



Air Quality Assessment

Land off Ashton Old Road, Manchester

STOR 128 Limited

MAN.3048.006.AQ.R.001



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Air Quality Assessment - MAN.3048.006.AQ.R.001

Project:	Ashton Old Road, Manchester
For:	STOR 128 Limited
Status:	Final
Date:	September 2022
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Non-Technical Summary

- i. Enzygo Limited was commissioned by STOR 128 Limited to undertake an Air Quality Assessment in support planning application for a Short-Term Operating Reserve energy facility at land off Ashton Old Road, Manchester.
- ii. Enzygo understand that the application seeks to amend the layout and engine classifications of the previously consented facility which comprised of four 4.4 MWe engines. The new application comprises six 2.3 MWe engines with a combined thermal input of 31.80 MWth. Each engine is served by a 13 m exhaust flue.
- iii. Pollutant emissions associated with the proposed engines have potential to cause impacts above those previously approved, and as such, a revised Air Quality Assessment is required to assess the significance of the emissions in line with the requirements of national planning policy.
- iv. Operational impacts were predicted based on maximum emission limit values provided in the medium combustion plant directive regulations and the facility operating for a maximum of 2,500 per year. Impacts were assessed in accordance with the Environmental Protection UK and Institute of Air Quality Management and Environmental Agency guidance and significance criteria.
- v. The results of the dispersion modelling indicated the facility would not give rise to significant impacts upon human and ecological sensitive receptors and associated emissions comply with the relevant air quality standards and assessment significance criteria.
- vi. Based on the predictions and the use of robust assumptions, it is considered that the revised facility is acceptable for planning and permitting purposes and there are no constraints to approval from an air quality perspective.

1.0 Introduction

1.1 Background

- 1.1.1 Enzygo Limited was commissioned by STOR 128 Limited to undertake an Air Quality Assessment to support a planning application for a proposed Short-term Operating Reserve (STOR) facility at land off Ashton Old Road, Manchester.
- 1.1.2 It is understood that the proposed STOR facility comprises 6 no. natural gas-powered electricity generators with an overall thermal input of 31.80 MWth. Each generator is served by a 13 m high (from ground level) exhaust flue. The technical data provided for the Edina TCG3020V20 engine is provided in Appendix A.
- 1.1.3 Nitrogen dioxide (NO₂) emissions associated with the combustion of natural gas have potential to cause adverse impacts at sensitive locations within the vicinity of the site. As such, an Air Quality Assessment (AQA) has been undertaken to assess the significance of these impacts in line with the requirements of the National Planning Policy Framework (NPPF). The assessment will also determine the impact of variations to the consented layout and engine sets.
- 1.1.4 Details of the assessment methodology, assessment inputs, results and conclusions are detailed within this report.

1.2 Site Location and Context

- 1.2.1 The Proposed Development is located at land off Ashton Old Road, Manchester within a well-established commercial/residential area at the approximate National Grid Reference (NGR): 388640, 397450.
- 1.2.2 The facility falls within Manchester City Council's (MCC) area of administration and is located approximately 30 m north of the A635 (Ashton Old Road) to the rear of Tower Mill. The facility is surrounded by existing industrial/commercial land uses, the closest residential receptors are approximately 110 m west of the facility along Louisa Street.
- 1.2.3 An Air Quality Management Area (AQMA), designated for annual mean NO₂ objective exceedances, is located within the assessment extents and further consideration has been taken to determine impacts within this sensitive area. The AQMA is situated approximately 40 m south of the Facility, on Ashton Old Road.
- 1.2.4 There are statutory ecological sites within the assessment area, which includes the Rochdale Canal Special Area of Conservations (SAC) and the Clayton Vale Local Nature Reserve (LNR). There are also no non-statutory local designations are located within 2 km of the site.
- 1.2.5 Figure 1 provides a map of the site location and surrounding context.

Figure 1 Site Location and AQMA

Legend

- Site Boundary
- Air Quality Management Area

Project Reference
MAN 3048.006.AQ

Land off Ashton Old Road, Manchester

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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, April 2021²;
- Air emissions risk assessment for your environmental permit, Environment Agency (EA), updated on 5th July 2022³;
- Environmental permitting: air dispersion modelling reports, EA, updated on 19th January 2021⁴; and
- Land-Use Planning and Development Control: Planning for Air Quality, Environmental Protection UK and Institute of Air Quality Management (IAQM), January 2017⁵.

UK Legislation and National Strategy

2.1.2 Government policy requires the Secretary of State to publish a national Air Quality Strategy (AQS). The national AQS¹ produced by the Department for Environment, Food and Rural Affairs (DEFRA) sets out the framework to reducing adverse impacts of air pollution upon human health, vegetation, and ecosystems. To achieve this the AQS defines air quality objectives (AQOs) for 10 key pollutant species, including NO₂, fine particulate matter (PM₁₀ and PM_{2.5}), carbon monoxide (CO), sulphur dioxide (SO₂), benzene (C₆H₆), lead (Pb), ozone (O₃), polycyclic aromatic hydrocarbons (PAHs) and 1,3- butadiene.

2.1.3 In accordance with the Environment Act (1995), Local Authorities (LAs) have an obligation to periodically review and assess air quality within their administration to determine if specified pollutants are exceeding relevant objectives. This review involves the assessment of present and likely future air quality and is termed Local Air Quality Management (LAQM).

2.1.4 Should the LAQM process identify areas which are predicted to or currently exceeding relevant AQOs the LA is required to designate an Air Quality Management Area (AQMA). The AQMA is then accompanied by an Air Quality Action Plan (AQAP) which sets various measures and polices to improve air quality with the goal of restoring compliance with the AQOs. The process of LAQM is informed by DEFRA's Technical Guidance LAQM (TG16)².

2.1.5 European Directive 2008/50/EC also sets out a similar approach to the AQS and defines limit values for the protection of human health and ecosystems. The Environmental Permitting

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, April 2021.

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

(England and Wales) (Amendment) (EU Exit) Regulations 2019 ensures that the Environmental Permitting (EP) regime can continue following the UK's exit from the European Union (EU).

2.1.6 The modelling assessment will be undertaken against the relevant long term and short-term environmental standards to determine associated impacts. These standards have been defined following health studies based on data for individuals within a population, and therefore the exposure should relate to that of an individual.

2.1.7 The regulations state also that exceedances of the objectives should be assessed in relation to air quality at locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present”

2.1.8 The limits values, objectives and target values which are applicable to this assessment are summarised in Table 1 with relation to human health receptors.

Table 1: Air Quality Limit Values and Objectives

Pollutant	Air Quality Objectives	
	Concentration ($\mu\text{g}/\text{m}^3$)	Averaging Periods
NO ₂	40	Annual mean
	200	1-hour mean; not to be exceeded more than 18 times a year

2.1.9 As the facility will combust natural gas, there would be no SO₂ or PM emissions. Table 2 summarises the advice provided in the DEFRA guidance LAQM (TG16)⁶ on where the EQS for pollutants considered within this report apply.

Table 2: Where the EQS Apply

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
1-hour mean	As above, and kerbside sites (for example, pavements of busy shopping streets) 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 are expected to spend one hour or longer	Kerbside sites where the public would not be expected to have regular access

⁶ Local Air Quality Management Technical Guidance 2016 LAQM (TG16), DEFRA, 2016

Averaging Period	Objectives Should Apply At	Objectives Should Not Apply At
24-hour mean	As above together with hotels Gardens of residential properties	Kerbside sites (as opposed to locations at the building facade), or any other location where public exposure is expected to be short term

2.2 Ecological Critical Loads and Levels

2.2.1 The assessment also considers impacts upon ecological designations in accordance with relevant EA guidance³. The significance of impacts will be compared against relevant critical loads and levels obtained from the UK Air Pollution Information System (APIS) website⁷.

2.2.2 Table 3 presents the Critical Levels (CLv) 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

2.2.3 Critical loads (CLO) for ecological designations considered further within the assessment are detailed in Sections 4.3.12 to 4.3.16.

2.3 Local Planning Policy

Manchester City Council Core Strategy

2.3.1 Manchester City Council (MCC) has produced their local planning strategy, on 11th July 2012 which sets out the council's vision and strategy for the district until 2027. A review of the Core Strategy document highlighted the following policy text in relation to air quality:

Policy DM1: Development Management

All development should have regard to the following specific issues for which more detailed guidance may be given within a supplementary planning document:-

Effects on amenity, including privacy, light, noise, vibration, air quality, odours, litter, vermin, birds, road safety and traffic generation. This could also include proposals which would be sensitive to existing environmental conditions, such as noise.

Policy EN16: Air Quality

The Council will seek to improve the air quality within Manchester, and particularly within Air Quality Management Areas, located along Manchester's principal traffic routes and at Manchester Airport. Developers will be expected to take measures to minimise and mitigate the local impact of emissions from traffic generated by the development, as well as emissions created by the use of the development itself, including from Combined Heat and Power and biomass plant.

- *When assessing the appropriateness of locations for new development the Council will consider the impacts on air quality, alongside other plan objectives. This includes cumulative impacts, particularly in Air Quality Management Areas.*

⁷ <http://www.apis.ac.uk/>

- 2.3.2 These policies will be adhered to during the preparation of the assessment by assessing impacts from combustion emissions on nearby existing sensitive locations.

3.0 Methodology

3.1 Emissions Assessment

3.1.1 Emissions associated with the combustion of the gas have potential to cause increases in pollutant concentrations in the vicinity of the site. 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 STOR 128 Limited and Edina;
- Process conditions were provided by Edina based on the technical datasheet for the proposed revised TCG 3020 V20 engine (Appendix A);
- Emission rates were provided by Edina and calculated based on the emissions data provided on the technical datasheet for the TCG 3020 V20 engine (Appendix A); and
- Appropriate data to describe meteorological conditions in the vicinity of the site were obtained from Atmospheric Dispersion Modelling (ADM) Limited.

3.1.2 Dispersion modelling was undertaken using ADMS 5 (v5.2.2.0), developed by Cambridge Environmental Research Consultants (CERC) Limited, to determine pollutant concentrations in the vicinity of the site; and compared against relevant assessment criteria.

3.1.3 Modelling predictions 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 EA Emissions from specified generators guidance⁸.

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 were selected to represent the permitted number of exceedances per year.

⁸ https://consult.environment-agency.gov.uk/psc/mcp-and-sg-regulations/supporting_documents/Specified%20Generators%20Modelling%20Guidance%20INTERIM%20FINAL.pdf

3.3 Stack Information

3.3.1 Combustion products associated with the proposed facility will be emitted from dedicated stacks associated with the Edina TCG 3020 V20 engines. The stack locations are detailed in Table 5 and presented in Figure 2.

Table 5: Stack Locations

Stack Reference	Stack Location NGR (m)		Stack Height (m)
Engine 1	388611.65	397454.60	13
Engine 2	388613.46	397449.51	13
Engine 3	388615.23	397444.44	13
Engine 4	388617.05	397439.38	13
Engine 5	388618.79	397434.29	13
Engine 6	388620.61	397429.24	13

Figure 2 – ADMS 5 Modelling Inputs



3.4 Process Conditions

3.4.1 Process conditions for the plant were provided through correspondence with STOR 128 Limited and information provided by the engines manufacturer Edina.

3.4.2 The 6no. engines are identical and therefore the parameters provided in Table 6 relate to all proposed engines.

Table 6: Process Conditions

Parameter	Unit	Engines 1 and 7
Stack diameter	m	0.7

Parameter	Unit	Engines 1 and 7
Stack Area	m ²	0.385
Flue gas efflux velocity	m/s	17.10
Volumetric flow rate (normalised, Dry) ^a	Nm ³ /s	8,773
Volumetric flow rate (actual Wet) ^b	Am ³ /h	23,697.7
Volumetric flow rate (actual Wet) ^b	Am ³ /s	6.583
Temperature	°C	387
Moisture Content (Wet)	%	10.5
Oxygen Content (Dry)	%	10.1

a: Referenced Conditions – 10.1% O₂, 273K, dry gas 0% moisture content.

b: Actual Conditions – 10.1% O₂, 660.15K, wet gas 10.5% moisture content.

3.5 Emissions

3.5.1 Emission rates associated with the generators were calculated based on maximum permitted emission concentrations prescribed in the MCPD regulations as summarised in Table 7. It is therefore considered that the maximum permissible emissions rates will be continuously emitted and that a worst-case assessment has been provided.

3.5.2 Concentrations are referenced at standard temperature (273K) and pressure (101.3kPa) and as dry gas at 5% oxygen. Details on engine parameters provided by Edina (Appendix A) were used to calculate mass emissions rates in grams per second. The calculation applies assumptions on typical actual conditions namely O₂% and moisture content provided in Table 6.

Table 7: 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	63.05	0.415

a: Referenced conditions - 5% O₂, 0°C (273.15K), dry gas 0% moisture content

b: Actual Conditions - 10.1% O₂, 387°C (660.15K), wet gas 10.5% moisture content

3.6 Time Varied Emissions

3.6.1 The initial planning application assessed a maximum operating window of 2,500 hours per annum and proposed specific operating envelopes throughout the day. STOR 128 Limited have confirmed this will not vary and the facility will operate for a maximum of 2,500 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. However, as the annual operational hours for each scenario are significantly lower than the full calendar year, an approach utilising hypergeometric probability distribution was undertaken for 1-hour NO₂ concentrations.

3.6.4 The hypergeometric distribution methodology is provided within the EA Guidance⁹ and informed by the EA document 'Specified generators: air dispersion modelling example short

⁹ <https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment>

term statistical analysis'¹⁰. This statistical analysis randomly selects multiple hours within a year and predicts the probability of an exceedance of the EQS.

3.6.5 The EA guidance⁹ states where the probability is:

- 1% or less – exceedances are highly unlikely;
- less than 5% – exceedances are unlikely as long as the generator plant operational lifetime is no more than 20 years; and
- more than or equal to 5% – there's potential for exceedances and the regulator will consider if acceptable on a case-by-case basis.

3.6.6 The EA guidance⁹ also states that annual mean PCs associated with operation hours less than a full calendar year can be calculated by scaling down long term predictions. In this instance a proportional factor of 0.285 was applied to annual mean PC results. The factor equates to the operational hours per year of 2,500 divided by the operational envelope of 8,760 hours.

3.7 Assessment Extents

3.7.1 Ambient concentrations were predicted over the area, NGR: 388000, 397060 to 389240, 397820. One Cartesian grid with a resolution of 10 m at a height of 1.5 m. Results were subsequently used to produce contour plots within the Surfer[®] visualisation software package. This area is indicated in Figure 3.

Figure 3 – Gridded Extents



¹⁰https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/781763/Specified_generator_air_dispersion_assessment_example_calculation.odt

3.8 Meteorological Data

- 3.8.1 Hourly sequential data used in this assessment was obtained from Manchester Airport meteorological station, located 15 km southwest of the Proposed Development. The choice of this station provides a suitable representative of conditions across the modelled domain.
- 3.8.2 Figure 4 shows the 5-year wind rose dataset. All meteorological data used in the assessment was provided by ADM Ltd, which is an established distributor of meteorological data within the UK.
- 3.8.3 Maximum emissions across the five years of meteorological data were utilised to ensure a robust case assessment.

Figure 4 – Meteorological Data Wind Roses



3.9 Roughness Length

- 3.9.1 The specific roughness length (z_0) values specified with ADMS-5 are summarised in Table 8.

Table 8: Utilised Roughness Length

Location	Roughness length (m)	ADMS Description
Application Site	0.5	Parkland, open suburbia
Manchester Airport Met Station	0.3	Agricultural areas (max)

- 3.9.2 The proposed facility is located within an existing industrial/commercial context and therefore the presence of building structure has potential to affect turbulence in the atmosphere. A value of 0.5 m is considered appropriate for the assessment.

- 3.9.3 The meteorological station is surrounded by agricultural fields. Given the surrounding area is void of significant building structures a value of 0.2 m is considered appropriate for the morphology of the assessment area.

3.10 Monin-Obukhov Length

- 3.10.1 The Monin-Obukhov length values are summarised in Table 9.

Table 9: Utilised Monin-Obukhov Lengths

Location	Monin-Obukhov length (m)	ADMS Description
Application Site	30	Mixed Urban and Industrial
Manchester Airport Met Station		

- 3.10.2 The application of Monin-Obukhov values considers the effect of heat production in populated areas which will influence atmospheric stability. The proposed facility is within an industrial setting, with the meteorological station within a rural context. A value of 30 is therefore deemed appropriate for the proposed facility and meteorological station, respectively.

3.11 Terrain Data

- 3.11.1 Areas of complex terrain have potential to affect the dispersion of pollutants which vary dependent on the height and location of modelled emission sources. The ADMS-5 user guidance suggest that terrain height effect should only be included where gradient exceed 1:10.
- 3.11.2 Ordnance Survey Landform Panorama terrain data was pre-processed using the dedicated function within ADMS 5 and covers a 12 km x 12 km area extending from the centre of the proposed site, this range encompasses all modelled receptor locations.

3.12 Building Effects

- 3.12.1 Buildings can influence the dispersion of pollutant and may lead to increases to ground level concentrations. A review of adjacent buildings was therefore undertaken and subsequently included within the model and are summarised in Table 10. Onsite building heights were provided by STOR 128 and considered to provide an accurate representation.
- 3.12.2 Offsite buildings, including adjacent industrial units were estimated using Google Earth.
- 3.12.3 Buildings within 5L of the stack, where L is the lesser of either the building height or the maximum projected width, or that have a height of more than 40% of the stack (3.2 m) have been included in the dispersion model. This approach follows the guidance provided by the Specified Generator Tranche B Screening Tool¹¹.

Table 10: Building Geometries

Building		NGR (m)		Height (m)	Length (m)	Width (m)	Angle (°)
		X	Y				
1	Engine 1	388621.5	397446.7	5.0	3.4	14.9	160.6
2	Engine 2	388619.7	397451.8	5.0	3.4	15.0	160.6
3	Engine 3	388617.8	397457.0	5.0	3.4	15.0	160.6
4	Engine 4	388623.3	397441.6	5.0	3.4	15.0	160.6
5	Engine 5	388625.1	397436.5	5.0	3.4	15.0	160.6
6	Engine 6	388626.9	397431.3	5.0	3.4	15.0	160.6

¹¹ Specified Generator Tranche B Screening Tool, Version 2.1, Environment Agency, February 2019

Building		NGR (m)		Height (m)	Length (m)	Width (m)	Angle (°)
		X	Y				
7	Tower Mill	388655.7	397417.4	6.5	29.5	67.8	160.8
8	Tower Mill	388668.8	397449.5	5.0	31.5	12.6	160.8
9	Tower Mill	388669.2	397435.3	12.5	4.6	3.7	162.1
10	Tower Mill	388679.9	397422.9	12.5	27.7	8.7	160.7
11	Ideal Recycling	388619.4	397466.9	6.0	9.8	20.3	159.1
12	Ideal Recycling	388632.9	397505.4	5.0	22.2	29.4	160.6
13	Commercial Units	388710.4	397445.2	12.5	35.0	37.1	160.6
14	Commercial Units	388728.2	397422.6	8.5	48.1	19.2	159.9
15	HV Switch Room	388645.4	397450.1	5.2	3.7	11.1	162.3
16	LV Switch Room/Auxiliary Transformer	388652.9	397450.2	3.2	8.5	3.1	161.7

3.12.4 A graphical representation of the modelled building layout is provided below.



3.13 NO_x to NO₂ Conversion

3.13.1 Ground level NO_x concentrations were predicted through dispersion modelling. NO₂ concentrations reported in the results section assume conversion from NO_x to NO₂, based upon EA guidance⁴ detailed below:

- 35% for short-term average concentrations; and
- 70% for long-term average concentrations.

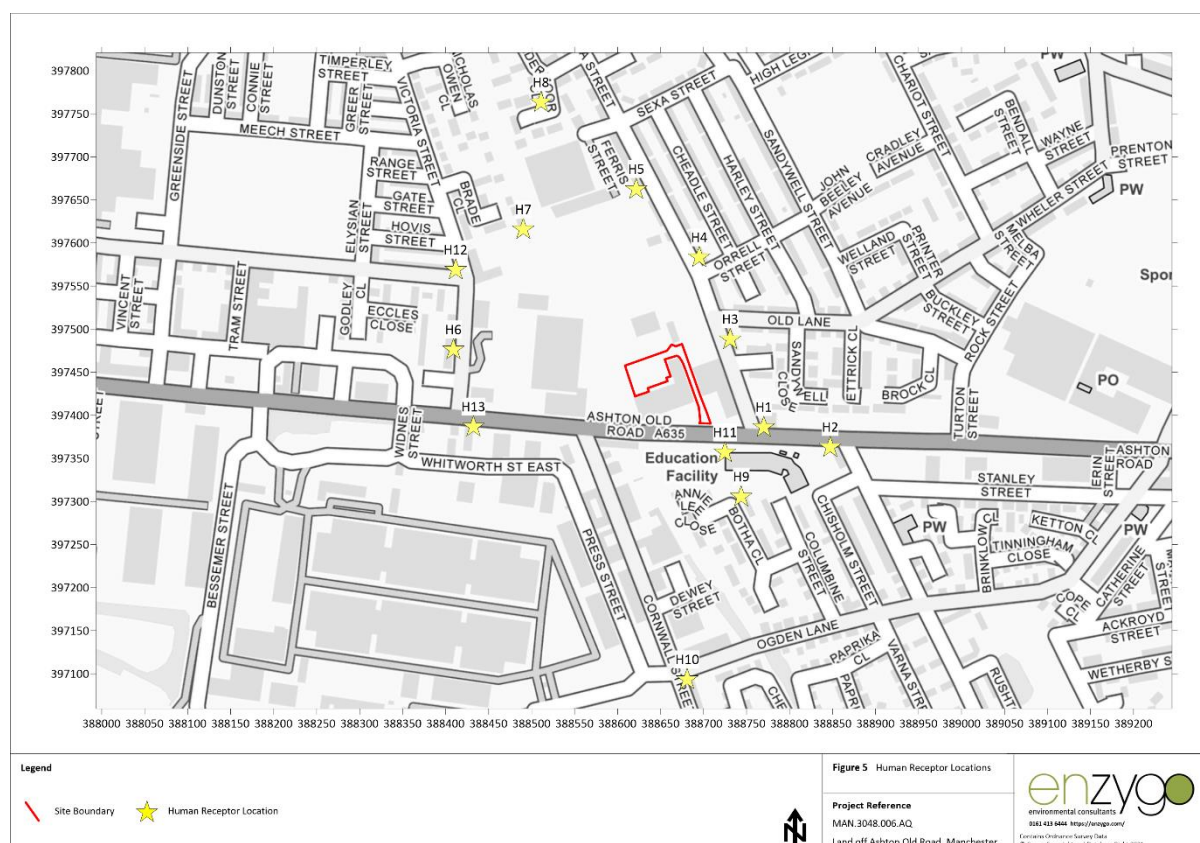
3.14 Human Sensitive Receptors

3.14.1 Sensitive human receptor locations surrounding the facility were identified from a desk-top study. These were modelled at the minimum height of relevant exposure. The modelled receptors are summarised in Table 11 and displayed in Figure 5.

Table 11: Sensitive Human Receptors

Receptor		Use	NGR (m)		Distance from Centre of Site (m)	Height (m)
			X	Y		
H1	Ashton Old Road	Residential	388770.0	397386.0	142	1.5
H2	Ashton Old Road	Residential	388847.2	397362.8	223	1.5
H3	Louisa Street	Residential	388731.0	397488.0	113	1.5
H4	Louisa Street	Residential	388695.0	397583.0	165	1.5
H5	Louisa Street	Residential	388621.8	397662.2	233	1.5
H6	Victoria Street	Residential	388409.0	397476.0	230	1.5
H7	Brade Close	Residential	388490.3	397615.4	235	1.5
H8	Aldermoor Close	Residential	388511.0	397763.0	355	1.5
H9	Stoneygate Walk	Residential	388743.9	397305.2	166	1.5
H10	Cornwall Street	Residential	388681.0	397093.0	340	1.5
H11	Varna Community Primary School	Educational	388724.9	397356.7	116	1.5
H12	Parkhouse Street	Residential	388411.7	397568.6	262	1.5
H13	Ashton Old Road	Residential	388432.4	397386.4	207	4.5

Figure 5 – Modelled Human Receptor Locations



3.15 Ecological Sensitive Receptors

3.15.1 With regard to receptors of ecological sensitivity, the EA guidance³ states that sites need only be considered where they fall within set distances of the activity:

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

3.15.2 A desktop study using the Multi-Agency Geographic Information for the Countryside (MAGIC) was undertaken to identify any ecological designations within the distances stated above.

3.15.3 The receptor points chosen to represent the closest points to proposed facility and are displayed in Table 12 and displayed in Figure 6.

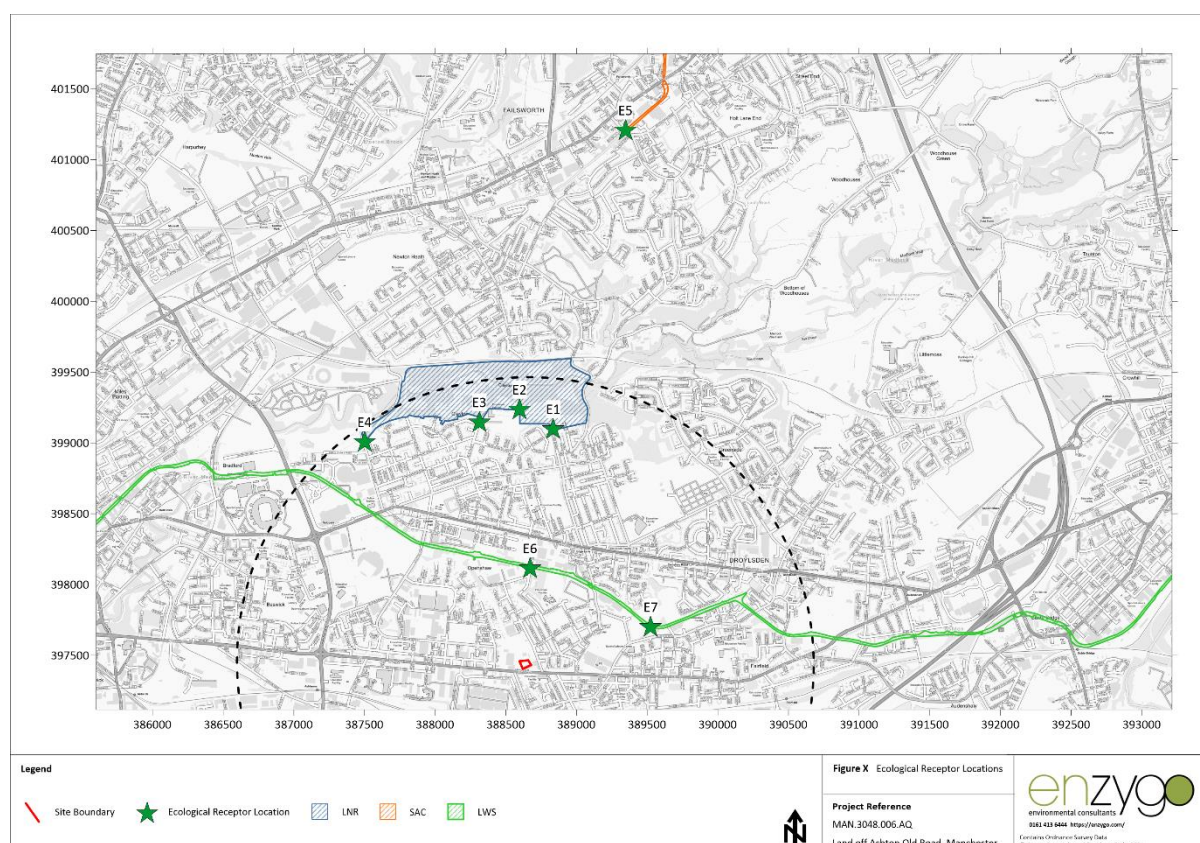
Table 12: Ecological Sensitive Receptors

Ecological Receptor		Type	Habitat	NGR (m)		Distance (m)
				X	Y	
E1	Clayton Vale	LNR	Broadleaved, Mixed and Yew Woodland	388835.6	399094.3	1,677
E2	Clayton Vale	LNR	Acid Grassland	388596.8	399232.4	1,803
E3	Clayton Vale	LNR	Broadleaved, Mixed and Yew Woodland	388312.4	399142.8	1,743
E4	Clayton Vale	LNR	Broadleaved, Mixed and Yew Woodland	387501.0	399002.9	1,939
E5	Rochdale Canal	SAC	Standing Open Water and Canals	389346.4	401204.6	3,841

Ecological Receptor	Type	Habitat	NGR (m)		Distance (m)
			X	Y	
E6	Ashton Canal (East)	LWS	Standing Open Water and Canals	388671.3 398111.2	682
E7	Ashton Canal (East)	LWS	Standing Open Water and Canals	389525.3 397696.7	930

3.15.4 For all designations the most sensitive habitat has been assessed.

Figure 6 – Modelled Ecological Receptors



3.16 Deposition Rates

3.16.1 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 06'¹². 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 13.

Table 13: Conversion Factors to Determine Dry Deposition Flux

Pollutant	Grassland Deposition Velocity (m/s)	Forest Deposition Velocity (m/s)	Conversion Factor ($\mu\text{g}/\text{m}^2/\text{s}$ to $\text{kg}/\text{ha}/\text{yr}$ of pollutant species)
NO ₂	0.0015	0.003	96.0

3.16.2 Predicted ground level pollutant concentrations were converted to kilo-equivalent ion depositions (keq/ha/yr) for comparison with the critical load for acid deposition at each of the identified ecological receptors. The standard conversion factors are shown in Table 14.

¹² AQTAG 06: Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air, EA, 2014

Table 14: Conversion Factors to Units of Equivalents

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

3.16.3 The total N proportion was calculated from NO_x concentrations.

3.16.4 For acid deposition, the proportion of the Environmental Quality Standard (EQS) consisting of the process contribution (PC) and predicted environmental concentration (PEC) were then calculated using the tool available on the APIS app website¹³.

3.17 Assessment Criteria and Significance of Impacts

3.17.1 Predicted ground level pollutant concentrations and deposition rates were compared with the relevant EQS identified within Table 1.

3.18 Assessment Criteria

EPUK and IAQM Guidance

3.18.1 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 facility); and
- Do-something (DS) (predicted background concentrations including with the addition of emissions from the proposed facility).

3.18.2 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.

3.18.3 The sensitivity impact significance of each receptor was defined in accordance with the criteria shown in Table 15. These are based upon the guidance provided within the EPUK and IAQM guidance⁵.

Table 15: 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

¹³ www.apis.ac.uk/app

- 3.18.4 The criteria shown in Table 15 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.
- 3.18.5 For short term impacts, the EPUK and IAQM guidance⁵ suggests the following criteria, as shown in Table 16, based on EA guidance.

Table 16: Significance of Impacts – Short Term Concentrations

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

- 3.18.6 Following the prediction of impacts at discrete receptor locations utilising the criteria in Table 15 and Table 16, 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.
- 3.18.7 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

- 3.18.8 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

3.18.9 The significance of predicted impact has been assessed in accordance with criteria in the EA guidance³ 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.

3.18.10 If both criteria are met predicted impacts can be considered insignificant and no further analysis is required.

Second Screening Stage

3.18.11 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.

3.18.12 If both 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

3.18.13 If emissions that affect SPAs, SACs, RAMSAR sites or 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.

3.18.14 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.

3.18.15 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.

3.18.16 In addition, the EA guidance also states that the APIS 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 Modelling Uncertainties

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

- Model uncertainty - due to model limitations;
- Data uncertainty - due to inaccuracies in input data, including emission estimates, operational procedures, land use characteristics and meteorology; and
- Variability - randomness of measurements used.

3.19.2 Whilst uncertainty in the model inputs and parameters cannot be fully reduced, the analysis of maximum emissions across the five years of meteorological data (2015 – 2019) provides sensitivity analysis which sufficiently accounts for variations in meteorological conditions. The application of maximum ELVs and 100% loading within the ADMS model also minimises potential uncertainties. As such, a sufficient degree of confidence can be placed in the results.

4.0 Baseline Conditions

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

4.1 Local Air Quality Management

4.1.1 DEFRA's AQMA database indicates that the Greater Manchester AQMA is located approximately 40 m south of the proposed facility. The AQMA is defined as:

"Greater Manchester Combined Authority AQMA (Manchester City Council) - This is the part of the Greater Manchester Combined Authority AQMA located within the Manchester City Council area."

4.1.2 It is therefore considered that impacts from the Proposed Development could affect sensitive receptors in this area, as such the assessment has included receptors within the Greater Manchester AQMA.

4.2 Local Air Quality Monitoring

4.2.1 To provide further context to existing air quality within the vicinity of the site the latest Greater Manchester monitoring data was reviewed which indicated that MCC undertake an extensive monitoring network.

4.2.2 A review of this data indicated the closest automatic analyser as the Tameside A635 Manchester Road (TS001) station, located 4 km north east of the proposed facility. Given the distance to the facility this station is unlikely to provide comparable conditions and is not considered a reliable source of baseline data for the site.

4.2.3 A further review of the diffusion tube monitoring locations identified indicated 10 sites which provide good representations of the surrounding environment. Data is presented in Table 17 with exceedances of the annual mean AQO highlighted in bold.

Table 17: Roadside Diffusion Tube Monitoring Results

Site ID and Name	NGR (m)		Distance to Site (m)	Annual Mean Concentration ($\mu\text{g}/\text{m}^3$)		
	X	Y		2017	2018	2019
MA28 - Ashton Old Road*	387951	397430	683	37.06	36.14	26.40
TA17 - Manchester Road Droylsden*	389106	398242	939	31.12	34.15	26.63
MA73 - Hyde Road*	388604	396042	1,388	38.69	38.04	27.31
MA86A - Pottery Lane*	387150	396808	1,609	32.11	33.63	25.49
MA87 - -Hyde Road/Pottery Lane*	386992	396569	1,854	33.25	33.98	22.89
MA95B - Ashton Old Road*	386668	397566	1,971			31.54
MA89A - Wenlock Way*	386710	396824	2,018	30.31	30.29	23.72
MA88A - Hyde Rd/Clowes Street*	386536	396699	2,222			32.48
MA79 - Victoria Terrace**	386875	395861	2,357	29.93	29.33	22.32
MA78 - Rostron Avenue**	386289	396828	2,421	33.16	33.04	23.21

* - Roadside Site

** - Urban Background Site

4.2.4 NO₂ diffusion tube monitoring data from 2017 to 2019 indicates historical exceedances of the annual mean AQO at two locations (MA95B and MA88), which are well above the 40 $\mu\text{g}/\text{m}^3$

objective. The historical data does however present marginal improvements to annual mean NO₂ concentrations with the majority of the results decreasing from 2017.

4.2.5 The closest location to the site (MAN28) indicates that A635 roadside concentrations are elevated but below the annual mean AQO for NO₂.

4.2.6 As confirmed by MCC MAN28 is approximately 1 m from the A635 carriageway, considering the closest modelled receptor to the A635, H2, is 2 m it is unlikely that existing locations would be subjected to pollutant concentrations above those monitored by MAN28 or exceeding the national AQOs.

4.2.7 Result from 2020 and 2021 have not been included due to the effect of COVID-19 lockdown restrictions on road vehicle exhaust emissions.

4.2.8 Figure 7 provides the locations of the monitoring locations

Figure 7 – Diffusion Tube 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 website⁷.

DEFRA Background Concentrations

4.3.2 Predictions of background pollutant concentrations on a 1 km by 1 km grid basis have been produced by DEFRA¹⁴ for the entire of the UK to assist LAs in their Review and Assessment of air quality. The facility site is located in the NGR grid square: 388500, 397500. The DEFRA background predictions are summarised in Table 18.

¹⁴ <https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018>

Table 18 Predicted DEFRA Background Pollutant Concentrations

Pollutant	2022 Predicted Background Concentration ($\mu\text{g}/\text{m}^3$)
NO _x	23.78
NO ₂	16.92

4.3.3 It should be noted that background concentrations for NO_x and NO₂, were obtained from the 2018 base maps, which are the most recent predictions available from DEFRA.

Review of Background NO₂ Concentrations

4.3.4 A comparison of monitored background concentrations was undertaken in the assessment area to establish the most representative conditions for the proposed site and surrounding area. A review of the MCC monitoring data determined that the Ashton Old Road (MA28) roadside diffusion tube monitor would provide a worse case approach when considering road vehicle exhaust emissions contributions from the A635 when compared to the application of DEFRA predictions.

4.3.5 Table 19 compares concentrations measured by the local roadside monitoring station (MA28) and DEFRA background predictions (388500, 397500).

Table 19 Comparison of Background Pollutant Concentrations

Data Source	Concentration ($\mu\text{g}/\text{m}^3$)	Difference (%)
MA28	26.40	43.80
DEFRA	16.92	

4.3.6 MA28 is situated approximately 700 m west of the proposed facility and located within the Greater Manchester AQMA. As comparisons can be drawn between the locations of MA28 and surrounding receptor locations, it is deemed suitable to utilise monitored roadside pollutant concentrations in preference to predictions provided by DEFRA.

4.3.7 Receptor locations H1, H2, H11 and H13 are within the Greater Manchester AQMA and are likely to experience elevated annual mean NO₂ concentrations which may not be accounted for within the DEFRA background concentrations. As these receptor locations are situated adjacent to the A635, and to account for road vehicle exhaust emission contributions from the A635, worse case assumption on background concentration have been applied. The use of the roadside monitor (MA28) as a roadside background concentration ensures that a robust estimate of roadside concentrations are considered in the predictions at these locations.

4.3.8 To assume as suitable background concentration at sensitive receptors H1, H2, H11 and H13, the NO₂ Fall-Off with Distance Calculator (Version 4.2)¹⁵ was used, with results detailed in Table 20.

Table 20 NO₂ Fall off with Distance Calculations

NO ₂ Monitoring Result ($\mu\text{g}/\text{m}^3$)	DEFRA Background Concentration ($\mu\text{g}/\text{m}^3$)	Distance to Kerb (Diffusion Tube)	Distance to Kerb (Receptor)	Adjusted Annual Mean Concentration ($\mu\text{g}/\text{m}^3$)
26.40	16.92	1 m	5 m (H1)	25.4
			3 m (H2)	26.6
			17 m (H11)	22.3
			3 m (H13)	26.9

¹⁵ <https://laqm.defra.gov.uk/air-quality/air-quality-assessment/no2-falloff/>

- 4.3.9 It is considered that this method provides a suitably robust background concentration estimate at receptors located near to the A635.
- 4.3.10 For receptors located outside the AQMA and beyond 50 m of the A635 background concentrations from the urban background monitoring location MA78 (Rostron Avenue) were applied in preference to DEFRA predictions. A concentrations of 23.2 $\mu\text{g}/\text{m}^3$ is considered a conservative estimate in such locations. The application of background concentrations is summarised in Table 21. It is considered that application of specific background concentration at receptors provides a suitably robust located assessment.

Table 21: Predicted Background Concentration at Sensitive Human Locations

Receptor		Predicted Background Concentration ($\mu\text{g}/\text{m}^3$)		Adjusted or Actual Monitored Concentration
		NO _x	NO ₂	
H1	Ashton Old Road	23.78	16.92	25.4*
H2	Ashton Old Road	23.78	16.92	26.6*
H3	Louisa Street	23.78	16.92	23.2**
H4	Louisa Street	23.78	16.92	23.2**
H5	Louisa Street	23.78	16.92	23.2**
H6	Victoria Street	23.78	16.92	23.2**
H7	Brade Close	23.78	16.92	23.2**
H8	Aldermoor Close	23.78	16.92	23.2**
H9	Stoneygate Walk	23.78	16.92	23.2**
H10	Cornwall Street	23.78	16.92	23.2**
H11	Varna Community Primary School	23.78	16.92	22.3*
H12	Parkhouse Street	23.78	16.92	23.2**
H13	Ashton Old Road	23.78	16.92	26.9*

* Adjusted via the NO₂ Fall off with Distance Calculation

** Diffusion Tube MA78

Short term Background Concentrations

- 4.3.11 It was assumed that the short-term background concentration of a substance is twice its long-term concentration as suggested within EA risk assessment for your environmental permit guidance³.

Ecological Receptor Baseline

- 4.3.12 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 to identify suitable habitat descriptions and associated critical loads. For the receptors with multiple habitats, the most sensitive habitat has been taken for both nitrogen and acid deposition. The critical loads for nitrogen deposition are presented in Table 22.

Table 22: Nitrogen Critical Load

ID	Designation	APIS Habitat	Nitrogen Critical Load (kgN/ha/yr)	
			Min	Max
E1	Clayton Vale	Acidophilous Quercus-dominated woodland	10	15
E2	Clayton Vale	Alpine and subalpine grasslands	5	10

ID	Designation	APIS Habitat	Nitrogen Critical Load (kgN/ha/yr)	
			Min	Max
E3	Clayton Vale	Acidophilous Quercus-dominated woodland	10	15
E4	Clayton Vale	Acidophilous Quercus-dominated woodland	10	15
E5	Rochdale Canal	Permanent oligotrophic waters: Softwater lakes	3	10
E6	Ashton Canal (East)	Permanent oligotrophic waters: Softwater lakes	3	10
E7	Ashton Canal (East)	Permanent oligotrophic waters: Softwater lakes	3	10

4.3.13 It should be noted that the critical loads shown for the Rochdale Canal (SAC) and Ashton Canal (LWS) 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 canals can be seen as a worst case assessment.

4.3.14 Table 23 shows the relevant critical loads for acid deposition.

Table 23: Acidity Critical Loads

ID	Designation	APIS Habitat	Critical Load (keq/ha/yr)		
			CLmaxS	CLmaxN	CLminN
E1	Clayton Vale	Broadleaved Unmanaged woodland	2.653	0.357	3.01
E2	Clayton Vale	Acid grassland	1.62	0.438	2.058
E3	Clayton Vale	Broadleaved Unmanaged woodland	2.653	0.357	3.01
E4	Clayton Vale	Broadleaved Unmanaged woodland	2.653	0.357	3.01
E5	Rochdale Canal	Freshwater	No critical loads available for this feature		
E6	Ashton Canal (East)	Freshwater	No critical loads available for this feature		
E7	Ashton Canal (East)	Freshwater	No critical loads available for this feature		

4.3.15 The APIS website provides no information on CLEs for the Rochdale Canal (SAC) or freshwater habitats relating to the Ashton Canal (LWS), as such it is not possible to complete an appropriate assessment of acidification at these designations.

4.3.16 Background deposition rates and concentration at the ecological receptor location were downloaded from the APIS website and are summarised in Table 24.

Table 24: Background Deposition Rates and Concentrations

ID	Nitrogen Deposition (kgN/ha/yr)	Acid Deposition (keq/ha/yr)		NO _x Background Concentration ug/m ₃
		Nitrogen	Sulphur	
E1	42.42	3.03	0.35	23.57
E2	25.34	1.81	0.29	23.57
E3	42.42	3.03	0.35	23.57
E4	42.42	3.03	0.35	25.47
E5	26.00	2.10	0.30	22.40
E6	26.00	2.10	0.30	22.40
E7	26.00	2.10	0.30	22.40

5.0 Results

5.1.1 Dispersion modelling was undertaken with the inputs described in Section 3. Reference should be made to Figure 8 and Figure 9 predicted pollutant contours across the assessment extents.

5.1.2 As stated previously, maximum concentrations across the five years of meteorological data (2015 - 2019) were utilised to account for varying meteorological conditions. Concentrations were assessed in the following sections against IAQM/EPUK⁵ and EA guidance³ significance criteria based on stack heights of 13 m and annual operating hours of 2,500.

5.2 Human Receptors

Annual Mean NO₂

5.2.1 Predicted annual mean NO₂ process concentrations at sensitive receptors are summarised in Table 25.

Table 25: Predicted Annual Mean NO₂ Concentrations

Receptor		Predicted Concentration (µg/m ³)		Proportion of EQS (%)		IAQM Impact Descriptor
		PC	PEC	PC	PEC	
H1	Ashton Old Road	2.26	27.66	6	69	Slight
H2	Ashton Old Road	1.47	28.07	4	70	Negligible
H3	Louisa Street	1.83	25.04	5	63	Negligible
H4	Louisa Street	2.32	25.52	6	64	Slight
H5	Louisa Street	1.81	25.01	5	63	Negligible
H6	Victoria Street	0.65	23.85	2	60	Negligible
H7	Brade Close	0.56	23.77	1	59	Negligible
H8	Aldermoor Close	0.67	23.87	2	60	Negligible
H9	Stoneygate Walk	0.85	24.06	2	60	Negligible
H10	Cornwall Street	0.15	23.35	0	58	Negligible
H11	Varna Community Primary School	1.46	23.76	4	59	Negligible
H12	Parkhouse Street	0.43	23.63	1	59	Negligible
H13	Ashton Old Road	0.77	27.67	2	69	Negligible
MAX		2.32	28.07	6	70	-

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

5.2.2 As indicated in Table 25, the PC proportions of the annual mean EQS are greater than 1% at 10 of 13 receptor locations. Based on the initial EA screening criteria, impacts on NO₂ concentrations at 10 receptor locations cannot be screened out as insignificant and further analysis is required for this substance.

5.2.3 Following the second stage of EA screening the annual mean PEC is less than 70% EQS at all 13 locations exceeding the 1% threshold and therefore impacts can be screened as insignificant in accordance with the EA guidance³.

5.2.4 In line with the IAQM guidance impacts are considered as slight adverse at 2 receptor locations (H1 and H4) and negligible at the remaining 11 locations.

5.2.5 Considering both the EA and EPUK/IAQM guidance, and highly robust background levels overall impacts on annual mean NO₂ concentrations can be considered as not significant.

5.2.6 Annual mean pollutant contours are presented in Figure 8, the contours show no exceedance of the AQO in the assessment extents.

Figure 8 – Modelled Annual Mean NO₂ Concentrations



1-Hour Mean NO₂

5.2.7 As mentioned in Section 3.6, an approach utilising hypergeometric probability distribution was undertaken in order to assess potential for exceedances of the 1-hour AQO based on the proposed annual operational hours (2,500). The cumulative hypergeometric distribution for each sensitive receptor location is detailed Table 26.

Table 26: Predicted 1-Hour Mean NO₂ – Hypergeometric Distribution

Receptor		Number of Exceedances	Hypergeometric Distribution (%)	Hypergeometric Distribution for Continuous Operation (%)
H1	Ashton Old Road	0	<0.1	<0.1
H2	Ashton Old Road	0	<0.1	<0.1
H3	Louisa Street	0	<0.1	<0.1
H4	Louisa Street	0	<0.1	<0.1
H5	Louisa Street	0	<0.1	<0.1
H6	Victoria Street	0	<0.1	<0.1
H7	Brade Close	0	<0.1	<0.1
H8	Aldermoor Close	0	<0.1	<0.1

Receptor		Number of Exceedances	Hypergeometric Distribution (%)	Hypergeometric Distribution for Continuous Operation (%)
H9	Stoneygate Walk	0	<0.1	<0.1
H10	Cornwall Street	0	<0.1	<0.1
H11	Varna Community Primary School	0	<0.1	<0.1
H12	Parkhouse Street	0	<0.1	<0.1
H13	Ashton Old Road	0	<0.1	<0.1

5.2.8 As indicated in Table 26, the cumulative hypergeometric distribution calculates the probability to be <0.1% at all receptor locations. Based on this probability, the 1-hour mean EQS for NO₂ is very unlikely to be exceeded at any location during operations of the facility.

5.2.9 It is therefore considered that an annual operational period of 2,500 hours is acceptable and that impacts on 1-hour mean NO₂ concentrations can be considered as not significant.

5.2.10 1-hour mean pollutant contours are shown in Figure 9. The contours do not indicate any exceedances of the EQS. It is critical to note that the concentrations presented below reflect impacts based on annual operations of 8,670 hours and actual impacts associated with 2,500 hours would reflect in a significantly reduced 99.79%ile value.

Figure 9 – Modelled 1-hour Mean NO₂ Concentrations



5.3 Ecological Receptors

Oxides of Nitrogen

5.3.1 Predicted annual mean NO_x concentrations at sensitive ecological receptors are summarised in Table 27.

Table 27: Predicted Annual Mean NO_x Concentrations

Receptor	Predicted Annual Mean Concentration (µg/m ³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
E1	0.27	23.84	1	79
E2	0.25	23.82	1	79
E3	0.22	23.79	1	79
E4	0.11	25.58	0	85
E5	0.09	22.49	0	75
E6	0.62	23.02	2	77
E7	0.24	22.64	1	75
MAX	0.62	25.58	2	85

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

5.3.2 Predicted 24-hour mean NO_x concentrations are summarised in Table 28. It is critical to note that the concentrations presented below reflect impacts based on annual operations of 8,670 hours and actual impacts associated with 2,500 hours would reflect in a significantly reduced 24-hour mean concentration.

Table 28: Predicted 24-Hour Mean NO_x Concentrations

Receptor	Predicted 24-Hour Concentration (µg/m ³)		Proportion of EQS (%)	
	PC	PEC	PC	PEC
E1	6.40	53.54	9	71
E2	7.33	54.47	10	73
E3	6.03	53.17	8	71
E4	4.35	55.29	6	74
E5	2.66	47.46	4	63
E6	12.05	56.85	16	76
E7	6.29	51.09	8	68
MAX	12.05	56.85	16	76

Predicted concentrations were assessed against the relevant CL: 75µg/m³.

5.3.3 As presented in Table 27 and Table 28, the PC proportion of the annual and 24-hour mean EQS is below 1% and 10% at all European ecological designations, and below 100% at all local designations.

5.3.4 Based on the initial EA screening criteria, impacts of annual and 24-hour mean NO_x concentrations can be screened out as insignificant and no further analysis is required.

5.3.5 Based on the conservative operational hours, impacts of NO_x concentrations at all ecological receptors can be considered as not significant.

Nitrogen Deposition

5.3.6 Predicted annual mean nitrogen deposition rates are summarised in Table 29.

Table 29 Predicted Annual Mean Nitrogen Deposition Rates

Receptor	Predicted Annual Mean Nitrogen Deposition Rate (kgN/ha/yr)		Proportion of EQS (%)			
			Low EQS		High EQS	
	PC	PEC	PC	PEC	PC	PEC
E1	0.08	42.50	1	425	1	283
E2	0.04	25.38	1	508	0	254
E3	0.06	42.48	1	425	0	283
E4	0.03	42.45	0	425	0	283
E5	0.01	26.01	0	867	0	260
E6	0.09	26.09	3	870	1	261
E7	0.03	26.03	1	868	0	260
MAX	0.09	42.50	3	870	1	283

5.3.7 As indicated in Table 29, the PC proportion of the EQS is less than 1% at European ecological designations and 100% at all local designations. Based on the initial EA screening criteria, impacts on nitrogen deposition rates can be screened out as insignificant at all locations and no further analysis is required for this substance.

5.3.8 Based on the PEC the CLs are exceeded at all ecological designations; however, this is due to high background deposition rates which exceed the CL as a baseline condition.

5.3.9 Impacts of N deposition at all ecological receptors can be considered as not significant.

Acid Deposition

5.3.10 Predicted annual mean acid deposition rates are summarised in Table 30. The APIS critical load function tool was used to determine whether there is an exceedance of the CL function for acid deposition.

Table 30 Predicted Annual Mean Acid Deposition Rates

Receptor	Predicted Annual Mean Acid Deposition Rate (keq/ha/yr)	% of Critical Load Function		Exceedance of CL Function (keq/ha/yr)
	N	PC	PEC	
E1	0.006	0.3	112.3	No Exceedance of PC Function
E2	0.003	0.0	101.9	No Exceedance of PC Function
E3	0.004	0.0	112.3	No Exceedance of PC Function
E4	0.002	0.0	112.3	No Exceedance of PC Function
E5	0.001	N/A	N/A	N/A
E6	0.006	N/A	N/A	N/A
E7	0.002	N/A	N/A	N/A
MAX	0.006	0	112.3	-

5.3.11 As shown in Table 30, the APIS critical load function tool indicated no exceedance of the CL function for acid deposition with all PC proportions below 100%. Based on the initial EA

screening criteria, impacts on acid deposition rates can be screened out as insignificant at all locations and no further analysis is required for this substance.

5.3.12 Similar to nitrogen deposition the PEC exceeds the EQS at all designations, again this is due to high background deposition rates which significantly exceed the CL as a baseline condition.

5.3.13 Impacts of acid deposition at all ecological receptors can be considered as not significant.

5.4 Construction Dust

5.4.1 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 STOR 128 Limited to undertake an Air Quality Assessment in support of the planning application for a STOR facility on land located off Ashton Old Road, Manchester.
- 6.1.2 It is understood that the proposed facility site comprises 6 no. 2.300 MWe natural gas-powered electricity generators with an overall thermal input of 31.80 MWth. Each generator is served by a 13 m high (from ground level) exhaust flue. The technical data provided for the Edina TCG3020V20 engine is provided in Appendix A.
- 6.1.3 Pollutant emissions associated with the combustion of natural gas by the generators have the potential to cause adverse 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.
- 6.1.4 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. Predicted Impacts were based on the facility operating at a maximum proposed 2,500 hours per year.
- 6.1.5 Impacts were based on maximum ELVs, as well the use of the maximum predicted concentrations over 5 assessment years. The effect of elevated concentrations at roadside receptor locations was also included. As such, the assessment is considered to be robust.
- 6.1.6 The annual mean EQS were not exceeded at any location within the assessment extents relevant of human exposure. Impacts at residential receptors were assessed as either negligible or slight adverse which can be screened out as insignificant.
- 6.1.7 Slight to moderate adverse impacts were predicted for short term NO₂ EQS at a number of receptors near to the facility. However, given the large headroom between the predicted concentrations and the EQS and considering the large overestimation of operational hours made in the assessment, impacts were considered as not significant.
- 6.1.8 The EQS for nitrogen and acid deposition on ecological designations was exceeded as a baseline condition however the process contribution from the plant emissions could be screened out as insignificant following the initial EA screening criteria.
- 6.1.9 Predicted impacts on existing all sensitive receptors were considered not significant in accordance with the EPUK and IAQM and EA guidance.
- 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
ADMS	Atmospheric Dispersion Modelling Software
APIS	Atmospheric Pollution Information System
AQA	Air Quality Assessment
AQLV	Air Quality Limit Value
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQS	Air Quality Strategy
AQTAG	Air Quality Technical Advisory Group
ASR	Annual Status Report
AW	Ancient Woodland
CERC	Cambridge Environmental Research Consultants
CL	Critical Level/Load
CO	Carbon Monoxide
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
O ₃	Ozone
PAHs	Polycyclic Aromatic Hydrocarbons
Pb	Lead
LNR	Local Nature Reserve
LWS	Local Wildlife Site
MAGIC	Multi-Agency Geographic Information for the Countryside
MCC	Manchester City Council
NNR	National Nature Reserve
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
PC	Process Contribution
PEC	Predicted Environmental Concentration
PM _{2.5}	Particulate Matter with an aerodynamic diameter less than 10µm
PM ₁₀	Particulate Matter with an aerodynamic diameter less than 2.5µm
SAC	Special Area of Conservation
SO ₂	Sulphur Dioxide
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
STOR	Short Term Operating Reserve
z ₀	Roughness Length

Appendix A – Engine Technical Data

TCG3020V20 - Natural Gas - 250NOx (Reduced output @ 2300kWe)			
Exhaust flow (wet)	12,590	kg/hr	
Exhaust H ₂ O (Wet)	10.5%	by vol	
Exhaust O ₂ (Wet)	9.0%	by vol	
Exhaust O ₂ (Dry)	10.1%	by vol	
Exhaust Exit Vol flow (dry)	8,773	Nm ³ /hr	
Exhaust Exit Vol flow (wet)	9,802	Nm ³ /hr	
Exit Flue Gas Temp	387	°C	±8%
Flue Gas Temp	660	K	
Exit Vol	23,697.7	m ³ /hr actual conditions	
Exit Vol	6.583	m ³ /s actual conditions	
Calculated Exit Vel	17	m/s	
Calc Exit Diameter	0.700	m	
Calc Exit Diameter	700	mm	
NOx Emission rate	250	mg/Nm ³	273K, 5%O _{2(dry)}
NOx Emission rate	1,500,203	mg/hr	
NOx Emission rate	0.394	g/s	



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