INDAVER

Ringaskiddy
Resource Recovery Centre

Natura Impact Statement | 2019



Delivering Sustainable Waste Treatment Solutions For a Growing Population

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Project

Natura Impact Statement for an Industrial Emissions Licence at Ringaskiddy Resource Recovery Centre at Ringaskiddy, Co. Cork

Client ARUP Consulting Engineers

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1. Introduction

1.1 Background

The information in this report has been compiled by DixonBrosnan Environmental Consultants, on behalf of the applicant. It provides information on and assesses the potential for the proposed Ringaskiddy Resource Recovery Centre, Co. Cork to impact on any Natura 2000 sites within its zone of influence. The information in this report forms part of and should be read in conjunction with the licence application documentation being submitted to the Environmental Protection Agency (EPA) in connection with the proposed development. An EIAR has also been prepared for the proposed development. This provides detailed assessments of the potential effects, mitigation measures and residual effects associated with the proposed project. Relevant chapters (8 Proposed site and project description, 9 Construction Activities, 10 Biodiversity, 11 Air Quality and 12 Noise and Vibration) are attached as Appendices to this NIS. Text from the EIAR is included in this NIS where relevant.

In May 2018 An Bord Pleanála granted planning permission to Indaver Ireland Ltd. (Indaver) for the Ringaskiddy Resource Recovery Centre (PL04.PA0045). As part of the planning process, the Board carried out AA of the proposed development. As part of this, the Board set out 24 separate Conditions, which were required before the facility could become operational. This Natura Impact Statement has been prepared in support of an application to the Environmental Protection Agency (EPA) for an Industrial Emissions Licence. Condition 3 of the planning permission states;

Construction of the development shall not commence until such time as an Industrial Emissions licence for the operation of the facility has been granted by the Environmental Protection Agency. Reason: in the interests of orderly development.

The Birds Directive (2009/147/EC) and the Habitats Directive (92/42/EEC) put an obligation on EU Member States to establish the Natura 2000 network of sites of highest biodiversity importance for rare and threatened habitats and species across the EU. In Ireland, the Natura 2000 network of European sites comprises Special Areas of Conservation (SACs, including candidate SACs) and Special Protection Areas (SPAs, including proposed SPAs). SACs are selected for the conservation of Annex I habitats (including priority types which are in danger of disappearance) and Annex II species (other than birds). SPAs are selected for the conservation of Annex I birds and other regularly occurring migratory birds and their habitats. The annexed habitats and species for which each site is selected correspond to the qualifying interests of the sites and from these the conservation objectives of the site are derived. The Birds and Habitats Directives set out various procedures and obligations in relation to nature conservation management in Member States in general, and of the Natura 2000 sites and their habitats and species in particular. A key protection mechanism is the requirement to consider the possible nature conservation implications of any plan or project on the Natura 2000 site network before any decision is made to allow that plan or project to proceed. Not only is every new plan or project captured by this requirement but each plan or project, when being considered for approval at any stage, must take into consideration the possible effects

it may have in combination with other plans and projects when going through the process known as Appropriate Assessment (AA).

The obligation to undertake Appropriate Assessment (AA) derives from Article 6(3) and 6(4) of the Habitats Directive, and both involve a number of steps and tests that need to be applied in sequential order. Article 6(3) is concerned with the strict protection of sites, while Article 6(4) is the procedure for allowing derogation from this strict protection in certain restricted circumstances. A screening for appropriate assessment of an application for consent for the proposed development must be carried out by the competent authority to assess, in view of best scientific knowledge, if the proposed development, individually or in combination with another plan or project is likely to have a significant effect on any European site. Each step in the assessment process precedes and provides a basis for other steps. The results at each step must be documented and recorded carefully so there is full traceability and transparency of the decisions made.

The Ringaskiddy Resource Recovery Centre is located 0.5km from Cork Harbour SAC and SPA as shown in **Appendix 1**. For this reason, it is necessary that the proposal be subject to the AA process. This document consists information to assist the EPA in carrying out Stages 1 and 2 of the Appropriate Assessment process. This Stage One Screening Report and Natura Impact Statement (NIS) for Appropriate Assessment comprises a compilation of the information relevant to the competent authority's assessments relating to the potential significant effects of the Ringaskiddy Resource Recovery Centre on Natura 2000 sites within the surrounding area. The Environmental Impact Assessment Report (EIAR), which has been prepared for this development and submitted with the application for an Industrial Emissions Licence. This provides detailed assessments of the potential effects, mitigation measures and residual effects associated with the proposed project and it provides much of the detail upon which this Natural Impact Statement (NIS) is based, particularly in relation to the receiving environment and baseline ecology. Relevant chapters (8 Proposed site and project description, 9 Construction Activities, 10 Biodiversity, 11 Air Quality and 12 Noise and Vibration) are attached as appendices to this NIS. Text from the EIAR is included in this NIS where relevant.

Where relevant, reference is also made to the previous reports prepared for this site. Information which was submitted for the planning application in 2016 (PL04.PA0045) via an NIS and Environmental Impact Statement (EIS) has been updated and this NIS gives due regard to additional information which was presented as part of the oral hearing process and to relevant conditions of the planning consent.

1.2 Aims of this report

The purpose of this report is to inform the AA process as required under the Habitats Directive (92/43/EEC) in instances where a plan or project may give rise to significant effects on a Natura 2000 site. This report aims to inform the Appropriate Assessment process in determining whether the development for which planning permission has been granted, both alone and in combination with other plans or projects, is likely to have a significant effect on

the Natura 2000 sites in the study area, in the context of their conservation objectives and specifically on the habitats and species for which the sites have been designated.

Documentation/guidelines of relevance to this NIS include the following:

- European Commission, 2001. Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Articles 6(3) and (4) of the Habitats Directive 92/43/EEC. Office for Official Publications of the European Communities, Brussels (EC, 2001);
- European Commission, 2000a. Communication from the Commission on the Precautionary Principle., Office for Official Publications of the European Communities, Luxembourg (EC, 2000a);
- Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (Draft) Office for Official Publications of the European Communities, Luxembourg (EC, 2018);
- Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the commission; (EC, 2007);
- Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities. Department of the Environment, Heritage and Local Government, Dublin (DEHLG, 2010a);
- Department of Environment Heritage and Local Government Circular NPW 1/10 and PSSP 2/10 on Appropriate Assessment under Article 6 of the Habitats Directive – Guidance for Planning Authorities (DEHLG, 2010b);
- Interpretation Manual of European Union Habitats. Version EUR 28. European Commission (EC, 2013) ;
- Applications for approval for Local Authority Developments made to An Bord Pleanála under 177AE of the Planning and Development Act, 2000, as amended (Appropriate Assessment): Guidelines for Local Authorities. An Bord Pleanála, Dublin (ABP, 2013).
- CJEU Case C 164/17 Edel Grace Peter Sweetman v An Bord Pleanála.

1.3 Consultation

Prior to the submission of planning application PL04.PA0045 for permission to the Board, meetings were held with Dr. Jervis Good (National Parks and Wildlife Service) on May 27, 2015, and September 9, 2015. At the meetings, Dr. Good specified the issues to be addressed in the NIS. A letter from the Development Applications Unit (DAU) of the Department of Arts, Heritage and the Gaeltacht, dated 11 September 2015, set out the heritage related observations/recommendations of the Department (**Appendix 2; Letter from the**

Development Applications Unit). This information is provided in various sections within the NIS as follows:

- Effects of air emissions (Point 1 of DAU letter) and dioxins and furans (Point 2 of DAU letter) are primarily addressed by assessing the available data as presented by a literature review on the potential ecological effects of mercury, dioxins, thalium and cadmium on bird receptors and otter (**Appendix 3; Mercury and Dioxin Literature review of potential ecological effects of mercury, dioxins, thalium and cadmium on bird receptors and otter**).
- Bird collision risk (Point 6 of DAU letter). This is addressed by a literature review on the risk of bird collisions with the proposed stack taking into account recent developments in Cork Harbour. (**Appendix 4; Collision Risk Review**)
- Assessment of potential bio-monitoring programme (Requested at the NPWS meeting, May 2015). (**Appendix 5; Biomonitoring**)
- Flue gas treatment residue and filter ash transport in Cork Harbour (Point 4 of DAU letter and flue gas treatment residue and filter transport in the Elbe Estuary (Point 5 of DAU letter). This is addressed by **Section 4.8** of this report**; Disposal of Boiler Ash and Flue Gas Cleaning Residues**.
- Increased predator attraction (Point 7 of DAU letter). This is addressed by **Section 4.10** of this report; **Increased predator density or activity or changes in predator behaviour**.
- Further information on the potential for accidental releases, both onsite and offsite, with a particular emphasis on risks associated with shipping of residues overseas for recovery or disposal. (**Section 4.8 Disposal of Boiler Ash and Flue Gas Cleaning Residues).**
- Trans-boundary effects, including flue gas cleaning residues disposal in salt mines or landfill, in Europe. (**Section 4.9; Trans-boundary effects - Flue gas cleaning residues disposal and boiler ash in salt mine or landfill in Europe**)
- Information on air emission monitoring data from Indaver's plant at Carranstown, Co Meath. (Requested at the NPWS meeting, May 2015). (**Appendix 6; NPWS on emission monitoring data Carranstown, Co. Meath, comparative data from similar waste-to-energy incinerator facilities, Effects of hazardous compounds and information on plant start-up and shut-down procedures**).
- Comparative data from similar waste-to-energy incinerator facilities (Point 3 of DAU letter). This information is provided in (**Appendix 6; NPWS on emission monitoring data Carranstown, Co. Meath, comparative data from similar waste-to-energy incinerator facilities, Effects of hazardous compounds and information on plant start-up and shut-down procedures**).
- Effects of hazardous compounds (Point 8 of DAU letter). This is addressed in **Appendix 6; NPWS on emission monitoring data Carranstown, Co. Meath, comparative data from similar waste-to-energy incinerator facilities, Effects of**

hazardous compounds and information on plant start-up and shut-down procedures.

- Information on plant start-up and shut-down procedures including frequency of start-up and shut-down, and emergency response procedures (Requested at the NPWS meeting, May 2015). (**NIS Appendix 6; NPWS on emission monitoring data Carranstown, Co. Meath, comparative data from similar waste-to-energy incinerator facilities, Effects of hazardous compounds and information on plant start-up and shut-down procedures**).

During the ABP planning oral hearing for the proposed development (2016), supplemental information was requested by Dr. Jervis Good of the National Parks and Wildlife Service (NPWS, Department of the Arts, Heritage and the Gaeltacht) in relation to possible effects from engineered nanoparticles. A literature review on nanoparticles was submitted to ABP during the oral hearing and is also included as **Appendix 20; Supplemental report to the NIS for a proposed Resource Recovery Centre and associated works at Ringaskiddy, Co. Cork**.

1.4 Relevant information

Information on the project (extracted from the EIAR) which was used to assess potential effects is included in the appendices as follows. This information, where relevant, is summarised in the text of this report.

Introduction to the project (Appendix 7) and Project description (Appendix 8).

- These provide an overview of the proposed development and a description of the proposed site and the Ringaskiddy Resource Recovery Centre development.

Construction Activities (Appendix 9)

- This appendix describes the construction operations and phasing for the proposed Ringaskiddy Resource Recovery Centre and outlines the measures to be taken to ensure the impact of the construction activities on the environment is minimised.

Biodiversity (Appendix 10).

- Provides a comprehensive assessment of the effects on ecology based on desktop studies and field surveys. Includes results of habitat mapping, surveys of wintering birds, breeding birds surveys, Common Tern breeding survey, mammals, with a particular emphasis on badger, otter and bats and intertidal survey.

Air Quality (Appendix 11)

Provides a detailed appraisal of potential effects on air which could arise from emissions generated during construction works or from emissions during operation. The scope of the study consists of the following components:

- Review of maximum emission levels and other relevant information needed for the modelling study;

- Identification of the significant substances which are released from the facility;
- Review of background ambient air quality in the vicinity of the facility;
- Air dispersion modelling of significant substances released from the facility;
- Particulate deposition modelling of Dioxins & Furans, Polycyclic Aromatic Hydrocarbons (PAHs) and heavy metals released from the facility;
- Identification of predicted ground level concentrations of released substances at the facility boundary and at sensitive receptors in the immediate environment;
- Evaluation of the significance of these predicted concentrations, including consideration of whether these ground level concentrations are likely to exceed the most stringent ambient air quality standards and guidelines.

Noise and vibration (Appendix 12)

Provides an assessment of the potential noise and vibration effects on the surrounding environment associated with the construction and operation of the proposed facility. As the proposed development is located 0.5km from the closest Natura 2000 site (Cork Harbour SPA) the risk of significant effects is considered very unlikely. However as there could potentially be effects on birds listed as qualifying interests for this SPA, where they occur outside the site boundary, noise and vibration is considered relevant. The conclusions of this appendix are included in the text of this report.

Hazard Identification and Risk Assessment Report (Appendix 13)

Sampling And Analysis Of Soil And Sediment Samples (Appendix 14)

Ecological Risk Assessment for PCDD/F for Indaver Ringaskiddy Resource Recovery Centre. (Appendix 15)

1.5 Authors of Report for Screening and Appropriate Assessment

This report for screening and NIS was prepared by Carl Dixon MSc. (Ecology) and Sorcha Sheehy PhD (Ecology) for DixonBrosnan Environmental Consultants. Both have considerable experience in ecological assessment and the preparation of Natura Impact Statements for a range of large and small scale developments. Additional information was provided by Arup and by Indaver, where required.

2. Regulatory Context and the Appropriate Assessment Procedure

2.1 Regulatory context

The Habitats Directive (Council Directive 92/43/EEC on the *Conservation of Natural Habitats and of Wild Fauna and Flora*) aims to maintain or restore the favourable conservation status of habitats and species of community interest across Europe. The requirements of these directives are transposed into Irish law through the European Communities (Birds and Natural Habitats Regulations; S.I. No. 477 of 2011).

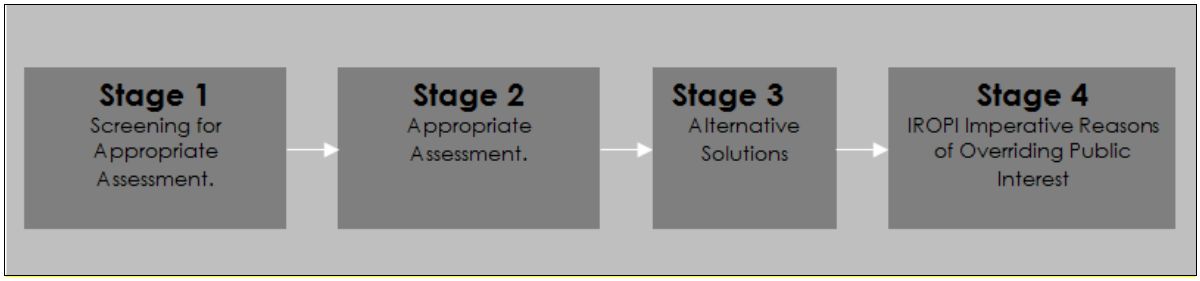
Under the Directive a network of sites of nature conservation importance have been identified by each Member State as containing specified habitats or species requiring to be maintained or returned to favourable conservation status. In Ireland the network consists of SACs and SPAs, and also candidate sites, which form the Natura 2000 network.

Article 6(3) of Council Directive 92/43/EEC of 21 May 1992 on the *Conservation of Natural Habitats and of Wild Fauna and Flora* (as amended) (hereafter 'the Habitats Directive') requires that, any plan or project not directly connected with or necessary to the management of a designated site, but likely to have a 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. A competent authority (e.g. the OPW or Local Authority) can only agree to a plan or project after having determined that it will not adversely affect the integrity of the site concerned.

The possibility of a significant effect on a designated or "European" site has generated the need for an appropriate assessment to be carried out by the competent authority for the purposes of Article 6(3). A Stage Two Appropriate Assessment is required if it cannot be excluded, on the basis of objective information, that the proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site. The first (Screening) Stage for appropriate assessment operates merely to determine whether a (Stage Two) Appropriate Assessment must be undertaken on the implications of the plan or project for the conservation objectives of relevant European sites.

2.2 Appropriate Assessment Procedure

The assessment requirements of Article 6(3) establish a stage-by-stage approach. This assessment follows the stages outlined in the 2001 European Commission publications "Assessment of plans and projects significantly affecting Natura 2000 sites: methodological guidance on the provisions of Articles 6(3) and 6(4) of the Habitats Directive 92/43/EEC" (2001) and Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (Draft) Office for Official Publications of the European Communities, Luxembourg (EC, 2015);



The stages are as follows:

Stage One: Screening — the process which identifies any appreciable effects upon a Natura 2000 site of a project or plan, either alone or in combination with other projects or plans, and considers whether these effects are likely to be significant;

Stage Two: Appropriate assessment — the consideration of the impact on the integrity of the Natura 2000 site of the project or plan, either alone or in combination with other projects or plans, with respect to the site's structure and function and its conservation objectives. Additionally, where there are adverse effects, an assessment of the potential mitigation of those effects;

Stage Three: Assessment of alternative solutions: The process which examines alternative ways of achieving the objectives of the project or plan that avoid adverse effects on the integrity of the Natura 2000 site. It is confirmed that no reliance is placed by the developer on Stage Three in the context of this application for development consent;

Stage Four: Assessment where no alternative solutions exist and where adverse effects remain — an assessment of compensatory measures where, in the light of an assessment of imperative reasons of overriding public interest (IROPI), it is deemed that the project or plan should proceed (it is important to note that this guidance does not deal with the assessment of imperative reasons of overriding public interest). Again, for the avoidance of doubt, it is confirmed that no reliance is placed by the developer on Stage Four in the context of this application for development consent.

It is the responsibility of the competent authority, in this instance EPA, to make a decision on whether or not the proposed licence should be approved, taking into consideration any potential impact upon any Natura 2000 site within its zone of influence.

3. Description of Project

3.1 Description of the project (See Appendices 7 and 8)

In May 2018, An Bord Pleanála (ABP) granted planning permission to Indaver for the proposed Ringaskiddy Resource Recovery Centre, Co. Cork (PL04.PA0045). The development will include a waste-to-energy facility for the treatment of up to 240,000 tonnes per annum of residual household, commercial and industrial hazardous and non-hazardous waste. Of the 240,000 tonnes of waste, up to 24,000 tonnes per annum of suitable hazardous waste will be treated at the facility.

In line with European Union and national policy, this residual waste will be diverted away from landfill and exports, moving the management of waste up the waste hierarchy, allowing Ireland to become more self-sufficient in the treatment of waste and reducing the environmental impact of residual waste management. The proposed development will maximise the extraction and recovery of valuable material (in the form of ferrous and non-ferrous metals) and energy (in the form of 21 megawatts of electricity) resources from residual waste.

The location of the site is shown in **Appendix 1, Figure 1 Site Location,** and an overview of the proposed development is provided in **Appendix 1, Figure 2 Proposed Site Layout**.

The site for the Ringaskiddy Resource Recovery Centre is located approximately 15km to the south-east of Cork City, in the townland of Ringaskiddy on the Ringaskiddy Peninsula in the lower part of Cork harbour. The site occupies an area of approximately 13.55 hectares and is located approximately 800m east of the village of Ringaskiddy. The site is located approximately 800m east of the village of Ringaskiddy.

The L2545, the main road from Ringaskiddy village to Haulbowline Island, forms the northern boundary of the site. The eastern boundary of the site extends to the foreshore of Cork Harbour along Gobby Beach. The site surrounds the Hammond Lane Metal Recycling Co Ltd facility

3.2 Main features of the Ringaskiddy Resource Recovery Centre

The proposed development will consist principally of a waste-to-energy facility (waste incinerator) for the treatment of up to 240,000 tonnes per annum of residual household, commercial and industrial non-hazardous and hazardous waste and the recovery of energy. Of the 240,000 tonnes of waste, up to 24,000 tonnes per annum of suitable hazardous waste will be treated at the facility. The proposed development will maximise the extraction and recovery of valuable material (in the form of ferrous and non-ferrous metals) and energy (in the form of 21 megawatts of electricity) resources from residual waste.

In addition to the provision of the waste-to-energy facility, the proposed development will include an upgrade of a section of the L2545 road, a connection to the national electrical grid, an increase in ground levels in part of the site, coastal protection measures above the foreshore on Gobby beach and an amenity walkway towards the Ringaskiddy Martello tower.

It is anticipated that the waste-to-energy facility will operate 24 hours per day, seven days a week and for an average of 8,000 hours per year. There will be planned shutdowns for maintenance. Waste acceptance will be limited to the hours 06.00 to 20.00 on weekdays and 09.00 to 14.00 on Saturdays.

3.3 Overview of waste-to-energy facility

The waste-to-energy facility will have the following elements (Refer to **Appendix 8: Description of Proposed Development** for further details):

- Main process building: this building will be up to 176m x 81m in plan and up to 50.7m in height, with a stack extending to 75m above Ordnance Datum (OD). This building will accommodate the main waste-to-energy plant and equipment including the bunker, the furnace, the boiler and the flue gas cleaning equipment and ancillary equipment. The warehouse, for spare parts storage, an administration area containing facilities and offices for the waste-to-energy operations staff and a laboratory, and a workshop will be located in this building.
- Turbine Hall and Aero-Condenser structure.
- Security Building/gate house and weighbridge.
- Administration building.
- Fire water storage tank and pump house.
- Surface water attenuation tank and firewater retention tank.
- Light fuel oil storage tank, ammonia storage tank and unloading area.
- Aqueous waste storage tank and unloading area.
- Electricity substation building, compound and grid connection.
- Site lighting.
- Emergency Access.
- Public Amenity footpath.
- L2545 road upgrade.
- Increase in levels of the Indaver site.
- Coastal protection measures.
- Diversion of services.

The design of the proposed facility has been optimised to include the most up to date emissions control and flue gas cleaning technology. The waste-to-energy process will consist of a number of main process elements as follows:

- waste acceptance.

- waste intake and storage.
- combustion process.
- energy recovery process.
- flue gas cleaning.

3.4 Waste Intake

Solid Waste

Solid hazardous and non-hazardous waste will arrive at the site in a number of different waste vehicles including compactor trucks, skip trucks ejector trailers and walking floors, with all contents covered. All waste trucks entering the waste-to-energy facility will pass through a scanner to detect the presence of any radioactive elements. Radioactive waste will not be accepted in the facility.

Waste trucks will drive onto the weighbridge, located at the entrance. All trucks carrying waste, which enter and leave the facility, will be weighed. A radiation detector will be installed on the incoming weighbridge that all waste deliveries will pass through. Drivers will present their documentation, relating to the waste load, to the staff in the security gatehouse. Some trucks, on long-term contracts, carrying non-hazardous waste, will access the facility using a swipe card, which will record their details. The drivers of these trucks will not have to report to the security offices. Following completion of the waste acceptance procedures, the trucks carrying solid waste will proceed via the site road to the enclosed tipping floor.

Covered trucks containing solid waste will enter the supervised tipping hall and will be directed towards discharge chutes. The trucks will discharge the waste into the bunker through chutes in the wall of the waste tipping hall

To prevent the egress of odours, the tipping hall will be maintained under negative pressure, i.e. air will be drawn in through any openings rather than escaping out. Air for combustion will be drawn from the tipping through the waste bunker. As the waste tipping hall will be an enclosed area, windborne litter will not be generated. The waste bunker capacity has been chosen to allow the facility to accept waste during periods when the furnace is shut down for maintenance and also to allow the facility to continue operating over prolonged periods, such as long weekends, without deliveries.

Crane operators, positioned in the control room/crane operator room overlooking the bunker, will use travelling grab cranes to mix the waste in the bunker, so that despite the variety within the solid waste loads delivered, the feed to the furnace will be relatively uniform. The grab cranes will feed the mixed waste into the hoppers. The waste will then be discharged to the furnace from the hopper.

Aqueous waste

Tankers of aqueous waste will be sampled and analysed prior to offloading into the aqueous waste storage tank or direct injection. This sampling may be done before or after arrival on

site. If sampled and analysed on site, the sampling will be done in the aqueous waste unloading area adjacent to the aqueous waste storage tank. Key parameters will be analysed to ensure conformity with the specified waste acceptance criteria and with the parameters agreed with the customers. As a minimum, water content, pH, chlorine and calorific value will be checked for each aqueous waste load. In the event that the specification for the aqueous waste load is not met, then arrangements will be made for the dispatch of the tanker to the most suitable facility either in Ireland or abroad

3.5 Combustion Process

A moving grate furnace is proposed for the facility. Grate furnaces are used for the destruction of a wide variety of waste streams and are a well-recognised, robust and established technology for these purposes. Waste is burned on the grate and the volatile gases and vapours released will immediately ignite in the furnace due to the temperature of the furnace gas, which will be within the range 850˚C and 1,000˚C. This means that a hazardous substance that is fed into the furnace does not come out unchanged as the same hazardous substance, either in the residues or in the exhaust gases. In the furnace the hazardous substance is oxidised which means it undergoes a chemical reaction and is converted into one or more different substances with different properties. These different substances are removed in the ash or flue gas cleaning residues and a very small quantity is discharged to the air in the exhaust gases. Compounds such as dioxins which form after combustion is complete (and at lower temperature windows in the boiler of around 450°C) are removed by the injection of activated carbon/clay.

The moving grate furnace will operate in a similar fashion to an escalator, pushing waste from the top of the furnace to the bottom to ensure complete combustion. The moving grate furnace is considered to be a 'Best Available Technique' for the treatment of the types of waste proposed.

The moving grate mechanism will transport the waste slowly from the feed point at the top of the furnace to the ash discharge at the bottom of the furnace. The rate at which the waste will travel through the furnace will be controlled to optimise the combustion. The waste will be in the furnace for approximately one hour.

As the waste enters the hot furnace the material will be heated due to contact with the hot flue gases and radiated heat from the walls of the furnace. The initial heat will drive off the moisture from the waste. In the next stage in the combustion process, the combustible gases and vapours will be driven off.

The volatile components of the organic material contained in municipal solid waste typically are produced in the form of hydrogen, carbon monoxide, methane and ethane. The combustion of these volatiles will take place in the furnace, immediately above the surface of the waste and in the combustion chamber above the grate.

The volatile gases and vapours released will immediately ignite in the furnace due to the temperature of the furnace gas, which will be within the range 850˚C and 1,000˚C. Typical

mean residence times of the gases and vapours in the combustion chamber will be 2 to 4 seconds.

The final section of the grate will be the burnout section where the ash will be held for long enough to ensure sufficient burnout.

The grate will discharge the resultant bottom ash into a water bath/ wet de-slaggers, and then via a conveyor to the ash hall.

3.6 Energy Recovery

The hot flue gases from the moving grate furnace will be directed through a steam boiler. In the boiler, heat will be transferred from the hot flue gases to water to generate steam. The steam from the boiler will drive a turbine, which will drive an electricity generator. Approximately 21MW of electricity will be generated, of which approximately 18.5MW will be exported to the national electrical grid.

3.7 Emission Reduction

Dioxins and Furans

Dioxins and furans are complex chlorinated hydrocarbon molecules, which are formed as a consequence of any combustion process. The facility is designed to minimise the reformation of dioxins and furans (the term 'dioxin' is taken to include dioxins and furans), by maintaining the flue gases at a high temperature of over 850˚C for over 2 seconds in the furnace and by rapidly cooling the gases from 450˚C to 250˚C. These measures will reduce the dioxin concentration in the flue gases to a low level. The flue gas cleaning equipment will reduce dioxin concentrations in the flue gas to levels well below the limit set in the Industrial Emissions Directive. Typical emissions from a facility with this equipment are 0.01ng TEQ/m3 (0.000,000,000,01g TEQ/m3).

Nitrogen Oxides (NO_x)

All combustion processes lead to the formation of oxides of nitrogen. These will be controlled in two ways. Optimal combustion conditions in the furnace will minimise the oxidation of nitrogen in the combustion air. Mixing of the waste will also prevent localised high temperatures in the furnace and cladding materials with suitable heat transfer properties will be used to give an optimal flue gas temperature. Secondly, De-NO_x' technology will be used. This technology uses the reaction of ammonia and nitrogen oxides at high temperature to convert the nitrogen oxides to nitrogen and water vapour. This reaction will be achieved by the injection of either an ammonia solution or urea into the first section of the boiler.

3.8 Flue Gas Cleaning

The flue gas cleaning equipment will reduce dioxin concentrations in the flue gas to levels well below the limit set in the EU Industrial Emissions Directive 2010/75/EC. Typical dioxin emissions from a facility with this equipment are 0.01ng TEQ/m3 i.e.one tenth of the concentration limit in the EU Industrial Emissions Directive.

The flue gas leaving the boiler will still be relatively hot at approximately 160˚C and will be further cooled in the cooling section to a temperature of about 145˚C. The lower temperature is required for the optimal operation of the lime and activated carbon or clay injection downstream.

Activated carbon consists of small, porous carbon particles, which due to their porosity have a very large surface area. The large surface area will adsorb heavy metals and trace levels of organics present in the flue gas, such as dioxins, furans, Polycyclic Aromatic Hydrocarbons (PAHs) and hydrocarbons. These carbon granules and other particulates, such as dust, will then be removed by filtration as the flue gases pass through the baghouse filter. The activated carbon/clay mixture will work in a similar manner to activated carbon and the activated carbon/clay mixture will contain a minimum of 10 % activated carbon. This is to ensure the adsorption of heavy metals and mercury. /The flue gases will then pass through a baghouse filter which will remove the dust, salts and the carbon particles from the gases. The dust cake forming in the baghouse filter will be removed and collected in hoppers located below.

The flue gases will then be discharged through the stack, the top of which will be at a level of 75mOD.

The stack emissions will be monitored as required by the EU Industrial Emissions Directive and in compliance with the industrial emissions licence.

3.9 Process Outputs: Ash and Solid Residues

Three types of ash and residues will be produced in the waste-to-energy plant. The average annual ash tonnages, assuming the plant is operating for 8000 hours, are given below:

- Bottom ash, 6,583 kg/h (15% moist)
- Boiler ash, 250kg/h
- Flue gas cleaning residues, 1,138kg/h

An annual average of 2,400 tonnes of ferrous metals, such as steel and 300 kg/h non-ferrous metals will be recovered from the bottom ash for recycling.

3.10 Process Inputs

As the facility uses an air-cooled condenser rather than cooling towers it will have a significantly lower water requirement than would otherwise be the case. The major water requirement will be for flue gas cleaning due to cooling by direct water injection and the wet

de-slagger. Process water (for the steam cycle), domestic potable water and water for cleaning account for the rest of the demand. The average consumption of water in the proposed facility will be 5.4 m^3/hr.

The facility will use light fuel oil at start up to bring the furnace to the required operating temperature of 850˚C. Light fuel oil may also be occasionally required as a supplementary fuel to maintain the temperature if waste of an exceptionally low calorific value is received. An automatic control system will bring light fuel oil on-line should the temperature drop below 850˚C.

It will also be required for operation of the emergency power generator. It is estimated that 400 tonnes of light fuel oil will be used per annum to raise the temperature at start up and maintain it as required. This light fuel oil will be supplied from an on-site storage tank.

Other inputs included sodium hydroxide (NaOH) 50% solution, and hydrogen chloride (HCl) 30% solution in the demineralisation facility, ammonium hydroxide (NH4OH) and sodium phosphate Na3PO4 for the boiler feed water, lime, activated carbon and clay in the flue gas cleaning and urea/ammonia in the de-NOx stage.

The quantities of inputs will vary, depending on the calorific value of the waste and the flue gas cleaning equipment chosen.

3.11 L2545 Road Upgrade

Upgrade works are proposed to a section of the L2545 local road, which is the road that adjoins the northern boundary of the site. The proposed works will consist of raising the level of a section of the road and improving the surface water drainage to alleviate local flooding issues along the road.

Background to flooding of the L2545 road

The existing levels of the L2545 road along the northern boundary of the Indaver site are set at circa 2.4m to 2.95mOD. Based on a review of all available information, the predicted 1 in 200 year design tidal level has been estimated as 2.73mOD. Sections of the road close to the Gobby beach car park are below this level and are therefore at risk of tidal flooding during a 1 in 200 year tidal event.

Based on a review of the historic flooding of the road, discussions with Cork County Council, and the preliminary flood risk assessment mapping produced by the OPW, there is a significant risk of pluvial flooding of the road during periods of heavy rainfall combined with high tide.

The existing storm water drainage system along the road consists of a 450mm diameter pipe which outfalls to the sea at Gobby Beach. There are a minimal number of gullies along the road to accept water and transfer it to the storm water sewer.

Therefore, it can be concluded that the existing formal drainage system along the road is inadequate. The dominant drainage mechanism for the road is “over the edge” drainage to the

Indaver site on the south side of the road. A number of channels have been cut in the berm on the southern side of the road which allow surface water runoff from the road to discharge directly into the Western Fields area of the Indaver site.

The invert level of the outfall is -0.28mOD. As the level of the tide rises above this elevation the drainage system can become tide locked if there is insufficient differential head at the outfall. When this occurs the surface water which has reached the pipe is unable to discharge through the outfall and collects in the drainage pipe. The discharge pipe becomes surcharged and any subsequent rain water falling on that area of the road normally drained by the existing gullies cannot drain away and causes the road to flood. This area of the road is located adjacent to the entrance to the public car park at Gobby beach.

Description of L2545 Upgrade

The proposed L2545 upgrade works will include raising a 185m section of the road to a maximum height of 3.45mOD between the car park and the eastern end of the Hammond Lane Metal Company. This is approximately 1.0m above the existing road level. This will elevate the road to above the 200 year design tidal water level plus an allowance for climate change. This will offer a high level of protection to the road from tidal flooding. The road will be raised over a length of approximately 185m in order to ensure a smooth transition down to existing road levels, in accordance with road design standards. The recently constructed footpath on the northern side of the road will also be raised to the new road level.

The proposed road drainage network upgrade will extend along the entire northern boundary of the Indaver site. It has been designed to cater for the 7 hours when the storm water outfall is tide locked by a 200 year design high tide, 2.73m top water level (TWL), combined with a 1 in 30 year rainfall event plus an allowance for climate change.

A 260 metre length of new linear concrete surface water channel will extend from the western boundary (of the western field area) of the Indaver site, running along the southern edge of the L2545 until it meets the entrance to the Hammond Lane Metal Company. This section of the L2545 is currently super-elevated – i.e. the camber on the road falls from north to south, therefore surface water drains to the south. This section of the L2545 will not be raised as the existing levels are already above the predicted 1 in 200 year design tidal level (2.73mOD). The new surface water channel will be drained at regular intervals by gullies which will outfall to the existing 450mm diameter surface water sewer beneath the road. Therefore, surface water will no longer flow from the road into the Indaver site (western fields) to the south.

The raised section of the L2545 between the car park and the eastern end of the Hammond Lane Metal Company will be drained by a kerb and gully sealed drainage system which will be connected to two new surface water pipes underneath the road. The two 1500mm diameter pipes will be approximately 190m in length and will provide 660m3 of surface water storage. There will be three large concrete chambers constructed on the line of the twin surface water pipes at the start middle and end of the run. The first two chambers will be situated in the road

and the terminal chamber will be constructed at the entrance to the car park by Gobby Beach. The recently constructed surface water drainage system on the Haulbowline road will be diverted into the terminal chamber. This chamber will be connected to the existing 450mm diameter surface water sewer via a short length of new 450mm diameter pipe, a new Class 1 bypass hydrocarbon interceptor and a new manhole constructed on the line of the existing pipe. This will allow the upgraded surface water drainage system to discharge to sea via the existing 450mm surface water outfall at Gobby Beach.

All of the above works will be within Indaver ownership, apart from a small area in Hammond Lane ownership. Consent has been given by Hammond Lane to undertake these works. Further details on flood risk are provided in **Appendix 16: Flood Risk Assessment.**

3.12 Increase in levels of the Indaver site

The ground levels of the Indaver site vary considerably in both the north-south direction and the east-west direction. Along the southern boundary of the site the levels vary from circa 10m OD to circa 41m OD. Along the northern boundary of the site the ground levels vary from circa 2.05m OD to circa 4.0m OD. As discussed above, the 1 in 200 year design tidal level has been estimated as 2.73m OD.

The levels of the low-lying parts of the site will be raised to 4.55mOD. The ground levels in the western fields area of the site consisting of a 10,000m3 area will be raised by a maximum height of 2.5m above ground level. A small area of land within the waste-to-energy side of the site adjacent to the L2545 road will also be raised to 4.55mOD. This level will offer a very high standard of flood protection to the site. The calculation of this level has been determined as follows:

The minimum site flood defence level was calculated at 4.28m OD Malin. This level allows for 2.73m (200 year tidal level) plus 1.05m (climate change) plus 0.5m (freeboard).

For climate change, the OPW Draft Guidance on the “Assessment of potential future scenarios for Flood Risk Management” suggests the use of two scenarios, a mid-range future scenario (MRFS) and a high end future scenario (HEFS). The MRFS represents a likely future scenario which is within the bounds of the widely accepted projections. The HEFS is a more extreme, but plausible future event, and is within the upper bounds of the widely accepted projections.

The proposed 1.05m allowance for climate change allows for the high-end future scenario (HEFS). It was decided to use an even more conservative site flood defence level of 4.55mOD given that that a number of recent developments close to the site in Ringaskiddy (UCC ERI Beaufort Research Facility) have already utilised this level. The 4.55mOD level will offer a very high standard of flood protection to the site. Further details on flood risk are provided in **Appendix 16; Flood Risk Assessment**.

3.13 Coastal Protection Measures

Coastal protection measures in the form of shingle above the foreshore on Gobby Beach are proposed along the eastern boundary of the Indaver site.

The coastline along the eastern boundary of the Indaver site consists of a glacial till face adjoining Gobby Beach. The glacial till face is very shallow near the public car park to the north and steepens to the south to a maximum of 10-12m high. Issues in relation to coastal erosion were raised by An Bord Pleanála during the course of the 2008 planning application process. In response to the issues raised by the Board, a coastal study was carried out by Arup in order to better understand the coastal processes in the vicinity of the site, the rate of erosion of the glacial till face and the specific coastal protection measures required. The coastal erosion study undertaken included an evaluation of the retreat rate of glacial till face based on historical information and surveys. Numerical wave modelling, a wave run-up assessment and beach sediment transport assessment were carried out.

The study found that the proposed development would not increase the current rate of erosion of the glacial till face.

As part of the study, a very conservative rate of erosion was applied to the site in order to assess whether the proposed development could be impacted over the duration of the planning permission (40 years in total). The study found that there would be no impact on the proposed development after 30 years. The study found that there could be a risk of an impact on a small section of the proposed development after 40 years however this would be confined only to the amenity walkway and a small section of a diverted gas pipeline outside of the fence line. The waste-to-energy facility would not be impacted by coastal erosion during the duration of the planning permission.

Indaver engaged with Gas Networks Ireland (GNI) in relation to the proposed diversion route within the Indaver site. GNI confirmed that they were satisfied that the proposed gas diversion route was feasible.

Coastal protection mitigation measures are not required for the waste-to-energy facility element of the development. However, given the concerns raised by An Bord Pleanála and given the low risk that the amenity walkway and a section of the diverted gas pipeline could be impacted in 40 years' time, coastal protection measures have been included in the planning application as a precautionary measure so as to reduce the rate of erosion of the glacial till face.

The protection measures will consist of the placement of approximately 1100m^3 of shingle (of appropriate size and shape (rounded) above the foreshore on Gobby beach along the eastern boundary of the Indaver site. This will be a 'soft' solution which will reduce erosion rates by increasing beach levels i.e. reducing near shore water depth and wave heights and will protect the glacial till face from breaking waves.

The addition of sacrificial material such as shingle, is well-recognised worldwide as a coastal engineering solution. The net coastal sediment transport will go from south to north according to wind conditions and swell, therefore the material is likely to move towards the north in the medium and long term. The Cork Harbour Special Protection Area (SPA) is located to the south west of the site therefore the sacrificial material will not impact on the SPA.

Further details on these mitigation measures are provided in **Chapter 13 Soils, Geology, Hydrogeology, Hydrology and Coastal Recession of this EIAR.** The proposed protection measures are a soft solution and are not likely to affect the coastline in the vicinity of the site. The net coastal sediment transport will go from south to north according to wind conditions and swell. Therefore, the material is likely to move towards the north in the medium and long term. The Cork Harbour Special Protection Area (SPA) is located to the south west of the site. The sacrificial material will not impact on the SPA.

3.14 Grid Connection

The waste-to-energy facility will be connected to the national electrical grid via the 38kV electrical substation (known as Lough Beg substation) adjacent to the eastern boundary of the Hammond Lane facility.

This connection method has been determined by a feasibility study carried out by ESB Networks (**Appendix 8; Description of Proposed Development**). Based on discussions with ESB Networks, the connection will simply be an extension of the 38kV line into the ESB side of the proposed Indaver electricity compound as this line currently terminates at the existing Lough Beg substation. ESB Networks have confirmed that the extension of the 38kV line into the Indaver site can be over ground or underground. Indaver have selected the underground option and the proposed routing for the underground lines has been identified on the drawings. The routing has been designed in compliance with ESB guidelines and standards. The grid connection will be made by running underground cables from the ESB side of the Indaver electricity compound to the Lough Beg substation.

The lands over which the entire grid connection will be constructed lie within Indaver's ownership (save for a small section comprising associated works on the adjacent Lough Beg substation owned by ESB Networks). These works will be carried out by ESB Networks.

Based on the discussions with ESB Networks in relation to the connection of the 38kV cable within the ESB Networks lands, there is the possibility to connect in two ways and the decision as to which way will be decided in the detailed engineering phase by ESB Networks:

- Option 1: Cable Connection within the ESB Lough Beg substation building.

  This involves a trench of approximately 5m to be excavated on the ESB side of the substation fence that will meet up with the trench that will be excavated on the Indaver lands from the new Indaver substation building to the ESB fence. The underground

cable will then emerge in the Lough Beg substation building and be connected to the existing busbar within the distribution board. There shall be some electrical switchgear for protections as per the ESB standards/specifications along with metering equipment that shall allow ESB to monitor usage on both import and export of power.

- Option 2: Cable connection directly to cable on existing end mast

  Much like option one this involves a trench of approximately 5m to be excavated on the ESB side of the substation fence that will meet up with the trench that will be excavated on the Indaver lands from the new Indaver substation building to the ESB fence. The underground cable will then emerge in the Lough Beg substation building. This cable shall then be connected to some electrical switchgear for protections as per the ESB standards/specifications along with metering equipment that shall allow ESB to monitor usage on both import and export of power. The cable shall then exit the Lough Beg substation via a second trench that will be excavated between the Lough Beg substation building and the mast that carries the existing 38Kv power line from the Barnahely substation. This trench shall be approximately 5m in length and will be within the ESB Networks Lough Beg substation lands. The underground cable will then emerge next to the existing mast and shall be connected directly to the existing 38kV line via a standard T connection, this form of connection is possible on an end mast like the one situated in the Loughbeg substation.

Due to the layout of the facility, there will be no requirement to divert the existing 38 kV lines which traverse the site.

3.15 Implementation of Best Available Techniques in the Waste-To-Energy Facility

3.15.1 Industrial Emissions Directive Definition of BAT

In the Industrial Emissions Directive, Directive 2010/75/EC, best available techniques are required to be used in pollution prevention and control.

The term “best available techniques” is defined in Article 2(10) of Directive as:

> *best available techniques” means the most effective and advanced stage in the development of activities and their methods of operation which indicates the practical suitability of particular techniques for providing the basis for emission limit values and other permit conditions designed to prevent and, where that is not practicable, to reduce emissions and the impact on the environment as a whole:*
>
> *i. “techniques” includes both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned;*
>
> *ii. “available techniques” means those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions,*

taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the Member State in question, as long as they are reasonably accessible to the operator;

iii. "best" means most effective in achieving a high general level of protection of the environment as a whole;"

The EU has prepared a series of reference documents, for different industrial activities, which define BAT for that activity. The final edition of the Best Available Techniques Reference Document (BREF) on Waste Incineration, entitled 'Waste Incineration (WI)', was published by the European Commission in August 2006. Chapter 5 of the BREF document lists the techniques which are considered BAT with respect to waste to energy facilities. The recommendations of the BREF document on waste incineration have been implemented throughout the design of the facility and will be implemented in its operation. A review of the BREF is nearing completion and it is expected that this will be published at EU level in mid to late 2019.

3.15.2 BAT and the Stockholm Convention on Persistent Organic Pollutants

The concept of BAT is also used in the Stockholm Convention on Persistent Organic Pollutants. PCBs, dioxins and furans are listed in Annex C of the Convention, which addresses persistent organic pollutants which are formed and released unintentionally. The Convention requires best available techniques (BAT) to be used to prevent or reduce the release of these chemicals.

In the Convention, Annex C deals with the use of BAT. In Annex C Part V B, the concept of best available techniques is not aimed at the prescription of any specific technique or technology, but at taking into account the technical characteristics of the installation concerned, its geographical location and the local environmental conditions. In determining best available techniques, consideration should be given to:

…(b) General release reduction measures: When considering proposals to construct new facilities or significantly modify existing facilities using processes that release chemicals listed in this Annex, priority consideration should be given to alternative processes, techniques or practices that have similar usefulness, but which avoid the formation and release of such chemicals.

In cases where such facilities will be constructed or significantly modified, in addition to the prevention measures outlined in section A of Part V the following reduction measures could also be considered in determining best available techniques:

(i) *Use of improved methods for flue-gas cleaning such as thermal or catalytic oxidation, dust precipitation, or adsorption;*

(ii) Treatment of residuals, wastewater, wastes and sewage sludge by, for example, thermal treatment or rendering them inert or chemical processes that detoxify them;

(iii) Process changes that lead to the reduction or elimination of releases, such as moving to closed systems;

(iv) Modification of process designs to improve combustion and prevent formation of the chemicals listed in this Annex, through the control of parameters such as incineration temperature or residence time."

The Convention allows for the participating parties to develop guidance with regard to best environmental practices. Ireland has prepared a National Implementation Plan, which was issued in 2012 by the Environmental Protection Agency.

4. Potential effects of project

4.1 Direct habitat loss or habitat degradation during construction

The proposed development site and immediately adjoining shoreline habitats, which will be affected by the construction of the proposed development, including the proposed beach nourishment works, do not lie within any designated Natura 2000 site.

Beach nourishment is a well-recognised coastal engineering solution worldwide. It is a soft solution and will not significantly affect the areas in the vicinity of the site. The net coastal sediment transport goes from south to north according to wind conditions and swell and, therefore, the material is likely to move towards the north in the medium and long term. The Cork Harbour Special Protection Area (SPA) is located to the south west of the site therefore the sacrificial material will not impact on the SPA.

Cork Harbour SPA

Although effects during construction on estuarine mudflats of high value for wintering birds listed as qualifying interests for the Cork Harbour SPA are extremely unlikely, such effects cannot be entirely discounted in the absence of mitigation.

Great Island Channel cSAC

Given the dilution provided in the harbour, the distance from qualifying habitats for the Great Island Channel cSAC and the robust nature of these habitats, any minor increases in silt in surface run-off, minor spills of hydrocarbons or other chemicals during construction or fire related effects will not have a significant effect on qualifying habitats for this cSAC.

Ballycotton Bay SPA and Sovereign Islands SPA

No potential effects on the Ballycotton Bay SPA or Sovereign Islands SPA during the construction phase have been identified due to their distance from the proposed development site and the absence of potential ecological pathways by which effects could occur.

4.2 Disturbance or displacement of birds during construction, operation and cumulative effects

Cork Harbour SPA

Construction and beach nourishment works will generate additional noise and activity which could lead to the short-term disturbance/displacement of birds. During operation there will be increased traffic and human activity associated with the site. There could also be in-combination effects due to the presence of other developments in Cork Harbour.

The shoreline habitats in proximity to the proposed development site are not considered of high value for birds listed as qualifying interests for the Cork Harbour SPA. However, some of these species were noted overflying the channel that separates the site from Spike Island or were recorded feeding along shoreline habitats. Whilst direct disturbance of qualifying

species within the SPA boundary are extremely unlikely, disturbance of such birds where they occur outside the SPA boundary cannot be entirely discounted without more detailed consideration.

Great Island Channel cSAC, Ballycotton Bay SPA and Sovereign Islands SPA

No potential effect on the Ballycotton Bay SPA or Sovereign Islands SPA have been identified due to their distance from the proposed development site. Disturbance of birds is not relevant to the Great Island Channel cSAC which was designated on the basis of habitats.

4.3 Bird collision risk during operation and cumulative effects

Cork Harbour SPA

Structures adjacent to the estuarine environment have the potential to create a collision risk under certain circumstances. The highest buildings at the site of the proposed development will be the main process building (between 23.7-50.7m AOD) and the stack (75 m AOD). Buildings at the site of the proposed development could potentially affect birds via increased collision risk. Bird collisions, if of sufficient magnitude, could potentially impact on the Cork Harbour SPA. There are a number of tall structures within the wider Cork Harbour area including wind turbines, other stacks etc. and, potentially, cumulative effects could occur which, in turn, could impact on the Cork Harbour SPA.

Great Island Channel cSAC, Ballycotton Bay SPA and Sovereign Islands SPA

No potential effects on the Ballycotton Bay SPA, or Sovereign Islands SPA have been identified due to their distance from the proposed development site and there is no evidence to indicate that the proposed development site lies within a migration route to these sites. Collision is not relevant to the Great Island Channel cSAC which was designated on the basis of habitats.

4.4 Emissions to water during operation

Cork Harbour SPA and Great Island Channel cSAC

In respect of the possible effects from emissions of pollutants from the facility, it is noted that no significant aqueous discharge into the marine environment is proposed from the resource recovery facility during operation. Any process effluent will be recycled for use in the process and will not be discharged off site. Storm water will be monitored and discharged off site only if monitoring determines that it is uncontaminated. Given the dilution provided in the marine environment and the distance from the facility to the Cork Harbour SPA and Great Island Channel cSAC, adverse effects from the discharge of storm water on Natura 2000 sites can be ruled out. Given the distance involved no effect on the Ballycotton Bay SPA and Sovereign Islands SPA will occur.

Wastes, fuel and liquid and solid process materials will be delivered to site by truck via the N28 and the L2545. All trucks carrying solid waste will be covered. Aqueous waste will come in tankers. All trucks will have to comply with the road transport legislation and regulations. The closest part of the Cork Harbour SPA to the N28 is Monkstown Creek. The N28 is several hundred metres from Monkstown Creek. The L2545 is nearly 1km from the Cork Harbour SPA at Loughbeg. A release from a truck, which is on the road network and conveying material to the site, will not reach the Cork Harbour SPA or other Natura 2000 sites, so no effect on Natura 2000 sites will occur.

4.5 Emissions to air

Cork Harbour SPA

The effects on air quality from emissions are specifically addressed in **Appendix 11; Air Quality** of this NIS**.** It is concluded that, based on the results of air dispersion modelling of process emissions, the air quality effects of the proposed facility will be insignificant. This appraisal incorporated all significant potential cumulative effects.

Notwithstanding the low risk created by emissions, a theoretical pathway, which could impact on ecology, is the aerial deposition of chemicals with ecotoxicological properties such as dioxin or mercury onto marine sediments. Bioaccumulation of such deleterious chemicals could then potentially occur. Generally, the effects, if any, would affect fauna higher up the food chain such as piscivorous birds, some of which are listed as qualifying interests for the Cork Harbour SPA (Common Tern, Cormorant, Red Breasted Merganser, Little Grebe, Great Crested Grebe and Grey Heron). Effects on the Cork Harbour SPA as a result of air emissions and bioaccumulation, although highly unlikely, could potentially occur.

Great Island Channel cSAC, Ballycotton Bay SPA and Sovereign Islands SPA

As set out in **Appendix 11; Air Quality**, in relation to spatial effects*,* the modelling results, using both the USEPA regulatory model AERMOD and the more advanced CALPUFF model, indicate that the maximum ambient ground level concentration occurs at or near the facility's southern boundary. The spatial impact of the facility is limited with concentrations falling off rapidly away from the maximum peak. Therefore, no potential impact from emissions, or subsequently from bio-accumulation, on the Ballycotton Bay SPA or Sovereign Islands SPA can occur due to their distances (18.4km and 19.7km respectively) from the proposed development site and the low level of emissions proposed. The Great Island Channel cSAC is located approximately 5km from the proposed development and is designated on the basis of habitats rather than species. Thus, direct effects via bioaccumulation do not arise and potential impact from direct emissions on these designated sites can be ruled out.

4.6 Accidental Releases from fire during operation

Cork Harbour SPA

A Hazard Identification & Risk Assessment exercise (HAZID&RA) was carried out to identify all potential accident scenarios that could arise at each area of the site where dangerous substances are stored or handled (**Appendix 13; Hazard Identification and Risk Assessment**). This report was prepared as a follow up document to the previous studies that were carried out for the proposed facility, in 2001 and in 2008. On those occasions, the design and scope of the facility incorporated a wider range of waste materials and included a wider range of activities. One of the implications of this was that the Seveso Regulations applied to the previous site designs. However, for the current proposal, the scope of the site is different and it does not incorporate some of the elements from the previous design (e.g. a bulk storage tank farm for waste solvents or a waste drum storage area). As such the number of hazards at the site and the associated risks presented by the activity have been greatly reduced when compared with the previous assessments and so the Seveso Regulations no longer apply to the facility. This formal risk assessment exercise plays a key role for Indaver in demonstrating that the risks presented by the facility can be considered to be As Low As Reasonably Practicable (ALARP).

These Regulations do not apply because as the quantities of hazardous materials at the site will be below the thresholds set out under this legislation.

Each scenario was assigned a semi-quantitative Risk Rating, based on the findings of this analysis. The Risk Ratings were then compared with the various criteria established in the risk assessment methodology in order to determine the significance of the risks associated with each scenario.

Based on the findings of the HAZID exercise, there were no scenarios identified which presented a Priority Risk and there was one scenario which presented a Substantial Risk, which was the bunker fire scenario. A fire in the bunker will result in the emissions to air of the products of the combustion and thermal radiation. The risk associated with this scenario was considered by the HAZID Team to be ALARP, due to the variety of measures that are in place to protect against a fire scenario, either by reducing the likelihood of occurrence or mitigating the effects if it did occur. Contamination by fire water will not occur as the bunker and the recovery tanks will be designed as water retaining structures.

Whilst effects on the Cork Harbour SPA are considered unlikely, they cannot be entirely discounted due to the relative proximity of the proposed development site.

Great Island Channel cSAC, Ballycotton Bay SPA and Sovereign Islands SPA

No potential impact on the Ballycotton Bay SPA or Sovereign Islands SPA will occur due to their distance from of the proposed development site and the low levels of proposed emissions. The Great Island Channel cSAC is located approximately 5km from the proposed development site and is designated on the basis of robust estuarine habitats. No appreciable impact on the qualifying interests of this designated site will occur.

4.7 Disposal of bottom ash

Circa 52,664 tonnes per annum of bottom ash will be produced in the waste-to-energy plant. The bottom ash will consist of silicates, minerals and glass compounds. All trucks leaving the facility, carrying bottom ash, will be securely covered. The bottom ash is expected to be similar to the bottom ash from the Meath waste-to-energy facility.

It is the intention of Indaver to identify potential uses for the bottom ash. The reuse of this material would assist in Ireland's envisaged transition to a circular economy as laid down in stated European and national policy positions as all wastes including those that are unavoidable such as residues are regarded as being capable of being transformed into useful and valuable resources. Such reuse is also compatible with the principle of self-sufficiency as laid down in the Waste Framework Directive.

The manner in which this material may be treated and transported is dependent upon how this material is classified and characterised which may be hazardous or non-hazardous, and accordingly an assessment of each finding is outlined below. Commission Regulation (EU) No. 1357/2014 and Commission Decision 2014/955/EU is utilised to determine the manner in which bottom ash may be characterised as non-hazardous or hazardous.

Bottom Ash characterised as Non-hazardous

Bottom ash from waste incineration in EU countries, including the UK, Netherlands and Belgium, is processed for use as an aggregate in construction of roads or other large-scale projects. This processed material is known as incinerator bottom ash aggregate (IBAA).

There are currently a number of proposed bottom ash recovery developments in Ireland including Beauparc, Co. Meath and Drehid, Co. Kildare. However, if these developments are not available by the time that the proposed development commences operations, a number of alternate options may be availed of. These include sending this material to landfill for recovery or disposal and the export of the bottom ash for recovery.

Bottom ash characterised as Hazardous

Should bottom ash be found to be a hazardous waste, the above treatment options are still suitable as they physical nature and composition of the bottom ash would not have changed. However, in this instance the facility accepting the waste would have to be licensed to accept this type of hazardous waste.

Fifty-five loads per week of bottom ash will be removed from the site via standard covered trucks. The bottom ash will pose no risk to the Cork Harbour SPA during transport from the site as it is transported on the L2545, the N28 and onwards to its final destination on the road network. The closest part of the Cork Harbour SPA to the N28 is Monkstown Creek. The N28 is several hundred metres from Monkstown Creek. The L2545 is nearly 1km from the Cork Harbour SPA at Loughbeg. A release from a truck, which is on the road network and conveying bottom ash from the site, will not reach the SPA or have a negative effect on it. The bottom ash will be recovered or disposed of in a licensed landfill facility or recovered in an ash recovery plant in Ireland (if one has been constructed and licensed)) or exported to an ash recovery facility in Europe.

Any landfills utilised for bottom ash for recovery or disposal must be suitably licensed by the Environmental Protection Agency (EPA) for recovery or disposal operations as laid down in Article 23 of the Waste Framework Directive.

In addition, all landfills are required to comply with the requirements of the EIA Directive and therefore were subject to the EIA process prior to the acceptance of any material including bottom ash. This Directive on Environmental Assessment aims to provide a high level of protection of the environment and to contribute to the integration of environmental considerations into the development of projects such as landfills with a view to reducing their environmental impact.

Similarly, the existing licensing process which all landfills in Ireland are subject to, requires compliance with an ongoing environmental monitoring regime in the form of stringent licence conditions. The issuing of such licences by competent authorities pursuant to the requirements laid down in the Waste Framework Directive stipulate that all necessary safety and precautionary measures, monitoring and control operations and closure and after-care provisions must be included in the granting of all such licences.

Such conditions set out the legal constraints under which landfills must operate in order to ensure that all operations are conducted in compliance with the requirements of the Waste Framework and Landfill Directives and do not cause environmental pollution.

Such conditions include those concerning:

- leachate management;
- groundwater and surface water management;
- landfill gas management;
- odour prevention and control; and
- nuisance monitoring.

This comprehensive monitoring regime will ensure that material such as bottom ash when sent to landfill for recovery or disposal will not have a material environmental impact. In the

alternative, bottom ash may be exported to outlets in Europe which are already able to recover aggregates from bottom ash.

These outlets have also been subject to the requirements of the Waste Framework and EIA Directives and the EIA process of the relevant jurisdiction. As referred to above in the context of landfills, these outlets are also subject to a separate national licensing regime on an ongoing basis which is a constituent part of the European law framework as laid down in the Waste Framework Directive.

Where the export of this material would involve movement to another EU county, the requirements of Regulation (EC) No 1013/2006 of 2006 on shipments of waste would also need to be adhered to.

Should this option be availed of, the bottom ash would be stored on site in the ash hall building until there is enough for export in a bulk consignment. Due to the air handling and filter systems controlling the ventilation of this area, there is no difference between storing 300 to 500 tonnes of bottom ash and the 3,000 tonnes of ash stored prior to export by ship from Ringaskiddy Port. Covered trucks would bring the bottom ash from the site to the port for loading into the vessel, typically over a two or three day period in the same vehicles that would transport the material to a national treatment facility if it were available. This equates to just under six trucks per hour over a two day period, but these truck movements would be confined to the local road network between the Indaver site and Ringaskiddy Port. Hence, the effect on the wider road network of this would be reduced when compared to transporting to a national treatment facility.

Even in the event that an accident happened, and 3,000 tonnes of bottom ash was spilled into Cork harbour from the ship, the inert nature of bottom ash (whether classified administratively as hazardous or non-hazardous) and it's leachate characteristics (which are non-toxic to the aquatic environment), combined with the large diluting potential of Cork Harbour means that there would be no impact on the Cork Harbour SPA. In this context no potential adverse effects on Natura 2000 sites from the disposal of bottom ash have been identified.

4.8 Disposal of Boiler Ash and Flue Gas Cleaning Residues

Circa 2,000 tonnes per annum of boiler ash and circa 9,104 tonnes per annum of flue gas cleaning residues will be produced in the waste-to-energy plant. The boiler ash and flue gas cleaning residues will be in the form of fine particles and will contain heavy metals.

These residues will be sent for treatment to salt mines licensed to accept this type of waste in Northern Ireland or Germany for recovery, where the residues are solidified and used to back-fill the mine instead of using other raw materials. For both options, the regulation of the transport of the ash would be subject to Trans Frontier Shipment (TFS) licence which is a licence which must be approved by the origin/destination/transit authorities consenting to the movement/transit and acceptance of wastes between EU member states. The regulation

governing this is EU Regulation 1013/2006. This licence tracks waste from origin to destination and ensures that each authority is aware of the status of the waste until final recovery when the individual TFS notification annex consigned with each shipment is signed off as having been received and treated by the receiver. This completed licence is then circulated back to Indaver as the producer as well as all relevant authorities.

If exported to the salt mines in Germany, the residues will be collected on the site in sealed silos (See **Photo 1** below) and. emptied into specialised tanker vehicles via a sealed connection (See **Photo 2** below). This will ensure there are no fugitive releases on the site.

Two container truck loads per week of boiler ash and eight or nine container truck loads per week of flue gas cleaning residues will be removed from the site. The ash and residue containers will be taken to a port, loaded onto a ship and shipped to Rotterdam, or another container port in Europe. From the port of entry the containers will be transported by road to the final destination. The shipping containers used for such transport are designed and operated in line with international standards.

If the residues are sent for recovery in a Saltmine in Ireland, then the residues may be pre-treated on site prior to dispatch. The pre-treatment process will consist of a simple batch mixer which will mix water with the residues. They will be discharged into $1m^3$ FIBC bags to harden prior to dispatch off-site. The equipment will be located close to the flue gas residue silos within the main process building.

Photo 1 Sealed silos



Photo 2 Loading area and tanker



It is noted that the accident risk during shipping of the boiler ash and residues is low. Van Den Bosch are an international logistic services provider which transports such residues for Indaver. They note that in the 51 years of their history no container has ever fallen overboard, and no ship has sunk with their containers on board.

As noted above the addition of water leads to the residues solidifying. Thus, in event of a shipping accident and if the transport container were to lose integrity, the residues would solidify on contact with water and solidified residues will be salvaged from the sea bed.

Given the extremely low risk of an accident, the low risk of leakage from the transport containers, the fact that the residues will solidify on contact with water, no appreciable effects on Natura 2000 sites along the shipping route from the disposal of this material will occur.

4.9 Trans-boundary effects - Flue gas cleaning residues disposal, boiler ash and bottom ash in salt mine or landfill in Europe

As noted above, the transport and disposal and recovery of flue gas cleaning residues disposal, boiler ash and bottom ash does not constitute a risk to any designated Natura 2000 sites during transport.

The aforementioned salt mines in Germany and Northern Ireland are required to comply with the requirements of the EIA Directive and therefore were subject to the EIA process prior to the acceptance of any waste material. This Directive on Environmental Assessment aims to provide a high level of protection of the environment and to contribute to the integration of environmental considerations into the development of projects such as salt mines accepting hazardous waste with a view to reducing their environmental impact.

Similarly, the existing licensing process which all of these salt mines are subject to, requires compliance with an ongoing environmental monitoring regime in the form of stringent licence conditions. The issuing of such licences by competent authorities pursuant to the requirements laid down in the Waste Framework Directive stipulate that all necessary safety and precautionary measures, monitoring and control operations and closure and after-care provisions must be included in the granting of all such licences.

Such conditions set out the legal constraints under which salt mines must operate in order to ensure that all operations are conducted in compliance with the requirements of the Waste Framework and Landfill Directives and do not cause environmental pollution.

If exported to another European country, the method of transport for bottom ash would be by ship and in bulk in consignments of 3,000 tonnes per shipment. The likely shipping route would be from Cork Port to Rotterdam. In the event of an accident during transport of the bottom ash at sea, the loss of the material to the seabed would not have a significant effect as the leachability of the bottom ash is low and it mainly constitutes, ferrous & non-ferrous metals, silicates (sand-type material) and inert material such as ceramics, glass and stones.

The facilities that the bottom ash would be sent for recovery have also been subject to the requirements of the Waste Framework and EIA Directives and the EIA process of the relevant jurisdiction. These outlets are also subject to a separate national licensing regime on an ongoing basis which is a constituent part of the European law framework as laid down in the Waste Framework Directive.

The German authorities are subject to current EU legislation including the Habitats Directive, which requires the consent authority for any project which has the potential to have a negative effect on a Natura 2000 site, and which is not directly connected with or necessary to the management of the site, to undertake an appropriate assessment. The Hattorf facility, which

is the proposed final destination of the flue gas residues from Ringaskiddy, has been approved by the relevant competent authority. The letter of confirmation is attached as **Appendix 18; Letter of Confirmation from Hattorf Facility**. There will be no significant effects on Natura 2000 sites from disposal of these residues.

4.10 Increased predator density or activity or changes in predator behaviour.

Local ecological effects could arise due to increased predator activity if species such as rats or gull species were attracted into the local area due to the presence of waste. Both species can predate on nests for ground nesting birds such as Common Tern. It is noted that trucks with municipal solid waste discharge their loads within a sealed building and that there will no storage of waste in outside spaces. Trucks are inspected on arrival to ensure that there is no waste adhering to wheels. A standard pest control programme will be implemented at the site. It is also noted that the closest nesting colony of high conservation value (Common Terns) is located approximately 750m away from the Indaver site. This colony is not located within a Natura 2000 site. There will be no ledges suitable for predatory species on the proposed stack. Under these circumstances, no significant effect on birds listed as special conservation interests or the conservation objectives for the Cork Harbour SPA will occur.

Likewise, there will be no significant effects on the qualifying interests or conservation objectives for the Ballycotton Bay SPA, Great Island Channel cSAC or Sovereign Islands SPA.

4.11 Impact from flooding and erosion and possible effects from climate change

Flooding of the site could introduce deleterious chemical substances into surface water with the potential effects on the marine environment. Coastal erosion could lead to structural damage. The project has been specifically designed to minimise such risks and resilience to climate change has been built into the project design as follows.

Site levels within the Indaver site

The ground levels of the Indaver site will be raised to alleviate localised flooding issues. Based on the precautionary principle, climate change scenarios have been considered in the modification of levels and the site design. The minimum levels of the site will be raised to 4.55m OD. This level will offer a very high standard of flood protection to the site. For climate change, the OPW Draft Guidance on the “Assessment of potential future scenarios for Flood Risk Management” suggests the use of two scenarios; a mid-range future scenario (MRFS) and a high end future scenario (HEFS). The MRFS represents a likely future scenario which is within the bounds of the widely accepted projections. The HEFS is a more extreme, but plausible future event, and is within the upper bounds of the widely accepted projections. The proposed 1.05m allowance for climate change allows for the high end future scenario. It was decided to use an even more conservative site flood defence level of 4.55m OD given that that a number of recent developments close to the site in Ringaskiddy (UCC ERI Beaufort

Research Facility) have already utilised this level. The 4.55m OD level will offer a very high standard of flood protection to the site. The ground floor level of most of the waste-to-energy plant will be at 5mOD. The floor level of the bunker will be 0mOD. The bunker, and any tanks constructed below 5mOD, will be of watertight concrete construction and will be impermeable.

Beach nourishment Scheme

The coastline, which forms the eastern boundary of the site, was found to have eroded over the past 100 years at varying rates. Rates identified from historical datasets have been extrapolated to give future conservative retreat rates of up to 36 or 55m over 100 years.

The proposed waste-to energy facility, with a design life of 25 to 30 years, has been located far enough away from the edge of the cliff to ensure that the development will not be impacted by the predicted retreat rates over the 25 – 30 design life. The possibility of impact in a further 30 year period would need to be assessed at the time of considering any application to extend the life of the facility. Never the less, it is proposed that approximately 1,100m^3 of sacrificial material, comprising shingle of appropriate size and rounded shape, will be deposited on the beach in the area extending from the car park at the north-eastern corner to the southern boundary of the Indaver site.

The sacrificial material has been designed to remain on site and help lower the natural erosion rate over a number of years. However, the length of time that the material remains in place will depend on the occurrence of extreme wave events which are impossible to forecast. The sacrificial material and the cliff face will be monitored, and the sacrificial material will be replenished as required

The proposed protection measures are a soft solution and will not significantly affect the adjoining areas of coastline in the vicinity of the site. The net coastal sediment transport will go from south to north according to wind conditions and swell. Therefore, the material is likely to move towards the north in the medium and long term. The Cork Harbour Special Protection Area (SPA) is located to the south west of the site. The sacrificial material will not impact on the SPA.

L2545 Road Upgrade

The principal design objective for the upgrade of the L2545 road is to improve the surface water drainage so that the road does not flood after prolonged rainfall and to raise the level of the road above the 1:200 year tidal event and to allow for climate change. The proposed road drainage network upgrade will extend along the entire northern boundary of the Indaver site. It has been designed to cater for the 6.5 hours when the storm water outfall is tide locked and a 1 in 100 year rainfall event plus an allowance for climate change. The increased storage will be in the form of oversized pipes placed underneath the road.

Grid Connection

The proposed development will be connected to the 38kV substation, which is located on the eastern side of the Hammond Lane premises, adjacent to the Indaver site. The connection will be via an underground trench.

Raising the level of the Western Field

The levels of a portion of the western field, i.e. the field which lies to the west of the entrance Hammond Lane premises, will be raised above the one in 200 year flood level to 4.55m OD.

Conclusions: Impact from flooding and erosion and possible effects from climate change

There will be no significant potential impact due to flooding or coastal erosion on the qualifying interests and conservation objectives for the Cork Harbour SPA, Ballycotton Bay SPA, Great Island Channel cSAC or Sovereign Islands SPA due to their distance from the proposed development site and the absence of significant predicted effects. It is noted that that measures have been out in place to prevent erosion and flooding. Thus, the proposed development will prevent erosion and flooding that would otherwise occur.

4.12 Potential effects from engineered nanoparticles

During the ABP planning oral hearing for the previous planning application (2016), supplemental information was requested by Dr. Jervis Good of the National Parks and Wildlife Service (NPWS, Department of the Arts, Heritage and the Gaeltacht) in relation to possible effects from engineered nanoparticles. A literature review on nanoparticles was submitted to ABP during the oral hearing and is also included as **Appendix 20; Supplemental report to the NIS for a proposed Resource Recovery Centre and associated works at Ringaskiddy, Co. Cork** of this report.

The NPWS submission, recommended that a review of the scientific literature on effects of engineered nanoparticles likely to originate from the proposed waste to energy facility (incinerator) is undertaken, and an assessment of their potential effects on Cork Harbour SPA be included as a supplement to the Natura Impact Statement (NIS). There are two possible pathways by which engineered nanoparticles, from the waste to energy facility (incinerator), could enter the environment and have a potential impact on a Natura 2000 site. One possible pathway is via emissions to air from the stack. The other possible pathway is via the flue gas cleaning residues if there was a spillage during transport or disposal.

As request a review of the scientific literature was carried and is included as **Appendix 20; Supplemental report to the NIS for a proposed Resource Recovery Centre and associated works at Ringaskiddy, Co. Cork** of this report. This report concluded the following

A literature review (Section 2) indicates that engineered nanoparticles could theoretically impact on marine macro-invertebrates and fish, including species which may form part of the

diet of birds listed as features of interest for the Cork Harbour SPA. At the present time however, there is no clear scientific evidence which indicates that the levels of nanoparticles likely to realistically occur in the existing environment represent a significant risk to birds feeding on macro-invertebrates in estuarine sediments or to piscivorous birds listed as features of interest for the Cork Harbour SPA. A literature review (Section 3) on nanoparticle emissions from Waste-To-Energy facilities concluded that the use of a fabric filter in the flue gas treatment systems leads to very low levels of engineered nanoparticles in air emissions. The air emissions from the facility are not predicted to be a significant source of engineered nanoparticles and it is further noted that the Cork Harbour SPA is located 0.5km from the proposed facility at its closest point.

Nanoparticles will be present in flue gas residues. It was concluded by the NIS (Section 5 above) that the risk of accidental release of flue gas residues during transport is not considered significant and this potential impact was screened out in the NIS. There will be no process aqueous discharges from the facility. The only aqueous discharges to the marine environment during construction or operation will be surface water and there will be no pathway for engineered nanoparticles to enter the surface water. There is no direct pathway to water, it is indirect and the particle concentrations in air associated with the waste to energy plant are effectively insignificant when compared with background. Particles in air may over time deposit on water but in this case the water body is Cork Harbour with a daily tidal flux of some 57 million m3/day, providing many orders of magnitude dilution of any particles depositing on water. For the receptor to be impacted there needs to be a significant concentration of particles in the water. From literature it is indicated that significant effects are most likely to occur at the mg/l level, whereas with the available dilution and the insignificantly small emission, it is not possible that the mg/l levels could ever be reached. Therefore, the potential for significant effects on prey items for birds within the Cork Harbour SPA from engineered nanoparticles is considered extremely remote for the foreseeable future. Following on from this comprehensive assessment of the potential effects on the qualifying interests and conservation objectives for Natura 2000 sites, it has been concluded that the proposed development will not have an adverse effect on the integrity of any Natura 2000 sites including the Cork Harbour SPA.

Thus, no significant potential impact from nanoparticles arising from the proposed facility has been identified for the Cork Harbour SPA, Great Island Channel cSAC, Ballycotton Bay SPA and Sovereign Islands SPA.

4.13 Potential Cumulative effects

Cumulative effects refer to a series of individual effects that may, in combination, produce a significant impact. The underlying intention of this in combination provision is to take account of cumulative effects from existing or proposed plans and projects and these will often only occur over time. There are a large number of active facilities and proposed developments within the Cork Harbour area which were taken into consideration as part of the assessment process. These include the following:

- Hammond Lane Metal Company Ltd. – now operating under a IE licence. No planned expansion. The existing Hammond Lane Metal Company is accessed from the N28 and is surrounded by the Indaver site. There is existing noise and activity associated with the site.
- 3MW Wind turbines – Currently in the Cork Lower Harbour there are four operational wind and one with planning permission. Each turbine has a maximum rotor tip height of 150m. The closest turbine is located approximately 400m south of the proposed stack for the Ringaskiddy Resource Recovery centre at the DePuy facility (Loughbeg). The other wind turbines are located at DePury (Loughbeg), GlaxoSmithKline (Curraghbinny) and at Janssen (Barnahely), located 1km, 1.7km and 2.5km from the proposed Indaver stack, respectively.
- ESB Aghada Power Station/BGE Power Station – Approximately 5km east of the proposed development is the ESB Power Station Stack, at Whitegate, with a height of 152m.
- Bord Gáis Eireann (BGE) Power Station Whitegate - Approximately 4km from the site of the proposed Ringaskiddy Resources Recovery Centre.
- Port of Cork - The Port of Cork redevelopment will be located approximately 700m from the proposed development. Increased noise and disturbance are likely to occur during development and operation of this facility. This is due for completion in 2020.
- M28 Cork to Ringaskiddy Motorway Scheme - Cork County Council, in association with the Transport Infrastructure Ireland (TII), plans to construct a new M28 motorway from the Bloomfield Interchange, near Douglas, to Ringaskiddy. Planning was granted for the scheme in 2018 (PL04.HA0053) however the project remains in the planning process at the time of writing this EIAR
- Cork Lower Harbour Main Drainage Scheme - Irish Water has completed construction of a new municipal sewage treatment plant at Shanbally, Ringaskiddy, for the Cork Lower Harbour Main Drainage Scheme. The plant has been operational since December 2016.
- Haulbowline Island Remediation Project, – The Ispat steel manufacturing facility, located adjacent to the naval base on Haulbowline Island, ceased operation in 2001 and the buildings on the site have been demolished. Remediation works complete, landscaping due to be complete in 2019 and park to be open to the public by May 2019.
- Spike Island – masterplan in place since 2012 but further no planned/permitted projects. Increased boat traffic to Spike Island and increased activity on the island, which is separated from the Indaver site by a 770m channel, could potentially impact on bird populations.
- The National Maritime College of Ireland/UCC ERI Beufort Building - The National Maritime College of Ireland (NMCI) aims to deliver research and enterprise campus in Ringaskiddy, Cork. Construction of the Beaufort Building was completed by UCC in

2015. It is proposed to expand the campus and to develop a marine and energy cluster focussing on research, development, commercialisation and innovation.

- The Island Crematorium – in operation.
- Irish Naval Service base, Haulbowline Island – in operation.
- Cork Lower Harbour Drainage Scheme – WwTP complete, other associated upgrade works (pump stations, pipelines) ongoing. Due to complete in 2019.
- Residential Developments - No planned/permitted projects.
- Amenity Developments in Ringaskiddy.
- Ferry and Cruise Ship Business.
- Pharmaceutical and Medical Device Manufactures.
- Other planned/permitted projects: (to be listed but stated that the construction/operation timelines are unknown).
- BioMarin - (PA No. 186603) extension to manufacturing building. Decision due 28 Nov 2018.
- GE Healthcare Life Science BioPark – (PL04 .248154) Planning granted. To be located in Barnahely.
- Pfizer Ireland - PA Ref 16/6937: Granted in Jan 2017.
- Novartis - No. of permitted projects including the permitted wind turbine.
- Local projects associated with the Community Gain Fund required by planning condition 18 of the ABP Planning Permission, May 2018.

There will be no significant potential cumulative impact due to flooding or coastal erosion on the qualifying interests and conservation objectives for the Ballycotton Bay SPA, Great Island Channel cSAC or Sovereign Islands SPA due to their distance from the proposed development site and the absence of significant potential effects. Potential cumulative effects in respect of the Cork Harbour SPA are addressed where relevant in **Section 7** of the NIS.

5. Description of receiving environment

5.1 Natura 2000 sites

In accordance with the European Commission Methodological Guidance (EC2001), a list of Natura 2000 Sites that can be potentially affected by the proposed project has been complied. All candidate SAC's (cSAC) and SPAs sites within a 20km radius of the proposed development have been identified at **Table 1**. It is noted that use of a 20km radius is a precautionary measure, as significant effects at this distance from the proposed development will not occur, even under abnormal operating conditions and in the absence of mitigation, due to the absence of significant aqueous emissions to the marine environment or effects from air emissions

Table 1: Designated sites within 20km

Designated site	Distance from site of proposed development
Candidate SAC sites	
Great Island Channel candidate Special Area of Conservation (Site code 001058)	Approximately 5 km north
SPA sites	
Cork Harbour Special Protection Area (Site code 004030)	Approximately 0.5 km south
Ballycotton Bay Special Protection Area (Site code 004022)	Approximately 18.4km east
Sovereign Islands SPA (Site code 004124)	Approximately 19.7km southwest

5.2 Qualifying interests

The qualifying interests for the Great Island Channel cSAC, Cork Harbour SPA and Ballycotton Bay SPA and Sovereign Islands SPA and the relevant conservation objectives are listed in **Tables 2, 3, 4 and 5** respectively. Full site synopses for all European Sites are included in **Appendix 19** of this report.

Table 2: Qualifying interests for the Great Island Channel SAC (001058)

Habitat Code	Habitat	Conservation objectives
1140	Mudflats and sandflats not covered by seawater at low tide	Maintain
1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	Restore

Table 3: List of qualifying interests under the EU Birds Directive for Cork Harbour SPA 004030

Annex of EU Birds Directive	Common Name	Scientific name	Conservation objectives
N/A	Cormorant	*Phalacrocorax carbo*	Maintain
N/A	Shelduck	*Tadorna tadorna*	Maintain

Annex of EU Birds Directive	Common Name	Scientific name	Conservation objectives
N/A	Oystercatcher	*Haematopus ostralegus*	Maintain
Annex 1	Golden Plover	*Pliuvialis apricaria*	Maintain
N/A	Lapwing	*Vanellus vanellus*	Maintain
N/A	Dunlin	*Calidris alpine*	Maintain
N/A	Black-tailed godwit	*Limosa limosa*	Maintain
N/A	Bar-tailed godwit	*Limosa lapponica*	Maintain
N/A	Curlew	*Numenius arquata*	Maintain
N/A	Redshank	*Tringa tetanus*	Maintain
N/A	Greenshank	*Tringa nebularia*	Maintain
Annex 1	Common tern	*Sterna hirundo*	Maintain
N/A	Little grebe	*Tachybaptus ruficollis*	Maintain
N/A	Great crested grebe	*Podiceps cirstatus*	Maintain
N/A	Grey heron	*Ardea cinerea*	Maintain
N/A	Wigeon	*Anas Penelope*	Maintain
N/A	Teal	*Anas crecca*	Maintain
N/A	Pintail	*Anas acuta*	Maintain
N/A	Shoveler	*Anas clypeata*	Maintain
N/A	Red-breasted merganser	*Mergus serrator*	Maintain
N/A	Grey plover	*Pliuvialis sqyuatarola*	Maintain
N/A	Black-headed gull	*Larus ribundus*	Maintain
N/A	Common gull	*Larus canus*	Maintain
N/A	Lesser black-backed gull	*Larus fuscus*	Maintain
	Wetlands		

Table 4: List of qualifying interests under the EU Birds Directive for Ballycotton Bay SPA (Site Code 004022)

Annex of EU Birds Directive	Common Name	Scientific name	Conservation Objectives
N/A	Teal	*Anas crecca*	**Objective 1:** To maintain the favourable conservation condition of the non-breeding waterbird Special Conservation Interest species listed for Ballycotton Bay SPA. **Objective 2:** To maintain the favourable conservation condition of the wetland habitat at Ballycotton Bay SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.
N/A	Ringed Plover	*Charadrius hiaticula*	
Annex 1	Golden Plover	*Pliuvialis apricaria*	
N/A	Grey plover	*Pliuvialis sqyuatarola*	
N/A	Lapwing	*Vanellus vanellus*	
N/A	Black-tailed Godwit	*Limosa limosa*	
N/A	Bar-tailed Godwit	*Limosa lapponica*	
N/A	Curlew	*Numenius arquata*	
N/A	Turnstone	*Arenaria interpres*	
N/A	Common gull	*Larus canus*	
N/A	Lesser Black-backed gull	*Larus fuscus*	
	Wetlands		

Table 5. List of qualifying interests under the EU Birds Directive for Sovereign Islands SPA (Site code 004124)

Annex of EU Birds Directive	Common Name	Scientific name	Conservation Objecitve
N/A	Cormorant	*Phalacrocorax carbo*	To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA

Appendix 10 Biodiversity of this NIS details the ecological baseline of the proposed development site based on direct surveys of the entire Indaver site and surrounding area and a review of desktop data. A flora and fauna report were prepared previously by the Aquatic Services Unit, University College Cork in 2001 for an EIS for the Indaver Ireland planning application for a Waste Management Facility at this location. DixonBrosnan previously prepared the Flora and Fauna chapters for similar EISs submitted in 2008 and an addendum to the EIS prepared in 2010.

In addition to the baseline surveys carried out for previous applications, the following surveys were carried out in 2014/2015:

- Habitat mapping;
- Surveys of wintering birds;
- Breeding birds surveys;
- Common Tern breeding survey;
- Mammals, with a particular emphasis on badger, otter and bats;
- Intertidal survey.

Further surveys were carried out in October and November 2018 and May 2019 as follows:

- Habitat mapping;
- Mammals, with a particular emphasis on badger, otter and bats;
- Invasive species;
- Breeding birds.

5.3 Annex I Habitats

5.3.1 Terrestrial habitats

Terrestrial habitat mapping was carried out in line with the methodology outlined in the Heritage Council publication *Best Practice Guidance for Habitat Survey and Mapping* (Heritage Council, 2011) in 2014 and 2015, 2018 and 2019. All habitats within the study area were classified to level 3 of the classification scheme outlined in *A Guide to Habitats in Ireland* (Fossit, 2000) and cross-referenced with habitats listed under Annex I of the Habitats Directive.

Due to an absence of agricultural management, a high proportion of the study area, including the proposed development site, is covered in scrub which has become more dominant over time. Some areas of Japanese Knotweed were recorded outside the proposed development footprint. These areas have been monitored and treated since 2017. As part of the ongoing management of the infestation at the Indaver site boundary, the site was resurveyed in May 2019 and treatment will continue. The monitoring and treatment will continue up to the start of construction on site and thereafter until construction is complete.

As detailed in **Appendix 10; Biodiversity**, the following habitats were recorded within the entire Indaver landholding in May 2019: Hedgerow WL1/Treelines WL2, Dry meadow and grassy verge GS2/Wet grassland GS4,Scrub WS1, Broadleaved woodland WD1, Improved agricultural grassland GA1, Conifer woodland WD3, Dense bracken HD1, Arable crops BC1/Recolonising bare ground ED3, Recolonising bare ground ED3 and Spoil and Bare Ground ED2. These habitats are considered of are of low ecological value and do not correspond to Annex I habitats or qualifying habitats within the local Natura 2000 sites.

5.3.2 Marine Habitats

A survey of the intertidal area in proximity to the proposed development was carried out by Dr. Stiofan Creaven in June 2015. The survey report is included in **Appendix 17; Marine Habitat Survey** of the NIS. The marine flora and fauna were examined with survey effort timed to correspond with low water on a Spring tide when as much of the shore as possible is exposed. The survey classified the habitats encountered during the survey as follows:

- The upper shore here can be classed as Barren Littoral Shingle (EUNIS habitat code A2.111).
- Bedrock and boulders were found scattered throughout the mid and lower shore. Vertical surfaces on these were characterised by a barnacle-limpet community (EUNIS habitat code A1.1131).
- Boulder tops, dominated by *Fucus spiralis*, can be classified as *Fucus spiralis* on sheltered upper eulittoral rock (EUNIS habitat code A1.312). In summer, the green alga *Ulva intestinalis* can become very common – as seen on the shore at Ringaskiddy. Vertical surfaces often lack the fucoid cover and are characterised by the barnacle-limpet community (EUNIS habitat code A1.1131) also seen on this beach.
- The presence of a substantial deposit of decaying algal matter in the mid shore complicates the allocation of a habitat type to this zone though the floral and faunal community encountered closely resembles *Fucus vesiculosus* on variable salinity mid eulittoral boulders and stable mixed substrata (EUNIS habitat code A1.323). The presence of ephemeral seaweeds (green algae here) occupying available space and patches of sediment found between the hard substrata containing the lugworm *Arenicola marina* and the sand mason *Lanice conchilega*, support this classification. The exposure level of this shore probably changes seasonally from sheltered to moderately exposed/exposed during storm events.

- The lower shore is characterised by littoral muddy sands with the habitat falling into a Polychaete/Bivalve-dominated muddy sand shore (EUNIS habitat code A2.24). Based on analysis of infaunal samples taken during the transects, this most closely resembles a *Macoma balthica* and *Arenicola marina* in muddy sand shores biotope (EUNIS habitat code A2.241) though with *Abra* present instead of *Macoma*. It also has elements of *Lanice conchilega* in littoral sand (EUNIS habitat code A2.245).

An attempt was made to obtain faunal samples at all stations visited. This effort was successful at two stations. The assemblage recorded is close to the EUNIS LS.LSa.MuSa.Lan *Lanice conchilega* in littoral sand grouping but instead of *Macoma balthica*, *Abra* is present. (EUNIS code A2.24 – Polychaete/bivalve dominated muddy sand shores). The common cockle (*Cerastoderma edule*) was also present here.

The report concluded that these habitats are all commonly encountered in an Irish context. Samples were faunally poor with only ten taxa present. All species found are typical of fine-grained sediments of the North East Atlantic. No rare or uncommon species were recorded.

5.4 Annex II Species

5.4.1 Birds

A detailed bird survey report is included as **Appendix 10; Biodiversity**. Information on birds is summarised below. It is noted that certain surveys were not repeated in 2018/2019. In respect of winter bird counts, it was concluded by previous surveys that the habitats in proximity to the site are not of high value for wintering birds and in the absence of any changes in such habitats, as determined by a walk over survey, it was concluded that no significant changes in usage by winter birds will have occurred. Likewise, in respect of intertidal surveys no significant changes in habitat type will have occurred since the previous surveys and a repeat survey was not considered necessary. It is also noted that no direct effects on intertidal habitats are proposed. It is also noted that a previous survey of Common Tern breeding at Cork Port was previously carried out. This colony is located 750m from the proposed development area, will not be affected and no repeat survey for this species was considered necessary.

Breeding Bird and site usage

Breeding bird surveys were carried out by DixonBrosnan during May 2008 using transect and point count methods. A total of 35 bird species were recorded during site visits. These results were largely comparable with those from surveys carried out at the same site in 2001. A breeding bird survey was carried also carried out by DixonBrosnan in May and June 2010 covering the area of shoreline potentially affected by coastal works and adjoining areas of habitat. Areas of scrub and grassland was found to support a mixture of typical countryside birds including Chaffinch, Willow Warbler, Wood Pigeon, Blackbird and corvid species.

As the coastal area in proximity to the site does not have extensive mudflats, there was a preponderance of species associated with rocky/shingle shore habitats. Such species include Rock Pipit, Ringed Plover and Oystercatcher. Other species noted include piscivorous species such as Common Tern, Cormorant, Grey Heron and Little Egret. Four gull species namely

Herring Gull, Greater Blackbacked Gull, Common Gull and Blackheaded Gull were also recorded.

Of the species recorded during the survey, six species (Oystercatcher, Cormorant Common Tern, Grey Heron, Blackheaded Gull and Common Gull) are listed as birds of special conservation interest for the Cork Harbour SPA.

Certain bird species are listed by BirdWatch Ireland as Birds of Conservation Concern in Ireland (Lynas *et al.,* 2007). Red List bird species are of high conservation concern, and Amber List species are of medium conservation concern. Two Red Listed species were recorded (Herring Gull and Black Headed Gull) and five amber listed species were recorded. (Swallow, Starling, Greater Black-Backed Gull, Cormorant and Common Gull).

In 2015, further breeding bird surveys were undertaken over three visits in May and June using a adapted version of the British Trust for Ornithology's (BTO) Common Bird Census Technique (Bibby *et al*., 2000 & Gilbert *et al*., 1998), with aspects of species specific survey methodologies employed where required (Gilbert *et al*., 1998). More detail on the methodology and the results are provided in **Appendix 10; Bird Survey Reports**.

A total of 28 species were recorded in the breeding bird survey in 2015. However, it was noted that not all of these species were breeding within the site. The results indicate that the bird community using the site was similar to that recorded previously. The reduction in bird species diversity (35 species in 2008 in comparison to 28 species in 2015) may have been due to increased dominance of scrub and a reduction in areas of semi-natural grassland.

A survey for breeding birds was also carried out in May 2019 to ascertain if usage patterns within the site had changed in the intervening period. A total of 28 species were recorded within the proposed development site. Three species were definitely breeding within the site (starling, song thrush and magpie) a further 10 species were probably breeding, 7 were possibly breeding, while the remaining 8 species were not breeding. It was concluded that the habitats to be affected are generally considered of local value and are not uncommon in the wider landscape. The nature conservation value of the breeding bird assemblage onsite is considered to be of ‘local’ value.

Survey of Common Tern-breeding

A breeding population of Common Tern is known to occur near the entrance to the Port of Cork approximately 750m from the proposed development area. A previous survey for the Ringaskiddy Port Redevelopment EIS (Port of Cork/RPS, 2014) recorded 45-50 breeding pairs on concrete structures (dolphins) adjacent to the entrance of the Port of Cork. DixonBrosnan resurveyed this Common Tern breeding colony over three days in May and June 2015, as this is the most significant breeding bird colony in the surrounding landscape. Approximately 50-55 breeding pairs were recorded (mean 53 breeding pairs).

Winter bird surveys

The winter bird surveys were undertaken on six dates between October 2014 and March 2015 (refer to **Appendix 10; Bird Survey Reports.**). The survey methodology was based on that used by the British Trust for Ornithology's (BTO) Wetland Bird Survey (WeBS) and also that for the Irish Wetland Bird Survey (I-WeBS). Ninety-minute counts were undertaken monthly at either high tide, mid tide and low tide. Survey vantage point locations for the winter bird counts are shown in **Appendix 10; Bird Survey Reports.** It was concluded by these surveys that the habitats in proximity to the site are not of high value for wintering birds and in the absence of any changes in such habitats in 2018 as determined by a walk over survey, it was concluded that no significant changes in usage by winter birds will have occurred.

A total of 38 bird species were recorded during the 2014/2015 winter bird surveys as detailed below in **Table 6**. It is noted that many of these birds were recorded overflying the channel, and that the survey covered a radius of approximately 300m from each vantage point. Five species (Mediterranean Gull, Dunlin, Little Egret, Great Northern Diver and Common Tern) are listed on Annex I of the Birds Directive. Certain bird species are listed by BirdWatch Ireland as Birds of Conservation Concern in Ireland. Red List bird species are of high conservation concern and the Amber List species are of medium conservation. Six red listed species were recorded namely Herring Gull, Curlew, Redshank, Black-Headed Gull, Dunlin and Knot.

The closest Special Protection Area (SPA) is the Cork Harbour SPA (Site Code 004030). A total of thirteen species listed as qualifying interests for the Cork Harbour SPA were recorded, namely, Cormorant, Oystercatcher, Dunlin, Curlew, Redshank, Greenshank, Great Crested Grebe, Grey Heron, Teal, Black-headed Gull, Common Gull, Lesser Black-backed Gull and Common Tern.

Winter roost cormorant

A night-time tree-roosting Cormorant survey was undertaken within Monkstown Creek during the 2011/12 and 2013/14 wintering seasons as part of the Ringaskiddy Port Redevelopment, Environmental Impact Statement (Port of Cork, 2014). The surveys recorded that during both wintering periods the Monkstown Creek tree-roost regularly supported nationally important numbers of roosting Cormorants. The number of cormorants using the Monkstown Creek tree-roost rose through late summer and autumn, peaking in October/November. The total peak number of birds recorded using the tree-roost was 334 birds, representing 2.45% of the most recently published Irish wintering population of 13,710 and 54.19% of the Cork Harbour SPA qualifying population at the time of designation (620 wintering individuals). The peak count also represents 133% of the most recently 5-year mean for Cork Harbour (252 individuals). The closest site, included within this night-time tree-roosting Cormorant survey, is located 1km from the proposed development area within the Indaver site.

Table 6: Winter bird counts results

Species	High tide count	Mid tide count	Low tide count
Oystercatcher	20	52	109
Black headed Gull		3	53
Herring Gull		4	17

Black Guillemot			3
Lesser Blackbacked gull	3	1	6
Cormorant	9	9	14
Common Gull	10	27	64
Redshank	2	4	11
Curlew		4	7
Mallard	3		
Glaucous Gull	1	1	5
Grey Heron	1	3	10
Hooded Crow	9	9	28
Wood Pigeon	23	3	12
Rook	234	31	10
Blackbird	2		8
Robin			2
Tree Sparrow	6		
Thrush		1	
Little Egret		4	7
Greater Black backed Gull	3	6	2
Greenshank		3	14
Mediterranean Gull			1
Teal			4
Great Crested Grebe		1	2
Brent Goose		69	107
Sanderling		2	
Goldfinch	1		2
Grey Wagtail	1	2	7
Meadow Pipit		1	2
Wren			1
Blue Tit		1	3
Turnstone			4
Knot			4
Great Northern Diver	2	1	1
Dunlin		225	
Jackdaw	7		
Starling		30	

Birds summary

Overall, the study area is of local value for a range of terrestrial bird species that are relatively common in the Irish countryside. The study area is of more value than the intensively agriculturally managed land in this area due to the presence of a greater diversity of habitats and semi-natural habitat. These have arisen due to an absence of active management of parts of the site. However, the study area does not support a community of birds or individual species that would be considered of significant conservation value, and the study area, which is small, does not provide critical resources for such communities and/or species.

The coastal area adjoining the site consists primarily of rock and shingle, and therefore does not support the high numbers of wintering waders that are characteristic of high value mudflats

with high densities of macro-invertebrates. Some species that are considered of high conservation value (Annex I of the Birds Directive, qualifying species for the Cork Harbour SPA and Red List) were noted in this general area. Many of these birds were recorded overflying the channel, and the site itself and the shoreline adjoining the site, did not support high numbers of these species.

6. Stage 1 Appropriate Assessment Screening

6.1 Identification of Relevant Natura 2000 Sites and Qualifying Interests/Special Conservation Interests

Adopting a precautionary principle, the Natura 2000 sites within 20km of the works were included in this assessment (**Table 7**). Of these, the Natura 2000 sites deemed relevant and screened in for Appropriate Assessment are those which have Conservations Objectives or Qualifying Interests (QIs)/Special Conservation Interests (SCIs) which may be impacted by the proposed works. The potential effects are discussed in detail in **Section 4** of this report. Those sites or individual qualifying interests that are screened out for Appropriate Assessment and require no further assessment at this stage are not assessed further. Sites/QIs/SCIs that are screened in for further assessment are highlighted in **Table 7**.

Table 7: Identification of relevant Natura 2000 sites. All those screened in for AA are highlighted (in bold)

Natura 2000 site	Qualifying Interest	Distance from proposed pipeline route (approx.)	Potential effects	Screened In/Out
Cork Harbour Special Protection Area (Site code 004030)*	Cormorant *Phalacrocorax carbo*	**0.5km**	Disturbance/displacement of birds listed as qualifying interests for the Cork Harbour SPA where they occur outside the SPA boundary including potential cumulative effects Collision risk for birds listed as qualifying interests for the Cork Harbour SPA where they occur outside the SPA boundary including potential cumulative effects Accidental Releases from the Site During the Construction Phase including cumulative effects Accidental Releases from fire during operation including cumulative effects Bioaccumulation and effects on piscivorous birds from air emissions of mercury and dioxins	**Screened In**
	Shelduck *Tadorna tadorna*			**Screened In**
	Oystercatcher *Haematopus ostralegus*			**Screened In**
	Golden Plover *Pliuvialis apricaria*			**Screened In**
	Dunlin *Calidris alpine*			**Screened In**
	Lapwing *Vanellus vanellus*			**Screened In**
	Black-tailed godwit *Limosa limosa*			**Screened In**
	Bar-tailed godwit *Limosa lapponica*			**Screened In**
	Curlew *Numenius arquata*			**Screened In**
	Redshank *Tringa tetanus*			**Screened In**
	Greenshank *Tringa nebularia*			**Screened In**
	Common tern *Sterna hirundo*			**Screened In**
	Little grebe *Tachybaptus ruficollis*			**Screened In**
	Great crested grebe *Podiceps cirstatus*			**Screened In**
	Grey heron *Ardea cinerea*			**Screened In**
	Wigeon *Anas Penelope*			**Screened In**
	Teal *Anas crecca*			**Screened In**
	Pintail *Anas acuta*			**Screened In**
	Shoveler *Anas clypeata*			**Screened In**
	Red-breasted merganser *Mergus serrator*			**Screened In**
	Grey plover *Pliuvialis sqyuatarola*			**Screened In**
	Black-headed gull *Larus ribundus*			**Screened In**
	Common gull *Larus canus*			**Screened In**
	Lesser black-backed gull *Larus fuscus*			**Screened In**
	Wetlands			**Screened In**
Great Island Channel candidate Special Area of	Mudflats and sandflats not covered by seawater at low tide [1140]	5km	No pathway exists due to robust nature of estuarine habitats, the absence of significant aqueous or air emissions and the dilution provided in the estuarine environment	**Screened Out**
	Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]			**Screened Out**

Natura 2000 site	Qualifying Interest	Distance from proposed pipeline route (approx.)	Potential effects	Screened In/Out
Conservation (Site code 001058)				
Ballycotton Bay Special Protection Area (Site code 004022)	Teal *Anas crecca*	18.4km	No pathway for interaction due to distance and the absence of significant aqueous and air emissions.	**Screened Out**
	Ringed Plover *Charadrius hiaticula*			**Screened Out**
	Golden Plover *Pliuvialis apricaria*			**Screened Out**
	Grey plover *Pliuvialis sqyuatarola*			**Screened Out**
	Lapwing *Vanellus vanellus*			**Screened Out**
	Black-tailed Godwit *Limosa limosa*			**Screened Out**
	Bar-tailed Godwit *Limosa lapponica*			**Screened Out**
	Curlew *Numenius arquata*			**Screened Out**
	Turnstone *Arenaria interpres*			**Screened Out**
	Common gull *Larus canus*			**Screened Out**
	Lesser Black-backed gull *Larus fuscus*			**Screened Out**
	Wetlands			**Screened Out**
Sovereign Islands SPA (Site code 004124)	Cormorant *Phalacrocorax carbo*	19.7km	No pathway for interaction due to distance and the absence of significant aqueous and air emissions.	**Screened Out**

6.2 Screening Assessment

The proposed project is not directly connected with or necessary to the management of any Natura 2000 site. It is, accordingly, necessary for the competent authority to assess whether the proposed development, either individually or in combination with other plans or projects, would be likely to have significant effects on any Natura 2000 site. As set out in detail in this Stage One Screening Report, the likely significant effects on Natura 2000 sites within a 20km radius of the proposed development have been considered. The use of a 20km radius was adopted as a precautionary measure as no significant potential effects at or beyond this distance were identified.

Four Natura 2000 sites are located within 20km of the proposed development site namely Cork Harbour SPA (0.5km to the south), Great Island Channel SAC (5km to the north) and the Ballycotton Bay SPA 18.4km east and Sovereign Islands SPA 19.7km southwest.

A precautionary approach has also been adopted in relation to the appraisal of whether the proposed development is likely to have significant effects on these four sites. Any significant potential effects were identified and, unless such effects could be discounted with certainty, it has been determined that a Stage 2 appropriate assessment should be carried out.

The conclusions in respect of each site are as follows.

6.2.1 Ballycotton Bay SPA and Sovereign Islands SPA

Given the low levels of emissions from the proposed development and the distance of these Natura 2000 sites from the proposed development site, no significant potential effects, whether direct, indirect or cumulative, will occur. These sites have therefore been screened out and no further assessment is considered necessary.

6.2.2 Great Island Channel cSAC

The Great Island Channel SAC (5km from the proposed development site) is designated on the basis of two qualifying Annex 1 habitats namely Mudflats and sandflats not covered by seawater at low tide and Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*). No faunal species are listed as qualifying interests for this site and thus potential effects from collision risk or bioaccumulation to higher trophic levels do not apply. These estuarine habitats are robust and any effects from minor accidental discharges of silt or hydrocarbons during construction or emissions during operation will have a negligible impact. Therefore, no significant effects from operational emissions, construction or direct removal of habitat, or disturbance will arise. Similarly, no significant potential effects from accidents such as fires during construction or operation or from shipping accidents whilst transporting ash and flue gas residues will occur. This site has therefore been screened out and no further assessment is considered necessary.

6.2.3 Potential effects on the Cork Harbour SPA

Although it is considered improbable that significant effects will occur, the likelihood of significant potential effects on the Cork Harbour SPA with respect to the following, cannot be entirely discounted without further analysis.

1. Disturbance/displacement of birds listed as qualifying interests for the Cork Harbour SPA where they occur outside the SPA boundary including potential cumulative effects
2. Potential for collision risk for birds listed as qualifying interests for the Cork Harbour SPA where they occur outside the SPA boundary including potential cumulative effects
3. Potential Accidental Releases from the Site During the Construction Phase including cumulative effects
4. Potential Accidental Releases from fire during operation including cumulative effects
5. Potential for bioaccumulation and effects on piscivorous birds from air emissions of mercury and dioxins.

6.3 Screening statement

Therefore, in line with a precautionary approach, a Stage 2 Appropriate Assessment of the proposed development is considered necessary in respect of the Cork Harbour SPA. It is also noted that during consultation with the NPWS and during the planning oral hearing queries were raised in relation to particular aspects of the development (**See Section 1.3; Consultation).** These queries are further addressed within the Stage 2 of this NIS.

7. Stage 2: Appropriate Assessment Natura Impact Statement

7.1 Characteristics of Relevant Site

As concluded in **Section 6; Stage 1 Appropriate Assessment Screening**, and adopting a precautionary approach, the only Natura 2000 site for which a Stage 2 Appropriate Assessment is required is the Cork Harbour SPA (Site code 004030). A site synopsis (NPWS, 2008) and conservation objectives (NPWS, 2014) are provided below.

7.1.1 Cork Harbour Special Protection Area (Site Code 004030)

Cork Harbour is a large, sheltered bay system, with several river estuaries - principally those of the Rivers Lee, Douglas, Owenboy and Owennacurra. The SPA site comprises most of the main intertidal areas of Cork Harbour, including all of the North Channel, the Douglas River Estuary, inner Lough Mahon, Monkstown Creek, Lough Beg, the Owenboy River Estuary, Whitegate Bay and the Rostellan and Poulnabibe inlets.

Owing to the sheltered conditions, the intertidal flats are often muddy in character. These muds support a range of macro-invertebrates, notably *Macoma balthica*, *Scrobicularia plana*, *Hydrobia ulvae*, *Nepthys hombergi, Nereis diversicolor* and *Corophium volutator*. Green algae species occur on the flats, especially *Ulva lactua* and *Enteromorpha* spp. Cordgrass (*Spartina* spp.) has colonised the intertidal flats in places, especially where good shelter exists, such as at Rossleague and Belvelly in the North Channel. Salt marshes are scattered through the site and these provide high tide roosts for the birds. Salt marsh species present include Sea Purslane (*Halimione portulacoides*), Sea Aster (*Aster tripolium*), Thrift (*Armeria maritima*), Common Saltmarsh-grass (*Puccinellia maritima*), Sea Plantain (*Plantago maritima*), Laxflowered Sea-lavender (*Limonium humile*) and Sea Arrowgrass (*Triglochin maritima*). Some shallow bay water is included in the site. Cork Harbour is adjacent to a major urban centre and a major industrial centre. Rostellan Lake is a small brackish lake that is used by swans throughout the winter. The site also includes some marginal wet grassland areas used by feeding and roosting birds.

The site is designated as a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Little Grebe, Great Crested Grebe, Cormorant, Grey Heron, Shelduck, Wigeon, Teal, Pintail, Shoveler, Red-breasted Merganser, Oystercatcher, Golden Plover, Grey Plover, Lapwing, Dunlin, Blacktailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Black-headed Gull, Common Gull, Lesser Black-backed Gull and Common Tern. The site is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

Cork Harbour is an internationally important wetland site, regularly supporting in excess of 20,000 wintering waterfowl, for which it is amongst the top five sites in the country. The two-

year mean of summed annual peaks for the entire harbour complex was 55,401 for the period 1995/96 and 1996/97. Of particular note is that the site supports internationally important populations of Black-tailed Godwit (905) and Redshank (1,782) - all figures given are average winter means for the two winters 1995/96 and 1996/97. At least 18 other species have populations of national importance, as follows: Little Grebe (51), Great Crested Grebe (204), Cormorant (705), Grey Heron (63), Shelduck (2,093), Wigeon (1,852), Teal (922), Pintail (66), Shoveler (57), Red-breasted Merganser (88), Oystercatcher (1,404), Golden Plover (3,653), Grey Plover (84), Lapwing (7,688), Dunlin (10,373), Bartailed Godwit (417), Curlew (1,325) and Greenshank (26). The Shelduck population is the largest in the country (over 10% of national total). The site has regionally or locally important populations of a range of other species, including Whooper Swan (10), Pochard (145) and Turnstone (79). Other species using the site include Gadwall (13), Mallard (456), Tufted Duck (113), Goldeneye (31), Coot (53), Mute Swan (38), Ringed Plover (34) and Knot (38). Cork Harbour is a nationally important site for gulls in winter and autumn, especially Black-headed Gull (4,704), Common Gull (3,180) and Lesser Black-backed Gull (1,440).

A range of passage waders occurs regularly in autumn, including such species as Ruff (5-10), Spotted Redshank (1-5) and Green Sandpiper (1-5). Numbers vary between years and usually a few of each of these species over-winter.

The wintering birds in Cork Harbour have been monitored since the 1970s and are counted annually as part of the I-WeBS scheme.

Cork Harbour has a nationally important breeding colony of Common Tern (3-year mean of 69 pairs for the period 1998-2000, with a maximum of 102 pairs in 1995). The birds have nested in Cork Harbour since about 1970, and since 1983 on various artificial structures, notably derelict steel barges and the roof of a Martello Tower. The birds are monitored annually, and the chicks are ringed.

Extensive areas of estuarine habitat have been reclaimed since about the 1950s for industrial, port-related and road projects, and further reclamation remains a threat. As Cork Harbour is adjacent to a major urban centre and a major industrial centre, water quality is variable, with the estuary of the River Lee and parts of the Inner Harbour being somewhat eutrophic. However, the polluted conditions may not be having significant effects on the bird populations. Oil pollution from shipping in Cork Harbour is a general threat. Recreational activities are high in some areas of the harbour, including jet skiing which causes disturbance to roosting birds.

Cork Harbour is of major ornithological significance, being of international importance both for the total numbers of wintering birds (i.e. > 20,000) and also for its populations of Black-tailed Godwit and Redshank. In addition, there are at least 18 wintering species that have populations of national importance, as well as a nationally important breeding colony of Common Tern. Several of the species which occur regularly are listed on Annex I of the E.U. Birds Directive, i.e. Whooper Swan, Golden Plover, Bar-tailed Godwit, Ruff and Common Tern. The site provides both feeding and roosting sites for the various bird species that use it. (NPWS, 2008).

7.2 Impact Assessment

In carrying out an appropriate assessment the competent authority (i.e., the EPA) is obliged to make a determination as to whether or not the proposed development would adversely affect the integrity of the relevant European site (i.e., the Cork Harbour SPA) in view of its conservation objectives. Accordingly, an appropriate assessment of the implications for the Cork Harbour SPA of the proposed development implies that, prior to its approval, all the aspects of the proposed development which can, by themselves or in combination with other plans or projects, affect the Cork Harbour SPAs conservation objectives must be identified in the light of the best scientific knowledge in the field.

7.2.1 Cork Harbour SPA Conservation Objectives

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site. The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

The favourable conservation status of a species is achieved 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, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

The qualifying interests and specific conservation objectives for the Cork Harbour SPA are detailed in *NPWS (2014) Conservation Objectives: Cork Harbour SPA 004030*. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. These are listed in **Table 3.**

7.2.2 Appraisal of Potential Significant Effects - Disturbance/displacement of birds listed as qualifying interests for the Cork Harbour SPA where they occur outside the SPA boundary including potential cumulative effects

7.2.2.1 Potential noise/disturbance effects during construction

The schedule for the construction and commissioning of the resource recovery centre is approximately 31 months and thus works will occur during the main wintering season for birds in Cork Harbour (October to March inclusive). Night-time works are likely to take place over a period of 6 to 8 weeks. The likely construction activities during this period will involve concrete pours for foundations, retaining walls etc.

The road upgrade will take circa 12 weeks to complete and it is anticipated that the upgrade of the road and the upgrade of the road drainage system will proceed in advance of the construction of the resource recovery facility.

The placement of sacrificial beach material will take approximately three weeks to complete and it is envisaged that it will be undertaken towards the end of the construction phase. Deliveries of shingle (sacrificial material) for the coastal protection works will take place over a period of two weeks. Placing of sacrificial beach material will take place outside the main wintering season for birds (October to March).

Due to the nature of the activities undertaken on a large construction site, there is potential for the generation of high levels of noise to the surrounding environment. A variety of items of plant will be in use depending on the construction phasing. There will also be vehicular movements to and from the site that will make use of existing roads.

The potential for vibration will be limited to vibration as a result of excavation works, rock breaking, piling operations and lorry movements on uneven road surfaces. The most potentially significant of these will be the vibration associated with rock breaking and piling operations. No blasting is proposed.

Disturbance stimuli can divert time and energy from other fitness-enhancing activities such as feeding, parental care, or mating displays. In other words, disturbance signifies a deviation in an animal's behaviour from patterns occurring without human influences. It is generally accepted that disturbance can cause temporary changes in behaviour of migratory and wintering waterfowl. However, birds can and often do compensate for this disturbance by altering their behaviour or habituating to human activities.

The closest part of the Cork Harbour SPA is located approximately 0.5 km south of the proposed development area and no effects on birds within the SPA from increased noise and activity during construction are predicted. A total of thirteen species listed as qualifying interests for the Cork Harbour SPA were recorded during winter bird counts, namely, Cormorant, Oystercatcher, Dunlin, Curlew, Redshank, Greenshank, Great Crested Grebe, Grey Heron, Teal, Black headed Gull, Common Gull, Lesser Black backed Gull and Common Tern. However, none of these species were recorded in nationally significant numbers in proximity to the site, with relatively small numbers recorded feeding along the rocky shoreline or overflying the channel. The shoreline in proximity to the proposed development site consists primarily of rocky shore/shingle habitat and lacks the large estuarine mudflats which are of high value for wintering birds. A breeding colony of Common tern and a colony of tree roosting cormorants are located 750m and 1km from the Indaver site respectively and no impact on either of these colonies will occur.

Notwithstanding the lack of high-quality feeding habitat, recreational usage may already be impacting on bird usage of Gobby beach, which is the shoreline adjacent to the site eastern boundary. It is noted that this beach is subject to high levels of disturbance from recreational users with or without dogs during daylight hours.

7.2.2.2 Mitigation Measures during construction

Mitigation Measures – Noise & Vibration

A construction environmental management plan (CEMP) has been prepared prior to construction commencing, refer to **Appendix 9; Construction Activities**. The Site Environmental Manager (SEM), appointed by the Contractor, will be responsible for the successful development, implementation and maintenance of the CEMP and will carry out environmental inspections.

During out of hours construction periods or other construction scenarios with high potential for noise and vibration generating activities, best practice noise and vibration control measures will be employed by the contractor. The best practice measures set out in BS 5228 (2009+A1 2014) Parts 1 and 2 will be complied with. This includes guidance on several aspects of construction site mitigation measures, including, but not limited to the following:

Selection of quiet plant

This practice will relate to static plant, such as compressors and generators. Units will be supplied with manufacturers' proprietary acoustic enclosures. The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item should be selected. Should a particular item of plant already on the site be found to generate high noise levels, the first action should be to identify whether or not said item can be replaced with a quieter alternative.

Noise control at source

If required, consideration will be given to noise control "at source". This refers to the modification of an item of plant or the application of improved sound reduction methods in consultation with the supplier. For example, resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can often be controlled by fixing resilient materials in between the surfaces in contact.

For mobile plant items such as cranes, dump trucks, excavators and loaders, the installation of an acoustic exhaust and or maintaining enclosure panels closed during operation can reduce noise levels by up to 10dB. Mobile plant will be switched off when not in use and not left idling.

- For piling plant, noise reduction will be achieved by enclosing the driving system in an acoustic shroud, where necessary. For steady continuous noise, such as that generated by diesel engines, it is possible to reduce the noise emitted by fitting a more effective exhaust silencer system or utilising an acoustic canopy to replace the normal engine cover.

- For percussive tools such as pneumatic concrete breakers, rock drills and tools a number of noise control measures include fitting muffler or sound reducing equipment to the breaker 'tool' and ensure any leaks in the air lines are sealed. Further reductions in noise levels will be achieved by erecting localised screens around breakers or drill bits when in operation in close proximity to noise sensitive boundaries.
- For concrete mixers, control measures will be employed during cleaning to ensure no impulsive hammering is undertaken at the mixer drum.
- For all materials handling, materials will not be dropped from excessive heights. Drops chutes and dump trucks will be lined with resilient materials.
- For compressors, generators and pumps, these will be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation, where required.
- All items of plant will be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.

Screening

Screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to all other forms of noise control. It has been assumed for the purposes of this assessment that a standard construction site hoarding will be erected around the site boundaries of the main building works of the waste to energy building. The site hoarding will be constructed of a material with a mass per unit of surface area greater than 7 kg/m^2 to provide adequate sound insulation.

In addition, careful planning of the site layout will also be considered. Where feasible, site buildings such as offices and stores will be placed between the source and receiver to provide noise screening.

Monitoring

Prior to the construction works commencing on site, environmental noise and vibration monitors will be installed at the selected monitoring locations. The SEM will be responsible for this monitoring.

Noise monitoring will be conducted in accordance with the International Standard ISO 1996: 2017: *Acoustics – Description, measurement and assessment of environmental noise*. Vibration monitoring will be conducted in accordance with BS 4866 (2010) *Mechanical vibration and shock. Vibration of fixed structures. Guidelines for the measurement of vibrations and evaluation of their effects on structures*.

7.2.2.3 Residual construction effects on the Cork Harbour SPA and special conservation interests for the Cork Harbour SPA where they occur in proximity to the Indaver site.

The application of noise limits, monitoring, and controlled working hours, along with implementation of appropriate noise and vibration mitigation measures as set out above, will ensure that noise and vibration impact is sufficiently controlled to within the relevant criteria.

The noise assessment presented in **Appendix 12; Noise and Vibration;** notes that noise levels associated with the Resource Recovery Centre for the worstcase construction scenarios assessed are calculated to be less than 35dB L_{Aeq} at the closest areas of the Cork Harbour SPA to the south of the development site. This particular area of the SPA is located in close proximity to a number of existing industrial facilities (i.e. GSK, De Puy and Hovione) with operational noise limits of 55dB L_{Aeq} during daytime periods and 45dB L_{Aeq} during night-time periods. Given that predicted construction noise levels at this location are significantly below the permitted operational noise levels from adjacent facilities, the noise effect from construction activities at the closest area of the SPA are short-term, imperceptible.

All other areas of the Cork Harbour SPA are located at distances beyond 1.5km from the proposed site with lower construction noise levels predicted at these distances, (less than 30dB L_{Aeq}) which is well below typical baseline noise levels in the surrounding environment Taking the above into consideration, the construction phase of the Resource Recovery Centre is determined to have no significant effect to the existing noise environment at any parts of the designated Cork Harbour SPA.

The breeding colony of common tern is located 750m from the Indaver site and the large night-time roost of Cormorants is located approximately 1km from the Indaver site. Given that the noise impact during construction will be insignificant at these distances, no adverse impact on the Cork Harbour SPA has been identified.

It is noted that the shoreline habitats in proximity to the Indaver site are not of high value for birds listed as special conservation interests for the SPA, although some of these species do occur. Disturbance from the proposed development is likely to arise during the construction phase due to increased noise levels. With the exception of limited amount of night-time activity, works will take place during the day when recreational usage of the beach is more likely to be a greater limiting factor for bird usage of the beach.

Night-time works are likely to take place over a period of 8 weeks. During any night-time periods, impact generating, percussive and high noise generating activities will be avoided. During weekday periods, the first hour will be used for setting up and mobilisation. Activities will be scheduled during this period to ensure the night-time noise criterion of 45dB LAeq,1hr will not be exceeded. During the 8 week period where night-time construction works are required, the main activity likely to take place will involve concrete pours for foundations and retaining walls.

This short-term night time activity has the potential to have a greater impact, as birds feeding during this period may be less habituated to increased noise, activity and lighting, which could lead to some short-term disturbance/displacement of birds during such works. However, as such an impact will be localised and short-term, and given the low value of the shoreline habitats adjoining the site for SPA species, no significant adverse impact on birds listed as qualifying interests for the Cork Harbour SPA, where they occur in proximity to the Indaver site, will occur.

7.2.2.4 Potential noise effects during operation

Once coastal protection works, road works and building construction works are complete, the main noise sources during the operational phase relate to the operation of the main process building.

There are four key sources associated with the operational phase as follows:

- process and building services plant (fixed installations);
- vehicle movements on site (mobile plant);
- car parking on site, and;
- additional vehicles on public roads.

7.2.2.5 Mitigation measures-operation

The following mitigation is proposed with respect to noise during operation.

Practicable noise control measures will be employed to ensure that noise from process and building services plant do not exceed the specified operational noise levels. Moreover, an acoustic attenuator will be included in the aero condenser structure. In addition to the measures outlined above, the following forms of noise control techniques will be employed as standard to ensure operational plant noise levels are kept to a minimum:

- plant will be sited as far away from noise-sensitive locations as is practicable;
- duct mounted attenuators will be installed on the atmosphere side of all air moving plant;
- splitter attenuators will be installed providing free ventilation to internal plant areas;
- anti-vibration mounts will be installed on all reciprocating plant.

7.2.2.6 Residual operational effects on the Cork Harbour SPA and special conservation interests for the Cork Harbour SPA where they occur in proximity to the Indaver site.

The noise assessment presented in **Appendix 12; Noise and Vibration** notes that noise levels associated with the operation of the resource recovery centre are calculated to be imperceptible at distances beyond 400 to 500m from the development site. The Indaver site is located 0.5km from the closest point of the Cork Harbour SPA. The breeding colony of common tern is located 750m from the Indaver site and the large night-time roost of Cormorants is located approximately 1km from the Indaver site. Given that the noise impact during operation will be imperceptible at the relevant distances, no adverse impact on the Cork Harbour SPA has been identified.

The overall noise and vibration impact of the proposed facility during operation is expected to be insignificant in the long term, taking account of the existing noise environment and the predicted impact of the proposal. There will no adverse effect on any bird species listed as special conservation interests for the Cork Harbour SPA, where they occur in proximity to the Indaver site, during the operational phase of the proposed development.

7.2.2.7 Cumulative effects from noise

The noise assessment presented in **Appendix 12; Noise and Vibration** assessed potential cumulative effects on the Cork Harbour SPA. It concluded that noise levels associated with the operation of the resource recovery centre are calculated to be imperceptible at distances beyond 400 to 500m from the development site. The closest area of the Cork Harbour SPA is located 500m to the south of the development site. This particular area of the SPA is located in close proximity to a number of existing industrial facilities (i.e. GSK, De Puy and Hovione) and hence the operation of the resource recovery centre will have no impact on noise levels at this area considering the contribution of these adjacent facilities to the existing noise environment. All other areas of the Cork Harbour SPA are located at distances beyond 1.5km from the proposed site and hence the operation of the resource recovery centre is determined to have no measurable or perceptible change to the existing noise environment at any of the designated Cork Harbour SPA's.

The Indaver site is located 0.5km from the closest point of the Cork Harbour SPA. It is noted that the shoreline habitats in proximity to the Indaver site are not of high value for birds listed as special conservation interests for this SPA. The nesting colony of Common Tern is located approximately 750m from the proposed Indaver site. The large night-time roost of Cormorants is located approximately 1km from the Indaver site.

Any predicted noise effects associated with the proposed resource recovery centre are well below those associated with the existing noise environment, and those noise effects associated with the proposed N28 Link road and the Port of Cork development and other planned projects. Hence, once operational, the proposed Resource Recovery Centre is expected to be imperceptible in terms of noise to its surrounding environment. Potential construction in-combination effects are not predicted to be significant given the background noise environment at the Indaver site. Based on the above, there will be no adverse effect on the bird species listed as special conservation interests for the Cork Harbour SPA.

7.2.3 Appraisal of Potential Significant Effects - Potential for collision risk for birds listed as qualifying interests for the Cork Harbour SPA where they occur outside the SPA boundary including potential cumulative effects

A literature review assessment of the potential for a collision risk for birds created by the type of stack proposed is included as **Appendix 4; Literature Review Bird Collision Risk.** This information is considered in relation to the proposed 75m OD stack for this development below.

Although collisions may occur there are a number of factors, such as total population size, natural mortality levels, and other human related influences, to be considered in order to put the collision mortality factor in proper perspective. Modelling by some authors has found that vulnerability to collision with buildings and towers varied over more than four orders of magnitude among species. Species that migrated long distances or at night, were much more likely to be affected by collisions than year-round residents or diurnal migrants. However, no

correlation has been established between relative collision mortality and long-term population trends for these same species.

7.2.3.1 Factors affecting risk of collision

Factors affecting risk of collision which were identified by the literature include the following**:**

Building height

There is some evidence to suggest that towers in the lower range (60 m to 150 m) pose a lower risk to migrating birds. The Indaver stack, which will have a height of 75m OD (circa 70m above the ground), will be within this lower range.

Lighting

Apart from size, often the most important structural factor related to collision probability is the use of lighting. There are no detailed studies of the different risks posed by different lighting systems, though several studies show that changes in the type of lighting used, particularly the replacement of continuous red or white lights with intermittent lighting, has, in some circumstances, reduced the trapping effect and thus mortality of nocturnal migrants.

The literature review indicates that, while any light source has the potential to attract birds and therefore increase collision risk, flashing lights are involved in significantly fewer collisions that continuous lights. There is also some indication that white lights are less attractive than red lights, although the results to date are inconclusive. While bird vision does differ from human, on the lower ultraviolet end of the spectrum, infrared light is also invisible to birds. The Indaver facility will have white flashing lights, the least risk option for bird collision.

Location of structure

The location of a structure can dramatically affect the likelihood of collision mortality. Clearly, structures present a greater risk of collision if placed on or near areas regularly used by large numbers of feeding, breeding, or roosting birds, or on migratory flyways or local flight paths, such as those between foraging and nesting or roosting areas. A recent radar study, which was commissioned by the Cork Lower Harbour Energy Group in order to identify nocturnal bird movement and interconnectivity within the Cork Harbour SPA, indicated that the proposed Indaver stack will not be located on or near any migratory route. Species of such nature are not shown to have flights routes near the facility.

Differing Species Susceptibility

Not all bird species are equally susceptible to collision. Gregarious species that form flocks during the autumn and winter appear prone to collision. Flight height is clearly an important factor in collision and varies greatly, depending not only on species and behaviour, but also on topography, season, time of day and weather conditions. Flight distance also affects flight height, with local movements, such as between feeding and nesting or roosting areas, tending to be at low altitude. Species of such nature are not shown to have flights routes near the

facility. However, as indicated previously the proposed Indaver stack will not be located on or near any migratory route.

Seasonality

There appears to be a correlation between seasonality and bird-strikes. This relates mainly to the seasonal movements of birds, with increased incidence of mortality events often occurring during peak migration periods. Higher mortality at this time is perhaps also due to the lack of familiarity of migrant and over-wintering birds with the locations of obstacles, compared with resident individuals. Determining risk based on migrant versus resident status is not straightforward, and mitigating factors, such as familiarity with the presence of structures, must be weighed against factors, such as period of exposure and species (or individual) susceptibility.

Flight characteristics

Commuting flights between foraging grounds generally take place at a lower altitude (i.e. 0-5 metres) and thus could potentially encounter the buildings of the proposed development. At Ringaskiddy, this is likely to include Cormorants, ducks, some wader species and gulls. However, flights such as this are likely to take place within the estuarine habitats (i.e. the open water or mudflats) and not over the landward site of the proposed development.

Some attempts have been made to quantify the risk of wind turbine collision. While this is not entirely comparable to collision risk with static buildings, such as stacks, it does give some indication of relative species risk. **Table 8** lists the bird species of qualifying interest and conservation concern located within Cork Harbour SPA. The vulnerability to collision of each of these species, according the *European Commission Guidelines on Windfarms* (2010) is also listed. It is most notably the flocking species of Dunlin, Lapwing and Golden Plover which are at potential risk of impact. The higher risk identified for Common Tern is probably associated with their foraging behaviour during breeding seasons.

Table 8: Bird species of qualifying interest and conservation concern within Cork Harbour SPA

	Common Name	***Scientific Name***	**Annex of EU Birds Directive**	**Vulnerability to Collision**
Qualifying interests	Cormorant	*Phalacrocorax carbo*	n/a	1
	Shelduck	*Tadorna tadorna*	n/a	0
	Oystercatcher	*Haematopus ostralegus*	n/a	0
	Golden Plover	*Pluvialis apricaria*	Annex I	2
	Lapwing	*Vanellus vanellus*	n/a	2
	Dunlin	*Calidris alpine*	n/a	2
	Black-tailed godwit	*Limosa limosa*	n/a	1
	Bar-tailed godwit	*Limosa laponica*	n/a	0
	Curlew	*Numenius aquata*	n/a	0
	Redshank	*Tringa tetanus*	n/a	0
	Common tern	*Sterna hirundo*	Annex I	3
Special Conservation Interest	Little grebe	*Tachybaptus ruficollis*	n/a	0
	Great crested grebe	*Podiceps cristatus*	n/a	2
	Grey heron	*Ardea cinerea*	n/a	0
	Wigeon	*Anas Penelope*	n/a	0
	Teal	*Anas crecca*	n/a	0
	Pintail	*Anas acuta*	n/a	0

	Shoveler	*Anas clypeata*	n/a	0
	Red-breasted merganser	*Mergus serrator*	n/a	0
	Grey plover	*Pluvialis squatarola*	n/a	0
	Black-headed gull	*Larus ribundus*	n/a	0
	Common gull	*Larus canus*	n/a	0
	Lesser black-backed gull	*Larus fuscus*	n/a	0

4 = Evidence on substantial risk of impact, 3 = Evidence or indications of risk or impact, 2 = Potential risk or impact, 1 = small or non-significant risk or impact, but still to be considered in assessments, 0 = no risk.

7.2.3.2 Mitigation measures

The top of the stack will be indicated by white strobe (flashing) obstacle warning lights. The lights will be incandescent or of a type visible to Night Vision Equipment. The lights will emit light at the near infra-red (IR) range of the electromagnetic spectrum specifically at or near 850 nanometres (nm) of wavelength. Light intensity to be of similar value to that emitted in the visible spectrum of light.

7.2.3.3 Conclusions

In determining the potential collision risk the following points were taken into consideration:

- A radar study was commissioned by the Cork Lower Harbour Energy Group, in order to identify nocturnal bird movement and interconnectivity within the Cork Harbour SPA. A number of significant nocturnal flight corridors were identified, particularly connecting Lough Beg to the Owenboy River Estuary at incoming and outgoing tide periods. This is located to the south of the proposed Ringaskiddy Resource Recovery Centre. No widespread distinct patterns were observed between Monkstown Creek and Lough Beg, although minor patterns were observed from birds flying northwards from Lough Beg over the Martello tower area, to the west of the proposed Ringaskiddy Resource Recovery Centre. No distinct flight patterns were observed over the proposed development site. The location of the proposed stack at Ringaskiddy Resource Recovery centre although 500m from the Cork Harbour SPA, is not a roosting area, or on a significant flightline or migratory path for the birds using the SPA.
- The coastal areas adjacent to the proposed development are not of high value for bird species listed as special conservation interests for the Cork Harbour SPA.
- The nesting colony of Common Tern is located approximately 750m from the proposed Indaver stack. The large night-time roost of Cormorants is located approximately 1km from the Indaver site. The surveys carried out do not indicate that either species have significant flight lines through the Indaver site.
- The proposed stack height is relatively low, at just 75m OD (circa 70m above the ground), a height which has been shown to pose less collision risk than higher wind turbines and communication towers. Migratory flights over the area, would generally occur at a much greater height that 75m OD, thus eliminating or very substantially reducing the collision risk to migratory birds overflying the site of the proposed development.

- The static nature of the stack, compared to wind turbines, means it will create a significantly lower risk of collision.
- The literature review indicates that flashing lights are involved in significantly fewer collisions that continuous lights. There is also some indication that white lights are less attractive than red lights. While bird vision does differ from human, on the lower ultraviolet end of the spectrum, infrared light is also invisible to birds. Therefore the proposal for a combination of white flashing and IR lights on the stack, is the most favourable choice and is unlikely to pose a significant collision risk to birds.
- The potential cumulative effects of this development, in combination with other developments in the vicinity, are not predicted to result in any adverse effects on the conservation objectives of the Cork Harbour SPA as the stack in the proposed development is located at a sufficient distance from other developments. The closest wind turbine is 400m away and, following radar studies conducted during the planning process for these turbines, no significant cumulative collision risk is predicted.

Based on the above and given the fact that the stack is a static structure, which is relatively low in height and which is not located on or in proximity to significant roosting areas, nesting areas, flight lines or migratory paths for birds, there will not be adverse effects on the constitutive characteristics (i.e., the thirteen bird species) of the Cork Harbour SPA. Specifically, in light of the best available scientific knowledge, the stack as proposed will not create a collision risk of a magnitude sufficient to adversely impact on the integrity of any of the special conservation interests and/or conservation objectives for the Cork Harbour SPA. Given the distance of the stack from other tall structures including wind turbines, no adverse cumulative effects to the integrity, special conservation interests and conservation objectives for the Cork Harbour SPA will occur.

7.2.4 Appraisal of Potential Significant Effects - Potential Accidental Releases from the Site During the Construction Phase

Potential accidental releases with a higher risk of occurrence during construction would include the release of silt or mud or a spill of fuel onto the L2545 road or onto Gobby Beach.

7.2.4.1 Mitigation during construction

A range of easily implemented control measures, will ensure that any risks are minimised as follows:

- To prevent incidental damage by machinery or by the deposition of spoil during the site clearance stage, any trees /habitats earmarked for retention will be securely fenced early in the construction phase. The fencing will be clearly visible to machine operators.
- A dedicated holding tank for storage of construction foul effluent will be constructed prior to commencement of the main construction activities. The effluent will be regularly disposed of off-site by tanker by a licensed contractor to an approved licenced facility

- Storm water will be managed carefully during construction. In general, storm water will be infiltrated to ground via silt traps and managed soakaways. The laydown areas will be suitably drained and any areas which will involve the storage of fuel and refuelling will be paved and bunded and hydrocarbon interceptors will be installed to ensure that no spillages will get into the surface water or groundwater.
- The construction management of the site will take account of the recommendations of the CIRIA guide *Control of Water Pollution from Construction Sites 2001*. Construction mitigation measures are outlined in **Appendix 9; Construction Activities**.
- The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including levels of rainfall, wind speeds and wind direction. The potential for effect from dust depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations. The majority of dust produced will be deposited close to the generated source. A series of measures, based on best practice, have been formulated (see below) for the construction phase of the project, as construction activities are likely to generate some dust emissions. Further details on these mitigation measures is included in **Appendix 11; Air quality**. In order to ensure that no dust nuisance occurs, the following dust control measures will be implemented.
    - Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic only apart from the contractor's car park which will be hardcore only.
    - Furthermore, any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions.
    - Vehicles using site roads will have their speed restricted, and this speed restriction must be enforced rigidly. On any un-surfaced site road, this will be 20 km/h, and on hard surfaced roads as site management dictates.
    - Vehicles delivering material with dust potential (soil, aggregates) will be enclosed or covered with tarpaulin at all times to restrict the escape of dust.
    - Wheel washing facilities will be provided for vehicle exiting site in order to ensure that mud and other wastes are not tracked onto public roads.
    - Public roads outside the site will be regularly inspected for cleanliness and cleaned as necessary.
    - Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting, or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.
    - During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.

- At all times, these procedures will be strictly monitored and assessed by the Site Environmental Manager (SEM) as outlined in the Construction Environmental Management Plan (CEMP). Boundary monitoring of dust emissions will be undertaken using Bergerhoff dust gauges at a number of locations near sensitive receptors with results compared to the TA Luft dust deposition level of 350 mg/(m^2*day) as an annual average. In the event of significant dust deposition occurring outside the site boundary, movements of materials likely to raise dust would be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations. Refer to **Appendix 9; Construction Activities**.

- Waste generated during the construction phase will be carefully managed according to the accepted waste hierarchy which gives precedence to prevention, minimisation, reuse and recycling over disposal with energy recovery and finally disposal to landfill.
- All waste removed from the site will be collected only by contractors with valid waste collection permits, under the Waste Management (Collection Permit) Regulations 2007 and 2008. All facilities to which waste will be taken will be audited in advance, to ensure that they have appropriate waste licences or permits, under the Waste Management Act 1996, as amended, and the regulations thereunder, allowing them to accept the type of waste that is to be sent there. Hazardous waste generation will be minimised, and such waste will be recovered where feasible, and only disposed of if recovery is not feasible. Hazardous waste will be managed in accordance with the relevant legislation.
- Excavated material will be reused onsite where feasible. Any clean and inert surplus excavated material, which is integral to the construction phase, may be reused as a by-product on other sites subject to Article 27 under the Waste Directive Regulations 2011 and notification to the EPA. Where a re-use for the material cannot be found or where the material is not suitable for re-use, the material may be sent to suitably permitted waste facilities or licenced soil recovery facilities in accordance with relevant waste legislation or disposed at suitable authorised waste facilities.
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting, or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods. This will minimise dust generation, groundwater infiltration, and generation of run-off.
- Earthworks operations will be carried out such that surfaces shall be designed with adequate falls, profiling and drainage to promote safe run-off and prevent ponding and flooding. Run-off will be controlled through erosion and sediments control structures appropriate to minimise the silt in the run-off. Care will be taken to ensure that the bank surfaces are stable to minimise erosion.
- There are no watercourses on site. Cork Harbour lies adjacent to the eastern boundary of the site. The employment of good construction management practices will minimise

the risk of pollution of soil, storm water run-off, seawater or groundwater and any deterioration in the quality or quantity of surface or groundwater.

- In general, storm water will be infiltrated to ground via managed soakaways. The laydown areas will be suitably drained and any areas which will involve the storage of fuel and refuelling will have paved areas with bunding and hydrocarbon interceptors to ensure that no spillages will get into the surface water or groundwater systems.
- The Construction Industry Research and Information Association (CIRIA) in the UK has issued a guidance note on the control and management of water pollution from construction sites, Control of Water Pollution from Construction Sites, guidance for consultants and contractors (Masters-Williams *et al*. 2001). Additional guidance is provided in the CIRIA technical guidance on Control of Water Pollution from Linear Construction Projects (Murnane *et al*. 2006).
- The guides are written for project promoters, design engineers and site and construction managers. They address the main causes of pollution of soil, groundwater and surface waters from construction sites and describes the protection measures required to prevent pollution of groundwater and surface waters and the emergency response procedures to be put in place so that any pollution, which occurs, can be remedied. The guides address developments on green field and potentially contaminated brownfield sites. The construction management of the site will take account of the recommendations of the CIRIA guidance to minimise as far as possible the risk of soil, groundwater and surface water contamination. Site activities considered in the guidance include the following:
    - Excavation; Earthmoving; Concreting operations; Spreading of topsoil; Road surfacing;
    - Site drainage, and the control and discharge of surface water runoff from the site;
    - Oil and fuel delivery and storage; and Plant maintenance.
- Measures, as recommended in the guidance above, that will be implemented to minimise the risk of spills and contamination of soils and waters, include:
    - Training of site managers, foremen and workforce, including all subcontractors, in pollution risks and preventative measures.
    - Careful consideration will be given to the location of any fuel storage facilities. These will be designed in accordance with guidelines produced by CIRIA, and will be fully bunded.
    - All vehicles and plant will be regularly inspected for fuel, oil and hydraulic fluid leaks. Suitable equipment to deal with spills will be maintained on site.
    - Where feasible, soil excavation will be completed during dry periods and undertaken with excavators and dump trucks. Topsoil and subsoil will not be mixed together.

- Ensure that all areas where liquids are stored or cleaning is carried out are in a designated impermeable area that is isolated from the surrounding area, e.g. by a roll-over bund, raised kerb, ramps or stepped access.
- Use collection systems to prevent any contaminated drainage entering surface water drains, watercourses or groundwater, or draining onto the land.
- Minimise the use of cleaning chemicals.
- Use trigger-operated spray guns, with automatic water-supply cut-off.
- Use settlement lagoons or suitable absorbent material such as flocculent to remove suspended solids such as mud and silt.
- Ensure that all staff are trained and follow vehicle cleaning procedures. Post details of the procedures in the work area for easy reference.
- Best practice, in accordance with relevant codes of practice and guidelines, will be followed to minimise the risk of spreading Japanese knotweed on or off the site during the construction phase.
- It is expected that the EPA will impose a condition, in the industrial emissions licence, requiring the monitoring of soil on site at regular intervals.
- The proposed placement of sacrificial material on the beach will be undertaken above the foreshore on Gobby Beach. Clean material will be used and there is not expected to be a significant impact on water quality. Refuelling of equipment will not be allowed on the beach.

- The implementation of the above measures will ensure that the risk of pollution of groundwater, soils and surface waters, resulting from the construction activities will be minimised.

7.2.4.2 Conclusions - Potential Accidental Releases from the Site During the Construction Phase

In the unlikely event that construction does result in small scale spillages of hydrocarbons or increased silt levels in surface water run-off, the effects on the marine environment would be limited and localised. Given the dilution provided in the marine environment and the distance of the Cork Harbour SPA from the proposed development such spillages would not have an adverse impact on the integrity of the Cork Harbour SPA or the conservation objectives for qualifying bird species.

The only accidental release from the site during construction, which would have the potential to have a negative effect on the SPA, would be a fire. In such a scenario, combustion products would be released during a fire. It is noted that the risk of fire during construction is low and the impact is also likely to be low as this development is industrial in nature with a predominance of steel, concrete and other non-combustible materials in the main process building. Fuel storage on site will be limited to small diesel tanks to supply earth moving plant. Moreover, it is also noted that the Cork Harbour SPA is located 0.5km from the Indaver site and thus any impact on the SPA from a construction fire is predicted to be negligible. Given

the dilution provided in the marine environment and the distance of the Cork Harbour SPA from the proposed development, run-off of fire water would not have an adverse impact on the integrity of the Cork Harbour SPA or the conservation objectives for qualifying bird species.

Overall, whilst minor localised effects on water quality could occur, there will not be an adverse effect on the integrity, special conservation interests and conservation objectives for the Cork Harbour SPA, even in the event of a highly unlikely accidental release from the site during the construction period.

7.2.5 Appraisal of Potential Significant Effects - Potential Accidental Releases from fire during operation

7.2.5.1 Hazard Identification and Risk Assessment study

Notwithstanding the fact that the proposed development will not be a major accident establishment, a number of accident scenarios which could potentially arise during the operation of the facility, were assessed in the Hazard Identification and Risk Assessment study to determine the risk each posed to human health and the environment. The only risk identified as substantial was a fire in the bunker.

7.2.5.2 Consequence of Fire in the Bunker

Byrne Ó Cléirigh (**Appendix 13; Hazard Identification and Risk Assessment**) modelled the effects of a fully developed fire in the bunker, which was the only substantial risk identified. The report concluded the following:

"[Calculations] show that there is a very wide margin of safety between the expected dioxin intake to people at receptors close to the Indaver site when compared with the WHO's Tolerable Daily Intake (TDI) for lifetime exposure of 1-4 pg/kg/day (taken as 1 pg/kg/day for the purposes of this calculation). As such the overall exposure to dioxins in the surrounding area as a result of the Indaver facility would be very low (over three orders of magnitude less than the overall TDI established by WHO).

The closest Protected Site to the Indaver facility is Lough Beg, which is part of the Cork Harbour SPA. This is located c.500 m from the facility. Applying the same calculations the resulting factor of safety works out as 4,390, based on the WHO criteria for human health."

It is predicted that the dioxin intake level at the closest point of the SPA would be negligible and would not have an adverse impact on the integrity of the Cork Harbour SPA or the conservation objectives for qualifying bird species.

The thermal radiation from a fully developed fire in the bunker was also modelled. A thermal dose end point of 4kW/m^2 is the level sufficient to cause pain to persons exposed if unable to reach cover within 20 seconds. The distance to this thermal dose was 52m. The closest point of the Cork Harbour SPA is approximately 0.5km from the site and well beyond this distance.

Accordingly, the thermal dose at the nearest point of the SPA would be well below a level which would affect any of the species identified as the qualifying interests for this SPA.

7.2.5.3 Control Measures to Prevent a Fire in the Bunker

The measures will be put in place to protect against a fire in the bunker, either by reducing the likelihood of occurrence or mitigating the effects if it did occur.

Prevention Measures

- All process activities at the site, including receipt and handling of materials at the bunker, will be carried out by trained operators. Indaver will develop standard operating procedures (SOPs) to governing how these activities are carried out.
- Indaver will conduct a visual inspection of waste as it is unloaded at the bunker. This inspection will be carried out by a trained operator. For new customers, loads will be emptied out in the tipping-hall area and examined in more detail prior to admittance to the bunker.
- A fire damper will be fitted, which will close in the event of a fire initiating at the bunker. This measure will ensure that there will be no air supply to the boiler from the bunker area under these circumstances.
- The bunker will be a concrete structure and will be compartmentalised (1-hour fire rating). This measure will help to mitigate against the risk of this scenario by limiting the rate at which a fire can develop in this area.
- Indaver will operate a hot work permitting system at the site, to control ignition sources.
- Where practicable, when maintenance works are required, equipment will be taken outside of the bunker for these works.
- The nature of the activity carried out at the site means that there is a quick throughput of material at the bunker. This means that waste is not left to settle within the bunker for a long period of time.
- Indaver will also implement a Bunker Management Programme. This will be carried out once or twice per year, prior to shutdown periods. Indaver will empty out the bunker to bring the inventory to low level (as far as practicable). This, in conjunction with the quick turnaround of material in the bunker, will help to avoid a situation where a waste batch is allowed to sit in the bunker for a long period of time.
- Indaver will install UV/IR detectors in the bunker and at the hopper. These detectors will enable early detection in the event of smouldering waste in the bunker. If practicable and safe to do so, Indaver can load this waste directly to the hopper and then add more waste on top to smother it. This is done at other sites in accordance with a documented procedure and this same procedure will be implemented at Ringaskiddy.
- A dedicated deluge system will be installed above the hopper.

- At the time of the 2015 HAZID&RA review it was noted that Indaver had implemented a monitoring programme at another of their sites, to study the potential for methane formation due to anaerobic digestion of waste in the bunker at that site. This study has since been completed and has found that the methane levels are very low during operations and rise to levels of up to 400 ppm during shutdowns, when there is no primary air extraction at the bunker. This concentration does not present a fire hazard. Indaver will install LEL detectors at the bunker at the Ringaskiddy site, so that similar monitoring can be carried out there also.
- A 250^{0} mm high stop block or kerb will be installed at the bunker to protect against the risk of a trailer falling into the bunker when unloading waste.

Control Measures if a fire occurs

- The control room is a manned area that has visibility on the bunker at all times via a large window that looks out onto it; this would facilitate rapid detection of smoke formation.
- A fire damper will be fitted, which will close in the event of a fire initiating at the bunker. This measure will ensure that there will be no air supply to the furnace from the bunker area under these circumstances.
- Fire wrapping will be installed on cables at the bunker, to ensure continued function in the event of a fire developing.
- A dedicated deluge system will be installed above the hopper.
- Indaver will install 4 no. fixed water cannons at the bunker, which will provide the facility to douse spot fires. This measure will allow Indaver to respond to a developing fire scenario, allowing the operator the facility to extinguish the event before it becomes fully developed. This allows the fire to be extinguished rapidly and with relatively low volumes of water when compared with a fully developed fire.
- Indaver will also install a sprinkler system in the bunker, back up to the water cannons. The sprinkler system will be designed to cover the bunker area with water, sufficient to extinguish a fully developed fire. As such, even in the worst-case fire scenario the policy is one of extinguishment and not one of controlled burn down. This allows the fire to be extinguished rapidly and with relatively low volumes of water when compared with a fully developed fire.
- The bunker will be designed to act as fire water retention facility, to prevent the risk of fire-fighting water that is applied at the bunker subsequently escaping off site as contaminated run-off.

7.2.5.4 Fire Water Containment

Fire water retention, for the retention and control of contaminated water generated when fighting a fire on site, will be provided to the waste-to-energy plant.

In the event of a fire in the bunker, the water used to fight the fire will be captured in the bunker where it will be stored for disposal. The bunker will have more than adequate capacity for the volume of water used to fight the fire as well as the waste which will be in it. If there is a fire in any other part of the waste-to-energy plant, the water used to fight the fire will be captured by the recovery water and clean water tanks which will be located below the building floor. The bunker and the recovery tanks will be designed as water retaining structures. The fire-fighting water from any fire anywhere else on site will be captured in the storm water drainage system and will be collected in the holding tank, where it can be stored for disposal or transfer to the aqueous waste storage tank on site, if contaminated. The outlet valve from the holding tank will close if there is a fire alarm. If the holding tank has insufficient capacity, the water will overflow to the attenuation tank, in which it can be retained pending testing and disposal.

7.2.5.5 Conclusions - Potential Accidental Releases from fire during operation

A range of mitigation measures will be implemented to prevent a fire in the bunker. Even in the event of a bunker fire the dioxin intake level at the closest point of the SPA would be negligible. Moreover, in the extremely unlikely event of a fire occurring, the thermal dose at the nearest point of the SPA would be well below a level which would affect the any of the species identified as the qualifying interests of the SPA. In the event of a fire in the bunker, the water used to fight the fire will be captured in the bunker, which will have sufficient capacity, where it will be stored for disposal. If a fire occurs in another part of the waste-to-energy building, the water used to fight the fire would be captured in the recovered water and clean water tanks which will be located under the floor. If a fire occurred in an external area, the potentially contaminated water used to fight the fire would drain to the storm water drainage system and be collected in the holding tank. If the holding tank has insufficient capacity, the water will overflow to the attenuation tank, in which it can be retained pending testing and disposal. Accordingly, there will no release of water used to fight the fire to the aquatic environment and no adverse effects on the conservation objectives of the Cork Harbour SPA can occur.

In light of the above evaluation, including the effective implementation of measures to prevent a fire, even if a fire did occur at the waste to energy facility, such a fire would not have an adverse impact on the integrity of the Cork Harbour SPA site and its conservation objectives. No potential in-combination effects, in relation to a fire on site, have been identified, which could have an adverse impact on the integrity of the Cork Harbour SPA or the conservation objectives for qualifying bird species.

7.2.6 Appraisal of Potential Significant Effects - Potential effects on piscivorous birds from air emissions and possible bioaccumulation

7.2.6.1 Assessment of potential air and sediment effects

Appendix 11; Air Quality of this NIS provides a detailed assessment of the potential effects on air. It is noted that due to the localised nature of possible effects from dust generation during construction, the limited nature of potential effects and the distance from the Cork Harbour SPA (0.5km) no significant potential impact from dust has been identified. Thus, this section is concerned with possible emissions from the operation of the facility.

The Ringaskiddy Resource Recovery Centre will have one furnace and flue gas cleaning line. The line will have a moving grate furnace with a state-of-the-art flue gas cleaning system the combustion of waste produces a number of emissions, the discharges of which are regulated by the EU Directive on Industrial Emissions (IED) (2010/75/EU). The emissions to atmosphere which have been considered are: Nitrogen Dioxide (NO_2), Sulphur Dioxide (SO_2), Total Dust (as PM_{10} and $PM_{2.5}$), Carbon Monoxide (CO), Total Organic Carbon (TOC), Hydrogen Fluoride (HF) and Hydrogen Chloride (HCl), Dioxins/Furans (PCDD/PCDFs), Cadmium (Cd) and Thallium (Tl), Mercury (Hg) and the sum of Antimony (Sb), Arsenic (As), Lead (Pb), Chromium (Cr), Cobalt (Co), Copper (Cu), Manganese (Mn), Nickel (Ni) and Vanadium (V). In addition, Polycyclic Aromatic Hydrocarbons (PAHs) have been assessed as incineration is a potential emission source for this group of compounds.

The scope of the study consists of the following components:

- Review of maximum emission levels and other relevant information needed for the modelling study;
- Review of construction phase potential emissions;
- Identification of the significant substances which are released from the facility;
- Review of background ambient air quality in the vicinity of the facility;
- Air dispersion modelling of significant substances released from the facility;
- Particulate deposition modelling of Dioxins and Furans, Polycyclic Aromatic Hydrocarbons (PAHs) and heavy metals released from the facility;
- Identification of predicted ground level concentrations of released substances at the facility boundary and at sensitive receptors in the immediate environment;
- The potential cumulative effects of the proposed development on air quality in combination with other relevant planned or permitted development in the area;
- Evaluation of the significance of these predicted concentrations, including consideration of whether these ground level concentrations are likely to exceed the most stringent ambient air quality standards and guidelines.

7.2.6.2 Modelling Under Maximum & Abnormal Operating Conditions

In order to assess the potential impact from the proposed facility under maximum and abnormal operations, a conservative approach was adopted that is designed to over-predict ground level concentrations. This cautious approach will ensure that an over-estimation of effects will occur and that the resultant emission standards adopted are protective of ambient air quality. The approach incorporated several conservative assumptions regarding operating conditions at the proposed facility. This approach incorporated the following features:

- For the maximum operating scenario, it has been assumed that the emission point is continuously operating at its maximum operating volume flow. This will over-estimate the actual mass emissions from the facility.
- For the maximum operating scenario, it has been assumed that the emission point is operating at maximum capacity for 24-hrs/day over the course of the full year.
- Abnormal operating emissions were obtained from the process engineer and are pessimistically assumed to occur.
- As a result of these conservative assumptions, there will be an over-estimation of the emissions from the facility and the impact of the proposed facility on the surrounding environment.

7.2.6.3 Modelling Study Methodology

The air dispersion modelling input data consists of detailed information on the physical environment (including building dimensions and terrain features), design details from all emission points on-site and a full year of worst-case meteorological data. Using this input data, the model predicts ambient ground level concentrations beyond the site boundary for each hour of the modelled meteorological year. The model post-processes the data to identify the location of the maximum ambient ground level concentration in the applicable format for comparison with the relevant limit values. This maximum concentration is then added to the existing background concentration to give the maximum predicted ambient concentration. The maximum ambient concentration is then compared with the relevant ambient air quality standard for the protection of human health to assess the significance of the releases from the site. In the absence of detailed guidance in Ireland, the selection of appropriate modelling methodology has followed the guidance from the USEPA which has issued detailed and comprehensive guidance on the selection and use of air quality models (1-3). Based on guidance from the USEPA, the most appropriate regulatory model for the current application is the AERMOD model (Version 15181). The selection of the appropriate meteorological data has followed the guidance issued by the USEPA.

7.2.6.4 Background Concentrations

The ambient concentrations detailed in the following sections include both the emissions from the site and the ambient background concentration for that substance. Background concentrations have been derived from a conservative analysis of the existing background air quality and an analysis of cumulative sources in the region in the absence of the

development. A detailed baseline air quality assessment (**Appendix 11; Air Quality**) was carried out to assess background levels of those pollutants, which are likely to be released from the site.

7.2.6.5 Cumulative Assessment

As the region around Ringaskiddy is partly industrialised and thus has several other potentially significant sources of pollutants, a detailed cumulative assessment of other industrial emission sources has been carried out using the methodology outlined by the USEPA. The effect of nearby air emission points sources (Janssen Biologics, Hovione Cork, GSK Ireland, ESB Aghada, Novartis Ringaskiddy Ltd, Pfizer Ireland Pharmaceuticals and BGE Whitegate) has been examined where interactions between the plume of the point source under consideration and those of nearby sources can occur. These include: 1) the area of maximum effect of the point source, 2) the area of maximum effect of nearby sources, 3) the area where all sources combine to cause maximum effect on air quality 4) Background concentrations for the area, based on natural, minor and distant major sources need also to be taken into account in the modelling procedure. A major baseline monitoring programme was undertaken over several months which, in conjunction with other available baseline data, was used to determine worst-case background concentrations in the region. Full detail of the cumulative impact assessment and associated results can be seen in **Appendix 11; Air Quality.**

7.2.6.6 Ambient Air Quality Standards

Ambient air quality legislation designed to protect human health and the environment is generally based on assessing ambient air quality at locations where the exposure of the population is significant, relevant to the averaging time of the pollutant. However, in the current assessment, ambient air quality legislation has been applied to all locations with a 10km radius of the facility regardless of whether any sensitive receptors (such as residential locations) are present for significant periods of time. This represents a worst-case approach and an examination of the corresponding concentrations at the nearest sensitive receptors relative to the actual quoted maximum concentration indicates that these receptors generally experience ambient concentrations significantly lower than that reported for the maximum value.

7.2.6.7 Receiving Environment

An extensive baseline survey was carried out in the region of the proposed Ringaskiddy Resource Recovery Centre facility over the period August 2014 to July 2015. This data supplements the extensive baseline surveys undertaken from November 2006 to February 2007 and from April 2008 to July 2008. These surveys focused on the significant pollutants likely to be emitted from the facility and which have been regulated in Council Directive 2010/75/EU. The substances monitored over these survey periods were NO_2, NO_X, PM_{10}, $PM_{2.5}$, benzene, SO_2, heavy metals, HCl, HF and PCDDs/PCDFs. The air monitoring program was used to determine long-term average concentrations for these pollutants in order to help quantify the existing ambient air quality in the region. NO_2, benzene and SO_2 were also monitored at a number of additional locations to give some spatial representation of the levels

of these species. The updated extensive baseline survey which was carried out in the region of the proposed Ringaskiddy Resource Recovery Centre facility over the period August 2014 to July 2015 focused on NO_2, PM_{10}, benzene, SO_2 and heavy metals over a year long period in order to capture any possible seasonal factors.

7.2.6.8 *AERMOD dispersion model*

Council Directive 2010/75/EU on Industrial Emissions Directive (IED) has established air emission limit values. The Directive has also outlined stringent operating conditions in order to ensure sufficient combustion of waste thus ensuring that dioxin formation is minimised. Specifically, combustion gases must be maintained at a temperature of 850°C for at least two seconds under normal operating conditions for non-hazardous waste whilst for hazardous waste containing more than 1% halogenated organic substances, the temperature should be raised to 1,100°C for at least two seconds. These measures will ensure that dioxins/furans, polychlorinated biphenyls (PCBs) and PAHs are minimised through complete combustion of waste.

Emissions from the proposed facility have been modelled using the AERMOD dispersion model which is the USEPA's regulatory model used to assess pollutant concentrations associated with industrial sources (1). Emissions have been assessed, firstly under maximum emissions limits of the EU Directive 2010/75/EU and secondly under abnormal operating conditions.

The Ringaksiddy Resource Recovery Centre facility has one main process emission point (flue). In order to assess the potential effect from the proposed facility under maximum and abnormal operations, a conservative approach was adopted that is designed to over-predict ground level concentrations. This cautious approach will ensure that an over-estimation of effects will occur and that the resultant emission standards adopted are protective of ambient air quality. The approach incorporated several conservative assumptions regarding operating conditions at the proposed facility.

- **NO_2 & NO_X**

NO_2 modelling results indicate that the ambient ground level concentrations will be below the relevant air quality standards for nitrogen dioxide under maximum and abnormal operation of the facility. Thus, no adverse effect on the environment is predicted under these conditions at or beyond the facility boundary.

The annual average NO_x concentration (including background concentration) will also be below the critical level for the protection of vegetation accounting for 60% of the annual limit value at the worst-case receptor in the region of the Lough Beg Proposed NHA and the Cork Harbour SPA. Thus, no adverse effect on the environment, including the conservation objectives of the Cork Harbour SPA, will occur.

- **SO_2, CO, PM_{10} & $PM_{2.5}$**

AERMOD modelling results indicate that ambient ground level concentrations will be below the relevant air quality standards for the protection of human health for sulphur dioxide, carbon

monoxide and PM10 under maximum and abnormal operation of the facility. Results will also be below the air quality standard for $PM_{2.5}$ and the SO2 critical level for the protection of vegetation under maximum and abnormal operation of the facility. Thus, no adverse effect on the environment is envisaged to occur under these conditions at or beyond the facility boundary. Thus, no adverse effect on the environment, including the conservation objectives of the Cork Harbour SPA, will occur.

- **TOC, HCl & HF**

AERMOD modelling results indicate that the ambient ground level concentrations will be below the relevant air quality guidelines for the protection of human health for TOC (assumed pessimistically to consist solely of benzene), HCl and HF under maximum and abnormal operation of the facility. Thus, no adverse effect on the environment, including the conservation objectives of the Cork Harbour SPA, will occur.

- **PCDD / PCDFs (Dioxins/Furans)**

Currently, no internationally recognised ambient air quality concentration or deposition standards exist for PCDD/PCDFs (Dioxins/Furans). Both the USEPA and WHO recommended approach to assessing the risk to human health from Dioxins/Furans entails a detailed risk assessment analysis involving the determination of the effect of Dioxins/Furans in terms of the TDI (Tolerable Daily Intake) approach. The WHO currently proposes a maximum TDI of between 1-4 pgTEQ/kg of body weight per day.

Background levels of Dioxins/Furans occur everywhere and existing levels in the surrounding area have been extensively monitored as part of this study. Monitoring results indicate that the existing levels are similar to rural areas in the UK and Ireland. The additional contribution from the proposed development to levels of Dioxins/Furans is minor, with levels at the maximum off-site receptor to the south of the facility, under maximum and abnormal operation, accounting for only a small fraction of existing levels. Levels at the nearest residential receptor will also be minor, with the annual contribution from the proposed facility accounting for less than 1% of the existing background concentration under maximum operating conditions. There will be no adverse effects on the conservation objectives of the Cork Harbour SPA from Dioxins or Furans.

- **PAHs**

PAHs modelling results, based on AERMOD, indicate that the ambient ground level concentrations will be below the relevant air quality target value for the protection of human health under maximum and abnormal operation of the facility. Thus, no adverse effect on the environment is envisaged to occur under these conditions at or beyond the facility boundary. Thus, no adverse effect on the environment, including the conservation objectives of the Cork Harbour SPA, will occur.

- **Hg**

Mercury (Hg) modelling results, based on AERMOD, indicate that the ambient ground level concentrations will be below the relevant air quality standards for the protection of human health under maximum and abnormal operation of the facility. Thus, no adverse effect on

public health or the environment is envisaged to occur under these conditions at or beyond the facility boundary. Thus, no adverse effect on the environment, including the conservation objectives of the Cork Harbour SPA, will occur

- **Cd and Tl**

AERMOD modelling results indicate that the ambient ground level concentrations will be below the relevant air quality standard for the protection of human health for cadmium under maximum and abnormal operation from the facility. Emissions at maximum levels equate to ambient Cd and Tl concentrations (including background concentrations) which are 28% of the EU annual target value for Cd close to the facility boundary (the comparison is made with the Cd limit value as this is more stringent than that for Tl). There will be no adverse effects on the conservation objectives of the Cork Harbour SPA from cadmium or thallium.

- **Sum of As, Sb, Pb, Cr, Co, Cu, Ni, Mn and V**

AERMOD modelling results indicate that the ambient ground level concentrations will be below the relevant air quality standards for the protection of human health for arsenic (As), nickel (Ni) and vanadium (V) (the metals with the most stringent limit values) under maximum and abnormal operation emissions from the facility (based on the ratio of metals measured at a Waste to Energy facility in Carranstown, County Meath). Thus, no adverse effect on public health or the environment is envisaged to occur under these conditions at or beyond the facility boundary. Thus, no adverse effects on the environment, including the conservation objectives of the Cork Harbour SPA, will occur under these conditions.

7.2.6.9 AERMOD Modelling Summary

Modelling results indicate that the ambient ground level concentrations will be below the relevant air quality standards or guidelines for all parameters under maximum and abnormal operation of the facility. The modelling results indicate that this maximum occurs in the region between the northern and north-eastern boundaries of the facility. Maximum operations are based on the emission concentrations outlined in EU Directive 2010/75/EU.

An appropriate stack height has been selected to ensure that ambient air quality standards for the protection of human health will not be approached even under abnormal operating scenarios. Air dispersion modelling was undertaken in an iterative fashion in order to determine the stack height for the facility. The air dispersion modelling study found that a stack height of 70 metres was appropriate.

The spatial effect of the facility is limited with concentrations falling off rapidly away from the location of the maximum ambient ground level concentration. For example, the short-term concentrations due to process emissions at the nearest residential receptor will be less than 23% of the short-term ambient air quality limit values. The annual average concentration results in an even more dramatic decrease in maximum concentration away from the facility with concentrations from emissions at the proposed facility accounting for less than 2% of the limit value (not including background concentrations) at worst case sensitive receptors near the facility.

7.2.6.10 CALPUFF Modelling Assessment

The CALPUFF modelling system has been recommended by the USEPA as a Guideline Model for source-receptor distances of greater than 50km and for use on a case-by-case basis in complex flow situations within 50km. CALPUFF has some important advantages over steady-state Gaussian models such as AERMOD in areas of complex meteorology.

- **NO_2 and NO_x**

NO_2 modelling results, using CALPUFF, indicate that the ambient ground level concentrations will be below the relevant air quality standards with emissions at maximum operations leading to ambient NO_2 concentrations (including background concentrations) which are 67% of the maximum ambient 1-hour limit value (measured as a 99.8th%ile) and 32% of the annual average limit value at the respective worst-case receptors. Thus, no adverse effects on the environment, including the conservation objectives of the Cork Harbour SPA, will occur under these conditions at or beyond the facility boundary.

- **SO_2, CO, PM_{10} & $PM_{2.5}$**

CALPUFF modelling results indicate that ambient ground level concentrations will be below the relevant air quality standards for the protection of human health for sulphur dioxide, carbon monoxide and PM_{10} / $PM_{2.5}$ under maximum and abnormal operation of the facility. Thus, no adverse effect on the conservation objectives of the Cork Harbour SPA will occur under these conditions at or beyond the facility boundary.

- **TOC, HCl & HF**

Modelling results indicate that the ambient ground level concentrations will be below the relevant air quality guidelines for TOC (assumed pessimistically to consist solely of benzene), HCl and HF under maximum and abnormal operation of the facility. Thus, no adverse effect on the environment, including the conservation objectives of the Cork Harbour SPA, will occur.

- **PCDD / PCDFs (Dioxins/Furans)**

Based on CALPUFF modelling results, the contribution from the facility is minor, with levels at the worst-case receptor to the south of the Facility, under maximum and abnormal operation, accounting for only a small fraction of existing levels. Levels at the nearest residential receptor (approximately 400 metres from the nearest point of the SPA), will be minor, with the annual contribution from the proposed facility accounting for less than 1% of the existing background concentration under maximum operating conditions. Thus, no adverse effect on the environment, including the conservation objectives of the Cork Harbour SPA, will occur.

- **PAHs**

PAHs modelling results, using CALPUFF, indicate that the ambient ground level concentrations will be below the relevant air quality target value for the protection of human health under maximum and abnormal operation of the Facility. Thus, no adverse effect on the environment, including the conservation objectives of the Cork Harbour SPA, will occur.

- **Hg**

CALPUFF modelling results indicate that the ambient ground level concentrations of Hg will be below the relevant air quality standards for the protection of human health under maximum and abnormal operation of the facility. Thus, no adverse effect on the environment, including the conservation objectives of the Cork Harbour SPA, will occur.

- **Cd and Tl**

CALPUFF modelling results indicate that the ambient ground level concentrations will be below the relevant air quality standard for the protection of human health for cadmium under maximum and abnormal operation from the facility. Emissions at maximum levels equate to ambient Cd and Tl concentrations (including background concentrations) which are 25% of the EU annual target value for Cd close to the facility boundary (the comparison is made with the Cd limit value as this is more stringent than that for Tl). Thus, no adverse effect on the environment, including the conservation objectives of the Cork Harbour SPA, will occur.

- **Sum of As, Sb, Pb, Cr, Co, Cu, Ni, Mn and V**

CALPUFF modelling results indicate that the ambient ground level concentrations will be below the relevant air quality standards for the protection of human health for arsenic (As), nickel (Ni) and vanadium (V) (the metals with the most stringent limit values) under maximum and abnormal operation emissions from the facility (based on the ratio of metals measured at a Waste-to-Energy facility in Carranstown, County Meath). Thus, no adverse effect on the environment, including the conservation objectives of the Cork Harbour SPA, will occur.

7.2.6.11 Conclusion on modelling results

Based on the emission guidelines outlined in Council Directive 2010/75/EU, detailed air dispersion modelling has shown that the most stringent ambient air quality standards for the protection of human health are not exceeded either as a result of operating under maximum or abnormal operating conditions.

The modelling results, using both the USEPA regulatory model AERMOD and the more advanced CALPUFF model, indicate that the location of the maximum ambient ground level concentration occurs at or near the facility's southern boundary. The spatial effect of the facility is limited with concentrations falling off rapidly away from the maximum peak. For example, the short-term limit values at the nearest residential receptor will be less than 19% of the short-term ambient air quality limit values. The annual average concentration has an even more dramatic decrease in maximum concentration away from the facility with concentrations from emissions at the proposed facility accounting for less than 2% of the limit value (not including background concentrations) at worst case sensitive receptors near the facility.

In the Cork Harbour SPA, levels are significantly lower than most background sources. The concentrations from emissions at the proposed facility accounting for less than 1% of the annual limit values for all pollutants under maximum operations of the facility.

A detailed cumulative assessment of the facility and the relevant industrial emission sources was carried out using the methodology outlined by the USEPA. The effect of relevant nearby air emission points sources (Janssen Biologics, Hovione Cork, GSK Ireland, ESB Aghada,

Novartis Ringaskiddy Ltd, Pfizer Ireland Pharmaceuticals and BGE Whitegate) have been modelled in detail. The conclusion of the cumulative assessment study is that there is no significant overlap between the various emission sources and the facility and that all air pollutants will remain in compliance with the ambient air quality standards.

7.2.6.12 Mitigation by Design

A number of measures have been incorporated into the design of the resource recovery centre to ensure that emissions from the plant do not exceed regulatory emission limit values as outlined in Industrial Emissions Directive 2010/75/EU. Air modelling predictions indicate that ambient air quality due to emissions from the proposed facility will be within the air quality standards at all locations beyond the site boundary, based on maximum and abnormal operating conditions. Thus, no specific additional mitigation measures are required during the operational phase of the facility. Based on the results of air dispersion modelling of process emissions, there will be no adverse effects on the conservation objectives of the Cork Harbour SPA during the operational phase of the proposed development.

7.2.6.13 Summary of Sediment and soil Survey

The report Sampling and analysis of soil and sediment samples for PCDDs, PCDFs and PCBs at various locations around Cork Harbour (AWN, 2015) is attached as **Appendix 14; Sampling and Analysis of Soil Sediment** of this report.

Soil and sediment sampling was conducted at 12 locations in the Cork Harbour Area and at EPA Iniscarra, with the aim of determining background concentrations of PCDD, PCDF and dioxin-like PCBs in the vicinity. Three of these sites are within the Cork Habour SPA. Samples were analysed for dioxins and furans with results compared to previous data recorded by AWN and EPA sampling in 2000.

The primary aims of the sampling programme carried out by AWN were as follows (where site refers to the proposed Resource Recovery Centre):

- Establish the current concentrations of PCDDs, PCDFs and dioxin-like PCBs in soil and sediments in the vicinity of the site;
- Discuss the relevance of recorded concentrations of PCDDs, PCDFs and dioxin-like PCBs; and
- Compare recorded concentrations in this round with soil and sediment dioxin and furan concentrations obtained for the site by AWN in 2001, 2008, 2009 and historically by the EPA and Cork County Council. As this report is concerned primarily with potential effects on the Cork Harbour SPA, the sediment sampling programme is relevant. The sediment sampling sites are indicated in the full report **(Appendix14 Sampling and Analysis of Soil Sediment)** and, as far as the Cork Harbour SPA is concerned, were located as follows:
    - Beach 1A, Strand at Whitegate Village (more than 3km east of the proposed development) within the Cork Harbour SPA
    - Beach 2A, Ringaskiddy – Gobby Beach adjacent to road to Haulbowline Island

- Beach 3A Mud Flats at Buncoille (Monkstown) (circa 2.5km northwest of the proposed development) within the Cork Harbour SPA
- Beach 4A Mud flats in bay west of Hovione plant at Loughbeg, (circa 900m southwest of the proposed development) within the Cork Harbour SPA.

By sampling in these areas, PCDD/F concentrations in the sediment of these designated areas can be determined and used to whether there will be any adverse effects on species which may breed, feed, roost or winter in the SPA. In addition, all sediment sampling sites chosen were in areas of muddy sediment which can provide bird feeding habitats and which are known, or which have an apparent potential, to accumulate contaminants. Details on the sampling methodology and assumptions which were required when assessing results are included in **Appendix 14.**

The results of sediment sampling show that PCDD/F concentrations in beach sediments were generally higher in the 2015 sampling event than in the 2009 event, with the exception of levels at location Beach 2A which reduced from 0.035 ng/kg to 0.015 ng/kg. The concentration at Beach 1A in Whitegate Village was significantly higher in 2015 with an increase in concentration of more than ten times that of 2009.

There are no Irish statutory threshold values for PCDD/F or dioxin-like PCBs in soils or sediments. However, there are Dutch Target and Intervention values assigned to sum value of the EC7 PCB congeners and in the absence of Irish guidance, these values are typically used. The Dutch Government have set a national target value of 20 µg/kg PCB in soil and a threshold value (the concentration above which remedial action should be considered) of 1000 µg/kg. The highest measured concentration in soil in the Cork Harbour area in the 2015 sampling round was 0.113 ng/kg at Location 3A (Martello Tower) which is well below even the target value, therefore the recorded concentrations can be considered as insignificant.

The AWN 2015 report concluded as follows:

> *"Background concentrations of PCDD/Fs in soil samples were found to be reduced from samples measured at similar locations in 2001 and 2008. The concentration at Martello Tower (Location 3A) continues to be elevated above locations and in this recent round, the total PCDD/F concentration at Roche's Point Lighthouse (Location 7A) was found to be highest with a TEQ of 0.802 ng/kg. Dioxin-like PCB concentrations were typically similar to recorded concentrations in 2008 and remain well below Dutch limit value concentrations. TEQ PCDD/F concentrations in beach sediment samples were shown to be slightly higher at three out of the four sampling locations in 2015 with the most elevated concentration (0.485 ng/kg) recorded at the strand in Whitegate Village to the east of the site (Beach 1A). PCDD/F concentrations in sediments were still well below UK EA limit values, however. TOC and pH values were within expected ranges with slight alkalinity in the sediment samples as expected in marine conditions. Heavy metal concentrations were recorded at each of the twelve locations with highest lead (110 mg/kg) and zinc (140 mg/kg) concentrations recorded at Locations 4A and 2A, respectively."*

7.2.6.14 Ecological Risk Assessment

An ecological risk assessment report was prepared by AWN which specifically considers the risk to piscivorous birds and otter within Cork Harbour. (Ecological Risk Assessment for PCDD/F for Indaver Ringaskiddy Resource Recovery Centre (AWN, 2019). This report is attached as **Appendix 15; Ecological Risk Assessment for PCDD/F for Indaver Ringaskiddy Resource Recovery Centre.**

The risk assessment approach taken was that presented by the US EPA in the documents: Framework for the Application of the Toxic Equivalency Methodology, Polychlorinated Dioxins, Furans and BiPhenyls in Ecological Risk Assessment, US EPA 2003 1 and Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities, US EPA, 1999 2.

The approach taken was as follows:

- Model baseline impact of existing background dioxin with respect to predicted concentration in bird egg and concentration in forage fish in otter diet. The bird species focused on were cormorant and common tern.
- Model worst case theoretical increase due to PCDD/F emissions from the waste-to-energy facility.
- Model impact of predicted sediment concentration on selected species.

The receptor location for sediment concentration was in front of Whitegate Village (Beach 1A), which had the highest background levels.

The baseline calculation for both gull eggs and otters follows the relevant equations from the Framework Application Document above as follows:

C (fish eating bird egg) = (Cs/Foc) x BSAF (egg) x fl(egg)

Where

C (fish eating bird egg) is dioxin concentration (pg/g)

Cs is dioxin concentration in sediment (pg/g)

Foc is fraction of organic carbon in sediment

BSAF is the Biota-sediment accumulation factor

The increase in dioxin concentration in sediment resulting from airborne dioxin deposition was estimated using a very conservative approach, which was to assume the maximum dioxin deposition rate from the proposed facility fell within the SAC. It was also assumed that the sediment in question was permanently exposed to the atmosphere, whereas in reality the sediments will be covered by the tide for much of the day. The modelled increase was determined using deposition data modelled by AWN and the MARI model for soil dioxin.

The ecological risk assessment report concluded the following:

- Baseline dioxin concentrations in the eggs of fish-eating birds and in otters considered to be low and well within limit values for the eggs of fish eating birds.
- The predicted change in dioxin concentrations is considered to be insignificant for both fish-eating birds eggs and otters, based on exposure to forage fish.

7.2.7 Summary of literature review on possible effects on the environment from emissions of dioxin and mercury with a particular emphasis on bio-accumulation in piscivorous birds (Appendix 3)

7.2.7.1 History of dioxin and mercury emissions from incineration

- The first EU legislation to reduce dioxin emissions from municipal waste incineration was adopted in 1989. This set out operational conditions, or Emission Limit Values (ELV) In 1989, for the first time the EU adopted legislation to reduce dioxin emissions from municipal waste incineration by setting up operational conditions. These Emission Limit Values (ELV) were set at Community level in the Waste Incineration Directive 2000/76/EC, leading which led to significant reductions in dioxin emissions (Waste Incineration Directive 2000/76/EC). It is estimated that industrial sources of dioxin and furan emissions in the EU have reduced by almost 80% over the last 20 years. Currently the main sources of dioxin emissions in the EU 25 member states, including Ireland, are from non-industrial activities.
- Since 1995, the Irish EPA have regularly monitored dioxin levels in cow's milk. Levels of dioxins in cow's milk have been consistently low since the surveys began. The levels of dioxins found in the most recent surveys (2012) are well below the EU limit in milk and milk products of 2.5 pg WHO-TEQ/g for dioxins only, and 5.5 pg WHOTEQ/ g for dioxins and PCBs combined. The EPA results are in line with the dioxin results from the latest report from the Cork County Council animal health surveillance programme, which has been operating in the Cork Harbour Region since 1991.The Cork Harbour report found dioxin, furan and PCB levels were significantly less than the applicable limits. This study, which began in 2005, found dioxins and furan levels remained generally stable at values considered as low background levels in European terms.
- In 1995, the US EPA adopted new emissions standards for WtE facilities pursuant to the Clean Air Act. These regulations dictated that WtE facilities with large units (i.e., >227 tonnes per day) should comply with new Clean Air Act standards by December 2000. While WTE companies in the US represent 84% of the total Municipal Solid waste combusted, they account for 0.54% of the controlled industrial dioxin emissions, and 0.09% of all dioxin emissions from controlled and open burning. Several studies suggest that WtE facilities now represent less than 1% of the US emissions of dioxins and mercury.

7.2.7.2 Impact of dioxins on wildlife

- In animal studies, tetrachlorodibenzo-p-dioxin TCDD and dioxin-like chemicals demonstrate many effects. Laboratory studies on birds have shown a variety of effects from dioxins including lethality, chick oedema, decreased growth rates decreases in locomotory responses, deficits in body motions and balance, aggressive behaviour and changes in brain neurotransmitters. Fish eating birds which inhabit areas contaminated with TCDD are chronically exposed during embryonic development via the yolk and this has anti-oestrogenic effects. *In ovo* exposure to these compounds during the perinatal period may be responsible for certain behavioural characteristics and reproductive dysfunction.

7.2.7.3 Dioxins in birds and incineration

- A number of studies have attempted to examine the direct links between dioxin contaminated sites and morbidity effects in birds occupyinghabitats adjacent to them including studies of Anhingas (*Anhinga anhinga*) and White Ibises (*Eudocimus albus*) collected from a colony next to a Florida municipal solid-waste (MSW) combustor and ash landfill and eggs of the Common Tern (*Sterna hirundo*) from the highly polluted colonies, located in the main sedimentation area of the Rhine and Meuse rivers. In the study of Anhingas, most of the measured residues, including TCDD, TCDF, arsenic, beryllium, cadmium and nickel, remained at pre-operational levels during the first five years of facility operation. In the study on Common terns the toxicity of a mixture of dioxins and dioxin-like compounds can be expressed in a single number - the toxic equivalency (TEQ) and this was used as a metric to examine the residual yolk sacs of the hatchlings. Highly polluted colonies, located in the main sedimentation area of the Rhine and Meuse rivers, contained on average 16ng TEQ per gram lipid, which was fivefold higher than the concentrations in the reference colony. These studies were carried out prior to the implementation of the Waste Incineration Directive in the EU and the Clean Air Act in the US, which has led to substantial reductions in incinerator emissions.

7.2.7.4 Effects of mercury in ecosystems

- Because mercury can be methylated and therefore become bioavailable in aquatic systems, it has historically been considered a problem for species directly associated with aquatic ecosystems, such as piscivorous birds. Studies indicate that there is background uniformity of mercury contamination in the North Atlantic which provides evidence of global pollution by mercury due to atmospheric deposition at long distance from emission sources.
- Birds, such as Heron (*Ardea cinerea*), that consume large fish as their prey, are predicted to be at greater risk of methylmercury poisoning than birds that consume smaller fish. When the quantities of fish consumed on a body weight basis is also considered for smaller birds such as the Kingfisher (*Alcedo atthis*), there is an elevated risk of methylmercury poisoning.

- High concentrations of mercury have been associated with developmental and behavioral abnormalities, impaired reproduction and survival, and in some cases with direct mortality.
- Several estimates exist in the published literature on mercury concentrations in soft tissues (liver, kidney, brain) that are associated with mercury poisoning in bird species. Estimates for extreme hazard and neurological effects were in the region of 20µg/g fresh weight in soft tissues, brain mercury concentrations of 15 µg/g (fresh weight), or liver or kidney mercury concentrations of 30 µg/g (fresh weight).
- It was observed that significant reproductive impairment due to methylmercury occurred at about one-fifth the tissue concentrations required to produce overt neurotoxicity. Such effects include decreased hatchability of eggs. Dietary methylmercury also reduces the appetite and growth rates of baby birds.

7.2.7.5 Waste incineration and mercury in birds

- This subject was intensively studied in the Everglades in south Florida. The Everglades system was historically highly contaminated with mercury which had been linked to local waste incineration. Some results supported the hypothesis that nestlings are protected from the harmful effects of mercury through deposition of mercury in growing feathers. The implementation of the Clean Air Act in 2000 led the significant decreases in local mercury inputs. Studies concluded that the Everglades has undergone a biologically significant decline in mercury availability in the wetland food web, possibly because of decreased local inputs. Recent studies on Black Kites found an almost four-fold higher blood mercury levels compared to captive birds. Birds are clearly vulnerable to mercury contamination. The majority of the research done to date, however, has been focused on select taxa (waterbirds), trophic levels (piscivores), habitat types (aquatic systems), geographic regions (North America and Europe), and life history stages (reproduction), leaving the assessment of mercury's threats to birds incomplete. While much is known about mercury's effects on birds, but many relationships between mercury and bird biology remain poorly understood. The taxonomic groups, geographic ranges, life history stages, habitat associations, and foraging guilds of birds that are significantly threatened by mercury pollution need to be better identified.

7.2.7.6 Conclusions of literature review on possible effects on the environment from emissions of dioxin and mercury with a particular emphasis on bio-accumulation in piscivorous birds (Appendix 3)

- Historically dioxin and mercury emissions from incinerators have been the cause of much public concern. However, the implementation of the EU Waste Incineration Directive 2000/76/EC and the Clean Air Act in the US has led to large reductions in incinerator emissions across the developed world. In Germany, for example, incinerator dioxin emissions have fallen from 400 grams to less than 0.5 grams a year, since the year 2000. Incinerators now represent less than 1% of total dioxin emissions

in Germany. In Ireland dioxin levels are currently significantly less than applicable limits and are considered as low background levels in European terms.

- Laboratory studies on birds and mammals have found an array of negative effects from dioxins and heavy metals. While several studies have attempted to replicate these effects in the wild, in areas which are heavy polluted, the results have been inconclusive. In one study, uptake of dioxins in the bird population resident near a waste incinerator were not increased in the ten years following the facility's opening. One complication of feeding animal's diets containing fish collected from contaminated waters, appears to be that other unaccounted for contaminants can influence the overall toxicity of the mixture. While gaps in the research exist, between lab and field-based studies, it does appear that the impact of polluted sediments on animals is complex. The complexities of examining individual and combination effects of dioxins, PCBs and heavy metals in the field seem, at present, to be beyond the reach of researchers. However, it does appear that the contribution of waste incineration to these pollutants has decreased significantly. In the years since strict legislation governing waste incineration has been implemented, mercury concentrations in bird feathers has dropped significantly alongside declines in mercury inputs from industrial sources.

7.2.7.6 Additional information requested by the NPWS during consultation in relation to possible emission effects (See section 3.3)

During consultation with the NPWS, information was sought in relation to particular issues that relate to the possible effects of emissions from the proposed facility on Natura 2000 sites. These are addressed in **Appendix 2; Letter from the Development Applications Unit** and the responses are summarised below. The NPWS information requirements are as follows:

- Comparative data from similar waste-to-energy incinerator facilities (Point 3 of DAU letter).
- Information on plant start-up and shut-down procedures including frequency of start-up and shut-down, and emergency response procedures (Requested at the NPWS meeting, May 2015).
- Review of potential bio-monitoring programmes (Requested at the NPWS meeting, May 2015).
- Information on air emission monitoring data from Indaver's plant at Carranstown, Co Meath. (Requested at the NPWS meeting, May 2015).
- Effects of hazardous compounds (Point 8 of DAU letter).

7.2.7.7 Conclusions - Effects on piscivorous birds from air emissions and possible bioaccumulation

In determining the potential impact from emissions and bioaccumulation, the following points were taken into consideration:

- In line with the Industrial Emissions Directive, Directive 2010/75/EC, best available techniques (BAT) are required to be used in pollution prevention and control. BAT have been incorporated into all aspects of the design of this project.
- The facility will be operated under an industrial emission licence. Indaver must implement an environmental management system to manage and control all aspects of the operation.
- Within the incineration process, a hazardous substance that is fed into the furnace does not come out unchanged as the same hazardous substance, either in the residues or in the exhaust gases. In the furnace the hazardous substance is oxidised which means it under goes a chemical reaction and is converted into one or more different substances with different properties. These different substances are removed in the ash or flue gas cleaning residues and a very small quantity is discharged to the air in the exhaust gases. Compounds such as dioxins which form after combustion is complete (and at lower temperature windows in the boiler of around 450°C) are removed by the injection of activated carbon/clay.
- Potential effects on air quality have been comprehensively addressed. This appraisal reviewed background information on ambient air quality, potential cumulative effects, identified significant substances which could arise from the facility, identified suitable models and used the two most appropriate models to predict the concentrations at ground level by reference to stringent air quality standards. Modelling was based on conservative assumptions which overestimate the impact of the facility. Notwithstanding these conservative assumptions it was concluded that '*Air modelling predictions indicate that ambient air quality levels from the proposed facility will be within the ambient air quality standards at all locations beyond the site boundary, based on maximum and abnormal operating conditions.'*
- Soil and sediment sampling was conducted at 12 locations in the Cork Harbour Area. with the aim of determining background concentrations of PCDD, PCDF and dioxin-like PCBs in the vicinity. Samples were obtained from areas of muddy sediments where birds will feed, and 3 sediment sampling locations were located within the Cork Harbour Special Protection Area (SPA). Background concentrations were found to be below the Dutch limit value concentrations and UK Environmental Agency limit values.
- A literature review concluded that dioxins and mercury can impact on birds and mammals. However, the implementation of the EU Waste Incineration Directive 2000/76/EC and the Clean Air Act in the US has led to large reductions in incinerator emissions across the developed world. In the years since strict legislation governing waste incineration has been implemented, mercury concentrations in bird feathers has dropped significantly alongside declines in mercury inputs from industrial sources.
- Since 1995, the Irish EPA have regularly monitored dioxin levels in cow's milk. Levels of dioxins in cow's milk have been consistently low since the surveys began. The levels of dioxins found in the most recent surveys (2012) are well below the EU limit in milk and milk products of 2.5 pg WHO-TEQ/g for dioxins only, and 5.5 pg WHOTEQ/ g for

dioxins and PCBs combined (Concannon, 2014). The 2013 report from Cork County Council animal health surveillance programme, which addresses the years 2005 – 2010, found dioxin, furan and PCB levels were significantly less than the applicable limits.

- An Ecological Risk Assessment concluded that the baseline dioxin concentrations in the eggs of fish-eating birds and in otters considered to be low and well within limit values for the eggs of fish eating birds. The predicted change in dioxin concentrations is considered to be insignificant for both fish-eating, birds eggs and otters, based on exposure to forage fish.
- A review of the start-up and shut down processes and procedures has concluded that the risk of poor performance with respect to dioxins during start-up and shut down of the furnace will be effectively prevented.
- The waste-to-energy plant at the Ringaskiddy Resource Recovery Centre will be very similar to the Indaver Carranstown, Co Meath, plant. Air emission monitoring data from the Carranstown facility show that the concentration of dioxins in emissions from the plant, in the years 2012, 2013 and 2014, were substantially less than one tenth of the licensed emission limit value. For the year 2014, the daily average emissions of dust, metals, acid gases, carbon monoxide, sulphur dioxide and nitrous oxides from the facility complied with the licensed emission limit values.
- In Belgium, France and the UK examples of incinerators can be found located within less than 0.5km of an SPA and the results suggest that proximity to an SPA does not, in general, create a significant barrier to permission being granted to incinerators in proximity to SPAs.
- The closest part of the Cork Harbour SPA is located 0.5km from the site boundary and the area of shoreline which adjoins the site boundary is not of high value for birds listed as special conservation interests for this SPA.
- Based on the above, and taking possible cumulative effects into consideration, there will be no adverse effects on the conservation objectives of the Cork Harbour SPA arising from any emission from the proposed waste-to-energy facility. Similarly, given the low background levels and the low concentrations of toxic substances in emissions, the risk that significant bioaccumulation will occur is considered negligible. Therefore, there will be no adverse effect on the integrity, special conservation interests and conservation objectives for the Cork Harbour SPA from emissions, including cumulative emissions and possible bioaccumulation.

7.2.7.8 Additional information requested by the NPWS during planning oral hearing (2016) (See section 3.3)

During the 2016 planning oral hearing supplemental information was requested by Dr. Jervis Good of the National Parks and Wildlife Service (NPWS, Department of the Arts, Heritage and the Gaeltacht) in relation to possible effects from engineered nanoparticles. A literature review on nanoparticles is included as **Appendix 20** of this report.

A literature review indicated that engineered nanoparticles could theoretically impact on marine macro-invertebrates and fish, including species which may form part of the diet of birds listed as features of interest for the Cork Harbour SPA. At the present time however, there is no clear scientific evidence which indicates that the levels of nanoparticles likely to realistically occur in the existing environment represent a significant risk to birds feeding on macro-invertebrates in estuarine sediments or to piscivorous birds listed as features of interest for the Cork Harbour SPA.

The literature review on nanoparticle emissions from Waste-To-Energy facilities concluded that the use of a fabric filter in the flue gas treatment systems leads to very low levels of engineered nanoparticles in air emissions. The air emissions from the facility are not predicted to be a significant source of engineered nanoparticles and it is further noted that the Cork Harbour SPA is located 0.5km from the proposed facility at its closest point.

Nanoparticles will be present in flue gas residues. It was concluded that the risk of accidental release of flue gas residues during transport is not considered significant and this potential impact is screened out in this NIS.

There will be no process aqueous discharges from the facility. The only aqueous discharges to the marine environment during construction or operation will be surface water and there will be no pathway for engineered nanoparticles to enter the surface water. There is no direct pathway to water, it is indirect and the particle concentrations in air associated with the waste to energy plant are effectively insignificant when compared with background. Particles in air may over time deposit on water but in this case the water body is Cork Harbour with a daily tidal flux of some 57 million m3/day, providing many orders of magnitude dilution of any particles depositing on water. For the receptor to be impacted there needs to be a significant concentration of particles in the water.

From literature it is indicated that significant effects are most likely to occur at the mg/l level, whereas with the available dilution and the insignificantly small emission, it is not possible that the mg/l levels could ever be reached. Therefore, the potential for significant effects on prey items for birds within the Cork Harbour SPA from engineered nanoparticles is considered extremely remote for the foreseeable future.

Following on from this comprehensive assessment of the potential effects on the qualifying interests and conservation objectives for Natura 2000 sites, it has been concluded that the proposed development will not have an adverse effect on the integrity of any Natura 2000 sites including the Cork Harbour SPA.

7.2.8 Implementation of Mitigation measures

7.2.8.1 Implementation of mitigation measures - evidence of how these will be secured and implemented and by whom and evidence of how measures will be monitored and should mitigation failure be identified how that failure will be rectified.

Indaver will appoint a construction management team for the duration of the construction phase. The construction management team will be based on site. The team will supervise the construction of the project, including monitoring the performance of the contractors to ensure that the proposed construction phase mitigation measures are implemented, and that construction effects, and nuisance are minimised.

The team will monitor the implementation of the construction mitigation measures. It a mitigation measure is not implemented or if it fails the construction management team will require the relevant contractor to immediately rectify the situation. Refer to **Appendix 9; Construction Activities**.

7.2.8.2 Implementation of mitigation measures - evidence of degree of confidence in their likely success.

The proposed mitigation measures are tried and tested on many construction projects and their efficacy is proven. The likely success of the proposed mitigation measures is high. The measures incorporated into the project design and mitigation measures have been drawn up in line with current best practice and include an avoidance of sensitive habitats at the design stage. It is clear in what the mitigation measures are designed to achieve in lowering or reducing the risk of impact to acceptable levels. The risk that mitigation measures will not function effectively in preventing adverse effects on designated sites is low.

7.2.8.3 Implementation of mitigation measures - timescale, relative to plan or project for their implementation or completion.

The timescale for implementation of the mitigation measures will be dependent on the construction programme of the proposed project. However, based on evidence from other projects, the mitigation measures can only commence in tandem with other site operations as staff, machinery and other resources are necessary to implement the measures. Certain mitigation measures will have to be undertaken in advance of certain construction works, while others can proceed in parallel and others will only be necessary following completion of the main site works.

7.2.9 Biomonitoring

The NPWS requested that the potential benefits and practicality of a bio-monitoring programme for mercury and dioxin levels within birds in Cork Harbour during operation of the facility be assessed. Specifically the use of bird feathers and eggs of piscivorous birds was considered as a potential mechanism for assessing possible bioaccumulation. A review

including a literature review was carried out to assess the viability of such a bio-monitoring programme (**Appendix 6 Information requested by the NPWS on emission monitoring data Carranstown, Co. Meath, comparative data from similar waste-to-energy incinerator facilities, Effects of hazardous compounds and information on plant start-up and shut-down procedures)**

7.2.9.1 Conclusion of bio-monitoring review

A notable method for examining the impact of pollutants in the wild is bio-monitoring. While studies on heavy metals, in particular mercury, are well established, non-invasive bio-monitoring for dioxins is still relatively new. Bird feathers and eggs have been successfully used to monitor mercury levels in birds for many years. In the case of dioxins, bird livers and muscle are commonly used, although a number of studies have successfully used eggs to monitor contamination levels. However, other factors, including age, sex, time of year, migratory status and, in the case of eggs, laying sequence, will affect the levels of mercury or dioxins detected. Therefore, using such techniques to monitor mercury patterns in a single area, or from a single source (in this case the proposed Indaver facility) appears very difficult if not impossible.

Indaver contacted representatives of the waste-to-energy industry in the UK, Ireland, Germany, Belgium and The Netherlands but found no evidence for a biomonitoring programme instigated by a specific incinerator. The general consensus was that such programmes are not required due to the low emission levels and the low potential for effects.

The predicted levels of dioxins and mercury generated by the facility will be low and no significant impact on piscivorous bird species is predicted. Given the difficulties inherent in determining the source of dioxins and mercury in piscivorous birds and the difficulties in ascribing levels to any particular source, the use of cows' milk is considered an adequate means of determining if problematic levels of dioxins are entering the food chain via atmospheric deposition. The EPA conducts such monitoring of dioxin in cow's milk in Ireland, including in the Ringaskiddy area.

8. Conclusions of the Natura Impact Statement

The Stage One Screening appraisal contained in this report considered the potential for significant effects arising from the proposed development on Natura 2000 sites within a 20km radius. Following screening, the only Natura 2000 site for which potential significant effects have been identified is the Cork Harbour SPA, which is located approximately 0.5km from the proposed development site at its closest point.

Effects which were considered to have the potential to impact on the Cork Harbour SPA relate to disturbance during construction and operation, a possible fire in the bunker during operation, effects on the marine environment during construction and operation, the collision risk to birds created by the stack during operation and the potential for emissions of substances with eco-toxicological effects and possible bioaccumulation through the food chain. Potential cumulative effects were also considered.

A range of precautionary measures have been incorporated into the project design, and other mitigation measures have been developed and proposed, with the purpose of avoiding or minimising effects on the qualifying interests and conservation objectives of the Cork Harbour SPA, which is located 0.5km from the Indaver site. The likely success of these measures was also considered and no particular difficulties in their effective implementation were identified.

The provisions of Article 6 of the 'Habitats' Directive 92/43/EC (2000) defines 'integrity' as the 'coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and / or population of species for which the site is or will be classified'. *The draft documents Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (Draft)* (EC, 2015) states that the integrity of the site can be usefully defined as the coherent sum of the site's ecological structure, function and ecological processes, across its whole area, which enables it to sustain the habitats, complex of habitats and/or populations of species for which the site is designated"

Following a comprehensive evaluation of the potential direct, indirect and cumulative effects on the qualifying interests and conservation objectives for the Cork Harbour SPA, it has been concluded that the proposed development will not have an adverse effect on the integrity of the Cork Harbour SPA.

Appendix 1

Site location and site layout figures

Appendix 2

Letter requested by the NPWS

Appendix 3

Literature review on the potential ecological effects of mercury, dioxins, thallium

Appendix 4

Literature review on bird collision risk

Appendix 5

Assessment of potential bio-monitoring programme

Appendix 6

Information requested by the NPWS on emission monitoring data Carranstown

Appendix 7

Introduction

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