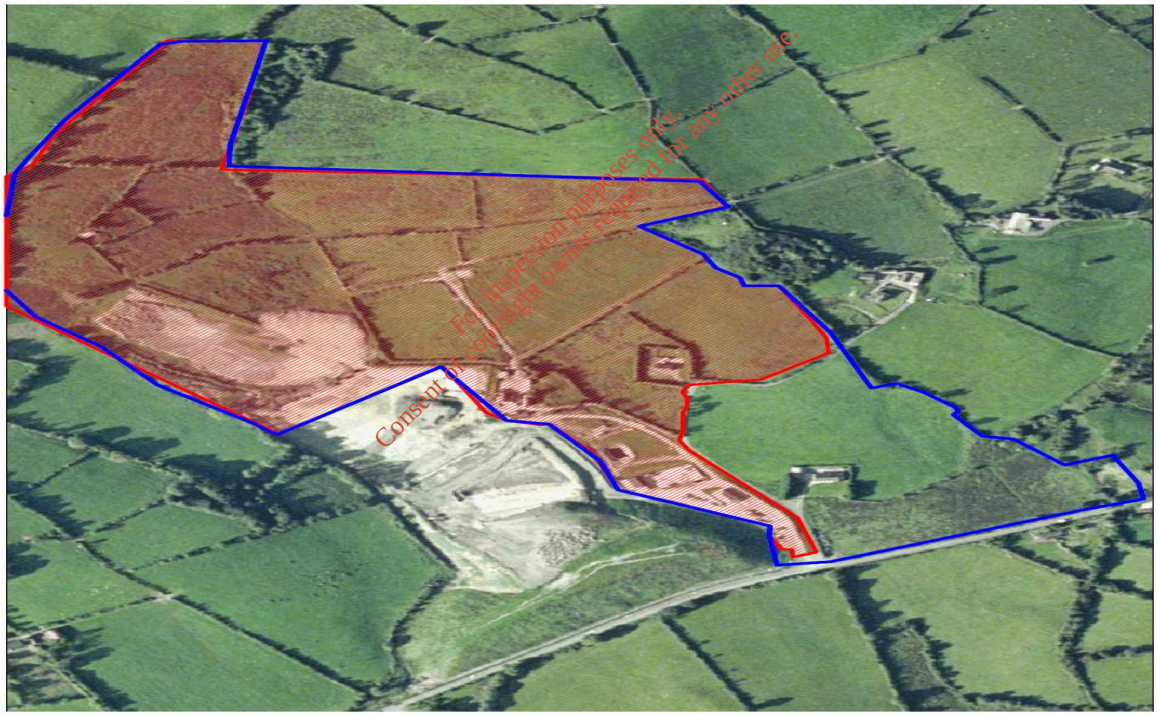
Oxigen Environmental Ltd.

Cavan Integrated Recycling Facility, Corranure, Co. Cavan



Environmental Impact Statement
September 2008
Volume II – Main Report

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1.0 INTRODUCTION

1.1 Background

Cavan County Council are currently the licensed operators of Corranure Landfill under EPA Waste Licence Register No. W077-02 for Corranure Landfill, Cootehill Road, Cavan, Co. Cavan. This waste licence was granted in May 2005 for the intake of 90,000 tonnes per annum and was managed by Cavan County Council staff until October 2007. Oxigen Environmental Ltd. are currently operating the site under a concession agreement and managing all activities, with Cavan County Council retaining responsibility for the completed Cells 0, 1 and 2.

In accordance with the Waste Management (Licensing) Regulations, 2004 (S.I. No. 395 of 2004), Oxigen Environmental are applying for a licence to the Environmental Protection Agency and for planning approval to An Bord Pleanala to operate the active landfill, which include Cell 3 together with the development of Cell 4, proposed development of a Materials Recovery Facility (MRF) and a Biological Waste Treatment Facility. This comprises of a total land area of 17.87ha. As required Oxigen Environmental Ltd. have prepared an Environmental Impact Assessment /Statement (EIA/EIS) and a Waste Licence Application in respect of this proposed development.

The Integrated Waste Recycling Facility will consist of the following waste management facilities:

- Landfill of 90,000 tonnes per annum - Development of Phase 3 (Cells 3 and 4)
- Civic Amenity Centre and associated infrastructure
- Materials Recovery Facility (MRF) for Construction and Demolition Waste Recovery /Commercial and Industrial Facility processing 180,000 tonnes per annum.
- Biological Waste Treatment Facility (including Mechanical Biological Treatment) treating up to 65,000 tonnes per annum of segregated domestic and commercial organic waste.

1.2 Structure of the Environmental Impact Statement

An Environmental Impact Statement (EIS),as part of the EIA process, is required to accompany a Waste Licence Application, where the volumes of waste are above a certain threshold volume (greater than 25,000 tonnes per annum), as outlined in Schedule 5 Part 2 of the Planning and Development Regulations, 2001 (S.I 600 of 2001).

The EIS contains information on the scale and nature of the proposed development, a description of the existing environment, impact assessment of the proposed development and mitigation measures to avoid, reduce and where possible remedy significant adverse effects on the receiving environment.

This Environmental Impact Statement (EIS) is arranged as follows:

- Volume I: A Non-Technical Summary
- Volume II: Main Report
- Volume III: Appendices
- Volume IV: Drawings

The existing environment and the subsequent impacts of the development are explained by reference to its possible impact on the following environmental topics:

Human Beings	Flora & Fauna
Soil & Geology	Hydrology
Hydrogeology	Air
Noise	Traffic
Climatic Factors	Landscape
Cultural Heritage	Material Assets
Interactions of the above	

Where appropriate, throughout the document the impacts of the proposed development on each of the above environmental topics are described under the following headings:

Section 1	Introduction
Section 2	The Existing Environment
Section 3	Environmental Impacts
Section 4	Proposed Mitigation Measures

Supporting documentation and maps are included in the document.

1.3 Planning Context

1.3.1 General overview

In the 1996 Census, the population of County Cavan was 52, 944, this had increased to 56,416 in 2002, showing an increase of 6.6% over the 6 years. Using CSO estimates for population growth in the border region as employed by the National Spatial Strategy, it is predicted that the County's population will experience an increase of approximately 2,500 by 2015.This static population highlights the importance of economic investment in the County to attract people who live and work in Cavan. The county is predominantly rural with a population density of twenty-seven persons per square kilometre, compared with the national figure of fifty three persons per square kilometre.

1.3.2 National Spatial Strategy

In 2002, the government published the National Spatial Strategy (NSS) for Ireland 2002 to 2020. NSS is a coherent national planning framework that centres on the following five core messages:

- A wider range of work opportunities;
- A better quality of life;
- Better places to live
- Effective urban and rural planning; and
- Getting things done.

The Spatial Strategy covers Ireland's seven regions, and outlined below is what the NSS means for Cavan

- Cavan occupies a strategic position on the corridor linking Dublin to South Donegal. It is also on a corridor between the Gateways of Dundalk and Sligo.
- Cavan town has been designated as a Hub. It will complement the role of Dundalk and Sligo as Gateways. It will capitalise on its midway position on the Dublin/South Donegal N3 route, and act as the catalyst in developing potential for economic development in the enterprise and tourism sectors
- In the context of increased cross-border co-operation, Cavan along with other places identified in the Strategy will become more of a cross-roads rather than having a peripheral position. This cross-roads position places Cavan strategically between Dublin and Derry/Letterkenny/South Donegal in a north-south sense and Dundalk - Sligo in an east-west sense. This will enhance the attractiveness of Cavan for economic development, particularly in terms of cross-border development.
- The NSS emphasises the importance of building upon the strong small and medium enterprise base in the central part of the border area to extend diversification of employment. A focus here will be utilising the network of towns in Cavan and strengthening their ability to provide a wide range of service functions for their hinterland areas and act as local economic engines.
- The NSS outlines a variety of mechanisms through which potential for economic development in rural areas can be achieved. A particular focus here is on sustaining rural communities including building up the structure of rural villages and their associated areas. The NSS establishes the national framework to elaborate on how this will be achieved through regional and county strategies.
- The NSS places much emphasis on strengthening the border area generally, to balance development nationally by harnessing potential for development and building on emerging opportunities for cross-border development.

1.3.3 Cavan Development Plan

The County Development Plan is the statutory Development Plan for County Cavan from 2003 to the year 2009, but excludes the Cavan Town Council, which is a separate Planning Authority. The current Development Plans for Cavan Town and Environs are:

- Cavan Town Environs Plan 2003-2009, is a land use structure and transportation plan with environmental objectives affecting the town environs area.

- Cavan Town Council Development Plan 2003-2009 which is the Town Council's Development Plan for the administrative unit of the town.

Each plan is complimentary to each other. The documents provide a development envelope for the town and zones lands for development uses, both of established and proposed development uses.

1.3.3.1 Aims

The aims of the Plans for Cavan Town are:-

1. To facilitate the sustainable economic and social development of the town, through the promotion of a positive climate for development initiative within the plan area.
2. To consider provision of a transportational and landuse structure that will provide the orderly planning and development of the town and accommodate sustainable urban growth.
3. To upgrade and expand the towns physical infrastructure to accommodate existing and projected needs.
4. To integrate housing and retail strategies, residential densities and childcare facilities as required under Part V of 2000 Act into the plan as is appropriate.
5. To conserve the natural and built environment of the town where it is recognised as having special value.
6. To strengthen the urban structure in the County through the planned orderly development of the County Town.
7. To accommodate urban fringe development where it is considered appropriate in the context of the planned orderly development of the haphazard uncoordinated urban sprawl prejudicial to the towns economic and social vitality.
8. To have reference to appropriate Departmental Directives in respect of location of retail development and its impact outside of the central area.
9. To have reference to the Town Renewal Plan designations and objectives as stated in the community's Town Renewal Plan as appropriate.

The strategy of the County Development Plan 2003-2009 aims towards the achievement of three distant goals:

- to facilitate the sustainable economic and social development of the county, through the promotion of a positive climate for economic initiatives in the towns, villages and rural areas;
- the conservation of the natural and built environment of the county; and
- the improvement of Cavan's physical infrastructure.

1.3.3.2 Sustainable development

Sustainable development concepts in a planning and development context therefore can be considered to be compatible with the following strategic policies:

- Promoting established urban areas as development growth area.
- Promoting smaller 'proto-urban' centre's as development areas particularly those located on transport corridors.
- Preferring development of established energy efficient urban centres with good inter-urban transportation.
- Promoting higher density development where appropriate within established urban areas.
- Promoting development of employment generators within or in proximity to residential areas.
- Providing the infrastructure to ensure adequate serviced land is available to meet these policy objectives in areas that are compatible with the concept of sustainability.

1.3.4 Policy for Siting Facilities

1.3.4.1 Bring Banks

- Policy is for 1 per 500 households
- Should be sited in sensible, safe locations
- Be easily accessible to the public
- Be strategically placed where access to other recycling facilities is not readily available.

1.3.4.2 Recycling Centres for Dry Recyclables

There are no national or international guidelines on the siting of such facilities but the siting of such facilities should have regard to the following site selection criteria:

- Facility to be placed within an urban area or as near as possible.
- Location of facility to be convenient to the majority of householders.
- Particular regard should be made to traffic considerations.

1.3.4.3 Biological Treatment Facilities

The primary legislation and technical guidance referring to biological treatment facilities are:

- The Waste Management Acts, 1996 – 2008
- National Strategy on Biodegradable Waste (NSBW) ,April 2006
- Animal By-products Regulation (1774/2002/EC)

The Working Document on the Biological Treatment of Biowaste – Annex V sets out a number of criteria that should be considered when selecting a composting site. These are as follows:

- Location, taking into account requirements relating to the feedstock waste and technology used
- Distance to such things as residential and recreational areas
- The proximity of waterways, waterbodies and other agricultural and urban sites
- The existence of protection zones in the area and the protection of the local environment

Cognisance should also be taken of the Animal By-Products Regulation and the Draft conditions for approval and operation of composting and biogas plants in Ireland issued by the Department of Agriculture, Fisheries and Food in January 2008.

The following controls are required for composting and biogas plants that are involved in the treatment of animal by-products:

- If a composting/biogas plant is located on premises where farmed animals are kept and does not only use manure which accrues from those animals, the plant shall be located at an adequate distance from the area where such animals are kept and there must, in any case, be total physical separation between that plant and those animals and their feed and bedding, with fencing where necessary. Approval of such sites will be risk-based and will be subject to stringent conditions regarding dedication of both personnel and equipment.
- The facility must be surrounded on all sides by permanent and effective animal-proof fencing.
- A lockable gate of minimum height of 1.8 m must be present at the entrance to the facility.
- In order to prevent the possibility of contact with farm animals either directly or indirectly (via vermin, birds etc), all initial processing of raw material must be carried out indoors.

These conditions are outlined in Volume III Appendix 1 -Draft conditions for approval and operation of composting and biogas plants in Ireland issued by the Department of Agriculture, Fisheries and Food in January 2008.

1.3.4.4 Landfills

Landfill site locations should be selected having regard to the following exclusionary factors:

- regionally important aquifers
- airports
- floodplains
- proposed Natural Heritage Areas or other environmentally related designations
- geologically unsuitable areas

- areas of high amenity or high archaeological interest (international, national or regional interest)

1.4 Environmental Policy

1.4.1 National Waste Management Policy

The Department of the Environment, Heritage and Local Government (DoEHLG) published the national waste management policy statement in September 1998, entitled 'Changing Our Ways' which includes a number of provisions relating to waste management infrastructure, including biological treatment facilities, waste transfer facilities and C&D waste recovery facilities, which are seen as necessary elements of an integrated waste management system for the country.
The Policy Statement set the following targets over a fifteen-year timescale:

- Diversion of 50% of household waste from landfill;
- The development of composting and other biological treatment facilities capable of treating up to 300,000 tonnes of biodegradable waste per annum;
- Recycling of 35% of municipal waste;
- Recycling of at least 50% of C&D waste within a five year period, with a progressive increase to at least 85% over fifteen years.

The DoEHLG also published the national waste policy statement in March 2002, entitled '*Preventing and Recycling Waste – Delivering Change'* which evolved from and is grounded in the 1998 policy statement '*Changing Our Ways.'* The 2002 waste policy statement '*Preventing and Recycling Waste -Delivering Change'* addresses the factors and practical considerations that are relevant to the achievement of Government policy objectives and for the prevention of and recovery of waste. The current legislative framework favours the reuse and recycling of organic and C&D waste.

The 2002 Waste Policy Statement:

- Highlights the necessary disciplines that must be imposed within waste management systems to secure real progress on waste prevention, re-use, and recovery;
- Outlines a range of measures that will be undertaken in the interests of minimising waste generation and ensuring a suitable expansion in re-use and recycling performance; and
- Identifies issues and possible actions that require further systematic consideration.

The 2002 waste policy statement concentrates on the 3 highest steps on the waste hierarchy recognising, as do the local and regional waste management plans, that emphasis must be given to the widest practicable realisation of waste prevention, minimisation, re-use, materials recycling and biological treatment before energy recovery through thermal treatment and final disposal in landfill.

In this respect the proposal currently put forward by Oxigen Environmental includes the recovery of 180,000 tonnes per annum of Construction and Demolition and Commercial and Industrial waste, also 65,000 tonnes of Biological municipal waste, which would otherwise contribute to waste produced for disposal. Each facility will be specifically designed, utilising the Best Available Technologies (BAT).

The 2002 waste policy statement also recommends the establishment of the National Waste Management Board to co-ordinate, monitor, review and advise on all aspects of waste management policy at all levels of the waste hierarchy. With respect to biodegradable municipal waste and agri-industrial waste (biowaste), EU and Irish waste management policy and legislation now require that biowaste be diverted from landfill to alternative waste management methods at increasing rates over the coming years. When landfilled, biodegradable waste produces methane, a greenhouse gas which is 21 times more potent than carbon dioxide.

In the governments policy statement 'Preventing and Recycling Waste- Delivering Change'(2002) it stated that '*A network of centralised biological treatment facilities is required to deal with organic and green wastes. This requirement is only now beginning to be addressed, but the provision of the necessary capacity is readily within the scope of local authorities and the private waste industry once segregated collection services are implemented'.*

And also:

Ultimately however, composting, whether carried out by the private sector or public authorities, should generate a product with a clear market value. To do so, it must be developed as a high quality product capable of competing with existing organic products (peat, manure) in terms of price and quality. It is necessary to create a clear identity for waste derived compost products, and build public confidence and trust in their suitability for use, through ensuring consistent quality'.

The proposed development will produce compost from biological municipal waste, which may also include organic material sourced from other transfer stations. The material from transfer stations will include organic material from municipal sources, and it will be the responsibility of the facility operator to collect the waste and ensure that it is suitable for treatment at the proposed facility.

The policy statement reinforced the requirements in relation to C&D waste recycling and recovery as set down in *Changing Our Ways*, namely up to 85% recycling of C&D waste produced by 2013. The policy statement places an onus to meet the target on the construction industry and called for the generation of markets and improved demand for recycled or recyclable material, especially in the manufacturing and construction sectors. The Region needs to ensure that the re-use and recycling of Construction and Demolition waste is maximised and that illegal collection and disposal of this material is completely ceased. Furthermore the Local Authorities in the Region should support and

promote the endeavours of the National Construction and Demolition Waste Council (NCDWC) and its producer responsibility initiative to reduce the generation of unnecessary C&D waste.

Draft Best Practice Guidelines on the preparation of Waste Management Plans for Construction and Demolition Projects have been produced by DoEHLG. These provide guidance on the preparation of Construction and Demolition Waste Management Plans and provide local authorities, engineers and developers with an agreed basis for the content of C&D Waste Management Plans. Coinciding with these draft guidelines, The NCDWC launched their Voluntary Construction Industry Initiative in October 2004. This initiative places responsibility on each participant in the construction industry to encourage best practice in waste management by promoting waste prevention, reduction and reuse of materials and recycling (National Construction and Demolition Waste Council, 2004).

The DoEHLG published a review of the Irish waste management sector in April 2004, entitled '*Waste Management – Taking Stock and Moving Forward'* which made reference to both the 1998 policy statement '*Changing Our Ways'* and the 2002 policy statement *'Delivering Change'*. The 2004 document reinforces the policies as set down by the previous documents and addresses the progress in the modernisation of waste management in Ireland. In relation to biodegradable waste, the document recognises that there is a need to make early and substantial progress on the provision of biological treatment facilities. The document proposed a number of Key Points for the future progress of policy issues, one of which, Key Point 7, stated:
"The draft National Biodegradable Waste Strategy now being published for consultation will be finalised by end-June 2004. Implementation of the Strategy (aspects of which are already in progress) will move ahead in accordance with the timetable set out in the Strategy itself."

This Strategy is discussed in Section 1.4.3. The document also addressed the progress in the C&D waste recovery area. The EPA's National Waste Database Report for 2001 indicated a 65% recovery rate for C&D waste, representing substantial progress towards the 85% recovery objective set for 2013. It states that very significant progress has been made in implementing Producer Responsibility Initiatives in relation to C&D waste and that the National Construction and Demolition Waste Council (NCDWC) has outlined details of a voluntary industry initiative aimed at achieving further progress in the recovery of C&D waste.

A study was published in 2001 on Waste Management Options and Climate Change. The study is intended to inform developing EU-level waste management policy, through a comparison of the available options for the treatment of the Municipal Solid Waste stream. The study has shown that, in over all terms, source segregation of Municipal Solid Waste (MSW) followed by the recycling (for paper, metals, textiles and plastics) and composting /Anaerobic digestion (AD) of putrescible wastes, gives the lowest net generation of greenhouse gases, compared with other options for the treatment of bulk MSW. It concluded that emissions of greenhouse gases associated with the

transportation of waste, residues and recovered materials are small in comparison with the much larger greenhouse gas generators in the system, such as those related to avoid energy / materials, landfill gas emissions and carbon sequestration.

The WMP aims to follow the Government approach to waste management policy as set out in their 1998 policy document *Changing Our Ways*. The main thrust of the policy is to reduce our national dependence on landfill and to aid local authorities in the transition to a modern integrated waste management system. The importance of the regional approach to waste management is underlined and support is expressed for increased private sector involvement.

The proposal put forward by Oxigen Environmental Ltd. of an Integrated Recycling Facility provides for the recovery of 180,000 tonnes of C&D and C&I waste, and 65,000 tonnes of biological municipal waste per annum. Each facility will be specifically designed, utilising the best available technologies. Any proposed development in this area will be subjected to all normal planning and waste licence processes.

1.4.2 Landfill Directive

In 1999, a European Union Directive dealing with the landfilling of waste, commonly known as the 'Landfill Directive' (1999/31/EC) was established. In addition to setting demanding new standards for all landfills in order to improve environmental protection, the Directive imposes restrictions on the consignment of certain waste materials to landfill. These restrictions include a gradual reduction in the quantity of biodegradable municipal waste which may be deposited in landfill sites.

The Landfill Directive defined progressive targets for the diversion of BMW (Biodegradable Municipal Waste) away from landfill. For example, the EU Landfill Directive 99/31/EC prescribe a staged reduction in the quantities of biodegradable municipal waste entering landfills, as follows:

- Minimum 25% reduction by 2006;
- Minimum 50% reduction by 2009; and
- Minimum 65% reduction by 2016.

The principal 'biodegradable' components of municipal waste are paper and cardboard, food and garden waste. Some 65% of all municipal waste is biodegradable. While significant improvement has been recorded in the rate of recycling, this has not been sufficient to reduce the reliance on waste disposal due to waste growth. Based on surveys carried out during 2003, approximately 15% of municipal waste generated is currently diverted from landfill; by contrast local authority waste management plans typically require up to 90% diversion of waste by 2013.

In order to meet the targets of local authority statutory waste management plans, a several fold increase in recycling capacity and biological treatment capacity is required. It is envisaged that in achieving both the national recycling and biological treatment

targets and those of the Landfill Directive will result in the overall diversion of approximately 76% of total biodegradable municipal waste from landfill. By 2009, in the region of 1.8 million tonnes of biodegradable municipal waste will need to be diverted annually in order to meet the Directive's targets.

Each Member State is obliged to take measures to implement the Landfill Directive targets and to produce a National Strategy setting out the proposed actions. In April 2006 Ireland's National Strategy on Biodegradable Waste was launched.

1.4.3 National Strategy on Biodegradable Waste

A National Strategy on Biodegradable Waste (NSBW) was launched in April 2006. It outlines Government policy for the diversion of biodegradable municipal waste (BMW) from landfill, building upon the key objectives established in policy documents Changing Our Ways (1998), Delivering Change - Preventing and Recycling Waste (2002) and Waste Management: Taking Stock and Moving Forward (2004). This sets ambitious targets for operational capacity to treat source separated food and garden waste by composting and anaerobic digestion for the following years;

- By 2010 - 250,000 tonnes minimum
- By 2013 - 320,000 tonnes minimum
- By 2016 - 330,000 tonnes minimum

The report states that a significant increase in biological treatment capacity is required to meet the targets set out by the Landfill Directive. This strategy is designed to secure the diversion of biodegradable municipal waste from landfill, the key benefit is to reduce the methane emissions from landfills and to encourage the separate collection of biodegradable waste.

The 2nd Draft of the current paper 'the European Commission Working paper on Biological Treatment of Biodegradable waste', states 'member states shall set up separate collection schemes with the aim of collecting biowaste separately from other types of waste in order to prevent the contamination of biowaste with other polluting wastes, materials and substances.'

These separate collection schemes shall at least cover:
Urban areas of more than 100 000 inhabitants within three years;
Urban areas of more than 2000 inhabitants within five years.

The approach of Oxigen to the management of the wastes it collects is in agreement with national and local policy in relation to meeting targets for the reduction of waste going to landfill. Oxigen intend to supply a third collection for their residential customers in Cavan, Longford, Monaghan, Leitrim, and Westmeath for the collection of biological waste which is already underway in Dundalk, Co. Louth. Oxigen were the first waste

company to introduce Brown Bins in the North East Region, and this will be extended and incorporated into Cavan shortly. This will further increase the recycling rates within the customer area. It will run alongside the current wheelie bin service. This service will be introduced as part of our commitment to further develop recycling opportunities for our customers. All waste collected by Oxigen is brought to their recycling facility for segregation and storage prior to despatch to other recycling facilities, which includes recycling of cardboard, paper, wood, metals and C&D waste.

A civic amenity area is currently in operation at Corranure landfill. Since the civic amenity site opened in 2002 the quantity of waste recycled has increased substantially annually, with a total of 1,616.42 tonnes being recycled in 2007. This centre provides a valuable recycling service to the local community and continues to expand and develop to further improving recycling rates.

The development of markets for recovered materials has widened to become an integral part of waste management operations; as commodities increase in price and as new markets are developing for recycled and recovered materials the end market is now becoming a fundamental part of the waste industry value chain. Once fully operational the Integrated Recycling Facility will produce in the region of up to 25,000 to 30,000 thousand tonnes of compost annually. This will be used by itself and blended with other media to produce a range of different horticultural products. The diverse attributes of this compost allow it to be used as a substitute for commonly used horticultural products; primarily peat, bark and topsoil.

The integrated waste treatment facility proposed by Oxigen Environmental Ltd. is in compliance with the specific policies outlined in the biowaste strategy and will provide must needed treatment capacity for biowaste in the North East Region. This facility will make a significant contribution to the National biodegradable waste diversion targets.

1.4.4 Waste Management Plan North East Region

The Waste Management Plan for the North East Region (2005-2010) states progress is required to meet the targets of 2015. The targets set include:

- 43% recycling
- 39% thermal treatment
- 18% landfill

These targets were to be implemented over a 15 year period and are based on the Best Practicable Environmental Option (BPEO) for the region which aims to maximise recycling to the greatest realistic extent and to divert residual waste away from landfill.

The Plan states that it is imperative for biological treatment to be introduced in the region to deal with organic waste produced from households and industry. Without

biological treatment the recycling targets will not be met nor will the requirements of the EU Directive on Landfill of Waste. Landfill will have a decreasing role in the management of the regions waste as the recycling rates increase, however in the short to medium term there is a significant need for landfill capacity.

Controls have been put on the categories of material accepted at facilities. Landfills no longer accept commercial recyclable packaging or C&D waste for disposal,(unless C&D waste can be put to beneficial use).The rise in waste disposal costs over the plan period has been beneficial in terms of stimulating recycling, but it also contributed to the increased waste charges.

The WMP states "The diversion of waste from landfills is the primary objective of the WMP. It is also the policy of the Plan to ensure that all counties in the region will have arrangements in place for landfill disposal". The local authorities of the North East Region have identified the need for landfill disposal in the short term and for the residual waste stream in the long term. In order to meet their obligations for waste disposal the landfill facilities at Corranure (Cavan), Scotch Corner (Monaghan) and White River (Louth) have been identified as providing medium to long term landfill capacity for the Region. Although recycling initiatives have taken place to date which has diverted some waste from landfill there are no realistic alternatives to landfill in the Region for the treatment of large quantities of waste and therefore landfill capacity is required.

All Commercial and Industrial waste in the North East Region is currently collected by private operators. The Quantity of C&I waste in the region was estimated to be 97,165 tonnes in 2003, approximately 40% higher than the 1998 estimate (69,588 tonnes). The current recycling rate for household waste in Cavan is 10%, with an average of 16% per household in the North East region. At present there are no large-scale C&D recycling facilities in the Region, and there were three permitted facilities for construction and demolition recycling and processing (as per NEWMP 2006). The quantity of household waste generated in the region in 2003 was estimated to be 161,350 tonnes. This is 54% higher than 1999, reflecting a growth in population, improved data collection in terms of weighbridges at landfills and continued economic growth. Currently no facility has been provided for the Central Biological Treatment of organic kitchen waste.

In 2002 the Central Statistics Office (CSO) reported a total of 110,263 households in the North East Region. In 2003, overall 23% of municipal waste was recovered, 16% of household waste and 35% of commercial & Industrial waste. The overall recycling target for the North East Region is to achieve 43% recycling by 2014 and the region is progressing steadily towards this target.

1.4.5 Private Sector Involvement in Waste Management

The WMP states that "The North East Local Authorities recognise that increased involvement of the private sector in the provision of waste services offers several potential benefits to the region, as outlined in the National Waste Policy statement

'Changing Our Ways'. Up to now the role of the private sector has focussed mainly on waste collection, and waste recycling to a certain extent. Partnership and further involvement will be developed with the private sector in the provision of new waste collection, recovery and disposal operations where appropriate.

In the North-East Region Oxigen are by far the largest waste collector providing door to door collections for household, commercial and industrial wastes. In County Cavan, OEL collects and has control of 95% of all waste collected in the County and similarly in County Monaghan controls and collects 50% of all door to door collections. OEL have increased their activity in the region, in the last number of years with the acquisition of four waste management companies in County Cavan. The largest of these companies being Cavan Waste Disposal. Prior to these acquisitions OEL's activity in the Region was concentrated in the east of the Region in Counties Louth and Meath.

The proposed Integrated Recycling Facility will provide a facility for recovery and residual waste disposal operations and this will augment the existing waste collection and recycling services already provided by the company. The operation of this facility will be significant in terms of the North-East Region meeting the objectives and targets set out in the replacement waste management plan and the biowaste facility element of the proposed facility will be proven to be of national significance in terms of Ireland meeting the landfill diversion targets as stipulated in the Landfill Directive.

Oxigen are the only waste management company operating in the North-East Region that is currently collecting and has control of the volume of waste necessary to ensure the viability of this proposed facility.

1.4.6 The Polluter Pays Principle

"The polluter pays principle is currently being applied in the County through collection and disposal charges. During the currency of this plan the Council will assess the feasibility of introducing more direct systems e.g. pay by weight."
The full costs of recycling and/or disposal of wastes is currently borne by the customers of Oxigen by collection fees. The 'polluter pays principle' is implemented in this way. Oxigen is currently examining methods to charge customers by weight or volume to further develop this principle.

The cost of waste disposal is constantly increasing due to the more stringent environmental controls imposed by EU legislation and the EPA waste licensing system. These costs have been further increased in July 2008 with an increase in the Landfill Levy which add €20 per tonne to the cost of the landfill disposal. These costs are borne by the polluters, whom in this case are the household, commercial and industrial customers of Oxigen. The rising costs of waste disposal are making recycling a more viable alternative and Oxigen is expecting to significantly increase its recycling rates over the next few years.

1.4.7 Inter-Regional Movement of Waste

The Waste Plan recognises that there should be flexibility with respect to the movement of waste across regional boundaries. In broad terms the capacity of waste facilities in the Region should primarily satisfy the needs of the Region whilst not precluding inter regional movement of waste and allowing flexibility to cater for the development of required national infrastructure. (2005 –2010)

Conditions attached to some planning permissions for waste infrastructure restrict facilities to handling only waste that arises in the geographic area covered by the Waste Management Plan, the rationale being the *proximity principle.* The Government's latest policy document '*Taking Stock and Moving Forward'*, recognises that the proximity principle has been interpreted too severely by some planning authorities and that some but not all planning authorities have been too literal in their interpretation of Waste Management Plans. The policy statement also states how each region has to take responsibility for its own waste. This policy on inter regional movement of waste has been reinforced by the recent Policy Direction issued by the Minister under Section 60 of the Waste Management Acts, 1996-2008.

While Oxigen Environmental Ltd. intends sourcing significant qualities of waste intake capacity for this integrated waste facility within the North East Region *circa* 85,000 MSW tonnes per annum in Year 1 of operation, waste from outside the region will also be accepted at the facility. The facility will accept the waste from other waste collection contractors operating both inside and outside of the region.

Overall Oxigen Environmental Ltd. predicts that in excess of 65% of all materials received at this facility will be recycled by 2012. This recycling rate is in line with the recycling target set out for recycling in the North East Waste Management Plan.

1.4.8 EU Regulation on Animal By-Products

A draft report was issued by the Department of Agriculture, Fisheries and Food in January 2008 based on EU Regulation No.1774/2002 laying down health rules concerning animal by-products not intended for human consumption. This Regulation is enforced by animal by-products regulations S.I 612 of 2006 and S.I 615 of 2006.This guidance document sets out criteria of the conditions for approval and operation of composting and biogas plants treating animal by-products in Ireland.

Oxigen Environmental Ltd. will prior to the construction and operation of their biowaste treatment facility consult with the Department of Agriculture, Fisheries and Food in relation to this proposed development and seek their approval for the operation of this facility.

The EU Regulation of the European Parliament and of the Council lay down health rules concerning animal by-products not intended for human consumption (Ref.: EC1774/2002 Animal By-Products Directive) exerts considerable influence over the

manner in which biowaste is managed in the future. The objective of the composting/biogas legislation is to ensure that all products of animal origin which are treated by biogas digestion or composting must meet the treatment standards required by Regulation(EC) No. 1774/2002 to ensure sufficient pathogen reduction so that the treated material may be safely applied to land.

Under Regulation (EC) No. 1774/2002, animal by-products are categorised in 3 distinct categories:

- Category 1
- Category 2
- Category 3

The processing parameters adopted and approved in a particular plant will determine the type of animal by-product that may be processed in the plant.
The following animal by-product materials may be used as feedstock in a biogas or composting plant in Ireland;

- Category 2 Material comprising of the following:
  - Manure
  - Digestive tract content separated from the digestive tract,

- Category 3 Material comprising of the following:
  - Catering waste
  - Former foodstuffs
  - Fresh by-products from fish from plants manufacturing fish products for human consumption

End-use criteria for different categories of material as well as processing parameter requirements will generally determine for operators what material is used as feedstock in a biogas/ composting plant.

From the perspective of municipal biodegradable waste, it is of particular significance that catering waste and mixtures of material containing catering waste are included within the definition of animal by-products within the regulations. Catering waste is defined as ‘all waste food including used cooking oil originating in restaurants, catering facilities and kitchens, including central kitchens and household kitchens’.

Catering waste is classified as a Category 3 material, and can therefore be directly transformed in a composting or anaerobic digestion plant. The regulations define one exception to catering waste being a Category 3 material. Article 4(1)(e) states that ‘catering waste from means of transport operating internationally’ is classed as a Category 1 material. The proposed biological treatment facility does not intend to accept any such Category 1 – catering waste material at their facility.

The design of the proposed facility will meet the required process standards and will also have the flexibility to incorporate additional European standards should they arise in the future.

1.4.9 Taskforce Report on Waste, Electrical and Electronic Equipment

In April 2004, a Taskforce report on waste, electrical and electronic equipment was published by the Department of Environment, Heritage and Local Government. This report reviewed the likely issues effecting the implementation of the WEEE and ROHS Directives in Ireland. The Taskforce identify that civic amenity facilities were critical points for WEEE collection and stated that unless the number and size of civic amenity facilities were significantly expanded, infrastructure and adequacies were envisaged to present a significant barrier to the implementation of the WEEE Directive.

To ensure that the civic amenity site located at Corranure Landfill is suitable for and has the adequate capacity for the collection of WEEE provision will be made for the secure and safe collection of these materials.

1.5 Alternatives considered

Waste Management practices are listed under the following headings:

- Prevention
- Minimisation
- Re-use
- Recycling
- Recovery
- Disposal

Oxigen is currently involved in a number of these practices and intends to develop a fully integrated waste management service that treats waste in accordance with EU and National policy and guidance. By providing a number of bins to each customer and charging by weight or volume Oxigen will encourage prevention, minimisation and recycling.

Oxigen intends to provide an integrated network of waste management treatment facilities that will include: materials recovery facility, biological waste treatment facility, civic amenity facility at Corranure Integrated Recycling Facility. Waste disposal by landfill is an integral part of the EU Waste Management Hierarchy, outlined above. As a disposal activity, landfill is considered a less favourable option when compared with prevention, minimisation, re-use, recycling and recovery. The EU hierarchy, along with national and regional waste management plans, recognise that while landfill is the least

preferred waste management option it is necessary for the disposal of residual waste after the more preferable options have been utilised.

The location of the MRF and biological treatment plant within Corranure landfill facility will provide the size and type of facilities required to meet the requirements of government policy on segregation of waste at source. The total site is 47.5ha in size with 10.046ha currently in use for the existing landfill (including closed cells, which will be subject to a licence application by Cavan County Council) and Civic Amenity site. Infrastructure such as good roads, services (water and foul sewers), and telecommunications infrastructure already exist at the site.

This site is geographically central within Ireland and a good road network having been already established. County Cavan has two National Primary Routes – the N3 (Dublin-Cavan-Enniskillen-Ballyshannon) and the N16 (Enniskillen-Blacklion-Sligo). A bypass road has been built to facilitate traffic flows to and from Dublin. The current landfill is situated on the Cavan-Cootehill Road, approximately 3 km North-East of Cavan Town, just off the N3 Cavan bypass. A new national primary road (East-West link) is also proposed from Dundalk via Cavan and Enniskillen to Sligo. County Cavan also has three National Secondary Routes-the N54, N55 and N87. This is one of the few sites that can provide ease of access, space, flexibility. Studies completed have shown the proposed facilities will have minimal impact on the existing local environment and community, while providing increased employment in the area.

Oxigen Environmental Ltd. have commenced the roll out of a brown bin service within the region from 2007 and the nearest composting facility with sufficient capacity is either in Carlow or Northern Ireland. Also Oxigen Environmental Ltd. intends to utilise the landfill gas to power the developed facilities and perhaps provide power to the national grid. A Feasibility study has been completed and requires further analysis to determine if sufficient quantities and quality can be obtained.

The location of this integrated plant is dependent upon a number of factors, namely

- Existing landfill site
- Space for development
- Proximity to waste arisings
- Compliance with the requisite land use planning & zoning objectives
- The proposed footprint area of the site
- Current access to the site
- The ownership of the land

The Corranure Landfill site is the most appropriate location for each of the proposed facilities. Grouping the facilities in one site allows for economies of scale in relation to transportation, planning, licensing and land costs. It is therefore not practical for this proposed development to be sourced on a green field site when sufficient land is available to Oxigen Environmental Ltd. for development at this already established landfill site. The reduction in the overall cost of recycling, makes recycling a more viable option than direct to landfill. The sites location to the Cavan bypass provides easy

access to major roads, other primary routes and to all parts of the North Eastern functional area, as well as the main centres of population.

1.6 Do-nothing Scenario

The proposed facilities will provide an environmentally sound recycling process for both organic residues and inert C&D waste. A do-nothing alternative will result in the continued land filling of organic waste and C&D waste which is a contradiction with European and Irish legislation that is geared towards the step-wise reduction of waste being consigned to landfill.

A total of 22,854 tonnes of household and commercial/industrial waste generated 20,095 tonnes (87.9%) were municipal waste and 2,759(12.1%) were commercial /industrial. County Cavan has the lowest tonnage of packaging waste (17,469 tonnes) of the four counties in the North Eastern region. Waste output from the agricultural sector in Cavan is very significant, at almost 1.2million tonnes per annum. (A strategy for the Economic, Social and Cultural Development of Co. Cavan 2002-2012).

The success of this biological waste treatment project is the quality and amount of biowaste (source separated household food and green waste) that is available for collection and treatment at the proposed facility. Typically, sectors such as hotels, restaurants, supermarkets and colleges contribute the most food waste to the commercial waste stream. Recovery rates and participation rates will also affect the amount of food waste to be collected.

Biological treatment of biowaste by composting allows the production of hygienic, stabilised and dry compost. Compost has many beneficial attributes including:

- Acts as a soil conditioner
- Supply of organic matter to the soil
- Acts as an Organic fertiliser with slow release of plant nutrients
- Can suppress plant disease
- Carbon Sequestration

High quality compost will be produced at the facility. Market outlets for the product will include replacement of peat derived products used by local authorities and other sectors, use by gardeners and landscapers, in horticulture and maybe land remediation or as landfill cover.

Benefit to the national economy indirectly accrues from elements such as;

- Landfill methane emission avoidance
- Fertiliser costs saved
- Carbon sequestration
- Peat avoidance
- Energy generation using spare heat

- Increased recycling rates due to cleaner dry recyclables

The do-nothing alternative will merely contribute to an ever-looming waste management crisis. Failing to comply with the European Landfill Directive may in future result in financial penalties being imposed upon Ireland.

1.7 Consultation and Scoping

A range of government departments, agencies and bodies, non-governmental organisations and interest groups were consulted during the preparation of this Environmental Impact Statement in order to ensure that all relevant issues were addressed. Specific concerns raised relating to any issue, environmental or otherwise, could subsequently be considered via design or procedural modifications or by the implementation of appropriate mitigation measures. Pre licence application consultation meetings were held with the EPA to determine the scope of the site project and investigations required for the waste licence application. A meeting was held on the 15th of April to discuss the implications of two separate licences on one site, details of the proposal and presentation given by WMT Consultants on behalf of Oxigen Environmental Ltd. attached in Volume III Appendix 2 (Statement Regarding the Risk potential). A further preliminary licence application meeting was held on the 25th of July with an EPA representative to discuss requirements and submission procedures.

The following is a list of contributories made to the EIS completed in 2003 for Cavan County Council and these have been incorporated into this EIS along with studies completed on behalf of Oxigen Environmental Ltd.

The relevant inputs of the various members of the Study Team are as follows:

Table 1.1 - List of Contributors to the EIS

Main Contributer	Contribution
BMA Geoservices Ltd.	Geology and Hydrogeology
Margaret Gowen & Co. Ltd.	Archaeology and Cultural Heritage
Ellen O Carroll, Archaeological Consultancy	Archaeology Assessment
WMT-Waste Management & Service GmbH	Statement regarding the risk potential
Roger Goodwillie & Associates & Claire Keogh	Terrestrial Ecology
RPS Consultants	Various (see appendix for details)
Envirocon Ltd.	Air Quality
Enterprise Ireland	Noise Aspects
Dr. Dieter Schrenk	Human Health
Frank Burke & Associates	Traffic Impact Assessment
BHP	Monitoring Data
Odour Monitoring Ireland	Odour Surveys
Ecofact Ltd.	Biological Assessment
Odour Monitoring Ireland	Landfill Gas Surveys
Michell & Associates	Landscape & Visual Assessment

All contributors assessments are provided in the Appendices contained in Volume III.

The following are a list of statutory bodies and non-government organisations (NGOs) that were consulted as part of the scoping exercise for the EIS:

Table 1.2 Statutory Bodies consulted

Statutory Bodies	Action
The Northern Regional Fisheries Board	Written Correspondence, sent 1-05-08
Department of Communications, Marine & Natural Resources	Written Correspondence, sent 1-05-08
Teagasc	Written Correspondence, sent 1-05-08
Bord Failte Eireann	Written Correspondence, sent 1-05-08
The North Eastern Health Board	Written Correspondence, sent 1-05-08
Health and Safety Authority	Written Correspondence, sent 1-05-08
Department of Environment, Heritage and Local Government	Written Correspondence, sent 1-05-08
Local Conservation Ranger	Written Correspondence, sent 1-05-08
Environmental Protection Agency	Written Correspondence, sent 1-05-08
The National Roads Authority	Written Correspondence, sent 19-06-08
Dublin Transport Office	Written Correspondence, sent 19-06-08
An Bord Pleanala	Written Correspondence, sent 19-06-08
Dept. Of Agriculture, Fisheries & Food	Written Correspondence, sent 19-06-08
The Office of Public Works	Written Correspondence, sent 19-06-08
The Heritage Council	Written Correspondence, sent 19-06-08
Dept. of Enterprise, Trade & Employment	Written Correspondence, sent 19-06-08
Dept. of Arts, Sports and Tourism	Written Correspondence, sent 19-06-08
Dept. of Community, Rural & Gaeltacht Affairs	Written Correspondence, sent 19-06-08
Dept. of Justice, and Law reform	Written Correspondence, sent 19-06-08
Electricity Supply Board	Written Correspondence, sent 19-06-08

Table 1.3 Non-Government Organisations

Non-Government Organisations	Action
An Taisce	Written Correspondence, sent 1-05-08

Replies from the statutory consultees are given in Volume III Appendix 3.

1.7.1 Public Consultation

A Preliminarily meeting was held was held with the Cavan Better Waste Management Association on 27th January 2008 with representatives from Oxigen Environmental Ltd. and Cavan County Council. During this meeting an outline was given by Oxigen Environmental Ltd. on the takeover of Corranure Landfill and proposals discussed for the development of the site. It was also stated further meetings would take place on request of the attendees as the type, details and licence application was progressed by Oxigen Environmental Ltd.

A meeting was held on the 26th of August with the Cavan Better Waste Management Association to discuss the ongoing developments and application process. This meeting outlined the intentions Oxigen Environmental have for development of the site and concerns and queries were discussed. Further meetings are planned with this group as part of ongoing discussions.

A list of attendees was taken at each meeting and given in Volume III Appendix 4.

2.0 PROJECT DESCRIPTION

2.1 Introduction

The service provided by Oxigen will consist of the provision and operation of recycling infrastructure at Cavan landfill for the management of contract waste. The facilities will accept waste from Oxigen's existing customers within the North East Region and from other regions in the border and midlands area. Oxigen Environmental Ltd. propose to develop Corranure Landfill site, which will consist of a number of waste management facilities.

- Landfill of 90,000 tonnes per annum - Development of Phase 3 to include completion of Cell 3 and development of Cell 4
- Civic Amenity Centre and associated infrastructure
- A Materials Recovery Facility processing 180,000 tonnes per annum.
- A Biological Waste Treatment Facility treating up to 65,000 tonnes per annum of segregated domestic and commercial organic waste.

Some elements of the proposed development utilise less advanced technologies than others and thus are more defined. For the Landfill and Construction and Demolition / Commercial and Industrial facility, the processes and technologies are relatively straightforward and thus are explained in more detail. The processes used in the BTF require more advanced technologies new to the site, the EIS describes both options for composting technologies and options for anaerobic digestion technologies.

2.2 Site Location

The existing landfill is located within the townlands of Corranure and Lismagratty adjacent to the Cavan-Cootehill Road (R188) and about 2km northeast of the Cavan Bypass (N3) (Site Location Plan Drawing No.01). It is situated ca. 3km to the north-east of Cavan Town as per Location Map Drawing No.01A. The predominant land use surrounding the site is one of agricultural pastureland. The original landfill is located in a valley. An elevation stretches to the north-east to a height of approximately 135m. The terrain to the southwest reaches a height of approximately 130m. It is located at a height of approximately 108 m to the south and 90 m to the north. There is a visible peak in the middle of the location. The peak has a height of approximately 114 m.

The total site is 47.5ha. in size, consisting of a haphazard field pattern enclosed by hedgerows and small clumps of woodland. The Lismagratty Stream runs to the northwest of the landfill. The Corranure Stream runs to the southwest along the boundary of the landfill. The landfill site accepts mainly municipal solid waste collected from the domestic and commercial sectors in County Cavan and neighbouring counties.

There are approximately 12 residences within 500m from the boundary of the landfill site. Four of these houses are under the ownership of Cavan County Council and one house is unoccupied. All access to the landfill site is along the R188 Cavan-Cootehill

Regional Road which is of mostly a good standard with relatively high traffic flows. The location of the landfill does not affect the town directly or indirectly, with a civic amenity site provided at the landfill for the recycling requirements of the general public. The proposed MRF and Composting Facility will cover an area of approx. 3.80ha. This area is currently exposed burrow dig. The area surrounding the proposed Integrated Recycling Facility serves the function to provide a physical separation between the waste activities and the local residents and remains as undisturbed lands. As material is excavated from the excavated area it will be regarded and naturally shaped, seeded and planted to mitigate against negative views and operation and construction noise associated with the development.

2.3 Site Layout

The functional design and layout of the integrated recycling facility is shown on Site Layout Plan Drawing No. 02. The design of this layout incorporates the current active landfill and civic amenity facility, Cell 3 is currently in operation with completion of this cell expected by the end of 2009. Cell 4 will then commence with expected life span of approx. 2.5 years. The existing weighbridges and wheel wash will be utilised by all onsite facilities, however an additional weighbridge will be added for sole use for the BTF. The internal roadways are designed to provide ease of flow of traffic, with a sufficient road area to provide ease of queuing and congestion at the public road.

The site is accessed via the Cavan-Cootehill Road (R188) and is serviced by electricity from the national grid. The existing telecommunications network provides services to the main office building and weighbridge. The water main connection will be sufficient to cater for peak demands of the proposed facility. This connection will not impact on the water supply of the locality.

The proposed development will connect to the existing foul sewer, which discharges to Cavan County Council treatment works. Leachate containment provisions ensure that waters that may have come in contact with waste is not discharged into the surface water system within the vicinity of the site, but collected and stored in the leachate tank. The foul sewer drainage network will remain completely separate from the surface water system. (Drawing No.15 Service Plan)

Surface water runoff from the roof and hard standing areas of the proposed building areas will be collected in underground storage tanks. Surface water to be discharged from the site will be via an oil interceptor prior to discharge.

The facility will consist of a number of elements namely:

Existing:

- Landfill area and associated infrastructure
- Civic Amenity Centre
- Main Administration Building
- Weighbridge
- Wheelwash

Proposed:

- Material Recovery Facility, consisting of a C&D waste reception and processing area, an aggregate stockpile area, to include a Dry Recyclables area
- Biological Waste Treatment Facility (BTF) and associated wheel wash
- Secondary Administration Building
- Car parking and vehicle storage

Generic layouts of these facilities are contained in Volume IV of this EIS.

2.3.1 Materials Recovery Facility

The Materials Recovery Facility will treat up to 180,000 tonnes per year, it will consist of a processing building of which will be adjacent to the BTF. This building will be 5,705m^2 with a height at eves of 15.5m and a height to ridge of 17.94m. Drawing No. 12 Recycling Sheds Location shows the location of the Materials Recovery Facility at Corranure Landfill site and details of buildings are shown in Drawing No. 13 Recycling Shed Elevation and Drawing No. 14 Recycling Sheds Plan.

Currently Cavan Waste Disposal Ltd. located at Killygarry Industrial Park, Cavan, Co. Cavan operates a Construction and Demolition (C&D) Waste Transfer Facility, with an annual tonnage of 24,990 tonnes. Cavan Waste Disposal Ltd. provides a waste transfer/recycling operation for commercial and industrial companies and also for domestic skip hire. The company handles primarily 'inert' waste material for processing and segregation, recycling material is stock piled for transport to authorised recycling facilities. Waste not suitable for transfer/recycling is taken directly to Corranure Landfill for disposal.

It is proposed to move current operations from Killygarry Industrial Park to Corranure Landfill. Operations at Cavan Waste Disposal Ltd. will cease. The proposed facility will deal with up to 180,000 tonnes per annum of C&D and C&I waste. Operations will include a reception area for waste tipping, a processing area incorporating screens and crushers, a stock piling area for the storage of segregated material. The types of crushing unit and screen to be utilised is dependent on the type of waste entering the facility and the end-use of the recovered material. Timber shredders and magnetic units can be provided for treatment of wood wastes and the recovery of metals. The proposed design ensures all waste off-loading and transferral operations will take place internally, thus minimising environmental impact.

The range of activities will include

- Processing and recovering recyclable material from construction and demolition waste material.
- Recovering cardboard, paper, plastics and transferring suitable material for recycling from both household, commercial and industrial waste collections

- Transferring green waste and material suitable for composting to a Mechanical Biological Treatment Facility

Construction and demolition waste will be accepted at the site for recovery as aggregate and wood chipping. Large pieces of wood and timber will be picked from the waste and fed into a wood chipper. Chipped wood will be used as an amendment material for composting. Metal will be extracted for sale to recycling companies. The remaining material will be screened through a trammel. The aggregate produced will be re-used in suitable construction uses. Fines and aggregates will be stored on site for recovery. Residual waste and treated wood will be landfilled. Cardboard and metal will be managed with the dry recyclables.

The proposed throughput capacity of this facility is 180,000 tonnes. This tonnage comprises of approx.10-15,000 tonnes of dry recyclables and 165-170,000 tonnes of C&D/C&I. Both these waste streams are sorted and segregated separately within the one building.

In the event that household hazardous waste was delivered along with intended loads it will be transferred immediately to the civic amenity facility.

2.3.2 The Biological Waste Treatment Facility

The proposed development will comprise a BTF for the conversion of a range of organic residues to compost and/or liquid digestate fertiliser. The location of the BTF is shown on Drawing No. 12 Recycling Sheds Location.

The BTF will treat up to 65,000 tonnes of biological waste. The main biowaste to be treated include:

- Biodegradable Municipal Waste (BMN) from the separate collection scheme
- Organic wastes from civic amenity sites, material recovery facilities and waste transfer stations;
- Commercial organic waste streams
- Water and Wastewater treatment plant sludge

2.3.2.1 Enclosed Composting Systems

The composting plant will comprise a fully enclosed dedicated warehouse type building with all treatment processes, including acceptance of waste, composting, refinement and storage of final products carried out within the building, which will be under negative pressure. Thus, the facility will, in effect, be an 'in-vessel' composting system no matter what technology is finally chosen. The building will have a height varying from approx. 15.5 at the eves and 18m at ridge.

The composting maturation, refinement and storage areas are separated from the rest of the building to minimise cross contamination between the waste coming into the facility

and the mature compost product. All products produced by the facility will meet the quality and composition criteria as set down in the Waste Licence.

The collected air from all parts of the composting process will be treated. The process used to treat the air will depend on the composting process used and may include biofilters, carbon filters, water scrubbers etc. The air treatment system will be fully enclosed and the treated air will be emitted to outdoors through a stack. Emissions from the stack will be sampled regularly and emission limit values (ELV's) will be set by the Waste Licence.

2.3.2.2 Anaerobic Digestion System

The design and layout of the anaerobic digestion (AD) facility will be based on extensive operational experiences in Europe. The final design and the construction of the AD will be subject to specialist contract. The primary objective of the AD facilities is to produce a liquid fertiliser (digested slurry) with beneficial agricultural characteristics, and as a secondary objective generate revenues from the sale of electricity produced from biogas.

Prior to anaerobic digestion the waste is transported to a sanitation tank. Between the storage tank and the sanitation tank a macerator is placed, which allows for the shredding of coarse particles in the waste, while it is being pumped through to the sanitation tank.

The biogas produced during the digestion process is primarily composed of methane (CH_4 55 – 60%) and carbon dioxide (CO_2 40 – 45%), with smaller amounts of hydrogen sulphide (H_2S) and ammonia (NH_3). The biogas is saturated with water and may contain dust particles. Prior to utilisation the methane should be treated in order to remove water/dust and H_2S. Water is removed by separation of condensed water and is usually done by use of water taps in the gas pipe. In case the efficiency proves to be insufficient, additional equipment e.g. demister, cyclone separator or moisture trap, may be required. A number of techniques are available for H_2S removal from biogas. One of the most suitable techniques for H_2S removal is air dosing to the reactor. This technique is based on the biological aerobic oxidation of H_2S to elemental sulphur by specialised microorganisms. The removal efficiency of H_2S is 80 – 90%. The type of biogas treatment used will be subject to specialist contract.

The biogas production fluctuates in time. Production fluctuates over both longer and shorter periods of time. Long period fluctuations, i.e. over days or hours, occur due to changes in loading of the AD-tanks. Short period fluctuations, i.e. over minutes or seconds, are inherent to the biological nature of the process. Short period fluctuations are compensated for by the installation of a biogas buffer in the gas line. This buffer comprises a large flexible gas container with a variable volume, placed in another rigid container.

The biogas can be utilised in a Combined Heat and Power (CHP) unit, in which a gas engine converts the biogas into electricity and heat at temperatures between 60^{o}C and

500^{o}C. The heat from the flue gas exhaust, the lubrication oil cooler and the cooling water system can be recovered (as steam and via a heat exchanger) and can be used for sanitation of the incoming waste in the sanitation tank. The CHP unit will have to comply with the emission standards as proposed in the European Community Initiative on the Biological Treatment of Biowaste. A flare can be installed adjacent to the biogas buffer for situations in which the biogas cannot be utilised in the CHP unit. Based on experiences in operational digestion facilities, the flare is in use for less than 5% of the time. The waste licence will set ELV's for both the flare and the CHP unit.

2.3.2.3 Animal By-Product Regulations/Requirements

The facility will have to be designed and operated to meet the Department of Agriculture, Fisheries and Food's guidelines on treating ABP's. The ABP regulations stipulate that processing requirements for Category 3 material which includes household and commercial organics collected from restaurants and hotels, which are given below;

- Maximum particle size of waste material before entering the unit is 12mm
- All the material in the process, at minimum, must reach 70^{o}C
- Minimum time in the unit without interruption 60 minutes

As part of the application process for approval, the plant technology manufacturer must provide documentary evidence and data to demonstrate that the system can comply with the requirements of the regulations and that the composting/ biogas technology used must be capable of achieving the required time, temperature and particle size requirements consistently without the risk of cross contamination.

Such evidence should include data on the suitability of the system to treat different feed stocks, achieve the time/ temperature parameters, its efficacy in destroying pathogens and the conditions under which it must be operated, including any seasonal variations. The evidence supplied by the manufacturer will be assessed by this Department who will determine whether the system (or the information supplied) is sufficient. The initial technology testing would be followed up by continuity tests on a regular basis.

In accordance with the principles prescribed in Regulation (EC) No. 1774/2002, the system of hazard analysis and critical control points (HACCP) plan must pay particular attention to the following points:

- Procedures/ checks at the plant for reception of animal by-products, i.e. waste acceptance procedures
- Processing of material to the required standards.
- Hygiene controls – including cleansing and disinfection facilities, as well as arrangements to prevent cross-contamination of processed material with raw material through the use of flow diagrams.
- Record keeping including laboratory sampling results.
- Details of what corrective actions will be taken when necessary.

The HACCP plan must include provision for a full audit trail of all materials that passes through the plant.

Regardless of the type of compost process, the final compost must meet standards in relation to the microbiological and chemical quality. The EU Working Paper on Biowaste requires that 'In the course of the composting process the entire quantity of the biowaste shall be mixed and exposed to an appropriate temperature'. The proposed EU regulation on Animal By-Products requires sanitation at 70^{o}C for one hour. However it allows alternatives, i.e lower temperatures for a longer period of time.

The quality of the compost depends on the quality of the incoming waste. Once a brown bin collection system has become well established, the level of contamination with the brown bin feedstock will improve. The facility will aim to produce high quality compost which will be in line with regulatory requirements. High quality compost will also provide for more market opportunities for the finished product.

Standard operating procedures (SOPs) will be followed to ensure the HACCP is adhered to and these will be documented in the plants procedures manual. All operatives will be familiar with all aspects of the HACCP and the SOPs through training and record keeping.

2.4 Description of Infrastructure

2.4.1 Security and Control/Access

The main entrance to the site is from the Cavan-Cootehill Road (R188). This will be a common entrance to traffic going to each facility as it links directly to the site road, which will be adequately signposted to direct traffic to the relevant facility. Fencing and security gates will be constructed around the entire site to ensure the site is secure, as shown in Drawing No.10 Site Fencing. This will be inspected and maintained regularly to ensure their integrity.

During operation hours, Oxigen Environmental Ltd. staff will supervise entry to the facility. The operation of the BTF will be continuous; however, all facilities will only be open for waste acceptance and waste processing (i.e pre-treatment, waste handling, compost turning, crushing, sieving, etc.) during the hours of operation. Outside operation hours, the Main Integrated Recycling Facility gate will be locked and monitored by CCTV. Security arrangements will be extended to enclose the new extension area.

Security measures to include CCTV cameras are installed and active at the Civic Amenity site, including the entrance and at the weighbridge. These are connected to the administrative building where recordings can be inspected. This will be extended to include the whole site and additional facilities. An active alarm system is installed and active in the administration building, all buildings are locked when not in use and outside facility operating hours.

An information and identification board is displayed at the entrance gate, with the following information:

- Name and type of facility
- Name of owner/operator
- Licence information
- Types of waste accepted and not accepted
- Operating times
- Contact and emergency telephone numbers

The leachate overflow lagoon is fenced and all associated infrastructure covered.

Figure 1 Entrance to Corranure Landfill

2.4.2 Road Network/Internal Roads

Access to the landfill is via the R188 Cavan-Cootehill Road. Cavan County Council is responsible for the maintenance of this road. The Cavan-Cootehill Regional Road (R188) has a deceleration turning lane provided for traffic approaching from Cavan Town, similarly a dedicated right turning lane has been implemented from approach

from the opposite direction. Warning signs have been placed on approaches to the site to warn drivers of HGV movements ahead.

Access to the site will be via the main entrance gates during operation hours. The general public access will be confined to the reception area and the Civic Amenity Area. The access road is of tarmac construction and a speed limit of 10km applies. The access road to the landfill, Material Recovery facility and BTF will be of substantial construction and will be surfaced to allow for proper dust suppression and cleaning. Adequate drainage will be provided and all surface water will be discharged to a petrol /oil interceptor before discharge to the surface water management system. An unpaved service road will be constructed around the perimeter of the proposed extension area. The site access and the internal roads proposed are illustrated in Drawing No. 02 Site Plan.

2.4.3 Hard Standing Areas

Areas around the administrative building and pubic recycling area are hard standing of tarmac surfacing. Vehicle parking, skip storage and dedicated storage bays will be provided in both concrete and tarmac surfacing. Surface water run-off from these locations to be diverted through a petrol /oil interceptor before discharge to the surface water management system. The interceptor shall be a Class 1 interceptor and silt trap and be in accordance with I.S EN 585-2:2003 (separator systems for light liquids) as is currently in place for surface water run-off for all run-off currently being discharged from at the southern boundary prior to discharge from the facility.

Hard standing, clearly identifiable, separate waste inspection area and a waste quarantine area will be provided and maintained at the facility where waste can be inspected prior to deposit. Drainage from these areas will be directed to the leachate management system. The design of the hard standing areas for the different facilities may be subject to change and will depend on the final design of each facility; this will be agreed with the agency prior to construction. An example of the design of the hard standing areas is given in Drawing No. 15 Services Plan.

2.4.4 Fuel storage

It is proposed that bulk fuel storage at the site will consist of 1 no. 20,000 litre diesel tank. The tank will be located within a fully reinforced concrete bunded area that conforms to standard bunding specification (BS8007-1987) with the capacity of holding 110% of the tank capacity. Integrity testing of the bund will be established in accordance with best practice.

The tank will be enclosed in a reinforced concrete bund with a capacity of 110%. Any accumulation of surface water in the bund will be removed using a vacuum tanker or pump. The water will be discharged to the leachate storage tank having first been passed through the petrol/oil interceptor. Within the C&D/C&I building other fuels or chemicals may be stored from time to time on bunded pallets within the maintenance

area. These may include lubricants, hydraulic oil, engine oil, brake fluid and other miscellaneous chemicals associated with general maintenance of equipment and machinery.

The equipment and machinery that will use the machinery yard and fuel tank will be as follows:

- 2 compactors
- 2 diggers (30T and 20T)
- 2 dump trucks (Volvo A40 and A25)
- I Bulldozer D6
- 1 tractor
- 1 Jeep
- Landfill compacter

- Stand-by generator

A spill kit containing absorbent materials and booms is located along side the fuel tank which will be used in the unlikely event of spillages and leakages. All current staff members have been fully trained in the use of skill kits.

2.4.5 Waste Quarantine Areas

The facilities will have their own designated waste quarantine areas. A fully bunded waste quarantine area will be maintained at the each facility to temporary store wastes accepted at the facility which are deemed unacceptable. The BTF and MRF will have indoor waste quarantine areas in their respective reception areas. The exact location of waste quarantine areas has not been finalised. The waste quarantine area located in the MRF building will consist of a bunded area and be constructed of reinforced concrete walled structures with drainage in the slab directed to the leachate storage tank.

2.4.6 Waste Inspection Areas

Waste loads are inspected at source by the driver of the vehicle and upon entering the facility by the operator. The facilities will have their own designated waste inspection areas. The BTF and MRF will have indoor waste quarantine areas in their respective reception areas. The exact location of waste inspection areas has not been finalised. The waste inspection areas will consist of a cleared floor area suitably labelled within the processing buildings. These locations will have a collection system for leachate which may potentially be generated at these locations.

For loads sent directly to the tipping face of the landfill, all loads are checked at the working face, any waste not suitable for acceptance shall be removed for recovery or disposal at an appropriate alternative facility, such wastes shall be stored in the waste Quarantine Area only. (EPA Licence W077-02 Condition 5.3).

2.4.7 Wheelwash

One wheelwash is located onsite. The wheelwash is used by all waste vehicles and tractors leaving the tip face area. The wheelwash is inspected daily by the landfill staff and desludged on a monthly basis. It contains a propriety system of primary settlement and water recirculation to minimise the wastewater generated. Wastewater is directed to the leachate storage tank and the silt desludged from the system is landfilled.

A separate wheel wash will be provided for the BTF. This wheel wash will be exclusive to this plant and designed in accordance with the Animal By-products Regulation or on particular request of the Department of Agriculture, Fisheries and Food.

Figure 2 Wheel wash at Corranure Landfill

2.4.8 Weighbridge and weighbridge office

Entry to and exit from the site for refuse truck,lorries and maintenance vans is through the main entrance gate. Car parking facilities for on-site personnel and visitors to the site is located at the entrance to the facility. All traffic is directed to the weighbridge. Two weighbridges of a platform design with the capacity of 60 tonnes and dimensions of approximately 18m x 3m. The two weighbridges are controlled by security barriers, each dedicated to incoming and outgoing vehicles. Every vehicle (with the exception of cars

for recycling and paying per bag) will be weighed and recorded using a digital weight software programme GeneSYS, located in the weighbridge office.

Oxigen Environmental operate the Precia Molen GeneSYS PC- based Weighbridge Management System, a Windows based program which enables the user to control all weighing operations, site control, traffic & access control and business management using the weighbridge as the point of control.

GeneSYS stores all relevant data in database form, from which cross- referenced reports can be generated as required and enables the possibility of any or all of the following:

- Operations for 24 hours a day, 7 days a week.
- Invoicing and customer billing without double/ triple- entry by administration staff direct from the weighbridge transaction
- Contracts management including cash, pre- paid and credit transactions with flexibility to handle different prices for customers, sources, locations, products and tonnage quotas
- Reports based upon a multitude of cross- referenced database variables such as by customer, product, location, haulier, vehicles, etc.
- Networking of individual sites to Head Office and linking to centralised databases if required
- Control of site operations and access through barriers, traffic lights, etc. and automation of filling operations
- Integration with clients' Order Management Systems, Invoicing Systems and Management Network

The principle advantages of this approach are as follows:

- Use of standard software in all cases
- Ease of implementation and integration with other applications
- Software developed under ISO 9000 quality system.

GeneSYS is a modular system which can keep pace as our business grows and can be installed as a stand- alone operation or as part of a server-based network. The system can be upgraded to driver-operation without the need to fundamentally change the software due to its configurable construction.

Ticket records will include:

- Date
- The name of the carrier
- Vehicle registration
- Producer/collector of waste
- Waste type (EWC code) and source
- Total weight
- Signed by driver/weighbridge person

Figure 3 Weighbridge and Weighbridge Office

2.4.9 Sewage Drainage Infrastructure

Foul waste water generated from the administration building is linked via a sewer pipe to the leachate storage tank. Storm water and any surface water from the paved areas on and around the Civic Amenity Site is directed into the Leachate storage tank. This storage tank is controlled by pumps and linked to the wastewater treatment plant in Cavan town by a rising main.

2.4.10 Surface Water Drainage Infrastructure

A silt trap and oil separator and inspection chamber are located south east of the landfill (inside the main entrance gates). The interceptor is a Class 1 interceptor and silt trap, in accordance with I.S EN 585-2:2003 (separator systems for light liquids) with manual shut-off value. Currently the surface water run-off from the east fence boundary of the site is being discharged from this location to the Corranure Stream.

Surface water run-off from phase 3 is diverted to a silt trap prior to discharge from the northern boundary as per Licence Condition 3.15.3. A surface water interceptor drainage ditch has been constructed to the north east of the site and can be seen of Cell 4 Drawing No. 11 Soil Storage. The interceptor drain will divert surface water flowing from the

northeast to the north before becoming in contact with the soil storage areas. The intercepted surface water will be diverted into the Lismagratty Stream. Further surface water drains in this area have already been constructed which will divert water either directly or by way of settlement areas to minimise contamination.

Surface water may be accumulated from the following areas and will need to be controlled and released off site:

- Lined cells prior to deposition of waste
- Capped sections of the landfill
- Runoff from undeveloped areas of the landfill
- Runoff from the landfill base under construction

Surface runoff from around the adjacent Cell 3 and access road will be collected in constructed swales. The swales will consist of stone filled or open trapezoidal channels, which will ultimately discharge to the existing surface control areas. Both the new and existing swales will be directed to the surface water management system and will cope with quantities collected for the whole catchment area. They will be lined as part of these works to prevent percolation of the surface water to the ground and to ensure it is conveyed to the settlement areas or uncontaminated to either the Corranure or the Lismagratty Stream. During construction of Cell 4, more interception drains and temporary settlement ponds will be established if needed to mitigate against the discharge of suspended solids to the existing streams.

On all hardstanding and paved areas of the proposed buildings surface water will be collected and directed to two separate underground water storage tanks for re-use on site. The surface water will be accumulated from the following areas:

- Roof of recycling buildings and administration building.
- All access roads to the recycling and administration buildings.
- Hardstanding areas around the recycling building and all car parking areas.

The underground water storage tanks will each hold 7,500L and overflow from these tanks will be directed to the Corranure stream.

Due to the proposed slopes and final levels of the landfill and the extent of hard paving and roads, the total volume of surface water run off from the site will be greater than that of the pre-developed site. In order to avoid any negative impact downstream, the rate of surface water discharge from the developed site will be controlled to approximately the same rate as the run off from the pre-developed site. Further details of the surface water drainage infrastructure from the development of the new proposed buildings will be submitted to the agency prior to construction of each facility.

2.4.11 Plant sheds, Garages and Equipment Compound

It is proposed to construct a new MRF building, BTF building. Both these buildings will be 5,705m^2 with a height at eves of 15.5m and a height to ridge of 17.94m. (refer to Drawing No.13 Recycling Sheds Elevation).

Processing equipment will be required onsite and this will be subject to change based on the process types chosen, typical equipment will include:

- A cardboard/paper baling machine
- A timber shredding machine
- Trommel/screening
- Manual Segregation

All cables are underground and ducted in 150mmO uPVC ducting. A diesel standby generator is located onsite which can provide temporary power in the event of a power cut.

2.4.12 Administration Buildings

An office is provided at the facility and it will be maintained in a suitable manner for the processing and storing of documentation. A telephone system and electronic transfer of information to and from the facility is provided. The weighbridge office is adjacent to the main building and processes all facility weighbridge documents.

A secondary Administration building will be constructed adjacent to the MRF building. This building will contain offices, bathroom facilities and canteen area. The building will be 8,000m floor space, and a height of 6m.

Figure 4 Administration Building at Corranure Landfill

2.4.13 Landfill Gas Infrastructure

The overall objective of a landfill gas management system is to collect all gas produced from the waste and treat it accordingly in order to minimise odours and emissions from the landfill.

Specific objectives include the following:

- Minimise the risk of gas migration beyond the boundary of the site
- Minimise the risk of gas migration into buildings/services on site
- Minimise impact on air quality through reduction of greenhouse gas emission
- Reduction of nuisance potential to surrounding environment (odour)
- To allow energy recovery where feasible

An active gas extraction system consists of the following elements:

- Gas extraction wells
- Gas extraction wellheads
- Gas collection pipework
- Condensate removal points
- Extraction pump
- Gas flare

- Telemetry System

A gas management system including gas extraction and flaring system will be installed at the site from the outset and extended during progressive capping of the cells. It is envisaged that the initial system will consist of horizontal gas collection pipes extending through the waste body to collect landfill gas as it is formed. The use of horizontal wells increases the collection efficiency of the gas system and allows for early control of landfill gas thus reducing build up of gas within the landfill and the potential for offsite migration of the gas.

Vertical wells will be drilled into the waste in areas where filling has temporarily ceased or where a permanent engineered capping system has been installed. Each vertical and horizontal well will be connected to a gas main via a manifold/valve system whereby the gas is drawn to the landfill gas flare. The pipeline will have sufficient valves to allow isolation of sections, and removal of condensate is necessary to prevent blockages and restriction of gas flow. This is achieved by the use of knock out drums, where the condensate is diverted to the leachate collection system.

The gas management system will be extended over new cells as they are progressively capped and the BAT principle will apply to all future gas extraction and utilisation systems. The detailed design, installation and commissioning of the entire landfill gas management system will be in accordance with the EPA Landfill Site Design Manual and any EPA Waste Licence granted for the facility.

2.4.14 Flaring of Landfill Gas

A fully enclosed landfill gas flare is installed and currently operational as part of the initial facility development. The size of the flare is 1,500m^3/hr treating gas from Cells 1, 2 and 3. The gas flare contains an extraction pump to draw the landfill gas from the wells through the collector pipework to the flare. Landfill gas is not currently used to generate energy on the site, a preliminary Gas Utilisation Feasibility Study has been completed.(Volume III, Appendix 5) On utilisation of landfill gas this flare will normally only be required to combust any excess gas that the engines may not be able to handle. If the capacity of flare is required to cover at least a portion of the engine capacity then the flare size will be suitably increased.

Corranure Landfill has a three Remote Telemetry Unit (RTU) installed to enable all relevant signals to be transmitted to a central PC. This system records day to day monitoring of the Gas Flow and Temperature of the Flare.

Data from the Remote Terminal Units (RTUs) will be received by a central PC by CPU420 Radio Data Concentrator and transferred to the SCADA Server PC (Supervisory Control and Data Acquisition system) where it is stored in an ODBC data base where the information can be viewed as trended (real-time or historical), tabular or report format, or as real time animated graphics. Access is password controlled via the BroadWin WebAccess software which is viewable on any intranet/internet connected

PC with the appropriate client plug-in software. Volume III, Appendix 6 ‘Telemetry & SCADA System Operational & Maintenance Manual’.

Figure 5 Landfill Flare

2.4.15 Utilisation of Landfill Gas

Landfill gas can be utilised as an energy source with the gas being burned in a gas engine to produce electricity. A number of sites in Ireland currently generate electricity from landfill gas which is then fed into the National Grid via a grid connection. Reuse of heat from the combustion process can greatly enhance the efficiency of the energy recovered from the gas.

Normally the size of power generation schemes are in the range of 1MW to 5MW. Typically some 600/700m3 of landfill gas (containing 50% methane) are required to generate 1 MW of electricity. The type of plant for power generation will depend on the quantity and quality of gas generated. Any excess gas would be sent to the flare to be combusted. Additional engine or flare capacity will be provided to ensure that gas is managed efficiently and the impact on the surrounding environment is minimised.

2.4.16 Landfill Leachate Infrastructure

A leachate collection system will collect any leachate generated within the site and be directed into the existing leachate storage tank. Leachate containment provisions ensure that waters that have come into contact with the waste are not discharged into the surface water system within the vicinity of the site. This collection system will be cleaned and maintained on a regular basis and inspections of the drainage channels will be carried out to ensure they are working efficiently

A leachate management system incorporating leachate extraction, storage and discharge offsite for final treatment is operated at the site. The Leachate collection system in Phase 3 of the landfill is documented in Section 2.6.6.5 of this EIS

In addition the leachate pumping system at the facility itself has been improved to allow the facility to better deal with future increases in leachate generation rates:

- All leachate generated on site is pumped into a leachate inlet pumping chamber adjacent to the existing lagoon. Leachate is pumped from this chamber into the leachate storage tank.
- A duty-standby pump system has been installed so as to ensure that sufficient pumping capacity will always be available to manage the leachate.
- A new leachate discharge pumps and rising main were constructed to pump leachate from the collection tank into the Cavan town sewer system. This arrangement facilitates easier management of the system and improves ease of monitoring of the pumping system by landfill staff.

A leachate collection system will collect any leachate generated within the proposed building area and be directed into the existing leachate storage tank.

- A collection drain will be constructed along the front of the new MRF building This will allow for the collection of any leachates generated within the processing shed.

Leachate containment provisions ensure that waters that have come into contact with the waste are not discharged into the surface water system within the vicinity of the site.

This collection system will be cleaned and maintained on a regular basis and inspections of the drainage channels will be carried out to ensure they are working efficiently.

2.4.17 Landfill Leachate Collection

The objectives of the leachate control system are as follows:

- To reduce the potential for seepage out of the landfill through the sides or the base by exploiting weaknesses in the liner or by flow though its matrix,

- To maintain low leachate head to prevent leachate rising to such an extent that it can spill over and cause uncontrolled pollution to surface water, and
- To minimise the interaction between the lachate and the liner to prevent groundwater contamination.

The leachate collection system for the landfill development will consist of a series of slotted pipes installed in the leachate drainage blanket which is placed on top of the lining system. The cells will be constructed so that the leachate drains towards the lowest point within each cell. A leachate collection sump will be located at the lowest point in each cell. From this sump leachate will be pumped from the cell to the storage lagoon The basal shape and detailed design of each cell and the leachate collection system will take into account the following:

- Appropriate falls towards the leachate collection sump to promote self cleansing and reduce blockages in the leachate collection pipework.
- The drainage media of the leachate collection blanket will have appropriate drainage and chemical characteristics for the volumes and types of leachate being generated.
- The pipework will be selected so as to resist chemical attack by the leachate, have a crush strength suitable to withstand the depth of drainage blanket, waste, capping and leachate layers placed above it, and
- The design and spacing of the pipework will take into account the required capacity, maximum and minimum slopes, and percentage area of slots.

In order to protect the drainage blanket, the leachate pipework, the underlying geomembrane barrier layer and the low permeability clay layer or equivalent, the first 2m of waste placed within the cells will be free of bulky or sharp objects and will not be compacted.

All leachate management will be in accordance with Chapter 7 of the EPA Landfill Site Design Manual unless otherwise agreed with the EPA through the Specified Engineering Works procedure relevant in any EPA Waste Licence granted for the facility.

A Supervisory Control and Data Acquisition (SCADA) system monitors remotely and automatically the level of leachate within the cells. The data obtained will automatically be transferred to the pump control room. This data will be recorded and an alarm system is in operation if maximum levels are exceeded.

2.4.18 Leachate Recirculation

Once the landfill is capped and complete, the leachate generation will continue to be monitored. Leachate recirculation is one of many techniques used to manage leachate from landfills. Because of the characteristics of landfill leachate the main goal of leachate control is to prevent uncontrolled dispersion. During leachate recirculation, the leachate is returned to a lined landfill for reinfiltration into the waste. This is considered a method of leachate control because as the leachate continues to flow through the

landfill it is treated through biological processes, precipitation, and sorption. This process also benefits the landfill by increasing the moisture content which in turn increases the rate of biological degradation in the landfill, the biological stability of the landfill, and the rate of methane recovery from the landfill.

There are numerous advantages to treating leachate through recirculation and the landfill productivity benefits as leachate is being treated. Landfills that use leachate recirculation experience a decrease in the concentration of the leachate compared to landfills without recycle treatment. This reduces the amount of leachate treatment that is needed and therefore costs are also reduced. The increased moisture content within the solid waste enhances the system conditions for improved biological decomposition of organic matter in the landfill. The organic matter in the leachate, which requires treatment outside the landfill, receives further treatment each time it is recycled through the landfill. The reducing environment within the landfill removes inorganics in the leachate through precipitation and sorption.

Leachate recirculation stabilizes the biological system in the landfill and this reduces the environmental threats of the landfill, and reduces the amount of postclosure monitoring that is required. Leachate recirculation increases the rate at which the waste decomposes and this increases the rate of methane production. This makes methane recovery for energy much easier. Leachate recirculation is a leachate management method that is relatively simple and inexpensive.

The disadvantages of leachate recirculation are:

- Because landfills are heterogeneous the leachate may find discrete channels to travel through. This makes it difficult to insure that the leachate is reacting with all of the waste and is thoroughly treated
- The risk of environmental exposure when leachate is applied to the surface of a landfill
- The lack of information and education regarding the subject increases the chances that it will be misapplied. The recirculation of leachate is best managed through an enclosed system and it is crucial that the distribution is strictly controlled to reduce preferential paths being created and therefore not getting the best out of the use of this resource.
- In the context of Corranure Landfill the recirculation of leachate would be well controlled through the horizontal gas systems which may be considered temporary or sacrificial but remain as stone channels throughout the higher and lower levels of the landfill. It is feasible that the higher level system will continue to be available for use after final capping for a number of years.

2.4.19 Storage Capacity for Leachate

Leachate will be collected and stored onsite in a fully engineered enclosed storage tank as shown on Drawing No. 2 Site Layout Plan.

This tank will serve to provide a mixing chamber for all the leachate collected from the site, thereby allowing varied ages of leachate to become mixed and resulting in a homogenous leachate for the onsite primary leachate treatment system. The tank will also provide storage for surface water drainage from the paved areas of the waste quarantine and leachate treatment plant areas of the facility.

The existing storage tank has a capacity of 1,531m^3, with overflow capacity for approximately 270m^3, therefore total capacity for leachate storage is 1,801m^3.
It is not intended to pre-treat the leachate on site, however there is sufficient space adjacent to the tank for future treatment facilities if for any reason becomes necessary to treat the leachate onsite.

Figure 6 Leachate Storage Tank and Overflow Lagoon

2.4.20 Leachate Treatment

The leachate being generated at Corranure Landfill is being sent to Cavan WWTP for treatment via the rising main. An odour suppression system of dosing with Sewage Conditioner Product Septiox (FerricNitrate) is carried out at the discharge to sewer pipe on site and can be enhanced at the collection sump prior to pumping into the storage tank.

The upgrade works at the WWTP provides the off site treatment capacity for leachate pumped from the landfill to the sewer system. The new leachate rising main from the landfill has also been commissioned which will allow a continuous discharge of leachate into the WWTP and prevent high loadings at irregular intervals which previously occurred when tankering of leachate was being employed during the construction phase of the rising main.

The WWTP is required to comply with the Urban Wastewater Treatment Regulations and the relevant water quality standards in the Cavan River. There is potential to use Cootehill WWTP as an alternative facility for the treatment of leachate removed from Corranure Landfill. Alternatively tankering of leachate can be accommodated in the event of the current pumping system via the rising main being inoperational. This is outlined in the Emergency Leachate Procedure contained in the Operations Plan.

2.4.21 Raw Material/Energy/Plant

It is proposed that the main requirements for fuel onsite will be road diesel, marked gas oils, central heating oil and natural gas. As detailed in the previous section fuels will be stored onsite in appropriately bunded, integrity tested tanks, which will allow for safe and contained dispensing of the fuel.

The table below presents an estimate to the consumption of materials used onsite. The final raw material, substances, preparations and energy requirements for each facility will be agreed with the Agency prior to the construction of each facility.

Table 2.1 Raw Materials, Energy and Plant

Material/Resource	Biological Treatment Facility	Materials Recovery Facility	Amount Stored
Hydraulic Oil	6,000 litres	6,000 litres	1,000 litres per facility
Electricity	8,000,000 kilowatt hours per annum	40,000 kilowatt hours per annum	None
Diesel	150,000 litres per annum	50,000 litres per annum	20,000 litres per facility
Water	See note below[@]	2,000 m^3 per annum	10,000 litres per facility

[@]Normal water input would be 200 litres per ton input. That is between 6000m^3 and 9000$m^3$for a 50,000 and 65,000 tonne biological treatment plant respectively.

2.5 Waste Acceptance, Handling and Processes

2.5.1 Waste Details for the existing Landfill

Corranure Landfill and Civic Amenity site is licensed to accept household waste, commercial waste, green waste, C&D waste, street cleaning residuals and hazardous

household waste as per the existing waste license (W077-02). Oxigen Environmental propose to accept 90,000 tonnes of waste per annum for disposal in the landfill, this will be achieved from the direct acceptance of non-hazardous municipal/industrial waste from permitted waste producers and also from the residue of waste from the MRF and the biological treatment plant. A waste acceptance procedure details the acceptance of different types of waste at the landfill. Only waste deemed acceptable are disposed at the landfill site.

At present the Civic Amenity Site accepts the following clean, dry separated recyclables from householders: newspapers to include magazines, cardboard, tetra pak, glass bottles and jars, aluminium and steel cans, wood and timber, plastic containers and plastic shrink wrap, textiles/footwear, electrical goods, fluorescent tubes, batteries wet and household, scrap steel, waste engine oil and oil filters, C&D waste and green waste.

Table 2.2 below shows the waste categories which the facility is currently licensed to accept under Waste Licence W077-02:

Table 2.2 Waste Categories and Quantities accepted under Waste LicenceW077-02

Waste Type	Maximum Tonnes per Annum
Household Waste	50,000
Commercial Waste	32,000
Construction & Demolition Waste	5,000
Green waste	2,000
Street Cleaning residues	900
Hazardous Waste	100
Total	**90,000**

2.5.2 Quantity and Composition of Waste Accepted

Table 2.3 outlines the waste quantities and types accepted at Corranure Landfill in 2007 (Cell 2 completed in June and Cell 3 the current active cell) and Table 2.4 shows the recycling figures at the Civic Amenity Site. The Construction and Demolition (C&D) waste accepted was used mainly for internal roads, landfill cover and landscaping. Quantities of these materials are shown in Table 2.5

Table 2.3 Types/Quantities of Waste Accepted at Corranure Landfill during the Year 2007

EWC Code	Description of Waste	Total (Tonnes)
200199P	Residues from Recycling of Polymeric Material	50.18
200303	Street Cleaning Residues	569.44
200301	Mixed Municipal Waste (Clean up)	802.2
200301	Mixed Municipal Waste (Mainly Private Waste Collection Service)	73275.11
200301	Mixed Municipal Waste - Household (Mainly Private Waste Collection Service)	4909.69
200301	Mixed Municipal Waste (Civic Amenity Site)	586.56
200301	Mixed Municipal Waste (Local Authority Collection Service)	514.28
80114	Sludges - Paint & Varnish	243.16
80118	Waste - Paint & Varnish	44.22
80318	Waste Printer Toner	76.98
100101	Bottom Ash	1907.91
170604	Insulation Material	11.44
200399	Non-Recyclable Waste	271.74
Total		**83,262.91**

Table 2.4 Types/Quantities of Waste Accepted at Corranure Civic Amenity Site during the Year 2007

EWC Code	Description of Waste	Total (Tonnes)
20 02 01	Green waste	176.53
15 01 01	Cardboard & Packaging	154.88
20 01 01	Paper and cardboard	477.51
20 01 10 / 20 01 11	Textile	54.28
15 01 07	Glass	139.44
20 01 33	Batteries	21.84
20 01 40	Metals	307.26
20 01 35	Discarded Electrical & Electronic equipment	56.38
20 01 21	Fluorescent tubes and lighting equipment	0.18
15 01 04	Aluminium PKN	1.16
15 01 03	Tetrapak	51.92
15 01 03	Wood	20.14
13 08 99	Waste Oil	1.6
15 01 04	Steel PKN	3.36
15 01 02	Plastic	11.44
17 01 07	C&D Waste	138.50
Total		**1,616.42**

Table 2.5 C&D Waste used on site for Internal Roads, Landfill Cover and Landscaping at Corranure Landfill during the year 2007

EWC Code	Description of Waste	Total (Tonnes)
17 02 01	Woodchip	3,863.24
19 12 09/20 01 01	Minerals (fines from C&D)	6,511
17 01 07/17 05 04 17 09 04	C&D Waste (Inc. Crushed rubble for Internal Roads)	15,748.94
Total		**26,123.18**

2.5.3 Waste Acceptance and Handling

All wastes accepted at the facility will be subject to waste acceptance measures, which will be approved by the EPA. An Environmental Management System (EMS) is in place at the landfill to ensure that an effective system of management, which will ensure that all appropriate pollution prevention and control techniques are in place and a process of continuous improvement, can be implemented. This EMS will be updated once the new facilities have been implemented. (Volume III, Appendix 7, Operations Plan (EMS) for the existing site). Table 2.6 and 2.7 shows the waste types and quantities, and annual quantities and nature of waste to be accepted on operation of the proposed Integrated Recycling facility. Waste acceptance and handling procedures for the facility are contained in Appendix 8.

Table 2.6 Proposed Waste Types and Quantities

Waste Type	Tonnes per Annum (Proposed)	Total (Over life of site) tonnes
Household	125,000	
Commercial	70,000	
Sewage Sludge	5,000	
C&D	100,000	
Ind. Non-haz Sludges	35,000	
Inert waste (imported for restoration)	35,000*	

***This will be produced from the C&D recycling process and is part of the 100,000 tonnes detailed under this heading

Table 2.7 Proposed Annual Quantities and Nature of Waste

Year	Non-hazardous waste (tonnes per annum)	Hazardous Waste(tonnes per annum)	Total annual quantity of Waste(tonnes per annum)
2009	90,000	0	90,000
2010	180,000	0	180,000
2011	280,000	0	280,000
2012	335,000	0	335,000

2.5.4 Operational Details

Oxigen Environmental Ltd. propose to operate the MRF and Biological Treatment Plant six days a week. See Table 2.8 for proposed hours of Operation, Waste Acceptance and Construction Hours. Entry to the proposed facilities is restricted to employees of Oxigen Environmental Ltd. and permitted/licensed waste contractors at all times during the operation of the facility. The landfill and Civic Amenity site will operate as normal and be unaffected by the proposed developments. Outside the normal working hours, the gates will be closed and access is only permitted by key personnel (i.e. site manager / assigned responsible person, etc.)

Table 2.8 Hours of Operation, Waste Acceptance and Construction

Proposed hrs (Mon-Sat)	Landfill	CA Site	MRF	BTF
Waste Acceptance	7.00-19.00	8.00-16.30	6.30-22.00	6.30-22.00
Operation	6.30-19.30	8.00-17.00	6.00-22.30	Continuous
Construction	8.00-18.00	NA	8.00-18.00	8.00-18.00

The BTF process will be continuous. However waste will only be accepted in the hours as stated above and will only process the waste (per-treatment, compost turning) during hours of operation. The site will be normally closed on Sundays and on Bank Holidays. Any acceptance or operation outside these hours will be in case of an emergency only and on agreement form the EPA. If necessary, approval will be sought to increase construction hours. Maintenance during out of hours may also be required for emergency breakdown etc.

The site will be operated in accordance with best international practice for similar facilities and in accordance with the Waste Management Act, 1996-2008, Waste Management (Licensing) Regulations 2004, EPA Landfill "Operational Practices" Manual (1997), the EU Directive on Landfill of Waste 1999, the EPA Waste Licence issued and the BAT Guidance Notes for Landfill Activities.

A list of all existing employees and their respective duties and responsibilities are detailed in Table 2.9 below.

Table 2.9 Management Structure at Corranure Landfill, Cootehill Road, Cavan

Title	Staff Member	Qualification	Responsibility
Manager	Paul Williams	20yrs experience in the waste industry	Site Management
Supervisor	Karl Smith	New Employee	Operations supervision
Environmental Officer	Joan Harrington	2 yrs Consultant 3 yrs Waste Industry	Licence Compliance
Engineering Consultant	Frank Smyth	15yrs Civil Construction	Supervision of developments onsite
Weighbridge operator	Ludmila Klaucane	4 yrs weighbridge operation	Weighbridge operations
Vehicle operator	Gerry Hoey	6 yrs in waste industry	Landfill Operations
Vehicle operator	Zsolt Pintes	2 yrs in waste industry	Landfill Operations
CA Site personnel	Janusz Wypyh	5 yrs in Recycling Facility	CA supervision and maintenance
CA Site personnel	Marcin Herei	4 yrs in Recycling Facility	CA supervision and maintenance
CA Site personnel	Vadymz Nakonechnyy	3 yrs in Recycling Facility	CA supervision and maintenance

Additional Staff personnel have been appointed for construction of Cell 4 and for the Capping of Cell 3. Further staff members will be appointed and reported to the EPA, as required once the construction of the Materials Recovery Facility and the Biological Treatment Plant have been completed and the facilities are operational.

2.5.5 Landfill of Waste

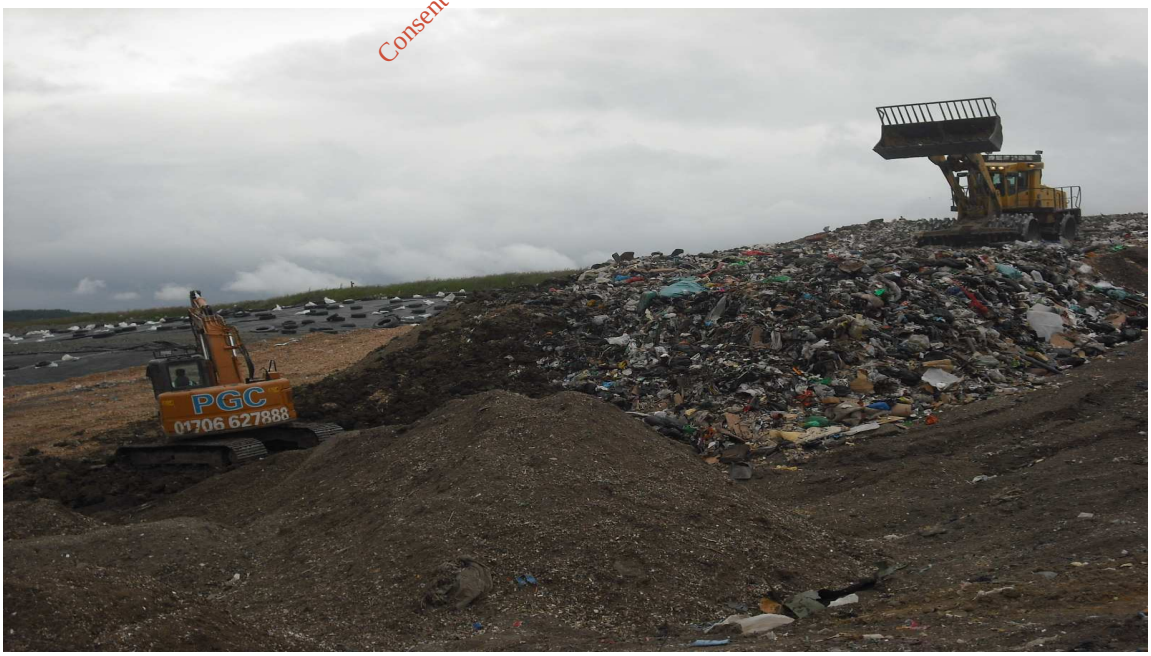
Oxigen Environmental Ltd. proposes to complete the filling of Cell 3 and develop Cell 4 with an allowable waste intake to remain at 90,000 tonnes per annum. Each cell will have a lifetime of approximately 2.5 years at the proposed increase filling rate of 90,000 per annum. Filling in Cell 3 commenced in June 2007 this Cell lies to the north of Cell 2. The highest point on completion of Cell 3 will be east of the facility adjoining Cell 2. The highest point will reach a height of 129.5m as per Condition 4.3 of the existing Waste Licence (W077-02). Cell 3 possesses a base seal and leachate collection in the west of the landfill section. Cell 3 lies above Cell 2 and an intermediate seal was inserted between Cell 3 and Cell 2. The Cell has an overall capacity of 239,000 tonnes. During the period June- December 2007, 50,416 tonnes of waste were placed in Cell 3.

The remaining capacity in Cell 3 from January onwards is estimated to be approximately 188,584 tonnes.

Cell 4 will be the direct expansion of Cell 3. However it has not been implemented yet. The low point of the planned Cell 4 lies in the north. Here the grounds have a height of 102.5 m. Cell 4 will be designed and constructed in accordance with EPA guidelines and be consistent with the principle of BAT and lined with a composite liner system. The leachate generated from both cells will be contained, collected and pumped for final treatment to Cavan Town WWTP. The landfill gas will be collected and flared. Each cell when filled will be capped and restored. The total landfill area is approximately 4.8 hectares. Drawing No. 02 Site Layout Plan provides an outline of the proposed extension area.

The cell will be divided by a bund, which will contain leachate within separate cells during operation and prevent surface water, which may be collected in the unused section being contaminated. It is intended the materials excavated during the construction of the cell will be used to create the screening /landscaping bunds surrounding the landfill. Extra material will be available for use in the subsoil and topsoil capping layers and this material will be stockpiled and stored separately during the construction and made available for capping as further described in section. Where possible cell construction and capping will be carried out together. Where landfilling has ceased in Cell 3 because final heights have been achieved, the waste in accordance with any EPA Waste Licence issued or as per the current Waste Licence (W077-02) will be provided with a temporary capping, allowed to settle and then permanently, but no later than 24 months after the final waste heights being achieved.

Figure 7 Landfilling of Waste Cell 3



2.5.6 Civic Amenity Centre

The function of the civic amenity site as part of the integrated waste facility proposed for the lands at Corranure, Co. Cavan will be to receive household waste directly delivered by the public which will contribute towards the achievement of the recycling and recovery targets of 43% by 2014, as set out in the North East WMP.

Oxigen proposes to take over the operation of the existing Civic Amenity site in accordance with the relevant national and EU legislation. The operation of the site will fully comply with best practice and to ensure that the scheme meets all the requirements of the Health, Safety and Welfare at Work (Construction) Regulations, 2001 and the draft 2005 Regulations, also the recent WEEE and RoHS Directives. The Civic Amenity site will process a minimum of 1,000 tonnes per annum of segregated household waste for recycling or recovery with the aim of increasing the throughput with targeted promotional activities & waste awareness initiatives.

The existing access road into the landfill, reception infrastructure to include weighbridge, wheel-wash and civic amenity disposal area will remain in their present locations. There are 8 full time employees at the site; site manager, deputy site manager, weighbridge operator and general site operatives. Facility staff will be available during the specified opening times to provide guidance & assistance to the public as required.

The civic amenity facility is used by the public for recycling and waste disposal which is located adjacent to the site entrance. The provision and operation of the Civic Amenity site as part of the integrated waste facility enables the segregation of household waste into the categories of:

- Waste suitable for re-use & recycling
- Waste suitable for composting
- Waste for disposal
- Household hazardous waste

It provides for the recovery of the following materials:

- Glass - clear, green, brown
- Various Plastic Containers - milk cartons, butter cartons, yoghurt containers
- Tetra Pak
- Newspapers
- Aluminium and Steel Cans
- Textiles and Foot ware
- Cardboard
- Fluorescent Light Tubes
- Batteries- Car and primary
- Waste Oil/Filters
- Wood-

- Scrap Metal
- Green Waste
- C&D Material
- Film Plastic
- WEEE Material
- Bulky Materials-furniture, mattresses

Materials from the Civic Amenity site will be processed, recycled, composted and/or disposed as necessary.

Figure 8 Civic Amenity Centre

2.5.7 Materials Recovery Facility

2.5.7.1 Proposed Operation of Materials Recovery Facility

The processing area will incorporate screens and crushers, and a stockpiling area for storage of segregated material. The material is pre-sorted before it is deposited into a sizer. Items unsuitable for processing by the sizer are removed e.g, gas bottles, large steel/concrete items. The sizer is fitted with a twin shaft with 6 no. blades per shaft. The

cutting table area is 4m x 2.3m. It has the capacity to process 125 tonnes per hour of C&D waste and 70 tonnes per hour of C&I Waste. The sizer reduces the size of the material deposited into it for further processing. The sizer discharge conveyor collects all the sized material from the sizer. The material will then be conveyed and transferred. This sizer transfer conveyor will transfer the material from the Sizer Discharge Conveyor to the LOS Conveyor. The long object separator removes any long objects that may have made it through the sizer. This eliminates the possibility of blockages once they are removed.

The material is transferred from the Sizer Transfer Conveyor to the Trommel Feeder Conveyor. The Overband Magnet will discharge ferrous metals into a holding bay underneath it. The ferrous metals pass through a quality control platform before being stored in the holding bay. This conveyor transfers material from the LOS Conveyor into the Series 3 Trommel. This Trommel has 60mm aperture punched plate screens. The 0-60mm fines are deposited on the Trommel collection conveyor. The oversize materials pass through the Trommel for further processing. The Trommel Collection Conveyor is situated beneath the Trommel to collect the 0-40mm fines and transfer them to the fines conveyor. This Trommel Discharge Conveyor transfers material from the discharge ring of the Trommel drum to the Double Drum Separator. This Double Drum Separator will separate screened waste into three fractions. Air Separation will be used to remove the hardcore first. Material is then transferred onto the second drum, where again air separation is used to remove the timber fraction. Remaining RDF type material is transferred into the settlement chamber to settle onto the transfer belt.

The Heavy Collection Conveyor collects the separated stone fraction from the Double Drum Separator and conveys it onto the Heavy Transfer Conveyor. The Heavy Discharge Conveyor collects the separated stone fraction from the Double Drum Separator and conveys it onto the Heavy Transfer Conveyor. The Mid-Heavy Collection Conveyor collects and transfers the mid-heavy fraction separated by the Double Drum Separator to the Mid Heavy Transfer Conveyor. This conveyor transfers the mid-heavy fraction separated by the Double Drum Separator to the Ballistic Feeder Conveyor. This conveyor transfers material from the Mid-Heavy Transfer Conveyor into the ballistic separator. This is a Brini type machine, which will give a three way split on the material being fed into it. This is done by means of a number of paddles oscillating on an inclined plane. The resulting three splits are fines material, RDF and Timber.

The rolling fraction separated from the Ballistic Separator will discharge onto the Timber Discharge Conveyor. Here the material will pass through a QC station where the timber fraction will be cleaned and discharge onto the Timber Bucket Elevator. This Fines Transfer Conveyor transfers the screened fines from the Trommel Collection Conveyor to the Fines Dosing Hopper. Once the fines have been conveyed from the trommel, they will be discharged here into the Dosing Conveyor. This will ensure that the material will be fed into the Flip-Flop, ensuring that the Flip-Flop will screen the material to its maximum capability. This Flip-Flop Feeder Conveyor transfers the material from the Fines Dosing Conveyor into the Flip-Flop for further processing.

The Undersize Overband Magnet will discharge ferrous metals into a holding bunker underneath. The Flip-Flop has two frames, moving relative to each other, flexibly mounted within a static support structure. Transverse mesh support beams are alternatively attached to the inner and outer frames. The beams cause the mesh section to cyclically stretch and relax. High accelerations results which prevent pegging and binding. An eccentric shaft is used to generate the relative movements to the side frames and results in the three differing motions being imposed on the "Flip Flop" movements of the mesh.

The undersize collection conveyor collects and transfers the screened fines from the Flip-Flop into a bay for stockpiling. This is a 37kW blower which will separate the residual fraction from the stone fraction leaving a cleaner product. This stone discharge conveyor will transfer the screened stone fraction from the Flip-Flop into a bay for stockpiling. The metals conveyor Incl. QC station is a standard conveyor used to pass the ferrous metals through a quality inspection area to ensure and contaminants are removed from the metal. This Conveyor transfers the light fraction separated by the Ballistic Separator and the Double Drum Separator to the CO-~Mingled shed for further processing.

The proposed design will ensure all waste off-loading and transferral operations will take place internally, thus minimising environmental impact.
The design of the MRF will have to comply with both Irish and European legislation and to all conditions and emission limits of the planning permission and the waste licence.

Figure 9 Typical Materials Recovery Facility

Oxigen Environmental Ltd will require waste producers to characterise the waste prior to acceptance by vehicle operators. The producer/holder of the waste must, if requested, provide documentation that the waste meets the Oxigen Environmental Ltd. specification. The waste skip is visually inspected by the vehicle operator, and waste not conforming to the specification will not be accepted by the vehicle operator.

Wastes (skipwaste, transfer waste and green bin waste) will be delivered by Oxigen Environmental Ltd employees and permitted/licensed waste contractors only. Prior to gaining access to the site the vehicle operator will be required to have adequate documentation to include waste type, source of the waste, vehicle type, vehicle number and drivers name into the weighbridge operator. The load will be required to be verified by the computer system prior to the barrier being raised.

Both site weighbridges are located adjacent to each other, at the entrance and exit of the facility. The driver will be directed to the appropriate building where the waste will be tipped in a reception area. The load will be inspected with non conforming waste being removed. Non-conforming waste (to be detailed within the Waste License) will be immediately removed to the waste quarantine area. The waste will be stored in the quarantine area pending its removal offsite. Oxigen Environmental Ltd. will maintain records of the waste type, quantity, and ultimate disposal/treatment facility.

The types of crushing unit and screen to be utilised will depend on the type of waste entering the facility and the end-use of the recovered material. Timber shredders and magnetic units can be provided for treatment of wood wastes and the recovery of metals.

A bin for dry recyclables will be available to all households on Oxigen's domestic routes. The expected participation rate and capture rate will lead to a likely figure of 15 % of total waste stream being collected in the source separated collection. This is a conservative estimate based on Oxigen's experience in collecting this material over a number of years. The MRF separation plant consists of OCC screens and ONP screens to separate paper; metals will be separated using magnets and eddy current separators; finally plastics will be separated using NIR optical separators.

It is predicted that up to 97% of the 'green bin' waste and 80% of 'skip' waste accepted at the facility shall either be recovered or recycled.

2.5.8 Biological Waste Treatment Facility

2.5.8.1 Waste Pre-Treatment and Biotunnel Composting

The pre-treatment of the Organic Waste includes the following phases of mechanical treatment:

- Shredding by a slow speed shredder, which reduce the size of the waste without causing excessive size reduction of the contaminant items which need to be sorted from the end compost to produce a marketable product;

- The structural material, fresh or re-circulated from the primary and secondary screening processes described below, is stored in a dedicated area and is fed to the same shredder alternately to the waste in order to achieve the desired mix.
- The mixed material, discharged from the shredder in another dedicated area, is collected by the wheel loader and fed to the first set of composting reactors (bio-tunnels) for the first phase of composting.

The air distribution system of the tunnel floor is based on plastic air ducts provided with spigots, embedded into the tunnel concrete floor.

The conceptual design of this system is based on the following:

- The pressure drop generated by the diaphragm at the end of the spigots allows for a uniform air distribution along the entire length of the tunnel.
- The high speed of the air at the spigot exit generates a self-cleaning effect
- The spigot ends are protected by small concrete channels that are built into the floor, which avoid the direct pressure of the material on the spigots and are convenient for cleaning;
- The mono-block tunnel aerated floor built by embedding the spigot pipes into the concrete casting constitutes a heavy-duty and wear-resistant floor where wheel loaders can operate continuously.

Spigots are properly meshed in order to optimise air distribution into the material preventing anaerobic zones to form in the pile.

All spigot pipes merge into an air plenum, located underground at the front of the tunnels, and receiving the air from the fan. The same plenum is also dedicated to leachate and condensate drainage through a water trap. Access to the plenum is provided through a sealed manhole for maintenance purposes.

The air which is blown into the material through the floor is partially re-circulated inside the tunnel and partially sent to the odour control system. Exhausted air is replaced by inletting of fresh air. Air sucked from the process buildings is used as fresh process air in the bio-tunnels. This design reduces the volume of air from the building to be processed by the odour control system.

Each biotunnel will be provided with an independent fan and three dampers to adjust fresh, re-circulated and exhaust air.

Figure 10 Typical Biological Treatment Facility

Furthermore, each tunnel is provided with two special sliding doors, one at the front and one at the back end of the reactor, which are opened only during the loading and unloading operations. To prevent re-contamination of the thermally treated waste, loading and unloading are always performed through opposite ends of the tunnels.

Once the tunnel has been loaded with the wheel loader, a movable material retention wall is put into position and the special in-feed tunnel door is closed. The batch process begins. At the end of the treatment, the tunnel is emptied from the opposite door and a new cycle can start. The loading and unloading of the tunnels is performed by wheel loaders.

The biotunnels have a spraying system installed under the ceiling, which is used to provide moisture when needed. Any wastewater produced is collected through the floor aeration system and conveyed to the wastewater collection tank.

The biotunnel fans are provided with variable frequency control (inverter). This allows reduction in flow-rate and/or pressure whenever the process does not require full performances, which is most of the time. In this respect, it should be noticed that the power consumption of a centrifugal fan is proportioned to the third power of its speed. Therefore, reducing the speed whenever possible would result in big savings in electrical consumption and therefore in operational costs.

The biotunnel process is subdivided into various phases, automatically controlled, which differ in control strategy in order to optimise the duration of each phase, the achievement of the first temperature barrier and the quality of the product.

During the loading phase, the air treatment systems deal with an open door providing enough ventilation inside the tunnel for proper working conditions. This phase ends when the switch, located on the door, indicates that the tunnel is closed and the control

system operator starts the process. Before starting the actual composting process, moisture and temperature are allowed to become uniform in the batch of material fed to the tunnel. This provides uniform characteristics in the quality of the product at the end of the process. This is achieved automatically by the control system using low flow-rates and full air re-circulation.

During the composting phase the control systems keeps the temperature within the best range for the aerobic process to occur (45-55°C). This phase is aiming at rapidly increasing the temperature beyond the set limit in order to comply with the hygienisation requirements (first temperature barrier). Temperature and oxygen are continuously monitored and the controller activates the air dampers and the fan speed in order to meet the target as soon as possible. If the set requirements are not achieved, an alarm is provided by the system allowing the plant operator to segregate the material and decide upon following process stages (prolonged process, different settings, etc.) When the first stage composting is concluded, the outlet door is opened and the material unloading starts. A specific "recipe" can be loaded and memorised in the control system for each tunnel, prescribing the sub-phases temperature ranges, duration, etc.

The following parameters are detected and monitored by an automation system:

Air oxygen content
The oxygen probe is located on the duct connecting the tunnel fan to the floor distribution system (plenum). This measurement regulates the mix of air (fresh and re-circulated) entering the material to avoid anaerobic conditions occurring.

Material temperature
Temperature probes detect the material temperature at different points in the tunnel. The measurements are properly averaged and used by the automation system to control the process.

Pressure in the tunnel
The tunnel is kept under negative pressure at all times in order to avoid uncontrolled odour emissions. This is performed detecting the pressure by means of a transmitter back-feeding the opening of the exhaust air damper.

Pressure in the tunnel air distribution plenum
This parameter is always monitored in order to ensure that air is flowing through the composting pile.

Fan speed
This important parameter is detected and automatically varied by the VFD according to the process requirements.

Dampers position
Re-circulated, fresh and exhaust air damper positions are controlled by means of the damper actuators and relevant limit switches providing proportional and limit signals.

A computerised control system, including visualisation on a PC with colour graphics, monitors the process and keeps its parameters within preset ranges. Details on this system are provided in a following section.

2.5.8.2 Primary Screening

The material treated in the biotunnels is taken to the primary screening system which produces the following two fractions:

- An oversized fraction larger than 40 mm, which is re-circulated to the waste pre-treatment area for use as structural material. An air separation system is used to clean this fraction from light plastic material (process reject) that otherwise would be concentrated in the biotunnel material;
- An undersize fraction smaller than 40mm which is taken by wheel loader to the curing buildings for the second biological treatment.

The screen used is of the rotary drum type which is able to process material with significant moisture content without clogging the screening panels.

The transfer of the oversized fraction takes place automatically by means of a group of conveyors which collect the oversized fraction from the screen and deliver it to the structural material collection area located in the pre-treatment building.

Moisture is added to the undersized fraction prior to its transfer to the curing area. In order to not compromise the achievement of the first temperature barrier, only fresh water or rain water is used in this phase of the process to prevent the re-contamination of the material.

2.5.8.3 Curing

Curing takes place in reactors, which are similar to the biotunnels, with the following differences:

- The width of the curing reactors is twice the width of the biotunnels
- The number of air ducts cast into the aerated concrete floor is the same, therefore, due to the larger width, the spacing of the air ducts is twice the spacing of the biotunnels
- The process is also based on the use of a PLC and a PC, but temperature of the material is the only process parameter which is measured and controlled to confirm the achievement of the second temperature barrier;
- There is no air recirculation system;
- Instrumentation installed in the curing system is limited to that necessary for the monitoring of the temperature of the processed material.

The reasons for the above differences is that the specific process air requirement (m^3/h of air per m^2 of floor) is less during curing, because the material is biologically less active than in the first treatment phase.

A moisture addition system is also installed in the curing reactors, where the consumption of water is more significant due to the long retention time of the curing process compared with the biotunnels. Only fresh water or rainwater is used in this phase of the process to prevent the recontamination of the material.

As illustrated above, the second temperature barrier takes place in the curing phase.
As in the case of the biotunnels, also the curing reactors are filled and emptied through opposite doors.

2.5.8.4 Secondary Screening

After curing, the material is processed by the secondary screening system, which generates the following two fractions:

- An oversized fraction larger than 10 mm, which is rejected or, depending on the quality of the material, re-circulated to the waste pre-treatment area to be used as structural material;
- An undersize fraction smaller than 10 mm which is the compost end-product.

Also for the secondary screening system, the screen used is of the "flip-flow" type which is able to process material with significant moisture content without clogging the screening panels.

If necessary to meet a seasonal demand of the product, the ample size of the curing reactors also allows them to be used for the storage of the finished product.

2.5.8.5 Odour Control System

The odour control system has the following features:

- All waste air flows from the building ventilation, composting process and screening are collected and processed by a scrubber and a biofilter;
- Two independent biofilters, with respective fans, operate in parallel;
- The surface of the biofilters is covered by a membrane cover which has the function of conveying the treated air to the stack and also preventing the generation of wastewater due to weather precipitations;
- The biofilter control systems include the monitoring and control of various parameters, such as (for each biofilter) filter media temperature, airflow rate, air pressure drop and fan rotation speed;
- The biofilters are equipped with a water spraying system for adding moisture when necessary.

Figure 11 Typical Odour Control System

2.5.8.6 Odour Management

The proposed odour control system is based on the biofiltration, a very effective technology for the management of odours generated by the biological treatment of municipal waste.

The two proposed biofilters are installed downstream of an air scrubber that has the function of increasing the moisture content of the processed air to a level close to saturation. The scrubbing process prevents the drying of the biofilter material and does not require the addition of any chemicals to the water sprayed into the scrubber.

2.5.8.7 Enclosed Composting Systems

The organic waste coming to the composting facility will be received at the reception area. The incoming waste will be inspected in a dedicated waste inspection area, and if required suspect waste will be transferred to a separate waste quarantine area for removal off-site. The floor of this area is engineered with suitable barriers and slopes in order to avoid leachate dispersion. After inspection, the waste may require some pre-treatment, which may consist of additional screening or shredding. This may be required in order to insure that the organic waste is the appropriate size for efficient composting, i.e 8 to 10cm.

After pre-treatment the organic waste is usually mixed with a bulking agent, i.e woodchips, cardboard, etc. This mixing will ensure that the material for composting will have a proper dry solid content (approx 40%) and Carbon to Nitrogen (C/N)-ratio (approx 30:1). The 'recipe' of the mixed organic material will depend upon the composting process to be used. The mixed material is then transferred to the first stage of the composting process. This stage will vary depending on the compost technology chosen.

- Tunnel composting
- Container composting
- Hangar composting
- Continuous flow

The retention period for the first phase of composting can vary between 2-8 weeks, depending on a number of factors, namely:

- The type of organic waste being composted
- The composting technique being used
- The frequency of turning required
- The amount of air being supplied to the compost
- The temperature and
- The moisture content of the organic mixture

The second phase of composting is maturation and is generally standard for all types of composting techniques. After phase one composting, the pre-mature compost is placed onto the aeration floor, based on a forced aeration system. An air extraction system, consisting of air collection ducts, water scrubber and biofilter are installed to treat the process air and to mitigate against odour emissions. The maturation process can vary from 2-8 weeks, depending on the composting technique used and the quality of the compost required. After the maturation phase the final stage of the process is compost refinement and storage. The matured and stabilised compost is sieved to remove impurities to the extent required by the relevant compost standard. The refined compost product is then brought to an enclosed storage area for temporary storage or bagging, depending on the market outlet.

2.5.8.8 Anaerobic Digestion System

After registration at the weighbridge, the incoming waste is directed to the AD reception building. The waste is unloaded into a reception tank and is visually inspected by one of the operators. All coarse materials (plastic, wood, stone, etc) are removed by a separator, in order to prevent damages to the system. Any suspect material is quarantined for removal offsite. The waste is then pumped to a storage tank. As per the Animal By Products (EC 1774/2002) sterilisation of the organic material will be achieved in the sanitation tank by heating the material to a core temperature of more than 133C for at least 20 minutes without interruption at a pressure (absolute) of at least 3 bars, produced

by saturated steam (from CHP unit). The heat treatment is applied as the sole process sterilisation phase, to kill off pathogens (bacteria and viruses) and proteins. The sanitation tank is operated as a batch process and is completely mixed.

After sanitation, the sanitised organics are pumped to the AD tank. The type of AD process will be subject to specialist contract. Generally the temperature in the aerobic digestion tank is maintained at 35^{o}C (mesophyllic conditions). At this temperature, mesophyllic micro organisms have their maximum activity, resulting in maximum biodegradation of organic material in minimum process time. Several types of mixing systems are available for the mixing of the slurry in the digestion tank, for example mechanical stirrers, biogas recirculation, or combinations of both. The average retention time of the organics in the AD-tank is approx 12-30 days.

The digested material (digestate) extracted from the AD tank is slurry, which is low in dry solids (5 – 10%). The digested material can be marketed as slurry or it can be dewatered to increase the dry solids content, making the product easier to handle. This will depend on the final market outlet.

Outside waste acceptance hours the security gate is closed and access is only permitted by the key personnel (i.e. site manager, permitted staff etc).

Type of waste to be collected will include household waste, garden waste and commercial waste. A third bin for organics will be available in urban areas such as Cavan, Clones and Virginia. Oxigen also propose to bring in source separated organic waste for processing at the facility from Drogheda, Dundalk and the sub-urban areas surrounding these towns (Laytown, Bettystown etc.). The estimated catchment for a 3-bin system will be 25,000 households, yielding approximately 8,000 to 10,000 tonnes of organic waste for composting. (The source separated waste will be combined with green waste). Chipped timber will be used as an amendment material.

The residual fraction of the waste will be treated in the BTF. This will recover ferrous metal from the waste and separate the biodegradable fractions for stabilisation. The waste will be shredded and trommelled to separate the < 40mm fraction which will consist of organic waste and paper. The oversize fraction will be landfilled. Ferrous metals will be removed using an overband magnet. The undersize fraction will be bio-stabilised in an aerobic in-vessel compost process. The stabilised waste will be recovered for use as daily cover in the adjacent landfill.

2.5.8.9 Household Waste

It will be assumed that all biowaste arisings within the kitchen will be collected and this fraction will include meat and fish and thus be subject to ABP Regulations.

Biowaste consists of source separated household biodegradable waste and includes the following materials:

- Cooked food, fat and gravy

- Raw meat and fish
- Raw fruit and vegetables
- Nut and egg shells
- Bread and cereal
- Teabags and coffee grains
- Indoor plants
- Paper

2.5.8.10 Garden Waste

Garden waste includes the following materials

- Grass cuttings
- Twigs and hedge trimmings
- Weeds and old garden plants
- Logs and branches

2.5.8.11 Wastewater Treatment Plant Sludge

As the population of the County is projected to grow over the next 20 years. Water, wastewater and industrial sludges will grow accordingly. In addition to this, the increased levels of treatment required as a result of the implementation of the European Urban Wastewater Treatment Directive, will cause a considerable increase in the quantities of sludge produced from the treatment of domestic and industrial effluents.

The decreasing availability of landfill capacity, coupled with forthcoming legislation in line with the EU Landfill Directive, mean that the current strategy of landfilling sludge cake from wastewater treatment plants is unsustainable. A new management strategy is required for this category of sludge. Composting of organic solid waste shows good potential as long term sustainable strategies for water and wastewater sludge management.

2.5.8.12 Commercial Waste

Commercial organic waste will also be suitable for collection and treatment. This material is quite similar to household kitchen waste.

Woodchip product may also be used from time to time as an amendment material
Other wastes may be accepted from time to time under agreement with the EPA.

2.5.9 Energy and Fuel Consumption

Oxigen Environmental will include procedures as part of the environmental control procedures and operating procedures, a procedure for the audit and control of fuel and energy usage, as well as measures for the reduction of both. An Energy consumption

matrix shall be completed as part of the Annual Environmental Report to the EPA.

Measures will be implemented to ensure best practice at the facility to ensure the minimum fuel and energy is consumed in the processing of waste and operation of the facility.

The proposed BTF Facility is designed to minimize the consumption of energy. The following features are provided for this purpose:

- The arrangement of the Facility is designed to limit to the maximum extent the volume of the areas which are simultaneously operational and this allows for meeting the requirement of six air exchanges per hour with less air treatment capacity;
- The entire odour control system is designed to minimize the pressure drop thorough the air ducts and the biofilters and this helps in keeping low the power consumption of the fan;
- All fans installed in the Facility are provided with variable frequency control (inverter), that reduces dramatically the power consumption when the fans are operating below the nominal capacity;
- The ABPR - Animal By-Product Regulations are met by without adding any external heat to the biological process which is able to self-generate all heat required for the two heat barriers.

2.6 Proposed Construction Development

2.6.1 Introduction

The proposed Integrated Recycling Development covers an area of approximately 17.87 hectares, Figure No.03 Site Ownership Plan shows the EPA licence layout. The proposed development is estimated to take between 12 and 18 months and include the following:

- Additional buildings (biological treatment plant and MRF buildings)
- Landfill cell development- Completion of Cell 3 and Excavation of Cell 4
- Landfill Gas Management Infrastructure
- Increased hard stand cover
- Extended drainage and sewer infrastructure
- To develop the operational infrastructure (i.e. development of inspection and quarantine area, water holding tank etc)
- Services to include final plumbing and electrical installation of all plant on site
- Emission Monitoring Infrastructure

It is expected that the site will be developed within approximately 18 months of grant of planning permission, with the site fully operational by end of 2010. This section of the

EIS describes the construction phase including infrastructure design and construction procedures.

The site development works and construction sequence for the proposed development will, in general, comprise the main steps set out below. All site development works shall be undertaken in conjunction with all planning conditions as set by Cavan County Council and in compliance with any specific requirements that may be set by the EPA within the waste licence for the facility. However, the schedule of works is subject to change depending on site conditions, planning conditions, weather etc.

2.6.2 Site Developments Works

The site development works will be undertaken as follows:

1. Identification of active services on site.
2. Diversion of all necessary services e.g. electricity supply, water etc.
3. Undertaking of earthworks cut and fill to include cart away of topsoil to establish formation level.
4. Construction of below ground services to site – foul, surface and water main.
5. Construction of additional services; connection to existing on-site drainage infrastructure – in liaison/agreement with Local Authority.
6. Construction of hardstanding areas – vehicle parking areas, clean skips storage areas etc.
7. Construction of above and below ground services (Mechanical and Electrical) – Telecom, Electricity, etc. in liaison/agreement with service providers.
8. Construction of two new building structures and above ground infrastructure i.e. waste quarantine area.
9. Installation of all plant and machinery in completed buildings.

2.6.3 Preliminary Works

The first step of the site development works will be to identify all site services i.e. surface water and foul sewer, electricity, water mains etc. The identification of these services at the earliest possible stage will allow safe uninterrupted development of the site and will reduce the potential for any environmental pollution to occur. Once these services have been identified any service which requires diversion will be moved or altered, in liaison/agreement with the service providers.

The necessary excavation to achieve the foundation level for the concrete retaining structure will then be undertaken and will be done using standard construction methods. Hard core fill will also be imported at this stage of the project to establish the formation level of the development.

2.6.4 Construction Works

The construction of all of the proposed below ground services to the site will be installed at this stage of the project. The proposed surface water and foul sewage systems are shown on Drawing No 15 Services Plan.

The proposed construction area will ultimately be connected to the existing drainage (surface water and foul) infrastructure. The ground works for the connecting pipe network shall be developed at this stage.

A mains water distribution system will be provided as part of the development infrastructure. The proposed development will be served by the Cavan County Council public main serving the existing facility. The connection to the water mains will be carried out in accordance with local authority requirements and the planning permission for the development. The water main connection will be sufficient to cater for the peak demands of the proposed additional buildings.

2.6.4.1 Hard standing Areas

All additional hardstanding areas will be constructed at this stage of the development, and shall be completed to the same standard as the existing hardcore material. Surface water runoff from these areas will discharge via the newly constructed surface water drainage system. Once all of the steps have been carried out the site will be ready for the construction of the additional buildings, Materials Recovery facility, Biological treatment facility and administration. These will be constructed in conjunction with the requirements of the planning permission and with agreement from the Environmental Protection Agency.

2.6.4.2 Construction Procedures

The earthworks contractor will be required to manage the works and control dust emissions, run-off, noise, sequencing of earthworks operations, stockpiling etc.

Earthworks are programmed to commence immediately following grant of planning permission. Details of the construction procedures shall be submitted to the Environmental Protection Agency for agreement, when final designs and construction schedules have been formulated.

2.6.4.3 Hours of work

Site work will normally be restricted to normal working hours (8.00am to 18.00 pm) with the exception of essential activities such as repairs and refuelling. Generally, site work will not be permitted on Sunday or at night-time except where programme constraints or safety concerns necessitate it.

2.6.4.4 Site Management

The site will be managed by the main contractor. The site manager/supervising engineer will oversee all of the construction activities including:

- Traffic management on-site including scheduling of deliveries
- Site security
- Control and management of site services
- Approval of development proposals

2.6.4.5 Other services

The existing ESB supply will be extended to the newly constructed buildings via an underground distribution cabling system. This connection will be made in conjunction with the ESB.

A network of telecommunication cable ducting will also be provided as part of the development infrastructure.

The external lighting scheme will be in accordance with the Guidance Notes for the reduction of light pollution as issued by the Institute of Lighting Engineers to ensure that:

- Lights are switched off when not required and outside agreed hours.
- The use of specifically designed lighting equipment that minimises the spread of light.
- Areas are not over lit. In non process areas a general luminance level of 20 lux will be provided in the low risk areas and 50 lux in the high risk areas. In loading bays, a general luminance level of 150 lux will be provided.

2.6.5 Wastes and Emissions

During the construction phase of the facility, Oxigen Environmental will implement best practice measures so as to reduce as much as possible any negative effects of the construction works on the environment.

The main environmental issues associated with the construction phase are as follows:

- Noise
- Vibrations
- Dust
- Vermin
- Litter
- Sustainable Construction Materials
- Storage of Plant, Fuel and Equipment on Site

Oxigen Environmental will implement the following controls to ensure construction of the facility is carried out with minimum impact on the surrounding environment.

During site development and construction works, the generation of waste and emissions will be as follows:

2.6.5.1 Solid Waste

Generally, solid waste arising during these phases will be retained onsite insofar as is practicable. Any offsite waste disposal will be agreed with the EPA, prior to transport offsite. A licensed waste contractor will be used for offsite disposal of waste arising during earthworks and construction.

2.6.5.2 Soil Stability

The overburden material to be excavated is primarily stiff brown clay with cobbles to a depth of 10-12m on stiff light gravelly sandy clay to a depth of 18-20m onto weathered shale rock. However, given the low permeability nature of the material, seasonal effects will be considered when scheduling bulk earthworks and these will be carried out in drier seasons where possible.

All excavated material will require careful handling and placement to ensure bund stability and prevent slippage and the risk of surface water contamination from material entering local streams and ditches. The excavated material will be handled carefully and in accordance with a method statement devised during the detailed design stage of the project.

2.6.5.3 Emissions to atmosphere

The operation of mobile plant and equipment will give rise to emissions to atmosphere of combustion gases, sulphur dioxide, oxides of nitrogen and particulates.

Fugitive dust emissions will arise through wind assisted dust generation during earthworks as topsoil is stripped and the site is levelled. Where required, water bowsers will be used to dampen down soil, thereby minimising fugitive dust emissions. A road sweeper will also be used if necessary to control and minimise the effects dust generation on the site. Dust associated with the construction phase is a potential environmental nuisance. Measures will be put into place to minimise airborne and fugitive dust emissions from the construction site. Water bowsers will be present at all times on site to spray down the area in order to prevent dry dirt on the ground surface from becoming airborne.

All site access roads, internal roads and roadways in the surrounding area will be regularly swept by road sweeping vehicles to ensure they are maintained free of debris and to prevent soil wash off to surface water drainage.

2.6.5.4 Vermin

Excavation work can potentially lead to disturbance and influx of vermin into construction site which may also then spread to surrounding areas. Vermin prevention measures are currently employed and activity will be monitored during the construction phase of the Integrated Recycling Facility. Additional preventive bait will be laid if required and any necessary extermination measures will be undertaken by the pest control contractor.

2.6.5.5 Noise

The operation of mobile plant and equipment, including HGV's will give rise to noise emissions during earthworks and site development. Construction equipment will comply with SI 320 of 1988: EC (Construction Plant and Equipment Permissible Noise Levels) Regulations, 1988, with consideration to be taken of BS 5228:1984: Noise Control in Construction and Open Sites.

As per the maintenance schedule all plant and machinery shall be maintained in efficient working order. All vehicles and plant will be fitted with exhaust silencers and any machinery not in use will be shut down or throttled to a minimum. All compressors will be fitted with properly lined and sealed acoustic covers which will be kept closed when machine is in use. All pneumatic percussive equipment will be fitted with mufflers or silencers as recommended by the manufacturer.

All equipment, plant and machinery shall be operated and maintained in accordance with the manufacturer's instructions.

All traffic and truck movement on and off site will be coordinated as far as possible to ensure deliveries of construction materials do not create a backlog. This will ensure noise disturbance is limited and concentrated to a few hours per day as opposed to continuous flow of HGVs over a prolonged period of time. Hours of works will be carried out in accordance with guidelines set down in the conditions of planning permission.

A topsoil berm will be constructed along the southeast boundary of the site to mitigate against noise disturbance to nearest residences from construction equipment such as excavators, lifting equipment and trucks.

Oxigen Environmental will ensure that noise levels do not exceed the levels outlined in the waste licence and will monitor all such emissions as per Schedule C of the existing waste licence W077-02.

2.6.5.6 Vibrations

Oxigen Environmental shall maintain vibration monitoring equipment on site to ensure vibrations caused during construction are within the limits specified by Cavan County Council. All data will be recorded and available for inspection on site.

2.6.5.7 Litter & Waste Management

All waste associated with the construction phase of the facility will be managed according to a construction waste management plan which will be agreed with Cavan County Council prior to commencement. The waste management plan will include procedures for dealing with packaging waste, inert soil and stones and C&D materials. All waste will be segregated as far as possible and will be sent off site for re-use, recovery and recycling.

Litter checks will be carried out daily to ensure no fugitive packaging or other associated wind blown litter pollutes the surrounding area. Any litter found associated with the construction works on site or surrounding areas will be cleaned up immediately and the source of the litter addressed to ensure preventive measures are in place to control any litter pollution recurring.

2.6.5.8 Surface Water

Strict control of erosion, sediment generation and other pollutants associated with the construction process will be implemented including silt barriers and ditches down slope from construction works to intercept waters with high sediment loads and accidental leakages/spillages.

2.6.5.9 Waste Water

There will be no sources of waste water arising from earthworks or construction activities onsite.

2.6.5.10 Sustainable Construction Materials

As per Oxigen Environmental Policy, all suppliers will be required to implement best practice in their services and provide environmental management policies. All construction materials will be from sustainable sources and both recycled and recyclable materials will be used as far as practicable.

2.6.5.11 Storage of Plant, Fuel and Equipment on Site

All plant and equipment stored on site shall be done so in a safe and secure manner to avoid any security breaches or environmental risks. All fuel stored on the construction site, and any other liquids/liquid containers shall be stored in an appropriately sealed metal container on bunded spill pallets. All containers of liquid substances will be clearly labelled as to their contents and Materials Safety Data Sheets maintained in the site office.

2.6.5.12 Employment

Employment within the site development phase of the proposed development is estimated at 20-25 employees, which will be construction based employment.

2.6.6 Construction of Cell 4

2.6.6.1 Excavation and Disposal of Materials for Cell 4 Works

Cell 4 shall be excavated to suitable bearing strata and filled with suitable material to the formation levels. (Drawing No. 04, Cell 4 Formation levels). Excavated material shall be disposed of / stored on the site in the areas indicated in Drawing No. 04 Soil Storage. The works will involve the construction of storage areas on the site for both suitable and unsuitable materials. Suitable materials will be stored in such a manner to allow their re-use in other areas of the site such as the capping of filled areas and the construction of embankments etc.

2.6.6.2 Construction of Groundwater Management System

A review of the previous groundwater control measures is being undertaken to determine whether there is a requirement for such measures to be incorporated into the design of Cell 4. Previous Cell design included the construction of an under cell drainage layer to lower groundwater levels and remove uplift pressures on the cell basal liner. This under cell drainage system would have allowed any water to gravitate to a groundwater pumping station for lifting via a rising main into the existing surface water management system. Once the review is complete, Oxigen will be able to forward considered proposals to ensure Groundwater and Surface water resources are protected.

2.6.6.3 Construction of Cell 4 – Engineered cell

Construction of Cell 4 comprising of approximately 17,500 m^2 area will be undertaken as one cell partitioned into two contained areas with a bund to distinguish between the working areas. They will be operated separately but in conjunction so that filling can successfully take place with the use of roads, turning areas and tipping operations. The main priority of each area is to meet the schedule laid down by the EPA regarding the control of landfill gas and capping within a specific period. The whole cell, incorporating a basal lining system of a leachate drainage blanket on a HDPE liner on a compacted soil or bentonite enhanced soil barrier layer and the construction of anchor trenches. Construction will be in accordance with the requirements of the Landfill Design Manual and the Waste Management Licence.

Figure 12 Proposed Cell 4 Construction Area

2.6.6.4 Ancillary Cell 4 Works

Surface water management works including construction of surface water interceptor drains, construction of surface water swales with associated pipelines to control surface water and comply with Condition 3.15 of the Waste Management Licence. Development will be connecting into the surface water swales already constructed during construction of early cells and utilizing the existing pipework for leachate collection and telemetry system which are distributed around the perimeter of Cell 4.

2.6.6.5 Leachate Collection System

Provision of a leachate collection system including leachate collection pipework, rising mains, pump housing, with ancillary valves, fittings, and service ducting, as indicated on Cell 4 Drawing No. 07, Leachate Collection. Non Return Valves and provision for other connections shall also be provided for as part of these works.

2.6.6.6 Site Clearance

Site clearance will comprise of main subsoil excavation to construction levels. Only those areas necessary for the construction of Cell 4 will be cleared. Wherever possible, suitable excavated soils will be immediately used to form a temporary cap on completed areas of Cell 3 and the remainder with be stored in the area shown on Drawing No.11 Soil Storage. The existing surface water system, temporary settlement ponds and a new diversion channel have been previously notified to the EPA and the Fisheries Authority.

This surface water management system that has been constructed is shown on this Drawing No. 11 Soil Storage. The measures taken will mitigate against the effects of suspended solid contaminated of surface water run-off. All stockpiles of material will be shaped and contoured primarily to reduce the contamination of surface water. Secondly they will be in keeping with surrounding areas with similar profiles whenever possible.

2.6.6.7 Surface Water Management

In addition to the existing infrastructure mentioned above, during construction of Cell 4, more interception drains and temporary settlement ponds will be established if needed to mitigate against the discharge of suspended solids to the existing streams as required under Condition 3.15

Specifically, a surface water interceptor drainage ditch has been constructed to the north east of the site and can be seen of Cell 4 Drawing No. 11,Soil storage. The interceptor drain will divert surface water flowing from the northeast to the north before becoming in contact with the soil storage areas. The intercepted surface water will be diverted into the Lismagratty Stream. Further surface water drains in this area have already been constructed which will divert water either directly or by way of settlement areas to minimise contamination. Surface runoff from around the adjacent Cell 3 and access road will be collected in constructed swales. The swales will consist of stone filled or open trapezoidal channels, which will ultimately discharge to the existing surface control areas. Both the new and existing swales will be directed to the surface water management system and will cope with quantities collected for the whole catchment area.

2.6.6.8 Groundwater Management System

A review of the groundwater protection measures is required to comply with Condition 3.16.1 of the Waste Management Licence. This condition indicates that effective groundwater management infrastructure shall be provided and maintained during the operation, restoration and aftercare of the phases of the landfill as a whole. The review will assess whether it is necessary to control ground water within the depth of the strata. Following interpretation of borehole and other excavation information it may not be necessary to have specific controls measures as the actual level of groundwater is considerably lower than the formation levels as show in Drawing No. 04 Formation levels and the in situ permeability and the depth of material could prove to be sufficient not to impact on construction as previously expected. Once the review is complete proposals will be forwarded to the agency.

The plan to comply with Condition 3.16.1 would be to construct a groundwater management infrastructure which will be capable of protecting the underlying groundwater resources from pollution due to activities on site. The groundwater management infrastructure shall also be capable of ensuring that the groundwater does not adversely impact upon the landfill. During Cell 4 construction and operation of the landfill facility, it may or may not be necessary to be prepared to control and manage the local water table.

Any groundwater arising from the construction of the facility shall be afforded treatment in the existing settlement lagoon to ensure it does not adversely impact upon the surface water environment upon discharge. It is proposed to intercept the groundwater underneath the basal liner system, to control the piezometric pressure on the liner and prevent hydrostatic uplift. The groundwater captured will be directed to a groundwater pumping station from which the water will be pumped to the existing surface water swales and settlement ponds, if necessary, prior to discharge to the Lismagratty stream.

A groundwater drain will be constructed adjacent to Cell 4 on the North West side of the construction works. This drain will be excavated below the formation level of Cell 4, so that any groundwater flowing under the liner of Cell 4 will be intercepted and diverted, thus limiting any build up of the volume of groundwater flows. The control will be constructed continuous with the Cell 4 groundwater drainage blanket allowing groundwater flow to be directed to the groundwater pumping station and pumped to the existing surface water management infrastructure.

During the excavation of material within Cell 4, it may be necessary to locally control groundwater by use of suction pumps, with dewatering boreholes or similar. Appropriate groundwater management infrastructure shall be available and put into operation when necessary to effectively manage groundwater inflows during construction. Any groundwater inflows shall be sufficiently controlled to ensure that emissions of polluting matter to natural watercourses are prevented. No substance shall be discharged in a manner, or at a concentration, which, following initial dilution, causes tainting of fish or shellfish.

During construction of Cell 4 of the landfill, interception drains and temporary settlement ponds have been established to mitigate against the discharge of suspended solids to the existing streams. Any water captured from exposed soil surfaces shall be diverted through settlement ponds prior to discharge to ensure adequate treatment. Following construction and during the early stages of waste placement in Cell 4, the dewatering system under Cell 4 will maintained and fully functional to ensure the water table is at an appropriate level to make certain the landfill liner in not adversely impacted by hydrostatic uplift.

2.6.6.9 Development of Cell 4

The development of the lined cells will comply with the requirements of Condition 3.11.2 and will follow the following sequence:

Preparation of soil storage areas will take place and surface water controls planned will be established.

- Soils and other materials, will be stripped and stored onsite.
- The surface water interceptor drainage ditch constructed, diversion of other sources of water and surface water drainage diversions located as shown on

Drawing No.11,Soil storage, shall be constructed with regard to Condition 3.15 and 3.16 of the waste licence.

- The cell area will be excavated to the levels and profile as shown on Drawing No's. 04 Formation level, 05 Finished levels (BES), 06 Finished Levels (Soils) 08 Section A-A and 09 Section B-B and suitable material arising from the excavations will be used to form capping for Cell embankments and safety bund etc. Excess materials shall be stockpiled.
- The installation of groundwater management system if required in accordance with Section 4 of this SEW and Waste Management Licence Condition 3.16.
- We are presently testing the in situ soil to determine whether it can be used to form the mineral element of the composite lining system. If these tests show the material cannot be used then we are considering employing Bentonite Enhanced Soil (BES) or a similar material known by its trade name as Trisoplast.
- Whichever material is employed it will comply with Licence Condition 3.11.1. (a).
- The use of soil from the excavation will be laid to a depth of 1metre and compacted to a conductivity of less than $1X10^{-9}$ m/s.
- The use of Bentonite Enhanced Soil (BES) to form the mineral element of the composite lining system will meet the following general requirements
  Permeability < 5 x $10.^{-10}$ *m/s* (BS1377: 1990: Part 6). 500mm of BES with this permeability is equivalent to the licence requirement of 1 metre of compacted soil with a permeability of 1 x 10^{-9} *m/s.*

If BES is used then it shall be placed to a minimum thickness of 500mm and will be placed in layers and subject to the contract quality assurance procedures as laid out in the EPA Landfill Design Manual.

The cells will be lined with 2mm thick, high-density polyethylene (HDPE) geomembrane. The liner will be textured on the side slopes and smooth on the base. The cell floors will fall to low points equipped with leachate pumps. The installation of the HDPE geomembrane will be subject to strict CQA in accordance with the EPA's Landfill Design Manual. The surface of the HDPE liner will be protected from damage using a suitable protection geotextile as required in Condition 3.11.1(b). The drainage layer will be installed as per as required in Condition 3.11.1(c)

The sidewalls will be designed and constructed to achieve an equivalent protection to the basal layer as required in Condition 3.11.1(d). A leak detection survey will be commissioned with any anomalies investigated and repairs will be made as appropriate

A full CQA report will be generated on completion of the construction works to meet the requirement of the EPA Landfill Manual – Landfill Site Design. Formation levels of the underside of the groundwater drainage blanket, if required, are presented on Drawing No.04 Formation Level, the basal lining system embankment details are presented on Drawing No.08 Section A-A, also showing the levels to the top of the leachate drainage stone.

2.6.6.10 Leachate Management Infrastructure

Leachate management infrastructure, as shown on Drawing No. 07 Leachate Collection, will include:

- A layer in accordance with Condition 3.11.1. (a) will be laid to form the liner on the cell floors. The proposed material to be used will most likely have an equivalent permeability of 1 x 10^{-9} m/s over a 500 mm thick layer. Any proposed material will be tested and submitted to the Agency for approval prior to use.
- Leachate collection pipework laid in a herringbone pattern terminating at the low point of the cells
- Leachate pumps located at the low point of the cells.
- Leachate collection will be via inclined side slope riser pipes linking the low point of cells to the rising main.
- A leachate storage tank of 1531m^3 is already, constructed and operational. This infrastructure is necessary for the management of leachate on the site in accordance with Schedule B: Specified Engineering Works - Installation of Leachate Management Infrastructure.

The leachate management system will be monitored by the extended SCADA system. Leachate will be, as needed, removed off site by sewer connection to the local waste water treatment facility.

2.6.6.11 Landfill Gas Management Infrastructure

The proposal for the Landfill Gas Management Infrastructure will be made prior to waste being deposited, these proposals with be similar to the previously submitted proposals. They will include a sacrificial horizontal extraction pipes spaced vertically and horizontally to maximize the capture gas as the filling of the cell takes place. It is planned to progress filling using one sub-cell at a time. This may include some filling of the adjacent sub cell to create access roads and safe embankment, but in principle the cells will be mainly treated as independent of each other. Therefore capping and vertical gas collection can be undertaken as required by the EPA.

2.6.6.12 Soil Management

Wherever possible, suitable excavated soils will be immediately used to form a temporary cap on completed areas of Cell 3 as shown on Drawing No. 02 Site Layout Plan and the remainder with be stored in the area shown on Drawing No.11 Soil Storage.

All stockpiles of material will be shaped and contoured primarily to reduce the contamination of surface water. Secondly they will be in keeping with surrounding areas with similar profiles whenever possible. Temporary and permanent stockpiling of different grades of material may take place on site and they will be stored to preserve the soil structure, were appropriate, for future use.

2.6.7 Landfill Construction Quality and Assurance Plan

A landfill Construction Quality Assurance (CQA) plan will be prepared for the development which will set out the materials, specifications and CQA procedure for the construction of the landfill engineering works. The CQA plan will be established based on the recommendations of the EPA in the Landfill Site Design Manual. The Landfill operator will employ an independent agency to carry out testing of all the elements of the lining system and to quality assure the data received from the contracts. The elements of the CQA relating to the Leachate Containment System will be the following:

a) Earthworks materials specification for both cutting and filling to form the required basal profile, and the perimeter and intermediate bunds. This will also include a description of the re-profiling of the in-situ clays and re-compacting in 250mm layers to form the clay liner.
b) Details of how and where the HDPE Geomembrane liner will be stored onsite and how it is to be laid and constructed. The details of this will include such items like the weld joints in the membrane, locations of joints and seams and details of personnel and equipment being used.
c) The CQA plan will outline details of the leak detection survey which will be conducted by an independent organisation and any other non-destructive testing to be carried out.
d) Details of the installation of the leachate pipe collection network within the granular layer. This will include details of the pipe work specifications and testing of the piped system by CCTV after installation. The granular drainage layer will be a material of hydraulic conductivity of 1×10^{-3} m/s and generally be a fine granular rounded stone of 20mm maximum size.
e) A statement will be included which allows for the measures to be undertaken in the event of the detection of leaks during the leak detection survey. This will include for a geophysical test after the granular protection layer has been placed. The test is operated on the basis that the HDPE liner acts as an insulator layer between the two conducting materials over and below the liner. Any damaged or defective areas of the HDPE liner will be recorded by instrumentation detecting localised current flows through the membrane. This system has been successful in detecting the damaged areas of the liner less than 1mm in diameter, and will be conducted by suitable experienced and independent operators.

2.7 Landfill Design/Operation

2.7.1 Introduction

The proper operation of the facility is critical to the mitigation of environmental impacts which could be generated from this integrated facility. The site will be operated in accordance with best international practices for similar facilities and in accordance with the Waste Management Licensing Regulations 2004; EPA Landfill 'Operational Practices' manual (1997) and as per waste licence as issued by the EPA. To comply with the EU Landfill Directive, a landfill must be situated and designed so as to meet the

necessary conditions for preventing pollution of the soil, groundwater or surface water and to ensure efficient collection of leachate. In this respect the EPA have prepared a Manual for Consultation "Landfill Site Design" (2002) to "assist landfill operators and designers to conform to the standards required, including the BAT principle, and to ensure that the long term environmental risks posed by landfills are minimised through effective containment monitoring and control".

A comprehensive Environmental Management Plan (EMP) will be prepared for the site. The purpose of the EMP is to set out the measures, procedures and guidance '*to prevent or reduce as far as possible negative effects on the environment, in particular pollution of surface water, groundwater, soil, air, as well the resulting risk to human and animal health, from landfilling of waste*'. This Environmental Management Plan will be updated as part of the requirements of any licence that may be issued for the development by the EPA.

When the waste arrives on site the documentation for the load will be checked (except members of the public presenting small quantities of waste and local authority vehicles). Vehicles will have their contents checked at the tip head and this will be cross checked with the documentation presented. If the waste is unacceptable the waste will be isolated and arrangements put in place to remove the waste from the site. Providing the load is acceptable the driver will be provided with a waste receipt on departure from the site.

2.7.2 Landfill Capacity

The final landform of the landfill shall not exceed 129.5m above OD as defined by the Waste Licence with cross sections of the proposed landscape berms shown in Drawing No. 08 Section A-A and Drawing No. 09 Section B-B

According to the EPA a municipal waste landfill can be expected to settle by between 10% and 25% (EPA Site Design Manual, 2000), reducing the amount of biodegradable waste to landfill, will result in the amount of settlement at landfills may not be as high. Therefore a conservative figure of 1m, or 5% settlement across the site, has been assumed in the design calculations for the purpose of estimating void space. The void space capacity for Cell 3 has been estimated at approximately 22, 0670.296m^3 in January 2008.

The relationship between void space in cubic metres (m^3) and tonnage of waste is influenced by a number of factors including:

- Type of daily cover
- Compaction System used
- Types of waste landfilled
- Presence of horizontal gas pipework

Typical recorded densities of waste from a range of landfills around Ireland have recorded values of between 0.7 tonnes/m^3 and 1 tonne/m^3. Using the parameters listed

above with relevance to this landfill and taking into account that the principal of BAT will be used through the lifespan of this landfill site a value of 0.85tonnes/m^3 is used for the purpose of this EIS giving:

$$220670.266m^3 \times 0.85 \text{ tonnes}/m^3 = 187{,}569.729 \text{ tonnes}$$

Cell 3 and Cell 4 are designed to take account of leachate generation, the cells are divided by a bund, which will contain leachate within separate cells during operation and prevent surface water, which may be collected in an unused cell, being contaminated.

2.7.3 Landfill Gas Generation

Landfill gas is created in the course of the biological conversion of organic components in the deposited waste. The formation of landfill gas creates an overpressure in the landfill body. As a result of this overpressure the landfill gas expands within the landfill body and migrates into the environment via the air paths or channels in the earth. The landfill gas primarily consists of methane and carbon dioxide. However landfill gas also contains aromatic substances and trace elements. Methane gas is combustible and creates an explosive mixture in concentrations between 5-15% volume. Carbon dioxide is a suffocating gas. Uncontrolled gas migrations can cause unpleasant odours or lead to major health risks.

Annex 1(4)of the EU Directive on the landfill of Waste (99/31/EC) deals with gas control and specifies that all landfills receiving biodegradable waste will have the gas collected, treated and used or, as a minimum, flared. Cell 3, which is in use, is currently only vented via horizontal gas drainage pipes in the landfill body. The entire installed gas extraction system is operated as an active gas extraction system. An exhauster positioned before the flare creates negative pressure in the gas wells and the horizontal gas drainage pipes which then actively extracts the landfill gas from the landfill body. The gas condensate which forms as a result of the cooling in the pipes during the gas extraction / transport is returned to the landfill at knock out points (KOP) or pumped into the leachate storage tank. The active gas extraction maintains a pressure balance within the entire landfill body. The overpressure generated by the gas production is absorbed by the negative pressure, so that gas can no longer escape from the landfill. Regularly checking the negative pressure and the gas concentration of the individual gas wells enables a uniform ventilation of the landfill body.

The rate of gas generation varies depending on the size and height of the landfill, rate of filling, age of waste, moisture content, pH, temperature, Oxygen and the degree of cover. Under optimum conditions one tonne of degradeable waste can theoretically produce 400-500m^3 of landfill gas (including moisture content). In practical terms the rate at which landfill gas may be collected for utilisation purposes may be much lower. Currently at Corranure Landfill an enclosed landfill gas flare is treating in the region of 1,200m^3/hr of bulk landfill gas generated from the old Landfill (Cell 0, 1 and 2) in addition to the active Cell 3. The Landfill Gas management Plan completed by RPS in

October 2007 calculates the Gas production from Corranure Landfill (Volume III, Appendix 9 'Landfill Gas Management Plan')

Gas will continue to be generated for between 20 and 50 years after placement, (depending on the aforementioned site conditions), with a peak in production after 2 to 5 years. The expected composition of the landfill gas as per the 'EPA Landfill Site Design Manual 2000' is presented in Table 2.10

Table 2.10 Typical Chemical Composition of Landfill Gas

Component (% Volume)	Typical Value(% Volume)	Observed Maximum (% Volume)
Methane	63.8	88
Carbon Dioxide	33.6	89.3
Oxygen	0.16	20.9
Nitrogen	2.4	87
Hydrogen	0.05	21.1
Carbon Monoxide	0.001	0.09
Ethane	0.005	0.0139
Ethene	0.018	-
Acetaldehyde	0.005	-
Propane	0.002	0.0171
Butanes	0.003	0.023
Helium	0.00005	-
Higher Alkanes	<0.05	0.07
Unsaturated Hydrocarbons	0.009	0.048
Halogenated Compounds	0.00002	0.032
Hydrogen Sulphide	0.00002	35
Organosulphur Compounds	0.00001	0.028
Alcohols	0.00001	0.127
Other	0.00005	0.023

Source: Environmental Protection Agency 2000. Landfill Site Design.

Possible utilisation of landfill gas will be examined.

It is proposed Landfill Gas monitoring is undertaken on a monthly basis by BHP monitoring services at a no.gas extraction boreholes located within the waste body of Cells 3 and 4. Analyses were preformed on each sample for methane (CH_4), carbon dioxide (CO_2), oxygen (O_2), temperature and pressure. The results of analysis for the existing landfill conducted by BHP in 2008 are contained in Volume III, Appendix 10.

Drawing No. 102 Monitoring locations shows the locations of perimeter boreholes that will be used to monitor off-site gas migration. The emission limit values for off-site gas migration in the Waste Licence are 1%v/v for methane and 1.5%v/v for carbon dioxide. As shown in Volume III, Appendix 10 (BHP Monitoring Results) methane levels obtained during the reporting for 2008 were within the 1%v/v limit at all locations.

However, carbon dioxide levels were exceeded during the reporting period on a no. of occasions, at locations G01, G06, G03 and GW05.

2.7.4 Leachate Generation

Cell 3 is currently active with an open surface with infiltration of water. Approximately 60-80 % of the rainfall transforms into leachate, depending on the degree of evaporation. In this case large amounts of precipitation water transform into infiltration water after long periods of rainfall or heavy rain. It is mandatory to collect the leachate in a liner system within the landfill to minimise the risk of groundwater pollution, as per the EU Directive on the landfill of Waste (99/31/EC)

A comprehensive leachate collection system has been installed in the Cell 3 area which prevents leachate from contaminating the groundwater close to the surface. The leachate management system will include monitoring, collection and recirculation infrastructure, removal of leachate from each cell, storage capacity of raw leachate in a covered engineered lined tank, discharged to a local municipal wastewater treatment facility.

Cell 3 is constructed with a base seal. This base seal was constructed in accordance with the requirements of the license W077-02. The requirements on the base seal systems from the licences listed above comply with the specifications of the Council Directive1999/31/EC. Thus sealing systems were created in Cell 3 through which leakage and thus any risk can be almost entirely ruled out. As the leachate in Cell 3 is transported out of the landfill body via pumps the only risk of groundwater contamination lies in the fact that a failure of the pumps could result in leachate building up in the landfill body and then overflowing from the facility grounds. The possibility of leachate overflow exists if a combination of different events such as the failure of the power supply to the landfill as a result of a lightning strike during a thunderstorm in combination with heavy rainfall were to occur. However as the surface of the facility lies approximately 7 m below the surface of the terrain and thus provides a high leachate storage potential, there is little danger of leachate overflow.

2.7.4.1 Leachate Formation

The formation of leachate depends on several factors, principally on the area of the landfill, the meteorological and hydrogeological factors and the effectiveness of the capping. The main factor is the quantity of rainfall in the region. The leachate transformed of rainfall is called “climatic caused leachate”. The rainfall in the region of Cavan is between 800 – 1000 mm in the year. Other factors for the quantity of new leachate generated are the evaporation and the retention capacity of the waste.
There are three phases to the completion of a landfill cell.

Phase 1: The building of the cell is completed. The drainage layer is in place but there is only a small quantity of waste deposited. In this phase the evaporation is low. The drainage material has a high permeability and a small surface. The evaporation rate is between 25 % and 60 %. It averages at approximately 35 %. So the transforming of

rainfall into leachate is about 65 %. But this phase is limited to a very short period of time in comparison to the lifetime of a cell or the aftercare.

Phase 2: The commencement of the landfilling process. The first layer of waste (1-2 m) is disposed in the landfill cell. So the drainage layer is covered with waste. A waste-surface has an evaporation rate between 60 % and 80 %. So the building of leachate is up to 40 % of an annual rainfall.

Initially the waste has a very high retention capacity. This retention capacity of the waste decreases during the time the waste is disposed in the cell. After a period this stored rainfall is discharged. This discharging is due to the increased load on this waste and the biological process undergoing in the waste. But these leachate quantities are low in comparison with the climatic caused leachate.

In Cavan there is 1,000 mm rainfall in a year = 20 – 40 % leachate = 200 – 400 mm / m² leachate and year. This is a leachate yield factor of about 0.55 – 1.1 l/m² each day for a landfill cell in operation. But the main factor for the quantity of leachate is evaporation. This evaporation depends on the parameters like temperature or humidity.

Phase 3: This is the last phase of a landfill cell. Here the cell is capped with a LLDPE-liner so rainfall and climatic caused leachate formation is eliminated. The biological reaction of the waste causes the formation of new leachate. This conversion together with the weight of the waste and the load of the capping material leads to a consolidation of the waste body. The leachate which was stored in the waste body is thereby released. In literature there is a leachate yield factor for this formed leachate of less than 0.1 l/m² per day. In the initial time period after capping the cell, this yield rate would be between 0.1 and 0.3 l/m² because of the leachate in the waste body what was not stored and is just seeping through the waste.

It is essential that the volume of leachate generated be kept to a minimum. The design and operation of the landfill should ensure that the ingress of both ground and surface water is minimised and controlled. The Leachate Management Plan completed in October 2007 by RPS consultants calculated the Leachate Generation form Corranure Landfill. This report is attached in Volume III, Appendix 12.

2.7.4.2 Leachate Composition

Leachate composition varies due to a number of different factors such as the age and type of waste and operational practices at the site.

The conditions within a landfill vary over time from aerobic to anaerobic thus allowing different chemical reactions to take place. Most landfill leachates have high BOD, COD, ammonia, chloride, sodium, potassium, hardness and boron levels. Ammonia is a contaminant, which may be used as an indicator of contamination, particularly in terms of surface water, as it can be toxic to fish at low concentrations (1 mg/l). Chloride is a mobile constituent, which is often used as an indicator of contamination. The leachate

from non-hazardous waste landfills may produce reducing conditions beneath the landfill, allowing the solution of iron and manganese from the underlying deposits.

Leachates from landfill sites for non-hazardous waste often contain complex organic compounds, chlorinated hydrocarbons and metals at concentrations which pose a threat to groundwater and surface waters. Solvents and other synthetic organic chemicals are a significant hazard, being of environmental significance at very low concentrations and resistant to degradation.

Samples of leachate were taken from the leachate tank on four occasions during July 2007 and analysed for a suite of parameters (as per Waste Licence W077-02). Overall values for the various parameters are at the lower end of the expected range of values for leachate as per the EPA Landfill Site Design Manual, 2000 (see Table 2.11 below) BHP Monitoring Results are in Volume III, Appendix 10.

Table 2.11 Typical leachate composition of 30 samples from UK/Irish Landfills accepting mainly domestic waste (1992 figures)

Determinand	Units	Mean Value
pH- Value	-	7.2
Conductivity	µs/cm	7789
Alkalinity	mg/l	3438
COD	mg/l	3078
BOD 20	mg/l	>834
BOD 5	mg/l	>798
TOC	mg/l	717
Fatty Acids (as C)	mg/l	248
Kjeidahl-N	mg/l	518
Ammoniacal	mg/l	491
Nitrate-N	mg/l	2.4
Nitrite-N	mg/l	0.2
Cyanide	mg/l	<0.05
Sulphate	mg/l	136
Phosphate	mg/l	3
Chloride	mg/l	1256
Boron	mg/l	7
Sodium	mg/l	904
Magnesium	mg/l	151
Potassium	mg/l	491
Calcium	mg/l	250
Vanadium	mg/l	0.73
Chromium	mg/l	0.07
Manganese	mg/l	1.99
Iron	mg/l	54.5
Nickel	mg/l	0.1
Copper	mg/l	0.04
Zinc	mg/l	0.58
Arsenic	mg/l	0.008
Cadmium	mg/l	<0.01
Tin	mg/l	5.4
Mercury	µg/l	0.1
Lead	mg/l	0.1
Aluminium	mg/l	<0.1
Silicon	mg/l	11.9

Source: EPA Landfill Operational Practices Manual, 1997.

2.7.4.3 BOD / COD Ratio

In general, the BOD-load increases on deposition of municipal waste in the cell. This becomes the acidogen phase. In this phase the substances which are readily biodegradable are degraded and there are high BOD and COD loads. In this acidogen phase the BOD / COD-ratio is about 0.5 – 1.0.

With the start of the methanogen phase (just before closure of the cell) the BOD / COD ratio decreases obviously. In this phase the BOD / COD-ratio is 0.15 – 0.05. Similarly the BOD load in the leachate decreases when the methanogen phase starts. In general the BOD load is reduced at about 30 % from the acidogen to the methanogen phase. But these absolute values are very strongly influenced by the composition of the waste emplaced in the Landfill.

Monitoring results of the analyses of the leachate show the BOD/COD ratio varies from 0.181 to 0.809 this gives a good indicator about the absolute loads and the BOD / COD ratio in the lifetime of a landfill cell.

2.7.5 Surface Water Generation

The existing soil is characterised by heavy clay soil with little rainwater acceptance potential resulting in little infiltration in the existing site. Surface water from the proposed development will be generated mainly from the rainfall running of the side slopes of the landfill and from paved areas. The area contributing to surface water run-off will increase with time as the landfill is progressively developed, subsequently capped and restored.

All surface water will be collected by surface water drains connected to the drainage layer within the capping system, surface water run-off shall be diverted to a silt trap and an oil interceptor prior to discharge from the facility. The quality of the surface water will be monitored prior to and after discharge as required.

Effluent from the wheelwash facilities and waste inspection areas will be regarded as leachate and as such will be diverted to the leachate management system. Run-off from administration buildings and hardstandings areas to include the surfaced roads around the site will be passed through an oil/petrol interceptor prior to discharge from the site.

Where practicable the surface water generated will be collected and stored for reuse on site. Collected water will be used for fire control measures, dust control and measures will be investigated so water may be reused in the wheel wash system.

2.7.6 Lining System

To comply with the EU Landfill Directive, a landfill must be situated and designed so as to meet the necessary conditions for preventing pollution of the soil, groundwater and surface water and to ensure efficient collection of leachate.

The lining system will consist of the following as per Condition 3.11 of the Waste Licence W077-02:A composite liner consisting of 1m layer of compacted soil with hydraulic conductivity of less than or equal to $1x10^{-9}$m/s, (or equivalent to be agreed by the agency) overlain by a 2mm thick high density polyethylene (HDPE) layer.A geotextile protection layer placed over the HDPE layer

- A 500mm thick drainage layer placed over the geotextile layer with minimum hydraulic conductivity of less than or equal to $1x10^{-3}$m/s, of pre-washed, uncrushed, granular, rounded stone(16-32mm grain size) incorporating leachate collection drains and
- The side walls shall be designed and constructed to achieve an equivalent protection

The site consists of low permeability stiff brown sandy, gravelly clay with boulders and cobbles (Boulder Clay). The thickness of the Boulder Clay varies between 8m and 18m. The bedrock consists of brown highly weathered shale and grey fractured greywacke. These lithologies are consistent with both the Coronea and the Red Island Formation, which are reported to be underlying the site, which are provisionally classed as a poor aquifer (PI). The vulnerability rating of the bedrock is low to moderate.

Variable head permeability levels undertaken indicate the overburden to have low permeability values (2.8×10^{-06} to 1.5×10^{-09} m/s). Laboratory permeability testing on compacted samples have indicated lower permeability values of 1.0×10^{-10} m/s which are consistent with previous permeability results on the site. Similar to the construction of the current cell, it is propose to use re-compacted in-situ boulder clay within the composite liner system. It is expected that the cells will be formed at 3-5m below existing ground level.

2.7.7 Capping of Cells

Factors which influence the rate of infiltration of rainfall into the waste and hence the generation of leachate are topography and configuration of the final top cover, which will affect the site's runoff pattern and the amount of water percolating into the landfill. Generally, steep slopes allow for high surface water run-off.

At present the waste is only partially covered by a layer of daily cover soil. In order to reduce the volume of leachate generated in the waste the final cover should consist of a low permeable layer to reduce infiltration of rainwater and to increase surface water run-off.

The following capping system is required under the current Waste Licence (W077-02) and is consistent with the Landfill Site Design Manual (2002).

- Top soil (150-300mm);
- Subsoils such that the total thickness of topsoil and subsoils is at least 1m;
- Drainage layer of 0.5m thickness having a minimum hydraulic conductivity of $1x10^{-4}$ m/s;
- Compacted mineral layer of a minimum 0.6m thickness with a permeability of less than $1x10^{-9}$ m/s or a geosynthetic material (e.g. GCL) that provides equivalent protection; and
- Gas collection layer of natural material (minimum 0.3m) or a geosynthetic layer

It is proposed that a similar capping system will be provided for Phase 3 unless otherwise agreed with the EPA

2.8 Environmental Nuisances

2.8.1 General

Environmental issues associated with the day to day operation of the Integrated Recycling Facility are as follows:

- Odour & Emissions to Air
- Noise
- Dust
- Litter
- Vermin
- Foul and Surface Water Management and Emissions
- Leachate
- Fuel Storage
- Energy and fuel consumption

Operations at Corranure Landfill are subject to the conditions of the current waste licence and any additional controls conditioned as part of the new waste licence will also be implemented. A complaints register is maintained at the main administration building, detailing any complaint received from the general public in respect of the operation of the facility.

2.8.2 Bird Control

Birds can be attracted to waste management facilities if there is available food for them to scavenge. The active landfill is an attraction for birds and daily controls on site control the bird population. The following applies to the landfill:

- One working face at any one time for the deposit of waste
- All waste deposited is compacted and covered as soon as practicable
- Any cover material which is eroded, washed off or otherwise removed is replaced at the end of the working day
- Bird scaring techniques are employed every day during operation.
- The surface water attenuation pond has been sized to ensure that it is not an attractant to bird.

The requirement for bird scaring techniques will be kept under constant review an all existing and new technology will be considered for use at the site on consultation with the EPA.The waste accepted at the BTF includes foodstuffs. However, all such waste will be delivered and removed from the facility in fully enclosed vehicles and all of the waste handling and storage activities will be carried out indoors. There will be no external handling or storage of waste that contains materials attractive to birds. The treatment processes in the BTF will be completely enclosed. All treated materials will be removed off-site in covered trucks. The MRF will not be handling material that is an attractant to birds.

2.8.3 Odour Control

Odour is the most significant environmental nuisance associated with the day to day operation of a Landfill facility. It also has the greatest potential to create a local nuisance and in turn result in complaints to both the facility and to the EPA.

The perception of odour as a nuisance will depend on a number of factors, such as the concentration of that substance in the atmosphere, the frequency of releases, the form of the release (intermittent or continuous) and the sensitivity of the individuals impacted. For each substance there is a limiting concentration in air below which its odour is not perceptible. This is generally referred to the odour threshold of a substance.

Over one hundred trace constituents have been identified in landfill gas and similarly for leachate. Unpleasant odours are usually associated with the sulphur-containing compounds, primarily mercaptans and sulphides. These compounds also have the lowest odour threshold concentration making them the most likely source of unpleasant odours detected in landfill gas. Organic acids and aldehydes may also be significant contributors to odours at landfills.

Odours from a landfill may be caused by:

- Arriving and queuing refuse vehicles
- Depositing odorous waste
- Working face
- Landfill gas emissions from temporary covered areas
- Landfill gas emissions from cracked and vents in capped cells
- Excavated old waste
- Landfill gas vented without combustion
- Gas well construction
- Leaking gas wells and collection piping
- Malfunctioning flares and utilisation plants
- Leachate collection and treatment systems (e.g. uncovered lagoons or wells)
- Associated landfill activities (e.g. composting)
- Odour masking agents

The following measures have been implemented to eliminate and or reduce potential odour nuisance at the facility.

Landfill gas is managed on site by means of landfill gas infrastructure as per the Gas Management Plan and Odour Management Plan Volume III, Appendix 9 & 11.

- Landfill Gas is monitored by site personnel daily and reported monthly to the EPA
- The flare is an enclosed type design and is tested annually

- An Odour Survey is completed annually or more frequently as requested by the EPA.
- An Odour Patrol Survey is completed both on and off site and recorded daily
- The leachate storage tank is enclosed
- Minimise the working face
- Daily and intermediate cover
- Covering waste lorries delivering waste to site,
- Effective landfill gas management system, with effectively sealed wells and pipework
- Effective leachate management system, with sealed wells, covered leachate storage tank, and odour suppression dosing system
- Phased Landfill Restoration Plan to reduce the landfill gas being emitted by capping cells on a phased basis.

Once the BTF is operational the volume of organic material to the landfill will be reduced and therefore odour emissions should decline. In the Biological Treatment Plant all exhaust air will be diverted through odour abatement units prior to discharge to the ambient atmosphere. With respect to the BTF, generally, the main reasons for the occurrence of (excessive) odour emissions from composting facilities are:

- Existence of anaerobic conditions in the fresh biowaste or in the composting material;
- Composition of the biowaste in the composting process, especially:
- High concentrations of sulphur components containing materials;
- High concentrations of nitrogen containing components causing ammonia emissions
- Temperatures in the composting process exceeding 65°C.

Consequently, the main measures for reducing odour emissions can be divided into four categories:

1. Management of the fresh biowaste handling and influencing the composition of the material fed into the composting process
2. Prevention of anaerobic conditions, i.e. allow sufficient passive or active aeration of the composting material and prevention of very wet process conditions
3. Monitoring and maintaining of temperature below 65°C
4. Application of emission reduction techniques

As long as the biowaste is contained in a waste collection/transport vehicle, it will not lead to odour emissions, since the material is not being handled outdoors. However, unloading of the material at the site and further handling may lead to odour emissions. To prevent emissions to the surroundings, the acceptance/unloading of all biowaste will be carried out indoors under negative pressure. The mixing of the biowaste prior to composting/digestion will be executed in the same enclosed building. The reception hall will be equipped with air ducts in the top of the roof, which collect the hall air and transport the air to an odour abatement unit, e.g. a biofilter. Since the hall will be under

slight negative pressure, the emissions via open doors will be minimised. To prevent delivered biowaste from getting anaerobic and odorous, all biowaste will be pre-treated and treatment will commence within one day of arrival and acceptance at the facility.

The input to the composting facility will vary. Appropriate mixing of waste streams prior to composting will be required to allow for a proper composting process and for the production of the desired quality compost. However this mixing is also essential to minimise odour emissions. The mixing will ensure that the composting mass:

- Has the appropriate dry solids content and has an adequate porosity, such as to facilitate the aeration process and prevent the formation of anaerobic zones in the composting mass during the process;
- Has the appropriate C/N-ratio to prevent excessive emissions of N-containing odour components;
- Has sufficiently low sulphur content. This will be achieved by diluting sulphur containing feedstock with other feedstock.

The first stage of the composting will be the most critical with respect to odour emissions, since easily biodegradable components, e.g. sugars, proteins and fats are degraded at a high rate, thus causing gaseous by-products.
For the composting process, treatment will be executed in a completely enclosed environment (e.g. composting tunnels, composting containers, etc.) or post-composting area. Applying a high aeration rate, thus ensuring the supply of sufficient oxygen to the composting mass, will prevent occurrence of anaerobic conditions. As the composting process proceeds in the post-composting area, less easily biodegradable components are degraded (e.g. cellulose structures) at a lower rate, reducing the risk of anaerobic conditions. The air supplied to the post-composting area in the later stages of the process can be regulated as required. All process air from the composting bays will be collected and treated by the odour abatement system.

If during composting, temperatures exceed by approximately 65°C odour emissions increase significantly due to the changes in process biochemistry. Excessive increase in composting temperatures will be especially relevant during the first stage in the compost tunnels when, due to the fast degradation, a lot of energy will be released. Temperature sensors will be used to measure the temperature during the treatment process and subsequently in the post-treatment area. The computer control system ensures that the composting temperature will not exceed 65°C, by adding more fresh process air to the biowaste. This reduces the odour load in the process air, which will be transported to the biofilter.

Due to the slow degradation in the maturation stage, temperatures will normally not raise above 65°C. If this happens incidentally, the variable blowers will increase the fresh process airflow to cool the maturating biomass.

2.8.4 Air Emissions

The BTF includes an odour control system based on biofiltration that is a simple and effective way of controlling the odour of the waste air coming from the building and process. Various designs are used to enhance the efficiency of the odour control system:

- The waste receiving operations take place in an enclosed area provided with a double-door system. The opening of the doors is synchronized to prevent odours escaping. Quick-closing doors are used in this area in order to reduce uncontrolled odour emissions
- All process phases take place in enclosed buildings provided with suction systems keeping the same buildings under negative pressure at all times, therefore avoiding external odour nuisance. The air sucked from the buildings is treated by a scrubbing unit followed by an ample biofilter
- Two independent biofiltration systems are provided, to make sure that in the event of an emergency shut-down, there is at least 50% available capacity. The biofilters are covered with a flexible membrane that protects them from the weather and conveys the treated air to the stack. This cover can be easily removed in case of a shut-down of the axial fan installed at the base of the stack
- The fans of the biofiltration system are designed with a 20% margin above their nominal capacity
- The size of the biofilters is very conservative and the resulting low speed of the air through the biofiltration media allows not only for superior odour control, but also for a reduction in the content of spores and bacteria remaining in the air discharged by the stack
- Dust is controlled by a bag filter prior to scrubbing and biofiltration
- Bioaerosols are controlled by reducing the speed of air though the biofilters

The facility includes an odour control system based on biofiltration that is a simple and effective way for controlling the odour of the waste air coming from the building and process. Various designs are used to enhance the efficiency of the odour control system:

Measures will be taken to ensure the marshalling yard will be kept clean and clear at all times. Use of approved odour control substances will be implemented both on the landfill face and any road surfaces where odour is detected.

Any complaints received at the facility will be dealt with promptly and immediate corrective action will be taken as per the Odour Monitoring and Control Procedure and Emergency Response and Corrective Action Procedures.

2.8.5 Noise

Noise monitoring is currently completed as per the noise monitoring requirement of the EPA Waste Licence (W077-02) and control procedures at the facility will be increased to control and reduce noise emissions in compliance with the new EPA Licence.
The main causes of noise nuisance at the facility will come from the following sources:

- Vehicle Tipping
- Traffic Movement on-site
- Plant and machinery
- Surrounding Traffic
- Processes in the recycling building

All Vehicles will be required to enter and leave at the speed limit of 10km/hr as per Waste Acceptance Procedures. All tipping will take place inside the facility so as to reduce external noise. All plant, machinery and fans etc. associated with the process will be designed to produce minimum noise and will be maintained to a high standard to ensure continuous compliance with emission limit values of the EPA licence.

The proposed design for the new facility building provides for reduced noise emissions as follows:

- All treatment and handling operations are conducted inside a building which is totally enclosed, thus the emission of noise from mobile and stationary equipment is controlled;
- The fans which treat the process air of the biotunnels and the curing areas are installed under a roof and segregated by walls from the outdoors;
- The two biofilter fans have a wheel casing insulated with noise control liner and their rotation speed is low.

2.8.6 Dust Emissions

A dust monitoring programme is currently active at the landfill with dust monitoring completed at the boundary area of the existing site. Oxigen Environmental will undertake a full review of the dust control requirements at the facility once operational and implement any necessary extra control measures.
Oxigen Environmental will implement additional dust monitoring and control procedures at the facility as per monitoring requirements of the EPA Licence.

- In dry weather, site roads and any other areas used by vehicles are sprayed with water as and when required to minimise airborne dust nuisance.
- All vehicles exiting the facility use the wheelwash
- During the routine inspections for litter, an inspection of the access road and the facility will be inspected for mud deposition, especially during periods of wet weather. Any mud will be removed through the washing of the area.

2.8.7 Litter Control

Litter procedures are currently in place to prevent litter nuisance at the facility or in the immediate area of the facility.

- The road network is kept free from debris caused by vehicles entering or leaving the facility, any debris is removed immediately
- Loose waste is immediately compacted as it is deposited on the landfill site, the maintenance of the active tipping area no more than 25 meters wide (as per EPA licence W077-02) and the daily covering of all waste.
- The active tipping area will be covered on a daily basis with inert material or an alternative mineral layer (e.g. recovered material from construction and demolition waste).
- All waste in non-active areas of the landfill will at all times be covered with soil or an alternative mineral layer.
- All wastes will be delivered to the site in covered vehicles. Any driver delivering uncovered waste will be deemed to be in breach of contract and appropriate action will be taken by Oxigen.
- Litter fencing is installed and maintained around the perimeter of the active tipping area, this infrastructure is inspected on a daily basis.
- All loose litter or other waste is removed, subject to agreement of the landowners, immediately and in any event by 10.00am of the next working day after such waste is discovered.
- Staff at the site will regularly patrol the public roads to ensure that there is no litter emanating from vehicles using the facility.

All waste delivered to and transferred off the different facilities will be in fully enclosed or covered vehicles. All waste handling operations at the BTF and MRF, including waste loading and off loading and processing, will only be carried out inside the buildings. In the event of an incident that results in windblown litter, each facility will be responsible to ensure its immediate collection. A daily litter patrol of the site perimeter and access road will be undertaken. Where the escape of litter has occurred it is immediately collected and returned to the site. Litter nuisance on site will be closely monitored and controlled as per Litter Control Procedures.

2.8.8 Vermin Control

Vermin and insects can potentially be a problem where putrescible waste is not handled properly. However, this usually arises where waste is either being disposed of (landfill) or being stored for long periods of time. Strict management and mitigation measures will be put in place to control vermin in the vicinity of the landfill and Civic Amenity site.

These include the following:

- Professional vermin control experts are currently employed on site and bait is laid at regular intervals 8 times a year. If vermin are noted on site this is employed at more regular intervals.
- Biodegradeable insecticide is sprayed on exposed waste in the active cell during the summer months. This may also be required at neighbouring house s and is completed on request of individuals.

Material entering the MRF may be stored on-site overnight, it will be stored in sealed trailers inside the building which will minimise the potential to attract vermin. The floor of the building and in particular the area handling mixed waste will be swept and washed down at regular intervals.

There will be no long-term storage of putrescible waste in the BTF. The treatment processes will be completely enclosed. All plant equipment and tipping areas will be cleaned regularly.

As a preventative measure each facility will employ a pest control contractor to implement vermin control measures on a routine basis. Each facility will be inspected daily for the presence of insects or vermin and de-infestation measures will be implemented as necessary. Records of any such pest control will be kept by at the facility.

Vermin/fly/insect control and monitoring procedures and associated complaints handling/corrective action forms will be implemented at the facility.

2.8.9 Foul and Surface Water Management and Emissions

Significant risks to surface water and sewer at the facility are caused by run off/leakage from waste collection vehicles, leachate from waste, fuel/chemical spillage, and bund failure.

Surface water monitoring and inspection procedures will be implemented at the facility as well as emergency type specific Corrective Action procedures to reduce any risk posed by a single incident. Chemical control procedures will also be implemented to reduce the possibility of a chemical spill on site.

All drainage infrastructure including interceptors, silt traps and aco drains will be installed at the facility to ensure that all required control measures are in place to significantly reduce the risk of surface and sewer water emissions outside the limits set by the EPA Licence.

Water Conservation and Waste Water Reduction will be attained at the BTF facility through the following design measures:

- The waste water generated is treated (screened and filtered) and reused for adding moisture to the material that is going through the composting process. The reuse of waste water cannot be 100% because of the limitations given by the ABPR
- To minimize the use of fresh water, the Facility is provided with a collection and storage system for the weather precipitations
- The two biofilters are covered to prevent the production of waste water deriving from the weather precipitations

2.8.10 Leachate Control

Leachate from the current landfill is stored in an enclosed storage tank, this leachate is discharged in agreement with Cavan County Council to the Cavan Wastewater Treatment Plant. In the event of an emergency the leachate can be tankered offsite to the Treatment Plant, or alternative facility agreed in advance with the EPA. Oxigen Environmental will maintain a leachate management system in accordance with the conditions of the waste licence (W077-02) and the existing Leachate Management Plan currently in place.

The design of the composting facility allows for leachate to be utilized providing moisture to the treatment process. The leachate and water treatment system is designed so as to maintain the zero cross-contamination principle. Contaminated water is only used to provide moisture prior to the first temperature barrier, then only fresh water or water from the rain water collection tank is used. After any use of contaminated water, the piping system is cleaned with fresh water.

All leachate will be diverted to the existing leachate collection tank from where it will be re-used as above or discharged to Cavan Wastewater Treatment Plant in accordance with the conditions of the waste licence and in agreement with Cavan County Council.

2.8.11 Other

In addition to the measures and controls outlined above, Oxigen Environmental will implement strict and responsible operational procedures at the facility, to ensure safe, efficient and environmentally safe activities. All areas of operation including waste acceptance, waste transfer and deposition on-site, equipment operation and maintenance, health and safety and training will be carried out in such a way that is in compliance with the EPA licence and does not pose any significant risk to the environment. Emphasis will be placed on energy reduction and emission control.

All staff will follow a strict reporting structure with clear and open channels of communication through line management.

2.9 Environmental Monitoring

2.9.1 Introduction

The following sections describe the proposed monitoring programmes to be established at the Integrated Recycling Facility. All environmental monitoring will be carried out under the conditions of the waste licence for the facility issued by the EPA. Emission Limit Values (ELV) will be set by the EPA for many of the parameters to be monitored. Exceeding these values will be judged by the EPA to be a noncompliance with the Waste Licence.

The primary aims of this monitoring programme are to comply with legislation and the requirements of the EPA and to monitor the quality of the environment in the vicinity of the facility and identify any adverse impacts from the development of the facility.

Monitoring will incorporate the Existing Waste Licence (W077-02) requirements as per Schedule D: Monitoring. This section covers monitoring locations, parameters, frequency (See Volume III, Appendix 13, 'EPA Licence W077-02') with additional monitoring added and included as deemed necessary. As part of the Waste Licence, an Annual Environmental Report (AER) will be formulated that will collate and report all monitoring data each year. A comparative assessment will be made with data from previous years. This report will also be submitted to the EPA.

It is intended that all sampling will be carried out by trained personnel from a suitable firm of consultants and that all analyses, with the exception of on-site readings, will be carried out by an accredited laboratory.

It should also be noted that the monitoring programme as outlined below may be changed by the conditions of the Waste Licence but it is envisaged that it will be largely similar to that outlined herein. Drawing No.102 outlines the monitoring points for the site, with Drawing No. 100 Surface Water monitoring points-Corranure Stream and Drawing No. 101 Surface Water monitoring points-Lismagratty Stream.

2.9.2 Dust Monitoring Programme

Dust will be monitored using Bergerhoff gauges, as specified in the German Engineering Institute VDI 2119 document "Measurement of Dustfall Using the Bergerhoff Instrument (Standard Method)". It is proposed that gauges will be installed around the site at the locations shown on Table 2.12 with the grid references tabulated below.

Table 2.12 Dust Monitoring Locations

Monitoring Point	Grid Reference	Monitoring Frequency	Analysis Method/Technique
D1	244261, 307710	Three times a year	Standard Method
D2	244183, 307944	Three times a year	Standard Method
D3	244438, 307859	Three times a year	Standard Method
D4	244508, 307745	Three times a year	Standard Method
D5	244100, 308423	Three times a year	Standard Method
D6 (Proposed)	244528, 308078	Three times a year	Standard Method

It is proposed that dust monitoring will take place three times per annum, twice between the months of May to September during which period dust generation can be most problematic.

In addition to the above the site and adjoining roads will be inspected on a daily basis for evidence of excessive generation of airborne dust.

2.9.3 Surface Water Monitoring

Surface water quality will be monitored both upstream and downstream of the proposed Integrated Recycling Facility during the operational life and as agreed by any subsequent closing licence. The surface water monitoring points to be used for chemical monitoring are outlined below for both the Corranure and Lismagratty Streams.

A visual inspection of all surface water streams on and adjacent to the site will also be carried out by site personnel on a weekly basis.

Table 2.13 Surface Water Sampling Locations

Monitoring Point	Grid Reference	Monitoring Frequency	Analysis Method/Technique
SW1	244132, 307466	monthly, quarterly, annually	Standard procedures
SW2	244325, 308642	monthly, quarterly, annually	Standard procedures
S3	245165, 309483	quarterly, annually	Standard procedures
S4	242407, 306009	quarterly, annually	Standard procedures
S5	243508, 307378	quarterly, annually	Standard procedures

- The surface water sampling locations will be tested in accordance with industry standard protocols and guidelines prepared by the EPA. Samples will be handled and transported in accordance with the same accepted protocols;
- The surface water sampling locations will be sampled Monthly, Quarterly and Annually for the range of parameters as listed in D.5 Surface Water, Groundwater and Leachate –parameters / frequency as per Waste Licence W077-02 (Volume III, Appendix 13).
- In the event of the facility closing down, surface water monitoring will continue at six month intervals until a closure license has been issued by the EPA. After care and monitoring of the facility once it has closed down would be agreed as part of the closing licence.
- It is also proposed to collate, tabulate and report the data including interpretation and comparison with the previous year's data. This information will be presented in the AER, which will also be submitted to the EPA.

In addition to the above a visual inspection of the surrounding surface water will be carried out on a daily basis to ensure that clay/mud/sand etc. is not impacting on the water quality during the construction phase. No additional monitoring of surface water will be required during the construction phase at the site.

2.9.4 Biological Assessment and Sediment Monitoring Programme

Biological Assessment and Sediment Monitoring points will be completed on the Corranure and Lismagratty Streams as follows to determine the invertebrate colony of the surface water environment on an annual basis.

The locations at which these samples will be obtained are shown on Table No. 2.14 with grid references tabulated below.

Table 2.14 Biological Assessment and Sediment Monitoring Locations

Monitoring Point	Grid Reference	Monitoring Frequency	Analysis Method/Technique
B1*	244120, 308450	Annually	EPA Q-Rating System
B2*	244530, 308860	Annually	EPA Q-Rating System
B3	245130, 309190	Annually	EPA Q-Rating System
B4	246100, 309600	Annually	EPA Q-Rating System
B5*	246600, 309700	Annually	EPA Q-Rating System
A1*	244662, 307928	Annually	EPA Q-Rating System
A2*	244164, 307484	Annually	EPA Q-Rating System
A3	243441, 307292	Annually	EPA Q-Rating System
A4	242861, 306700	Annually	EPA Q-Rating System
A5*	242405, 306018	Annually	EPA Q-Rating System

Sediment Monitoring only to be carried out at monitoring points marked with an asterisk and this is to be completed once off after commencement of the operations. Appropriate methods to be used for the assessment of stream sediments and in accordance with the Agency's Landfill Manual, Landfill Monitoring, 2nd Edition.

2.9.5 Groundwater Monitoring Programme

Groundwater quality will be monitored at the sampling locations as per the Waste Licence W077-02.

Proposed Monitoring Sites
For the location and reference points for the proposed monitoring points refer to Figure No. 102 Monitoring Points with grid references below.

Table 2.15 Proposed Groundwater Sampling Locations

Monitoring Point	Grid Reference	Monitoring Frequency	Analysis Method/Technique
GW02	244232, 307511	Monthly, Quarterly, Annually	Standard methods
GW04	243980, 308134	Monthly, Quarterly, Annually	Standard methods
GW05	244099, 308430	Monthly, Quarterly, Annually	Standard methods
GW06	244355, 308181	Monthly, Quarterly, Annually	Standard methods
GW07	244550, 307964	Monthly, Quarterly, Annually	Standard methods
GW08	244841, 307862	Monthly, Quarterly, Annually	Standard methods
GW09	244415, 307966	Monthly, Quarterly, Annually	Standard methods

Table 2.16 Private Well Monitoring Locations

Monitoring Point	Grid Reference	Monitoring Frequency	Analysis Method/Technique
PW02	244513, 308125	Annually	Standard methods
PW05BT	244157, 307500	Annually	Standard methods
PW08	244989, 307677	Annually	Standard methods
PW09	245024, 307632	Annually	Standard methods
PW10	245052, 307601	Annually	Standard methods
PW11	244982 ,307630	Annually	Standard methods
PW13	244665, 307808	Annually	Standard methods
PW15	243955, 307604	Annually	Standard methods
PW16	245047, 307620	Annually	Standard methods

Table 2.17 Surface Water, Groundwater and Leachate – Parameters and Frequency

PARAMETER	SURFACE WATER	GROUNDWATER	LEACHATE
	Monitoring Frequency	**Monitoring Frequency**	**Monitoring Frequency**
Visual Inspection/Odour Note 2	Weekly	Quarterly	Quarterly
Groundwater Level	Not Applicable	Monthly	Not Applicable
Leachate Level	Not Applicable	Not Applicable	Continuous
Ammoniacal Nitrogen	Quarterly Note 8	Monthly	Annually
BOD	Quarterly Note 8	Not Applicable	Annually
COD	Quarterly	Not Applicable	Annually
Chloride	Quarterly	Quarterly	Annually
Dissolved Oxygen	Quarterly	Quarterly	Not Applicable
Electrical Conductivity	Quarterly Note 8	Monthly	Annually
pH	Quarterly Note 8	Monthly	Annually
Total Suspended Solids	Quarterly Note 8	Not Applicable	Not Applicable
Metals / non metals Note 3	Annually	Annually	Annually
Cyanide (Total)	Not Applicable	Annually	Annually
Fluoride	Not Applicable	Annually	Annually
List I/II organic substances Note 4	Once off Note 5	Annually Note 5	Once off Note 5
Mercury	Annually	Annually	Annually
Sulphate	Annually	Annually	Annually
Total Alkalinity	Annually	Annually	Not applicable
Total P/orthophosphate	Annually Note 8	Annually	Annually
Total Oxidised Nitrogen	Annually Note 8	Not Applicable	Annually
Total Organic Carbon	Not Applicable	Monthly	Not Applicable
Residue on evaporation	Not Applicable	Annually	Not Applicable
Faecal Coliforms Note 10	Not Applicable	Annually	Not Applicable
Total Coliforms Note 10	Not Applicable	Annually	Not Applicable
Biological Assessment	Annually Note 6	Not Applicable	Not Applicable
Sediment Assessment	Once off Note 9	Not Applicable	Not Applicable

Note 1: All the analysis shall be carried out by a competent laboratory using standard and internationally accepted procedures.
Note 2: Where there is evident gross contamination of leachate, additional samples should be analysed.
Note 3: Metals and elements to be analysed by AA/ICP should include as a minimum: boron, cadmium, calcium, chromium (total), copper, iron, lead, magnesium, manganese, nickel, potassium, sodium and zinc.
Note 4: Samples screened for the presence of organic compounds using Gas Chromatography / Mass Spectrometry (GC/MS) or other appropriate techniques and using the list I/II Substances from EU Directive 76/464/EEC and 80/68/EEC as a guideline. Recommended analytical techniques include: volatiles (US Environmental Protection Agency method 524 or equivalent), semi-volatiles (USEPA method 525 or equivalent, and pesticides (USEPA method 608 or equivalent).
Note 5: 2 surface water locations, 3 groundwater locations and 2 leachate locations to be agreed by the Agency for these parameters.
Note 6: Appropriate biological methods (such as EPA Q-Rating System) to be used for the assessment of rivers and streams.
Note 7: Visual Inspection and Leachate Levels to be monitored at all leachate monitoring points specified in Table D.1.1. Leachate composition to be monitored at the leachate lagoon and two locations within the waste body.
Note 8: Monitoring at discharge points SW-1 and SW-2 shall be carried out monthly for these parameters.

Note 9: Appropriate methods to be used for the assessment of stream sediments and in accordance with the Agency's *Landfill Manual, Landfill Monitoring, 2nd Edition.*
Note 10: In the case where groundwater is extracted for drinking water, if there is evidence of bacterial contamination, the analysis at up gradient and downgradient monitoring points shall include enumeration of total bacteria at 22°C and 37°C and faecal Streptococci.

The main elements of the programme during the operational phase are as follows:

- The monitoring wells will be sampled in accordance with industry standard protocols and guidelines prepared by the EPA. Samples will be handled and transported in accordance with the same accepted protocols;
- The groundwater monitoring wells will be sampled Monthly, Quarterly and Annually for the range of parameters as listed in D.5 Surface Water, Groundwater and Leachate –parameters / frequency as per Waste Licence W077-02 (Volume III, Appendix 13)
- In the event of the facility closing down, monitoring will continue at six month intervals until a closure license has been issued by the EPA. After care and monitoring of the facility once it has closed down would be agreed as part of the closing licence;
- Data will be collated, tabulated, reported and maintained at the site. It is also proposed to present data within the AER, which will be submitted to the EPA.

No monitoring of groundwater additional to that outlined for the operational phase will be required during the construction phase at the site.

2.9.6 Noise Monitoring Programme

Noise monitoring will be carried out on an annual basis. Subject to licensing conditions imposed by the EPA there will be 4 No. noise monitoring locations with 7 additional Noise Sensitive locations. Noise monitoring will be completed as per the existing waste licence and include the following locations. Noise monitoring will be carried out at any other noise sensitive location as specified by the agency.

The proposed locations for noise monitoring are shown below in Table No. 2.18

Table 2.18 Proposed Noise Monitoring Locations

Monitoring Point	Grid Reference	Monitoring Frequency	Analysis Method/Technique
B1/NSL5	244463, 307791	Annual	Standard
B2	244231, 307989	Annual	Standard
B3/NSL3	244204, 307522	Annual	Standard
B4	244020, 308148	Annual	Standard
NSL1	244515,308114	Annual	Standard
NSL2	244765, 307840	Annual	Standard
NSL4	244420, 307947	Annual	Standard
NSL6	243952, 307615	Annual	Standard
NSL7	243559, 307937	Annual	Standard

Frequency analysis (1/3 Octave band analysis) will also be completed annually as per the International Standards Organisation. ISO 1996. Acoustics -description and measurement of Environmental noise. Parts 1, 2 and 3.

Additional noise monitoring will take place during the construction of each facility.

Noise monitoring will be undertaken, by suitably qualified persons.
The results of the noise monitoring undertaken at the facility and an interpretation of these results will be reported in the AER to be submitted to the EPA.

2.9.7 Landfill Gas within the Waste and Boundary Locations

Gas monitoring will include monitoring within Cells 3 and 4. Gas monitoring points will be installed in the waste body during and on completion of Phase 3 and these will be agreed in advance with the EPA in accordance with conditions of the Waste Licence.

Monitoring of Gas at boundary locations will include the points listed below, the number location of each point are subject to agreement with the agency and upon the proposed drilling works.

Table 2.19 Monitoring at Boundary Locations

Monitoring Point	Grid Reference	Monitoring Frequency	Analysis Method/Technique
G02	224297, 308020	Monthly	Infra Red Gas Analysis
G07	244252, 308065	Monthly	Infra Red Gas Analysis
G08	244183, 308126	Monthly	Infra Red Gas Analysis
G09	244076, 308139	Monthly	Infra Red Gas Analysis
G10	244082, 307939	Monthly	Infra Red Gas Analysis
G11	244125, 307903	Monthly	Infra Red Gas Analysis

2.9.8 Leachate Monitoring

Monitoring of Leachate will be in accordance with conditions as set by the Waste Licence and shall include the leachate storage tank and collection chambers. Monitoring point SE1 is located at the leachate storage tank (Grid reference E244377, N307864). Points within the waste body are yet to be finalised. These shall be installed in the waste body during and on completion of Phase 3 and these will be agreed in advance with the EPA in accordance with conditions of the Waste Licence.

2.9.9 Landfill Gas Enclosed Flare

The enclosed flare parameters and monitoring frequency is shown on Table No. 2.20 below, this monitoring is active in the current landfill site as per Waste Licence W077-02, also included is monitoring frequency for the Gas Utilisation Plant which is currently not in place at the existing landfill however may be added as the site develops.

Table 2.20 Landfill Gas Combustion Plant/Enclosed Flare

Parameter	Flare (enclosed)	Utilisation Plant	Analysis Method Note 1/ Technique Note
	Monitoring Frequency	**Monitoring Frequency**	
Inlet			
Methane (CH_4) % v/v	Continuous	Weekly	Infrared analyser/flame ionisation detector/thermal conductivity
Carbon dioxide (CO_2) % v/v	Continuous	Weekly	Infrared analyser/thermal conductivity
Oxygen (O_2) % v/v	Continuous	Weekly	Electrochemical/thermal conductivity
Total Sulphur	Annually	Annually	Ion chromatography
Process Parameters			
Combustion Temperature	Continuous	Quarterly	Temperature Probe/datalogger
Outlet			
Carbon monoxide (CO)	Continuous	Continuous	Flue gas analyser/datalogger
Nitrogen Oxides (No_x)	Annually	Annually	Flue gas analyser
Sulphur dioxide (SO_2)	Annually	Annually	Flue gas analyser
Particulates	Not applicable	Annually	Isokinetic/Gravimetric
TOC	Annually	Not applicable	Flame ionisation

Note 1: All monitoring equipment used should be intrinsically safe.
Note 2: Or other methods agreed in advance by the agency.

2.9.10 Additional Monitoring

Additional Monitoring will be completed on site and as requested by the EPA, this will include odour and bioaerosol monitoring as per Table No. 2.21 below.

Table 2.21 Additional Monitoring-Odour & Bioaerosol Monitoring

Parameter	Location	Monitoring Frequency	Analysis Method/Technique
Odour	As per Dust monitoring locations	Annually	Agreed with Agency
Bacteria	As per Dust monitoring locations	Annually	Agreed with Agency
Aspergillus fumigatus	As per Dust monitoring locations	Annually	Agreed with Agency
PM10 (ug/m3)	As per Dust monitoring locations	Annually	Agreed with Agency

A meteorological station shall be maintained at the site as per the terms of the existing licence, details as per Climate Section. Table No. 2.22 shows the Meteorological Monitoring currently obtained at the facility. However Evaporation, Evapotranspiration and Humidity are obtained from the Clones weather station.

Table 2.22 Meteorological Monitoring

Parameter	Monitoring Frequency	Analysis Method/Technique
Precipitation Volume	Daily	Standard
Temperature (min/max.)	Daily	Standard
Wind Force and Direction	Daily	Standard
Evaporation	Daily	Standard
Evapotranspiration Note 1	Daily	Standard
Humidity	Daily	Standard
Atmospheric Pressure Note 1	Daily	Standard

Note 1: Monitoring frequency for these parameters may be decreased with the agreement of the Agency.

(Meteorological Monitoring Records for 2008 are attached in Volume III, Appendix 14).

A Topographical Survey and Slope Stability Assessment shall be carried out annually. Nuisance monitoring will continue and be reported in compliance with the Existing Licence (W077-02). An annual report on the environmental monitoring is completed as per the EPA requirements.

2.10 Decommissioning and Aftercare (Contingency Arrangements)

2.10.1 Contingency Plans for Breakdown and Emergencies Onsite

A phone number is posted outside the facility on the notice board in the event that emergencies arise outside of normal operating hours and days. Breakdown of equipment will be handled by prompt repair and/or having replacement equipment. An employee will be assigned to check leachate pumps on a daily basis. In terms of site dispatched

machinery, provision will be made for at least 100% duty and 50% standby plant and equipment. This will be implemented through providing plant and equipment onsite and detailing the availability of equipment from nearby plant hire companies.

Emergencies of an accidental nature during normal working hours will be handled by calling in the Gardai, the Fire Brigade or Ambulance Services. The site will be manned Monday to Friday between 06:00 and 22:00 hours and there will be staff employed onsite for one hour either side of opening hours in order to prepare and complete site procedures. Security personnel will be onsite at all other times.

2.10.2 Arrangements in Case of Contamination of Environmental Media

The containment system and the very low permeability of natural subsoil's and bedrock beneath the site will mitigate against the possibility of a major groundwater contamination incident. In the unlikely event of the need to contain contaminated groundwater, extraction wells will be installed at the point of discharge and along the north-western (downgradient) side of the facility. Leachate spills are unlikely to occur as leachate pumping and containment facilities will be connected to pressure sensors which will activate and/or shut off the pumps.

In the unlikely event of an accidental spillage or leakage of a significant polluting material (e.g. leachate, oils chemicals) an emergency response procedure will be activated. This will include immediate notification of the incident to the site manager and other organisations such as the EPA, Cavan County Council, the North Eastern Fisheries Board, etc. if required. The spillage will be immediately contained with absorbent mats and containment booms. A specialist consultant will be retained to manage the clean up and remediation if necessary. Any spills or leaks on active areas of the site will drain to either the leachate lagoon or the balancing pond. The outlet from the pond will contain a cut-off valve, which will allow containment of contaminants.

The containment system within and beneath the landfill and the low permeability of the underlying subsoils will ensure that the risk of subsurface migration of landfill gas is minimal. In addition, landfill gas will be actively vented, flared and/or utilised during the life and aftercare phases of the development. In the improbable event of significant levels of landfill gas being found in any gas monitoring wells in the buffer zone around the landfill, the area will be physically investigated and as appropriate the installation of gas drainage or barrier layers will be taken.

2.10.3 Closure and Restoration Strategy

Oxigen Environmental Ltd. have set out plans in the unlikely event of facility shut down, or a planned cessation for a period of greater than six months of all or part of the site involved in the licensed activity. Should either of the above conditions occur Oxigen Environmental Ltd. will decommission, render safe or remove for disposal/recovery, all materials, waste, ground, plant and equipment that may result in environmental pollution.

A Closure, Restoration and Aftercare Management Plan (CRAMP) was completed in August 2007 by RPS Consulting engineers for and behalf of Cavan County Council dealing specifically with the closure and aftercare of Cells 1 and 2 (See Volume III, Appendix 15). A similar report will be produced for Cell 3 to include any related decommissioning, maintenance, monitoring and civil work required to comply with the waste licence and the EPA Manual 'Landfill Restoration and Aftercare'(1999).

The landfill will be restored in accordance with best operation practices. Closure and restoration of the landfill will generally be carried out in accordance with the EPA Manual 'Landfill Restoration and Aftercare' (1999). The leachate and gas collection systems, control facilities and monitoring points will be operated and maintained until the waste has stabilised, as recommended in the EU Directive on the landfill of waste or as agreed with the EPA. The final contours and topography of the site will be in keeping with the restoration of the old landfill and the surrounding area. The final capping system will be progressively installed and sown/planted after the landfill cells/construction phases reach full capacity. This plan will be reviewed annually by Oxigen Environmental Ltd.

Following implementation of the plan, Oxigen Environmental Ltd. will produce a validation report that demonstrates its successful implementation. This report will confirm that there is no continuing risk of environmental pollution from the site.

This report shall address:

1. Disposal of raw materials
2. Disposal of wastes
3. Decommissioning of plant and equipment
4. Disposal of obsolete equipment
5. Results of monitoring and testing
6. The need for ongoing monitoring and investigations

The report will be submitted to the Agency within three months of execution of the Plan.

The leachate collection system, the landfill gas collection facilities, the control facilities (monitoring boreholes) and monitoring points (surface water control points) will be in operation and maintained until the waste has stabilised. In accordance with the EU Directive on Landfill of Waste (99/31/EC) and the EPA Landfill Manuals, the landfill will be remediated on the basis of the EPA licence.

Monitoring of groundwater, surface water, leachate and landfill gas will continue after the closure of the landfill as recommended in the EU Directive on Landfill of Waste (99/31/EC) and until such time as the Waste Licence has been surrendered to the EPA.

2.10.4 Post Closure Monitoring/Management

After the landfill facility has ceased accepting waste the monitoring and management systems will continue to operate as normal until such time as the EPA determines that the landfill no longer poses an environmental risk and the Waste Licence has been surrendered. The Agency will be informed of any non-compliance with Waste Licence requirements, the causes of such non-compliances if determinable, and any remediation measures proposed and implemented.

2.10.4.1 Leachate Monitoring and Management System

Leachate will be monitored within the landfill cells and also at the leachate storage tank. While the leachate levels are expected to drop off dramatically after the full capping and restoration of the landfill, a certain quantity of leachate will still be generated as water contained within the waste body slowly percolates through the landfill.

Monitoring of leachate levels within the landfill cells will continue as per the operational phase of the landfill. The leachate head within the cells will reduce over time as less liquid percolates through the capped landfill. Monitoring of the leachate at the discharge point will also continue post closure. The results of this sampling will be carefully monitored to ensure that the leachate meets with any discharge standards described by the Waste Licence. In the event of leachate levels exceeding any of the limits set forth, discharge of the leachate will cease until remediation measures have been implemented and/or monitoring results show compliance.

2.10.4.2 Landfill Gas Monitoring and Management System

The collection and utilisation of the landfill gas will continue for as long as there is sufficient gas to allow for combustion. Depending on a number of factors within the waste body and the type of waste that will be landfilled prior to closure of the facility, the timeframe for gas generation and hence monitoring is difficult to establish.

The monitoring of landfill gas will continue at all locations specified in the Waste Licence for as long as the Agency deems necessary or until the Waste Licence is surrendered. Monitoring of emission limits at the gas engines and/or gas flare will also be carried out as per the conditions set out in the Waste Licence. In the event of the emission limits being exceeded appropriate remediation measures will be introduced.

2.10.4.3 Groundwater Monitoring and Management

Groundwater monitoring will continue at all locations specified in the Waste Licence for as long as the Agency deems necessary or until the Waste Licence is surrendered. The groundwater will be analysed and the results compared to the standards as set out in the Waste Licence.

If concentrations of pollutants above those limits set out in the Waste Licence are detected a full investigation will be conducted to try and determine the cause of such

pollution including upstream and downstream monitoring. If the landfill is found to be the source of such pollution remediation measures will be proposed and the Agency consulted.

2.10.4.4 Surface Water Monitoring and Management

Monitoring of the contaminants within the surface water will be carried out in accordance with the Waste Licence and any breaches will be reported to the Agency. If any exceedence is recorded, discharge of the surface water will cease and polluted water treated as leachate.

3.0 ENVIRONMENTAL IMPACTS AND REMEDIAL MEASURES

3.1 Human Beings

3.1.1 Introduction

The principal concern is that human beings experience no significant negative impacts as a consequence of the construction and operation of this development. However, the effects of a development may impinge upon human beings either directly or indirectly. Air quality, water quality, noise and landscape may impact directly while flora, fauna and road traffic may impact indirectly. A desk study was carried out to examine all relevant information pertaining to socio-economic activity in the study area to include Cavan County Development Plan and the Strategy for the Economic, Social and Cultural Development for County Cavan were examined in relation to any planning issues. A Previous EIS, which was undertaken in 2003 was examined, to include a study completed by Dr. Dieter Schrenk, titled 'Human Health'. (contained in Volume III, Appendix 16).

3.1.2 Existing Environment

The site is located in the Corranure townlands, the land area is approx. 47.5 hectares in total. The primary land use in the vicinity of the landfill is agriculture. The majority of the area surrounding the proposed development is designated as rural, characterised by scattered individual dwellings. There are approximately 12 residences within 500m from the boundary of the landfill site. Four of these houses are under the ownership of Cavan County Council, three of which are unoccupied.

Cavan County is predicted to grow its economy in both rural and urban areas. The population of Cavan as recorded in the 2002 Census of Population was 56,416, which is an increase from the previous census of 52,994 in 1996.

The site is approximately 3km from the centre of Cavan town and approx.5 km from the town of Ballyhaise. The population density of Cavan Town is 2,080 to 4690 sq Km, with the surrounds 120 to 2,080 sq Km. Cavan town is one of the major centres of employment in the County. The town contains some small to medium sized industry but the population is largely rural with the predominant activity being agriculture.

The site is currently a non hazardous landfill and Civic amenity site with the remaining area currently fallow agricultural lands. The site is not adjacent to any area of high natural beauty, high quality landscape character, views or prospects, listed buildings, scenic routes, amenity use designated areas, proposed Natural Heritage Area, Special Areas of Conservation or Special Protection Areas. In addition, it does not interfere in any manner with the cultural heritage of the area. Noise, dust and air quality are dealt with in Sections 3.6 and 3.7 of the EIS.

There is no reason to expect the population is more (or less) vulnerable to health effects from the proposed development than humans located elsewhere in the county.

At present there is insufficient evidence to demonstrate a clear link between cancer and exposure to landfill. This is of note as the subject is quite extensively studied and the population potentially affected is huge. Virtually all the studies that have demonstrated even small effects have been those concerning hazardous waste sites. A number of studies have reported putative links between landfill sites and congenital abnormalities but again these studies are somewhat inconsistent and predominantly also reflect information from hazardous waste. The association between adverse birth outcomes such as low birth weight and birth defects is more compelling, but as yet cannot be described as causal. However, we can conclude that any impacts from the proposed landfill will be at a very low level. Reports of increased risk of respiratory, skin and gastrointestinal illnesses amongst residents in the vicinity of landfills in general are based mainly on self-reported symptoms and large studies have failed to demonstrate any consistent effects. Although this evidence must not be dismissed, consideration should be given to the strong possibility of bias and the influence of fears and worry related to the waste sites.

3.1.3 Impacts on Human Beings

3.1.3.1 'Do nothing' Impact

Waste is a major problem for Ireland. We continue to produce vast quantities, while the importance of the 'Reduce, Reuse, Recycle' philosophy is encouraged the need for landfill will continue. Landfills are of limited lifespan, if this space is not available illegal dumping leads to potential problems with vermin, leachate, gases as well as the practical risks associated with uncontrolled dumping. Recycling at this facility will decrease the landfill requirements while increasing the void space for longer landfill lifespan. By creating a composting facility at the site the volume of municipal waste entering the landfill will be significantly reduced and this will reduce the quantity of landfill gas and therefore odour emissions associated with landfills.

For an effect on human health outside the development there must be emissions of some type from the site. The main possible emissions include:

- Noise
- Traffic
- Landfill gas
- Leachate
- Wind-blown litter
- Vermin and insects

Transport of waste can also have an impact on the environment in terms of noise, vehicular emission, accidental spillages, potential emissions to the receiving environment from waste in transit etc.

The day-to -day operation of the current landfill and civic amenity site, including the workings associated with all machinery and visitors to the site, are currently undertaken in compliance with the existing EPA Waste Licence (W077-02), and with all health and safety laws and regulations.

3.1.3.2 Noise

Noise is an identified form of air pollution and uncontrolled it can cause nuisance or a deterioration of amenities and the quality of human life. The potential impact of the proposed facilities on noise levels in the area is described in Section 3.7: Noise. Baseline Noise measurements are included in this section.

Noise levels will increase in the immediate vicinity during the construction period due to increased traffic and construction work. Any noise effects are likely to be related mainly to annoyance. The relatively short-term construction period minimises the risk of any health effects.

In summary it is concluded that noise levels at the nearest sensitive location (occupied residential premises) will not significantly deviate from the current background day time noise levels. Due to the existing background noise levels existing at the site, it is contended that the proposed development will not impact on the surrounding environment.

3.1.3.3 Traffic

All access to the landfill site is along the R188 Cavan-Cootehill Regional Road which is of mostly a good standard with relatively high traffic flows. A dedicated left turn lane into the landfill is provided from the Cavan town side of the landfill.

A traffic impact assessment and road safety audit was conducted in order to assess the potential impacts of additional traffic movements generated during operation of the facilities (Section 3.8: Traffic). The proposed facilities will initially result in total, some 242 movements created by the provision of the new facilities, 122 HGV & 120 others, would be created over the working day. This would average 17 movements per hour, the worst periods would be the 7.30 to 8.30 period in the morning (journey to work and outward truck movements) and the 5.00 to 6.00 pm period in the evening (trucks to base and journey home) when an estimated 40 trips (32 car & 8 HGV movements) would be generated. As such the worst case scenario from a traffic aspect would be that an estimated 302 additional trips would be generated per day or 50 in the peak hours. It was concluded that the increased landfill traffic will not have a large impact on peak hour flows on the R188.

3.1.3.4 Bioaerosols

The potential impact of bioaersols has been the subject of increased concern over the past number of years. Reviews of existing research Health Effects of Composting, A study of three compost sites and review of past data, UK Environment Agency, 2001

and Bioaerosols and Composting, A Literature Evaluation, Draft Report by Cre, (Composting Association of Ireland) has found that; Bioaerosols are endemic in the environment and are created by decaying wood, leaves, in fields. The general pubic is not at risk since mans natural immune system provides adequate defence. Members of the pubic with particular susceptibility (weaker immune system) are more at risk and can be more sensitive to bioaerosols. This facility is to be fully enclosed and air from within the building will be extracted and treated through an approved odour abatement system and will also serve to mitigate against bioaerosol emissions.

Bioaerosols are generated by many activities including agricultural harvesting and storage, timber processing and animal rendering (poultry houses). Monitoring of these plants has recorded bioaerosol levels as high as or higher than waste composting activities. Workers at composting facilities will be more exposed to bioaerosols than the surrounding population. Therefore measures to reduce exposure where possible are advisable, although there appears to be no significant difference in the health of compost site workers in general

The primary potential air pollutants derived from the proposed development are detailed in Section 3.6 Air Quality. Primary pollutants include the following: sulphur dioxide (SO_2), particulate matter, lead, oxides of nitrogen (NO_x), carbon monoxide (CO) and volatile organic compounds (VOCs).

3.1.3.5 Water usage

It is anticipated that the normal daily water requirement for the site will be minimal, and will be sourced from the council mains. Surface Water (rainfall from buildings) will be collected in specifically designed storage tanks and used for spraying roadways and reuse in the plant. Process water will be restricted to use by composting facility and to include the rotary atomisers onsite, therefore, processing related water demands will be low.

3.1.3.6 Telecommunications

The telecommunications requirement of the facility should not place the current telecommunications network under stress.

3.1.3.7 Foul sewage system

It is anticipated that there will be no additional stress placed on the local foul water sewer network, an upgraded rising main is currently in use, and therefore it is not predicted additional volumes created will cause a problem.

3.1.3.8 Environmental nuisances

As with any facility that deals with waste, some environmental nuisances can occur within the site and within the environs. Due to the distance between the nearest residence and the waste recycling and processing facility, the impact from nuisances is

deemed minimal. Strict control over the individual processes, good housekeeping practices, maintenance of odour abatement technology and staff training is essential to ensure the site will not impact on receptors in the area.

3.1.3.9 Aerosol control

Liquid wastes in the form of road gulley sludges will be accepted onsite, and will be stored in specially designed holding tanks. These wastewaters shall consist primarily of rainwater, and will be treated (i.e. filtered) onsite prior to disposal. It is therefore contended that the aerosol generation will be minimal.

3.1.3.10 Employment

The proposed development will provide employment for at least 40 people directly over its lifespan. Further indirect employment will be created for service personnel to include maintenance, monitoring, surveys, construction, etc. This Integrated Recycling Facility aims to improve waste management in the region as per the North East Waste Management Plan, this will be achieved by the commitment to recycling by the population of the region and community as a whole. The site will provide for the recycling of 245,000 tonnes per annum of recyclable waste.

Oxigen Environmental Ltd. propose to develop the site further and supply power to the national grid, this will be achieved by using combined heat power units (CHP) to convert landfill gas into heat and electricity.

3.1.4 Proposed Mitigation Measures

3.1.4.1 Site Operation

The design and operation of the proposed site will be in accordance with the Landfill Directive, Guidance Documents and the EPA licence, which will minimise emissions from the site. The absence of hazardous waste entering the site will significantly reduce the likelihood of substances that could be toxic in low levels appearing in leachate. Groundwater and particularly drinking water will not be contaminated given proper operation and mitigation.

Mitigation measures introduced to reduce the environmental nuisances of dust, odour, litter, traffic, vermin, birds, leachate and landfill gas will greatly reduce the level of concern for the health of the local community surrounding the landfill. These measures are currently in place at the existing facility in accordance with an Environmental Management Plan for the landfill as per Waste Licence W077-02 and will be incorporated to include the proposed development once in operation.

3.1.4.2 Leachate

Completed Cells 3 & 4 will be progressively capped and restored. The cells are situated and designed so as to meet the necessary conditions for the prevention of the pollution

of the soil, groundwater and surface water and to ensure efficient collection of leachate in accordance with the EU Directive on Landfill and Waste (99/31/EC), the EPA Manual on 'Landfill Site Design' and BAT Principle (Best Available Technology).

The provision of a composite lining system within each cell will ensure that the groundwater reservoir will be protected from leachate contamination. All leachate will be pumped to the rising main as per current procedures and transferred to the wastewater treatment plant at Cavan. This will have no impact on the health quality of the population living in the vicinity of the landfill or on the environment.

3.1.4.3 Landfill Gas

Odour, in most instances, does not represent any direct harm to human health but can be very disturbing. Landfill gas contains the gases carbon dioxide and methane as major constituents. Both gases show extremely low toxicity and are natural constituents of the lower atmosphere. Landfill gas also contains trace amounts of other gaseous compounds generated during the microbial degradation of organic waste. Some of these compounds, though not occurring in toxic concentrations, can be sensed by humans because of the low smelling threshold for such compounds, e.g., for hydrogen sulphide.

Therefore, landfill gas is contained and collected as can be possibly completed. Operations on the site involve minimisation of the area of the site exposed at any time to enable better control of landfill gases. A landfill gas collection and flaring system is currently active at the landfill. The absence of hazardous waste entering the site will significantly reduce the likelihood of substances that could be toxic in low levels appearing in the landfill gas.

The possible utilisation of landfill gas for energy generation will be examined at a later stage. The current practice of collection and flaring (and possible utilisation) of landfill gas will have no impact on human health (Refer to Section 3.6 Air Quality).

3.1.4.4 Groundwater Protection

Groundwater in many areas is a major source of drinking water. The quality of groundwater, therefore, has to be protected rigorously. The lining system of the Cells 3 and 4 of Corranure Landfill in addition to the large depths of in-situ low permeability clay will prevent any leachate from reaching groundwater thus making sure that groundwater quality, human health, and the environment will not be affected by the proposed development. (Refer to Section 3.4 Hydrogeology)

3.1.4.5 Vermin and Pest Control

Rodents can be harmful since they may transfer pathogenic viruses, micro-organisms, parasites etc. and may, therefore, represent an important factor for the spreading of various diseases. Control of rodents is a mandatory prerequisite for any landfill. Vermin control specialists are currently employed on site this will be extended as the site develops.

The following operation procedures are implemented and will continue to be implemented on a daily basis as mitigating measures against vermin and pests:

- The landfill working area will be kept as small as possible (max. 25metres wide).
- The waste will be compacted with a high tonnage steel wheel compactor
- Active waste disposal areas will be temporarily covered by approximately 0.3 m of soil when there is no disposing of waste taking place for a lengthy period of time
- Waste lorries transporting waste to the site will be covered appropriately
- All waste will be stored indoors or in sealed containers were possible prior to removal off site and waste activities and site procedures will incorporate vermin prevention measures
- Fly nuisance will be minimised by the rapid removal of degradable waste offsite, the washing of the floor in the building with disinfectant and the covering of all stored waste onsite

3.1.4.6 Control of Birds and Flies

Birds are prevented from gathering on and feeding at the existing landfill facility by the use of bird scaring techniques, these techniques are employed every day until the waste activities cease. This will be continued and extended to include all site activities.

Waste handling procedures onsite will be such that waste is exposed only within the MRF building and all stored waste is within sealed containers and therefore not a source of food for scavenging birds.

To prevent the occurrence of birds and flies the following mitigating measures are currently being implemented:

- A landfill supervisor has been appointed to control birds by the use of bird control equipment. Birds are monitored on a daily basis, with records kept of control measures and effectiveness of use.
- The working area will be kept as small as possible (max. 25 metres wide)
- Application of daily cover
- The waste will be compacted with a steel wheel compactor and covered with 0.3m of soil after deposition
- The formation of puddles will be minimised
- During fly season a licensed insecticide will be sprayed on tipping area, offices, and machinery and residents houses as appropriate or required.
- Waste handling procedures will be adopted for all activities, with all stored waste for removal offsite in sealed containers

3.1.4.7 Litter Control

Current litter control practices include daily litter patrol of the site perimeter and access road, where any windblown litter is removed, subject to the agreement of the

landowners, immediately and in any event by 10.00am of the next working day after such waste is discovered. The landfill will be covered at the end of the working day and litter control infrastructure inspected on a daily basis.

Waste handling procedures will be implemented at the site, which will include the proposed storage practices to be employed, and the proposed practice of sorting of waste within the building only. This will ensure that waste is never left in the open air uncovered, and as such the potential for litter escape will be minimal.

The operation of the site will ensure that any potential impact caused by litter is reduced by implementing the following:

- High compaction of waste in thin layers using high tonnage compactors
- Daily cover of working area
- Establishment of 6 metre high fence (net) around the perimeter of the site
- Litter trapped in the netting will be removed on a regular basis.
- Tipping front always to be established below surrounding soil bund
- Tipping front established in shelter from wind direction (possibility for 2-3 different working areas according to wind direction)
- Waste handling procedures will be implemented, proposed storage practices will be employed, and the proposed practice of sorting waste within the building only.
- A procedure is established for the operation of the landfill in adverse weather conditions.
- A daily litter patrol of the site perimeter and access road will be undertaken, where any wind blown litter will be removed.

3.1.4.8 Dust and Odour

In dry weather, site roads and other areas of vehicle usage are sprayed with water as and when required to minimise airborne dust nuisance. Also prior to exiting the facility, all waste vehicles shall use the wheel wash. Waste handling operations on the site ensure that all tipping of waste where possible occurs within the operational building, and therefore onsite dust generation is restricted to the movement of traffic onsite.

Emissions such as landfill gas and leachate generation shall be monitored and regulated so that these emissions will not result in significant interference with the environment beyond the facility. Due to waste handling procedures, the storage of waste in sealed/covered containers and the sorting of the waste within a building it is anticipated that the potential of odour on the nearest residence will be negligible.

To avoid the exposure to dust, the waste will be covered at the end of each day to prevent any litter or waste dispersal by wind. Furthermore, during dry weather, site roads and other areas used by site vehicles are sprayed with water. To avoid odour, the tipping face will be kept as small as possible, the waste will be compacted, the tipping area will be covered every evening with cover material, and waste lorries will be

appropriately covered while on site. Further measures such as all processing will be completed indoors and amelioration measures will be added to ensure control or dust and odour.

3.1.4.9 Contamination of Local Roads

Access to the facility is via the Cavan-Cootehill Road (R188). The potential impact of the facility on the roads will be through the generation of mud, dust and litter. The access road shall be routinely inspected by site personnel, and will be washed down should the need arise. This will minimise the impact of the facility on the road network.

All HGV's leaving the landfill must pass through a wheelwash to prevent any transfer of contaminated material to the local road network. The roadway will be routinely inspected and be washed down as necessary. Contamination of local roads will be kept to a minimum. No impact on human health is to be expected.

3.1.4.10 Fire Control/Fire Safety

There is a fire hydrant at the entrance gates and fire extinguishers present on site which are to be used in the event of a fire. Prevention of fire on site will include the elimination of the following:

- Burning waste delivered to site on fire
- Self ignition due to increased temperature caused by decomposition of organic waste
- Insufficient landfill compaction
- Waste delivered to the site that is observed to be on fire or smoking will be directed to the waste inspection area where closer inspection will be carried out to decide whether to extinguish the fire at once or to alert the fire fighting service.

All fires on site are to be treated as a major hazard and a potential emergency situation, and as such must be dealt with accordingly. A 1500-gallon water filled bowser, pump and hose is to be kept onsite and regularly maintained so as to be available for fire fighting at all times. Should such incidents occur then the Fire Brigade and the Environment Protection Agency (EPA) shall be informed by the Operational Supervisor as soon as is practicable. Fires within buildings, and of plant and equipment, are covered in the Health and Safety Manual. As this is a non hazardous waste landfill it is considered that there will be minimal potential for explosions and it is likely that the risk will be limited to small aerosols (e.g. hairsprays etc). Landfill personnel and emergency services need to be aware of the risk and take appropriate precautions as set out in the site health and safety manual.

3.1.4.11 Fire Prevention Measures

Fire measures to be implemented include:

1. The provision of appropriate fire extinguishers as recommended by a specialist supplier to deal with types of fire sources that may be encountered on site. Regular inspections are to be carried out and any missing, damaged, defective or out of date appliances replaced as a priority
2. Provision of sand bunkers at appropriate locations for use in dousing fires
3. Provision of 1500-gallon water bowser and pump for initial dousing/containment of fires.
4. Fire suppression equipment on machines is to be checked daily by the driver/operator and any faults reported.
5. Training of employees in the correct selection and use of fire extinguishing media for the range of types of fire incidents that may be encountered on site.
6. The enforcement of a strict no smoking policy except in designated areas.
7. The enforcement of a no fires/burning policy on the site.
8. A contract for maintenance of fire equipment with specialist suppliers
9. A maintenance and defect reporting system for all portable and fixed plant
10. A maintenance and defect reporting system for all electrical appliances
11. Training of evacuation procedures and location of assembly points.

There will be two fire extinguishers located at each door of the waste buildings, namely powder and foam. All staff onsite will be trained in fire prevention, fighting and evacuation procedures. The amount of waste stored onsite will be kept to a minimum and will be stored in sealed/closed containers. Firewalls will be constructed within all processing buildings onsite.

Fire extinguishers are located within the administration buildings, these are serviced annually and additional extinguishers will be provided as per requirements. To prevent fire in a waste disposal area availability of oxygen or air must be avoided and can be achieved by the following operational practices:

- High compaction of waste with a steel wheel compactor
- Daily cover of waste
- Active waste disposal areas will be temporarily covered with approximately 0.3 m of soil when not in use
- A stockpile of soil will be located close (< 500 m) to the working area in case of fire. If fire is observed in areas away from the working area it should be isolated by spreading of soil, followed by sealing of all possible sources of oxygen (vents, exposed surfaces etc) thus eventually extinguishing the fire.
- If the landfill operator is unable to handle the fire the local fire station shall be contacted. All fire incidents should be reported to the local fire station and guidelines should be included in the landfill operator's manual. All staff on site will be trained in fire prevention, control and evacuation procedures An Emergency Response Procedure is also in place.

3.2 Flora & Fauna

3.2.1 Introduction

A study of the terrestrial ecology was carried out in 2003 by Roger Goodwillie and Associates for a previous EIS. This study was undertaken to assess the ecological value of the site and to assess the potential impacts of the proposed development on flora and fauna. The site and its environs were assessed in terms of habitat, hedgerows and mammals. The habitats present are described in their current status and an evaluation of the conservation value is also given. An updated Ecological Impact Assessment of Corranure Landfill was compiled by Claire Keogh, Msc. in Environmental Science. It consists of an overview of the previous study. (A full copy of this report Terrestrial Ecology completed by Roger Goodwille and Associates (2003) and an overview by Claire Keogh in August 2008 is attached in Volume III, Appendix 18 of this EIS).

3.2.2 Existing Environment

The site lies in drumlin country where low rounded hills create an undulating topography with a north or north-west grain. Streams form part of the north-eastern and western boundaries and both flow north into the Annalee and Erne catchment. The soil is heavy so that the fields become full of rushes if not mown regularly, and are generally used for extensive grazing

The habitats on site are predominantly wet grassland (GS4 in Fossitt 2000) with earth banks (BL2) between the fields, usually with hedgerows (WL1). In places there are drainage ditches (FW4), an artificial pond (FL8) and, around an old farmstead - recolonising bare ground (ED3). The streams are eroding/upland in character (FW1) and that on the north-eastern end has cut a sizeable valley where oak-ash-hazel woodland (WN2) is developing.

3.2.2.1 Wet grassland

Though apparently dominated by rushes *Juncus effusus,* most of the fields still have an equal if not greater content of grasses, especially meadow foxtail *Alopecurus pratensis,* Yorkshire fog *Holcus lanatus,* rough-stalked meadowgrass *Poa trivialis* and sweet vernal grass *Anthoxanthum odoratum.* Mixed with these are sorrel *Rumex acetosa,* marsh ragwort *Senecio aquaticus,* broad-leaved dock *Rumex obtusifolius,* purple loosestrife *Lythrum salicaria,* greater birdsfoot trefoil *Lotus pedunculatus,* creeping buttercup *Ranunculus repens* and meadow buttercup *R.acris.* The general character of the vegetation suggests that it has been subject to some mowing and fertilisation (by slurry). The soil is subject to poaching so that wet, puddled patches may arise anywhere, on paths, at the entrance to fields or even on mid slopes. Here sweet grass *Glyceria fluitans,* bog stitchwort *Stellaria uliginosa,* brooklime *Veronica beccabunga,* wild angelica *Angelica sylvestris* and lesser spearwort *Ranunculus flammula* are characteristic.

A low area just south of the western extremity of the site adds tufted hairgrass *Deschampsia cespitosa,* yellow flag *Iris pseudacorus,* great willowherb *Epilpbium hirsutum,* meadow vetchling *Lathyrus pratensis,* tufted vetch *Vicia cracca,* marsh bedstraw Galium *palustre* and meadowsweet *Filipendula ulmaria,* species that are also found around some of the hedgerows and ditches.

3.2.2.2 Field boundaries

A ditch and bank occurs around every field, often colonised or planted with hawthorn *Crataegus monogyna,* blackthorn *Prunus spinosa,* bramble *Rubus fruticosus,* grey willow *Salix cinerea* and gorse *Ulex europaeus.* A major hedge occurs along the north-western boundary where quite large ash *Fraxinus excelsior* are joined by holly *Ilex aquifolium,* honeysuckle *Lonicera periclymenum* and wild roses *Rosa canina* and *R.cf sherardii.* Here also the hedge flora is well developed with the following species

Digitalis purpurea	foxglove
Vicia sepium	bush vetch
Veronica chamaedrys	germander speedwell
Dryopteris filix-mas	male fern
Conopodium majus	pignut
Potentilla sterilis	barren strawberry
Viola riviniana	common violet
V. reichenbachiana	early violet
Plantago lanceolata	ribwort plantain
Stellaria holostea	greater stitchwort
Oxaiis acetosetla	wood sorrel
Primula vulgaris	primrose

These species variously recur in other field boundaries but where woody species are absent there is a different, healthy component in the flora e.g.

Potentilla erecta	tormentil
Hypericum pulchrum	shining St John's wort
Luzula campestris	field woodrush
Succisa pratensis	devilsbit
Pedicularis sylvestris	lousewort
Hypochoeris radicata	catsear
Calliergon cuspidatum	amoss
Rhytidiadelphus squarrosus	a moss

3.2.2.3 Wetlands

Areas of water retention have been significantly colonised by sweet grass *Glyceria fluitans* and *G.declinata* with yellowcress *Rorippa palustris* and water starwort *Callitriche stagnalis* also. Around the edges marsh foxtail *Alopecurus geniculatus,* toad rush *Juncus bufonius* and curled dock *Rumex crispus* are frequent and these spread up the drainage track to some extent with much:

Stellaria uliginosa	bog stitchwort
Montia fontana	blinks
Cerastium glomeratum	sticky mouse-ear
C.fontanum	common mouse-ear
Myosotis discolor	changing forget-me-not
Veronica serpyllifolia	thyme-leaved speedwell
V.beccabunga	brooklime
Capsella bursa-pastoris	shepherd's purse.

Drainage ditches are generally characterised by willowherbs *Epilobium hirsutum, E.parviflorum,* soft rush *Juncus effusus,* sharp-flowered rush *J.acutiflorus,* tufted hairgrass Deschampsia cespitosa and field horsetail *Equisetum arvense* and other plants of wet grassland.

The streams on site do not have a distinct flora as such, though the one at the north-eastern corner has cut such a valley that it attracts a varied woodland flora, described below.

3.2.2.4 Woodland

A fringe of hazel woodland covers the valley side of the stream in the north-eastern corner of the site and is contiguous with a larger area on the other side, outside this site. The ground below the trees is used for shelter by animals and is steep in places but a significant flora survives in protected sites including many of the hedge plants but also:

Prunus spinosa	blackthorn
Cardamine flexuosa	wavy bittercress
Lysimachia nemorum	yellow pimpernel
Ranunculus ficaria	celandine
Sanicula europaea	wood sanicle
Orchis mascula	early purple orchid
Brachypodium sylvaticum	false brome
Fragaria vesca	wild strawberry
Dryopteris affinis	male fern
D.dilatata	buckler fern
Plagiomnium undulatum	moss
Atrichum undulatum	“
Fissidenssp	“
Plagiochila asplenoides	a liverwort

3.2.2.5 Recolonising ground

An abandoned house/shed remains in the west centre with loose material around it and some bare trampled ground. These support such typical species as nettle *Urtica dioica,* creeping thistle *Cirsium arvense,* pineapple weed *Matricaria discoidea,* wild turnip *Brassica rapa* and ragwort *Senecio jacobaea.* Soft rush *Juncus effusus,* marsh ragwort

Senecio aquaticus, Yorkshire fog *Holcus lanatus*, creeping buttercup *Ranunculus repens* and white clover *Trifolium repens* are in the area while crested dogstail *Cynosurus cristatus*, red fescue *Festuca rubra*, common bent *Agrostis capillaris* and hoary willowherb *Epilobium parviflorum* are also widespread.

3.2.2.6 Fauna

The mammal fauna of the site is limited to the Irish hare and fox which occur in open surroundings though wood mice are present in the hazel woodland and also probably some of the hedges. It is expected that they occur in the surrounding hedges. Pygmy shrew would be expected but were not heard on this visit. No evidence of badger was encountered though the animal may be likely to occur as a visitor during feeding. Likewise there were no frogs seen though they are very likely to occur in areas of the site.

The bird fauna is made up of a segment typical of open fields, i.e. woodpigeon and meadow pipit and also a group of hedge birds. The latter are robin, wren, dunnock, willow warbler, long-tailed tit, reed bunting and redpoll. Sedge warblers were also present in the bushes close to ditches or streams. In winter snipe and additional meadow pipit would be the most common birds in the fields but the ground is not suitable for waders, other than an occasional curlew.

3.2.2.7 Overall Evaluation

The habitats encountered on the site are widespread and very typical throughout the Irish countryside and none of the habitats recorded are of high conservation value. The site contains species typical of drumlin country and very widely distributed in Cavan and adjacent parts of Roscommon, Meath and Longford. There are no habitats or species of significant interest when compared in a county sense though the stream valley in the north-eastern corner retains a good selection of woodland organisms and is locally valuable.

The site is not included in any designated area and is unlikely to be included in the future. Likewise it does not contain habitats or species listed as of special interest by the EU Habitats Directive (92/43/EEC) or by the Birds Directive (79/409/ EEC). There are no plants included in the Flora Protection Order 1999 though most of the bird species have general protection under the Wildlife Act 1976.

3.2.3 Environmental Impacts

The principal habitat occurring on the site is wet grassland. This habitat is considered to be of low ecological value. This habitat has been partially affected by works undergoing on the site over the last number of years, however is restricted to the active area of the facility. Excavation work, bulk dig and soil storage has being prevalent in centre of the site and where proposal for cell excavation and building construction is proposed. The total area for site development will be 5.739 hectares, therefore most of the lands will remain in their current state and be unaffected by the proposed developments. The area of land to be disturbed by the development is limited to the direct land-take of the proposed

development, the remaining lands will be maintained in their existing state as a buffer zone, thus reducing the overall impact of the development on the surrounding area.

Several hedgerows occur along the boundaries of the site, these will be retained and not be impacted upon by the proposed development. The fringe of hazel woodland covering the valley side of the stream in the north-eastern corner will not be impacted upon as development will be localised to the existing excavated/burrow dig areas.

The proposed development will involve the removal of one internal hedgerow, and an evergreen tree shelter belt (behind disused dwelling house).

The proposed development has the potential to adversely affect the adjacent watercourses through discharges to surface water and surface water runoff. Any negative impacts on the watercourses would be considered of high significance and be monitored at all times.

Fauna recorded on the site are regarded as common and widespread. It is unexpected to have an increase in scavenging birds and mammals that are currently on the landfill site. The proposed development will not have any significant impact on the existing fauna.

3.2.4 Proposed Mitigation Measures

The best features in terms of flora and fauna are located at each side of the northern third of the site where the stream woodland occurs on the east and a well-grown hedge/ tree line on the west.

The following measures are recommended to reduce the impact of hedgerow removal:

- Clearing of hedgerows will be undertaken outside the nesting period which is from March 1st to August 31st.
- The trees and hedgerows planted, before, during and after the proposed developments life span, will consist of species representative of those in the surrounding environs.

The streams will require adequate measures to prevent contamination. Strict controls will be implemented to avoid pollution or sedimentation of the streams during the construction phase. This involves upgrading and extending the existing surface water drainage system. Measures include the construction of surface water attenuation ponds, silt traps and any other measures deemed necessary.

A compressive landscaping programme is to be undertaken on the site. The programme will be conducted on a phased basis and will consist of native woodland boundary planting. Species chosen will be native and reflect the species composition of the surrounding hedgerows.

Measures including fencing where appropriate, will be taken to protect hedgerows from damage during the construction and operation phases of the site. It is recommended that the

areas around trees and hedgerows be left undisturbed and not be used for stockpiling or storing machinery.

A comprehensive restoration plan for the site will be undertaken progressively during the life of the development and upon decommissioning. This will include habitat restoration and conservation.

3.3 Soil & Geology

3.3.1 Introduction

Information on the substrata underlying the proposed development site was obtained through the Geological Survey of Ireland (GSI) and from information contained in a previous EIS of the Site. BMA Geoservices Ltd. was appointed at this time to carry out a geology/hydrogeology assessment in 2003. (A copy of this report 'Geology and Hydrogeology Assessment' is in Volume III, Appendix 19)

3.3.2 Existing Environment

The site comprises of over-grown grassed disused agricultural land, in fields bounded by hedgerows. The lands surrounding the site are of agricultural use. Corranure Landfill is mapped as being underlain by lythotypes belonging to the Longford-Down Inlier. This is made up of a belt of rocks which extends from the coast of County Down to County Longford. The Longford-Down Inlier can be divided into two distinct zones, a Northern and a Central Belt, which in turn can be subdivided into several tectono-stratigraphical fault-bounded Tracts.

The GSI map shows that the site is crossed with a NE-SW trend by a section of the Catrickteane Fault, which separates Tract 2 which represented by the Coronea Formation and Tract 3 which is represented by the Red Island Formation. The Coronea Formation is composed of green greywackes, red shales and minor spilitic lavas. The Red Island Formation consists of green to greenish-grey medium or coarse-grained, locally conglomeratic, volcanoclastic greywacke with subordinate grey to greyish black shales. Both the Coronea Formation and the Red Island Formation are believed to be of Middle Ordovician Age (468-458 Ma). This information was based on An Foras Tailtantus book, Soil Associations of Ireland and their land use potential together with the general soil map of Ireland, scale 1 :(575,000)

Soil Type 25 is the most extensive soil type which features in the area. Soil Type 25 is comprised of 50% Gleys, 40% Acid Brown Earths and 10% Interdrumlin Peats and Peaty Gleys. This Soil Type 25 occupies 2.57% of the country. It occurs mainly in Cavan, Monaghan, West Mayo, Longford, Clare, Donegal and Leitrim. The predominant soil (50%) is an imperfectly to poorly drained Gley of loam to clay loam texture and of medium base status. The main associated soil (40%) consists of a moderately well-drained Acid Brown Earth of loam to clay loam texture and low base status. This soil is

friable and structure is usually fairly well developed. However, the lower horizons tend to be plastic when wet with less well developed structure.

The use range of the principal soil is limited. It is more suitable to pasture than to arable cropping. Poaching may be a serious limitation to pasture utilisation in wetter periods whilst growth is also somewhat restricted in spring and autumn. The associated soil can be utilised for arable crops and pasture. From the physical standpoint, it is moderately suited to tillage. However, frequency and degree of drumlin slopes is a limitation to machinery use.

In the interdrumlin flats Peat and Peaty Gleys account for 10% of the soils in Soil Type 25. These have serious drainage problems due to high water tables and poor porosity and cannot be greatly improved unless these issues are rectified. Their main use is for summer grazing.

3.3.2.1 Overburden Geology

A total of nine trial pits were excavated and a total of six shell and auger boreholes (GW1-3, R01, R02 and R04) were drilled in June 2003. Previously in 1998 another six boreholes were drilled in this area.

3.3.2.2 Boulder Clay

The surface layer in the landfill extension area consists of firm to stiff brown sandy, gravelled clay with boulders and cobbles (boulder clay). Sporadic layers of sand or gravel may also occur. As a result of the information gained from the exploration drilling carried out on location this glacial boulder clay layer possesses a thickness of 8 to 25 m. The geophysical explorations provide evidence for substantially higher thicknesses. On average the boulder clay possesses a thickness 10 to 15 m.

According to the geophysical explorations the boulder clay close to the surface (approx. 1 to 4 m below the surface) consists of a gravely clay distinguished by higher proportions of gravel and sand and includes the soil formation zone.

Below the boulder clay are middle Ordovician rock from the Coronea formation and the Red Island formation. These consist of fractured highly weathered shale, fractured jointed greywacke and broken fractured fine to medium grained sandstone.

3.3.3 Environmental Impacts

The proposed development will involve the removal of the subsoil's at the site to facilitate construction of Cell 4 and level platforms will be created for the proposed buildings, the development will result in permanent covering of part of the site with roadways, paths and other impervious surfaces. Lands north of the site will remain as unused agricultural lands.

As the impermeability of the boulder clay prevents the permeation of possible leachate in the event of a failure, a contamination of the top strata is not to be expected. For example a dirt particle which permeates the boulder clay at an assumed vertical permeability of $1.0 \cdot 10^{-08}$ m/s would require 30 years in order to negotiate a depth of 10 m and enter the bedrock 10^{-09} groundwater aquifer ($1.0 \cdot 10^{-09}$ m/s equates to 300 years). However as, according to statements from the GSI, the movement of the groundwater in the top strata is extremely limited a risk situation can be ruled out here.

A possible hydrological risk is limited to the surface water on location, which feeds directly into the receiving waters from the gravely clay close to the surface. This possible risk must be avoided via appropriate technical measures. The design and position of monitoring facilities (position and expansion of the groundwater wells) must take into account this potential danger.

3.3.4 Proposed Mitigation Measures

The removal of subsoil is an inevitable consequence of implementing the proposed development; this will be done in accordance with the Waste Management Act and Regulations. Topsoil and other soils will be stockpiled to be used as cover material and for final landscaping of the development. New leachate drains installed on site will be constructed in accordance with applicable building standards thereby minimising the potential for leaks in underground pipes. All fuels will be stored in fully bunded areas in accordance with relevant environmental guidelines and recognised standards and tested in accordance with the waste licence conditions. All vehicles will be serviced and fuelled in appropriately designated areas which will be fully contained to prevent spillages into the surface water network. Appropriate measures such as spill kits etc. will be at designated locations on the site.

3.4 Hydrogeology

3.4.1 Introduction

This section details the baseline quality of the underlying groundwater existing at the site and addresses the impact of the proposed development on the underlying groundwater. BMA Services Ltd Report and WMT (Waste Management Technology & Service GmbH conducted a study ‘Statement regarding the risk potential of landfill in terms of gas and leachate emissions. (Reports attached in Volume III, Appendix 20)

3.4.2 Existing Environment

3.4.2.1 Regional Hydrogeology

The bedrock underlying the site is made of argillites, greywackes and spilitic lavas. In these lithologies groundwater flow is generally structurally controlled fissure flow permeability therefore well yields could be extremely variable. A Groundwater Protection Scheme for County Cavan providing a definitive classification of the importance of the aquifers present in the bedrock is not available yet. However, the GSI

has provided a provisional classification of the two bedrock formations underlying the proposed extension area. This classification for both the Coronea and the Red Island Formation is "Poor Aquifer, Generally Unproductive except for Local Zones (PI)".

3.4.2.2 Overburden

The boulder clay primarily consists of stiff impermeable clay. In accordance with the Geological Survey of Ireland (GSI) appraisal, it is to be assumed that no continuous loose sediment water bearing complex exists in the granular aquifer for these overburdens/beds. Existing groundwater is to be categorized as a restricted, perched, almost stagnant water table without lateral extension. The descriptions of the local water logging close to the surface and the slouchy areas emphasize the impermeability of the boulder clay.

The 9 trial pits created in 2003 by BMA Services Ltd. did not encounter any groundwater in the depths between 3.9 m to 6.7 m below the surface. Of the 6 trial pits bored down to the bedrock during this period of time only one discovered groundwater in a sandier bed of the boulder clay at a depth of 7 m. The head permeability tests performed in 2003 indicated an extremely low permeability for the boulder clay. Values from $2.8 \cdot 10^{-06}$ to $1.5 \cdot 10^{-09}$ m/s were determined, however the value $2.8 \cdot 10^{-06}$ represents an exception as a considerably sandier clay layer was tested. The average of all of the permeability values is $3.1 \cdot 10^{-07}$ m/s. The tests carried out in 1998 confirm these values. The results were between $1.98 \cdot 10^{-06}$ to $7.01 \cdot 10^{-08}$ m/s which provides an average of $9.81 \cdot 10^{-07}$ m/s. As the results of the head permeability tests reflect more horizontal permeability it is reasonable to assume that the existing vertical permeability, which are decisive for an evaluation, are an additional magnitude lower. For an investigation with regard to the requirements for the landfill's sealing system we can assume a permeability of $1.0 \cdot 10^{-08}$ to $1.0 \cdot 10^{-09}$ m/s.

The bed rock belonging to the Coronea formation and the Red Island formation is to be categorized as a fractured aquifer as a result of the high level of tectonic stresses. The rocks encountered in the course of the drillings allow us to infer middle to low permeability. As a result of the packer tests a maximum permeability of $7.8 \cdot 10^{-06}$ m/s was determined. The GSI assessment classifies both formations as "poor aquifer, generally unproductive except local zones (P1)". In accordance with the results of the groundwater level observation the bedrock contains confined groundwater.

The surface water arising as a result of rainfall forms in the low-thickness gravely clay layer close to the surface, which, according to the geophysical investigations, represents approximately the first 1 to 4 m of the boulder clay. The surface layers of the impermeable part of the boulder clay function as acquicludes along which the surface waters flow towards the receiving waters, Lismagratty Stream and the Corranure Stream, on the basis of the given topography.

3.4.2.3 Monitoring Boreholes

Oxigen currently propose to install a number of boreholes to include an additional 12 no. landfill gas and 5 no. groundwater monitoring boreholes in selected locations in order to provide permanent monitoring points for landfill gas and groundwater. Currently this proposal is undergoing a tender process and will be completed within the next no. of months.

Drawing No. DG0007-02 Proposed Landfill Gas and Groundwater Borehole Locations show the proposed Borehole locations. The exact location and depth of the boreholes shown are indicative only and are to be agreed once works are been completed on site. Volume III, Appendix 21 contains the Schedule of Groundwater Monitoring Boreholes and Gas Monitoring Boreholes, Site location map and also the monitoring boreholes construction details.

3.4.2.4 Bedrock

Due to the nature of the bedrock fissure flow is the dominant type of groundwater flow. Four packer tests were performed in the bedrock during drilling operations in 1998. The highest permeability value was of 7.8 x 10^{-06} m/s, indicating a low to moderate permeability.

3.4.2.5 Vulnerability

With the presence of overburden thickness generally in excess of 10m except for the area to the east near R04 where the boulder clay has a thickness of 8m. This implies a general vulnerability rating of low, which would become moderate in the area near R04. The application of the Response Matrix for Landfills from Groundwater Protection Schemes would give the area under investigation a rating of R2[1]

3.4.2.6 Groundwater Levels

Groundwater level in the bedrock varies between 101.05mOD and 110.48mOD. The direction of groundwater flow appears to be northwards with a gradient of 0.06 based on the information available.

3.4.2.7 Groundwater Quality

As a requirement of Waste Licence W077-02 monitoring is completed of the groundwater in the Landfill area. This is completed monthly and quarterly for a variety of parameters. All private wells within 500m of the boundary of the landfill monitored quarterly and annually. (Refer to Volume III, Appendix 10 for BHP monitoring data).

GW01 is located up gradient of the landfill, with SA01 at junction of Cell 2 and Cell 3 with GW04 and GW05 located north of the site. Total coliforms are found at all points with faecal coliforms at GW04. No elevated levels of List I/II organics were found or any heavy metal concentrations.

PW08, PW09, PW10, PW11, PW13, are located up gradient of the landfill site in a south east direction with PW05BT, PW15 up gradient in a south-western direction of the site or down gradient. All locations were free from microbial contamination except PW5 BT, PW09, PW13 which exhibited the presence of low levels of coliform bacteria. All waters were clear and odourless and free from synthetic organic and heavy metal concentrations.

3.4.3 Environmental Impacts

The 8 to 25 m thick top strata possess extremely low vertical permeability ($1.0 \cdot 10^{-08}$ to $1.0 \cdot 10^{-09}$ m/s). The quality of this layer in terms of the requirements for a naturally occurring geological barrier in accordance Council Directive 1999/31/EC are clearly exceeded in particular with regard to the thickness. If the Council Directive requires a minimum thickness of $\geq$1 m then here 10 times the value is achieved. Taking into account the fact that the thickness of the boulder clay exceeds the requirements by a factor of 10 to 15 then the requirements are more than fulfilled from a compensatory perspective.

There will be no direct discharges to groundwater or any groundwater abstractions as part of the proposed integrated facility.

- Lowering the groundwater levels during construction of landfill
- Leachate generation threat to groundwater
- Storage of fuels or other potential polluting substances lead to increase in risk of contamination

3.4.4 Proposed Mitigation Measures

The measures that will be adopted in order to protect the groundwater are:-

- To provide containment of the base and the sides of the landfill
- To provide a leachate collection and removal system in order to maintain a low leachate head

Containment will be achieved by provision of a composite liner system which consist of a flexible membrane liner (FML) made of high density polyethylene (HOPE). This will be laid directly on the 1m thick compacted clay liner with a permeability of less than $1x10^{-9}$m/s. Even if leakage occurred through the FML, the clay below acts as a natural secondary barrier system or fail-safe layer. However, the FML will be installed under strict Construction Quality Assurance (CQA) to ensure that the risk of leakage through the FML will be minimised. Groundwater is further protected by the large depths (up to 20m) of in-situ low permeability clay underlying the entire site.

During construction the clay will be analysed on an ongoing basis for clay content, water content and plasticity index to insure that the requirements are met ($k<1 \times 10^{-9}$ m/s). The FML will be checked for defects and the seams will be leak tested prior to covering with a

500m thick leachate collection layer consisting of rounded stone. This layer will contribute to protecting the composite liner against damages during the initial phases of waste disposal.

3.5 Hydrology

3.5.1 Introduction

The proposed developments at the Corranure Landfill site are within the catchment area of the Annalee River to the north and the Cavan River to the south-west. Two small streams are present in the boggy area to the north-west and the east of the existing landfill site. Both these streams flow towards the north-west and eventually become tributary of the Annalee River. The southern half of the site, including the existing landfill is drained by the Corranure stream which flows south west towards Cavan Town and eventually becomes a tributary of the Cavan River.

3.5.2 Existing Environment

The existing landfill is situated on the site of a small lake, Lismagratty Lough which is now filled. The small Corranure stream which formerly emptied the lake use to flow along the north western slope of the landfill but has since been diverted as part of the remediation works carried out in 2001/2002. The stream flows for about 4km from the landfill to Cavan Town, where it is culverted under the town to its confluence with the Cavan River.

The stream is also culverted for several hundred meters where the stream passes under the Cavan - Cootehill road approximately 2km downstream of the landfill and at the Cavan by-pass at Cootehill Road Bridge. There are also short culverts immediately downstream and upstream of the landfill. The Cavan River flows for seven kilometres from Cavan town through Coalpit and Derrygid Lakes to its confluence with the Annalee River west of Butler's Bridge. The Lismagratty stream drains the area of the proposed extension area. Both the Corranure and Lismagratty streams are tributaries of the Annalee River. The Annalee flows into Lough Oughter, which in turn drains via the Erne River into Upper and Lower Loughs Erne.

Surface water monitoring is conducted at the site, as per the requirements of Waste Licence W077-02. Seven surface water monitoring locations have been sampled Five sites SW-1, K1, K2, K3 and K4 are located on the Corranure Stream while SW-2 and A2 are located on the Lismagratty Stream SW-1 and SW-2 are monitored monthly with all the sample points completed quarterly and annually. (Schedule D: Monitoring Waste Licence W077-02)

On analysis of results for the period 2007 and 2008, the quality of the surface water deteriorates between K1 (which is located upstream of the landfill) and K2 (downstream of the landfill), evident in Chloride and Total Suspended Soils results and improves at K3 (further downstream of the landfill), however the results are slightly elevated at K4

(located South east of the site). The highest recorded level of suspended solids (836mg/l) was noted at K3 in the 1st Quarter. Levels were generally high at K4, with levels above the recommended standard of 25mg/l on all sampling occasions except Quarter 2 of 2008.

Results of SW-1 monitoring point are consistent with K2, however Ammonical Nitrogen remains consistently low at all points but is slightly elevated at SW-1 over the time period reaching 13.65mg/l in the first quarter of 2007. These results have continued to improve into 2008 and substantial improvements can be seen in Q2 of 2008. The emission limit of 35mg/l for Suspended Solids (as per Schedule C3 of the waste licence) is exceeded in the 1st,2nd,3rd quarters (225mg/l, 364mg/l and 50mg/l) of 2007 and the 1st quarter of 2008 (152mg/l).

Monitoring at SW-2 commenced in 2008 and a substantial improvement can be seen in suspended solids from 132mg/l to 1 mg/l of Quarter 1 and 2 respectively. This perhaps reflects the effectiveness of the silt trap lagoon placed at this point on the Lismagratty stream in April. Monitoring at A2 shows elevated suspended solids and chloride results for 2008 in comparison to 2007. This point is further downstream from the landfill and elevated suspended solids and chloride results provide evidence of activity offsite and an influence on the water quality.

Annual sampling carried out in the 4th Quarter of 2007 showed no exceeded limits for calcium, cadmium, chromium, copper, lead, manganese, sodium, zinc and mercury. A slightly elevated level of iron was recorded at K4 during 2007 annual sampling. Levels of iron were below the recommended limit for all other sampling points. No elevated iron levels were evident in 2008 Annual Monitoring Results. An olfactory inspection showed there was no odour evident at any time.
(Refer to Volume III, Appendix 10 for BHP monitoring data).

A biological assessment was undertaken in October 2007 and again in June 2008 by Ecofact Environmental Consultants. Macro invertebrate surveys were carried out at 10 sites: 5 locations (A1 - A5) on the Corranure Stream and 5 locations (B1 –B5) on the Lismagratty Stream. (This report 'Biological Assessment' is included in Volume III, Appendix 22). The 2008 biological survey was undertaken between June and September which is the optimal time for such an appraisal. However no discernible decline in water quality was apparent in either the Corranure or the Lismagratty Streams, when compared with previous survey results.

No result was obtained for monitoring sites A1 and B1 as these locations were dry on both sample occasions. A Q3 rating was obtained from B2 - B5, this shows no change in the biological assessment carried out in 2007 and 2006. A Q3 rating was recorded for A2 on the Corranure Stream showing an improvement to the previous year's monitoring. One monitoring location A3 improved in water quality from a rating of Q2 in 2006 to Q3, for both 2007 and 2008, seriously polluted to moderately polluted. Monitoring site A4 increased to Q3 in 2008 from a Q2 in 2007 and A5 remains at Q2, seriously polluted, this is the furthermost monitoring point from the site

The results remain similar to previous surveys, with the Lismagratty Stream maintaining its moderately polluted status (Q3) as per 2003 results. This uniform level of pollution is likely to be due to non-point agricultural sources.
The Corranure Stream has become seriously polluted (Q2) at A4 and A5 in the last year from its moderately polluted status in the last number of surveys. The location of these points indicates that influences of activities outside the landfill appear to be having a negative effect on the water quality.

In the past the Corranure stream has been polluted by leachate from the landfill. It has been shown that the surface water quality at the existing landfill has improved since the remediation measures were put in place in 2001/2002 and the pollution status 1km downstream of the landfill has improved from grossly polluted (Q1) to seriously polluted (Q2).

The most recent available assessment of the Cavan River (Code 36/C/02) states that 'once again quality deteriorated considerably below Cavan town where the river was heavily silted and was characterised by excessive algal growth and a faunal composition indicative of considerable organic pollution'. (This statement ensued from observations and surveying at station 0300 just over 2km downstream of Cavan and station 0400 at the bridge u/s of the Annalee confluence.)

The Quality of River and Lake Water in Co. Cavan by Cavan County Council shows a baseline Q rating of Q2-3 for station 0300 just over 2km downstream of Cavan and a Q rating of 2-3 at station 0400 located at the bridge u/s of the Annalee confluence dated 2005. It states this Cavan River is assessed as being unsatisfactory. Overall the river is in poor condition. The river is already slightly polluted prior to entering the urban area. It states an improvement in chemical quality is recorded at most stations from 2004. No record of water quality testing is reported since 2005.

The impact of the proposed extension area on surface water quality will not be adverse, all leachate generated will be contained, collected and treated at the Wastewater Treatment Plant located in Cavan Town.

3.5.2.1 Fish Assessment

Conservation Services have carried out a fish assessment of the area surrounding Corranure Landfill site. Fish were assessed at five sites on the Corranure Stream in 1998 (Conservation Services 1998); no fish of any species were recorded at that time. Site A5, which is in the section of the Corranure stream with the best fish habitat, was resurveyed in May 2003. In 10 minutes of electrofishing the only fish species recorded was Three-spined Stickleback.

Electrofishing was carried out at five sites on the Lismagratty Stream in May 2003. No fish of any species were recorded at sites B1 & B2, which were fished for 5 minutes and 9 minutes respectively. At sites B3 & B4, both of which were fished for 15 minutes, the only fish species recorded was Three-spined Stickleback. The absence of trout from sites

B1 - B4 is notable, as the habitat at all of these sites is suitable for juvenile salmonids. A single adult brown trout (24-year old, 19.0cm length) was recorded in 18 minutes of electrofishing at Site B5, where the salmonid habitat was rated as good salmonid nursery. The results of the fish survey therefore indicate that despite good salmonid nursery habitat, the Lismagratty Stream holds a very small number of trout. The virtual absence of trout must be ascribed to past and/or present water quality problems.

The Northern Regional Fisheries Board were contacted to obtain updated information on electrofishing surveys in the area, a Regional Inspector, Michael Fitzpatrick confirmed no survey has been completed in the last number of years.

However, an Electro fishing survey was carried out on the Annalee river by the Northern Regional Fisheries Board, as part of the programme of surveillance monitoring for the Water Framework Directive, between the 30th of June and the 8th of July 2008. The survey was conducted on the Annalee river (90.2km d/s of the Cavan R Confluence) Grid Reference IH40241 IG10373 on the 2nd of July 2008. A total of 8 fish species were captured on the Annalee river. Roach (882) were the most common species followed by perch (313), gudgeon (198) and brown trout (20). All fish species were identified, measured for length and weight and scales for age analysis. A number of physical habitat variables were measured at each site to complement the species lists. A water sample and a multi-habitat kick sample were also taken. A detailed report of these findings will be available in early 2009.

3.5.2.2 Sediment Assessment

Sediment sampling and analysis was undertaken in February 2008 by BHP at six locations, three on the Corranure stream A1, A2, A5 and three on the Lismagratty stream B1, B2, B5. These locations are per the waste licence (W077-02) Schedule D: Monitoring and the report is contained in Volume III, Appendix 23. The aim of this analysis was to assess if any contamination was present in the sediment of the surface water.

Dutch Target Intervention Values where chosen as the most suitable standard available for sediment assessment. In summary, all locations sampled and analysed have contaminant concentrations lower than the action level where remediation would be required. Some parameters do fall between the optimum and action levels and the results show a general trend of having a higher concentration further downstream from the site. Therefore it can be concluded, the landfill is the not the sole contributing source of contamination with local activities a major factor in the water quality of the area.

3.5.3 Environmental Impacts

If the proposed development is implemented, there would be reduced recharge to the ground in the landfill area, however this reduction in potential recharge to the underlying groundwater resources is not considered to be a significant negative impact given the location of this area within the wider rural setting where most of the rain fall will percolate the underlying water table. As part of the water management system, it is proposed to discharge treated water runoff to Lismagratty Stream. This could have a potential negative

impact on the water quality of the stream. However, the correct design and use of attenuation ponds, grit traps and interceptors will prevent the occurrence of surface water contamination. Furthermore, the site is underlain by bedrock that is considered to have poor potential for groundwater resources and private wells will continue to be monitored.

It would be important that the biological impact, if any, of the landfill should be carefully monitored, and water quality to include sediments from the river should be periodically tested for a broad spectrum of contaminants. The chemical water quality monitoring programme will be continued and carefully observed to ensure no further deterioration in the existing water quality.

All site works will be conducted in an environmental responsible manner as to minimise the environmental impacts on the water environment. Surface water and groundwater will not be affected by leachate from the extended landfill as all leachate will be contained, collected and treated off-site. Regular monitoring and control measures at the landfill during construction and operation will ensure further protection of water sources. Surface water and runoff will be diverted through a drainage system, and the runoff will meet the quality standards as defined in the licence. The surface water drainage system will be fitted with an oil interceptor prior to discharge to the surface water system. The oil interceptor will have an automatic shut off valve fitted which will stop emissions to the local surface water network if oil is detected in the run-off.

3.5.4 Proposed Mitigation Measures

Detailed measures to prevent contamination of surface waters with suspended solids and other construction generated pollutants during the construction and operation of the proposed development are outlined below:

- Release of suspended solids to surface waters should be kept to a minimum. The key factors in erosion and sediment control are to intercept and manage off- and on-site runoff. This limits the potential for soils to be eroded and enter streams in runoff. Runoff and surface erosion control is more effective and less expensive than sediment control with sediment control ponds and grit traps.
- Raw or uncured waste concrete should be disposed of by removal from the site or by burial on the site in a location and in a manner that will not impact on the watercourse.
- Wash down water from exposed aggregate surfaces, cast-in-place concrete and from concrete trucks should be trapped on-site to allow sediment to settle out and reach neutral pH before clarified water is released to the stream or drain system or allowed to percolate into the ground.
- Fuels, lubricants and hydraulic fluids for equipment used on the site should be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment according to codes of practice.
- Fuelling and lubrication of equipment should not be carried out close to water courses.

- Any spillage of fuels, lubricants or hydraulic oils should be immediately contained and the contaminated soil properly disposed of.
- Waste oils and hydraulic fluids should be collected in leak-proof containers and properly disposed of.
- A spill response action plan should be put in place, and spill response materials kept on site, to ensure that any spills of potentially polluting materials are prevented from entering surface waters.
- All site works will be conducted in an environmental responsible manner, training will be provided and all staff will adhere to procedures outlined.

3.6 Air Quality

3.6.1 Introduction

The air quality of the area is typical of a rural environment where agriculture is the predominant land use. The main sources of atmospheric emissions in this area are from the existing landfill, surrounding agricultural practices and from traffic movements along the R188 road.

The baseline air quality was determined to assess the potential impact of both the site development and operational phases on the existing atmospheric environment, namely dust generation, sulphur dioxide, oxides of nitrogen and particulate matter. Other aspects of the atmospheric environment, i.e. odour and noise are dealt with in Sections 3.6 Air Quality and 3.7 Noise.

3.6.2 Existing Environment

Sources of atmospheric emissions from the operation of the proposed development are as follows:

- Area sources include uncontrolled landfill gas emissions from fissures in completed areas and also from recently tipped waste in operational Cell 3.
- Emissions generated from waste trucks and other vehicles travelling along the access and internal haul roads to the tipping area.
- Composting Process

The types of air pollutants emitted from a landfill can be grouped under the following headings:

- Dust and PM_{10}
- Bioaerosols
- Odours
- Landfill Gas

3.6.2.1 Aerosols, Dust and PM_{10}

Aerosols are defined as fine particulate material, water droplets and microbial emissions from the activities carried out at the landfill. They are typically particles which remain airborne for a reasonable length of time and generally range in size from less than 0.1 jxm to about 100 urn. Small sized particles, including PM_{10}, have potential health implications, as they may be inhaled and enter the lower respiratory tract. Airborne particles greater than about 30-50 urn will tend to remain airborne for only a few tens of metres downwind of the emission source, whereas the finer-sized fraction can travel a significant distance under windy conditions.

Emissions of dust and PM_{10} (particulate material with a mean diameter of < 10 pm) will occur within the landfill extension from trucks travelling along the access and internal haul roads and from tipping the waste material into the active face of the cell. Generally, trucks travelling along internal loosely surfaced (unpaved) haul roads are the main source of dust within a landfill.

Daily covering of the freshly deposited waste take place daily with inert material and so dust emissions from the active cell area will be very low. Fine-sized materials such as waste cement, etc. may occasionally be disposed along with the standard municipal waste and this can generate substantial short-term dust emissions as it is deposited.

As part of the current waste licence, dust deposition monitoring is carried out at five locations near the site boundary for 30 days, three times a year (twice from May to September) as required under Schedule D of the Waste Licence (W077-02). The five locations, designated D1-D5, are shown in Drawing No.102 Monitoring Locations. Site D1 is located along the existing western boundary, Site D2 between Cell 2 and Cell 3, Site D3 is near the eastern boundary, Site D4 is close to the site entrance and D5 is at the most northern position of Phase 3. The dust deposition limit specified in Schedule C.2 of the Waste Licence is 350 mg/m^2/day, expressed as a monthly average over a 30-day period. Bergerhoff gauges are used as specified in the German Engineering Institute VDI2119 document 'Measurement of Dustfall using the Bergerhoff Instrument (Standard Method).

Dust monitoring was completed during June to September at four monitoring points in 2007. D1 experienced levels in excess of the 350mg/m^2/day in June and July (431.9 mg/m^2/d and 629.7mg/m^2/d respectively.)
D2 is located at the active part of the landfill and experienced levels of 912. 4 mg/m^2/d, 583.3 mg/m^2/d in June and September, an exceptionally high level was experienced in July 13868.9 mg/m^2/d, with a large amount of grit observed in the sample. D3 is located adjacent to the site access road and experienced deposition in excess of the limit in June and September 2007 (levels of 683.3 mg/m^2/d and 682.8 mg/m^2/d respectively) D4 is located close to the landfill entrance and experienced deposition levels of 390.8 mg/m^2/d in August 2007.

Table No. 3.1 provides a summary of dust monitoring results for 2007, all results are contained in Volume III, Appendix 10.

Table 3.1: Dust monitoring Results June-September 2007

2007	D1	D2	D3	D4	Limit
May-June	431.9	912.4	683.3	311.4	350mg/m^2/day
June-July	629.7	13868.9	59.4	43.5	350mg/m^2/day
July-Aug	57.5	void	223.8	390.8	350mg/m^2/day
Aug-Sept	168.9	583.3	682.8	204.4	350mg/m^2/day

Monitoring of locations D1-D5 was completed in February-March and June-July 2008, all locations experienced a lower level of deposition than the limit of 350 mg/m^2/d with the exception of D1(816.1 mg/m^2/d). This monitoring location is located close to the Cootehill Road (R188) and the furthest point from site activities and onsite vehicle movement. The dust gauge has been moved to between Cell 1 and Cell 2 in agreement with the EPA.

Fig 3.2: Dust monitoring Results 2008

2008	D1	D2	D3	D4	D5	Limit
Feb-Mar	816.1	18.9	198.9	212.2	67.2	350mg/m2/day
Jun-July	82.8	NS	252.2	327.2	73.3	350mg/m2/day

NS: Not Sampled, Jar broken and replaced

3.6.2.2 Bioaerosols

The composting building will be enclosed and due to the fact that bioaerosols fall off with distance from the composting facility, typically reaching background levels within 250m (Monitoring the Health Impacts of Waste Composting Plants, UK Environmental Agency Technical Report), it is envisaged that generally there will be no negative impacts on residents in the area due to bioaerosols.

3.6.2.3 Sulphur dioxide and Nitrogen oxides

Ambient concentrations of sulphur dioxide and nitrogen dioxide in the vicinity of the landfill would be similar to those recorded in rural locations elsewhere in Ireland and well below the existing National Air Quality Standards (NAQS) (SI: No 244 of 1987). They would also be well below the more stringent future limit values specified in the Air Quality Standards Regulations 2002 (SI No 271 of 2002).

There are no significant emission sources of sulphur dioxide in the area, as houses in the locality would be either low-sulphur distillate oil or peat. Diesel fuel used by road vehicles also have a very low sulphur content. Sulphur dioxide concentrations would be generally less than a daily average of 20 ug/m^3 and an annual level of less than 10 ug/m^3. These daily concentrations are below 18% of the future limit value.

Annual ambient nitrogen dioxide concentrations adjacent to the southern boundary of the site next to the R188 will typically be less than about 15 ug/m^3; which is well below levels likely to exceed the future annual limit specified in the 2002 Regulations.

The daily traffic flow along this road out of Cavan was surveyed and the AADT (Annual Average Daily Traffic) on the R188 northeast (Cootehill side) of the facility was 4460 vehicles per day with a HGV content of 8 % during the working day, while the AADT on the southwest of the facility was 5545 vehicles per day with a HGV content of 7.4%. Along the other boundaries to the proposed landfill extension ambient average levels of nitrogen dioxide will be generally less than 10 ug/m^3. These concentrations would be comparable to results obtained from background sites operated by the Environmental Protection Agency, which indicate annual nitrogen dioxide levels of less than 10 ug/m^3 (Kilkitt, Co. Monaghan)

3.6.2.4 Odours

Malodorous compounds generated within a landfill include hydrogen sulphide, organic sulphides (mercaptans), amines and other volatile organic compounds, some of which have very low odour detection levels of below 1 part per billion (ppb). These trace gaseous compounds are generated during the anaerobic decomposition of the waste deposited in the landfill cells. The Environmental Agency in the UK has identified over 500 trace organic and inorganic compounds generated from deposited municipal waste. However, only a small number of these compounds are likely to cause a potential odour problem at ambient concentrations experienced beyond the site boundary.

A Landfill Gas Leakage Survey was undertaken on the 24th January and also on 4th June 2008 by Odour Monitoring Ireland, (both reports are in Volume III, Appendix 25). The main aim of this survey was to identify the key mechanisms that lead to the release of landfill gas leakage from a site, and to identify on a site map, the locations of landfill gas leakage in order to perform remediation of the identified leakage areas. Landfill gas leakage is the predominant source of odour complaints and the survey identified a total number of 11 leakage zones. Each leakage zone was given a remediation strategy to mitigate the individual leakage areas. The main areas of concern on the capped cells were all emission points should be appropriately sealed, with gas abstraction applied. Also flanked areas should be constructed to minimise landfill gas leakage and all waste adequately covered and landfill gas abstraction fitted. These works are ongoing and improvements are currently being achieved in the active landfill.

As part of the environmental monitoring programme specified in the Waste Licence, regular inspection of certain boundary locations by staff is carried out on a daily basis to assess the presence or absence of odours. Due to the nature of the activity carried out at Corranure Landfill, it is not possible to eliminate all sources of malodours from the land filling operation. However, with ongoing improvements being made to reduce and contain potential malodorous emission sources at the landfill, the potential for nuisance complaints at nearby houses will continue to decline.

3.2.6.5 Landfill Gas

Landfill gas is the primary component of air emissions from a landfill site both during its operation and also after the cells have been completed and capped. The main constituents of landfill gas are methane (CH_4), carbon dioxide ($C0_2$), oxygen, nitrogen and hydrogen with the remainder consisting of a large number of trace gases.
The dominant source in terms of potential health risk is where large uncontrolled surface emissions of landfill gas occur within confined areas of a site.

However, although the gas is highly odorous, emissions from within a landfill are unlikely to result in significant ambient concentrations of individual trace compounds beyond the site boundary. Dilution rates of several hundred times are normally available above the surface of a landfill cell, even during slack wind conditions. The distance to the boundary of the landfill will result in a further substantial reduction in the ambient concentration, due to natural dispersion mechanisms.

The National Climate Change Strategy estimate that a substantial reduction of 50% in methane emissions from landfills can be achieved by flaring (converting the methane to carbon dioxide), or used to produce electricity. With the installation of the gas collection network and flaring, emissions of methane and other greenhouse gases will decrease dramatically from the landfill. These local measures will help meet the target of reducing methane emissions to 60% below the 1990 levels from the waste sector in Ireland by 2010.

A gas utilisation feasibility study has concluded that a likely sustainable gas flow of 500-600m^3/hr between 2007 and 2020 could be produced, with methane levels remaining at approximately 50%, producing in excess of 1MW power generation. A peak flow of 800 m^3/hr was determined for 2013 which would sustain a maximum of 1.5MW power generation. Based on this preliminary study, the utilisation of landfill gas may be viable, but would need verification through more detailed assessment including an onsite gas pumping trial to determine the quality of the gas resource and confirm the gas flows could be sustained over the given time period. The viability of utilising the landfill gas is also dependent on economic viability, including ESB connection costs which need to be determined. (Volume III, Appendix 5 ‘Preliminary Gas Utilisation Feasibility Study’)

3.6.3 Environmental Impacts

The main potential pollutant that may impact the air quality includes odour, oxides of nitrogen, sulphur dioxide, hydrogen sulphides, carbon monoxide, volatile organic compounds, and particulates and particulate matter with an aerodynamic diameter of less than ten micrometers (PM_{10}).

In total, some 242 movements created by the provision of the new facilities, 122 HGV & 120 others, would be created over the working day. This would average 17 movements per hour. As such the worst case scenario from a traffic aspect would be that an estimated 302 additional trips would be generated per day.

For paved or macadam roads, the emission rate was estimated to be in the order of 0.001 g/s per VKT and 0.01 g/s for unpaved roads. The paved section from the entrance to north of the wheelwash is about 0.3km with the unpaved haul road section within the extension area of about 0.4km. With the implementation of the dust measures outlined in Section 3.6, emissions of dust and PM_{10} will be adequately controlled within the landfill facility. Overall, the emissions of total airborne particulates from tipping waste is regarded to be slight or imperceptible.

The daily cover of the deposited waste material significantly reduces the quantity of malodours being released from the surface of the cells and along with the installation of a landfill gas collection network emissions from the landfill will decrease. The installation of a gas collection network, with flaring will reduce emissions of landfill gas from the whole site. Due to the nature of the activity, it is likely odorous emissions from the landfill may occasionally be detected beyond the site boundary, with a slight to moderate short-term impact depending on weather conditions.

However, with improvements being carried out in relation to the management of the landfill as required under the conditions in the Waste Licence, it is predicted that impacts of malodours will continue to be minor. The dust control measures, such as a wheel wash, construction of paved internal haul roads and spraying road surfaces with water during dry weather conditions should effectively control dust emissions from the landfilling activities at Corranure Landfill. With these measures, the impact of dust emissions will be slight with no significant impact beyond the landfill boundary.

Handling of residual waste in the waste transfer facility has the potential for dust generation, all waste transfer activities will take place indoors, thus reducing the potential for the off-site deposition of dust. The facility roads will be paved and regularly swept, which will minimise the potential for dust generation. A strict onsite policy of maintaining closed doors at all times (apart from receipt and dispatch of waste) from each of the site buildings to minimise the emission of dust and hence any off-site impact. During dry weather conditions, the haul roads will be sprayed with water from a mobile tanker to control dust emissions. Condition 7.4 of the Waste Licence states in dry weather, site roads and any other areas used by vehicles will be sprayed with water as and when required to minimise airbone dust nuisance.

In the winter months, the surface is likely to be sufficiently damp from rain for much of the time so that spraying is not necessary. However, with higher air temperatures and periods of dry weather more frequent in the summer months, spraying the road surface with water is likely to take place on a regular basis. Typically, a wind speed above 5m/s will result in significant dust-blow from the road surface and the rate of re-suspension of material will increase as the wind speeds rises.

3.6.3.1 Odours

The impact of odours on the ambient air quality will depend on the emission rate, the distance downwind to the sensitive receptor location and the dispersive properties of the

lower air layers. The distance downwind at which the 'odour detection' concentration is reached may be within a few metres of the odour source if the rate of emission is low or a considerable distance if the emission rate is very strong. The wind speed and direction are also major factors in determining whether emissions from the landfill will cause a community nuisance beyond the site boundary.

The management of the proposed landfill extension includes daily cover of compacted waste and this will significantly reduce the potential for malodorous emissions from the surface of the active cell. The two cells will be lined with a HDPE liner and clay layer with a gas collection network also installed as the cells are developed. The liner will prevent lateral migration of landfill gas and so reduce the emissions of malodorous gases beyond the boundary of the landfill cell. Collecting the gas generated within the cells and burning this gas in a flare-stack will reduce the potential for malodours from the landfill being experienced beyond the site boundary.

The impact on air quality due to odorous emissions from Cell 3 and 4 is predicted to be slight near the site. Identification of potential odour emission hot-spots and the development of the gas collection network within the extension area will further help to reduce the detection of malodours beyond the site boundary.

3.6.3.2 Dust and Aerosols

The primary source of particulate aerosols within the proposed landfill extension will be from the haul roads such as unpaved sections or where silt has accumulated on the road surface. There is no on-site leachate treatment system, with the leachate collected in a lagoon and pumped via a rising main to Cavan Wastewater Treatment Plant so droplet aerosol formation from the landfill will not take place. Close contact with aerosols from landfill refuse or leachate will increase the risk of certain infections due to the presence of various micro-organisms present in the refuse/clay material. These could present a health risk for on-site workers, if certain health and safety conditions are not enforced. However, the risk of infection beyond the site boundary due to aerosols from the landfill dispersing downwind is very low. Based on the proposed operation, of the landfill extension at Corranure no significant impact on the health of the local community or environment is predicted.

The biological waste treatment facility will have no open storage of any material. All tipping and mechanical pre-treatment of waste will be carried out on designated tipping areas within the enclosed building under a slight negative pressure, so any dust generated will be within the building. The fresh bio waste will be largely wet in nature; not giving rise to dust emissions when treated. The dry solids content of the compost will be kept below 65-70% by process control measures, since higher dry solids contents may give rise to excess dust formation. Compost transport will take place in covered trucks only.

3.6.4 Proposed Mitigation Measures

The operation of the proposed development at Corranure will be carried out in accordance with the requirements as specified in the waste licence issued by the EPA with regard to

controlling and reducing atmospheric emissions. The EPA will receive monitoring reports on a scheduled basis detailing the sites operations to ensure compliance with the waste licence conditions.

The measures to control and reduce emissions include:

- Tipping of waste material shall be restricted to a designated area of the active cell.
- Waste material will be covered daily with suitable inert material, such as subsoil, stone, rocks, bricks, crushed concrete etc., to control emissions of dust and malodours from the surface of the active cell. At the end of each week, the tipped material will be covered with a layer of inert material, with a minimum depth of 150mm.
- When the surface of the cell has reached the design height it will be capped, restored and re-seeded with grass.
- Burning of any waste material on-site shall be prohibited.
- Mobile plant equipment used on-site will be regularly maintained to prevent excessive exhaust emissions of particulates and other pollutants.
- Haul roads within the landfill extension will be covered with compacted hardcore to reduce dust emissions from trucks travelling to and from the tipping area.
- The public road near the entrance to the landfill and hard-paved road surfaces within the site reception area will be maintained to ensure any spillages of material from vehicles entering or leaving the site will be promptly removed to reduce dust emissions from the road surface.
- A mobile water sprayer will be employed during dry weather conditions to reduce dust emissions from the access road and haul roads within the landfill site.
- During dry spells if dust is being generated, stockpiles will be kept moist.
- All trucks departing from the site will pass through the wheelwash, which shall be maintained with the silt removed on a regular basis.
- All gas or leachate collection boreholes will be capped and inspections carried out at regular intervals to inspect the completed cells for leaks and uncontrolled venting of landfill gas.
- Regular inspections will be carried out of completed cells to identify and eliminate, where practicable uncontrolled emissions of landfill gas

3.7 Noise & Vibration

3.7.1 Introduction

This section will assess the potential noise and vibration impacts of the proposed development on the existing landfill site.

3.7.2 Existing Environment

A noise monitoring survey is completed annually at the site as part of the current Waste Licence W077-02. A copy of the annual noise report completed by BHP in April 2008 is attached in Volume III, Appendix 10.

A cirrus 831A Type 1 sound level meter was used to monitor noise levels and carry out 1/3 octave frequency analysis. 30-minute daytime levels are recorded at 9 noise locations, located at the boundary of the site and incorporate all noise sensitive locations. Noise emission limits measured at any noise sensitive location is 55 db(A) L_{Aeq} for daytime and 45 Db(A) L_{Aeq} for night-time noise emissions. Also there shall be no clearly audible tonal component in the noise emission from the activity at any noise sensitive location.

The nearest residences to the proposed extension are under Cavan County Council ownership (only one habituated) marked NSL1 and NSL4 in Drawing No. 102. Noise measurements were made close to the residences at locations NSL1, NSL4 and NSL2.

The following parameters were measured:

$L_{Aeq,T}$ the equivalent continuous noise level for the measurement period. This parameter is very sensitive to local high-level short time sources, e.g. local traffic, etc.

$L_{A10,T}$ the sound level equalled or exceeded for 10% of the measurement period, the parameter usually used for traffic noise assessment.

$L_{A9O,T}$ the sound level equalled or exceeded for 90% of the measurement period. This level is sometimes taken to represent the "background" noise level.

The measured noise level results are shown in Table 3.3

Table 3.3 Noise monitoring completed on 8th April 2008

Location	Duration (mins)	LAEQ dB	LA10 dB	LA90 dB
NSL1	30	50.7	52	41.3
NSL2	30	69.8	73.8	45.3
NSL3 (B3)	30	68.7	72.6	41.6
NSL4	30	58.1	58.3	45
NSL5 (B1)	30	57.1	60.4	46.9
NSL6	30	45.8	46.7	39
B4	30	39.2	41.7	29.8
B2	30	57.9	58.9	45.8
NSL7	30	47.6	50.2	42.8

Noise levels for NSL1, NSL7, NSL6 and B4 are less than the daytime limit of 55 dB(A). The noise level of 50.7 dB(A) at location NSL1 were principally due to landfill operation with intermittent traffic from the Cootehill Road. Readings of 58.1dB (A) were recorded at NSL4.The measured noise level of 69.8 dB(A) at NSL2 and NSL368.7dB(A) was principally due to traffic both located at the side of R188 Cootehill Road. NSL5 (B1) and B2 are located inside the boundary of the landfill, at the weighbridge or at active internal activity, and as such are not noise sensitive locations.

The current on-site machinery which may contribute to on site noise includes two Compactors, two diggers, two dump trucks, one bull dozer, one tractor and a site jeep.

Intermittent sources of noise include tipping vehicle and reverse sirens at the active working face, with vehicles stalling on the weighbridge. At the existing landfill road traffic is the greatest background source of noise in the area. The results of the annual 2008 monitoring is consistent with previous years monitoring and results obtained from a survey completed in August 2007.

Ground vibration can be generated from construction traffic, light vehicles on the roadway and in construction activity. There is currently no vibration monitoring completed in the vicinity of the existing site and not a requirement of the existing Licence (W077-02). Hence there was no baseline evaluation of vibration levels undertaken. There will be no perceptible increase in road traffic generated ground vibration from the completed development.

3.7.3 Environmental Impacts

The proposed development consists of:

- The construction of all the proposed activities
- The operation of the completed facilities
- The subsequent road traffic flow associated with the operation of these facilities

The maximum noise levels predicted will occur during the construction phase of the development and will pertain for short periods only and restricted to day light hours, typically between 8am and 6pm.Weekend construction work will be restricted to Saturday mornings only (8am to 12pm). All construction plant and equipment will comply with the European communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations 1988, (Statutory Instrument No.320 of 1988). Typical noise levels for construction machinery ranges from 119 to 130 dB at 1m, good engineering and noise mitigation measures will be employed where necessary, and as on-site construction activities shall occur during normal working hours, it is considered that the noise impacts on the local environment during the construction phase of the proposed development will not be significant.

The MRF will be operating from 6am to 10.30pm, 6 days a week. The majority of the traffic movements will be between 6.30 and 10pm Monday to Saturday and with only limited movements outside these hours.
The main noise sources during the operational phase of the facility are likely to include:

- Vehicles entering the site
- Civic Amenity and employee vehicles entering and leaving the site
- Loading shovel
- Screening Equipment (Trommel, OCC/ONP Star Screens & Conveyors)

3.7.4 Proposed Mitigation Measures

A 3.5m topsoil berm will be constructed along the northeast of the site in line with house locations and around the processing and stockpiling areas of the facility. As the site develops mitigation measures will be assessed and implemented as necessary.

There are several mitigation measures that can be put in place to further reduce noise levels impacting on the receiving environment, this will include

- Proper training of operators in equipment use to minimise noise generation, excessive revving of engines, ensuring that vehicles are operated with noise control hoods closed and equipment turned off when not in use.
- Proper maintenance of vehicles and equipment, checking the efficiency of silencers, lubrication of bearings
- The control of on-site activities through the implementation of good management practices will combine to ensure the noise generated at the site will not have any undesirable effects on the existing neighbouring environment
- The closure of all doors on the main plant buildings
- A speed limit of 10km per hour applies to the site

A daytime limit of 55 dB(A) is proscribed by the EPA as the target level appropriate for noise sensitive locations. This level is not exceeded at the noise sensitive locations situated at Corranure landfill due to onsite current activities. The proposed landfill activity area is further from the nearest house than that the existing site. The impact on

residences will remain 'not significant'. Regular monitoring of noise will indicate if the levels are exceeding the standard limits.

The ground vibration from the compaction operations can potentially generate high levels in the immediate vicinity but due to the distance of the nearest occupied residence there are no off-site vibration effects. No amelioration measures are required.

3.8 Traffic

3.8.1 Introduction

A Traffic Impact Assessment Survey was undertaken by Frank Burke and Associates of the existing traffic and examines the expected volumes of traffic that will be generated as a result of the proposed developments and its impact on the surrounding road network. Also a Road Safety Audit was completed in August 2008. (The completed reports are attached in Volume III, Appendix 17)

3.8.2 Existing Environment

The site is located 2km north east of the Cavan bypass (N3). The proposed development will use the existing entrance to the site. The entrance to the landfill is located on a Regional Road (R188) running between Cavan & Cootehill. The R188 (i.e. the receiving road) serves as a regional link road as well as the local community of northeast Cavan in that it is a link road between the N2 at Carrickmacross & Castleblaney and the N3 at Cavan Town. Currently from the traffic generation aspect both the landfill (mainly HGV movements) and in particular the amenity area (cars/light goods) generate considerable volumes of traffic. It is assumed that the level of traffic associated with these facilities will continue at current levels. The general surfacing and structure of the road is considered good. A turning lane has been provided for traffic from both sides entering the landfill.

The geometrics and alignment of the R188 varies in standard in that it would have poor to good alignment in places in both the horizontal and vertical. In the vicinity of the landfill, the alignment of the R188 is best described as "fair" in that while there is reasonable forward visibility on the road, the horizontal alignment of the R188 is such that it provides very limited passing opportunity. Structurally the pavement of the section of the receiving road in the vicinity of the entrance to the landfill is in reasonable condition. The cross-section of the R188 in the area generally consists of a pavement varying in width from 6.0 to 7.5m, with grass verges on both sides also varying in width from 0 to 3m.

There is good exit visibility at the landfill entrance in both directions and the entrance is wide enough to easily accommodate HGV’s entering and leaving. The sightline in the north-eastern direction is achieved by way of a hedge reduction in the adjacent field to the northeast, while the sightline to the southwest is achieved by way of a fence set back. We would also indicate that there is a lane (cul-de-sac c. 3m in width) serving two houses and farmlands located immediately adjacent to the entrance, as such the junction of the facility entrance and the R188 serves traffic exiting both the facility and the lane. The fence set

back on the Cavan side, referred to above, allowed for the provision of a slip lane for traffic coming from the Cavan direction and turning left into the landfill. Further the overall road width between fences outside the facility allowed for the provision of a 3m right-turning lane for traffic coming from the Cootehill direction and turning right into the facility. As such there is very little impact of turning traffic leaving the R188 on the free flow of traffic on the regional road at the site entrance.

3.8.3 Baseline Traffic Survey

The landfill site incorporates both a landfill operation and a civic amenity site, as such traffic is generated by both operations, including journey to work trips for staff and servicing. In respect of the landfill operation, traffic in the main consists of refuse collection vehicles (RGV's), while the civic amenity facility generates in the main car traffic. There would be a small number of staff, visitors and servicing trips associated with the existing facilities. Current staff levels on site amounts to 12 and includes both office staff and general operatives.

A short duration traffic count carried out at the facility entrance on the Friday the 4th of July last (8am to 6pm) with the following objectives: -

1) To determine the existing traffic flows on the R188 at the entrance to the facility
2) To determine the traffic generated by the facility and the existing traffic patterns at the entrance
3) To establish the base line in order to enable a traffic assessment of the overall development (existing and proposed) to be carried out

The details of the count are shown in Table 3.4 for each hour of the survey period and cover the following movements: -

1) Cootehill to Cavan Town
2) Cootehill to Landfill
3) Cavan to Cootehill
4) Cavan to Landfill
5) Landfill to Cootehill
6) Cootehill to Cavan Town

In effect all the movements at the junction were counted. There is an office/weighbridge on site, wherein all HGV movements are recorded together with some of the larger household/miscellaneous loads that enter the civic amenity facility. This allowed for a cross check of the HGV's entering the landfill. The largest volume of vehicle movements into and out of the landfill site observed during the survey were cars/vans etc. using the civic amenity site.

Table 3.4- Results of Traffic Count at Landfill Entrance

Time	Landfill		Cootehill App		Cavan App		Total	Total	Total
	Left	Right	Straight Note 1	To Landfill Note 2	Straight Note 3	To Landfill Note 4	Landfill	Cootehill	Cavan
8 -9	3(0)	9(1)	113(8)	4(0)	91(8)	9(1)	25(2)	212(16)	222(16)
9 -10	6(1)	28(2)	139(10)	4(0)	117(11)	24(3)	62(6)	256(22)	308(26)
10 -11	5(1)	36(2)	156(11)	5(1)	133(12)	39(2)	85(6)	299(25)	364(27)
11 -12	7(1)	64(4)	158(12)	8(2)	135(12)	56(3)	135(10)	308(27)	413(29)
12 - 1	6(1)	49(1)	164(8)	10(3)	148(15)	46(3)	111(8)	328(27)	407(27)
1 – 2	6(0)	51(5)	166(12)	12(1)	134(12)	54(6)	116(12)	312(25)	405(35)
2 - 3	6(2)	60(6)	175(12)	7(3)	167(16)	63(7)	136(18)	355(33)	465(41)
3 - 4	7(0)	58(2)	204(14)	6(1)	170(14)	59(1)	130(4)	387(29)	491(31)
4 – 5	3(0)	30(1)	220(12)	3(0)	176(16)	29(1)	65(2)	402(28)	455(30)
5 - 6	1(0)	15(1)	240(14)	0(0)	180(15)	1(1)	17(2)	421(29)	435(31)

Note 1: From Cootehill straight to Cavan
Note 2: From Cootehill to Cavan but turning right into the landfill
Note 3: From Cavan Town to Cootehill
Note 4: From Cavan Town to Cootehill but turning left into the landfill

The figures in brackets denote HGV trips. Arising from the survey, the following would be the main points: -

1) During the survey period the facility generated some 880 traffic movements of which 72 were HGV movements, the remainder been cars/light goods
2) Some 11.5% of the overall movements were from or towards Cootehill, the remainder originated or had a destination in the direction of Cavan Town/Cavan Bypass.
3) Some 15% of the HGV movements were from or towards Cootehill.
4) It was observed during the survey that some vehicles, mainly cars using the facility that came from the Cootehill direction continued towards Cavan.
5) There was virtually no traffic on the adjacent lane.

The survey indicated that that the annual average daily traffic on the R188 northeast (Cootehill side) of the facility was 4460 vehicles per day with a HGV content of 8 % during the working day, while the AADT on the southwest of the facility was 5545 vehicles per day with a HGV content of 7.4%. The short duration count were expanded in accordance with RT201 to yield the AADT's (factor used was that for a 7 hour count - 9am to 1 pm & 2pm to 5pm). The confidence level for the predicted AADT's is 17%. It should be noted that from a traffic aspect the worst hours are 5-6pm for the R188 Cootehill side and 3-4pm on the Cavan side, the former would be the expected norm while the latter resulted from the usage of the civic amenity site. The predicted AADT on the Cootehill side would correspond quite favourable with figures supplied by Cavan County Council, wherein a count on the R188 at Corravahan in January 2007 (c. 3 km on the Cootehill side of the landfill) indicated an AADT of 4088 for the R188 with a HGV content of 7%. Yearly peak hour flow for the R188 based on the predicted AADT's are 490 & 609 on the Cootehill & Cavan sides respectively (5-6pm on a Friday in August). It

should be noted that the 5-6 peak hour flow would lower in practice as the civic amenity site would be closed during this hour. In this regard, a yearly peak hour flow of 550 would be more applicable.

As indicated by Table C4.2 in RT180 "Geometric Design Guidelines" indicates that a 7m road would have a 2-way capacity of 700 and 1300 plus for levels of service for the facilities respectively, clearly there is spare capacity on the receiving road at present.

3.8.4 Accident Statistics on R188

Accident statistics on the R188 in the vicinity of the existing landfill entrance were examined. The following table shows the statistics for the period 1988 to 2005 for the section of the regional road extending c. 3 km each side of the entrance: -

Table 3.5– Accident Statistics on the R188

Period	Material Damages	Minor Inj.	Serious Inj.	Fatality	Total	Remarks
88 - 98	18	3	3	0	24	Extract from previous EIS on landfill
99 - 02	13	6	1	0	20	Cavan Co Co records
02 - 05	12	2	3	0	17	Cavan Co Co records
Totals	**43**	**11**	**7**	**0**	**61**	**Remarks**

The statistics indicate that some 3 accidents were recorded within 100m of the entrance in the period 99-02, there were no recorded accidents in the period 02-05. The statistics indicate that the accident record on the R188 would be normal for the class of road and traffic in that over the 6km stretch some 3.6 accidents per year on average were recorded (or 0.6accidents/kilometer). The majority of the accidents recorded were minor been either material damage or minor injury.

The existing arrangement to include a right turning lane and left turning slip road, appears to be working well. It is essential that the sightline to the northeast is maintained (existing hedge of the field is cut down to c. 0.8m in height), by either setting back the fence to the northeast (preferred option -see mitigation measures) to provide 160m sightlines from a set back of 4.5m from the edge of the carriageway or to continue to maintain the height of the hedge/bank to the northeast to a maximum of 1m in height so as to achieve the same result (current situation). Either option will provide the full sightlines but the permanent fence set back would be the preferred solution.

3.8.5 Traffic Generation

As indicated above, the proposal is to add two new facilities at the Corranure Landfill site to include for the provision of both a MRF dealing with C&D waste as well as commercial

and industrial waste together with a Mechanical & Biological Waste Treatment (MBT - composting) facility at an existing landfill site.

In line with the proposed new facilities, it is proposed to change the operating hours of the existing facilities as follows: -

Table 3.6 – Operation Hours

Facility	Operating Hours	Waste Acceptance Hrs	Construction
Landfill	6.30 – 19.30	7.00 – 19.00	8.00 – 18.00
Civic Amenity	8.00 – 17.00	8.00 – 16.30	Not applicable
WRF	6.00 – 22.30	6.30 – 22.00	8.00 – 18.00
BTF	Continuous (24hrs)	6.30 – 22.00	8.00 – 18.00

Note: - (1) The facility will operate 6 days per week, i.e. Monday to Sunday inclusive
(2) It is not proposed to operate or accept waste at the facilities on Sundays or Bank Holidays except in emergencies

3.8.5.1 Traffic Generated by the Biological Treatment Facility (BTF)

The projected throughput of the BTF facility will amount to 65,000 tonnes per annum. In this regard, 60,000 tonnes will be imported, while some 5,000 tonnes will be sourced from the civic amenity facility on site. Imported material will be transported to the site in both skip lorries (8t loads) and HGV's (22t loads) in an estimated trip ratio of 3:2. As such the average tonnage imported per working day (based on a 52 week year & 6 day week) is 193 tonne. In this regard, it is estimated 30 HGV movements made up of 18 skip movements (9 in & 9 out) and 12 HGV movements (6 in & 6 out). Some 48,750 tonnes of compost will be produced at the BTF will be exported after allowing for reduction during the process and waste separated during the screening process prior to composting and screening of the final compost. The screened waste will be disposed on-site in the landfill. The final compost material will be exported in HGV's (22t) for packing/use elsewhere. It should be noted that different vehicles will be used for exporting the final product from those used to import the raw material for the composting process. In this regard average tonnage exported per working day is 157 tonnes.

An estimated 16 HGV movements made up of 8 out and 8 in movements would be generated from the product. Some 6 staff will be employed at the BTF, with occasional additional trips generated by visitors, veterinary inspections, servicing etc., as such we would estimate that an additional 20 other vehicle movements would be created during the day. In all some 66 movements, 46 HGV & 20 others would be created over the working day at the BFT. This would average 5 movements per hour, the worst periods would be the 7.30 to 8.30 period in the morning and the 5-6 pm period in the evening when some 10 trips would be generated mainly associated with the journey to work.

3.8.5.2 Traffic Generated by the Materials Recovery Facility

The throughput of the recycling facility will amount to 180,000 tonnes per annum. In this regard, the 175,000 tonnes will be imported and some 5,000 tonnes will be sourced from the civic amenity facility on site. Imported material will be transported to the site by different means of transport including ejector lorries (20t loads), skip lorries (8t loads) and hook lorries (15t containers) carrying an estimated 45,000tonne, 12,000 tonnes & 18,000tonnes respectively. Arising from this the average tonnage imported per working day (based on a 52 week year & 6 day week) is 561 tonne. An estimated 66 HGV movements made up of 48 ejector lorry movements (24 in & 24 out), 10 skip movements (5 in & 5 out) and 8 hook lorry movements (4 in & 4 out). Some 137,700 tonnes of recyclables will be exported after allowing for waste separated during the screening/separation process (10% of imported tonnage) and the use of an estimated 24,300 tonnes (15% of the remainder) of C&D material, rubble and fines used on-site as landfill cover etc. The separated waste from the screening process will be disposed on-site in the landfill. The final recyclable material will be exported in HGV's (20t) for reuse. It should be noted that the same ejector vehicles will be used for exporting the final product as those used to import the raw material.

An estimated 23 outward movements would be required, as there are 24 inward loads per day, in theory no additional outward trips should be generated. This is not practicable, as such for assessment purposes, we have allowed for 10 additional movements per day made up of 5 out and 5 in movements to cater for logistic bottlenecks. In relation to the provision of this facility, it is proposed to locate all drivers, helpers, operatives and additional office staff on-site at the Corranure facility (estimated 60 at full production), with occasional additional trips generated by visitors, servicing etc., as such and allowing for car sharing we would estimate that at worst an additional 100 vehicle movements would be created during the day. In all some 176 movements, 76 HGV & 100 others would be created over the working day. This would average 12 movements per hour during the working day, the worst periods would be the 7.30 to 8.30 period in the morning and the 5.00 to 6.00 pm period in the evening when an estimated 30 trips would be generated, these would mainly be car movements.

It will be necessary to provide a car/truck parking area on-site to cater for both staff and HGV parking for the new facility.

Arising from the above, in total, some 242 movements created by the provision of the new facilities, 122 HGV & 120 others would be created over the working day. This would average 17 movements per hour, the worst periods would be the 7.30 to 8.30 period in the morning (journey to work and outward truck movements) and the 5.00 to 6.00 pm period in the evening (trucks to base and journey home) when an estimated 40 trips (32 car & 8 HGV movements) would be generated.

From a traffic aspect, the worst case would arise when construction on extending the cells in the landfill would coincide with the full operation of the site (all facility fully operational). Construction of the cells would be estimated to generate some 60 (30 HGV & 30 others) trips per day or some 10 trips during the morning and evening peaks. There

will be some reduction in trips allowing for the extended operating hours of the landfill, we have not taken this into consideration. As such the worst case scenario from a traffic aspect would be that an estimated 302 additional trips would be generated per day or 50 in the peak hours, this is set out in the following table:-

Table 3.7 Traffic Generated by the New Facilities

Facility	Day (HGV)	Day (other)	Day Total	Peak Hr. (HGV)	Peak Hr (other)	Peak Hr Total
BTF	46	20	66	4	6	10
MRF	76	100	176	6	24	30
Construction	30	30	60	3	7	10
Totals	152	150	**302**	13	37	**50**

3.8.6 Environmental Impacts

The maximum amount of waste that will be accepted at the facility will be 335,000 tonnes per year. The potential catchment area for the facility includes counties Cavan, Monaghan, Louth, Meath, Westmeath, Kildare, Laois, Longford and Leitrim.
As indicated the proposed new facilities will generate some 302 movements per day (worst case) or an estimated 50 trips in the peak hour. New HGV movements would be reasonably evenly spread over the working day and would not correspond with peak hour flows on the receiving road. Some 90% of these trips would travel in the direction of Cavan town based on the current usage.

Given the background yearly peak hour traffic is of the order of 550 (worst case), compared with the capacity for levels of service C&D of 700 & 1300 respectively, it is reasonable to assume that traffic will split in the same ration as existing traffic in that the bulk of the traffic will head for Cavan Town/Bypass where it will diverse quickly. It is reasonable to conclude that the most affected section of the receiving road, i.e. the section of the R188 from the entrance to the N3 bypass, in the opening year will still operate at a level of service C, when the traffic on the section will rise to some 595 vehicles in the peak hour, and will continue to do so for some 8-9 years thereafter, after which it will drop to a level of "high" D as background traffic increases. The growth rate on the R188 will be of the order of 2% per annum in line with the predictions for non-national roads set out in the NRA publication "Future Traffic Forecasts - 2002-2040". The R188 to the northeast of the landfill will continue to operate at a level of service C for many years to come as background and generated traffic on that section of road will be much lower.

The other main impacts of the additional traffic on the receiving environment would be two-fold: -

- Traffic entering and leaving the landfill safely
- Impact on the structure of the road pavement for the long-term

In respect of the former, a number of mitigation measures can be taken to maximise the safe use of the existing entrance, these are listed below. In respect of the latter, traffic from

the facility will mean an increase in "loaded HGV" movements on the pavement over the current position this will result in a reduction in the effective life of the existing pavement. This is a road maintenance issue and it is normal for the local authority to include a development levy in any grant of planning to cater for any expenditure incurred by them on upgrading the receiving road.

3.8.7 Construction Traffic for Proposed New Facilities

Traffic during the construction phase for the new facilities will in volumetric terms be much lower than that generated by the operation of both facilities with an estimated peak staffing level of 25-30 site staff generating some 60 car movements and 60 HGV movements per day (30 in & 30 out). Clearly the impacts in respect of traffic during the construction phase will be less than that occurring during the operational phase

3.8.8 Proposed Mitigation Measures

In respect of the maximising safety for both passing traffic on the R188 and traffic using the entrance to the landfill, the following mitigation measures are proposed:

- Set back the fence along the existing field boundary of the field to the northeast in order to provide sightlines of 160m at a set back of 4.5m. This would guarantee entrance sightlines in full compliance with NRA DMRB for a design speed of 85km/hr or as a minimum continue to maintain the height of the hedge of the field to the northeast to a maximum height of 1m
- Consideration should be given to providing traffic route lighting on the R188 at the entrance and for 250m on both approaches
- Provide advance warning signs on the R188 by erecting warning signs, 2 no., indicating the presence of the landfill entrance on each approach. The location, wording and size of signs to be agreed with Cavan County Council
- Adequate parking is to be provided on site to cater for additional staff car parking, truck parking

Additionally the following improvements may also be provided on the approach to the existing landfill site to improve driver awareness of the presence of the landfill entrance ahead:

- Warning signs should be placed on the approaches to the landfill to warn drivers of the HCV movements ahead.
- A regular inspection of the public road to be undertaken and in the event of significant quantities of mud on the road, the road shall be swept accordingly.
- The road will be inspected for any windblown litter, which will be collected accordingly. All trucks will be suitably covered to prevent the accumulation of litter during transport.
- The site has two weighbridges that allow for two vehicles to be entering or leaving the site at the same time without contributing to the overall queue system.

- Traffic to and from the site will not be permitted to park on the public roadway or to impede the free flow of traffic on the adjoining road network.

3.9 Landscape

3.9.1 Introduction

The aim is to provide an assessment of the landscape and visual impact of the proposal, in relation to disruption of the landscape character and visual impact on properties and areas accessible to the public.

3.9.2 Existing Environment

Mitchell & Associates undertook an assessment of the visual effects of the proposed landfill development on the surrounding area, completed in 2003. A full copy of this report 'Landscape and Visual Assessment' is attached in Volume III, Appendix 26 of this EIS. Also a photomontage assessment has been completed of the proposed BTF and MRF buildings, these impressions are also contained in Appendix 26.

3.9.2.1 Topography

The subject site slopes from the boundary of the R188 at a height of between 112 and 113m O.D. upwards to the ridge of the reinstated landfill form at a highest point of over 127m O.D. From this point the land slopes down in a north-west direction to the low point of the reinstated land form at a height of 113m O.D. The land to the north-west of this point is currently in operation and with varying heights, with the highest point at present being to the west of the site at a height of 122m O.D. To the north-west of this land is Cell 4 which is currently under construction (See Drawings 5 and 6)

The proposed BTF and MRF buildings will be a height of 138.44m O.D at a distance of 321m from the R188 Cavan-Cootehill Road.

3.9.2.2 Slope Regime

Slope angles vary from between 1 in 5 and 1 in 10 at the steeper end of the scale, to an angle of between 1 in 10 and 1 in 50 on the shallower slopes.

3.9.2.3 Existing Vegetation

The existing vegetation consists of hedgerows and small clumps of woodland, the predominant species being Hawthorn *(Crataegus Moonogyna),* Bramble *(Rubus Fruiticosus),* Gorse *(Ulex Europaeus),* and with some Ash *(Fraxinus Excelsior)* and Holly *(Hex Aquifolium).*

There is a hedgerow along the boundary at the R1B8 Regional Road which consists of Alder *(Alnus Glutinora).* The main ground-cover over the site is rough grassland.

3.9.2.4 Land Use

The existing landfill is located immediately to the south west of the site; with the Civic Amenity facility adjacent to the main entrance gate and extends to a pocket of associated buildings beyond the Leachate Tank, lagoon and enclosed Flare. The predominant land use surrounding the site is one of agricultural pastureland.

3.9.2.5 Visual Analysis

The landscape locally is visually-dominated by the existing landfill and its associated buildings. It is situated in the middle of agricultural pastureland with a haphazard field pattern enclosed by hedgerows and small clumps of woodland. Areas of steep slopes are confined to the existing landfill site and southern end of the site. Views into the site are confined along the R188 Regional Road and to the laneway giving access to the existing farm buildings. There are also views into the site from isolated housing units surrounding the site located to the west, the east and south-east of the site.

3.9.3 Environmental Impacts

Construction impacts relate to ground disturbance, hedgerow removal and erection of buildings. The scale and sweep of the landscape will absorb the mass of the proposed development into this already established landfill site. Therefore there will be little visual change in terms of the perceived mass of the landfill when viewed from a distance. Visual mitigation of the short term views into the site will be mitigated by planting of the mound with a natural pattern of scrub woodland and a mix of wild grasses and wildflowers.

The existing landfill site will remain at its present height of approximately 128m O.D. The proposed further extension to the North will be raised to a height of approximately 128.5m O.D., so it will be partially obscured by the existing landfill. The proposed buildings will be a maximum height of 138.44m O.D and will be partly visible from the R188 roadway. View point 1 and view point 2 show impressions of the proposed buildings and their position on the current site.

The areas immediately surrounding the proposed development are not densely populated. Therefore limited impact on residential amenity is predicted.

3.9.4 Proposed Mitigation Measures

Primary mitigation of the Integrated Recycling Facility will be achieved by virtue of the scale of the visual catchment area within which the site is located. The scale and sweep of the landscape will absorb the mass of the proposed landfill into its natural fabric. Therefore there will be little visual change in terms of the perceived mass of the landfill when viewed from a distance.

Visual impacts of the short term views into the site will be mitigated:

- by virtue of the proposed level of the landfill site being at the same height as the existing thus being obscured from view from the South of the site, from the R188.
- through the configuration and grading of the proposed landfill volume to create a form in the landscape that will be visually compatible with the surrounding landscape by mimicking a natural weathered landform.
- Through the selection and planting of the appropriate vegetation cover utilizing a combination of scrub woodland and wild grasses which will further visually reduce the apparent mass of volume in the landscape.
- Mitigation will also be by the implementation of appropriate site management in keeping the site tidy and dust to a minimum.

The planting of the mound with a natural pattern of scrub woodland will further serve to mitigate the apparent mass in the landscape. It is intended that the utilization of a scrub woodland mix of Hawthorn, Alder, Beech, Oak and Blackthorn will create a stable and visually - appropriate plant community on the flanks of the mound. The remaining areas of mounding will be covered by an appropriate mix of wild grasses and wildflowers as a low ground cover and visual foil to the scrub-woodland. The matrix from which these plant communities will be grown will consist of 150mm topsoil, overlying 850mm subsoil, which will allow for the development of an adequate root zone for the proposed plant material.

Appropriate finishes will lessen the impact of the buildings within the landscape. The colour and finishes selected for all buildings will be muted in shade and tone, taking into account the surrounding environment. New planting would become an effective screen as it matures and will integrate the development into the surrounding landscape as per View point 1. The screening bund south of the proposed buildings will lessen the visual impact of the building from the R188 road; this would be further enhanced by additional planting.

Best landfill management and operational practices in accordance with EPA Guidelines will ensure that the development of the facility at Corranure Landfill will have no adverse impact on the surrounding lands.

3.10 Archaeology & Cultural Hertiage

3.10.1 Introduction

Landscape features to include all humanly created and portable artefacts, which might reflect the prehistoric, historic, architectural, engineering and/or social history of the area are required to be examined. Margaret Gowen & Co. Ltd. carried out an assessment of the archaeological, architectural and cultural heritage of the existing site and proposed extension (Cell 3 and 4) to Corranure Landfill in 2003. (A full copy of this report 'An assessment of the archaeological, architectural and cultural heritage of the existing site and proposed extension' is attached in Volume III, Appendix 27 of this EIS).The report was based on a desk study together with a field inspection of the area in question. The report also draws on a previous report prepared as part of the Environmental Impact Study

(EIS) and Waste Licence Application for the present landfill in 1998 (Reilly 1998), and on the results of archaeological monitoring subsequently carried out during expansion within the landfill in August 2001 (O'Meara 2001). Ellen O Carroll (Archaeological Consultant) conducted a walkover assessment in August 2008, this assessment is also contained in Volume III, Appendix 27.

3.10.2 Existing Environment

In topographical terms, the existing landfill and proposed development area lie in a sheltered valley bounded by drumlin hills on all sides. These hills were settled in the Early Medieval period as evidenced by ringforts in Lismagratty (CN021:063), Corranure (CN021:018), Drumbo (CN020:027) and Cross (CN020:007), located approximately 60m, 520m, 200m and 700m respectively from the proposed landfill boundary. Settlement continued into the nineteenth century as evidenced by a number of farmsteads shown both within, and surrounding the Cell 3 and 4 area. Cell 3 (being the active Cell) and Cell 4 are situated on the western side of the landfill site. There is no topsoil and very little subsoils present in these areas.

Nothing of archaeological significance was uncovered during the monitoring of Cell 4 while a small burnt spread was uncovered during earlier monitoring phases by O Meara in 2001. The burnt spread, which was situated on the edge of a wetland area, presently characterised by a prolific growth of reeds, and indicated as such on the revised 1912 edition OS six-inch map, presented itself as a small spread of fire-cracked and blackened stone measuring a maximum of 2.8m long and 1.9m wide, and no more than 5cm deep. The proposed development site of the Materials Recovery Facility and the Biological Waste Treatment facility is presently subdivided into two areas by a hedgerow and ditch. The proposed treatment centres are to be located on the eastern side of the landfill site *ca* 60 metres south west of the ringfort RMP CN021:063. The area for the MRF is located on the southern side of the hedgerow while the area for the Biological Treatment facility is on the northern portion.

The area for the MRF is defined by a hedgerow on the northern edges and green marshy fields on the western and southern edges. The western edge of this development area abuts a small roadway leading into the landfill site. The proposed development area has been largely modified and excavated out on the past. The ground levels have been reduced and the area has been paved with gravel. A small area of greenfield remains unmodified at the eastern end of the development site

The location for the Biological Treatment facility consists of a large sub-rectangular area and is subdivided from the MRF area by a bank and hedgerow on its southern side. The area is delineated by substantially excavated ground on the northern and eastern edges and a roadway on the western edges. A small lane also runs alongside the southern boundaries. All topsoil and substantial quantities of subsoil have been removed from the development site. Nothing of archaeological significance was noted in the area proposed for development in areas A or B.

The ringfort (CN0021-63) located close to the development site was also examined. It is a bivallete ditched enclosure and is presently covered totally in hazel coppice wood and other scrub vegetation. It is difficult to access the interior of the ringfort. It was noted that the excavated areas, associated with the extraction of cover material for the landfill site is currently right up to the corner of the southwestern edge of the ringfort.

3.10.3 Environmental Impacts

The walkover assessment has indicated that the two proposed building areas and Cell 3 and 4 proposed for development have been largely modified and excavated to natural subsoils during the lifetime of Corranure landfill. The excavation of Cells 3 and 4 have had various levels of archaeological monitoring completed in association with their development in the recent past. A small burnt spread was the only archaeological feature uncovered during these monitoring phases. There is one small area of marshy greenfield located at the western portion at location of MRF.

Areas where the MRF and the Biological Waste Treatment facility is to be located is situated approx 60 metres from an existing ringfort (CN 0021-063). There will be no physical impact on this ringfort. As the surrounding landscape is largely developed, modified and encroached upon in the past there will be a low visual impact upon the ringfort. The ringfort is presently covered in hedgerows and hazel coppice wood and presents itself as a line of trees rather than an archaeological site in the present landscape.

3.10.4 Proposed Mitigation Measures

The following mitigation measures are recommended:

- An appropriate buffer zone to be devoid of any development surrounding Lismagratty ringfort (RMP CN 021-063) and to be agreed with the DoEHLG.
- Archaeological monitoring or testing of the marshy greenfield areas located at the eastern end of Area A (MRF Building).
- It is recommended that an action plan be established to provide appropriate preservation and conservation of Lismagratty ringfort and the surrounding areas. This should be done in association with the Heritage Division of the DoEHLG.

Monitoring and supervision by an archaeologist will ensure that any archaeological soils, features, finds and deposits and all further features, finds and deposits associated with nineteenth and twentieth century settlement that may be disturbed below the ground surface will be identified, excavated and recorded.

3.11 Climate

3.11.1 Introduction

The North East region has on average a rainfall between 800 and 1200mm per year. The region has on approximately 150 to 175 rain days annually and between 1400 and 1500 hours of sunshine. An onsite weather station a 'Davis Weather Station II' is currently active on the site and is used to record the following meteorological data.

- Temperature
- Precipitation
- Wind speed and direction

The following additional data is recorded at Clones weather monitoring station based in Monaghan. This is the nearest meteorological station is located 22km to the NE.

- Humidity
- Atmospheric Pressure
- Evapotranspiration

A summary of all meterological data for 2008 is contained in Volume III, Appendix 14.

3.11.2 Existing Environment

The local climate is an important factor in determining the magnitude and direction of maximum air quality impact due to atmospheric emissions from the operation of the landfill facility at Corranure. The wind speed will affect the rate of dilution of emissions from the various emission sources of dust, PM_{10} and gaseous compounds generated within the landfill. The precipitation pattern of the locality affects the generation of leachate within the landfill and so contributes to the decomposition of waste material in the cell. It is also important in controlling emissions of dust and PM_{10} from the road surfaces.

3.11.2.1 Wind

Fugitive dust emissions from a surface occur if the winds are sufficiently strong, turbulent, the surface dry and loose to cause re-suspension from the ground and road surfaces. The surface needs to have a relatively low moisture content for this type of dust emission to take place and any wetting, either by rainfall or sprayers, will greatly reduce the potential for fugitive dust emissions to take place. A wind speed at ground level in excess of about 5 m/s is considered to be the threshold above which re-suspension of fine-sized material from an exposed surface may take place.

The long-term wind direction and speed statistics for the period 1968-97 shows it is evident that the prevailing winds are from a south westerly direction, approximately 60% of winds are from the western sector with an incidence of calm 'slack' wind conditions of

about 5%. The annual average wind speed at Clones is 4.4 m/s with less than 6% of the hourly observations recording wind speeds over 9 m/s.

3.11.2.2 Rainfall

Precipitation data taken from Clones Weather Station are given in Table 3.8. There is no significant difference in the long-term monthly totals recorded during the winter period (Oct-March) compared to the summer period. The precipitation occurring in the winter period is normally associated with more prolonged Atlantic frontal weather depressions passing over the region compared to the summer when rainfall is more likely to be associated with heavier showery conditions."

The local rainfall pattern is important as it affects the moisture content of the surface of internal haul roads and hence potential for fugitive dust emissions from the road surface.

Table 3.8 Mean rainfall in millimetres (2007) at Clones, Co. Monaghan

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
2007	105.5	64.4	80.7	17.9	64.4	73.7	134.4	98.3	54.6	42.2	64.7	111.1	911.9
mean	90.8	67.4	77.5	55.9	67	68	60.3	85.8	82.7	97.3	85.3	90.3	928.4

3.11.2.3 Air Temperature

The daily temperatures at Clones weather station for 2007 is presented in Table 3.9. The climatological records for the landfill indicate a comparable annual mean temperature of 9.0 C during 2002/03 with a maximum hourly temperature reported of 26 C

Table 3.9 Mean air temperatures in degrees C. (2007) at Clones, Co. Monaghan

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
2007	6.1	5.4	6.3	10.6	11	14	14.4	14.6	12.7	11.4	8.5	5.8	10.1
mean	4	4.2	5.7	7.5	10.1	12.9	14.5	14.2	12.1	9.8	5.9	4.8	8.8

The proposed extension of the landfill facility will not have a significant impact on the climate of the area as the final shape and form of the site will have a minimal effect on the overall wind field in the vicinity of Corranure.

3.11.3 Environmental Impacts

The proposed extension of the landfill facility will not have a significant impact on the climate of the area. Emissions of methane and other greenhouse gases will be insignificant from the landfill due to gas collection and flaring. The main sources of air emissions from the developments, namely the C&D and biological treatment plant are pollutants of climatic concern (primarily CO_2, NO_x and SO_2) would be vehicular/traffic which may have the potential to contribute to atmospheric conditions.

3.11.4 Proposed Mitigation Measures

Adherence to mitigation measures as mentioned in sections (namely Air Quality Section 3.6 and Traffic Section 3.8) and good site practice during the construction and operation phases of the proposed development will ensure that the overall impact of air emissions will not be significant. All management practices will be based on Best Available Technology.

3.12 Material Assets

3.12.1 Introduction

The effect of the facility on the material assets of the locality may be looked at through the following headings

- The change affected on the urban structure/the change in the value of the property in the area
- The effects to amenity and areas of natural beauty

The positive effects of the facility (i.e. the provision of sustainable employment and improved road structure) must be considered in conjunction with the detrimental effects, if any, on the environs.

3.12.2 Existing Environment

The siting of the proposed activities is considered to be suitable for the following reasons:

- The waste recycling and processing facility and biological treatment plant does not require any major modifications to the existing telecommunications or electricity supplies in the area.
- The proposed development will reduce the need to transport larger volumes of waste greater distances for treatment and disposal.
- The site is not overlooking or shadowing any existing development
- It is unlikely the development will cause a decrease in adjoining property values, given the existence of an already established landfill. Cavan County Council has purchased 4 dwellings that are immediately adjoining the landfill.

3.12.3 Environmental Impacts

The facility site and the immediate surroundings are not designated as a Natural Heritage Area or a proposed candidate Special Area of Conservation (pSAC), nor is it designed under any of the other nature conservation or landscape designations currently used in Ireland.

In summary, it is contended that the material asset values will not be significantly affected by the facility as the environmental impacts (air, noise and water pollution, visual intrusion, traffic impacts) of the proposed activity are shown to be minimal.

3.12.4 Proposed Mitigation Measures

The current licensed landfill site is 14.270 ha. in size, the total area Oxigen are applying for an EPA licence is 17.87 ha. Therefore the proposed development to Corranure Landfill will not have an adverse impact on land use as the amount of land in use is small and it is proposed to restore the lands to agricultural use following the closure of the landfill.

The main potential impact on material assets of the area relate to an overall reduction in the residential quality as a result of environmental nuisances (odour, litter, vermin, birds, noise, insects and pests, fires, mud and dust). Since 2001, substantial improvements have been carried out to the infrastructure and operational practices of the existing landfill and measures for the control of environmental nuisances are in place.

3.13 Interaction of the foregoing

3.13.1 Introduction

All environmental factors are inter-related to some extent. As defined in the Environmental Protection Agency 'Guidelines on the information to be contained in Environmental Impact Statements, accumulative effect is defined as '*the addition of many small impacts to create one larger, more significant impact'*. A synergistic impact occurs where '*the resultant impact is of greater significance than the sum of its constituents'*

The significant impacts of the proposed operations and the measure proposed to mitigate these impacts have been outlined in this report. However, in any development with the potential for environmental impact, there is also the potential for interaction/inter-relationships between the impacts of the different environmental aspects. The result may either exacerbate the magnitude of the impact or may in fact ameliorate it.

3.13.2 Environmental Impacts

There is potential for the interaction between the impacts of the proposed development within and adjacent to the proposed development. Atmospheric and noise emissions from the facilities has the potential to impact on human beings in the vicinity of the site. Impacts from dust and odour have the most significant impact of the proposed facilities.

3.13.2.1 Human Beings/Fauna

Landfills and waste facilities have the potential to attract unwanted fauna such as rats, flies and birds (particularly gulls and crows). These species can impact on humans from both a health and nuisance point of view. Mitigation measures to protect against these potential impacts are proposed in this EIS to include environmental nuisance control, humans, fauna, after which effects on the local community are expected to be insignificant.

3.13.2.2 Human Beings/Water

Contamination of the Corranure and Lismagratty Streams could potentially affect the amenity value of these water courses and this would affect human beings. Contamination of groundwater beneath the site could impact on local domestic wells. Mitigation measures to ameliorate these potential impacts are proposed in Sections 3.4 and 3.5 Surface Water and Groundwater.

3.13.2.3 Human Beings/Air

Dust emissions, gas emissions, noise emissions and odours from the facility have the potential to impact on human beings in the vicinity of the site. Impacts from dust, gas, odours are addressed in Section 3.6 Air, whereas noise impacts on humans addressed in Section 3.7 Noise. Mitigation measures are proposed for each potential impact and the likely significant effects on the population are expected to be minor.

3.13.2.4 Human Beings /Landscape

The development has the potential to affect human beings in the form of visual intrusion. Mitigation measures such as woodland planting and screening berms are proposed in Section3.9 Landscape, after which effects are expected to be insignificant.

3.13.2.5 Water/Flora and Fauna

Contamination of surface water has the potential to impact on the water quality of the streams and rivers down gradient of the site. This impact could potentially affect the aquatic life of these water courses. Mitigation measures are outlined in Section 3.5 Hydrology.

3.13.2.6 Water/soil

Soil beneath the site can act as a pathway for contaminants reaching both the groundwater and surface water. Mitigation measures to protect against this potential impact are proposed in Section 3.4 Hydrogeology.

While there is potential for the impacts to interact/inter-relate and result in a cumulative impact, it is deemed unlikely that any of these cumulative impacts will result in significant environmental degradation.

3.13.4 Proposed Mitigation Measures

The facility will be operated to the Best Available Techniques (BAT) as per EPA recommendations and under conditions of a waste Licence. All information will be available to interested parties: a complaints register will be maintained. The EPA will undertake regular environmental audits, which will demonstrate how the facility is performing. These measures will result in interaction in all environmental criteria.

Compliance monitoring will be undertaken, as per regulatory conditions and will be reported on, as part of the annual environmental report for the whole facility. These reports will be made available to interested parties, which will alley public concerns as to the operation of the site and will result in a positive interaction with respect to human beings.