SSE Tarbert Next Generation Power Station

Environmental Impact Assessment Report (EIAR)
Volume I

Chapter 07 Air Quality

SSE Generation Ireland Limited

November 2023

Delivering a better world

Prepared for:

SSE Generation Ireland Limited

Prepared by:
AECOM Ireland Limited
4th Floor
Adelphi Plaza
Georges Street Upper
Dun Laoghaire
Co. Dublin A96 T927
Ireland

T: +353 1 238 3100
aecom.com

Table of Contents

Plates

Tables

Appendix (Refer to EIAR Volume II)

No Appendices

Figures (Refer to EIAR Volume III)

Figure 7.1: Modelled sources from SSE Tarbert Site

Figure 7.2: Modelled sources from SSE Tarbert Site and Cumulative Developments.

Figure 7.3: Modelled ecological receptors.

Figure 7.4: Modelled human receptors.

Figure 7.5: Annual Mean NO_2 ($\mu g/m^3$) PC - Proposed Development Scenario.

Figure 7.6: 99.79th%ile 1-hour NO_2 ($\mu g/m^3$) PC - Proposed Development Scenario.

Figure 7.7: 99.18th%ile 24-hour SO_2 ($\mu g/m^3$) PC - Proposed Development Scenario.

Figure 7.8: 99.73rd%ile 1-hour SO_2 ($\mu g/m^3$) PC - Proposed Development Scenario.

Figure 7.9: Maximum 8-hour rolling mean CO ($\mu g/m^3$) PC - Proposed Development Scenario.

Figure 7.10: Annual Mean PM_{10} ($\mu g/m^3$) PC - Proposed Development Scenario.

Figure 7.11: 90.41st%ile 24-hour PM_{10} ($\mu g/m^3$) PC - Proposed Development Scenario.

Figure 7.12: Annual Mean SO_2 ($\mu g/m^3$) PC - Proposed Development Scenario.

7. Air Quality

7.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) assesses the impact of the Proposed Development on local air quality. Impacts on air quality can affect human receptors through harm to health and amenity, and nature conservation receptors through harm to vegetation and habitat.

The Site of the Proposed Development (herein referred to as "the Site") is located within the boundary of the existing SSE Tarbert site, Tarbert, Co. Kerry.

This chapter provides a description of the relevant legislation and policy framework, assessment methodology, baseline conditions at the Proposed Development and its surroundings, an estimate of the anticipated air emissions associated with each of the phases of the Proposed Development, the mitigation measured required to prevent, reduce, or offset any likely significant effects, and the likely residual effects after these methods have been employed.

Full details on the background and Site history are provided in Chapter 4 (Existing Site) and details of the Proposed Development are presented in Chapter 5 (Description of the Proposed Development) and the Planning Statement submitted with this planning application.

7.1.1 Scope of Assessment

The construction, operational and decommissioning phases of the Proposed Development are covered by this assessment. The air quality impacts arising from these are summarised as follows:

- Construction Phase:
  - Emissions of dust and particulates from construction activity; and
  - Emissions of oxides of nitrogen (NO_X) (including nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$) from construction phase traffic movements.
- Operational Phase:
  - Combustion emissions associated with combustion sources for generating power, including NO_X (including NO_2), PM_{10} and $PM_{2.5}$, carbon monoxide (CO), ammonia (NH_3) and sulphur dioxide (SO_2); and
  - Emissions of NO_2 and particulate matter PM_{10} and $PM_{2.5}$ from operational phase traffic movements from transport of Hydrotreated Vegetable Oil (HVO) fuel.

During the decommissioning phase, potential air quality impacts will be very similar to impacts referred to under the construction phase. It is considered that impact and subsequent effect identified for construction in this assessment can also be used to represent potential impacts and effects during the decommissioning phase. As such, the impact and effect of decommissioning on local air quality is not considered further in this chapter.

7.2 Legislation and Policy

7.2.1 National Air Quality Standards

The *National Air Quality Standards*[1] were transposed from the following EU legislation:

- European Union (EU) air quality legislation is provided within Directive 2008/50/EC (Clean Air for Europe (CAFE)), which came into force on 11 June 2008. This Directive consolidated previous legislation which was designed to deal with specific pollutants in a consistent manner and provided new air quality objectives for particulate matter with an aerodynamic diameter of less than 2.5µm ($PM_{2.5}$). The consolidated Directives include:
  - Directive 99/30/EC - the First Air Quality 'Daughter' Directive - sets ambient Air Quality Limit Values (AQLVs) for NO_2, oxides of nitrogen (NO_X), sulphur dioxide, lead and particulate matter with an aerodynamic diameter of less than 10µm (PM_{10});
  - Directive 2000/69/EC - the Second Air Quality 'Daughter' Directive - sets ambient AQLVs for benzene and carbon monoxide; and
  - Directive 2002/3/EC - the Third Air Quality 'Daughter' Directive - seeks to establish long term objectives, target values, an alert threshold and an information threshold for concentrations of ozone in ambient air.
- The fourth daughter Directive was not included within the consolidation and is described as Directive 2004/107/EC. This sets health-based limits on polycyclic aromatic hydrocarbons, cadmium, arsenic, nickel and mercury, for which there is a requirement to reduce exposure to as low as reasonably achievable.
- Directive 2008/50/EC has been implemented through the *Air Quality Standards Regulations 2011*[1]. These regulations set out upper and lower assessment thresholds for the pollutants of concern. The Air Quality Standards include thresholds to encourage a higher standard of air quality where possible.

The EU Limit Values and National Air Quality Standards that are of relevance to this assessment are presented in Table 7.1 In addition to the Limit Values and Air Quality Standards, Table 7.1 provides relevant Environmental Assessment Levels and averaging periods for other pollutants, as referred to within Environmental Protection Agency (EPA) guidance (AG4)[2]. These, which are commonly associated with industrial emissions, are not covered by the EU Directives detailed, but are considered potentially harmful to the environment and human health if present at concentrations exceeding the Environmental Assessment Levels listed.

Table 7.1 also provides Critical Loads for nutrient nitrogen and acid (nitrogen and sulphur), set by the Convention on Long-Range Transboundary Air Pollution, as presented on the Air Pollution Information

[1] Government of Ireland (2011). *Air Quality Standards Regulations 2011, S.I. No. 180 of 2011.*
[2] EPA (2020). *Dispersion Modelling from Industrial Installations Guidance Note (AG4).*

System (APIS)[3], for habitats that may potentially be affected by emissions associated with the Proposed Development.

Table 7.1: Air Quality Standards and Environmental Assessment Levels

Pollutant	Averaging Period	Irish Air Quality Standard / EU Limit Value / Environmental Assessment Level	Allowable Exceedance
Irish Air Quality Standard / EU Limit Value			
Nitrogen dioxide (NO_2)	Annual mean	40 µg/m^3	No exceedances allowed
	Hourly mean	200 µg/m^3	18 allowable exceedances (99.79th percentile of hours/year)
Particulate matter (PM_{10})	Annual mean	40 µg/m^3	No exceedances allowed
	Daily mean	50 µg/m^3	35 allowable exceedances (90.41st percentile of days/year)
Fine particulate matter ($PM_{2.5}$)	Annual mean	20 µg/m^3	No exceedances allowed
Carbon monoxide (CO)	Rolling 8-hour maximum	10,000 µg/m^3	No exceedances allowed
Sulphur dioxide (SO_2)	Daily mean	125 µg/m^3	3 allowable exceedances (99.18th percentile of days/year)
	Hourly mean	350 µg/m^3	24 allowable exceedances (99.73rd percentile of hours/year)
Oxides of nitrogen (NO_X) – for the protection of ecosystems	Annual mean	30 µg/m^3	No exceedances allowed
Sulphur dioxide (SO_2) – for the protection of ecosystems	Annual mean/winter mean	20 µg/m^3	No exceedances allowed
Convention on Long-Range Transboundary Air Pollution Critical Loads			
Nutrient nitrogen deposition	Annual	Habitat relevant Critical Loads	No exceedances allowed
Acid Deposition	Annual	Habitat specific Critical Loads	No exceedances allowed

7.2.2 Industrial Emissions Directive

The installed aggregated thermal capacity of the Proposed Development will exceed 50MW. As such, its operations will fall within the remit of the EU's Industrial Emissions Directive (2010/75/EU). The

[3] APIS (2016). *Hosted & Maintained by UK Centre for Ecology and Hydrology. www.apis.ac.uk*

primary aims of the Industrial Emissions Directive are to prevent or reduce pollution from industrial activities, to reduce waste and to promote energy efficiency. The Directive applies to all large industrial installations and to power plants which are above a certain size threshold. The Directive will apply to the applicable combustion plant associated with the Proposed Development.

The EPA is the statutory body responsible for issuing and enforcing Industrial Emissions Licences (IELs). The operator will be required to obtain an IEL from the EPA for the proposed Open Cycle Gas Turbine (OCGT) power plant; this is expected to be through a licence modification. Licences are determined having regard to the principle of Best Available Techniques (BAT), which, in turn, is based on the Best Available Techniques Reference Documents ("BREF" documents, available at: https://eippcb.jrc.ec.europa.eu/reference) developed and published by the European Commission. The EU has prepared a series of reference documents for different industrial activities, which define BAT for each activity.

7.2.3 Relevant Environmental Legislation

Other national legislation that relates to air quality and are of relevance to this assessment are listed are follows:

- European Union (Environmental Impact Assessment) (Environmental Protection Agency Act 1992) (Amendment) Regulations 2020 - S.I. No. 191 of 2020.
- European Communities (Birds and Natural Habitats) (Amendment) Regulations 2021 - S.I. No. 293 of 2021.
- European Union (Industrial Emissions) Regulations 2013 - S.I. No. 138 of 2013.
- Environmental Protection Agency (Industrial Emissions) (Licensing) Regulations 2013 - S.I. No. 137 of 2013; and
- European Communities (Birds and Natural Habitats) Regulations 2011.

7.2.4 National Planning Policy

7.2.4.1 Project Ireland 2040

Project Ireland 2040 is the Government's long-term overarching strategy for future development and infrastructure in Ireland. It consists of several documents, including the *National Planning Framework* (NPF)[4], which is the Government's high-level strategic plan for shaping the future growth and development of Ireland up to 2040.

The NPF includes the following overarching aim that is relevant to this assessment:

> *'Creating a Clean Environment for a Healthy Society:*
>
> *…Promoting Cleaner Air: Addressing air quality problems in urban and rural areas through better planning and design.'*

[4] Government of Ireland (2018). *National Planning Framework*.

The NPF includes National Policy Objective 64, which stresses the importance of improving ambient air quality:

> *'National Policy Objective 64: Improve air quality and help prevent people being exposed to unacceptable levels of pollution in our urban and rural areas through integrated land use and spatial planning that supports public transport, walking and cycling as more favourable modes of transport to the private car, the promotion of energy efficient buildings and homes, heating systems with zero local emissions, green infrastructure planning and innovative design solutions.'*

Project Ireland 2040 also includes the Government's National Development Plan (NDP) 2021-2030[5]. This document is focused on Ireland's long-term economic, environmental, and social progress up to 2030, and references improvements in air quality as an additional benefit to improving energy efficiency for the primary purpose of reducing carbon emissions.

The air quality assessment described in this chapter will demonstrate whether or not the emissions associated with the Proposed Development contravene the relevant aims and objectives of Project Ireland 2040.

7.2.5 Local Planning Policy

The Proposed Development is located within Co. Kerry; therefore, they are the planning authority. Accordingly, the Kerry County Development Plan (Kerry CDP)[6] takes precedence when considering how air quality impacts the planning decision, however a review of neighbouring county's development plans (Limerick and Clare) was undertaken in order to identify any potential constraints, none were identified. The Kerry CPD sets out the following objectives with regards to local air quality:

- **Objective AQ1:** Protect local air quality from emissions that are harmful to human health and the local environment.
- **Objective HH1:** Protect the public from threats to health and wellbeing across the functions of relevance to the Kerry CDP.

7.3 Methodology

7.3.1 Construction Dust Assessment

The movement and handling of soils and spoil during construction activities for the Proposed Development is anticipated to lead to the generation of some short-term airborne dust. The occurrence and significance of dust generated is difficult to estimate and depends heavily upon the nature of the activity being carried out and the meteorological and ground conditions at the actual time and location of the work.

[5] Government of Ireland (2021). *National Development Plan 2021-2030*.
[6] Kerry County Council (2022) Kerry County Development Plan 2022-2028 Volume 5 http://docstore.kerrycoco.ie/KCCWebsite/planning/devplan/vol5updatednew.pdf

At present, there are no statutory standards relating to the assessment or control of dust. The emphasis of the regulation and control of construction dust, therefore, is through the adoption of good practice when working on site to mitigate any potential impacts. 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 control dust emissions at source.

The Institute of Air Quality Management (IAQM) provides professional guidance for good practice and a framework of approaches for qualitative assessment of risk of dust emissions from construction and demolition activities[7]. The guidance considers the risk of dust emissions from unmitigated activities to cause human health impacts (associated with PM_{10}), 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.

The assessment undertaken for the Proposed Development is consistent with the overarching approach to the assessment of the impacts of construction, and the application of example descriptors of impact and risk set out in IAQM guidance. It considers the risk of potential impacts occurring with good practice measures and embedded mitigation in place and if necessary, recommends additional mitigation measures appropriate to the identified risks to receptors. The steps in the assessment are to:

- identify receptors within the appropriate study area for the Site;
- identify the potential magnitude of emissions through consideration of the scale, duration and location of activities being carried out;
- establish the sensitivity of the area through determination of the sensitivity of receptors and their distance from construction activities;
- determine the risk of dust emissions causing significant effects on receptors as a result of the potential magnitude of emissions and the sensitivity of the area, assuming no additional mitigation (beyond the identified development design and impact avoidance measures) is applied.
- confirm the appropriateness of embedded good practice measures based on the level of risk, to reduce likely effects at receptors so it is not significant, and determine additional measures to mitigate the specific impacts, if necessary, and;
- summarise the potential residual effects of the mitigated works.

The following four activities involved in the construction phase of the Proposed Development have the potential to impact on local air quality, based on the nature of construction activities proposed:

- demolition (buildings and structures);
- earthworks (soil stripping, spoil movement and stockpiling);

[7] IAQM (2014) *IAQM Guidance on the assessment of dust from demolition and construction*, Institute of Air Quality Management, London, Updated 2016, https://iaqm.co.uk/text/guidance/construction-dust-2014.pdf

- construction; and
- trackout Heavy Duty Vehicle (HDV) movements on unpaved roads and offsite mud on the highway).

7.3.1.1 Receptor Identification

Screening criteria from the IAQM to determine whether a construction dust assessment is required includes determining whether receptors are present. The screening criteria for human receptors which is generally used in industry, based on professional guidance from the IAQM, is 350m from the boundary of the Site or 50m from the construction traffic route up to 500m from the Site. These distances are conservative whereby beyond this distance a negligible mass of material will persist.

The screening criteria for ecological receptors cited in the IAQM guidance is 50m from the boundary of the site or 50m from the construction traffic route up to 500m from the site. This smaller distance relative to human receptors is used as the larger dust particles which affect ecological receptors are less likely to travel beyond this distance.

There are several residential sites within 350m of the Site boundary, as shown in Figure 7.4, in addition the River Shannon and River Fergus Estuaries Special Protection Area (SPA) is within 50m of the Site boundary and the Lower River Shannon Special Area of Conservation (SAC) is just beyond that distance from the Site boundary. It is noted though that both ecological receptors are tidal and are regularly submerged by the tide. The effect of dust emissions on these ecological sites are not therefore considered further in this assessment.

7.3.1.2 Magnitude Definitions

The categorisation detailed in the IAQM guidance[7] for the potential magnitude of construction activities to generate dust emissions is provided in Table 7.2. This categorisation has been used in the assessment carried out.

Table 7.2: Example Definitions of the Magnitude of Construction/ Demolition Activities

Magnitude	Demolition	Earthworks	Construction	Trackout
Large	Total building volume >50,000m^3, potentially dust construction material (e.g., concrete), on-site crushing and screening, demolition activities >20m above ground level	Site area >1ha potentially dusty soil type (e.g., clay). >10 heavy earth moving vehicles at once, bunds >8m high, total material moved >100,000 tonnes	Total building volume >100,000 m^3, on-site concrete batching, sandblasting	>50 Heavy Duty Vehicles (HDV) peak outward movements per day, potentially dusty surface material (e.g., high clay content), unpaved road length >100m
Medium	Total building volume 20,000 – 50,000m^3, potentially dusty construction material, demolition activities 10 to 20 m above ground level	Site area 0.25 – 1 ha, moderately dusty soil type (e.g., silt), 5 – 10 heavy earth moving vehicles at once, bunds 4-8m high, total material moved 20,000 – 100,000 tonnes	Total building volume 25,000 – 100,000m^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 – 100m
Small	Total building volume <20,000m^3, construction material with low potential for dust release (e.g., metal cladding or timber), demolition activities <10m above ground level, demolition during wetter months	Site area <0.25ha, large grain soil type (e.g., sand), <5 heavy earth moving vehicles at once, bunds <4 m high, total material moved <20,000 tonnes	Total building volume <25,000m^3, low dust potential construction materials. E.g., metal/timber	<10 HDV peak outward movements per day, surface material low dust potential, unpaved road length <50m

7.3.1.3 Receptor Sensitivity Definitions

The assessment of the significance of the effects of construction dust has been made with respect to the receptor and area sensitivity definitions as outlined in Table 7.3: to Table 7.5. Sensitivity definitions have been made with reference to the IAQM guidance.

Table 7.3: Receptor Sensitivity to Construction/ Demolition Dust

Sensitivity	Human Perception of Dust Soiling	Human Health with respect to PM_{10}
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 and hospitals/healthcare centres
Moderate sensitivity	Enjoy a reasonable level of amenity; appearance/ aesthetics/ value of property could be diminished by soiling; receptor not expected to be present continuously	Only workforce present (no residential or high sensitivity receptors) 8- hours per day or more
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 (depending on parking duration)	Transient human exposure, e.g., footpaths, playing fields and parks.

Distances have been measured from source to receptor in bands of less than 20m, less than 50m, less than 100m and less than 350m for earthworks and construction. For track out, the receptor distances have been measured from receptor to track out route (up to 50m) and up to 500m from the construction site exit. These distance bands have been applied in Table 7.4 and Table 7.5.

Table 7.4: Sensitivity of the Area to Dust Soiling on People/ Property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
High	≥1	High	High	Medium	Low
Moderate	≥1	Medium	Low	Low	Low
Low	≥1	Low	Low	Low	Low

Table 7.5: Sensitivity of the Area to Human Health

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
High (annual mean PM_{10} concentration <24 µg/m^3)	≥1	Medium	Low	Low	Low
Medium (annual mean PM_{10} concentration <24 µg/m^3)	≥1	Low	Low	Low	Low
Low	≥1	Low	Low	Low	Low

7.3.1.4 Risk Definitions

The potential risks from emissions from unmitigated construction activities have been defined with reference to the magnitude of the potential emission and the highest sensitivity receptor(s) within the area, as summarised in Table 7.6.

Table 7.6: Classification of Risk of Unmitigated Impacts

Area Sensitivity to Activity	Magnitude		
	Large	Medium	Small
Demolition			
High	High risk	Medium risk	Medium risk
Medium	High risk	Medium risk	Low risk
Low	Medium risk	Low risk	Negligible
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

7.3.1.5 Construction Dust Assessment Methodology Summary

To summarise, the methodology for determining the risk of unmitigated impacts considers impacts on dust soiling and on human health. The steps used in doing so for dust soiling are as follows:

- Define the potential dust emission magnitude (Table 7.2)
- Define the sensitivity of the area (Table 7.4), this needs to take account of:
  - Receptor sensitivity (Table 7.3:),
  - Receptor distance; and
  - Classification of risk due to unmitigated impacts (Table 7.6).

The steps taken in determining human health are as follows:

- Define the potential dust emission magnitude (Table 7.2)
- Define the sensitivity of the area (Table 7.5), this needs to take account of:
  - Receptor sensitivity (Table 7.5),
  - Receptor distance; and
  - Classification of risk due to unmitigated impacts (Table 7.6).

7.3.2 Construction and Operational Traffic Assessment

Transport Infrastructure Ireland (TII) technical guidance document PE-ENV-01106[8] sets out criteria whereby a detailed assessment can be screened out as unlikely to affect air quality. The guidance is used extensively in Ireland for this purpose. These criteria are:

- Road alignment will change by 5m or more; or
- Annual average daily traffic (AADT) flows will change by 1,000 or more; or
- Heavy duty vehicle (HDV) (vehicles greater than 3.5 tonnes, including buses and coaches) flow will change by 200 AADT or more; or
- Daily average speed change by 10kph or more; or
- Peak hour speed will change by 20kph or more.

As shown in Chapter 14 of this EIAR, traffic flows during the construction phase of development are anticipated increase by a maximum of 278 per day for LDVs and 44 per day for HDVs.

During operation, traffic flows are anticipated to increase by a maximum of 40 for LDVs (staff travel) and 36 HDVs (HVO delivery) per day.

These changes in traffic during either the construction or operation phase are well below the relevant assessment criteria and the fact that these will access the Proposed Development along the existing

[8] TII (2022) Air Quality Assessment of Specified Infrastructure Projects – Overarching Technical Development PE-ENV-01106 (tiipublications.ie)

public road network, no significant change in air quality is likely from traffic during the construction or decommissioning phases. Therefore, consideration of vehicle effects has been screened out of this assessment.

7.3.3 Operational Phase Emissions Assessment

The assessment of operational phase emissions has made use of the current version of the Atmospheric Dispersion Modelling System ADMS 6 (version 6.0), published by Cambridge Environmental Research Consultants (CERC). ADMS 6 is software approved for use by the EPA[2] and has been subject to successful validation studies undertaken by CERC and other entities independent from CERC. The general model parameters are discussed in detail in the following sections.

In this assessment two scenarios are modelled, the first scenario assesses the potential impact from sources from the Proposed Development, which is limited to the proposed OCGT, at the proposed 1800 hours of operation annually, operating at 100% load. Pollutants emissions included in the assessment are NO_X, CO, SO_x, particulates and NH_3 slip due to SCR abatement. This scenario is referred to as the Proposed Development Scenario.

The second scenario is the Cumulative Developments Scenario includes all of the proposed OCGT, the generators which form the Tarbert Temporary Emergency Generation (TEG) Site operational for 500 hours per year each and sources from Moneypoint Power Station.

7.3.3.1 Source Emissions Data – Proposed Development Scenario

Representative source characteristics and emissions data has been obtained for an F-class gas turbine unit from the project engineer, optimised for use with HVO. This information has been scrutinised and data relevant to the dispersion modelling assessment extracted and used as model input data, as listed Table 7.7 and in Figure 7.1 (refer to EIAR Volume III).

Table 7.7: ADMS 6 Model Source Input Data

Source Parameters	OCGT Generator
Stack location X	107535
Stack location Y	149578
Release heights (m)	55
Stack diameter (m)	9
Exit Velocity (m/s)	34.88
Exhaust Mass Flow (kg/s)	1237
Temperature (°C)	350
Exhaust Volume Flow (Nm^3/h)	2,607,082
NO_X Emission conc. (mg/Nm^3)	50
CO Emission conc. (mg/Nm^3)	100

Source Parameters	OCGT Generator
PM_{10} Emission conc. (mg/Nm^3)	10
SO_2 Emission conc. (mg/Nm^3)	5
NH_3 Emission conc. (mg/Nm^3)	10
Emission rate (g/s NO_X)	36.3
Emission rate (g/s CO)	72.6
Emission rate (g/s PM_{10})	7.3
Emission rate (g/s SO_2)	3.63
Emission rate (g/s NH_3)	6

[1]Stack locations are in Irish National Grid

7.3.3.2 Source Emissions Data - Cumulative Developments Scenario

In addition to the Proposed Development sources, cumulative sources from the surrounding areas have also been modelled. The cumulative sources included within this assessment are TEG, Moneypoint Power Station and the sources outlined as part of the Proposed Development Scenario. Source characteristics and emissions data has been obtained from licences and stack emissions monitoring reports. Information provided has included proposed stack emissions monitoring reports. This information has been scrutinised and data relevant to the dispersion modelling assessment extracted and used as model input data, as listed in Table 7.8 and in Figure 7.2 (refer to EIAR Volume III).

Table 7.8: Cumulative Sources ADMS 6 Model Source Input Data

Source Parameters	TEG Unit 1	TEG Unit 2	TEG Unit 3	Moneypoint A1-1	Moneypoint A1-3	Moneypoint Aux. Boiler
Stack location X	107145	107118	107090	103503	103637	103549
Stack location Y	149454	149466	149479	151696	151646	151802
Release heights (m)	30	30	30	220	220	3
Stack diameter (m)	4	4.0	4.0	6.89	6.89	0.45
Exit Velocity (m/s)	23.0	23.0	23.0	28.94	14.47	11.8
Exhaust Mass Flow (kg/s)	138.1	138.1	138.1	-	-	-
Temperature (°C)	451.6	451.6	451.6	72	72	200
Exhaust Volume Flow (Nm^3/h)	392,636	392,636	392,636	2,400,000	1,200,000	3,488

Source Parameters	TEG Unit 1	TEG Unit 2	TEG Unit 3	Moneypoint A1-1	Moneypoint A1-3	Moneypoint Aux. Boiler
NO_X Emission conc. (mg/Nm^3)	90	90	90	200	200	350
CO Emission conc. (mg/Nm^3)	100	100	100	-	-	-
PM_{10} Emission conc. (mg/Nm^3)	17	17	17	-	-	-
SO_2 Emission conc. (mg/Nm^3)	66	66	66	200	200	350
Emission rate (g/s NO_X)	9.8	9.8	9.8	133.33	66.67	0.34
Emission rate (g/s CO)	10.9	10.9	10.9	-	-	-
Emission rate (g/s PM_{10})	1.9	1.9	1.9	-	-	-
Emission rate (g/s SO_2)	7.2	7.2	7.2	133.33	66.67	0.34

[1]Stack locations are in Irish National Grid

7.3.3.3 Model Receptors

The model predicts the contribution of emissions of NO_X and SO_2 to annual mean concentrations at the discrete ecological receptors listed in Table 7.9 and Figure 7.3 (refer to EIAR Volume III). Within 15km of the Proposed Development, a total of 15 sensitive nature conservation site receptors have been selected to adequately represent various habitats across the Special Areas of Conservation (SAC) areas and sections of the Special Protection Area (SPA), including various habitats within the River Shannon and River Fergus Estuaries SPA.

Sensitive habits inside SACs and SPAs were identified by the AECOM ecologists. The ecologists selected coordinates that would be representative of the specific sensitive habitats inside the SAC and SPA areas which are sensitive to air quality. Receptor points were modelled at air quality sensitive habitats (e.g., coastal saltmarsh, salt meadows, and Salicornia) at the closest point to the Proposed Development. Ecological receptors have been modelled at a height of 0m above the ground.

Table 7.9: Modelled Ecological Receptors

Receptor ID	X	Y	Receptor Description	Habitat
E1a	107195	149405	River Shannon and River Fergus Estuaries SPA	Intertidal
E1b	107557	149217	River Shannon and River Fergus Estuaries SPA	Intertidal
E1c	107669	149668	River Shannon and River Fergus Estuaries SPA	Intertidal
E2a	107596	147662	Lower River Shannon SAC	Coastal Saltmarsh
E2b	107596	147662	Lower River Shannon SAC	Atlantic Salt Meadows
E2c	107596	147662	Lower River Shannon SAC	Molina meadows on calcareous, peaty or clayey-silt-laden soils
E2d	92652	153760	Lower River Shannon SAC	Salicornia and other annuals colonising mud and sand
E2e	108960	152912	Lower River Shannon SAC	Mediterranean Salt Meadows
E2f	107382	149078	Lower River Shannon SAC	Estuaries
E2g	97505	152660	Lower River Shannon SAC	Coastal Lagoons
E2h	99734	150585	Lower River Shannon SAC	Large Shallow Inlets and Bays
E2i	102360	152365	Lower River Shannon SAC	Perennial Vegetation of Stony Banks
E2j	110440	136312	Lower River Shannon SAC	Broadleaved deciduous woodland
E3	1111777	1440066	Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA	Bog
E4	104582	135652	Moanveanlagh Bog SAC	Bog

The model also predicts the contribution of emissions of the following pollutants to concentrations at discrete human health receptors:

- Annual and 1-hour mean NO_2 concentrations.
- 1-hour and 24-hour mean SO_2 concentrations.
- Rolling 8-hour mean CO concentrations.
- Annual and 24-hour mean PM_{10} concentrations.
- Annual mean $PM_{2.5}$ concentrations.

Within 15km of the Proposed Development, a total of 15 human health receptors have been selected to represent the potential impacts across this area, shown in Table 7.10 and Figure 7.4 (refer to EIAR

Volume III). These receptors are all residential properties. All human health receptors have been modelled at height of 1.5m above the ground.

The human health receptors were selected to represent worst-case exposure at locations where there is relevant sensitivity and represent other receptors in their vicinity. For example, in a cluster of houses, only one discrete receptor point has been modelled. The human health points were places on the closest point of a property to the Proposed Development (e.g., on the façade of a residential property).

Table 7.10: Modelled Human Health Receptors

Receptor ID	X	Y	Receptor Description
R1	107422	149253	Residential Property
R2	107461	149255	Residential Property
R3	107524	149283	Residential Property
R4	107669	149264	Residential Property
R5	107219	148479	Residential Property
R6	106804	147938	Residential Property
R7	107171	147741	Residential Property
R8	108525	147540	Residential Property
R9	109259	147679	Residential Property
R10	110044	150178	Residential Property
R11	109576	150532	Residential Property
R12	107565	152788	Residential Property
R13	105946	152181	Residential Property
R14	104522	151779	Residential Property
R15	104206	148150	Residential Property

7.3.3.4 Meteorological Data

Hourly sequential wind speed, wind direction, precipitation, temperature, and relative humidity data has been sourced from the meteorological station at Shannon Airport, to inform the dispersion modelling. Shannon Airport is also located along the Shannon Estuary, approximately 30km north-east of the Site. Shannon Airport was selected as the closest site where all the necessary meteorological parameters are available and the meteorological conditions there are considered to be suitably representative of the Site. For air quality modelling, the EPA's AG4 guidance[2] recommends using five years of meteorological data from an appropriate meteorological site, where the most recent year is compiled within the last 10 years of the assessment date. Windrose plots, produced from the meteorological data used in this assessment, are presented for Shannon Airport 2017– 2021 in Plate 7.1.

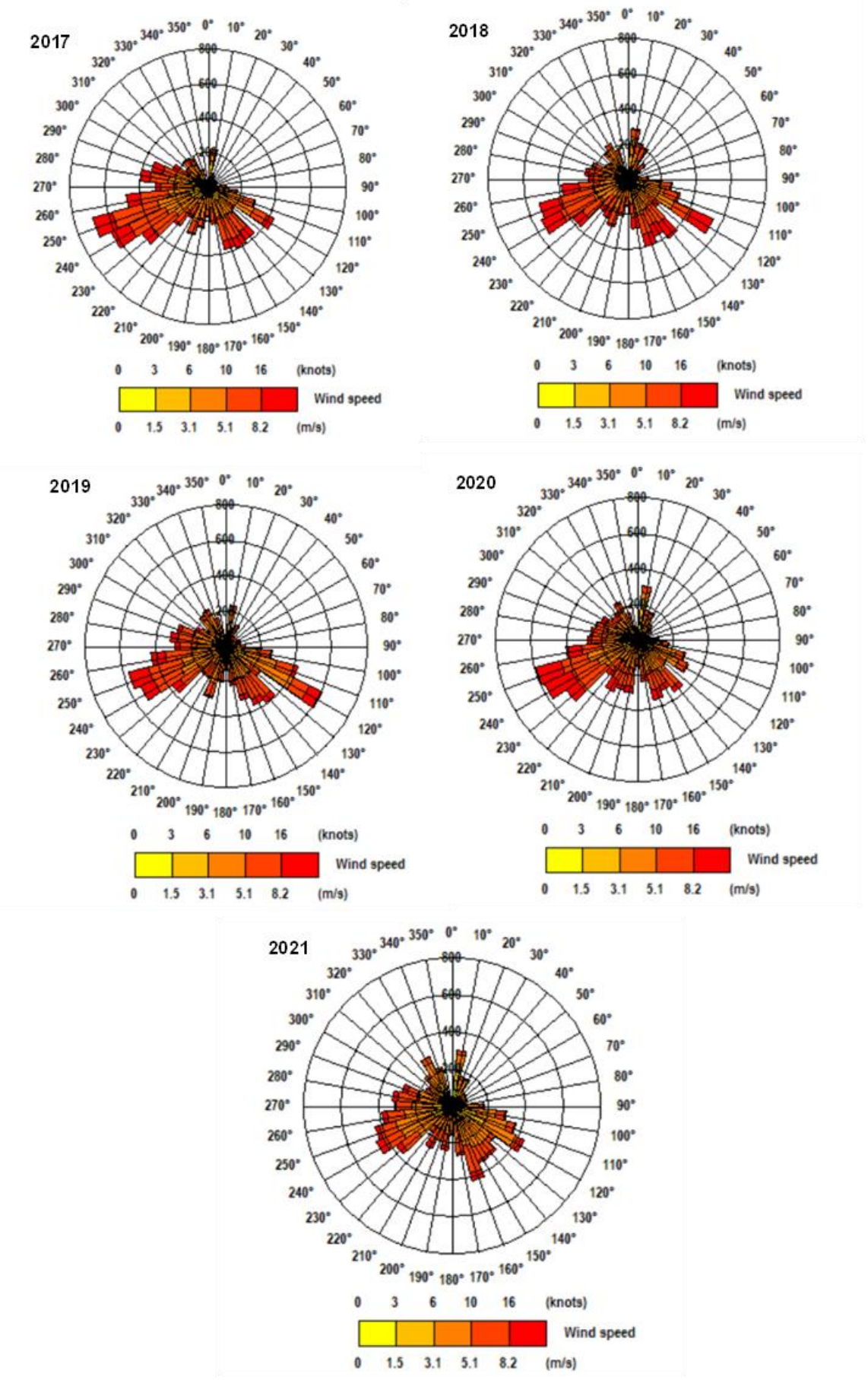

Plate 7.1: Windrose plots for Shannon Airport 2017-2021

The windrose plots show that the most common direction from which wind occurs is south-east, however, there are a range of speeds occurring from all directions and it is conceivable that the worst impacts could occur in any direction relative to the Site depending on meteorological conditions during any randomly occurring event.

Five years of meteorological data are used in the assessment which allows consideration of inter-annual variation. The contribution of emissions to pollutant concentrations and deposition rates reported at each receptor location is the worst-case value calculated at that location over the five years modelled.

In terms of how the dispersion model utilises the meteorological data, the latitude of the study area was set at 53º, the surface roughness of the study area set at 0.3m, to account for the fact that the study area is a combination of the estuary waterbody and swathes of open countryside with limited urban areas. The minimum Monin-Obukhov length set at 10m, to represent small towns and rural areas. For the meteorological site, the surface roughness was set at 0.2m to represent a typical meteorological site, which should be distanced well away from nearby buildings and structures.

7.3.3.5 Modelled Buildings and Structures

The buildings and structures around the Site that make up the existing SSE Tarbert buildings have the potential to affect the dispersion of emissions from the exhaust stacks. The ADMS 6 buildings effect module has therefore been used to incorporate building downwash effects as part of the modelling procedure. Building effects are typically considered where a structure of height greater than 40% of the stack height is situated within eight to ten stack heights of the emissions source. Modelled buildings are shown in Plate 7.2. The layout takes account of structures which will be in built and demolished as part of the Proposed Development. Therefore, represents the site layout as the Proposed Development will operate.

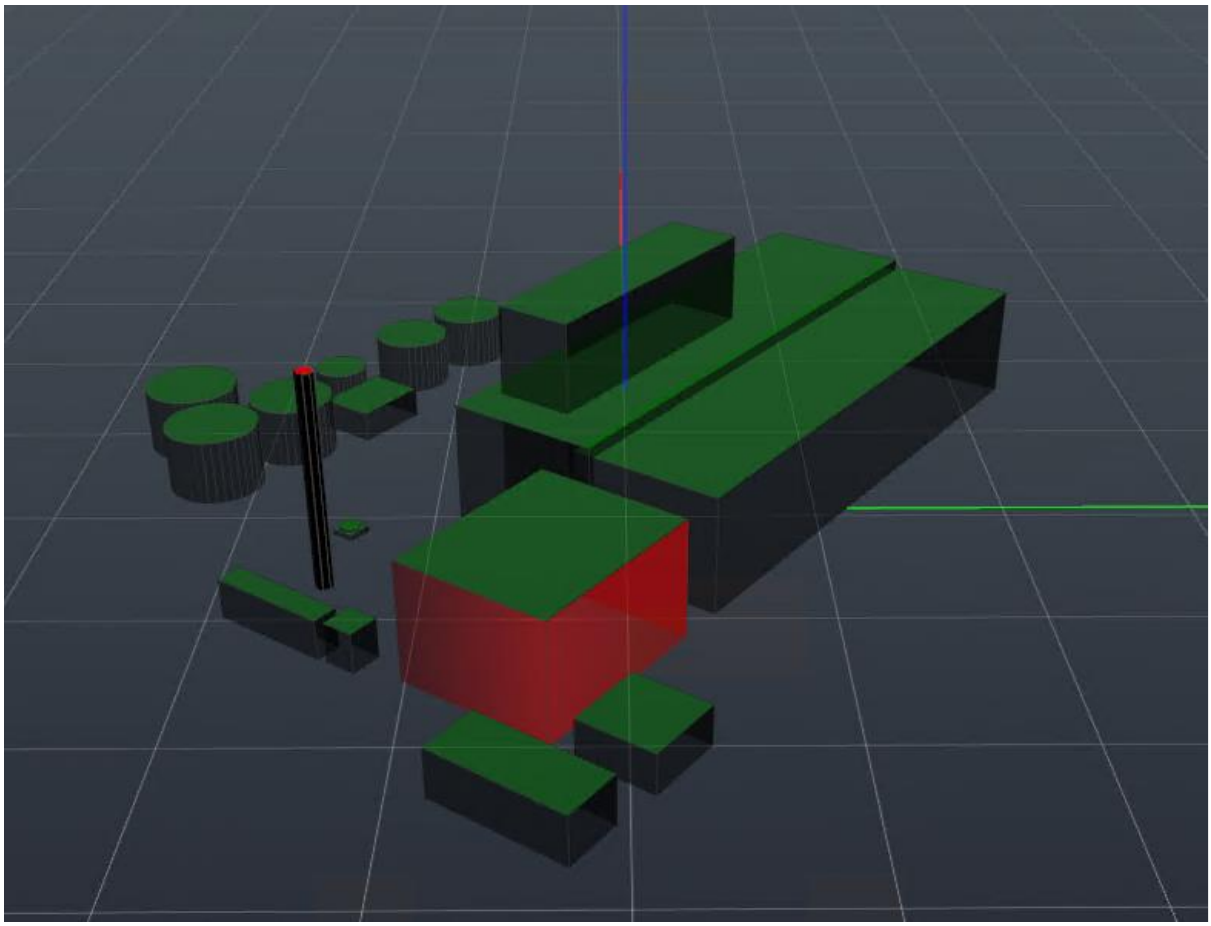

Plate 7.2: Modelled Buildings within ADMS (facing West)

Note: Looking east, the OCGT stack is shown with the red dot on top and the main building (as modelled within ADMS) in the model is shaded in red.

The dimensions of the structures that have been modelled as buildings within ADMS are provided in Table 7.11.

Table 7.11: Building Dimensions

Building	X	Y	Z (m)	Length (m)	Width (m)	Shape
Gas Turbine Building	107505	149526	30	40	50	Rectangular
Generator Fin-Fan Cooler	107516	149586	10	30	7	Rectangular
Admin Building & Workshop	107452	149529	12	35	15	Rectangular
Store	107471	149505	10	20	20	Rectangular
Fuel Polishing System	107624	149578	8	15	20	Rectangular
Ammonia Storage Bund	107561	149576	2	6	6	Rectangular
Denim Water Tank 1	107588	149614	17	24	24	Circular
Denim Water Tank 2	107612	149624	17	24	24	Circular

Building	X	Y	Z (m)	Length (m)	Width (m)	Shape
Day Storage Fuel Tank	107639	149588	10	14	14	Circular
Bulk Fuel Tank 1	107654	149569	14	20	20	Circular
Bulk Fuel Tank 2	107672	149555	14	20	20	Circular
Raw/Fire Water Tank	107608	149597	16	22	22	Circular
Lube Oil Fin Fan Cooler	107505	149568	10	8	8	Rectangular
Existing Power Station 1	107595	149460	30	40	150	Rectangular
Existing Power Station 2	107594	149508	56	20	73	Rectangular
Existing Power Station 3	107613	149488	33	40	150	Rectangular
Ammonia Storage Tank	107561	149576	3	5	5	Circular

7.3.3.6 Terrain Data

Terrain data was sourced from the U.S. Geological Survey, which provides data with a 50m resolution. ADMS 6 is limited to 66,000 terrain points in a model run. Using terrain data with a resolution of 50m, it could not be used to cover the full 15km area that was required for this assessment. Therefore, the terrain data was processed to provide a variable resolution of 50m for the majority of the study area and 200m resolution of the rest of the study area. This allowed for the consideration of terrain over a wider area whilst maintaining a suitable resolution for dispersion modelling. The lower resolution terrain begins ~10km to the south of the Designated Development. The 50m resolution terrain data south-western extent of the terrain data is at ING 91438, 140678 and the 200m resolution terrain data south-western extent of the terrain data is at ING 91382, 134741. The total terrain extends 25km to the west and 20km to the north from the south-western point of the 200m resolution terrain data.

The lowest point of the terrain data is 4m below sea level and occurs 10km west of the Proposed Development, however the Shannon Estuary does not have height data and has been assumed as zero. It is likely that this height data for this would be lower than this. The highest point of the terrain data is 251m above sea level and occurs 17km south-west.

7.3.3.7 Pollutant Conversions

NO_X to NO_2

To quantify annual mean NO_2, it was assumed that 100% of NO_X emissions released from the stack are converted to NO_2 in the atmosphere. This represents a precautionary approach in that in reality, this conversion is ozone-limited and not all NO_X emissions will be converted.

Nitrogen deposition was calculated from annual mean NO_X concentrations.

To quantify 1-hour NO_2, it was assumed that 50% of NO_X emissions released from the stack are converted to NO_2 in the atmosphere.

Nitrogen and Acid Deposition

Annual mean NO_2 and NH_3 concentrations are converted to N deposition using the methodology set out in EPA's AG4 guidance[2]. Nitrogen deposition flux (as µg/m^2/s) is calculated by applying a deposition velocity factor of 0.0015m/s to the annual mean NO_2 contribution as (µg/m^3) and 0.020m/s to the annual mean NH3 contribution as (µg/m^3) at habitats with short vegetation (non-woodland) and a deposition velocity factor of 0.003m/s and 0.030m/s to annual mean NO_2 and NH_3, respectively, as (µg/m^3) contribution at habitats with tall vegetation (woodland). Deposition rate (as kgN/ha/yr) for each are then calculated by applying a unit conversion factor of 95.9 to the NO_2 contribution and 260 for the NH_3 contribution before being summed to calculate total deposition flux (as µg/m^2/s). These values can then be compared to a site relevant critical load determined using the APIS database[3].

The deposition flux for each of these contributors to nitrogen acidification is converted to keq/ha/yr using a conversion factor of 6.84 for NO_2 and 18.5 for NH_3. The sulphur derived acidification is calculated from annual mean SO_2 (as µg/m^3), firstly by applying a deposition velocity of 0.012m/s for non-woodland and 0.024m/s for woodland to derive a deposition flux as (µg/m^2/s), this is then converted to keq/ha/yr using a conversion factor of 9.84. As outlined in AG4, the APIS critical load database and critical load function tool[9] can then be used to determine the impacts.

7.3.4 Describing Significant Effects

The EPA EIAR Guidelines[10] does contain a method to determine and describe the effect of a proposed development, but that approach is not wholly appropriate for air quality. This is because the relationship between magnitude of change in air quality conditions and receptor sensitivity is not linear. Receptor sensitivity to air quality impacts does not have a graded scale and instead, receptors are considered either sensitive to air quality impacts or not sensitive. Furthermore, the impact description of a change in pollutant concentration is not based on the magnitude of change alone, but that change relative to the pollutant concentration experienced at a receptor once the Proposed Development is in operation. The reason for this is to take account that smaller changes in air quality conditions can constitute a greater level of impact than a large change in conditions, where they occur at receptors that are predicted to experience pollutant concentrations close to or in excess of an Air Quality Standard or Environmental Assessment Level.

The EPA AG4 guidance document on dispersion modelling[2] does not include the specific means by which to describe the significance of effect on local air quality as a result of new emissions, with regards to determining the suitability of a development from a planning perspective. It does, however, provide criteria that Environmental Licence applicants should aim to achieve in terms of the maximum allowable air quality impacts from an Environmental Licencing perspective.

UK Environment Agency guidance[11] and IAQM and EPUK guidance[12] has been developed to determine whether or not an air quality effect can be screened as insignificant or not by the regulator, or significant or not by the planning authority, respectively. The approach described in these documents have been

[9] APIS (2023). Critical Load Function Tool. https://www.apis.ac.uk/critical-load-function-tool
[10] EPA (2022). Guidelines on the information to be contained in Environmental Impact Assessment Reports.
[11] UK EA (2016). Air Emissions Risk Assessment for your Environmental Permit Guidance – Updated 2022.
[12] IAQM & EPUK (2017). Land-Use Planning & Development Control: Planning for Air Quality.

considered and utilised alongside the EPA AG4 guidance[2] in this assessment. Where possible, the approaches described in the air quality specific guidance have been reported in a manner that is compatible with the requirements of the EPA Guidelines[10], more detail on this is provided in the sections which follow.

7.3.4.1 Construction Phase Dust and Particulate Matter Assessment

For amenity effects from dust and particulates associated with construction activities, the aim is to bring forward a scheme, including additional mitigation measures where necessary, that will control impacts so that they give rise to negligible or minor effects (at worst) at the closest sensitive receptors. Determination of whether an effect is likely to be significant or not is based on professional judgement (from experience of similar projects) in the context of appropriate professional guidance (IAQM, 2014[7]), taking account of whether effects are permanent or temporary, direct or indirect, constant or intermittent and whether any secondary effects are caused (in this instance, secondary effects refer to dust that is generated and deposited (primary impact) and then re-suspended and deposited again by further activity).

The classification of amenity impacts (from dust soiling) and health effects on receptors exposed to impacts has been assessed using the relationship between the magnitudes of effects identified, in combination with receptor sensitivity and other related factors where appropriate (as described in the relevant guidance[8], which results in a classification of effects as defined in Table 7.12.

Table 7.12: Description of Dust Impacts and Effects

Magnitude of Effect[1]	Change in dust deposition and short term PM_{10} Concentrations	Significance of Effects
High	Dust impact is likely to be intolerable for any more than a very brief period of time and is very likely to cause complaints from local people. Increase in PM_{10} concentrations at a location where concentrations are already elevated and to the extent that the short term PM_{10} air quality objective is likely to be exceeded.	**Significant to Profound:** A significant Impact that is likely to be a material consideration in its own right.
Medium	Dust impact is likely to cause annoyance and might cause complaints but can be tolerated if prior warning and explanation has been given. Increase in PM_{10} concentrations at a location where concentrations are already elevated and to the extent that the short term PM_{10} air quality objective is at risk of being exceeded.	**Moderate:** A significant effect that may be a material consideration in combination with other significant impacts but is unlikely to be a material consideration in its own right.
Slight	Dust impact may be perceptible, but of a magnitude or frequency that is unlikely to cause annoyance to a reasonable person or to cause complaints. Limited increase in PM_{10} concentrations.	**Not significant to Slight:** An impact that is not significant but that may be of local concern.
Negligible	Dust impact is unlikely to be noticed by and/ or have an effect on sensitive receptors. Negligible increase in PM_{10} concentrations.	**Imperceptible:** An impact that is not significant.

Magnitude of Effect[1]	Change in dust deposition and short term PM_{10} Concentrations	Significance of Effects

Notes: [1] Terminology adapted to align with EPA Guidelines[10]

7.3.4.2 Operational Phase Emissions

EPA AG4 Approach

The EPA's *Guidance Note (AG4)*[2] does not specifically provide a criterion for determining significance of any effect from the predicted air quality impacts. It does, however, in its section on model accuracy and sensitivity studies, state that "*the process contribution (PC) should be less than 75% of the ambient air quality standard and less* than *this where background levels account for a significant fraction of the ambient air quality standard based on the formula":*

- Maximum Allowable PC = 0.75*(AQS) where there is no significant background concentration; or
- Maximum Allowable PC = 0.75*(AQS – BC) where there is a significant background concentration

In this text provided by the EPA, PC refers to the process contribution of modelled emissions only. Air Quality Standard (AQS) refers the relevant concentration outlined in Section 7.2.1 of this document, though will be referred to as Environmental Assessment Level (EAL) hereafter. Background Concentration (BC) refers to the concentration of pollutant already present in the receiving environment. The term Predicted Environmental Concentration (PEC) is used throughout this document and is calculated as the sum of PC and BC, it therefore refers to the total concentrations at receptors.

UK Environment Agency (UK EA) Permitting Approach

The UK EA guidance[11] and IAQM and EPUK[12] Guidance provide an alternative and more precautionary approach to determining whether the impact of a proposed development has an effect that is potentially significant or not. Although, it should be noted that the UK Guidance is intended for use in areas of the UK where pollutant concentrations are often elevated close to or above the EAL. For application in rural Ireland, it can be considered a conservative means of determining potential significance. It should also be noted that the IAQM guidance is predominantly for urban development projects where road traffic emissions are often the biggest contributor to air quality impacts, rather than industrial installations, although there is no reason why the significance criteria described within it cannot be adopted for industrial sites.

According to the UK EA Guidance[11], an impact on human health sensitive receptors may be considered insignificant where:

- The short-term Process Contribution (PC - impact) is <=10% of the EAL; and
- The long-term Process Contribution (impact) is <=1% of the EAL.

Where an impact on human health sensitive receptors cannot be screened out at this stage, additional criteria is provided, including consideration of the Predicted Environmental Concentration (PEC – total

pollutant concentration), where the PC is added to the background (or ambient) concentrations. The impact may be considered insignificant where:

- The short-term PC is <20% of the EAL and
- The long-term PEC is <70% of the EAL.

Where an impact on human health sensitive receptors still cannot be screened as insignificant at this stage, it does not necessarily mean that the effect is now significant. At this stage, model inputs are reviewed, and detail enhanced where it can be. The predicted PC and PEC are then reviewed relative to the appropriate EALs and the headroom (gap between the PEC and the EAL) that remains once the Proposed Development is in operation - i.e., is there a risk of an exceedance of an EAL and/ or does the operation of the Proposed Development constrain future development of the area.

For this assessment, the 'insignificant' terminology used in the UK EA guidance[11] applies to effects that can be described as 'Imperceptible' to 'Slight' in the EPA Guidelines[10]. It may also apply to effects that can be described as 'Moderate' in the EPA Guidelines, where such effects relate to a limited number of sensitive receptors and / or the EAL remain not at risk of any exceedance. This is justified by the 'Moderate' effect being listed as between the 'Imperceptible' and 'Significant' description of effects referred to by the EPA Guidelines[10].

For impacts in nature conservation receptors, the UK EA Guidance states that they may be considered insignificant ('not significant') where:

- The short-term PC is less than 10% of the short-term environmental standard for protected conservation areas; and
- The long-term PC is less than 1% of the long-term environmental standard for protected conservation areas.

Where the long-term process contribution exceeds this criteria, ecologically sensitive receptors may also be considered insignificant ('not significant') where:

- The long-term PEC is <70% of the EAL.

Where an impact on nature conservation sensitive receptors still cannot be screened as insignificant at this stage, again it does not necessarily mean that the effect is now significant. Model inputs and assumptions shall be reviewed, and detail enhanced where it can be. The predicted PC and PEC are then reviewed relative to the appropriate EAL and the headroom that remains once the Proposed Development is in operation – i.e., is there a risk of an exceedance of an EAL and / or does the operation of the Proposed Development constrain future development of the area.

Again, the 'insignificant' terminology used in the UK EA Guidance[11] applies to effects that can be described as 'Imperceptible' to 'Slight' in the EPA Guidelines[10]. It may also apply to effects that can be described as 'Moderate' in the EPA Guidelines, where such effects relate to a limited number of sensitive receptors and / or the EAL remain not at risk of any exceedance. Ultimately, the significance of air quality impacts on nature conservation sites has been determined by a professional ecologist.

IAQM Planning Approach

Like the UK EA Guidance[11], the IAQM and EPUK[12] approach does not define a graduating scale of human health receptor sensitivity. Instead, human health receptors are considered either sensitive or not, depending on the period of time for which they are exposed to emissions. The absolute magnitude of change in pollutant concentrations between the baseline and operational phase scenarios, in relation to the EAL, is described and this is used to consider the risk of those Standards and Levels being exceeded.

For a change in annual mean concentrations of a given magnitude, IAQM and EPUK have published recommendations for describing the impacts at individual receptors, as set out in the following table.

Table 7.13: The description of impacts referred to in the IAQM Guidance.

Long term average concentration at receptor in assessment year	% Change in concentration relative to Air Quality Assessment Level (AQAL)[1]				
	<1 (Imperceptible)	1 (Very Low)	2 to 5 (Low)	6 to 10 (Medium)	>10 (Large)
75% or less of AQAL	Negligible	Negligible	Negligible	Slight	Moderate
76% - 94% of AQAL	Negligible	Negligible	Slight	Moderate	Moderate
95% - 102% of AQAL	Negligible	Slight	Moderate	Moderate	Substantial
103% - 109% of AQAL	Negligible	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Negligible	Moderate	Substantial	Substantial	Substantial

Notes:

[1] For this assessment, IAQM effect descriptions are aligned with EPA Guidelines as follows:

Negligible = Imperceptible; Slight = Not Significant to Slight; Moderate = Moderate; and Substantial = Significant to Profound

The IAQM and EPUK Guidance states that the descriptors are for individual receptors only and that overall significance is determined using professional judgement. It also states that it is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the objective value. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainty, which is why there is a category that has a range around the objective value, rather than being exactly equal to it.

A change in predicted long-term (annual mean) concentrations of less than 0.5% of an EAL is considered to be ‘imperceptible’. A PC (impact) that is ‘Negligible’, given normal bounds of variation, will not be capable of having a direct effect on local air quality that could be considered to be significant.

The IAQM and EPUK guidance suggests the potential for ‘Low’ air quality impacts as a result of changes in pollutant concentrations between 2% and 5% of relevant EALS. For example, for long-term NO_2 concentrations, this relates to changes in concentrations ranging from 0.6 – 2.1 µg/m^3. In practice, changes in concentration of this magnitude, and in particular changes at the lower end of this band are likely to be very difficult to distinguish due to the inter-annual effects of varying meteorological conditions. Therefore, in the overall evaluation of significance the potential for impacts to have

significant air quality effect within this band will be considered in this context and will not be capable of having a direct effect on local air quality that can be considered to be significant.

Changes in concentration of more than 5% ('Medium' and 'High', the two highest bands) are considered to be of a magnitude which is far more likely to be discernible above the natural variation in baseline conditions and, as such, carry additional weight within the overall evaluation of significance for air quality. 'Moderate' impacts do not necessarily constitute a significant effect, where they do not contribute to an exceedance or risk of an exceedance of an EAL, particularly where such impacts relate to a small minority of receptors with the majority experiencing lesser impacts. A 'Significant' to 'Profound' impact will almost certainly constitute a significant effect that will require additional mitigation to address.

The IAQM and EPUK Guidance[12] also provides thresholds for determining whether short-term impacts on human health sensitive receptors have the potential to cause a significant effect or not. Again, it is noted that the IAQM guidance is not specific to industrial facilities, but still provides a useful guide to scale the severity of impacts. This guidance deviates from the UK EA Guidance in that the criteria it provides does not take account of background concentrations, although the guidance does state that this is not intended to play down the importance of total short-term concentrations; the IAQM Guidance indicates that severity of peak short-term concentrations can be described without the need to reference background concentrations as the PC is used to measure impact, not the overall concentration at a receptor. The peak short-term PC from an elevated source has been adopted for this assessment as follows:

- PC <=10% of the EAL represents an impact that is 'Imperceptible' to 'Not significant';
- PC 11-20% of the EAL is small in magnitude representing a 'Slight' impact;
- PC 21-50% of the EAL is medium in magnitude representing a 'Moderate' impact; and
- PC >51% of the EAL is large in magnitude representing a 'Significant' to 'Profound' impact.

7.3.4.3 Significance of Effects

Following the assessment of each individual air quality effect (construction dust and operational plant), the significance of all of the reported effects is then considered for the Proposed Development in their entirety. The potential for the Proposed Development to contribute to or interfere with the successful implementation of policies and strategies for the management of local air quality are considered if relevant, but the principal focus is any change to the likelihood of future achievement of the EALs (which also relate to compliance with Kerry County Council (KCC) goals for local air quality management and objectives are set for the protection of human health).

In terms of the significance of the effects (consequences) of any adverse impacts, an effect is reported as being either significant or not. If the overall effect of the Proposed Development on local air quality or on amenity is found to be 'Moderate' (where a large proportion of sensitive receptors are affected and/ or there is risk of EALs being exceeded) or 'Significant' to 'Profound', this is deemed to be significant for EIAR purposes. Effects found to be 'Moderate' (where limited sensitive receptors are affected and there is no risk of exceedance of an EAL) to 'Imperceptible' are not considered to be significant.

7.3.5 Limitations and Assumptions

The air quality assessment has followed an industry standard approach, with reference to relevant guidance documents and methodologies, to provide the best possible means of predicting potential air quality impacts associated with the Proposed Development at Offsite receptors, and the determination of significance. However, given the nature of the assessment, it is inevitable that there are limitations associated with any approach, and those relevant to this assessment are summarised:

- Inherent uncertainties with dispersion modelling:
  - The dispersion model can only be as accurate as the data inputted into it, including the source emissions data. To minimise the uncertainties associated with such data, the assessment has used emissions information from manufacturers, licences or stack emissions monitoring reports, as appropriate.
  - Meteorological data has been sourced from Shannon Airport, the nearest meteorological station to the Proposed Development site with the complete dataset required for dispersion modelling. It is located approximately 17km to the west of the Site. To reduce the uncertainty in the representativeness of the meteorological data, the assessment has modelled five years of meteorological data and reported the worst impact for each pollutant and averaging period over the five-year period for each receptor. The assessment has also accounted for the influence in varying terrain and surface roughness, to better represent local conditions in the vicinity of the Site.
- Uncertainties in baseline conditions:
  - The assessment refers to background air quality monitoring data reported by the EPA, and is therefore not project specific, in line with the approach set out in EPA AG4 guidance[2].
  - Background nitrogen deposition rate data is not reported as standard by the EPA. The background value used to inform this assessment has been taken from research published by the EPA[13]. In that research it is stated that *"annual estimated N deposition (wet and dry) to semi-natural grassland habitats ranged from 2 to 22kg $ha^{-1}a^{-1}$, with an average national deposition of 12.1kg ha^{-1} a^{-1}"*. That average value was taken as the background for this assessment.

The air quality assessment has also made a number of assumptions where precise information or data is not available. Where possible, assumptions are informed by relevant guidance. Assumptions based on operational characteristics are precautionary. Key assumptions are summarised:

- It is assumed in the assessment that the Proposed Development will be operational for 1,800 hours of the year (either under normal operation or start-up conditions). This is precautionary as in reality it will operate for less than that.
- It is assumed that the TEG is operational 500 hours of the year. This is precautionary as in reality it will operate for less than that.

[13] Development of Critical Loads for Ireland: Simulating Impacts on Systems (SIOS) Author: Julian Aherne, Jason Henry and Marta Wolniewicz.

- The rate of conversion of NO_X to NO_2 from modelled emissions sources has been assumed to be 100% for annual mean NO_2 and 50% for hourly mean NO_2 across the study area, in the absence of NO_X, NO_2 and O_3 data. In reality, the conversion of NO_X to NO_2 at locations close to the source, the conversion of NO_X to NO_2 is likely to be less efficient than that, the assessment therefore takes a conservative approach.

7.4 Baseline Environment

7.4.1 Monitored Baseline

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 as cited in AG4[2] 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.

All receptors used within this assessment are consistent with Zone D.

Background pollutant data is added to the modelled pollutant concentrations and deposition rates to estimate total pollutant concentrations and deposition rates, which can then be compared against the relevant EALs.

Background concentrations were sourced from EPA monitoring data for monitoring locations included EPA Zone D, which is used to represent rural locations. Site specific nitrogen and acid deposition values are used in this assessment, these values represent the Proposed Development Site as it currently exists. In this manner, it includes existing sources of pollutant, such as the Tarbert HFO Power Station, which will be decommissioned after December 2023. The background pollutant concentrations are therefore likely to be an over-estimate of the real-world situation for this assessment. It would not be practical to remove the input of the Tarbert HFO Power Station from these background concentrations because of the method by which these background concentrations are determined as they are not formed with an emissions inventory whereby an individual source contribution can be extracted. The assessment therefore presents a conservative estimate of air pollution with the Proposed Development. All relevant background concentrations used to inform this assessment are summarised in Table 7.14.

Table 7.14: EPA Zone D Background Concentrations and Deposition Rate[a]

Pollutant	Averaging Period	Concentration (µg/m^3) or Deposition Rate (kg/ha/yr)
NO_x	Annual mean	14.0
NO_2	Annual mean	7.4
	1-hr[c]	14.8

Pollutant	Averaging Period	Concentration (µg/m^3) or Deposition Rate (kg/ha/yr)
SO_2	Annual mean	5.0
	1-hr	10.0
	24-hr	10.0
N deposition	Annual rate[d]	Site specific
Acid deposition	Annual rate[d]	Site specific
CO	8-hr rolling	0.8
PM_{10}	Annual mean	12.7
	24-hr	25.4
$PM_{2.5}$	Annual mean	8.4

[a]Average across Zone D monitoring sites taken from summary tables that informed the Air quality in Ireland 2022 report.

[b]Includes elevated NO_x concentrations monitored at Birr due to proximity to N52.

[c]Short-term background concentrations are double the annual mean concentrations.

[d]Data collected from APIS.

7.4.2 Determination of Stack Height

7.4.2.1 Stack Height Assessment

A stack height assessment has been undertaken to establish a suitable release height of emissions to encourage optimal dispersion and help mitigate significant air quality effects. The results of the stack height assessment are shown in Plate 7.3, where the NO_2 concentrations are presented for a high stack release temperature (454 °C) and low stack release temperature scenario (350 °C). Meteorological years 2017 -2022 where tested, 2018 meteorological is presented in Plate 7.3 as the year which was predicted to experience the highest impact.

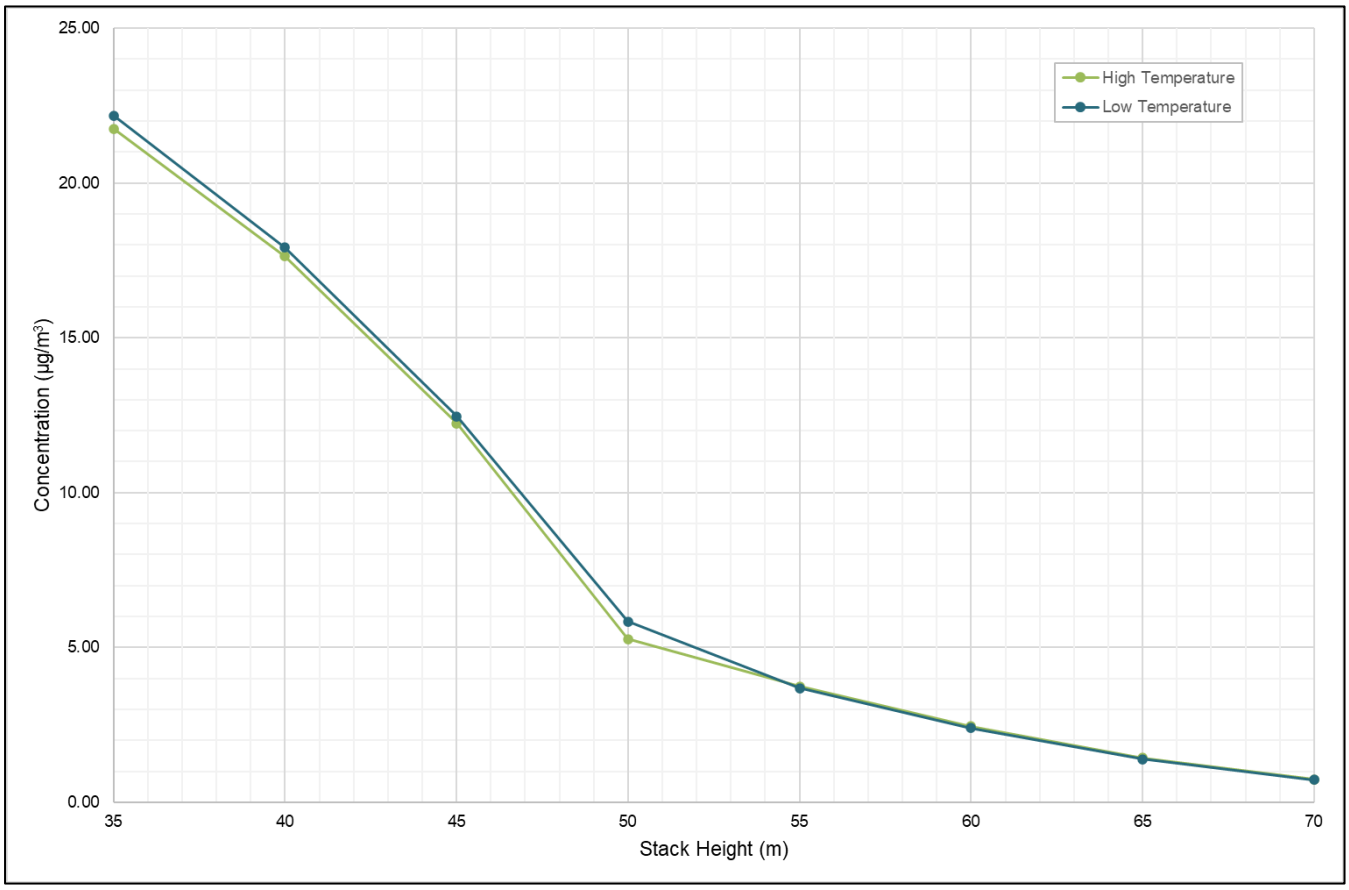

Plate 7.3: Annual Mean NO_2 Contribution by Stack Height

Plate 7.3 shows that increasing the stack height has the greatest benefit at the location of maximum impact within the model domain.

A stack height of 55m is proposed for the proposed OCGT. Releasing emissions from a height of 55m provides a relatively low concentration of pollutant at the location of maximum impact within the model domain. A stack higher than this is predicted to offer diminishing returns in terms of concentrations of pollutants at receptors, As shown in Plate 7.3. At a height of 55m the predicted impact at the high temperature and low temperature scenarios are predicted to converge, as shown in Plate 7.3.

7.5 Potential Impacts

7.5.1 Construction Dust Assessment

7.5.1.1 Magnitude Identification

Magnitude of risk of dust impacts for the Proposed Development, based on examples described in the methodology section of this chapter as set out in Table 7.15.

Table 7.15: Dust Emission Magnitude of Construction/ Demolition Activities for the Proposed Development

Activity	Dust Emission Magnitude Assigned for Proposed Development	Reasoning
Demolition	Small	Demolition activities will be minimal, the total volume of material being removed is likely to be <20,000m^3 and not a potentially dusty material
Earthworks	Small	The property boundary covers a large area, however, the Site boundary and the area within that where earthworks are likely to take place is very small. It is, therefore, unlikely that more than a few earthmovers will be on the Site at any one time, due to the fact that the site will continue to function while construction occurs. In addition, open areas at the Site are currently comprised of hardstanding which is not a dusty material.
Construction	Small	Total building volume is anticipated to be small and is likely to consist mainly of prefabricated modules, minimising the use of potentially dusty materials on site.
Trackout	Small	A small number of HDV trips is anticipated, there is little unpaved road around the application site

Table 7.15 shows that the dust emission magnitudes have been defined as small for demolition, earthworks, construction and trackout.

7.5.1.2 Sensitivity of the Area

To determine the sensitivity of the surrounding receptors to dust soiling, the criteria outlined in the methodology section are initially used to determine receptor sensitivity. Receptors are located within a predominantly agricultural area, where the baseline dust soiling environment would be expected to be high. However, with consideration to the fact that the nearest receptors are located particularly close to the Site boundary and traffic route, the final sensitivity of the area is Medium.

To determine the sensitivity of the surrounding receptors to human health, baseline annual mean PM_{10} concentrations have been considered, as presented in Table 7.14. It is estimated that baseline annual mean PM_{10} concentrations are low (as qualified in Table 7.5), the final sensitivity of the area is Low.

7.5.1.3 Risk of Impacts from Unmitigated Activities

The risk of impacts from dust soiling and human health caused by unmitigated activities is presented in Table 7.16.

Table 7.16: Risk of Impacts from Unmitigated Activities from the Proposed Development

Potential Impacts	Demolition	Earthworks	Construction	Trackout
Dust Soiling	Low Risk	Low Risk	Low Risk	Negligible
Human Health	Negligible	Negligible	Negligible	Negligible

The risk assessment for construction dust indicates that there would be a negligible to low risk of unmitigated dust impacts on human health (PM_{10}) and a negligible risk for dust soiling from unmitigated activities for the Proposed Development. These risk classifications are solely used to select the appropriate schedule of mitigation measures, examples of which are set out in guidance published by the IAQM[7]. For all but the smallest of sites the use of the high-risk schedule of measures represents good working practice.

On consideration of the likely effectiveness of these measures, additional site-specific measures will be identified in the contractors' Construction Environmental Management Plan (CEMP). The CEMP has a procedure for dealing with complaints during construction and associated works, where these complaints require actions to further mitigate dust emissions, measures to address this may include:

- Cutting and grinding operations, if required, will be conducted using equipment and techniques that reduce emissions and incorporate appropriate dust suppression measures.
- Damping down of dust-generating equipment and vehicles within the Site and the provision of dust suppression in all areas of the Site that are likely to generate dust.
- Use water suppression and regular cleaning during earth moving activities.
- Materials stockpiles likely to generate dust enclosed or securely sheeted, damped down or stabilised as appropriate.
- Covering materials, deliveries or loads entering and leaving the construction site.
- Mixing of grout or cement-based materials will be undertaken using appropriate techniques/ mitigation.
- Measures will be taken to keep roads and accesses clean; and
- Vehicle, plant and equipment maintenance records will be kept on-site and reviewed regularly.

It is considered that with the implementation of appropriate good practice control measures set out in the CEMP, the potential effect from fugitive emissions of dust during construction would not be significant.

7.5.2 Operational Phase Site Emissions Assessment

The assessment has quantified the contribution of emissions from the proposed OCGT generator to pollutant concentrations at 15 human health sensitive receptors and pollutant concentrations and deposition rates at 15 ecological sensitive receptors within the model domain. These receptors are shown in Figure 7.3 and Figure 7.4 (refer to EIAR Volume III). The contribution has been compared to relevant EALs to determine the magnitude of impact. The pollutant contribution to pollutant concentrations and deposition rates has been added to the background contribution to provide an estimate of total pollutant concentrations and deposition rates. These values can be directly compared to the relevant EALs.

This results section is split among the two scenarios, the Proposed Development Scenario, which comprises the proposed OCGT, as presented in Section 7.3.3.1. As discussed previously, results are presented as PC, with reference to the contribution from modelled sources, and with addition of BC, as PEC. Both PC and PEC are presented in terms of concentration and as a portion of the relevant EAL.

Isopleth plots providing a visual representation of how pollutants disperse are presented for the Proposed Development Scenario in Figure 7.5 to Figure 7.12 (refer to EIAR Volume III).

7.5.2.1 Proposed Development Scenario

Table 7.17: presents annual mean concentrations of NO_2 at human receptor locations in the Proposed Development Scenario.

Table 7.17: Modelled Annual-Mean NO_2 Emissions at Human Health Receptor Locations – Proposed Development

Receptor ID	EAL ($\mu g/m^3$)	PC ($\mu g/m^3$)					Max PC ($\mu g/m^3$)	PC/EAL (%)	BC ($\mu g/m^3$)	PEC ($\mu g/m^3$)	PEC/ EAL (%)
		2017	2018	2019	2020	2021					
R1	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7.4	7.4	18.5%
R2	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7.4	7.4	18.5%
R3	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7.4	7.4	18.5%
R4	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7.4	7.4	18.5%
R5	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7.4	7.4	18.5%
R6	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7.4	7.4	18.5%
R7	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7.4	7.4	18.5%
R8	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7.4	7.4	18.5%
R9	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7.4	7.4	18.5%
R10	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7.4	7.4	18.5%
R11	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7.4	7.4	18.5%
R12	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7.4	7.4	18.5%
R13	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7.4	7.4	18.5%

Receptor ID	EAL (µg/m³)	PC (µg/m³)					Max PC (µg/m³)	PC/EAL (%)	BC (µg/m³)	PEC (µg/m³)	PEC/ EAL (%)
		2017	2018	2019	2020	2021					
R14	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7.4	7.4	18.5%
R15	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7.4	7.4	18.5%

The results presented in Table 7.17: show that predicted concentrations of annual mean NO_2 are low at human receptors. The maximum PC at any human receptor location is less than 0.1µg/m³, which is less than 0.1% of the EAL. The PEC at each site is 18.5% of the EAL.

Within the context of EPA guidance on maximum allowable PC[10] (Maximum Allowable PC = 0.75*AQS), all predicted results are considerably within the allowable range. In the context of UK EA guidance on significance[11], all PCs are less than 1% of the EAL and, under those criteria, can be screened out as not significant.

The final method for determining significance set out in Section 7.3.4 is from the professional guidance published by IAQM and EPUK[12]. As presented in Section 7.3.4 this guidance sets out impact descriptors as a product of change in concentration (PC), with consideration to the long-term total concentration of pollutants (PEC). The largest predicted PC of annual mean NO_2, as presented in Table 7.17:, is 0.1% of the EAL, and with a PEC of 18.6% of the EAL, the impact can be described as imperceptible for all receptors, using EPA terms. The impact of annual mean NO_2 at human receptors is therefore not significant.

Table 7.18 shows predicted concentrations of 99.79th percentile 1-hour mean NO_2 at human receptors in the Proposed Development Scenario.

Table 7.18: Modelled 99.79th Percentile 1-Hour Mean NO_2 Emissions at Human Health Receptor Locations – Proposed Development

Receptor ID	EAL (µg/m³)	PC (µg/m³)					Max PC (µg/m³)	PC/EAL (%)	BC (µg/m³)	PEC (µg/m³)	PEC/ EAL (%)
		2017	2018	2019	2020	2021					
R1	200	0.1	0.4	0.4	0.3	0.3	0.4	0.2	14.8	15.2	7.6%
R2	200	0.1	0.3	0.4	0.3	0.2	0.4	0.2	14.8	15.2	7.6%
R3	200	0.1	0.2	0.3	0.2	0.2	0.3	0.2	14.8	15.1	7.6%
R4	200	1.1	0.9	0.9	1.2	1.0	1.2	0.6	14.8	16.0	8.0%
R5	200	0.6	1.4	1.2	1.4	0.9	1.4	0.7	14.8	16.2	8.1%
R6	200	0.5	1.4	1.0	1.5	0.6	1.5	0.8	14.8	16.3	8.2%
R7	200	0.7	1.0	0.9	1.1	0.6	1.1	0.6	14.8	15.9	8.0%
R8	200	1.4	1.0	1.2	1.7	1.0	1.7	0.9	14.8	16.5	8.3%
R9	200	1.0	1.0	1.2	1.8	0.8	1.8	0.9	14.8	16.6	8.3%
R10	200	2.4	2.4	2.3	2.4	1.9	2.4	1.2	14.8	17.2	8.6%
R11	200	2.9	2.8	2.9	2.9	2.4	2.9	1.5	14.8	17.7	8.9%
R12	200	0.9	1.1	1.0	1.1	0.9	1.1	0.6	14.8	15.9	8.0%
R13	200	2.7	2.7	2.7	2.5	2.5	2.7	1.4	14.8	17.5	8.8%
R14	200	1.2	1.3	1.3	1.3	0.8	1.3	0.7	14.8	16.1	8.1%
R15	200	0.4	0.2	0.4	0.5	0.3	0.5	0.3	14.8	15.3	7.7%

The results presented in Table 7.18 show that predicted concentrations of 99.79th percentile 1-hour mean NO_2 are low at human receptors. The maximum PC at any human receptor location (R11) is 2.9µg/m^3, which is 1.5% of the EAL. The maximum PEC at any human receptor location (also R11) is 17.7µg/m^3, which is 8.9% of the EAL.

Within the context of EPA guidance on maximum allowable PC[10] (Maximum Allowable PC = 0.75*AQS), all predicted results are considerably within the allowable range. In the context of UK EA guidance on significance[11], all PCs are less than 10% of the Environmental Assessment Level, under those criteria, would be considered not significant.

The final method for determining significance set out in Section 7.3.4 is from the professional guidance published by IAQM and EPUK[12]. As presented in Section 7.3.4 this guidance sets out impact descriptors as a product of change in concentration (PC), with consideration to the short-term PC. The largest predicted PC of 1-hour mean NO_2, as presented in Table 7.18, is 1.5% of the EAL, and with the PEC 8.9% of the EAL, the impact can be described as imperceptible at most for any receptors. The impact of 1-hour mean NO_2 at human receptors is therefore not significant.

Table 7.19 shows predicted concentrations of 99.18th percentile 24-hour mean SO_2 at human receptors in the Proposed Development Scenario.

Table 7.19: Modelled 99.18th Percentile 24-Hour Mean SO_2 Emissions at Human Health Receptor Locations – Proposed Development

Receptor ID	EAL (µg/m^3)	PC (µg/m^3)					Max PC (µg/m^3)	PC/EAL (%)	BC (µg/m^3)	PEC (µg/m^3)	PEC/ EAL (%)
		2017	2018	2019	2020	2021					
R1	125	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10.0	10.0	8.0%
R2	125	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10.0	10.0	8.0%
R3	125	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10.0	10.0	8.0%
R4	125	0.1	0.1	0.1	0.1	<0.1	0.1	0.1	10.0	10.1	8.1%
R5	125	<0.1	0.1	0.1	0.1	<0.1	0.1	0.1	10.0	10.1	8.1%
R6	125	<0.1	0.1	<0.1	0.1	<0.1	0.1	0.1	10.0	10.1	8.1%
R7	125	<0.1	0.1	0.1	0.1	<0.1	0.1	0.1	10.0	10.1	8.1%
R8	125	0.1	0.1	0.1	0.1	<0.1	0.1	0.1	10.0	10.1	8.1%
R9	125	<0.1	0.1	0.1	0.1	<0.1	0.1	0.1	10.0	10.1	8.1%
R10	125	0.2	0.2	0.2	0.3	0.1	0.3	0.2	10.0	10.3	8.2%
R11	125	0.2	0.3	0.2	0.3	0.1	0.3	0.2	10.0	10.3	8.2%
R12	125	<0.1	0.1	<0.1	<0.1	<0.1	0.1	0.1	10.0	10.1	8.1%
R13	125	0.2	0.2	0.2	0.1	0.1	0.2	0.2	10.0	10.2	8.2%
R14	125	0.1	0.1	0.1	0.1	0.1	0.1	0.1	10.0	10.1	8.1%
R15	125	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10.0	10.0	8.0%

The results presented in Table 7.19 show that predicted concentrations of 99.18th percentile 24-hour mean SO_2 are low at human receptors. The maximum PC at any human receptor location (R10 and R11) is 0.3µg/m^3, which is 0.2% of the EAL. The maximum PEC at any human receptor location (also R10 and R11) is 10.3µg/m^3, which is 8.2% of the EAL.

Within the context of EPA guidance on maximum allowable PC[10] (Maximum Allowable PC = 0.75*AQS), all predicted results are considerably within the allowable range. In the context of UK EA guidance on significance[11], all PCs are less than 10% of the Environmental Assessment, under those criteria, would be considered not significant.

The final method for determining significance set out in Section 7.3.4 is from the professional guidance published by IAQM and EPUK[12]. As presented in Section 7.3.4 this guidance sets out impact descriptors as a product of change in concentration (PC), with consideration to the short-term PC. The largest predicted PC of 24-hour mean SO_2, as presented in Table 7.19, is 0.2% of the EAL, and with the PEC 8.2% of the EAL, the impact can be described as imperceptible at the most affected receptor. The impact of 24-hour mean SO_2 at human receptors is therefore not significant.

Table 7.20 shows predicted concentrations of 99.73rd percentile 1-hour mean SO_2 at human receptors in the Proposed Development Scenario.

Table 7.20: Modelled 99.73rd Percentile 1-Hour Maximum SO_2 Emissions at Human Health Receptor Locations – Proposed Development

Receptor ID	EAL (µg/m³)	PC (µg/m³)					Max PC (µg/m³)	PC/EAL (%)	BC (µg/m³)	PEC (µg/m³)	PEC/ EAL (%)
		2017	2018	2019	2020	2021					
R1	350	<0.1	0.1	0.1	<0.1	<0.1	0.1	<0.1	10.0	10.1	2.9%
R2	350	<0.1	0.1	0.1	<0.1	<0.1	0.1	<0.1	10.0	10.1	2.9%
R3	350	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10.0	10.0	2.9%
R4	350	0.2	0.2	0.2	0.2	0.2	0.2	0.1	10.0	10.2	2.9%
R5	350	0.1	0.2	0.2	0.2	0.1	0.2	0.1	10.0	10.2	2.9%
R6	350	0.1	0.2	0.1	0.2	0.1	0.2	0.1	10.0	10.2	2.9%
R7	350	0.1	0.2	0.2	0.2	0.1	0.2	0.1	10.0	10.2	2.9%
R8	350	0.2	0.2	0.2	0.3	0.2	0.3	0.1	10.0	10.3	2.9%
R9	350	0.2	0.2	0.2	0.2	0.1	0.2	0.1	10.0	10.2	2.9%
R10	350	0.5	0.5	0.5	0.5	0.3	0.5	0.1	10.0	10.5	3.0%
R11	350	0.6	0.6	0.6	0.6	0.5	0.6	0.2	10.0	10.6	3.0%
R12	350	0.2	0.2	0.2	0.2	0.2	0.2	0.1	10.0	10.2	2.9%
R13	350	0.5	0.5	0.5	0.5	0.5	0.5	0.1	10.0	10.5	3.0%
R14	350	0.2	0.3	0.3	0.2	0.1	0.3	0.1	10.0	10.3	2.9%
R15	350	0.1	<0.1	0.1	0.1	0.1	0.1	<0.1	10.0	10.1	2.9%

The results presented in Table 7.20 show that predicted concentrations of 99.73rd percentile 1-hour mean SO_2 are generally low at human receptors. The maximum PC at any human receptor location (R11) is 0.6 µg/m³, which is less than 0.1% of the EAL. The maximum PEC at any human receptor location (also R11) is 10.6µg/m³, which is 3.0% of the EAL.

Within the context of EPA guidance on maximum allowable PC[9] (Maximum Allowable PC = 0.75*AQS), all predicted results are considerably within the allowable range. In the context of UK EA guidance on significance[10], all PCs are less than 10% of the Environmental Assessment Level, under those criteria, would be considered not significant.

The final method for determining significance set out in Section 7.3.4 is from the professional guidance published by IAQM and EPUK[12]. As presented in Section 7.3.4 this guidance sets out impact descriptors as a product of change in concentration (PC), with consideration to the short-term PC. The largest predicted PC of 1-hour mean SO_2, as presented in Table 7.20, is less than 0.1% of the EAL, and with the PEC 3.0% of the EAL, the impact can be described as imperceptible at the most affected receptor. As the PEC is considerably smaller than the EAL, the impact of 24-hour mean SO_2 at human receptors is therefore not significant.

Table 7.21 shows predicted concentrations of maximum 8-hour mean CO at human receptors in the Proposed Development Scenario.

Table 7.21: Modelled Maximum 8-Hour Mean CO Emissions at Human Health Receptor Locations – Proposed Development

Recept or ID	EAL (µg/m³)	PC (µg/m³)					Max PC (µg/m³)	PC/EAL (%)	BC (µg/m³)	PEC (µg/m³)	PEC/ EAL (%)
		2017	2018	2019	2020	2021					
R1	10,000	0.9	1.6	1.9	1.4	1.2	1.9	<0.1	0.8	2.7	<0.1%
R2	10,000	0.7	1.7	2.2	1.4	1.0	2.2	<0.1	0.8	3.0	<0.1%
R3	10,000	0.4	1.3	2.2	1.0	1.1	2.2	<0.1	0.8	3.0	<0.1%
R4	10,000	4.4	3.9	8.1	10.1	2.7	10.1	0.1	0.8	10.9	0.1%
R5	10,000	6.1	8.8	5.1	5.0	5.0	8.8	0.1	0.8	9.6	0.1%
R6	10,000	5.1	7.3	6.7	8.1	3.3	8.1	0.1	0.8	8.9	0.1%
R7	10,000	4.1	4.7	3.4	4.8	3.7	4.8	<0.1	0.8	5.6	0.1%
R8	10,000	8.6	7.4	6.1	10.6	5.5	10.6	0.1	0.8	11.4	0.1%
R9	10,000	5.7	4.7	6.8	8.5	3.3	8.5	0.1	0.8	9.3	0.1%
R10	10,000	8.7	8.8	7.8	8.6	6.9	8.8	0.1	0.8	9.6	0.1%
R11	10,000	9.2	9.9	9.9	9.6	7.4	9.9	0.1	0.8	10.7	0.1%
R12	10,000	5.1	5.0	3.0	2.7	3.0	5.1	0.1	0.8	5.9	0.1%
R13	10,000	10.2	1<0.1	8.3	7.6	7.0	10.2	0.1	0.8	11.0	0.1%
R14	10,000	3.6	3.4	4.5	4.6	3.3	4.6	<0.1	0.8	5.4	0.1%
R15	10,000	2.3	1.0	3.8	3.1	2.0	3.8	<0.1	0.8	4.6	<0.1%

The results presented in Table 7.21 show that predicted concentrations of maximum 8-hour mean CO are low at human receptors. The maximum PC at any human receptor location (R8) is 10.6µg/m³, which is 0.1% of the EAL. The maximum PEC at any human receptor location (also R8) is 11.4µg/m³, which is 0.1% of the EAL.

Within the context of EPA guidance on maximum allowable PC[10] (Maximum Allowable PC = 0.75*AQS), all predicted results are considerably within the allowable range. In the context of UK EA guidance on significance[11], all PCs are less than 10% of the EAL and, under those criteria, would be considered not significant.

The final method for determining significance set out in Section 7.3.4 is from the professional guidance published by IAQM and EPUK[12]. As presented in Section 7.3.4 this guidance sets out impact descriptors as a product of change in concentration (PC), with consideration to the short-term PC. The largest

predicted PC of maximum 8-hour CO, as presented in Table 7.21, is 0.1% of the EAL, and with the PEC 0.1% of the EAL, the impact can be described as imperceptible for all receptors. The impact of maximum 8-hour CO at human receptors is therefore not significant.

Table 7.22 shows predicted concentrations of annual mean PM_{10} at human receptors in the Proposed Development Scenario.

Table 7.22: Modelled Annual Mean PM_{10} Emissions at Human Health Receptor Locations – Proposed Development

Receptor ID	EAL (µg/m³)	PC (µg/m³)					Max PC (µg/m³)	PC/EAL (%)	BC (µg/m³)	PEC (µg/m³)	PEC/ EAL (%)
		2017	2018	2019	2020	2021					
R1	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R2	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R3	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R4	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R5	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R6	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R7	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R8	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R9	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R10	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R11	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R12	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R13	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R14	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R15	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%

The results presented in Table 7.22 show that predicted concentrations of annual mean PM_{10} are low at human receptors. The maximum PC at any human receptor location is less than 0.1µg/m³, which is less than 0.1% of the EAL. The maximum PEC at any human receptor location is 12.7µg/m³, which is 31.8% of the EAL.

Within the context of EPA guidance on maximum allowable PC[10] (Maximum Allowable PC = 0.75*AQS), all predicted results are considerably within the allowable range. In the context of UK EA guidance on significance[11], all PCs are less than 1% of the EAL and, under those criteria, would be considered not significant.

The final method for determining significance set out in Section 7.3.4 is from the professional guidance published by IAQM and EPUK[12]. As presented in Section 7.3.4 this guidance sets out impact descriptors as a product of change in concentration (PC), with consideration to the long-term total concentration of pollutants (PEC). The largest predicted PC of annual mean PM_{10}, as presented in Table 7.22, is less than 0.1% of the EAL, and with the PEC 31.8% of the EAL, the impact can be described as imperceptible all receptors. The impact of annual mean PM_{10} at human receptors is therefore not significant.

Table 7.23 shows predicted concentrations of 90.41st percentile 24-hour mean PM_{10}.

Table 7.23: Modelled 90.41st Percentile 24-Hour Mean PM_{10} Emissions at Human Health Receptor Locations – Proposed Development

Receptor ID	EAL (µg/m³)	PC (µg/m³)					Max PC (µg/m³)	PC/EAL (%)	BC (µg/m³)	PEC (µg/m³)	PEC/ EAL (%)
		2017	2018	2019	2020	2021					
R1	50	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	25.4	25.4	50.8%
R2	50	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	25.4	25.4	50.8%
R3	50	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	25.4	25.4	50.8%
R4	50	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	25.4	25.4	50.8%
R5	50	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	25.4	25.4	50.8%
R6	50	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	25.4	25.4	50.8%
R7	50	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	25.4	25.4	50.8%
R8	50	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	25.4	25.4	50.8%
R9	50	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	25.4	25.4	50.8%
R10	50	0.1	0.1	0.1	0.1	<0.1	0.1	0.2	25.4	25.5	51.0%
R11	50	0.1	0.1	0.1	0.1	<0.1	0.1	0.2	25.4	25.5	51.0%
R12	50	0.1	0.1	0.1	<0.1	<0.1	0.1	0.2	25.4	25.5	51.0%
R13	50	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	25.4	25.4	50.8%
R14	50	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	25.4	25.4	50.8%
R15	50	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	25.4	25.4	50.8%

The results presented in Table 7.23 show that predicted concentrations of 90.41st percentile 24-hour mean PM_{10} are low at human receptors. The maximum PC at any human receptor location (R10, R11 and R12) is 0.1µg/m³, which is 0.2% of the EAL. The maximum PEC at any human receptor location (also R10, R11 and R12) is 25.5µg/m³, which is 51.0% of the EAL.

Within the context of EPA guidance on maximum allowable PC[10] (Maximum Allowable PC = 0.75*AQS), all predicted results are considerably within the allowable range. In the context of UK EA guidance on significance[11], all PCs are less than 10% of the EAL and, under those criteria, would be considered not significant.

The final method for determining significance set out in Section 7.3.4 is from the professional guidance published by IAQM and EPUK[12]. As presented in Section 7.3.4 this guidance sets out impact descriptors as a product of change in concentration (PC), with consideration to the short-term PC. The largest predicted PC of 24-hour mean PM_{10}, as presented in Table 7.23, is 0.2% of the EAL, and with the PEC 51.0% of the EAL, the impact can be described as imperceptible for all receptors. The impact of 24-hour mean PM_{10} at human receptors is therefore not significant.

Table 7.24 show predicted concentrations of annual mean $PM_{2.5}$ at human receptors in the Proposed Development Scenario.

Table 7.24: Modelled Annual Mean $PM_{2.5}$ Emissions at Human Health Receptor Locations – Proposed Development

Receptor ID	EAL (µg/m³)	PC (µg/m³)					Max PC (µg/m³)	PC/EAL (%)	BC (µg/m³)	PEC (µg/m³)	PEC/ EAL (%)
		2017	2018	2019	2020	2021					
R1	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R2	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R3	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R4	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R5	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R6	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R7	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R8	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R9	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R10	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R11	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R12	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R13	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R14	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R15	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%

The results presented in Table 7.22 show that predicted concentrations of annual mean $PM_{2.5}$ are low at human receptors. The maximum PC at any human receptor location is less than 0.1µg/m³, which is less than 0.1% of the EAL. The maximum PEC at any human receptor location is 8.4µg/m³, which is 42.0% of the EAL.

Within the context of EPA guidance on maximum allowable PC[10] (Maximum Allowable PC = 0.75*AQS), all predicted results are considerably within the allowable range. In the context of UK EA guidance on significance[11], all PCs are less than 1% of the EAL and, under those criteria, would be considered not significant.

The final method for determining significance set out in Section 7.3.4 is from the professional guidance published by IAQM and EPUK[12]. As presented in Section 7.3.4 this guidance sets out impact descriptors as a product of change in concentration (PC), with consideration to the long-term total concentration of pollutants (PEC). The largest predicted PC of annual mean PM_{10}, as presented in Table 7.22, is less than 0.1% of the EAL, and with the PEC 42.0% of the EAL, the impact can be described as imperceptible all receptors. The impact of annual mean $PM_{2.5}$ at human receptors is therefore not significant.

Table 7.25 show predicted concentrations of annual mean NO_X at ecological receptors in the Proposed Development Scenario.

Table 7.25: Modelled Annual Mean NO_X Emissions at Ecological Receptor Locations – Proposed Development

Receptor ID	EAL (µg/m³)	PC (µg/m³)					Max PC (µg/m³)	PC/EAL (%)	BC (µg/m³)	PEC (µg/m³)	PEC/ EAL (%)
		2017	2018	2019	2020	2021					
E1a	30	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.0	14.0	46.7%
E1b	30	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.0	14.0	46.7%
E1c	30	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.0	14.0	46.7%
E2a	30	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.0	14.0	46.7%
E2b	30	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.0	14.0	46.7%
E2c	30	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.0	14.0	46.7%
E2d	30	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.0	14.0	46.7%
E2e	30	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.0	14.0	46.7%
E2f	30	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.0	14.0	46.7%
E2g	30	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.0	14.0	46.7%
E2h	30	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.0	14.0	46.7%
E2i	30	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.0	14.0	46.7%
E2j	30	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.0	14.0	46.7%
E3	30	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.0	14.0	46.7%
E4	30	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	14.0	14.0	46.7%

The results presented in Table 7.25 show that predicted concentrations of annual mean NO_X are low at ecological receptors. The maximum PC at any ecological receptor location is less than 0.1µg/m³, which is less than 0.1% of the EAL. The maximum PEC at any ecological receptor location is 14.0µg/m³, which is 46.7% of the EAL.

Within the context of EPA guidance on maximum allowable PC[10] (Maximum Allowable PC = 0.75*AQS), all predicted results are considerably within the allowable range. In the context of UK EA guidance on significance[11], all PCs are less than 1% of the EAL and, under those criteria, would be considered not significant.

The final method for determining significance set out in Section 7.3.4 is from the professional guidance published by IAQM and EPUK[12]. As presented in Section 7.3.4 this guidance sets out impact descriptors as a product of change in concentration (PC), with consideration to the long-term total concentration of pollutants (PEC). The largest predicted PC of annual mean NO_X, as presented in Table 7.25, is less than 0.1% of the EAL, and with the PEC 46.7% of the EAL, the impact can be described as imperceptible for all receptors. The impact of annual mean NO_X at ecological receptors is therefore not significant.

Table 7.26 shows predicted concentrations of annual mean SO_2 at ecological receptors in the Proposed Development Scenario.

Table 7.26: Modelled Annual Mean SO_2 Emissions at Ecological Receptor Locations – Proposed Development

Receptor ID	EAL (µg/m³)	PC (µg/m³)					Max PC (µg/m³)	PC/EAL (%)	BC (µg/m³)	PEC (µg/m³)	PEC/ EAL (%)
		2017	2018	2019	2020	2021					
E1a	20	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0.1	5.0	5.0	25.0%
E1b	20	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0.1	5.0	5.0	25.0%
E1c	20	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0.1	5.0	5.0	25.0%
E2a	20	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0.1	5.0	5.0	25.0%
E2b	20	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0.1	5.0	5.0	25.0%
E2c	20	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0.1	5.0	5.0	25.0%
E2d	20	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0.1	5.0	5.0	25.0%
E2e	20	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0.1	5.0	5.0	25.0%
E2f	20	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0.1	5.0	5.0	25.0%
E2g	20	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0.1	5.0	5.0	25.0%
E2h	20	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0.1	5.0	5.0	25.0%
E2i	20	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0.1	5.0	5.0	25.0%
E2j	20	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0.1	5.0	5.0	25.0%
E3	20	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0.1	5.0	5.0	25.0%
E4	20	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0. 1	<0.1	5.0	5.0	25.0%

The results presented in Table 7.26 show that predicted concentrations of annual mean SO_2 are low at ecological receptors. The maximum PC at ecological receptor locations (E2i) is 0.0012µg/m³, which is less than 0.1% of the EAL. The maximum PEC at any ecological receptor location is 5.0µg/m³, which is 25% of the EAL.

Within the context of EPA guidance on maximum allowable PC[10] (Maximum Allowable PC = 0.75*AQS), all predicted results are considerably within the allowable range. In the context of UK EA guidance on significance[11], all PCs are less than 1% of the EAL and, under those criteria, would be considered not significant.

The final method for determining significance set out in Section 7.3.4 is from the professional guidance published by IAQM and EPUK[12]. As presented in Section 7.3.4 this guidance sets out impact descriptors as a product of change in concentration (PC), with consideration to the long-term total concentration of pollutants (PEC). The largest predicted PC of annual mean SO_2, as presented in Table 7.26, is less than 0.1% of the EAL, and with the PEC 25.0% of the EAL, the impact can be described as imperceptible for all receptors. As the PEC is considerably smaller than the EAL, the impact is not significant.

Table 7.27 shows predicted concentrations of annual nitrogen deposition at ecological receptors in the Proposed Development Scenario.

Table 7.27: Modelled Annual Nitrogen Deposition at Ecological Receptor Locations – Proposed Development

Receptor ID	EAL (kg/ha/yr)	Max PC (µg/m^3)		Total N Dep (kg/ha/yr)	PC/EAL (%)	BC (kg/ha/yr)	PEC (kg/ha/yr)	PEC/ EAL (%)
		NO_X	NH_3					
E1a	5	<0.01	<0.01	<0.001	<0.1	3.98	3.98	79.6
E1b	5	<0.01	<0.01	<0.001	<0.1	3.98	3.98	79.6
E1c	5	<0.01	<0.01	<0.001	<0.1	3.98	3.98	79.6
E2a	5	<0.01	<0.01	<0.001	<0.1	5.16	5.16	103.2
E2b	5	<0.01	<0.01	<0.001	<0.1	5.16	5.16	103.2
E2c	5	<0.01	<0.01	<0.001	<0.1	5.16	5.16	103.2
E2d	5	0.01	<0.01	0.001	<0.1	3.86	3.86	77.2
E2e	5	0.01	<0.01	0.001	<0.1	3.91	3.91	78.2
E2f	5	<0.01	<0.01	<0.001	<0.1	3.98	3.98	79.6
E2g	5	0.01	<0.01	0.002	<0.1	3.28	3.28	65.6
E2h	5	0.01	<0.01	0.001	<0.1	3.45	3.45	69.0
E2i	5	0.01	<0.01	0.002	<0.1	4.14	4.14	82.8
E2j	5	<0.01	<0.01	<0.001	<0.1	5.02	5.02	100.4
E3	10	0.01	<0.01	0.001	<0.1	5.02	5.02	50.2
E4	5	0.01	<0.01	0.001	<0.1	5.00	5.00	100.0

The results presented in Table 7.27 show that predicted concentrations of annual nitrogen deposition are low at ecological receptors. The maximum PC (contribution from the Proposed Development) at any ecological receptor location (E2g and E2i) is 0.002 kg/ha/year, which is <0.1% of the EAL. The maximum PEC at any ecological receptor location (E2a, E2b and E2c) is 5.16 kg/ha/year, which is 103.2% of the EAL. The table shows that there is a high background contribution of nitrogen deposition at all receptor locations, the predicted PC, by comparison, is very small.

Within the context of EPA guidance on maximum allowable PC[10] (Maximum Allowable PC = 0.75*(AQS – BC) where there is a significant background concentration), all predicted results are considerably within the allowable range. In the context of UK EA guidance on significance[11], the impacts of nitrogen deposition at all receptors can be screened out as not significant based on the screening criteria, this is because the PC is less than 1% at all receptors.

The final method for determining significance set out in Section 7.3.4 is from the professional guidance published by IAQM and EPUK[12]. As presented in Section 7.3.4 this guidance sets out impact descriptors as a product of change in concentration (PC), with consideration to the long-term total concentration of pollutants (PEC). The largest predicted PC of annual mean deposited nitrogen, as presented in Table 7.27, is <0.1% of the EAL, the impact can be described as imperceptible for all receptors. The impact of annual mean deposited nitrogen at ecological receptors is therefore not significant.

Table 7.28 shows predicted concentrations of annual acid deposition at ecological receptors in the Proposed Development Scenario.

Table 7.28: Modelled Annual Acid Deposition at Ecological Receptor Locations – Proposed Development

Receptor ID	EAL (keq/ha/yr)			Max PC (keq/ha/yr)		PC/EAL (%)	BC (keq/ha/yr)		PEC/ EAL (%)
	MinCLminN	MinCLMaxN	MinCLMaxS	N	S		N	S	
E1a	0.071	0.375	0.303	0.00001	0.00001	<0.1	0.06	0.28	90.7
E1b	0.071	0.375	0.303	0.00002	0.00001	<0.1	0.06	0.28	90.7
E1c	0.071	0.375	0.303	0.00001	0.00001	<0.1	0.06	0.28	90.7
E2a	0.071	0.375	0.303	0.00002	0.00002	<0.1	0.05	0.37	112.0
E2b	0.071	0.375	0.303	0.00002	0.00002	<0.1	0.05	0.37	112.0
E2c	0.071	0.375	0.303	0.00002	0.00002	<0.1	0.05	0.37	112.0
E2d	0.071	0.375	0.303	0.00011	0.00010	0.1	0.05	0.28	88.1
E2e	0.071	0.375	0.303	0.00011	0.00010	0.1	0.07	0.28	93.4
E2f	0.071	0.311	0.24	0.00003	0.00003	<0.1	0.06	0.28	109.3
E2g	0.071	0.311	0.24	0.00013	0.00012	0.1	0.04	0.23	86.9
E2h	0.071	0.311	0.24	0.00008	0.00007	<0.1	0.04	0.25	93.3
E2i	0.071	0.311	0.24	0.00015	0.00013	0.1	0.06	0.30	115.8
E2j	0.071	0.311	0.24	0.00004	0.00003	<0.1	0.04	0.36	128.6
E3	0.143	0.509	0.366	0.00011	0.00010	<0.1	0.05	0.36	80.6
E4	0.143	0.46	0.317	0.00006	0.00006	<0.1	0.04	0.36	87.0

The results presented in Table 7.28 show that predicted concentrations of annual acid deposition are generally low at ecological receptors. The maximum PC at all ecological receptor locations (E2d, E2e, E2g, E2i) is 0.1% of the EAL. The maximum PEC at any ecological receptor location (E2j) is 128.6% of the EAL. The table shows that there is a high background contribution of acid deposition at all receptor locations, the predicted PC, by comparison, is very small.

Within the context of EPA guidance on maximum allowable PC[10] (Maximum Allowable PC = 0.75*(AQS – BC) where there is a significant background concentration), all predicted results are considerably within the allowable range. In the context of UK EA guidance on significance[11], the impacts of acid deposition at all receptors can be screened out as not significant based on the screening criteria, this is because the PC is less than 1% at all receptors.

The final method for determining significance set out in Section 7.3.4 is from the professional guidance published by IAQM and EPUK[12]. As presented in Section 7.3.4 this guidance sets out impact descriptors as a product of change in concentration (PC), with consideration to the long-term total concentration of pollutants (PEC). The largest predicted PC of annual mean deposited acid, as presented in Table 7.28, is 0.1% of the EAL, the impact can be described as imperceptible for all receptors. The impact of annual mean deposited acid at ecological receptors is therefore not significant.

7.6 Mitigation

Based on the assessments in this chapter, no additional measures to mitigate the effects of air quality are required, outside the scope of good practice and the Site's Industrial Emissions Licence. Additional mitigation measures to control fugitive dust in the construction phase of the Proposed Development are referred to in Section 7.5.1.3, which have been carried froward to the CEMP, and may be utilised in the event of complaints pertaining to dust emissions.

7.7 Cumulative Impacts

This section presents results from the cumulative developments scenario outlined in Section 7.3.3.2 of this document.

Table 7.29 presents annual mean concentrations of NO_2 at human receptor locations in the cumulative developments scenario which comprises the Proposed Development Scenario (proposed OCGT) and sources from cumulative developments (TEG and Moneypoint Power Station) as outlined in Section 7.3.3.2. These developments were identified as the only additional sources of air pollution not captured in the background concentrations which will be in place when the Proposed Development is operational.

Table 7.29: Modelled Annual-Mean NO_2 Emissions at Human Health Receptor Locations – Cumulative Developments

Receptor ID	EAL (µg/m³)	PC (µg/m³)					Max PC (µg/m³)	PC/EAL (%)	BC (µg/m³)	PEC (µg/m³)	PEC/ EAL (%)
		2017	2018	2019	2020	2021					
R1	40	0.2	0.2	0.3	0.3	0.2	0.3	0.8	7.4	7.7	19.3%
R2	40	0.3	0.2	0.3	0.3	0.2	0.3	0.8	7.4	7.7	19.3%
R3	40	0.3	0.2	0.3	0.3	0.2	0.3	0.8	7.4	7.7	19.3%
R4	40	0.3	0.2	0.3	0.3	0.2	0.3	0.8	7.4	7.7	19.3%
R5	40	0.2	0.2	0.2	0.2	0.2	0.2	0.5	7.4	7.6	19.0%
R6	40	0.2	0.2	0.2	0.2	0.2	0.2	0.5	7.4	7.6	19.0%
R7	40	0.2	0.2	0.2	0.2	0.2	0.2	0.5	7.4	7.6	19.0%
R8	40	0.2	0.1	0.2	0.2	0.2	0.2	0.5	7.4	7.6	19.0%
R9	40	0.2	0.1	0.2	0.2	0.2	0.2	0.5	7.4	7.6	19.0%
R10	40	0.4	0.3	0.4	0.3	0.4	0.4	1.0	7.4	7.8	19.5%
R11	40	0.5	0.3	0.5	0.4	0.4	0.5	1.3	7.4	7.9	19.8%
R12	40	0.8	0.7	0.7	0.7	0.4	0.8	2.0	7.4	8.2	20.5%
R13	40	0.6	0.5	0.7	0.5	0.4	0.7	1.8	7.4	8.1	20.3%
R14	40	0.3	0.2	0.4	0.3	0.3	0.4	1.0	7.4	7.8	19.5%
R15	40	0.1	0.1	0.1	0.1	0.1	0.1	0.3	7.4	7.5	18.8%

The results presented in Table 7.29 show that predicted concentrations of annual mean NO_2 are low at human receptors. The maximum PC at any human receptor location (R12) is 0.8µg/m³, which is 2.0% of the EAL. The maximum PEC at any human receptor location (also R12) is 8.2µg/m³, which is 20.5% of the EAL.

Within the context of EPA guidance on maximum allowable PC10 (Maximum Allowable PC = 0.75*AQS), all predicted results are considerably within the allowable range. In the context of UK EA guidance on significance11, the effects at all human receptor locations can be considered as not significant as the PEC is less than 70%.

The final method for determining significance set out in Section 7.3.4 is from the professional guidance published by IAQM and EPUK[12]. As presented in Section 7.3.4 this guidance sets out impact descriptors as a product of change in concentration (PC), with consideration to the long-term total concentration of pollutants (PEC). The largest predicted PC of the annual mean NO_2, as presented in Table 7.29, is 2.0% of the EAL, and with the PEC 20.5% of the EAL, the impact can be described as imperceptible at all receptors. The impact of annual mean NO_2 at human receptors is therefore not significant.

Table 7.30 shows the predicted concentrations of the 99.79th percentile 1-hour mean NO_2 at human receptors in the cumulative development scenario.

Table 7.30: Modelled 99.79th Percentile 1-Hour Mean NO_2 Emissions at Human Health Receptor Locations –Cumulative Developments

Receptor ID	EAL (µg/m^3)	PC (µg/m^3)					Max PC (µg/m^3)	PC/EAL (%)	BC (µg/m^3)	PEC (µg/m^3)	PEC/ EAL (%)
		2017	2018	2019	2020	2021					
R1	200	21.6	16.4	23.1	21.5	18.2	23.1	11.6	14.8	37.9	19.0%
R2	200	24.6	17.2	24.7	23.6	18.7	24.7	12.4	14.8	39.5	19.8%
R3	200	26.1	18.2	25.6	24.6	21.1	26.1	13.1	14.8	40.9	20.5%
R4	200	23.9	18.5	23.0	21.5	22.0	23.9	12.0	14.8	38.7	19.4%
R5	200	9.7	8.6	9.4	10.8	9.8	10.8	5.4	14.8	25.6	12.8%
R6	200	8.3	8.4	8.1	8.6	8.9	8.9	4.5	14.8	23.7	11.9%
R7	200	7.2	7.4	7.0	7.8	8.9	8.9	4.5	14.8	23.7	11.9%
R8	200	9.2	8.0	9.0	10.1	10.1	10.1	5.1	14.8	24.9	12.5%
R9	200	11.1	9.4	10.0	10.8	10.2	11.1	5.6	14.8	25.9	13.0%
R10	200	7.8	8.4	9.7	9.4	8.9	9.7	4.9	14.8	24.5	12.3%
R11	200	7.3	8.2	9.6	9.8	8.4	9.8	4.9	14.8	24.6	12.3%
R12	200	9.9	9.6	9.3	10.0	9.2	10.0	5.0	14.8	24.8	12.4%
R13	200	8.2	8.5	11.3	9.4	7.6	11.3	5.7	14.8	26.1	13.1%
R14	200	4.3	4.3	6.3	4.4	4.2	6.3	3.2	14.8	21.1	10.6%
R15	200	4.6	5.8	7.0	5.9	5.1	7.0	3.5	14.8	21.8	10.9%

The results presented in Table 7.30 show that predicted concentrations of 99.79th percentile 1-hour mean NO_2 are low at human receptors. The maximum PC at any human health receptor location (R3) is 26.1 µg/m^3, which is 13.1% of the EAL. The maximum PEC at any human receptor location (also R3) is 40.9 µg/m^3, which is 20.5% of the EAL.

Within the context of EPA guidance on maximum allowable PC[10] (Maximum Allowable PC = 0.75*AQS), all predicted results are considerably within the allowable range. In the context of UK EA guidance on

significance[11], all PCs are less than 20% of the Environmental Assessment Level minus the short-term background, under those criteria, would be considered not significant.

The final method for determining significance set out in Section 7.3.4 is from the professional guidance published by IAQM and EPUK[12]. As presented in Section 7.3.4 this guidance sets out impact descriptors as a product of change in concentration (PC), with consideration to the short-term PC. The largest predicted PC of 1-hour mean NO_2, as presented in Table 7.30, is 13.1% of the EAL, and with the PEC 20.5% of the EAL, the impact can be described as moderate at the most affected receptor. As the PEC is considerably smaller than the EAL, the impact of 1-hour NO_2 at human receptors is therefore not significant.

Table 7.31 shows the predicted concentrations of 99.18th percentile 24-hour mean SO_2 at human receptors in the cumulative development scenario.

Table 7.31: Modelled 99.18th Percentile 24-Hour Mean SO_2 Emissions at Human Health Receptor Locations – Cumulative Developments

Receptor ID	EAL (µg/m^3)	PC (µg/m^3)					Max PC (µg/m^3)	PC/EAL (%)	BC (µg/m^3)	PEC (µg/m^3)	PEC/ EAL (%)
		2017	2018	2019	2020	2021					
R1	125	10.3	5.5	10.6	12.2	6.6	12.2	9.8	10.0	22.2	17.8%
R2	125	12.6	5.9	11.3	12.9	8.3	12.9	10.3	10.0	22.9	18.3%
R3	125	16.2	7.3	11.8	11.8	10.8	16.2	13.0	10.0	26.2	21.0%
R4	125	17.1	7.7	11.5	11.4	12.6	17.1	13.7	10.0	27.1	21.7%
R5	125	4.4	3.7	3.9	4.7	4.0	4.7	3.8	10.0	14.7	11.8%
R6	125	3.9	4.4	3.3	3.4	4.6	4.6	3.7	10.0	14.6	11.7%
R7	125	3.7	3.0	3.0	3.5	4.4	4.4	3.5	10.0	14.4	11.5%
R8	125	4.4	3.6	4.2	4.1	4.4	4.4	3.5	10.0	14.4	11.5%
R9	125	3.8	3.3	3.9	4.3	3.2	4.3	3.4	10.0	14.3	11.4%
R10	125	4.7	3.8	4.0	4.0	4.0	4.7	3.8	10.0	14.7	11.8%
R11	125	4.4	3.9	4.5	4.3	4.0	4.5	3.6	10.0	14.5	11.6%
R12	125	5.6	6.1	5.4	6.7	3.7	6.7	5.4	10.0	16.7	13.4%
R13	125	4.3	5.1	5.2	5.9	3.2	5.9	4.7	10.0	15.9	12.7%
R14	125	1.7	2.2	3.8	2.1	1.8	3.8	3.0	10.0	13.8	11.0%
R15	125	2.1	2.1	2.7	2.2	2.9	2.9	2.3	10.0	12.9	10.3%

The results presented in Table 7.31 show that predicted concentrations of 99.18th percentile 24-hour mean SO_2 are low at human receptors. The maximum PC at any human receptor location (R4) is 17.1µg/m^3, which is 13.7% of the EAL. The maximum PEC at any human receptor location (also R4) is 26.2µg/m^3, which is 21.0% of the EAL.

Within the context of EPA guidance on maximum allowable PC[10] (Maximum Allowable PC = 0.75*AQS), all predicted results are considerably within the allowable range. In the context of UK EA guidance on significance[11], all PCs are less than 20% of the Environmental Assessment Level minus the short-term background, under those criteria, would be considered not significant.

The final method for determining significance set out in Section 7.3.4 is from the professional guidance published by IAQM and EPUK[12]. As presented in Section 7.3.4 this guidance sets out impact descriptors as a product of change in concentration (PC), with consideration to the short-term PC. The largest predicted PC of 24-hour mean SO_2, as presented in Table 7.31, is 13.7% of the EAL (R11), and with the PEC 21.0% of the EAL, the impact can be described as moderate at the most affected receptor. As the PEC is considerably smaller than the EAL, the impact of 24-hour SO_2 at human receptors is therefore not significant.

Table 7.32 shows predicted concentrations of 99.73rd percentile of 1-hour mean SO_2 at human receptor locations in the cumulative development scenario.

Table 7.32: Modelled 99.73rd Percentile 1-Hour Maximum SO_2 Emissions at Human Health Receptor Locations – Cumulative Developments

Receptor ID	EAL (µg/m³)	PC (µg/m³)					Max PC (µg/m³)	PC/EAL (%)	BC (µg/m³)	PEC (µg/m³)	PEC/ EAL (%)
		2017	2018	2019	2020	2021					
R1	350	32.1	25.4	36.3	34.3	28.3	36.3	10.4	10.0	46.3	13.2%
R2	350	36.5	26.7	39.1	36.8	29.8	39.1	11.2	10.0	49.1	14.0%
R3	350	39.8	28.7	40.2	37.2	31.1	40.2	11.5	10.0	50.2	14.3%
R4	350	35.8	29.2	36.0	32.9	32.5	36.0	10.3	10.0	46.0	13.1%
R5	350	15.8	14.0	16.7	16.7	16.1	16.7	4.8	10.0	26.7	7.6%
R6	350	14.3	14.0	14.2	13.8	16.0	16.0	4.6	10.0	26.0	7.4%
R7	350	13.6	13.8	13.0	13.3	16.2	16.2	4.6	10.0	26.2	7.5%
R8	350	17.0	13.8	15.9	15.1	18.2	18.2	5.2	10.0	28.2	8.1%
R9	350	19.7	15.8	16.7	18.1	16.7	19.7	5.6	10.0	29.7	8.5%
R10	350	14.1	14.8	16.4	15.4	16.0	16.4	4.7	10.0	26.4	7.5%
R11	350	14.0	14.4	17.2	16.2	15.1	17.2	4.9	10.0	27.2	7.8%
R12	350	19.4	17.8	18.1	19.2	17.8	19.4	5.5	10.0	29.4	8.4%
R13	350	15.9	16.1	21.4	16.8	14.8	21.4	6.1	10.0	31.4	9.0%
R14	350	6.5	6.4	10.9	6.7	7.1	10.9	3.1	10.0	20.9	6.0%
R15	350	6.3	10.5	12.4	10.5	8.6	12.4	3.5	10.0	22.4	6.4%

The results presented in Table 7.32 show that predicted concentrations of 99.73rd percentile 1-hour mean SO_2 are generally low at human receptors. The maximum PC at any human receptor location (R3) is 40.2µg/m³, which is 11.5% of the EAL. The maximum PEC at any human receptor location (also R3) is 50.2µg/m³, which is 14.3% of the EAL.

Within the context of EPA guidance on maximum allowable PC[10] (Maximum Allowable PC = 0.75*AQS), all predicted results are considerably within the allowable range. In the context of UK EA guidance on significance[11], all PCs are less than 20% of the Environmental Assessment Level minus the short-term background, under those criteria, would be considered not significant.

The final method for determining significance set out in Section 7.3.4 is from the professional guidance published by IAQM and EPUK[12]. As presented in Section 7.3.4 this guidance sets out impact descriptors

as a product of change in concentration (PC), with consideration to the short-term PC. The largest predicted PC of 1-hour mean SO_2, as presented in Table 7.32, is 11.5% of the EAL, and with the PEC 14.3% of the EAL, the impact can be described as moderate at the most affected receptor. As the PEC is considerably smaller than the EAL, the impact of 1-hour SO_2 at human receptors is therefore not significant.

Table 7.33 shows predicted concentrations of maximum 8-hour mean CO at human receptors in the cumulative development scenario.

Table 7.33: Modelled Maximum 8-Hour Mean CO Emissions at Human Health Receptor Locations – Cumulative Developments

Receptor ID	EAL (µg/m³)	PC (µg/m³)					Max PC (µg/m³)	PC/EAL (%)	BC (µg/m³)	PEC (µg/m³)	PEC/ EAL (%)
		2017	2018	2019	2020	2021					
R1	10,000	27.5	17.6	38.4	39.4	24.5	39.4	0.4	0.8	40.2	0.4%
R2	10,000	36.0	22.1	48.2	48.8	29.8	48.8	0.5	0.8	49.6	0.5%
R3	10,000	55.3	24.1	51.0	50.9	40.7	55.3	0.6	0.8	56.1	0.6%
R4	10,000	52.5	30.2	40.8	36.4	43.5	52.5	0.5	0.8	53.3	0.5%
R5	10,000	16.8	11.5	18.2	17.8	14.9	18.2	0.2	0.8	19.0	0.2%
R6	10,000	17.1	17.0	15.5	16.7	17.2	17.2	0.2	0.8	18.0	0.2%
R7	10,000	8.9	8.8	10.4	12.1	8.3	12.1	0.1	0.8	12.9	0.1%
R8	10,000	17.1	13.8	12.3	18.7	12.1	18.7	0.2	0.8	19.5	0.2%
R9	10,000	10.8	9.8	11.8	13.5	8.8	13.5	0.1	0.8	14.3	0.1%
R10	10,000	14.3	14.8	13.2	15.2	12.6	15.2	0.2	0.8	16.0	0.2%
R11	10,000	16.4	17.4	16.9	16.3	12.4	17.4	0.2	0.8	18.2	0.2%
R12	10,000	8.9	7.2	5.6	8.4	8.9	8.9	0.1	0.8	9.7	0.1%
R13	10,000	13.6	14.6	11.2	11.7	12.3	14.6	0.1	0.8	15.4	0.2%
R14	10,000	8.3	6.8	8.7	8.4	7.7	8.7	0.1	0.8	9.5	0.1%
R15	10,000	7.5	3.8	7.9	8.8	7.6	8.8	0.1	0.8	9.6	0.1%

The results presented in Table 7.33 show that predicted concentrations of maximum 8-hour mean CO are low at human receptors. The maximum PC at any human receptor location (R3) is 55.3µg/m³, which is 0.6% of the EAL. The maximum PEC at any human receptor location (also R3) is 56.1µg/m³, which is 0.6% of the EAL.

Within the context of EPA guidance on maximum allowable PC[10] (Maximum Allowable PC = 0.75*AQS), all predicted results are considerably within the allowable range. In the context of UK EA guidance on significance[11], all PCs are less than 10% of the EAL and, under those criteria, would be considered not significant.

The final method for determining significance set out in Section 7.3.4 is from the professional guidance published by IAQM and EPUK[12]. As presented in Section 7.3.4 this guidance sets out impact descriptors as a product of change in concentration (PC), with consideration to the short-term PC. The largest predicted PC of maximum 8-hour CO, as presented in Table 7.33, is 0.6% of the EAL, and with the PEC

0.6% of the EAL, the impact can be described as imperceptible for all receptors. The impact of maximum 8-hour CO at human receptors is therefore not significant.

Table 7.34 shows predicted concentrations of annual mean PM_{10} at human receptors in the cumulative development scenario.

Table 7.34: Modelled Annual Mean PM_{10} Emissions at Human Health Receptor Locations – Cumulative Developments

Receptor ID	EAL (µg/m³)	PC (µg/m³)					Max PC (µg/m³)	PC/EAL (%)	BC (µg/m³)	PEC (µg/m³)	PEC/ EAL (%)
		2017	2018	2019	2020	2021					
R1	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R2	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R3	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R4	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R5	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R6	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R7	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R8	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R9	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R10	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R11	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R12	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R13	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R14	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%
R15	40	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	12.7	12.7	31.8%

The results presented in Table 7.34 show that predicted concentrations of annual mean PM_{10} are low at human receptors. The maximum PC at any human receptor location is less than 0.1µg/m³, which is less than 0.1% of the EAL. The maximum PEC at any human receptor location is 12.7µg/m³, which is 31.8% of the EAL.

Within the context of EPA guidance on maximum allowable PC[10] (Maximum Allowable PC = 0.75*AQS), all predicted results are considerably within the allowable range. In the context of UK EA guidance on significance[11], all PCs are less than 1% of the EAL and, under those criteria, would be considered not significant.

The final method for determining significance set out in Section 7.3.4 is from the professional guidance published by IAQM and EPUK[12]. As presented in Section 7.3.4 this guidance sets out impact descriptors as a product of change in concentration (PC), with consideration to the long-term total concentration of pollutants (PEC). The largest predicted PC of annual mean PM_{10}, as presented in Table 7.34, is less than 0.1% of the EAL, and with the PEC 31.8% of the EAL, the impact can be described as imperceptible all receptors. The impact of annual mean PM_{10} at human receptors is therefore not significant.

Table 7.35 shows predicted concentrations of 90.41st percentile 24-hour mean PM_{10}.

Table 7.35: Modelled 90.41st Percentile 24-Hour Mean PM_{10} Emissions at Human Health Receptor Locations – Cumulative Developments

Receptor ID	EAL (µg/m³)	PC (µg/m³)					Max PC (µg/m³)	PC/EAL (%)	BC (µg/m³)	PEC (µg/m³)	PEC/ EAL (%)
		2017	2018	2019	2020	2021					
R1	50	0.4	0.2	0.4	0.3	0.2	0.4	0.8	25.4	25.8	51.6%
R2	50	0.4	0.2	0.5	0.3	0.3	0.5	1.0	25.4	25.9	51.8%
R3	50	0.7	0.3	0.6	0.4	0.3	0.7	1.4	25.4	26.1	52.2%
R4	50	0.8	0.4	0.9	0.6	0.5	0.9	1.8	25.4	26.3	52.6%
R5	50	<0.1	0.1	0.1	0.1	<0.1	0.1	0.2	25.4	25.5	51.0%
R6	50	<0.1	0.2	0.1	0.1	0.1	0.2	0.4	25.4	25.6	51.2%
R7	50	<0.1	0.1	0.1	0.1	<0.1	0.1	0.2	25.4	25.5	51.0%
R8	50	0.1	0.1	0.1	0.1	0.1	0.1	0.2	25.4	25.5	51.0%
R9	50	0.1	0.1	0.1	0.1	0.1	0.1	0.2	25.4	25.5	51.0%
R10	50	0.6	0.5	0.6	0.6	0.3	0.6	1.2	25.4	26.0	52.0%
R11	50	0.5	0.4	0.4	0.4	0.2	0.5	1.0	25.4	25.9	51.8%
R12	50	0.3	0.3	0.2	0.2	0.3	0.3	0.6	25.4	25.7	51.4%
R13	50	0.1	0.1	0.1	0.2	0.1	0.2	0.4	25.4	25.6	51.2%
R14	50	0.2	0.2	0.2	0.2	0.2	0.2	0.4	25.4	25.6	51.2%
R15	50	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	25.4	25.4	50.8%

The results presented in Table 7.35 show that predicted concentrations of 90.41st percentile 24-hour mean PM_{10} are low at human receptors. The maximum PC at any human receptor location (R4) is 0.9µg/m³, which is 1.8% of the EAL. The maximum PEC at any human receptor location (also R4) is 26.3µg/m³, which is 52.6% of the EAL.

Within the context of EPA guidance on maximum allowable PC[10] (Maximum Allowable PC = 0.75*AQS), all predicted results are considerably within the allowable range. In the context of UK EA guidance on significance[11], all PCs are less than 10% of the EAL and, under those criteria, would be considered not significant.

The final method for determining significance set out in Section 7.3.4 is from the professional guidance published by IAQM and EPUK[12]. As presented in Section 7.3.4 this guidance sets out impact descriptors as a product of change in concentration (PC), with consideration to the short-term PC. The largest predicted PC of 24-hour mean PM_{10}, as presented in Table 7.35, is 1.8% of the EAL, and with the PEC 52.6% of the EAL, the impact can be described as imperceptible for all receptors. The impact of 24-hour mean PM_{10} at human receptors is therefore not significant.

Table 7.36 shows predicted concentrations of annual mean $PM_{2.5}$ at human receptors in the cumulative development scenario.

Table 7.36: Modelled Annual Mean $PM_{2.5}$ Emissions at Human Health Receptor Locations – Cumulative Developments

Receptor ID	EAL (µg/m³)	PC (µg/m³)					Max PC (µg/m³)	PC/EAL (%)	BC (µg/m³)	PEC (µg/m³)	PEC/ EAL (%)
		2017	2018	2019	2020	2021					
R1	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R2	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R3	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R4	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R5	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R6	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R7	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R8	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R9	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R10	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R11	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R12	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R13	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R14	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%
R15	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8.4	8.4	42.0%

The results presented in Table 7.36 show that predicted concentrations of annual mean $PM_{2.5}$ are low at human receptors. The maximum PC at any human receptor location (R4) is less than 0.1µg/m³, which is less than 0.1% of the EAL. The maximum PEC at any human receptor location (also R4) is 8.4µg/m³, which is 42.0% of the EAL.

Within the context of EPA guidance on maximum allowable PC[10] (Maximum Allowable PC = 0.75*AQS), all predicted results are considerably within the allowable range. In the context of UK EA guidance on significance[11], all PCs are less than 1% of the EAL and, under those criteria, would be considered not significant.

The final method for determining significance set out in Section 7.3.4 is from the professional guidance published by IAQM and EPUK[12]. As presented in Section 7.3.4 this guidance sets out impact descriptors as a product of change in concentration (PC), with consideration to the long-term total concentration of pollutants (PEC). The largest predicted PC of annual mean PM_{10}, as presented in Table 7.36, is less than 0.1% of the EAL, and with the PEC 42.0% of the EAL, the impact can be described as imperceptible all receptors. The impact of annual mean $PM_{2.5}$ at human receptors is therefore not significant.

Table 7.37 shows predicted concentrations of annual mean NO_x at ecological receptors in the cumulative developments' scenario.

Table 7.37: Modelled Annual Mean NO_X Emissions at Ecological Receptor Locations – Cumulative Developments

Receptor ID	EAL (µg/m³)	PC (µg/m³)					Max PC (µg/m³)	PC/EAL (%)	BC (µg/m³)	PEC (µg/m³)	PEC/ EAL (%)
		2017	2018	2019	2020	2021					
E1a	30	0.2	0.1	0.3	0.2	0.2	0.3	1.0	14.0	14.3	47.7%
E1b	30	0.3	0.2	0.3	0.3	0.2	0.3	1.0	14.0	14.3	47.7%
E1c	30	0.4	0.3	0.5	0.4	0.3	0.5	1.7	14.0	14.5	48.3%
E2a	30	0.2	0.2	0.2	0.2	0.2	0.2	0.7	14.0	14.2	47.3%
E2b	30	0.2	0.2	0.2	0.2	0.2	0.2	0.7	14.0	14.2	47.3%
E2c	30	0.2	0.2	0.2	0.2	0.2	0.2	0.7	14.0	14.2	47.3%
E2d	30	0.2	0.3	0.3	0.2	0.3	0.3	1.0	14.0	14.3	47.7%
E2e	30	0.6	0.5	0.6	0.6	0.4	0.6	2.0	14.0	14.6	48.7%
E2f	30	0.2	0.2	0.3	0.2	0.2	0.3	1.0	14.0	14.3	47.7%
E2g	30	0.2	0.3	0.3	0.2	0.3	0.3	1.0	14.0	14.3	47.7%
E2h	30	0.1	0.1	0.1	0.1	0.1	0.1	0.3	14.0	14.1	47.0%
E2i	30	0.2	0.3	0.4	0.2	0.3	0.4	1.3	14.0	14.4	48.0%
E2j	30	0.1	0.1	0.1	0.1	0.1	0.1	0.3	14.0	14.1	47.0%
E3	30	0.2	0.1	0.1	0.2	0.2	0.2	0.7	14.0	14.2	47.3%
E4	30	<0.1	0.1	<0.1	0.1	<0.1	0.1	0.3	14.0	14.1	47.0%

The results presented in Table 7.37 show that predicted concentrations of annual mean NO_x are low at ecological receptors. The maximum PC at any ecological receptor location (E2e) is 0.6µg/m³, which is 2.0% of the EAL. The maximum PEC at any ecological receptor location (also E2e) is 14.6µg/m³, which is 48.7% of the EAL.

Within the context of EPA guidance on maximum allowable PC[10] (Maximum Allowable PC = 0.75*AQS), all predicted results are considerably within the allowable range. In the context of UK EA guidance on significance[11], the PEC at all ecological receptors is less than 70% and can be screened out as not significant.

The final method for determining significance set out in Section 7.3.4 is from the professional guidance published by IAQM and EPUK[12]. As presented in Section 7.3.4 this guidance sets out impact descriptors as a product of change in concentration (PC), with consideration to the long-term total concentration of pollutants (PEC). The largest predicted PC of NO_x, as presented in Table 7.37, is 2.0% of the EAL, and with the PEC 48.7% of the EAL, the impact can be described as imperceptible at all receptors. The impact of annual mean NO_X at ecological receptors is therefore not significant.

Table 7.38 shows predicted concentrations of annual mean SO_2 at ecological receptors in the cumulative development scenario.

Table 7.38: Modelled Annual Mean SO_2 Emissions at Ecological Receptor Locations – Cumulative Developments

Receptor ID	EAL (µg/m³)	PC (µg/m³)					Max PC (µg/m³)	PC/EAL (%)	BC (µg/m³)	PEC (µg/m³)	PEC/ EAL (%)
		2017	2018	2019	2020	2021					
E1a	20	0.2	0.1	0.3	0.2	0.2	0.3	1.5	5.0	5.3	26.5%
E1b	20	0.3	0.2	0.3	0.3	0.2	0.3	1.5	5.0	5.3	26.5%
E1c	20	0.4	0.3	0.4	0.4	0.3	0.4	2.0	5.0	5.4	27.0%
E2a	20	0.2	0.2	0.2	0.2	0.2	0.2	1.0	5.0	5.2	26.0%
E2b	20	0.2	0.2	0.2	0.2	0.2	0.2	1.0	5.0	5.2	26.0%
E2c	20	0.2	0.2	0.2	0.2	0.2	0.2	1.0	5.0	5.2	26.0%
E2d	20	0.2	0.2	0.3	0.2	0.2	0.3	1.5	5.0	5.3	26.5%
E2e	20	0.6	0.5	0.6	0.6	0.4	0.6	3.0	5.0	5.6	28.0%
E2f	20	0.2	0.2	0.2	0.2	0.2	0.2	1.0	5.0	5.2	26.0%
E2g	20	0.2	0.3	0.3	0.2	0.3	0.3	1.5	5.0	5.3	26.5%
E2h	20	0.1	0.1	0.1	0.1	0.1	0.1	0.5	5.0	5.1	25.5%
E2i	20	0.2	0.3	0.4	0.2	0.3	0.4	2.0	5.0	5.4	27.0%
E2j	20	0.1	0.1	0.1	0.1	0.1	0.1	0.5	5.0	5.1	25.5%
E3	20	0.2	0.1	0.1	0.1	0.2	0.2	1.0	5.0	5.2	26.0%
E4	20	<0.1	<0.1	<0.1	0.1	<0.1	0.1	0.5	5.0	5.1	25.5%

The results presented in Table 7.38 show that predicted concentrations of annual mean SO_2 are low at ecological receptors. The maximum PC at any ecological receptor location (E2e) is 0.6µg/m³, which is 3.0% of the EAL. The maximum PEC at any ecological receptor location (also E2e) is 5.6µg/m³, which is 28.0% of the EAL.

Within the context of EPA guidance on maximum allowable PC10 (Maximum Allowable PC = 0.75*AQS), all predicted results are considerably within the allowable range. In the context of UK EA guidance on significance[11], the PEC at all ecological receptors is less than 70% and can be screened out as not significant.

The final method for determining significance set out in Section 7.3.4 is from the professional guidance published by IAQM and EPUK[12]. As presented in Section 7.3.4 this guidance sets out impact descriptors as a product of change in concentration (PC), with consideration to the long-term total concentration of pollutants (PEC). The largest predicted PC of annual mean SO_2, as presented in Table 7.38, is 3.0% of the EAL, and with the PEC 28.0% of the EAL, the impact can be described as imperceptible at all receptors. The impact of annual mean SO_2 at ecological receptors is therefore not significant.

Table 7.39 shows predicted concentrations of annual nitrogen deposition at ecological receptors in the cumulative development scenario.

Table 7.39: Modelled Annual Nitrogen Deposition at Ecological Receptor Locations – Cumulative Developments

Receptor ID	EAL (kg/ha/yr)	Max PC (µg/m^3)		Total N Dep (kg/ha/yr)	PC/EAL (%)	BC (kg/ha/yr)	PEC (kg/ha/yr)	PEC/ EAL (%)
		NO_X	NH_3					
E1a	5	0.3	<0.001	0.04	0.7	3.98	4.02	80.3
E1b	5	0.3	<0.001	0.04	0.9	3.98	4.02	80.5
E1c	5	0.5	<0.001	0.07	1.3	3.98	4.05	80.9
E2a	5	0.2	<0.001	0.03	0.6	5.16	5.19	103.8
E2b	5	0.2	<0.001	0.03	0.6	5.16	5.19	103.8
E2c	5	0.2	<0.001	0.03	0.6	5.16	5.19	103.8
E2d	5	0.3	0.002	0.04	0.8	3.86	3.90	78.0
E2e	5	0.6	0.002	0.09	1.8	3.91	4.00	80.0
E2f	5	0.3	<0.001	0.04	0.7	3.98	4.02	80.3
E2g	5	0.3	0.002	0.04	0.9	3.28	3.32	66.5
E2h	5	0.1	0.001	0.01	0.2	3.45	3.46	69.2
E2i	5	0.4	0.002	0.06	1.1	4.14	4.20	83.9
E2j	5	0.1	<0.001	0.02	0.3	5.02	5.04	100.7
E3	10	0.2	0.002	0.03	0.3	5.02	5.05	50.5
E4	5	0.1	0.001	0.01	0.2	5.00	5.01	100.2

The results presented in Table 7.39 show that predicted concentrations of annual nitrogen deposition are low at ecological receptors. The maximum PC at any ecological receptor location (E2e) is 0.09 kg/ha/year, which is 1.8% of the EAL. The maximum PEC at any ecological receptor location (E2a, E2b and E2c) is 5.19 kg/ha/year, which is 103.8% of the EAL. The table shows that there is a high background contribution of nitrogen deposition at all receptor locations, the predicted PC, by comparison, is very small.

Within the context of EPA guidance on maximum allowable PC[10] (Maximum Allowable PC = 0.75*(AQS – BC) where there is a significant background concentration), all predicted results are considerably within the allowable range. In the context of UK EA guidance on significance[11], the impacts of nitrogen deposition cannot be screened out as not significant at ecological receptors E1c, E2e and E2i as the PC is greater than 1% with the PEC greater than 70%. At all receptors, including E1c, E2e and E2i, it is, however, predicted that there will be no new exceedances as a result of the Proposed Development, on that basis the development can likely be considered not significant.

The final method for determining significance set out in Section 7.3.4 is from the professional guidance published by IAQM and EPUK[12]. As presented in Section 7.3.4 this guidance sets out impact descriptors as a product of change in concentration (PC), with consideration to the long-term total concentration of pollutants (PEC). The largest predicted PC of annual mean deposited nitrogen, as presented in Table 7.39, is 1.8% of the EAL, the impact can be described as imperceptible for all receptors. The impact of annual mean deposited nitrogen at ecological receptors is therefore not significant.

Using the significance criteria described in Section 7.3.4 of this document, the impact of nitrogen deposition is predicted to be not significant.

This assessment offers a conservative prediction of the air pollution climate in the vicinity of the site. It is important to acknowledge that the reason PEC of nitrogen deposition as shown in Table 7.39 is high is because of the existing background concentrations. These background concentrations are likely to comprise existing sources of pollutants, such as Moneypoint Power station, which is modelled in this assessment, we are therefore likely to be double counting this contribution in the calculated PEC. The Tarbert HFO Power Station, which expected to be decommissioned by the time the Proposed Development is operational, is also likely to be a contributor to the background nitrogen deposition concentrations used in this assessment.

Table 7.40 shows predicted concentrations of annual acid deposition at ecological receptors in the cumulative development scenario.

Table 7.40: Modelled Annual Acid Deposition at Ecological Receptor Locations – Cumulative Developments

Receptor ID	EAL (keq/ha/yr)			Max PC (keq/ha/yr)		PC/EAL (%)	BC (keq/ha/yr)		PEC/ EAL (%)
	MinCLminN	MinCLMaxN	MinCLMaxS	N	S		N	S	
E1a	0.071	0.375	0.303	0.003	0.030	8.8	0.06	0.28	99.5
E1b	0.071	0.375	0.303	0.003	0.033	9.6	0.06	0.28	100.3
E1c	0.071	0.375	0.303	0.005	0.050	14.7	0.06	0.28	105.3
E2a	0.071	0.375	0.303	0.002	0.023	6.7	0.05	0.37	118.7
E2b	0.071	0.375	0.303	0.002	0.023	6.7	0.05	0.37	118.7
E2c	0.071	0.375	0.303	0.002	0.023	6.7	0.05	0.37	118.7
E2d	0.071	0.375	0.303	0.003	0.030	8.8	0.05	0.28	96.8
E2e	0.071	0.375	0.303	0.006	0.072	20.8	0.07	0.28	114.1
E2f	0.071	0.311	0.24	0.003	0.029	10.3	0.06	0.28	119.6
E2g	0.071	0.311	0.24	0.003	0.034	11.9	0.04	0.23	98.7
E2h	0.071	0.311	0.24	0.001	0.008	2.9	0.04	0.25	96.1
E2i	0.071	0.311	0.24	0.004	0.044	15.4	0.06	0.30	131.2
E2j	0.071	0.311	0.24	0.001	0.014	4.8	0.04	0.36	133.4
E3	0.143	0.509	0.366	0.002	0.021	4.5	0.05	0.36	85.1
E4	0.143	0.46	0.317	0.001	0.007	1.7	0.04	0.36	88.7

The results presented in Table 7.40 show that predicted concentrations of annual acid deposition are generally low at ecological receptors. The maximum cumulative PC at any ecological receptor location (E1e) is 20.8% of the EAL. The maximum PEC at any ecological receptor (E2j) is 133.4% of the EAL. The table shows that there is a high background contribution of acid deposition at all receptor locations, the predicted PC, by comparison, is very small.

Within the context of EPA guidance on maximum allowable PC[10] (Maximum Allowable PC = 0.75*(AQS – BC) where there is a significant background concentration), all predicted results are considerably within the allowable range. In the context of UK EA guidance on significance[11], the impacts of acid deposition cannot be screened out as not significant at any ecological receptors. As highlighted in the previous paragraphs, the assessment is highly conservative and includes the input of existing installations in the model and in the background concentrations of pollutants, including deposited acid. This means that there is some double counting of pollutant input. The background pollutant concentrations in this assessment are also likely to include a not inconsiderable input from Moneypoint and from the Tarbert HFO Power Station which will be decommissioned by the time the Proposed Development is operational. The overall impact is likely to be considerably smaller than presented in these tables.

7.8 Summary

A dispersion modelling assessment has been undertaken on emissions associated with the construction and operation of the proposed OCGT, operating up to 1800 hours per year on air quality sensitive SAC and SPA habitats and selected human health receptors within 15km.

The air quality assessment of construction impacts assumes that the impact avoidance measures outlined within Section 7.5 will be incorporated into the CEMP for the Proposed Development, as they are standard good practice measures that are routinely applied across large construction sites. No specific additional mitigation has been identified as necessary for the construction phase of the Proposed Development. No significant effects have been identified.

For human health receptors during the operation phase, the assessment has determined that the impact of the Proposed Development Scenario and subsequent total pollutant concentrations (PEC) does not result in a significant effect on local air quality. The assessment has identified several incidences of moderate impacts at human receptors in both the Proposed Development Scenario and the Cumulative Developments Scenario. This, however, does not indicate a significant impact, owed to the good overall air quality at in the vicinity of the Site.

In a similar manner, the impacts at ecological sites in both scenarios are unlikely to be significant. It is predicted that the PCs (process contributions of modelled emissions only) from the Proposed Development Scenario are all <0.1% of the Environmental Assessment Level. The higher PCs in the cumulative scenario are likely to be due to unavoidable double counting of contributions from Moneypoint and the contribution of the Tarbert HFO Power Station in the background, as described in the previous sections. This assessment has therefore shown to represent a conservative approach to modelling the Proposed Development.

7.9 References

[1] Government of Ireland (2011). Air Quality Standards Regulations 2011, S.I. No. 180 of 2011.

[2] EPA (2020). Dispersion Modelling from Industrial Installations Guidance Note (AG4).

[3] APIS (2016). Hosted & Maintained by UK Centre for Ecology and Hydrology. www.apis.ac.uk

[4] Government of Ireland (2018). National Planning Framework.

[5] Government of Ireland (2021). National Development Plan 2021-2030.

[6] Kerry County Council (2022) Kerry County Development Plan 2022-2028 Volume 5 http://docstore.kerrycoco.ie/KCCWebsite/planning/devplan/vol5updatednew.pdf

[7] IAQM (2014) IAQM Guidance on the assessment of dust from demolition and construction, Institute of Air Quality Management, London, Updated 2016, https://iaqm.co.uk/text/guidance/construction-dust-2014.pdf

[8] TII (2022) Air Quality Assessment of Specified Infrastructure Projects – Overarching Technical Development PE-ENV-01106 (tiipublications.ie)

[9] EPA (2022). Guidelines on the information to be contained in Environmental Impact Assessment Reports.

[10] UK EA (2016). Air Emissions Risk Assessment for your Environmental Permit Guidance – Updated 2022.

[11] IAQM and EPUK (2017). Land-Use Planning and Development Control: Planning for Air Quality.

[12] Development of Critical Loads for Ireland: Simulating Impacts on Systems (SIOS) Author: Julian Aherne, Jason Henry and Marta Wolniewicz.

aecom.com