Immingham Green Energy Terminal

Preliminary Environmental Information Report

Appendix 6B Operational Site Emissions Assessment Method

Associated British Ports

December 2022

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1 Introduction

1.1.1 Site emissions include those associated with the following sources:

- Vessel energy generation plant when docked; and
- Emissions from landside flares and stacks when the site is operational.

1.1.2 The combined impact of site emissions is then reported at the selected air quality sensitive receptors that may potentially be impacted by those emissions.

1.1.3 The impact of emissions on nearby air quality sensitive receptors has been predicted using the Advanced Dispersion Modelling System (ADMS) 5 (version 5.42), published by CERC. ADMS 5 is nationally recognised dispersion modelling software that has undergone extensive validation by CERC and by organisations independent of CERC.

2 Emissions Data

2.1.1 Vessel emissions data focuses on those released when vessels are in dock during operation of the Project. This is considered the only time when vessel emissions can be considered static and potentially impact on the same locations for prolonged periods of time.

2.1.2 When vessels are in motion, travelling at c.10 knots (12 mph) when manoeuvring and c.20 knots (23 mph) when up to speed, emissions from each vessel movement will be transient and the impact on a location will be for a period of minutes, not hours. For example, a vessel travelling at 20 knots will have travelled 10 km within approximately 16 minutes. Given that the Project will have two berths and it is anticipated that it will take three days for each vessel to discharge and load cargo, there is the potential for up to 800 vessel movements in a year. This equates to an average of 2.2 two-way vessel movements per day. Therefore, on average, emissions from vessels in motion will impact at a given locations for less than an hour per day and the level of impact experienced over that time will vary as each vessel source at first moves closer to and then more distant from that location. It is considered that such limited emissions will not be capable of contributing to a significant effect at sensitive locations.

2.1.3 Whilst some information on the vessels that will dock at the facility is known – there will be two vessels in dock for most of the time and these vessels will range between 100 and 250m in length with a draft of up to 14m and have a capacity when fully laden of up to 55,000 tonnes – the energy demand, energy generation plant and fuel type that will meet that demand is unknown. In the absence of Project-specific vessels emissions data, a literature review has been undertaken to establish a reasonable estimate of emissions when vessels are docked.

2.1.4 Typical energy demand for docked vessels was taken from a MAN Diesel publication[1], which estimates energy demand for a 155,000 m3 Liquified Natural Gas (LNG) Carrier ("large conventional size") as 7.5 MW when discharging and 4 MW when loading. Further review was then undertaken to establish representative emissions data that could meet that energy demand.

2.1.5 Wartsila publish emissions data for all of their marine vessel engines based on multiple fuel types[2] . To meet the energy demand of 7.5 MW required when a vessel is in dock, emissions data for a Wartsila 14V31 marine auxiliary engine has been used to represent typical engine emissions for discharge and loading activities. The Wartsila 14V31 engine generates 8.26 MW at 100% load. Emissions data for this plant operating on both LNG as fuel and Marine Gas Oil (MGO) as fuel is provide in Table B.1. It has been assumed that 50% of the docked vessel engines will run on LNG and 50% on MGO.

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[1] Wenniger and Tolgos (2008), LNG Carrier Power, Man Diesel, available at: https://www.yumpu.com/en/document/read/3274591/lng-carrier-power-man-diesel-turbo
[2] https://www.wartsila.com/marine/engine-configurator

Table B.1. Vessel Emissions Data

Parameter	Wärtsilä 14V31 (MGO)	Wärtsilä 14V31 (LNG)	Unit/Notes
Capacity	8260	8260	kW per engine
Operating Load	100	100	%
Operating profile	4380	4380	Hours/year
Release point location	522180, 416204	522180, 416204	x,y
	522190, 416064	522190, 416064	
Emission release height	45	45	Assumed m above ground level
Internal diameter of release point	0.903	0.934	M
Temperature of emissions	268	285	°C
Mass flow of emissions	14.7	15.3	kg/s
Engine speed	720	720	RPM
MARPOL emission standard[1]	$44 \times 720^{-0.23}$	$44 \times 720^{-0.23}$	Tier II NO_X emission standard: 44·n(-0.23), where n = RPM
Emission rate	80,029	80,029	g/kWh
Mass NO_X emission rate	22.2	22.2	g/s

[1] Emissions standard for SO_2: Inside an Emission Control Area, including North Sea area, established to limit SOx emissions 1.50% m/m prior to 1 July 2010; 1.00% m/m on and after 1 July 2010; 0.10% m/m on and after 1 January 2015.

2.1.6 In addition to docked vessel emissions, emissions from landside sources are also included in the assessment. These include combustion and process emissions associated with converter plant, assumed to be operational for 8760 hours of the year, and combustion emissions associated with flares that are assumed to be operational on pilot mode for 8760 hours per year and on operational mode for 365 hours per year. Emissions data for these sources are summarised in Table B.2.

Table B.2. Landside Source Emissions Data

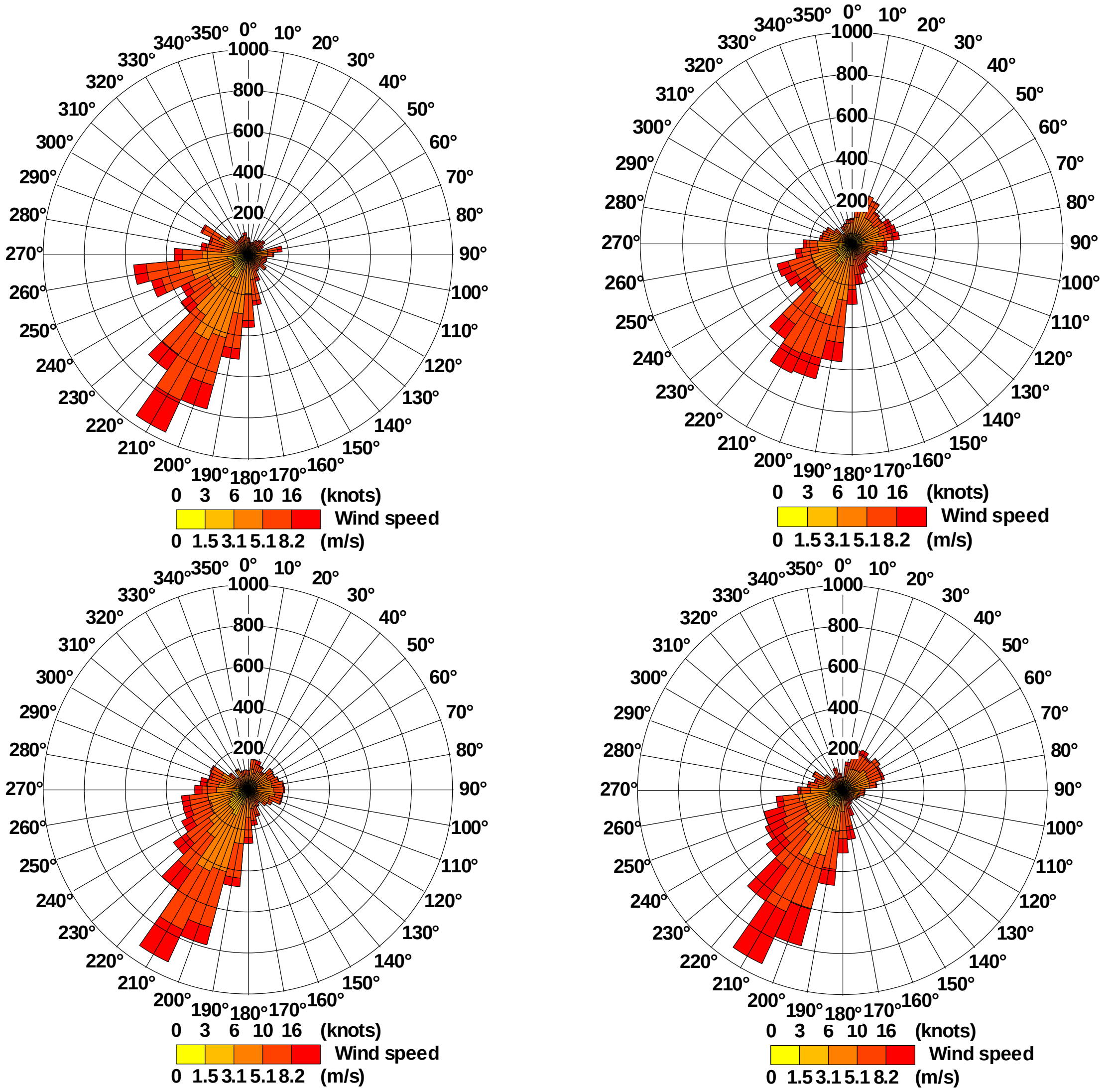
ID	X	Y	Source Type	Height (m)	Diameter (m)	Temperature (°C)	Flow rate (kg/s)	Volume flux (m3/s)	Mass Emission Rate (g/s)					Emissions Profile (hrs/yr)
									NO_X	NH_3	CO	SO_2	VOC	
A1	520956	415282	Reformer Box Top/Flue Gas Stack T1	30	0.45	143.9	6.3	-	0.078	0.018	-	-	-	8760
A2	520892	415310	Reformer Box Top/Flue Gas Stack T2	30	0.45	143.9	6.3	-	0.078	0.018	-	-	-	8760
A3	520828	415339	Reformer Box Top/Flue Gas Stack T3	30	0.45	143.9	6.3	-	0.078	0.018	-	-	-	8760
A4	519770	414475	Reformer Box Top/Flue Gas Stack FT1	30	0.45	143.9	6.3	-	0.078	0.018	-	-	-	8760
A5	519756	414401	Reformer Box Top/Flue Gas Stack FT2	30	0.45	143.9	6.3	-	0.078	0.018	-	-	-	8760
A6	520008	414577	Reformer Box Top/Flue Gas Stack FT3	30	0.45	143.9	6.3	-	0.078	0.018	-	-	-	8760
A7	520938	415367	HPU Flare T1	37	0.15	1700	3.7	-	1.013	-	-	-	-	365

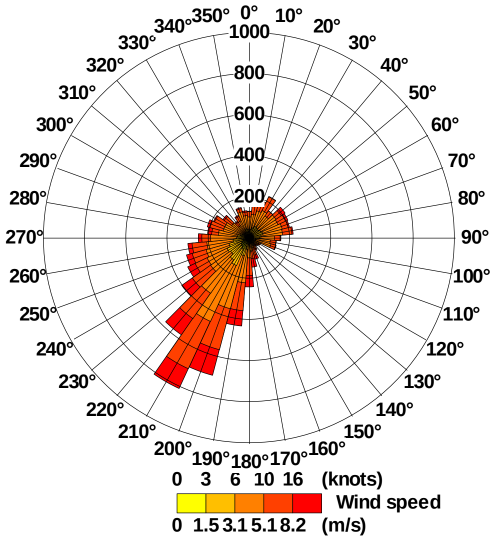
ID	X	Y	Source Type	Height (m)	Diameter (m)	Temperature (°C)	Flow rate (kg/s)	Volume flux (m3/s)	Mass Emission Rate (g/s)					Emissions Profile (hrs/yr)
									NO_X	NH_3	CO	SO_2	VOC	
A8	520874	415395	HPU Flare T2	37	0.15	1700	3.7	-	1.013	-	-	-	-	365
A9	520809	415426	HPU Flare T3	37	0.15	1700	3.7	-	1.013	-	-	-	-	365
A10	519687	414504	HPU Flare FT1	37	0.15	1700	3.7	-	1.013	-	-	-	-	365
A11	519839	414372	HPU Flare FT2	37	0.15	1700	3.7	-	1.013	-	-	-	-	365
A12	520091	414548	HPU Flare FT3	37	0.15	1700	3.7	-	1.013	-	-	-	-	365
A14	520793	415211	Ammonia Storage Flare Pilots	55	0.60	1700	-	0.0108	0.00164	-	0.01389	0.00003	0.00133	8760
A15	520793	415211	Ammonia Storage Flare	55	0.60	1700	2.3	-	2.602	-	-	-	-	365
A17	Same as sources 7 – 12	Same as sources 7 – 12	HPU Flare Pilots	37	0.15	1700	-	0.0065	0.00164	-	0.01389	0.00003	0.00133	8760

3 Meteorological Data

3.1.1 Wind rose plots for the five years of hourly sequential meteorological data from Humberside Airport is provided in **Plate B-1**.

Plate B-1 Wind Rose Plots – Humberside Airport 2017 – 2021





3.1.2 It is standard practice to consider point source emissions, such as those associated with this assessment, with up to five years of hourly sequential meteorological data. This is to account for interannual variation and the maximum yearly contribution from the point sources across those five years is reported at each receptor.

3.1.3 Five years of hourly sequential meteorological data from Humberside Airport has been used to inform the quantification of emissions contributions to air quality impacts from vessels and onsite sources. Humberside Airport is approximately 10 km to the southwest of the Project site.

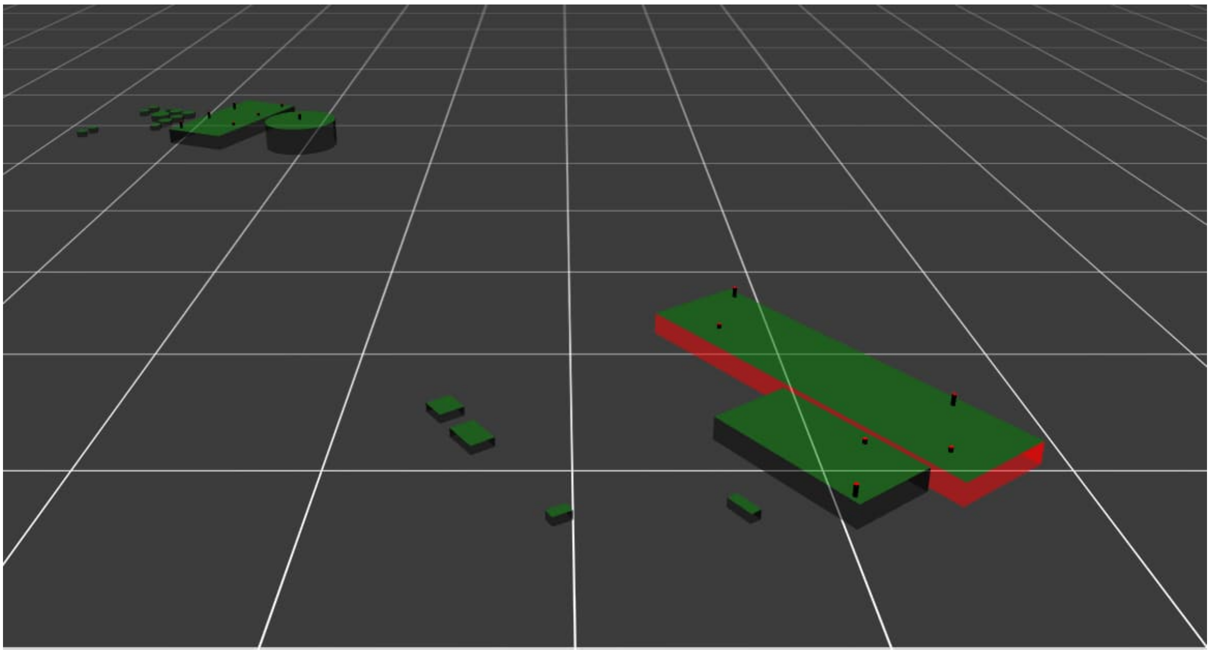
3.1.4 **Plate B-1** shows how consistent wind speed and direction have been over the five years considered, with the clear prevalence of south-westerlies.

4 Building Downwash

4.1.1 The buildings and structures that make up the Project have the potential to affect the dispersion of emissions from the modelled emission points. This is because of building downwash, which is caused by the creation of a cavity of recirculating winds in the area near to buildings, which often leads to elevated concentrations downwind of affected point sources.

4.1.2 The ADMS 5 buildings effect module has therefore been used to incorporate building downwash effects as part of the modelling procedure. Site buildings of a similar height to the modelled sources have been included within the dispersion model, as illustrated below in **Plate B-2**. Because of uncertainty in building layout, buildings and structures were grouped together to provide a precaution.

Plate B-2 Illustration of Modelled Buildings



5 Terrain Data and Surface Roughness

5.1.1 Due the proximity of the Project to the Humber Estuary, the land in the vicinity of the Project and across the Immingham area is relatively flat with limited variation in height above sea level. The limited variation in height that does occur is not to the extent that it will influence the dispersion of emissions to air from Project sources, nor how those emissions will impact on sensitive receptors. The dispersion model of site emissions has been set up on the basis that the model domain is flat.

5.1.2 With regards to surface roughness, the dispersion model has been set up on the basis that a surface roughness of 0.5 m represents the entirety of the model domain. The ADMS 5 software describes such a surface roughness as representing areas of parkland or suburbia. This is considered to represent the average surface roughness across the model domain, but also the areas close to the emission sources. In reality, surface roughness will vary across the model domain, with a value of 1 m representing locations in Immingham and built-up areas of the Port of Immingham, and values 0.0001 representing the Humber Estuary.

5.1.3 The use of a single surface roughness value is considered at this stage to represent a precautionary estimate of pollutant impacts, given the location of receptors relative to the Project site and the presence of the nearby estuary. A lower surface roughness value encourages better dispersion and therefore, impacts at the nature conservation receptors in close proximity to the estuary are likely to be lower than those reported in this assessment.

6 Air Quality Sensitive Receptors

6.1.1 The assessment of vessel and landside emission sources focuses on specific nature conservation receptors sensitive to potential air quality impacts, including increased rates of nitrogen deposition. The operation of the Project has the potential to impact on nitrogen deposition through emissions of NO_X (the proportion of NO_X converted to NO_2) and NH_3. The former is a by-product of combustion, the latter a by-product of urea-based SCR emissions technology. The nature conservation receptors of relevance to this assessment are summarised in Table B.3 and illustrated in Figure 6.1 (PEI Report, Volume III).

Table B.3. Nature Conservation Sensitive Receptors

Receptor ID	X	Y	Description
E1	518347	417802	Saltmarsh habitat within the Humber Estuary SAC, approximately 3.4km from East Site
E2	517001	419691	Saltmarsh habitat within the Humber Estuary SAC, approximately 5.7km from East Site
E3	523790	413174	Saltmarsh habitat within the Humber Estuary SAC, approximately 3.5km from East Site
E4	516492	420321	Saltmarsh habitat within the Humber Estuary SAC, approximately 6.5km from East Site
E5	514553	422884	Saltmarsh habitat within the Humber Estuary SAC, approximately 9.7km from East Site
E6	514550	422998	Saltmarsh habitat within the Humber Estuary SAC, approximately 9.7km from East Site
E7	525956	411375	Saltmarsh habitat within the Humber Estuary SAC, approximately 6km from Vessel Berth
E8	526333	411086	Saltmarsh habitat within the Humber Estuary SAC, approximately 6.4km from Vessel Berth
E9	527136	410868	Saltmarsh habitat within the Humber Estuary SAC, approximately 7.2km from Vessel Berth
E10	523857	418287	Saltmarsh habitat within the Humber Estuary SAC, approximately 2.9km from Vessel Berth
E11	523254	418899	Saltmarsh habitat within the Humber Estuary SAC, approximately 2.7km from Vessel Berth
E12	519830	421761	Saltmarsh habitat within the Humber Estuary SAC, approximately 6km from Vessel Berth

Receptor ID	X	Y	Description
E13	526249	416864	Saltmarsh habitat within the Humber Estuary SAC, approximately 4.1km from Vessel Berth
E14	527141	416671	Saltmarsh habitat within the Humber Estuary SAC, approximately 5km from Vessel Berth
E15	529069	416859	Saltmarsh habitat within the Humber Estuary SAC, approximately 6.9km from Vessel Berth
E16	518051	415615	Local Wildlife Site Woodland Habitat, approximately 2km from West Site
E17	518286	415761	Site of Importance for Nature Conservation Grassland Habitat, approximately 2km from West Site
E18	521269	415512	Priority Woodland Habitat, approximately 0.4km from East Site
E19	520742	414998	Priority Woodland Habitat, approximately 0.2km from East Site
E20	519956	415190	Priority Woodland Habitat, approximately 0.6km from West Site
E21	516446	417896	Priority Woodland Habitat, approximately 4.7km from West Site

6.1.2 In addition to the nature conservation receptors listed above, the impact of onsite emissions sources has also been quantified at nearby human health sensitive receptors to the Project site. These receptors are summarised in Table B.4 and illustrated in Figure 6.1 (PEI Report, Volume III).

Table B.4. Human Health Sensitive Receptors

Receptor ID	X	Y	Description
R1	519223	414220	Residential Property on Somerton Road approximately 0.5km from West Site
R2	519141	414353	Residential Property on Somerton Road approximately 0.5km from West Site
R3	519388	414955	Residential Property on Kings Road A1173 approximately 0.4km from West Site
R4	519228	414998	Residential Property on Chestnut Avenue approximately 0.5km from West Site
R5	519015	414537	Residential Property on Talbot Road approximately 0.7km from West Site
R6	518477	414778	Residential Property on Pelham Road approximately 1.3km from West Site

Receptor ID	X	Y	Description
R7	518237	414294	Residential Property on Margaret Street approximately 1.5km from West Site
R8	519552	411773	Residential Property on Church Lane approximately 2.6km from West Site
R9	520827	412115	Residential Property on South Marsh Road approximately 2.4km from West Site
R10	519930	414857	Residential Property on Queens Road approximately 0.1km from West Site
R11	519971	414827	Residential Property on Queens Road approximately 0.1km from West Site
R12	520063	414760	Residential Property on Queens Road approximately 0.1km from West Site

7 Background Pollutant Concentration Data

7.1.1 The dispersion model predicts the contribution of pollutants from vessel and landside emission sources at selected air quality sensitive receptors. To report total pollutant concentrations that can be compared to the relevant air quality standards at the selected air quality sensitive receptors, this contribution needs to be added onto the background (or ambient) pollutant concentrations that are representative of those locations. Background pollutant data is summarised in Table B.5 and Table B.6.

7.1.2 For human health receptors, background NO_2 concentration data has been sourced from Defra's background pollutant concentration maps from the dataset with a base year of 2018[3] . Limited current or recent background pollutant concentration data exists for SO_2, CO or any VOCs, with the most recent data published in Defra's 2001 background maps[4] . For nature conservation receptors, background NO_X, SO_2, NH_3 and nitrogen deposition rate data has been sourced from the Air Pollution Information System (APIS)[5] . APIS reports background concentration data as a 3-year average and current background maps cover the period 2018-2020.

Table B.5. Background Pollutant Data – Nature Conservation Receptors

Receptor ID	Grid Square	Annual Mean Concentration (µg/m^3)			Nitrogen Deposition Rate (kgN/ha/yr))	
		NO_X	SO_2	NH_3	Short Vegetation	Long Vegetation
E1	518500_417500	21.4	3.7	2.1	20.1	33.8
E2	517500_419500	22.5	3.6	2.1	20.7	34.9
E3	523500_413500	20.4	3.8	2.0	19.1	32.2
E4	516500_420500	36.5	3.1	2.2	20.9	34.9
E5	514500_422500	13.8	1.8	2.2	20.8	34.9
E6	514500_422500	13.8	1.8	2.2	20.8	34.9
E7	525500_411500	19	2.0	2.0	19.1	32.2
E8	526500_411500	19.6	1.8	2.0	19.1	32.2
E9	527500_410500	31.9	2.2	2.0	18.8	31.9
E10	523500_418500	17.8	2.3	2.0	18.9	31.9

[3]https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018
[4] https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2001
[5] https://www.apis.ac.uk/app

Receptor ID	Grid Square	Annual Mean Concentration (µg/m^3)			Nitrogen Deposition Rate (kgN/ha/yr))	
		NO_X	SO_2	NH_3	Short Vegetation	Long Vegetation
E11	523500_418500	17.8	2.3	2.0	18.9	31.9
E12	519500_421500	16.2	2.2	2.1	20.2	33.9
E13	526500_416500	17.4	1.8	2.0	18.4	31.1
E14	527500_416500	16.4	1.7	2.0	18.2	30.8
E15	529500_416500	15.2	1.6	1.9	17.8	30.3
E16	518500_415500	19.6	3.9	2.1	19.9	33.4
E17	521500_415500	21.3	3.5	2.0	19.3	32.5
E18	520500_414500	22.3	3.0	2.1	19.5	32.7
E19	519500_415500	28.6	4.8	2.1	19.9	33.1
E20	516500_417500	16.2	3.4	2.1	20.4	34.2
E21	518500_417500	21.4	3.7	2.1	20.1	33.8

Table B.6. Background Pollutant Data – Human Health Receptors

Receptor ID	Grid Square	Annual Mean Concentration (µg/m^3)			
		NO_2	SO_2	CO	VOC (as C_6H_6)
R1	518500_417500	16.8	7.6	0.3	0.4
R2	517500_419500	16.8	7.6	0.3	0.4
R3	523500_413500	16.8	7.6	0.3	0.4
R4	516500_420500	16.8	7.6	0.3	0.4
R5	514500_422500	16.8	7.6	0.3	0.4
R6	514500_422500	14.1	7.9	0.3	0.7
R7	525500_411500	14.1	7.9	0.3	0.7
R8	526500_411500	11.1	6.2	0.3	0.3
R9	527500_410500	13.5	7.4	0.3	0.3
R10	523500_418500	16.8	7.6	0.3	0.4

Receptor ID	Grid Square	Annual Mean Concentration (µg/m^3)			
		NO_2	SO_2	CO	VOC (as C_6H_6)
R11	523500_418500	16.8	7.6	0.3	0.4
R12	519500_421500	15.9	8.6	0.3	0.4
Notes: for pollutants with an averaging period of less than the annual mean, the background concentration is represented as double the annual mean concentration provided in this table.					

8 Pollutant Conversion

NO_X to NO_2

8.1.1 Emissions of nitrogen oxides from combustion sources are typically dominated by nitric oxide (NO), typically in the ratio of NO to NO_2 of 9:1. However, it is NO_2 that has specified environmental standards due to its potential impact on human health and indirect impacts on sensitive habitat.

8.1.2 In the ambient air, nitric oxide is oxidised to nitrogen dioxide by the ozone present, and the rate of oxidation is dependent on the relative concentrations of nitric oxide and ozone in the ambient air.

8.1.3 For the point source emissions modelled, a NO_X to NO_2 conversion rate of 70% has been assumed over an annual mean averaging period and a conversion rate of 35% has been assumed for an hourly mean averaging period, in line with Environment Agency guidance[6] .

NO_2 and NH_3 to Nitrogen Deposition

8.1.4 Annual mean NO_2 concentrations are converted to N deposition using the following factors as set out in Environment Agency guidance[7] :

- Deposition flux (as µg/m2/s) is calculated by applying deposition velocity factors of:
  - 0.0015 m/s to the annual mean NO_2 contribution (as µg/m^3) at habitats with short vegetation (non-woodland) and a deposition velocity factor of 0.003 m/s to annual mean NO_2 (as µg/m^3) contribution at habitats with tall vegetation (woodland); and
  - 0.020 m/s to the annual mean NH_3 contribution (as µg/m^3) at habitats with short vegetation (non-woodland) and a deposition velocity factor of 0.030 m/s to annual mean NH_3 (as µg/m^3) contribution at habitats with tall vegetation (woodland);
- Deposition rate (as kgN/ha/yr) is then calculated by applying unit conversion factors of:
  - 95.9 to the calculated deposition flux for NO_2 (as µg/m^2/s);
  - 260 to the calculated deposition flux for NH_3 (as µg/m^2/s)

8.1.5 Total nitrogen deposition is then the sum of the deposition rate calculated from NO2 and NH_3 concentrations at any specific location.

[6] Environment Agency (2016), Air emissions risk assessment for your environmental permit, updated 2022, available at: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit
[7] Environment Agency (2014), AQTAG06 - Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air

9 Modelled Results

9.1.1 Table B.7 provides the predicted impact of Project emissions on nature conservation sensitive receptors and total pollutant concentrations and deposition rates with the Project in operation.

Table B.7. Air Quality Impacts – Nature Conservation Receptors

Receptor ID	Impact				Total Concentration / Deposition Rate			
	Annual Mean Concentration (µg/m³)			Nitrogen Deposition Rate (kgN/ha/yr))	Annual Mean Concentration (µg/m³)			Nitrogen Deposition Rate (kgN/ha/yr))
	9.1.2	9.1.3	9.1.4		9.1.5	9.1.6	9.1.7	
E1	0.4	<0.01	<0.01	0.04	22.3	3.7	**2.1**	**20.1**
E2	0.2	<0.01	<0.01	0.02	23.0	3.6	**2.1**	**20.7**
E3	0.5	<0.01	<0.01	0.05	21.5	3.8	**2.0**	19.1
E4	0.2	<0.01	<0.01	0.02	**36.9**	3.1	**2.2**	**20.9**
E5	0.1	<0.01	<0.01	0.01	14.0	1.8	**2.2**	**20.8**
E6	0.1	<0.01	<0.01	0.01	14.0	1.8	**2.2**	**20.8**
E7	0.2	<0.01	<0.01	0.02	19.4	2.0	**2.0**	19.1
E8	0.2	<0.01	<0.01	0.02	20.0	1.8	**2.0**	19.1
E9	0.2	<0.01	<0.01	0.02	**32.3**	2.2	**2.0**	18.8
E10	3.0	<0.01	<0.01	0.31	24.0	2.3	**2.0**	19.2
E11	3.3	<0.01	0.01	0.33	24.6	2.3	**2.0**	19.2
E12	0.2	<0.01	<0.01	0.02	16.7	2.2	**2.1**	**20.2**
E13	1.3	<0.01	<0.01	0.13	20.2	1.8	**2.0**	18.5
E14	1.0	<0.01	<0.01	0.10	18.4	1.7	**2.0**	18.3
E15	0.6	<0.01	<0.01	0.06	16.5	1.6	**1.9**	17.9
E16	0.5	<0.01	<0.01	0.10	20.7	3.9	**2.2**	**33.5**
E17	0.5	<0.01	<0.01	0.05	22.5	3.5	**2.1**	**19.4**
E18	3.4	<0.01	0.07	0.69	**30.5**	3.0	**2.0**	**33.4**
E19	2.0	<0.01	0.05	0.39	**33.4**	4.8	**2.2**	**33.5**

Receptor ID	Impact				Total Concentration / Deposition Rate			
	Annual Mean Concentration (µg/m³)			Nitrogen Deposition Rate (kgN/ha/yr))	Annual Mean Concentration (µg/m³)			Nitrogen Deposition Rate (kgN/ha/yr))
	9.1.2	9.1.3	9.1.4		9.1.5	9.1.6	9.1.7	
E20	1.4	<0.01	0.04	0.27	19.7	3.4	**2.1**	**34.5**
E21	0.3	<0.01	<0.01	0.06	22.0	3.7	**2.1**	**33.9**

Notes: Values in **bold** denote an exceedance of an air quality objective, environmental assessment level or critical load. For NH_3 it is assumed that the appropriate environmental assessment level is 1 µg/m³, where lichens or bryophytes (including mosses, liverworts and hornwarts) are present.

9.1.8 Air quality impacts on sensitive nature conservation sites are summarised as follows:

- Impacts to annual mean NOX concentrations are more than 1% of the air quality objective at some saltmarsh locations within the SAC, but where this occurs, total concentrations remain well below the objective value. Elsewhere, NOx impacts exceed 1% of the air quality objective at the undesignated Priority Habitats.
- Impacts to annual mean SO2 are less than 1% of the air quality objective at all locations. Total concentrations are well below the air quality objective also.
- Impacts to annual mean NH3 are less than 1% of the environmental assessment level at all saltmarsh habitats. Impacts do exceed 1% of the assessment level on nearby undesignated Priority Habitat site, assuming that those sites have lichens or bryophytes (including mosses, liverworts and hornwarts) present.
- Impacts to nitrogen deposition exceed 1% of the critical load for saltmarsh habitat at two areas within the SAC. At these locations, total deposition rates with the Project in operation are below the critical load value. Elsewhere within the SAC, impacts are <1% of the Critical Load. Impacts of more than 1% of the critical load are predicted on nearby undesignated Priority Habitat site.

9.1.9 Table B.8 provides the predicted impact of Project emissions on human health sensitive receptors and total pollutant concentrations with the Project in operation.

Table B.8. Air Quality Impacts – Human Health Receptors

Receptor ID	Impact						Total Concentration					
	Annual Mean NO_2	Hourly Mean NO_2	Daily Mean SO_2	Hourly Mean SO_2	8-Hour Max CO	Annual Mean VOC (as C_6H_6)	Annual Mean NO_2	Hourly Mean NO_2	Daily Mean SO_2	Hourly Mean SO_2	8-Hour Max CO	Annual Mean VOC (as C_6H_6)
R1	0.6	22.5	<0.1	<0.1	0.5	<0.1	17.4	56.1	15.1	15.1	0.8	0.4
R2	0.6	20.4	<0.1	<0.1	0.6	<0.1	17.4	54	15.1	15.1	0.9	0.4
R3	0.6	22.4	<0.1	<0.1	0.6	<0.1	17.4	56	15.1	15.1	0.9	0.4
R4	0.6	21.7	<0.1	<0.1	0.6	<0.1	17.4	55.3	15.1	15.1	0.9	0.4
R5	0.5	20.8	<0.1	<0.1	0.7	<0.1	17.3	54.4	15.1	15.1	1	0.4
R6	0.4	18.1	<0.1	<0.1	0.5	<0.1	14.5	46.3	15.8	15.8	0.8	0.7
R7	0.4	17.5	<0.1	<0.1	0.7	<0.1	14.5	45.7	15.8	15.8	1	0.7
R8	0.3	13.7	<0.1	<0.1	0.4	<0.1	11.4	35.9	12.4	12.4	0.7	0.3
R9	0.3	15.0	<0.1	<0.1	0.4	<0.1	13.8	42	14.8	14.8	0.7	0.3
R10	1.1	25.8	<0.1	<0.1	0.8	<0.1	17.9	59.4	15.1	15.1	1.1	0.4
R11	1.1	26.9	<0.1	<0.1	0.8	<0.1	17.9	60.5	15.1	15.1	1.1	0.4
R12	1.2	27.3	<0.1	<0.1	0.8	<0.1	17.1	59.1	17.1	17.1	1.1	0.4

9.1.10 Air quality impacts on sensitive human health receptors are summarised as follows:

- Impacts to annual mean NO2 concentrations are <5% of the air quality standard at worst. At locations where total pollutant concentrations with the Project in operation account for <75% the objective, this equates to a negligible impact.
- Impacts to hourly mean NO2 concentrations range from 7% to 14% of the air quality objective. A change of between 11% and 20% of the objective is described as a slight adverse and total concentrations remain <31% of the air quality objective.
- Impacts to daily mean and hourly SO2, 8-hour maximum CO and annual mean VOCs (as C6H6) are less than 1% of the relevant air quality objectives at all locations. Total concentrations are well below the air quality objectives also.