9 Air, Odour and Climate

9.1 Introduction

This air quality chapter describes the outcomes of the air quality, odour and climate impact assessment that was carried out to assess the possible impacts from the Construction and Operational stages of the Proposed Development with respect to relevant guidelines.

The likely impacts on air quality and climate from the construction phase of the planned development have been qualitatively evaluated. The outcomes of this assessment were used to suggest appropriate mitigation measures to be employed during the construction phase to reduce potential impacts.

With regard to the operational phase, air dispersion modelling was completed to assess the impact of emissions from the planned air and odour emissions points associated with the Anaerobic Digestion Facility to local ambient air quality pollutant concentrations. The location and magnitude of the worst-case ground level concentrations for each pollutant were also identified.

The Proposed Development of an Anaerobic Digestion Facility on a site of *ca.* 4.0 hectares is located in the townland of Glenloughaun, Co. Galway. The Proposed Development will accept and treat 90,000 tonnes per annum of locally sourced agricultural manures, slurries and crop-based feedstocks to produce grid quality biomethane (renewable natural gas) suitable for direct injection into GNI's distribution network. The renewable natural gas (RNG) produced at the facility will be used as a direct replacement for conventional natural gas and in doing so contribute towards the Government's aspiration to develop 5.7TWh of indigenous biomethane production. In addition to RNG, the facility will produce a nutrient rich biobased fertiliser which can be used as a direct replacement for fossil fuel derived fertiliser. The facility will also be specified to allow the recovery of biogenic carbon dioxide (CO_2).

The development will consist of the following:

- Demolition and site clearance works including the removal of an existing shed (with a GFA of c. 126.8 sq.m), and adjacent hard standing areas and tank structure, located centrally on the site.
- Construction of 2 no. primary digesters (with an overall height of c. 12.1m), a pump house (with a GFA of c. 115.3 sq.m), and 2 no. post digester tanks (with an overall height of c. 12.1m), located in the northwestern section of the site.
- Construction of 2 no. prepits (c. 4.3m in height), a pasteurisation buffer tank (c. 4.3m in height), and a pasteurisation unit (with a maximum height of c. 4.2m), located to south of the primary digesters, within the western section of the site.
- Construction of a digestate storage tank (c. 16.4m in height) located centrally on site, to the southeast of the primary and post digester tanks.
- Construction of a digestate treatment building and a feedstock reception building (with a height of c. 12.1m and a GFA of c. 1,703.7 sq.m) with an odour abatement system (with a height of c. 13m to top of odour abatement stack), located in the southwestern section of site.
- Construction of combined heat and power (CHP) unit (c. 2.6m in height and c. 5.6m in height to flue, with a GFA of c. 38.53 sq.m), a biogas boiler (c. 2.6m in height and c. 5.6m in height to flue, with a GFA of c. 12.74 sq.m), a backup boiler (c. 2.6m in height),

and a gas treatment system (c. 4.2m in height), located in the southeast section of the site.

- Construction of a CO2 liquefactor (with an overall height of c. 10.7m to top of storage vessels), and an emergency/ safety flare (c. 11.3m in height), a grid injection unit (with a height of c. 2.8m and a GFA of c. 21.7 sq.m), a fuel storage tank (c. 2m in height), and a propane tank compound accommodating 2 no. propane tanks (c. 1.6m in height), located in the southern section of the site.
- Construction of roofed silage clamps (with a GFA of c. 665.7 sq.m and a height of c. 8.7m), located centrally on site.
- Construction of a two-storey office building (with a GFA of c. 327.4 sq.m and a height of c. 11m) and an ESB substation (with a GFA of c. 23.5 sq.m and a height of c. 3.4m), within the eastern section of the site, adjacent to the site entrance.
- Alterations to the adjacent local road frontage including improved access arrangements and boundary setback to allow for improved access and safety.
- Associated and ancillary works including parking (8 no. standard, 3 no. EV and 1 no. accessible parking spaces and bike storage for 12 no. bikes), a weighbridge, solar PV arrays at roof level, wastewater treatment equipment, bunding and surface treatments, attenuation pond, boundary treatments, lighting, services, drainage, landscaping, and all associated and ancillary works.

9.2 Consultation

ORS have been commissioned to assess the potential effects of the Proposed Development in terms of air quality/climate and odour during the construction and operational phases.

The principal members of the ORS EIA team involved in this assessment include the following persons:

- **Project Scientist and Lead-Author:** Andrew Evans – B.A. (Geography & Economics), MSc. (Sustainable Energy & Green Technologies). Current Role: Environmental Consultant. Experience *ca.* 8 years.
- **Project Consultant and Co-Author:** Christopher Carr (Irwin Carr) – B.Sc. (Environmental Health), Post-Grad Diploma (Acoustics & Noise Control), MIAQM, MIEnvSc. Current Role: Consultant. Experience *ca.* 11 years.
- **Project Lead & Reviewer:** Oisín Doherty – B.Sc. (Geography with Environmental Science), MSc. (Environmental Management), CEnv, MIEnvSc. Current Role: Chartered Environmental Consultant. Experience ca. 15 years.

Consultation between ORS and other members of the planning/design team was undertaken to obtain information required to assess the potential construction and operational phase effects on local air quality and climate.

9.3 Assessment Methodology and Significance Criteria

9.3.1 Desktop Study

A desk-based assessment method was used to assess baseline air quality for the receiving environment of the proposed site. The baseline information that is detailed in this section of the assessment was obtained from publicly available sources.

The following documents and sources were referenced:

- EPA Ambient Air Monitoring Station Data (EPA web page)
- Air Quality in Ireland Reports 2017 – 2023 (EPA web page)
- Meteorological Data 2016 – 2025 (Met Éireann)
- Composting and Anaerobic Digestion Association of Ireland (CRÉ)
- Local Terrain Data (OSI)
- Government of Ireland (2024) Climate Action Plan 2024
- Other Maps and plans published by the Ordnance Survey of Ireland (OSI)
- UK Highways Agency (2007) Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1 - HA207/07 (Document and Calculation Spreadsheet)
- World Health Organisation (2006) Air Quality Guidelines - Global Update 2005 (and previous Air Quality Guideline Reports 1999 and 2000)
- Institute of Air Quality Management (IAQM) (2024) Guidance on the Assessment of Dust from Demolition and Construction Version 2.2
- Reports, maps and data published by the Environmental Protection Agency (EPA).
- Hanrahan, P (1999a) The Plume Volume Molar Ratio Method for Determining NO2/NOX Ratios in Modelling – Part 1: Methodology J. Air and Waste Management Assoc. 49 1324-1331
- Hanrahan, P (1999b). The Plume Volume Molar Ratio Method for Determining NO2/NOX Ratios in Modelling – Part 21: Evaluation Studies J. Air and Waste Management Assoc. 49 1332-1338
- UN Economic and Social Council, Executive Body for the Convention on Long-Range Transboundary Air Pollution, ECE/EB.AIR/WG.5/2007/3
- Galway County Development Plan 2022 - 2028

9.3.2 Assessment Methodology and Significance Criteria

This chapter was prepared using the following guidance documents:

- Institute of Air Quality Management (IAQM) (2024) Guidance on the Assessment of Dust from Demolition and Construction Version 2.2.
- Biosurf - S. Majer, K. Oehmichen and F. Kirchmeyr (2016) D5.3 Calculation of GHG Emission Caused by Biomethane.
- EPA, (2023) Ireland's Provisional Greenhouse Gas Emissions
- EPA, (2024) Ireland's Greenhouse Gas Emissions Projections
- Economic Assessment of Biogas and Biomethane in Ireland, SEAI
- EPA, (2022). Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.
- EPA (2020) Air Dispersion Modelling from Industrial Installations Guidance Note (AG4).
- EPA (2021) Air Guidance Note 5 (AG5) Odour Impact Assessment Guidance for EPA Licensed Sites.

- EPA (2019) Odour Emissions Guidance Note (Air Guidance Note AG9)
- Transport Infrastructure Ireland (2022) – Air Quality Assessment of Proposed National Roads – Standards.
- Transport Infrastructure Ireland (2011) Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (DoEHLG)
- Transport Infrastructure Ireland (2025) TII Road Emissions Model (REM): Model Development Report GE-ENV-01107
- UK National Highways (2024) LA 105 Air quality (vertical barriers) (Design Manual for Roads and Bridges)
- UK DEFRA (2018) Part IV of the Environment Act 1995: Local Air Quality Management (LAQM) Technical Guidance (TG16).
- UK DEFRA (2016a) Part IV of the Environment Act 1995: Local Air Quality Management (LAQM). Policy Guidance (PG16).
- UK Highways Agency (2007) Design Manual for Roads and Bridges, DMRB Screening Model (v1.03c) (Calculation Spreadsheet).
- Clean Air for Europe (CAFÉ) Directive 2008/50/EC.
- S.I. No.180 of 2011, Air Quality Standards (AQS) Regulations 2011.
- UK Dep. BEIS Combined Heat and Power – Environmental A detailed guide for CHP developers – Part 3
- EPA (2024) License Application Instruction Note 2 (IN2) (DRAFT) Assessing the Impact of Ammonia Emissions to Air and Nitrogen Deposition from EPA licensable activities on European Sites.
- EPA (2024) License Application Instruction Note 1 (IN1) Assessing the Impact of Ammonia Emissions and Nitrogen Deposition from the Intensive Agriculture Installations on European Sites.

Detailed legislation and standards relating to air quality and odour relevant to the evaluation are addressed in the sections below.

The significance criteria used throughout this assessment to rate the impacts to air quality, odour and climate are based on those outlined within the EPA Guidance document Guidelines on the information to be contained in Environmental Impact Assessment Reports (2022).

Construction Emissions – Applicable Limit Values for Dust and Dust Deposition

The EU ambient air quality standards outlined in **Table 9.1** have set ambient air quality limit values for PM_{10} and $PM_{2.5}$ dust particles which are less than 10 microns and are of greatest concern when considering human health.

In relation to larger dust particles fractions that can give rise to unwanted dust spoiling, there are no statutory guidelines regarding the maximum dust deposition levels that may be generated during the construction phase of a development in Ireland.

Generally, the German TA-Luft standard for dust deposition (non-hazardous dust) (German VDI, 2002) is applied and states a maximum permissible emission level for dust deposition of 350 mg/m^2/day averaged over a one-year period at any receptors outside the site boundary.

Recommendations from the Department of the Environment, Heritage and Local Government (DOEHLG, 2004) apply the Bergerhoff limit of 350 mg/m^2/day to the site boundary of quarries. This limit value can be applied with regard to dust impacts from construction of the development.

Construction Emissions – Methodology for Assessing Ambient Air Impacts

During the construction stage of the Proposed Development the most likely effect on air quality will be from construction dust emissions (nuisance dust and PM_{10}/$PM_{2.5}$ emissions) associated with activities such as excavations, infilling materials, stock piling and movement of vehicles. For the purposes of this assessment the Institute of Air Quality Management (IAQM) construction dust guidance (IAQM, 2024) was utilized.

To assess the potential effects accordingly, construction activities are divided into 4 categories:

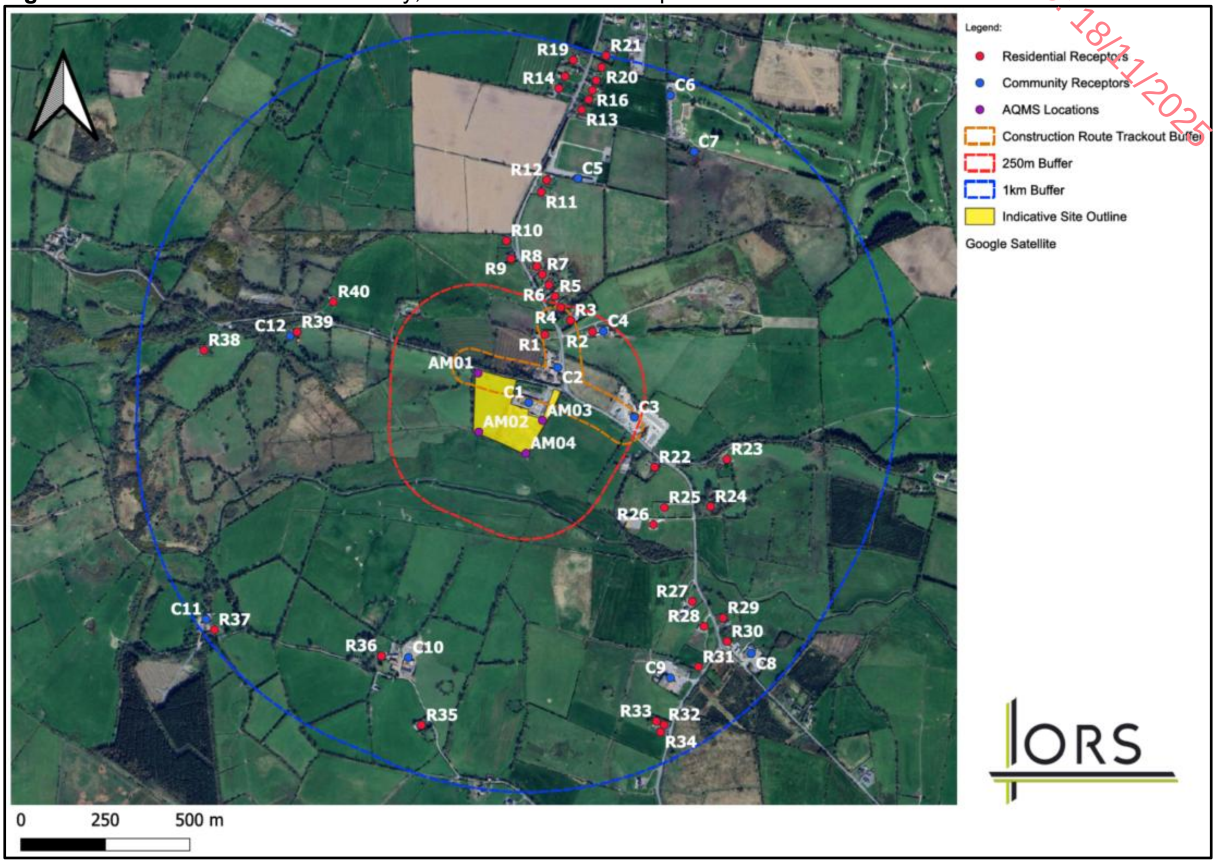
- Demolition (not required in this assessment)
- Earthworks
- Construction; and
- Trackout (described as the transport of dust and dirt from the construction / demolition sites onto public road network, where it may be deposited and then re-suspended by vehicles using the network).

A qualitative assessment of construction dust has been undertaken in line with the IAQM 2024 guidance. The study area for this assessment was 250m from the Proposed Development boundary and or within 50m of the roads used by construction vehicles on the public road up to 250m from the site entrance. The first stage is to assess the requirement for an evaluation. The requirement for an assessment is based on distances of human and/or ecological receptors of the site.

Human receptors are largely residential houses located to the North and Southeast of the site. The nearest human and residential receptor to the site is a residential house located approximately 160m North of the proposed site boundary. Dust will be created during the construction of the Proposed Development which may have adverse effects on local sensitive receptors e.g., residents living nearby.

The construction dust assessment study area including identified receptors is included as part of **Figure 9.1.**

Figure 9.1: Site construction boundary, buffer zones and receptor locations



The construction on site effect has been assessed qualitatively to evaluate the risk of dust effects and decide suitable mitigation measures to control risk appropriately. The degree of mitigation advised for each activity is then established, being proportionate with the associated risk (Low, Medium or High risk). In accordance with the IAQM construction dust guidance, mitigation is advised for all risk levels.

Construction phase traffic also has the potential to affect air quality and climate. The UK DMRB guidance (UK Highways Agency, 2024), states that the following traffic scoping criteria shall be used to determine whether the air quality impacts of a project can be scoped out or require an assessment based on the changes between the do something traffic (with the project) compared to the do minimum traffic (without the project) in the opening year:

- Annual average daily traffic (AADT) ≥ 1000; or
- Heavy duty vehicle (HDV) AADT ≥ 200; or
- A change in speed band; or
- A change in carriageway alignment by ≥ 5m.

The construction stage traffic will not increase current levels by 1,000 AADT or 200 HDV AADT and therefore does not meet the above scoping criteria. Consequently, a detailed air assessment of construction stage traffic emissions has been scoped out from any further assessment as theeffects are considered to be not significant..

The use of the UK guidance is recommended by the TII (2011) in the absence of specific

Irish guidance. This approach is considered best practice and can be applied to any development that causes a change in traffic.

Odour Emissions

Appendix 9.4 gives background on odour as a nuisance and describes how the possibility for odour occurrences were evaluated for this EIAR. Dispersion modelling has been employed to calculate the impacts of the Proposed Development on the neighbouring environment with respect to odour and the assessment has been completed with reference to the EPA guidance document titled EPA Air Dispersion Modelling Guidance Note (AG4), (EPA, 2020). Dispersion modelling information regarding input and methodology are described in **Section 9.3.4**.

A full description of the odour abatement system can be found in **Chapter 2 Section 2.2.9.**

The UK Environment Agency (Environment Agency, 2011 and adapted for Irish EPA use) has published detailed guidance on appropriate odour threshold levels based in part on the offensiveness of the odour. Specific exposure criteria with respect to the "annoyance potential" which is described as "the likelihood that a specific odorous mixture will give reasonable cause for annoyance in an exposed population". Three categories are used to rank industrial sources with regard to their offensiveness, these are "low", "medium" and "high" with exposure criteria linked to each category. Exposure criteria range from 1.5OUE/m^3 for highly offensive sources, 3.0 OUE/m^3 for moderately offensive sources to 6.0 OUE/m^3 for the least offensive sources. There are no details with regard to an anaerobic digestion facility and affiliated odour treatment system covered, however, it is expected to be of medium, therefore a conservative approach has been taken and the exposure threshold criteria has been assumed as worst case at 1.5 OUE/m^3.

Process Emissions

Carbon monoxide (CO), nitrogen oxides (as NO_2), ammonia and odour may be emitted from the development during the operational stage and have been included as part of the ambient baseline monitoring and air dispersion modelling. Sulphur dioxide (SO_2), VOCs, hydrogen sulphide (H_2S), PM_{10} and $PM_{2.5}$ were included in the baseline modelling but not as part of the site-specific air dispersion modelling as emissions of these pollutants are not anticipated. This will be covered in more detail in **Section 9.3.4**.

Details with respect to ambient air quality pollutants are covered below, these sections also cover the assessment for the potential for ambient air quality impacts. Ambient air quality impacts from the Proposed Development on the local environment have been determined using air dispersion modelling, this modelling has been completed in conjunction and compliance with Air Dispersion Modelling from Industrial Installations Guidance Note (AG4), (EPA, 2020).

Ambient Air Quality Standards

National and European statutory bodies have established limit values in ambient air for a variety of pollutants to safeguard and minimise the risk to human health. These limit values are referred to as "Air Quality Standards" and are derived from health and environmental factors. Refer to **Table 9.1** and **Table 9.2** below.

Suitable standards or limit values are applied in terms of compliance to gauge air quality significance criteria. The relevant standards applicable in Ireland include the Air Quality Standards Regulations 2011 (S.I. No 180 of 2011), which transposed the requirements of Directive 2008/50/EC on ambient air quality and cleaner air for Europe, specifically limit values for the pollutants NO_2, PM_{10}, and $PM_{2.5}$.

Directive 2008/50/EC merges the previous Air Quality Framework Directive (96/62/EC) and its successive daughter directives (including 1999/30/EC and 2000/69/EC) and includes ambient limit values for $PM_{2.5}$.

With regard to VOCs, the limit for benzene has been used for the purpose of this project and a worst-case assumption made that all VOCs released are benzene. There will be a variety of VOCs within the process emissions, not limited to benzene. The limit value for benzene has been employed as it is the only VOC with a legislated ambient air quality standard (**see Table 9.1**), the limit value is also quite stringent which makes this approach extremely conservative and robust and grossly overestimates the effect and significance of VOCs.

Table 9.1: Air Quality Standards Regulations 2011 (based on EU Council Directive 2008/50/EC)

Pollutant	Regulation (Note 1)	Limit Type	Value
Nitrogen Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 µg/m³ NO_2
		Annual limit for protection of human health	40 µg/m³ NO_2
		Critical limit for protection of vegetation	30 µg/m³ $NO + NO_2$
Sulphur dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 24 times/year	350 µg/m³
		Daily limit for protection of human health - not to be exceeded more than 3 times/year	125 µg/m³
		Annual and Winter critical level for the protection of ecosystems	20 µg/m³
Carbon Monoxide	2008/50/EC	8-hour limit (on a rolling basis) for protection of human health	10 mg/m³ (8.6 ppm)
Benzene*	2008/50/EC	Annual Limit Value for protection of human health	5 µg/m³
Particulate Matter (as PM_{10})	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m³ PM_{10}
		Annual limit for protection of human health	40 µg/m³ PM_{10}
$PM_{2.5}$	2008/50/EC	Annual limit for protection of human health	25 µg/m³ $PM_{2.5}$

* Expressed as Volatile Organic Compounds (VOCs) in this assessment for worst case analysis.

Table 9.2: EA, UN and EPA Ambient Air Quality Standards

Pollutant	Guidance	Limit Type	Value
Ammonia*	EA, UK H1 Part 2	1-hour average 100%ile	< 2,500 µg/m^3
		Annual average	< 180 µg/m^3
	UNECE	Annual average for protection of sensitive lichens / bryophytes	< 1 µg/m^3
		Annual average for the protection of woodland / heath lands	< 3 µg/m^3
Hydrogen sulphide	EA, UK H1 Part 2	1-hour average 100%ile	< 140 µg/m^3
		Annual average	< 150 µg/m^3
Odour	Irish EPA AG4 & AG9	Expressed as 1 hr average at the 98%ile	< 1.50 OuE/m^3

* Source UN Economic and Social Council, Executive Body for the Convention on Long-Range Transboundary Air Pollution, ECE/EB.AIR/WG.5/2007/3

Methodology for Assessing Ambient Air Effects – Operational Traffic Emissions

A scoping exercise taken from the DMRB document, titled "LA 105 Air quality (vertical barriers)" has been utilised, where the scoping criteria as listed below has been used to determine whether the air quality impacts of the proposed development can be scoped out or require further assessment based on the changes between the do something traffic (with the project) compared to the do minimum traffic (without the project) in the opening year:

1) annual average daily traffic (AADT) ≥ 1,000; or

2) heavy duty vehicle (HDV) AADT ≥ 200; or

3) a change in speed band; or

4) a change in carriageway alignment by ≥ 5 m

This information is obtained from the transport and traffic assessment and civils design reports for the proposed development. As per the guidelines, where the project does not lead to a change in any of the traffic scoping criteria then an air quality assessment shall not be required and can be scoped out.

Where the project triggers the traffic scoping criteria, and the need for an assessment has been concluded, the type of assessment, either a simple or detailed assessment, shall be determined. Where a simple assessment has been deemed appropriate, air quality modelling shall be employed using the DMRB screening tool. This tool was published by the UK National Highways and is used to predict pollutant concentrations at receptor locations near to roads. This screening tool, though withdrawn by the UK National Highways in favour of an as yet publicly unavailable, updated modelling tool, has been noted as still applicable as a screening tool for road traffic emissions to decide whether more detailed dispersion modelling needs to be undertaken. This tool is considered relevant for Irish applications and indeed Transport Infrastructure Ireland (TII) have created a dispersion algorithm, which has replicated the function of the Design Manual for Roads and Bridges (DMRB) screening tool (See report: “TII Road Emissions Model (REM): Model Development Report”)

The DMRB screening model takes input data on annual average daily traffic flow (AADT), annual average speeds, the proportion of different vehicle types, the type of road, and the distance from the centre of the road to the receptor. This data is then utilised to predict pollutant concentrations at receptor locations near to roads. For this Proposed Development, the closest receptor location is used, where the annual mean concentrations of nitrogen dioxide (NO2) and PM10, as well as oxides of nitrogen (NOx) and carbon monoxide are predicted at this receptor location.

Where the scoping criteria is triggered, or the DMRB screening tool predicts exceedances and thus more detailed assessment is needed, air dispersion modelling will be undertaken using AERMOD, which is described in further detail in section 9.3.4.

The TII guidance (2011) states that the air quality assessment must progress to detailed modelling if:

- Concentrations exceed 90% of the air quality limit values when assessed by the screening method; or
- Sensitive receptors exist within 50m of a complex road layout (e.g. grade separated junctions, hills etc).

9.3.3 Field Survey

Onsite monitoring (and subsequent lab analysis as necessary) was carried out for the below parameters to evaluate background levels for the site. To remain as conservative and robust as possible, figures obtained from the closest EPA monitoring station where available, were utilised, as per AG4; these values are greater than results obtained from the onsite monitoring. Onsite results for NH_{3_3} and H_2S were utilised in the absence of data generated from EPA monitoring locations. Data from the Portlaoise monitoring station was utilised for the Carbon Monoxide values and data from the Ballinasloe monitoring station was utilised for the $PM_{10/2.5}$ values. Data from Portlaoise monitoring station was from 26/08/2024-25/09/2024 due to the fact data readings for CO ceased on 25/09/2024. Additionally, Portlaoise is not an accurate representation of the likely CO concentrations at the site due to Portlaoise being an urban centre located in Air Zone D. CO readings from Portlaoise are likely higher to those representative at the proposed site and are therefore conservative. Fieldwork was completed September/October 2024 and consisted of the following elements;

- $PM_{2.5}$ and PM_{10} Monitoring (EPA Monitoring Station)
- NO, NO_2 and NOx Monitoring
- SO_2 Monitoring
- H_2S Monitoring
- NH_3 Monitoring
- CO Monitoring (EPA Monitoring Station)

Table 9.3: Baseline Air Quality Monitoring Data in the Vicinity of Proposed Plant

Compound	Site specific baseline monitoring 11th Sep 24 to 11th Oct 24
Carbon Monoxide 8-hr (Annual Mean) (1 Location)(26/08/2024-25/09/2024)	0.85 (Min 0.57 – Max 1.22) (mg/m³)

Oxides of Nitrogen (Annual Mean) (4 locations)	Avg. 3.95 (Min 2.4 - Max 4.6) (µg/m^3)
Sulphur Dioxide (Annual Mean) (4 locations)	Avg. < 1.64 (Min/Max < 1.64 (LOD)) (µg/m^3)
Particulate matter as PM_{10} (Annual Mean) (1 Location)	Avg. 11.39 (Min 1.25 - Max 38.75) (µg/m^3)
Particulate matter as $PM_{2.5}$ (Annual Mean) (1 Location)	Avg. 7.63 (Min 0.69 - Max 31.39) (µg/m^3)
Ammonia (Annual Mean) (3 locations)	Avg 8.78 (Min 5.93 - Max 12.04) (µg/m^3)
Hydrogen Sulphide (Annual Mean) (4 locations)	Avg 0.11 (Min <0.11 (LOD) - Max 0.11) (µg/m^3)

* Average, minimum and maximum values from 4 individual monitoring locations on site are shown. Monitoring was performed for the month of September/October 2024. All analysis was performed in a UKAS certified laboratory for such analytes.

Site walkover surveys were conducted by ORS consultants on the 11th September 2024 and 10th October 2024 to identify and assess features on site including:

- Site Terrain
- Current Site Odour (Sniff Test according to AG5 EPA Assessment – not used as input as per AG4 guidelines, for evaluation and information purposes only)
- Site receptors

Please refer to **Appendix 9.2 and 9.3** for details of monitoring locations and a further breakdown of monitoring data collected from onsite monitoring.

9.3.4 Impact Assessment Methodology

This section describes criteria applied to the assessment of air quality and odour receptors.

<u>**Methodology for Assessing Ambient Air Impacts from Process Emissions**</u>

AERMOD is an USEPA model which relies on steady-state Gaussian plume theory and is used to evaluate odour and pollutant concentrations linked to industrial emissions. AERMOD is a step up from the Industrial Source Complex-Short Term 3 (ISCST3) model which has been extensively utilised for industrial emissions. Simulation of dispersion in the boundary layer has been improved significantly with AERMOD resulting in a more exact representation of real-world scenarios and therefore increase the precision of the model with respect to maximum ambient concentrations.

EPA Guidance document "Air Dispersion Modelling from Industrial Installations Guidance Note 2020 (AG4)" recommends AERMOD as an applicable model for gauging the impact of odour and air industrial emissions. The dispersion modelling project comprised of the below steps:

- Evaluation of applicable emission data and other related material to run the modelling software.
- Review of background/baseline sulphur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO) etc. concentrations.
- Running the air dispersion model with regard to odour and specified pollutants under maximum/worst case emission setting.
- Reporting of modelled ground level concentrations.
- Review of the impact of the modelled concentrations with respect to relevant air quality limit values

The modelling project has been undertaken using biomethane/natural gas as a fuel source for the CHP and boiler. These have been inputted within the model to operate at maximum concentrations and volumetric flow rates. The abatement stack emission point regarding odour is also based on maximum concentrations and volumetric flow rates. It was also assumed within the model that the CHP, biomethane boiler and odour abatement stack emission points in the plant would be operating 24 hrs per day, 365 days per year.

The model created was used to evaluate concentrations of carbon monoxide (CO), nitrogen oxides (as NO_2) and odour outside the site boundary and how this may affect air quality at various receptor locations.

Model input data relied on details with respect to the physical environment (i.e. terrain, buildings etc.), design details of all industrial emission points situated on site and meteorological data. The model was then able to project odour and ambient air pollutants outside the limits of the site boundary. As this model adopted a robust approach where input parameters have been overestimated (as per AG4 guidance), this will lead to an over-approximation of actual ambient air levels that will occur.

AERMOD Dispersion Modelling Data

The inputs for the dispersion modelling assessment are described in detail in this Section. The site layout, including the nearest residential properties, is shown in **Appendix 9.2**.

AERMOD Dispersion Modelling Package Description

The AMS.EPA Regulatory Model (AERMOD) is the current US EPA regulatory model used to predict pollutant concentrations from a wide range of sources that are present at typical industrial facilities.

The model accepts hourly meteorological data to define the conditions for plume rise, transport, diffusion and deposition. It estimates the concentration or deposition value for each source and receptor combination for each hour of input meteorology and calculates user-selected short term averages. The model also takes into account the local terrain surrounding the facility. Since most air quality standards are stipulated as averages or percentiles, AERMOD allows further analysis of the results for comparison purposes.

Percentile analysis for emissions is calculated for the maximum averages using the AERMOD-percent post-processing utility. This utility calculates the maximum concentration of a pollutant from all receptors at a specific percentile, for a specific period. Employing the percentile facilitates the omission of unusual short-term meteorological events that may cause elevated pollutant concentrations and hence a more accurate representation of the likely average pollutant concentrations over an averaging period.

The following information was input into the model for the prediction of maximum ground level ambient pollutant concentrations from the proposed renewable facility.

Input Parameters

The site layout map, building plans and elevations were used as a template for all sources, relevant structures and the boundary of the facility. Below are general details of the proposed facility.

Odour Emissions

The main source of emissions from the proposed site have been confirmed as:

- Feedstock Reception Building
- Digestate Treatment Building
- Liquid Feed Tanks
- Pasteurisation Tanks

It has also been confirmed that the emissions from each of these potential sources will pass through a proposed Odour Treatment System. The total odour emissions from the Odour Treatment System are based on the maximum odour concentration from the system, as well as the total volume of air passing through the system, as summarised below:

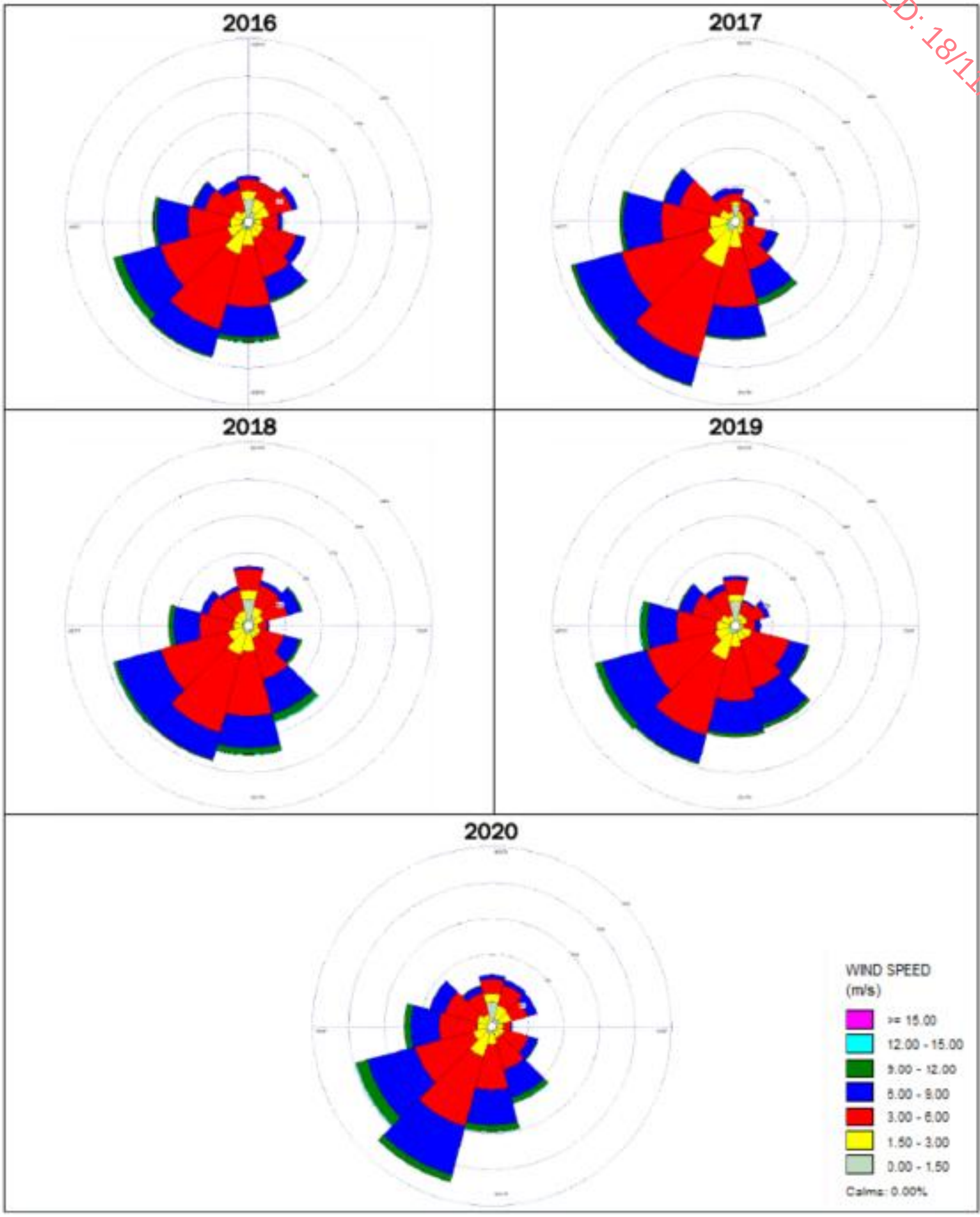
- The maximum odour concentration from the Odour Treatment System is 1,000ouE/m^3.
- The Feedstock Reception Building has a volume of approx. 10,547m^3 and the Digestate Treatment Building has a volume of approx. 8,432m^3, which corresponds to a total volume of 18,980m^3.
- The ventilation and Odour Treatment System will be designed to achieve a minimum 3 no. air changes per hour which corresponds to a flowrate of 56,940m^3/hour, providing adequate air changes in accordance with BAT.
- The Odour Treatment System will be designed to treat 63,772m^3/hour providing an overcapacity of approximately 12% and an odour destruction efficiency of 95-99.5%.

Meteorological Data

Five years of hourly sequential meteorological data was used for the AERMOD dispersion modelling assessment. The closest weather station to the site can be identified on Figure 6.1 of the EPA's AG4 Guidance Note as Gurteen, which has an annual mean wind speed of 4.3m/s.

Gurteen has been deemed representative of the average wind in the vicinity of the site, which allowed for the determination of the predicted overall average impact of emissions from the facility. The windrose data for each individual year is presented in **Figure 9.2** overleaf.

Figure 9.2: Annual Windrose Data – Gurteen



Building Downwash

When one or more buildings in the vicinity of a point source interrupt wind flow, an area of turbulence known as a building wake is created. Pollutants emitted from a relatively low level can be caught in this turbulence, affecting their dispersion. This phenomenon is called building downwash. In order to conduct an analysis of downwash effects of the point sources created to mimic the release of air from the facility, the dimensions/ heights of the proposed buildings on-site were obtained from drawings.

Digital Terrain Data

AERMOD contains a terrain data pre-processor called AERMAP. Receptor and source elevation data from AERMAP output is formatted for direct insertion into an AERMOD control file. The elevation data are used by AERMOD when calculating air pollutant concentrations.

Regulatory dispersion models applicable for simple to complex terrain situations require information about the surrounding terrain. With the assumption that terrain will affect air quality concentrations at individual receptors, AERMAP first determines the base elevation at each receptor and source. For complex terrain situations, AERMOD captures the essential physics of dispersion in complex terrain and therefore needs elevation data that convey the features of the surrounding terrain. In response to this need, AERMAP searches for the terrain height and location that has the greatest influence on dispersion for each individual receptor. This height is the referred to as the hill height scale. Both the base elevation and hill height scale data are produced by AERMAP as a file or files which can be directly inserted into an AERMOD input control file.

A baseline survey was completed at the proposed site location for selected priority pollutants, the current impact of pollutants from other sources in the vicinity of the planned site have therefore been evaluated as part of this input data (i.e. any other emission source facilities in the locality). To remain as robust and conservative as possible the CHP and odour abatement stack were assumed to be in constant operation, in reality there will need to be down time for maintenance, which could be 5 - 7% of the operating year. The CHP, biomethane boiler and odour abatement stack emissions are considered the worst-case results as the flare will only operate for a short duration throughout the full year and will never operate simultaneously.

Process Emissions Data

AERMOD has been utilised to evaluate the air quality impact from the planned odour abatement emission source and also the from the two combustion sources positioned onsite i.e. the CHP and biomethane boiler.

There is also the possibility of emissions to air being generated from the planned gas upgrading plant, planned pressure relief valves, digestor vents at the site however, due to the nature and / or the infrequent use of these emission sources air dispersion modelling was not required to evaluate the possible impact from these sources. Digestor membrane vents contain air only and are used to control the pressure within the double membrane of the dome. There is no release of biogas through the digestor air vents. Pressure relief valves are not intended for routine use onsite. The PRV are only used in the unlikely event of all other gas outlets being simultaneously out of service.

The Biogas Upgrading Unit, CO_2 Liquefaction and Grid Injection Unit (GIU) have been scoped out of the air dispersion modelling as they are designed to be gas tight with no risk of emissions.

The total odour from the Odour Treatment System is detailed in the **Table 9.4** below.

Table 9.4: Odour Emission Rate from Odour Treatment System

Stack	Odour Concentration (ouE/m^3)	Total Volume (m^3/hour)	Total Volume (m^3/second)	Total Odour Emission Rate (ou/s)
Odour Treatment System	1,000	63,772	17.71	**17,714**

It can be seen from the table above that the total odour emission rate from the Odour Treatment System is 17,714ou/s, which has been included as part of the odour model.

Pollutant Emissions

The two main identified sources of atmospheric emissions are the CHP and gas boiler proposed on site.

Table 1.5 details the normalised volume flow (Nm^3/s) for each of the emission points associated with the proposed site.

Table 1.5: Normalised Flow Rates from Stacks

Stack	Actual Volume Flow (m^3/hr)	Normalised Volume Flow (Nm^3/hr)*	Normalised Volume Flow (Nm^3/s)
CHP	7,756	2,813	1.30
Boiler	365	260	0.07

**Normalised volume flow of both stacks is based on 273.15K, 101.3kPa and 5% 02.*

The suppliers have provided information which details the expected level of pollutants from the identified sources.

Table 9.6: Expected Emission Levels from CHP and Gas Boiler (data given by supplier)

Pollutant	Unit	CHP	Boiler
Oxides of Nitrogen (NO_x)	mg/Nm^3	250	93
Carbon Monoxide (CO)	mg/Nm^3	1,000	N/A

Table 7 below relates to the emission concentrations values through the flues associated with

the CHP unit and gas boiler on the proposed site, based on the expected emission levels detailed in the **Table 9.6** above.

Table 9.7: Emission Concentrations values though the flues associated with the CHP units and gas boiler, based on expected emission levels as provided by supplier

Pollutant	CHP Emission Concentration Values (mg/Nm^3)	Boiler Emission Concentration Values (mg/Nm^3)	Stack Emissions (g/s)	
			CHP Engine (1.30 Nm^3/s)	Boiler (0.07 Nm^3/s)
Oxides of Nitrogen (NOx)	250	93	**0.195**	**0.007**
Carbon Monoxide (CO)	1,000	N/A	**0.781**	**N/A**

In line with EPA AG4 Guidance, further assessment of the site has been undertaken to account for the stack emissions operating at 75%, rather than at a maximum which is reflected above. This additional assessment is included in **Appendix 9.5**.

Ammonia Emissions

The ammonia emissions on site are associated with the farmyard manure (chicken litter and cattle manure) that will be stored in the reception building, as well as the storage of digestate fibre in another part of the building. While the different material will be stored in 2 distinct areas, all of the emissions of which will be directed through the Odour Treatment System (OTS).

The emissions from the building will be:

- 2.28ppm, corresponding to a 'pre-scrubber' ammonia concentration of 1.59mg/ m^3.
- 0.45ppm, corresponding to a 'pre-scrubber' ammonia concentration of 0.31mg/ m^3.

The total ammonia from the OTS is detailed in **Table 9.8** below.

Table 9.8 Total ammonia emissions from the OTS

Stack	Ammonia Concentration 'Pre-Scrubber' (mg/m^3)	Ammonia Concentration 'Post-Scrubber' (mg/m^3)	Total Volume (m^3/hour)	Total Volume (m^3/second)	Total Ammonia Emission Rate (g/s)
OTS	1.59*	0.40	35,075	**9.74**	**0.0039**
	0.31	0.08	28,697	**7.97**	**0.0006**

**The applicant has advised that this rise is the ammonia concentration 'pre-scrubber', so a minimum reduction of 75% would then be applied to the concentration, which is considered conservative.*

It can be seen from the table above that the total ammonia emission rate from the Odour Treatment System is 0.0045g/s, which has been included as part of the ammonia model.

Detailed dispersion modelling was carried out for NO_2 and CO. SO_2 has not been modelled for these sources as it has been shown that there is no sulphur content in the fuel of natural gas which is structurally identical to biomethane. The emissions for SO_2 using these systems are therefore negligible (Department for Energy Security and Net Zero and Department for Business, Energy & Industrial Strategy, UK. 2021: Combined Heat and Power – Environmental A detailed guide for CHP developers – Part 3).

Table 9.9: Sources scoped in/out of modelling

Potential Source	Modelled	Justification
CHPs	Yes	Will be emitting to air
Boiler	Yes	Will be emitting to air
Odour Abatement	Yes	Will be emitting to air
Biogas Upgrading Unit	No	Designed to be gas tight – no risk of emissions
CO_2 Liquefaction	No	Designed to be gas tight – no risk of emissions
Grid Injection Unit (GIU)	No	Designed to be gas tight – no risk of emissions

Stack Emission

Table10 below shows the ventilation rates of the stacks relied upon in the assessment.

Table 9.10: Ventilation Rates from Odour & Pollutant Emission Stacks

Parameter	Odour Treatment System	CHP 1	CHP 2	Boiler
X – coordinate	183430	183549	183552	183543
Y – coordinate	227148	227118	227116	227116
Stack Height (m)	13	6	6	5.6
Stack tip diameter (m)	1.0	0.3	0.3	0.2
Actual Volume Flow (m^3/hr)	63,772	7,756	7,756	365
Flue Gas Temp (K)	293	753	753	383
Efflux Velocity (m/s)	22.57	30.49	30.49	3.23

Potential and Fugitive Emission Points

The biogas flare will have a capacity of 110% of the estimated maximum hourly biogas produced and will safeguard the secure and complete combustion of biogas where necessary. The usage of this emergency flare is envisaged to be infrequent and would operate only in the unlikely event that both CHP and gas upgrader are not operational. Planned preventative maintenance will ensure that these two units are staggered in maintenance downtime, backup power supplies will be installed on site to mitigate for a power cut i.e. an event that could affects both units simultaneously.

Operational Traffic Emissions

Applying the scoping criteria as outlined in Section 9.3.2

1 annual average daily traffic (AADT) ≥ 1,000; or (64 additional trips anticipated – HGVs and office staff vehicles)

2) heavy duty vehicle (HDV) AADT ≥ 200; or (54 additional trips anticipated – HGVs only)

3) a change in speed band; or (none)

4) a change in carriageway alignment by ≥ 5 m (none)

Though scoped out according to the criteria above, a simple assessment has been carried out, where site specific information has been input into the DMRB Screening Tool to forecast pollution concentrations at a receptor position, specifically R1, which represents the closest sensitive receptor to the site.

Pollutant concentration measurements from onsite monitoring (2.8 µg/m3 for NO_2) and Ballinasloe Monitoring Station (11.39 µg/m3 for PM_{10}) have been used as the baseline pollutant concentrations for the area and are representative of the "Do minimum" scenario. All onsite monitoring data is detailed in **Appendix 9.3**. Traffic inputs as used in the scoping criteria are used to predict the pollutant concentration as a result of the increased traffic emissions due to the proposed development and represent the "Do something" scenario for 2025/26 assuming (as a worst-case scenario), receptors are 3m away from road links.

Table 9.11 Projected NO_2 and PM_{10} traffic concentrations for "Do-Something (DS)" and "Do Minimum (DM)" scenarios

Receptor	NO_2				PM_{10}			
	DM (µg/m3)	DS (µg/m3)	Change (µg/m3)	Magnitude	DM (µg/m3)	DS (µg/m3)	Change (µg/m3)	Magnitude
R1	2.81	2.82	0.01	Negligible	11.40	11.40	0.0005	Negligible

LA105 DMRB guidance gives details for assessing significance of air quality effects of a development in relation to nitrogen dioxide (NO_2) and particulate matter (PM_{10}). **Table 9.12** below describes the corresponding terms used to describe the level of significance from the DMRB in conjunction with EPA EIAR guidance.

Table 9.12 Traffic air quality effects (Operational Stage)

Magnitude of change in annual mean NO_2 or PM_{10} (µg/m^3)	Magnitude (DMRB)	Significance (EPA)

>4 (>10%)	Large	Significant, Very Significant, Profound
>2 (>5%)	Medium	Moderate
>0.4 (>1%)	Small	Slight
<0.4 (<1%)	Negligible	Not significant, Imperceptible

Using the significance criteria as listed in Table 9.11, it is concluded that the change in emissions of NO_2 and PM_{10} at the nearby sensitive receptor road link because of the Proposed Development will be imperceptible i.e. the magnitude of change of annual mean pollutant concentration is <0.4 μg/m^3. Furthermore, the screening tool does not predict exceedances of air quality standards as listed in **Table 9.12** and so a detailed air quality assessment has been scoped out. The operational phase effect to air quality is **long-term, localised, neutral and imperceptible**

9.4 Description of the Receiving Environment

9.4.1 Background

This section of the chapter provides the baseline information in relation to air quality and odour that exists in the vicinity of the Proposed Development. The subject site occupies a total area of *ca.* 4.0 ha and is situated in the townland of Glenloughaun, Co. Galway. The site is approximately 3km south of the town of Ballinasloe, Co. Galway and approximately 4.5km east of the village of Aughrim, Co. Galway. The approximate grid reference location for the centre of the site is M 83478 227186, ITM: 583430, 727211.

Figure 9.3 Indicative site development boundary (In red) and surrounding environment.

Air quality monitoring programs are routinely undertaken by the EPA and Local Authorities. The most recent annual report on air quality "Air Quality in Ireland Report 2023" (EPA 2024), 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 2021), see **Figure 9.4** below. Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 23 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000 is defined as Zone D. In terms of air monitoring, the location of the Proposed Development is categorised as Zone D (EPA 2021). The development site was assessed as Zone D.

The typical baseline air quality data outlined below in **Table 9.13** is based on a review of the Air Quality Monitoring Report 2023 (EPA, 2024).

Table 9.13: Typical Air Quality Monitoring Data Representative of EPA Zone D Monitoring Sites

Pollutant	Zone D Monitoring Stations	EPA Baseline Monitoring Data Annual Mean 2023 ($\mu g/m^3$)	Average ($\mu g/m^3$)	Relevant Limit Value
NO_2	Emo Court	2.3	8.1	NO_2 annual mean limit for the protection of human health = 40 $\mu g/m^3$
	Birr	11.3		
	Castlebar	6.6		

	Carrick-on-Shannon	10		
	Kilkitt	1.7		
	Edenderry	8.6		
	Briarhill	16.1		
NO_X	Emo Court	4.1	16.3	NO_x annual mean limit for the protection of human health = 30 µg/m^3
	Birr	26.4		
	Castlebar	9.5		
	Carrick-on-Shannon	21.0		
	Kilkitt	2.5		
	Edenderry	13.5		
	Briarhill	36.7		
CO	Birr	0.6	0.6	CO maximum daily 8–hour mean value = 10 mg/m^3
PM_{10}	Castlebar	9.9	8.4	PM_{10} annual mean limit for the protection of human health = 40 µg/m^3
	Kilkitt	7.1		
	Claremorris	8.1		
	Askeaton	8.4		

It can be seen from the **Table 9.13** above that the annual mean concentrations for all pollutants are below the relevant limit values for the protection of human health as outlined in the Air quality standards regulations 2011 (**Table 9.1**) which is based on EU Council Directive 2008/50/EC.

The background concentrations utilised within this assessment represent an average of the above values.

As per AG4 guidance monitoring of background odours is inappropriate and cannot be added to modelled odour concentrations.

In summary, existing baseline levels of the pollutants based on extensive long-term data from the EPA are below ambient air quality limit values in the vicinity of the Proposed Development. This indicates there is a relatively good level of air quality in the area of the Proposed Development.

9.4.2 Climate and Regional Air Quality

Applicable Agreements and Emissions Ceilings

Ireland ratified the Gothenburg Protocol at the 1979 UN Convention on Long Range Transboundary Air Pollution. The European Union directive on ambient air quality assessment and management came into effect in September 1996 96/62/EC and describes the policy framework for 12 air pollutants identified to have harmful effects on human health and the environment. Air quality limit levels (i.e. ambient pollutant concentrations not to be breached), for the pollutants are described through a series of daughter directives. The first daughter directive, 1990/30/EC, sets limit values for NO2, amongst other pollutants, in ambient air. Following the daughter directives, EU council directive 2008/50/EC came into effect in June 2008, combining the existing air quality legislation. Directive 2008/50/EC was transposed into Irish national legislation in 2011 through the Air Quality Standards Regulations 2011. The directive consolidated the four daughter directives and one council decision into a single directive on air quality. The new directive also introduced a new limit value for fine particulate matter, $PM_{2.5}$, but does not alter the existing air quality standards.

National emission reduction obligations defined targets for the main air pollutants to be attained in 2020 and into the future and to also contain emission reduction obligations 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 NH3 (1% reduction) and 10 kt for PM2.5 (18% reduction). The National Emissions Ceiling Directive (NECD - European Commission Directive 2001/81/EC) also proposed the same limit values as the Gothenburg Protocol (1999).

On a national level, the Air Pollution Act (1987) is the main legislation concerning air quality in Ireland and defines the process by which local authorities can take steps which are deemed necessary to manage air pollution appropriately.

As described above, the Air Quality Standards Regulations transpose Directive 2008/50/EC into Irish law. Limit values for various pollutants in ambient air are described in these regulations. With regard to this project/development the ambient background pollutant levels deemed applicable for human health and the environment in terms of annual mean are described in **Table 9.1 and 9.2.**

It is also important to note that 4 air quality zones have been established in Ireland for evaluation and management purposes. Dublin is categorized as Zone A and Cork as Zone B. Zone C consists of 23 towns with a population of greater than 15,000. The remainder of the country, which denotes rural Ireland but also includes all towns with a population of less than 15,000, is defined as Zone D. The development site lies within Zone D.

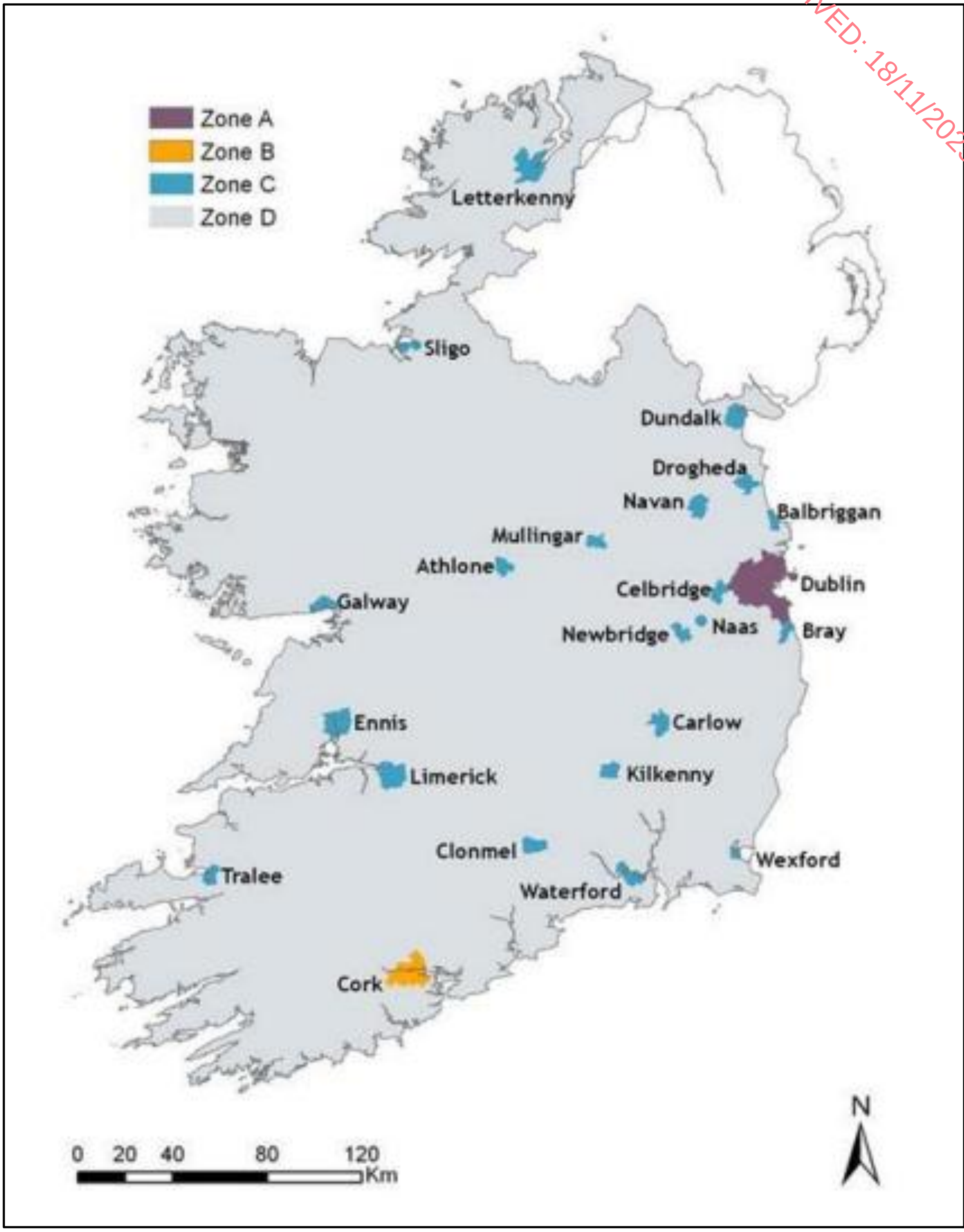


Figure 9.4: Air Framework Directive Zones (EPA, Air Quality in Ireland Report 2016)

Climate Agreements

Ireland ratified the United Nations Framework Convention on Climate Change in April 1994 and the Kyoto Protocol in principle in 1997 and formally in May 2002. 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 under the Kyoto Protocol to 13% above the 1990 level over the period 2008 to 2012.

The UNFCCC is continuing detailed negotiations in relation to GHGs reductions and in relation to technical issues such as Emission Trading and burden sharing. The most recent Conference of the Parties to the Convention (COP29) took place in Baku from the 11th to the 22nd of November 2024 and focused on accelerating global climate action through enhanced finance, stronger commitments, and inclusive solutions. A key component was the establishment of a New Collective Quantified Goal (NCQG) for climate finance, aiming to mobilize at least $300 billion annually by 2035, to support developing nations in reducing emissions and adapting to climate change. COP29 emphasized the importance of updating Nationally Determined Contributions (NDCs) to align with the Paris Agreement's 1.5°C target. The Paris Agreement was established at COP21 in Paris in 2015 and is an important milestone in terms of international climate change agreements. The "Paris Agreement", agreed by 200 nations, has a stated aim of limiting global temperature increases to no more than 2°C above pre-industrial levels with efforts to limit this rise to 1.5°C. The aim is to limit global GHG emissions to 40 gigatonnes as soon as possible whilst acknowledging that peaking of GHG emissions will take longer for developing countries. Contributions to greenhouse gas emissions will be based on Intended Nationally Determined Contributions (INDCs) which will form the foundation for climate action post 2020. The conference emphasized the need for transparency in climate actions. Countries were encouraged to submit their first biennial transparency reports. These reports are crucial for tracking progress and informing future climate policies.

The EU, on the 23rd/24th of October 2014, agreed the "2030 Climate and Energy Policy Framework". The European Council endorsed a binding EU target of at least a 40% domestic reduction in greenhouse gas emissions by 2030 compared to 1990. The target will be delivered collectively by the EU in the most cost-effective manner possible, with the reductions in the Emission Trading Scheme (ETS) and non-ETS sectors amounting to 43% and 30% by 2030 compared to 2005, respectively. Secondly, it was agreed that all Member States will participate in this effort, balancing considerations of fairness and solidarity. The policy also outlines, under "Renewables and Energy Efficiency", an EU binding target of at least 27% for the share of renewable energy consumed in the EU in 2030.

The Climate Action and Low Carbon Development Act 2015 identifies plans to be drafted and accepted by the Government in relation to climate change for the purpose of a transition to a low carbon, climate resilient and environmentally sustainable economy. The act required the establishment of the Climate Change Advisory Council and the establishment and approval by the government of a National Mitigation Plan (to be published every five years), National Adaptation Framework and an Annual Transition Statement. The first National Mitigation Plan for Ireland was published in July 2017 and defines the central roles of the key Ministers accountable for the sectors covered by the Plan – Electricity Generation, the Built Environment, Transport and Agriculture. This first Plan defines the initial foundations to be implemented to transition Ireland to a low carbon, climate resilient and environmentally sustainable economy by 2050. The Plan also includes over 100 individual actions for various Ministers and public bodies to take forward.

In addition to the publication of the National Mitigation Plan (DCCAE, 2017), the government also publishes a Climate Action Plan, i.e. Climate Action Plan 2024 (Government of Ireland, 2024).

The Climate Action Plan outlines the current status across key sectors including Electricity, Transport, Built Environment, Industry and Agriculture and outlines the various broadscale measures required for each sector to achieve ambitious decarbonisation targets. The Climate Action Plan also details the required governance arrangements for implementation including an increased level of involvement from local government.

The national policy position for Climate Change establishes a vision for Ireland of low-carbon by 2050 (80% reduction on 1990 emissions) across the electricity generation, built environment and transport sectors; and in parallel, an approach to carbon neutrality in the agriculture and land use sectors, including forestry.

Regional Policy Objectives

A review of the Galway County Development Plan (2022 – 2028) was carried out to determine the policies and objectives relevant to climate action throughout the region. It is noted in the vision of the plan that it is seeking to develop in a sustainable and environmentally sensitive manner.

The Council shall work with appropriate stakeholders and agencies in order to achieve an integrated and sustainable approach to the development of the County. This will accord with the following strategic aims:

- To reduce the County's CO2 emissions by achieving international, national, regional and any local targets for achieving a low carbon economy by 2050; and increase efficiency in Local Authority activities through its development management functions;
- To promote the sustainable development of the County by ensuring that the future development is considered and managed against the risk of flooding; To increase awareness of the potential impacts of climate change to enable people to adapt and manage future extreme weather events such as flooding within the County;
- To reduce County Galway's dependency on imported fossil fuels and to provide alternative energy sources by harnessing the County's potential for renewable energy sources while strengthening the grid transmission networks.

Applicable policy objectives in relation to climate are found below.

Climate Change Policy Objectives Applicable:

RD 1 – To facilitate the development of the rural economy through supporting a sustainable and economically efficient agriculture and food industry, together with forestry, fishing and aquaculture, energy and extractive industries, the bio-economy and diversification into alternative on-farm and off-farm activities, while at the same time noting the importance of maintaining and protecting the natural landscape and built heritage which are vital to rural tourism.

RD 2 – To support and develop a diverse base of smart economic specialisms as dynamic drivers in our rural economy, including innovation and diversification in agriculture and sustainable energy and green agenda projects.

AD 1 – To facilitate the development of sustainable agricultural practices and facilities within the county, subject to complying with best practice guidance, normal planning and environmental criteria and the development management standards in *Chapter 15 Development Management Standards.*

AD 4 – To ensure agricultural waste is managed and disposed of in a safe, efficient and sustainable manner having regard to the environment and in full compliance with the

European Communities Good Agricultural Practice for the Protection of Waters Regulations (2014) and relevant best practice guidelines.

WM 2 – Support and promote the circular economy principles, prioritising prevention, reuse, recycling and recovery, and to sustainably manage residual waste. New developments will be expected to take account of the provisions of the Waste Management Plan for the Region and observe those elements of it that relate to waste prevention and minimisation, waste recycling facilities, and the capacity for source segregation.

WM 3 – Support and facilitate the provision of adequate waste recovery and disposal facilities for the county.

AQ 1 – To promote the preservation of best ambient air quality compatible with sustainable development in accordance with the EU Ambient Air Quality and Cleaner Air for Europe (CAFÉ) Directive (2008/50/EC) and ensure that all air emissions associated with new developments are within Environmental Quality Standards as set out in the Air Quality Standards Regulations 2011 (SI No. 180 of 2011) (or any updated/superseding documents).

CC 1 – Support and facilitate the implementation of European, National and Regional objectives for climate adaptation and mitigation taking into account other provisions of the Plan (including those relating to land use planning, energy, sustainable mobility, flood risk management and drainage) and having regard to the Climate mitigation and adaptation measures.

CC 2 – It is a policy objective of the Planning Authority to support the transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050, by the way of reducing greenhouse gases, increasing renewable energy, and improving energy efficiency.

CC 6 – To support the implantation of the Renewable Energy Strategy contained in Appendix 1 of the Galway County Development Plan to facilitate the transition to a low carbon county.

CC 7 – Support the delivery of sustainable development projects under the European Green Deal and utilise the Climate Action Fund/ Just Transition Fund established under the National Development Plan to encourage public and private climate mitigation and adaptation projects in line with criteria set out by the Fund at the time.

EG 1 – To support the development of the gas network and associated generating capacity in order to sustainably support and augment renewable electrical energy generated in County Galway.

RE 5 – Support and facilitate the sustainable development and the use of appropriate renewable energy resources and associated infrastructure within the County having due regard to the Habitats Directive and to the detailed policy objectives and Development Standards set out in the Local Authority Renewable Energy Strategy as follows:

- Renewable Energy Transmission
- Renewable Energy Generation
- 'Strategic Areas' for renewable energy development
- Onshore Wind Energy
- Solar Energy
- Bioenergy/Anaerobic Digestion
- Micro-renewables

- Marine Renewables
- Hydro Energy
- Geothermal Energy
- Alternative Technologies
- Energy Efficiency & Conservation
- Sustainable Transport
- Auto production
- Battery Storage
- Repowering/Renewing Wind Energy Developments
- Community Ownership

RE 7 – To facilitate and support appropriate levels of renewable energy generation in County Galway, considering the need to transition to a low carbon economy and to reduce dependency on fossil fuels.

9.4.3 Future Climate Conditions

An EPA report, High-resolution Climate Projections for Ireland – A Multimodel Ensemble Approach, Report No. 339 details projected future baseline conditions. The report indicates that mid-century mean annual temperatures are predicted to rise by 1.3 – 1.6°C under worse case scenarios and incidences of heatwaves are expected to rise by the middle of the century. The coldest 5% of daily minimum temperatures are projected to rise by 1–2.4°C. Incidences of intense precipitation occurrences are predicted to increase over the year as a whole and in the winter and autumn months, with "likely" predicted increases of 5–19%. The number of extended dry periods (defined as at least 5 consecutive days for which the daily precipitation is less than 1mm) is also projected to increase substantially by the middle of the century over the full year and for all seasons except spring. The projected increases in dry periods are largest for summer.

9.4.4 Methodology for Assessing Impacts on Climate and Regional Air Quality

The quantity of carbon emitted from natural cycles through the earth's atmosphere, waters, soils and biota is much greater than the quantity added by anthropogenic GHG sources. However, the focus of bodies such as the UNFCCC and the IPCC is on anthropogenic emissions because it is these emissions that have the potential to alter the climate by disrupting the natural balances in carbon's biogeochemical cycle and altering the atmosphere's heat-trapping ability.

Construction Phase

Construction traffic and embodied energy of construction materials are likely to be a possible cause of greenhouse gas emissions because of construction related to the Proposed Development. Construction plant and machinery will lead to CO_2 and NO_2 emissions during construction of the planned development. Due to the period, nature and scale of construction, CO_2 and NO_2 emissions from construction plant, machinery and embodied energy of construction resources will have a short-term and imperceptible impact on climate.

Operational Phase

Biomethane and carbon accounting. CO_2 released when biomethane is combusted is biogenic (recently fixed carbon). Accordingly, claims of "carbon-neutral" performance are conditional on (i) tight control of methane slip across upgrading, storage and combustion and (ii) a transparent life-cycle boundary. This EIAR therefore treats benefits conservatively and deducts slip and parasitic energy.

Fossil gas displacement (primary benefit): The facility will export approximately 510–580 Nm³/h of biomethane, equivalent to ~45–51 GWh/year. On an energy-equivalent basis this displaces natural gas in the grid. Using a representative displacement factor of ~0.18–0.20 tCO_2 per MWh, the indicative avoided combustion emissions are ~8–10 kilotonnes CO_2 per year. This provides the dominant, verifiable GHG benefit.

Avoided manure-management emissions (additional benefit): More than half of the feedstock comprises animal manures/slurries. Relative to baseline storage and landspreading, anaerobic digestion can reduce methane formation. Avoided emissions will be quantified at licensing using IPCC (2019 Refinement) Tier 2 factors appropriate to local practices (MCF, VS, B_0, climate).

Net effect and significance: After conservative deductions for methane slip and on-site energy demand, the project delivers a net positive GHG balance, driven by fossil gas displacement and supplemented by avoided manure emissions. The operational effect on climate is therefore assessed as slight–to–moderate positive and long-term at regional scale. Effects on regional air quality are **imperceptible** to **slight** and **not significant**.

9.5 Likely Significant Effects

The assessment focuses on predicted effects in relation to air quality and climate. The assessment relates to effects occurring during both the construction and operational phases of the development.

9.5.1 Do-Nothing Scenario

The Do-Nothing scenario relates to the preservation of the current site with no planned development occurring. In this situation, air quality will continue as per the baseline levels described in **Section 9.4.1** and will alter with respect to changes in the local and wider area.

9.5.2 Receptor Sensitivity

<u>**Construction**</u>

Regarding the construction stage of the planned development the most likely effect on air quality will be from construction dust emissions (nuisance dust and PM_{10}/$PM_{2.5}$ emissions) associated with activities such as excavations, infilling materials, stock piling and movement of vehicles.

The Proposed Development is deemed large in scale and nature and is classified as such with respect to “Potential for Construction Dust Effects (TII, 2011)” therefore there is the potential for significant dust soiling 100m from the construction source (TII 2011) (**Table 9.13**).

There are no sensitive receptors (residential receptors) within 50m of the site. Therefore, the surrounding area can be classified as low risk with respect to construction dust effect in this regard.

Table 9.13: Potential for Construction Dust Effects (TII, 2011)

Source		Potential Distance for Significant Effects (Distance from Source)		
Scale	**Description**	**Soiling**	**PM_{10}**	**Vegetation Effects**
Major	Large construction sites, with high use of haul roads	100m	25m	25m
Moderate	Moderate sized construction sites, with moderate use of haul roads	50m	15m	15m
Minor	Minor construction sites, with limited use of haul roads	25m	10m	10m

IAQM (2024) conditions described in **Appendix 9.1** were also considered, these detail how the estimation of dust emission magnitudes (prior to mitigation) for earthworks, construction and track out actions which are shown in **Table 9.14** were completed.

Table 9.14 Summary of Dust Emissions Magnitudes (Before Mitigation).

Activity	IAQM Criteria	Dust Emission Magnitude
Earthworks	Total site area where earthworks may occur is >10,000m^2 Undeveloped land –soil type may include potentially dusty soil The number of heavy earth moving vehicles active at any one time is estimated to be approximately 5-10 The height of bunds on site will be 4-8m The total material to be moved is estimated to be >20,000 tonnes Earthworks may occur in both wet and dry months.	Large
Construction	Total building volume will approximately be <25,000m^3. Construction materials are expected to be potentially dusty. On-site concrete batching is not expected to be proposed.	Medium
Trackout	Number of heavy vehicles per day out of the site is estimated to be 10-50 Vehicle may travel on unpaved roads 50-100m The surface type of the site has the potential to be dusty	Large

According to IAQM construction dust guidance the following factors are considered with regard to sensitivity of an area:

- The specific sensitivities of receptors in the area;
- The proximity and number of those receptors;
- In the case of PM_{10}, the local background concentration; and
- Site-specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.

Human and ecological receptors are assessed against the potential effect from the associated construction of the development and HGV routes which could generate trackout. Construction activities are applicable up to 250m from the planned development site boundary, however trackout actions are only deemed applicable 50m from the periphery of the route, in accordance with IAQM construction dust guidance. It is expected that site traffic will access/egress the site via the Glenloughaun/R355 junction to the east of the site. Online NPWS (National Parks and Wildlife Services) databases were used to locate sensitive ecological receptors in the vicinity of the planned development. Human receptors were determined by referring to online satellite imagery. As shown in **Figure 9.1**, there are 8 sensitive receptors within the 250m buffer zone (4 residential and 4 community), of which 6 are within the 50m trackout buffer (3 residential and 3 community). There are no designated ecological receptors within 50m of the trackout route or site boundary; therefore, impacts from construction dust are not anticipated to adversely affect ecological receptors.

Table 9.15 describes the established sensitivity of the locality with the factors specified that guided the assessment (please refer to **Appendix 9.1** for more information).

Table 9.15 Assessed risk of Dust Impacts from Earthworks/Construction/Trackout (without mitigation)

Potential Effect		Sensitivity of the surrounding area		
		Earthworks	**Construction**	**Trackout**
Dust soiling	Receptor sensitivity	High	High	High
	Number of receptors	1-10	1-10	1-10
	Distance from the source	<250m	<250m	<50m
	Overall Sensitivity of the Area	**Low**	**Low**	**Low**
Human health	Receptor sensitivity	High	High	High
	Annual Mean PM_{10} concentration ($\mu g/m^3$)	11.39	11.39	11.39
	Number of receptors	1-10	1-10	1-10
	Distance from the source	<250m	<250m	<50m
	Overall Sensitivity of the Area	**Low**	**Low**	**Low**
Ecological	Receptor sensitivity	**NA**		

According

Construction - Risk of Effects

The dust emission magnitude described in **Table 9.14** has been merged with the sensitivity of the area in **Table 9.15** to establish the risk of effects of construction activities before mitigation. These have been assessed considering risk categories of each activity in **Appendix 9.1**.

Emission effects from planned construction are finite and short-term. Dust risk effects from construction activities causing dust soiling are classified as low risk and medium risk in terms of impacts on human health, as is shown in **Table 9.16**.

Table 9.16 Summary of Dust Risk from Construction Activities (without mitigation)

Potential Impact	Dust Risk Impact		
	Earthworks	**Construction**	**Trackout**
Dust soiling	Low risk	Low risk	Low risk
Human health	Low risk	Low risk	Low risk

With the implementation of mitigation measures, as defined in Section 9.6, the magnitude of dust emission is expected to reduce from medium to small. With the implementation of mitigation measures, the air quality effects are anticipated to be temporary, negligible and short-range.

Operational

Sensitive receptors within 1km of Proposed Development and its access road were selected for inclusion within the odour and air dispersion modelling assessments. The sensitive receptors modelled represent residential and amenity (i.e. schools, churches etc.) within the vicinity of the Proposed Development and were chosen due to their proximity to the Proposed Development. Designated sites up to 15km away were also considered within the evaluation, the model extents were that of a 1km radius for residential and community receptors and 15km radius for designated sites - therefore any points beyond this used representative locations within the scope of the model. Designated sites were searched on the EPA website. The types of designated areas are listed below:

- **Special Areas of Conservation (SAC):** These areas are given special protection under the European Union’s Habitats Directive to protect some of the most threatened habitats and species across Europe.
- **Special Protection Areas (SPA):** Areas designated under the European Commission on the conservation of wild birds (the Birds Directive). All EU Member States are required to identify internationally important areas for breeding, over-wintering and migrating birds and designate them as SPA’s.
- **Natural Heritage Areas (NHA):** This is an area considered important for the habitats present or which holds species of plants and animals whose habitat needs protection.

Details of the receptor locations are provided in **Table 9.17, 9.18** and **9.19**. In addition to predicting the worst-case impact beyond the site boundary, the predicted impact at the worst-case sensitive receptor will also be reported for the dispersion modelling results (see **Section 9.5.4**).

Table 9.17 Residential Sensitive Receptors within 1km of Subject Site

Receptor Identity	Receptor Description	X Coordinate (m) ITM	Y Coordinate (m) ITM	Direction from application area	Approx. distance from site boundary (m)
R1	Residential Property	583553	727443	N	161
R2	Residential Property	583694	727453	N	201
R3	Residential Property	583629	727486	N	209
R4	Residential Property	583600	727524	N	243
R5	Residential Property	583583	727558	N	275
R6	Residential Property	583565	727591	N	298
R7	Residential Property	583545	727623	N	322
R8	Residential Property	583529	727646	N	342
R9	Residential Property	583452	727669	N	342
R10	Residential Property	583439	727722	N	389

R11	Residential Property	583542	727867	N	558
R12	Residential Property	583558	727903	N	598
R13	Residential Property	583662	728111	N	825
R14	Residential Property	583595	728175	N	867
R15	Residential Property	583683	728141	N	859
R16	Residential Property	583694	728169	N	889
R17	Residential Property	583613	728210	N	907
R18	Residential Property	583705	728198	N	920
R19	Residential Property	583637	728259	N	961
R20	Residential Property	583721	728237	N	962
R21	Residential Property	583734	728272	N	999
R22	Residential Property	583878	727050	E	346
R23	Residential Property	584092	727074	E	532
R24	Residential Property	584045	726934	E	548
R25	Residential Property	583908	726930	E	431
R26	Residential Property	583875	726880	SE	428
R27	Residential Property	583990	726651	SE	656
R28	Residential Property	584025	726578	SE	731
R29	Residential Property	584081	726602	SE	757
R30	Residential Property	584094	726533	SE	812
R31	Residential Property	584009	726457	SE	809
R32	Residential Property	583907	726285	SE	898
R33	Residential Property	583883	726296	SE	878
R34	Residential Property	583896	726264	SE	912
R35	Residential Property	583187	726285	S	859
R36	Residential Property	583068	726490	S	719
R37	Residential Property	582572	726568	SW	967
R38	Residential Property	582541	727397	W	808
R39	Residential Property	582817	727451	W	540
R40	Residential Property	582925	727541	NW	465

Table 9.18 Commercial, Education, Religious, Community Etc. Sensitive Receptors within 1km of Subject Site

Receptor Identity	Receptor Description	X Coordinate (m) ITM	Y Coordinate (m) ITM	Direction from application area	Approx. distance from centre of subject site (m)
C1	Business	583505	727243	N	21
C2	Business	583591	727347	N	65
C3	Business	583819	727199	NE	231
C4	Farmyard	583726	727454	NE	220
C5	Sports Club	583651	727908	N	626
C6	Sports Club	583925	728155	NE	936
C7	Restaurant	583995	727987	NE	815
C8	Farmyard	584165	726498	SE	889
C9	Business	583925	726425	SE	786
C10	Farmyard	583148	726486	S	693
C11	Farmyard	582547	726599	SE	968
C12	Farmyard	582796	727440	W	559

Table 9.19 European Designated Sites within a 15 km Radius of the Subject Site

Receptor Identity	Designated Site	Citation	X Coordinate (m) ITM	Y Coordinate (m) ITM	Direction from application area	Approx. distance from centre of subject site (km)
E1	Glenloughaun Esker	SAC	58259	727024	W	0.75
E2	River Suck Callows	NHA	586624	728807	E	3.5
E3	River Suck Callows	SPA	586624	728807	E	3.5
E4	Killure Bog	NHA	581952	732441	N	5.4
E5	Crit Island West	NHA	578742	733071	NW	7.5
E6	Annaghbeg Bog	NHA	582528	736222	N	9.1
E7	Moorfield Bog	NHA	585683	717150	S	10.3
E8	Eskerboy Bog	NHA	579348	717393	SW	10.6
E9	Cloonoolish Bog	NHA	582671	715907	S	11.3
E10	Ardgraigue Bog	SAC	583462	714463	S	12.7
E11	River Shannon Callows	SAC	596235	725820	SE	12.9
E12	Middle Shannon Callows	SPA	596239	725814	SE	12.9
E13	Castlesampson Esker	SAC	592060	738636	NE	14.3
E14	Killeglan Grassland	SAC	586065	741734	N	14.8

9.5.3 Point Sources - Operational Phase

The information relating to the operational phase impacts of the Proposed Development is drawn from the operation of the AERMOD model. It is important to note that emissions are overestimated where possible in terms of input i.e. emission rates, background concentration, operating hours, location of concentrations, ambient air limit values, worst case locations, modelled years results considered etc.

9.5.4 Receptor Results

Odour

Odour modelling was carried out for each individual year with the results at the nearest sensitive locations presented in **Table 9.20** below. All results are the odour concentration in (ou_E/m^3).

Table 9.20: 98th Percentile of the Max 1-hr odour levels at nearest residential properties (odour concentration in (ou_E/m^3))

Location	2016	2017	2018	2019	2020	Average
R1	1.42	1.33	1.35	1.34	1.39	1.37
R2	1.00	1.07	1.07	1.00	1.00	1.03
R3	1.08	1.15	1.08	1.02	1.10	1.09
R4	1.18	1.15	1.13	1.13	1.17	1.15
R5	1.10	1.16	1.10	1.08	1.16	1.12
R6	1.00	1.07	1.06	1.02	1.03	1.04
R7	1.00	0.99	0.97	1.01	0.98	0.99
R8	0.94	0.95	0.91	0.94	0.93	0.94
R9	0.94	0.95	0.98	0.89	0.80	0.91
R10	0.84	0.93	0.86	0.81	0.70	0.83
R11	0.70	0.70	0.73	0.68	0.60	0.68
R12	0.67	0.67	0.68	0.66	0.58	0.65
R13	0.59	0.60	0.53	0.54	0.46	0.54
R14	0.55	0.53	0.56	0.49	0.40	0.50
R15	0.59	0.59	0.54	0.54	0.47	0.54
R16	0.57	0.58	0.53	0.53	0.46	0.53
R17	0.51	0.50	0.52	0.49	0.40	0.48
R18	0.56	0.55	0.52	0.51	0.45	0.52
R19	0.51	0.50	0.49	0.48	0.38	0.47
R20	0.54	0.53	0.49	0.48	0.42	0.49
R21	0.51	0.51	0.46	0.45	0.39	0.47
R22	0.21	0.27	0.18	0.23	0.23	0.22
R23	0.12	0.21	0.10	0.16	0.14	0.15
R24	0.12	0.15	0.09	0.13	0.15	0.13

Location	2016	2017	2018	2019	2020	Average
R25	0.15	0.19	0.13	0.17	0.19	0.17
R26	0.14	0.18	0.13	0.15	0.19	0.16
R27	0.07	0.08	0.06	0.07	0.10	0.08
R28	0.05	0.06	0.05	0.06	0.08	0.06
R29	0.05	0.07	0.05	0.06	0.08	0.06
R30	0.05	0.06	0.04	0.05	0.07	0.05
R31	0.04	0.05	0.04	0.05	0.07	0.05
R32	0.04	0.03	0.04	0.04	0.05	0.04
R33	0.04	0.04	0.04	0.04	0.05	0.04
R34	0.04	0.03	0.04	0.04	0.05	0.04
R35	0.04	0.02	0.06	0.02	0.05	0.04
R36	0.07	0.02	0.10	0.03	0.10	0.06
R37	0.06	0.02	0.11	0.04	0.07	0.06
R38	0.06	0.02	0.02	0.05	0.04	0.04
R39	0.15	0.10	0.12	0.22	0.12	0.14
R40	0.26	0.20	0.30	0.46	0.24	0.29
C1	1.40	1.43	1.44	1.41	1.43	1.42
C2	1.16	1.35	1.27	1.26	1.17	1.24
C3	0.46	0.65	0.45	0.53	0.50	0.52
C4	0.84	1.07	0.99	0.93	0.85	0.93
C5	0.66	0.68	0.62	0.63	0.61	0.64
C6	0.51	0.59	0.49	0.51	0.48	0.51
C7	0.50	0.61	0.48	0.49	0.46	0.51
C8	0.04	0.05	0.04	0.04	0.06	0.05
C9	0.05	0.05	0.05	0.05	0.07	0.06
C10	0.07	0.02	0.08	0.04	0.08	0.06
C11	0.06	0.02	0.10	0.04	0.06	0.06
C12	0.15	0.09	0.09	0.17	0.11	0.12

For the proposed site layout, all approved or existing dwellings are below the 1.5ou_E/m^3 when considered as individual years and as a 5-year average of the 98th percentile.

Odour Significance

An assessment of the significance of the odour impact at each receptor using the specified criterion within the AG5 odour guidance (see Error! Reference source not found.**9.2**) and dispersion modelling results (see **Table 9.20**) has been made in **Table 9.21** below.

Table 9.21: Significance of Estimated Odour Emissions at Considered Receptors considering max. reading from the five-year model)

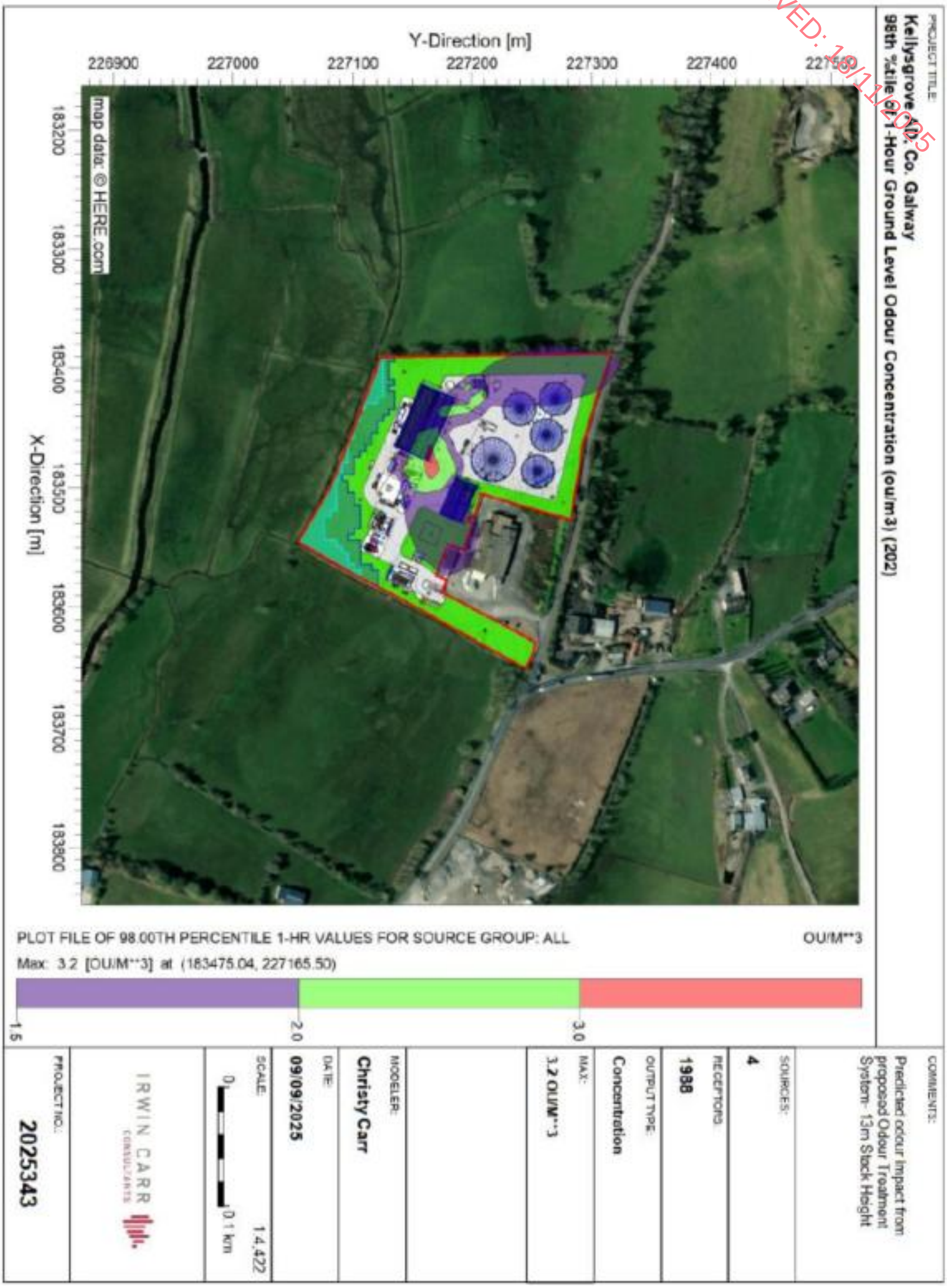
Receptor ID		Maximum Annual 98th Percentile Hourly Mean Concentration (ou_E/m^3)		Receptor Sensitivity	Impact Descriptor
R1	Dwelling to the N	1.42	2016	High	Negligible
R2	Dwelling to the NE	1.07	2017	High	Negligible
R3	Dwelling to the NE	1.15	2017	High	Negligible
R4	Dwelling to the NE	1.18	2016	High	Negligible
R5	Dwelling to the NE	1.16	2020	High	Negligible
R6	Dwelling to the NE	1.07	2017	High	Negligible
R7	Dwelling to the NE	1.01	2019	High	Negligible
R8	Dwelling to the N	0.95	2017	High	Negligible
R9	Dwelling to the N	0.98	2018	High	Negligible
R10	Dwelling to the N	0.93	2017	High	Negligible
R11	Dwelling to the N	0.73	2018	High	Negligible
R12	Dwelling to the N	0.68	2018	High	Negligible
R13	Dwelling to the N	0.60	2017	High	Negligible
R14	Dwelling to the N	0.56	2018	High	Negligible
R15	Dwelling to the S	0.59	2017	High	Negligible
R16	Dwelling to the S	0.58	2017	High	Negligible
R17	Dwelling to the SE	0.52	2018	High	Negligible
R18	Dwelling to the W	0.56	2016	High	Negligible
R19	Dwelling to the W	0.51	2016	High	Negligible
R20	Dwelling to the W	0.54	2016	High	Negligible
R21	Dwelling to the W	0.51	2017	High	Negligible
R22	Dwelling to the W	0.27	2017	High	Negligible
R23	Dwelling to the W	0.21	2017	High	Negligible
R24	Dwelling to the W	0.15	2020	High	Negligible
R25	Dwelling to the W	0.19	2020	High	Negligible
R26	Dwelling to the W	0.19	2020	High	Negligible
R27	Dwelling to the W	0.10	2020	High	Negligible
R28	Dwelling to the W	0.08	2020	High	Negligible
R29	Dwelling to the W	0.08	2020	High	Negligible

Receptor ID		Maximum Annual 98th Percentile Hourly Mean Concentration (ou_E/m^3)		Receptor Sensitivity	Impact Descriptor
R30	Dwelling to the W	0.07	2020	High	Negligible
R31	Dwelling to the SW	0.07	2020	High	Negligible
R32	Dwelling to the SW	0.05	2020	High	Negligible
R33	Dwelling to the SE	0.05	2020	High	Negligible
R34	Dwelling to the S	0.05	2020	High	Negligible
R35	Dwelling to the S	0.06	2018	High	Negligible
R36	Dwelling to the SE	0.10	2018	High	Negligible
R37	Dwelling to the SE	0.11	2018	High	Negligible
R38	Dwelling to the SE	0.06	2016	High	Negligible
R39	Dwelling to the E	0.22	2019	High	Negligible
R40	Dwelling to the E	0.46	2019	High	Negligible
C1	Business to the N	1.44	2018	Medium	Negligible
C2	Business to the N	1.35	2017	Medium	Negligible
C3	Business to the NE	0.65	2017	Medium	Negligible
C4	Farmyard to the NE	1.07	2017	Medium	Negligible
C5	Sports Club to the N	0.68	2017	Medium	Negligible
C6	Sports Club to the NE	0.59	2017	Medium	Negligible
C7	Restaurant to the NE	0.61	2017	Medium	Negligible
C8	Farmyard to the SE	0.06	2020	Medium	Negligible
C9	Business to the SE	0.07	2020	Medium	Negligible
C10	Farmyard to the S	0.08	2020	Medium	Negligible
C11	Farmyard to the SE	0.10	2018	Medium	Negligible
C12	Farmyard to the W	0.17	2019	Medium	Negligible

As indicated in **Table 9.21**, the significance of odour impacts has been predicted to be no worse than 'Negligible' at all receptors.

The AG5 guidance states that only if the impact is greater than slight, the effect is considered significant. As such, the impact at all of the receptors is considered not significant, in accordance with the stated methodology.

Figure 9.5: Modelled 98th Percentile Hourly Ground Level Mean Odour Concentration (ou_E/m^3) (2020)


PROJECT TITLE:
Kellysgrove AD, Co. Galway
98th %tile of 1-Hour Ground Level Odour Concentration (ou/m3) (202)
Y-Direction [m]
226900
227000
227100
227200
227300
227400
227500
X-Direction [m]
183200
183300
183400
183500
183600
183700
183800
map data: © HERE.com
PLOT FILE OF 98.00TH PERCENTILE 1-HR VALUES FOR SOURCE GROUP: ALL
OU/M**3
Max: 3.2 [OU/M**3] at (183475.04, 227165.50)
1.5
2.0
3.0
COMMENTS:
Predicted odour impact from proposed Odour Treatment System: 13m Stack Height
SOURCES:
4
RECEPTORS:
1988
OUTPUT TYPE:
Concentration
MAX:
3.2 OU/M**3
MODELER:
Christy Carr
DATE:
09/09/2025
SCALE:
1:4,422
0
0.1 km
IRWIN CARR CONSULTANTS
PROJECT NO.:
2025343

NO_2

For the purposes of this assessment the emissions of oxides of nitrogen have been recorded as nitrogen dioxide in the risk assessment (as nitrogen oxide converts to nitrogen dioxide over time) as follows:

- For short-term PCs and PECs, assume only 50% of emissions of oxides of nitrogen convert to nitrogen dioxide in the environment
- For long-term PCs and PECs, assume all oxides of nitrogen convert to nitrogen dioxide

NO_2 modelling was carried out for each individual year with the results at the nearest sensitive locations presented in **Table 9.22** and **9.23** below. All results are the NO_2 concentration in µg/m³.

Table 9.22: Annual Average NO_2 concentrations at nearest residential and community locations (units in µg/m³)

Location	2016	2017	2018	2019	2020	Average
R1	0.62	0.60	0.61	0.58	0.62	0.61
R2	0.53	0.66	0.54	0.54	0.72	0.60
R3	0.50	0.59	0.53	0.52	0.67	0.56
R4	0.47	0.50	0.48	0.46	0.55	0.49
R5	0.45	0.45	0.44	0.43	0.47	0.45
R6	0.42	0.41	0.42	0.40	0.42	0.41
R7	0.38	0.37	0.39	0.37	0.37	0.38
R8	0.35	0.34	0.36	0.35	0.34	0.35
R9	0.33	0.31	0.36	0.31	0.34	0.33
R10	0.30	0.28	0.33	0.29	0.32	0.31
R11	0.25	0.25	0.26	0.26	0.24	0.25
R12	0.24	0.24	0.25	0.24	0.23	0.24
R13	0.19	0.19	0.1	0.19	0.20	0.19
R14	0.19	0.20	0.20	0.19	0.18	0.19
R15	0.19	0.19	0.20	0.19	0.20	0.19
R16	0.20	0.20	0.20	0.19	0.21	0.20
R17	0.19	0.20	0.20	0.19	0.18	0.19
R18	0.19	0.19	0.19	0.18	0.20	0.19
R19	0.22	0.23	0.23	0.22	0.20	0.22
R20	0.18	0.18	0.18	0.17	0.19	0.18
R21	0.16	0.17	0.17	0.16	0.18	0.17
R22	0.34	0.40	0.27	0.33	0.30	0.33
R23	0.21	0.25	0.18	0.22	0.20	0.21

Location	2016	2017	2018	2019	2020	Average
R24	0.18	0.22	0.15	0.17	0.19	0.18
R25	0.21	0.25	0.17	0.20	0.22	0.01
R26	0.16	0.20	0.14	0.17	0.20	0.18
R27	0.08	0.10	0.07	0.08	0.11	0.09
R28	0.07	0.08	0.06	0.07	0.09	0.07
R29	0.06	0.09	0.06	0.07	0.09	0.07
R30	0.06	0.08	0.06	0.06	0.08	0.07
R31	0.06	0.07	0.05	0.06	0.08	0.06
R32	0.06	0.04	0.05	0.05	0.06	0.05
R33	0.06	0.04	0.05	0.05	0.06	0.05
R34	0.06	0.04	0.05	0.05	0.05	0.05
R35	0.04	0.03	0.05	0.04	0.05	0.04
R36	0.06	0.04	0.08	0.05	0.09	0.06
R37	0.06	0.03	0.09	0.05	0.05	0.05
R38	0.06	0.05	0.05	0.06	0.04	0.05
R39	0.10	0.08	0.09	0.12	0.08	0.09
R40	0.14	0.15	0.17	0.21	0.12	0.15
C1	1.36	1.19	1.41	1.20	1.21	1.28
C2	0.80	0.97	0.85	0.83	1.04	0.90
C3	0.60	0.67	0.56	0.62	0.64	0.62
C4	0.50	0.61	0.50	0.50	0.66	0.55
C5	0.23	0.24	0.24	0.23	0.26	0.24
C6	0.20	0.23	0.22	0.21	0.28	0.23
C7	0.21	0.25	0.22	0.22	0.31	0.24
C8	0.05	0.07	0.05	0.06	0.08	0.06
C9	0.07	0.05	0.05	0.06	0.07	0.06
C10	0.05	0.04	0.07	0.04	0.07	0.06
C11	0.05	0.03	0.08	0.04	0.05	0.05
C12	0.09	0.07	0.08	0.10	0.07	0.08
NO_2 Limit	**40**	**40**	**40**	**40**	**40**	**40**
E1	0.039	0.030	0.028	0.039	0.028	0.033
E2	0.072	0.087	0.074	0.072	0.080	0.077
E3	0.072	0.087	0.074	0.072	0.080	0.077

Location	2016	2017	2018	2019	2020	Average
E4	0.029	0.031	0.036	0.037	0.034	0.034
E5	0.019	0.019	0.023	0.025	0.016	0.021
E6	0.024	0.022	0.027	0.021	0.024	0.023
E7	0.005	0.004	0.007	0.007	0.007	0.006
E8	0.008	0.005	0.007	0.005	0.007	0.006
E9	0.005	0.003	0.006	0.004	0.006	0.005
E10	0.003	0.003	0.006	0.004	0.006	0.004
E11	0.010	0.012	0.008	0.009	0.009	0.010
E12	0.010	0.012	0.008	0.009	0.009	0.010
E13	0.019	0.023	0.018	0.018	0.021	0.020
E14	0.022	0.019	0.021	0.018	0.016	0.019

The annual NO_2 limit for protection of human health is given as 40 µg/m3, whilst the critical limit for protection of vegetation (ecological receptors) is 30 µg/m3.

Table 9.23 below details the 99.8% of Max 1-Hour NO_2 concentration at each of the sensitive receptors for the MET Data 2016 – 2020

Table 9.23: Short Term NO_2 concentrations at nearest residential and community locations (units in µg/m^3)

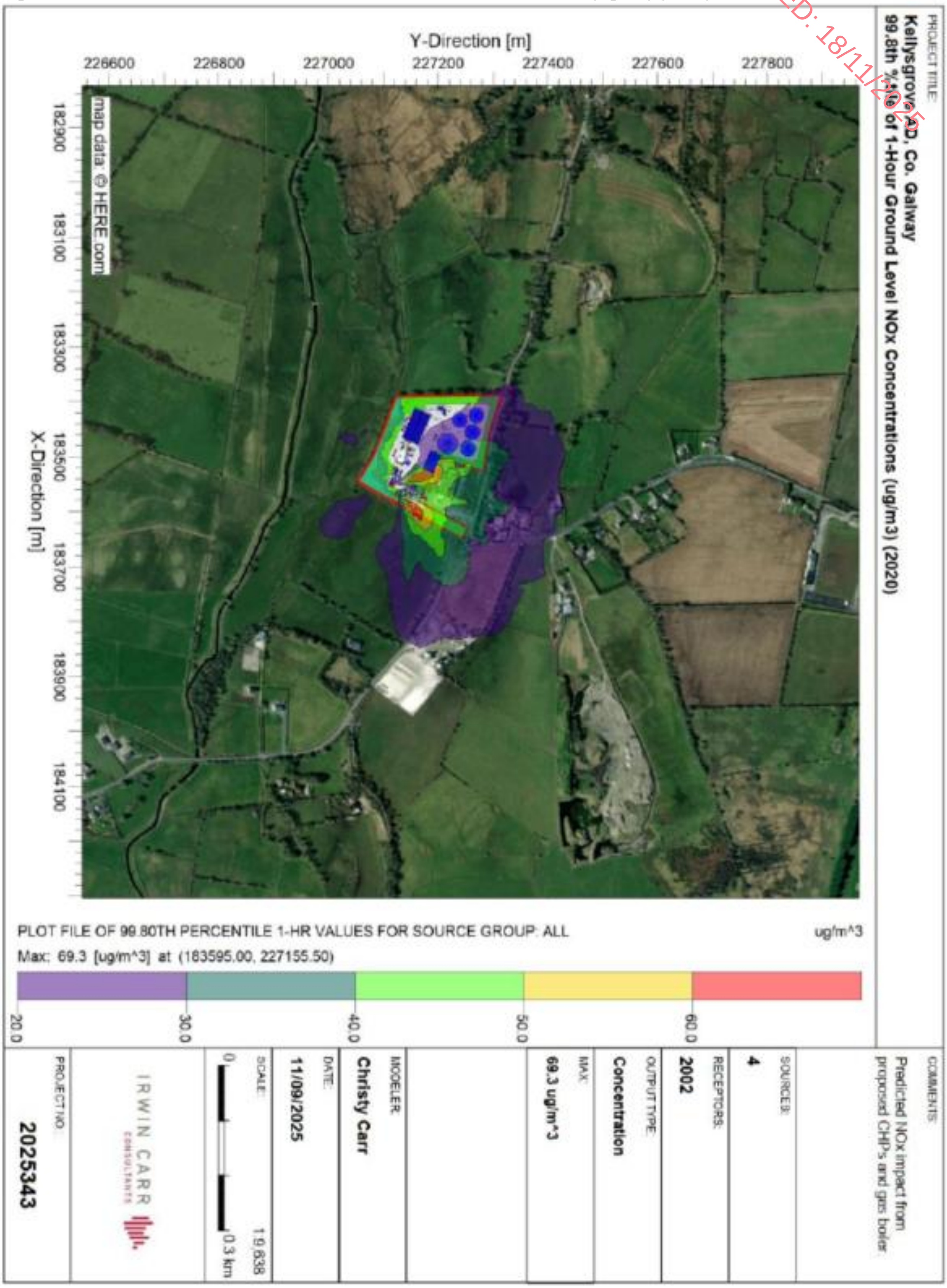
Location	99.8% of Max 1-Hour
R1	9.2
R2	7.8
R3	7.1
R4	7.4
R5	7.0
R6	6.6
R7	6.2
R8	6.0
R9	5.6
R10	5.1
R11	4.4
R12	4.2
R13	3.5
R14	3.6
R15	3.6

R16	3.7
R17	3.8
R18	3.6
R19	4.0
R20	3.4
R21	3.2
R22	5.0
R23	3.7
R24	3.3
R25	3.4
R26	3.1
R27	1.9
R28	1.7
R29	1.8
R30	1.8
R31	1.6
R32	1.4
R33	1.4
R34	1.4
R35	1.3
R36	1.7
R37	2.0
R38	2.3
R39	2.8
R40	4.3
C1	20.5
C2	9.6
C3	8.8
C4	7.0
C5	4.1
C6	3.6
C7	3.8
C8	1.7

C9	1.4
C10	1.3
C11	2.0
C12	2.5
Hourly limit for protection of human health	**200**

The results above have assumed that 50% of short-term emissions of oxides of nitrogen convert to nitrogen dioxide.

Figure 9.6: 99.8th %tile of 1-Hour Ground Level NOx Concentrations (ug/m³) (2020)



CO

CO modelling was carried out for each individual year with the mean year result at the nearest sensitive location presented in **Table 9.24** below. All results are the CO concentration in µg/m³. **Figure 9.7** below illustrates the predicted CO dispersion from the source emitter, the CHP stack.

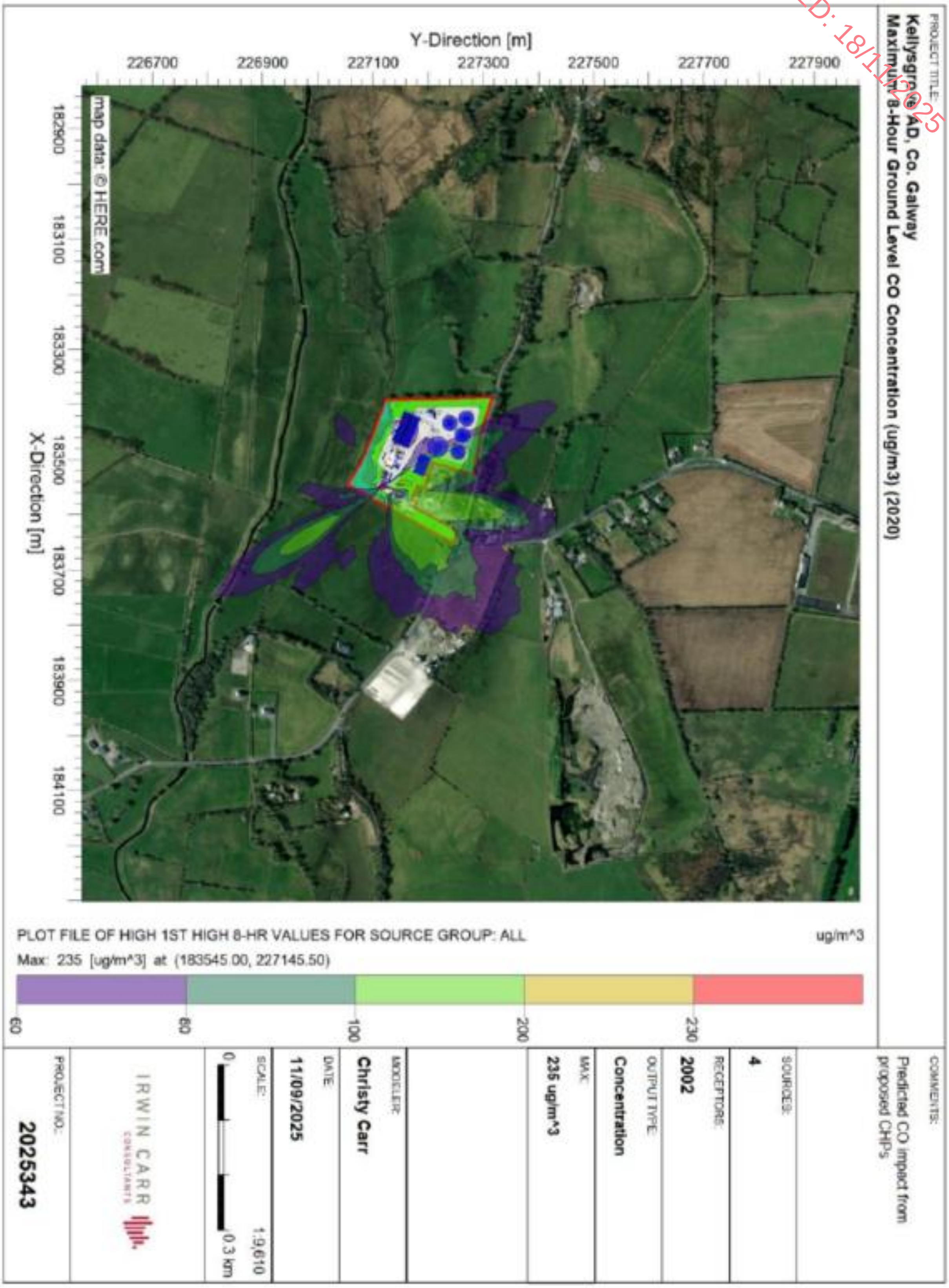
Table 9.24: Mean Daily 8-Hour Mean CO concentration at nearest residential and community locations (units in in µg/m³), averaged over 5 years

Location	2016 - 2020
R1	65.6
R2	52.9
R3	49.9
R4	47.5
R5	44.5
R6	41.6
R7	39.1
R8	38.5
R9	33.6
R10	31.9
R11	27.7
R12	25.1
R13	19.9
R14	17.9
R15	19.3
R16	19.1
R17	17.8
R18	18.1
R19	19.1
R20	16.8
R21	16.0
R22	36.7
R23	25.8
R24	22.7
R25	22.6
R26	28.1
R27	23.1

R28	21.7
R29	17.5
R30	19.4
R31	16.2
R32	16.8
R33	15.3
R34	15.2
R35	16.8
R36	10.4
R37	15.5
R38	13.7
R39	18.5
R40	26.0
C1	165.1
C2	70.2
C3	55.2
C4	47.5
C5	21.9
C6	18.3
C7	21.9
C8	16.1
C9	17.2
C10	17.7
C11	18.0
C12	18.4
Limit (8-hr mean)	**10,000**

The predicted 8-hour ground level CO concentrations in each year, as well as the 5-year average are significantly below the limit values.

Figure 9.7: Modelled Maximum 8-Hour Ground Level CO Concentrations (ug/m^3) (2020)



Ammonia

In addition to residential receptors included in **Table 9.18**, ammonia levels were also assessed in areas of specific in relation to the protection of human health and vegetation. All designated areas within approximately 15km of the site are outlined in **Table 9.19**. There were fourteen designated sites located within approx. 15km of the proposed facility.

Ammonia modelling was caried out for each individual year with the results at the nearest sensitive locations presented in **Table 9.25** below. All results are the ammonia concentration in (µg/m^3).

Table 9.25: Annual Average Ground Level Ammonia Concentrations at human, community and ecological receptors (units in µg/m^3).

Year	2016	2017	2018	2019	2020	Average
R1	0.026	0.031	0.026	0.026	0.031	0.028
R2	0.018	0.021	0.019	0.018	0.019	0.019
R3	0.020	0.024	0.020	0.019	0.022	0.021
R4	0.021	0.024	0.020	0.020	0.024	0.022
R5	0.019	0.023	0.020	0.020	0.024	0.022
R6	0.018	0.021	0.019	0.018	0.021	0.019
R7	0.017	0.019	0.017	0.017	0.019	0.018
R8	0.016	0.017	0.016	0.016	0.016	0.016
R9	0.015	0.016	0.016	0.014	0.013	0.015
R10	0.014	0.014	0.014	0.013	0.011	0.013
R11	0.011	0.011	0.011	0.011	0.010	0.011
R12	0.011	0.011	0.011	0.010	0.009	0.010
R13	0.009	0.009	0.008	0.008	0.008	0.008
R14	0.008	0.008	0.008	0.007	0.006	0.007
R15	0.008	0.009	0.008	0.008	0.007	0.008
R16	0.008	0.008	0.008	0.008	0.007	0.008
R17	0.008	0.008	0.007	0.007	0.006	0.007
R18	0.008	0.008	0.007	0.007	0.007	0.008
R19	0.007	0.007	0.007	0.007	0.006	0.007
R20	0.008	0.008	0.007	0.007	0.007	0.007
R21	0.007	0.007	0.007	0.007	0.006	0.007
R22	0.006	0.007	0.004	0.006	0.006	0.006
R23	0.005	0.006	0.004	0.005	0.004	0.005
R24	0.004	0.005	0.003	0.005	0.005	0.004
R25	0.004	0.005	0.003	0.005	0.005	0.004
R26	0.003	0.004	0.003	0.004	0.004	0.004

R27	0.003	0.002	0.002	0.002	0.003	0.003
R28	0.002	0.002	0.002	0.002	0.003	0.002
R29	0.002	0.002	0.002	0.002	0.003	0.002
R30	0.002	0.002	0.002	0.002	0.003	0.002
R31	0.002	0.002	0.002	0.002	0.003	0.002
R32	0.002	0.001	0.002	0.002	0.002	0.002
R33	0.002	0.001	0.002	0.002	0.002	0.002
R34	0.001	0.001	0.002	0.002	0.002	0.002
R35	0.002	0.001	0.002	0.001	0.002	0.002
R36	0.002	0.001	0.003	0.002	0.003	0.002
R37	0.002	0.001	0.003	0.002	0.003	0.002
R38	0.003	0.002	0.002	0.002	0.002	0.002
R39	0.005	0.003	0.003	0.005	0.004	0.004
R40	0.005	0.004	0.005	0.008	0.006	0.006
C1	0.035	0.040	0.036	0.036	0.036	0.037
C2	0.026	0.031	0.028	0.027	0.027	0.028
C3	0.009	0.012	0.009	0.010	0.009	0.010
C4	0.016	0.020	0.018	0.017	0.017	0.018
C5	0.011	0.012	0.011	0.010	0.011	0.011
C6	0.008	0.009	0.007	0.008	0.008	0.008
C7	0.008	0.010	0.008	0.007	0.008	0.008
C8	0.002	0.002	0.002	0.002	0.003	0.002
C9	0.002	0.002	0.002	0.002	0.003	0.002
C10	0.002	0.001	0.002	0.002	0.002	0.002
C11	0.002	0.001	0.002	0.002	0.002	0.002
C12	0.004	0.003	0.002	0.004	0.003	0.003
E1	0.0018	0.0010	0.0010	0.0013	0.0012	0.0013
E2	0.0016	0.0023	0.0017	0.0015	0.0017	0.0018
E3	0.0016	0.0023	0.0017	0.0015	0.0017	0.0018
E4	0.0008	0.0008	0.0009	0.0009	0.0007	0.0008
E5	0.0005	0.0004	0.0005	0.0005	0.0004	0.0005
E6	0.0005	0.0005	0.0006	0.0004	0.0005	0.0005
E7	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002
E8	0.0002	0.0001	0.0003	0.0001	0.0002	0.0002
E9	0.0002	0.0001	0.0002	0.0001	0.0001	0.0001
E10	0.0001	0.0001	0.0002	0.0001	0.0002	0.0001

E11	0.0002	0.0003	0.0002	0.0002	0.0002	0.0002
E12	0.0002	0.0003	0.0002	0.0002	0.0002	0.0002
E13	0.0004	0.0005	0.0004	0.0003	0.0004	0.0004
E14	0.0004	0.0003	0.0004	0.0003	0.0003	0.0003

All of the modelled Ground Level Concentrations of ammonia detailed in **Table 9.25** above are significantly below the limit values as provided in **Table 9.1** in relation to the protection of human health and vegetation. EA, UK H1 Part 2 guidance sets a limit of <180 μg/m^3 and UNECE guidance sets a limit of <1 μg/m^3 for the protection of sensitive lichens/ bryophytes and <3 μg/m^3 for the protection of woodland/ heathlands.

Table 9.26 below details the maximum year result 1-hour concentration at each of the sensitive receptors for the MET data 2016-2020.

Table 9.26: Ammonia concentrations at residential and identified locations (units in μg/m^3).

Location	Maximum 1-Hour
R1	0.7
R2	0.6
R3	0.6
R4	0.5
R5	0.4
R6	0.4
R7	0.5
R8	0.5
R9	0.6
R10	0.6
R11	0.4
R12	0.4
R13	0.4
R14	0.4
R15	0.4
R16	0.4
R17	0.4
R18	0.4
R19	0.4
R20	0.4
R21	0.4

R22	0.9
R23	0.9
R24	0.7
R25	0.8
R26	0.7
R27	0.5
R28	0.5
R29	0.5
R30	0.5
R31	0.5
R32	0.4
R33	0.5
R34	0.5
R35	0.4
R36	0.4
R37	0.4
R38	1.3
R39	0.9
R40	1.8
C1	1.0
C2	1.0
C3	0.6
C4	0.6
C5	0.4
C6	0.4
C7	0.4
C8	0.5
C9	0.5
C10	0.4
C11	0.4
C12	1.0
Limit (Max 1-Hour)	**2,500**

The background ammonia level is provided in the SCAIL website which is based on a 3-year average. The grid references provided in **Table 9.19** were searched, with background ammonia level given in **Table 9.27** below.

Table 9.27 compares the highest annual average predicted levels at the designated areas with:

- The Process Contribution (PC), the maximum modelled concentration of the substance due to process emissions alone.
- Predicted Environmental Concentration (PEC) – that is, the maximum modelled concentration (of ammonia) due to the process emissions combined with estimated baseline concentrations.
- PC and PEC as a percentage of the objective or guideline.

For the assessment of annual mean concentrations, the annual mean contribution of the process can be added to the annual mean estimate for background.

Table 9.27: Ammonia concentrations at designated ecologically sensitive locations.

	Location	Guideline (µg/m³)*	Background (µg/m³)	Highest PC (µg/m³)	PEC (µg/m³)	PC/ Guideline level (%)	PEC/ Guideline level (%)
E1	Glenloughaun Esker SAC	1	2.21	0.0018	2.2118	0.18	221
E2	Suck River Callows NHA	1	2.05	0.0023	2.0523	0.23	205
E3	River Suck Callows SPA	1	2.05	0.0023	2.0523	0.23	205
E4	Killure Bog NHA	1	1.97	0.0009	1.9709	0.09	197
E5	Crit Island West NHA	1	2.00	0.0005	2.0005	0.05	200
E6	Annaghbeg Bog NHA	1	1.98	0.0006	1.9806	0.06	198
E7	Moorfield Bod NHA	1	2.32	0.0002	2.3202	0.02	232
E8	Eskerboy Bog NHA	1	2.25	0.0003	2.2503	0.03	225
E9	Cloonoolish Bog NHA	1	2.36	0.0002	2.3602	0.02	236
E10	Ardgraigue Bog SAC	1	2.31	0.0002	2.3102	0.02	231

	Location	Guideline (µg/m³)*	Background (µg/m³)	Highest PC (µg/m³)	PEC (µg/m³)	PC/ Guideline level (%)	PEC/ Guideline level (%)
E11	River Shannon Callows SAC	1	2.15	0.0003	2.1503	0.03	215
E12	Middle Shannon Callows SPA	1	2.1	0.0003	2.1103	0.03	211
E13	Castlesampson Esker SAC	1	2.06	0.0005	2.0605	0.05	206
E14	Killeglan Grassland SAC	1	2.33	0.0004	2.3304	0.04	233

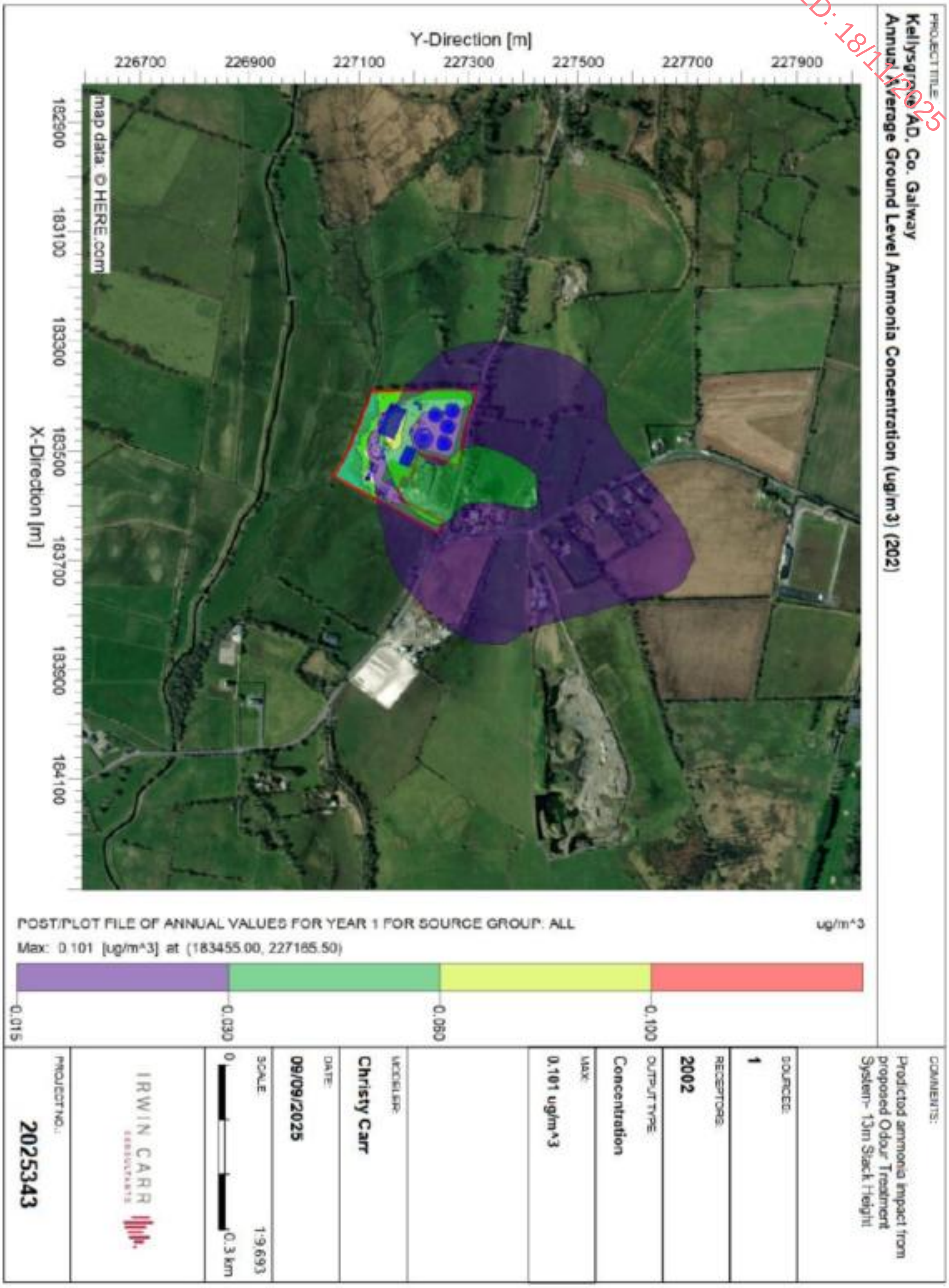
**Conservatively, Guideline Values for all designated sites were assumed to be 1 µg/m³.*

The ammonia concentrations at the sites are dominated by the background concentrations, which are approximately 197 – 236% of the air quality guideline for ammonia.

At all locations, the Critical Level of ammonia is exceeded, however the PC of the proposed site is significantly <1%, and as a result considered insignificant for the purposes of this assessment.

Figure 9.8 overleaf illustrates the modelled annual average ground level ammonia concentrations for 2020.

Figure 9.8: Annual Average Ground Level Ammonia Concentrations (ug/m^3) (2020).



Receptor Summary

Table 8 below compares the highest annual average predicted levels at the residential receptors where:

- The Process contribution (PC)- the maximum modelled concentration of the substance due to process emissions alone
- Predicted Environmental Concentration (PEC) – that is, the maximum modelled concentration due to process emissions combined with estimated baseline concentrations.
- PC and PEC as a percentage of the objective or guideline.

In accordance with A3.195 of Part IV of the Environment Act 1995 Environment (Northern Ireland) Oder 2002 Part III Local Air Quality Management Technical Guidance LAQM.TG(09) February 2009;

> *"For the assessment of annual mean concentrations, the annual mean contribution of the process can be added to the annual mean estimate for background."*

In relation to the predicted short-term peak 1-hr concentrations, twice the background concentration level was added to the predicted environmental concentration (PEC) (UK Environment Agency).

Table 9.28: Air Quality Summary

Pollutant	Limit Type	Value (µg/m³)	Baseline (µg/m³)	Max Level (µg/m³)	PEC (µg/m³)	PC of limit (%)	PEC of Limit (%)
Nitrogen Dioxide (NO_2)	99.8% max 1-hr	200	14.6	22.1	36.7	11.0	18.3
	Annual Average	40	7.3	1.47	8.8	3.7	21.9
Carbon Monoxide (CO)	8-hr mean	10,000	0.3	165.9	166.2	1.7	1.7
Odour	98th %tile of 1-Hour	3	0	1.44	1.44	47.9	47.9
Ammonia	Max 1-Hour	2,500	4.2	1.77	5.97	0.007	0.2
	Annual Average	180	2.1	0.049	2.15	0.03	1.2

**The maximum annual average levels for Nitrogen Dioxide, Ammonia and Carbon Monoxide are predicted when the volume flow from the proposed facility is at 75%, rather than a 100%. Full details of the assessment undertaken at 75% volume flow are included in Appendix 9.5.*

It can be seen that the worst case predicted level at any residential locations in the vicinity of the development do not exceed the limit level when considered as a PC or PEC.

It should also be noted that the PC under maximum operations does not exceed 75% of the ambient air quality standards, based on the maximum emission limits of the stacks.

9.5.5 Critical Levels and Critical Loads for Designated Ecological Sites

A review has been completed with regard to emissions from the Proposed Development on critical levels and loads for designated sites within 15 km of site, shown in **Table 9.19**.

Nitrogen Conversion

In terms of nitrogen deposition, reference was made to draft document "Licence Application Instruction Note 2 (IN2) (EPA, 2019). IN2 provides a framework for assessing whether ammonia and nitrogen oxide emissions from licensable activities pose significant risks to nearby European Sites. A key assessment requirement is that if a facility's emissions are within 250m of a European Site or exceed 1% of the critical levels or loads, an AA is required. As can be seen in **Table 9.29** and **9.30** the process contribution (PC) is well below 1% at the nearest designated sites.

The Critical Load specifies the annual nitrogen that can be deposited for a given area per year. Below this level, sensitive habitat should not be affected. The dry deposition flux (μg/$m^{2/}$s of NO_2) was calculated using AQTAG06 (Technical Guidance on Detailed Modelling Approach for an Appropriate Assessment for Emissions to Air), where the predicted ground level of NO_2 (in μg/m^3) was multiplied by the relevant deposition velocity.

The dry deposition was then multiplied by the conversion factor provided in the guidance to convert to the levels of kg.N/ha/yr. The conversion factors are provided in Table 8.1 and 8.2 of the AQTAG06 as presented in the **Table 9.29** below.

Table 9.29: Conversion Factors

Pollutant	NH_3 Deposition Velocity (m/s)	Conversion Factor
NO_2 to Nitrogen	0.0015 (short vegetation)	95.9
NH_3 to Nitrogen	0.02 (short vegetation)	260

Table 9.30 overleaf converts the highest Process Contribution in μg/m^3 to kg.N/ha/yr, using the conversion factors detailed in **Table 9.26** above.

Table 9.30: Conversion of Highest NO_2 Results to N

Location	Pollutant	Highest PC ($\mu g/m^{-3}$)*	NO_2 Deposition Velocity (m/s)	Conversion Factor	Highest PC (kg.N/ha/yr)
E1	NO_2 to N	0.040	0.0015 (short vegetation)	95.9	0.006
E2		0.087			0.013
E3		0.087			0.013
E4		0.037			0.005
E5		0.025			0.004
E6		0.027			0.004
E7		0.007			0.001
E8		0.008			0.001
E9		0.006			0.001
E10		0.006			0.001
E11		0.012			0.002
E12		0.012			0.002
E13		0.023			0.003
E14		0.022			0.003

**The highest PC at all locations is predicted when the volume flow from the facility is at 100%, rather than at 75%. Full details of the assessment undertaken at 75% are included in Appendix 9.5.*

It should be noted that the worst-case results presented in **Table 9.30** above take account of the additional assessment undertaken, which accounts for the facility at 75% volume flow rather than maximum capacity.

Ammonia Conversion

Table 9.31 overleaf converts the highest Process Contribution in $\mu g/m^3$ to kg.N/ha/yr, using the ammonia conversation factors detailed in **Table 9.29** above.

Table 9.31: Conversion of Highest Ammonia Results to Nitrogen

Location	Pollutant	Highest PC ($\mu g/m^{-3}$)*	NO_2 Deposition Velocity (m/s)	Conversion Factor	Highest PC (kg N/ha/yr)
E1	NH_3 to N	0.018	0.002 (short vegetation)	260	0.010
E2		0.0023			0.012
E3		0.0023			0.012
E4		0.0009			0.004
E5		0.0005			0.003
E6		0.0006			0.003
E7		0.0002			0.001
E8		0.0003			0.001
E9		0.0002			0.001
E10		0.0002			0.001
E11		0.0003			0.002
E12		0.0003			0.002
E13		0.0005			0.003
E14		0.0004			0.002

**The highest PC at all locations is predicted when the volume flow from the facility is at 100%, rather than at 75%. Full details of the assessment undertaken at 75% are included in Appendix 9.5.*

Total Nitrogen Deposition

By combining the maximum predicted Nitrogen deposition impacts in **Table 9.30** and **9.31**, the total Nitrogen deposition at each of the designated sites due to the proposed development can be estimated, as detailed in **Table 9.32**.

Table 9.32: Conversion of Highest Ammonia Results to Nitrogen

Location	PC from NO_2 Contributions (kg.N/ha/yr)	PC from NH_3 Contributions (kg.N/ha/yr)	Total Nitrogen Deposition (kg.N/ha/yr)
E1	0.006	0.010	0.016
E2	0.013	0.012	0.025
E3	0.013	0.012	0.025
E4	0.005	0.004	0.009
E5	0.004	0.003	0.007
E6	0.004	0.003	0.007
E7	0.001	0.001	0.002
E8	0.001	0.001	0.002
E9	0.001	0.001	0.002
E10	0.001	0.001	0.002
E11	0.002	0.002	0.004
E12	0.002	0.002	0.004
E13	0.003	0.003	0.006
E14	0.003	0.002	0.005

**The highest PC at all locations is predicted when the volume flow from the facility is at 100%, rather than at 75%. Full details of the assessment undertaken at 75% are included in Appendix 9.5.*

Using similar methodology to the assessment undertaken in **Section 9.5.4** above the PC and PEC can be seen in **Table 9.33** below.

Table 9.33: Nitrogen concentration at designated ecologically sensitive locations.

Location		Critical Load (kg N/ha/yr)	Background (kg N/ha/yr)	Highest PC* (kg.N/ha/yr)	PEC (kg N/ha/yr)	PC/ Guideline level (%)	PEC/ Guideline level (%)
E1	Glenloughaun Esker SAC	5	5.99	0.016	6.00	0.32	120
E2	Suck River Callows NHA	5	5.43	0.025	5.44	0.49	109
E3	River Suck Callows SPA	5	5.43	0.025	5.44	0.49	109
E4	Killure Bog NHA	5	5.30	0.009	5.31	0.18	106

Location		Critical Load (kg N/ha/yr)	Background (kg N/ha/yr)	Highest PC* (kg.N/ha/yr)	PEC (kg N/ha/yr)	PC/ Guideline level (%)	PEC/ Guideline level (%)
E5	Crit Island West NHA	5	5.44	0.007	5.44	0.14	109
E6	Annaghbeg Bog NHA	5	5.41	0.007	5.41	0.14	108
E7	Moorfield Bog NHA	5	6.08	0.002	6.08	0.04	122
E8	Eskerboy Bog NHA	5	6.03	0.002	6.03	0.05	121
E9	Cloonoolish Bog NHA	5	5.89	0.002	5.89	0.04	118
E10	Ardgraigue Bog SAC	5	5.74	0.002	5.74	0.004	115
E11	River Shannon Callows SAC	5	5.22	0.004	5.22	0.08	104
E12	Middle Shannon Callows SPA	5	5.86	0.004	5.86	0.08	117
E13	Castlesampson Esker SAC	10	5.73	0.006	5.73	0.06	57
E14	Killeglan Grassland SAC	5	5.83	0.005	5.83	0.11	117

The highest PC included in **Table 9.33 combines Nitrogen deposition from the predicted NO_2 and NH_3 impacts.*

Considering criteria as outlined in EPA Industrial Note 1, the PC at all locations is less than 0.3kg.N/ha/yr, and as a result would be considered negligible for the purposes of the Nitrogen assessment.

Considering criteria as outlined in EPA Industrial Note 2, the maximum predicted Nitrogen deposition is significantly <1% at all of the locations assessed, and the Critical Level of Nitrogen is not exceeded at any location.

9.5.6 Human Health

Air dispersion modelling was completed to evaluate the potential effects of the planned development regarding EU ambient air quality standards which were established on the grounds of protecting human health. As shown by the modelled results, projected ambient concentrations including background levels fall within all National and EU ambient air quality limit values and, thus, will not cause a significant impact on human health.

Conservative and robust assumptions were made defining the input data for the air dispersion model, this methodology results in an over-estimation of actual real-world levels that are likely to be generated.

9.5.7 Impact from other Potential Emissions Points

The 1no. flare will operate infrequently therefore it is envisaged that this emission point will have an insignificant effect on local air quality beyond the site boundary. The effect to air quality and climate from the flare is classed as negligible.

The proposed pressure relief valves and digestor vents also have the potential to release emissions to the atmosphere however due to the infrequent extent of these emissions, small scale nature and mitigation features included as part of plant design these emissions are considered not significant as a source for possible impacts to local air quality and odour. A review of associated mitigation features with regard to process emissions to the atmosphere can be viewed in **Section 9.6.2**.

Another possible source of nuisance emission is fugitive odour emissions from transfer and handling of feedstock arriving to site. A review of intended abatement measures associated with this type of odour emissions can be found in **Section 9.6.2**.

9.5.8 Traffic

The volume of traffic associated with the planned development will not be significant during both operation and construction; quantitative evaluation of ambient air quality and climate impacts was not required under the criteria from the LAQM Guidance (2022) and TII guidelines (2011) (see **Section 9.3.2**). During site operation the planned development will cause an extra 27 HGV/day during sites busiest periods to the neighbouring road network and is below the 200HGV level for change in traffic volumes which requires a quantitative air assessment. Therefore, the influence from traffic linked to the planned development with regard to climate will be long term and not significant.

9.5.9 Climate

Producing biogas for use as a fuel source is deemed CO_2 positive and consequently does not add GHGs to the environment as long as efficient recovery and combustion for heat and/or power as it substitutes the need for fossil fuels.

The generation of *ca.* 510-580 Nm^3 of biomethane per hour which will be distributed to the gas network for use as an alternative to conventional fossil fuels. The outcome of the Proposed Development once in operation will be a slight, positive, long-term effect on climate and regional air quality. The planned development will be self-reliant with regard to heat and power production as the CHP and biomethane boiler onsite will both run on the biomethane generated at the plant.

9.5.10 Decommissioning Phase

The decommissioning stage climate and air quality impacts will be similar to those defined for the construction stage of the planned development.

9.5.11 Risks of Accidents and Disasters

The planned development will be licenced under the Industrial Emissions (IE) Directive; therefore, the site will conform with all appropriate legislation and will apply all risk reduction processes as specified within the relevant IE licence in order to avoid off-site impacts.

Additionally, the Proposed Development will conform with all appropriate health and safety guidelines and legislation.

A screening evaluation was carried out, where an inventory of dangerous substances (in the context of the Seveso III/COMAH Directive for major accidents and disasters) was compiled. Applying the aggregate calculation method outlined in the Seveso III/COMAH Directive, the proposed facility, when operating at full capacity i.e. assuming biogas in the digester headspaces, biomethane in pipework, LPG gas and diesel for fuelling machinery, remains below the lower-tier threshold for COMAH. Thus, this specific regulation does not apply ((**see Section 2.3.3, Chapter 2** for further details).

The proposed development has been designed in line with good industry practice, and, as such, mitigation against the risk of accidents/injuries is embedded through the design and in accordance with planning and legislative requirements and the risk management legislation in place

With regard to the construction stage of the development, the contractor will ensure that the construction area is compliant with all relevant health and safety guidelines and legislation.

9.5.12 Installation of Gas Pipeline

The proposed gas pipeline connecting to the existing Gas Networks Ireland pipeline south of Ballinasloe will be installed along the R355 road, intersecting the M6 before joining into the distribution pipe along the R466. This is an indicative routing of the pipeline to the site and is subject to change pending detailed network modelling and design. The final pipeline will be designed, consented and delivered by Gas Networks Ireland.

Installation of the pipeline will involve temporary excavation work and will result in disturbance of the underlying soil and subsoil. Land stripping / earth-moving works throughout periods of high winds and dry weather conditions can be a significant cause of dust.

9.6 Mitigation Measures and Monitoring

9.6.1 Construction Phase

The continuous management of fugitive dust will reduce significant dust emissions and mitigate once it has been created. The assigned contractor will be responsible for the control and ongoing monitoring of the dust management plan throughout the entire construction period. The aim of dust management is to safeguard against significant dust nuisance. To achieve a transparent and regulated approach, the following managed plan has been developed, this is guided by best practice from Ireland, the UK (IAQM 2024, BRE 2003, Scottish Office 1996 and UK ODPM 2002). and the USA (USEPA 1997).

Site Dust Management Plan

The aim is to provide appropriate site supervision by inhibiting dust development to unsuitable airborne levels at source. This is to be accomplished by appropriate site strategy and well known/established control procedures.

Throughout the construction planning stage, the location of activities and storage piles will acknowledge and recognise nearby sensitive receptors/locations and existing prevailing winds to inhibit the chance of significant dust nuisance/soiling (see **Figure 9.2** for Windrose for Gurteen Meteorological Station).

The prevailing wind is mainly south-westerly therefore construction compounds and storage piles should be located downwind of sensitive receptors/locations to decrease the likelihood for nuisance dust to affect/occur at sensitive receptors.

Suitable site supervision will involve the capacity to respond to unfavourable weather conditions by restricting construction activities on-site or by immediate effective control measures prior to the likelihood of nuisance incidences.

Throughout periods where rainfall is greater than 0.2mm/day, dust generation is generally suppressed (BRE 2003, UK ODPM 2002). The likelihood of significant dust incidences is also connected to threshold wind speeds greater than 10 m/s (19.4 knots) (at 7m above ground) to displace loose material from storage piles and other exposed materials (USEPA 1986).

Due care should be practiced during site works during periods of high wind as these are times where the possibility for significant dust emissions is highest. The prevailing meteorological conditions in the site locality are favourable for dust suppression on average for the majority of an average meteorological year. However, there will be instances where due diligence will be necessary to ensure dust nuisance events are not experienced. Below details examples of the methods that shall be used during periods of unfavourable meteorological events:

- Contractors shall have good site management procedures throughout the construction works to avoid the creation of airborne dust. Contractors are obliged to guarantee that sufficient preventative measures to limit dust generation are employed through suitable method statements, accounting for the risks and mitigation measures described in the CEMP.
- Throughout working hours, dust control procedures will be assessed as appropriate, subject to the prevailing meteorological conditions.
- The name and contact details of an appropriate person to contact concerning air quality and dust issues shall be exhibited on the site boundary, this notice board should also detail head/regional office contact details.
- It is advisable that community engagement commences before works begin on site describing the nature and duration of the works to local residents and businesses.
- Where complaints are received concerning dust, records will be maintained including likely causes and suitable action taken to alleviate any issues as a result of the construction. Management of any complaints will be done in conjunction with a suitable Complaints Procedure.
- During activities which pose a high probability of dust production and/or during periods of adverse weather conditions the rate of site inspections should be increased.
- Site inspections will be completed frequently to monitor compliance with dust control strategies set out in the CEMP and the results recorded of these inspections, including nil returns.
- The dust reduction strategies should be evaluated at regular intervals during the project to preserve the effectiveness of the techniques employed and to safeguard the minimisation of dust using best practice and procedures. In the event of dust spoiling/nuisance occurring beyond the boundary of the site, site activities will be assessed, and suitable measures utilized to negate the nuisance. Outlined dust mitigation measures to be employed are described below.

- Fully enclose or cover certain operations, where possible, when there is a high possibility for dust generation.
- Prevent site runoff of water or mud.
- Keep site barriers and fencing clean using watering procedures.
- Remove materials that have the capability to produce dust from site as soon as practicable, unless being reused on site.
- Opt for mains or battery powered equipment in preference to diesel or petrol powered generators where practicable.
- Use cutting or grinding equipment fitted with suitable dust suppression techniques such as water sprays or local extraction.
- Make certain an adequate water supply is available on the site for effective dust/particulate matter suppression/mitigation.
- Use enclosed chutes and conveyors and covered skips.
- Reduce drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever possible.
- Make certain equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
- Strictly no bonfires or burning of waste materials on site.

Site Roads / Haulage Route

Construction HGV/truck activities on site roads (especially unpaved roads) can be a substantial source of fugitive dust if suitable control measures have not been applied. The use of speed restrictions is commonly the most effective way of suppressing dust on unpaved haul roads. Various studies have proven that this method can have an effectiveness varying from 25 to 80% (UK ODPM 2002):

- A speed limit of 15km/hr will be applied as an effective control measure for dust for on-site vehicles utilising unpaved road surfaces.
- Entrance gates should be located at a minimum 10m from local sensitive receptors as much as is reasonably practical/possible.
- Watering of the site will be utilised during periods of prolonged dry weather to ensure unpaved or areas associated with problematic dust are kept moist. Frequency of watering will be dependent on weather conditions, vehicle activity and soil type, dust suppression such as sprinklers, bowsers etc. should be available during the construction phase.
- A road sweeper will be applied as required to control mud and dust on the site access roads.
- All vehicles must switch off engines once stationery i.e. no idling vehicles on site.
- Vehicles entering and leaving sites must be covered to prevent dusty emissions from materials during transport.
- Document all inspections of haul roads and any follow-up action in a site logbook.
- Employ a wheel washing system with rumble grids to remove collected dust and mud prior to leaving the site where reasonable.
- Sand and other aggregates must be stored in bunded areas and are not allowed to dry out and become airborne, unless this is required, in which case ensure that appropriate additional control measures are in place.

- Bulk cement and other fine powder materials must be delivered in covered tankers and stored in silos with suitable control systems to negate escape from material and overfilling during delivery.

Land Stripping / Earth Moving

Land stripping / earth-moving works throughout periods of high winds and dry weather conditions can be a significant cause of dust.

- Throughout dry and windy periods, and when there is a possibility of dust nuisance, watering shall be performed to ensure moisture content of materials being relocated is high enough to increase the stability of the soil and thus suppress dust.
- During times of very high winds (gales), actions likely to generate significant dust emissions should be rescheduled until the gale has receded.
- Revegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable
- Use hessian mulches where it is not possible to revegetate or cover with topsoil, as soon as is practicable
- Only remove covers in small areas during work and not all at once.

Storage Piles

The position and moisture content of storage piles are key factors which determine their capacity for dust emissions. The below measures shall be utilised to minimise fugitive dust formation from storage piles:

- Overburden material shall be shielded from exposure to wind by storing the material in sheltered regions of the site. Where possible storage piles should be positioned downwind of sensitive receptors.
- Adequate watering will take place to ensure the moisture content is high enough to suppress dust. The watering of stockpiles has been found to have an 80% control efficiency (UK ODPM 2002).
- Plan site layout so that machinery and dust causing activities including stockpiling are located away from receptors, as far as is possible.
- Erect solid screens or barriers around dusty activities or the site boundary which are at least as high as any stockpiles on site.

Site Traffic on Public Roads

Escape of debris, aggregates and fine material onto public roads should be decreased to a minimum by utilising the following measures:

- Vehicles delivering or collecting material with capacity for dust emissions shall be covered with tarp, to limit the blow-off of dust.
- A wheel wash facility should be installed near the entrance of the construction site, where feasible. All trucks leaving the site must pass through the wheel wash. In addition, public roads outside the site shall be regularly inspected for cleanliness, as a minimum daily, and cleaned as necessary.

Summary of Dust Mitigation Measures

The constant control of fugitive dust will maintain the prevention of significant emissions, instead of an inefficient attempt to manage them once they have been released. The main elements with respect to control of dust will be:

- The design of a site policy on dust and the allocation of the site management responsibilities for dust management.
- The creation of a documented system for managing site practices regarding dust control.
- The development of a method by which the functionality of the dust control plan can be consistently monitored and assessed; and
- The requirement of effective procedures to handle any complaints.

These procedures will be strictly monitored and assessed continuously throughout the construction stage. In the occurrence of dust nuisance outside the site boundary, activities likely to cause dust would be restricted and adequate procedures applied to resolve the problem before the recommencement of construction operations.

Climate and Regional Air Quality

Various site-specific mitigation methods can be applied throughout the construction stage of the Proposed Development to support emissions reduction - such as the restriction of on-site or delivery vehicles from leaving engines idling, even over brief periods. Reducing waste of materials due to inadequate timing or over stocking of materials on site will assist to minimise the carbon footprint of the site.

Traffic

Traffic emissions associated with site have been projected as not significant therefore no detailed mitigation/remediation related to air and climate emissions from traffic have been described.

9.6.2 Operational Phase

Odour Emissions

The stack height of the proposed odour abatement system has been designed in an iterative fashion to ensure that an adequate height was selected to aid dispersion of the emissions and achieve compliance with indicative odour standards at all off-site locations. It has been determined that a minimum stack height of 13.0 m would provide adequate dispersion to achieve compliance with the odour guideline value at all locations at or beyond the site boundary.

A variety of mitigation technologies has been integrated within the Proposed Development so as to reduce and minimise possible emission odour. Further detail of the variety and scale of proposed technologies can be found in **Chapter 2: Project Description**.

Process management and supervision are key when limiting generation of odour at a source. Emissions to the atmosphere are controlled and managed by end of process mitigation equipment and a stack height that is suitable to disperse the exhausted plume accordingly.

The odour treatment proposed for the plant will consist of an odour abatement system and carbon filters with a high range of efficiency to remove compounds such as hydrogen sulphide, ammonia and siloxanes in the exhaust gas so as to avert odour impacts of significance beyond the site boundary.

The planned biogas upgrading plant will include active sensors for CH_4, CO_2, H_2S and the gas will be recirculated back through the scrubbing process in the event that it does not meet the required levels. H_2S will be trapped on activated carbon, water vapour will be emitted to the atmosphere. All CO_2 will be captured and liquified. There will be no CH_4 emissions from the proposed biogas upgrading plant.

The following odour abatement measures have been integrated into the design of the plant:

- The Feedstock Reception Building has been constructed to accommodate multiple trucks to unload at any one time. This will significantly reduce the number of trucks waiting outside of the building and therefore minimising fugitive odour emissions on-site.
- The proposed Feedstock Reception Building will be designed and constructed to be maintained under negative air pressure.
- All feedstock handling activities at the facility will be carried out within a ventilated building which will be extracted to an odour abatement system using ammonia scrubbing, UV treatment and active carbon filtration to remove odorous compounds. The building will operate under negative pressure with a minimum of 3 air changes per hour. Ventilation pipe work installed in the headspace of the building will be connected to a high-volume medium-pressure fan that will draw off the warm, buoyant building air that will be generated by a combination of emissions from the feedstock materials in the intake area and from fugitive emissions from the movement of the material to the pre-treatment and digesters.
- The main entrances to the reception building will be fitted with rapid response roller shutter doors. A closed-door management strategy will be enforced.
- Treated emissions from the odour control plant in the reception building will be discharged via a 13.0 m stack to enhance dispersion. The proposed location of the odour abatement system emission point within the site footprint was also designed to ensure that the distance between the emission point and the nearest sensitive receptors was maximised, thereby aiding dispersion.

The following additional mitigation measures will be adopted for the management of the Proposed Development:

- Vehicles exiting the reception building will be subjected to cleaning procedures in accordance with the DAFM Conditions Document in a designated cleaning area located outside of this door.
- Where there is a potential for odours from deliveries of feedstock, these will be delivered in covered or sealed containers.
- Feedstock delivery times will be controlled in order to minimise truck waiting times outside of the reception building and therefore minimising fugitive odour emissions on-site.
- Biobased fertiliser will be stabilised and pasteurised before storage and removal from the site in order to minimise odour generation.
- An odour management plan will be prepared for the operational phase of the site to ensure that all odour control methods applied are sufficient and assessed at regular intervals. The plan will also outline a procedure for addressing any odour complaints.

As described previously, the Proposed Development will be licenced by the EPA under the Industrial Emissions Directive and will therefore need to comply to all associated processes and conditions as directed by the IE licence to avoid significant impacts to local odour, climate and air quality.

<u>Process Emissions</u>

The proposed stack height for the CHP has been designed in an adaptive manner to guarantee that an acceptable height has been incorporated into site layout to support effective dispersion of emissions and comply with applicable EU ambient air quality standards at all offsite locations.

As a result of the air dispersion modelling evaluation, mitigation measures designed into site and planned supervision of the proposed AD facility (as described within this chapter and in Chapter 2), no supplementary abatement measures are planned for the CHP, flare and biomethane boiler stack during the operational stage of the development.

9.7 Cumulative Effects

9.7.1 Construction Phase

There is potential for cumulative dust effects at adjacent site receptors should the construction stage of the planned development overlap with the construction of any other authorised development within 250m of the site. Dust alleviation measures described in **Section 9.6.1** shall be employed during the construction stage of the planned development preventing significant cumulative effects on air quality. Due to suitable mitigation measures in position, any cumulative impacts on air quality and climate linked with the construction stage of the planned development are considered short-term and not significant.

9.7.2 Operational Phase

Cumulative impacts are unlikely, in terms of odour or air quality. Any existing sources of emissions to air have been included by way of background air quality data during the air dispersion modelling phase.

9.7.3 Indirect Impacts

Ammonia emissions to air occurs from slurry and chicken manure spreading with the use of nitrogen fertilisers. Ammonia can create particulate matter in the atmosphere which can have adverse effects on human health.

Ammonia is one of the key air pollutants monitored and reported under National Emissions Ceiling Directive (2016/2284/EU) which was ratified to give effect to the landmark UNECE Gothenburg Protocol under the Convention on Long Range Transboundary Air Pollution in 1999. Under this directive Ireland's ceiling for ammonia is 116 KT per annum, with an obligation to decrease ammonia emissions to 107.5 KT by 2030 or by *ca.* 10%. In 2020 Ireland infringed its ammonia ceiling emitting 123.4 KT of ammonia.

Using slurry/manure as a feedstock for the AD process instead of direct land spreading will create a more readily available form of the nitrogen present in the slurry, thus increasing nitrogen uptake within the soil and reducing ammonia emissions to air. Also, the use of digestate as a biobased fertiliser can replace the need for using of of inorganic nitrogen fertiliser which would facilitate reduction of ammonia emissions.

The digestate produced will meet prescribed standards for digestive quality respiration activity, metals, pathogenic organisms, impurities, organic matter and maturity. Digestate storage tanks will be covered to prevent rainwater ingress and as they will contain spent digestate there will be a lower odour potential from the digested storage tanks. The digestate will be spent by the time it is sent to the digestate storage tanks because of the digestion process; by which time all biomethane will have been extracted. The digestate will also have undergone pasteurisation during the process. The various scrubbing methods at this stage will reduce the potential for odour.

Therefore, the Proposed Development will have a long-term slight positive indirect effect on air quality.

9.8 Residual Impacts

According to Environmental Protection Agency guidelines, Residual Impact is described as 'the degree of environmental change that will occur after the proposed mitigation measures have taken place.' The mitigation strategy above recommends actions which can be taken to reduce or offset the scale, significance and duration of the impacts on the surrounding odour, air quality or climate.

The purpose of this assessment is to specify mitigation measures where appropriate to minimise the 'risk factor' to all aspects of air quality such as to minimize the potential for odours to be generated, air quality limits to be exceeded etc. This 'risk factor' is reduced or offset by recommending the implementation of a mitigation strategy in each area of the study. On the implementation of this mitigation strategy, the potential for impact will be lessened.

A site-specific Construction Environmental Management Plan (CEMP) will be devised and implemented throughout the duration of the construction phase. This document will contain all the necessary procedures required to prevent and minimise any environmental risks posed by the project on the surrounding environment.

9.8.1 Construction Phase

A summary of the predicted impacts associated with the construction phase in terms of quality, significance, and duration, along with the proposed mitigation measures and resulting residual impacts are summarised in **Table 9.29**.

The overall impact anticipated by the construction phase of the project following the implementation of suitable mitigation measures is considered to be **negative, imperceptible** to **moderate, and temporary**.

9.8.2 Operational Phase

A summary of the predicted impacts associated with the operational phase in terms of quality, significance, and duration, along with the proposed mitigation measures and resulting residual impacts are summarised in **Table 9.29**.

There is a slight positive long-term impact at national scale in terms of climate due to the development being self-reliant and giving the grid an alternative to conventional fossil fuels. There is a slight negative long-term impact at local level with regards to vehicle movements associated with the operating plant. The overall impact anticipated by the operational phase of the project following the implementation of suitable mitigation measures is considered to be **neutral to negative**, **imperceptible to slight**, and **temporary to long-term**.

Table 9.29: Summary of predicted construction phase impacts, mitigation measures and residual impact

Potential Source	Environmental Receptor	Effect Description	Quality	Significance	Duration	Mitigation	Residual Effect
Fuel Storage	Site personnel/local environment/ local receptors	Fumes released to the environment	Negative	Slight	Temporary	• Temporary Fuels used during construction will be stored in sealed containers.	Negative, Imperceptible, Temporary
Stockpiling	Site personnel/local environment/ local receptors	Dust from stockpiles leaving site boundary into nearby properties/amenities or local roads	Negative	Significant	Temporary	• At the construction planning stage, the siting of activities and storage piles will take note of the location of sensitive receptors and prevailing wind directions in order to minimise the potential for significant dust nuisance. • During dry and windy periods, and when there is a likelihood of dust nuisance, watering shall be conducted to ensure moisture content of materials being moved is high enough to increase the stability of the soil and thus suppress dust.	Negative Slight, Temporary
Use of heavy plant / multiple plant use	Site personnel, air pollution, local receptors	Air emissions	Negative	Slight	Temporary	• The Contractor must monitor performance of plant and machinery to ensure that the proposed mitigation measures are implemented, and that dust effects and nuisance are minimised. • The prevention of on-site or delivery vehicles from leaving engines idling, even over short periods.	Neutral, Not significant Temporary
Topsoil stripping	Site personnel/local environment/ local receptors	Dust leaving site boundary into nearby local receptors/amenities	Negative	Significant	Temporary	• During working hours, dust control methods will be monitored as appropriate, depending on the prevailing meteorological conditions. • During periods of very high winds (gales), activities likely to generate significant dust emissions should be postponed until the gale has subsided. • Overburden material shall be protected from exposure to wind by storing the material in sheltered regions of the site.	Negative, Moderate, Temporary

Potential Source	Environmental Receptor	Effect Description	Quality	Significance	Duration	Mitigation	Residual Effect
						• Where possible storage piles should be located downwind of sensitive receptors. • Sufficient watering will take place to ensure the moisture content is high enough to suppress dust.	
Construction and operation of compound buildings and amenities	Site personnel/local environment/ local receptors	Dust leaving site boundary into nearby local receptors/amenities	Negative	Slight	Temporary	• Implementation of Construction Environmental Management Plan. • The specification of a site policy on dust and the identification of the site management responsibilities for dust issues. • The development of a documented system for managing site practices with regard to dust control. • The development of a means by which the performance of the dust minimisation plan can be regularly monitored and assessed. • The specification of effective measures to deal with any complaints received. • The name and contact details of a person to contact regarding environmental issues shall be displayed on the site boundary, this notice board should also include head/regional office contact details site. • A complaints register will be kept on site detailing all telephone calls and letters of complaint received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out. • At all times, the procedures put in place will be strictly monitored and assessed. • The dust minimisation measures shall be reviewed at regular intervals during the works to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures.	Negative, Not significant Temporary

Potential Source	Environmental Receptor	Effect Description	Quality	Significance	Duration	Mitigation	Residual Effect
						• Record any exceptional incidents that cause dust and/or air emissions, either on or off site and the action taken to resolve the situation in a dedicated logbook.	

Potential Source	Environmental Receptor	Effect Description	Quality	Significance	Duration	Mitigation	Residual Effect
Constructing and operating site access roads	Local receptors, roads and environment	Site and delivery vehicles travelling on unsealed roads	Negative	Moderate	Temporary	• A speed restriction of 15 km/hr will be applied as an effective control measure for dust for onsite vehicles using unpaved site roads. • Access gates to the site shall be located at least 10m from sensitive receptors, where possible • Watering shall be conducted during sustained dry periods to ensure that unpaved areas are kept moist. • Any hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads shall be restricted to essential site traffic only. • Vehicles delivering or collecting material with potential for dust emissions shall be enclosed or covered with tarpaulin at all times to restrict the escape of dust. • A wheel wash facility shall be installed if feasible. All trucks leaving the site must pass through the wheel wash. • Public roads outside the site shall be regularly inspected for cleanliness, as a minimum on a daily basis, and cleaned as necessary.	Negative, Slight Temporary

Table 9.30: Summary of predicted Operational phase impacts, mitigation measures and residual impact

Potential Source	Environmental Receptor	Effect Description	Quality	Significance	Duration	Mitigation	Residual Effect
Biogas Release	Local receptors, Environment	Air Emissions	Negative	Moderate	Temporary	• The flare stack will have an operational capacity of 110% of the expected maximum hourly biogas production and will ensure the safe and complete combustion of the biogas where necessary.	Neutral, Imperceptible, Long-term
Odour Release (Various)	Local receptors, Environment	Odour Emissions	Negative	Moderate	Long-term	• The odour abatement proposed for the facility will consist of odour treatment system and carbon filters with a high level of efficiency to remove impurities such as hydrogen sulphide, ammonia, bioaerosols, siloxanes etc. in the exhaust gas to prevent odour impacts of significance beyond the site boundary. • H_2S will be trapped on activated carbon; CO_2 and water vapour will be emitted to the atmosphere. • The Feedstock Reception Building has been designed to allow for multiple trucks to unload at any one time. This will significantly reduce the number of trucks waiting outside of the building and therefore minimising fugitive odour emissions on-site. • The proposed reception building will be sealed to prevent fugitive emissions from this building • All waste activities at the facility will be carried out within a ventilated building which will be extracted to an odour abatement system using carbon filtration and / or UV methodologies to remove odorous compounds. • The building will operate under negative pressure with up to 3 air changes per hour. Ventilation pipe work installed in	Neutral, Imperceptible, Long-term

Potential Source	Environmental Receptor	Effect Description	Quality	Significance	Duration	Mitigation	Residual Effect
						the headspace of the building will be connected to an industrial centrifugal fan that will draw off the warm, buoyant building air that will be generated by a combination of emissions from the feedstock materials in the intake area and from fugitive emissions from the movement of the material to the pre-treatment and digesters. • The main entrances to the reception building will be fitted with rapid response roller shutter doors. A closed-door management strategy will be enforced. • Treated emissions from the odour control plant in the reception building will be discharged via a 13.0 m stack to enhance dispersion. The proposed location of the odour abatement system emission point within the site footprint was also designed to ensure that the distance between the emission point and the nearest sensitive receptors was maximised, thereby aiding dispersion. • All feedstocks will be delivered in covered or sealed containers. • Feedstock delivery times will be controlled in order to minimise truck waiting times outside of the reception building and therefore minimising fugitive odour emissions on-site. • Digestate will be stabilised before storage and removal from the site in order to minimise odour generation. • As part of the company ISO14001 standard EMS, an odour management plan will be prepared for the operational phase of the site to ensure that all odour control methods applied are sufficient and assessed at regular intervals. The	

Potential Source	Environmental Receptor	Effect Description	Quality	Significance	Duration	Mitigation	Residual Effect
						plan will also outline a procedure for addressing any odour complaints.	
Combustion Process (Various)	Local receptors, Environment	Air quality	Negative	Moderate	Long-term	• The proposed biogas upgrading plant will include in line sensors for CH_4, CO_2, H_2S and the gas will be recirculated back through the scrubbing process if it does not meet the required levels. • The stack height proposed for the CHP emission point emission point has been designed in an iterative fashion to ensure that an adequate height was selected to aid dispersion of the emissions and achieve compliance with the EU ambient air quality standards at all off-site locations (including background concentrations for air pollutants).	Negative, Imperceptible, Long-Term
Dust Nuisance	Local receptors, Environment	Air quality/dust nuisance	Negative	Moderate	Long-Term	• Vehicles exiting the Feedstock Reception Building will be subjected to cleaning procedures in accordance with the DAFM Conditions Document in a designated cleaning area.	Negative, Imperceptible, Long-Term
Fugitive Methane Emissions	Local receptors, Environment	Air Emissions	Negative	Moderate	Long-Term	• The facility will adhere to BAT principles in both its design and operational phases to enhance environmental performance. • All anaerobic digestion (AD) tanks will be sealed, fitted with covers, and connected to an integrated biogas collection system to prevent methane escape. • All feedstocks will be managed within a dedicated Feedstock Reception Building equipped with air handling and odour treatment systems, minimising potential emissions. • Biogas storage membranes will typically be maintained at 50% capacity to provide a storage buffer under standard operating conditions. • The facility will operate under a SCADA system, ensuring continuous 24/7	

Potential Source	Environmental Receptor	Effect Description	Quality	Significance	Duration	Mitigation	Residual Effect
						monitoring and control of all critical processes. • To reduce residual biomethane content in digestate, the AD system will maximise hydraulic retention time, maintaining a standard HRT of 60 days. • All digestate will undergo pasteurisation prior to dispatch, effectively neutralising anaerobic bacteria. This treatment ensures any subsequent breakdown of organic material is aerobic, producing CO_2 rather than methane. • Methane Detection Survey Commissioning Survey: A comprehensive methane detection survey will be conducted during commissioning to identify and address any potential leaks before full operations commence. Annual Surveys: Methane detection surveys will be performed annually to locate any emissions. Any identified leaks will be prioritised for immediate repair. • The applicant's lifecycle maintenance budget will include provisions for the replacement of gas domes on a 7-10 year cycle to maintain integrity. • Emergency flare and PRV's will be included in the facility's routine Planned Preventative Maintenance (PPM) Plan to ensure reliable and efficient operation. • Biobased fertiliser applications will follow best practices to minimise atmospheric nitrogen emissions, contributing to environmental protection. • When market conditions allow, the applicant will begin capturing and marketing biogenic CO_2 emissions,	

Potential Source	Environmental Receptor	Effect Description	Quality	Significance	Duration	Mitigation	Residual Effect
						enhancing the facility's carbon management strategy.	

9.9 Monitoring

Construction Phase

Dust deposition monitoring will be carried out at selected areas along the extent of the site boundary during the construction stage of the Proposed Development. As much as reasonably practical/possible monitoring should begin a minimum of 1 month prior to any site work beginning in order to capture baseline dust levels. The siting of dust monitoring locations will be considered based on representative monitoring with respect to sensitive receptors and prevailing wind direction. The German Standard VDI 2119 (Bergerhoff Method) will be employed where dust gauges consisting of a collection vessel and dust stand will be positioned at representatively important dust locations.

The collection vessel is fixed to the stand with the opening of the collection vessel located approximately 2m above ground level. The applicable limit value is the TA Luft limit value of 350 mg/m^2/day for a monitoring period of between 28 - 32 days.

Operational Phase

The Proposed Development will be a licenced facility under the Industrial Emissions Directive and will therefore be required to conduct "sniff surveys" in accordance with AG5 at regular intervals to demonstrate that mitigation measures are sufficient to prevent odour nuisance at sensitive off-site locations. Stack monitoring of the odour abatement system exhaust will also be required at regular intervals under the conditions of the IE Licence.

Emissions monitoring of selected point sources will also be carried out in accordance with conditions of the future IE license. Typically, this monitoring would be carried out for the CHP and odour abatement stack due to their continuous nature and being the primary point sources onsite.

9.10 Summary of Significant Impacts

The receptors for this assessment are considered to be local residences, amenities and designated sites. Whilst the development proposals have the potential to cause effects to the sensitive receptors identified, the recommended mitigation measures will ensure that the risk of potential impacts are reduced to negligible.

9.11 Statement of Significance

A worst-case assessment was utilised throughout the air quality impact study in order to assess any risk associated with the proposed operation of the plant. The scheduled emission points for the proposed anaerobic digester plant will be controlled through the EPA licensing process, requiring air quality levels to be monitored and maintained. The air quality impact assessment has demonstrated that the emissions will result in an acceptable air quality impact in accordance with the air quality standard regulations 2011 (S.I. No. 180 of 2011).

Typical ambient air emission targets, based on EPA Environment Agency criteria relevant to negating potentially high offensive odours and nuisance pollutants will be achieved at the surrounding sensitive receptors. The dispersion modelling indicates that, based on worst case emission concentrations the existing dispersion experienced in the vicinity of the site allows for the sites emissions to fall within the stringent ambient air target values.

Where a potential impact has been identified, mitigation measures have been provided which when implemented reduces the impact of significance to ***' negligible'.*** The mitigation

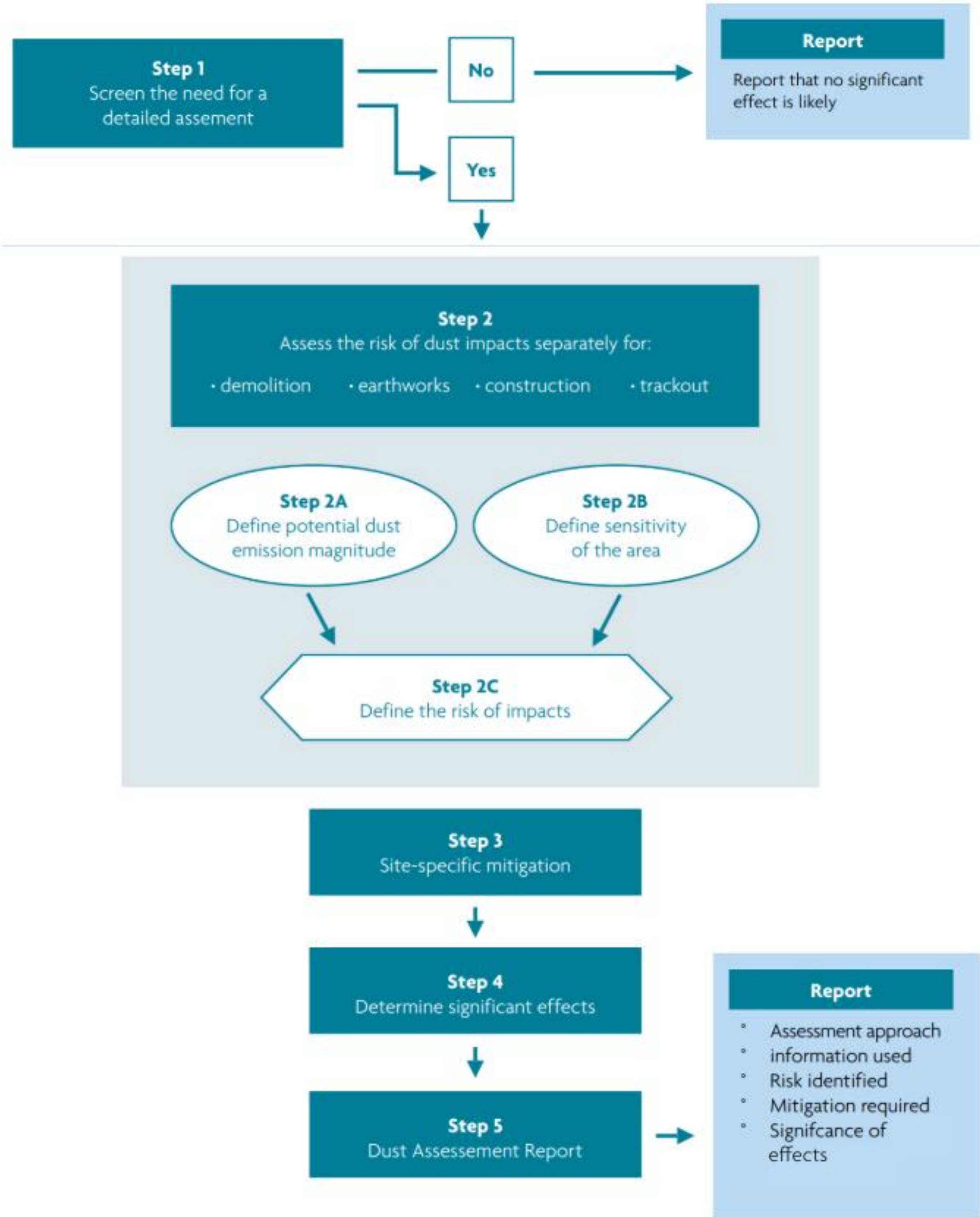
ORS

steps are presented in Section 9.6.

APPENDIX 9.1

Methodology for construction dust assessment to evaluate the potential impacts, construction activities are divided into demolition, earthworks, construction and track out. The factors are based upon the IAQM construction dust guidance. The assessment follows the steps proposed in the guidance as per **Appendix Figure 9.1.1** below.

Appendix Figure 9.1.1: Steps to Perform a Dust Assessment (IAQM, 2024)



Step 1 and Step 2 methods from the IAQM construction dust guidance are defined below to assign dust risk categories for each of the different construction actions.

<u>Step 1: Screen the requirement for assessment</u>

Step 1 is to screen out the necessity for construction dust assessment at all, this is usually a somewhat conservative level of screening. An assessment is usually necessary where there is;

A human receptor within;

- 250 m of the boundary of the site or
- 50m of the route used by construction vehicles on the public highway, up to 250 m from the site entrances.

An ecological receptor;

- 50m off the site boundary
- 50m of the routes used by construction vehicles on the public highway, up to 250 m from the site entrances.

<u>Step 2A: Defining the potential dust emission magnitude</u>

Demolition

The dust emission magnitude classification for demolition is different for each site in terms of timing, building type, time period and size. Examples of the potential dust emission classes are provided in the guidance are as follows;

<u>Large:</u> total building volume > 75,000 m^3, potentially dusty construction material, on-site crushing and screening, demolition activities > 12m above ground level;.

<u>Medium:</u> total building volume 12,000 m^3 to 75,000 m^3, potentially dust creating construction material, demolition activities 6m to 12m above ground level

<u>Small:</u> total building volume < 12,000 m^3, construction material with low potential for dust release, demolition activities less than 6 meters above ground, demolition during wetter months.

Earthworks

The dust emission magnitude classification for earthworks is different for each site in terms of timing, geology, topography and time-scale. Examples of the potential dust emission classes are provided in the guidance as follows;

<u>Large:</u> total site area > 110,000m^2, potentially dusty soil type e.g. clay, greater than 10 heavy earth moving vehicles active at any one time, formation of bunds greater than 6m in height.

Medium: total site area 18,000 to 110,000 m^2, moderately dusty soil type e.g. silt, 5 to 10 heavy earth moving vehicles active at any one time, formation of bunds 3 to 6m in height.

Small: total sight area less than 18,000 m^2, soil type with large grain size e.g. sand, less than five heavy earth moving vehicles active at any one time, formation of bunds < 3 meters in height.

Construction

The dust emission magnitude classification for construction is varied for each site in terms of timing, building type, duration, and scale. Examples of the potential dust emissions classes are provided in the guidance as follows:

Large: total building volume > 75,000 m^3, piling, on site concrete batching, sandblasting;

Medium: Total building volume 12,000 to 75,000 m^3, potentially dusty construction material e.g. on site concrete batching;

Small: total building volume less than 12,000 m^3, construction material with low potential for dust release e.g. metal cladding or timber.

Track out

Considerations which determine the dust emission magnitude class of trackout activities are vehicle size, vehicle speed, vehicle number, geology and duration. Examples of the potential dust emissions classes are provided in the guidance as follows;

Large: >50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m;

Medium: 20-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m; and

Small: <20 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50m.

Step 2B; Defining the sensitivity of the area

The sensitivity of the area is specified for dust soiling, human health and ecosystems. The sensitivity of the area takes into account the following considerations;

- the specific sensitivities of receptors in the area
- the proximity and number of those receptors
- in the case of PM_{10}, the local background concentration; and
- site specific factors, such as weather there are natural shelters such as trees, to reduce the risk of windblown dust.

Appendix Table 9.1.1 has been used to describe the sensitivity of varying types of receptors, dust soiling, health effects and ecological effects.

Appendix Table 9.1.1: Sensitivity of the Locality

Sensitivity	Dust Soiling	Human Receptors	Ecological Receptors
High	• Users can reasonably expect enjoyment of a high level of amenity; or • the appearance, aesthetics or value of their property would be diminished by soiling; and • the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. • indicative examples include dwellings, museums and other culturally important collections, medium and long term car parks and car showrooms.	• locations where members of the public are exposed over a period relevant to the air quality objective for PM10 (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). • Indicative examples include residential properties. Hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.	• locations with an international or national designation and the designated features may be affected by dust soiling; or • locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain. • indicative examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.
Medium	• users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or • the appearance, aesthetics or value of their property could be diminished by soiling; or • the people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. • indicative examples include parks and places of work.	• locations where the people exposed are workers, and exposure is over a time relevant to the air quality • objective for PM10 (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). • Indicative examples include office and shop workers, but will generally not include workers occupationally exposed to PM10, as protection is covered by Health and Safety at Work legislation.	• locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or • locations with a national designation where the features may be affected by dust deposition. • indicative example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.
Low	• the enjoyment of amenity would not reasonably be expected; or • property would not reasonably be expected to be	• locations where human exposure is transient. • indicative examples include public footpaths, playing	• locations with a local designation where the features may be affected by dust deposition. • indicative example is a local Nature

	diminished in appearance, aesthetics or value by soiling; or • there is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. • Indicative examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parksb and roads.	fields, parks and shopping streets.	Reserve with dust sensitive features.

Regarding the sensitivities assigned of the different types of receptors surrounding the site and numbers of receptors within certain distances of the site, a sensitivity classification for the area can be defined for each. **Appendix Table 9.1.2** to **Appendix Table 9.1.4** indicate the method used to determine the sensitivity of the area for dust soiling, human health and ecological impacts, respectively.

For trackout, as per the guidance, it is only considered necessary consider trackout impacts up to 50m from the edge of the road.

Appendix Table 9.1.2: Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<250
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Appendix Table 9.1.3: IAQM 2024 Sensitivity of the area to Human Health

Receptor Sensitivity	Annual Mean PM10 concentration	Number of Receptors	Distance from the Source (m)			
			<20	<50	<100	<250
High	>32 µg/m3 (>18 µg/m3 in Scotland)	>100	High	High	High	Medium
		10-100	High	High	Medium	Low
		1-10	High	Medium	Low	Low
	28-32 µg/m3 (16-18 µg/m3 in Scotland)	>100	High	High	Medium	Low
		10-100	High	Medium	Low	Low
		1-10	High	Medium	Low	Low
	24-28 µg/m3 (14-16 µg/m3 in Scotland)	>100	High	Medium	Low	Low
		10-100	High	Medium	Low	Low
		1-10	Medium	Low	Low	Low
	<24 µg/m3 (<14 µg/m3 in Scotland)	>100	Medium	Low	Low	Low
		10-100	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Medium	>32 µg/m3 (>18 µg/m3 in Scotland)	>10	High	Medium	Low	Low
		1-10	Medium	Low	Low	Low
	28-32 µg/m3 (16-18 µg/m3 in Scotland)	>10	Medium	Low	Low	Low
		1-10	Low	Low	Low	Low
	24-28 µg/m3 (14-16 µg/m3 in Scotland)	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
	<24 µg/m3 (<14 µg/m3 in Scotland)	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Low	-	≥1	Low	Low	Low	Low

Appendix Table 9.1.4: IAQM 2024 Sensitivity of the area to Ecological Impacts

Receptor Sensitivity	Distance from the Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

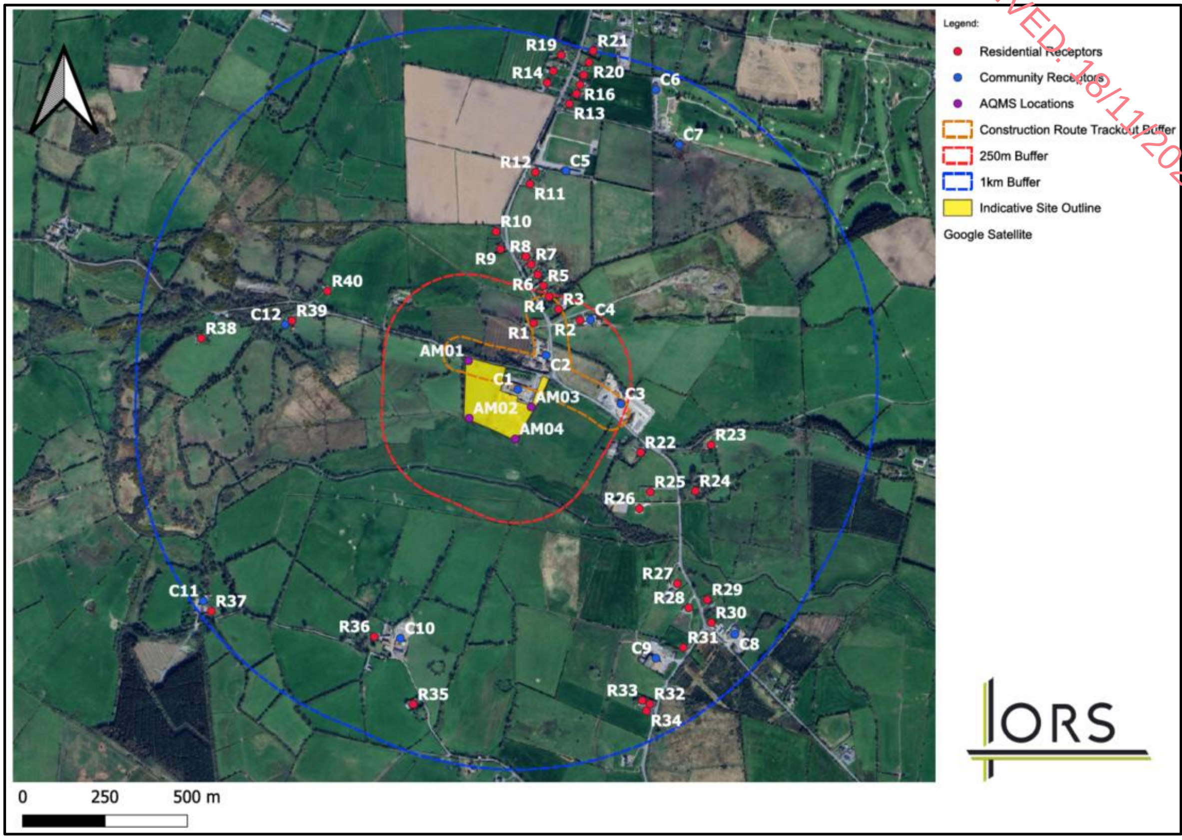
The final step is to use both the dust emission magnitude classification with the sensitivity of the area, to establish a potential risk of effects for each construction activity, before the use of mitigation. **Appendix Table 9.1.5** shows the method used to assign the level of risk for each construction activity.

Appendix Table 9.1.5: IAQM 2024 Risk of Dust Impacts from Earthworks/Construction/Trackout

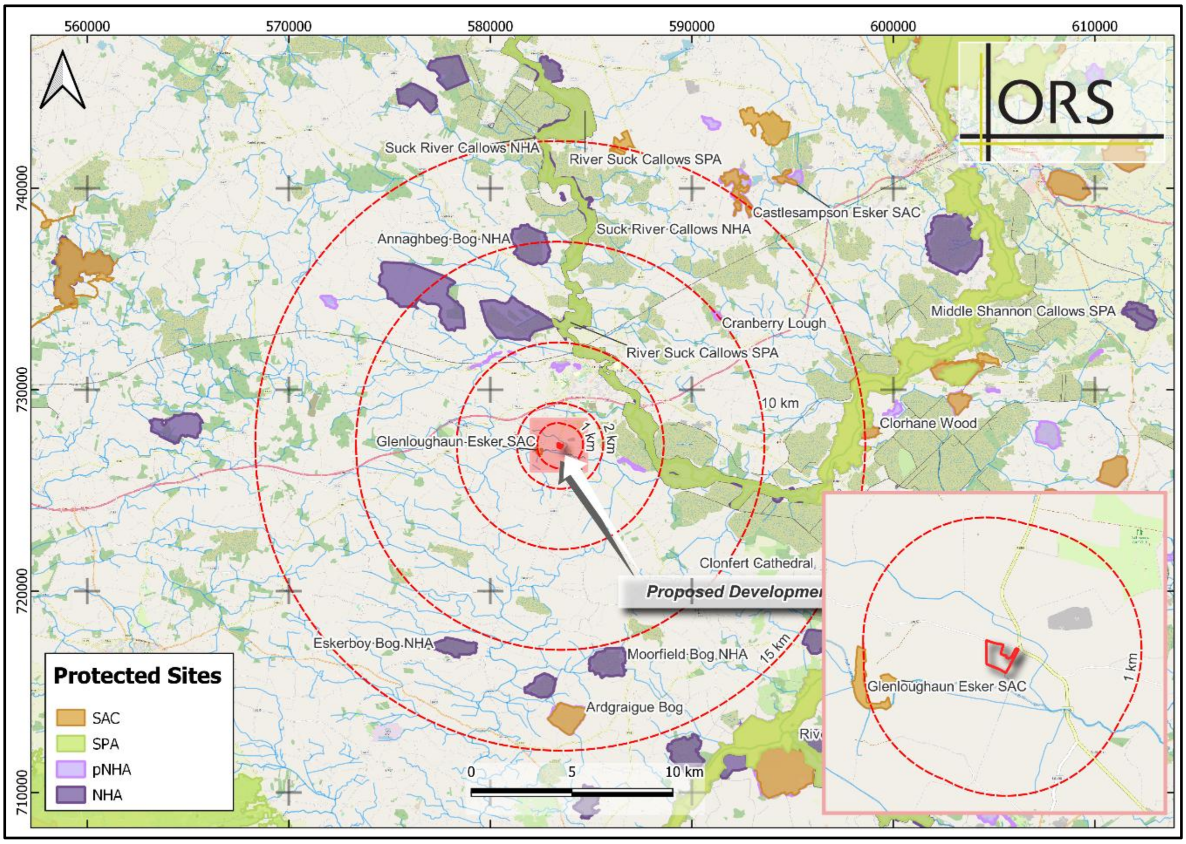
Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

APPENDIX 9.2

Appendix Figure 9.2.1: Receptor and AQMS Locations



Appendix Figure 9.2.2: Designated Site Locations



APPENDIX 9.3

Appendix Table 9.3.1: Onsite Monitoring Gaseous Compounds

AQMS Location Reference	Location Description	Grid Reference (ITM)	NO (µg/m³)	NO_2 (µg/m³)	NOx (µg/m³)	H2S (µg/m³)	NH3 (µg/m³)	SO2 (µg/m³)	CO (mg/m³)	PM10 (µg/m³)	PM/2.5 (µg/m³)
AM01			1.80	2.80	4.60	0.11	5.93	1.64	-	-	-
AM02			1.40	1.80	3.20	0.11	12.04	1.64	-	-	-
AM03			3.30	2.30	5.60	0.11	283.82	1.64	-	-	-
AM04			1.30	2.40	2.40	0.11	8.36	1.64	-	-	-
Portlaoise Monitoring Station	Portlaoise	647699, 698617	-	-	-	-	-	-	0.85	-	-
Ballinasloe Monitoring Station	Ballinasloe	585071, 730962	-	-	-	-	-	-	-	11.39	19.64
		Average	**1.95**	**2.55**	**3.95**	**0.11**	**8.78**	**1.64**	**0.30**	**11.39**	**19.64**
Values at LOD											

Appendix Table 9.3.2: Onsite Sniff Test

Location	Odour Intensity	Odour Persistence	Location Sensitivity	Odour Descriptor
Day 1 Sniff Survey – 12/09/2024				
AM01	**0**	**0**	**0**	**No detectable odour**
AM02	**0**	**0**	**0**	**No detectable odour**
AM03	**0**	**0**	**0**	**No detectable odour**
AM04	**0**	**0**	**0**	**No detectable odour**
Day 2 Sniff Survey – 09/10/2024				
AM01	**0**	**0**	**0**	**No detectable odour**
AM02	**0**	**0**	**0**	**No detectable odour**
AM03	**0**	**0**	**0**	**No detectable odour**
AM04	**0**	**0**	**0**	**No detectable odour**

Appendix Figure 9.3.1: AQMS Locations

APPENDIX 9.4

Defining & Describing Odour

Odours are sensations resulting from the reception of a stimulus by the olfactory sensory system, which consists of two separate subsystems: the olfactory epithelium and the trigeminal nerve. The olfactory epithelium, located in the nose, is capable of detecting and discriminating between many thousands of different odours and can detect some of them in concentrations lower than those detectable by currently available analytical instruments (Water Environment Federation, 1995). The function of the trigeminal nerve is to trigger a reflex action that produces a painful sensation. It can initiate protective reflexes such as sneezing to interrupt inhalation. The olfactory system is extremely complex and peoples' responses to odours can be variable. This variability is the result of differences in the ability to detect odour; subjective acceptance or rejection of an odour due to past experience; circumstances under which the odour is detected; and the age, health and attitudes of the human receptor.

Odour Intensity & Threshold

The measure of strength of an odour sensation is called odour intensity and is linked to the odour concentration. The minimum concentration of an odorous substance that causes an olfactory sensation is the odour threshold. Odour thresholds are usually defined by an odour panel. Odour threshold is not a precisely defined value as it depends on the odour panellists involved and the method & means of introducing the odour sensation to the panel. Odour detection concerns the minimum odorous substance concentration necessary to observe the presence of the stimulus however an odour recognition threshold concerns the minimum odorous substance concentration necessary to recognise the nature of the stimulus. Typically, the recognition threshold exceeds the detection threshold by a factor of 2 to 10 (Water Environment Federation, 1995).

Odour Character

The nature of an odour characterizes it from another odour of equal intensity. Odours are identified based on odour descriptor terms (e.g. earthy, chemical etc.). Odour character is assessed by contrast with other odours.

Hedonic Tone

Hedonic tone of an odour concerns its pleasantness or unpleasantness. When an odour is assessed in a test house for its hedonic tone in the neutral context of an olfactometric presentation, the panel is exposed to a stimulus of controlled intensity and duration. The degree of pleasantness or unpleasantness is determined by each panel member's experience and associations. The responses among panel members may differ depending on odour nature; an odour pleasant to some may be found highly unpleasant by others.

Relevant Odour Standards

Exposure of the public to a specific odour comprises of two factors; the concentration & the duration that the public may perceive the odour. The recognition threshold is generally 5 OUE/m3 and the ambient concentration at which the odour may be deemed a nuisance is between 5 and 10 OUE/m3 based on hydrogen sulphide (H2S) (Warren Spring Laboratory, 1980).

The recognition threshold is generally about five times this concentration (5 OUE/m^3) and the ambient concentration at which the odour may be considered a nuisance is between 5 and 10 OUE/m^3 based on hydrogen sulphide (H_2S) (Warren Spring Laboratory, 1980). Clarkson and Misslebrook (1991) proposed that a “faint odour” was an acceptable threshold criteria for the assessment of odour as a nuisance. Historically, it has been generally accepted that ambient odour concentrations of between 5 and 10 OUE/m^3 would give rise to a faint odour only, and that only a distinct odour (ambient concentration of >10 OUE/m^3) could give rise to a nuisance (McGovern & Clarkson, 1994). However, this criteria has generally been based on waste water treatment plants where the source of the odour is generally hydrogen sulphide. In 1990, a survey of the populations surrounding 200 industrial odour sources in the Netherlands showed that there were no justifiable complaints when 98%ile compliance with an odour exposure standard of a “faint odour” (5 - 10 OUE/m^3) was achieved (McGovern & Clarkson, 1994).

APPENDIX 9.5

Receptor Results – 75% Scenario

In line with the EPA AG4 Guidance, an additional assessment was undertaken to account for the stacks operating at 75% volume flow.

Input Parameters

Table 9.5.1 details the normalised volume flow (Nm^3/s) for each of the emission points associated with the proposed site, based on the emissions.

Table 9.5.1: Normalised Flow Rates from Stacks

Stack	Actual Volume Flow (m^3/hr)	Normalised Volume Flow (Nm^3/hr)*	Normalised Volume Flow (Nm^3/s)
CHP 1 & 2	5,817	2,110	0.59
Boiler	274	195	0.05

Table 9.5.2 below relates to the emission concentrations values through the flues associated with the CHP unit and gas boiler on the proposed site, based on the expected emission levels detailed in the **Table 9.5.1** above.

Table 9.5.2: Emission Concentrations

Pollutant	CHP Emission Concentration Values (mg/Nm^3)	Boiler Emission Concentration Values (mg/Nm^3)	Stack Emissions (g/s)	
			CHP Engine (0.97 Nm^3/s)	Boiler (0.05 Nm^3/s)
Oxides of Nitrogen (NOx)	250	93	**0.147**	**0.005**
Carbon Monoxide (CO)	1,000	N/A	**0.586**	**N/A**

Ammonia

The total ammonia from the odour treatment system (OTS) is detailed in **Table 9.5.3**

Table 9.5.3 Total ammonia emissions from the OTS

Stack	Ammonia Concentration 'Pre-Scrubber' (mg/m^3)	Ammonia Concentration 'Post-Scrubber' (mg/m^3)	Total Volume (m^3/hour)	Total Volume (m^3/second)	Total Ammonia Emission Rate (g/s)
OTS	1.59*	0.40	26,306	**7.31**	**0.0029**
	0.31	0.08	21,526	**5.98**	**0.0005**
	Total		47,829	**13.29**	**0.0034**

It can be seen from **Table 9.5.3** that the total ammonia emission rate from the OTS is 0.0034g/s, which has been included as part of this additional ammonia model.

Residential Receptor Results

NO_2

NO_2 modelling was carried out for each individual year with the results at the nearest sensitive locations presented in **Table 9.5.4** and **9.5.5** below.

All results are the NO_2 concentration in µg/m^3.

Table 9.5.4: Annual Average NO_2 concentrations at nearest residential locations (75% Volume Flow)

Location	2016	2017	2018	2019	2020	Average
R1	0.54	0.54	0.54	0.52	0.56	0.54
R2	0.48	0.60	0.50	0.49	0.67	0.55
R3	0.45	0.53	0.48	0.47	0.62	0.51
R4	0.42	0.45	0.43	0.42	0.50	0.44
R5	0.40	0.41	0.40	0.39	0.43	0.41
R6	0.37	0.37	0.38	0.37	0.38	0.37
R7	0.34	0.34	0.35	0.34	0.34	0.34
R8	0.32	0.31	0.33	0.32	0.31	0.32
R9	0.30	0.29	0.33	0.29	0.32	0.31
R10	0.29	0.27	0.31	0.27	0.30	0.29
R11	0.24	0.24	0.26	0.25	0.23	0.24
R12	0.23	0.23	0.24	0.24	0.22	0.23
R13	0.19	0.19	0.19	0.19	0.19	0.19
R14	0.19	0.20	0.20	0.20	0.18	0.19
R15	0.19	0.20	0.20	0.19	0.20	0.20
R16	0.20	0.20	0.21	0.20	0.20	0.20
R17	0.20	0.21	0.21	0.20	0.18	0.20
R18	0.20	0.20	0.20	0.19	0.20	0.20
R19	0.23	0.24	0.24	0.22	0.21	0.23
R20	0.18	0.18	0.19	0.18	0.19	0.18
R21	0.17	0.17	0.17	0.16	0.18	0.17
R22	0.29	0.35	0.23	0.28	0.27	0.28
R23	0.19	0.22	0.15	0.19	0.18	0.19
R24	0.16	0.19	0.13	0.15	0.17	0.16
R25	0.18	0.21	0.15	0.17	0.20	0.18
R26	0.14	0.17	0.12	0.15	0.18	0.15
R27	0.07	0.09	0.06	0.07	0.10	0.08
R28	0.06	0.07	0.05	0.06	0.08	0.07

Location	2016	2017	2018	2019	2020	Average
R29	0.06	0.08	0.05	0.06	0.08	0.07
R30	0.06	0.07	0.05	0.06	0.08	0.06
R31	0.06	0.06	0.05	0.05	0.05	0.05
R32	0.06	0.03	0.04	0.05	0.05	0.05
R33	0.06	0.03	0.04	0.04	0.05	0.05
R34	0.06	0.03	0.04	0.05	0.05	0.05
R35	0.04	0.03	0.05	0.03	0.05	0.04
R36	0.05	0.04	0.07	0.04	0.08	0.06
R37	0.05	0.03	0.08	0.05	0.05	0.05
R38	0.06	0.04	0.05	0.06	0.04	0.05
R39	0.09	0.07	0.09	0.11	0.08	0.09
R40	0.14	0.12	0.17	0.21	0.12	0.15
C1	1.41	1.25	1.47	1.28	1.30	1.34
C2	0.71	0.87	0.76	0.74	0.95	0.81
C3	0.53	0.58	0.48	0.54	0.56	0.54
C4	0.46	0.55	0.46	0.45	0.61	0.50
C5	0.23	0.23	0.23	0.22	0.25	0.23
C6	0.21	0.23	0.23	0.22	0.28	0.23
C7	0.22	0.25	0.22	0.22	0.30	0.24
C8	0.05	0.06	0.04	0.05	0.07	0.06
C9	0.06	0.05	0.05	0.05	0.07	0.05
C10	0.05	0.04	0.06	0.04	0.07	0.05
C11	0.05	0.04	0.06	0.04	0.07	0.05
C12	0.08	0.07	0.08	0.10	0.07	0.08
Limit	**40**	**40**	**40**	**40**	**40**	**40**

Table 9.5.5 below details the 99.8% of Max 1-Hour NO_2 concentration at each of the sensitive receptors for the MET Data 2017 – 2020.

Table 9.5.5: Short Term NO_2 concentrations at nearest residential locations (75% Volume Flow)

Location	99.8% of Max 1-Hour
R1	8.4
R2	7.2
R3	6.5
R4	6.7
R5	6.1

R6	5.7
R7	5.5
R8	5.3
R9	5.1
R10	5.0
R11	4.2
R12	4.1
R13	3.7
R14	3.9
R15	3.7
R16	3.8
R17	3.8
R18	3.7
R19	4.1
R20	3.5
R21	3.3
R22	4.5
R23	3.7
R24	3.5
R25	3.4
R26	2.8
R27	2.1
R28	1.9
R29	1.9
R30	2.0
R31	1.7
R32	1.7
R33	1.7
R34	1.7
R35	1.6
R36	1.6
R37	2.1
R38	2.4
R39	2.9
R40	4.3

C1	22.1
C2	9.3
C3	7.9
C4	6.4
C5	4.0
C6	3.7
C7	3.8
C8	2.1
C9	1.7
C10	1.3
C11	2.1
C12	2.7
Limit	**200**

The results above have assumed that 50% of short term emissions of oxides of nitrogen convert to nitrogen dioxide.

CO

CO modelling was carried out for each individual year with the results at the nearest sensitive location presented in **Table** below. All results are the CO concentration are in µg/m^3.

Table 9.5.6: Max Daily 8-Hour Mean CO concentration at nearest residential locations (75% Volume Flow)

Location	99.8% of Max 1-Hour
R1	56.4
R2	48.9
R3	46.7
R4	39.2
R5	37.7
R6	34.5
R7	34.7
R8	33.9
R9	30.1
R10	28.6
R11	26.3
R12	23.6
R13	20.0
R14	16.5
R15	19.0
R16	18.3
R17	16.7
R18	17.8
R19	20.4
R20	17.6
R21	17.1
R22	30.0
R23	23.8
R24	24.2
R25	20.4
R26	22.7
R27	20.2
R28	18.6
R29	17.3
R30	16.3

R31	13.7
R32	19.0
R33	17.5
R34	17.1
R35	17.0
R36	11.3
R37	15.1
R38	13.0
R39	16.2
R40	25.3
C1	165.9
C2	57.6
C3	49.9
C4	42.0
C5	20.9
C6	18.4
C7	21.0
C8	16.2
C9	20.4
C10	18.6
C11	15.7
C12	16.3
Limit	**10,000**

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The predicted ground level CO concentrations in each year, as well as the 5-year average are significantly below the limit values.

ECOLOGICAL RESULTS

NO_2

Modelling was undertaken to confirm the emissions from the site layout, the results of which are provided in the **Table 9.5.7** below. All results are the NO_2 concentration are in µg/m^3.

Table 9.5.7: Annual Average NO_2 Concentrations at Ecologically Sensitive Locations (75% Volume Flow)

Location	2016	2017	2018	2019	2020	Average
E1	0.0036	0.029	0.026	0.040	0.025	0.031
E2	0.069	0.086	0.069	0.068	0.075	0.073
E3	0.069	0.086	0.069	0.068	0.075	0.073
E4	0.027	0.027	0.033	0.033	0.030	0.030
E5	0.017	0.017	0.020	0.022	0.014	0.018
E6	0.021	0.019	0.024	0.018	0.020	0.021
E7	0.004	0.004	0.006	0.007	0.006	0.005
E8	0.007	0.004	0.007	0.004	0.006	0.006
E9	0.005	0.002	0.005	0.003	0.005	0.004
E10	0.003	0.003	0.006	0.004	0.005	0.004
E11	0.009	0.010	0.007	0.008	0.008	0.009
E12	0.009	0.010	0.007	0.008	0.008	0.009
E13	0.017	0.021	0.015	0.016	0.018	0.017
E14	0.020	0.016	0.019	0.016	0.014	0.017

All of the predicted Ground Level Concentrations of NO_2 detailed in **Table 9.5.7** above are significantly below the limit values as provided in **Table 9.1** in relation to the protection of vegetation.

Ammonia

Ammonia modelling was carried out to confirm the emissions from the site layout, the results of which are provided in the **Table 9.5.8** below. All results are the Ammonia concentration are in µg/m^3.

Table 9.5.8: Annual Average NH_3 Concentrations at Natura 2000 Sites (75% Volume Flow)

Location	2016	2017	2018	2019	2020	Average
E1	0.0017	0.009	0.0010	0.0012	0.0011	0.0012
E2	0.0013	0.0019	0.0014	0.0012	0.0014	0.0014
E3	0.0013	0.0019	0.0014	0.0012	0.0014	0.0014
E4	0.0006	0.0006	0.0007	0.0007	0.0006	0.0006
E5	0.0004	0.0004	0.0004	0.0004	0.0003	0.0004
E6	0.0004	0.0004	0.0005	0.0003	0.0004	0.0004
E7	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001
E8	0.0001	0.0001	0.0002	0.0001	0.000	0.0001

Location	2016	2017	2018	2019	2020	Average
E9	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001
E10	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001
E11	0.0002	0.0002	0.0001	0.0002	0.0002	0.0002
E12	0.0002	0.0002	0.0001	0.0002	0.0002	0.0002
E13	0.0003	0.0004	0.0003	0.0003	0.0003	0.0003
E14	0.0003	0.0003	0.0003	0.0003	0.0002	0.0003

All of the predicted Ground Level Concentrations of NH_3 detailed in **Table 9.5.8** above are significantly below the limit values as provided in **Table 9.1** in relation to the protection of vegetation.