6. Population and Human Health

6.1 Introduction

This chapter addresses potential effects of the proposed development on population and human health and includes an assessment of the likely significant adverse effects on the environment arising from the vulnerability of the proposed development to risks of major accidents and/or disasters.

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.

6.1.1 Population and Human Health

Population and Human Health, as outlined in EPA Guidance, is a broad ranging topic which "*covers the existence, activities and health of people, usually considering people as groups or 'populations'*".

The proposed development has the potential to affect population and human health in several ways. Aspects examined in this chapter primarily relate to effects from the proposed development on socio-economic activities and on local community health. The potential effects on population and human health arising from traffic, visual effects, natural amenity, nuisance, built and natural heritage, air and noise emissions, climate change etc, are dealt with in the specific chapters in this EIS dedicated to those topics (see below):

- **Chapter 5** ***Construction Activities***;
- **Chapter 7** ***Roads and Traffic***;
- **Chapter 8** ***Air Quality***;
- **Chapter 9** ***Climate***;
- **Chapter 10** ***Noise and Vibration***;
- **Chapter 11** ***Landscape and Visual Impact Assessment***;
- **Chapter 12** ***Biodiversity***;
- **Chapter 13** ***Soils, Geology, Hydrogeology, Hydrology and Coastal Recession***;
- **Chapter 14** ***Archaeological, Architectural and Cultural Heritage***; and
- **Chapter 15** ***Material Assets*****.**

Human health effects are primarily considered through an assessment of the environmental pathways by which health can be affected such as air, noise, water or soil. Therefore, the health assessment relies on the assessments in the relevant chapters listed above and draws on the findings as necessary to examine whether the effects arising from any identified effects may have a health effect and to ensure that the effects which may have a health effect are fully considered.

However, the health assessment also considers health improvement and improvement to services. Other aspects, such as changes in traffic flows which are dealt with in **Chapter 7** ***Roads and Traffic*** have also been considered in this chapter in relation to the assessment of socio-economic and health effects to ensure that the effects of these issues on population and human health have been addressed.

6.1.2 Major Accidents and Disasters

Indaver carried out a hazard identification and risk assessment (HAZID&RA) for the proposed development. This is included as **Appendix 6.1** to this EIS. In accordance with the European Commission's EIA guidance, there are two key considerations:

- The Project's potential to cause major accidents and/or disasters for human health, cultural heritage and/or the environment; and
- The vulnerability of the Project to potential disaster/accident.

The assessment of the vulnerability of the development to risks of major accidents and disasters is included in this EIS in accordance with the EIA Directive 2014/52/EU which states the need to provide

"a description of the expected significant adverse effects of the project on the environment deriving from the vulnerability of the project to risks of major accidents and/or disasters which are relevant to the project concerned".

The HAZID&RA was drawn up to provide a systematic methodology for assessing these aspects. This is in accordance with the requirements of Directive 2014/52/EU and is structured in the following manner:

- Identification of the relevant major accidents (end events) that could arise at the proposed development site.
- Identification of the potential initiating event(s) that could give rise to each end event, including consideration of external events such as disasters.
- Assessment of the level of risk presented by each scenario.
- Identification of the measures that are in place, or that need to be in place, to reduce the risks and/or mitigate the effects of these scenarios.

The underlying objective of the assessment is to ensure that appropriate precautionary actions are taken for those projects which "*because of their vulnerability to major accidents and/or natural disasters, […] are likely to have significant adverse effects on the environment*".

6.2 Assessment Methodology

6.2.1 Population and Human Health

6.2.1.1 Introduction

Aspects examined in this chapter primarily relate to effects from the proposed development on socio-economic activities and on local community health. These two themes are discussed in some sections of this chapter but separately in other sections where appropriate.

6.2.1.2 Guidance

This chapter has been prepared having regard to the following guidelines:

- Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022);
- Department of Housing, Planning and Local Government (2018) Guidelines for Planning Authorities and an Bord Pleanála on carrying out Environmental Impact Assessment, (August 2018);
- EPA (2003) Advice Notes on Current Practice in the Preparation of Environmental Impact Statements;
- US EPA (2016) Health Impact Assessment Resource and Tool Compilation;
- European Commission Guidance (2003) Implementation of Directive 2001/42 on the assessment of the effects of certain plans and programmes on the environment;

- European Commission (2017) Environmental Impact Assessment of Projects - Guidance on the preparation of the Environmental Impact Assessment Report;
- Fáilte Ireland (2011) Guidelines for treatment of tourism in an Environmental Impact Statement;
- IEMA (2017) Health in Environmental Impact Assessment - A Primer for a Proportionate Approach;
- IPI (2009) Health Impact Assessment (Institute of Public Health Ireland 2009);
- World Health Organisation (WHO) (2018) Environmental Noise Guidelines for the European Region 2018;
- WHO (2009) Night time Noise Guidelines for Europe;
- WHO (2005) WHO Air Quality Guidelines for particulate matter, ozone, nitrogen dioxide and sulphur dioxide;
- WHO (1999) Guidelines for Community Noise;
- WHO (2014) Regional Office for Europe. Health in impact assessments: opportunities not to be missed.
- WHO (2016) Dioxins and their effects on Human Health WHO Fact sheet No. 225.
- HSA (2023) Guidance on technical land-use planning advice for planning authorities and COMAH establishment operators

6.2.1.3 Consultation

During the preparation of the 2016 EIS, consultations were held with a number of parties in order to ensure that environmental issues, including socio-economic, recreational and amenity issues relating to the project were addressed. The parties consulted are listed in **Appendix 1.2** of **Chapter 1** ***Introduction*** of this EIS.

Effects on health were addressed as part of the following assessments and are summarised in this chapter:

- Hazard Identification and Risk Assessment Study (HAZID&RA) (Refer to **Appendix 6.1**)
- Soil dioxin and dibenzofuran (PCDD/F) monitoring programme (Refer to **Appendix 6.2**)
- Modelling of PCDD/F Intake for the proposed development (Refer to **Appendix 6.3**)

6.2.1.4 Impact Assessment Methodology – Population (Socio-economics)

The appraisal of likely significant effects of the proposed development on socio economics is a qualitative assessment and was conducted by reviewing the current socio-economic environment in the areas close to the proposed development. This included a review of data in relation to demographics, heritage, amenities, community, economic activity, tourism and employment.

In general, the demographic data quoted throughout this chapter is from the most recent Census (2022). Data from the Labour Force Survey (formerly the National Quarterly Household Survey) has also been used.

It is noted that in January 2019, legislation was passed which finalised the revision of Local Government boundary arrangements in Cork. This means that from 31 May 2019, the transition areas of Ballincollig, Blarney, Tower, Glanmire, Douglas, Donnybook, Grange, Frankfield, Rochestown and Togher became part of the Cork City rather than Cork county. Refer to the Cork County Council website for further details.

Information was also sourced from the following sources:

- Cork County Development Plan 2022-2028;
- Central Statistics Office (CSO) (www.cso.ie);

6.2.1.5 Impact Assessment Methodology – Human Health

Impact Assessment Methodology – Guidance

The recitals to the 1985 (85/337/EEC) and 2011 (2011/92/EU) EIA Directives refer to "*human health*" and include "*Human Beings*" as the corresponding environmental factor. The 2014 EIA Directive (2014/52/EU) changes this factor to "*Population and Human Health*". However, no specific guidance on the meaning of the term Human Health has been issued in the context of Directive 2014/52/EU.

In addition, no specific guidance on the assessment of human health in the context of EIA has been issued to date.

The 2022 EPA guidelines on the information to be contained in Environmental Impact Assessment Reports (Section 3.3.6) note that "*While no specific guidance on the meaning of the term Human Health has been issued in the context of Directive 2014/52/EU, the same term was used in the SEA Directive (2001/42/EC). The Commission's SEA Implementation Guidance states 'The notion of human health should be considered in the context of the other issues mentioned in paragraph (f)'. (Paragraph (f)47 lists the environmental factors including soils, water, air etc).*"

The 2022 EPA guidelines note that the above health assessment approach is consistent with the approach set out in the 2002 EPA Guidelines where health was considered through assessment of the environmental pathways through which it could be affected, such as air, water or soil:

'The evaluation of effects on these pathways is carried out by reference to accepted standards (usually international) of safety in dose, exposure or risk. These standards are in turn based upon medical and scientific investigation of the direct effects on health of the individual substance, effect or risk. This practice of reliance upon limits, doses and thresholds for environmental pathways, such as air, water or soil, provides robust and reliable health protectors [protection criteria] for analysis relating to the environment.'

The 2022 EPA guidelines also note under Section 3.3.6 that "*In an EIAR, the assessment of impacts on population & human health should refer to the assessments of those factors under which human health effects might occur, as addressed elsewhere in the EIAR e.g. under the environmental factors of air, water, soil etc..*" and that "*Assessment of other health & safety issues are carried out under other EU Directives, as relevant. These may include reports prepared under the Industrial Emissions, Waste Framework, Landfill, Strategic Environmental Assessment, Seveso III, Water Framework Directive, Floods or Nuclear Safety Directives. In keeping with the requirement of the amended Directive, an EIAR should take account of the results of such assessments without duplicating them.*"

These principles are again supported in Guidelines for Planning Authorities and an Bord Pleanála on carrying out Environmental Impact Assessment, August 2018 issued by the Department of Housing, Planning and Local Government (reference page 28):

"consideration of human health effects resulting from the construction and operation of a project should focus on health issues arising in the context of the other environmental factors listed in Article 3 of the Directive/ Section 171A of the Act, namely:

- *Population;*
- *Biodiversity, with particular attention to protected species and habitats;*
- *Land, soil, water, air and climate;*
- *Material assets, cultural heritage and the landscape;*
- *Interaction between the above factors".*

Section 1.3.1 (page 37_of the European Commission guidance (2017) relating to the preparation of the EIS in relation to "*human health*" states:

"Human health is a very broad factor that would be highly Project dependent. The notion of human health should be considered in the context of other factors in Article 3(1) of the EIA Directive and thus environmentally related health issues (such as health effects caused by the release of toxic substances to the environment, health risks arising from major hazards associated with the Project, effects caused by changes in disease vectors caused by the Project, changes in living conditions, effects on vulnerable groups, exposure to traffic noise or air pollutants) are obvious aspects to study. In addition, these would concern the commissioning, operation, and decommissioning of a Project in relation to workers on the Project and surrounding population"

The Institute of Environmental Management and Assessment (IEMA) is the largest professional body for environmental practitioners in the United Kingdom and worldwide, with nearly 15,000 members. As such it is an authoritative body on Environmental matters. IEMA issued a discussion document in 2017 "Health in Environmental Impact Assessment - A Primer for a Proportionate Approach" which it describes as a primer for discussion on what a proportionate assessment of the impacts on health should be in EIA and is a useful document when considering what can and should be assessed in the context of this EIS. Due regard has been had to the general approach advocated in this document when undertaking this assessment.

One of the messages in the IEMA document in terms of assessing health in EIA, is that there should be a greater emphasis on health outcomes, (that is the potential effects on human health), rather than simply the health determinants, (that is the agents or emissions which could have the potential to have health effects). The IEMA document noted that in EIA, there has previously been a strong focus on just the agents or emission levels (e.g. dust) rather than focusing on the effects of these agents/emission levels on human health. This change in emphasis does not mean a complete change in practice. For example, measurement and modelling of dust levels continues to be an essential part of the health assessment.

The IEMA document notes that:

"Public health is defined as the science and art of promoting and protecting health and well-being, preventing ill-health and prolonging life through the organised efforts of society and has three domains of practice: health protection, health improvement and improving services".

The IEMA document suggests that these three domains should be considered in the assessment of human health in EIA. Examples of health protection issues to be considered could include issues such as chemicals, radiation, health hazards, emergency response and infectious diseases whilst health improvement issues could include lifestyles, inequalities, housing, community and employment. Examples of improving services issues could include service planning, equity and efficiencies. This correlates well with Directive 2014/52/EU.

The World Health Organization (WHO) defined health in its broader sense in its 1948 constitution as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity". Therefore, whilst the EPA guidance is useful in terms of health protection, for a more holistic assessment as per the IEMA document, it is also worthwhile to look at broader health effects in terms of opportunities for improvement of health and for improvement of access to services. While it is important to do this, it is also important not to attribute every conceivable event as being a health effect. To further rely on the WHO definition, a health effect would be something that would have a material impact on somebody's physical mental and social well-being be that positive or negative.

Therefore, health protection, health improvement and improving services are all considered in this assessment of human health effects. The methodology for assessing health protection is considered further below.

Health Impact Assessment and Environmental Impact Assessment

The IEMA document notes that Health Impact Assessment (HIA) and EIA are separate processes and that whilst a HIA can inform EIA practice in relation to human health, a HIA alone will not necessarily meet the requirements of the EIA Directive in relation to human health. Further, HIA is not routinely carried out for major infrastructure schemes in Ireland, such as this proposed development, and it is typically a non-statutory document that is normally prepared on a voluntary basis by developers overseas, e.g. in the UK.

Guidance for performing HIAs was issued by the Institute of Public Health in Ireland in 2009 and they have outlined that there are considerable difficulties in performing a HIA for a project of this nature. Not least of these is the difficulty of getting baseline health data as it is quite difficult (due to patient confidentiality and other reasons) to accurately determine levels of even relatively common medical conditions in a relatively defined population that might be affected. Qualitative and quantitative baseline health data is a vitally important part of the HIA process. This is because it is first important to determine the baseline health status of the community before it is possible to determine the quantitative impact that a proposal might have on health.

In the absence of accurate baseline data, it is very difficult to assess qualitative and quantitative changes that might occur as a result of a project of this nature.

More useful generalised data that might exist for larger areas (such as a city or county) may be used (as discussed in **Section 6.3.1** below), but these datasets would be at most an estimate of the local baseline and not accurate enough to allow for meaningful interpretation specific to the proposed development. Possible local effects, perhaps due to socio-economic variations or for other reasons would not be evident using data for larger population areas making the process inaccurate. This difficulty is not unique to the proposed development.

The IEMA document (IEMA, 2017), notes that the WHO provides an overview of health in different types of impact assessment (WHO, 2014) and presents the WHO perspective on the relationship of HIA to other types of impact assessment as follows:

"The health sector, by crafting and promoting HIA, can be regarded as contributing to fragmentation among impact assessments. Given the value of impact assessments from a societal perspective, this is a risk not to be taken lightly ... The need ... and justification for separate HIA cannot automatically be derived from the universally accepted significance of health; rather, it should be demonstrated whether and how HIA offers a comparative advantage in terms of societal benefits ...

Health issues can, and need to, be included [in impact assessment] irrespective of levels of integration. At the same time, from a civic society perspective, it would be unacceptable for HIA to weaken other impact assessments. A prudent attitude suggests optimizing the coverage of health along all three avenues:

- *better consideration of health in existing impact assessments other than HIA;*
- *dedicated HIA; and*
- *integrated forms of impact assessment.*"

It is clear therefore that the WHO does not support a stand-alone HIA unless it can be demonstrated to be of advantage over the assessment of population and human health in the EIS. In this case no such advantage exists and indeed given the lack of baseline data, a stand-alone HIA would add very little to the assessment process. It is for these reasons that this assessment of human health is part of this EIS and that no stand-alone HIA has been prepared for the proposed development.

It is therefore important to note that this assessment on human health is provided as part of the overall EIS rather than a stand-alone HIA. The HIA is defined as a combination of procedures, methods and tools that systematically judges the potential, and sometimes unintended, effects of a policy, plan, programme or project on both the health of a population and the distribution of those effects within the population.

In contrast, the assessment of human health in the context of an EIAR focuses the attention of the assessment on likely significant effects, i.e. on effects that are deemed likely to occur and, if they were to occur, would be expected to be significant (as per the requirements of Directive 2014/52/EU). Conducting a HIA will not necessarily meet the population and human health requirements of the EIA Directive.

Therefore, health protection, health improvement and improving services are all considered in this assessment. The methodology for assessing health protection and health is considered further in the following sections.

Health Protection

The assessment of human health for the proposed development, in terms of health protection, follows the approach set out in the EPA guidelines and in the European Commission's SEA Implementation Guidance. That is the assessment on potential effects on human health is guided using health-based standards. It is also similar in nature to the US EPA guidance. Human Health protection is considered through the assessment of the environmental factors (pathways) through which health could be affected such as air, noise, water and soils. The US EPA guidance includes a four-step approach which is represented graphically in **Figure 6.1** of **Volume 3** ***Figures***.

The potential noise, air, soils and water impacts which could affect human health were identified (Hazard Identification), the scale of these potential impacts (Dose-Response Assessment) and their duration (Exposure Assessment) were assessed and the significance of the potential impact on human health determined (Risk Characterisation).

When using a recognised Health Based Standard such as the one issued by the WHO 2009, the dose-response assessment is actually included in the standard.

In other words, the authorities or expert committees which recommended a specific threshold or parameter (i.e. a limit value) in a standard will have inherently taken into account the health problems at the different exposure levels and thus set the limit value within the standard to prevent these health problems (i.e. significant effects on human health) from occurring.

Health Improvement

Projects that have the potential to generate environmental benefits, protect the population from public health dangers as well as support regeneration, reduce unemployment and improve socio-economic circumstance, could contribute to improving the health and wellbeing of communities.

The assessment for the proposed development, in terms of health improvement, includes an assessment of the likely significant effects of the proposed development on the socio-economics of the community.

Psychological Impacts

In the planning process, potential adverse effects on psychological health are often mentioned, for example, anxiety and stress experienced by those who are worried that they will experience a change in the environment in which they live.

The community will experience annoyance from the temporary effects of the construction phase. This is probably the same as for any construction project and will be relatively limited given the location of the site. Annoyance however, is not in itself a health effect.

For virtually every proposal for any development there are concerns about potential adverse effects on a person's overall psychological well-being. This is somewhat a more difficult matter to assess as there are no direct measurements one can use. While one can give great detail in predicting for example noise emissions one cannot use the same scientific certainty in predicting psychological effects. It is not possible to use a standards-based approach for example.

There are various degrees of psychological effect, and these can be both positive and negative. Although identifying the potential effects is possible, quantifying them is difficult as there are no direct measurements available and the same effects may have a different impact on different people. For example, for some individuals demolishing an old building could be viewed as removing an eyesore or making way for something better but alternatively for others, it can be seen as a loss of heritage.

Another example of this is how people reacted to the Covid pandemic. Many had very significant concerns about contracting Covid, with increased levels of anxiety and even leading to increased psychological ill health, whereas others were anxious because of movement restrictions or requirements to wear masks in public.

While some impacts on health are very predictable, such as the impacts of increasing noise or decreasing air quality, the impacts on psychological health from the same situation can differ very significantly between people depending on their perspectives.

In terms of assessing the psychological impact, an impact is assessed as either positive or negative, if it is likely that the overwhelming majority of people will experience that effect. Where different psychological impacts are anticipated from the same scenario the assessed psychological impact is neutral.

There can also be a positive effect, whereby people may look forward to employment opportunities both direct, as in those who will be employed in construction and operation of the facility, and indirect for those whose jobs in, for example pharmaceutical and chemical companies, may be more secure with a solution to ongoing waste issues.

There can also be adverse effects of varying degrees. At the lower end of this impact might be annoyance where somebody is annoyed by for example, outside noise, dust depositing with construction of the roads. This is not a medical effect as such. If someone develops a psychological illness such as anxiety or depression this would be a medical effect.

There is also the very real concern that people may be worried they will get cancer, largely due to misinformation.

The potential effects are minimised or mitigated by education of the reality and provision of regular information on the facts. However, there is no documented evidence from these projects to link adverse outcomes with psychological health in Ireland. There is for example, no evidence of an increase in psychological illness around incinerators. This would suggest that despite people holding genuine concerns prior to the facility being built that once operational and people can see the absence of effects, then any such worries dissipate.

6.2.1.6 Standards

Air Quality – Appropriate Standards

The starting point in selecting the appropriate standard to apply is Directive 2008/50/EC of the European Parliament and of the Council, as amended by Commission Directive (EU) 2015/1480 on ambient air quality and cleaner air for Europe (CAFE Directive). In Ireland, air quality is monitored by the EPA to ensure that the relevant limit values specified by EU directives (that set out the targets for specific air pollutants) are achieved. Limit values have been specified in the CAFE Directive for the following air pollutants (as described in detail in **Table 6.1**:

- Sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and oxides of nitrogen (NO_x), particulate matter (PM_{10} and $PM_{2.5}$) and lead;
- Carbon monoxide and benzene;
- Ozone; and
- Arsenic, Cadmium, Nickel and Benzo(a)pyrene.

Table 6.1:Limit values as set out in the CAFE Directive

Pollutant	Limit Value Objective	Averaging Period	Limit Value ug/m^3	Limit Value ppb	Basis of Application of the Limit Value	Limit Value Attainment Date
SO_2	Protection of human health	1 hour	350	132	Not to be exceeded more than 24 times in a calendar year	1 Jan 2005
SO_2	Protection of human health	24 hours	125	47	Not to be exceeded more than 3 times in a calendar year	1 Jan 2005
NO_2	Protection of human health	1 hour	200	105	Not to be exceeded more than 18 times in a calendar year	1 Jan 2010
NO_2	Protection of human health	calendar year	40	21	Annual mean	1 Jan 2010
PM_{10}	Protection of human health	24 hours	50		Not to be exceeded more than 35 times in a calendar year	1 Jan 2005
PM_{10}	Protection of human health	calendar year	40		Annual mean	1 Jan 2005
$PM_{2.5}$ - Stage 1	Protection of human health	calendar year	25		Annual mean	1 Jan 2015
$PM_{2.5}$ - Stage 2	Protection of human health	calendar year	20		Annual mean	1 Jan 2020
Lead	Protection of human health	calendar year	0.5		Annual mean	1 Jan 2005
Carbon Monoxide	Protection of human health	8 hours	10,000	8620	Not to be exceeded	1 Jan 2005
Benzene	Protection of human health	calendar year	5	1.5	Annual mean	1 Jan 2010

Additionally, it should be noted that provisions were also made for the inclusion of new ambient limit values relating to $PM_{2.5}$. These are clearly appropriate and robust standards.

Air quality standards protect the vulnerable including those with respiratory illnesses, the old, very young and infirm. Whilst slightly higher levels of oxides of nitrogen above the limit values may have no effect on the vast majority of the population, elevated levels of pollutants in ambient air may be significant for these vulnerable groups within the population. This assessment has relied on compliance with the limit values in the CAFE Directive to determine likely significant effects on human health. Therefore, adherence to these limit values is considered to represent that there will be no adverse effect on human health due to air quality emissions as **Table 6.1** outlines that the levels set primarily for the protection of human health.

Noise – Appropriate Standards

As set out in **Chapter 10** ***Noise and Vibration***, in the absence of statutory guidance or other specific limits prescribed by local authorities, an appropriate best practice measure has been adopted as the standard for this project. Best practice guidelines in the construction phase are taken from the British Standard BS 5228 – 1: 2009 +A1 2014: Code of practice for noise and vibration control on construction and open sites – Noise.

The noise assessment criteria are based on the Guidelines set out by regulatory bodies such as the EPA, the WHO. It also includes well established standards such as BS 5228 Code of Practice for the Control of Noise and Vibration on Construction and Open Sites. Part 1 – Noise and Part 2 – Vibration (2009 +A1 2014).

Construction Noise Criteria

Construction noise is temporary in nature and usually experienced over a short to medium-term period. This characteristic requires it to be considered differently to other longer-term sources of noise. Construction activities on larger-scale developments of this nature will inevitably result in noise being generated temporarily.

There is no Irish guidance specifically published for the short to medium-term construction work such as that required for the proposed development. There are in fact very few residences in the immediate vicinity.

Operational Noise Criteria

In relation to human health specifically, for the operational phase the most applicable guidelines are those issued by the WHO. There are new Guidelines in relation to Environmental Noise issued in October 2018 (WHO, Environmental Noise Guidelines for the European Region, 2018). These deal with specific sources of noise such as Roads, Rail, Aircraft and Wind Turbines. They do not specifically deal with construction noise or industrial noise. They supersede and supplement previous Guidelines issues by the WHO including the Community Noise Guidelines 1999 (WHO, WHO (1999) Guidelines for Community Noise, 1999) in relation to community effects of noise and subsequent guidance on Night Time noise in Europe 2009.

In their recent guidance (WHO, Environmental Noise Guidelines for the European Region, 2018), the WHO state that large proportions of the European population are exposed to noise levels in excess of 55dB Lnight.

The WHO guidelines identify some health effects at quite low night time levels and proposed a population Guidance, for roads, of 45dB Lnight outside residential properties.

The operational noise criteria set for the project is based on guidance contained within the EPA's *Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities* (NG4, EPA 2016). Following a review of the prevailing background noise levels, an operational noise level of 55dB LAeq,T for daytime periods and 45dB LAeq,T for night-time periods has been set at noise sensitive locations (i.e. residential dwellings and The National Maritime College of Ireland (NMCI)). Refer to **Chapter 10** ***Noise and Vibration***.

6.2.1.7 Literature Review

Introduction

The introduction of waste incinerators has resulted in numerous studies of the effects of this process on human health. These have been carried out in either the occupational or community setting. Most of the published studies have looked at incinerators whose emissions of dioxins, particulates and heavy metals were far greater than would be emitted by a modern incinerator such as that proposed for Ringaskiddy. Basic scientific principles indicate that the more controlled the emissions are, the lower the level of toxins which are emitted, the less potential for any health effects.

Therefore, the studies that are available, which will be discussed in more detail in the following literature review section, in many ways show a "worse than worst" case scenario for modern incinerators.

They can nevertheless be valuable in making an assessment of the possible human health effects, as if there is little discernible effect with poor controls, therefore we can be scientifically certain there will be still fewer effects with greater controls.

The health outcomes that have been examined in the various published studies include respiratory symptoms and illness, reproductive effects and the development of cancer. In addition to studies of the possible consequences of non-specific exposure to emissions from waste incinerators, research has also been conducted to determine the presence or effects of exposure to certain substances known to be present in incinerator emissions. In recent years, more attention has also been given to particulate matter such as PM_{10} and $PM_{2.5.}$

Previously, reliance has been on the publication from 2003 by the Health Research Board on Health and Environmental Effects of Landfilling and Incineration of Waste and the publication, A review of the environmental and Health effects of Waste Management published in May 2004 by the UK Department of the Environment, Food and Rural Affairs (DEFRA).

Both of these are now somewhat dated. The studies quoted were largely related to older generation incinerators and prior to EU Directives which set limits on emissions but can be assessed in addition to more recent publications.

A PubMed electronic search was also performed on the 24th August 2025 using the key words “waste incineration” to identify further studies and any more recently published studies. A total of 7,419 articles were identified. When the search was narrowed using the three words “waste incineration health” 1,701 articles were identified. . These are all of varying age and relevance.

It is possible to refine searches in PubMed using a “review” filter and when this was done with the terms “waste incineration health” there were a total of 244 articles. This identifies the articles published in peer reviewed medical journals which attempted to review the available scientific information from other publications. By further selecting “Systemic review” 22 articles were identified.

The aforementioned Health Research Board (HRB) report was commissioned in 2003 to review existing data on waste management methods at that time. It presented the available data at that time. In general, it did not make recommendations on the best solutions and in some ways, this is disappointing but that was not its remit. Regarding the human health effects of incineration, it stated: -

“There is some evidence that incinerator emissions may be associated with respiratory morbidity. Acute and chronic respiratory symptoms are associated with incinerator emissions.

A number of well-designed studies have reported associations between developing certain cancers and living close to incinerator sites. Specific cancers identified include primary liver cancer, laryngeal cancer, soft-tissue sarcoma and lung cancer. It is hard to separate the influences of other sources of pollutants, and other causes of cancer and, as a result, the evidence for a link between cancer and proximity to an incinerator is not conclusive.

Further research, using reliable estimates of exposure, over long periods of time, is required to determine whether living near landfill sites or incinerators increases the risk of developing cancer.

Studies of specific environmental agents and specific cancers may prove more definitive in the future.”

The current status of this statement and its implications for facilities such as Ringaskiddy will be explored in more detail in this assessment.

The DEFRA report although covering many of the same studies went further in terms of scientific interpretation and in those terms was probably more helpful in an assessment of the risks or otherwise associated with a technology such as incineration. For example, it said:

“We looked in detail at studies of incineration facilities and found no consistent or convincing evidence of a link between cancer and incineration. There is little evidence that emissions from incinerators make respiratory problems worse. In most cases the incinerator contributes only a small proportion to local levels of pollutants.”

Since the DEFRA report several important reviews were made. Some of the more important are summarized here.

WHO Workshop

The World Health Organisation (WHO) published Population health and waste management: scientific data and policy options. Report of a WHO workshop. Rome, Italy, in March 2007. Published 2008. It states:

"Evidence is inadequate to draw conclusions that can be used to determine optimal policy choice on incineration: relatively few good quality studies exist, and they refer to old generation incineration plants-an important distinction, as stack emissions from modern plants are much reduced compared to old generation plants. The adoption of emission abating technology enforced by European Union EU has resulted in a less likely occurrence of measurable health effects on populations resident in the proximity of newer generation incinerators."

And

"Studies pointing to an increase in soft tissue sarcomas (STS) and non-Hodgkin's lymphomas (NHL) support a possible aetiological role of 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8 T4CDD). The evidence is inadequate to draw conclusions that can be used to determine optimal policy choices on incineration: relatively few good quality studies exist, and they refer mostly to old generation incineration plants – an important distinction, as stack emissions from modern plants are much reduced compared to old generation plants. The adoption of emission-abating technology, enforced by the European Union (EU), has resulted in a less likely occurrence of measurable health effects on populations resident in the proximity of new generation incinerators."

The Porta Review 2009

The Porta review 2009 *Systematic review of epidemiological studies on health effects associated with management of municipal solid waste Daniela Porta et al Environ Health.* 2009 Dec 23;8:60.

As the title suggests it did concentrate on Municipal Solid Wastes (MSW) sites but did include other studies as well. It reported:

"In most cases the overall evidence was inadequate to establish a relationship between a specific waste process and health effects; the evidence from occupational studies was not sufficient to make an overall assessment. For community studies, at least for some processes, there was limited evidence of a causal relationship and a few studies were selected for a quantitative evaluation. In particular, for populations living within two kilometres of landfills there was limited evidence of congenital anomalies and low birth weight with excess risk of 2 percent and 6 percent, respectively. The excess risk tended to be higher when sites dealing with toxic wastes were considered.

For populations living within three kilometres of old incinerators, there was limited evidence of an increased risk of cancer, with an estimated excess risk of 3.5 percent. The confidence in the evaluation and in the estimated excess risk tended to be higher for specific cancer forms such as non-Hodgkin's lymphoma and soft tissue sarcoma than for other cancers".

This is broadly in line with previous reviews. Of course, the most important point is that these findings relate to "old" incinerators, 20 years or older. As pointed out in the EIS, and indeed in the WHO review quoted above, the proposed facility will have to comply with the strictest EU emission standards and simply cannot be compared to the older generation studied.

The Giusti Review 2009

Giusti, L., (2009) A review of waste management practices and their impact on human health, Waste Management, 29(8):2227-39:

This study concluded:

"The main conclusion of the overall assessment of the literature is that the evidence of adverse health outcomes for the general population living near landfill sites, incinerators, composting facilities and nuclear installations is usually insufficient and inconclusive."

This is consistent with the other studies.

Forastiere 2011

Forastiere 2011 (Forastiere, 2011) *Health Impact Assessment of Waste Management in three Countries, Environmental Health,* 10:53.

Forastiere et al. performed a Health Impact Assessment of the effects of waste management including incineration in three countries, England, Italy and Slovakia. It is somewhat historical as it looked incinerators operating in 2001. It made some assumptions based on populations living within 3 km of incinerators based on assumed increases in environmental levels of particulate matter and NO2 which do not occur around modern incinerators. Nevertheless, their conclusions were:

"Past exposures from incinerators were likely to cause a sizeable health impact, especially for cancer, in Italy and England. However, the current impacts of landfilling and incineration can be characterized as moderate when compared to other sources of environmental pollution, e.g. traffic or industrial emissions, which have an importance on public health".

This emphasises the difference between historic and modern facilities.

Mattiello 2013

Mattiello 2013 (Mattiello, 2013) Health effects associated with the disposal of solid waste in landfills and incinerators in populations living in surrounding areas: a systematic review, International Journal of Public Health, 58(5):725-35.

The Mattiello et al. review concluded:

"It is confirmed that historically incinerators are an important source of pollution and harm for the health of populations living nearby; however, changes in technology are producing more reassuring results".

Sharma 2013

Sharma (Sharma, 2013) *The impact of incinerators on human health and environment, Reviews on Environmental Health*, 28(1):67-72.

One review which is out of step with the others is an Indian article published in 2013. This concentrated on potential options for dealing with health care waste. It stated:

"Incinerators releases a wide variety of pollutants depending on the composition of the waste, which leads to health deterioration and environmental degradation. The significant pollutants emitted are particulate matter, metals, acid gases, oxides of nitrogen, and sulphur, aside from the release of innumerable substances of unknown toxicity. This process of waste incineration poses a significant threat to public health and the environment. The major impact on health is the higher incidence of cancer and respiratory symptoms; other potential effects are congenital abnormalities, hormonal defects, and increase in sex ratio. The effect on the environmental is in the form of global warming, acidification, photochemical ozone or smog formation, eutrophication, and human and animal toxicity".

It suggested greater use of autoclaves and plasma pyrolysis being a solution for the biological hazards of health care waste. This is simply not consistent with the vast majority of published reviews so should be treated with great caution but also as its emphasis was on health care waste it is much less relevant for a facility such as is proposed.

Tait 2019

Again this reviewed published papers and many of these were also included in the previous reviews. It concluded:

Older incinerator technology and infrequent maintenance schedules have been strongly linked with adverse health effects. More recent incinerators have fewer reported ill effects, perhaps because of inadequate time for adverse effects to emerge. A precautionary approach is required.

De Tito 2019

This is an important study as it concentrated on modern incinerators as is proposed here. Many of the other studies are weakened by the fact that many of the reported findings are historical and relate to incinerators with emissions that would not be allowed today.

We found no studies indicating that modern-technology waste incineration plants, which comply with the legislation on emissions, are a cancer risk factor or have adverse effects on reproduction or development. There are several factors in favor of this affirmation: (a) the emission levels of the plants currently built in the developed countries are several orders of magnitude lower than those of the plants in whose environments epidemiological studies have been carried out and which have found some kind of negative association in terms of health; (b) risk assessment studies indicate that most of the exposure is produced through the diet and not by a direct route; and (c) monitoring dioxin level studies in the population resident in the environment of incineration plants did not reveal increases of these levels when compared with a population living in reference areas.

Vinti 2021

This studied solid waste management options and included landfills and incinerators. It concluded:

Twenty-nine studies were identified that met the inclusion criteria of our protocol, assessing health effects only associated with proximity to landfills, incinerators, and dumpsites/open burning sites. There was some evidence of an increased risk of adverse birth and neonatal outcomes for residents near each type of MSW site. There was also some evidence of an increased risk of mortality, respiratory diseases, and negative mental health effects associated with residing near landfills. Additionally, there was some evidence of increased risk of mortality associated with residing near incinerators. However, in many cases, the evidence was inadequate to establish a strong relationship between a specific exposure and outcomes, and the studies rarely assessed new generation technologies. Evidence gaps remain, and recommendations for future research are discussed.

UK Health Security Agency

UK Health Security Agency is a governmental body in the UK charged with analysing information and making recommendations on issues that may pertain to human health in England.

In a statement updated as recently as 9th June 2025 they were quite unequivocal. It stated

UKHSA's opinion on incinerators is that modern, well run and regulated Municipal Waste Incinerators are not a significant risk to public health, as these incinerators only make a small contribution to local concentrations of air pollutants.

This is obviously very reassuring. As some of the evidence to support this statement they state:

A study by Douglas and others in 2017 on exposure to incinerator emissions in Great Britain, between 2002 and 2010, showed a very small contribution (1000 times lower) of particulate matter (PM10) from MWI to ambient background pollution levels.

The paper demonstrated that PM10 emissions from MWI correlate well with the levels of other pollutant emissions, therefore we consider PM10 to be a reasonable proxy for other pollutants. For example, emissions of heavy metals, polycyclic aromatic hydrocarbons, and dioxins.

It is worth quoting the Executive Summary of this report:

This report provides a systematic review of the available evidence regarding the potential health impacts of air pollutants emitted by municipal waste incinerators (MWI) on nearby communities. It builds on the Health Protection Agency's (HPA) (a predecessor to the UK Health Security Agency) position statement from 2009 and supports UK Health Security Agency's (UKHSA) current opinion statement, which is that modern, well run and regulated municipal waste incinerators are not a significant risk to public health.

The evidence considered was focused on MWI in the UK and European Union (EU), reporting epidemiological health outcomes from exposure to MWI emissions, from the incineration process.

Twelve eligible studies were identified investigating a range of physical health outcomes:

- *cancer*
- *pregnancy and adverse birth outcomes*
- *mortality*
- *morbidity*
- *hospital admission*

These studies have been assessed for the overall evidence of association and important findings are summarised in this report.

The papers identified for inclusion were epidemiological studies with measured physical human health outcomes and an exposure period post implementation of the Waste Incineration Directive (WID, 2000), in countries in the European Union in 2000, which included the UK. The implementation of the Waste Incineration Directive (WID) came into operation in late 2003 for new build MWI and 2005 for existing MWI. (European Union, 2000; Defra, 2015). This criterion ensured that the studies considered in this review were applicable to UK MWI and considered health effects from the emissions from the incineration process only.

The studies included have a variety of limitations which affect their applicability to modern MWI: a long latency period for cancer was not considered in the studies; and there is a lack of adjustment for confounders, for example, co-exposures to other pollutants. However, the majority of the studies identified found no association for exposure and health outcomes.

Levels of airborne emissions from individual MWI are significantly lower now than in the past due to implementation of stricter legislative controls and improved technologies (WID, 2000). Additionally, these incinerators only make a small contribution to local concentrations of air pollutants when compared to other sources of air pollution.

This systematic review shows that currently there is no clear evidence of association between human health exposure to emissions from modern, well-regulated MWI and morbidity, cancers, or adverse birth outcomes in the UK.

SAHSU 2018

SAHSU 2018 (Ghosh, 2018)

The UK Small Area Health Statistics Unit (SAHSU) study was published in 2018. This was funded by Public Health England amongst others was one of the largest studies ever published. Its particular importance is that it studied incinerators operating under modern limits. It was titled "*Foetal growth, stillbirth, infant mortality and other birth outcomes near UK municipal waste incinerators [MWI]; retrospective population-based cohort and case-control study".*

Indeed, interestingly in the now normal conflict of interest statements one of the 14 authors declared Greenpeace membership and another Friends of the Earth membership. This most robust study was therefore entirely independent from the incineration industry. The study was large enough to be able to detect even small changes if such existed.

The result of the study was:

"Analyses included 1,025,064 births and 18,694 infant deaths. There was no excess risk in relation to any of the outcomes investigated during pregnancy or early life of either mean modelled MWI PM10 or proximity to an MWI".

The conclusion was:

"This large national study found no evidence for increased risk of a range of birth outcomes, including birth weight, preterm delivery and infant mortality, in relation to either MWI emissions or living near an MWI operating to the current EU waste incinerator regulations in Great Britain. The study should be generalisable to other MWIs operating to similar regulations and with similar waste streams."

While one might say that this may have been expected given the other studies above, it is the first study that one might say extends to the level of proof that there are no adverse health effects with a modern incinerator.

European Council Directives

The Waste Incineration Directive (WID) introduced in 2000 set stringent operating conditions and sets minimum technical requirements for waste incineration and co-incineration. It consolidated new and existing incineration controls into a single piece of European legislation.

The requirements of the Directive were developed to reflect the ability of incineration plants to more cost effectively achieve high standards of emission control in comparison to the 1980s. Previous waste incineration directives only applied to municipal and hazardous waste. WID updated the requirements of the 1989 municipal waste incineration (MWI) directives (89/429/EEC and 89/369/EEC) and, merged them with the 1994 Hazardous Waste Incineration Directive (94/67/EC), consolidated new and existing incineration controls into a single piece of European legislation (2000/76/EC).

This has now been superseded by the Industrial Emissions Directive. The proposed facility will have to abide by the strictest of criteria from the first day of operation. The Directive specifies air emission limits which must not be exceeded. The basis of the emission limits is to prevent, or limit as far as is practicable, negative effects on the environment and the resulting risks to human health.

Dioxins

Dioxins and furans will form spontaneously in a combustion process from chlorine atoms, carbon that has not been fully oxidised, and various catalysts in cooling smoke; hence, the process is the same for waste incineration plants, turf fires and tiled stoves alike. Each of the 200 dioxin and furan compounds is of a different degree of toxicity; for that reason, their so-called toxicity units (TUs) are determined and summarized into units of grams per toxicity unit (g TU).

Indeed, the public concern on dioxins was so significant that the Food Safety Authority of Ireland (FSAI) published a report in 2003 (FSAI, 2003) on the potential effect on food if waste incineration of municipal waste was introduced into Ireland. They stated:

"In relation to the introduction of waste incineration in Ireland, as part of a national waste management strategy, the FSAI considers that such incineration facilities, if properly managed, will not contribute to dioxin levels in the food supply to any significant extent and will not affect food quality or safety".

The WHO issued an update to their fact sheet on dioxins No. 225 which was updated in November 2023 (WHO, Dioxins and their effects on human health, WHO Fact sheet N°225 , 2023).

This stated:

"Proper incineration of contaminated material is the best available method of preventing and controlling exposure to dioxins. It can also destroy PCB-based waste oils. The incineration process requires high temperatures, over 850°C. For the destruction of large amounts of contaminated material, even higher temperatures - 1000°C or more - are required".

Regarding effects on human health it commented:

"Short-term exposure of humans to high levels of dioxins may result in skin lesions, such as chloracne and patchy darkening of the skin, and altered liver function. Long-term exposure is linked to impairment of the immune system, the developing nervous system, the endocrine system and reproductive functions.

Chronic exposure of animals to dioxins has resulted in several types of cancer. TCDD was evaluated by the WHO's International Agency for Research on Cancer (IARC) in 1997 and 2012. Based on animal data and on human epidemiology data, TCDD was classified by IARC as a "known human carcinogen".

However, TCDD does not affect genetic material and there is a level of exposure below which cancer risk would be negligible".

"Due to the omnipresence of dioxins, all people have background exposure and a certain level of dioxins in the body, leading to the so-called body burden. Current normal background exposure is not expected to affect human health on average. However, due to the high toxic potential of this class of compounds, efforts need to be undertaken to reduce current background exposure".

Much of the attention in debates in the past about the human health effects of incinerators has concentrated on dioxins and furans.

The dioxin emissions from modern incinerators are up to 1,000 times less than 20 years ago. This can be seen from the situation in Germany, one of the countries in Europe that has studied this area most closely and one where environmental concerns are taken very seriously. Whereas in 1990 one third of all dioxin emissions in Germany came from waste incineration plants, for the year 2000 the figure was less than 1%.

It is estimated that in Germany now, for example, chimneys and tiled stoves in private households alone discharge approximately twenty times more dioxins into the environment than all the waste incineration plants together (UN, 1999). This is also evident from the fact that in winter airborne dioxin loads are up to five times higher than in summer when heating systems are out of operation, but the incineration plants are still operating. Nevertheless, this has not stopped some people continuing to imply that incinerators are the only source of dioxins however, most dioxins we are exposed to are in our diet.

The major dioxin sources are dairy products, as well as some other foods. One however rarely sees this fact highlighted in the press except perhaps after occasional "scares" such as the 2008 Italian one, when high levels of Dioxins were found in some agricultural products around Naples, as reported by Malisch (2017). Interestingly, this was attributed to illegal landfills not incineration.

In addition, there was in 2008 a recall of Irish pork products in relation to elevated dioxins. This was detected through routine monitoring of food. This was traced to contaminated feed which in turn traced back to contaminated oil. There was no evidence of a public health issue.

Because the food we eat is increasingly not from the immediate vicinity in which we live but rather from the broader national and international sources the effect of any source may be dispersed far and wide but equally we may be more vulnerable to high levels coming from all parts of the world rather than our own "back-yard".

Heavy Metals

Heavy metals, such as lead and mercury, are retained in the filtering devices of waste incineration plants. They are not regarded as carcinogens. Whether or not they are poisonous for human beings will depend on whether they reach their thresholds of effectiveness. In effect, for these to have a human health effect, they must leave the incinerator in the form of emissions and enter the human body either by inhalation or ingestion and theoretically, but rarely in practice, through the skin.

For these substances, too, there has been an impressive decline in emissions from modern incinerators compared with historical measures. Improved controls and reduction in amounts in wastes presenting for treatment explains the marked reduction experience in their emissions.

For example, whereas in 1990, emissions in Germany amounted to as much as 57,900 kilograms (kg) of lead and 347 kg of mercury from the incineration of household waste, the respective levels declined to 130.5 kg (equivalent to 0.2% of initial emissions) and 4.5 kg (1.3% of initial emissions) in the year 2001. Thus, lead and mercury emissions from the incineration of household waste are also no longer significant for human exposure to emissions of toxic substances.

Specific Health Issues

Respiratory symptoms and illness

Some older studies, described in the 2003 Health Research Board (HRB) report did show that symptoms of respiratory illness, such as chronic cough, wheeze and sinus trouble, were significantly greater in those living near a hazardous waste incinerator than in their control community.

It should be noted that these studies predated much stricter environmental controls on the emissions of particulates to which the proposed Ringaskiddy site would operate.

Studies of self-reported symptoms must always be treated with caution as they can be more revealing about peoples' concerns rather than actual health effects. Again, while there have been some of these in the past none were without issues.

As any respiratory symptom that might occur must in turn be related to increase in some airborne contaminant, be it particulate matter or products of combustion such as Sulphur Dioxide or Nitrogen Dioxide. It follows that with the vast reduction of the emission of these in newer incinerators, to levels where there is little or no change in the baseline conditions, these effects will not occur. In effect the emissions from modern incinerators will not cause coughs or respiratory symptoms.

Reproductive Effects

Very often when one discusses incineration, concerns are expressed about potential reproductive effects.

It is true that in the 1980s studies quoted in the HRB report there were reported to be an increase in the frequency of twinning in human and cattle populations in an area in central Scotland at increased risk from incinerator emissions.

These findings have not been replicated.

The HRB report also mentions a study of open chemical combustion in the Netherlands in the 1960's was carried out to investigate the incidence of orofacial clefts in the region and to determine any association with the local combustion facility. The authors concluded that these results inferred an association between the incinerator and the increased local incidence of orofacial clefts. Although this increase was probably a true finding, the possibility of other influencing factors, such as alternative sources of exposure, could not be ruled out.

This study is of open chemical burning and bears no relation to modern incineration and so is of no relevance to the proposed facility but again is described here as it is often quoted by persons opposing incineration per se.

A review performed by Ashworth et al (Ashworth, 2014) entitled Waste incineration and adverse birth and neonatal outcomes: a systematic review was published in 2014 and is probably the most authoritative ever published.

This concluded:

"that a comprehensive literature search yielded fourteen studies, encompassing a range of outcomes (including congenital anomalies, birth weight, twinning, stillbirths, sex ratio and infant death), exposure assessment methods and study designs. For congenital anomalies most studies reported no association with proximity to or emissions from waste incinerators and "all anomalies", but weak associations for neural tube and heart defects and stronger associations with facial clefts and urinary tract defects. There is limited evidence for an association between incineration and twinning and no evidence of an association with birth weight, stillbirths or sex ratio, but this may reflect the sparsity of studies exploring these outcomes".

It went on:

"The current evidence-base is inconclusive and often limited by problems of exposure assessment, possible residual confounding, lack of statistical power with variability in study design and outcomes. However, we identified a number of higher quality studies reporting significant positive relationships with broad groups of congenital anomalies, warranting further investigation.

Future studies should address the identified limitations in order to help improve our understanding of any potential adverse birth outcomes associated with incineration, particularly focussing on broad groups of anomalies, to inform risk assessment and waste policy."

The SASHU study (Ghosh, 2018) confirms no adverse effects with modern incinerators. This studied over 1 million births so is an extremely robust study.

Cancer

It is fair to say some studies have reported putative links between incinerators and cancers. However, not one of these studies was without problems. In the past incinerators were often sited in urban, industrial and otherwise polluted areas. This introduced major confounders for studying cancers such as deprived populations, urban living, other sources of industrial pollutions, cigarette smoking habits etc.

It is also true that other studies did not support such a link.

The largest study by Elliot (Elliot, 1996) in 1996 examined 72 No. incinerators. This included essentially all incineration plants, irrespective of age, up to 1987. This was by far the largest and statistically probably the best study ever conducted. It studied a total of 14 million people.

It nevertheless was unable to convincingly demonstrate an excess of cancers in areas within 7.5 km of incinerators once socio-economic confounding was taken into account.

There were reported individual increases for stomach, lung, colorectal and primary liver cancers. This however was thought to be largely due to residual confounding by socio-economic factors. Liver cancer, for example, was the most strongly significant (37% excess risk within 1 km of municipal waste incinerators) but, on review of cancer registration data, this cancer category was reported to be frequently misclassified or misdiagnosed (mainly secondary liver tumours). In a follow up study to they attempted to determine the size of any true excess in the vicinity of municipal waste incinerators. In a sample of cases subjected to histological and medical record reviews, only about half were reported to be true primary liver cancer. This resulted in a re-estimation and significant reduction of the calculated excess risk previously reported.

The strong association between deprivation and primary liver cancer was thought to remain an influence on the residual result.

Nevertheless, the overall finding from this very large study was of no increase in cancers in those living close to incinerators.

As a result of this study but also taking into account studies previously published, the UK Department of Health's Committee on Carcinogenicity (COC) published a statement in March 2000 (COC, 2000), evaluating the evidence linking cancer with proximity to municipal solid waste incinerators in the UK. The Committee specifically examined the results of these studies, and concluded that,

"Any potential risk of cancer due to residency (for periods in excess of ten years) near to municipal solid waste incinerators was exceedingly low and probably not measurable by the most modern techniques".

The Committee agreed that the observed excess of all cancers, stomach, lung and colorectal cancers was due to socio-economic confounding and was not associated with emissions from incinerators. The Committee agreed that, at that time, there was no need for any further epidemiological investigations of cancer incidence near municipal solid waste incinerators.

Indeed, the DEFRA report published in 2004 and referred to in the introduction of the Literature Review concluded:

"We looked in detail at studies of incineration facilities and found no consistent or convincing evidence of a link between cancer and incineration. There is little evidence that emissions from incinerators make respiratory problems worse. In most cases the incinerator contributes only a small proportion to local levels of pollutants."

This absence of a measurable effect was evident even with older and undoubtedly dirtier incinerators. When this is true we can be as scientifically certain as we can be that there can be no effect with lower emissions from modern facilities regulated to the highest standards.

Conclusion

There have been a large number of studies on the health effects of incineration. There was some evidence particularly with older types of incinerators with higher levels of emissions, of environmental health effects. With modern incinerators with highly controlled levels of emissions no reputable study has shown any significant health effects.

While some would caution that some effects could take a long time to materialise, for any realistic assessment this is extremely reassuring and of course very much in keeping with what we would expect due to reduced and strictly controlled emissions associated with modern incinerators.

6.2.2 Major Accidents and Disasters

6.2.2.1 General

The starting point for the scope and methodology of this assessment is that the proposed development will be designed, built and operated in line with recognised good practice and, as such, major accidents will be very unlikely to occur and the associated risks will be low.

A formal HAZID&RA was carried out to identify all potential accident scenarios that could arise at each area of the proposed development site where dangerous substances are stored or handled. This HAZID&RA is presented in **Appendix 6.1** of the EIS. Each scenario was assessed using the HAZID&RA methodology to determine its likelihood of occurrence and the severity of effect to people and the environment if it did occur. This approach gives a semi-quantitative assessment of the overall level of risk associated with each accident scenario identified. When carrying out this assessment consideration was taken of any relevant prevention or mitigation measures in place when determining the risks associated with each scenario.

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 to determine the significance of the risks associated with each scenario. This approach allowed Indaver to prioritise attention on the scenarios presenting the highest risk and to ensure that all necessary measures would be in place to prevent accidents occurring and to limit the consequences of any such accidents for population and human health and for the environment. The assessment was also to determine the risks to the proposed development from major accidents and disasters.

When assessing the risks associated with scenarios identified in the risk assessment, consideration was given to potentially vulnerable receptors in the surrounding environs, i.e. occupied areas, culturally significant developments and environmental receptors such as land, soil and water.

In carrying out this assessment, a systematic approach was adopted to identify credible major accident scenarios and to assess the probability of occurrence for each. For each scenario identified, an assessment was made of the expected significant adverse effects. Consideration was also given to the range of mechanisms by which these scenarios could arise, for both on-site and off-site initiating events, including those caused by major accidents and/or disasters. These events were identified, evaluated and their potential contribution to the risks presented at the site were considered when drawing up the scenarios in the worksheets.

The approach to carrying out the risk assessment, and consequence modelling, for this development is consistent with the approach used by other industrial operators covered by the Cork County Council Major Emergency Plan. Although this approach is primarily used for establishments under the COMAH Regulations (SI No. 209 of 2015). This project does not qualify as such an establishment; however the methodology provides a robust framework to identify all such major accident hazards and risks as outlined below.

6.2.2.2 Guidance and Legislation

Legislative Requirement

In accordance with the requirements of the EIA Directive 2014/52/EU and associated Regulations, Indaver carried out a risk assessment for the proposed development of a resource recovery centre at Ringaskiddy. This was conducted using a systematic methodology, to assess the severities of impacts and likelihoods of occurrence for accident scenarios at the plant. This assessment examined the risks of these accident scenarios to human health and to the environment.

Recital 15 of the EIA Directive states that:

(15) In order to ensure a high level of protection of the environment, precautionary actions need to be taken for certain projects which, because of their vulnerability to major accidents, and/or natural disasters (such as flooding, sea level rise, or earthquakes) are likely to have significant adverse effects on the environment. For such projects, it is important to consider their vulnerability (exposure and resilience) to major accidents and/or disasters, the risk of those accidents and/or disasters occurring and the implications for the likelihood of significant adverse effects on the environment. In order to avoid duplications, it should be possible to use any relevant information available and obtained through risk assessments carried out pursuant to Union legislation, such as Directive 2012/18/EU of the European Parliament and the Council1 and Council Directive 2009/71/Euratom, or through relevant assessments carried out pursuant to national legislation provided that the requirements of this Directive are met.

It is clear from the Directive that a major accident and/or disaster assessment should be mainly applied to establishments under the COMAH Directive or to nuclear installations. However, the EIAR requirements must be satisfied by all developments which qualify under the EIA Directive and so the risks have been assessed and this chapter has been prepared accordingly.

Guidance Documents

The Environmental Protection Agency (EPA) has published Guidelines on the Information to be contained in Environmental Impact Assessment Reports, which are referred to when identifying the information requirements for this chapter.

In accordance with the provisions in Section 3.3.5 of the EPA guidance, the scoping of this chapter considers the extent to which other assessments may address some types of effects adequately and appropriately. As such, much of the information that supports this chapter of the EIS is described in the HAZID&RA report for the development, which is referenced throughout this chapter. A copy of the HAZID&RA report is included in **Appendix 6.1** to **Chapter 6** ***Population and Human Health*** of this EIS.

The HAZID&RA methodology is a semi-quantitative approach, as described in **Section 6.2.2.4**. This approach enables the operator to identify the relevant accident scenarios at their site and to determine the significance of the risk that each scenario presents using a calibrated ranking system. This approach also enables the operator to identify scenarios that require further assessment, as described in this chapter and in the accompanying HAZID&RA report.

This approach is comparable to the approaches used when carrying out risk assessments for e.g. COMAH establishments, ATEX risk assessments or environmental liabilities risk assessments.

6.2.2.3 Study Area

As part of the process of conducting the risk assessment, details of the surrounding environment were collated, to ensure that full consideration was given to the specific nature of surrounding environs when determining the severity of impact in the event of an accident at the site. The surrounding environment is discussed in the following sub-sections.

Geology and Hydrogeology

The majority of proposed development site (including the area proposed for the waste to energy facility) is underlain by Lower Carboniferous marine interbedded grey/brown sandstone, siltstone and mudstone. Bedrock encountered during the site investigations was noted as pale green MUDSTONE/green grey fine-grained SANDSTONE, and depth to bedrock was found to vary across the site, from 0.3 m below ground level (bgl) in the centre of the site, to 10.1m bgl to the east of the site.

The bedrock aquifer beneath the site and Ringaskiddy area is classified as “LI: Locally Important Aquifer – Bedrock which is moderately productive only in local zones” and “LK: Locally Important Aquifer – Karstified” (see **Figure 13.12** in **Chapter 13** ***Soils, Geology, Hydrogeology, Hydrology and Coastal Recession***). The site is not underlain by karst and so the LK designation is not applicable to the aquifer under the site. There is no indication of any naturally occurring springs in the earlier OSI maps which show the site prior to the cutting of the southern steep slope.

According to the GSI Well Database and the Groundwater Vulnerability map for South Cork, groundwater is not used for public or private water supply in the Ringaskiddy area.

Aquifer or groundwater vulnerability is the ease with which the groundwater may be contaminated by human activity and depends upon the aquifer's intrinsic geological and hydrogeological characteristics. The vulnerability is determined by the permeability and the attenuation capacity of any overlying deposits. For example: bedrock with a thick, low permeability, and clay-rich overburden is less vulnerable than bedrock with a thin, high permeability, and gravelly overburden.

The aquifer at the site is classified by the GSI as having 'Extreme' vulnerability, with some areas classified as 'Rock at or near Surface, or Karst' (**Figure 13.13**). (Note - as the bedrock geology at this site is not limestone no karst is present). Within an area of 2 km from the proposed development, the majority of the aquifer falls into 'Extreme' vulnerability classes, becoming 'High' further west and south. The groundwater vulnerability rating of the site is dictated by the shallow depth of bedrock rather than the site being underlain by limestone bedrock.

Chapter 13 of the EIS provides a more detailed description of the geology and hydrogeology of the site and surrounding environs.

The HAZID&RA took note of the vulnerability of the surrounding geology and hydrogeology when determining the severity ratings for scenarios involving an environmental release at the site.

Flora and Fauna

There are no environmental designations pertaining to the site footprint; in other words, the site does not form part of any Natural Heritage Area (NHA), Special Protection Area (SPA), Special Area of Conservation (SAC) or candidate Special Area of Conservation (cSAC), Nature Reserve, or National Park. However, there are several such sites in the vicinity of the proposed development. **Table 12.2** of **Chapter 12** ***Biodiversity*** identifies the designated conservation areas within a 20 km radius and shows the distances to each from the development site.

Cork Harbour is also as an Important Bird Area (IBA). The reasons for this classification are set out in **Table 12.4**. Details of other habitats within the proposed development site are outlined in **Table 12.6**.

Table 12.5 shows the flowering and endangered flowering plants within Ordnance Survey National Grid 10km square (Hectad) W76. No protected, rare or threatened floral species were recorded within the proposed development site during the 2024/2025 site surveys.

The HAZID&RA considered the proximity of the development to protected sites and proposed natural heritage areas when determining the severity ratings for the accident scenarios.

Watercourses (tides and currents)

Cork Harbour is an important and attractive water body with many beneficial uses. The harbour, a drowned river valley, is the tidal estuary of the River Lee and extends about 20 km from Cork City to the open sea. In simple terms, the upper harbour estuary widens uniformly in the direction of the open sea and the tidal currents move simply up and down the estuary as the tide ebbs and flows.

The eastern part of the proposed development site is located adjacent to the West Channel of Cork Harbour. The nearest stream/river to the site is the stream Glounatouig, which is approximately 3 km west from the site boundary.

According to the Admiralty Chart, the tidal data for Passage West and for Cobh are as shown in **Table 6.2**.

Table 6.2 Tidal data for Cobh

Location	Lat N	Long W	Heights in metres above datum				Datum and remarks
			MHWS	MHWN	MLWN	MLWS	
Cobh	51°50’	8°18’	4.1	3.3	1.3	0.5	0.13 m above OD (Dublin)
Passage West	51°52’	8°20’	4.4	3.6	1.5	0.7	0.13 m above OD (Dublin)

There were no implications for accident hazards at the site associated with tidal activity. Further discussion of flood risk and coastal erosion is provided below.

Weather Conditions

For the purposes of the HAZID&RA exercise, the meteorological parameters of most interest are ambient temperature, wind speed, atmospheric stability and rainfall. High ambient temperatures lead to increased evaporation rates from spilled materials. Low wind speeds and high atmospheric stability lead to reduced dispersion of a release, allowing higher concentrations to accumulate in the atmosphere. High wind speeds on the other hand can give rise to high angles of flame tilt in the event of a pool fire.

Cork Airport is the closest weather monitoring station to the site and weather data for this station was obtained from Met Éireann for the period 1991 to 2020, which is the latest 30-year period reported on by Met Éireann. The data is shown in Table 1.3 of the HAZID&RA report.

The temperature data shows that the average daily maximum temperature varies from 8.2°C in January to 18.6°C in July. The highest temperature recorded at the station over the 30-year reporting period was 27.8°C.

Wind speed and atmospheric stability are strongly interrelated. Greater atmospheric stability is found at low wind speeds and only certain combinations of wind speed and stability can occur. The data shows an average wind speed of 9.8 knots or 5.04 m/s.

The primary concerns with respect to rainfall is to determine whether there is the potential for flooding. This is discussed in **Section 6.3.2.1.** Aside from the risks presented by rainfall, there is also the potential for the road drainage network to become tide-locked at high tide, which can give rise to flooding of the road. This hazard, and the measures that will be put in place to mitigate it, are described in **Chapter 13.**

Listed buildings and monuments

There are no recorded archaeological sites within the proposed development site, including the area proposed for coastal protection and the section of L2545 to be upgraded, refer to **Figure 14.1** of **Chapter 14 *Archaeological, Architectural and Cultural Heritage***. There are no protected structures within the proposed development site that are listed in the Cork County Development Plan 2022 to 2028 or the National Inventory of Architectural Heritage for County Cork. There are no cultural heritage sites within the proposed development site.

A Martello tower, listed in the Record of Monuments and Places, (RMP No. CO087-053) stands approximately 70m to the south of the proposed development site and part of the site lies within the Zone of Archaeological Potential (ZAP) or Zone of Notification for this recorded monument. Ordnance Survey maps show that a path once led north-east through the proposed development site from the Martello tower to the sea shore at the eastern end of the Ringaskiddy peninsula. The Martello tower is also listed in the Record of Protected Structures (RPS 00575) in the Cork County Development Plan and the National Inventory of Architectural Heritage for County Cork (Registration No. 20987047). The path associated with the tower is considered to be a part of the curtilage of the Protected Structure.

In total there are 50 recorded archaeological sites within a 2km radius of the proposed development site that are listed in the Record of Monuments and Places for County Cork (RMP) and the Sites and Monuments Record (SMR) Database of the Archaeological Survey of Ireland (ASI). These are identified in **Table 14.1** (**Chapter 14**).

6.2.2.4 Impact Assessment Methodology

Due to the range of materials stored at the site, the HAZID&RA examined scenarios involving flammable risks (fires and explosions), risks of acute toxic exposure to human health and risks of spills to the environment.

When assessing the impacts of accident scenarios to people in the vicinity, a consequence modelling exercise was carried out, using a range of pre-determined endpoints.

Current Practice

The methodology that was used for the risk assessment is based on a technique outlined in Annex D of BS 8800: 1996, Guide to Occupational Health and Safety Management Systems. Similar risk assessment techniques have also been outlined by the IChemE and the US Naval Weapons Centre's Practical Risk Analysis for Safety Management. The methodology that was used at the Ringaskiddy site is one that has been built on and developed over many years, based on operational experience of applying it at numerous industrial facilities, both in Ireland and overseas.

The approach that was adopted is consistent with guidance from the Health & Safety Authority . The assessment includes the elements of risk identification, risk analysis and risk evaluation.

- Risk identification is the process of finding and recognising risks and includes the process of hazard identification.
- Risk analysis consists of determining the range of consequences and probabilities of identified events and the effectiveness of existing controls. The methods used may be qualitative, semi-quantitative or quantitative.
- Risk evaluation is the process of comparing estimated risk levels with pre-defined tolerance criteria to inform decisions. For the operator, risk evaluation will be about evaluating the risks that have been identified and analysed to determine whether they are tolerable.

Site Specific Risk Assessment Methodology

This section describes the risk assessment methodology that was used when carrying out the risk assessment at the site. This methodology is described in more detail in the accompanying HAZID&RA report.

The risk assessment was carried out by a team of personnel from Indaver and from Byrne Ó Cléirigh (external consultants). The team divided the Resource Recovery Centre into a series of installations (i.e. areas where dangerous substances are stored or handled and which were identified as potentially presenting a significant accident scenario), each of which was assessed in turn.

Each installation identified a series of scenarios, or end events, and documented them in the HAZID&RA worksheets. The potential consequences of each scenario were described and a Severity Rating was assigned, using the descriptors shown in **Table 6.3**.

Table 6.3 Severity Ratings for Accident Scenarios

Severity Rating	Category Description	Health & Safety		Environmental Impact
		On-Site	Off-Site	
0	Negligible	None	None	None
1	Minor	Minor injury	None	None
2	Appreciable	Multiple injuries with return to work	Discomfort	Discoloration of water or air
3	Severe	Major permanent disability	Some hospitalisation for screening	Minor short term damage to adjacent land or water courses
4	Very Severe	Single fatality	Minor injuries	Significant short term damage or minor long term damage requiring clean up action
5	Catastrophic	Multiple fatalities	Major injuries or fatalities	Major incident with significant loss of species or habitat

When assessing impacts to health & safety, consideration is given to both on-site and off-site impacts, based on the descriptors shown above, to determine the appropriate Severity Rating. The range of impacts covered by this scale enables Indaver to assess and rank the impacts of a wide range of scenarios, from relatively minor events to major accidents.

To support this assessment, a representative selection of credible worst-case scenarios was identified and consequence modelling was carried out to calculate the impacts of these scenarios to the surrounding area. The consequence modelling endpoints that were used in this assessment are described in the accompanying HAZID&RA report.

Once the various accident scenarios for a particular installation were identified and Severity Ratings assigned to each, the Team then examined the various initiating events which could potentially give rise to each scenario and the details were set out in the Risk Assessment Register (RAR) sheet. The potential initiating events which were considered included, inter alia, mechanical failure, human error, control equipment failure, as well as external events such as domino effects from an external event or a disaster such as flooding or earthquake. A copy of the RAR worksheets is included in the HAZID&RA report.

Each initiating event – end event combination was assigned a Frequency Rating by the team, based on the descriptors shown in **Table 6.4**.

Table 6.4 Frequency Ratings for Accident Scenarios

Frequency Rating	Descriptor	Frequency Range per Annum
1	Virtually Impossible	$< 1 \times 10^{-8}$
2	Improbable	1×10^{-8} to 1×10^{-5}
3	Unlikely	1×10^{-5} to 1×10^{-3}
4	Infrequent	1×10^{-3} x to 0.1
5	Occasional	1 to 10
6	Frequent	>10

Numerical Risk Ratings were determined for each scenario identified in the course of the exercise using the following equations:

$R_H = S_H \times L$

$R_E = S_E \times L$

Where:

RH is the Risk Rating with respect to health and safety

RE is the Risk Rating with respect to the environment

SH is the Severity Rating with respect to health and safety

SE is the Severity Rating with respect to the environment

L is the Likelihood Rating for a specific initiating event – end event combination.

The significance of the Risk Rating for each scenario was assessed using the matrix shown in **Table 6.5**.

Table 6.5 Matrix of Risk Ratings

Risk Rating		Severity				
		1	**2**	**3**	**4**	**5**
Frequency	**1**	1 – Trivial	2 – Trivial	3 – Trivial	4 – Trivial	5 – Minor
	2	2 – Trivial	4 – Trivial	6 – Minor	8 – Minor	10 – Moderate
	3	3 – Trivial	6 – Minor	9 – Moderate	12 – Substantial	15 – Priority
	4	4 – Trivial	8 – Minor	12 – Substantial	16 – Priority	20 – Priority
	5	5 – Minor	10 – Moderate	15 – Priority	20 – Priority	25 – Priority
	6	6 – Minor	12 – Substantial	18 – Priority	24 – Priority	30 – Priority

A Risk Reduction Register (RRR) was then completed for each scenario on the back of this assessment. This was used to set out any specific scenarios or locations at the site where the HAZID&RA Team identified or recommended additional risk reduction or mitigation measures. When making these recommendations, consideration was given to the risk level associated with each scenario using the criteria set out in **Table 6.6**.

Table 6.6 Significance of Risk Ratings for Accident Scenarios

Risk Rating	Risk Level	Action and Timescale
≤ 4	Trivial	Generally no action is required for scenarios with such low risk levels and if so, there would be no need for detailed working to demonstrate ALARP (i.e. are As Low As Reasonably Practicable).
5 to 8	Minor	No additional controls are required in most cases. Consideration may be given to a more cost-effective solution or improvement that imposes no additional cost burden. Monitoring is required to ensure that controls are maintained.
9 to 11	Moderate	Efforts should be made to reduce the risk, but the cost of prevention should be carefully measured and limited. Risk reduction measures should be implemented within a defined time period. Where a moderate risk is associated with a scenario whose consequences are in the category of Very Severe or Catastrophic (Severity Rating 4 or 5) further assessments may be necessary to establish more precisely the likelihood of harm as a basis for determining the need for improved control measures.

Risk Rating	Risk Level	Action and Timescale
12 to 14	Substantial	The activity should not be started until the risk has been reduced. Considerable resources may have to be allocated to reduce the risk. Where the risk involves a current activity, urgent action should be taken.
≥ 15	Priority	The activity should not be started or continued until the risk has been reduced. If it is not possible to reduce risk, even with unlimited resources, this activity must be prohibited.

6.3 Baseline Environment

6.3.1 Population and Human Health

6.3.1.1 Project Location

Site Description

The site covers an area of approximately 13.55 hectares and is situated on a north-facing slope. The land rises from north to south, and also generally from east to west. The lowest elevation is approximately 2.05-3.0m Ordnance Datum (OD) along the northern boundary with the local road. The highest point is approximately 41.0mOD along the southern site boundary in the vicinity of the Martello Tower, which is in the adjoining field to the south. The site is currently covered in scrub with some pockets of trees and open grass areas. Refer to **Figure 4.1** which shows the existing site layout. There are no buildings or structures on the existing site.

The overall outer boundary of the site is roughly rectangular in shape with narrower sections at the eastern and western ends, and with the Hammond Lane Metal Recycling Company Ltd metal/scrap processing yard located centrally within the site with its own direct access from the local L2545 road to the north. Although this yard is located centrally within the Indaver site, it does not form part of the site. There is also an ESB Networks (ESBN) compound (referred to as Loughbeg substation) located between the eastern boundary of the Hammond Lane facility and the Indaver site. Refer to **Figures 4.1** and **4.2** which show the existing site layout.

Immediate Vicinity

The site encircles the Hammond Lane Metal Recycling Company facility. The facility contains several metal buildings, concrete walls, and some large pieces of machinery. Hammond Lane expanded its facilities in 2015. There is also an ESBN compound (referred to as Loughbeg substation) located adjacent to the eastern boundary of the Hammond Lane facility. Refer to **Figures 4.1** to **4.6**.

The L2545 is an extension of the N28 that leads from Ringaskiddy past the proposed development site and over the bridge to the crematorium on Rocky Island, Haulbowline Naval Base and Haulbowline Island Recreational Park.

The National Maritime College of Ireland (NMCI) and the UCC ERI Beaufort Building are both located opposite the Indaver site. The NMCI opened in 2004 and is a public-private partnership between Cork Institute of Technology, the Irish Naval Service and Focus Education.

The UCC ERI Beaufort Building is located on the site to the east of the NMCI. MaREI (Centre for Marine and Renewable Energy) and the Lir National Ocean Test Facility are both located in the UCC ERI Beaufort Building. Further developments for these institutions may be located on the remainder of the land to the east of the NMCI (refer to **Figures 4.3** to **4.6**).

Some warehouses are located on the northern side of the L2545 road, to the west of the National Maritime College of Ireland.

The land to the immediate south of the Indaver site is owned by IDA Ireland and is in agricultural use. Refer to **Figures 4.3** to **4.6**. Just beyond the southern boundary, the site is further visually defined by the high voltage electricity line that runs west overhead to connect with the ESB sub-station near Shanbally and east (then north) to Haulbowline Island.

Further to the southwest, the land continues to rise slightly to create the ridgeline on which a Martello Tower is located at the highest point (43mOD). South of the Martello Tower. the land has recently been used for the extraction of approximately 134,000m^3 of topsoil and subsoil over an area of 9.3 hectares for earthworks as part of the Haulbowline Island remediation project (Planning file No. 166219) which is now complete.

A 1.5 km single carriageway section of the M28 Cork to Ringaskiddy Motorway Project, referred to as the '*Protected Road Scheme*', is currently under construction. This section extends from Barnahely to the eastern side of Ringaskiddy and intersects the northwestern boundary of the proposed development site. The construction stage of the Protected Scheme is nearing completion at the time of writing this EIS. The remaining elements of the main M28 Cork to Ringaskiddy Motorway Project, which will upgrade the corridor to a dual carriageway standard, are expected to have a construction duration of approximately 36 months.

There is a single, large, white-painted residential property (Ring House) located approximately 50m from the boundary, set within a field and surrounded by trees. This property is owned by the Port of Cork.

Refer to **Figure 4.7** which shows the location of the proposed M28 Cork to Ringaskiddy Motorway Scheme within and adjacent to the proposed development site.

The roads and public realm through Ringaskiddy village and along the L2545 to Gobby Beach have recently been upgraded to facilitate active travel modes.

The Wider Area

The centre of Ringaskiddy village is located approximately 800m to the west of the site of the proposed development. The Port of Cork's port facilities are located to the north of Ringaskiddy village.

The Ringaskiddy peninsula is industrial in character, with a number of pharmaceutical companies having large manufacturing facilities in the area, in addition to the Port of Cork facilities. The locations of some of these industries are shown in **Figures 4.3 to 4.6**. There are currently four 100 metre hub-height 3MW wind turbines in operation on industrial sites in Ringaskiddy. The two DePuy wind turbines are located 290m south and 1.2km southwest of the Indaver site boundary on two separate sites in Loughbeg.

The Cork Harbour area has a mixture of urban developments, such as Cobh, Rushbrooke and Monkstown, and pockets of industry near the shore. Spike Island is located approximately 500m to the east of the site, with the disused Fort Mitchell prison being situated there and is a popular destination for tourists. There is an Irish Naval Service base situated on Haulbowline Island (refer to **Figure 4.3**) and a crematorium on Rocky Island. Both islands lie to the north of the site. Haulbowline Island Recreational Park was opened in 2021 and is located approximately 1km to the north of the site.

6.3.1.2 Principal Potential Receptors

An appraisal of the principal potential receptors within the environs of the proposed facility including homes, schools and commercial and industrial premises was conducted and is detailed below.

Homes

According to the Cork County Development Plan 2022-2028 (CCDP), the settlement of Ringaskiddy continues to comprise two villages, Shanbally and Ringaskiddy. The CCDP notes that there is very limited potential for residential expansion in this area due to its designation as a Strategic Employment Location and its importance for future industrial and port-related operations. Reflecting this, the CCDP does not zone land for residential development within Ringaskiddy, ensuring that the area remains focused on supporting industrial growth and related uses.

The nearest residence is adjacent to the western boundary of the site and will be located approximately 500 metres from the main process building in the proposed development.

Haulbowline Island Recreational Park

Haulbowline is an island of about 84 acres which is linked by bridge to Ringaskiddy. Haulbowline is State property and is the headquarters of the Irish Navy.

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. Since then, Cork County Council undertook remediation works and redeveloped it as a public park (Haulbowline Island Recreational Park), which was associated with the steelworks on Haulbowline Island. The new park is on the east side of the Haulbowline whilst the western section is occupied by the Naval Service.

Childcare Facilities

Ferryview Childcare Centre is located at the entrance to the Ferryview housing estate, approximately 650m west of the site.

Health, Social, and Community Facilities

Local area facilities include the Community Centre at Ringaskiddy. Churches located in the study area include those located at Ringaskiddy, Shanbally, Monkstown, Passage West, Carrigaline and Cobh.

Schools and Colleges

As discussed previously, the National Maritime College of Ireland (NMCI) is located across the L2545 road from the site. Details are provided below in **Table 6.7** on primary and post primary schools located in the study area. The distances calculated are the linear distance from entrance to the main site where the process building will be located to the particular educational facility.

There is one primary school within Ringaskiddy Village – Ringaskiddy Lower Harbour National School, which is located within the village. Shanbally National School is situated approximately 1.45km west of Ringaskiddy West, adjacent to the N28.

Table 6.7 Primary and Post Primary Schools in the Area

School Type	Name	Address	Distance from Main Site
Primary	Ringaskiddy Lower Harbour N.S.	Ringaskiddy	1.3km
Primary	Shanbally National School	Shanbally	3.3km
Primary	Star of the Sea Primary School	Passage West	4.5km
Primary	Scoil Barra Naofa	Monkstown	2.7km
Primary	Bunscoil Rinn an Chabhlaigh	Rushbroke	2.4km
Primary	Gaelscoil Cobh	Cobh	2.9km
Primary	St. Mary's National School	Cobh	2.7km
Primary	St. Joseph's National School	Cobh	2.7km
Primary	Walterstown National School	Cobh	6.2km
Primary	Gaelscoil Charraig Ui- Leighin	Carrigaline	5.7km
Primary	Owenabue Educate Together N.S.	Carrigaline	5.5km
Primary	St. John's Girls' N.S.	Carrigaline	6.5km
Primary	St. John's Boys' N.S.	Carrigaline	6.1km
Primary	St. Mary's Church of Ireland N.S.	Carrigaline	5.7km
Primary	Whitegate National School	Whitegate	4.9km
Primary	Crosshaven Boys' National School	Crosshaven	3.1km
Primary	Templebreedy National School	Crosshaven	3.5km

School Type	Name	Address	Distance from Main Site
Primary	Scoil Bhríde	Crosshaven	3.2km
Post Primary	Carrigaline Community School	Carrigaline	5.8km
Post Primary	Edmund Rice College	Carrigaline	5.9km
Post Primary	Gaelcholáiste Charraig Uí Leighin	Carrigaline	6.7km
Post Primary	St. Peter's Community School	Passage West	4.5km
Post Primary	Coláiste Muire	Cobh	2.7km
Post Primary	Cobh Community College	Cobh	2.9km

6.3.1.3 Heritage and Amenity

Heritage

Archaeological, architectural and cultural heritage are discussed in **Chapter 14** ***Archaeological, Architectural and Cultural Heritage*** of this EIS. In summary, there are no recorded archaeological sites, no cultural heritage sites and no protected structures within the proposed development site. A Martello Tower, listed in the Record of Monuments and Places, (RMP No. CO087-053---) and listed in the Record of Protected Structures (RPS 00575) stands approximately 70m to the south of the proposed development site. Refer to **Chapter 14** for further details.

Ordnance Survey maps show that a path once led north-east through the proposed development site from the Martello tower to the sea shore at the eastern end of the Ringaskiddy peninsula. Refer to **Chapter 14** for further details. Anecdotal evidence suggests that the site was used as a source of material for land reclamation elsewhere in Ringaskiddy, and that this accounts for the steep escarpment running east-west within the site. Although it is shown on historic maps, much of the path is no longer in existence, most likely due to the removal of soil in the past. There is no legal registered right-of-way along this path.

A farm track runs through waste-to-energy side of the site (east of Hammond Lane) from the L2545 to the southern boundary of the site. Although there is no legal registered right-of-way, the site appears to be used very occasionally as a pedestrian link between the shore and the Martello Tower.

Nature Conservation Areas are discussed in **Chapter 12** ***Biodiversity*** of this EIS. In summary, there are no environmental designations located within the site of the proposed development. The majority of the site is currently covered in scrub with some pockets of trees and open grass areas. Gobby Beach is located along the eastern boundary of the site. The closest area of Cork Harbour Special Protection Area (SPA) is located 0.5km to the south of the site. Refer to **Chapter 12** for further details.

There is a Geological Heritage Site within the proposed development (Refer to **Figure 13.4**). The Ringaskiddy Geological Heritage Area (CK077) is described as a coastal exposure along a beach, and includes prominent boulder, cliffs and outcrops at beach level which is located adjacent to the proposed development along Gobby Beach. This Geological Heritage lies within the site along the eastern coastal boundary. Another Geological Heritage Area is located approximately 630m to the north of the proposed development and is called Haulbowline and Rocky Island (CK053). This Geological Heritage Site is described as two very contrasting small islands at the entrance to Cork Harbour, one which comprises rock outcrop and one split between Irish Navy Headquarters and a parkland amenity.

Scenic routes and designated landscapes are discussed in detail in **Chapter 11** ***Landscape and Visual Impact Assessment*** of this EIS. In summary, there are some scenic routes and scenic landscape designations in close proximity to the site in the CCDP. Refer to **Chapter 11** for further details.

Local Amenity

From a local amenity viewpoint, the N28 road which passes through Ringaskiddy Village is a busy road carrying port and industrial traffic twenty-four hours per day. The road is the National Primary Route N28. It passes eastwards through Ringaskiddy Village as far as the junction with the entrance to the ferry port and the main road to Loughbeg and continues eastwards as the L2545 past the Indaver site as the access road to Hammond Lane, the crematorium at Rocky Island, the National Maritime College of Ireland, the Beaufort Laboratory, the Naval Base on Haulbowline Island and Gobby Beach.

The sandy/rocky shore at the eastern end of the peninsula at Ringaskiddy is known as Gobby Beach. This beach is a local amenity served by a small public car park (Gobby Beach car park) and is frequently used by local residents for walking.

There is a footpath to the Martello Tower from the main Ringaskiddy to Loughbeg Road. As discussed in **Section 6.3.1.3** above, the site appears to be used very occasionally as a pedestrian link between the shore and the Martello Tower.

The Deepwater Quay at Ringaskiddy is one of Cork Harbour's premier shore fishing locations. During the winter months, bottom fishing will produce Flatfish, Whiting and Codling. Ray is caught during the summer, while Coalfish and Conger can be caught all year round. Fishing is also carried out from the shore at Gobby Beach.

Local sports clubs include Raffeen Creek Sports Club in Ringaskiddy which comprises Raffeen Creek Golf Club, Raffeen Creek Pitch and Putt Club and two soccer pitches. Shamrocks Hurling and Football Club is located in Shanbally, near Ringaskiddy. The Hibernian Soccer Club is also based in Shanbally.

Haulbowline Island is identified as an East Cork Bird Trail Hotspot. A bird reserve is located at Loughbeg.

The Ringaskiddy and District Residents Association received a grant of planning in 2014 for the construction of a community children's playground on a site adjacent to the N28 in Ringaskiddy Village. It officially opened in May 2015.

In 2015, the Port of Cork received permission from An Bord Pleanála, for an expansion project, which included for new public pier, slipway and boarding platform at Paddy's Point which has since been completed.

The East Tip, part of the Former Ispat Steelworks on Haulbowline Island, has underwent remediation works by Cork County Council and redevelopment as a public park (Haulbowline Island Recreational Park). The new park is on the east side of the Haulbowline whilst the western section is occupied by the Naval Service.

6.3.1.4 Amenity in Cork Harbour

There is extensive recreational use of Cork Harbour, mainly the Lower Harbour, for sea angling and boating. Leisure and recreational activities within the Harbour and its immediate surrounds include sailing, rowing, windsurfing, canoeing, angling, bird watching, swimming and walking. Sailing is a popular amenity in Cork Harbour and there are several sailing/yacht clubs in the Harbour including Lower Aghada Tennis and Sailing Club, East Ferry Marina, Cobh Sailing Club, Monkstown Bay Sailing Club and Royal Cork Yacht Club, which is in Crosshaven.

Spike island has become a visitor attraction, with boat tours operating from Cobh. Cork County Council published a master plan for Spike Island in 2012. While much of the master plan's vision has been implemented, elements such as the proposed aquarium combined with marine research demonstrations remains unfulfilled. The new five year tourism plan for Cork (2024-2029) highlights further enhancement of the "harbour islands experience", with improved connectivity between islands like Fota, Haulbowline, and Spike Island with better travel connections and active travel infrastructure. Spike Island is separated from the Indaver site by a channel (West Channel) which is circa 700m wide.

Meitheal Mara is a maritime cultural organisation based in Cork. It was founded in 1994 as a community employment Currach building project and frequently uses the harbour for boating activities. Meitheal Mara organises the annual Ocean to City Race for rowing boats and canoes.

Typically, boats use the main shipping channel (known as Cobh Road) which runs north of Haulbowline Island and Spit Bank, and north and east of Spike Island.

Leisure craft including sailing and motor boats use the West Channel on occasion but there are depth restrictions due to the shallow nature of the channel and the presence of Curlane Bank to the south and Spit Bank to the north. Depths range from 0.2m to 5.9m (Chart Datum) and the channel is too shallow to be used as a shipping channel. Sailing race courses around the harbour pass in close proximity to Spike Island and there is an annual sailing race around Spike Island.

The race takes place during the summer at a high tide (preferably spring tide) when there is enough depth in the channel for larger boats such as cruisers. Other annual sailing races in the Harbour include Cork Week, which is held every two years.

The Monkstown and Cork Harbour Rowing Club is based in Monkstown. Irish Coastal Rowing Federation Clubs which utilise Cork Harbour include Rushbrooke, Passage West, Commodore, Crosshaven, Blackrock, East Ferry, Cobh Fishermen, Maritime College and Naval Service rowing clubs.

Fota Estate, Fota House and Arboretum, Fota Wildlife Park, Fota Island Hotel and Spa and Fota Golf Club are situated on Fota Island, in the Upper Harbour. Other golf clubs around the Harbour area include Monkstown and Cork Golf Clubs.

Amenities in Passage West and Monkstown include a sea front walk which runs north to Hop Island, and a children's playground which is located in Passage West.

6.3.1.5 Economic Activity

Tourism

In 2011, Fáilte Ireland published Guidelines on the treatment of tourism in an Environmental Impact Statement, noting that there are two interactions between tourism and the environment:

- Impacts caused by tourism projects (e.g. marinas and holiday villages);
- Impacts affecting tourism (e.g. the quality of a destination or a tourism activity).

The Guidelines note that the assessment of effects on tourism should be treated as a specialist sub-section of the topic 'Population and Human Health', with particular elements being considered, as appropriate within other sections, e.g. Landscape, Flora and Fauna (Biodiversity) and Cultural Heritage etc. Chapter 3 of the Guidelines list a number of factors – in order of priority are the reasons why tourists visit and enjoy Ireland. These factors have been considered where relevant in various sections of this EIS as follows:

Table 6.8 Reasons why tourist visit and enjoy Ireland in order of priority (according to the Guidelines).

Factor	EIS Chapters / Notes
Beautiful scenery	Landscape and Visual (Ch. 11) The guidelines note that "*there appears to be evidence that the visitors expectation of 'beautiful scenery' does not exclude an admiration of new modern developments – such as windfarms-which appear to be seen as an indicative of a modern informed and responsible attitude to the environment"*
Friendly & hospitable people	The guidelines note that "*this is not an environmental factor though it is indirectly covered under the 'Human Beings' section of the EIS*". Refer to **Section 6.3.1.9** for demographic details.
Safe & Secure	The Guidelines note that "*this is not an environmental issue though some of the factors that are sometimes covered under the heading of 'Human Beings' – such as social inclusion or poverty – can point to likely effects and interactions*". Refer to **Section 6.5.2** for details on the HAZID assessment
Easy, relaxed pace of life	The Guidelines note that "*this is not an environmental issue though it is partially covered under 'Human Beings' see comments above"*. Refer to 6.3 on receiving environment.
Unspoilt environment	Biodiversity (Ch. 12), Landscape and Visual (Ch. 11). Emissions are addressed in Air Quality (Ch. 8), Climate (Ch. 9), Noise and Vibration (Ch. 10), Soils, Geology, Hydrology, Hydrogeology and Coastal Recession (Ch. 13) and Material Assets (Ch. 15). Traffic is addressed in Roads and Traffic (Ch. 7)

Factor	EIS Chapters / Notes
Nature, wildlife, flora	Biodiversity (Ch 12), Landscape and Visual (Ch. 11). Emissions are addressed in Air Quality (Ch. 8), Climate (Ch. 9), Noise and Vibration (Ch .10), Soils, Geology, Hydrology, Hydrogeology and Coastal Recession (Ch .13) and Material Assets (Ch. 15). Traffic is addressed in Roads and Traffic (Ch. 7) The guidelines note that "*this topic also considers the effect on physical access to and visibility of these sites*". Access to Gobby Beach during construction is addressed in Construction Activities (Ch. 5). Visibility is addressed in Landscape and Visual (Ch. 11).
Interesting history and culture	Landscape and Visual (Ch. 11) and Cultural heritage (Ch. 14). The guidelines note that "*the principal issues are to avoid damage to sites and structures of cultural, historical, archaeological or architectural significance – and to their contexts or settings. It also considers the effect on physical access to and visibility of these sites*" Access and visibility to Martello tower is addressed in Landscape and Visual (Ch. 11) and Cultural heritage (Ch. 14).
Good range of natural attractions	Biodiversity (Ch. 12), Landscape and Visual (Ch. 11) and Cultural Heritage (Ch. 14)
Plenty of things to see and do	The Guidelines note that "*this is not an environmental issue though it is partially covered by the Human Beings section, where tourism resources of an area are described and assessed*". Refer to **Section 6.3.1.3** for details on heritage and amenity.

Ferry Terminal

Although Ringaskiddy is not currently a popular tourist destination, it is, and is expected to remain, an important tourist transit port.

Brittany Ferries operates one ferry route from the Ringaskiddy terminal to France (Roscoff) The ferry operates twice a week from March to early November. The ferries have a capacity to transport 2,400 passengers (up to 650 cars).

The deep-water berth at Cobh has the capacity to handle very large cruise ships. Occasionally there are two or even three cruise ships in the Harbour. If the Cobh cruise ship berth is occupied, the other cruise ship or ships dock at Ringaskiddy. In 2024, Cork Harbour welcomed 103 cruise ships carrying over 190,000 passengers between April and November. The cruise ships make a significant contribution to the local economy, estimated at 17 million euros annually.

Military fortifications

The lower harbour contains a number of important military fortifications such as Spike Island, Fort Davis, Fort Camden, Cobh Fort and Ringaskiddy Martello Tower, which contribute to the rich heritage and character of the harbour. Though Ringaskiddy itself is not a tourist destination, strategic plans are being prepared to develop the area as a more significant tourism and recreational attraction.

Spike Island

As discussed previously, there are already regular tours from Cobh to the military fortification on Spike Island. The new five-year tourism plan for Cork (2024-2029) highlights further enhancement of the "*harbour islands experience*", with improved connectivity between islands like Fota, Haulbowline, and Spike Island with better travel connections and active travel infrastructure.

Port of Cork

Paddy's Point Amenity Area was included as part of the Port of Cork's redevelopment plan, and includes a new public pier, slipway, and landscaped amenity area, with further proposed enhancements as part of the Port of Cork's Masterplan 2050 vision.

Haulbowline Island

The East Tip, part of the Former Ispat Steelworks on Haulbowline Island, has underwent remediation works by Cork County Council and redevelopment as a public park (Haulbowline Island Recreational Park). The new park is on the east side of the Haulbowline whilst the western section is occupied by the Naval Service.

6.3.1.6 Commercial and Industrial Premises

Refer to **Chapter 2** ***Policy and Planning Framework and Need for the Scheme*** for information relating to zoning.

A considerable area of land in Ringaskiddy, including most of the site, is zoned for industrial development. IDA Ireland owns part of the industrial zoned land, with the remainder in private and Port of Cork ownership. IDA Ireland includes the Ringaskiddy area in its ongoing promotion of industrial development. Ringaskiddy is a significant centre of pharmaceutical manufacture at an international level. Since the late 1960s, some very large pharmaceutical manufacturing plants have been constructed in the area. Other businesses in the area include car importers, electronics manufacturing, and grain, cement and molasses storage.

Commercial service companies in Ringaskiddy include a small convenience shop and a public house (The Ferry Boat Inn) on the main street of Ringaskiddy Village.

The Port of Cork company initially operating as the Cork Harbour Commissioners, has been developing the Ringaskiddy port facilities since the early 1980s. According to the Port of Cork website, the Port of Cork Company had a throughput of approximately 10.5 million tonnes of traffic in 2020, and there are extensive port facilities in the Harbour. It is estimated that 300,000 containers annually come through the Port of Cork. The Company operates a container and ferry port at Ringaskiddy. Its deepwater berth at Ringaskiddy is of major economic importance to the region. Facilities at the deepwater berth can handle a range of cargo types, including roll-on roll-off, lift-on lift-off and dry bulk.

Cargo ships service the Tivoli Container Port, approximately 6km to the northwest of the site. Under Port of Cork's future strategic plan, the container terminal at Tivoli and the city quays were to undergo a phased move from 2020 and completed by 2025 to Ringaskiddy for which it has received planning permission. However, due to planning conditions and capacity constraints (specifically the need to complete the M28 and Dunkettle road schemes), both Tivoli and Ringaskiddy are currently operating in parallel for container traffic.

The land use and development policy for the Ringaskiddy area is for this industrial and port development to continue.

6.3.1.7 Commercial Fisheries

Vessels more than 12m in length are not permitted to fish within Cork Harbour. Vessels fish mainly out of Cobh and Crosshaven.

Boats are engaged in potting for lobster, edible or brown crab, Velvet crab and the common shore or green crab. Shrimp are also potted extensively in late summer and autumn. A limited amount of mullet fishing takes place during the summer months and trawling takes place, particularly later in the year for codling and flat fish. The channel between Spike Island and the Ringaskiddy shore is occasionally used as a trawling route for boats fishing for species such as plaice, skate and flounder when the conditions outside the harbour are too inclement for fishing. The edges of the channel below the low water mark are used for potting for Green Crab, Velvet Crab and Shrimp.

Occasional scallop fishing is undertaken south of Cuskinny on the southern shore of Great Island. Potting is undertaken extensively from inside the Dognose Bank (Fort Davis/Carlisle) along the rocky coast on the eastern side of the Lower Harbour. Up to 2,000 pots can be laid in this area at any one time and in general the area is considered very productive for all potted species. Potting for Shrimp, Crab and Lobster is also undertaken along the Great Island shore, east of Cuskinny, and to a limited extent in the East Ferry channel. Green crab is also fished in the North Channel, north of Great Island.

Trawling is undertaken in several places around the harbour especially along the shelf bordering the main channels.

Netting for Mullet is undertaken around Aghada, mainly during the summer.

Over-fishing is a threat to all fisheries and responsible management and conservation of the resources are required if long-term sustainability is to be ensured. In light of this, Lobster conservation measures have been adopted by the Cork Harbour fishermen in line with their counterparts around the Irish Coast.

6.3.1.8 Aquaculture

Mussel culture is totally banned in Cork Harbour because of the prevalence of the organisms that cause Paralytic Shellfish Poisoning. Oysters are the main species cultivated. The Sea Fisheries Protection Authority (SFPA) lists[1] three sites within Cork Harbour classified as production areas for bivalve mollusc production (North Channel West, North Channel East and Rostellan). All three sites are classified for oyster (*Crassostrea gigas*) production. Rostellan is noted by the SFPA as being a 'Dormant Fishery', having been dormant for at least 12 months.

This designation requires minimum standards of water quality to be maintained under European Communities (Quality of Shellfish Waters) Regulations 2006 (S.I. No. 268 of 2006), as amended. It also obligates public authorities to report information relevant to water quality in designated areas to the Department of Housing, Planning and Local Government.

6.3.1.9 Demographics

In general, the demographic data quoted throughout this chapter is from the most recent Census (2022). It is noted that in January 2019, legislation was passed which finalised the revision of Local Government boundary arrangements in Cork. This means that from May 31st of 2019, the transition areas of Ballincollig, Blarney, Tower, Glanmire, Douglas Donnybook, Grange, Frankfield, Rochestown and Togher became part of the Cork City rather than Cork County. Refer to the Cork County Council website[2] for further details.

The Central Statistics Office (CSO) has been used as a source of information to characterise the study area. Where applicable the study area has been described in terms of the local Electoral Divisions and Small Areas. Ireland is divided into 3,441 ED and there are 18,919 Small Areas. Small areas are generally towns and villages around the country. Ringaskiddy is included in the electoral division of Carrigaline (ED number 082) and specific statistics can be found for the Ringaskiddy-Loughbeg area under the CSO Small Area Population Statistics (SPAS) database.

The boundaries of some local electoral areas have also changed. Some small areas and electoral division boundaries in Cork were redrawn to reflect population changes and data protection needs, however, Ringaskiddy is still officially part of the Carrigaline Electoral Division.

Recent Trends in Population

The smallest geographical units distinguished by the Central Statistics Office (CSO) are Electoral Divisions (ED).

As discussed above, the EDs were reconfigured on the 31st of May 2019 after the revision of Local Government boundaries in Cork. The Census data for these realigned boundaries have been reconfigured and therefore the CSO data presented in this chapter represents the ED boundaries from the 2022 Census.

The Indaver site is located within the Carrigaline ED (082) within the Carrigaline Local Electoral Area. The Carrigaline Local Electoral Area comprises of six Electoral Divisions in total at the time of the 2022 Census.

Carrigaline (ED 082) includes the villages of Ringaskiddy and Shanbally and Carrigaline town north of the Owenboy River.

Table 6.9 outlines the population change between 2016 and 2022 and the growth rate of these population figures. The substantial increase in Cork City population, together with the decrease in Cork County from 2016 to 2022 its due to the extension of Cork City boundaries in 2019 mentioned above, which as part of the planned expansion, saw the population of the city growing by 85,000 people at the time of implementation. The population in the electoral division of which the development is proposed (Carrigaline 082) showed a population increase of 9.3%, above the state and county percentage of population change for the same period.

[1] Sea-Fisheries Protection Authority, 2024/2025 List of Classified Bivalve Mollusc Production Areas in Ireland (Available at: https://www.sfpa.ie/LinkClick.aspx?fileticket=NAJBu8tNhLQ%3D&portalid=0)

[2] https://www.corkcoco.ie/en/council/accessibility-maps-and-publications/cork-boundary-change-information

Table 6.9 Population of State, County Cork, Cork City, and Carrigaline local areas from 2016-2022.

District	2016	2022	Change from 2016-2022 (%)
State	4,761,865	5,149,139	+8.1
Cork County	417,211	360,152	-13.7
Cork City	125,657	224,004	+78.3
Carrigaline[1] (082)	12,118	13,249	+9.3

Note 1 – Includes Ringaskiddy village
(Data source: CSO website www.cso.ie)

Household Size

Table 6.10**Table 6.10** below outlines the average household size in each of the geographical areas assessed. The statistics illustrate a small decrease in household size in the state and in Cork City from 2016 to 2022. An increase was recorded for Cork City. This could relate to the change in the aforementioned Government boundaries. It is also noted that the information available on average household size in 2022 was for Cork City and Cork County combined. The household size in the area of the proposed development (Carrigaline 082) was higher than the State, City and County for 2016. No information for Carrigaline was available in 2022.

Table 6.10 Average Household Size (persons by household)

District	2016	2022
State	2.75	2.74
Cork County	2.8	2.72 (average of Cork County and Cork City)
Cork City	2.4	2.72 (average of Cork County and Cork City)
Carrigaline (082)	2.9	Not available

(Data Source: CSO website www.cso.ie)

The 2022 Census reported 4,497 private households in the Carrigaline ED ,of which, the majority of households were characterised as 'Married couple with children' (40.4%), 'One person' (16.3%) and 'Married couple' (14.7%). Of the 4,495 permanent private households in the Carrigaline ED in 2022, the majority of permanent private households were characterised as 'Owned with mortgage or loan' (44.3%) or 'Owned outright' (1511) (33.6%).

Age Profile

Table 6.11 shows the age cohorts for 2022 across the State, Cork City, Cork County, Carrigaline Electoral Division (082), and Ringaskiddy-Loughbeg town/settlement.

Statistics show that Carrigaline (082) has an above average proportion aged 0-14 (21%) compared to the State (19.6%), Cork City (16.3%) and Cork County (20%). The 2022 statistics show that Carrigaline Electoral Division also has an above average proportion age 25-44 (27.8%) compared to the State (21.2%), Cork City (26.3%) and Cork County (26.6%). Ringaskiddy-Loughbeg settlement has its biggest age cohort at 45-64 with 32.4%, compared to the 19.8% from the State.

Table 6.11 Age Cohort 2022

District	0-14 (%)	15-24 (%)	25-44 (%)	45-64 (%)	65+ (%)	Total (number)
State	19.6	11.5	21.2	19.8	11.6	5,149,139
Cork City	16.3	13.0	26.3	22.0	15.0	224,004
Cork County	20.0	12.5	26.6	22.0	14.9	360,152
Carrigaline (082)	21.0	12.7	27.8	22.1	13.4	13,249

(Data Source: CSO website www.cso.ie)

In the 2022 Census, 6,232 of people aged 15 years and over in Carrigaline ED were categorised as 'At Work'. This figure accounts for 60.6% of the population compared to 2.8% or people whose economic status was registered as 'Short term unemployed' or 'Long term unemployed'. Those with an economic status of 'Student' or 'Retired' accounted for 24.6% collectively in 2022 in Carrigaline ED.

Recent trends in Employment

Recent trends in employment were evaluated using CSO information generated from the 2016 and 2022 Censuses and Small Area population statistics. The information was compiled on the basis that:

- The labour force is defined as the sum of people aged 15 years and over who are at work or who are employed.
- The participation rate is the proportion of persons in the labour force aged 15 years and over expressed as a percentage of all persons in that age group.

Statistics shown in **Table 6.12** and **Table 6.13** below outline the employment figures for the State, Cork City and Cork County, and in the main towns near Ringaskiddy, respectively.

In summary, there was an increase in the total number of persons aged 15 years and over at work in the State, and in Cork City, with a decrease in Cork County between the period of 2016 and 2022. Once again, Cork County and Cork City respective decrease and increase are due to the extension of 2019 border extension of Cork City. This is represented, consequently, by the increase in percentage of participation in labour force in Cork City and decrease in Cork County, together with the same scenario in total labour force numbers.

Regarding the main towns near Ringaskiddy, there was a decrease in unemployed persons over 15 years, with an increase in persons at work in all the towns represented.

Table 6.12 Employment Figures for the State and Cork City and County for Persons 15 years and over.

Area	Total Persons		At Work		Unemployed (ex. 1st time job seekers)		Total in Labour Force		% Rates of Participation in Labour Force	
	2016	**2022**	**2016**	**2022**	**2016**	**2022**	**2016**	**2022**	**2016**	**2022**
State	4,761,865	5,149,139	2,006,641	2,320,297	265,962	176,276	2,304,037	2,531,099	61.4	61.2
Cork City	542,868	584,156	50,483	103,249	8,024	5,399	59,426	112,240	55.2	60.0
Cork County	417,211	360,152	179,890	161,174	16,460	11,282	198,177	171,626	61.6	61.0

(Data Source: CSO website www.cso.ie)

Table 6.13 Employment Figures for the main towns near Ringaskiddy (Persons over 15 years and over).

Town	Unemployed (ex. first time job seekers)		At Work	
	2016	**2022**	**2016**	**2022**
Ringaskiddy-Loughbeg	30	12	219	275
Carrigaline	540	396	6,971	8,494
Cobh	765	439	5,093	6,317
Monkstown/Passage West	285	198	2,522	2,720

Data Source: CSO website www.cso.ie)

6.3.1.10 *Labour Force Survey*

The Labour Force Survey Data (formerly known as the National Quarterly Household Survey) statistics for the first quarter (Q1) of 2025 show that there was an annual increase in employment of 3.3% or 89,900 in comparison to same period of 2024, bringing the total employment to 2,794,100 persons. There were 124,200 persons (15-74 years) unemployed in the first quarter of 2025 (4.3%), up from 4.1% in Q1 2024.

Employment in the construction sector increased by 6,100 or 3.6% in Q1 of 2025 in comparison to the same period of 2024.

Table 6.14 shows the distribution of employment sectors in 2022 in Ringaskiddy-Loughbeg and locally. Commerce and trade, manufacturing industries, and professional services are significant employment groups in Ringaskiddy-Loughbeg and the surrounds.

Table 6.14 Distribution of employment by broad industrial group in towns near Ringaskiddy (number of persons aged 15 years and over) in 2022.

Employment Sector	Ringaskiddy-Loughbeg	Cobh	Passage West-Monkstown	Crosshaven	Carrigaline
Agriculture, forestry and fishing	1	20	20	7	38
Building and construction	21	282	191	91	479
Manufacturing industries	79	1,299	522	316	2,028
Commerce and trade	57	1,337	622	326	1,988
Transport and communications	20	563	223	135	723
Public administration	5	444	126	72	366
Professional services	51	1,393	690	356	1,992
Other	41	979	326	207	880
Total	275	6,317	2,720	1,510	8,9494

6.3.1.11 *Health Status of Population*

Population

When the potential effects on human health of any emissions are assessed, amongst the most important factors to be considered will be, the number of people who may be exposed, the duration of that exposure and the vulnerability or sensitivity of those individuals to those emissions.

Residential areas, public and private health facilities, workplaces, commercial areas and educational facilities are particularly important because significant numbers of persons usually spend significant time at these locations.

Places of worship and recreational areas are also important because of the significant numbers but the fact persons usually spend less time in these places, may be relevant for some emissions.

Agricultural areas usually have limited numbers of persons present and for a limited time but farm residences themselves are considered like any other homes.

The sensitivity of an area in this context refers to the vulnerability of the population. Vulnerable persons include the sick, the very young or old. Receptors that are considered to be very highly sensitive include health care facilities, both public and private, as these are more likely to include the elderly ill or infirm. Sensitive receptors also include schools, because of the children. When health impacts are assessed particular attention must be given to these groups.

A considerable number of industries are situated in the Ringaskiddy area. This means that a considerable number of people work in the area. When assessing environmental impact there are several reasons why persons at work are less vulnerable than, for example, residents. The most obvious of these is time. People typically spend about 40 hours per week in a work area whereas much more time is spent in the home. Of course, some people who work in the area will also live in the area but again their exposure would not be expected to be any greater than a home maker for example who lives and works in the home. Also, the population at work is less likely to include the vulnerable such as the very young, the very old and the ill. For these reasons, environmental levels designed to ensure the safety of residents it will automatically by sufficient to protect those at work.

This of course should not be confused with the workers in the facility itself who have potentially higher exposure than environmental levels. While their safety is part of the role of the Health and Safety Authority, the most appropriate measure of workplace exposure for these individuals is the Occupational Exposure Limits Values or OELVs.

Community Health Profile

Physically the proposed development lies in Cork County Council local authority area. Evidence shows that different communities have varying susceptibilities to health effects both positive and negative as a result of social and demographic structure, behaviour and relative economic circumstance.

Whilst specific health data for individuals in the vicinity of the proposed development is confidential and difficult to establish, as has been detailed in the methodology section above, a community profile has been used to establish the baseline and identify unequal distributions in existing factors such as deprivation or burden of poor health, in order that changes in community exposure to certain health pathways and their degree of impact on the population or community can be assessed.

According to the Central Statistics Office (CSO) based on the 2022 census:

In April 2022 in Cork, almost 128,600 people (22% of the county's population) reported experiencing at least one long-lasting condition or difficulty to any extent. Of these, 48,002 (8% of the county's population) reported experiencing at least one long-lasting condition or difficulty to a great extent or a lot. A further 80,587 (14% of the county's population) reported experiencing at least one long-lasting condition or difficulty to some extent or a little.

Nationally,1.1 million people (22%) reported experiencing at least one long-lasting condition or difficulty to any extent, of whom 407,342 (8%) experienced a long-lasting condition or difficulty to a great extent and 702,215 (14%) to some extent.

In Ireland overall, more females (22%) than males (21%) experienced a long-lasting condition or difficulty to any extent. In Cork, this rate was 23% for females and 21% for males.

The general health question had five response options on the census form ranging from very good, good, fair, bad to very bad.

Just over 494,000 people (85%) in Cork stated their health was very good or good in Census 2022. This was down from 88% in Census 2016 and 89% in Census 2011. Nationally, 83% of people had good or very good health, down from 87% in 2016 and 88% in 2011.

Among the county's females,162,049 (55%) reported very good health, as did 55% of males (160,129).

There were also 9,220 people who reported bad or very bad health in the county, up from 8,029 people in 2016.

In Cork, more than 49,600 people smoked daily in April 2022 which was 8% of the population, compared with 9% nationally. Just over 25,600 people (4%) smoked occasionally while almost 113,000 people had given up smoking (19%). Almost 359,400 people stated they never smoked (62%). Nationally, 60% of the population never smoked.

The number of males in the county who smoked daily was greater than the number of females (27,879 males compared with 21,736 females).

Other data on the health profile of the community in Cork can be found from Cancer data compiled by the National Cancer Registry of Ireland (NCRI). From the most recent data available 2006-2017, mapping invasive cancer rate Cork County has invasive cancer rates slightly above average for Ireland. This is largely attributable to higher rates of bowel cancer and to a lesser extent breast cancer.

There has, in the past, been reported high cancer rates around Cork Harbour and in Cobh in particular. It is interesting the NCRI found it appropriate to issue a statement on this. In fact, they issue a similar statement twice, initially in 2011 and subsequently in 2016

It stated:

Recent media coverage has interpreted information from the National Cancer Registry as suggesting a link between cancer rates in Cobh, Co. Cork and a former steel plant on Haulbowline Island, near the town. The Registry does not believe that this interpretation is correct, for a number of reasons.

- *Although cancer risks in Cobh for some cancers are above the national average, half of the areas in the country will always be above average, and this is meaningless in itself;*
- *Cancer rates in Cobh are not exceptional when compared to similar towns. Many towns in Ireland have higher cancer rates, with no suggestion of external factors;*
- *While the risks of some cancers in Cobh are above average, the risk of many others is below average. Selective reporting of the high rates only serves to cause unnecessary worry to residents;*
- *As cancers take 15 to 20 years to develop, it is impossible to link recent exposures to current cancer risk or changes in risk.*
- *No exposure has been identified which could cause an increase in the risk of such a wide range of cancers as has been suggested for Cobh—cancers of the lung and prostate, for instance, have no risk factors in common—and cancer risk to the population of Cobh is caused by a combination of many factors.*

These factors are well known and mostly related to behaviour or lifestyle—for instance smoking, diet, exercise, alcohol—and the cancer data shows that the population of Cobh is similar to that of towns of similar size in these characteristics.

The National Cancer Registry is an independent body which continuously monitors cancer rates and risks to the Irish population. The information is freely available for people to study and draw their own conclusions, and they have published an atlas of cancer risk for the whole island of Ireland. This shows that cancer risk varies by area, but not in any consistent way for different cancers, and that there is no cancer "blackspots" with increased risk for all cancers.

In reality then while rates may vary the National Cancer Registry of Ireland (NCRI) have clearly stated that there are no cancer black spots.

It is somewhat more difficult to get reliable data on respiratory illness such as Chronic Obstructive Pulmonary Disease (COPD) and asthma. We know for example that whilst approximately 1 in 8 persons suffer from asthma, it is not possible to map those as there is no register for asthma sufferers in the same way as there is one for cancers. There is some evidence that asthma rates in Ireland are quite high by International standards.

According to the National Clinical & Integrated Care Programme updated in October 2024, it is estimated that 380,000 people are living with COPD in Ireland, yet only 110,000 are diagnosed. As set out in the National Healthcare Quality Report System (NHQRS 2023), Ireland had the fourth highest rate of hospital admission with COPD in the OECD in 2021. The national age-sex standardised hospitalisation rate for COPD in 2021 was 259.31 per 100,000 population. The latest data from the OECD (2021 or nearest year) reports that Ireland's rate of hospitalisation for COPD (219.23) was above the OECD average (118.8) (NHQRS, DOH 2023). There are approximately 450,000 people with doctor-diagnosed asthma in Ireland (approx. 1 in 10 of population), of whom approximately 240,000 are estimated to have uncontrolled asthma (HSE 2020). In 2022, the age-sex standardised hospitalisation rate for asthma was 33.4 per 100,000 population.

In the latest data reported by the OECD, 2021 or nearest year, Ireland reported a rate of 28.56 hospitalisations per 100,000 population, which was higher than the OECD average of 23.3 hospitalisations per 100,000 population. As set out in the National Healthcare Quality Report System (NHQRS DOH 2023), Ireland had the 10th highest rate of hospital admission with asthma in the OECD in 2021. Evidence suggests that the prevalence of asthma within the Irish population is rising; for example, one study reported that there was a 42% relative increase in the prevalence of asthma in Irish teenagers between 1998 and 2003 (Kabir et al 2011). Hence, obstructive lung disease places a huge burden on Irish Healthcare.

Hospital admission data suggests a slightly lower rate of COPD admissions in Cork than average in Ireland. Again, these figures must be treated with some caution but certainly does not suggest a problem in Cork that is not elsewhere.

For asthma admissions the picture is that 44.9 admissions per 100,000 per year for asthma Cork is almost exactly average for the country of 43.5 per 100,000. This could be compared to figures such as Donegal where the rate is 73 per 100,000. Again, the standard warning is there about misinterpreting these figures, but we can state that there is no evidence that Cork is any worse than anywhere else in Ireland.

6.3.2 Major Accidents and Disasters

6.3.2.1 Disasters / External Impacts

In carrying out the risk assessment, the team considered worst case scenarios, including scenarios involving complete loss of containment from a vessel or tank, or scenarios involving a fully developed fire. The risk assessment worksheets in the HAZID&RA report (**Appendix 6.1**) show that a variety of initiating events was considered when determining the probabilities of occurrence for these scenarios. As part of this assessment, consideration was also given to the potential for an accident to arise at the site as a result of a disaster or other external impact. These are discussed in the following sub-sections.

Earthquakes

The School of Cosmic Physics (part of the Dublin Institute for Advanced Studies) was consulted regarding the risks posed by seismic activity in Ireland. The School has had a seismic network in operation in Ireland since 1978. They have indicated that Ireland is seismically very stable and that there is nothing to suggest that this will change in the coming millennia.

The HAZID&RA report includes a series of maps (Figures 2.1 to 2.3 incl.) showing earthquake incidents and earthquake risk.

- There is a map with incidents of earthquakes in Europe between 1900 and 2006. This shows that there were no earthquakes exceeding the threshold of M3.5 recorded in Ireland during that time period.
- The maps of earthquake hazards shows that the risk of an earthquake in Ireland is amongst the lowest in Europe.

These maps are included in Section 2.4.1 of the HAZID&RA report.

Referring to **Section 13.3.1.2** (**Chapter 13**), the potential landslide risk in the vicinity of the site is primarily confined to the shoreline. As described in **Section 13.4.4,** Indaver proposes the placement of sacrificial material above the foreshore on Gobby Beach to mitigate the risks associated with shoreline erosion.

Based on these considerations, the risk associated with earthquakes or ground movement at the site is extremely remote. If this did occur, there would be the potential for loss of containment of materials from vessels. These loss of containment events are identified and assessed in the HAZID&RA worksheets. It was considered that the risk from an earthquake or ground movement would have a negligible contribution to the probabilities of occurrence of these scenarios.

Flooding

Referring to the meteorological data in Table 1.3 of the HAZID&RA report, in the worst-case rainfall event, the highest quantity of rainfall that could fall onto a bund area would be 73.2 mm in 24-hours. Any build-up of water in the bunds could therefore be easily managed by Indaver operators by allowing the rainwater to drain via oil-water separators, in accordance with normal operating procedures at the site.

The risk of flooding in the surrounding area was also considered. As noted in **Section 13.3.3.3** (**Chapter 13**), the risk of flooding is very low. Historically there have been events where the road adjoining the Indaver site has flooded. This has occurred in instances of high rainfall and high tides, where the surface water drainage outfall was 'tide-locked'.

Indaver will upgrade the road drainage network in the vicinity of the site to further protect against this flood risk. Upgrade works will be conducted on the L2545 road as part of the proposed development, including improvement of the drainage systems in order to mitigate against future flood risks. In addition the levels of the low-lying parts of the site will be raised to 4.55 m OD. This is much higher than the minimum required flood defence level, which is calculated to be 3.42 m. The finished floor levels of the buildings on site will be even higher, at above 5 m OD.

These measures will provide a very high standard of flood protection to the site. The Flood Risk Assessment is included in **Appendix 13.4** for reference.

The coastal study found that there would be no risk from coastal erosion 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, but this would be confined only to the amenity walkway and viewing platform located outside of the security fenceline. However, even allowing for the conservative assumptions used to predict the rate of erosion, the waste-to-energy facility itself will not be impacted by coastal erosion after 40 years.

Based on the study findings and taking into consideration the mitigation measures that will be implemented, it was considered that there is no credible accident scenario at the site resulting from flooding or coastal erosion effects.

Power failure

There are no accident scenarios identified at the site which would be associated with a power failure. There will be no materials at the site which are unstable or which require a power supply to ensure that they are stored or handled safely, e.g. materials requiring a temperature-controlled environment.

The site will have a UPS system and emergency diesel generator to provide power in the event of a power cut. This means that Indaver would retain the facility to activate the fire protection systems in the event of a disruption to the electrical supply to the site.

If a power failure occurred to a key item of plant or equipment at the same time as potentially hazardous materials were being delivered to the site (e.g. a delivery of aqueous ammonia to the storage tank), the transfer would be halted for the duration of the loss of power event.

Based on the controls that will be in place it was considered that there was no credible risk of a major accident scenario associated with a power failure to the site.

Aircraft Impact

The closest airport to the proposed development site is Cork Airport, which is located at a distance of c.13 km from the proposed development. **Figure 6.2** of **Volume 3** ***Figures*** shows the plot of the Public Safety Zone (PSZ) for this airport. This is taken from a report[3] by ERM (Environmental Resources Management) Ireland Ltd, which was commissioned by the Department of Transport and the Department of the Environment and Local Government.

[3] Public Safety Zones: Cork, Dublin and Shannon Airports, ERM, June 2003 (Draft) on behalf of Department of Transport and Department of Environment & Local Government.

The aim of these PSZs was to protect people on the ground from the risk of an aircraft crash by using land use planning controls on developments in the vicinity of airports. Essentially a PSZ is used to prevent inappropriate use of land where the risk to people is the greatest.

The plot shows that the PSZ runs in a north-south direction. The proposed development at Ringaskiddy is located to the east of the airport, just outside the range of the map shown. The proposed development is located more than 10km outside of the PSZ contours. As such the risk of an aircraft impacting the proposed development is therefore considered to be extremely remote and therefore was not considered as a credible scenario in the HAZID&RA.

Helicopter Impact from Haulbowline Naval Base Activities

As outlined in **Section 15.5.3.1** of **Chapter 15** ***Material Assets***, the potential effects of the stack plume was assessed in relation to helicopter operations at the Naval Base. The assessment, which is provided in **Appendix 8.8** to **Chapter 8** ***Air Quality*** demonstrated that any impact of the plume on the functionality of helicopter engines (and in particular leading to engine failure) from the proposed development, would be confined to less than 14m from the tip of the stack.

This is supported in the assessments provided by two independent aviation experts provided in **Appendices 15.1** and **15.2** which established that general aviation safety rules would demand a 150m clearance from such structures and therefore a helicopter could not safely get close enough to the stack and plume for engine failure to be initiated.

Based on these considerations, the risk from helicopter impact to the site was considered to be negligible.

High Wind Speeds

Met Éireann has produced a map showing the estimated maximum gust speeds for a 50-year return period in Ireland. This is reproduced in **Figure 6.3** of **Volume 3** ***Figures***.

Windspeed data from the Cork Airport weather station shows that the mean wind speed over the period was 9.8 knots (5.0 m/s; 18.1 km/h), with a maximum hourly average wind speed of 26.3 knots (13.5 m/s; 48.7 km/h). Data from Met Éireann shows that the typical maximum gust speeds for a 50-year return period are in the range up to 50 m/s (180 km/h) depending on the location of the site in Ireland. For Cork Airport, the highest gust over the period was 80 knots (148 km/h), and the highest 10-minute mean wind speed was 56 knots (104 km/h).

While high winds, and sustained high winds, may be disruptive to certain operations, the wind speeds typically experienced in Cork do not significantly influence the likelihood of an accident or incident, and there are no scenarios in which a high wind speed is likely to directly result in an accident or incident.

Extremes in Ambient Temperature

The highest ambient temperature at the site (based on a 30-year return period) would be of the order of 27.8°C. There are no scenarios envisioned in which high ambient temperatures could give rise to an accident scenario at the site.

The data shows that the lowest temperature recorded during this period was 3.1°C. The only hazards identified which would be presented by extreme low temperatures are the risk of a vehicle collision at the site due to formation of ice on the ground and the risk of freezing in the water main. The potential for a traffic accident exists at all times and is included as an initiating event for relevant scenarios in the HAZID&RA. While there may be an increased risk in the event of heavy icing on site, this would be mitigated by the measures that Indaver will have in place. Indaver will ensure that only operators with appropriate waste collection permits will be allowed to bring vehicles onto the site. Furthermore, all vehicles arriving on site will be checked at Security and Indaver will provide induction training for all drivers operating at the site. The induction training will be provided to new drivers and will be renewed every year to all drivers. Indaver will maintain records of this training.

There will also be a speed limit on site. Indaver will also monitor ground conditions on site in areas accessed by vehicles during freezing temperatures and will salt/grit areas if required to reduce the risks associated with icy conditions. Indaver will also supervise all deliveries to the tipping hall and a Tipping Hall Operator will guide the driver to ensure that the deliveries are carried out in a safe and controlled manner.

Indaver will mitigate against the risk of water freezing in the water main on site by ensuring that it is designed to meet the necessary standards and the requirements of the Fire Certificate and those of the insurance company. The ring main will be underground and any chambers for hydrants will be insulated and heat traced, the underground ring main will surface inside the building and in areas such as the tipping hall and bunker the internal ring main will be insulated.

As a result, no credible accident scenario resulting from extremes in ambient temperature was included as an initiating event by the HAZID&RA Team.

Lightning

Referring to guidance from the UK HSE, it advises that the use of BS 62305 is the expected standard for lightning protection at hazardous industries . The HSE states that the likelihood of a major accident being initiated by a lightning strike at a well-designed and maintained hazardous installation is, therefore, low so Inspectors must act proportionately to focus on those major hazard installations where reasonably foreseeable risk remains.

In other guidance, the UK HSE notes that the probability of an accident arising as a result of lightning strike at a typical facility involved in the storage of flammable liquids is extremely remote, with a probability of 1 x 10-7 per annum. This guidance is for activities involved in the storage and handling of materials which would present a greater fire hazard than the materials at the Indaver facility.

All areas of the site which will be used for the storage and handling of dangerous substances will be assessed under BS EN/IEC 62305 and, where required, will be fitted with lightning protection systems which will be designed and installed in accordance with same.

The UK Met Office has operated a lightning location network since 1987 (in its current form known as ATDnet), which allows for the detection of lightning activity across Europe and in turn the development of maps showing the density of lightning strikes. A 2014 research paper analysed the data from the network.

This shows that, in general, Ireland is an area of relatively low lightning activity, with the paper noting that:

Over the UK, Ireland and Scandinavia the densities are generally lower than the rest of Europe. Some of the lowest densities are observed over the Atlantic, North Sea and Baltic Sea.

A separate, volunteer organisation also operates a series of lightning monitoring stations across Europe (Blitzortung), with the data that is collected also used to generate lightning density maps. The lightning density map for Ireland and the UK for 2015 is shown in **Figure 6.4** of **Volume 3** ***Figures***. This also shows that Ireland is, in general, an area of low lightning activity.

Based on the measures that will be in place and on the guidance, it was considered that the risk that a lightning strike could initiate a major accident was found to be negligible.

6.3.2.2 Major Accidents Hazards from Offsite Establishments

The proposed development site is located to the east of Ringaskiddy village. The other developments in the vicinity of the Indaver site are described in this section.

There is metal reclamation works at Hammond Lane, which is surrounded by the Indaver site. The proposed waste-to-energy facility will be located to the east of Hammond Lane. Due to the proximity of this site to the proposed development, the HAZID&RA gave consideration to the potential risk that an incident at the metal reclamation works could act as an initiator to an accident scenario at the Indaver establishment.

Section 2.4.9 of the HAZID&RA report notes that, in the event of a fire at Hammond Lane, the Emergency Response Team would mobilise at Indaver, to review whether any actions should be taken at the site. However, due to the separation distances between the installations at Indaver and the Hammond Lane site, it was not envisaged that any fire scenario arising at Hammond Lane would present any risk of escalation / domino effects to the Indaver facility.

The DePuy Wind Energy turbine directly to the south of the proposed development was also considered by the HAZID&RA. The impact of collapse of the entire turbine or the catastrophic failure of a turbine blade when rotating at high speed were evaluated.

The assessment for the DePuy site found that the risk presented by the facility to the Indaver site was extremely remote and would make no significant contribution to the risk of a major accident at Indaver.

Apart from the Hammond Lane site, the next nearest building to the Indaver site at which there is industrial/commercial activity is a warehousing operation (Yara Ireland) located immediately northwest of the Indaver site. There is also the National Maritime College of Ireland site as well as the Beaufort Research Building, which are adjacent to this warehousing facility.

As outlined in Section 1.3.1 of the HAZID&RA Report, there are several COMAH establishments in the broader vicinity of the planned development at Ringaskiddy, as follows:

- Pfizer – Pharma (API) – upper tier
- Sterling – Pharma (API) – upper tier
- Carbon Chemical Group – Chemical suppliers – lower tier
- Thermofischer – Pharma – upper tier
- Hovione – Pharma – lower tier

The closest of these sites is the Hovione establishment, which is located c.800m from the proposed development. There is no potential for an accident at the Indaver site to present any risk to any of these establishments.

In the event that the Indaver site falls within the Public Information Zones (PIZ) of any of these developments, e.g. as a result of changes at one of these developments, the operators of that site will be required to provide Indaver with an information package on the hazards presented by their establishment. If this happens, then Indaver will review the information and, if necessary, update the HAZID&RA and/or the emergency response arrangements at the site to reflect this.

6.4 Characteristics of Proposed Development

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.

The proposed development will generate additional traffic, and noise and air emissions, which will be within the applicable emission limits. No process or sanitary effluent will be discharged to Cork Harbour. Emissions from the proposed development are addressed in the relevant sections of the EIS.

Up to 320 people will be directly employed during the construction phase. Up to 63 people will be directly employed during the operational phase.

The L2545 upgrade will reduce flood risk on the road which will be of benefit both to the Ringaskiddy Resource Recovery Centre and also to the other existing users of this road including NMCI, the crematorium on Rocky Island and the Naval Base on Haulbowline Island. Haulbowline Island Recreational Park will also benefit due to the improved upgrade of the L2545. The increase in ground levels in part of the Indaver site will reduce flood risk.

A new bitumen macadam footpath will be constructed to give access from Gobby Strand to the Martello Tower. It is proposed to run along the eastern edge of the site and will be fenced with a low timber fence along the eastern edge. A viewing area will be provided at the higher southeast corner of the site providing expansive views over Cork Harbour, Spike Island and Cobh.

Coastal protection in the form of sacrificial material is proposed above the foreshore along the section of Gobby Beach owned by Indaver in order to slow the rate of coastal recession.

It is expected that, if granted planning permission, Indaver would be required to establish a Community Benefit Fund to fund environmental and other community projects and initiatives in the Ringaskiddy area. It is predicted that the value of the fund will amount to approximately €240,000 per year.

The development of the site will involve the storage and handling of certain materials which have the potential to give rise to accident scenarios which could present risks to human health and/or to the environment. Details of the installations at the site that were considered for the risk assessment are included in the HAZID&RA report in **Appendix 6.1**.

6.5 Potential Effects

6.5.1 Population and Human Health

6.5.1.1 Introduction

Effects on humans as a result of the proposed development have been considered in detail in other chapters of this EIS, as follows:

Chapter 5 *Construction Activities*,

Chapter 7 *Roads and Traffic*,

Chapter 8 *Air Quality*,

Chapter 9 *Climate*,

Chapter 10 *Noise and Vibration*,

Chapter 11 *Landscape and Visual*,

Chapter 12 *Biodiversity*,

Chapter 13 *Soils, Geology, Hydrogeology, Hydrology & Coastal Recession*,

Chapter 14 *Archaeological, Architectural and Cultural Heritage*,

Chapter 15 *Material Assets*.

The effects of the proposed development on human beings in relation to health and safety, residential and recreational amenity and economic activities are evaluated in the following sections.

6.5.1.2 Do-Nothing Scenario

Population

Based on past trends and current planning policy at development plan and local area plan level, it can be expected that industrial and port development will continue in the Ringaskiddy area. The Port of Cork expansion project will involve a substantial expansion of Ringaskiddy Port. Residential development in Ringaskiddy and Shanbally villages will be confined to that which is required to meet local needs.

Residential and other developments will continue in other areas around Cork Harbour, apart from in the coastal areas zoned for protection. Amenity developments are proposed along the N28 and L2545 roads, together with an amenity area as part of the Port of Cork's redevelopment plan. Improved connectivity between islands such as Fota, Haulbowline, and Spike Island is highlighted in the new five-year tourism plan for Cork (2024-2029), with better travel connections and active travel infrastructure.

Further development of the Port of Cork is expected, with a new planning application submitted in 2025 for the continuation of works started in 2015.

One consequence of this general development will be an intensification of industrial, port and other activity adjacent to Ringaskiddy village, and in the Lower Harbour. This development will take place regardless of whether the proposed development is built or not. Cork County Development Plan (2022-2028) identifies Ringaskiddy as a Strategic Employment Area and that the site is '*suitable for large standalone industry with suitable provision for appropriate landscaping and protection of the access points and provision for open space bufferto the Martello Tower and its associated pedestrian accesses*' and '*suitable for the extension of the Third Level Educational campus and enterprise related development including marine related education, enterprise, research and development. Consideration will also be given to established operators in Ringaskiddy for the provision of ancillary office accommodation and for Research and Development facilities*', therefore it is probable that the site would be developed if the proposed development does not proceed.

If the proposed development did not go ahead, the L2545 road would continue to be affected by tidal flooding. In the scenario where the proposed sacrificial beach material was not to be undertaken, coastal recession would continue as it is at present.

In a do-nothing scenario there will remain a deficiency of appropriate waste management options for the Cork and Munster areas which may hinder development of the urban areas and industry.

Human Health

Given the nature of the proposed development, human health has primarily been assessed in terms of air quality and also noise (for the construction phase particularly).

Chapter 8 ***Air Quality***, concludes that, for the "Do Nothing" scenario the existing air quality emission sources contained within the area of the proposed development will remain in place. Therefore, the existing baseline air quality environment is not expected to change in the "Do Nothing" scenario.

Chapter 10 ***Noise and Vibration***, concludes that in the event that the proposed development does not proceed, the existing noise environment to the east of the site will remain relatively unchanged assuming no additional development in the area. To the west of the site, the operation of the M28 Cork to Ringaskiddy Motorway Scheme once operational will alter the noise environment. The noise environment from the road scheme (currently under construction) will introduce a new source to the surrounding environment which will increase the ambient and background noise levels at noise sensitive locations in proximity. developments.

In summary, under the 'do-nothing' scenario, if the proposed development were not to go ahead, it is unlikely that the community population health status would change from the current baseline.

6.5.1.3 Amenity Aspects during Construction

Traffic Aspects in relation to Residential Amenity

Traffic congestion has the potential to affect how the local population use and access local residents use amenities. It is clear from the extensive consultations which Indaver has carried out with both the local community and the statutory authorities that traffic congestion on the main N28 approaches to Ringaskiddy and to the site, and how this congestion should be managed during the peak hours, is a major concern. The effect of the generated traffic on the local road network is assessed in **Chapter 7** ***Roads and Traffic*** of this EIS and mitigation measures which Indaver intend to include in their development proposals are investigated where necessary.

With all of the above issues in mind, Indaver has approached the design, construction and operation of the proposed development on the principle of minimising traffic at peak periods where possible (until the M28 is operational).

It is anticipated that the road upgrade and drainage works would commence at the beginning of the project and progressed to completion as soon as possible. The first task of the road upgrade will be to construct a temporary two-way road, approximately 250m long, to the south of the existing road to create working space for the construction of the raised section of the road, the upgraded drainage system and the diversion of services. The traffic will be diverted onto the temporary road until the upgrade works have been completed. A construction traffic management plan will be in place to manage traffic effects.

It is estimated that temporary road will be in place for a fourteen-week period during the road upgrade works. During the fourteen-week period, the Gobby Beach car park may be temporarily closed for up to six weeks however access to the beach will be maintained for the duration of the works.

Gobby Beach

Approximately 1,150m^3 of imported rounded shingle of appropriate size will be placed, as sacrificial material, at the toe of the glacial till face on Gobby Beach which forms the eastern boundary of the site. The works will extend along the beach from near the car park at the northern end of the Indaver site to the southern boundary of the Indaver site. The material will be deposited above the high-water mark.

The placement of the sacrificial beach material (shingle) required for the coastal protection works will take approximately three weeks to complete. It is envisaged that the first instalment of the shingle will be undertaken towards the end of the construction phase.

The imported shingle will be transported by road and temporarily deposited at the car park at Gobby Beach. A bulldozer will be used to spread the imported shingle in the designated area. It is anticipated that access for construction machinery across the beach will be facilitated by laying down temporary tracks.

To ensure the safety of the general public, it is envisaged that the area of the beach, in which the construction works will take place and the area of the car park in which the materials will be stored, and which will be used by the machinery, will be closed to the public for the duration of the proposed works, approximately three weeks. However, access to the rest of the beach will be maintained for the duration of the works.

The traffic impacts associated with this construction activity will be minor and are addressed in **Chapter 7** ***Roads and Traffic***. In addition, the shingle will be replenished as required in the future but it is unlikely to be required on a frequent basis. Further details are provided in **Chapter 13** ***Soils, Geology, Hydrogeology, Hydrology & Coastal Recession*** of this EIS. The effects experienced for the initial instalment of shingle will be repeated during replenishment.

In addition, as detailed above, during the L2545 works, Gobby Beach car park may need to be closed for up to 6 weeks to facilitate the construction works. However, access to the beach will be maintained for the duration of the works.

6.5.1.4 Economic Effects during Construction

The construction of the proposed development will cost in excess of €200 million. There will be a maximum number of 320 jobs created during construction. There will also be a substantial number of indirect jobs, created in the off-site construction services providers and material suppliers. These jobs will be a beneficial economic effect of the proposed development. In addition, it is envisaged that local shops, pubs and service providers in the area will experience increased trade during the construction phase.

In general, the development will lead to a general increase in economic activity in the area.

6.5.1.5 Health and Safety (during Construction)

A discussed in **Section 6.5.2.1,** there are no special or unique hazards associated with the construction of the plant on this particular site that would not be encountered on any normal construction site for an industrial building.

As discussed in **Section 5.13** of **Chapter 5** ***Construction Activities***, a Health and Safety Plan will be prepared which will address health and safety issues from the design stages through to the completion of the construction and maintenance phases as required by the Safety, Health and Welfare at Work (Construction) Regulations 2013.

6.5.1.6 Hazard Identification and Risk Assessment Study

As outlined in this chapter, Indaver carried out a hazard identification and risk assessment (HAZID&RA) for the development. In accordance with the European Commission's EIA guidance, there are two key considerations to consider:

- The Project's potential to cause major accidents and/or disasters for human health, cultural heritage and/or the environment;
- The vulnerability of the Project to potential disaster/accident.

The assessment of the vulnerability of the development to risks of major accidents and disasters is included in this EIS in accordance with the EIA Directive 2014/52/EU which states the need to provide a description of "*the expected significant adverse effects of the project on the environment deriving from the vulnerability of the project to risks of major accidents and/or disasters which are relevant to the project concerned*". The risk assessment is included as **Appendix 6.1**.

Notwithstanding the fact that the proposed development will not be a major accident establishment, a number of accident scenarios were assessed in the study to determine the risk each posed to human health and the environment. Following industry best practice, five risk ratings of increasing significance, based on the probability of occurrence and the hazard posed, were assigned to the scenarios. The risk ratings were trivial, minor, moderate, substantial and priority. No priority risks were identified, and one substantial risk was identified. The substantial risk was a fire in the bunker.

Control measures are proposed as part of the proposed development (Refer to **Chapter 4** ***Description of the Proposed Development*** of this EIS and **Appendix 6.1** ***Hazard Identification and Risk Assessment (HAZID) Report***. The study concluded that, with the control measures in place, the risks posed to human health and the environment by the facility will be as low as reasonably practical (ALARP). The risk assessment also confirmed that the proposed development will not be a major accident establishment and that the Seveso III Directive and Regulations will not apply to the centre. The Major Accidents and Disasters sections of this chapter also presents an assessment of the likely significant adverse effects on the environment arising from the vulnerability of the proposed development to risks of major accidents and/or disasters. The conclusions are that there are no major accident hazard implications during the construction phase of the proposed development. The accident scenarios discussed in mainly relate to hazards associated with the storage and handling of dangerous substances or the storage and handling of waste at the site.

As such, these hazards will not arise until after the construction phase has been completed and the operational phase has commenced.

A discussion of the effects arising from normal operations of the plant is provided in other chapters of this EIS. There are no residual effects associated with the scenarios discussed in the Major Accidents and Disasters section of this chapter, except in the case of an accident scenario. In the event of an accident occurring during operations, Indaver will have emergency response measures in place to minimise the impacts to human health and to the environment. As the site will be licensed by the EPA, Indaver has conducted an environmental liabilities risk assessment (ELRA) and prepared a closure restoration and aftercare management plan (CRAMP), in accordance with the EPA's guidance both of which have been included in the licence application to the EPA.

Indaver has also prepared ELRA's for their operations at Carranstown and at Dublin Port and a similar approach has been adopted for the assessment at Ringaskiddy. In accordance with the EPA's guidance, Indaver has put the appropriate financial provisions in place at these other sites to cover the liabilities and potential liabilities identified in the ELRA.

Indaver will ensure that appropriate financial provisions are in place, accordance with the EPA guidance, for the Ringaskiddy site also.

6.5.1.7 Effects on Human Health (during Construction and Operation)

Health Protection

Emissions to Air

All construction of the proposed development will take place several hundred metres from the nearest residence. Construction dust by its nature is heavy and disperses over a confined area as it falls to ground. The exact nature of the dust depends on the nature of the soil being excavated and the construction materials used. Mitigation measures, in terms of dust control, on the construction site with sound construction methods will minimise any effects and these are outlined in **Chapter 8** ***Air Quality*** and **Chapter 9** ***Climate***.

While in a construction project of this scale it is inevitable that there will be occasional dust generation, this is likely to be very localised in place and time. As detailed in **Chapter 8** ***Air Quality*** and **Chapter 9** ***Climate***, it is extremely unlikely that the construction activities will result in air quality standards being exceeded over any significant period of time in the environment outside the construction site. It can, therefore, be stated with confidence that there will be no significant human health effects arising from emissions to air including dust generation.

As for the operational phase while it has been suggested that emissions from incinerators cause various health effects. There have been extensive studies of the potential health effects of incinerators on human health. A literature review of peer-reviewed research papers reporting these studies is detailed in **Section 6.2.1.5** above.

The review noted that many of the studies on health effects are of historical incinerators which had much higher emissions than the incinerator proposed as part of the proposed development and predate the various EU Directives which have imposed stringent limits on emissions.

In relation to this proposed development, as outlined in **Chapter 8** ***Air Quality*** and **Chapter 9** ***Climate***, even with worst case scenario with maximal permissible emissions to air, in worst case weather and environmental conditions, no Air Quality Standards will be breached at the nearest or indeed any receptors

When one looks at the other Indaver incinerator in Ireland in Carranstown, Co. Meath, and its efficient operation it is clear that in practice as well as in theory that there will be no adverse effects on Air Quality. Therefore, it can be concluded, according to evidence in the literature, that modern well-run incinerators will not have a deleterious effect on human health.

The predicted effect of the proposed development based on site specific effectors is assessed below.

Dioxins

The results of dioxin sampling performed and detailed separately below in this chapter shows that background soil PCDD/F concentrations for the sites sampled in the Ringaskiddy area were typical of a mixed urban/rural area. The PCDD/F values measured in the survey are well below any of the recorded levels or limits defined in the above literature and are low by international standards. This is despite the history of heavy industry in the area, most particularly the Irish Steel plant in the vicinity which now is closed. This source in particular, given the nature of the activity that was carried out there and recent well publicised soil contaminations within the plant itself, is likely to have emitted pollutants including dioxins far in excess of those which will be emitted by the proposed development. It is doubly reassuring therefore that despite this the baseline levels are good.

It is of note that when the MARI (a theoretical Most At Risk Individual) is considered there is a small increase in weekly dioxin dose which remains well below the TWI (Tolerable Weekly Intake). It is estimated indeed that the increase is only 1.2% of the TWI. We use the theoretical being MARI because if the most vulnerable individual conceivable is unaffected then all individuals are unaffected. In fact, this MARI does not exist as it is based on many "worst case" assumptions. No human being will be exposed to the extent of MARI and as MARI's exposure shows a very small increase (1.2%), we can all be very reassured that Dioxins and Furans will not increase significantly.

Because of the absence of impact on the local levels and bearing in mind most human dioxin exposure is dietary anyway and the food we eat and the milk we drink usually comes from far and wide it is a straightforward conclusion that the proposed facility will have no significant effect on dioxin intake either locally or nationally. As shown in data issued by the Federal Ministry for the Environment, Nature and Nuclear Safety (2005) between 1990 and 2005 the dioxins emitted by incinerators in Germany dropped from 400 grams of dioxins per year to less than 0.5 grams. This occurred despite a near doubling of the waste being treated by Germany during the same time period.

Indaver have operated an incinerator in Carranstown, Co. Meath since August 2011. Emissions from that facility are constantly monitored and licensed by the EPA. Dioxin emissions for every year since opening have been a fraction of the licensed limit.

Based on the information available from the literature, from detailed modelling of the proposed development, and from the experience of a similar facility operated by the same company in Ireland since 2011, the human health impact from emissions of dioxins to air is assessed as negligible.

Particulate Matter

Much of the attention on respiratory issues has occurred because of concerns regarding particulate matter or dust. This is despite much lower emissions from modern incinerators than was achievable heretofore. Virtually any development where combustion takes place, and that includes the heating systems and solid fuel or oil boilers for steam generation has the potential to emit particulate matter. However, none of these other sources are as measured and regulated as incinerators.

Background particulate measurements were performed near Ringaskiddy. These suggest low levels of PM10 and PM2.5 in the area. These represent Particulate Matter less than 10 microns and 2.5 microns respectively. To put these numbers into perspective even the finest grain of sand will be in the order of 100 microns in diameter.

As stated previously, in relation to the huge reduction in the amounts of dioxins emitted, the same story is true with regard to particulate matter, or dust, emitted from incinerators. This matter will be dealt with more comprehensively later. The same report referenced above, issued by the German Federal Ministry for Environment, Nature Conservation and Nuclear Safety (2005), in relation to Dioxins also stated that between 1990 and 2001 the particulate matter emitted by incinerators in Germany dropped from 25,000 tonnes of dust per year to 3,000 tonnes.

Air modelling in **Chapter 8** ***Air Quality*** of this document predicts that the contribution from the site in the context of this baseline is minor with levels even under maximum operation remaining significantly below levels which would be expected in urban areas even at the worst-case boundary receptor. Levels at the nearest residential receptor will be minor, with the annual contribution from Indaver and associated traffic will be small. Predicted levels for both PM_{10} and $PM_{2.5}$ are well below relevant Air Quality Standards. This has also already been well established in Indaver's facility in Meath with stack emissions for total dust averaging 2% of the Legal Limit. The 2024 Annual Environmental Report (Indaver, 2025) for Indaver in Meath showed 100% compliance with all parameters measured against the emission limit values.

In another report to the EPA entitled "Emissions Compliance Report" (submitted as part of a licence review application to the EPA), this report very reassuringly states:

Following a review of the site's AERs for the last 5 years (2019 - 2023), no exceedances in the emission limit values (ELVs) for A1-1 were recorded.

While very small particulates, sometimes called ultrafine particles, cannot be modelled but there is no evidence that the facility will be a significant source. The US EPA (Baldauf, 2015) had a workshop on Ultrafine particles and concluded.

Controlled human exposure studies have shown that exposures to UFPs can cause biologic changes in several cardiovascular pathways, but similar to short-term exposure epidemiological studies, do not yet provide evidence to support the conclusion that UFPs are more toxic than other PM size fraction.

Based on the information available from the literature, from detailed modelling of the proposed development, and from the experience of a similar facility operated by the same company in Ireland since 2011, the human health effects from emissions of particulates to air is assessed as negligible.

Other Air Quality Issues

As has been carried out for dioxins and particulate matter (PM_{10} and $PM_{2.5}$), similar baseline assessments and modelling has been carried out for other aspects of air quality. These have included PAHs (Polycyclic Aromatic Hydrocarbons), SO_2 (Sulphur Dioxide), NO_2 (Nitrogen Dioxide) and NOx, CO (Carbon Monoxide), TOC (assumed in worst case to be solely Benzene), HCl (Hydrochloric Acid) and HF (Hydrofluoric Acid). This is detailed in the **Chapter 8** ***Air Quality*** of this EIS. All of these predict levels are below Air Quality Standards even at maximum operation in worst case scenario weather conditions. It is reasonable from this to extrapolate no deleterious health effects.

The situation is identical with modelled metals. This included Mercury, Cadmium and Thallium as well as the sum of other relevant metals. Again, the levels predicted are simply not consistent with a detrimental health effect.

Ultrafine particles are sometimes mentioned despite the fact that by far the most important source of these in the air is traffic and specifically diesel-powered vehicles. Emissions of these from the facility given the filters etc, to prevent these are not anticipated to have significant effects.

Again, evidence from the Carranstown Facility, which has been in operation since 2011 has confirmed that this is the case for an existing facility.

Based on the information available from the literature, from detailed modelling of the proposed development, and from the experience of a similar facility operated by the same company in Ireland since 2011, human health impact from emissions to air including the emissions of heavy metals to air is assessed as negligible.

Water

Water quality

As detailed in **Chapter 13** ***Soils Geology, Hydrogeology, Hydrology and Coastal Recession***, there has been considerable attention given to ensuring that there will be no adverse effect on water quality. Where necessary mitigation measures are put in place to ensure continued supply of high quality and safe drinking water. The vast majority of residences in the area receive their water by mains which will continue to be monitored in the normal way.

No adverse effect on water quality is predicted and therefore there will be no health effect.

Flooding

The design of the construction and operational phase of the proposed development has considered the risk of flooding at every step. The design of the construction and ancillary works will ensure that there is no increased risk of flooding and indeed flood protection measures have been included and therefore there will be no health effect. Refer to **Appendix 13.4** ***Flood Risk Assessment*****.**

Soil Contamination

As detailed in **Chapter 13** ***Soils Geology, Hydrogeology, Hydrology & Coastal Recession*****,** no soil contamination is predicted and therefore we can be confident of no adverse effects on human health.

Psychological Health

The community will experience minor annoyance from the temporary effects of the construction phase.

Whilst individual annoyance cannot be discounted, annoyance in itself is not a health effect. There is no evidence that there are any significant effects on human health from simply transient levels of annoyance. In these circumstances the negative effects are assessed at Slight.

As identified in the methodology section above, concerns are likely in relation to public perceptions in relation to the health effects of the emissions of incinerators. This is likely to be added to by some catastrophising which can happen in the media. It is also possible that some people opposed to incinerators the actually accentuate this. The actual facts however very different. As outlined above there are minimal adverse health effects attributable to modern well-run incinerator. The best mitigation factor would appear to be information and education. There is no evidence of ongoing psychological effects around incinerators published in literature and indeed no evidence in relation to the other Indaver facility in Carranstown, Co. Meath.

Therefore, the assessment is that while some worries and anxieties are possible in the short to medium-term, these will be minimised by making available appropriate information regarding the proposed development and its effects and negligible long-term effects are predicted.

Noise Improvements

During the construction phase of the proposed development, there will be a slight to moderate short-term effect on nearby noise sensitive properties due to noise emissions from construction works and site traffic.

Due to the distance between the construction works and the nearest sensitive receptors, however, the calculated noise effects are within the relevant criterion set for this phase. This means that there will be no adverse health outcomes.

The assessment has concluded that due to the distance between the proposed development and the nearest sensitive buildings, the proposed site layout and the recommended noise mitigation measures, the proposed development can operate within the adopted day, evening and night-time noise limit values once operational.

Overall, there will be a long term, not significant noise effect to the nearest noise sensitive locations taking account of the existing noise environment and the predicted effect of the operation of the proposed development. This means that there will be no adverse health outcomes.

Health Improvements

There is the potential for a significant opportunity for health improvements associated with the proposed development. These include the potential for economic development as well as tourism which in itself is associated with an improvement in health status.

The Community Benefit Fund of approximately €240,000 per year has the potential to provide real health improvements. It could help to provide extra opportunities for recreation and exercise as well as health and education facilities.

There is also the potential for improvements in social health with a reduction in unemployment and particularly long-term unemployment. The proposed development will also provide a resource to support employment in the area but also at National level. Such a potential if realised will bring with it benefits including reduced inequality in society. The residual effect will be positive.

Access to Services

There is potential for improvement in access to services and in particular waste management. The proposed development has the potential to facilitate sustainable disposal of both municipal and industrial waste. In addition, the Community Benefit Fund will have the potential to add local amenities. The residual effect will be positive.

Conclusions

While some studies, particularly in the past, report health effects in relation to incinerators, nearly all of these studies are, by their nature, historical and refer to toxic or industrial burning processes. These virtually all pre-date modern technology and the associated large decreases in emissions. They also pre-date current regulatory restrictions on allowable emissions such as the EU Air Quality Directive and the EU Industrial Emissions Directive.

We know from direct experience that modern incinerators operate well within these stringent guidelines. The Indaver incinerator in Meath, widely predicted by objectors in advance of it's commissioning to greatly exceed those limits, has in operation been a great example of a well-run facility.

Modelling for emissions of particulate matter in the form of PM_{10} and $PM_{2.5}$ does not support any likelihood of a detrimental health effect.

There has been nothing published in recent literature which would significantly change this position. Overall, there is little evidence to suggest that waste incinerators are associated with the increased respiratory symptoms, or other medical conditions, in the surrounding population. This is consistent with the data from risk assessments, emissions and ambient air monitoring in the vicinity of incinerators, which indicate that modern, well-managed facilities make a very small contribution to background levels of air pollution.

Multiple reputable reviews quoted above support this position.

The fact that the proposed development will be operated in accordance with the strict terms of the EU Industrial Emissions Directive, means that emissions will be lower than from practically all facilities assessed in publications cited herein, reducing even further any possible risk.

The Emissions Compliance Report (Indaver, 2025), submitted to the EPA on emissions from the Indaver facility in Carranstown, Co. Meath states that the plant operates well below the Legal licensed limit and there have been no exceedances over the 5 years to 2023. A review of the most recent AER submitted to the EPA confirmed the same situation for 2024. The Indaver Annual Sustainability Report for 2024 shows (on page 91) that all parameters are well within the licensed limits and Dioxins are also considerably less than 1% of the legal limit. This shows that in practice as well as in theory modern, well run incinerators, do not pose an environmental risk.

All information available on the proposed development therefore, both from modelling and from actual results of a similar facility in Ireland, indicates that all emissions will be well within the statutory Air Quality Standards. These provide strong evidence that there will be no deleterious effect on human health either in the immediate vicinity or in the wider context, due to its operation.

Dioxin Uptake Modelling

General

A soil dioxin and dibenzofuran (PCDD/F) monitoring programme was conducted by AWN Consulting in the Cork Harbour area in 2001 and was repeated in 2008 and in 2015. Dioxin-like polychlorinated biphenols (PCB) were included in the monitoring programme. The full report of the baseline soil monitoring is presented in **Appendix 6.2**. The dioxin intake model, the RISC Human PCDD/F Intake Model, for the Maximum At Risk Individual (MARI), prepared in 2015 for the planning application, was updated in 2019 to include the updated air dispersion model prepared as part of an EIAR and application to the EPA for an Industrial Emissions Licence. The full report is presented in **Appendix 6.3**.

An assessment was prepared in 2025 to take account of any changes in the baseline conditions and the outputs of the air dispersion model from **Chapter 8** ***Air Quality*** of this EIS. This assessment is also presented in **Appendix 8.1** of this EIS.

The impact of increased short term PCDD/F emissions from accidental fire scenarios was also modelled by BOC. This assessment is included as Appendix 6 to the HAZID in **Appendix 6.1** to this EIS. Based on worst case assumptions associated with the fire scenarios, the daily intake levels for PCDD/F set by the WHO were not exceeded.

Findings of Soil Monitoring

Soil and sediment sampling was conducted at 12 no. 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. Refer to **Appendix 6.2**. Samples were analysed for dioxins and furans with results compared to previous data recorded by AWN and EPA sampling in 2000. The conclusions of the sampling and analysis programme were 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 EA UK 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.

In August 2025 AWN prepared a Technical Assessment to address the baseline PCDD/F exposure in the Ringaskiddy area and whether that has changed over the period of time since the planning application was prepared. This Technical Assessment is also included in **Appendix 6.2**.

The primary mechanism for PCDD/F to enter the food chain is through atmospheric deposition and the Irish EPA considers that cows' milk is a particularly suitable matrix for assessing their presence in the environment, since cows tend to graze over relatively large areas and these compounds will, if present, concentrate in the fat content of the milk. The EPA also advise that in accordance with current practice, testing for dioxin-like polychlorinated biphenyls (PCBs) was included in their testing programme also.

AWN obtained, from the EPA POPS Team (POPS is Persistent Organic Pollutants. POPS@epa.ie) PCDD/F (and PCB) data for the Ringaskiddy area, for the time period 2013 to 2023. The data showed that the PCDD/F and PCB concentrations in milk (and hence in the general environment) over the time period 2013 to 2023 have remained practically unchanged over that time period and are considered to be low, at 6 to 8% of the limit value for PCDD/F in milk.

It can therefore be concluded that, based on the above data, the baseline environment with regard to PCDD/F in the Ringaskiddy area can be considered to be unchanged since the original planning application was submitted in 2016.

Soil Uptake Modelling Results

Soil sampling and ambient air monitoring data, was used to establish a baseline for PCDD/F (hereafter referred to as 'dioxins and furans') intake for a theoretical Maximum At Risk Individual (MARI) in the vicinity of the proposed Ringaskiddy Waste-to-Energy facility. The report of the soil uptake modelling results is presented in Appendix 6.3. The MARI was assumed to live at the point of maximum dioxin and furan deposition from the proposed development and to be a subsistence farmer, who obtained all their meat, milk and vegetables from a 100m diameter site, upon which the maximum deposition flux impacted. The annual average dioxin and furan emissions under maximum operating conditions (worst case emissions) and assuming that both municipal solid waste and hazardous waste facilities were operating at maximum permitted dioxin concentration in the flue gas, maximum permitted flue gas exhaust flow rates and maximum throughput, were used to model soil PCDD/F concentrations over the operating life of the facility. This was a very conservative assumption as it assumed the facility operated 24 hours per day, 365 days per year at the maximum emission concentration and flue gas flow rate. The modelled soil and air values were then added to the baseline value for dioxin and furans and input to the RISC HUMAN Model.

The outcome of the 2019 assessment presented in **Appendix 6.3** confirmed that the conclusions 2016 documentation were unchanged and that in the predicted increase was only 1.2% of the EC TWI giving a final value of 2.2443 pg/kg bw/week compared to the EC TWI of 14 pg/kg bw/week.

A Technical Assessment was prepared to take account of the new air dispersion model prepared for this EIS and even when adopting a conservative approach where all of the predicted increase in PCDD/F was assumed to be available for uptake, the predicted increase in dioxin and furan intake for the MARI was estimated to increase by 0.1903 pg WHO-TEQ/kg body weight/wk, to 2.2729pg WHO[1]TEQ/kg body weight/wk, an increase of just 1.36% of the EC TWI limit value of 14 pg WHO-TEQ /kg body weight. This Technical Assessment is also included in **Appendix 6.3**.

The TWI was set by the EU in order to protect human health and was based on applying a safety factor to the LOAEL (Lowest Observed Abnormal Effect Levels) for dioxin and furans. It was therefore concluded that the predicted impact of the emissions from the waste-to-energy facility, even assuming both municipal solid waste and hazardous waste facilities operating at maximum capacity, maximum permitted exhaust flow rates and maximum permitted dioxin and furan concentrations, in terms of dioxin and furan dose to a theoretical MARI, is not significant, with the dioxin and furan dose to the MARI predicted to increase by only 1.36% of the limit value. The facility will have no impact on human health with respect to dioxin and furan intake.

6.5.1.8 Residential Amenity Impacts During Operation

Traffic Aspects in relation to Residential Amenity

It is clear from the extensive consultations which Indaver has carried out with both the local community and the statutory authorities that traffic congestion on the main N28 approaches to Ringaskiddy and to the site, and how this congestion should be managed during the peak hours, is a major concern.

The effect of the generated traffic on the local road network is assessed in **Chapter 7** ***Roads and Traffic*** of this EIS and mitigation measures which Indaver intend to include in their development proposals are investigated where necessary.

With all of the above issues in mind, Indaver has approached the design, construction and operation of the Resource Recovery Centre on the principle of minimising traffic at peak periods where possible (until the M28 becomes operational).

During construction, the morning construction traffic will be scheduled to coincide with the lower traffic flows between 06:00 - 07:00, the higher traffic flows which occur later are avoided, as discussed in **Section 7.7.1** of **Chapter 7.**

During operation, Indaver will minimise traffic at peak periods through the implementation of a HGV booking system, and the arrangement of operational personnel shifts and visitor traffic so that the facility generates minimal traffic on the local road network during the peak traffic periods once operational. These initiatives are similar to those developed at the Port of Cork as part of their approach to management of traffic flow at peak times. Furthermore, a robust staff Mobility Management Plan, will ensure that there are no staff movements to or from the facility for two-hour periods in the morning and evening by car (until the M28 is operational), while HGV movements will also be reduced to a minimum level during these times. Further details are provided in **Chapter 7** ***Road and Traffic*** of this EIS.

Indaver is aware of the concern expressed by the community at the public meetings in relation to the provision of enhanced active mode travel facilities including improved footpaths, cycle facilities and controlled safe road crossing points. Works commenced in October 2024 on the Ringaskiddy Urban Realm and Active Travel Scheme in Ringaskiddy to provide an enhanced public realm in the village centre as well as a new active travel route along the existing N28, from the Port of Cork entrance to the car park at Gobby Beach. The proposed enhancement works include a new shared use pedestrian/cycle facility on the north side of the N28 as well as Public Realm improvements to the village centre including new paving, landscaping and junction improvement works. Speed reduction measures in the form of gateway features and raised pedestrian crossings will also be included in the scheme. The assumed construction programme for the Ringaskiddy Urban Realm and Active Travel Scheme is 12 months and as such the scheme shall be completed prior to the commencement of construction of the proposed development.

Residential Amenity – Other Aspects

The proposed development will not involve any activities or processes completely new to the Ringaskiddy area. The proposed development will be located beside a Hammond Lane which handles scrap steel for recycling.

The off-loading of liquid wastes from tankers in the waste-to-energy facility will be a similar activity and on a similar scale to the off-loading and loading of solvent tankers in the pharmaceutical facilities. In most of these facilities, total waste management is handled by specialist waste contractors and brokerages, for shipment overseas.

Currently, two of the pharmaceutical facilities in the Ringaskiddy area operate incinerators which are licensed by the EPA, and which treat hazardous and non-hazardous waste generated on site. The proposed Waste-to-Energy facility will be larger in scale than the existing incinerators but will use similar combustion technology to treat the waste.

The tipping hall and bunker will be under negative pressure to prevent odours from the facility impacting on local residents. There will not be a significant effect from odours resulting from the proposed development.

Trucks carrying solid waste to the facility will be enclosed or covered to prevent litter escaping and the waste tipping floor will be enclosed. Litter will not escape to cause a nuisance to residents.

The ongoing effects of the operations of the facility due to the traffic generated, emissions to the atmosphere and noise are discussed in **Chapters 7** ***Roads and Traffic***, **Chapter 8** ***Air Quality*** and **Chapter 10** ***Noise and Vibration*** of this EIS, respectively. The effects on landscape are assessed in **Chapter 11** ***Landscape and Visual Assessment*** of this EIS. There are not expected to be any other effects on residential amenity.

Community Benefit Fund

If granted planning permission, it is predicted that the local community will benefit from the distribution of the Community Benefit Fund (approximately €240,000 annually) for local projects including new facilities and upgrades to existing facilities.

The existing Indaver facility in Meath contributes to a Community Benefit Fund as part of the planning conditions of that facility. The Meath fund is administered by the Indaver Community Liaison Committee, which was established in 2009 prior to the main construction works period.

The Committee in Meath is made up of two representatives from the local resident's association, two local area councillors, two members of Indaver and two members of the local authority, who also act as administrators of the fund.

As part of Indaver Meath's planning conditions, for every tonne of waste that Indaver accepts at the Meath waste-to-energy facility, €1.27 is allocated to the Community Benefit Fund which currently amounts to approximately €298,000 per year. In Ringaskiddy, it is estimated that the fund will be approximately €240,000 per year for the life of the facility. So far in Meath, the fund has amounted to over €3,000,000 which has been invested in a range of important projects and community initiatives, such as:

- the construction and lighting of a new safe footpath;
- financing the construction of a school building, and
- supporting local cultural, community, arts and sports groups/clubs.

6.5.1.9 Recreational Amenity Effects

Coastal Protection Works

As detailed previously, shingle will be placed at the toe of the glacial till face on Gobby Beach which forms the eastern boundary of the site during the construction period. The works will extend along the beach from near the car park at the northern end of the Indaver site to the southern boundary of the Indaver site. The material will be deposited above the high-water mark. This is discussed further in **Chapter 13 *Soils, Geology, Hydrogeology, Hydrology and Coastal Recession*.**

The placement of the sacrificial beach material (shingle) required for the coastal protection works will take approximately three weeks to complete. It is envisaged that the first instalment of the shingle will be undertaken towards the end of the construction phase.

The imported shingle will be transported by road and temporarily deposited at the car park at Gobby Beach. A bulldozer will be used to spread the imported shingle in the designated area. It is anticipated that access for construction machinery across the beach will be facilitated by laying down temporary tracks.

To ensure the safety of the general public, it is envisaged that the area of the beach, in which the construction works will take place and the area of the car park in which the materials will be stored, and which will be used by the machinery, will be closed to the public for the duration of the proposed works, approximately three weeks. However, access to the rest of the beach will be maintained for the duration of the works.

The sacrificial material has been designed to remain on site and help lower the natural erosion rate over a number of years. However, the expected duration of the material cannot be determined since it depends on the occurrence of extreme wave events which are impossible to forecast. Therefore, it is anticipated that monitoring of the sacrificial material and the cliff face will take place on an annual basis. Replenishment of the material will be carried out as determined by the monitoring results. It is proposed that the placement of further additional sacrificial material is carried out if the cliff top retreat rate averaged over the entire length is more than 0.5m per year measured over a period of six years, which would indicate some acceleration in the current retreat rate, or when the cliff top has retreated locally by approximately 3m, whichever is sooner.

The operation of the proposed development will not encroach on the shoreline amenity. However, due to the close proximity of the truck traffic on the internal roads of the proposed development and the presence of the large building, the shoreline will be more subject to traffic noise and will have a more industrial ambience than it does currently. Similarly, the amenity of the L2545 road on the northern side of the proposed

development will be reduced as the site frontage will have a greater industrial ambience, even with the proposed planting and screening. A public amenity footpath will be provided on the eastern and southern sides of the site, from the boundary near the shoreline to the southern site boundary close to the Martello Tower. The recreational amenity for boat traffic in the West Channel will be slightly reduced as the site will have a more industrial ambience than it has currently.

The effect on landscape is assessed in **Chapter 11** ***Landscape and Visual Assessment*** of this EIS. There are not expected to be any other effects on recreational amenity.

Community Facilities

It is expected that some of the 63 direct jobs, and a number of indirect jobs, will be taken up by people moving to live in the area. There will be a consequent slight increase in demand for community facilities. As detailed previously, up to 320 people will be directly employed during the construction phase. These jobs will be a beneficial economic effect of the proposed development. Local community projects including new facilities and upgrades to existing facilities will benefit from the Community Benefit Fund.

Land Use

Land use and land take is discussed further in **Chapter 15** ***Material Assets***. No economic activity will be displaced by constructing the proposed Resource Recovery Centre on the site.

Agriculture

The emissions to atmosphere from the proposed development, which are detailed in **Chapter 8** ***Air Quality*** of this EIS, will be extremely low with no adverse effects on the environment envisaged. In particular, based on the monitoring of emissions from Indaver's Waste-to-Energy facility in Co Meath and its other facilities, the emissions of dioxins will be well below the EU Directive limit.

There will be no significant effects on farming activities in the Ringaskiddy area or in the region surrounding the Lower Harbour. In an area, to which the incineration of municipal solid waste is a new activity (two of the existing pharmaceutical facilities in the Ringaskiddy area operate incinerators which are licensed by the EPA), there may be a public perception of a risk to human health and a risk of contamination of farm produce from dioxins in the emissions.

There is no evidence of food companies or outlets boycotting food produce from locations close to modern incineration facilities, such as the Indaver facility in Co Meath. There have been incinerators in the Ringaskiddy area for many years. The soil dioxin surveys showed that dioxin levels in the soils around the Lower Harbour were below the German target level and well below the level at which crop restrictions would be imposed in Germany. The EPA Persistent Organic Pollutants team monitor PCDD/F data for the Ringaskiddy area. Their data for the period 2013 to 2023 shows no material change in PCDD/F concentrations in milk (and therefore in the general environment) at 6 to 8% of the limit value in that period. Refer to **Appendix 6.2**. This situation will not change because of the operation of the proposed development.

Tourism

As set out in **Section 6.3.1.5** above, Fáilte Ireland published guidelines on the treatment of tourism in an Environmental Impact Statement, in 2011.

Ringaskiddy is not currently a popular tourist destination, but certain sites of value to local tourism in proximity to the proposed development have been identified as potentially being affected by the proposed development. These sites are the Ringaskiddy port, Gobby Beach, the Martello Tower and Spike Island. In accordance with Fáilte Ireland guidelines the potential effects of the proposed development have been appraised for these locations.

The potential effects of the proposed development on the visual, biodiversity and cultural heritage have been appraised in **Chapter 11** ***Landscape and Visual Assessment***, **Chapter 12** ***Biodiversity*** and **Chapter 14** ***Archaeological, Architectural & Cultural Heritage*** of this EIS respectively.

Ringaskiddy Port
For tourists using Ringaskiddy Port for the cruise ships or ferry terminal, the proposed development will appear as another industrial facility in the area, refer to **Chapter 11** ***Landscape and Visual Assessment***. The potential effects of the proposed development on the port in relation to traffic has been appraised in **Chapter 7** ***Roads and Traffic*** of this EIS.

Gobby Beach
To ensure the safety of the general public, it is envisaged that the area of the beach, in which the construction works (placement of shingle(sacrificial material)) will take place and the area of the car park in which the materials will be stored, and which will be used by the machinery, will be closed to the public for the duration of the proposed works. However, access to other sections of the beach will be maintained for the duration of the works. The duration of the works is expected to be approximately three weeks.

The traffic impacts associated with this construction activity will be minor and are addressed in **Chapter 7** ***Roads and Traffic***. In addition, the shingle will be replenished as required in the future but it is unlikely to be required on a frequent basis. It is proposed that the placement of further additional sacrificial material is carried out if the cliff top retreat rate averaged over the entire length is more than 0.5m per year measured over a period of six years, which would indicate some acceleration in the current retreat rate, or when the cliff top has retreated locally by approximately 3m, whichever is sooner. Further details are provided in **Chapter 13** ***Soils, Geology, Hydrogeology, Hydrology and Coastal Recession*** of this EIS. The effects experienced for the initial instalment of shingle will be repeated during replenishment.

In addition, during the L2545 works, Gobby Beach car park may need to be closed for up to six weeks to facilitate the construction works. However, access to the beach will be maintained for the duration of the works.

L2545 Road Upgrade Works
The L2545 upgrade will reduce flood risk on the road which will be of benefit both to the proposed development and also to the other existing users of this road including Beaufort, NMCI, the crematorium on Rocky Island and the Naval Base on Haulbowline Island. The proposed landscaping along the L2545 will improve the approach to Gobby Beach.

Martello Tower
A new bitumen macadam footpath will be constructed to give access from Gobby Beach to the Martello Tower. It is proposed to run along the eastern edge of the site and will be fenced with a low timber fence along the eastern edge. A viewing area will be provided at the higher southeast corner of the site providing expansive views over Cork Harbour, Spike Island and Cobh.

The proposed development has been sensitively designed in relation to the Martello Tower protected structure in order to retain its prominence when viewed from around the harbour. The main process building is situated at a distance from the tower and aligned to have its narrowest part face the tower. The development does not block views of the tower from most viewpoints around the harbour. The building has been set down as far as possible into the ridgeline and appears to be at a similar or lower height than the Martello Tower from most viewpoints. The stack does however extend well above the height of the tower although it is set at a distance from it, and the vertical form of the existing wind turbines and electricity pylons rise higher than the tower and are situated directly adjacent to it. Refer to **Chapter 11** ***Landscape and Visual Assessment*** and **Chapter 14** ***Archaeological, Architectural & Cultural Heritage*** of this EIS further details.

Spike Island
The lower harbour area is currently and will continue to undergo process of change in its visual and landscape character in the short, medium and long term with the other planned and permitted developments in the area including the M28 Cork to Ringaskiddy Motorway Scheme and redevelopment of the Ringaskiddy Port and continued development of other industrial, renewable energy and pharmaceutical projects in the lower harbour area.

The cumulative effect of these developments on the landscape character will be negative in the short term but is deemed to the positive in the medium to long term once operational as the area transitions from a slightly unkempt, semi-industrial area, to a more developed cluster of industry, energy and education campus style landscape. The proposed development will be seen in many ways as an extension of this landscape. Overall, the greater surrounding area is deemed capable of absorbing the development without changing the character of Cork Harbour landscape.

As such, it is considered that the proposed development is compatible with the plans for greater tourist amenities in the Lower Harbour, such as is envisaged by the Spike Island master plan.

6.5.1.10 Economic Benefit

When the proposed development becomes operational, it is anticipated that 63 people will be employed at the facility. It is estimated that the employment provided will contribute positively to the economy of the South Cork area. The proposed development will also generate annual expenditure on maintenance, security, insurance and various other services, which will be from local suppliers where possible. The employees at the facility may frequent the shops and pubs in Ringaskiddy village, thus adding to the general economic activity in the village. See previous sections also in relation to the Community Benefit Fund.

Assuming that Indaver's experience in Meath is indicative, the centre will be a niche point of interest for the area. The Cork facility will attract a specific category of visitors to Ringaskiddy annually. The Meath site attracted visitors even as it was being built. During construction, Indaver provided a visitor room and viewing platform for interest groups and stakeholders. Since the opening of the facility in 2011, visitors have been accommodated in a visitor centre in the main administrative building. To date, more than 3,000 local, national and international visitors have come to the Meath facility. Visitors include local and national secondary schools; Irish and international third-level institutions, specifically from renewable energy, engineering, and sciences fields; local authorities, municipalities, and elected officials from Ireland and abroad; national and international industry groups, waste-to-energy operators, and energy bodies; and local, national, and international media including TV, radio, and print journalists. The visitors have come from a range of different countries, including the U.S.A., Belgium, Finland, and the Netherlands.

As Indaver is committed to education and research, it is proposed that the facility in Ringaskiddy will have a visitor centre (located in the administration building) similar to the one in Meath. It will act as a gateway to the site and will showcase best practice in resource recovery management and sustainability.

6.5.1.11 Shellfish Production, Fishing and Angling

The proposed development will not discharge effluent to Cork Harbour and therefore will not affect water quality in the designated shellfish growing area.

The upgraded surface water drainage system in the L2545 road will discharge to Cork Harbour via a Class 1 hydrocarbon bypass interceptor and via the existing 450mm surface water outfall at Gobby Beach. There will be no effect on the water quality of Cork Harbour as a result of the road drainage system.

The sacrificial material will be placed above the high tide level and will not effect on water quality.

The proposed development will not have a significant effect on shellfish production, fishing or angling in Cork Harbour.

6.5.2 Major Accidents and Disasters

6.5.2.1 Assessment of Effects during Construction

There are no special or unique hazards associated with the construction of the plant on this particular site that would not be encountered on any typical construction site for an industrial building. As discussed in **Section 5.13** of **Chapter 5** ***Construction Activities***, a Health and Safety Plan will be prepared which will address health and safety issues from the design stages through to the completion of the construction and maintenance phases as required by the Safety, Health and Welfare at Work (Construction) Regulations 2013.

The Construction and Environmental Management Plan (CEMP) summarises the environmental strategy that will be adopted to ensure all risks. The CEMP sets out the mechanism by which environmental protection is

to be achieved. The effective implementation of the CEMP will help to reduce the risks to the environment associated with the construction phase of the project. This will ensure that the potential risks of major accident and/or disaster are identified, avoided and mitigated, as necessary. The CEMP is included as **Appendix 5.1** to this EIS.

This includes the development of a Construction Waste Management Plan (CWMP) to ensure that waste arising during the construction of the site will be minimised and that wastes will be managed and disposed of in accordance with regulatory requirements, ensuring that optimum levels of reduction, re-use and recycling are achieved.

6.5.2.2 Assessment of Effects during Operation

The risk assessment team examined 111 scenarios at the proposed development, using the methodology described in **Section 6.2.2.4** above. Of these, 108 scenarios were found to present credible accident hazards and they were each assigned a Severity Rating and a Frequency Rating, as described above.

The distributions of risk ratings, based on the risks presented to human health and the risks presented to the environment, are shown in **Table 6.15** and **Table 6.16.**

Table 6.15 Frequency Distribution of Risk Ratings (human health)

Risk Rating		Severity				
		1	2	3	4	5
Frequency	1	0	0	0	0	0
	2	10	17	9	0	2
	3	28	23	9	0	0
	4	4	3	1	0	0
	5	0	1	0	0	0
	6	0	0	0	0	0

Table 6.16 Frequency Distribution of Risk Ratings (environment)

Risk Rating		Severity				
		1	2	3	4	5
Frequency	1	0	0	0	0	0
	2	7	25	6	0	0
	3	17	42	1	0	0
	4	3	5	1	0	0
	5	1	0	0	0	0
	6	0	0	0	0	0

The scenarios identified in the HAZID&RA involve accident scenarios such as fires and loss of containment events involving materials that are hazardous to human health. As such the effects arising from these scenarios would involve direct effects to human health and/or to the environment. The assessment also considered whether there would be any risk that an accident scenario at Indaver could initiate an accident off site.

Based on the findings of the HAZID&RA 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. This scenario received a Severity Rating of 3 for both Human Health and for the Environment and a Likelihood Rating of 4.

In addition to the bunker fire scenario, several other accident scenarios were also considered for further assessment. These present lower risks, but broaden the assessment of credible worst-case scenarios that could arise at the proposed development. They are a loss of containment of aqueous solution of ammonia or hydrochloric acid and a fire following loss of containment of aqueous solvent waste.

Fire in the Bunker

This scenario received a Severity Rating of 3 for both Human Health and for the Environment and a Likelihood Rating of 4. As such the risk mitigation measures to protect against this scenario were examined in more detail to ensure that all necessary measures would be put in place.

Smoke Plume – Human Health

The combined effects of all three phases of a bunker fire on human health have been examined and are described in Section 2.8.1 of **Appendix 6.1 HAZID&RA**.

The results show that there is a very large margin of safety between the expected dioxin intake to people at the locations described, 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 proposed development would be very low (over three orders of magnitude less than the overall TDI established by WHO).

Smoke Plume – Environmental Effects

Based on the results of this assessment, the increase in soil PCDD/F concentrations over a 30-year period was calculated to be 0.0001337 ng I-TEQ/kg, applying an assumption of one small fire (1-tonne) per annum, and 0.0004445 ng I-TEQ/kg, applying an assumption of two 50-tonne fires over the 30-year period. These were very conservative assumptions when compared with Indaver's operational experience at other plants.

Based on this approach the total contribution to soil concentrations within the zone of influence (a 20 km radius around the site) was calculated to be 0.000577 ng I-TEQ/kg. This was found to be significantly lower (two orders of magnitude) than the lowest background soil concentration measured in the Ringaskiddy area, which was 0.052 ng I-TEQ/kg (measured at the Indaver site in 2015).

Based on this assessment, the calculated values for the PCDD/F contribution made by the proposed development were found to be insignificant.

There will be no effect of significance to the soils and/or the food chain from dioxins released in the event of accidental fires in the solid waste bunker at Indaver.

Thermal Radiation

Three levels of fire scenario are considered here. In the first two, the structure of the bunker building would remain intact or largely intact and so the effects to the surrounding area would be minor. In the third scenario, the escalation event, involving a fully developed fire at the bunker, it is assumed that the structure of the building could be damaged by the fire and so this shielding effect would no longer be provided.

Each of the off-site receptors examined are comfortably outside of the hazard distances.

As such there is no risk of adverse effects to any off-site receptors arising from the thermal radiation emitted in all three scenarios.

The mitigation measures are described in more detail in **Section 6.6.2** and ensure that the risks associated with this scenario are ALARP.

Loss of Containment of Aqueous Solution of Ammonia or Hydrochloric Acid

Human Health

The effects of the loss of containment of aqueous ammonia or hydrochloric acid on human health have been examined and are described in Section 2.8.2 of **Appendix 6.1** ***HAZID&RA***. The HAZID&RA identified that the aqueous solutions of ammonia and hydrochloric acid can give rise to the evolution of potentially toxic gas (Ammonia or Hydrogen Chloride).

The closest off-site receptor is at Hammond Lane. At its closest point to the site boundary, Hammond Lane lies within c.100 m of the Ammonia tank. As such, there is the potential for the 1% concentration to extend as far as the eastern boundary of Hammond Lane in the absolute worst-case scenario (i.e. full loss of containment from the ammonia tank, in calm atmospheric conditions and with the wind blowing in an unfavourable direction). The effects of this scenario can be mitigated by having people evacuate the area or taking shelter. Indaver will develop its emergency response arrangements to include provision for alerting Hammond Lane in the event of a release.

The results indicate that there is no risk of lethal effects at any of the other off-site receptors (Ringaskiddy, DePuy or the Maritime College), even in the worst-case scenario.

Using the AEGL-2 concentrations rather than the lethality exposure levels result in longer hazard distances, as would be expected. In this case the results show that for some scenarios the AEGL-2 concentration could extend to several off-site receptors, again depending on the atmospheric conditions and wind direction. In this case, there is no significant risk of lethal effects, but persons downwind following a major release should either remain indoors or evacuate the area in order to protect against exposure effects.

Environmental Effects

The environmental effects of the loss of containment of an aqueous solution of ammonia or hydrochloric acid have been assessed in Section 2.8.2 of **Appendix 6.1** ***HAZID&RA***. No significant environmental risks were identified in the assessment.

Aqueous Ammonia, which will be stored on the site, is identified as an environmentally hazardous material. As described in Section 2.5.4 of **Appendix 6.1**, the probability of loss of aqueous ammonia from the aqueous Ammonia tank, is remote given the tank will be double skinned. In the event the tank is damaged, the inventory of the tank could be released into an area of concrete hard standing and graded towards a channel which is routed to the surface water network. Once collected in the surface water network, Indaver can shut down the outfall and divert to a dedicated retention tank. This will be done automatically by fitting a TOC, conductivity and pH meter on the line, which will shut down the outfall when necessary. There will also be a switch which can be activated by Indaver personnel to manually shut down the outfall.

As a result, there will be no significant effect on the environment. Consideration was also given to the effects from a loss of containment of aqueous HCl. This will be stored in an intermediary bulk container (IBC), which will be fitted with a bund to retain spills. In the event of a release outside of the bund, it would be collected in the site drainage system, as described above. Given the smaller inventory of HCl when compared with aqueous ammonia, and the fact that hydrochloric acid is not classed as environmentally hazardous, the consequences associated with a release of HCl are minor when compared with ammonia. Furthermore, the measures that are in place to protect against a release of ammonia escaping off site would also protect against a HCl release – in particular the pH meter would activate a shut-down of the drainage system in the event of an excessively high or low pH reading.

Fire Following Loss of Containment of Aqueous Solvent Waste

Human Health

As discussed in Section 2.72 of **Appendix 6.1**, in the event that a pool fire arose following the loss of the containment, none of the fire scenarios would give rise to any adverse effects at the off-site receptors, refer to Section 2.8.3 of **Appendix 6.1**.

Environmental Effects

In the event of a fire at the aqueous solvent waste storage, there would be no significant environmental effects to the surrounding area. In the event of a fire, there is the potential for contaminated fire-fighting water to accumulate on site. The environmental hazard in this case is relatively low but there would be the potential for some contaminants to become entrained in the fire-fighting water. Indaver will provide a dedicated retention tank on site to collect run off in such scenarios. This tank will be sized on the basis of a fire-water retention study. There are no significant risks of a major accident to the environment associated with this scenario.

6.6 Mitigation and Monitoring

6.6.1 Population and Human Health

The Health and Safety features incorporated into the design of the proposed development are outlined in **Chapter 4** ***Description of the Proposed Development*** of this EIS. The Health and Safety policy, procedures and work practices of the proposed development will conform to all relevant health and safety legislation both during the construction and operational stages of the proposed development. The proposed development will be designed and constructed to best industry standards, with an emphasis being placed on the health and safety of employees, local residents and the community at large. The technology to be employed in the proposed development is well understood and has been used successfully in equivalent projects internationally, with no implications for health and safety. The characteristics of the proposed development are presented in **Chapter 4** ***Description of the Proposed Development*** of this EIS and in the drawings submitted with the 2016 planning application and the updated drawings submitted with this planning documentation pack (2025).

Many of the mitigation measures described elsewhere, such as in relation to emissions to air and noise will have the effect of mitigating any effects on human health. In addition, to minimise any potential psychological effects in relation to worry about human health effects, even though the overwhelming evidence is that there are none, ongoing information and education of the community will be made available. This may be facilitated by information and performance of the facility and emissions being available on a website for the public to review. Seeing the real values will likely reassure reasonable persons.

To minimise the risk that the proposed development will cause nuisance, comprehensive mitigation measures will be implemented, during both the construction and operational phases of the development. These mitigation measures will reduce any significant negative effects of the proposed development on the residential amenity of the local area. Refer to the following EIS Chapters for further details of mitigation measures:

Chapter 5 ***Construction Activities*****,**

Chapter 7 ***Roads and Traffic*****,**

Chapter 8 ***Air Quality*****,**

Chapter 9 ***Climate*****,**

Chapter 10 ***Noise and Vibration*****,**

Chapter 11 ***Landscape and Visual Assessment*****,**

Chapter 12 ***Biodiversity*****,**

Chapter 13 ***Soils, Geology, Hydrogeology, Hydrology & Coastal Recession*****,**

Chapter 14 ***Archaeological, Architectural and Cultural Heritage*****, and**

Chapter 15 ***Material Assets***

6.6.2 Major Accidents and Disasters

6.6.2.1 Mitigation During Construction

As noted in **Section 6.5.2**, none of the hazards identified in this report arise during the construction phase of the proposed development. However, a Construction and Environmental Management Plan (CEMP) will be in place to ensure that the construction is carried out in a safe manner with regard to safeguarding the environment from potential incidents on site. The CEMP also sets out the Construction Traffic Management Plan which will be finalised and implemented by the Contractor. The CEMP is included in **Appendix 5.1** of this EIS.

Risk assessment is an integral part of the CEMP. Furthermore, the PSCS (Project Supervisor Construction Stage) will ensure that the interaction of different activities at the site is managed safely so as not to present any unacceptable risks. The CEMP will also incorporate the development of an Incident Response Plan (IRP) to ensure that, in the unlikely event of an incident, response efforts are prompt, efficient, and appropriate. The objectives of the IRP will be to:

- Ensure the health and safety of workers and visitors along the site.
- Minimise any impacts to the environment and ensure protection of the water quality and the aquatic species dependent on it.
- Minimise any impacts on properties, services etc.
- Establish procedures that enable personnel to respond to incidents with an integrated multi-departmental effort and in a manner that minimises the possibility of loss and reduces the potential for affecting health, property, and the environment.
- The CEMP also sets out provisions for traffic management during the carrying out of the construction works.

6.6.2.2 Mitigation During Operation

In assessing the risks presented at each installation within the site, **Appendix 6.1** ***HAZID&RA*** noted a range of measures that will be in place to mitigate the risks associated with the various accident scenarios identified at each area of the site that was assessed. The areas assessed were as follows:

- Bunker
- Furnace
- Boiler
- Flue Gas Cooling Section Water Quench [no MAH]
- Activated Carbon Silo
- Bag House

- Flue Gas Residue Storage
- Flue Gas Cooling Section (water quench / heat exchanger) [no MAH]
- ID Fan [no MAH]
- Stack [no MAH]
- Water treatment plant, chemical storage (IBCs of aqueous HCl and NaOH)
- Piperacks
- General storage area (fuel oil, aqueous waste, aqueous ammonia)

For those areas identified as presenting a credible risk of a significant accident scenario, the scenarios were documented and assessed in the HAZID&RA worksheets, which are included in Appendix 3 to the HAZID&RA report (**Appendix 6.1** of this EIS). The worksheets were also used to document the risk reduction and mitigation measures that will be in place to protect against these scenarios.

Based on the findings of the HAZID&RA exercise, there were no scenarios identified which presented a Priority Risk (see **Table 6.5**) and there was one scenario which presented a Substantial Risk. This scenario involved a fire at the bunker. This scenario received a Severity Rating of 3, for both Human Health and for the Environment, and a Likelihood Rating of 4, giving the scenario a Risk Rating of 12. As such the risk assessment team examined the risk reduction measures planned for this area to ensure that all necessary measures would be in place to protect against this scenario.

Risk Mitigation Measures at Bunker

As noted above, the scenario involving a fire at the bunker was identified as presenting the highest risk rating of the scenarios examined in the HAZID&RA. The following risk reduction and risk mitigation measures will be put in place to protect against this scenario.

- 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 govern 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.
- Fire wrapping will be installed on cables at the bunker, to ensure continued function in the event of a fire developing.
- 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 (typical residence time of a 4-5 days). 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 lower the bunker level to bring the inventory to low level (as far as practicable). This, in conjunction with the quick turnaround of material in the bunker (4-5

days residence time), 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 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.
- 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 of 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 closed dry head sprinkler system in the bunker, as back up to the water cannons. The sprinkler system will be designed 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.
- A 250 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.
- 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.

These measures govern all stages of the potential development of this scenario. The measures will protect against the conditions arising under which a fire could occur, they will enable rapid detection and response at the early stages in the event that a fire scenario developing, they will enable extinguishment of the fire even in the event of escalation to a fully developed fire scenario, and protect against the risk of environmental contamination from fire-fighting run off.

With these measures in place, the HAZID&RA found that Indaver would have all necessary measures in place at the bunker, throughout all phases of the operation. As such the risks associated with this scenario were considered to be ALARP (as low as reasonably practicable).

During the course of the planning oral hearing in April and May 2016 held by An Bord Pleanála (ABP), concerns were raised about the ability of people to safely leave Haulbowline Island during such an event. The analysis in the HAZID&RA Report (Section 2.8.1) shows that that the worst case thermal radiation levels at the closest point to the bunker fire on the public road would result in exposure levels of 3.8 kW/m^2 at this point. As such there is no risk of adverse impacts to any off-site receptors arising from the thermal radiation emitted in this scenario.

Risk Mitigation Measures at Containment Areas

The following risk reduction and risk mitigation measures will be put in place to protect against accident scenarios involving loss of containment of materials in tanks or IBCs.

- Design of tanks incorporating measures to protect against siphoning of the tank contents (e.g. a hole in pipeline at top point on tank outlet or a check valve) in the event of line failure.
- Impact protection on storage tanks.

- Double skinned tanks, with leak detection between skins to detect a leak in the primary containment layer (fuel oil, ammonia).
- Deliveries to the tanks are manned activities carried out by trained operators.
- Transfer hoses are inspected by trained operators prior to delivery being made.
- Visual inspection of tankers prior to acceptance on site.
- Overfill protection system on storage tanks (level gauging, level switches).
- Personal protective equipment (PPE) for operators involved in carrying out deliveries, where required.
- Contents of aqueous waste tank are diluted (>70% water), thereby reducing the fire hazard.
- UN approved containers / packaging for materials; caged IBCs to protect against loss of containment of aqueous HCl due to impact.
- Bunded IBCs to retain a spill from the primary containment.
- Investigations / follow up if supplier provides faulty or damaged IBC.

Other Control Measures (general, site-wide measures)

In addition to identifying area-specific measures, the risk assessment also noted a series of other measures which provide risk reduction or mitigation across multiple site areas.

- All operators will be trained in the tasks they must carry out, with periodic refresher training as required.
- Documented SOPs for carrying out activities on site.
- Trained fitters for carrying out maintenance works.
- Regular site inspection.
- Formalised preventative maintenance program on site (SAP).
- Lock out, tag out procedure when carrying out maintenance works on plant. Permit to work sign off by authorised party.
- Vessels, piping designed to recognised standard/specification.
- Indaver personnel conduct screening / assessing of deliveries to site.
- Speed limit / traffic management controls.
- Oil water separator on drains.
- ATEX zoning.
- Control of ignition sources on site.
- Fire-fighting system - hoses, extinguishers.
- Fire-fighting systems / water main and water cannons.
- Spill kits.
- Emergency response team.

Based on these assessments, and on the controls that will be implemented as risk reduction and risk mitigation measures at the site, the risks associated with accident scenarios at the Indaver facility in Ringaskiddy were found to be ALARP.

6.6.2.3 Monitoring During Construction

The CEMP will include provision for continuous inspections, auditing and monitoring of the construction works. The Site Environmental Manager (SEM) will draw up a schedule of monitoring, which will set out roles and responsibilities for monitoring and reporting the works. In the event that the monitoring results indicate that the works are not being carried out in accordance with the contractual requirements, the SEM is responsible for initiating and reporting on the corrective actions to be implemented.

The SEM and the Construction Manager will also carry out quarterly audits to ensure that the Contractor engaged in carrying out the works is successfully meeting all environmental commitments / requirements under the CEMP.

The effective implementation of the CEMP will help to reduce the risks associated with the construction phase of the project in terms of the environmental effects. The PSCS (Project Supervisor Construction Stage) will monitor performance against the CEMP to ensure that it is adhered to throughout the process.

6.6.2.4 Monitoring During Operation

Indaver will ensure that there are appropriate controls in place (infrastructural and procedural) to manage the risks associated with the planned operations at the Resource Recovery Centre.

Indaver will also install detection and alarm systems to enable operators to rapidly detect and respond in the event of process deviations or accidents developing at the site. These will include:

- Oxygen monitoring at the furnace, with interlocks on the supply to ensure excess oxygen and protect against incomplete combustion.
- Interlocks will also be installed to prevent oil flow to the furnace when burners are not firing.
- Vibration detection on the fan at the furnace.
- Periodic cleaning of the furnace as part of the preventative maintenance programme, to protect against the risk of slag accumulation on the walls of the furnace.
- UV/IR detection systems.
- Pressure gauge at the burner, with interlocks to bring system to safe shut down.
- Process control system at the boiler system, linked to temperature monitors.
- Monitoring of stack emissions.
- Indaver will implement an automatic purge control sequence before the boiler is fired.
- Process controls to detect pressure drop at the bag house, with alarm.
- Process controls with temperature and weight detection at the bag house.
- Screening assessments of deliveries to the site. Indaver will also conduct investigations where issues arise with waste arriving on site (e.g. waste arriving in a damage container).
- Preventative maintenance programme to ensure that plant and equipment remains fit for purpose.
- Overfill protection systems on storage tanks (level gauging and level switches).
- Indaver will also conduct daily visual inspections of the site.

6.7 Residual Effects

6.7.1 Population and Human Health

The proposed mitigation measures will either avoid, prevent or reduce effects to human beings during the construction and operation phases of the proposed development.

From health protection terms strong evidence is that there will be no deleterious effects. Mainly as a result of a misunderstanding of the health effects of modern well-run incinerators it is acknowledged that some public anxiety might remain, but this will be mitigated by an education program and no long-term adverse health effects are predicted.

The potential economic benefits both direct from employment in the facility itself and indirect from positive effects on other sources of employment has potential to give positive health effects

It is considered that there will be a minor residual effect on the recreational amenity of the site and its immediate vicinity as the site will have somewhat more of an industrial character than it does at present. However, the industrial context is in keeping with its location within a Strategic Economic Area.

The jobs created during construction and operation, and the contribution which Indaver and its employees will make to the local economy, will have a slight positive economic effect on the Ringaskiddy and Cork City and County areas.

It is estimated that the Community Benefit Fund will be approximately €240,000 per year for the life of the waste-to-energy facility. This considerable sum of money on an ongoing basis for the community has major potential to provide improved access to services and health improvements.

As no adverse effect is predicted in terms of health protection, and potentially positive effects are predicted in terms of access to services and health improvements the overall residual effect on human health of the project is assessed as being positive.

6.7.2 Major Accidents and Disasters

6.7.2.1 Residual Effects During Construction

There are no major accident hazard implications during the construction phase of the proposed development. The accident scenarios discussed in this chapter of the EIS mainly relate to hazards associated with the storage and handling of dangerous substances or the storage and handling of waste at the site. As such, these hazards will not arise until after the construction phase has been completed and the operational phase has commenced (see **Section 6.7.2.1**).

6.7.2.2 Residual Effects During Operation

A discussion of the effects arising from normal operations of the plant is provided in other chapters of this EIS. There are no residual effects associated with the scenarios discussed in this chapter, except in the case of an accident scenario. In the event of an accident occurring during operations, Indaver will have emergency response measures in place to minimise the effects to human health and to the environment.

As the site will be licensed by the EPA, Indaver has conducted an environmental liabilities risk assessment (ELRA) and prepared a closure restoration and aftercare management plan (CRAMP), in accordance with the EPA's guidance. Indaver has prepared ELRA's for their operations at Carranstown and at Dublin Port and a similar approach will be adopted for the assessment at Ringaskiddy. In accordance with the EPA's guidance, Indaver has put the appropriate financial provisions in place at these other sites to cover the liabilities and potential liabilities identified in the ELRA.

Indaver will ensure that appropriate financial provisions are in place, accordance with the EPA guidance, for the Ringaskiddy site also.

6.8 Cumulative Impacts

6.8.1 Population and Human Health

Following a review of the committed projects and the planning files for Cork County Council and An Bord Pleanála, the cumulative effects of the proposed development on population and human health with the following have been assessed:

Proposed Projects:

- **Port of Cork (Planning Ref. No. OA04.321875)** - Ringaskiddy Port Redevelopment

- **Port of Cork (Planning Ref. No. 224356)** New Vehicular Entrance and Temporary Use of Lands for Open Storage of Port Related Cargo
- **Cork County Council (Planning Ref. No. HA04.HA0053/ MA04.MA0014)** – M28 Cork to Ringaskiddy Project
- **Janssen Sciences Ireland UC (Planning Ref. No. 254704) –** Permission for an upgrade and extension to the existing biomedicines manufacturing facility
- **Pfizer Ireland Pharmaceuticals (Planning Ref. No. 235834) –** Permission for construction of Bld. 124 – Site Lab Building
- **Electricity Supply Board (ESB) (Planning Ref. No. 235104) –** Construction/installation of an open cycle gas turbine (OCGT) generating unit and associated plant and equipment.

No projects or plans other than those listed in this chapter were identified as having potential cumulative effects.

It is not considered that there will be any negative cumulative effects on population and human health. **Chapter 8** ***Air Quality*** and **Chapter 10** ***Noise and Vibration*** confirm that no significant negative cumulative effects on air quality or noise and vibration are predicted.

Jobs created as a result of the construction and operation of the projects listed above, along with employment generated as a result of the proposed development, will result in a slight, positive, long-term effect on the economy.

Refer to **Chapter 16** ***Cumulative Effects***, Other Effects and Interactions, for a detailed description of each project/development listed above.

6.8.2 Major Accidents and Disasters

In the context of a discussion of cumulative effects, consideration was made of the risk that a major accident arising at the Indaver site could act as an initiator of a further accident. Consideration was also made of the risk that a major accident elsewhere could give rise to a major accident at the development.

The consequence modelling results in the HAZID&RA report show the extent of the effects from accident scenarios arising at Indaver. When considering the potential for cumulative effects, in which a fire or explosion could damage other plant or equipment, the following endpoints have been used:

- 4 kW/m^2: Sufficient to cause pain to persons exposed if unable to reach cover within 20 seconds. However, with appropriate protective clothing, emergency response actions lasting several minutes may be undertaken. The distance to this heat flux level is often used by fire responders when determining the limiting distance at which personnel can be deployed.
- 6.3 kW/m^2: This is the heat flux reported by the Chemical Industries Association (CIA)[4] as a maximum level to which an emergency exit should be exposed.
- 8 kW/m^2: This is the threshold value reported in EI19[5] at which protective cooling water may be required to prevent escalation of a fire event to exposed items of plant and equipment.
- 12.7 kW/m^2: This level of thermal radiation is noted in the HSA's LUP guidance as the level at which the fire could spread to a building in the event of sustained fire attack.
- 25.6 kW/m^2: This level of thermal radiation is noted in the HSA's LUP guidance as the level at which the fire could rapidly spread to a building in the event of fire attack.

Referring to the model results in the HAZID&RA report (**Appendix 6.1**), the scenario giving rise to the longest hazard distances to these thermal radiation levels is that of a fire in the waste bunker.

[4] "Guidance for the location and design of occupied buildings on chemical manufacturing sites" 2010 (Chemical Industries Association)

[5] "Model Code of Safe Practice Part 19: Fire precautions at petroleum refineries and bulk storage installations" (Energy Institute)

As noted in **Section 6.6.2**, Indaver will have controls in place to fight a fire in this area and prevent it escalating to become fully developed. However, in the worst case scenario if the fire escalated to this level, then the thermal radiation level of 25.6 kW/m^2 would not be experienced by people in the surrounding area, due to the elevation and shielding at the bunker, and 8 kW/m^2 could be experienced at a distance of up to 27m. Based on these model results, there is no risk of domino / cumulative effects to any receptors off site from this scenario.

Consideration was also given to the risks that an event occurring off site could initiate an accident at Indaver. This is discussed in more detail in **Section 6.3.2.2**.

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