

Air Quality Assessment for Insynch Energy Services Limited 12 MWe Gas Peaking Facility, Knowsley Industrial Estate

Project 6623

Issue A1

Issue date: 27th May 2021

Document number: R6623-IE-0002

Stopford Energy & Environment,
the trading name of Stopford Projects Ltd

VAT Registration Number: 388 107 726
Company Registration Number: 1630328

Enquiries:

Stopford Energy & Environment
Custom House
Merseyton Road
Ellesmere Port
Cheshire
CH65 3AD
United Kingdom

tel: +44 (0)151 357 7740
fax: +44 (0)151 345 8087
enquiries@stopford.co.uk



ISO 9001
Certificate Number 5021

Contents

Executive Summary.....	4
1 Introduction.....	5
2 Legislation	7
2.1 European Legislation.....	7
2.2 UK Legislation.....	7
2.3 Local Air Quality Management	8
2.4 National Planning Policy	8
2.5 National Planning Practice Guidance	9
2.6 Local Planning Policy.....	10
2.7 Gas Generators.....	10
3 Proposed Site Parameters.....	12
3.1 Modelled domain.....	12
3.2 Sensitive receptors	12
3.3 Conservation Receptors.....	13
3.4 Background Pollution	15
3.5 Coastline.....	17
3.6 Operational Hours.....	18
3.7 Stack Height.....	18
4 Modelling Input Data.....	19
4.1 Modelling Software	19
4.2 Plant Details	19
4.3 Process and Emission Data.....	20
4.4 Surface Roughness	21
4.5 Meteorological Data	21
4.6 Nearby Buildings	22
5 Assessment Criteria.....	25
5.1 Determining Significance.....	25
5.2 AQS Limits for Nitrogen Dioxide.....	26
5.3 Limits for Nitrogen Dioxide for Conservation Areas.....	26
5.4 Workplace Exposure Limits.....	27
6 Results	28
6.1 HI Screening Tool.....	28
6.2 Dispersion Modelling.....	28
6.3 Conservation Areas.....	34
6.4 Stack Height.....	35
6.5 Discussion	36
7 Construction Phase Impacts	37
7.1 Standards and Guidelines.....	37
7.2 Planning Policy and Control	37

7.3	Preliminary Air Quality Impact	38
7.4	Generation of Fugitive Dust and Dust Sensitive Receptors.....	38
7.5	Mitigation.....	38
8	Conclusions	40
	References.....	42
	Appendices.....	44
Appendix I.	Wind Roses.....	44

Revision History

Issue	Originated/Updated by (date)	Reviewed by (date)	Approved by (date)	Nature of changes
P1	Peter Shanahan (19/05/2021)	Kate Riley (26/05/2021)		
A1	Peter Shanahan (19/05/2021)	Kate Riley (26/05/2021)	Deb Pal (27/05/2021)	

Executive Summary

Site Description	The proposed 12 MWe gas peaking electrical generation installation is centred on NGR 343779,399351. Site area is 0.4882 ha. The site consists of vacant land on the Knowsley Industrial Estate, Acornfield Road, Kirkby, L33 7UZ. Sensitive receptors within a 10 km radius include: residential areas and schools to the west towards Kirkby. Residential receptors 0.2 km to the north are assessed. Conservation areas within a 10 km radius include: two SSSIs and one local nature reserve.
Process data and emissions data	The assessment considers the emission of NO _x as NO ₂ from stacks of six individual gas-powered generator units. The "worst-case" impacts from these point sources were assessed using the pollutant emission limits specified in the Medium Combustion Plant Directive. The assessment also considered five years of hourly sequential meteorological data.
Dispersion Model	The dispersion modelling exercise was completed using ADMS 5.2 software.
Background air quality	Background NO ₂ for receptor locations was determined from Defra air quality modelling, corrected against monitoring station data (20% increase for background modelled NO ₂).
Assessment (Scope)	The assessment was completed in four parts: 1. Detailed dispersion modelling of pollutants at sensitive receptors (receptor domain) within 10 km radius of the stack. 2. The impact on conservation areas. 3. Stack height assessment. 4. Construction phase impacts. The impacts of the facility on local air quality have been reviewed against criteria provided by the Environment Agency and the Institute of Air Quality Management.
Results	Proposed stack heights 9.04 m above ground level will ensure that the impact of the facility has no significant impact with respect to ground level NO₂ concentrations. Long term NO₂ PEC is <70% of the EAL for six gensets running up to 1,500 hours per year. Short term (100th percentile) NO₂ PC does not exceed the relative EAL for any hour of dispersion modelling for six gensets running up to 1,500 hours per year. With regards to construction phase impacts, windblown dust was considered a potential nuisance. However, given the low sensitivity of the area the qualitative assessment concluded that off-site impacts could be effectively mitigated by employing good site practices.
Conclusions	This report concludes that overall, the proposed development will not have a significant impact on local air quality or conservation areas. This is because the estimated long term and short term NO ₂ ground concentrations meet Environment Agency thresholds. Worst case emission levels (as likely permitted) were used for the dispersion modelling method (i.e. all six gensets running, MCPD ELV), whereas the proposed installation will likely be operating below these limits.

I Introduction

A 12 MWe gas peaking installation is proposed to be located off Acornfield Road, Kirkby, L33 7UZ (Figure 1). The central grid reference for the site is 343779,399351. The 0.4882 ha site is currently vacant, bounded by industrial units to the north, south and west, and to the east by Acornfield Road.

The site is to consist of six 2 MWe natural gas powered engines housed within container units (12.2 x 3.0 x 3.3 m) (Figure 2). Exhaust stacks are mounted to the tops of the containers.

This report describes the data used in the emissions modelling, the methodology adopted, the assumptions that have been made and the results generated by the dispersion model. The assessment was based upon the specifications provided by the technology supplier and employs industry best practice by modelling worst-case emission limits. Consequently, actual emissions will be less than those referenced.

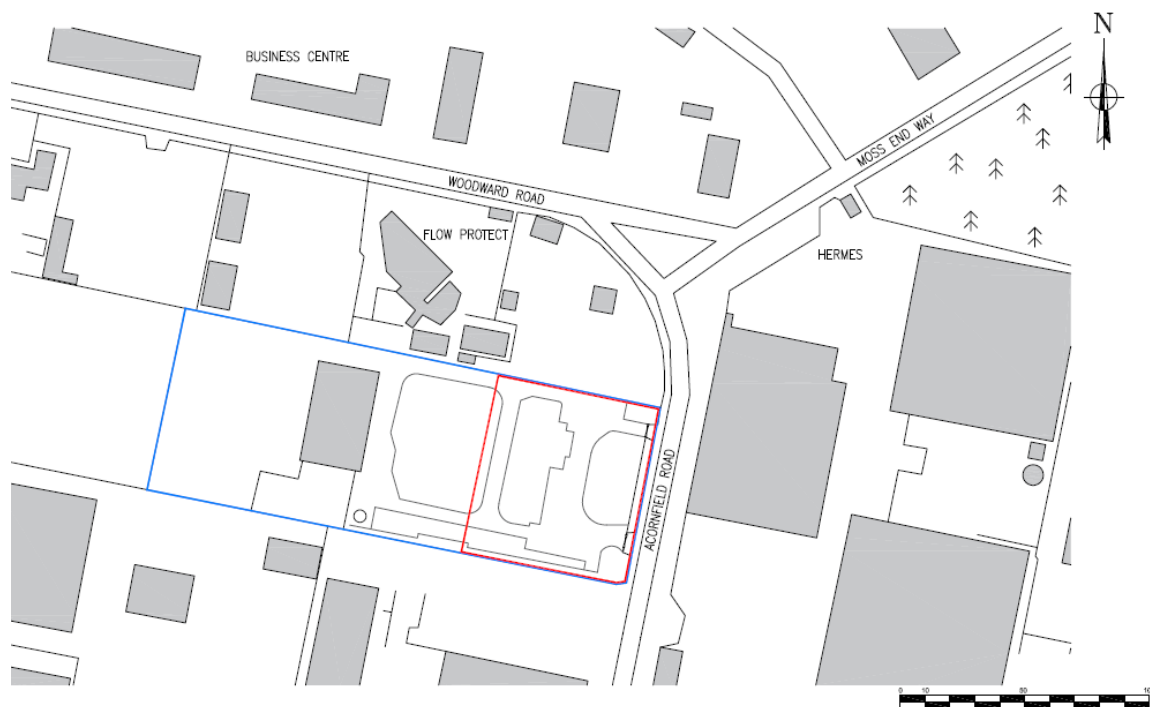


Figure 1 Proposed site location. Day Architects.

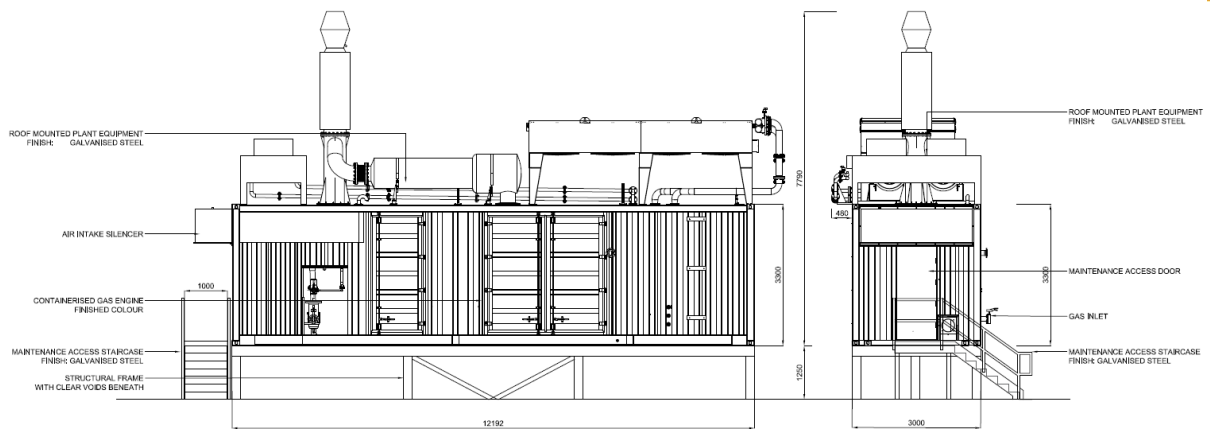


Figure 2 Proposed gas genset units, Siemens SGE-86 EM.

The objectives of the assessment are:

- Assess the impact of emissions to air from the facility on the ground level concentration of the regulated pollutants defined in the relevant air quality regulations.
- Provide an estimate of the impacts of the facility on conservation areas.
- Assess the impact on local air quality from increases in stack height.

This air quality assessment does not include emissions from road vehicles or mobile plant operating on site, nor does it include the construction phase impacts of the development. However, reference is made to industry best practice with regards to reducing construction phase impacts.

2 Legislation

2.1 European Legislation

European Union (EU) air quality legislation is provided within Directive 2008/50/EC, which came into force on 11th June 2008. This Directive consolidated previous legislation which was designed to deal with specific pollutants in a consistent manner and provided new air quality objectives (AQOs) for particulate matter with an aerodynamic diameter of less than 2.5 μm ($\text{PM}_{2.5}$). The consolidated Directives include:

- Directive 99/30/EC - the First Air Quality "Daughter" Directive - sets ambient Air Quality Limit Values (AQLVs) for nitrogen dioxide (NO_2), oxides of nitrogen (NO_x), sulphur dioxide (SO_2), lead and particulate matter with an aerodynamic diameter of less than 10 μm (PM_{10});
- Directive 2000/69/EC - the Second Air Quality "Daughter" Directive - sets ambient AQOs for benzene and carbon monoxide (CO); and
- Directive 2002/3/EC - the Third Air Quality "Daughter" Directive - seeks to establish long-term objectives, target values, an alert threshold and an information threshold for concentrations of ozone in ambient air.

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

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

2.2 UK Legislation

The Air Quality Standards Regulations (2010) came into force on 11th June 2010 and transpose the EU Directive 2008/50/EC into UK law. AQLVs were published in these regulations for 7 pollutants, as well as Target Values for an additional 6 pollutants.

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 2007. 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 may vary slightly.

The National Emissions Ceiling Directive (NECD) (2001/81/EC), the UK National Emission Ceilings Regulations 2018 (ref. 12), sets national targets for reductions of pollutants, including NO_x. Restrictions on plants with higher NO_x intensity, such as fast start gas peaking plant, directly contributes to achieving NECD targets.

2.3 Local Air Quality Management

Under Section 82 of the Environment Act (1995) (Part IV), Local Authorities (LAs) are required to periodically review and assess air quality within their area of administration under the system of Local Air Quality Management (LAQM). This review and assessment of air quality involves considering present and likely future air quality against the AQOs. If it is predicted that levels at locations of relevant exposure are likely to be exceeded, the LA is required to declare an Air Quality Management Area (AQMA). For each AQMA the LA is required to produce an Air Quality Action Plan, the objective of which is to reduce pollutant concentrations in pursuit of the AQOs.

2.4 National Planning Policy

The National Planning Policy Framework (NPPF) (ref. 5) sets out the Government's core policies and principles with respect to land use planning, including air quality. The document includes the following considerations which are relevant to this assessment.

Under Paragraph 170, the planning system should contribute to and enhance the natural and local environment by: *Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information.*

Under Paragraph 181: *Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications.*

2.5 National Planning Practice Guidance

The National Planning Practice Guidance (NPPG), Ministry of Housing, Communities & Local Government (ref. 4), is a web-based resource to support the NPPF and make it more accessible. The relevant air quality sections (ref. 3) are highlighted below:

Paragraph 001 states: *The Department for Environment, Food and Rural Affairs (Defra) carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with relevant Limit Values. It is important that the potential impact of new development on air quality is taken into account where the national assessment indicates that relevant limits have been exceeded or are near the limit, or where the need for emissions reductions has been identified.*

Paragraph 002 states: *Air quality is also an important consideration in habitats assessment, strategic environmental assessment and sustainability appraisal which can be used to shape an appropriate strategy, including through establishing the 'baseline', appropriate objectives for the assessment of impacts and proposed monitoring.*

Paragraph 005 states: *Whether air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity.*

Paragraph 007 states: *Assessments need to be proportionate to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions), and because of this are likely to be location specific. The scope and content of supporting information is best discussed and agreed between the local planning authority and applicant before it is commissioned. It is not necessary for air quality assessments that support planning applications to duplicate aspects of air quality assessments that will be done as part of non-planning control regimes, such as under Environmental Permitting Regulations. Air quality is a consideration in Environmental Impact Assessment, if one is required, and also in a Habitats Regulations Appropriate Assessment.*

2.6 Local Planning Policy

The Knowsley Council Local Plan (ref. 6) is a series of Development Plan Documents setting policies and proposals for the use of land in the Knowsley area. The Local Plan provides the current basis for the determination of planning applications within the Council's area of administration.

Air quality within Knowsley is generally good with no Air Quality Management Areas designated within the borough.

A review of the Local Plan indicated the following policy in relation to air quality that is relevant to this assessment:

- Policy CS2 - Development Principles - Minimising negative impact upon air quality and ensuring any negative impacts are appropriately mitigated. Development that will have an unacceptable impact will only be permitted where the benefits of the proposal clearly outweigh the harm.
- Policy CS8 - Maintenance and Enhancement of Knowsley's Existing Green Infrastructure. Mitigate air pollution.

Reference has been made to these policies during the undertaking of this Air Quality Assessment.

2.7 Gas Generators

Local Planning Authorities do not regulate the gas generators proposed for the development site. However there are permitting regulations in the UK which set Emission Limit Values (ELVs) as discussed below.

The Medium Combustion Plant Directive 2015/2193 (MCPD, ref. 15), introduced in 2015, requires all combustion plant with rated thermal input between 1 and 50 MWth to obtain and comply with the conditions of a permit. In transposing the requirements of the MCPD into the Environmental Permitting Regulations (EPR), Defra introduced additional controls for Specified Generators (SGs). SGs are those MCPs that generate electricity for >50 hours per annum (incl. testing) or export electricity to the grid. The SG regulations also applies to generators with a capacity up to 50 MWth burning any fuel (ref. 6) and covers an individual generator or a number of generators (ref. 8) if they are:

- on the same site
- operated by the same operator

- for the same purpose (i.e. generating electricity)

For engines and turbines the standard ELV for nitrogen oxides is 190 mg/Nm^3 (at a temperature and pressure of 273.15K and 101.3kPa, with a correction for the water vapour content of the waste gases to dry gas, standardised to O_2 concentration of 15%) (ref. 10). The parameters for the proposed MCP/SG units are discussed in Section 4.3.

A specified generator must not cause a breach of an air quality standard. Operators must ensure protection of:

- human health – known as sensitive receptors
- conservation sites – known as habitats

Guidance from the Environment Agency outlines detailed dispersion modelling required for permitting a specified generator (ref. 11). This includes:

- Describe the site location and expected operational life.
- State the number of generators on site and the thermal capacity for each.
- Describe the operating envelope.
- Operational hours the specified generator will operate per year within the described operating envelope, accounting for 'typical' and 'maximum' operating hours per year.
- Characterise the emissions.
- Model the effect of buildings and terrain.
- Predicted Environmental Concentrations (PECs) at individual receptor locations - important in or near AQMAs.
- Assess sensitive receptors where there is relevant public exposure, including where members of the public have access, are regularly present and can be exposed for a significant portion of the averaging time of the standard (standards do not apply where health and safety at work provisions are in place and where members of the public do not have access).
- Assess the NO_x impacts on conservation areas.

3 Proposed Site Parameters

3.1 Modelled domain

A modelling domain of 80 m grid spacing across a 4 x 4 km area, centred on the site was selected as representative for the dispersion modelling method used as well as incorporating complex surface roughness (Section 4.4).

3.2 Sensitive receptors

Sensitive receptor locations within 2 km of the proposed site, as required under Environment Agency guidance (ref. 11), are listed in Table 1, and shown in Figure 3.

Table 1 Sensitive receptor locations within 2 km of proposed gas peaking plant on Knowsley Industrial Estate.

No.	Name	Type	Easting	Northing	Distance from site (km)
R1	Depot Road	Residential	343763	399569	0.2
R2	Acorn Venture Urban Farm	Public	343782	399616	0.2
R3	North Perimeter Road	Residential	343844	399871	0.5
R4	North Perimeter Road	Residential	343916	399945	0.6
R5	Top House Farm	Residential	344578	398879	0.9
R6	Sandy Brow Farm	Residential	344431	397918	1.5
R7	Acornfield Close	Residential	343517	397835	1.5
R8	Park Brow	School	342336	398017	1.9
R9	Sports centre	Public	342381	398498	1.6
R10	Simonswood	School	341873	398800	1.9
R11	St Maries	School	342127	399255	1.6
R12	Warehouse Road	Residential	342594	399615	1.1
R13	Dale Lane	Residential	342824	399812	0.9
R14	Dale Lane	Residential	342885	399772	0.9
R15	Southhead	Residential	343163	400055	0.9
R16	Bullens Farm	Residential	343631	399944	0.6

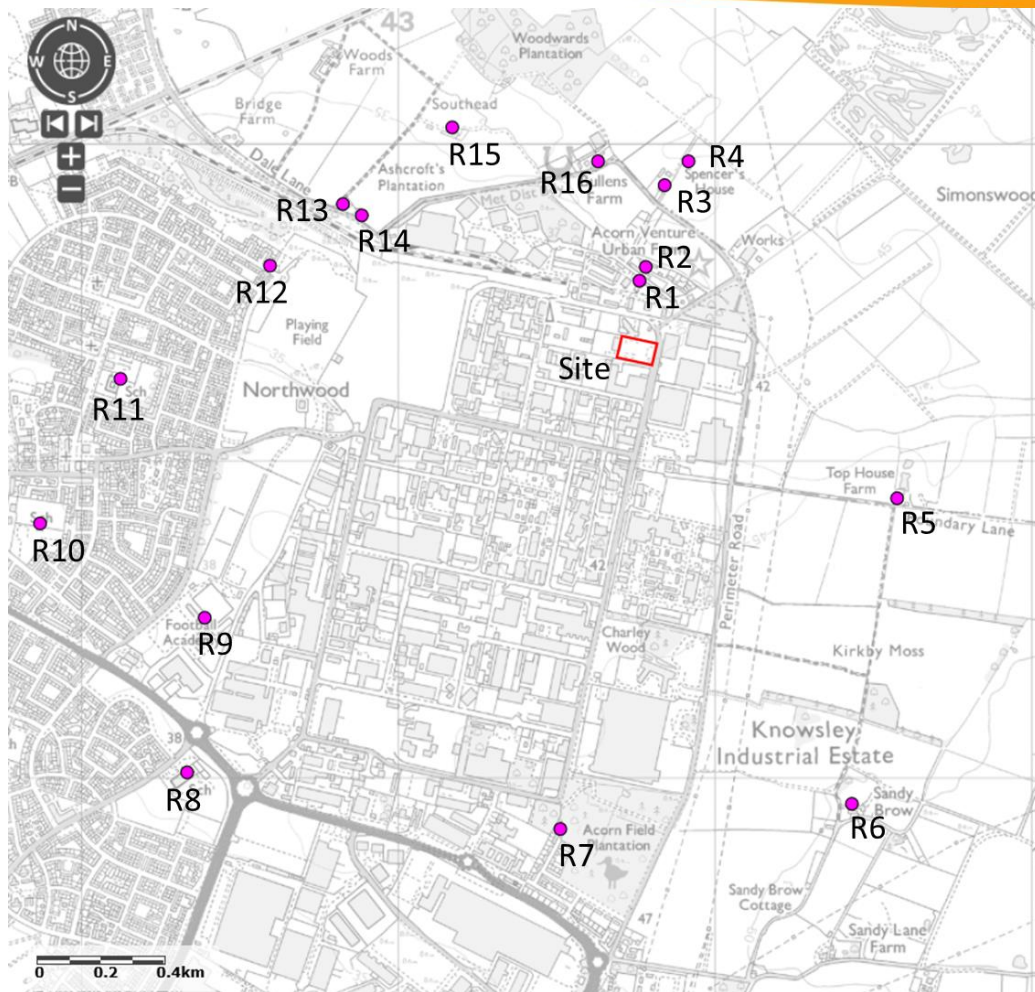


Figure 3 Sensitive receptor locations within 2 km of proposed gas peaking plant on Knowsley Industrial Estate.

3.3 Conservation Receptors

In accordance with Environment Agency guidance (ref. 9), Local Nature Reserves within 2 km of the proposed installation are screened using Defra Magic Map. As shown in Figure 4, there is one Local Nature Reserve 1.3 km from the proposed site: Acornfield Plantation.

In accordance with Environment Agency guidance (ref. 9), protected conservation areas, including special protection areas (SPAs), special areas of conservation (SACs) and Ramsar sites (protected wetlands), are screened within a 10 km radius of the proposed installation. Figure 5 shows two SSSIs within 10 km: Ravenhead Brickworks and Stanley Bank Meadow (SPAs, SACs and Ramsar along the Mersey estuary are shown beyond the 10 km screening distance).

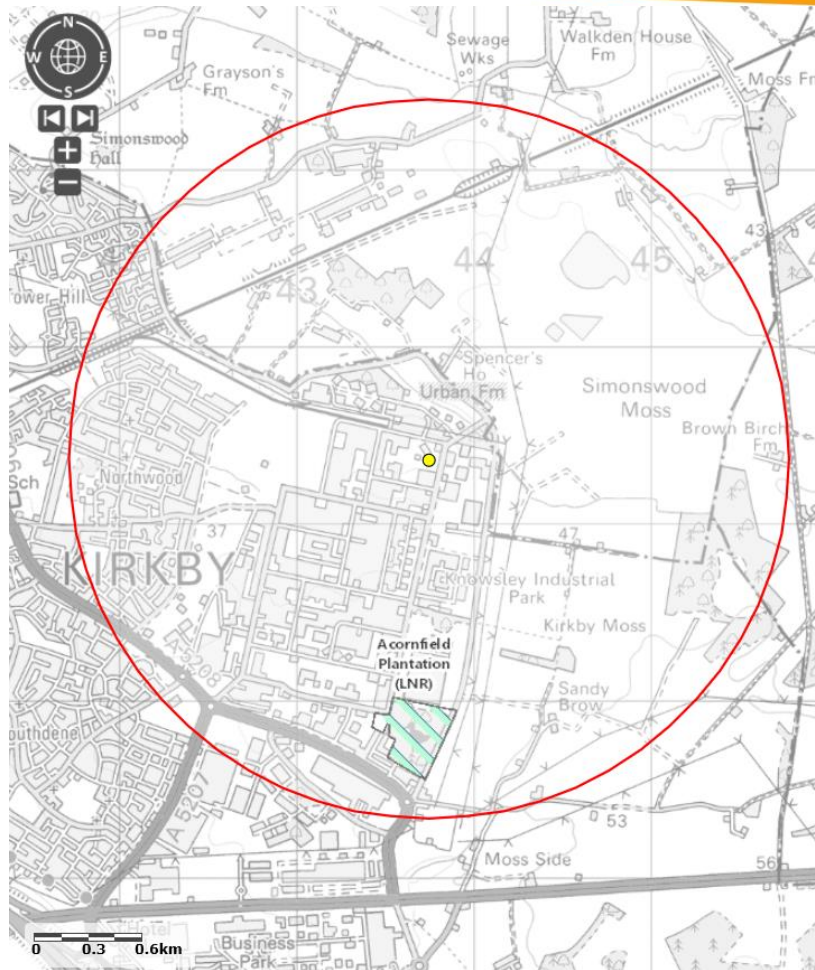


Figure 4 Local Nature Reserves within 2 km radius of proposed gas peaking plant.

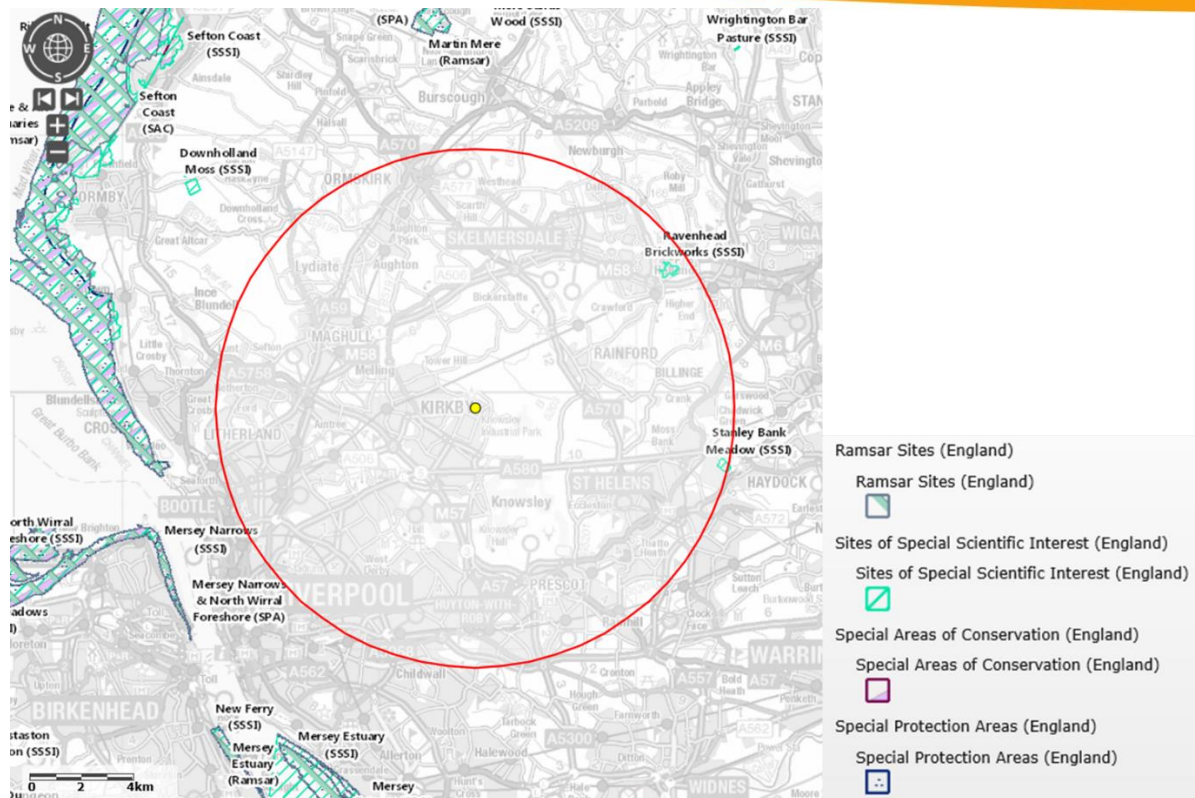


Figure 5 Protected conservation areas within 10 km radius of proposed gas peaking plant.

3.4 Background Pollution

3.4.1 Air Quality Management Areas

AQMAs surrounding the proposed site as required under Environment Agency guidance (ref. 11) are shown in Figure 6 below. The only AQMA within 1 km from the proposed site is the one for West Lancashire District. This AQMA is specific to Moor Street and Stanley Street in Ormskirk, approximately 9 km northwest of the proposed site. This AQMA can therefore be screened out of this assessment due to the distance between the gas genset stacks and Ormskirk. All other AQMAs are over 1 km away.

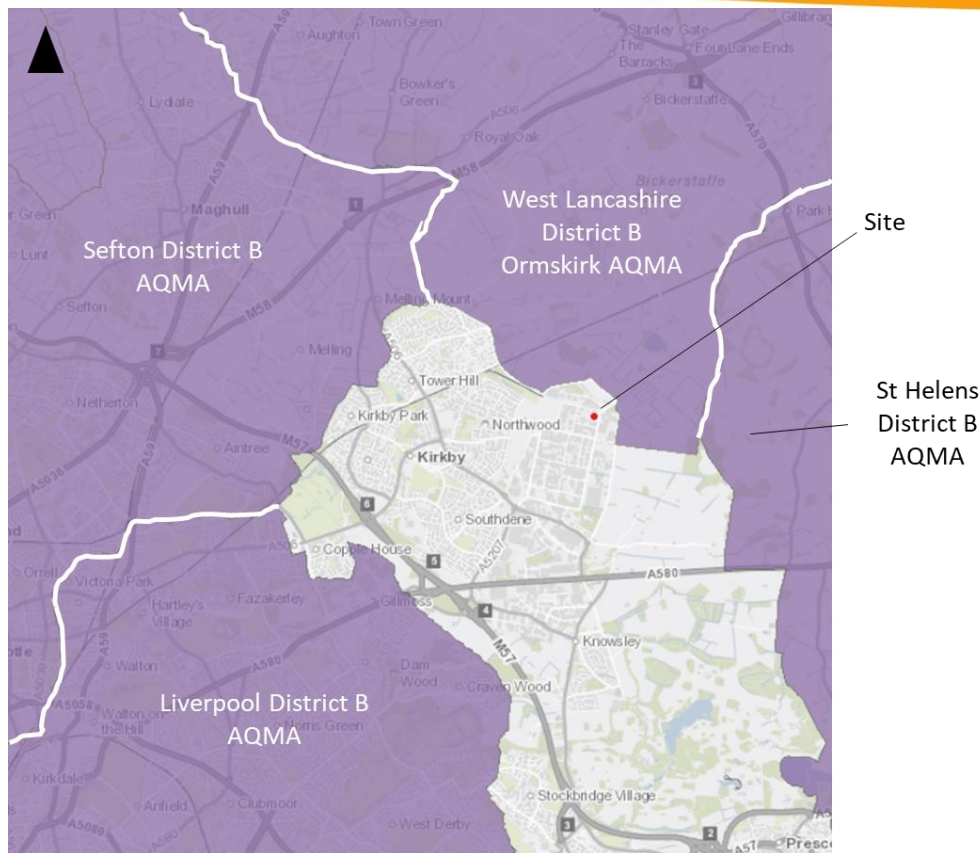


Figure 6 NO_x as NO₂ Air Quality Management Areas surrounding the proposed site (ref. 29).

3.4.2 Background NO₂ Correction

While Knowsley Council conducts automatic monitoring and operates diffusion tubes across their borough, there are no measurements conducted within the modelling domain and it is necessary to use background mapping data supplied by Defra (ref. 2). In the absence of local monitoring data, forecast background pollution data issued by Defra, at a 1km x 1km grid resolution, were used to estimate background pollutant concentrations of NO₂ for the grid square where the maximum process contribution occurs from the dispersion modelling. However, before using the background maps, their accuracy was assessed by comparison with the measurements (urban background and suburban only) taken within the Knowsley Council borough (ref. 30). Table 2 shows the NO₂ monitoring locations reported by Knowsley Council (where data capture is >75% for each respective year). Figure 7 shows the comparison between measured and modelled NO₂, falling within 25% confidence interval, with modelled NO₂ being underestimated. As a result, the Defra modelled background NO₂ for the receptor locations in this assessment will be divided by 0.83 (determined from linear regression, Figure 7).

Table 2 Urban background and suburban pollution monitoring locations for NO₂ in Knowsley Councils(2017-2019) with respective Defra modelled NO₂ background.

Site	Site Type	Method	Year	x	y	Measured NO ₂	Modelled NO ₂
						(µg/m ³)	
Knowsley 9	Suburban	Diffusion Tube	2017	345596	389180	26.30	20.16
			2018			25.00	20.21
			2019			26.40	19.42
Knowsley 10	Suburban	Diffusion Tube	2017	345424	389325	22.90	20.16
			2018			23.30	20.21
			2019			23.90	19.42
Knowsley 11	Suburban	Diffusion Tube	2017	346329	389782	28.60	23.60
			2018			26.40	24.80
			2019			28.90	23.73

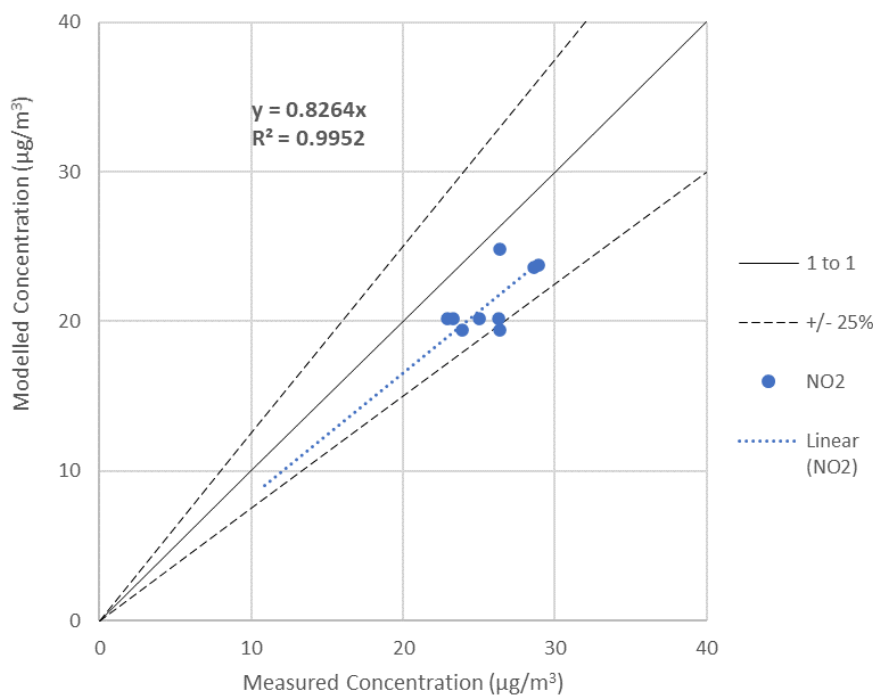


Figure 7 Comparison between measured and modelled NO₂ pollution within the Knowsley council area (2017-2019).

3.5 Coastline

The proposed site is located approximately 13 km east from the coast, therefore the dispersion modelling will not need to account for coastal effects to meteorology (i.e. 5 km or less from coastlines).

3.6 Operational Hours

The proposed gas peaking plant is expected to be operational for 1,500 hours per engine per year (equivalent to approximately 4 hours per day) as a rolling average, as and when called upon by the local distribution network. This is in accordance with Environment Agency guidance for gas combustion plant exporting electricity (ref. 18).

3.7 Stack Height

With reference to Environment Agency guidance (ref. 12) a stack height assessment for the proposed gensets has been undertaken for the following heights above ground level:

- 9.04 m (as proposed)
- 10 m
- 11 m
- 12 m
- 13 m
- 14 m
- 15 m

Note that the technology supplier Siemens would caution against a total stack height >10 m due to the added requirements for securing larger stack structures.

4 Modelling Input Data

4.1 Modelling Software

4.1.1 H1 Screening Tool

The Environment Agency's H1 Software Tool (ref. 19) was used to screen impacts from the proposed installation of gas gensets, running periodically for 17% of the year, at the Knowsley Industrial Estate.

4.1.2 Dispersion Modelling Software

The detailed dispersion modelling software used in the assessment was ADMS 5.2 (Cambridge Environmental Research Consultants), which allows users to model industrial sources using 'new generation' atmospheric dispersion and deposition modelling principles to simulate the short-range transport (<10 km) of buoyant and passive pollutants in the atmosphere, either individually or in combination, over periods from less than one hour to many years. ADMS can calculate long term average pollutant concentrations as well as peak hourly and percentile values and includes modules that can be used to determine complex effects such as the influence of buildings and terrain on dispersion.

4.2 Plant Details

The emission parameters for the proposed genset units are provided in Table 3.

Table 3 Stack locations and parameters for the 2 MWe Siemens natural gas powered SGE-86EM engines.

Parameter	Value
Stack Locations (NGR x,y)	Stack 1 - 343762,339362 Stack 2 - 343769,339360 Stack 3 - 343777,339358 Stack 4 - 343757,339337 Stack 5 - 343764,339335 Stack 6 - 343771,339333
Stack Inner Diameter (m)	0.5
Stack heights (m)	9.04
Efflux Temperature (°C) +/-20°C	361
Average efflux velocity (m/s)	27
Normalised volumetric flow rate (Nm ³ /s) - per engine	2.3
%H ₂ O volume	0
%O ₂ volume	5

4.3 Process and Emission Data

Exhaust emissions for NO_x and NO₂ are taken to be at the emission limit value of 190 mg/Nm³, set out in the MCPD (ref. 15).

According to Siemens, the expected emission rate for each SGE-86EM engine is 250 mg/Nm³ ±10% at 5% O₂, which is equivalent to 93 mg/m³ ±10% at 15% O₂. Therefore use of the MCP emission limits is a worst case assumption.

Emission limit value for NO_x as NO₂ (assuming for this assessment 100% of NO_x comprises of NO₂) for the gas engines have been converted to emission values at standard temperature (273.15 K), pressure (101.3 kPa) and oxygen (15%) values (Table 4).

Table 4 Emission values for NO_x as NO₂ for each of the six off 2 MWe Siemens natural gas powered SGE-86EM engines.

Pollutant	MCP/SG Emission Limit Value* (mg/Nm ³)	Emissions at Actual conditions ** (mg/Am ³)	Actual pollutant emission rate*** (g/s)
NO _x	190	221	0.5

* Standard conditions 273.15 K; 101.3 kPa; dry gas; 15% O₂

** Actual Exhaust conditions 634.15 K; 101.3 kPa; dry gas; 5% O₂

***At normalised flow rate 8,291 Nm³/h (Siemens)

4.4 Surface Roughness

Due to the proposed site location being within an industrial estate, surrounded by a mixture of open agricultural areas to its east and urban area of Kirkby to its west, the Complex Terrain setting was used in ADMS. Figure 8 shows the selection of surface roughness classes in relation to the site location.

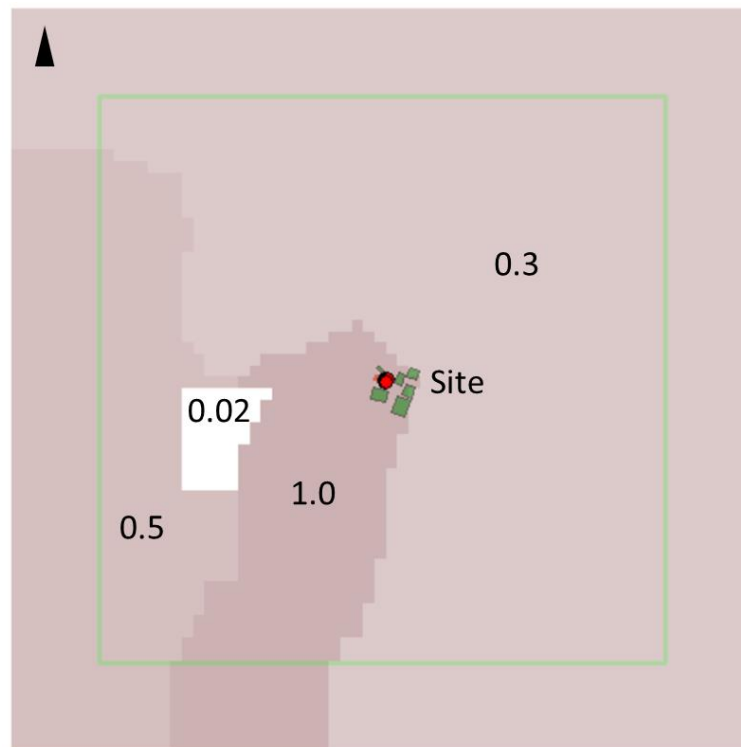


Figure 8 Complex terrain surface roughness for proposed site. 0.3m for open agriculture; 1.0m for industrial estate; 0.5m for urban; 0.02 m grassland.

4.5 Meteorological Data

Five years of hourly sequential meteorological data recorded 2016-2020 were obtained from Atmospheric Dispersion Modelling Limited. The meteorological data used in the assessment was obtained from Numerical Weather Prediction (NWP) models that provide more representative meteorological data than observed data for the location of the proposed site.

The wind roses for the five years of met data are provided in Appendix I and shows the wind direction has components from between the west and northwest, and south to southeast, at speeds more than 1.5 m/s.

To ensure a worst-case modelling scenario, a sensitivity analysis was conducted with ADMS which identified that the 2017 meteorological dataset produced the highest modelled long-term ground level

NO₂ concentrations 25.73 µg/m³ across the modelling domain (based upon a stack height of 9.04 m) (Figure 9). The met sensitivity was conducted with the following ADMS settings:

- No buildings
- Complex surface roughness
- All six gas gensets running continuously

The 2017 NWP met dataset was used in subsequent assessments of impacts.

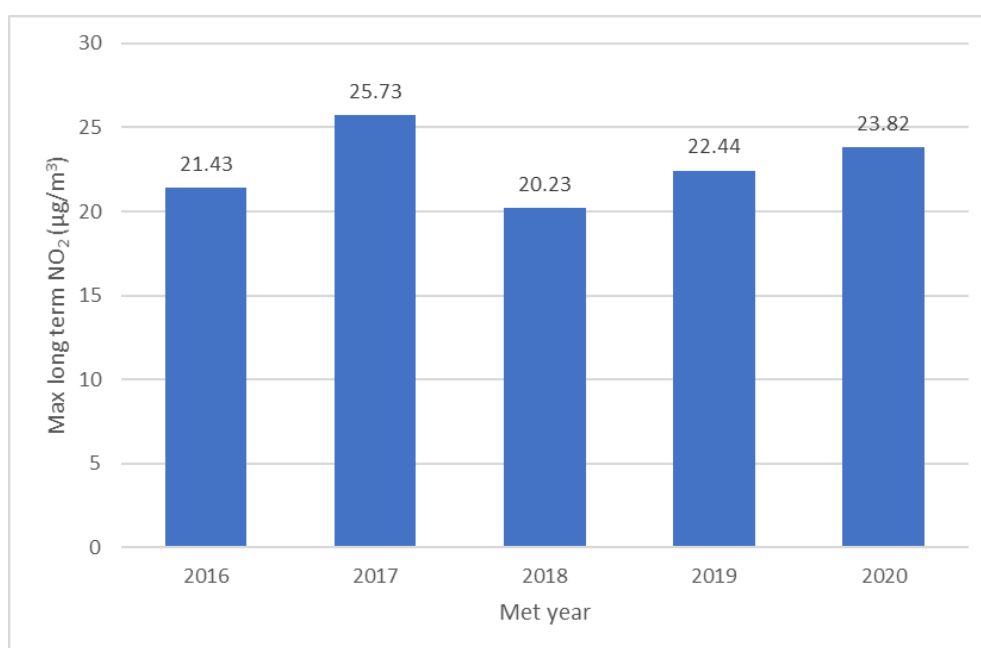


Figure 9 Maximum long term NO₂ ground concentrations sensitivity of Numerical Weather Prediction (NWP) meteorological data 2016-2020 for the site location.

4.6 Nearby Buildings

The proximity of structures to an emission source can adversely impact plume dispersion by entraining the emissions into the turbulent wake, which can draw emissions to the ground quicker and in higher concentrations than would normally occur. The location of the buildings considered to affect dispersion at the proposed Knowsley Industrial Estate location are provided in Table 5 and illustrated relative to the source parameters in Figure 10.

Offsite building no. 6, a 10 m tall building approximately 60 m south of the proposed gensets, is determined as the 'main' building impacting local air circulation. Figure 11 shows gridded long term and short term NO₂ for each individual building effect, with building no. 6 having long term

concentrations of NO₂ similar to that of building 7 (west of the site), but the highest short ground concentrations of NO₂.

Table 5 Modelled building data.

Building	Coordinates (m)	Height (m)	Length (m)	Width (m)	Angle (degrees)
Offsite 1	343724,399428	5	50	25	135
Offsite 2	343863,399361	10	75	50	20
Offsite 3	343953,399397	15	68	68	20
Offsite 4	343922,399278	15	85	75	20
Offsite 5	343868,399768	10	125	100	20
Offsite 6	343720,399251	10	110	85	105
Offsite 7	343689,399370	8	40	25	15

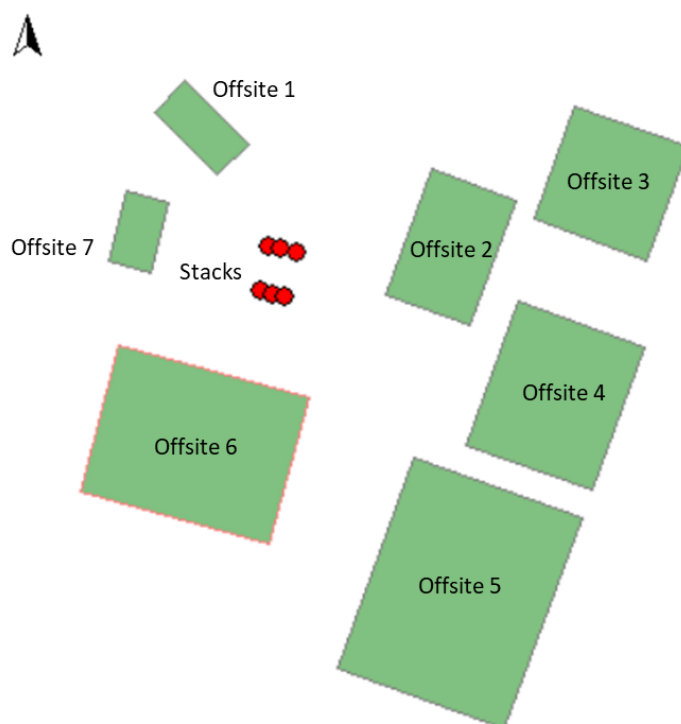


Figure 10 Building layouts for Knowsley Industrial Estate using ADMS Mapper.

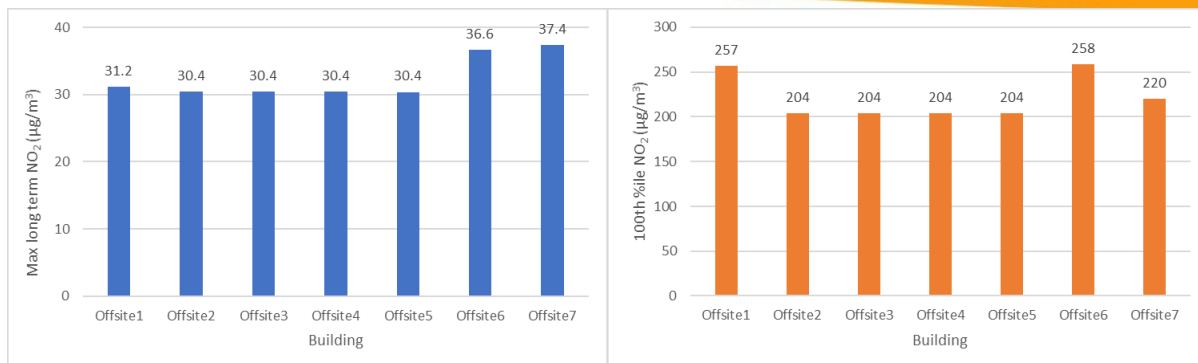


Figure 11 Gridded long term (left) and short term 100th percentile (right) NO₂ for each building.

5 Assessment Criteria

5.1 Determining Significance

5.1.1 Stage 1 Screening

The Environment Agency provides guidance (ref. 9) for stage 1 screening the significance of air quality impacts associated with industrial processes. Guidance recommends that a 1% significance threshold relative to a long-term standard is applied, with a corresponding 10% significance threshold for the assessment of short-term impacts.

The long-term process contribution 1% threshold is based on the assumptions that:

- It is unlikely that an emission at this level will make a significant contribution to adverse air quality since process contributions will be small in comparison to background levels even if a standard is exceeded.
- The proposed 1% threshold is an order of magnitude below the standard and provides a substantial buffer to protect human health and the environment.

The short-term process contribution 10% threshold is based on the assumptions that:

- Spatial and temporal conditions mean that process contributions are more likely to dominate ambient environmental concentrations.
- Short-term background concentrations can be assumed to be twice the long-term concentration.
- The 10% threshold is an order of magnitude below the standard and provides a substantial safety margin to protect human health and the environment.

As a result of these assumptions, the following threshold for NO₂ impacts was used as recommended in the EA Guidance:

- A process contribution of <1% of the annual average objective threshold is considered insignificant; and
- A process contribution of <10% of the short-term objective threshold is considered insignificant.

5.1.2 Stage 2 Screening

The Environment Agency provides guidance (ref. 9) for stage 2 screening the significance of air quality impacts associated with industrial processes in term of the Predicted Environmental Concentration

(PEC), where required. Maximum hourly (100th percentile) NO₂ PEC is required under Environment Agency guidance for specified generators (ref. 11).

The thresholds for stage 2 screening are:

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

5.1.3 Combustion Plant Operation - Scaling Back Annual Means

We consider in this assessment the limited operation time of 1,500 hours for the gensets over a year in factoring of the NO₂ impacts to sensitive receptors and to conservation areas. As above, the continuous running of all six gensets will be modelled over the selected met year, and then scaled back for the 1,500 hours (i.e. 17% of the year) in accordance with Environment Agency guidance on annual mean assessment for specified generators (ref. 11).

5.2 AQS Limits for Nitrogen Dioxide

All combustion processes release varying proportions of NO and NO₂. Most of the oxides of nitrogen that are released from combustion processes are in the form of NO which is oxidised in the atmosphere to NO₂. The UK Air Quality Strategy (AQS) limit value for NO₂ includes two objectives:

- An annual average value of 40 µg/m³, and
- A limit for the 1-hour mean of 200 µg/m³ not to be exceeded more than 18 times per year (equivalent to the 99.79th percentile).

5.3 Limits for Nitrogen Dioxide for Conservation Areas

From Environment Agency guidance (ref. 9), limits for NO_x as NO₂ at protected conservation areas are:

- Long-term PC is less than 1% of the long-term environmental standard for protected conservation areas (annual 75 µg/m³ NO_x as NO₂).
- Short-term PC is less than 10% of the short-term environmental standard for protected conservation areas (daily 30 µg/m³ NO_x as NO₂).

For Local Nature Reserves:

- Long-term PC is less than 100% of the short-term environmental standard.

- Short-term PC is less than 100% of the short-term environmental standard.

5.4 Workplace Exposure Limits

The Workplace Exposure Limits (WEL) for NO₂ (ref. 28) are as follows:

- 8-hour = 960 µg/m³
- 15-minutes = 1,910 µg/m³

6 Results

6.1 HI Screening Tool

The results from H1 screening are shown in Table 6 below.

Table 6: Results of Screening Assessment

Location	Stage 1			Stage 2		
	EAL ($\mu\text{g}/\text{m}^3$)	PC ($\mu\text{g}/\text{m}^3$)	PC as % EAL	Background conc. ($\mu\text{g}/\text{m}^3$)	PEC ($\mu\text{g}/\text{m}^3$)	PEC as % EAL
Short term	200	2,360	1,362	16.1	-	1,406 ¹
Long-term	40	19.3	72.4	16.1	32.7	81.7

Stage 1 screening shows that the short-term PC is >10% of the short-term environmental standard, and long-term PC is >1% of the long-term environmental standard.

Stage 2 screening shows that the short-term PC is > 20% of the of the short-term environmental standard minus twice the long-term background concentration, and that the long-term PEC is >70% of the long-term environmental standard.

The results in Table 6 show that the emissions cannot be screened out and detailed modelling is required to assess the impact of emissions on the environment and human health. This is covered in the next section.

6.2 Dispersion Modelling

Dispersion modelling for long term and short term NO₂ emissions impacts on sensitive receptors are provided in the following sections.

¹ Assessment of short-term PEC is based on short-term PC as a percentage of the short-term environmental standard minus twice the long-term background concentration.

6.2.1 Assessment of Long Term NO₂ emissions

Table 7 shows that long-term NO₂ PC is > 1% significance threshold at receptors R1-R6 and R15-R16, therefore the PEC is considered. Table 7 also shows that long term NO₂ PEC is <70% of the EAL at all sensitive receptors with all six gensets in operation.

As discussed in Section 5.1.3, the installation will be operating up to 1,500 hours per year (17% of year), applying a scaling down factor of 0.17 to the long term NO₂ PC results in predicted long term PEC being <70% at sensitive receptors R1 and R2 (Table 8).

Figure 12 shows a plot of long term NO₂ PC in relation to sensitive receptors (assuming continuous running of the six gensets for the 2017 met year) within the grid domain.

Table 7 Long-term PC and PEC of NO₂ emissions at sensitive receptors from continuous running of six gensets at proposed site. EAL = 40 µg/m³. Exceedance PC >1% of EAL shown in red.

Location	PC (µg/m ³)	PC (% EAL)	Corrected Background conc. (µg/m ³)	PEC (µg/m ³)	PEC (% EAL)
R1	8.51	21.3	16.14	24.65	61.6
R2	6.33	15.8	16.14	22.46	56.2
R3	2.17	5.4	16.14	18.31	45.8
R4	1.54	3.9	16.14	17.68	44.2
R5	1.39	3.5	14.38	15.77	39.4
R6	0.42	1.1	14.66	15.09	37.7
R7	0.16	0.4	18.52	18.68	46.7
R8	0.06	0.1	18.33	18.39	46.0
R9	0.07	0.2	18.33	18.40	46.0
R10	0.08	0.2	18.43	18.51	46.3
R11	0.13	0.3	15.80	15.93	39.8
R12	0.24	0.6	15.80	16.04	40.1
R13	0.29	0.7	15.80	16.09	40.2
R14	0.32	0.8	15.80	16.13	40.3
R15	0.63	1.6	12.81	13.44	33.6
R16	1.96	4.9	16.14	18.10	45.2

Table 8 Long-term impacts of NO₂ emissions at sensitive receptors R1 and R2 from 1,500 hours running of six gensets at proposed site. EAL = 40 µg/m³.

Location	PC x 0.17 (µg/m ³)	PC (% EAL)	Corrected Background conc. (µg/m ³)	PEC (µg/m ³)	PEC (% EAL)
R1	1.45	3.6	16.14	17.58	44.0
R2	1.08	2.7	16.14	17.21	43.0
R3	0.37	0.9	16.14	16.51	41.3
R4	0.26	0.7	16.14	16.40	41.0
R5	0.24	0.6	14.38	14.61	36.5
R6	0.07	0.2	14.66	14.74	36.8
R7	0.03	0.1	18.52	18.54	46.4
R8	0.01	0.0	18.33	18.34	45.9
R9	0.01	0.0	18.33	18.34	45.9
R10	0.01	0.0	18.43	18.45	46.1
R11	0.02	0.1	15.80	15.82	39.6
R12	0.04	0.1	15.80	15.84	39.6
R13	0.05	0.1	15.80	15.85	39.6
R14	0.06	0.1	15.80	15.86	39.6
R15	0.11	0.3	12.81	12.92	32.3
R16	0.33	0.8	16.14	16.47	41.2

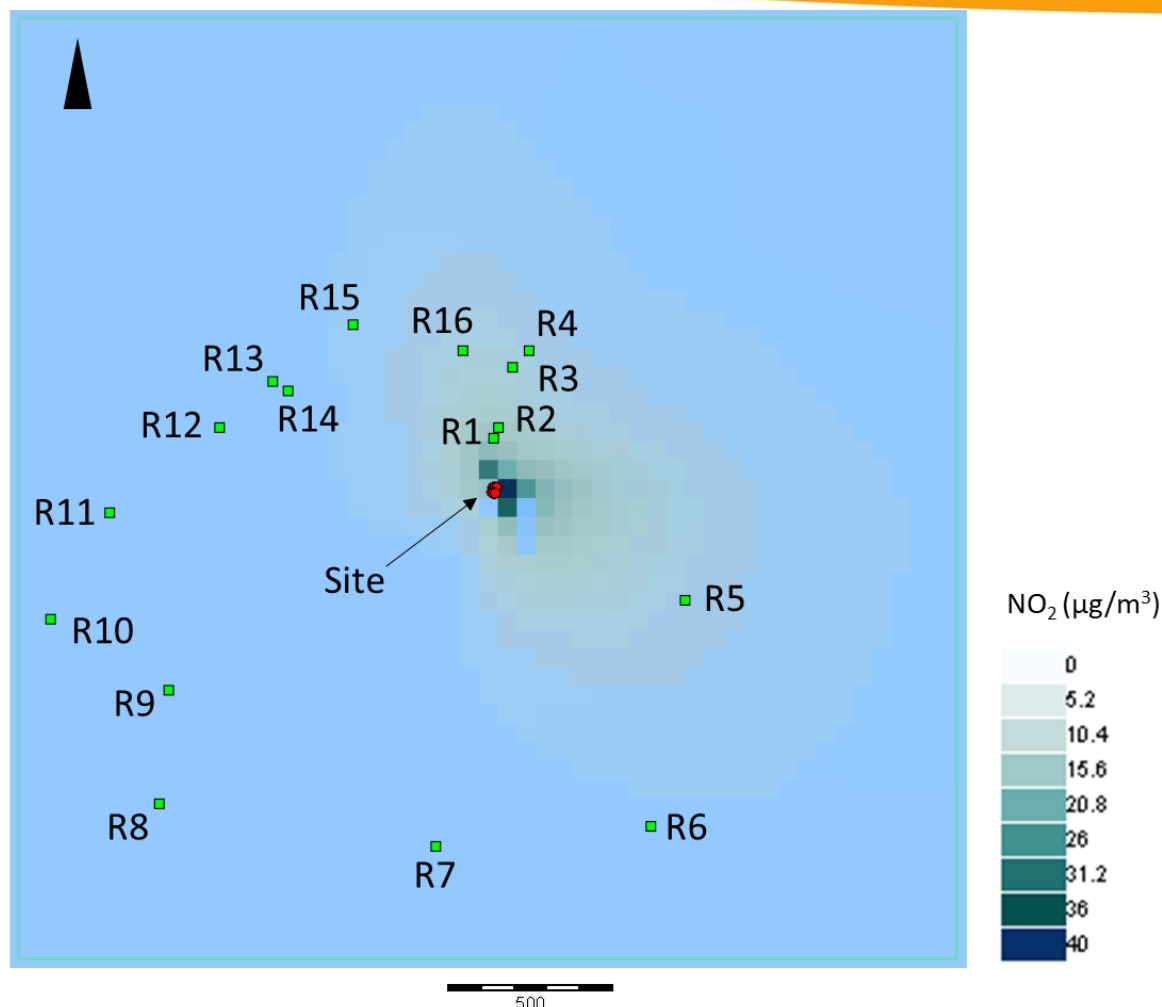


Figure 12 Long term NO₂ process contribution at sensitive receptors from continuous running of six proposed gas peaking generators. Kriging interpolation within grid domain with ADMS.

6.2.2 Assessment of Short Term NO₂ emissions

Table 9 shows short term PC of NO₂ is >10% of the 200 µg/m³ EAL at sensitive receptors R1-R6, and R11-R16, based on continuous operation over a year (and using corrected 2019 background NO₂). Based on continuous operation, the short term PEC is >20% of the EAL at sensitive receptors R1-R5 and R16. However, the installation will be operating up to 1,500 hours per year. Using Environment Agency guidance (ref. 11), statistical analysis is required if short-term predictions shows that 19 or more hours exceed the environmental standard at a sensitive receptor over the modelled operating envelope. Dispersion modelling shows predicted short term NO₂ PC was found to not exceed the 200 µg/m³ EAL at any of the sensitive receptors for any hour of met year 2017 (nor for met years 2016, 2018, 2019 and 2020). Therefore, further statistical analysis is not required.

Figure 13 shows a plot of short term NO₂ PC in relation to sensitive receptors (assuming continuous running of the six gensets for the 2017 met year) within the grid domain.

Table 9 Short-term (100th percentile) PC and PEC of NO₂ emissions at sensitive receptors from continuous running of six gensets at proposed site. EAL = 200 µg/m³ Exceedance PC >10% of EAL and PEC >20% EAL shown in red.

Location	PC (µg/m ³)	PC (% EAL)	Background conc. (µg/m ³)	EAL minus 2x background (µg/m ³)	PEC (% EAL ²)
R1	101.65	50.8	16.14	167.72	60.6
R2	90.05	45.0	16.14	167.72	53.7
R3	79.30	39.7	16.14	167.72	47.3
R4	66.81	33.4	16.14	167.72	39.8
R5	53.48	26.7	14.38	171.25	31.2
R6	23.39	11.7	14.66	170.67	13.7
R7	17.69	8.8	18.52	162.97	10.9
R8	15.81	7.9	18.33	163.34	9.7
R9	15.69	7.8	18.33	163.34	9.6
R10	16.72	8.4	18.43	163.14	10.2
R11	22.43	11.2	15.80	168.40	13.3
R12	27.86	13.9	15.80	168.40	16.5
R13	31.05	15.5	15.80	168.40	18.4
R14	32.73	16.4	15.80	168.40	19.4
R15	30.82	15.4	12.81	174.38	17.7
R16	56.66	28.3	16.14	167.72	33.8

² Assessment of short-term PEC is based on short-term PC as a percentage of the short-term environmental standard minus twice the long-term background concentration.

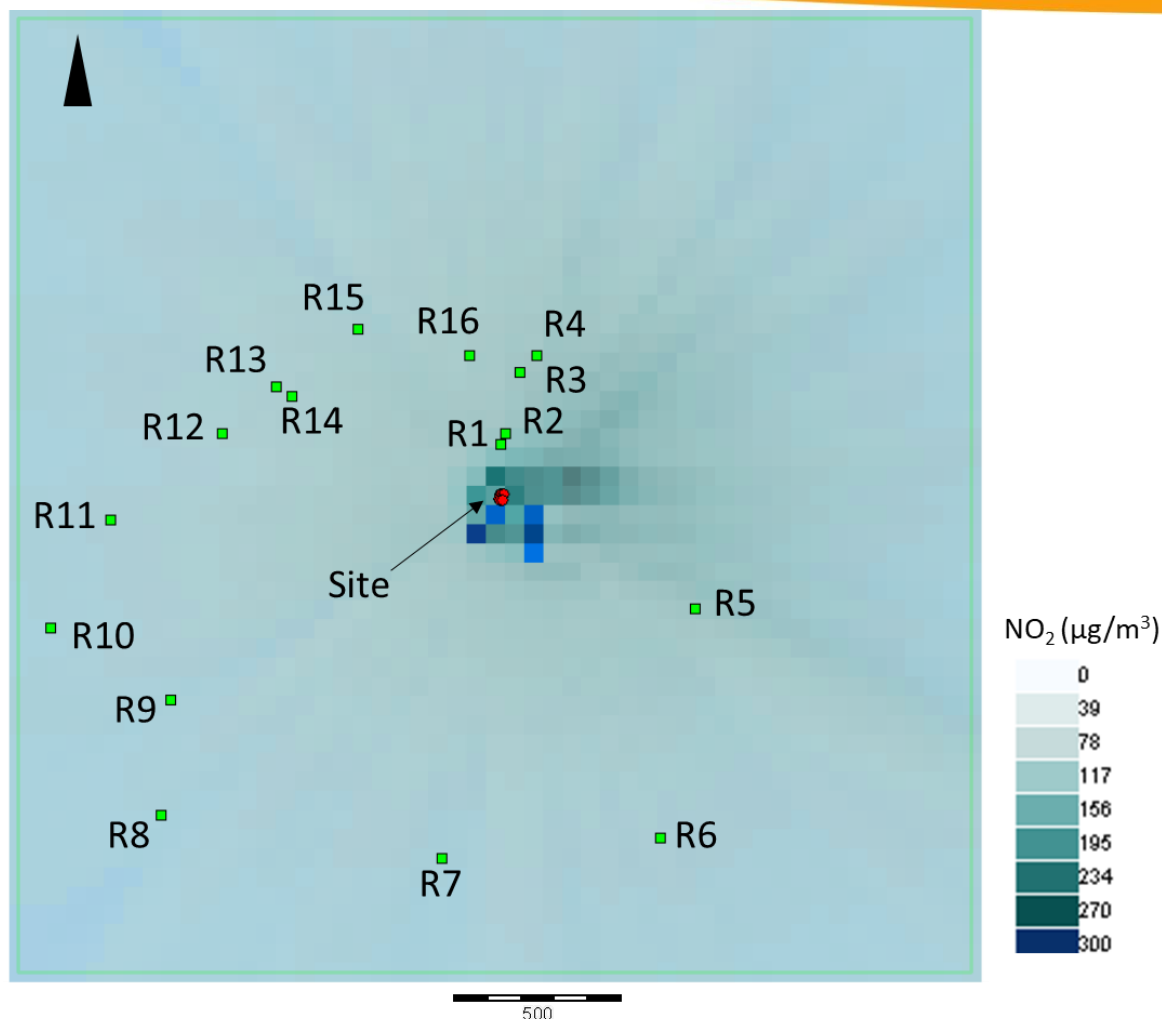


Figure 13 Short term (100th percentile) NO₂ process contribution at sensitive receptors from continuous running of six proposed gas peaking generators. Kriging interpolation within grid domain with ADMS.

6.3 Conservation Areas

ADMS dispersion modelling was used to screen for NO₂ impacts for six gensets in operation for a full year to the conservation areas discussed in Section 3.3. Complex Surface Roughness was not applied in assessing the impacts to the conservation areas due to the large area that would have to be modelled (emission site surface roughness was 1.0 m and conservation area surface roughness was 1.5 m).

Table 10 shows estimated long term and short term NO₂ at the screened conservation areas. At the Acornfield Plantation local nature reserve, long term and short term NO₂ are both <100% of the respective EAL. For the two SSSI areas, long term NO₂ are both <1% of the EAL and short term NO₂ is <10% of the EAL.

Table 10 Long term and short term (100th percentile) NO₂ process contribution at conservation areas.

Site	Long-term NO ₂ PC (µg/m ³)	Long-term PC as % of 30 µg/m ³ EAL (%)	Max (100th) short-term NO ₂ PC (µg/m ³)	Max short-term PC as % of 75 µg/m ³ EAL (%)
Acornfield Plantation LNR	0.19	0.5	19.91	26.5
Ravenhead Brickworks SSSI	0.02	0.1	3.12	4.2
Stanley Bank Meadow SSSI	0.02	0.1	2.10	2.8

6.4 Stack Height

Stack heights between 9.04 and 15 m were assessed using ADMS dispersion modelling. Long-term NO₂ PC, scaled back by 0.17, are predicted to fall on the site boundary at NGR 343818,399357. The PC and PEC values are within WEL limits for NO₂ (Section 5.4).

Figure 14 shows maximum estimated NO₂ PC values, scaled back by 0.17, for increasing stack heights. Increasing stack heights of the gensets decreases NO₂ PC values as expected, however the location of the maximum ground concentrations, as above, does not change.

Due to sensitive receptor R1 being 0.2 km north of the proposed site (Table 1) this assessment looked at impacts to this receptor from increasing stack height. No significant decrease in NO₂ PC values is evident from increasing the stack height, above the proposed 9.04 m, when considering uncertainty in the dispersion modelling.

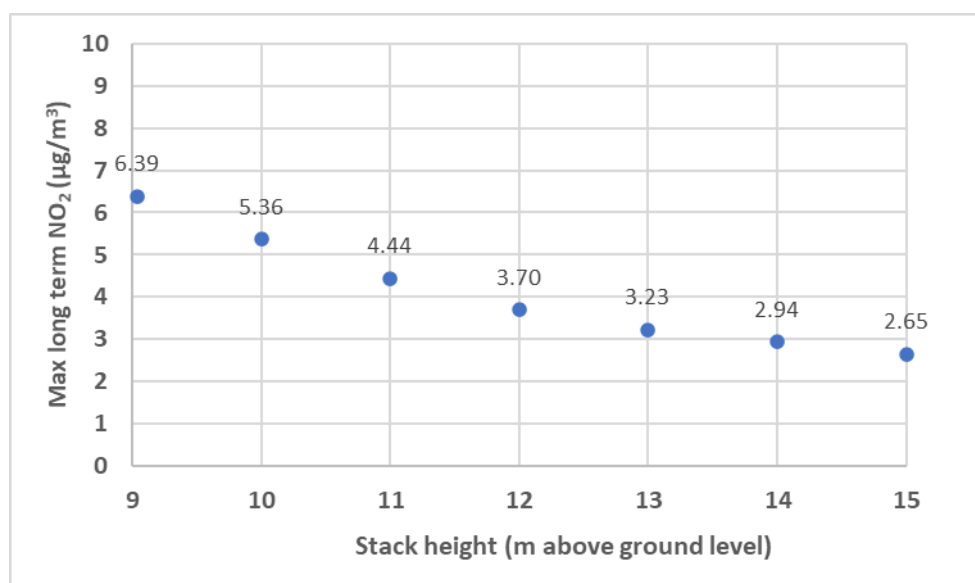


Figure 14 Predicted long term NO₂ process contribution for six gensets operating scaled back to 1,500 hours/year with stack heights 9-15 m.

6.5 Discussion

Worst case Medium Combustion Plant Directive emission limits of $190 \text{ mg/m}^3 \text{ NO}_x$ as NO_2 from each of the six proposed gensets, running at 1,500 hours of the year, are estimated to have long term PEC <70% of the EAL at sensitive receptors. Short term NO_2 PC does not exceed the $200 \text{ } \mu\text{g/m}^3$ EAL at any sensitive receptor location for any hour of the 2016-2020 met data used (18 exceedances of the short-term EAL being the maximum permitted). Therefore there is no significant impact on sensitive receptors from the proposed gas peaking plant.

Dispersion modelling for NO_2 impacts to protected conservation areas, with six gensets running continuously in a year, shows NO_2 emissions are < 1% of long-term EALs and <10% of short-term EALs. For nature reserves, NO_2 emissions are within respective EALs for these areas. Therefore there is no significant impact on conservation areas from the proposed gas peaking plant.

Increasing stack height above 9.04 m, the proposed stack height, will not give a significant improvement on local air quality. Increasing stack heights would incur additional engineering for the container units as reported by the technology supplier and would add to the visual impact to the site, without significant benefits to air quality.

7 Construction Phase Impacts

As well as assessing the impact of emissions generated by the development on local air quality, the air quality assessment also addresses potential construction phase impacts. However, construction phase impacts cannot be easily quantified, and a qualitative approach has been employed here. The emphasis of the assessment of construction phase impacts is therefore on the minimisation of potential emissions at source through appropriate environmental management controls relating to site management practices.

7.1 Standards and Guidelines

Airborne particles cover a wide range of particle sizes and types (e.g. wind-blown dust, sea salt aerosols and pollen). In the UK and continental Europe, air quality standards are related to particles of less than 10 µm diameter. Due to their larger size and weight, fugitive dust particles from construction activities tend to be deposited within a relatively short distance from their point of emission. Consequently, any potential impacts associated with dust are most likely to be related to nuisance dust deposited in the vicinity of the development, rather than concerns regarding ambient PM₁₀ concentrations. Normally nuisance dust in the community is perceived as an accumulated deposit on horizontal surfaces (e.g. car roofs, greenhouses, etc). When the rate of deposition is sufficiently rapid to cause noticeable fouling, discoloration or staining, then dust is generally considered to be a nuisance. However, the point at which an individual makes a complaint regarding dust is highly subjective. Examples of dust-sensitive receptors are listed in Table 11 (ref. 25).

Table 11 Dust sensitive receptors (ref. 25)

High Sensitivity	Medium Sensitivity	Low Sensitivity
Hospitals and Clinics	Schools	Farms
Retirement Homes	Residences	Light and Heavy Industry
Hi-tech Industries	Food Retailers	Outdoor Storage
Food Processors	Offices	

7.2 Planning Policy and Control

Local Authorities can use development management policies to mitigate against dust generated from construction (ref. 26), and when necessary, planning conditions can be used to specify specific control and monitoring measures. This will generally apply only to larger development sites where the potential impact is likely to be greater.

7.3 Preliminary Air Quality Impact

Construction of the proposed installation will have a short-term impact on air quality, mainly from dust generated during the limited earthworks and plant operations, and to some extent from NO₂ emissions from plant and vehicles. The ~0.5 ha site area is regarded as medium scale industrial development so the spatial impact will be slight.

The proposed development sits within the Knowsley Council Local Plan as discussed in Section 2.6. The construction impact on air quality from the proposed installation is regarded to be very low.

7.4 Generation of Fugitive Dust and Dust Sensitive Receptors

Unlike other atmospheric pollutants, the generation of fugitive dust is particularly dependent upon weather conditions. The most significant meteorological factors with respect to the dispersion of fugitive dust emissions are rainfall, predominant wind speeds and prevailing wind directions.

When considering that windspeeds at the development site are in excess of 5 m/s for a significant fraction of time, there is the potential to generate wind-blown dust, and good industry practice dictates that mitigation measures should be employed.

7.5 Mitigation

The following air quality impact mitigation measures are proposed for the construction phase of the Plastic to Fuel installation following industry guidance and BRE (ref. 27).

7.5.1 Control of Dust

- Avoid activities during dry weather periods.
- Use of enclosures – use of screens and sheeting to contain dust.
- Use of water suppression and wheel washing.
- Choice of location and facilities for site storage where required (aggregates, sand, soil, cement etc.).
- Location of dust generating activities e.g. stone/flag cutting. A mobile crushing plant is not required for the proposed site development.
- Transport route selection and location.

- No burning on site (it is an offence to dispose of waste material by burning on a construction site).
- Clean roads regularly, where appropriate, using an approved mechanical road sweeper. Public roads will need to be cleaned subject to Local Authority or Highway Authority requirements. Site roads will need to be cleaned on a daily (working day) basis and maybe more frequently.

7.5.2 Construction Plant Emissions

- Age and type of plant. Use vehicles and plant with low exhaust emissions (e.g. with particle traps) and emission controls such as catalysts or diesel particulate filters (DPFs).
- Plant maintenance.
- Plant abatement (e.g. use of particulate traps).
- Plant fuel.
- Avoid unnecessary vehicle movements and manoeuvring, and limit speeds to 5 mph on unsurfaced roads and 10 mph on properly surfaced and maintained roads.

7.5.3 Monitoring

- Monitoring prior to and during development.
- Consideration of sensitive receptors in the vicinity of the site.
- Liaison with local residents and businesses.
- Use of 'Considerate Contractor Schemes' or equivalent.
- Competent staff being on site during all operations.

8 Conclusions

This report concludes that overall, the proposed development of six 2 MWe gas generators will not have a significant impact on local air quality.

Worst case Medium Combustion Plant Directive emission limit values for NO₂ were used as an input to the dispersion modelling for emissions from six stacks (9.04 m height above ground level). Hourly sequential meteorological data were used to provide the meteorology for the assessment. The air quality assessment was carried out in four parts:

- 1 A worst-case air quality assessment was carried using emission limits for NO₂ defined within the MCPD.
- 2 A screening assessment was completed to determine the impact of the facility on conservation area receptors within a 10 km radius of the stack, and to confirm if a detailed modelling of ecological impacts is required.
- 3 An assessment was carried out to confirm a stack heights of 9.04 m would allow sufficient dispersion of emissions to ensure negligible impact on ground level pollutant concentrations.
- 4 A qualitative study was completed to determine if detailed assessment of construction phase impacts is required.

For sensitive receptors, long term NO₂ PC was scaled back by a factor of 0.17 to account for limited operational hours (1,500 hours per year) for six gensets in operation. Dispersion modelling was based on MCPD emission limits of 190 mg/m³ NO_x as NO₂ from each of the six proposed gensets. Long term predicted environmental concentration of NO₂ is <70% at all sensitive receptors and therefore screened as not having a significant impact on local air quality for human receptors.

Short term NO₂ impact on sensitive receptors is not significant as hourly sequential analysis with 2016-2020 met data predicted no exceedances of the 200 µg/m³ EAL, therefore no further analysis (e.g. using hypergeometric method) is required.

Dispersion modelling for local conservation areas (two SSSI sites within 10 km, one local nature reserve within 2 km) showed no significant impact on air quality for these areas.

The stack height assessment was carried out using an iterative approach for a range of stack heights between 9.04 m and 15 m. The assessment showed that a stack height of 9.04 m will provide adequate pollutant dispersion and that there would only be very minor appreciable benefits gained by increasing the stack height further.

Likely construction impacts (i.e. dust) are considered to be low and mitigated by the developers following the “contractors code of practice” incorporating best practice and minimisation of potential dust nuisance. Air quality impacts during construction should be reviewed and managed during the in accordance with a Construction Management Plan.

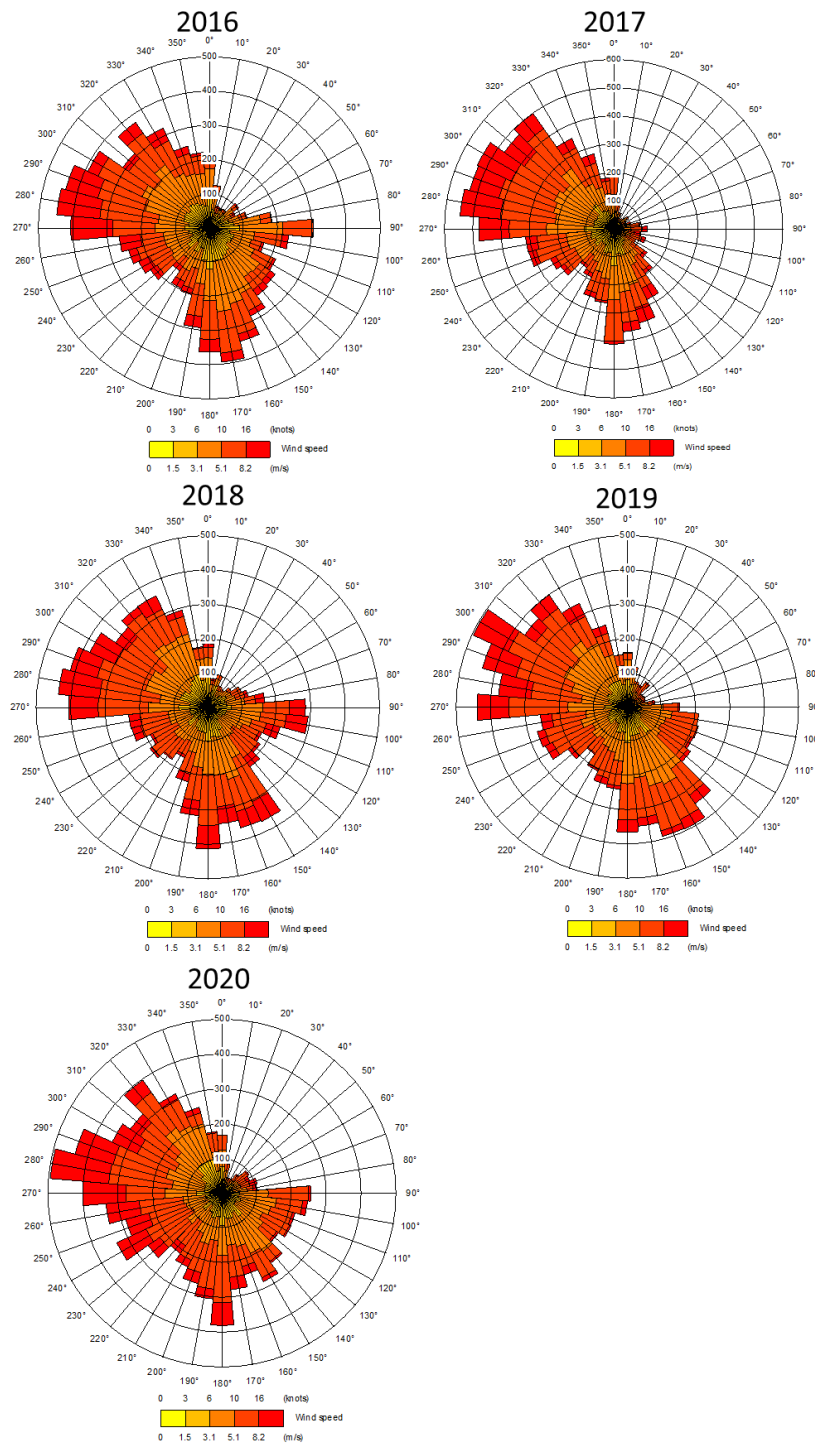
References

- 1 Defra (2021), Local Authority Details, CSV data files for Billingham monitoring site. UK Air Information Resource. Department for the Environment, Food and Rural Affairs. https://uk-air.defra.gov.uk/data/flat_files?site_id=BIL
- 2 Defra (2021), Background Mapping data for local authorities. UK Air Information Resource. Department for the Environment, Food and Rural Affairs. <https://uk-air.defra.gov.uk/data/laqm-background-maps>
- 3 Ministry of Housing, Communities & Local Government (2014), Planning practice guidance - Air Quality. <https://www.gov.uk/guidance/air-quality--3>
- 4 Ministry of Housing, Communities & Local Government (2016), Planning practice guidance. <https://www.gov.uk/government/collections/planning-practice-guidance>
- 5 Ministry of Housing, Communities and Local Government (2019), National Planning Policy Framework.
- 6 Knowsley Council (2016), Knowsley Local Plan: Core Strategy. A Development Plan Document Adopted by resolution of the Council.
- 7 Environment Agency (2019), Medium combustion plant and specified generators: environmental permits. <https://www.gov.uk/guidance/medium-combustion-plant-and-specified-generators-environmental-permits>
- 8 Environment Agency (2019), Specified generator: when you need a permit. <https://www.gov.uk/guidance/specified-generator-when-you-need-a-permit>
- 9 Environment Agency (2020), Air emissions risk assessment for your environmental permit. <https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit>
- 10 Environment Agency (2019), Specified generator: comply with permit conditions. <https://www.gov.uk/guidance/specified-generator-comply-with-permit-conditions>
- 11 Environment Agency (2019), Specified generators: dispersion modelling assessment. <https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment>
- 12 Environment Agency (2021), Environmental permitting: air dispersion modelling reports. <https://www.gov.uk/guidance/environmental-permitting-air-dispersion-modelling-reports>
- 13 Environment Agency (2021), Guidance on dispersion modelling for oxides of nitrogen assessment from specified generators. https://consult.environment-agency.gov.uk/psc/mcp-and-sg-regulations/supporting_documents
- 14 UK Government (2018), The National Emission Ceilings Regulations 2018. <https://www.legislation.gov.uk/uksi/2018/129/contents/made>

- 15 European Commission (2020), The Medium Combustion Plant Directive. <https://ec.europa.eu/environment/industry/stationary/mcp.htm>
- 16 Siemens (2019), SGE-86EM natural gas genset power rating. IC-G-B-86-006. Version 40/21/02/2019.
- 17 Environmental Protection UK (2012), Combined Heat and Power: Air Quality Guidance for Local Authorities. Environmental Protection UK.
- 18 Environment Agency, BAT guidance for >50MWth gas and liquid fuel combustion plant exporting electricity under commercial arrangements for <1,500 hours per annum.
- 19 Environment Agency (2017), H1 Software Tool User Guide. Version 2.78.
- 20 APIS (2020), Nitrogen deposition: Rivers and Streams, Air Pollution Information System. <http://www.apis.ac.uk>
- 21 Defra (2020), Ambient air quality map. UK Air Information Resource. <https://uk-air.defra.gov.uk/data/iaqm-background-maps?year=2017>
- 22 Holman et al (2019). A guide to the assessment of air quality impacts on designated nature conservation sites – version 1.0, Institute of Air Quality Management, London. www.iaqm.co.uk/text/guidance/airquality-impacts-on-nature-sites-2019.pdf
- 23 SNIFFER (2010), Final Report for SCAIL Combustion. Project UKPIR15. SNIFFER, Edinburgh.
- 24 Environment Agency. Releases from waste incinerators - Guidance on assessing group 3 metal stack emissions from incinerators. Version 4. LIT 7349.
- 25 Department for Communities and Local Government (2005), Minerals policy statement 2: controlling and mitigating the environmental effects of minerals extraction in England. Annex 1: dust. The Office of the Deputy Prime Minister.
- 26 Defra (2017), Air Quality. A Briefing for Directors of Public Health. Department of the Environment, Food and Rural Affairs.
- 27 BRE (2003), Control of dust from construction and demolition activities.
- 28 HSE (2020), EH40/2005 Workplace exposure limits 4th Edition. Health and Safety Executive.
- 29 Defra (2021), Air Quality Management Areas, UK AIR <https://uk-air.defra.gov.uk/aqma/maps/>
- 30 Knowsley Council (2020), 2020 Air Quality Annual Status Report, Knowsley Metropolitan Borough Council. Provided on request from Knowsley Council Environmental Health department.
- 31 Sefton Council (2019), 2019 Air Quality Annual Status Report, Sefton Council. <https://www.sefton.gov.uk/environmental-protection/air-quality/>

Appendices

Appendix I. Wind Roses





Air Quality Assessment
for
Insynch Energy Services Limited
27th May 2021
Project 6623
Document number: R6623-IE-0002

Stopford Energy & Environment
Custom House
Merseyton Road
Ellesmere Port
Cheshire
CH65 3AD
United Kingdom

+44 (0) 151 357 7740
+44 (0) 151 345 8087

www.stopford.co.uk