SECTION 2

TABLE OF CONTENTS

LIST OF TABLES

2. THE PROPOSED FACILITY

2.1 General Description of the Site

The site of the proposed development is located approximately 2.5 km south west of Donard, the nearest town, and 5 km north of Baltinglass. The site location is depicted on Figure 1.1 and Drawing No. BRI/101, Rev A.

The site comprises an existing sand & gravel pit that has been partially backfilled with commercial & industrial (C&I) and construction and demolition (C&D) wastes.

Wastes were previously deposited in the site prior to BRI assuming control of the site. A trial pitting exercise, which involved the excavation of 67 trial pits on the site, was undertaken in December 2003 by ERML to ascertain the nature and extent of the wastes deposited on the site. A full report is attached in Appendix 9. No hazardous wastes were found during this site investigation. Three zones of waste (denoted Zones A to C on Drawing BRI/102, Rev A) were identified:

The developer's Master Plan for this site is to:

- Continue with the processing of the remaining sand and gravel deposits
- Process, treat and recover previously deposited wastes, which represent a potential source of pollution
- Reinstate and restore the lands by filling the void left by sand and gravel extraction with residual treated wastes from on site and off site sources.

2.2 Description of Waste Types and Quantities

The Master Plan includes waste management activities on the site thus a Waste Licence must be applied for and granted by the Environmental Protection Agency (EPA or Agency) before proceeding with some of the project.

The developer envisages a private sector operated integrated waste management facility on the site, which addresses the hierarchy of waste management i.e. waste recovery, recycling, reuse and finally disposal. There are several waste streams that could be catered for at the facility including wastes arising from private and public sector sources.

The principal waste streams that could be managed at the BRI Facility in Whitestown Lower, west Wicklow are as follows:

- wastes previously deposited at the subject site
- Wastes arising from the excavation/remediation of other unauthorised landfill sites located along or close to the N81 corridor.
- C&I and C&D wastes arising in west Wicklow, south Kildare, north Carlow and the south Dublin area that should be processed to recover wastes prior to disposal
- Treated residual wastes from other waste management facilities
- Source separated dry recyclables and/or organic wastes that would arise in west Wicklow if suitable collection and programmes are introduced as envisaged in the County Wicklow Waste Management Plan 2000-2004 (CWWMP) (reference sections 4.7.1 and 4.7.2)
- Household and like commercial wastes from west Wicklow upon closure of the Rampere landfill estimated to be in ca. 4 to 5 years.

The precise quantity of some of these waste streams that may arise and be delivered to the proposed BRI facility at Whitestown Lower is not known. Given this uncertainty the developer has decided to plan and develop a facility and waste management infrastructure that are flexible in terms of the nature and quantity of wastes that can be processed, treated, recovered and deposited at the site during the course of completion of the restoration works. Notwithstanding uncertainty in the quantity of some of the waste streams, the following waste types and quantities are potentially available.

1. Wastes on site:

Three zones of waste were identified on site (See report in Appendix 9) Waste included commercial, industrial and C&D wastes, all underlying a surface layer of silt/clay of variable thickness of between 0.2 to 1.8 metres. There was no evidence of hazardous or household wastes. It was apparent that soil cover layers were placed during deposition. Practically all of the wastes were quite dry during the December 2003 site investigation. The estimated quantity of wastes in Zones A to C is ca. 180,000m^3 or ca. 240,000 tonnes.

Zone A typically contained wood, metals, plastics & paper/cardboard, in a soils/fines matrix. Wastes were found from what appeared to be commercial and industrial sources, including a Dublin Airport source. Much of this waste was packaging waste (paper/cardboard/plastics).

Zone B had a very high percentage of soils/fines (commonly in excess of 90% or higher). The soils/fines were predominantly clean, with sparse non-inert waste intermixed.

Waste in Zone C appears to date back to 1998 (based on a newspaper and correspondence identified from 1998) and was the most decomposed. Some of the wastes in this zone appear to have been passed through a shredding process. The fines were heavily stained from interaction with the decomposing wastes within this zone.

At Zones A and C it is estimated that the soils/fines and other inert materials comprise 70 to 80% of the total mass of waste. At Zone B it is estimated that the soils/fines and other inert materials make up greater than 90% of the total mass of the waste body.

The thickness of waste encountered in the trial pits varied between 1.1m and 6m. However, it is noted that the full thickness of the waste when it was greater than 6 to 7m could not be determined due to physical limitations of the mechanical excavator.

2. Wastes from Nearby Unauthorised Sites:

Detailed information on the location and size of unauthorised landfill sites in west Wicklow is not available to the developer. It is known that there is one large site within 1 km of the BRI site. It is understood this site contains in the order of 300,000 m^3 of mixed C&I and C&D wastes. Thus, there could be some 350,000 tonnes of waste requiring management and safe recovery and disposal. There is a small unauthorised landfill (ca. 10,000 tonnes) at Coolamadra Co. Wicklow. There are several other former landfills in west Wicklow along the N81 near Blessington, which will or have been investigated by Wicklow County (Reference CWWMP Section 4.7.12). Some of these sites may require remediation. A possible remedial strategy for some of these sites is excavation, removal and treatment of the wastes at a facility such as the proposed BRI Facility. It is assumed that most of these wastes at other landfill sites are mixed C&I and C&D wastes.

3. Imported C&I and C&D wastes

The County Wicklow Waste Management Plan 2000-2004 addressed the need for the development of recovery facilities by the private sector etc. To a large degree the road network will dictate the potential catchment area of the facility for these types of wastes. (Refer to Sections 4.7.2 and 4.7.8 of CWWMP)

4. Source Separated Dry Recyclables and/or Organic Wastes

The towns and villages in west Wicklow where source separated dry/wet wastes might arise are Blessington, Baltinglass, Donard, Kiltegan, Dunlavin etc., (See Sections 4.7.1 and 4.7.2 of CWWMP). The applicant intends to hold discussions with Wicklow County Council with a view to the development of these separate collections.

The discussions above suggest a need for a facility to process relatively large quantities of waste in a short time frame. Determination of an appropriate design capacity of the facility is to a degree subjective and dependent on the plant required to handle and process the wastes. To ensure expedient treatment of the previously deposited wastes on the site and to provide capacity for treatment and recovery of other source separated wastes the developer proposes a processing capacity of at least 180,000 tonnes per annum made up approximately by the following waste streams.

On site or imported C&I, C&D and Household Wastes	160,000 t/a
Source Separated Recyclable Wastes	10,000 t/a
Source Separated Organic Wastes	10,000 t/a
Total	180,000 t/a

The annual rate of disposal in the lined landfill will depend on the recovery rates at the facility, the total void to be filled to restore the site to a rolling landform and the desirable duration of the site reinstatement and restoration works. The rate of disposal is the subject of further discussions in this report. In any event, the developer envisages a disposal rate of over 100,000 t/a.

2.3 Description of Key Waste Management Infrastructure

On the basis of the foregoing the developer is proposing to develop the following key waste management infrastructure:

- Mobile Waste Recovery Unit(s) (MRU)
- Resource Recovery Building (RRB) which will include:
  - (i) Materials Recovery Facility (MRF) infrastructure
  - (ii) Centralised Composting Facility (CCF) infrastructure
- Lined area in which processed and treated residual wastes will be deposited

The design and operation of these key facilities are described in greater detail in the following sections.

The associated and ancillary infrastructure that will be provided at this proposed state of the art facility is described in Section 2.11.

2.4 Mobile Recovery Units

2.4.1 Overview of Design and Operation

Data from a Trial Pitting site investigation undertaken in December 2003 (Appendix 9) suggested that there is approximately ca. 180,000 m^3 of previously deposited wastes on-site in three zones.

The excavation and processing of the previously deposited wastes will be carried out using Mobile Plant operated within the three Waste Zones that were identified in December 2003 by ERML. The MRU will be used to excavate, process and recover previously deposited wastes through possible activities including excavation, screening, hand-picking, shredding and crushing. After these wastes have been removed the MRU will be set up in lined areas containing deposited residual wastes to process, treat and recover any mixed builders'/C&D skip wastes that are accepted at the site that would be more appropriately screened and processed with the MRU plant outdoors. A MRU may also be set up on a hardstand adjacent to the Resource Recovery Building (RRB) as discussed in Section 2.5.

The excavation and processing of the existing waste zones will be progressive starting at Zone B, proceeding to Zone C and then to Zone A. As it is efficient to have excavation and recovery processes occur in close proximity to each other as it reduces transportation of wastes the plant will be positioned within a Zone and all the wastes will be excavated within the zone before proceeding to the next zone.

Depending on the types of wastes encountered different types and configurations of plant can be used for recovery purposes. The plant comprising the MRU will be adjusted to maximize recovery of previously deposited wastes and any imported C&D wastes. It is anticipated that there will be a minimum of 1 MRU on site at any given time.

Various components of the MRU are described in Section 2.4.2.

2.4.2 Plant

The MRU will include some or all of the following plant:

- 20 tonne (minimum) excavator(s),
- 25 to 40 tonne dumpers,
- Finger screen(s),
- Mobile picking station
- Shredder,
- Trommel screen,
- Crushing plant,
- Magnet to remove metals, and

- Air compressor with Blower to remove light wastes.

Examples of possible plant are presented in Appendix 4.

2.4.3 Capacity

There will be sufficient plant to process at least 100,000 tonnes annually. The nature of the plant is such that it will not be difficult to attain or exceed this capacity by adding plant.

Sufficient plant will be on site to ensure duty capacity and up to 50% stand-by capacity.

2.4.4 Potential Configurations of Plant

Some initial comments on the composition of the MRU based on the nature of the in-situ waste encountered are provided below.

2.4.4.1 Plant to be used in Waste Zone B

Based on observations in the 67 trial pits dug in December 2003 it appears that most of the waste in Zone B comprises soils, stone, broken concrete, bricks etc. with a very small percentage of non-inert materials. In this instance the MRU will likely comprise excavator(s), dumper(s) and finger screen(s). The fines fraction from the finger screen will be typically less than 50 mm. The fines may be further screened using a Trommel screen. If the quantity of non-inert waste is small in the oversize fraction arising from the finger screen the oversize material will be crushed and reused for site hauls roads and other engineering purposes. If the oversize is too contaminated with non-inert wastes then it will be taken to the Resource Recovery Building (RRB) for further processing.

2.4.4.2 Plant to be used in Waste Zones A and C

The December 2003 trial pit exercise revealed a higher portion of non-inert materials in Zones A and C as compared with Zone B. Zone A has a higher percentage of heavier C&D wastes (e.g. stone, bricks concrete) and Zone C has a higher portion of shredded lighter wastes (e.g. paper, card, wood and plastic). The quantity of putrescible material observed in these wastes was negligible. Some of the light wastes are biodegradable and could be treated in a composting unit if mixed with other imported organic wastes.

The composition of the MRU that will be required to process and treat the wastes in Zones A and C will be slightly different than discussed above in relation to Zone B.

If the in-place wastes have not been previously shredded then it may be appropriate to carry out an initial screening using a finger screen with the resultant oversize fraction being taken to the RRB for further processing and the resultant fines, either recovered for restoration purpose on site or deposited in a lined disposal area.

If the in place wastes are predominantly sorted light wastes that have already been shredded then the only option may be to further shred and deposit the residue in the lined disposal area, having passed them over a magnet to remove any metals. All potential wastes and configurations of the MRU are not discussed here but as stated earlier there will be a wide range of facilities and plant on the site to cater for all of the wastes encountered during the excavation of the previously deposited wastes. The screening units generally control the processing capacity of the MRU.

2.4.5 Materials Management

In summary the wastes that will arise from the initial processing of the previously deposited wastes will be:

- Fines for recovery and reuse on site for restoration or covering in the residual waste disposal facility.
- Stone, concrete, bricks for recovery and use on site or offsite.
- Mixed residue for disposal or further recovery at the facility.

2.5 Resource Recovery Building (RRB)

2.5.1 Overview of Design and Operation

It is proposed to construct a Resource Recovery Building (RRB) to house infrastructure for:

- Recovery of previously deposited wastes following the initial screening/separation activities carried out using the MRU
- Processing and treating imported C&I and C&D wastes for recovery purposes
- Processing and treating imported household wastes for recovery purposes
- Receipt and processing of imported source separated organic waste for composting
- Receipt and processing of imported source separated recyclable wastes

The RRB as designed will be ca. 40m x 55m x 12m high at the eaves. The building will consist of a concrete floor, steel beam construction and clad with metal cladding. The exterior finish will be light grey in colour. The proposed RRB location is depicted in Drawing BRI/103, Rev A.

The RRB will contain various plant and other infrastructure. It is intended that it will be multi-functional, that is the plant and infrastructure can be used for a variety of applications.

It will be used for processing previously deposited wastes, which cannot be processed in the MRU. As well it will be used to receive and process various imported wastes. It will also include infrastructure to process imported source separated wastes. These are described below.

The RRB will house a Centralised Composting Facility (CCF) with an annual capacity of 10,000 tonnes (food wastes and green wastes). It is proposed to use an in-vessel composting technology to facilitate the proper management of the process and potential nuisances. Compost will be cured after discharge from the in-vessel composting (ca. 14 days) on-site (ca. 3 months). This proposed composting infrastructure offers the potential to develop full-scale composting programmes for some communities in west Wicklow and surrounding areas.

The source separated recyclable wastes received at the site would include glass, paper newspaper, cardboard, plastics, and metal. These wastes could be collected from residential sources (e.g. bring banks) or commercial sources. This proposed recovery infrastructure offers the potential to develop full-scale recycling programs for some communities in west Wicklow and surrounding areas.

2.5.2 Plant

The Plant in the RRB will be set up to receive wastes and facilitate recycling and recovery activities. The plant inside the RRB will comprise some or all of the following:

- Excavator (s)/ Grab(s)
- Wheeled Loader
- Finger screen(s)
- Trommel Screen
- Shredder
- Various hoppers and conveyors
- Picking line
- Magnet to remove metals
- Eddy Current (aluminium)
- Air compressor with Blower to remove light wastes
- Baler
- Fork-lift

Possible plant and equipment to be used in the Centralised Composting Facility (CCF) attached to the RRB include:

- Feedstock Mixer
- In-vessel composter (as designed by Wright Environmental Management Inc.)
- Other equipment available in the RRB

In addition there will be a farm tractor and water bowser and road sweeper on the site to control mud and dust on the hardstand area surrounding the RRB. Examples of some of the plant are included in Appendix 4.

2.5.3 Capacity

There will be sufficient plant to process 70,000 tonnes per year of wastes including source separated recyclable and wet organic wastes. Up to 10,000 tonnes per year of source separated organic waste will be accepted for processing at the RRB.

Plant will be selected to have sufficient duty capacity and up to 50% stand-by capacity.

2.5.4 Potential Configuration of Plant

A possible configuration of the plant is depicted on Figure 2.1 (Appendix 1 Volume II).

2.5.5 Materials Management

A schematic of plant and equipment that will be installed in the building and an outline of the waste flows in the building are depicted on Figure 2.1.

2.6 Waste Processing, Recovery and Residual Waste Scenarios

Table 2.6.1 presents a possible scenario for the quantities of waste to be processed, received and disposed at the proposed facility in Year 2. In later years (probably during year 3) there will not be a requirement to process previously d3eposited wastes and thus the quantity of imported wastes processed will increase. It is hoped that initiatives by BRI in cooperation with the County Council will result in an increase in the recovery rate of source separated dry recyclables and organics also.

2.7 Residual Waste Disposal Facility

Residual wastes from previously deposited wastes and imported wastes will be appropriately disposed of in fully engineered and lined areas within the site.

Table.2.6.1: A Possible Annual Waste Processing, Recovery and Disposal Scenario at the Facility in Year 2 of operations

Waste Type	Description	Quantity (t/a)		
		Processed	Recovered	Disposed on Site
1. Wastes Previously Deposited On site	Zones A to C	120,000	60,000	60,000
Subtotal		**120,000**	**60,000**	**60,000**
2. Imported C&I or C&D or Household Requiring Processing and Treatment	Mixed – various sources	20,000	10,000	10,000
	Source Separated Organic Waste	5,000	2,500*	0
	Source Separated Recyclable Waste	5,000	4,500	500
Subtotal		**30,000**	**17,000**	**10,500**
3. Imported Pre-treated C&I and C&D not requiring processing and treatment.		0	0	30,000
Subtotal		**0**	**0**	**30,000**
Total		**150,000**	**77,000**	**100,500**

***Composting results in mass reduction of ca. 50%**

2.7.1 Overview of Design

The potential extent of the residual waste disposal facility is depicted on Drawing BRI/110, Rev A. Drawing BRI/109, Rev A presents the proposed restoration levels for the landfill. Cross-sections of the side slopes and the completed landform are shown on Drawing BRI/111, Rev A. The current landfill design as shown avoids encroachment on the cSAC described in Section 3.5 of this EIS.

Large cuts and fills will be required in order to shape the existing pit into a useable void space for waste disposal. Earthworks construction will be ongoing over the life of landfilling activities on the site.

The infill below the surrounding land surface will range between 2 and 20 metres deep. The maximum level of deposited residual waste will be 172 mOD. The ultimate area of the floor including all Phases of development, upon completion will be ca. 6 ha.

The edge of the lined area (footprint) of the landfill will be ca. 9 ha. Buffer lands will be available outside the limits of the landfill for fencing, environmental monitoring installations, site roads, and surface water drainage systems. The buffer lands will also allow for provision of landscaping berms and shelterbelts of trees and other vegetation. Further details on proposed plantings, prepared by the landscape architect for the project, are contained in Appendix 13.

2.7.2 Landfill Infrastructure

The landfill slopes and base will be lined with a composite liner including a HDPE geomembrane to comply with the requirements of the Landfill Directive. There will be a leachate collection system comprising a drainage layer 0.5 m thick and perforated HDPE collection pipe. The lined landfill base will be sloped to promote drainage to sumps in which submersible leachate pumps will be installed to remove leachate from the base of the landfill. The landfill lining and leachate collection systems are described in detail in section 2.7.5 and 2.7.6, respectively. The completed landfill will be capped with a number of soil layers as described in detail in section 2.7.8.

2.7.3. Void Space of Landfill

The landfill foot print, design slopes of the lined excavation, landfill base area and contours and the final restoration contours govern the volume of the void that will be filled. The landfill formation contours will be selected to leave a minimum of 1m of soil above the groundwater table. The final restoration contours are shown on Drawing BRI/109, Rev A. The shape and height off the landform have been designed based on input from the landscape architects. The engineered capping layers will be placed on the final surface of the waste that plateaus at 170 mOD. Wastes will be placed above the levels shown to allow for volume decrease and compression of the waste over time.

The computed potential volume of the void formed by the base and side slope surfaces shown on Drawing BRI/110, Rev A (i.e. the area inside the edge of liner and including the void that would be created by removing the hardstand and the RRB) and the restoration surface contours shown on Drawing BRI/109, Rev A is approximately 920,000 m^3. The relevant volumes that lead to this estimate are as follows:

Table 2.7.1 Landfill Volumes

Materials	Estimated Volume (m^3)	
1. Total Volume between formation and restoration surfaces		**1,200,000**
2. Engineering and Restoration Materials placed in landfill area		
Clay Liner on base	60,000	
Drainage layer on base	30,000	
Engineered Final Capping layers assuming 2.1 metre cap	190,000	**280,000**
3. Estimated Net Volume to be filled by Residual Wastes and daily/intermediate cover		**920,000**

The anticipated tonnage of residual wastes that will fill the ca. 920,000 m^3 is 782,000 tonnes based on a post settlement waste density of 0.85 tonnes/m^3.

Materials balance calculations have been carried out (See Table 2.7.2) which indicates a shortfall in soil fill requirements.

On the basis of the foregoing estimates and excluding the higher specification engineering materials required in the lining and capping system the Net Materials Balance for soils to build embankments, road, platforms and cover wastes during operations is a deficit of 96,000 m^3. This deficit assumes that the building platform is removed and Phase 6 of the lined landfill is constructed. This deficit in soil can be easily made up by processing C&D wastes and thereby recovering the soil/fines fraction. These recovered fines will be used for covering and capping wastes and also mechanical protection of the side slope lining system.

Table 2.7.2: Preliminary Earthworks Materials Balance Calculations

Item	Description	Volumes (m³)		
		Cut	Fill Required	Recovered or Excess Soil
1.	**Previously Deposited Waste**	180,000	0	90,000
2.	**Construction of Engineered Facility to Formation Levels**			
2.1	Initial Development Works: Roads, Hardstands and Phase 1 of Lined Disposal Area	100,000	41,000	59,000
2.2	Ongoing Development of Lined Disposal Areas ▪ Reinstate Levels in areas of excavation of previously deposited wastes ▪ Additional Earthworks within proposed Phases 2 to 5	0 84,000	82,000 16,000	(-82,000) 68,000
2.3	Removal of hardstand area beneath building to form Phase 6	68,000	0	68,000
3.	**Materials for Engineering and Operations Purposes**			
3.1	Silt/Clay for low permeability liner 1m thick	0	60,000	-
3.2	Drainage layer on lined base of landfill 0.5 m thick	0	30,000	-
3.3	Daily and Intermediate Cover and liner protection requirements (ca.)	0	200,000	(-200,000)
3.4	Capping System ▪ Topsoil/Subsoil ▪ Drainage Layer ▪ Clay Barrier ▪ Gas Drainage Layer	0 0 0 0	90,000 30,000 45,000 30,000	(-90,000) - - -

2.7.4 Landfill Phasing and Construction

The conceptual plan for this site is to develop the lined landfill in six distinct Phases, identified Phases 1 to 6 on Drawing BRI/110, Rev A. The sixth phase comprises the area of the proposed RRB and adjoining hardstand. Thus, it is assumed for the purpose of this report that the RRB and associated infrastructure and hardstand will be decommissioned to allow the sixth phase of landfill development. This area would then be filled and restored to ultimately produce a landform suitable for agricultural use. Drawings BRI/103 to BRI/107, Rev A show the progression of landfill development to the edge of the hardstand area adjoining the RRB.

2.7.5 Liner System Details

The proposed landfill facility will include a base and slope lining system that will contain leachate. The lining system on the base will be overlain by a drainage layer, 0.5m thick, which will direct leachate to sumps.

The lining system on the base will be a composite liner that will comprise a layer of compacted clayey silt (i.e. a compacted clay liner – CCL) a minimum of 1 m thickness and a 2 mm thick high density polyethylene (HDPE) geomembrane. The soil liner will have a coefficient of permeability of less than 1×10^{-9} m/sec. The provisional design levels for the top surface of the base liner will be as shown on Drawing BRI/110, Rev A. The proposed base levels are dictated by the water table level beneath the floor of the sand and gravel pit, and the need to create a positive grade for gravity flow of leachate towards sumps where pumps will be installed in the leachate collection system. The base liner design concept is illustrated on Drawing BRI/110, Rev A.

2.7.6 Leachate Collection System at Base of Lined Areas

A leachate collection, drainage layer and piping system will be installed on the lining system that will be constructed on the base of the landfill.

Drawing BRI/110, Rev A depicts a layout of the leachate collection system. The leachate collection system will consist of a 150 mm ID minimum diameter perforated HDPE collector pipes laid in a 0.5 m thick layer of drainage stone. The wall thickness of the pipe will be selected to avoid crushing due to a overburden loads.

The material comprising the drainage layer will have a permeability of greater than 1×10^{-3} m/sec.

The proposed completed levels of the lining system will vary between 140.5 mOD to 147 mOD. The plan is to drain leachate by gravity flow in a number of runs of perforated pipe lying within the 0.5m thick drainage layer. The base of the landfill will be shaped so that there is a minimum overall slope of greater than 1.0%. The perforated leachate collection pipe will drain to sumps as shown on Drawing BRI/110, Rev A.

2.7.7 Leachate Removal/Evacuation from the Lined Landfill

The plan is to remove leachate from the base of the landfill by submersible pumps. The leachate will be pumped from the landfill base and discharged ultimately into a leachate holding tank.

The pumping system will include a HDPE perforated pipe (well screen) laid horizontally on the base of a stone filled sump. The horizontal well screen (300 mm ID diameter HDPE pipe) will feed a submersible pump that will be equipped with level switches that will activate the pump when the leachate head reaches a prescribed level. The horizontal well screen will be connected to an inclined HDPE riser pipe that will be laid on the lined side slopes.

The discharge from the submersible pumps will likely be through 40 to 60 mm diameter pipes. It will be possible to insert and withdraw the submersible pumps and discharge lines for routine maintenance, repair or replacement. The leachate evacuation pumps will discharge into a leachate gravity/rising main that will connect to a holding tank.

2.7.8 Landfill Capping System

2.7.8.1 Capping System

The landfill will be capped with several different soil materials that will serve to allow for gas collection (if required) and also to minimise infiltration of rainfall and thus leachate generation. Restoration will take place progressively. Low permeability clay/silt will be used to provide an infiltration barrier. A geosynthetic clay liner (GCL) will be considered in lieu of the clay/silt barrier layer although there will be a general strategy during operations and post closure to ensure the wastes are wet in order to promote rapid bio-degradation. The overall thickness of the capping system will be on average ca. 2.1 metres if the clay barrier and gas collection layers comprise natural materials. Geosynthetic layers will be considered and proposed to the EPA to potentially reduce the thickness of the final capping system to 1.3 metres. The capping system will be completed over an area of approximately 9.0 hectares.

Starting at the ground surface the capping system would potentially comprise:

Component	Average Thickness (mm) (approx.)
Topsoil	150
Subsoil	850
Drainage layer	300
Clay/Silt Barrier Layer*	500
Gas Collection Layer*	300
	2100

*Note – geosynthetic materials will be considered for these layers and proposed to the EPA for approval.

2.7.8.2 Specifications of Capping Materials

- The topsoil will have an organic content, which will be capable of sustaining grass.

- The subsoil will be a mixture of silt and sand (a loam) and will be free draining.
- The mineral drainage layer will have a permeability of less than 1 x 10^{-4} m/sec.
- The clay/silt barrier layer will be compacted and will have a permeability of less than 1 x 10^{-9} m/sec or equivalent geosynthetic material.
- The gas collection layer will comprise permeable, clean, coarse sand and gravel with a permeability less than 1 x 10^{-4} m/sec or equivalent geosynthetic material.

2.8 Leachate Management at the Facility

2.8.1 Sources of Leachate

There will be four potential sources of leachate at the facility.

2.8.1.1 Area of Previously Deposited Wastes

Leachate may be encountered during excavation of previously deposited wastes.

2.8.1.2 At the RRB and adjoining hardstand

Wastes will be tipped on the floor of the RRB and possibly on the hardstand outside of the building. Any water that comes into contact with these wastes would be considered to be potentially contaminated and will have to be handled appropriately.

2.8.1.3 At the Compost Facility

Leachate will be generated at the CCF. However, it will be captured in an integral purpose built system and re-circulated in the composting tunnels. Although not expected any excess leachate will be directed to the facility's leachate management system.

2.8.1.4 At the Residual Waste Disposal Facility

The lined residual waste disposal facility will also produce leachate.

2.8.2 Quantities of Leachate

2.8.2.1 Leachate from the Previously Deposited Wastes

The quantity of leachate likely to be present in this area is small as these wastes were deposited in unlined areas that have been capped with silt/clay soil. During excavation of the waste there is a potential for leachate to be generated. The quantity of leachate that may be generated during excavations cannot be readily predicted. Any leachate encountered will be pumped to the leachate collection system.

2.8.2.2 Leachate from the RRB and adjoining hardstand

The liquid in this area may be mildly contaminated as it may be in contact with wastes for short periods of time. The quantity of potentially contaminated liquid will relate to rainfall events during the year and the area of hardstand. It is expected that the runoff from this area will not be considered leachate. In any case it will be directed to a holding pond to be located in the proposed Phase 5 of the landfill development.

2.8.2.3 Leachate from the Composting Process

The composting technology is designed to ensure that there is no generation of leachate requiring treatment. The composting process involves a considerable amount of water. An appropriate composting recipe will ensure that leachate generation is minimised.

There are a total of 10 No. collection areas and pumps in the composting tunnel. Each of the two sections of the composting tunnel has 5 No. collection areas and pumps. Any leachate that is generated in the composting tunnel is re-circulated back onto the compost in the area of generation. Any excess leachate is directed away from the composting tunnel through a piping system and into a holding tank.

The composition of leachate is feedstock dependent. Any leachate generated at the proposed facility will be characteristic of source separated organic waste that is blended with wood waste amendments.

2.8.2.4 Leachate Generation at the Residual Waste Disposal Facility

Key Parameters

Leachate generation depends on a number of factors including climate, site topography, nature of the wastes, landfill cover materials and vegetation, and the phasing and operational procedures. It is acknowledged in the industry that an accurate prediction of leachate generation is difficult.

The key parameters to be considered are:

- Surface area of exposed waste
- Surface area of restored land
- Input rate of waste
- Absorptive capacity of waste
- Rainfall
- Evaporation of waste and temporary cover surfaces
- Evapotranspiration from fully restored areas

A key consideration in leachate generation computations is the filling and restoration plans and the timing of the placement of the final capping layers on the landfill surface.

Comments on Presumed Filling and Restoration Plans

At this site it is the developer's aspiration to fill and restore the site progressively. However, because a small rounded hill is proposed it will not be possible to fill, and restore each development phase as a separate unit. Physical space constraints on the site do not make this possible. Instead filling must proceed from bottom up to a relatively low level in a development phase and then move into the next phase before the height of waste is too high in any one area. In this type of site, landfill base construction must proceed nearly continuously in order to stay ahead of the filling operations.

At this site interim soil covers will be placed on sub-horizontal waste surfaces in areas where active filling is no longer taking place. The lined pit will be filled from the bottom up largely in horizontal lifts that will cover one or more lined development phases. The final capping and restoration layers will have to be placed progressively from the bottom of the outer waste slopes, as the landfill rises vertically eventually to form the finished landform. Drawings BRI/103, Rev A to BRI/108, Rev A illustrate this concept. Leachate generation computations must take this type of filling and restoration into account. During most of the life of the facility the wastes will be open and the surface will not be restored. The area of the site fully capped and restored will be small until perhaps the last 2 years of the filling programme.

Comments on other Parameters

The amount of absorptive capacity and evaporation from the waste will depend on the waste types. There is published data for absorptive capacity of municipal solid waste (MSW). It is assumed that the residual wastes deposited at this facility will be similar to MSW for the purposes of the calculations.

Evaporation from the landfilled materials is also difficult to predict. Therefore, a reasonable allowance of approximately half of the estimated actual evapotranspiration at the site has been made in the water balance calculations.

The amount of infiltration that will eventually infiltrate through the proposed engineered capping system is not easily predicted. Experience would suggest that 20% of the total rainfall may penetrate final covers (Bagchi, 1994).

Investigators in Wales (Cherrill and Phillips, 1997) have calculated that, in the case of engineered capping system, the infiltration may be in the range of 50 to 120 mm/year if the capping system includes a barrier layer with a permeability of 1x 10^{-8} m/sec. The experience with native glacial tills placed and compacted with tracked equipment can produce a barrier layer in the final cap with a permeability of less than 1 x10^{-8} m/sec. Therefore, a lower infiltration rate than 50 mm/year above may be expected.

As a percentage of net rainfall this range equates to 10 to 25% of the average computed effective rainfall at the site. A very conservative infiltration rate, through the proposed completed capping system, of 25% of the average effective rainfall (i.e. 190mm/yr) has been made in the calculations.

Results of Calculations

Table 2.8.1 enclosed gives the results of an illustrative calculation of leachate generation at this site. The calculations indicate that the average annual generation rate during the operational phase will range between 3,400 and 24,500 m^3/year. It should be noted that these calculations are indicative only and the generation rates will vary from month to month and year to year. It is likely the maximum generation rates will be during approximately the months of November through to April. It is likely that significant quantities of leachate may not be observed in the first few months to years of the operations, as it will take time for the wastes to reach their field capacity. It should also be noted that isolation of areas within each of the lined development phases to separate potentially clean surface water runoff from water that has been in contact with waste within a completely lined phase is currently not proposed but may be considered during development of the landfill.

Table 2.8.1 Leachate Volumes

Year	Surface Areas (ha)			Volume of Leachate (m^3/year)
	Open with waste	Partly restored	Fully Restored	
1	1.11	0.0	0.0	3,399
2	1.11	1.11	0.0	7,628
3	1.11	2.22	0.0	11,857
4	1.11	3.33	0.0	16,086
5	1.11	4.44	0.0	20,315
6	1.11	4.44	1.11	22,429
7	1.11	3.33	3.33	22,428
8	1.11	3.33	4.44	24,542
9	0.0	3.33	5.55	23,257
10	0.0	0.0	8.88	16,912
11	0.0	0.0	8.88	16,912
12	0.0	0.0	8.88	16,912
13	0.0	0.0	8.88	16,912
14	0.0	0.0	8.88	16,912
15	0.0	0.0	8.88	16,912

The leachate generation rate in the post closure period will depend largely on the construction of the capping system. Based on the assumptions previously indicated the average annual quantity of leachate following closure and restoration of the site will be approximately 17,000 m^3/year.

A very low permeability clayey barrier will be installed in the capping system at this site to reduce leachate generation to less than 100 mm/year. As a consequence, the long-term leachate generation rate is expected to be between 5,000 and 9,000 m^3/year.

These conservative indicative rates will be reviewed during the operational period and compared with pumping rates.

2.8.3 Leachate Management Plan

2.8.3.1 Overview

Previously Deposited Wastes – Leachate if encountered, will be isolated to the extent possible and pumped to the leachate holding area on-site. Leachate will be taken off-site for processing.

RRB – Any liquids generated in the RRB and adjoining hardstands will be directed to a lined area initially.

CCF – Leachate will be recirculated or directed to leachate holding tank or pond.

Residual Waste Disposal Facility - Leachate will be re-circulated to further biodegrade the residual wastes. Leachate will be pumped from the lined areas and discharged to a tank from which it will be removed by closed tankers for off-site final treatment at a Waste Water Treatment Plant.

2.8.3.2 Storage Facilities

The plan is to use the lined landfill area as the primary facility for leachate storage. During the operational period of the facility, the maximum planned leachate level within the lined area will be 1.0 metres above the lowest level on the HDPE lined base. The volume of leachate contained in the landfill will vary with depth of leachate at the base.

The second storage facility will be a HDPE tank. The minimum proposed capacity is 50 m^3.

There will be high and low level switches in the leachate-holding tank. The leachate evacuation pumps in the landfill will shut off, if the level in the tank exceeds a prescribed level.

One tanker will be located near the leachate holding tank. It will be filled on a batch basis, and subsequently removed by a truck, which will leave an empty tanker. The pavement area in which the buried holding tank and leachate tanker will be located will be sloped to a gully that will drain back into the holding tank or the lined landfill area.

The bulk tanker will haul the leachate to the closest suitable Waste Water Treatment Plant in County Wicklow.

2.8.3.3 Leachate Re-circulation

A leachate re-circulation system will be designed. The system will include pumping leachate back from the sumps at the base of the landfill, into buried piping systems installed below the surface of the waste.

2.8.3.4 System for Monitoring Leachate Levels

Leachate levels will be measured in the leachate evacuation pump sumps. Pressure transducers will also be installed in the drainage layer constructed on the lining system. Installation of vertical risers within the waste as landfilling proceeds will also be considered.

2.8.3.5 Leachate Disposal

Leachate will be removed by a vacuum tanker. The proposed method of disposal of leachate from the proposed landfill is the treatment plant located at Baltinglass, County Wicklow.

2.9 Gas Management at the Facility

2.9.1 Sources of Gas at the Facility

Gases are generated in landfills and in other waste management facilities as a consequence of the aerobic but mostly anaerobic biodegradation of organic matter in the deposited waste.

The sources of gases are as follows:

2.9.1.1 At the Previously Deposited Wastes and location of the operating MRU

It is not anticipated that any gas will be generated as result of recovery activities. However, landfill gas may be encountered during the excavation of previously deposited wastes. It is expected that the introduction of oxygen into the wastes during excavation will result in the cessation of anaerobic gas generation.

2.9.1.2 At the RRB

As the retention time for wastes tipped in the RRB will be short and as oxygen will have been introduced into the waste during excavation, the likelihood of gases arising in the building will be low.

2.9.1.3 At the CCF

Gases will be generated during the in-vessel composting process as part of the normal composting process.

2.9.1.4 At the Residual Waste Disposal Facility

The residual wastes placed in the lined area for the purpose of restoring the site will contain non-recoverable textiles, paper, cardboard and timber. These materials will biodegrade and produce landfill gas. The quantity and nature of the gas will depend on the mixture of the materials deposited in the residual waste disposal facility and a number of factors, which are described below.

2.9.2 Quantity and Nature of Waste Biodegradation Gases

The principal source of gas at the Facility will be the residual waste disposal facility

2.9.2.1 Background

The quantity and rate of gas production in a landfill is dependent upon a number of factors including the:

- nature/composition of the waste;
- biodegradable fraction of the organic constituents of the waste;
- moisture content and density of the waste;
- temperature.

The exact composition or mixture of the waste to be deposited in the landfill is not known. Therefore an accurate estimate of the quantity of biodegradable matter present in the landfill and total quantity of gas produced cannot be made. Since this is the case, the discussion below addresses possible gas generation rates based on a number of arbitrary assumptions.

The total maximum yield of gas is in the range of 400 m^3/dry tonne of waste or approximately 500 m^3/wet tonne of waste according to Archer, 1987. It is assumed that these values apply to total municipal solid waste stream, which includes residential, commercial and industrial wastes. Tchobanoglous et al, 1993 indicates that maximum amount of gas that can be produced under optimum conditions will be in the range of 10 to 17 ft^3/lb of biodegradable volatile solids in the organic fraction of the municipal solid waste. A generation value of 12 ft^3/lb (approximately 750 m^3/tonne) is reported in the same reference, for mixed organic waste.

In summary, it is accepted from research that not all of the organic fraction of the wastes deposited in a landfill will biodegrade and form biogas because:

- lignin contents inhibits biodegradation;
- some materials are contained in plastic bags;
- some materials may not be exposed to sufficient moisture.

In Tchobanoglous, 1993 the relative rates of biodegradation and by inference the rate of gas production are suggested as follows, where rapidly biodegradable is defined as 3 months to 5 years and slowly biodegradable is up to 50 years or more.

2.9.2.2 Gas Production Rates - Literature Review

A literature review found that the rate of production is highly variable and may fall in the range of 3.9 to 130 m^3/tonne/year (Archer, 1987). Other references suggest lower rates of production in the range of 1 to 10 m^3/tonne/year, (EPA, 1997 and Bagchi 1994). It is obvious that if the total quantity of gas that is produced is fixed at say 750 m^3/tonne then the rate of production will be a function of the overall duration over which the degradation process will occur. If the waste slowly degrades then the duration of degradation will be long and the rate of production will be low.

2.9.2.3 Gas Production Estimates - Computation Methodology

A probabilistic gas production model was developed using GasSim software. GasSim is freely available commercial software developed by Golder Associates (UK) Ltd for the Environment Agency of England and Wales. GasSim is the Agency's preferred model for landfill gas assessments.

GasSim will allow the computer simulation of predicted gas generated by the site to be modelled on the basis of key waste input parameters and it's setting.

Few of the landfill parameters (such as the waste stream compositions and fill rates) can be known exactly, particularly for future years. However, each parameter can be described by a range of possible/probable values incorporating the available information. During each simulation, the parameters are assigned a value within the defined ranges. After a number of iterations, a range of possible predicted gas production rates or outcome values are obtained and it becomes possible to quantify the likelihood of a certain outcome.

This approach uses statistical distributions or probability density functions (PDFs) to characterise most of the input parameters. Each time a calculation is carried out, one value from the defined input distributions is chosen by the computer code and, for example, a concentration at the receptor is calculated. Each result is stored such that after repeating the same calculation three times, an output distribution for the concentration at the receptor is obtained. The distribution output is given in terms of percentiles (%iles). These (%iles) specify the probability with which a certain value (e.g. gas production rate) will not be exceeded. For instance, if the 95%ile of a gas production rate distribution is given as 1,000m^3/hour, there is a 95% chance that the actual production rate will be below or equal to 1,000m^3/hour. It follows that there is also a 5% (1 in 20) chance that the actual production rate will be above this.

The typical input parameters used to calculate the theoretical volume of gas generated at the site are:

- Infiltration;
- Waste Composition (breakdown);
- Waste quantity;
- Site filling rate;
- Waste moisture content, density, effective porosity, hydraulic conductivity and adsorptive capacity.

Due to the probabilistic nature of this model, ranges of potential outcomes are provided where appropriate.

2.9.2.4 Conceptual Model (GasSim)

A conceptual model for the gas generation at the Brownfield site was prepared using site-specific data where possible. Where this data was not available, default values reported in the GasSim model were used.

The following data were used for the model parameterisation:

- Effective Rainfall (infiltration rate) was estimated at 762 mm/annum using available met data;
- Waste composition (breakdown) – three different waste streams (Scenario's 1 to 3) were defined. The details of these waste streams have been included in the following Table 2.9.1;
- Waste input (quantity) and filling rate at the site was estimated at 100,000 tonnes per annum for a period of 8 years. Furthermore the area covered per annum was assumed at 2.5% of the total available area;
- Waste moisture content - GasSim default values were used for the waste moisture contents (i.e. paper – 30%, card – 30%, textiles – 25%, wood – 20%, putrescible - 65%);
- Waste density was estimated to range at 0.75 – 1.0 tonnes/m^3 (default);
- Effective Porosity of the waste was estimated to range at 1-20% (default);
- Hydraulic Conductivity of the waste was estimated to range at 10^{-9} – 10^{-5} $^m/_s$ (default);
- Adsorptive Capacity of the waste was estimated to range at 1-5% (default).

Table 2.9.1: Waste Composition used in the Conceptual Model.

Waste Type (% from each source)	Waste Source (%)			Characteristics (%)			
	Scenario 1	Scenario 2	Scenario 3	Water Content	Cellulose	Hemi-Cellulose	Decomposition
Paper	20.0	20.0	20.0	30	87.4	8.4	98
Card	8.0	8.0	8.0	30	57.3	9.9	64
Textiles	4.0	4.0	4.0	25	20	20	50
Wood	28.0	14.0	14.0	20	21	11	75
Other Putrescible	0	0	14.0	65	55.4	7.2	76
Non-Biodegradable	40.0	54.0	40.0	-	-	-	-
TOTAL	100	100	100				

The above mentioned waste Scenario's 1-3 represent theoretical estimates of three different waste streams. It has been assumed that paper, card and textile's part will be constant at 32% of the waste streams. The quantities of wood, putrescible and non-biodegradable wastes have been estimated to vary.

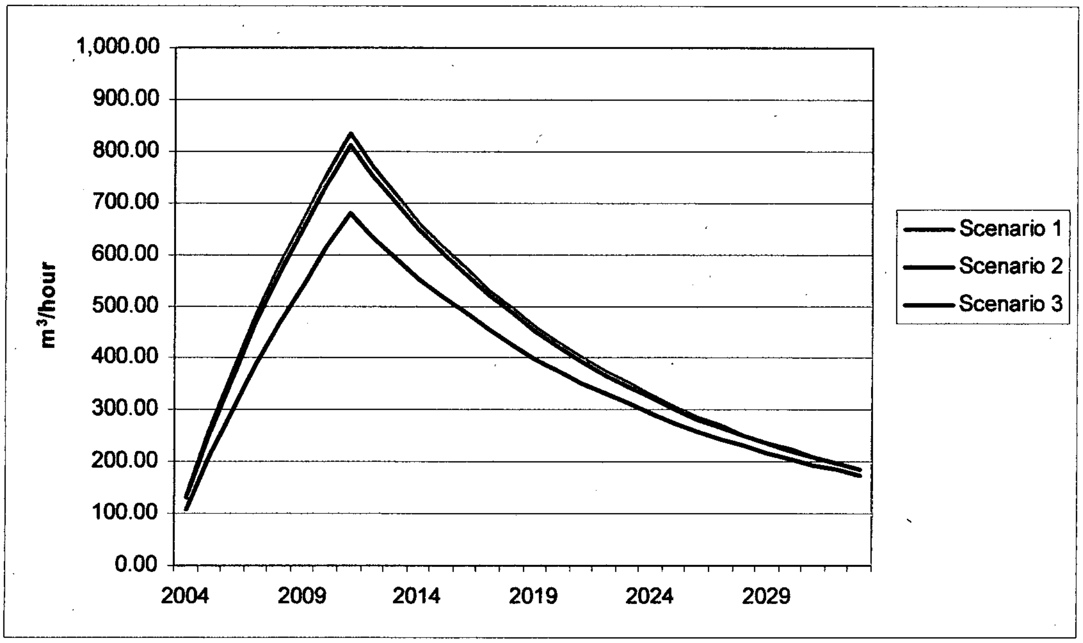
The characteristics at the Table 2.9.1 represent default values of the GasSim model.

2.9.2.5 Total Estimated Volume of Landfill Gas

The estimated quantity of landfill gas generated at the site was computed based on the conceptual model described above. The outcome of the three waste stream scenario's estimate a peak landfill gas production at the site of 680–830 m^3/hour at the final stage of the landfill operation.

The following Table 2.9.2 depicts the outcome of the three waste scenarios as described in Section 2.9.2.4 of this report.

Table 2.9.2: Estimated Landfill Gas Production at the Brownfield Site



2.9.2.6 Comment on Estimates

It is apparent and acknowledged in the technical literature that theoretical estimates based on a multiplicity of assumptions as indicated above will not be accurate and will only give approximate upper limits of gas quantities and production rates. Further estimates will be made once more accurate estimates of the waste composition are available and following waste deposition and gas pumping tests.

2.9.3 Landfill Gas Composition

The composition of landfill gas is well documented in the technical literature. Table 2.9.2 presents a typical composition of landfill gas during the biodegradation phases of municipal solid waste.

The composition of landfill gas at the proposed facility will not be precisely the same as that shown in Table 2.9.3.

Table 2.9.3 Typical Landfill Gas Composition

Component	Typical Value (% Volume)
Methane	63.8
Carbon Dioxide	33.6
Oxygen	0.16
Nitrogen	2.4
Hydrogen	0.05
Carbon Monoxide	0.001
Saturated Hydrocarbons	0.005
Unsaturated Hydrocarbons	0.009
Halogenated Hydrocarbons	0.00002
Hydrogen sulphide	0.00002
Organosulphur Compounds	0.00001
Alcohols	0.00001
Others	0.00005
Water	0.001-0.004

2.9.4 Landfill Gas Management Plan

The plans for gas management in the main functional areas of the facility are described below.

2.9.4.1 Areas of Previously Deposited Wastes during the operation of the MRU

Care will be taken during excavations as landfill gas is flammable. There will be no smoking or open flames in proximity of excavation areas.

In addition, the following site practices will be employed to minimise the occurrence of odour:

i. adequate compaction
ii. effective use of appropriate types of cover
iii. progressive capping and restoration
iv. effective leachate management in a closed tank
v. active gas collection

2.9.4.2 Area of the Resource Recovery Building and adjoining Hardstand

It is not anticipated that any gas will be generated as result of activities inside the RRB.

2.9.4.3 Compost Facility

Off-gases from the tunnel composting process will be directed to a biofilter and vented to atmosphere as described in Section 3.3.2 of Appendix 3, (Volume II of the EIS).

2.9.4.4 Residual Waste Disposal Facility

As discussed above it is the residual waste disposal facility that will produce the greatest volume of gas at the facility.

The proposed gas management plan in relation to the residual waste disposal facility comprises five elements:

i. Minimisation of volumes of putrescibles;
ii. Containment and isolation;
iii. Monitoring;
iv. Passive venting;
v. Active collection and flaring.

i) Minimisation

Gas volumes will be minimised by treating putrescible wastes, to the extent practical at the facility.

ii) Containment and Isolation

The side slopes and base of the landfill excavation will be lined such that there is a barrier to horizontal migration of landfill gas.

Buildings close to the landfill designed and constructed in accordance with Department of Environment guidelines relating to Protection of New Buildings and Occupants from Landfill Gas. Buildings constructed with isolation measures will not be alarmed. Buildings without isolation measures will be alarmed.

Active collection of gas on the perimeter of the waste body will also prevent the migration of gas through the subsurface.

The back up passive venting system will also help reduce the potential for migration into the surrounding geologic deposits that surround the site.

iii) Monitoring

Monitoring of the subsurface around the perimeter of the site will be carried out to ensure that gas is not escaping. Periodic surface and subsurface surveys within the waste body as landfilling proceeds will be carried out to assess the generation of gas.

Prior to installation of the active system, monitoring of gas in the waste body will be carried out via surface and subsurface surveys. When monitoring results indicate a significant increase in the quantities of landfill gas, steps will be taken to install the active system.

iv) Passive Venting

Passive venting will naturally take place from the deposited waste and through any interim cover materials.

Upon closure and restoration of sections of the landfill, passive venting of gas would be possible through the capping system which will include a 300 mm thick drainage layer comprising sand/gravel placed over the final upper layer of waste or interim inert fill cover. The passive venting system will be the backup system to the active system. A sub horizontal piping system may be laid in the gas drainage layer to direct gas to vertical vent pipes that would be installed where possible across the restored surface.

v) Active Collection System

The active collection system would comprise a network of wells, connected to an appropriately sized flaring unit. The wells would be installed in the waste body as soon as practicable after monitoring results indicate significant quantities of landfill gas. Provisionally, an active system is planned for installation after year 2.

As part of the flaring system equipment selection emissions from the flare-stack would be assessed for source, quantity, level and rate, and composition. The location of the flare will be in the landfill compound area shown on Drawing BRI/103, Volume III of the EIS.

A condensate removal system would be designed. Condensate would be collected and discharged into the landfill via a borehole or into the leachate collection system.

A maintenance programme for the active gas collection system will be specified at a later date and agreed during with the EPA.

The developer will consider the possibility of utilising landfill gas to generate energy at the site.

2.10 Surface Water Drainage Infrastructure and Management

Some features of the proposed storm water drainage infrastructure and management plan are highlighted below:

- Surface water accumulating in lined areas containing waste will be treated as leachate.

- Surface Drainage systems will be provided for all paved areas. These will comprise closed pipes draining to silt settling tanks, oil-water separators and soak holes.
- Storm water management ponds for clean surface water will be provided in the southeast corner of the site as shown on Drawing BRI/104, Volume III of the EIS, after the previously deposited wastes in this area have been excavated and removed. Silt fences and temporary earth bunds will be installed prior to excavation of existing Waste Zone B, to ensure that only clean runoff discharges into the drainage channels that lead from the site to the Carrigower River.
- Liquid from wheel washes will be drained back into the landfill.
- Runoff from completed landfill areas will be collected in perimeter French drains and directed to soakaways or storm water management ponds.

2.11 Other Facility Infrastructure

In keeping with the requirements of the EPA in regard to licensed waste management facilities and Best Available Technology (BAT) the following infrastructure will be provided at the site in conjunction with the key waste management infrastructure discussed in Sections 2.3 to 2.6. Drawing BRI/103, Rev A illustrates a preliminary layout plan of the various infrastructure that will be provided at the facility.

2.11.1 Site Security Arrangements including gates and fencing

There is an entrance gate at the site. The entrance area will be upgraded with the installation of a new gate and short lengths of security fencing (ca. 2.4 m high) along the N81. Post and wire fencing will be installed around the rest of the site.

2.11.2 Design of Site Roads

The facility entrance will be paved with macadam. Internal haul roads will be engineer and constructed of hardcore material generated during recovery activities.

2.11.3 Design of Hard-Standing Areas

Hardstands will comprise well-compacted granular fill (hardcore) or concrete and/or macadam surfaces. The hardstand areas are shown on Drawing BRI/103. The purpose of the hardstand is to facilitate vehicle movements and reduce dust emissions.

2.11.4 Weighbridge

There will be two weighbridges on-site.

2.11.5 Wheel-Wash

There will be a wheel-wash on the site.

2.11.6 Laboratory Facilities

There will be a laboratory on the site for testing of soils and soil-like materials with field assay kits.

2.11.7 Fuel Storage Areas

Diesel fuel will be stored on-site in appropriately bunded areas.

2.11.8 Waste Quarantine Areas

There will be waste quarantine areas on-site. An existing shed and surrounding hardstand will be used for waste quarantine during the excavation of the previously deposited wastes. A mobile waste quarantine area will be constructed adjacent to areas where previously deposited wastes are being excavated. It will comprise of skips. There will be a waste quarantine area adjacent to the RRB. It will consist of a hard stand and skips. This quarantine area will also be used for wastes rejected during landfilling.

2.11.9 Waste Inspection Areas

All waste will be inspected as it is excavated, weighed in, processed in the RRB, MRU, CCF and as it is deposited in the lined landfill.

2.11.10 Traffic Control

Site personnel will control traffic in and around the site.

2.11.11 Sewerage Infrastructure

Foul sewage will be handled in an approved proprietary plant. Treated effluent will be discharged into an appropriately designed percolation area. EPA specifications will be adhered to.

TABLE 2.13.1 BROWNFIELD RESTORATION IRELAND LTD. - INDICATIVE TIMESCALE FOR REMEDIATION AND RESTORATION OF PIT, WHITESTOWN LOWER, CO. WICKLOW.

PROJECT TIME SCHEDULE															
TASK	DESCRIPTION	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
	Assumed Year of Operation -			YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	YEAR 11	YEAR 12
1	**PLANNING APPLICATION AND WASTE LICENCE APPLICATION**														
2	**DEVELOPMENT**														
	Construction of Infrastructure, Roads, etc.														
	Construction of Resource Recovery Building and Central Composting Facility														
	Construction of Phase 1 Lined Landfill														
	Construction of Phase 2 lined Landfill														
	Construction of Phase 3 Lined Landfill														
	Construction of Phase 4 Lined Landfill														
	Construction of Phase 5 Lined Landfill														
	Decommissioning of RRB & Construction of Phase 6 Lined Landfill														
3	**EXCAVATION & REMEDIATION**														
	Remediation of Zone B														
	Remediation of Zone C														
	Remediation of Zone A														
4	**FILLING**														
	Commencement of Activities														
	Filling of Phase 1 to ca. 153 mOD														
	Filling of Phase 2 to ca. 153 mOD														
	Filling of Phase 3 to ca. 153 mOD														
	Filling of Phase 4 to ca. 153 mOD														
	Filling of Phase 5 to ca. 153 mOD														
	Phase 1 to 5 to form mound to ca. 162 mOD														
	Filling of Phase 6														
5	**RESTORATION**														
	Fianl Capping														
	Final Landscaping And Maintenance														

2.11.12 Other Services

The facility will require three-phase power, telephone and a water supply. Presently there is single-phase power on the site.

Three-phase power will be secured from the ESB or by operating diesel generators. A sub station may be required at the site. A provisional location is shown on Drawing BRI/103, Rev A. The location will be agreed with the ESB.

There are telephone lines into the existing house on the site that will be used or replaced as required.

There is a domestic mains water supply into the site and a domestic well. The existing well cannot be used for drinking purposes as it is close to existing bodies of waste. The existing facilities will be augmented by a groundwater well drilled on the western side of the site and also by capturing rainwater from the roof of the RRB.

2.11.13 Plant Sheds, Garages and Equipment Compound

Equipment will be parked initially on the site in a compound that will be constructed around the existing shed and on the eastern side of the site. Plant will also be parked within the gravel pit as it is worked out and during the excavation and processing of the previously deposited wastes. Plant will also be parked on the hardstand adjoining the RRB.

2.11.14 Site Accommodation

A security/check-in hut as well as a canteen will be constructed on-site. Employees working at the proposed RRB will have access to this site accommodation. The existing house on the site will be used for as long as it is available by site personnel and contractor's staff.

2.11.15 Fire Control System including water supply

Fire control would be provided by using on-site soils to smother a fire or by contacting the local fire brigade in Balltinglass/Blessington. In addition during development of the facility the groundwater table will be accessible at the floor of the pit. Groundwater could be pumped from a pond for a large part of the expected life of the project. A water supply borehole will be drilled near the proposed site offices to provide an additional water supply.

2.11.16 Screening Berms and Enabling Landscaping

These activities will improve the appearance of the existing site as well as to reduce the views, from surrounding areas, of waste management and other activities.

These activities will involve the development of bunds, and plantings including grasses and trees.

Further detail is presented in Section 3.8 "Landscape".

2.11.17 Litter Fence

A 5 to 6 metre high litter fence will be erected around the perimeter of the residual waste disposal area.

2.11.18 Overhead 110kV Power Lines

The Carlow-Poulaphuca-Stratford 110kV overhead power line crosses the site in a north-south direction, as depicted in Figure 3.1.1. Following consultations with ESB International (ESBI) in March 2004, a proposed alteration to the power line has been agreed in principal. This will involve the installation of 23 metre high strain four pole-set structures, which will allow a greater span across the site.

As the site is filled, an additional pole set will be installed to raise the power lines to the required height, as outlined by the ESBI in their March 2004 correspondence. All costs for the proposed alteration will be met by the developer.

In addition, the ESBI have set out general guidelines that are applicable to this line with regard to the proposed development. This master plan has taken account of these guidelines and is not in conflict.

2.12 Construction and Development of the Facility

2.12.1 Initial Development Phase

It is planned, subject to authorisations, that construction of enabling earthworks and Phase 1 of the landfill will be constructed in 2005. A 5 to 7 month programme of development is envisaged.

Development works will involve earthworks, landfill lining, construction of leachate management systems, other civil engineering works such as services, drainage systems and roads, building construction, plant installation and landscaping. The works will be intensive for a short duration likely producing some temporary dust, noise and traffic impacts from time to time.

2.12.2 Ongoing Development Work

Further development work at the site will follow into areas that have been cleared of previously deposited wastes. Most of the development work will be earthworks, landfill lining, construction of leachate and gas management systems and construction of haul roads.

2.13 Facility Operations

2.13.1 Overview

Facility operations include:

- excavating previously deposited wastes,
- accepting wastes,
- processing and treating wastes,
- removing recovered wastes from the facility or using recovered wastes at the site
- maintenance of the infrastructure and plant,
- filling the engineered lined void and
- restoring the site

A consolidated provisional programme for development works, excavation of wastes, filling the engineered lined void, and restoration of the site is presented on Table 2.13.1.

Further details on facility operations are described in the sections that follow.

2.13.2 Operating Times

The facility will accept materials from Monday to Friday, 8:00 am to 5:30 pm and Saturday 8:00 am to 4:00 pm.

Operations onsite will be between 7:00 am and 6.30 pm Monday to Friday and on Saturday between 7:00 am and 5:00 pm.

The facility will be closed on Sundays and Bank Holidays.

Hours of construction may include an earlier start time and finish time Monday to Friday (i.e. 7.00 am to 7.00 pm) and/or Saturday (i.e. 7.00 am to 2.00 pm).

2.13.3 Personnel

There will be approximately 10 operatives and a site manager employed directly to operate and manage the facility. Consultants will be retained to undertake environmental monitoring.

2.13.4 Waste Acceptance Procedures

- Only customers arriving at the facility with a contract will be admitted.
- Lorries will be weighed in.
- Drivers will be directed to the appropriate tipping area to unload. Loads will be inspected where tipped. Tipping will be strictly supervised by a site operative and if any unacceptable material is observed a tracked excavator, operated by site staff, will be used to recover and load the unacceptable material back into a vehicle. Should unacceptable waste be discovered in the tipped load, a report will be completed by the site personnel.
- Lorries will be weighed out and leave the facility.

Waste acceptance procedures that are outlined in EPA manuals will be reviewed and incorporated into the standard operating procedures for the site.

2.13.5 Plant

The MRU will include some or all of the following plant:

- 20 tonne (minimum) excavator(s);
- 25 to 40 tonne dumpers;
- Finger screen(s);
- Mobile picking station;
- Shredder;
- Trommel screen;
- Crushing plant;
- Magnet to remove metals;
- Air compressor with Blower to remove light wastes.

The plant inside the RRB will comprise some or all of the following:

- Excavator (s)/ Grabs;
- Wheeled Loader;
- Fingerscreen(s);
- Trommel Screen;
- Shredder;

- Various hoppers and conveyors;
- Picking lines;
- Magnet to remove metals;
- Eddy Current (aluminium);
- Air compressor with Blower to remove light wastes;
- Baler;
- Forklift.

Possible plant and equipment to be used in the Centralised Composting Facility (CCF) attached to the RRB include:

- Feedstock Mixer;
- In-vessel composter (as designed by Wright Environmental Management Inc.);
- Other equipment available in the RRB.

Plant related to waste disposal and covering in the lined landfill will include:

- Waste Compactors;
- Excavator;
- Bull dozer;
- 25-30 tonne dump truck;
- JCB / Road Sweeper;
- Farm tractor and bowser.

2.13.6 Waste Handling

Imported Waste

Following check-in at the weighbridge office, the hauler will be directed to one of three areas, depending on the type of waste in the load:

- Loads of treated wastes, which do not require further processing for waste recovery purposes will be directed to the residual waste disposal facility, where they will be tipped and inspected;
- Loads of untreated (C&I / Household) wastes will be directed to the Resource Recovery Building, where they will be tipped and inspected. There are a number of waste handling processes that may be carried out inside and around the building;
- Loads of predominantly inert C&D wastes that require further processing for waste recovery purposes will be directed to a Mobile Recovery Unit, which will be positioned initially near the existing waste zones, or laterally in a lined area or the hardstand adjoining the RRB.

Further details on the plant and processes in the RRB and at the MRU are provided in previous Sections of the EIS.

Wastes On-Site

Wastes on-site will be excavated, inspected, processed, recovered and transferred to the RRB or to the Residual Waste Disposal Facility or off-site.

Wastes in the Residual Waste Disposal Facility

- Wastes will be tipped and inspected;
- Wastes in the landfill will be placed in lifts of 3m and then compacted with a compactor;
- Compacted waste will be covered with daily cover, which may be inert fill or artificial materials;
- The width of the daily working area will be 30m.

2.14 Facility Decommissioning and Restoration Scheme

2.14.1 Restoration Plan

The premise of the project is to restore the existing sand and gravel pit following the completion of excavation of previously deposited wastes and landfilling operations at the site.

2.14.2 Proposed Contours

The plan is to restore the former sand and gravel pit to a landform that blends into the surrounding landscape i.e. to the indicative final contours as presented on Drawing BRI/109, Rev A.

The final level of the landform will be 172 mOD at its highest point, after consolidation and settlement.

2.14.3 Restoration Layers

The uppermost layer on the landfill surface will be topsoil approximately 150 mm thick. The land surface will be restored from the outside edges of the landform inward as depicted on the conceptual development and restoration plans (See Drawings BRI/103 to BRI/108). Soil berms and restoration layers will be brought up on the external surfaces of the landfill once filling is above the edge of the adjoining ground.

Below the topsoil there will be a layer of subsoil ca. 850 mm thick. This layer will overlie environmental control layers (See EIS, Volume I, Section 2.7).

Surface runoff from the completed surface will be controlled as required by a system of open and French drains installed along the edge of the completed landform.

2.14.4 Landscaping Plan

An assessment of the existing landscape; landscape during construction and landfilling at the site as well as post closure landscape including a Landscaping Plan is included in Section 3.8 of the EIS. There will be some initial landscaping works as shown on the Drawings contained in Appendix 13, Volume II of the EIS.

The proposed final Landscape Plan involves planting trees and shrubs along former hedgerows and along boundaries of the site. Woodlots will be established on the restored surface. The surface will be seeded with grass to return the site back to its former condition prior to the commencement of sand and gravel extraction and waste activities.

2.15 Predicted Emissions from the Proposed Facility

The EPA's guidance notes indicate that the nature, composition, quantity, level and rate of emissions should be furnished. Information is provided below in regard to the emissions. The impact of the emissions is addressed in more detail in Section 3 of the EIS. The potential emissions from the proposed development are as follows

- Dust into the atmosphere
- Odours into the atmosphere
- Landfill Gas into the subsurface or through any waste capping/cover layers
- Exhaust Gas from enclosed gas flares, gas utilisation plants or the CCF biofilter
- Leachate from the residual waste disposal area into groundwater/surface water
- Noise during construction and during operations
- Litter
- Traffic

2.15.1 Dust

Source/Location

Dust emissions could potentially be generated from the following proposed activities:

- Further sand and gravel extraction
- Construction activities
- Excavation of previously deposited waste
- Recovery of previously deposited waste
- Traffic to and from the site
- Recovery of imported wastes
- Disposal of residual waste in a lined landfill
- Landfill capping and final site restoration activities

Nature/ Period/ Composition/ Quantity

Dust levels will increase during periods of dry weather, and from areas of significant activity, in particular the excavation of previously deposited wastes and the disposal of residual wastes.

The dusts will compose fine particles resulting from the construction, disposal activities and will not be considered harmful if inhaled. However, due caution will be taken during the excavation of previously deposited wastes, and appropriate personnel protective equipment will be used.

Quantities are not expected to exceed the EPA emission limit values for dust at the site boundary for scheduled activities such as the proposed development.

2.15.2 Odours

Source/Location

Odorous emissions could potentially be generated from the following proposed activities:

- Excavation of previously deposited wastes
- Recovery and management of previously deposited materials,
- Recovery and management of incoming non-hazardous Commercial & Industrial, Household and Construction & Demolition wastes

Nature/Period/Composition/Quantity

Odour emissions from the proposed activities will typically arise during the excavation of previously deposited wastes, of which the non-inert wastes are currently biodegrading. However, these odours are expected to be short-lived as venting and natural attenuation of the odours is expected to occur quite rapidly during excavation as oxygen enters the wastes.

It is noted that the excavation of the previously deposited wastes will occur within a three year time period. Odours typically associated with decomposing wastes are expected, however, due to the low percentage of readily biodegradable wastes to be excavated (ca. <10%), perceptible odours of significance from the site boundary are not expected.

2.15.3 Landfill Gas

The Agency's guidance notes request a risk assessment in relation to the gas emissions. This subsection has been included to address potential risks.

Nature and Composition of the Gas Emissions

The nature and composition of the gas emissions would be typical of landfill gas as described above.

Emission Rates

The emission rates from a landfill site depend on the rate of gas production, the gas pressure in the landfill, the barometric pressure and the nature of the materials, which contain or enclose the deposited wastes.

During the operating life emissions would preferentially be through the surface of the waste. As the landfill is capped with low permeability material, the disperse emissions to air would decrease. Instead the emissions would be via a system of passive vents through the cap.

The gas production rate and the design of the gas management systems will govern the emission level, rate and quantity.

Active collection and a backup system of passive venting through the capping system are proposed. The intent of these systems will be to relieve the gas pressures in the landfill and thus mitigate the potential for advection and diffusion of gas through the base and side slope liner systems. The active and passive systems may not release all of the gas and there may be emissions through the proposed capping system that includes a low permeability clay barrier.

It has been shown through modelling of the advection and diffusion processes that emission rates through landfill caps with a clay barrier are relatively low (Kjeldson, 1996). A sample calculation by Kjeldson indicated that the combined diffusive and advective flux of methane through a 1 m clay soil layer would be 133 $g/m^2/year$ based on the assumptions made. Based on a methane density of $0.72kg/m^3$ at 20°C the volume of the emission will be approximately 16,500 $m^3/year$ (through a 9.0 ha capped waste surface). This rate is relatively low in comparison to the production rates. Some of the measured rates also reported by Kjeldson are between 10 and 100 times greater. However, a variety of conditions exist at the sites where measurements were taken. The sample calculation does not account for any attenuation due to chemical or biological processes in the soil. It is known that methane in the landfill gas will oxidise as it migrates through unsaturated soil layers. Laboratory studies by Kightly and Nedwell, 1994 suggest that large quantities of methane can be oxidised in landfill covers soils.

Emission of biogas through the side slope liner will be minimised by the proposed lining systems and active gas collection.

Pathways

A potential pathway for subsurface gas emissions may be from the waste body through the landfill base and side slope liner systems. The nature and low permeability of the lining systems will effectively minimise advection and diffusion of gas.

The pathway for emissions to ambient air will be through a passive venting system if the active system fails and minimally through the top cover as discussed. Otherwise the ambient air is the pathway for emissions from the flare stack.

Receptors of Emissions and Assessment of Risks

Potential receptors of subsurface gas emissions are the buildings on the site and the surrounding lands. The risk to on site structures and the surrounding lands is considered to be low with the proposed passive control measures. To ensure that hazards do no exist in the site buildings gas monitoring boreholes are proposed as described in Section 4. Biogas will also be monitored in the subsurface outside the waste disposal area, within the buffer zones.

Trigger levels will apply as specified by the EPA with respect to gas levels recorded in offices, subsurface monitoring boreholes outside areas of waste and in underground structures outside areas of waste.

Potential receptors of diluted landfill gas in the atmosphere are local residents surrounding the site. The health risk is assessed to be low. The potential for exposure to an odour nuisance will be monitored during the initial two years of operations. If odours develop into a nuisance it will be mitigated with active collection systems or odour control measures, other than already proposed, such as misting systems.

2.15.4 Exhaust Gases

An active gas collection system will be designed to effectively reduce the pressure in the landfill and remove gases for flaring. The biogas emissions to ambient air will be significantly minimised. The emissions from a landfill with an active collection system will be via the flare stack.

Recently specified Emission Limit Values for a flare are provided in Table 2.15.1. The flare at the BRI facility will be selected to meet these values.

Table 2.15.1: Emission Limit Values for Enclosed Flare (Based on Waste Licence No. 165-1)

Parameter	Enclosed Flare Emission Limit Value
Nitrogen Oxides (NO_x)	150 mg/m3
CO	50 mg/m3
Particulates	Not applicable
Total Organic Carbon (TOC)	10 mg/m3
TA Luft Organics Class I	Not applicable
TA Luft Organics Class II	Not applicable
TA Luft Organics Class III	Not applicable
Hydrogen Chloride	50 mg/m3 (at mass flows > 0.3 kg/h)
Hydrogen Fluoride	5 mg/m3 (at mass flows > 0.3 kg/h)

2.15.5 Leachate Emissions from the Proposed Lined Disposal Area

Source of Leachate Emissions

Should there be leachate emissions from the facility there would be a point discharge at the leachate holding tank or a disperse discharge through the landfill base.

The discharge through the base may be leakage via holes in the geomembrane and via diffusion through the 2 mm thick geomembrane. The leachate would then migrate via advection and diffusion through the minimum 1 metre thick compacted clay liner (CCL) until it reaches the native unsaturated glacial sediments. The unsaturated zone beneath the landfill base will generally be between 2 and 3 m thick. Leachate would migrate vertically downward through the unsaturated sediments to the saturated sediments where it will mix with the groundwater beneath the site.

Contaminants in the leachate will be attenuated in four media, the HDPE liner, the compacted clay liner, the unsaturated sediments and the saturated sediments. The impact of leachate on the underlying groundwater will depend on the quantity and composition of the leachate that finally reaches the groundwater flow system and the volumetric flow rate of the groundwater. Within the CCL and the unsaturated sediments several processes such as adsorption, biological uptake, cation and anion exchange, filtration and precipitation will attenuate many of the contaminants present in leachate. Some of these processes and dilution will also occur in the groundwater flow system beneath the site.

Quantity, Level and Rate

Leakage through defects in a composite liner may be calculated using semi-empirical formulae developed by Giroud et al in the 1980s and early 1990s. However, assumptions must be made with respect to a number of variables that include: the head of leachate on the liner; the contact conditions of the geomembrane on the 1 m thick low permeability soil layer beneath the liner; and the number and area of the defects or holes in the geomembrane. The applicable formula for leakage through holes is as follows:

$$Q = 0.21\, i_{avg}\, a^{0.1}\, h^{0.9}\, k^{0.74}$$

Where;

- Q = m^3/s
- i_{avg} = a dimensionless factor that depends on the head of leachate and the thickness of the clay layer, in this case the maximum assumed head is 1.5 m on average for calculation purposes and the minimum thickness of the clay layer will be 1 m, therefore based on a paper by Giroud et al, 1994 this factor will be approximately 1
- a = the area of the defect in m^2
- h = hydraulic head which is assumed to be a maximum of 1.5 m for the purposes of a worse case calculation
- k = permeability of the clay layer which will be 1×10^{-9} m/sec

This formula is applicable in situations where there is good contact between the geomembrane and the clay layer. It is assumed that this will be the case.

The size and number of defects must be assumed based on past experience. The technical literature suggests defect areas of less than 10^{-5} m^2 can be assumed. If there is third party QA/QC then it may be assumed there are 5 or less holes per hectare.

On the basis of the foregoing assumptions the leakage through a 6 ha landfill base is 6 ha x 9 litres/ha/day = 54 litres per day. This is equivalent to approximately 20 m^3/year. This estimate is based on theoretical and empirical formulae and a worse case leachate head of 1.5 m. In practice the leachate head will be less than 1.5 m as the proposed maximum head at the low end of the sloped landfill base is 1.0 m.

Giroud et al, 1989a, estimated leakage rates through intact geomembranes for a number of different leachate heads and assuming there is a pervious layer beneath the geomembrane. On the basis of the reported rates in Table 7 in Giroud et al, 1989a, a 2mm thick HDPE geomembrane and an assumed maximum leachate head of 1.5m, the leakage rate through the liner material will be 44 m^3/year. This is considered to be an overestimate of the leakage rate at the proposed landfill since as noted by Giroud et al, 1989a, the nature of the material overlying and underlying the geomembrane will have a significant effect on the leakage rate (i.e. the rate will be reduced if low permeability material underlies the geomembrane).

It is apparent from the technical literature and the illustrative calculations presented above, that it is not possible to provide a unique leachate emission rate for this or any proposed facility. If all of the assumptions represent the real situation, then the leachate emission quantity, level and rate through the base of the landfill will be less than 100 m^3/year.

The other leachate emission point from the landfill is the discharge of the pump located in the leachate-holding tank. This emission is a controlled point discharge into either a tanker that will convey leachate from the landfill to the foul sewers. The estimated quantity of this discharge will vary as outlined in Table 2.8.1.

Nature and Composition

The nature and composition of the leachate emissions will depend largely upon the nature and composition of the wastes deposited in the landfill and a number of other factors including temperature, moisture content, depth of fill and stage of the decomposition of the waste in the landfill. The wastes disposed in the lined landfill will be residual materials following treatment and recovery of construction and demolition or commercial and industrial wastes). The quantity of each type of waste is not known and therefore it is difficult to predict the nature and composition of the leachate. Data on the composition of leachate from a variety of landfills is included in the tables accompanying the Preliminary Risk Assessment (Appendix 9, Volume III).

2.15.6 Noise

Source/Location

Noise emissions will occur during construction. The sources and location of noise emission include the following:

- Excavators, bulldozers, dumper trucks, compactors and tractors operating within the site
- Operation of the materials recovery unit
- Site personnel vehicles entering and leaving the site from the N81
- Movement of a number of delivery vehicles associated with site buildings and materials to construct the landfill liner

Nature/Period/ Composition/Quantity

It is very unlikely that all of these sources of noise would operate simultaneously. In addition, their operation will be limited to the opening hours of the site.

Section 3.9 includes a noise impact assessment for the proposed development. The expected noise emissions will result from two main activities, namely;

- During construction and excavation
- Waste recovery and disposal activities

Noise emissions during construction and excavation are not expected to exceed the EPA emission values at the site boundary for scheduled activates of this nature during the period. This is due to the fact that most of this activity will take place below the current surface, therefore the existing topography should attenuate any noise emissions.

As much of the waste recovery as possible will be undertaken within the Resource Recovery Building, noise emissions will be contained. Where wastes are being excavated, the MRU will be positioned to avoid emission limits at the facility boundary.

2.15.7 Litter

Source/Location

Litter emissions potentially could occur in particular during the excavation of the previously deposited wastes. Wastes arriving at the site will be covered and will be processed indoors in the Resource Recovery Building. As the Material Recovery Unit will be mobile, the location of the litter source will vary depending on the location of this unit.

Nature/Period/ Composition/Quantity

As the excavation of the previously deposited wastes will only last for less that 3 years, this period of this emission is short lived. Processing and disposal of residual wastes will not be undertaken during periods of excessive wind speed. In addition, mobile litter fences will be erected at locations where processing of these wastes is being undertaken.

During the disposal of residual wastes in the lined landfill, the material will be covered on a daily basis.

2.15.8 Traffic

Source/Location/Nature/Period/ Composition/Quantity

With an assumed importation rate of waste of 180,000 tonnes per annum in 20 tonne payloads, it is expected that the proposed waste management facility will generate in the region of 33 HGV per day carrying materials to the Whitestown Lower site and leaving empty (over 10 year lifespan). In addition there may be up to 20 HGV per day carrying soils from the site and arriving empty. There will be construction traffic for 3 to 4 months per year.

As indicated in Section 3.6 of the EIS, and in the Traffic Assessment Report (Appendix 8 of Volume II), the increases in traffic on the local roads network serving the proposed development are likely to be insignificant.

2.15.9 Surface Water to Groundwater or River Carrigower

Source/Location

Unloading, loading and recovery activities will take place within the Resource Recovery Building. Potential emissions to water are from surface water on the hardstand and leachate encountered during the excavation of previously deposited wastes.

Nature/Period/Composition/Quantity

Surface water will drain to the edges of the hardstand and subsequently to a soakholes via an interceptor. The frequency of the potential emission will be directly related to rainfall. When it rains, there is potential for emission.

In terms of leachate emission during the excavation of previously deposited wastes, this again will be relative to recent rainfall levels. During excavation activities, measures will be put in place to collect any leachate from these wastes, which will include earth bunds, sumps and pumping plant. All leachate will be taken off site for treatment.