10.0 WATER AND HYDROLOGY

10.1 INTRODUCTION

The EPA provided screening opinion on the requirement for an EIS and has requested an EIS is prepared to support the Industrial Emissions Licence Review Application that seeks to obtain permission to operate a Regenerative Thermal Oxidiser (RTO) unit at the Kingspan facility in Castleblayney, Co. Monaghan.

The proposed RTO will be located within the existing fence line of the Kingspan facility. This chapter has been prepared to examine the potential impacts of the proposed RTO. The effects of the proposed development are considered, taking account of mitigation measures to reduce or eliminate any residual impacts on hydrology and water quality.

The impact on groundwater is included in Chapter 9.

10.2 STUDY METHODOLOGY

10.2.1 General

The methodology used in this assessment follows current Irish guidance as outlined below:

- Environmental Protection Agency (EPA) ‘Guidelines on the Information to be Contained in Environmental Impact Statements’, (2002);
- Environmental Protection Agency (EPA) ‘Advice Notes on Current Practice (in the Preparation of EIS)’, (2003); and

In assessing likely potential and predicted impacts, account is taken of both the importance of the attributes and the predicted scale and duration of the likely impacts.

10.2.2 Criteria for Rating Impacts

The quality, magnitude and duration of potential impacts defined in accordance with the criteria provided in the EPA Guidelines, and the NRA criteria for rating the magnitude and significance of impacts on the water related attributes, are summarised in Table 10-1 and Table 10-2, respectively.
### Table 10-1 Glossary of Impacts following EPA Guidance Documents

<table>
<thead>
<tr>
<th>Impact Characteristic</th>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td>Positive</td>
<td>A change which improves the quality of the environment</td>
</tr>
<tr>
<td></td>
<td>Neutral</td>
<td>A change which does not affect the quality of the environment</td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td>A change which reduces the quality of the environment</td>
</tr>
<tr>
<td>Significance</td>
<td>Imperceptible</td>
<td>An impact capable of measurement but without noticeable consequences</td>
</tr>
<tr>
<td></td>
<td>Slight</td>
<td>An impact which causes noticeable changes in the character of the environment</td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
<td>An impact that alters the character of the environment in a manner consistent</td>
</tr>
<tr>
<td></td>
<td>Significant</td>
<td>An impact, which by its character, magnitude, duration or intensity alters a</td>
</tr>
<tr>
<td></td>
<td>Profound</td>
<td>An impact which obliterates sensitive characteristics</td>
</tr>
<tr>
<td>Duration</td>
<td>Short-term</td>
<td>Impact lasting one to seven years</td>
</tr>
<tr>
<td></td>
<td>Medium-term</td>
<td>Impact lasting seven to fifteen years</td>
</tr>
<tr>
<td></td>
<td>Long-term</td>
<td>Impact lasting fifteen to sixty years</td>
</tr>
<tr>
<td></td>
<td>Permanent</td>
<td>Impact lasting over sixty years</td>
</tr>
<tr>
<td></td>
<td>Temporary</td>
<td>Impact lasting for one year or less</td>
</tr>
<tr>
<td>Type</td>
<td>Cumulative</td>
<td>The addition of many small impacts to create one larger, more significant</td>
</tr>
<tr>
<td></td>
<td>‘Do Nothing’</td>
<td>The environment as it would be in the future should no development of any</td>
</tr>
<tr>
<td></td>
<td>Indeterminable</td>
<td>When the full consequences of a change in the environment cannot be described</td>
</tr>
<tr>
<td></td>
<td>Irreversible</td>
<td>When the character, distinctiveness, diversity, or reproductive capacity of</td>
</tr>
<tr>
<td></td>
<td>Residual</td>
<td>Degree of environmental change that will occur after the proposed mitigation</td>
</tr>
<tr>
<td></td>
<td>Synergistic</td>
<td>The resultant impact is of greater significance than the sum of its</td>
</tr>
<tr>
<td></td>
<td>‘Worst Case’</td>
<td>The impacts arising from a development in the case where the mitigation</td>
</tr>
</tbody>
</table>

The duration of each impact is considered to be either temporary, short-term, medium term, long-term, or a permanent impact. Temporary impacts are considered to be those which are construction related and last less than one year. Short term impacts were seen as impacts lasting one to seven years; medium-term impacts lasting seven to fifteen years; long-term impacts lasting fifteen to sixty years; and permanent impacts lasting over sixty years.
### Table 10-2 Criteria for rating impact magnitude at EIS stage – Estimation of magnitude of impact on hydrology attribute (NRA)

The NRA criteria for estimation of the importance of hydrological attributes at the site during the EIA stage are summarised in Table 10-3 below.

<table>
<thead>
<tr>
<th>Importance</th>
<th>Criteria</th>
<th>Typical Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely High</td>
<td>Attribute has a high quality or value on an international scale</td>
<td>River, wetland or surface water body ecosystem protected by EU legislation e.g. ‘European sites’ designated under the Habitats Regulations or ‘Salmonid waters’ designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988.</td>
</tr>
<tr>
<td>Very High</td>
<td>Attribute has a high quality or value on a regional or national scale</td>
<td>River, wetland or surface water body ecosystem protected by national legislation – NHA status Regionally important potable water source supplying &gt;2500 homes Quality Class A (Biotic Index Q4, Q5) Flood plain protecting more than 50 residential or commercial properties from flooding Nationally important amenity site for wide range of leisure activities</td>
</tr>
<tr>
<td>High</td>
<td>Attribute has a high quality or value on a local scale</td>
<td>Salmon fishery Locally important potable water source supplying &gt;1000 homes Quality Class B (Biotic Index Q3-4) Flood plain protecting between 5 and 50 residential or commercial properties from flooding Locally important amenity site for wide range of leisure activities</td>
</tr>
<tr>
<td>Medium</td>
<td>Attribute has a medium quality or value on a local scale</td>
<td>Coarse fishery Local potable water source supplying &gt;50 homes Quality Class C (Biotic Index Q3, Q2- 3) Flood plain protecting between 1 and 5 residential or commercial properties from flooding</td>
</tr>
</tbody>
</table>
Table 10-3  Criteria for Rating Impact Significance of Hydrological Attributes (NRA)

<table>
<thead>
<tr>
<th>Importance</th>
<th>Criteria</th>
<th>Typical Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Attribute has a low quality or value on a local scale</td>
<td>Locally important amenity site for small range of leisure activities&lt;br&gt;Local potable water source supplying &lt;50 homes&lt;br&gt;Quality Class D (Biotic Index Q2, Q1)&lt;br&gt;Flood plain protecting 1 residential or commercial property from flooding&lt;br&gt;Amenity site used by small numbers of local people</td>
</tr>
</tbody>
</table>

10.2.3 Sources of Information

This assessment was considered in the context of the available baseline information, potential impacts, and other available relevant information. In collating this information, the following sources of information and references were consulted:

- Latest EPA *Envision* water quality monitoring data for watercourses in the area;
- Neagh Bann River Basin District (IE06_03) Management Plan 2009-2015;
- The Planning System and Flood Risk Management, Guidelines for Planning Authorities (Department of the Environment, Heritage and Local Government (DoEHLG) and the Office of Public Works (OPW));
- Office of Public Works flood mapping data ([www.floodmaps.ie](http://www.floodmaps.ie)); and OPW preliminary flood risk assessment (PFRA) indicative mapping website [www.cfiram.ie](http://www.cfiram.ie);
- National Parks and Wildlife Services (NPWS) – [www.npws.ie](http://www.npws.ie) on-line database; Protected Site Register; and

The methodology for the assessment and mitigation measures proposed has regard to the following guideline documents:


10.3 RECEIVING ENVIRONMENT

The Kingspan facility is located within the Killycard/ Bree Industrial estate in Castleblayney, Co. Monaghan, which is lies adjacent to the N2 (National Road). The site is accessible from the N2 and from a local road of the R181.

10.3.1 Hydrology (Surface Water) – Drainage Catchment

The hydrological environment and site location are presented in Figure 10-1.
The regional topography consists of undulating landscape with associated drumlins. The Kingspan site itself is relatively flat and lies at approximately 128 m-129 m above Ordnance Datum (Malin Head).

There are no significant water courses immediately surrounding the site, there are however a number of streams and rivers within a 2 km radius of the site (see Figure 10-1). The development is located within the Fane River Catchment which forms part of the Neagh Bann International River Basin District (NB IRBD) (IE06_03) as defined under the EU Water Framework Directive (2000/60EC) European Communities Directive 2000/60EC, establishing a framework for community action in the field of water policy, (commonly known as the Water Framework Directive [WFD]).

The Fane River is located approximately 2 km to the north of the site which flows eastwards and into the Blayney Castle Lake (or Muckno Lough), located approximately 1.5 km to the northeast of the site, which is the main water feature in the area.

10.3.2 Hydrology (Surface Water Quality)

The WFD requires ‘Good Water Status’ for all European waters by 2015, to be achieved through a system of river basin management planning and extensive monitoring. ‘Good status’ means both ‘good ecological status’ and ‘good chemical status’.

In 2009 the NB IRBD River Management Plan (RMP) 2009-2015 was published. In the NB IRBD RMP, the impacts of a range of pressures were assessed including diffuse and point pollution, water abstraction and morphological pressures (e.g. water regulation structures). The purpose of this exercise was to identify water bodies at risk of failing to meet the objectives of the WFD by 2015 and include a programme of measures to address and alleviate these pressures by 2015.

The strategies and objectives of the WFD in Ireland have influenced a range of national legislation and regulations. These include the following:

- **Statutory Instrument (SI) No. 293 of 1988 European Communities (Quality of Salmonid Waters) Regulations 1988**
- **Local Government (Water Pollution) Acts 1977-1990**
- **SI No. 258 of 1988 Water Quality Standards for Phosphorus Regulations 1998**
- **SI No. 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations 2009**

In accordance with the WFD, each river catchment within each River Basin district was assessed and a water management plan detailing the programme of measures was put in place for each. For the Fane River WMU (Water Management Unit) the main pressure preventing achievement of ‘Good Status’ is diffuse agricultural pollution.

Q-Values are used by the EPA to express biological water quality, based on changes in the macro invertebrate communities of riffle areas brought about by organic pollution. Table 7-4 below summarises an explanation of the ratings; for example, Q1 indicates a seriously polluted water body while Q5 indicates unpolluted water of high quality.

Table 10-4 also indicates the key used by the EPA mapping format to indicate quality status.
### Quality Ratings (Q) Status Water Quality Key

| Q5, Q4-5 | High | Unpolluted |
| Q4      | Good | Unpolluted |
| Q3-4    | Moderate | Slightly Polluted |
| Q3, Q2-3 | Poor | Moderately Polluted |
| Q2, Q1-2, Q1 | Bad | Seriously Polluted |

**Table 10-4** EPA Biological Q ratings & key (source: www.epa.ie)

The EPA sample locations along the Fane River are shown in Figure 10-2 and summarised in Table 10-5 below. For the purpose of the current baseline assessment of the proposed development the Fane River both upgradient and downgradient of Muckno Lake were assessed.

<table>
<thead>
<tr>
<th>No.</th>
<th>Location</th>
<th>Location</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS06F10180</td>
<td>Fane – 2nd Bridge u/s Laragh (Main Road)</td>
<td>Upgradient</td>
<td></td>
</tr>
<tr>
<td>RS06F10200</td>
<td>Derrycreevy Bridge</td>
<td>Upgradient</td>
<td></td>
</tr>
<tr>
<td>RS06F10300</td>
<td>Fane Clarebane Bridge</td>
<td>Downgradient</td>
<td></td>
</tr>
</tbody>
</table>

**Table 10-5** EPA sampling locations for the Fane River

Figure 10-2 shows the EPA monitoring stations in the regional area. Limited monitoring of the water quality of the Fane River is available from 2006 and 2012 and is summarised in Table 10-6.

<table>
<thead>
<tr>
<th>Sampling location no.</th>
<th>Location</th>
<th>Location</th>
<th>2006*</th>
<th>2012*</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS06F10180</td>
<td>Fane – 2nd Bridge upstream Laragh (Main Road)</td>
<td>Upgradient</td>
<td>Q3</td>
<td>-</td>
</tr>
<tr>
<td>RS06F10200</td>
<td>Derrycreevy Bridge</td>
<td>Upgradient</td>
<td>-</td>
<td>Q3</td>
</tr>
<tr>
<td>RS06F10300</td>
<td>Fane Clarebane Bridge</td>
<td>Downgradient</td>
<td>Q3</td>
<td>-</td>
</tr>
</tbody>
</table>

**Table 10-6** Historical EPA monitoring results for the Fane River

Note: * indicates Biological Quality Ratings (Q-Values)

The monitoring of surface water undertaken by the EPA, with Q-Values of 3 indicates that the Fane River is of ‘Poor Status’ during sampling for the years outlined.

In a similar classification for surface water lakes, the WFD status for the Blayney Castle (Muckno Lake) from a review of the EPA Envision Database was classed as ‘Bad Status’ for periods between 2007-2009 and 2010-2012. The WFD risk score for the lake is ‘1b’ which means it is ‘at risk of not achieving good status’ by 2015.

#### 10.3.3 Areas of Conservation

Muckno Lake is designated as a proposed Natural Heritage Area (pNHA - 000563) which is approximately 1.5 km north east of the site, (refer also to Chapter 8).

#### 10.3.4 Flooding

A review of the records for previous floods in the area was carried out by viewing the OPW flood database website (www.floodmaps.ie). As shown in Insert 10-1, no flood events have been recorded at the proposed development.

The closest recorded flood event occurred approximately 2 km northeast of the Kingspan site, at Derrycreevy (a combined 450m of R181 and R182 roads and junction and surrounding farmland) in 17th of November 2009. The flood event has been assigned at
quality code of 4 (contains flood information that, insofar as it has been possible to establish, is probably true).

In July 2011, consultants were appointed by the Office of Public Works (OPW) to carry out a major study of flooding in the NB IRBD catchment. The North Western - Neagh Bann CFRAM Study identifies and examines in detail the causes of flooding throughout the catchment and when complete will produce an integrated plan of specific measures to address the significant flood risk factors in a proactive and comprehensive way. A review of the North Western - Neagh Bann Catchment-based Flood Risk Assessment and Management (CFRAM) Study (UoM 06) Inception Report highlighted that there were no flood occurrences at the proposed location at the Kingspan site.

10.3.5 Water Supply and Waste Water

The Kingspan facility within the industrial estate is serviced by public mains water supply for canteens and toilets only. The facility does not use water in its manufacturing process. The new RTO development uses a quench system to reduce the temperature from the oxidiser which required some additional water input. The requirement for water for quenching c. 0.5 m³ an hour for 16 hrs a day (but potentially up to 24 hrs) and an additional 0.1 m³ per hour for scrubber water top up. There is capacity for this supply available from the mains water supply.

There are no process waste waters and any domestic foul water is discharged to the public sewer network. The quench system as part of the new RTO development produces an aqueous effluent discharge consisting primarily of a chloride saline solution, which will be diverted to the sewer.

Runoff from the roof area and yard areas are contained within a separate storm water system which discharges directly to the public storm water system after passing through an interceptor.

10.3.6 Rating of Site Importance of the Hydrological Features

Based on the NRA methodology (i.e. Table 10-3 Criteria for rating site importance of hydrological features) this site is rated as having Medium Importance based on the
10.3.7 Conceptual Model

Interpretative cross sections have been finalised for the site with views appropriate to the characterisation of the site in terms of the geological, hydrogeological and hydrological environment. These figures are based on available data for the site from Chapter 9.0 Soil, Geology and Hydrogeology.

Figure 9-9 (in Chapter 9) presents schematic cross sections for the Kingspan site local setting and regional area, respectively considering the groundwater and surface water flow towards Muckno Lake (pNHA).

10.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

Kingspan produce insulation boards for use in all elements of the building industry and building types using a number of organic chemicals during the production process.

The proposed thermal oxidiser will treat organic compounds used in the process. The compounds are broken down within a carefully controlled system in the presence of heat and air into combustion products including carbon dioxide and water. Oxides of nitrogen and carbon monoxide can be produced from the combustion process. The combustion of one of the VOC's will generate hydrogen chloride that will be removed by an absorber where the gas is contacted with a water based solution. Treated emissions will then be discharged to atmosphere in a stack 12 m in height. The height of the absorber unit will be approximately 10 m.

The RTO unit will be installed in an area further away from the housing in Bree townland that borders the site to the north. The unit footprint will be approximately 5 m wide, 18 m in length and less than 4 m in height except for the absorber unit and stack. All equipment except for the 12 m high exhaust stack (installed to ensure appropriate dispersion in the atmosphere) and the 10 m high absorber unit will be below the roofline of existing buildings. The oxidiser will be located on an existing concreted area and existing buildings will shield the unit from all angles to domestic housing except for the adjacent road access point. The nearest housing to the oxidiser unit in line with this access point is approximately 200 m away.

The proposed regenerative thermal oxidiser (RTO) is proposed is suitable for the treatment of the organic compounds concerned and will achieve the required emission limits for VOC. The system recovers heat to maximise energy efficiency and minimise emissions (carbon dioxide) associated with fuel use that can contribute to climate change.

A quench system will also be used to rapidly reduce the temperature of the exhaust from the oxidiser and to prevent complex, chlorinated hydrocarbon compounds being formed and to control the incoming gas temperature into the absorber. A new aqueous effluent discharge will be sent to sewer comprising principally of a saline solution (chloride salts in water).

10.5 POTENTIAL IMPACT OF THE PROPOSED DEVELOPMENT

10.5.1 General

An analysis of the potential impacts of the proposed development on the hydrological environment during the construction and operation are outlined below. Due to the inter-
relationship between soils, geology and hydrogeology, and surface water (hydrology) the
following impacts discussed will be considered applicable to Chapter 9.0 of the EIS.

The proposed development will comprise the construction of the RTO on a 90 m$^2$ footprint
on existing made ground within the Kingspan facility boundary. The key civil engineering
works which will have potential impact on the hydrological environment during construction
and operation are summarised below.

10.5.2 Construction Phase

The key civil engineering works which will have potential impact on the hydrological
environment during construction are:

- Excavation of made ground, soil to bedrock to a maximum of 2.0 metres below
ground level for foundations to support the RTO unit.
- Localised excavation of made ground to facilitate connection to onsite utility services
  including water, gas (from onsite LPG) and public sewer line
- Importation of engineering fill, crushed stone, concrete, reinforcement and other
  construction materials

The potential impacts of construction in relation to the hydrological environment have been
assessed based under the following headings:

10.5.2.1 Accidental Spills and Leaks

During construction of the development, there is a risk of localised accidental pollution
incidences from the following sources:

- Spillage or leakage of oils and fuels from construction machinery or site vehicles.
- Run-off from concrete and cement during pad foundation construction.

Accidental spillages may result in or run off from concrete (the cement component is highly
alkaline) entering storm water drainage as the site is mostly covered in concrete. There is
also a less likely pathway through the underlying groundwater.

10.5.2.2 Surface Water Run-off

Surface water run-off during the construction phase may contain increased silt levels or
become polluted from construction activities. All surface water run-off is captured by the
onsite storm water system which discharges via one of the two petrol interceptors before
entering the public sewer line.

Based on the points stated above in relation to the construction phase the potential impact
on the hydrological environment during construction (following EPA, 2002) is considered to
have a Neutral, Temporary, Imperceptible Impact, i.e. an impact capable of measurement
but without noticeable consequences.

10.5.3 Operation Phase

The key works which could have any potential impact on the hydrological environment
during operation are summarised below:

- Fuelling: The RTO unit uses only LP Gas fuel to heat the chamber to reach the target
  oxidation temperature which will be connected from the existing LPG tank.
• Process waste water (saline solution) from the RTO process will be discharged to the foul sewer system.
• A 6 m³ Sodium Hydroxide (NaOH - aka Caustic Soda) storage tank will be required for the Scrubber/Neutralisation system. This will be stored inside a bunded area.
• Requirement for water for quenching c. 0.5 m³ an hour for 16 hours per day and an additional 0.1 m³ per hour for scrubber water top-up. There is capacity for this supply available from the mains water supply.

The potential impacts in relation to the hydrological environment which have been assessed are as follows:

• There is no likely impact on the surface water receptors in the vicinity of the proposed RTO development as discharge effluent will be discharged to the foul sewer system.
• There will be no direct discharges of contaminated water to groundwater or soil environments during the operational phase. Mitigation measures are in place to contain any accidental leaks (see below and Chapter 14).

The potential impact on hydrology during operation (following EPA, 2002) is considered to have a Neutral, Long term, Imperceptible Impact i.e. an impact capable of measurement but without noticeable consequences.

10.6 Do-Nothing Scenario

This section considers the Proposed Development in the context of the likely impacts upon the receiving environment should the proposed development not take place.

Based on information from the Soil & Groundwater Baseline Report (2015) the results show that generally there is no impact from current or historical use of the site (AWN 2015). For the Kingspan Insulation Ltd. facility, the current operations represent the “do-nothing” scenario.

10.7 Remedial & Mitigation Measures

The design of the proposed development has taken account of the potential impacts on the hydrology environment local to the area where construction will take place and containment of contaminant sources during operation. Measures have been incorporated into the design to mitigate the potential effects on the surrounding hydrology. These are described in further detail below.

10.7.1 Construction Phase

All ready-mixed concrete will be brought to site by truck. A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline waste waters or contaminated storm water to the underlying subsoil of the 15 m by 8 m footprint area.

Any accidental emissions from fuel spills from construction vehicles will be directed through the surface water drainage system through oil interceptors prior to discharge to storm water rather than infiltrate directly to ground.
10.7.2 Operation Phase

Operation of the plant will be according to BAT (Best Available Technology) principles and incompliance with the licence for the site to ensure that inputs to, and subsequent contamination of soil and water environments does not occur during normal and/or emergency conditions.

LP Gas fuel only is used for the operation of the RTO.

Saline solution waste water generated during the RTO operation process will be discharged to the foul sewer system, and not to ground or storm water drainage.

Storage of hazardous materials i.e. Sodium hydroxide (used in the scrubber/ neutralisation system) will be stored in a 6 m³ storage tank inside on a bunded concrete hard stand. The design of all bunds will conform to standard bunding specifications - BS8007:1987.

As the site will be paved any accidental emissions from fuel spills or contaminated run-off will be directed through the surface water drainage system through oil interceptors prior to discharge to storm water rather than infiltrate directly to ground.

The required additional water capacity for water quenching required for operation of the RTO is available.

10.8 PREDICTED IMPACT OF THE PROPOSED DEVELOPMENT

The residual impacts are those that would occur after the mitigation measures have taken effect.

No discharges to sewer of process effluent currently occur from the site. The introduction of the RTO will introduce a new, low volume effluent that will be saline in nature. The volumes are anticipated to be 0.6m³/hr or less. This discharge will combine with contributions from other domestic, commercial and industrial properties leading to a very substantial dilution of the saline levels within the discharge prior to treatment. The effluent will undergo treatment at the Castleblayney wastewater treatment works operated by Irish Water prior to discharge to Lough Muckno. The Material Assets Chapter of the EIS (Chapter 6) identifies suitable treatment capacity in the public wastewater treatment works is available.

Irish Water have evaluated an application and confirmed acceptance of the effluent, thereby confirming the effluent will not impact the treatment capability of the treatment process and that subsequent discharge from their facility will not impact Lough Muckno. No impact resulting from salinity levels within the effluent is anticipated to occur as a result of dilution in the public sewer system, subsequent treatment and additional dilution following discharge into the receiving water.

There are no planned discharges to ground or surface waters. As such, for the proposed development the residual impact for hydrology including discharges to sewer is considered to be Neutral in terms of quality and of Imperceptible significance as a result of this proposed development on the surrounding hydrological environment.

Following the NRA criteria for rating the magnitude and significance of impacts on the hydrological related attributes, the magnitude of impact is considered Negligible.
10.9 MONITORING

Water monitoring and testing of bund integrity will be undertaken as part of the current EPA licence requirements during the operational phase of development.

10.10 REINSTATEMENT

No reinstatement is required.

10.11 INTERACTIONS

Assessment of hydrology overlaps with soils, geology, aquifers and ecology considerations. As such any measures identified in these studies have been considered in this assessment.

10.12 DIFFICULTIES ENCOUNTERED IN COMPILING THE EIS

No difficulties were encountered in this assessment.
10.13 REFERENCES

- EPA (2002). EPA Guidelines on the information to be contained in Environmental Impact Statements; (March 2002); Environmental Protection Agency, Co. Wexford, Ireland
- IGI (2013). Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements
FIGURES
Figure 10.2
EIS for a Regenerative Thermal Oxidiser at Bree Industrial Estate, Castleblayney, Co. Monaghan

CLIENT:
Kingspan Insulation Ltd.

PROJECT:
EPA Monitoring Stations

PROJECT Ref: 14_8217

Legend
- Site Outline
- EPA_MON_QStations
- EPA_Rivers

Copyright: Ordnance Survey Ireland/ Government of Ireland, DCENR, GSI. Ordnance Survey Ireland Licence No. EN 0047212. AWN licence no. EN 0007513

Note: Drawing is for illustrative purposes only; Do not scale

Consent of copyright owner required for any other use.

11.0 AIR QUALITY & CLIMATE

11.1 INTRODUCTION

The following chapter presents an assessment of the impacts of the proposed planned introduction of a regenerative thermal oxidiser (RTO) and discontinuation of a previously licensed emission point, at the Kingspan facility in Castleblayney, County Monaghan. The chapter will specifically discuss the impacts in terms of air quality and climate of the local environment as defined in the EPA Advice Notes on Current Practice in the Preparation of Advice Notes, 2003.

The site is located approximately 1 km south-west of Castleblanney and 26 km north-west of Dundalk. The town has a population of just over 3,500 people.

Air dispersion modelling was carried out using the United States Environmental Protection Agency’s regulated model AERMOD. The modelling of air emissions from the site was carried out to assess the concentrations of Total Organic Compounds (TOC), Formaldehyde, PM$_{2.5}$/PM$_{10}$ and TA Luft Organics Class 1 and the consequent impact on human health. The study will also assess SO$_2$, CO, NO$_2$, HCl and HF directly from the proposed RTO (A2-14). To obtain all the meteorological information required for use in the model, data collected during 2002 - 2006 from Clones has been incorporated into the modelling. The air dispersion modelling input data consisted of information on the physical environment, design details for all emission points on-site and a full year of meteorological data. Using this input data, the model predicted ambient concentrations at various receptors for each hour of the meteorological year. This study adopted a worst-case approach which will lead to an over-estimation of the actual levels that will arise.

11.2 STUDY METHODOLOGY

11.2.1 General

Emissions from the site have been modelled using the AERMOD dispersion model (Version 14134) which has been developed by the U.S Environmental Protection Agency (USEPA) and the American Meteorological Society (AMS). The model is recommended as an appropriate model for assessing the impact of air emissions from industrial facilities in the EPA Guidance document “Air Dispersion Modelling from Industrial Installations Guidance Note (AG4) (2010)”.

The model is a “new-generation” steady-state Gaussian plume model used to assess pollutant concentrations associated with industrial sources. The model is an enhancement of the Industrial Source Complex-Short Term 3 (ISCST3) model which has been widely used for emissions from industrial sources. Details of the model are given in Appendix E1. Fundamentally, the model has made significant advances in simulating the dispersion process in the boundary layer. This will lead to a more accurate reflection of real world processes and thus considerably enhance the reliability and accuracy of the model particularly under those scenarios which give rise to the highest ambient concentrations.

11.2.2 Criteria for Rating of Impacts

Air Quality

In order to reduce the risk to health from poor air quality, national and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or “Air Quality Standards” are health or environmental-based levels for which additional factors may be considered. The applicable standards in Ireland include the Air Quality Standards...
Regulations 2011, which incorporate EU Directive 2008/50/EC. In line with the approach outlined in AG4, where no EU air quality standard exists, relevant statutory standards from other EU countries such as the UK, Germany or Denmark should be used. The most stringent European guideline / limit value from the sources outlined below should be referenced when determining compliance in the absence of an applicable EU ambient air quality standard. The relevant statutory guidance can be obtained from the following source:

- Appendix D of the UK Environment Agency “IPPC H1 – IPPC Environmental Assessment for BAT” outlines both short term (1-Hour) and long term (annual) limit values for VOCs.

Emissions of Volatile Organic Compounds from Organic Solvent Regulations (2002) (SI No. 543 of 2002) outlines appropriate mass emission limits of volatile organic compounds from a range of industries. However, no statutory air quality standards for the individual organic compounds exist in Irish legislation. In the absence of statutory standards, it is common practice to reference other suitable authorities such as the World Health Organisation (WHO) or derive an ambient air quality guideline from occupational exposure limits (OEL).

Although the WHO has ambient air quality guidelines for a small range of volatile organic compounds, guidance has been issued by the UK Environment Agency entitled “IPPC Environmental Assessment and Appraisal of BAT” (Environment Agency, 2003) for an extensive range of organic compounds. The guidance outlines the approach for deriving both short-term and long-term environmental assessment levels (EAL). In relation to the long-term (annual) EAL, this can be derived by applying a factor of 100 to the 8-hour OEL. The factor of 100 allows for both the greater period of exposure and the greater sensitivity of the general population. For short-term (1-hour) exposure, the EAL is derived by applying a factor of 10 to the short term exposure limit (STEL). In this case, only the sensitivity of the general population needs be taken into account as there is no need for additional safety factors in terms of the period of exposure. Where STELs are not listed then a value of 3 times the 8-hour time weighted average occupational exposure limit may be used.

Climate

Ireland ratified the United Nations Framework Convention on Climate Change (UNFCCC) in April 1994, the Kyoto Protocol in principle in 1997 and formally in May 2002 (Framework Convention on Climate Change, 1999 and Framework Convention on Climate Change, 1997). For the purposes of the European Union burden sharing agreement under Article 4 of the Kyoto Protocol, in June 1998, Ireland agreed to limit the net growth of the six Greenhouse Gases (GHGs) under the Kyoto Protocol to 13% above the 1990 level over the period 2008 to 2012 (ERM, 1998). The UNFCCC is continuing detailed negotiations in relation to GHGs reductions and in relation to technical issues such as emissions trading and burden sharing. The EU has recently published the “20-20-20 Climate and Energy Package” which calls for a 20% reduction in greenhouse gas emissions, a 20% share of renewable energy and 20% energy efficiency improvements by 2020.

In 1999, Ireland signed the Gothenburg Protocol to the 1979 UN Convention on Long Range Transboundary Air Pollution. The initial objective of the Protocol was to control and reduce emissions of Sulphur Dioxide (SO₂), Nitrogen Oxides (NOₓ), Volatile Organic Compounds (VOCs) and Ammonia (NH₃). To achieve the initial targets Ireland was obliged, by 2010, to meet national emission ceilings of 42 kt for SO₂ (67% below 2001 levels), 65 kt for NOₓ (52% reduction), 55 kt for VOCs (37% reduction) and 116 kt for NH₃ (6% reduction). In 2012, the Gothenburg Protocol was revised to include national emission reduction commitments for the main air pollutants to be achieved in 2020 and beyond and to include emission reduction commitments for PM₂.₅. In relation to Ireland, 2020 emission targets are 25 kt for SO₂ (65% below 2005 levels), 65 kt for NOₓ (49% reduction), 43 kt for VOCs (25% reduction), 108 kt for
NH$_3$ (1% reduction) and 10 kt for PM$_{2.5}$ (18% reduction). COM(2013) 917 final is the “Proposal for a Council Decision for the acceptance of the Amendment to the 1999 Protocol to the 1979 Convention on Long-Range Transboundary Air Pollution to Abate Acidification, Eutrophication and Ground-level Ozone”.

European Commission Directive 2001/81/EC, the National Emissions Ceiling Directive (NECD), prescribes the same emission limits as the 1999 Gothenburg Protocol. A National Programme for the progressive reduction of emissions of these four transboundary pollutants has been in place since April 2005 DEHLG (2004)(200a). The most recent data available from the EU in 2010 indicated that Ireland complied with the emissions ceilings for SO$_2$, VOCs and NH$_3$ but failed to comply with the ceiling for NO$_X$ (EEA, 2010). COM(2013) 920 final is the “Proposal for a Directive on the reduction of national emissions of certain atmospheric pollutants and amending Directive 2003/35/EC”. The proposal will apply the 2010 NECD limits until 2020 and establish new national emission reduction commitments which will be applicable from 2020 and 2030 for SO$_2$, NO$_X$, NMVOC, NH$_3$, PM$_{2.5}$ and CH$_4$. In relation to Ireland, 2020-29 emission targets are for SO$_2$ (65% below 2005 levels), for NO$_X$ (49% reduction), for VOCs (25% reduction), for NH$_3$ (1% reduction) and for PM$_{2.5}$ (18% reduction). In relation to 2030, Ireland’s emission targets are for SO$_2$ (83% below 2005 levels), for NO$_X$ (75% reduction), for VOCs (32% reduction), for NH$_3$ (7% reduction), for PM$_{2.5}$ (35% reduction) and for CH$_4$ (7% reduction).

A National Programme for the progressive reduction of emissions of the four transboundary pollutants is in place since April 2005 (DoEHLG, 2004). A review of the National Programme in 2007 (DEHLG, 2007) showed that Ireland was on target to comply with the emissions ceilings for SO$_2$, VOCs and NH$_3$ by 2010, but that the ceiling for NO$_X$ presents a difficulty even with the implementation of additional measures. The most recent data available from the EU in 2010 indicated that Ireland complied with the emissions ceilings for SO$_2$, VOCs and NH$_3$ but failed to comply with the ceiling for NO$_X$ (EEA, 2011).

11.3 RECEIVING ENVIRONMENT

11.3.1 Air Quality

Air quality monitoring programs have been undertaken in recent years by the EPA and Local Authorities. The most recent annual report on air quality Air Quality Monitoring Annual Report 2013, EPA (2014a), details the range and scope of monitoring undertaken throughout Ireland. As part of the implementation of the Framework Directive on Air Quality (1996/62/EC), four air quality zones have been defined in Ireland for air quality management and assessment purposes (EPA, 2014a). In terms of air monitoring, the location of Kingspan Insulation in Castleblayney is categorised as Zone D (EPA, 2014a). Further information on baseline air quality can be found in Appendix E.

Toluene, ethylbenzene, m- & p-xylene and o-xylene measurements were carried out at one Zone A location in 2013 (Rathmines, Dublin) giving average levels of between 0.35 –1.9 µg/m$^3$ as an annual mean and 1.9 – 12.8 µg/m$^3$ as a maximum 1-hour value EPA (2014a).

NO$_2$ monitoring is currently carried out at two rural Zone D locations in 2013, Emo and Kilkitt and in one urban area, Castlebar (2014a). Based on the above information a conservative estimate of the background NO$_2$ concentration in the region of Castleblayney is 10 µg/m$^3$ and the 99.8th%ile of one-hour NO$_2$ is 59.3 µg/m$^3$.

The NO$_x$ annual average in 2013 for both rural sites (Emo and Kilkitt) was 5 and 5 µg/m$^3$ respectively with the results for Castlebar averaging 16 µg/m$^3$. The annual mean background NO$_x$ concentration for Castleblayney in 2014 was estimated at 13 µg/m$^3$. 
Long-term PM$_{10}$ monitoring was carried out at the urban Zone D locations of Castlebar, and Claremorris in 2013. Based on this information and the comparative size of towns a conservative estimation for 90th%ile of the 24-hour maximum is 22 µg/m$^3$ and annual mean background PM$_{10}$ concentration in the region of the site is 14 µg/m$^3$.

SO$_2$ concentrations for the representative rural Zone D monitoring stations at Kilkitt are between 2013 and 2010 on average 6.8 µg/m$^3$ for the 99.2th%ile of 24 hour mean (limit value = 125 µg/m$^3$). The 99.7th%ile of 1 hour SO$_2$ was 10 µg/m$^3$, which is significantly below the 350 µg/m$^3$ limit value. CO concentrations in Zone D were monitored in Shannon Town in 2012 and 2011 using a rolling 8 hour mean concentration. The limit value is 10,000 µg/m$^3$ for the rolling 8 hour mean. Concentrations at Shannon Town were on average 410 µg/m$^3$ in 2012 and 2011.

In relation to the annual averages, the ambient background concentration is added directly to the process concentration whilst for the maximum 1-hour, twice the annual average was used.

### 11.3.2 Climate

Anthropogenic emissions of greenhouse gases in Ireland included in the Kyoto Protocol are outlined in the most recent review by the EPA (EPA, 2014b). Combustion of fossil fuels for energy purposes is the greatest source of emissions at 97% of CO$_2$ (2012 data). The largest share of energy emissions in 2013 is from fuel combustion for power generation (21% of total emissions) and road transport (21%). Industry and commercial sources account for 14.8% of emissions. The dominant primary fuels, on which the electricity generation system currently relies in terms of electricity generation output, are gas (62%), coal (14%), renewables (16%), peat (8%) and oil (2%) (2011 Data) (SEAI, 2011).

Greenhouse gases have different efficiencies in retaining solar energy in the atmosphere and different lifetimes in the atmosphere. In order to compare different greenhouse gases, emissions are calculated on the basis of their Global Warming Potential (GWP) over a 100-year period, giving a measure of their relative heating effect in the atmosphere. The GWP100 for CO$_2$ is the basic unit (GWP = 1), whereas CH$_4$ has a global warming potential equivalent to 21 units of CO$_2$ and N$_2$O has a GWP100 of 310.

In terms of compliance with the Kyoto Protocol, in 2013, total national greenhouse gas emissions were estimated to be 57.813 million tonnes carbon dioxide equivalent (Mt CO$_2$eq). This was 0.7% lower (0.408 Mt CO$_2$eq) than emissions in 2012. Emissions from energy (principally electricity generation) decreased by 11.1% (1.46 Mt CO$_2$eq) in 2013. The EPA explained this change in terms of an increase in the share of renewables in gross electricity consumption of 6.6% in 2013 compared to 2012. Hydro resources were significantly higher in 2013 than in 2012 (up 27.9%) which resulted in less electricity generation from conventional fossil fuelled fired power stations (EPA, 2014b). 2013 data indicated that Ireland was in compliance with the EU’s Effort Sharing Decision (Decision 406/2009/EC) (EPA, 2014b).

### 11.3.3 Prevailing Weather Pattern

Clones meteorological station, which is located approximately 35 km north-west of the site, collects data in the correct format and has a data collection of greater than 90%. Long-term hourly observations Clones meteorological station provide an indication of the prevailing wind conditions for the region. The windroses, shown in Figure 11-1, indicate the wind speed and direction which are typically distributed at Clones. The windrose is presented in a circular format, showing the frequency of winds which blow from particular directions. The length of each "spoke" around the circle is related to the frequency of time that the wind blows from a particular direction. Each concentric circle represents a different frequency, emanating from zero at the centre to increasing frequencies at the outer circles. Results indicate that the prevailing wind direction is from south to north-westerly in direction over the period 2002 -
2006. The mean wind speed is approximately 8.9 m/s (1978 to 2007 average). Calm conditions account for only a small fraction of the time in any one year peaking at 103 hours in 2006 (1.2% of the time) between 2002 and 2006. The number of missing hours are also very low with an average of 21 missing hours / year over the period 2002 – 2006 (0.2% of the time).

**Figure 11-1** Clones Windrose

### 11.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

A thermal oxidiser is proposed to reduce emissions of volatile organic compounds (VOC) from two stack exhaust points from the production process designated stacks A2-1a and A2-1b.

The thermal oxidiser (A2-14) will treat organic compounds used in the process. The compounds are broken down within a carefully controlled system in the presence of heat and air into combustion products including carbon dioxide and water. Oxides of nitrogen and carbon monoxide can be produced from the combustion process. The combustion of one of the VOC’s will generate hydrogen chloride that will be removed by an absorber where the gas is contacted with a water based solution. Treated emissions will then be discharged to atmosphere in a stack 12 m in height. The height of the absorber unit will be approximately 10 m.

A regenerative thermal oxidiser (RTO) is proposed as it is suitable for the treatment of the organic compounds concerned and will achieve the required emission limits for VOC. The system recovers heat to maximise energy efficiency and minimise emissions (carbon dioxide) associated with fuel use that can contribute to climate change. A quench system will also be used to rapidly reduce the temperature of the exhaust from the oxidiser and to prevent
complex, chlorinated hydrocarbon compounds being formed and to control the incoming gas temperature into the absorber.

As well as the addition of the RTO, further alterations on site are recommended in order to further reduce formaldehyde emissions, which the do-nothing scenario will show in Section 11.6 exceed EAL at the EPA licensed limit. In order to ensure EAL's are achieved the proposed alterations to the plant also include adjustments to stacks A2-12 and A2-5. Reviewing previous monitoring data it was found that these stacks are the two remaining significant contributors of formaldehyde concentrations at the worst case off site locations. The worst case monitored emission concentration and volume flow for each stack is applied (based on recent reports; Catalyst Environmental “CDU-0361, CDU-0428” and Q.E.D Engineering Ltd for 2011, 2012 and 2013). Combining the worst case mass emission rates, less A2-1 which will be replaced with A2-14, show a mass emission rate for across the site of
0.45 kg/h, a significant proportion of this from A2-5 and A2-12. In order to reduce the emissions from A2-5 and A2-12 it is proposed to increase the stack height for both stacks.

In summary, emission conditions will remain as per licenced (P0057-02) unless included in the below modifications:

- Replacement of A2-1a and A2-1b with the RTO (A2-14);
- Changes in the A2-12 and A2-5 stack heights and locations; and
- Reduction of the EPA licenced site wide mass emission limit of 2.7 kg/h for formaldehyde in order to achieve compliance with ambient air quality standards;

The predicted impact on the receiving environment of the above alterations in the plant are demonstrated in the following sections.

11.5 POTENTIAL IMPACT OF THE PROPOSED DEVELOPMENT

11.5.1 Construction Phase

The greatest potential impact on air quality during the construction phase of the proposed development is from construction dust emissions and the potential for nuisance dust. While construction dust tends to be deposited within 200 m of a construction site, the majority of the deposition occurs within the first 50 m. There is the potential for a number of greenhouse gas emissions to the atmosphere during the construction phase of the development. Construction vehicles, generators etc., may give rise to CO\(_2\) and NO\(_2\) emissions. When the dust minimisation measures detailed in the mitigation section of this chapter are implemented, fugitive emissions of dust from the site will be insignificant and pose no nuisance at nearby receptors. Due to the size and nature of the construction activities, CO\(_2\) and NO\(_2\) emissions during construction will have a negligible impact on climate.

11.5.2 Operational Phase

The installation of the RTO is designed to significantly reduce emissions, compared to the current concentrations emitted by A2-1a and A2-1b. Emissions from the oxidiser unit will include releases of combustion products including oxides of nitrogen, carbon monoxide and any residual releases of VOC not removed by the oxidiser. VOC emissions from the process that can lead to ozone formation will be significantly reduced.

Formaldehyde emissions on site had previously been noted as exceeding the ambient air quality emission values when at the EPA licenced limit. The current licenced limit for formaldehyde is a total site mass emission rate of 2.7 kg/h. The proposed reduction of this to
0.9 kg/h is predicted to achieve compliance for over both short term (hourly) and long term (annual) periods of evaluation for ambient ground level concentrations.

11.6 DO-NOTHING SCENARIO

The Do-Nothing Scenario occurs when the plant continues to run as in the baseline scenario as per the current IPPC licence (P0057-02). Ambient Ground Level Concentrations (GLCs) of VOCs have been predicted for the baseline scenario below, prior to any modifications being made to the licenced emission points. All emissions are calculated on a weekday 16 hour cycle, with no predicted emissions for Saturday and Sunday. Below is a summary of the emissions for the pollutants which have the greatest potential to exceed ambient limit values for the Do-Nothing Scenario. A full assessment of the Do-Nothing Scenario for actual and licenced conditions is shown in Appendix E.

Total VOC (as C)

The modelling results associated with the baseline emissions of a range of VOCs indicate that the ambient ground level concentrations are below the relevant air quality standards for all compounds even when one assumes that the full licence limit is emitted by the compounds with the most stringent environmental assessment level (EAL). Licence limit emissions from all emission points lead to ambient concentrations which are less than 19% of the maximum ambient 1-hour limit values and less than 6% of the annual limit values at the worst-case off-site location in the worst-case year. Actual emissions from all emission points lead to ambient concentrations which are less than 58% of the maximum ambient 1-hour limit values and less than 16% of the annual limit values at the worst-case off-site location in the worst-case year.

Class I Emissions

The modelling results associated with the emissions of a range of Class I compounds (namely formaldehyde, formic acid and phenol) are detailed in Table 11-1 and Table 11-2 and Figure 11-2 for licence conditions and actual concentrations, respectively. The modelling results for actual conditions are based on the average of results from BAT Class I measurements taken by Catalyst Environmental Report “CDU-0361” Dated 25/06/2014, ESG Report “LEK09469/Version 1”, Dated 16/01/14 and QED Engineering Ltd Report “Annual Report of Air Emissions Monitoring 2013” Dated 03/01/14. The results indicate that taking the worst-case approach that the full licence limit is emitted by the compounds with the most stringent environmental assessment level (formaldehyde) leads to a theoretical exceedance of the licence limit (Table 11-1). However, measurements based on actual Class I emission concentrations and volume flows from all emission points lead to ambient concentrations while not in compliance, with ambient concentrations, are significantly closer to both the maximum ambient 1-hour limit value and annual limit value at the worst-case off-site location.
<table>
<thead>
<tr>
<th>Pollutant / Met Year</th>
<th>Annual Mean Background (µg/m³)</th>
<th>Averaging Period</th>
<th>Process Contribution (organics class I) (µg/m³)</th>
<th>Predicted Environmental Concentration (organics class I) (µg/m³)</th>
<th>Standard (µg/m³) Note 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organics Class I / 2002</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td>527</td>
<td>527</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>n/a</td>
<td>Annual Mean</td>
<td>15.9</td>
<td>15.9</td>
<td>5</td>
</tr>
<tr>
<td>Organics Class I / 2003</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td>486</td>
<td>486</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>n/a</td>
<td>Annual Mean</td>
<td>16.4</td>
<td>16.4</td>
<td>5</td>
</tr>
<tr>
<td>Organics Class I / 2004</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td>565</td>
<td>565</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>n/a</td>
<td>Annual Mean</td>
<td>17.8</td>
<td>17.8</td>
<td>5</td>
</tr>
<tr>
<td>Organics Class I / 2005</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td>549</td>
<td>549</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>n/a</td>
<td>Annual Mean</td>
<td>18.4</td>
<td>18.4</td>
<td>5</td>
</tr>
<tr>
<td>Organics Class I / 2006</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td>513</td>
<td>513</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>n/a</td>
<td>Annual Mean</td>
<td>19.5</td>
<td>19.5</td>
<td>5</td>
</tr>
</tbody>
</table>

Note 1 Based on the Worst-Case Organic Class I compound – Formaldehyde for both for Maximum 1-hr & Annual Mean

Table 11-1 Dispersion Model Results at Worst-case Receptors Anywhere Offsite – Organics Class I at Licence Limits
<table>
<thead>
<tr>
<th>Pollutant / Met Year</th>
<th>Annual Mean Background (µg/m³)</th>
<th>Averaging Period</th>
<th>Process Contribution (organics class I) (µg/m³)</th>
<th>Predicted Environmental Concentration (organics class I) (µg/m³)</th>
<th>Standard (µg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organics Class I / 2002</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td>111</td>
<td>111</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>n/a</td>
<td>Annual Mean</td>
<td>2.4</td>
<td>2.4</td>
<td>5</td>
</tr>
<tr>
<td>Organics Class I / 2003</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td>109</td>
<td>109</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>n/a</td>
<td>Annual Mean</td>
<td>2.5</td>
<td>2.5</td>
<td>5</td>
</tr>
<tr>
<td>Organics Class I / 2004</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td>107</td>
<td>107</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>n/a</td>
<td>Annual Mean</td>
<td>3.3</td>
<td>3.3</td>
<td>5</td>
</tr>
<tr>
<td>Organics Class I / 2005</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td>116</td>
<td>116</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>n/a</td>
<td>Annual Mean</td>
<td>2.9</td>
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<td>Organics Class I / 2006</td>
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<tr>
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<td>n/a</td>
<td>Annual Mean</td>
<td>2.8</td>
<td>2.8</td>
<td>5</td>
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</tbody>
</table>

**Note 1** Based on the Worst-Case Organic Class I compound – Formaldehyde for both for Maximum 1-hr & Annual Mean

**Table 11-2** Dispersion Model Results at Worst-case Receptors Anywhere Offsite – Organic Class I at Actual Emission Concentrations & Volumes Flows.
Isopropyl Chloride Emissions

The modelling results associated with the emissions of isopropyl chloride indicate that the ambient ground level concentrations are below the relevant air quality standards for isopropyl chloride.

For the current situation, emissions from all emission point leads to ambient concentrations which are less than 7% of the maximum ambient 1-hour isopropyl chloride limit value and less than 7% of the annual limit value at the worst-case off-site location in the worst-case year.

Formaldehyde Emissions

The modelling results associated with the emission of formaldehyde are detailed in Table 11-3 based on licence conditions and actual measurements of emission concentrations and volume flow (based on recent report by Catalyst Environmental “CDU-0361”).

The modelling results for actual conditions are based on the results from formaldehyde measurements taken by Catalyst Environmental Report “CDU-0361” dated 25/06/2014. The results indicate that the ambient ground level concentrations are above the relevant air quality standards for formaldehyde.

Licenced conditions significantly exceed the ambient air quality standard at the worst case off-site location. For the current monitored situation, emissions from all emission point leads to ambient concentrations which are less than 43% of the maximum ambient 1-hour formaldehyde limit value and less than 25% of the annual limit value at the worst-case off-site location in the worst-case year.
<table>
<thead>
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<th>Pollutant / Met Year</th>
<th>Annual Mean Background (µg/m³)</th>
<th>Averaging Period</th>
<th>Process Contribution (Formaldehyde) (µg/m³)</th>
<th>Predicted Environmental Concentration (Formaldehyde) (µg/m³)</th>
<th>Standard (µg/m³)</th>
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<tbody>
<tr>
<td>Formaldehyde / 2002</td>
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<td>Maximum 1-Hour</td>
<td>335.3</td>
<td>335.3</td>
<td>100</td>
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<tr>
<td></td>
<td></td>
<td>Annual Mean</td>
<td>10.2</td>
<td>10.2</td>
<td>5</td>
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<tr>
<td>Formaldehyde / 2003</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td>309.4</td>
<td>309.4</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Annual Mean</td>
<td>10.5</td>
<td>10.5</td>
<td>5</td>
</tr>
<tr>
<td>Formaldehyde / 2004</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td>359.9</td>
<td>359.9</td>
<td>100</td>
</tr>
<tr>
<td></td>
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<td>Annual Mean</td>
<td>11.4</td>
<td>11.4</td>
<td>5</td>
</tr>
<tr>
<td>Formaldehyde / 2005</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
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</tr>
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<td>Annual Mean</td>
<td>11.4</td>
<td>11.4</td>
<td>5</td>
</tr>
<tr>
<td>Formaldehyde / 2006</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td>326.8</td>
<td>326.8</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Annual Mean</td>
<td>12.5</td>
<td>12.5</td>
<td>5</td>
</tr>
</tbody>
</table>

**Table 11-3** Dispersion Model Results at Worst-case Receptors Anywhere Offsite – Formaldehyde At Licence Limit Emission Concentrations & Volumes Flows

**Phenol Emissions**

The modelling results associated with the emission of phenol indicate that the ambient ground level concentrations are below the relevant air quality standards for phenol. For the current monitored situation, emissions from all emission point leads to ambient concentrations which are less than 1% of the maximum ambient 1-hour phenol limit value and annual limit value at the worst-case off-site location in the worst-case year.

**MDI Emissions**

The modelling results associated with the emission of MDI leads to ambient concentrations which are less than 4% of the maximum ambient 1-hour MDI limit value and annual limit value at the worst-case off-site location in the worst-case year.

**Dust Emissions**

The modelling results associated with the emission of Dust are detailed indicate that the ambient ground level concentrations are below the relevant air quality standards annual mean for PM₁₀.

Licenced conditions are in compliance with the PM₁₀ annual mean ambient air quality standard at the worst case off site location. For the current monitored situation, emissions from all emission point leads to ambient concentrations which are 53% of the annual limit value at the worst-case off-site location in the worst-case year and up to 96% of the 90th%ile of 24 hour means.
11.7 REMEDIAL & MITIGATION MEASURES

11.7.1 Construction Phase

In order to ensure that no dust nuisance occurs, a series of measures will be implemented. In summary the measures which will be implemented will include:

- Hard surface roads will be swept to remove mud and aggregate materials from their surface.
- Furthermore, any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions.
- Vehicles using site roads will have their speed restricted to the existing restrictions in force.
- During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions. At all times, these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust would be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

Construction vehicles, generators etc., may give rise to some CO$_2$ and N$_2$O emissions. However, due to short-term and temporary nature of these works the impact on climate will not be significant.

11.7.2 Operation Stage

The stack heights of the curing oven (A2-5 and A2-12) and RTO (A2-14) have been designed in an iterative fashion to ensure that an adequate height was selected to aid dispersion of the plume. Provided A2-14 is built to a height of 12 m and A2-5 and A2-12 are increased to a height of 14.8 m above local ground level the air impact assessment outlined below has demonstrated that mitigation measures are not required.

11.7.3 Residual Impacts

The results of the air dispersion modelling study show that the residual impacts of the proposed development on air quality & climate will be insignificant.

11.8 PREDICTED IMPACT OF THE PROPOSED DEVELOPMENT

11.8.1 Impacts of Stack Emissions

Ambient Ground Level Concentrations (GLCs) of VOCs have been predicted, full details of the predictions can be found in Appendix E. The pollutant of greatest concern at the Kingspan plant is Formaldehyde, which has the most stringent environmental assessment levels for Class 1 Organics. All emissions are calculated for two scenarios, a weekday 24 hour cycle for 5 days a week, with no predicted emissions for Saturday and Sunday and a continuous 24 hour a day, 7 days a week cycle. These are longer than the plant currently operates, however are taken as a worst case scenario in the case of expansion of operating hours in future.
Total VOC (as C)

The modelling results associated with the emissions of a Total VOCs are compared below to the relevant air quality standards for all compounds, even when one assumes that the full licence limit / actual emissions is emitted by the compounds with the most stringent EAL. For the 1 hour maximum it is assume that all TOC is comprised solely of toluene, while for the annual mean concentration it is assumed TOC is comprised of Isopropyl Chloride. Emissions from all emission points for the 24 hour cycle for 5 days a week lead to ambient concentrations which are 16% of the maximum ambient 1-hour limit values and 9% of the annual limit values at the worst-case off-site location in the worst-case year. For continuous emissions, annual mean concentrations rise to 12% of the annual limit values at the worst-case off-site location in the worst-case year. Total VOC concentrations are found to improve due to the proposed development, both with respect to the short term and long term EAL for 24 hour cycles 5 day a week and continuous emission cycles.

Class I Emissions

The modelling results associated with the emissions of a range of Class I compounds (mainly formaldehyde, formic acid and phenol) are detailed in Table 11.4 and Figure 11.3. The results indicate that taking the worst-case approach that the full licence limit is emitted by the compounds with the most stringent environmental assessment level (formaldehyde) leads to a theoretical exceedance of the licence limit (Table 11.4). Formaldehyde has the most stringent annual mean and 1-hour maximum limit of the three. Predictions based on formaldehyde as an individual emission concentration are discussed in a following section. These show that while class I organics, modelled at the licence limit, exceed the standards, when formaldehyde is modelled individually the standard is achieved. The limits for formic acid and phenol are much higher. Class I VOC concentrations are found to improve due to the proposed development, both with respect to the short term and long term EAL for both 24 hour, 5 day a week cycle and continuous emission cycles.
<table>
<thead>
<tr>
<th>Pollutant / Met Year</th>
<th>Annual Mean Background (µg/m³)</th>
<th>Averaging Period</th>
<th>Process Contribution (Class I organics) (µg/m³)</th>
<th>Predicted Environmental Concentration (Class I organics) (µg/m³)</th>
<th>Standard (µg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organics Class I / 2002</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td>477</td>
<td>477</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>n/a</td>
<td>Annual Mean</td>
<td>23</td>
<td>23</td>
<td>5</td>
</tr>
<tr>
<td>Organics Class I / 2003</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td>468</td>
<td>468</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>n/a</td>
<td>Annual Mean</td>
<td>24</td>
<td>24</td>
<td>5</td>
</tr>
<tr>
<td>Organics Class I / 2004</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td>460</td>
<td>460</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>n/a</td>
<td>Annual Mean</td>
<td>27</td>
<td>27</td>
<td>5</td>
</tr>
<tr>
<td>Organics Class I / 2005</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td>462</td>
<td>462</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>n/a</td>
<td>Annual Mean</td>
<td>27</td>
<td>27</td>
<td>5</td>
</tr>
<tr>
<td>Organics Class I / 2006</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td>482</td>
<td>482</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>n/a</td>
<td>Annual Mean</td>
<td>29</td>
<td>29</td>
<td>5</td>
</tr>
</tbody>
</table>

**Note 1** Based on the Worst-Case Organic Class I compound – Formaldehyde for both for Maximum 1-hr & Annual Mean

**Table 11-4** Dispersion Model Results at Worst-case Receptors Anywhere Offsite – Organics Class I at Licence Limits for 24 Hour Cycle for 5 Days a Week
Formaldehyde Emissions

As detailed previously, the current licenced mass emission limits for formaldehyde (combined 2.7 kg/hr across the site) is predicted to cause an exceedance of the ambient EAL. A new limit of roughly half the current site limit (<0.9 kg/hr across the site) achieves compliance when combined with an alteration of the curing oven stacks to 14.8 m in height above grade level. Stacks A2-12 and A2-5 will also be relocated. The increase in stack height reduces formaldehyde concentrations at the site boundary by approximately 30% for 1-hour evaluation periods and approximately 20% for long term annual averages. The new (reduced) mass limit will still be comfortably above the total emission for the site of 0.45 kg/hr if the worst case monitoring results for each stack historically recorded are assumed to coincide at the same time together.

The modelling results associated with the emission of formaldehyde are detailed in Table 11-5, Figure 11-4 and Figure 11-5 for the updated scenario with 24 hour cycle, 5 days a week. For the continuous emissions, results are shown in Table 11-6. The results indicate that the ambient ground level concentrations are below the relevant air quality standards for formaldehyde for both the 24 hour-cycle for 5 days a week and continuous emissions. Emissions from all emission points leads to ambient concentrations which are less than 96% or 95% of the maximum ambient 1-hour formaldehyde limit value for the 24 hour, 5 day a week cycle and continuous cycles, respectively. Concentrations were found to be less than 68% or 46% of the annual limit value for the 24 hour-cycle for 5 days a week and continuous cycles respectively at the worst-case off-site location in the worst-case year. As noted above, previous monitoring shows that the sum of the worst case scenarios at each stack equates to a mass emission rate of 0.45 kg/h while the mass emission for the proposed scenario is 0.9
kg/h when running on a 24 hour-cycle for 5 days a week and 0.64 kg/h when the plant runs continuously. Therefore, it is expected that ambient ground level concentrations will be significantly below the concentrations in the assessment. Formaldehyde concentrations are found to improve due to the proposed development, both with respect to the short term and long term EAL.

<table>
<thead>
<tr>
<th>Pollutant / Met Year</th>
<th>Annual Mean Background (µg/m³)</th>
<th>Averaging Period</th>
<th>Process Contribution (Formaldehyde) (µg/m³)</th>
<th>Predicted Environmental Formaldehyde Concentration (µg/m³)</th>
<th>Standard (µg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formaldehyde / 2002</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td>60.9</td>
<td>60.9</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>n/a</td>
<td>Annual Mean</td>
<td>3.8</td>
<td>3.8</td>
<td>5</td>
</tr>
<tr>
<td>Formaldehyde / 2003</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td>67.6</td>
<td>67.6</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>n/a</td>
<td>Annual Mean</td>
<td>3.6</td>
<td>3.6</td>
<td>5</td>
</tr>
<tr>
<td>Formaldehyde / 2004</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td>63.2</td>
<td>63.2</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>n/a</td>
<td>Annual Mean</td>
<td>4.8</td>
<td>4.8</td>
<td>5</td>
</tr>
<tr>
<td>Formaldehyde / 2005</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td>68.0</td>
<td>68.0</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>n/a</td>
<td>Annual Mean</td>
<td>4.3</td>
<td>4.3</td>
<td>5</td>
</tr>
<tr>
<td>Formaldehyde / 2006</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td>65.5</td>
<td>65.5</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>n/a</td>
<td>Annual Mean</td>
<td>4.3</td>
<td>4.3</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 11-5 Dispersion Model Results at Worst-case Receptors Anywhere Offsite – Formaldehyde with Proposed Emission Concentrations & Volumes Flows at Licence Limits for 24 Hour Cycle 5 days a week
<table>
<thead>
<tr>
<th>Pollutant / Met Year</th>
<th>Pollutant</th>
<th>Annual Mean Background (µg/m³)</th>
<th>Averaging Period</th>
<th>Process Contribution (Formaldehyde) (µg/m³)</th>
<th>Predicted Environmental Formaldehyde Concentration (µg/m³)</th>
<th>Standard (µg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formaldehyde / 2002</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td></td>
<td>41.5</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>n/a</td>
<td>Annual Mean</td>
<td></td>
<td>3.6</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Formaldehyde / 2003</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td></td>
<td>46.2</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>n/a</td>
<td>Annual Mean</td>
<td></td>
<td>3.4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Formaldehyde / 2004</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td></td>
<td>43.1</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>n/a</td>
<td>Annual Mean</td>
<td></td>
<td>4.8</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Formaldehyde / 2005</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td></td>
<td>46.4</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>n/a</td>
<td>Annual Mean</td>
<td></td>
<td>4.1</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Formaldehyde / 2006</td>
<td>n/a</td>
<td>Maximum 1-Hour</td>
<td></td>
<td>44.9</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>n/a</td>
<td>Annual Mean</td>
<td></td>
<td>4.0</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

Table 11-6 Dispersion Model Results at Worst-case Receptors Anywhere Offsite – Formaldehyde with Proposed Emission Concentrations & Volumes Flows for Continuous Emissions
Figure 11-4  1-Hour Maximum Formaldehyde Process Contribution (µg/m³) Year 2005 – Do Something Scenario for 24 Hour 5 Days a Week Cycle

Figure 11-5  Annual Mean Formaldehyde Process Contribution (µg/m³) Year 2004 – Do Something Scenario for 24 Hour 5 Days a Week Cycle
Proposed Emissions from Stack A2-14

Emission data for the proposed RTO has been provided by the manufacturer. The emission rates have been modelled and the impact on appropriate EAL’s are detailed below for the contribution due to the new RTO alone as no other major emission points emit these parameters. Emission rates are outlined for the following pollutants; SO₂, CO, HF, NO₂ and HCl. The emission rates are based on estimated maximum hourly rates and a volume flow of 5500 Nm³/hr.

The predicted concentrations are below the ambient EAL’s for these five pollutants. However, the 1 hour 99.8th%ile values for NO₂ are up to 94% of the short term ambient limit value (Table 11-7 and Table 11-8).

<table>
<thead>
<tr>
<th>Pollutant / Met Year</th>
<th>Annual Mean Background (µg/m³)</th>
<th>Averaging Period</th>
<th>NO₂ Process Contribution (µg/m³)</th>
<th>NO₂ Predicted Environmental Concentration (PEC) (µg/Nm³)</th>
<th>Standard (µg/Nm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO₂ / 2002</td>
<td>20</td>
<td>99.8th%ile of 1-hr means</td>
<td>163</td>
<td>183</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Annual Mean</td>
<td>11</td>
<td>21</td>
<td>40</td>
</tr>
<tr>
<td>NO₂ / 2003</td>
<td>20</td>
<td>99.8th%ile of 1-hr means</td>
<td>168</td>
<td>188</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Annual Mean</td>
<td>12</td>
<td>22</td>
<td>40</td>
</tr>
<tr>
<td>NO₂ / 2004</td>
<td>20</td>
<td>99.8th%ile of 1-hr means</td>
<td>158</td>
<td>184</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Annual Mean</td>
<td>9</td>
<td>19</td>
<td>40</td>
</tr>
<tr>
<td>NO₂ / 2005</td>
<td>20</td>
<td>99.8th%ile of 1-hr means</td>
<td>167</td>
<td>187</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Annual Mean</td>
<td>9</td>
<td>19</td>
<td>40</td>
</tr>
<tr>
<td>NO₂ / 2006</td>
<td>20</td>
<td>99.8th%ile of 1-hr means</td>
<td>162</td>
<td>182</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Annual Mean</td>
<td>8</td>
<td>18</td>
<td>40</td>
</tr>
</tbody>
</table>

*Table 11-7* Dispersion Model Results at Worst-Case Receptors Anywhere Offsite – NO₂ with Proposed Emission Concentrations & Volumes Flows for 24 Hour 5 Days a Week Cycle.
Table 11-8 Dispersion Model Results at Worst-Case Receptors Anywhere Offsite – NO₂ with Proposed Emission Concentrations & Volumes Flows for Continuous Emissions.

Proposed Emissions from Stack A2-14 with Increased Volumetric Flow

The impact of an increased volumetric flow through the RTO unit (of 8000 Nm³/hr) on the short and long term EAL’s is show in Table 11-9 and Table 11-10. All other parameters and stacks remain as previously modelled.

The impact of the increased volumetric flow on the worst-case receptors offsite is negligible for TOC, Class I Organics and formaldehyde. This is due to low emissions from A2-14 in comparison to other stacks such as A2-12 and A2-5. However, the impact of increasing the volume flow can be seen for HF, HCl, NO₂, CO and SO₂. The worst case offsite NO₂ concentrations are found to have a beneficial impact with respect to the short term EAL but adverse impact for the long term EAL.
### Short term

<table>
<thead>
<tr>
<th>Met Year</th>
<th>Predicted 1-Hour maximum Environmental VOC (as C) Concentration (µg/m³)</th>
<th>Predicted 1-Hour maximum Environmental Class I organics Concentration (µg/m³)</th>
<th>Predicted 1-Hour maximum Environmental Formaldehyde Concentration (µg/m³)</th>
<th>Predicted 99.7%ile of 1-Hour Environmental Concentration SO₂ (µg/m³)</th>
<th>Predicted 8 Hour mean Environmental Concentration CO (µg/m³)</th>
<th>Predicted 99.8th%ile of 1-Hour maximum Environmental Concentration NO₂ Concentration (µg/Nm³)</th>
<th>Predicted 1-Hour maximum Environmental Concentration (HCl) (µg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>1378.6</td>
<td>505.3</td>
<td>90.0</td>
<td>84.3</td>
<td>1953.3</td>
<td>175.2</td>
<td>22.3</td>
</tr>
<tr>
<td>2003</td>
<td>1274.0</td>
<td>467.0</td>
<td>90.6</td>
<td>83.1</td>
<td>1904.6</td>
<td>182.8</td>
<td>20.7</td>
</tr>
<tr>
<td>2004</td>
<td>1083.7</td>
<td>530.8</td>
<td>90.8</td>
<td>83.8</td>
<td>1926.5</td>
<td>174.1</td>
<td>22.0</td>
</tr>
<tr>
<td>2005</td>
<td>1430.9</td>
<td>524.6</td>
<td>89.9</td>
<td>82.9</td>
<td>1930.9</td>
<td>178.4</td>
<td>22.7</td>
</tr>
<tr>
<td>2006</td>
<td>1305.3</td>
<td>478.5</td>
<td>95.9</td>
<td>82.5</td>
<td>1972.9</td>
<td>176.2</td>
<td>21.3</td>
</tr>
</tbody>
</table>

**Table 11-9** Summary of Short Term Dispersion Model Results at Worst-case Receptors – Increased Volumetric Flow

### Long term

<table>
<thead>
<tr>
<th>Met Year</th>
<th>Predicted Annual Mean Environmental VOC (as C) Concentration (µg/m³)</th>
<th>Predicted Annual Mean Environmental Class I organics Concentration (µg/m³)</th>
<th>Predicted Annual Mean Environmental Formaldehyde Concentration (µg/m³)</th>
<th>Predicted Environmental Concentration SO₂ 24 Hour 99.2%ile (µg/m³)</th>
<th>Predicted Environmental Concentration HF Annual Mean (µg/m³)</th>
<th>Predicted Environmental Concentration NO₂ Annual Mean (µg/Nm³)</th>
<th>Predicted Environmental Concentration HCl Annual Mean (µg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>80.0</td>
<td>14.5</td>
<td>3.5</td>
<td>32.1</td>
<td>0.1</td>
<td>17.0</td>
<td>0.6</td>
</tr>
<tr>
<td>2003</td>
<td>81.6</td>
<td>14.7</td>
<td>3.1</td>
<td>34.3</td>
<td>0.1</td>
<td>18.2</td>
<td>0.7</td>
</tr>
<tr>
<td>2004</td>
<td>87.4</td>
<td>15.9</td>
<td>3.9</td>
<td>29.4</td>
<td>0.1</td>
<td>16.0</td>
<td>0.5</td>
</tr>
<tr>
<td>2005</td>
<td>91.2</td>
<td>16.6</td>
<td>3.9</td>
<td>33.2</td>
<td>0.1</td>
<td>15.8</td>
<td>0.5</td>
</tr>
<tr>
<td>2006</td>
<td>97.9</td>
<td>17.7</td>
<td>3.7</td>
<td>31.2</td>
<td>0.1</td>
<td>15.6</td>
<td>0.5</td>
</tr>
</tbody>
</table>

**Table 11-10** Summary of Long Term Dispersion Model Results at Worst-case Receptors – Increased Volumetric Flow
In summary the impact of the revision of license conditions for formaldehyde causes at least a 66% reduction in annual mean and 82% reduction in 1-hour maximum concentrations of formaldehyde at the worst case off-site location compared to current licensed conditions when running a 24 hour cycle for 5 days a week. This is a significantly beneficial impact with respect to human health in both the short and long term as it reduces formaldehyde, which is a known carcinogen, to below the ambient air quality standards. Estimations of all pollutants are predicted using the worst-case scenario for emissions and it is expected that actual emissions will be considerably less. The largest adverse impacts of the stack occur in the short term for maximum 1-hour concentrations of NO₂. However, these impacts remain below the ambient air quality standards and therefore are considered minor.

A bypass on the RTO unit is present to reroute emissions around the abatement plant directly to stack A2-14 should the RTO require to be shut down. No production will continue to occur with the RTO unit offline (see Chapter 14).

11.8.2 Climate Change

It is not predicted that road traffic will be an additional source of greenhouse gas emissions as a result of the development. However the LPG usage on site will be impacted due to the installation of the RTO.

Mass emission of CO₂ from the fuel consumption for the RTO is calculated in order to predict the climate change impact. CO₂ emissions are based on 0.23 kg of CO₂ per kWh (SEAI) for LPG. The RTO is estimated to increase LPG usage on site by a third, or 624,952 kWh which equates to an increase of 143 t CO₂ per annum. Additional emissions from the use of electricity will also occur. Combined, total emissions are estimated to be less than 200 t of CO₂ equivalent per year.

The contribution of the RTO to total greenhouse gas emissions in Ireland is considered insignificant (compared to 57.8 million t of CO₂ equivalent in 2013) and thus will be imperceptible in terms of Ireland’s obligations under the Kyoto Protocol.

11.9 MONITORING

Monitoring should continue as specified in the EPA IPC Licence, with the exception of A2-1. This states that annual monitoring of the stacks A2-2, A2-3, A2-5, A2-9, A2-10, A2-12 for Class I, Class II and Class III organics using a GC/MS analysis method. In future, A2-14 should be included in this monitoring program. Dust monitoring at A2-6, A2-7, A2-9, A2-10 should also be conducted annually using an Isokinetic/Gravimetric methodology. The licence stipulates that daily monitoring of the pressure difference across dust filters should be conducted.

11.10 REINSTATEMENT

No reinstatement measures are required with respect to air quality

11.11 INTERACTIONS

Previously, access to the site was via the east of Bree Estate Road. This route required all vehicles accessing the site must pass a number of sensitive residential receptors. In May 2015 a new access to the Bree Estate Road from the west was opened, this will link the Bree Industrial Estate directly to the N2. This will beneficially impact on the receptors to the north
and east of the site as it is predicted vehicles will utilise this improved access point.

Local buildings may influence the dispersion of the pollutants. Buildings which have the potential to influence have been included using the PRIME Building Downwash Program (BPIP Prime) and have been incorporated into the model to determine the influence (wake effects) of these buildings on dispersion in each direction considered.

### 11.12 DIFFICULTIES ENCOUNTERED IN COMPILING THE EIS

Information in this assessment is based on how stacks are currently licenced under P0057-02. No difficulties were encountered while compiling the EIS.
11.13 REFERENCES

- EEA (2011) NEC Directive Status Reports 2010
- EPA (2010) Air Dispersion Modelling from Industrial Installations Guidance Note (AG4)
- FCCC (1999) Ireland - Report on the in-depth review of the second national communication of Ireland
- SEAI Energy Forecast for Ireland to 2020 – 2011 Report
- USEPA (1999) “Comparison of Regulatory Design Concentrations: AERMOD vs. ISCST3 vs. CTDM PLUS”
- USEPA (2004a) AERMOD Description of Model Formulation
- USEPA (2005) Guidelines on Air Quality Models, Appendix W to Part 51, 40 CFR Ch.1
12.0 NOISE AND VIBRATION

12.1 INTRODUCTION

This section of the Environmental Impact Statement (EIS) assesses the noise and vibration impacts associated with installation of the proposed Regenerative Thermal Oxidiser (RTO) at the existing Kingspan facility in Castleblaney, Co. Monaghan. Relevant impacts during both the Construction and Operational phases of the proposed development are addressed with reference to the most appropriate guidance documents. The chapter has been prepared by AWN Consulting Ltd. (AWN) based on information provided by the project team.

Due to the location of the proposed RTO within the existing site, the distances to the nearest noise sensitive properties and screening from existing buildings, the noise and vibration impact relating to the proposed modifications to the facility are negligible and considered to be of minor long term impact.

12.2 STUDY METHODOLOGY

The study has been undertaken using the following methodology:

- Annual noise monitoring data undertaken at the nearest noise sensitive locations to the facility as part of the exiting IPPC licence (P0057-02) has been reviewed to determine the operational noise levels associated with current operations. The reviewed data has been used to determine compliance with the existing noise emission limits and the main sources contributing the surrounding noise environment;
- The relevant noise emissions limits values relating to operational activities have been reviewed in line with the EPA’s NG4 guidance document relating to the control of noise emissions from scheduled activities;
- Predictive calculations have been performed to assess the potential impacts associated with the construction and operation of the proposed RTO development at the most sensitive locations surrounding the development site; and,
- A schedule of mitigation measures have been proposed to reduce, where necessary, the identified potential impacts relating to noise and vibration from the proposed development.

12.3 RECEIVING ENVIRONMENT

The Kingspan facility is located within Killycard Industrial Estate, located approximately one kilometre to the south-west of Castleblaney. The site is bounded to the north by residential dwellings, to the south by the N2 Dual Carriageway, to the east by agricultural lands and residential dwellings and to the west by adjacent industrial facilities and residential dwellings beyond.

The closest noise sensitive properties are those located approximately 50 m north-east of the site along the Coill Darach road which the facility is located. Additional properties are located approximately 200m to the north-west of the facility (The Willows).

Activities at Kingspan site are largely contained within the manufacturing buildings with the exception an external dust extract system, chiller and extract units located along the southern building façade in addition to vehicle movements to and from the site.
12.3.1 Applicable Criteria

12.3.1.1 Noise

The Kingspan facility is currently licenced by the EPA under an existing Industrial Emissions licence (Licence no. P0057-02). Schedule B4 of the licence sets the following emission limit values with respect to operational noise from the facility at the nearest noise sensitive locations over day and night-time periods:

<table>
<thead>
<tr>
<th>Daytime, dB L_{Aeq, 30mins}</th>
<th>Night-time, dB L_{Aeq, 30mins}</th>
</tr>
</thead>
<tbody>
<tr>
<td>55^{Note1}</td>
<td>45^{Note1}</td>
</tr>
</tbody>
</table>

Table 12-1 Noise Emission Limits Values

Note 1 There shall be no clearly tonal component or impulsive component in the noise emission from the activity at any noise sensitive location.

In the case of this licence, daytime refers to the time period between 08:00 and 22:00 hrs and night-time between 22:00 and 08:00 hrs. The licence has recently been updated and falls under the Industrial Emissions Directive (IED).

Section 4.3 of the NG4 document discusses the rational for setting noise emission limits for new and existing sites, which states:

“In instances where existing licences are in place the noise criteria stated in the licence still stand. If these licences come under review at a future date consideration will be given on a case by case basis in relation to changing from the previous approach (i.e. daytime and night-time noise limits) to the approach outlined in this guidance note (i.e. daytime, evening and night-time limits).”

In the case of the Kingspan facility, considering a new IED is being sought as part of this application, it is considered reasonable that the updated licence complies with the most up to date relevant guidance documents relating to noise (i.e. NG4, 2012).

NG4 provides guidance relating to selecting the most appropriate noise emission limits for a new development, taking account of the baseline noise environment, the document however states that ‘This methodology only applies to new licence applications as it is considered impractical to attempt to retrospectively apply the approach to existing licensed facilities’.

In this instance, considering noise levels from the facility have operated under the ‘typical limit values’ set for licenced sites to date (refer to Table 12-1), it is proposed to maintain these limit values as part of any revised IED licence issued. It is proposed, however, to introduce a new evening criterion to comply with the new guidelines which set a limit value of 50dB L_{A,T} for this period and to update the time periods over which day and night-time periods are defined.

In summary, the revised noise emission limits values for the Kingspan facility are proposed as follows:

- Daytime (07:00 to 19:00hrs) 55dB L_{A,T};
- Evening (19:00 to 23:00hrs) 50dB L_{A,T}; and,
- Night-time (23:00 to 07:00hrs) 45dB L_{A,T}. 

Kingspan EIS Chapter 12, Page 2
12.3.1.2 Vibration

The existing IE licence for the Kingspan facility does not set any emission limits values relating to vibration. There are no sources of vibration associated with the existing facility which give rise to any appreciable levels of vibration to the surrounding environment. There are not vibration sources associated with the proposed RTO and hence no changes to the existing vibration will occur.

In light of the above, no vibration limits are deemed necessary for the existing or updated Kingspan facility.

12.3.2 Annual Noise Monitoring

Annual noise monitoring is undertaken at the Kingspan facility in compliance with Condition 6.13 of its existing IE licence. To date, monitoring has been undertaken by Q.E.D Engineering on an annual basis and form part of the facility’s Annual Environmental Report (AER).

A total of four noise sensitive locations (NSL’s) are monitored as part of the annual survey which have been previously agreed with the Agency. Figure 12-1 below displays the location of the monitoring locations and the overall site context.

![Figure 12-1 Site Context and Current Location of NSL’s Monitoring Locations (Source Bing Maps)](image)

A review of the most recent noise monitoring surveys between 2012 and 2014 has been undertaken to determine the range of noise levels measured at the facility and compliance with the relevant limits values.

Full survey methodologies and details are set out in the individual noise monitoring reports issued by QED and available upon request. In line with schedule B.4 of the licence, sample periods over day and night-time periods are 30 minutes.
Tables 12-2 to 12-5 summarise the results of the noise monitoring surveys in terms of the following two parameters:

$L_{Aeq}$ This is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period (T). The closer the $L_{Aeq}$ value is to either the $L_{A90}$ value indicates the relative impact of the intermittent sources and their contribution. The relative spread between the values determines the impact of intermittent sources, such as traffic, on the background.

$L_{A90}$ Refers to those A-weighted noise levels in the lower 90 percentile of the sampling interval; it is the level which is exceeded for 90% of the measurement period. It will therefore exclude the intermittent features of traffic and is used to describe a background level. Measured using the “Fast” time weighting.

Table 12-2 summarises the results of the annual noise survey measured at Location NSL 1 between 2012 and 2014.

<table>
<thead>
<tr>
<th>Year</th>
<th>Period</th>
<th>$L_{Aeq}$, 30 mins</th>
<th>$L_{A90}$, 30 mins</th>
<th>Survey Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>Day</td>
<td>55</td>
<td>43</td>
<td>Traffic along N2 dominates noise levels. Kingspan facility not audible</td>
</tr>
<tr>
<td></td>
<td>Night</td>
<td>44</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>Day</td>
<td>49</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Night</td>
<td>39</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>Day</td>
<td>56</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Night</td>
<td>53</td>
<td>38</td>
<td></td>
</tr>
</tbody>
</table>

Table 12-2  Summary of Annual Noise Monitoring Results NSL 1 (2012 -2014)

The main comments relating to noise levels measured at this location note that road traffic along the N2 Dual carriageway to the south of the site is the main contributor. The operation of the Kingspan facility was not audible during any survey periods at this location.
Table 12-3 summarises the results of the annual noise survey measured at Location NSL 2 between 2012 and 2014.

<table>
<thead>
<tr>
<th>Year</th>
<th>Period</th>
<th>NSL2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lₐₑₐq, 30 mins</td>
</tr>
<tr>
<td>2014</td>
<td>Day</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>Night</td>
<td>53</td>
</tr>
<tr>
<td>2013</td>
<td>Day</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>Night</td>
<td>44</td>
</tr>
<tr>
<td>2012</td>
<td>Day</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td>Night</td>
<td>52</td>
</tr>
</tbody>
</table>

Table 12-3  Summary of Annual Noise Monitoring Results NSL 2 (2012 -2014)

The main comments relating to noise levels measured at this location note that road traffic along the local road fronting this house in addition to intermittent traffic entering and exiting the facility were the main contributors to measured noise levels. The operation of the Kingspan facility was noted to be audible at low level at this location.

Table 12-4 summarises the results of the annual noise survey measured at Location NSL 3 between 2012 and 2014.

<table>
<thead>
<tr>
<th>Year</th>
<th>Period</th>
<th>NSL 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lₐₑₐq, 30 mins</td>
</tr>
<tr>
<td>2014</td>
<td>Day</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>Night</td>
<td>50</td>
</tr>
<tr>
<td>2013</td>
<td>Day</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>Night</td>
<td>49</td>
</tr>
<tr>
<td>2012</td>
<td>Day</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>Night</td>
<td>55</td>
</tr>
</tbody>
</table>

Table 12-4  Summary of Annual Noise Monitoring Results NSL 3 (2012 -2014)

The main comments relating to noise levels measured at this location note that road traffic along the local road fronting this house in addition to intermittent traffic entering and exiting the facility were the main contributors to measured noise levels. Operations associated with a loading area were also noted to be audible at low level at this location. Dog barking was noted as an additional source at this monitoring location over day and night-time periods.
Table 12-5 summarises the results of the annual noise survey measured at Location NSL 4 between 2012 and 2014.

<table>
<thead>
<tr>
<th>Year</th>
<th>Period</th>
<th>NSL 4</th>
<th>Survey Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>L_{Aeq}</td>
<td>L_{A90, 30 mins}</td>
</tr>
<tr>
<td>2014</td>
<td>Day</td>
<td>58</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>Night</td>
<td>49</td>
<td>44</td>
</tr>
<tr>
<td>2013</td>
<td>Day</td>
<td>55</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>Night</td>
<td>50</td>
<td>43</td>
</tr>
<tr>
<td>2012</td>
<td>Day</td>
<td>60</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>Night</td>
<td>57</td>
<td>49</td>
</tr>
</tbody>
</table>

The main comments relating to noise levels measured at this location note that road traffic along the local road fronting this house in addition to intermittent traffic entering and exiting the facility were the main contributors to measured noise levels. Operations associated with a loading area were also noted to be audible at low level at this location. Dog barking was noted as an additional source at this monitoring location over day and night-time periods.

The results of the surveys indicate that due to the presence of external sources from passing local traffic, dog barking and other activities within the local surrounding environment, the L_{Aeq} parameter is largely influenced by these sources. As this parameter is a logarithmic average, it is especially sensitive to relatively loud noises of short duration. For example, a single passage of a vehicle or a dog barking can govern the L_{Aeq} value of a measurement over a period much longer than the time for which the event was audible. Thus, where the noise emissions are steady, as plant items from the Kingspan facility site are in continuous operation, the L_{A90} parameter better reflects the magnitude of these emissions.

The EPA recognises the requirement for the use of this parameter as a descriptor of noise emissions from a facility and discusses this in its NG4 guidance document as follows:

"Subjective comments on audibility and the dominance of noise sources should be included along with difficulties in identifying sources etc. For some noise surveys, the L_{A90,T} index may be used to give a good indication of the actual noise output from the site, where the noise emissions on site are relatively steady and extraneous noises may unduly influence the measured L_{Aeq,T}.

On consideration of the continuous nature of the plant items associated with the Kingspan facility, the L_{A90} parameter is considered to best describe noise levels associated with this site. It should be noted, that due to the close proximity of the N2 Dual carriageway, this source will also influence the steady background L_{A90} parameter at the measurement locations.

Review of the measured L_{A90} parameter at the four noise sensitive locations indicates that noise levels over day and night-time periods are well within the relevant emission limit values of 55 dB(A) and 45 dB(A). One exception to this was recorded during the night-time period of the 2014 survey at NSL 4 where an L_{A90} value of 48 dB was recorded. Given that no operational activities have changed over the last 3 years at the facility, this value is considered to be associated with an external source.
12.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The proposed development involves the introduction of a new regenerative thermal oxidiser (RTO) to the facility. The unit will be installed in an area further most from the housing in Bree townland that borders the site to the north. The unit footprint will be approximately 5 m wide, 18 m in length and less than 4 m in height with the exception of the absorber unit and stack which will be 10 and 12 m high respectively. The RTO will be located adjacent to the existing fume extraction and chiller unit to the southern façade of the building.

The RTO will typically operate on an 18 hour day but depending on market demand may operate on a continual 24 hour basis. The RTO will operate for 30 minutes to 1 hour either side of the manufacturing process operating hours to allow for suitable warm up and shut down periods if not run on a continuous basis.

The operation of this new unit has the potential to add to operational noise levels from the Kingspan facility at the nearest noise sensitive locations.

The construction phase will be of short term duration requiring the installation of foundations, connections to on-site utility services and installation and commission of the new plant.

12.5 POTENTIAL IMPACT OF THE PROPOSED DEVELOPMENT

12.5.1 Construction Phase

The construction phase of the development will involve a minimal level of intrusive construction works at the site. As noted in Section 12.4 this phase will primarily involve foundation works, connections to existing on-site utilities and installation of the new unit. Given the range of activities currently on-site and the noise levels associated with each, activities associated with the construction phase are not expected to add to any notable levels of noise beyond the site boundary.

In terms of constrictions noise limits, there is no statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. Local authorities typically control construction activities by imposing limits on the hours of operation. In order to minimise the impact on nearby sensitive locations, it is common practice to limit the times of day during which it is permissible to carry out construction work that could create high levels of noise. In the absence of specific guidelines, reference is made to British Standard, BS 5228 (2009 +A1 2014) Code of Practice for Noise and Vibration Control on Construction and Open Sites Part 1 which sets out an approach for setting appropriate construction noise limits for residential dwellings.

The BS 5228 ‘ABC method’ calls for the designation of a noise sensitive location into a specific category (A, B or C) based on existing ambient noise levels in the absence of construction noise. This then sets a threshold noise value that, if exceeded, indicates a significant noise impact is associated with the construction activities as summarised in Table 12-6.
Assessment Category and Threshold Value Period (L_{Aeq}) | Threshold Value (dB) 
--- | --- | --- | --- 
| Category A | Category B | Category C |
| Night-time (23:00 to 07:00hrs) | 45 | 50 | 55 |
| Evenings & Weekends | 55 | 60 | 65 |
| Daytime (07:00 – 19:00hrs) and Saturdays (07:00 – 13:00hrs) | 65 | 70 | 75 |

Table 12-6 Example Threshold of Significant Effect at Dwellings

Note A: Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.
Note B: Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.
Note C: Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.
Note D: 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

Taking into account the standard above and making reference to the baseline noise environment monitored around the development site, a construction noise limit of 65 dB L_{Aeq} is proposed at the nearest noise sensitive locations.

In order to estimate the potential noise impacts during this phase, noise levels have been calculated using guidance set out in BS 5228 – 1 for the main activities likely to be required.

For the purposes of calculations, assumed construction activities associated with the installation of the RTO have been made at a distance of 120 m representing the closest property to the north-east, NLS 4 and at 180 m representing noise sensitive properties to the west at ‘The Willows’. The calculations assume that the equipment is operating continuously over any 1 hour period. For NSL’s to the north-east, screening effects from the intervening warehouse are accounted for in the calculations whilst no screening is assumed to the west. This last aspect is considered to be conservative in nature as some screening by buildings is present. Table 12-7 summarises the construction noise calculations based on the assumptions set out above.

Table 12-7 Construction Noise Calculations at NSL’s

The results of the assessment indicate that construction noise levels at the nearest noise sensitive locations are all well below the recommended construction noise limits for daytime periods of 65 dB L_{Aeq,T}. Construction activities will be carried out during regular daytime hours and night-time construction related activity is not anticipated.

The calculated noise levels are also within the operational noise limits set for the site for daytime periods (i.e. 55 dB L_{Aeq,T}).

The noise impact from this phase is considered to be of slight, short term impact.
12.5.2 Operational Phase

During the operational phase of the proposed development, the potential noise impacts relating to the operation of the new RTO unit principally derive from noise generated from operation of fans associated with the equipment. No other changes in terms of the noise environment is expected as a result of this proposed development. There are no additional traffic movements to and from the site associated with this development other than irregular movements for the delivery of chemicals (e.g. once a month) and removal of any salt build ups in the scrubber system (potentially only every couple of years). All other items of plant and processes will remain unchanged.

In order to assess the potential impact of operational plant and equipment on site, a noise model of the site and surrounding area was developed using a proprietary noise calculation package Brüel & Kjær Type Predictor. This is an acoustic modelling package for computing noise levels in the vicinity of different types of noise sources. The calculation standard used in the model is the ISO 9613 (1996) Standard Acoustics: Attenuation of Sound during Propagation Outdoors. Part 2: General Method of Calculation.

The model takes account of the various factors affecting the propagation of sound in accordance with the standard, including:

- the magnitude of the noise source in terms of sound power;
- the distance between the source and receiver;
- the presence of obstacles such as screens or barriers in the propagation path;
- the presence of reflecting surfaces;
- the hardness of the ground between the source and receiver;
- attenuation due to atmospheric absorption, and;
- meteorological effects such as wind gradient, temperature gradient and humidity.

Existing Plant Items

An initial model was developed for the existing scenario to calibrate against the survey data and to calculate the contribution of existing site-sources at noise sensitive locations external to the site. There are two types of systems of external plant associated with the facility, namely NS1 and NS2 associated with the existing dust and fume extract systems present onsite.

Both sources are located along the south-western building façade and are significantly screened from the nearest residential locations to the north-east. Noise source data for both items of plant has been provided by Kingspan as measured on the site previously. The following noise levels are associated with these items of plant:

<table>
<thead>
<tr>
<th>Source</th>
<th>Sound Pressure Level, dB(A)</th>
<th>Reference Distance, (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS 1</td>
<td>88</td>
<td>1</td>
</tr>
<tr>
<td>NS 2</td>
<td>82</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 12-8 Existing External Plant Items Noise Levels

This information coupled with OS mapping and site drawings was used to calculate noise levels during the existing scenario at the four noise sensitive locations NSL1 to NSL4. An additional location to the north-west of the site was also modelled, NSL5. Figure 12-2 presents the noise contour plot associated with the existing fixed plant items at the facility.

Given both plant items operate continually, the predicted noise levels are the same over day and night-time periods.
Specific noise levels at the individual NSL’s are summarised in Table 12-9 below.

<table>
<thead>
<tr>
<th>Sound Pressure Level, existing plant items</th>
<th>Calculated noise level, dB $L_{Aeq,T}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSL 1</td>
<td>24</td>
</tr>
<tr>
<td>NSL 2</td>
<td>28</td>
</tr>
<tr>
<td>NSL 3</td>
<td>31</td>
</tr>
<tr>
<td>NSL 4</td>
<td>27</td>
</tr>
<tr>
<td>NSL 5</td>
<td>30</td>
</tr>
</tbody>
</table>

*Table 12-9 Calculated Specific Noise Levels from Existing Fixed Plant Items*

The calculated noise level associated with the existing fixed plant items are in the range of 24 to 30 dB $L_{Aeq,T}$, and are all well below the noise emission limits associated with the facility. Whilst the calculated noise levels are typically below the $L_{A90}$ values measured during the annual noise surveys, the surveys were noted to be influenced by other extraneous sources, most notably the N2 dual carriageway.

**RTO Unit**

The RTO unit will be installed adjacent to NS 2 to the south-west of the main building. Specific noise data relating to this item of plant has not yet been finalised. Information provided by proposed suppliers have noted that the noise sources associated with this unit are associated with the various fans and motors operating the system. Table 12-10 lists below the operational items assumed for this unit with the sound pressure level at a distance of 1 m, assuming fan enclosures, where applicable.
<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Unit</th>
<th>Sound Pressure Level, dB(A) at 1m</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS3a</td>
<td>Laden Air Fan with insulated casing</td>
<td>Suction Unit</td>
<td>70</td>
</tr>
<tr>
<td>NS3b</td>
<td>Laden Air Fan Motor</td>
<td>Suction Unit</td>
<td>80</td>
</tr>
<tr>
<td>NS3c</td>
<td>Combustion air fan motor with insulated Burner Package</td>
<td>Burner Package</td>
<td>70</td>
</tr>
<tr>
<td>NS3d</td>
<td>Purge fan</td>
<td>Burner Package</td>
<td>80</td>
</tr>
<tr>
<td>NS3e</td>
<td>Purge fan motor</td>
<td>Burner Package</td>
<td>70</td>
</tr>
<tr>
<td>NS3f</td>
<td>Stack</td>
<td></td>
<td>50 Note 1</td>
</tr>
</tbody>
</table>

### Table 12-10  Source Noise Levels associated with RTO unit

**Note 1**  
In the absence of any specific data relating to noise emissions from this element of the unit, a limit value of 50 dB at 1m has been applied to this area. Attenuation to the fans/ motors connected to this stack will be required to be designed to achieve this level.

Taking account of the sources noted above, noise levels were calculated at the nearest noise sensitive locations. The sources associated with the RTO have been modelled at a height of 4 m above ground level, with the exception of the stack which has been modelled at a height of 12 m. All sources are modelled at a distance of 5 m from the building façade. Figure 12-3 displays the noise contour plot associated with the existing plant combined with the proposed RTO unit.

![Cumulative Noise Contour Model of Existing Fixed Plant Items plus RTO unit](image)

**Figure 12-3  Cumulative Noise Contour Model of Existing Fixed Plant Items plus RTO unit**

Specific noise levels at the individual NSL’s are summarised in Table 12-11 below. Given both plant items can operate continually, the same emissions values have been applied to day and night-time periods.
Table 12-11 Calculated Specific Noise Levels from Existing and Proposed RTO Fixed Plant Items

<table>
<thead>
<tr>
<th>Scenario</th>
<th>NSL 1</th>
<th>NSL 2</th>
<th>NSL 3</th>
<th>NSL 4</th>
<th>NSL 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Scenario</td>
<td>24</td>
<td>28</td>
<td>31</td>
<td>27</td>
<td>30</td>
</tr>
<tr>
<td>Proposed Scenario</td>
<td>25</td>
<td>29</td>
<td>32</td>
<td>30</td>
<td>35</td>
</tr>
<tr>
<td>Increase</td>
<td>+1</td>
<td>0</td>
<td>+1</td>
<td>+3</td>
<td>+5</td>
</tr>
</tbody>
</table>

The calculated cumulative noise level associated with the existing and proposed fixed plant items are in the range of 25 to 35 dB $L_{A_{eq},T}$. The operation of the RTO unit is calculated to increase noise levels by 0 to 3 dB(A) at properties to the north of the site to within 25 to 32 dB(A).

To the north-west of the site, noise levels are calculated to increase by 5 dB to a level of 35 dB(A). This is considered to be conservative (an over predictive) as additional screening will be provided by Kingspan and neighbouring facility buildings. The calculated noise levels at all locations are well below the proposed operational emission limit values of 55 dB, 50 dB, and 45 dB $L_{A,T}$ during day, evening and night-time periods respectively.

The operation of the proposed RTO is determined to have a slight, long-term impact at the nearest noise sensitive locations.

### 12.6 DO-NOTHING SCENARIO

Prior to May 2015, access to the facility and other businesses in the industrial estate was from the N2 through the Bree housing estate to the north of the site. However, road improvements to the N2 Castleblaney bypass and the removal of access restrictions from the N2 direct to the industrial estate now enable HGV and car traffic to enter directly into the industrial estate. All such traffic is now rerouted away from the residential areas with the result that noise levels at housing to the north of the facility should improve if all other aspects including traffic flows along the N2 remain constant.

During the Do-Nothing Scenario, no changes to the operational plant or on-site activities will occur. In this instance, the noise levels recorded during the annual noise surveys summarised in Section 12.3.1 will remain nominally unchanged or improve due to the road access modifications into the industrial estate. The calculated noise levels associated with fixed plant items associated with the ‘Do Nothing’ scenario are displayed in Figure 12-2 and Table 12-9. During this scenario, operational noise levels comply with the emission limit values conditioned as part of the current IPPC licence (P0057-02).

### 12.7 REMEDIAL & MITIGATION MEASURES

#### 12.7.1 Construction Phase

With regard to construction activities, best practice control measures for noise and vibration from construction sites are found within BS 5228 (2009 +A1 2014) Code of Practice for Noise and Vibration Control on Construction and Open Sites Parts 1 and 2. Whist construction noise are expected to be minimal and well within the criteria set out in this document, the contractor will ensure that all best practice noise and vibration control methods will be used, as necessary in order to ensure impacts to nearby residents are not
significantly affected. In this regard, various mitigation measures can be considered and applied during the construction of the proposed development, such as:

- Limiting the hours during which site activities likely to create high levels of noise or vibration are permitted;
- Maintaining site access roads even so as to mitigate the potential for vibration from lorries.
- Selection of plant with low inherent potential for generation of noise and/ or vibration;
- Erection of barriers as necessary around items such as generators or high duty compressors, where applicable;
- Situating noisy plant as far away from sensitive properties as permitted by site constraints.

### 12.7.2 Operational Phase

The site setting and layout is such that the nearest noise sensitive locations are set back and well screened by the existing and proposed new on-site noise sources.

Noise levels calculated as part of this assessment have indicated that the cumulative operation of existing and proposed fixed plant items are well below the relevant day, evening and night-time noise emission limits applicable at the nearest noise sensitive locations.

The noise model has been developed using a range of likely plant items and their associated operational noise levels. During the detailed design of the proposed development, all items of plant required to serve the RTO unit will be designed to operate at or below the operational limit values set out in Table 12-10 of this Chapter. Potential mitigation measures to reach these levels include insulated casing to fans, attenuators to stacks and enclosures to other plant items as required.

All plant items will be designed to ensure no tonal components are associated with any operational plant item.

### 12.8 PREDICTED IMPACT OF THE PROPOSED DEVELOPMENT

#### 12.8.1 Construction Phase

During the construction phase of the project there will be minimal impact on nearby noise sensitive properties due to noise emissions from site activities. The application of binding noise limits, hours of operation, distances to noise sensitive areas along with implementation of appropriate noise and vibration control measures, will ensure that noise and vibration impact will not have any significant impact on the surrounding environment. The impact during this phase will be neutral, slight and short-term.

#### 12.8.2 Operational Phase

During the operation of the facility with the additional plant in operation, noise levels from on-site operations are predicted to remain well within the relevant day, evening and night-time noise emissions limits at the nearest noise sensitive locations.

Noise levels are predicted to increase by an imperceptible margin at the closest noise sensitive properties to the north-east of the site (current locations NSL 1 to NSL 4) and hence overall impacts are determined to be neutral and long-term.
Noise levels are predicted to increase by a slight margin at the closest noise sensitive properties to the north-west and hence overall impacts are determined to be **negative**, **slight** and **long term**.

Overall, assuming noise levels associated with the proposed RTO are designed to operate within the relevant noise limits set out in this chapter, operational noise levels at all locations are within the relevant limit values.

### 12.9 MONITORING

In line with the facilities existing and future, revised Industrial Emission licence, noise levels will be monitored on an annual basis at the nearest noise sensitive locations. Taking account of the location proposed for the new RTO unit and referring to the annual noise survey reports between 2012 to 2014, it is proposed that Monitoring Location NSL 1 is relocated to the north-west of the site (to a location on public access road between the site and assessment location NSL 5 illustrated in Figures 12-2 and 12-3 of this report) to confirm noise levels following the commissioning of the RTO unit.

### 12.10 REINSTATEMENT

No reinstatement is required that has a material effect on noise and vibration.

### 12.11 INTERACTIONS

No interactions with other elements covered in the EIS have been identified.

### 12.12 DIFFICULTIES ENCOUNTERED IN COMPILING THE EIS

No difficulties have been encountered in preparing this EIS chapter. Data used for the RTO is based on preliminary design information. During the detailed design of the proposed development, all items of plant required to serve the RTO unit will be designed to operate at or below the operational limit values set out in Table 12-10 of this Chapter.
12.13 REFERENCES

- EPA, OEE – 2012 Guidance Noise for Noise – Licence Applications, Surveys and Assessments in Relation to Scheduled Activities
13.0 WASTE MANAGEMENT

13.1 INTRODUCTION

This chapter has been prepared to address the potential impacts of waste management from the installation of a Regenerative Thermal Oxidiser (RTO) at the Kingspan facility in the Bree Industrial Estate in Castleblaney, Co. Monaghan. This chapter will identify the existing site conditions and the potential impacts that may arise as a result of construction works required for installation of the equipment. The chapter will also look at potential waste impacts on the receiving environment once the equipment has been installed.

In assessing the potential and predicted impact, account is taken of both the importance of the attributes and the scale and duration of the likely impacts.

This chapter has been prepared by a suitably qualified waste consultant.

13.2 STUDY METHODOLOGY

The assessment of the impacts of the proposed installation arising from the generation of waste materials was carried out taking account of the methodology specified in the EPA guidelines and advice notes, referred to in Chapter 1 Introduction.

An extensive document review was carried out to assist in identifying current and future requirements for waste management and included the following National and Regional Waste Policies, Strategies and Reports:

- Monaghan County Development Plan 2013-2019;
- North East Region Waste Management Plan 2005 -2010;
- Department of Environment, Heritage and Local Government (DoEHLG), National Strategy on Biodegradable Waste (2006);
- DoEHLG, Taking Stock and Moving Forward (2004);
- DoEHLG, Making Ireland’s Development Sustainable – Review, Assessment and Future Action, World Summit on Sustainable Development (2002);
- DoEHLG, Preventing and Recycling Waste - Delivering Change (2002); and

In addition, the following best practice guidelines and codes of practice were consulted:

- National Construction and Demolition Waste Council (NCDWC) and DoEHLG, Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects (2006); and

The primary legislative instruments that govern waste management in Ireland and which are applicable to this project are:

13.3 RECEIVING ENVIRONMENT

The existing Kingspan manufacturing facility is located within the Bree Industrial Estate in Castleblayney, Co. Monaghan which lies adjacent to the N2 National Primary Road. There is also a safety supplies business, plastic recovery and packaging business and other warehousing space located within the estate and there are further industrial units located adjacent to the site to the north-west. These units form the majority of significant industrial activity to the south-west of Castleblayney town. The remaining lands in the area are currently used for residential and agricultural purposes.

In terms of waste management, the receiving environment is defined by Monaghan County Council as the local authority responsible for administering waste management activities in the area. This is governed by requirements as set out in the North East Region Waste Management Plan 2005 – 2010. This current plan is being evaluated under the transposing regulations (S.I. 126 of 2011) of the Waste Framework Directive (2008/98/EC). A new Regional Waste Management Plan for the Connacht-Ulster Region has been issued for public consultation which will cover the Monaghan area as well as Galway, Mayo, Sligo, Roscommon, Leitrim, Donegal and Cavan. Until the new regional plan is implemented the current plan will remain in place.

The current plan addresses all areas of waste management – from waste prevention and minimisation, to collection, treatment, recovery and final disposal and is guided by International, EU and Irish legislation and policy on waste management. The document sets a target for waste management in the region of:

- 43% Recycling
- 39% Energy Recovery
- 18% Disposal

These targets are overarching of all waste sectors and include the commercial and industrial (C&I) sector which would be most relevant to the Kingspan facility.
The plan sets a primary objective to further increase the recycling of C&I waste in the North East Region and outlines additional objectives to:

- "Adopt commercial waste bye-laws to provide for the presentation of commercial/industrial waste in a source segregated manner";
- Ensure that "existing Recycling Centres will, where practical, accept commercial waste on a fee paying basis";
- Ensure that "consideration will be given to the provision of new facilities which will cater for waste not provided for in the collection system such as WEEE, C&D type waste and hazardous materials such as batteries. The cooperation of the business sector will be sought in the provision of these facilities"; and
- "To require the collection of source segregated organic waste from commerce and industry".

The plan Evaluation Report issued in December 2012 reported that approximately 56% of C&I waste was sent for disposal in 2010, a large proportion of which was biodegradable waste. It is anticipated that this percentage will have decreased significantly since 2011 with the introduction of the Waste Management (Food Waste) Regulations for commercial premises and the commissioning of Indaver’s Waste to Energy facility in Duleek, Co. Meath.

The evaluation report recommended the continued and increased enforcement and regulation of the management and reporting of commercial waste and that local policy objectives be amended to take account of legislative changes brought about by the Waste Framework Directive Regulations and the Waste Management (Food Waste) Regulations. The report also recommended to adopt and enforce the material specific targets of the waste packaging regulations and reduce the major producer exemption threshold from 25 tonnes to 10 tonnes.

The external receiving environment can, therefore, be characterised as one where there is increasing awareness and responsibility on the commercial and industrial sector to provide accurate data on waste generation and to enforce source segregation and collection of all waste streams.

13.3.1 Existing Site Waste Management

The existing internal environment, in terms of baseline establishment for this waste chapter, is an active manufacturing facility with written procedures for facility waste management and existing contracts with approved waste management contractors. The types and quantities of waste materials generated by the manufacturing, dispatch and administration operations are well defined and are documented by Kingspan’s systems assurance team.

The facility is managed in accordance with Kingspan’s Integrated Management System (IMS) incorporating the company’s Environmental Management System (EMS) which is accredited to ISO14001. There are written procedures (Integrated Work Procedures or IWPs) within the system that are specific to waste management including Handling and Storage of Hazardous Waste/Hazardous Waste Containers/Items and Handling and Storage of Non-Hazardous Waste. The company’s EMS Policy Statement also states a commitment to implement the waste hierarchy and to reduce waste by-products.

The hazardous and non-hazardous waste materials in Table 13-1 were generated at the Kingspan facility during 2014 and were reported to the EPA as part of the company’s 2014 AER. Figure 13-1 shows the total waste breakdown in graphical form.
Table 13-1  Total Waste Generation at Kingspan Facility in 2014 (note: * denotes hazardous)

<table>
<thead>
<tr>
<th>Waste Description</th>
<th>EWC Code</th>
<th>Quantity (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper and Cardboard Packaging</td>
<td>15 01 01</td>
<td>13.9</td>
</tr>
<tr>
<td>Wooden Packaging</td>
<td>15 01 03</td>
<td>9.1</td>
</tr>
<tr>
<td>Plastic Packaging</td>
<td>15 01 02</td>
<td>17.43</td>
</tr>
<tr>
<td>Insulation Materials</td>
<td>17 06 04</td>
<td>313</td>
</tr>
<tr>
<td>Mixed Municipal Waste</td>
<td>20 03 01</td>
<td>28</td>
</tr>
<tr>
<td><strong>Total (non-hazardous)</strong></td>
<td></td>
<td><strong>381.43</strong></td>
</tr>
<tr>
<td>Waste Adhesives and Sealants*</td>
<td>08 04 09</td>
<td>4.4</td>
</tr>
<tr>
<td>Paints, Inks and Resins*</td>
<td>20 01 27</td>
<td>10.3</td>
</tr>
<tr>
<td>Cloths, Wipes, Filters, Absorbents*</td>
<td>15 02 02</td>
<td>2.2</td>
</tr>
<tr>
<td>Packaging containing Residues of or contaminated by Hazardous Substances*</td>
<td>15 01 10</td>
<td>0.108</td>
</tr>
<tr>
<td>Paints and Varnishes*</td>
<td>08 01 11</td>
<td>0.12</td>
</tr>
<tr>
<td>Waste Ink*</td>
<td>08 03 12</td>
<td>0.043</td>
</tr>
<tr>
<td>Aqueous Sludges*</td>
<td>08 04 13</td>
<td>0.976</td>
</tr>
<tr>
<td>Gases in Pressure Containers*</td>
<td>16 05 04</td>
<td>0.091</td>
</tr>
<tr>
<td>Aqueous Liquid Waste*</td>
<td>16 10 01</td>
<td>1.104</td>
</tr>
<tr>
<td><strong>Total (hazardous)</strong></td>
<td></td>
<td><strong>19.34</strong></td>
</tr>
<tr>
<td><strong>Total Waste</strong></td>
<td></td>
<td><strong>400.77</strong></td>
</tr>
</tbody>
</table>

Figure 13-1  Illustration of Total Waste Breakdown at Kingspan Facility in 2014

There are a number of contractors currently engaged by Kingspan to manage their facility waste materials. These are:

<table>
<thead>
<tr>
<th>Contractor Name</th>
<th>National Waste Collection Permit No.</th>
<th>Waste Facility Permit/Waste Licence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxigen Environmental Ltd.</td>
<td>NWCP0-08-01106-03</td>
<td>W0144-01</td>
</tr>
<tr>
<td>Dee Environmental Services Ltd.</td>
<td>NWCP0-09-10626-01</td>
<td>W0054-02</td>
</tr>
<tr>
<td>(Waste Broker)</td>
<td>(Guinan Haulage Ltd.)</td>
<td>(SRCL Ltd.)</td>
</tr>
<tr>
<td>Rilta Environmental Ltd.</td>
<td>NWCP0-09-01192-02</td>
<td>W0192-03</td>
</tr>
</tbody>
</table>

Table 13-2  Current Waste Management Contractors at Kingspan Facility

Waste materials in the manufacturing and storage areas of the site are segregated and stored in waste receptacles prior to collection by one of the above contractors. Waste insulation materials, generated primarily from the cutting process, are compacted into briquettes to reduce the waste volume prior to collection. Hazardous waste is stored inside the manufacturing warehouse in a bunded area (Bund L). Waste oils are stored externally in self-bunded tanks.
Typical office waste material generated from activities in the administration building is collected in area waste stations within the building and transferred to the building waste storage area on a regular basis by the office maintenance staff.

13.4 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

Kingspan manufactures insulation boards for use in all elements of the building industry and building types using a number of organic chemicals in the production process.

The proposed development comprises primarily of the installation of an RTO to treat air emissions from the manufacturing process as well as foundation works, utility connections and exhaust stack with associated scrubber. An additional 6 m³ storage tank will be installed for sodium hydroxide used in the equipment scrubber/neutralisation system. Appropriate containment to prevent any impact on the environment arising from accidental spills will be introduced. There will also be slight reconfiguration and extending of two existing stacks within the manufacturing building roof.

The unit footprint will be approximately 5 m wide, 18 m long and less than 4 m in height. The absorber unit will extend to 10 m high and the exhaust stack will extend beyond the adjacent building roofline to 12 m high. The unit will be installed on an existing concreted area with new concrete installed. The main manufacturing building will shield the RTO from all angles to domestic housing. The unit will only be visible from the adjacent HGV site access road.

During construction works for the proposed installation, the excavation of existing concrete and sub-base materials for the equipment foundations will generate small volumes of waste materials. Similar waste material will also be generated in excavating trenches for utility connections. The RTO will run on LPG which will be supplied from the existing site storage tank and will require connection into the existing site water supply for the quench system. In addition, the installation works are likely to generate typical construction waste materials from excess material offcuts, new equipment packaging and construction staff presence (i.e. food waste).

Once installation and commissioning of the equipment is complete, there will not be any regular waste materials generated from its operation. The quench system process of rapidly reducing the temperature of the exhaust from the oxidiser to prevent complex, chlorinated hydrocarbons from being formed will generate a liquid wastewater effluent. This effluent discharge, comprising principally of chloride salts in water (saline solution), will be sent directly to the site foul waste network and is discussed in more detail in Chapter 10 Water & Hydrology.

13.5 POTENTIAL IMPACT OF THE PROPOSED DEVELOPMENT

A small volume of soil & stones and general construction waste materials are likely to be generated as a result of the proposed development but these are expected to be minor in comparison to the overall waste volume currently generated at the facility annually. The current process for the management of general waste, packaging and timber can easily be continued during the construction phase of the proposed development. Existing waste receptacles can be used and collection frequencies increased, where necessary.

Additional waste streams likely to be generated, which are not currently being collected at the site, such as soil & stones, concrete, hard plastic and metals will require separate waste collection receptacles to ensure that the maximum recovery potential of the waste is
achieved. As with any soil excavation, there is potential for the soil and sub-base material which is excavated to be contaminated. Any potentially contaminated material encountered will have to be classified and disposed of in accordance with EC Council Decision 2003/33/EC and EC Council Directive 1999/31/EC, which establish criteria for the acceptance of waste at landfills. The groundwater and soil quality baseline study carried out in February 2015 and presented in Chapter 10 Water & Hydrology did not identify any contaminants in the soil.

There are no known asbestos containing materials (ACM’s) present on site, however asbestos was found in the previous administration building which was rebuilt in 2008. In the event that any suspect asbestos is encountered during the construction/demolition works, an asbestos specialist will be engaged to assess the building and recommend removal procedures.

A carefully planned waste management strategy during the construction phase will ensure that the impact on the environment will be neutral, short-term and imperceptible. Waste generation rates will be presented in Section 13.8.

As outlined previously, there will be no additional regular waste material generated after commissioning of the RTO so it can be concluded that there will be no environmental impact in the long-term.

13.6 DO-NOTHING SCENARIO

This section considers the proposed development in the context of the likely waste impacts on the receiving environment should the development not take place.

There are existing procedures, processes and contracts in place for the management of waste materials at the Kingspan facility. In addition, no issues have been reported against the facility in respect of waste management. Conformity with recent changes in waste legislation identified previously along with a new regional waste management plan will ensure that the facility continues to operate in accordance with best waste management practices and continues to have a neutral impact on the environment. For the Kingspan facility, the current operations represent the ‘Do-Nothing Scenario’.

13.7 REMEDIAL & MITIGATION MEASURES

The proposed development has taken account of the potential impact to the environment from waste generated during both the construction and operational phases. Measures have been incorporated into the design of the project to mitigate the potential generation of wastes from the installation process. These measures are as follows:

- Concrete rubble and soils excavated as part of foundation works for the RTO and trenches for connection to utilities will be reused where possible within the project. The opportunities for reuse within the site will be limited as the facility is fully operational at present but potential sources for reuse will be sought off-site locally to avoid disposal.
- All ready-mixed concrete will be brought to site by truck and pre-planned to ensure the correct quantities are ordered and to eliminate having excess material which will have to be disposed of as waste. A risk assessment for concreting works will also be prepared including measures to prevent surface water contamination and uncontrolled releases of concrete.
• Design changes in relation to stack reconfiguration for the proposed development (A2-8 and A2-14) and reconfiguration of stacks A2-5 and A2-12 have been prepared with due consideration for minimal change and, as a result, minimum generation of waste.

• European legislation on packaging and packaging waste will reduce the amount of plastic/cardboard etc. waste that will be generated on site as part of delivery of the RTO and associated equipment to site. This packaging waste will be disposed of in line with current processes for this type of waste on site.

• The RTO being proposed for installation at the site has been chosen based on Best Available Technology (BAT) principals and will significantly improve the environmental impact of air emissions from the site. The treatment process does not generate any regular solid waste and principally generates a saline liquid effluent which is suitable for discharge to sewer. Periodically (i.e. every couple years), the acid gas scrubber may require the removal of scaled salt build-up. Such waste will be containerised, of small quantity and will be managed in accordance with current site waste management procedures.

13.8 PREDICTED IMPACT OF THE PROPOSED DEVELOPMENT

Existing facility waste generation types and volumes as outlined in Section 13.3.1 will not change as a result of the proposed development, either during the construction or operational phases.

The following waste types are expected to be generated as a result of construction works required for installation of the RTO:

<table>
<thead>
<tr>
<th>Waste Material</th>
<th>EWC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Non-Hazardous:</strong></td>
<td></td>
</tr>
<tr>
<td>Concrete</td>
<td>17 01</td>
</tr>
<tr>
<td>Wood and plastic</td>
<td>17 02</td>
</tr>
<tr>
<td>Metals (including their alloys)</td>
<td>17 04</td>
</tr>
<tr>
<td>Soil, stones</td>
<td>17 05</td>
</tr>
<tr>
<td><strong>Hazardous:</strong></td>
<td></td>
</tr>
<tr>
<td>Electrical and electronic components</td>
<td>16 02</td>
</tr>
<tr>
<td>Other construction and demolition wastes potentially containing dangerous substances</td>
<td>17 09 03</td>
</tr>
</tbody>
</table>

**Table 13-3** General waste types generated during construction and EWCs

The EPA has produced figures for construction and demolition (C&D) waste recorded in the National Waste Database. This included a percentage breakdown of waste showing the percentage of each waste type in the C&D stream. The US EPA has also produced figures for the characterisation of building-related C&D waste.

Table 13-4 shows the breakdown of the C&D waste types (from Irish EPA figures) produced on a typical construction site.
Waste Types | %
--- | ---
Soil & Stones | 83
Concrete | 13
Metals | 2
Other | 2
Total Waste | 100

Table 13-4 Breakdown of Waste Materials typically generated on an Irish Construction Site

Based on the footprint of the proposed equipment (18 m X 5 m) and the depth to bedrock below ground level in this area of 0.8 m, (from site investigation undertaken by AWN Consulting Ltd. in February 2015), it is estimated that approximately 100 m³ of material will be required to be excavated for the RTO foundation. The thickness of concrete in this area was noted as 160 mm, meaning that approximately 12 m³ of concrete waste will be removed. The remaining 88 m³ will comprise of a gravel sub-base and gravelly clays. The site investigation and laboratory soil analysis did not indicate the presence of any contaminants at this location and the typically light industrial nature of the neighbouring facilities would also suggest that this excavated material should be clean. However, in the event that contaminated material is encountered, it will be required to be classified and disposed of in accordance with EC Council Decision 2003/33/EC and EC Council Directive 1999/31/EC, which establish criteria for the acceptance of waste at landfills.

A waste generation model has been prepared to estimate the tonnage of remaining construction materials likely to be generated as a result of the construction works. Waste audit records and data published by the EPA are available to predict waste generation rates for typical developments on a per m² basis and this has been adapted to suit the Kingspan project. The percentage breakdown in Table 13-4 above has then been applied to provide a breakdown of material types.

Note that until final materials and methods of construction have been decided it is not possible to predict with a high level of accuracy the construction waste that will be generated.

<table>
<thead>
<tr>
<th>Waste Types</th>
<th>Tonnes</th>
<th>Approx. Loads</th>
<th>Re-Use %</th>
<th>Recycling Tonnes</th>
<th>%</th>
<th>Disposal Tonnes</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil &amp; Stones</td>
<td>170.8</td>
<td>9</td>
<td>85</td>
<td>145.18</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Concrete</td>
<td>34.56</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>80</td>
<td>27.65</td>
<td>20</td>
</tr>
<tr>
<td>Metals</td>
<td>0.40</td>
<td>1</td>
<td>5</td>
<td>0.02</td>
<td>90</td>
<td>0.36</td>
<td>5</td>
</tr>
<tr>
<td>Other</td>
<td>0.20</td>
<td>1</td>
<td>10</td>
<td>0.02</td>
<td>40</td>
<td>0.08</td>
<td>50</td>
</tr>
<tr>
<td>Total Waste</td>
<td>205.96</td>
<td>9</td>
<td>145.22</td>
<td>28.09</td>
<td>32.65</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 13-5 Estimated Construction Waste Quantities to be generated at the Kingspan Facility

The current process for the management of general waste, packaging and timber can easily be continued during the construction phase of the proposed development. Existing waste receptacles will be used and collection frequencies increased, where necessary. Additional small waste receptacles (e.g. tipper skips) will be brought in to site for the duration of the project to ensure maximum segregation of waste streams. The existing waste contractor will collect and transfer the waste as receptacles are filled.

All waste arisings will be handled by an approved waste contractor holding a current waste collection permit and will be transferred to a facility holding the appropriate certificate of registration (COR), permit or licence, as required. Written records will be maintained by Kingspan detailing the waste arising during the construction phase.
A carefully planned waste management strategy during the construction phase will ensure that the impact on the environment will be neutral, short-term and imperceptible.

As outlined previously, there will be no additional regular waste material generated during the operational phase of the RTO. A minor quantity of waste salt material, as scale build-up in the gas sump of the scrubber tower, is anticipated to be generated on an irregular basis (e.g. during planned maintenance). This volume is unlikely to be more than 2/3 m$^3$ in volume and arise every couple of years. Such salts will be containerised, labelled and removed from site for suitable treatment by a suitably licensed waste contractor. The long-term waste impact can be concluded to be neutral and imperceptible.

13.9 MONITORING

Kingspan’s systems assurance team will monitor source segregation of waste during the construction phase by carrying out regular audits and highlighting the waste management requirements to contractors at the start of the project. As mentioned previously, written records of waste movements will be maintained on site throughout the project.

Kingspan maintain written records and site waste management monitoring procedures on site as part of their existing activities. These waste records are submitted to the EPA as part of their AER. During the construction phase and when the proposed equipment becomes operational, this monitoring process will remain in place.

13.10 REINSTATEMENT

Minor reinstatement of hardstanding around the foundations of the proposed development may be required. There may also be some minor works required to close building façade openings left as a result of reconfiguration of some of the air emission stacks.

13.11 INTERACTIONS

Waste management primarily overlaps with Chapter 10 Soils & Geology in relation to the composition and environmental quality of excavated soil required as part of the project and, as such, any measures identified in Chapter 7 have been considered in this assessment.

As identified in Chapter 6 Material Assets, it is not anticipated that the local waste service capabilities will be negatively impacted by the proposed development.

There are no other significant interactions between waste management and other chapters with this EIS.

13.12 DIFFICULTIES ENCOUNTERED IN COMPILING THE EIS

Waste generation models depend on the accuracy of trends and reported data to make estimations on future waste arisings. While the models are generally accurate, it is important to monitor actual waste generation and make changes to the provisions for storage and collection as necessary.
13.13 REFERENCES

- Monaghan County Development Plan 2013-2019
- North East Region Waste Management Plan 2005 -2010
- DoEHLG, Taking Stock and Moving Forward (2004)
  - European Communities (Waste Electrical and Electronic Equipment) Regulations 2011
  - Waste Management (Registration of Brokers and Dealers) Regulations 2008 (S.I. No. 113 of 2008)
  - Waste Management (Food Waste) Regulations 2009 (S.I. No. 508 of 2009)
- Local Government Act 1994 (and Amendments) and Regulations (S.I. No. 8 of 1994)
- Litter Pollution Act 1997 (S.I. No. 12 of 1997)
14.0 ACCIDENT PREVENTION AND RESPONSE

14.1 INTRODUCTION

This chapter evaluates impacts on the accident prevention and response systems and infrastructure in place at Kingspan with and without the RTO unit in place. The accident prevention procedures at the facility detail the integrated management system (IMS) methods already in place to minimise risks of accidents and protect staff safety, members of the public, public infrastructure such as waste water treatment plant and the environment. Potential unplanned events include fire or explosion from flammable material or vapour accumulation and the spillage of chemicals including chemicals used in production or fuels to provide heat for production processes and buildings.

14.2 STUDY METHODOLOGY

The existing procedures and infrastructure in place to prevent, and if they arise, respond to an unplanned release of chemical that can cause harm to the environment or the public are described in this Chapter. This includes the identification of potential hazards, pathways offsite and protective measures to prevent the offsite movement of chemicals arising from unplanned events. Potential risks associated with the introduction of the RTO unit are then examined and evaluated. Whether modifications to the existing management systems in place are required to prevent or respond to unplanned events have then been identified.

Consequence modelling has been carried out to evaluate the effect of a scenario whereby excess concentrations of volatile organic compounds (VOC) rapidly ignite within the combustion chamber of the RTO and lead to overpressure. The modelling was completed using TNO Effects v9 modelling software. The TNO Multi-Energy Model was used to determine the overpressure consequences. This modelling demonstrates there are no significant hazards to public safety arising from the introduction of the RTO unit.

The volumes of chemicals stored at the Kingspan facility are below thresholds classifying the facility as a SEVESO establishment designed to minimise risks associated with sites storing significant quantities of potentially dangerous chemicals. The Chemicals Act (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2015 that will be in place from June 1st 2015 to implement the SEVESO III Directive (2012/18/EC and its predecessors) are not applicable.

14.3 RECEIVING ENVIRONMENT

This section describes the current systems in place for accident prevention including the procedures which will be maintained and continually improved in future whether or not the proposed RTO unit is introduced.

Kingspan has an Accident Prevention Policy in place. Risk assessments for each factory area have been carried out and employees are made aware of their contents. Emergency response plans are in place to manage potential emergencies including fire and unplanned events including chemical spillage. The plans include identification of the necessary emergency equipment, maintenance of such equipment, regular testing and practise drills.

Practice Drills are carried out according to a pre-determined schedule and the results recorded. Kingspan will review its emergency preparedness and response plans and procedures, in the event of an occurrence of incidents or emergency situation. The site is
manned with personnel from 8am to 12 midnight Monday to Friday. Outside of these hours and at weekends the site is protected by a Preventative Smart CCTV system. This system includes 1) Total Perimeter Security 2) Intruder Alert and Fire Alarm monitoring 3) Process Alarm monitoring 4) Remote Access on gates & doors. The company have also employed a local security firm who are available for emergency call outs.

14.3.1 Accident Prevention Procedures

Kingspan implements and maintains an integrated management system (IMS). The company seeks to meet customer expectations and commits to continual improvement in quality, safety and environmental management in accordance with ISO 9001, ISO 14001, and OHSAS 18001. The site is also preparing for ISO 50001 (energy management). The principle procedures associated with accidents prevention (and response) are identified below:

<table>
<thead>
<tr>
<th>Procedure Reference</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CB IMP 016</td>
<td>Identification of Environmental Aspects &amp; Impacts</td>
</tr>
<tr>
<td>CB IMP 017</td>
<td>Prevention of Environmental Incidents</td>
</tr>
<tr>
<td>SSW PIR CHEM 07</td>
<td>Delivery &amp; Storage of Fuel Oils</td>
</tr>
<tr>
<td>CB IMP 151</td>
<td>Interceptors &amp; Bunding</td>
</tr>
<tr>
<td>CB IMP 152</td>
<td>Handling &amp; Storage of Hazardous Waste, Haz Waste Containers &amp; Items</td>
</tr>
<tr>
<td>CB IMP 153</td>
<td>Handling &amp; Storage of Non Haz. Waste</td>
</tr>
<tr>
<td>CB IMP 158</td>
<td>Notification and Communication of Environmental Incidents</td>
</tr>
<tr>
<td>CB IMP 164</td>
<td>Emergency procedure – Formaldehyde (grab sample)</td>
</tr>
<tr>
<td>CB IMP 181</td>
<td>Emergency Procedure - Pentane</td>
</tr>
<tr>
<td>CB IMP 182</td>
<td>Emergency Procedure – Chemical Spill</td>
</tr>
<tr>
<td>CB IMP 183</td>
<td>Informing EPA of major incident on site</td>
</tr>
</tbody>
</table>

14.3.2 Organisation, Personnel and Training for Accident Prevention

The organisational structure is appropriate to minimise the risk of an accident and to minimise the consequences should one occur. All employees are made aware of the potential for major accidents and are trained, where relevant, in procedures needed to ensure that policy objectives are met. In addition, all contractors’ employees are made aware of the potential for major accidents and their responsibilities in relation to them. They are trained, where relevant, in procedures needed to ensure that policy objectives are met.

All employees are made aware of their responsibilities in the management of major accidents and are selected and trained to ensure that they have the necessary skills and experience to perform their duties. Employees and their designated safety representative have access to relevant safety information and to data on Material Safety Data Sheets. All employees working directly with chemicals receive Chemical Safety Training upon induction. Refresher training is carried out at intervals of three years. All employees are issued with a copy of the Company Safety Statement upon induction and once per year thereafter. Risk assessments have been drafted for each work area on the site and a summary of these are also issued to employees upon induction and once per year thereafter. Risk assessments are reviewed and revised twice per year and the Safety Statement is reviewed and revised on an annual basis.
Feedback from employees is encouraged on major accident issues in the course of training, risk assessment review and Integrated H&S / Environmental audits. Kingspan employees are also encouraged to make suggestions and raise specific major accident concerns, which they may identify during operational activities. The necessary resources are made available for training of management and employees in the prevention of accidents, including major accidents. Systems are in place to co-ordinate the S.H.E Management System and ensure its effectiveness.

Responsibility for setting training schedules for employees lies with Departmental Managers. The Site Training Coordinator is responsible for organising and coordinating training. Departmental Managers are responsible for ensuring that training is carried out in accordance to the training schedule.

14.3.3 Identification of Hazards

Identification of potential hazards allows a response procedure to be put in place and improved accident prevention procedures for specific hazards. The policy of Kingspan with respect to the identification of hazards are:

- The levels of risk are reduced to 'as low as reasonably practicable'.
- Hazards arising from normal and abnormal operations are identified and their likelihood and severity assessed.
- The identification and evaluation of hazards covers all phases of our operations including storage, product transfer and control of emissions to the environment.
- Identification of hazards, their possible consequences and prevention and control measures are detailed in the Company’s Risk Assessments.
- The results of such risk assessments are analysed and areas for improvement identified, prioritised and scheduled. A summary of all Risk Assessments should be issued to all Employees.

14.3.4 Planning for Emergency

When planning for an emergency it is the current policy of Kingspan that:

- Operations are to be carried out in a manner, which serves to protect the community and the company employees from injury or illness and which avoids damage to the environment. This policy extends to protection from major hazards.
- An on-site emergency plan has been prepared and maintained, which details the required response of the company personnel in the event of an accident.
- The emergency plan includes arrangements for contacting the emergency services. The emergency services will in turn contact those people in the surrounding environment that might be affected.
- The relevant personnel are trained in their emergency response duties under the on-site plan, together with first aid and fire-fighting training.
- The emergency plan / emergency evacuation plan is tested periodically and reviewed to ensure their continued effectiveness.
- The company co-operates fully with the local Fire Authority and other emergency services for emergency planning.

14.3.5 Monitoring Performance

In order to ensure the accident prevention procedures are adhered to, Kingspan monitor the performance of compliance. Kingspan has developed, implemented and maintained systems which actively monitor adherence to all safety procedures adopted in order to minimise the risk from accident hazards. Active monitoring of performance includes inspections and
preventative maintenance of safety critical plant, equipment and instrumentation as well as checking compliance with training, instructions and safe working practices.

All accidents and incidents are systematically reported and investigated by the Company’s investigation team. Investigations examine both the immediate cause of an incident and any underlying causes. All accidents and incidents are discussed at Safety Committee Meetings. When an incident has occurred the corrective/preventative action determined by these investigations will be recorded in the Corrective Action Log and implemented to a set deadline to reduce the likelihood of future incidents.

14.3.6 Infrastructure in Place to Prevent Uncontained Spills

A spillage of chemical onsite could present an offsite hazard either through the generation of vapour, by infiltrating the ground, reaching groundwater or by entering a public sewer system. If entering an effluent sewer system, a chemical could reach a sensitive receiving environment via the Castleblayney waste water treatment plant before reaching Lough Muckno. There are currently no discharges to effluent from the site (though the proposed RTO unit will introduce one). A chemical also has the potential to interfere with the waste water treatment plant’s effective operation. If discharged into the storm-water drains, a chemical could be discharged directly to a sensitive receiving environment such as Lough Muckno. In the event of fire, contaminated firewater could be generated which has the potential to be discharged offsite. Breaks in either the effluent or storm-water sewers could also provide a pathway to ground or groundwater.

As a consequence of these potential risks, very stringent procedures are in place to manage chemicals and prevent spills from initially occurring. In addition, physical infrastructure exists to prevent the risk of chemicals reaching the environment or members of the public in the unlikely event of a spill.

All materials are appropriately labelled, segregated and stored with appropriate containment. Delivery areas of bulk chemicals are served by spill aprons with all connections within the spill apron. Spill aprons are dedicated areas where a tanker can be parked over to allow the delivery of chemicals and in the unlikely event of a spill mean chemicals drain to a common collection point. Containment is in place to capture spills within the apron should they occur, storing the full volume of a tanker delivery.

Liquid chemicals are fully bunded with a volume of either 110% capacity of the largest tank or container or 25% of the total volume stored, whichever is the greater. Bunds are containment systems that surround tanks and collect any material in the event of a spill and can comprise concrete structures or plastic units depending on the size of the tanks.

Bunds are checked for integrity as part of a three yearly programme. Bulk raw materials are transferred via pipe with no or limited levels of manual handling of chemicals involved which reduces the potential for spills arising from human error. In future, the integrity programme will incorporate the underground fuel transfer line present on site. Other, smaller volume chemicals are typically stored in protected containers and stored in bunted areas away from vehicle access to prevent the risk of damage from vehicle movements. Incompatible materials are stored in segregated areas. Bulk tanks are also fitted with fill alarms that automatically trip pumps to prevent continued filling of the tank and any spillage of material that could result from overfilling.

Underground pentane chemical transfer lines have double containment with leak detection. Other metal chemical lines are continuously welded to prevent leaks from joints where practical. An inspection programme is also in place to visually inspect any connection points.
Dusty materials or those with the potential to cause litter are stored inside to prevent the potential for wind blowing the material offsite. Any spills of solid materials are cleaned up and removed offsite.

**14.3.7 Infrastructure in Place to Prevent Chemicals Reaching the Receiving Environment**

In the unlikely event of a spill both occurring and not being contained within bunds or spill apron containment areas, concrete and hardstanding is present in all areas of the site to prevent any uncontained spill reaching the ground or groundwater. Gravity will take chemicals towards rainwater collection systems and storm-water sewers. These drains will be isolated by shut off valves to prevent the offsite discharge of chemicals. Additional valves have been proposed to prevent the discharge of water used to quench a fire where the potential exists for chemicals to contaminate such water. Two hydrocarbon interceptors are in place on the outlets of the onsite surface water collection systems as a further protective measure to prevent hydrocarbon fuels and chemicals such as kerosene fuel entering a public storm-water drain.

Spill collection material is also present onsite including the availability of absorbent granules, ‘socks’ and mats to soak up any chemicals.

Together with appropriate storage of chemicals, bunding and spill aprons and the use of hardstanding and a containable storm sewer (once the stop valves are in place), three levels of protection will be present to prevent chemicals including fuels reaching the environment.

No offsite incident involving the spillage of chemicals or fuels has occurred in the history of Kingspan operations at the site. Ground and groundwater monitoring carried out in 2015 has additionally identified no significant contamination.

**14.3.8 Firewater Retention**

Minor engineering works are to be carried out to ensure any firewater generated in the event of a large scale fire is retained onsite. This includes connecting the onsite draining system for the main production area where chemicals are stored to a large underground tank that is currently not in use for other applications. Up to 560 m$^3$ of water used to fight any fire in conjunction with rainfall volumes and any chemicals can be stored in the tank. Additional protective measures being reviewed for feasibility by the company include the use of barriers on doorways to retain any liquid within buildings.

**14.3.9 Emergency Response Procedures**

Emergency response procedures are in place for both specific chemicals and to cover all general chemicals should an accident occur leading to its unplanned release. They include dedicated procedures on the management of pentane, minor chemical spills (classified as spills less than 200 litres) and major chemical spills in the unlikely event of their occurrence. The procedures and appropriate training ensure appropriate and rapid response and clean up. An additional procedure is in place to inform the Environmental Protection Agency (EPA) of any major incidents involving fire, chemical spillage, pollution or any malfunction or breakdown of key control equipment or monitoring equipment.

**14.4 CHARACTERISTICS OF THE PROPOSED RTO UNIT**

Kingspan intends to introduce a regenerative thermal oxidiser (RTO) to the currently operational plant. The RTO will treat organic compounds used in the process. The
compounds are broken down within a carefully controlled system in the presence of heat and air into combustion products including carbon dioxide and water. Oxides of nitrogen and carbon monoxide can be produced from the combustion process. The combustion of one of the VOC’s will generate hydrogen chloride that will be removed by an absorber where the gas is contacted with a water based solution. Treated emissions will then be discharged to atmosphere in a stack 12 m in height.

The proposed RTO abatement system consists of the following components:

1. Inlet stream - Raw gas consisting of VOC to be treated
2. Suction Fans to draw extracted air from the production plant into the treatment unit
3. Combustion chamber with ceramic bed matrix that combusts the VOC and converts them into combustion products, principally water and carbon dioxide (CO₂).
4. A burner that provides heat into the combustion chamber (rating of less than 150 Kilowatts, using clean burning LPG fuel)
5. Cooling quench system (to cool gas prior to the acid gas scrubber system and prevent complex chlorinated hydrocarbon compounds being generated)
6. Washing column dosed with a soda (sodium hydroxide) solution (an acid gas scrubber system that removes acidic components including hydrogen chloride before being discharged to air)
7. Exhaust stack with appropriate monitoring platform, access and sampling points.

Additional details on the RTO unit are included in Chapter 2.

14.5 POTENTIAL IMPACT OF THE PROPOSED RTO

14.5.1 Potential Unplanned Events during Construction

No or extremely low volumes of chemicals are anticipated to be required during construction and risks from chemicals to the receiving environment during this phase are expected to be very low. Earthworks have the potential to increase releases of dusty material to surface waters via roadways and these are described further in the air quality Chapter (Chapter 11).

There are potential health and safety risks arising from the construction phase due to the use of large, mobile machinery and heavy equipment and materials.

14.5.2 Potential Unplanned Events during Operation

Potential Impacts associated with the RTO unit include:

- The risk of chemical spill associated with the storage of circa 6 m³ of caustic solution (sodium hydroxide).
- The introduction of a new pathway to public services and the environment via a discharge of effluent to foul sewer. This could present a pathway for any spills occurring adjacent to the sewer line (e.g. via manholes) or for out of spec discharges from the RTO unit itself.
- The potential for higher emissions to be discharged to air from operation of the RTO outside design specification.
- The risk of overpressure in the RTO from ignition of excess concentrations of VOC (above the lower explosive limit (LEL) of the compounds being treated).
14.6 DO-NOTHING SCENARIO

The Do-Nothing scenario represents continuation of current practice. Accident prevention and response processes will continue to be reviewed and a process of continuous improvement will continue to be in place as part of the site’s IMS certified to ISO 9001 (quality), ISO 14001 (environment) and OSHAS 18001 (health and safety).

14.7 REMEDIAL AND MITIGATION MEASURES

Existing accident prevention and response procedures and infrastructure will continue to be in place on site and extended to include construction and operation of the RTO unit. This includes appropriate containment of the caustic solution tank to prevent the potential for spills. The delivery and transfer of the chemical will continue to be carried out in accordance with the existing procedures for the transfer of chemicals. A lower explosive limit flammability monitor on the RTO will be installed, which will automatically shut down the unit if excess VOC concentrations on the inlet to the RTO are detected to prevent overpressure. The alarms and trips will be set well below the level that can present a risk of such an occurrence. Additional shut off valves will be installed onsite to enable suitable retention volume to be available onsite in the event of fire onsite and to protect surface waters and public sewerage treatment systems.

14.8 PREDICTED IMPACT OF THE PROPOSED DEVELOPMENT

14.8.1 Potential Unplanned Events during Construction

No or extremely low volumes of chemicals are anticipated to be required during construction and risks from chemicals to the receiving environment during this phase are expected to be very low.

There are potential health and safety risks arising from the construction phase due to the use of large, mobile machinery and heavy equipment and materials. Access for vehicles, equipment and materials will be directly from the N2 road. Access through the neighbouring Bree housing estate is now prevented by security barriers ensuring safe separation of vehicle movements and members of the public. Work will also be carried out within the security perimeter of the Kingspan facility itself with no uninvited public access permitted.

14.8.2 Potential Unplanned Events during Operation

Chemical Spill

The introduction of the RTO (the Do-Something scenario) will not significantly change the accident prevention and response procedures from those in the Do-Nothing Scenario. The management practices onsite will hence not require significant modification. Appropriate secondary containment (bunding) around the caustic chemical storage tank equal to 110% of the tank’s volume will be provided and the storage tank will be fitted with overfill protection. Any rainwater falling on concrete hardstanding around the RTO will drain to the existing surface water collection systems and existing protective measures. An existing spill apron will be used to contain any spills from tanker unloading by capturing any leaks in the unlikely event of their occurrence and draining the component into a containment sump. The risk of chemical spill may be incremental to the additional chemical deliveries but is considered to be extremely low given the onsite history and the existing protective measures and procedures onsite.
The current accident prevention and response procedures for Kingspan require only minor amendments for the proposed RTO. For this reason the impact can be considered very low in both the short and long term.

**Introduction of new pathway to sewer**

The tank containment provided will prevent spills of caustic solution from entering the new sewer line being introduced.

The potential for out of spec material to be discharged to sewer exists if controls for the acid gas scrubber (absorber unit) do not operate correctly. The effluent will comprise principally of a saline solution. Potential fluctuations in chloride levels and acidity or alkalinity levels could occur due to the presence of acid gas being scrubbed and from the use of caustic solution. Protective measures to prevent this happening include alarms being fitted to critical control systems to alert the operator of out of specification conditions occurring and to respond accordingly including where necessary the shut-down of the system.

The volume of effluent discharged will be low (<0.6 m³/hr) relative to the flows collected by the sewer system and treated at the Castleblayney wastewater treatment works. The principal component of the water is chloride (‘salt’) with the principal environmental effect being the potential to increase the brackishness of any receiving water. In the event of an ‘out of spec’ discharge occurring, the discharge will be diluted many fold, thereby reducing the concentration of the ‘out of spec’ component. Irish Water who are responsible for the wastewater treatment works will identify conditions as part of their acceptance of the effluent discharge to ensure no adverse impacts from either planned or unplanned discharges occur at the treatment works. Such discharges will not have any negative impact on the ultimate receiving water, Lough Muckno.

The impact can be considered very low in both the short and long term.

**Emissions to Air outside Design Specification**

Higher emissions to air could result from the RTO operated outside design performance specifications. This could arise if temperature of the system is not correct and residence time is lower than desired on the RTO or the acid gas scrubber does not function properly (e.g. due to interruptions to the dosing of the water with caustic solution or insufficient water is supplied to the scrubber unit).

Control systems will be installed to ensure correct operation and prevent such unplanned events from occurring. These alarms will be connected to the control systems that will trigger alerts if operating parameters go outside defined tolerances. Alarms include:

- Blower fault
- Process valves incorrectly positioned
- High / low combustion chamber temperature
- High / low laden air pressure
- High / low combustion air pressure
- High / low laden air differential pressure
- High / low fuel pressure
- Low instrument air pressure

Critical alarms will be programmed to directly shut down the unit as part of the controlled shut down of the unit.
Control instrumentation will include temperature and differential pressure transmitters, a pH controller for the scrubber liquor dosing, level indicators (e.g. in scrubber liquor sumps) and a stack flow meter. An electrically heated purge gas will prevent acid condensate formation in the cold parts of the system and ensure appropriate mixing and treatment of gases. A flame detector will identify if the burner is lit.

In the event of an external grid supply interruption, the existing 250KVA emergency generator onsite will kick in and has sufficient capacity to meet the duty of the RTO to continue operating the fans and controls of the system, thereby minimising the potential for only partial treatment and build up of VOC inside the unit as part of a controlled shut down.

Whilst the unit is shutting down, extracted air from the process will be redirected around the RTO unit and scrubber and discharged direct to air via stack A2-14 without treatment (similar to current baseline). This is an important safety feature of the system. In the event of shut down of the RTO, production will also cease. Bypass events are therefore likely to be rare, of very short duration and discharge rates will be similar to the existing site operation. The impacts associated with any discharge whilst the unit is shutting down will be neutral, slight and short term.

The release of air emissions outside design performance, specification and in turn outside requirements that will be stipulated in any revised IE Licence are expected to be unlikely to occur and if they do occur will only occur for very short periods of time as the RTO unit will be shut down if the unplanned event continues to occur. The impact on human health can be considered to be very low and short term.

**Risk of Overpressure Resulting from Ignition of Excess Levels of VOC**

The risk and consequences of overpressure in the RTO from excess concentrations of VOC (above the lower explosive limit of the compounds being treated) is assessed in this section. Monitoring and automatic shut-down systems will be installed to prevent such an occurrence however and the following is to illustrate the effect assuming no such protection is in place and a condition arises where excess concentrations of VOC within the combustion chamber arise.

Explosion scenarios can result in damaging overpressures, especially when flammable vapour/air mixtures are ignited in a congested area. Consequence modelling was completed using specialist consequence modelling and risk appraisal software to evaluate the potential effects in the unlikely event of such an event occurring. The inputs to the model are described in Table 14-1.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composition of flammable atmosphere:</td>
<td>Blowing agent mixture</td>
</tr>
<tr>
<td>Volume of RTO chamber</td>
<td>17 m³</td>
</tr>
<tr>
<td>Flammable mass is based on stoichiometric mixture of blowing agent and air in the chamber</td>
<td>0.62 kg VOC</td>
</tr>
<tr>
<td>Representative chemical for VCE model input</td>
<td>Isopropane has been used as it has the highest heat of combustion and overpressure consequences are (slightly) greater compared to other agents</td>
</tr>
<tr>
<td>Confined fraction</td>
<td>1.0 (VCE is confined in chamber)</td>
</tr>
<tr>
<td>Curve number</td>
<td>7 strong deflagration Due to high strength ignition source (open flame), and confinement within chamber</td>
</tr>
</tbody>
</table>

**Table 14-1 Vapour Cloud Explosion (VCE) Model Inputs**

The falloff in over pressure with distance is illustrated in Figure 14-1. A very rapid fall off in pressure (and hence consequence) is illustrated such that the effects at the nearest housing that can be affected by an overpressure are much lower than close to the RTO.

**Figure 14-1 Overpressure vs Distance**
It is concluded the resulting overpressure level would cause light to moderate damage to the Shabra Plastics site. The level of individual risk is acceptable when compared to HSA land use planning criteria (HSA, 2010). No significant impacts are expected at any residential dwellings in the area. The 20 mbar (safe distance) level extends to a number of dwellings to the north of the site along Coill Darach. The maximum overpressure level at this location is 22 mbar, just above the safe limit. The worst case expected impact is glass breakage; no structural damage is expected to arise.

Explosion risk will be minimised by the presence of a lower explosive limit monitor.

14.9 MONITORING

In accordance with the Safety, Health, and Welfare at Work (Construction) Regulations, 2006 (SI No. 504 of 2006), a safety management system will be put in place on-site to minimise and monitor any risks to both construction personnel and site visitors. The construction compound within the Kingspan site will not be accessible to the public and will have strict procedures in place for allowing entrance to visitors and contractors. As no chemicals will be involved during the construction phase, negligible risks are presented by chemicals to the environment.

The operation of the RTO will be completely automated, connected to the factory and a remote Ethernet link installed direct to the manufacturer. The Ethernet link enables specialist support to always be available to monitor operating parameters and modify the RTO’s operation if required. Controls include automated start up and shut down as appropriate. Critical alarms will be programmed to directly shut down the unit should the unit not operate with strictly defined performance parameters. This includes the LEL monitor described previously.

Emissions to air will be monitored in accordance with any revised Industrial Emissions Licence to demonstrate emissions to air do not have any potential adverse impact on human health or the environment.

Safety and environmental indicators will continue to be tracked to assess the effectiveness of the IMS procedures and environmental and safety protection systems in place. These include indicators to demonstrate how well preventative measures are considered and planned (leading indicators) and indicators to assess the frequency and significance of unplanned events in the unlikely event of them arising (lagging indicators).

14.10 INTERACTIONS

Unplanned events have the potential to interact with a variety of environmental aspects covered by this EIS. They include: Population and Human Health (Chapter 5); Material Assets (Chapter 6); Land, Soils, Geology and Hydrogeology (Chapter 9); Water and Hydrology (Chapter 10); and Air quality and Climate (Chapter 11).

14.11 REINSTATEMENT

Following construction, all hardstanding in and around the RTO and sewer lines will be reinstated to ensure no pathway to ground is present.
14.12 DIFFICULTIES ENCOUNTERED IN COMPILING THE EIS CHAPTER

No difficulties were encountered in compiling this chapter.
14.13 REFERENCES