ATTACHMENT A

NON-TECHNICAL SUMMARY

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ATTACHMENT A.1 NON-TECHNICAL SUMMARY

A.1.1 Introduction

Glanpower Ltd. (company registration number 465847), with registered offices at 19 High Street, Tullamore, Co. Offaly is applying to the Environmental Protection Agency (EPA) for a waste licence. The purpose of the application is for the company to operate a proposed energy from waste facility at Derryclure, Tullamore, County Offaly. Notification of the application has been posted at the site location; submitted in writing to Offaly County Council, and advertised in the *Tullamore Tribune* newspaper, issue of 14th June 2012.

Following construction and testing, the proposed facility will utilise municipal waste (65,000tonnes per annum) and energy crop biomass (10,000tonnes per annum) for the generation of renewable energy, by a system based on pyrolysis technology.

The proposed facility will be constructed on a site in the townland of Derryclure, located approximately 8km south of Tullamore, Co. Offaly as shown in Figure A.1.1. The site is entirely within the functional area of Offaly County Council and is adjacent to the existing N80 national secondary road.

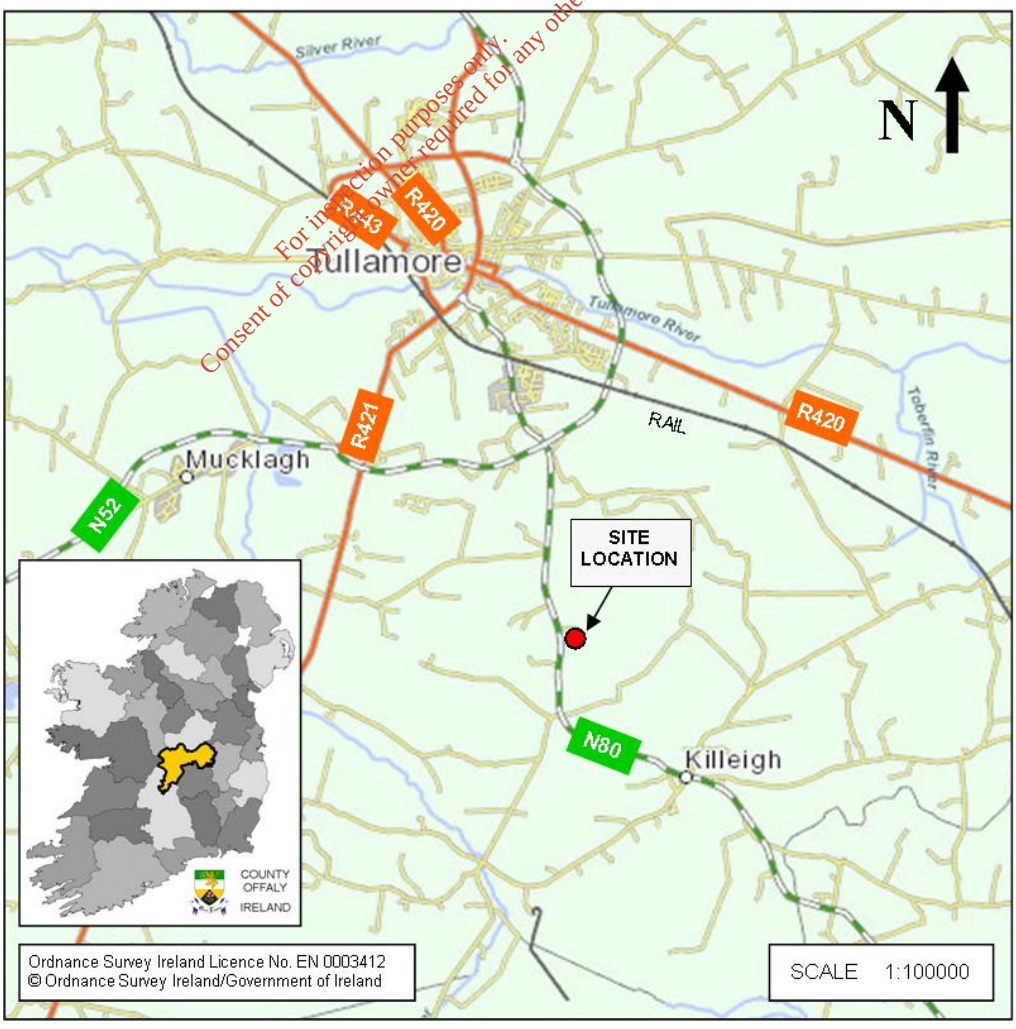


Figure A.1.1: Location of the Site

The site of the proposed facility (grid reference 2351E, 2202N) is approximately 4.5ha (11.3acres) in size and was selected based on its central location with the Midlands Region and other factors including spatial issues, planning considerations, environmental screening, road network connectivity and capacity, electricity grid accessibility, historic land use and financial considerations.

The waste to be accepted at the facility will comprise 65,000tonnes per annum of non-hazardous mixed municipal household and commercial waste. Waste will be subject to pre-treatment on-site prior to recovery.

The facility was granted planning permission by An Bord Pleanála (planning ref. PL19.238420) on 21st July 2011. The application for planning permission was supported by the submission of an Environmental Impact Statement (EIS). A copy of the EIS is included with this application.

A.1.2 Company & Facility Overview

A.1.2a Company Information

Glanpower is a wholly Irish-owned and operated company, dedicated to the development and operation of environmentally sustainable, alternative power generation projects in Ireland and abroad. Glanpower's aim is to produce energy which is dependable, cost-effective, environmentally responsible, and which is derived from renewable sources. Further company information and contact details are included in the form submitted as part of the application.

Glanpower was founded in 2008. The company's primary purpose at that time was to research and develop renewable energy opportunities within the Irish energy market. Included in the company's research were investigations into the best available and emerging technologies in wind energy, solar energy and energy-from-waste, both in Ireland and abroad. The key outcome of that research was, in broad terms, to develop particular core technologies and bring them to full energy production status. Since that time, Glanpower has increasingly focused its attention on the energy-from-waste sector. The company has identified a pyrolysis system suitable for the thermal treatment of waste (and biomass), uniquely configured to be sustainable and responsible.

A.1.2b Facility Overview

The facility will support national and regional waste policy, by providing a local means of handling waste produced within the Midlands area and diverting waste from landfill.

The generation and export of electricity from waste and biomass sources delivers added benefits. The facility will support greater energy security as it will provide a local source of energy, helping to reduce dependence on imported fuel. Also the production of electricity from renewable means will help to reduce dependence on fossil fuels which are a non-renewable source of energy.

The proposed Glanpower Energy from Waste facility has been submitted to the European Investment Bank as one of two Irish

proposals for the EU Commission NER 300 funding programme for innovative renewable energy[1].

A.1.2c Classes of Activity

The proposed facility will be classified under a number of the waste activities defined in the Fourth Schedule of the Waste Managements Acts 1996 to 2011.

The principal class of waste activity applicable, under the Fourth Schedule of the Waste Management Acts 1996 to 2011, will be as follows:

> *"R 1. Use principally as a fuel or other means to generate energy: This includes incineration facilities dedicated to the processing of municipal solid waste only where their energy efficiency is equal to or above:*
>
> *- 0.60 for installations in operation and permitted in accordance with applicable Community acts before 1 January 2009,*
>
> *- 0.65 for installations permitted after 31 December 2008, using the following formula, applied in accordance with the reference document on Best Available Techniques for Waste Incineration:*
>
> *Energy Efficiency = (Ep – (Ef+Ei)/(0.97x(Ew+Ef))*
>
> *where-*
>
> *'Ep' means annual energy produced as heat or electricity and is calculated with energy in the form of electricity being multiplied by 2.6 and heat produced for commercial use multiplied by 1.1(GJ/year),*
>
> *'Ef' means annual energy input to the system from fuels contributing to the production of steam (GJ/year),*
>
> *'Ew' means annual energy contained in the treated waste calculated using the net calorific value of the waste (GJ/year),*
>
> *'Ei' means annual energy imported excluding Ew and Bf(GJ/year), '0.97' is a factor accounting for energy losses due to bottom ash and radiation."*

The other classes of activity applicable to the proposed facility, under the Fourth Schedule of the Waste Management Acts 1996 to 2011, include:

"R 12. Exchange of waste for submission to any of the operations numbered R 1 to R 11 (if there is no other R code appropriate, this can include preliminary operations prior to recovery including pre-processing such as, amongst others, dismantling, sorting, crushing, compacting, pelletising, drying, shredding, conditioning, repackaging, separating, blending or mixing prior to submission to any of the operations numbered R1 to R11)."

"R 13. Storage of waste pending any of the operations numbered R 1 to R 12 (excluding temporary storage (being preliminary storage

[1] http://www.dcenr.gov.ie/Energy/Sustainable+and+Renewable+Energy+Division/NER+300.htm, 29th May 2012

according to the definition of 'collection' in section 5(1)), pending collection, on the site where the waste is produced)".

It is the intent of Glanpower to ensure the maximum recovery of both waste accepted and waste arising at the site. In this way, the quantity of waste consigned for disposal to landfill will be minimised (less than 15% of waste intake).

A.1.3 Management of the Facility

A.1.3a Technical Competence & Site Management

The Executive Board of Glanpower Ltd. will have overall responsibility for the construction and operation of the proposed facility. The facility will be operated by a dedicated management team. The staff of the facility will be technically experienced and qualified in the areas of waste; engineering; environmental management; health and safety; finance; administration, human resources and maintenance.

A.1.3b Environmental Management System

An Environmental Management System (EMS) will be developed by Glanpower for the management of the environmental aspects of the proposed facility. The EMS will address the provision of all resources, human and otherwise, necessary to ensure control and continuous improvement in the environmental management of the facility. The EMS will be subject to an assessment for suitability (management review) by a member of senior management, at least on a yearly basis.

A.1.3c Hours of Operation

Construction activities on-site (approximately 12 months duration) will be limited to the hours of 7:00am to 6:30pm Monday to Friday and 8:00am to 1:30pm Saturday. No construction activity will be permitted on a Sunday or public holidays.

Waste will be accepted during the hours of 7:00am to 6:00pm Monday to Saturday inclusive. Waste will not be accepted at the site on weekends or public holidays.

Handling, pre-treatment and processing of waste will be carried out within the facility building on a continual basis i.e. 24 hours per day. It is intended that continuous (24 hours per day) waste pre-treatment, storage and handling (R12/R13) activities will be facilitated at all times during the year i.e. up to 8,760 hours per annum. Based on the requirement for maintenance of pyrolysis/energy recovery plant, it is expected that pyrolysis and energy recovery (R1) activities will be carried on for approximately 8,000 hours per annum.

Deliveries of waste to the site will only be accepted at the facility from suitably permitted waste hauliers holding valid waste collection permits. Waste acceptance and handling procedures will be implemented on-site, which will include for the inspection of waste. Non-conforming waste materials which are not permitted at the facility will be quarantined for removal and appropriate treatment off-site as required.

A.1.4 Infrastructure & Operation

A.1.4a Site Infrastructure

The proposed facility will utilise energy crop biomass and mixed municipal waste materials to generate renewable energy.

The facility will consist of a single building, which will house the following:

- Reception and pre-treatment area;
- Enclosed fuel recovery area;
- Pyrolysis area;
- Engine areas;
- Office, visitor reception and staff accommodation;
- Ancillary accommodation (weighbridge, services including power, water mains, telephone/broadband);
- Maintenance areas.

Condensing units associated with the steam turbine will be located on the roof of the main building.

Externally the site will be secured by perimeter fencing and gates. The site will accommodate:

- Vehicular access roads and pedestrian footpaths;
- Staff and visitor car parking;
- Security hut;
- Service yard (and underground trade effluent tank);
- Emergency generator;
- Fuel oil storage tank and bund;
- Water storage tank and associated pump house;
- Regenerative Thermal Oxidiser (RTO);
- Fuel and lube oil delivery areas;
- Transformer compound;
- Emergency flare stack;
- Foul sewage treatment area;
- Vehicle utilities (wheelwash, weighbridge).

The main building will be a steel framed structure 7,740m² in size, 129m long and 60m wide, with a selected aluminium cladding to finish externally. Visually the building is divided into three sections or stages representing the internal processes involved, namely:

1. Reception & Pre-Treatment
2. Fuel Feed and Pyrolysis System
3. Engine, Steam Generation and Office Accommodation Areas

A schematic of the building layout is shown in Figure A.1.2.

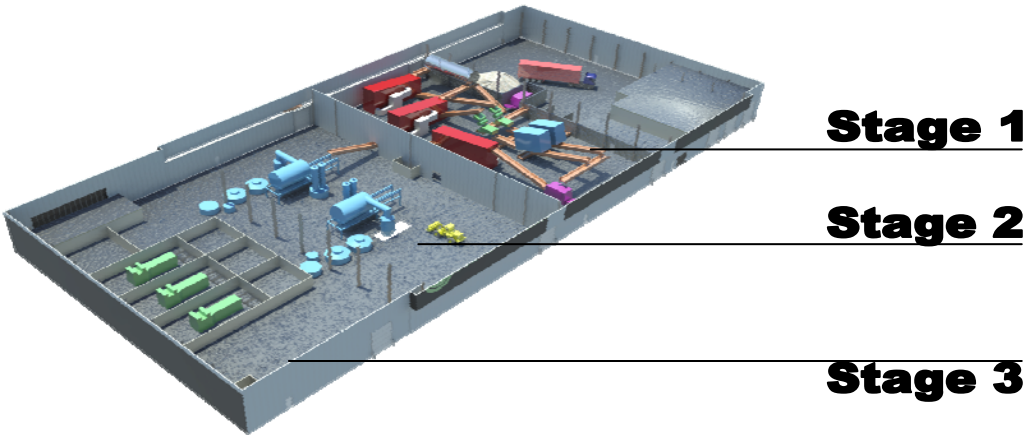


Figure A.1.2: Schematic of Facility

Three taller bays (height 15.9m) are expressed in a separate cladding panel and divided from each other by a translucent cladding bay. The final bay (height 11.4m) is to accommodate the engines and office accommodation. The main stack will be 30m (above ground) in height.

Service infrastructure on-site will include power, telephone/broadband, water mains, surface water network and a sanitary effluent treatment system.

A.1.4b Process Description

The proposed Glanpower pyrolysis plant has been developed as an efficient system to convert waste and energy crop biomass into a clean gas for electricity production. A summary of the process is shown in Figure A.1.3.

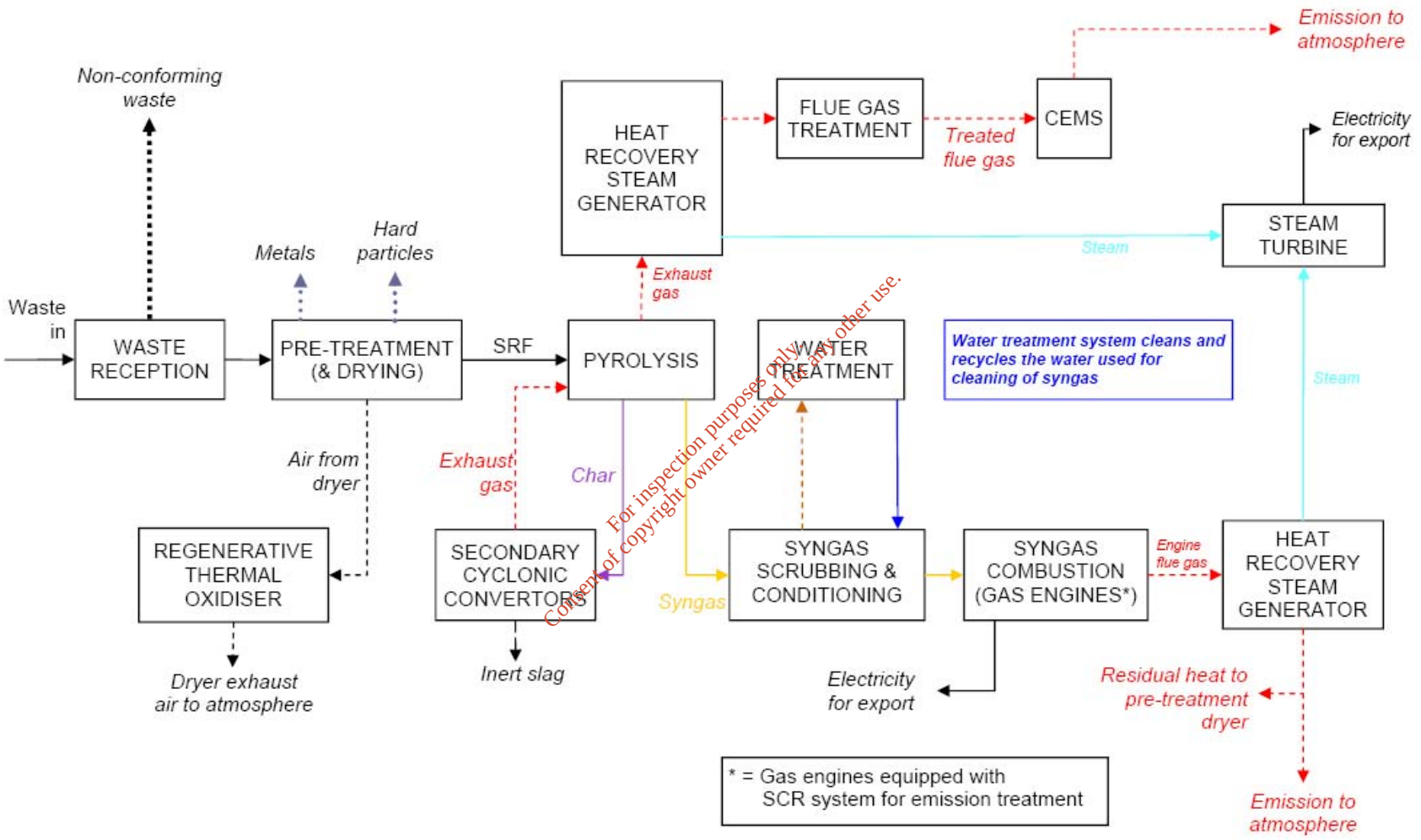


Figure A.1.3: Summary of Process

Pre-Treatment

The first step in the process is the reception, screening and pre-treatment of waste. This is to ensure that unsuitable and potentially hazardous waste materials within the incoming waste feed are removed for appropriate recovery/disposal off-site. Unsuitable materials include batteries, electrical items, hazardous substances etc. Glass, metal and hard particles are also removed to enable the recycling of these fractions off-site. The pre-treatment stage, involving shredding and drying steps, converts the remaining waste in to a Solid Recovered Fuel (SRF). The SRF is then subject to pyrolysis, which is the core process step of the proposed Glanpower facility.

Pyrolysis

Pyrolysis is the thermochemical decomposition of material at elevated temperatures in the absence of oxygen. In contrast with conventional incineration, waste material is not directly combusted in a fire. Material is instead superheated (in the absence of oxygen) and broken down in to a gaseous by-product (synthesis gas or 'syngas') and a solid by-product (char). The solid carbon char generated is used as the fuel to generate heat necessary for pyrolysis to occur.

Glanpower Pyrolysis System

In the case of the proposed Glanpower facility, pre-treated waste (or SRF) and energy crop biomass will be the materials subjected to pyrolysis. Heat in the pyrolysis flue gas will be recovered (steam generation) for use in a steam turbine for the production of electricity.

The syngas generated by the Glanpower pyrolysis system will be subsequently cleaned and combusted in three gas engines, for the direct generation of electricity. This electricity will be exported to the National Grid.

Excess heat energy in the gas engine flue stream will also be recovered for (steam generation) for use in the steam turbine to produce additional electricity. Residual heat remaining in the engine flue gas will also be recovered for drying waste at the pre-treatment stage.

Emissions

To minimise odour emissions from the handling of municipal waste, air to be ventilated will be passed through a dedicated odour abatement unit (if not used as process air). Odorous air arising from the drying step will also be specially vented, through a Regenerative Thermal Oxidiser. Exhaust emissions from the pyrolysis stage will be treated using a flue gas treatment system prior to discharge to atmosphere. Emissions from the gas engines will be through three 30m stacks.

All emissions from the plant to atmosphere (including noise), surface water and groundwater will be monitored continuously or at regular intervals as required.

Treatment of Process Water

Water is used in the process mainly for cleaning the syngas generated by pyrolysis.

A multi-step water treatment system will be employed to treat and recycle this water. Excess water will be diverted to the secondary cyclonic convertors.

Residues

The most significant residue stream arising from the operation of the facility will be a solid, inert, vitrified slag material arising from the combustion of char in the secondary cyclonic convertors (3,200tonnes per annum). Residues arising from the syngas cleaning and flue gas treatment steps will be reprocessed within the overall system.

Electricity Generation

The plant will generate 11MW electricity of which approximately 9MW will be exported to the National Grid via substation at Clonminch, Tullamore, Co. Offaly. Grid connection consent has been agreed and confirmed with ESB Networks.

The main process steps may be summarised as follows:

- Waste reception;
- Waste pre-treatment;
- Waste drying;
- Fuel feed to pyrolysis chamber;
- Pyrolysis chamber;
- Char recovery and delivery system;
- Secondary cyclonic convertor (thermal oxidiser);
- Syngas scrubbing;
- Syngas conditioning;
- Heat recovery from pyrolysis;
- Syngas engines;
- Heat recovery from syngas engines;
- Flue gas treatment;
- Steam turbine;
- Scrubber water treatment system;
- Utilities.

A.1.4c Compliance with Waste Incineration Directive

The facility has been designed to comply with the requirements of the Waste Incineration Directive (2000/76/EC). This has been achieved in the following ways:

1. Limiting the scope of the facility to the acceptance of non-hazardous waste only and incorporating a pre-treatment stage in the design. The pre-treatment stage ensures that materials not suitable for pyrolysis are removed. The pre-treatment step has been designed to achieve a particular specification for moisture content, composition and particle size (prior to the pyrolysis step).

2. The heat generated in the process is recovered as far as practicable. Measures include (i) heat recycle from char combustion to pyrolysis chambers; (ii) heat recovery steam generators to recover heat from pyrolysis flue gas residual heat and gas engine heat; (ii) residual gas engine exhaust heat recovery for drying of waste at pre-treatment stage.

3. The main process residue will be a vitrified slag (from the combustion of pyrolysis-derived char) which is not harmful to the environment or human health. Residues from the gas scrubbing and flue gas treatment steps will be reprocessed within the pyrolysis system, directly in the plant.

4. Recyclable waste materials are removed insofar as practicable at the pre-treatment stage. The vitrified slag residue (3,200tonnes per annum or approximately 5% of waste intake) will initially be sent to landfill for disposal, however approval will be sought for use of the product as an aggregate for road building / land cover. Transport of such waste residues will only be carried out by hauliers holding a valid waste collection permit for the classes of waste concerned.

A.1.5 Emissions

The normal emissions from the facility will comprise:

- Emissions to air from pyrolysis units, waste handling/drying and gas engines;
- Emissions to surface water from site and roof runoff;
- Emissions to groundwater from sanitary effluent system;
- Noise emissions from operation of plant and vehicle movements.

The control and monitoring of emissions are described at Sections A.1.6 and A.1.7 respectively.

A.1.5a Emissions to Air

The sources of emissions to atmosphere resulting from the proposed Glanpower facility are summarised below. There will be no fugitive or uncontrolled emissions to air from the proposed facility.

- **2 no. PGE Prima 3000 Pyrolysis Units**

  Emissions arising from the pyrolysis of pre-treated waste (Solid Recovered Fuel) and energy crop biomass will be made up primarily of oxides of nitrogen (NO_x), sulphur dioxide (SO_2) and carbon monoxide (CO). Other emission constituents, including particulates, volatile organic compounds (VOC), hydrogen chloride, hydrogen fluoride and metals arise in minor quantities.

  The emissions arising from the two pyrolysis units will be emitted from one primary stack, 30m in height above ground on a continuous basis (except during planned shutdowns). The stack will emerge from the roof of the main building.

These emissions are regulated under the Waste Incineration Directive (WID).

- **3 no. Syngas-Fired Engines**

  There will be three engines at the facility. Emissions arising from the combustion of syngas in the gas engines will be made up primarily of oxides of nitrogen (NO_x) and carbon monoxide (CO). Other emission constituents, including particulates and volatile organic compounds (VOC) arise in minor quantities. It has been verified with the engine supplier that the combustion of the syngas will cause emissions no higher than those resulting from the burning of natural gas.

  The emissions from three gas engines will be emitted from three secondary stacks, 30m in height above ground on a continuous basis (except during planned shutdowns). These secondary stacks will emerge from the roof of the main building, adjacent to the primary stack described above. These emissions are not regulated under the Waste Incineration Directive.

- **Regenerative Thermal Oxidiser (associated with waste drying)**

  The drying of waste at the pre-treatment stage will result in an off-gas stream of odorous air. This air will be treated in a single Regenerative Thermal Oxidiser (RTO) to decompose all odour generating components present in the dryer exhaust gas before it is emitted to atmosphere. The RTO is dedicated solely to the treatment of waste pre-treatment dryer exhaust air.

  Emissions from the RTO will be emitted from 1 stack, 19m in height, on a continuous basis (except during planned shutdowns). This stack is located at the southern side of the main building. This emission (odour only) is not regulated under the Waste Incineration Directive.

- **Waste Reception Hall (management of odour)**

  The handling of municipal waste in the waste reception hall will result in the presence of significant odour. The waste reception hall has been designed to be air tight to prevent the egress of odour to the external environment. Air not drawn for use in the process will be directed through a dedicated odour abatement unit and vented at 15m height.

  The emission of air from the waste reception hall will be on a continuous basis. This emission is not regulated under the Waste Incineration Directive.

- **Emergency generator**

  A standard emergency generator will be installed at the facility to ensure continued operation in the event of loss of electrical power. Emissions to air will consist primarily of oxides of nitrogen (NO_X), carbon monoxide (CO) and dust. The emergency generator will only be operated under abnormal

conditions (i.e. loss of power from National Grid and site supply) and for approximately 20 minutes weekly for testing.

A.1.5b Emissions to Surface Water

There will be one surface water emission point to an existing open drainage ditch at the west of the site. This drainage ditch ultimately discharges to the Clodiagh River, approximately 5km from the site.

Surface water emissions will comprise non-contaminated runoff from the internal site roadways, pavement and yard areas, in addition to runoff from building roof areas. All runoff water will drain to the outfall through an underground drainage network via petrol interceptors, grit traps and an underground surface water attenuation tank. The quantity and flow of surface water runoff at the outfall will vary depending on rainfall amounts.

The landscaped areas of the site will continue to drain naturally to existing drainage ditches and will not be open to sources of potential contamination from the process or operations on-site.

There will be no process effluent discharge from the facility to surface water.

A.1.5c Emissions to Sewer

There will be no emissions to a sewer of a sanitary authority from the proposed facility. All sanitary effluent from the facility (toilets, sinks, canteen etc.) will be treated on-site in a packaged treatment plant and discharged to groundwater via polishing filter.

A.1.5d Emissions to Groundwater

There will be one emission point to groundwater consisting of the discharge from the site sanitary effluent treatment system. Wastewater from toilets, sinks, showers, canteen and kitchen areas will be treated on-site in a package effluent treatment plant. The treatment system and polishing filter have been designed in accordance with EPA guidelines and the requirements of Offaly County Council, to achieve a high standard of quality prior to discharge to groundwater. The effluent treatment system is based on Sequence Batch Reactor (SBR) technology, which is commonly used in domestic and commercial wastewater treatment. The effluent treatment system and discharge point to groundwater will be located in the southwest corner of the site.

There will be no fugitive or uncontrolled emissions from the facility to ground or groundwater.

The proposed activities will not give rise to an emission in to an aquifer containing the List I and II substances specified in the Annex to Council Directive 80/68/EEC as amended.

A.1.5e Noise Emissions

The main sources of external noise will be the regenerative thermal oxidiser, electrical transformers, emergency generator and roof-mounted condenser units associated with the steam turbine. All other significant items of waste handling / process equipment will be housed indoors to minimise the emission of noise to the external environment. Equipment will be designed with acoustic enclosures.

A.1.5f Other Nuisances

All waste handling activities will be undertaken indoors to reduce the potential for bird nuisance, wind blown litter and vermin. The potential for wind blown litter is minimised as the site is located in a low lying area with shelter provided to the south by the existing Derryclure Woods. Additional shelter will be provided by means of site landscaping in accordance with planning requirements.

Measures planned to minimise dust include wheelwash provision; good housekeeping and site management practices; air-tight building design and the paving of roads, footpaths, yard and car-parking areas.

Traffic will be managed through the provision of a new left-turn decelerating lane from the N80 main road; new roundabout on the access road between the entrances of Derryclure landfill and the proposed facility; car parking facilities; new lighting and site speed limit.

The facility has been designed with detection, alarm and suppression systems for fire protection in consultation with Offaly County Council.

A.1.6 Emission Control & Abatement

The facility has been designed to ensure that emissions from the plant are not harmful to human health or the environment and are compliant with the relevant requirements of the Waste Incineration Directive (2000/76/EC). The monitoring of emissions is described at Section A.1.7.

A.1.6a Control of Emissions to Air

Emissions to air will be minimised in the first instance by a pre-treatment step which ensures a consistent, homogeneous fuel feed for the pyrolysis system.

Emissions from Pyrolysis

The pyrolysis process further minimises harmful emissions by inherently avoiding the direct combustion of raw waste in an oxygen environment. The emissions arising from the pyrolysis process will be treated prior to discharge at the stack, using a combination of physical and chemical treatment in a flue gas treatment system.

Emissions from Gas Engines

The combustion of syngas in the gas engines will cause emissions no higher than those resulting from the burning of natural gas. The gas engines will be equipped with a Selective Catalytic Reduction system for treatment of flue gas. Accordingly these emissions will not have a harmful impact on air quality.

Emissions from Emergency Generator

The emissions arising from the emergency generator will be sampled and analysed when the generator is installed and commissioned. This will ensure the generator operates according to expected emission levels. Weekly testing of the generator and ongoing maintenance will ensure emissions do not exceed expected values. Emissions from the generator will only arise during abnormal conditions.

Control of Odour Emissions

The air-tight building design will ensure that potential odour emissions are eliminated to the greatest extent possible. Air not used in the process to be vented from the waste reception hall will be directed through a dedicated odour abatement unit before venting to atmosphere. A Regenerative Thermal Oxidiser (RTO) will be installed for the treatment of odour arising from the waste drying step. These measures will ensure that there is no significant odour impact at the nearest sensitive receptor.

A.1.6b Control of Emissions to Surface Water

The surface water discharge will consist of uncontaminated runoff rainwater only. In an emergency event of surface water contamination (e.g. uncontrolled spill, fire etc.), contaminated surface water flowing to drain will be held in an underground attenuation tank to prevent the release of pollutants in to the water environment.

The surface water drainage system has been designed to control the emission rate of surface water from the site. The rate of discharge will be controlled and limited by hydrobrake. Excess water during heavy rainfall will be stored in the underground attenuation tank.

All potentially pollutant raw materials stored on-site will be contained in designated areas. Bunding will be provided where necessary to contain unplanned releases from material storage areas, including at the external oil storage tank.

A.1.6c Control of Emissions to Groundwater

The effluent treatment system has been designed in accordance with EPA guidelines and the requirements of Offaly County Council. The design has been agreed to regulate the quantity and quality of treated sanitary effluent discharged to groundwater.

There will be no fugitive emissions to groundwater. Areas where materials are in transit or handled on-site are of hardstanding and any potential spills or releases would be contained in the surface water drainage system. All potentially polluting raw materials will be stored in bunded areas to prevent unplanned releases to drain.

A.1.6d Control of Noise Emissions

The facility has been sited taking account of the surrounding built environment, to avoid proximity to existing residential areas and noise sensitive locations. The nearest noise sensitive location (NSL) is a single dwelling located approximately 350m to the northwest of the site. To minimise noise emissions arising from the process, all main process items of plant will be sited indoors within the main process building. Acoustic enclosures will be installed on items of plant generating significant noise. Since planning approval, new design modifications require the installation externally of a Regenerative Thermal Oxidiser (RTO), emergency generator, transformers, water pump house and roof-mounted condensing units. Based on noise levels measured in the existing noise environment (dominated by N80 traffic), it is not expected these will create a significant additional impact on the noise environment.

There are no equipment items or activities on-site which could generate significant vibration emissions to the external environment.

A.1.7 Monitoring of Emissions

Emissions to the environment will be monitored and sampled in accordance with the requirements of the EPA. This will ensure that the facility and equipment operate as designed and intended.

All monitoring will be recorded and files retained on-site. Subject to grant of waste licence, monitoring results will be reported to the EPA in the format specified by licence conditions.

A.1.7a Air Monitoring & Sampling

The emissions arising from the pyrolysis process will be monitored continuously for the following parameters and any others required by the EPA:

- Oxides of nitrogen (NO_x)
- Sulphur dioxide (SO_2)
- Carbon monoxide (CO)
- Total Organic Carbon (TOC)
- Total dust (particulates)
- Hydrogen chloride (HCl)
- Hydrogen fluoride (HF)
- Oxygen (O_2)
- Temperature

The emissions will be monitored using a Continuous Environmental Monitoring System (CEMS) installed at the main stack, which will relay results to a central computerised control system. The personnel operating the plant will be able to monitor the results. The operation will be set up to automatically and safely shut down in the event of a breach in emission limit set points.

Other pollutant parameters including metals, dioxins and furans will be monitored by taking grab samples on a quarterly basis. This periodic sampling and the associated laboratory analysis will be undertaken by an accredited laboratory.

Spot checks for odour will be carried out weekly at a minimum of two boundary locations, depending on wind direction.

A.1.7b Surface Water Monitoring & Sampling

A monitoring chamber installed at the surface water outfall point at the west of the site will enable continuous monitoring of parameters including flow, temperature, pH, conductivity and TOC.

Sampling and laboratory analysis of surface water in the existing drainage ditches will also be carried out periodically during the construction phase.

A.1.7c Groundwater Monitoring & Sampling

The discharge from the outlet of the effluent treatment system will be monitored at a dedicated sampling chamber. Samples will be taken on a quarterly basis and analysed for levels of biological oxygen demand (BOD), chemical oxygen demand (COD) and total suspended solids (TSS). Sampling and analysis will be undertaken by an accredited laboratory.

Two groundwater monitoring wells have been installed on-site, one upstream and one downstream of the facility. This will allow for the monitoring of ambient groundwater quality in proximity to the licensed activities. It is proposed that samples will be collected monthly and analysed for levels of total organic carbon (TOC), ammonia and conductivity. It is proposed that samples will be analysed for additional parameters once every six months (twice per annum) including pH, nitrate, nitrite, chloride, metals and organohalogens. The parameters and frequency of ambient groundwater monitoring will be carried out as specified by the EPA. All sampling and analysis will be undertaken by an accredited laboratory.

A.1.7d Noise Monitoring & Sampling

An environmental noise survey will be commissioned annually to measure and assess the daytime and night-time noise levels. Noise levels will be measured at four site boundary locations and at the site boundary of one noise sensitive location (NSL) off-site. All measurements will be reported in accordance with EPA guidelines.

A.1.7e Meteorological Monitoring & Sampling

A meteorological monitoring station will be installed at the facility for the continuous measurement of wind speed, wind direction and atmospheric pressure. Precipitation and temperature will also be measured on a daily basis. It is proposed to locate the weather station, subject to detailed design, on the north-west corner of the roof of the main process building, or an alternative location agreeable to the EPA.

A.1.8 Resource Use & Energy Efficiency

A.1.8a Raw & Ancillary Materials

The pre-treatment (including drying) of waste (65,000tonnes per annum) will generate approximately 50,000tonnes per annum (tpa) of solid recovered fuel (SRF) material through the removal of dry recyclable fractions, non-conforming waste and moisture content. Where significant quantities of waste accepted are dry may increase the quantity of SRF generated. The plant has been sized to treat up to 62,400tonnes per annum of SRF based on 8,000 hours of operation per year.

SRF and energy crop biomass (10,000tpa) will be the materials that ultimately fuel the pyrolysis and gas engine systems.

Within the pyrolysis chamber, the SRF and biomass will be thermally decomposed in to a solid material stream of char and gaseous stream of synthetic gas.

The solid char will fuel the secondary cyclonic convertors that provide the heat energy to the pyrolysis chambers. These secondary cyclonic convertors will be initially primed with low sulphur kerosene oil (approximately 6.5tpa). The regenerative thermal oxidiser, associated with the waste drying step, will also be fuelled using low sulphur kerosene oil (approximately 15.4tpa).

Minor quantities of transformer oil, hydraulic oils and lubricants will be used in the operation of plant components (e.g. electricity substation, motor compactors etc.).

Water used in the system, including the syngas cleaning water, will be treated using minor quantities of chemicals including caustic (pH adjustment), sulphuric acid (pH adjustment), monoethylene glycol (water jackets operation) and bromine biocide (water treatment for cooler operation), chlorine dioxide biocide (prevention of Legionella) and sand media (media filtration).

Urea solution/ammonia (SNCR and SCR reagents) will be used in the treatment of flue gas prior to emission to atmosphere.

Activated carbon will be used for cleaning of syngas prior to combustion in the gas engines.

Water will be sourced from connection to the public mains and will be stored on-site in a 1000m^3 capacity tank.

A.1.8b Energy Efficiency

The proposed facility will be a net exporter of electricity through (i) combustion of syngas in 3 no. 3.2MW engines (ii) recovery of residual heat energy for production of steam feed to a 1.56MW steam turbine. The plant will generate 11MW electricity of which approximately 9MW will be exported to the National Grid via substation at Clonminch, Tullamore, Co. Offaly.

Energy Efficiency in Design

Specific energy efficient measures incorporated in to the design of the facility include:

- Use of char produced by pyrolysis as a fuel source for the system;
- Two stage pyrolysis process which reduces the impact of corrosivity, allowing for maximum energy recovery;
- Use of gas engines to combust gas product derived from pyrolysis (exporting energy to the National Grid);
- Use of excess heat in the gas engine exhaust stream for drying of waste at pre-treatment stage and residual heat recovery via steam turbine to generate electricity;
- Pyrolysis exhaust gas heat recovery via steam turbine to generate electricity.

Operational measures for energy efficiency will include installation of sprung door close devices to reduce heat loss from rooms; lighting control and automation; electronic document management (scan, e-mail based systems) to minimise the use of photocopiers; office heater control by timer(s) and monitoring of facility energy use.

Energy Efficiency Requirements of Waste Incineration Directive

The facility has been demonstrated to meet the energy efficiency requirements of the Waste Framework Directive under the criteria commonly known as the "R 1 formula". This R 1 formula provides a standard method of calculating the energy efficiency of plants where waste is used *"principally as a fuel or other means to generate energy"*. The formula and resulting value acceptable for energy efficiency is defined in the Fourth Schedule of the Waste Management Acts 1996 to 2011. For new facilities, the minimum value acceptable using the "R 1 formula" is 0.65. The energy efficiency of the Glanpower facility has been calculated to be 0.84.

High Efficiency CHP

The facility has also been assessed against the requirements of Directive 2004/8/EC on the promotion of cogeneration based on useful heat demand in the internal energy market. In order to qualify as a High Efficiency Combined Heat and Power (CHP) plant, the Glanpower facility must demonstrate primary energy savings (PES) of at least 10% compared with separate production of heat and electricity. This is calculated using a formula defined in the Directive (2004/8/EC). According to this formula, the PES of the proposed facility will be 17.9%.

Glanpower has submitted a 'High Efficiency Combined Heat and Power' (HE CHP) application to the Commission for Energy Regulation (CER).

Energy Efficiency Requirement of the Waste Management Acts 1996 to 2011

The facility will be a net exporter of electricity to the National Grid. Low grade heat will be further recovered from the process for drying waste, heating the fuel storage area and generating electricity in a steam turbine.

A.1.9 Materials Handling

A.1.9a Quantity & Nature of Waste

This application seeks consent for the acceptance, pre-treatment and recovery of 65,000tonnes per annum of non-hazardous municipal household and commercial waste as shown in Table A.1.1. As the facility will be subject to market competition, it is not possible to predict at this stage the exact quantities of each waste type.

Table A.1.1: Waste Types Accepted at the Facility

Waste Type	Tonnes Per Annum (proposed)
Household	0 – 65,000
Commercial	0 – 65,000
Sewage Sludge	0
Construction and Demolition	0

Waste Type	Tonnes Per Annum (proposed)
Industrial Non-Hazardous Sludges	0
Industrial Non-Hazardous Solids	0 – 65,000
Hazardous	Not accepted

Waste will be accepted and handled at the site in accordance with site specific procedures.

A.1.9b Waste Arisings

The main waste arising will be 3,200tonnes per annum of inert, vitrified slag material arising from the combustion of pyrolysis-derived char in the secondary cyclonic convertors. The quantity of vitrified slag residue will be minimised by ensuring a consistent level of pre-treatment, monitoring of system temperature and oxygen levels and scheduled maintenance of all plant and equipment. The vitrified slag residue (3,200tonnes per annum or 5% of waste intake) may initially be sent to landfill for disposal, however approval will be sought for use of the product as an aggregate for road building / land cover.

All metals, glass and hard particles in the incoming waste stream will be removed at the pre-treatment stage for off-site recycling. Similarly non-conforming waste items arising in waste consignments (e.g. hazardous materials, WEEE, etc.) will be quarantined for recovery or disposal off-site. The recovery or disposal route will be determined on a case-by-case basis, taking account of the waste hierarchy.

Process residues arising, including scrubber water treatment residues, flue gas treatment residues and waste oils will be reprocessed within the pyrolysis system preventing the requirement for treatment as waste off-site.

Minor quantities of waste arising from the operation of the facility will include office waste, kitchen waste, garden (landscaping) waste, waste electrical and electronic equipment (computers, electrical appliances etc.) Reduction of waste arising will be included as an objective of the site Environmental Management System (EMS) to ensure unnecessary quantities of these waste streams are prevented and that necessary consumption is minimised.

Liquid waste from the emptying of hydrocarbon interceptors will be treated as hazardous waste and processed off-site at a licensed facility for recovery/disposal.

A.1.9c Waste Reuse & Recycling

The facility will include a pre-treatment step to maximise the amount of material which may be separated out of the incoming waste stream for recycling. Heavy particles (including glass, ceramics, stones); metals and waste electrical and electronic equipment will be removed at the pre-treatment stage for recycling off-site.

The facility will assist in improving recycling rates for metal and glass by removing these fractions from mixed municipal waste consignments or "*black bin* waste".

A.1.10 Existing Environment & Impact of the Facility

The facility has been designed to ensure that the emissions which will arise from the facility do not have an adverse impact on human health or the environment.

A description of the existing environment (air quality, water quality, noise levels, ecology) is included in the Environmental Impact Statement (EIS) included with this application. Further to the impact assessment detailed in the EIS, a summary of the impact of emissions is included below.

A.1.10a Impact of Emissions to Air

Emissions from Pyrolysis

The design of the pyrolysis process and the flue gas treatment technologies selected will ensure that the emissions to air will be compliant with the limit values set under the Waste Incineration Directive (2000/76/EC). This will safeguard against harmful impact to human health or the environment.

Emissions from Gas Engines

The combustion of syngas in the gas engines will cause emissions no higher than those resulting from the burning of natural gas. Accordingly these emissions will not have a harmful impact on air quality.

Odour Emissions

There will be no significant odour impact at the nearest sensitive receptor as a result of the control measures described at Section A.1.6a.

Impact Assessment – Air Dispersion Model

The impact of emissions to air from the facility has been assessed using best practice air dispersion modelling software, AERMOD. Modelling was completed in accordance with EPA guidelines. The model considered the combined impact of facility emissions and existing background concentrations of air pollutants (e.g. oxides of nitrogen, sulphur dioxide etc.).

The air dispersion model was completed initially as part of the Environmental Impact Assessment (EIA) process at planning stage. The model has been revised taking account of the latest design modifications and these results are included as part of this application.

The results of the air quality modelling analysis undertaken indicates that ambient air quality will remain below the relevant air quality standard limits and guidelines values. This has been demonstrated for the worst case scenario of facility operation (i.e. maximum potential emissions).

A.1.10b Impact of Emissions to Surface Water

According to the control measures described at Section A.1.b, there will be no impact on surface water quality. The maximum allowable discharge of surface water runoff will be no greater than the runoff rate from a greenfield site.

A.1.10c Impact of Emissions to Groundwater

The sanitary effluent treatment design and surface water collection system will ensure there is no significant impact on groundwater quality.

A.1.10d Impact of Noise Emissions

The control measures described at Section A.1.6d are designed to minimise noise emissions. The assessment of noise impact has been completed using noise modelling computer software. The noise model was completed initially as part of the Environmental Impact Assessment (EIA) process at planning stage. Additional items of plant have been incorporated in a revised facility design since the grant of planning permission. Based on the existing noise environment and influence of traffic noise from the adjacent N80 national secondary route, it is concluded that noise emissions from the facility will not have a significant impact on the existing noise environment.

There will be no vibration impact arising from the proposed waste activities.

A.1.10e Impact on Ecology

The ecological assessment of the site and surrounding area identified the site land and associated habitats as having relatively low ecological value. The site is not located in proximity to a sensitive habitat or an area designated under conservation legislation (e.g. Special Protection Area, Special Area of Conservation, Natural Habitat Area etc.). A Screening Statement for Appropriate Assessment report was completed in accordance with the requirements of the EU Habitats Directive.

The construction phase (of twelve months duration approx.) has the potential to affect at least one breeding and growing season for most species. Mitigation measures have been identified to minimise the impact of construction and operation phase activities on the ecology features present (e.g. hedgerows, birds etc.). These measures are described in the Environmental Impact Statement (EIS). Examples of these measures include landscaping of the site (with native species); reduced lighting design and maximum retention and maintenance of existing hedgerows.

In summary, there is no negative ecological impact of significance envisaged from the construction or operation of the proposed facility.

A.1.11 Accident Prevention & Emergency Response

Glanpower Ltd. is committed to operating the proposed facility to the highest standards of practice in health and safety, environmental and quality management.

Safety in Design

The facility design is being carried out according to standards, design codes and applicable safety legislation. The design programme includes for EHS Design Review, Hazard and Operability (HAZOP) review and constructability review. The proposed activities are not for the purposes of an establishment to which the European Communities (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2000 (S.I. No. 74 of 2006) apply.

Critical items of equipment (including pumps, computers, power supply) will be installed on a duty-standby basis or with spare back-up capacity.

Safety in Construction

During the construction phase, the approach to construction safety will be the responsibility of Glanpower in conjunction with its appointed PSDP/PSCS. A Construction Management Plan (CMP) will be implemented on-site to ensure the facility is constructed in a safe and environmentally responsible manner.

Safety in Operation

The facility will be operated under a Safety Statement approved by senior management. A dedicated QEHS Manager will assume overall responsibility for the management of health and safety on-site. Glanpower will apply strict rules on safety such as a Permit to Work System, training of operators and staff and provision and use of personal protection equipment (PPE).

An equipment maintenance schedule will be implemented to ensure that equipment failure is prevented and that any associated incident is avoided.

The monitoring of emissions by CEMS and automatic interlocks on emission set points will ensure that unauthorised emissions are prevented.

Competence

A Human Resources professional will be appointed to oversee the recruitment, qualifications, training, appraisal and development of employees. This is to ensure that the necessary skills and experience are employed on-site for the ongoing protection of employee health and safety as well as environmental protection.

Fire Protection

The fire protection system to be provided at the proposed facility includes for automatic detection, alarm and suppression in accordance with the requirements of Offaly County Council.

Emergency Planning

For operational activities, a Site Emergency Plan will be prepared prior to start-up on-site which sets out the response measures to be taken by personnel in the event of an emergency. The Site Emergency Plan, to be agreed with the EPA, will have four basic components, namely prevention; preparedness; response; recovery.

A.1.12 Remediation, Decommissioning, Restoration & Aftercare

The proposed facility has a projected life span of approximately 20 years, which may be extended through equipment maintenance, upgrades, repairs and/or replacements. An Environmental Liabilities Risk Assessment (ELRA) will be prepared upon commencement of operations to cover potential liabilities arising from the development.

In the unforeseen event of facility closure or cessation of waste activities, Glanpower Ltd. is committed to ensuring that any associated (negative) environmental impact is prevented or minimised to the greatest possible extent. Under a closure/cessation scenario, a Decommissioning Management Plan will be prepared and submitted to the EPA for agreement. This Plan will be informed by the ELRA.

Measures to be implemented upon closure of the facility would include:

- Notification of EPA and local stakeholders;
- Removal of all materials from site;
  - Raw materials returned to supplier, sold onwards or disposed of in accordance with legal requirements and the waste hierarchy;
  - Remaining stock of waste/biomass (fuel) feed processed on-site where possible or alternatively disposed under permit;
  - Petrol interceptors purged (contents transported under permit for disposal at a licensed facility);
- Decommissioning of all plant and equipment under engineering supervision;
- Cleaning, inspection and making secure of facility and site;
- Compilation of handover package including site drawings, documentation and legal records.

If the site is to be permanently vacated, the land will be returned to its current agricultural use.

It is currently envisaged that minimal aftercare provisions will be required as all residual waste items at the site upon closure will be removed for off-site recycling or disposal (in accordance with the waste hierarchy).

A.1.13 Statutory Requirements

The EPA cannot grant a waste licence unless it is satisfied that the conditions outlined in Section 40(4) of the Waste Management Acts 1996 to 2011 have been met. A summary of the compliance with these conditions is included below.

A.1.13a Impact of Facility on Environment and Health

Emissions from the proposed facility will not cause environmental pollution and will not contravene relevant standards, as summarised below.

Operating Standards (General)

The facility has been designed in line with the requirements of BAT, the Waste Incineration Directive (2000/76/EC), architecture and engineering design codes (Eurocodes, British Standards etc.) and monitoring equipment standards prescribed by the EPA. The scope of the detailed design of the facility (ongoing at time of application) includes provision for conformity with health and safety standards (e.g. ATEX requirements, CE Marking, PSDP, PSCS, HAZOP etc.)

Air Emissions & Abatement Air Quality Standards

The Waste Incineration Directive (2000/76/EC) will be applicable to exhaust emissions from the pyrolysis units and associated secondary cyclonic convertors. A flue gas treatment step has been incorporated in the design for the abatement of these emissions. Emissions ultimately discharged from the stack will be below the applicable limits set out in Waste Incineration Directive 2000/76/EC. The cumulative impact of emissions from the facility and existing background air quality will be within Air Quality Standards under the worst case scenario operating conditions.

Effluent Emission Standards

There will be no discharge of trade effluent to surface water or sewer of a sanitary authority. Surface water runoff from areas of hardstanding and building roof areas will drain to an underground surface water network and be discharged centrally via oil interceptors, attenuation tank and hydrobrake to an existing ditch.

There will be a single emission to ground/groundwater, comprising the discharge of sanitary effluent arising from toilets, sinks, kitchen/canteen areas etc. The discharge will be treated by an on-site package wastewater treatment plant (WWTP) and a polishing filter, designed in accordance with EPA guidelines.

The facility has been designed to prevent the unauthorised or accidental release of polluting substances to groundwater in accordance with the Groundwater Directive 80/68/EC and Article 8(7) of the Waste Incineration Directive.

Noise Standards

As part of the site selection criteria, the distance from site to neighbouring residences, businesses and other receptors was considered. The nearest noise sensitive location (NSL) is sited a distance of approximately 350m from the proposed facility.

Ecological Standards

A detailed ecological assessment of the facility was completed as part of the EIS, which considered relevant legislation and governing standards including the Wildlife Acts 1976 and 2000, EC Habitats Directive (92/43/EEC) and EC Birds Directive (79/409/EEC), among others.

A screening exercise for Appropriate Assessment was completed for the project (Section 8.8 of the EIS) and it was concluded that there are not likely to be significant effects on any designated (Natura 2000) conservation sites.

Standards for the Management of Residue

In accordance with the Waste Incineration Directive, the system has been designed so that, where practicable, process residues (e.g. syngas scrubbing residues) will be reprocessed within the pyrolysis system. This eliminates the need for their disposal off-site. The vitrified slag residue will initially be sent to landfill for disposal, however approval will be sought for use of the product as an aggregate for road building / land cover. The quantity of waste consigned for disposal to landfill from the facility will be less than 15% of waste intake.

A.1.13b Application of Best Available Techniques (BAT)

The facility has been designed in accordance with Best Available Techniques (BAT), as prescribed in the following documents:

- Reference Document on the Best Available Techniques for Waste Incineration, European Commission, August 1996;
- Batneec Guidance Note for the Waste Sector (Revision 1 – May 1996), EPA;
- BAT Guidance Note on Best Available Techniques for the Waste Sector: Waste Transfer and Materials Recovery, EPA, December 2011.

A.1.13c Compliance with Waste Management Plan

The facility will be located within the area governed by the Waste Management Plan for the Midland Region (WMPMR). The proposed activity is consistent with the objectives of the Waste Management Plan for the Midland Region 2005-2010 (extended to 2014).

The grant of planning consent for the proposed development by An Bord Pleanála (planning ref. PL 19.238420) was provided having regard to the Waste Management Plan for the Midlands Region, 2005-2010.

A.1.13d Fit and Proper Person

Neither Glanpower Ltd. nor any Director of Glanpower Ltd. (in their present or previous roles) has been convicted of any offence under environmental legislation.

The management and staff of the facility will be suitably qualified and experienced to operate the facility. Personnel will be specifically recruited in the areas of quality, environmental management, health and safety. Organisation structures for both company's senior management and facility management have been devised, in the context of the proposed facility.

Staff will receive extensive training in facility operating procedures. Training will be completed in conjunction with equipment suppliers, through formal service/maintenance contracts.

A.1.13e Meeting Financial Commitments & Liabilities

Glanpower is a start-up company. Glanpower Ltd. is fully committed to furnish the EPA with any evidence required to satisfy the Agency of the company's ability to meet any financial commitments or liabilities that will be entered into or incurred in carrying on the activities to which this

application relates or in consequence of ceasing to carry out these activities.

Environmental Liabilities Risk Assessment

Prior to commencement of operations it is proposed to carry out an Environmental Liabilities Risk Assessment (ELRA), in accordance with EPA guidelines, to identify the possible requirement(s) for financial provision addressing potential environmental liabilities. This will be submitted to the EPA upon completion.

Insurance

Glanpower Ltd. has been working extensively with the insurance industry to ensure that the facility is fully covered for both construction and operational activities for both public and environmental liabilities. Insurance policies will commence with construction and be advanced for commissioning and overall process operation.

Contingency

In the event of an unforeseen scenario requiring the closure of the facility, Glanpower is committed to ensuring the complete decommissioning and restoration of the site in accordance with a Decommissioning Management Plan for the activities (ref. Section A.1.12). This will be enabled by suitable financial provision to be supported by future operating profit arising from the commercial activities.

A.1.13f Acceptability of Method of Treatment (Environmental Protection)

Pyrolysis is a proven technology, used in the chemical industry to produce charcoal, activated carbon, methanol and other chemicals. Using these principles, the proposed Glanpower facility has been designed as a commercially viable, pyrolytic conversion system that is efficient, environmentally safe and reliable.

The method of treatment assists in the protection of the environment in the following ways: (i) diversion of waste from landfill; (ii) reclamation of recyclable material from residual (black bin) waste by pre-treatment; (iii) renewable energy production as an alternative to fossil fuels, and (iv) reduced environmental impact compared with conventional incineration. Furthermore, the facility is consistent with the requirements of Best Available Techniques (BAT).

A.1.13g Other Statutory Requirements

Other provisions of Section 40(4) of the Waste Management Acts 1996 to 2011 are already addressed in previous sections. These include energy efficiency (Section A.1.8b); control of noise (Section A.1.6d); accident prevention (Section A.1.11); cessation of activity (Section A.1.12).

A.1.13h Waste Hierarchy

Since 2011, the waste hierarchy is embedded in the Waste Management Acts 1996 to 2011. This hierarchy ranks the five main methods of waste treatment in order of preference, specifically (i) prevention; (ii) preparing for re-use; (iii) recycling; (iv) other recovery including energy recovery, and (v) disposal.

The proposed facility will result in moving waste quantities upward from the bottom of the hierarchy (disposal to landfill) to a preferable method of treatment i.e. energy recovery. The inclusion of the pre-treatment step will increase the amount of material recycled, which is a further step upward on the waste hierarchy.

A.1.13i Self Sufficiency and Proximity

The activities will be compliant with the principles of self sufficiency and proximity[2]. The waste capacity of the plant (65,000tpa) has been determined based on the quantities of waste available within the Midlands Region. These quantities are based on EPA published figures and future projections made by the Economic and Social Research Institute (ESRI). The facility is sited centrally within the Midlands Region, with a good standard of road access via the N80 national secondary road route.

A.1.14 Declaration of Application

This application includes the formal, signed declaration of Glanpower Ltd. for the making of an application to the EPA for a Waste Licence.

A.1.15 Glossary of Terms

AERMOD	Atmospheric dispersion modelling computer software
ATEX	ATmosphères Explosives (Explosive Atmospheres)
BOD	Biological Oxygen Demand
CE	Certified Equipment
CEMS	Continuous Environmental Monitoring System
CHP	Combined Heat and Power
CMP	Construction Management Plan
CO	Carbon monoxide
COD	Chemical Oxygen Demand
E, N	Easting and Northing co-ordinates (Irish National Grid)
EC	European Community
EEC	European Economic Community
EHS	Environmental, Health & Safety
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
ELRA	Environmental Liabilities Risk Assessment
ELV	Emission Limit Value
EMS	Environmental Management System
EPA	Environmental Protection Agency
ESB	Electricity Supply Board
ESRI	Economic and Social Research Institute
EU	European Union
ha	Hectare

[2] Section 37(A) of the Waste Management Acts 1996 to 2011

HAZOP	HAZard and OPerability Study
HCl	Hydrogen Cholride
HE CHP	High Efficiency Combined Heat and Power
HF	Hydrogen Fluoride
HRSG	Heat Recovery Steam Generator
m	metre
m^2	square metre
m^3	cubic metre
MW	MegaWatt
Natura 2000	Conservation sites protected under the EU Birds Directive and EU Habitats Directive
N	North
NO_X	Oxides of nitrogen
NSL	Noise Sensitive Location
O_2	Oxygen
PES	Primary Energy Savings
PGE	Premier Green Energy Ltd.
pH	Measure of how acidic or basic an aqueous solution is
PPE	Personal Protective Equipment
PSDP	Project Supervisor Design Process
PSCS	Project Supervisor Construction Stage
QEHS	Quality, Environmental, Health & Safety
R1	Recovery code assigned, under European and national waste legislation, to waste recovery facilities meeting a minimum standard of energy efficiency,
REFIT	Renewable Energy Feed-In-Tariff
RTO	Regenerative Thermal Oxidiser
SBR	Sequence Batch Reactor
SCR	Selective Catalytic Reduction
S.I.	Statutory Instrument
SNCR	Selective Non-Catalytic Reduction
SO_2	Sulphur dioxide
SRF	Solid Recovered Fuel
tpa	tonnes per annum
TOC	Total Organic Carbon
TSS	Total Suspended Solids
TüV	Technischer Überwachungsverein (German Technical Inspection Association)
VOC	Volatile Organic Compounds
WEEE	Waste Electrical and Electronic Equipment
WID	EU Waste Incineration Directive
WMPMR	Waste Management Plan for the Midlands Region
WWTP	Wastewater Treatment Plant

ATTACHMENT B

GENERAL

SUPPORTING INFORMATION

(9 pages)

- Attachment B.1 Company Information
- Attachment B.2 Site Plan, Location & Service Details
- Attachment B.3 Planning Permission
- Attachment B.6 Advertisement, Site Notice & Notice to Local Authority
- Attachment B.7 Type of Waste Activity

ATTACHMENT B.1 COMPANY INFORMATION

B.1.1 Memorandum and Articles of Association

The Memorandum and Articles of Association for Glanpower Ltd. are included as Appendix B.1.

B.1.2 Company Registration

Glanpower Ltd. is registered in the Republic of Ireland, with registered offices at:

19 High Street,
Tullamore,
Co. Offaly.

Company Registration Number: 465847

B.1.3 List of Company Directors

Table B.1.1: Glanpower Company Directors

Director Name	Title
Mr. Brian Gillen	Managing Director
Mr. Raphael McEvoy	Technical Director
Mr. John McDonald	Director – Infrastructure
Mr. Shay Gillen	Director
Mr. Keith Garry	Director

B.1.4 Site Ownership Details

A Site Ownership Plan is included as Appendix B.2 (Drawing No. IE0310150-22-DR-0001).

ATTACHMENT B.2 SITE PLAN, LOCATION & SERVICE DETAILS

B.2.1 Site Plan, Site Location & Site Services Drawings

The plan drawings listed in Table B.2.1 are included in Appendix B.

Table B.2.1: Plan Drawings

Drawing Title	Drawing Number	Application Ref.
Site Plan	IE0310150-22-DR-0002	Appendix B.3
Location Map	IE0310150-22-DR-0003	Appendix B.4
Services Plan	IE0310150-22-DR-0004	Appendix B.5

ATTACHMENT B.3 PLANNING PERMISSION

B.3.1 An Bord Pleanála Planning Permission PL19.238420

A copy of the notification of grant of planning permission (An Bord Pleanála Ref. No. PL.19238420) is included as Appendix B.6. Condition 7 of PL.19238420 requires that elements of site infrastructure servicing the proposed development shall *"comply with the requirements of the planning authority"*.

B.3.2 Offaly County Council Planning Permission PL2/10/307

A copy of the planning permission (planning ref. PL2/10/307) and associated thirty conditions, granted by Offaly County Council on 14 January 2011, is included as Appendix B.7.

B.3.3 Current Planning Status

Due to the ongoing detailed design process, the proposed final site layout will include a number of additional external features, further to those approved in the latest grant of planning permission (PL19.238420).

The main differences between the current grant of planning permission and the proposed final scheme is summarised in Table B.3.1 below. Further planning application(s) will be required to regularise these deviations/design modifications.

Table B.3.1: Design Modifications subject to Planning Approval

Difference	Location
Water Storage Tank (revised design)	External
Firewater Pumphouse (new)	External
Weighbridge (relocated)	External
Emergency Generator (new)	External
Louvres added to building elevations (additional)	External
Regenerative Thermal Oxidiser Unit (new)	External
Emergency flare stack and piperack (new)	External
Steam turbine condensers (new)	External
Engine condensers (new)	External
Cooling equipment for pyrolysis units (new)	External

There are no changes proposed to the waste intake (65,000tpa waste) or waste treatment model (pre-treatment, pyrolysis and energy recovery) granted consent under PL.19238420. All waste treatment activities will continue to be carried on indoors within the main process building.

ATTACHMENT B.6 ADVERTISEMENT, SITE NOTICE & NOTICE TO LOCAL AUTHORITY

A copy of the newspaper advertisement is included as Appendix B.8.

A copy of the complete newspaper in which the advertisement was placed (*Tullamore Tribune*, 14th June 2012) is enclosed with the original application.

A copy of the site notice is included as Appendix B.9. The two locations of the site notice are indicated on the Site Layout drawing included as Appendix D.1 (drawing no. IE0310150-22-DR-0005).

A copy of the notice to the local authority is included as Appendix B.10.

ATTACHMENT B.7 TYPE OF WASTE ACTIVITY

B.7.1 Principal Waste Activity

The principal class of waste activity under the Fourth Schedule of the Waste Management Acts 1996 to 2011 will be as follows:

"R 1. Use principally as a fuel or other means to generate energy..."

The proposed facility will be based on pyrolysis technology which has been commercialised to make renewable and alternative energy products from a variety of biomass and waste materials. The technology can process virtually any carbonaceous material, converting it into forms of usable energy that can be consumed at the source or supplied to customers via a network.

Pyrolysis is broadly used in the chemical industry, to produce charcoal, activated carbon, methanol and other chemicals from wood, to produce coke from coal, to convert biomass into synthesis gas (syngas), to turn waste into safely disposable substances, and for the cracking of medium-weight hydrocarbons from oil to produce lighter ones like gasoline.

Subject to comprehensive pre-treatment on-site[1], waste will be used as a fuel in the pyrolysis plant to recover energy. Conditioned gas resulting from the pyrolysis process will fuel three syngas engines, thereby generating electricity. Electricity generated on-site will serve internal plant requirements and surplus electrical energy will be exported to the national grid.

The process differs from conventional incineration insofar as waste is not directly combusted. Instead waste is pre-treated to form a Solid Recovered Fuel (SRF) material. Using a hydraulic loading system, air (oxygen) will be excluded from the SRF material feed to the thermal treatment stage. Compared with the direct incineration of waste, the pyrolysis of SRF will result in the process being more efficient and consistent in its ability to supply undisturbed energy to the national grid. Further information on the energy efficiency of the facility is provided in Attachment G.2.

The quantity of material subjected to pyrolysis (and the R 1 activity) consists of the material remaining after pre-treatment. The quantity of waste is further addressed in Section H.1 of the application form.

Three Stage Summary of Energy from Waste (Pyrolysis) Process

1. Pre-treatment: Following inspection upon arrival, non-conforming waste materials will be removed. Conforming waste will be shredded and screened further for the removal of metals, plastics and heavy fractions (eg, stones, glass, batteries etc.). The remaining material will be dried (to 5% moisture content) and shredded further (to within tolerance size of 50mm). This pre-treatment stage will produce a Solid Recovered Fuel (SRF) material from the waste intake, which will be fed to the next stage of the process on a conveyor.

[1] Pre-treatment activities covered under Class R12.

2. Pyrolysis: A hydraulic loading system to the pyrolysis chamber will remove oxygen from the fuel prior to entering the pyrolysis chambers. This will be achieved by compression to drive out the entrapped air. The fuel (SRF) will introduced to the pyrolysis chambers at high temperatures and this will convert the fuel to both a gas fraction and a solid fraction. The gas fraction will then be cleaned and scrubbed before being passed on to the engines.

   The solid fraction (or char) and process residue liquids will be fed into secondary cyclonic convertors to provide heat for the pyrolysis chambers. This combustion will result in an inert reusable vitrified slag residue. Recycling of the char and process residues in this way improves the overall efficiency of the process.

   The gas produced by pyrolysis will be scrubbed for use in gas engines to generate electricity.

3. Energy Recovery: The process will operate in the form of a combined heat and power (CHP) plant. Energy will be recovered from the process in the form of electrical energy generated in the gas engines and heat energy recovered from both the pyrolysis chambers and the gas engines. The electrical energy will be exported to the grid and the heat energy will be recovered for use in the process where practicable (drying at pre-treatment stage). Residual heat energy will be used to produce steam. The steam, in turn, will be used to generate electricity in a steam turbine. The facility will be a net exporter of electricity to the National Grid.

B.7.2 Other Relevant Activities

The following other activities will take place at the site under the Fourth Schedule of the Waste Management Acts 1996 to 2011:

"R 12. Exchange of waste for submission to any of the operations numbered R 1 to R 11 (if there is no other R code appropriate, this can include preliminary operations prior to recovery including pre-processing such as, amongst others, dismantling, sorting, crushing, compacting, pelletising, drying, shredding, conditioning, repackaging, separating, blending or mixing prior to submission to any of the operations numbered R1 to R11)."
This activity will cover the pre-treatment stage. All waste accepted at the facility (65,000tpa) will be subject to preliminary operations (including sorting, separating, drying, compacting). Separated waste (metals, glass, hard particles) and non-conforming waste (WEEE, hazardous waste items) will be sent off-site for recovery/recycling. Conforming waste will be submitted to the next stage of the process (pyrolysis system) for energy recovery.

"R 13. Storage of waste pending any of the operations numbered R 1 to R 12 (excluding temporary storage (being preliminary storage according to the definition of 'collection' in section 5(1)), pending collection, on the site where the waste is produced.)"
Following pre-treatment (R 12), materials intended for energy recovery (R 1) will be temporarily stored on-site. SRF material can be baled and stored on-site prior to being directed onward to the pyrolysis stage. It is possible that a future local market may arise for the vitrified slag residue waste stream (non-leaching, inert slag) for reuse as road fill material. In this event, the vitrified slag residue would be stored on-site prior to removal for reuse.

The R 4 class of activity (recycling/reclamation of metals and metal compounds) was also considered but deemed not to be applicable. Ferrous and non-ferrous metals will be removed from the waste intake at pre-treatment stage (R 12 activity) and will be transported off-site for recycling at an independent facility licensed/permitted for activity R 4.

The quantities of materials handled under each waste activity are addressed in Section H of the application.

Waste Recovery Intent

With regard to the recovery of waste materials, the intent of Glanpower is to ensure:

- the maximum recovery of all waste accepted on-site; and
- the maximum recovery of all waste arising on-site;
- that all waste materials are disposed of in accordance with the waste hierarchy, insofar as practicable.

Waste recovery may not always be possible, for example where (unforeseen) items of quarantined waste require disposal. A number of the waste materials separated at the pre-treatment stage (stones, ceramics, other hard particles etc.) may also require disposal to landfill in the absence of a suitable outlet that is higher on the waste hierarchy.

Similarly, during the initial operation of the facility, the vitrified slag (arising from the combustion of char on-site) may require disposal to landfill until a recovery outlet within the market is confirmed. This inert material has been identified as suitable for use as road building/aggregate material.

The maximum quantity of residual waste which would be consigned for disposal from the facility has been estimated, as summarised in Table B.7.3. (Tables B.7.1 and B.7.2 are included within the application form.)

Table B.7.3: Maximum Quantity of Residual Waste Consigned for Disposal from the Proposed Facility

Waste for Consignment (Disposal)	% Intake	Quantity (tonnes per annum)	Remarks
Hard particles (stones, glass, ceramics, other)	Up to 7.5%	4,875	Estimate includes glass which may be recyclable.
Vitrified slag arising from char combustion	Up to 5%	3,200	Identified as suitable material for road building. Recovery outlet options currently under investigation.
Hazardous waste	0.9%[2]	585	Hazardous waste quarantined on-site would be directed for suitable treatment/recovery in the first instance.
Total	Up to 13%	8,660	

As shown in Table B.7.3, the maximum quantity of residual waste consigned from the facility for onward transport and submission to disposal at an authorised facility will not exceed 15% of the annual intake. This threshold is consistent with the waste recovery activity defined in Class No. 10 of Part I of the Third Schedule to the Waste Management (Facility Permit and Registration) (Amendment) Regulations 2008 (S.I. No. 86 of 2008). It is noted that this threshold is directly applicable to facilities outside the waste licensing regime (having a waste intake no greater than 50,000tonnes per annum).

[2] EPA Municipal Waste Characterisation Report 2008

ATTACHMENT C

MANAGEMENT OF THE FACILITY

SUPPORTING INFORMATION

(15 pages)

- Attachment C.1 Technical Competence & Site Management
- Attachment C.2 Environmental Management System
- Attachment C.3 Hours of Operation

ATTACHMENT C.1 TECHNICAL COMPETENCE & SITE MANAGEMENT

C.1.1 Management Structure

The proposed Glanpower facility will be managed at an executive and operational level by the existing Glanpower senior management team. This organisational structure is summarised in Figure C.1.1 below.

The facility will be operated by a dedicated management team, to be recruited on a phased basis and as construction of the facility is progressed and pending the outcome of all consent and regulatory approvals. The proposed facility organisational structure is summarised in Figure C.1.2 below. The proposed facility General Manager is a company Director and member of Glanpower Ltd. executive management.

The Compliance Manager will be responsible (at senior management level) for the implementation of environmental, health and safety and quality management systems on-site including training. The Compliance Manager will regularly report on compliance and environmental performance metrics at meetings of senior management.

The Quality, Environmental, Health & Safety (QESH) Manager will report directly to the Compliance Manager and will be responsible for the day-to-day management of the company Environmental Management System, in addition to safety and quality systems.

It will be the responsibility of the QESH Manager to ensure managers and team leaders are actively involved in the environmental management programme. Environmental management will be included in training for all employees.

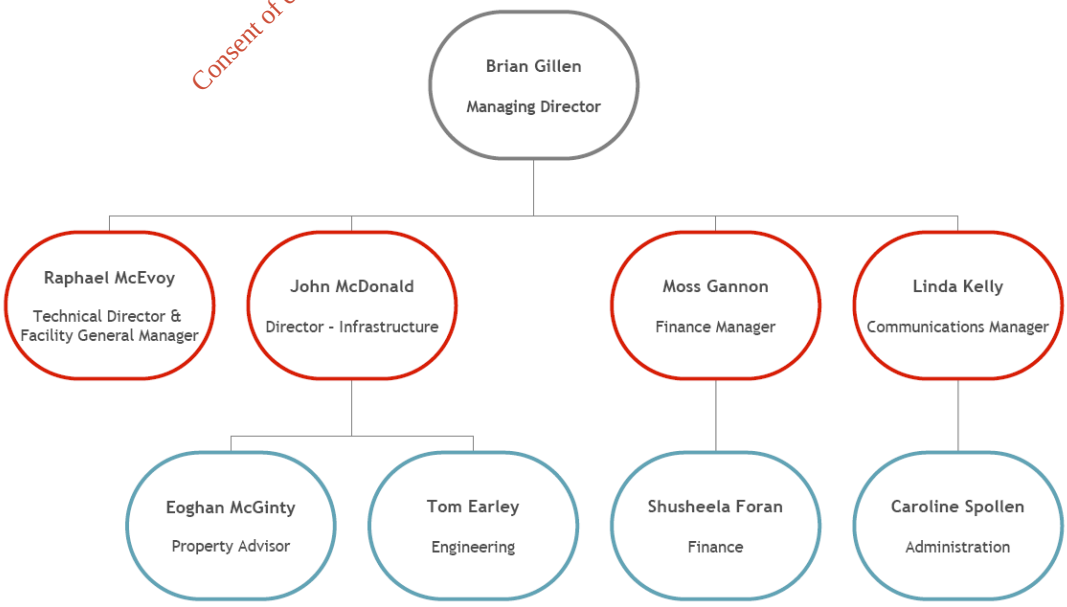


Figure C.1.1: Organisation Chart – Management of Glanpower Ltd.

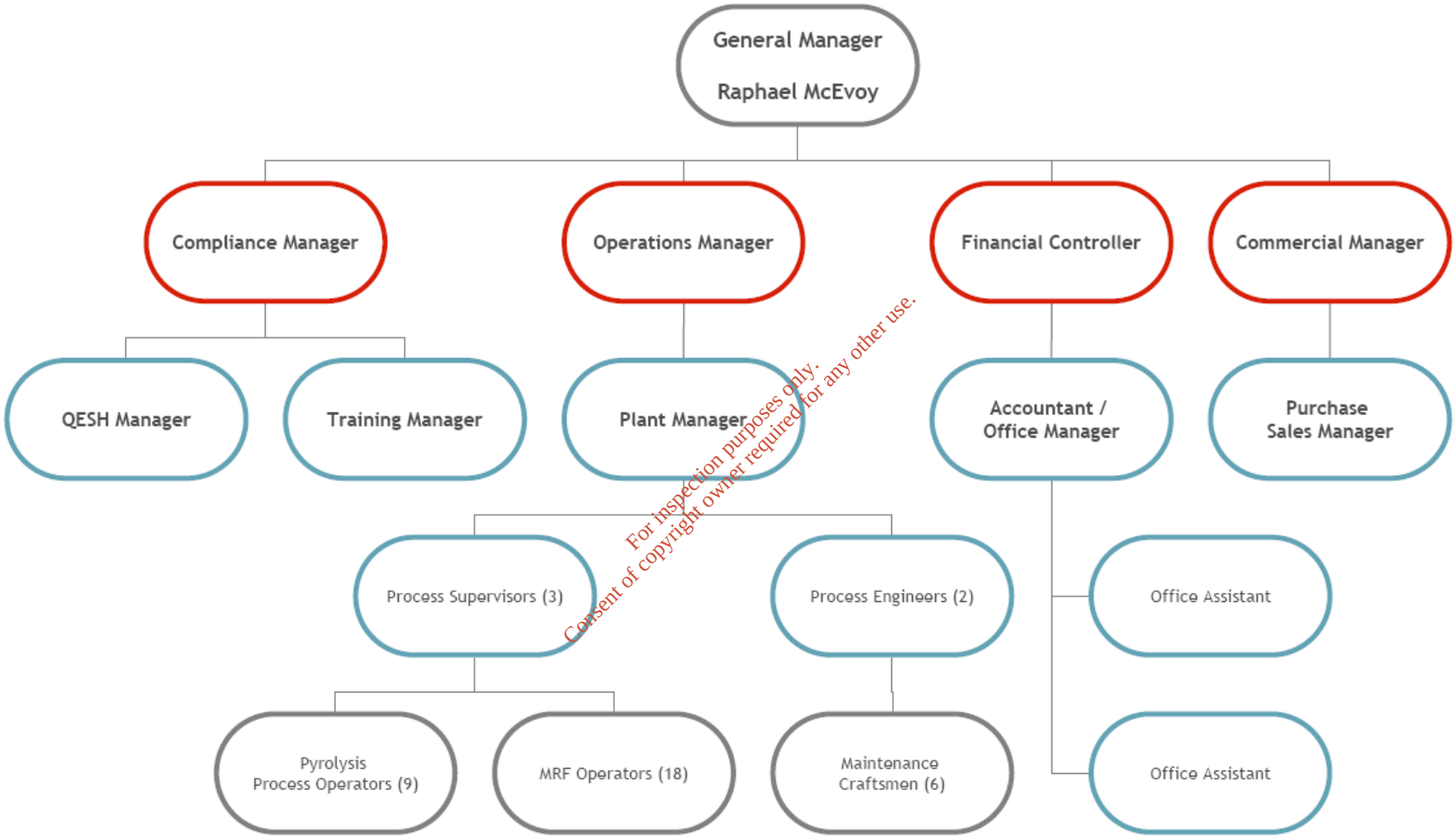


Figure C.1.2: Organisation Chart – Derryclure Energy from Waste Facility

C.1.2 Responsibilities, Qualifications & Training

Details of the duties, responsibilities, qualifications and training of key personnel for the proposed Glanpower facility are included in Table C.1.1 overleaf.

Overall responsibility for environmental management at the facility will be assigned to the Compliance Manager, supported by the QESH Manager. It is planned that the facility will employ 50 personnel when fully operational. Plant operators, security and technical staff will work in three 8-hour shifts (8am-4pm, 4pm-12midnight, 12midnight-8am), averaging 16 employees per shift. The facility will be manned and operational 24 hours per day.

Support staff including office and administration personnel will generally work 8am-4pm/9am-5pm. Hours of operation are defined in Attachment C.3.

The recruitment of facility management is subject to full regulatory approval and will commence on a phased basis with recruitment initially focused on senior management and regulatory compliance roles. This includes the roles of Operations Manager, Compliance Manager and Plant Manager. As construction progresses, the remaining roles outlined in Figure C.1.2 and Table C.1.1 will be filled as required prior to facility commissioning and operation.

Table C.1.1: Management Information & Technical Competence

Name	Position	Duties and Responsibilities	Experience / Qualifications
Brian Gillen	Managing Director	Overall responsibility for human, financial, legal and technical management/resourcing of company	Former Managing Partner with EAP Solutions; former International Business Director of Employee Advisory Resource (an International Organisational & Human Resources Consultancy Company). Former member of Dublin City Council's Corporate Policy Group, former board member of the Dublin Chamber of Commerce. Educated in Ireland and abroad with qualifications from the National University of Ireland and Dublin Business School in Business, Organisational Behaviour, Education and Public Relations.
Raphael McEvoy	Technical Director & Facility General Manager	Responsible for all elements of the proposed Glanpower facility. He will also sit on the Executive Board of the Glanpower group and will have responsibility for all aspects of Glanpower Ireland Ltd. Recruitment of key senior personnel including HR Manager. Development with HR Manager of recruitment procedures to ensure technical and managerial competence of new employees.	Director of RME Environmental. Former Director of Terado Environmental. Sits on the Board of Directors of the CIDC (Consultants of Ireland Development Company), an overseas construction design consortium. Degree in Environmental Science and a Masters Degree in Applied Environmental Science.

Name	Position	Duties and Responsibilities	Experience / Qualifications
Moss Gannon	Group Finance Manager	Responsible for all aspects of the Glanpower group financial accounting and management reporting systems	Chartered accountant with over 20 years experience. Managed various projects for *PriceWaterHouse Coopers* in Northern Ireland, Belgium and Saudi Arabia.
TBC	Operations Manager	Responsible for the construction phase management and subsequent operation of the facility, supported by the Plant Manager.	Minimum - University degree in engineering (electrical or mechanical preferred). >5 years experience in a similar role (incineration / energy generation) with demonstrable track record in waste management sector.
TBC	Compliance Manager	Responsible for the implementation of all quality and management systems and accreditation for Glanpower ie QMS/IS0 9001, EMS/IS0 14001, safety management/OHSAS 18001. Responsible for compliance with all aspects of the EPA operating licence including emission monitoring requirements.	Fully trained Quality & Environmental Auditor and a Qualified Trainer. >5 years experience in an EHS management role within industry
TBC	Plant Manager	Responsible for facility efficiency and safety, within all licence requirements. Responsible for equipment maintenance, service and calibration including emissions	Process/chemical engineering or similar qualification with >8 years technical experience in operating a large industrial facility. Experience in the waste handling sector. Excellent

Name	Position	Duties and Responsibilities	Experience / Qualifications
		treatment and abatement systems.	knowledge of process/chemical control processes
TBC	Commercial Manager	Responsible for the development, management and maintenance of all supply contracts with strategic partners and key suppliers.	Minimum degree in business studies/commercial management discipline. Experience in contract and legal affairs.
TBC	Financial Controller	Responsible for all accounting and financial aspects of Glanpower operations.	Qualified accountant with minimum of 10 years in an audit or financial management position.
TBC	Purchase Manager	Responsible for sourcing and procurement of all utilities, equipment and raw materials for the facility.	Degree in business, purchasing, supply chain management or relative discipline, proven negotiating skills, proficient in MS office products
TBC	Company Accountant	Responsible for the preparation of monthly accounts for the business, supported by two office assistants on invoicing and credit control	Recognised financial/accounting qualification, minimum 5 years experience within a senior financial management role
TBC	QESH Manager	Manage the day-to-day operation of quality and environmental systems for the Derryclure Energy Centre. Responsible for all Health & Safety …aspects of the facility. Promote within the local community integrated waste management, targeting schools, youth groups. Manage	Minimum degree in chemical/process engineering, environmental science or related discipline. Minimum experience will include operation of management systems (ISO 14001/OHSAS 18001).

Name	Position	Duties and Responsibilities	Experience / Qualifications
		waste audits for local companies.	
TBC	Training Manager	Responsible for the training of all employees in line with the operation of all on-site processes. Development of site induction programme for staff, contractors and visitors	Minimum degree qualification with >5 years experience in a senior training/HR role. Conversant in process/mechanical engineering.
TBC	Communications Officer/Manager	Responsible for all external communications with the local community, media and interest groups.	Diploma/degree and/or post graduate level in any business related discipline. Public Relations Management experience essential
TBC	Human Resources Manager	Provision of human resources services, policies and programmes, recruiting and staffing. Working with Training Manager to develop and implement training for all employees and contractors.	Degree in HR Management, 5-7 years of general HR experience, knowledge of Irish employment legislation

C.1.3 Training

Construction

During the construction phase, training will be the responsibility of the appointed construction management firm and building contractors. It is the intention of Glanpower to procure the services of a suitably experienced engineering / project management firm, with the necessary capabilities, skills and experience to ensure the facility is constructed in line with the requirements of applicable Health & Safety legislation and planning conditions. The Project Supervisor Construction Stage (PSCS) role will be fulfilled by a suitably qualified body.

Commissioning

During the commissioning phase and following the recruitment of plant operators, training will be the responsibility of the Training Manager in liaison with Premier Green Engineering (PGE), designers of the pyrolysis process technology to be utilised in the proposed facility. Other equipment suppliers will also be engaged for the purposes of operation and maintenance support. Extensive training will be carried out during the commissioning phase to ensure the efficient and safe operation of plant. All training will be carried out in co-operation with the relevant equipment vendors and training documentation (eg, Operating & Instruction Manuals) will be maintained centrally on-site.

Operation

During the operational phase, training will be the responsibility of the Training Manager, working closely with the HR Manager. All training records and written files will be maintained by the HR Manager to demonstrate operator competence. Each employee will have a training log maintained on file, with a record of all training completed. Internal training will be supplemented by external courses, e-learning etc. as required.

The HR Manager will be responsible for documenting the skills and competencies required for each job at the facility.

C.1.4 Environmental Awareness Raising & Training

Central to the Glanpower Environmental Management System (EMS) will be a training programme to ensure relevant personnel have an adequate awareness of the EMS and of their roles and responsibilities in minimising adverse environmental impacts.

Employees, contractors, suppliers, and customers will have a role and responsibility in meeting the company's objectives and targets, and to manage and, where practicable, reduce environmental impacts of their respective activities.

The Training Manager, working with other members of facility management, will be responsible for implementing a training programme for Glanpower personnel. The Training Manager and QESH Manager will be responsible for identifying competence and training requirements and developing the Environmental Training and Awareness Programme.

The Environmental Training and Awareness Programme will address:

- the importance of conformance with the environmental policy, procedures and the EMS;
- the significant environmental impacts of their work activities;
- their roles and responsibilities in achieving conformance;
- the potential consequences of departure from specified operating procedures including their legal and personal liabilities.

Apart from specific on-the-job training methods of general awareness raising may include:

a) internal talks, meetings, briefings and presentations

b) (electronic) journals, newsletters and circulars

c) written guidance to staff and suppliers

d) notice boards and posters

e) staff awareness and suggestion schemes

f) e-mails, intranet and the Internet.

Awareness of EMS requirements will be communicated to Senior Management through a Management Review process or, if necessary, through direct communication via the Compliance Manager.

Contractors and other persons working on behalf of the company who perform work that has associated environmental aspects associated with their work will be assessed for competence in managing the environmental aspects of their work. Evidence of external training completed by contractors may be requested of the contracting companies.

The QESH Manager will develop an external communications programme to facilitate communication and awareness within the local community.

C.1.5 Quality Management

The QESH Manager will be responsible for implementing a Quality Management System (QMS) at the facility to co-ordinate the practices on-site in line with best practice. It will also be the responsibility of the QESH Manager to ensure site quality practices are aligned with environmental and safety management systems. It is the intention of Glanpower to develop a comprehensive quality management system and in time, seek external accreditation of the company's system for quality management to the international standard ISO 9001.

ATTACHMENT C.2 ENVIRONMENTAL MANAGEMENT SYSTEM

An Environmental Management System (EMS) for the facility has not been developed at this stage as the proposed development has not received full regulatory approval. It is the intention of Glanpower to develop an EMS and the proposed approach to environmental management, in addition to quality, safety and health, is outlined in Sections C.2.1 and C.2.2 below.

C.2.1 Company Quality, Environmental, Safety & Health (QESH)

It is the intention of Glanpower to operate this facility to highest standards of quality, environmental protection and safety management. In line with this requirement, dedicated personnel (Compliance Manager, QESH Manager) will be employed at the facility to develop and implement policies and systems specific and appropriate to the site and operation. These personnel will be suitably qualified and experienced as outlined in Table C.1.1, Attachment C.1.

A Safety Statement will be prepared for the facility in line with Sections 18-24 of the Safety, Health and Welfare at Work Act, 2005 and the *HSA Guidelines on Risk Assessments & Safety Statements*. In addition, the requirements of the General Application Regulations, 2007 will be taken into account as well as other relevant safety requirements.

In order to demonstrate compliance with best practice requirements in our approach to QESH, it is the intention of Glanpower to develop comprehensive site-specific management systems and seek external accreditation to the following international standards within the first five years of operation:

- Environmental Management: ISO 14001
- Safety Management: OHSAS 18001
- Quality Management: ISO 9001

C.2.2 Glanpower Environmental Management System (EMS)

The Glanpower EMS will be designed to achieve the company Environmental Policy and structure the resources, provisions and procedures necessary for environmental management. This will ensure Environmental Aspects of the facility's activities and operations are identified and appropriate controls are put in place to prevent environmental impacts.

The EMS will be implemented so as to raise awareness and encourage continual improvement in environmental management. This approach, in accordance with the requirements of ISO 14001, is summarised in Figure C.2.1 below.

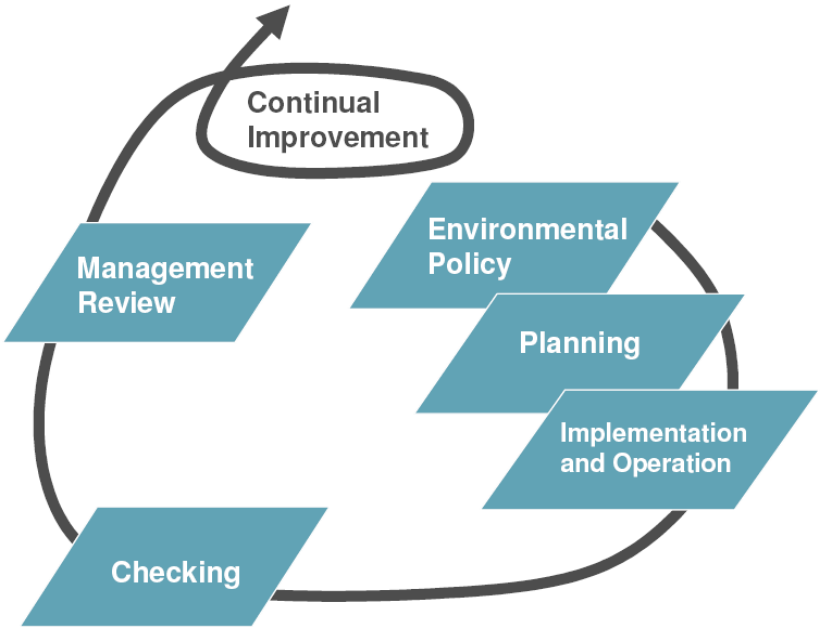


Figure C.2.1: Approach to Environmental Management System

Glanpower is committed to maintaining compliance to the EMS through the process of continual improvement, and will ensure compliance through auditing, monitoring and operational controls.

The EMS provisions above will be facilitated through:

1. Detailed procedures to be developed for the Glanpower facility at Derryclure, in order to achieve continual improvement and control of environmental performance in a manageable and cost effective manner;
2. Measurement and monitoring of Environmental Aspects for data/information relevant to environmental performance and compliance to applicable legal requirements;
3. Environmental programmes with associated objectives and targets to achieve site environmental improvement;
4. Training, awareness and management review to ensure responsibilities of all relevant persons are addressed, and environmental progress is maintained;
5. Audits to ensure compliance to the EMS.

As part of the EMS, ongoing assessment of environmental performance will be the responsibility of the Compliance Manager. The Compliance Manager will ensure environmental metrics are recorded and reported to the Facility General Manager (and executive level where required). Environmental metrics (eg, air emissions data, water use, waste production, waste intake, biomass consumption, energy consumption and production etc.) will be recorded for the purposes of an Annual Environmental Report to be submitted to the EPA.

In summary, the Glanpower EMS will define and implement:

- Environmental Policy;
- Schedule of Environmental Objectives and Targets;

- Corrective Action Procedures;
- Awareness and Training (documentation, procedures);
- Management structure (for environmental management);
- Communications Procedures (internal and external);
- Requirements for reporting of environmental performance;
- Audit procedures (including checking performance and raising corrective actions);
- Environmental procedures and forms;
- Management Review (by senior management).

ATTACHMENT C.3 HOURS OF OPERATION

C.3.1 Proposed Hours of Operation

The pyrolysis process requires energy (or an external heat source) to allow the thermo-chemical reaction to take place within the reactor. This heat will be derived from the hot gases produced by the combustion of char in the secondary cyclonic convertors, which will initially be primed (fired) with low sulphur kerosene. Once a supply of char from the pyrolysis process is available, this will then be used as the fuel supply for the secondary cyclonic convertors and the kerosene burners will be switched off.

To ensure a consistent char supply to provide the necessary heat for pyrolysis, the system will be operated on a **continuous 24-hour basis**. Continuous operation will also enable the maintenance and control of consistent operational conditions (eg, temperature and oxygen levels).

Once operational, the facility will be operated on a 3 x 8-hour shift basis, 24 hours per day (08:00-16:00; 16:00-00:00; 00:00-08:00), with employees arriving on-site approximately 5-30 minutes in advance of each shift commencing. As noted in Section 5.4.2 of the EIS, the traffic generated during hours of operation will not have a significant impact on the local road network.

It is envisaged that shutdown periods will be kept to a minimum as there will be two pyrolysis units in place. Where maintenance and calibration are required, one unit will be shut down at a time enabling continued processing and operation using the remaining two online units. Similarly, three gas engines will be operated in parallel providing sufficient capacity to match the quantity of incoming syngas and allowing for maintenance requirements.

C.3.2 Proposed Hours of Waste Acceptance/Handling

Waste will be accepted during the hours of 7:00am to 6:00pm Monday to Saturday. There will be no waste deliveries to site on weekends or public holidays.

Handling and pre-treatment of waste will be carried out on a continual basis 24 hours per day, Monday to Sunday. This is to ensure continuous operation as outlined in Section C.3.1 above.

C.3.3 Proposed Hours of Construction & Development Works

In accordance with the requirements of Offaly County Council, construction activities on-site will be limited to the hours of 7:00am to 6:30pm Monday to Friday and 8:00am to 1:30pm Saturday. No construction activities will be permitted on a Sunday or public holidays. Any deviation required from the permitted hours will be subject to advance agreement with Offaly County Council.

As noted in Section 5.4.3 of the EIS, the traffic generated during hours of construction/development works will not have a significant impact on the local road network.

Construction is expected to take approximately 12 months from commencement. Site enabling works have commenced and it is planned to commence construction of the facility in August / September 2012. Pending the outcome of the application process for a waste licence, the facility may commence operations on 100% energy crop biomass intake (no waste intake).

ATTACHMENT D

INFRASTRUCTURE & OPERATION

SUPPORTING INFORMATION

(67 pages)

- Attachment D.1 Infrastructure
- Attachment D.2 Facility Operation

ATTACHMENT D.1 INFRASTRUCTURE

D.1.1 Summary of Site Infrastructure

The proposed energy-from-waste facility will utilise mixed municipal waste and energy crop biomass materials to generate renewable energy. The proposed system, based on pyrolysis technology, can process virtually any organic material, converting it into forms of usable energy that can be consumed at the source or supplied to customers via the electricity grid. Prior to pyrolysis, mixed municipal waste will be pre-treated to Solid Recovered Fuel (SRF).

The pyrolysis process is a well-established technology for converting organic materials into a clean-burning natural gas product, which is then combusted for power production, or can be further processed to produce other fuels.

The facility will consist of a single building, which will house the following:

- Reception and pre-treatment area;
- Enclosed fuel recovery area;
- Pyrolysis area;
- Engine areas;
- Office, visitor reception and staff accommodation;
- Ancillary accommodation (weighbridge, services including power, water mains, telephone/broadband);
- Maintenance areas;

Condensing units associated with the steam turbine will be located on the roof of the main building.

Externally the 4.5ha site will accommodate:

- Vehicular access roads and pedestrian footpaths;
- Staff and visitor car parking;
- Security hut;
- Service yard (and underground trade effluent tank);
- Emergency generator;
- Fuel oil storage tank and bund;
- Water storage tank and associated pump house;
- Regenerative Thermal Oxidiser (RTO);
- Fuel and lube oil delivery areas;
- Transformer compound;
- Emergency flare stack;
- Foul sewage treatment area;
- Vehicle utilities (wheelwash, weighbridge).

A general site layout drawing is included as Appendix D.1 (drawing no. IE0310150-22-DR-0005).

D.1.a Site Security Arrangements

The site will be enclosed by a permanent fence 2.4m high. The fence will be of *Kylemore* perimeter mesh material. An entrance gate will be installed at the main point of entry to the site from the site access road. As the facility will operate on a 24-hour/7-day basis, the main entrance security will be provided at the security hut and adjacent entry-exit barrier. CCTV will be installed and monitored from the security hut.

The electrical basis of design includes for 15 no. external pole mounted CCTV cameras around the perimeter of the facility. CCTV cameras will also be installed in the waste reception area, throughout the pyrolysis, dryer, office, reception and staff accommodation areas. The exact locations of all CCTV cameras will be agreed prior to commencement of work on site.

The security hut will be manned during hours of waste acceptance and all consignments of waste will enter the facility via the security hut. No unauthorised access will be allowed beyond the security hut.

Visitors to site will be accommodated at the visitor car park and will enter the facility via reception. A register of visitors to site will be maintained by reception personnel, including visitor name, visitor company, Glanpower contact name and sign-in/sign-out times. Visitors will be accompanied on-site at all times by Glanpower personnel.

Selected areas of the facility (including process and management offices) will be restricted for employee access only, by means of electronic swipe card. Contractors will be required to undertake induction training prior to commencing works on-site. All contractor works will be supervised by Glanpower Health & Safety personnel and will be subject to a site permit to work system.

D.1.b Designs for Site Roads

Details of the proposed site access road from the N80 to facility entrance are included in the drawing included as Appendix D.2 (drawing no. IE0310150-22-DR-0006). It is proposed to have the permanent access to the proposed development from the existing Offaly County Council access road. This will involve upgrading the existing access roadway to install a new internal access roundabout and improvements to the existing major/minor junction with the N80 (National Primary Road). The new roundabout will be designed in accordance with NRA TD 16/93.

The proposed site paving layout is detailed in the drawing included as Appendix D.3 (drawing no. IE0310150-22-DR-0007). All truck movements will be via security hut and the eastern site roadway to the yard at the rear (south) of the facility. This roadway from the facility entrance to the yard at the rear will be of asphalt pavement surfacing.

The roadway serving all staff and visitor vehicle movements, through the car parking areas, will be of asphalt concrete pavement surfacing.

This staff roadway will also be used for occasional deliveries of lube oil (for maintenance of internal engines) to the site. There will be a dedicated external reception area for lube oil deliveries. No lube oil will be stored on-site. Upon delivery, fresh lube oil will displace spent lube oil in the engines and spent lube oil extracted will be immediately transported off-site for recovery under licence. Minor quantities of other oils (e.g. gearbox oils etc.) will be stored in a suitable bunded area within the maintenance room.

Details of surface water drainage are included in Section D.1.k.

D.1.c Design of Hardstanding Areas

The service yard to the rear of the facility, lube oil delivery area and oil tank refuelling area will be of concrete pavement surfacing. The water tank and pump house will be sited in a small area of gravel hardstanding.

The building will be surrounded by concrete footpath to enable pedestrian access. All areas of hardstanding will be bounded by in-situ concrete road kerb.

Car parking areas will be of porous pavement surfacing. Site access road and paving layout details are included in Section D.1.b. Details of surface water drainage are included in Section D.1.k.

The site paving layout is detailed in Appendix D.3 (drawing no. IE0310150-22-DR-0007).

D.1.d Plant

A single surface mounted road vehicle weighbridge will be provided at the security entrance barrier for all trucks entering the facility, as shown on the drawing included as Appendix D.4 (drawing no. IE0310150-22-DR-0008). The platform will be a composite steel and concrete design, constructed to provide a rigid and reliable installation. The weighbridge will be equipped with an automated measuring and tagging system. The weighbridge will have a capacity of 50,000kg x 20kg and be 18.0m long by 3.0m wide in size. The weighbridge station will be capable of establishing the gross weight of incoming trucks and subsequently the tare weight confirmation of trucks (following their first weighing). Truck drivers will use a badge swipe for identification purposes. The badge identification reading and weight will be recorded electronically.

D.1.e Wheel-wash

A vehicle wash will be located in the service yard to the rear of the facility, as shown on the drawing included as Appendix D.4 (drawing no. IE0310150-22-DR-0008). All trucks entering/leaving the facility will be required to use the vehicle wash.

The vehicle wash area will be a dished concrete yard sloping to a central drainage channel. The drainage channel will drain to an underground tank (10m^3). This proprietary recycle tank will have a recycled water compartment and silt separator compartment that will be

capable of having its contents removed by tanker truck. The recycle tank will be a concrete encased GRP vented tank, having two compartments in order that silt from the truck washings can be separated and the water in turn can be re-used in the jet washing of further vehicles. The reuse of water in this way will assist in the conservation of water. There will be an overflow to the trade effluent storage tank.

D.1.f Laboratory Facilities

There will be no laboratory facilities directly associated with the proposed facility. Laboratory analysis, where required, will be undertaken by accredited laboratory bodies or suitable alternative, subject to prior written agreement with the EPA.

In accordance with the EIS, it is proposed to undertake a quarterly surface water monitoring programme at the dry ditch in the vicinity of the site, during the construction phase of the facility.

Permanent monitoring equipment will be installed for the continuous measurement of stack emissions. Discontinuous monitoring (including noise, water, air and odour quality) will be undertaken by independent specialists and accredited laboratories as required.

Further details on emissions monitoring are included in Attachments F.2 to F.7.

D.1.g Fuel Storage

The primary fuel for the gas engines will be syngas, derived from the pyrolysis of municipal solid waste/biomass feed.

The secondary cyclonic converters within the system will initially be primed / fired with low sulphur kerosene oil however once the char feed is sufficient to sustain the temperature the kerosene burners will be switched off. The Regenerative Thermal Oxidiser (RTO) will also be fuelled from the same fuel oil supply.

Kerosene oil will be stored on-site in a horizontal, rectangular, double skin bunded, steel tank with square ends, manufactured to OFS T200 standard with a volumetric capacity of 20m^3. The oil tank will be sited south of the service yard, as shown on the drawing included as Appendix D.4 (drawing no. IE0310150-22-DR-0008). The bunding capacity of the tank is designed in excess of 110% of tank capacity. Bund integrity will be inspected independently on a triennial basis, or more regularly if required and results recorded. A spill basin/catch will be installed for unloading operations, draining via petrol interceptor to the surface water drainage network.

The hydraulic loader in the waste reception hall will also fuelled by diesel, which will be stored in a bunded container, to be selected during detailed design (ongoing).

The electrical transformer compound located on-site will contain a volume of oil (free of polychlorinated biphenyl (PCB)). This transformer will be a standard package designed in line with best engineering practice and will be suitably bunded.

D.1.h Waste Quarantine Areas

A dedicated waste quarantine area will be provided in the northeast corner of the waste reception hall. The location of the waste quarantine area is shown on the drawing included as Appendix D.8 (drawing no. IE0310150-22-DR-0011).

The waste quarantine area will be clearly signed and sited in a location distinct from other service/operational areas. Waste materials (such as hazardous and WEEE items) removed following inspection will be stored in the waste quarantine area for transport off-site (under valid permit) and disposal/recovery at a suitably licensed facility. Drainage from the waste quarantine area will be via floor channels to the external underground trade effluent storage tank.

Within the facility, materials removed during the pre-treatment stage (eg, metals, hard particles etc.) will be temporarily stored in segregated, labelled bays prior to collection and recycling/recovery/disposal off-site. These bays will be located in the waste reception area, as shown on the drawing included as Appendix D.8.

A draft Waste Handling procedure has been developed for the proposed facility (ref. Attachment H.3).

D.1.i Waste Inspection Areas

A waste inspection area will be located and clearly signed within the waste reception area, as shown on the drawing included as Appendix D.8 (drawing no. IE0310150-22-DR-0011). Following unloading of waste, each load will be subject to inspection by Glanpower personnel to ensure all unsuitable waste items are removed to the Waste Quarantine Area. The waste reception hall, incorporating the waste inspection area, drains to an underground effluent tank located beneath the external service yard.

A draft Waste Acceptance procedure has been developed for the proposed facility (ref. Attachment H.2).

D.1.j Traffic Control

The proposed development will use the same access road as the existing Derryclure Landfill facility. Traffic proceeds from this link onto the local road network via the N80 National Secondary route. Details of the entrance to site from the main public road (N80), including a proposed new left turn decelerating lane from Tullamore, are included in the drawing included as Appendix D.2 (drawing no. IE0310150-22-DR-0006).

From the facility entrance gate, a speed limit of 20km/hr will apply and this will be clearly signposted. On-site movements of trucks carrying waste to the facility will be separated insofar as possible from staff and visitor vehicular movements. From the facility entrance, trucks carrying waste will proceed left towards the service yard at the rear of the facility. Staff and visitor vehicles will proceed right after the facility entrance, to designated car parking areas. Vehicular access will be monitored at the security hut and via CCTV.

The external parking areas have been designed to provide a total of 77 no. car parking spaces for staff and visitors (subject to final agreement with Offaly County Council).

D.1.k Sewerage & Surface Water Drainage Infrastructure

Sewerage Infrastructure

The Glanpower facility will not discharge trade effluent emissions to the sewer of a sanitary authority. The pyrolysis system of energy generation, as a "dry system", does not have a wet trade discharge. However, periodic wash-down of the process area in the building may be required. Floor wash-down points will be provided which will discharge to an external underground storage tank (50m^3). This tank, to be selected at detailed design stage, will retain this trade effluent until siphoned off to tanker for disposal at a licensed facility.

It is estimated that approximately 1.5m^3/day foul effluent will be generated by canteen facilities, sinks, toilets etc. on the site. This is based on 50 employees per day x 60 litres per person per day. This domestic discharge will be piped underground by gravity to an on-site packaged treatment plant. The proposed *Aswaflow* Wastewater Treatment System (NSAI Agrément (IAB) Approval 02/149, EN 12566-3, No. B 31.06.015.01) is a Sequential Batch Reactor (SBR) mechanical aeration system designed to cater for 4 - 12 P.E. (population equivalent) in a 7,000 litre tank.

The system comprises the following primary components:

- Dual chambered pre-cast concrete tank for primary treatment (septic tank).
- A single chamber pre-cast concrete tank for secondary treatment [Sequential Batch Reactor (SBR)] tank

The *Aswaflow* effluent treatment system is designed with a comprehensive alarm system. Alarming will occur with overloading or under-loading of the system and if there is a failure/blockage of the pumps or aerator device. In addition, the system will have a high water alarm system.

Discharge from the treatment plant will be pumped to an on-site raised percolation area and discharged via polishing filter. This has been sized based on the effluent generated by 50 employees per day. Further information on the design of the wastewater treatment plant (WWTP) and polishing filter are documented in the design report prepared by the selected WWTP vendor. A copy of the report is included as Appendix D.5. The location of the treatment system and percolation area is shown on the drawing included as Appendix D.1 (drawing no. IE0310150-22-DR-0005). The site drainage layout, including foul pipe network is shown on the drawing included as Appendix D.6 (drawing no. IE0310150-22-DR-0009).

A water treatment system will be installed on-site for the treatment of scrubber water liquid i.e. pH corrected water. This is further described in Section D.2.16, Attachment D.2. Treated scrubber water will be continuously recirculated within the scrubber system.

Surface Water Drainage Infrastructure

As there will be no process or trade effluent discharge to surface water, the surface water drainage network on-site will carry uncontaminated rainwater runoff only during normal operation. The network has been designed with attenuation measures to allow for flooding and spill containment.

The rate of surface water discharge from the site will be controlled and limited by hydrobrake, to be no greater than the greenfield equivalent runoff. Excess water during heavy rainfall will be stored in an underground attenuation tank. The drainage plan for the site is summarised in Figure D.1.1 overleaf.

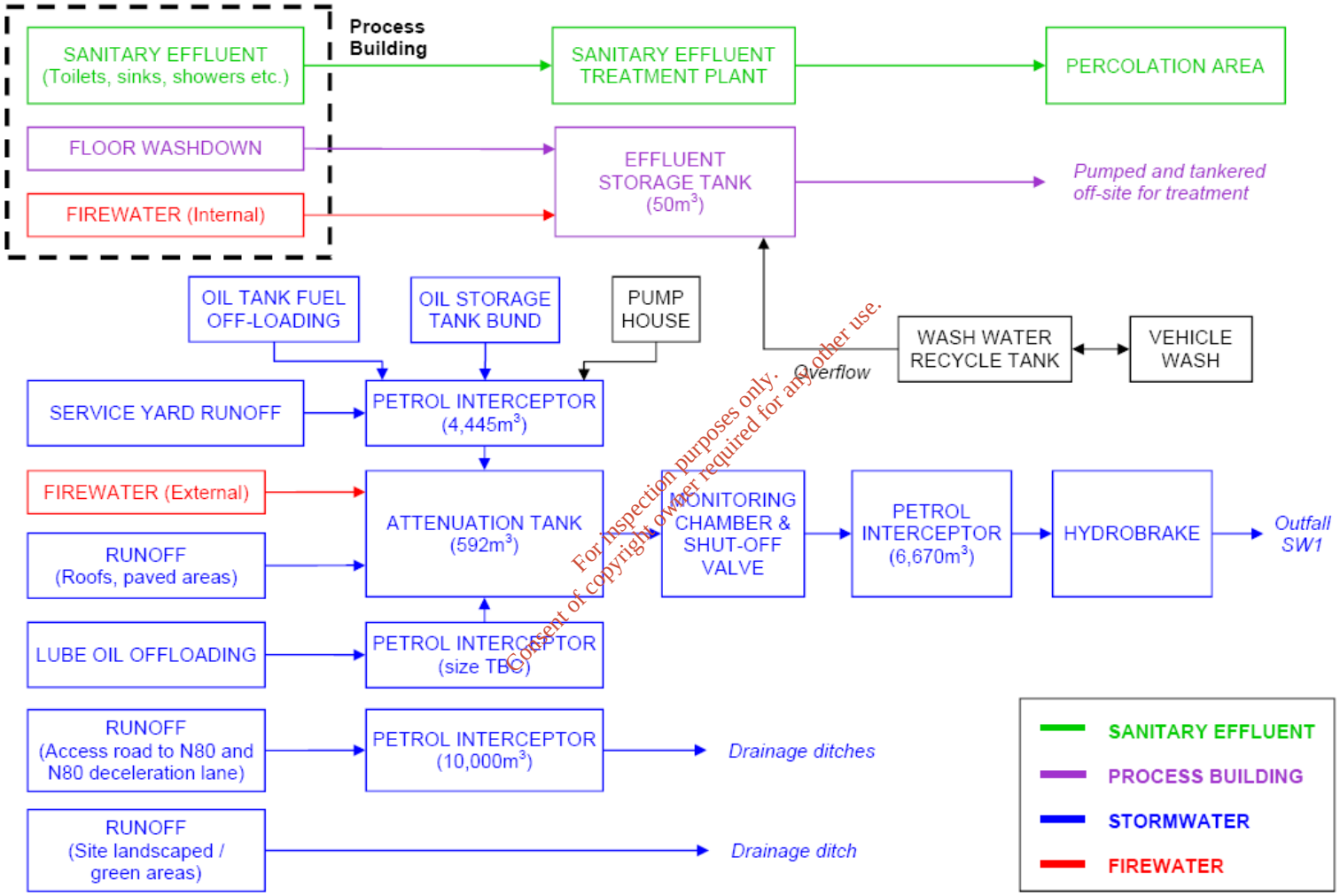


Figure D.1.1: Site Drainage Schematic

The surface water drainage design philosophy has been prepared in accordance with the requirements of the following technical design documentation:

- The Greater Dublin Strategic Drainage Study (GDSDS);
- EN 752 – Gravity Drainage Systems outside Buildings;
- CIRIA Report C697 – The SUDS Manual;
- BRE Digest 365 – Design of Soakaways.

The following design criteria have been used in the surface water drainage design:

- Overall Site Area = 2.1ha, broken down as follows:
  - Paved impermeable area = 1.2ha;
  - Porous paving area = 0.3ha;
  - Landscaping = 0.6ha.
- Conservatively assumption for the purposes of sizing pipes and attenuation volume that 20% of area contributing to porous paving/infiltration trenches etc. will overflow to the gravity surface water drainage network.
- Soakaway and infiltration trench permeability rates used were based on the IGSL site investigation report "*Report on Site investigation for Energy Park Derryclure*" (Mar 2010) which was submitted as part of the planning application to Offaly County Council (ref. PL2/10/307).
- Met Éireann Rainfall statistics for Athlone were used.

The proposed site drainage layout is detailed in the drawing included as Appendix D.6 (drawing no. IE0310150-22-DR-0009). This drawing includes:

- the diversion strategy for existing ditches on-site
  - existing ditches have been diverted from under structures and paved areas
  - abandoned ditch routes will be backfilled with a land drain pipe laid in the bottom of the trench to allow migratory groundwater to drain
- infiltration trench high level overflow levels

A high level overflow will be provided from each infiltration area to the positive gravity drainage network and the attenuation volume has been sized conservatively to assume 20% of the runoff from the porous paved areas may migrate to the attenuation structure.

Key drainage features (including manhole and trench details) are detailed in the drawing included as Appendix D.7 (drawing no. IE0310150-22-DR-0010).

Roads and Pavement Drainage

Runoff from internal site roadways and other paved areas will discharge to an underground piped gravity drainage network (featuring petrol interceptors) prior to discharge to the existing ditch network. All road and paving gullies will be trapped.

Roof Drainage

Runoff from building roof areas will be collected in the underground surface water drainage network and discharged to the existing drainage ditch network.

Attenuation and Flow Restriction to Receiving System

The proprietary attenuation structure and hydrobrake flow control device have been designed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS).

The 1:30 year storm will be attenuated in a proprietary underground storage tank (592m^3) and the 1:100 year event will be retained within the boundary of the site (either in the underground storage tank or on the surface of paved areas, low lying landscaped areas etc.)

A high level overflow will be provided from the storage structure to the ditch network to allow storm events in excess of the 1:100 year event to overspill to the ditch network.

Hydrocarbon Interceptors

Four petrol interceptors (2 no. bypass interceptors and 2 no. full retention interceptors) will service the surface water drainage system. All interceptors will comply with EN 858 and details of each interceptor are included in Table D.1.1. The full retention interceptor servicing the lube oil delivery area will be sized and selected during the detailed design phase.

Table D.1.1: Hydrocarbon Interceptors

Unit	Location			
	Service Yard	**Downstream of Hydrobrake**	**Access Road (from N80)**	**Lube Oil Delivery**
Model	Klargester NS 80 Class 1	Klargester NSBD 12 Class 1	Klargester NSBD 18 Class 1	Klargester
Type	Full Retention	Bypass	Bypass	Full retention
Capacity	4445m^2	6670m^2	10,000m^2	TBC
Design Flow Rate (max)	80 l/s	12 l/s	18 l/s	TBC

Hydro-Brake Flow Control Device

A Hydro brake MD6 unit flow restriction device will be installed to control the discharge rate from the site to the adjacent drainage ditch network.

The greenfield runoff rate from the site has been calculated based on IOH 124 method (paragraph 6.6.1.2 – GDSDS) and the allowable discharge rate is 8.61l/s.

The hydrobrake device has been sized to restrict surface water outfall to 8.62l/s at a design head of 1.5m. The invert level of the hydrobrake is 76.165m and the orifice size is 111mm.

Oil Storage Tank Area

The oil storage tank area at the rear of the building will be bunded in accordance with all EPA and Offaly County Council requirements. Surface water runoff from this bund will be pumped to the surface water system (once inspected and verified as being uncontaminated) on a regular basis as part of the plant's maintenance procedure. In the event of an oil spill from the tank, bunded material will be pumped and tankered off-site for treatment.

Undeveloped Areas

Approximately 2.1ha of the site will be drained to the surface water collection system as described above. The remaining 2.4ha of the site comprises landscaped or green areas which will continue to drain naturally to existing drainage ditches. Surface waters collected from the undeveloped parts of the site will not come in to contact with potential contamination (e.g. spills) from the plant. The undeveloped areas of the site will be landscaped with trees and shrubs which will increase the time of concentration of storm flows.

D.1.l All Other Services

Power

The current connection agreement being discussed with Electricity Supply Board (ESB) Networks proposes to connect the site with the upstream Clonminch 38kVa Station via approx 3km of overhead or underground 20kV rated cabling. The station in Clonminch is located due north of the site on the town side (Tullamore) of the town's bypass road and is the closest station with existing spare capacity.

This 20kV incoming utility cable will terminate at the ESB Substation (Substation 1), located at the site boundary away from the main process building. ESB networks will cable directly into the adjacent 20kV Client MV Switchroom. This is the battery limits of the ESB supply.

2 no. outgoing feeders from this 20kV MV switchboard will connect to the main process building MV switchboard via two 20kV / 10kV transformers.

The main building 10kV switchboard will be located in Substation 2 at the south-west corner of the main process building.

The external substation and MV / LV power network is shown on the drawing included as Appendix D.4 (drawing no. IE0310150-22-DR-0008). The internal MV switchroom is shown on the internal layout of the plant (Appendix D.8, drawing no. IE0310150-22-DR-0011).

It should be noted that the final arrangement of the electricity supply is subject to negotiations with ESB Networks and all conditions governing connection to the distribution system.

Water Supply

It is proposed that water for domestic, floor washdown and fire-fighting requirements will be sourced from a new connection to the existing public water mains along the N80. This connection will serve all potable water outlets within the building, two no. cold water storage tanks in the administration area (main process building) and an external combined washdown water and fire water storage tank (1000m^3).

The combined washdown water and fire water storage tank will have approximately 700m^3 dedicated to fire water use and 300m^3 for washdown / process water use. Pipework connections will be arranged to ensure the minimum water storage requirements for fire water cannot be reduced. The fire water storage requirements and the acceptability of a combined washdown water / firewater storage tank will be confirmed during detailed design (ongoing).

Water from the public mains will also be utilised during the construction phase. Infrastructural measures to reduce water usage include:

- All toilets will be dual flush with a maximum flush of 6 litres;
- All showers will be single showers operated by push button;
- All wash hand basins will be fitted with push button taps;
- All urinals will be controlled by motion sensors to limit unnecessary flushing while the building is not in use.

Condition No. 5 of the An Bord Pleanála consent directs that water supply arrangements will comply with the requirements of Offaly County Council. On-site storage will be provided in the water tank to be sited in the service yard to the rear of the facility. All water used on-site, except drinking water will be drawn through storage, either from the main water tank. This is in compliance with conditions 14(a)-14(f) of the local authority consent (PL2/10/307).

All water infrastructure including hydrants and watermain pipes will be designed and installed in accordance with requirements of planning conditions

An electromagnetic water meter with radio transmitter will be installed. The water meter will be linked to the Local Authorities Telemetry System, subject to the agreement of Offaly County Council. The water meter will be connected and commissioned prior to commencement of works on-site.

Sewerage and surface water drainage infrastructure is described in Section D.1.k.

Communications & IT Systems

Communication and IT systems for the facility will be centred in a server room to be located on the first floor of the main building. This server room will also house IT servers, CCTV hardware, PA racks, phone PABX, radio hardware etc. A telephone line will be installed on-site for connection to the existing overhead telephone line on the N80. Telecommunication lines will be buried underground and ducted.

Telephone connections will be provided to the reception, office and security hut areas of the facility, with internal phone connection to process areas as required. Fibre connectivity will be confirmed during the detailed design phase. It is intended that a wireless (Wi-Fi) internet network will be installed at the facility for office and visitor use.

A public address system will be installed in the offices and drivers area, with microphone positions in the main control room, supervisor office and main reception.

D.1.m Plant Sheds, Garages & Equipment Compound

There will be no distinct plant shed or garage separate to the main building. All process plant and equipment will be housed in the main building.

Two transformers (cast resin 2000kVa 10kV/400V) will be located externally, south of the main process building. The requirement for these transformers has been identified, in order to balance the facility electrical load. Both transformers will have the capacity to supply the full building load, allowing either of the transformers to be bypassed for regular maintenance operations.

Service Yard

The service yard will be located to the rear (south/south-east) of the facility, as shown in the drawing included as Appendix D.4 (drawing no. IE0310150-22-DR-0008). The main yard area will be 3675m^2 (105m x 35m) in size and made of concrete paved surface. All trucks carrying waste loads to the facility will be directed to the service yard prior to entering the facility via airlock doors. The water tank and pump house will be sited adjacent to and accessed from the service yard. Similarly the fuel oil storage tank will also be accessed from this yard. The service yard will drain via petrol interceptor to the proposed surface water drainage pipe network. The site vehicle wash (Section D.1.e) will also be located in the service yard.

D.1.n Site Accommodation

Security Hut

The security hut will be located to the front (north) of the facility. The hut will approximately 25m^2 (5m x 5m) in size, for office accommodation to be occupied by 1-2 security personnel. Vehicular access past the security hut will be controlled by electronically controlled barriers, for both entry and egress.

Main Building

Staff and visitor facilities will be located in two main areas of the proposed main process building. In the north-west corner, administrative and management personnel will be based over two floors. Ground floors areas will include:

- Visitor reception and toilets;
- Office store;

- Cleaner's store;
- Open plan office area;
- Three no. meeting rooms;
- Canteen.

On the first floor, additional accommodation will be provided, including:

- Boardroom;
- Three no. office rooms;
- Server room;
- Tea station;
- Fallow space for possible future expansion

To the south-east of the building, the following facilities will be supplied at ground floor level for operator and supervisor level personnel:

- Accessible changing in proximity to waste reception hall;
- Lockers, shower, changing and bathroom facilities;
- Supervisor's office;
- Canteen and canteen store;
- Cleaner's store.

The main staff accommodation areas are shown on the drawing included as Appendix D.9 (drawing no. IE0310150-22-DR-0012). All staff facilities are located for ease of egress in the event of emergency.

D.1.o Fire Control System (and Firewater Supply)

The Fire Protection System will be a FM approved automatic dry sprinkler system providing coverage and protection to all areas of the facility. The sprinkler system will be designed in accordance with NFPA and FM Global datasheets.

The system will comprise an above ground water storage tank, diesel fire pumps, a system pressurisation / jockey pump, external above ground fire hydrants, underground distribution pipework, sprinkler lead-in mains to each zone, zone alarm check valves, sprinkler distribution pipework, sprinkler heads at ceiling level, sprinkler heads in voids, exposed sprinkler heads, internal fire hose reels, dry risers, system alarms, system monitoring and interface with the fire detection system.

The IT/Server rooms, electrical switchgear room and electrical transformer room will be provided with a dry sprinkler system.

All other areas will be provided with sprinkler protection on the design criteria i.e. classification, design density, system type and specification of sprinkler heads which will be determined during detailed design.

External Hydrants

External protection will be provided by fire hydrants which will be connected to and supplied with fire water, from the underground fire main. The fire main circuit will be installed in a ring formation around the site, as shown in the drawing included as Appendix D.4 (drawing no. IE0310150-22-DR-0008). Hydrants will be installed to ensure that

all areas of the building will be protected. The underground fire main will be cement lined ductile iron pipework.

Nitrogen Purge

A Nitrogen Purge System will be mounted on hopper locations, including:

- Pyrolysis Unit Feed Hopper;
- Char Extraction Hopper;
- Char Cooling Hopper.

The nitrogen purge is dual purpose. It will be initiated at the start of every ramp-up and ramp-down cycle to eliminate air from the pyrolysis process, but also will act as a suppression system in the event of a fire being detected. Fire detection will be mounted in form of UV sensors at the sensitive flash points and each system will be flooded with nitrogen instantaneously in the event of fire detection.

Flashback Prevention

Flame arresters and non return valves will be installed after the gas booster system to avoid flash back.

Secondary Cyclonic Convertors – Fire Protection

The secondary cyclonic convertor will be supplied with CO_2 extinguishers mounted over the oil burners and the char feed line will have an inadequate stoichiometric air supply to satisfy any form of combustion prior to entry into the thermal oxidiser.

Syngas Engines – Fire Protection

Each of the ignition chambers in the syngas engines will be fitted with dedicated fire suppression mounted over each valve. The control sensors for each of these will be activated by fire detection.

D.1.p Civic Amenity Facilities

Civic amenity facilities will not be provided at the facility. Existing civic amenity facilities are provided by Offaly County Council at the adjacent Derryclure Landfill site.

D.1.q Any Other Waste Recovery Infrastructure

A general description of the main building within which both pre-treatment and incineration activities will occur is included in Section D.1.t.

The front end of the proposed facility will comprise a waste reception and pre-treatment stage, for the removal of inorganic recyclable material. This waste recovery activity is covered under activity code R12 *("Exchange of waste for submission to any of the operations numbered R1 to R11...")* as described in Attachment B.7.

The building will be accessed by delivery vehicles via an interlock area. This is to ensure that the building interior is never open to the outside air and the release of odours from the plant is minimised. The delivery interlock area will be located to the rear of the building. The first set of doors will only open if the inner doors are closed. The inner doors will only open once the outer doors are closed. This ensures that no odours

or waste will escape from the delivery area. The ventilation of the waste reception hall and material recovery areas has been designed so that odorous air is abated before air is vented to atmosphere.

The waste material will be tipped onto a tipping floor area before being fed into the pre-treatment system.

The pre-treatment process involves conveying the waste through the following pre-treatment steps.

1. Pre-shredder to reduce the fuel size;
2. Trommel unit to sort the fuel removing fines;
3. Eddy currents and magnets to remove ferrous and non-ferrous metals;
4. Wind separator units to lift lighter fractions and drop out heavy fraction (eg, stones / batteries);
5. Final shredder to reduce the fuel to within tolerance size of <50mm;
6. Dryer to ensure that the fuel is dried to 5% moisture content;
7. Onward fuel feed to the next stage of the process.

The process is detailed in full in Attachment D.2.

Incineration infrastructure for the recovery of accepted waste not removed at the pre-treatment stage is described in Section D.1.t.

D.1.r Composting Infrastructure

Not applicable

D.1.s Construction & Demolition Waste Infrastructure

Construction and demolition waste will not be accepted at the site.

D.1.t Incineration Infrastructure

The selected building design is a 7,665m^2 (82,510ft^2) steel framed structure with a selected aluminium cladding to finish externally. Visually the building is divided into three sections or stages representing the internal processes involved. A schematic of the building layout is shown in Figure D.1.2 and a description of each building section / process stage is included below.

The three taller bays (height 15.9m) are expressed in a separate cladding panel and divided from each other by a translucent cladding bay. Access doors for equipment and maintenance purposes are also located in these bays giving a modular appearance to the outside of the building and breaking down the overall mass of the building. The final bay is to accommodate the syngas engines, steam generator area and staff accommodation. This area has a lower ceiling height which is reflected in the reduced height of the parapet in this area (height 11.4m). The office accommodation area will be split over two floors and

will be naturally lit via a double height curtain wall façade to address the entrance to the site.

Cross section drawings of the proposed building are included as Appendix D.10 (drawing no. IE0310150-22-DR-0013) and Appendix D.11 (drawing no. IE0310150-22-DR-0014).

The building will be hermetically sealed to minimise odour release from internal waste handling. The delivery interlock area will be located to the rear of the building. The interlock will again further minimise the release of odours from the plant.

Due to adjacency of the Offaly County Council landfill and the confirmed landfill gas migration, the building will be designed, constructed and operated with regard to Department of the Environment Guidelines on "*Protection of New Buildings and Occupants from Landfill Gas*".

The site is currently in an area that has a low radon level according to Radiological Protection Institute of Ireland (RPII) data[1]. However, a radon barrier will be installed under the floor slab in the Administration area (north-west corner of main process building).

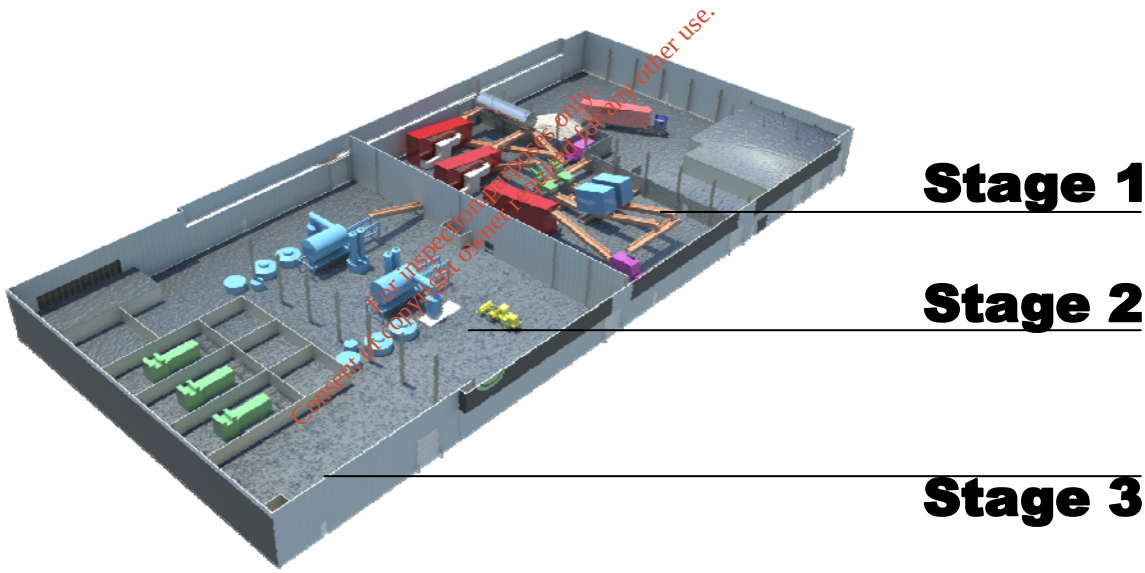


Figure D.1.2: Three Stages of Process

Stage 1 Reception & Pre-treatment

The proposed waste reception and pre-treatment infrastructure is outlined in Section D.1.q.

Stage 2 – Fuel Feed Mechanism & Pyrolysis

A proprietary fuel feed mechanism will be used to remove oxygen from the material feed prior to entering the pyrolysis chamber. The fuel will be introduced to the chamber at high temperatures and this will immediately convert the fuel to a gas fraction (synthesis gas) and a solid fraction in the form of a carbon char. The gas fraction will then be cleaned and scrubbed before being passed on to the syngas engines.

[1] http://www.rpii.ie/radon-map.aspx

Char and process residue liquids will then be combusted in two secondary cyclonic convertors to provide heat for the two pyrolysis chambers. This combustion will result in the generation of inert vitrified slag material, suitable for use as road building/aggregate material. The recycling of the char and process residues will greatly improve the overall efficiency of the process.

Stage 3 – Energy Generation

The syngas produced by pyrolysis will be combusted in three syngas engines, generating electricity for export to the National Grid. Excess heat from the pyrolysis stage will be recovered using a Heat Recovery Steam Generator (HRSG) to produce steam. This steam, in turn, will feed a steam turbine generating electricity.

Heat energy from the operation of the gas engines will also be recovered in two ways:

1. Drying of waste at pre-treatment stage;
2. Similar to pyrolysis heat recovery, residual gas engine heat will be used to produce steam, which in turn will feed the steam turbine, generating electricity.

D.1.t(i) Compliance with Article 4(2) of Waste Incineration Directive

Information outlining compliance of the proposed Glanpower facility with Articles 4(2) and 4(3) of the Waste Incineration Directive (2000/76/EC) is included below.

Article 4(2) states that

"Without prejudice to Directive 96/61/EC, the application for a permit for an incineration or co-incineration plant to the competent authority shall include a description of the measures which are envisaged to guarantee that:

(a) the plant is designed, equipped and will be operated in such a manner that the requirements of this Directive are taking into account the categories of waste to be incinerated;

(b) the heat generated during the incineration and co-incineration process is recovered as far as practicable e.g. through combined heat and power, the generating of process steam or district heating;

(c) the residues will be minimised in their amount and harmfulness and recycled where appropriate;

(d) the disposal of the residues which cannot be prevented, reduced or recycled will be carried out in conformity with national and Community legislation.

Point (a) the plant is designed, equipped and will be operated in such a manner that the requirements of this Directive are taking into account the categories of waste to be incinerated;

The plant has been designed for the processing of mixed municipal solid waste (87% of total intake) and energy crop biomass (13% of total intake) only. As described in Section L.4.1, Attachment L.4, assuming the implementation of a 3-bin household system, there remains a regional treatment requirement of 122,897 tonnes of MSW waste in the Midlands region currently (for the region to be self sufficient in the

disposal of its own waste). The Glanpower proposal will provide for 65,000 tonnes of this MSW waste to be diverted from landfill for energy recovery (ie, upward on the waste hierarchy).

A pre-processing stage has been incorporated in to the design whereby the fines material, moisture, hard particles, metal fraction and unclassified non-combustible material will be separated out. These materials will then be recycled[2] off-site, whereas otherwise they would have been disposed to landfill. The pre-treatment step maximises recycling rates and results in a consistent, homogeneous fuel feed for which the process equipment has been specifically designed. The residual waste quantity consigned for disposal will be minimised in this way.

The facility will not accept hazardous waste and any hazardous waste items identified in waste consignments received will be removed during inspection and then quarantined for disposal/recovery off-site as required. Waste acceptance and handling procedures will be implemented, as set out in Attachment H.

The facility is in compliance with BAT, as described in Section L.1.3, Attachment L.1.

Point (b) the heat generated during the incineration and co-incineration process is recovered as far as practicable e.g. through combined heat and power, the generating of process steam or district heating;

It is the intention of Glanpower to recover the maximum amount of energy possible from the process and do so in the most efficient and environmentally friendly manner. Glanpower has chosen gas engines for generating electricity directly from the combustion of syngas. Firstly, heat energy in the exhaust gas from the gas engines will be utilised in a Heat Recovery Steam Generator (HRSG). The HRSG is a boiler that uses available heat energy to convert water to steam. The steam will then be used in a steam turbine to generate electricity. Residual heat in the gas engines flue stream will then be utilised for the drying of waste at pre-treatment stage.

Heat will also be recovered from the pyrolysis units themselves. Heat in the pyrolysis flue gas will be utilised in a separate HRSG (as above) to produce steam. This steam will be utilised in the steam turbine, to producing additional steam for the generation of electricity.

The option of utilising heat energy for district heating was explored however this option is neither technically or economically feasible at present based on site location and market demand, among other factors.

The energy efficiency of the facility meets the criteria of high performance CHP and of the Waste Incineration Directive “R1 formula”, as described in Attachment G.2.

Point (c) the residues will be minimised in their amount and harmfulness and recycled where appropriate;

The process has been designed to accommodate the reprocessing of intermediate residue streams arising from the pyrolysis and gas

[2] Recycling or disposal method higher on the waste hierarchy, insofar as practicable.

scrubbing processes. The design intent is to minimise waste residue streams which would otherwise require treatment off-site.

Flue Gas Treatment Residues

Residue streams will arise from the spent media associated with the gas conditioning, scrubbing and flue gas treatment steps. This includes activated carbon media and ceramic filter residue. These streams will be reprocessed within the pyrolysis / secondary cyclonic convertor systems.

Gas Scrubbing / Water Treatment Residues

The scrubbing of gas and treatment of scrubber water on-site (centrifuge, electrolysis coagulation, activated carbon, media filtration, RO/membrane technology) will result in the generation of both fine particles residue (cyclone separator) and oil fractions (syngas scrubbing). These residues will be recycled back to the secondary cyclonic convertors / pyrolysis chambers. Excess (treated) water from the water treatment system will be diverted through the secondary cyclonic convertors.

The design of the scrubber water treatment system (recycle loop) avoids the generation of a contaminated water effluent emission which would require off-site treatment.

Waste Residues

The process will result in one primary residue stream requiring recovery/disposal off-site. This comprises the inert, vitrified slag material arising from the combustion of char in the secondary cyclonic convertor. The volume of this slag generated will be relatively low, in contrast with high ash residues from conventional incineration plans. Approximately 3,200tonnes per annum of slag (approximately 5% of annual waste intake) will initially be sent to landfill for disposal, however approval will be sought for use of the product as an aggregate for road building / land cover.

Point (d) the disposal of the residues which cannot be prevented, reduced or recycled will be carried out in conformity with national and Community legislation.

As described above, the process has been designed to reprocess intermediate residues including flue gas treatment and water treatment residues. The primary waste residue stream will comprise 3,200tonnes per annum of vitrified slag (approximately 5% of total waste intake). This inert slag material is suitable for reuse as road building material and it is intended to direct this material for reuse/recovery subject to market demand. During the early years of operation, it may be necessary to divert the slag material for disposal to landfill.

As described in Section B.7.2 of Attachment B.7, it is conservatively estimated that the quantity of waste requiring consignment off-site for disposal to landfill (including slag) would be less than 15% of waste intake.

D.1.t(ii) Compliance with Article 4(3) of Waste Incineration Directive

Article 4(3) states that

"The permit shall be granted only if the application shows that the proposed measurement techniques for emissions in to the air comply with Annex III and, as regards water, comply with Annex III paragraphs 1 and 2":

The proposed measurement techniques selected for the Glanpower facility have been chosen to ensure compliance with Annex III of the Waste Incineration Directive 2000/76/EC. Further details on the proposed measurement and sampling systems are included in Attachment F.

D.1.u Any Other Infrastructure

A number of maintenance cranes will be required in the facility.

Two gantry cranes will be installed longitudinally along the axis of the pyrolysis units. The gantry cranes will run on rails, attached to their own structure completely independent of the main building structure. These cranes will be required for maintenance of the pyrolysis units.

Five no. jib cranes will also be installed within the main process building to allow for equipment maintenance (three cranes for the syngas engines and two for the steam turbines).

For information purposes, it is noted that the facility is sited adjacent to the existing Derryclure Waste & Recycling Facility, owned and operated by Offaly County Council (EPA Licence No. W0029-04).

ATTACHMENT D.2 FACILITY OPERATION

D.2.1 Facility Description

The proposed Glanpower pyrolysis plant has been developed as an efficient system to convert mixed municipal waste and energy crop biomass into a synthesis gas, which can in turn be used for energy production. The facility will accept up to 65,000tonnes per annum of municipal solid waste and 10,000tonnes per annum of energy crop biomass.

The Glanpower facility has been designed with a nominal pre-treatment capacity of 15tonnes per hour (waste intake). The pyrolysis units have been designed to process 3.9tonnes per hour of SRF each. The two pyrolysis units proposed for the facility will therefore provide a total installed pyrolysis capacity of 7.8tonnes per hour.

The main process units will consist of the following:

- Waste reception;
- Waste pre-treatment;
- Waste drying;
- Fuel feed to pyrolysis chamber;
- Pyrolysis chamber;
- Char recovery and delivery system;
- Secondary cyclonic convertor (thermal oxidiser);
- Syngas scrubbing;
- Syngas conditioning;
- Heat recovery from pyrolysis;
- Syngas engines;
- Heat recovery from syngas engines
- Flue gas treatment;
- Steam turbine;
- Scrubber water treatment system;
- Utilities.

The internal layout of the process building is included as Appendix D.8 (drawing no. IE0310150-22-DR-0011).

A description of each process units listed above and its operation is included in Sections D.2.2 - D.2.17, assuming normal operation. Where necessary, a further sub-section is provided covering abnormal conditions. Abnormal conditions relating to multiple process units or the overall facility are addressed in Section D.2.18.

During normal operation, emissions to atmosphere will be generated from the pyrolysis chamber and gas engine exhausts, in addition to the regenerative thermal oxidiser (RTO) associated with the pre-treatment drying step. Odour emissions will be generated from waste handling activities in the waste reception hall and material recovery areas.

During abnormal conditions (loss of electrical power), the emergency generator will result in emissions to air. In the event of plant malfunction, it may also be necessary to divert the syngas (i.e. the pyrolysis-derived, gas engine fuel) to the emergency gas flare which will directly generate emissions (abnormal conditions only). Further details on facility emissions are addressed in Section E and emissions control in Section F of this application.

There are no laboratory facilities proposed for the facility and no laboratory activities will be undertaken on-site. All laboratory testing and analysis will be undertaken by suitably accredited third party facilities.

A summary description of how the proposed facility will comply with Article 6 of the Waste Incineration Directive is provided in Section D.2.19.

A simplified process flow diagram for the overall process is included as Figure D.2.1.

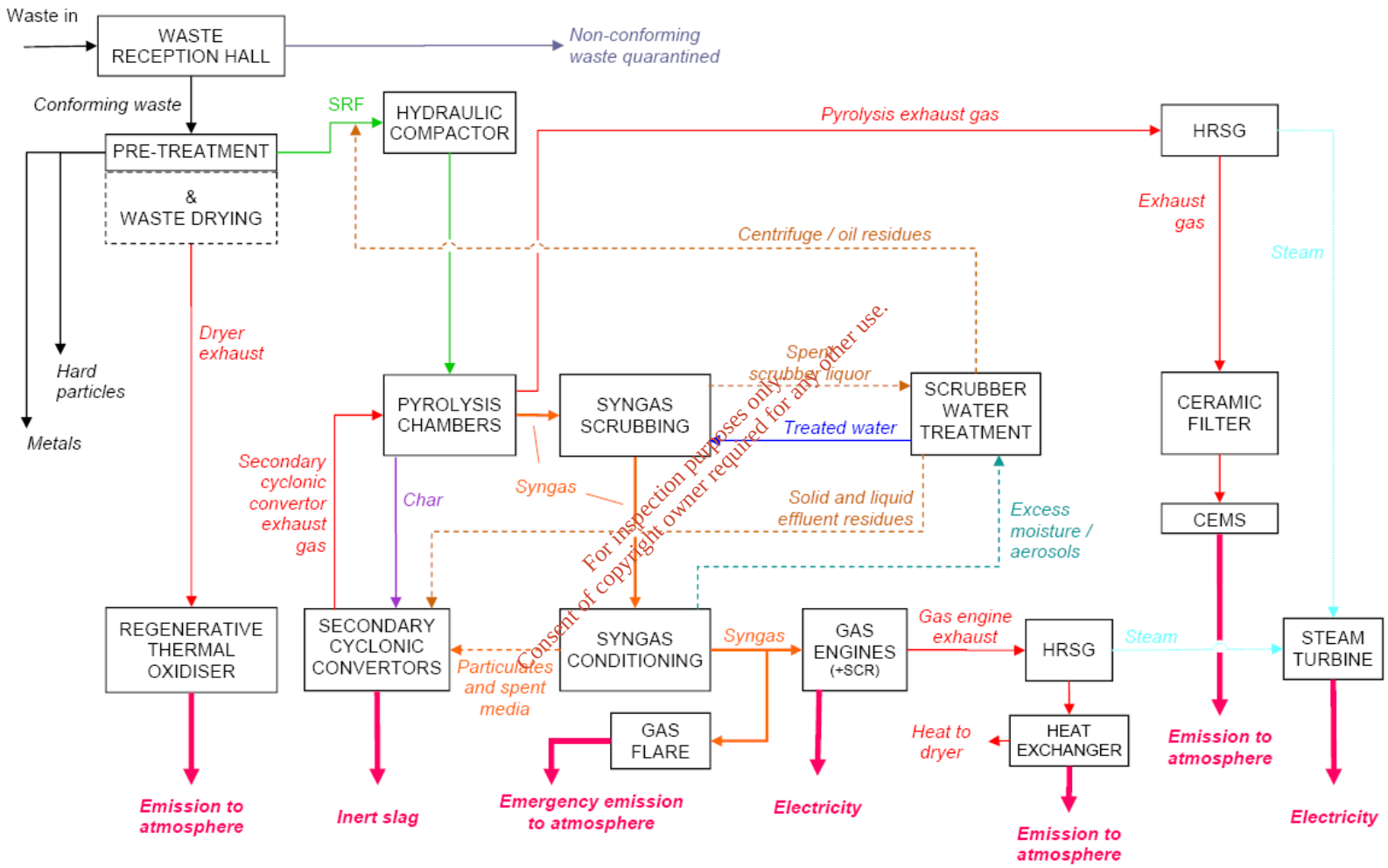


Figure D.2.1: Simplified Process Flow Diagram

D.2.2 Waste Reception

The facility will be managed to ensure that only hauliers holding valid waste collection permits will be allowed to transport waste to the facility. Glanpower will maintain a permit register on-site for all hauliers and a copy of permits as required. Mixed municipal waste will be delivered to site in either lift back collection trucks or trailers with walking floors. All trucks will be fully sealed.

The waste reception hall will be air tight and waste will be received in the waste reception hall through double interlock doors. Waste will be unloaded indoors so as to minimise the escape of odours to the external environment. Air to be vented from the waste reception hall will be handled in a number of ways. The combustion air required for the secondary cyclonic convertors will be drawn from the waste reception hall and this air will ultimately vent through the primary 30m stack. The combustion will act as effective odour abatement. Air for the waste dryer will also be drawn from the waste reception hall and this air stream will vent through a Regenerative Thermal Oxidiser for odour abatement. The remaining waste reception hall air will be directed through an odour abatement system (UV / ionisation / ozone) prior to venting to atmosphere.

Accepted waste tipped on to the floor of the waste reception hall will be lifted and loaded to the plant pre-shredder hopper using a mobile grab machine. The grab machine is fitted with a purpose made grab to pick up the waste for loading to the intake hopper. One manually operated mobile grab will load the plant at approximately 16 tonnes per hour. The intake hopper allows a controlled feed of waste material to the pre-shredder unit.

A second operator, driving a loading shovel will ensure the floor is kept clean and that the waste pile is kept sufficiently close for the grab operator to work on it.

The waste acceptance procedure is addressed in Section H of the application (Attachment H.2). Frequent inspection of waste consignments received will be undertaken to ensure compliance with this procedure.

The waste handling procedure is also addressed in Section H of the application (Attachment H.3).

Records of all waste handled on-site will be maintained on a daily basis. A summary of waste accepted on-site will be submitted monthly to Offaly County Council and to the EPA at the frequency required. Records will be retained on-site for a minimum of five years after which time they will be archived or disposed.

The waste reception process is summarised in Figure D.2.2 below.

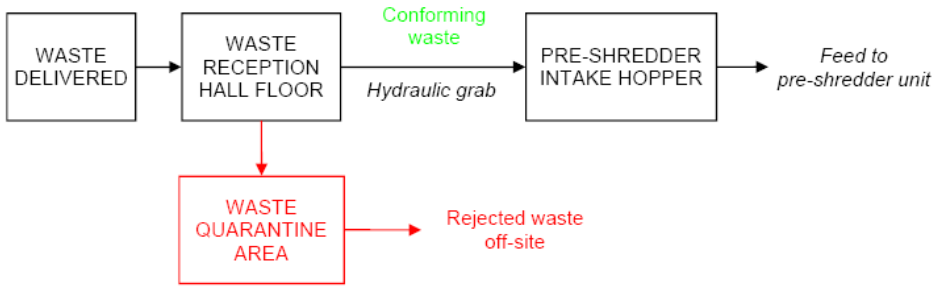


Figure D.2.2: Waste Reception

Waste will be stored in the waste reception hall for a maximum period of 24 hours and up to 48 hours maximum for unusual periods such as Bank Holidays. The waste reception hall has been sized to meet storage requirements arising from Bank Holiday demand.

Abnormal Conditions

Waste in the waste reception hall will be under the supervision of process operators and in the event of fire, smouldering waste will be readily observed. Fire hydrants will be installed at the facility to provide for fire fighting requirements in the event of an emergency. Operators will be trained in emergency and fire response. The automatic fire detection system will also alarm in the event of fire. A description of the fire control system is included in Section D.1.o.

The facility has been designed to include two pyrolysis units and three syngas engines which provide for redundancy. In the event of equipment malfunction and shut-down, the waste intake will be managed and controlled according to available plant capacity.

In the event of pyrolysis or energy recovery equipment malfunction, the pre-treatment stage of the overall process can run autonomously and pre-treated waste may be baled. This would allow for the continuation of waste acceptance.

If the downtime of the plant is unexpectedly extended and the storage capacity of the site is exceeded, it is proposed to sell SRF material in the open market.

D.2.3 Waste Pre-Treatment

The pre-treatment of waste at the proposed facility, summarised in Figure D.2.3a below, will consist of the following steps:

1. Pre-shredding (<150 mm size);
2. Trommel screen i.e. drum separation (separation of waste into two streams; (i) 50-150mm and (ii) less than 50mm);
3. Removal of ferrous metals by drum magnet;
4. Removal of non-ferrous metals by eddy separator unit;
5. Removal of heavy particles (e.g. glass, ceramic, stone etc.) by wind separator unit;
6. Drying (to 5% ± 2.5% moisture content);
7. Final shredding (<50mm);

8. Baling (if required).

The pre-treatment of waste will result in feedstock specification to the pyrolysis unit in line with Solid Recovered Fuel (SRF) with calorific value of 15-22MJ/kg.

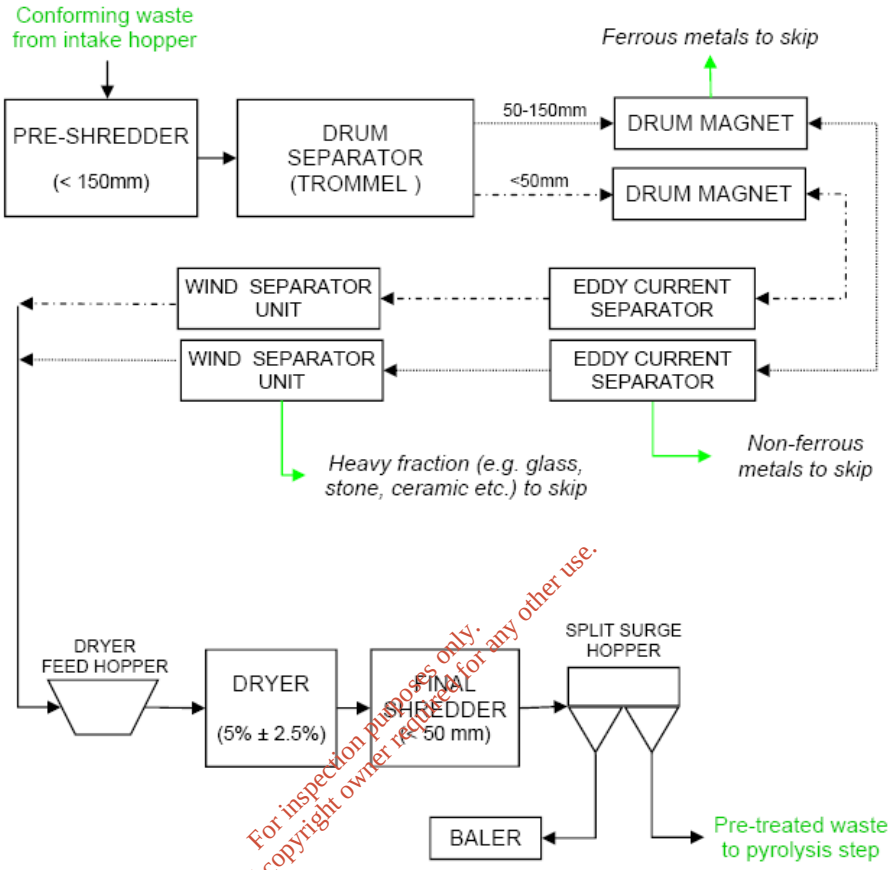


Figure D.2.3a: Pre-Treatment Overview

1. Pre-Shredding

The waste will be loaded to the plant pre-shredder at a nominal rate of up to 12 tonnes per hour where it will be reduced to a maximum particle size of 150mm. The nominal processing capacity of the pre-shredder unit is 15.5 tonnes per hour. The pre-shredder will be operated by a combination of electrical motors and hydraulics and will also open any bagged waste. Shredded waste will leave the underside of the machine on a rubber conveyor to the trommel screen.

Further information on the selected pre-shredder unit is contained in the vendor brochure included as Appendix D.12.

2. Trommel Screen (Drum Separation)

The shredded waste (<150mm) will then be passed through a trommel screen (or drum separator) which is designed to separate the waste stream into two different fractions – one fraction 50-150mm, and one fraction less than 50mm. The trommel unit is a combination of a recirculation fan, a separation section with a rotating round drum (12m long) and a connecting expansion room. Once separated, each fraction will be conveyed to one of two separate drum magnet units. Chutes will be enclosed as far as possible to prevent any material spillage.

Further information on the selected drum separator unit is contained in the vendor brochure included as Appendix D.13.

3. Drum Magnets

Both large (50-150mm) and small (<50mm) waste fractions will be passed separately through drum magnets where ferrous metal (up to 5% of the total waste stream content) will be removed and collected for further recycling off-site. The magnets will collect the metals from both waste streams and deposit them on a common collection conveyor. This common conveyor will feed to a removable skip in a dedicated bay for ferrous metal collection.

The final drum magnet (to be selected during detailed design) will be a Bakker magnet or equivalent.

4. Eddy Separator Units

The separated waste streams will then be passed separately through eddy separator units which will separate out the non-ferrous metals in the waste streams (up to 2.5% of the total waste stream content). The eddy current is a conveyor belt that runs at a relatively high speed fitted with a separation drum at the discharge end. The separation drum runs at a different speed to the conveyor drum and has the effect of throwing off any non-ferrous metals (e.g. aluminium). Non-ferrous metals will be collected onto a common collection conveyor from both material streams and fed to a removable skip in a dedicated bay for non-ferrous metal collection. Non-ferrous metals will be recycled off-site.

Further information on the selected eddy separator unit is contained in the vendor brochure included as Appendix D.14.

5. Wind Separator Units

The separated waste streams will then each be passed through one of two wind separator units, which will remove hard, heavy materials such as stones, glass and ceramics. These materials can potentially consist of up to 7.5% of the total waste stream and will be collected for recycling off-site (where possible). In addition to maximising the recycling of these materials, it is important they are removed as they may otherwise damage the final shredder. The blown, lighter fraction materials will be extracted from the wind separator units by a series of conveyors. These material streams (from both units) will be recombined in a single stream and conveyed onward for drying and final shredding.

Further information on the wind separator unit is contained in the vendor brochure included as Appendix D.15.

6. Drying

The dryer will be fitted with a feed hopper and screw feeder. The feed hopper itself will be equipped with a metering screw, which allows material into the dryer at a controlled bed depth. The drying step is described as a process unit at Section D.2.4.

7. Final Shredding

The final shredder unit will shred dried waste materials to a maximum size of 50mm, suitable for onward feed to the pyrolysis step.

Further information on the final shredder is contained in the vendor brochure included as Appendix D.16.

After the final shredder, waste is conveyed to a split surge hopper. This hopper allows material to be fed directly by conveyor to the pyrolysis unit inlet hoppers (Section D.2.5) or alternatively to the baling line, described below. The surge hopper will have storage capacity of at least one hour production (7.8tonnes). The hopper has been designed so that material can be fed to the baler unit simultaneously while the hopper still feeds the pyrolysis units. The pyrolysis units will have priority over the baling line but the baling line will accommodate any excess material.

8. Baling

An automatic baling press will be installed to compress the shredded waste (now 'Solid Recovered Fuel' or SRF) into high density, compact bales. The selected baling press is a standard package unit and is CE certified. The baler will operate automatically as the hopper fills with material. The baling press hopper opening and chute may be altered to suit a variety of materials. A shear cutter is designed within the unit to cut off material at different steps, reducing the amount of energy required to separate the waste at the baler chamber entry. Bales will be fed directly on to a bale wrapper which will automatically wrap the bale with PVC film suitable for storage. Bales will be collected by a forklilft and stored in a bale storage area for later processing. A provisional location for the bale storage area has been identified, between the pre-treatment area of the plan and the steam generator area, as shown on the drawing included as Appendix D.8 (drawing no. IE0310150-22-DR-0011).

The baling step is summarised in Figure D.2.3b below and further technical information on the automatic baling press is contained in the vendor brochure included as Appendix D.17.

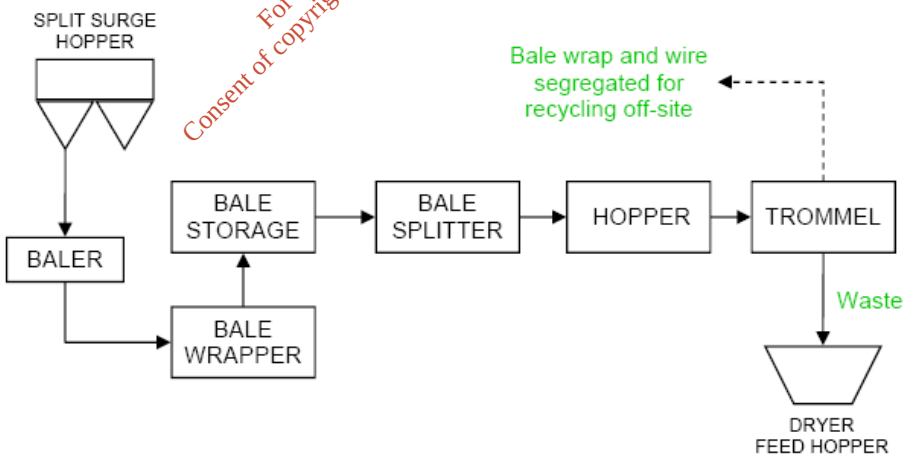


Figure D.2.3b: Pre-Treatment – Baling Step

Baled waste will ultimately be fed via bale splitter, conveyors and trommel screen back onto the processing line at the entry point to the to the dryer. The trommel screen associated with the baling step will remove PVC film wrapping and wires. Collected PVC wrap and wire materials will be segregated for recycling off-site.

Abnormal Conditions

Waste in the waste reception hall will be under the supervision of process operators and in the event of fire, smouldering waste will be

readily observed. Operators will be trained in emergency and fire response. The automatic fire detection system will also alarm in the event of fire. A description of the fire control system is included in Section D.1.o, Attachment D.1. The baling unit provides redundancy and contingency buffer storage between the waste pre-treatment and waste recovery activities.

The facility has been designed with space available for the installation of optical sorter units, which could be installed between the wind separator units and dryer feed hopper. These sorters work by selecting certain product by a near infra red scanner system and blowing that material off the processing line using compressed air jets. These units are highly selective and useful if certain types of waste need to be removed from the waste stream. Materials extracted from such units could be collected and transferred by conveyor back to the tipping reception hall. Optical sorter units can be retrofitted later if this is necessary for operational improvements.

D.2.4 Waste Drying

Waste material for drying will be processed from two sources:

1. Material processed through the wind separator units i.e. directly from pre-treatment (Section D.2.3);
2. Bale-split material from storage which was previously pre-treated and baled.

Material will be conveyed to a single rotary drum dryer to reduce the moisture content (to 5%) before feeding to the pyrolysis chambers. The drying process is summarised in Figure D.2.4 below.

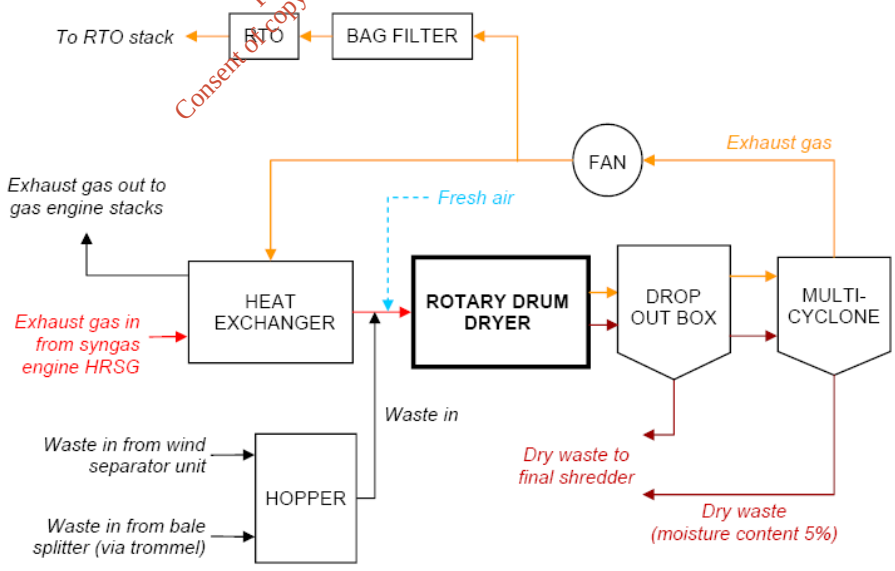


Figure D.2.4: Waste Drying Stage

The dryer inlet rotary valve will dump the waste on a chute which is placed in the process air flow through the drum. The heat energy for drying will be recovered from the syngas engine flue gas, via heat exchanger. Heat recovery from the syngas engines is later described in Section D.2.13. The syngas engine flue gases from the HRSG unit

(280°C) will enter the heat exchanger. Energy will be extracted from these flue gases to heat up the dryer air from 110°C to 208°C. This will equate to 2.6MWth of heat transfer or energy export from the energy generation (R 1) activity to the pre-treatment (R 12) activity.

The rotating drum is designed with multiple drying sections for performance efficiency. At the first contact between the process air and the wet product, a spontaneous evaporation occurs, resulting in a fast temperature drop of the drying air. Following this, a slower and progressive dehydration takes place in the next section of the drum. During the drying stage, the temperature of the waste will be raised and the desired moisture content will be achieved by regulating the outlet temperature of the process air. Set parameters in the control system (PLC) will adjust the inlet temperature accordingly.

After the drum, the dried waste will be separated from the process air by gravity and velocity reduction in a drop out box (heavy fraction) and in a multi-cyclone (light fraction) based on centrifugal force. Rotary valves beneath the drop out box and multi-cyclone will forward the dried waste (now solid recovered fuel - SRF) to a conveyor for final shredding.

The off gas from the dryer will be split in two streams after the main fan. The first stream will be returned to the heat exchanger and burner achieving an energy saving and reducing the volume of gas sent to the regenerative thermal oxidiser (RTO). The second stream will be diverted to the bag filter and RTO prior to release to atmosphere.

Further technical information on the rotary drum dryer is contained in the vendor specification included as Appendix D.18.

The primary function of the RTO is to decompose all odour generating components present in the dryer exhaust gas. The three-canister RTO has been designed with a thermal efficiency of 95% based on a combustion temperature of 800°C. The canisters will be of mild steel material and the refractory lined combustion chamber will be operated on a residence time of one second. Details of emissions from the RTO are described in Attachment E.1.

Further technical information on the RTO is contained in the vendor specification included as Appendix D.19.

Abnormal Conditions

The dryer will be subject to HAZOP assessment during the detailed design phase of the proposed facility in order to address abnormal operating conditions.

D.2.5 Fuel Feed to Pyrolysis Chambers

Two identical pyrolysis units will be installed in the proposed facility. Each pyrolysis unit will have a capacity of 3.9 tonnes per hour and will be fed by a hydraulic feed loading system. From the split surge hopper, the SRF (solid recovered fuel) will be conveyed on parallel lines to the two pyrolysis units.

The twin hydraulic feed loading system (to each pyrolysis chamber) is will squeeze out air from the fuel to ensure that oxygen and nitrogen are excluded. This is achieved by compaction of the feedstock with a

piston against a closed gate valve to remove any intrinsic air. The hydraulic compactor set is shown graphically in Figure D.2.5.

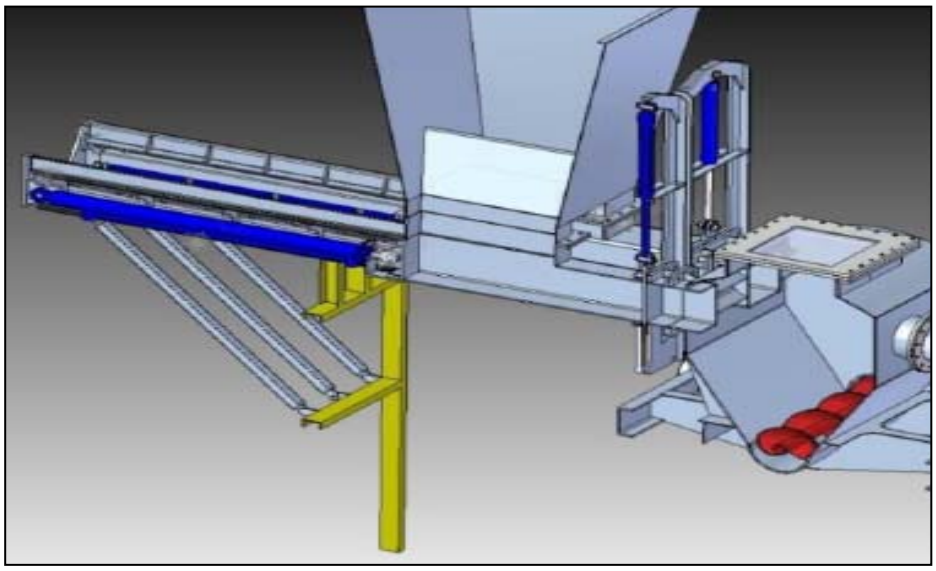


Figure D.2.5: Hydraulic Compactor Set

Excluding oxygen prevents combustion of the fuel and ensures that no dioxins can be formed. Excluding nitrogen ensures that gas resulting from the pyrolysis process is not diluted and that NO_X levels when the gas is combusted are minimised. Each hydraulic ram is capable of 5 cycles per minute and each hydraulic cylinder is capable of delivering 3.9 tonnes/hour of material in to the infeed hopper. By increasing the piston loading speed, increased gas and char production is achieved. The fuel feed will be monitored by camera relayed to monitor in the control room. Position switches will be supplied on the fuel compactor gate valves. The input scroll will be equipped with variable speed drive (VSD) monitoring with feedback to the control system, incorporating monitoring of both frequency inverter and shaft speed.

The compactor hopper is designed to act as a buffer mechanism, to facilitate material accumulation over the compactors and thus ensure that the compaction zone in front of the cylinders is always occupied. To guarantee adequate material flow the feedstock may require agitation or use of bridge breaking devices to allow the fuel to gravitationally feed into the compaction zone. The bridge breaking device is controlled and sequenced in conjunction with cylinder location on the compactors to avoid over compaction of the fuel within the hopper. The level control in the hopper is determined by high and low sensors detecting fill level. In the event of low level alarm activation the cylinders will not operate.

The infeed hopper is the temporary storage area for the input material prior to feeding the retort at the appropriate rate and acts as a buffer zone to allow material to accumulate in front of the retort. The infeed hopper has an integrated screw feeder incorporated into the design, in addition to other features such as level control, manhole access, maintenance rollers, and integrated bridge breaking device to ensure optimum fuel feed into the retort for the SRF. A schematic diagram of the SRF feed to the pyrolysis chamber retort is shown in Figure D.2.6.

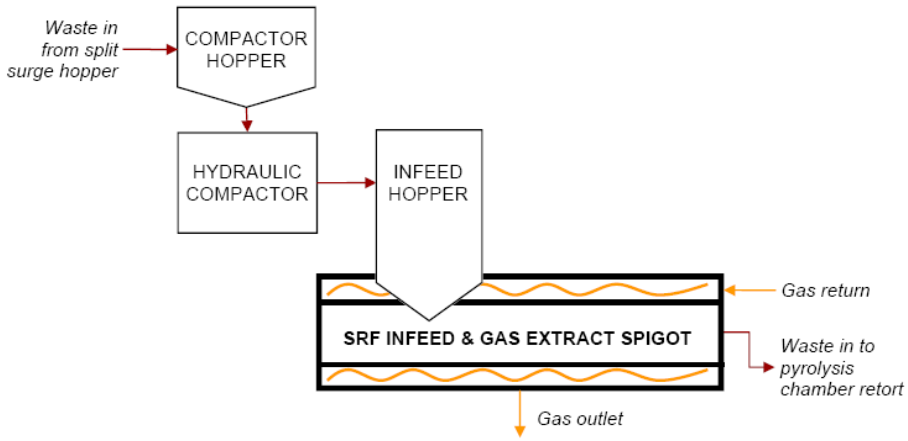


Figure D.2.6: SRF Feed to Pyrolysis Chamber Retort

The infeed hopper is flanged to the infeed and gas extract spigot as shown in Figure D.2.7 below. The spigot consists of a dual pipe configuration where the fuel enters on the inner tube and gas exits on the outer tube. The infeed scroll feeds through a central axis where the fuel is delivered into the retort. A water jacket surrounds the fuel feed tube to ensure the fuel is not prematurely pyrolysed prior to entry into the retort while assisting suitable water cooling effects onto the steel shell of the spigot. The gas train is located on the outer tube where the design also incorporates a water jacket to assist in temperature control on the steel shell.

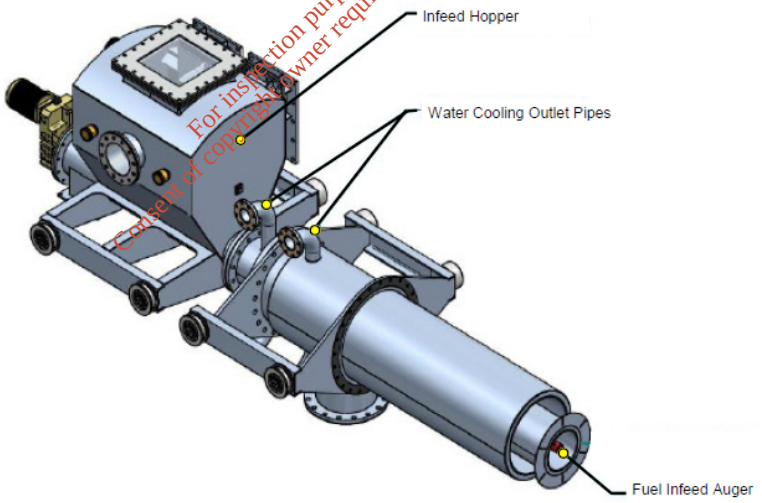


Figure D.2.7: Schematic of Infeed Hopper and SRF Infeed

The water jacket assists in temperature control for both front and back end spigots (SRF feed and char extract) and in particular maintains the temperature for the gas seal mechanisms. The water jacket consists of a standby and duty pump arrangement, which will deliver chilled water to the circuit via a standard 300kW cooler system, with flow rates of 45m^3/hour to ensure optimum heat transfer on the spigots. Thermal dispersion flow sensors monitor flow and temperature within both the flow and return circuits. The water jacket flow is controlled by a set of inline centrifugal pumps.

Abnormal Conditions

- In the event of the compactor hopper being empty, the system will run empty and cause no safety or operational issues.
- If there is a blockage in the fuel feed, whereby the input scroll jams or stops for any reason it will auto-reverse, re-start and alarm.
- Each of the two hydraulic feed systems can be operated individually giving slightly lower throughput to the system depending on fuel density.
- A high quality seal on the gate valve prevents any reverse flow of syngas into the feed system.
- The hydraulic rams of the fuel infeed demonstrate inherent safety in design as the hydraulic rams will not push air into the pyrolysis chamber. Oxygen and nitrogen monitoring will be provided at the pyrolysis chamber
- A relief system is incorporated on the hydraulics to prevent damage to equipment in the event of control failure (and resulting excess hydraulic pressure).
- Low fuel alarms and automatic/manual lock-out of rams are provided on the feed system.
- The pressure in the pyrolysis chamber and downstream is continuously monitored and alarmed by SIL assessed loop.
- In the event of power loss, the system automatically fails safe and nitrogen purge is commenced.
- For infrequent maintenance access to gate valves and hydraulic pistons, the layout has been designed to allow for Mobile Elevated Work Platform (MEWP) access and an access platform will be provided.

D.2.6 Pyrolysis Chambers

Two identical pyrolysis units will be installed in the proposed facility. Each unit operates on the principle of pure pyrolysis. A schematic of the pyrolysis chamber, including main inputs and outputs, is shown in Figure D.2.8.

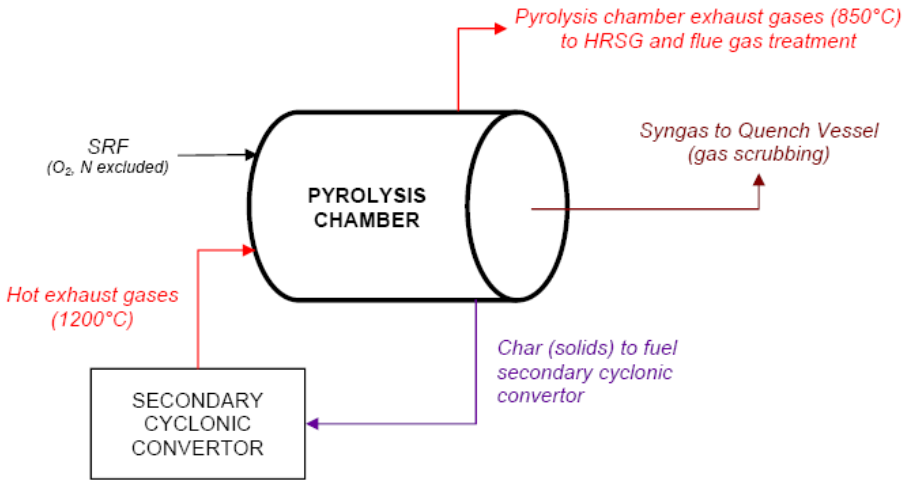


Figure D.2.8: Pyrolysis Chamber Overview

The chamber includes a custom vane design within a metal shell (tube retort) which will progressively advance the fuel in an auger fashion along the inside to ensure maximum fuel residence time, uniform constant heat exposure and minimal shell stress while converting the fuel to a gas and char at an optimum rate (Figure D.2.9). The speed (rpm) on the pyrolysis chamber determines residence time and feed transfer rate. The pyrolysis chamber is maintained under slight positive pressure. The pressure in the chamber and downstream will be continuously monitored and alarmed by SIL assessed loop.

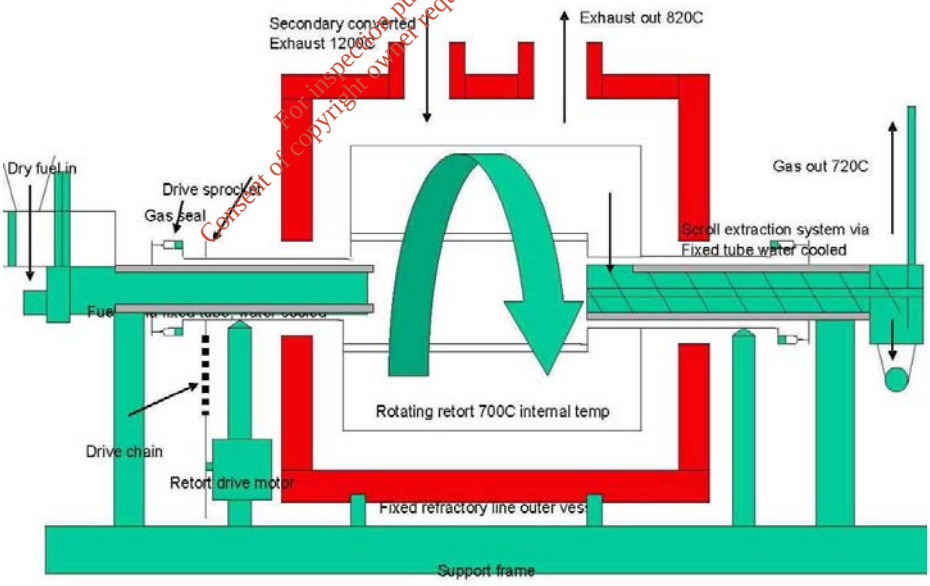


Figure D.2.9: Pyrolysis Chamber Assembly

Within the rotary kiln chamber, SRF is thermally decomposed at temperatures of 700°C ± 50°C into (i) the main desired product, a carbon- and hydrogen-rich synthesis gas stream, termed ‘syngas’ and (ii) solid carbon-based char. Any inert material embedded in the SRF remains in the char.

The syngas produced is a mixture of light gases, heavier gases and condensable organics. The light gases (which comprise the main

fraction) include hydrogen, carbon monoxide, carbon dioxide, methane and ethane and similar short chain hydrocarbons. The composition of the gas produced is further discussed (in the context of emission control) in Section F.1.1, Attachment F.1.

As no oxygen is present in the reactor, no combustion takes place and dioxins and furans cannot be formed. The syngas will exit the pyrolysis chamber through a water cooled extraction pipe and be forced through an impingement baffle to separate heavy particles. The heavier char particles will fall into the bottom of the hopper and will be extracted through a rotary valve to the char system (Section D.2.7). The syngas with remaining fine dust content will then be directed for gas scrubbing (Section D.2.9), conditioning (Section D.2.10) and ultimately combustion (Section D.2.12).

As the system controls temperature and residence time within this oxygen free environment, the quality of syngas generated (and therefore the cracking of the hydrocarbons) will be regulated accordingly. The system has been designed to heat up the fuel as quickly as possible to the pyrolysis temperatures in order to minimise carbon in the ash.

The heat energy required for thermal decomposition will be provided by the hot exhaust gases (1,200°C) from the secondary cyclonic convertor, which will heat the retort externally on all surfaces. The heat will radiate towards the centre of the shell thereby giving its heat energy to the retort and fuel inside.

The residual solids or “char” fraction will be transferred to a secondary cyclonic convertor (burner) as fuel for the system (Section D.2.7).

The thermal energy in the hot exhaust gases heating the pyrolysis chamber (at approx. 850°C) will be recovered in a heat recovery steam generator (HRSG) (Section D.2.11). The HRSG will produce steam to feed a steam turbine, which will in turn drive an electrical generator for the production of electricity.

Abnormal Conditions

- The input and extract scroll sizes to the chamber have been designed so that there cannot be more fuel input than equivalent char output.
- The pyrolysis system is gas tight and this is proved by the ability to lift the water level in the gas washing system. This is part of leak testing during start-up and has been demonstrated during commissioning.
- If the retort rotation fails there is a back-up system, which will be installed using either (i) uninterrupted power supply (UPS) for a minimum of 30 minutes supply to the retort drive or (ii) batteries and a DC motor to keep the retort turning and prevent thermal distortions to the vessel. Furthermore it is possible with a metal bar to rotate the retort by insertion on the cog mechanism.
- The design is such that the retort may be inspected by the extraction of the front and rear spigots to reveal and allow access to the internal vessel.

- As before, discharge scroll has auto-reverse function in event of blockage.
- The pyrolysis chamber and the whole of the gas system can be injected with nitrogen in the event of it being necessary to purge out the gas (jammed scrolls, maintenance, servicing etc). Gas overpressure will be released by a gas venting system at both inlet and outlet ends of the retort. The gas pressure in the retort will be controlled by the gas booster fan that increases velocity to reduce pressure or reduces velocity to increase pressure.

D.2.7 Char Recovery & Delivery System

From each of the two pyrolysis units, char will be recovered and delivered to the two secondary cyclonic convertors in the same manner. This process is described below.

Char (consisting of solid carbon and ash) is the main by-product of the pyrolysis chamber as a result of the thermo chemical fuel cracking process which takes place, leading to the reforming of hydrocarbons and production of syngas (Section D.2.6).

From the pyrolysis chamber, char will be delivered as fuel to the secondary cyclonic convertor. The method of delivery is summarised in Figure D.2.10 and described below.

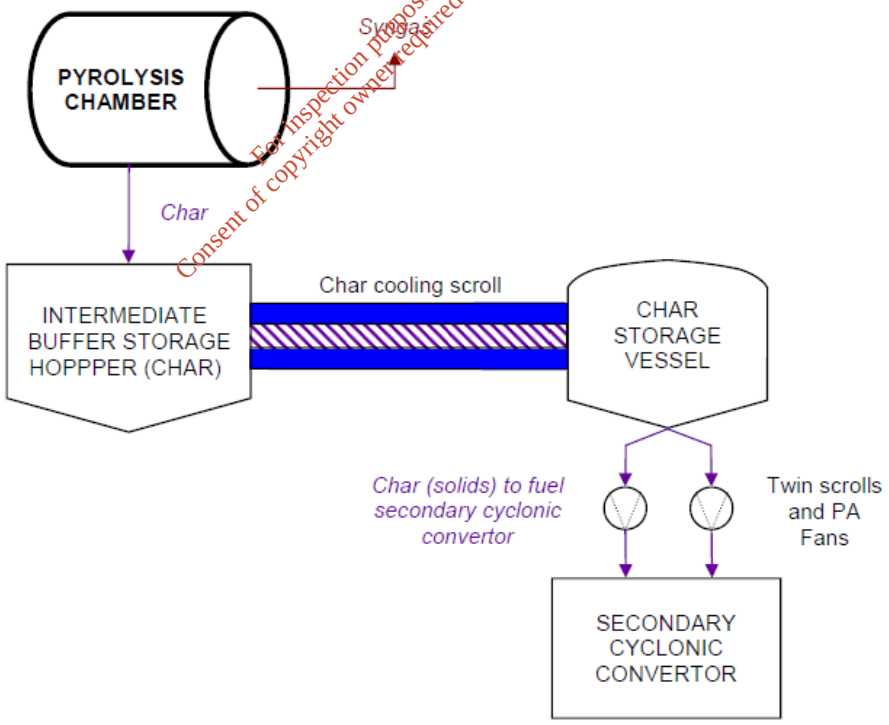


Figure D.2.10: Char Recovery & Delivery to Secondary Cyclonic Convertor

The carbon char has minimal hydrocarbon content, chlorines, sulphur and contaminants. Results of laboratory analysis on char derived from 100% MSW pyrolysis feed are included in Appendix D.20. This char has been demonstrated to provide a stable fuel for the secondary

cyclonic convertors (Section D.2.8), delivering consistent and uniform heat back to the pyrolysis chambers. Newly formed hot char will be extracted from the retort using a screw conveyor complete with water jackets to an intermediate buffer storage hopper. Hot char will then be transferred from the intermediate hopper to the char storage vessel via a long char-cooling scroll. The char and scroll will be cooled with an external water jacket on the external tubular surfaces. The char will then exit the scroll via gate valve and feed into the char storage vessel.

When the volume of char in the storage vessel is at the optimum level, scrolls and pulverised fuel fans will be initiated to extract the char from the vessel and inject it into the thermal oxidiser.

The vessel is designed with active cooling, both on an exterior water jacket and internal cooling pipework, to maintain suitable temperature conditions. The extract scrolls at bottom of vessel will be equipped with suitable water jackets and will incorporate variable speed driven motors with revolutions per minute (RPM) sensing.

The primary air fan for delivery of the char to the secondary cyclonic convertor will be a direct drive fan comprising of welded steel plate casing having flanged inlet and outlets.

Abnormal Conditions

- Duty/standby pumps will be provided to prevent loss of cooling water supply to the char cooling scrolls. In addition, flow monitoring will be provided on the cooling water circuit with alarm. Pressure and temperature switches will also be provided in the design.
- In the event of power failure, the system will automatically fail safe and nitrogen purge will commence.

D.2.8 Secondary Cyclonic Convertors (Thermal Oxidisers)

Two identical secondary cyclonic convertor units will be installed in the proposed facility to support the two pyrolysis units.

The process for each secondary cyclonic convertor is described below. (To avoid confusion with the regenerative thermal oxidiser (RTO) associated with the pre-treatment drying stage, this unit will not be referred to as a thermal oxidiser.) An overview of the secondary cyclonic convertor, its main inputs and outputs, is included as Figure D.2.11.

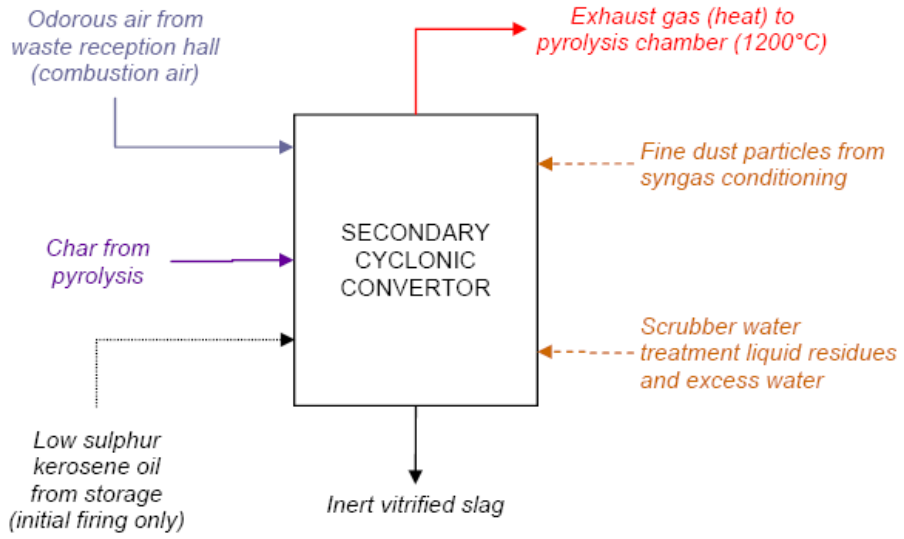


Figure D.2.11: Overview of Secondary Cyclonic Convertor

The residual solids or "char" generated by SRF pyrolysis will be transferred by fan from the pyrolysis chamber (Section D.2.7) as a fuel for the secondary cyclonic converter. The secondary cyclonic converter will be initially primed / fired with low sulphur kerosene. However, once the char feed is sufficient to sustain the combustion temperature, the kerosene supply to the burners will be isolated. The char will be conveyed with flue return gas pneumatically in to the secondary cyclonic convertor via two char burners. The char will be combusted to generate the heat for the main pyrolysis chamber, as shown in Figure D.2.12. The char burners will be equipped with a central nozzle to inject the char with conveying air. The balance of the combustion air required will be applied around the char nozzle on a concentric air register.

The air intake for combustion will be drawn from part of the waste reception hall (approx. 23,400m^3/hour). The combustion in the secondary cyclonic convertors will also act effectively as abatement for the odour contained in air drawn from the waste reception hall. The remainder of odorous air to be vented from the waste reception hall will be handled separately as described in Section D.2.2.

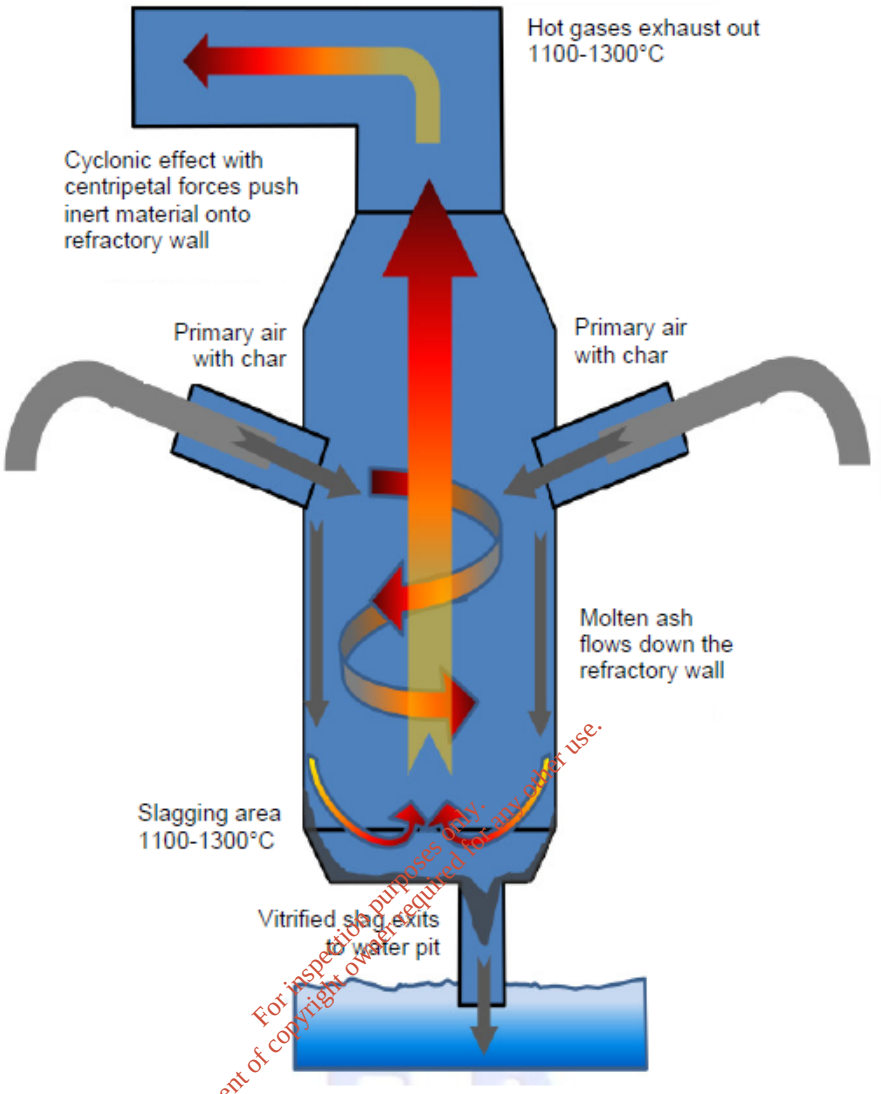


Figure D.2.12: Char Combustion at Secondary Cyclonic Convertor

The secondary cyclonic convertor has been designed specifically to operate with the carbon char as its primary fuel. The unit will also periodically handle the intermediate residue streams arising from syngas conditioning (Section D.2.10) and scrubber water treatment (Section D.2.16).

Entry of the carbon char to the secondary cyclonic convertor is regulated by automatic temperature and oxygen level control, providing for a temperature of 1,150°C for over two seconds. The requisite combustion temperature will be guaranteed by the provision of a residence tube, as described below. Temperature monitoring will be provided at the top of the thermal oxidiser, retort surface, inlet and outlet of the residence tube.

The principle of the control routine is to accurately calculate the amount of combustion air required for the amount of char being fed in real time. This is achieved by measuring the speed of the scrolls emptying the char buffer storage hopper. The volume of char passed by the scrolls and known char density allows for the calculation of char mass. The combustion air required is then calculated (Nm^3/kg char).

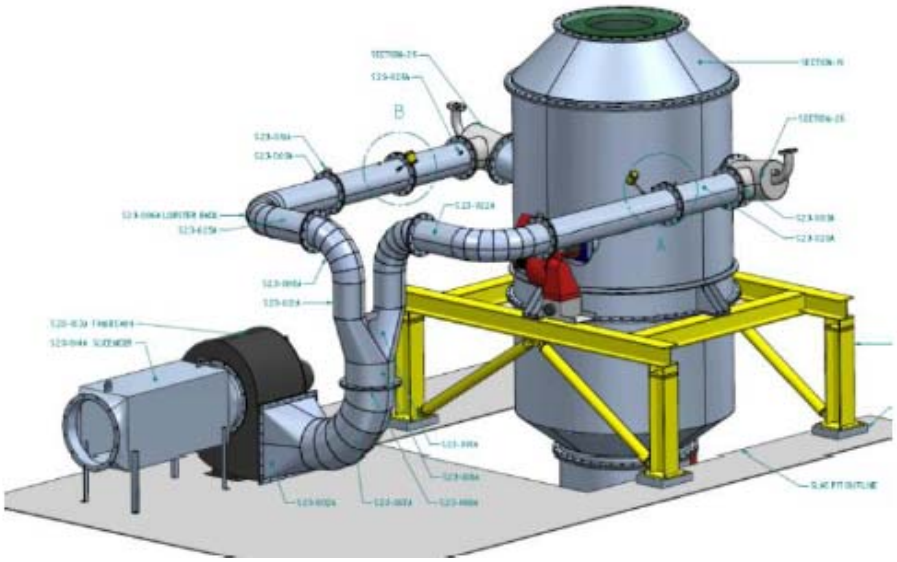


Figure D.2.13: Schematic of Secondary Cyclonic Convertor

Air will be supplied by forced draught fan equipped with a mass air flow meter placed in the forced draught duct for measurement of air flow. Air rate is also trimmed to match char characteristics based on the measured amount of oxygen in the flue gases leaving the secondary cyclonic convertor (9% ± 2%). A final top level control loop is also applied based on the relationship between residual oxygen level and temperature. This control loop is used to vary the oxygen trim set-point dynamically to match a desired outlet temperature at the secondary cyclonic convertor.

Pressure will also be monitored in the chamber of the secondary cyclonic convertor. Negative pressure will be maintained with pressure alarm and automatic shutdown provided.

Within the secondary cyclonic convertor, the hot gases will be forced into a cyclonic downward action causing the heavy ash to melt and fly outward onto the walls, where it will flows down and out of the converter in the form of a vitrified slag. This slag output has been demonstrated to be an inert vitrified, non-leaching material. Results of laboratory analysis of slag resulting from the combustion of 100% MSW derived char are included in Appendix D.21. The base of the secondary cyclonic convertor is designed to accommodate the flow of inert material and ash content from the char forming the molten slag. The slag will initially adhere to the side walls of the convertor and then flow towards the base, where the bottom and side wall surfaces will act as a crucible liner containing molten slag material. The graded crucible floor design allows the molten slag to flow towards a ceramic tile floating above a water trough. As the slag reaches the edge of the tile, it will cascade in to a water trough where it solidifies into the inert, non-leaching, vitrified material.

The base has been designed using specialised refractory material installed in three layers (Figure D.2.14) to ensure no heat transfer from the slag to the crucible. This ensures that the slag material will not prematurely solidify in the base of the crucible.

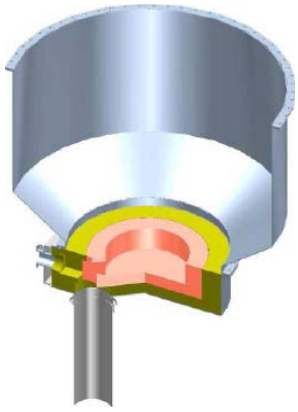


Figure D.2.14: Base of Secondary Cyclonic Convertor

The hot gases on reaching the bottom of the refractory lined vessel turn upwards and out from the converter toward the pyrolysis chamber.

Residence Tube

The interconnection between the secondary cyclonic convertor and the pyrolysis chamber has been designed, by means of residence tube, to ensure sufficient residence time is provided for the desired combustion at the operating temperature. This is in accordance with the requirements of Article 6.1 Paragraph 2 of the Waste Incineration Directive. Computational Flow Dynamics (CFD) modelling and design calculations for the residence tube system have confirmed that a residence time of 2 seconds at 1,150°C is achieved. The residence tube is shown schematically in Figure D.2.15.

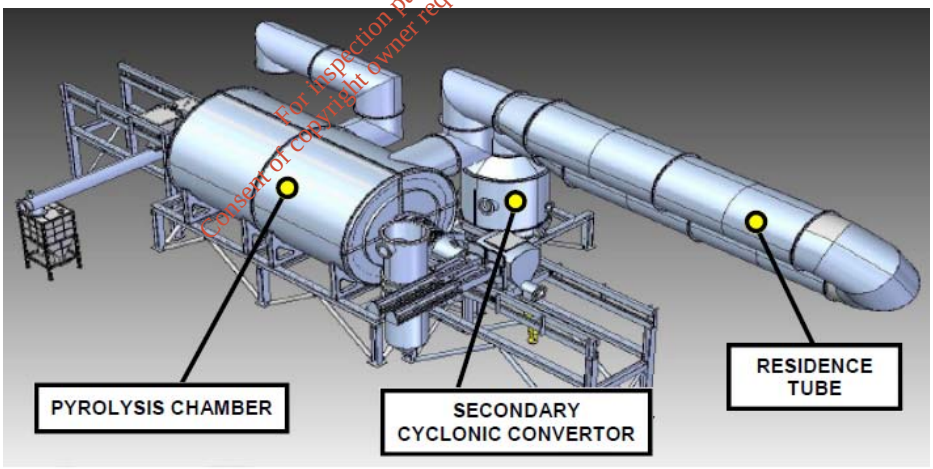


Figure D.2.15: Residence Tube

Abnormal Conditions

- During initial start-up of the secondary cyclonic convertor, if the oil supply fails, the system will automatically shut down with nitrogen purge.
- The slag burner is located at the critical point where slag should flow out, in order to keep the slag molten and prevent blockage.
- The slag outlet box is designed to maintain slag molten and has a gradient on the floor to ensure molten slag flows in the direction of the slag burner.

- For inspection of the refractory element, the secondary cyclonic convertor is a flanged system which can be opened up safely.
- In the event of ID fan failure or blockage in the heat recovery system causing back-pressure in the system, high pressure will be detected by monitor in the chamber of the secondary cyclonic convertor.
- In the unlikely event of a major failure in the secondary cyclonic convertor, the water bath would act as a relief system

D.2.9 Syngas Scrubbing

The syngas produced in the pyrolysis chamber is a mixture of light gases, heavier gases and condensable organics. The light gases, which comprise the main fraction, include hydrogen, carbon monoxide, methane and ethane and similar short chain hydrocarbons. The syngas at this stage will contain quantities of particulates, tars and other constituents which will be removed in the gas scrubbing system.

Two identical syngas scrubbing systems will each support the two pyrolysis units. Each system comprises the following three main steps, as shown in Figure D.2.16.

1. Venturi Quench Vessel
2. Gas Wash Tower
3. Scrubbing Towers & Demister System

The syngas scrubbing process will also knock out any remaining entrained particulates in the syngas, by a combination of pressure drop and impingement.

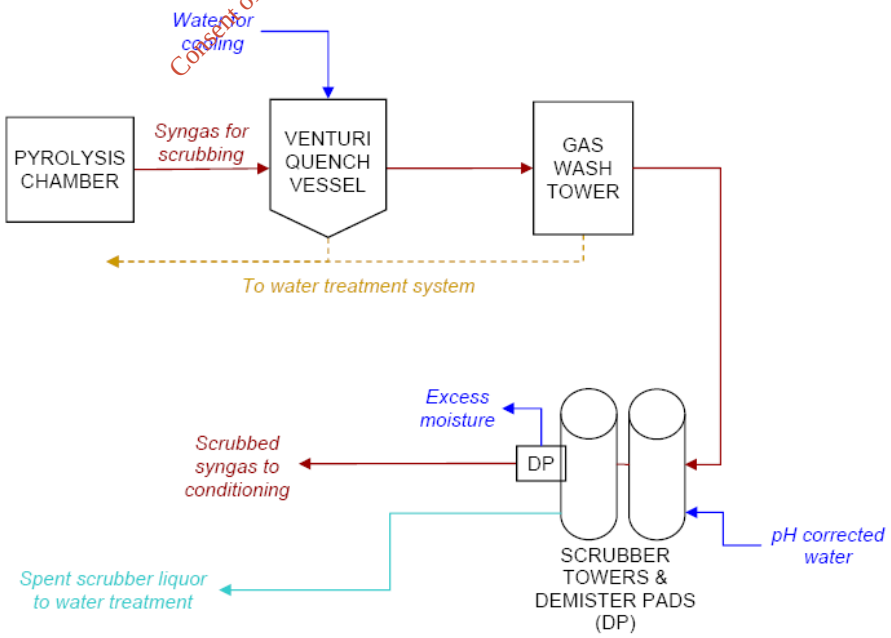


Figure D.2.16: Overview of Syngas Scrubbing System

1. Venturi Quench Vessel

The quench tower will cool the syngas by direct contact with a cooling fluid, namely water. Cooling is required to condense the heavier organic oils and tars from the syngas, without significant condensation of the added water. Liquid from the venturi quench vessel will be directed to the scrubber water treatment system (Section D.2.16) for treatment. Syngas temperature will be monitored at the inlet to the venturi quench vessel.

2. Gas Wash Tower

The gas wash tower consists of a stainless steel vessel with high-pressure nozzle sets distributed internally to ensure complete contact with the gas volume entering the vessel. The gas wash will remove solids and gas soluble contaminants while cooling the syngas prior to entry into the packed bed scrubber. Syngas temperature will be monitored at the top of the gas wash chamber. Liquid from the gas wash tower will be directed to the scrubber water treatment system (Section D.2.16) for treatment. The gas wash tower has been designed with flow switches and a low flow reading on any flow switch will automatically shut down the system.

3. Scrubbing Towers & Demister System

From the gas wash tower, the cooled syngas will then enter a packed bed scrubber operated in a two-stage system, which offers both counter flow and co-current flow with an open packing and demisting system. The scrubbing liquid, namely pH corrected water, will remove soluble acid gases. The water added at the quench stage will be recovered by sub-cooling in the packed bed with the heat energy in the gas being extracted to the cooling radiator in the scrubber liquor recycle system.

The first stage will carry over oils in the water most of which will settle in the reservoir tank. The gas flow will be co-current with the water in the first tower. The first tower has been custom designed and constructed based upon the lowest gas flow possible with higher irrigation rate of water.

The second tower (to remove finer particles) consists of a conventional counter-current contact tower with random packing. The velocity of the syngas will be constant in the first and second towers.

Any residual oils not captured in the quench tower will be separated in the scrubber sump.

Prior to syngas exit from the scrubbing tower system, dual demister pads will remove excess moisture in the syngas stream. The first stage demister will eliminate water carry over at higher flow rates while the second stage demister becomes more effective at lower flow rates. At any given time only one of the dual demisters will be functional.

Differential pressure will be monitored between the gas wash and exit of the second scrubber tower, with alarm.

From the scrubbing towers and demister pads, syngas will be directed for further conditioning (Section D.2.10).

Abnormal Conditions

- Dust collectors will be operated on a multi-pod system where one filter can be isolated if required.
- The gas wash chamber is an open design without packing.
- An inspection hatch is included in the design to access scrubber packing and also to provide access for the removal of packing from the bottom.
- Overpressure and pressure fluctuations on the gas washing water circuit will be prevented by a relief/modulating valve.
- The gas washing system is designed such that reverse flow will not be possible. This will be controlled by provision of adequate water valves.
- A trip system will be provided on the scrubber system such that in the event of high water level, the system automatically shuts down.

D.2.10 Syngas Conditioning (Pre-Engine Syngas Stage)

Following the scrubbing stage and prior to combustion in the engines, the syngas will be further conditioned to ensure optimum engine performance.

The syngas conditioning and pre-engine stage will comprise the following five steps, as shown in Figure D.2.17.

1. Cyclone Separator & Demister System
2. Gas Meter
3. CV Analyser
4. Activated Carbon Filter
5. Ceramic Fine Filter

The twin syngas lines from the two pyrolysis units will be connected to a cyclone separator and demister, gas meter and CV analyser. The twin lines will merge prior to use in the gas engines (Section D.2.12), to allow for routing control to the syngas engines or emergency flare.

Activated carbon filters and ceramic fine filters will be installed on each of the lines to the engines. Conditioned syngas will be directed to the syngas engines by means of gas booster fans.

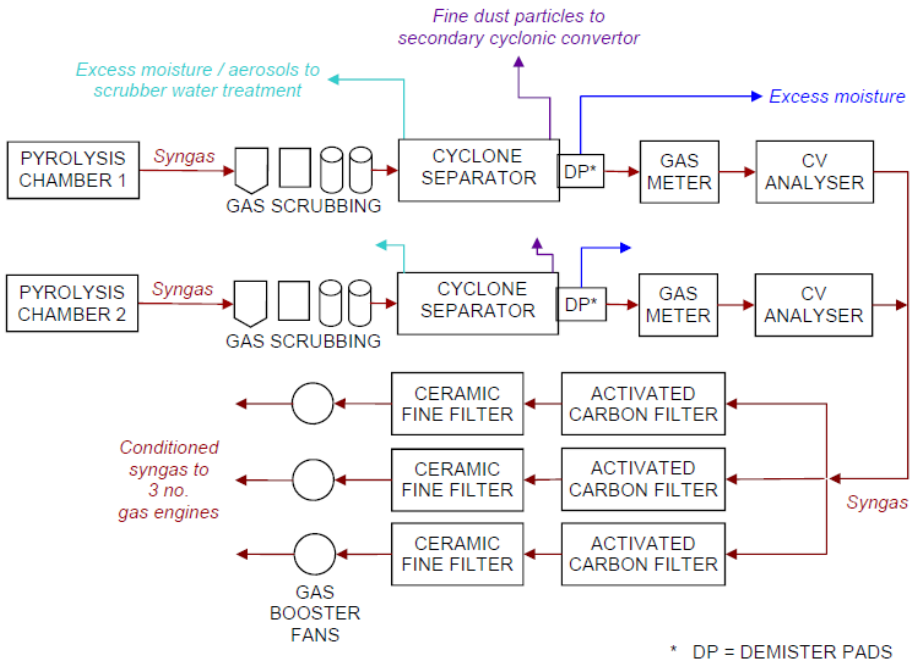


Figure D.2.17: Overview of Syngas Conditioning System

1. Cyclone Separator & Demister System

The proposed cyclone separator is a conventional single stage cyclone separator, in which remaining fine dust (carbon char) particles entrained in the syngas will be removed and processed in the secondary cyclonic convertor. Vortex separation also spins out excess moisture/aerosols which will be collected at the base of the cyclone. From the base of the cyclone, captured liquor (if any) can be directed to the water treatment system for removal of hydrocarbons.

Immediately after the cyclone separator, a demister pad will further remove remaining moisture in the syngas stream after the wet scrubbing process. Similar to the top of the scrubbing tower system, a dual demister pad system will be employed to allow for high and lower flow rates.

A cyclone separator will be provided on each of the two gas lines from the twin scrubbing systems.

2. Gas Meter

A turbine gas meter will be positioned after the cyclone separator step to determine flow to the syngas engines. The meter type selected is a high precision meter manufactured to ISO EN 9951 standard, with low pressure loss and pulsed output.

A gas meter will be provided on each of the two gas lines from the two cyclone separators.

3. CV Analyser

The Calorific Value (CV) analyser (type CWD 2005) is a high speed process gas analyser for monitoring and control of calorific value, Wobbe index, specific gravity and air/fuel ratio. The syngas will be passed through an ultrasonic measuring cell to analyse the specific

gravity and then the continuous syngas sample is burned and monitored under controlled conditions in the combustion chamber.

A CV analyser will be provided on each of the two gas lines from the two gas meters. Following the CV analyser step, the two gas lines are combined to allow for distribution to the syngas engines.

4. Activated Carbon Filter

The next step of gas conditioning at the pre-engine stage is activated carbon filtration. Activated carbon is a method of filtering that uses a piece of activated carbon to remove contaminants and impurities, utilising chemical adsorption. Activated carbon is designed to provide a large section of surface area, in order to allow contaminants the most possible exposure to the filter media. This carbon is generally activated with a positive charge and is designed to attract negatively charged water contaminants. Carbon filtering is commonly used for water purification, but is also used in air and gas purifiers. Carbon filters are most effective at removing chlorine, sediment and volatile organic compounds (VOCs).

Duty-standby activated carbon filters will be provided before each of the syngas engines.

5. Ceramic Fine Filter

The ceramic fine filter is a final syngas purification/conditioning step, to be installed for the removal of fine particles (<150-210µm) and remaining condensate vapour from the syngas stream. Fine filters are fitted with filter candles made from Pantel (special fire clay). As the gas flows through the filter candles from the outside to the inside, fine particulate matter will be separated out on the outer wall. The filter material used is chemically resistant/neutral and has a high filtration performance coupled with a low pressure loss. Detached solid matter will fall to the bottom of the hopper section of the filter unit, where it will be discharged directly to a collection drum. This (carbon char) residue will be reprocessed within the secondary cyclonic convertor.

The cleaning of the ceramic filter elements of accumulated particle matter will be carried out periodically by reverse pulse cleaning. Condensate build-up will be drained via siphon/condensate separator and directed to the water treatment system.

A ceramic fine filter will be provided before each of the syngas engines. Ceramic filters are highly efficient achieving a particulate reduction below 5mg/m^3.

Following the ceramic fine filtration, gas booster fans (on each of the three gas engine lines) will deliver the scrubbed and conditioned syngas to the gas engines.

Abnormal Conditions

The syngas conditioning system will be subject to HAZOP during the detailed design phase.

D.2.11 Heat Recovery from Pyrolysis

The pyrolysis system to be employed will convert waste and energy crop biomass material in to solid char and gas products (as described

in Section D.2.6). The char will be combusted to generate the heat energy necessary for pyrolysis to occur (Section D.2.8), thereby making energy recovery an inherent part of the overall process.

Each pyrolysis unit will produce 6.2 kg/sec flue gas at 750°C after exiting the retort unit. There will be two pyrolysis units. A single Heat Recovery Steam Generator (HRSG), capturing the heat from these pyrolysis flue gas streams, will be installed and commissioned. The HRSG is a boiler that will produce steam, which can in turn be used to generate electricity using a steam turbine. This HRSG will produce superheated steam at 38 bar absolute pressure and 400°C.

A second HRSG unit will be installed to recover heat from the gas engines, as described in Section D.2.13.

Steam produced by the HRSG will be utilised in a 1.56MW steam turbine for the generation of electricity. The cooled pyrolysis exhaust gas (approximately 272°C) will then be directed for treatment prior to emission to atmosphere. Flue gas treatment is described in Section D.2.14. An overview of the pyrolysis exhaust heat recovery scheme is provided in Figure D.2.18.

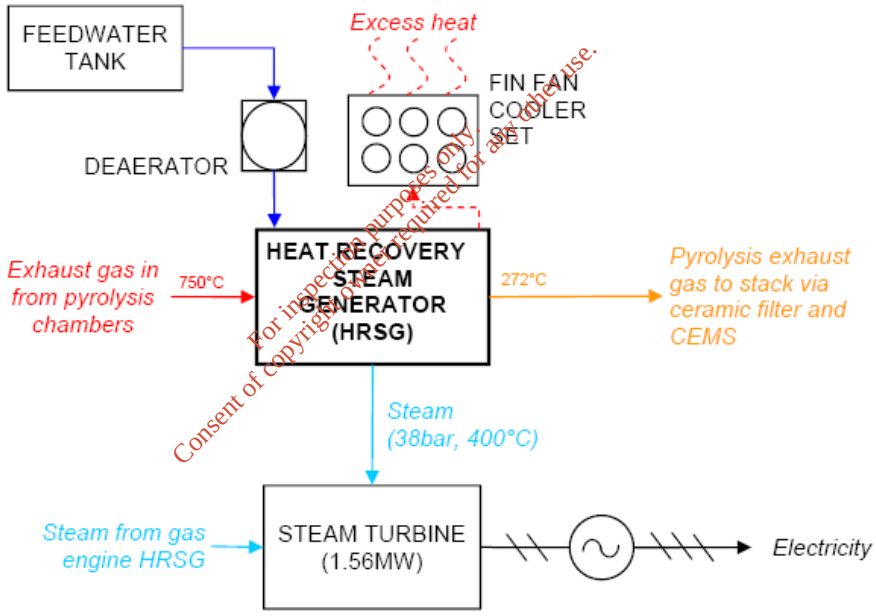


Figure D.2.18: Overview of Heat Recovery from Pyrolysis Exhaust

The type of HRSG unit (2 no.) to be employed at the facility is a two pass heat recovery steam boiler, equipped with safety controls and full complement of water mountings for operation in accordance with best engineering practice. The HRSG design provides for an all welded horizontal multi-tubular unit to the requirements of BS EN 12953. The boiler shell is cylindrical and will comprise of a single/double strake with welded seams. The inlet box will be refractory lined with the outlet being externally insulated. One feed water pump will be located on the HRSG base frame. The units will be subject to a full hydraulic test in the presence of an insurance company surveyor during commissioning.

Feedwater Tank

A feedwater tank will be specified during detailed design stage to accommodate the volume of feedwater required for the HRSG units and economisers.

Deaerator

A deaerator will also be installed for the removal of oxygen (to 7ppb) and other dissolved gases which may be present in the feedwater. In particular, dissolved oxygen will be removed to prevent corrosion damage to the metal pipework.

Economiser

An economiser system will be integrated with the HRSG packages, complete with ancillary equipment (e.g. discharge transition hood, safety valve, water and gas bypass).

The economiser is to be manufactured from extended surface tubing, within a carbon steel casing. The economiser system has a design pressure of 24barg and design temperature of 300°C. The unit is CE marked.

Fin Fan Cooler Set

In the event of a proportion of the excess heat not being required by the HRSG, the heat will be dissipated by means of a fin fan cooler system, to be selected at detailed design stage (ongoing). This system will comprise of a standard package modular design. Pump sets will be adequately sized for delivery of water to and from the fin fan in a duty / standby arrangement.

Dust levels in the downstream gas from the HRSG will be monitored by CEMS. Acoustic enclosures will be provided surrounding the unit, to mitigate against elevated noise levels in the vicinity. Temperature monitoring will be provided on the outlet of the HRSG as well as within the acoustic enclosures.

Abnormal Conditions

- The evaporative condenser has been designed with excess capacity to prevent any blockage and also has been designed to cope with winter conditions to prevent ice formation in the condenser.
- The economiser will be supplied complete with an actuator switch, fitted to the boiler feed water-regulating valve. At low operating loads, or whenever the regulating valve approaches its closed position, the bleed valve operates to ensure a flow of water at all times through the economiser. This will prevent steaming within the unit, and thus possible vapour locking.
- A steam turbine bypass linked to an air cooled condenser system will be installed to enable the discharge of steam in the event of steam turbine failure. The bypass of the steam turbine will be closed during normal operation of the plant. The condenser will be designed to condense the whole of the steam from the HRSG unit.

D.2.12 Syngas Engines

The scrubbed and conditioned syngas will provide the fuel for engines to generate electricity. There will be a total of three syngas engines. Each engine unit in operation will consume 3,000m^3 of syngas per hour at full production.

Each engine unit will generate 3.2MWe of electricity for export to the national grid, providing a maximum electricity export capability (from the gas engines alone) of 9.6MWe.

Heat energy contained in the syngas engine exhaust will also be recovered in a Heat Recovery Steam Generator (HRSG). The syngas engine and associated exhaust heat recovery system is summarised in Figure D.2.19.

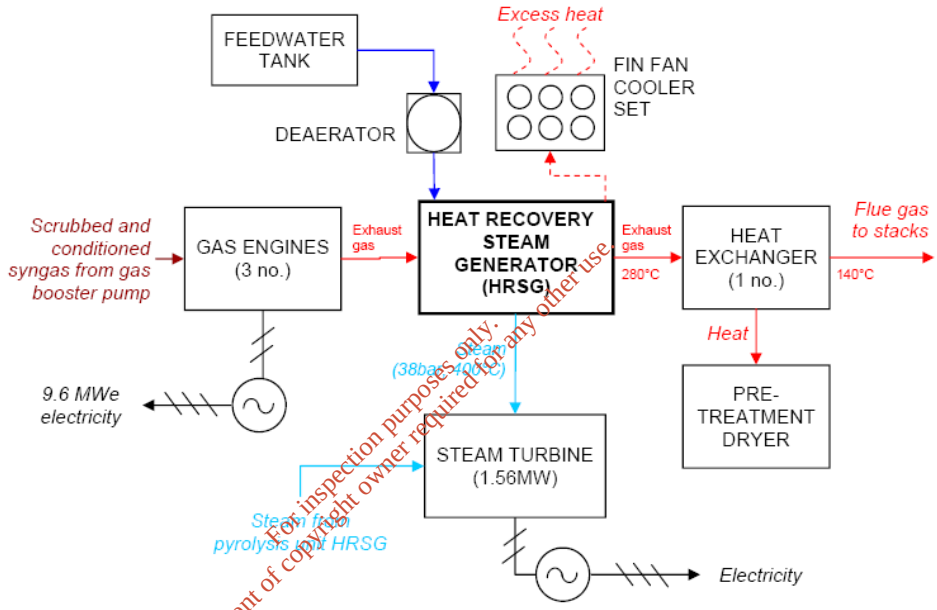


Figure D.2.19: Overview of Syngas Engine & Heat Recovery System

Each engine unit will provide an output of 3.2MWe. The syngas engine system has been designed and will be installed in accordance with the relevant UK and Irish gas codes. The final engine manufacturer will be selected during detailed design (ongoing). The engine system will include:

- Engine starting system (pneumatic starter motor);
- Engine crankcase ventilation system including motor driven oil separator unit;
- Gas train (including isolating valve, pressure indicator, gas strainer, pneumatic shut off valves, zero pressure regulator, flexible connector to engine and external safety shut off valve);
- Engine lubrication oil system (including lubrication oil cooler, filters, lubrication oil circulating pump, priming pump, lubrication oil level top up control system, lubrication oil sump with integral lubrication oil tank in bedplate as part of lubrication oil circuit.

Each engine will be equipped with air-fuel turbocharging and two-stage intercooling, single cylinder heads with four-valve technology and centrally arranged industrial spark plug with intensive plug seat cooling. The design intent is to provide low energy consumption, long service intervals, and efficient energy conversion.

The syngas engines will be operated from wall mounted electronic control panels (standard instrumentation). In addition there will be a microprocessor controlled high-voltage ignition system and monitoring of engine operation through TEM and exhaust emissions, controlled according to combustion chamber temperature. A gas analyser will be supplied on the engine package. The syngas will be monitored for oxygen level, immediately before the emergency flare and syngas engine.

The engines will be equipped with a Selective Catalytic Reduction (SCR) injection system for treatment of flue gas, as described in Section D.2.14.

Gas Flare

A gas flare will be installed at ground level, external to the building as shown on the drawing included as Appendix D.4 (drawing no. IE0310150-22-DR-0008). The tie-in point for the gas flare will be after the CV analysers (where twin gas lines merge) and before the activated carbon filters (where the gas line diverges before the three gas engines). The flare provides for a safe means of disposal of gas in emergency situations or exceptional circumstances.

Abnormal Conditions

- The gas wash system has been designed with demisters to limit any potential for fouling of the gas engines.
- An auto-divert valve and pressure relief valve are included in the design, in the event of the gas engine tripping. As above, the gas flare will provide for a safe means of disposal of syngas in emergency situations or exceptional circumstances.
- The gas engine systems will be subject to HAZOP review during detailed design.

D.2.13 Heat Recovery from Syngas Engines

The heat energy contained in the engine exhaust gas will be recovered in a Heat Recovery Steam Generator (HRSG). This HRSG is separate to that associated with the pyrolysis units (Section D.2.11) but will operate according to the same principle. The heat recovery from the syngas engines is summarised in Figure D.2.19 above (Section D.2.12).

This HRSG will also produce superheated steam at 38 bar absolute pressure and 400°C, to feed the same steam turbine (1.56MW) connected with the pyrolysis heat recovery boiler (Section D.2.11).

The gas engine exhaust stream from the HRSG (approximately 280°C) will then be directed to a heat exchanger, where residual heat energy will be extracted to heat up the dryer air used in the waste pre-

treatment step (Section D.2.4). The pre-treatment dryer air will be heated from approximately 110°C to 208°C in this way.

The syngas engine flue gases will exit the dryer heat exchanger at approximately 140°C prior to emission through the secondary (engine) exhaust stacks.

Similar to the ancillary equipment described in Section D.2.11, the heat recovery from the syngas engines will include feedwater supply, deaerator, economiser and fin fan cooler set.

Abnormal Conditions

Abnormal conditions for the syngas engine heat recovery scheme will be addressed using equivalent measures described for pyrolysis heat recovery abnormal conditions (Section D.2.11). Furthermore, each system will be subject to HAZOP review during detailed design.

D.2.14 Flue Gas Treatment & Odour Abatement

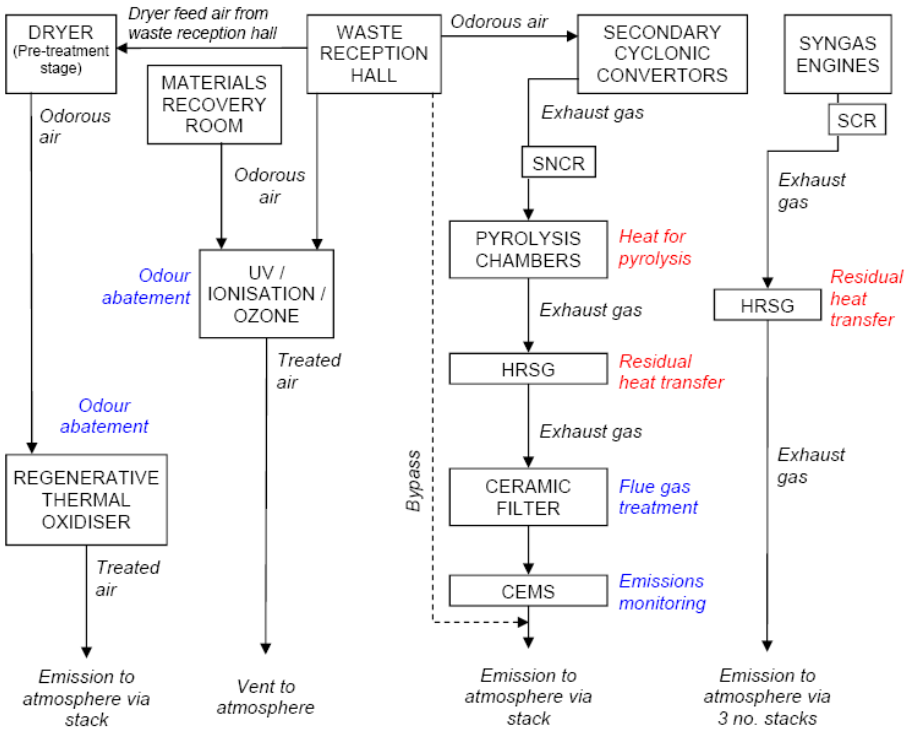
There will be two main sources of flue gas (emissions to atmosphere via stack) from the proposed facility, namely:

1. Exhaust gas from pyrolysis chambers (2 no.)
2. Exhaust gas from gas engines (3 no.)

In addition odorous air from the sources below will be abated prior to being emitted to atmosphere.

1. Odorous air from drying of waste:
   - Directed to Regenerative Thermal Oxidiser (RTO) prior to emission to atmosphere. (The dryer feed air will be drawn from waste reception hall)
2. Air from waste reception hall and materials recovery area:
   - The secondary cyclonic convertors will draw air for combustion from the waste reception hall. This air will ultimately vent through the primary 30m stack (air may bypass directly to stack when no combustion occurs).
   - Remaining odorous air to be vented from the waste reception hall and materials recovery area will be directed to an odour treatment unit and vent.

The treatment / abatement of flue gas and odorous air from the facility is summarised in Figure D.2.20 and further described below.



Abbreviations:
SCR = Selective Catalytic Reduction
SNCR = Selective Non-Catalytic Reduction
HRSG = Heat Recovery Steam Generator
CEMS = Continuous Environmental Monitoring System

Figure D.2.20: Overview of Flue Gas Treatment & Odour Abatement

D.2.14(a) Flue Gas Treatment – Pyrolysis Exhaust Gas

The pyrolysis process in itself is the primary method for minimising the quantity and harmfulness of emissions to atmosphere arising from the above two streams (compared at least with alternative conventional incineration technologies). Furthermore, the gas scrubbing/conditioning and flue gas treatment steps have been designed to ensure that emissions from the plant are compliant with the Waste Incineration Directive (2000/76/EC) and that the impact on human health or the environment would be insignificant.

The dedicated flue gas treatment stage for the pyrolysis system comprises the following five steps, as shown in Figure D.2.21 overleaf.

1. Selective Non-Catalytic Reduction (SNCR) using Ammonia/Urea Injection
2. Ceramic Filter
3. Emission to atmosphere

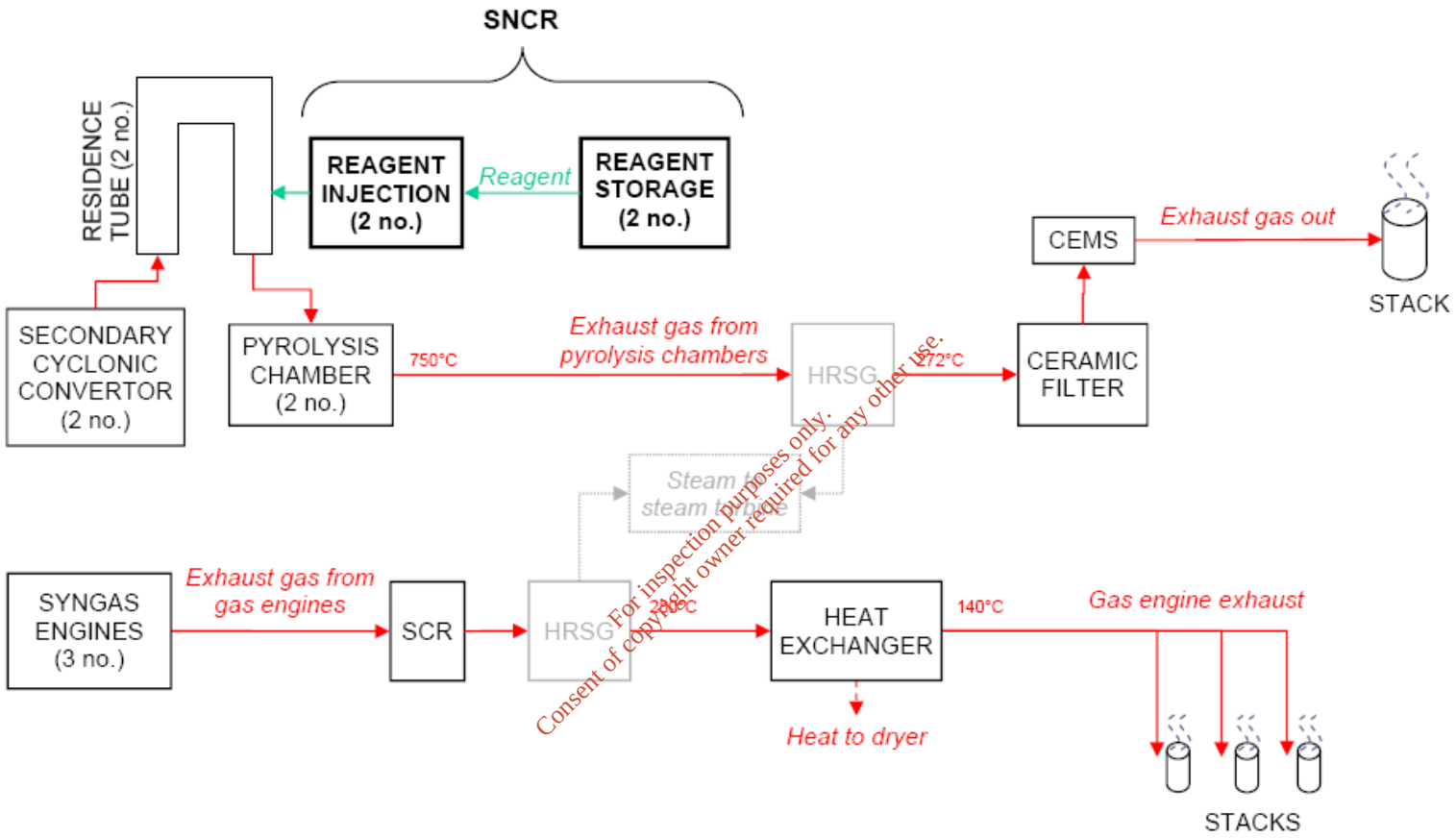


Figure D.2.21a: Overview of Flue Gas Treatment – Pyrolysis System

Dedicated treatment/abatement system components (for emissions to atmosphere) are identified in bold.

Abbreviations: CEMS = Continuous Environmental Monitoring System
HRSG = Heat Recovery Steam Generator
SCR = Selective Catalytic Reduction
SNCR = Selective Non-Catalytic Reduction

1. Selective Non-Catalytic Reduction (SNCR)

SNCR is an established, BAT compliant method of reducing nitrogen dioxide (NO_x) concentrations in plant emissions. This is achieved by injection of a reduction agent, in this case ammonia or urea, at a point in the flue gas path where the temperature is maintained within a particular temperature range (850 - 1000°C). The nitrogen oxides in the flue-gas will be reduced to nitrogen and water vapour by the reduction agent.

SNCR will be provided at the residence tube between the secondary cyclonic convertor and pyrolysis chamber, as a means of treatment on this exhaust gas stream. Ammonia/urea will be injected using air atomisation upstream of the second limb of the residence tube, using air dilution for temperature control. Using MSW derived char only with no dedicated flue gas treatment, average NO_x concentrations from the pyrolysis system are approximately 400mg/m^3, thereby requiring a minimum 50% reduction by secondary techniques to ensure compliance with the Waste Incineration Directive limit of 200mg/m^3.

According to the BREF note on Waste Incineration, NO_x reductions of up to 90% may be achieved using SNCR.

2. Ceramic Filter

Particulate emissions arising from the pyrolysis process will be captured using a ceramic filter system. Ceramic filter elements are formed from ceramic fibres as long, hollow, porours-wall cylindrical tubes, flanged at one end and closed at the other. A typical ceramic filter system is shown in Figure D.2.21b.

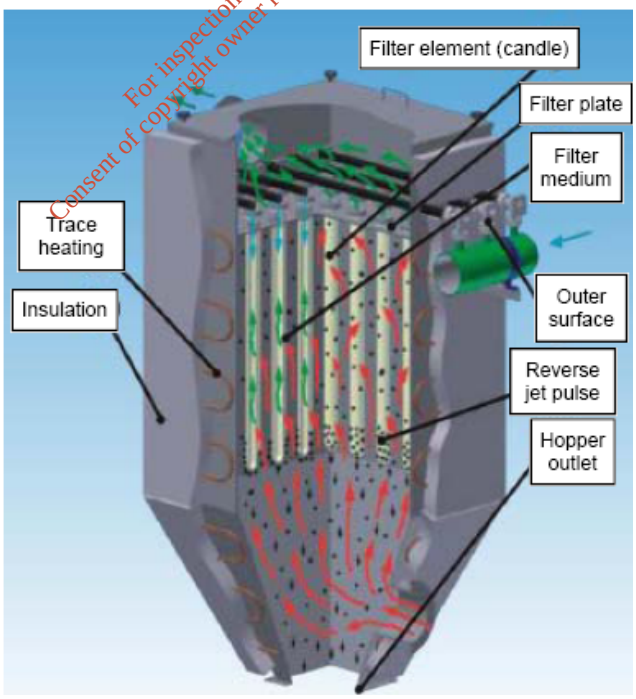


Figure D.2.21b: Ceramic Filter

The filter elements hang vertically from a filter plate within the filter vessel. The header plate separates the filter's clean and dirty compartments. Hot flue gas is drawn through the filter medium from outside to inside. Particulates and dry scrubbing absorbents will be collected on the outer surface of each filter element. The particulates

will be removed from the element by a reverse jet pulse. This reverse pulse causes the accumulated solids to be detached from the outer surface of the filter elements. The accumulated solids will be discharged through the hopper outlet for disposal.

The filter body can be protected with insulation and trace heating to prevent the formation of condensation when the equipment is not in use.

3. Emission to Atmosphere

Treated flue gas will then be directed to through a Continuous Environmental Monitoring System (CEMS). The flue gas will ultimately be emitted to atmosphere at the primary 30m stack. The discharge ID fan has been designed to incorporate air flow from the two pyrolysis units. During detailed design (ongoing), the ID fan will be suitably sized to accommodate the volume of air and back pressure within the system.

The stack will be equipped with a variable diameter, laminar flow chimney designed specifically for this facility incorporating ID fan control. This is to ensure that back pressure on engine exhaust will not be excessive. A controlled damper system will be installed to ensure sufficient emission velocity at the ultimate exhaust point.

The CEMS unit will be installed for the monitoring of emissions. Further details on the monitoring of emissions to air are included in Attachment F.2.

D.2.14(b) Flue Gas Treatment – Syngas Engines

The gas engines will each be equipped with a Selective Catalytic Reduction (SCR) unit, designed primarily for the reduction of NO_X emissions to atmosphere. The SCR system will provide for up to 90% reduction in NO_X emissions before gas engine exhaust is emitted to atmosphere.

D.2.14(c) Odour Abatement – Waste Reception Hall & Materials Recovery Area

The main building will be accessed by delivery vehicles via an interlock area located to the rear of the building. The first set of doors will only open if the inner doors are closed. The inner doors will only open once the outer doors are closed. This is to ensure that no odours will escape from the delivery area.

Air in the waste reception hall will be vented at a number of points and odour abated as required. Combustion air for use in the secondary cyclonic convertors will be drawn from the waste reception hall, ultimately venting through the building's primary 30m stack. The combustion will act effectively as odour abatement. This air flow can also bypass directly to the stack when combustion does not occur.

Air will also be drawn from the waste reception hall for use in the pre-treatment dryer. The handling of this air stream is described at D.2.14(d) below.

The remaining air to be vented from the waste reception hall (and air from the materials recovery area) will be directed through a dedicated odour abatement unit before venting to atmosphere. The method of

abatement for this air stream will be based on UV / ionisation / ozone treatment (detailed design ongoing).

D.2.14(d) Odour Abatement – Dryer Air

The drying of waste at pre-treatment stage will in itself be a source of odour. Feed air to the dryer unit will be drawn from the waste reception hall. Air discharged from the dryer will be vented through a Regenerative Thermal Oxidiser (RTO). A description of the dryer and RTO is included in Section D.2.4.

Abnormal Conditions

In the event of failure of a catalytic convertor on a gas engine, the engine may be taken out of service for repair and the plant operated using two gas engines only. Each gas engine exhaust will directed to a dedicated stack.

The flue gas treatment system will be subject to HAZOP during the detailed design phase (ongoing).

D.2.15 Steam Turbine

The two HRSG units (pyrolysis exhaust heat recovery and gas engine heat recovery) will produce 2.262 kg/s steam at 38 bar and 400°C.

The steam produced will feed a condensing steam turbine which in turn will drive an electrical generator. The electrical output of the generator will be 1.569 MWe at the electrical terminals.

The steam turbine unit process is summarised in Figure D.2.22 below.

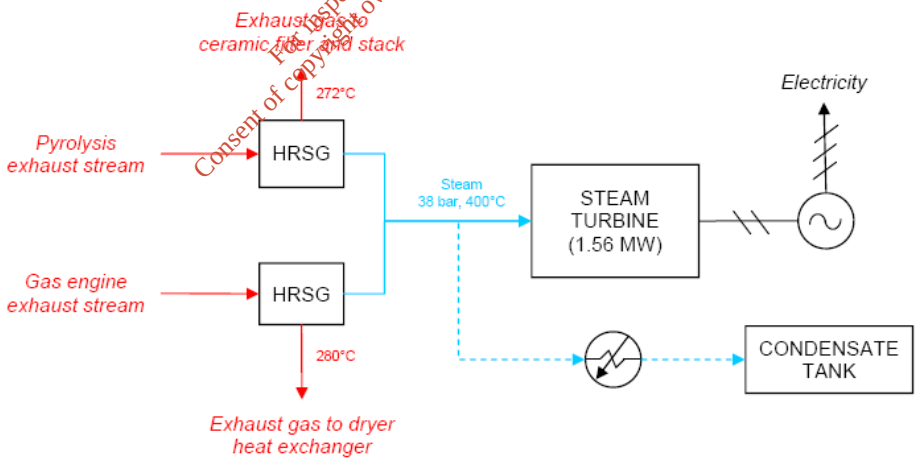


Figure D.2.22: Steam Turbine Diagram

Steam turbine by pass valves systems will be installed to enable the discharge of live steam to condensers in the event of turbine tripping or malfunction on start-up. This will increase the flexibility of the plant operation.

The steam turbine by pass system will be closed during normal operation of the plant and can be remotely operated. The system will incorporate the following control features:

- Condensate regulating valve, controlling up stream pressure;

- De-superheating device, allowing suitable steam conditions in the condenser;
- Control device (for steam pressure and temperature).

Steam Condensers

A frame type air cooled mounted condenser will be selected during detailed design (ongoing). It will be mounted externally at roof level. The surface area for thermal exchange will be made of circular finned tubes of up to 50 mm in diameter. The air cooled condenser will be designed to condense the whole of the steam from the two HRSG units. The air cooled condenser will be able to condense the saturated steam in by pass over the turbine.

D.2.16 Scrubber Water Treatment System

Water treatment is required to treat the spent liquids used for syngas scrubbing (Section D.2.9) and syngas conditioning (Section D.2.10). Treated water will be continuously recycled in the system, thereby minimising the demand for potable water in the process and ensuring no effluent emission to surface water, groundwater or public sewer.

The scrubber water treatment process is summarised in Figure D.2.23. Spent scrubber liquor from both the scrubbed and conditioned syngas stream will be directed to two water reservoirs. pH adjustment may also be applied at the reservoirs. From each water treatment reservoir, the water for treatment will be directed through centrifuge, media filtration, electrolysis, activated carbon filtration and reverse osmosis stages to remove contaminants in a stepwise approach.

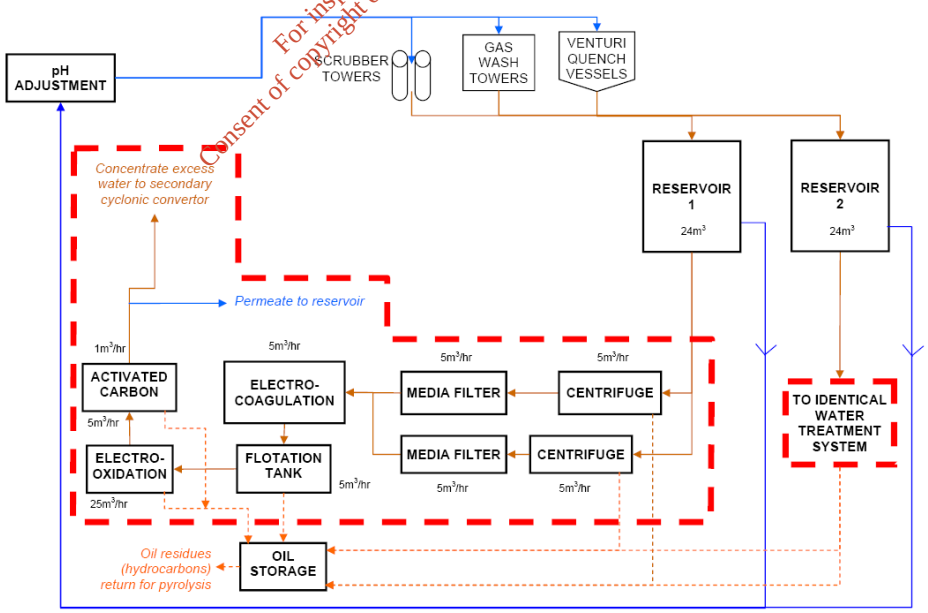


Figure D.2.23: Overview of Scrubber Water Treatment System[3]

[3] The interconnection with the syngas scrubbing system (Section D.2.9) is shown for Reservoir 1 only, however Reservoir 2 is connected in the same manner. (One reservoir serves each of the two syngas scrubbing systems, which are downstream of the two pyrolysis units.)

1. Water Treatment Reservoir

Each of the two water treatment reservoirs has a capacity of 24m^3, designed to operate with a capacity of 20m^3. Each tank is designed to be equipped with gradient heated floor, large entry distribution manifold and weirs to assist water/contamination separation.

2. Centrifuge

Two centrifuge units (duty-standby arrangement) are associated with each water treatment reservoir. The centrifuge step will allow for the removal of gross contaminants. Each centrifuge unit has been designed for a process flow of 5m^3/hour. The centrifuge residues will be recycled in the system, added to the SRF feed for pyrolysis.

3. Media Filter

Two media filter units (duty-standby arrangement) are associated with each water treatment reservoir and are placed after the centrifuge step. The media filter will remove particulate matter from the water. A variable velocity filtration system has been selected due to its robust construction, BOD/COD reduction capacity and the effectiveness of the back-wash design. Each media filter unit has been designed for a process flow of 5m^3/hour.

4. Electrolysis

Electrolysis will be employed for the removal of polyaromatic hydrocarbons (PAHs), BTEX compounds, COD and BOD from the water stream.

Following the media filter step, water will be directed to the electro-coagulation (EC) unit. The EC step involves the passing of electric current through the water, with a subsequent surface reaction in the following flotation tank. EC generates micro hydrogen and gas bubbles whereby the bubbles float vertically in the flotation tank, forcing the hydrocarbon material vertically upward.

Secondary electrolysis or electro-oxidation is subsequently carried out on the water. Electro-oxidation is used to produce oxidants capable of removing contaminants from the water. The electro-oxidation units have been designed to operate continuously with electrode replacement at frequent intervals. The design includes a solid state Boron Doped Diamond (BDD) electrode that is robust, chemically and thermally stable and requires only infrequent replacement (when compared with previous generation electrodes). The electro-oxidation process is used for the removal of chemical contamination made up of 'hard COD'. Furthermore, ammoniacal nitrogen is converted to nitrogen gas to mitigate the concentration of ammoniacal nitrogen in the process water stream.

5. Activated Carbon Filtration

Activated carbon (AC) filtration utilises activated carbon to remove contaminants and impurities by chemical adsorption. The AC filtration step will remove chlorine, sediment and volatile organic compounds (VOCs) from the water stream.

The AC filter unit on the water treatment system, to accommodate 5m^3/hour flow, will be selected during detailed design stage.

Abnormal Conditions

The scrubber water treatment system will be subject to HAZOP review during detailed design phase.

D.2.17 Utilities

The facility will be served by a number of utilities as described below. The drawing included as Appendix D.9 (drawing no. IE0310150-22-DR-0012) shows the HVAC Plant Room at ground floor level and Comms/IT room at first floor level.

Water

Water will be supplied to the site from public mains for domestic, washdown and fire-fighting purposes. A water storage tank on-site will have capacity for 1000m^3, with approximately 700m^3 for fire-fighting and 300m^3 for potable and general facility requirements (scrubber water treatment, floor wash-down etc.).

Electricity

A 20kV connection to the electricity distribution network will be installed for the import and export of electricity. Electricity will be imported to the site during construction phase, start-up and maintenance shutdowns. During the operational phase, electricity will be provided from on-site generation.

Internal distribution transformers will step the voltage down from 10kV to 400V and 240V, where required for motor, equipment, light and control system circuits.

The anticipated electrical load is summarised in Table D.2.1.

Table D.2.1: Facility Electrical Load

Description	Generating Capacity (MW)
Gas Engine 1	3.2
Gas Engine 2	3.2
Gas Engine 3	3.2
Steam Turbine	1.56
Total Generating Capacity	**11.16**
Total Parasitic Load	2
Total Export Load (MEC)	**9.16**

The main electrical systems will be monitored and controlled centrally within the main Glanpower building. Control switches will be provided in the Motor Control Centre (MCC) room to regulate the 400kV supply.

Nitrogen

Nitrogen, required for system purge, will be generated on-site from natural air using a standard pressure swing adsorption (PSA) technology. The system's design is based on the regulation of gas adsorption and adsorbent regeneration by means of changing pressures in two adsorber-adsorbent containing vessels. The process requires constant temperature, close to ambient. Nitrogen is produced at above-atmospheric pressure, while the adsorbent regeneration is achieved at below-atmospheric pressure. The PSA unit specification is outlined in Table D.2.2.

Table D.2.2: Nitrogen (N_2) Unit Specification

Rated flow of nitrogen (N_2)	27.0Nm^3/hour (±5%)
Purity titre	99.99% which, in other terms, is evaluated against residual oxygen content of 0.01% (100ppm subject to a tolerance of ±15ppm_v). Other traces of contaminants (e.g. CO, Ar) present but at negligible concentration. Residual CO is ≤ 10 ppm_v.
Residual humidity of N_2	Approx. -50°C dew point
Nature of adsorbent load	High selectivity carbon molecular sieves
Duty	Continuous, 24 hour, 8700 hours/year
Outlet N_2 product pressure	6.5barg
Average compressed air feed consumption	183 Nm^3/hour (air factor 6.8:1)

Nitrogen storage will consist of a bottle rack arrangement.

Compressed Air

Compressed air is required for instrumentation and plant duties and the system will consist of air compressors, air dryers, air receivers, air filters and a distribution network.

All items of plant requiring compressed air will demand service at similar pressure, therefore one common generation system will be installed (subject to verification during ongoing detailed design).

Plant/equipment 'user groups' will however require minimum dew point/dryness quality as indicated below calling for progressive staged treatment of the compressed air stream.

- Plant Air: Oil free with pressure dew-point temperature of +2°C or better
- Instrument Air: Oil free with pressure dew point temperature of -40°C or better

The system will be designed to allow equipment receiving instrument air to be switched to plant air.

Compressed air will be supplied to the two distribution systems at a pressure that provides a nominal 7 Barg to all user points. To accommodate pressure losses through downstream drying equipment and transmission lines, the current system philosophy is based on a compressor discharge pressure of 10 Barg.

Plant air will be required at a pressure dew-point of +2ºC or better and this will be derived from air cooled refrigerated type dryers. The capacity of each air cooled refrigerated type dryer will include the required plant air usage plus “pre-treatment” of compressed air required for additional drying to instrument air quality.

Instrument air will be required at a pressure dew-point of -40°C or better and this will be derived from adsorption type desiccant dryers. The dryers will be dual tower, fully automatic heatless regenerative type.

Abnormal Conditions

In the event of electrical failure (i.e. loss of electrical power), the system will fail safe and the nitrogen purge will commence. Switchrooms will be fitted out with emergency lighting, emergency exit signs and fire detection.

The electrical power supply to the facility will be supported by an Un-Interruptible Power Supply Unit (UPS) to provide for the critical power needs. In summary, these needs include all life safety systems, building CCTV equipment, security systems, Comms-IT power and fire protection systems. A UPS (400/230V, 3 Phase, 50Hz) will be provided in the server room to provide power to IT/VT cabinets. The unit will have 30 minutes autonomy and will have no redundancy. The panel will have an integral static bypass switch and an external maintenance bypass switch. Power for the UPS system will be taken from the Essential (EDP) side of the main building services switchboard.

The emergency generator will provide a source of power in the event of electrical power failure. The generator selected is a 1138kVA standby rated, diesel powered generator with acoustic enclosure (rated 83dB(A) at 1m). The emergency generator will be located externally, to the rear of the facility, as shown on the drawing included as Appendix D.4 (drawing no. IE0310150-22-DR-0008).

D.2.18 Other Abnormal Conditions

Glanpower will operate HR procedures to ensure the facility is sufficiently staffed by competent and trained personnel at all times during operation. This will prevent lack of operational control in the event of personnel absence due to illness, bereavement etc.

A scheduled equipment maintenance programme will be operated by Glanpower for the calibration, repair and maintenance of all equipment throughout the plant. A dedicated on-site maintenance area (approx. 280m^2) is provided adjacent to the waste reception hall.

Duty/Stand-by Arrangements

Duty/stand-by arrangements have been incorporated in to the plant design for critical equipment items including:

- Hydraulic pumps on fuel feed to pyrolysis chambers;
- Cooling water pumps to fuel input and extract scrolls and char cooling scroll;
- PA fans for char transfer to secondary cyclonic convertor;
- Pumps for high-pressure and low-pressure water supply to quench venturi and twin scrubbers;
- Strainers on gas cleaning water loop;
- Dryers connected to compressed air system.

D.2.19 Compliance with Article 6 of the Waste Incineration Directive

Article 6 of the Waste Incineration Directive addresses the operating conditions of incineration plants. An assessment of the compliance of the proposed Glanpower facility against the requirements of Article 6 is summarised in Table D.2.3.

Table D.2.3: Article 6 of Waste Incineration Directive – Assessment of Compliance

Article 6	Assessment of Compliance
1. Incineration plants shall be operated in order to achieve a level of incineration such that the slag and bottom ashes Total Organic Carbon (TOC) content is less than 3% or their loss on ignition is less than 5% of the dry weight of the material. If necessary appropriate techniques of waste pre-treatment shall be used.	The proposed process comprises two stage thermal treatment i.e. pyrolysis chamber followed by secondary cyclonic convertor. Waste pre-treatment is applied as described in Section D.2.3. Laboratory analysis of the slag arising is included in Appendix D.21.
(1 continued:) Incineration plants shall be designed, equipped, built and operated in such a way that the gas resulting from the process is raised, after the last injection of combustion air, in a controlled and homogeneous fashion and even under the most unfavourable conditions, to a temperature of 850°C, as measured near the inner wall or at another representative point of the combustion chamber as authorised by the competent authority, for two seconds. If hazardous wastes with a content of more than 1 % of halogenated organic substances, expressed as chlorine, are incinerated, the temperature has to be raised to 1,100 °C for at least two seconds.	Minimum temperature in the secondary cyclonic convertor is set at 900˚C based on char having less than 1% halogenated organic substances. Temperature monitoring will be installed at the top of the secondary cyclonic convertor, surface temperature of the retort and at the inlet to the heat recovery system. The temperature will also be measured at the inlet and outlet of the purpose installed residence time tube. CFD modelling and design calculations have confirmed the requisite two seconds residence time. An additional residence time tube will be installed to provide two seconds residence time indent to that from the flow dynamics in the secondary cyclonic convertor.
(1 continued:) Each line of the incineration plant shall be equipped with at least one auxiliary burner. This burner must be switched on automatically when the temperature of the combustion gases after the last injection of combustion air falls below 850 °C or 1,100 °C as the case may be. It shall also be used during plant start-up and shut-down operations in order to	Each of the two secondary cyclonic convertors will be supported by an auxiliary burner as described in Section D.2.8. The auxiliary burners will incorporate a temperature control loop to fulfil the requirements of Article 6 Paragraph 3.

Article 6	Assessment of Compliance
ensure that the temperature of 850 °C or 1,100 °C as the case may be is maintained at all times during these operations and as long as unburned waste is in the combustion chamber.	
(1 continued:) During start-up and shut-down or when the temperature of the combustion gas falls below 850°C or 1,100°C as the case may be, the auxiliary burner shall not be fed with fuels which can cause higher emissions than those resulting from the burning of gasoil as defined in Article 1(1) of Council Directive 75/716/EEC, liquefied gas or natural gas.	The auxiliary burners will be fired with low sulphur kerosene oil.
2. Co-incineration plants shall be designed, equipped, built and operated in such a way that the gas resulting from the co-incineration of waste is raised in a controlled and homogeneous fashion and even under the most unfavourable conditions, to a temperature of 850 °C for two seconds. If hazardous wastes with a content of more than 1% of halogenated organic substances, expressed as chlorine, are co-incinerated, the temperature has to be raised to 1 100 °C.	Not applicable. The proposed plant is classified as an incineration plant (not co-incineration)
3. Incineration and co-incineration plants shall have and operate an automatic system to prevent waste feed: (a) at start-up, until the temperature of 850°C or 1,100°C as the case may be or the temperature specified according to paragraph 4 has been reached; (b) whenever the temperature of 850°C or 1,100°C as the case may be or the temperature specified according to paragraph 4 is not maintained; (c) whenever the continuous measurements required by this Directive show that any emission limit value is exceeded due to disturbances or failures of the purification devices.	The waste and SRF feed systems will comprise automatic conveyors which will be operated under temperature set-point control. The waste and SRF feed systems will comprise automatic conveyors which will be operated under temperature set-point control. Emission values detected by the CEMS above set-point emission limit values will automatically trigger an operator alarm. Upon activation of such alarm, the operator will immediately stop the waste feed forward until the emission alarm has been investigated and satisfactorily resolved.
4. Conditions different from those laid down in paragraph 1 and, as regards the temperature, paragraph 3 and specified in the permit for certain categories of waste or for certain thermal processes may be authorised by the competent authority, provided the requirements of this Directive are met. Member States may lay down rules governing these authorisations. The change of the operational conditions shall not cause	Not applicable It is not proposed to operate the facility under conditions different from those laid down in paragraph 1 or paragraph 3.

Article 6	Assessment of Compliance
more residues or residues with a higher content of organic pollutants compared to those residues which could be expected under the conditions laid down in paragraph 1.	
(4 continued:) Conditions different from those laid down in paragraph 2 and, as regards the temperature, paragraph 3 and specified in the permit for certain categories of waste or for certain thermal processes may be authorised by the competent authority, provided the requirements of this Directive are met. Member States may lay down rules governing these authorisations. Such authorisation shall be conditional upon at least the provisions for emission limit values set out in Annex V for total organic carbon and CO being complied with.	Not applicable It is not proposed to operate the facility under conditions different from those laid down in paragraph 2 or paragraph 3.
(4 continued:) In the case of co-incineration of their own waste at the place of its production in existing bark boilers within the pulp and paper industry, such authorisation shall be conditional upon at least the provisions for emission limit values set out in Annex V for total organic carbon being complied with.	Not applicable
(4 continued:) All operating conditions determined under this paragraph and the results of verifications made shall be communicated by the Member State to the Commission as part of the information provided in accordance with the reporting requirements.	Not applicable to Glanpower. Reporting to the European Commission is the responsibility of the EPA.
5. Incineration and co-incineration plants shall be designed, equipped, built and operated in such a way as to prevent emissions into the air giving rise to significant ground-level air pollution; in particular, exhaust gases shall be discharged in a controlled fashion and in conformity with relevant Community air quality standards by means of a stack the height of which is calculated in such a way as to safeguard human health and the environment.	The results of (i) the air modelling exercise undertaken as part of the Environmental Impact Statement and (ii) revised air model based on subsequent design alteration have demonstrated that the facility will not give rise to significant ground-level air pollution.
6. Any heat generated by the incineration or the co-incineration process shall be recovered as far as practicable.	Heat is recovered at various stages of the process. The pyrolysis chamber intrinsically recovers the heat of the secondary cyclonic convertor exhaust in order for the pyrolysis reaction to occur. Residual heat in the pyrolysis exhaust gas will be recovered in a Heat Recovery Steam Generator, producing steam. This steam will feed a steam turbine, which in

Article 6	Assessment of Compliance
	turn will drive a generator producing electricity. Similarly, excess gas engine exhaust heat will be recovered by a separate Heat Recovery Steam Generator (HRSG) producing steam. This steam will feed the same steam turbine described above, resulting in additional electricity generation. Residual gas engine exhaust heat will be recovered via heat exchanger for use in the pre-treatment dryer. The energy efficiency of the plant is addressed in Attachment G.2
7. Infectious clinical waste should be placed straight in the furnace, without first being mixed with other categories of waste and without direct handling.	Consignments of infectious clinical waste will not be accepted at the facility. Elements of clinical waste identified at waste reception will be quarantined for appropriate treatment off-site.
8. The management of the incineration or the co-incineration plant shall be in the hands of a natural person who is competent to manage the plant.	Glanpower is committed to the appointment of a suitably qualified and experienced management team for the operation of the proposed plant. Technical competence and site management is addressed in Attachment C.1. Glanpower and its senior management fulfil the criteria of a “fit and proper” person, as described in Attachment L.2.

ATTACHMENT E

EMISSIONS

SUPPORTING INFORMATION

(15 pages)

- Attachment E.1 Emissions to Atmosphere
- Attachment E.2 Emissions to Surface Waters
- Attachment E.3 Emissions to Sewer
- Attachment E.4 Emissions to Groundwater
- Attachment E.5 Noise Emissions
- Attachment E.6 Environmental Nuisances

ATTACHMENT E.1 EMISSIONS TO ATMOSPHERE

Potential emissions to atmosphere resulting from the proposed Glanpower facility, as originally designed, are detailed in Section 11 of the Environmental Impact Statement (EIS). A summary of the final stack arrangement and associated emissions to air is included in Table E.1.1 below, based on modifications incorporated into the final design arrangement. The sources of the emissions to atmosphere from the proposed facility are as follows:

- 2 no. pyrolysis units;
- 3 no. syngas-fired engines;
- Regenerative Thermal Oxidiser or 'RTO' (associated with waste drying);
- Waste reception hall and materials recovery area odour abatement;
- Emergency generator (minor emission, abnormal operating conditions only).

The design modifications in stack/flue arrangement, compared with that originally proposed in the EIS, are summarised in Table E.1.1.

Table E.1.1: Summary Description of Final Stack Arrangement

Emission to Atmosphere	Original Stack Arrangement (EIS)	Final Stack Arrangement
Pyrolysis Units (2 no.)	One stack. Two SPU exhaust lines routed to single primary 30m stack	No change (one stack)
Syngas Engines (3 no.)	Three secondary stacks (one per engine)	No change. Three secondary stacks (one per engine)
Waste reception hall odour abatement	One stack. All air from waste reception hall routed via activated carbon (AC) filter to one dedicated stack.	Air from the waste reception hall will be drawn for use in the dryer (discharging via RTO stack) and for use as combustion air in secondary cyclonic convertors (discharging via primary 30m pyrolysis stack). Air remaining to be vented will be directed through an odour abatement to new vent close to roof level.
Materials recovery area odour abatement	Waste reception hall and materials recovery area combined as waste handling area in EIS	Air vented via odour abatement unit to new vent close to roof level (same vent as that for waste reception hall) and 8 no. low level roof vents.
Regenerative Thermal Oxidiser (waste drying)	Not included in original design	New stack adjacent to waste reception hall odour abatement

Emission to Atmosphere	Original Stack Arrangement (EIS)	Final Stack Arrangement
		exhaust (replaces stack originally intended for routing of waste reception hall air via AC filter)
Emergency Generator	Not included in original design	New exhaust from emergency generator
Total emission points (to air)	5	7

A number of measures have been incorporated into the design of the facility to ensure that emissions from the plant will not exceed regulatory emission limit values and that emissions will not have an adverse impact on human health or the environment.

Emissions from Pyrolysis System

The pyrolysis process has been designed to ensure that no dioxins can be formed. Any chlorine in the feed will break down and be converted to hydrogen chloride gas (HCl). HCl is highly soluble in water and will therefore be removed and neutralised in the wet scrubbing process. The absence of oxygen prevents the formation of other gases (the largest being nitrogen) that would dilute the gas produced and increase NO_X levels in the gas engine. Acid components will be removed with the pyrolysis gas and the char will not contain acid gas precursor chemicals such as sulphur or chlorine.

With respect to heavy metals, volatile metals such as lead, mercury, antimony, bismuth, etc, which have significant vapour pressure at the pyrolysis temperature, will be reduced to metallic form and will be trapped in the gas scrubber, appearing as a component of the sludge from the scrubber.

After the pyrolysis stage the next stage will be syngas scrubbing, which commences in the primary char separation hopper. The gas will exit the main chamber through a water cooled extraction pipe and will be forced through a 180° turn. This design serves to separate heavy particles by impingement on the baffle plate and by inertia as the gas flow changes direction. The heavier char particles will fall into the bottom of the hopper and will be extracted through a rotary valve to the char system.

The syngas with fine dust content will then enter the hot gas cyclone. This will be a conventional single stage cyclone separator in which remaining dust will be removed to the char system.

The exhaust gas from the two-stage thermal treatment process will be subject to a flue gas treatment stage (Section D.2.14, Attachment D.2), prior to emission to atmosphere. This will ensure compliance with the emission limits established in the Waste Incineration Directive (2000/76/EC).

Syngas Engine Emissions

The operation of the three syngas engines will be a source of emissions. Syngas engine emissions will be minimised as the engines

will be fitted with a Selective Catalytic Reduction (SCR) system, primarily for abatement of NO_X.

Odour

There will be a number of air flows for ventilation of the waste reception hall. Some of the air from the waste reception hall will be drawn as combustion air in the secondary cyclonic convertors, ultimately venting through the building's primary 30m stack. The combustion will act effectively as odour abatement. This air flow can also bypass directly to the stack when combustion does not occur.

Air in the waste reception hall will also be used as feed air for the dryer. Odorous air arising from the drying of waste will be directed through a Regenerative Thermal Oxidiser (RTO), for the treatment of odour, before emission to atmosphere.

Air remaining in the waste reception hall and air from the materials recovery area will be directed through a dedicated odour abatement unit before venting to atmosphere. The method of abatement for this air stream will be based on UV / ionisation / ozone treatment.

Emergency Generator

The emergency generator will be a minor source of emissions as it will only be run for extended periods of time during abnormal conditions (i.e. loss of power from both National Grid supply and on-site supply). The generator will be run for approximately 20 minutes per week for testing. It is estimated that the emergency generator will be used for a total of 20 hours per year.

E.1.1 Stack Emissions

A list of all emission points is included below, categorised under the headings prescribed by the EPA *Waste Licensing Application Guidance Notes (2011)*. There will be seven emission points. Locations of these are as shown on drawing included as Appendix E.1 (drawing no. IE0310150-22-DR-0015).

a) Composting Emissions
Not applicable

b) Particulates – waste storage/treatment/handling
Not applicable

c) Landfill Gas Emissions
Not applicable

d) Landfill Leachate Emissions
Not applicable

e) Infectious organisms/pathogens (clinical waste handling)
Not applicable

f) Thermal oxidiser emissions

- A2-5 Regenerative Thermal Oxidiser (RTO)

g) Other emissions

- A2-1 Primary Stack (Pyrolysis Units)

- A2-2 Engine Exhaust Stack (Gas Engine 1)
- A2-3 Engine Exhaust Stack (Gas Engine 2)
- A2-4 Engine Exhaust Stack (Gas Engine 3)
- A2-6 Odour Abatement Unit
- A2-7 Emergency Generator

Further information on the nature and type of the emissions to air is detailed in the Tables E.1(ii) and E.1(iii) - for each emission point. These tables are included as Appendix E.2. Information on the minor emission point (emergency generator) is detailed in the Table E.1(iv), also included within Appendix E.2.

E.1.2 Fugitive Emissions

- **Dust emissions from solids stored in the open**
  Not applicable. All waste will be unloaded and stored indoors and there will be no storage of solids in the open.

  Loading and unloading operations
  Loading and unloading of waste will take place indoors. The facility structure will be air tight with vehicles only entering and exiting the structure through air lock doors. As such there will be no fugitive emissions to atmosphere from loading/unloading operations.

- **Cleaning operations**
  Cleaning operations will take place within the building and will not results in fugitive emissions

- **Emissions from wastewater / leachate treatment**
  The wastewaters generated will be re-circulated within the process – the contaminants will end up in the residual solid waste streams and the excess water will be evaporated off, thermally oxidised in the secondary cyclonic convertor and emitted to atmosphere (via stack exhaust A2-1 listed above).

  The wastewater treatment system for sanitary effluent is designed as an enclosed system and therefore will not result in fugitive emissions.

The oil tank located in the services yard will be filled using a closed loop system to prevent fugitive emissions. This tank will breathe to atmosphere, as normal for diesel storage tanks.

The construction and operation of the facility will generate additional traffic on the surrounding road network. Traffic can contribute to ground level concentration of certain substances, particularly NO_X. However the amount of additional traffic generated will not be significant (refer to EIS Section 6) and therefore emissions from traffic will not have a significant impact on air quality.

The vitrified slag arising from the secondary cyclonic convertor is inert and odourless and will not result in fugitive emissions. Flue gas treatment residues will be reprocessed within the two-stage treatment process and therefore will not be stored in significant quantities which may otherwise be a source of fugitive emissions.

Other chemicals which will be used on-site, such as water treatment chemicals, SNCR and SCR reagent (urea/ammonia), biocides and filter media (listed in Table G.1, Attachment G.1) will be stored indoors within the main building in enclosed containers.

ATTACHMENT E.2 EMISSIONS TO SURFACE WATERS

The surface water drainage system is described in detail in Section D.1.k, Attachment D. Further information on the surface water management system has been submitted to Offaly County Council, as part of the original planning application (ref. PL2/10/307). The surface water drainage system on-site was designed using the software package MicroDrainage. Met Éireann rainfall data for Athlone was used in the design.

E.2.1 Process Water

There will be no process effluent discharge from the facility to public sewer. Washwater from the cleaning of the waste reception hall floor and water from the external wheelwash will drain to an underground effluent storage tank, located beneath the service yard. Collected effluent from this tank will be siphoned off to tanker for collection under permit and subsequent disposal to a suitably licensed facility.

The scrubber water treatment system (Section D.2.16, Attachment D.2) will operate on a continuous recycle loop. Excess water from this system will be directed to the secondary cyclonic convertor.

E.2.2 Stormwater

The surface water drainage system will discharge to one outfall (SW1) as shown on the drawing included as Appendix E.1 (IE0310150-22-DR-0015).

Full details of the surface water emission are set out in Table E.2(i), included as Appendix E.3. Table E.2(ii) has not been completed due to the nature of emission, varying with rainfall. However it is expected that surface water emission limits will be included as a condition of any waste licence granted by the EPA. These limits will apply to parameters including but not limited to total suspended solids, pH, TOC and electrical conductivity.

Surface water emissions at SW1 will comprise non-contaminated runoff from the internal site roadways and other paved areas, in addition to runoff from building roof areas. All runoff will drain to the outfall at SW1 through an underground drainage network via petrol interceptors, grit traps and an underground surface water attenuation tank (592m^3).

The proprietary attenuation structure and hydrobrake flow control device have been designed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS), to provide a maximum discharge rate of 8.62l/s.

The attenuation tank has been sized to provide sufficient capacity for a 1:30 year storm. In the case of greater rainfall amounts, up to a 1:100 year rainfall event, these stormwaters will be retained within the boundary of the site (either within the attenuation tank, on the surface of paved areas, low lying landscaped areas, etc.).

A high level overflow will be provided from the storage structure to the ditch network to allow storm events in excess of the 1:100 year event to overspill to the ditch network.

The landscaped areas of the site will continue to drain naturally to existing drainage ditches and will not be open to sources of potential contamination from the process or operations on-site.

E.2.3 Potential for Surface Water Contamination

There are two main potential causes for contamination of surface waters on-site, as follows:

1. Fire on-site resulting in firewater draining to surface water network
2. Chemical spills and leaks on areas of hardstanding draining to surface water network

In the event of fire on-site, the surface water outfall SW1 will be shut and firewater will be contained within the attenuation tank and underground surface water network to prevent the potential release of pollutants which may be contained in the firewater.

Detailed procedures and training will be established for the use, handling and storage of all chemicals on-site to ensure the risk of spills is minimised. Chemicals will be stored in designated, labelled areas and bunding will be provided where required. Bunding will be designed in accordance with EPA requirements. Preventative maintenance and routine monitoring of tanks and equipment will minimise the likelihood of leaks/spills occurring and ensure that any leaks are quickly detected and controlled.

Drainage from the surface water network will pass through three petrol interceptors and monitoring chamber, prior to discharge at SW1. The implementation of chemical storage/handling best practice measures coupled with physical drainage and monitoring infrastructure on-site will ensure that surface water emissions discharged are not contaminated.

The underground attenuation tank and effluent collection tank will be fitted with level alarms to inform site operators of any blockages and potential for overflow. All bunds and external tanks will be subject to regular inspection and maintenance.

ATTACHMENT E.3 EMISSIONS TO SEWER

There will be no emissions to the sewer of a sanitary authority from the proposed facility.

Tables E.3(i) and E.3(ii) have therefore not been completed.

ATTACHMENT E.4 EMISSIONS TO GROUNDWATER

E.4.1 Percolation Area Emission to Groundwater

There will be one emission to ground from the groundwater percolation area of the proposed facility at GW1, as shown on the drawing included as Appendix E.1 (IE0310150-22-DR-0015). Table E.4(i) of the application has been completed with details of this emission to groundwater and is included as Appendix E.4.

The emission will consist of treated sanitary effluent from canteen facilities, sinks, toilets etc. on-site. The sanitary effluent will be treated and discharged through an on-site *Aswaflow* packaged treatment plant and polishing filter. Further details on the Aswaflow treatment plant are included in Section D.1.k, Attachment D. The soil polishing filter has been sized based on the "T" value determined from the percolation test carried out by Offaly County Council.

The treatment system and polishing filter have been designed to achieve a high standard prior to discharge to groundwater. The expected emission values are summarised in Table E.4.1 below.

Table E.4.1: Typical Sanitary Effluent Quality

Parameter	Prior to Treatment	Treated (*Aswaflow* plant)	After Polishing Filter
pH	6-8	7-7.5	7
BOD_5	>300	<15	<5
COD	>900	<75	<35
Total solids	>200	<30	<4
Ammonia (NH_3-N)	<60	<10	<1

The above values are taken from the detailed design report carried out by the selected wastewater treatment vendor, Molloy Precast Ltd. Further information on the design of the wastewater treatment plant and polishing filter are documented in this report (included as Appendix D.5).

E.4.2 Other Groundwater Emissions

Measures to prevent fugitive groundwater emissions are described in Section F.1.2, Attachment F.

ATTACHMENT E.5 NOISE EMISSIONS

The main sources of noise have been identified in Table E.5(i), included as Appendix E.5. The sound data has not been completed pending the final selection of manufacturer for plant equipment. As detailed design is progressed, Glanpower will submit all noise data obtained from manufacturers to the EPA.

E.5.1 Operational Noise Emissions

There will be a number of different noise sources associated with the operation of the facility. These include noise generating equipment which will run during normal operation and also equipment which will only run in emergency situations. The noise generated by the facility if not properly mitigated could impact on ambient noise levels in the surrounding environment.

All significant process plant and equipment (e.g. engines etc.) will be housed within the building and therefore will have minimal impact on ambient noise levels external to the building. Construction materials and cladding for the buildings housing noise generating plant and equipment will have an appropriate Sound Reduction Index (SRI).

Based on design modifications since the submission of the original planning application and EIS, a number of new noise sources will be sited outdoors. These include:

- Regenerative Thermal Oxidiser (RTO);
- Pump house
- External back up generator;
- Electrical transformers;
- Steam turbine condenser units.

Based on the location of the proposed facility and existing noise levels (as measured in the EIS) dominated by traffic on the adjacent N80, it is predicted that these additional noise sources will not cause a significant increase in noise to the external environment.

The facility will be designed using acoustic enclosures where necessary, so that there will be no clearly audible tonal or impulsive component in the noise from the proposed plant at any noise sensitive location.

The minimisation of noise will form an integral part of the detailed design. The various noise control and attenuation measures to be employed at the plant can be summarised as follows:

- As part of the detailed design and tendering process, stringent noise level criteria will be specified for all plant and equipment;
- Acoustic insulation / enclosures and attenuation will be provided on plant and equipment as necessary;
- Plant and equipment will be maintained and serviced on a maintenance schedule;
- Site access roads will be of smooth hard standing surface to reduce vehicular noise.

E.5.2 Other Noise Emissions

All significant sources of plant noise during the operational phase will be located within the main building. The other sources of noise emissions associated with the proposed development are construction phase noise and site traffic, as described below.

(i) Construction Phase Noise

An assessment of noise generated during construction of the facility was completed as part of the EIS (Section 9.5 of EIS). In summary, construction noise will be generated for a limited period during the construction phase. The level of construction noise during the daytime will be minimised as much as practicable to limit the impact on ambient noise levels and noise sensitive receptors (e.g. residential dwellings) in the vicinity.

(ii) Site Traffic

An assessment of the traffic generated by the proposed development was completed as part of the EIS. As concluded in Section 5.4.2 of the EIS, it is estimated that the proposed development will increase network flows on the adjacent national secondary route by 0.6%. Given the adjacency of the site to the N80 and existing traffic noise, it is considered that there will be an imperceptible impact on ambient noise levels as a result of site traffic.

E.5.3 Vibration Emissions

No rock blasting or related activities will be undertaken during the construction phase. The building foundations will be piled and this activity will be carried out using a continuous flight auger, a technique which is used to minimise noise and vibration. Therefore it is not anticipated that this activity will generate vibrations significant enough to impact on local residents.

There are no significant sources of vibration associated with the plant or equipment to be used as part of the proposed activities.

ATTACHMENT E.6 ENVIRONMENTAL NUISANCES

E.6.1 Bird Control

As all waste consignments will be delivered in enclosed trucks and as all waste handling operations will be undertaken indoors, it is not expected that the facility will be a particular attraction for birds.

Bird diversity was assessed as part of the EIS and determined to be relatively low with Hooded Crows *Corvus cornix,* flocks of Linnet *Carduelis cannabina* and a single Mistle Thrush *Turdus viscivorus* noted within the site. A Kestrel *Falco tinnunculus* was seen flying past the site to the west. Previous studies recorded Rook *Corvus frugilegus*, Wren *Troglodytes troglodytes,* Spotted Flycatcher *Musciapa striata*, Siskin *Carduelis spinus* and Treecreeper *Certhia familiaris* at the site (Fehily Timoney & Company; 2008). Barn Swallow *Hirundo rustica* would also be expected to use the site.

It is considered important that the facility does not impact on the existing bird population. In order to minimise the effect of lighting and visual disturbance on the nearby nature Derryclure Woods, planting of Holly *Ilex aquifolium* will take place at the commencement of the development (2 plants/m). This evergreen native tree species will block out much of the security lighting that may be required and other visual stimuli whilst providing food and shelter for a range of existing birds and insects. Temporary security and working lighting will be cowled and adjustable to be directed downwards.

E.6.2 Dust Control

The following mitigation measures will be put in place to minimise and dust generation and thus preventing any significant impacts on air quality:

- Wheel washing of all trucks leaving site;
- Good housekeeping and site management including the proper storage of spoil/loose materials on site;
- Proper containment of loose materials that are transported on or off site;
- Damping of site road as necessary.

Further mitigation measures will be employed during the construction phase to prevent where possible and otherwise minimise dust emissions. These measures will be documented in the Construction Management Plan to be prepared for submission to the local authority, in accordance with Condition 11 of the planning approval granted by An Bord Pleanála (ref. PL 19.238420). Such measures will include, among others, control of earthen stockpiles (e.g. excavated material), site traffic management plan, dedicated car parking area, site speed limit, regular monitoring of dust emissions and daily inspections of site activities and work schedule.

E.6.3 Fire Control

Details of the fire risk and emergency response system are included in Section 2.6.3 of the EIS and Section D.1.o, Attachment D.1.

E.6.4 Litter Control

All waste will be accepted at the site in enclosed trucks. The cover on each waste consignment will only be removed once the truck has entered the facility to prevent windblown litter. Furthermore, all waste will be handled and pre-treated within the building.

The external areas, roads and footpaths will be monitored daily for litter by scheduled inspections and maintained in a clean and orderly manner using good housekeeping practices. A written inspection log will be maintained to record time of inspection and any actions taken.

The facility is sited in a low lying area, with shelter provided to the south from Derryclure Woods and as such, the activity is not located in a particularly exposed location. A landscaping plan, to be finalised in accordance with Condition 12 of the planning consent (ref. PL 19.238420), will provide further shelter to reduce wind impacts

E.6.5 Traffic Control

A detailed traffic impact assessment was completed for the proposed development, the results of which are documented in Section 5 of the EIS. The traffic control for the site is summarised in Section D.1.j (Attachment D.1) of this application.

It is proposed to provide a roundabout on the existing internal site access road, which will facilitate ease of access to the site. A ghost island will be provided at the centre of the access road where it adjoins the N80. The sightline provision for access onto the N80 is 215m in either direction, from a setback distance of 3m from the roadside edge. This is in accordance with the NRA *Design Manual for Roads and Bridges*.

Prior to the commencement of development, details of a Construction Traffic Management Plan (CTMP) for the control and operation of the upgraded junction during the construction phase will be submitted and agreed in writing with Offaly County Council. The CTMP will be subject to ongoing review during the construction period, related to the numbers of construction employees based on-site. Works on the proposed junction and access road will be completed to the satisfaction of Offaly County Council within the first phase of development and well in advance of commencement of operations. This is in accordance with the requirements of Condition 8 of the planning consent granted by An Bord Pleanála (ref. PL 19.238420).

Furthermore, a detailed site lighting layout including provision for lighting of all internal roads, storage and hardstanding areas, circulation areas between buildings and pedestrian walks etc. will be submitted for agreement to Offaly County Council.

E.6.6 Vermin Control

Due to the proposed reception of municipal waste in significant quantities, there is potential for attracting vermin such as rats, insects and flies. Vermin control will be managed with good housekeeping techniques and a contract with a specialist pest control company will be established.

The following control measures will reduce the potential impacts from vermin and pests:

- Undertaking all waste reception and storage operations involving biodegradable materials within enclosed buildings;
- Minimising the time between initial collection of waste and process at the proposed facility;
- Weekly site inspections by staff members (including written records/logs of all site visits, inspections, treatment and other actions);
- Monthly inspection by specialist pest control company, including inspection and treatment of areas where rats are likely to live (drains, culverts, etc);
- Potential odour emissions from the waste handling area will pass through an activated carbon filter to remove any residual odour, which may attract vermin;
- Good housekeeping measures to ensure the site is litter free;
- Following arrival at the facility, waste will be handled and processed within a timeframe of 24 hours, extending up to a maximum of 48 hours for events including Bank Holidays and unplanned/emergency downtime.

E.6.7 Road Cleansing

Wheel wash facilities will be provided on-site for both construction and operational phases to ensure the quantities of dust on the local road network arising from site activities are minimised.

The internal site roads, access road and footpaths will be inspected and cleaned regularly by water spray as required.

Good housekeeping practices will be employed at the site to keep the site, roads and footpaths litter free.

ATTACHMENT F

CONTROL & MONITORING

SUPPORTING INFORMATION

(22 pages)

- Attachment F.1 Emissions Control and Abatement
- Attachment F.2 Air Quality Monitoring & Sampling
- Attachment F.3 Surface Water Monitoring & Sampling
- Attachment F.4 Effluent to Sewer – Monitoring & Sampling
- Attachment F.5 Groundwater Monitoring & Sampling
- Attachment F.6 Noise Monitoring
- Attachment F.7 Meteorological Monitoring

ATTACHMENT F.1 EMISSIONS CONTROL & ABATEMENT

F.1.1 Air Emissions

Stack Emissions

A2-1 Primary Stack (Pyrolysis Units)

The pyrolysis units have been designed to comply with the emission limits set out in Directive 2000/76/EC on the incineration of waste. The quantity and quality of air emissions resulting from the pyrolysis process are optimised in the following ways:

1. Process optimisation
   - Waste acceptance and handling procedures
   - Pre-treatment step, including waste drying, to convert waste intake to homogeneous Solid Recovered Fuel (SRF)
   - Combustion optimisation (char combustion in secondary cyclonic convertors)
2. Physical and chemical treatment of pyrolysis-derived syngas
   - Syngas scrubbing
   - Syngas conditioning
3. Physical and chemical treatment of flue gas
   - Flue gas treatment (including SNCR on pyrolysis flue gas and SCR on engine flue gas)

The pyrolysis technology has been developed as an efficient system to convert biomass and waste into a clean gas for use in CHP (combined heat and power) and electricity production without emitting hazardous toxins that other technologies (eg, conventional incineration) may generate. The pyrolysis process may be summarised as follows:

- Incoming fuel will be thermally decomposed in chambers at high temperature in the absence of oxygen;
- The hydrogen rich synthetic gases (syngas) formed in the chambers will be scrubbed to remove any contaminants;
- The cleaned syngas will then be combusted in three engines, thereby generating energy;
- Non-volatile fractions in the fuel will be converted into a solid char;
- The char will be combusted to deliver the heat in the chambers.

The pre-treatment step[1] (removing metals, hard particles and moisture) provides a homogeneous Solid Recovered Fuel (SRF). This provides a cleaner material for incineration than direct combustion of the waste.

The syngas scrubbing and conditioning steps are described in Sections D.2.9 and D.2.10 respectively of Attachment D.2.

[1] Section D.2.3, Attachment D.2

The flue gas treatment step is described in Section D.2.14, Attachment D.2.

Further details on the treatment, abatement and control proposed for the emissions from the pyrolysis units (emission point A2-1) are given in Table F.1 (A2-1), Appendix F.2.

A2-2 / A2-3 / A2-4 Secondary Stacks (Syngas Engines)

Each of the three syngas engines will have an associated secondary stack (3 no. stacks in total for engines).The syngas produced in the pyrolysis chambers is a mixture of light gases (including hydrogen, carbon monoxide, methane and ethane and similar short chain hydrocarbons), heavier gases and condensable organics. The composition of the syngas is compared with typical natural gas composition in Table F.1.1. The data contained in this table for syngas was determined by laboratory analysis of syngas discharged from a trial pyrolysis unit[2], which is identical to that proposed for the Derryclure facility. Six samples of syngas were analysed and the results averaged to give typical syngas composition. The trial unit was operated on 100% SRF feed (worst case scenario for emissions). The certificates of analysis for syngas composition are included as Appendix F.1.

Table F.1.1: Comparison of Waste Derived Synthesis Gas (Syngas) and Natural Gas

Parameter	% vol / vol		Comments
	Natural Gas	Syngas	
Hydrogen (H_2)	≤0.1% (molar)*	3.13	Converted to water during combustion
Oxygen (O_2)	≤0.2% (molar)*	1.36	Low levels of oxygen will have little effect on combustion
Hydrogen Sulphide (H_2S)	≤ 5mg/m^3 *	<0.01	
Nitrogen (N_2)	0-5	9.18	
Carbon Monoxide (CO)	No limits stated	11.63	Converted to CO_2 during combustion
Methane (CH_4)	70-90	40.99	
Carbon Dioxide (CO_2)	0-8	22.72	Unaffected during combustion
Ethane (C_2H_6)	0-20	1.67	Converted to CO_2 and water during combustion
Propene (C_3H_6)	No limits stated	3.8	
Propane (C_3H_8)	No limits stated	0.5	
C4 – Butane (n-C_4H_{10})	No limits stated	0.59	
C5 – Pentane (n-C_5H_{12})	No limits stated	0.04	

* = Limit specified in UK Gas Safety (Management) Regulations 1996 (UK S.I. No. 551 of 1996).

[2] Single trial pyrolysis unit operated by vendor under permit.

The syngas engines will each be equipped with a Selective Catalytic Reduction (SCR) injection system to minimise the emissions of NO_X to the atmosphere.

Based on the gas comparison tabulated above and proposed SCR abatement system, the combustion of syngas in the engines will not result in the emission of any greater level of pollutants than the combustion of natural gas. Based on full combustion, the hydrogen and carbon monoxide will be fully consumed and converted to water and carbon dioxide.

Further details on the treatment, abatement and control proposed for the emissions from the syngas engines (emission points A2-2, A2-3 and A2-4) are given in Table F.1 (A2-2, A2-3, A2-4), Appendix F.2.

It is noted that Chapter IV of the Industrial Emissions Directive (2010/75/EU) establishes the future monitoring requirements for waste incineration and co-incineration plants. Article 42 of this Directive states that the Chapter (provisions for waste incineration and waste co-incineration plants) *"shall not apply to gasification or pyrolysis plants, if the gases resulting from this thermal treatment of waste are purified to such an extent that they are no longer a waste prior to their incineration and they can cause emissions no higher than those resulting from the burning of natural gas"*.

While the primary emission point (A2-1) will be required to meet the provisions of Industrial Emissions Directive Chapter IV, it is submitted that the combustion of scrubbed and conditioned syngas, as a fuel for the generation of electricity, will not be subject to the provisions for waste incineration and waste co-incineration plants.

A summary of the design measures to minimise emissions to atmosphere is provided in Table F.1.2.

Table F.1.2: Summary of Air Emission Parameters and Control

Emission Parameter	Emission Control Employed
Dioxins / Furans	The hydraulic loading system to the pyrolysis chamber has been designed to squeeze out any air from the fuel to ensure that oxygen will be excluded. The exclusion of oxygen prevents combustion of the fuel within the pyrolysis chambers and ensures that no dioxins can be formed.
Nitrogen Oxides (NO_x)	The hydraulic loading system to the pyrolysis chamber has been designed to squeeze out any air from the fuel to ensure that oxygen will be excluded. The exclusion of nitrogen ensures that the syngas is not diluted and that NO_x levels are minimised (when the syngas is combusted). Dedicated flue gas treatment including SNCR.
Chlorine (Cl)	Any chlorine in the feed will break down and be

Emission Parameter	Emission Control Employed
	converted to hydrogen chloride gas (HCl). HCl is highly soluble in water, and will therefore be removed and neutralised in the wet scrubbing process.
Acid components	Acid components will be removed with the pyrolysis syngas. The char does not contain acid gas precursor chemicals such as sulphur and chlorine.
Heavy metals	Volatile metals such as lead, mercury, antimony, bismuth etc. that have significant vapour pressure at the pyrolysis temperature will be reduced to metallic form and will be trapped in the gas scrubber, appearing as a component of the sludge from the scrubber.
Particulate matter (heavy particles)	After the pyrolysis stage the next process step is gas scrubbing which will be performed in the primary char separation hopper. The syngas will exit the pyrolysis chambers through water cooled extraction pipes. The syngas will then be forced through a 180° turn in the pipes. This serves to separate heavy particles by impingement on the baffle plates and by inertia as the gas flow changes direction. The heavier char particles will fall into the bottom of the hoppers and will be extracted through rotary valves to the char system. Flue gas treatment including ceramic filter.
Particulate matter (fine particles)	Cyclone separator, activated carbon filters and ceramic filters as part of syngas conditioning and flue gas treatment systems. Ceramic filters are used as they operate at high temperatures without the requirement for dilution air to cool exhaust down changing the conditions for effective emissions monitoring. Ceramic filters are highly efficient achieving a particulate reduction as low as 5mg/m^3.

A2-5 Regenerative Thermal Oxidiser (RTO)

The drying of waste at the pre-treatment stage will give rise to malodorous air. For this reason, exhaust gas from the dryer unit will be directed to a dedicated Regenerative Thermal Oxidiser (RTO). The purpose of the RTO is to decompose all odour generating components present in the dryer exhaust gas. Further details on the RTO unit are included in Section D.2.4, Attachment D.2. Further details on the

treatment of odorous air arising from waste drying are (emission point A2-5) are given in Table F.1 (A2-5), Appendix F.2.

A2-6 Waste Reception Hall / Materials Recovery Area

Waste will be unloaded and stored indoors within the waste reception hall so as to minimise the escape of odours. Also the facility's structure will be air tight with vehicles only entering the structure through rapid operation rolling airlock doors. Odorous air to be vented from the waste reception hall and materials recovery area will be handled in a number of ways. The combustion air required for the secondary cyclonic convertors will be drawn from the waste reception hall and this air will ultimately vent through the primary 30m stack. The combustion will act as effective odour abatement. Air for the waste dryer will also be drawn from the waste reception hall and this air stream will vent through a Regenerative Thermal Oxidiser for odour abatement. The remaining air from the waste reception hall and materials recovery area will be directed through an odour abatement system (UV / ionisation / ozone) prior to venting to atmosphere. The flue gas treatment and odour abatement systems for the facility are described in Section D.2.14, Attachment D.2. Further details on the treatment of this odorous air stream are (emission point A2-6) are given in Table F.1 (A2-6), Appendix F.2.

A2-7 Emergency Generator

Emissions from the emergency generator will be tested during the commissioning phase of the facility, to ensure they are consistent with the levels specified by the supplier for normal operation. Sampling and analysis will be undertaken by an accredited laboratory to verify the emission levels of oxides of nitrogen (NO_X), carbon monoxide (CO), total organic carbon (TOC) and particulates.

The emergency generator will be tested weekly for approximately 20 minutes during which time any abnormal emissions will be detected and investigated.

The emergency generator will only be operated during abnormal conditions. Table F.1 for this emission point A2-7 has been completed and is included in Appendix F.2.

Fugitive Air Emissions

As discussed in Section E.1.2 (Attachment E.1), there will be no significant fugitive emissions generated by the activities proposed for the Glanpower facility, requiring dedicated treatment/abatement.

Odorous air to be vented from the waste reception hall and materials recovery area will be vented as described previously.

Odour associated with the waste drying operation will be treated at the regenerative thermal oxidiser.

F.1.2 Effluent Emissions

The activities proposed will not have a wet trade (process) discharge to public sewer. There will be no emission to the sewer of a sanitary authority.

Scrubber Liquor

The scrubber water treatment system will be operated on a continuous recycle loop system, as described in Section D.2.16, Attachment D.2. Excess water from this system will be directed to the secondary cyclonic convertor. The pre-treatment chemical composition of the scrubber water is included in Table F.1.3.

Table F.1.3: Pre-treatment Chemical Composition of Scrubber Water

Parameter	Concentration (mg/l)	Method of Analysis
BOD	1991	APHA-5210-B
COD	4312	APHA-5220-D
Total Suspended Solids	518	APHA-5240-D
Total Dissolved Solids	16447	APHA-2540-C
pH	4 (no units)	APHA-4500-H
MTBE	74.82	GC-MS
Diesel Range Organics	2.85	GC-MS
Benzene	48.28	GC-MS
Toluene	16.08	GC-MS
Ethylbenzene	2.85	GC-MS
Xylene (o,m,p)	1.14	GC-MS
Total Cyanides	5.26	APHA-4500-CN-C
Total PAH	2625.15	GC-MS
Acenaphthene	210.43	GC-MS
Acenaphthylene	252.59	GC-MS
Anthracene	681.47	GC-MS
Benzo(a)anthracene	39.65	GC-MS
Benzo(b)fluoranthene	7.49	GC-MS
Benzo(k)fluoranthene	172.42	GC-MS
Benzo(g,h,i)perylene	1.93	GC-MS
Chrysene	289.59	GC-MS

Parameter	Concentration (mg/l)	Method of Analysis
Dibenz(a,h)anthracene	4.97	GC-MS
Fluoranthene	490.11	GC-MS
Indeno(1,2,3,c,d)pyrene	1.21	GC-MS
Naphthalene	98.46	GC-MS
Phenanthrene	8.79	GC-MS
Pyrene	98.83	GC-MS
Benzo(a)pyrene	266.73	GC-MS

The primary method for reduction of BOD, COD, PAH, BTEX is electro-coagulation and electro-oxidation, as described in Section D.2.16, Attachment D.2.

Wash Water

Wash down of the process area in the building will be required. Floor wash down points will be provided which will drain to an external underground storage tank (located beneath the service yard). This tank will retain the wash down effluent until siphoned off to tanker for transport off-site under permit and treatment/disposal to a suitably licensed facility.

As discussed in Attachments E.2 and E.4, there will be a single surface water discharge (SW1) and a single discharge to ground/groundwater (GW1). Details of the treatment/abatement applied to these emissions are provided below.

Surface Water Discharge - SW1

The surface water drainage system has been designed to control the emission of surface water from point SW1 at a maximum allowable discharge no greater than the greenfield runoff rate. The runoff rate was calculated based on IOH 124 method (paragraph 6.6.1.2 of the Greater Dublin Strategic Drainage Study). The hydrobrake to be installed at the surface water outfall will regulate the flow of surface water emission within the allowable discharge of 8.62l/s.

Surface waters collected from building roof areas, areas of hard-standing will discharge at SW1 via petrol interceptors. Further details on these petrol interceptors are included in Section D.1.k, Attachment D.1. An attenuation tank has been designed to provide capacity for a 1:30 year storm.

Table F.1 (SW1) has been completed for the surface water emission and is included in Appendix F.3. Table F.1 (SW1) includes information on the treatment, abatement and control for surface water emissions.

Ground/Groundwater Discharge - GW1

There will be a single emission to ground/groundwater discharged through an on-site *Aswaflow* packaged treatment plant and polishing filter.at GW1, as described in Section E.4.1, Attachment E.4 and Section D.1.k, Attachment D.1.

Table F.1 (GW1) has been completed for the ground/groundwater emission and is included in Appendix F.4. Table F.1 (GW1) includes information requested on the treatment, abatement and control for ground/groundwater emissions.

Fugitive Effluent Emissions

Fugitive effluent emission may arise from the following three main sources:

1. Storage of materials and substances
2. Underground storage tanks (loss of containment)
3. Fuel or oil spills from moving vehicles

The control and abatement of these potential fugitive emissions is discussed further below.

1. <u>Storage of Materials & Substances</u>

All raw materials, wastes, chemicals, residues and consumables will be handled indoors within the main building, with the exception of the following:

- Oil stored in the external storage tank. The oil storage tank will be bunded in accordance with EPA requirements.
- Effluent siphoned from underground effluent storage tank located beneath service yard. Waste will only be withdrawn from the effluent tank by a specialist contractor.
- Contaminated runoff siphoned from underground attenuation tank located to west of building (in event of contaminated surface water or firewater requiring diversion for off-site treatment). Contaminated runoff will only be withdrawn from the attenuation tank, if necessary, by a specialist contractor.
- Potable water stored externally. In the event of loss of containment of potable water, there will be no pollutant released to the environment.
- Lube oil required for the operation of the syngas engines will be delivered at a dedicated external area to the west of the building. This area has been designed with dedicated drainage, via petrol interceptor, to the surface water drainage system.

Materials and substances stored indoors, with the potential to pollute surface and/or groundwaters, will be stored in appropriate containers/tanks, in designated areas with bunding provided as required to prevent unplanned release. Bunded areas will be provided in accordance with the requirements of the EPA Guidance Note on *Storage & Transfer of Materials for Scheduled Activities*.

2. <u>Underground storage tanks (loss of containment)</u>

There will be two underground storage tanks (surface water attenuation tank and effluent storage tank). These will be designed in accordance with *BS8007 Design of aqueous Liquid Retaining Concrete Structures* to prevent release of contents to groundwater.

3. Fuel or oil spills from moving vehicles

All vehicles arriving and leaving or operating at the facility will be driven on areas of hardstanding. In the event of a spill not entering a surface water drain, the spill will be cleaned using a spill kit and the clean up material treated appropriately as waste for off-site disposal. In the event of a fuel spill entering the surface water system, the petrol interceptors will act to prevent the onward release of pollutants (e.g. PRO, DRO) being discharged from the surface water system. Spill kits will be maintained on-site, containing a range of absorbent materials (pads, socks, granules etc.) to clean up any fuel/oil or other hazardous spill.

F.1.3 Noise Emissions

The facility has been sited in an area of low residential density and is located approximately 350m from the nearest noise sensitive location (private dwelling north-west of site).

All significant items of process equipment and plant generating noise will stored indoors. External noise sources will include the regenerative thermal oxidiser (RTO), transformers, emergency generator and steam turbine condenser units. Based on the results of the baseline noise survey for the site and the dominant influence of traffic noise from the N80, there is no significant impact envisaged from the additional noise sources included in the updated design.

The air-tight system of interlock doors (designed primarily for the control of odour) will also ensure that noise arising from operations within the main facility building will not be emitted through open doors.

Items generating significant noise levels will be housed within acoustic enclosures where possible.

The number of HGV deliveries to site will be limited to 18 per day, reducing the possible impact from traffic related noise. The facility is sited adjacent to the existing N80 national road route. The existing ambient noise environment is dominated by traffic noise, as demonstrated by the daytime and night-time noise surveys completed as part of the Environmental Impact Statement (EIS). The facility will be operated to ensure that noise emissions do not cause an increase >5dB(A) above existing noise levels at the nearest noise sensitive location.

ATTACHMENT F.2 AIR QUALITY MONITORING & SAMPLING

F.2.1 Stack Emissions Monitoring

The measurement of emissions to air will be carried out in accordance with the requirements of:

1. Governing legislation (namely Article 11 of the Waste Incineration Directive 2000/76/EC where applicable);
2. Specifications of equipment manufacturers;
3. EPA Guidance:
   - Guidance Note on Site Safety Requirements for Air Emissions Monitoring (AG1);
   - Air Emissions Monitoring Guidance Note #2 (AG2);
   - Air Guidance Note on the Implementation of I.S. EN 14181 (AG3);
   - Odour Impact Assessment Guidance for EPA Licensed Sites (AG5).

Monitoring of emissions to air will be undertaken as described below.

A2-1: Pyrolysis Unit Stack

Emissions from the primary 30m stack will be monitored at the stack location A2-1, located at grid reference E235161, N220194, as shown on the drawing included as Appendix E.1. (drawing no. IE0310150-22-DR-0015). Monitoring will comprise continuous measurements (CEMS unit), scheduled periodic grab samples and spot checks as required by governing legislation (primarily the Waste Incineration Directive (2000/76/EC)). The sample points will be clearly signed or labelled as appropriate. The completed Table F.2 (A2-1), describing the emission parameters to be monitored, monitoring frequency and accessibility of sampling points, is included in Appendix F.5.

Measurements of pollutants and air emission monitoring equipment will be in compliance with the following standards:

1. BS EN 15267-1:2009 Air Quality: Certification of Automated Measuring Systems. General principles;
2. IS EN 14181 Stationary source emissions. Quality assurance of automated measuring systems[3];
3. BS EN 13284: 2002 Stationary source emissions – Determination of low range mass concentration of dust;
4. BS EN 14884: 2005 Air quality. Stationary source emissions. Determination of total mercury: automated measuring systems.

Monitoring equipment will be certified to MCERTS standard and in line with the requirements of EPA Guidance Note AG2. Maintenance / service agreements will be established with suppliers for scheduled calibration, service and repair (where required) of all monitoring equipment.

[3] The application of the standard EN 14181 will be informed by the guidance contained in CEN/TR 15983: 2010 Stationary source emissions – guidance on the application of EN 14181:2004.

Continuous Measurements

The following parameters will be subject to continuous measurement utilising probes positioned in the stack:

- Oxides of nitrogen (NO_X);
- Sulphur dioxide (SO_2);
- Carbon monoxide (CO);
- Total Organic Carbon (TOC);
- Particulates (total dust);
- Hydrogen chloride (HCl);
- Hydrogen fluoride (HF);

The concentration of oxygen, temperature, pressure and water vapour content of the exhaust gas will also be continuously measured at the stack A2-1.

The CEMS unit to be installed will be an ABB automatic system (ACF-NT) or equivalent, based on FTIR[4] spectrometer, which is capable of measuring a broad suite of parameters including NO, SO_2, HCl and CO. The unit designed by ABB includes a self-diagnostic feature so that errors are automatically identified, documented and a maintenance request is generated. ABB analysers have been approved for industrial use by most certifying authorities and conform to UK MCERTS standard requirements.

Measurements recorded will be relayed to a central SCADA computer system, running a specialist software-based package for emission recording. A live measurement feed to this control system will enable operators to monitor and thus control emissions. All emission measurements recorded will be stored on the computerised system and specialist software will provide rapid access to average results of varying frequencies (eg, half hour, weekly, monthly, annual averages

Periodic (Non-continuous) Measurements

The following parameters will be subject to periodic measurement:

- Cadmium (Cd) + Thalium (Ti);
- Mercury (Hg);
- Heavy metals including antimony (Sb), arsenic (As), (Cd), chromium (Cr), cobalt (Co), copper (Cu), lead (Pb), manganese (Mn), nickel (Ni) and vanadium (V);
- Dioxins and furans (PCDD/F).

The frequency of monitoring for these parameters is outlined in Table F.2 (A2-1), included in Appendix F.5. Grab samples will be taken by an independent testing and laboratory service, using MCERTS accredited contractors where feasible.

Independent laboratory facilities undertaking analysis of periodic grab samples will be selected on the basis of INAB/UKAS accreditation to the international standard ISO 17025 for relevant parameters.

[4] Fourier Transform InfraRed Spectroscopy

A2-2 / A2-3 / A2-4: Syngas Engine Stacks

As described in Section F.1.1, it is submitted that the engine stack emissions (arising from combustion of syngas) will not be subject to the provisions of the Industrial Emissions Directive (2010/75/EU). Based on the nature of the emissions arising from the combustion of the syngas, discontinuous monitoring on a quarterly basis is proposed for the gas engine stacks. All monitoring will be carried out in accordance with EPA requirements (ref. guidance documents AG2, AG3 described above) and at the frequency determined by the EPA.

The completed Table F.2 (A2-2 / A2-3 / A2-4), describing the emission parameters to be monitored, monitoring frequency and accessibility of sampling points, is included in Appendix F.5. The co-ordinates for these monitoring points are as follows:

- A2-2: E235158, 220194
- A2-3: E235158, 220194
- A2-4: E235158, 220193

F.2.2 Ambient Monitoring

Ambient monitoring of odour will be undertaken weekly at various points on the site boundary, including a minimum of two boundary locations. The method for this monitoring of odour will be 'sniff test'. An additional off-site location (i.e. nearest residence) will be included in the weekly monitoring inspection if wind is blowing from the direction of the site towards the off-site residence.

Based on wind direction (recorded at the site meteorological station) and weather forecast for a given day, routine monitoring will be undertaken at varying locations to be selected in accordance with EPA guidance[5]. As noted in Section 3 of EPA guidance AG5, the locations of the individual observations are likely to vary with each assessment. Accordingly grid co-ordinates for odour monitoring locations have not been stated. Odour monitoring locations AA1-1 and AA1-2 have been highlighted as indicative locations on the drawing included as Appendix E.1 (drawing no. IE0310150-22-DR-0015). Assuming that the wind is blowing in the direction from the facility to the nearest receptor, these are indicative locations for upwind and downwind monitoring locations.

The monitoring points will typically include:

1. Upwind site boundary location
2. Off-site receptor located downwind (depending on wind direction)
3. Downwind site boundary location

In the event of odour being detected or receipt of complaint regarding odour, ambient monitoring of odour will be carried out. Additional monitoring locations to those described above may be included (i.e. at points perpendicular to the plume axis and equidistant from the source).

[5] Air Guidance Note 5 (AG5) Odour Impact Assessment Guidance for EPA Licensed Sites

The suspected source of any odour is visited only when the ambient monitoring at all locations has been completed. All findings will be documented in a *Field Record Sheet*, prescribed by the EPA guidance note referred to previously.

An *Odour Complainant Log Sheet* will be made available to members of the public at reception. This will allow for members of the public to register odours which they have personally experienced and believe to be associated with operations at the site.

Completed Field Record Sheets and Odour Complainant Log Sheets will be stored on file and reviewed regularly by designated Glanpower personnel.

All ambient odour monitoring will be undertaken in accordance with the requirements of EPA Guidance AG5 Odour Impact Assessment Guidance for EPA Licensed Sites. Details are summarised in Table Ff (AA1-1 / AA1-2) included in Appendix F.5.

ATTACHMENT F.3 SURFACE WATER MONITORING & SAMPLING

F.3.1 Construction Phase Monitoring

Surface water monitoring will be carried out on a quarterly basis during the construction phase in order to monitor water quality and ensure that construction works are not having any impact on the surface waters. Samples will be collected at two points (one upstream and one downstream of site works) for analysis by an accredited laboratory for the following parameters as a minimum:

- Electrical conductivity;
- Temperature;
- Turbidity;
- Chemical Oxygen Demand (COD);
- Total Suspended Solids;
- pH;
- Orthophosphate;
- Diesel Range Organics (DRO);
- Petrol Range Organics (PRO).

The results of the analysis will then be compared with the relevant surface water quality standards in S.I. 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations 2009. Any results which exceed the standards or show unusual trends will be investigated and corrective actions will be implemented by the construction management team.

F.3.2 Operational Phase Monitoring

Surface water emissions at SW1 (E23507, N22022) will comprise non-contaminated runoff from the internal site roadways and other paved areas in addition to runoff from building roof areas. All runoff will drain to the outfall at SW1 through an underground drainage network via petrol interceptors, grit/silt traps and an underground surface water attenuation tank. In accordance with the *BAT Guidance Notes for the Waste Sector: Waste Transfer Activities*, interceptors have been provided for to safeguard against potential pollution from oil/chemical spillage and vehicle washing. Petrol interceptors will be visually inspected on a monthly basis and emptied/cleaned in accordance with supplier recommendations. The monthly visual inspection will incorporate a check of the surface water discharge point for potential damage and maintenance/repair if required. All inspections and associated actions (if any) will be documented in written/electronic records as part of the Environmental Management System (EMS).

Point Source Monitoring

Monitoring of the surface water emission will comprise continuous monitoring of flow, temperature, pH, conductivity and additional parameters requested by the EPA or Offaly County Council. The monitoring location MSW1 (E235086, N220223) is shown on the

drawing included as Appendix E.1 (drawing no. IE0310150-22-DR-0015). Further details are included in Table F.2 (MSW-1) included in Appendix F.6.

Ambient Monitoring

As the facility will only discharge uncontaminated surface water runoff (at a rate no greater than the greenfield equivalent), it is not considered necessary to include for surface water monitoring of the existing drainage ditch upstream/downstream of the emission point SW1. The design of the surface water network (including attenuation), good site management practices and emission monitoring will ensure that surface water emissions are sufficiently controlled and monitored.

ATTACHMENT F.4 EFFLUENT TO SEWER – MONITORING & SAMPLING

There will be no discharge to the sewer of a sanitary authority. Accordingly there is no requirement for associated monitoring/sampling.

ATTACHMENT F.5 GROUNDWATER MONITORING & SAMPLING

F.5.1 Construction Phase Monitoring

Monitoring of groundwater quality status, during both construction and operational phases of the facility, will be undertaken at two groundwater well locations installed at the site (one upgradient, one downgradient of the facility).

During the construction phase, groundwater sampling will be undertaken at the two groundwater well locations (AGW1-1, AGW1-2) to monitor the impact (if any) of construction works on local groundwater quality. Groundwater samples collected during the construction phase will be analysed for parameters including pH, conductivity, nitrate, nitrite, ammonia (NH_4), TOC, chloride, fluoride, heavy metals and organohalens.

F.5.2 Operational Phase Monitoring

Point Source Monitoring

There will be one emission to ground from the groundwater percolation area of the proposed facility at GW1, as shown on the drawing (Appendix E.1). A sampling point MGW1-1 will be located at the discharge of the *Aswaflow* package treatment plant (E235117, N220142). At this point, samples will be collected on a quarterly basis for laboratory analysis. Details of the parameters to be monitored are included in Table F.2 (GW-1) included in Appendix F.7.

Ambient Monitoring

Groundwater monitoring will be carried out at two monitoring wells which have been installed as part of site investigation works. One groundwater well is sited upgradient of the facility (AGW1-1) and the other is sited downgradient of the facility (AGW1-2), taking in to account the position of the main building, paved and landscaped areas and the direction of groundwater flow. The groundwater monitoring wells are located as follows:

- AGW1-1 E235106, N220162
- AGW1-2 E235279, N220251

Sampling at the groundwater wells described above and the associated laboratory analysis will be undertaken on a quarterly basis. An independent suitably accredited laboratory will be engaged for the analysis of parameters including, but not limited to:

- Conductivity;
- Total Organic Carbon (TOC);
- Ammonia (NH_4)
- pH;
- Nitrate;
- Nitrite;
- Chloride;

- Fluoride;
- Metals (Cd, Tl, Hg, Pb, Cr, Cu, Mn, Ni, As, Co, V, Sn) and their compounds;
- Organohalens;
- Total coliforms.

Further parameters will be included for analysis if required by the EPA. The details for monitoring of groundwater samples are included in Table Ff (AGW1-1 / AGW1-2), included in Appendix F.8.

Results of monitoring will be compared against the groundwater quality standards contained in S.I. 9 of 2010 European Communities Environmental Objectives (Groundwater) Regulations 2010.

ATTACHMENT F.6 NOISE MONITORING

F.6.1 Point Source Emission Monitoring

It is proposed to commission an independent noise survey during the first year of operation of the facility, to assess the noise levels arising from the significant sources of noise identified in Attachment E.5. These noise levels will be compared against supplier data. For each significant noise source (N1 to N6), the following data will be collated and reviewed:

- Location and height of noise source
- Sound pressure level (dBA) at a distance of 1m from the source
- 1/3 octave band analysis (dB) including an assessment of tonal/impulsive noise component(s)
- Period/duration of noise emission
- Loading details (plant running at 75%, 50% capacity etc.)

F.6.2 Ambient Noise Monitoring

An independent environmental noise survey will be commissioned annually (or more frequently as determined by the EPA) to assess noise levels at four site boundary locations (AN1-1, AN1-2, AN1-3, AN1-4) and at the nearest noise sensitive location (AN1-5), as shown on the drawing included as Appendix E.1 (drawing no. IE0310150-22-DR-0015). The coordinates of the proposed monitoring locations are as follows:

- AN1-1 E235078, N220262
- AN1-2 E235093, N220120
- AN1-3 E235348, N220131
- AN1-4 E235343, N220248
- AN1-5 E234925, N220612

For each monitoring location, the following data will be recorded and reviewed:

- Sound pressure levels (L_{Aeq}, L_{A90}, L_{A50}, L_{A10}, L_{Amax}) (dBA)
- 1/3 octave band analysis (dB) including an assessment of tonal/impulsive noise component(s)
- Noise sources observed (whether from site or external sources)
- Loading details (plant running at 75%, 50% capacity etc.)
- Weather conditions

Noise monitoring will be undertaken in accordance with the requirements of EPA guidance NG4 and ISO 1996 Acoustics – Description and Measurement of Environmental Noise and EPA guidance. The annual noise survey will include daytime, evening and

night-time measurements, in accordance with EPA guidelines. The noise monitoring regime is summarised in Table Ff (AN1, AN2, AN3, AN4, AN5), included in Appendix F.9.

In the event of a complaint received from an external party with regard to facility noise emissions, the complaint will be investigated and a noise monitoring survey may be undertaken if deemed necessary.

ATTACHMENT F.7 METEOROLOGICAL MONITORING

A meteorological monitoring station (reference point AA2) will be installed on-site to allow for the measurement of wind speed, wind direction, atmospheric pressure, precipitation volume and temperature. Subject to detailed design (ongoing), the location of the weather station will be as shown on the drawing included as Attachment E.1 (grid reference E235122, N220221) or an alternative location agreeable to the EPA.

The proposed meteorological monitoring regime is outlined in Table Ff (AA2), included in Appendix F.10.

A windsock will be installed on top of the main building, visible from the public roadway. Measurements of meteorological conditions will be in accordance with the guidelines of the World Meteorological Organisation.

ATTACHMENT G

RESOURCE USE & ENERGY EFFICIENCY

SUPPORTING INFORMATION

(9 pages)

- Attachment G.1 Raw Materials, Intermediates & Products
- Attachment G.2 Energy Efficiency

ATTACHMENT G.1 RAW MATERIALS, INTERMEDIATES & PRODUCTS

The process related raw materials, intermediates, products and other materials to be used during the operation of the proposed facility are listed in Table G.1. This table include the quantities to be stored, annual usage, nature of use, toxicity data and environmental information.

Chemical substances will be stored in accordance with supplier recommendations and a register of Material Safety Data Sheets (MSDS) will be maintained on-site.

Table G.1 Details of Process related Raw Materials, Intermediates, Products, etc., used or generated on the site

Ref. Nº or Code	Material/ Substance[1]	CAS Number	Danger[2] Category	Amount Stored (tonnes)	Annual Usage (tonnes)	Nature of Use	R[3] - Phrase	S[3] - Phrase
M1	Solid recovered fuel (SRF)	N/A	Not applicable		62,400 (max)	Fuel for pyrolysis	Not applicable	Not applicable
M2	Biomass (wood chip)	N/A	Not applicable		10,000	Fuel for pyrolysis	Not applicable	Not applicable
M3	Low sulphur kerosene oil	8008-20-6	Harmful, irritant, dangerous for the environment	18	6.5	Priming of thermal oxidiser and RTO (6.5t excludes RTO)	R65, R38, R51/53	S23, S24, S36/37, S43, S61, S62
M4	Hydraulic oils	Mixture	Not applicable	Minor	Minor	Lubricant (eg, motors, compactors, plant etc.)	Not applicable	Not applicable
M5	Intermediate residual char	Mixture	Not applicable	N/A	Variable	Intermediate residual from pyrolysis process used as fuel for thermal oxidiser	Not applicable	Not applicable
M6	Vitrified slag residue (inert)	Mixture	Not applicable	65	Not applicable	Residue of char combustion	Not applicable	Not applicable
M7	Syngas (mixture of carbon monoxide and hydrogen)	Mixture	Extremely flammable, toxic	Not applicable	Variable based on fuel intake	Product of pyrolysis units used as fuel for gas engines		
	- Carbon monoxide	630-08-0	Extremely flammable, toxic				R12, R61, R23, R48/23	
	- Hydrogen	12408-02-5	Extremely flammable				R12	
M8	Sodium hydroxide (caustic)	1310-73-2	Corrosive	Minor	Minor	pH adjustment for water used in scrubber	R35	Not applicable
M9	Sulphuric acid	7664-93-9	Corrosive	Minor	Minor	pH adjustment for water used in scrubber	R34	S24/25, S26, S28, S36/37/39
M10	Transformer oil	63148-62-9	Not applicable	Minor	0	Transformers	Not applicable	Not applicable
M11	Electricity import (Note 4)	N/A	Not applicable	Not applicable	To be confirmed	Start-up/shutdown period requirements	Not applicable	Not applicable
M12	Nitrogen (gaseous)	7727-37-9	Not applicable	To be	To be	System purging	Not	Not

Ref. Nº or Code	Material/ Substance[1]	CAS Number	Danger[2] Category	Amount Stored (tonnes)	Annual Usage (tonnes)	Nature of Use	R[3] - Phrase	S[3] - Phrase
				confirmed	confirmed		applicable	applicable
M13	SNCR reagent (urea / ammonia)	Mixture	Not applicable	To be confirmed	To be confirmed	SNCR (NO_X abatement – pyrolysis emissions)		
M14	SCR reagent (urea ammonia)	Mixture	Not applicable	To be confirmed	To be confirmed	SCR (NO_X abatement – syngas engine emissions)		
M15	Activated carbon	7440-44-0	Not applicable	Minor	Minor	Syngas cleaning filter (prior to engines)	Not applicable	S22, S24/25
M16	Stabilised chlorine dioxide biocide	Mixture	Irritant	Minor	Minor	Process water treatment (prevention of Legionnella)	R31, R36/37/38	S26, S24/25, S36/37/39
M17	Monoethylene glycol	000107-21-1	Harmful	Minor	Minor	Water jackets operation	R22	S2
M18	Stabilised bromine biocide	Mixture	Irritant	Minor	Minor	Water treatment for cooler operation	R31, R36/38	S26, S28, S37, S50
M19	Sand media			Minor	Minor	Water circuit purification		

Notes: 1. In cases where a material comprises a number of distinct and available dangerous substances, please give details for each component substance.
2. c.f. Article 2(2) of SI Nº 77/94
3. c.f. Schedules 2 and 3 of SI Nº 77/94
4. The required electricity import during start-up and shutdown for the entire facility, including pre-treatment activities, will be determined at detailed design stage (ongoing).

ATTACHMENT G.2 ENERGY EFFICIENCY

G.2.1 Energy Efficiency in Design

The pyrolysis technology proposed has been developed as an efficient system to convert energy crop biomass and pre-treated waste into a clean gas for use in CHP (combined heat and power) and electricity production. The process will provide a source of low carbon indigenous electricity. The process has been designed to be inherently energy efficient by utilising the char produced by pyrolysis as a fuel source for the system (as described in Sections D.2.7 and D.2.8, Attachment D.2). The two stage pyrolysis process reduces the impact of corrosivity and allows for maximum energy recovery.

The facility will be a net exporter of energy, through the generation of electricity directly in the syngas engines and secondly, by using Heat Recovery Steam Generators linked to a steam turbine for the recovery of residual heat energy. The combined efficiency of this approach has been reviewed against gas turbine technology and the relative efficiencies are higher for the chosen route.

Gas engines were chosen due to their higher open cycle efficiency (35% compared to 28%) and also because the gas pressure requirements are considerably lower than that for a gas turbine, i.e. less than 1 bar compared to approximately 18 bar. The compression of gas is expensive and uses large amounts of parasitic load. With a gas engine, a lower pressure gas storage system can be used that is simpler to operate and avoids gas liquids formation and disposal. In addition the operation and maintenance of a gas engine is simpler than a turbine.

Heat energy will be recovered from the pyrolysis unit exhaust stream in a Heat Recovery Steam Generator (HRSG). This HRSG will produce steam feeding a steam turbine, which in turn will drive a generator to produce electricity.

Similarly, excess heat in the syngas engine exhaust stream will be recovered in a second HRSG. This HRSG will produce additional steam for the facility's single steam turbine. Residual heat in the syngas engine exhaust stream will then be recovered via heat exchanger for drying in the preparation of the solid recovered fuel (SRF).

In traditional pyrolysis technologies the convention has been to use some (up to 30%) of the product or syngas to heat the retort and the by products i.e. char, tars and oils produced, would be disposed of to landfill. The technology proposed by Glanpower uses the energy in the char, tar and oils as fuel for the system thereby allowing all syngas to go for electricity generation.

Further energy efficiency measures to be implemented during the operational phase are as follows:

- All doors will be fitted with sprung door closers to conserve heat;
- When not in use, all equipment (lights, heaters, plant and equipment) will be switched off;

- Where practical, site lighting will:
  - Be on a timer / photovoltaic / sensor system,
  - On low lux for after hours,
  - Controlled by photocells to ensure light fittings do not operate during daytime hours;
- Documents will be scanned and e-mailed instead of photocopying where possible;
- Building lighting will be controlled by central switching i.e. non essential light fittings will be turned off when not required;
- All office heaters will be controlled by time clocks to ensure heaters do not operate when not required;
- Overall energy usage for the construction site will be monitored on an ongoing basis to ensure excessive electricity is not being used.

G.2.2 Energy Efficiency Requirements of Waste Framework Directive

It is submitted that the principal class of waste activity under the Fourth Schedule of the Waste Management Acts 1996 to 2011 will be as follows:

"R1. Use principally as a fuel or other means to generate energy: This includes incineration facilities dedicated to the processing of municipal solid waste only where their energy efficiency is equal to or above:
- 0.60 for installations in operation and permitted in accordance with applicable Community Acts before 1 January 2009
- 0.65 for installations permitted after 31 December 2008, using the following formula, applied in accordance with the reference document on Best Available Techniques for Waste Incineration: Energy efficiency $(E_p-(E_f + E_i)) / (0.97 \times (E_w+E_f))$*"*

The energy efficiency criteria (commonly known as the 'R1 formula') is calculated as follows:

$$\frac{(E_p - (E_f + E_i)}{(0.97 \times (E_w + E_f)}$$

where:

E_p equals the annual produced and utilised energy from waste (total of heat/steam plus electricity as equivalents) (GJ/year). According to BREF notes, this includes both exported and circulated energy. Electricity output is multiplied by 2.6 as it is considered to be move valuable than heat. Heat output is multiplied by 1.1

E_f equals the annual energy input to the system by imported energy (fuels) contributing to the production of steam (GJ/year) e.g. auxiliary fuels. Only the energy contributing to normal operations is included here.

E_i equals the annual imported energy without steam production (excluding E_w and E_f) (GJ/year) e.g. for start-up and shutdown

E_w equals the annual energy contained in the treated waste calculated using the net calorific value of the waste (GJ/year)

0.97 is the factor applied to account for energy losses in bottom ash and radiation

This has been calculated in accordance with the *"Guidelines on the Interpretation of the R1 Energy Efficiency Formula for Incineration Facilities Dedicated to the Processing of Municipal Solid Waste According to Annex II of Directive 2008/98/EC on Waste"*[1].

For the Glanpower facility, the energy efficiency has been calculated to a value of 0.84, in excess of the requisite value of 0.65.

The calculation of the energy efficiency using this formula is included in Appendix G.1.

G.2.3 High Performance CHP

Directive 2004/8/EC[2] (as amended) on the promotion of cogeneration based on useful heat demand in the internal energy market defines high efficiency cogeneration, as providing primary energy savings (*PES*) of at least 10% compared with the references for separate production of heat and electricity.

The values used for calculation of electricity from cogeneration are determined on the basis of the expected or actual operation of the unit under normal conditions of use. Under Annex III of Directive 2004/8/EC, *PES* is primary energy savings, which is defined as:

$$PES = \left[1 - \frac{1}{\frac{CHP\ H\eta}{Ref\ H\eta} + \frac{CHP\ E\eta}{Ref\ E\eta}} \right]$$

where:

CHP Hη is the heat efficiency of the cogeneration production defined as annual useful heat output divided by the fuel input used to produce the sum of useful heat output and electricity from cogeneration.

Ref Hη is the efficiency reference value for separate heat production.

CHP Eη is the electrical efficiency of the cogeneration production defined as annual electricity from cogeneration divided by the fuel input used to produce the sum of useful heat output and electricity from cogeneration. Where a cogeneration unit generates mechanical energy, the annual electricity from cogeneration may be increased by an additional element

[1] European Commission Directorate General Environment, June 2011

[2] European Directive on the promotion of cogeneration based on a useful heat demand in the internal energy market and amending Directive 92/42/EEC

representing the amount of electricity which is equivalent to that of mechanical energy. This additional element will not create a right to issue guarantees of origin in accordance with Article 5.

$Ref\,E\eta$ is the efficiency reference value for separate electricity production.

For the Glanpower facility, the primary energy savings (PES) has been calculated to a value of 0.179 (17.9%). As the primary energy savings value is greater than 10%, the overall system can therefore be classified as a high efficiency CHP plant.

The calculation of the PES using the above formula is described in Appendix G.2.

G.2.4 Compliance with Waste Management Acts 1996 to 2011 (Energy Efficiency)

Subparagraph (xii) of paragraph (a) of Section 41(2) of the Waste Management Acts 1996 to 2011 requires that *"it shall be a condition of any waste licence covering incineration or co-incineration with energy recovery that the recovery of energy take place with a high level of energy efficiency"*.

The commercial premise of the plant is based on energy generation and in this regard the success of the operation, in addition to environmental performance, is driven by achieving the highest possible degree of energy efficiency. The system proposed has been designed to achieve an overall process efficiency greater than 80%. This will enable compliance with the proposed Renewable Energy Feed In Tariff (REFIT) for High Efficiency Combined Heat and Power. This connection with the REFIT regime is a critical rationale for the development, as proposed.

As described in Section G.2.2, the facility meets the energy efficiency criteria established under the Waste Framework Directive.

G.2.5 Energy Production

The proposed Glanpower Energy from Waste facility has been submitted to the European Investment Bank as one of two Irish proposals for the EU Commission NER 300 funding programme for innovative renewable energy[3].

The anticipated electrical load is summarised in Table G.2.1 overleaf. The facility will be a net exporter of electricity. The current connection agreement being discussed with Electricity Supply Board (ESB) Networks proposes to connect the site with the upstream Clonminch 38kVa Station via approx 3km of overhead or underground 20kV rated cabling. The station in Clonminch is located due north of the site on the town side (Tullamore) of the town's bypass road and is the closest station with existing spare capacity.

[3] http://www.dcenr.gov.ie/Energy/Sustainable+and+Renewable+Energy+Division/NER+300.htm

Table G.2.1: Facility Electrical Load

Description	Generating Capacity (MW)
Gas Engine 1	3.2
Gas Engine 2	3.2
Gas Engine 3	3.2
Steam Turbine	1.56
Total Generating Capacity	**11.16**
Total Parasitic Load	2
Total Export Load (MEC)	**9.16**

ATTACHMENT H

MATERIALS HANDLING

SUPPORTING INFORMATION

(10 pages)

- Attachment H.1 Waste Types & Quantities
- Attachment H.2 Waste Acceptance
- Attachment H.3 Waste Handling
- Attachment H.4 Waste Arisings
- Attachment H.5 Waste Reuse & Recycling

ATTACHMENT H.1 WASTE TYPES & QUANTITIES

H.1.1 Waste Types and Quantities

The types and quantities of wastes to be accepted at the proposed facility are provided in Tables H.1(A), (B), (C) and H.1.2 of the application form. The classes of waste activity are described in Attachment B.7.

All waste materials accepted at the facility (65,000tpa) will be subject to pre-treatment (preliminary operations) prior to submission to energy recovery. This activity is covered under Class R12.

The pre-treatment step will result in the removal of recyclable fractions (including glass, metals, hard particles), non-conforming items (hazardous materials, WEEE etc.) and 95% moisture. It is estimated that recyclable and non-conforming waste removed will reduce the amount of material sent for energy recovery by approximately 9% of the total waste intake. The quantity of waste remaining will be reduced by approximately 30% at the drying step, before submission for pyrolysis. The overall pre-treatment activity will result in 40,000-50,000tonnes per annum of Solid Recovered Fuel (SRF) suitable for pyrolysis. These figures are based on the waste composition profile contained in the *EPA Municipal Waste Characterisation Report 2008*. The waste composition profile for the proposed Glanpower facility is tabulated in Appendix H.1.

However the facility has been designed to process a greater quantity of SRF material, up to 62,400tonnes per annum, whilst remaining within the limits of 65,000tonnes per annum waste intake. This will allow for any possible variation in the quality of waste intake, whereby a greater proportion of the incoming waste material would be converted to SRF suitable for pyrolysis. This variation may arise due to the possible acceptance of dry waste consignments, greater segregation of waste at source etc.

To allow for variations in the waste consignments accepted (e.g. dry waste loads), it is submitted that up to a maximum of 62,400tonnes per annum of waste will be used principally as fuel, under the R1 activity.

Following pre-treatment operations and prior to pyrolysis, solid recovered fuel (SRF) (62,400tpa maximum) may be stored temporarily in the fuel storage area to allow for process control. The vitrified slag (3,200tpa) arising from the combustion of pyrolysis char will also be stored temporarily on-site pending consignment off-site, however the slag stream arises only following the processing of SRF (no additional tonnage). The storage activities may be considered under Class R13.

No consignments of hazardous waste will be accepted at the facility.

H.1.2 Pre-Treatment

The requirements for pre-treatment of waste are set out in the technical guidance document *"Municipal Solid Waste – Pre-treatment & Residuals Management"* (EPA, 2009).

For waste-to-energy (WtE) incineration, it is required to demonstrate that what is accepted for combustion has been appropriately pre-treated.

Source Separation

The proposed Glanpower development has been designed to treat the quantities of 'third bin' or 'black bin' waste arising from source separated (2-bin or 3-bin) streams (see Attachment L.4). The facility will not accept 'green bin' (source separated dry recyclable) or 'brown bin' (source separated biodegradable) waste for thermal treatment. This is in compliance with the minimum pre-treatment obligations specified by the EPA for WtE incineration.

Additional Pre-Treatment Onsite

The front end of the proposed Glanpower facility will incorporate additional pre-treatment equipment to ensure that inorganic recyclable material remaining in the 'black bin' waste stream is diverted from the WtE incineration step for reuse/recycling off-site. The pre-treatment process on-site is described in Section D.2.3, Attachment D.2.

Biodegradable Waste Treatment

The need for infrastructure to deal with the biodegradable component of the residual bin from municipal waste collections has been identified by the EPA. The National Waste Report 2010 (NWR 2010) states that:

"Source separated collections of biodegradable waste in themselves will not ensure that Ireland meets the diversion targets set out in the EU Landfill Directive. For example, the residual bin from a three bin household collection service can contain up to 47% biodegradables (by weight)…Treatment of this biodegradable component of the residual waste will be essential in order to meet the 2013 and 2016 Landfill Directive diversion obligations."

Furthermore, the NWR 2010 states that:

"Waste to energy incineration and refuse derived fuel will certainly contribute, as will mechanical biological treatment (MBT) processes."

It is submitted that the Glanpower model proposed, in terms of the waste types and quantities to be accepted and further pre-treated, will ensure the following:

- Diversion of municipal inorganic recyclable waste in the black bin stream from landfill;
- Provision of infrastructure to treat the biodegradable portion of the residual bin from municipal collection services (thereby diverting this biodegradable portion from landfill)[1].

[1] This has been identified by the EPA as a "priority for improvement in biodegradable municipal waste management in Ireland." (p.34 of NWR, 2009)

ATTACHMENT H.2 WASTE ACCEPTANCE

H.2.1 Waste Acceptance Procedure

A draft waste acceptance procedure document has been prepared by Glanpower for the proposed facility and a copy is included as Appendix H.2. This will be further developed following the facility's construction and prior to commencement of operations.

ATTACHMENT H.3 WASTE HANDLING

H.3.1 Waste Handling Procedure

A draft waste handling procedure document has been prepared by Glanpower for the proposed facility and a copy is included as Appendix H.3. This will be further developed following the facility's construction and prior to commencement of operations.

ATTACHMENT H.4 WASTE ARISINGS

H.4.1 Solids Residues

Solids Residues Generated

The methods proposed for minimising the amount and harmfulness of residues are described in Attachment D.1.t.

Tables H.4(i) and H.4(ii) of the application form have been completed and are included as Appendices H.4 and H.5 respectively.

The pyrolysis system will process up to a maximum of 62,400 tonnes per annum (tpa) of fuel, sourced from pre-treated mixed municipal solid waste or SRF (up to 62,400 tpa maximum) and energy crop biomass (up to 10,000 tpa maximum). The overall intake of waste and biomass will be balanced to match the capacity of the pyrolysis units (7.8tph). The primary solid residue generated will be approximately 3,200 tpa of inert vitrified slag (approximately 5% of fuel input). This quantity is low volume compared with high ash residues from conventional incineration plants.

Spent oils and flue gas treatment media arising from the various plant components, including the water treatment system, may be recycled internally within the system i.e. combined with the feedstock to the pyrolysis unit or the secondary cyclonic convertor, depending on the substance and its energy content. (Lube oil used for the operation of the gas engines will be replaced at regular intervals on a '*supplier take-back*' basis i.e. spent lube oil will be replaced by fresh oil and spent oil removed by the oil supplier for treatment off-site.)

Storage of Residues

The vitrified slag residue arising from the combustion of char in the secondary cyclonic convertors will be stored in floor pits directly beneath the secondary cyclonic convertors (ref. Section D.2.8, Attachment D.2).

This inert slag material is suitable for reuse as road building material and it is intended to direct this material for reuse/recovery subject to market demand. During the early years of operation, it may be necessary to divert the slag material for disposal to landfill. Laboratory analysis is included as Appendix D.22.

Glanpower has initiated further research to demonstrate conclusively that the slag material is suitable for reuse and appropriate for different outlets, as an inert material. It is anticipated that this research will have been completed prior to commencement of operations.

H.4.2 Other Waste Arisings

Minor quantities of wastes will be generated in the day-to-day operation of the facility. A description of these wastes is included in Table H.4.1 overleaf. Reduction of waste arising will be included as an objective of the site Environmental Management System (EMS) to ensure unnecessary quantities of these waste streams are prevented and that necessary consumption is minimised

Table H.4.1: Other Wastes Arising

Waste Type	EWC Code(s)	EWC Description	Details and Quantities	Handling, Reuse & Disposal Details
Oil interceptor waste	13 05 02* 13 05 06* 13 05 07*	Sludges from oil/water separators Oil from oil/water separators Oily water from oil/water separators	Minor quantities of residual waste arising from scheduled inspection and emptying petrol interceptors, to prevent pollutant emission to surface water outfall	Oil interceptors will be emptied by a suitably qualified and permitted contractor and waste arising will be sent for off-site treatment
WEEE (Waste Electrical and Electronic Equipment)	16 02 14	Discarded equipment other than those mentioned in 16 02 09 to 16 02 13	Minor quantities of equipment used on-site, broken beyond repair or requiring replacement as recommended by supplier following period of use	In accordance with supplier recommendations and the waste hierarchy
Canteen waste	20 01 01 20 01 02 20 01 08 20 01 25 20 01 39 20 01 40	Paper and cardboard Glass Biodegradable kitchen/canteen Edible oil and fat Plastics Metals	Minor quantities of waste generated by on-site canteen/kitchenette facilities provided for 50 no. staff/employee members.	Recyclable canteen waste including glass, aluminium cans and other metals will be sent for off-site recycling. Grease trap(s) on outlets from the kitchen/canteen areas will be emptied by a specialist contractor and contents collected for off-site recycling. Based on the minor quantities of paper/cardboard and biodegradable food waste generated by the canteen, it is proposed that these streams be processed on-site.
Office waste	20 01 01 20 01 21*	Paper and cardboard Fluorescent tubes and other	Minor quantities of waste generated by office activities (e.g. reception, management/administration offices,	A supplier will be engaged for the purchase of fluorescent light tubes on a replacement (supplier take-back) basis.

Waste Type	EWC Code(s)	EWC Description	Details and Quantities	Handling, Reuse & Disposal Details
	20 01 29* 20 01 30 20 01 33* 20 01 35* 20 01 39 20 01 40	mercury containing waste Detergents containing dangerous substances Detergents other than those mentioned in 20 01 29 Batteries and accumulators included in 16 06 01, 16 06 02 or 16 06 03 and unsorted batteries and accumulators containing these batteries Discarded electrical and electronic equipment other than those mentioned in 20 01 21 and 20 01 23 containing hazardous components Plastics Metals	meeting rooms, security hut etc.).	Waste arising from office cleaning activities (eg, detergents) which cannot be recycled or processed on-site will be sent for off-site disposal. Battery boxes will be placed in the office for collection of waste batteries and these will be sent for off-site recycling. Recyclable office waste including plastics and metals will be sent for off-site recycling. Office paper and cardboard waste will be processed on-site within the pre-treatment and pyrolysis system. As the quantities of these streams will be relatively minor, the transport of these materials off-site is not considered justified.
Garden green waste (landscaping)	20 02 01 20 02 02	Biodegradable waste Soil and stones	Minor quantities of garden waste generated by landscaping activities (planting, pruning, cutting of grass areas)	Green garden waste (grass cuttings etc.) will be composted on-site among planted areas, where suitable.

ATTACHMENT H.5 WASTE REUSE & RECYCLING

H.5.1 Reuse and Recycling

It is the intention of Glanpower to utilise mixed municipal waste currently sent to landfill for pre-treatment and recovery, whereby the recyclable inorganic fraction will be firstly removed for reuse or recycling (insofar as practicable) and only the residual fraction will be used at the pyrolysis stage for conversion to energy.

The proposed activities include for the following segregated waste streams to be sent for recycling (or reuse):

- Heavy particles (including glass, ceramics, stones)
- Ferrous and non-ferrous metals
- Waste electrical electronic equipment

In addition, the vitrified slag residue arising from the pyrolysis process (approx. 3,200 tonnes per annum) has been demonstrated to be an inert waste, suitable for reuse as road building/aggregate material. During the early years of operation, it may be necessary to divert the slag material for disposal to landfill.

As described in Section B.7.2, Attachment B.7, the maximum quantity of residual waste consigned from the facility for onward transport and submission to disposal at an authorised facility will not exceed 15% of the annual waste intake.

H.5.2 Reuse and Recycling Targets – EC (Waste Directive) Regulations 2011

Section 31(2) of the European Communities (Waste Directive) Regulations 2011 (S.I. No. 126 0f 2011) establishes two specific targets for reuse and recycling for the year 2020. These targets are described below with details of how the proposed Glanpower facility will contribute to the targets set out.

Target 31(2)(a)

"By 2020, the preparing for reuse and the recycling of waste materials such as, at least, paper, metal, plastic, and glass from households and possibly from other origins as far as these waste streams are similar to waste from households, shall be increased to a minimum of overall 50% by weight."

The most recently published National Waste Report (EPA) shows that in 2010, a recycling rate of 53% was achieved for these waste streams.

The pre-treatment stage of the proposed facility is designed to supplement and enhance the model of source separation, by removing both metal and glass residual streams which remain in the 'black bin' or 'third bin' (mixed municipal waste) from domestic and commercial sources. This means that mixed municipal waste accepted at the Glanpower facility will be purged of all glass and metal waste materials, which will be sent off-site for recycling. This achieves the desired effect

of further increasing recycling rates, by tackling the problem of residual recyclable waste (glass, metal) deposited in 'black' (or third) bins.

It is considered that the recycling of waste paper and plastic streams is best achieved at source and that the continued progression toward a 2-bin or 3-bin system (replacing 1-bin collection) nationally will provide the most appropriate mechanism for sustaining the recycling rates in paper and plastics.

Target 31(2)(b)

"By 2020, the preparing for reuse, recycling and other materials recovery, including backfilling operations using waste to substitute other materials, of non-hazardous construction and demolition waste excluding naturally occurring material defined in category 17 05 04 in the list of waste shall be increased to a minimum of 70% by weight."

Consignments of construction and demolition (C&D) waste will not be accepted at the proposed facility and as such, the responsibility for achieving this target will primarily lie with the facilities formally accepting and handling (C&D) waste.

However, where minor quantities of construction and demolition waste are discovered to be mixed in municipal consignments, these will be handled in such a way as to facilitate the greatest possible rate of recycling, reuse and recovery. For example, glass, metals, ceramics, other hard particles (e.g. stones) which may arise from construction and demolition activities will be segregated during pre-treatment for reuse, recycling or recovery off-site. Disposal to landfill will only be utilised where more preferable options on the waste hierarchy are not feasible. These wastes may arise from minor C&D activities such as refurbishment of dwellings, garden works, DIY etc.

ATTACHMENT I

EXISTING ENVIRONMENT & IMPACT OF THE FACILITY

SUPPORTING INFORMATION

(26 pages)

- Attachment I.1 Assessment of Atmospheric Emissions
- Attachment I.2 Assessment of Impact on Receiving Surface Water
- Attachment I.3 Assessment of Impact on Sewer
- Attachment I.4 Assessment of Impact of Ground/Groundwater Emissions
- Attachment I.5 Ground and/or Groundwater Contamination
- Attachment I.6 Assessment of Noise Impact
- Attachment I.7 Assessment of Ecological Impacts & Mitigation Measures

ATTACHMENT I.1 ASSESSMENT OF ATMOSPHERIC EMISSIONS

I.1.1 Baseline Air Quality

A description of the existing environment in terms of air quality is provided in Section 11.4.7 of the EIS. This description is provided in the context of relevant air quality standards and governing legislation (ref. Section 11.2 of the EIS). Further information on the air dispersion modelling completed for the proposed facility is included in Section I.1.3.

For emissions to air, the Schedule to S.I. 394 of 2004 lists twelve principal polluting substances to be taken into account (if relevant) by the EPA for the fixing of emission limit values. These substances are listed in Table I.1.1.

Table I.1.1: Principal Polluting Substances – Air (S.I. 394 of 2004)

Polluting Substance	Assessment
Sulphur dioxide and other sulphur compounds	Yes – EIS (Sections 11.3, 11.4, 11.5)
Oxides of nitrogen and other nitrogen compounds	Yes – EIS (Sections 11.3, 11.4, 11.5) and updated air dispersion model (Appendix I.1 to this Attachment)
Carbon monoxide	Yes – EIS (Sections 11.3, 11.4, 11.5)
Volatile Organic Compounds	Yes – EIS (Sections 11.3, 11.4, 11.5)
Metals and their compounds	Yes – EIS (Sections 11.3, 11.4, 11.5)
Dust	Yes – EIS (Sections 11.3, 11.4, 11.5)
Asbestos (suspended particulates, fibres)	Not applicable
Chlorine and its compounds	Yes (Hydrogen chloride) – EIS (Sections 11.3, 11.4, 11.5)
Fluorine and its compounds	Yes (Hydrogen fluoride) – EIS (Sections 11.3, 11.4, 11.5)
Arsenic and its compounds	Yes (Heavy metals) – EIS (Sections 11.3, 11.4, 11.5)
Cyanides	Not applicable
Substances and preparations which have been proved to possess carcinogenic or mutagenic properties or properties	No consignments of hazardous waste will be accepted at the facility. As the input non-hazardous waste feed will be subject to thorough inspection and pre-treatment, any waste containing hazardous substances

Polluting Substance	Assessment
which may affect reproduction via the air	(carcinogenic/mutagenic/affecting reproduction via the air) will be quarantined. Dioxin/furan emissions are addressed in detail within the EIS (Sections 11.3, 11.4, 11.5)

The First Schedule to the Air Pollution Acts 1987 and 2011 lists nine pollutants or categories of pollutants. These substances are considered in Table I.1.2.

Table I.1.2: Principal Polluting Substances – Air (Air Pollution Acts)

Polluting Substance	Assessment
All smoke, gas, aerosols and dust.	Yes – EIS (Sections 11.3, 11.4, 11.5) Odour considered in air dispersion model contained in EIS and updated air dispersion model (Appendix I.1 to this attachment)
Sulphur dioxide and other sulphur compounds	Yes – EIS (Sections 11.3, 11.4, 11.5)
Oxides of nitrogen and other nitrogen compounds	Yes – EIS (Sections 11.3, 11.4, 11.5)
Carbon monoxide	Yes – EIS (Sections 11.3, 11.4, 11.5)
Organic compounds	Yes – EIS (Sections 11.3, 11.4, 11.5)
Heavy metals and their compounds	Yes – EIS (Sections 11.3, 11.4, 11.5)
Asbestos fibres, glass fibres or mineral fibres	Not applicable
Chlorine and its compounds	Yes (Hydrogen chloride) – EIS (Sections 11.3, 11.4, 11.5)
Fluorine and its compounds	Yes (Hydrogen fluoride) – EIS (Sections 11.3, 11.4, 11.5)

As concluded in Section 11.5 of the EIS and Appendix I.1 (revised air dispersion model), the assessment of atmospheric emissions from the proposed facility shows that emissions of main polluting substances (as

defined in the Schedule S.I. 394 of 2004 and Air Pollution Acts 1987 and 2011 respectively) to the atmosphere are not likely to impair the environment.

I.1.2 Surrounding Habitat and Landscape

The habitat areas surrounding the site are described in detail in Section 8.3 of the EIS.

The existing landscape is described in Section 6.4.1 of the EIS.

The topography of the area is generally flat with no abrupt changes in terrain.

Designated areas of ecological interest (eg, SPA / SAC / cSAC / NHA / pNHA) within 5km of the site are listed in Table 8.3 of the EIS.

Assessment of ecological impacts and mitigation measures is addressed in Attachment I.7.

I.1.3 Air Dispersion Modelling

Details of the original air dispersion modelling study completed for the facility are included in Section 11.4 of the EIS. The predicted ground level concentrations of emissions modelled are described in Section 11.4.9 of the EIS and summarised in Table 11.4 of the EIS.

Based on design modifications since the preparation of the EIS and the introduction of the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011), the air dispersion model was revised to account for the changes in stack and emission properties. The results of the revised air model are included in Appendix I.1. The revised air model shows that the emissions to air will not exceed any of the current Air Quality Standard limit values.

I.1.4 Noise Environment & Impact Assessment

Noise emissions to the surrounding environment are addressed in Attachment I.6.

ATTACHMENT I.2 ASSESSMENT OF IMPACT ON RECEIVING SURFACE WATER

I.2.1 Existing Surface Water Environment

A description of the existing environment with respect to surface waters and discharge from the proposed facility is provided in Section 10.3 of the EIS. This includes details of the existing site topography, flood risk assessment and existing water quality.

While the facility will not discharge directly to a river or lake, Table I.2(i) has been completed as far as possible (with available data), to include the laboratory analysis results of surface water monitoring carried out at two surface water ditch locations as part of the Environmental Impact Assessment. These monitoring locations are shown are shown in Figure I.2.1.

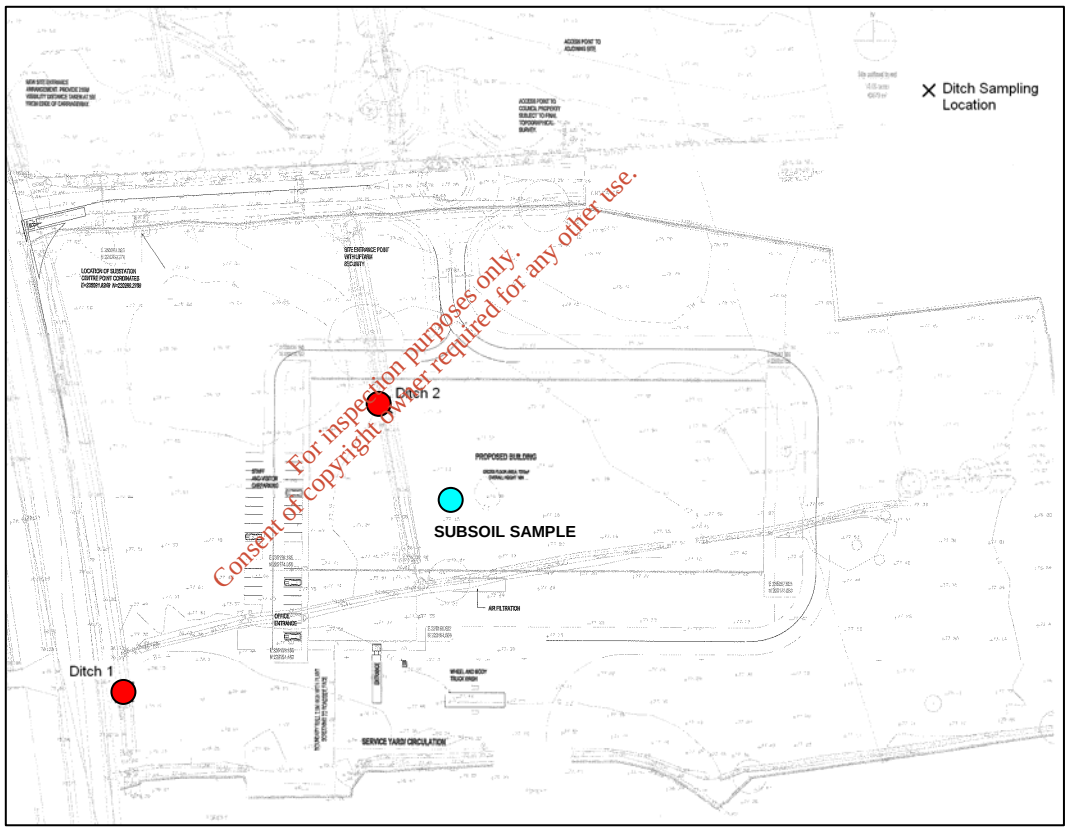


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Figure I.2.1: Location of Surface Water Monitoring Points (EIS Survey)

In addition to the parameters listed in Table I.2(i), water samples were also analysed for arsenic, PCB (polychlorinated biphenyl) congeners, PAH (polyaromatic hydrocarbons) and TPH (total petroleum hydrocarbons).

Arsenic levels of 2.36µg/l (ditch 1) and 1.87 µg/l (ditch 2) were recorded, both within the Environmental Quality Standard (EQS) of 7.5µg/l arsenic for inland surface waters established in the *European Communities Environmental Objectives (Surface Water) Regulations 2009 (SI No. 272 of 2009)*.

Levels of PCB congeners, PAH and TPH measured for both ditch locations were below the respective limits of detection.

I.2.2 Assessment of Impacts of Proposed Facility

An assessment of construction and operational phase impacts on surface water is included in Sections 10.4 and 10.5 of the EIS and where necessary, mitigation measures have been identified to prevent significant quantitative/qualitative impact on the receiving environment.

The nearest major watercourse, the river Clodiagh, is located approximately 5km west of the development site.

The site area does not overlap with any sensitive areas or areas of special interest and there are no sites within the predicted scope of influence of the proposed development. Designated sites occurring within 10km (and their distance from the site of proposed development) are listed in Table 8.3 of the EIS.

Table I.2(i)-1: SURFACE WATER QUALITY Monitoring Point/ Grid Reference: Ditch 1

Parameter	Results (mg/l)				Sampling method[2] (grab, drift etc.)	Normal Analytical Range[2]	Analysis method / technique
	March 2010	Date	Date	Date			
pH							
Temperature							
Electrical conductivity EC							
Ammoniacal nitrogen (as N)	0.78				Grab	<0.2mg/l	TM099
Chemical oxygen demand							
Biochemical oxygen demand							
Dissolved oxygen DO							
Calcium Ca							
Cadmium Cd (dissolved)	<0.0001				Grab	<0.1µg/l	TM152
Chromium Cr (dissolved)	0.0162				Grab	<0.22µg/l	TM152
Chloride Cl	13.2				Grab	<2mg/l	TM184
Copper Cu							
Iron Fe							
Lead Pb (dissolved)	0.00037				Grab	<0.02µg/l	TM152
Magnesium Mg							
Manganese Mn							
Mercury Hg (dissolved)	<0.00001				Grab	<0.01µg/l	TM183
Nickel Ni							
Potassium K							
Sodium Na							
Sulphate SO_4	40.1				Grab	3mg/l	TM184
Zinc Zn							
Total alkalinity (as $CaCO_3$)							
Total organic carbon TOC							
Total oxidised nitrogen TON							
Nitrite NO_2							
Nitrate NO_3							
Faecal coliforms (/100mls)							
Total coliforms (/100mls)							
Phosphate PO_4							

Table I.2(i)-2: SURFACE WATER QUALITY Monitoring Point/ Grid Reference: Ditch 2

Parameter	Results (mg/l)				Sampling method[2] (grab, drift etc.)	Normal Analytical Range[2]	Analysis method / technique
	March 2010	Date	Date	Date			
pH							
Temperature							
Electrical conductivity EC							
Ammoniacal nitrogen (as N)	<0.02				Grab	<0.2mg/l	TM099
Chemical oxygen demand							
Biochemical oxygen demand							
Dissolved oxygen DO							
Calcium Ca							
Cadmium Cd (dissolved)	<0.0001				Grab	<0.1µg/l	TM152
Chromium Cr (dissolved)	0.0206				Grab	<0.22µg/l	TM152
Chloride Cl	11.6				Grab	<2mg/l	TM184
Copper Cu							
Iron Fe							
Lead Pb (dissolved)	0.000389				Grab	<0.02µg/l	TM152
Magnesium Mg							
Manganese Mn							
Mercury Hg (dissolved)	<0.00001				Grab	<0.01µg/l	TM183
Nickel Ni							
Potassium K							
Sodium Na							
Sulphate SO_4	28.9				Grab	3mg/l	TM184
Zinc Zn							
Total alkalinity (as $CaCO_3$)							
Total organic carbon TOC							
Total oxidised nitrogen TON							
Nitrite NO_2							
Nitrate NO_3							
Faecal coliforms (/100mls)							
Total coliforms (/100mls)							
Phosphate PO_4							

ATTACHMENT I.3 ASSESSMENT OF IMPACT ON SEWER

There will be no emissions to sewer of a sanitary authority from the proposed development.

ATTACHMENT I.4 ASSESSMENT OF IMPACT OF GROUND/GROUNDWATER EMISSIONS

I.4.1 Existing Ground/Groundwater Environment

A description of the existing environment with respect to soils, geology and hydrogeology is provided in Section 7.3 of the EIS. This includes details of the soil, bedrock geology, hydrogeology and groundwater, aquifer vulnerability, groundwater wells and other local conditions including gas migration from the adjacent landfill and radon.

As part of the EIS, a sample of sub-soil was recovered for environmental testing purposes and results were reported in the EIS. The location on-site from where the sub-soil sample was retrieved is shown in Figure I.2.1.

Results of this groundwater monitoring and locations of the monitoring wells are included in Table I.4(i)-1 and Table I.4(i)-2. The locations of the monitoring wells (AGW1-1, AGW1-2) are also shown on the drawing included as Attachment E.1 (drawing no. IE0310150-22-DR-0015).

I.4.2 Assessment of Impacts of Proposed Facility

An assessment of construction and operational phase impacts on soils/geology/hydrogeology is included in Section 7.4 of the EIS and where necessary, mitigation measures have been identified in Section 7.5, to prevent significant impact on the receiving ground/groundwater environment.

Table I.4(i)-1: GROUNDWATER QUALITY Monitoring Point/ Grid Reference: AGW1-1 / 235106E, 220162N

Parameter	Results (mg/l)				Sampling method[2] (composite, dipper etc.)	Normal Analytical Range	Analysis method / technique
	Date 09/02/2012	Date	Date	Date			
pH	7.6						
Temperature							
Electrical conductivity EC	810µS cm^{-1}						
Ammoniacal nitrogen NH_4-N	7.3						
Dissolved oxygen DO	7.3						
Residue on evaporation (180°C)							
Calcium Ca	160						
Cadmium Cd	<0.00008						
Chromium Cr	0.0052						
Chloride Cl	31						
Copper Cu	<0.001						
Cyanide Cn, total	<0.05						
Iron Fe	1.4						
Lead Pb	0.0011						
Magnesium Mg	33						
Manganese Mn	0.032						
Mercury Hg	0.0014						
Nickel Ni	0.0062						
Potassium K	6.1						
Sodium Na	29						

Table I.4(i)-1: GROUNDWATER QUALITY (contd.)

GROUNDWATER QUALITY (SHEET 2 OF 2) Monitoring Point/ Grid Reference: AGW1-1 / 235106E, 220162N

Parameter	Results (mg/l)				Sampling method[2] (composite, dipper etc.)	Normal Analytical Range	Analysis method / technique
	Date 09/02/2012	Date	Date	Date			
Phosphate PO_4	<0.2						
Sulphate SO_4	18						
Zinc Zn	0.0039						
Total alkalinity (as $CaCO_3$)	530						
Total organic carbon TOC	81						
Total oxidised nitrogen TON	<0.2						
Arsenic As	0.015						
Barium Ba	1.2						
Boron B	0.054						
Fluoride F	0.31						
Phenol (Phenols total)	<0.03						
Phosphorous P	<0.2						
Selenium Se	0.026						
Silver Ag	<0.0005						
Nitrite NO_2	0.022						
Nitrate NO_3	<0.5						
Faecal coliforms (/100mls)	0						
Total coliforms (/100mls)	0						
Water level (m OD)							

Table I.4(i)-2: GROUNDWATER QUALITY Monitoring Point/ Grid Reference: AGW1-2 / 235279E, 220251N

Parameter	Results (mg/l)				Sampling method[2] (composite, dipper etc.)	Normal Analytical Range	Analysis method / technique
	Date 09/02/2012	Date	Date	Date			
pH	7.2						
Temperature							
Electrical conductivity EC	1,100µS cm^{-1}						
Ammoniacal nitrogen NH_4-N	10						
Dissolved oxygen DO	7.0						
Residue on evaporation (180°C)							
Calcium Ca	270						
Cadmium Cd	<0.00008						
Chromium Cr	0.005						
Chloride Cl	16						
Copper Cu	<0.001						
Cyanide Cn, total	<0.05						
Iron Fe	3.3						
Lead Pb	<0.001						
Magnesium Mg	45						
Manganese Mn	0.2						
Mercury Hg	0.00064						
Nickel Ni	0.032						
Potassium K	4.1						
Sodium Na	11						

Table I.4(i)-2: GROUNDWATER QUALITY (contd.)

GROUNDWATER QUALITY (SHEET 2 OF 2) Monitoring Point/ Grid Reference: AGW1-2 / 235279E, 220251N

Parameter	Results (mg/l)				Sampling method[2] (composite, dipper etc.)	Normal Analytical Range	Analysis method / technique
	Date 09/02/2012	Date	Date	Date			
Phosphate PO_4	<0.2						
Sulphate SO_4	37						
Zinc Zn	0.0034						
Total alkalinity (as $CaCO_3$)	720						
Total organic carbon TOC	110						
Total oxidised nitrogen TON	0.3						
Arsenic As	0.014						
Barium Ba	0.64						
Boron B	0.049						
Fluoride F	0.34						
Phenol (Phenols total)	<0.03						
Phosphorous P	<0.2						
Selenium Se	0.01						
Silver Ag	<0.0005						
Nitrite NO_2	0.052						
Nitrate NO_3	1.2						
Faecal coliforms (/100mls)	0						
Total coliforms (/100mls)	0						
Water level (m OD)							

ATTACHMENT I.5 GROUND AND/OR GROUNDWATER CONTAMINATION

As stated in the Waste Application Guidance notes for heading *I.5 Ground and/or groundwater contamination*:

> "*This question principally applies to existing activities or new ones developed on former industrial sites, though not all greenfield sites are necessarily what they seem and therefore should be checked out*"

The proposed development is neither an existing activity nor a development taking place on a former industrial site. Accordingly, a further assessment (beyond the completed investigations outlined below) is not required for ground and/or groundwater contamination.

The site of the proposed development is a greenfield site with no existing industrial activities or evidence of previous industrial activities in the past. An assessment of the local archaeology, architecture and cultural heritage is included in Section 13 of the EIS.

In relation to the greenfield nature of the site, the Environmental Impact Statement incorporates as assessment of the existing soils, geology and hydrogeology (Section 7); surface water environment (Section 10); and archaeology (Section 13) and details of the respective investigations completed. From these studies, there is no evidence of previous industrial activity or associated ground/groundwater contamination on-site.

A Site Investigation Report (IGSL Ltd., March 2010), detailing the results of soil and groundwater analysis, is included as Attachment 3 to the EIS. The percolation test completed by Offaly County Council is also included as Attachment 8 to the EIS. Results of groundwater monitoring completed on-site are described in Attachment I.4.

ATTACHMENT I.6 ASSESSMENT OF NOISE IMPACT

I.6.1 Ambient Noise Levels & Noise Criteria

The existing noise environment is defined by the results of a baseline day and night-time noise survey carried out in April 2010. The results of this survey (including tonal analysis) and description of the background noise levels are included as Tables 9.3, 9.4, 9.5 and 9.6 of the EIS.

The main sources of noise on-site are shown on the drawing included as Appendix E.1 (drawing no. IE0310150-22-DR-0015).

It is noted that the baseline noise survey of April 2010 (and preparation of the Environmental Impact Statement) was carried out prior to the issue of the EPA's guidance note NG4 (Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities) issued in April 2012. Therefore, the timing and location of measurements for the baseline survey is not in accordance with latest guidance. Similarly, a detailed technical report in accordance with Section 6.4 of NG4 has not been prepared.

However, the results available from the baseline survey have been assessed against the guidance contained in NG4 for noise assessment insofar as possible.

Glanpower will carry out a full revised assessment in accordance with NG4 if so required by the EPA.

Noise Criteria

For preparation of a waste licence application, Section 4 of NG4 highlights the requirement for proposal and justification of suitable criteria noise levels. Section 4.4.2 of NG4 outlines the methodology for selection of appropriate noise criteria for licensed operations.

This methodology has been developed for the Derryclure site based on available noise monitoring results and the assessment is continued overleaf.

Step 1: Quiet Area Screening of the Development Location

Table 1.6.a: Quiet Area Screening

Site Details	
Site Name	Derryclure Energy from Waste Facility
Licence Application Reference	
Site Address	Derryclure
	Tullamore
	Co. Offaly

Quiet Area Screening of the Development Location		
Screening Question	**Answer (Yes / No)**	
Is the site >3km away from urban areas with a population >1,000 people?	Yes ☑	No ☐
Is the site >10km away from urban areas with a population >5,000 people?	Yes ☐	No ☑
Is the site >15km away from urban areas with a population >10,000 people?	Yes ☐	No ☑
Is the site >3km away from any local industry?	Yes ☐	No ☑
Is the site >10km away from any major industry centre?	Yes ☑	No ☐
Is the site >5km away from any national primary route?	Yes ☑	No ☐
Is the site >7.5km away from any motorway or dual carriageway?	Yes ☑	No ☐
QUIET AREA?	Yes ☐	No ☑
Other Relevant Comments	The site is located approximately 8km south of Tullarmore town, which has a population of 11,375[1]. While the site is >5km away from any national primary route, it is located adjacent to the national secondary route N80 and Derryclure landfill site.	

[1] Preliminary population figure for Census 2011. The population of Tullamore town recorded in Census 2006 was 10,900.

As shown in the Table I.6.a above, the site is not a Quiet Area as per the EPA definition. Accordingly, the noise assessment is continued at Step 2.

Step 2: Quiet Area Screening of the Development Location

NG4 recommends that where a site is not considered a quiet area, a series of attended noise measurement surveys at the nearest noise sensitive locations (NSLs) are conducted over day, evening and night-time periods, following the guidance in Section 6.1 of NG4.

The baseline survey of 2010 was carried out over day and night-time periods only as the requirement for evening period measurements did not exist at the time of the survey. The daytime measurements were carried out during the early afternoon and do not qualify as evening time measurements. The template for a non-quiet area survey[2] has been completed overleaf with available results. The measurement locations were not selected in accordance with the guidance of Section 6, NG4 however the locations do include the boundary extents and the nearest Noise Sensitive Location.

[2] NG4 Appendix IV

Table I.6.b: Non-Quiet Area Baseline Noise Survey Details

Site Details	
Site Name	Derryclure Energy from Waste Facility
Licence Application Reference	
Site Address	Derryclure
	Tullamore
	Co. Offaly

Baseline Noise Survey – Set up of Equipment				
Date (dd/mm/yy)			10/04/10	
Start Time (hh:mm)			14:00	
Noise Meter set to record	**L_{Aeq}**		Yes ☑	No ☐
	L_{AF90}		Yes ☑	No ☐
	L_{AFmax}		Yes ☑	No ☐
	Set to record L_{Aeq} in 1/3 octaves		Yes ☑	No ☐
	At 15 minute intervals		Yes ☑ *	No ☐
	Set to nearest 15 minute period		Yes ☐	No ☑
Noise meter calibration date (dd/mm/yy)			04/07/08	
Noise calibrator calibration date (dd/mm/yy)				
Noise meter check calibrated			Yes ☑	No ☐
Wind Speed Data	**Equipment:**	Not used	**Start of Survey**	**End of Survey**
Average Wind Speed (m/s)				
Wind Direction (degrees)				
Set Up By:	MAGS DALTON		Name (Block Letters)	
	Environmental Consultant		Position	
			Signed	

* = Daytime measurements were conducted over a 30 minute period.

Note: This sheet has been completed retrospectively for the survey of April 2010 based on the issue of guidance NG4 (April 2012). Accordingly not all information required by NG4 is available.

Table I.6.c: Results of Baseline Noise Survey

Period	Receiver[1]	Time	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)			Comments
			L_{Aeq}	L_{AFmax}	L_{AF90}	
Daytime	NSL1	30 mins	70	85	55	Traffic noise on N80 dominant. Banging noise, birdsong and farm traffic also audible.
	B1	30 mins	75	88	58	Traffic noise on N80 and Derryclure landfill access roads dominant. Derryclure landfill plant noise. Birdsong, banging noise, car horn also audible
	B2	30 mins	78	94	57	Traffic noise on N80 dominant. Birdsong audible. Derryclure landfill traffic and plant inaudible.
	B3	30 mins	49	68	40	Traffic on N80 dominant noise source. Bird song, distant hum of machinery at landfill area audible.
	B4	30 mins	54	71	41	Traffic on N80, landfill operations audible. (Existing buildings shielding noise from landfill.)
Evening	-	-	As the baseline noise survey was completed prior to issue of noise guidance document NG4, measurements were not completed for the evening period.			
Night-time[2]	NSL1	15 mins	65	77	46	Traffic on N80 dominant. Frequent traffic (approx. 1 vehicle passing every 3 seconds.)
	B1	15 mins	70	87	43	Traffic on N80 (frequent, fast moving traffic)
	B2	15 mins	71	88	41	Traffic on N80 (frequent, fast moving traffic)
	B3	15 mins	50	63	27	Traffic on N80 (frequent, fast moving traffic)
	B4	15 mins	47	58	37	Traffic noise on N80 (distant noise)

Note 1: A map showing the location of the receivers / noise monitoring locations is included in Figure I.6.1 overleaf.

Note 2: The night-time noise survey commenced at 22.00, in accordance with the definition of night-time (22.00-08.00) applicable at the time of the survey. NG4 updates the definition of night-time hours as 23.00-07.00.

This sheet has been completed retrospectively for the survey of April 2010 based on the issue of guidance NG4 (April 2012). Accordingly not all information required by NG4 is available. A separate sheet has not been completed for each receiver. The table above presents the noise survey results together for all receptors.

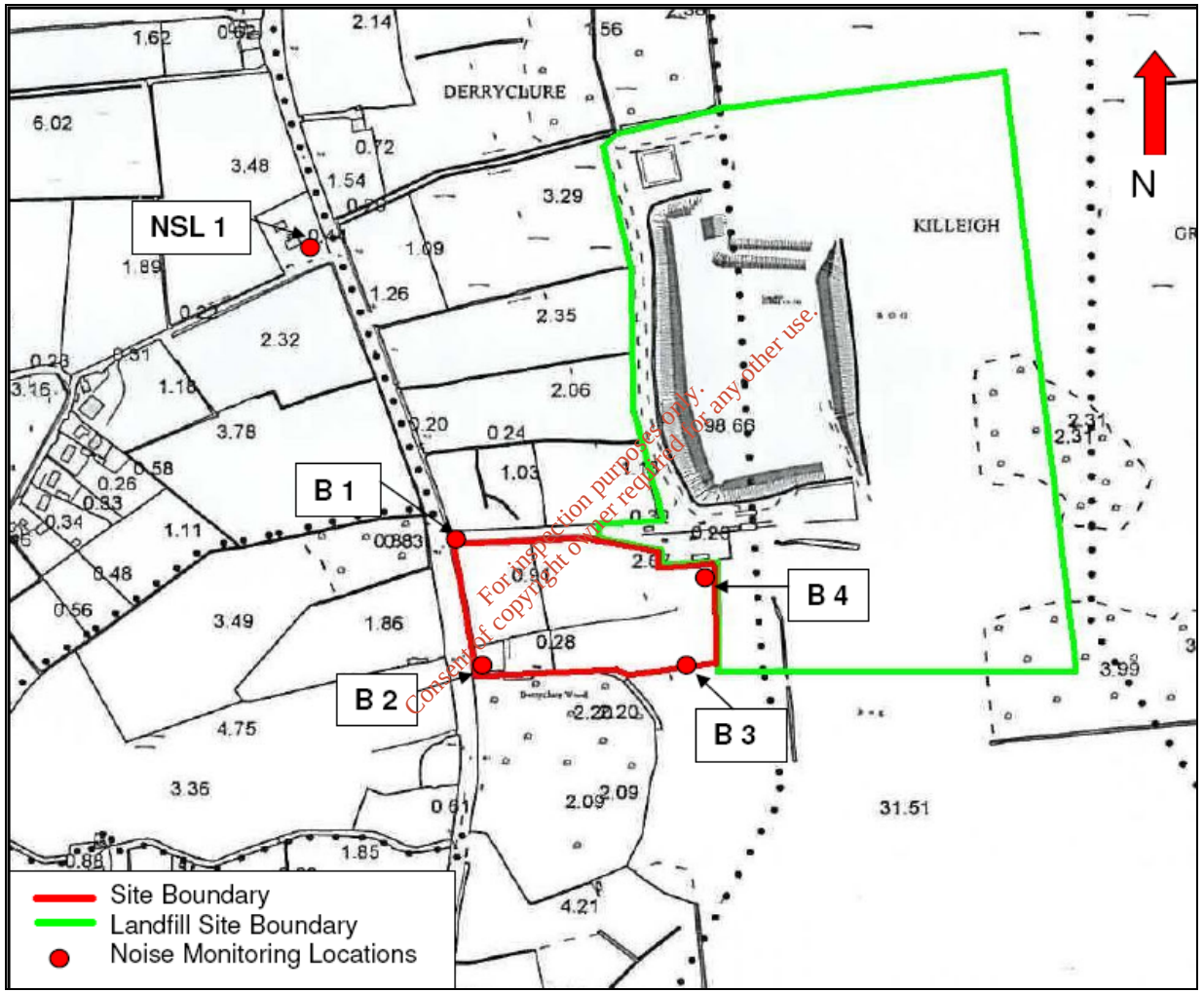

Figure I.6.1: Noise Monitoring Locations for Baseline Noise Survey

Step 3: Screen for Areas of Low Background Noise

The results available from the baseline survey of 2010 are compared below with the prescribed criteria for low background noise.

Table I.6.d: Assessment of Baseline Noise Survey Results against Low Background Noise Criteria

Threshold	Low Background Noise Criteria (dB L_{AF90})	Baseline Survey Result (dB L_{AF90})				
		NSL1	B1	B2	B3	B4
Average Daytime Background Noise Level	≤ 40	55	58	57	**40**	41
Average Evening Background Noise Level[1]	≤ 35	-	-	-	-	-
Average Night-time Background Noise Level[2]	≤ 30	46	43	41	**27**	37

The comparison of baseline noise survey results against low background criteria show that the nearest noise sensitive location (NSL1) is not in an area of low background noise. In the absence of evening period noise measurements, it is still shown that NSL1 could not be classified as an area of low background noise as the criteria for daytime and night-time noise levels are not met. The existing noise environment surveyed is mostly dominated by traffic on the N80 and daytime landfill operations.

In general, lower noise levels are recorded at the eastern site boundary and noise monitoring results available show that locations B3 and B4 may be considered as areas of low background noise. Further survey data (including evening period measurements) would be required to comprehensively assess these areas. However, it is noted that there is no noise sensitive location (NSL) in proximity to the eastern boundary of the site.

Step 4: Determine Appropriate Noise Criteria

Based on the assessment contained in Steps 1-3 above, it is considered that the site of the proposed facility is neither within a Quiet Area nor an Area of Low Background Noise.

It is noted that the baseline noise survey of April 2010 was not completed in accordance with the guidance contained in NG4 (issued April 2012) and the periods surveyed (e.g. night-time 22:00-08:00) do not reflect the most recent guidance (e.g night-time 23:00-07:00). Similarly, noise measurements were not recorded for the evening period. It is also unclear from the data available whether or not the eastern site boundary would be considered as an Area of Low Background Noise.

However, based on the available results it is submitted that the nearest Noise Sensitive Location is not within a Quiet Area or an Area of Low Background Noise. It is concluded that the noise limits for "all other areas" as prescribed in Table 1, Section 4 of NG4 would be applicable at the nearest noise sensitive location (NSL1).

Location	Daytime Noise Criterion, dB $L_{Ar,T}$ (07:00 to 19:00)	Evening Noise Criterion, dB $L_{Ar,T}$ (19:00 to 23:00)	Night-time Noise Criterion, dB $L_{Ar,T}$ (23:00 to 07:00)
NSL1	55dB	50dB	45dB

I.6.2 Impact of Proposed Development on Noise Environment

An assessment of potential construction and operational phase impacts on the receiving noise environment was completed as part of the EIS (Sections 9.5 and 9.6).

As the final selection of equipment/plant for the facility is ongoing, it is not possible to include detailed calculations for the determination of noise levels at specific locations at this time. Table I.6(i) has been completed to include an estimate of the sound pressure levels which will be experienced at typical points on the boundary of the operation and at the off-site noise sensitive location. This is based on the results of the EIS. A full assessment will be completed following the final selection of equipment/plant suppliers and results made available to the EPA.

Table I.6(i) Ambient Noise Assessment

Third Octave analysis for noise emissions should be used to determine tonal noises

	National Grid Reference	Sound Pressure Levels		
	(5N, 5E)	$L(A)_{eq}$	$L(A)_{10}$	$L(A)_{90}$
1. SITE BOUNDARY				
B1:	22026N, 23507E	68		65
B2:	22013N, 23509E	63		60
B3:	22013N, 23531E	48		45
B4:	22024N, 23534E	53		50
2. NOISE SENSITIVE LOCATIONS				
NSL1:	22061N, 23490E	58		55

The locations of the points listed in Table I.6(i) are also shown on the site drawing included as Appendix E.1. The noise sensitive location is a private dwelling located approximately 350m northwest of the site and is the closest sensitive receptor.

Further to the assessment contained in the EIS, additional sources of noise are now included in the facility design. These include a

Regenerative Thermal Oxidiser, electrical transformers, roof-mounted steam condensing units and an emergency generator. Based on the results of the baseline noise survey and the dominance of traffic noise on the N80 national route (adjacent to the western site boundary), it is concluded that there will be no significant adverse impact on the noise environment due to these additional sources of noise.

ATTACHMENT I.7 ASSESSMENT OF ECOLOGICAL IMPACTS & MITIGATION MEASURES

I.7.1 Description of Ecology of the Site

A detailed description of the ecology of the site is included in Section 8 of the EIS. The proximity of the site to designated areas (ie, SPAs, SACs, (p)NHAs) is described in Section 8.3.2 of the EIS (ref. Table 8.3). A list of protected, rare and other notable flora and fauna species occurring within 10km of the site is included as Table 8.4 of the EIS.

I.7.2 Location of Existing Habitats

A drawing showing the location of existing habitats (flora and fauna) is included as Figure 8.1 in the EIS.

I.7.3 Description of Impacts of Development on Habitats

Based on the results of the flora and fauna investigation completed in the context of the proposed development, a description of the impact assessment and findings is included as Section 8.4 of the EIS.

A formal screening assessment was undertaken by specialist ecology consultants to determine the need to carry out an Appropriate Assessment (AA) under the Habitats Directive (92/43/EEC). Due to the distance of this site from any designated sites (Special Areas of Conservation / Special Protection Areas) and lack of connectivity between the impact source and possible receptors, is was concluded that there are no likely significant effects on these designated sites. This is summarised in the Screening Statement for Appropriate Assessment Report (July 2010) that is included as Attachment 7 to the EIS. The AA Screening process is summarised in Section 8.8 of the EIS. The 'Screening Statement for Appropriate Assessment Report' is included also as Appendix I.2.

I.7.4 Description of Natural Progression of Site Habitats

Section 8.4.1 of the EIS addresses the natural progression of the site habitats in the absence of the development (i.e. "Do Nothing" Impact).

I.7.5 Mitigation Measures

Mitigation measures identified for construction and operational phases are summarised in Sections 8.5.1 and 8.5.2 of the EIS respectively. A number of public bodies were consulted as part of the EIS process. The list of bodies consulted and responses received are included in Section 1.7.1 of the EIS. This list includes, but is not limited to, the National Parks & Wildlife Service, Department of the Environment, Heritage & Local Government, Irish Wildlife Trust, Environmental Protection Agency, Birdwatch Ireland and An Taisce.

I.7.6 Watercourses & Associated Fisheries

As concluded in Section 10.8 of the EIS, the development is not predicted to have any significant adverse impact on watercourses. Therefore no mitigation measures are required with respect to local fisheries and accordingly further consultation with Inland Fisheries Ireland and/or local angling clubs is not required.

I.7.7 Modification of Watercourses

There is no proposal to modify and/or divert a watercourse as part of this development. The nearest major watercourse, the river Clodiagh, is located approximately 5km west of the development site.

As described in Section D.1.k, Attachment D.1, minor ditches on the site will be reconfigured as part of the surface water drainage system for the facility. Existing ditches will be diverted from under structures and paved areas. Abandoned ditch routes will be backfilled with a land drain pipe laid in the bottom of the trench to allow migratory groundwater to drain.

ATTACHMENT J

ACCIDENT PREVENTION & EMERGENCY RESPONSE

SUPPORTING INFORMATION

(4 pages)

- Attachment J.1 Accident Prevention & Emergency Response

ATTACHMENT J.1 ACCIDENT PREVENTION & EMERGENCY RESPONSE

J.1.1 Accident Prevention

The operation of the proposed facility will involve hazards such as quantities of combustible material, storage of chemicals, high voltage power lines and equipment, high temperature steam, low pressure gas, etc. Prior to start-up, a comprehensive set of standard operating procedures will be drawn up for operation of the plant which in addition to training provided will minimise risk. Additionally, in compliance with the 2005 Health, Safety and Welfare at Work Act, Glanpower will draw up a safety statement covering operation of the plant and appoint safety representatives from the plant work force

The following measures will be implemented to improve safety and minimise the risk of emergency situations

- The plant design will be carried out according to standards, design codes, laws, good practices and experiences by qualified bodies;
- The design will be reviewed to check for safety hazards in steady and non-steady state conditions and for operability;
- Back-up systems for pumps, computers, power supply, instruments etc. will be provided for critical situations;
- A fire detection and fire fighting system will be installed in accordance with requirements (see Section D.1.o, Attachment D.1);
- A thorough interlock system will automatically shut down the plant in a safe manner in the event of critical equipment failure;
- The installations will be commissioned according to a schedule that provides also testing of safety systems;
- The installations will be inspected by Glanpower safety personnel before starting up;
- The installations will be well maintained and cleaned.
- Glanpower will apply strict rules on safety such as a Permit to Work System, training of operators and staff and provision and use of personal protection equipment (PPE).

J.1.2 Emergency Response

During the construction phase, the approach to construction safety will be the responsibility of Glanpower in conjunction with its appointed PSCS. Construction work will be subject to a permit system supervised by construction safety personnel.

For operational activities, a Site Emergency Plan will be prepared prior to start-up on-site which sets out the response measures to be taken by personnel in the event of an emergency. These measures will be

designed to ensure maximum protection for the site employees, site visitors and people in other premises near the site, to limit property damage and to minimise impact on site operations and the environment. The Site Emergency Plan, to be agreed with the EPA, will have four basic components, as follows:

1. Prevention

Prevention involves identifying potential hazards and then taking measures to remove the hazard, or reduce the potential for the hazard and its adverse effects. A hazard and operability (HAZOP) study for the proposed pyrolysis equipment has already been undertaken. Further HAZOP reviews will be undertaken for the remaining items of plant (pre-treatment, syngas engines, steam turbine etc.) and their interconnectivity, as the design is finalised.

The installation will be designed and manufactured to achieve the highest possible level of safety. The equipment will offer access without danger for inspection and maintenance purposes.

All components of medium voltage circuits will be protected from any possible accidental contact by means of solid or metal panels. These panels will be provided with key-operated locks. Accessible live parts of low voltage circuits will be shrouded to prevent accidental contact. Where access is necessary to allow “testing for dead” or “diagnostic” testing, equipment will be protected to minimum standard of IP 20 with the doors open.

Suitably qualified and experienced environmental, health and safety personnel will be employed by Glanpower to implement and maintain on-site EHS systems, with the goal of ‘*zero incidents*’. Spill kits will be provided at suitable internal and external points, during both construction and operational phases, bearing in mind the location of floor and surface water drains. The surface water drainage system has been designed to protect release of pollutants to the environment and details of this infrastructure are included in Section D.1.k, Attachment D.1. Additional measures to prevent pollutant release to the environment are detailed throughout Attachment F.

2. Preparedness

Emergency planning, training programmes, emergency drill and exercise programmes are integral components of an effective preparedness programme. The site will have a dedicated Emergency Response Team which will be given specific training. Evacuation routes will be defined and all personnel will be aware of them. During the latter phase of construction and through commencement of operations on-site, it is the intention of Glanpower to implement site specific Environmental and Health & Safety Management Systems. These systems will be operated by Glanpower EHS personnel and it is the company’s intention to pursue external accreditation to the international standards OHSAS 18001 for safety management and ISO 14001 for environmental management. All Glanpower employees will be made aware of these systems through induction and regular refresher training, which will prepare workers to respond to an emergency event should it arise. Separate induction and training procedures will be developed for both visitors and contractors,

depending on the nature of visit to site and areas of the facility to be accessed.

3. Response

Response activities address the immediate and short term effects of an emergency. The site will be occupied on a continuous basis except during shut-down periods when there will be a maintenance and security presence on-site. The site will be equipped with fire fighting facilities (including on-site water storage) as detailed in Section D.1.o, Attachment D.1.

The proposed response to abnormal operating conditions is detailed throughout Section D.2. The system will be automatically shutdown in the event of electrical supply failure, failure of level control, loss of combustion temperature and loss of water seal (secondary cyclonic convertor). Continuous process and emission monitoring, regular equipment maintenance and scheduled calibration will ensure that emergency response measures are required on an infrequent basis and only if an incident arises.

An external sign at the facility entrance will display the company name, hours of operation, EPA licence reference number, emergency contact name, phone number and e-mail address. This will ensure that any complaints which may arise from members of the general public may be directed to appropriate personnel and responded to promptly. Any complaints received will be subject to investigation, which will be notified to the EPA. The findings of such an investigation will be documented and filed for record and notified to the EPA and other local authorities as required.

4. Recovery

Recovery activities include restoration of services (power, water, telecommunications) in the event of loss of supply caused by an unforeseen incident on-site, damage by storm or external event, etc. Recovery activities will be co-ordinated with suppliers and the relevant authorities if and when necessary.

Restarting of processes and equipment will be subject to equipment inspection and system checks. These will be documented in the Operation and Maintenance Manual other vendor-supplied documentation.

J.1.3 Insurance

Glanpower is committed to ensuring that sufficient and full insurance cover is provided for, including public liability and environmental impairment. The company has obtained several quotations for insurance cover and these are currently under internal review. Glanpower will decide on the most suitable at the time of commencement of construction.

ATTACHMENT K

REMEDIATION, DECOMMISSIONING, RESTORATION & AFTERCARE

SUPPORTING INFORMATION

(2 pages)

- Attachment K.1 Cessation of Activity

ATTACHMENT K.1 CESSATION OF ACTIVITY

The proposed facility has a projected life span of approximately 20 years, which may be extended through equipment maintenance, upgrades, repairs and/or replacements. The basis of design for the facility specifies that the design life of equipment will not be less than 25 years or 200,000 hours of operation, whichever is the longer.

Should circumstances arise whereby it becomes necessary to shut down the facility, then Glanpower will ensure that any negative environmental impact is minimised. This will include the following measures:

- Removal of any chemicals or waste stored on-site, either by return to supplier if unused or recovery/disposal to licensed facility. Any oils, lubricants or fuels that are on site at the time of closure will be disposed of/recycled under permit.
- Drainage of petrol interceptors, removal of contents under permit to licensed facility and closure/sealing of site drains to ensure no ongoing releases from the site that would necessitate operator management.
- Plant equipment, machinery etc. will be cleared out following final operation cycle, then dismantled and stored under suitable conditions until it may be sold, or if a suitable buyer cannot be located, disposed of/recycled under permit.
- The plant buildings will be subject to thorough house cleaning prior to final departure.
- The site and buildings will be left in secure manner. Gates and doors will be locked and appropriate security measures will be implemented on site in the event of the site potentially being vacant for an extended period of time.
- Drawings and records relating to the site and structures will be retained on file for handover to future occupant/buyer.
- If the site is being permanently vacated it will be returned to its current agricultural use.
- There will be no asbestos used in the construction of the facility so its decommissioning will not arise.

It is the intention of Glanpower, upon commencement of activities, to undertake a detailed and fully costed Environmental Liabilities Risk Assessment (ELRA) to cover potential liabilities arising from planned developments. The ELRA will be completed in accordance with EPA guidance. This ELRA will inform any update to the formal Decommissioning Management Plan for this site which will address the approach to closure, restoration and aftercare management of the site.

It is currently envisaged that minimal aftercare provisions will be required as all residual waste items at the site upon closure will be removed for off-site recycling or disposal (in accordance with the waste hierarchy). The ELRA and Decommissioning Management Plan for the facility will be submitted to the Environmental Protection Agency.

ATTACHMENT L

STATUTORY REQUIREMENTS

SUPPORTING INFORMATION

(18 pages)

- Attachment L.1 Compliance with Waste Management Acts 1996 to 2011
- Attachment L.2 Fit and Proper Person
- Attachment L.3 Waste Hierarchy
- Attachment L.4 Self Sufficiency & Proximity

ATTACHMENT L.1 COMPLIANCE WITH WASTE MANAGEMENT ACTS 1996 TO 2011

L.1.1 Section 40(4) Waste Management Acts 1996 to 2011

Section 40(4) states that:

"The Agency shall not grant a waste licence unless it is satisfied that—

(a) any emissions from the recovery or disposal activity in question (''the activity concerned'') will not result in the contravention of any relevant standard, including any standard for an environmental medium, or any relevant emission limit value, prescribed under any other enactment,

(b) the activity concerned, carried on in accordance with such conditions as may be attached to the licence, will not cause environmental pollution,

(bb) if the activity concerned involves the landfill of waste, the activity, carried on in accordance with such conditions as may be attached to the licence, will comply with Council Directive 1999/31/EC on the landfill of waste,

(c) the best available technology not entailing excessive costs will be used to prevent or eliminate or, where that is not practicable, to limit, abate or reduce an emission from the activity concerned,

(cc) the activity concerned is consistent with the objectives of the relevant waste management plan or the hazardous waste management plan, as the case may be, and will not prejudice measures taken or to be taken by the relevant local authority or authorities for the purpose of the implementation of any such plan,

(d) if the applicant is not a local authority, the corporation of a borough that is not a county borough, or the council of an urban district, subject to subsection (8), he or she is a fit and proper person to hold a waste licence,

(e) the applicant has complied with any requirements under section 53.

(f) energy will be used efficiently in the carrying on of the activity concerned,

(g) any noise from the activity concerned will comply with, or will not result in the contravention of, any regulations under section 106 of the Act of 1992,

(h) necessary measures will be taken to prevent accidents in the carrying on of the activity concerned and, where an accident occurs, to limit its consequences for the environment,

(i) necessary measures will be taken upon the permanent cessation of the activity concerned (including such a cessation resulting from the abandonment of the activity) to avoid any risk of environmental pollution and return the site of the activity to a satisfactory state.''

(j) the intended method of treatment is acceptable from the point of view of environmental protection, in particular when the method is not in accordance with section 32(1)."

L.1.2 Environmental and Health Impacts of Facility

Sections 40(4)a-b of the Waste Management Acts 1996 to 2011 (WMA 1996 to 2011), as amended, is concerned with ensuring emissions do not contravene any relevant standard and that the activity does not cause any environmental pollution.

As documented in the Environmental Impact Statement (EIS) and Sections E, F and I of this application, emissions from the proposed facility will not cause impacts which would be harmful to human health or the environment.

L.1.2(a) Operating Standards

- The delivery and reception of waste at the facility will comply with Article 5(1) of the Waste Incineration Directive. No hazardous waste will be accepted at the facility and any hazardous waste discovered in combination with non-hazardous waste loads will be quarantined for removal off-site. Waste acceptance and handling procedures are addressed within Attachments H.2-H.3. Access to/from the waste reception hall will be through rapid operation double shutter doors, to ensure no egress of odours to atmosphere or windblown litter to the surrounding environment.
- As outlined in Section J.1, a Safety Management System will be developed for the operation of the facility, with the objective of achieving accreditation to the international standard OHSAS 18001.
- The architecture and engineering design has been undertaken by independent professional consultants, in line with latest standards and guidelines (Eurocodes, British Standards etc.)
- Monitoring equipment will meet EPA standards for monitoring and calibration (including those outlined in guidance documents AG3 ‘Air Guidance Note on the Implementation of IS EN 14181’; AG1 ‘Guidance Note on Site Safety Requirements for Air Emissions Monitoring’ and AG3 ‘Air Emissions Monitoring Guidance Note #2’.
- The plant will operate in accordance with BAT as described in Section L.1.3.
- An Explosion Protection Document (EPD) will be prepared in advance of commencement of operations, in accordance with the requirements of Directive 1999/92/EC (ATEX 137) on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres. This will address ATEX (Atmospheres Explosibles) requirements, also in accordance with Directive 1994/9/EC (ATEX 100a) concerning equipment and protective systems for use in potentially explosive atmospheres.
- Verification of CE Marking of pressure equipment and assemblies will be carried out in accordance with the requirements of the Pressure Equipment Directive 97/23/EC.

L.1.2(b) Air Emissions & Ambient Air Quality Standards

- The pyrolysis system and syngas engines have been designed to comply with the limits established in the Waste Incineration Directive.
- Results of the air modelling study (Sections 11.3, 11.4 and 11.5 of the EIS and Appendix I.1, Attachment I) for the facility demonstrate that even at maximum potential emissions from the operation of the proposed facility, ambient air quality will remain below the relevant air quality standard limits and guidelines values. The modelling completed represents the worst case scenario and it is anticipated that actual emissions from the facility will be below the modelled values. It is therefore concluded that there will be no significant impact on air quality from the operation of the proposed facility.
- The emissions of dioxins from incineration processes is often the most controversial element associated with an incineration project. However, as the facility will be based on pyrolysis technology (in the absence of oxygen), the process inherently mitigates against dioxin formation.

L.1.2(c) Effluent Emission Standards

There will be no discharge of process effluent from the facility, in line with Article 8(2) of the Waste Incineration Directive.

There will be a single emission to ground/groundwater, comprising the discharge of sanitary effluent arising from toilets, sinks, kitchen/canteen areas etc. The discharge will be treated by an on-site package wastewater treatment plant (WWTP) and a polishing filter. The WWTP and polishing filter have been designed in accordance with EPA *Guidelines on Wastewater Treatment Systems for Small Communities, Businesses, Leisure Centres and Hotels*. Further details on the wastewater treatment system and standard of effluent discharged are included in Section D.1.k, Attachment D and Section E.4.1, Attachment E respectively.

The facility has been designed to prevent the unauthorised or accidental release of polluting substances to groundwater in accordance with the Groundwater Directive 80/68/EC and Article 8(7) of the Waste Incineration Directive.

Surface water runoff from areas of hardstanding and building roof areas will drain to an underground surface water network and be discharged centrally via oil interceptors, attenuation tank and hydrobrake to an existing ditch. The surface water system has been designed in accordance with:

- The Greater Dublin Strategic Drainage Study (GDSDS);
- EN 572 – Gravity Drainage Systems outside Buildings;
- CIRIA Report C697 – The SUDS Manual;
- BRE Digest 365 – Design of Soakaways.

L.1.2(d) Noise Standards

As described in Section E.5.1, Attachment E, a number of measures have been incorporated in the design of the building to ensure noise emissions at the nearest noise sensitive location are minimised. Furthermore, the design of the facility, provision of acoustic enclosures and the indoor siting of major equipment will ensure that there is no tonal or impulsive noise arising from the proposed activities. Attachment I.6 includes details of the impact assessment completed. It is submitted that the facility and in particular, the nearest Noise Sensitive Location (NSL) do not lie within a Quiet Area or Area of Low Background Noise as defined by the EPA (ref. EPA Guidance Document AG4).

L.1.2(e) Ecological Standards

As part of the EIS, the impact of the facility has been assessed against the following legislation and governing standards, with respect to the protection of habitats:

- Wildlife Acts, 1976 and 2000;
- European Communities (EC) Habitats Directive (92/43/EEC);
- EC Birds Directive (79/409/EEC);
- European Communities (Natural Habitats) Regulations 1997 SI No. 94 of 1997, as amended;
- Flora (Protection) Order, 1999;
- The Planning and Development Act, 2000, as amended; and
- National Biodiversity Plan, 2002.

A screening exercise for Appropriate Assessment was completed for the project (Section 8.8 of the EIS) and it was concluded that there are not likely to be significant effects on any Natura 2000 sites.

Further detailed assessment against relevant flora and fauna standards is included in Attachment I.7 and Section 8 of the EIS.

L.1.2(f) Waste Arisings Standards

Dry residues including the vitrified slag residue (identified at Attachment H.4) will be stored and transported off-site in enclosed containers. This is in accordance with the requirements of Article 9 of the Waste Incineration Directive.

The quantity of vitrified slag residue will be minimised by process control measures including (i) ensuring a consistent level of pre-treatment; (ii) monitoring of system temperature and oxygen levels; and (iii) scheduled maintenance of all plant and equipment.

As demonstrated in Appendix D.21, the slag arising from combustion of pyrolysis-derived char is inert.

The EPA Technical Guidance Document entitled *Municipal Solid Waste – Pre-treatment & Residuals Management* requires that what is

accepted for combustion by a waste-to-energy facility has been appropriately pre-treated. Waste accepted at the proposed facility will undergo significant pre-treatment as described in Section D.2.3, Attachment D.2. The minimum pre-treatment requirement is source separation (2 bin or equivalent), which is already facilitated by existing waste collection operators in the region. The proposed facility will only accept the mixed municipal ('black bin') fraction from domestic and commercial collections.

All metals in the incoming waste stream will be removed at the pre-treatment stage for off-site recycling.

Pre-treated waste will be broken down by pyrolysis into gas and char components prior to combustion. The synthesis gas will be scrubbed and conditioned prior to combustion in gas engines.

L.1.3 Application of Best Available Techniques (BAT)

Section 40(4)(c) of the WMA 1996 to 2011 requires that BAT (Best Available Techniques) will be employed to prevent, eliminate, abate or reduce emissions.

The design and operation of the proposed facility has been assessed against the following BAT guidance documents and details related to compliance with relevant BAT are outlined below.

Table L.1.1: Best Available Techniques

BAT Guidance	Details of Application to Proposed Activity
Reference Document on the Best Available Techniques for Waste Incineration, European Commission, August 1996	Refer to Appendix L.1
Batneec Guidance Note for the Waste Sector (Revision 1 – May 1996), EPA	Refer to Appendix L.2
BAT Guidance Note on Best Available Techniques for the Waste Sector: Waste Transfer and Materials Recovery, EPA, December 2011	Refer to Appendix L.3

L.1.4 Compliance with National and Regional Waste Policy

Section 40(4)(c) of the WMA 1996 to 2011 requires that the activity is consistent with the objectives of the relevant waste management plan.

A detailed assessment of the proposed development in the context of national and regional waste policy is included as Section 3 of the EIS.

The facility will be located within the area governed by the Waste Management Plan for the Midland Region (WMPMR). The proposed activity is consistent with the objectives of the WMPMR 2005-2010, as detailed in Section 3.4.1 of the EIS. The lifetime of the WMPMP 2005-2011 was extended to 2014 in April 2011, without significant alteration to the content or objectives of the plan[1]. The plan is currently subject to evaluation to comply with the Waste Framework Directive (2008/98/EC), transposed through European Communities (Waste Directive) Regulations 2011 (S.I. 126 of 2011). The evaluation is to be completed by 31st December 2012[2].

The consent granted by An Bord Pleanála for the proposed development (ref. PL 19.238420) is stated as "*having regard to - …(c) the Waste Management Plan for the Midlands Region, 2005-2010*".

L.1.5 Fit and Proper Person

Section 40(4)(d) of the WMA 1996 to 2011 requires that the applicant for a Waste Licence is a fit and proper person. Please refer to Attachment L.2.

L.1.6 Compliance with Section 53

Section 40(4)(e) of the WMA 1996 to 2011 requires that the applicant complies with any requirements under Section 53 of the WMA 1996 to 2011. Section 53 addresses the provision of evidence by an applicant to demonstrate his/her ability to meet the necessary financial provisions regarding waste recovery and disposal.

Financial provision is addressed in Section L.2.3, Attachment L.2.

L.1.7 Energy Efficiency

Section 40(4)(f) of the WMA 1996 to 2011 requires that energy will be used efficiently in the carrying on of the activity.

The energy efficiency of the facility is addressed in Section G.2 of the application.

L.1.8 Control of Noise Emissions

Section 40(4)(g) of the WMA 1996 to 2011 requires that any noise from the activity will comply with, or will not result in the contravention of, any regulations under section 106 of the Act of 1992.

Noise emissions from the proposed facility are addressed in Section 9 of the EIS, Attachment E.5, and Attachment I.6.

[1] http://www.offaly.ie/eng/Services/Environment/News/Waste_Management_Plan_Review_2011.html, 7th June 2012

[2] http://www.offaly.ie/eng/Services/Environment/News/Notice_re_evaluation_of_Midlands_Waste_Management_Plan.html, 7th June 2012

L.1.9 Accident Prevention

Section 40(4)(h) of the WMA 1996 to 2011 requires necessary measures will be taken to prevent accidents and, where an accident occurs, to limit its consequences for the environment.

Accident Prevention and Emergency Response are addressed in Section J of the application.

L.1.10 Cessation of Activity

Section 40(4)(i) of the Waste Management Acts 1996 to 2011 requires that necessary measures will be taken upon the permanent cessation of the activity concerned to avoid risk of environmental pollution and that the site will be returned to a satisfactory state.

The considerations for closure, restoration and aftercare management are addressed in Section K of the application.

L.1.11 Acceptability of Method of Treatment (Environmental Protection)

Section 40(4)(j) of the WMA 1996 to 2011 requires that the intended method of treatment is acceptable from the point of view of environmental protection.

The proposed system has been developed as an efficient system to convert biomass and waste into a clean gas for use in CHP (combined heat and power) and electricity production without emitting hazardous toxins to the environment. The process provides a source of low carbon indigenous electricity that is central to reducing emissions and maintaining reliable future supplies of power.

At the core of the technology is a process known as pyrolysis. Pyrolysis is the chemical decomposition of organic substances by heating. Pyrolysis is a special case of thermolysis, and is most commonly used for organic materials. It does not involve reactions with oxygen or any other reagents and within the pyrolysis unit proposed, oxygen is specifically excluded through various mechanisms and controls.

Pyrolysis is broadly used in the chemical industry, to produce charcoal, activated carbon, methanol and other chemicals from wood, to produce coke from coal, to convert biomass into synthesis gas (syngas), to turn waste into safely disposable substances, and for the cracking of medium-weight hydrocarbons from oil to produce lighter ones like gasoline. Using these principles the Glanpower system has been designed to be a commercially viable pyrolytic conversion system that is efficient, reliable, continuous, environmentally safe, and works in conjunction with energy policy factors.

The Glanpower pyrolysis system will convert pre-treated waste and energy crop biomass materials into a clean-burning synthesis gas, which will then be combusted for power production. The system incorporates the best elements of past designs and performances, coupled with process improvements to yield a very flexible, fuel diverse, low capital and reliable energy from waste system.

The method of treatment assists in the protection of the environment in the following ways:

1. Diversion from landfill: The proposed development will divert mixed municipal waste from landfill, upward on the waste management hierarchy, consistent with European and national waste legislation. The facility will provide infrastructure to divert the residual biodegradable fraction of 'black bin' or 'third bin' waste away from landfill (as described in Section L.3.1, Attachment L.3).

2. Recycling: The pre-treatment stage of the proposed activity will result in a number of waste streams including metals, glass, ceramics and heavy particles (i.e. stones) being removed at the pre-treatment stage for recycling off-site. This results in an improvement for the environment when compared with the existing disposal route to landfill or conventional incineration.

3. Net (renewable) energy producer: The facility will be a source of renewable energy from waste, with a nominal export capacity of approximately 9MW electricity to the National Grid. The project assists in the conservation of natural resources by providing an alternative source of renewable energy. Energy efficiency is addressed in Attachment G.2.

4. Reduced environmental impact compared to conventional incineration: Pyrolysis differs from conventional incineration by the exclusion of oxygen. By thermally decomposing the waste rather than burning it, the potential for dioxin formation and dioxin emissions is removed.

It is submitted that the project is consistent with the requirements of BAT (refer to Section L.1.3 above).

ATTACHMENT L.2 FIT AND PROPER PERSON

L.2.1 Convictions under the Waste Management Acts

Neither Glanpower Ltd. nor any Director of Glanpower Ltd. has been convicted of any offence under the Waste Management Acts 1996 to 2011, the EPA Acts 1992 to 2007, the Local Government (Water Pollution) Acts 1997 to 2007, the Air Pollution Acts 1987 and 2011 or any other environmental legislation.

L.2.2 Technical Knowledge and/or Qualifications

Details of the technical knowledge/qualifications of the existing and proposed staff for the operation of the proposed facility are included in Attachment C.1.

The management and staff of the facility will be supported by equipment vendor personnel for the purposes of commissioning and installation, training, maintenance and equipment replacement/repair. This will be formalised through the operation of service/maintenance contracts, as appropriate following completion of the construction phase.

Independent expertise will be continually engaged for the purposes of monitoring (e.g. environmental emissions including noise and air) and certification (e.g. ISO 9001, ISO 14001 etc.).

L.2.3 Financial Provision

Glanpower is a start-up company. Glanpower Ltd. is fully committed to furnish the EPA with any evidence required to satisfy the Agency of the company's ability to meet any financial commitments or liabilities that will be entered into or incurred in carrying on the activities to which this application relates or in consequence of ceasing to carry out these activities.

Environmental Liabilities Risk Assessment

Prior to commencement of operations, it is proposed to carry out an Environmental Liabilities Risk Assessment (ELRA), in accordance with EPA guidelines, to identify the possible requirement(s) for financial provision addressing potential environmental liabilities. This will be submitted to the EPA upon completion.

Insurance

Glanpower Ltd. has been working extensively with the insurance industry to ensure that the facility is fully covered for both construction and operational activities for both public and environmental liabilities. Insurance policies will commence with construction and be advanced for commissioning and overall process operation.

Contingency

In the event of an unforeseen scenario requiring the closure of the facility, Glanpower is committed to ensuring the complete decommissioning and restoration of the site in accordance with a Decommissioning Management Plan for the activities. This will be enabled by suitable financial provision to be supported by future operating profit arising from the commercial activities.

ATTACHMENT L.3 WASTE HIERARCHY

Section 21A Subsection (1) of the Waste Management Acts 1996 to 2011 establishes the following waste hierarchy as a priority order in waste prevention and management legislation and policy:

a) Prevention;

b) Preparing for re-use;

c) Recycling;

d) Other recovery (including energy recovery);

e) Disposal

The basis for the development and success of the Glanpower facility is centred on the diversion of (non-hazardous) waste from landfill, upward on the waste hierarchy, to recycling and other recovery (including energy recovery).

The front-end or pre-treatment stage of the proposed Glanpower process has been designed to remove the metals, glass, ceramics and other large particles (disposed by user via black bin) for recycling off-site thereby maximising the recycling of these constituents. Only the remaining fraction (dry recyclables removed) will be subject to pyrolysis (energy recovery).

L.3.1 Diversion from Landfill

EU and national targets demand significant diversion of waste from landfill in accordance with the waste hierarchy, as summarised in Table L.3.1.

Table L.3.1: Targets for Diversion of Waste from Landfill[3]

Title	Target	Status (2010)	EPA Indicator Status
Waste Management: Changing our Ways (DEHLG, 1998)	50% diversion from landfill of managed household waste by end 2013	41%	Risk
Landfill Directive (1999/31/EC)	By 2013, biodegradable municipal waste (BMW) going to landfills must be reduced to 50% of the total quantity (by weight) BMW produced in 1995 (<610,000T)	+250,000T	Risk
	By 2016, BMW going to landfills must be reduced to 35% of the total quantity (by weight) BMW produced in 1995 (427,000T)	+433,000T	Risk

[3] From Tables 1A, 1B, National Waste Report 2010, EPA

The National Waste Report 2010 (NWR 2010) identifies the need for additional infrastructure to achieve these targets. The report states that (nationally) there remains *"a conservative estimate of c. 131,000T available organic waste in the managed household waste stream that is not separately collected at kerbside"*. Furthermore, this report states that *"not all of this potentially 'available' organic material is suitable for brown-bin collection systems (e.g. food still in packaging)"*.

The report highlights the present difficulty in diversion of biodegradable municipal waste (BMW) from landfill using existing waste treatment facilities, stating that: *"Source separated collections of biodegradable waste in themselves will not ensure that Ireland meets the diversion targets set out in the EU Landfill Directive…Treatment of (the) biodegradable component of the residual waste will be essential in order to meet the 2013 and 2016 Landfill Directive diversion obligations…Waste to energy incineration and refuse derived fuel will certainly contribute, as will mechanical biological treatment (MBT) processes*".

The NWR 2010 reiterates the preceding NWR for 2009 by stating that "*it is a national priority that the necessary infrastructure be developed to treat both organic wastes that must be collected separately and the biodegradable portion of the residual bins from municipal waste collections"*.

It is submitted that the Glanpower proposal will result in the diversion of 65,000tpa of municipal waste (including approximately 47% or 30,550tpa biodegradable content) from landfill, upward on the waste hierarchy, contributing significantly to regional and national targets in this area.

L.3.2 Delivering the Best Environmental Outcome

The method of waste treatment proposed is considered to deliver the best environmental outcome for the treatment of residual (black bin) waste, when compared with the alternative options of disposal to landfill and conventional incineration. The reasons for this may be summarised as follows:

1. Diversion of municipal waste from landfill;
2. Increased recycling;
3. Net energy production;
4. Reduced environmental impact compared to conventional incineration;
5. Compliance with BAT.

These are discussed further at Section L.1.11.

L.3.3 Life Cycle Assessment

Guidance on the life cycle assessment in waste management was reviewed, primarily the findings of the European Commission Report entitled "Environmental Assessment of Municipal Waste Management Scenarios: Part II – Detailed Life Cycle Assessments", 2007.

The report includes the following notable conclusions in the context of the proposed activities:

1. There are large economic and environmental advantages, even benefits from avoided impacts, in a strategy that completely avoids landfilling of municipal wastes. This is particularly the case in the context of climate change.

2. For all separately collected waste fractions, recycling (including composting with energy recovery) is usually the waste treatment option with the lowest environmental impact, and for the remaining wastes ("other wastes" and the residuals that are not separately collected) incineration is the option with the lowest environmental impact.

In response to the first conclusion above, the Glanpower proposal is based on the diversion of municipal waste from landfill, upward on the waste hierarchy, for 'other recovery (including energy recovery)'.

The proposed activity is also in keeping with the second conclusion above. It is proposed that Glanpower will handle the residual municipal waste fraction of source separated waste, so that separately collected waste fractions (e.g. green bin and brown bin waste streams) are recycled by alternative means (i.e. not handled at the Glanpower facility). The residual municipal waste fraction (i.e. black bin) will be subject to pre-treatment as part of the Glanpower proposal, removing dry recyclable fractions (including glass, metals, ceramics and other heavy particles) and returning them to the "green bin" stream for recycling. This ensures a maximum quantity of dry recyclable waste is separated from the overall waste stream and sent for recycling. Following the pre-treatment stage, the remaining waste will be subject to the pyrolysis (energy recovery) process.

ATTACHMENT L.4 SELF SUFFICIENCY & PROXIMITY

Section 37(A) of the Waste Management Acts 1996 to 2011 establishes into law the principles of self sufficiency and proximity, with respect to waste management.

It is estimated that Glanpower can source all of the waste material for the proposed facility (65,000 tonnes per annum) within reasonable proximity i.e. from within the Midlands Region, based on published waste statistics. It is envisaged that Glanpower will source its waste from streams currently sent for disposal to landfill, moving these streams favourably upward on the waste hierarchy, as described in Attachment L.3.

L.4.1 Waste Quantities within the Midlands Region

As part of the Environmental Impact Statement, waste quantities within the Midlands Region were assessed based on the latest figures available at the time of EIS preparation (EPA National Waste Report 2008). The latest figures available for 2010[4], show that 161,992 tonnes of municipal solid waste (MSW) was collected from domestic, commercial and industrial sources in the Midlands Region.

Based on the following scenario (Midlands Region):

- Total Collected and Brought Household Waste[5] 107,873 t
- Total C&I Waste[6] 54,119 t
- **Total MSW (Midlands Region) 161,992 t**

The national target rate for recycling of municipal waste is set at 35% for end 2013 by the Department of the Environment, Community & Local Government (*Waste Management: Changing Our Ways, Department of Environment, Heritage & Local Government, 1998*). This rate of 35% was surpassed in 2010 and assuming this rate is sustained for household waste (e.g. by 3-bin system etc.), the following fraction would remain:

- Remaining Household Waste (recycled fraction excluded)[7] 68,778 t
- Total C&I Waste[8] 54,119 t

For the Midlands region to be self sufficient in the disposal of its own waste, this represents a regional treatment requirement of 122,897 t, based on 2010 figures. The NWR 2010 acknowledges the potential for improvement in the economic climate to increase this volume. It is stated that *"It will be a challenge to meet waste diversion and waste recovery targets if municipal waste generation increases with economic recovery and the necessary waste infrastructure is not in place."*

[4] National Waste Report 2010, EPA 2012
[5] Appendix B, National Waste Report 2010, EPA 2012
[6] Total commercial municipal waste disposed at landfills of Midlands Region i.e. Derryclure, Ballydonagh, Kyletalesha and Ballaghaveny landfill sites (ref. Appendix E of National Waste Report 2010)
[7] Mixed/residual (black bin collection) and household waste delivered to landfill, Appendix B National Waste Report 2010
[8] Total commercial and industrial waste disposed to landfill in Midlands region, Appendix E, National Waste Report 2011

The Economic and Social Research Institute (ESRI) has published figures outlining the predicted growth in national municipal waste generation to 2025, as shown in Figure L.4.1. This reinforces the requirement of Section 37(A) Subsection (1) Paragraph (a) of the Waste Management Acts 1996 to 2011 – "*…to establish an integrated and adequate network of waste disposal installations and of installations for the recovery of mixed municipal waste collections from private households, including where such collection also covers such waste from other producers, taking in to account best available technologies*".

The Glanpower facility will provide an installation for the recovery of mixed municipal waste, which is a preferred alternative to landfill disposal. An assessment of the facility in the context of best available technologies (BAT) is included in Section L.1.3, Attachment L.1.

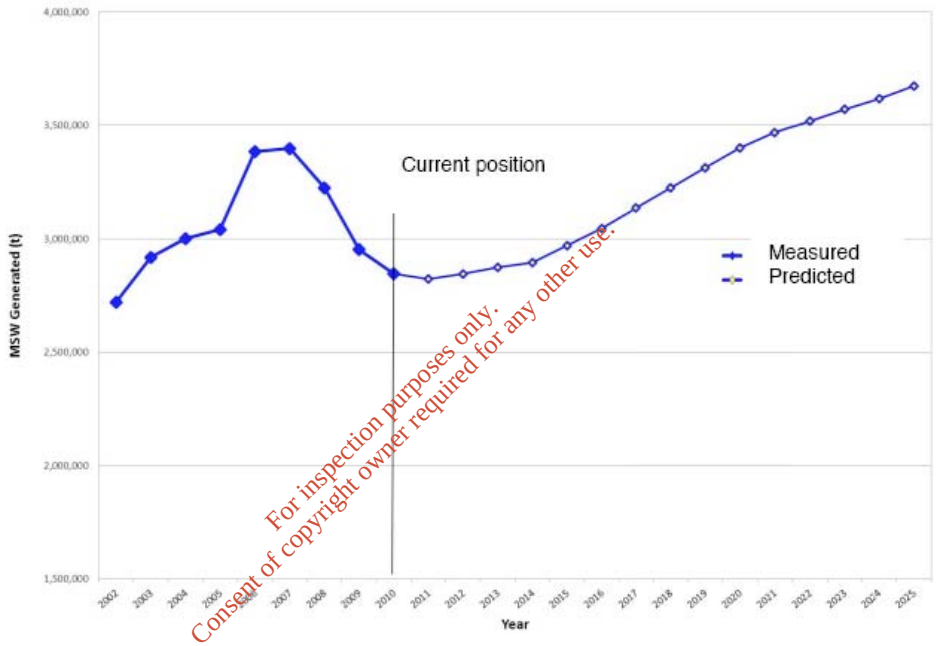

Figure L.4.1: Predicted growth in Municipal Waste for Ireland[9]

L.4.2 Waste Treatment within the Midlands Region

The landfill capacity of the Midlands Region at present is 47,100 tpa, based on the capacity of Kyletalesha landfill in Co. Laois, however Laois County Council has announced its intention to cease landfilling operations at the Kyletashla site in 2012. Kyletashla Landfill is the only operational landfill within the Midlands Region (carrying out disposal activities on-site), following the cessation of landfilling activities at the Derryclure landfill site in October 2011. It is noted that the Ballaghveny Landfill (North Tipperary County Council) also ceased landfilling on 26th February 2011 and Ballydonagh Landfill (Westmeath County Council) ceased landfilling on 31st July 2010.

The Glanpower proposal offers a preferred alternative to landfill disposal within the Midlands Region. Without the development of alternative treatment methods (such as the Glanpower facility) the

[9] Source: National Waste Report 2010, EPA

Midlands region is presented with a scenario where it will be forced to export increasing quantities of waste outside the region, in order to meet targets for diversion from landfill, and thereby deviate from the principles of self sufficiency and proximity.

The development of this waste recovery facility will enhance and diversify the existing waste network within the Midlands Region, in compliance with Section 37(A) Subsection (3) of the Waste Management Acts 1996 to 2011, which states that:

"The network shall enable waste to be disposed of or waste referred to in subsection (1) to be recovered in one of the nearest appropriate installations, by means of the appropriate methods and technologies, in order to ensure a high level of protection for the environment and public health".

As described in Section B.7.2, Attachment B, the Glanpower proposal seeks to maximise waste recovery and minimise the volume of waste consigned for disposal.

L.4.3 The Need for Specialised Installations

Section 37(A) Subsection (2) of the WMA 1996 to 2011 states that *"the network shall be designed to enable the Community as a whole to become self sufficient in waste disposal as well as in the recovery of waste referred to in subsection (1), and to enable the State to move towards that aim individually, taking into account geographical circumstances or the need for specialised installations for certain types of waste"*.

The Glanpower proposal, based on pyrolysis technology, is a new method for the treatment of waste in Ireland. One of the distinct or special advantages of the proposed facility lies in its capacity to recover the residual biodegradable fraction of municipal waste (as discussed in Section L.3.1, Attachment L.3).

The Glanpower facility will provide recovery infrastructure for the treatment of residual biodegradable materials. The need for such infrastructure to divert waste from landfill is identified at Section L.3.1, Attachment L.3. As demonstrated in Attachment G.2, the facility is a high efficiency waste to energy facility under the terms of the Waste Management Acts 1996 to 2011 and Waste Incineration Directive 2000/76/EC. The waste activities which will take place at the facility are described in Attachment B.7.

L.4.4 Economic Feasibility

The feasibility of the Glanpower facility at the Derryclure site has been assessed in the context of the increasing differential in the proposed levy structure of energy-from-waste versus landfill disposal. It is submitted that the economic basis exists to allow a move upward on the waste management hierarchy and a diversion of waste from landfill.

The efficiency of the proposed process and the ability of the business plan to compete in the waste market, even against lower gate fees, means that the proposal will provide a viable alternative to landfill in the

Midlands region. The offering of thermal treatment has been touted for some time as the solution to the over dependency on landfill[10] and the Midlands Regional Waste Management Strategy supports the development of an Energy from Waste facility[11].

The site of the facility is central within the Midlands Regional Authority area (Figure L.4.2), ensuring a sustainable and convenient catchment area for the sourcing of waste. The selection of the Derryclure site was further addressed as part of the Environmental Impact Statement.

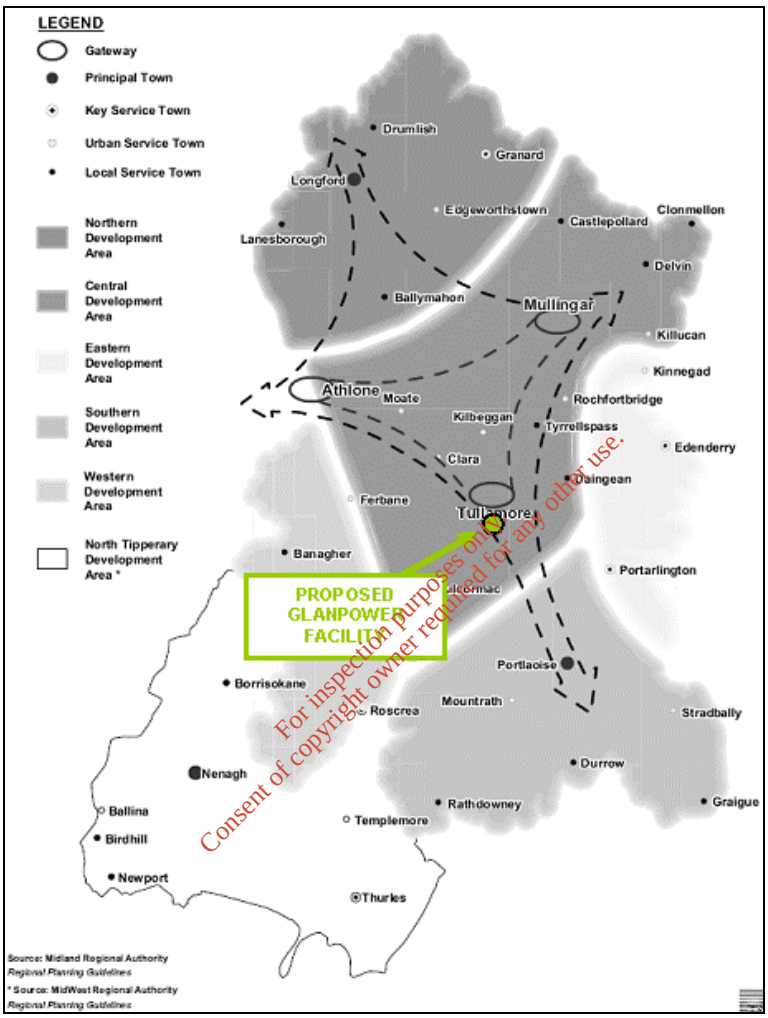

Figure L.4.2: Site Location (Midlands Regional Authority Area)

L.4.5 Self Sufficiency & Proximity - Summary

In summary, the regional waste management policy for the Midlands supports the establishment of energy-from-waste as a method for handling waste. The region is presently a net exporter of waste and is heavily reliant on disposal to landfill. This does not support the national objective of each region being able to be self-sufficient in the provision of waste management treatment and disposal infrastructure. There is sufficient waste feed available within proximity to justify the establishment of the proposed facility, sited centrally within the

[10] Section 3.3.4 of Environmental Impact Statement
[11] Section 3.4.1 of Environmental Impact Statement

Midlands region. The facility's financial viability is assured by the increasing differential in the proposed levy structure of energy-from-waste versus landfill disposal. The proposed facility will greatly contribute towards the Midlands region targets for diversion of waste from landfill. This will accordingly assist the broader objective at national level.