Appendix 7A

Air Quality Impact Assessment

[THIS PAGE INTENTIONALLY LEFT BLANK]

Proposed Derrygreenagh Power Project

Environmental Impact Assessment Report

Appendix 7A: Air Quality Impact Assessment

DOCUMENT HISTORY

Document Ref	Air Quality Dispersion Modelling Assessment		
Revision	EIAR issue		
Author	Elisa Uginet, Danny Duce		
Signed	*[Signature redacted]*	**Date**	January 2024
Approved By	Garry Gray		
Signed	*[Signature redacted]*	**Date**	January 2024
Document Owner	AECOM		

GLOSSARY

Abbreviation	Description
CO	Carbon monoxide
DMRB	Design Manual for Roads and Bridges
EFT	Emission Factor database Tool
ELV	Emission Limit Values
Env Std	Environmental Standard
EPA	Environmental Protection Agency
HRA	Habitats Regulations Assessment
IAQM	Institute of Air Quality Management
IED	Industrial Emissions Directive
IPPC	Integrated Pollution Prevention and Control
NO_X	Oxides of nitrogen
NO_2	Nitrogen dioxide
PC	Process Contribution
PEC	Predicted Environmental Concentration (PC + Background)
PM_{10}	Particulate Matter of 10 µm diameter
$PM_{2.5}$	Particulate Matter of 5 µm diameter
SAC	Special Area of Conservation
SO_2	Sulphur Dioxide
SPA	Special Protection Area
NHA	National Heritage Area
TOC	Total Organic Carbon
VOC	Volatile organic compounds

CONTENTS

TABLES

ANNEXES

1.0 OVERVIEW

1.1.1 This air quality dispersion modelling report quantifies the potential impact of the operation of a new Combined Cycle Gas Turbine (CCGT) unit and an Open Cycle Gas Turbine (OCGT) unit, gas above ground installation (AGI), electricity grid connections including substations and associated buildings and infrastructure ('the Proposed Development') on land within the Derrygreenagh bog group (Bord na Móna Energy Park) in Co. Offaly, Republic of Ireland. It also considers potential impacts from the Overall Project, which includes the Proposed Development as well as the Gas Connection Corridor.

1.1.2 Emissions to air from the Proposed Development and Overall Project have the potential to adversely affect human health and sensitive ecosystems. This report details the results of a dispersion modelling assessment of emissions from the process and associated road traffic.

1.1.3 The magnitude of air quality impacts at sensitive human receptors are quantified for pollutants emitted from the stack of the Proposed Development and Overall Project. The impact of emissions on sensitive ecological receptors is considered in the context of relevant Critical Loads (deposition to ground) or Critical Levels (atmospheric pollutant concentrations) for designated nature sites.

1.1.4 The assessment considers emissions from the Proposed Development and Overall Project during normal operational conditions (at full and minimum load) and during the use of back-up fuel. Non routine emissions, such as those which may occur during the commissioning process or other short-term events typically only occur on an infrequent basis, are detected by the process control system and rectified within a short time period and are tightly regulated by the Environmental Protection Agency (EPA). For this reason, no detailed consideration of impacts associated with non-routine or emergency events is included within this assessment.

2.0 SCOPE

2.1 Combustion Plant Emissions

2.1.1 The assessment considers the impact of process emissions on local air quality, under normal operating conditions, from the emissions stacks ('the stacks') serving the combustion process. This includes the CCGT, OCGT, AGI and GRF dew point heaters and the auxiliary boiler. The assessment considers impacts in the year in which the Proposed Development is due to commence operation, 2027.

2.1.2 The dispersion of emissions is predicted using the dispersion model ADMS 6. The results are presented in both tabular format and as contours of predicted ground level process contributions overlaid on mapping of the surrounding area.

2.1.3 Emissions to air from combustion facilities are currently governed by Directive 2010/75/EU, the Industrial Emissions Directive (IED) (European Commission, 2010), which was transposed into Irish law in April 2013 (Environmental Protection Agency (Industrial Emissions) (Licensing) Regulations 2013, S.I. No. 138/2013). This Directive amends, consolidates and replaces seven Directives on pollution from industrial installations, including those relating to Integrated Pollution Prevention and Control (IPPC).

2.1.4 The IED contains measures relating to the control of emissions, including emissions to air, for example by specifying minimum standards for gas temperature and the residence time of combustion gases within the combustion chamber. The Directive sets limits on emissions of a wide range of air pollutants and requires operators to monitor and report emissions to air as well as to other environmental media.

2.1.5 The Proposed Development would be regulated under the Industrial Emissions Directive (IED) and in accordance with the Large Combustion Plants BREF. This BREF was updated, and the final version was published in 2017 and was formally adopted by the EU soon after. For the purposes of the IED and Permitting, the conclusions from the updated BREF should be regarded as enforceable through Environmental Permits and it is assumed that the Environmental Protection Agency (EPA) would set specific limits on the Environmental Permit based on the BAT-associated emission levels (BAT-AELs).

2.1.6 The design of the flue gas treatment system needs to be fully compliant with current legislation, meeting the requirements of BAT as well as the EPA Act and the IED. In accordance with Article 15, paragraph 2, of the IED, the emission limits that the Proposed Development plant will be designed to meet will be based on BAT. BAT-AELs are included in the Large Combustion Plants BREF that has now been published and these have been applied in the air impact assessment accordingly.

2.1.7 The pollutants considered within this assessment from the Proposed Development stacks are:

- oxides of nitrogen (NO_X), as Nitrogen Dioxide (NO_2);
- particulate matter (as PM_{10} and $PM_{2.5}$ size fractions);

- carbon monoxide (CO); and
- Ammonia (NH_3).

2.1.8 A comparison has been made between predicted model output concentrations, and short-term and long-term Environmental Standards (Env Std), set out within EPA's Air Dispersion Modelling from Industrial Installations Guidance Note (AG4) (EPA, 2019).

2.2 Cumulative Impacts

2.2.1 Impacts from existing sources of pollution in the area have been accounted for in the adoption of site-specific background pollutant concentrations from archive sources and a programme of project-specific baseline air quality monitoring in close proximity to the Proposed Development.

2.2.2 The other development specifically modelled in the cumulative impact assessment is the LEL Castlelost Approved Development (Ref SEP-0347).

2.2.3 The assessment of cumulative impacts is contained in Section 8 of this Report.

2.3 Sources of Information

2.3.1 The information used within this air quality assessment includes:

- data on emission concentrations to atmosphere from the process, taken from limit values in the IED and BAT-AEL values, or data provided by Bord na Móna Powergen Limited and Fichtner Consulting Engineers;
- details on the development layout provided by Bord na Móna Powergen Limited and Fichtner Consulting Engineers;
- OSi (Ordnance Survey Ireland) mapping;
- baseline air quality data from project specific monitoring, published sources and Local Authorities;
- Information on the construction plans;
- meteorological data supplied by ADM Ltd; and
- road traffic flow data from the AECOM traffic team.

2.4 Assessment Structure

2.4.1 The remainder of this Appendix is set out as follows:

- Section 3: Assessment criteria;
- Section 4: Assessment methodology;
- Section 5: Summary of baseline air quality;
- Section 6: Construction Assessment;
- Section 7: Operation Dispersion Modelling Results;
- Section 8: Cumulative Impacts;

- Section 9: Assessment limitations and assumptions; and
- Section 10: Conclusions.

3.0 ASSESSMENT CRITERIA

3.1 Environmental Standards for the Protection of Human Health

3.1.1 The Environmental Standards criteria for the protection of human health, against which impacts from the Proposed Development and road traffic are evaluated, are set out within Table 7A.1. The criteria are taken from the Environmental Standards contained within EPA's Air Dispersion Modelling from Industrial Installations Guidance Note (AG4) (EPA, 2019).

3.1.2 The Clean Air for Europe (CAFE) programme revisited the management of Air Quality within the EU and replaced the EU Framework Directive 96/62/EC (Council of European Communities, 1996), its associated Daughter Directives 1999/30/EC (Council of European Communities, 1999), 2000/69/EC (Council of European Communities, 2000), 2002/3/EC (Council of European Communities, 2002), and the Council Decision 97/101/EC (Council of European Communities, 1997) with a single legal act, the Ambient Air Quality and Cleaner Air for Europe Directive 2008/50/EC (Council of European Communities, 2008).

3.1.3 The Air Quality Directive is currently transposed into Irish legislation by the Air Quality Standards Regulations (S.I. 180 of 2011). These Limit Values are binding in the Republic of Ireland and have been set with the aim of avoiding, preventing or reducing harmful effects on human health and on the environment as a whole. The Directive also lists a number of Target Values.

Table 7A.1: Environmental Standards for Air (for the Protection of Human Health)

POLLUTANT	SOURCE	CONCENTRATION ($\mu G/M^3$)	MEASURED AS
NO_2	EU Air Quality Limit Values	40	Annual Mean
		200	1-hour mean, not to be exceeded more than 18 times per year
PM_{10}	EU Air Quality Limit Values	40	Annual Mean
		50	24-hour mean, not to be exceeded more than 35 times a year
$PM_{2.5}$	EU Air Quality Limit Values	20	Annual Mean
CO	EU Air Quality Limit Values	10,000	Maximum daily running 8-hour mean

3.2 Assessment Criteria for Sensitive Ecological Receptors

3.2.1 The Republic of Ireland is bound by the terms of the European Birds and Habitats Directives and the Ramsar Convention. The Conservation of Habitats and Species Regulations 2010 provides for the protection of European sites created under these polices, i.e. Special Areas of Conservation (SACs) designated under the Habitats Directive, Special Protection Areas (SPAs) designated under the Birds Directive, and Ramsar Sites designated as wetlands of international importance under the Ramsar Convention. The 2010 Regulations apply specific provisions of the European Directives to SACs, SPAs, candidate SACs (cSACs) and proposed SPAs (pSPAs), which require them to be given special consideration and further assessment by any development which is likely to lead to a significant effect upon them.

3.2.2 The legislation concerning the protection and management of designated sites and protected species within the Republic of Ireland is set out within the provisions of the Wildlife Acts 1976 to 2021.

3.2.3 The impact of emissions from the Proposed Development on sensitive ecological receptors are quantified within this assessment in two ways:

- as direct impacts arising due to increases in atmospheric pollutant concentrations; and
- indirect impacts arising through deposition of acids and nutrient nitrogen to the ground surface.

3.2.4 The Critical Levels for the protection of vegetation and ecosystems are set out in Table 7A.2, and apply regardless of habitat type. These values have been adopted as the assessment criteria for the impact of the process on designated nature sites.

Table 7A.2: Critical Level (CLe) Environmental Assessment Levels for Air (for the Protection of Designated Habitat Sites)

POLLU-TANT	SOURCE	CONCENTRATION (µG/M³)	MEASURED AS	NOTES
NO_X (as NO_2)	EU Air Quality Limit Values	30	Annual mean	-

3.2.5 Critical Load criteria for the deposition of acids and nutrient nitrogen are dependent on the habitat type and species present and are specific to the sensitive receptors considered within the assessment. The Critical Loads are set out on the Air Pollution Information System website (Centre for Ecology and Hydrology (CEH), 2022). Although this website is UK based, the AG4 Guidance stipulates that Critical Loads for the equivalent type of habitats should be used.

3.2.6 The Critical Load criteria adopted for the sensitive ecological receptors considered by the assessment are presented in the model results section of this report.

4.0 METHODOLOGY

4.1 Overview

4.1.1 This section describes the approach taken to the assessment of emissions associated with the operation of the Proposed Development. This has been broken down into four sub-sections.

- Qualitative assessment of construction dust;
- Modelling of combustion emissions from the stack; and
- Modelling of construction phase road traffic emissions on local roads.

4.1.2 The outputs from the modelling of combustion emissions from the stack and road traffic have been used to determine the combined change in concentrations of NO_2, PM_{10} and $PM_{2.5}$ at a number of receptors located in close proximity to local roads. The approach taken to the prediction of impacts is determined later within this section of the report.

4.2 Construction Dust Assessment

4.2.1 While part of the Site is existing hard standing, the movement and handling of soils and spoil during the Proposed Development and Overall Project construction activities is anticipated to lead to the generation of some short-term airborne dust. The occurrence and significance of dust generated by earth moving operations is difficult to estimate and depends heavily upon the meteorological and ground conditions at the time and location of the work within the Site, and the nature of the actual activity being carried out.

4.2.2 At present, there are no statutory Irish standards relating to the assessment or control of construction dust. Dust (including PM_{10}) from construction will be considered using a risk-based screening assessment (Institute of Air quality Management (IAQM), 2023).

4.2.3 The emphasis of the regulation and control of construction dust is therefore through the adoption of good working practice on Site. It is intended that significant adverse environmental effects are avoided at the design stage and through embedded mitigation where possible, including the use of good working practices to minimise dust formation.

4.2.4 The IAQM provides guidance for good practice qualitative assessment of risk of dust emissions from construction and demolition activities (IAQM, 2023). The guidance considers the risk of dust emissions from unmitigated activities to cause human health (PM_{10}) impacts, dust soiling impacts, and ecological impacts (such as physical smothering, and chemical impacts for example from deposition of alkaline materials). The appraisal of risk is based on the scale and nature of activities and on the sensitivity of receptors, and the outcome of the appraisal is used to determine the level of good practice mitigation required for adequate control of dust.

4.2.5 The following four potential activities have been screened as potentially significant, based on the nature of construction activities proposed as part of the Proposed Development (IAQM, 2023):

- demolition (of buildings, roads or site clearance);
- earthworks (spoil movement and stockpiling);
- construction; and
- track-out (HGV movements on unpaved roads and offsite mud on the highway).

Magnitude Definitions

4.2.6 The potential magnitude of dust emissions is categorised through consideration of the scale, duration and location of construction activities being carried out and is classified as Small, Medium or Large;

4.2.7 The magnitude of each activity is determined by professional judgment, but examples given in the IAQM guidance can help to make that judgment. These examples are as detailed in Table 7A.3 below.

Table 7A.3: IAQM Examples of Definition of Magnitude of Construction Activities

MAGNITUDE	DEMOLITION	EARTHWORKS	CONSTRUCTION	TRACKOUT
Large	Total building volume >75,000 m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >12 m above ground level	Site area >110,000 m^2 potentially dusty soil type (e.g. clay). >10 heavy earth moving vehicles at once, bunds >6 m high,	Total building volume >75,000 m^3, on-site concrete batching, sandblasting	>50 Heavy Duty Vehicle (HDV) (>3.5 tonne) peak outward movements per day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m
Medium	Total building volume 12,000 m^3 – 75,000 m^3, potentially dusty construction material, demolition activities 6-12 m above ground level	Site area 18,000 m^2 – 110,000 m^2, moderately dusty soil type (e.g. silt), 5 – 10 heavy earth moving vehicles at once, bunds 3-6 metres high	Total building volume 12,000 – 75,000 m^3, potentially dusty materials e.g. concrete, on-site concrete batching	10 – 50 HDV peak outward movements per day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 – 100 metres
Small	Total building volume <12,000 m^3, construction	Site area <18,000 m^2, large grain soil type (e.g. sand), <5 heavy earth	Total building volume <12,000 m^3, low dust potential construction	<10 HDV peak outward movements per day, surface material low

MAGNITUDE	DEMOLITION	EARTHWORKS	CONSTRUCTION	TRACKOUT
	material with low potential for dust release (e.g. metal cladding or timber), demolition activities <6 m above ground, demolition during wetter months	moving vehicles at once, bunds <3 metre high	materials e.g. metal/timber	dust potential, unpaved road length <50 metres

Receptor Sensitivity Definitions

4.2.8 The Study Area for the assessment of construction dust has been applied, using criteria proposed within IAQM guidance (IAQM, 2023), and extends:

- up to 250m beyond the Site boundary and 50m from the construction traffic route (up to 250m from the Site entrances), for human health receptors; and
- up to 50m from the Site boundary and/ or construction traffic route (up to 250m from the Site entrances) for ecological receptors.

4.2.9 The assessment of construction dust has been made with respect to the receptor and area sensitivity definitions as outlined in Table 7A.4 to Table 7A.7 below. Sensitivity definitions have been made with reference to the IAQM guidance; receptors beyond 50 metres are defined as low sensitivity; ecological receptors (including statutory designations, and non-statutory ecological receptors of location importance such as county wildlife sites, national and local nature reserves) have not been included as there are no such sites within the screening distance.

Table 7A.4: Receptor Sensitivity to Construction Dust Effects

POTENTIAL DUST EFFECT	HUMAN PERCEPTION OF DUST DEPOSITION EFFECTS	PM_{10} HEALTH EFFECTS	ECOLOGICAL EFFECTS
High sensitivity	Enjoy a high level of amenity; appearance/ aesthetics/ value of property would be diminished by soiling; receptor expected to be present continuously	Public present for 8 hours per day or more, e.g. residential, schools, care homes	Locations with an international or national designation and the designated features may be affected by dust deposition
Moderate sensitivity	Enjoy a reasonable level of amenity; appearance/ aesthetics/ value of property could be	Only workforce present (no residential or high sensitivity receptors) 8	Locations where there is a particularly important plant species, where dust sensitivity is uncertain or unknown

POTENTIAL DUST EFFECT	HUMAN PERCEPTION OF DUST DEPOSITION EFFECTS	PM_{10} HEALTH EFFECTS	ECOLOGICAL EFFECTS
	diminished by soiling; receptor not expected to be present continuously	hours per day or more	or locations with a national designation where the features may be affected by dust deposition
Low sensitivity	Enjoyment of amenity not reasonably expected; appearance/ aesthetics/ value of property not diminished by soiling; receptors are transient / present for limited period of time; e.g. playing fields, farmland, footpaths, short term car parks	Transient human exposure, e.g. footpaths, playing fields, parks	Locations with a local designation which may be affected by dust deposition

4.2.10 Distances are measured from source to receptor in bands of less than 20 metres, less than 50 metres, less than 100 metres and less than 250 metres for demolition, earthworks and construction. For trackout the receptor distance measured from receptor to trackout route (up to 50 metres) and up to 250 metres from the Site exit. These distances bands have been applied in Table 7A.5 and Table 7A.6. For ecological impacts the distance bands are as set out in Table 7A.7.

Table 7A.5: Sensitivity of the Area to Dust Deposition Effects on People and Property, With Less than 100 Properties Present

RECEPTOR SENSITIVITY	DISTANCE FROM THE SOURCE (M)			
	<20	<50	<100	<250
High	High	High	Medium	Low
Moderate	Medium	Low	Low	Low
Low	Low	Low	Low	Low

Table 7A.6: Sensitivity of the Area to Human Health Impacts, with Less than 100 Properties Present, where the Annual Mean PM_{10} Concentration is less than 24 µg/m^3

RECEPTOR SENSITIVITY	DISTANCE FROM THE SOURCE (M)			
	<20	<50	<100	<250
High (where the annual mean PM_{10} concentration <24 µg/m^3)	Medium	Low	Low	Low
Medium (where the annual mean PM_{10} concentration <24 µg/m^3)	Low	Low	Low	Low

RECEPTOR SENSITIVITY	DISTANCE FROM THE SOURCE (M)			
	<20	<50	<100	<250
Low	Low	Low	Low	Low

Table 7A.7: Sensitivity of the Area to Ecological Impacts

RECEPTOR SENSITIVITY	DISTANCE FROM SOURCE (M)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Risk Definitions

4.2.11 The potential risks from emissions from unmitigated construction activities have been defined with reference to the magnitude of the potential emission and the sensitivity of the highest receptor(s) within the effect area, as summarised in Table 7A.8 below.

Table 7A.8: Classification of Risk of Unmitigated Impacts

AREA OF SENSITIVITY TO ACTIVITY	MAGNITUDE		
	LARGE	MEDIUM	SMALL
Earthworks			
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible
Construction			
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible
Trackout			
High	High risk	Medium risk	Low risk
Medium	Medium risk	Low risk	Negligible
Low	Low risk	Low risk	Negligible
Demolition			
High	High risk	Medium risk	Medium risk
Medium	High risk	Medium risk	Low risk
Low	Medium risk	Low risk	Negligible

4.3 Modelling of Combustion Emissions from the Stacks

Dispersion Model Selection

4.3.1 The assessment of emissions from the Proposed Development stack has been undertaken using the latest version of ADMS 6 (V6.0.0.1). ADMS is a modern dispersion model that has an extensive published validation history. This model has been extensively used throughout Ireland to demonstrate regulatory compliance and is listed as a suitable model in the AG4 guidance.

4.3.2 The assessment of emissions from road traffic associated with the Proposed Development has used the latest version of ADMS-Roads (V5.0) to quantify pollution levels at selected receptors. ADMS-Roads is a modern dispersion model that has a published track record of use for the assessment of local air quality impacts, including model validation and verification studies.

Modelled Scenarios

4.3.3 Four emissions scenarios have been modelled, as outlined below:

- Full Load continuous operation of both the CCGT and OCGT with auxiliary equipment running normally, running on natural gas fuel;
- Backup operation of both the CCGT and OCGT, running on backup fuel (emergency full load operation);
- Low Load of both the CCGT and OCGT with auxiliary equipment running normally, running on natural gas fuel;
- A cumulative impact assessment including the Proposed Development and LEL Castlelost.

4.3.4 The dispersion modelling undertaken in the assessment of emissions from the above scenarios are:

- modelling of maximum ground-level impacts from the Full Load scenarios at a range of release heights, between 25m and 70m above ground level, in order to evaluate the effect of increasing effective release height on dispersion;
- modelling of impacts on a variable resolution receptor grid and at discrete sensitive human receptors for all pollutants, at a release height of 60m above ground level for the CCGT and 45m above ground level for the OCGT; and
- modelling of impacts at selected sensitive ecological receptors, at a release height of 60m above ground level for the CCGT and 45m above ground level for the OCGT.

Cumulative Assessment Considerations

4.3.5 Following the EPA's AG4 Guidance Note (EPA, 2020), a cumulative impact assessment has been undertaken. Appendix E of the AG4 guidance lays out the methodology required to determine whether a nearby existing source needs to be included in the air dispersion modelling assessment and if so which pollutants should be included. It does state that the need for such an assessment is expected to be limited, as is the case here. Aside from the fact that only industrial installations with a high emission potential (>100 or 250 tonnes/annum depending on the type) need to be considered, it also states that they only need to be included if they are located in an area where emissions from the Proposed Development are above 5% of the Air Quality Standard (AQS), when operating in normal conditions, i.e. with the primary fuel. As shown in figures 7A.4 to 7A.6 for NO_2

and CO, there are no such sources within the area where the PC is above 5% of the AQS for each modelled pollutant, therefore there is no need to include any existing sources in the assessment.

4.3.6 The AG4 guidance (EPA, 2020) doesn't include a methodology for consented but not yet operating facilities, that will not be included in the background but will probably be operating at the same time as the Proposed Development. As a conservative assumption, the decision was made to include emissions from LEL Castlelost as it falls into that category and is located less than 10 km away. Results included the LEL Castlelost facility are presented throughout this report within the cumulative assessment sections.

Model Inputs

4.3.7 The general model conditions used in the assessment are summarised in Table 7A.9. Other more detailed data used to model the dispersion of emissions is considered below. All coordinates are displayed in the ITM coordinate system.

Table 7A.9: General ADMS 5 Model Conditions

VARIABLE	INPUT
Surface roughness at source	0.2
Surface roughness at meteorological site	0.3
Receptors	Selected discrete receptors
	Nested receptor grid, variable spacing
Receptor location	X,Y co-ordinates determined by GIS
	z = 1.5 m for residential receptors
	z = 0 m for ecological receptors
Source location	X,Y co-ordinates given by Fichtner
Emissions	IED emission limits, BAT-AEL values or given by Fichtner
Sources	CCGT – >500MW turbine emitting through 1 Stack. OCGT – >100MW turbine emitting through 1 Stack Auxiliary Boiler – 7.5 MW boiler AGI and GRF heaters – 5*610 kW dew point heaters % LEL Castlelost OCGT stacks
Meteorological data	5 years of meteorological data, Mullingar Meteorological Station (2018 – 2022)
Terrain data	Flat terrain
Buildings that may cause building downwash effects	The main buildings on site in the immediate vicinity of the stack were modelled, as shown in Table 7A. 18

Emissions Data

4.3.8 For the CCGT stack, the height considered to represent BAT based on the range of stack heights assessed is 60 metres above ground level, with an internal diameter of 8.2 metres. For the OCGT stack, the height considered to represent BAT based on the range of stack heights assessed is 45 metres above ground level, with an internal diameter of 5 metres.

4.3.9 For other smaller sources, the stack height has been provided by Fichner, as any variation would not be significant in terms of air quality impacts.

4.3.10 The physical properties of each combustion emission source, as represented within the model, are presented in Table 7A.10 and Table 7A.11.

4.3.11 The position of the stacks within the modelled domain is illustrated in Figure A7.1 of Annex A to this report.

Table 7A.10: Sources Properties – CCGT and Auxiliary Boiler

PARAMETER	UNIT	FULL LOAD	LOW LOAD	BACKUP	AUXILIARY BOILER
Fuel		Gas	Gas	Backup Fuel	Gas
Stack position	(ITM) m	649618, 738365	649618, 738365	649618, 738365	649618, 738365
Stack release height	M	60	60	60	60
Effective internal stack diameter	M	8.2	8.2	8.2	0.6
Flue temperature	°C	87.8	74.0	87.0	170.0
Flue O_2 content (dry)	%	11.03	12.12	11.18	3.0
Stack flow (actual)	kg/s	758	486	760	3.06
Stack flow at reference conditions (NTP, dry, 11% O_2)	Nm^3/s	798	453	826	2.0

Table 7A.11: Sources Properties – OCGT, Dew Point Heaters and LEL Castlelost

PARAMETER	UNIT	FULL LOAD	LOW LOAD	BACKUP	DEW POINT HEATER (PER UNIT)	CASTLELOST OCGTS (PER UNIT)
Fuel		Gas	Gas	Backup Fuel	Gas	Gas
Stack position	(ITM) m	649497, 738197	649497, 738197	649497, 738197	AGI: 649274,738355 GRF centre: 649302,738373	645011, 738903 645018, 738881 645024, 738861 645030, 738841 645036, 738820
Stack release height	M	45	45	45	7	25
Effective internal stack diameter	M	5.0	5.0	5.0	0.2	4.5
Flue temperature	°C	435.7	405.7	437.7	170.0	727.15
Flue O_2 content (dry)	%	15.0%	15.0%	15.0%	NA	NA
Stack flow (actual)	kg/s	351.4	221.5	347.7	0.306*	375.66*

PARAMETER	UNIT	FULL LOAD	LOW LOAD	BACKUP	DEW POINT HEATER (PER UNIT)	CASTLELOST OCGTS (PER UNIT)
Stack flow at reference conditions (NTP, dry, 11% O_2)	Nm^3/s	276	129	286	NA	NA

* m^3/s

4.3.12 The modelled pollutant emission rates (in g/s) are determined by the daily average BAT-AEL values set out within the BREF or Emission Limit Values (ELVs) set out within the IED. The emissions limits assumed to apply to the Proposed Development are shown in Table 7A.12.

4.3.13 Pollutant mass emission rates from the combustion process associated with the Proposed Development (in g/s) have been calculated by multiplying the daily average and half hour average ELVs by the volumetric flow rate at reference conditions. The pollutant mass emission rates from the stacks, as used within the dispersion modelling assessment, are presented in Table 7A.13 and Table 7A.14.

4.3.14 For the normal operation scenario, this assessment assumes that the Proposed Development would operate at continuous design load (8,760 hours per year). No time-based variation in stack emissions has therefore been accounted for within the model. For the assessment of short-term impacts, emissions have been modelled at the maximum emission rate, reflecting the assumption that it is not possible to predict when the operational hours may be.

Table 7A.12: Air Emission Limit Values (ELVs) as Specified in the Industrial Emission Directive (IED, 2010/75/EU) and the BAT-AELs (Official Journal of the European Union, 2019) – Natural Gas

ITEM	POLLUTANT	EMISSION LIMIT (mg/Nm^3)	
		HALF-HOUR AVERAGE (BASED ON IED)	DAILY AVERAGE (BASED ON BAT-AEL)
OCGT (new)	NO_X (as NO_2)	50	35
	CO	40	NA
CCGT (new)	NO_X (as NO_2)	40	30
	CO	30	NA
	NH_3	3 (for SCR)	NA

Table 7A.13: Pollutant Emission Rates for natural gas sources

POLLUTANT	UNIT	CCGT FULL LOAD	CCGT LOW LOAD	OCGT FULL LOAD	OCGT LOW LOAD	AUXILIARY BOILER	DEW POINT HEATER (UNIT)	LEL CASTLELOST OCGT
NOx Long-term	g/s	23.9	NA	9.7	NA	0.20	0.0053	4.42
NOx Short-term	g/s	31.9	18.1	13.8	6.4	0.20	0.0053	4.42
CO Short-term	g/s	23.9	13.6	11.0	5.2	NA	NA	5.05

POLLUTANT	UNIT	CCGT FULL LOAD	CCGT LOW LOAD	OCGT FULL LOAD	OCGT LOW LOAD	AUXILIARY BOILER	DEW POINT HEATER (UNIT)	LEL CASTLELOST OCGT
NH_3 Long-term	g/s	2.4	NA	NA	NA	NA	NA	NA

Table 7A.14: Pollutant Emission Rates for Backup Fuel sources

POLLUTANT	UNIT	CCGT	OCGT
NOx Long-term	g/s	NA	NA
NOx Short-term	g/s	206.4	71.5
CO Short-term	g/s	82.6	28.6
PM_{10} Short-term	g/s	8.3	2.9

Modelled Domain – Discrete Sensitive Human Receptors

4.3.15 Ground-level concentrations of the modelled pollutants relevant to human health have been predicted at discrete air quality sensitive receptors, as listed in Table 7A.15. The locations of these sensitive human receptors are also shown in Figure 7A.1 of Annex A to this Appendix. The residential receptors have been selected to be representative of residential dwellings in the area around the Proposed Development and Overall Project.

4.3.16 A number of the sensitive human receptors are also in close proximity to traffic routes which would experience changes to vehicle flows during the construction of the Proposed Development and Overall Project. The residential receptors which are located in close proximity to traffic routes have been specified in the table below. At these locations, an assessment has been made of the effect of emissions from construction traffic on local concentrations of NO_2, PM_{10} and $PM_{2.5}$.

4.3.17 The flagpole height of all of the sensitive human receptors listed in Table 7A.15 has been set within the model at 1.5m above ground level.

Table 7A.15: Modelled Domain - Selected Discrete Human Receptor Locations

ID	RECEPTOR NAME	RECEPTOR TYPE	GRID REFERENCE		DIST FROM STACK (M)	ASSESSED FOR IMPACTS FROM:
			X	Y		
R01	Property on the R400 in Rochfortbridge	Residential	646674	740506	3641	Operational, Construction Dust and Construction Traffic
R02	Property on the R400 south of M6	Residential	647811	739607	2193	Operational, Construction Dust and Construction Traffic

ID	RECEPTOR NAME	RECEPTOR TYPE	GRID REFERENCE		DIST FROM STACK (M)	ASSESSED FOR IMPACTS FROM:
			X	Y		
R03	Property on the R400 south of M6	Residential	647896	739416	2013	Operational, Construction Dust and Construction Traffic
R04	Property on the R400 south of site entrance	Residential	650417	737275	1302	Operational and Construction Traffic
R05	Property on the R400 near Yellow River	Residential	651734	736015	3125	Operational and Construction Traffic
R06	Property on the R400 north of Rhode	Residential	652790	735094	4524	Operational and Construction Traffic
R07	Property on L1010 Togher, west Rhode	Residential	652261	732837	6031	Operational
R08	Property on a farm north of Croghan	Residential	647987	736196	2507	Operational
R09	Property on a farm Rathconnel	Residential	653895	740026	4588	Operational
R10	Property in Hardwood	Residential	650972	742398	4254	Operational
R11	Property on Rahanine Rd	Residential	647852	740562	2819	Operational
R12	Property on a farm, south of M6	Residential	646923	739040	2709	Operational, Construction Dust
R13	Property on the L1009	Residential	651418	737943	1848	Operational
R14	Property in Farthingstown, south of M6	Residential	646521	739046	3094	Construction Traffic
S01	Rhode Community Pre-school	School	653135	733457	5975	Operational
S02	Rhode N.S. School	School	653421	732449	6959	Operational
S03	Scoil Bhride, Croghan P.S., School	School	648075	732508	5864	Operational
S04	St Joseph's Secondary, Rochfortbridge, School	School	646457	740659	3906	Operational

ID	RECEPTOR NAME	RECEPTOR TYPE	GRID REFERENCE		DIST FROM STACK (M)	ASSESSED FOR IMPACTS FROM:
			X	Y		
S05	Miltownpass National School	School	649972	743861	5507	Operational
S06	Stonebridge Park Playschool, Rochfortbridge	School	647048	740980	3667	Operational

Modelled Domain – Discrete Sensitive Ecological Receptors

4.3.18 In accordance with the EPA's AG4 guidance, the impacts associated with emissions from the combustion process on statutory sensitive ecological sites have been quantified. The assessment has considered National Heritage Areas (NHAs) within 2 km and European designated sites within 15 km of the Proposed Development and Overall Project's sources for Operational impacts and within 200m for Construction impacts, as recommended by the risk assessment guidance.

4.3.19 Ground-level concentrations of the modelled pollutants relevant to sensitive ecological receptors have been predicted at locations listed in Table 7A.16. The locations of these receptors are also shown in Figure A7.2 of Annex A to this Appendix.

4.3.20 For sensitive ecological receptors, the flagpole height has been set within the model at ground level (z=0m).

Table 7A.16: Modelled Domain – Ecological Receptor Locations

ID	RECEPTOR NAME	RECEPTOR TYPE	GRID REFERENCE		DIST FROM STACK (M)	ASSESSED FOR IMPACTS FROM:
			X	Y		
E1	Raheenmore Bog SAC	Ecological	644515	732937	7246	Operational
E2a	Split Hills and Long Hill Esker SAC	Ecological	638528	735357	11331	Operational
E2b	Split Hills and Long Hill Esker SAC	Ecological	638112	736103	11577	Operational
E2c	Split Hills and Long Hill Esker SAC	Ecological	636231	737637	13278	Operational
E3a	Lough Ennell SAC	Ecological	638953	742566	11414	Operational
E3b	Lough Ennell SAC and SPA	Ecological	639983	744758	11558	Operational
E3c	Lough Ennell SAC	Ecological	641577	744896	10360	Operational
E3d	Lough Ennell SAC	Ecological	641495	746150	11252	Operational
E3e	Lough Ennell SAC and SPA	Ecological	642105	748907	12945	Operational

ID	RECEPTOR NAME	RECEPTOR TYPE	GRID REFERENCE		DIST FROM STACK (M)	ASSESSED FOR IMPACTS FROM:
			X	Y		
E4	Mount Hevey Bog SAC	Ecological	659975	747758	13981	Operational
E5	Wooddown Bog SAC	Ecological	648907	753667	15318	Operational

Modelled Domain – Receptor Grid

4.3.21 Emissions from the stack have also been modelled on a receptor grid of variable spacing, in order to:

- determine the location and magnitude of maximum ground level impacts; and
- enable the generation of pollutant isopleth plots.

4.3.22 The dispersion model output is reported at specific receptors and as a nested grid of values. The inner grid extends 2 km from the stack at a resolution of 25m, the middle grid 5 km at a resolution of 100m, and the outer grid 20 km at a resolution of 500m. Details of the receptor grid are summarised in Table 7A.17. All gridded model outputs are reported at 0m above ground level (z=0m).

Table 7A. 17: Modelled Domain - Receptor Grid

GRID SPACING (M)	DIMENSIONS (M)	ITM REFERENCE OF THE CENTRE OF THE SQUARES
20	4000 x 4000	649618, 738365
100	10,000 x 10,000	
500	40,000 x 40,000	

Terrain

4.3.23 The Proposed Development is situated 3km from Rochfortbridge village. The area in general is generally flat with some very small gradients and changes in ground height. The AG4 Guidance states that “Terrain downwash is defined by the USEPA as occurring when terrain features are greater than 40 % of the Good Engineering Practice (GEP) stack height within 800m of the stack”. This criterion allows the need to include terrain in the model to be screened out.

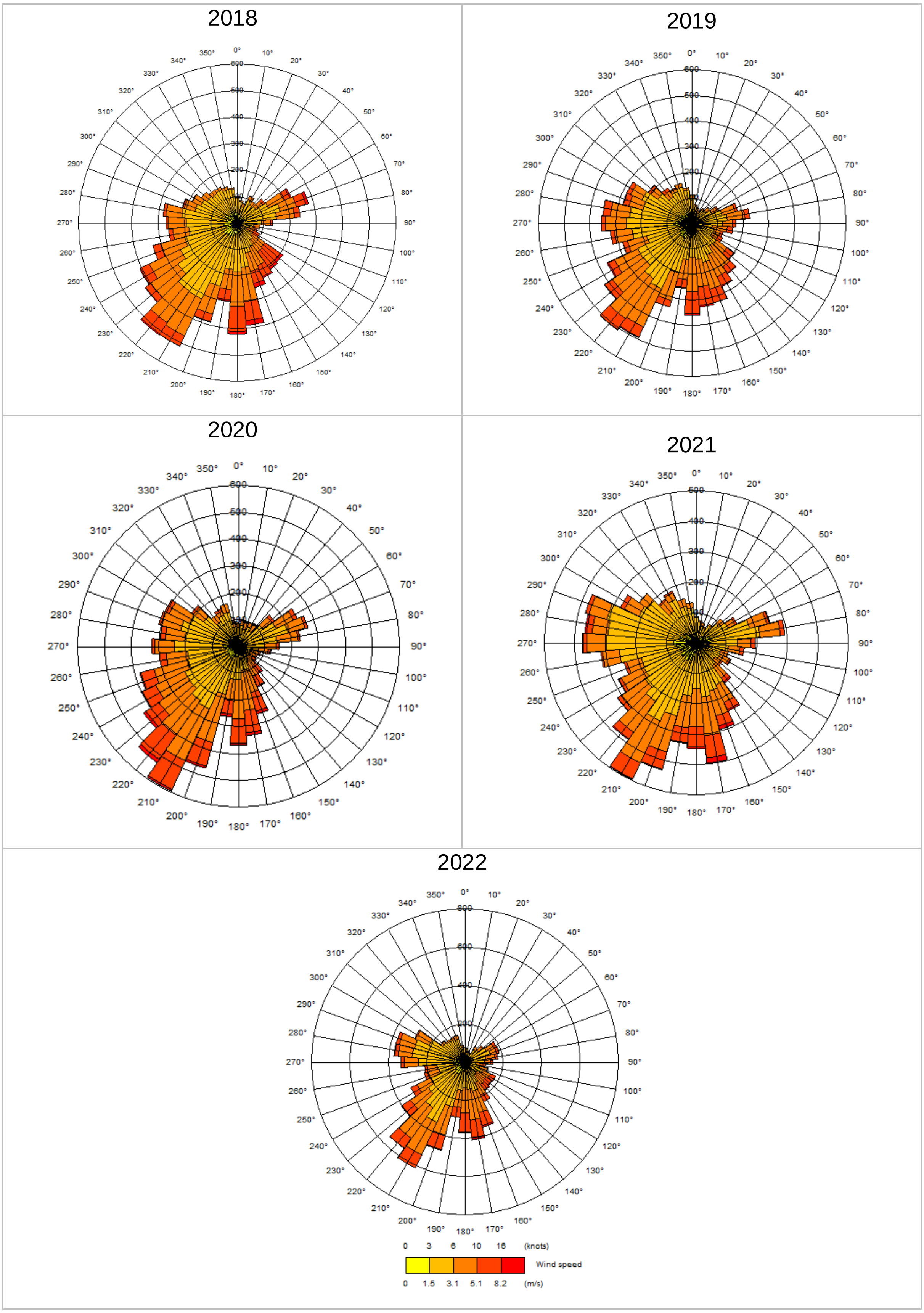
Meteorological Data

4.3.24 Actual measured hourly-sequential meteorological data is available for input into dispersion models, and it is important to select data as representative as possible for the development modelled. This is usually achieved by selecting a meteorological station as close to the Site as possible, although other stations may be used if the local terrain and conditions vary considerably, or if the station does not provide sufficient data.

4.3.25 The meteorological site that was selected for the assessment is Mullingar Meteorological Station, located approximately 20 km north north-west of the Site, at a flat field in a principally agricultural area, and therefore a surface roughness of 0.3m (representative of an agricultural area) has been selected for the meteorological site.

4.3.26 The modelling for this assessment has utilised 5 years of meteorological data for the period 2018 – 2022. Wind roses for each of the years within this period are shown in Figure 7A.8.

Figure 7A. 8: Wind roses for Gurteen, 2018 to 2022



Building Downwash Effects

4.3.27 The buildings and structures that make up the Proposed Development and Overall Project have the potential to affect the dispersion of emissions from the stacks. The ADMS building effects module has therefore been used to incorporate building downwash effects as part of the modelling. Buildings greater than one third of the range of stack heights modelled have been included within the modelling assessment.

4.3.28 Structures associated with the Proposed Development and Overall Project that are considered to be of sufficient height and volume to potentially impact on the dispersion of emissions from the Proposed Development stacks include the CCGT structures, including the cooling system, the OCGT structures, various tanks and separate buildings. The heights for these buildings were calculated from cross sections produced by Fichtner Consulting. Some buildings have a sloping roof but, as ADMS software is unable take that into account, the highest point of each roofs has been used as a most conservative option, as it increases the downwash effect.

4.3.29 Parameters for these structures are displayed in Table 7A. 18.

Table 7A. 18: Structures Incorporated into the Modelling Assessment

MAIN STRUCTURE FOR	STRUCTURE	SHAPE	X (M ITM)	Y (M ITM)	HEIGHT (M)	LENGTH/ DIAM (M)	WIDTH (M)	ANGLE (°)
CCGT	TurbineHall1	Rectangular	649543	738333	30	80	49	67
	TurbineHall2	Rectangular	649597	738356	40	35	30	67
	Inlet	Rectangular	649552	738372	34	10	16	67
	TurbineHall3	Rectangular	649621	738339	15	14	19	67
	Cooling	Rectangular	649443	738327	32	88	51	67
OCGT	OCGT1	Rectangular	649518	738206	13	20	7	67
	OCGT2	Rectangular	649477	738189	13	20	7	67
Other	Building1	Rectangular	649461	738258	12	77	23	67
	Building2	Rectangular	649651	738367	10	19	40	67
	Building3	Rectangular	649376	738235	10	24	54	67
	Tank1	Circular	649647	738403	15	18	18	0
	Tank2	Circular	649676	738393	15	18	18	0
	Tank3	Circular	649611	738258	22	22	22	0
	Tank4	Circular	649580	738245	22	22	22	0

4.3.30 The local area upwind and downwind of the site is relatively flat, predominantly agricultural in all directions. A surface roughness of 0.3m, corresponding to the maximum value associated with agricultural areas, has therefore been selected to represent the local terrain.

NO_X to NO_2 Conversion

4.3.31 Emissions of nitrogen oxides from industrial point sources are typically dominated by nitric oxide (NO), with emissions from combustion sources typically in the ratio of nitric oxide to nitrogen dioxide of 9:1. However, it is nitrogen dioxide that has specified Environmental Standards due to its potential impact on human health. In the ambient air, nitric oxide is oxidised to nitrogen dioxide by the ozone present, and the rate of oxidation is dependent on the relative concentrations of nitric oxide and ozone in the ambient air.

4.3.32 For the purposes of detailed modelling, and in accordance with AG4 Guidance it is assumed that 100% of nitric oxide emitted from stacks is oxidised to nitrogen dioxide in the long term and 50% of the emitted nitric oxide is oxidised to nitrogen dioxide in the local vicinity of the Proposed Development in the short-term.

Calculation of Deposition at Sensitive Ecological Receptors

4.3.33 The deposition of nutrient nitrogen and acid at sensitive ecological receptors is calculated, using the modelled process contribution predicted at the receptor points. The deposition rates are determined using conversion rates and factors contained within AG4 Guidance, which account for variations deposition mechanisms in different types of habitat.

4.3.34 The conversion rates and factors used in the assessment are detailed in Table 7A.19 and Table 7A.20.

Table 7A.19: Conversion Factors – Calculation of Nutrient Nitrogen Deposition

POLLUTANT	DEPOSITION VELOCITY GRASSLANDS (M/S)	DEPOSITION VELOCITY FORESTS (M/S)	CONVERSION FACTOR (µG/M^3/S TO KG/HA/YR)
NO_X as NO_2	0.0015	0.003	96
NH_3	0.02	0.03	259.7

Table 7A.20: Conversion Factors – Calculation of Acid Deposition

POLLUTANT	DEPOSITION VELOCITY GRASSLANDS (M/S)	DEPOSI-TION VELOCITY FORESTS (M/S)	CONVER-SION FACTOR (µG/M^3/S TO KG/HA/YR)	CONVER-SION FACTOR (KG/HA/YR TO KEQ/HA/YR)
NO_2	0.0015	0.003	96	0.0714
NH_3	0.02	0.03	259.7	0.0714

Specialised Model Treatments

4.3.35 For the assessment of impacts on human health receptors, emissions have been modelled such that they are not subject to dry and wet deposition or depleted through chemical reactions. The assumption of continuity of mass is likely to result in an over-estimation of impacts at receptors, and therefore is considered to be conservative.

4.3.36 For the assessment of impacts on ecological receptors, emissions have been modelled such that they are subject to dry, but not wet, deposition, and not depleted through chemical reactions. Modelling of dry deposition only has been undertaken as wet deposition is not considered to be significant if sulphur and other acidic pollutants are not present in the plume (IAQM, 2020). The input parameters were chosen following the ADMS 6 User Guide recommendations for NOx and NH_3 (CERC, 2023).

4.4 Modelling of Emissions from Road Traffic

Modelled Scenarios

4.4.1 Quantitative assessment of the impact of exhaust emissions from additional road traffic has been undertaken, in order to assess the change in air quality statistics at sensitive receptors in close proximity to the designated access routes to the Proposed Development. The latest version of 'ADMS-Roads' (V5.0) has been used to model the dispersion of road traffic emissions, allowing the quantification of pollution levels at selected receptors.

4.4.2 The approach taken to the assessment of road traffic emissions is outlined further within the remainder of this section.

Model Inputs

4.4.3 The general model conditions used in the assessment of road traffic emissions are summarised in Table 7A.21. Other more detailed data used to model the dispersion of emissions is considered below.

Table 7A.21: General ADMS Roads Model Conditions

VARIABLE	INPUT
Surface Roughness at source	0.2 m
Receptors	Selected discrete receptors
Receptor location	X,Y co-ordinates determined by GIS. The height of residential receptors were set at 1.5 metres
Emissions	NO_X, PM_{10} and $PM_{2.5}$
Emission Factors	TII Road Emissions Model for baseline (2022) and construction year (2025) scenarios
Meteorological Data	1 year of hourly sequential data, Mullingar (2022)
Emission Profiles	None used
Terrain Types	Flat terrain
Model Output	Long-term annual mean NO_X concentration ($\mu g/m^3$)
	Long-term annual mean PM_{10} concentration ($\mu g/m^3$)
	Long-term annual mean $PM_{2.5}$ concentration ($\mu g/m^3$)

Traffic Data

4.4.4 Predicted vehicle movements during the construction phase of the Proposed Development are detailed in EIAR Volume I, Chapter 14: Traffic.

4.4.5 The change in vehicle movements is predicted to peak at 11 one-way LGV (light goods vehicles) movements and 692 one-way HGV (heavy goods vehicles) movements accessing the Site via the M6 and R400. There are several identified sensitive receptors within 200m of affected links, and therefore a detailed assessment of construction traffic impacts has been conducted.

4.4.6 The derivation of the traffic data used in this assessment is set out in EIAR Chapter 14: Traffic. The data used in the road traffic dispersion modelling has been provided for the following scenarios:

- 2023 baseline traffic (for model verification process);
- 2025 baseline traffic + committed development traffic (the total future baseline traffic flows for the Construction assessment); and
- 2025 baseline traffic + committed development traffic + peak construction traffic from the Proposed Development (the total traffic flows with the Proposed Development for the Construction assessment).

4.4.7 For the 2023 baseline scenario, the background values used in the assessment need to be annualised with a complete year of observed meteorological data. For this reason, this scenario has been undertaken using 2022 emission factors and NO_X to NO_2 conversion factors for road traffic.

4.4.8 2025 represents peak construction traffic for air quality impacts, i.e. it is the peak for total traffic, leading to the highest emissions. A conservative assumption of using the highest 3-month peak traffic levels as the traffic levels for the whole year has been made. The traffic data used in the modelling of road traffic emissions are presented in Annex B to this report.

Emissions Data

4.4.9 The magnitude of road traffic emissions for the baseline and with development scenarios are calculated from traffic flow data using the TII's current emission factor database tool, updated in July 2023 (TII, 2023). The assessment considers the construction phase impact of road traffic emissions at receptors adjacent to roads in the vicinity of the Proposed Development.

Modelled Domain – Discrete Receptors

4.4.10 The receptors for which the impacts of road traffic emissions have been predicted are listed in Table 7A.15. At these locations, an assessment has also been made of the combined effect of emissions from the Proposed Development stack.

Meteorological Data

4.4.11 As for the model runs carried out for the Proposed Development, hourly sequential data from Mullingar Meteorological Station has been used for 2022, consistent with the year chosen to verify the performance of the model against measured nitrogen dioxide concentrations.

Consideration of Terrain

4.4.12 Emissions from road traffic make the greatest contribution to pollutant concentrations at sensitive receptors adjacent to the source (i.e. at the roadside). For this reason, there is not normally a large variation in height between the emission source and residential properties next to the roads included in the model. Therefore, terrain has not been included in the road traffic modelling assessment.

NO_X to NO_2 Conversion

4.4.13 To accompany the publication of the guidance document LAQM.TG(22) (Defra, 2022), a NO_X to NO_2 converter was made available as a tool to calculate the road NO_2 contribution from modelled road NO_X contributions. The tool comes in the form of an MS Excel spreadsheet and uses borough specific data to calculate annual mean concentrations of NO_2 from dispersion model output values of annual mean concentrations of NO_X. Version 8.1 (April 2020) (Defra, 2020) of this tool was used to calculate the total NO_2 concentrations at receptors from the modelled road NO_X contribution and associated background concentration. Due to the location of the Proposed Development, the Transport Infrastructure Ireland (TII) Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes states to "assume that regional concentrations in Ireland are characterised by a local authority in Northern Ireland (Craigavon)". The 'All other non-urban UK traffic' mix was selected, and the same year as the emissions tool was selected to stay consistent (see paragraph 4.5.8).

Bias Adjustment of Road Contribution NO_X, PM_{10} and $PM_{2.5}$

4.4.14 The modelled road NO_X contributions from the ADMS-Roads model have been adjusted for bias following the method described in LAQM.TG(22).

4.4.15 In order to inform model verification, a NO_2 diffusion tube monitoring survey was undertaken in the study area. The monitoring used in this assessment took place between the 9 of March 2023 and the 24 of August 2023. The locations of the diffusion tubes are presented in

4.4.16 Table 7A. 24 and in Figure 7A-1 of Annex A of this report.

4.4.17 A direct comparison can be made between concentrations modelled at the roadside diffusion tube locations and measured concentrations. Table 7A.22 provides a summary of the bias adjustment process. The year 2022 has been used for annualization as the last full calendar year. Of the full survey, eight tubes have been selected to be used for verification as they are the ones on the side of modelled roads. As some monitoring locations are close to the kerb, the concentrations have also been adjusted for calibration (verification) purposes to a virtual receptor location at the same distance back from the carriageway as the nearest sensitive receptor to the road link (DT3).

Table 7A.22: Summary of Bias Adjustment Process

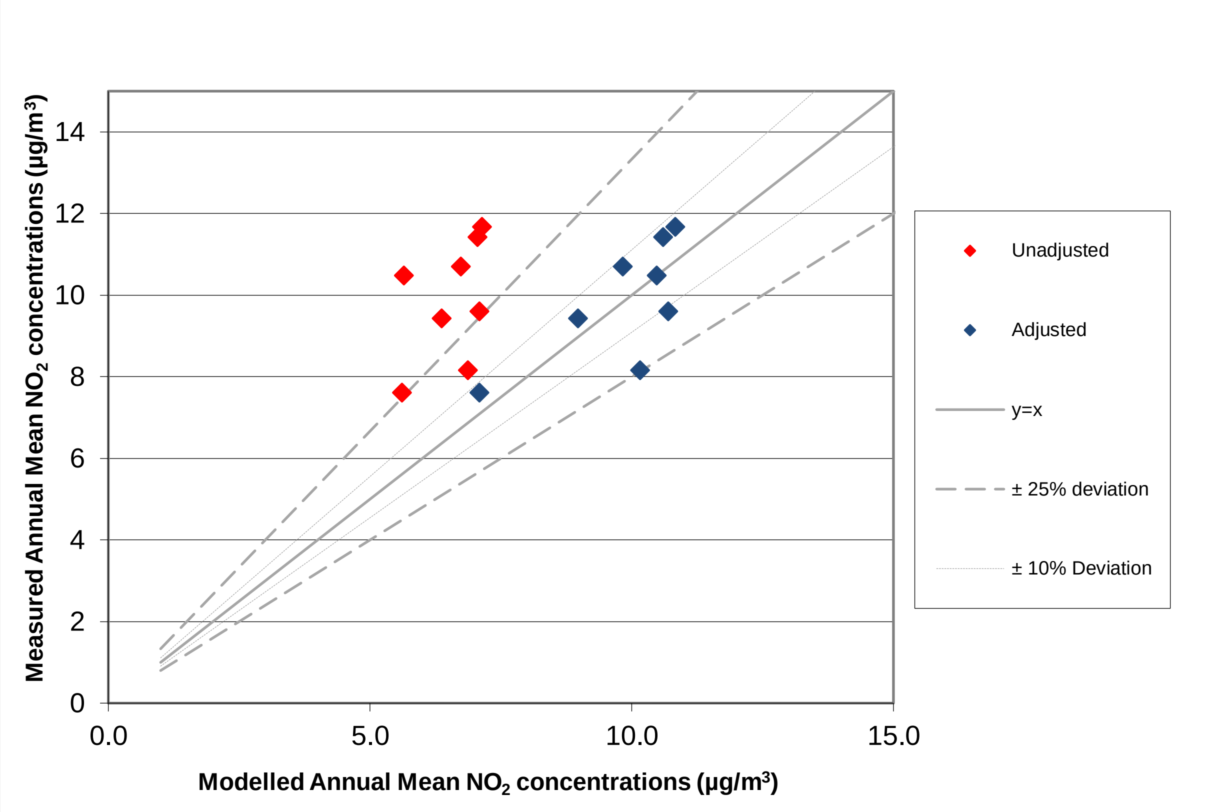
TUBE ID	**ZONE**	**2022 ANNUALISED AND ADJUSTED MONITORED ROAD NO_X (μg/m^3)**	**2022 ANNUAL MEAN MODELLED ROAD NO_X (μg/m^3) *BEFORE ADJUST-MENT***	**2022 ANNUAL MEAN MODELLED ROAD NO_X (μg/m^3) *AFTER ADJUST-MENT***	**VERIFICATION FACTOR FOR ROAD NO_X ADJUSTMENT**
DT2	Main	9.0	4.4	11.0	
DT3*		5.3	1.8	4.4	
DT5		8.6	3.2	7.8	
DT6		12.3	4.4	10.8	2.48
DT8		12.8	4.5	11.2	
DT10		6.3	4.0	10.0	
DT11		11.0	3.8	9.4	
DT9	M6 Embankment	10.6	1.9	10.6	5.67

*Distance corrected

4.4.18 The red dots on the graph below) show the variation of the unadjusted modelled concentration of total annual mean NO_2 at the measurement locations in the whole traffic study area. The blue dots show the adjusted modelled concentration at the total annual mean at the measurement locations. The comparison of measured and modelled concentrations here suggests that the model under-predicted at various locations in the Main and M6 Embankment study areas. Therefore, bias adjustment factors were required; the factor of 2.48 was applied to the modelled road NO_X in Main area and 5.67 on the M6 Embankment Area.

4.4.19 The uncertainty in the model has been assessed by comparing the adjusted modelled predictions to the measured concentrations of NO_2 and calculating the RMSE. LAQM TG(22) (Defra, 2022) identifies a standard of model uncertainty expressed as an RMSE value that is within 10% of the objective value as the idea for annual mean nitrogen dioxide 10% of the objective value is 4 μg/m^3. A RMSE value for the whole study area of 1.0 μg/m^3 was obtained for the adjusted model predictions, which being below 4 μg/m^3, is evidence of a robust level of performance from the model.

Graph 7A. 1: Modelled NO2 Versus Monitored NO_2 for the Road Traffic Study Area



4.4.20 The same bias adjustment factor derived for the modelled contributions of the primary pollutant NO_X has been applied to the modelled road PM_{10} and $PM_{2.5}$ contributions, as recommended in LAQM.TG(22).

Predicting the Number of Days in which the Particulate Matter 24-hour Mean Objective is Exceeded

4.4.21 The guidance document LAQM.TG(03) (Defra, 2003) sets out the method by which the number of days in which the particulate matter 24 hr objective is exceeded can be obtained based on a relationship with the predicted particulate matter annual mean concentration. The most recent guidance LAQM.TG(22) suggests no change to this method. As such, the formula used within this assessment is:

$$No.of\ Exceedances = 0.0014 * C^3 + \frac{206}{C} - 18.5$$

4.4.22 Where C is the annual mean concentration of PM_{10}.

Predicting the Number of Days in which the Nitrogen Dioxide Hourly Mean Objective is Exceeded

4.4.23 Research projects completed on behalf of Defra and the Devolved Administrations (Laxen and Marner, 2003; AEAT, 2008), have concluded that the hourly mean nitrogen dioxide objective is unlikely to be exceeded if annual mean concentrations are predicted to be less the 60 µg/m^3.

4.4.24 In 2003, Laxen and Marner concluded:

"…local authorities could reliably base decisions on likely exceedances of the 1-hour objective for nitrogen dioxide alongside busy streets using an annual mean of 60 µg/m^3 and above."

4.4.25 The findings presented by Laxen and Marner (2003) are further supported by AEAT (2008) who revisited the investigation to complete an updated analysis including new monitoring results and additional monitoring sites. The recommendations of this report are:

"Local authorities should continue to use the threshold of 60 µg/m^3 NO_2 as the trigger for considering a likely exceedance of the hourly mean nitrogen dioxide objective."

4.4.26 Therefore, this assessment will evaluate the likelihood of exceeding the hourly mean nitrogen dioxide objective by comparing predicted annual mean nitrogen dioxide concentrations at all receptors to an annual mean equivalent threshold of 60 µg/m^3 nitrogen dioxide. Where predicted concentrations are below this value, it can be concluded that the hourly mean nitrogen dioxide objective (200 µg/m^3 NO_2 not to be exceeded more than 18 times per year) will be achieved.

Specialised Model Treatments

4.4.27 No specialised model treatments have been used in the assessment of road traffic emissions.

5.0 BASELINE AIR QUALITY

5.1 Overview

5.1.1 This section presents the information used to evaluate the background and baseline ambient air quality in the area surrounding the Site (see Figures 7A.1 and 7A.2 in Annex A). The following steps have been taken in the determination of background values. Where appropriate, the study focuses on data gathered in the vicinity of the Site:

- review of local and national ambient monitoring data;
- review of other monitoring undertaken in the area around the Site; and
- review of background data and Site relevant Critical Loads from the APIS website.

5.1.2 The baseline data presented in this section covers the whole study area: the Power Plant Area, the Electricity Grid Connection, the Gas Connection Corridor and the surrounding land.

5.2 Ambient Monitoring Data

Existing Air Quality

5.2.1 The existing environment has been described with reference to the most recently published EPA Air Quality Report and supplementary data (EPA, 2022).

5.2.2 The EPA manages the national ambient air quality network, which consists of 116 monitoring stations as of 2022, located across the country that monitor a range of pollutants, including some of those of relevance to this assessment. The most recent EPA Air Quality Report available was published in 2022 and refers to monitoring data gathered in 2021 and earlier.

5.2.3 EU legislation on air quality requires that Member States divide their territory into zones for the assessment and management of air quality. The zones in place in Ireland during the most recently available report of monitoring (EPA, 2022) are:

- Zone A – Dublin conurbation.
- Zone B – Cork conurbation;
- Zone C – large towns with a population >15,000; and
- Zone D – the remaining area of Ireland.

5.2.4 The EPA operate a network of air quality monitoring across the country. Data gathered by the nearest air quality monitoring undertaken to the Proposed Development Site is summarised in Table 7A. 23. Data is also presented as the average across the representative Zone D sites.

Table 7A. 23 Air Quality Monitoring Data

MONITORING STATION		POLLUTANT	REPORTED CONCENTRATION (µg/m^3)[1]				AIR QUALITY STANDARD (µg/m^3)
			2018	2019	2020	2021	
Zone D Average[5]		NO_2	4.7	5.7	4.0	7.3	40[2]
		NO_X	6.7	7.8	5.4	14.5	30[3]
		PM_{10}	10.7	12.3	11.9	11.6	40[2]
		$PM_{2.5}$	7.5	9.3	8.3	7.9	25[2]
		CO[4]	400 (0)[6]	100 (0)	400 (0)[6]	300 (0)	10,000[2]

Notes:

1 Values as reported by the EPA in the Supplementary Tables to Support the annual Air Quality in Ireland reports.

2 For the protection of human health.

3 For the protection of ecosystems (nature conservation receptors).

4 Rolling 8-hour average – number of exceedances of the rolling 8-hour maximum Air Quality Standard provided in parenthesis).

5 Zone D average data discounts sites with data capture of <50%.

6 Average for Zone C – no Zone D data available.

5.2.5 The EPA data summarised in Table 7A. 23 above demonstrates that the existing air quality in the vicinity of the Proposed Development is unlikely to be constrained and concentrations are generally well below the respective Air Quality Standards and Environmental Assessment Levels for the protection of human health and ecosystems.

5.2.6 Monitored annual mean NO_X concentrations reported by the EPA for Zone D suggest that background values at the nature conservation sites considered in this assessment are not currently constrained by the pollutants associated with harm to ecosystems.

<u>AECOM Project Specific Monitoring</u>

5.2.7 To provide further detail on the variation in background NO_2 concentrations throughout the study area, a project specific diffusion tube survey was undertaken.

5.2.8 Results presented below are based on measurements realised between the 9 of March 2023 and the 24 of August 2023. The results from the survey were annualised to 2022 in line with the methodology set out in LAQM.TG (22) (Defra, 2022). The year 2022 has been as it is the last full calendar year. The results of the survey are shown in

5.2.9 Table 7A. 24. The raw monitoring data is located in Annex C. Monitoring data was annualised using data from the Edenderry, Emo Court and Kilkenny rural and background monitoring stations. Data for these sites was sourced from the airquality.ie website, operated by the EPA.

Table 7A. 24 AECOM NO_2 Diffusion Tube Concentrations Monitored in 2023 and Annualised to 2022

SITE ID	GRID REF NIOS (M)	SITE TYPE	PERIOD MEAN CONCENTRATION (µg/m³)						BIAS ADJUSTED ANNUALISED MEAN (µg/m³)
			Mar	Apr	May	June	July	Aug	
DT1	50550, 401173	Roadside	5.5	5.3	5.8	5.8	4.1	3.6	5.9
DT2	51078, 400677	Roadside	8.4	8.3	8.1	8.9	8.6	6.4	9.6
DT3	53992, 397531	Roadside	8.0	11.1	11.9	14.5	Road closed near tube	Road closed near tube	11.2
DT4	54116, 396987	Roadside	9.6	8.8	8.9	9.7	Road closed near tube	Road closed near tube	9.1
DT5	50145, 401566	Roadside	6.4	8.9	10.6	12.0	Web / other in tube	5.9	9.4
DT6	50025, 401713	Roadside	9.6	9.6	13.0	12.4	Web / other in tube	8.5	11.4
DT7	49099, 402827	Roadside	7.0	7.3	9.5	8.2	6.2	6.2	8.8
DT8	49144, 402633	Roadside	Web / other in tube	10.0	12.8	11.8	7.4	6.3	11.7
DT9	48188, 402481	Roadside	6.9	9.1	11.7	12.3	7.0	Web / other in tube	10.5
DT10	48446, 403356	Roadside	6.9	7.8	6.4	Tube on floor	7.6	5.8	8.2
DT11	59036, 403232	Roadside	Missing	Missing	8.8	10.6	8.2	5.8	10.7
DT12	54366, 396965	Background	5.0	4.6	3.9	5.1	Missing	6.5	5.4
DT13	48145, 403670	Background	4.0	4.1	3.1	3.8	2.4	Web / other in tube	3.9

5.2.10 The project specific NO_2 measurement results are all well below the annual mean NO_2 objectives. The annual mean NO_2 concentrations measured at background locations (DT12 to DT13) are markedly lower.

5.3 Summary of Background Air Quality

5.3.1 The background pollutant concentrations used to inform this assessment have been obtained from the most recent Air Quality in Ireland report published by the EPA (2022) and diffusion tube measurements. With the 6 months survey complete, the average annualised NO_2 concentration measured at background locations (DT12 and DT13) has been used as a representative measurement of the local background option. All other pollutant were sourced from publicly available data.

5.3.2 The background pollutant concentration data is listed in Table 7A. 25. For pollutants with averaging periods of less than the annual mean, it is standard practice to assume the background concentration is the annual mean (long-term) value doubled, which is in line with EPA AG4 guidance (2020). Background nitrogen and acid deposition values, and ammonia concentrations were sourced from the APIS website (APIS, 2023). For the other pollutants, the latest version of the EPA report has been used and values for zone D for 2021 were selected as the latest year. The same values were used to represent the backgrounds in future years, as a conservative assumption (overall background concentrations have followed a downward trend over the past few years).

Table 7A. 25 Background Pollutant Concentrations

Pollutant	Averaging Period	Rural Concentration ($\mu g/m^3$ unless stated)
Nitrogen dioxide (NO_2)	Annual mean	4.6
	Hourly mean	9.2
Carbon monoxide (CO)	Rolling 8-hour mean	300
Particulate matter (PM_{10})	Annual mean	11.6
	Daily mean	11.6
Fine particulate matter ($PM_{2.5}$)	Annual mean	7.9
Oxides of nitrogen (NO_X) – for the protection of ecosystems	Annual mean	Site specific, see result section
Nitrogen deposition	Annual mean	Site specific, see result section
Acid deposition	Annual mean	Site specific, see result section
Ammonia	Annual mean	Site specific, see result section

5.4 Predicted Baseline Pollutant Concentrations of NO_2, PM_{10} and $PM_{2.5}$ at Discrete Receptors Close to Roads

Baseline

5.4.1 Baseline annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$, and the number of expected exceedances of the 24-hour 50 $\mu g/m^3$ PM_{10} air quality objectives at the receptors sensitive to changes in road traffic emissions during the current 2022 baseline scenario are listed in Table 7A. 26 below.

Table 7A. 26 Air Quality Statistics Predicted for Baseline Scenario in 2022

ID	RECEPTOR NAME	ANNUAL MEAN POLLUTANT CONCENTRATION (µg/m^3)			NUMBER OF DAYS OF EXCEEDANCE OF 24-HOUR MEAN OF 50 µg/m^3 (DAYS)
		NO_2	PM_{10}	$PM_{2.5}$	
R01	Property on the R400 in Rochfortbridge	7.7	12.0	8.1	1
R02	Property on the R400 south of M6	10.5	12.2	8.3	1
R03	Property on the R400 south of M6	8.3	12.0	8.1	1
R04	Property on the R400 south of site entrance	8.2	12.1	8.2	1
R05	Property on the R400 near Yellow River	7.1	12.0	8.1	1
R06	Property on the R400 north of Rhode	9.6	12.3	8.4	1
R14	Property in Farthingstown, south of M6	6.8	11.8	8.0	1

5.4.2 In the Baseline scenario the annual mean concentrations of all pollutants near to main roads in the vicinity of the Site are well below the environmental standards, indicating that air quality in the area around the Proposed Development is of a very good standard.

Future Construction Baseline

5.4.3 Predicted annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$, and the number of exceedances of the 24-hour 50 µg/m^3 PM_{10} air quality objective, at the selected receptors for the road traffic assessment, during the future 2025 baseline scenario for the Proposed Development are listed in Table 7A. 27. As described at paragraph 4.5.6 the traffic flows used for the future baseline scenario include other committed developments.

Table 7A. 27 Air quality baseline statistics predicted for 2025 baseline scenario (including other committed developments)

ID	RECEPTOR NAME	ANNUAL MEAN POLLUTANT CONCENTRATION (µg/m^3)			NUMBER OF DAYS OF EXCEEDANCE OF 24-HOUR MEAN OF 50 µg/m^3 (DAYS)
		NO_2	PM_{10}	$PM_{2.5}$	
R01	Property on the R400 in Rochfortbridge	7.1	12.0	8.1	1
R02	Property on the R400 south of M6	9.4	12.2	8.3	1
R03	Property on the R400 south of M6	7.6	12.0	8.2	1
R04	Property on the R400 south of site entrance	7.5	12.2	8.3	1
R05	Property on the R400 near Yellow River	6.6	12.0	8.1	1

ID	RECEPTOR NAME	ANNUAL MEAN POLLUTANT CONCENTRATION (µg/m³)			NUMBER OF DAYS OF EXCEEDANCE OF 24-HOUR MEAN OF 50 µg/m³ (DAYS)
		NO_2	PM_{10}	$PM_{2.5}$	
R06	Property on the R400 north of Rhode	8.6	12.4	8.4	1
R14	Property in Farthingstown, south of M6	8.6	12.0	8.1	1

5.4.4 The predicted future baseline scenario for the construction year pollutant concentrations are well below all AQS values for all pollutants, indicating that air quality in the vicinity of the Proposed Development will continue to be of a very good standard. Compared to 2022, slightly higher concentrations of NO_2 are predicted alongside the M6, though still within the AQS objective values.

Future Operational Baseline

5.4.5 Predicted annual mean concentrations of NO_2, PM_{10} and CO, at the selected receptors during the future 2025 baseline scenario for the Proposed Development are listed in Table 7A. 28. As described at paragraph 4.5.6 the traffic flows used for the future baseline scenario include other committed developments. Although the operation of the Proposed Development won't have started in 2025, it is the latest year baseline traffic has been modelled for and, as future backgrounds and emissions from vehicles are expected to decrease year on year, it is a conservative assumption.

Table 7A. 28 Air quality baseline statistics predicted for 2025 baseline scenario (including other committed developments)

ID	RECEPTOR NAME	ANNUAL MEAN POLLUTANT CONCENTRATION (µg/m³)		
		NO_2	PM_{10}	CO
R01	Property on the R400 in Rochfortbridge	7.1	12.0	150
R02	Property on the R400 south of M6	9.4	12.2	150
R03	Property on the R400 south of M6	7.6	12.0	150
R04	Property on the R400 south of site entrance	7.5	12.2	150
R05	Property on the R400 near Yellow River	6.6	12.0	150
R06	Property on the R400 north of Rhode	8.6	12.4	150
R07	Property on L1010 Togher, west Rhode	4.6	11.6	150
R08	Property on a farm north of Croghan	4.6	11.6	150
R09	Property on a farm Rathconnel	4.6	11.6	150
R10	Property in Hardwood	4.6	11.6	150
R11	Property on Rahanine Rd	4.6	11.6	150
R12	Property on a farm, south of M6	4.6	11.6	150

ID	RECEPTOR NAME	ANNUAL MEAN POLLUTANT CONCENTRATION (µg/m³)		
		NO_2	PM_{10}	CO
R13	Property on the L1009	4.6	11.6	150
S01	Rhode Community Pre-school	4.6	11.6	150
S02	Rhode N.S. School	4.6	11.6	150
S03	Scoil Bhride, Croghan P.S., School	4.6	11.6	150
S04	St Joseph's Secondary, Rochfortbridge, School	4.6	11.6	150
S05	Miltownpass National School	4.6	11.6	150
S06	Stonebridge Park Playschool, Rochfortbridge	4.6	11.6	150

5.4.6 The predicted future baseline scenario for the construction year pollutant concentrations are well below all AQS values for all pollutants, indicating that air quality in the vicinity of the Proposed Development will continue to be of a very good standard. Compared to 2022, slightly higher concentrations of NO_2 are predicted alongside the M6, though still within the AQS objective values.

5.5 Point Source Emissions Background Concentrations for Different Averaging Times

5.5.1 In accordance with EPA’s AG4 guidance, the annual mean background pollutant concentrations have been obtained from the EPA or from project specific monitoring as described above and the short-term background concentration is assumed to be twice the annual mean concentration for NO_2 and CO and one and the same as the annual mean background concentration for PM_{10}.

6.0 CONSTRUCTION PHASE ASSESSMENT

6.1 Construction Dust Assessment

6.1.1 The construction phase for the Overall Project is 4 years, with the construction of the Power Plant Area (as defined in chapter 5) spanning 4 years, the Electricity Grid Connection almost 3 years and the Gas Connection Corridor element almost 2 years. There is the potential for impacts on local air quality and public amenity from emissions generated during the construction phase of the Overall Project.

Impact Assessment for Power Plant Area

6.1.2 Receptors potentially affected by dust soiling and short-term concentrations of PM_{10} generated during construction activities are limited to those located within 250m of the nearest construction activity, and/ or within 50m of a public road used by construction traffic that is within 250m of the construction site entrances. Ecological receptors are limited to those located within 50m of the nearest construction activity and/ or within 50m of a public road used by construction traffic that is within 250m of the construction site entrance.

6.1.3 There are no human health, amenity or ecological receptors falling into those screening distances within 250 m of the Power Plant Area site or the access point. Further consideration of the effect of fugitive dust and particulate matter emissions from construction operations at the Power Plant Area site, has not therefore been carried out.

Impact Assessment for Electricity Grid Connection

Magnitude Assessment

6.1.4 The area where significant earthworks will be required are restricted to the preparation of the substation sites, which represents only a small part of the planning application area, and a corridor/zone where the buried sections of cabling would be installed. Excavated material would be utilised where possible to backfill trenches following installation of the cable in order to minimise removal of material from site.

6.1.5 According to IAQM criteria, the Electricity Grid Connection site has been classified in terms of its potential for pre-construction, earthworks, construction activities and trackout to generate emissions of dust as a ‘small’ site. This is due to the size of the overall area where earthworks would take place, in particular the substation site at the southern extent of the site. There would be a limited extent of excavation and cable installation works which would be carried out at any one time. Note that the guidance uses the term “demolition” instead of “pre-construction” but this is more appropriate here as there is no demolition as such, some site clearance activities will be required pre-construction and would mostly be akin to earthworks activities (and were therefore assessed using the risk factors for earthworks instead of demolition).

Receptor Identification

6.1.6 The period of time in which there is expected to be activity with the potential to give rise to fugitive dust emissions within the distance criteria for any receptor is likely to be limited in the case of cable trench excavations. Each sensitive receptor would not be near to the same level of construction activity at the same time, and each receptor along the route is likely to be at its most sensitive (i.e. at the closest to the activity) for a relatively limited period. The construction of the substations, however, would occur over a nine-month period.

6.1.7 Potential dust impacts (pre-mitigation) have been assessed based on the receptor sensitivity and distance criteria outlined above and using professional judgment. The only human health and amenity receptors falling into those screening distances are in Croghan, next to the substation site at the southern extent of the site. The southern Site access is via the L1010 Togher between Rhode and Croghan, with only one residential receptor east along the proposed construction traffic route and within 500m of the Site entrance. The sensitivity of the area can be considered “medium” or “high” both for dust soiling impacts and for human health impacts from PM_{10} releases from all activities, on account of the distance from the activity source to the receptors, and the existing low background concentration particulates (<24 µg/m^3).

6.1.8 All Ramsar sites, SPAs, SACs SACs and NHAs are further than 50m from the construction works associated with the Electricity Grid Connection. Deposition of nutrient nitrogen and acid to waterbodies and watercourses has not been considered as these types of receptors are not considered to be at risk from such emissions. Therefore, an assessment of construction dust on ecological receptors has not been carried out.

Area Sensitivity Assessment

6.1.9 The receptor sensitivity to the effects of dust deposition and PM_{10} (human health) impacts has been determined for all activities, based on the closest distance from the identified receptors to those activities, as summarised in Table 7A.29 below. The overall area sensitivity to dust deposition and PM_{10} (human health), based on the area sensitivity for each activity listed in Table 7A.29 below, is considered to be ‘high’.

Table 7A.29: Area Sensitivity for Receptors of Construction Dust

ACTIVITY	POTENTIAL IMPACT	RECEPTOR SENSITIVITY AND DISTANCE TO ACTIVITY	OVERALL AREA SENSITIVITY
Pre-construction	Dust deposition	High <20 m	High
	Health PM_{10}	High <20 m	Medium
Earthworks	Dust deposition	High <20 m	High
	Health PM_{10}	High <20 m	Medium
Construction	Dust deposition	High <20 m	High
	Health PM_{10}	High <20 m	Medium
Trackout	Dust deposition	High <20 m	High

ACTIVITY	POTENTIAL IMPACT	RECEPTOR SENSITIVITY AND DISTANCE TO ACTIVITY	OVERALL AREA SENSITIVITY
	Health PM_{10}	High <20 m	Medium

6.1.10 The risk of impacts from unmitigated activities has been determined through a combination of the potential dust emission magnitude and the sensitivity of the area, for each activity to determine the level of mitigation that should be applied. The risk of impacts from unmitigated activities are summarised in

6.1.11 Table 7A.30 below.

Table 7A.30: Risk of Impacts from Unmitigated Activities

POTENTIAL IMPACT	RISK OF IMPACT FROM ACTIVITY			
	PRE-CONSTRUC-TION	EARTHWORKS	CONSTRUCTION	TRACKOUT
Dust Soiling	Low risk	Low risk	Low risk	Low risk
Human Health PM_{10}	Low risk	Low risk	Low risk	Low risk
Ecology	Not applicable	Not applicable	Not applicable	Not applicable

6.1.12 The level of mitigation required to reduce dust and particulates from the Electrical Grid Connection construction activities to avoid significant impacts on receptors has been determined based on the above risk assessment.

6.1.13 Mitigation measures to be embedded within the Proposed Development will therefore be defined as listed in the 'low risk' schedule of measures listed in section 8.2 of the IAQM guidance and Annex E of this report. Additional site-specific measures will be identified in the Construction Environmental Management Plan (CEMP) if necessary.

Impact Assessment for Gas Connection Corridor

Magnitude Assessment

6.1.14 The area of excavation will be significantly smaller than the planning application area and restricted to a corridor/zone in the immediate vicinity of the pipeline trench. Excavated material would be utilised where possible to backfill the trench following installation of the gas pipeline in order to minimise removal of material from site.

6.1.15 According to IAQM criteria, the Gas Connection Corridor site has been classified in terms of its potential for pre-construction, earthworks, construction activities and trackout to generate emissions of dust as a 'small' site. This is due to the size of the overall area where earthworks would take place, in conjunction with the limited extent of excavation and pipeline installation works which would be carried out at any one time. Note that the guidance uses the term "demolition" instead of "pre-construction" but this is more appropriate here as there is no demolition as such, some site clearance activities will be required pre-construction and would mostly be akin to earthworks activities (and were therefore assessed using the risk factors for earthworks instead of demolition).

Receptor Identification

6.1.16 The period of time in which there is expected to be activity with the potential to give rise to fugitive dust emission within the distance criteria for any receptor is likely to be very limited. Pipeline excavation and pipe laying is expected to progress along the route throughout the construction programme and each sensitive receptor would not be near to the same level of construction activity at the same time, and each receptor along the route is likely to be at its most sensitive (i.e. at the closest to the activity) for a relatively limited period (less than a week).

6.1.17 Potential dust impacts (pre-mitigation) have been assessed based on the receptor sensitivity and distance criteria outlined above and using professional judgment. Although there are residential properties within the planning application boundary, only a few properties lie within 250m of the construction activity area, i.e. where the pipeline is getting buried. This includes a couple of properties in Farthingstown as well as another couple on the R446, where the pipeline crosses the road. The southern Site access is via R400, with no residential receptor along the proposed construction traffic route and within 500m of the Site entrance. The sensitivity of the area can be considered “medium or high” both for dust soiling impacts and for human health impacts from PM_{10} releases from all activities, on account of the distance from the activity source to the receptors, and the existing low background concentration particulates (<24 $\mu g/m^3$).

6.1.18 All Ramsar sites, SPAs, SACs and NHAs are further than 50m from the construction works associated with the Gas Connection Corridor. Deposition of nutrient nitrogen and acid to waterbodies and watercourses has not been considered as these types of receptors are not considered to be at risk from such emissions. Therefore, an assessment of construction dust on ecological receptors has been screened out.

Area Sensitivity Assessment

6.1.19 The receptor sensitivity to the effects of dust deposition and PM_{10} (human health) impacts has been determined for all activities, based on the closest distance from the identified receptors to those activities, as summarised in Table 7A.31 below. The overall area sensitivity to dust deposition and PM_{10} (human health), based on the area sensitivity for each activity listed in Table 7A.10 below, is considered to be ‘high’.

Table 7A.31: Area Sensitivity for Receptors of Construction Dust

ACTIVITY	POTENTIAL IMPACT	RECEPTOR SENSITIVITY AND DISTANCE TO ACTIVITY	OVERALL AREA SENSITIVITY
Pre-construction	Dust deposition	High <20 m	High
	Health PM_{10}	High <20 m	Medium

ACTIVITY	POTENTIAL IMPACT	RECEPTOR SENSITIVITY AND DISTANCE TO ACTIVITY	OVERALL AREA SENSITIVITY
Earthworks	Dust deposition	High <20 m	High
	Health PM_{10}	High <20 m	Medium
Construction	Dust deposition	High <20 m	High
	Health PM_{10}	High <20 m	Medium
Trackout	Dust deposition	High <20 m	High
	Health PM_{10}	High <20 m	Medium

6.1.20 The risk of impacts from unmitigated activities has been determined through a combination of the potential dust emission magnitude and the sensitivity of the area, for each activity to determine the level of mitigation that should be applied. The risk of impacts from unmitigated activities are summarised in Table 7A. 35 below.

Table 7A.32: Risk of Impacts from Unmitigated Activities

POTENTIAL IMPACT	RISK OF IMPACT FROM ACTIVITY			
	PRE-CONSTRUC-TION	EARTHWORKS	CONSTRUCTION	TRACKOUT
Dust Soiling	Low risk	Low risk	Low risk	Low risk
Human Health PM_{10}	Low risk	Low risk	Low risk	Low risk
Ecology	Not applicable	Not applicable	Not applicable	Not applicable

6.1.21 The level of mitigation required to reduce dust and particulates from the Gas Connection Corridor construction activities to avoid significant impacts on receptors has been determined based on the above risk assessment.

6.1.22 Mitigation measures to be embedded within the Proposed Development will therefore be defined as listed in the 'low risk' schedule of measures listed in section 8.2 of the IAQM guidance and Annex E of this report. Additional site-specific measures will be identified in the Construction Environmental Management Plan (CEMP) if necessary.

6.2 Construction Dispersion Modelling Results

Modelling Results for NO_2

6.2.1 The predicted change in annual mean NO_2 concentrations that would occur during the traffic associated with construction works for the Proposed Development, at the selected sensitive receptors (being the residential receptors specified in Table 7A.15), are presented in Table 7A. 33. Any errors in the addition of PC to the baseline concentrations are due to rounding only.

6.2.2 The maximum predicted change in annual mean NO_2 concentrations at the selected sensitive receptors is +0.5 µg/m^3, and this would occur in the vicinity of receptor R06, a property on the R400 north of Rhode. The reported change in concentration at this location is predominantly due to the impact of emissions from construction road traffic. The annual mean NO_2 PEC at all of the receptors would remain below the annual mean NO_2 Environmental Standard, therefore the change is not predicted to lead to a risk of the annual mean air quality standard being exceeded.

6.2.3 The receptor with the highest PEC is receptor R02, south of the R400/ M6 junction. At this location annual mean NO_2 concentrations are predicted to be 9.8 µg/m^3. With the Proposed Development being constructed, annual mean concentrations would remain below the annual mean Environmental Standard for NO_2.

6.2.4 The significance of the predicted change in annual mean NO_2, PM_{10} and $PM_{2.5}$ concentrations during construction in planning terms is discussed in Chapter 7: Air Quality (refer to ES Volume I).

Table 7A. 33:Predicted change in annual mean NO_2 concentrations at discrete receptors (µg/m^3) due to construction road traffic emissions, with comparison against Environmental Standard criteria

RECEPTOR	2025 BASELINE	CHANGE DUE TO ROAD	PC % ENV STD	PEC	PEC % ENV STD
R01	7.1	0.1	0.2	7.2	18.0
R02	9.4	0.4	1.0	9.8	24.5
R03	7.6	0.4	0.9	8.0	19.9
R04	7.5	0.4	1.0	7.9	19.7
R05	6.6	0.3	0.7	6.9	17.3
R06	8.6	0.5	1.4	9.1	22.7
R14	8.6	0.2	0.4	8.7	21.8

Modelling Results for PM_{10} and $PM_{2.5}$ Particulates

6.2.5 Change in annual mean PM_{10} and $PM_{2.5}$ concentrations at discrete receptors that would occur from the road traffic associated with the construction of the Proposed Development, at the selected sensitive receptors, is presented in Table 7A. 34 and Table 7A. 35. Any errors in the addition of PC to the baseline concentrations are due to rounding only.

6.2.6 The maximum predicted change in annual mean PM_{10} and $PM_{2.5}$ concentrations at the selected sensitive receptors is +0.2 µg/m^3. This change in annual mean PM_{10} and $PM_{2.5}$ concentrations would not be a perceptible at air quality sensitive receptors, nor would it result in any additional days on which the PM_{10} 24-hour objective is exceeded.

6.2.7 The predicted annual mean concentrations are well below the respective Environmental Standards for PM_{10} and $PM_{2.5}$.

Table 7A. 34: Predicted change in annual mean PM_{10} concentrations at discrete receptors ($\mu g/m^3$) due to construction road traffic emissions, with comparison against Environmental Standard criteria

RECEPTOR	2025 BASELINE	CHANGE DUE TO ROAD	PC % ENV STD	PEC	PEC % ENV STD
R01	12.0	<0.1	0.1	12.0	30.0
R02	12.2	0.1	0.3	12.3	30.8
R03	12.0	0.1	0.3	12.1	30.4
R04	12.2	0.1	0.3	12.3	30.8
R05	12.0	0.1	0.2	12.1	30.3
R06	12.4	0.2	0.4	12.6	31.5
R14	12.0	<0.1	0.1	12.0	30.0

Table 7A. 35: Predicted change in annual mean $PM_{2.5}$ concentrations at discrete receptors ($\mu g/m^3$) due to construction road traffic emissions with comparison against Environmental Standard criteria

RECEPTOR	2025 BASELINE	CHANGE DUE TO ROAD	PC % ENV STD	PEC	PEC % ENV STD
R01	8.1	<0.1	0.1	8.1	40.7
R02	8.3	0.1	0.3	8.3	41.7
R03	8.1	0.1	0.3	8.2	41.1
R04	8.2	0.1	0.3	8.3	41.6
R05	8.1	<0.1	0.2	8.2	41.0
R06	8.4	0.1	0.5	8.5	42.4
R14	8.0	<0.1	0.1	8.2	40.8

7.0 OPERATION DISPERSION MODELLING RESULTS

7.1 Confirmation of Release Heights

7.1.1 This section reports the results of a confirmation of the release height for the emissions stacks (‘the stacks’) serving the combustion process, using the ADMS 6 dispersion model. The selection of an appropriate stack release height requires a number of factors to be taken into account, the most important of which is the need to balance a release height sufficient to achieve adequate dispersion of pollutants against other constraints such as visual impact. Separate assessments have been conducted for the CCGT and OCGT.

7.1.2 For the CCGT, emissions from the stack have been modelled at heights between 40m and 80m, at 5m increments. A graph, showing the PC to annual mean and maximum 1-hour pollutant concentrations for a modelled unit emission rate is presented in Graph 7A. 2. The purpose of the graph is to evaluate the optimum release height in terms of the dispersion of pollutants which would occur, against the visual constraints of further increases in release height. The comparison is based on emissions from the Normal Operation scenario.

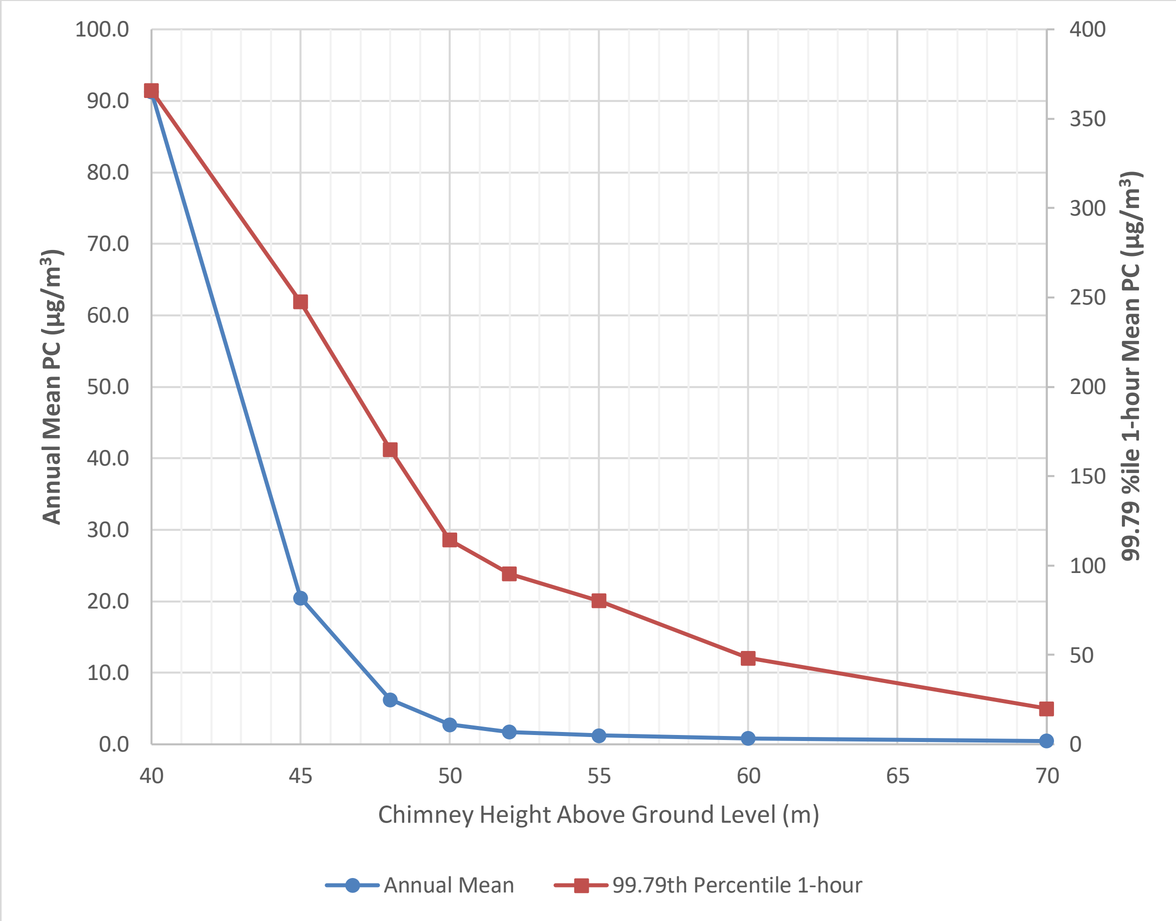
7.1.3 Analysis of the annual mean curve shows that the benefit of incremental increases in release height up to 55m is relatively pronounced. At heights above 60m, the air quality benefit of increasing release height further is reduced.

7.1.4 The relative benefit of increasing the release height on maximum 1-hour concentrations follows a similar pattern to the annual mean curve. A flattening of the curve is seen at heights of greater than 60m, above which a reduced improvement in ground level concentrations is predicted with increasing release height.

7.1.5 The design release height of the stack is 60m above ground level. The graph illustrates that the use of a stack releasing emissions at 60m above ground level or greater would be capable of mitigating both the short-term and long-term impacts of the modelled emissions of all pollutants, such that no significant adverse effects would occur at any receptor. The incremental benefit of further increases in the release height become less effective in reducing the PC to annual mean ground-level concentrations.

7.1.6 It is therefore considered that 60m represents a height at which the visual impacts of further increases in stack release heights outweigh the benefits to air quality, in terms of human health.

Graph 7A. 2: Predicted Process Contribution to annual mean NO_2 ground level pollutant concentrations at stack release heights between 40 m and 80 m



7.1.7 For the OCGT, emissions from the stack have been modelled at heights between 25m and 80m, at 5m increments. A graph, showing the PC to annual mean and maximum 1-hour pollutant concentrations for a modelled unit emission rate is presented in Graph 7A. 3. The comparison is based on emissions from the Normal Operation scenario.

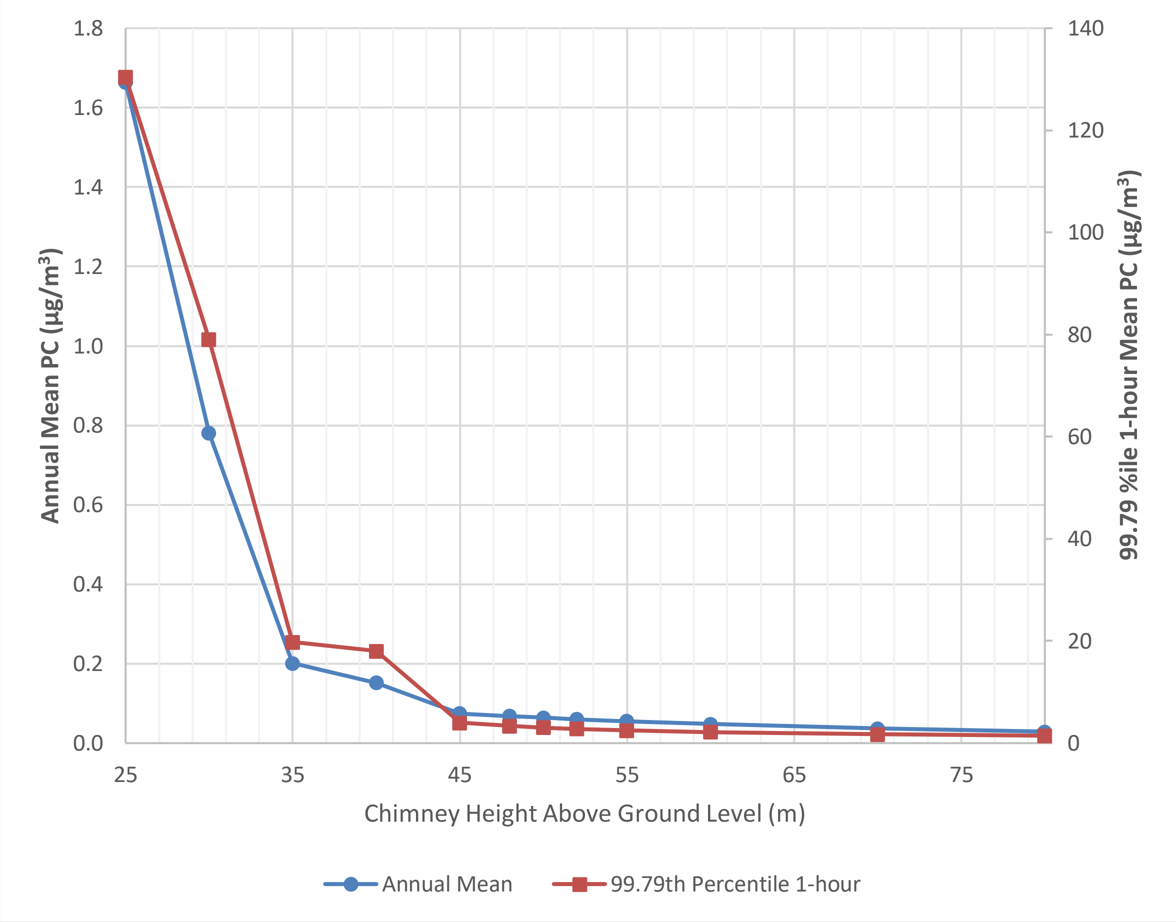
7.1.8 Analysis of the annual mean curve shows that the benefit of incremental increases in release height up to 40m is relatively pronounced. At heights above 45m, the air quality benefit of increasing release height further is reduced.

7.1.9 The relative benefit of increasing the release height on maximum 1-hour concentrations follows a relatively similar pattern to the annual mean curve. A flattening of the curve is seen at heights of greater than 45m, above which a reduced improvement in ground level concentrations is predicted with increasing release height.

7.1.10 The design release height of the stack is 45m above ground level. The graph illustrates that the use of a stack releasing emissions at 45m above ground level or greater would be capable of mitigating both the short-term and long-term impacts of the modelled emissions of all pollutants, such that no significant adverse effects would occur at any receptor. The incremental benefit of further increases in the release height become less effective in reducing the PC to annual mean ground-level concentrations.

7.1.11 It is therefore considered that 45m represents a height at which the visual impacts of further increases in stack release heights outweigh the benefits to air quality, in terms of human health.

Graph 7A. 3: Predicted Process Contribution to annual mean NO_2 ground level pollutant concentrations at stack release heights between 25 m and 80 m



7.2 Sensitivity of Results to Meteorological Data

7.2.1 The dispersion modelling assessment has been undertaken using meteorological data from Mullingar, for the years 2018 to 2022. Table 7A.36, below, presents the maximum predicted ground-level impact, for a number of the averaging periods evaluated throughout the assessment, for each year of meteorological data within the dataset. The comparison is based on emissions from the Normal Operation stack at the previously selected heights, and the figure highlighted in bold is the highest value obtained from the five years of meteorological data modelled.

Table 7A.36: Maximum Modelled Impact on Ground Level Concentrations (µg/m^3), Raw Model Output

MET YEAR	AVERAGING PERIOD AND STATISTIC		
	ANNUAL AVERAGE	1 HR 99.79TH %ILE	MAX 8 HR RUNNING MEAN
2018	0.6	27.4	169.1
2019	0.7	25.3	208.4
2020	**1.0**	**49.5**	**221.6**
2021	0.7	30.2	212.3
2022	0.7	33.9	208.1

7.2.2 The results presented in Table 7A.36 demonstrate that there is a variation in the meteorological dataset for which the maximum modelled impact is reported for each averaging period. For this reason, the values reported in the table are the maximum value obtained from modelling each of the five years meteorological data within the assessment. The reported values can therefore be considered to represent a worst-case assessment of impacts that would be experienced during typical meteorological conditions.

7.3 Modelling Results for NO_2

7.3.1 This section focuses on the change in local annual mean NO_2 concentrations that would occur as a result of the operation of the stacks.

7.3.2 An isopleth plot, showing the modelled PC (sometimes referred to as a ‘contour’ plot) to annual mean NO_2 concentrations due to emissions from the main stacks at full load operating on natural gas, is presented in Figure 7A-4 of Annex A to this report for the 2020 meteorological year (maximum modelled concentrations). An isopleth plot of the PC showing the PC to 99.79th percentile of 1-hr NO_2 concentrations is presented in Figure 7A-5 of Annex A to this report for the 2020 meteorological year (maximum modelled concentrations).

7.3.3 The annual mean contour plot indicates that the maximum PC to ground level NO_2 concentrations would occur approximately 600 m to the north-east of the location of the CCGT stack, not in a location where the public would be regularly present for any length of time. At this location, the predicted annual mean NO_2 PC is 1.0 µg/m^3, which is 2.6% of the Environmental Standard. The PEC is 5.6 µg/m^3 which is 14.1% of the Environmental Standard.

7.3.4 The largest predicted increase in 99.79th percentile of hourly means NO_2 concentrations, during full load continuous operation, occur closer to the main stack. The maximum predicted PC to short term NO_2 concentrations is 49.5 µg/m^3. Such an impact is 24.7% of the 99.79th percentile 1-hour Environmental Standard for NO_2 of 200 µg/m^3. The PEC in the area around the location of maximum impact is 58.7 µg/m^3, which is 29.3% of the Environmental Standard.

7.3.5 During operation on the backup fuel, the maximum predicted PC to short term NO_2 concentrations is 322 µg/m^3. Such an impact is 161% of the 99.79th percentile 1-hour Environmental Standard for NO_2 of 200 µg/m^3. The PEC in the area around the location of maximum impact is 331 µg/m^3, which is 165% of the Environmental Standard.

7.3.6 The high maximum predicted 99.79th percentile impact on backup fuel is due to the conservative nature of the model inputs to the assessment, a stack NO_X concentration at the upper end of the expected range has been assumed, in reality it is likely that the selected unit will be capable of much lower emissions. The small affected area where the exceedance is predicted to occur is a location to the north-east of the Power Plant Area site boundary, in an area where members of the public would not normally be present. At the most impacted sensitive receptor the predicted change is 48.9µg/m^3 or 24.4% of the 1-hour NO_2 air quality standard, when the Power Plant is operating at full load with secondary fuel.

Change in NO_2 Concentrations at Discrete Receptors during Operational Phase

7.3.7 The predicted change in annual mean NO_2 concentrations, that would occur during the operation of the Proposed Development, at the selected sensitive receptors, is presented in Table 7A. 37. Any errors/ discrepancy in the addition of PC to the baseline concentrations are due to rounding only.

7.3.8 The maximum predicted change in annual mean NO_2 concentrations from the full load scenario (continuous operation) at selected receptors is 0.3 µg/m^3, and this would occur at R13, a property on the L1009 north-east of the Power Plant Area. The annual mean NO_2 PC at all receptors would remain below the annual mean NO_2 Environmental Standard, therefore the change is not predicted to lead to a risk of the annual mean air quality standard being exceeded.

7.3.9 The receptor with the highest PEC is receptor R02. At this location annual mean NO_2 concentrations are predicted to be 9.5 µg/m^3. Therefore, with the Proposed Development in operation, annual mean concentrations would remain below the annual mean Environmental Standard for NO_2.

7.3.10 The predicted change in short-term NO_2 concentrations (99.79th percentile of hourly means), that would occur during the operation of the Proposed Development, at the selected sensitive receptors, is presented in Table 7A. 38.

7.3.11 The maximum predicted change in short-term NO_2 concentrations from the full load scenario (continuous operation) at selected receptors is 7.7 µg/m^3, and this would occur at R13, a property on the L1009 north-east of the Power Plant Area. The short-term NO_2 PC at all receptors would remain below the short-term NO_2 Environmental Standard, therefore the change is not predicted to lead to a risk of the annual mean air quality standard being exceeded.

7.3.12 The receptor with the highest PEC is also receptor R02. At this location annual mean NO_2 concentrations are predicted to be 25.8 µg/m^3. Therefore, with the Proposed Development in operation, short-term concentrations would remain below the Environmental Standard for NO_2.

7.3.13 Results for other scenarios are reported in Table 7A. 39 to Table 7A. 40. For the Backup and Low Load scenarios, only short-term emissions were modelled as they will only be occurring for short period of time.

Table 7A. 37: Predicted Change in Annual Mean NO_2 Concentrations at Discrete Receptors (μg/m^3) Due to Emissions from the Proposed Development for the Full Load Scenario, with Comparison Against Environmental Standard Criteria

RECEPTOR	BACKGROUND	PC PROPOSED DEVELOPMENT STACK	PC % AQS	PEC	PEC % AQS
R01	7.1	0.1	0.3%	7.2	18.0%
R02	9.4	0.1	0.4%	9.5	23.9%
R03	7.6	0.1	0.3%	7.7	19.3%
R04	7.5	0.2	0.4%	7.7	19.1%
R05	6.6	0.1	0.3%	6.7	16.8%
R06	8.6	0.1	0.2%	8.7	21.7%
R07	4.6	0.1	0.2%	4.7	11.7%
R08	4.6	0.1	0.1%	4.7	11.6%
R09	4.6	0.2	0.5%	4.8	12.0%
R10	4.6	0.2	0.6%	4.8	12.1%
R11	4.6	0.2	0.4%	4.8	11.9%
R12	4.6	0.1	0.2%	4.7	11.7%
R13	4.6	0.3	0.6%	4.9	12.1%
S01	4.6	0.1	0.2%	4.7	11.7%
S02	4.6	0.1	0.2%	4.7	11.7%
S03	4.6	<0.1	0.1%	4.6	11.6%
S04	4.6	0.1	0.2%	4.7	11.7%
S05	4.6	0.2	0.4%	4.8	11.9%
S06	4.6	0.1	0.3%	4.7	11.8%

Table 7A. 38: Predicted Change in 99.79th Percentile of Hourly Mean NO_2 Concentrations at Discrete receptors (μg/m^3) Due to Emissions from the Proposed Development for the Full Load Scenario, with Comparison Against Environmental Standard Criteria

RECEPTOR	BACKGROUND	PC PROPOSED DEVELOPMENT STACK	PC % AQS	PEC	PEC % AQS
R01	14.2	4.0	2.0%	18.2	9.1%
R02	18.8	7.0	3.5%	25.8	12.9%
R03	15.2	6.6	3.3%	21.8	10.9%
R04	15	7.6	3.8%	22.6	11.3%
R05	13.2	4.2	2.1%	17.4	8.7%
R06	17.2	3.4	1.7%	20.6	10.3%
R07	9.2	3.5	1.8%	12.7	6.4%
R08	9.2	3.6	1.8%	12.8	6.4%
R09	9.2	3.6	1.8%	12.8	6.4%
R10	9.2	4.0	2.0%	13.2	6.6%
R11	9.2	5.2	2.6%	14.4	7.2%
R12	9.2	4.6	2.3%	13.8	6.9%
R13	9.2	7.7	3.8%	16.9	8.4%
S01	9.2	3.3	1.7%	12.5	6.3%
S02	9.2	3.2	1.6%	12.4	6.2%
S03	9.2	2.9	1.5%	12.1	6.1%
S04	9.2	3.8	1.9%	13.0	6.5%
S05	9.2	3.4	1.7%	12.6	6.3%
S06	9.2	4.2	2.1%	13.4	6.7%

Table 7A. 39: Predicted Change in 99.79th Percentile of Hourly Mean NO_2 Concentrations at Discrete receptors (µg/m³) Due to Emissions from the Proposed Development for the Backup scenario, with Comparison Against Environmental Standard Criteria

RECEPTOR	BACKGROUND	PC PROPOSED DEVELOPMENT STACK	PC % AQS	PEC	PEC % AQS
R01	14.2	25.4	12.7%	39.6	19.8%
R02	18.8	43.1	21.5%	61.9	30.9%
R03	15.2	40.7	20.4%	55.9	28.0%
R04	15	47.4	23.7%	62.4	31.2%
R05	13.2	25.9	13.0%	39.1	19.6%
R06	17.2	21.4	10.7%	38.6	19.3%
R07	9.2	22.2	11.1%	31.4	15.7%
R08	9.2	22.2	11.1%	31.4	15.7%
R09	9.2	22.5	11.2%	31.7	15.8%
R10	9.2	25.0	12.5%	34.2	17.1%
R11	9.2	32.4	16.2%	41.6	20.8%
R12	9.2	29.3	14.6%	38.5	19.2%
R13	9.2	48.9	24.4%	58.1	29.0%
S01	9.2	20.8	10.4%	30.0	15.0%
S02	9.2	20.5	10.3%	29.7	14.9%
S03	9.2	18.2	9.1%	27.4	13.7%
S04	9.2	23.3	11.6%	32.5	16.2%
S05	9.2	21.2	10.6%	30.4	15.2%
S06	9.2	25.9	12.9%	35.1	17.5%

Table 7A. 40: Predicted Change in 99.79th Percentile of Hourly Mean NO_2 Concentrations at Discrete receptors (µg/m³) Due to Emissions from the Proposed Development for the Low Load scenario, with Comparison Against Environmental Standard Criteria

RECEPTOR	BACKGROUND	PC PROPOSED DEVELOPMENT STACK	PC % AQS	PEC	PEC % AQS
R01	14.2	3.0	1.5%	17.2	8.6%
R02	18.8	5.2	2.6%	24.0	12.0%
R03	15.2	5.5	2.8%	20.7	10.4%
R04	15	7.4	3.7%	22.4	11.2%
R05	13.2	3.2	1.6%	16.4	8.2%
R06	17.2	2.9	1.4%	20.1	10.0%
R07	9.2	2.7	1.3%	11.9	5.9%
R08	9.2	3.3	1.6%	12.5	6.2%
R09	9.2	3.4	1.7%	12.6	6.3%
R10	9.2	3.5	1.8%	12.7	6.4%
R11	9.2	3.9	1.9%	13.1	6.5%
R12	9.2	3.5	1.8%	12.7	6.4%
R13	9.2	6.0	3.0%	15.2	7.6%
S01	9.2	2.6	1.3%	11.8	5.9%
S02	9.2	2.4	1.2%	11.6	5.8%
S03	9.2	2.1	1.0%	11.3	5.6%
S04	9.2	2.9	1.4%	12.1	6.0%
S05	9.2	3.0	1.5%	12.2	6.1%
S06	9.2	3.1	1.6%	12.3	6.2%

7.3.14 Based on the results of the modelling, it is predicted that the operation of the Proposed Development would not directly increase the risk of an exceedance of the annual mean Environmental Standard at sensitive receptors for NO_2 for any scenario.

7.3.15 The significance of the predicted change in annual mean NO_2, CO, PM_{10} and $PM_{2.5}$ concentrations during operation is discussed in EIAR Chapter 7: Air Quality and Climate in EIAR Volume I.

7.4 Modelling Results for CO

7.4.1 The predicted change in 8-hour rolling CO concentrations, that would occur during the operation of the Proposed Development, at the selected sensitive receptors, is presented in Table 7A. 41. Any errors/ discrepancy in the addition of PC to the baseline concentrations are due to rounding only.

7.4.2 The maximum predicted change in 8-hour rolling CO concentrations from the full load scenario (continuous operation) at selected receptors is 11.7 µg/m^3, and this would occur at R13, a property on the L1009 north-east of the Power Plant Area. The 8-hour rolling CO PC at all receptors would remain below the 8-hour rolling CO Environmental Standard, therefore the change is not predicted to lead to a risk of the annual mean air quality standard being exceeded.

7.4.3 The receptor with the highest PEC is also Receptor R13. At this location 8-hour rolling CO concentrations are predicted to be 311.7 µg/m^3. Therefore, with the Proposed Development in operation, annual mean concentrations would remain below the 8-hour rolling Environmental Standard for CO, and any measured exceedance at this location would not be directly caused by the operation of the Proposed Development.

7.4.4 Results for other scenarios are reported in Table 7A. 42 to Table 7A. 43.

Table 7A. 41: Predicted Change in 8-hour Rolling CO Concentrations at Discrete Receptors (µg/m^3) Due to Emissions from the Proposed Development for the Full Load Scenario, with Comparison Against Environmental Standard Criteria

RECEPTOR	BACKGROUND	PC PROPOSED DEVELOPMENT STACK	PC % AQS	PEC	PEC % AQS
R01	300	4.9	<0.1%	304.9	3.0%
R02	300	9.0	0.1%	309.0	3.1%
R03	300	10.9	0.1%	310.9	3.1%
R04	300	10.0	0.1%	310.0	3.1%
R05	300	4.5	<0.1%	304.5	3.0%
R06	300	3.8	<0.1%	303.8	3.0%
R07	300	3.7	<0.1%	303.7	3.0%
R08	300	4.4	<0.1%	304.4	3.0%
R09	300	4.0	<0.1%	304.0	3.0%
R10	300	4.8	<0.1%	304.8	3.0%
R11	300	6.5	0.1%	306.5	3.1%
R12	300	6.0	0.1%	306.0	3.1%
R13	300	11.7	0.1%	311.7	3.1%
S01	300	4.0	<0.1%	304.0	3.0%
S02	300	3.5	<0.1%	303.5	3.0%
S03	300	2.8	<0.1%	302.8	3.0%
S04	300	4.6	<0.1%	304.6	3.0%

RECEPTOR	BACKGROUND	PC PROPOSED DEVELOPMENT STACK	PC % AQS	PEC	PEC % AQS
S05	300	3.9	<0.1%	303.9	3.0%
S06	300	4.3	<0.1%	304.3	3.0%

Table 7A. 42: Predicted Change in 8-hour Rolling CO Concentrations at Discrete Receptors (µg/m^3) Due to Emissions from the Proposed Development for the Backup Scenario, with Comparison Against Environmental Standard Criteria

RECEPTOR	BACKGROUND	PC PROPOSED DEVELOPMENT STACK	PC % AQS	PEC	PEC % AQS
R01	300	16.3	0.2%	316.3	3.2%
R02	300	30.0	0.3%	330.0	3.3%
R03	300	36.2	0.4%	336.2	3.4%
R04	300	33.0	0.3%	333.0	3.3%
R05	300	14.9	0.1%	314.9	3.1%
R06	300	12.9	0.1%	312.9	3.1%
R07	300	12.0	0.1%	312.0	3.1%
R08	300	14.2	0.1%	314.2	3.1%
R09	300	13.2	0.1%	313.2	3.1%
R10	300	15.8	0.2%	315.8	3.2%
R11	300	21.5	0.2%	321.5	3.2%
R12	300	19.9	0.2%	319.9	3.2%
R13	300	39.1	0.4%	339.1	3.4%
S01	300	13.3	0.1%	313.3	3.1%
S02	300	11.7	0.1%	311.7	3.1%
S03	300	9.4	0.1%	309.4	3.1%
S04	300	15.7	0.2%	315.7	3.2%
S05	300	12.7	0.1%	312.7	3.1%
S06	300	14.2	0.1%	314.2	3.1%

Table 7A. 43: Predicted Change in 8-hour Rolling CO Concentrations at Discrete Receptors (µg/m^3) Due to Emissions from the Proposed Development for the Low Load Scenario, with Comparison Against Environmental Standard Criteria

RECEPTOR	BACKGROUND	PC PROPOSED DEVELOPMENT STACK	PC % AQS	PEC	PEC % AQS
R01	300	3.1	<0.1%	303.1	3.0%
R02	300	6.2	0.1%	306.2	3.1%
R03	300	7.6	0.1%	307.6	3.1%
R04	300	9.5	0.1%	309.5	3.1%
R05	300	3.7	<0.1%	303.7	3.0%
R06	300	2.8	<0.1%	302.8	3.0%
R07	300	2.5	<0.1%	302.5	3.0%
R08	300	3.7	<0.1%	303.7	3.0%
R09	300	3.6	<0.1%	303.6	3.0%
R10	300	4.2	<0.1%	304.2	3.0%
R11	300	4.7	<0.1%	304.7	3.0%
R12	300	4.2	<0.1%	304.2	3.0%
R13	300	8.4	0.1%	308.4	3.1%
S01	300	2.9	<0.1%	302.9	3.0%
S02	300	2.8	<0.1%	302.8	3.0%
S03	300	2.1	<0.1%	302.1	3.0%

RECEPTOR	BACKGROUND	PC PROPOSED DEVELOPMENT STACK	PC % AQS	PEC	PEC % AQS
S04	300	2.9	<0.1%	302.9	3.0%
S05	300	2.9	<0.1%	302.9	3.0%
S06	300	3.4	<0.1%	303.4	3.0%

7.5 Modelling Results for PM_{10}

7.5.1 The predicted change in short-term PM_{10} concentrations (90.71th percentile 24-hour mean), that would occur during the operation of the Proposed Development, at the selected sensitive receptors, is presented in Table 7A. 41. Any errors/ discrepancy in the addition of PC to the baseline concentrations are due to rounding only.

7.5.2 The maximum predicted change in short-term PM_{10} concentrations from the backup scenario (emergencies operation) at selected receptors is 0.1 µg/m^3, and this would occur at R09 – R11, R13 and S05. The short-term PM_{10} PC at all receptors would remain below the short-term PM_{10} Environmental Standard, therefore the change is not predicted to lead to a risk of the annual mean air quality standard being exceeded.

7.5.3 The receptor with the highest PEC is at the same receptors. At these locations short-term PM_{10} concentrations are predicted to be 11.7 µg/m^3. Therefore, with the Proposed Development in operation, annual mean concentrations would remain below the short-term PM_{10} Environmental Standard.

7.5.4 Results for other scenarios are reported in Table 7A. 42 to Table 7A. 43.

Table 7A. 44: Predicted Change in 90.71th Percentile of Hourly Mean PM_{10} Concentrations at Discrete Receptors (µg/m^3) Due to Emissions from the Proposed Development for the Backup Scenario, with Comparison Against Environmental Standard Criteria

RECEPTOR	BACKGROUND	PC PROPOSED DEVELOPMENT STACK	PC % AQS	PEC	PEC % AQS
R01	11.6	<0.1	0.1%	11.6	23.3%
R02	11.6	<0.1	0.1%	11.6	23.3%
R03	11.6	<0.1	0.1%	11.6	23.3%
R04	11.6	<0.1	0.1%	11.6	23.3%
R05	11.6	<0.1	0.1%	11.6	23.3%
R06	11.6	<0.1	0.1%	11.6	23.3%
R07	11.6	<0.1	0.1%	11.6	23.3%
R08	11.6	<0.1	<0.1%	11.6	23.2%
R09	11.6	0.1	0.1%	11.7	23.3%
R10	11.6	0.1	0.1%	11.7	23.3%
R11	11.6	0.1	0.1%	11.7	23.3%
R12	11.6	<0.1	<0.1%	11.6	23.2%
R13	11.6	0.1	0.2%	11.7	23.4%
S01	11.6	<0.1	0.1%	11.6	23.3%
S02	11.6	<0.1	0.1%	11.6	23.3%
S03	11.6	<0.1	<0.1%	11.6	23.2%
S04	11.6	<0.1	0.1%	11.6	23.3%
S05	11.6	0.1	0.1%	11.7	23.3%
S06	11.6	<0.1	0.1%	11.6	23.3%

7.6 Modelling Results: Impact on Designated Nature Sites

7.6.1 The results of the dispersion modelling of predicted impacts on sensitive ecological receptors are presented in Table 7A.45 to Table 7A.48. The tables set out the predicted PC to atmospheric concentrations of NH_3, NO_X, acid deposition and nutrient nitrogen deposition for the full load scenario, as it is the only scenario with potential changes du annual mean concentrations and depositions.

7.6.2 The EPA AG4 guidance document on dispersion modelling (EPA, 2020) and the EPA guidance document on Environmental Impact Assessment (EPA, 2022) do not specify a numerical value for significance as such, therefore, for the purposes of this assessment, impacts on nature conservation receptors have been considered to be imperceptible and therefore screened out from the need for further assessment where the annual mean PC is less than 1% of the relevant environmental standard. This approach is comparable with an approach set out within the UK Environment Agency guidance for assessing emissions to air from combustion processes.

7.6.3 The assessment results show that the predicted impacts are within the above criteria for insignificance at all of the selected receptors; no PCs of more than 1% of the long-term Critical Loads have been predicted to occur at any designated site.

7.6.4 The effect of atmospheric pollutant concentrations, nitrogen deposition rates and acid deposition rates on local Ramsar, SPA, SAC and NHAs can therefore be screened out without further assessment as it can be concluded with confidence that significant effects would not occur.

Table 7A.45: Dispersion Modelling Results for Ecological Receptors Due to Emissions from the Proposed Development for the Full Load Scenario - NO_X Annual Mean

REC ID	SITE NAME	ANNUAL MEAN (µg/m^3)					
		BKG µg/m^3	CLE	PC	PC/ CL	PEC	PEC/ CL
E1	Raheenmore Bog SAC	3.1	30	<0.1	0.2%	3.1	10.3%
E2a	Split Hills and Long Hill Esker SAC	3.2	30	0.1	0.2%	3.3	11.0%
E2b	Split Hills and Long Hill Esker SAC	3.3	30	0.1	0.2%	3.3	11.1%
E2c	Split Hills and Long Hill Esker SAC	3.3	30	0.1	0.2%	3.3	11.1%
E3a	Lough Ennell SAC	3.1	30	<0.1	0.1%	3.1	10.4%
E3b	Lough Ennell SAC and SPA	3.0	30	<0.1	0.2%	3.0	10.1%
E3c	Lough Ennell SAC	3.1	30	0.1	0.2%	3.1	10.4%
E3d	Lough Ennell SAC	3.0	30	0.1	0.2%	3.0	10.2%
E3e	Lough Ennell SAC and SPA	2.9	30	0.1	0.2%	3.0	10.0%
E4	Mount Hevey Bog SAC	4.0	30	0.1	0.4%	4.1	13.8%
E5	Wooddown Bog SAC	3.4	30	0.1	0.3%	3.5	11.5%

Table 7A.46: Dispersion Modelling Results for Ecological Receptors Due to Emissions from the Proposed Development for the Full Load Scenario – NH_3 Annual Mean

REC ID	SITE NAME	ANNUAL MEAN (µg/m^3)					
		BKG µg/m^3	CLE	PC	PC/ CL	PEC	PEC/ CL
E1	Raheenmore Bog SAC	2.5	1	0.003	0.3%	2.5	250.3%
E2a	Split Hills and Long Hill Esker SAC	2.5	1	0.004	0.4%	2.5	253.4%
E2b	Split Hills and Long Hill Esker SAC	2.5	1	0.004	0.4%	2.5	247.4%
E2c	Split Hills and Long Hill Esker SAC	2.9	1	0.003	0.3%	2.9	292.3%
E3a	Lough Ennell SAC	2.6	1	0.002	0.2%	2.6	255.2%
E3b	Lough Ennell SAC and SPA	2.5	1	0.003	0.3%	2.5	254.3%
E3c	Lough Ennell SAC	2.5	1	0.003	0.3%	2.5	247.3%
E3d	Lough Ennell SAC	2.4	1	0.003	0.3%	2.4	244.3%
E3e	Lough Ennell SAC and SPA	2.3	1	0.003	0.3%	2.3	232.3%
E4	Mount Hevey Bog SAC	2.7	1	0.006	0.6%	2.7	265.6%
E5	Wooddown Bog SAC	2.4	1	0.005	0.5%	2.4	235.5%

Table 7A.47: Dispersion Modelling Results for Ecological Receptors due to Emissions from the Proposed Development for the Full Load Scenario – Nutrient Nitrogen Deposition (kg/ha/yr)

REC ID	SITE NAME	NUTRIENT NITROGEN DEPOSITION (KG/HA/YR)					
		BACKGROUND NITROGEN DEPOSITION (Kg N/ha/yr)	CLE	PC	PC/ CL	PEC	PEC/ CL
E1	Raheenmore Bog SAC	7.53	5	0.02	0.4%	7.55	151.0%
E2a	Split Hills and Long Hill Esker SAC	6.34	5	0.05	1.0%	6.39	127.8%
E2b	Split Hills and Long Hill Esker SAC	6.84	5	0.05	1.0%	6.89	137.8%
E2c	Split Hills and Long Hill Esker SAC	6.96	5	0.04	0.8%	7.00	140.0%
E3a	Lough Ennell SAC	7.04	5	0.02	0.3%	7.06	141.1%
E3b	Lough Ennell SAC and SPA	6.28	5	0.02	0.4%	6.30	126.0%
E3c	Lough Ennell SAC	6.51	5	0.02	0.5%	6.53	130.7%
E3d	Lough Ennell SAC	7.5	5	0.04	0.8%	7.54	150.8%
E3e	Lough Ennell SAC and SPA	5.98	5	0.03	0.5%	6.01	120.1%
E4	Mount Hevey Bog SAC	6.82	5	0.05	0.9%	6.87	137.3%
E5	Wooddown Bog SAC	6.77	5	0.04	0.7%	6.81	136.1%

Table 7A.48: Dispersion Modelling Results for Ecological Receptors Due to Emissions from the Proposed Development for the Full Load Scenario – Total Acid Deposition N + S (keq/ha/yr)

REC ID	SITE NAME	NUTRIENT NITROGEN DEPOSITION (KG/HA/YR)								
		BACKGROUND SULPHUR DEPOSITION (KEQ /HA/YR)	BACKGROUND NITROGEN DEPOSITION (KEQ /HA/YR)	MinCL minN	MinCL maxN	MinCL maxS	PC	PC/ CL	PEC	PEC/ CL
E1	Raheenmore Bog SAC	0.48	0.04	0.143	0.371	0.228	0.0016	0.4%	0.52	140.6%
E2a	Split Hills and Long Hill Esker SAC	0.49	0.04	0.143	0.379	0.237	0.0035	0.9%	0.53	140.4%
E2b	Split Hills and Long Hill Esker SAC	0.48	0.04	0.143	0.379	0.237	0.0035	0.9%	0.52	137.8%
E2c	Split Hills and Long Hill Esker SAC	0.53	0.04	0.143	0.379	0.237	0.0028	0.7%	0.57	150.7%
E3a	Lough Ennell SAC	Not Sensitive								
E3b	Lough Ennell SAC and SPA									
E3c	Lough Ennell SAC									
E3d	Lough Ennell SAC									
E3e	Lough Ennell SAC and SPA									
E4	Mount Hevey Bog SAC	0.49	0.05	0.143	0.358	0.215	0.0034	0.9%	0.54	151.8%
E5	Wooddown Bog SAC	0.48	0.05	0.143	0.411	0.268	0.0026	0.6%	0.53	129.6%

8.0 CUMULATIVE IMPACTS

8.1.1 The emissions to air from other committed developments and cumulative emission sources in the area around the site have been assessed in this section as separate groups within the dispersion model. The source groups are described below:

- The Proposed Development; and
- The LEL Castlelost Approved Development.

8.1 Dispersion Modelling Results – Human Health

8.1.1 Annex D includes the cumulative modelled results for annual mean NO_2, 99.79th Percentile NO_2, 8-hour rolling CO, daily NO_x, nutrient nitrogen and acid deposition. Discussion of the modelled results is within the following sections.

<u>Annual Mean NO_2</u>

8.1.2 The maximum predicted Process Contribution (PC) at sensitive receptors is 0.3 µg/m^3 at R13, a property on the L1009 north-east of the Power Plant Area. This represents 0.7% of the Environmental, and the PEC off 4.9 µg/m^3 represents 12.2% of the Standard.

<u>99.79th Percentile NO_2</u>

8.1.3 With the sources running on natural gas, the highest predicted PC at sensitive receptors is located at R13, a property on the R400 south of the Power Plant Area Site entrance. The predicted PC is 8.5 µg/m^3 which is 4.3% of the Environmental Standard. The predicted PEC is 17.7 µg/m^3 which is 8.9% of the Environmental Standard.

<u>8-hour Rolling CO</u>

8.1.4 For 8-hour rolling CO with the sources running on natural gas, the highest predicted PC is 13.5 µg/m^3 at R13, a property on the L1009 east of the Power Plant Area. This represents 0.1% of the Environmental Standard of 10,000µg/m^3.

8.1.5 The significance of the predicted change in NO_2 and CO concentrations from other committed developments and cumulative emission sources is discussed in EIAR Chapter 7: Air Quality and Climate (refer to EIAR Volume I).

8.2 Dispersion Modelling Results – Ecological Receptors

8.2.1 The predicted process contributions for each of the modelled scenarios, due to the operation of the Proposed Development, at the selected sensitive ecological receptors:

- Do not exceed the first stage screening threshold of 1% of the environmental standard for annual mean NOx concentrations;
- Do not exceed the screening threshold of 1% of the environmental standard for annual mean nutrient nitrogen deposition; and
- Do not exceed the screening threshold of 1% of the environmental standard for annual mean acid deposition.

8.2.2 As the screening thresholds were not exceeded, there would not be the need to proceed to a more detailed assessment of the effect of emissions from Proposed Development and Overall Project.

9.0 ASSESSMENT OF LIMITATIONS AND ASSUMPTIONS

9.1.1 This section outlines the potential limitations associated with the dispersion modelling assessment. Where assumptions have been made, these are also detailed here.

9.1.2 The greatest uncertainty associated with any dispersion modelling assessment arises through the inherent uncertainty of the dispersion modelling process itself. Despite this, the use of dispersion modelling is a widely applied and accepted approach for the prediction of impacts from a development such as this.

9.1.3 In order to minimise the likelihood of under-estimating the PC to ground level concentrations from the emissions stack, the following assumptions have been made within the assessment:

- The Proposed Development has been assumed to operate on a continuous basis i.e. for 8,760 hour per year, although in practice the plant will require routine maintenance periods;
- The modelling predictions are based on the use of five full years of meteorological data from Mullingar, for the years 2018 to 2022 inclusive; the use of five years data can be considered to represent the majority of meteorological conditions that would be experienced during the future operation of the Proposed Development; and
- Emission concentrations for the process are calculated based on the use of IED limits, BAT-AEL concentrations, manufacturer data or maximum measured emission rates at comparable facilities.

9.1.4 The following assumptions have been made in the preparation of the assessment:

- A 100% NO_x to NO_2 conversion rate has been assumed in predicting the long-term PC, and 50% for the short-term PC; and
- Local background data in Ireland is relatively difficult to obtain therefore, aside from NO_2, national values were used.

9.1.5 In particular, the use of IED or BAT-AEL emission limits for most of the pollutants in the study is likely to result in an over-prediction of impacts from the Proposed Development. Emissions tests on other facilities of comparable design within the UK have shown that actual emissions associated with this type of facility actually represent only a fraction of their respective ELVs for most pollutants.

10.0 SUMMARY

10.1.1 This report has assessed the impact on local air quality of the operation of the Proposed Development and Overall Project. The assessment has used the dispersion models ADMS and ADMS Roads.

10.1.2 The assessment of emissions from the Proposed Development emissions stacks ('the stacks') has focused on the impact on ground-level concentrations of the pollutants specified in the IED. Particular attention has been given to the impact on concentrations of NO_2 and CO in the vicinity of residential properties in close proximity to the Proposed Development and Overall Project and near to major traffic routes.

10.1.3 An evaluation of release height for the Proposed Development CCGT stack has shown that a release height of 60m above ground level is capable of mitigating the short-term and long-term impacts of emissions to a level which is not significant, with regard to existing air quality and ambient air quality standards. The design of the Proposed Development includes a CCGT stack with a release height of 60m above ground level. The same process showed that a release height of 45m above ground level for the OCGT is capable of mitigating the short-term and long-term impacts of emissions to a level which is not significant, with regard to existing air quality and ambient air quality standards.

10.1.4 Emissions from the Proposed Development stacks and construction road traffic would result in small increases in ground-level concentrations of the modelled pollutants. Taking into account available information on background concentrations within the modelled domain, predicted operational concentrations of the modelled pollutants would be within current Environmental Standards for the protection of human health at sensitive receptors.

10.1.5 The results from modelling of emissions from the Proposed Development stacks predicted an impact on annual mean NO_2 concentrations of less than 0.4 $\mu g/m^3$ at sensitive receptors.

10.1.6 The modelling of impacts at designated ecological sites has predicted that Proposed Development stacks emissions would give rise to an increase in atmospheric concentrations of NO_X or through deposition of nutrient nitrogen and acid that are at a magnitude of less than 1% of the relevant criteria.

10.1.7 The use of emission concentrations at the BAT-AEL emission limit values is likely to have resulted in an over-prediction of impacts from the Proposed Development and Overall Project. Therefore, the reported impacts are considered to represent a realistic worst case and a robust assessment of likely significance effects at all sensitive receptor locations has been carried out.

11.0 REFERENCES

AEAT (2008), Analysis of the relationship between annual mean nitrogen dioxide concentrations and exceedances of the 1-hour mean AQS Objective, accessed on 18th October 2023 http://laqm.defra.gov.uk/documents/NO2relationship_report.pdf

CERC (2023), ADMS Roads and ADMS 6 Validation Papers, Cambridge Environmental Research Consultants, from: http://www.cerc.co.uk/environmental-software/model-validation.html accessed on 18th October 2023

Centre for Ecology and Hydrology and APIS (2023) Air Pollution Information Service, url: http://www.apis.ac.uk accessed on 18th October 2023

Council of European Communities (1999), First Daughter Directive on limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air, 1999/30/EC

Council of European Communities (2000), Second Daughter Directive on limit values for benzene and carbon monoxide in ambient air, 2000/69/EC

Council of European Communities (2002), Third Daughter Directive on ozone in ambient air, 2002/3/EC.

Council of the European Union (1996) Council Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management

Council of the European Union (1997) Directive 97/101/EC: Council Decision of 27 January 1997 establishing a reciprocal exchange of information and data from networks and individual stations measuring ambient air pollution within the Member States

Council of the European Union (2008) Council Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe

Council of the European Union (2015) Council Directive (EU) 2015/2193 of 25 November 2015 on the limitation of emissions of certain pollutants into the air from medium combustion plants

Environmental Protection Agency (2020). Air Dispersion Modelling from Industrial Installations Guidance Note (AG4). https://www.epa.ie/publications/compliance--enforcement/air/air-guidance-notes/epa-air-dispersion-modelling-guidance-note-ag4-2020.php accessed on 18th October 2023

Environmental Protection Agency (2023). Air Quality in Ireland 2022. https://www.epa.ie/publications/monitoring--assessment/air/air-quality-in-ireland-2022.php accessed on 18th October 2023

Environmental Protection Agency (2022). Guidelines on the Information to be Contained in Environmental Impact Assessment Reports. https://www.epa.ie/publications/monitoring--assessment/assessment/guidelines-on-the-information-to-be-contained-in-environmental-impact-assessment.php accessed on 18th October 2023

European Commission (2017). Best Available Techniques (BAT) Reference Document for Large Combustion Plants, Publications Office of the European Union, 2017

Government of Ireland – Department of Housing, Local Government and Heritage (2020). Project Ireland 2040 – National Planning Framework. https://assets.gov.ie/100716/f6daba1e-cb06-4eeb-94a7-98fea655517e.pdf accessed on 18th October 2023

Government of Ireland – Department of Housing, Local Government and Heritage (2018). Project Ireland 2040 – National Development Plan 2018 - 2027, Updated 26 November 2020. https://www.gov.ie/pdf/?file=https://assets.gov.ie/37937/12baa8fe0dcb43a78122fb316dc51277.pdf#page=null accessed on 18th October 2023

Government of Ireland (2011). National Air Quality Standards Regulations - S.I. No. 180 of 2011. https://assets.gov.ie/46933/e3e8439ee9ef4bd7bb8443e57ede2944.pdf accessed on 18th October 2023

Transport Infrastructure Ireland (formerly National Roads Authority) (2011). Air Quality Assessment of Proposed National Roads - Standard https://www.tiipublications.ie/library/PE-ENV-01107-01.pdf accessed on 18th October 2023

Institute of Air Quality Management (2023) Guidance on the assessment of dust from demolition and construction 2023 Version 2.1 dated August 2023.

Institute of Air Quality Management (2017) Land-Use Planning & Development Control: Planning for Air Quality v1.2.

Institute of Air Quality Management (2020) A guide to the assessment of air quality impacts on designated nature conservation sites, v1.1 May 2020

TII (2023), Road Emission Model, accessed via URL https://web.tii.ie/ accessed on 30th October 2023

Defra (2020), Defra NO_x to NO_2 Calculator (v8.1, august 2020), accessed via URL https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc accessed on 14th December 2022

EA (2018), Air emissions risk assessment for your environmental permit, https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit. Accessed 14th December 2022

European Commission (2010), Industrial Emissions Directive

Official Journal of the European Union (2017), Commission Implementing Decision (EU) 2017/1442of 31st July 2017, establishing best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for large combustion plants

Laxen and Marner (2003), Analysis of the Relationship between 1-hour and annual mean nitrogen dioxide at UK Roadside and Kerbside Monitoring Sites

Cambridge Environmental Research Consultants (2023), ADMS 6 User Guide v6, https://www.cerc.co.uk/environmental-software/user-guides.html (Accessed 27/10/2023)

ANNEX A: FIGURES (INCLUDED IN CHAPTER 7)

ANNEX B: ROAD TRAFFIC FLOW DATA

Traffic Data used in Modelling of Road Emissions

Table B.1: 2023 baseline traffic data

LINK	AADT (VEH/DAY)	%HDV	SPEED (KPH)
R400 north of M6/R400 junction	2930	7.4%	70.7
R400 south of M6/R400 junction but north of Site entrance	2810	17.1%	70.7
R400 south of Site entrance	2806	17.2%	70.7
M6	17624	8.5%	120

Table B.2: 2025 baseline traffic + committed development traffic data

LINK	AADT (VEH/DAY)	%HDV	SPEED (KPH)
R400 north of M6/R400 junction	3008	7.7%	70.7
R400 south of M6/R400 junction but north of Site entrance	3229	25.3%	70.7
R400 south of Site entrance	3047	21.9%	70.7
M6	18436	10.3%	120

Table B.3: 2025 baseline traffic + committed development traffic + Proposed Developments peak overlap construction traffic data

LINK	AADT (VEH/DAY)	%HDV	SPEED (KPH)
R400 north of M6/R400 junction	3098	8.5%	70.7
R400 south of M6/R400 junction but north of Site entrance	3937	30.4%	70.7
R400 south of Site entrance	3440	25.9%	70.7
M6	19223	12%	120

ANNEX C: RAW DIFFUSION TUBE RESULTS FROM GRADKO LABORATORY

ANNEX D: ASSESSMENT OF CUMULATIVE IMPACTS

Table 7A. 49: Predicted change in annual mean NO_2 concentrations at discrete receptors (µg/m^3) due to emissions from the Proposed Development for the Cumulative scenario on natural gas, with comparison against Environmental Standard Criteria

RECEPTOR	BACKGROUND	PC PROPOSED DEVELOPMENT STACK	PC % AQS	PEC	PEC % AQS
R01	7.1	0.1	0.3%	7.2	18.1%
R02	9.4	0.2	0.4%	9.6	23.9%
R03	7.6	0.1	0.4%	7.7	19.4%
R04	7.5	0.2	0.4%	7.7	19.2%
R05	6.6	0.1	0.3%	6.7	16.8%
R06	8.6	0.1	0.3%	8.7	21.8%
R07	4.6	0.1	0.2%	4.7	11.7%
R08	4.6	0.1	0.2%	4.7	11.7%
R09	4.6	0.2	0.5%	4.8	12.0%
R10	4.6	0.2	0.6%	4.8	12.1%
R11	4.6	0.2	0.5%	4.8	12.0%
R12	4.6	0.1	0.2%	4.7	11.7%
R13	4.6	0.3	0.7%	4.9	12.2%
S01	4.6	0.1	0.2%	4.7	11.7%
S02	4.6	0.1	0.2%	4.7	11.7%
S03	4.6	<0.1	0.1%	4.6	11.6%
S04	4.6	0.1	0.3%	4.7	11.8%
S05	4.6	0.2	0.5%	4.8	12.0%
S06	4.6	0.2	0.4%	4.8	11.9%

Table 7A. 50: Predicted change in 99.79th percentile of hourly means NO_2 concentrations at discrete receptors (µg/m^3) due to emissions from the Proposed Development for the Cumulative scenario on natural gas, with comparison against Environmental Standard Criteria

RECEPTOR	BACKGROUND	PC PROPOSED DEVELOPMENT STACK	PC % AQS	PEC	PEC % AQS
R01	14.2	4.0	2.0%	18.2	9.1%
R02	18.8	7.0	3.5%	25.8	12.9%
R03	15.2	6.6	3.3%	21.8	10.9%
R04	15	7.6	3.8%	22.6	11.3%
R05	13.2	4.3	2.1%	17.5	8.7%
R06	17.2	3.7	1.8%	20.9	10.4%
R07	9.2	3.6	1.8%	12.8	6.4%
R08	9.2	3.6	1.8%	12.8	6.4%
R09	9.2	4.1	2.1%	13.3	6.7%
R10	9.2	4.0	2.0%	13.2	6.6%
R11	9.2	5.2	2.6%	14.4	7.2%
R12	9.2	4.8	2.4%	14.0	7.0%
R13	9.2	8.5	4.3%	17.7	8.9%
S01	9.2	3.5	1.8%	12.7	6.4%
S02	9.2	3.4	1.7%	12.6	6.3%
S03	9.2	2.9	1.5%	12.1	6.1%
S04	9.2	3.8	1.9%	13.0	6.5%
S05	9.2	3.4	1.7%	12.6	6.3%
S06	9.2	4.2	2.1%	13.4	6.7%

Table 7A. 51: Predicted change in 8-hour rolling CO concentrations at discrete receptors ($\mu g/m^3$) due to emissions from the Proposed Development for the Cumulative scenario on natural gas, with comparison against Environmental Standard Criteria

RECEPTOR	BACKGROUND	PC PROPOSED DEVELOPMENT STACK	PC % AQS	PEC	PEC % AQS
R01	300	6.7	0.1%	306.7	3.1%
R02	300	9.0	0.1%	309.0	3.1%
R03	300	10.9	0.1%	310.9	3.1%
R04	300	10.0	0.1%	310.0	3.1%
R05	300	4.7	<0.1%	304.7	3.0%
R06	300	4.3	<0.1%	304.3	3.0%
R07	300	4.0	<0.1%	304.0	3.0%
R08	300	4.4	<0.1%	304.4	3.0%
R09	300	4.4	<0.1%	304.4	3.0%
R10	300	4.8	<0.1%	304.8	3.0%
R11	300	6.5	0.1%	306.5	3.1%
R12	300	7.0	0.1%	307.0	3.1%
R13	300	13.5	0.1%	313.5	3.1%
S01	300	4.6	<0.1%	304.6	3.0%
S02	300	4.3	<0.1%	304.3	3.0%
S03	300	3.0	<0.1%	303.0	3.0%
S04	300	7.7	0.1%	307.7	3.1%
S05	300	3.9	<0.1%	303.9	3.0%
S06	300	5.3	0.1%	305.3	3.1%

Table 7A.52: Dispersion Modelling Results for Ecological Receptors for the Cumulative Scenario- NO_X Annual Mean

REC ID	SITE NAME	ANNUAL MEAN (µg/m^3)					
		BKG µg/m^3	CLE	PC	PC/ CL	PEC	PEC/ CL
E1	Raheenmore Bog SAC	3.1	30	<0.1	0.2%	3.1	10.3%
E2a	Split Hills and Long Hill Esker SAC	3.2	30	0.1	0.2%	3.3	11.0%
E2b	Split Hills and Long Hill Esker SAC	3.3	30	0.1	0.2%	3.3	11.1%
E2c	Split Hills and Long Hill Esker SAC	3.3	30	0.1	0.2%	3.3	11.1%
E3a	Lough Ennell SAC	3.1	30	<0.1	0.1%	3.1	10.4%
E3b	Lough Ennell SAC and SPA	3.0	30	0.1	0.2%	3.0	10.1%
E3c	Lough Ennell SAC	3.1	30	0.1	0.2%	3.1	10.4%
E3d	Lough Ennell SAC	3.0	30	0.1	0.2%	3.1	10.2%
E3e	Lough Ennell SAC and SPA	2.9	30	0.1	0.2%	3.0	10.0%
E4	Mount Hevey Bog SAC	4.0	30	0.1	0.4%	4.2	13.9%
E5	Wooddown Bog SAC	3.4	30	0.1	0.3%	3.5	11.5%

Table 7A.53: Dispersion Modelling Results for Ecological Receptors for the Cumulative Scenario- NH_3 Annual Mean

REC ID	SITE NAME	ANNUAL MEAN (µg/m^3)					
		BKG µg/m^3	CLE	PC	PC/ CL	PEC	PEC/ CL
E1	Raheenmore Bog SAC	2.5	1	0.003	0.3%	2.5	250.3%
E2a	Split Hills and Long Hill Esker SAC	2.5	1	0.004	0.4%	2.5	253.4%
E2b	Split Hills and Long Hill Esker SAC	2.5	1	0.004	0.4%	2.5	247.4%

REC ID	SITE NAME	ANNUAL MEAN (µg/m³)					
		BKG µg/m³	CLE	PC	PC/ CL	PEC	PEC/ CL
E2c	Split Hills and Long Hill Esker SAC	2.9	1	0.003	0.3%	2.9	292.3%
E3a	Lough Ennell SAC	2.6	1	0.002	0.2%	2.6	255.2%
E3b	Lough Ennell SAC and SPA	2.5	1	0.003	0.3%	2.5	254.3%
E3c	Lough Ennell SAC	2.5	1	0.003	0.3%	2.5	247.3%
E3d	Lough Ennell SAC	2.4	1	0.003	0.3%	2.4	244.3%
E3e	Lough Ennell SAC and SPA	2.3	1	0.003	0.3%	2.3	232.3%
E4	Mount Hevey Bog SAC	2.7	1	0.006	0.6%	2.7	265.6%
E5	Wooddown Bog SAC	2.4	1	0.005	0.5%	2.4	235.5%

Table 7A.54: Dispersion Modelling Results for Ecological Receptors for the Cumulative Scenario – Nutrient Nitrogen Deposition (kg/ha/yr)

REC ID	SITE NAME	NUTRIENT NITROGEN DEPOSITION (KG/HA/YR)					
		BACKGROUND NITROGEN DEPOSITION (Kg N/ha/yr)	CLE	PC	PC/ CL	PEC	PEC/ CL
E1	Raheenmore Bog SAC	7.53	5	0.02	0.4%	7.55	151.0%
E2a	Split Hills and Long Hill Esker SAC	6.34	5	0.05	1.0%	6.39	127.8%
E2b	Split Hills and Long Hill Esker SAC	6.84	5	0.05	1.0%	6.89	137.8%
E2c	Split Hills and Long Hill Esker SAC	6.96	5	0.04	0.8%	7.00	140.0%
E3a	Lough Ennell SAC	7.04	5	0.02	0.3%	7.06	141.1%
E3b	Lough Ennell SAC and SPA	6.28	5	0.02	0.4%	6.30	126.0%

REC ID	SITE NAME	NUTRIENT NITROGEN DEPOSITION (KG/HA/YR)					
		BACKGROUND NITROGEN DEPOSITION (Kg N/ha/yr)	CLE	PC	PC/ CL	PEC	PEC/ CL
E3c	Lough Ennell SAC	6.51	5	0.03	0.5%	6.54	130.7%
E3d	Lough Ennell SAC	7.5	5	0.04	0.9%	7.54	150.9%
E3e	Lough Ennell SAC and SPA	5.98	5	0.03	0.5%	6.01	120.1%
E4	Mount Hevey Bog SAC	6.82	5	0.05	1.0%	6.87	137.4%
E5	Wooddown Bog SAC	6.77	5	0.04	0.7%	6.81	136.1%

Table 7A.55: Dispersion Modelling Results for Ecological Receptors for the Cumulative Scenario – Total Acid Deposition N + S (keq/ha/yr)

REC ID	SITE NAME	NUTRIENT NITROGEN DEPOSITION (KG/HA/YR)								
		BACKGROUND SULPHUR DEPOSITION (KEQ /HA/YR)	BACKGROUND NITROGEN DEPOSITION (KEQ /HA/YR)	MinCL minN	MinCL maxN	MinCL maxS	PC	PC/ CL	PEC	PEC/ CL
E1	Raheenmore Bog SAC	0.48	0.04	0.143	0.371	0.228	0.0016	0.4%	0.52	140.6%
E2a	Split Hills and Long Hill Esker SAC	0.49	0.04	0.143	0.379	0.237	0.0036	0.9%	0.53	140.4%
E2b	Split Hills and Long Hill Esker SAC	0.48	0.04	0.143	0.379	0.237	0.0036	0.9%	0.52	137.8%
E2c	Split Hills and Long Hill Esker SAC	0.53	0.04	0.143	0.379	0.237	0.0029	0.8%	0.57	150.8%
E3a	Lough Ennell SAC	Not Sensitive								
E3b	Lough Ennell SAC and SPA									

REC ID	SITE NAME	NUTRIENT NITROGEN DEPOSITION (KG/HA/YR)								
		BACKGROUND SULPHUR DEPOSITION (KEQ /HA/YR)	BACKGROUND NITROGEN DEPOSITION (KEQ /HA/YR)	MinCL minN	MinCL maxN	MinCL maxS	PC	PC/ CL	PEC	PEC/ CL
E3c	Lough Ennell SAC									
E3d	Lough Ennell SAC									
E3e	Lough Ennell SAC and SPA									
E4	Mount Hevey Bog SAC	0.49	0.05	0.143	0.358	0.215	0.0034	0.9%	0.54	151.8%
E5	Wooddown Bog SAC	0.48	0.05	0.143	0.411	0.268	0.0027	0.7%	0.53	129.6%

ANNEX E: CONSTRUCTION DUST MITIGATION MEASURES

Table F.1: Embedded Construction Phase Mitigation Measures

PHASE	MITIGATION MEASURE
Communications	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.
	Display the head or regional office contact information.
	Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. In London additional measures may be required to ensure compliance with the Mayor of London's guidance. The DMP may include monitoring of dust deposition, dust flux, realtime PM_{10} continuous monitoring and/or visual inspection.
Site Management	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
	Make the complaints log available to the local authority when asked.
	Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.
Monitoring	Undertake daily on-site and off-site visual inspections, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.
	Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.
	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
	Agree dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.
Preparing and maintaining the site	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
	Erect solid screens or barriers if required around dusty activities or the site boundary that are at least as high as any stockpiles on site.
	Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period.
	Avoid site runoff of water or mud.
	Keep site fencing, barriers and scaffolding clean using wet methods.

	Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.
	Cover, seed or fence any stockpiles to prevent wind whipping.
Operating vehicle / machinery and sustainable travel	Ensure all vehicles switch off engines when stationary - no idling vehicles
	Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
	Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
Operations	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
	Use enclosed chutes and conveyors and covered skips.
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
	Ensure 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.
Measures specific to earthwork	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
	Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
	Only remove the cover in small areas during work and not all at once.
Measures specific to construction	Avoid scabbling (roughening of concrete surfaces) if possible.
	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.
Waste Management	Avoid bonfires and burning of waste materials.
Measures specific to trackout	Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site.
	Avoid dry sweeping of large areas.
	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
	Record all inspections of haul routes and any subsequent action in a site log book.
	Implement a wheel washing system.