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Abbreviations

Abbreviation	In full
AADT	Annual Average Daily Traffic
ADMS	Atmospheric Dispersion Modelling System
AGL	Above Ground Level
APIS	Air Pollution Information System
As	Arsenic
AQAL	Air Quality Assessment Level
AQMA	Air Quality Management Area
AQMAU	Air Quality Modelling and Assessment Unit
ARN	Affected Road Network
ASR	Annual Status Report
BAT-AEL	Best Available Technique-Associated Emission Levels
BATC	BAT Conclusion
BREF	BAT Reference Document
CAZ	Clean Air Zone
Cd	Cadmium
CERC	Cambridge Environmental Research Consultants
CHP	Combined Heat and Power
CL	Critical Level
CLd	Critical Load
Co	Cobalt
Cr	Chromium
Cu	Copper
DM	Do Minimum
DS	Do Something
EA	Environment Agency
ECA	Emissions Control Area
EFT	Emissions Factor Toolkit
ELV	Emissions Limited Values
EPUK	Environmental Protection UK
ES	Environmental Statement
g/s	grams per second
GHG	Greenhouse Gas
HCl	Hydrogen chloride
HF	Hydrogen fluoride

HFO	Heavy Fuel Oil
HRA	Habitats Regulations Assessment
Hg	Mercury
IED	Industrial Emissions Directive
IAQM	Institute for Air Quality Management
IMO	International Maritime Organisation
Keq/ha/yr	Kilo equivalents per hectare per year
KgN eq/ha/yr	kilograms of nitrogen equivalent per hectare per year
KgS eq/ha/yr	kilograms of sulphur equivalent per hectare per year
kW	kilowatt
LCP	Large Combustion Plant
LNR	Local Nature Reserve
LWS	Local Wildlife Site
MBC	Middlesbrough Borough Council
Mn	Manganese
NH ₃	Ammonia
Ni	Nickel
NNR	National Nature Reserve
NRA	Navigation Risk Assessment
NO	Nitric oxide
NO ₂	Nitrogen dioxide
O ₃	Ozone
Pb	Lead
PC	Process Contribution
PCM	Pollution Climate Mapping
PEC	Predicted Environmental Concentration
PM	Particulate Matter
RCBC	Redcar and Cleveland Borough Council
SAC	Special Area of Conservation
SAF	Sustainable Aviation Fuel
Sb	Antimony
SCR	Selective Catalytic Reduction
SFOC	Specific Fuel Oil Consumption
SNCR	Selective Non-Catalytic Reduction
SO ₂	Sulphur dioxide
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest

STBC	Stockton-on-Tees Borough Council
TI	Thallium
TOMP	Toxic Organic Micro Pollutants
UKEAN	United Kingdom Eutrophying & Acidifying Network
V	Vanadium
VOC	Volatile Organic Compound
WI	Waste Incineration

1 Introduction

1.1 Overview

- 1.1.1 Emissions to air during the operation of the Proposed Development have the potential to adversely affect human health and sensitive ecosystems, if not appropriately controlled. Emissions associated with the operational phase could give rise to potential localised air quality effects from emissions from operational road and shipping traffic and also from the point source emissions from the Proposed Development once operational.
- 1.1.2 This technical Appendix accompanies **Chapter 8: Air Quality (Environmental Statement (ES) Volume I, Application Document Ref. 6.1)** and describes in detail the assessment of operational traffic using dispersion modelling. The model input parameters are discussed and the full results are presented to determine the impacts and effects of traffic emissions as a result of the operation of the Proposed Development. Operational shipping emissions have also been considered using information from the Navigation Risk Assessment (NRA) which is outlined in **Chapter 20: Marine Navigation (ES Volume I, Application Document Ref. 6.1)** and information sourced from the International Maritime Organisation (IMO). The appendix also describes the dispersion modelling inputs and assessment of the point source emissions from the Proposed Development once operational.
- 1.1.3 The magnitude of air quality impacts at sensitive human and ecological receptors have been quantified for pollutants emitted as a result of the operation of the Proposed Development. The impact of emissions on sensitive ecological receptors has been considered in the context of relevant critical levels (CL) and critical loads (CLd) for designated and non-designated ecological sites.
- 1.1.4 The assessment has considered emissions from the main stacks of the Proposed Development during normal operational conditions. Non-routine emissions, such as those which may occur during the commissioning process, start up, or other abnormal short-term events would typically only occur on an infrequent basis, would be detected by the process control system and rectified within a short time period. The plant operation will also be regulated by the Environment Agency (EA) through the Environmental Permit required for the operation of the Proposed Development. For these reasons, no detailed consideration of impacts associated with abnormal or emergency events has been included in this assessment.
- 1.1.5 Annex A: and Annex B: of this Appendix provide the results tables for all pollutants released from the main stacks of the operational Proposed Development.

- 1.1.6 In addition, an assessment of visible plumes from the operational Proposed Development has been carried out to inform the **Statutory Nuisance Statement (Application Document Ref. 5.5)** and **Chapter 13: Landscape and Visual Amenity (ES Volume I, Application Document Ref. 6.1)**. The details of this assessment are provided in Annex C:.

2 Scope

2.1 Operational road emissions

- 2.1.1 A quantitative assessment of traffic emissions during the operation of the Proposed Development has been carried out, as the numbers of additional vehicles associated with the operational phase of the Proposed Development are above the Environmental Protection UK (EPUK)/Institute for Air Quality Management (IAQM) [Ref 1] screening criteria requiring such assessment.

2.2 Operational shipping emissions

- 2.2.1 An assessment of emissions from ship movements associated with the delivery of biomass and waste wood feedstock has been undertaken, as it is anticipated that the additional shipping movements may have the potential to impact nearby sensitive receptors.

- 2.2.1.1 Information for the assessment has been sourced from the NRA, which is outlined in **Chapter 20: Marine Navigation (ES Volume I, Application Document Ref. 6.1)**, as well from the IMO Greenhouse Gas (GHG) study [Ref 2].

- 2.2.2 A study area was defined based on the Local Air Quality Management (LAQM) TG(22) guidance [Ref 3] and the impacts on sensitive receptors were determined in accordance with the method set out in the EA air emissions risk assessment guidance [Ref 5].

- 2.2.2.1 The dispersion of emissions from the operational shipping movements has been predicted using the latest version of the atmospheric dispersion modelling system (ADMS) roads modelling software (currently ADMS Roads version 5.1.0.2) [Ref 4].

2.3 Operational plant emissions

- 2.3.1 The assessment has considered the impact of the operational process emissions on local air quality, under normal operating conditions, with the plant operational for 8,760 hours per year.

- 2.3.2 The study area for the operational Proposed Development point source emissions extends up to 15km from the Main Site, in order to assess the potential impacts on ecological receptors, in line with the EA risk assessment methodology [Ref 5], which requires assessment for larger emitters of:

- Special Protection Areas (SPA), Special Areas of Conservation (SAC), Ramsar sites and Sites of Special Scientific Interest (SSSI) within 15km; and

- Local Nature Sites (including ancient woodlands, Local Wildlife Sites (LWS) and National and Local Nature Reserves (NNR and LNR) within 2km.
- 2.3.3 In terms of human health receptors, impacts from such operational proposed developments typically become negligible within approximately 2km, however the sensitive receptors in the vicinity of the Proposed Development are greater than 2km from the Main Site. The assessment therefore uses the closes areas of human occupation as human health receptors.
- 2.3.4 The dispersion of emissions from the Proposed Development's main stacks has been predicted using the latest version of the atmospheric dispersion modelling system (ADMS) (currently ADMS version 6.0.2.5). The results are presented in both tabular format within this Appendix and as contour plots of predicted ground level Process Contributions (PC) overlaid on mapping of the surrounding area (**Figures 8.12 – 8.17, ES Volume II, Application Document Ref. 6.2**).

2.4 Sources of information

- 2.4.1 The information that has been used within this assessment includes:
- **Chapter 4: Proposed Development (ES Volume I, Application Document Ref. 6.1)**;
 - details on the site layout;
 - Ordnance Survey mapping;
 - operational traffic data generated by Arup transport consultants (**Appendix 18C (ES Volume III, Application Document Ref. 6.3)**);
 - operational shipping data generated by data from the NRA which is outlined in **Chapter 20: Marine Navigation (ES Volume I, Application Document Ref. 6.1)**;
 - data on emissions to atmosphere from the process provided by the project engineers, in line with Industrial Emissions Directive (IED) [Ref 6] emission limits and Best Available Technique - Associated Emission Levels (BAT-AEL) values;
 - baseline air quality data from published sources and Local Authorities; and
 - meteorological data supplied by ADM Ltd.

3 Methodology

3.1 Operational traffic assessment

3.1.1 The operational traffic assessment methodology is the same as that described in **Appendix 8A Construction Air Quality Assessment (ES Volume III, Application Document Ref. 6.3)**, with the exception of the assessment scenarios and receptor locations, which are outlined below.

Assessment scenarios

3.1.2 Traffic flows have been provided for:

- 2024 baseline scenario;
- 2031 Do Minimum (DM) scenario, which is the future operational year traffic flows without the Proposed Development in situ; and
- 2031 Do Something (DS) scenario, which is the same as the DM scenario but includes the operational traffic generated by the Proposed Development.

Sensitive receptors

Human receptors

3.1.3 The construction Affected Road Network (ARN) is wider than the operational ARN, and so some receptors included in the construction assessment are not relevant for the operational assessment. Sensitive human receptor locations included in the operational traffic assessment are detailed in Table 3.1 and their locations are shown in **Figure 8.6: Operational Assessment - Operational Traffic ARN & Human Receptors (ES Volume II, Application Document Ref 6.2)**.

Table 3.1 Sensitive human receptors included in the operational traffic assessment

Receptor ID	X	Y	Description	Shortest Distance to Road Source (m)
CT001	448225	524996	Residential Property - Cowpen Lane Farm	151
CT002	448062	525341	Residential Property - Cowpen Bewley	83
CT003	447154	525670	Residential Property on Rowlands Grove	46
CT004	447004	525864	Residential Property on Rowlands Grove	16
CT005	446264	526075	Residential Property on Bewholme Close	22
CT006	446096	526021	Residential Property on Dryden Close	28

Receptor ID	X	Y	Description	Shortest Distance to Road Source (m)
CT007	445765	525899	Residential Property on Tennyson Road	29
CT008	447237	525539	Residential Property on Wolviston Back Lane	107
CT009	446657	526082	Residential Property on Elvington Close	54
CT016	445649	525748	Residential Property on Haydon Grn	43
CT017	445371	525931	Residential Property on Sunderland Rd	40
CT018	445002	525944	Residential Property on Coal Lane	56

Ecological receptors

- 3.1.4 The sensitive ecological receptor locations are detailed in Table 3.2 and shown in **Figure 8.7: Operational Assessment - Operational Traffic ARN & Ecological Receptors (ES Volume II, Application Document Ref. 6.2)** were included in the operational traffic assessment.

Table 3.2 Sensitive ecological receptors for the operational traffic assessment

Receptor ID	X	Y	Description	Shortest Distance to Road Source (m)
CE001	450600	523713	Teessmouth and Cleveland Coast SPA, Ramsar and SSSI	0 - 200
CE001_10	450593	523719		
CE001_20	450585	523726		
CE001_30	450577	523732		
CE001_40	450569	523738		
CE001_50	450562	523744		
CE001_60	450554	523751		
CE001_70	450546	523757		
CE001_80	450538	523763		
CE001_90	450531	523770		
CE001_100	450523	523776		
CE001_110	450515	523782		
CE001_120	450507	523789		
CE001_130	450500	523795		

Receptor ID	X	Y	Description	Shortest Distance to Road Source (m)
CE001_140	450492	523801		
CE001_150	450484	523808		
CE001_160	450476	523814		
CE001_170	450469	523820		
CE001_180	450461	523827		
CE001_190	450453	523833		
CE001_200	450446	523838		
CE002	450688	523724	Teesmouth and Cleveland Coast SPA, Ramsar and SSSI	0 - 200
CE002_10	450694	523731		
CE002_20	450701	523739		
CE002_30	450708	523746		
CE002_40	450714	523754		
CE002_50	450721	523761		
CE002_60	450728	523769		
CE002_70	450734	523776		
CE002_80	450741	523784		
CE002_90	450748	523791		
CE002_100	450754	523798		
CE002_110	450761	523806		
CE002_120	450768	523813		
CE002_130	450774	523821		
CE002_140	450781	523828		
CE002_150	450788	523836		
CE002_160	450794	523843		
CE002_170	450801	523851		
CE002_180	450808	523858		
CE002_190	450814	523866		
CE002_200	450821	523873		
CE004	450186	521692	Teesmouth and Cleveland Coast SPA, Ramsar and SSSI	0-190
CE004_10	450184	521702		
CE004_20	450181	521711		
CE004_30	450179	521721		
CE004_40	450177	521731		

Receptor ID	X	Y	Description	Shortest Distance to Road Source (m)
CE004_50	450175	521741		
CE004_60	450172	521750		
CE004_70	450170	521760		
CE004_80	450168	521770		
CE004_90	450166	521780		
CE004_100	450163	521789		
CE004_110	450161	521799		
CE004_120	450159	521809		
CE007	448986	524676	Teesmouth and Cleveland Coast SPA, Ramsar and SSSI	0 - 150
CE007_10	448994	524682		
CE007_20	449002	524687		
CE007_30	449010	524693		
CE007_40	449019	524699		
CE007_50	449027	524704		
CE007_60	449035	524710		
CE007_70	449044	524715		
CE007_80	449052	524721		
CE007_90	449060	524726		
CE007_100	449069	524732		
CE007_110	449077	524738		
CE007_120	449085	524743		
CE007_130	449093	524749		
CE007_140	449102	524754		
CE007_150	449110	524760		
CE008	450639	523536	Teesmouth and Cleveland Coast SPA, Ramsar and SSSI	0 - 190
CE008_10	450630	523531		
CE008_20	450621	523526		
CE008_30	450613	523521		
CE008_40	450604	523516		
CE008_50	450595	523512		
CE008_60	450586	523507		
CE008_70	450578	523502		
CE008_80	450569	523497		

Receptor ID	X	Y	Description	Shortest Distance to Road Source (m)
CE008_90	450560	523492		
CE008_100	450551	523487		
CE008_110	450543	523483		
CE008_120	450534	523478		
CE008_130	450525	523473		
CE008_140	450516	523468		
CE008_150	450508	523463		
CE008_160	450499	523458		
CE008_170	450490	523453		
CE008_180	450481	523449		
CE008_190	450474	523445		
CE009	447971	525275	Cowpen Bewley Woodland Country Park – LNR	16

- 3.1.5 The road traffic provided by the Arup traffic consultants (**Appendix 18C: Assessment of Operation Effects (ES Volume III, Application Document Ref. 6.3)**); is provided in Table 3.3.
- 3.1.6 The ARN modelled for the operational traffic assessment is shown in **Figures 8.6: Operational Assessment - Operational Traffic ARN & Human Receptors** and **8.7: Operational Assessment - Operational Traffic ARN & Ecological Receptors (ES Volume II, Application Document Ref. 6.2)**.

Table 3.3 Road traffic data used in the operational traffic assessment

Road/Link ID	Avg. Speed (kph)	2024 Base			2031 Do-Minimum			2031 Do-Something		
		Total AADT	HDV	HDV (%)	Total AADT	HDV	HDV (%)	Total AADT	HDV	HDV (%)
1	48	4,490	629	14.0	4,686	656	14.0	5,147	797	15.5
2	97	8,146	362	4.4	8,501	378	4.4	8,706	378	4.3
3	97	6,911	475	6.9	7,212	496	6.9	7,238	496	6.8
4	97	4,950	986	19.9	5,166	1,029	19.9	5,396	1,170	21.7
5	97	4,950	986	19.9	5,166	1,029	19.9	5,396	1,170	21.7
6	80	4,950	986	19.9	5,166	1,029	19.9	5,396	1,170	21.7
7	64	9,170	228	2.5	9,570	238	2.5	9,604	238	2.5
8	64	13,290	1,612	12.1	13,869	1,682	12.1	14,066	1,823	13.0
9	64	8,211	84	1.0	8,569	88	1.0	8,570	88	1.0
10	64	30,520	1,248	4.1	31,851	1,302	4.1	31,853	1,302	4.1
11	113	3,946	294	7.5	4,118	307	7.5	4,118	307	7.5
13	64	33,563	2,694	8.0	35,026	2,811	8.0	35,194	2,942	8.4
14	64	33,563	2,694	8.0	35,026	2,811	8.0	35,193	2,942	8.4
39	64	27,236	958	3.5	28,423	1,000	3.5	28,431	1,000	3.5

3.2 Operational shipping assessment

- 3.2.1.1 The operational shipping assessment methodology is the same as that described in **Appendix 8A Construction Air Quality Assessment (ES Volume III, Application Document Ref. 6.3)**, with the exception of the vessels being assessed in the operational phase compared to the construction phase.
- 3.2.2 As defined in NRA (**Appendix 20A: NRA (ES Volume III, Application Document Ref. 6.3)**), operational shipping movements constitute Phase 3 of the marine operations, which covers the import of biomass and waste wood feedstock via the quay. As such, only this phase has been included in the operational shipping assessment.
- 3.2.3 It is intended that Sustainable Aviation Fuel (SAF) will be exported from the Proposed Development via pipelines to third party marine export facilities. As such, it is not considered necessary to assess the air quality impacts arising from the marine export of products from the Proposed Development, as this will not lead to an increase in the consented shipping movements on the Tees.
- 3.2.4 In total, during the operational phase, there will be 93 large ship movements annually for the import of biomass and waste wood feedstock. Although these numbers are relatively small compared to the TG(22) guidance [Ref 3] on assessing shipping emissions, the same precautionary approach advised by Natural England detailed in the **Appendix 8A: Construction Air Quality Assessment (ES Volume III, Application Document Ref. 6.3)**, has been followed for the operational assessment of shipping emissions.
- 3.2.4.1 Any key differences between the operational phase shipping assessment and the construction phase shipping assessment are outlined below.

Sensitive receptors

- 3.2.5 A desktop study was undertaken to identify existing sensitive receptors that may be impacted by shipping movements in the operational phase. As with the construction phase assessment, it is considered that there are no sensitive human receptors within 250m or 1km of the study area and therefore human receptors can be screened out from requiring assessment.
- 3.2.6 For sensitive ecological receptors, the same screening area outlined in TG(22) [Ref 3] was utilised, with sensitive ecological receptors identified within 1km of either the shipping route or the quay area. In total there were seven ecological sites identified, all of which were part of the Teesmouth and Cleveland Coast SPA, Ramsar and SSSI site.

3.2.7 The ecological receptors for which the impact of shipping emissions will be predicted are listed in Table 3.4. Modelled receptors are presented in **Figure 8.5: Shipping Assessment Study Area (ES Volume II, Application Document Ref. 6.2).**

Table 3.4 Modelled receptors for the operational shipping assessment

Receptor ID	X	Y	Description	Shortest distance to road source (m)
SE001	454272	526950	Teesmouth and Cleveland Coast SPA, Ramsar and SSSI & Saltholme LWS	Quay: 3.1km Shipping Route: 341m
SE002	455556	527008	Teesmouth and Cleveland Coast SPA, Ramsar and SSSI	Quay: 3.5km Shipping Route: 825m
SE003	453959	526193		Quay: 2.3km Shipping Route: 502m
SE004	454278	528315	Teesmouth and Cleveland Coast and Seaton Dunes and Common	Quay: 4.5km Shipping Route: 767m
SE005	455624	527450	Teesmouth and Cleveland Coast SPA, Ramsar and SSSI	Quay: 4.5km Shipping Route: 695m
SE006	453586	525412		Quay: 1.6km Shipping Route: 1.0km
SE007	454702	526166		Quay: 2.4km Shipping Route: 230m

3.2.8 Background deposition information has been gathered for each of the selected sensitive ecological receptors from the Air Pollution Information Service (APIS) website [Ref 17] for NO_x, NH₃, nutrient nitrogen deposition and acid deposition. Information on the selected background concentrations are displayed below in Table 3.5.

Table 3.5 APIS Critical levels and critical loads

Ecological receptor ID	Annual mean NO _x critical level (µg/m ³)	Annual mean SO ₂ critical level (µg/m ³)	Critical load class	N critical load (minimum)	Acid critical load (keq/ha/yr)
SE001	30	20	Coastal sand dune	5	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00
SE002	30	20	Coastal sand dune	5	
SE003	30	20	Saltmarsh	10	
SE004	30	20	Coastal sand dune	5	
SE005	30	20	Coastal sand dune	5	
SE006	30	20	Coastal sand dune	5	
SE007	30	20	Salt marsh	10	

Dispersion model set up

The general model conditions used in the assessment of shipping emissions are summarised in

- 3.2.9 Table 3.6. Other more detailed data used to model the dispersion of emissions is considered below.

Table 3.6 General ADMS roads model conditions for the operational shipping assessment

Variable	Input
Surface roughness at source	0.3m
Minimum Monin-Obukhov length for stable conditions	30m
Receptors	Selected discrete receptors
Receptor location	X, Y coordinates determined by GIS. The height of ecological receptors will be modelled at 0m, representative of ground level
Modelled pollutants	NO _x , PM ₁₀ , PM _{2.5} , SO ₂
Emission factors	Fourth IMO GHG Study [Ref 2]
Meteorological data	One year of hourly sequential data, Durham Tees Valley Meteorological Station (2024)
Emission profiles	None used – emissions averaged across a 24-hour period
Terrain types	Flat terrain
Model output	Long-term annual mean NO _x concentration (µg/m ³) Long-term annual mean PM ₁₀ concentration (µg/m ³) Long-term annual mean PM _{2.5} concentration (µg/m ³) Long-term annual mean SO ₂ concentration (µg/m ³)

Vessels

3.2.10 Information on the vessels involved in the operational phase was sourced from the NRA (**Appendix 20A: NRA (ES Volume III, Application Document Ref. 6.3)**). The breakdown of the vessels included in Marine Phase 3 is detailed below in Table 3.7.

Table 3.7 Operational shipping phase - vessels

Vessel Type	No. of anticipated transits*	Period of navigation activity	IMO GHG Vessel class
Panamax	28	Annually	Bulk Carrier
Handymax	65	Annually	Bulk Carrier
Note: Anticipated transits (total) is defined as round trips including both arrival and departure.			

3.2.11 The specific vessel type used in each phase was cross-referenced against the IMO GHG study [Ref 2] to determine the power output (kW) of the associated main engine, auxiliary engine and boiler engine both at berth and at sea in order to determine emissions both idling at the quay and navigating through the River Tees. The modelling categories used for at berth and manoeuvring emissions calculations are shown in Table 3.8.

Table 3.8 Operational phase Vessel modelling categories

Vessel Type	Description	Units
Bulk carrier	35,000 – 59,999	DWT
	60,000 – 99,999	DWT

Vessels at berth

- 3.2.11.1 For vessels at berth, the emissions were calculated using the time each vessel would spend at berth, as defined by the **NRA (Appendix 20A: NRA (ES Volume III, Application Document Ref. 6.3))**, the auxiliary engine power at berth, boiler power at berth, specific fuel oil consumption (SFOC) and pollutant emission factors, as defined by the IMO GHG study [Ref 2].
- 3.2.11.2 It is assumed that all vessels will turn off their main engines at berth and will only run on auxiliary engines and use boiler power (where one is installed).
- 3.2.11.3 The estimated heights were taken from Southampton Clean Air Zone (CAZ) - Air Quality Modelling Methodology report [Ref 7].
- 3.2.11.4 Details of the operational phase vessel at berth modelling are provided below in Table 3.9.

Table 3.9 Details of the operational phase vessels at berth modelling

Vessel	IMO GHG vessel class	Auxiliary engine load at berth (kW)	Boiler power at berth (kW)	Average time at berth (hrs)	Modelled berth height (m)
Panamax	Bulk carrier	240	260	1344	30
Handymax	Bulk carrier	150	130	2340	30

- 3.2.11.5 Emissions for each vessel at berth were calculated using the methodology outlined in **Appendix 8A: Construction Air Quality Assessment (ES Volume III, Application Document Ref. 6.3)**.

Vessels manoeuvring

- 3.2.11.6 For vessels manoeuvring, the emissions were calculated based on the time spent manoeuvring, main engine, auxiliary engine and boiler power whilst manoeuvring, specific fuel consumption (for an engine with a given fuel) and pollutant emission factors. As with the vessels at berth part of the assessment, information was sourced from the fourth IMO GHG study [Ref 2].
- 3.2.11.7 Details of the construction phase vessel manoeuvring modelling are provided below in Table 3.10.

Table 3.10 Details of the operational phase vessels manoeuvring modelling

Vessel	IMO GHG vessel class	Main engine load (kW)	Auxiliary engine load (kW)	Boiler power (kW)	Time moving – segment A (hrs)	Time moving – segment B (hrs)	Modelled height (m)
Panamax	Bulk carrier	9,748	410	-	14.6	15.3	30
Handymax	Bulk carrier	8,177	260	-	33.9	35.4	30

3.2.12 Emissions for each vessel at berth were calculated using the methodology outlined in **Appendix 8A: Construction Air Quality Assessment (ES Volume III, Application Document Ref. 6.3)**.

3.3 Operational plant assessment

3.3.1 The assessment of point source emissions from the operational Proposed Development has been undertaken using the advanced dispersion model ADMS, supplied by Cambridge Environmental Research Consultants Limited (CERC). ADMS is a modern dispersion model that has an extensive published validation history for use in the UK. This model has been extensively used throughout the UK for regulatory purposes [Ref 8].

Modelled scenarios

3.3.2 The dispersion modelling undertaken for the assessment of emissions from the operational Proposed Development stacks includes reporting of the impacts for the scenario that results in the highest impacts of each pollutant modelled, at the worst-case human health receptor and at all ecological receptors.

Model inputs

3.3.3 The general model conditions used in the assessment are summarised in Table 3.11.

Table 3.11 General ADMS 6 model inputs

Variable	Input
Surface roughness at source	0.3m
Surface roughness at meteorological site	0.2m
Receptors	Selected discrete receptors (Table 3.14 and Table 3.15)
	Regular spaced grid
Receptor location	x, y coordinates determined by GIS

Variable	Input
	z (ground level) = 1.5 m for residential receptors
	z = 0 m for ecological receptors
Source location	x, y coordinates determined by GIS
Emissions	BAT-AELs and data provided by LGF and the project engineers
Sources ⁱ	A1 Stack (Combined Heat and Power (CHP) Plant Stack) A2 Stack (Sustainable Aviation Fuel (SAF) Production Product Pretreatment – Stack 1) A3 Stack (SAF Production Main Processing – Stack 1) A15 Stack (SAF Production Main Processing – Stack 2) A16 Stack (SAF Production Main Processing – Stack 3) A14 Stack (SAF Production Main Processing – Stack 4)
Meteorological data	5 years of meteorological data, Durham Tees Valley (Teesside Airport) Meteorological Station (2020 – 2024)
Terrain data	Not required
Buildings that may cause building downwash effects	As detailed in Table 3.16.

Emissions data

- 3.3.4 During normal operation, the A1 and A2 stacks would be the primary sources of emissions from the operation of the Proposed Development, as these relate to the CHP plant and the SAF Production Product Pretreatment.
- 3.3.5 It is considered that 140m above ground level (AGL) is the appropriate stack height for the A1 stack and 100m AGL for the A2 stack in order to result in impacts that are not significant at human health receptors and would limit significant effects reported at ecological receptors, with the current conservative model input parameters used in this assessment.
- 3.3.6 It is recognised that the actual stack locations have not been fixed, however their location will remain within the same Works Area (stacks A2, A3, A14, A15 & A16 in Work No.1 and A1 in Work No.2 as described in the **draft DCO (Application Document Ref. 3.1)**), and therefore would not vary significantly. It is considered that should a stack be located within 30m of its assessed location, the effect on the assessment results would not change the assessment outcome, considering the worst-case assumptions that

ⁱ Emission sources A4-A13 are intermittent/emergency/fugitive vents/stacks and as such have not been incorporated into the operational modelling.

have been applied in the assessment. The 30m deviation stated would result in stacks remaining within the same Works Area.

- 3.3.7 The physical properties of the assessed emission sources are shown in Table 3.12 and the stack locations are shown in **Figure 8.9: Operational Assessment - Operational Plant Stack and Building Locations (ES Volume II, Application Document Ref. 6.2)**.

Table 3.12 **Modelled point source emissions inventory**

Parameter	Unit	Stack A1 (CHP Plant)	Stack A2 (SAF Production Product Pretreatment – Stack 1)	Stack A3 (SAF Production Main Processing – Stack 1)	Stack A14 (SAF Production Main Processing Stack 4)	Stack A15 (SAF Production Main Processing – Stack 2)	Stack A16 (SAF Production Main Processing – Stack 3)
Indicative stack position	(NGR) m	452851, 523898	452868, 523737	452539, 523976	452541, 523765	452541, 523756	452541, 523746
Stack release height (AGL)	m	140	100	60	60	60	60
Internal stack diameter	m	2.75	2.75	0.55	0.65	0.55	0.35
Flue temperature	°C	130	150	277	88	89	89
Flue H ₂ O content	%	10.5	10.0	8.8	7.7	21.5	3.1
Flue O ₂ content (dry)	%	3.6	12.4	3.2	6.8	23.3	23.3
Reference O ₂	%	6	3	-	-	-	-
Stack gas exit velocity	m/s	29.9	29.9	28.1	31.9	30.4	29.3
Stack flow (actual)	Am ³ /s	177.8	177.8	6.7	10.6	7.2	2.8
Stack flow at normalised conditions (STP, dry)	Nm ³ /s	125.0	48.8	3.0	7.4	4.3	2.1
STP = Standard temperature and pressure (0°C, 1 atmosphere (101.325 kilopascals))							

- 3.3.8 Under the IED and Environmental Permitting regime, listed activities are required to meet relevant Emission Limit Values (ELVs) or BAT-AEL, as defined in the IED, associated BAT Reference Documents (BREFs) and BAT Conclusions (BATC).
- 3.3.9 The CHP plant (Stack A1) would be a listed Large Combustion Plant (LCP) activity and therefore would be required to meet the BAT-AELs associated with LCP plant combusting sustainably sourced biomass feedstock in line with the requirements of the SAF mandate (biomass), as detailed in the LCP BATC [Ref 10]. As the CHP plant may also combust waste woodⁱⁱ, it would also be classed as a waste co-incineration activity, and therefore there are relevant BAT-AELs detailed in the Waste Incineration (WI) BATC [Ref 11] that also need to be considered in the assessment.
- 3.3.10 To enable the maximum flexibility in the CHP fuel type, it is proposed that the most stringent BAT-AELs from the LCP BATC or WI BATC are applied to the CHP plant emissions, which would enable the use of 100% biomass or 100% waste wood, or any combination of the two types of fuel. This approach has been agreed with the EA during pre-application discussions on the Environmental Permit required for the operational Proposed Development.
- 3.3.11 The WI BATC provides the BAT-AEL for “other metals” as a combined total of Antimony (Sb), Arsenic (As), Lead (Pb), Chromium (Cr), Cobalt (Co), Copper (Cu), Manganese (Mn), Nickel (Ni) and Vanadium (V) with a range of 0.075 – 0.3mg/Nm³. For this assessment, the upper value of the BAT-AEL has been applied to each individual metal to provide a conservative assumption, when in reality it is likely that each metal will be emitted at a lower concentration.
- 3.3.12 The assessment of Cr(VI) has taken into account the assessment methodology detailed in the AQMAU Releases from Waste Incinerator guidance [Ref 12]. The methodology provides monitoring data of the individual metal species from Waste Incineration plant, collected from operational plant between 2007 – 2015. The monitoring data indicated that Cr(VI) comprised a maximum of 0.03% of the “other metals” BAT-AEL. It has therefore been assumed that Cr(VI) emissions are at a maximum of 0.03% of the other metals BAT-AEL in this assessment.
- 3.3.13 As with the metals listed above, the BATC also listed a combined BAT-AEL for Cadmium (Cd) and Thallium (Tl) of <5µg/Nm³. For the purposes of this

ⁱⁱ This will include waste wood defined as “waste” under IED

assessment, both Cd and TI have been modelled at a conservative emission level of $5\mu\text{g}/\text{Nm}^3$.

- 3.3.14 The thermal pretreatment of biomass feedstock for the SAF production process would also be a listed LCP activity. This will process non-waste biomass material and therefore the BAT-AELs from the LCP BATC for biomass combustion apply. There will also be some combustion of syngas produced during this stage and therefore the application of the IED Annex V Part 2 ELVs for gaseous fuels also need to be considered.
- 3.3.15 As with the emission concentrations for the CHP plant, it has therefore been assumed that the thermal pretreatment process will achieve the most stringent BAT-AELs from those applicable, to enable maximum flexibility in its operation, as agreed with the EA during Environmental Permit pre-application discussions.
- 3.3.16 The LCP BATC includes BAT-AELs as annual and daily averages, and therefore where available these have been used to assess impacts against the relevant air quality assessment level (AQAL) objective averaging periods. Additionally, the IED calculates hourly emission levels as 200% of monthly average values and therefore these have also been used to assess emissions against hourly AQAL objectives, where relevant.
- 3.3.17 The BAT-AELs applied to the Thermal Oxidiser have been derived from the Waste Gas Management and Treatment Systems in the Chemical Sector BATC [Ref 13].
- 3.3.18 For all emissions modelling, it is considered that modelling at these maximum values represents the worst-case impacts; in practice, emission concentrations are likely to be lower than permitted ELVs.
- 3.3.19 Emissions of particulate matter (PM) from grinding activities have been modelled at the BAT-AEL associated with the use of fabric filters of $5\text{mg}/\text{Nm}^3$.
- 3.3.20 The modelled pollutant emission rates (in grams per second (g/s)) have been calculated by multiplying the relevant emission concentration by the volumetric flow rate at normalised reference conditions. The emission limits assumed to apply to the Proposed Development are shown in Table 3.13.
- 3.3.21 As the assessment has assumed that the Proposed Development would operate at continuous design load (8,760 hours per year) no time-based variation in emissions has been included in the model.

Table 3.13 Emission concentrations and the assessed emission rates

Pollutant	Stack A1 (CHP Plant)		Stack A2 (SAF Production Product Pretreatment – Stack 1)		Stack A3 (SAF Production Main Processing – Stack 1)		Stack A14 (SAF Production Main Processing – Stack 4)		Stack A15 (SAF Production Main Processing – Stack 2)		Stack A16 (SAF Production Main Processing – Stack 3)	
	Emission conc. (mg/Nm ³)	Emission rate (g/s)	Emission conc. (mg/Nm ³)	Emission rate (g/s)	Emission conc. (mg/Nm ³)	Emission rate (g/s)	Emission conc. (mg/Nm ³)	Emission rate (g/s)	Emission conc. (mg/Nm ³)	Emission rate (g/s)	Emission conc. (mg/Nm ³)	Emission rate (g/s)
Oxides of nitrogen (NO _x (as NO ₂))	140 (annual) 150 (daily) 300 (hourly)	17.5 (annual) 18.8 (daily) 37.5 (hourly)	100 (annual) 110 (daily) 200 (hourly)	4.9 (annual) 5.4 (daily) 9.8 (hourly)	130.0	0.4	-	-	-	-	-	-
Carbon monoxide (CO)	75 (annual)	9.4 (annual)	100 (annual) 200 (hourly)	4.9 (annual) 9.8 (hourly)	-	-	-	-	-	-	-	-
Sulphur dioxide (SO ₂)	35 (annual) 45 (daily) 300 (hourly)	4.4 (annual) 5.6 (daily) 37.5 (hourly)	35 (annual) 38.5 (daily)	1.7 (annual) 1.9 (daily)	150.0	0.5	-	-	-	-	-	-

Pollutant	Stack A1 (CHP Plant)		Stack A2 (SAF Production Product Pretreatment – Stack 1)		Stack A3 (SAF Production Main Processing – Stack 1)		Stack A14 (SAF Production Main Processing – Stack 4)		Stack A15 (SAF Production Main Processing – Stack 2)		Stack A16 (SAF Production Main Processing – Stack 3)	
	Emission conc. (mg/Nm ³)	Emission rate (g/s)	Emission conc. (mg/Nm ³)	Emission rate (g/s)	Emission conc. (mg/Nm ³)	Emission rate (g/s)	Emission conc. (mg/Nm ³)	Emission rate (g/s)	Emission conc. (mg/Nm ³)	Emission rate (g/s)	Emission conc. (mg/Nm ³)	Emission rate (g/s)
			70 (hourly)	3.4 (hourly)								
Volatile Organic Compounds (VOCs)	5	0.6	-	-	20	0.06	-	-	-	-	-	-
Ammonia (NH ₃)	10	1.3	12	0.6	8.0	0.02	-	-	-	-	-	-
Particulates (PM)	5 (annual) 7.5 (daily) 40 (hourly)	0.6 (annual) 0.9 (daily) 5.0 (hourly)	5.0 (annual) 5.5 (daily) 10 (hourly)	0.2 (annual) 0.3 (daily) 0.5 (hourly)	5.0	0.02	5.0	0.04	5.0	0.02	5.0	0.01
Hydrogen chloride (HCl)	5 (annual) 9 (daily)	0.6 (annual) 1.1 (daily)	6	0.3	-	-	-	-	-	-	-	-

Pollutant	Stack A1 (CHP Plant)		Stack A2 (SAF Production Product Pretreatment – Stack 1)		Stack A3 (SAF Production Main Processing – Stack 1)		Stack A14 (SAF Production Main Processing – Stack 4)		Stack A15 (SAF Production Main Processing – Stack 2)		Stack A16 (SAF Production Main Processing – Stack 3)	
	Emission conc. (mg/Nm³)	Emission rate (g/s)	Emission conc. (mg/Nm³)	Emission rate (g/s)	Emission conc. (mg/Nm³)	Emission rate (g/s)	Emission conc. (mg/Nm³)	Emission rate (g/s)	Emission conc. (mg/Nm³)	Emission rate (g/s)	Emission conc. (mg/Nm³)	Emission rate (g/s)
Hydrogen fluoride (HF)	1.0	0.1	1.2	0.06	-	-	-	-	-	-	-	-
Mercury (Hg)	0.005	0.0006	0.006	2.9E-04	-	-	-	-	-	-	-	-
Cadmium (Cd) & Thallium (Tl)	0.005	0.0006	-	-	-	-	-	-	-	-	-	-
Other metals ^[1]	0.3	0.04	-	-	-	-	-	-	-	-	-	-
Chromium VI (Cr(VI))	9.0E-05	1.1E-05	-	-	-	-	-	-	-	-	-	-
Dioxins (PCDD/PCDF)	3.0E-08	3.8E-9	-	-	-	-	-	-	-	-	-	-
¹ Other metals include: Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V												

- 3.3.22 In order to meet the BAT-AELs, emissions of oxides of nitrogen (NO_x) from the Proposed Development will be controlled through various measures including primary emission controls such as the use of low-NO_x burners and secondary abatement controls such as Selective Non-Catalytic Reduction (SNCR)/Selective Catalytic Reduction (SCR).
- 3.3.23 SNCR/SCR can result in an emission of ammonia (NH₃) slip. Ammonia has a significantly higher deposition rate than NO₂ and therefore its emission can result in a significant increase in the nitrogen deposition impacts at ecological receptors. As a result of this, further abatement may be required (such as wet scrubbing) to reduce the ammonia emissions to ensure that nitrogen deposition impacts from the operational Proposed Development are considered acceptable. This would be considered as additional mitigation in terms of the Habitats Regulations Assessment (HRA), as this is beyond what is required to meet the BAT-AELs for the Proposed Development.
- 3.3.24 Results for the BAT-AEL scenario, and a scenario where additional mitigation is installed to further reduce both the NO_x and NH₃ emission concentrations to below the BAT-AEL levels (to 50mg/Nm³ and 1mg/Nm³ respectively) from Stack A1 and A2 are provided in Section 7.
- 3.3.25 It is considered that the use of additional technologies to reduce emissions of NO_x and NH₃ beyond the BAT-AELs would be the subject of a BAT Assessment and Cost-benefit Analysis that would be required to support the Environmental Permit application for the operational Proposed Development.

Modelled domain – discrete receptors

- 3.3.26 The modelling has predicted concentrations of the pollutants relevant to human health at the maximum location anywhere and at discrete air quality sensitive receptors, as listed in Table 3.14. The locations of these receptors are also shown in **Figure 8.10: Operational Assessment - Operational Plant Modelled Human Receptors (ES Volume II, Application Document Ref. 6.2)**. The receptors are selected to be representative of residential dwellings and recreational areas in the area around the Proposed Development. For human health receptors, concentrations have been predicted at a height of 1.5m.

Table 3.14 Human health receptor locations

Receptor ID	Receptor Description	Grid reference		Distance and direction from the Operational Site
		X	Y	
R001	Greatham	449625	527163	3.7km north west
R002	Seaton Carew	452088	528902	4.3km north
R003	Dormanstown	458030	523805	4.1km east
R004	Port Clarence	449337	522190	2.6km south west
R005	Billingham	447285	524857	4.4km west
R006	Marsh House Lane	449803	526833	3.3km north west
R007	Saltview Terrace	450089	521652	2.4km south west
R008	Normanby Road	453406	520890	2.5km south
R009	Warrenby	457950	525045	4.2km east
R010	Cowpen Bewley	448280	524753	3.4km west

Sensitive ecological receptors

- 3.3.27 In accordance with the EA's Risk Assessment Guidance [Ref 5], the impacts associated with emissions from the Proposed Development on statutory sensitive ecological sites have been quantified. The assessment considers European designated sites (SAC, SPA and Ramsar sites) and SSSI within 15km of the operational Proposed Development, as recommended by the EA's risk assessment guidance for "large emitters". The most notable of these sites is the Teesmouth and Cleveland Coast SPA, Ramsar and SSSI, located within 100m south west of the Main Site at the closest point.
- 3.3.28 In addition, LWS and NNR located within 2km of the Proposed Development have also been included in the assessment.
- 3.3.29 Ground-level concentrations of the modelled pollutants relevant to sensitive ecological receptors have been predicted at locations listed in Table 3.15. The locations of these receptors are shown in **Figure 8.11: Operational Assessment - Operational Plant Modelled Ecological Receptors (ES Volume II, Application Document Ref. 6.2)**. The location reported for each ecology site is the point closest to the Proposed Development, taken to be representative of the worst-case.

Table 3.15 Ecological receptor locations

Receptor ID	Receptor Name	Designation	Grid reference		Distance and direction from the Main Site
			X	Y	
E001a	Teesmouth and Cleveland Coast	SPA, Ramsar and SSSI	453525	525480	0.5km north east
E001b	Teesmouth and Cleveland Coast	SPA, Ramsar and SSSI	451725	525095	0.7km north west
E001c	Teesmouth and Cleveland Coast	SPA, Ramsar and SSSI	453631	525726	0.6km north east
E001d	Teesmouth and Cleveland Coast	SPA, Ramsar and SSSI	453767	525907	0.9km north east
E001e	Teesmouth and Cleveland Coast	SPA, Ramsar and SSSI	453835	526701	1.7km north east
E002	North York Moors	SAC, SPA and SSSI	461290	513666	10.5km south east
E003	Northumbria Coast	SPA and Ramsar	448223	537446	13.5km north
E004	Durham Coast (Dunes)	SAC	448164	537409	12.8km north
E005	Lovell Hill Pools	SSSI	459638	519116	4.9km south east
E006	Saltburn Gill	SSSI	467001	521269	9.7km east
E007	Hart Bog	SSSI	445296	535374	12.8km north west
E008	Briarcroft Pasture	SSSI	439545	519349	11.5km south west
E009	Pike Whin Bog	SSSI	441449	533370	13.5km north west
E010	Whitton Bridge Pasture	SSSI	438693	522289	12.0km west
E011	Coatham Marsh	LWS	458494	524683	1.3km east
E012	Eston Pumping Station	LWS	456470	523790	2.6km east
E013	Teesmouth	NNR	451848	524955	0.5km north

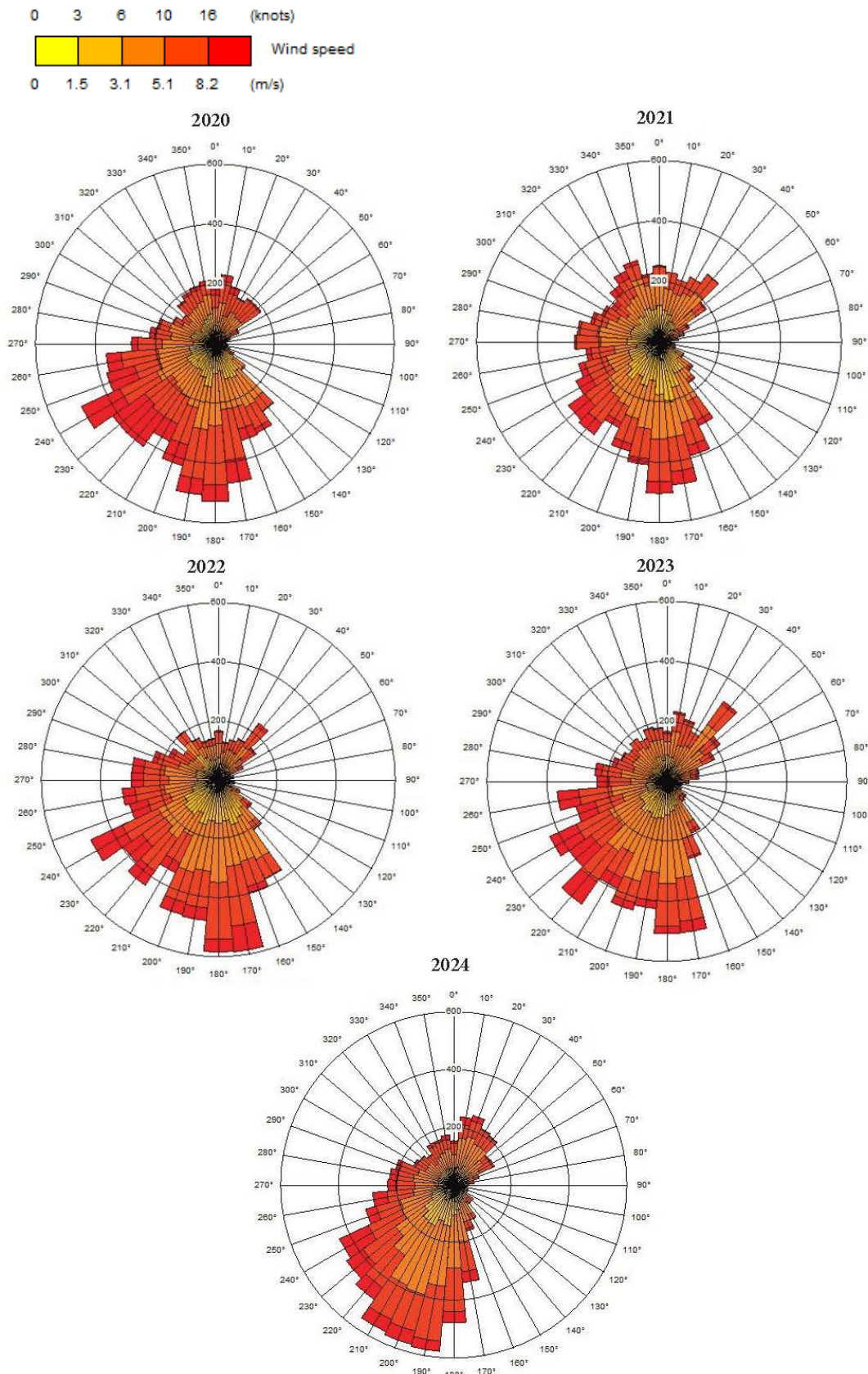
Modelled domain – receptor grid

3.3.30 Emissions from the Proposed Development have been modelled on a receptor grid that is 7km by 7km centred on the stacks at the Proposed Development. The grid spacing is 50m. In order to capture the impacts and produce isopleths for ecological receptors at Teesmouth and Cleveland Coast site to the northeast of the stacks at the Proposed Development, a larger grid has been used.

- 3.3.31 In addition, the identified receptors have been included as specified points within the model and therefore are unaffected by grid spacing.

[Meteorological data](#)

- 3.3.32 Actual measured hourly-sequential meteorological data is available for input into dispersion models, and it is important to select data as representative as possible for the site that will be modelled. This is usually achieved by selecting a meteorological station as close to the site as possible, although other stations may be used if the local terrain and conditions vary considerably, or if the station does not provide sufficient data.
- 3.3.33 The meteorological site that was selected for the assessment is Durham Tees Valley (Teesside Airport), located approximately 18km south west of the Main Site, at a flat airfield in a principally agricultural area. A surface roughness of 0.2m (representative of an agricultural area) has been selected for the meteorological site within the model.
- 3.3.34 The modelling for this assessment has utilised five years of meteorological data for the period 2020 – 2024. Wind roses for each of the years within this period are shown in Inset 3.1.



Inset 3.1 Wind roses for Durham Tees Valley (Teesside Airport), 2020 to 2024

Building downwash effects

- 3.3.35 The buildings that make up the Proposed Development have the potential to affect the dispersion of emissions from the operational process stacks. The ADMS buildings effect module has therefore been used to incorporate building downwash effects as part of the model set up. Buildings greater than one-third of the range of the stack height modelled have been included within the modelling assessment.
- 3.3.36 Buildings associated with the Proposed Development that have been considered to be of sufficient height and volume to potentially impact on the dispersion of emission stacks are shown in Table 3.16. A plan showing the buildings layout used in the ADMS simulation (B1-B13) is illustrated in **Figure 8.9: Operational Assessment - Operational Plant Stack and Building Locations (ES Volume II, Application Document Ref. 6.2)**.
- 3.3.37 The dimensions of the buildings included in the model are the maximum measurements that could potentially be required and have been provided by the Applicant.

Table 3.16 Buildings incorporated into the modelling assessment

Building	Height (m)	Length (m)	Width (m)	Angle (°) to North
B1	60	405	102	90
B2	50	131	142	90
B3	30	39	104	90
B4	50	175	104	90
B5	20	94	154	90
B6	25	63	77	90
B7	20	42	103	90
B8	30	31	41	90
B9	30	91	65	90
B10	30	72	228	90
B11	20	62	77	90
B12	25	132	65	90
B13	30	267	101	90

Terrain

- 3.3.38 The local area immediate to the Proposed Development is primarily flat land, with various surrounding industrial facilities in close proximity of the

Proposed Development at Seal Sands. The closest urban area to the Proposed Development is Middlesbrough, located 4.2km south across the River Tees.

- 3.3.39 A surface roughness of 0.3m, corresponding to the minimum value associated with the terrain type, has therefore been selected to represent the local terrain.
- 3.3.40 Site-specific terrain data has not been used in the model, as there are no potentially significant changes in gradient within the study area.

[NO_x to NO₂ conversion](#)

- 3.3.41 Emissions of NO_x from industrial point sources are typically dominated by nitric oxide (NO), with emissions from combustion sources typically in the ratio of NO to nitrogen dioxide (NO₂) of 9:1. However, it is NO₂ that has specified environmental standards due to its potential impact on human health. In the ambient air, NO is oxidised to NO₂ by the ozone (O₃) present, and the rate of oxidation is dependent on the relative concentrations of NO and O₃ in the ambient air.
- 3.3.42 For the purposes of detailed modelling, and in accordance with EA technical guidance, it is assumed that 70% of NO emitted from the stack is oxidised to NO₂ in the long term (i.e. annual mean) and 35% in the short term (i.e. hourly mean).

[Calculation of deposition at sensitive ecological receptors](#)

- 3.3.43 The deposition of nutrient nitrogen and acid at sensitive ecological receptors has been calculated using the modelled process contributions (PC) predicted at the receptor points. The deposition rates are determined using conversion rates and factors contained within published guidance [Ref 14], which takes into account variations in the deposition mechanisms for different types of habitat.
- 3.3.44 The conversion rates and factors used in the assessment are shown in Table 3.17.

Table 3.17 Nutrient nitrogen and acid deposition conversion factors

Pollutant	Deposition velocity grassland (m/s)	Deposition velocity woodland (m/s)	Deposition Conversion factors	
			Nutrient Nitrogen ($\mu\text{g}/\text{m}^2/\text{s}$ to $\text{kg}/\text{ha}/\text{yr}$)	Acid ($\text{kg}/\text{ha}/\text{yr}$ to $\text{keq}/\text{ha}/\text{yr}$)
NO_x as NO_2	0.0015	0.003	96	0.07
NH_3	0.02	0.03	259.7	0.07
SO_2	0.012	0.024	157.7	0.06
HF and HCl	0.03	0.06	306.7	0.03

Specialised model treatments

- 3.3.45 Emissions have been modelled such that they are not subject to be depleted through chemical reactions. The assumption of continuity of mass is likely to result in an over-estimation of impacts at receptors and therefore is considered to be conservative.

4 Baseline air quality

4.1 Overview

4.1.1 This section presents the information used to evaluate the background and baseline ambient air quality in the area surrounding the Proposed Development. The following steps have been taken in the determination of background values:

- identification of Air Quality Management Areas (AQMA);
- review of Stockton-on-Tees Borough Council (STBC), Redcar and Cleveland Borough Council (RCBC) and Middlesborough Borough Council (MBC) ambient monitoring data;
- review of data from Defra's background mapping database; and
- review of background data and site relevant critical loads from the Air Pollution Information System (APIS) website.

4.1.2 Full details of the baseline air quality can be found in Section 4.2 of the **Chapter 8: Air Quality (ES Volume I, Application Document Ref. 6.1)**.

4.2 Air Quality Management Areas

4.2.1 No AQMAs have been declared for the Proposed Development. The nearest AQMA is the Scarborough AQMA, approximately 23km to the south east of the Proposed Development. The Scarborough AQMA was declared across the village of Staithes in 2004 for exceedances of the annual and 24-hour mean PM₁₀ air quality objectives alongside the sulphur dioxide (SO₂) 15-minute, hourly and 24-hour mean air quality objectives caused by domestic heating. In 2018, the Scarborough AQMA was amended to cover the annual mean and 24-hour mean PM₁₀ air quality objectives only [Ref 15].

4.2.2 However, given the distance to the AQMA, it is considered unlikely that the AQMA would be affected by the emissions as a result of the operation of the Proposed Development.

4.3 Local authority monitoring data

4.3.1 Local authority monitoring data has been reviewed for 2024 utilising the latest available 2025 Air Quality Annual Status Reports (ASRs) published by STBC, RCBC and MBC (as detailed in **Chapter 8: Air Quality (ES Volume I, Application Document Ref. 6.1)**).

4.3.2 STBC conducts automatic monitoring at three sites, and passive diffusion tube monitoring at 14 sites within their administrative area. However, none are located within 2km of the Main Site.

- 4.3.3 RCBC undertook automatic monitoring at two sites, with passive diffusion tube monitoring at 14 sites during 2024.
- 4.3.4 MBC also undertook automatic monitoring at two sites, with passive diffusion tube monitoring at 22 sites, however again, none are located within 2km of the Main Site.
- 4.3.5 The nearest automatic monitoring station is the RCBC suburban site Redcar Dormanstown, located 4km east of the Main Site. Redcar Dormanstown monitored concentrations of NO₂, PM₁₀, PM_{2.5} and O₃ throughout 2024.
- 4.3.6 The annual mean NO₂ concentration recorded at Redcar Dormanstown in 2024 (the latest year with available monitoring data) was 8.6µg/m³, well below the annual mean Air Quality Assessment Level (AQAL) (as detailed in **Chapter 8: Air Quality (ES Volume I, Application Document Ref. 6.1)**). In the last five years, no exceedances of the annual mean NO₂ AQAL of 40µg/m³ were recorded. There were also no recorded exceedances of the hourly mean NO₂ AQAL of 200µg/m³ (not to be exceeded more than 18 times a year).
- 4.3.7 The annual mean PM₁₀ and PM_{2.5} concentrations recorded at Redcar Dormanstown in 2024 were 12.4µg/m³ and 6.9µg/m³ respectively. Over the last five years, no exceedances of the annual mean PM₁₀ AQAL (40µg/m³) or the annual mean PM_{2.5} AQAL (20µg/m³) were recorded. There were also no recorded exceedances of the 24-hour PM₁₀ AQAL of 50µg/m³, not to be exceeded more than 35 times a year.
- 4.3.8 However, due to the distance between this monitoring site and the Main Site, it is not likely to be representative of baseline air quality conditions at the Main Site.
- 4.4 [Defra background data](#)
- 4.4.1 Defra's 2021-based background maps are available at a 1x1km resolution for the UK for 2021 and are projected forward to the year 2040. These projections of pollution concentrations across England are available for NO₂ and NO_x.
- 4.4.2 Data for 2024 has been presented for the assessment to represent a conservative approach, as the typical trend shown in the Defra background mapping is that over the projected time period, concentrations of NO₂ and NO_x are shown to be decreasing. This corresponds to a reduction over time of vehicle emissions as newer, cleaner vehicles replace older ones. Therefore, assuming no reduction occurs until the earliest potential opening year of the Proposed Development (i.e. 2031) is considered to represent a

conservative approach, and is in line with advice from the EA on similar projects.

- 4.4.3 A review of the background map concentrations over the study area for human health receptors shows that the concentrations presented in Table 4.1 for the Main Site location are also representative of the background concentrations at the receptor locations (the average NO₂ concentration in the grid squares with identified receptors was 11.0µg/m³), however to enable a worst case assessment, the maximum value from receptors in the vicinity of the Main Site has been used.
- 4.4.4 Background concentrations of Carbon Monoxide (CO), Sulphur Dioxide (SO₂) and Volatile Organic Compounds (VOCs) (assessed against the AQAL for Benzene for a conservative assessment) have been taken from the 2010 Pollution Climate Mapping (PCM) background maps in line with the Background Concentrations Maps User Guide [Ref 16] and as advised by the LAQM Helpdesk.

Table 4.1 Defra background concentrations from 2024 – Main Site

OS grid coordinate (m)		2024 Annual Mean Concentrations (µg/m ³)					
X	Y	NO ₂	PM ₁₀	PM _{2.5}	CO	SO ₂	VOCs
451500	523500	10.9	14.4	8.9	5.2	217	2.0
452500	523500	11.6	15.4	8.7	5.3	219	3.2
453500	523500	14.1	19.1	8.8	5.4	224	4.1
451500	524500	12.2	16.4	9.6	5.3	224	1.8
452500	524500	14.5	19.9	10.1	5.4	232	2.8
453500	524500	22.6	33.8	10.2	6.6	227	7.9

- 4.4.5 Background concentrations for NH₃ for human receptors have been taken from the Brompton National Ammonia Monitoring Network site, which is the nearest monitoring location that monitors gaseous NH₃, located approximately 28km south west from the Proposed Development has been continuously monitoring gaseous NH₃ since 2006 and remains operational as of 2025. NH₃ backgrounds for the Proposed Development are displayed in Table 4.2. The 2020 NH₃ monitoring data was selected as the worst-case value of the six most recent years of monitoring data at the site (2018-2024).
- 4.4.6 For ecological receptors, the background NH₃ values from APIS (2021) were used [Ref 17].

Table 4.2 NH₃ Background pollutant concentration for human receptors

Site Name	OS grid coordinate		Site Type	Distance to site (km)	2020 Annual mean NH ₃ concentration (µg/m ³)
	X	Y			
Brompton	438950	498850	Rural Background	28km south west	11.6

4.4.7 Background concentrations for hydrogen chloride (HCl) have been taken from the High Muffles United Kingdom Eutrophying & Acidifying Network (UKEAN) site, the nearest monitoring location that monitored gaseous HCl between 2011 and 2015, located approximately 38km south east of the Proposed Development. No monitoring of HCl was undertaken at the High Muffles site or at any other site in the Acid Gases and Aerosols Monitoring Network in the UK after January 2016 [Ref 18].

4.4.8 Therefore, the worst-case HCl concentration measured in 2011 at the High Muffles site has been used as the background HCl concentration for the Proposed Development, displayed in Table 4.3.

Table 4.3 HCl Background pollutant concentration

Site Name	OS grid coordinate		Site Type	Distance to site (km)	2011 Annual mean HCl concentration (µg/m ³)
	X	Y			
High Muffles	477552	493869	Rural Background	38km south east	0.42

4.4.9 The background concentration for hydrogen fluoride (HF) has been selected from the Expert Panel on Air Quality Standards [Ref 19] report on Halogens and Hydrogen Halides in Ambient Air, which includes a consideration of background concentrations of these pollutants in the UK. The long-term HF background concentration of 0.003µg/m³ has therefore been utilised throughout the assessment.

4.5 Metals background data

4.5.1 Background concentrations for various metals included in the assessment have been taken from the respective metals monitoring networks operated in the UK [Ref 20].

4.5.2 There are no available background values for Thallium (Tl).

4.5.3 For Mercury (Hg), background concentrations have been taken from Chilbolton Observatory, the only monitoring station with similar site surroundings as the Proposed Development to monitor gaseous Hg, despite its distance at 380km south of the Proposed Development. The

2025 annual average concentration has been selected as it is the highest average annual mean concentration with data capture >70% over the past 5 years of available monitoring data [Ref 21]. Hg backgrounds for the Proposed Development are displayed in Table 4.4.

Table 4.4 Hg Background pollutant concentration

Site Name	OS grid coordinate		Site Type	Distance to site (km)	2025 mean Annual Hg concentration ($\mu\text{g}/\text{m}^3$)
	X	Y			
Chilbolton Observatory	439390	139078	Rural Background	380km south	0.001

4.5.4 Antimony (Sb), background concentrations have been taken from the Heigham Holmes Heavy Metals Network site [Ref 20]. Heigham Holmes is the nearest rural background site to measure Sb, with available data from 2010 to 2013. 2012 recorded the highest average annual mean concentration so has been used as a worst-case background concentration for the Proposed Development, as displayed in Table 4.5.

Table 4.5 Sb Background pollutant concentration

Site Name	OS grid coordinate		Site Type	Distance to site (km)	2012 Annual mean Sb concentration ($\mu\text{g}/\text{m}^3$)
	X	Y			
Heigham Holmes	644179	320519	Rural Background	280km south east	0.0008

4.5.5 For the following heavy metals; As, Cd, Cr (II) and (III), Co, Cr(VI), Pb, Mn, Ni, V, background concentrations were taken as the averages from six years of automatic monitoring data (2018 – 2025) from the two closest Heavy Metals Network monitoring sites in Scunthorpe (Scunthorpe Low Santon and Scunthorpe Town). Both of these urban industrial sites were included as both are at a similar distance to the Proposed Development (118km south east), with similar surroundings. Details of these sites are provided in Table 4.6.

4.5.6 Average background concentrations for As, Cd, Cr, Co, Pb, Mn, Ni, V are presented in Table 4.7.

4.5.7 The background concentration for hexavalent Cr(VI) has been calculated as 20% of the total Cr (II and III) annual mean concentration.

Table 4.6 Background heavy metal network sites

Site Name	OS grid coordinate (m)		Site Type	Distance to site (km)
	X	Y		
Scunthorpe Low Santon	492936	411943	Urban Industrial	118km south east
Scunthorpe Town	490338	410836	Urban Industrial	118km south east

Table 4.7 Heavy metals background concentrations

Pollutant	Average background concentration ($\mu\text{g}/\text{m}^3$)
As	0.0008
Cd	0.0004
Cr (II) and (III)	0.003
Cr(VI) ^[1]	0.0006
Co	0.0002
Cu	0.005
Pb	0.01
Mn	0.05
Ni	0.001
V	0.005
^[1] Hexavalent Cr(VI) calculated as 20% of the total Cr (II and III) annual mean concentration.	

4.6 Other background data

- 4.6.1 For Dioxins/Furans (PCDD/F), background concentrations have been taken from the Hazelrigg Toxic Organic Micro Pollutants (TOMPs) Network site at Lancaster, as it is the most similar to the Proposed Development in terms of surrounding environment (industrial presence) [Ref 23]. The most recent PCDD/F data is from 2016, but the data was averaged for the most recent six-year (2010-2016) period to give a background value, as displayed in Table 4.8.

Table 4.8 PCDD/F Background pollutant concentration

Site Name	OS grid coordinate		Site Type	Distance to site (km)	Average Annual mean PCDD/F concentration ($\mu\text{g}/\text{m}^3$)
	X	Y			
Hazelrigg	349286	457793	Rural Background	120km south west	3.56E-09

4.7 Ecological site background data

- 4.7.1 The NO_x, NH₃ and SO₂ background concentrations for designated SAC, SPA and SSSI sites are available from the APIS website [Ref 16]. The 2021 concentrations (latest available in APIS) present at the relevant habitat receptor sites are presented in Table 4.9.

Table 4.9 APIS background data for ecological receptors

Receptor ID	Name	APIS Backgrounds		
		NO _x (µg/m ³)	NH ₃ (µg/m ³)	SO ₂ (µg/m ³)
E001a	Teesmouth and Cleveland Coast	35.4	1.4	7.0
E001b	Teesmouth and Cleveland Coast	15.9	1.2	2.0
E001c	Teesmouth and Cleveland Coast	22.0	1.4	3.7
E001d	Teesmouth and Cleveland Coast	22.0	1.4	3.7
E001e	Teesmouth and Cleveland Coast	16.3	1.3	3.2
E002	North York Moors	6.4	1.0	0.9
E003	Northumbria Coast	7.2	1.5	1.1
E004	Durham Coast	7.2	1.5	1.1
E005	Lovell Hill Pools	9.6	1.3	1.4
E006	Saltburn Gill	7.8	1.1	1.2
E007	Hart Bog	8.1	1.6	1.1
E008	Briarcroft Pasture	8.4	2.0	1.3
E009	Pike Whin Bog	7.3	1.5	1.1
E010	Whitton Bridge Pasture	7.8	1.9	1.2
E011	Coatham Marsh	16.8	1.2	2.7
E012	Eston Pumping Station	18.3	1.4	2.5
E013	Teesmouth	20.5	1.3	2.3

- 4.7.2 In addition, the APIS website provides information on the relevant critical load ranges for the assessment of depositional impacts, as well as background nitrogen deposition and acid deposition loads. The background data is presented in Table 4.10, and the relevant critical load classes and ranges are shown in the results (Table 7.6 and Table 7.7). Where woodland and forest habitats are specified, the higher background deposition concentrations relating to such habitats have been used, with the

background for all other habitat types being taken as those for short vegetation.

Table 4.10 APIS background deposition information

Receptor ID	Name	APIS Backgrounds		
		N-Deposition (kg N/ha/yr)	Acid Deposition	
			(Keq N/ha/yr)	(Keq S/ha/yr)
E001a	Teesmouth and Cleveland Coast	13.3	0.9	0.2
E001b	Teesmouth and Cleveland Coast	13.8	1.0	0.3
E001c	Teesmouth and Cleveland Coast	13.3	1.0	0.2
E001d	Teesmouth and Cleveland Coast	13.3	1.0	0.2
E001e	Teesmouth and Cleveland Coast	13.5	1.2	0.3
E002	North York Moors	15.5	1.2	0.2
E003	Northumbria Coast	13.4	1.0	0.2
E004	Durham Coast	13.4	1.0	0.2
E005	Lovell Hill Pools	13.5	1.0	0.2
E006	Saltburn Gill	21.8	1.6	0.2
E007	Hart Bog	14.8	1.1	0.2
E008	Briarcroft Pasture	16.2	1.2	0.2
E009	Pike Whin Bog	15.7	1.1	0.1
E010	Whitton Bridge Pasture	16.1	1.2	0.1
E011	Coatham Marsh	12.2	0.9	0.2
E012	Eston Pumping Station	12.7	0.9	0.2
E013	Teesmouth	13.8	1.0	0.2

4.8 Summary of background air quality

- 4.8.1 Background data for human receptors for NO₂, PM₁₀, PM_{2.5}, SO₂, CO and VOCs have been derived from the Defra background maps and PCM data. The background concentrations for all other species included in the assessment were taken from the various available monitoring networks.
- 4.8.2 The background NO_x, NH₃ and SO₂ concentrations for ecological receptors were sourced from APIS using the specific location for the relevant ecological receptors.
- 4.8.3 Where no short-term concentrations are available, short-term background concentrations have been calculated by multiplying the selected annual

mean background concentration by a factor of two, in accordance with the EA Risk Assessment methodology [Ref 8].

5 Operational traffic modelling results

5.1 Human health

Results of NO₂ modelling

- 5.1.1 The predicted annual mean NO₂ concentrations for the DM and DS scenarios at each receptor are presented in Table 5.1. The maximum change in NO₂ concentrations between the DS and DM scenarios is 0.1µg/m³, which is less than 1% of the NO₂ objective (40µg/m³), the effect of the Proposed Development on human receptors is considered to be negligible for annual mean NO₂ at all human health receptors and therefore not significant.

Table 5.1 Results of NO₂ modelling for operational traffic

Receptor ID	DM 2031 (µg/m ³)	DS 2031 (µg/m ³)	Change (µg/m ³)	Impact Descriptor
CT001	9.6	9.6	< 0.1	Negligible
CT002	12.2	12.3	0.1	Negligible
CT003	11.2	11.2	< 0.1	Negligible
CT004	9.0	9.0	< 0.1	Negligible
CT005	8.5	8.5	< 0.1	Negligible
CT006	8.8	8.9	0.1	Negligible
CT007	7.9	8.0	0.1	Negligible
CT008	8.3	8.4	0.1	Negligible
CT009	8.3	8.3	0.1	Negligible
CT016	13.3	13.3	< 0.1	Negligible
CT017	12.2	12.2	< 0.1	Negligible
CT018	7.6	7.7	< 0.1	Negligible

Results are presented to one decimal place.

Results of PM₁₀ modelling

- 5.1.2 The predicted annual mean PM₁₀ concentrations for the DM and DS scenarios at each human receptor are presented in Table 5.2. As the maximum change in PM₁₀ concentrations between the DS and DM scenarios is <0.1µg/m³ which is less than 1% of the PM₁₀ objective (40µg/m³), the effect of the Proposed Development on human receptors is considered to be negligible for annual mean PM₁₀ and therefore not significant.

Table 5.2 Results of PM₁₀ modelling for operational traffic

Receptor ID	DM 2031 (µg/m ³)	DS 2031 (µg/m ³)	Change (µg/m ³)	Impact Descriptor
CT001	10.3	10.3	< 0.1	Negligible
CT002	13.3	13.3	< 0.1	Negligible
CT003	10.6	10.6	< 0.1	Negligible
CT004	10.5	10.5	< 0.1	Negligible
CT005	10.0	10.0	< 0.1	Negligible
CT006	10.1	10.1	< 0.1	Negligible
CT007	11.8	11.8	< 0.1	Negligible
CT008	11.9	11.9	< 0.1	Negligible
CT009	11.0	11.0	< 0.1	Negligible
CT016	9.6	9.6	< 0.1	Negligible
CT017	9.8	9.8	< 0.1	Negligible
CT018	10.8	10.9	< 0.1	Negligible

Results are presented to one decimal place.

Results of PM_{2.5} modelling

- 5.1.3 The predicted annual mean PM_{2.5} concentrations for the DM and DS scenarios at each human receptor are presented in Table 5.3. As the change in PM_{2.5} concentrations between the DS and DM scenarios is less than 1% of the PM_{2.5} target (10µg/m³), the effect of the Proposed Development on all human receptors is considered to be negligible for annual mean PM_{2.5} and therefore not significant.

Table 5.3 Results of PM_{2.5} modelling for operational traffic

Receptor ID	DM 2031 (µg/m ³)	DS 2031 (µg/m ³)	Change (µg/m ³)	Impact Descriptor
CT001	6.1	6.1	< 0.1	Negligible
CT002	6.3	6.3	< 0.1	Negligible
CT003	5.4	5.4	< 0.1	Negligible
CT004	5.3	5.3	< 0.1	Negligible
CT005	5.5	5.5	< 0.1	Negligible
CT006	5.5	5.5	< 0.1	Negligible
CT007	5.4	5.4	< 0.1	Negligible
CT008	5.4	5.4	< 0.1	Negligible
CT009	5.8	5.8	< 0.1	Negligible

Receptor ID	DM 2031 ($\mu\text{g}/\text{m}^3$)	DS 2031 ($\mu\text{g}/\text{m}^3$)	Change ($\mu\text{g}/\text{m}^3$)	Impact Descriptor
CT016	5.3	5.3	< 0.1	Negligible
CT017	5.5	5.5	< 0.1	Negligible
CT018	5.8	5.8	< 0.1	Negligible
Results are presented to one decimal place.				

5.2 Ecological receptors

5.2.1 NO_x , NH_3 , nitrogen and acid deposition have been calculated for all receptors modelled in the assessment. The results are provided in Table 5.4 to Table 5.7.

5.2.2 Impacts at most ecological receptors can be considered to be insignificant as they are <1% of the relevant critical level or lower critical load.

Results of NO_x modelling

5.2.3 For NO_x annual mean, the predicted PC is greater than 1% of the annual mean NO_x critical level (equating to a change of $0.3\mu\text{g}/\text{m}^3$) at one transect point (CE002) within the Teesmouth and Cleveland Coast SPA, Ramsar and SSSI site, as shown in Table 5.4Table . The maximum change in annual mean NO_x PC was $0.5\mu\text{g}/\text{m}^3$, or 1.5% of the critical level at CE002.

5.2.4 However, together with the background concentration, the long-term PEC is less than 70% of the annual mean NO_x critical level for this receptor and therefore impacts at receptors with regards to annual mean NO_x concentrations can be screened out as insignificant.

Results of NH_3 modelling

5.2.5 For NH_3 annual mean, the predicted PC is less than 1% of the annual mean NH_3 critical level (equating to a change of $0.03\mu\text{g}/\text{m}^3$) at all ecological receptors. Therefore, impacts at receptors with regards to annual mean NH_3 concentrations can be screened out as insignificant. Results are shown in Table 5.5.

Nitrogen deposition results

5.2.6 For nitrogen deposition, the assessment has considered contributions from both NO_x and NH_3 . The nitrogen deposition rates for the sensitive ecological receptors are detailed in Table 5.6. The magnitude of change of nitrogen deposition was less than 1% of the critical load at all ecological receptors with the exception of CE002, which at the closest point to the road on the transect has a predicted nitrogen deposition representing 1.7% of the critical load. At 10m from the road (i.e. receptor CE002_10), the

nitrogen deposition is reduced to 1.0% and therefore can be considered to be insignificant beyond 10m from the road.

- 5.2.7 As a result, the impacts on all ecological receptors can be considered to be insignificant.

Acid deposition results

- 5.2.8 For acid deposition, the assessment has considered contributions from nitrogen only. The acid deposition rates for the sensitive ecological receptors are detailed in Table 5.7 and the PC as a percentage of the critical load is less than 1% at all ecological receptors assessed. The results for acid deposition can then be considered as insignificant.

Detailed results summary tables

Annual mean NO_x results

- 5.2.9 The impacts of the operational traffic assessment for annual mean NO_x are shown below in Table 5.4. The critical level for NO_x is 30µg/m³ for each ecological receptor.

Table 5.4 Results of the operational traffic impact assessment at ecological receptors on NO_x

Ecological receptor ID	DS-DM NO _x (µg/m ³)	Max NO _x change (DS-DM) as % of CL (30µg/m ³)	DS PEC (µg/m ³)	PEC as % of the CL (30µg/m ³)
CE001	0.2	0.8%	19.5	65.1%
CE001_10	0.1	0.5%	19.4	64.8%
CE001_20	0.1	0.4%	19.4	64.7%
CE001_30	0.1	0.3%	19.4	64.6%
CE001_40	0.1	0.2%	19.4	64.6%
CE001_50	0.1	0.2%	19.4	64.5%
CE001_60	0.1	0.2%	19.4	64.5%
CE001_70 - CE001_200	< 0.1	0.2%	19.3	64.5%
CE002	0.5	1.5%	19.8	65.9%
CE002_10	0.3	0.9%	19.6	65.2%
CE002_20	0.2	0.7%	19.5	65.0%
CE002_30	0.2	0.5%	19.5	64.9%
CE002_40	0.1	0.5%	19.4	64.8%
CE002_50	0.1	0.4%	19.4	64.7%
CE002_60	0.1	0.4%	19.4	64.7%

Ecological receptor ID	DS-DM NO _x (µg/m ³)	Max NO _x change (DS-DM) as % of CL (30µg/m ³)	DS PEC (µg/m ³)	PEC as % of the CL (30µg/m ³)
CE002_70	0.1	0.3%	19.4	64.6%
CE002_80	0.1	0.3%	19.4	64.6%
CE002_90	0.1	0.2%	19.4	64.6%
CE002_100	0.1	0.2%	19.4	64.6%
CE002_110	0.1	0.2%	19.4	64.5%
CE002_120	0.1	0.2%	19.4	64.5%
CE002_130	0.1	0.2%	19.4	64.5%
CE002_140	0.1	0.2%	19.3	64.5%
CE002_150 – CE002_200	< 0.1	0.2%	19.3	64.5%
CE007	0.1	0.3%	18.6	61.9%
CE007_10	0.1	0.2%	18.5	61.8%
CE007_20	0.1	0.2%	15.1	50.2%
CE007_30	0.1	0.2%	15.0	50.2%
CE007_40	0.1	0.2%	15.0	50.1%
CE007_50 - CE007_150	< 0.1	0.1%	15.0	50.1%
CE008	0.1	0.2%	19.3	64.5%
CE008_10 - CE008_190 -	< 0.1	0.1%	19.3	64.4%
CE009	0.1	0.4%	14.7	49.1%
All results are presented to one decimal place CL = Critical Level, PEC = Predicted Environmental Concentration				

Annual mean NH₃ results

5.2.10 The impacts of the operational traffic assessment for NH₃ are shown below in Table 5.5. The critical level for NH₃ is 3µg/m³ for each ecological receptor.

Table 5.5 Results of the operational traffic impact assessment at ecological receptors for NH₃

Ecological receptor ID	DS-DM NH ₃ (µg/m ³)	Max NH ₃ change (DS-DM) as % of CL	DS PEC (µg/m ³)	PEC as % of the CL (3µg/m ³)
CE001	< 0.1	0.4%	1.4	46.5%
CE001_10	< 0.1	0.3%	1.4	46.4%
CE001_20	< 0.1	0.2%	1.4	46.4%
CE001_30	< 0.1	0.2%	1.4	46.3%

Ecological receptor ID	DS-DM NH ₃ (µg/m ³)	Max NH ₃ change (DS-DM) as % of CL	DS PEC (µg/m ³)	PEC as % of the CL (3µg/m ³)
CE001_40 – CE001_200	< 0.1	0.1%	1.4	46.3%
CE002	< 0.1	0.9%	1.4	47.0%
CE002_10	< 0.1	0.5%	1.4	46.7%
CE002_20	< 0.1	0.4%	1.4	46.5%
CE002_30	< 0.1	0.3%	1.4	46.5%
CE002_40	< 0.1	0.3%	1.4	46.4%
CE002_50	< 0.1	0.2%	1.4	46.4%
CE002_60	< 0.1	0.2%	1.4	46.4%
CE002_70	< 0.1	0.2%	1.4	46.4%
CE002_80	< 0.1	0.2%	1.4	46.3%
CE002_90	< 0.1	0.2%	1.4	46.3%
CE002_100 – CE002_200	< 0.1	0.1%	1.4	46.3%
CE007	< 0.1	0.2%	1.5	48.5%
CE007_10	< 0.1	0.2%	1.5	48.5%
CE007_20	< 0.1	0.2%	1.3	44.3%
CE007_30 – CE007_150	< 0.1	0.1%	1.3	44.3%
CE008 – CE008_190	< 0.1	0.1%	1.4	46.3%
CE009	< 0.1	0.3%	1.5	51.3%
All results are provided to one decimal place. CL = Critical Level, PEC = Predicted Environmental Concentration				

Nitrogen deposition results

- 5.2.11 The impacts of the operational traffic assessment for nitrogen deposition are shown below in Table 5.6. The minimum critical load for nitrogen deposition used in the assessment is 10kg N/ha/yr for each of the ecological receptors, which is the lower end of the Critical Load range for coastal floodplain and grazing marsh for receptors CE001 – CE008 which constitute the Teesmouth and Cleveland SPA, Ramsar and SSSI site. For CE009, which is the Cowpen Bewley LNR this is based on broadleaved, mixed and yew woodland. The relevant habitat type for each of the receptors locations was determined from data held on APIS [Ref 17] and Magic Maps [Ref 9].

Table 5.6 Results of the operational traffic impact assessment at ecological receptors on nitrogen deposition

Ecological Receptor ID	DS-DM PC Nitrogen Deposition (Kg N/ha/yr)	Max Nitrogen Deposition PC (DS-DM) as % of CLd	DS PEC (Kg N/ha/yr)	DS PEC as % of Min CLd
CE001	0.1	0.7%	15.6	156.2%
CE001_10	0.1	0.5%	15.1	151.4%
CE001_20	< 0.1	0.4%	14.9	148.9%
CE001_30	< 0.1	0.3%	14.7	147.3%
CE001_40	< 0.1	0.3%	14.6	146.1%
CE001_50	< 0.1	0.3%	14.5	145.3%
CE001_60	< 0.1	0.2%	14.5	144.7%
CE001_70	< 0.1	0.2%	14.4	144.1%
CE001_80	< 0.1	0.2%	14.4	143.7%
CE001_90	< 0.1	0.2%	14.3	143.4%
CE001_100	< 0.1	0.2%	14.3	143.1%
CE001_110 – CE001_200	< 0.1	0.1%	14.3	142.9%
CE002	0.2	1.7%	18.0	179.8%
CE002_10	0.1	1.0%	16.2	161.6%
CE002_20	0.1	0.7%	15.6	156.0%
CE002_30	0.1	0.6%	15.3	152.9%
CE002_40	0.1	0.5%	15.1	150.9%
CE002_50	< 0.1	0.4%	15.0	149.5%
CE002_60	< 0.1	0.4%	14.8	148.4%
CE002_70	< 0.1	0.4%	14.7	147.5%
CE002_80	< 0.1	0.3%	14.7	146.7%
CE002_90	< 0.1	0.3%	14.6	146.1%
CE002_100	< 0.1	0.3%	14.6	145.6%
CE002_110	< 0.1	0.3%	14.5	145.1%
CE002_120	< 0.1	0.2%	14.5	144.7%
CE002_130	< 0.1	0.2%	14.4	144.4%
CE002_140	< 0.1	0.2%	14.4	144.1%
CE002_150	< 0.1	0.2%	14.4	143.8%
CE002_160	< 0.1	0.2%	14.4	143.6%
CE002_170	< 0.1	0.2%	14.3	143.4%
CE002_180	< 0.1	0.2%	14.3	143.2%

Ecological Receptor ID	DS-DM PC Nitrogen Deposition (Kg N/ha/yr)	Max Nitrogen Deposition PC (DS-DM) as % of CLd	DS PEC (Kg N/ha/yr)	DS PEC as % of Min CLd
CE002_190	< 0.1	0.2%	14.3	143.0%
CE002_200	< 0.1	0.1%	14.3	142.8%
CE007	< 0.1	0.4%	15.1	150.8%
CE007_10	< 0.1	0.3%	15.0	149.7%
CE007_20	< 0.1	0.3%	14.7	146.7%
CE007_30	< 0.1	0.3%	14.6	146.1%
CE007_40	< 0.1	0.2%	14.6	145.6%
CE007_50	< 0.1	0.2%	14.5	145.3%
CE007_60	< 0.1	0.2%	14.5	145.0%
CE007_70	< 0.1	0.2%	14.5	144.8%
CE007_80	< 0.1	0.2%	14.5	144.6%
CE007_90 – CE007_150	< 0.1	0.1%	14.4	144.4%
CE008	< 0.1	0.3%	14.9	148.7%
CE008_10	< 0.1	0.2%	14.7	146.6%
CE008_20	< 0.1	0.2%	14.5	145.4%
CE008_30	< 0.1	0.2%	14.5	144.6%
CE008_40 – CE008_190	< 0.1	0.1%	14.4	144.0%
CE009	< 0.1	0.8%	28.2	282.2%
All results are provided to one decimal place. CLd = Critical Load, PEC = Predicted Environmental Concentration				

Acid deposition results

- 5.2.12 The effects from the operational traffic for acid deposition are shown below in Table 5.7. The minimum critical load (CL) for acid deposition used in the assessment is based on the relevant habitat type for each receptor, as determined by APIS [Ref 17] and Magic Maps [Ref 9]. For receptors CE001 – CE008 which constitute the Teesmouth and Cleveland SPA, Ramsar and SSSI site, this was based on the lower end of the Critical Load range for coastal floodplain and grazing marsh. For CE009, which is the Cowpen Bewley LNR this is based on broadleaved, mixed and yew woodland.

Table 5.7 Results of the operational traffic impact assessment at ecological receptors for acid deposition

Ecological Receptor ID	CLd (keq/ha/yr)	DS-DM Acid Deposition (keq/ha/yr)	Max Acid Deposition (DS-DM) as % of CLd
CE001	Min CL Min N: 0.856	<0.01	0.1%
CE001_10	Min CL Max N: 4.856	<0.01	0.1%
CE001_20	Min CL Max S: 4.00	<0.01	0.1%
CE001_30 – CE001_200		<0.01	< 0.1%
CE002	Min CL Min N: 0.856	<0.01	0.2%
CE002_10	Min CL Max N: 4.856	<0.01	0.1%
CE002_20	Min CL Max S: 4.00	<0.01	0.1%
CE002_30		<0.01	0.1%
CE002_40		<0.01	0.1%
CE002_50		<0.01	0.1%
CE002_60		<0.01	0.1%
CE002_70		<0.01	0.1%
CE002_80 – CE002_200		<0.01	< 0.1%
CE007	Min CL Min N: 0.856	<0.01	0.1%
CE007_10 – CE007_150	Min CL Max N: 4.856 Min CL Max S: 4.00	<0.01	< 0.1%
CE008 – CE009_190	Min CL Min N: 0.856 Min CL Max N: 4.856 Min CL Max S: 4.00	<0.01	< 0.1%
CE009	Min CL Min N: 0.357 Min CL Max N: 2.689 Min CL Max S: 2.332	<0.01	0.2%
All results are provided to one decimal place. CLd = Critical Load, PEC = Predicted Environmental Concentration			

6 Operational shipping modelling results

- 6.1.1.1 NO_x, SO₂, nitrogen and acid deposition has been calculated for all receptors modelled in the assessment for the operational shipping assessment. The results are provided in Table 6.1 to Table 6.8.
- 6.1.1.2 Impacts at all ecological receptors can be considered to be insignificant as they are <1% of the relevant critical level or lower critical load, or well below the critical level with consideration of the background levels.

Results of NO_x modelling

- 6.1.1.3 The impacts of the operational shipping assessment for annual mean NO_x are shown below in Table 6.1 for emissions at berth and Table 6.2 for emissions whilst manoeuvring. The critical level for NO_x is 30µg/m³ for each ecological receptor.

Table 6.1 Results of the operational shipping impact assessment on NO_x at ecological receptors - at berth

Ecological receptor ID	PC (µg/m ³)	PC as % of CL	PEC (µg/m ³)	PEC as % of the CL
SE001	<0.01	<0.01%	28.9	96.2%
SE002	<0.01	<0.01%	18.7	62.4%
SE003	<0.01	<0.01%	19.3	64.2%
SE004	<0.01	<0.01%	15.6	52.1%
SE005	<0.01	<0.01%	21.0	70.0%
SE006	<0.01	<0.01%	30.7	102.4%
SE007	<0.01	<0.01%	28.9	96.2%
PC = Process Contribution, CL = Critical Level, PEC = Predicted Environmental Concentration				

Table 6.2 Results of the operational shipping impact assessment on NO_x at ecological receptors - manoeuvring

Ecological receptor ID	PC (µg/m ³)	PC as % of CL	PEC (µg/m ³)	PEC as % of the CL
SE001	<0.01	<0.01%	28.9	96.2%
SE002	<0.01	<0.01%	18.7	62.4%
SE003	<0.01	<0.01%	19.3	64.2%
SE004	<0.01	<0.01%	15.6	52.0%
SE005	<0.01	<0.01%	21.0	70.0%
SE006	<0.01	<0.01%	30.7	102.4%
SE007	<0.01	0.01%	28.9	96.2%
PC = Process Contribution, CL = Critical Level, PEC = Predicted Environmental Concentration				

Results of SO₂ modelling

6.1.1.4 The impacts of the operational shipping assessment for annual mean SO₂ are shown below in Table 6.3 for emissions at berth and Table 6.4 for emissions whilst manoeuvring. The critical level for SO₂ is 20µg/m³ for each ecological receptor.

Table 6.3 Results of the operational shipping impact assessment on SO₂ at ecological receptors – at berth

Ecological receptor ID	PC (µg/m ³)	PC as % of CL	PEC (µg/m ³)	PEC as % of the CL
SE001	<0.01	<0.01%	2.9	14.6%
SE002	<0.01	<0.01%	2.1	10.7%
SE003	<0.01	<0.01%	2.5	12.7%
SE004	<0.01	<0.01%	2.2	10.8%
SE005	<0.01	<0.01%	2.1	10.5%
SE006	<0.01	<0.01%	3.6	18.2%
SE007	<0.01	<0.01%	2.9	14.6%
PC = Process Contribution, CL = Critical Level, PEC = Predicted Environmental Concentration				

Table 6.4 Results of the operational shipping impact assessment on SO₂ at ecological receptors – manoeuvring

Ecological receptor ID	PC (µg/m ³)	PC as % of CL	PEC (µg/m ³)	PEC as % of the CL
SE001	<0.01	<0.01%	2.9	14.6%
SE002	<0.01	<0.01%	2.1	10.7%
SE003	<0.01	<0.01%	2.5	12.6%
SE004	<0.01	<0.01%	2.1	10.7%
SE005	<0.01	<0.01%	2.1	10.5%
SE006	<0.01	<0.01%	3.6	18.2%
SE007	<0.01	0.01%	2.9	14.6%
PC = Process Contribution, CL = Critical Level, PEC = Predicted Environmental Concentration				

Nitrogen deposition results

6.1.1.5 The impacts of the operational shipping assessment for nitrogen deposition are shown below in Table 6.5 for emissions at berth and Table 6.6 for emissions whilst manoeuvring. The minimum critical load for nitrogen deposition used in the assessment and the relevant habitat type for each of the receptor locations was determined from data held on APIS [Ref 17] and Magic Maps [Ref 9] and is shown above in Table 3.5.

Table 6.5 Results of the operational shipping impact assessment on nitrogen deposition at ecological receptors – at berth

Ecological Receptor ID	PC nitrogen deposition (Kg N/ha/yr)	PC as % of CLd	PEC (Kg N/ha/yr)	PEC as % of min CLd
SE001	<0.01	<0.01%	13.5	270.2%
SE002	<0.01	<0.01%	12.5	250.0%
SE003	<0.01	<0.01%	13.5	135.0%
SE004	<0.01	<0.01%	13.4	268.0%
SE005	<0.01	<0.01%	12.5	250.0%
SE006	<0.01	<0.01%	13.3	266.0%
SE007	<0.01	<0.01%	12.9	129.0%
PC = Process Contribution, CLd = Critical Load, PEC = Predicted Environmental Concentration				

Table 6.6 Results of the operational shipping impact assessment on nitrogen deposition at ecological receptors – manoeuvring

Ecological Receptor ID	PC nitrogen deposition (Kg N/ha/yr)	PC as % of CLd	PEC (Kg N/ha/yr)	PEC as % of min CLd
SE001	<0.01	<0.01%	13.5	270.2%
SE002	<0.01	<0.01%	12.5	250.0%
SE003	<0.01	<0.01%	13.5	135.0%
SE004	<0.01	<0.01%	13.4	268.0%
SE005	<0.01	<0.01%	12.5	250.0%
SE006	<0.01	<0.01%	13.3	266.0%
SE007	<0.01	<0.01%	12.9	129.0%
PC = Process Contribution, CLd = Critical Load, PEC = Predicted Environmental Concentration				

Acid deposition results

- 6.1.1.6 The effects of the operational shipping assessment for acid deposition are shown below in Table 6.7 for emissions at berth and Table 6.8 for manoeuvring. The minimum critical load for acid deposition used in the assessment and the relevant habitat type for each of the receptor locations was determined from data held on APIS [Ref 17] and Magic Maps [Ref 9] and is shown above in Table 3.5.

Table 6.7 Results of the operational shipping impact assessment at ecological receptors on acid deposition

Ecological receptor ID	CLd (keq/ha/yr)	PC acid deposition (keq/ha/yr)	PC acid deposition as % of CLd
SE001	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE002	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE003	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE004	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE005	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE006	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE007	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
PC = Process Contribution, CLd = Critical Load			

Table 6.8 Results of the operational shipping impact assessment at ecological receptors on acid deposition

Ecological receptor ID	CLd (keq/ha/yr)	PC acid deposition (keq/ha/yr)	PC acid deposition as % of CLd
SE001	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE002	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE003	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%

Ecological receptor ID	CLd (keq/ha/yr)	PC acid deposition (keq/ha/yr)	PC acid deposition as % of CLd
SE004	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE005	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE006	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
SE007	Min CL Min N: 0.856 Min CL Max N:4.856 Min CL Max S:4.00	< 0.1	<0.1%
PC = Process Contribution, CLd = Critical Load			

7 Operational plant emissions modelling results

7.1 Human health receptor results

- 7.1.1 Table 7.1 provides a summary of the impacts of all pollutant species included in the assessment at the worst case human health receptor modelled. The results are discussed in the sections below.
- 7.1.2 Annex A provides tables containing all modelled results for pollutants predicted at all the human health receptors.

Table 7.1 Summary impacts for all pollutants at the worst case receptor locations

Pollutant	Averaging period	AQAL (µg/m³)	PC (µg/m³)	PC/AQAL %	Magnitude of Impact	BC (µg/m³)	PEC (µg/m³)	PEC/AQAL %	Significance of effect
NO ₂	Annual mean	40	0.2	0.5%	Negligible	9.5	9.6	24.1%	Insignificant
	Hourly mean (as the 99.79 th percentile)	200	4.1	2.1%	Imperceptible/Negligible	22.5	26.6	13.3%	Insignificant
PM ₁₀	Annual mean	40	<0.1	<0.1%	Negligible	9.4	9.4	23.4%	Insignificant
	24-hour mean (as the 90.41 st percentile)	50	<0.1	0.2%	Imperceptible/Negligible	18.7	18.8	37.6%	Insignificant
PM _{2.5}	Annual mean	12	<0.1	0.1%	Negligible	5.2	5.2	43.5%	Insignificant
CO	Maximum daily running 8-hour mean	10,000	3.0	<0.1%	Imperceptible/Negligible	441.0	444.0	4.4%	Insignificant
	Hourly mean (as the 100 th percentile)	30,000	9.0	<0.1%	Imperceptible/Negligible	451.0	460.0	1.5%	Insignificant
SO ₂	24-hour mean (as the 99.2 nd percentile)	125	1.0	0.8%	Imperceptible/Negligible	4.1	5.1	4.1%	Insignificant
	Hourly mean (as the 99.7 th percentile)	350	3.6	1.0%	Imperceptible/Negligible	4.2	7.8	2.2%	Insignificant
	15-minute mean – (as the 99.9 th percentile)	266	6.7	2.5%	Imperceptible/Negligible	4.2	10.9	4.1%	Insignificant

Pollutant	Averaging period	AQAL (µg/m³)	PC (µg/m³)	PC/AQAL %	Magnitude of Impact	BC (µg/m³)	PEC (µg/m³)	PEC/AQAL %	Significance of effect
VOCs	Annual mean	5	<0.1	0.1%	Negligible	0.4	0.4	8.5%	Insignificant
	24-hour mean (as the 100 th percentile)	30	0.1	0.4%	Imperceptible/Negligible	0.8	0.9	3.0%	Insignificant
NH ₃	Annual mean	180	<0.1	<0.1%	Negligible	11.6	11.6	6.5%	Insignificant
	Hourly mean (as the 100 th percentile)	2,500	<0.1	<0.1%	Imperceptible/Negligible	23.2	23.3	0.9%	Insignificant
HCl	Hourly mean (as the 100 th percentile)	750	0.8	0.1%	Imperceptible/Negligible	0.8	1.6	0.2%	Insignificant
HF	Annual mean	16	<0.1%	<0.1%	Negligible	<0.1	<0.1	0.1%	Insignificant
	Monthly mean (as the 100 th percentile)	16	<0.1%	<0.1%	Negligible	<0.1	<0.1	<0.1%	Insignificant
	Hourly mean (as the 100 th percentile)	160	0.2	0.1%	Imperceptible/Negligible	<0.1	0.2	0.1%	Insignificant
Sb	Annual mean	5	<0.1	<0.1%	Negligible	<0.1	<0.1	<0.1%	Insignificant
	Hourly mean (as the 100 th percentile)	150	<0.1	<0.1%	Imperceptible/Negligible	<0.1	<0.1	<0.1%	Insignificant
As	Annual mean	0.006	<0.001	6.4%	Slight adverse	<0.001	0.0012	19.5%	Insignificant ^[1]
Cd	Annual mean	0.005	<0.001	0.1%	Negligible	<0.001	<0.001	8.5%	Insignificant

Pollutant	Averaging period	AQAL (µg/m³)	PC (µg/m³)	PC/AQAL %	Magnitude of Impact	BC (µg/m³)	PEC (µg/m³)	PEC/AQAL %	Significance of effect
	24-hour mean (short term, as the 100 th percentile)	0.03	<0.001	0.2%	Imperceptible/Negligible	<0.001	0.001	2.9%	Insignificant
Cr(III)	Hourly mean (as the 100 th percentile)	2.0	0.003	0.2%	Imperceptible/Negligible	0.003	0.006	0.3%	Insignificant
Cr(VI)	Annual mean	0.00025	1.1E-07	0.05%	Negligible	0.0006	0.0006	245%	Insignificant
Pb	Annual mean	0.25	<0.01	0.2%	Negligible	0.01	0.02	6.1%	Insignificant
Ni	Annual mean	0.02	<0.001	1.9%	Negligible	0.001	0.001	7.5%	Insignificant
	Hourly mean (as the 100 th percentile)	0.7	0.03	4.1%	Imperceptible/Negligible	<0.01	0.03	4.4%	Insignificant
Co	Annual mean	0.2	<0.1	0.2%	Negligible	<0.1	<0.1	0.3%	Insignificant
	Hourly mean (as the 100 th percentile)	6.0	0.03	0.5%	Imperceptible/Negligible	<0.01	0.03	0.5%	Insignificant
Cu	24-hour mean (short term, as the 100 th percentile)	0.05	<0.01	6.5%	Imperceptible/Negligible	<0.01	<0.01	16.8%	Insignificant
Mn	Annual mean	0.15	<0.01	0.3%	Negligible	0.05	0.05	33.5%	Insignificant

Pollutant	Averaging period	AQAL (µg/m³)	PC (µg/m³)	PC/AQAL %	Magnitude of Impact	BC (µg/m³)	PEC (µg/m³)	PEC/AQAL %	Significance of effect
	Hourly mean (as the 100 th percentile)	1,500	0.03	<0.1%	Imperceptible/Negligible	0.10	0.13	0.01%	Insignificant
Hg	24-hour mean (as the 100 th percentile)	0.06	<0.01	0.1%	Negligible	<0.1	<0.1	2.7%	Insignificant
	Hourly mean (as the 100 th percentile)	0.6	<0.001	0.1%	Imperceptible/Negligible	0.003	0.004	0.6%	Insignificant
Tl	Annual mean	1.0	<0.1	<0.1%	Negligible	n/a – No Suitable Background Value			Insignificant
	Hourly mean (as the 100 th percentile)	30	0.03	0.1%	Imperceptible/Negligible	n/a – No Suitable Background Value			Insignificant
V	24-hour mean (as the 100 th percentile)	1.0	<0.1	0.3%	Imperceptible/Negligible	<0.01	<0.01	1.4%	Insignificant
Annual mean	N/A	N/A	<u>3.6x10⁻¹¹</u>	N/A	Negligible	3.6x10 ⁻⁹	3.6x10 ⁻⁹	N/A	Insignificant

AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration

^[1] As has been modelled at the BAT-AEL for “other metals”, assuming the whole emission is as As. The AQMAU guidance [Ref 12] states that monitoring data has shown that a maximum of 5% of the other metals emission occurs as As, and therefore it is considered that the actual PC would be 0.3% of the As AQAL and therefore would be considered negligible, resulting in an insignificant effect.

NO₂ emissions

- 7.1.3 The predicted change in annual mean NO₂ concentrations at the identified human health receptors occurring during the operation of the Proposed Development, are presented in Annex A: Table A1.1. The results shown represent the highest (worst-case) results from all five years of the meteorological data used in the model for the operating scenario that resulted in the highest impacts at receptors.
- 7.1.4 The maximum predicted annual mean NO₂ concentration that occurs anywhere within the Study Area as a result of the Proposed Development is 0.37µg/m³, which represents 0.9% of the annual mean AQAL. This occurs approximately 1.3km to the north of the Main Site. The maximum annual mean NO₂ predicted environmental concentration (PEC) (i.e. the PC + the background concentration) is 23.2µg/m³ and therefore is well below the annual mean NO₂ AQAL of 40µg/m³ (representing 58% of the AQAL).
- 7.1.5 NO₂ emissions from the operational Proposed Development are therefore not predicted to lead to a risk of the annual mean AQAL being exceeded anywhere within the Study Area.
- 7.1.6 As shown in Annex A: Table A1.1, the discrete human receptor most affected by emissions from the Proposed Development is receptor R002, with a predicted annual mean NO₂ PC of 0.2µg/m³, representing 0.5% of the AQAL. With the background concentration, the PEC represents 24.1% of the AQAL and therefore is considered to be well below the AQAL as a result of the operation of the Proposed Development. The significance of the predicted change in annual mean NO₂ concentrations is presented in Annex A: Table A1.1 and discussed in Section 6.2 of **Chapter 8: Air Quality (ES Volume I, Application Document Ref. 6.1)**.
- 7.1.7 The maximum predicted hourly mean NO₂ concentration (as the 99.79th percentile of hourly averages) that occurs anywhere within the Study Area as a result of the Proposed Development is 7.4µg/m³. This occurs approximately 500m to the south of the Main Site.
- 7.1.8 The maximum PEC (i.e. the PC + background concentration) is 51.9µg/m³ and is therefore well below the hourly mean NO₂ AQAL of 200µg/m³. NO₂ emissions from the operational Proposed Development are therefore not predicted to lead to a risk of the hourly mean AQAL being exceeded anywhere within the Study Area.
- 7.1.9 The discrete receptor most affected by the short-term emissions from the Proposed Development is receptor R008 (Normanby Road), with a predicted hourly mean NO₂ concentration as a result of the Proposed Development of 4.1µg/m³, representing 2.1% of the AQAL. The PEC is

below 70% of the AQAL and therefore the impact of hourly NO₂ concentrations is considered insignificant at all sensitive human receptors.

- 7.1.10 Using the EPUK/IAQM descriptors, the magnitude of change of hourly NO₂ concentrations as a result of the operation of the Proposed Development is considered imperceptible and therefore the impact is negligible at all human receptors, as shown in Annex A: Table A1.2.
- 7.1.11 Contour plots of the dispersion of NO₂ from the operational Proposed Development are provided in **Figures 8.11: Operational Assessment - Operational Plant Modelled Ecological Receptors** and **8.12: Operational Assessment - Operational Plant Isopleths of NO₂ Hourly Concentration (ES Volume II, Application Document Ref. 6.2)**.

PM₁₀ and PM_{2.5} emissions

- 7.1.12 The predicted annual mean PM₁₀ and PM_{2.5} PCs are below 1% of the relevant AQAL at all human receptor locations. In addition, when added to the background concentrations in the Study Area, the annual mean PECs remain less than 70% of the relevant AQALs. The impacts of annual mean PM₁₀ and PM_{2.5} as a result of operation of the Proposed Development can therefore be considered negligible at all human receptors, and can be screened out as insignificant. The results at individual human receptors are presented in Annex A: Table A1.3 and Table A1.5.
- 7.1.13 The daily mean PM₁₀ PCs are <0.2% of the AQAL at all human receptors and can therefore be screened out as insignificant (<10% of the short-term AQAL) and are therefore the magnitude of change is considered imperceptible, with negligible impacts at all human receptors. The impacts of daily mean PM₁₀ can therefore be considered insignificant at all human receptors, with the results at individual human receptors presented in Annex A: Table A1.4.

CO emissions

- 7.1.14 The maximum hourly and 8-hour running mean PC that occur anywhere as a result of the Proposed Development represent <0.1% of the relevant AQALs and therefore can be considered to be of an imperceptible magnitude of change with a negligible impact at all human receptor locations, being less than 10% of both the hourly and 8-hour running AQAL. The results at individual human receptors have been presented in Annex A: Table A1.6 and Table A1.7.

SO₂ emissions

- 7.1.15 The short-term PCs for SO₂ are applicable to human health impacts; 15-minute mean (99.9th percentile), hourly mean (99.7th percentile) and the daily mean (99.2nd percentile).
- 7.1.16 The short-term 15-minute mean (99.9th percentile), hourly mean (99.7th percentile) and the daily mean (99.2nd percentile) PCs for SO₂ are all below 10% of the relevant AQALs at all human receptor locations and so are considered to be imperceptible with negligible impact. The impacts of short-term SO₂ emissions from the operation of the Proposed Development can therefore be considered insignificant at all human receptors, with the results at individual human receptors presented in Annex A: Table A1.8, Table A1.9 and Table A1.10.

VOC emissions

- 7.1.17 The annual mean and daily mean VOC PCs at all human receptors are below 1% and 10% of the AQAL respectively and so can be screened out as imperceptible and negligible. Additionally, the annual mean VOC PECs are below 70% of the AQAL at all human receptors. The results at individual human receptors have been presented in Annex A: Table A1.11 and Table A1.12.

NH₃ emissions

- 7.1.18 The maximum predicted annual mean PCs that occur anywhere as a result of the operational Proposed Development represent less than 0.1% of the relevant AQALs and therefore can be considered negligible at all human receptor locations. In addition, when added to the background concentration in the study area, the hourly PEC remains less than 0.1% of the relevant AQAL, and the annual average PEC is below 0.1% of the relevant AQAL at all human receptors. The results at individual human receptors have been presented in Annex A: Table A1.13 and Table A1.14.

HCl emissions

- 7.1.19 The hourly mean HCl PCs (as 100th percentile) are below 10% of the hourly HCl AQAL (750µg/m³) at all human receptors and so can be screened out as imperceptible and therefore negligible. The results at individual human receptors have been presented in Annex A: Table A1.15.

HF emissions

- 7.1.20 The hourly and monthly HF PCs (100th percentile) are below 10% and 1% of the respective HF AQALs (160 µg/m³ hourly and 16µg/m³ monthly) at all human receptors and so can be screened out as insignificant. The results at

individual human receptors have been presented in Annex A: Table A1.16 and Table A1.17.

Annual mean metal emissions

- 7.1.21 The maximum annual mean PCs of the following metals; Sb, Cd, Co, Pb, Mn and Tl, were less than 1% of the respective AQALs and therefore can be considered to be negligible and insignificant at all human receptor locations. In addition, when added to the background concentrations in the study area, the annual average PEC is below 70% of the relevant AQAL at all human receptors (EA Risk Assessment guidance). The results of annual mean metal concentrations at individual receptors have been presented in Annex A: Table A1.18 to Table A1.38 for Sb, Cd, Co, Pb, Mn, Hg and Tl.
- 7.1.22 For annual mean As, in line with the EPUK/IAQM impact descriptors, a slight adverse impact was predicted at the worst-case receptor R002 (Seaton Carew), with a PC annual mean As concentration as a result of the operation of the Proposed Development of $0.0004\mu\text{g}/\text{m}^3$, representing 6.4% of the AQAL. It should however be noted that As has been modelled at the BAT-AEL for other metals, assuming the whole emission is as As, when the AQMAU metals assessment guidance [Ref 12] shows that monitoring data has demonstrated that As comprises a maximum of 5% of the “other metals” BAT-AEL and therefore it is considered that the actual impacts would be 0.3% of the AQAL and therefore would be considered negligible and insignificant.
- 7.1.23 All other modelled sensitive human receptors were predicted to have negligible impacts for annual mean As. Results are displayed in Annex A: Table A1.20.
- 7.1.24 For annual mean Ni, PCs were >1% of the AQAL at the worst-affected human receptors (R002, R007, R008 and R009) and therefore are considered to be negligible, in line with the EPUK/IAQM impact descriptors, with results shown in Annex A: Table A1.33. As the annual PECs were <70% of the AQAL, the effects of annual mean Ni concentrations could be considered insignificant at all sensitive human receptors.
- 7.1.25 For annual mean Cr(VI), negligible impacts were predicted at all modelled sensitive human receptors in line with the EPUK/IAQM impact descriptors, as shown in Annex A: Table A1.24. The PC concentrations were screened out as insignificant in line with the Environment Agency Risk Assessment guidance as the maximum modelled PC was 0.05% of the AQAL of $0.00025\mu\text{g}/\text{m}^3$ at R002 (Seaton Carew). The Cr(VI) emissions were modelled at a maximum of 0.03% of the other metals BAT-AEL in this

assessment, in line with methodology in the AQMAU Releases from Waste Incinerator guidance [Ref 12].

- 7.1.26 The maximum modelled PEC was more than 70% of the AQAL, however, this is due to a background concentration selected for Cr(VI), which was taken from Scunthorpe and therefore is likely to be heavily influenced by the Steel Works and therefore higher than the conditions around the Proposed Development. It is not known what the exact Cr(VI) background concentration is at the Proposed Development, as this is not routinely monitored in the UK and there is no monitoring of Cr(VI) in close proximity to allow for a reasonable estimate.
- 7.1.27 It is therefore considered that the impacts on selected sensitive human receptors are insignificant for Cr(VI).

Short-term metal emissions

- 7.1.28 The short-term PCs for the following metals were also modelled; Hg (daily and hourly), Cd (daily), Sb (hourly), Cu (daily), Cr(III) daily, Mn (hourly), Ni (hourly), V (daily), Co (hourly) and Tl (hourly).
- 7.1.29 The maximum daily PCs (short-term) for Cd and V were less than 10% of the respective daily AQALs. In addition, the maximum daily PCs (long-term) for Hg and Cr(III) were less than 1% of the respective AQAL. As such, the impacts of daily Cd, V, Hg and Cr(III) could be screened out as insignificant at all sensitive modelled human receptors in line with the EA Risk Assessment guidance.
- 7.1.30 Therefore, the maximum impacts of changes in short-term metal concentrations can be considered negligible, with the results of daily Cd, Cr(III), Hg and V at individual human receptors presented in Annex A: Table A1.22,
- 7.1.31 Table A1.23, Table A1.32 and Table A1.37.
- 7.1.32 The daily PCs for Cu were greater than 1% of the daily mean AQAL at all sensitive human receptors modelled and could therefore not be screened out as insignificant in line with the EA Risk Assessment guidance. However, utilising the EPUK/IAQM guidance, the short-term impacts at all sensitive human receptors as a result of daily Cu PCs are deemed to be negligible, with an imperceptible magnitude of change at all sensitive human receptors. The daily Cu PCs are presented in Annex A (Table A1.27).
- 7.1.33 The maximum hourly PCs for the following metals; Hg, Sb, Mn, Ni, Co and Tl were screened out as insignificant in line with the EA Risk Assessment guidance, as the hourly PCs were <10% of the hourly AQALs. Therefore, the impacts at all human receptors as a result of short-term (hourly) Hg, Sb,

Mn, Ni, Co and Tl concentrations were deemed negligible at all sensitive human receptors, using the EPUK/IAQM impact descriptors. The results of these hourly mean heavy metal concentrations (Hg, Sb, Mn and Ni) at individual human receptors have been presented in Annex A (Table A1.31, Table A1.19, Table A1.30 and

7.1.34 Table A1.34, respectively).

7.2 Ecological receptor results

7.2.1 The results of the dispersion modelling of predicted impacts on sensitive ecological receptors are presented in Table 7.2 to Table 7.7. The tables set out the predicted PC compared to the concentrations of NO_x, SO₂, NH₃ and HF, and also nutrient nitrogen and acid deposition.

7.2.2 Specific significance criteria relating to impacts on sensitive designated ecological receptors are set out within the EA Risk Assessment guidance [Ref 5]. The impact of stack emissions can be regarded as insignificant at sites with statutory designations if:

- the long-term PC is less than 1% of the critical level, or if greater than 1% then the PEC is less than 70% of the critical level; and
- the short-term PC is less than 10% of the critical level

7.2.3 The impact of stack emissions can be regarded as insignificant at sites of local importance if:

- the long-term PC is less than 100% of the critical level; and
- the short-term PC is less than 100% of the critical level.

7.2.4 The effect of atmospheric NO_x, SO₂, NH₃ and HF concentrations, nitrogen deposition rates and acid deposition rates on the modelled receptor locations is considered in detail in the report to inform the future Habitats Regulations Assessment Appropriate Assessment Report (HRA). Further discussion on the significance of the impact on sensitive ecological receptors is provided in **Chapter 10: Terrestrial Ecology (ES, Volume I, Application Document Ref. 6.1)**.

7.2.5 Annex B: provides tables containing all modelled results for pollutants predicted at ecological receptors, with the below discussion providing a summary of the results.

Oxides of nitrogen emissions – critical levels

7.2.6 The assessment results show that the predicted annual average and daily average NO_x impacts are below the criteria for insignificance at the majority

of the ecological receptors assessed for the operating scenario that resulted in the highest impacts at receptors.

- 7.2.7 PCs of less than 1% of the annual average critical level for NO_x occurred at all sensitive ecological receptors except E001a, E001c - E001e (Teemouth and Cleveland Coast) and can therefore be screened out as insignificant at most receptors in line with the EA Risk Assessment guidance [Ref 5].
- 7.2.8 Due to the high existing annual mean NO_x background at ecological receptors E001a, E001c - E001e (Teemouth and Cleveland Coast), the PECs at these receptors are greater than 70% of the critical level. Although, the impacts attributed to the Proposed Development could not be screened out as insignificant at the first stage of screening, they are only slightly over the screening threshold of 1%. The PECs are E001c – E001e remain below 100% of the critical level, however the background at E001a is already exceeding the critical level.
- 7.2.9 A contour plot of the annual mean NO_x concentrations from the Proposed Development is provided in **Figure 8.15: Operational Assessment - Operational Plant Isopleths of NO_x Annual Concentrations (ES Volume II, Application Document Ref. 6.2)** which shows that the area where the 1% of the critical level is exceeded only represents a small proportion of the habitat site. Additionally, the area where the 1% is exceeded is regularly inundated by the tide (Seal Sands) and therefore there is limited vegetation present that could be impacted by atmospheric concentrations of NO_x.
- 7.2.10 When assessed against the daily critical level of 75µg/m³, the daily NO_x PCs are below the 10% screening threshold for insignificance at all sensitive ecological receptors except at E001a and E001c, where the daily NO_x PCs were slightly over 10% at 7.6µg/m³ and 7.7µg/m³ or 10.1% and 10.3% respectively.
- 7.2.11 The critical level of 75µg/m³ for daily mean NO_x is only applicable to locations where there are high concentrations of SO₂ and O₃, which is generally not the current situation in the UK, as is the case for the location of the Proposed Development.
- 7.2.12 In 2024, a maximum AOT40 value of 2,777µg/m³·h was reported in the vicinity of the Proposed Development (within STBC authority area) as reported on the UKAIR Dataset (Ozone AOT40 Long Term Objective 2024 – Compliance Status by Local Authority) [Ref 22]. This falls below the long-term objective for ozone for the protection of vegetation AOT 40 of 6,000µg/m³·h (May to July). The maximum predicted Defra background annual mean SO₂ concentration within the Main Site area was 7.9µg/m³ in 2024, which is also below the critical level of 20µg/m³.

- 7.2.13 In this instance, the IAQM considers that a higher value of $200\mu\text{g}/\text{m}^3$ can be used as a short-term daily mean NO_x critical level [Ref 24].
- 7.2.14 When comparing to the higher critical level ($200\mu\text{g}/\text{m}^3$), the daily mean NO_x PCs at all sensitive ecological receptors were $<10\%$ of the AQAL and therefore exceedances are very unlikely, and the impacts can be considered insignificant.
- 7.2.15 Due to the worst-case assumptions used in the assessment, it is considered that the predicted impacts are conservative and that an exceedance of the annual or daily critical level is unlikely to occur as a result of the emissions from the operational Proposed Development.

Table 7.2 NO_x Dispersion modelling results for ecological receptors

Receptor ID	Site Name	Annual average (µg/m ³)							24-hour average (µg/m ³)						
		CL	PC	PC % of CL	BC	PEC	PEC % of CL	Impact descriptor	CL ^[1]	PC	PC % of CL	BC	PEC	PEC % of CL	Impact descriptor
E001a	Teessmouth and Cleveland Coast	30	0.5	1.5%	35.4	35.8	119.4%	Moderate adverse	200	7.6	3.8%	70.7	78.3	39.1%	Negligible
E001b		30	0.1	0.5%	15.9	16.1	53.6%	Negligible	200	5.7	2.8%	31.9	37.6	18.8%	Negligible
E001c		30	0.5	1.5%	22.0	22.5	75.0%	Negligible	200	7.7	3.8%	44.1	51.8	25.9%	Negligible
E001d		30	0.4	1.4%	22.0	22.5	74.9%	Negligible	200	6.1	3.0%	44.1	50.2	25.1%	Negligible
E001e		30	0.4	1.3%	16.3	16.7	55.5%	Negligible	200	4.2	2.1%	32.6	36.8	18.4%	Negligible
E002	North York Moors	30	0.1	0.2%	6.4	6.4	21.3%	Negligible	200	1.3	0.7%	12.7	14.0	7.0%	Negligible
E003	Northumbria Coast	30	0.1	0.3%	7.2	7.3	24.3%	Negligible	200	1.0	0.5%	14.4	15.4	7.7%	Negligible
E004	Durham Coast	30	0.1	0.3%	7.2	7.3	24.3%	Negligible	200	1.0	0.5%	14.4	15.4	7.7%	Negligible
E005	Lovell Hill Pools	30	0.1	0.2%	9.6	9.7	32.2%	Negligible	200	1.2	0.6%	19.2	20.4	10.2%	Negligible
E006	Saltburn Gill	30	0.1	0.2%	7.8	7.8	26.0%	Negligible	200	0.8	0.4%	15.5	16.3	8.2%	Negligible
E007	Hart Bog	30	0.1	0.2%	8.1	8.2	27.3%	Negligible	200	1.0	0.5%	16.2	17.3	8.6%	Negligible
E008	Briarcroft Pasture	30	<0.1	0.1%	8.4	8.4	28.0%	Negligible	200	0.8	0.4%	16.7	17.6	8.8%	Negligible
E009	Pike Whin Bog	30	<0.1	0.1%	7.3	7.3	24.5%	Negligible	200	1.2	0.6%	14.6	15.8	7.9%	Negligible

Receptor ID	Site Name	Annual average ($\mu\text{g}/\text{m}^3$)							24-hour average ($\mu\text{g}/\text{m}^3$)						
		CL	PC	PC % of CL	BC	PEC	PEC % of CL	Impact descriptor	CL ^[1]	PC	PC % of CL	BC	PEC	PEC % of CL	Impact descriptor
E010	Whitton Bridge Pasture	30	<0.1	0.1%	7.8	7.8	26.1%	Negligible	200	0.9	0.4%	15.6	16.4	8.2%	Negligible
E011	Coatham Marsh	30	0.1	0.4%	16.8	16.9	56.4%	Negligible	200	2.1	1.0%	33.6	35.7	17.8%	Negligible
E012	Eston Pumping Station	30	0.2	0.5%	18.3	18.5	61.7%	Negligible	200	3.5	1.8%	36.7	40.2	20.1%	Negligible
E013	Teesmouth	30	0.2	0.6%	20.5	20.6	68.8%	Negligible	200	5.7	2.8%	40.9	46.6	23.3%	Negligible

^[1]The critical level of $75\mu\text{g}/\text{m}^3$ for daily mean NO_x is only applicable to locations where there are high concentrations of SO_2 and O_3 , which is generally not the current situation in the UK, as is the case for the location of the Proposed Development. As such, the IAQM considers that a higher value of $200\mu\text{g}/\text{m}^3$ can be used as a short-term critical level.

CL = Critical Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration

NH₃ – critical levels

- 7.2.16 The assessment results show that the predicted annual average NH₃ impacts at all the ecological receptors are below the criteria for insignificance ($\leq 1\%$ of the critical level, the first stage screening criteria of the EA Risk Assessment guidance) for all ecological receptors except at Teesmouth and Cleveland Coast (E001a, E0001c and E001d). However, at these ecological sites, the PEC is well below 70% of the critical level, and so the effect is considered insignificant. The impacts of annual average NH₃ concentrations as a result of the operation of the Proposed Development are considered to be insignificant at all ecological receptors. The results are shown in Table 7.3.

Table 7.3 Dispersion modelling results for ecological receptors – NH₃ annual mean

Receptor ID	Site Name	Annual Average (µg/m ³)							
		CL	PC	PC % of CL	Magnitude of Impact	BC	PEC	PEC % of CL	Significance of Effect
E001a	Teesmouth and Cleveland Coast	3	0.04	1.3%	Negligible	1.4	1.4	46.7%	Insignificant
E001b		3	0.01	0.4%	Negligible	1.2	1.2	41.2%	Insignificant
E001c		3	0.04	1.4%	Negligible	1.4	1.4	48.1%	Insignificant
E001d		3	0.04	1.2%	Negligible	1.4	1.4	47.9%	Insignificant
E001e		3	0.03	1.1%	Negligible	1.3	1.3	43.1%	Insignificant
E002	North York Moors	1	<0.01	0.5%	Negligible	1.0	1.0	95.5%	Insignificant
E003	Northumbria Coast	1	0.01	0.8%	Negligible	1.5	1.5	149.7%	Insignificant
E004	Durham Coast	3	0.01	0.3%	Negligible	1.5	1.5	49.9%	Insignificant
E005	Lovell Hill Pools	3	0.01	0.2%	Negligible	1.3	1.3	43.2%	Insignificant
E006	Saltburn Gill	3	<0.01	0.2%	Negligible	1.1	1.1	35.5%	Insignificant
E007	Hart Bog	1	0.01	0.6%	Negligible	1.6	1.6	163.7%	Insignificant
E008	Briarcroft Pasture	3	<0.01	0.1%	Negligible	2.0	2.0	66.7%	Insignificant
E009	Pike Whin Bog	3	<0.01	0.1%	Negligible	1.5	1.5	49.9%	Insignificant
E010	Whitton Bridge Pasture	3	<0.01	0.1%	Negligible	1.9	1.9	63.7%	Insignificant
E011	Coatham Marsh	3	0.01	0.4%	Negligible	1.2	1.2	41.4%	Insignificant
E012	Eston Pumping Station	3	0.01	0.5%	Negligible	1.4	1.4	46.1%	Insignificant
E013	Teesmouth	3	0.02	0.5%	Negligible	1.3	1.3	43.8%	Insignificant

Receptor ID	Site Name	Annual Average (µg/m³)							
		CL	PC	PC % of CL	Magnitude of Impact	BC	PEC	PEC % of CL	Significance of Effect
CL = Critical Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									

SO₂ – Critical levels

- 7.2.17 The assessment results show that the predicted annual average SO₂ impacts at all the ecological receptors are below the criteria for insignificance ($\leq 1\%$ of the critical level, the first stage screening criteria of the Environment Agency risk assessment guidance) for all ecological receptors. The impacts of annual average SO₂ concentrations as a result of the operation of the Proposed Development are considered to be insignificant at all ecological receptors.

Table 7.4 Dispersion modelling results for ecological receptors – SO₂

Receptor ID	Site Name	Annual Average (µg/m ³)							
		CL	PC	PC % of CL	Magnitude of Impact	BC	PEC	PEC % of CL	Significance of Effect
E001a	Teesmouth and Cleveland Coast	20	0.2	0.9%	Negligible	7.0	7.2	35.9%	Insignificant
E001b		20	0.1	0.4%	Negligible	2.0	2.1	10.5%	Insignificant
E001c		20	0.2	0.9%	Negligible	3.7	3.9	19.6%	Insignificant
E001d		20	0.2	0.8%	Negligible	3.7	3.9	19.5%	Insignificant
E001e		20	0.1	0.7%	Negligible	3.2	3.3	16.5%	Insignificant
E002	North York Moors	20	<0.1	0.1%	Negligible	0.9	0.9	4.7%	Insignificant
E003	Northumbria Coast	20	<0.1	0.1%	Negligible	1.1	1.1	5.5%	Insignificant
E004	Durham Coast	20	<0.1	0.1%	Negligible	1.1	1.1	5.5%	Insignificant
E005	Lovell Hill Pools	20	<0.1	0.1%	Negligible	1.4	1.4	6.9%	Insignificant
E006	Saltburn Gill	20	<0.1	0.1%	Negligible	1.2	1.2	6.1%	Insignificant
E007	Hart Bog	20	<0.1	0.1%	Negligible	1.1	1.2	5.8%	Insignificant
E008	Briarcroft Pasture	20	<0.1	0.0%	Negligible	1.3	1.3	6.3%	Insignificant
E009	Pike Whin Bog	20	<0.1	0.1%	Negligible	1.1	1.1	5.6%	Insignificant
E010	Whitton Bridge Pasture	20	<0.1	0.0%	Negligible	1.2	1.2	6.0%	Insignificant
E011	Coatham Marsh	20	<0.1	0.2%	Negligible	2.7	2.7	13.7%	Insignificant
E012	Eston Pumping Station	20	0.1	0.3%	Negligible	2.5	2.6	12.8%	Insignificant
E013	Teesmouth	20	0.1	0.4%	Negligible	2.3	2.4	11.9%	Insignificant

CL = Critical Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration

HF emissions

- 7.2.18 The maximum daily mean HF PCs are below 10% of the daily AQAL and therefore can be considered insignificant at all ecological receptor locations. The results at individual ecological receptors have been presented in Annex B (Table B1.1).
- 7.2.19 As shown in Table 7.5, the weekly mean HF PCs are below 1% of the weekly AQAL at most ecological receptors. At Teesmouth and Cleveland Coast (E001a – E01e and E011 – E013), the weekly PCs are >1% of the AQAL, however, the PECs are below 70% of the AQAL, in line with the EA Risk Assessment guidance [Ref 5], and so effects can be considered insignificant at all ecological receptor locations.

Table 7.5 Dispersion modelling results for ecological receptors – weekly HF

Receptor ID	Site Name	Weekly Average ($\mu\text{g}/\text{m}^3$)							
		AQAL	PC	PC % of AQAL	Magnitude of Change ^[1] & Impact	BC	PEC	PEC % of AQAL	Significance of Effect
E001a	Teessmouth and Cleveland Coast	0.5	0.017	3.4%	Imperceptible, Negligible	0.003	0.020	4.0%	Insignificant
E001b		0.5	0.010	2.0%	Imperceptible, Negligible	0.003	0.013	2.6%	Insignificant
E001c		0.5	0.017	3.4%	Imperceptible, Negligible	0.003	0.020	4.0%	Insignificant
E001d		0.5	0.014	2.7%	Imperceptible, Negligible	0.003	0.017	3.3%	Insignificant
E001e		0.5	0.011	2.1%	Imperceptible, Negligible	0.003	0.014	2.7%	Insignificant
E002	North York Moors	0.5	0.002	0.5%	Imperceptible, Negligible	0.003	0.005	1.1%	Insignificant
E003	Northumbria Coast	0.5	0.003	0.5%	Imperceptible, Negligible	0.003	0.006	1.1%	Insignificant
E004	Durham Coast	0.5	0.003	0.6%	Imperceptible, Negligible	0.003	0.006	1.2%	Insignificant
E005	Lovell Hill Pools	0.5	0.003	0.5%	Imperceptible, Negligible	0.003	0.006	1.1%	Insignificant
E006	Saltburn Gill	0.5	0.002	0.4%	Imperceptible, Negligible	0.003	0.005	1.0%	Insignificant
E007	Hart Bog	0.5	0.003	0.7%	Imperceptible, Negligible	0.003	0.006	1.3%	Insignificant
E008	Briarcroft Pasture	0.5	0.002	0.4%	Imperceptible, Negligible	0.003	0.005	1.0%	Insignificant
E009	Pike Whin Bog	0.5	0.001	0.3%	Imperceptible, Negligible	0.003	0.004	0.9%	Insignificant
E010	Whitton Bridge Pasture	0.5	0.002	0.4%	Imperceptible, Negligible	0.003	0.005	1.0%	Insignificant
E011	Coatham Marsh	0.5	0.006	1.2%	Imperceptible, Negligible	0.003	0.009	1.8%	Insignificant

Receptor ID	Site Name	Weekly Average ($\mu\text{g}/\text{m}^3$)							
		AQAL	PC	PC % of AQAL	Magnitude of Change ^[1] & Impact	BC	PEC	PEC % of AQAL	Significance of Effect
E012	Eston Pumping Station	0.5	0.007	1.5%	Imperceptible, Negligible	0.003	0.010	2.1%	Insignificant
E013	Teesmouth	0.5	0.014	2.7%	Imperceptible, Negligible	0.003	0.017	3.3%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration ^[1] In line with the EPUK/IAQM guidance, the magnitude of change of PCs are classed as imperceptible when $\pm 10\%$ of the short-term AQAL									

Nitrogen deposition – critical loads

- 7.2.20 Critical Load ranges account for the variation in ecosystem response across the whole of Europe [Ref 16]. The assessment of depositional impacts has been based on the lower end of the relevant critical load range for each habitat assessed, in order to ensure a worst-case assessment has been carried out.
- 7.2.21 The EA states that depositional impacts that are below 1% of the relevant critical load for a site can be regarded as insignificant. Guidance from the IAQM clarifies that the 1% threshold is not intended to be precise to a set number of decimal places but to the nearest whole number [Ref 24].
- 7.2.22 All ecological sites except Teesmouth and Cleveland Coast (E001a and E001c- E001e) have impacts that can be screened as being insignificant as they are less than 1% of the lower end of the critical load, in line with EA guidance.
- 7.2.23 The air quality assessment of operational impacts has assumed that the BAT-AELs will be met for the operational plant as required under the IED and in accordance with the use of BAT under the Environmental Permitting regime.
- 7.2.24 An additional modelling scenario has been carried out at lower NO_x and NH₃ emission concentrations that would be achievable with additional mitigation, in order to reduce the nutrient nitrogen deposition impacts at the ecological receptors where these cannot be considered to be insignificant.
- 7.2.25 This scenario and associated results are discussed further in Section 7.3.
- 7.2.26 Table 7.6 presents the nutrient nitrogen deposition results for the modelled ecological receptors.

Table 7.6 Dispersion modelling results for ecological receptors – nutrient nitrogen deposition (Kg N/ha/yr)

Receptor ID	Site Name	Most stringent CLd class	Lower value of applicable CLd range	BC nitrogen deposition (kg N/ha/yr)	BC % of CLd	PC (kg N/ha/yr)	PC % CLd	PEC (kg N/ha/yr)	PEC % Cld	Significance of Effect
E001a	Teesmouth and Cleveland Coast	Coastal dune grasslands (grey dunes)	5	13.32	266%	0.26	5.11%	13.58	272%	Potentially significant
E001b		Atlantic, upper-mid, mid-low salt marshes	10	13.81	138%	0.08	0.81%	13.89	139%	Insignificant
E001c		Atlantic, upper-mid, mid-low salt marshes	10	13.26	133%	0.26	2.59%	13.52	135%	Potentially significant
E001d		Atlantic, upper-mid, mid-low salt marshes	10	13.26	133%	0.23	2.31%	13.49	135%	Potentially significant
E001e		Coastal dune grasslands (grey dunes)	5	13.51	270%	0.21	4.14%	13.72	274%	Potentially significant
E002	North York Moors	Raised and blanket bogs	5	15.49	310%	0.03	0.59%	15.52	310%	Insignificant
E003	Northumbria Coast	Coastal dune grasslands (grey dunes)	5	13.43	269%	0.05	0.98%	13.48	270%	Insignificant

Receptor ID	Site Name	Most stringent CLd class	Lower value of applicable CLd range	BC nitrogen deposition (kg N/ha/yr)	BC % of CLd	PC (kg N/ha/yr)	PC % CLd	PEC (kg N/ha/yr)	PEC % CLd	Significance of Effect
E004	Durham Coast (Dunes)	Coastal dune grasslands (grey dunes)	5	13.43	269%	0.05	0.98%	13.48	270%	Insignificant
E005	Lovell Hill Pools	No comparable habitat with established critical load for estimate available								
E006	Saltburn Gill	Carpinus and Quercus mesic deciduous forest	15	21.76	145%	0.05	0.33%	21.81	145%	Insignificant
E007	Hart Bog	Raised and blanket bogs	5	14.77	295%	0.04	0.79%	14.81	296%	Insignificant
E008	Briarcroft Pasture	Low and medium altitude hay meadows	10	16.23	162%	0.01	0.15%	16.24	162%	Insignificant
E009	Pike Whin Bog	Valley mires, poor fens and transition mires	5	15.70	314%	0.02	0.35%	15.72	314%	Insignificant
E010	Whitton Bridge Pasture	Low and medium altitude hay meadows	10	16.08	161%	0.01	0.12%	16.09	161%	Insignificant
E011	Coatham Marsh	Sub-Atlantic semi-dry calcareous grassland	10	12.23	122%	0.07	0.71%	12.30	123%	Insignificant

Receptor ID	Site Name	Most stringent CLd class	Lower value of applicable CLd range	BC nitrogen deposition (kg N/ha/yr)	BC % of CLd	PC (kg N/ha/yr)	PC % CLd	PEC (kg N/ha/yr)	PEC % Cld	Significance of Effect
E012	Eston Pumping Station	Sub-Atlantic semi-dry calcareous grassland	10	12.74	127%	0.09	0.86%	12.83	128%	Insignificant
E013	Teesmouth	Coastal stable dune grassland (calcareous type)	10	13.76	138%	0.10	0.98%	13.86	139%	Insignificant
CLd = Critical Load, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration										

Acid deposition – critical loads

- 7.2.27 Critical Load ranges account for the variation in ecosystem response across the whole of Europe (CEH and APIS). The assessment has used the lower end of the relevant Critical Load range at each receptor to ensure a conservative assessment is carried out.
- 7.2.28 The EA considers depositional impacts that are below 1% of the relevant critical load for a site can be regarded as insignificant. Guidance from the IAQM clarifies that the 1% threshold is not intended to be precise to a set number of decimal places but to the nearest whole number [Ref 24].
- 7.2.29 Acid deposition is derived from nitrogen deposition modelling values for NO₂ and NH₃ using standard conversion factors and expressed as kilograms of nitrogen equivalent per hectare per year (KgN eq/ha/yr). Whilst acid deposition from SO₂ is determined using the relevant standard conversion factors and expressed as kilograms of sulphur equivalent per hectare per year (KgS eq/ha/yr). Emission of HCl and HF from the Proposed Development have also been included in the assessment of acid deposition and expressed as kiloequivalents per hectare per year (Keq/ha/yr). Table 7.7 presents the acid deposition results at all ecological receptors.
- 7.2.30 At ecological receptors E001a, E001c, E001d (Teesmouth and Cleveland Coast), the acid deposition PC is greater than 1% of the relevant critical load. However, in line with the EA Risk Assessment guidance [Ref 5], although these receptor points have impacts that are over the 1% screening level for determining insignificance, as the PEC is less than 70% of the critical load, the impacts can be considered insignificant.

Table 7.7 Dispersion modelling results for ecological receptors – acid deposition (Keq/Ha/Yr)

Receptor ID	Site Name	Lowest CLd class applicable	Acid deposition			PC acid deposition (keq/ha/yr)			
			CLd (keq/ha/yr)	BC (keq/ha/yr)	BC % CLd	PC	PC % CLd	PEC % CL	Significance of Effect
E001a	Teesmouth and Cleveland Coast	Calcareous grassland (using base cation)	Min CL Min N: 0.856 Min CL Max N: 4 Min CL Max S: 4.856	N: 0.92 S: 0.21 Total: 1.13	28.3%	0.04	1.1%	29.4%	Insignificant
E001b		Calcareous grassland (using base cation)	Min CL Min N: 0.856 Min CL Max N: 4 Min CL Max S: 4.856	N: 0.99 S: 0.25 Total: 1.24	31.0%	0.02	0.4%	31.4%	Insignificant
E001c		Calcareous grassland (using base cation)	Min CL Min N: 0.856 Min CL Max N: 4 Min CL Max S: 4.856	N: 0.95 S: 0.22 Total: 1.17	29.3%	0.05	1.1%	30.4%	Insignificant
E001d		Calcareous grassland (using base cation)	Min CL Min N: 0.856 Min CL Max N: 4 Min CL Max S: 4.856	N: 0.95 S: 0.22 Total:	29.3%	0.04	1.0%	30.3%	Insignificant
E001e		Calcareous grassland (using base cation)	Min CL Min N: 0.856 Min CL Max N: 4 Min CL Max S: 4.856	N: 0.96 S: 0.27	30.8%	0.04	0.9%	31.6%	Insignificant
E002	North York Moors	Dwarf shrub heath	Min CL Min N: 0.499 Min CL Max N: 0.792	N: 1.11 S: 0.15	159.1%	0.01	0.7%	159.7%	Insignificant

Receptor ID	Site Name	Lowest CLd class applicable	Acid deposition			PC acid deposition (keq/ha/yr)			
			CLd (keq/ha/yr)	BC (keq/ha/yr)	BC % CLd	PC	PC % CLd	PEC % CL	Significance of Effect
			Min CL Max S:0.15						
E003	Northumbria Coast	Calcareous grassland (using base cation)	Min CL Min N: 0.856 Min CL Max N: 4 Min CL Max S: 4.856	N: 0.96 S: 0.17	28.3%	0.01	0.2%	28.4%	Insignificant
E004	Durham Coast (Dunes)	Calcareous grassland (using base cation)	Min CL Min N: 0.856 Min CL Max N: 4 Min CL Max S: 4.856	N: 0.96 S: 0.17	28.3%	0.01	0.2%	28.4%	Insignificant
E005	Lovell Hill Pools		No comparable habitat with established critical load for estimate available for this site						
E006	Saltburn Gill	Unmanaged Broadleaved/Coniferous Woodland	Min CL Min N: 0.142 Min CL Max N: 2.639 Min CL Max S: 2.448	N: 1.56 S: 0.17	65.6%	0.01	0.3%	65.8%	Insignificant
E007	Hart Bog	Bogs	Min CL Min N: 0.321 Min CL Max N: 0.469 Min CL Max S: 0.148	N: 1.06 S: 0.16	260.1%	<0.01	1.0%	261.1%	Insignificant
E008	Briarcroft Pasture	Calcareous grassland (using base cation)	Min CL Min N: 1.071 Min CL Max N: 5.071 Min CL Max S:4	N: 1.16 S: 0.15	25.8%	0.01	0.1%	25.9%	Insignificant
E009	Pike Whin Bog		No sensitive features – no CLs available for this site						

Receptor ID	Site Name	Lowest CLd class applicable	Acid deposition			PC acid deposition (keq/ha/yr)			
			CLd (keq/ha/yr)	BC (keq/ha/yr)	BC % CLd	PC	PC % CLd	PEC % CL	Significance of Effect
E010	Whitton Bridge Pasture	Calcareous grassland (using base cation)	Min CL Min N: 1.071 Min CL Max N: 5.071 Min CL Max S: 4	N: 1.15 S: 0.14	25.4%	0.01	0.1%	25.6%	Insignificant
E011	Coatham Marsh	Calcareous grassland (using base cation)	Min CL Min N: 1.071 Min CL Max N: 5.071 Min CL Max S: 4	N: 0.87 S: 0.16	0.1%	0.01	0.1%	4.1%	Insignificant
E012	Eston Pumping Station	Calcareous grassland (using base cation)	Min CL Min N: 0.86 Min CL Max N: 4 Min CL Max S: 4.856	N: 0.91 S: 0.17	27.0%	0.01	0.3%	27.3%	Insignificant
E013	Teessmouth		No sensitive features – no CLs available for this site						
CLd = Critical Load, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									

Metals – deposition to ground

- 7.2.31 In line with the EA's Risk Assessment methodology, substance deposition to ground ($\text{mg}/\text{m}^2/\text{day}$) has been assessed for the following metals to determine the potential impact when absorbed by soil and leaves ('deposition'): As, Cd, Cr(III), Cu, Pb, Hg and Ni.
- 7.2.32 Substance deposition to ground has been assessed for a range of metals and is considered to be insignificant for Cd, Cr (III), Cu and Pb in line with the EA risk assessment guidance due to the PC to Ground ($\text{mg}/\text{m}^2/\text{day}$) being <1% of the respective ground limits. Therefore, as the maximum PC deposition to ground of Cd, Cr, Cu and Pb can be screened out as insignificant. The results of Cd, Cr, Cu and Pb deposition to ground ($\text{mg}/\text{m}^2/\text{day}$) at individual ecological receptors are presented in Annex B (Table B1.3 to Table B1.6).
- 7.2.33 However, this cannot be said for As, Hg and Ni where the maximum deposition to ground values are 6.7%, 1.2% and 1.2% of the deposition to ground limit respectively, indicating there may be potential for significant effects at the identified ecological receptor locations, as indicated in Table 7.8 to Table 7.10.
- 7.2.34 As previously stated for the assessment of metal species these have been conservatively assessed at the BAT-AEL for each individual species in the case of As and Ni, when the BAT-AEL applied to total metals, and therefore it is considered that the actual emissions of each metal species would be considerably less than this and therefore the actual impacts will be insignificant.
- 7.2.35 Hg has been assessed at the upper end of the BAT-AEL ranges for the relevant emissions, and still only represents 1.2% of the deposition to ground limit at the worst case receptor. It is considered that typical emissions would be well below the upper BAT-AEL limit, to ensure compliance with annual average emission limits in the Environmental Permit and therefore it is considered that the assessment is very conservative and that actual impacts are likely to be insignificant.
- 7.2.36 For Hg and Ni, the potential for significant effects from deposition to ground was only observed at the worst affected Teesmouth and Cleveland Coast.

Table 7.8 Dispersion modelling results for ecological receptors – As deposition to ground (mg/m²/day)

Receptor ID	Site Name	As Deposition to ground				Significance
		PC to air (µg/m ³)	PC to ground (mg/m ² /day)	PC to ground limit (mg/m ² /day)	PC to ground % of limit	
E001a	Teessmouth and Cleveland Coast	0.001	0.001	0.02	6.5%	Unlikely to be Significant due to conservative nature of the assessment assuming all metal species release at the combined BAT-AEL.
E001b		<0.001	<0.001	0.02	1.7%	
E001c		0.001	0.001	0.02	6.5%	
E001d		0.001	0.001	0.02	6.7%	
E001e		0.001	0.001	0.02	6.5%	
E002	North York Moors	<0.001	<0.001	0.02	1.1%	Unlikely to be Significant due to conservative nature of the assessment assuming all metal species release at the combined BAT-AEL.
E003	Northumbria Coast	<0.001	<0.001	0.02	1.9%	
E004	Durham Coast	<0.001	<0.001	0.02	1.9%	
E005	Lovell Hill Pools	<0.001	<0.001	0.02	1.3%	
E006	Saltburn Gill	<0.001	<0.001	0.02	1.1%	
E007	Hart Bog	<0.001	<0.001	0.02	1.4%	
E008	Briarcroft Pasture	<0.001	<0.001	0.02	0.6%	PC <1%, Insignificant
E009	Pike Whin Bog	<0.001	<0.001	0.02	0.6%	PC <1%, Insignificant
E010	Whitton Bridge Pasture	<0.001	<0.001	0.02	0.5%	PC <1%, Insignificant
E011	Coatham Marsh	<0.001	<0.001	0.02	2.4%	Unlikely to be Significant due to conservative nature of the assessment
E012	Eston Pumping Station	<0.001	<0.001	0.02	2.8%	

E013	Teesmouth	<0.001	<0.001	0.02	1.9%	assuming all metal species release at the combined BAT-AEL.
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Table 7.9 Dispersion modelling results for ecological receptors – Hg deposition to ground (mg/m²/day)

Receptor ID	Site Name	Mercury Deposition to ground				
		PC to air (µg/m ³)	PC to ground (mg/m ² /day)	PC to ground limit (mg/m ² /day)	PC to ground % of limit	Significance
E001a	Teesmouth and Cleveland Coast	1.8E-05	4.6E-05	0.004	1.2%	Unlikely to be Significant due to the conservative nature of the assessment.
E001b		5.2E-06	1.3E-05	0.004	0.3%	PC <1%, Insignificant
E001c		1.8E-05	4.7E-05	0.004	1.2%	Unlikely to be Significant due to the conservative nature of the assessment.
E001d		1.6E-05	4.2E-05	0.004	1.1%	
E001e		1.5E-05	3.8E-05	0.004	1.0%	PC <1%, Insignificant
E002	North York Moors	2.1E-06	5.6E-06	0.004	0.1%	PC <1%, Insignificant
E003	Northumbria Coast	3.6E-06	9.4E-06	0.004	0.2%	PC <1%, Insignificant
E004	Durham Coast (Dunes)	3.6E-06	9.3E-06	0.004	0.2%	PC <1%, Insignificant
E005	Lovell Hill Pools	2.7E-06	7.0E-06	0.004	0.2%	PC <1%, Insignificant
E006	Saltburn Gill	2.3E-06	6.0E-06	0.004	0.1%	PC <1%, Insignificant
E007	Hart Bog	2.9E-06	7.5E-06	0.004	0.2%	PC <1%, Insignificant
E008	Briarcroft Pasture	1.1E-06	2.8E-06	0.004	0.1%	PC <1%, Insignificant

Receptor ID	Site Name	Mercury Deposition to ground				
		PC to air ($\mu\text{g}/\text{m}^3$)	PC to ground ($\text{mg}/\text{m}^2/\text{day}$)	PC to ground limit ($\text{mg}/\text{m}^2/\text{day}$)	PC to ground % of limit	Significance
E009	Pike Whin Bog	1.3E-06	3.3E-06	0.004	0.1%	PC <1%, Insignificant
E010	Whitton Bridge Pasture	9.1E-07	2.3E-06	0.004	0.1%	PC <1%, Insignificant
E011	Coatham Marsh	5.2E-06	1.3E-05	0.004	0.1%	PC <1%, Insignificant
E012	Eston Pumping Station	6.2E-06	1.6E-05	0.004	0.4%	PC <1%, Insignificant
E013	Teesmouth	6.3E-06	1.6E-05	0.004	0.4%	PC <1%, Insignificant

Table 7.10 Dispersion modelling results for ecological receptors – Ni deposition to ground (mg/m²/day)

Receptor ID	Site Name	Ni Deposition to ground				Significance
		PC to air (µg/m ³)	PC to ground (mg/m ² /day)	PC to ground limit (mg/m ² /day)	PC to ground % of limit	
E001a	Teessmouth and Cleveland Coast	0.001	0.001	0.11	1.2%	Unlikely to be Significant due to conservative nature of the assessment assuming all metal species release at the combined BAT-AEL.
E001b		<0.001	<0.001	0.11	0.3%	PC <1%, Insignificant
E001c		0.001	0.001	0.11	1.2%	Unlikely to be Significant due to conservative nature of the assessment assuming all metal species release at the combined BAT-AEL.
E001d		0.001	0.001	0.11	1.2%	
E001e		0.001	0.001	0.11	1.2%	
E002	North York Moors	<0.001	<0.001	0.11	0.2%	PC <1%, Insignificant
E003	Northumbria Coast	<0.001	<0.001	0.11	0.3%	PC <1%, Insignificant
E004	Durham Coast (Dunes)	<0.001	<0.001	0.11	0.3%	PC <1%, Insignificant
E005	Lovell Hill Pools	<0.001	<0.001	0.11	0.2%	PC <1%, Insignificant
E006	Saltburn Gill	<0.001	<0.001	0.11	0.2%	PC <1%, Insignificant
E007	Hart Bog	<0.001	<0.001	0.11	0.3%	PC <1%, Insignificant

Receptor ID	Site Name	Ni Deposition to ground				
		PC to air ($\mu\text{g}/\text{m}^3$)	PC to ground ($\text{mg}/\text{m}^2/\text{day}$)	PC to ground limit ($\text{mg}/\text{m}^2/\text{day}$)	PC to ground % of limit	Significance
E008	Briarcroft Pasture	<0.001	<0.001	0.11	0.1%	PC <1%, Insignificant
E009	Pike Whin Bog	<0.001	<0.001	0.11	0.1%	PC <1%, Insignificant
E010	Whitton Bridge Pasture	<0.001	<0.001	0.11	0.1%	PC <1%, Insignificant
E011	Coatham Marsh	<0.001	<0.001	0.11	0.4%	PC <1%, Insignificant
E012	Eston Pumping Station	<0.001	0.001	0.11	0.5%	PC <1%, Insignificant
E013	Teesmouth	<0.001	<0.001	0.11	0.3%	PC <1%, Insignificant

7.3 Additional mitigation – ecological receptor results

- 7.3.1 As stated previously, the air quality assessment of operational impacts has assumed that the BAT-AELs will be met for the operational plant as required under the IED and in accordance with the use of BAT under the Environmental Permitting regime. As a form of embedded mitigation, the emissions of NO_x will be controlled to the required BAT-AELs through the use of low-NO_x burners and SNCR/SCR.
- 7.3.2 Due to the use of SNCR/SCR resulting in an additional emission of NH₃ slip, further abatement in the form of an additional SNCR/SCR to further reduce NO_x and wet scrubbing to reduce NH₃ may be required to reduce the impacts of nitrogen deposition from the Proposed Development. This would be required on the emissions from the CHP plant stack and the SAF Production Product Pretreatment stack.
- 7.3.3 An additional modelling scenario has therefore been carried out at the lower NO_x and NH₃ emission concentrations that would be achievable with this additional mitigation, with the resulting annual NO_x and nutrient nitrogen deposition impacts at ecological receptors shown in Table 7.11 and Table 7.12.
- 7.3.4 At the lower NO_x and NH₃ emission concentrations, the predicted annual mean NO_x PC was 0.2µg/m³ at E001a (Teesmouth and Cleveland Coast) which represents 0.7% of the annual CL and so can be screened out as insignificant in line with the EA Risk Assessment guidance [Ref 5]. This is a significant reduction of 0.3µg/m³ from the predicted annual NO_x PC at E001a at the BAT-AELs (0.5µg/m³ at 1.5% of the CL).
- 7.3.5 A significant reduction in the predicted nutrient nitrogen deposition PCs was predicted in the additional modelling scenario, shown in Table 7.12. At the BAT-AELs, PCs in exceedance of 1% of the relevant lower critical load were predicted for ecological receptors E001a, E001c, E001d and E001e (Teesmouth and Cleveland Coast). At the lower NO_x and NH₃ emission concentrations, the predicted PCs were below 1% of the relevant critical load at E001c to E001e. At the lower NO_x and NH₃ emission concentration, the nutrient nitrogen deposition PC at the worst-case receptor E001a was 1.16% of the relevant CL. However, average nutrient nitrogen deposition at the worst-case ecological receptor over the five-year period (2020 to 2024) was 0.91% of the CL (5kgNha/yr), and therefore the potential for significant effects is deemed to be unlikely given that nitrogen deposition likely impacts over longer time periods than one year.

Table 7.11 NO_x Dispersion Modelling Results for Ecological Receptors - Lower NO_x and NH₃ emission concentrations

Receptor ID	Site Name	Annual average (µg/m ³)							24-hour average (µg/m ³)						
		CL	PC	PC % of CL	BC	PEC	PEC % of CL	Impact descriptor	CL ^[1]	PC	PC % of CL	BC	PEC	PEC % of CL	Impact descriptor
E001a	Teesmouth and Cleveland Coast	30	0.2	0.7%	35.4	35.6	118.6%	Moderate adverse	200	7.6	3.8%	70.7	78.3	104.4%	Negligible

^[1]The critical level of 75µg/m³ for daily mean NO_x is only applicable to locations where there are high concentrations of SO₂ and O₃, which is generally not the current situation in the UK, as is the case for the location of the Proposed Development. As such, the IAQM considers that a higher value of 200µg/m³ can be used as a short-term critical level.

CL = Critical Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration

Table 7.12 Dispersion Modelling Results for Ecological Receptors – Nutrient Nitrogen Deposition (Kg N/ha/yr) – Lower NO_x and NH₃ emission concentration

Receptor ID	Site Name	Most stringent CL class	Lower value of applicable CL range	BC nitrogen deposition (kg N/ha/yr)	BC % of CL	PC (kg N/ha/yr)	PC % Critical Load	PEC (kg N/ha/yr)	PEC % Critical Load	Significance of Effect
E001a	Teesmouth and Cleveland Coast	Coastal dune grasslands (grey dunes)	5	13.32	266%	0.06	1.16%	13.38	268%	Insignificant
E001c		Atlantic, upper-mid, mid-low salt marshes	10	13.26	133%	0.06	0.59%	13.32	133%	Insignificant
E001d		Atlantic, upper-mid, mid-low salt marshes	10	13.26	133%	0.05	0.51%	13.31	133%	Insignificant
E001e		Coastal dune grasslands (grey dunes)	5	13.51	270%	0.04	0.87%	13.55	271%	Insignificant

PC = Process Contribution, CL = Critical Load, BC = Background Concentration, PEC = Predicted Environmental Concentration

^[1] Average nutrient nitrogen deposition PC 0.91% CL across 2020 to 2024.

8 Assessment limitations and assumptions

- 8.1.1 This section outlines the potential limitations associated with the dispersion modelling assessment. Where assumptions have been made, this is also detailed.
- 8.1.2 The greatest uncertainty associated with any dispersion modelling assessment arises through the inherent uncertainty of the dispersion modelling process itself. Nevertheless, the use of dispersion modelling is a widely applied and accepted approach for the prediction of impacts from industrial sources.
- 8.1.3 In order to minimise the likelihood of under-estimating the PC to ground level concentrations from the operational Proposed Developments stacks, the following conservative assumptions have been made within the assessment:
- the operational Proposed Development has been assumed to operate on a continuous basis i.e. for 8,760 hour per year;
 - the operational Proposed Development has been assumed to operate at 100% load, however this will not always be the case;
 - the modelling predictions are based on the use of five full years of meteorological data from Durham Tees Valley (Teesside Airport) meteorological station for the years 2020 to 2024 inclusive, with the highest result being reported for all years assessed, other years therefore result in lower impacts;
 - the largest possible building sizes have been included in the assessment; therefore, the stack height represents the highest required to achieve the impacts presented in this assessment; and
 - emission concentrations for the process are calculated based on the use of IED limits and BAT-AEL concentrations; in practice annual average rates would be below this to enable continued compliance with Environmental Permit requirements.

9 Conclusions

- 9.1.1 This report has assessed the impact on local air quality of the operation of the Proposed Development. The assessment has used the dispersion model ADMS to predict the increases in pollutant species released from the operational Proposed Development to the local study area.
- 9.1.2 An assessment of the operational traffic impacts from the Proposed Development on both sensitive human and ecological receptors has been undertaken. It was determined that the effect on the selected sensitive receptors is not significant.
 - 9.1.2.1 The effect of the operational shipping movements associated with the Proposed Development on sensitive ecological receptors can be considered to be not significant. This is based on the modelled concentrations being less than 1% of the relevant critical level or critical load.
- 9.1.3 An evaluation of the release height for emission points A1 and A2, which are the main sources of emissions from the site, has shown that release heights of 140m and 100m respectively above ground level are capable of mitigating the short-term and long-term impacts of emissions to an acceptable level, with regard to existing air quality and ambient air quality standards at both human health and ecological receptors.
- 9.1.4 Emissions from the Proposed Development's stacks would result in small increases in ground-level concentrations of the modelled pollutants. Taking into account available information on background concentrations within the modelled domain, predicted operational concentrations of the modelled pollutants would be within current environmental standards for the protection of human health.
- 9.1.5 The modelling of impacts at designated ecological sites has predicted that emissions would give rise to no significant effects with regard to increases in atmospheric concentrations of SO₂, NH₃ or HF. In addition, it is considered unlikely that the deposition of metals to ground would result in insignificant impacts due to the worst case assumptions made in the assessment.
- 9.1.6 Depositional impacts of nutrient nitrogen and annual mean NO_x impacts are considered to be insignificant with additional mitigation applied (at the lower NO_x and NH₃ emission concentrations).

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Annex A: Human receptors – additional results – operational plant

Table A1.1 Predicted change in annual mean NO₂ concentrations

Receptor	AQAL (µg/m³)	PC (µg/m³)	PC /AQAL %	Magnitude Impact	of	BC (µg/m³)	PEC (µg/m³)	PEC/AQAL %	Significance of effect
Maximum	40	0.37	0.9%	Negligible		11.2	11.6	29.0%	Insignificant
R001		0.06	0.2%	Negligible		8.1	8.2	20.5%	Insignificant
R002		0.18	0.5%	Negligible		9.5	9.6	24.1%	Insignificant
R003		0.08	0.2%	Negligible		10.9	11.0	27.4%	Insignificant
R004		0.07	0.2%	Negligible		12.7	12.8	32.0%	Insignificant
R005		0.02	0.0%	Negligible		14.6	14.6	36.6%	Insignificant
R006		0.06	0.2%	Negligible		8.6	8.7	21.7%	Insignificant
R007		0.12	0.3%	Negligible		11.5	11.7	29.1%	Insignificant
R008		0.11	0.3%	Negligible		11.3	11.4	28.4%	Insignificant
R009		0.10	0.3%	Negligible		10.8	10.9	27.1%	Insignificant
R010		0.02	0.1%	Negligible		12.3	12.4	30.9%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									

Table A1.2 Predicted change in hourly mean NO₂ concentrations (as the 99.79th percentile of hourly averages)

Receptor	AQAL (µg/m³)	PC (µg/m³)	PC /AQAL %	Magnitude of Change ^[1] & Impact	BC (µg/m³)	PEC (µg/m³)	PEC/AQAL %	Significance of Effect
Maximum	200	7.4	3.7%	Imperceptible, Moderate adverse	23.2	30.6	15.3%	Insignificant
R001		2.1	1.1%	Imperceptible, Negligible	16.3	18.4	9.2%	Insignificant
R002		3.9	1.9%	Imperceptible, Negligible	18.9	22.8	11.4%	Insignificant
R003		3.4	1.7%	Imperceptible, Negligible	21.7	25.2	12.6%	Insignificant
R004		2.5	1.3%	Imperceptible, Negligible	25.5	28.0	14.0%	Insignificant
R005		1.7	0.8%	Imperceptible, Negligible	29.2	30.9	15.5%	Insignificant
R006		2.3	1.2%	Imperceptible, Negligible	17.2	19.5	9.8%	Insignificant
R007		3.3	1.6%	Imperceptible, Negligible	23.1	26.3	13.2%	Insignificant
R008		4.1	2.1%	Imperceptible, Negligible	22.5	26.6	13.3%	Insignificant
R009		2.9	1.5%	Imperceptible, Negligible	21.5	24.4	12.2%	Insignificant
R010		1.9	1.0%	Imperceptible, Negligible	24.7	26.6	13.3%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration								
^[1] In line with the EPUK/IAQM guidance, change in PCs are classed as imperceptible when ±10% of the short-term AQAL								

Table A1.3 Predicted change in annual mean PM₁₀ concentrations

Receptor ID	AQAL (µg/m³)	Annual Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	40	0.01	0.01%	Negligible	10.40	26.0%	10.40	26.0%	Insignificant
R002		0.01	0.03%	Negligible	9.37	23.4%	9.38	23.4%	Insignificant
R003		0.01	0.01%	Negligible	9.65	24.1%	9.66	24.1%	Insignificant
R004		<0.01	0.01%	Negligible	9.90	24.7%	9.90	24.8%	Insignificant
R005		<0.00	0.00%	Negligible	10.35	25.9%	10.35	25.9%	Insignificant
R006		0.01	0.01%	Negligible	10.80	27.0%	10.80	27.0%	Insignificant
R007		0.01	0.02%	Negligible	9.70	24.2%	9.71	24.3%	Insignificant
R008		0.01	0.02%	Negligible	10.61	26.5%	10.62	26.6%	Insignificant
R009		0.01	0.02%	Negligible	8.22	20.5%	8.23	20.6%	Insignificant
R010		<0.01	0.00%	Negligible	10.77	26.9%	10.77	26.9%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									

Table A1.4 Predicted change in daily mean PM₁₀ concentrations (as the 90.41st percentile of daily averages)

Receptor ID	AQAL (µg/m³)	Daily Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Change ^[1] & Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	50	0.03	0.1%	Imperceptible, Negligible	20.8	41.6%	20.8	41.7%	Insignificant
R002		0.08	0.2%	Imperceptible, Negligible	18.7	37.5%	18.8	37.6%	Insignificant
R003		0.04	0.1%	Imperceptible, Negligible	19.3	38.6%	19.3	38.7%	Insignificant
R004		0.03	0.1%	Imperceptible, Negligible	19.8	39.6%	19.8	39.7%	Insignificant
R005		0.01	<0.1%	Imperceptible, Negligible	20.7	41.4%	20.7	41.4%	Insignificant
R006		0.03	0.1%	Imperceptible, Negligible	21.6	43.2%	21.6	43.3%	Insignificant
R007		0.07	0.1%	Imperceptible, Negligible	19.4	38.8%	19.5	38.9%	Insignificant
R008		0.06	0.1%	Imperceptible, Negligible	21.2	42.5%	21.3	42.6%	Insignificant
R009		0.05	0.1%	Imperceptible, Negligible	16.4	32.9%	16.5	33.0%	Insignificant
R010		0.01	<0.1%	Imperceptible, Negligible	21.5	43.1%	21.6	43.1%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									
^[1] In line with the EPUK/IAQM guidance, the magnitude of change of PCs are classed as imperceptible when ±10% of the short-term AQAL									

Table A1.5 Predicted change in annual mean PM_{2.5} concentrations

Receptor ID	AQAL (µg/m³)	Annual Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	12	0.01	0.04%	Negligible	5.3	44.5%	5.3	44.6%	Insignificant
R002		0.01	0.10%	Negligible	5.2	43.4%	5.2	43.5%	Insignificant
R003		0.01	0.05%	Negligible	5.6	47.0%	5.6	47.1%	Insignificant
R004		<0.01	0.04%	Negligible	5.7	47.1%	5.7	47.1%	Insignificant
R005		<0.01	0.01%	Negligible	6.4	53.3%	6.4	53.3%	Insignificant
R006		0.01	0.05%	Negligible	5.3	43.8%	5.3	43.9%	Insignificant
R007		0.01	0.07%	Negligible	5.6	46.4%	5.6	46.5%	Insignificant
R008		0.01	0.08%	Negligible	6.2	52.0%	6.2	52.1%	Insignificant
R009		0.01	0.06%	Negligible	5.0	41.6%	5.0	41.7%	Insignificant
R010		<0.01	0.01%	Negligible	5.6	46.9%	5.6	46.9%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									

Table A1.6 Predicted change in 8-hour rolling CO concentrations

Receptor ID	AQAL (µg/m³)	8-hour Rolling Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Change ^[1] & Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	10,000	2.0	0.02%	Imperceptible, Negligible	435	4.4%	437	4.4%	Insignificant
R002		2.5	0.02%	Imperceptible, Negligible	443	4.4%	445	4.5%	Insignificant
R003		1.9	0.02%	Imperceptible, Negligible	442	4.4%	444	4.4%	Insignificant
R004		2.4	0.02%	Imperceptible, Negligible	440	4.4%	442	4.4%	Insignificant
R005		1.1	0.01%	Imperceptible, Negligible	449	4.5%	450	4.5%	Insignificant
R006		1.9	0.02%	Imperceptible, Negligible	433	4.3%	435	4.3%	Insignificant
R007		3.0	0.03%	Imperceptible, Negligible	441	4.4%	444	4.4%	Insignificant
R008		2.4	0.02%	Imperceptible, Negligible	451	4.5%	453	4.5%	Insignificant
R009		1.9	0.02%	Imperceptible, Negligible	427	4.3%	429	4.3%	Insignificant
R010		1.3	0.01%	Imperceptible, Negligible	436	4.4%	438	4.4%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									
^[1] In line with the EPUK/IAQM guidance, the magnitude of change of PCs are classed as imperceptible when ±10% of the short-term AQAL									

Table A1.7 Predicted change in hourly mean CO concentrations (as the 100th percentile of hourly averages)

Receptor ID	AQAL (µg/m³)	Hourly Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Change ^[1] & Impact	BC	BC % of AQA L	PEC	PEC % of AQAL	Significance of Effect
R001	30,000	5.5	0.02%	Imperceptible, Negligible	435	1.5%	441	1.5%	Insignificant
R002		4.7	0.02%	Imperceptible, Negligible	443	1.5%	447	1.5%	Insignificant
R003		5.1	0.02%	Imperceptible, Negligible	442	1.5%	447	1.5%	Insignificant
R004		6.6	0.02%	Imperceptible, Negligible	440	1.5%	447	1.5%	Insignificant
R005		4.2	0.01%	Imperceptible, Negligible	449	1.5%	453	1.5%	Insignificant
R006		5.9	0.02%	Imperceptible, Negligible	433	1.4%	439	1.5%	Insignificant
R007		7.0	0.02%	Imperceptible, Negligible	441	1.5%	448	1.5%	Insignificant
R008		9.0	0.03%	Imperceptible, Negligible	451	1.5%	460	1.5%	Insignificant
R009		5.0	0.02%	Imperceptible, Negligible	427	1.4%	432	1.4%	Insignificant
R010		5.3	0.02%	Imperceptible, Negligible	436	1.5%	442	1.5%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									
^[1] In line with the EPUK/IAQM guidance, the magnitude of change of PCs are classed as imperceptible when ±10% of the short-term AQAL									

Table A1.8 Predicted change in 15-minute mean SO₂ concentrations (as the 99.9th percentile of 15-minute averages)

Receptor ID	AQAL (µg/m³)	15-Minute Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Change ^[1] & Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	266	3.9	1.5%	Imperceptible, Negligible	3.4	1.3%	7.4	2.8%	Insignificant
R002		5.9	2.2%	Imperceptible, Negligible	4.1	1.5%	10.0	3.8%	Insignificant
R003		6.2	2.3%	Imperceptible, Negligible	4.5	1.7%	10.7	4.0%	Insignificant
R004		4.6	1.7%	Imperceptible, Negligible	3.9	1.5%	8.6	3.2%	Insignificant
R005		2.5	0.9%	Imperceptible, Negligible	4.7	1.8%	7.2	2.7%	Insignificant
R006		4.2	1.6%	Imperceptible, Negligible	3.1	1.2%	7.3	2.7%	Insignificant
R007		4.4	1.6%	Imperceptible, Negligible	4.3	1.6%	8.7	3.3%	Insignificant
R008		6.7	2.5%	Imperceptible, Negligible	4.2	1.6%	10.9	4.1%	Insignificant
R009		4.4	1.6%	Imperceptible, Negligible	4.3	1.6%	8.6	3.2%	Insignificant
R010		3.1	1.2%	Imperceptible, Negligible	4.8	1.8%	7.9	3.0%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									
^[1] In line with the EPUK/IAQM guidance, the magnitude of change of PCs are classed as imperceptible when ±10% of the short-term AQAL									

Table A1.9 Predicted change in hourly mean SO₂ concentrations (as the 99.7th percentile of hourly averages)

Receptor ID	AQAL (µg/m³)	Hourly Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Change ^[1] & Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	350	2.1	0.6%	Imperceptible, Negligible	3.4	1.0%	5.5	1.6%	Insignificant
R002		3.4	1.0%	Imperceptible, Negligible	4.1	1.2%	7.5	2.1%	Insignificant
R003		2.6	0.7%	Imperceptible, Negligible	4.5	1.3%	7.1	2.0%	Insignificant
R004		2.3	0.7%	Imperceptible, Negligible	3.9	1.1%	6.2	1.8%	Insignificant
R005		1.7	0.5%	Imperceptible, Negligible	4.7	1.3%	6.4	1.8%	Insignificant
R006		2.2	0.6%	Imperceptible, Negligible	3.1	0.9%	5.3	1.5%	Insignificant
R007		2.6	0.7%	Imperceptible, Negligible	4.3	1.2%	6.9	2.0%	Insignificant
R008		3.6	1.0%	Imperceptible, Negligible	4.2	1.2%	7.8	2.2%	Insignificant
R009		2.3	0.7%	Imperceptible, Negligible	4.3	1.2%	6.6	1.9%	Insignificant
R010		1.8	0.5%	Imperceptible, Negligible	4.8	1.4%	6.6	1.9%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									
^[1] In line with the EPUK/IAQM guidance, the magnitude of change of PCs are classed as imperceptible when ±10% of the short-term AQAL									

Table A1.10 Predicted change in daily mean SO₂ concentrations (as the 99.2nd percentile of daily averages)

Receptor ID	AQAL (µg/m³)	Daily Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Change ^[1] & Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	125	0.7	0.5%	Imperceptible, Negligible	3.4	2.8%	4.1	3.3%	Insignificant
R002		1.0	0.8%	Imperceptible, Negligible	4.1	3.3%	5.1	4.1%	Insignificant
R003		0.6	0.5%	Imperceptible, Negligible	4.5	3.6%	5.1	4.0%	Insignificant
R004		0.9	0.7%	Imperceptible, Negligible	3.9	3.1%	4.8	3.8%	Insignificant
R005		0.5	0.4%	Imperceptible, Negligible	4.7	3.8%	5.2	4.1%	Insignificant
R006		0.6	0.5%	Imperceptible, Negligible	3.1	2.5%	3.7	3.0%	Insignificant
R007		0.9	0.7%	Imperceptible, Negligible	4.3	3.5%	5.3	4.2%	Insignificant
R008		0.9	0.7%	Imperceptible, Negligible	4.2	3.4%	5.1	4.1%	Insignificant
R009		0.7	0.5%	Imperceptible, Negligible	4.3	3.4%	4.9	3.9%	Insignificant
R010		0.6	0.4%	Imperceptible, Negligible	4.8	3.8%	5.3	4.3%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									
^[1] In line with the EPUK/IAQM guidance, the magnitude of change of PCs are classed as imperceptible when ±10% of the short-term AQAL									

Table A1.11 Predicted change in annual VOC (as benzene) concentrations

Receptor ID	AQAL (µg/m³)	Annual Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	5	0.002	0.03%	Negligible	0.43	8.7%	0.44	8.7%	Insignificant
R002		0.006	0.12%	Negligible	0.42	8.3%	0.42	8.5%	Insignificant
R003		0.003	0.05%	Negligible	0.49	9.8%	0.49	9.9%	Insignificant
R004		0.002	0.05%	Negligible	0.50	10.0%	0.50	10.0%	Insignificant
R005		0.001	0.01%	Negligible	0.54	10.8%	0.54	10.8%	Insignificant
R006		0.002	0.03%	Negligible	0.40	8.0%	0.40	8.0%	Insignificant
R007		0.004	0.08%	Negligible	0.48	9.5%	0.48	9.6%	Insignificant
R008		0.003	0.06%	Negligible	0.51	10.2%	0.51	10.3%	Insignificant
R009		0.003	0.07%	Negligible	0.54	10.8%	0.54	10.9%	Insignificant
R010		0.001	0.02%	Negligible	0.51	10.1%	0.51	10.2%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									

Table A1.12 Predicted change in daily mean VOC (as benzene) concentrations

Receptor ID	AQAL (µg/m³)	Daily Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Change ^[1] & Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	30	0.10	0.33%	Imperceptible, Negligible	0.87	2.9%	0.97	3.2%	Insignificant
R002		0.10	0.32%	Imperceptible, Negligible	0.83	2.8%	0.93	3.1%	Insignificant
R003		0.07	0.24%	Imperceptible, Negligible	0.98	3.3%	1.05	3.5%	Insignificant
R004		0.10	0.34%	Imperceptible, Negligible	1.00	3.3%	1.10	3.7%	Insignificant
R005		0.05	0.18%	Imperceptible, Negligible	1.08	3.6%	1.13	3.8%	Insignificant
R006		0.11	0.35%	Imperceptible, Negligible	0.80	2.7%	0.90	3.0%	Insignificant
R007		0.10	0.34%	Imperceptible, Negligible	0.95	3.2%	1.05	3.5%	Insignificant
R008		0.10	0.35%	Imperceptible, Negligible	1.02	3.4%	1.12	3.7%	Insignificant
R009		0.07	0.25%	Imperceptible, Negligible	1.08	3.6%	1.15	3.8%	Insignificant
R010		0.07	0.22%	Imperceptible, Negligible	1.01	3.4%	1.08	3.6%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									
^[1] In line with the EPUK/IAQM guidance, the magnitude of change of PCs are classed as imperceptible when ±10% of the short-term AQAL									

Table A1.13 Predicted change in annual mean NH₃ concentrations

Receptor ID	AQAL (µg/m³)	Annual Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	180	0.008	0.004%	Negligible	11.6	6.5%	11.6	6.5%	Insignificant
R002		0.022	0.012%	Negligible	11.6	6.5%	11.6	6.5%	Insignificant
R003		0.010	0.006%	Negligible	11.6	6.5%	11.6	6.5%	Insignificant
R004		0.008	0.005%	Negligible	11.6	6.5%	11.6	6.5%	Insignificant
R005		0.002	0.001%	Negligible	11.6	6.5%	11.6	6.5%	Insignificant
R006		0.008	0.004%	Negligible	11.6	6.5%	11.6	6.5%	Insignificant
R007		0.014	0.008%	Negligible	11.6	6.5%	11.6	6.5%	Insignificant
R008		0.013	0.007%	Negligible	11.6	6.5%	11.6	6.5%	Insignificant
R009		0.013	0.007%	Negligible	11.6	6.5%	11.6	6.5%	Insignificant
R010		0.003	0.001%	Negligible	11.6	6.5%	11.6	6.5%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									

Table A1.14 Predicted change in hourly mean NH₃ concentrations (as the 100th percentile of hourly averages)

Receptor ID	AQAL (µg/m³)	Hourly Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Change ^[1] & Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	2,500	0.04	<0.01%	Imperceptible, Negligible	23.2	0.93%	23.3	0.93%	Insignificant
R002		0.03	<0.01%	Imperceptible, Negligible	23.2	0.93%	23.3	0.93%	Insignificant
R003		0.03	<0.01%	Imperceptible, Negligible	23.2	0.93%	23.3	0.93%	Insignificant
R004		0.04	<0.01%	Imperceptible, Negligible	23.2	0.93%	23.3	0.93%	Insignificant
R005		0.03	<0.01%	Imperceptible, Negligible	23.2	0.93%	23.3	0.93%	Insignificant
R006		0.04	<0.01%	Imperceptible, Negligible	23.2	0.93%	23.3	0.93%	Insignificant
R007		0.05	<0.01%	Imperceptible, Negligible	23.2	0.93%	23.3	0.93%	Insignificant
R008		0.05	<0.01%	Imperceptible, Negligible	23.2	0.93%	23.3	0.93%	Insignificant
R009		0.04	<0.01%	Imperceptible, Negligible	23.2	0.93%	23.3	0.93%	Insignificant
R010		0.04	<0.01%	Imperceptible, Negligible	23.2	0.93%	23.3	0.93%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									
^[1] In line with the EPUK/IAQM guidance, the magnitude of change of PCs are classed as imperceptible when ±10% of the short-term AQAL									

Table A1.15 Predicted change in hourly mean HCl concentrations (as the 100th percentile of hourly averages)

Receptor ID	AQAL (µg/m³)	Hourly Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Change ^[1] & Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	750	0.6	0.1%	Imperceptible, Negligible	0.8	0.1%	1.4	0.2%	Insignificant
R002		0.5	0.1%	Imperceptible, Negligible	0.8	0.1%	1.3	0.2%	Insignificant
R003		0.5	0.1%	Imperceptible, Negligible	0.8	0.1%	1.4	0.2%	Insignificant
R004		0.7	0.1%	Imperceptible, Negligible	0.8	0.1%	1.5	0.2%	Insignificant
R005		0.5	0.1%	Imperceptible, Negligible	0.8	0.1%	1.3	0.2%	Insignificant
R006		0.6	0.1%	Imperceptible, Negligible	0.8	0.1%	1.5	0.2%	Insignificant
R007		0.7	0.1%	Imperceptible, Negligible	0.8	0.1%	1.5	0.2%	Insignificant
R008		0.8	0.1%	Imperceptible, Negligible	0.8	0.1%	1.6	0.2%	Insignificant
R009		0.5	0.1%	Imperceptible, Negligible	0.8	0.1%	1.4	0.2%	Insignificant
R010		0.6	0.1%	Imperceptible, Negligible	0.8	0.1%	1.4	0.2%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									
^[1] In line with the EPUK/IAQM guidance, the magnitude of change of PCs are classed as imperceptible when ±10% of the short-term AQAL									

Table A1.16 Predicted change in hourly mean HF concentrations (as the 100th percentile of hourly averages)

Receptor ID	AQAL (µg/m³)	Hourly Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Change ^[1] & Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	160	0.12	0.08%	Imperceptible, Negligible	0.006	0.004%	0.13	0.08%	Insignificant
R002		0.10	0.07%	Imperceptible, Negligible	0.006	0.004%	0.11	0.07%	Insignificant
R003		0.11	0.07%	Imperceptible, Negligible	0.006	0.004%	0.12	0.07%	Insignificant
R004		0.14	0.09%	Imperceptible, Negligible	0.006	0.004%	0.15	0.09%	Insignificant
R005		0.10	0.06%	Imperceptible, Negligible	0.006	0.004%	0.11	0.07%	Insignificant
R006		0.13	0.08%	Imperceptible, Negligible	0.006	0.004%	0.14	0.09%	Insignificant
R007		0.15	0.10%	Imperceptible, Negligible	0.006	0.004%	0.16	0.10%	Insignificant
R008		0.19	0.12%	Imperceptible, Negligible	0.006	0.004%	0.19	0.12%	Insignificant
R009		0.11	0.07%	Imperceptible, Negligible	0.006	0.004%	0.12	0.07%	Insignificant
R010		0.12	0.08%	Imperceptible, Negligible	0.006	0.004%	0.13	0.08%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									
^[1] In line with the EPUK/IAQM guidance, the magnitude of change of PCs are classed as imperceptible when ±10% of the short-term AQAL									

Table A1.17 Predicted change in monthly mean HF concentrations (as the 100th percentile of monthly averages)

Receptor ID	AQAL (µg/m³)	Monthly Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Change ^[1] & Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	16	0.004	0.03%	Imperceptible, Negligible	0.003	0.02%	0.007	0.05%	Insignificant
R002		0.008	0.05%	Imperceptible, Negligible	0.003	0.02%	0.011	0.07%	Insignificant
R003		0.005	0.03%	Imperceptible, Negligible	0.003	0.02%	0.008	0.05%	Insignificant
R004		0.008	0.05%	Imperceptible, Negligible	0.003	0.02%	0.011	0.07%	Insignificant
R005		0.002	0.01%	Imperceptible, Negligible	0.003	0.02%	0.005	0.03%	Insignificant
R006		0.004	0.03%	Imperceptible, Negligible	0.003	0.02%	0.007	0.04%	Insignificant
R007		0.010	0.06%	Imperceptible, Negligible	0.003	0.02%	0.013	0.08%	Insignificant
R008		0.008	0.05%	Imperceptible, Negligible	0.003	0.02%	0.011	0.07%	Insignificant
R009		0.006	0.04%	Imperceptible, Negligible	0.003	0.02%	0.009	0.06%	Insignificant
R010		0.003	0.02%	Imperceptible, Negligible	0.003	0.02%	0.006	0.04%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									
^[1] In line with the EPUK/IAQM guidance, the magnitude of change of PCs are classed as imperceptible when ±10% of the short-term AQAL									

Table A1.18 Predicted change in annual mean Sb concentrations

Receptor ID	AQAL (µg/m³)	Annual Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	5	<0.1	<0.01%	Negligible	0.0008	0.02%	<0.1	0.02%	Insignificant
R002		<0.1	<0.01%	Negligible	0.0008	0.02%	<0.1	0.02%	Insignificant
R003		<0.1	<0.01%	Negligible	0.0008	0.02%	<0.1	0.02%	Insignificant
R004		<0.1	<0.01%	Negligible	0.0008	0.02%	<0.1	0.02%	Insignificant
R005		<0.1	<0.01%	Negligible	0.0008	0.02%	<0.1	0.02%	Insignificant
R006		<0.1	<0.01%	Negligible	0.0008	0.02%	<0.1	0.02%	Insignificant
R007		<0.1	<0.01%	Negligible	0.0008	0.02%	<0.1	0.02%	Insignificant
R008		<0.1	<0.01%	Negligible	0.0008	0.02%	<0.1	0.02%	Insignificant
R009		<0.1	<0.01%	Negligible	0.0008	0.02%	<0.1	0.02%	Insignificant
R010		<0.1	<0.1%	Negligible	0.0008	0.02%	<0.1	0.02%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									

Table A1.19 Predicted change in hourly mean Sb concentrations (as the 100th percentile of hourly averages)

Receptor ID	AQAL (µg/m³)	Hourly Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Change ^[1] & Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	150	0.02	0.01%	Imperceptible, Negligible	0.002	0.001%	0.02	0.02%	Insignificant
R002		0.02	0.01%	Imperceptible, Negligible	0.002	0.001%	0.02	0.01%	Insignificant
R003		0.02	0.01%	Imperceptible, Negligible	0.002	0.001%	0.02	0.01%	Insignificant
R004		0.02	0.02%	Imperceptible, Negligible	0.002	0.001%	0.03	0.02%	Insignificant
R005		0.02	0.01%	Imperceptible, Negligible	0.002	0.001%	0.02	0.01%	Insignificant
R006		0.02	0.01%	Imperceptible, Negligible	0.002	0.001%	0.02	0.02%	Insignificant
R007		0.03	0.02%	Imperceptible, Negligible	0.002	0.001%	0.03	0.02%	Insignificant
R008		0.03	0.02%	Imperceptible, Negligible	0.002	0.001%	0.03	0.02%	Insignificant
R009		0.02	0.01%	Imperceptible, Negligible	0.002	0.001%	0.02	0.01%	Insignificant
R010		0.02	0.01%	Imperceptible, Negligible	0.002	0.001%	0.02	0.02%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									
^[1] In line with the EPUK/IAQM guidance, the magnitude of change of PCs are classed as imperceptible when ±10% of the short-term AQAL									

Table A1.20 Predicted change in annual mean As concentrations

Receptor ID	AQAL (µg/m³)	Annual Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance
R001	0.006	0.0001	1.7%	Negligible	0.0008	13.2%	0.0009	14.8%	Insignificant
R002		0.0004	6.4%	Minor Adverse	0.0008	13.2%	0.0012	19.5%	Insignificant
R003		0.0002	2.8%	Negligible	0.0008	13.2%	0.0010	15.9%	Insignificant
R004		0.0002	2.5%	Negligible	0.0008	13.2%	0.0009	15.6%	Insignificant
R005		<0.0001	0.7%	Negligible	0.0008	13.2%	0.0008	13.8%	Insignificant
R006		0.0001	1.6%	Negligible	0.0008	13.2%	0.0009	14.7%	Insignificant
R007		0.0003	4.5%	Negligible	0.0008	13.2%	0.0011	17.6%	Insignificant
R008		0.0002	3.4%	Negligible	0.0008	13.2%	0.0010	16.5%	Insignificant
R009		0.0002	3.5%	Negligible	0.0008	13.2%	0.0010	16.6%	Insignificant
R010		<0.0001	0.8%	Negligible	0.0008	13.2%	0.0008	13.9%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									

Table A1.21 Predicted change in annual mean Cd concentrations

Receptor ID	AQAL (µg/m³)	Annual Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	0.005	<0.00001	<0.1%	Negligible	0.0004	8.9%	0.0004	8.4%	Insignificant
R002		0.00001	0.1%	Negligible	0.0004	8.9%	0.0004	8.5%	Insignificant
R003		<0.00001	0.1%	Negligible	0.0004	8.9%	0.0004	8.4%	Insignificant
R004		<0.00001	<0.1%	Negligible	0.0004	8.9%	0.0004	8.4%	Insignificant
R005		<0.00001	<0.1%	Negligible	0.0004	8.9%	0.0004	8.4%	Insignificant
R006		<0.00001	<0.1%	Negligible	0.0004	8.9%	0.0004	8.4%	Insignificant
R007		<0.00001	0.1%	Negligible	0.0004	8.9%	0.0004	8.4%	Insignificant
R008		<0.00001	0.1%	Negligible	0.0004	8.9%	0.0004	8.4%	Insignificant
R009		<0.00001	0.1%	Negligible	0.0004	8.9%	0.0004	8.4%	Insignificant
R010		<0.00001	<0.1%	Negligible	0.0004	8.9%	0.0004	8.4%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									

Table A1.22 Predicted change in daily mean Cd concentrations (as the 100th percentile of daily averages)

Receptor ID	AQAL (µg/m³)	Daily Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Change ^[1] & Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	0.03	<0.0001	0.2%	Imperceptible, Negligible	0.0008	2.8%	0.001	2.9%	Insignificant
R002		<0.0001	0.1%	Imperceptible, Negligible	0.0008	2.8%	0.001	2.9%	Insignificant
R003		<0.0001	0.1%	Imperceptible, Negligible	0.0008	2.8%	0.001	2.9%	Insignificant
R004		<0.0001	0.2%	Imperceptible, Negligible	0.0008	2.8%	0.001	2.9%	Insignificant
R005		<0.0001	0.1%	Imperceptible, Negligible	0.0008	2.8%	0.001	2.9%	Insignificant
R006		<0.0001	0.2%	Imperceptible, Negligible	0.0008	2.8%	0.001	2.9%	Insignificant
R007		<0.0001	0.2%	Imperceptible, Negligible	0.0008	2.8%	0.001	2.9%	Insignificant
R008		<0.0001	0.2%	Imperceptible, Negligible	0.0008	2.8%	0.001	2.9%	Insignificant
R009		<0.0001	0.1%	Imperceptible, Negligible	0.0008	2.8%	0.001	2.9%	Insignificant
R010		<0.0001	0.1%	Imperceptible, Negligible	0.0008	2.8%	0.001	2.9%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									
[1] In line with the EPUK/IAQM guidance, the magnitude of change of PCs are classed as imperceptible when ±10% of the short-term AQAL									

Table A1.23 Predicted change in daily mean Cr(III) concentrations (as the 100th percentile of daily averages) – long term

Receptor ID	AQAL (µg/m³)	Daily Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Change ^[1] & Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	2	0.003	0.2%	Imperceptible, Negligible	0.003	0.2%	0.006	0.3%	Insignificant
R002		0.003	0.1%	Imperceptible, Negligible	0.003	0.2%	0.006	0.3%	Insignificant
R003		0.002	0.1%	Imperceptible, Negligible	0.003	0.2%	0.005	0.3%	Insignificant
R004		0.003	0.2%	Imperceptible, Negligible	0.003	0.2%	0.006	0.3%	Insignificant
R005		0.002	0.1%	Imperceptible, Negligible	0.003	0.2%	0.005	0.2%	Insignificant
R006		0.003	0.2%	Imperceptible, Negligible	0.003	0.2%	0.006	0.3%	Insignificant
R007		0.003	0.2%	Imperceptible, Negligible	0.003	0.2%	0.006	0.3%	Insignificant
R008		0.003	0.2%	Imperceptible, Negligible	0.003	0.2%	0.006	0.3%	Insignificant
R009		0.002	0.1%	Imperceptible, Negligible	0.003	0.2%	0.005	0.3%	Insignificant
R010		0.002	0.1%	Imperceptible, Negligible	0.003	0.2%	0.005	0.3%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									
^[1] In line with the EPUK/IAQM guidance, the magnitude of change of PCs are classed as imperceptible when ±10% of the short-term AQAL									

Table A1.24 Predicted change in annual mean Cr(VI) concentrations at human receptors

Receptor	AQAL (µg/m³)	PC (µg/m³)	PC/AQAL %	Magnitude of impact	BC (µg/m³)	PEC (µg/m³)	PEC/AQAL %	Significance of Effect
R001	0.00025	<0.01	0.01%	Negligible	0.0006	0.00061	245%	Insignificant
R002		<0.01	0.05%	Negligible	0.0006	0.00061	245%	Insignificant
R003		<0.01	0.02%	Negligible	0.0006	0.00061	245%	Insignificant
R004		<0.01	0.02%	Negligible	0.0006	0.00061	245%	Insignificant
R005		<0.01	0.01%	Negligible	0.0006	0.00061	245%	Insignificant
R006		<0.01	0.01%	Negligible	0.0006	0.00061	245%	Insignificant
R007		<0.01	0.03%	Negligible	0.0006	0.00061	245%	Insignificant
R008		<0.01	0.02%	Negligible	0.0006	0.00061	245%	Insignificant
R009		<0.01	0.03%	Negligible	0.0006	0.00061	245%	Insignificant
R010		<0.01	0.01%	Negligible	0.0006	0.00061	245%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration								

Table A1.25 Predicted change in annual mean Co concentrations

Receptor ID	AQAL (µg/m³)	Annual Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	0.2	<0.01	0.05%	Negligible	<0.01	<0.01%	<0.01	0.14%	Insignificant
R002		<0.01	0.19%	Negligible	<0.01	<0.01%	<0.01	0.28%	Insignificant
R003		<0.01	0.08%	Negligible	<0.01	<0.01%	<0.01	0.17%	Insignificant
R004		<0.01	0.08%	Negligible	<0.01	<0.01%	<0.01	0.16%	Insignificant
R005		<0.01	0.02%	Negligible	<0.01	<0.01%	<0.01	0.11%	Insignificant
R006		<0.01	0.05%	Negligible	<0.01	<0.01%	<0.01	0.13%	Insignificant
R007		<0.01	0.13%	Negligible	<0.01	<0.01%	<0.01	0.22%	Insignificant
R008		<0.01	0.10%	Negligible	<0.01	<0.01%	<0.01	0.19%	Insignificant
R009		<0.01	0.11%	Negligible	<0.01	<0.01%	<0.01	0.19%	Insignificant
R010		<0.01	0.02%	Negligible	<0.01	<0.01%	<0.01	0.11%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									

Table A1.26 Predicted change in hourly mean Co concentrations (as the 100th percentile of hourly averages)

Receptor ID	AQAL (µg/m³)	Hourly Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Change ^[1] & Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	6	0.02	0.3%	Imperceptible, Negligible	<0.01	0.01%	0.02	0.4%	Insignificant
R002		0.02	0.3%	Imperceptible, Negligible	<0.01	0.01%	0.02	0.3%	Insignificant
R003		0.02	0.3%	Imperceptible, Negligible	<0.01	0.01%	0.02	0.3%	Insignificant
R004		0.02	0.4%	Imperceptible, Negligible	<0.01	0.01%	0.02	0.4%	Insignificant
R005		0.02	0.3%	Imperceptible, Negligible	<0.01	0.01%	0.02	0.3%	Insignificant
R006		0.02	0.4%	Imperceptible, Negligible	<0.01	0.01%	0.02	0.4%	Insignificant
R007		0.03	0.4%	Imperceptible, Negligible	<0.01	0.01%	0.03	0.4%	Insignificant
R008		0.03	0.5%	Imperceptible, Negligible	<0.01	0.01%	0.03	0.5%	Insignificant
R009		0.02	0.3%	Imperceptible, Negligible	<0.01	0.01%	0.02	0.3%	Insignificant
R010		0.02	0.4%	Imperceptible, Negligible	<0.01	0.01%	0.02	0.4%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									
^[1] In line with the EPUK/IAQM guidance, the magnitude of change of PCs are classed as imperceptible when ±10% of the short-term AQAL									

Table A1.27 Predicted change in daily mean Cu concentrations (as the 100th percentile of daily averages) – long term

Receptor ID	AQAL (µg/m³)	Daily Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Change ^[1] & Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	0.05	0.003	6.0%	Imperceptible, Negligible	0.005	10.2%	0.008	16.3%	Insignificant
R002		0.003	5.9%	Imperceptible, Negligible	0.005	10.2%	0.008	16.2%	Insignificant
R003		0.002	4.5%	Imperceptible, Negligible	0.005	10.2%	0.007	14.7%	Insignificant
R004		0.003	6.3%	Imperceptible, Negligible	0.005	10.2%	0.008	16.5%	Insignificant
R005		0.002	3.3%	Imperceptible, Negligible	0.005	10.2%	0.007	13.6%	Insignificant
R006		0.003	6.5%	Imperceptible, Negligible	0.005	10.2%	0.008	16.8%	Insignificant
R007		0.003	6.2%	Imperceptible, Negligible	0.005	10.2%	0.008	16.4%	Insignificant
R008		0.003	6.4%	Imperceptible, Negligible	0.005	10.2%	0.008	16.6%	Insignificant
R009		0.002	4.6%	Imperceptible, Negligible	0.005	10.2%	0.007	14.8%	Insignificant
R010		0.002	4.1%	Imperceptible, Negligible	0.005	10.2%	0.007	14.4%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									
^[1] In line with the EPUK/IAQM guidance, the magnitude of change of PCs are classed as imperceptible when ±10% of the short-term AQAL									

Table A1.28 Predicted change in annual mean Pb concentrations

Receptor ID	AQAL (µg/m³)	Annual Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	0.25	<0.01	<0.1%	Negligible	0.01	6.0%	0.02	6.0%	Insignificant
R002		<0.01	0.2%	Negligible	0.01	6.0%	0.02	6.1%	Insignificant
R003		<0.01	0.1%	Negligible	0.01	6.0%	0.02	6.1%	Insignificant
R004		<0.01	0.1%	Negligible	0.01	6.0%	0.02	6.1%	Insignificant
R005		<0.01	<0.1%	Negligible	0.01	6.0%	0.02	6.0%	Insignificant
R006		<0.01	<0.1%	Negligible	0.01	6.0%	0.02	6.0%	Insignificant
R007		<0.01	0.1%	Negligible	0.01	6.0%	0.02	6.1%	Insignificant
R008		<0.01	0.1%	Negligible	0.01	6.0%	0.02	6.1%	Insignificant
R009		<0.01	0.1%	Negligible	0.01	6.0%	0.02	6.1%	Insignificant
R010		<0.01	<0.1%	Negligible	0.01	6.0%	0.02	6.0%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									

Table A1.29 Predicted change in annual mean Mn concentrations

Receptor ID	AQAL (µg/m³)	Annual Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	0.15	<0.01	0.1%	Negligible	0.05	33.0%	0.05	33.3%	Insignificant
R002		<0.01	0.3%	Negligible	0.05	33.0%	0.05	33.5%	Insignificant
R003		<0.01	0.1%	Negligible	0.05	33.0%	0.05	33.4%	Insignificant
R004		<0.01	0.1%	Negligible	0.05	33.0%	0.05	33.3%	Insignificant
R005		<0.01	0.0%	Negligible	0.05	33.0%	0.05	33.3%	Insignificant
R006		<0.01	0.1%	Negligible	0.05	33.0%	0.05	33.3%	Insignificant
R007		<0.01	0.2%	Negligible	0.05	33.0%	0.05	33.4%	Insignificant
R008		<0.01	0.1%	Negligible	0.05	33.0%	0.05	33.4%	Insignificant
R009		<0.01	0.1%	Negligible	0.05	33.0%	0.05	33.4%	Insignificant
R010		<0.01	0.0%	Negligible	0.05	33.0%	0.05	33.3%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									

Table A1.30 Predicted change in hourly mean Mn concentrations (as the 100th percentile of hourly averages)

Receptor ID	AQAL (µg/m³)	Hourly Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Change ^[1] & Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	1,500	0.02	<0.01%	Imperceptible, Negligible	0.10	0.01%	0.12	0.01%	Insignificant
R002		0.02	<0.01%	Imperceptible, Negligible	0.10	0.01%	0.12	0.01%	Insignificant
R003		0.02	<0.01%	Imperceptible, Negligible	0.10	0.01%	0.12	0.01%	Insignificant
R004		0.02	<0.01%	Imperceptible, Negligible	0.10	0.01%	0.12	0.01%	Insignificant
R005		0.02	<0.01%	Imperceptible, Negligible	0.10	0.01%	0.12	0.01%	Insignificant
R006		0.02	<0.01%	Imperceptible, Negligible	0.10	0.01%	0.12	0.01%	Insignificant
R007		0.03	<0.01%	Imperceptible, Negligible	0.10	0.01%	0.13	0.01%	Insignificant
R008		0.03	<0.01%	Imperceptible, Negligible	0.10	0.01%	0.13	0.01%	Insignificant
R009		0.02	<0.01%	Imperceptible, Negligible	0.10	0.01%	0.12	0.01%	Insignificant
R010		0.02	<0.01%	Imperceptible, Negligible	0.10	0.01%	0.12	0.01%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									
^[1] In line with the EPUK/IAQM guidance, the magnitude of change of PCs are classed as imperceptible when ±10% of the short-term AQAL									

Table A1.31 Predicted change in hourly mean Hg concentrations (as the 100th percentile of hourly averages)

Receptor ID	AQAL (µg/m³)	Hourly Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Change ^[1] & Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	0.6	<0.001	0.1%	Imperceptible, Negligible	0.003	0.5%	0.003	0.6%	Insignificant
R002		<0.001	0.1%	Imperceptible, Negligible	0.003	0.5%	0.003	0.6%	Insignificant
R003		<0.001	0.1%	Imperceptible, Negligible	0.003	0.5%	0.003	0.6%	Insignificant
R004		0.001	0.1%	Imperceptible, Negligible	0.003	0.5%	0.004	0.6%	Insignificant
R005		<0.001	0.1%	Imperceptible, Negligible	0.003	0.5%	0.003	0.6%	Insignificant
R006		0.001	0.1%	Imperceptible, Negligible	0.003	0.5%	0.004	0.6%	Insignificant
R007		0.001	0.1%	Imperceptible, Negligible	0.003	0.5%	0.004	0.6%	Insignificant
R008		0.001	0.1%	Imperceptible, Negligible	0.003	0.5%	0.004	0.6%	Insignificant
R009		<0.001	0.1%	Imperceptible, Negligible	0.003	0.5%	0.003	0.6%	Insignificant
R010		<0.001	0.1%	Imperceptible, Negligible	0.003	0.5%	0.003	0.6%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									
^[1] In line with the EPUK/IAQM guidance, the magnitude of change of PCs are classed as imperceptible when ±10% of the short-term AQAL									

Table A1.32 Predicted change in daily mean Hg concentrations (as the 100th percentile of daily averages) – long term

Receptor ID	AQAL (µg/m³)	Daily Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Change ^[1] & Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	0.06	<0.001	0.1%	Imperceptible, Negligible	0.002	2.5%	0.002	2.6%	Insignificant
R002		<0.001	0.1%	Imperceptible, Negligible	0.002	2.5%	0.002	2.6%	Insignificant
R003		<0.001	0.1%	Imperceptible, Negligible	0.002	2.5%	0.002	2.6%	Insignificant
R004		<0.001	0.1%	Imperceptible, Negligible	0.002	2.5%	0.002	2.6%	Insignificant
R005		<0.001	0.1%	Imperceptible, Negligible	0.002	2.5%	0.002	2.6%	Insignificant
R006		<0.001	0.1%	Imperceptible, Negligible	0.002	2.5%	0.002	2.6%	Insignificant
R007		<0.001	0.1%	Imperceptible, Negligible	0.002	2.5%	0.002	2.6%	Insignificant
R008		<0.001	0.1%	Imperceptible, Negligible	0.002	2.5%	0.002	2.7%	Insignificant
R009		<0.001	0.1%	Imperceptible, Negligible	0.002	2.5%	0.002	2.6%	Insignificant
R010		<0.001	0.1%	Imperceptible, Negligible	0.002	2.5%	0.002	2.6%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									
^[1] In line with the EPUK/IAQM guidance, the magnitude of change of PCs are classed as imperceptible when ±10% of the short-term AQAL									

Table A1.33 Predicted change in annual mean Ni concentrations

Receptor ID	AQAL (µg/m³)	Annual Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	0.02	0.0001	0.5%	Negligible	0.001	5.6%	0.001	6.1%	Insignificant
R002		0.0004	1.9%	Negligible	0.001	5.6%	0.001	7.5%	Insignificant
R003		0.0002	0.8%	Negligible	0.001	5.6%	0.001	6.4%	Insignificant
R004		0.0002	0.8%	Negligible	0.001	5.6%	0.001	6.3%	Insignificant
R005		<0.0001	0.2%	Negligible	0.001	5.6%	0.001	5.8%	Insignificant
R006		0.0001	0.5%	Negligible	0.001	5.6%	0.001	6.1%	Insignificant
R007		0.0003	1.3%	Negligible	0.001	5.6%	0.001	6.9%	Insignificant
R008		0.0002	1.0%	Negligible	0.001	5.6%	0.001	6.6%	Insignificant
R009		0.0002	1.1%	Negligible	0.001	5.6%	0.001	6.6%	Insignificant
R010		<0.0001	0.2%	Negligible	0.001	5.6%	0.001	5.8%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									

Table A1.34 Predicted change in hourly mean Ni concentrations (as the 100th percentile of hourly averages)

Receptor ID	AQAL (µg/m³)	Hourly Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Change ^[1] & Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	0.7	0.02	3.0%	Imperceptible, Negligible	0.002	0.003%	0.02	3.3%	Insignificant
R002		0.02	2.6%	Imperceptible, Negligible	0.002	0.003%	0.02	2.9%	Insignificant
R003		0.02	2.8%	Imperceptible, Negligible	0.002	0.003%	0.02	3.1%	Insignificant
R004		0.02	3.4%	Imperceptible, Negligible	0.002	0.003%	0.03	3.7%	Insignificant
R005		0.02	2.5%	Imperceptible, Negligible	0.002	0.003%	0.02	2.8%	Insignificant
R006		0.02	3.2%	Imperceptible, Negligible	0.002	0.003%	0.02	3.5%	Insignificant
R007		0.03	3.7%	Imperceptible, Negligible	0.002	0.003%	0.03	4.0%	Insignificant
R008		0.03	4.1%	Imperceptible, Negligible	0.002	0.003%	0.03	4.4%	Insignificant
R009		0.02	2.7%	Imperceptible, Negligible	0.002	0.003%	0.02	3.0%	Insignificant
R010		0.02	3.1%	Imperceptible, Negligible	0.002	0.003%	0.02	3.4%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									
^[1] In line with the EPUK/IAQM guidance, the magnitude of change of PCs are classed as imperceptible when ±10% of the short-term AQAL									

Table A1.35 Predicted change in annual mean TI concentrations

Receptor ID	AQAL (µg/m³)	Annual Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	1	<0.1	<0.1%	Negligible	No Suitable Background Value			Insignificant	
R002		<0.1	<0.1%	Negligible	No Suitable Background Value			Insignificant	
R003		<0.1	<0.1%	Negligible	No Suitable Background Value			Insignificant	
R004		<0.1	<0.1%	Negligible	No Suitable Background Value			Insignificant	
R005		<0.1	<0.1%	Negligible	No Suitable Background Value			Insignificant	
R006		<0.1	<0.1%	Negligible	No Suitable Background Value			Insignificant	
R007		<0.1	<0.1%	Negligible	No Suitable Background Value			Insignificant	
R008		<0.1	<0.1%	Negligible	No Suitable Background Value			Insignificant	
R009		<0.1	<0.1%	Negligible	No Suitable Background Value			Insignificant	
R010		<0.1	<0.1%	Negligible	No Suitable Background Value			Insignificant	
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									

Table A1.36 Predicted change in hourly mean TI concentrations (as the 100th percentile of hourly averages)

Receptor ID	AQAL (µg/m³)	Hourly Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Change ^[1] & Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	30	0.02	0.07%	Imperceptible, Negligible	No Suitable Background Value			Insignificant	
R002		0.02	0.06%	Imperceptible, Negligible	No Suitable Background Value			Insignificant	
R003		0.02	0.06%	Imperceptible, Negligible	No Suitable Background Value			Insignificant	
R004		0.02	0.08%	Imperceptible, Negligible	No Suitable Background Value			Insignificant	
R005		0.02	0.06%	Imperceptible, Negligible	No Suitable Background Value			Insignificant	
R006		0.02	0.07%	Imperceptible, Negligible	No Suitable Background Value			Insignificant	
R007		0.03	0.09%	Imperceptible, Negligible	No Suitable Background Value			Insignificant	
R008		0.03	0.10%	Imperceptible, Negligible	No Suitable Background Value			Insignificant	
R009		0.02	0.06%	Imperceptible, Negligible	No Suitable Background Value			Insignificant	
R010		0.02	0.07%	Imperceptible, Negligible	No Suitable Background Value			Insignificant	
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									
^[1] In line with the EPUK/IAQM guidance, the magnitude of change of PCs are classed as imperceptible when ±10% of the short-term AQAL									

Table A1.37 Predicted change in daily mean V concentrations (as the 100th percentile of daily averages) – short term

Receptor ID	AQAL (µg/m³)	Daily Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Change ^[1] & Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	1	<0.01	0.3%	Imperceptible, Negligible	0.01	1.0%	0.01	1.3%	Insignificant
R002		<0.01	0.3%	Imperceptible, Negligible	0.01	1.0%	0.01	1.3%	Insignificant
R003		<0.01	0.2%	Imperceptible, Negligible	0.01	1.0%	0.01	1.3%	Insignificant
R004		<0.01	0.3%	Imperceptible, Negligible	0.01	1.0%	0.01	1.4%	Insignificant
R005		<0.01	0.2%	Imperceptible, Negligible	0.01	1.0%	0.01	1.2%	Insignificant
R006		<0.01	0.3%	Imperceptible, Negligible	0.01	1.0%	0.01	1.4%	Insignificant
R007		<0.01	0.3%	Imperceptible, Negligible	0.01	1.0%	0.01	1.4%	Insignificant
R008		<0.01	0.3%	Imperceptible, Negligible	0.01	1.0%	0.01	1.4%	Insignificant
R009		<0.01	0.2%	Imperceptible, Negligible	0.01	1.0%	0.01	1.3%	Insignificant
R010		<0.01	0.2%	Imperceptible, Negligible	0.01	1.0%	0.01	1.3%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									
^[1] In line with the EPUK/IAQM guidance, the magnitude of change of PCs are classed as imperceptible when ±10% of the short-term AQAL									

Table A1.38 Predicted change in annual mean PCDD/F concentrations

Receptor ID	AQAL (µg/m³)	Annual Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
R001	N/A	9.55E-12	N/A	Negligible	3.6E-09	N/A	3.6E-09	N/A	Insignificant
R002		3.58E-11	N/A	Negligible	3.6E-09	N/A	3.6E-09	N/A	Insignificant
R003		1.59E-11	N/A	Negligible	3.6E-09	N/A	3.6E-09	N/A	Insignificant
R004		1.42E-11	N/A	Negligible	3.6E-09	N/A	3.6E-09	N/A	Insignificant
R005		4.09E-12	N/A	Negligible	3.6E-09	N/A	3.6E-09	N/A	Insignificant
R006		9.15E-12	N/A	Negligible	3.6E-09	N/A	3.6E-09	N/A	Insignificant
R007		2.51E-11	N/A	Negligible	3.6E-09	N/A	3.6E-09	N/A	Insignificant
R008		1.90E-11	N/A	Negligible	3.6E-09	N/A	3.6E-09	N/A	Insignificant
R009		1.99E-11	N/A	Negligible	3.6E-09	N/A	3.6E-09	N/A	Insignificant
R010		4.58E-12	N/A	Negligible	3.6E-09	N/A	3.6E-09	N/A	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									

Annex B: Ecological receptors – additional results– operational plant

Table B1.2 Dispersion modelling results for ecological receptors – daily mean HF concentrations (100th percentile of daily averages)

Receptor ID	AQAL (µg/m ³)	Daily Average (µg/m ³)							
		PC	PC % of AQAL	Magnitude of Change ^[1] & Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
E001a	5	0.05	1.0%	Imperceptible, Negligible	0.006	0.1%	0.01	0.3%	Insignificant
E001b		0.04	0.7%	Imperceptible, Negligible	0.006	0.1%	0.01	0.3%	Insignificant
E001c		0.05	1.0%	Imperceptible, Negligible	0.006	0.1%	0.01	0.3%	Insignificant
E001d		0.04	0.8%	Imperceptible, Negligible	0.006	0.1%	0.01	0.3%	Insignificant
E001e		0.03	0.6%	Imperceptible, Negligible	0.006	0.1%	0.01	0.2%	Insignificant
E002		0.01	0.2%	Imperceptible, Negligible	0.006	0.1%	0.01	0.3%	Insignificant
E003		0.01	0.1%	Imperceptible, Negligible	0.006	0.1%	0.01	0.2%	Insignificant
E004		0.01	0.1%	Imperceptible, Negligible	0.006	0.1%	0.01	0.3%	Insignificant
E005		0.01	0.2%	Imperceptible, Negligible	0.006	0.1%	0.01	0.2%	Insignificant
E006		0.01	0.1%	Imperceptible, Negligible	0.006	0.1%	0.02	0.4%	Insignificant
E007		0.01	0.1%	Imperceptible, Negligible	0.006	0.1%	0.03	0.6%	Insignificant
E008		0.01	0.1%	Imperceptible, Negligible	0.006	0.1%	0.04	0.9%	Insignificant
E009		0.01	0.2%	Imperceptible, Negligible	0.006	0.1%	0.01	0.3%	Insignificant
E010		0.01	0.1%	Imperceptible, Negligible	0.006	0.1%	0.01	0.3%	Insignificant
E011		0.01	0.3%	Imperceptible, Negligible	0.006	0.1%	0.01	0.3%	Insignificant

Receptor ID	AQAL (µg/m³)	Daily Average (µg/m³)							
		PC	PC % of AQAL	Magnitude of Change ^[1] & Impact	BC	BC % of AQAL	PEC	PEC % of AQAL	Significance of Effect
E012		0.02	0.5%	Imperceptible, Negligible	0.006	0.1%	0.01	0.3%	Insignificant
E013		0.04	0.7%	Imperceptible, Negligible	0.006	0.1%	0.01	0.2%	Insignificant
AQAL = Air Quality Assessment Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration									
^[1] In line with the EPUK/IAQM guidance, the magnitude of change of PCs are classed as imperceptible when ±10% of the short-term AQAL									

Table B1.3 Dispersion modelling results for ecological receptors – Cd deposition to ground (mg/m²/day)

Receptor ID	Site Name	Cd Deposition to ground				
		PC to air (µg/m ³)	PC to ground (mg/m ² /day)	PC to ground limit (mg/m ² /day)	PC to ground % of limit	Significance of effect
E001a	Teessmouth and Cleveland Coast	0.00001	0.00002	0.009	0.2%	PC <1%, Insignificant
E001b		<0.00001	0.00001	0.009	0.1%	PC <1%, Insignificant
E001c		0.00001	0.00002	0.009	0.2%	PC <1%, Insignificant
E001d		0.00001	0.00002	0.009	0.2%	PC <1%, Insignificant
E001e		0.00001	0.00002	0.009	0.2%	PC <1%, Insignificant
E002	North York Moors	<0.00001	<0.00001	0.009	0.0%	PC <1%, Insignificant
E003	Northumbria Coast	<0.00001	0.00001	0.009	0.1%	PC <1%, Insignificant
E004	Durham Coast (Dunes)	<0.00001	0.00001	0.009	0.1%	PC <1%, Insignificant
E005	Lovell Hill Pools	<0.00001	<0.00001	0.009	0.0%	PC <1%, Insignificant
E006	Saltburn Gill	<0.00001	<0.00001	0.009	0.0%	PC <1%, Insignificant
E007	Hart Bog	<0.00001	<0.00001	0.009	0.0%	PC <1%, Insignificant
E008	Briarcroft Pasture	<0.00001	<0.00001	0.009	0.0%	PC <1%, Insignificant
E009	Pike Whin Bog	<0.00001	<0.00001	0.009	0.0%	PC <1%, Insignificant
E010	Whitton Bridge Pasture	<0.00001	<0.00001	0.009	0.0%	PC <1%, Insignificant
E011	Coatham Marsh	<0.00001	0.00001	0.009	0.1%	PC <1%, Insignificant
E012	Eston Pumping Station	<0.00001	0.00001	0.009	0.1%	PC <1%, Insignificant
E013	Teessmouth	<0.00001	0.00001	0.009	0.1%	PC <1%, Insignificant

PC = Process Contribution

Table B1.4 Dispersion modelling results for ecological receptors – Cr deposition to ground (mg/m²/day)

Receptor ID	Site Name	Cr Deposition to ground				
		PC to air (µg/m ³)	PC to ground (mg/m ² /day)	PC to ground limit (mg/m ² /day)	PC to ground % of limit	Significance of effect
E001a	Teessmouth and Cleveland Coast	0.001	0.001	1.5	0.1%	PC <1%, Insignificant
E001b		<0.001	0.000	1.5	<0.1%	PC <1%, Insignificant
E001c		0.001	0.001	1.5	0.1%	PC <1%, Insignificant
E001d		0.001	0.001	1.5	0.1%	PC <1%, Insignificant
E001e		0.001	0.001	1.5	0.1%	PC <1%, Insignificant
E002	North York Moors	<0.001	<0.001	1.5	<0.1%	PC <1%, Insignificant
E003	Northumbria Coast	<0.001	<0.001	1.5	<0.1%	PC <1%, Insignificant
E004	Durham Coast (Dunes)	<0.001	<0.001	1.5	<0.1%	PC <1%, Insignificant
E005	Lovell Hill Pools	<0.001	<0.001	1.5	<0.1%	PC <1%, Insignificant
E006	Saltburn Gill	<0.001	<0.001	1.5	<0.1%	PC <1%, Insignificant
E007	Hart Bog	<0.001	<0.001	1.5	<0.1%	PC <1%, Insignificant
E008	Briarcroft Pasture	<0.001	<0.001	1.5	<0.1%	PC <1%, Insignificant
E009	Pike Whin Bog	<0.001	<0.001	1.5	<0.1%	PC <1%, Insignificant
E010	Whitton Bridge Pasture	<0.001	<0.001	1.5	<0.1%	PC <1%, Insignificant
E011	Coatham Marsh	<0.001	<0.001	1.5	<0.1%	PC <1%, Insignificant

E012	Eston Pumping Station	<0.001	0.001	1.5	<0.1%	PC <1%, Insignificant
E013	Teesmouth	<0.001	<0.001	1.5	<0.1%	PC <1%, Insignificant

Table B1.5 Dispersion modelling results for ecological receptors – Cu deposition to ground (mg/m²/day)

Receptor ID	Site Name	Cu Deposition to ground				
		PC to air (µg/m ³)	PC to ground (mg/m ² /day)	PC to ground limit (mg/m ² /day)	PC to ground % of limit	Significance of effect
E001a	Teesmouth and Cleveland Coast	0.001	0.001	0.25	0.5%	PC <1%, Insignificant
E001b		<0.001	<0.001	0.25	0.1%	PC <1%, Insignificant
E001c		0.001	0.001	0.25	0.5%	PC <1%, Insignificant
E001d		0.001	0.001	0.25	0.5%	PC <1%, Insignificant
E001e		0.001	0.001	0.25	0.5%	PC <1%, Insignificant
E002	North York Moors	<0.001	<0.001	0.25	0.1%	PC <1%, Insignificant
E003	Northumbria Coast	<0.001	<0.001	0.25	0.1%	PC <1%, Insignificant
E004	Durham Coast (Dunes)	<0.001	<0.001	0.25	0.1%	PC <1%, Insignificant
E005	Lovell Hill Pools	<0.001	<0.001	0.25	0.1%	PC <1%, Insignificant
E006	Saltburn Gill	<0.001	<0.001	0.25	0.1%	PC <1%, Insignificant
E007	Hart Bog	<0.001	<0.001	0.25	0.1%	PC <1%, Insignificant
E008	Briarcroft Pasture	<0.001	<0.001	0.25	<0.1%	PC <1%, Insignificant
E009	Pike Whin Bog	<0.001	<0.001	0.25	0.1%	PC <1%, Insignificant
E010	Whitton Bridge Pasture	<0.001	<0.001	0.25	<0.1%	PC <1%, Insignificant

E011	Coatham Marsh	<0.001	<0.001	0.25	0.2%	PC <1%, Insignificant
E012	Eston Pumping Station	<0.001	0.001	0.25	0.2%	PC <1%, Insignificant
E013	Teesmouth	<0.001	<0.001	0.25	0.2%	PC <1%, Insignificant
PC = Process Contribution						

Table B1.6 Dispersion modelling results for ecological receptors – Pb deposition to ground (mg/m²/day)

Receptor ID	Site Name	Pb Deposition to ground				
		PC to air (µg/m ³)	PC to ground (mg/m ² /day)	PC to ground limit (mg/m ² /day)	PC to ground % of limit	Significance of effect
E001a	Teesmouth and Cleveland Coast	0.001	0.001	1.1	0.1%	PC <1%, Insignificant
E001b		<0.001	<0.001	1.1	<0.1%	PC <1%, Insignificant
E001c		0.001	0.001	1.1	0.1%	PC <1%, Insignificant
E001d		0.001	0.001	1.1	0.1%	PC <1%, Insignificant
E001e		0.001	0.001	1.1	0.1%	PC <1%, Insignificant
E002	North York Moors	<0.001	<0.001	1.1	<0.1%	PC <1%, Insignificant
E003	Northumbria Coast	<0.001	<0.001	1.1	<0.1%	PC <1%, Insignificant
E004	Durham Coast (Dunes)	<0.001	<0.001	1.1	<0.1%	PC <1%, Insignificant
E005	Lovell Hill Pools	<0.001	<0.001	1.1	<0.1%	PC <1%, Insignificant
E006	Saltburn Gill	<0.001	<0.001	1.1	<0.1%	PC <1%, Insignificant
E007	Hart Bog	<0.001	<0.001	1.1	<0.1%	PC <1%, Insignificant
E008	Briarcroft Pasture	<0.001	<0.001	1.1	<0.1%	PC <1%, Insignificant

E009	Pike Whin Bog	<0.001	<0.001	1.1	<0.1%	PC <1%, Insignificant
E010	Whitton Bridge Pasture	<0.001	<0.001	1.1	<0.1%	PC <1%, Insignificant
E011	Coatham Marsh	<0.001	<0.001	1.1	<0.1%	PC <1%, Insignificant
E012	Eston Pumping Station	<0.001	0.001	1.1	0.1%	PC <1%, Insignificant
E013	Teesmouth	<0.001	<0.001	1.1	<0.1%	PC <1%, Insignificant
PC = Process Contribution						

Annex C: Visible plumes – operational plant

- C.1.1 The ADMS module can assess the potential for visible plumes to form, based on the initial water content of the release, and the humidity of the ambient air. The plume from a stack is described by the model developers as being “visible” when liquid water is present in the plume above a critical threshold of 0.002kg/kg.
- C.1.1 The initial water vapour mixing ratio of the plume from the CHP Plant Stack (A1) has been calculated as 0.0007kg/kg (mass of water vapour per unit mass of dry release at the stack), which is therefore below the critical threshold of 0.002kg/kg, indicating that visible plumes will not be present from the A1 stack.
- C.1.1 Likewise, the initial water vapour mixing ratio of the plume from the SAF Production Product Pretreatment Stack 1 (A2) has been calculated as 0.0006kg/kg (mass of water vapour per unit mass of dry release at the stack), which is again below the critical threshold of 0.002kg/kg. It is therefore considered that visible plumes will not be present from the A2 stack.
- C.1.1 Due to the nature of the other activities from the operational Proposed Development, no other operational stack emissions are considered likely to result in visible plumes.
- C.1.1 However, due to the initial water content and the low temperature of the release, there is potential for visible plumes to occur from the cooling towers, recognising that these are plume abated to reduce the potential for visible plumes to form.
- C.1.1 The original version of the EA H1 Risk Assessment Guidance published in 2003 included a methodology for the assessment of the impacts of visible plumes, however this guidance is now superseded. Nevertheless, an assessment of the potential for visible plumes from the cooling towers has been carried out so that the outputs can be discussed in **Chapter 13: Landscape and Visual Amenity (ES Volume I, Application Document Ref. 6.1.)** and the **Statutory Nuisance Statement (Application Document Ref. 5.5)**.
- C.1.1 The potential for visible plumes to occur from the cooling cells has been modelled as shown in Table C1.1.

Table C1.1 Cooling cell visible plume model inputs

Parameter	Wet Cooling System
Number of vents	15
Release height (m)	15.3
Vent diameter (m)	12
Flow rate per vent	800kg/s
Water ratio (kg/kg, dry)	0.033
Temperature (°C)	33

C.1.1 ADMS defines the plume to be ‘visible’ at a particular downwind distance if the ambient humidity at the plume centreline is below 98%, above which it is considered the plume would be indistinguishable from clouds.

C.1.1 The results for the cooling tower modelling are shown in Table C1.2, which indicates that the average predicted plume lengths are between 40 – 61m long, and that the percentage of the time when visible plumes would go beyond the Main Site boundary is less than 10%.

Table C1.2 Visible plumes for the cooling towers

Met Year	Percentage of Time plume is visible	Average Visible Plume Length (m)	Percentage of Year Visible beyond the Main Site
2020	75%	55	9%
2021	73%	61	9%
2022	68%	53	7%
2023	72%	48	5%
2024	68%	40	3%



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