Darwen Resource Recovery Park – WTS and AD, Lower Eccleshill Road, Darwen, BB3 0EH

Air Quality Assessment

784-B043732
25th April 2024

PRESENTED TO

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EXECUTIVE SUMMARY

This report presents the findings an air quality assessment undertaken to assess the CHP engine emission impacts in support of an application to vary the environmental permit to allow the operation of a new Anaerobic Digestion (AD) Facility at Darwen Materials Recovery Facility, Lower Eccleshill Road, Darwen, Blackburn, Lancashire, BB3 0EH.

SUEZ are seeking to vary the environmental permit to allow the operation of a new Anaerobic Digestion (AD) Facility. In addition to the AD Facility, SUEZ will continue to operate the waste transfer station and MRF at the site. Waste that is accepted as part of the waste transfer station and MRF will be stored within the confines of a building or within a canopy building.

Air Quality Assessment for the Protection of Human Health

The predicted long-term and short-term NO_2 and SO_2 concentrations from the emissions of the operation of the proposed CHPs are all below the relevant AQOs for the protection of human health.

The significance of effects of the emissions on the ground level receptors from the CHP operations with respect to long-term NO_2 and SO_2 is determined to be ‘insignificant ’.

Habitat Assessment

The significance of effects of long-term and short-term effects of NO_x (as NO_2) and SO_2 emissions on the ecological receptors from the CHP operations is determined to be ‘insignificant ’.

The long-term process contributions (PC, as predicted by the detailed dispersion model) of NO_x (as NO_2) and SO_2 from CHP operations are all less than 1% of the relevant critical level or load (CL) and it can be considered inconsequential.

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ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
AADT	Annual Average Daily Traffic
AD	Anaerobic Digestion
ADMS	Atmospheric Dispersion Modelling Software
AERMOD	AERMOD is the state-of-the-science, steady-state Gaussian air dispersion model that is EPA-approved for most refined modelling scenarios. BREEZE AERMOD is an enhanced version of the EPA-approved AERMOD that provides modelers with the tools and functionality required to perform air quality analyses that help to address permitting, regulatory, and nuisance issues, perform academic research, and assist companies worldwide with capital planning
ASR	(Air Quality) Annual Status Report
AQAL	the Air Quality Assessment Level
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQO	Air Quality Objectives
AQS	Air Quality Standards
CHP	Combined Heat and Power
CL	Critical Level
DEFRA	Department for Environment Food & Rural Affairs
EA	Environment Agency
EAL	Environmental Assessment Limits
EC	European Commission
EFT	The Emissions Factors Toolkit
EIA	Environmental Impact Assessment
EPUK	Environmental Protection UK
EU	European Union
EUWA	The European Union (Withdrawal) Act 2018
EPAQS	The Expert Panel on Air Quality Standards
HCI	Household, Commercial & Industrial
HIA	Health Impact Assessment
IAQM	The Institute of Air Quality Management
LA	Local Authority
LAQM	Local Air Quality Management
LT	Long-term
MCP	Medium Combustion Plant
MCPD	The Medium Combustion Plant Directive
MHCLG	the Ministry for Housing, Communities and Local Government

Acronyms/Abbreviations	Definition
MRF	Material Recycling Facility
MWth	Thermal megawatt
NMVOCs	Non-methane volatile organic compounds
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NPPF	The National Planning Policy Framework
NTF	The National Transfer Format (NTF) is a file format designed in 1988 specifically for the transfer of geospatial information
OS	the UK Ordnance Survey
PC	Process Contribution
PEC	Predicted Environment Concentration
PPG	Planning Policy Guidance
PPS	Planning Policy Statements
SAC	Special Areas of Conservation
SG	Specified Generator
SO_2	Sulphur Dioxide
SPA	Special Protection Area
SSSI	Sites of Special Scientific Interest
ST	Short-term
SUEZ	SUEZ Recycling and Recovery UK Ltd
VOC	Volatile organic compounds
WHO	World Health Organization
WTS	Waste Transfer Station
UK	The United Kingdom
USEPA	U.S. Environmental Protection Agency

1.0 INTRODUCTION

This report presents the findings of an air quality assessment undertaken to assess the CHP engine emission impacts in support of an application to vary the environmental permit to allow the operation of a new Anaerobic Digestion (AD) Facility at Darwen Materials Recovery Facility, Lower Eccleshill Road, Darwen, Blackburn, Lancashire, BB3 0EH.

The site is operated by SUEZ Recycling and Recovery UK Ltd (SUEZ) and currently regulated under a bespoke environmental permit (EPR/BB3609KA) which allows the operation of a Material Recycling Facility (MRF), Plastics Physical Treatment Facility, Glass Bulking Facility and Household, Commercial & Industrial (HCI) Waste Transfer Station.

SUEZ are seeking to vary the environmental permit to allow the operation of a new Anaerobic Digestion (AD) Facility. The process will generate biogas which then ultimately feeds into a biogas upgrading plant to National Gas Grid criteria and injected into the gas grid. Alternatively, the biogas may be processed by the Combined Heat and Power (CHP) engines to generate heat and electricity that would be used by the AD plant. Each CHP engine will have a capacity of more than 1 megawatt thermal (MWth) and less than 50MWth. As such, it is considered that the CHP engines will be subject to the Medium Combustion Plant Directive (MCPD).

To facilitate the installation and operation of the AD facility, SUEZ are seeking to demolish the existing buildings and site infrastructure and redevelop the whole site.

In addition to the AD Facility, SUEZ will continue to operate the waste transfer station and MRF at the site. Waste that is accepted as part of the waste transfer station and MRF will be stored within the confines of a building or within a canopy building. The waste transfer station will comprise a new building which will be used for the acceptance, bulking and treatment of general municipal/residual black bag and bulky waste prior to treatment via shredding. There will also be a canopy building which will be used for the bulking of non-hazardous waste prior to transfer off site for recovery and/or disposal.

1.1 SITE LOCATION

The Site is located approximately 4km south of Blackburn Town Centre. The central Grid Reference is approximately 369400,423950. The application site is bounded to the north, east and south by woodland with grassland/farmland beyond, to the west by railway lines with industrial and commercial buildings beyond.

Reference should be made to **Figure 1-1** for a map of the application site and surrounding area. The proposed site layout plan is shown in **Figure 1-2**.

Figure 1-1. Site Location

Figure 1-2. The Proposed Site Plan

1.2 CONTEXT

The potential impacts from the operational phase of the Site are emissions to air from the Combined Heat and Power (CHP) engines. Air dispersion modelling, under normal operating conditions, was undertaken to assess combustion emissions from the CHP engine stacks. Emissions from the proposed flare on Site is a back-up flare and is not considered as they do not form part of normal operations.

The objective of this air quality assessment is to determine whether off-site impacts from the proposed engine emissions meet the required air quality objectives (AQOs) or air quality Environmental Assessment Limits (EALs) for the protection of human health, vegetation and habitats.

Baseline air quality conditions have been defined.

The detailed modelling results have been presented in this report in terms of the emitted pollutant Process Contribution (PC) and Predicted Environmental concentration (PEC = PC+ Background concentration). AERMOD modelling was undertaken for the most representative meteorological dataset and the worst-case, highest predicted long-term and short-term PECs were compared to the appropriate AQOs/ EALs or relevant impact assessment criteria.

1.3 REPORT STRUCTURE

Following this introductory section, the remainder of this report is structured as follows:

- Section 1.0: Introduction
- Section 2.0: Policy and Legislative Context
- Section 3.0: Assessment Methodology
- Section 4.0: Baseline Conditions
- Section 5.0: Detailed Modelling Methodology
- Section 6.0: Detailed Modelling Assessment Results
- Section 7.0: Habitat Assessment
- Section 8.0: Conclusions

All technical Appendices are included at the end of this report for information.

2.0 POLICY AND LEGISLATIVE CONTEXT

2.1 DOCUMENTS CONSULTED

The following documents were consulted during the undertaking of this assessment:

Legislation and Best Practice Guidance

- Environmental Permitting: Core Guidance, for the Environmental Permitting (England and Wales) Regulations 2016 (Si 2016 No 1154), last revised: March 2020, Defra.
- The Air Quality Standards Regulations (Amendments), 2016;
- The Air Quality Strategy for England, Defra, April 2023;
- The Environment Act, 1995;
- The Environment Act, 2021;
- Local Air Quality Management Technical Guidance LAQM.TG(22), Defra, 2022;
- Guidance of air emissions risk assessment for your environmental permit, 21 December 2023;
- Guidance of Environmental permitting: air dispersion modelling reports; 19 January 2021;
- A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites (Version 1.1), IAQM, May 2020; and
- Ecological Assessment of Air Quality Impacts, CIEEM, January 2021.

Websites Consulted

- Google maps (maps.google.co.uk);
- The UK National Air Quality Archive (www.airquality.co.uk);
- Multi-Agency Geographic Information for the Countryside (http://magic.defra.gov.uk/);
- Planning Practice Guidance (http://planningguidance.planningportal.gov.uk/); and,
- Blackburn with Darwen Borough Council (https://www. blackburn.gov.uk).

Site Specific Reference Documents

- Blackburn with Darwen Borough Council: 2022 Air Quality Annual Status Report (ASR); and,
- Blackburn with Darwen Borough Council: Local Plan 2021-2037, Regulation 19 Publication Plan consultant (January 2022).

2.2 AIR QUALITY LEGISLATIVE FRAMEWORK

European Legislation

European air quality legislation is consolidated under Directive 2008/50/EC, which came into force on 11th June 2008. This Directive consolidates previous legislation which was designed to deal with specific pollutants in a consistent manner and provides new air quality objectives for fine particulates. The consolidated Directives include:

- **Directive 1999/30/EC** – the First Air Quality 'Daughter' Directive – sets ambient air limit values for NO_2 and oxides of nitrogen, sulphur dioxide, lead and PM_{10};

- **Directive 2000/69/EC** – the Second Air Quality 'Daughter' Directive – sets ambient air limit values for benzene and carbon monoxide; and,
- **Directive 2002/3/EC** – the Third Air Quality 'Daughter' Directive – seeks to establish long-term objectives, target values, an alert threshold and an information threshold for concentrations of ozone in ambient air.

The fourth daughter Directive was not included within the consolidation and is described as:

- **Directive 2004/107/EC** – sets health-based limits on polycyclic aromatic hydrocarbons, cadmium, arsenic, nickel and mercury, for which there is a requirement to reduce exposure to as low as reasonably achievable.

The European Commission (EC) Directive Limits, outlined above, have been transposed in the UK through the Air Quality Standards Regulations. In the UK responsibility for meeting ambient air quality limit values is devolved to the national administrations in Scotland, Wales and Northern Ireland.

The European Union (Withdrawal) Act 2018 (EUWA) provides a new framework for the continuity of 'retained EU law' in the UK. EU Directives no longer have to be implemented by the UK except to any extent agreed or decided by the UK unilaterally.

EUWA retains the domestic effect of EU Directives to the extent already implemented in UK law, by preserving the relevant domestic implementing legislation enacted in UK law before 'Implementation Period' completion day. Though the EU Directives are not retained, following the UK's departure from the EU, the EUWA converts the current framework of Air Quality targets, however the role that the EU instructions were party to are lost.

UK Legislation

The Air Quality Standards Regulations (Amendments 2016) seek to simplify air quality regulation and provide a new transposition of the Air Quality Framework Directive, First, Second and Third Daughter Directives and also transpose the Fourth Daughter Directive within the UK. The Air Quality Limit Values are transposed into the updated Regulations as Air Quality Standards, with attainment dates in line with the European Directives. SI 2010 No. 1001, Part 7 Regulation 31 extends powers, under Section 85(5) of the Environment Act (1995), for the Secretary of State to give directions to Local Authorities (LAs) for the implementation of these Directives.

The UK Air Quality Strategy is the method for implementation of the air quality limit values in England, Scotland, Wales and Northern Ireland and provides a framework for improving air quality and protecting human health from the effects of pollution.

For each nominated pollutant, the Air Quality Strategy sets clear, measurable, outdoor air quality standards and target dates by which these must be achieved; the combined standard and target date is referred to as the Air Quality Objective (AQO) for that pollutant. Adopted national standards are based on the recommendations of the Expert Panel on Air Quality Standards (EPAQS) and have been translated into a set of Statutory Objectives within the Air Quality (England) Regulations (2000) SI 928, and subsequent amendments. The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020 amends the AQO for PM2.5 outlined within the Air Quality Standards Regulations (2010 & 2016 Amendments).

Guidance of air emissions risk assessment for your environmental permit requests to compare the impact of the emissions to air to the following environment standards:

- Air Quality Standards Regulations 2010 Limit Values and Target Values;
- UK Air Quality Strategy Objectives; and
- Environmental Assessment Levels.

The Environmental Standards and Limits Values

The Air Quality Standards Regulations 2010 Limit Values and the Limit values are presented in **Table 2-1** and **Table 2-2**.

Table 2-1. Environmental Standards and Limits Values

Substance	Averaging time	Concentration	Environmental Standard	Exceedances (number of times a year that you can exceed the limit
NO_2	1-Hour Mean	200µg/m^3	Limit Value	Up to 18 1-hour periods
	Annual Mean	40µg/m^3	Limit Value	None
SO_2	1 Hour Mean	350 µg/m^3	Limit Value	Up to 24 1-hour periods
	24 Hour Mean	125 µg/m^3	Limit Value	Up to 3 24-hour periods

Table 2-2. Ecological Air Quality Standards, Objectives, Limit and Target Values

Pollutant	Applies	Objective	Concentration Measured as	Date to be achieved and maintained thereafter	European Obligations	Date to be achieved and maintained thereafter
NO_X	UK	30 µg/m^3	Annual Mean	31st December 2000	30 µg/m^3	19 July 2021
SO_2	UK	20 µg/m^3	Annual Mean	31st December 2000	20 µg/m^3	19 July 2021
	UK	20 µg/m^3	Winter average	31st December 2000	20 µg/m^3	19 July 2021

Within the context of this assessment, the annual mean objectives are those against which facades of residential receptors will be assessed and the short-term objectives apply to all other receptor locations, where people may be exposed over a short duration, both residential and non-residential such as using gardens, balconies, walking along streets, using playgrounds, footpaths or external areas of employment uses.

A guidance of institute of air quality management (IAQM) sets out the critical levels for the protection of vegetation and ecosystems. The NO_2 and SO_2 critical levels adopted in the IAQM guidance of "*A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites (Version 1.1), IAQM, May 2020*" are presented in **Table 2-3**.

Table 2-3. Critical Levels

Pollutant	Averaging Period	Critical Level
NO_X	24 hours	75 µg/m^3
	Annual	30 µg/m^3
SO_2	Annual	10 µg/m^3 (for lichens and bryophytes)
	Annual	20 µg/m^3

Local Air Quality Management

Under Section 82 of the Environment Act (1995) (Part IV) Local Authorities (LAs) are required to periodically review and assess air quality within their area of jurisdiction under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves assessing present and likely future air quality against the AQOs. If it is predicted that levels at the façade of buildings where members of the public are regularly present (normally residential properties) are likely to be exceeded, the LA is required to declare an Air Quality Management Area (AQMA).

2.3 ENVIRONMENTAL PERMITTING AND POLICY GUIDANCE

The DEFRA guidance within 'Environmental Permitting: Core Guidance - For the Environmental Permitting (England and Wales) Regulations 2016 (Si 2016 No 1154), last revised: March 2020', includes details on the 'national air quality strategy' as follows:

> *"A1.23 Part IV of the Environment Act 1995 concerns air quality. Section 80 requires the Secretary of State to prepare a national air quality strategy, and section 81 requires the Environment Agency and Natural Resources Wales to have regard to that strategy when discharging their pollution control functions."*

3.0 ASSESSMENT METHODOLOGY

Guidance within 'Air emissions risk assessment for your environmental permit', last updated 21 December 2023, details methodologies for analysing and presenting the detailed modelling results.

3.1 COMPARE AND SUMMARISE MODELLING RESULTS

The guidance states that the following should all be included and considered in the results of the assessment:

- The PC;
- The PEC;
- The substances which are screened out;
- The substances that have been included for detailed assessment;
- The relevant environmental standards referred to when evaluating emissions; and
- Any additional action required, for example a cost benefit analysis.

3.2 DETERMINING WHETHER FURTHER ACTION IS REQUIRED

Pre-application discussions with the Environment Agency may have already shown whether it is required to take further action, such as a cost benefit analysis of your proposals.

3.2.1 When Further Action is not Required

Further action is not required if the assessment has shown that both of the following apply:

- The proposed emissions comply with BAT associated emission levels (AELs) or the equivalent requirements where there is no BAT AEL; and
- The resulting PECs will not exceed environmental standards.

3.2.2 When Further Action is Required

A cost benefit analysis is required if any of the following apply:

- The PCs could cause a PEC to exceed an environmental standard (unless the PC is very small compared to other contributors – if this is the case contact the Environment Agency);
- The PEC is already exceeding an environmental standard;
- The activity or part of it is not covered by a 'BAT reference document' (BREF);
- The proposals do not comply with BAT AELs - in this case you'll need to make a request for an exception ('derogation') that includes a cost benefit analysis of your proposals; and
- The EA has asked to do a BAT assessment.

3.2.3 Discussion on Detailed Modelling Results

Guidance within 'Environmental permitting: air dispersion modelling reports, 19 January 2021' states the following:

> *"The assessment should include a discussion of results (what they mean and their significance):*

For a detailed modelling assessment PCs are insignificant where they are less than:

- *10% of a short-term environmental standard; and*
- *1% of a long-term environmental standard."*

4.0 BASELINE CONDITIONS

This section provides a review of the existing air quality in the vicinity of the application site in order to provide a benchmark against which to assess potential air quality impacts of the proposed development. Baseline air quality in the vicinity of the application site has been defined from several sources, as described in the following sections.

4.1 AIR QUALITY REVIEW

Air Quality Review

As required under section 82 of the Environment Act 1995, Blackburn with Darwen Borough Council has conducted an ongoing exercise to review and assess air quality within its area of jurisdiction.

Local Air Quality Management (LAQM)

Four AQMA(s) are currently designated within Blackburn with Darwen Borough Council as detailed in **Table 4-1**.

Table 4-1. Local Authority AQMA Details

AQMA	Description	Date Declared	Pollutants Declared
AQMA 1 - Intack	An area encompassing a number of properties at the junction of Accrington Rd / Shadsworth Rd / Whitebirk Rd	Declared 13/11/2005	Nitrogen Dioxide NO_2 Annual Mean
AQMA 2 - Bastwell	An area encompassing a number of properties at the junction of Whalley New Road / Whalley Range / Plane St	Declared 13/11/2005	Nitrogen Dioxide NO_2 Annual Mean
AQMA 6 - Blackamoor	An area encompassing a number of properties at the junction of Roman Road & B6231	Declared 1/2/2012	Nitrogen Dioxide NO_2 Annual Mean
AQMA 7 - Four Lane Ends	An area encompassing a number of properties at the junction of B6233, Revidge Rd & Lammack Rd	Declared 1/2/2012	Nitrogen Dioxide NO_2 Annual Mean

AQMA 6 – Blackamoor is located approximately 1250 m north of the Site.

AQMA 1 – Intack is located approximately 4.2 m north of the Site.

AQMA 2 – Bastwell is located approximately 5.0 km north of the Site.

AQMA 6 – Blackamoor is located approximately 5.6 km north of the Site.

Blackburn with Darwen Borough Council propose to revoke the AQMAs at Intack, Bastwell and Four Lane Ends.

Therefore, the receptor within the Blackamoor AQMA has been included as part of the modelling assessment.

Air Quality Monitoring

Monitoring of air quality within Blackburn with Darwen Borough Council has been undertaken through both automatic and non-automatic monitoring methods in 2021. These have been reviewed in order to provide an indication of existing air quality in the area surrounding the application site. The most recent monitoring data within Blackburn with Darwen Borough Council was undertaken during 2021.

Automatic Monitoring

Blackburn with Darwen Borough Council undertook automatic pollution monitoring during 2021 at 1 location. The monitoring location (CM1) is located at Joiners Square, approximately 4.0 km north of the site. The most recently available data between 2017 to 2021 are presented in **Table 4-2**.

Table 4-2. Monitored Annual Mean Pollutant Concentrations at Automatic Monitoring Locations

Site ID	Location	Site Type	Distance from Kerb of Nearest Road (m)	Inlet Height (m)	2017 NO_2 Annual Mean (µg/m³)	2018 NO_2 Annual Mean (µg/m³)	2019 NO_2 Annual Mean (µg/m³)	2020 NO_2 Annual Mean (µg/m³)	2021 NO_2 Annual Mean (µg/m³)
CM1	Blackburn Accrington Road	Roadside	3.2	3	21.2	19.5	20.2	17.2	19.4

As outlined in **Table 4-2**, the monitored annual average concentrations are below the AQO for NO_2 (40 µg/m³ annual mean) between 2017 and 2021.

Non - Automatic Monitoring

Blackburn with Darwen Borough Council undertook non- automatic (i.e. passive) monitoring of NO_2 at 46 sites during 2021. The closest diffusion tube is diffusion tube DT31, which is located on 145 Blackburn Road, approximately 600 m south-west of the application site. The most recently available diffusion tube data between 2017 and 2021 are presented in **Table 4-3**.

Table 4-3. Monitored Annual Mean NO_2 Concentrations at Diffusion Tubes

Site ID	Location	X	Y	Site Type	Distance from Kerb (m)	Inlet Height (m)	Annual Mean NO_2 Concentration (µg/m³)				
							2017	2018	2019	2020	2021
DT6	St Edwards School, Blackburn Road	368298	423985	Roadside	2.4	3.0	-	20.5	20.9	18.0	18.0
DT27	Pot House Lane	370188	423058	Roadside	1.5	3.0	-	-	-	16.3	13.3
DT31	145 Blackburn Road	368552	423366	Roadside	4.0	3.0	29.2	22.4	23.2	20.7	17.7
DT34	486 Blackburn Road	368240	424299	Roadside	6.5	3.0	34.6	26.9	25.2	24.8	22.1
DT40*	161 Roman Road	369634	425359	Roadside	4.0	3.0	39.5	29.4	30.3	26.7	24.9
DT41*	113 Stopes Brow	369591	425360	Kerbside	0.6	3.0	**46.7**	30.6	29.4	27.3	26.8
*Located within AQMA											

4.2 BACKGROUND POLLUTANT MAPPING

Background pollutant concentration data on a 1km x 1km spatial resolution is provided by the UK National Air Quality Archive[1] and is routinely used to support LAQM and Air Quality Assessments where local pollutant monitoring has not been undertaken.

Background concentrations were referenced from the UK National Air Quality Information Archive database based on the National Grid Co-ordinates of 1 x 1 km grid squares nearest to the site. Defra issued revised 2018

1 www.airquality.co.uk.

based background maps for NO_X and NO_2. The mapped background concentrations adjacent to the site are summarised in **Table 4-4** below.

Table 4-4. Predicted Background Concentrations

Year	UK NGR (m)		Background Mapping Data	
	X	Y	NO_2	NO_x
2019	369500	423500	10.90	14.41
2020	369500	423500	10.36	13.64
2021	369500	423500	10.00	13.12
2022	369500	423500	9.64	12.62

Table 4-4 indicates that there were no background exceedances of the relevant AQOs within the vicinity of the facility between 2019 and 2022.

For SO_2 background, Blackburn with Darwen Borough Council does not routinely monitor sulphur dioxide anywhere within the county. The concentration was extracted for the Defra's 'Background Maps 2001' report. The SO_2 concentrations in the 'Background Maps 2001' report ranges 3.04 µg/m^3 to 5.28 µg/m^3 within the Council. The maximum concentration of 5.28 µg/m^3 has been used in the assessment to produce a worst-case assessment.

4.3 BASELINE/BACKGROUND CONCENTRATIONS INCLUSIVE OF CONTRIBUTIONS FROM TRAFFIC EMISSIONS

Traffic emissions have been considered at selected receptor locations. A verified baseline traffic model has been produced using ADMS Roads to determine baseline pollutant levels for NO_2, which includes the contributions from the traffic emissions. Details of background concentrations of NO_2 used in this assessment are provided in Appendix A.

5.0 DETAILED MODELLING METEOROLOGY

In order to consider the air quality impacts of the facility on the local air quality a quantitative assessment using the third generation Breeze AERMOD dispersion model has been undertaken. AERMOD is a development from the ISC3 dispersion model and incorporates improved dispersion algorithms and pre-processors to integrate the impact of meteorology and topography within the modelling output.

The model utilises hourly meteorological data to define conditions for plume rise, transport, diffusion and deposition. It estimates the concentration for each source and receptor combination for each hour of input meteorology and calculates user-selected short-term averages.

5.1 MODELLING PARAMETERS AND AVERAGING PERIOD

The dispersion modelling has assessed the impact of emissions from the facility taking into consideration of the operation of the two CHPs.

The same averaging period should be used for comparison of emissions against environmental standards. For example, most long-term standards are expressed as an annual mean and many short-term standards as an hourly mean. Note that there are certain exceptions to this which are important when considering compliance with statutory EQS. The averaging period associated with the relevant modelled pollution are detailed in **Table 5-1.**

Table 5-1. Modelling Parameters and Averaging Period

Parameter	Modelled As	
	Short-Term	Long-Term
NO_2	99.79th percentile (%ile) 1-hour mean	Annual mean
SO_2	99.18th %ile 24-hour 99.73rd %ile 1-hour 15min (99.90%ile 1-hour)	Annual mean for the protection of vegetation and ecosystems

For short term averaging periods the following UK DEFRA methodology, for example, has been followed.

For 1-hour NO_2 concentrations:

- 99.79th percentile (%ile) 1-hour Process Contribution NO_2 + 2 x (annual mean background contribution NO_2).

5.2 CHP ENGINE EMISSION SOURCE

It is proposed to install two Jenbacher J416GS-B.L gas engines at the proposed AD Plant and each of the CHP has an electrical output 1.2MW el.

The emissions from the CHPs have been derived from the engine specifications and the emission monitoring data from two same JMC 416 GS-B.L CHP engines operating at the SUEZ's AD facility at Charlton Lane. The mass emissions used within AERMOD and stack gas parameters are presented in **Table 5-2.**

Table 5-2. CHP Stack Emissions for the Assessment and Stack Parameters

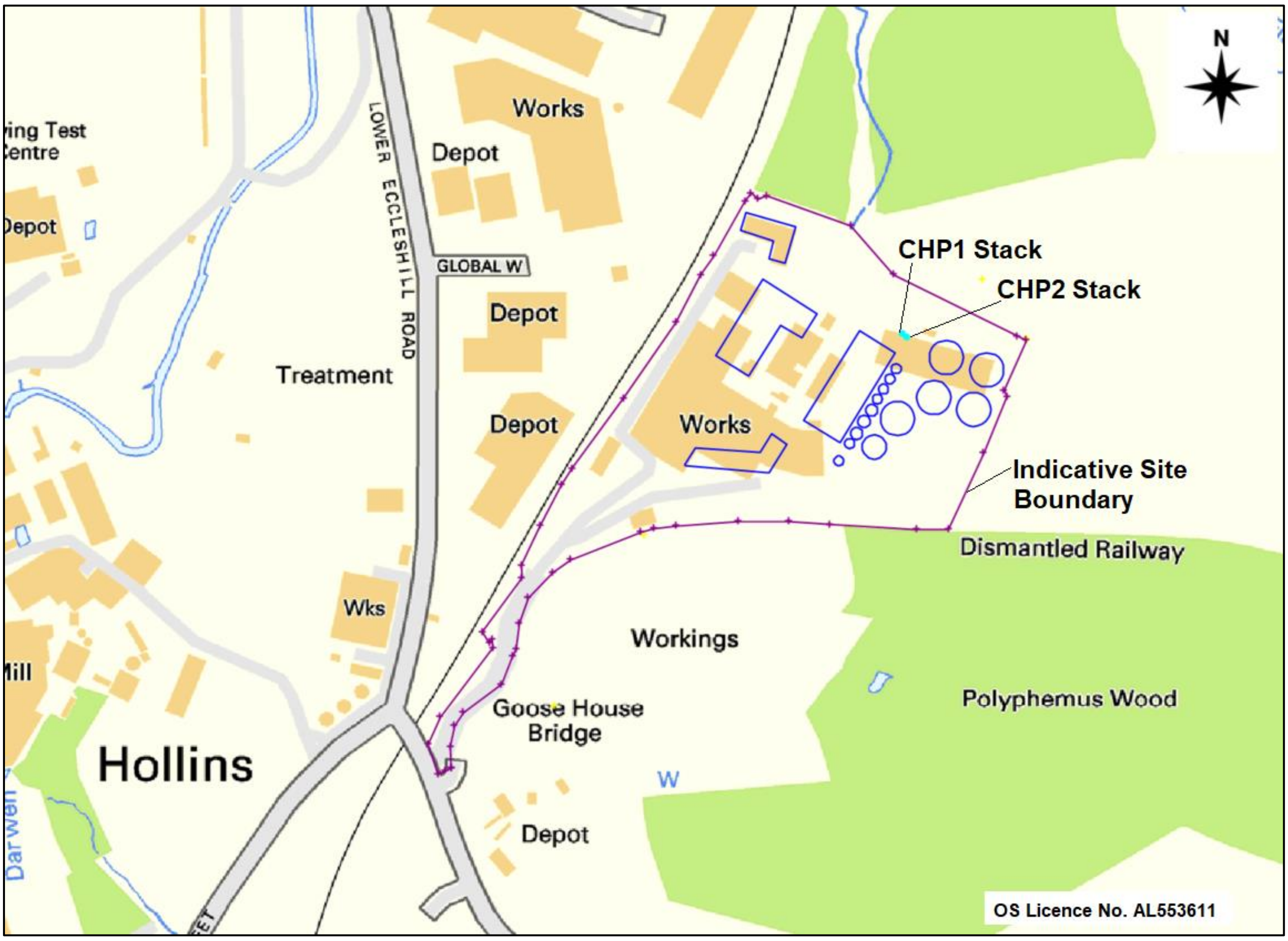
Parameter	Emission Rate (Each CHP)	Unit
NO_x Emissions, dry, 0 °C, 5% O_2	250	mg/Nm^3
SO_2 Emissions, dry, 0 °C, 5% O_2	52.55 [a]	mg/Nm^3
Exhaust Gas Volume, Wet	5,174	Nm^3/hr
Exhaust Gas Volume, dry	4616	Nm^3/hr
Stack Gas Temperature	422	°C
Stack Moisture content	11	%
Exhaust Gas Flow Rate at stack conditions: Wet and at 422 °C	13,172	Am^3/s
Mass NO_x Emissions	1,154	kg/hr
	0.321	g/s
Mass SO_2 Emissions	242.6	kg/hr
	0.067	g/s
Modelled stack diameter	0.346	m
Stack velocity	38.91	m/s
Stack Height (m)	19.0 m above Ground Level	m

Note:

a. *The concentrations were derived from 'Stack emissions testing reports' at SUEZ Recovery & Recycling UK, Charlton Lane EcoPark for CHP Gas Engine 1 & 2, in January 2022.*

The locations of the modelled emission points are illustrated in **Figure 5-1**.

Figure 5-1. Locations of Emission Sources



5.3 CHP OPERATION HOURS

The air quality assessment is based on two proposed CHP engines to be operating continuously at same time to produce a worst-case assessment.

There is an emergency flare installed on the site. The flare will be used in backup capacity and for emergency releases, for example, the CHP engines being shut down for maintenance. As the stand-by flare will be operational for less than 10 per cent of the time (on an annual basis), the flare emissions do not need to be monitored according to the EA guidance (Guidance on the management of landfill gas, LFTGN 03, September 2004. Therefore, the emergency flare emissions have not been included in the assessment.

5.4 SENSITIVE RECEPTORS

5.4.1 Discrete (Individual) Human Receptors

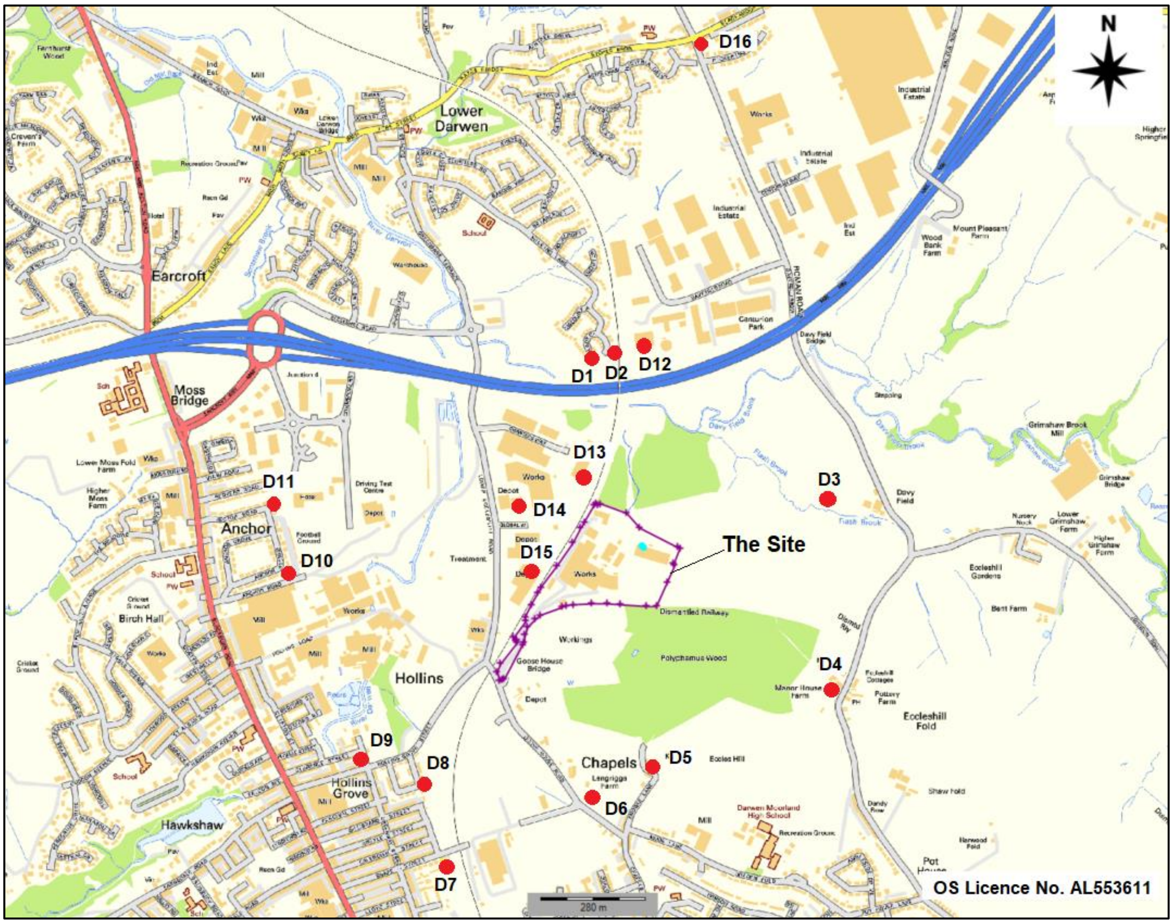
The discrete sensitive receptors identified for the purposes of this air quality assessment are contained in **Table 4-3** and shown in **Figure 5-2**. The assessment has also been undertaken to determine the potential impacts on those selected receptors.

It should be noted that these do not represent an exhaustive list of all receptors within the vicinity of the Site, rather worst-case representative locations within and adjacent to the site.

Table 5-3. Modelled Sensitive Human Receptors

Receptor ID	Receptor Name	UK NGR (m)	
		X	Y
D1	Lady Close (Residential)	369350	424507
D2	Lord's Crescent (Residential)	369404	424521
D3	Davy Field Gardens (Residential)	369975	424141
D4	Manor House Farm (residential)	369983	423629
D5	Knowle Cottage, Knowle Fold (Residential)	369503	423418
D6	Langriggs Farm (Residential)	369352	423340
D7	Snape Street (Residential)	368956	423165
D8	Surrey Avenue (Residential)	368901	423377
D9	Clarence Street (Residential)	368726	423445
D10	Anchor Avenue (residential)	368539	423939
D11	Redvers Road (residential)	368486	424186
D12	Centurion Business Park	369487	424550
D13	Wheelbase Engineering	369322	424189
D14	Wilkinson Catering	369154	424114
D15	Darwen MOT Centre	369179	423945
D16	AQMA Blackamoor	369634	425359

Figure 5-2. Location of Sensitive Human Receptors



5.4.2 Ecological Receptors

Guidance contained in 'air emissions risk assessment for your environmental permit' (Defra and Environment Agency, 2 August 2016) states that assessments should consider the impact on the conservation areas:

Examining if there are any of the following within 10km of the site:

- special protection areas (SPAs);
- special areas of conservation (SACs); and
- Ramsar sites (protected wetlands).

Examining if there are any of the following within 2km of the site:

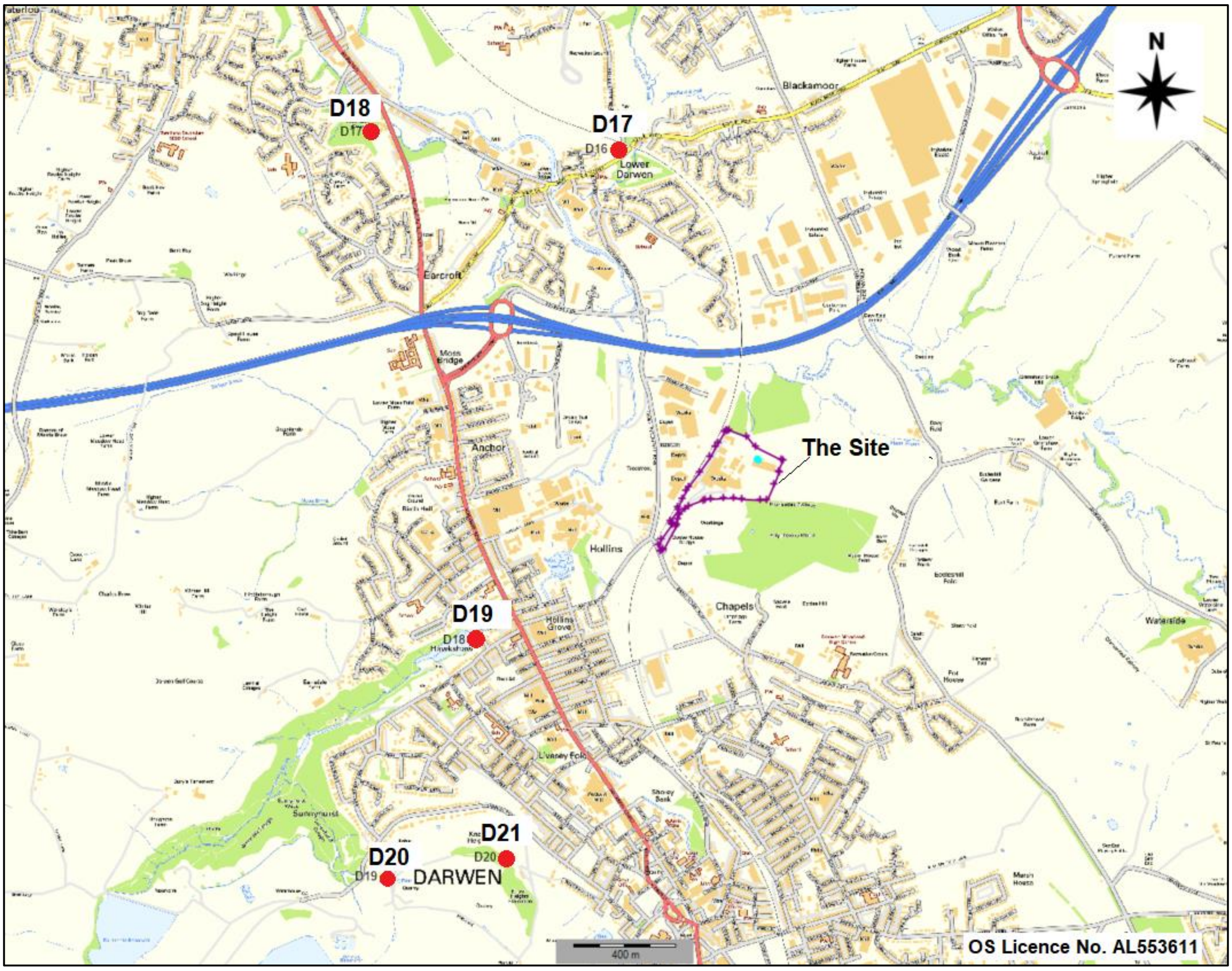
- sites of special scientific interest (SSSIs); and
- local nature sites (ancient woods, local wildlife sites and national and local nature reserves)

A review has identified the ecological sites which are presented in **Table 5-4** and **Figure 5-3**. These have been included in the habitat assessment as ecological receptors.

Table 5-4. Modelled Ecological Receptors

Receptor ID	Receptor Name	UK NGR (m)	
		X	Y
D17/E1	River Darwen Parkway (LNR)	368915	425224
D18/E2	Fernhurst Wood (Ancient & Semi-Natural Woodland)	367950	425295
D19/E3	Sunnyhurst Woods (LNR)	368356	423294
D20/E4	West Pennine Moors (SSSI)	368010	422361
D21/E5	Knowl Heights Wood (Ancient & Semi-Natural Woodland)	368477	422438

Figure 5-3. Location of Ecological Receptors



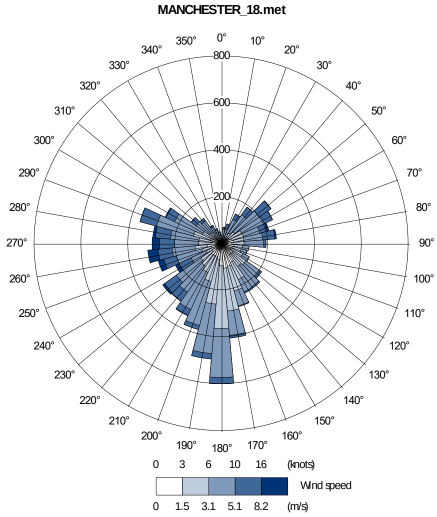
5.4.3 Cartesian Grid Receptor

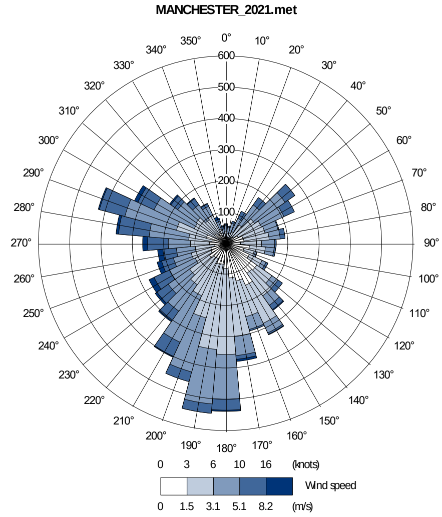
A Cartesian receptor grid was used in the model in order to produce the concentration contour lines. The Cartesian receptor grid consists of receptors identified by their x (East-west) and y (north-south) coordinates. The grid was constructed with grid spacing (x, y) of 50m x 50m over an area covering 4000m by 4000m with south-west corner UK NGR (m) of 367500, 422000.

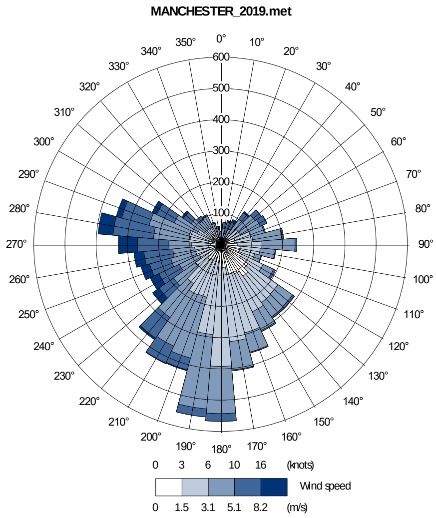
5.5 METEOROLOGICAL DATA

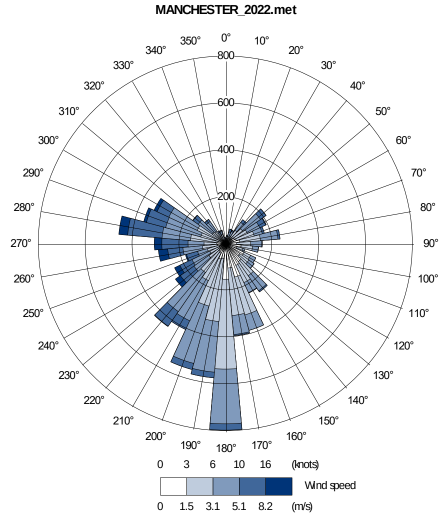
The 5-year meteorological data (2018 – 2022 inclusive) used in the assessment is derived from Manchester Airport weather station, which is considered representative of conditions within the vicinity of the site, with all the complete parameters necessary for the AERMOD model. Reference should be made to **Figure 5-4** for an illustration of the prevalent wind conditions at the Manchester weather station.

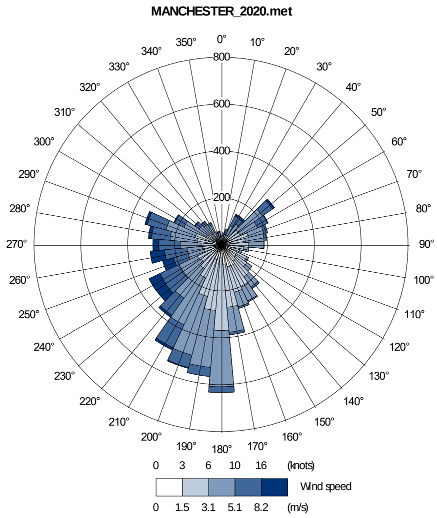
Figure 5-4. Manchester Airport Meteorological Station Windrose











5.6 SURFACE CHARACTERISTICS

The land uses surrounding the Site are mostly described as woodlands, industrial/commercial uses and grasslands. A surface roughness value of 0.5m (a value for parkland and open suburbia land use) has been used in the modelling for a worst-case assessment.

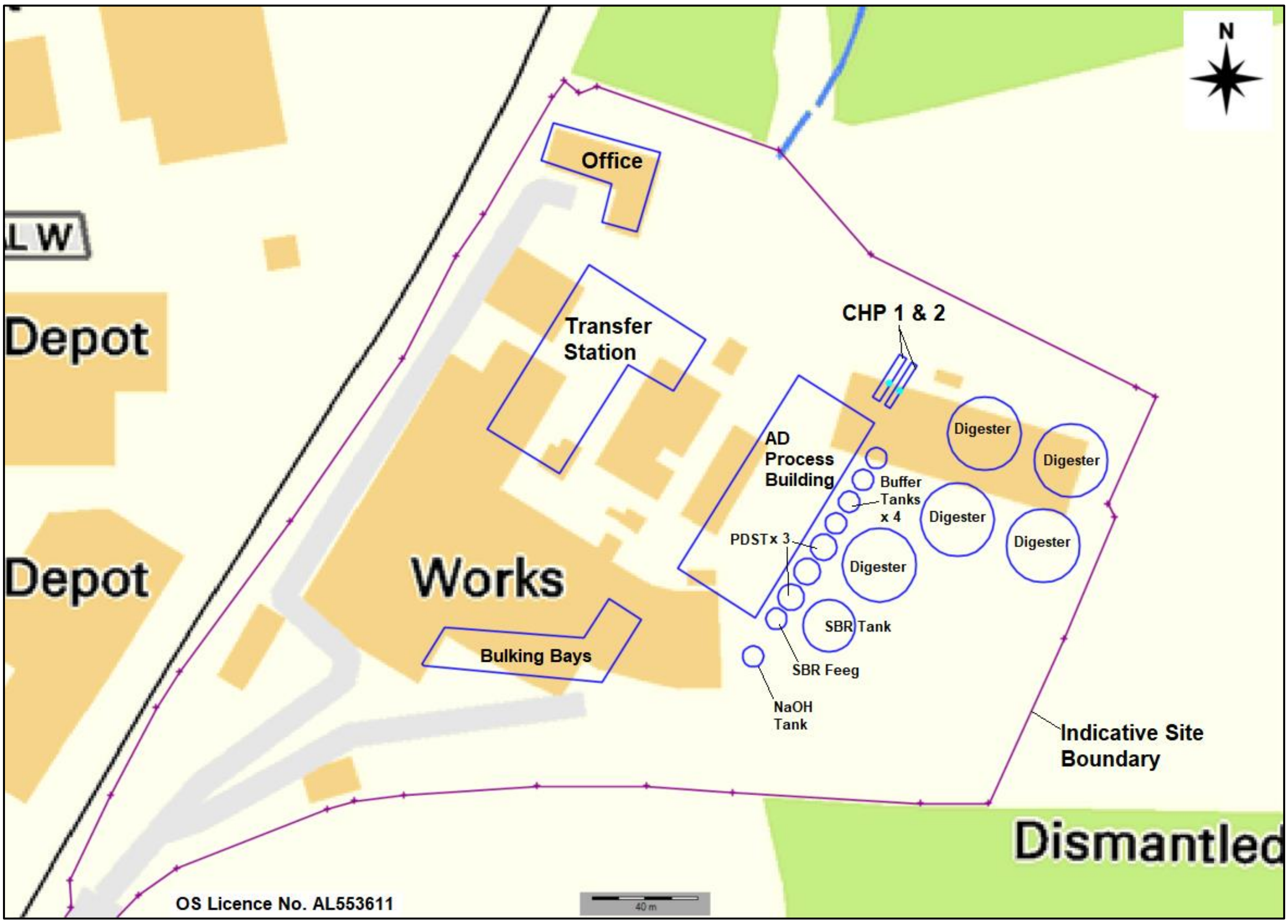
5.7 BUILDINGS IN THE MODELLING ASSESSMENT

Buildings nearby or immediately adjacent to the stacks could potentially cause building downwash effects on emission sources and have therefore been modelled. The locations and dimensions of the buildings used in the model are given in **Table 5-5** and illustrated in **Figure 5-5**.

Table 5-5. Locations and Heights of Buildings Used in the Model

ID	Name	UK NGR (m)		Modelled Building Height (m)	Note
		X	Y		
OFFICE	Existing Suez Office	369357	424105	9.24	-
TRANSFER	Transfer Station	369414	424023	11.74	-
AD	AD Process Building	369433	423916	16.2	-
BULKING	Bulking Bays	369375	423892	11.6	-
DIGEST1	Digester Tank 1	369521	423987	15.3	Radius = 14 m
DIGEST2	Digester Tank 2	369554	423976	15.3	Radius = 14 m
DIGEST3	Digester Tank 3	369511	423954	15.3	Radius = 14 m
DIGEST4	Digester Tank 4	369543	423944	15.3	Radius = 14 m
DIGEST5	Digester Tank 5	369481	423936	15.3	Radius = 14 m
SBR_T	SBR Tank	369462	423913	13.0	Radius = 10 m
BUFFER1	Buffer Tank 1	369480	423977	17.8	Radius = 4 m
BUFFER2	Buffer Tank 2	369475	423969	17.8	Radius = 4 m
BUFFER3	Buffer Tank 3	369469	423961	17.8	Radius = 4 m
BUFFER4	Buffer Tank 4	369464	423952	17.8	Radius = 4 m
PDST1	PDST Tank 1	369460	423943	11.5	Radius = 5 m
PDST2	PDST Tank 2	369453	423934	11.5	Radius = 5 m
PDST3	PDST Tank 3	369447	423924	11.5	Radius = 5 m
SBR_F	SBR Feed	369441	423916	8.0	Radius = 4 m
NAOH	NaOH Tank	369433	423902	8.0	Radius = 4 m

Figure 5-5. Locations of Modelled Buildings



5.8 TREATMENT OF TERRAIN

The presence of steep terrain can influence the dispersion of emissions and the resulting pollutant concentrations. USEPA guidance indicates that terrain effects should be considered if the gradient exceeds 1:10. A digital terrain file in the UK Ordnance Survey (OS) Landranger format (.NTF) has been used in the assessment.

5.9 NO_X TO NO_2 CONVERSION

Emissions of NO_x from combustion processes are predominantly in the form of NO. Excess oxygen in the combustion gases and further atmospheric reactions cause the oxidation of NO to NO_2. Given the short travel time to the areas of maximum concentration and the rate of reaction to convert NO to NO_2, it is unlikely that more than 30% of the NO_x is present at ground level as NO_2. This conversion factor is based on comparison of ambient NO and NO_2 continuous measurements evaluated over recent years.

Ground level NO_x concentrations have been predicted through dispersion modelling. NO_2 concentrations reported in the results section assume 70% conversion from NO_x to NO_2 for annual means and a 35% conversion for short term (hourly) concentrations, based upon EA methodology[2].

5.10 MODELLING UNCERTAINTY

Uncertainty in dispersion modelling predictions can be associated with a variety of factors, including:

- Model uncertainty - due to model limitations;
- Data uncertainty - including emissions estimates, background estimates and meteorology; and,
- Variability - randomness of measurements used.

However, potential uncertainties in model results have been minimised as far as practicable and worst-case inputs considered in order to provide a robust assessment. This included the following:

- Choice of model - AERMOD is a commonly used atmospheric dispersion model and results have been verified through a number of studies to ensure predictions are as accurate as possible;
- Facility operating parameters - Operational parameters were provided for the facility;
- Emission rates - Emissions were based on 24-hour operation, this is likely to overestimate impacts as periods of shut down have not been considered;
- Background concentrations - Background pollutant concentrations were obtained from a number of recognised sources in order to consider baseline levels in the vicinity of the site, as detailed within the main report text; and,
- Variability - All model inputs are as accurate as possible and worst-case conditions have been considered where necessary in order to ensure a robust assessment of potential pollutant concentrations.

2 Conversion Ratios for NO_x and NO_2, Environment Agency, updated.

6.0 DETAILED MODELLING ASSESSMENT RESULTS

The detailed computational modelling assessment of process emissions was undertaken using the input parameters detailed in Section 5.

All predicted concentrations have been compared to the relevant environmental assessment criteria, as detailed in Sections 2 and 3.

6.1 NITROGEN DIOXIDE (NO_2)

Long-Term (annual Mean) NO_2

The long-term emissions of NO_2 from the sources considered were assessed for all 5 years of meteorological data. The maximum process contributions (PCs) within the modelled receptor locations and their associated predicted environmental concentrations (PECs) are compared against the relevant AQO, in **Table 6-1.**

From the meteorological dataset, the year resulting in maximum long-term NO_2 PC concentration was identified as 2018. The predicted maximum PC occurs at the receptor location of Darwen MOT Centre (D15).

The maximum NO_2 PC in Table 6.1 is 0.93 µg/m^3 and the associated NO_2 PEC is 12.87 µg/m^3, which is below the relevant long-term AQS of 40 µg/m^3 for the protection of human health.

Table 6-1. The Maximum Long-Term (Annual Mean Concentration of NO_2

Pollutant	Year	Process Contrib'tn (PC)	PC as %age of AQO	Background [(a)]	PEC (PC +Background)	Easting (m)	Northing (m)	Receptor Name
NO_2	2018	0.93	2.31	11.94	12.87	369179	423945	Darwen MOT Centre
NO_2	2019	0.88	2.19	11.94	12.82	369179	423945	Darwen MOT Centre
NO_2	2020	0.87	2.17	11.94	12.81	369179	423945	Darwen MOT Centre
NO_2	2021	0.86	2.15	11.94	12.80	369179	423945	Darwen MOT Centre
NO_2	2022	0.88	2.20	11.94	12.82	369179	423945	Darwen MOT Centre
AQOs		40 µg/m^3						

Note:

a. *Background concentrations Inclusive of contributions from the traffic emissions.*

Table 6.2 presents a summary of the predicted nitrogen dioxide concentrations, both PCs and PECs, at the modelled receptors locations.

The impact description of changes associated with the modelled emissions with respect to annual mean NO_2 exposure has been assessed with reference to the criteria in Section 3. The outcomes of the assessment are summarised in **Table 6-2.**

Table 6-2. The Long-Term (Annual Mean) Concentrations of NO_2 and Impact Description of Effects at Receptors

Receptor		Predicted Annual Mean Concentration (µg/m³) – 2018 Met Data, and NO_2 Impact Description at Receptors						
ID	**Name**	**Process Contribution (PC)**	**PC as percentage of AQO (%)**	**Background [(a)]**	**PEC (PC +Background)**	**PEC as percentage of AQO**	**PEC as percentage of AQO**	**Impact Descriptor**
D1	Lady Close (Residential)	0.36	0.89	24.70	25.06	62.6%	<70% of AQO	Insignificant
D2	Lord's Crescent (Residential)	0.42	1.06	23.85	24.27	60.7%	<70% of AQO	Insignificant
D3	Davy Field Gardens (Residential)	0.43	1.08	17.54	17.97	44.9%	<70% of AQO	Insignificant
D4	Manor House Farm (residential)	0.28	0.71	13.75	14.03	35.1%	<70% of AQO	Insignificant
D5	Knowle Cottage, Knowle Fold (Residential)	0.07	0.18	11.51	11.58	29.0%	<70% of AQO	Insignificant
D6	Langriggs Farm (Residential)	0.09	0.22	12.18	12.27	30.7%	<70% of AQO	Insignificant
D7	Snape Street (Residential)	0.08	0.19	14.36	14.44	36.1%	<70% of AQO	Insignificant
D8	Surrey Avenue (Residential)	0.14	0.35	14.53	14.67	36.7%	<70% of AQO	Insignificant
D9	Clarence Street (Residential)	0.14	0.34	15.43	15.57	38.9%	<70% of AQO	Insignificant
D10	Anchor Avenue (residential)	0.16	0.39	14.96	15.12	37.8%	<70% of AQO	Insignificant
D11	Redvers Road (residential)	0.11	0.29	16.97	17.08	42.7%	<70% of AQO	Insignificant
D12	Centurion Business Park	0.49	1.21	22.82	23.31	58.3%	<70% of AQO	Insignificant
D13	Wheelbase Engineering	0.32	0.80	17.63	17.95	44.9%	<70% of AQO	Insignificant
D14	Wilkinson Catering	0.41	1.02	17.65	18.06	45.1%	<70% of AQO	Insignificant
D15	Darwen MOT Centre	0.93	2.31	11.94	12.87	32.2%	<70% of AQO	Insignificant
D16	AQMA Blackamoor	0.19	0.46f	29.00	29.19	73.0%	73% of AQO	Insignificant
AQOs	**40 µg/m³**							

Note:

a. *Background concentrations Inclusive of contributions from the traffic emissions*

The percentage changes in process contribution of NO_2 relative to the AQAL as a result of the engine operations at all receptor locations, with respect to NO_2 exposure, are determined to be 2.31% or less. The PEC is less than 73% of the relevant long-term environment standard. As either the PC is less than 1% of the long-term environment standard or the PEC is less than 70% of the long-term environment standard at each receptor location, the effect of the engine operations on the local area is considered to be insignificant.

The percentage changes in process contribution of NO_2 relative to the AQAL at AQMA Blackamoor is less than 0.5% and the impact on the AQMA is determined to be 'insignificant'.

The predicted long-term NO_2 concentrations from the modelled emission sources are considered acceptable for the protection of human health.

Short-Term (1-Hour Mean) NO_2

The short-term emissions of NO_2 from the sources considered were assessed for all 5 years of meteorological data. The maximum PCs within the modelled receptor locations and their associated PECs are compared against the relevant AQS, in **Table 6-3.**

From the meteorological dataset, the year resulting in maximum short-term NO_2 PC concentration was identified during 2018. The predicted maximum short-term PC occurs at the receptor location of Darwen MOT Centre (D15).

The highest short-term NO_2 PC in **Table 6-3** is 11.66 µg/m^3 and the associated short-term NO_2 PEC is 35.54 µg/m^3, which is below the relevant short-term AQO of 200 µg/m^3 for the protection of human health.

Table 6-3. The Maximum Short-Term (1-Hour Mean, 99.79th Percentile) Concentrations of NO_2

Pollutant	Year	Process Contrib'tn (PC)	PC as %age of AQO	Background (a)	PEC(a) (PC +Background)	Easting (m)	Northing (m)	Receptor Name
NO_2	2018	11.66	5.83	23.88	35.54	369179	423945	Darwen MOT Centre
NO_2	2019	11.24	5.62	23.88	35.12	369179	423945	Darwen MOT Centre
NO_2	2020	11.39	5.69	23.88	35.27	369179	423945	Darwen MOT Centre
NO_2	2021	11.57	5.78	23.88	35.45	369179	423945	Darwen MOT Centre
NO_2	2022	11.66	5.83	23.88	35.54	369179	423945	Darwen MOT Centre
AQOs		**200 µg/m^3**						

Note:

a. *Background concentrations Inclusive of contributions from the traffic emissions.*

The short-term NO_2 PEC concentrations have been calculated at each of the discrete receptors listed for the worst meteorological year of 2022 and these results are detailed in **Table 6-4** (overleaf).

Table 6-4. Summary of the Predicted Short-Term NO_2 Concentrations at Discrete Receptors

Receptor		Predicted 1-hour Mean (99.79th Percentile) Concentration (µg/m³) – 2018 Met Data				
ID	**Name**	**Process Contribution (PC)**	**PC as %age of AQO**	**Background (a)**	**PEC (PC +Background)**	**PEC as percentage of AQO**
D1	Lady Close (Residential)	2.28	1.14	49.40	51.68	25.8%
D2	Lord's Crescent (Residential)	2.35	1.17	47.70	50.05	25.0%
D3	Davy Field Gardens (Residential)	6.37	3.18	35.08	41.45	20.7%
D4	Manor House Farm (residential)	5.91	2.95	27.50	33.41	16.7%
D5	Knowle Cottage, Knowle Fold (Residential)	2.26	1.13	23.02	25.28	12.6%
D6	Langriggs Farm (Residential)	2.94	1.47	24.36	27.30	13.6%
D7	Snape Street (Residential)	1.42	0.71	28.72	30.14	15.1%
D8	Surrey Avenue (Residential)	2.24	1.12	29.06	31.30	15.7%
D9	Clarence Street (Residential)	1.93	0.97	30.86	32.79	16.4%
D10	Anchor Avenue (residential)	3.09	1.55	29.92	33.01	16.5%
D11	Redvers Road (residential)	3.36	1.68	33.94	37.30	18.6%
D12	Centurion Business Park	2.47	1.24	45.64	48.11	24.1%
D13	Wheelbase Engineering	3.79	1.89	35.26	39.05	19.5%
D14	Wilkinson Catering	7.03	3.52	35.30	42.33	21.2%
D15	Darwen MOT Centre	11.66	5.83	23.88	35.54	17.8%
D16	AQMA Blackamoor	1.33	0.66	58.00	59.33	29.7%
AQOs	**200 µg/m³**					

Note:

a. *Background concentrations Inclusive of contributions from the traffic emissions.*

As shown in **Table 6-4**, there are no exceedances of the short-term NO_2 AQO at any of the identified sensitive receptors. The predicted impacts are significantly below the AQO of 200 µg/m³. The percentage changes in process contribution of short-term NO_2 relative to the AQAL are less than 6% and the short-term impact is determined to be 'insignificant'.

Therefore, the predicted short-term NO_2 concentrations from the engine operations are considered acceptable for the protection of human health.

The contour plots of the predicted long-term and short-term ground level PCs of NO_2 for all receptors, including discrete and grid receptors are presented in **Figure 6-1** and **Figure 6-2**. The contour plots show that the predicted maximum concentrations occur adjacent to the emission sources, with a predicted decrease in concentration with the increased distance from the stacks.

Figure 6-1. Long-Term NO_2 Ground Level PC from Kingdom Avenue Emissions – 2018 Met Data

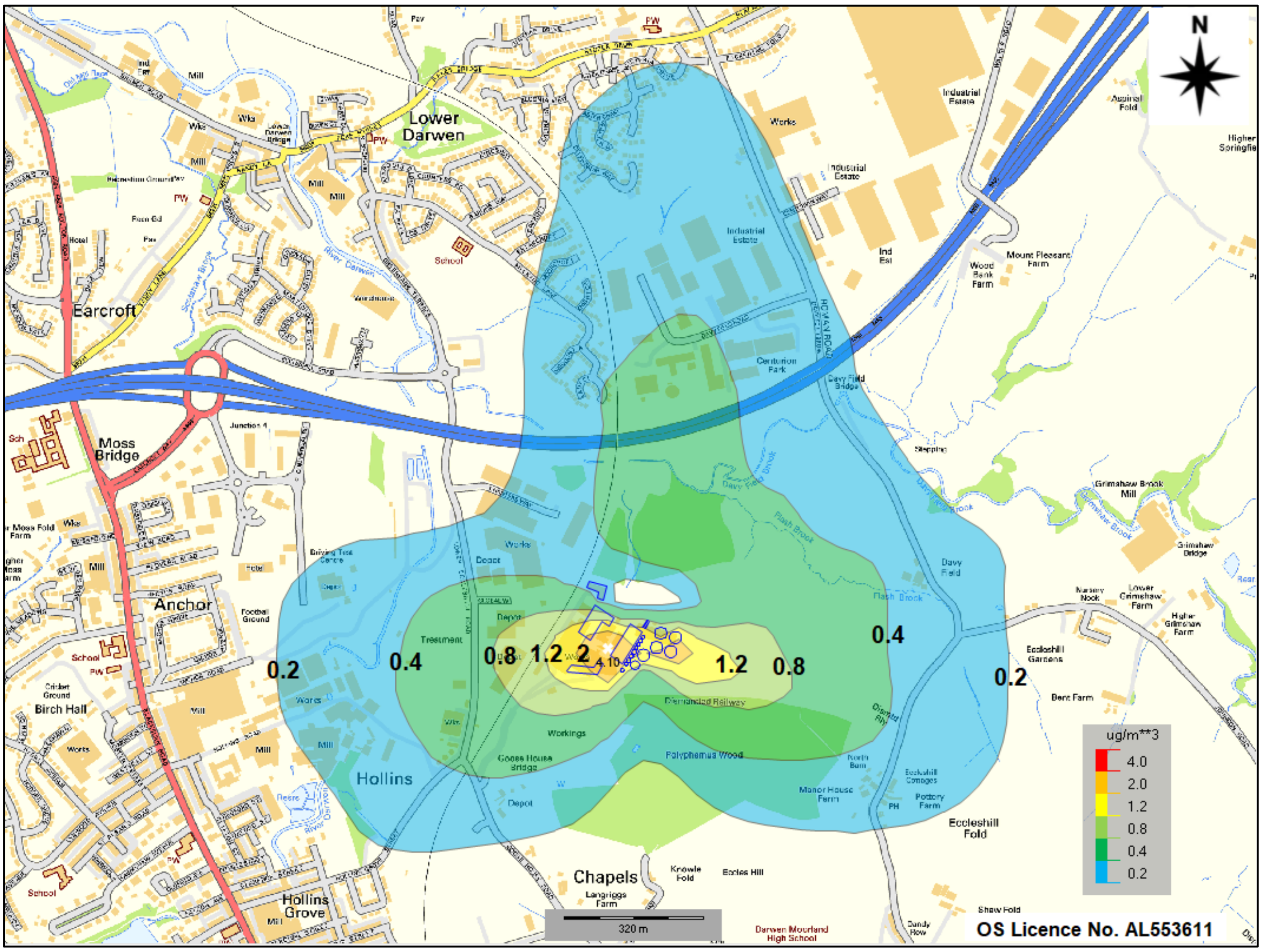
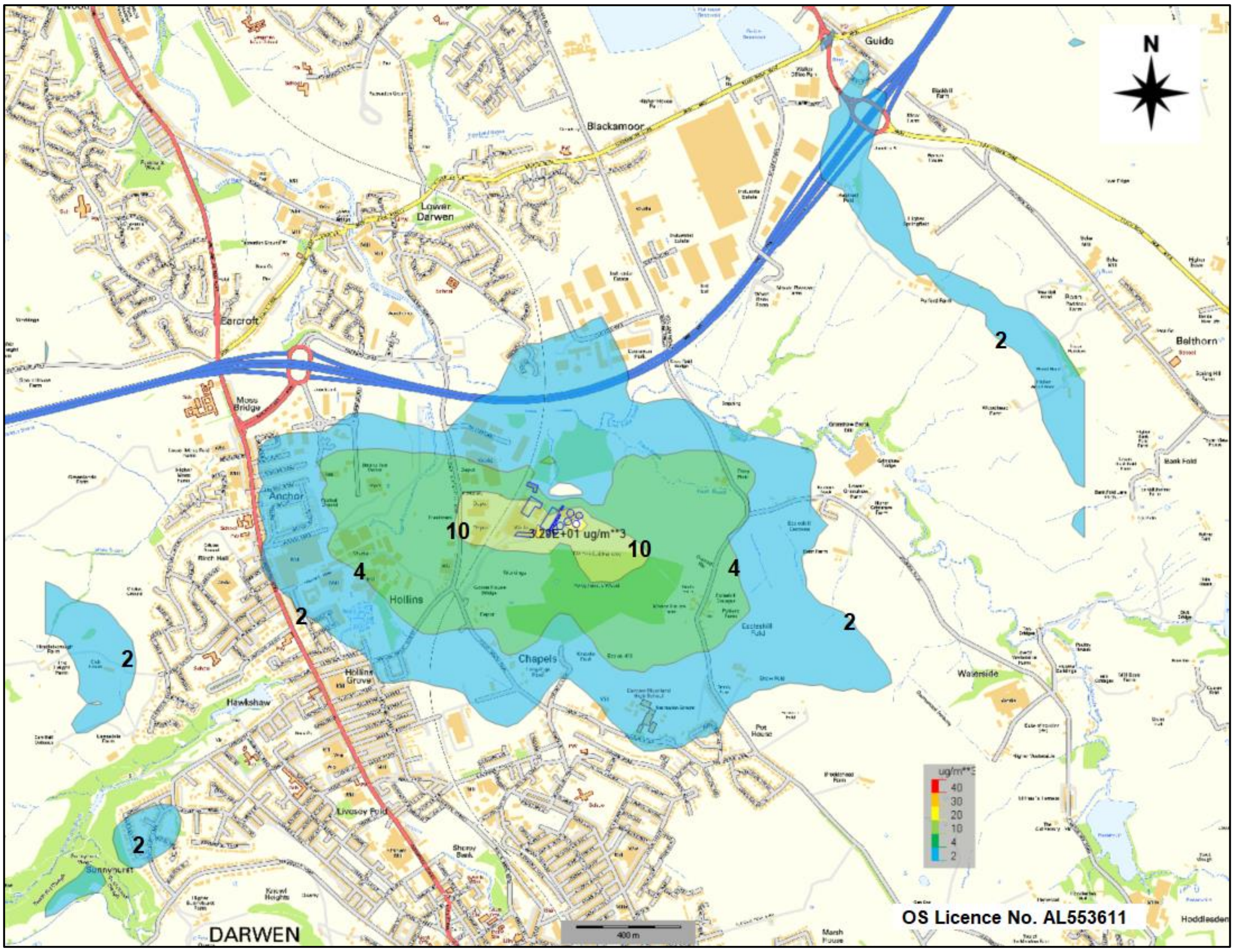


Figure 6-2. Predicted Short-Term NO_2 Ground Level Concentrations (PC, 1-Hour Mean, 99.79th Percentile) - 2018 Met Data



6.2 SULPHUR DIOXIDE (SO_2)

Predicted ground level short-term SO_2 concentrations were assessed against the relevant AQOs using 2018 met data (the year resulting in maximum short-term PC concentration). The results of the model predictions at each discrete receptor, inclusive of background, are summarised in **Table 6-5.**

Table 6-5. Summary of Predicted SO_2 Concentrations

Receptor	Predicted SO_2 Concentration (µg/m^3)					
	24-hour Mean (99.18th Percentile) (a)		1-hour Mean (99.73rd Percentile) (b)		15-minute Mean (99.9th Percentile) (c)	
	Process Contrib'tn (PC)	PEC (PC +Background)	Process Contrib'tn (PC)	PEC (PC +Background)	Process Contrib'tn (PC)	PEC (PC +Background)
D1	0.28	6.51	1.33	11.89	2.19	16.34
D2	0.36	6.59	1.40	11.96	1.91	16.07
D3	0.33	6.56	3.46	14.02	6.24	20.39
D4	0.31	6.54	3.27	13.83	6.10	20.25
D5	0.06	6.29	1.17	11.73	2.21	16.36
D6	0.09	6.32	1.50	12.06	2.91	17.06
D7	0.08	6.31	0.83	11.39	1.24	15.39
D8	0.15	6.38	1.33	11.89	1.92	16.07
D9	0.16	6.39	1.07	11.63	1.87	16.02
D10	0.18	6.41	1.75	12.31	3.20	17.35
D11	0.11	6.34	1.96	12.52	2.96	17.11
D12	0.42	6.65	1.46	12.02	2.00	16.15
D13	0.23	6.46	2.23	12.79	3.08	17.23
D14	0.34	6.57	4.00	14.56	6.78	20.93
D15	1.00	7.23	6.84	17.40	9.49	23.64
D16	0.16	6.39	0.76	11.32	1.09	15.24
AQOs and Limit Values	125		350		266	

Note:

(a) Inclusive of Background concentration of 6.23 µg/m^3;

(b) Inclusive of Background concentration of 10.56 µg/m^3; and

(c) Inclusive of Background concentration of 14.15 6µg/m^3.

The maximum PEC of 24-hour mean SO_2 emissions is 7.23 µg/m^3 when using 2018 met data. Therefore, the short-term (24-hour) PECs of SO_2 at all receptors are below the relevant short-term AQS of 125 µg/m^3 for the protection of human health.

The maximum PEC of 1-hour mean SO_2 emissions is 17.40 µg/m^3 when using 2018 met data which does not exceed the relevant short-term AQS of 350 µg/m^3 for the protection of human health.

The maximum PEC of 15-minute mean SO_2 emissions is 23.64 µg/m^3 when using 2018 met data, which does not exceed the relevant short-term AQS of 266 µg/m^3 for the protection of human health.

Considering that the percentage changes in short-term process concentrations of SO_2 are below 20% of relevant short-term AQSs and the short-term impacts on the receptors are insignificant, the short-term SO_2 contour plots have not been presented.

7.0 HABITAT ASSESSMENT

The habitat assessment has been undertaken for the following identified nature conservation sites.

- River Darwen Parkway (LNR) - located approximately 1.35 km north-northwest of the CHPs;
- Fernhurst Wood (Ancient & Semi-Natural Woodland) - located approximately 2.0 km northwest of the CHPs;
- Sunnyhurst Woods (LNR) - located approximately 1.3 km southwest of the CHPs;
- West Pennine Moors (SSSI) - located approximately 2.2 km southwest of the CHPs; and,
- Knowl Heights Wood (Ancient & Semi-Natural Woodland) - located approximately 1.85 km southwest of the CHPs.

The long-term and short-term concentrations among those ecological sites have been calculated for habitat assessment against relevant critical loads, using 2018 met data (the year resulting in maximum long-term and short-term PC concentrations).

7.1 PREDICTED NITROGEN OXIDE CONCENTRATIONS

Critical Level of Long-Term and Short-Term NO_x (as NO_2)

Table 7-1 presents a summary of the maximum predicted nitrogen oxide concentrations using 2018 met data (the year resulting in maximum long-term and short-term PC concentrations at the ecological receptors).

Table 7-1. Summary of Predicted NO_X (as NO_2) Concentrations for Protection of Vegetation and Ecosystems

Ecological Receptor	Predicted Maximum Annual Mean Concentration (µg/m^3) – 2018 Met Data				Predicted 24-hour Mean Concentration (µg/m^3) – 2018 Met Data			
	Process Contrib't n (PC)	PC as %age of AQO	BC	PEC[(a)] (PC +Background)	Process Contrib't n (PC)	PC as %age of AQO	BC	PEC[(b)] (PC +Background)
River Darwen Parkway (LNR)	0.13	0.42	13.38	13.51	1.24	1.24	15.79	17.02
Fernhurst Wood (Ancient & Semi-Natural Woodland)	0.06	0.18	13.47	13.53	0.89	0.89	15.89	16.79
Sunnyhurst Woods (LNR)	0.11	0.36	15.84	15.95	1.18	1.18	18.69	19.87
West Pennine Moors (SSSI)	0.03	0.09	13.68	13.71	0.40	0.40	16.14	16.54
Knowl Heights Wood (Ancient & Semi-Natural Woodland)	0.04	0.12	13.68	13.72	0.47	0.47	16.14	16.62
AQO/Critical Level (CL)	30[(c)]				75[(d)]			

Note:

[(a)] The Background concentration was taken from http://www.apis.ac.uk/.

[(b)] The Background concentration was taken from http://www.apis.ac.uk/.

[(c)] The AQO of 30 µg/m^3 is the annual standard for the protection of vegetation and ecosystems; and

[(d)] The AQO of 75 µg/m^3 is the daily standard for the protection of vegetation and ecosystems.

The annual mean NO_x (as NO_2) PC at all ecological receptors range from 0.03 to 0.13 µg/m^3 and the PEC are below the annual mean critical level of 30 µg/m^3 for the protection of vegetation and ecosystems at all modelled conservation site.

The NO_x (as NO_2) daily (24 hour) predicted environmental concentration at all ecological receptors are below the daily mean critical levels of 75 µg/m^3 for the protection of vegetation and ecosystems.

The significance of changes associated with the operations of the facility with respect to annual mean NO_x (as NO_2) exposure ecological receptors has been assessed with reference to the criteria in Section 3. The outcomes of the assessment are summarised in **Table 7-2.**

Table 7-2. The Long-Term (Annual Mean) Concentrations of NO_2 and Significance of Effects at Ecological Receptors

Receptor	Predicted Annual Mean Concentration (µg/m^3) – 2018 Met Data, and NO_2 Significance Impacts at Ecological Receptors						
	Process Contrib'tn (PC)	PC as %age of AQO	BC	PEC[(a)] (PC +Background)	PEC as %age of AQO	PEC as %age of AQAL	Impact
River Darwen Parkway (LNR)	0.13	0.42	13.38	13.51	45.02	≤70% of AQAL	Insignificant
Fernhurst Wood (Ancient & Semi-Natural Woodland)	0.06	0.18	13.47	13.53	45.08	≤70% of AQAL	Insignificant
Sunnyhurst Woods (LNR)	0.11	0.36	15.84	15.95	53.16	≤70% of AQAL	Insignificant
West Pennine Moors (SSSI)	0.03	0.09	13.68	13.71	45.69	≤70% of AQAL	Insignificant
Knowl Heights Wood (Ancient & Semi-Natural Woodland)	0.04	0.12	13.68	13.72	45.72	≤70% of AQAL	Insignificant

The percentage change in process concentrations relative to the AQAL as a result of the facility operations at all ecological receptor locations, with respect to NO_x (as NO_2) exposure, is determined to be 0.42 % or less. The emissions are insignificant at the ecological receptors.

As the percentage change in long-term process concentrations relative to the CL is below 1% at all ecological receptor locations, further acid deposition assessment has not been undertaken.

In summary, the NO_x impacts from the proposed development on the ecological receptors are insignificant.

7.2 PREDICTED SULPHUR DIOXIDE CONCENTRATIONS

Critical Level of Long-Term SO_2

Table 7-3 presents a summary of the maximum predicted long-term sulphur dioxide concentrations using 2018 met data (the year resulting in maximum long-term PC concentrations).

Table 7-3. Summary of Predicted SO_2 Concentrations for Protection of Vegetation and Ecosystems

Receptor	Predicted Maximum Annual Mean Concentration (µg/m³) – 2018 Met Data						
	Process Contrib'tn (PC)	PC as %age of AQO	BC	PEC[a] (PC +Background)	PEC as %age of AQO	PEC as %age of AQAL	Significance
River Darwen Parkway (LNR)	0.03	0.13	2.12	2.15	10.73	≤75% of AQAL	insignificant
Fernhurst Wood (Ancient & Semi-Natural Woodland)	0.01	0.06	2.12	2.13	10.66	≤75% of AQAL	insignificant
Sunnyhurst Woods (LNR)	0.02	0.11	1.34	1.36	6.81	≤75% of AQAL	insignificant
West Pennine Moors (SSSI)	0.01	0.03	1.34	1.35	6.73	≤75% of AQAL	insignificant
Knowl Heights Wood (Ancient & Semi-Natural Woodland)	0.01	0.04	1.34	1.35	6.74	≤75% of AQAL	insignificant
AQO/Critical Level (CL)	20 [c]						

Note:

[a] The Background concentration was taken from http://www.apis.ac.uk/; and

[b] The AQO of 20 µg/m³ is the annual standard for the protection of vegetation and ecosystems.

The annual mean SO_2 PC at all ecological receptors range from 0.01 to 0.03 µg/m³ and the PEC are below the annual mean critical level of 20 µg/m³ for the protection of vegetation and ecosystems at all modelled conservation sites.

The percentage change in process concentrations relative to the AQAL as a result of the facility operations at all ecological receptor locations, with respect to exposure, is determined to be 0.13 % or less. The emissions are 'insignificant' at the ecological receptors.

As the percentage change in long-term process concentrations relative to the CL is below 1% at all ecological receptor locations, further acid deposition assessment has not been undertaken.

The SO_2 impact from the proposed development on the ecological receptors is insignificant.

8.0 CONCLUSIONS

Tetra Tech have undertaken an air quality assessment to assess the CHP engine emission impacts in support of an application to vary the environmental permit to allow the operation of a new Anaerobic Digestion (AD) Facility at Darwen Materials Recovery Facility, Lower Eccleshill Road, Darwen, Blackburn, Lancashire, BB3 0EH.

The air quality impact assessment includes:

(1) Undertaking an air quality assessment of the atmospheric emissions from the operations of two CHPs using AERMOD dispersion modelling software package.

Baseline air quality conditions have been defined.

The detailed modelling results have been presented in this report in terms of the emitted pollutant Process Contribution (PC) and Predicted Environmental concentration (PEC) (PEC = PC + Background concentration). AERMOD modelling has been undertaken using the most representative meteorological dataset. The worst-case and highest predicted long-term and short-term PECs were compared to the appropriate AQOs/ EALs or relevant impact assessment criteria.

Air Quality Assessment for the Protection of Human Health

The predicted long-term and short-term NO_2 and SO_2 concentrations from the emissions of the operation of the proposed CHPs are all below the relevant AQOs for the protection of human health.

The significance of effects on the emissions on the ground level receptors from the CHP operations with respect to long-term NO_2 and SO_2 is determined to be ‘insignificant’.

Habitat Assessment

The annual mean and daily (24 hour mean) NO_x PEC at the ecological receptors from the CHP operations are below the relevant critical level for the protection of vegetation and ecosystems. The annual mean SO_2 PEC at the ecological receptors from the CHP operations are below the relevant critical level for the protection of vegetation and ecosystems.

The significance of long-term and short-term effects of NO_x (as NO_2) and SO_2 emissions on the ecological receptors from the CHP operations is determined to be ‘insignificant ’.

The long-term process contributions (PC, as predicted by the detailed dispersion model) of NO_x (as NO_2) and SO_2 from CHP operations are all less than 1% of the relevant critical level or load (CL) and it can be considered inconsequential.

APPENDIX A – TRAFFIC AIR QUALITY ASSESSMENT FOR BACKGROUND CONCENTRATIONS

The traffic air quality modelling assessment has utilised:

- ADMS Roads 5.0;
- Backgrounds determined from the non-Modelled Roadside Contribution;
- 2019 Manchester Meteorological Data;
- Emissions Factor Toolkit (v11, 2021);
- NO_x to NO_2 calculator (v8.1,); and,
- 2019 AADT Traffic Data downloaded from the Department for Transport database.

The inputs for the traffic model are as follows in Tables A1 and A2.

Air quality assessment areas, including ADMS road sources and receptor locations are presented in Figure A1.

Table A1. Traffic Data used in the ADMS Roads Traffic Modelling

Link	Speed (km/h)	2018	
		AADT	HGV %
Goose House Lane (North of Site)	48	6,734	1.2
Hollins Grove Street	48	6,061	1.2
Lower Eccleshill Road	48	6,734	1.2
A666 Blackburn Road (South of Earcroft Way)	48	15,520	3.2
Earcroft Way	48	21,146	3.6
A666 Blackburn Road (North of Earcroft Way)	48	12,006	2.7
Paul Rink Way	48	16,917	3.6
Greenbank Terrace	48	7,408	1.2
B6231 Sandy Lane	48	9,605	2.7
B6231 Fore Street / Stopes Brow	48	10,565	2.7
B6231 Roman Road (North of Blackamoor Road)	48	21,506	4.0
Blackamoor Road	48	10,565	2.7
Roman Road (South of Blackamoor Road)	48 / 96	21,506	4.0
Holden Fold	48	4,898	1.2
Chapels	48	6,122	1.2
Goose House Lane (South of Site)	48	6,734	1.2
M65 (West of J4)	112	73,737	6.1
M65 (East of J4)	112	79,659	6.0

Table A2. ADMS Roads Model Inputs

Parameter	Description	Input Value
Chemistry	A facility within ADMS-Roads to calculate the chemical reactions in the atmosphere between Nitric Oxide (NO), NO_2, Ozone (O_3) and Volatile organic compounds (VOCs).	No atmospheric chemistry parameters included
Meteorology	Representative meteorological data from a local source	**Manchester 2019 Meteorological Station** hourly sequential data
Surface Roughness	A setting to define the surface roughness of the model area based upon its location.	**1.0m** representing a typical surface roughness for **Cities and Woodlands** was used for the Site **0.5m** representing a typical surface roughness for **Parkland, Open Suburbia** for the met. Measurement site.
Latitude	Allows the location of the model area to be set	United Kingdom = **53.71**
Monin-Obukhov Length	This allows a measure of the stability of the atmosphere within the model area to be specified depending upon its character.	Cities and Large Towns= **30m** was used for the Site Small Towns = **10m** was used for the met. Measurement site.
Elevation of Road	Allows the height of the road link above ground level to be specified.	All road links were set at ground level = **0m**, with bridges set at 5m.
Road Width	Allows the width of the road link to be specified.	Road width used depended on data obtained from OS map data for the specific road link
Topography	This enables complex terrain data to be included within the model in order to account for turbulence and plume spread effects of topography	No topographical information used
Time Varied Emissions	This enables daily, weekly or monthly variations in emissions to be applied to road sources	No time varied emissions used
Road Type	Allows the effect of different types of roads to be assessed.	**Urban (Not London)** settings were used for the relevant links
Road Speeds	Enables individual road speeds to be added for each road link	Based on national speed limits
Canyon Height	Allows the model to take account turbulent flow patterns occurring inside a street with relatively tall buildings on both sides, known as a “street canyon”.	No canyons used within the model
Road Source Emissions	Road source emission rates are calculated from traffic flow data using the in-built EFT database of traffic emission factors.	The **EFT** Version **11.0 (2021)** dataset was used.
Year	Predicted EFT emissions rates depend on the year of emission.	**2019** data for verification and baseline operational phase assessment

This traffic data has been utilised to assess the corresponding receptors within the assessment. These receptors are outlined in Table A3.

Table A3. Modelled Existing Sensitive Receptor Locations

Discrete Sensitive Receptors		Receptor Height (m)
AERMOD ID /ADMS ID	Name	
D1	Lady Close (Residential)	1.5
D2	Lord's Crescent (Residential)	1.5
D3	Davy Field Gardens (Residential)	1.5
D4	Manor House Farm (residential)	1.5
D5	Knowle Cottage, Knowle Fold (Residential)	1.5
D6	Langriggs Farm (Residential)	1.5
D7	Snape Street (Residential)	1.5
D8	Surrey Avenue (Residential)	1.5
D9	Clarence Street (Residential)	1.5
D10	Anchor Avenue (residential)	1.5
D11	Redvers Road (residential)	1.5
D12	Centurion Business Park	1.5
D13	Wheelbase Engineering	1.5
D14	Wilkinson Catering	1.5
D15	Darwen MOT Centre	1.5
D16	AQMA Blackamoor	1.5

This data has been input into the ADMS Roads 4.1 model and the model has been verified to local monitoring data of NO_2.

Table A4. Comparison of Roadside Modelling & Monitoring Results for NO_2

Tube location	NO_2 µg/m^3		
	Monitored NO_2	Modelled NO_2	Difference (%)
DT6	20.90	21.03	0.60
DT27*	16.30	15.81	-3.03
DT28*	16.00	14.75	-7.78
DT29	26.40	28.58	8.26
DT31	20.70	21.49	3.80
DT33*	25.30	24.40	-3.55
DT34*	24.80	23.86	-3.78
DT38*	33.40	31.25	-6.43
DT39*	31.50	31.78	0.90
DT40*	26.70	26.13	-2.15
DT41*	27.30	29.12	6.68
*Located in AQMA			

The final model produced data at the monitoring locations to within 10% of the monitoring results at all of the verification points, as recommended by TG(22) guidance.

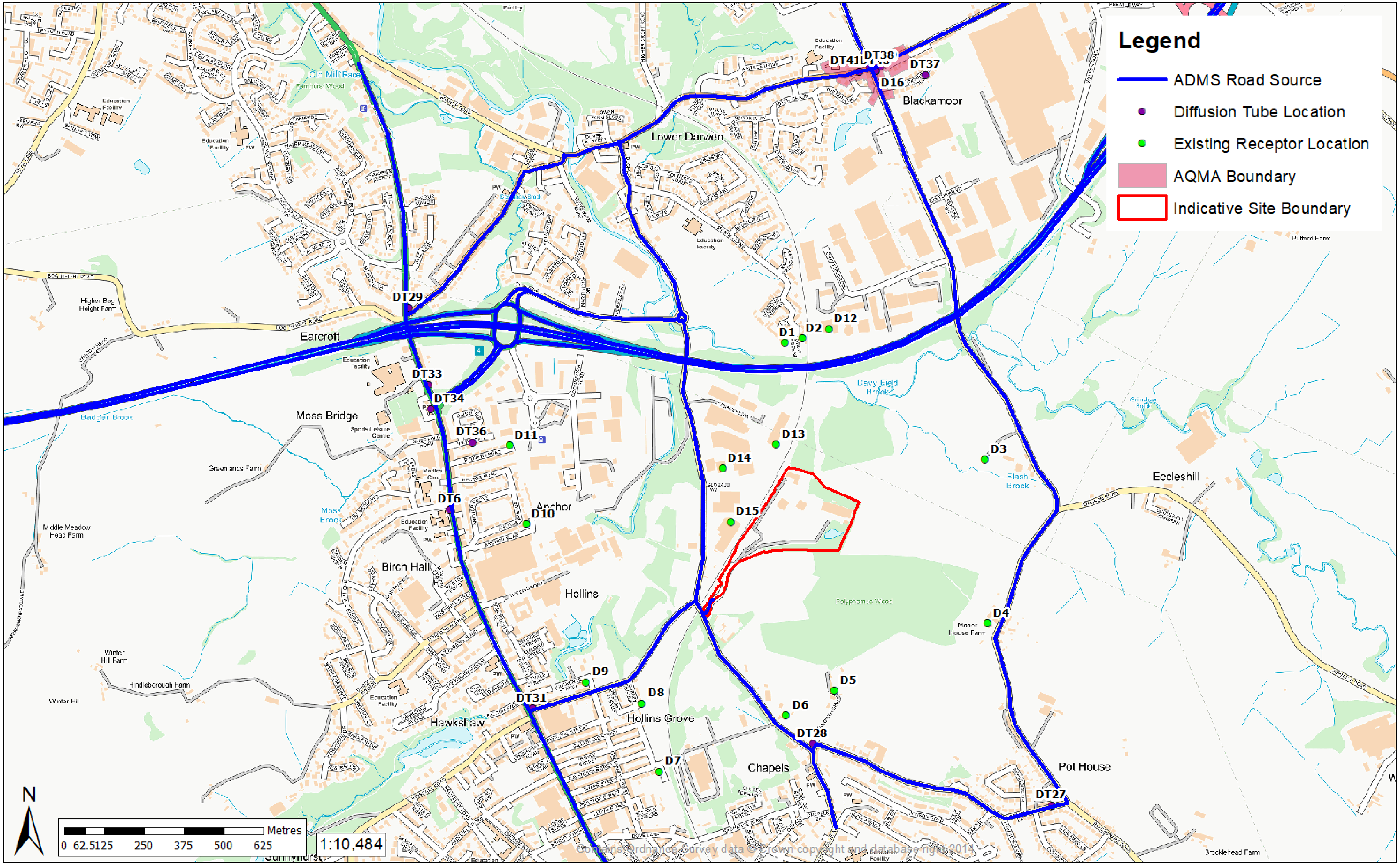
The final verification model correlation coefficient (representing the model uncertainty) is 1.00. This was achieved by applying a model correction factor of 1.13 to roadside predicted NO_X concentrations before converting to NO_2. This figure demonstrates that the model predictions were in line with the road traffic emissions at the monitoring locations.

The modelled baseline concentrations of NO_2 are outlined in Table A5.

Table A5. Predicted 2018 Annual Average Concentrations of NO_2

Discrete Sensitive Receptors		Modelled Baseline (2018) Pollutant Concentrations (µg/m^3)
AERMOD ID /ADMS ID	Name	NO_2
D1	Lady Close (Residential)	24.70
D2	Lord's Crescent (Residential)	23.85
D3	Davy Field Gardens (Residential)	17.54
D4	Manor House Farm (residential)	13.75
D5	Knowle Cottage, Knowle Fold (Residential)	11.51
D6	Langriggs Farm (Residential)	12.18
D7	Snape Street (Residential)	14.36
D8	Surrey Avenue (Residential)	14.53
D9	Clarence Street (Residential)	15.43
D10	Anchor Avenue (residential)	14.96
D11	Redvers Road (residential)	16.97
D12	Centurion Business Park	22.82
D13	Wheelbase Engineering	17.63
D14	Wilkinson Catering	17.65
D15	Darwen MOT Centre	11.94
D16	AQMA Blackamoor	29.00

Figure A-1 Traffic Air Quality Assessment Area



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