3 DESCRIPTION OF THE PROPOSED DEVELOPMENT

3.1 Introduction

This section describes a number of elements that are proposed for the Kilshane Cross Recycling Park. These include the design and operation of the following elements:

- A **Construction and Demolition Waste Recovery Facility** (C&DRF) processing 75,000 tonnes per annum (tpa);
- A **Biological Waste Treatment Facility** (BTF) treating 45,000tpa of segregated domestic and commercial organic waste;
- A **Waste Transfer Facility** (WTF) processing 65,000tpa of municipal solid waste; and
- A **Sludge Hub Centre** (SHC) treating 26,511tpa of de-watered sludge cake from wastewater treatment facilities in County Fingal.

As this is a Design Build and Operate (DBO) project, the exact nature of the treatment processes or technologies will emerge from the procurement process and thus have yet to be agreed. As a result, the following process descriptions are generic in nature. Some elements of the proposed development utilise less advanced technologies than others and thus are more defined. For the C&DRF and WTF, the processes and technologies are relatively straightforward and thus are explained in more detail. The processes to be used in the BTF and the SHC require more advanced technologies and thus cannot be detailed until the procurement process has been finished. Notwithstanding this, the main generic process operations for the BTF and the SHC are detailed. For the BTF process, the EIS describes both options for composting technologies and options for anaerobic digestion technologies.

3.2 The Proposed Development

3.2.1 *The Site*

The site is situated approximately 1.5km north of the M50/N2 interchange towards the southern end of County Fingal, in the townland of Newtown (see Figure 1.1). It comprises undulating and fallow agricultural land in a single, large field approximately 15ha in size. The field is surrounded by hedgerows, bordered to the east by the N2 and to the west by a small stream. The new N2: Finglas to Ashbourne Road Scheme intersects the northeast corner of the field, approximately 100m to the north of the proposed development, and is currently being constructed.

Located to the south and west of the site is the large Huntstown Quarry (operated by Roadstone Dublin Ltd.). Small residential developments are located to the east and north of the site and the privately owned Huntstown Power Station is located to the south. The majority of the surrounding landscape is agricultural.

To the north and east of the site, which lies at approximately 75m to 78m AOD, the land rises gently to a ridge at 80m AOD before dropping down to lower ground. There is a high point north of the site, at 84m AOD, on the eastern side of the N2 just above Dunsoghly. To the south, the wider landscape is generally flat heading towards the M50. To the immediate south of the site is a landscape bund (approximately 4-5m high), with associated planting, which runs parallel to the site's southern boundary. To the south west and west the land is generally flat before rising suddenly to become a series of high mounds and ridges that have been created from the workings of the Huntstown Quarry. These mounds and ridges rise above the site and are not permanent topographical features.

The field within which the site resides rises gently from south to north with subtle higher points at the central southern end and central northern end. There is a stream that runs down the western boundary of the site, running south to north, which eventually joins the River Ward to the northeast. The stream cuts deeply into the ground, forming steep banks at the southwestern corner of the site. A topographical survey of the site is given in Drawing No. 1234/01/202.

3.2.2 General Site Layout

The functional design and layout of the proposed Kilshane Cross Recycling Park, hereto referred to as the Recycling Park, is shown on Drawing No. 1234/01/203. In designing this layout, the following criteria have been used.

1. Ease of traffic flow within the site.
2. Sufficient road areas within the site to accommodate queuing of vehicles and to avoid traffic queuing on the public road.
3. Availability of the weighbridge to heavy vehicles using the Facility.
4. Sufficient room for landscaping of the site.
5. Sufficient area for the stockpiling of processed C&D waste.

3.2.3 *Security and Entry Control Facilities*

The main entrance to the site is from the existing N2. This is a common entrance and traffic going to each facility will utilise it. There is a site road running through the Recycling Park, which can be seen in Drawing No. 1234/01/203. The site road splits inside the main entrance gate. Traffic going to the C&DRF will take the right-hand-side road, while traffic going to the BTF, WTF, SHC and the site office block will take the left-hand-side road. The site road will be adequately sign posted to direct traffic to the relevant facility.

The site will be secured with a variety of security fencing, as shown in Drawing No. 1234/01/203. Details of the security fencing and the main facility entrance gate are shown on Drawing No. 1234/01/216.

Fingal County Council, as the licence owners, will be responsible for the security of the overall Recycling Park. Each facility operator will be responsible for its own security and will have its own fencing, which will be detailed as part of the tendering process.

During operating hours, 07:00 and 22:00 Monday to Saturday, Fingal County Council staff will supervise the main facility entrance. The process in the Biological Waste Treatment Facility (BTF) and the Sludge Hub Centre (SHC) will be continuous. Thus the operation of these facilities will effectively 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 operating hours, the main Recycling Park entrance gate will be locked, and monitored by CCTV. Other details in relation to the operation hours of the Recycling Park are given in Section 3.2.7.

There will be two weighbridges in the Recycling Park. One weighbridge will be solely for the C&DRF and the other weighbridge will be utilised by the other three facilities. Fingal County Council will operate both weighbridges and the weighbridges will be linked via telemetry.

At the main entrance on the N2, an information and identification board will be erected, displaying the following information:

- Name and type of the facility;
- Name of the owner and/or operator;
- Licence information;
- Types of waste accepted and not accepted;
- Operating times;

- Contact and emergency telephone numbers; and
- Authority responsible for the operating licence and control of the site.

3.2.4 *Layout of Buildings*

The Facility will consist of a number of elements namely:

- C&D Waste Recovery Facility (C&DRF), consisting of a C&D waste reception and processing area, an aggregate stockpiling area, a C&D administration building and a weighbridge;
- Biological Waste Treatment Facility (BTF);
- Sludge Hub Centre (SHC);
- Waste Transfer Facility (WTF);
- Main Administration Building
- Maintenance Shed, and
- Weighbridge Facility

The layout of these buildings is shown in Drawing No. 1234/01/203. More detailed plans of the WTF, the administration blocks and the weighbridge facility are shown in Drawing Nos. 1234/01/210, 1234/01/208, 1234/01/209 and 1234/01/211, respectively. The exact design and layout of both the BTF and the SHC will depend on the successful tender. Generic layouts of these types of facilities are given in Appendix 2.

3.2.5 *Waste Acceptance, Inspection & Quarantine*

All wastes accepted at the facility will be subject to waste acceptance measures, which will be licensed by the EPA. Only non-hazardous waste will be accepted at the Recycling Park. Each facility operator will require waste producers to characterise the waste prior to acceptance at the site. There will be no acceptance of wastes delivered by individual householders. The producer/holder/collector of the waste must, if requested, provide documentation that the waste meets the required specification. Waste not conforming to the required specification will not to be accepted at the site.

It is possible that third party waste collectors will deliver a small portion of the wastes to the facility. All waste delivery vehicles arriving at the facility will be obliged to enter onto the weighbridge where they will be weighed and the accompanying documentation checked by the Fingal County Council weighbridge operators. The vehicle will then drive from the weighbridge to the appropriate facility.

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It is possible that third party waste collectors will deliver a small portion of the wastes to the facility. All waste delivery vehicles arriving at the facility will be obliged to enter onto the weighbridge where they will be weighed and the accompanying documentation checked by the Fingal County Council weighbridge operators. The vehicle will then drive from the weighbridge to the appropriate facility.

Any waste delivered to the facilities that does not have the appropriate documentation or which, upon inspection at the weighbridge, is deemed not to be suitable will not be accepted. In such event the weighbridge operator will record the name of the waste delivery contractor, the driver, the registration number of the vehicle and the nature and origin of the waste. The weighbridge operator will instruct the vehicle driver to return the waste to the producer. Records of any such incidents will be maintained on site and reported to the EPA.

Any waste identified as not suitable following off loading at the relevant facility will be immediately removed to the waste quarantine areas in the facilities. The waste will be stored in the quarantine area pending its removal off site by the waste producer or the waste contractor who delivered the waste. In the event of the producer or contractor refusing to remove the waste The facility operator will ensure that it is removed off site and disposed of at an appropriate facility as soon as possible. Non-compliant waste will only be stored on-site over night if such wastes are delivered near the end of the working day and the contractor cannot arrange for the waste to be hauled off site until the following day. The facility operator and Fingal County Council will maintain records of the waste type, quantity, and ultimate disposal/treatment facility.

The facilities will have their own designated waste inspection and quarantine areas. The BTF and WTF will have indoor waste inspection and quarantine areas in their respective reception areas. The C&DRF will have outdoor waste inspection and quarantine areas in the waste reception/processing area. The exact location of the waste inspection and quarantine areas for the BTF have not been decided due to the fact that the exact process and design of the BTF has not been finalised. However, theses areas will be located indoors, in the reception area of the BTF building.

There will be no requirement for waste inspection or quarantine areas in the SHC. This is due to the fact that the facility will be treating sludge wastes from municipal wastewater treatment plants, and as such, the sludges will be homogenous in nature and Fingal County Council regulates the source of the waste.

3.2.6 *Facility Process Descriptions*

This section details the processes to be carried out at each facility in the Recycling Park. The exact nature of the treatment processes or technologies will emerge from the procurement process and thus have yet to be agreed. The following is a generic description of the processes for each facility.

3.2.6.1 C&D Waste Recovery Facility (C&DRF)

The principal process at the proposed C&DRF will be the treatment of C&D waste at the outdoor C&D waste recycling area. The materials being treated will mainly consist of soil, rubble, old road material, reinforced concrete, bricks, blocks, etc. This material will be brought on-site in bulk haulage vehicles and large skips, and will be the result of large development and infrastructural projects. The facility will produce a variety of aggregate types depending on the final market for the material. This material will be stockpiled in a designated area of the site and it will be sold as an aggregate product. In addition, any clean homogenous loads of topsoil, subsoil, bricks, etc. will be stockpiled separately without treatment.

All waste upon arrival at site will be weighed and the materials handling supervisor on site will log relevant information regarding content, source and weight. The C&D waste will be directed to the outdoor reception/ processing area. It will be a condition that all containers entering the site will be covered with industrial tarpaulin.

The unprocessed C&D waste will be fed into a hopper by a grab crane or loading shovel depending on the type of material. From the hopper the material will be fed into a mobile crusher and the crushed material goes by conveyor belt to a screening rig. Before the screens, the conveyor passes a magnet, which extracts steel and metal (e.g. reinforcing bars) from the crushed material. The screens sort the crushed material into different aggregate sizes and put them into stockpiles depending on size.

The grade of material recovered will be largely dependent on available market outlets and the processing equipment will have the flexibility to produce a number of grades. The crushed material will be moved to the aggregate stockpile area for storage. In addition, homogenous loads (topsoil, subsoil, bricks, etc.) will be stockpiled without processing.

Quality Control

The purpose of the proposed operation is to recover and recycle particular elements of construction and demolition waste through pre-sorting of materials at source prior to transportation to the application site.

The objective of Fingal County Council and the eventual operator of the facility will be to do this in a manner that is sustainable and environmentally friendly, in line with the high environmental standards set by the company for all of its operations. Safeguards to ensure that only suitable material is received on site include but are not limited to:

- Materials to be recovered and recycled will only be accepted from approved Contractors who are aware of the need for and who undertake strict segregation and sorting of waste prior to transporting it to the application site.

- All material arriving on site will be subject to a visual inspection on site prior to and during unloading.
- Any Contractor who persistently carries unacceptable waste to the application site will be refused further use of the facility.

The aggregates produced will be tested for their suitability as a civil engineering material. This testing effectively will be quality assurance and will be vital for the selling of the processed material. There are currently no Irish standards for aggregates recovered from C&D wastes, but the materials produced at the facility will have to match the properties of virgin building materials in order to compete in the market. A quality programme based on the chemical composition and leaching characteristics of the aggregates may be adopted to ensure quality standards. These leaching tests to establish the quality of the product are recognised by the Dutch Department of the Environment and are the same as leaching tests carried out in Germany. The recycled product will also go through standard physical tests, such as grading, relative strength, vulnerability to weathering, dust content, etc. An insurance that the recovered aggregate product will satisfy all relevant quality standards will be written into the DBO contract.

3.2.6.2 Biological Waste Treatment Facility

Introduction

The biological treatment facility planned for Kilshane will utilise either aerobic in-vessel composting or anaerobic digestion (AD) to treat biowaste collected in the Dublin Region. Other waste streams may also feed into the facility and include separately collected kitchen waste from restaurants, hotels and other commercial sectors. Biological treatment of organic waste is well established in other EU countries and in particular Germany, Austria and Holland, who have been successfully composting organic waste for over 20 years. Smaller amounts of organic waste has been treated through anaerobic digestion in these countries. Interest in anaerobic digestion is growing across the EU with countries such as Germany, Denmark, Sweden and Spain showing a lot of interest in this type of technology.

There are many proven types of composting and AD technologies on the market that have a great deal of commercial experience. Newer technologies are always coming online to meet regulatory requirements and in some cases to address some of the shortcomings recognised with some of the proven 'older' technologies. In-vessel composting and AD technology will be described in the following sections.

In-Vessel Composting

In-vessel composting systems are contained systems developed primarily with the intention of protecting the environment, providing rapid decomposition of organic material and offering greater control over the process, especially when compared to the more traditional methods of open air windrow composting. The Animal By-Products (ABP) Regulation EC No. 1774/ 2002 requires that Category 3 waste, which includes catering and kitchen waste be treated in an in-vessel composting system. Because of tighter restrictions on how food waste can be processed and because of the greater emphasis on preventing nuisance at composting plants, a fully enclosed in-vessel composting or Anaerobic Digestion system will be utilised at the proposed site.

Layout of a Typical In-Vessel Composting Plant

The composting facility will be fully enclosed in a large building and will comprise the following elements:

- Waste reception area;
- Pre-treatment area;
- In-vessel composting units;
- Maturation pads;
- Odour abatement systems;
- Process control and monitoring equipment; and
- Post treatment and bagging area.

Stages in an In-Vessel Composting Process

The following processing steps are typical of all in-vessel composting systems:

- Waste acceptance and pre-treatment of incoming waste;
- Biological processing;
- Maturation;
- Post Treatment; and
- Process Control and Monitoring.

A process flow diagram for a typical in-vessel composting system is given in Figure 3.2.1 overleaf.

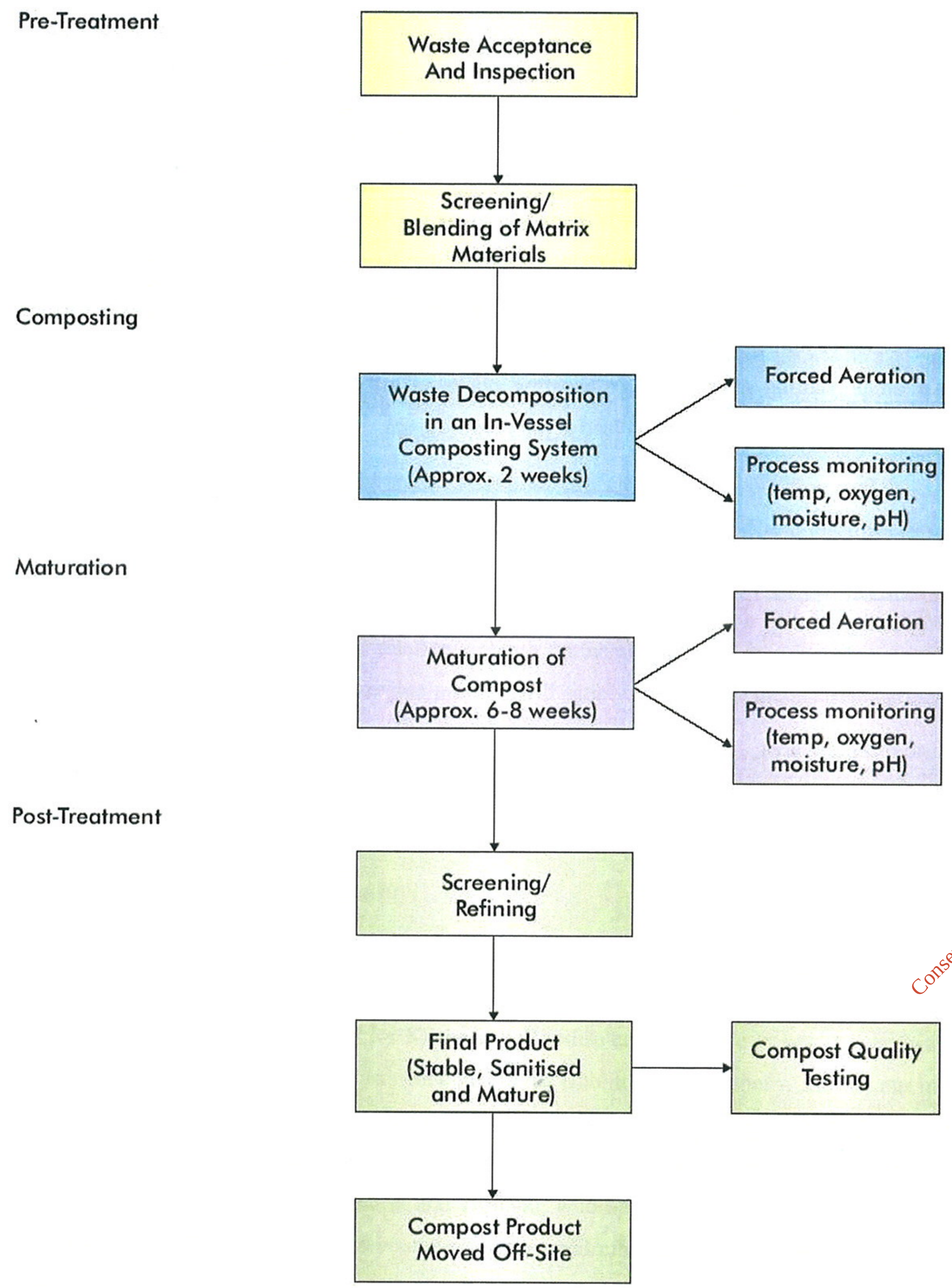


Figure 3.2.1 Process Flow Diagram for a Typical In-Vessel Composting System

Waste Acceptance and Pre-Treatment

All waste to be accepted at the facility will be inspected and deposited in the enclosed waste reception building where it will undergo pre-treatment.

Pre-treatment of feedstock can include:

- Screening of oversize material;
- Mechanical or manual sorting to remove contaminants;
- Homogenisation of feedstock to provide uniform particle size not greater than 12mm (as per ABP Regulations); and
- Mixing of waste materials to obtain an optimum C:N ratio of between 25:1 and 40:1, depending on incoming material.

Removal of contaminants from the feedstock will assist in producing high quality compost. Once the material has undergone the relevant pre-treatment processes the waste will then be placed in the in-vessel units and the process will begin.

Trommel screens are often used at the first stage of composting to remove the optimum particle size for composting, which must now not be greater than 12mm (as per ABP Regulations). The oversize material is usually reintroduced into the process as a bulking material. Oversize material will be reused as much as possible in the composting process, reducing the amount of additional bulking material required and also the amount of waste material to be sent for disposal. The screened material can then be mixed with the required amount of bulking material, such as wood chips, to ensure an optimum C:N ratio and also to allow for aeration of the matrix material.

Biological Processing

In-vessel systems supply optimum conditions for microbes to live and breakdown the waste by providing optimum aeration and moisture in an insulated system. Once there is sufficient fresh air and moisture in the system, microbes (mesophilic bacteria) flourish and decompose the waste. Moisture is supplied sometimes form an external source but quite often is supplied by recirculating leachate from the process. Temperatures within the vessel begin to rise rapidly which are further increased due to insulation of the vessels. Maintaining high temperatures within the vessel will ensure that a sanitised product will be produced. The principle of in-vessel composting systems is to maintain these optimum conditions for as long as required.

Once temperatures reach 60-65°, the metabolic activity of the microbes (thermopilic bacteria) begins to drop off. The waste is then removed from the vessel, where it will undergo maturation. Residence times in in-vessel systems can vary from a few hours to approximately 2 weeks.

Maturation

Maturation usually takes place by placing piles of the treated material on aerated floors, which continue to supply air to the material. Maturation periods usually last for 6-8 weeks depending on the quality of the product required. The constant supply of air will ensure continued microbial action until a point where the microbes begin to die off and the material has become fully stabilised and mature, usually indicated by temperatures of <40°C in the piles.

Post-Treatment of Finished Product

Additional screening of the finished product may also be required to remove further contaminants from the product. Further refining of the product can be carried out by using ballistic separators, air classifiers, eddy current separators and magnet separators to remove metals, plastics and other contaminants from the compost. The finished product is normally screened to 15mm and below and the oversize reintroduced back into the process. In a final processing step, the compost can be blended with additives (e.g. sand, brick dust, nutrients such as N/P/K) to meet different specifications and then bagged or moved off site in bulk quantities.

Process Control and Monitoring

In-vessel composting processes are typically fully automated, which allow site operators to continuously monitor key process parameters such as:

- Pre-treatment of incoming waste;
- pH levels;
- Temperature;
- Aeration;
- Moisture;
- C:N ratio;
- Compost quality testing; and
- Odour abatement technology.

Monitoring and control of the above parameters will ensure that the process runs efficiently and that there are no significant impacts on the environment.

Process Air

The enclosed building will be kept under negative pressure with the processed air being extracted using a ventilation system. The air is treated using a wet scrubber to remove dust and particles, and is then passed through a biofilter or other suitable odour abatement technology, such as carbon adsorption, to remove odorous compounds in the exhaust air.

Within the actual in-vessels units there is control over the air entering and leaving the system as a means of offering control over the composting process and preventing odorous conditions at the site. Incoming fresh air is forced under positive pressure or sucked under negative pressure through holes in the vessel floor (or walls) through the waste material. The air is then circulated maintaining aerated conditions in the vessel. When temperatures exceed the optimum temperature air is then exhausted from the vessel and fresh air is drawn in. The process air will then be extracted from the building and treated as described above.

Material Mass Balances

For a 45,000 tonne plant working at full capacity approximately 27,000 tonnes of compost will be produced on an annual basis. Experience has shown that 5-10% of all material treated will need to be removed as residue from the facility and disposed off to landfill or incinerated

Anaerobic Digestion

Anaerobic Digestion (AD) is a biological process where organic waste can be broken down by micro-organisms in the relative absence of oxygen to produce a mixture of biogas, solid digestate and nutrient rich wastewater. Agricultural wastes such as animal and poultry manure, Municipal Solid Waste (MSW) and biowaste can be treated using AD. AD plants treating category 3 material (Catering waste) must also be designed and operated to meet the requirements of the Animal By-Products (ABP) Regulation (1774/ 2002).

Biogas consists primarily of a mixture of Methane (40-70%) and Carbon Dioxide (30-60%) with small quantities of hydrogen, hydrogen sulphide, and ammonia present. Biogas is commonly used in a

Combined Heat and Power (CHP) station to produce electricity and heat through a gas engine and steam boiler. Energy produced can be used to fuel the AD plant and the excess can be exported to the national grid or can possibly used to provide power to the other facilities in the Recycling Park. Fresh biogas is saturated with water and requires cleaning and drying before it is used to generate electricity.

The digestate that is produced at the end of the process is usually mechanically dewatered and the separated solids (fibre) may be applied directly to land or be matured through composting to form a mature compost product.

The liquid effluent is high in nutrients and can be used as a liquid fertiliser. Some of the effluent can also be recirculated back into the process as process feed water.

Anaerobic Digestion has the advantages of:

- Removing organics from landfill and offering a more sustainable programme for organic waste management and in reducing landfill leachate and methane gas production which has the potential to be 30 times the global warming potential of carbon dioxide.
- Energy production from biogas mainly in the form of electricity and heat.
- Indirectly it offers the added environmental benefits of producing a material which can be used as a soil improver and reduce the use of artificial fertilisers.

Layout of a Typical AD Plant

An example of a layout of an AD plant can be seen in Figure 3.2.2. The facility was designed to treat 50,000 tonnes of biowaste, which is located in Belgium. The main elements of an AD processing facility comprise:

- Waste reception building
- Pre-treatment area
- Pasteurisation plant – to meet ABP Regulations
- Gas handling equipment such as pipes, valves, flares, gas cleaning and storage equipment
- Gas engines, turbines and electricity generators
- Steam generators - to provide heat to the digester
- Digestate dewatering equipment such as presses, centrifuges, effluent storage
- Maturation pads
- Odour abatement systems
- Process control and monitoring equipment

- Pre and post-treatment equipment such as screens, magnetic and eddy current separators

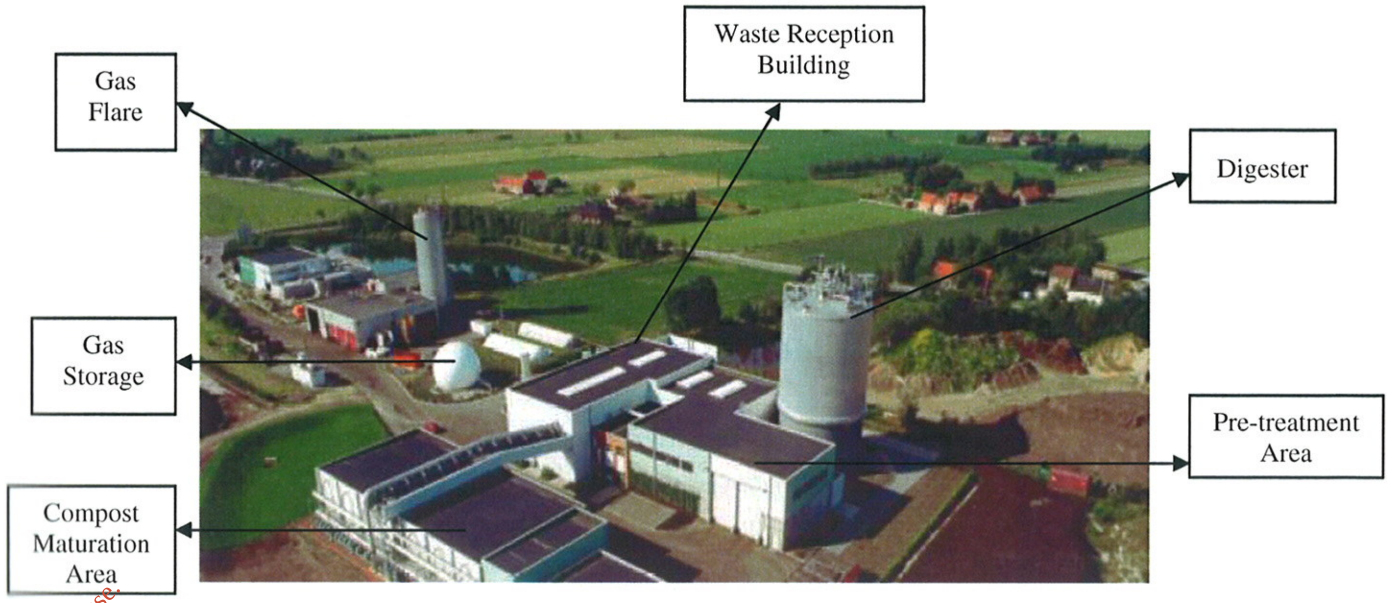


Figure 3.2.2 Layout of a Single Stage Termophilic 50,000 Tonne AD Plan in Belgium

Stages in an Anaerobic Digestion Process

The following processing steps are typical of all AD processing facilities:

- Waste Acceptance and Pre-treatment
- Biological Processing
- Post -Treatment of End Process Products - Digestate and Biogas
- Process Control and Monitoring

Figure3.2.3 below outlines a typical AD treatment process.

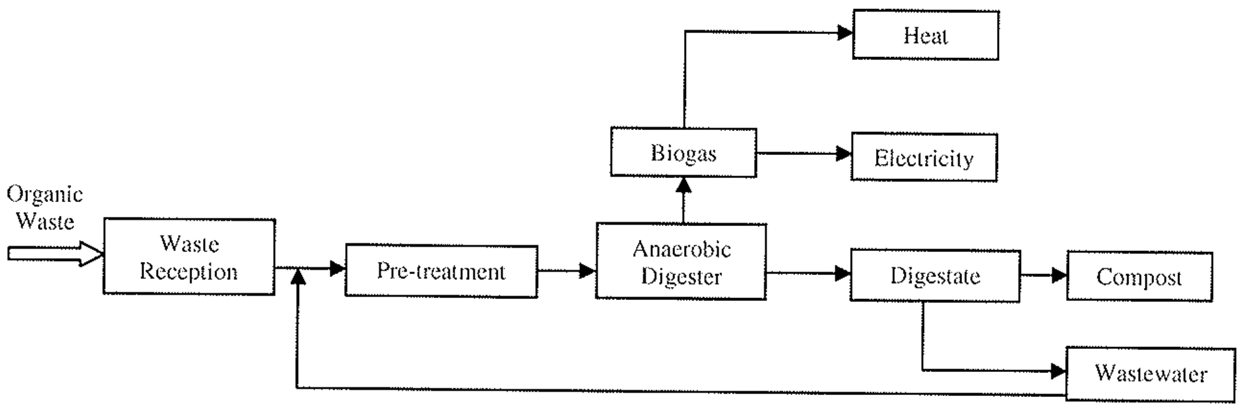


Figure 3.2.3 General Processing Steps in an AD Process

Waste Acceptance and Pre-Treatment

All waste to be accepted at the facility will be inspected and deposited at the enclosed waste reception building where it will undergo pre-treatment. Pre-treatment can sometimes vary and is dependent on the type of process used (especially in relation to wet/ dry digestion).

Pre-treatment of feedstock can include:

- Screening of oversize material;
- Mechanical or manual sorting to remove contaminants;
- Homogenisation of feedstock to provide uniform particle size not greater than 12mm (as per ABP Regulations); and
- Mixing of waste materials to obtain an optimum C:N ratio of between 20:1 and 30:1.

Once the material has undergone the relevant pre-treatment processes the waste will then be placed in the digester and the AD process will begin.

Biological Process

AD is a completely biological process, which utilises bacteria solely. In AD, it is considered that there are four biological degradation steps:

1. Hydrolysis phase (utilising Acidogenic bacteria)
2. Acidification phase (utilising Acidogenic bacteria)
3. Acetogenic phase (utilising Acetogenic bacteria)
4. Methanogenic phase (utilising methanogenic bacteria to finally produce methane gas)

The first step is the decomposition of plant or animal matter into more useable sized molecules, such as sugar. The second and third step entails the conversion of decomposed matter into organic acids. In the final stage the organic acids are converted into methane gas. The methanogenic bacteria are the most sensitive to environmental changes in the process and can therefore determine the capability and efficiency of the AD process.

Digesters are usually constructed of steel and/or reinforced concrete. Reactors may be vertical or horizontal depending on the technology. The reactor volume will depend on the volume of waste throughput and the residence time. The digestion tank requires a mixing system which can either be mechanical or achieved by diffusing the biogas through the organic slurry. The digester can be either above or below ground level and is insulated. In Northern Europe digesters are fitted with internal heat exchangers to maintain temperatures close to the optimum for bacterial growth, in order to produce the methane gas.

Centralised anaerobic digestion plants (CAD plants) can be mesophilic (about 35°C) or thermophilic (about 55°C). Thermophilic systems offer several advantages, including higher methane production, faster throughput, better pathogen and virus 'kill' and the prospect of compost production to a consistent standard. However, thermophilic systems are more expensive and require greater levels of control (Refer to Table3.2.1 for more information).

The digesters operate mainly as plug flow systems, with fresh material being fed into the mixed batch which is allowed to spill out into the overflow.

Processing times in digesters can vary between 12-30 days, depending on parameters such as feedstock composition, process type and temperature.

Post-Treatment of End Process Products- Digestate and Biogas

Once the AD process has been brought to completion in the digester, the digestate that has been produced is removed and processed further. The degree of processing of the digestate depends on site-specific conditions, but usually includes a mechanical dewatering of the digestate using equipment such as a belt or screw press or centrifuges, to reduce the moisture content of the digestate down to about 55-60%, which ensures optimum conditions for aerobic maturation.

The separated solids (fibre) can sometimes be applied directly to land. More commonly though they are matured through composting to form a mature compost product, with the wastewater being recirculated back into the process. The fibres are usually composted on aerated maturation pads, similar to those described in Section 1.2.3 for approximately 2-4 weeks, depending on the composting technology used. The compost produced is usually of high quality and undergoes quality testing on a monthly basis to confirm the quality of the product.

Not all the process wastewater may be recirculated back into the process as some fresh water is needed in the process. Depending on the feedstock and the process, there can be large amounts of wastewater to deal with. Some may be used as a liquid fertiliser or treated in a conventional wastewater treatment plant to allow discharge limits to be met. However, the wastewater is generally sent to local sewage treatment plants.

The biogas, which is high in methane, will generally need to be cleaned by removing sulphur and dust and is dried to prevent corrosion. Biogas is commonly used in a CHP station to produce electricity and heat through gas engines and a steam boiler. Higher value biogas-use options include feeding the gas into the natural gas grid. The biogas can also be used as an upgraded biogas transport fuel and thus limit petrol and diesel usage on site.

Process Control and Monitoring

AD processes are typically fully automated, which enables site operators to closely monitor and control key process parameters, such as:

- Pre-treatment of incoming waste;
- pH levels;
- Temperature;
- C:N ratio;
- Concentration of volatile fatty acids;
- Ammonia and H_2S levels;
- Compost quality; and
- Odour abatement technology.

Monitoring and control of the above parameters will ensure that the process runs efficiently and that there are no negative impacts on the environment.

Process Air

The waste reception building, pre-treatment and maturation area will be kept under negative pressure. The processed air will be extracted using a ventilation system and will be treated using a wet scrubber to remove dust and particles. The air will then be passed through a biofilter or other suitable odour abatement technologies to remove odorous compounds in the exhaust air.

Classification of Anaerobic Digestion Process

There a number of variations to the type of AD process that can be utilised at AD facilities. AD processes are usually classified according to the number of steps in the process, the concentration of total solids in the feedstock and the processing temperature within the digester. These can all affect the reaction rate and stability, and the amount of biogas produced. Thus, AD processes may be classified under the following headings:

- Single Step / Two Step Processes;
- Wet Process / Dry Process;
- Mesophilic Digestion / Thermophilic Digestion; or
- Batch / Continuous Flow

Single Step or Two Step Processes

In a single step process all the biological processing steps take place simultaneously in one digester. In a two step process the biological processing steps can be optimised and spread amongst two or more digesters, which can lead to greater overall reaction rates and biogas yields. Single step processes are the most common in Europe with approximately 90% of all AD plants utilising this type of process. Some of the advantages and disadvantages of single step and two step processes are given in Table 3.2.1.

Wet Process / Dry Process

Processing systems can be classified according to the amount of total solids (TS) in the feedstock. In wet systems solid wastes are diluted with water using recirculated wastewater and fresh process water until the TS content is <15%, which ensure that the waste feedstock is pumpable and mixable. In dry systems TS content is usually between 20-40%. A system with TS >40% is usually not possible due to the fact that microbes require a great deal of water to live in and water content <60% will inhibit microbial reaction in the digester. In practice, there is an even spilt between AD plants in Europe using wet and dry digestion. Some of the advantages and disadvantages of wet and dry processes are given in Table 3.2.1.

Mesophilic Digestion / Thermophilic Digestion

Different processing temperatures have an influence on the rate of decomposition of the material and the biogas yield. In mesophilic systems optimal processing temperature are in the range of 35-40°C. Thermophilic processes operate in the range of 50-55°C. The process temperature has an influence over the rate of reaction and the biogas yield. Refer to Table 3.2.1 which gives the advantages and disadvantages of mesophilic and thermophilic processing systems.

Batch / Continuous Flow

In batch systems, digesters are filled with the waste in one go and the degradation steps of the waste continues sequentially. Batch systems are technically simpler than continuous flow systems and require more land space due to smaller heights of the digesters. In a continuous flow reactor waste is constantly fed into the reactor where the waste is degraded.

Table 3.2.1 Advantages and Disadvantages of Different AD Processes

Process	Advantages	Disadvantages
Single Step Vs. Two Step Digestion		
Single Step All the material is digested in one reactor.		• Risk of acidifying and ammonia inhibition during the process and risk of process instability. • Higher retention time.
Two Step The different stages of decomposition are separated. For example, the acetogenesis and the methanogenesis processing stage.	• More process stability • Microbes are given the chance to adapt to their optimum conditions in different reactors and the reaction rate proceeds more efficiently and there is a chance that more biogas can be produced.	• Higher expenditure in technical equipment and construction
Wet Process Digestion vs. Dry Process Digestion		
Wet Process When the Total Solid content (TS) of feed stocks <10%		• Requires a large amount of process water • Requires a greater reactor volume • Requires more pre-treatment due to layering of slurried waste and the need for removal of scum layer and heavy and light fractions of contaminants. • Requires additional digestate dewatering when the digestate is going to be used further. • Excess wastewater is usually greater than for dry system
Dry Process When The TS of Feed stocks is between 20-40%	• Requires a smaller volume reactor • Less pre-treatment	• This is offset by the heavier duty waste handling devices equipment required to push the heavier digestate through the system.
Mesophilic Digestion Vs. Thermophilic Digestion		
Mesophilic Digestion Optimal processing temperature range of 35-40°C	• Higher process stability, due to larger diversity of mesophilic bacteria.	

Thermophilic Digestion Optimal processing temperature range of 50-55°C	• Greater sanitisation • Faster throughput • Higher gas yield • Greater degree of decomposition and more consistent standard of digestate.	• Stability may only achieved after 6 months because acetogenic bacteria, which degrade acetic acid, only exist in small concentrations and need a longer time to accumulate.

As can be seen in Table 3.2.1, different processes generally can have a number of advantages and disadvantages. It is important to note that it is difficult to make a decision on the type of AD processing technology to choose based on this information alone, as specific AD technologies will inherently have their own advantages and disadvantages.

Process Energy

Biogas yield from AD plants is very dependant on the type of feedstock used. In an AD process treating biowaste between, 70 and 120 m^3 of biogas could be produced. Figure 3.2.4 provides an example of a typical mass balance for a single step, mesophilic plant processing 45,000 tonnes of biowaste.

It is assumed that the process will produce 100 m^3 of biogas per tonne of organic waste digested. The biogas is recovered through a CHP plant to produce thermal and electrical energy. An electrical and thermal conversion efficiency of 35% and 55%, respectively, were assumed along with a 10% loss in heat, refer to Figure 3.2.5 for an overall summary of energy recovery.

Not all of the remaining energy is readily available for export or sale. Some of the heat is required in the digesters to heat up the waste and usually a third of the electrical energy is used to power the plant in a sustainable manner, with the surplus electricity (0.7MW) and heat (1.1MW) being available for export.

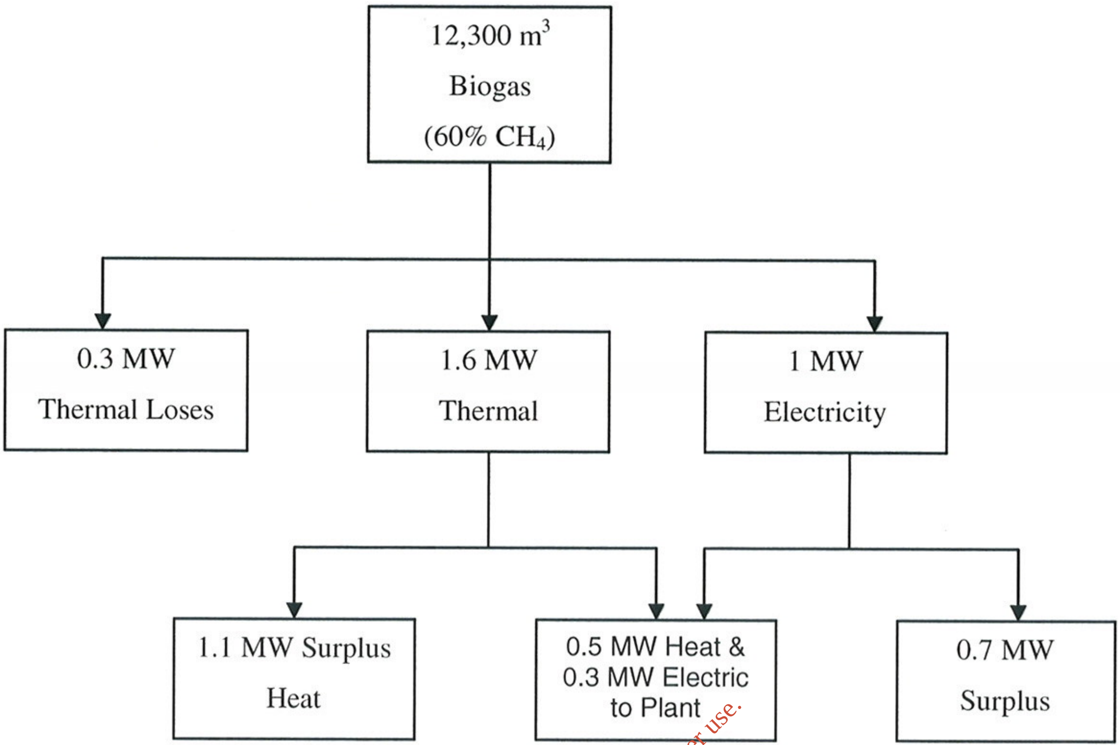


Figure 3.2.4 Energy Balances for a 45,000 tonne AD Processing Plan (model adopted from the UK Composting Association Guide to Anaerobic Digestion, 2005)

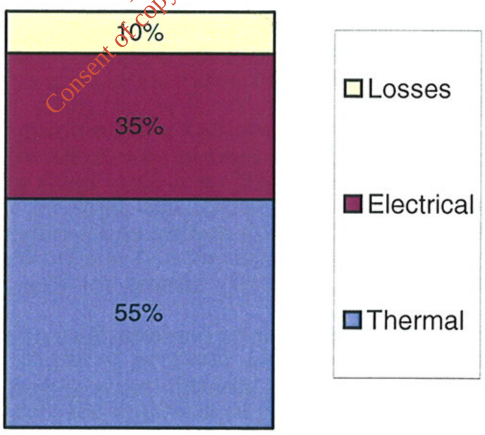


Figure 3.2.5 Summary of Overall Energy Recovery

Material Mass Balances

For a 45,000 tonne plant working at full capacity approximately 20,000 tonnes of compost would be produced along with 4.5 million cubic metres of biogas on an annual basis. Approximately 450 tonnes of residue and 20,000 litres of wastewater would also be produced and need to be treated / disposed off-site.

Summary

In general, the biological treatment technology and facility operation at Kilshane Recycling Park will meet the following requirements:

- The chosen technology, subsequent facility design and operation will be such that residents in the area are not impacted from odour, dust, noise, and bioaerosol emissions and other nuisances such as litter, dirt, or risk of fire etc.
- The chosen technology and subsequent facility design and operation will also be in accordance with the EU ABP and National Guidelines.
- All waste handling operations such as waste acceptance, inspection, tipping, mixing and blending will take place within an enclosed building.
- The chosen technology will provide for either aerobic or anaerobic processing within enclosed vessels to limit environmental nuisance.
- Compost/ digestate fibres will be matured on maturation pads for a period of time following which, a fully stabilised and mature compost product will be produced.
- The treatment process will be strictly monitored on a daily basis to ensure the treatment system is progressing efficiently and to ensure that high quality end products are produced.
- High quality compost will be produced, typically aiming for Class 1 compost according to the proposed EU Biowaste Directive and the foreseen marketability of compost products.
- The quality of the compost will be tested on a monthly basis according to the stipulations within the future EPA Waste Licence.
- Process air will be extracted to an air treatment unit such as a wet scrubber and biofilter for example to remove dust and particles and any odorous compounds in the exhaust air. However, other odour abatement technologies may be used, which will be decided upon during the procurement stage. All odour abatement systems will be properly maintained and operated on site to ensure that odorous conditions do not arise at the site.
- Health and Safety at the facility will be of utmost importance and will be seriously considered when choosing the appropriate technology.

3.2.6.3 Waste Transfer Facility

In the future, large articulated trailers will be required to transfer waste to other waste treatment facilities, i.e. landfill facilities, the material recovery facility, the thermal treatment unit, etc. This will involve the transfer of residual waste at the proposed WTF on-site from Refuse Collection Vehicles (RCVs) to large articulated trailers

After weighing and logging at the weighbridge facility, the municipal solid waste will enter the facility in RCVs. The RCVs will reverse into the WTF via a number of doorways on the southern side of the building (Refer to Drawing No. 1234/01/210). The RCVs will then empty their loads onto a large tipping floor in the building and will exit the WTF via the same doorways they entered. There will be a one-way traffic system employed for vehicles entering and leaving the facility.

The tipped waste will then be transferred to large volume articulated trailers, which will be able to hold approximately 20 to 22tonnes of waste. The waste will be transferred into the trailers by mechanical grabs or front-end loaders. The trailers way also be filled using a hopper and conveyor belt system. The exact method of waste transferral will emerge from the DBO procurement process. The empty articulated trailers will enter the WTF through the western side of the building and the full trailers will exit on the eastern side of the building. This one-way traffic system will ensure efficiencies in waste transferral.

There may be an option to accept the dried product from the Sludge Hub Centre (SHC) for further transfer. A load of dried product from the SHC would be weighed at the weighbridge facility on-site and would then enter the WTF the same way as the residual waste. The dried product would be loaded into the large articulated trailers by front end loader or by a hopper and conveyor system. The dried product would then be transferred off-site to a thermal treatment facility.

The WTF will be under slight negative pressure and the collected air will be transferred to an air treatment system. This will mitigate the emission of any odours generate during the transferral process from the WTF. Doors will remain closed except when vehicles are entering and exiting the facility.

3.2.6.4 Sludge Hub Centre

The sludge facility will take in raw and digested sludge cake from the satellite sites and treatment works. As well as the site itself there will be an access road built to the N2 as shown in Drawing No. 1234/01/203.

A thermal drying facility will be constructed to treat the sludge to a standard suitable for either re-use off-site either as a fuel or as a dried product for use in agriculture.

The preferred procurement route for the development is under a DBO contract using the restricted procedure, involving a 20 year operating period. The successful tenderer will have to submit a design incorporating the best practicable technology that demonstrates minimal environmental effects during the construction and operation of the facility. At this stage, consideration has been made within the EIA process of buildings up to 15m tall and a stack up to 25m, for the worse-case assessment, (and includes, biofilter, drying plant, pipework and other structures and buildings). This would cover an area measuring approximately 65m east to west and 34m north to south. These buildings will be able to accommodate all the process options identified above An outline of the various processes that are identified as being acceptable for the site are given in the following sub-sections.

Thermal Drying

Thermal drying produces a granulated or pelletised product with a very high dry-solids content (in excess of 90%), by direct or indirect application of an external heat source to dewatered sludge cake. The fuel source is commonly natural gas or oil. The size of the plant is a function of the amount of water to be evaporated, so the water content of the cake input is the controlling parameter. The quality of the final product is a function of the nature of the sludge feedstock and the design of the plant. Product quality varies significantly from a well-granulated material to dusty and fluffy low-density products. The benefits of thermal drying include:

- Significant reduction in volume resulting in reduced handling costs;
- The production of a stable, easily handled product;
- Effective removal of pathogens; and
- A large degree of flexibility in terms of product end-use.

Thermally dried sewage sludge is commonly used in agriculture and can be used as a fuel substitute in municipal waste plants, cement and brick kilns and industrial furnaces.

Use of Dried Product in Agriculture

Thermally dried sludge is the preferred form of biosolids for use as a soil conditioner in agriculture. It is easy to apply with standard farm machinery and has a much lower storage volume requirement than other stabilised products. Agricultural application of biosolids in any form is governed by existing legislation under S.I. No.148 of 1998 - *The Waste Management (Use of Sewage Sludge in Agriculture) Regulations 1998* and by *The Code of Good Practice for the use of Biosolids in Agriculture* (December 1999). Contained in both documents are maximum levels for concentrations of heavy

metals in soil, above which additional metal loads in the form of biosolids may not be applied. S.I. No. 267 of 2001 - *The Waste Management (Use of Sewage Sludge in Agriculture) (Amendment) Regulations 2001* - introduces further control on agricultural disposal of sludge and requires that the use of sewage sludge shall be subject to a nutrient management plan.

Re-use of Dried Product as an Industrial Fuel and Off-site Energy Recovery

Dried sewage sludge has a Calorific Value (CV) similar to that of dried peat and approximately 60% of coal. Dried, digested sludge has a CV of 11 to 15MJ/kg and dried, undigested sludge has a CV of around 15 to 18 MJ/kg. There is scope for the recovery of this energy by using the dried product as a substitute fuel for coal in the manufacture of products such as cement and bricks. Such a use would be attractive in sustainability terms, as it would replace that of a fossil fuel. It also has the financial advantage that the investment in the capital cost of the energy recovery equipment will already have been made by the industry concerned.

Additional expenditure may be required, however, to meet new emissions legislation, particularly for the control of SOx, NOx and CO to meet the requirements of the European *Waste Incineration Directive*. This is dependent on available headroom within existing limits and whether the particular industry is currently using waste fuels, and therefore has to comply with tighter standards already.

There are potential difficulties with this option, as with use of dried product in agriculture, in that users may be wary of signing up to long term contracts to take the dried product. Commercial and legislative pressures may change their own circumstances and make the product less attractive for use. However the dried form of biosolids is the most versatile, and other outlets may become available.

Liquor disposal

The liquor generated by the treatment process is typically high strength (in particular having a high Biochemical Oxygen Demand[5] and ammonia content) and a treatment and disposal route is required for this waste stream. Partial treatment on-site of the liquor will be undertaken with discharge to the existing Dublin sewerage system and will have to meet daily load limits, which will be fully agreed before the DBO contract is let. A new sewer will be laid from the liquor treatment plant and the effluent will be pumped to a high point on the N2 and then discharged by gravity to the North Fringe Sewer. The North Fringe Sewer discharges by gravity to the Sutton Pumping Station which pumps to the Ringsend Wastewater Treatment Plant (WWTP). The Ringsend WWTP treats a substantial population equivalent and discharges into Dublin Bay. Ringsend was recently upgraded in 2003 and was officially opened on 30th June 2003 with a design capacity of 1.7million population equivalent. It

[5] A measure of the organic matter present.

consists of primary settlement, secondary treatment (via sequenced batch reactors) and ultraviolet disinfection. The sludge produced at the works is treated using hydrolysis and digestion before being dewatered and dried.

Construction, Design & Operation of the SHC

The construction programme for the development has yet to be finalised however, it is envisaged that the development will take approximately 18 months to construct and this will commence in 2006. Construction activities will normally be restricted to between 07.00 - 18.00 hours on weekdays. Evening and night-time working is not expected, although it is possible that limited 24 hour working may be required to meet specific demands, however, this would be with prior agreement from the local planning authority. This will be written into the DBO contract. Other mitigation measures have been assumed in this EIS and these are presented in Section 4. The DBO for the SHC will ensure that any effects potentially arising during the construction phase are equal to and/or its positive effects are of greater significance than those outlined in this EIS; and/or its negative effects are of lesser significance than those outlined in this EIS.

The treatment process offered by the DBO contractor will also be subject to operational limits e.g. for noise, odour and air quality, i.e. the process will operate without exceeding specified limits for noise and odour levels, and ground levels of atmospheric pollutants.

3.2.7 Working Hours

The Kilshane Recycling Park will operate between the hours of 07:00 and 22:00 Monday to Saturday and will normally be closed on Sundays and on Bank Holidays. The facility will also be open for waste acceptance during these hours.

The process in the Biological Waste Treatment Facility (BTF) and the Sludge Hub Centre (SHC) will be continuous. Thus the operation of these facilities will effectively 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 operating hours, the main Recycling Park entrance gate will be locked, and monitored by CCTV.

The proposed facilities will accept waste outside these hours only when they are required to cater for the late arrival of waste haulage vehicles due to breakdown or other circumstances. No loading, separation, breaking down of waste or other procedures will take outside normal working hours. Maintenance may also be carried out outside operating hours.

These operation hours are seen as provisional. Each facility will be procured through the DBO process and the exact operation hours will be finalised in the procurement stage of the DBO process. The finalised operation and waste acceptance hours for each of the facilities will be agreed and finalised with the regulatory bodies.

3.2.8 Employment

The provisional estimate is that there will be approximately 40No. full-time staff employed at the proposed Recycling Park. As each facility will be procured through the DBO process, the exact details of the staff to be employed at each facility and the management structure for each facility can only be finalised in the procurement stage of the DBO process. The finalised staffing levels and management structure for each facility will be agreed and finalised with the regulatory bodies.

3.2.9 Plant Buildings, Garages

A vehicle maintenance building will be provided adjacent to the WTF, the location of which is shown on Drawing No. 1234/01/203. This building will be fitted with secure storage areas to accommodate power tools, other small plant and equipment. A proprietary bunded container to EPA requirements will also be provided for the storage of hydraulic oil in the maintenance building.

3.2.10 Site Accommodation

There will be two administrative blocks at the proposed development. The main administration block will be located adjacent to the WTF. The C&DRF will also have an administration block. Both buildings will include:

- Manager's offices;
- Administration offices;
- Conference/meeting room;
- Store rooms and Telemetry rooms;
- Canteens; and,
- Toilets, showers and changing rooms.

The administration buildings will be located as shown in Drawing No. 1234/01/203. Details of the administration buildings are shown on Drawing No. 1234/01/208 & 209.

It is the intention of Fingal County Council to utilise the meeting room in the main administration building for the provision of a public education area for environmental education needs. Poster presentations and literature on waste management and on the workings of the waste management facility will be available in this meeting room. Provision will also be made for the inspection of the EPA Waste Licence and Annual Environmental Reports (AERs) in this room.

In addition a weighbridge office/kiosk will also be provided at the main weighbridge facility at the location shown on Drawing No. 1234/01/203. Details of the weighbridge office are shown on Drawing No. 1234/01/211.

3.2.11 Fuel Storage

In each facility bunded fuel storage will be provided for the diesel fuel utilised for the on site plant and equipment. The exact nature of bunded fuel storage tank will depend on the various processes to be utilised and will emerge from the DBO procurement process

3.2.12 Laboratory Facilities

A small laboratory will be established on-site in the main administration building, which will allow for the carrying out of routine monitoring requirements for the whole of the Recycling Park. Groundwater and surface water analyses will be carried out on a periodic basis. The parameters to be analysed include BOD, COD, Conductivity, Dissolved Oxygen, Ammonia, Phosphorus, etc. and the laboratory will be equipped accordingly. There will also be another laboratory facility as part of the BTF. Basic parameters (e.g. dry solids, volatile solids, pH, etc.) for process control measures will also be measured in this laboratory. A stove and a small oven for drying samples will be provided in the laboratory. Portable instrumentation such as pH and temperature meters will be retained on-site in the laboratory.

It should be noted that it is not intended to carry out the full suite of analyses for groundwater or surface water at the Recycling Park. An external, accredited laboratory will carry out the analysis of the samples, as required under the EPA licence conditions.

3.2.13 Sewerage and Waste Water Treatment

The site drainage network is illustrated on Drawing No. 1234/01/205. The main types of wastewater generated by the proposed facility will be:

1. Domestic wastewater from the site accommodation blocks and from the individual facilities, generated by approximately 40 staff (toilets, showers, sinks, etc.).
2. Internal Run-off and waste down water from the Waste Transfer Facility.
3. Partially treated liquor from the Sludge Hub Centre.
4. Leachate/overflow from the in-vessel composting option for the Biological Treatment Facility; the majority of the leachate would be recycled in the composting system.
5. Leachate from the Anaerobic Digestion option for the Biological Treatment Facility
6. Overflow from the wheelwash.
7. Fire water from potential fire fighting activities.

The composition of this runoff and wash water would typically have a significant level of ammoniacal nitrogen and suspended solids, as well as Biochemical and Chemical Oxygen Demand (BOD/COD). The majority of the waste water would be partially treated liquor from the Sludge Hub Centre. The maximum daily load limits and the maximum concentration limits of the treated liquor are given in Tables 3.2.2 and 3.2.3.

The AD option for the BTF would produce leachate that would either have to be treated on-site and then discharged to sewer, or discharged directly to sewer. As an illustration of the type of leachate that is produced from a AD process Tables 3.2.4 and 3.4.5 give the composition of the input leachate into an on-site wastewater treatment facility and the composition of the treated leachate, respectively. These figures are from the Dranco AD Plant in Brecht in Belgium, which treats with up to 55,000 tpa of source separated biological waste.

The daily foul water loading for the whole facility is given in Table 3.2.6

Table 3.2.2 Maximum Daily Load Limits for the Liquor from the Sludge Hub Centre

Parameter	Maximum Average Daily Quantity	Maximum Hourly Peak Quantity
BOD	72 kg/day	6 kg/h
COD	128 kg/day	11 kg/h
Total Suspended Solids (TSS)	608 kg/day	38 kg/h
Total Kjeldahl Nitrogen (Kj-N)	92 kg/day	8 kg/h
Ammonia (NH_3-N)	36 kg/day	3 kg/h
Phosphorus (P)	8 kg/day	1 kg/h
pH	6-8	6-8
Maximum Effluent Flowrate	480 m^3/day	30 m^3/h
Maximum Effluent Temperature	30°C	40°C

Table 3.2.3 Maximum Concentration Limits for Liquor from the Sludge Hub Centre

Parameter	Maximum Concentration Limit
Oil	No significant visible oil
Metals and their compounds	
Mercury	0.03 mg/l
Cadmium	0.05 mg/l
Thallium	0.05 mg/l
Arsenic	0.15 mg/l
Lead	0.2 mg/l
Chromium	0.5 mg/l
Copper	0.5 mg/l
Nickel	0.5 mg/l
Zinc	1.5 mg/l
Dioxins and Furans	0.3 mg/l

Table 3.2.4 Composition of Input to Wastewater Treatment Plant of Dranco AD Plant, Brecht, Belgium

Parameter	Unit	Average
Capacity	m^3/d	173
COD_{TOTAL}	mg/l	12,710
	kg/d	2,200
Ratio BOD_5/COD_T		0.44
Kj-N	mg/l	1,450
	kg/d	255
Ratio COD_T/Kj-N		8.6
TSS	mg/l	2,765

Table 3.2.5 Composition of Output from Wastewater Treatment Plant of Dranco AD Plant, Brecht, Belgium

Parameter	Unit	Average
Capacity	m^3/d	173
COD_{total}	mg/l	125
BOD_{total}	mg/l	25
Kj-N	mg/l	12
NH_4-N	mg/l	2
NO_x-N	mg/l	5
P_{total}	mg/l	0
SO_4^{2-}	mg/l	200
Conductivity	µS/cm	6,000

Table 3.2.6 Foul Water Loading

Foul Water Sources	Hydraulic Loading Volume (m^3/day)	Organic Loading BOD_5 (mg/l)	Total BOD_5 Loading (kg/day)
1. Domestic Wastewater	7.2[1]	300	2.16
2. Internal Runoff from WTF	1.5	70	0.105
3. Partially Treated Liquor from SHC	480	150	72
4. Leachate/Overflow from BTF: Compost	1.5	70	0.105
5. Leachate from BTF: AD	18	58	10.5
6. Overflow from Wheel Wash	1.5	70	0.105
Total[3]	**508.2**	**167[2]**	**84.87**

1. This value assumes a hydraulic loading of 180litre/person/day with 40 operatives on site. This value represents the hydraulic loading for a domestic residence and therefore a worst-case scenario (working day is 12hr). This value should adequately cover usage of the on-site sanitation system by site operatives.
2. Mean BOD loading in mg/l calculated from Total BOD_5 Loading divided by Total Hydraulic Loading Volume.
3. This value takes the worse case for the BTF, which would be the AD option

3.2.14 *Water Management*

The main types of surface water generated at the proposed facility are as follows:

- Surface runoff from all external concrete hardstand areas. The composition of this runoff is generally the same as surface water runoff from roads. .
- Storm water from the roofs of the facility buildings.

For surface water and storm water management of the proposed Kilshane Cross Recycling Park, the site design has been split into two catchment areas. The first area covers the northern section of the site, encompassing the Construction and Demolition Waste Recovery Facility and the first part of the entrance road up to the weighbridge kiosk (see Drawing No. 1234/01/203). The second area covers the southern section of the site, encompassing the Sludge Hub Centre site, the Waste Transfer Site and the road network south of the weighbridge. The Biological Treatment Facility will be a net user of water and surface water and storm water from the roof of the building will be collected and diverted to a storage tank, for use in the composting/digestion process. The location of the water storage tank will depend on the design of the BTF. These details will emerge from the DBO process.

The surface water attenuation design for the north of the site is via a Stormcell attenuation system. The attenuation system has been designed to deal with a storm event flow of 15l/s. The outflow will be hydraulically controlled by a Hydrobrake set to a maximum outflow of 4l/s/ha. The surface water will be passed to the attenuation via a petrol interceptor (by-pass) and grit trap. A monitoring manhole will be provided for monitoring of the surface water discharge after the Hydrobrake manhole.

The surface water attenuation design for the south/east of the site is via a Sustainable Urban Drainage System (SUDS) designed attenuation pond and settlement pond (see Drawing No. 1234/01/207). The surface water will be passed to the attenuation pond via a petrol interceptor (by-pass). The entrance weir is designed to pass the maximum expected surface water storm event of 180l/s. The attenuation pond is split into two sections, separated by a rectangular weir and a 250mm diameter pipe. The pond acts as a settlement pond allowing suspended particles in the water to settle before discharging to the second pond. The second stage pond outflow will be hydraulically controlled by the Hydrobrake, which will be set to a maximum outflow of 4l/s/ha. The attenuation pond will continue to back-up for the duration of the storm period. The pond will empty under the hydraulic control of the Hydrobrake. The outflow is monitored via a manhole located after the Hydrobrake manhole.

Additional information on the surface water management system is detailed in Section 4.4.2.

3.3 Nuisance Control

3.3.1 General

The operation of the proposed Recycling Park will be undertaken under licence issued by the EPA. The conditions of the licence will include measures to minimise or prevent nuisance to the public occurring as a result of the operations of the facility. Fingal County Council will maintain a complaint register, detailing any complaint received from the general public in respect of the operation of the facility, at the main administration building. The following sections detail the proposed nuisance control measures to be undertaken at the site. Fingal County Council also undertakes to implement any additional control measures included in the Waste Licence.

3.3.2 Bird Control

Birds can be attracted to waste management facilities if there is available food for them to scavenge. This can present a hazard if the facility is located in proximity to airports. The proposed development site is within 2km of the perimeter of Dublin Airport. Due to the sensitive location from the air navigation perspective the facility has been designed and will be operated in a manner which does not attract birds.

The waste accepted at the BTF and the WTF will include 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 internally. There will be no external handling or storage of waste that contains materials attractive to birds.

The treatment processes in the BTF, WTF and SHC will be completely enclosed. All treated materials will be removed off-site in covered trucks. The C&DRF will not be handling material that is an attractant to bird.

The surface water attenuation pond has been sized to ensure that it is not an attractant to bird.

3.3.3 Fire Control

A number of fire control measures will be put in place at the site. These include the following:

- Providing a water supply to the Recycling Park, to each separate facility, to the surface water attenuation pond and to fire hydrants.
- Training of all site operatives and employees in fire prevention and control and emergency response procedures.

- Prominent posting of emergency response contact numbers (fire service, Gardaí, ambulance and other agencies).
- The provision of fire extinguishers and smoke detectors in all site buildings.
- Smoking will not be permitted at any of the waste management facilities.

In the event of a fire at any of the facilities, any excess firewater will be contained within the buildings and collected with the internal drainage system. The firewater will subsequently be analysed prior to possible tankering off-site to an approved wastewater plant.

3.3.4 Litter Control

Site operations will not generate litter. 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, WTF and SHC, including waste loading and off loading and processing, will only be carried out inside the buildings. Operations at the C&DRF will not generate litter. Waste will not be off loaded in open areas and recovered materials will not be stored outside the building. In the event of an incident that results in windblown litter, each facility will be responsible to ensure its immediate collection.

3.3.5 Aerosol Control

It is envisaged that there will be no nuisance associated with aerosols at the proposed Kilshane Cross Recycling Facility. All biological treatment of organic waste will be undertaken within a closed system and the composting/digestion will be undertaken within a controlled closed environment and thereafter within a fully enclosed building.

A forced aeration system and the ventilation system will create a slightly negative pressure environment within buildings, so that air emission to the ambient atmosphere, when doors are temporarily opened, will not occur. The negative pressure will induce an air flow into the buildings rather than from the buildings.

Control of bioaerosols will be achieved by diverting all process air through an odour abatement system, e.g. a biofilter treatment system. Exhaust air from the Biological Treatment Facility will be distributed into the biofilter by perforated air pipes underneath the biofilter media. The loading rate of the biofilter is primarily determined by the volume of the airflow, than the concentration of odour components in the airflow. The typical loading rate of the biofilter comprises 100-150 m^3 exhaust air/m^2 biofilter/hour.

Section 4.6.1.3 details a Bioaerosol impact assessment of the proposed Recycling Park and measures to mitigate the possible impact of Bioaerosols are detailed in Section 4.6.2.3.

3.3.6 *Odour Control*

Due to the fact that all operations in the treatment and storage of waste will be undertaken within the Biological Treatment Facility (BTF), the Sludge Hub Centre (SHC) and the Waste Transfer Facility (WTF), and all exhaust air will be diverted through odour abatement units prior to discharge to the ambient atmosphere, it is envisaged that there will be no nuisance associated with odour at the proposed Kilshane Cross Recycling Park.

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. Preventing 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.

<u>Management of fresh biowaste and material composition</u>

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.

<u>Aeration of composting material</u>

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.

<u>Monitoring of temperature</u>

For composting, if temperatures exceed approximately 65°C during the composting process, odour emissions increase significantly, due to the changes in process biochemistry. Excessive increase in composting temperatures will be especially relevant in the first stage of the composting 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 in the 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.

Section 4.6.1.2 details an odour impact assessment of the proposed Recycling Park and measures to mitigate the possible impact of odours are detailed in Section 4.6.2.2.

3.3.7 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.

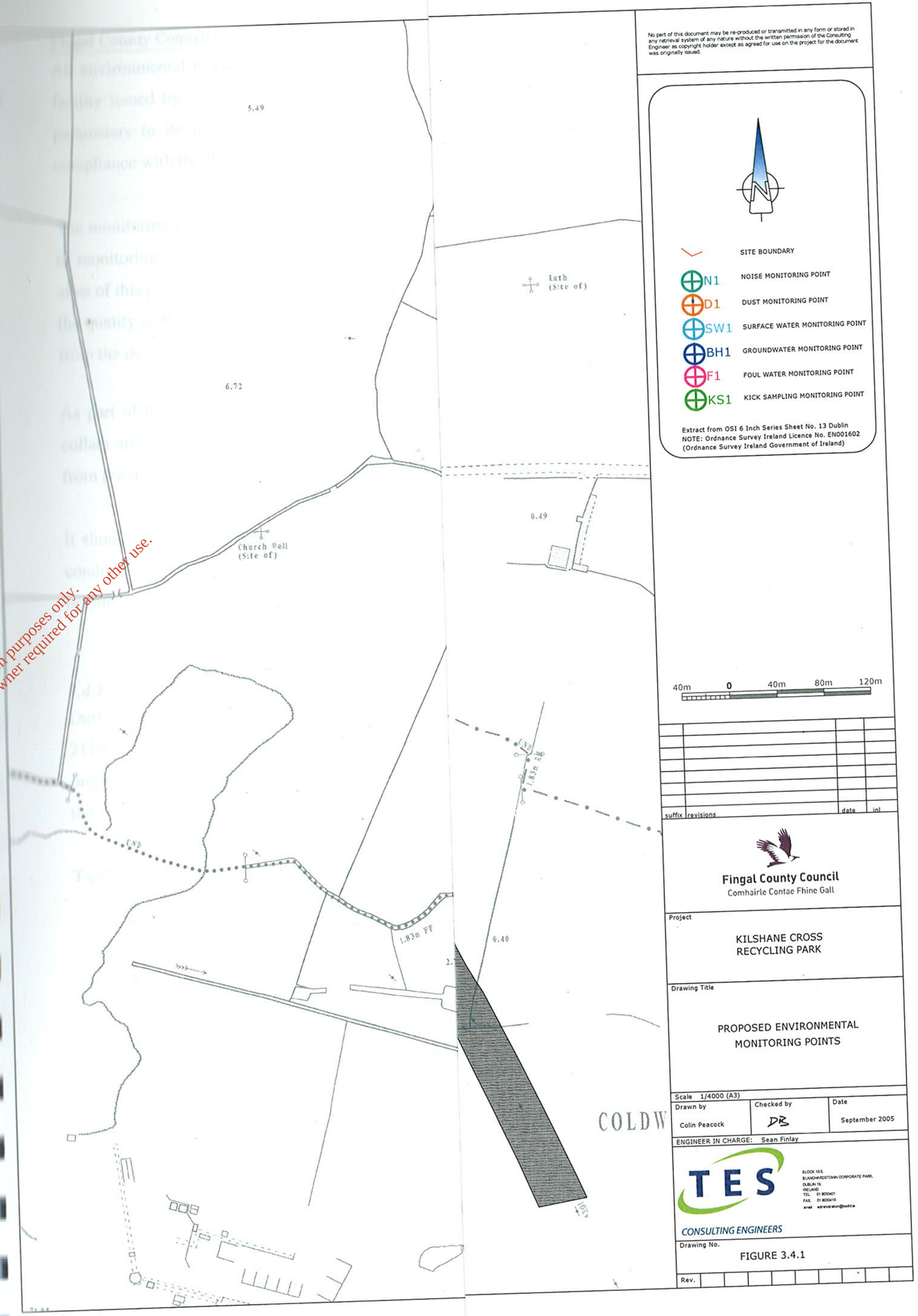
Waste containing material attractive to vermin and insects arriving at the BTF, SHC and WTF facilities will generally be transported off-site the same day. In the event that such waste has to be stored on-site overnight, it will be stored in sealed trailers inside the building which will minimise the 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.

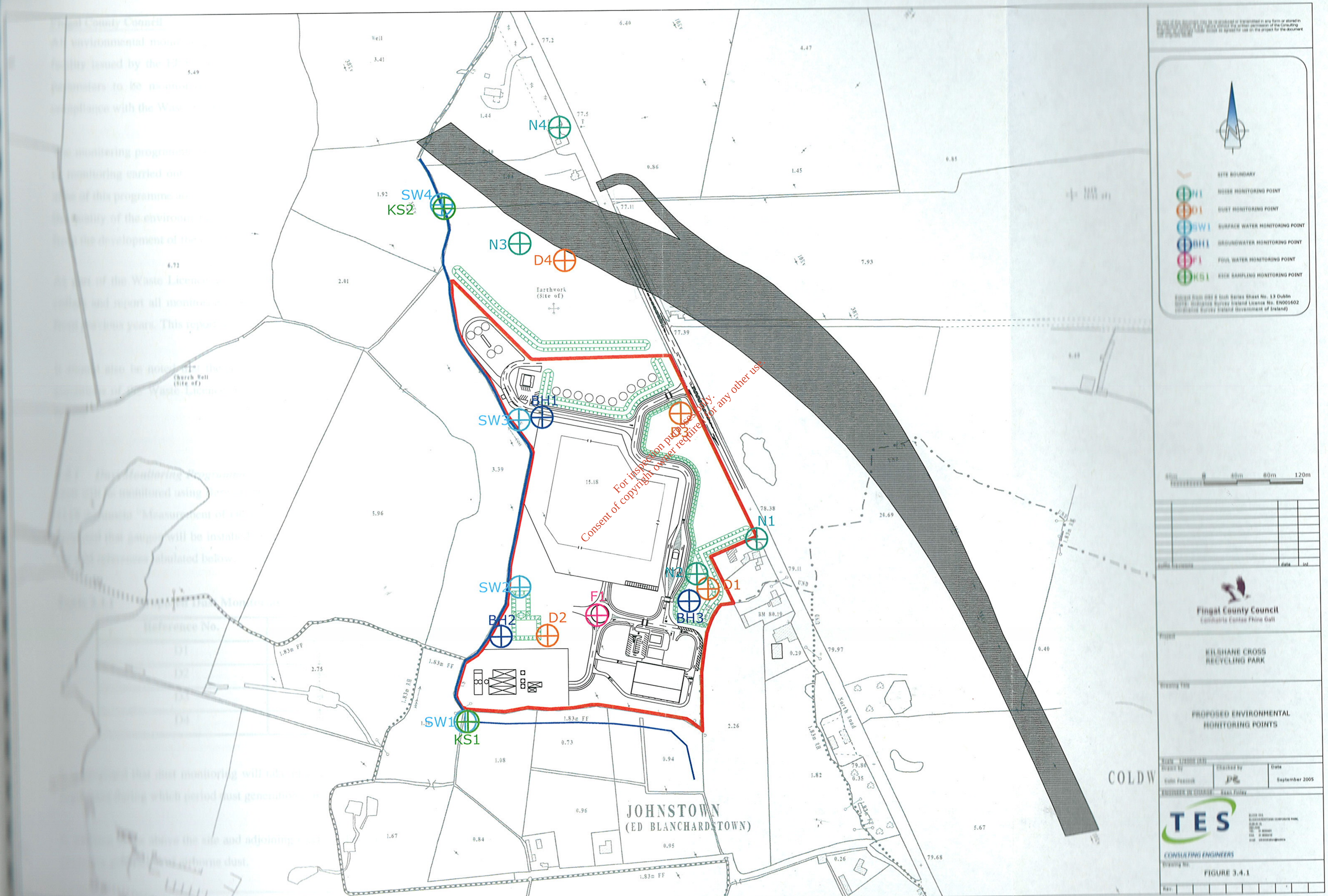
There will be no long-term storage of putrescible waste in the BTF and SHC. The treatment processes will be completely enclosed. All plant equipment and tipping areas will be cleaned regularly.

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.

3.4 Environmental Monitoring

The following sections describe the proposed monitoring programmes to be established at the Kilshane Cross Recycling Park.




N4
SW4
KS2
N3
D4
Earthwork (Site of)
Church Well (Site of)
BH1
SW3
D3
N1
N2
D1
SW2
F1
BH2
D2
BH3
SW1
KS1
JOHNSTOWN
(ED BLANCHARDSTOWN)
COLDW
North Road
SITE BOUNDARY
N1 NOISE MONITORING POINT
D1 DUST MONITORING POINT
SW1 SURFACE WATER MONITORING POINT
BH1 GROUNDWATER MONITORING POINT
F1 FOUL WATER MONITORING POINT
KS1 KICK SAMPLING MONITORING POINT
Ordnance Survey Ireland Licence No. EN001602
40m 0 40m 80m 120m
Fingal County Council
KILSHANE CROSS
RECYCLING PARK
PROPOSED ENVIRONMENTAL
MONITORING POINTS
Date
September 2005
CONSULTING ENGINEERS
FIGURE 3.4.1

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 non-compliance with the Waste Licence.

The monitoring programme outlined below has been developed on the basis of the results of the suite of monitoring carried out as part of the baseline studies for the preparation of this EIS. The primary aims of this 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 Recycling Park and identify any adverse impacts from the development of the facility

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 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.

3.4.1 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 Figure No.3.4.1 with the grid references tabulated below.

Table 3.4.1 Proposed Dust Monitoring Locations

Reference No.	Grid Reference
D1	E311576 N241957
D2	E311380 N241902
D3	E311545 N242171
D4	E311406 N242359

It is proposed that dust monitoring will take place once per annum between the months of May and 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.

3.4.2 *Ecological Monitoring Programme*

Kick samples from KS1 and KS2 will be taken and analysed, in accordance with EPA guidelines, 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 Figure No.3.4.1, with grid references tabulated below.

Table 3.4.2 Proposed Kick Sampling Locations

Reference No.	Grid Reference
KS1	E 311283 N241798
KS2	E 311261 N242424

3.4.3 *Groundwater Monitoring Programme*

Groundwater quality will be monitored at the three borehole sampling locations. Two of the existing borehole locations, BH1 and BH2, will be redrilled in the vicinity of the existing boreholes to ensure ease of access for monitoring purposes.

It is intended that all groundwater sampling will be carried out by trained personnel from Fingal County Council or a suitable firm of consultants and that all analyses will be carried out by an accredited laboratory.

Proposed Monitoring Sites

For the location and reference points for the proposed monitoring points refer to Figure No. 3.4.1, with grid references below.

Table 3.4.3 Proposed Groundwater Sampling Locations

Reference No.	Grid Reference
BH1	E311377 N242168
BH2	E311324 N241902
BH3	E311553 N241943

Operational Phase

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

- Water levels in the monitoring wells will be measured on a periodic basis;

- 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 at six monthly intervals until at least one year following the commencement of operations at the last facility to be constructed, to establish any potential effects on groundwater quality;
- After the all of the facilities are in operation the groundwater monitoring wells will be sampled annually;
- 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;
- The samples recovered from these wells will be analysed for the list of parameters given in Table 3.4.4, which is in accordance with the parameters required for compliance monitoring as outlined in the Landfill Monitoring Manual published by the EPA in December 1995;
- The analytical programme will be carried out such that an ion balance can be computed in accordance with an accepted standard such as the "Standard Methods for the Examination of Water and Wastewater", published by APHA, AWWA and WEF (1992, 18th edition). The ion balance will be within the industry standard accepted percentage error for normal groundwater.
- It is also proposed, on an annual basis, to sample all three monitoring wells and test for the following parameters:
  - ➢ Full chemical and metal analyses as outlined in Table 3.4.4;
  - ➢ Diesel range organics (µg/l);
  - ➢ Petrol range organics (µg/l);
  - ➢ Mineral oils (µg/l);
  - ➢ BTEX compounds (benzene, toluene, ethyl-benzene & xylene) (µg/l);
  - ➢ Faecal Coliforms; and
  - ➢ Total Coliforms.
- Data will be collated, tabulated and reported, including interpretation and comparison with the previous year's data. 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.

Table 3.4.4 Proposed Analyses for Groundwater Samples

Parameter	Unit
PH	pH Units
Temperature *	°C
Electrical Conductivity *	µS/cm @ 20°C
Ammoniacal Nitrogen	mg/l as NH_4 -N
Dissolved Oxygen *	mg/l as O_2
Residue on Evaporation	mg/l @ 180 °C
Calcium	mg/l as Ca
Cadmium	mg/l as Cd
Chromium	mg/l as Cr
Copper	mg/l as Cu
Cyanide	mg/l as CN
Iron	mg/l as Fe
Lead	mg/l as Pb
Magnesium	mg/l as Mg
Manganese	mg/l as Mn
Nickel	mg/l as Ni
Nitrate	mg/l as N
Phosphate	mg/l as P
Potassium	mg/l as K
Mercury	mg/l as Hg
Sodium	mg/l as Na
Sulphate	mg/l as SO_4
Zinc	mg/l as Zn
Total alkalinity	mg/l as $CaCO_3$
Total Organic Carbon	mg/l as C

* Field and Laboratory Measurements

3.4.4 Surface Monitoring Programme

Surface water quality will be monitored both upstream and downstream of the proposed Recycling Park during the operational life and as agreed by any subsequent closing licence. Surface water will also be monitored prior to the two proposed discharge points for the collected and attenuated surface water runoff. The samples will be taken after the proposed oil interceptors, prior to discharge.

It is intended that all surface water sampling will be carried out by trained personnel from Fingal County Council staff or by a suitable firm of consultants retained by Fingal County Council. All analyses, with the exception of on-site readings, will be carried out by an accredited laboratory.

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.

Proposed Monitoring Sites

For the location and reference numbers for the proposed monitoring points refer to Figure 3.4.1. These reference points and respective grid references are tabulated below in Table 3.4.5.

Table 3.4.5 Proposed Surface Water Monitoring Points

Location	Reference No.	Grid Reference
Upstream	SW1	E311280 N241798
SW Discharge 1	SW2	E311347 N241962
SW Discharge 2	SW3	E311349 N242165
Downstream	SW4	E311258 N242428

The elements of the surface water monitoring programme will be similar to the groundwater programme and are as follows:

- Surface water sampling locations will be identified with a permanent marker and water levels at the monitoring locations will be measured on a monthly basis;
- The surface water sampling locations 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 surface water sampling locations will be sampled at quarterly intervals until at least one year following the commencement of operations at the last facility to be constructed, to establish any potential effects on surface water quality.

- After the first year of operations of all the facilities, surface water sampling locations will be sampled at six month intervals.
- 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.
- The samples recovered from surface water sampling locations will be analysed for the list of parameters given in Table 3.4.6, and for Organic substances listed below which is in accordance with the parameters required for compliance monitoring as outlined in the Landfill Monitoring Manual published by the EPA in December 1995 and S.I. 12, 2001, Water Quality-Dangerous Substances- Regulations
- The analytical programme will be carried out such that an ion balance can be computed in accordance with an accepted standard such as the "Standard Methods for the Examination of Water and Wastewater", published by APHA, AWWA and WEF (1992, 18th edition). The ion balance will be within the industry standard accepted percentage error for normal groundwater.

Analysis of a range of diesel range organics, petrol range organics, mineral oils, and BTEX compounds (benzene, toluene, ethyl-benzene & xylene) in accordance with S.I. 12, 2001, Water Quality-Dangerous Substances Regulations will be sampled for at the same interval as the stated parameters.

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.

Table 3.4.6 Proposed Analyses for Surface Water Samples

Parameter	Unit
pH	pH Units
Temperature *	°C
Electrical Conductivity *	µS/cm @ 20°C
Chemical Oxygen Demand	mg/l as O_2
Biochemical Oxygen Demand	mg/l as O_2
Ammoniacal Nitrogen	mg/l as N- NH_4
Dissolved Oxygen *	mg/l as O_2
Chloride	mg/l as Cl
Chlorine (Residual)	mg/l as Cl
Cadmium	mg/l as Cd
Calcium	mg/l as Ca
Chromium	mg/l as Cr
Copper	mg/l as Cu
Iron	mg/l as Fe
Lead	mg/l as Pb
Magnesium	mg/l as Mg
Manganese	mg/l as Mn
Mercury	mg/l as Hg
Nickel	mg/l as Ni
Nitrate	mg/l as N
Phosphate	mg/l as P
Potassium	mg/l as K
Phenols	µg/l as C_6H_5OH
Sodium	mg/l as Na
Sulphate	mg/l as SO_4
Zinc	mg/l as Zn
Total Organic Carbon	mg/l as C
Total alkalinity	mg/l as $CaCO_3$
Volatile Organic Compounds	
Semi-Volatile Organic Compounds	
Simazine & Atrazine	

* Field and Laboratory Measurements

3.4.5 *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. The proposed locations for noise monitoring are as outlined in Figure 3.4.1 and tabulated below in Table 3.4.7.

Table 3.4.7 Proposed Noise Monitoring Points

Reference No.	Grid Reference
N1	E311637 N242017
N2	E311563 N241976
N3	E311352 N242380
N4	E311402 N242521

An additional round of 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.

3.4.6 Foul Sewer Monitoring Programme

The effluent will be sampled at the on-site sewer manhole (F1), the location of which is represented in Figure 4.7.1. The National Grid Reference for the sewer discharge monitoring point is E311441, N241926. The effluent discharge will be sampled on a quarterly basis.

4 POTENTIAL ENVIRONMENTAL EFFECTS/ IMPACTS AND MITIGATION MEASURES

4.1 Human Beings/Socio-Economic

4.1.1 Potential Effects/ Impacts

4.1.1.1 Predicted Impact of Operation

There are a limited number of residences that will be impacted negatively upon by the proposed Kilshane Cross Recycling Park. There are 15No. dwellings within a 1km radius of the proposed development. The majority of those residing within a one-kilometre radius of the subject site will not have their social or travel patterns disrupted and will encounter little or no change to their existing situation. The communities within Mulhuddart and Corduff to the west of the subject lands and Finglas to the south, are served by the social, employment, educational, and retail landuses contained within their respective areas, including those to be found in Blanchardstown and the Dublin City core. Likewise, though in a more limited manner, those residing in St. Margaret's to the east of the proposed site are served by a school, post office, church and shops within that hamlet.

The traffic movements generated by the business parks and industrial estates to the west of the N2 are not generally undertaken on that section of the national route between Kilshane Cross and the nearby M50 interchange. As such, the economic travel patterns in the vicinity of the proposed site are likely to remain unaffected.

The proposed site of the Recycling Park is not contained within or is not located 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, European sites, Special Areas of Conservation, or Special Protection Areas.

The proposed development will provide employment for at least 80 people directly over its lifespan. Further indirect employment will be created for service personnel.

The enterprise will provide for the recycling of some 211,511 tonnes per annum of recyclable waste.

In the Fingal Development Plan 2005-2011, the proposed Recycling Park is located within Zoning Objective 'RU' relating to Rural and Agriculture. This zone seeks to preserve rural amenity by