494 including VAT. This gives an average unit price of 19.17cent per kWh.

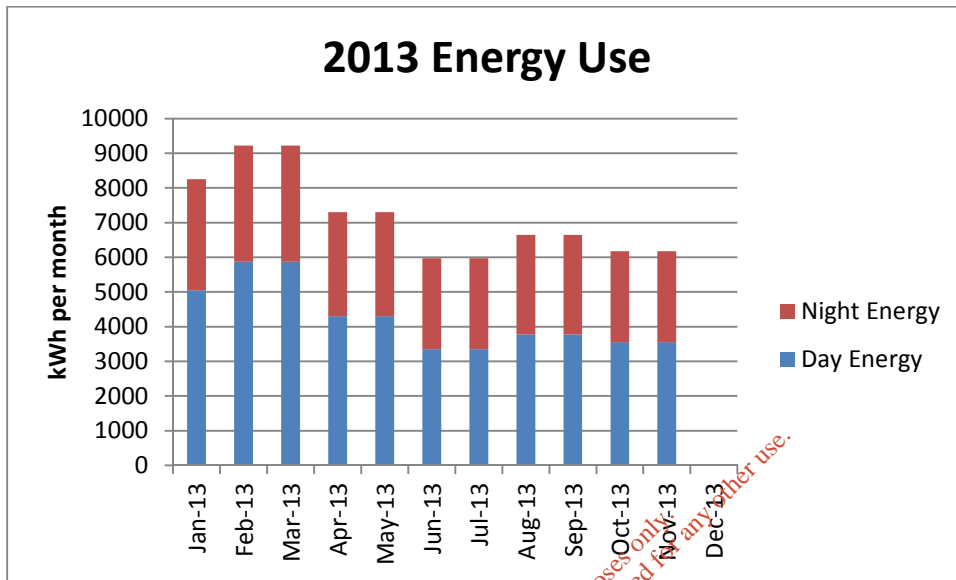


Figure Error! No text of specified style in document - 2013 Energy Use

The facility uses:

- Electricity for the compactors, leechate pumps, flares, heating of the archive facilities and hut and outside lighting.
- Kerosene to heat the main office building.
- Diesel for the site vehicle
- Diesel for the rented (and externally fueled) landfill machinery.
- Solar Hot water for the Domesic water consumption of the main building.

The diesel for the onsite pickup truck was not noted on the day, but is expected to be reasonably small, as it remains predominantly for site usage and is an appropriate vehicle for the terrain and usage. See procurement section regarding any replacement.

The diesel used in the machinery for the rented landfill vehicles was unknown at the time and is beyond the scope of this audit. **For advice on machinery energy reduction, please log on to**

3.2 Energy Costs

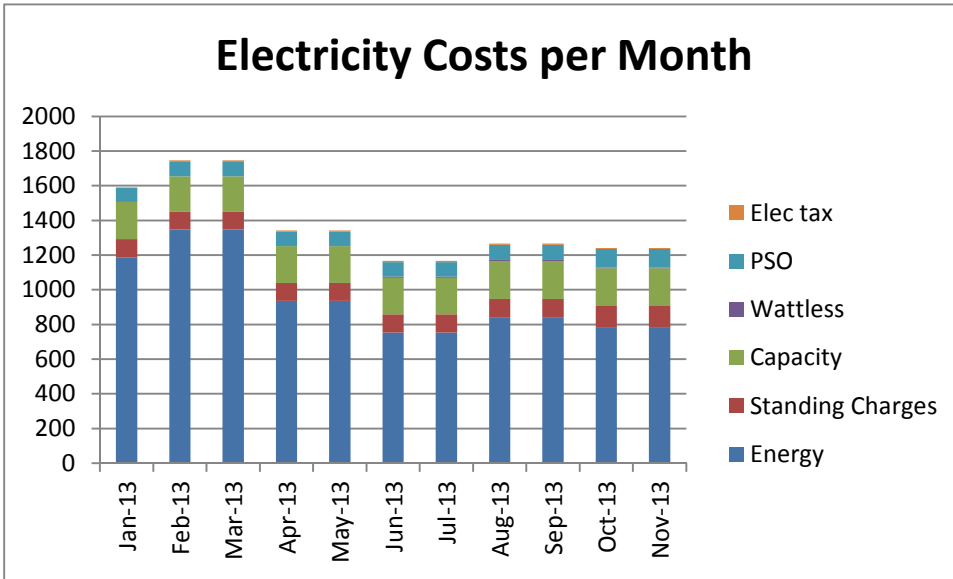


Figure 3: 2013 Energy Costs by Month

The site energy costs are high for the usage at 19.17cent per kWh. This can be reduced as noted in section 4. The site is on the NPS tender and should be re-evaluated after the MIC is reduced (see section 4) to ascertain if the site remains on the correct tariff after the MIC is reduced.

Annual Energy costs can be broken down as follows:

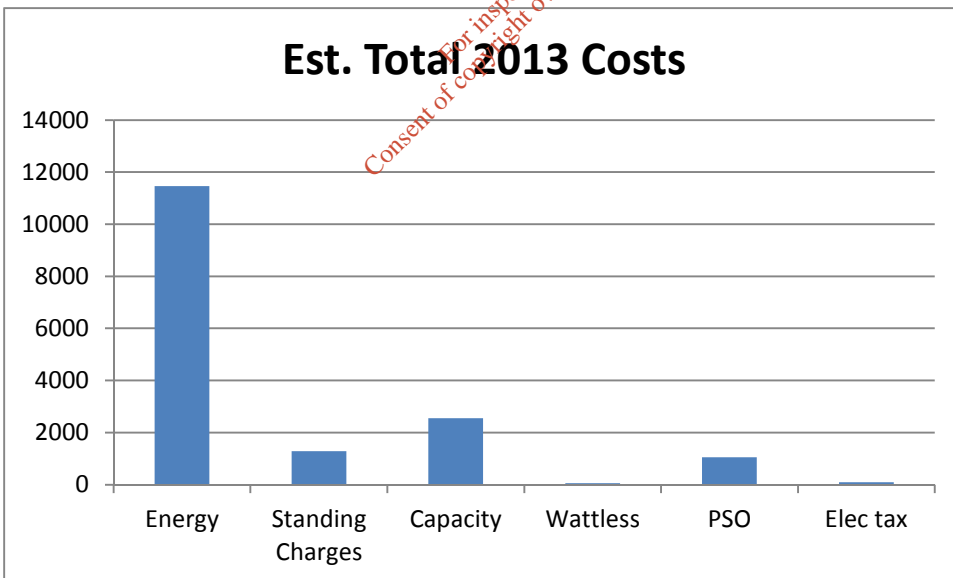


Figure 4: 2013 Cost breakdown

The above chart shows the split in costs between energy and other costs for the electricity bills.

3.3 Main Electrical Energy Consumers

The site electricity use was reasonably easy to decipher where the main energy users were without extensive monitoring. While monitoring may be useful to identify further gains in energy reduction, a number of clear savings opportunities have been identified that should be implemented prior to spending significant monies of further monitoring.

3.3.1 Night Electricity Usage:

The site is closed from 4.30pm and opens after 9am. The main leachate pumps are not used at night, and therefore the remaining night loads are easily identifiable.

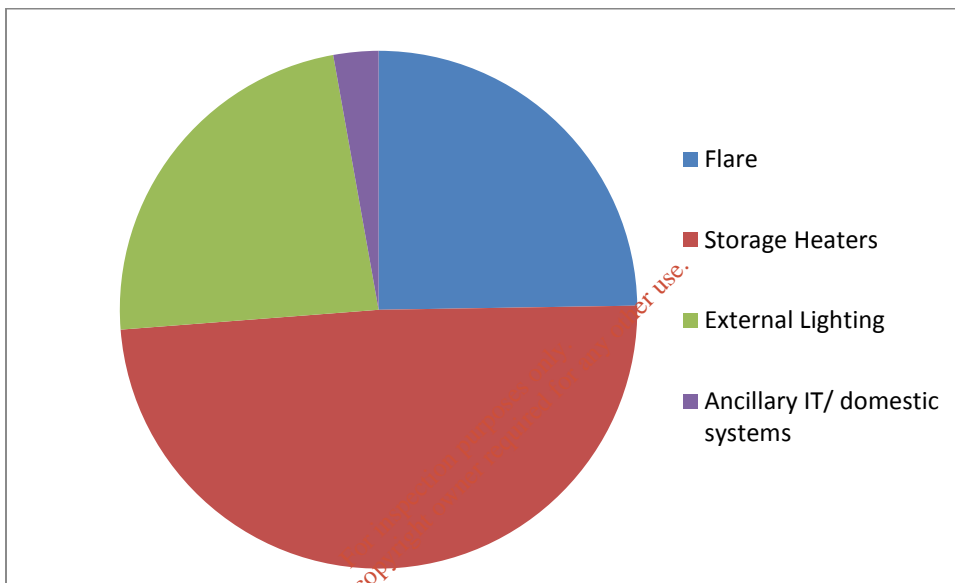


Figure 5: Split of Night time Energy Loads

3.3.2 Day time usage

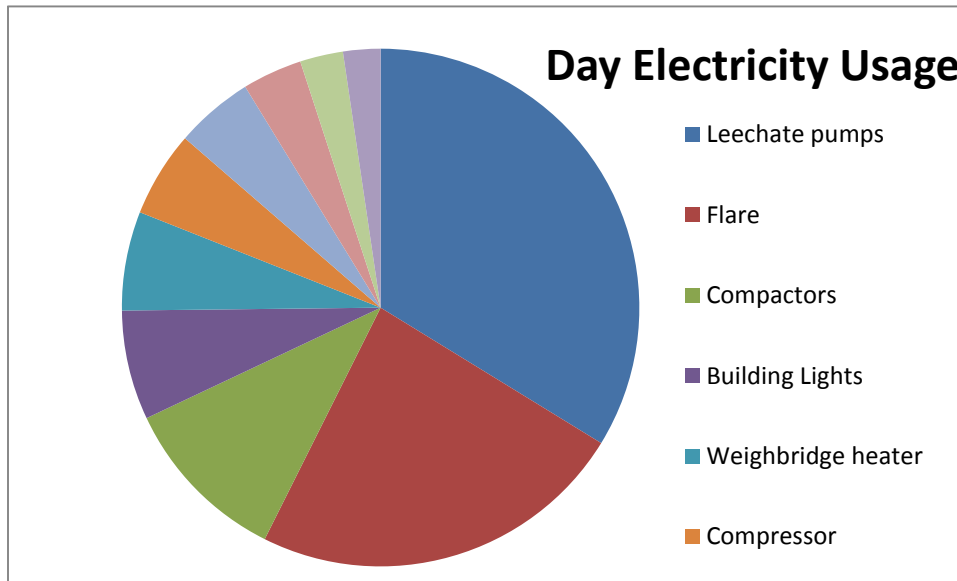


Figure Error! No text of specified style in document.5: Day Electricity Usage

	Day Usage	% of total
Leachate pumps	17221	34%
Flare	12045	24%
Compactors	5400	11%
Building Lights	3494	7%
Weighbridge heater	3150	6%
Compressor	2730	5%
Hut heater	2496	5%
PCs	1904	4%
Ancillary IT/ domestic systems	1369	3%
External Lighting	1191	2%

Table 3: Estimate of Primary Electrical Energy Consumers

3.3.3 Flare

The flare operates on a continuous 24/7 basis and is designed to pull the methane from the cells and burn it in the flare stack to reduce odours and the greenhouse gas potential of the methane. The main blower is powered by an 11kW Brook Crompton EFF3 motor connected directly without gears/belts. It was running at 47% speed, controlled by the HMI on the SCADA. Operation of this system is critical to odour and methane emission control of the system and any changes should be carefully considered. The system is a proprietary system and is run and maintained by a third party. An estimate of the power used at 47%, assuming fan efficiency laws would be in the region of 2-2.5kW. This matches with the night time energy use excluding known energy use. It is therefore clear that the 11kW motor is significantly oversized and not particularly efficient. As the system is a proprietary system, it would be recommended to replace the motor with an IE3 5.5kW to 7.5kW (to allow for future expansion) when the machine is being serviced or on failure of the existing motor.

The site management detailed an extensive monthly calibration exercise that is required to maintain the system operating within parameters, and this will ensure minimisation of excess energy usage.

3.3.4 Leachate pumps

The site has 7 leachate borehole type pumps, 2 sewage type pumps and 2 pneumatic pumps in the gas sumps. The leachate pumps are carefully controlled via float sensors and are required to be maintained at a particular level. As the leachate is dependent on rain fall in the open cells and decomposition in the closed cells, the rate of generation of leachate will decrease over time as will the rainfall ingress as the landfill fills up and new cells are closed. The main method of controlling the use of the leachate pumps is to minimise rain fall on the open sections of the landfill by prompt covering of the open cells when filled.

As the lifetime of the landfill is 2-3 years more, no specific actions on replacement of pumps is identified.

Efficiency of Leachate pumps: The 2-4 kW leachate pumps were not tested for efficiency, as this was beyond the scope of the energy audit. A similar analysis has been carried out by the TEA on leachate pumps used in a similar site in Tipperary showing that there is no significant saving available from replacing the leachate pumps for energy efficiency reasons. On failure or replacement, ensure the most efficient motor/ pump combination is selected.

3.3.5 Hut heater

There is a 2kW oil filled radiator in the hut at the customer section of the facility. The site operator who was located in the station needs to keep the door open to view the customers, and is frequently in and out of the facility. The heater was off at the time of the audit, but is frequently used. Clearly a convective heater in a location with an open door is not particularly effective or efficient.

Options:

1. Change the layout of the cabin to have a warm location with proper external doors and a draught lobby.
2. Install a small capacity (500W – 1000W) radiant heater with a personnel sensor that operates only when the person is inside the hut. This will be far more effective at heating the operator, and will save a modest amount of energy. It should be located appropriately overhead the operator out of reach. A switch should be located conveniently to the operator so it can be switched off and on easily.

Estimated savings assuming 2500kWh or 1250 full load hours for the existing heater, a 500W infra-red operating 50% of the time in the winter months would use approximately 500kWh- 1000kWh and save 1500-2000kWh or up to €340. This will probably cost less than €150 including a sensor and should be installed for less than €200 giving a 1 year payback.



Figure Error! No text of specified style in document.6: sample infrared heater and controls

Above is a sample (SEAI do not endorse any brand or supplier) of the required equipment obtained via a web search. (Images courtesy of www.hygienesuppliesdirect.com). A well-stocked hardware store should have an appropriate small infrared heater. Care should be taken not to install too large a heater in the small hut, or it will excessively warm the operator and could be a fire risk.

3.3.6 Weighbridge Heat Pump

The weighbridge heat pump operates as a heating and cooling device. At the time of entry, the heater was operating giving a high degree of thermal comfort (i.e. the interior temperature was high) at a reasonably low cost. For future design, use of poorly insulated porta-cabins for staff that will be stationary for long periods at desks and windows will lead to excessive energy usage, if replacing the facility, energy use should be considered carefully, with high insulation levels, and south facing over shaded windows used to minimise energy use. No specific action is proposed other than careful management of the set points to ensure a balance between appropriate energy use and thermal comfort

3.3.7 Compactors

The compactors are an enclosed proprietary system. The efficiency of the motor/ design is beyond the scope of this assessment, however there are a number of items that can be completed to ensure they use as little energy as possible:

1. Cycle when full. If the machine is cycled only when full, the number of cycles will be significantly reduced, and the hydraulic load of the additional material will be negligible in comparison to the machines internal inertia/ loads.
2. Maintain the equipment, particularly lubricating the runners. The main slides of the hydraulic movement should be well lubricated to ensure the friction is minimised. This should be discussed with the company that supplied the system at the next service interval and a maintenance program put in place.

3.3.8 Interior lighting:

The interior lighting is well designed, effective and efficient. Good housekeeping and regular reminders to ensure lights are not in use when the staff are not in their offices will minimise energy use. Consideration should be given to installing PIR sensors in halls and bathrooms if lights are left on excessively. If installing sensors in the offices, daylight step lighting with PIR should be used that automatically adjust the lighting levels as daylight

increases or decreases should be installed. These are significantly more expensive than simple on-off sensors, but will result in better acceptability to personnel working within the office environment, and therefore will be used to better effect.

	No. Fixtures	No. lamps per fixture	Type	Estimated Circuit watts	Installed Watts
Hall	6	2	T5	28	336
Office	2	2	T5	28	112
Ladies	2	1	2D	32	64
Gents	2	1	2D	32	64
Elec	1	2	T5	28	56
FD5	2	2	T5	28	112
FD6	2	2	T5	28	112
Canteen	2	2	T5	28	112
Changing	2	2	T8	64	256
Total	21				1224

Figure 7: interior lighting loads

Several assumptions have been made in terms of the ballast type etc. but it should be broadly accurate. An easy way to understand if interior light is efficient is to calculate the installed lighting power density (watts per m²) and check if it is within ASHRAE² 90.1 guidance ranges. For offices, the ASHRAE 90.1:2007 lighting standard gives office lighting should be no more than 11 watts per m². The office at 130m² gives a lighting power density of 9.5Watts per m², which is well within the standard. This standard is proposed to be reduced to 8.8 for the 2014 edition, which shows how good the lighting is, in the context of changes in lighting technology.

3.3.9 Office Equipment

There are approximately 6 computers installed in the facility, some with large monitors. The Computers have an auto-shut down facility. Staff should be reminded to use the hibernate function when away from their desks.

3.4 Thermal Energy use

There is only one non-electric thermal energy use for the site. I.e. the main office heating. The building is heated with a modern condensing kerosene burner with well managed controls. The insulation includes dry lining and cavity construction, and the blown insulation is covering the 250mm joists leading to believe that the building is good practice from a small office point of view. The kerosene used for the building heating was 900 Litres (one fill) in the last 12 months. As the building is 130m², this equates to a

² American Society of Heating, Refrigeration and Air-conditioning Engineers guidance document 90.1 is widely used in the US and Canada.

figure of 70.6 kWh/m² per annum for heating. This would be considered good practice and no specific upgrade recommendations are made.

There is a solar thermal panel installed in the facility providing hot water. The staff indicated subsequently that this results in the boiler being off for the majority of the summer months. As with all heating systems, careful and skilled use of the controls will ensure that no energy is wasted in the building, and this should be maintained and improved over time.

The oil boiler should be serviced once per 2 years based on the usage of 1000L per year.

Thermal Energy Consumer	% of Total	Comments
Space Heating	90%	Estimated.
Domestic hot water etc.	10%	

3.5 Energy Performance Indicators (EnPIs)

The site usage is 3.9kWh per tonne excluding diesel.

The building is 70.6 kWh/ m² which are a good measurement.

3.6 Renewable energy feasibility

3.6.1 Solar PV.

Solar Photovoltaic have fallen considerably in price over the last 5 years and are now approaching cost effective at 8-10 year paybacks. In the case of the landfill, consideration could be given to installation of PV panels to offset the base load of the site during the day. As the average load in the facility is approximately 10kW on the day time rate, and this will largely be higher during peak solar production, an array of 7-9 kW would be appropriate. This base load should be measured in advance of the installation. This would eliminate approximately 10-15% of the total load currently and as the landfill closes would increase to 30%.

One clear reservation would be the need for appropriate security for the site, as landfills/ recycling centres typically have a higher theft rate, and this must be a consideration in any Renewable energy project.

3.6.2 Wind energy

The site annual average wind speed is low, using data from the SEAI wind atlas, which is reasonably accurate. This would make any wind generator an unattractive financial investment. Solar PV would be far superior for the site.

3.6.3 Heat pump for heating main building.

The main building could be heated by a heat pump system instead of an oil boiler. While the payback for this would be long currently, the installed cost of these systems is falling rapidly while the price of oil has risen steadily for the last 10 years. This should be examined at least every two years to ascertain the correct time to install a suitable system.

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4 Opportunities for Energy Savings

4.1 Recent/Existing Energy Saving Initiatives

The main site lighting was split into two circuits in November, with one half of the lighting being turned off after hours, and the remaining security lighting remaining on to allow the CCTV camera's operate.

The site building has solar hot water installed.

The weighbridge has an air source heat pump installed to provide heating and cooling.

4.2 Suggested Opportunities for Energy Savings

The audit team on site on the day identified a number of energy savings initiatives that will save significant money. A number of other smaller ones have been identified subsequent to that analysis.

4.2.1 MIC reduction.

The Site Maximum import capacity (MIC, or the maximum energy use required in one 15 minute period) is set to 74 KVA. This costs €34.36 per KVA per annum including Vat with the public service obligation, based on the same number, costing 17.23 (2014) per KVA per annum. In total the reduction from 74 to 29 KVA will save a total of 45KVA. This will result in an annual saving of €2,321 including VAT (€2045 excluding VAT).

4.2.2 Storage heater elimination.

The two external portacabins are heated with a 3kW storage heater that was set to 50% capacity on both the input and output dials. These facilities are used for storing files, some related to the landfill, others to other facilities. A typical 3kW storage heater set to position 3 out of 6 will use on average of 12-24 kWh per day. As these two heaters are switched on all year round, they will use 8760-17520 kWh per annum or €750-€1500. A mid-range estimate of €1,200 would be appropriate in this case.

Possible solutions:

1. Move the files to the county council central file repository and disconnect both storage heaters. This will save an estimated €1200 per annum.
2. Install de-humidifiers to eliminate moisture, rather than heating. The heaters could be retained for frost protection and switched to input 1 for 3-4 months per annum. This would save an estimated €600-€800 per annum (1/2 to 2/3 of the energy use).

Either way, this particular use of energy is a clear identified significant saving of energy from the site.

Table 4: Opportunities for Energy Savings

Ref	Opportunity	Indicative Savings	Budget Cost	Category	Target Date	Additional Information	Status
01	Reduce MIC	2321	500	Technical	6 Months		
02	Eliminate archive heating	1200	0	Organisational	6 Months		
03	Infrared heating for hut	340	300	Technical	3 Months		
04	Housekeeping with lighting, heating and IT equipment	200	0	Organisational	6 Months		
	Total	4061	800				

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5 Next Steps

5.1 Three Months of Mentoring Support

- The site staff (John and Mary) should review and implement as appropriate the actions listed in section 4.
- Elizabeth should feedback from bills the relative success in reduction of cost.

5.2 Compliance with National Obligations

- Carlow County council should carefully review the obligations set out in section 1.4.2, identify compliance gaps (if any) and (if there are any such gaps) implement a programme to ensure that the organisation is compliant with all relevant obligations.

5.3 Embracing Best Practice

- All staff should use SEAI's [Energy Link network](#) to benefit from the experience of others who have already implemented successful energy saving measures and initiatives, and to tap into the remarkable knowledge base of network members.

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Appendix A – Site Tour Checklist

Item	Score						Observations / Comments
	Poor			Excellent			
	1	2	3	4	5	N/A	
Physical Condition of Buildings / Plant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Insulation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Steam / Condensate / Hot Water Leaks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Boiler House	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Compressed Air	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Cooling Systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Production Plant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Lighting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Evidence of Energy Awareness (posters etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Staff demonstrated awareness, but no identifiable posters etc.
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

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