



Air Quality Assessment

Gas-Powered Reserve Energy Facility, Land off Dig Gate Lane, Rochdale

Rochdale Power Ltd

SHF.3050.001.AQ.R.002



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Non-Technical Summary

- i. Enzygo Limited was commissioned by Rochdale Power Limited to undertake an Air Quality Assessment in support of the planning application for a Gas-Powered Reserve Energy Facility located at Land off Dig Gate Lane, Rochdale.
- ii. Enzygo understands that the proposals comprise the development of a 4.4 MW, one engine, gas-powered reserve energy facility.
- iii. The Proposed Development includes 1 no. gas-powered generator served by a 10 m exhaust flue.
- iv. Pollutant emissions associated with the combustion of natural gas by the generators have the potential to cause impacts at sensitive locations within the vicinity of the site. As such, an Air Quality Assessment has been undertaken to assess the significance of these impacts in line with the requirements of national planning policy.
- v. Operational impacts were predicted based on a conservative assessment with the plant operating continuously. As such, predicted concentrations are considered to be assessed robustly. The impacts were assessed against Environmental Agency and air quality professional body guidance criteria.
- vi. The dispersion modelling results indicated that impacts upon human and ecological sensitive receptors were predicted to be not significant for all pollutants and criteria.
- vii. Based on the predictions and the use of robust assumptions, it is considered that the proposals are therefore considered acceptable for planning purposes.

1.0 Introduction

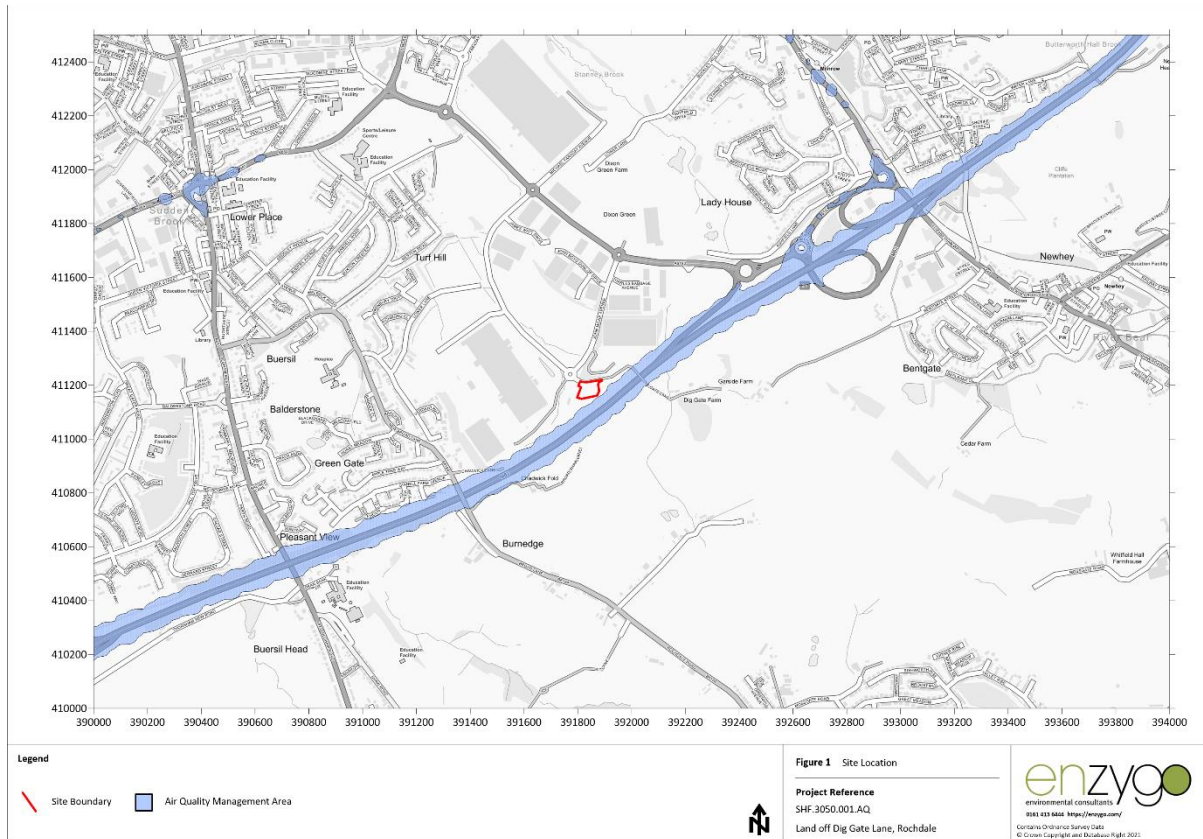
1.1 Background

- 1.1.1 Enzygo Limited was commissioned by Rochdale Power Limited to undertake an Air Quality Assessment in support of the planning application for the development of a 4.4MW, one engine, gas-powered reserve energy facility located on land off Dig Gate Lane, Rochdale, OL16 4NR.
- 1.1.2 Enzygo understands that the development is a gas peaking plant that will provide electricity to the national grid at times of peak demand.
- 1.1.3 The Proposed Development includes 1 no. gas-powered generator served by a 10 m (from ground level) exhaust flue. (JMS 624 GS-N.L Technical Datasheet shown in Appendix A).
- 1.1.4 Pollutant emissions, namely oxides of nitrogen (NO_x), associated with the combustion of natural gas by the generators have the potential to cause impacts at sensitive locations within the vicinity of the site. As such, an Air Quality Assessment has been undertaken to assess the significance of these impacts in line with the requirements of the National Planning Policy Framework (NPPF).
- 1.1.5 Gas will be piped to site and road traffic associated with the facility will be limited to site maintenance. As such, road traffic impacts have been screened out as not significant and have not been considered further.

1.2 Site Location and Context

- 1.2.1 The proposed development is located at land at Dig Gate Lane, Rochdale at approximate National Grid Reference (NGR): 391830, 411150.
- 1.2.2 The application site is located on agricultural land on the southern edge of the Kingsway Business Park and is surrounded by large warehouses and distribution centres, with agricultural land located further south, beyond the M62 which abuts the southern site boundary.
- 1.2.3 The closest residential area lies approximately 500 m to the west of the site boundary. There are further significant residential areas in all directions at greater distances.
- 1.2.4 Whilst the site is located within the Rochdale Borough Council (RBC) boundary, there are sensitive receptors to the south of the site within Oldham Metropolitan Borough Council's (OMBC) area of administration that have the potential to be affected.
- 1.2.5 The site boundary lies 7 m at its closest point to an Air Quality Management Area (AQMA).
- 1.2.6 There are also designated ecological sites within the distance thresholds defined by the Environment Agency and potential air quality impacts on these sites have also been considered. The main air pollutants of concern with respect to ecology are nitrogen oxides, nitrogen deposition and acid deposition.
- 1.2.7 Figure 1 provides a map of the site location and surrounding context.

Figure 1 Site Boundary and Surrounding Context



1.3 Limitations

1.3.1 This report has been produced in accordance with Enzygo's standard terms of engagement. Enzygo has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from Enzygo; a charge may be levied against such approval.

2.0 Legislation Guidance and Policy

2.1.1 The following legislation, guidance and policy will be considered and adhered to during the preparation of the Air Quality Assessment:

- The Air Quality Standards (Amendment) Regulations, updated on 31st December 2016¹;
- Part IV of the Environment Act (1995);
- The National Planning Policy Framework (NPPF), updated on 20th July 2021;
- The National Planning Practice Guidance (NPPG), relevant chapters updated on 1st November 2019;
- Local Air Quality Management Technical Guidance 2016 LAQM (TG16), DEFRA, 2016²;
- Air emissions risk assessment for your environmental permit, Environment Agency (EA), updated on 7th October 2020³;
- Environmental permitting: air dispersion modelling reports, EA, updated on 24th May 2019⁴; and
- Land-Use Planning and Development Control: Planning for Air Quality, Environmental Protection UK and Institute of Air Quality Management (IAQM), January 2017⁵.

2.2 UK Legislation

2.2.1 The Air Quality Standards (Amendment) Regulations (2016) came into force on 31st December 2016. These Regulations amend the Air Quality Standards Regulations 2010 and transpose the EU Directive 2008/50/EC into UK law. Air Quality Limit Values (AQLVs) were published in these regulations for 7 pollutants, as well as Target Values for an additional 6 pollutants.

2.2.2 Part IV of the Environment Act (1995) requires UK government to produce a national Air Quality Strategy (AQS) which contains standards, objectives, and measures for improving ambient air quality. The most recent AQS was produced by the Department for Environment, Food and Rural Affairs (DEFRA) and published in July 2007¹. The AQS sets out Air Quality Objectives (AQOs) that are maximum ambient pollutant concentrations that are not to be exceeded either without exception or with a permitted number of exceedances over a specified timescale. These are generally in line with the AQLVs, although the requirements for compliance vary slightly.

2.2.3 Table 1 presents the AQOs for pollutants considered within this assessment.

Table 1 Air Quality Limit Values and Objectives

Pollutant	Air Quality Objectives	
	Concentration ($\mu\text{g}/\text{m}^3$)	Averaging Periods
Nitrogen dioxide (NO_2)	40	Annual mean
	200	1-hour mean; not to be exceeded more than 18 times a year

¹ The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, DEFRA, 2007

² Local Air Quality Management Technical Guidance 2016 LAQM (TG16), DEFRA, February 2018.

³ <https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit>

⁴ <https://www.gov.uk/guidance/environmental-permitting-air-dispersion-modelling-reports>

⁵ Land-Use Planning and Development Control: Planning for Air Quality, EPUK and IAQM, January 2017

2.2.4 Table 2 summarises the advice provided in the DEFRA guidance LAQM (TG16)² on where the AQOs for pollutants considered within this report apply.

Table 2 Environmental Assessment Levels

Averaging Period	Objectives Should Apply At	Objectives Should Not Apply At
Annual mean	All locations where members of the public might be regularly exposed Building façades of residential properties, schools, hospitals, care homes etc.	Building facades of offices or other places of work where members of the public do not have regular access Hotels, unless people live there as their permanent residence Gardens of residential properties Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
24-hour and 8-hour mean	All locations where the annual mean objective would apply, together with hotels Gardens of residential properties	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term
1-hour mean	All locations where the annual mean and 24-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets) Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer	Kerbside sites where the public would not be expected to have regular access

2.3 Ecological Critical Loads and Levels

2.3.1 A critical load (CL) is defined by the UK Air Pollution Information System (APIS)⁶ as:

"A quantitative estimate of exposure to deposition of one or more pollutants, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge. The exceedance of a critical load is defined as the atmospheric deposition of the pollutant above the critical load."

2.3.2 A critical level is defined as:

"Threshold for direct effects of pollutant concentrations according to current knowledge. Exceedance of a critical level is defined as the atmospheric concentration of the pollutant above the critical level."

2.3.3 A critical load therefore refers to deposition of a pollutant, while a critical level refers to pollutant concentrations in the atmosphere (which usually have direct effects on vegetation or human health).

⁶ <http://www.apis.ac.uk/>

- 2.3.4 When pollutant loads (or concentrations) exceed the critical load or level it is considered that there is a risk of harmful effects. The excess over the critical load or level is termed the exceedance. A larger exceedance is often considered to represent a greater risk of damage.
- 2.3.5 Maps of critical loads and levels and their exceedances have been used to show the potential extent of pollution damage and aid in developing strategies for reducing pollution. Decreasing deposition below the critical load is seen as means for preventing the risk of damage. However, even a decrease in the exceedance may infer that less damage will occur.
- 2.3.6 Critical loads have been designated within the UK based on the sensitivity of the receiving habitat and have been reviewed for the purpose of this assessment.
- 2.3.7 Table 3 presents the critical levels for the protection of vegetation for pollutants considered within this assessment.

Table 3 Critical Levels for the Protection of Vegetation

Pollutant	Critical Level	
	Concentration ($\mu\text{g}/\text{m}^3$)	Averaging Periods
Oxides of Nitrogen (NO_x)	30	Annual mean
	75	24-hour mean

2.4 Local Planning Policy

Rochdale Core Strategy

- 2.4.1 The Development Site lies within Rochdale Borough Council (RBC). The Rochdale Borough Council Core Strategy was adopted in October 2016 and is the lead document in the Rochdale Local Plan.
- 2.4.2 A review of the Core Strategy document⁷ highlighted the following policy in relation to air quality:

- **“Policy G9 - Reducing the impact of pollution, contamination, and land instability**

We will reduce all forms of pollution, contamination, and land instability in the borough, by:

- Focusing on measures that reduce air pollution in Air Quality Management Areas, and other areas where pollution levels are unacceptable, particularly around motorways and main roads;*
- Requiring that development does not have impacts that lead to an unacceptable increase in air, water, noise, light or other pollution;*
- Ensuring sensitive new developments such as housing, schools and hospitals are not adversely affected by existing sources of pollution such as roads and certain types of industry;*
- Requiring a Low Emissions Strategy (LES) where development requires a Transport Assessment, and in other circumstances as appropriate;*
- Using planning conditions or obligations to control pollution from new development, or the impact of pollution on new development.”*

⁷<https://www.rochdale.gov.uk/downloads/download/266/core-strategy> Rochdale Metropolitan Borough Council. 2016

Rochdale Unitary Development Plan

2.4.3 The Unitary Development Plan from the 1996-2016 Local Plan is also remains in place until the Allocations Development Plan is adopted. The following policy relates to air quality:

- **Policy G/EM/2: Environmental Management**

If the emission of pollutants from a proposed development cannot readily be controlled by other environmental legislation, such development will not be permitted where it would be likely to result in an increase in air, water, noise, light or other pollution, which would be harmful to the environment, and to land uses and land users in the area.

Where permission is granted, it will be subject to appropriate conditions or obligations to ensure that air, water, and noise pollution is kept to acceptable levels."

Oldham Local Plan

2.4.4 The Oldham Local Plan was adopted in November 2011. The Development Plan Document - Joint Core Strategy and Development Management Policies⁸ contains the following policy relating to air quality:

- **Policy 9 - Local Environmental Quality and Amenity**

a. The council will protect and improve local environmental quality and amenity by ensuring development:

- i. is not located in areas where it would be adversely affected by neighbouring land uses; and*
- ii. does not have an unacceptable impact on the environment or human health caused by air quality, odour, noise, vibration or light pollution; and*
- iii. does not cause significant harm to the amenity of the occupants and future occupants of the development or to existing and future neighbouring occupants or users through impacts on privacy, safety and security, noise, pollution, the visual appearance of an area, access to daylight or other nuisances; and*
- v. does not result in unacceptable level of pollutants or exposure of people in the locality or wider area. Developments identified in the Air Quality Action Plan will require an air quality assessment; and*
- vi. is not located in areas where an identified source of potential hazard exists and development is likely to introduce a source of potential hazard or increase the existing level of potential hazard; and*
- vii. minimises traffic levels and does not harm the safety of road users. Proposals to work from home must also ensure provision is made for access, servicing and parking."*

2.4.5 These policies will be considered during the preparation of the assessment which will enable the Council or EA to make a full assessment of potential hazards and impacts associated with the proposed STOR facility.

⁸ https://www.oldham.gov.uk/download/downloads/id/1445/development_plan_document_-_joint_core_strategy_and_development_management_policies.pdf

3.0 Methodology

3.1 Emissions Assessment

3.1.1 The proposal would not introduce any new sensitive receptors at the site. However, emissions associated with the combustion of the gas has the potential to cause increases in pollutant concentrations in the vicinity of the site.

3.1.2 An industry standard atmospheric dispersion model, ADMS 5.2, was used to model releases of the identified substances. The dispersion modelling procedure was as follows:

- Information on plant exhaust dimensions and position were provided by Rochdale Power Limited;
- Process conditions were provided by Rochdale Power Limited and on the technical datasheet for the JMS 624 GS-N.L (Appendix A);
- Emission rates were provided by Rochdale Power Limited and based on the emissions provided on the technical datasheet for the JMS 624 GS-N.L (Appendix A);
- Appropriate data to describe meteorological conditions in the vicinity of the site were obtained from Atmospheric Dispersion Modelling (ADM) Ltd;
- The above information was entered into the dispersion model to determine pollutant concentrations in the vicinity of the site; and
- The study results were compared with the relevant assessment criteria.

3.1.3 Dispersion modelling was undertaken using ADMS 5 (v5.2.2.0), which is developed by Cambridge Environmental Research Consultants (CERC) Ltd. ADMS 5 is a short-range dispersion modelling software package that simulates a wide range of buoyant and passive releases to atmosphere. It is a new generation model utilising boundary layer height and Monin-Obukhov length to describe the atmospheric boundary layer and a skewed Gaussian concentration distribution to calculate dispersion under convective conditions.

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

3.1.5 It should be noted the modelling prediction produced by the ADMS-5 are widely accepted within the UK by the EA and DEFRA.

3.2 Modelling Scenarios

3.2.1 The modelled pollutant scenarios considered in the modelling assessment are summarised in Table 4. Given that the proposed facility will utilise natural gas inputs there are no associated emissions of sulphur SO₂ and PM and these have not been assessed further in accordance with the EA "Emissions from specified generators guidance"⁹.

⁹ https://consult.environment-agency.gov.uk/psc/mcp-and-sg-regulations/supporting_documents/Specified%20Generators%20Modelling%20GuidanceINTERIM%20FINAL.pdf

Table 4 Dispersion Modelling Scenarios

Pollutant	Modelled As	
	Short Term	Long Term
NO ₂	99.79th percentile (%ile) 1-hour mean	Annual mean
NO _x	24-hour mean	Annual mean
Nitrogen deposition	-	Annual deposition
Acid deposition	-	Annual deposition

3.2.2 Some short-term air quality criteria are framed in terms of the number of occasions in a calendar year on which the concentration should not be exceeded. As such, the percentile (%ile) shown in Table 4 was selected to represent the relationship between the permitted number of exceedances of short-period concentrations and the number of periods within a calendar year.

3.2.3 Emissions have been based on the maximum emissions provided by the engine manufacturer. This ensures a robust approach has been considered using a worst-case scenario.

3.3 Process Conditions

3.3.1 Process conditions for the plant were provided through correspondence with Rochdale Power Limited. Reference should be made to Table 5 for the generator parameters for generator load modelled.

Table 5 Process Conditions

Parameter	Unit	JMS 624 GS-N.L
Stack location	NGR	391859.2, 411182.8
Stack diameter	m	0.80
Stack height	m	10.00
Flue gas efflux velocity	m/s	23.81
Volumetric flow rate (normalised, wet) ^a	Nm ³ /s	18,850.00
Volumetric flow rate (actual)	m ³ /s	11.97
Temperature	°C	351.00

a: based on wet gas, 0°C standard pressure from technical data sheet (see Appendix A) - 100% load.

3.3.2 The stack height within the model was reduced by 5 m, i.e. to a height of 5 m above the surrounding ground level, to account for the proposal to dig the site in by 5 m. This assures that a robust case assessment has been carried out.

3.4 Assessment Criteria

3.4.1 Predicted ground level pollutant concentrations and deposition rates were compared with the relevant, AQOs, AQLVs, critical levels and critical loads identified within Section 2.0. These criteria are collectively referred to as Environmental Quality Standards (EQSs).

3.5 Emissions

3.5.1 The emission rates from the engine exhaust were calculated based on maximum permitted emission concentrations given in the proposed plant technical datasheet. The calculated mass emissions rate in grams per second is shown in Table 6. It is therefore considered that the maximum permissible emissions rates will be continuously emitted and that a worst-case assessment has been provided.

Table 6 Emission Rates

Pollutant	Maximum Normalised Emission (mg/Nm ³) ^a	Maximum Actual Emission (mg/m ³) ^b	Mass Emission Rate (g/s)
NO _x	250.00	73.03	0.874

a: Referenced at 5% O₂, 0°C

b: Actual conditions assuming O₂ 9% and moisture content 11%

3.6 Time Varied Emissions

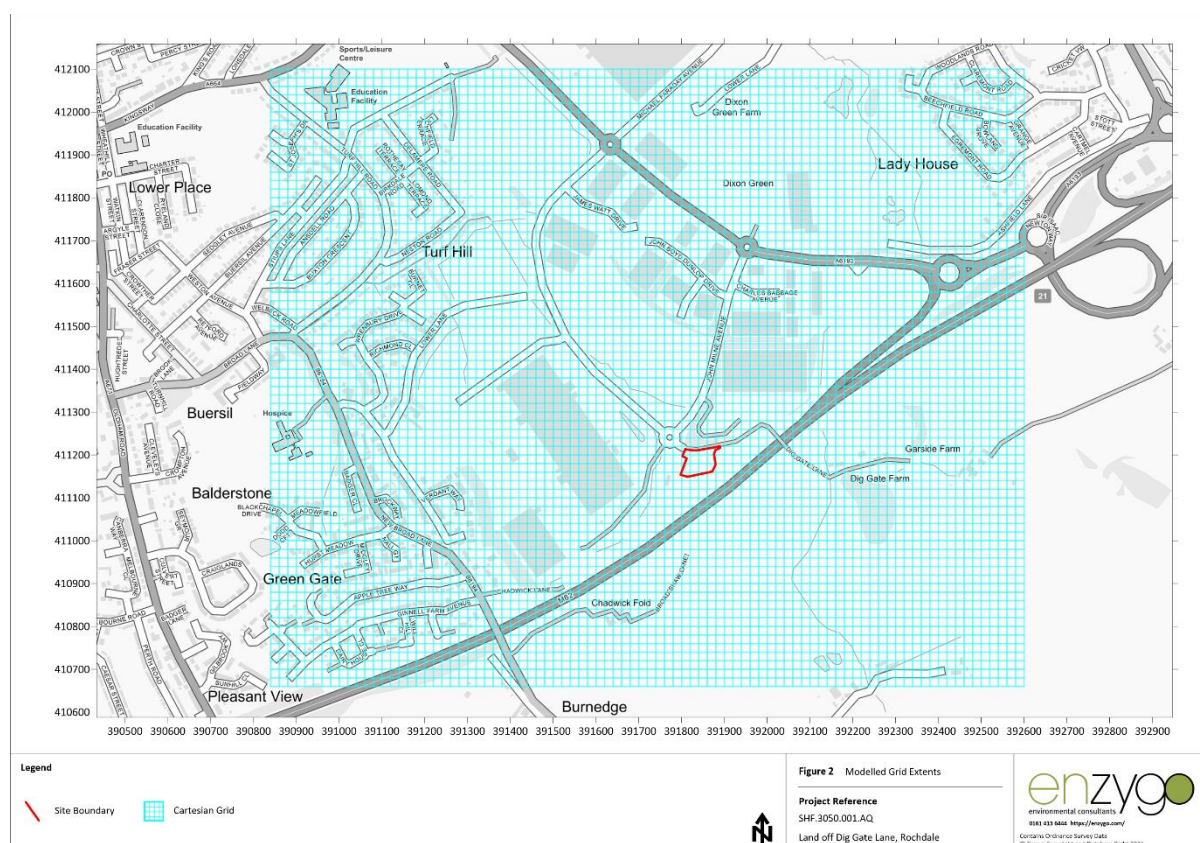
- 3.6.1 Rochdale Power Limited have confirmed that the facility will operate for a maximum of 4,000 hours per annum.
- 3.6.2 Specific operating hours are unknown and to provide operational flexibility, it is therefore difficult to accurately assess the short-term impacts for NO₂ concentrations, given that objectives are based on the number of allowances that can be exceeded for a specified averaging period.
- 3.6.3 Therefore, the ADMS model was run for a full calendar year (8,760 hours) of continuous operation to ensure that the varying hourly meteorological conditions were captured.
- 3.6.4 EA guidance¹⁰ states that annual mean PCs associated with operation hours less than a full calendar year, annual mean concentrations can be calculated by applying a proportional factor. In this instance a factor of 0.4566 was applied to annual mean PC results. The factor equates to the operational hours per year of 4,000 divided by the operational envelope of 8760 hours.
- 3.6.5 However, as the 1-hour NO₂ AQO is expressed as a percentile of hourly concentrations over a year, representing this metric with a limited and unknown emitting period is less straightforward. EA guidance¹⁰ recommends an approach utilising hypergeometric probability distribution although as a worst case scenario this assessment has calculated the 99.79th %ile of hourly NO₂ means based on a continuous operation for the whole year.

3.7 Assessment Extents

- 3.7.1 Ambient concentrations were predicted over the following areas, relating to the modelling domain of human receptor locations:
- NGR: 390840, 410660 to 392600, 412100.
- 3.7.2 One Cartesian grid with a resolution of 20 m and a height of 1.5 m was included in the model. Results were subsequently used to produce contour plots within the Surfer[®] visualisation software package. This area is indicated in Figure 2.

¹⁰ <https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment>

Figure 2 Modelled Grid Extents



3.8 Human Sensitive Receptors

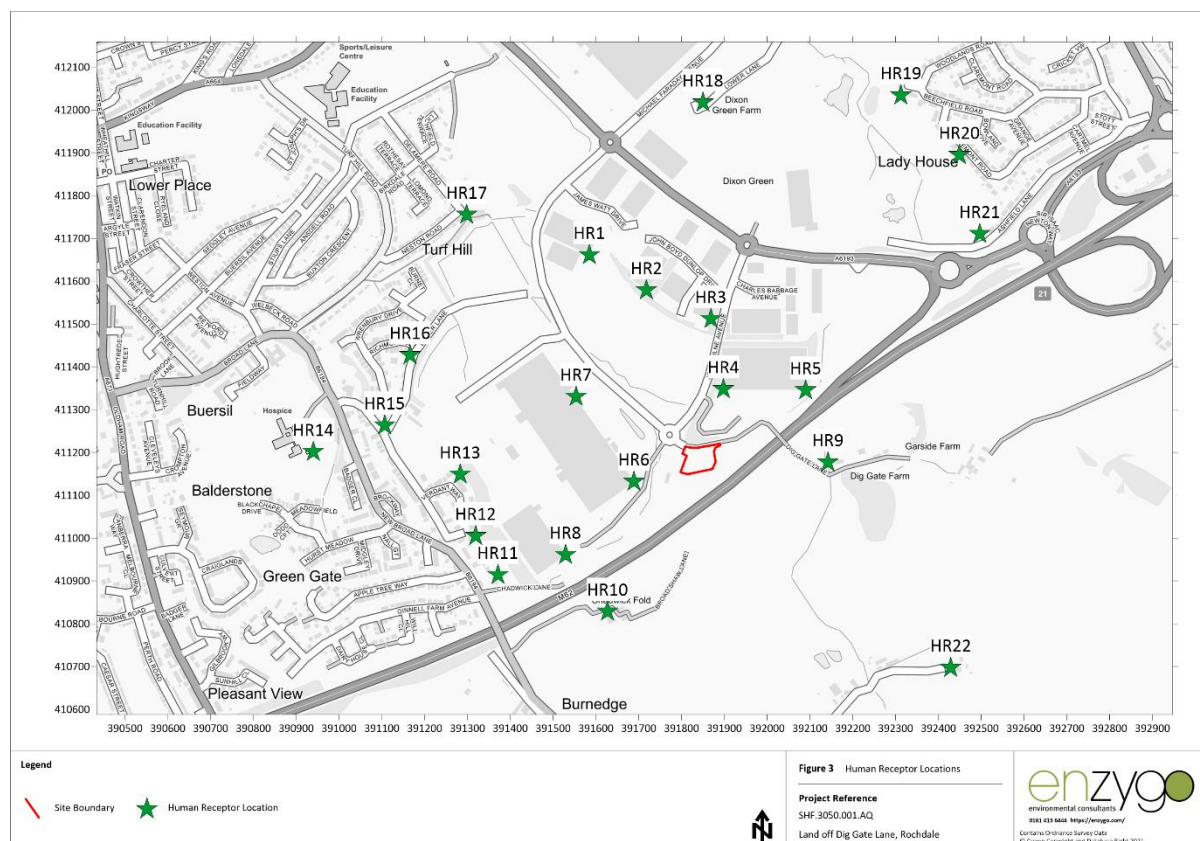
3.8.1 A sensitive receptor is defined as any location which may be affected by changes in air quality. A desk-top study was undertaken in order to identify any sensitive human receptor locations in the vicinity of the site that required specific consideration during the assessment. These were modelled at the minimum height of relevant exposure and the maximum height with reference to the flue height. The modelled receptors are summarised in Table 7 and shown in Figure 3.

Table 7 Sensitive Human Receptors

Receptor		Use	NGR (m)		Distance from Centre of Site (m)	Height (m)
			X	Y		
HR1	Thales	Commercial	391584.4	411660.9	565	1.5
HR2	Takeuchi Manufacturing	Commercial	391718.0	411578.6	441	1.5
HR3	Industrial Unit	Commercial	391868.3	411511.4	363	1.5
HR4	Source BioScience	Commercial	391897.7	411347.6	209	1.5
HR5	Amazon1	Commercial	392090.1	411345.0	327	1.5
HR6	Amazon2	Commercial	391688.6	411131.7	140	1.5
HR7	toyou	Commercial	391553.4	411329.9	327	1.5
HR8	Xpo Rochdale	Commercial	391528.7	410960.6	354	1.5
HR9	Dig Gate Farm	Residential	392141.8	411176.7	316	1.5
HR10	Chadwick Fold	Residential	391627.0	410827.8	380	1.5
HR11	3 White Horse Meadows	Residential	391370.6	410913.8	514	1.5

Receptor		Use	NGR (m)		Distance from Centre of Site (m)	Height (m)
			X	Y		
HR12	6 Farlands Rise	Residential	391318.9	411004.6	529	1.5
HR13	13 Verdant Way	Residential	391282.8	411148.1	544	1.5
HR14	Springhill Hospice	Medical	390939.7	411200.9	889	1.5
HR15	227 Broad Lane	Residential	391106.2	411263.0	729	1.5
HR16	12 Richmond Close	Residential	391165.6	411427.2	717	1.5
HR17	60 Neston Road	Residential	391298.1	411755.0	803	1.5
HR18	Dixon Green Farm	Residential	391849.8	412016.9	866	1.5
HR19	67 Beechfield Road	Residential	392312.4	412034.2	1,008	1.5
HR20	83 Egremont Road	Residential	392448.7	411894.7	969	1.5
HR21	70 Ashfield Lane	Residential	392496.5	411710.2	872	1.5
HR22	Bryney Hayes Farm	Residential	392429.0	410697.1	754	1.5

Figure 3 Human Sensitive Receptors



3.8.2 It should be noted that only residential receptors were assessed against long term (annual mean) AQOs. This is in line with guidance shown in Table 2 which states that annual mean AQOs are not applicable at commercial properties.

3.9 Ecological Sensitive Receptors

3.9.1 With regard to receptors of ecological sensitivity, the EA guidance 'Air emissions risk assessment for your environmental permit'¹³ states:

"Note that conservation sites need only be considered where they fall within set distances of the activity:

- SPAs, SACs or Ramsar sites within 10 km of the installation; and
- SSSIs, National Nature Reserves (NNRs), Local Nature Reserves (LNRs), Local Wildlife Sites (LWS) and Ancient Woodland (AW) within 2 km of the location."

3.9.2 A study was undertaken to identify any statutory designated sites of ecological or nature conservation importance within the distances stated above. This was completed using the Multi-Agency Geographic Information for the Countryside (MAGIC)¹¹ web-based interactive mapping service¹¹, which draws information on key environmental schemes and designations.

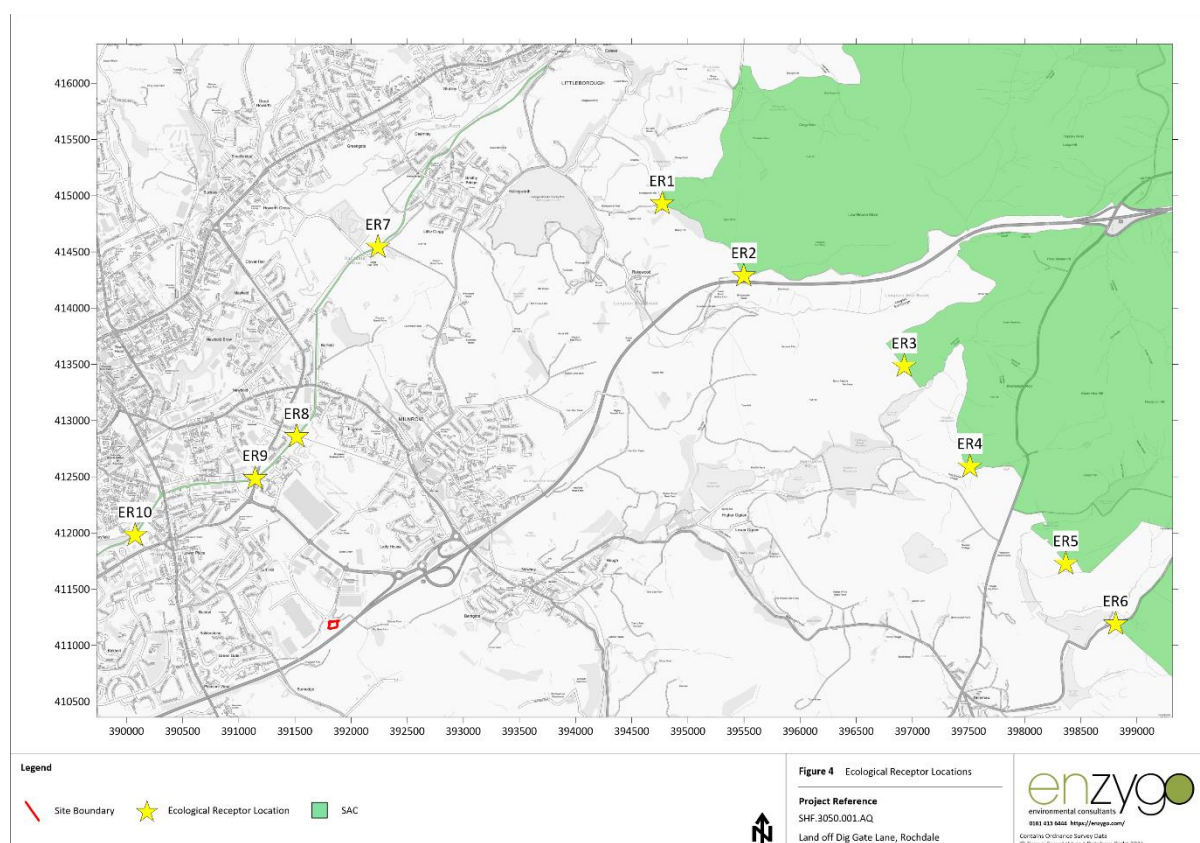
3.9.3 The receptor points chosen to represent the closest points to the proposed site and are displayed in Table 8 and Figure 4.

Table 8 Ecological Sensitive Receptors

Ecological Receptor		Designation	NGR (m)		Distance from Exhaust Location (m)
			X	Y	
ER1	South Pennine Moors	SAC	394770.1	414927.3	4,788
ER2	South Pennine Moors	SAC	395499.3	414285.7	4,828
ER3	South Pennine Moors	SAC	396928.4	413483.6	5,609
ER4	South Pennine Moors	SAC	397511.7	412589.2	5,864
ER5	South Pennine Moors	SAC	398367.2	411723.9	6,565
ER6	South Pennine Moors	SAC	398809.6	411189.2	6,983
ER7	Rochdale Canal	SAC	392240.7	414540.1	3,414
ER8	Rochdale Canal	SAC	391515.5	412856.9	1,734
ER9	Rochdale Canal	SAC	391147.5	412483.5	1,496
ER10	Rochdale Canal	SAC	390075.9	411980.2	1,938
ER11	Rochdale Canal	SAC	388306.1	410291.6	3,624

¹¹ Multi-Agency Geographic Information for the Countryside, www.magic.gov.uk

Figure 4 Ecological Sensitive Receptors



3.10 Baseline Conditions

- 3.10.1 A desktop study was undertaken to define the baseline air quality within the vicinity of the development. The baseline year will correspond with either the current year or the most recent year that monitoring data is available.
- 3.10.2 Pollutant background concentrations for the site, monitoring and human receptor locations have been sourced from the DEFRA background maps¹².
- 3.10.3 Background concentrations and depositions for ecological receptors have been derived from the APIS website⁶.
- 3.10.4 All Baseline information is detailed in Section 4.0.

3.11 Meteorological Data

- 3.11.1 Meteorological data used in this assessment was taken from Manchester Airport meteorological station over the period 1st January 2015 to 31st December 2019 (inclusive). Manchester Airport meteorological station is located at approximate NGR: 381745, 383960, which is approximately 29 km south-west of the development site.
- 3.11.2 All meteorological data used in the assessment was provided by ADM Ltd, which is an established distributor of meteorological data within the UK. Figure 5 shows wind roses of utilised meteorological data. As previously stated, maximum emissions over the five years of meteorological data were utilised to ensure a worse case assessment. Hourly sequential formats were used with the dispersion modelling.

¹² <https://uk-air.defra.gov.uk/data/laqm-background-home>

Figure 5 Manchester Airport Wind Rose



3.12 Roughness Length

3.12.1 The specific roughness length (z_0) values used to represent conditions in the vicinity of the application site, as well as conditions at the meteorological are summarised in Table 9.

Table 9 Utilised Roughness Length

Location	Roughness length (m)	ADMS Description
Application Site	0.5	Parkland, open suburbia
Meteorological Station	0.3	Agricultural (max)

3.12.2 Values of z_0 are considered appropriate for the morphology of the assessment area.

3.13 Monin-Obukhov Length

3.13.1 The Monin-Obukhov length provides a measure of the stability of the atmosphere. The specific length values used to represent conditions in the vicinity of the application site, as well as conditions at the meteorological are summarised in Table 10.

Table 10 Utilised Monin-Obukhov Lengths

Location	Monin-Obukhov length (m)	ADMS Description
Application Site and Meteorological Station	30	Mixed urban/industrial

3.13.2 Monin-Obukhov values are considered appropriate for the morphology of the assessment area.

3.14 Terrain Data

3.14.1 Ordnance Survey Landform Panorama terrain data was included for the site and surrounding area in order to take account of the specific flow field produced by variations in ground height

throughout the assessment extents. This was pre-processed using the dedicated function within ADMS 5 and covers a 11.5 km x 11.5 km area extending from the centre of the proposed site.

- 3.14.2 In addition to take account of the proposal being dug 5 m metres below the surrounding ground level building and stack heights were adjusted accordingly.

3.15 Building Effects

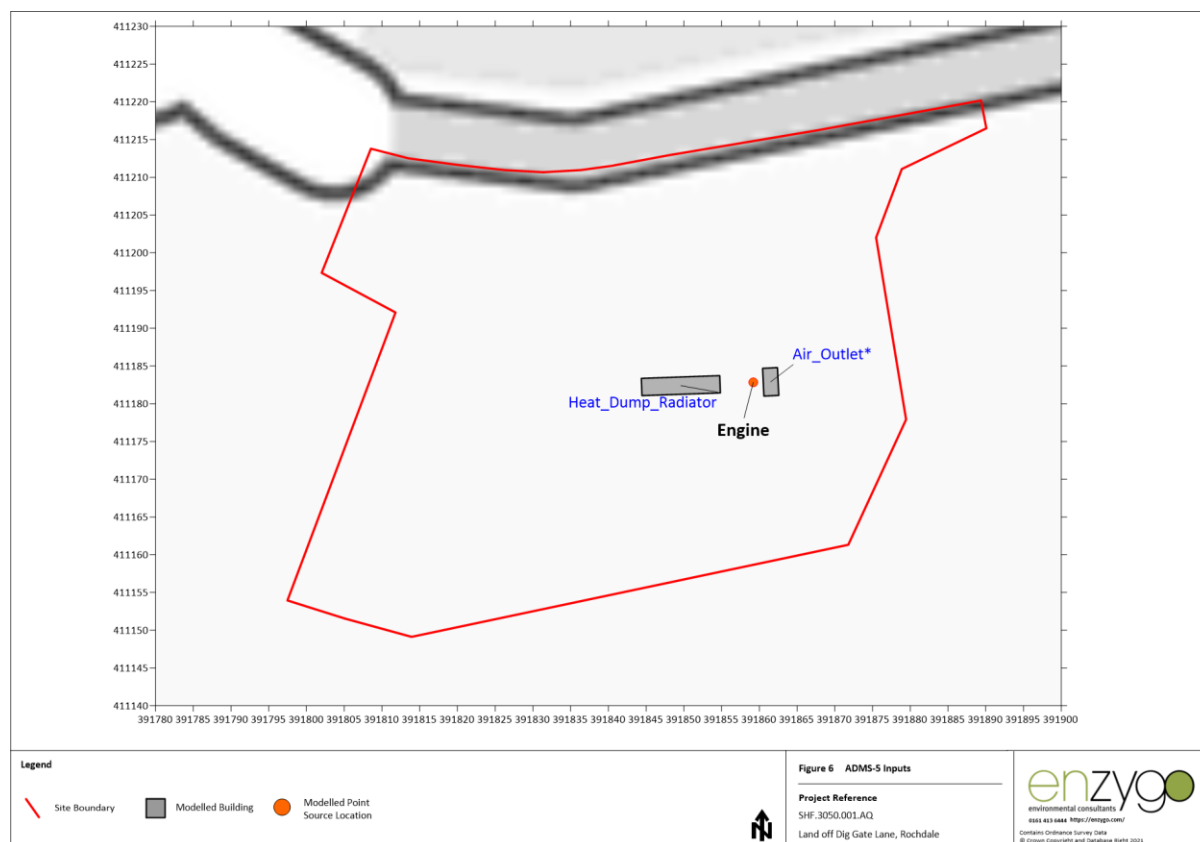
- 3.15.1 The dispersion of substances released from elevated sources can be influenced by the presence of buildings close to the emission point. Structures can interrupt the wind flows and cause significantly higher ground-level concentrations close to base of buildings than would arise in the absence of the buildings. Building heights were provided by the project architect.
- 3.15.2 As it is proposed to excavate the site level by 5 m only buildings higher than 5m were included in the model and were modelled at their height above the existing ground level (i.e. actual height minus 5 m). The buildings included within the model are summarised in Table 11.

Table 11 Building Geometries

	Building	NGR (m)		Height (m)	Length (m)	Width (m)	Angle (°)
		X	Y				
1	Air Outlet Attenuator	391861.5	411182.9	3.7	3.7	2.0	177.3
2	Heat Dump Radiator	391849.6	411182.4	1.7	2.3	10.4	178.0

- 3.15.3 Figure 6 shows a graphical representation of the building layout and the ADMS 5 model input.

Figure 6 ADMS 5 Modelling Inputs



3.16 NO_x to NO₂ Conversion

- 3.16.1 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 NO₂.
- 3.16.2 Ground level NO_x concentrations were predicted through dispersion modelling. NO₂ concentrations reported in the results section assume 70% conversion from NO_x to NO₂ for long term concentrations and 35% conversion for short-term concentrations, based upon EA guidance⁴.

3.17 Deposition Rates

- 3.17.1 Deposition rates were calculated using the conversion factors provided within EA document 'Technical Guidance on Detailed Modelling approach for an Appropriate Assessment for Emissions to Air AQTAG 06'¹³. Predicted pollutant concentrations were multiplied by the relevant deposition velocity and conversion factor to calculate the speciated dry deposition flux. The conversion factors used are presented within Table 12.

Table 12 Conversion Factors to Determine Dry Deposition Flux

Pollutant	Grassland Deposition Velocity (m/s)	Forest Deposition Velocity (m/s)	Conversion Factor (µg/m ² /s to kg/ha/yr of pollutant species)
NO ₂	0.0015	0.003	96.0

- 3.17.2 The conversion to units of equivalents, a measure of the potential acidifying effect of a species, was undertaken by multiplying the dry deposition flux by the standard conversion factors shown in Table 13.

Table 13 Conversion Factors to Units of Equivalents

Species	Conversion Factor from kg/ha/yr to keq/ha/yr
Nitrogen	Divide by 14

- 3.17.3 The total nitrogen proportion was calculated from NO_x concentrations. For acid deposition, the proportion of the EQS consisting of the PC and PEC were then calculated using the tool available on the APIS app website.

3.18 Assessment Criteria

- 3.18.1 Predicted ground level pollutant concentrations and deposition rates were compared with the relevant AQOs identified within Table 1. These criteria are collectively referred to as EQSs.

3.19 Significance of Impacts

EPUK and IAQM Guidance

- 3.19.1 The assessment considered the following scenarios in order to quantify impacts at sensitive receptors in the vicinity of the site:
- Do-minimum (DM) (predicted background concentrations without the proposed installation); and

¹³ AQTAG 06: Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air, EA, 2014

- Do-something (DS) (predicted background concentrations including with the addition of emissions from the proposed installation).

3.19.2 Receptors potentially sensitive to changes in pollutant concentrations were identified within the assessment extents. LAQM (TG16)² provides the following examples of where annual mean AQOs should apply:

- Residential properties;
- Schools;
- Hospitals; and
- Care homes.

3.19.3 The sensitivity impact significance of each receptor was defined in accordance with the criteria shown in Table 2. These are based upon the guidance provided within the EPUK and IAQM guidance⁵.

Table 14 Significance of Impacts – Long Term Concentrations

Long Term Average Concentration	% Change in Concentration Relative to AQO			
	1	2-5	6-10	>10
75% or less of AQO	Negligible	Negligible	Slight	Moderate
76 - 94% of AQO	Negligible	Slight	Moderate	Moderate
95 - 102% of AQO	Slight	Moderate	Moderate	Substantial
103 - 109% of AQO	Moderate	Moderate	Substantial	Substantial

3.19.4 The criteria shown in Table 14 is adapted from the EPUK and IAQM guidance with sensitivity descriptors included to allow comparisons of various air quality impacts. It should be noted that changes of 0%, i.e. less than 0.5%, will be described as negligible in accordance with the EPUK and IAQM guidance⁵.

3.19.5 For short term impacts, the EPUK and IAQM guidance⁵ suggests the following criteria, as shown in Table 15, based on EA guidance.

Table 15 Significance of Impacts – Short Term Concentrations

% Change in Hourly Concentration Relative to AQO			
<10	10-20	20-50	>50
Negligible	Slight	Moderate	Substantial

3.19.6 Following the prediction of impacts at discrete receptor locations utilising the criteria in Table 14 and Table 15, the EPUK and IAQM guidance states that this framework is to be used as a starting point to make a judgement on significance of effect but other influences might need to be accounted for. Whilst impacts might be determined as 'slight', 'moderate' or 'substantial' at individual receptors, overall effect might not necessarily be deemed as significant in some circumstances. The following factors may provide some assistance in determining the overall significance of a development:

- Number of properties affected by significant air quality impacts and a judgement on the overall balance;
- Where new exposure is introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective will be relevant;

- The percentage change in concentration relative to the objective and the descriptions of the impacts at the receptors;
- Whether or not an exceedance of an objective is predicted to arise or be removed in the study area due to a substantial increase or decrease; and
- The extent to which an objective is exceeded e.g. an annual mean NO₂ concentration of 41 µg/m³ should attract less significance than an annual mean of 51 µg/m³.

EA Guidance Criteria

3.19.7 Guidance for assessing the significance of emissions impacts from point sources are also given in the EA's online guidance³. Predicted pollutant concentrations are summarised in the following formats:

- Process contribution (PC) - Predicted pollutant concentration as a result of emissions from the site only; and
- Predicted environmental concentration (PEC) - Total predicted pollutant concentration as a result of emissions from the site and existing baseline levels.

Initial Screening Stage

3.19.8 The significance of predicted impact has been assessed in accordance with criteria in the EA guidance 'Air emissions risk assessment for your environmental permit' and through consideration of likely effects as a result of the proposals. The EA guidance states that process contributions can be considered insignificant if:

- the short-term PC is less than 10% of the short-term environmental standard; and
- the long-term PC is less than 1% of the long-term environmental standard.

3.19.9 If these criteria are not met then a second stage of screening to determine the impact of the PEC is required.

Second Screening Stage

3.19.10 If the above criteria are not met, then a second stage of screening is required to determine the impact of the PEC

- The short-term PC is less than 20% of the short-term environmental standards minus twice the long-term background concentration; and
- The long-term PEC is less than 70% of the long-term environmental standards.

3.19.11 If both of these criteria are met during the second stage of screening then predicted impacts can be considered insignificant. Should these criteria be exceeded then the PEC should be checked against the EQS.

Ecological Screening

3.19.12 If emissions that affect Special Protection Areas (SPAs), Special Areas of Conservation (SACs), RAMSAR sites or Site of Special Scientific Interest (SSSIs) meet both of the following criteria outlined within the EA guidance³, they can be considered insignificant:

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

- the long-term PC is less than 1.0% of the long-term environmental standard for protected conservation areas.
- 3.19.13 If the predicted long-term PC is greater than 1.0% and the PEC is less than 70% of the long-term environmental standard, the emissions can be considered insignificant. Should the predicted PEC be greater than 70% of the long-term environmental standard, the PEC should be checked against the EQS for the ecological receptor.
- 3.19.14 When considering impacts at local nature sites and the emissions meet both of the following criteria, impacts can be considered insignificant if:
- The short-term PC is less than 100% of the short-term environmental standard; and
 - The long-term PC is less than 100% of the long-term environmental standard.
- 3.19.15 In addition, the EA guidance also states that the APIS⁶ critical load function tool should be used to determine whether there is an exceedance of deposition of nutrient nitrogen or acidity, as the standard of exceedance is site-specific.
- 3.19.16 All the above factors were considered and an overall significance determined for the impact of the emissions. It should be noted that the determination of significance relies on professional judgement and reasoning should be provided as far as practicable. This has been considered throughout the assessment when defining predicted impacts.

3.20 Modelling Uncertainties

- 3.20.1 Uncertainty in dispersion modelling predictions can be associated with a variety of factors, including:
- Model uncertainty - due to model limitations;
 - Data uncertainty - due to errors in input data, including emission estimates, operational procedures, land use characteristics and meteorology; and
 - Variability - randomness of measurements used.
- 3.20.2 Potential uncertainties in model results were minimised as far as practicable and worst-case inputs used in order to provide a robust assessment. This included the following:
- Choice of model - ADMS 5.2.0 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;
 - Meteorological data - Modelling was undertaken using five meteorological data sets (2015-2019) from the most appropriate observation site to the development to take account of worst-case conditions;
 - Plant operating conditions - Operational parameters were supplied by the supplier's Engine datasheet. As such, these are considered to be representative of likely operating conditions;
 - Emission rates – based on plant maximum emissions provided by the engine supplier (Appendix A). As such, these are considered to be worst case emissions and actual emissions are likely to be considerably less than this. As an additional worst case consideration, the engine was modelled to be operational continuously.

- Background concentrations - Obtained from the DEFRA mapping study for human receptors. Although these may underestimate actual concentrations in the vicinity of pollutant sources, such as roads, they are considered suitable for an assessment of this nature;
- Receptor locations - A Cartesian Grid at a height of 1.5m, to replicate breathing height, was included in the model in order to predict concentrations throughout the assessment extents. Specified Receptor points were also included at sensitive locations to provide additional consideration of these areas, varied heights were included to represent the window elevations of each associated building; 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.

3.20.3 It is considered that the use of the stated measures to reduce uncertainty and the use of worst-case assumptions when necessary has resulted in model accuracy of an acceptable level.

4.0 Baseline Conditions

Existing air quality conditions in the vicinity of the installation were identified in order to provide a baseline for assessment. These are detailed in the following sections.

4.1 Local Air Quality Management

4.1.1 Following a review of DEFRA's AQMA database one AQMA was identified within the vicinity of the Proposed Development as detailed below:

"Greater Manchester Combined Authority (GMCA) AQMA (Rochdale Metropolitan Borough Council) - This is the part of the Greater Manchester Combined Authority AQMA located within the Rochdale Council area."

4.1.2 Similarly neighbouring OMBC has designated areas part of the GMCA AQMA within their borough.

4.1.3 The AQMA has been declared for exceedances of the annual mean AQO for NO₂ and is located 7 m from the site boundary at its closest point. The location of the AQMA is shown in Figure 1 and in the site location context is a reflection of elevated concentrations due to traffic emissions from the M62.

4.2 Local Air Quality Monitoring

4.2.1 RBC monitors pollutant concentrations using continuous methods throughout their area of administration. A review of the most recent air quality monitoring data available indicates no one automatic analysers within the vicinity of the site. However OMBC has one automatic analyser located within 3 km of the site. Monitoring data from recent years at this location has been presented in Table 16.

Table 16 Automatic Monitoring Results

ID	Site Name	Type	Dist' to Site (m)	Annual Mean Concentration (µg/m ³)			
				2018	2019	2020	2021
4	Crompton Way	Roadside	2,843	28	30	23	25

4.2.2 The automatic monitoring indicates no exceedances of the AQO at this location.

4.2.3 RBC and OMBC also use passive diffusion tubes to monitor NO₂ concentrations throughout the borough. A review of their most recent monitoring data available indicated that there are 8 diffusion tubes operated by RDC and 2 tubes operated by OMBC located in the vicinity of the site. Data is presented in Table 17 with exceedances of the annual mean AQO highlighted in bold.

Table 17 Diffusion Tube Monitoring Results

ID	Site Name	Type	Distance to Site (m)	Annual Mean Concentration (µg/m ³)			
				2018	2019	2020	2021
15A	M62 Depot Milnrow	Roadside	1,375	24.2	27.0	20.3	23.0
16A	Ashfield Road Milnrow	Urban Background	907	22.6	19.9	18.8	18.3
17A	Kingsway Rochdale	Urban Background	1,582	36.1	23.5	18.5	17.6
22A	19 Kingsway Rochdale	Roadside	1,593	28.6	43.4	31.5	32.7
23A	174 Oldham Road	Roadside	1,696	-	37.8	27.6	31.4

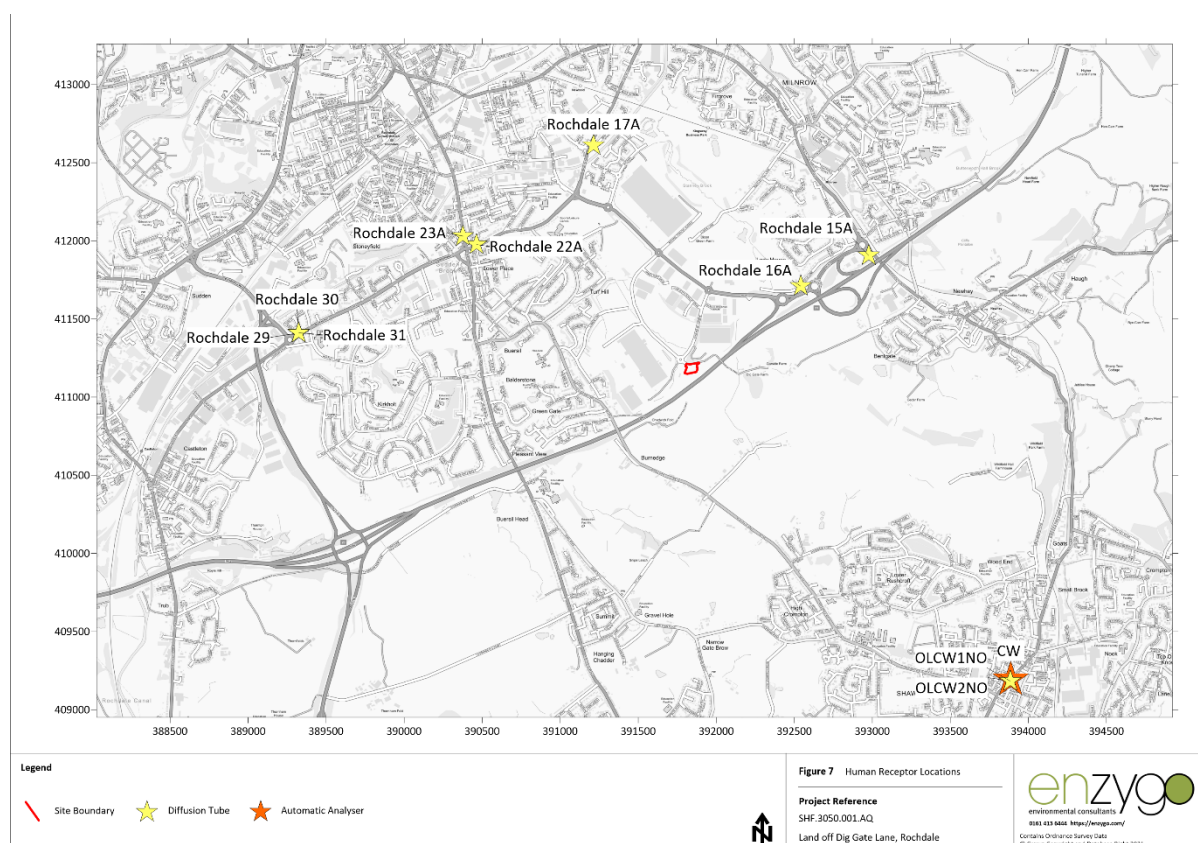
ID	Site Name	Type	Distance to Site (m)	Annual Mean Concentration ($\mu\text{g}/\text{m}^3$)			
				2018	2019	2020	2021
29	Queensway, Rochdale	Roadside	2,515	-	-	-	31.1
30	Queensway, Rochdale	Roadside	2,515	-	-	-	31.1
31	Queensway, Rochdale	Roadside	2,515	-	-	-	31.1
OLCW2	Crompton Way 2	Roadside	2,847	30.6	33.3	24.9	28.9
OLCW1	Crompton Way 1	Roadside	2,847	31.8	32.0	24.2	28.9

4.2.4 As indicated in Table 17, there was one exceedance of the NO_2 annual mean AQO at the Rochdale 22 diffusion tube monitoring locations in recent years. Concentrations monitored in 2020 and to a lesser extent 2021 are likely to be influenced by COVID location measures.

4.2.5 Monitors Rochdale 15A and 16A are located at similar distances from the M62 as the Proposed Development site although, unlike the site location, they are close to a major road junction. Therefore they can be considered as a worst case representation of ambient levels near the site and nearby sensitive receptors.

4.2.6 The location of all monitoring locations considered in this assessment are shown in Figure 7.

Figure 7 Monitoring Locations



4.3 Background Pollutant Concentrations

4.3.1 Pollutant background concentrations for the site, monitoring and receptor locations have been sourced from the DEFRA background maps, local monitoring networks and the APIS website⁶.

4.3.2 The total concentration of a pollutant is comprised of explicit local emission sources (such as roads and industrial sources) and the background component. The background component

consists of indeterminate sources which are transported into an area from further away by meteorological conditions. Background pollutant concentrations are therefore the ambient level of pollution that is not affected by local sources of pollution.

DEFRA Background Concentrations

4.3.3 Predictions of background pollutant concentrations on a 1 km by 1 km grid basis have been produced by DEFRA for the entire of the UK to assist LAs in their Review and Assessment of air quality. The assessment extents are located in the following grid squares NGR:

- 391500, 411500
- 391500, 410500
- 392500, 411500
- 391500, 412500
- 390500, 411500
- 392500, 412500
- 392500, 410500

4.3.4 Data for these locations was downloaded from the DEFRA website for NO_x and NO₂ for the purpose of this assessment. The background concentrations used are summarised in Table 18.

Table 18 Predicted DEFRA Background Pollutant Concentrations

DEFRA Grid Square Receptor Reference	Pollutant	2021 Predicted Background Concentration (µg/m ³)
391500, 411500 Site, HR1-HR4, HR6, HR7, HR12, HR13, HR15-HR17	NO _x	20.91
	NO ₂	15.28
391500, 410500 HR8, HR10, HR11	NO _x	22.40
	NO ₂	16.30
392500, 411500 HR5, HR9, HR20, HR21	NO _x	25.45
	NO ₂	18.26
391500, 412500 HR18	NO _x	18.09
	NO ₂	13.41
390500, 411500 HR14	NO _x	20.60
	NO ₂	15.07
392500, 412500 HR19	NO _x	18.47
	NO ₂	13.67
392500, 410500 HR22	NO _x	12.64
	NO ₂	16.93

4.3.5 Background concentrations for NO_x and NO₂ were predicted for 2021. These are based on the most recent predictions available from DEFRA. Whilst the background concentrations shown take account emissions from major roads, as they represent concentrations over a 1 km grid square, it is reasonable to assume that they do not reflect existing concentrations at locations closer to major roads such as the M62.

4.3.6 As the proposed development and the nearest human sensitive receptors are located relatively close to the M62 this assessment has assumed a background for these receptors based on the maximum NO₂ concentrations monitored at diffusion tube locations Rochdale 15A and Rochdale 16A as described in Section 4.2. This ensures that elevated background concentrations at receptors close to the M62 have been considered in this assessment.

4.3.7 As such a background concentration of 27.0 µg/m³ has been used for human sensitive receptors. A comparison with the DEFRA background concentrations shown in Table 18 indicates that the use of this background this can be considered as a robust assumption.

Short term Background Concentrations

4.3.8 With relation to short-term background concentrations, it was assumed that the short-term concentration of a substance is twice its long-term concentration as suggested within EA risk assessment for your environmental permit guidance³.

Ecological Impacts Baselines

4.3.9 Critical loads have been designated within the UK based on the sensitivity and relevant features of the receiving habitat. A review of the APIS website was undertaken in order to identify the most suitable habitat description and associated critical load for the designations considered within the model. It should be noted that for the receptors with multiple habitats, the most sensitive habitat has been taken for both nitrogen and acid deposition have been utilised for the purpose of this assessment. The critical loads for nitrogen deposition are presented in Table 19.

Table 19 Nitrogen Critical Load

Ecological Designation	Feature	Critical Load Classs	Nitrogen Critical Load (kgN/ha/yr)	
			Min	Max
South Pennine Moors (SAC)	Blanket Bogs (if active)	Raised and blanket bogs	5	10
Rochdale Canal (SAC)	Standing Open Water and Canals	Luronium natans - Floating water-plantain	3	10

4.3.10 It should be noted that the critical loads shown for the Rochdale Canal SAC apply to soft water oligotrophic or dystrophic lakes with the lower load relating to alpine lakes. Therefore the use of these critical loads for the canal can be seen as a worst case assessment.

4.3.11 Table 20 shows the relevant critical loads for acid deposition at site.

Table 20 Acid Critical Load

Ecological Designation	APIS Habitat	Critical Load (ke/ha/yr)		
		CLmaxS	CLmaxN	CLminN
South Pennine Moors (SAC)	Raised and blanket bogs	0.86	1.81	0.321
Rochdale Canal (SAC)	Standing Open Water and Canals	No Sensitivity to Acidification for Site		

4.3.12 No sensitivity for acid deposition is given for the Rochdale Canal SAC and therefore no assessment of acidification is possible at this designation.

4.3.13 Background deposition rates at the ecological receptor locations were downloaded from the APIS website and are summarised in Table 21. As no location specific values were given for the Rochdale Canal designation the maximum value in the given range was used for each receptor.

Table 21 Background Deposition Rates

ID	Ecological Designation	APIS Habitat	Background Deposition Rate		
			Nitrogen (kgN/ha/yr)	Acid (keq/ha/yr)	
				Nitrogen	Sulphur
ER1	South Pennine Moors	Raised and blanket bogs	27.1	1.9	0.3
ER2	South Pennine Moors	Raised and blanket bogs	27.3	1.9	0.3
ER3	South Pennine Moors	Raised and blanket bogs	27.2	1.9	0.3
ER4	South Pennine Moors	Raised and blanket bogs	27.2	1.9	0.3
ER5	South Pennine Moors	Raised and blanket bogs	27	1.9	0.3
ER6	South Pennine Moors	Raised and blanket bogs	27.1	1.9	0.3
ER7	Rochdale Canal	Standing Open Water and Canals	22.9	N/A	N/A
ER8	Rochdale Canal	Standing Open Water and Canals	22.9	N/A	N/A
ER9	Rochdale Canal	Standing Open Water and Canals	22.9	N/A	N/A
ER10	Rochdale Canal	Standing Open Water and Canals	22.9	N/A	N/A
ER11	Rochdale Canal	Standing Open Water and Canals	22.9	N/A	N/A

4.3.14 Background pollutant concentrations at the ecological receptor locations were downloaded from the APIS website and are summarised in Table 22.

Table 22 Background Concentrations

Ecological Receptor		Background NO _x Concentration (µg/m ³)
ER1	South Pennine Moors	15.2
ER2	South Pennine Moors	19
ER3	South Pennine Moors	12.9
ER4	South Pennine Moors	12
ER5	South Pennine Moors	11.5
ER6	South Pennine Moors	11.5
ER7	Rochdale Canal	33.3
ER8	Rochdale Canal	33.3
ER9	Rochdale Canal	33.3
ER10	Rochdale Canal	33.3
ER11	Rochdale Canal	33.3

4.3.15 As no location specific values were given for the Rochdale Canal designation the maximum value in the given range was used for each receptor.

5.0 Results

Dispersion modelling was undertaken with the inputs described in Section 3.

Predicted pollutant concentrations were predicted separately for 5 assessment years and the maximum concentration reported in the following sections for each relevant substance and metric. Concentrations were assessed in the following sections against IAQM/EPUK⁵ and EA guidance⁴ criteria.

5.1 Human Receptors

Annual Mean NO₂

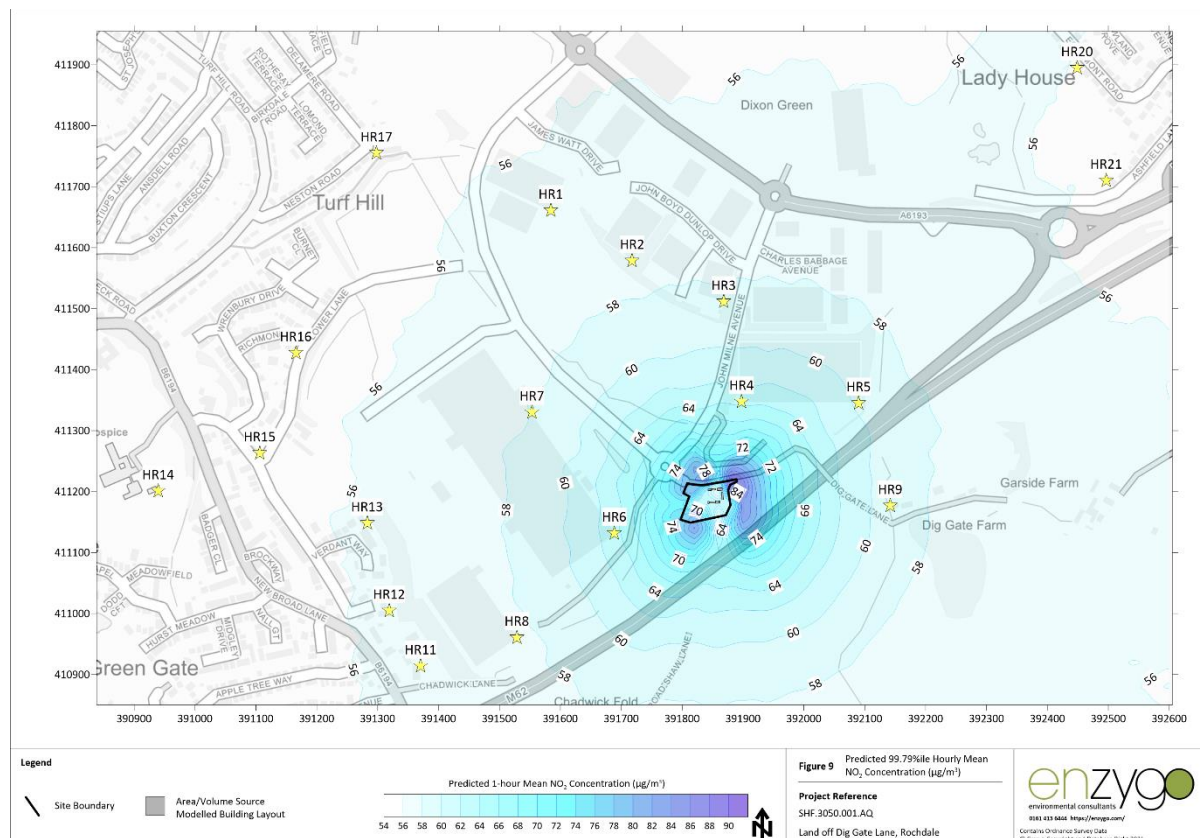
5.1.1 Predicted annual mean NO₂ process concentrations at sensitive receptors are summarised in Table 23 and contours shown in Figure 8.

Table 23 Predicted Annual Mean NO₂ Concentrations

Receptor		Predicted Concentration (µg/m ³)		Proportion of EQS (%)		IAQM Impact Descriptor
		PC	PEC	PC	PEC	
HR9	Dig Gate Farm	0.61	27.61	2	69	Negligible
HR10	Chadwick Fold	0.16	27.16	0	68	Negligible
HR11	3 White Horse Meadows	0.11	27.11	0	68	Negligible
HR12	6 Farlands Rise	0.09	27.09	0	68	Negligible
HR13	13 Verdant Way	0.07	27.07	0	68	Negligible
HR14	Springhill Hospice	0.04	27.04	0	68	Negligible
HR15	227 Broad Lane	0.04	27.04	0	68	Negligible
HR16	12 Richmond Close	0.04	27.04	0	68	Negligible
HR17	60 Neston Road	0.05	27.05	0	68	Negligible
HR18	Dixon Green Farm	0.15	27.15	0	68	Negligible
HR19	67 Beechfield Road	0.14	27.14	0	68	Negligible
HR20	83 Egremont Road	0.13	27.13	0	68	Negligible
HR21	70 Ashfield Lane	0.12	27.12	0	68	Negligible
HR22	Bryney Hayes Farm	0.07	27.07	0	68	Negligible

Predicted concentrations were assessed against the annual mean EQS of 40 µg/m³.

Figure 8 Predicted Annual Mean NO₂ Contours



1-hour Mean NO₂

5.1.2 Predicted 99.79%ile 1-hour mean NO₂ process concentrations at sensitive receptors are summarised in Table 24 and contours shown in Figure 9.

Table 24 Predicted 99.79%ile 1-Hour Mean NO₂ Concentrations

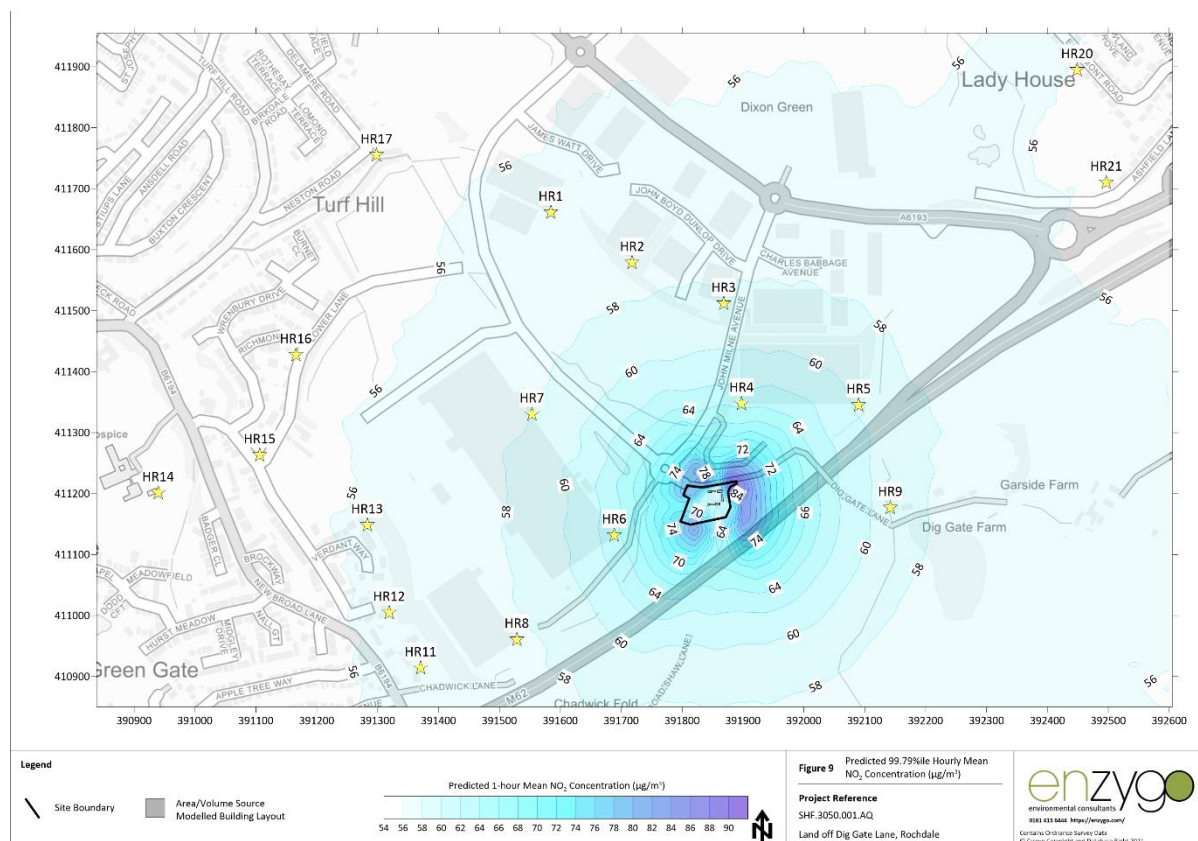
Receptor		Predicted Concentration (µg/m ³)		Proportion of EQS (%)		IAQM Impact Descriptor
		PC	PEC	PC	PC ^a	
HR1	Thales	2.62	56.62	1	28	Negligible
HR2	Takeuchi Manufacturing	3.68	57.68	2	29	Negligible
HR3	Industrial Unit	4.97	58.97	2	29	Negligible
HR4	Source BioScience	11.81	65.81	6	33	Negligible
HR5	Amazon1	6.04	60.04	3	30	Negligible
HR6	Amazon2	10.41	64.41	5	32	Negligible
HR7	toyou	4.36	58.36	2	29	Negligible
HR8	Xpo Rochdale	3.70	57.70	2	29	Negligible
HR9	Dig Gate Farm	5.59	59.59	3	30	Negligible
HR10	Chadwick Fold	3.71	57.71	2	29	Negligible
HR11	3 White Horse Meadows	2.43	56.43	1	28	Negligible
HR12	6 Farlands Rise	2.35	56.35	1	28	Negligible
HR13	13 Verdant Way	2.49	56.49	1	28	Negligible

Receptor		Predicted Concentration ($\mu\text{g}/\text{m}^3$)		Proportion of EQS (%)		IAQM Impact Descriptor
		PC	PEC	PC	PC ^a	
HR14	Springhill Hospice	1.43	55.43	1	28	Negligible
HR15	227 Broad Lane	1.74	55.74	1	28	Negligible
HR16	12 Richmond Close	1.61	55.61	1	28	Negligible
HR17	60 Neston Road	1.66	55.66	1	28	Negligible
HR18	Dixon Green Farm	1.97	55.97	1	28	Negligible
HR19	67 Beechfield Road	2.06	56.06	1	28	Negligible
HR20	83 Egremont Road	2.34	56.34	1	28	Negligible
HR21	70 Ashfield Lane	2.11	56.11	1	28	Negligible
HR22	Bryney Hayes Farm	2.15	56.15	1	28	Negligible

Predicted concentrations were assessed against the 99.79%ile 1-hour mean EQS of $200 \mu\text{g}/\text{m}^3$

a: PEC proportion of the EQS minus twice the long-term background.

Figure 9 Predicted 99.79%ile 1-Hour Mean NO₂ Contours



5.1.3 As indicated in Table 23, predicted annual mean NO₂ concentrations were well below 75% of the relevant EQS at all sensitive receptor locations for all meteorological data sets. Although, the PC proportion of the annual mean EQS is greater than 1% at one receptor location (HR9) the exposure to the annual mean PEC is less than 70% of the long-term EQS.

5.1.4 As such impacts on annual mean NO₂ concentrations can also be considered as negligible and screened out as insignificant according to the criteria detailed in Section 3.19.

5.1.5 As indicated in Table 24, predicted 99.79%ile 1-hour mean NO₂ concentrations were also well below the relevant EQS at all sensitive receptor locations. The PC proportion of the EQS is less than 10% at all sensitive receptor locations and as such, impacts on 1-hour mean NO₂ concentrations can also be considered as negligible and screened out as insignificant according to the criteria detailed in Section 3.19.

5.1.6 In line with the IAQM guidance impacts on annual and 1-hour mean concentrations are considered as negligible at all modelled receptor locations, as such all NO₂ impacts from the proposed facility are considered as **not significant**.

5.2 Ecological Receptors

Oxides of Nitrogen

5.2.1 Predicted annual mean NO_x concentrations at sensitive ecological receptors are summarised in Table 25.

Table 25 Predicted Annual Mean NO_x Concentrations

Receptor	Predicted Concentration (µg/m ³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
ER1	0.03	15.23	0.1	51
ER2	0.02	19.02	0.1	63
ER3	0.02	12.92	0.1	43
ER4	0.02	12.02	0.1	40
ER5	0.02	11.52	0.1	38
ER6	0.02	11.52	0.1	38
ER7	0.12	33.42	0.4	111
ER8	0.16	33.46	0.5	112
ER9	0.12	33.42	0.4	111
ER10	0.04	33.34	0.1	111
ER11	0.04	33.34	0.1	111

Predicted concentrations were assessed against the relevant CL: 30µg/m³.

5.2.2 Predicted 24-hour mean NO_x concentrations are summarised in Table 26.

Table 26 Predicted 24-Hour Mean NO_x Concentrations

Receptor	Predicted Concentration (µg/m ³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
ER1	0.21	30.61	0.3	41
ER2	0.23	38.23	0.3	51
ER3	0.20	26.00	0.3	35
ER4	0.20	24.20	0.3	32
ER5	0.23	23.23	0.3	31
ER6	0.18	23.18	0.2	31
ER7	0.67	67.27	0.9	90
ER8	1.37	67.97	1.8	91
ER9	1.65	68.25	2.2	91
ER10	0.81	67.41	1.1	90

Receptor	Predicted Concentration ($\mu\text{g}/\text{m}^3$)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
ER11	0.77	67.37	1.0	90

Predicted concentrations were assessed against the relevant CL: $75\mu\text{g}/\text{m}^3$.

5.2.3 As indicated in Table 25, predicted annual mean NO_x concentrations were below the relevant EQS at all sensitive receptor locations.

5.2.4 The PC proportion of the EQS is below 1% at all ecological receptor locations. As such, impacts on annual mean NO_x concentrations at all ecological sites can be screened out as insignificant according to the criteria detailed in Section 3.19.

5.2.5 As indicated in Table 26, predicted 24-hour mean NO_x concentrations were also below the relevant EQS at all sensitive receptor locations, and PC proportions of the EQS is below 10% at all ecological receptor locations.

5.2.6 Therefore, impacts on 24-hour mean NO_x concentrations at all ecological receptors can also be screened out as insignificant according to the criteria detailed in Section 3.19. As such, all NO_x impacts on ecological designations can be considered as **not significant**.

Nitrogen Deposition

5.2.7 Predicted annual mean nitrogen deposition rates are summarised in Table 27.

Table 27 Predicted Annual Mean Nitrogen Deposition Rates

Receptor	Predicted Deposition Rate ($\text{kgN}/\text{ha}/\text{yr}$)		Proportion of EQS (%)			
			Low EQS		High EQS	
	PC	PEC	PC	PEC	PC	PEC
ER1	0.00	27.10	0.1	542	0.0	271
ER2	0.00	27.30	0.1	546	0.0	273
ER3	0.00	27.20	0.1	544	0.0	272
ER4	0.00	27.20	0.0	544	0.0	272
ER5	0.00	27.00	0.0	540	0.0	270
ER6	0.00	27.10	0.0	542	0.0	271
ER7	0.02	22.92	0.6	764	0.2	229
ER8	0.02	22.92	0.8	764	0.2	229
ER9	0.02	22.92	0.6	764	0.2	229
ER10	0.01	22.91	0.2	764	0.1	229
ER11	0.01	22.91	0.2	764	0.1	229

5.2.8 As indicated in Table 27, predicted annual mean nitrogen deposition rates were above both the low and high EQSs at all sensitive receptor locations. This is due to the high background deposition rates, which exceed the EQSs as a base condition.

5.2.9 However, the PC proportion of the EQS is less than 1 % at all ecological receptor locations (maximum of 0.7%). Impacts on annual mean nitrogen deposition rates at all ecological receptors can be screened out as insignificant according to the criteria detailed in Section 3.19.

5.2.10 As such, all nitrogen deposition impacts on ecological receptors are considered as **not significant**.

Acid Deposition

- 5.2.11 Predicted annual mean acid deposition rates are summarised in Table 28. For this assessment, and following the approach recommended by APIS for situations where the baseline flux exceeds the equivalent ' N_{min} ' value, the nitrogen deposition (in keq/ha/yr) has been compared directly against the N_{max} (APIS⁶).
- 5.2.12 This was based on the acid critical loads and background depositions for each location as shown in Table 20 and Table 21 respectively.

Table 28 Predicted Annual Mean Acid Deposition Rates

Receptor	Predicted Deposition Rate (keq/ha/yr)		% of Critical Load Function (N_{max})	
	S	N	PC	PEC
ER1	0.000	0.000	0.02	122
ER2	0.000	0.000	0.01	122
ER3	0.000	0.000	0.01	122
ER4	0.000	0.000	0.01	122
ER5	0.000	0.000	0.01	122
ER6	0.000	0.000	0.01	122
ER7	0.000	0.001	N/A	N/A
ER8	0.000	0.002	N/A	N/A
ER9	0.000	0.001	N/A	N/A
ER10	0.000	0.000	N/A	N/A
ER11	0.000	0.000	N/A	N/A

- 5.2.13 As shown in Table 28, the PC proportion of the EQS is less than 1% at all ecological receptor locations (maximum of 0.02%). Impacts on annual mean acid deposition rates at all ecological receptors can be screened out as insignificant according to the criteria detailed in Section 3.19.
- 5.2.14 As such all acid deposition impacts on ecological receptors is considered as **not significant**.

5.3 Construction Dust

- 5.3.1 The construction period is unlikely to be over a long period of time or require extensive earthworks or construction. Therefore any impacts are likely to be transient and not significant.

6.0 Conclusions

- 6.1.1 Enzygo Limited was commissioned by Rochdale Power Limited to undertake an Air Quality Assessment in support of the planning application for the development of a 4.4MW, one engine, gas-powered reserve energy facility located on land off Dig Gate Lane, Rochdale, OL16 4NR.
- 6.1.2 Enzygo understands that the development is a gas peaking plant that will provide electricity to the national grid at times of peak demand.
- 6.1.3 The Proposed Development includes 1 no. gas-powered generator served by a 10 m (from ground level) exhaust flue. (JMS 624 GS-N.L Technical Datasheet shown in Appendix A).
- 6.1.4 NO₂ and NO_x associated with the combustion of natural gas by the generators have the potential to cause impacts at sensitive locations within the vicinity of the site. As such, an Air Quality Assessment has been undertaken to assess the significance of these impacts in line with the requirements of the NPPF.
- 6.1.5 Impacts were predicted based on a conservative assessment with the plant operating continuously. As such, predicted concentrations are considered to be assessed robustly. The impacts were assessed against Environmental Agency and air quality professional body guidance criteria.
- 6.1.6 Dispersion modelling of NO_x was undertaken using ADMS 5 (v5.2). Impacts at sensitive receptors were quantified and the results compared with the relevant EQSs and criteria provided by EPUK/IAQM and the EA.
- 6.1.7 Impacts were based on the plant emitting the maximum permitted pollutant concentration as well the use of the maximum concentrations over 5 assessment years and robust background levels. As such, predicted concentrations are likely to be a robust prediction of actual impacts.
- 6.1.8 The relevant EQS were not exceeded at any location within the assessment extents at human receptors. The EQS for nitrogen deposition on ecological designations was exceeded as a baseline condition however the process contribution from the plant emissions could be screened out as insignificant.
- 6.1.9 Predicted impacts on existing pollutant concentrations were considered to be not significant at all sensitive receptor locations for all pollutants and assessment periods.
- 6.1.10 Based on the predictions and the use of robust assumptions, it is considered that the overall air quality impacts of the proposals would be not significant. In terms of air quality, the proposal is therefore considered acceptable for planning purposes.

7.0 Abbreviations

%ile	Percentile
ADM	Atmospheric Dispersion Modelling
AQA	Air Quality Assessment
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Strategy
CERC	Cambridge Environmental Research Consultants
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
EPUK	Environmental Protection UK
EQS	Environmental Quality Standard
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
NGR	National Grid Reference
NO	Nitric Oxide
NO ₂	Nitrogen Dioxide
NO _x	Oxides of nitrogen
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
OMBC	Oldham Metropolitan Borough Council
PC	Process Contribution
PEC	Predicted Environmental Concentration
RBC	Rochdale Borough Council
z ₀	Roughness Length

Appendix A Engine Technical Datasheet

JENBACHER

Technical Description

Cogeneration Unit
JMS 624 GS-N.L

dyn. GC Profile 1 (150ms/30%)

For Information



Electrical output	4499	kW el.
Thermal output	2838	kW

Emission values
NOx < 250 mg/Nm³ (5% O₂) | < 95 mg/Nm³ (15% O₂)

0.02 Technical data of engine

Manufacturer		JENBACHER
Engine type		J 624 GS-K12
Working principle		4-Stroke
Configuration		V 60°
No. of cylinders		24
Bore	mm	190
Stroke	mm	220
Piston displacement	lit	149,70
Nominal speed	rpm	1.500
Mean piston speed	m/s	11,00
Length	mm	9.533
Width	mm	2.111
Height	mm	2.564
Weight dry	kg	17.100
Weight filled	kg	18.100
Moment of inertia	kgm ²	92,70
Direction of rotation (from flywheel view)		left
Radio interference level to VDE 0875		N
Starter motor output	kW	20
Starter motor voltage	V	24

Thermal energy balance

Power input	kW	9.896
Intercooler	kW	1.688
Lube oil	kW	458
Jacket water	kW	692
Exhaust gas cooled to 180 °C	kW	1.248
Exhaust gas cooled to 100 °C	kW	1.818
Surface heat	kW	142

Exhaust gas data

Exhaust gas temperature at full load	[8] °C	351
Exhaust gas temperature at bmep= 18,4 [bar]	°C	~ 386
Exhaust gas temperature at bmep= 12,3 [bar]	°C	~ 421
Exhaust gas mass flow rate, wet	kg/h	23.865
Exhaust gas mass flow rate, dry	kg/h	22.385
Exhaust gas volume, wet	Nm ³ /h	18.850
Exhaust gas volume, dry	Nm ³ /h	17.009
Max.admissible exhaust back pressure after y-pipe	mbar	50

Combustion air data

Combustion air mass flow rate	kg/h	23.150
Combustion air volume	Nm ³ /h	17.914
Max. admissible pressure drop at air-intake filter	mbar	10

basis for exhaust gas data: natural gas: 100% CH₄; biogas 65% CH₄, 35% CO₂



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- Property and Sites**
- Waste and Mineral Planning**
- Flooding, Drainage and Hydrology**
- Landscape Architecture**
- Arboriculture**
- Permitting and Regulation**
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