LITTLE ISLAND

BIOENERGY

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ATTACHMENT A.1 - NON-TECHNICAL SUMMARY

Introduction

Little Island BioEnergy (LIBE) Limited proposes to construct a Renewable Bioenergy Plant that will generate up to 4MW of renewable electricity from 90,000 tonnes per annum (tpa) of non-hazardous biodegradable waste, utilising anaerobic digestion (AD) technology. The plant will be located at Inchera, Little Island, County Cork, see **Figure A-1**.

A Planning Application (Register Ref. 154926) and associated Environmental Impact Statement (EIS) for the development of a Renewable Bioenergy Plant at Inchera, Little Island, Co. Cork was submitted to Cork County Council (CCC) on the 6th May 2015. This application is currently under consideration, accordingly confirmation in writing from CCC is include within **Attachment B.6** of this Industrial Emissions Licence (IEL) application. An Environmental Impact Statement (EIS) was submitted with the planning application and a copy of the EIS is also included in this application. The EIS is subdivided into three volumes:

- Volume I – Non Technical Summary (NTS)
- Volume II – EIS
- Volume III – Appendices to EIS

Planning Drawings were also submitted with the EIS and accompany this application.

The NTS (Volume I) should be read in conjunction with this attachment.

Class of Activity

The relevant activities in the First Schedule of the EPA Act 1992, as amended, to which the activity relates are as follows:

11.4

b) Recovery, or a mix of recovery and disposal, of non-hazardous waste with a capacity exceeding 75 tonnes per day involving one of more of the following activities, (other than activities to which the Urban Waste Water Treatment Regulations 2001 (S.I. No.254 of 2001) apply):

(i) biological treatment

c) Notwithstanding clause (b), when the only waste treatment activity carried out is anaerobic digestion, the capacity threshold for that activity shall be 100 tonnes per day.

Alternatives

Chapter 5 of the EIS (Volume II) outlines the site selection process and the main alternative design layouts and technologies considered for the proposed Renewable Bioenergy Plant at Inchera, Little Island, Co. Cork and a summary is presented below.

Sites

In choosing the site cognisance has been paid to guidelines on siting of such plants. Thirty fives sites were selected for evaluation, twenty seven of which were eliminated due to environmental sensitivities. The eight remaining sites were taken forward for a more detailed appraisal against a number of planning and environmental criteria. A weighting factor was applied to each of the criteria and shortlisted sites were assessed against each of the weighting criteria. The eight sites were ranked in order of environmental preference.

The site selection process demonstrates that the Inchera site represents a suitable site satisfying a number of environmental criteria, namely:

- The application area has a favourable zoning designation and offers the opportunity to bring a previously developed industrial site back into productive use;
- The site is remote from residential properties with the nearest located in excess of 600m from the centre of the subject site;
- The subject site is located within close proximity of the N25 (Cork-Waterford), the N8 (Cork-Dublin) and the N40 (Jack Lynch Tunnel) which provide excellent accessibility to all areas of the Southern Waste Management Region which the proposed Plant is intended to serve;
- It is not subject to any statutory nature conservation designation;
- The site is located within the City Harbour and Estuary Landscape Area which is of national importance and is assigned a high value in terms of landscape

character and sensitivity. However, given the site's industrial context and the previous use of the site as an industrial facility, the proposed development will not result in a significant effect on this landscape character area;

- There are no known recorded archaeological, architectural or other cultural heritage sites within the application area;
- It is not located within an area identified as a Groundwater Source Protection Zone; and
- The site is not located within an area identified as susceptible to flooding.

Alternative Site Layout

The final plant design evolved through a number of iterations. Mitigation measures recommended in the EIS are incorporated into the final design.

Modelling undertaken as part of the Air Quality Assessment informed the final height of the combined heat and power stack as 28m, the flare stack as 8.2m, the boiler stack as 10m and the odour control system stack as 25m. These are considered the appropriate levels to ensure optimum environmental performance. The modelling established that at this height no air quality standards or guidelines will be exceeded. The assessment concludes that the controls built into the proposed plant mean that emissions to air will have no significant adverse effects on air quality or the health of local people.

The location of the biogas flare at the north-eastern boundary of the subject site was informed by the assessment of land use planning implications which accompanies this application (see **Attachment B.10**). This location has been chosen in order to maximise the distance between the enclosed flare and the adjacent BASF Plant which is an upper-tier Seveso site.

The final design configuration is optimal from a process engineering, civil engineering and environmental and planning perspective.

Alternative Processes

AD has considerable advantages over other forms of waste treatment technologies including In Vessel Composting (IVC), Energy from Waste (EfW) and landfill as summarised below.

The IVC process is aerobic and so produces water, CO_2 and heat. The biogas produced in AD provides a fuel for the generation of electricity and/or heat, displacing the use of fossil fuels. AD can be a net producer of energy. This is in contrast to composting, which requires the consumption of energy to provide aeration for microbial activity. The AD process generates enough heat and power both to maintain itself and to export surplus electricity to the national grid.

EfW, in common with AD, is a waste treatment technology that is also used to produce renewable electricity from waste. However, AD offers the environmental advantage of producing a compost-like material (termed digestate), rather than just electricity.

The disposal of biodegradable waste in landfills can result in negative effects on the environment, as well as risks to human health. By capturing and combusting biogas, AD prevents fugitive methane emissions. Methane is a potent greenhouse gas (GHG) with a global warming potential 25 times that of CO_2. When the captured biogas is combusted, methane is converted into CO_2 and water, resulting in a net GHG emissions reduction.

Several different types of Anaerobic Digestion (AD) technologies are available for processing biodegradable wastes. These can be broken into three general types: wet, dry continuous and dry batch. Wet AD was selected as the preferred technology option for the proposed plant based upon a number of process engineering criteria including; process robustness, flexibility, gas yield, gas quality and digestate stability.

It was concluded that the Best Available Technique (BAT) for the use of gas from the proposed Renewable Bioenergy Plant, is a spark ignition engine based combined heat and power (CHP).

The advantages are that the plant will:

- Be better able to adapt to any variations in composition of the gas supply as a result of changes in the incoming waste or in the digestion process;
- Provide the most effective means of energy recovery, supplying all of the generated renewable electricity to the National Grid; and
- Utilise the heat from the CHP plant in the pasteurisation, digestion and other ancillary processes such as drying of the digestate.

These factors will substantially reduce GHG emissions from the proposed plant and will offset greenhouse gas emissions by providing renewable energy to the National Grid.

The Application Area

Surrounding Area

The site is located in a heavily industrialised area within the townland of Inchera at the western end of Little Island and comprises an area of circa 2 hectares (ha) (c. 5 acres). The location of features mentioned below are presented on **Figure A-1** at the end of this section.

The application area is situated circa 6kms east of Cork City. Access to the subject site is provided from the R623 Regional Road. The site is near to the northern entrance to the Jack Lynch Tunnel (N40 – South Ring Road) and the Dunkettle Interchange which forms the junction between the N25 Cork-Waterford (east) National Primary Route and the M8 Cork-Dublin (north) Motorway.

A number of small-scale companies are located to the north and west of the application area within Hoffman Business Park. Bord Gais own and operate a gas compound to the west of the application area and within the business park. Further north and within the control of Tapella Ltd. is an area of undeveloped ground encompassing a portion of Dunkettle Shore proposed Natural Heritage Area (pNHA). The R623 is located approximately 80m west of the site.

BASF Ireland, a chemical manufacturing plant, occupies the area to the south of the subject site. Immediately east of the application site there is an area of undeveloped ground and beyond this is a Pfizer pharmaceutical plant**.**

Cork Harbour Special Protection Area (SPA) is located approximately 100m west of the proposed development site beyond the R623. A separate report prepared by Matt Hague, Consultant Ecologist, entitled '*Natura Impact Statement – Provision of Information to an Appropriate Assessment for the Development of a Renewable Bioenergy Plant at Inchera, Little Island, Cork'* accompanies this application (see **Attachment B.6**). The assessment concludes that it can be clearly demonstrated that the proposed project will not result in any significant effects on any relevant Natura 2000 site within a 15km radius of the proposed plant.

Residential development is present in clustered form, with the nearest residence located at a distance of over 500m to the north of the subject site and north of the N25 at North Esk. There is a residential estate, St. Lappan's Place, approximately 1km east of the centre of the subject site. In total there are 94 residential properties situated within 1km of the subject site.

There are two schools, a sports complex and playing pitches within 1km of the subject site.

The Subject Site

The zoning objective of the proposed development site and all lands immediately surrounding it is 'Existing Built-Up Area'. These are areas of existing development where opportunities are present for in-fill development, redevelopment, refurbishment or change of use and do not have a specific zoning objective. It is considered that further development of such areas is more sustainable than continually encouraging growth in undeveloped areas. Indeed, the redevelopment of brownfield sites is deemed to be inherently more sustainable than the development of greenfield sites and is to be encouraged as set out in objective **ZU 4-1** of the Cork County Development Plan 2014.

The site was formally occupied by Pfizer Pharmaceuticals and is now in the ownership of Tapella Limited. It forms part of a larger landholding of circa 20ha, occupied by Hoffman Business Park, a National Roads Authority (NRA) compound and a Bord Gais site, see **Figure A-2**. In the recent past the application area has been substantially cleared of the structures associated with the operation of the Pfizer plant and is dominated by a range of artificial surfaces.

The site is accessed via the internal access road that serves Hoffman Business Park, with entrances located on the R623 to the west of the site.

The subject site is a largely vacant, roughly rectangular shaped plot and varies in height across the site from 7.1m above ordnance datum (AOD) along the western boundary of the site, to 9.5m AOD at the centre of the site. The site drops steeply to approximately 2.0m AOD along the eastern boundary.

The natural topsoil at the subject site has been largely removed and made ground comprising areas of paved access roads, concrete foundations and floors, areas of hardcore fill and grassed / landscaped areas extend across the site.

A decommissioned wastewater treatment plant (WwTP) and utilities building associated with the former Pfizer plant are present at the eastern extent of the site. It is proposed as part of this application that these features will be demolished to allow for redevelopment. A watermain and associated wayleave also exists towards the east of the site.

There is some established screening within and adjacent to the site. On the western boundary there is an established c. 2.5m high hedgerow. Along the southern boundary, within the BASF plant, there is a mature, ornamental screen hedge varying in height from 5 to 20m tall. A stand of trees exists along portions of the eastern boundary and there is currently no screening on the northern boundary.

There is a remnant stone wall associated with the walled garden of the former Inchera House located along a portion of the northern boundary. There are a number of semi-mature ornamental trees along the wall, most of which are immediately outside of the site.

Existing Environmental Conditions

Air Quality

An Air Quality and Climate Assessment undertaken by Odour Monitoring Ireland forms **Chapter 8** of the Environmental Impact Statement (EIS) (Volume II) that accompanies this application. Full details of the monitoring undertaken, dispersion modelling, impacts of proposed emissions and measures for mitigating impacts are presented within this chapter.

The EU Air Framework Directive deals with each EU Member State in terms of 'Zones' and 'Agglomerations' for air quality. For Ireland, four zones, A, B, C and D have been defined. Inchera and its environs are classified for the purposes of this assessment as falling within Zone B. There is no data available from the national air quality monitoring database for air quality specific to Inchera. Available data from the EPA Monitoring Site located in a Zone B area has been referenced for Carbon Monoxide, Nitrogen Oxides,

Sulphur Dioxide and PM_{10} and $PM_{2.5}$ levels and is considered representative of background air quality in the study area.

For completeness, a baseline air quality survey was performed between December 2014 and January 2015 at five locations in the vicinity of the application area. This survey was undertaken in order to assess the baseline air quality concentrations of specific key pollutants including Nitrogen dioxide, Sulphur dioxide, Benzene, Total particulate matter and Odours. This monitoring also allowed for the assessment of cumulative baseline emissions in the vicinity of the proposed plant. Each of the key pollutants was determined to be within the limit values for both the protection of human health and eco systems. The results of the survey conclude that air quality in the vicinity of the application area is expected to be average/good with typical levels of pollutants for a suburban area.

An odour sniff survey was performed in the vicinity of the application area at eleven locations over two individual events during Dec 2014 and Jan 2015. No distinct odours were detected, therefore baseline odours were considered to be ambient, not distinct and neutral.

Noise

A Noise Assessment undertaken by AWN Consulting Ltd. is presented in **Chapter 10** (Volume II) of the EIS that accompanies this application. It considers the impact of the noise generated during the operational phase of the proposed plant on the nearest noise sensitive locations (NSLs). Some 95 residences, 2 schools and 31 commercial properties located within 1km of the application site's boundary are considered to be NSLs for the purpose of this assessment.

Environmental noise surveys were carried out by AWN Consulting Ltd during January 2015 at seven monitoring locations. They include three residential receptors (Locations M01 – M03) which are representative of the nearest properties to the west, north and east of the site. These surveys captured typical background and ambient noise levels.

Presently the noise environment in the study area is dominated by road traffic noise emanating from the N8 (Cork-Dublin) National Primary Road, N25 (Cork-Waterford),

N40 (Cork South Ring Road) and other local roads, and plant noise from adjacent industries.

The entire study area is designated as *'not an area of low background noise'* in accordance with the standards set out in the Agency's Guidance Note for Noise: License Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4).

Soils and Geology, Hydrology and Hydrogeology

An assessment of soils and geology was prepared by O'Callaghan, Moran and Associates and is presented in **Chapter 12** of the EIS (Volume II). A hydrogeological assessment was undertaken by Environmental Risk Solutions (ERS) Ltd. and is presented in **Chapter 13** of the EIS (Volume II). Both chapters should be read in conjunction with this application.

This application is accompanied by a Baseline Report (see **Attachment I.4**). The purpose of the Baseline Report is to summarise all of the evaluated information collected relating to soil and groundwater at the application site to produce a report which identifies the state of soil and groundwater contamination by relevant hazardous substances.

The natural topsoil at the subject site has been largely removed and made ground now extends across the site, as confirmed by Teagasc mapping. The made ground typically comprises re-enforced concrete foundations or bitumen paving above brown gravelly clay or brown clayey gravel fill.

Beneath the made ground lies naturally occurring brown subsoils comprising either very clayey sandy gravels or sandy very gravelly clays across the majority of the site. The GSI has mapped the underlying bedrock as Dinantian Pure Unbedded Limestones from the Waulsortian Limestones Formation. There are no structural fault lines running through the site. The depth to bedrock has been found to vary from approximately 8 m depth to over 18 m depth from previous site investigations. The thickness of subsoils across the site also has been found to vary in response to the variation in the depth to bedrock surface.

In 2015, twelve trial pits were excavated across the site and samples from the made ground and subsoils were collected. One sample from each trial pit was selected for analysis. The samples submitted to the laboratory were analysed for pH, chloride and Extractable Petroleum Hydrocarbons (EPH) (C_{8}-C_{40}). There was no visual / olfactory evidence of contamination noted during the excavations, with the exception of one trial pit (TP-6) where a slight chemical odour was noted. An elevated chloride concentration was detected in the sample collected from TP-6, relative to the results reported for samples analysed from the other trial pits. However, EPH was not detected in the TP-6 sample, which was the trial pit in which a slight chemical odour was noted during sampling. There was a low level detection of EPH in one of the trial pits (TP-12). The sample collected from TP-9 had elevated chloride values in comparison to the other samples. None of the reported concentrations are considered to be of environmental significance.

Groundwater beneath the site was measured at depths ranging from 2.25 m to 8.7 m below ground level in February 2015, equating to 0.85 m above Ordnance Datum (mAOD) to -0.03 mAOD. Groundwater is expected to flow within both the sand and gravel deposits and the limestone bedrock to discharge to the adjacent marine waters in Lough Mahon. Previous groundwater flow mapping completed by Pfizer (URS, 2011) indicated general groundwater flow to the northwest at gradients ranging from 0.0018 to 0.0028. It is expected that gradients and flow directions will vary locally across the site reflecting topography and variations in the underlying geology.

The limestone bedrock is classified by the Geological Survey of Ireland (GSI) as a Regionally Important Aquifer – karstified (diffuse) (Rkd). According to the GSI the site is underlain by undifferentiated sands and gravels, but these have not been classified as an aquifer. Nevertheless it is expected that these fluvio-glacial deposits are in hydraulic continuity with the bedrock aquifer providing additional storage capacity and a component of intergranular flow above the secondary permeability (fissure / conduit flow) within the karst limestone bedrock system.

Groundwater quality has been impacted by historic anthropogenic activities and significant decreasing concentration trends with time have been observed for chloroform and methyl tertiary-butyl ether (MTBE). Both compounds have very high aqueous solubility, which explains the initial high concentrations observed and the

significant reductions which have occurred over time as the compounds have dissolved and migrated within groundwater.

Surface water in the area includes Lough Mahon, which together with the outer River Lee Estuary, forms the upper section of Cork Harbour. The River Lee flows into Lough Mahon in the upper harbour. Water quality in the River Lee at Leemount Bridge has been classified by the EPA as being Good Status (Q4). Surface water quality in Lough Mahon has been classified by the EPA as being Intermediate. Lough Mahon and Upper Cork Harbour are designated Nutrient Sensitive Transitional Waters (EPA).

A search on the Office of Public Works (OPW) National Flood Hazard Mapping website found no record of past flooding within the proposed development area. A Preliminary Flood Risk Assessment prepared by Tobin Consulting Engineers is included as **Appendix I.2** to this application. The Flood Risk Assessment concludes that the developed site will be located in Flood Zone C and is assumed to be appropriate from a flood risk perspective.

Ecology

An Ecological Impact Assessment (EcIA) was prepared by Matt Hague, Consultant Ecologist and is presented in **Chapter 11** of the EIS (Volume II) that accompanies this application.

The application area is not subject to any statutory or non-statutory designations. No natural or semi-natural habitats or features of significant value for wildlife are present on the site. However, it is in close proximity to three European designated areas, (Natura 2000 sites) as follows:

- Great Island Channel cSAC (001058), approximately 2.6km to the east of the application area at the nearest point;
- Blackwater River (Cork/Waterford) cSAC (002170), approximately 15km to the north at the nearest point; and,
- Cork Harbour SPA (004030), approximately 99m to the south west.

In addition, a total of five proposed Natural Heritage Areas (pNHA) are located within 5km of Inchera, as follows:

- Dunkettle Shore pNHA (001082), 160m to the north;
- Douglas River Estuary pNHA (001046), approximately 500m to the south west;
- Glanmire Wood pNHA (001054), approximately 1.7km to the north west;
- Rock Farm, Little Island pNHA (001074), approximately 2km to the south east; and
- Great Island Channel pNHA (001058), approximately 2.2km to the east.

The site visit, mapping and available aerial and street-level photographs show that the site itself contains few if any features of any ecological significance. The great majority of the site comprises a large, open area of built land, substantially cleared in the recent past .

Although the proposed development site contains a considerable amount of buddleia, no invasive plant species were recorded on the site.

Very few if any features suitable for protected species such as bats or nesting birds are present within the development area.

The site itself is comprised entirely of anthropogenic (man-made) habitats of negligible ecological importance. Any individual animals or birds present on the site, including seabirds, are likely to be transitory, particularly due to the presence of high value habitats in close proximity. The site itself contains no Key Ecological Receptors (KERs).

Overall it can be concluded that the site proposed for development is, in isolation, of no significance for nature conservation.

Baseline Report

A Baseline Report accompanies this application and is presented in **Attachment I.4**. The scope of the report is based on the European Commission's *Guidance concerning baseline reports under Article 22(2) of Directive 2010/75/EU on industrial emissions* (2014).

The report presents the potential relevant hazard substances to be used (source), the underlying ground conditions (pathway) and the soils, groundwater and surface water environment (receptors) of the application area.

It is considered that the integrated control measures at the site means that the operational phase of the proposed plant will not result in any deterioration in the existing soil or groundwater quality at the site.

An Environmental Liabilities Risk Assessment (ELRA) commissioned by Pfizer as part of their Closure Plan was submitted to the EPA in 2012. The report states that elevated concentrations of certain organic chemicals were noted in past soils and groundwater monitoring reports. The locations are specific and associated with past site activities. The IPPC groundwater monitoring programme has demonstrated a continuous downward trend in contaminant concentration. The substantial reductions over time and the high solubility of the compounds indicates that there are no significant residual sources of contamination present beneath the site. The current contaminant levels are no longer regarded as environmentally significant. The EPA reviewed the site investigation reports, the residual management plan and the site closure plan and accepted that residual contamination represented a minimal health and environmental risk.

Environmental screening undertaken as part of the EIS submitted with this application revealed no evidence of contamination in the made ground or subsoils at the application site. There was no visual / olfactory evidence of contamination noted during the excavations, with the exception of one trial pit (TP-6) where a slight chemical odour was noted.

The facility has been designed to ensure the protection of soil and groundwater. All materials handling will be undertaken indoors and external areas of hardstanding and bunding are designed to eliminate a direct pathway for any hazardous substances to pollute the underlying ground.

Robust environmental management practices will ensure that the risk of unplanned events will be minimised. The facility will be operated under an Environmental Management System (EMS) which will ensure adequate procedures and work practices are in place to prevent pollution of the environment.

The entire site process will be constantly monitored on a SCADA system to continuously assess the performance of the plant and identify any adjustments necessary to prevent technical issues arising thus limiting the potential for environmental incidents.

The plant will be operated in accordance with stringent regulatory controls and limits. The EPA licence will impose an extensive range of conditions in accordance with international and national threshold limits. The plant will also be subject to environmental performance reporting requirements and regular inspections by as part of the licence.

Control of Major Accident Hazards

The proposed Renewable Bioenergy Plant is not an establishment to which the EC (Control of Major Accident Hazards involving Dangerous Substances) Regulations (S.I. No. 74 of 2006) apply.

However, the location of the subject site is within proximity of BASF which is classified as an 'upper tier' facility and Pfizer as a 'lower tier' establishment under the European Communities (Control of Major Accident Hazards Involving Dangerous Substances) Regulations, 2006. For any developments in the vicinity of Seveso establishments, the Health and Safety Authority (HSA) can issue technical advice regarding the acceptability or otherwise of the risks involved. The HSA have issued a guidance document which outlines the approach when making such a determination. An assessment was prepared by AWN Consulting entitled *Assessment of Land Use Planning Implications for the Development of a Renewable Bioenergy Plant at Inchera, Little Island, Cork* using the HSA's guidance and is included within **Attachment B.9** of this application.

The findings of the assessment demonstrate that the proposed development at this location satisfies the HSA's criteria for Land Use Planning matters, and the HSA would not advise against the development on this basis.

BAT and BREF

The design and method of operation at the plant is based on the relevant Conclusions on BAT contained within the following BAT Reference Documents:

- Best Available Techniques for Energy Efficiency 2009 (ENE BREF)
- Best Available Techniques for the Waste Treatment Industries 2006 (WT BREF)
- Best Available Techniques on Emissions from Storage 2006 (Emissions from Storage BREF)

- Best Available Techniques for Large Combustion Plants 2006 (LCP BREF)
- Best Available Techniques in the Slaughterhouses and Animal By-products Industries 2005 (Slaughterhouses and Animal By-products BREF)

These BREFs address design, operational and procedural matters, including efficient processing, waste acceptance, storage, energy efficiency, emission controls and environmental management systems (EMS) to reduce a facility's impact on the environment.

Development Description

LIBE will utilise anaerobic digestion (AD) as its core technology to generate renewable energy from up to 90,000 tonnes per annum of non-hazardous domestic, commercial, industrial and agricultural biodegradable.

The plant will generate a consistent supply of up to 4MW of renewable electricity, which is enough energy to power 7,500 local homes annually. Heat generated will be reused in the AD process and can also be made available to neighbouring enterprises that may have a use for it.

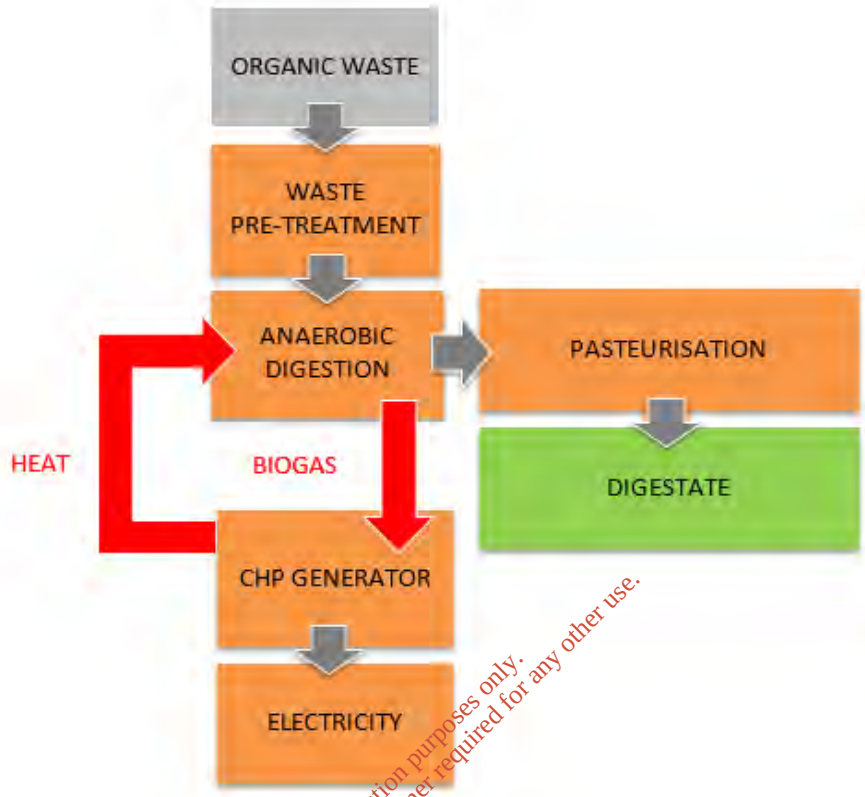
Anaerobic Digestion

AD is a sustainable form of renewable energy production through a naturally occurring process in which micro-organisms break down biodegradable material, in the absence of oxygen in an enclosed system.

The process produces a biogas, which is largely made up of methane (60%) and carbon dioxide (40%), and a compost like material, known as 'digestate'. The digestate is nutrient rich, and free from odour, contaminants and pathogens and can be used as an organic biofertiliser which replaces the use of artificial fertilisers. The biogas is converted into renewable heat and electricity for use in homes and businesses.

An overview of the process is presented in **Plate A.1**.

Plate A.1 Overview of Anaerobic Digestion Process



Characteristics of the Development

The plant has been designed with the flexibility to process a wide range of both solid and liquid organic feedstock suitable for AD. A complete list of waste types proposed to be accepted at the facility is provided within **Table D.2 (i)** in Attachment D. Flexibility is provided through the incorporation of two separate identical processing lines, each capable of processing 45,000 tonnes per annum of feedstock.

A detailed description of the proposal is included in **Attachment D** and **F** of this application and **Chapter 2** of the EIS (Volume II).

In summary, the proposed 90,000 tonne per annum plant will comprise the following:

- The Main Building will be divided up internally to contain the feedstock reception and pre-treatment areas, quarantine area, digestate dewatering and storage areas and effluent treatment area. An odour control system and stack will be

located immediately adjacent to this building. The building will be approximately 14m tall in order to accommodate delivery/removal vehicles and to contain equipment used to treat the waste, and ventilation ductwork.

- The Tank Farm will be bunded and shall contain the pre-treatment, digestion, pasteurisation, process water, concentrate and chemical storage tanks. The tallest tanks will be approximately 24m to the highest point.
- The Biogas Treatment Area will incorporate the combined heat and power (CHP) units consisting of 2 x 2MW engines and associated stack, a biogas holder, a standby gas flare, a boiler and associated stack and gas treatment facilities including a gas booster and gas dryer.
- An Administration Building incorporating a reception area welfare facilities, canteens, offices, meeting and training rooms, a laboratory, storage and first aid rooms, communications and control rooms.

A number of ancillary structures will be located outside these areas and will include a bunded diesel refuelling area, a workshop, a boiler, a motor control centre (MCC) kiosk, an electrical substation, transformers, weighbridges and kiosk, wheelwash, pipe bridge, access stairways, walkways and gantries, car parking, lighting, fencing and security gates.

The application for planning permission includes the demolition of a decommissioned wastewater treatment plant (WwTP) and utilities building present at the eastern end of the application area. The total area of demolition is 1425m^2. The scope of work includes the demolition of all above ground structures, with removal off site for recycling or disposal at appropriately licenced facilities. Sub surface structures will remain in situ and will be absorbed into the proposed re-grading of the site.

Process Description

A schematic of the process flow indicating the various processes through each element of the plant is presented in **Figure A.3** at the end of this attachment. The process can be broadly divided into 3 main stages:

- Pre-treatment: after waste is delivered inside the main building, it will be blended with recycled process liquid to create an organic slurry. Material that is unsuitable for treatment by anaerobic digestion (AD) will be recovered (e.g.

metal, plastic etc.) and exported off site for further treatment, recycling or disposal.

- AD treatment: the slurry will be pumped to the digestion tanks where the organic material will be broken down in the absence of oxygen in enclosed sealed tanks to produce both biogas and digestate.
- Post treatment: the slurry will then be pumped to the pasteurisation tank for treatment in a batch manner to the appropriate Transformation Standard in accordance with Animal By-Product Regulations (ABPR). The captured biogas will be combusted in CHP engines to produce renewable heat and electricity. The electricity will be exported to the national grid (up to 4MW), and will be sufficient to power 7,500 homes. The heat will be reused in the process and can also be made available to neighbouring activities which have a requirement for heat. The digestate will undergo moisture content reduction through the use of centrifuges to produce a cake-like material which, if derived from source separated material, can be used as a biofertiliser. The process liquor remaining after the centrifuge will be treated onsite to reduce the ammonia and BOD content prior to re-use within the process with the excess discharged to the municipal sewer.

Wastes Accepted, Produced and End-Products

The facility if permitted will process up to 90,000 tonnes per annum of non-hazardous domestic, commercial, industrial and agricultural biodegradable waste.

Potentially up to c.10,500t of digestate will be exported from the plant per annum. If derived from source separated feedstock the digestate (fibre fraction) will be Animal By-Products compliant, and, it will also comply with the appropriate quality standard and quality assurance scheme (UK PAS110 or equivalent scheme). This will mean that the digestate will be certified as a non-waste where it is supplied to designated market sectors. The pre-treatment process ensures that this fibre fraction digestate is of requisite required size and quality for use in end markets as a soil conditioner, fertiliser or growing medium.

Digestate derived from mixed residual municipal organics (known as ‘organic fines’), cannot be certified as a non-waste product in accordance with EU Regulations. This

material, if produced, cannot be applied to food producing agricultural land, but can be used for brownfield and contaminated land restoration schemes, or it can be landfilled.

Solid wastes extracted from the feedstock both pre and post digestion will comprise ferrous and non-ferrous metals, glass, plastic, paper and card and grit. These will be sent off-site for treatment at an appropriately licensed waste management facility. Potentially up to 5,200 tonnes could be generated per annum.

Liquid wastes produced will be limited to process effluent from the effluent treatment plant. The excess treated effluent not re-used within the process will be discharged to the public sewer. It is estimated that approximately 200m^3 per day will be discharged.

End-Product

Two containerised CHP units will be installed at the facility, each with a rating of 2MWe. Electricity will be generated from the combustion of biogas with air, and heat will be recovered from the cooling jacket, oil lubrication system and flue gas.

Heat recovered from the CHP plant will be used within the process for heating the pasteurisation units and digestion tanks, as well as for other ancillary processes. This will utilise approximately 40% of the heat generated, with the remainder being available to export to off-site heat users. An energy balance for the process is presented the Table below.

Table A.1 Projected Energy Balance

Inputs		
Total Feedstock	90,000	tonnes per annum
Biogas Energy Recovered	68,743	MWh
Heat Recovered from Biogas		
Total Annual Thermal Output	29,765	MWht
Annual Parasitic Heat Load	11,765	MWht
Heat Available for digestate drying and export from Site (per annum)	18,000	MWht
Electricity Generated from Biogas		
Total Annual Electrical Output	29,490	MWhe

Inputs		
Annual Parasitic Electrical Load	8,282	MWhe
Electricity exported to National Grid	21,202	MWhe

Operational Parameters

Anaerobic digestion is a continuous process therefore the facility is required to operate 24 hours per day, 7 days per week. Waste will be accepted into the plant and outputs removed between the hours of 07:00 to 18:00 Monday to Saturday inclusive. No deliveries will take place on Sundays or Bank Holidays.

Under normal operation the plant will be powered by the on-site CHPs with supply from the grid provided only as a backup.

The consumables required for the process are presented in the Table below.

Table A.2 List of Plant Consumables

Material	Annual Usage	Comment
DERV	2,500 litres	Refuelling of onsite vehicles.
Sodium Hydroxide (caustic)	65t	Required for pH control in organic slurry post pastuerisation.
Polyelectrolyte	15t	Required for dewatering process.
Antifoaming Agent	10t	Infrequent use within digesters.
Sulphuric Acid	230t	Used at pasteurisation stage to acidify the slurry to prevent emissions of ammonia.
Hydrogen Peroxide	480t	Used at pasteurisation stage to assist with slurry stabilisation.
Ferric Sulphate	110t	Direct injection into digesters and grit removal tanks for biogas desulphurization.

For process liquid substances on automatic dosing systems, dedicated tanks with bunds and high level bund alarms will be provided. Other materials which are provided in drums or solid form will be placed in a dedicated containment area. All oil and chemical storage areas will be fully bunded with the capacity to store 110% of the

content of the tanks. Suitable procedures will be put in place for approved supply and delivery of chemicals and deliveries carried out under supervision.

Abatement, Recovery and Treatment Systems

The avoidance of environmental impacts is integral to the design and operation of the plant. A summary of the main technologies and techniques to prevent or eliminate, or where this is not practicable, limit, reduce or abate emissions from the installation are presented below.

All of these measures are in accordance with Best Available Techniques (BAT) as prescribed in the European Commission's Reference Documents. Both the generic and specific BAT measures outlined in each of the BREFs examined will be implemented on site during the operational phase.

All abatement systems are considered to comply with BAT requirements, detailed information of the plant's compliance with BAT conclusions are presented in **Tables I.8 (i-a-i-e)** of **Attachment I**.

Air Quality

The proposed odour control system is based on the principles of good odour management including containment, capture, extraction and treatment.

In terms of odour containment, the main building will be sealed with a near 100% leak proof building fabric. All external process features, such as pipework and tanks, will be enclosed and sealed, with negative extraction applied to ensure no fugitive emissions of odours during operation. All waste handling and pre-treatment activities will be carried out indoors at the facility. The building will be placed under negative pressure.

The waste intake buildings will be fitted with rapid roller doors which will be interlocked and fitted with air curtains so as to maintain good building integrity in terms of odour containment (main access doors only) when doors are opened intermittently during delivery of feedstock. Pedestrian doors will remain closed and only open when access is required.

In terms of odour capture, a network of extraction pipework will be fitted throughout the main building and process equipment so as to provide negative pressure extraction to all odour generation areas / tanks/ sumps located within the facility boundary. This will be ducted to the odour control system for treatment.

The three stage odour treatment plant will consist of a biotrickling filter, followed by plasma injection, and finally carbon polishing, prior to all treated air being vented through a 25m high stack for final dispersion. The overall system will be capable of achieving an exhaust odour threshold concentration of less than 1,000 OuE/m^3 with a typical value in the exhaust stream of 700 OuE/m^3. The system has been designed with 100% duty and 50% standby in mind so that odour treatment coverage is available during routine maintenance of either system.

A full description of the proposed odour control system including a schematic is presented in **Attachment F**.

Biogas can contain hydrogen sulphide (H_2S) generated from the degradation of protein matter in the organics. In order to limit the SOx emissions from the CHP, H_2S in the biogas will be controlled by the addition of ferric chloride to the grit removal tanks and digestion tanks. The proposed design of a 28m high stack is considered to represent a good level of environmental performance, to ensure adequate dispersion of treated process air.

The flare stack (c.8.2m tall) is designed to operate in the event that more biogas is generated than is used. The flare stack will normally only be required to operate when the CHP units are not in use for routine maintenance and are unavailable to use the biogas produced by the digester. The expected availability of CHP engines is >93%. The combustion of biogas by the CHP units of the backup flare will destroy any potentially odorous compounds contained in the biogas.

A dual fuel (biogas and diesel) standby boiler and associated 10m stack will provide hot water for pasteurisation and digester heating requirements in the event that the CHP units go out of service (planned or unplanned). The boiler will also provide heat during the commissioning phase of the plant.

Noise

The main generators of noise will be the CHP engines, gas boosters and the waste pre-treatment activities that will be undertaken inside the main building.

The CHP engines will be housed in acoustic enclosures with a minimum R_w of 24 dB(A), whilst the standby boiler and gas boosters will be housed in containers with a minimum R_w of 24 dB(A).

The waste pre-treatment operations will take place in the main building. This building will be constructed using Kingspan wall and roof panels. The wall panels will have a minimum sound reduction index ($_{Rw}$) value of 24dB(A), whilst the roof panels will have a minimum $_{Rw}$ value of 26dB(A). Furthermore, the access roller shutter doors will remain closed in between vehicles entering and exiting the building.

Surface Water Drainage

Sustainable Drainage Systems (SuDS) measures are incorporated into the design to manage and control surface water runoff from the development and also to treat the runoff in order to remove any suspended solids and hydrocarbons prior to discharge.

Rainwater harvesting is a key measure included in the management of surface water runoff for the plant. Rainfall runoff from the site will be stored and attenuated an underground storage tank, and will be used for ancillary processes such as wash water for the floor of the reception, processing and storage areas of the main building, as well as in the vehicle and wheelwash facilities. Excess runoff will be discharged from the site to the existing municipal surface water drainage network at a controlled release rate. There will be no discharge of process effluent, other than to the foul sewer.

Any rain water collecting within the bunded tank farms will be pumped into the surface water drainage system, provided there is no evidence of potential contamination or spill within the bunded area. In the event that there is evidence of contamination discharge will be undertaken manually via over pumping to the foul sewer.

Surface water run-off will pass through a petrol interceptor water prior to attenuation within the underground tank. It is estimated that an average of approximately 32m^3 per day of clean runoff will be discharged after rainfall harvesting.

In the event of a fire, fire water retention will be in compliance with the requirements of the EPA Guidance on Fire Water Retention. Fire water, should it arise, will be dealt with in a number of different ways as follows:

- Firewater generated in the main building will be directed to drainage sumps along the centre of the building, which is effectively a bunded tank with a capacity of 535m^3;
- Firewater generated in the tank farm will be contained within the bund walls which have a capacity of approximately 4196m^3; and,
- Firewater generated elsewhere on the site will be directed to the surface water attenuation tank via a petrol interceptor.

Quality analysis of the water will be undertaken which will inform an appropriate and safe method of treatment or disposal. Contaminated waters are therefore prevented from reaching the municipal storm and foul sewer network, ground or groundwater.

A detailed description of the proposed surface water philosophy is provided in **Attachment F.1** and **Appendix 1** of the Baseline Report which accompanies this application as **Attachment I.4**. A summary of all incorporated operational phase mitigation measures and techniques to avoid pollution as a result of surface water emissions are summarised in **Chapter 13** of the EIS (Volume II).

Foul Water Drainage

An on-site process effluent treatment plant is an important element of the proposed plant. This facility will treat separated liquid digestate from the centrifuge stage of the AD process. Process water discharged from the wheelwash and vehicle wash and sanitary wastewater will be routed directly to the foul sewer. It should be noted that runoff from the washing of the main building floor will be captured within the internal foul drainage system and recycled directly to the AD process.

The treated process water from the process effluent treatment plant which will utilise reverse osmosis (RO) technology is recycled into the main process and is used to dilute the incoming feedstock. Excess treated process water that is not required for the process will be discharged to the municipal sewer.

It is estimated that up to 200m^3/day of treated process effluent will be discharged to the sewer. This effluent will have a significantly reduced organic loading following the treatment in the on-site WwTP, with a maximum population equivalent of approximately 750 (based on 1 PE = 54g of BOD per day).

A detailed description of the proposed foul water drainage system is provided in **Attachment F.1** and **Appendix 1** of the Baseline Report which accompanies this application as **Attachment I.4**. A summary of all incorporated operational phase mitigation measures and techniques to avoid pollution as a result of foul water are provided in **Chapter 12** and **14** of the EIS (Volume II).

Proposed Emissions and Impacts

Proposed emissions from the plant and a summary of the assessment of the effects of the emissions are presented below.

Air

There will be four scheduled emission points associated with the operation of the plant:

- A2-1: a single multi-flue stack which will discharge the residual levels of pollutants from 2 x 2MW combined heat and power (CHP) engines and the standby boiler to atmosphere at a height of 28m above ground level;
- A2-3: a standby gas flare (8.2m) which can be used to combust excess biogas when combustion by the CHP or storage in the gas holder is unavailable; and
- A2-4: odour control stack through which treated air from the odour control system will be vented for dispersion to atmosphere at a height of 25m above ground level.
- A2-5: a standby boiler and 10m stack used during commissioning and maintenance to provide heat to the digesters and pasteurisation tanks when the CHP engines are not running.

Pollutants likely to be emitted from the named emission points A2-1, A2-3 and A2-4 and A2-5 include the following compounds:

- Carbon monoxide
- Oxides of nitrogen

- Sulphur dioxide
- Total particulates
- Total non-methane volatile organic compounds
- Ammonia
- Hydrogen Sulphide

Table A.3 Nature and Quantity of Point Source Emissions to Air

Emission Point Ref.	Parameter	Volume to be Emitted	Source	Discharges to
A2-1	Carbon monoxide Oxides of nitrogen Sulphur dioxide Total particulate matter Total non-methane volatile organic compounds Ammonia Hydrogen Sulphide	14,632 Nm³/hr	CHP Engines	Atmosphere
A2-3	Carbon monoxide Oxides of nitrogen Sulphur dioxide Total particulate matter Total non-methane volatile organic compounds Ammonia Hydrogen Sulphide	45,234 Nm³/hr	Gas Flare	Atmosphere
A2-4	Odour Ammonia Hydrogen Sulphide	121,126 Nm³/hr	Odour Control System	Atmosphere
A2-5	Carbon monoxide Oxides of nitrogen Sulphur dioxide	6,000 Nm³/hr	Standby Boiler	Atmosphere

An Air Quality Assessment undertaken by Odour Monitoring Ireland is included as **Chapter 8** of the EIS (Volume II). The assessment describes the potential impacts to ambient air quality from the proposed Inchera Renewable Bioenergy plant. A worst case of assessment was utilised throughout the study in order to assess any risk

associated with the operation of the plant. Particular attention is given to the potential exposure of receptors to airborne pollutants resulting from the development and operation of the plant. Sensitive receptors, including commercial enterprises, residential dwellings and schools within circa 1 km of the subject site and designated ecological sites up to 15 km have been included in the assessment.

The air modelling study (using AERMOD Prime) demonstrates that emission levels as a result of the operation of the plant will not result in any air quality impact in line with Irish and European assessment criteria limits.

In terms of odour, the predictive modelling undertaken as part of this assessment establishes that odour concentrations at the site boundary and at all sensitive receptors will be well below the allowable national and international guidance limit values.

Fugitive emissions of odours will be negligible as all buildings and processes containing odorous activities will be of high containment integrity (near 100% integrity) and all areas where odorous activities occur will be placed under negative extraction.

The Air Quality and Climate Assessment demonstrates that the controls built into the facility mean that emissions to air from the plant will have no significant adverse effects on air quality. All predicted ground level concentrations (GLCs) at or beyond the facility boundary will be in compliance with air quality limit values for both the protection of human health and flora and fauna.

Surface Water

There will be one point source emission to surface water (SW1) from the plant. Only treated excess storm water runoff will be discharged from this point to the municipal storm sewer network. It is estimated that an average of approximately 32m^3 per day of clean runoff will be discharged after rainfall harvesting.

Table A.4 Nature of Point Source Emission to Surface Water

Emission Point Ref.	Parameter	ELV	Quantity	Source	Discharges to
SW1	N/A	No Limits Proposed	Estimated 32m^3/day	Clean uncontaminated surface water run-off	Existing municipal storm sewer

A hydrological assessment undertaken by Environmental Risk Solutions (ERS) Ltd. is included as **Chapter 13** of the EIS (Volume II).

The assessment describes the potential impacts to surface water from the plant. It is based on a desk study review of published hydrological data for the area, a review of previous site investigations carried out at the proposed site, and a site walkover. Assuming implementation of recommended mitigation measures and operation of the site in accordance with an IEL, the residual impacts to hydrology are concluded to be imperceptible.

Sewer

There will be one point source emission to sewer (SE1) from the on-site process effluent treatment plant which will utilise RO technology. It is estimated that up to 200m^3/day of excess treated process effluent will be discharged to the sewer.

Table A.5 Nature and Quantity of Point Source Emission to Sewer

Emission Point Ref.	Parameter	Quantity	Source	Discharges to
SE1	pH BOD COD NH_4 Suspended Solids	200m^3/day (maximum)	Process Effluent Treatment Plant	Municipal Sewer

This effluent will have a significantly reduced organic loading following the treatment in the on-site WwTP, with a maximum population equivalent of approximately 750 (based on 1 PE = 54g of BOD per day).

Effluent from the municipal sewer will ultimately be treated at the Carrigrennan WwTP prior to discharge at Marino Point.

The proposed discharge is not anticipated to give rise to any significant environmental effects due to the level of treatment it will undergo on site prior to discharge to the municipal sewer.

Groundwater

There will be no direct discharge to ground from the plant. The plant will be constructed on an impermeable surface with the main process tanks contained within a bunded area with the capacity to store 110% of the content of the largest tank. Mitigation measures contained within **Chapter 12**, Soils and Geology and **Chapter 13**, Hydrogeology and Hydrogeology of the EIS (Volume II) will ensure that there are no emissions to ground.

Noise

The main generators of noise will be the CHP engines, gas boosters, standby boiler and the waste pre-treatment activities that will be undertaken inside the main building.

The noise assessment presented in **Chapter 10** of the EIS (Volume II) demonstrates that the EPA NG4 noise criterion limits as prescribed for daytime, evening, and night-time are comfortably met at all noise sensitive locations (NSL) assessed.

The operational noise assessment of fixed plant associated with the proposed plant has shown that in accordance with the scale in the *Guidelines on the Information to be contained in Environmental Impact Statements'* there will be an imperceptible impact at all of the NSLs assessed. This means that there will be no impact.

The assessment demonstrates that the predicted noise levels produced by offsite traffic accessing and egressing the proposed plant will also result in an imperceptible impact.

Table A.6 Noise Criteria for Area Designation

Baseline Environment	Proposed ELVs		
	Day (07:00-19:00) $L_{AF\ 90}$ dB	Evening (19:00-23:00) $L_{AF\ 90}$ dB	Night (23:00-07:00) $L_{AF\ 90}$ dB
Not an Area of Low Background Noise	≥41	≥36	≥31

Determination of Emission Levels

As demonstrated in the information provided in this application and the accompanying EIS, Little Island BioEnergy Ltd. is committed to the principle of BAT being used at the plant to prevent or eliminate, or, where that is not practicable, to limit, abate or reduce an emission from the plant.

Atmosphere

The 'as discharged' emission levels for each of the proposed point source emissions to atmosphere for Carbon monoxide, Oxides of nitrogen, Sulphur dioxide, Total particulates, Total non methane VOCs, Ammonia, Hydrogen Sulphide and Odour was established through air dispersion modelling (AERMOD Prime (12345)) undertaken as part of the Air Quality and Climate Assessment. A detailed description of the modelling undertaken is presented in **Attachment E.1** and **Chapter 8** of the EIS (Volume II).

The results of the model were compared against statutory EU and Irish ambient air quality limits. The proposed emission levels for point source emissions to atmosphere will not exceed International or Irish air quality standards or those set out in the IEL. The assessment establishes that the quality of the receiving environment will not be impaired as a result of the proposed emissions from the plant.

Surface Water

The proposed rate of discharge of 32m^3 per month of clean treated stormwater to the existing municipal storm sewer was established based on analysis of the plant's water requirements. A water balance was established and identified the amount of water required in all water use areas of the plant; this allowed the development of a better-integrated water use programme in order to reduce the demand for potable water.

Sewer

The proposed discharge of 200m^3 per day of process effluent to the existing municipal foul sewer is based on an analysis of the plant's mass balance which establishes the dilution requirements of the process. In order to optimise the facility's effluent use, process effluent is treated at the onsite effluent treatment plant, with the maximum quantity recycled back into the process and the excess discharged to the municipal sewer.

Noise

The noise assessment presented in **Chapter 10** of the EIS was undertaken in line with the methodology set out in the Agency's *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)*'. The procedure

contained in the NG4 guidance sets out a methodology to determine an acceptable noise limit at a noise sensitive location (NSL). In accordance with NG4 the noise environment at each NSL assessed has been categorised as *'not an area of low background noise'*. The proposed emission levels for noise are in line with the Agency's requirements for areas designated as such.

Monitoring

All aspects of the proposed plant will be controlled and monitored by a central Supervisory Control and Data Acquisition (SCADA) control system. This system will incorporate alarm tagging so as to ensure consistent performance over the life time of the plant. The system will also allow for maintenance of optimum conditions required at the various stages of the plant to ensure safe and efficient operation of the plant.

The SCADA system will be designed, installed and commissioned to receive and control all plant and equipment including the CHP units on site. The system has clear screen pictures representing each stage of the process, ensuring that the operational staff will have a quick and easy overview of the plant operation.

Instrumentation equipment will be located throughout the plant to ensure safe operation of the plant and will allow measurement of the plant's operation and performance. These will include measurements of the feed rates into tanks; level controllers in the digester tanks; temperature transducers to continuously measure the temperature within the tanks; the quality of the gas produced; links to the gross and parasitic meters; and the discharge from the tanks. Measuring instrumentation will be independently calibrated as required and applicable certificates will be contained and held on record.

Infrastructure, surfacing and equipment within the site (including tanks, bunds, pipes, structures, roads, hardstand areas, drains etc.) will be inspected on a regular basis to check for equipment malfunctions, structural deterioration, operator errors and leaks and will be maintained and repaired as necessary. Tanks will be fitted with level indicators to prevent overfilling. In addition, the operator will undertake visual checks on all plant and equipment at least once a week and, if deemed necessary, bring forward any planned maintenance or undertake remedial works.

LIBE is committed to proactive monitoring and a collaborative approach with the regulatory authorities to ensure that the highest standards will be maintained. Monitoring will be undertaken in accordance with the IEL conditions. The plant will also be subject to environmental performance reporting requirements and regular inspections by the EPA.

An application for approval under the Animal By-products Regulations will be made to the Department of Agriculture, Food and the Marine. All approved plants are subject to regular monitoring inspections by the Department's Veterinary Inspectors.

Abnormal Operating Conditions

All aspects of the proposed plant will be controlled and monitored by the central SCADA control system as described above.

The standby gas flare is designed to operate in the event that more biogas is generated than is used by the CHP engines. The flare stack will normally only be required to operate when the CHP units are not in use for routine maintenance and are unavailable to use the biogas produced by the digesters. The expected availability of CHP engines is >93%. There are two CHP units and normally only 1 engine will be off line (for maintenance) at a time. The duty of the flare is designed to cater for the maximum hourly biogas production rate.

The function of the flare stack is to prevent the gasholder from becoming overfull, which would in turn result in over pressurisation of the gas system and release to atmosphere (by the pressure relief valves) of unburnt biogas.

The grit removal and digestion tanks will be fitted with pressure relief valves (PRVs). This device is a safety device to protect the roof against excessively high or low pressures, which could occur under abnormal fault conditions. This device should not operate under normal working conditions. The PRVs will only operate if the CHPs and the flare stack are inoperable. The availability of CHP is expected to be >93% (for each engine) and availability of the flare >95%, therefore the risk of PRV venting biogas to the atmosphere equals 0.02%.

A dual fuel (biogas and diesel) standby boiler will be located adjacent to the CHP units to provide hot water for pasteurisation and digester heating requirements in the event

that the CHP units go out of service (planned or unplanned). The boiler will also provide heat during the commissioning phase of the plant.

In the event of a power cut or 'black-out' the plant will automatically shutdown. Feedstock will be prevented from entering the process during periods of automatic shutdown and most electrical /electronic equipment, motors and fans will cease operating except those required to cool the plant and provide emergency lighting. In the event of a black out, however, such motors and fans will require an emergency power supply. This will be provided by a backup or emergency electrical generator powered by a diesel motor.

A fire detection and early warning system will be installed and adequately maintained and regularly tested. This system along with the presence of security personnel when least activity is taking place on site will ensure early detection of a fire during night-time, weekends and holiday periods. Systems will be installed to allow the segregation and containment of firewater until an appropriate and safe method of disposal or treatment is determined. Firewater will be prevented from entering surface water and groundwater.

Cessation of Activities

An Environmental Liability Risk Assessment (ELRA) and Closure Plan has been prepared in accordance with the Agency's Guidance on assessing and costing environmental liabilities. The ELRA and CRAMP are presented in **Attachment K** of this application.

The financial provision contained within the ELRA is based on the worst case scenario identified in the assessment undertaken. The estimated maximum liability that may be incurred is calculated at €921,790. This estimate is inclusive of a contingency of 20% and exclusive of VAT

LIBE is in the process of identifying and putting in place the appropriate financial provision to cover this potential liability, the details of which will be confirmed to the EPA under separate cover.

The Closure Plan has been developed on the basis of cessation of waste processing activities and sale of the site and buildings for redevelopment. In accordance with EPA

guidance, the plan has been costed on the basis that closure may be required with little or no wind down of activities in preparation for closure. The total closure costs have been estimated at €991,599 this estimate is inclusive of a contingency of 20% and exclusive of VAT.

LIBE will make the necessary financial provision to cover the requirements of this closure plan and will provide the EPA with confirmation of the provisions once they are in place.

Site Management & Hours of Operation

Overall site management and control will rest with the applicant, LIBE. The Stream Group is a member of a number of professional bodies including Cré and the Irish Waste Management Association (IWMA).

The facility will employ some 16 no. staff working during the operational phase over three pre-determined shifts as follows:

- 07:00-16:00hrs - 7 staff
- 13:00-22:00hrs - 6 staff
- 22:00-07:00 hrs - 3 staff

The site manager will be responsible for directing all Operations and Maintenance (O&M) activities on site. Fulltime on-site Plant Maintenance Engineers will work to proactively manage the maintenance of the plant. This work will involve the immediate resolution of any technical problems that may arise.

An Environmental Management System (EMS) will be developed for the management of all environmental issues on site prior to the commencement of the operational phase of the plant.

Environmental Quality Standards

The emission limit values proposed in the application and those that will be set by the EPA in the licence are and will be based on achieving compliance with the relevant Environmental Quality Standards (EQS).

Protection of Groundwater (80/68/EEC and 2006/118/EC)

The design of the proposed plant has been undertaken using technical guidance, relevant pollution prevention guidelines and other codes of best practice in order to limit the potential for contamination of groundwater and other potential adverse impacts. There are no planned discharges to ground from the proposed plant.

The design of the plant includes an extensive number of measures to ensure the protection of groundwater and include:

- Processing areas will be constructed on an impermeable surface incorporating a designed drainage system to prevent discharges to groundwater;
- Tanks will be constructed in a bunded area so that any leaks/spillages will be contained. The impermeable bund will be capable of containing at least 110% of the volume of the largest tank within the bund;
- Waste will be unloaded inside the main building on a contained concrete structure with an integrated foul water drainage system. No waste will be unloaded or stored outdoors;
- Organic slurry will be contained within a network of pipes and sealed tanks;
- Wash down water from the floor of the reception area will be redirected back into the process;
- Incompatible wastes and substances will be stored separately through segregated bays or dedicated buildings according to their hazardous potential and will have separate drainage collection;
- Refuelling and the servicing of plant and machinery will only occur in areas of hard standing which have been designated for this purpose;
- Oils, greases and hydraulic fluids will be stored under cover in a bunded area;
- Systems are built into the design of the site to ensure that environmental media are not impacted in the event of a fire. The plant is designed so that in the event of a major accident, all contaminated run-off will be retained on site for appropriate assessment and treatment or disposal if required;
- In the event of a fire, the contained systems will allow firewater to be retained on site until quality analysis of the water is undertaken which will inform an appropriate and safe method of disposal. Contaminated waters are therefore

prevented from reaching the existing municipal stormwater drainage network, ground or groundwater;

- Good site management practices will be implemented to reduce risks of spills, including regular monitoring and inspection of construction storage vessels and ensuring that all plant is properly maintained and serviced;
- A contingency plan will be developed to deal with potential leaks and spills and an emergency spill response kit will be maintained on site; and,
- Any soil contaminated from an accidental spillage will be contained and treated appropriately and in accordance with the Waste Management Act 1996-2012.

Waste Hierarchy and Waste Management Act

The proposed plant accords with the Waste Hierarchy as it seeks to maximise the recycling and recovery of non-hazardous biodegradable waste through the production of renewable electricity and heat and a stabilised digestate.

The proposed plant will help Ireland meet a number of important EU commitments, as well as contributing towards achieving national recycling targets. EU Directives such as the Waste Framework Directive (2008/98/EC) encourage the use of AD to convert non-hazardous organic material, which is currently discarded, into renewable energy and a nutrient rich fertiliser.

The EU Landfill Directive (1999/31/EC) sets mandatory targets for a reduction in the amount of biodegradable municipal waste disposed of to landfill, and this material can be processed by AD. The plant can therefore make a significant contribution to the management of organic materials in Ireland.

The proposed plant will provide urgently needed biological treatment infrastructure in Cork and the Southern Waste Management Region as a whole to process the increasing volumes of source separated domestic and commercial organics that will be collected in accordance with the two pieces of recently transposed Food Waste Legislation, thus also helping to achieve national recycling targets.

Waste Prevention

The plant is designed to generate energy from organic waste and to produce digestate that can be used as a product and recycled to land as a soil conditioner and natural fertiliser when derived from source separated waste. As all of the incoming feedstocks will be classified as waste, the only opportunity for waste prevention relates to the small amounts of office and canteen waste and other wastes that will be generated in the administration and welfare facilities and through plant maintenance. Waste prevention awareness will be promoted at the facility and LIBE will operate a source segregation policy as part of the EMS to maximise the recovery of potential recyclable materials from these waste streams.

Minimising Pollution over Long Distances

A Natura Impact Statement (NIS) accompanies this application (see **Attachment B.6**) and assesses any likely significant effects from the proposed development on Natura 2000 sites within a 15km radius of the site.

The identified potential source-pathway-receptor link between the proposed plant and all Natura sites are:

- Emissions to air from the combustion process of biogas associated with the generation of heat and electricity during the operation of the CHP or flare; and
- Changes in surface water quality through the discharge of treated surface water run-off to the municipal stormwater drainage system which in turn discharges to Lough Mahon.

The assessment considers the potential effects associated with the construction and operation of the Renewable Bioenergy Plant. It concludes that it can be clearly demonstrated that the proposed development will not result in any significant effects on any relevant Natura 2000 site within a 15km radius of the facility either on the integrity of these sites, or any qualifying features for these site for which they have been classified/designated as being of European importance, either as a stand-alone development or in-combination with other plans or projects within its zone of influence.

Table A.7 Summary of Identified Likely Significant Effects for the Operational Phase of the Plant

Environmental Factor	Likely Effects Identified	Brief Description of the Effect	Proposed Mitigation Measure
Chapter 7 (Human Beings)	• Potential effect of loss of land due to development of the site. • Potential effect of developing a plant within proximity of Seveso sites. • Effect of potential degradation of air quality as a result of the operation of scheduled emission points at the proposed plant. • Effect of increase in noise associated with the plant's operation causing disturbance to the local community. • Effect of demand for accommodation/housing within the local area. • Potential effect on economy and employment within the area. • Potential impact on tourism in Cork Harbour.	• The proposed plant is compliant with the statutory land use zoning of the application area and will bring a brownfield site back into productive use. There will be no significant effect on land use. • An assessment of land use planning implications demonstrates that the proposed development at this location satisfies the Health and Safety Authority's criteria for land use planning matters, and the HSA would not advise against the development on this basis. • Both air quality and noise emissions are dealt with separately in the EIS under **Chapter 8** and **10** respectively, see below for further details. • The facility will employ 16 permanent staff. It is not anticipated that will have any significant long-term impact on	• The plant will be operated in a manner that will either eliminate or minimise the risk of environmental nuisance including odours, noise, litter, vermin and pests. • Careful consideration has been given in the design phase of the proposed plant to ensure that adverse effects do not occur as a result of the operation of this plant. These measures, are outlined below: ➢ An impermeable surface will extend across the entire site which will be serviced by an engineered drainage system; ➢ Waste is not handled outside the main processing building; ➢ The main building is totally enclosed with access to the waste reception area only possible through automatic rapid open/shut doors; ➢ Extraction systems in the building maintain negative pressure inside all areas of the building. This encourages air to flow into the building, thus preventing uncontrolled egress of odour when access doors are opened;

Environmental Factor	Likely Effects Identified	Brief Description of the Effect	Proposed Mitigation Measure
		housing demand during the operation of the facility. • The most significant positive impact will be the permanent employment opportunities that will result from the operational phase, and jobs associated with supplying goods and services to the plant. • During the operational stage the proposed plant will have a slight to moderate neutral and cumulative impact in the short-term and a slight impact in the medium and longer term on the local landscape character with the development being in keeping with the existing character and perception of an industrial landscape. Visually the proposed development is set within an existing industrial context and as such will give rise to slight to moderate negative and cumulative visual impact in the short, medium and longer term.	➢ Air extracted from the waste processing building is treated before release to the atmosphere; ➢ There are no emissions to atmosphere from the AD tanks or other process vessels as the entire system is enclosed in a series of connected pipes and tanks; ➢ Acoustic containment is provided for the CHP engines, standby boiler and boosters; ➢ The combustion of biogas by the CHP facility or gas flare will destroy any potentially odorous compounds contained in the biogas; ➢ The building will be set into the landscape and will display colours/textures that assist its blending into the surroundings; and ➢ The proposed development will be designed and constructed in such a way so as to comply with all relevant health and safety regulations.

Environmental Factor	Likely Effects Identified	Brief Description of the Effect	Proposed Mitigation Measure
Chapter 8 Air Quality	• Air quality impacts may arise from process based emissions and traffic movements associated with the operational phase of the proposed plant. Traffic based air quality emissions will result from traffic making deliveries and collections to and from the proposed plant and employee traffic movements.	• There is no significant increase in the air quality impact of named pollutants as a result of increased baseline traffic numbers in 2014, 2017, 2022 and 2032 with only a slight increase occurring in pollutant concentration predicted 5m from the road centreline. • Of all the receptors evaluated, C15, a commercial receptor, is identified as the worst case receptor with a maximum predicted GLC of odour less than or equal to 0.15 Ou_E/m^3 at the 98th percentile of hourly averages for the worst case meteorological year Cork Airport 2008. This is less than 10% of the odour impact criterion of 1.5 Ou_E/m^3 stated in Irish EPA Guidance AG4. In addition, the maximum predicted odour concentration anywhere in the vicinity of the proposed plant will be less than or equal to 0.20 Ou_E/m^3 for the 98th percentile of hourly averages for the worst case meteorological year Cork	• The air quality emissions from each of the gas utilisation engines, flare and boiler will exhaust through a 28m, 8m and 10m stack respectively, while emissions from the odour control system will exhaust through a 25m stack. • All buildings and processes containing odorous activities will be of high containment integrity (near 100% integrity) and all areas where odorous activities occur will be placed under negative extraction. • All odorous air will be vented through a three stage odour treatment process to deodorise the collected air. In addition, this treated air will be vented through a 25m stack to provide further dispersion as a final protection. • Access doors to the waste reception area will be of rapid roller type and fitted with air curtains to prevent emissions from escaping from doorways when vehicles access the main building's reception area. • An odour management plan will be implemented at the proposed facility in line with EPA requirements.

Environmental Factor	Likely Effects Identified	Brief Description of the Effect	Proposed Mitigation Measure
		Airport 2008. This is 13% of the worst case odour impact criterion of 1.5 Ou_E/m^3 stated in Irish EPA Guidance AG4. As the GLC value is assessed as being below 1.0 Ou_E/m^3 at each of the residential, commercial and designated site receptors in the vicinity of the proposed plant when fully operational, odour from the proposed plant will not result in any significant impact in the vicinity of the facility. • Ground level concentrations of classical air pollutants were predicted at each of the named sensitive receptors (residential, commercial and designated sites). The cumulative predicted GLC of each pollutant for the protection of human health is well within their respective ground level concentration limit (range of less than 0.10 to 74.70% of impact criterion when the proposed plant is at 100% operation capacity.	

Environmental Factor	Likely Effects Identified	Brief Description of the Effect	Proposed Mitigation Measure
Chapter 9 Landscape & Visual	• Potential landscape impacts associated with changes to the character of the landscape that arise from the insertion of the proposed development into the existing context. • Potential visual impacts as a result of the development of the proposed plant at Inchera.	• During the operational stage the proposed development will have a slight to moderate neutral and cumulative impact in the short-term and a slight impact in the medium and longer term on the local landscape character with the development being in keeping with the existing character and perception of an industrial landscape. • Visually the proposed development is set within an existing industrial context and as such will give rise to slight to moderate negative and cumulative visual impact in the short, medium and longer term.	• Screen tree planting will be provided to the western and eastern boundaries of the site, which will assist in screening the lower levels of the development from the R623 road to the west of the site and the proposed future link access road from the N25 to Little Island to the east to the site. • The proposed landscape planting will generally be established with forestry planting techniques, i.e. bare root transplants, whips and feathered trees which adapt readily to disturbed ground conditions. • The remnant stone wall to the northern boundary of the site will be retained and protected within the scheme. • All light standards shall be fitted with horizontal cut-off light fixtures to minimise potential for light spill.
Chapter 10 Noise	• Potential effects of noise generated by both fixed and mobile plant at the development site. • Potential impacts associated with employee movements, vehicles making deliveries to the plant and removing end product from the plant.	• The cumulative noise impact at Locations each of the NSLs assessed is imperceptible from fixed plant associated with the proposed plant. This means that there will be no impact. A similar conclusion is reached in relation to all residential	• Waste pre-treatment operations will take place in the main building. This building will be constructed using Kingspan wall and roof panels. The wall panels will have a minimum sound reduction index (Rw) value of 24dB(A), whilst the roof panels will have a minimum Rw value of 26dB(A). The access roller shutter doors will remain

Environmental Factor	Likely Effects Identified	Brief Description of the Effect	Proposed Mitigation Measure
		properties (95) assessed in the study area. • In terms of the nearest commercial property a 3dB increase in overall noise levels is predicted. This relates to a just noticeable increase in noise levels with an associated moderate impact. It is noted that the existing noise environment is dictated by existing industrial noise associated with existing facilities in the area. • The NG4 noise criterion limits as prescribed for daytime, evening, and night-time are comfortably met at all NSLs assessed here. • Predicted noise levels from traffic movements associated with the proposed development have an imperceptible impact.	closed in between vehicles entering and exiting the building. • The CHP engines will be housed in acoustic enclosures with a minimum Rw of 24 dB(A), whilst the standby boiler and gas boosters will be housed in containers with a minimum Rw of 24 dB(A). • Equipment will be selected such that impulsive and tonal issues will not be audible at offsite noise sensitive locations.
Chapter 11 Flora and Fauna	• Potential impacts on key ecological receptors (KERs) as a result of emissions to atmosphere and changes in surface water flow and quality	• The main pollutants with the potential to affect the KERs are nitrogen oxides (NO_x) and oxides of sulphur, mainly SO_2, as well as ammonia. Modelling undertaken as part of the air	• Mitigation measures proposed in relation to emissions to atmosphere are presented under **Chapter 8** above. • Measures are incorporated into the Plant's design to manage and control the amount

Environmental Factor	Likely Effects Identified	Brief Description of the Effect	Proposed Mitigation Measure
	as a result of the development of the proposed plant. • Potential noise and visual disturbance generated from the operation of the plant.	quality assessment demonstrates that the cumulative predicted GLC of NOx, SO_2 and is well within the limit value for the protection of habitats when the proposed plant is at 100% operation capacity. No significant impacts are predicted on any KER as a result of any stack emissions from the proposed plant. • The impact of stormwater run-off during the operational phase on the KERs will be insignificant due to the attenuation and treatment incorporated into the plant's design. • The noise assessment presented in **Chapter 10** demonstrates that the change in ambient noise levels due to all operations associated with the plant would be slight or barely perceptible and no significant long-term impact on the conservation status of any individual bird species or population or any other group of fauna is predicted.	of surface water run-off before being discharged to Cork Harbour. • Suitable site management procedures will be implemented to avoid and/or minimise the generation of excessive human disturbance, dust, noise and litter throughout the operational lifetime of the plant. • Lighting used on the site will incorporate an appropriate lamp design and be sited to ensure that overspill is controlled to avoid adverse light pollution of any adjacent habitats outside the application site.

Environmental Factor	Likely Effects Identified	Brief Description of the Effect	Proposed Mitigation Measure
		• The area surrounding the subject site is already subject to artificial lighting and any additional lighting at the plant is unlikely to add significantly to the extent and overall levels of light pollution within the local area. • Overall the impact of operational disturbance on the KERs will be insignificant.	
Chapter 12 Soils and Geology	• Potential effects from the accidental spillage of chemicals and fuels from operating plant and accidental discharge of untreated process effluent from the plant, which could cause contamination if the contaminants enter the soil environment.	• Any such spillage, if unmitigated, could contaminate the underlying subsoils. However, there will be no direct or indirect emissions to ground during the operational phase and the entire site will be covered with an impermeable surface. Given the plant design and mitigation measures that will be applied it is considered that any negative impact on the soils and geology associated with spills and leaks will be imperceptible and temporary in nature, with no long term effects.	• All process areas of the site will be located either within buildings with paved floors or on paved ground and there will be no direct access to the subsoils for any rain-water or other surface water run-off in the process areas. Impermeable surfacing will extend across the entire site. • All chemicals at the site will be stored under cover in a bunded area or in double skinned storage tanks. • All fuels will be stored in bunded tanks with the provision of a storage / retention capacity of 110% of tank storage volume and will be stored in a designated area. • All process liquor/effluent will be circulated in enclosed pipes and stored in covered tanks. The tanks will be located in areas

Environmental Factor	Likely Effects Identified	Brief Description of the Effect	Proposed Mitigation Measure
			which are bunded to 110% of the largest tank capacity. • All storage tanks will be located in appropriately sized and constructed bunds, whose design complies with the Agency's Guidance Note on the Storage and Transfer of Materials (EPA 2004). • All onsite vehicles will be regularly maintained and checked to ensure any damages or leakages are repaired. • All process effluent will be treated on site and recycled or discharged under consent from the EPA to the local foul sewer network. • Process water from the wheelwash will be discharged off site to the foul sewer network. • Wash-down water from the building floor will be captured and directed back into the digestion process. • Rainfall runoff from roofs, the bunded tank farm, roads and hardstand areas will be harvested and reused on-site. Any excess runoff will be discharged to the local stormwater sewer network following attenuation and treatment in a hydrocarbon interceptor. There will be no discharge of stormwater runoff to ground.

Environmental Factor	Likely Effects Identified	Brief Description of the Effect	Proposed Mitigation Measure
			• The plant is designed so that in the event of a major accident at the facility, all contaminated runoff will be retained on site for appropriate treatment and disposal. • All unloading of waste material and all processing at the site will be undertaken indoors under cover on a contained concrete surface to ensure that no contamination escapes to ground. • Any soil contaminated from an accidental spillage will be contained and treated appropriately and in accordance with the Waste Management Act 1996-2012.
Chapter 13 Water (Surface Water)	• Potential effects of changes to flooding characteristics from the development of the site affecting runoff characteristics. • Potential impacts of accidental spillage of hazardous materials that runoff the site impacting surface water quality. • Potential effects of the discharge of storm water from the development to Lough Mahon.	• Flood risk assessments indicate that the site will not create or be impacted by flooding. • Operations will comply with conditions within an IEL and thus the risk to surface water will be reduced to as low as reasonably practical (ALARP). • Surface water from process areas will be treated in oil water interceptors and attenuated on site prior to discharge to the stormwater sewer.	• An engineered stormwater drainage system will be incorporated into the design of the plant. • Stormwater will be attenuated and treated on site prior to its reuse within ancillary processes with the excess discharged at a greenfield runoff rate to the existing municipal stormwater sewer network.

Environmental Factor	Likely Effects Identified	Brief Description of the Effect	Proposed Mitigation Measure
		• Potential Impacts to hydrology before considering additional mitigation factors are concluded to be Imperceptible.	
Chapter 13 Water (Groundwater)	• Potential effects of the accidental release of contaminants to ground during operations impacting groundwater quality in the aquifer.	• The site will be required to operate under an IEL issued by the EPA, which typically include several conditions aimed at preventing uncontrolled releases to ground (e.g. frequent bund and underground structure drainage integrity assessments, environmental liability risk assessments, environmental management systems). Furthermore, an impermeable surface will extend across the entire site which will be serviced by an engineered drainage system. • The magnitude of the impact is considered to be negligible to small Adverse depending on the location and nature of the release (e.g. the type of material, quantity lost and the mobility and hazardous properties of the compounds).	• During the operational stage, impermeable surfacing will extend across the entire site. • Fuel and chemical storage tanks should be bunded to a capacity at least 110% of the storage tank. • Small chemicals used on the site should be stored within appropriate secondary containment.

Environmental Factor	Likely Effects Identified	Brief Description of the Effect	Proposed Mitigation Measure
Chapter 14 Cultural Heritage	• Potential effects of disturbance to known or unknown archaeological sites or cultural heritage as a result of the development of the proposed plant.	• There will be no direct or indirect impacts on any archaeological heritage sites or cultural heritage during the operational phase, therefore mitigation is not proposed.	• No mitigation proposed.
Chapter 15 Traffic and Transport	• Potential adverse impacts on local road network as a result of increased generation of traffic associated with the development.	• The traffic impact of the proposed development will result in the generation of 26 No. additional light vehicle trips and 25 No. HGV trips per 24hr day on the local road network. These are upper value assessment figures in excess of the likely daily average traffic generation. • The impact of the development upon the annual average daily traffic (AADT) is at worst forecast to be 1.1% which is significantly below the NRA threshold value of 10% for uncongested networks and similarly significantly less than the 5% threshold for networks that experience congestion. Clearly the further from the development the more dispersed the development traffic and accordingly the more	• The developer will adhere to a routing policy to ensure all movements are made via the strategic road network to avoid HGV passing through residential areas as far as is practical. • A policy of safety and environmental awareness for all HGV drivers accessing the site will be employed. • Suitable verge clearance measures can be implemented at the existing western access to re-establish clear sightlines across the existing widened verge to the west, ultimately providing drivers at the access with visibility sightlines in excess of the 90m required in the NRA: DMRB for a design speed of 60kph.

Environmental Factor	Likely Effects Identified	Brief Description of the Effect	Proposed Mitigation Measure
		diluted the impact. It follows therefore that the impact upon the greater road network is likely to be negligible and indeed imperceptible to existing road users. • The maximum impact upon the percentage content of HGVs in the traffic flow is shown to be less than 1% which is clearly not significant especially when the receiving environment is significantly industrial in nature. • Existing traffic flows combined with the traffic forecast as arising from the proposed development is suitably accommodated by existing infrastructure accordingly infrastructure improvement measures are not required to facilitate the proposed development. • Visibility sightlines at the existing eastern site access are compliant with the DMRB standards for national primary roads and recent accident records show no traffic hazard. Given the safety record of the	

Environmental Factor	Likely Effects Identified	Brief Description of the Effect	Proposed Mitigation Measure
		existing eastern access, it is reasonable to presume that the modest intensification in vehicular use is unlikely to create a significant traffic hazard.	

ATTACHMENT Nº A.1 NON-TECHNICAL SUMMARY

FIGURES

Dunkettle Interchange
Drainage Basin
Pfizer Pharmaceutical
Cara Partners
St. Lappan's Place
Little Island Sports Complex
Cork Golf Club
Janssen Pharmaceutical
BOC Gases
Subject Site
BASF Ireland
Hoffmann Business Park
Playing Fields
Jack Lynch Tunnel

NOTES

1. ORDNANCE SURVEY IRELAND LICENCE NO. EN 0080715 (C) ORDNANCE SURVEY & GOVERNMENT OF IRELAND

2. OSI DISCOVERY SHEETS NO'S: OS1606

LEGEND

- Proposed Renewable Bioenergy Plant Application Area
- Dunkettle Shore PNHA
- Cork Harbour SPA

Revision	Drawn By	Chkd By	Date	Comments
-	GS	PG	25.06.15	

LITTLE ISLAND BIOENERGY

Proposed Renewable Bioenergy Plant

Inchera, Little Island, Cork

Title: Site Location and Surrounding Land Uses

FIGURE A.1

Scale 1:15000 @ A3

Date JUNE 2015

NOTES

1. ORDNANCE SURVEY IRELAND LICENCE NO. EN 0080715 (C) ORDNANCE SURVEY & GOVERNMENT OF IRELAND

2. 1:2,500 OS SHEETS NO'S: 6384-A, 6384-B

LEGEND

- Proposed Renewable Bioenergy Plant Application Area (c. 2Ha)
- Tapella Total Landholding Area
- Existing Wayleave
- Bord Gais

Revision	Drawn By	Chkd By	Date	Comments
-	GS	PG	25.06.15	

LITTLE ISLAND BIOENERGY

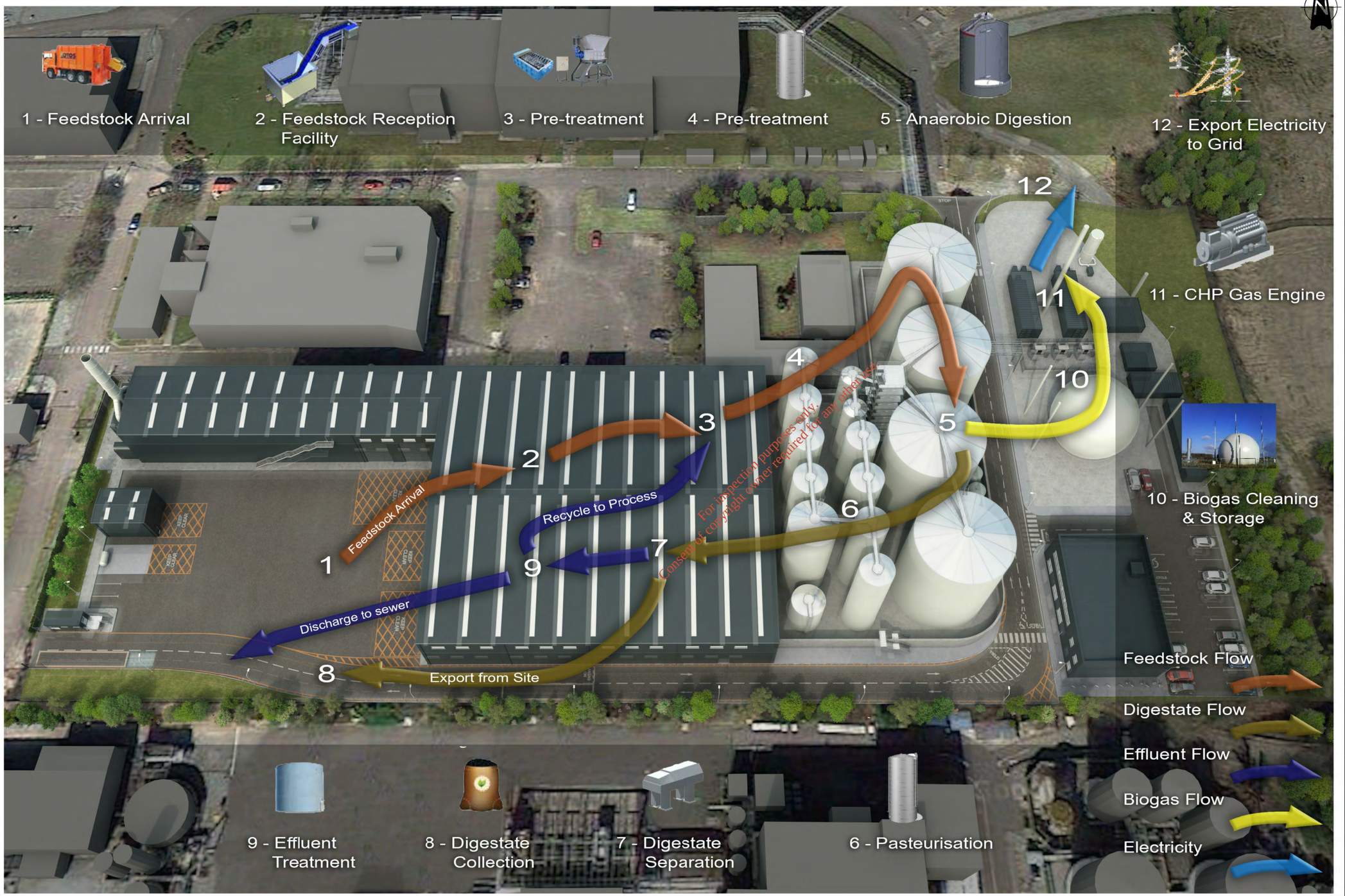
Proposed
Renewable Bioenergy Plant

Inchera,
Little Island,
Cork

Title: Tapella Landholding and Application Area

FIGURE A.2

Scale	Date
1:2500 @ A3	JUNE 2015



Process Flow Schematic

Not to Scale @ A3

NOTES

Revision	Drawn By	Chkd By	Date	Comments
-	AC	AC	25.06.15	

CLIENT: LITTLE ISLAND BIOENERGY

Pivotal ANIMATIONS
WE CREATE VISUALISATIONS THAT MOVE, MOTIVATE AND PERSUADE

Proposed
Renewable Bioenergy Plant

Inchera,
Little Island,
Cork

Title: Process Flow Schematic

FIGURE A.3

Scale	Date
N.T.S.@ A3	JUNE 2015

LITTLE ISLAND

BIOENERGY

Attachment B

GENERAL

CONTENTS

FIGURES

ATTACHMENT B.1 – COMPANY PARTICULARS

Certificate of Incorporation

Number 556915

Certificate of Incorporation

I hereby certify that

LITTLE ISLAND BIOENERGY LIMITED

is this day incorporated under
the Companies Acts 1963 to 2013,
and that the company is limited.

Given under my hand at Dublin this
Tuesday, the 3rd day of February, 2015

for Registrar of Companies

Company Registration Number

CRO Number: 556915

Registered Office

Address: Unit 1 Avondale Business Park, Carysfort Avenue, Blackrock, Co. Dublin

ATTACHMENT B.2 - LOCATION MAPS

Location maps detailing the plant's setting in a regional context and within its immediate vicinity are presented at the end of **Attachment B** on **Figure B.1** and **Figure B.2**.

As is required these drawings are also presented as geo-referenced digital drawing files (AutoCAD) in a separate CD-Rom entitled IED Licence Application, Section B2, E.6 and F.3.

ATTACHMENT B.6 - PLANNING PERMISSION UNDER CONSIDERATION

A Planning Application (Register Ref. 154926) and associated Environmental Impact Statement (EIS) for the development of a Renewable Bioenergy Plant at Inchera, Little Island, Co. Cork was submitted to Cork County Council (CCC) on the 6th May 2015. A request for further information was received by the applicant on the 29th June 2015 and a response is currently being prepared. Confirmation in writing from CCC as is required is included at the end of this attachment.

Environmental Impact Statement

As is required by this application two hardcopies and two copies on CD-Rom of the EIS have been submitted. The EIS is subdivided into three volumes as follows:

- Volume I Non-Technical Summary
- Volume II Environmental Impact Statement
- Volume III Appendices to Environmental Impact Statement

Planning Drawings (**7722-2000** – **7722-2039**) as submitted to CCC are also included in this application.

The EIS being submitted as part of this application is identical to that submitted for planning purposes to CCC.

Appropriate Assessment

A Natura Impact Statement (NIS) prepared by Matt Hague Consultant Ecologist was submitted to CCC as part of the planning application. The full report is presented in at the end of this Attachment.

The assessment considered the potential effects associated with the construction (including demolition) and operation of the plant. It clearly demonstrates that the plant will not result in any significant effects on any relevant Natura 2000 site within a 15km radius of the facility either on the integrity of these sites, or any qualifying features for these site for which they have been classified/designated as being of European importance, either as a standalone development or in-combination with other plans or projects within its zone of influence.

It is considered that this NIS provides sufficient relevant information to allow the Competent Authority to undertake Step 5 of the Appropriate Assessment process and reach a determination that the development of the plant at this location will not affect the integrity of any of the identified relevant Natura 2000 sites within a 15km radius of the proposed project under Article 6 of the Habitats Directive (92/43/EEC).

Licences and Permits

The subject site was formerly occupied by Pfizer Cork Ltd. and operated as a bulk pharmaceutical manufacturing installation. Production activities were licenced under the Integrated Pollution Prevention Control Licence (IPPC) by the Environmental Protection Agency (EPA).

Activities at the site ceased in 2010 and the EPA IPPC Licence (Reg. No. P0103-02) was subsequently transferred to Tapella Ltd. in 2012. An application for the surrender of this licence was submitted by Tapella in April 2015 to the EPA and is under consideration.

Cork County Council Planning Application Confirmation Letter

Comhairle Contae Chorcaí
Cork County Council

Planning Department,
County Hall,
Carrigrohane Road, Cork.
Tel (021) 4276891 • Fax (021) 4867007
Email: planninginfo@corkcoco.ie
Web: www.corkcoco.ie
An Rannóg Pleanála,
Halla an Chontae,
Bóthar Charraig Ruacháin, Corcaigh.
Fón: (021) 4276891 • Faics: (021) 4867007
R-phost: planninginfo@corkcoco.ie
Suíomh Gréasáin: www.corkcoco.ie

Ms. Paula Galvin
Environment Manager
Stream BioEnergy Limited,
Unit 1
Avondale Business Park
Blackrock
Co. Dublin

29/05/2015

Re: ***15/04926***
Construction of a renewable bioenergy plant to generate up to 4MW of electricity from 90,000 tonnes of non-hazardous biodegradable waste per annum utilising anaerobic digestion (AD) technology on a 2.01 hectares site. The proposed plant will comprise the following elements:
(1) Demolition of the existing decommissioned waste water treatment plant and associated ancillary buildings and the existing utility building located on the east side of the site (c. 1425sqm footprint);
(2) Main processing building (c.4500sqm floor area up to 14.5m high) incorporating feedstock reception and processing areas, digestate treatment areas, dewatering and storage areas, quarantine areas and the odour control system (c. 12m high, 73sqm floor area) and 25m high stack;
(3) Service yard area including 2no. weighbridges, weighbridge office (c.435m high and 17sqm floor area), 2no. car parking spaces, bunded vehicle refuelling area (c.56sqm floor area) with diesel storage tank (2500 litres), workshop (c. 7m high and c. 70sqm floor area), and 1no. wheel wash;
(4) Tank farm (c.2900sqm footprint) encompassing 4no. digester tanks (up to 25.5m max. height, c. 5000 metres cubed), 4no. grit removal buffer tanks (up to 24m max. height, c. 630 metres cubed), 2no. post-digestion buffer tanks (up to 24m max. height, c. 630 metres cubed) and 2no. pasteurisation tanks (up to 19m max. height, c. 217metres cubed), 2no. post pasteurisation and sludge storage tanks (up to 24m max. height, c. 630 metres cubed), 1no. process water tank (up to 25.5m max. height, c. 1280 metres cubed), 1no. concentrate tank (up to 10m max. height, c. 240 metres cubed) , 4no. chemical storage tanks (up to 5m max. height, c. 48.1 metres cubed), total 20no. tanks in the tank farm, to include a stairwell tower (up to 25m max. height), gantry walkways, 3m high bund wall, 2no. bund access stairs, and 6no. tank emergency access ladders;
(5) 2no. enclosed Combined Heat and Power (CHP) 2MW engines (c. 3.6m high and c.66sqm floor area each), 28m high CHP stack, c.14m high gas storage dome (1800 metres cubed) with 4no. lightning rod electrodes (c.18m high), 8.2m high biogas flare stack, gas treatment equipment enclosed in a c.1.8m high container (c.31sqm floor area) containing a gas booster and dryer and a c.2.5m high container (c.79sqm floor area) containing a boiler,

10m high boiler stack, 3no. bunded electrical transformers (c.5m high with 1m high bund wall and c.117sqm floor area), c.3.0m high substation (c.70sqm floor area) and a motor control centre (MCC) kiosk (c.2.5m high and c.50sqm floor area);
(6) Two-storey administration and welfare building including laboratory facilities (c.787sqm floor area, up to 9m high), 31 no. car parking spaces and a 14no. space bicycle rack, 2.4m high perimeter fencing, 2no. 7m wide access gates and 2no. 2m wide pedestrian access gates, 2no. directional signs (total area of 9sqm), internal circulation roads, pipebridge, walkways, concrete foundation slabs and all site works, facilities and services;
(7) Ancillary site development works and services including landscaping, boundary fencing, lighting etc.
Access will be through existing permitted vehicular accesses onto the R623 Regional Road.

At: Inchera, Little Island, Co. Cork

Dear Ms Galvin,

I confirm that the planning application described above was lodged with the Planning Authority on the 06/05/2015 by McCutcheon Halley Walsh, Chartered Planning Consultants on behalf of Stream BioEnergy Limited. The application is due for decision on 30 June 2015

The application was accompanied by the required number of copies of the Environmental Impact Statement.

Yours faithfully,

Caitriona Ni Mhainnin
Administrative Officer

Planning Application for a Renewable Bioenergy Plant

at

Inchera, Little Island, Co. Cork

Stage I: Screening for Appropriate Assessment

Stage II: Natura Impact Statement

Prepared By:

Matt Hague
Consultant Ecologist

On Behalf Of:

STREAM
BIOENERGY

CONTENTS

TABLES

FIGURES

1.0 INTRODUCTION

1.1 Background

This report comprises a Stage I Screening for Appropriate Assessment and Stage II Natura Impact Statement (NIS). It provides the information required to allow Cork County Council (the 'Competent Authority) to undertake Appropriate Assessment (AA) of the potential effects of the proposed development of a Renewable Bioenergy Plant at Inchera, Little Island, Co. Cork.

The purpose of the report is to determine the effects, if any, of the proposed development and associated features on Natura 2000 sites, also known as European Sites (candidate Special Area of Conservation (cSAC) and Special Protection Area (SPA), designated for nature conservation), and to assess if there is the potential for significant effects on the qualifying interests or on the conservation objectives of these sites.

In the preparation of this report a desk study review and field visit were undertaken and the potential impacts on the Natura 2000 sites as well as on other ecological receptors, both as a result of the proposed development and in-combination with other developments in the area, are assessed.

1.2 Figures and Appendices

The requirements for an Appropriate Assessment are set out under Article 6 of the EU Habitats Directive (92/34/EEC), transposed into Irish law through *The European Communities (Birds and Natural Habitats) Regulations* 2011 (SI No. 477 of 2011). An outline of the AA process is presented in **Appendix I**. An Environmental Impact Statement (EIS) has been prepared for the project, and this EIS is presented separately.

Figure 1 of this report shows the site location in relation to relevant Natura 2000 sites.

1.3 Ecologist and Experience

Matthew Hague, Consultant Ecologist, conducted the Assessment. Mr Hague is a Chartered Environmentalist (CEnv) and a full member of the Chartered Institute of Ecology and Environmental Management (CIEEM).

2.0 METHODOLOGY

2.1 Baseline Data Collection

A desk-based assessment was undertaken of the area surrounding the proposed development at Inchera, focusing on habitats and species that are listed as qualifying interests in the designation of the Natura 2000 sites.

This report takes the following guidance documents into account:

- *Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities* (Department of Environment, Heritage and Local Government, 2010 revision);
- *Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities*. Circular NPWS 1/10 & PSSP 2/10; and
- *Assessment of Plans and Projects Significantly Affecting European sites: Methodological Guidance on the Provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC* (European Commission Environment Directorate-General, 2001).

Information was collated from the organisations and websites listed below:

- Information on land-use zoning from the online mapping of the Department of the Environment, Community and Local Government (http://www.myplan.ie/en/index.html)
- Recent OSI mapping and aerial photography;
- Photographs taken at the site;
- Online data available on European Sites as held by the National Parks and Wildlife Service (NPWS) (www.npws.ie);
- South West River Basin District Management Plan 2009–2015;
- Available Information on water quality in the area available (www.epa.ie and http://gis.epa.ie/Envision/);
- Information on the South West River Basin District (www.wfdireland.ie);
- Information on soils, geology and hydrogeology in the area (www.gsi.ie);
- Information on the status of EU protected habitats in Ireland (NPWS, 2013);
- National Biodiversity Plan 2011–2016 (Department of Arts, Heritage and the Gaeltacht, 2011);
- Cork County Development Plan 2014;
- Cork City Development Plan 2015–2021;
- Blarney Electoral Area Local Area Plan 2011;
- County Cork Biodiversity Action Plan 2009–2014;
- South Western Regional Planning Guidelines (2010–2022);
- Dunkettle Interchange Improvement Scheme Environmental Impact Statement (Jacobs Consulting Engineers, 2012);and
- Dunkettle Interchange Improvement Scheme Natura Impact Statement (Jacobs Consulting Engineers, 2012).

The report has regard to the following legislative instruments:

- European Commission (EC) Habitats Directive 92/43/EEC;
- European Commission (EC) Birds Directive 2009/147/EC;
- European Communities (Birds and Natural Habitats) Regulations 2011 (SI no 477 of 2011).

The report takes full account of the proposed design of the plant and a detailed examination of all key elements of the proposal was undertaken.

Conservation Objectives for all of the Natura 2000 sites have been provided by NPWS and these have been reviewed as part of this study. In addition, records of key species, held by the National Biodiversity Data Centre (NBDC) and Bat Conservation Ireland (BCI), were analysed.

2.2 Field Visit

A field visit was undertaken on 23rd July 2014, to assess the overall ecological value of the site, with particular reference to any European protected habitats and species.

Given the amount of information available, including from NPWS and other sources, it has been possible to gather adequate information on the site and the adjacent area (in particular, the Natura 2000 sites), in order to make an informed, sound judgement as to the potential impacts of the proposed development on the qualifying interests of Natura 2000 sites.

2.3 Assessment of Impact Significance

In ecological and environmental impact assessment, for the risk of an impact to occur there must be a 'source', such as a construction site; a 'receptor', such as a designated site for nature conservation; and a pathway between the source and the receptor, such as a watercourse that links the construction site to the designated site. Although there may be a risk of an impact it may not necessarily occur, and if it does occur, it may not be significant.

Potential impacts on qualifying habitats, species and conservation objectives may result from:

- Habitat loss and/or fragmentation;
- Impacts to habitat structure;
- Disturbance to species of conservation concern;
- Impacts on water quality;
- Air pollution;
- Noise pollution;
- Mortality to species (such as roadkill).

In addition, the significance of the potential impacts depends on:

- Effectiveness of mitigation measures;
- Distance of pathway between source and receptor;
- Character of existing environment; and
- Tolerance of receptor to potential impacts.

Under the *Birds and Habitats Regulations*, 2011, the first test that has to be considered is whether the proposed development, either alone or in combination with other relevant projects and plans, would be likely to have a significant impact. Impacts are judged to be significant where they affect the integrity of the site with respect to the conservation objectives of the features for which the site was designated/classified.

The purpose of Stage 1 is twofold:

- To screen out those aspects of the proposal that can be considered not likely to have a significant impact; and
- To screen out the key qualifying features of the designation that are not likely to be significantly impacted by the proposal.

In order to undertake an appropriate screening, the guidance produced by the Department of the Environment, Heritage and Local Government (DoEHLG) in 2010 (revised) has been followed in order to:

- Characterise the potential impacts to the qualifying interests of any Natura 2000 site or sites that may result from the proposed development;
- Assess the likely significance of potential impacts on the qualifying interests of any Natura 2000 site or sites within the potential zone of influence of the proposed development; and
- Assess the risk of an adverse effect on the integrity of the site or occurring to a qualifying interest feature for which the site is of European interest.

Where it cannot be concluded with confidence that effects are unlikely, under the precautionary principle, further detailed consideration is required to assess the potential impact of the project on the integrity of the relevant Natura 2000 site(s) in question. Where uncertainty or doubt remains, an adverse effect should be assumed.

2.4 Ascertaining the Threat to Site Integrity

The Competent Authority (Cork County Council) will be required to determine whether the proposed development would adversely affect the integrity of any Natura 2000 site, or sites, in light of the conservation objectives for that particular site or sites. The integrity of a site is defined as:

"The integrity of a site is the coherence of its ecological structure and function, across its whole area, which enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was designated/classified."

Further to the above, an adverse effect on integrity can also be defined as one that is likely to prevent the site from making the same contribution to favourable conservation status for the relevant features as it did at the time of its classification/designation.

3.0 DESCRIPTION OF THE PROJECT

3.1 Location and Setting

The site is located in the townland of Inchera, Little Island, Cork and comprises an area of circa 2 hectares (ha) (c. 5 acres).

The site was formally occupied by Pfizer Pharmaceuticals and is now in the ownership of Tapella Limited. It forms part of a larger landholding of circa 20ha owned by Tapella Limited.

The application area is situated circa 6kms east of Cork City and is located in close proximity to the Dunkettle Roundabout, which forms the junction between the M8 (Cork-Dublin) motorway, the N25 (Cork-Waterford) national primary route and the northern entrance to the Jack Lynch Tunnel (N40, South Ring Road).

In the recent past the application area has been substantially cleared of the structures associated with the operation of the Pfizer plant and is dominated by a range of artificial surfaces. A decommissioned wastewater treatment plant (WwTP) and a utilities building are still present within the site boundary and will be removed as part of this application.

The subject site is a vacant, roughly rectangular shaped plot and varies in height across the site from 7.5m above ordnance datum (AOD) along the western boundary of the site, to 9.5m AOD at the centre of the site. The site drops steeply to approximately 2.0m AOD along the eastern boundary.

The site is bounded to the north and west by buildings associated with the Hoffman Business Park and undeveloped land to the east. BASF Ireland, a chemical manufacturing plant, occupies the area to the south and the R623 is located approximately 80m west of the site.

The zoning objective of the proposed development site and all lands immediately surrounding it is 'Existing Built-Up Area'. These are areas of existing development where opportunities are present for in-fill development, redevelopment, refurbishment or change of use and do not have a specific zoning objective. It is considered that further development of such areas is more sustainable than continually encouraging growth in undeveloped areas. Indeed, the redevelopment of brownfield sites is deemed to be inherently more sustainable than the development of greenfield sites and is to be encouraged as set out in objective **ZU 4-1** of the Cork County Development Plan 2014.

3.2 Description of the Proposal

The plant is designed to process 90,000 tonnes per annum (tpa) of non-hazardous biodegradable waste utilising anaerobic digestion (AD technology).

The plant will generate a consistent supply of up to 4MW of renewable electricity, which is enough energy to power 7,500 local homes annually. Heat generated will be reused in the AD process.

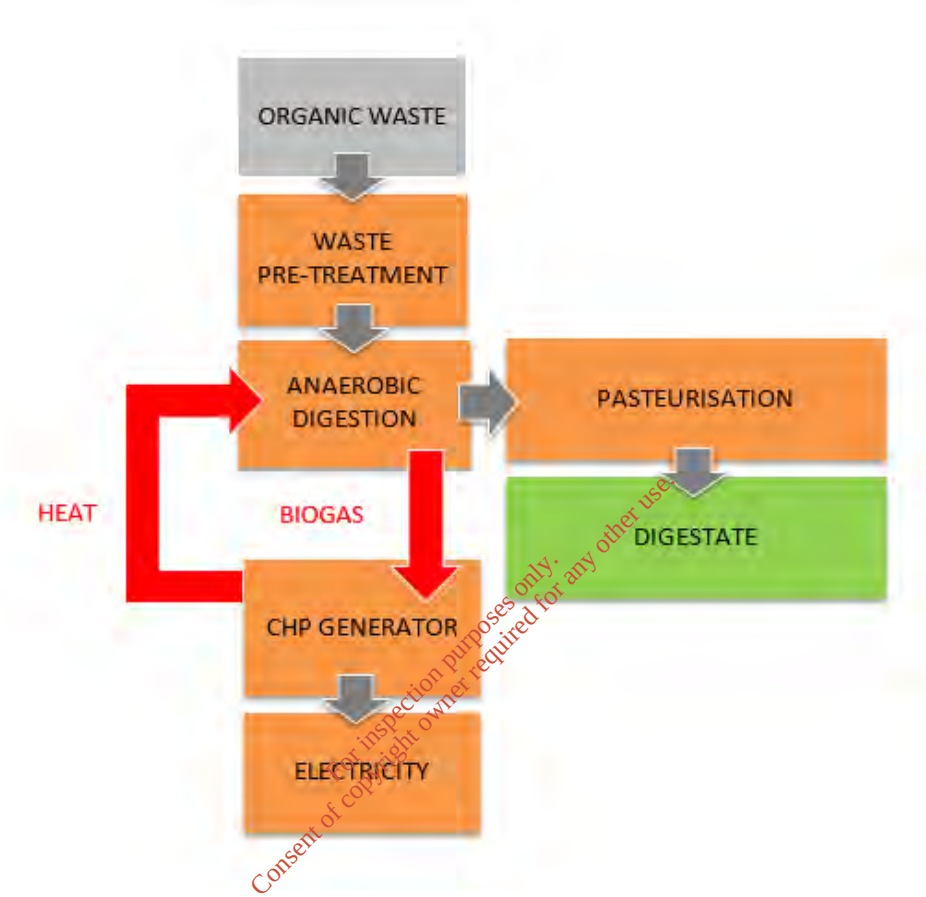
AD is a sustainable form of renewable energy production through a naturally occurring process in which micro-organisms break down biodegradable material, in the absence of oxygen in an enclosed system.

The process produces a biogas, which is largely made up of methane (60%) and carbon dioxide (40%), and a soil improver material, known as 'digestate'. The digestate is nutrient rich, and free from odour, contaminants and pathogens and can be used as an organic

biofertiliser which replaces the use of artificial fertilisers. The biogas can be converted into renewable heat and electricity for use in homes and businesses.

An overview of the process is presented in **Plate 1.**

Plate 1 Overview of Anaerobic Digestion Process



AD is a proven, efficient, and environmentally sustainable technology that delivers multiple benefits. Germany currently has over 7,500 operating AD plants, which add significantly to its economy and to its renewable energy portfolio. While AD has been used successfully for decades in the UK water sector, with approximately 150 operating plants, until recently there were only a handful of plants operating in other sectors. However, the UK industry has grown rapidly in the last 5 years, with 147 plants currently operating outside the water sector and hundreds more in the planning process

3.3 Plant Design

A detailed description of the proposal is presented in **Chapter 2** of the EIS (Volume II). The plant layout and design, dimensions, sections and elevations are presented in the Planning Drawings that accompany this application.

In summary, the proposed 90,000 tonne per annum plant will comprise the following:

- The Main Building will be divided up internally to contain the feedstock reception and pre-treatment areas, quarantine area, digestate dewatering and storage areas and effluent treatment area. An odour control system and stack will be located immediately adjacent to this building. The building will be approximately 14m tall in order to

accommodate delivery/removal vehicles and to contain equipment used to treat the waste, and ventilation ductwork.

- The Tank Farm will be bunded and shall contain the pre-treatment, digestion, pasteurisation, process water, concentrate and chemical storage tanks. The tallest tanks will be approximately 24m to the highest point.
- The Biogas Treatment Area will incorporate the combined heat and power (CHP) units consisting of 2 x 2MW engines and associated stack, a biogas holder, a standby gas flare, a boiler and associated stack and gas treatment facilities including a gas booster and gas dryer.
- An Administration Building incorporating a reception area welfare facilities, canteens, offices, meeting and training rooms, a laboratory, storage and first aid rooms, communications and control rooms

A number of ancillary structures will be located outside these areas and will include a bunded diesel refuelling area, a workshop, a boiler, a motor control centre (MCC) kiosk, an electrical substation, transformers, weighbridges and kiosk, wheelwash, pipe bridge, access stairways and gantries, car parking, lighting, fencing and security gates.

This application for planning permission includes the demolition of a decommissioned wastewater treatment plant (WwTP) and utilities building present at the eastern end of the application area. The total area of demolition is 1425m^2. The scope of work includes the demolition of all above ground structures, with removal off site for recycling or disposal at appropriately licenced facilities. Sub surface structures will remain in situ and will be absorbed into the proposed re-grading of the site.

Following the grant of planning permission, the site would undergo a construction programme of 12 months duration followed by a commissioning period. Demolition will be undertaken in parallel with the construction phase and the expected duration for these works is approximately 2 months.

If consented, it is planned to commence construction in 2016, with the plant becoming operational in late 2017.

3.4 Process Description

The process can be broadly divided into 3 main stages:

- Pre-treatment: after waste is delivered inside the main building, it will be blended with recycled process liquid to create an organic slurry. Material that is unsuitable for treatment by anaerobic digestion (AD) will be recovered (e.g. metal, plastic etc.) and exported off site for further treatment, recycling or disposal.
- AD treatment: the slurry will be pumped to the digestion tanks where the organic material will be broken down in the absence of oxygen in enclosed sealed tanks to produce both biogas and digestate.
- Post treatment: the slurry will then be pumped to the pasteurisation tank for treatment in a batch manner to the appropriate Transformation Standard in accordance with Animal By-Product Regulations (ABPR). The captured biogas will be combusted in CHP engines to produce renewable heat and electricity. The electricity will be exported to the national grid (up to 4MW) and the heat will be reused in the process. The digestate will undergo moisture content reduction through the use of centrifuges to produce a cake-like material which, if derived from source separated material, can be used as a biofertiliser. The process liquor remaining after the centrifuge will be treated

onsite to reduce the ammonia and BOD content prior to re-use within the process with the excess discharged to the municipal sewer.

The facility will operate continuously on a 24 hour period, Monday to Sunday with waste deliveries received between the hours of 07:00 and 18:00 Monday to Saturday excluding Bank Holidays.

The plant will operate under an Industrial Emissions Licence (IEL) to be issued by the Environmental Protection Agency (EPA).

3.4.1 Combined Heat and Power

The combined heat and power (CHP) units are generators used for converting biogas into heat and power. Two containerised CHP units are planned for the facility, each with a rating of 2MWe. Electricity is generated from the combustion of biogas while air and heat is recovered from the cooling jacket, oil lubrication system and flue gas.

Combustion gas emissions from the two CHP units will be via 2 flues within a single combined wind shield stack that is 28m in height and 1m in diameter.

The plant will be a net power producer with the excess green electricity from the CHP engines exported to the national grid via a substation incorporating transformers. Enough electricity will be exported to power 7,500 local homes.

Heat recovered from the CHP plant will be used within the process for heating the pasteurisation units and digestion tanks, as well as for other ancillary processes. The reuse of this heat will avoid the consumption of natural gas from the grid and the associated carbon emissions in extracting and distributing this fossil fuel.

3.4.2 Surface Water Drainage

Surface water drainage design has been carried out in accordance with requirements of BS EN 752:2008; the Greater Dublin Strategic Drainage Study (GDSDS) and the "*Recommendations for Site Development Works for Housing Areas*" – published by the former Department of the Environment (D.O.E.). Drainage of the site is achieved by a combination of piped and channel drainage systems.

The site has been evaluated for Sustainable Urban Drainage Systems (SuDS) and the most suitable measures have been incorporated into the surface water management system design for the plant. The principal behind SuDs is to reduce the quantity of discharge from developments to predevelopment flows and also to improve the quality of run-off from proposed developments.

Rainwater harvesting is a key measure included in the management of surface water runoff for the plant. Rainfall runoff from the site will be stored and attenuated within an underground storage tank, and will be used for ancillary processes such as washwater for the floor of the reception, processing and storage areas of the main building, as well as in the wheelwash facility. Excess runoff will be discharged from the site to the existing municipal surface water drainage network at a controlled release rate of 6.1 l/s/ha. There will be no discharge of process effluent, other than to the foul sewer.

It is proposed to collect the surface water runoff from hardstanding areas, tank farm and buildings via a network of pipes. Surface water captured in the tank farm will be tested for contaminants prior to discharge to the piped drainage system. There will be a valve on the

outlet of the bund and the discharge will be undertaken manually. All surface water to be discharged to the attenuation/rainwater harvesting tank shall pass through a petrol interceptor that will retain any hydrocarbons in the runoff and thereby improve the quality of the runoff. The quality of runoff from the proposed development will be further enhanced as the surface water attenuation tank will also act as a settlement pond.

In relation to the capacity of the system the surface water discharge system has been designed as follows:

- The surface water attenuation tank will cater for the 1:30yr storm event (and includes for washwater requirements);
- No internal property flooding for the 1:100yr storm event;
- The surface water attenuation/storage system caters for storm water attenuation and site operational reuse purposes;
- A climate change factor of 20% has been incorporated; and
- Discharge from the site shall be restricted to Greenfield runoff rates.

An outline of the proposed surface water drainage system is provided on **Drawing 7722-2030**. Full details of the surface water drainage philosophy are provided in the *Engineering Services Report* presented in **Appendix 2-1** of the EIS (Volume III).

3.4.3 Foul Water Drainage including Process Water

Potential sources of foul water in the proposed development are:

- Wastewater from sanitary facilities (Weighbridge Office and Administration Building);
- Overflow water from the wheelwash;
- Run off from the bunded tank farm (if contaminated); and
- Treated process effluent from the Process Water Tank.

The proposed foul water drainage network is provided on **Drawing No. 7722-2032** and a detailed description is contained within Tobin Consulting Engineers *Engineering Services Report*. The foul collection network will be a gravity system, due to the gradient of the site.

Sanitary wastewater (wastewater from toilets, washing facilities, kitchens etc.) will be collected in each building and directed to the existing public foul sewer, via a foul water collection network. It is estimated that up to 1m^3/day of sanitary wastewater will be discharged directly to the municipal sewer and treated at Carrigrenan WwTP on Little Island.

Excess washwater runoff from the wheel wash will drain to the foul collection network and ultimately to the existing public foul sewer. It is estimated that up to 10m^3/day of washwater will be discharged to the sewer.

Surface water captured in the tank farm will be tested for contaminants prior to discharge to the surface water drainage system. There will be a valve connection on the outlet of the bund to the surface water system so that in the event that surface water runoff becomes contaminated, the valve will remain closed and discharge will be undertaken manually via over pumping to the foul sewer.

Process effluent will be produced in the process. The AD process has been designed in order to maximise the reuse of this effluent. The effluent arises from the separate liquid generated at the dewatering stage following digestion and pasteurisation. The effluent will be treated to reduce its organic content. The likely treatment process will be reverse osmosis (RO) that will utilise membrane technology to separate soluble organic components from the liquid. Reverse

osmosis produces a low solute concentration permeate that filters through the semi-permeable membranes, and a high solute concentrate that contains the filtered components. Before entering the RO plant, the effluent passes through a suspended solids removal system on order to prevent the membranes in the RO plant becoming critically fouled.

The permeate delivered from the RO plant will be recycled to the front end of the process where it will be added to the incoming feedstock in the twin shaft shredders, in order to reduce the dry solids concentration of the incoming material to c.18%.

Excess treated process water that is not required for dilution of incoming feedstock will be discharged to the foul network as treated effluent. It is estimated that up to 200m^3/day of treated process effluent will be discharged to the sewer. This effluent will have a significantly reduced organic loading following the RO treatment, with a maximum population equivalent of c.750.

4.0 STAGE 1: SCREENING FOR APPROPRIATE ASSESSMENT

4.1 Potential Zone of Influence of the Proposed Development

There are no set recommended distances for projects to consider Natura 2000 sites as being relevant for assessment. Rather, NPWS (2010) recommends that '*the distance should be evaluated on a case-by-case basis with reference to the nature, size and location of the project, and the sensitivities of the ecological receptors, and the potential for in combination effects'*. In the case of the development at Inchera it is considered reasonable to assume that the Natura 2000 sites associated with Cork Harbour are the only sites with any potential to be impacted on. Nevertheless, all Natura 2000 sites within 15km of the application area are included in the screening exercise.

There are three Natura 2000 sites within a 15km radius of the application area. These sites are listed in **Table 1** and their locations shown in **Figure 1**.

Table 1: Natura 2000 Sites within a 15km Radius of Application Area

Natura 2000 Site	Site Code	Location (closest point)
Great Island Channel cSAC	001058	2.6km east of the application area
Blackwater River (Cork/Waterford) cSAC	002170	14.97km north of the application area
Cork Harbour SPA	004030	99m to the south west of the application area

Conservation Objectives documents for the relevant Natura 2000 sites have been prepared by NPWS, dated 6th June 2014 (Great Island Channel cSAC), 16th December 2014 (Cork Harbour SPA) and 31st July 2012 (Blackwater River (Cork/Waterford cSAC).

The edge of the Blackwater River (Cork/Waterford) cSAC falls marginally within the 15km radius, however it is not considered reasonable to expect that there would be any of the identified potential impacts on that site as a result of the proposed development, given the distance, topography and absence of hydrological connectivity between the proposed development site and the cSAC, and the features for which the cSAC is designated. The Blackwater River (Cork/Waterford) cSAC is therefore not considered further in this report.

Both Cork Harbour SPA and Great Island Channel cSAC are deemed relevant and have been screened-in for this assessment.

A summary of the qualifying features, conservation objectives and vulnerabilities of each of these Natura 2000 sites is provided in **Table 2**.

Table 2: Natura 2000 Site Information

Natura 2000 Site	Qualifying Features	Conservation Objectives	Vulnerabilities and Threats (text extracted from NPWS Natura 2000 Standard Data Forms (www.npws.ie)
Great Island Channel cSAC (001058) (1443.21ha)	• Mudflats and sandflats not covered by seawater at low tide [1140] • Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]	Dated 6th June 2014: To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in Great Island Channel SAC. To restore the favourable conservation condition of Atlantic salt meadows (*Glauco- Puccinellietalia maritimae*) in Great Island Channel SAC.	The site receives polluted waters from agricultural, domestic and industrial sources. Various surveys, however, indicate that the levels of pollutants in the water and sediments of this part of the harbour are not excessive, and the site appears to have a normal macro-invertebrate fauna. The Midleton sewage outfall has recently been relocated to a more favourable location. A major road [the N25] has recently been constructed across intertidal flats in the north-western sector of the site. Owing to the proximity of the site to Cork City, reclamation schemes continue to be a threat. Aquaculture occurs in the North Channel and may cause disturbance to birds. Spartina is well established and may have caused some alterations to the intertidal and salt marsh habitats.

Natura 2000 Site	Qualifying Features	Conservation Objectives	Vulnerabilities and Threats (text extracted from NPWS Natura 2000 Standard Data Forms (www.npws.ie)
Cork Harbour SPA (004030) (2587.25ha)	• Little Grebe (*Tachybaptus ruficollis*) [A004] • Great Crested Grebe (*Podiceps cristatus*) [A005] • Cormorant (*Phalacrocorax carbo*) [A017] • Grey Heron (*Ardea cinerea*) [A028] • Shelduck (*Tadorna tadorna*) [A048] • Wigeon (*Anas penelope*) [A050] • Teal (*Anas crecca*) [A052] • Pintail (*Anas acuta*) [A054] • Shoveler (*Anas clypeata*) [A056] • Red-breasted Merganser (*Mergus serrator*) [A069] • Oystercatcher (*Haematopus ostralegus*) [A130] • Golden Plover (*Pluvialis apricaria*) [A140] • Grey Plover (*Pluvialis squatarola*) [A141] • Lapwing (*Vanellus vanellus*) [A142] • Dunlin (*Calidris alpina*) [A149] • Black-tailed Godwit (*Limosa limosa*) [A156] • Bar-tailed Godwit (*Limosa lapponica*) [A157] • Curlew (*Numenius arquata*) [A160] • Redshank (*Tringa totanus*) [A162] • Black-headed Gull (*Chroicocephalus ridibundus)* [A179] • Common Gull (*Larus canus*) [A182] • Lesser Black-backed Gull (*Larus fuscus*) [A183] • Common Tern (*Sterna hirundo*) [A193] • Wetland and Waterbirds [A999]	Dated 16th December 2014: To maintain the favourable conservation condition of all listed bird species in Cork Harbour SPA, To maintain the favourable conservation condition of the wetland habitat in Cork Harbour SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.	There are no serious imminent threats to the wintering birds. Though the intertidal areas receive polluted water, there are no apparent significant impacts on the associated flora and fauna. Oil pollution from shipping in Cork Harbour is a general threat. Aquaculture occurs though it is not known if this has significant impacts on the birds. Recreational activities are high in some areas, including jet skiing which causes disturbance to roosting birds. Extensive areas of estuarine habitat has been reclaimed since about the 1950s for industrial, port-related and road projects, and further reclamation remains a threat.

4.2 Assessment of Likely Impacts

The purpose of this section (Section 4) is to screen out those aspects of the proposal that can be considered not likely to have a significant impact, as well as those features of the relevant Natura 2000 sites that are not likely to be significantly impacted from the exposure to a potential hazard and/or pathway.

All of the Natura 2000 sites identified in **Table 1** are of a sufficient distance from the proposed plant to ensure that they would not be affected by any direct loss of habitat at these sites. The only hazards identified with a potential source-pathway-receptor link between the proposed plant and the relevant Natura sites are:

- Effects of **disturbance** (i.e. noise, vibration and human and visual disturbance) during either the construction (including demolition) or operational phases of the proposed development. This includes the demolition of the existing utility building and the WwTP;
- The effects of **dust deposition** during the construction phase (including demolition) of the proposed development;
- Potential impacts on **water quality** arising from the process during the operational phases of the proposed development;
- The **discharge of treated surface water** run-off from the site to Cork Harbour during either the construction (including demolition) or operational phases of the proposed development;
- **Emissions to air** through the combustion process to generate electricity and heat during the operational phase of the proposed development.

The screening of the potential hazards is provided in **Table 4**.

Table 3: Screening Assessment of Potential Hazards & Potential for Significant Effects from the Project in View of the Site's Conservation Objectives

Potential Impact	Nature of Potential Impact	Screening Assessment	Natura 2000 Site with Potential Source-Pathway-Receptor Link	Potential For Significant Effect
Disturbance (Potential issue during construction (including demolition) and operation)	Noise and visual disturbance generated during construction and operation of the Plant has the potential to negatively impact on the habitats and species for which the Natura 2000 sites are designated, as well as on the block of woodland to the north, part of the Dunkettle Shore pNHA and home to a colony of little egrets (see **Chapter 11** of the EIS (Volume II) for further details). The potential impact of short-term disturbance comprises the short term loss of fitness of overwintering birds. This includes the demolition of the existing disused wastewater treatment plant and a utilities building, which will take place during the initial construction phase.	A noise impact assessment prepared by AWN consulting is presented in **Chapter 10** of the EIS (Volume II). Environmental noise surveys were carried out during January 2015 at seven monitoring locations. These surveys captured typical background and ambient noise levels. It is evident from the baseline noise monitoring results and the descriptions of the noise climate at each of the monitoring locations, that the entire study area can be designated as 'not an area of low background noise' in accordance with the standards set out in the EPA *Noise Guidance Note* (NG4). Monitoring undertaken at Location M03, located in the vicinity of the nearest residential property to the east of the proposed development site in the St. Lappans Place estate is considered to be representative of the noise levels experienced at the nearest boundary of the Cork Harbour SPA to the application area. The baseline noise environment at M03 is dictated by traffic noise from the R623, distant industrial plant noise and anthropogenic sources in the area. Noise levels at the closest boundary of the SPA to the subject site are, based on observations and review of the Cork City Agglomeration Environmental Directive	Cork Harbour SPA Great Island Channel cSAC	**No significant effects resulting from disturbance are predicted on the integrity of any designated site. The proposed development is not likely to result in a measurable impact on any qualifying feature in light of the conservation objectives for the Natura 2000 sites.** **The Potential Hazard is therefore Screened out.**

Potential Impact	Nature of Potential Impact	Screening Assessment	Natura 2000 Site with Potential Source-Pathway-Receptor Link	Potential For Significant Effect
		Noise Mapping and are considered to be in the order of 55-60 L_{Aeq} during daytime periods when construction (including demolition) works are proposed. These levels are similar to those recorded at M03. With regard to the potential impact of the construction of the proposed plant, the predicted noise levels from the loudest phase of construction i.e. site preparation (including demolition) of 44dB $L_{Aeq,1hr}$ has been logarithmically added to the estimated ambient noise level at the SPA i.e. 55 $L_{Aeq,1hr}$ (worst case approach). When the cumulative levels are compared to the ambient noise level, it is concluded that the impact of the construction phase will be slight and barely perceptible at the SPA. Furthermore, the expected levels of noise within the nearest section of the SPA are an order of magnitude such that it is expected that traffic noise from the local road (R623), which is currently the dominant source of noise on this section of the SPA, will remain the loudest source of noise during the construction phase with contributions from the site works predicted not to significantly affect overall ambient noise levels in the SPA.		

Potential Impact	Nature of Potential Impact	Screening Assessment	Natura 2000 Site with Potential Source-Pathway-Receptor Link	Potential For Significant Effect
		Winter bird surveys were undertaken during the preparation of the Dunkettle Interchange EIS and NIS (Dec 2010 and March 2011). According to the information presented in the Dunkettle Interchange NIS, a high tide roost for overwintering birds is present, approximately 1.2km to the north west of the proposed development site at Inchera, to the west of the Jack Lynch Tunnel (intertidal polder, NGR W728 726). In addition a colony of little egrets is located approximately 200m to the north west of the application area, within Dunkettle Shore pNHA. However the little egret is not a Qualifying Interest for Cork Harbour SPA. No other significant overwintering bird roost sites are present within the Zone of Influence of the proposed development (information from Birdwatch Ireland, NPWS and the Dunkettle Interchange EIS/NIS). Given the findings of the detailed noise assessment (that construction works (including demolition) are not predicted to significantly affect overall ambient noise levels in the SPA) and the distances between the proposed development site and either the high tide roost at the Jack Lynch polder or the little egret colony, it can be concluded that the proposed development is not likely to have significant effects on the SPA in view of its conservation objectives. No significant effect resulting from noise or disturbance during construction is predicted.		

Potential Impact	Nature of Potential Impact	Screening Assessment	Natura 2000 Site with Potential Source-Pathway-Receptor Link	Potential For Significant Effect
		Furthermore, several safeguards exist to minimise the effects of construction noise and these will be incorporated into the Construction and Demolition Environmental Management Plan (CDEMP). The safeguards include the following: All plant items used during the construction phase will comply with standards outlined in European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations, 1998; and Guidance set out in BS5228-1:2009+A1, which covers noise control on construction sites. The assessment of operational noise from fixed plant and traffic movements associated with the development has shown that the adopted criterion will not be exceeded at the nearby noise sensitive locations. Additionally, mitigation in the form of acoustic enclosures is incorporated into the design of the CHP engines, standby boiler and boosters. Therefore, specific mitigation measures to reduce operational noise are considered unnecessary. This is predicted to result in a situation where the expected operational noise levels in the area of the nearest section of the SPA to the application area are an order of magnitude such that traffic noise from the local road (R623), which is currently the dominant source of noise on this section of the SPA, will		

Potential Impact	Nature of Potential Impact	Screening Assessment	Natura 2000 Site with Potential Source-Pathway-Receptor Link	Potential For Significant Effect
		remain the loudest source of noise on an ongoing basis. Contributions from the site operations are predicted not to significantly affect overall ambient noise levels in the SPA. The plant will be lit at night by light standards fitted with cut off horizontal cowls to minimise light spill and direct light downwards. The area surrounding the subject site is already subject to artificial lighting and any additional lighting at the plant is unlikely to add significantly to the extent and overall levels of light pollution within the local area. It is considered that the majority of species within the immediate and surrounding area will be habituated to the existing levels of light in and around the edge of Cork Harbour and they would readily adapt to the additional lighting at the Plant. No significant impact is predicted.		

Potential Impact	Nature of Potential Impact	Screening Assessment	Natura 2000 Site with Potential Source-Pathway-Receptor Link	Potential For Significant Effect
Dust Deposition (Potential issue during construction including demolition only)	Dust generated during construction (including demolition) of the Plant may be deposited at a distance from the site and has the potential to negatively impact on the habitats and species for which the Natura 2000 sites are designated.	Construction activities such as demolition, excavation, earth moving and backfilling can generate dust, particularly in dry weather conditions. The extent of dust generation is dependent on the nature of the material (soils, peat, sands, gravels, silts etc.) and the location of the construction activity. In addition, the potential for dust dispersion depends on the local meteorological factors such as rainfall, wind speed and wind direction. Vehicles transporting material to and from the site also have the potential to cause dust generation along the selected haul routes. The construction phase (including demolition) of this proposal is deemed for the purposes of the air quality assessment (**Chapter 8** of the EIS) to be of a minor to moderate scale. At such a scale there is a risk that dust may cause an impact at sensitive receptors (including habitats) within 50m of the source of the dust generated. This is far less than the distance to the nearest Natura 2000 site (Cork Harbour SPA, 99m from the nearest edge of the application area). As a result the impact on habitats will be imperceptible. This risk is assessed as insignificant.	Cork Harbour SPA Great Island Channel cSAC	**No significant effects are predicted from dust deposition on the integrity of any designated site. The proposed development is not likely to result in a measurable impact on any qualifying feature in light of the conservation objectives for the Natura 2000 sites.** **The Potential Hazard is therefore Screened out.**

Potential Impact	Nature of Potential Impact	Screening Assessment	Natura 2000 Site with Potential Source-Pathway-Receptor Link	Potential For Significant Effect
		A Construction and Demolition Environmental Management Plan (CDEMP) incorporating dust mitigation measures will further reduce any impacts significantly and this will be implemented as part of the proposed development.		
Potential impacts on water quality arising from the process (Potential issue during operation only)	Changes in water quality can have a range of environmental impacts on habitats and species in aquatic environments and terrestrial environments. Industrial discharges and diffuse pollution from foul and surface water run-off can contribute to a reduction in water quality through a net contribution of nutrients or contamination from a wide range of organic and inorganic compounds. The impact of industrial discharges, consented or otherwise, is dependent upon the type discharge, the permitted volumes and the baseline water quality and hydrological conditions of the receiving waters. The main hazards to changes in water quality are: toxic contamination, changes in pH, nutrient and organic enrichment and sedimentation.	See Section 3.4.3 for full details of foul and process water treatment. Process effluent will be treated on-site to reduce its organic content. The likely treatment process will be a reverse osmosis (RO) plant that will utilise membrane technology to separate soluble organic components from the water. The permeate delivered from the RO plant will be added to the incoming feedstock. Excess permeate that is not required will be of sufficient quality to be discharged directly to the municipal foul sewer as a treated effluent. It is estimated that up to 200m^3/day of treated process effluent will be discharged to municipal sewer. This effluent will have a significantly reduced organic loading following the RO treatment, with a maximum population equivalent of approximately 750 (based on 1 PE = 54g of BOD per day).	Cork Harbour SPA	**No significant adverse effects resulting from foul or process water are predicted on the integrity of any designated site. The proposed development is not likely to result in a measurable impact on any qualifying feature in light of the conservation objectives for the Natura 2000 sites.** **The Potential Hazard is therefore Screened out.**

Potential Impact	Nature of Potential Impact	Screening Assessment	Natura 2000 Site with Potential Source-Pathway-Receptor Link	Potential For Significant Effect
		The concentrate generated in the RO process will be recycled back to the main process via the Process Water Tank. Some of the concentrate will be reblended into the dewatered cake and exported offsite. In addition, floor washdown from incoming waste will be redirected back into the process. Sanitary wastewater (wastewater from toilets, washing facilities, kitchens etc.) will be collected from the Administration Building and Weighbridge Office and will be directed to the existing public foul sewer, via a foul water collection network. It is estimated that up to 1m^3/day of sanitary wastewater will be discharged directly to the municipal sewer and treated at Carrigrenan WwTP on Little Island.		
Discharge of treated surface water (Potential issue during construction (including demolition) and operation)	Changes in water quality can have a range of environmental impacts on habitats and species in aquatic environments and terrestrial environments as described in the previous section.	During the construction phase there is the risk of pollution and siltation entering watercourses including surface water drainage channels and, as a consequence, Cork Harbour SPA. In order to ensure there are no construction impacts, either on European sites or on water quality in general, all hazardous substances, such as fuels, oils, cement and concrete products, will be stored on-site in secure areas remote from drainage connections to the existing surface water drainage network.	Cork Harbour SPA	**No significant adverse effects resulting from treated surface water are predicted on the integrity of any designated site. The proposed development is not likely to result in a measurable impact on any qualifying feature in light of the conservation objectives for the Natura 2000 sites.** **The Potential Hazard is therefore Screened out.**

Potential Impact	Nature of Potential Impact	Screening Assessment	Natura 2000 Site with Potential Source-Pathway-Receptor Link	Potential For Significant Effect
		The contractor will take adequate precautions as part of the construction methodology to avoid any pollution from construction and demolition activities, via run-off to the surface water drainage network. This may include the use of settlement tanks, silt traps and hydrocarbon interceptors. The contractor will put a Construction and Demolition Environmental Management Plan (CDEMP) and a risk assessment in place in order to ensure compliance with the surface water quality requirements. The implementation and effectiveness of these mitigation measures will be inspected and recorded regularly during the entire construction period and where deficiencies or faults are identified the contractor will remedy them immediately. See Section 3.4.1 for full details of surface water treatment during the operational phase. The proposed plant will require the discharge of clean treated surface water run-off via the existing municipal storm network to Cork Harbour. No process effluent will be discharged other than to the foul sewer. The discharge will comprise surface water run-off from the Renewable Bioenergy Plant site that will only be discharged following treatment in a hydrocarbon interceptor and grit trap and its attenuation in SuDS constructed on the development site.		

Potential Impact	Nature of Potential Impact	Screening Assessment	Natura 2000 Site with Potential Source-Pathway-Receptor Link	Potential For Significant Effect
		A SuDS (attenuation tank) has been incorporated into the overall design of the plant to manage and control surface water runoff at greenfield rates (6.1 l/s/ha) and to remove any suspended solids. **Based on the source of the discharge (surface water run-off), its treatment prior to discharge and its estimated quantity (c.32m^3/day) no significant changes in water quality are predicted to occur in Cork Harbour.**		
Emissions to air (Potential issue during operation only)	The combustion of biogas derived from anaerobic digestion to generate power will produce a range of emissions. The main emissions with a potential to affect ecosystems within the zone of influence include nitrogen oxides (NO_X), oxides of sulphur, predominantly SO_2. and ammonia (NH_3) emissions. Emissions to the atmosphere from the gas engines will be vented through a 28m stack. Emissions from the biogas flare stack will be vented through an 8.2m stack. Emissions from the odour control stack will be vented through a 25m stack. Emissions from the boiler will be vented through a 10m stack.	The combustion process produces a range of pollutants that could potentially adversely affect the habitats and species for which the cSAC and SPA are designated. In accordance with the Precautionary Principle, it was considered that the results of a comprehensive Air Quality study should be analysed in order to allow a detailed assessment of the potential of this element of the proposed development to impact on the Natura 2000 sites.	Cork Harbour SPA Great Island Channel cSAC	**Under the Precautionary Principle, potential adverse effects on individual qualifying features exist.** **<u>The Potential Hazard is therefore Screened in, and Stage 2 of the Appropriate Assessment Process is required.</u>**

4.3 In Combination Effects

It is a requirement of the *Birds and Natural Habitats Regulations,* 2011 that when considering whether a plan or project will adversely affect the integrity of a European site the assessment must take into account in-combination effects with other current or reasonably foreseeable plans and projects.

- If it can be clearly demonstrated that the plan or project will not result in any effects on the integrity of a European site then the plan or project may proceed without considering the in-combination test, further;
- If there are identified effects arising from the plan or project (even if they are perceived as minor and not likely to have a significant effect on the integrity of a European site), then these effects must be considered 'in-combination' with the effects arising from other plans and projects.

Cork County Development Plan 2014, Cork City Development Plan 2015-2021 and Blarney Electoral Area LAP 2011 were reviewed as part of the assessment into potential 'in combination' effects' as these strategic plans guide the future development of Cork City and Little Island itself. The Plans have been subject to assessment under Article 6(3) of the Habitats Directive and in each case it was concluded that the Plan would not result in any significant effects, nor would it have the potential to affect the integrity of any Natura 2000 site.

In order to identify potential 'In Combination Effects', other developments in the vicinity of Inchera were identified using Cork County Council's on-line planning search. No similar projects are proposed, however recent developments recorded include Reg. Ref.: 14/4711 (demolition of structures on an adjacent site – BASF) and the proposed Dunkettle Interchange road scheme. It is understood that the works proposed at the BASF site are now complete.

The Dunkettle Interchange EIS and NIS were reviewed as part of the preparation of this report. The potential impact of construction noise on birds and Cork Harbour SPA was examined in great detail in these documents, and at the Oral Hearing for the scheme held by An Bord Pleanála (Case reference: PL04G.HA0039). The NIS concluded that the proposed mitigation for construction noise and disturbance (comprising a solid 3m high hoarding at the relevant location) would be highly likely to be successful. No conditions relating to construction noise were imposed by An Bord Pleanála in its decision to grant permission for the motorway scheme. NPWS (as per statement from Dr J. Good, Divisional Ecologist, quoted on page 51 of the Inspector's Report) was satisfied with the mitigation proposed.

Given the firm conclusions presented in **Chapter 10** (Noise) of the EIS for the proposed development at Inchera, and the fact that the application area is considerably further from either the high tide roost at the Jack Lynch polder or the little egret colony, it is concluded that there will be no impacts via noise or disturbance, on Cork Harbour SPA in view of its conservation interests Therefore, it is considered that any seasonal restrictions on construction (including demolition) are unnecessary.

It is therefore concluded that the proposed project will not have any 'In-Combination Effects' with these or any other projects, on any Natura 2000 site.

4.4 Screening Conclusion

The first part of the screening process requires consideration of the project in respect of whether it is directly connected with or necessary for the management of European Sites. 'Directly' in this context means solely conceived for the conservation management of a site and 'management' in this context refers to the management measures required in order to

maintain in favourable condition the features for which the European Site has been designated.

- The proposed development is neither directly connected with, nor necessary for, the management of any Natura 2000 sites.

It is considered that both the proposed development at Inchera and the spread lands (the impact 'source') are potentially linked, via the air 'pathway', with Natura 2000 sites associated with Cork Harbour (the 'receptors').

For the reasons outlined in Section 4 it has been concluded that the proposed development should be subject to Appropriate Assessment under Article 6(3) of the EU Habitats Directive (Stage II Appropriate Assessment).

5.0 STAGE 2: NATURA IMPACT STATEMENT

The screening of potential hazards has assessed that disturbance, dust, foul water and discharge of treated surface water run-off to Cork Harbour are not likely to have any significant impact on any Natura 2000 site. These potential hazards are therefore screened-out from any further assessment.

Based on the Stage 1 screening of potential hazards outlined in **Section 4**, it is not possible to rule out with certainty the potential effects arising from the proposed development of a Renewable Bioenergy Plant at Inchera, Little Island, Co. Cork from the following environmental pathway:

- Emissions to air.

Therefore, further relevant information is provided below in order to allow Cork County Council (the Competent Authority) to ascertain whether or not the pathway identified above is likely to have a significant effect on the integrity of the relevant Natura 2000 sites in light of their conservation objectives.

5.1 Assessment Methodology

Within this stage of the assessment, the potential impact of emissions to air from the proposed development is examined in respect to the conservation objectives of the relevant Natura 2000 sites and to their integrity.

This assessment is based on the methodological guidance produced by the EC in 2001[1] for a Stage 2: Appropriate Assessment and entails five steps as follows:

- Step One: Information Checklist;
- Step Two: Impact Prediction;
- Step Three: Conservation Objectives;
- Step Four: Mitigation Measures; and
- Step Five: Outcomes (this Step to be completed by the Competent Authority).

5.2 Step One: Information Checklist

Table 4 provides an Information Checklist that identifies the conservation objectives of the European site and to identify those aspects of the project that will affect those objectives.

Table 4: Information Checklist for an Appropriate Assessment

Information Required	Known or Available	Details
Full characteristics of the project which may affect the European site	☑	See Section 3
The total range or area the project will cover	☑	See Section 3 and **Figure 1**

[1] European Commission (2001). *Assessment of Plans and Projects Significantly Affecting European Sites: Methodological Guidance on the Provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC* . European Commission Environment Directorate-General.

Information Required	Known or Available	Details
Size and specifications of the project	☑	The application for the construction (including demolition) and operation, under an IEL to be issued by the EPA, of a Renewable Bioenergy Plant for the processing of 90,000 tonnes per annum of non-hazardous biodegradable waste through the use of anaerobic digestion and the conversion of the biogas produced to electrical power and heat in combined heat and power units at Inchera, Little Island, Co. Cork.
The characteristics of the existing, proposed and other approved projects which may cause interactive or cumulative impacts with the project being assessed and which may affect the European site	☑	See Sections 4.3 and 5.3.8
Planned or contemplated nature conservation initiatives likely to affect the status of the site in the future.	☑	The Conservation Objectives of the relevant Natura 2000 sites are to maintain or restore the favourable conservation condition of the habitats and species for which the sites are designated.
The relationship between the project and the European site	☑	See Sections 4.1, 4.2 and 5.3.
The information requirements of the authorisation body or agency	☑	Environmental Impact Statement (EIS) and Natura Impact Statement (NIS) in respect of the proposed development of a Renewable Bioenergy Plant.
Information about the Site		
The reasons for the designation of the European site	☑	See Section 4
The conservation objectives of the European Site and the factors that contribute to their conservation value of the site	☑	See Section 4
The conservation status of the site (favourable or otherwise)	☑	See Section 4
The existing baseline condition of the European site	☑	See Section 4
The key attributes of any Annex I habitats or Annex II species in the European Site	☑	See Section 4

5.3 Step Two: Impact Prediction – Emissions to Air

5.3.1 *Nature of Hazard*

The operation of the proposed plant (the combustion of biogas to generate electricity and heat as well as the emission of ammonia from the odour control stack, and emissions from the biogas flare and boiler) has the potential to produce a range of emissions that could potentially adversely affect any sensitive qualifying Annex I habitats within Natura 2000 sites, and any Annex II qualifying species (in the case of cSACs) or Annex I qualifying birds (in the case of SPAs).

The main pollutants with the potential to affect the designated sites are nitrogen oxides (NOx) and oxides of sulphur, mainly SO_2, and ammonia.

Under the EPA's 2012 *Integrated Pollution Prevention and Control (IPPC) Licensing – Application Guidance Notes* emissions to air from any gas boilers over 5MW and or other fuel boilers over 250kW, are to be regarded as significant. Below this size they should be considered as minor emissions. Combustion of biogas at the proposed plant will take place in two 2MW gas engines and is therefore below the 5MW threshold contained within the guidance.

Guidance produced by the UK's Environment Agency (EA UK) to assess the risks to the environment and human health in their H1 Environmental Risk Assessment Framework that provides an overview guide and supporting technical appendices including Appendix F – Air Quality[2] states that

"*SPAs, SACs or Ramsar sites should be screened against relevant air quality standards only where such sites occur within 10km of the installation (or 15km for a coal or oil-fired power station) for environmental permitting purposes*".

Further to this, EA UK guidance under AQTAG14[3] indicates that based on the size of the individual combustion process, the proposed development would not trigger an Appropriate Assessment (**Table 2**).

Table 5: AQTAG014 Distance Criteria to Identify Installations which are 'Relevant' for the Purpose of the Habitats Directive

Size of Individual Combustion Process (MW)	Distance to European Site (km)
>50	<10
20-50	<2
5 – 20	<0.5
<5	**0**

Despite this guidance, for the purpose of this Appropriate Assessment exercise a precautionary approach of a 15km radius zone of influence from emissions to air has been taken.

5.3.2 *Air Quality Assessment Methodology*

An Air Quality and Climate Assessment was undertaken by Odour Monitoring Ireland to inform the production of the Environmental Impact Statement (EIS) which has been prepared as part of the planning application for the proposed Renewable Bioenergy Plant. This assessment is presented as **Chapter 8** of the EIS (Volume II) and should be read in conjunction with this NIS.

Detailed atmospheric dispersion modelling was undertaken using the AERMOD model, which is widely used and accepted by the EPA for undertaking such assessments. Its predictions have been validated for dispersion from tall stacks against real time monitoring data by the United States Environmental Protection Agency (USEPA).

[2] Environment Agency (2011). *H1 Annex F – Air Emissions*. V2.2 dated December 2011. Environment Agency, Bristol.

[3] Environment Agency paper AQTAG 14 assessment under the Habitats Regulations for PPC installations with combustion processes

The model predictions are based on a 'worst case scenario':

- Worst case flue gas concentrations for Carbon monoxide, **Oxides of nitrogen, Sulphur dioxide**, Total particulates, Total non-methane VOC's, **Ammonia** and Hydrogen sulphide were assumed to be emitted from the exhaust stacks in order to ascertain worst case predicted ground level concentrations of compounds at sensitive receptors and in the vicinity of the facility. These are typical limits prescribed by the EPA during the Licensing process.
- The gas engines were assumed to operate all of the time, which will never be the case (maintenance down time is estimated to be 1 to 2% of the operating year). Emissions from the operation of the gas engines provide for worst case results as the operation of the boiler and flare will be a matter of days in the full year and at no time will they operate simultaneously.
- The worst case baseline figure gathered during the survey of the application area and from a review of EPA air quality data was utilised in calculations to remain conservative.
- Emissions as a result of traffic were accounted in the final predictions at each sensitive receptor.

5.3.3 *Air Quality Standards*

The air quality limit values of relevance to sensitive ecological receptors are presented in **Tables 6** and **7**. Standards potentially relevant to this NIS are in bold.

Table 6: EU and Irish Ambient Air Quality Standards

Pollutant	Directive / Regulation	Limit Type	Value
Nitrogen Dioxide	2008/50/EC and SI 180 of 2011	Hourly limit for protection of human health – not to be exceeded more than 18 times/year-1 hour average	200 µg/m^3 NO_2
		Annual limit for protection of human health-Annual	40 µg/m^3 NO_2
		Annual limit for protection of vegetation-Annual	**30 µg/m^3 $NO + NO_2$**
Sulphur Dioxide	2008/50/EC and SI 180 of 2011	Hourly limit for protection of human health – not to be exceeded more than 24 times/year-1 hour average	350 µg/m^3
		Daily limit for protection of human health – not to be exceeded more than 3 times/year-24hr average	125 µg/m^3
		Annual & Winter limit for the protection of ecosystems-Annual	**20 µg/m^3**
Particulate Matter as PM_{10}	2008/50/EC and SI 180 of 2011	24-hour limit for protection of human health – not to be exceeded more than 35 times/year-24 hour average	50 µg/m^3 PM_{10}
		Annual limit for protection of human health-Annual	40 µg/m^3 PM_{10}

Pollutant	Directive / Regulation	Limit Type	Value
Particulate matter as $PM_{2.5}$	2008/50/EC and SI 180 of 2011	Annual limit for protection of human health-Annual	25µg/m^3 $PM_{2.5}$
Benzene Note1	2008/50/EC and SI 180 of 2011	Annual limit for protection of human health	5 µg/m^3
Carbon Monoxide	2008/50/EC SI180 of 2011	8-hour limit (on a rolling basis) for protection of human health	10 mg/m^3

Note 1 Expressed as Total non methane Volatile Organic Compounds (VOC's) in this assessment for worst case analysis.

Table 7: EA, UN and EPA Ambient Air Quality Standards

Pollutant	Guidance	Limit Type	Value
Ammonia Note 1	EA, UK H1 Part 2	1 hour average 100%ile	<2,500 µg/m^3
	EA, UK H1 Part 2	Annual average	<180 µg/m^3
	UNESC	**Annual average for protection of sensitive lichens / bryophytes**	**<1 µg/m^3**
	UNESC	**Annual average for the protection of woodland / heath lands**	**<3 µg/m^3**
Hydrogen sulphide	EA, UK H1 Part 2	1 hour average 100%ile	<140 µg/m^3
	EA, UK H1 Part 2	Annual average	<150 µg/m^3
Odour	Irish EPA AG4 Guidance	Expressed as 1 hr average at the 98%ile	<1.50 OuE/m^3

Note 1 Denotes source UN Economic & Social Council, Executive Body for the Convention on Long-Range Transboundary Air Pollution, ECE/EB.AIR/WG.5/2007/3

The above standards have been set by environmental and health professionals across Europe following extensive worldwide research and are designed to protect the most sensitive of receptors, including areas valued for their flora and fauna.

5.3.4 *Baseline Conditions*

The EU Air Framework Directive deals with each EU Member State in terms of 'Zones' and 'Agglomerations' for air quality. For Ireland, four zones, A, B, C and D have been defined and are included in the *Air Quality Standards (AQS) Regulations* (SI No 180 of 2011).

- Zone A – Dublin conurbation;
- Zone B – Cork conurbation;

- Zone C – 21 towns in Ireland with population > 15,000; and
- Zone D – remaining area of Ireland.

Inchera and its environs are classified for the purposes of this assessment as falling within Zone B. While there is some availability of recent and historic data for air quality in major cities, there is no data available from the national air quality monitoring database for air quality specific to Inchera. As such, available data from the EPA Monitoring Site located in a Zone B area has been referenced and is considered representative of background air quality in the study area. For the purposes of this NIS the relevant compounds are nitrogen oxides and sulphur dioxide (see **Table 8.6** of the EIS, reproduced below as **Table 8**).

In addition and for completeness, a baseline air quality survey was performed between December 2014 and January 2015 at five locations in the vicinity of the application area (see **Figure 8.2** of **Chapter 8** of the EIS (Volume II)). This survey was undertaken in order to assess the baseline air quality concentrations of specific key pollutants including nitrogen dioxide and sulphur dioxide. This monitoring also allowed for the assessment of cumulative baseline emissions in the vicinity of the proposed plant. The results of monitoring undertaken are presented on **Table 8.7** of the EIS and reproduced below as **Table 9**.

With regard to ammonia, it is assumed that emissions will occur from the gas utilisation engines and the odour control system. This is considered worst case assessment for critical exposure impact on sensitive habitats. No defined baseline levels of ammonia were measured. Therefore, it is assumed that an impact criterion of 20% of the critical exposure levels is utilised so as to take account of any incident of ammonia emissions being greater than the critical level.

Table 8: EPA Baseline Air Quality Monitoring Data for Zone Sites (Old Station Road, Cork)

Compound	Old Station Rd 2013 Cork ($\mu g/m^3$)[1]
	Zone B
Carbon monoxide 8 hr (Annual mean)	300
Oxides of nitrogen (Annual mean)	**23**
Sulphur dioxide (Annual mean)	**5**
Particulate matter as PM10 (Annual mean)	19
Particulate matter as PM2.5 (Annual mean)	11
Benzene (mg/m3) (Annual mean)	0.8

Notes: [1] see EPA Air Quality in Ireland 2013 Report – Key indicators in Air Quality, www.epa.ie

Table 9: Baseline Air Quality Monitoring Data in the Vicinity of Proposed Plant

Compound	Site specific baseline monitoring Dec 2014 to Jan 2015 (µg/m^3)[1]
Carbon monoxide 8 hr (Annual mean)	-
Oxides of nitrogen (Annual mean) (5 locations)	**Avg. 18.91 (Min 15.40 – Max 26.27)**
Sulphur dioxide (Annual mean) (5 locations)	**Avg. 1.27 (Min 0.95 – Max 1.45)**
Particulate matter as PM10 (Annual mean) (2 locations)	Avg. 15
Particulate matter as PM2.5 (Annual mean) (2 locations)	Avg. 8
Benzene (mg/m3) (Annual mean) (5 locations)	Avg. 0.48 (Min 0.33 – Max 0.84)

[1] denotes that the average, minimum and maximum values from 5 individual monitoring locations are presented to represent annual average baseline data for the location of the proposed facility. Monitoring was performed between the period of Dec 2014 to Jan 2015. Monitoring locations A1 to A5 are presented in **Figure 8.2** of **Chapter 8** of the EIS. All analysis was performed in a UKAS certified laboratory for such analytes.

5.3.5 *Assessment of Effects from Emissions to Air*

The assessment of combustion pollutant impacts on the relevant Natura 2000 sites is undertaken in light of Environmental Assessment Levels (EALs) for benchmark concentration of a particular pollutant set out within EU and national air quality standards, below which there is unlikely to be a significant adverse impact on the qualifying interests for which a Natura 2000 site is of European interest.

The combustion of biogas to generate heat and electricity has the potential to release emissions to air with the potential to affect the relevant Natura 2000 sites lying within a 15km radius of the proposed plant.

The main pollutants identified with the potential to affect habitats are NOx and oxides of sulphur, mainly SO_2. The potential impacts on the ecosystems within the European sites have been assessed by reference to critical levels set out in EU and National Air Quality Standards, below which significant harmful effects on sensitive elements of the environment do not occur, according to current understanding.

Great Island Channel cSAC is designated for two particular habitats; mudflats and sandflats not covered by water at low tide and Atlantic salt meadows. According to the site's Conservation Objectives documentation the Atlantic salt meadows habitat is described as being in "Favourable Conservation Condition". The mud and sand flat habitat is described being in need of restoration to "Favourable Conservation Condition". The wetland habitats in Cork Harbour SPA are described in the site's Conservation Objectives documentation as being in "Favourable Conservation Condition".

The habitats of Cork Harbour are not highly sensitive to fluctuations in air quality and it would not be expected that emissions from industrial sources such as the proposed plant would have any impacts on such habitats. It is considered that they are more at risk of impacts from habitat loss and other factors, such as impacts to the physical structure (sediment circulation, flooding, erosion and succession) and vegetation structure (zonation, height, cover and composition) of the site, none of which factors are relevant to the current study.

Nevertheless, for all European sites in the study area (defined as 15km radius from the proposed development), the process contribution (PC) and predicted environmental concentration (PEC) of NOx and SO_2 were calculated for comparison against relevant critical level.

As previously discussed, the Inchera site is located within EPA Baseline Air Quality Zone B (Cork Conurbation, see **Table 8**). However, the data recording point for Zone B (Old Station Road, Cork City) is not representative of Inchera or Little Island in general. It was therefore considered appropriate to assess the potential impacts of the proposed plant against the baseline monitoring data undertaken in the vicinity of the application area (see **Table 9**). This methodology provides a more accurate assessment of potential impacts of the proposed plant.

The predicted process contributions to the critical levels for NO_x and SO_2, compared against relevant air quality standards and modelled baseline values are presented in **Tables 10** and **11** respectively.

Table 10: Maximum Predicted Nitrogen Oxide (NO_x) Concentrations (µg/m³)

Natura 2000 Site	Critical Level (µg/m3) (from SI 180 of 2011)	Baseline Value (µg/m3) (Modelling undertaken by Odour Monitoring Ireland Ltd)	PC (µg/m3)	PC as % of Critical Level	PEC (µg/m3)	PEC as % of Critical Level
Great Island Channel cSAC	30	18.91	1.01	3.3	19.92	66.4
Cork Harbour SPA		18.91	1.05	3.5	19.96	66.5

Table 11: Maximum Predicted Sulphur Dioxide (SO2) Concentrations (µg/m³)

Natura 2000 Site	Critical Level (µg/m3) (from SI 180 of 2011)	Baseline Value (µg/m3) (Modelling undertaken by Odour Monitoring Ireland Ltd)	PC (µg/m3)	PC as % of Critical Level	PEC (µg/m3)	PEC as % of Critical Level
Great Island Channel cSAC	20	1.27	0.16	0.8	1.43	7.15
Cork Harbour SPA		1.27	0.12	0.6	1.39	6.95

The significance of the long-term process contribution (PC) is assessed against the following criteria:

- If the PC is less than 1% of the relevant long-term benchmark (EAL, critical level or critical load), the emission is 'not likely to have a significant effect alone or in combination irrespective of the background levels';

If this criterion is exceeded consideration of the predicted environmental concentration (PEC) is required and the following criteria applied:

- If the PEC is less than 70% of the relevant long-term benchmark, the emission is 'not likely to have a significant effect'.

NOx

As the predicted PC of NOx from the proposed plant is just above the 1% of the applied critical level at all relevant Natura 2000 sites but is below the PEC level of 70% it can be concluded that NOx emissions are not likely to have a significant effect on these sites.

SO_2

As the predicted PC of SO_2 from the proposed plant is below the 1% of the applied critical level at all relevant Natura 2000 sites it can be concluded that SO_2 emissions are not likely to have a significant effect on these sites.

Ammonia

The predicted cumulative operational phase emissions of Ammonia at Natura 2000 sites for the worst case meteorological year (Cork Airport, 2008) is presented in **Table 12** below.

Table 12: Maximum Predicted Ammonia Concentrations

Natura 2000 Site	Pollutant	AA NH_3 ($\mu g/m^3$) yr 2008	Impact Criterion $\mu g/m^3$	% of Criterion
Great Island Channel cSAC	Ammonia – Annual Average	0.03	<1 (lichens/bryophytes)	3
Cork Harbour SPA	Ammonia – Annual Average	0.02	<1 (lichens/bryophytes	2
Great Island Channel cSAC	Ammonia – Annual Average	0.03	<3 (woodland/heath lands)	1
Cork Harbour SPA	Ammonia – Annual Average	0.02	<3 (woodland/heath lands)	0.66

It should be noted that neither Great Island Channel cSAC nor Cork Harbour SPA contain habitats sensitive to ammonia at these concentrations. The purpose of the table is to show that ammonia levels predicted are significantly below the impact criteria for even the most sensitive habitats.

Based on these predictions, it is considered that there is no requirement to undertake any further assessment with regard to critical levels of the emissions of NOx, SO_2 or NH_3, either alone or in-combination with any other plans and projects, as the proposed Renewable Bioenergy Plant is not likely to have an adverse effect on the integrity of the identified relevant Natura 2000 sites, irrespective of the background levels.

5.3.6 *Mitigation Measures for Air Quality*

In order to sufficiently ameliorate any potential negative impacts on air quality, a schedule of measures has been formulated for both the construction and operational phases of the proposed plant.

Incorporated Mitigation

The design and operation of the proposed plant is intended to ensure that waste is not handled outside the reception building. A number of measures are incorporated to ensure that fugitive emissions of odours are minimised from the reception area of the main building:

- The main building is totally enclosed with access into or out of the building only possible through automatic rapid open/shut doors. Pedestrian doors will for remain closed and only open when access is required. This will ensure the risk of egress of odour through building apertures is minimised; and
- Extraction systems in the reception area of the main building will maintain negative pressure inside all areas where waste is handled and processed. This will encourage air to flow into the building, thus further preventing uncontrolled egress of odour.

Other controls on emissions to air which will be implemented as an integral part of the design are as follows:

- The air extracted from the waste processing building will be treated in an odour control system which will incorporate a biotrickling filter, plasma injection and carbon filtration vessel prior to being exhausted through a 25m stack. The stack will be located to the west of the main building, the stack is considered to have sufficient height to ensure an adequate level of dispersion;
- There will be no emissions to atmosphere from the digestion tanks or other process vessels containing odorous materials as waste will be contained within fully sealed tanks; and
- The combustion of biogas by the CHP units or gas flare will destroy any potentially odorous compounds contained in the biogas (combustion temp circa 500 deg C). The proposed design of a 28m high stack is considered to represent a good level of environmental performance, to ensure adequate dispersion.

Construction Phase Mitigation

It should be noted that the mitigation measures presented below include the demolition aspect of this development proposal. These works will be undertaken in parallel with the construction of the plant.

A full traffic management plan and dust management plan will be incorporated into the Construction and Demolition Environmental Management Plan (CDEMP) in order to minimise such emissions as a result of the construction phase of the development. This will be generated specifically for the proposed development when detailed design is completed.

In order to ensure that no dust nuisance occurs at sensitive receptors, a series of measures will be implemented through the CDEMP:

- On site roads shall be regularly cleaned and maintained as appropriate;
- Hard surface roads shall be swept to remove mud and aggregate materials from their surface as a result of the development;
- Any un-surfaced roads shall be restricted to essential site traffic only;
- Any on site road that has the potential to give rise to fugitive dust will be regularly watered, as appropriate, during extended dry and/or windy conditions;
- Vehicles using site roads shall have their speed restricted, and this speed restriction will be enforced rigidly. On any un-surfaced site road and on hard surfaced roads speed shall be restricted to 20 km per hour;
- Vehicles delivering material with dust potential (soil, aggregates) will be enclosed or covered with tarpaulin at all times to restrict the escape of dust;
- Material handling systems and site stockpiling of materials shall be designed and laid out to minimise exposure to wind. Water misting or sprays shall be used as required if particularly dusty activities are necessary during dry or windy periods;
- At all times, these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the subject site boundary, movements of materials

likely to raise dust will be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations;

- In relation to the completion of the proposed development, the hard standing surface, and all roads will be tarmacadamed/concreted where applicable. In periods of dry weather when dust emission would be greatest, a road sweeper, which would also dampen the road, will be employed as required to prevent the generation of dust; and
- In terms of good practice construction vehicles and equipment will receive regular maintenance. Technical inspection will be performed of vehicles to ensure they will perform most efficiently. A Traffic Management Plan will be implemented to minimise congestion.

Climate

Emissions of oxides of nitrogen, sulphur dioxide, carbon monoxide and carbon dioxide will be mitigated by using efficient construction vehicles, appropriate scheduling of construction activities to minimise duration, the shutting off of equipment during periods of inactivity if they do occur, and a transport management plan as part of the CEMP as described above. No additional mitigation measures are considered necessary.

Operational Phase Mitigation

Scheduled emission points operated within the facility will be regulated through the EPA Licencing process and emission limit values utilised in this assessment are typical of emission limit levels used on EPA Licenced sites.

The air quality assessment demonstrates that emission levels as a result of the operation of the proposed plant will not result in any air quality impact in line with Irish and European assessment criteria limits. The air quality emissions from each of the gas utilisation engines, flare and boiler will exhaust through a 28m, 8m and 10 m stack respectively stack respectively, while emissions from the odour control system will exhaust through a 25m stack.

In terms of the likelihood of fugitive emissions of odours, these will be negligible as all buildings and processes containing odorous activities will be of high containment integrity (near 100% integrity) and all areas where odorous activities occur will be placed under negative extraction. All odorous air will be vented through a three stage odour treatment process to deodorise the collected air. In addition, this treated air will be vented through a 25m stack to provide further dispersion as a final protection.

In terms of access doors to the waste reception area, these will be of rapid roller type and fitted with air curtains to prevent emissions from escaping from doorways when vehicles access the main building's reception area.

The entire odour management system including the containment, extraction and treatment system will be monitored by a network of sensors to ensure it is functioning adequately.

An odour management plan will be implemented at the proposed facility in line with EPA requirements.

Climate

The proposed plant at Inchera will play an important role in achieving key national targets. It will help achieve the Government's target's set out in the Energy Policy Framework 2007-2020 which defines a national target for the contribution of renewable energy to gross electricity consumption at 15% by 2010 rising to 33% by 2020. It will contribute to the Ireland's share of

the EU's binding target for renewable energy, which is proposed to be 15% by 2020. And it will help to achieve the EU Landfill Directive's requirement to reduce the amount of biodegradable municipal waste sent to landfill to 35% of 1995 levels by 2016.

The effects of the proposed plant on climate are expected to be negligible given the fact that the facility will be a net generator of electricity to the national grid. The facility will generate renewable energy from organic material by means of anaerobic digestion and displace the need to use fossil fuels for the generation of electricity. The facility will export 21,200MWh, enough renewable electricity to power 7,500 homes locally. No additional mitigation is considered necessary.

5.3.7 *Residual Impacts for Air Quality*

No residual impacts on air quality are anticipated as a result of the proposed development of a Renewable Bioenergy plant at Inchera, Little Island, Cork.

Construction Phase

The effect of construction (including demolition) of the proposed plant on air quality will not be significant following the implementation of the proposed mitigation measures. No residual impacts are anticipated.

Operational Phase

Scheduled emission points operated within the proposed plant will be regulated through the EPA Licensing process. This assessment demonstrates that the level of emissions will not result in any air quality impact in line with Irish and European assessment criteria limits. No residual impacts are anticipated.

5.3.8 *In Combination Effects*

It is considered from the assessment undertaken that the proposed construction and operation of a Renewable Bioenergy Plant at Inchera, Little Island, Co. Cork will not result in any significant effects on any Natura 2000 site or on any qualifying features for which a particular site is of European interest as a stand-alone development. Therefore, it is considered that there is not a requirement to undertake any further assessment in-combination with other plans and projects.

5.3.9 *Assessment Conclusion*

The assessment indicates that the risk of exposure to air emissions from the proposed Renewable Bioenergy Plant at Inchera is negligible for the relevant Natura 2000 sites within a 15km radius of the plant. As no habitats will be directly impacted by the emissions to air then no indirect impacts to any EU Habitats Directive Annex II qualifying species or EU Birds Directive qualifying Annex I birds are considered likely. Therefore no significant effects are predicted on the integrity of any identified Natura 2000 site.

5.4 Step Three: Conservation Objectives

It is necessary to assess whether or not emissions to air from the proposed plant will adversely affect the integrity of the relevant Natura 2000 sites within its potential zone of influence, as defined by the conservation objectives for these sites as identified in **Table 3**.

Emissions to air from the operation of a Renewable Bioenergy Plant at Inchera, Little Island, Co. Cork are not likely to have any measureable or significant effects on the integrity of any of

the relevant Natura 2000 sites or on any qualifying habitats and/or species for which these sites are of designated, in light of the conservation of these sites and/or features, as a stand-alone development.

5.5 Step Four: Mitigation Measures

As no effects are predicted on any Natura 2000 site or on any qualifying habitats and/or species no specific avoidance and mitigation measures are proposed in respect of the proposed development over and above those measures included within the overall scheme design, as described in Section 5.3.6.

The operation of the proposed Renewable Bioenergy Plant will be subject to an Industrial Emissions Directive (IED) licence and any conditions/limits set by the EPA and by any monitoring requirements.

6.0 SUMMARY AND CONCLUSIONS

This assessment has considered the potential effects associated with the construction and operation of a Renewable Bio-Energy Plant at Inchera, Little Island, Co. Cork.

The assessment has concluded that it can be clearly demonstrated that the project will not result in any significant effects on any relevant Natura 2000 site within a 15km radius of the facility either on the integrity of these sites, or any qualifying features for these site for which they have been classified/designated as being of European importance, either as a stand-alone development or in-combination with other plans or projects within its zone of influence.

It is considered that this NIS provides sufficient relevant information to allow the Competent Authority (Cork County Council) to undertake Step 5 of the Appropriate Assessment process and reach a determination that the proposed development will not affect the integrity of any of the identified relevant Natura 2000 sites under Article 6 of the Habitats Directive (92/43/EEC).

APPENDIX I: BACKGROUND TO APPROPRIATE ASSESSMENT

The Natura 2000[4] network is a Europe-wide network of ecologically important sites (SPAs and cSACs – also known as 'European Sites') that have been designated for protection under either the EU Birds Directive (*Council Directive 79/409/EEC on the Conservation of Wild Birds*) or the EU Habitats Directive (*Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna*).

The main aim of the Habitats Directive is "to contribute towards ensuring biodiversity through the conservation of natural habitats of wild fauna and flora in the European territory of the Member States to which the treaty applies". Any actions taken must be designed to "maintain or restore, at a favourable conservation status, natural habitats and species of wild fauna and flora of Community interest". Under Article 6 of the Habitats Directive, an assessment is required where a plan or project may give rise to significant effects upon a Natura 2000 site.

In addition, it is a matter of law that candidate SACs (cSACs) and Sites of Community Importance (SCI) are considered in this process.

Article 6 (paragraphs (3) and (4)) of the Habitats Directive states that:

> (3) Any plan or project not directly connected with or necessary to the management of the site but likely to have significant effect thereon, either individually or in combination with other plans or projects, shall be subject to Appropriate Assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.
> (4) If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of social or economic nature, the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted.''

The requirements of the Habitats Directive are transposed into Irish law by means of the *European Communities (Birds and Natural Habitats) Regulations 2011* (hereafter referred to as the *Birds and Habitats Regulations*)[5] and by the *Planning and Development (Amendment) Act 2010*, as amended.

[4] The EU Habitats Directive, Article 3.1, states "A Coherent European ecological network of Special Areas of Conservation and Special Protection Areas pursuant to Directive 79/409/EEC shall be set up under the title Natura 2000"

[5] SI No. 477 of 2011

In Ireland, the statutory agency responsible for the designated areas is NPWS.

Stages in the Assessment

European Commission guidance (2001)[6] sets out the principles on how to undertake decision making in applying the Habitats Directive. The requirements of the Habitats Directive comprise four distinct stages:

Stage 1: Screening is the process which initially identifies the likely impacts upon a European site of a project or plan, either alone or in combination with other projects or plans, and considers whether these impacts may be significant. It is important to note that the burden of evidence is to show, on the basis of objective information, that there will be no significant effect; if the effect may be significant, or is not known, that would trigger the need for an Appropriate Assessment. There is European Court of Justice case law to the effect that unless the likelihood of a significant effect can be ruled out on the basis of objective information, then an Appropriate Assessment must be made.

Stage 2: Appropriate Assessment is the detailed consideration of the impact on the integrity of the European site of the project or plan, either alone or in combination with other projects or plans, with respect to the site's conservation objectives and its structure and function. This is to determine whether or not there will be adverse effects on the integrity of the site. This stage also includes the development of mitigation measures to avoid or reduce any possible impacts.

Stage 3: Assessment of alternative solutions is the process which examines alternative ways of achieving the objectives of the project or plan that would avoid adverse impacts on the integrity of the European site, should avoidance or mitigation measures be unable to cancel out adverse effects.

Stage 4: Assessment where no alternative solutions exist and where adverse impacts remain. At Stage 4 an assessment is made with regard to whether or not the development is necessary for imperative reasons of overriding public interest (IROPI) and, if so, of the compensatory measures needed to maintain the overall coherence of the Natura 2000 network.

Conservation Objectives of European Sites

The conservation objectives for a European Site are intended to represent the aims of the Habitats and Birds Directives in relation to that site. To this end, habitats and species of European Community importance should be maintained or restored to 'favourable conservation status' (FCS), as defined in Article 1 of the Habitats Directive below:

[6] European Commission (2001) *Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites: Methodological Guidance on the Provisions of Article 6 (3) and (4) of the Habitats Directive 92/43/EEC*

The conservation status of a natural habitat will be taken as 'favourable' when:

- Its natural range and the area it covers within that range are stable or increasing;
- The specific structure and functions which are necessary for its long term maintenance exist and are likely to continue to exist for the foreseeable future;
- Conservation status of typical species is favourable as defined in Article 1(i).

The conservation status of a species will be taken as favourable when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats;
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future;
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Guidance from the European Commission[7] indicates that the Habitats Directive intends FCS to be applied at the level of an individual site, as well as to habitats and species across their European range. Therefore, in order to properly express the aims of the Habitats Directive for an individual site, the conservation objectives for a site are essentially to maintain (or restore) the habitats and species of the site at (or to) FCS.

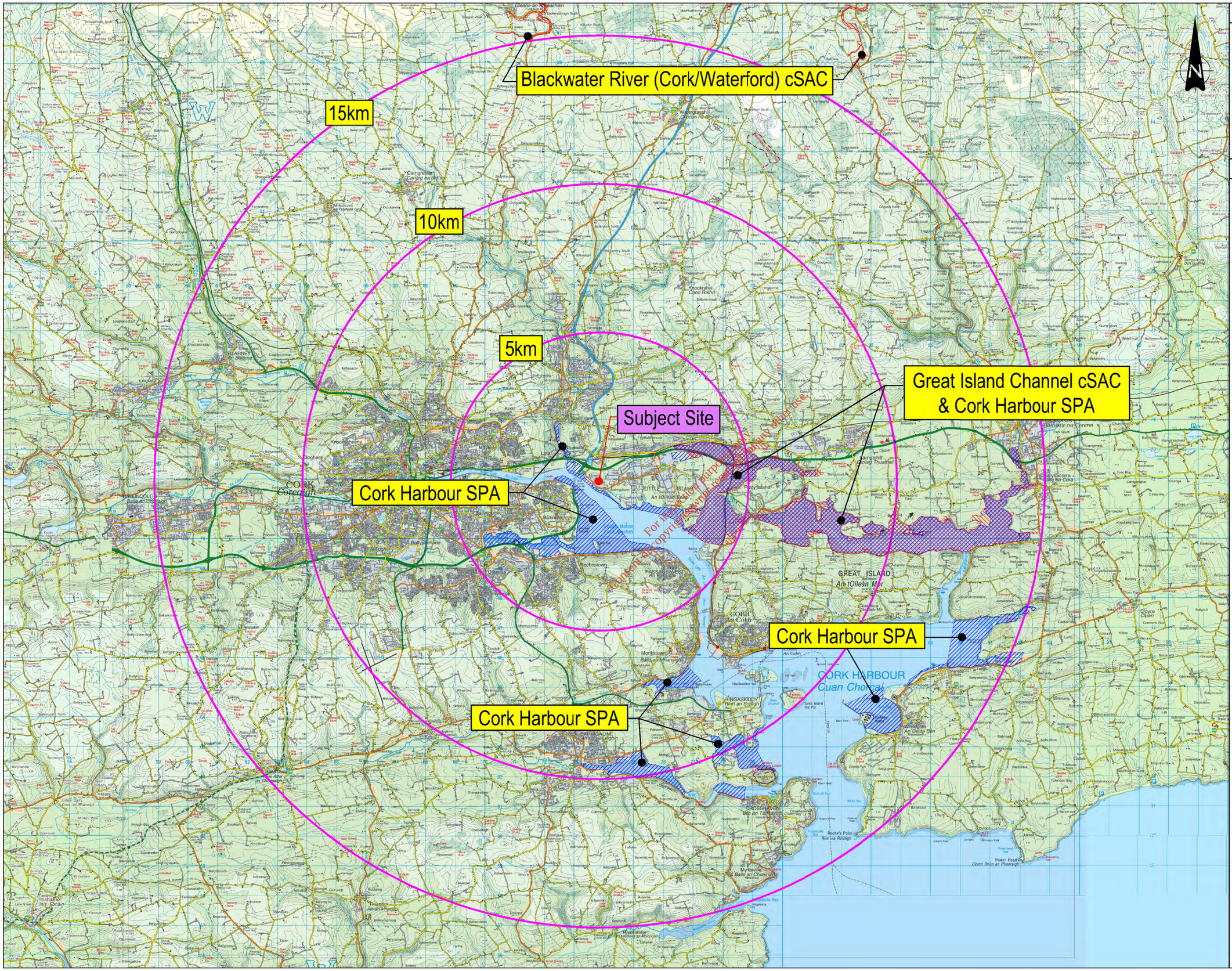
The European Commission guidance recommends that screening should fulfil the following steps:

1. Determine whether the plan (or policy) is directly connected with or necessary for the management of Natura 2000 sites;
2. Describe the plan and describe and characterise any other plans or projects which, in combination, have the potential for having significant effects on Natura 2000 sites;
3. Identify the potential effects on Natura 2000 sites;
4. Assess the likely significance of any effects on Natura 2000 sites.

[7] Managing Natura 2000 sites: the provisions of Article 6 of the Habitats Directive 92/43/EEC. (European Commission 2000)

FIGURE

Figure 1: Natura 2000 Sites within a 15 Kilometre Radius of the Development Site



NOTES

1. EXTRACT FROM 1:50000 ORDNANCE SURVEY IRELAND DISCOVERY SERIES MAPPING - MAP NO's. - OS1404, OS1406, OS1408, OS1604, OS1606, OS1608, OS1804, OS1806 & OS1808.

2. ORDNANCE SURVEY IRELAND LICENCE NO. EN 0060715 (C) ORDNANCE SURVEY & GOVERNMENT OF IRELAND

LEGEND

- Proposed Renewable Bioenergy Plant
- Cork Harbour Special Protection Area
- Candidate Special Area of Conservation (Great Island Channel & Blackwater River)
- 5km, 10km, 15km radius from the site

Revision	Drawn By	Chkd By	Date	Comments
-	MH	PG	10.04.15	

CLIENT: STREAM BIOENERGY

Matt Hague
Consultant Ecologist

Proposed
Renewable Bioenergy Plant

Inchera,
Little Island,
Co. Cork

Title - Natura Impact Statement
Natura 2000 Sites

FIGURE 1

Scale	Date
1/120000 @ A3	APRIL 2015

ATTACHMENT - B.9 NOTICES

Site Notice

APPLICATION TO THE ENVIRONMENTAL PROTECTION AGENCY FOR A LICENCE

Little Island BioEnergy Limited, Unit 1, Avondale Business Park, Carysfort Avenue, Blackrock, County Dublin, is applying to the Environmental Protection Agency (EPA) for an Industrial Emissions Licence (IEL) for a Renewable Bioenergy Plant at Inchera, Little Island, Co. Cork. The plant will accept up to 90,000 tonnes per annum of non-hazardous biodegradable waste.

The class and nature of the industrial emissions directive activity in accordance with the First Schedule to the Act of 1992 is:

11.4 (b) Recovery, or a mix of recovery and disposal of non-hazardous waste with a capacity exceeding 75 tonnes per day involving one or more of the following activities, (other than activities to which the Urban Waste Water Treatment Regulations 2001 (S.I. No. 254 of 2001) apply):

(i) biological treatment;

11.4 (c) Notwithstanding clause (b), when the only waste treatment activity carried out is anaerobic digestion, the capacity threshold for that activity shall be 100 tonnes per day.

An Environmental Impact Statement (EIS) will be submitted to the Agency with the application. The EIS and any further information relating to the effects on the environment of the emissions from the activity which may be furnished to the Agency in the course of the Agency's consideration of the application, will be available at the headquarters of the Agency.

A copy of the EIS has been submitted to Cork County Council.

Location of Site Notice

The location of the site notice is presented on **Figure B.2** at the end of **Attachment B**.

Newspaper Notice


Irish Examiner
Monday 29.06.2015

Public Notices

APPLICATION TO THE ENVIRONMENTAL PROTECTION AGENCY FOR A LICENCE

Little Island BioEnergy Limited, Unit 1, Avondale Business Park, Carysfort Avenue, Blackrock, County Dublin, is applying to the Environmental Protection Agency (EPA) for an Industrial Emissions Licence (IEL) for a Renewable Bioenergy Plant at Inchera, Little Island, Co. Cork. The plant will accept up to 90,000 tonnes per annum of non-hazardous biodegradable waste. The class and nature of the industrial emissions directive activity in accordance with the First Schedule to the Act of 1992 is:11.4 (b) Recovery, or a mix of recovery and disposal, of non-hazardous waste with a capacity exceeding 75 tonnes per day involving one or more of the following activities, (other than activities to which the Urban Waste Water Treatment Regulations 2001 (S.I. No. 254 of 2001) apply): (i) biological treatment; 11.4 (c) Notwithstanding clause (b), when the only waste treatment activity carried out is anaerobic digestion, the capacity threshold for that activity shall be 100 tonnes per day. An Environmental Impact Statement (EIS) will be submitted to the Agency with the application. The EIS and any further information relating to the effects on the environment of the emissions from the activity which may be furnished to the Agency in the course of the Agency's consideration of the application, will be available at the headquarters of the Agency.
A copy of the Environmental Impact Statement has been submitted to Cork County Council. A copy of the application for the licence may be inspected on the Agency's website or inspected at or obtained from the headquarters of the Agency as soon as is practicable after the receipt by the Agency of the application for the licence.

Notice to Relevant Planning Authority

LITTLE ISLAND
BIOENERGY

Little Island BioEnergy Limited
Unit 1 Avondale Business Park
Carysfort Avenue, Blackrock, Co. Dublin
Tel: +353 (0)1 685 4935

Cork County Council
Planning Department
County Hall
Carrigrohane Road
Cork

23rd June 2015

Ref: Application to the Environmental Protection Agency (EPA) for an Industrial Emissions Licence by Little Island BioEnergy Limited,
Notice under Section 87(1)(a) of the Act of 1992

Dear Sir/Madam,

Little Island BioEnergy Limited, Unit 1 Avondale Business Park, Carysfort Avenue, Blackrock, Co. Dublin, is applying to the Environmental Protection Agency (EPA) for an Industrial Emissions Licence (IEL) FOR A Renewable Bioenergy Plant at Inchera, Little Island, Co. Cork. The plant will accept up to 90,000 tonnes per annum of non-hazardous biodegradable waste.

Planning permission is under consideration by Cork County Council for the development (Register Ref. 154926).

The class and nature of the industrial emissions directive activity in accordance with the First Schedule of the Act of 1992 is:

11.4 (b) Recovery, or a mix of recovery and disposal, of non-hazardous waste with a capacity exceeding 75 tonnes per day involving one or more of the following activities (other than activities to which the Urban Waste Water Treatment Regulations 2001 (S.I. No. 254 of 2001) apply):

(i) biological treatment

11.4 (c) Notwithstanding clause (b), when the only waste treatment activity carried out is anaerobic digestion, the capacity threshold for that activity shall be 100 tonnes per day.

An Environmental Impact Statement (EIS) will be submitted to the Agency with the application. The EIS and further information relating to the effects on the environment of the emissions from the activity which may be furnished to the Agency in the course of the Agency's consideration of the application, will be available at the headquarters of the Agency.

Yours sincerely,

Paula Galvin (Environment Manager)

Directors: K. Fitzduff, P. Doyle | Registered Office: Unit 1 Avondale Business Park, Carysfort Avenue, Blackrock, Co. Dublin. Reg. No: 556915

ATTACHMENT - B.10 SEVESO II REGULATIONS

The Renewable Bioenergy Plant at Inchera is not an establishment to which the EC (Control of Major Accident Hazards involving Dangerous Substances) Regulations (S.I. No. 74 of 2006) apply.

However, the location of the subject site is within proximity of a number of sites which do qualify under the Seveso Regulations. For any developments in the vicinity of Seveso establishments, the Health and Safety Authority (HSA) can issue technical advice regarding the acceptability or otherwise of the risks involved. The HSA have issued a guidance document which outlines the approach when making such a determination. An assessment was prepared by AWN Consulting Ltd. entitled ***Assessment of Land Use Planning Implications for the Development of a Renewable Bioenergy Plant at Inchera, Little Island, Cork*** using the HSA's guidance and is presented at the end of this attachment.

The methodology used in this assessment is the same as that used by the HSA when issuing advise to planning authorities in relation to developments at or in the vicinity of Seveso establishments.

The report concludes the proposed plant would satisfy all of the HSA's criteria for individual and societal risk when making decisions based on land use planning matters and, as such, the HSA would not advice against the proposed development in this regard.

LAND USE PLANNING ASSESSMENT AND SOCIETAL RISK ASSESSMENT OF PROPOSED RENEWABLE BIOENERY PLANT, INCHERA, LITTLE ISLAND, CORK

awnconsulting

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Technical Report Prepared For

Stream Bioenergy
Unit 1, Avondale Business Park,
Carysfort Avenue,
Blackrock,
Co. Dublin

Technical Report Prepared By

Maeve McKenna BEng MEngSc CEng MIEI AMIChemE

Our Reference

MMcK/14/8198SR01

Date of Issue

27th April 2015

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Document History

Document Reference		Original Issue Date	
MMcK/14/8198SR01		27th April 2015	
Revision Level	Revision Date	Description	Sections Affected

Record of Approval

Details	Written by	Approved by
Signature		
Name	Maeve McKenna	Dr. Fergal Callaghan
Title	Principal Risk Consultant	Director
Date	27th April 2015	

CONTENTS

TABLES

FIGURES

1.0 INTRODUCTION

AWN Consulting Ltd. was requested by Stream BioEnergy to complete a land use planning and societal risk assessment of a proposed Renewable Bioenergy Plant at Inchera, Little Island, Cork. The assessment considers the potential impacts of major accident hazards at nearby establishments in Little Island that are notified to the Health and Safety Authority and are subject to the provisions of the European Communities (Control of Major Accident Hazards Involving Dangerous Substances) Regulations, 2006 (COMAH Regulations 2006). The assessment also addresses potential accident scenarios on site involving biogas.

This report outlines the following:

- Overview of proposed Renewable Bioenergy Plant and nearby COMAH establishments;
- Assessment methodology and criteria;
- Land use planning assessment of major accident hazards;
- Assessment of proposed Renewable Bioenergy Plant;
- Societal risk assessment;
- Conclusions.

2.0 OVERVIEW OF PROPOSED DEVELOPMENT AND SURROUNDING LAND USES

2.1 Development

The proposed Renewable Bioenergy Plant is designed to process 90,000 tonnes per annum of non-hazardous biodegradable material, such as household, commercial, industrial and agricultural organic waste. The facility layout is illustrated on **Figure 1** overleaf and comprises the following areas:

- The Main Building will be contain the following areas:
  - feedstock reception and pre-treatment area;
  - digestate dewatering treatment and storage area;
  - effluent treatment and quarantine area;
- An odour control system and stack will treat and exhaust the air extracted from the Main Building;
- The Tank Farm will be bunded and will contain pre-treatment, digestion, pasteurisation and chemical storage tanks;
- The Biogas Treatment Area will incorporate combined heat and power units, a biogas holder, a standby gas flare and gas treatment facilities including a gas booster and gas dryer and boilder;
- The Administration Building will include welfare facilities, laboratory and control room; and
- Ancillary structures will be located outside these areas and will include a bunded diesel refuelling area, a workshop, a boiler, a motor control centre kiosk, an electrical substation, transformers, weighbridges and kiosk, wheelwash, pipe bridge, access stairways, walkways and gantries, car parking, lighting, fencing and security gates.

The process can be broadly divided into 3 main stages:

- Pre-treatment: after waste is delivered inside the main building, it will be blended with recycled process liquid to create an organic slurry. Material that is unsuitable for treatment by anaerobic digestion (AD) will be recovered (e.g. metal, plastic etc.) and exported off site for further treatment, recycling or disposal.
- AD treatment: the slurry will be pumped to the digestion tanks where the organic material will be broken down in the absence of oxygen in enclosed sealed tanks to produce both biogas and digestate.
- Post treatment: the slurry will then be pumped to the pasteurisation tank for treatment in a batch manner to the appropriate Transformation Standard in accordance with Animal By-Product Regulations (ABPR). The captured biogas will be combusted in CHP engines to produce renewable heat and electricity. The electricity will be exported to the national grid (up to 4MW), and will be sufficient to power 7,500 homes. The heat will be reused in the process and can also be made available to neighbouring activities which have a requirement for heat. The digestate will undergo moisture content reduction through the use of centrifuges to produce a cake-like material which, if derived from source separated material, can be used as a biofertiliser. The process liquor remaining after the centrifuge will be treated onsite to reduce the ammonia and BOD content prior to re-use within the process with the excess discharged to the municipal sewer.

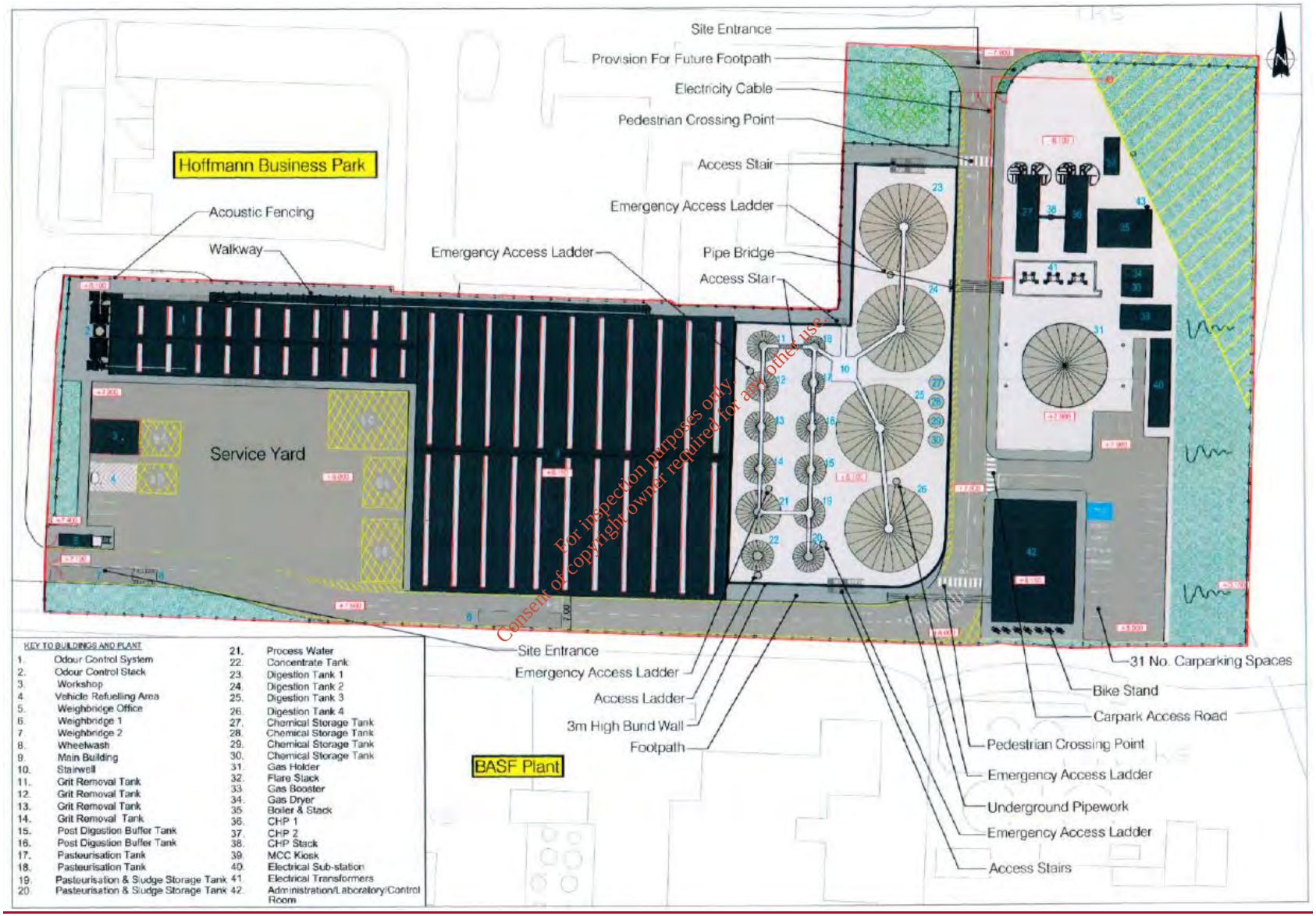


Figure 1 Site Layout Plan

Operating hours:

Waste will be received between the hours of 07:00 and 18:00 Monday to Saturday, excluding Bank Holidays. The AD process will operate continuously 24 hours per day, Monday to Sunday. No outdoor operations will take place during night-time hours.

Staffing:

The proposed plant is estimated to employ some 16 no. staff working over three predetermined shifts as follows:

- 07:00-16:00hrs 7 Staff
- 13:00-22:00hrs 6 Staff
- 22:00-07:00 hrs 3 Staff

Personnel employed in a full time capacity on site will include:

- Site Manager
- Operations Supervisor
- General Operatives
- Drivers
- Maintenance Engineer
- Laboratory Technician
- Administrative Personnel
- Weighbridge Operator
- Security

2.2 Location

The proposed development site at Inchera is situated at the western end of Little Island, approximately 6km east of Cork City centre (see **Figure 2**). The plant will occupy an area of circa 2ha (c.5 acres). This site is part of a larger landholding of approximately 20ha which was formerly occupied by Pfizer and is now owned by Tapella Limited. The site is near to the northern entrance of the Jack Lynch Tunnel (N40) and the Dunkettle Roundabout which forms the junction between the N25 Cork-Waterford (east) national primary route and the M8 Cork-Dublin (north) motorway.

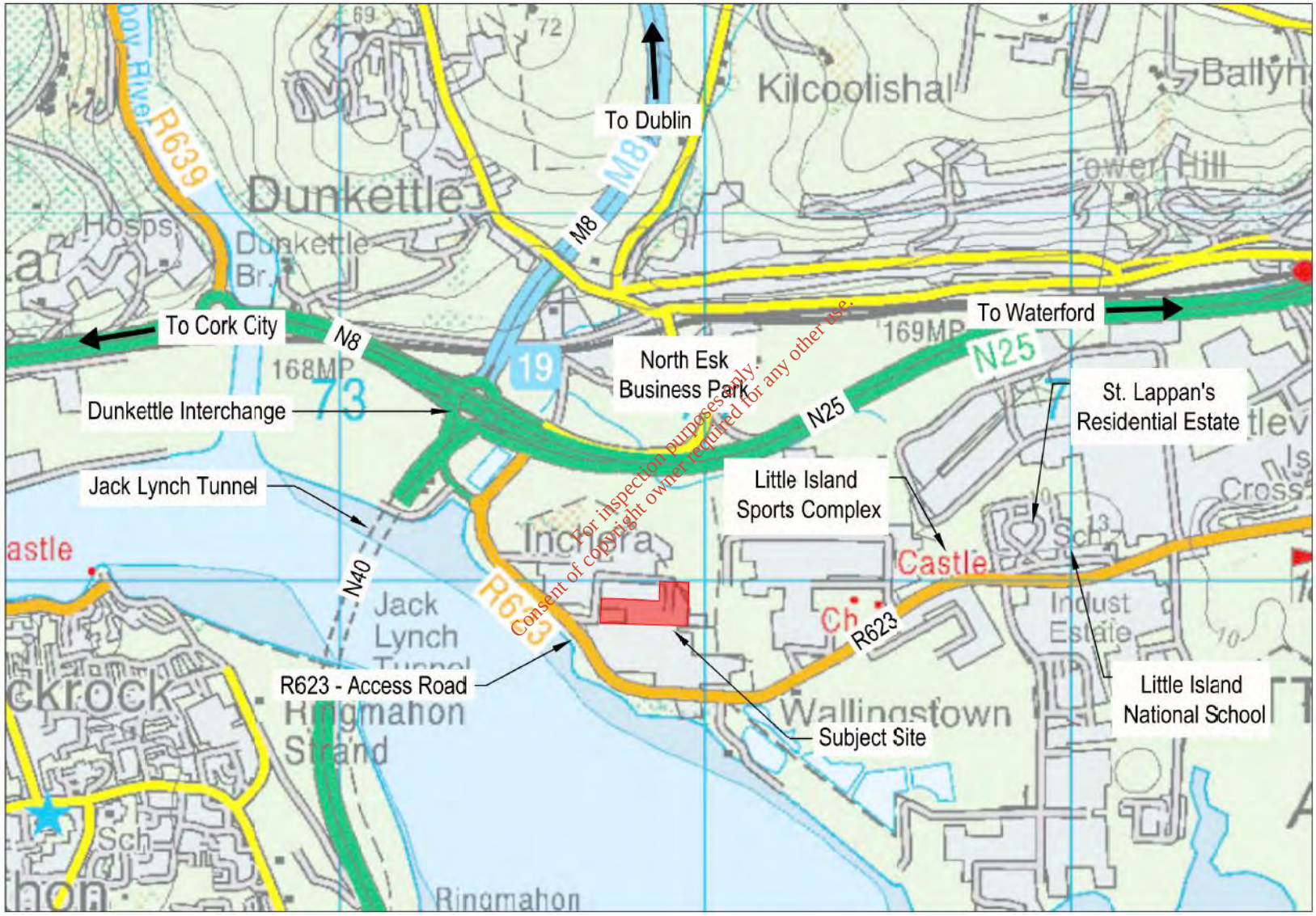


Figure 2 Site Location

2.3 Surrounding Land Uses

Much of the infrastructure associated with the former operation of the site as a Pfizer pharmaceutical plant have been removed. However, several buildings within the 20ha site have been retained by Tapella Ltd. (the current owners) and these are occupied by small-scale companies including Epi-Light Ltd., Solovotrin Therapeutics and Nexphar Ltd. Apart from a WwTP and a utilities building all other features have been removed from the 2ha subject site.

The site is located within a heavy industrialised area within Little Island. A number of pharmaceutical and chemical operations are located within the immediate environs of the proposed development site including BASF Ireland, Pfizer Ireland and Cara Partners.

Much of the landscape between the subject site and Cork City, particularly along the northern coastline of the Cork Harbour area, is characterised by industrial, commercial, dockland and port activity.

Non-industrial uses on Little Island include a sports and community facility located approximately 650m east of the subject site, a housing estate comprising approximately 50 dwellings (St Lappan's) circa 850m to the northeast, and a school and hotel over 1km to the northeast (see **Figure 2**).

To the north of the N25 is the North Esk Business Park, a school and extensive housing stretching eastward to Glounthaune. The closest residence (approx. 500m) to the proposed site is located within a cluster of houses immediately south of the North Esk Business Park.

2.4 Seveso Establishments

There are four Seveso establishments at Little Island (that are subject to the provisions of the COMAH Regulations 2006). **Table 1** details the establishments and location, tier (lower/upper), consultation distance and distance to the proposed development.

Establishment	Location	Tier	Consultation Distance	Distance to Site	Notes
BASF Ireland Ltd.	Little Island, Co. Cork	Upper	1000 m	Adjacent	Consultation distance from 2009 Cork Development Plan (2nd Edition, Jan 2012) for Cognis Ireland Ltd.
Pfizer Ireland Pharmaceuticals, Little Island Active Pharmaceutical Plant	Little Island, Co. Cork	Lower	1000 m	250 m	Consultation distance from 2009 Cork Development Plan (2nd Edition, Jan 2012)
Janssen Pharmaceuticals	Little Island, Co. Cork	Lower	1000 m	880 m	Consultation distance advised by HSA
BOC Gases Ireland Ltd.	Little Island Co. Cork	Lower	700 m	1000 m	Consultation distance from 2009 Cork Development Plan (2nd Edition, Jan 2012)

Table 1 Seveso Establishments at Little Island

The proposed development site lies within the consultation distance of BASF Ireland Ltd., Pfizer Ireland Pharmaceuticals and Janssen Pharmaceuticals (see **Figure 3**).

In relation to Janssen Pharmaceuticals, although the proposed development falls within the consultation distance surrounding this site, the establishment is almost 900 m from the proposed development site. It has been excluded from further consideration in the study as it is extremely unlikely that the risk based land use planning zones surrounding the Janssen establishment extend to the proposed development site.

The land use planning and societal risk assessment is based on potential impacts of major accident hazards at the BASF Ireland Ltd. and Pfizer Ireland Pharmaceuticals establishments.

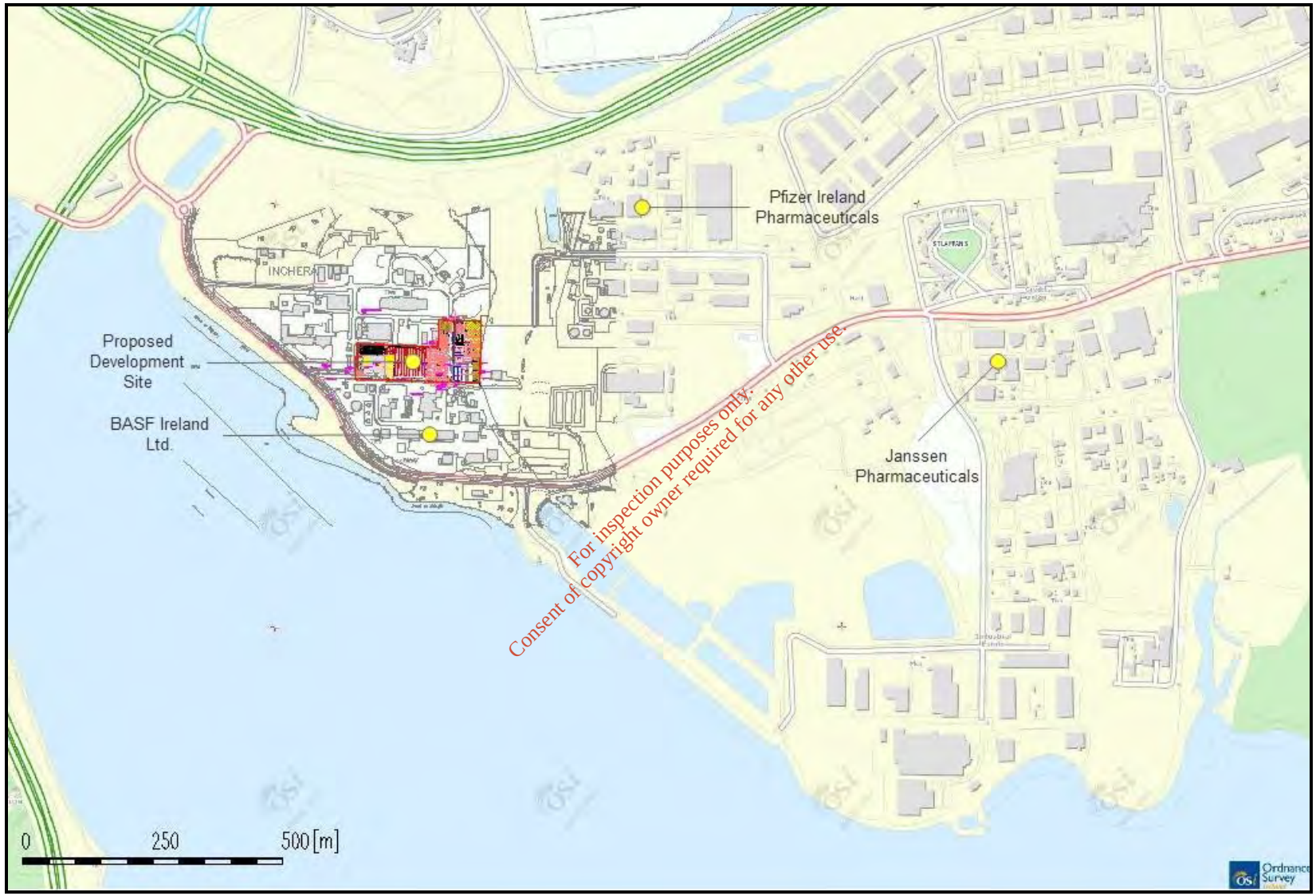


Figure 3 Little Island Seveso Sites

3.0 ASSESSMENT METHODOLOGY AND CRITERIA

3.1 Introduction

Trevor Kletz in his seminal work on the subject stated that the essential elements of quantitative risk assessment (QRA) are:

(i) how often is a Major Accident Hazard (MAH) likely to occur and
(ii) Consequence Analysis – what is the impact of the incident (Kletz, 1999)

Kletz also commented that another way of expressing this method of QRA is:

- How often?
- How big?
- So what?

The "how often?" question is generally answered by using frequency analysis techniques such as Event Tree Analysis (ETA) and Fault Tree Analysis (FTA), as described in the TNO Red Book (CPR 12E) (Committee for Prevention of Disasters, 1997). In the current assessment, conservative frequency data specified by the HSA for land use planning purposes in *Policy and Approach of the Health and Safety Authority to COMAH Risk-based Landuse Planning* (HSA, 2010) are applied to representative worst case major accident scenarios.

The 'how big' element of the QRA was conducted with reference to previous consequence modelling studies carried out by (or on behalf of) BASF Ireland Ltd. and Pfizer Ireland Pharmaceuticals and using TNO Effects Version 9 modelling software.

The "so what" element is perhaps the most contentious issue associated with QRA, as one is essentially asking what is an acceptable level of risk, in this case risk of fatality, posed by a facility. Individual and societal risk is quantified using TNO Riskcurves modelling software. The acceptability of the level of risk of fatality exposed to users of the proposed Renewable Bioenergy Plant is assessed with reference to published acceptability criteria.

The Health and Safety Authority (HSA) in Ireland has not specified tolerability criteria for individual risk of fatality, other than through restrictions to land use planning in the vicinity of notified COMAH establishments (see Section 3.1.2).

In the UK, the following annual individual risk of fatality criteria apply to members of the public (Trbojevic, 2005):

10^{-4}	Intolerable limit for members of the public;
10^{-5}	Risk has to be reduced to the level As Low As Reasonably Practicable (ALARP);
3×10^{-6}	LUP limit of acceptability;
10^{-6}	Broadly acceptable level of risk
10^{-7}	Negligible level of risk

The UK HSE generally uses a three tier framework for risk tolerability:

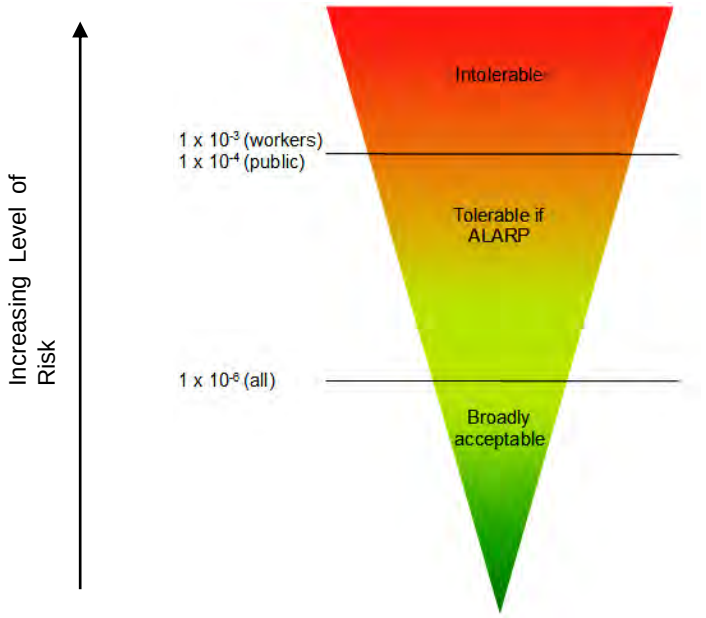


Figure 4 Risk Tolerability Criteria

The recommended upper risk of fatality bound for employees is set at 1 x 10^{-3}/year. The Chemical Industries Association (CIA, 2003) suggests that to allow only for the major hazard aspects of an employee's job, the upper bound should be reduced by a factor of 10 and thus be set at 1 x 10^{-4}/year.

3.2 Land Use Planning and Risk Assessment

The Seveso II Directive (2003/105/EC) requires member states to ensure that account is taken of the long-term need to maintain appropriate distances between establishments and residential areas, buildings and areas of public use, major transport routes as far as possible, recreational areas and areas of particular natural sensitivity or interest.

The HSA is the Competent Authority in Ireland as defined by COMAH Regulations which implement the Seveso II Directive. The HSA is responsible for ensuring that the impacts of facilities which fall within the remit of this legislation are taken into account with respect to land use planning.

A risk-based approach to land use planning near hazardous installations has recently been adopted by the HSA and is set out in the guidance document *Policy and Approach to COMAH Risk-based Land-use Planning* (HSA, 2010). This approach involves delineating three zones for land use planning guidance purposes, based on the potential risk of fatality from major accident scenarios resulting in damaging levels of thermal radiation (e.g. from pool fires), overpressure (e.g. from vapour cloud explosions) and toxic gas concentrations (e.g. from an uncontrolled toxic gas release).

The HSA has defined the boundaries of the Inner, Middle and Outer Land Use Planning (LUP) zones as:

10^{-5}/year Risk of fatality for Inner Zone (Zone 1) boundary
10^{-6}/year Risk of fatality for Middle Zone (Zone 2) boundary
10^{-7}/year Risk of fatality for Outer Zone (Zone 3) boundary

The process for determining the distances to the boundaries of the inner, middle and outer zones for a Seveso establishment is outlined as follows:

- Determine the consequences of major accident scenarios using the modelling methodologies described in the HSA LUP Policy/Approach Document (HSA, 2010);
- Determine the severity (probability of fatality) using the probit functions specified by the HSA;
- Determine the frequency of the accident (probability of event) using data specified by the HSA; and
- Calculate the individual risk of fatality as follows:

Risk = Frequency x Severity

The 2010 HSA Risk-Based LUP Policy/Approach document provides guidance on the type of development appropriate to the inner, middle and outer LUP zones. The advice for each zone is based on the UK Health and Safety Executive (HSE) PADHI (Planning Advice for Developments near Hazardous Installations) methodology. The PADHI methodology sets four levels of sensitivity, with sensitivity increasing from 1 to 4, to describe the development types in the vicinity of a COMAH establishment.

The Sensitivity Levels used in PADHI are based on a rationale which allows progressively more severe restrictions to be imposed as the sensitivity of the proposed development increases. The sensitivity levels are:

Level 1 Based on normal working population;
Level 2 Based on the general public – at home and involved in normal activities;
Level 3 Based on vulnerable members of the public (children, those with mobility difficulties or those unable to recognise physical danger); and
Level 4 Large examples of Level 3 and large outdoor examples of Level 2 and Institutional Accommodation.

Table 2 details the matrix that is used by the HSA to advise on suitable development for technical LUP purposes:

Level of Sensitivity	Inner Zone (Zone 1)	Middle Zone (Zone 2)	Outer Zone (Zone 3)
Level 1	✓	✓	✓
Level 2	×	✓	✓
Level 3	×	×	✓
Level 4	×	×	×

Table 2 LUP Matrix

3.3 Societal Risk Criteria

Vrijling and van Gelder (2004) have defined Societal Risk as:

"the relation between frequency and the number of people suffering from a specified level of harm in a given population from the realisation of specified hazards"

An important distinction in Societal Risk assessment is the number of persons that may be affected by off-site impacts, such as people with restricted mobility or children that may be affected by the need to rapidly evacuate a significant number of people from an area.

It is therefore prudent, when considering the Societal Risk Impacts of a development, to consider the nature and extent of a population which could be located in the vicinity of establishments with major accident hazard potential, or if adjacent lands are not already developed, to consider the nature and extent of a population which should be permitted to be located in this area.

It is recognised that it is not necessary to restrict all access by people to such lands, but it is considered prudent to restrict the number and type of persons which could be impacted.

The HSA LUP Policy and Approach document (HSA, 2010) recommends that for some types of development, particularly those involving large numbers of people, it is likely that the deciding factor from the point of view of land use planning is the societal risk, i.e. the risk of large numbers of people being affected in a single accident.

The HSA specifies the following societal risk criteria:

- Upper societal risk criterion value of 1 in 5000 for 50 fatalities (planning authority should advise against permitting the development)
- Broadly acceptable region of 1 in 100,000 for 10 fatalities (planning authority should not advise against permitting the development)
- Significant risk regions between these two values (planning authority should be advised of HSA approach to Risk-based Land Use Planning)

Expectation Value

The Expectation Value (EV) is also known as Potential Loss of Life (PLL) and is the average number of persons receiving the specified level of harm. It is defined by Hirst (Hirst et al, 2000) as:

$$\boldsymbol{EV} = \sum[\boldsymbol{f}(\boldsymbol{N}) \times \boldsymbol{N}]$$

Where f is the frequency of an event causing N number of fatalities.

$$N = Exposed\ population \times Probability\ of\ fatality$$

The Expectation Value does not include an allowance for aversion to multi-fatality incidents. It gives equal weight to the frequencies and consequences of accidents.

Hirst and Carter (Hirst et al., 2000) shows that:

$$EV = F \times N$$

Where

F Cumulative frequency of all events leading to N fatalities

The HSA have cited the following acceptability criteria for societal risk:

- Upper societal risk criterion value of 1 in 5000 (200 cpm) for 50 fatalities;
- Broadly acceptable societal risk criterion value of 1 of 100,000 (10 cpm) for 10 fatalities;

Significant risk region between 1 in 5000 for 50 fatalities and 1 in 100,000 for 10 fatalities.

The equivalent EV values are as follows:

- Upper societal risk EV criterion value:

  EV = 200 cpm x 50 fatalities = 10,000

- Broadly acceptable societal risk EV criterion value:

  EV = 10 cpm x 10 fatalities = 100

- Significant risk region: EV = 100 – 10,000.

3.4 Consequence Modelling

The impacts of physical effects were determined by modelling accident scenarios using DNV PHAST Version 6.7 and TNO Effects Version 9.0 modelling software.

At Pfizer, BASF and the proposed Renewable Bioenergy Plant, physical consequences from major accident scenarios relate to:

- thermal radiation from fires;
- overpressure effects of vapour cloud explosions (VCEs);
- exposure to toxic or asphyxiating substances.

3.4.1 Flammable Hazards

The flammable hazards, which may be observed during major-accidents, include the following:

Pool Fire:

In the event of a release of flammable/combustible liquid from a tank or pipe work, a pool of liquid may form. Subsequent ignition of the material will result in a pool fire. The principal parameter of interest is the thermal radiation generated from such a fire.

Flash Fire:

Flash fires are associated with major accidents involving releases of flammable liquids or gases, which form a gas/vapour cloud which ignites at some point remote from the release point.

Combustion takes place relatively slowly and there is no significant overpressure. It is generally assumed that the thermal effects are limited to people within the flame envelope where there is a high probability of fatality. Flash fires would have a negligible effect on plant and buildings due to the short duration of the fire and the negligible overpressures created. For modelling purposes it is assumed that ignition can occur down to a concentration of 50% LFL (lower flammable limit).

Vapour Cloud Explosion

A Vapour Cloud Explosion (VCE) may be observed during major accidents. Combustion of a flammable gas-air mixture will occur if the composition of the mixture lies in the flammable range and if an ignition source is available. When ignition occurs in a flammable region of the cloud, the flame will start to propagate away from the ignition source. The combustion products expand causing flow ahead of the flame. Initially this flow will be laminar. Under laminar or near laminar conditions the flame speeds for normal hydrocarbons are in the order of 5 to 30 m/s which is too low to produce any significant blast over-pressure. Under these conditions, the vapour cloud will simply burn, causing a flash fire. In order for a vapour cloud explosion to occur, the vapour cloud must be in a turbulent condition.

Turbulence may arise in a vapour cloud in various ways:

- By the release of the flammable material itself, for instance a jet release from a high pressure vessel.
- By the interaction of the expansion flow ahead of the flame with obstacles present in a congested area.

Table 3 contains a number of factors used by the UK HSE's Major Hazard Assessment Unit which can help in deciding if combustion of a vapour cloud will cause a VCE or flash fire.

Factors suggesting that vapour cloud ignition will result in a flash fire	Factors suggesting that vapour cloud ignition will result in a VCE
Less reactive fuel, e.g. saturated hydrocarbon	More reactive fuel, e.g. unsaturated hydrocarbon
Absence of (semi) confining structures at or near the release point	Presence of (semi) confining structures at or near the release point
Small mass of fuel, i.e. less than 10 te entering the vapour cloud	Large mass of fuel, i.e. > than 10 te, entering the vapour cloud
No energetic release of fuel, e.g. from atmospheric storage	Energetic release of fuel, e.g. from pressurised storage
Absence of strong ignition sources	Presence of strong ignition sources, e.g. bang box ignition

Table 3 Factors for use when deciding whether or not VCE hazards should be assessed

In the case of a vapour cloud explosion the principal parameter of interest is the over-pressure observed at various locations.

3.4.2 Toxic Hazards

A toxic release is defined as the release of a substance to the environment, which is toxic or poisonous to humans and/or the environment. Once toxic material is released, it can be transported by the receiving media over large distances.

3.4.3 Criteria for Toxic Exposure

Toxic Dose

The toxicity expressed by a given substance in the air is influenced by two factors, the concentration in the air (c) and the duration of exposure (t). A functional relationship between c and t can be developed, such that the end product of this relationship is a constant:

$$\mathbf{f(C,t) = constant}$$

This constant is known as the Toxic Load and is calculated as follows:

$$\text{Toxic Load} = C^n.t$$

The UK Health and Safety Executive have set out Specified Level of Toxicity (SLOT) Dangerous Toxic Load (DTL) values. The UK HSE has defined land use planning SLOT as:

- Severe distress to almost everyone in the area;
- Substantial fraction of exposed population requiring medical attention;
- Some people seriously injured, requiring prolonged treatment;
- Highly susceptible people possibly being killed.

These criteria are fairly broad in scope, reflecting the fact that:

- There is likely to be considerable variability in the responses of different individuals affected by a major accident;
- There may be pockets of high and low concentrations of a toxic substance in the toxic cloud release, so that not everyone will get exactly the same degree of exposure; and
- The available toxicity data are not usually adequate for predicting precise dose-response effects.

The SLOT DTL value approximately equates to the toxic load which would give rise to 1% fatality. The UK HSE has also assigned Significant Likelihood of Death (SLOD) Dangerous Toxic Load (DTL) values to toxic substances. The SLOD DTL value equates to the toxic load which would give rise to a likely fatality of 50%.

The HSA's LUP Policy and Approach Document (HSA, 2010) sets out criteria for assessing the effects of a toxic gas release on persons outdoors, persons indoors and with respect to property damage.

Toxic Effects to Persons Outdoors (HSA, 2010)

For persons outdoors, the risk of fatality due to exposure to a toxic substance is calculated using probit equations in the form of:

$$\text{Probit} = a + b \ln C^n.t$$

where a, b and n are constants and ($C^n.t$) represents the toxic load.

For assessment of exposure to toxic substances, the HSA recommends that probits be selected from the most well established sources:

- TNO (Dutch technical research organisation);
- AIChE (American Institute of Chemical Engineers); or
- UK HSE (UK Health and Safety Executive).

Toxic Effects to Persons Indoors (HSA, 2010)

The risk to persons indoors from exposure to a toxic vapour cloud depends on the effective ventilation rate of the building, which may depend on the wind speed. Air change rates of 2.5 and 2 changes per hour are typically assumed for D5 and F2 weather conditions. The impact of a toxic release on an indoor population can be assessed using the same probit equations but it is necessary to modify the effective concentration and duration of exposure to take account of infiltration into the building.

Property Damage (HSA, 2010)

The major concern generally relates to whether any toxic liquid spill (or firewater) could escape and pollute water courses and the environment.

3.4.4 Thermal Radiation Criteria

Fire scenarios have the potential to create hazardous heat fluxes. Therefore, thermal radiation on exposed skin poses a risk of fatality.

Potential consequences of damaging radiant heat flux and direct flame impingement are categorised in **Table 4** (HSA, 2010, CCPS, 2000, EI, 2007 and McGrattan et al, 2000).

Thermal Flux (kW/m^2)	Consequences
1 – 1.5	Sunburn
5 – 6	Personnel injured (burns) if they are wearing normal clothing and do not escape quickly
8 – 12	Fire escalation if long exposure and no protection
32 – 37.5	Fire escalation if no protection (consider flame impingement)
31.5	US DHUD, limit value to which buildings can be exposed
37.5	Process equipment can be impacted, AIChE/CCPS
Up to 350	In flame. Steel structures can fail within several minutes if unprotected or not cooled.

Table 4 Heat Flux Consequences

In relation to persons indoors, the HSA have specified the thermal radiation consequence criteria (from an outdoor fire) detailed in **Table 5** (HSA, 2010).

Thermal Flux (kW/m^2)	Consequences
> 25.6	Building conservatively assumed to catch fire quickly and so 100% fatality probability
12.7 – 25.6	People are assumed to escape outdoors, and so have a risk of fatality corresponding to that outdoors
< 12.7	People are assumed to be protected, so 0% fatality probability

Table 5 Heat Flux Indoors

Thermal Dose Unit (TDU) is used to measure exposure to thermal radiation. It is a function of intensity (power per unit area) and exposure time:

$$\text{Thermal Dose} = I^{1.33}\, t$$

where the Thermal Dose Units (TDUs) are $(kW/m^2)^{4/3}.s$, I is thermal radiation intensity (kW/m^2) and t is exposure duration (s).

The HSA recommends that the Eisenberg probit function (HSA, 2010) is used to determine probability of fatality to persons outdoors from thermal radiation as follows:

$$\text{Probit} = -14.9 + 2.56 \ln (I^{1.33}\, t)$$

I Thermal radiation intensity (kW/m^2)
t exposure duration (s)

Probit (Probability Unit) functions are used to convert the probability of an event occurring to percentage certainty that an event will occur. The probit variable is related to probability as follows (CCPS, 2000):

$$P = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{Y-5} \exp\left(-\frac{u^2}{2}\right) du$$

where P is the probability of percentage, Y is the probit variable, and u is an integration variable. The probit variable is normally distributed and has a mean value of 5 and a standard deviation of 1.

The Probit to percentage conversion equation is (CCPS, 2000):

$$P = 50\left[1 + \frac{Y-5}{|Y-5|} erf\left(\frac{|Y-5|}{\sqrt{2}}\right)\right] \qquad ($$

The relationship between Probit and percentage certainty is presented in **Table 6** (CCPS, 2000).

%	0	1	2	3	4	5	6	7	8	9
0	—	2.67	2.95	3.12	3.25	3.36	3.45	3.52	3.59	3.66
10	3.72	3.77	3.82	3.87	3.92	3.96	4.01	4.05	4.08	4.12
20	4.16	4.19	4.23	4.26	4.29	4.33	4.36	4.39	4.42	4.45
30	4.48	4.50	4.53	4.56	4.59	4.61	4.64	4.67	4.69	4.72
40	4.75	4.77	4.80	4.82	4.85	4.87	4.90	4.92	4.95	4.97
50	5.00	5.03	5.05	5.08	5.10	5.13	5.15	5.18	5.20	5.23
60	5.25	5.28	5.31	5.33	5.36	5.39	5.41	5.44	5.47	5.50
70	5.52	5.55	5.58	5.61	5.64	5.67	5.71	5.74	5.77	5.81
80	5.84	5.88	5.92	5.95	5.99	6.04	6.08	6.13	6.18	6.23
90	6.28	6.34	6.41	6.48	6.55	6.64	6.75	6.88	7.05	7.33
%	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
99	7.33	7.37	7.41	7.46	7.51	7.58	7.65	7.75	7.88	8.09

Table 6 Conversion from Probits to Percentage

For long duration fires, such as pool fires, it is generally reasonable to assume an effective exposure duration of 75 seconds to take account of the time required to escape. With respect to exposure to thermal radiation outdoors, the Eisenberg probit relationship implies:

- 1% fatality – 966 TDUs (6.8 kW/m^2 for 75 s exposure duration) (Dangerous Dose)
- 10% fatality – 1452 TDUs (9.23 kW/m^2 for 75 s exposure duration)
- 50% fatality – 2387 TDUs (13.4 kW/m^2 for 75 s exposure duration)

3.4.5 Overpressure Criteria

Explosions scenarios can result in damaging overpressures, especially when flammable vapour/air mixtures are ignited in a congested area. **Table 7** describes blast damage for various overpressure levels (Mannan, 2012).

Side-on Overpressure (mbar)	Description of Damage
1.5	Annoying noise
2	Occasional breaking of large window panes already under strain
3	Loud noise; sonic boom glass failure
7	Breakage of small windows under strain
10	Threshold for glass breakage
20	"Safe distance", probability of 0.95 of no serious damage beyond this value; some damage to house ceilings; 10% window glass broken
30	Limited minor structural damage
35 – 70	Large and small windows usually shattered; occasional damage to window frames
>35	Damage level for "Light Damage"
50	Minor damage to house structures
80	Partial demolition of houses, made uninhabitable
70 - 150	Corrugated asbestos shattered. Corrugated steel or aluminium panels fastenings fail, followed by buckling; wood panel (standard housing) fastenings fail; panels blown in
100	Steel frame of clad building slightly distorted
150	Partial collapse of walls and roofs of houses
150-200	Concrete or cinderblock walls, not reinforced, shattered
>170	Damage level for "Moderate Damage"
180	Lower limit of serious structural damage 50% destruction of brickwork of houses
200	Heavy machines in industrial buildings suffered little damage; steel frame building distorted and pulled away from foundations
200 – 280	Frameless, self-framing steel panel building demolished; rupture of oil storage tanks
300	Cladding of light industrial buildings ruptured
350	Wooden utility poles snapped; tall hydraulic press in building slightly damaged
350 – 500	Nearly complete destruction of houses
>350	Damage level for "Severe Damage"
500	Loaded tank car overturned
500 – 550	Unreinforced brick panels, 25 - 35 cm thick, fail by shearing or flexure
600	Loaded train boxcars completely demolished
700	Probable total destruction of buildings; heavy machine tools moved and badly damaged

Table 7 Blast Damage

There are a number of modes of explosion injury including eardrum rupture, lung haemorrhage, whole body displacement injury, missile injury, burns and toxic exposure. **Table 8** describes injury criteria from blast overpressure including probability of eardrum rupture and probability of fatality due to lung haemorrhage.

Probability of Eardrum Rupture (%)	Peak overpressure (mbar)
1 (threshold)	165
10	194
50	435
90	840
Probability of Fatality due to Lung Haemorrhage (%)	**Peak overpressure (mbar)**
1 (threshold)	1000
10	1200
50	1400
90	1750

Table 8 Injury Criteria from Explosion Overpressure

The HSA recommends that the Hurst, Nussey and Pape probit function (HSA, 2010) is used to determine probability of fatality to persons outdoors from overpressure as follows:

$$Probit = 1.47 + 1.35 \ln P$$

P Blast overpressure (psi)

The Hurst, Nussey and Pape probit relationship implies:

- 1% fatality – 168 mbar (Dangerous Dose)
- 10% fatality – 365 mbar
- 50% fatality – 942 mbar

The HSA uses relationships published by the Chemical Industries Association (CIA) to determine the probability of fatality for building occupants exposed to blast overpressure. The CIA has developed relationships for 4 categories of buildings (CIA, 2010):

- category 1: hardened structure building (special construction, now windows);
- category 2: typical office block (four storey, concrete frame and roof, brick block wall panels);
- category 3: typical domestic dwelling (two storey, brick walls, timber floors); and
- category 4: 'portacabin' type timber construction, single storey.

The CIA relationships imply the overpressure levels corresponding to probabilities of fatality of 1%, 10% and 50% detailed in **Table 9.**

Probability of fatality	Overpressure Level, mbar			
	Category 1	Category 2	Category 3	Category 4
1% fatality (dangerous dose)	435	100	50	50
10% fatality	519	183	139	115
50% fatality	590	284	300	242

Table 9 Blast Overpressure Consequences Indoors

For the purposes of this assessment, it is assumed that the vulnerability of building occupants at the proposed Renewable Bioenergy development to side-on overpressure are represented by Category 2 type structures.

3.5 Modelling Parameters

3.5.1 Weather Conditions

Weather conditions at the time of a major-accident have a significant impact on the consequences of the event. Typically, high wind speeds slightly increase the impact of fires, particularly pool fires.

Atmospheric Stability Class and Wind Speed

In order to adequately assess the consequences of a major-accident, weather conditions must be selected that represent the weather experienced at the site. The standard atmospheric stability classes are listed in **Table 10.**

A-G Stability	Conditions	Typically observed during
A	Very unstable – Sunny with light winds	Day-time
B	Unstable – Less sunny or more windy than A	Day-time
C	Moderately unstable – Very windy/sunny or overcast/light wind	Day-time
D	Neutral – little sun and high wind or overcast/windy night	Day or Night-time
E	Moderately stable – Less overcast and less windy than D	Night-time
F	Stable – Night with moderate clouds and light/moderate winds	Night-time
G	Very Stable – Possibly Fog	Night-time

Table 10 Atmospheric Stability Classes

The following Pasquill stability/wind speed pairs are used for consequence modelling:

- average weather conditions are represented by stability category D and a wind speed of 5 m/s, i.e. Category D5;
- worst case conditions for toxic dispersion are represented by stability category F and a wind speed of 2 m/s, i.e. Category F2;
- a wind speed of 10 m/s represents the worst case condition for fire scenarios, with stability category D, i.e. Category D10.

Wind Direction

Figure 5 illustrates a wind rose based on hourly wind speed and direction data for Cork Airport (2004 – 2014). It can be seen that the prevailing wind direction is from the south west.

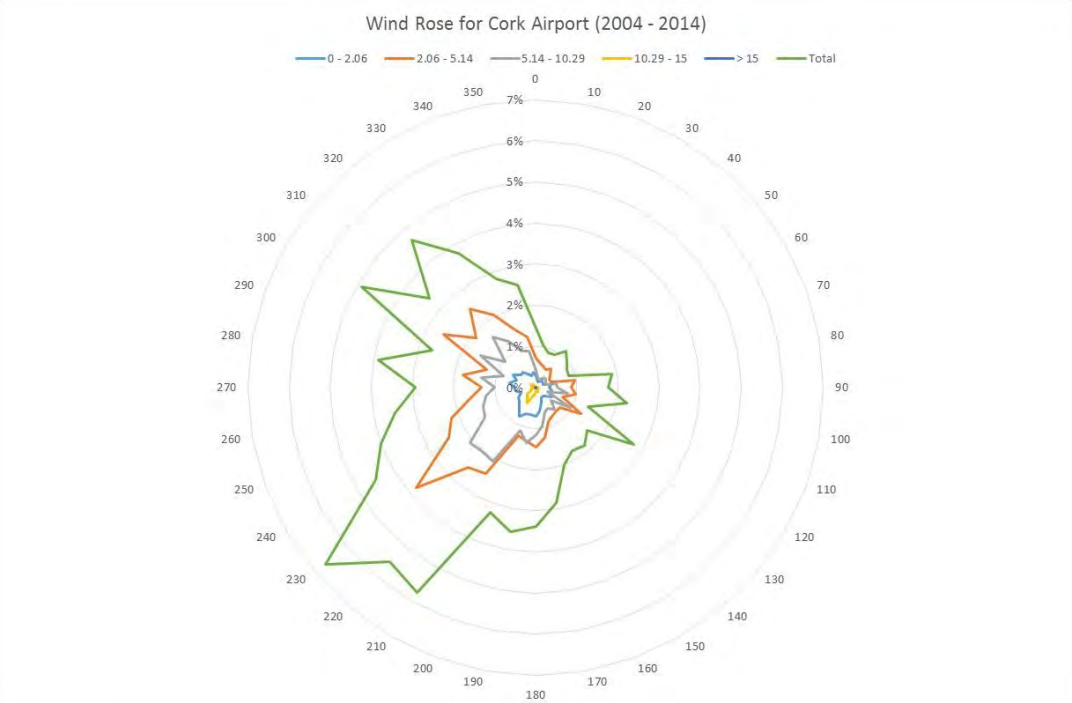


Figure 5 Wind Rose Cork Airport 2004 - 2014

Ambient Temperature

The ambient and surface temperature conditions significantly impact the results of the consequence modelling. Typically, atmospheric temperatures in the Cork area range from -4°C to 28°C through the year.

According to the weather data recorded between 1981 and 2010 at Cork Airport, the average atmospheric temperature observed is 9.9°C. Therefore, an ambient temperature of 10°C has been selected to represent typical temperature conditions at the site.

Ambient Humidity

Weather data for Cork Airport, monthly and annual mean and extreme values datasheet supplied by Met Éireann, indicates a mean morning (09:00 UTC) relative humidity of 87% and a mean afternoon (15:00 UTC) humidity of 77%. Therefore, for this assessment, a representative ambient humidity of 82% has been assumed.

3.5.2 Surface Roughness

Surface roughness describes the roughness of the surface over which the cloud is dispersing. Typical values for the surface roughness are as follows (DNV, PHAST Version 6.7):

Roughness length	Description
0.0002 m	Open water, at least 5 km
0.005 m	Mud flats, snow, no vegetation
0.03 m	Open flat terrain, grass, few isolated objects
0.1 m	Low crops, occasional large obstacles, x/h > 20
0.25 m	High crops, scattered large objects, 15 < x/h < 20
0.5 m	Parkland, bushes, numerous obstacles, x/h < 15
1.0 m	Regular large obstacles coverage (suburb, forest)
	City centre

Table 11 Surface Roughness

The proposed development is located in an area that is mainly industrial. A surface roughness length of 1.0 m has been selected for this study.

3.6 Individual Risk Assessment Methodology

TNO Riskcurves modelling software is used in this assessment to calculate individual risk of fatality contours and risk based land use planning zones associated with major accident scenarios.

3.7 Societal Risk Assessment Methodology

HSA LUP Guidance describes various societal risk indices, however full consideration of the FN curve is recommended as a more robust approach. TNO Riskcurves modelling software is used in this assessment to calculate FN curves for the proposed development and for determining the Expectation Value.

4.0 LAND USE PLANNING ASSESSMENT OF MAJOR ACCIDENT HAZARDS

4.1 BASF Ireland Ltd.

Information on major accident hazards at BASF Ireland Ltd. was provided to AWN Consulting by the operator. The following major accident hazards at BASF Ireland Ltd. are assessed herein:

- Tank farm:
  - Solvent spill and pool fire in bund;
  - Solvent tank rupture due to confined vapour cloud explosion in tank;
- Process building:
  - Reactor burst due to inadvertent chemical charge to reactor and violent decomposition reaction, with overpressure consequences;
  - Release of flammable solvent from high pressure reactor and vapour cloud explosion.

4.1.1 Pool Fire in Tank Farm Bund

In the event of a spill of solvent from a tank at the tank farm, a pool of flammable material will form within the bund. Should this material ignite, a pool fire would result with thermal radiation consequences. The pool fire model in TNO Effects modelling software was used to model the consequences of a pool fire involving 44 tonnes of solvent in a bund area of 50 sqm.

Consequences

Results are summarised as follows:

Thermal radiation level, kW/m²	Consequences	Distance (m)		
		2 m/s	5 m/s	10 m/s
4.1	Threshold of fatality	22	21	20
6.8	1% mortality outdoors	18	18	18
12.6	Persons indoors protected	13	15	15
37.5	Equipment damage	7	8	10

Table 12 BASF - Pool Fire in Bund: Thermal Radiation Results

The BASF solvent tank is approximately 50m from the boundary of the proposed development site. The thermal radiation level (for the worst case wind speed scenario) at 50m from the bunded pool fire is less than 0.5 kW/m^2. No building damage, equipment damage or injury to personnel (indoors or outdoors) at the proposed development site is expected to result from this scenario.

Frequency

The HSA specifies a likelihood of 1E-03 per year when assessing bunded pool fire scenarios for land use planning purposes.

4.1.2 Confined Vapour Cloud Explosion at Tank Farm

There is the potential for a flammable vapour-air mixture to form within the vapour space of the solvent tanks at the tank farm at BASF. Should this flammable mixture

meet an ignition source within the tank (for example, due to electrostatic discharge that builds up during a tanker loading operation), then there is the potential for a confined vapour cloud explosion to occur within the vessel. **Table 13** details the distances to overpressure levels associated with specified levels of damage and mortality to persons outdoors and indoors arising from this scenario.

Peak overpressure (mbar)	Consequences	Distance (m)
20	Safe distance - probability of 0.95 of no serious damage beyond this value; some damage to house ceilings; 10% window glass broken	136
35	Light damage	89
170	Moderate damage	29
350	Severe damage	18
168	1% mortality outdoors	29
365	10% mortality outdoors	18
942	50% mortality outdoors	10
100	1% mortality indoors in buildings on site at proposed development	42
183	10% mortality in buildings on site at proposed development	27
284	50% mortality in buildings on site at proposed development	21

Table 13 BASF – Confined VCE in Solvent Tank at Tank Farm: Overpressure Results

The BASF solvent tank is approximately 50m from the proposed development site boundary. The overpressure level at 50m from the solvent tank (confined VCE scenario) is 77 mbar. This is sufficient to cause light structural damage however the probability of fatality of building occupants in the Main Building is less than 1%. (Note that as outlined in Section 3.4.5 the overpressure level corresponding to 1% mortality indoors in Category 2 type structures is 100 mbar). .

Frequency

The HSA specifies a likelihood of 1E-04 per year when assessing confined vapour cloud explosion scenarios in bulk storage tanks, for land use planning purposes.

4.1.3 Reactor Burst in Process Building

One of the processes at BASF has a violent decomposition (detonation) reaction hazard if the incorrect chemical is inadvertently charged to the reactor. This would result in the reactor bursting with overpressure consequences. **Table 14** details the distances to overpressure levels associated with specified levels of damage and mortality to persons outdoors and indoors arising from this scenario.

Peak overpressure (mbar)	Consequences	Distance (m)
20	Safe distance - probability of 0.95 of no serious damage beyond this value; some damage to house ceilings; 10% window glass broken	410
35	Light damage	268
170	Moderate damage	86
350	Severe damage	54
168	1% mortality outdoors	87
365	10% mortality outdoors	53
942	50% mortality outdoors	31
100	1% mortality in buildings on site at proposed development	125
183	10% mortality in buildings on site at proposed development	82
284	50% mortality in buildings on site at proposed development	62

Table 14 BASF – Reactor Burst in Process Building: Overpressure Results

The process building is approximately 40m from the proposed development site. The overpressure level at the proposed Main Building (approx. 45m from the hazard) is 480 mbar and the overpressure level at the proposed Administration Building (approx. 65m from the hazard) is 265 mbar. Should this scenario occur, there is a likelihood of significant impacts at the proposed plant in terms of building damage and injury/fatality of occupants in the Main Building and the Administration Building.

Frequency

The HSA specifies a likelihood of 1E-04 per year when assessing reactor burst scenarios with overpressure consequences, for land use planning purposes.

4.1.4 Release of Solvent from High Pressure Reactor and VCE in Process Building

BASF have identified a vapour cloud explosion as a major accident scenario following ignition of a release of flammable solvent from a high pressure reactor in their process building. This VCE scenario would result in overpressure consequences. **Table 14** details the distances to overpressure levels associated with specified levels of damage and mortality to persons outdoors and indoors arising from this scenario.

Peak overpressure (mbar)	Consequences	Distance (m)
20	Safe distance - probability of 0.95 of no serious damage beyond this value; some damage to house ceilings; 10% window glass broken	170
35	Light damage	112
170	Moderate damage	36
350	Severe damage	23
168	1% mortality outdoors	36
365	10% mortality outdoors	22
942	50% mortality outdoors	13
100	1% mortality in buildings on site at proposed development	52
183	10% mortality in buildings on site at proposed development	34
284	50% mortality in buildings on site at proposed development	26

Table 15 BASF – Solvent Release from Reactor and VCE in Process Building: Overpressure Results

The BASF process building is approximately 40m from the proposed development site's boundary. The overpressure level at 40m from the solvent tank (confined VCE scenario) is 145mbar which equates to light – moderate damage. However the probability of fatality of building occupants in the proposed Main Building and in the Administration Building is less than 1%.

Frequency

The HSA specifies a likelihood of 1E-04 per year when assessing the overpressure consequences of a vapour cloud explosion scenario following a release from process, for land use planning purposes.

4.1.5 Risk Based Land Use Planning Zones for BASF

Riskcurves modelling software was used to model the individual risk of fatality contours arising from the major accident scenarios assessed in Section 4.1.1 – 4.1.4. The consequence results and frequencies of major accident hazards were input to the software. **Figure 6** illustrates individual risk of fatality land use planning contours for the BASF establishment.

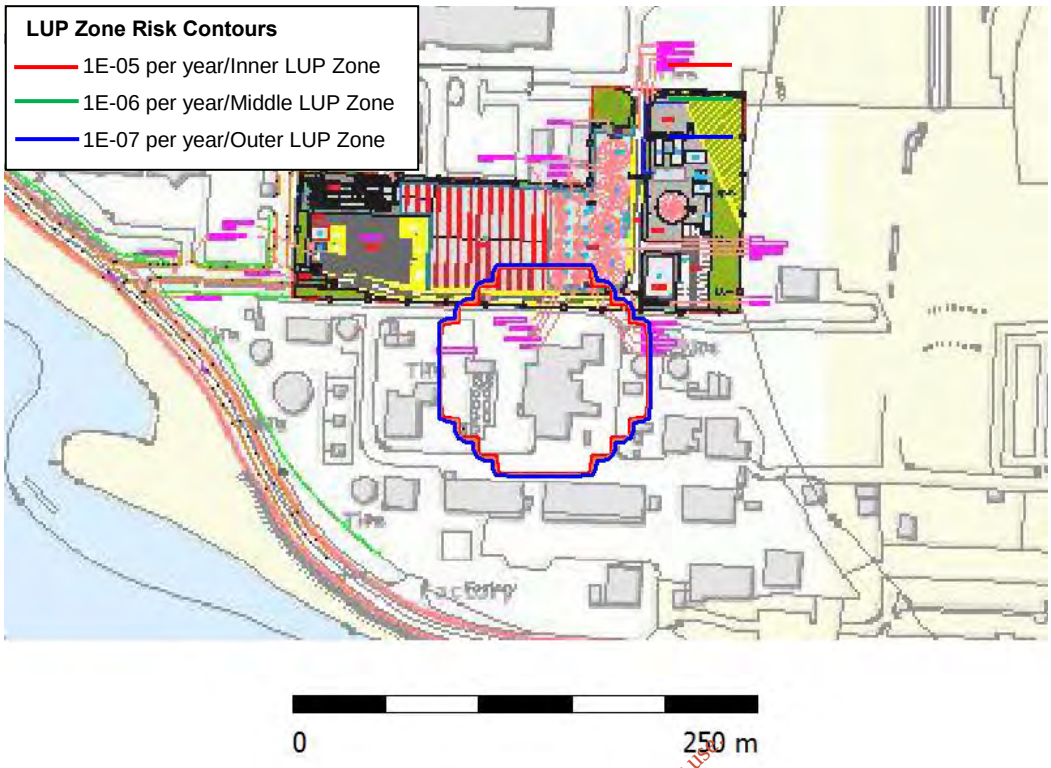


Figure 6 BASF Land Use Planning Contours

It is concluded that part of the proposed development falls within the inner risk based land use planning contour for the BASF establishment. The proposed Renewable Bioenergy Plant is a workplace with less than 100 occupants. With reference to HSA guidance (HSA, 2010) it is classified as Sensitivity Level 1, which is acceptable in the Inner LUP Zone.

4.2 Pfizer Ireland Pharmaceuticals

Information on major accident hazards at Pfizer Ireland Pharmaceuticals was provided to AWN Consulting by the operator. The following major accident hazards at Pfizer Ireland Pharmaceuticals are assessed herein:

- Tank farm:
  - Solvent spill and pool fire in bund; and
  - Toxic release from storage.
- Process building:
  - Toxic release from process;
  - Runaway exothermic reaction, reactor burst, release of hydrogen and confined VCE; and
  - Hydrogen leak from reactor and VCE.

4.2.1 Pool Fire in Tank Farm Bund

In the event of a spill of solvent from a tank at the tank farm, a pool of flammable material will form within the bund. Should this material ignite, a pool fire would result with thermal radiation consequences. The pool fire model in TNO Effects modelling software was used to model the consequences of a bunded pool fire.

Consequences

Results are summarised as follows:

Thermal radiation level, kW/m²	Consequences	Distance (m)		
		2 m/s	5 m/s	10 m/s
4.1	Threshold of fatality	45	43	43
6.8	1% mortality outdoors	37	37	34
12.6	Persons indoors protected	28	30	25
37.5	Equipment damage	14	17	13

Table 16 Pfizer - Pool Fire in Bund: Thermal Radiation Results

The tank farm at Pfizer is approximately 350m from the proposed development site. The thermal radiation level at 350m from the bunded pool fire is negligible. No building damage, equipment damage or injury to personnel (indoors or outdoors) at the proposed Renewable Bioenergy Plant development site is expected to result from this scenario.

Frequency

The HSA specifies a likelihood of 1E-03 per year when assessing bunded pool fire scenarios for land use planning purposes.

4.2.2 Toxic Release from Storage

The worst case scenario involving the release of toxic material from storage was identified with reference to hazard identification studies provided by Pfizer. TNO Effects was used to model the release and dispersion of toxic vapour for this scenario.

Consequences

Table 17 details the distances to the SLOT DTL outdoors, and the distance to the toxic dose outdoors corresponding to 1% probability of fatality.

Toxic Dose	Distance (m)	
	Category F2	Category D5
SLOT DTL	90	64
1% Fatality – TNO Probit	70	40

Table 17 Pfizer – Toxic Release from Storage: Dispersion Results

The tank farm at Pfizer is approximately 350m from the proposed development site. The toxic dose at 350m from the release point is significantly less than that corresponding to SLOT DTL effects or 1% probability of fatality. No harmful effects to personnel at the proposed development site are expected to result from this scenario.

Frequency

The HSA specifies a likelihood of 1E-04 per year per vessel when assessing major toxic releases from storage for land use planning purposes.

4.2.3 Toxic Release from Process

The worst case scenario involving the release of toxic material from the process was identified with reference to hazard identification studies provided by Pfizer. TNO Effects was used to model the release and dispersion of toxic vapour for this scenario.

Consequences

Table 18 details the distances to the SLOT DTL outdoors, and the distance to the toxic dose outdoors corresponding to 1% probability of fatality.

Toxic Dose	Distance (m)	
	Category F2	Category D5
SLOT DTL	68	Not reached
1% Fatality – TNO Probit	TBC	Not reached

Table 18 Pfizer – Toxic Release from Process: Dispersion Results

The process building at Pfizer is approximately 300m from the proposed development site. The toxic dose at 300m from the release point is significantly less than that corresponding to SLOT DTL effects or 1% probability of fatality. No harmful effects to personnel at the proposed development site are expected to result from this scenario.

Frequency

The HSA specifies a likelihood of 1E-04 per year when assessing major toxic releases from process for land use planning purposes.

4.2.4 Hydrogenator Failure and Confined Vapour Cloud Explosion

In the event of rupture of the hydrogenator, overpressure consequences will arise as a result of the released energy. A confined vapour cloud explosion hazard also exists following ignition the released hydrogen, also with overpressure consequences. **Table 19** and **Table 20** details the distances to overpressure levels associated with specified levels of damage and mortality to persons outdoors and indoors arising from the rupture and VCE scenarios.

Peak overpressure (mbar)	Consequences	Distance (m)
20	Safe distance - probability of 0.95 of no serious damage beyond this value; some damage to house ceilings; 10% window glass broken	68
35	Light damage	45
170	Moderate damage	14
350	Severe damage	9
168	1% mortality outdoors	14
365	10% mortality outdoors	9
942	50% mortality outdoors	5
100	1% mortality in buildings on site at proposed development	21
183	10% mortality in buildings on site at proposed development	14
284	50% mortality in buildings on site at proposed development	10

Table 19 Pfizer – Hydrogenator Rupture in Process Building: Overpressure Results

Peak overpressure (mbar)	Consequences	Distance (m)
20	Safe distance - probability of 0.95 of no serious damage beyond this value; some damage to house ceilings; 10% window glass broken	235
35	Light damage	142
170	Moderate damage	39
350	Severe damage	24
168	1% mortality outdoors	39
365	10% mortality outdoors	24
942	50% mortality outdoors	10
100	1% mortality in buildings on site at proposed development	59
183	10% mortality in buildings on site at proposed development	37
284	50% mortality in buildings on site at proposed development	28

Table 20 Pfizer – Confined VCE in Process Building following Reactor Burst: Overpressure Results

The process building at Pfizer is approximately 300m from the proposed development site. The overpressure level at 300 m the release point is significantly less than 20 mbar which corresponds to a safe distance. No property damage, injury or harmful effects to personnel at the proposed development site are expected to result from this scenario.

Frequency

The HSA specifies a likelihood of 1E-04 per year when assessing pressure vessel failure or an associated VCE in a confined or semi-confined area due to the release of flammable material, for land use planning purposes.

4.2.5 Hydrogenator Leak from Reactor and Confined Vapour Cloud Explosion

A confined vapour cloud explosion in the production building following a leak of hydrogen from the hydrogenator has the same consequences as a confined VCE following the release of hydrogen to the reactor burst scenario.

The overpressure consequences of a confined VCE following a hydrogen leak from the hydrogenator are detailed in Section 4.2.4.

4.2.6 Risk Based Land Use Planning Zones for Pfizer

Riskcurves modelling software was used to model the individual risk of fatality contours arising from the major accident scenarios assessed in Section 4.1.1 – 4.1.4. The consequence results and frequencies of major accident hazards were input to the software. **Figure 7** illustrates individual risk of fatality land use planning contours for the Pfizer establishment.

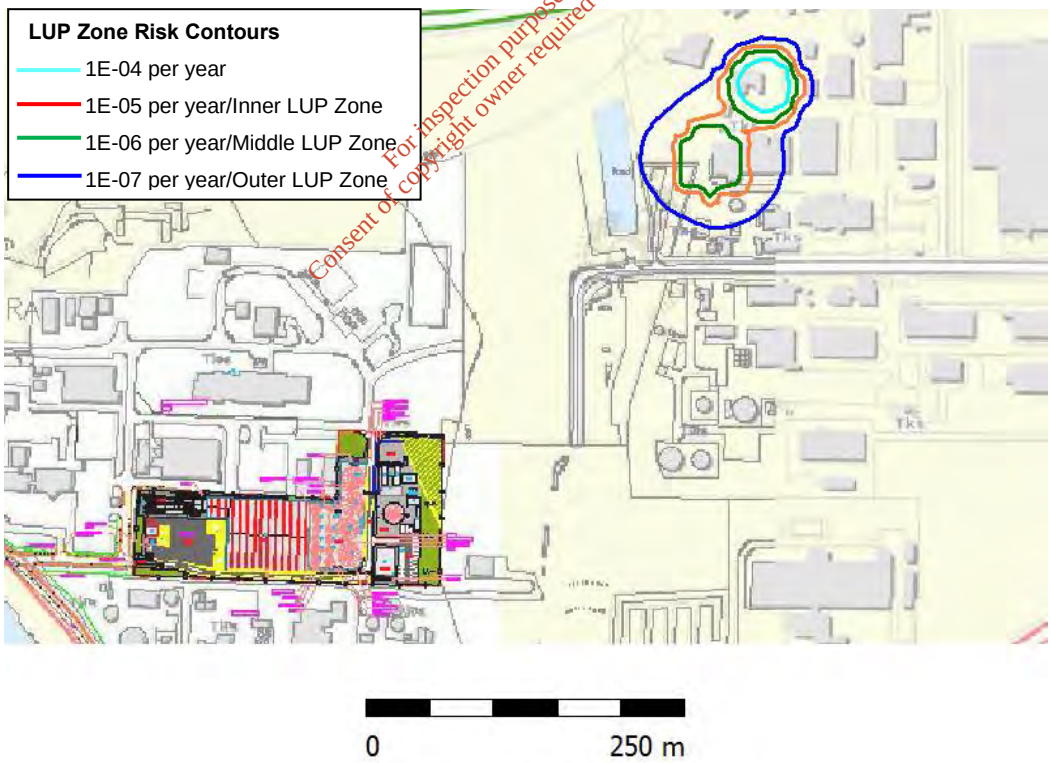


Figure 7 Pfizer Land Use Planning Contours

It is concluded that the proposed development falls outside of the outer risk based land use planning contour for the Pfizer establishment. The proposed Renewable Bioenergy Plant is a workplace with less than 100 occupants. With reference to HSA guidance (HSA, 2010) it is classified as Sensitivity Level 1, which is acceptable outside of the Outer LUP Zone.

5.0 ASSESSMENT OF PROPOSED STREAM BIOENERGY DEVELOPMENT

This section contains an assessment of the impacts of potential accident scenarios at the proposed Renewable Bioenergy Plant on site and at nearby Seveso Establishments. It has been undertaken using HSA guidance (HSA, 2010).

The main hazard associated with the proposed development is the storage and handling of biogas, a mixture comprising circa 60% methane and 40% carbon dioxide.

The following installations have been identified as potential locations where a fire or explosion scenario might occur:

- Biogas holder: accidental release of biogas and flash fire or vapour cloud explosion;
- Flare stack: Failure of flare ignition
- Digester tanks: accidental release of biogas and flash fire or vapour cloud explosion

5.1 Biogas Holder

The biogas holder is a 1,800 m^3 capacity double membrane storage vessel which will be used to store biogas at a pressure of 25 mbar. This vessel maintains system pressure and acts as a buffer for biogas production and use.

Hazards associated with the presence of flammable biogas in the biogas holder are as follows:

- Storage: There is no vapour cloud explosion hazard associated with storage of biogas as the biogas is stored under pressure and no oxygen present (a flammable biogas-air mixture cannot form).

- Leak: The vapour cloud explosion hazard associated with a leak from the biogas holder (for example, leak from pressure relief valve) was investigated and found to be negligible.

- Major release/ catastrophic rupture: In the event of a major release or catastrophic rupture of the biogas holder, there is the potential for a flammable biogas-air mixture to form outdoors. Should this flammable mixture meet an ignition source (for example, the boiler), then there is the potential for an unconfined vapour cloud explosion to occur outdoors.

The TNO Multi-Energy model in Effects software was used to model the overpressure consequences of a vapour cloud explosion. It is assumed that should the flammable mass ignite and a vapour cloud explosion occur, the explosion strength is represented by Curve 5 of the TNO Multi Energy Model (medium deflagration). This is justified as methane has a relatively narrow explosion range (4.4 – 16.5%) and the release is outdoors in a relatively unconfined area.

Table 21 details the distances to overpressure levels associated with specified levels of damage and mortality to persons outdoors and indoors arising from this scenario.

Peak overpressure (mbar)	Consequences	Category D5 Distance (m)	Category F2 Distance (m)
20	Safe distance - probability of 0.95 of no serious damage beyond this value; some damage to house ceilings; 10% window glass broken	165	169
35	Light damage	93	96
170	Moderate damage	19	20
350	Severe damage	Not reached	Not reached
168	1% mortality outdoors	19	20
365	10% mortality outdoors	Not reached	Not reached
942	50% mortality outdoors	Not reached	Not reached
100	1% mortality in buildings at proposed development	33	34
183	10% mortality in buildings at proposed development	17	18
284	50% mortality in buildings at proposed development	Not reached	Not reached

Table 21 Biogas Holder Major Release or Rupture and VCE Overpressure Results

Impacts on Site

The overpressure levels resulting from a vapour cloud explosion following rupture of the biogas holder are sufficient to cause light to moderate damage to the Administration Building and minor damage at the Main Building. The probability of fatality indoors is not expected to exceed approximately 1%.

Domino Effects at Nearby Seveso Establishments

The biogas holder is approximately 90 m from the process building at BASF and approximately 130 m from the tank farm. Depending on the ignition source, e.g. from a vehicle at the car park, the boiler or the flare, the distance from the cloud centre to the process building would vary from approx. 65 m to 125 m and the distance from the cloud centre to the tank farm would vary from approx.120 m to 165 m.

At the process building, the worst case scenario that would be expected is light damage to the building structure. It is not expected that a vapour cloud explosion following rupture of the biogas holder would trigger any domino major accident scenarios at the BASF process building.

The worst case overpressure level expected to result at the tank farm is approx. 25 mbar. This is not expected to cause sufficient damage to trigger any domino effects at the tank farm.

The biogas holder is over 350 m from the process building at Pfizer and over 400 m from the tank farm area. A vapour cloud explosion following catastrophic rupture of the biogas holder is not expected to cause any damage or domino effects at the Pfizer establishment.

Frequency

The median failure rate applied by the UK HSE (UK HSE 2012) for catastrophic rupture of spherical vessels is 4E-06 per year. Assuming an ignition probability of 50% (based on TNO Purple Book ignition data and to take account of various possible ignition sources on site including the boiler, vehicles and the flare), the likelihood of a vapour cloud explosion following rupture of the biogas holder is 2E-06 per year.

The likelihood of a major release from a spherical vessel is given as 5E-6 by the UK HSE. Assuming an ignition probability of 50%, the likelihood of a vapour cloud explosion following a major release from the biogas holder is 2.5E-06 per year.

5.2 Flare

The flare is used to combust excess biogas when combustion by the CHP or storage in the gas holder is unavailable. If the flare failed to ignite while gas is flowing, a release to atmosphere may result. If the resulting gas cloud was subsequently ignited elsewhere on site, there is the potential for a vapour cloud explosion to result.

Table 22 details the distances to overpressure levels associated with specified levels of damage and mortality to persons outdoors and indoors arising from this scenario.

Peak overpressure (mbar)	Consequences	Category D5 Distance (m)	Category F2 Distance (m)
20	Safe distance - probability of 0.95 of no serious damage beyond this value; some damage to house ceilings; 10% window glass broken	16	43
35	Light damage	9	24
170	Moderate damage	2	5
350	Severe damage	Not reached	Not reached
168	1% mortality outdoors	2	5
365	10% mortality outdoors	Not reached	Not reached
942	50% mortality outdoors	Not reached	Not reached
100	1% mortality in buildings at proposed development	3	9
183	10% mortality in buildings at proposed development	1	4
284	50% mortality in buildings at proposed development	Not reached	Not reached

Table 22 Biogas Release through Flare (Unignited) and VCE Overpressure Results

Impacts on Site

The overpressure levels resulting from a vapour cloud explosion following a release of biogas through the flare stack unignited are not sufficient to cause damage to on site buildings. Light to moderate damage is expected in the immediate vicinity of the flare and knock on effects are not expected to arise at the digester tanks or biogas holder.

Domino Effects at Nearby Seveso Establishments

No impacts off site at Seveso Establishments are expected to arise from this scenario.

Frequency

No data is available on the likelihood of the flare to ignite. The likelihood of a vapour cloud explosion is conservatively taken as 1E-04 per year in line with HSA LUP guidance on VCEs from process.

5.3 Digester Tanks

There are 4 steel digester tanks in which the primary anaerobic digestion process will take place. The vessel head space will contain biogas, and the volume of the head space will depend on the hydraulic retention time in the tank. The maximum head space is expected to be 1,600 m^3 of biogas at 30 mbar. The operational temperature will allow either mesophilic (c.37°C) or thermophilic (c.55°C) temperature regimes. Each digestion tank will be fitted with a 'cow horn' PRV to relieve overpressure if necessary.

The accident hazards are similar to those explored for the biogas holder.

The TNO Multi-Energy model in Effects software was used to model the overpressure consequences of a vapour cloud explosion in the event of catastrophic rupture of a digester tank or a major release of biogas from the head space.

Table 23 details the distances to overpressure levels associated with specified levels of damage and mortality to persons outdoors and indoors arising from this scenario.

Peak overpressure (mbar)	Consequences	Category D5 Distance (m)	Category F2 Distance (m)
20	Safe distance - probability of 0.95 of no serious damage beyond this value; some damage to house ceilings; 10% window glass broken	154	155
35	Light damage	87	88
170	Moderate damage	18	18
350	Severe damage	Not reached	Not reached
168	1% mortality outdoors	18	18
365	10% mortality outdoors	Not reached	Not reached
942	50% mortality outdoors	Not reached	Not reached
100	1% mortality outdoors	31	31
183	10% mortality outdoors	16	16
284	50% mortality outdoors	Not reached	Not reached

Table 23 Digester Tank Rupture or Major Release of Biogas and VCE Overpressure Results

Impacts on Site

The overpressure levels resulting from a vapour cloud explosion following rupture of a digester tank is sufficient to cause light to moderate damage to the Administration Building and minor damage at the Main Building. The probability of fatality indoors is not expected to be between 1 % and 10 %.

Domino Effects at Nearby Seveso Establishments

Digestion Tank 4 is approximately 50 m from the process building at BASF and 85 m from the tank farm. The worst case scenario at the process building is expected to be

light damage to the building structure. It is not expected that a vapour cloud explosion following rupture of the biogas holder would trigger any domino major accident scenarios at the BASF process building.

The worst case overpressure level expected to result at the tank far is approx. 35 mbar which is sufficient to cause light damage. It is possible that a leak from a tank would result however rupture of vessels is not expected to occur.

The digester tanks are over 350 m from the process building at Pfizer and over 400 m from the tank farm area. A vapour cloud explosion following catastrophic rupture of a digester tank is not expected to cause any damage or domino effects at the Pfizer establishment.

Frequency

Vessels that are only slightly pressurised are treated as atmospheric tanks by the UK HSE in terms of failure and release frequency (UK HSE, 2012).

The likelihood of a catastrophic rupture of a large vessel (> 450 m^3) is given as 5E-6 per year by the UK HSE. Assuming an ignition probability of 50%, the likelihood of a vapour cloud explosion following a major release from the biogas holder is 2.5E-06 per year. For 4 No. digesters this equates to 1E-05 per year.

The likelihood of a major release from a large vessel is given as 1E-4 by the UK HSE. Assuming an ignition probability of 50%, the likelihood of a vapour cloud explosion following a major release from the biogas holder is 5E-05 per year. This equates to 2E-04 for 4 No. digesters.

5.4 Risk Contours for Proposed Development

Riskcurves modelling software was used to model the individual risk of fatality contours arising from the accident scenarios identified at the proposed Renewable Bioenergy Plant. The consequence results and frequencies of major accident hazards were input to the software. **Figure 6** illustrates individual risk of fatality land use planning contours for the proposed development.

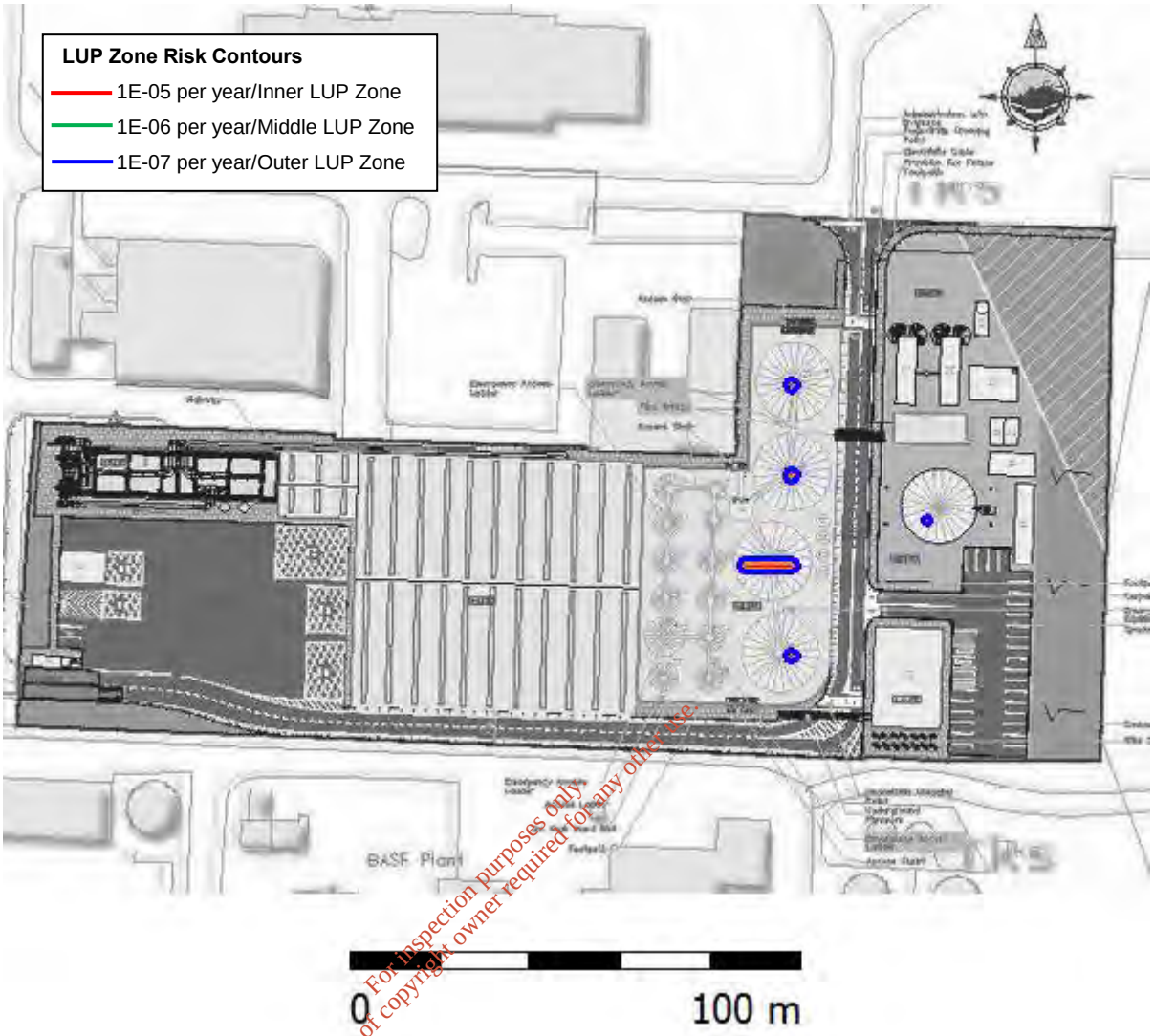


Figure 8 Individual Risk of Fatality Contours for Proposed Renewable Bioenergy Plant

It is concluded that the individual risk of fatality contours are extremely small. For the flare scenario, the maximum level of individual risk of fatality is less than 1E-07 per year and no contours were generated at this location.

The level of individual risk of fatality on site arising from hazards associated with the storage and processing of biogas is acceptable.

6.0 SOCIETAL RISK ASSESSMENT

6.1 Societal Risk Model Inputs

Staffing:

The proposed plant is estimated to employ some 16 no. staff working over three predetermined shifts as follows:

- 07:00-16:00hrs 7 Staff
- 13:00-22:00hrs 6 Staff
- 22:00-07:00 hrs 3 Staff

Personnel employed in a full time capacity on site will include:

- Site Manager
- Operations Supervisor
- General Operatives
- Drivers
- Maintenance Engineer
- Laboratory Technician
- Administrative Personnel
- Weighbridge Operator
- Security

Table 24 contains a conservative estimation of the number of people on site at each occupied location.

Location	No. of People	Occupancy
Main building	4	1
Administration building	4	1
Workshop	1	0.5
Weighbridge office	1	1

Table 24 Population at Proposed Development Site

Societal risk model inputs comprise consequence modelling results, individual risk model outputs, and population data for the site as per **Table 24**.

6.2 Societal Risk Results

The FN Curve for the proposed development is shown on **Figure 9**.

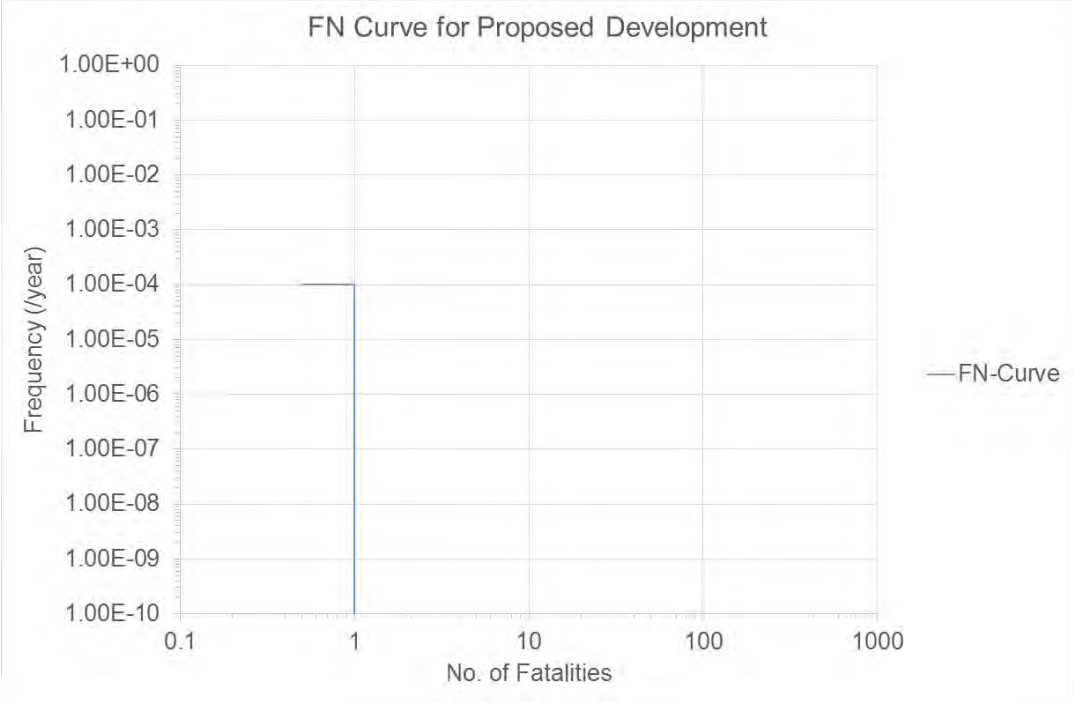


Figure 9 FN Curve for Proposed Renewable Bioenergy Plant

The FN curve predicts a societal risk of 1 fatality (N) at a frequency (F) of 1E-04 (or 100 cpm).

The expectation value is:

EV = F x N = 100 x 1 = 100

It is concluded that the societal risk associated with the proposed development is in the broadly acceptable region when compared to HSA criteria outlined in Section 3.3.

7.0 CONCLUSION

A Land Use Planning and Societal Risk Assessment was completed for a proposed Renewable Bioenergy Plant at Inchera, Little Island, Co. Cork. The assessment considered the impacts of major accident hazards at nearby establishments in Little Island that are notified to the Health and Safety Authority and that are subject to the provisions of the COMAH Regulations, 2006. These include BASF Ireland Ltd. which is adjacent to the proposed development site and lies immediately to the south and Pfizer Ireland Pharmaceuticals which is approximately 250 m to the north east.

The consequences and risk of fatality arising from of major accident hazards at BASF Ireland Ltd. were assessed and it is concluded that the a small portion of the proposed development site falls within the inner risk based land use planning contour for the BASF establishment. The proposed Renewable Bioenergy Plant is a workplace with less than 100 occupants. With reference to HSA guidance (HSA, 2010) it is classified as Sensitivity Level 1, which is acceptable in the Inner LUP Zone.

The consequences and risk of fatality arising from major accident hazards at Pfizer Ireland Pharmaceuticals were assessed and it is concluded that the proposed development falls outside of the outer risk based land use planning contour for the Pfizer establishment. The proposed Renewable Bioenergy Plant is acceptable in this context.

Potential accident scenarios at the proposed Renewable Bioenergy Plant were assessed and it is concluded that although the worst case scenarios involving biogas may cause some damage on site and impact areas where people are likely to present, the overall level of individual risk of fatality is acceptable.

A societal risk assessment was completed and it is concluded that the level of societal risk at the proposed development is within the broadly acceptable region when compared to HSA criteria.

8.0 REFERENCES

Centre for Chemical Process Safety (CCPS) (2000), Guidelines for Chemical Process Quantitative Risk Analysis, 2nd Edition, AIChemE

Chemical Industries Association (CIA) (2003), Guidance for the location and design of occupied buildings on chemical manufacturing sites, 2nd Edition

Chemical Industries Association (CIA) (2010), Guidance for the location and design of occupied buildings on chemical manufacturing sites, 3rd Edition

Committee for Prevention of Disasters (1999), Guidelines for Quantitative Risk Assessment, CPR 18E, First Edition, The Hague ("Purple Book")

Energy Institute (EI) (2007), Model Code of Safe Practice Part 19 Fire Precautions at Petroleum Refineries and Bulk Storage Installations, 2nd Edition

Health and Safety Authority (HSA) (2010), Policy and Approach of the Health & Safety Authority to COMAH Risk-Based Land-Use Planning Including Detailed Implementation by Sector (http://www.hsa.ie/eng/Your_Industry/Chemicals/COMAH/Approach_to_LUP_under_Comah_Regs.pdf)

Hirst, I.L. and Carter, D.A., A "Worst Case" Methodology for Risk Assessments of Major Accident Installations, Process Safety Progress, Vol. 19, No. 2, 2000
Hirst, I.L., Carter, D.A., Porter, S.R and Turner, R.M., Numerical Risk Assessment and Land Use Planning

Kletz T. (1999), HAZOP and HAZAN, Identifying and assessing process industry hazards, Institute of Chemical Engineers, 4th Edition

McGrattan K.B., Baum H.R., Hamins A. (2000), National Institute for Standards and Technology (US Department of Commerce), NISTIR 6546, Thermal Radiation from Large Pool Fires

Trbojevic V.M. (2005), Risk criteria in EU, Proceedings of European Safety and Reliability Conference 2005, Poland

UK Health and Safety Executive (HSE) (2001), Reducing Risks Protecting People

UK Health and Safety Executive (HSE) (2012), Planning Case Assessment Guide, Chapter 6K, Failure Rate and Event Data for use within Land Use Planning Risk Assessments (http://www.hse.gov.uk/landuseplanning/failure-rates.pdf)

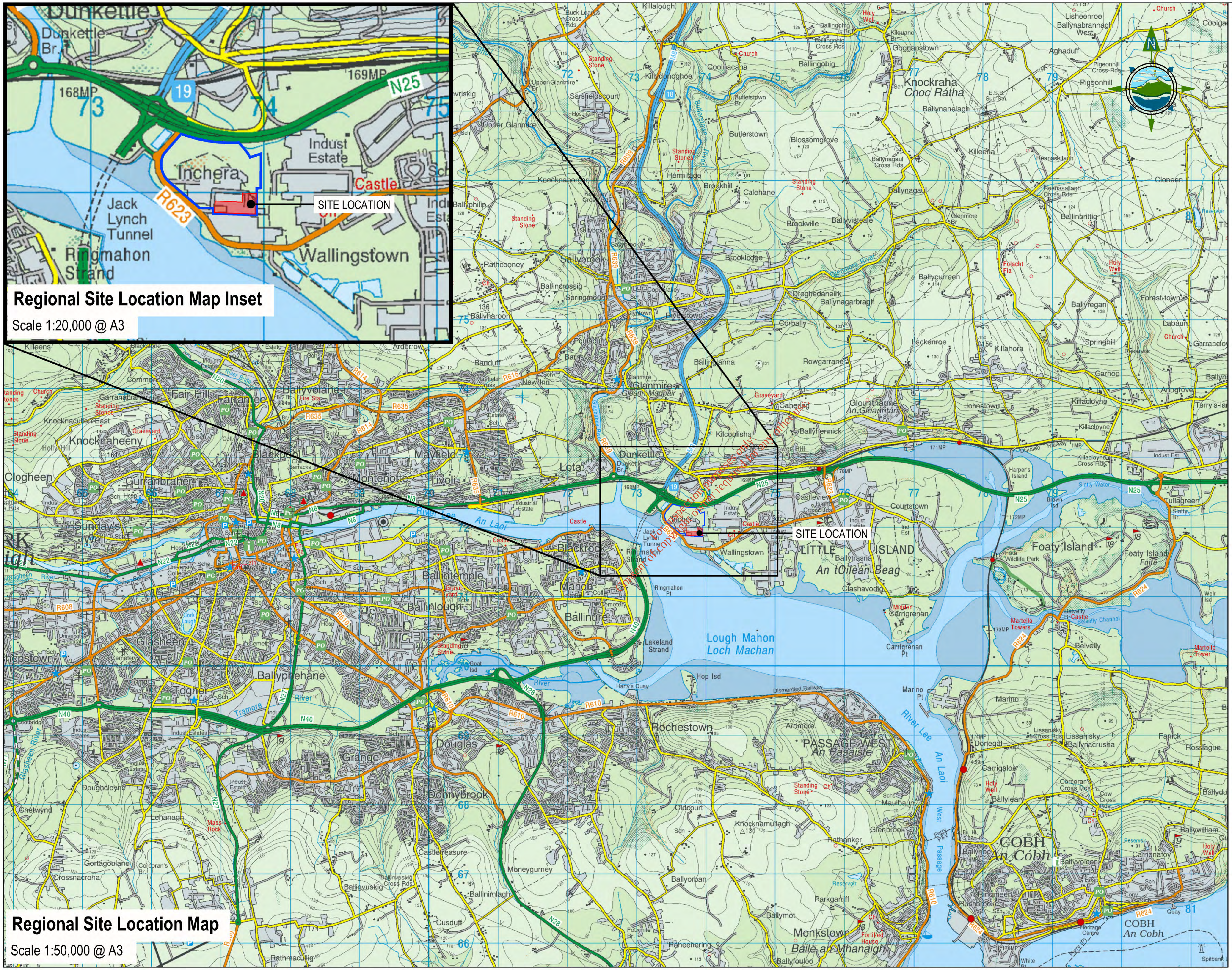
UK Health and Safety Executive (HSE), SLOT SLOD DTL database,
Toxicity levels of chemicals, Assessment of the Dangerous Toxic Load (DTL) for Specified Level of Toxicity (SLOT) and Significant Likelihood of Death (SLOD), Available from http://www.hse.gov.uk/chemicals/haztox.htm, Accessed September 2014

Vrijling, J.K. and van Gelder (2004), P.H.A.J.M., Societal Risk and the Concept of Risk Aversion

FIGURES

Figure B.1 Regional Site Location Map

Figure B.2 Application Area and Location of Site Notices



LEGEND

Proposed Renewable Bioenergy Plant Application Area (c.2Ha)

Tapella Total Landholding Area

NOTES:

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING.
2. ALL LEVELS SHOWN FELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD
3. OSI DISCOVERY SHEET NO: OS1606

Rev	Date	Description	By	Chkd.

Client: LITTLE ISLAND BIOENERGY

Project: RENEWABLE BIOENERGY PLANT INCHERA, LITTLE ISLAND, CORK

Title: REGIONAL SITE LOCATION MAP

Scale @ A3: AS SHOWN

Prepared by:	Checked:	Date:
M.Nolan	J.Frehill	June 2015

Project Director: MMcD

Drawing Status: Licence Application

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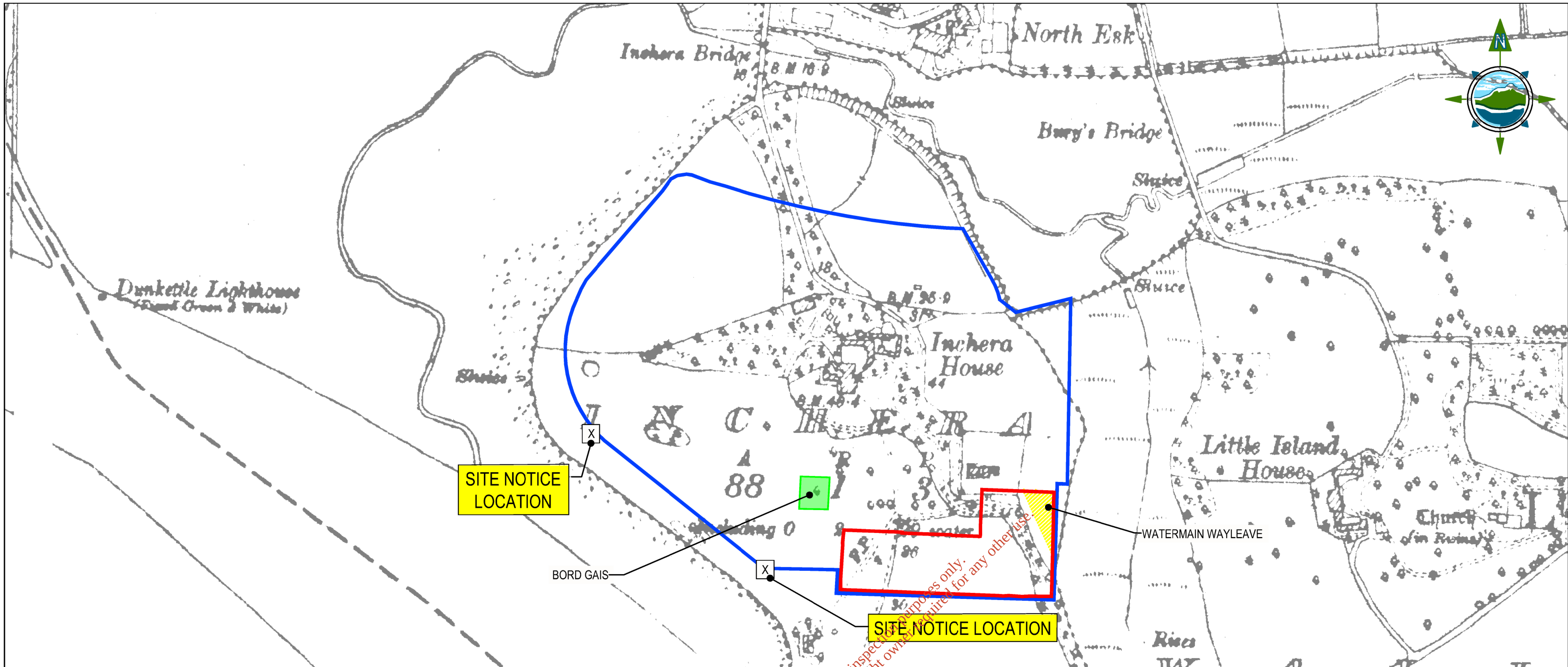
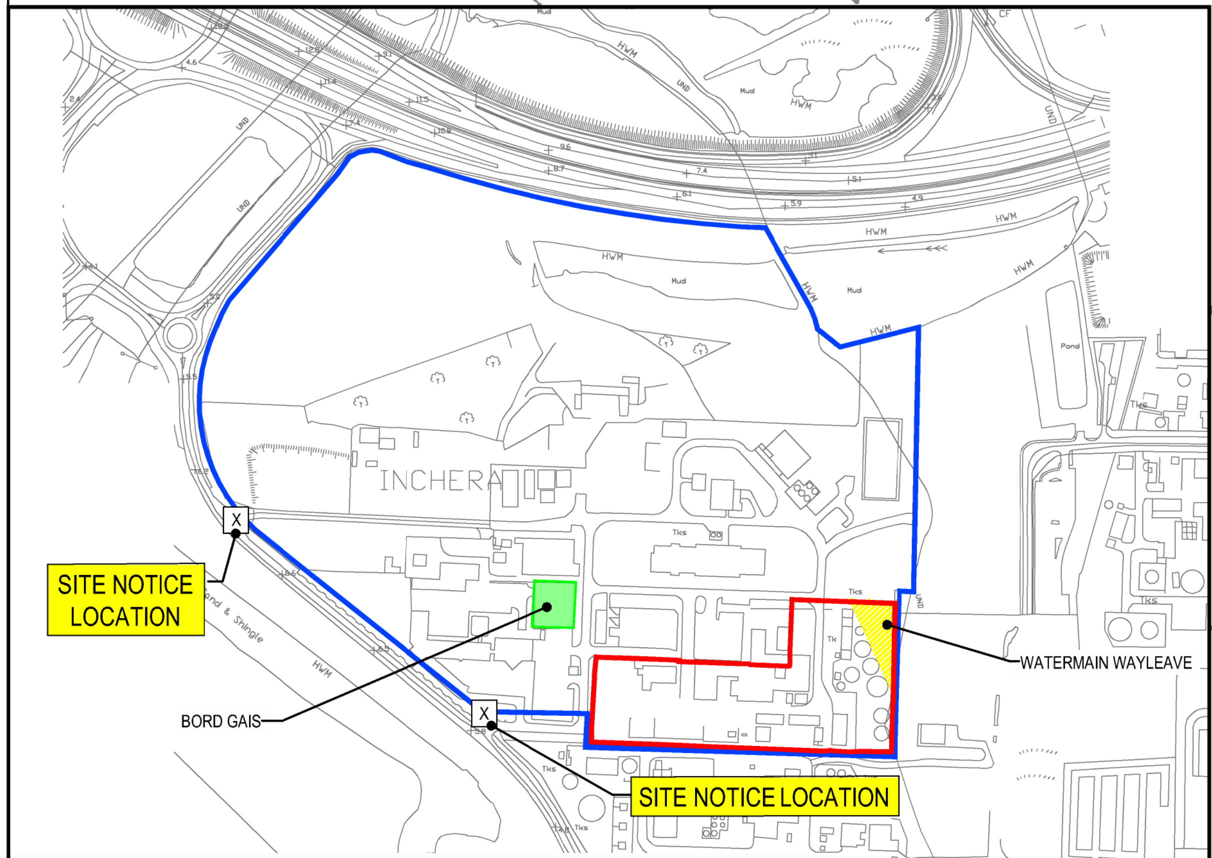
Drawing No.: Figure B.1

Revision:



APPLICATION AREA (Site Location Map)

Scale 1:5000 @ A3



APPLICATION AREA (Site Location Map) Inset

Scale 1:6000 @ A3

LEGEND

- Renewable Bioenergy Plant Application Area
- Tapella Landholding Area
- Bord Gais
- Existing Wayleave for Watermain
- Site Notice Location

NOTES:

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING.
2. ALL LEVELS SHOWN RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD
3. 6" OS SHEET NO: CORK 75
4. 1:2,500 OS SHEET NO'S: 6384-A, 6384-B

Rev	Date	Description	By	Chkd.

Client: LITTLE ISLAND BIOENERGY

Project: RENEWABLE BIOENERGY PLANT INCHERA, LITTLE ISLAND, CORK

Title: APPLICATION AREA AND LOCATION OF SITE NOTICES

Scale @ A3: AS SHOWN		
Prepared by: M.Nolan	Checked: J.Frehill	Date: April 2015
Project Director: MMcD		
Drawing Status: IE Licence Application		

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Drawing No.: Figure B.2 Revision: