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Appendices

INTRODUCTION

7.1 This chapter of the ES considers the potential air quality effects on the surrounding area associated with the proposed development at the Application Site.

7.2 This assessment describes the scope, relevant legislation, assessment methodology and the baseline conditions currently existing at the Application Site and its surroundings.

7.3 The assessment then considers any potentially significant environmental effects that the Proposed Development would have on the baseline environment; the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been employed.

SCOPE

7.4 The scope of the assessment has been defined based on the Scoping Opinion Request submitted to Nottinghamshire County Council (NCC), and during pre-application discussions with Bassetlaw District Council (BDC), who provided the following Scoping response:

> ***"Air Quality and traffic generation***
>
> *The proposed future development is not in an area where emissions from road transport are considered to be particularly high. However, Environmental Health has some specific concerns about the likely increase in emissions from road transport (particularly Nitrogen Dioxide and particulate matter from HGV's) as a result of this development. Therefore any increase in road traffic (particularly HGV's) needs to be considered by the application to ensure that the annual average and/or hourly mean air quality objectives are not exceeded. The authority recommends that background readings and modelled screening based on air dispersion modelling software (such as ADMS 5, Urban, Aermod or similar) are provided to the planning authority in order to provide reassurance that the levels will not be breached by any increase in vehicle movements."*

7.5 This assessment has therefore considered potential construction dust, road vehicle emissions and combustion emissions from onsite power generation plant comprising four diesel powered generators which are used to power the rig during drilling and one smaller 'camp' generator which provides power for day to day site activities.

RELEVANT LEGISLATION, STANDARDS AND GUIDANCE

Relevant Planning Policies

National Planning Policy Framework

7.6 The National Planning Policy Framework (NPPF) describes the policy context in relation to pollutants including air pollutants:

> *"The Government's objective is that planning should help to deliver a healthy natural environment for the benefit of everyone and safe places which promote wellbeing.*
>
> *To achieve this objective, the planning system should contribute and enhance the natural and local environment by:*
>
> *[...] preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of land, air, water or noise pollution or land instability."*

7.7 Specifically in terms of development with regard to air quality:

> *"Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan."*

Local Planning Policy

Nottinghamshire County Council

7.8 Nottinghamshire County Council's Adopted Minerals Local Plan[1] has the following polices relevant to air quality:

'Policy M3.1 Information In Support Of Planning Applications

Planning permission for minerals development will not be granted unless sufficient information is provided to enable a balanced assessment of all relevant factors:

(…)(k) transport arrangements (including access, traffic generation and routeing);

(…)(n) measures to minimise pollution and environmental disturbance.

Policy M3.7 Dust

Planning permission for minerals development will only be granted where dust generation will not lead to an unacceptable impact. Where

[1] Nottinghamshire County Council. Nottinghamshire Minerals Local Plan. Adopted December 2005

appropriate conditions will be imposed to suppress dust generation. Such conditions may relate to the:

(a) layout of the site, design of stockpiles;

(b) containment of conveyors and processing plant and dust collection equipment;

(c) use of bowsers, sprays, and vapour masts on haul roads, stockpiles, transfer points;

(d) design of material – handling systems, drop heights, wind guards, loading points;

(e) use of binders on haul roads and stockpiles;

(f) limiting on-site vehicle speed;

(g) soil handling strategies;

(h) limiting levels of dust measured in a specific way; provision of monitoring facilities.

Policy M3.13 Vehicular Movements

Planning permission for minerals development will only be granted where the highway network can satisfactorily accommodate the vehicle movements likely to be generated and would not cause unacceptable impact upon the environment and disturbance to local amenity.'

Air Quality Strategy

7.9 The Government's policy on air quality within the UK is set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (AQS) July 2007[2]. The AQS sets out a framework for reducing hazards to health from air pollution and ensuring that international commitments are met in the UK.

7.10 The AQS sets standards and objectives for ten priority pollutants. Standards are the concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. Objectives are policy targets often expressed as maximum concentrations not to be exceeded either without exception or with a limited number of exceedences within a specified timescale.

7.11 Many of the objectives in the AQS are made statutory with the Air Quality Regulations 20103 for the purpose of Local Air Quality Management (LAQM).

7.12 The strategy objectives for the pollutants considered in this report are shown in Table 7-1.

[2] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland - Defra - July 2007
[3] The Air Quality Standards Regulations 2010 No. 188

Table 7- 1
Relevant Air Quality Strategy Objectives

Pollutant	Standard	Measured as	Allowable exceedences
Human Health Standards			
Nitrogen Dioxide	40µg/m^3	Annual Mean	-
	200µg/m^3	1 Hour Mean	18/year
Particles <10µm (PM_{10}) (gravimetric)	40µg/m^3	Annual Mean	-
	50µg/m^3	24 Hour Mean	35/year
Particles <2.5µm ($PM_{2.5}$) (gravimetric)	25µg/m^3	Annual Mean	
Carbon Monoxide	10mg/m^3	Running 8hr mean	
Benzene (as surrogate for NMVOC)	5µg/m^3	Annual Mean	
Vegetation and Ecosystem Standards			
NOx	30µg/m^3	Annual Mean	

Local Air Quality Management (LAQM)

7.13 Part IV of the Environment Act 1995 requires local authorities to review and assess existing and predict future air quality in their areas as part of a rolling 'review and assessment' process. In areas where exceedance of one or more of the air quality objectives are predicted, the local authority must designate an Air Quality Management Area (AQMA). Once designated; the local authority must then draw up an Air Quality Action Plan (AQAP) setting out the measures it intends to take in pursuit of achieving the air quality objectives in the AQMA.

7.14 The core guidance documents for use by persons involved in Local Air Quality Management (LAQM), or considering the impacts of a development with the potential to impact on air quality as covered by LAQM, are LAQM TG (16)[4] and LAQM PG (16)[5].

Environmental Permitting Regulations

7.15 The EA regulates the management of extractive waste generated by the drilling of exploratory boreholes under Schedule 20 to the Environmental Permitting (England and Wales) Regulations 2010 which implements the Extractive Waste Directive (2006/21/EC more commonly referred to as the Mining Waste Directive (MWD)).

7.16 Guidance Notes produced by DEFRA provide a framework for regulation of installations and additional Technical Guidance Notes produced by the EA are used to provide the basis for permit conditions.

[4] DEFRA, Local Air Quality Management Technical Guidance LAQM.TG(16), (April 2016).
[5] DEFRA, Local Air Quality Management Policy Guidance, LAQM.PG(16) (April 2016).

7.17 Of particular relevance to the assessment of air quality impacts is the EA's environmental risk assessment guidance for environmental permits for undertaking a risk assessment of air emissions[6].

Standards and Guidance in Relation to Dust

7.18 There are no statutory limit values for dust deposition above which 'nuisance' is deemed to exist – 'nuisance' is a subjective concept and its perception is highly dependent upon the existing conditions and the change which has occurred.

7.19 Guidance for control of dust from construction has been produced by the Institute for Air Quality Management (IAQM)[7]. The IAQM guidance document provides site evaluation guidelines based upon the size in square metres, proximity to receptors, nature of activities and sensitivity of receptors to rate an application site between a low risk to high risk. On the basis of an evaluation of risk the guidance then prescribes a range of best practice mitigation measures to be applied at an application site.

Regulation of Vehicular Exhaust Emissions

Road Vehicles

7.20 The emission of combustion pollutants from vehicle exhausts is regulated by European Directives with the phasing in of more stringent standards for new vehicles over the past 20 years for a range of pollutants including NOx, CO, unburnt hydrocarbons and Particulate Matter (PM). The actual emission limits vary depending on vehicle size (i.e. car, LDV, HDV) and fuel type (i.e. diesel or petrol).

Non-Road Mobile Machinery (NRMM)

7.21 NRMM is defined as any mobile machine, item of transportable industrial equipment, or vehicle (with or without bodywork) that is:

- not intended for carrying passengers or goods on the road
- installed with a combustion engine - either an internal spark ignition (SI) petrol engine, or a compression ignition diesel engine

7.22 In the UK, the legislation governing emissions produced by diesel engines fitted in NRMM is the Non-Road Mobile Machinery (Emission of Gaseous and Particulate Pollutants) Regulations 1999, as amended which sets emission standards for carbon monoxide (CO), hydrocarbons, oxides of nitrogen (NOx) and PM.

[6] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

[7] Institute of Air Quality Management, Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance (2012).

Environmental Protection UK Guidance

7.23 Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) have together published guidance[8] to help ensure that air quality is properly accounted for in the development control process. It clarifies when an air quality assessment should be undertaken, what it should contain, and how impacts should be described and assessed. Importantly, it sets out a recommended approach to assess the significance of impacts as summarised in Appendix 7-1.

Standards and Guidance in Relation to Ecosystems

Critical Levels

7.24 Critical levels are a quantitative estimate of exposure to one or more airborne pollutants in gaseous form, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge. Critical levels for the protection of vegetation and ecosystems are specified within relevant European air quality directives and corresponding UK air quality regulations (see Table 7-2).

Table 7- 2
Critical Levels for the Protection of Vegetation and Ecosystems

Pollutant	Concentration (µg/m^3)	Measured as
Nitrogen Oxides	30	Annual mean
	75	Daily mean

Critical Loads

7.25 Critical loads are a quantitative estimate of exposure to deposition of one or more pollutants, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge. Critical loads are set for the deposition of various substances to sensitive ecosystems. In relation to combustion emissions critical loads for eutrophication and acidification are relevant which can occur via both wet and dry deposition, however on a local scale only dry (direct deposition) is considered significant.

7.26 Empirical critical loads for eutrophication (derived from a range of experimental studies) are assigned based for different habitats, including grassland ecosystems, mire, bog and fen habitats, freshwaters, heathland ecosystems, coastal and marine habitats, and forest habitats and can be obtained from the UK Air Pollution Information System (APIS) website (www.apis.ac.uk/). The critical loads relevant to this assessment are detailed in Appendix 7-1.

[8] Environmental Protection UK and Institute of Air Quality Management, 'Land-Use Planning and Development Control: Planning for Air Quality, May 2015.

METHODOLOGY

7.27 The assessment is based upon a comparison of the current baseline situation against the air quality impacts resulting from the 'Proposed Development'.

Construction Dust

7.28 The construction phase (and decommissioning and restoration which has been assessed as 'demolition') of the Proposed Development has the potential for the generation of dust. To assess the potential impacts associated with this a qualitative assessment has been undertaken using guidance published by the Institute for Air Quality Management (IAQM) as summarised in Figure 7- 1 below.

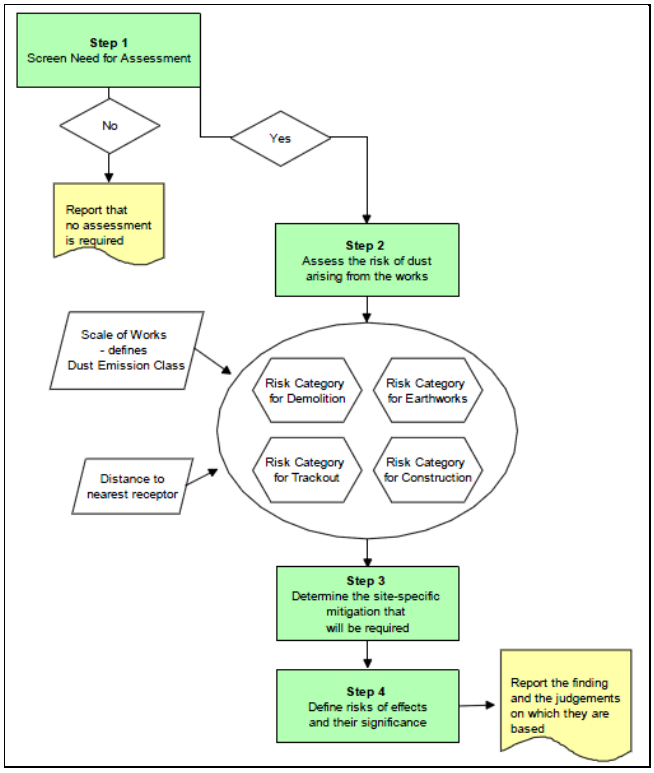

Figure 7- 1
IAQM Construction Dust – Overview of Approach

7.29 Subsequently, recommendations for any further mitigation measures on site have been made and the residual effects following the implementation of such measures assessed.

Road Vehicle Emissions

7.30 The assessment of emissions from road vehicle movements has been undertaken with reference to the following documents:

- LAQM.TG(16);

- DMRB[9] Volume 11, Section 3, Part 1 HA207/07- Air Quality (an Interim Advice Note); and
- Land-Use Planning and Development Control: Planning for Air Quality (2014) – EPUK and IAQM.

7.31 For the purposes of this assessment detailed air dispersion modelling has been undertaken using the Cambridge Environmental Research Consultants (CERC) ADMS Roads v3.4 air dispersion model, following guidance provided in LAQM.TG(09) to predict concentrations of NO_2 and PM_{10} as detailed in Technical Appendix 7-1.

7.32 Vehicle emissions are calculated using the Emissions Factors Toolkit (EFT) published by Defra which calculates road vehicle pollutant emission rates for NOx, PM_{10}, (exhaust and brake, tyre and road wear) and $PM_{2.5}$ (exhaust and brake, tyre and road wear) for a specified year, road type, vehicle speed and vehicle fleet composition.

7.33 The EFT provides pollutant emission rates for 2008 through to 2030 and takes into consideration the following information available from the National Atmospheric Emissions Inventory (NAEI):

- fleet composition data for motorways, urban and rural roads in London and rest of the UK;
- fleet composition based on European emission standards from pre-Euro I to Euro 6/VI;
- scaling factors reflecting improvements in the quality of fuel and some degree of retrofitting; and
- technology conversions in the national fleet.

7.34 Whilst there is current uncertainty over NOx emissions from vehicle exhaust (particularly from Euro 5 and 6 LGV's) it is important to note the EFT is not based on the Euro emission standards. Specifically, the latest version of the EFT (v6) includes updated NOx emission coefficients for Euro 5 and 6 diesel cars (and LGVs) taken from the European Environment Agency (EEA) COPERT 4v10 emission calculation tool, reflecting evidence on the real-world emission performance of these vehicles.

7.35 It is therefore considered appropriate to assess vehicle exhaust emissions against the latest EFT predictions, particularly given that development trips will largely comprise HDV's and given that the proposed opening year is within the near future.

7.36 Similarly DEFRA produce national predictions of background air quality for current and future years accounting for changes to legislation and technology and the latest background predictions produced by DEFRA have been applied.

[9] DMRB Volume 11, HA207/07- Air Quality, Highways Agency, 2007.

Onsite Power Plant Combustion Emissions

7.37 Detailed atmospheric dispersion modelling of the emissions of combustion pollutants from the stacks serving the onsite power generation plant has been based upon the following stages:

- identification of sensitive receptors;
- review of process design proposals and emission sources;
- compilation of the existing air quality baseline with due regard to Review and Assessments of local air quality;
- calculation of process contribution to ground level concentrations for pollutants emitted from the process; and
- quantification of impacts on ecological receptors.

7.38 This assessment has been reported in detail in the accompanying Technical Appendix 7-1.

Assessment of Human Health Effects

7.39 The potential effects on human health have been assessed within the detailed dispersion modelling assessment by comparison of predicted impacts against the health based air quality objectives. These air quality objectives are set for the protection of health in relation to direct exposure via inhalation.

Assessment of Impacts on Vegetation and Ecosystems

7.40 The potential impacts on ecosystems within the threshold distances defined by the Environment Agency Environmental Permitting Risk Assessment Guidance have been assessed by reference to both critical levels and critical loads. Both are set with respect to values below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge.

Cumulative Impacts

7.41 Where appropriate, the potential for cumulative impacts of combustion emissions from the road vehicle and onsite power generation plant has been undertaken.

Air Quality Significance Criteria

7.42 The Town and Country Planning (Environmental Impact Assessment) Regulations 2011 require ‘a description of the likely significant effects of the development on the environment, which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the development’. This has resulted in Environmental Statements using descriptors for the purposes of summarising impacts. This air quality assessment uses descriptors; the rationale used to determine which descriptor is appropriate is described in the sections below.

Combustion Emissions

7.43 In the case of significance criteria for the assessment of combustion emissions from vehicles and onsite power generation plant, the impact criteria described within guidance issued by Environmental Protection UK (EPUK)[10] have been applied as presented in Table 7- 3.

Table 7- 3
EPUK Impact Descriptors for Receptors

Long term average concentration at receptor in assessment year	% Change in concentration relative to AQAL			
	<1	1-5	5-10	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
75-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial

7.44 To determine the overall significance of the effects, the following factors are also considered:

- The existing future air quality in the absence of development;
- The extent of current and future pollution exposure to the impacts;
- The worse-case assumptions adopted when undertaking the prediction of impacts; and
- The extent to which the proposed development has adopted best practice to eliminate and minimise emissions.

Dust

7.45 The assessment of significance for odour and dust impacts is undertaken qualitatively and the criteria applied can be 'Insignificant', 'Adverse' or 'Beneficial'. The magnitude will be judged as 'Slight', 'Moderate', 'Substantial', or 'Very Substantial'.

BASELINE CONDITIONS

Existing Air Quality

Local Review and Assessment of Air Quality

7.46 The Application Site is situated within the administrative area of Bassetlaw District Council who regularly review and assess their air quality with their last report, the 2015 Updating and Screening Assessment.

[10] EPUK & IAQM, 2015. Land-Use Planning & Development Control: Planning for Air Quality. May 2015, V1.1

7.47 Owing to the largely rural nature of the district, the only significant source of pollution is the A1 which passes through the district.

7.48 Non-automatic monitoring for nitrogen dioxide is undertaken at 25 locations the closest of which is on the Retford road in Blyth, near to the A1. The 2014 and 2015 data for this location indicated annual average NO_2 concentrations of 33.1µg/m³ and 32.6µg/m³ respectively.

Air Quality Background Maps

7.49 Defra provides national predictions of background concentrations on a 1km x 1km resolution based upon 2011 values and projected forward. This also provides a breakdown of the relative contributions of various sources.

7.50 The 2016 background concentrations for the area of the site are presented below in Table 7- 4.

Table 7- 4
2016 Background Concentrations (µg/m^3)

Pollutant	x462500, y387500	x462500, y368500	x463500, y386500	x464500, y385500
NO_2	11.0	11.5	11.6	10.6
NO_x	14.6	15.4	15.5	14.1
PM_{10}	17.5	18.4	19.1	18.4
$PM_{2.5}$	10.5	10.8	11.0	10.6

7.51 From Table 7- 4 it can be seen that existing air quality is considered to be good, with concentrations 'well below', i.e. less than 50% of the AQO's.

Meteorology – Dispersion of Emissions

7.52 A windrose for the average conditions recorded at Robin Hood (Doncaster) Airport, located approximately 13km to the north-northeast of the site is presented below in Figure 7- 2.

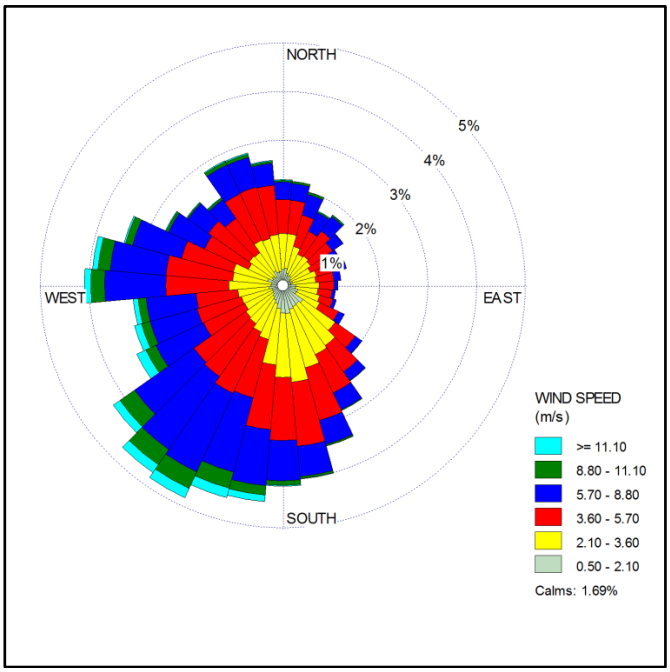

Figure 7- 2
Windrose for Robin Hood Airport Meteorological Station 2010 -2014

Rainfall Data

7.53 Relevant rainfall data applicable to the site has been obtained from the Meteorological Office website for the local area (1981 – 2010). The average number of days with rainfall greater than 0.2mm is 160-170 days per year (44% days of the year).

Sensitive Receptors

Human Receptors

7.54 Sensitive receptor locations are those where the public may be exposed to dust, vehicle or onsite power plant combustion emissions potentially arising from the Proposed Development. A selection of discrete sensitive receptors considered in the assessment is presented in Table 7- 5.

Table 7- 5
Discrete Sensitive Receptors Locations

ID	Receptor	Receptor Type	Grid Reference (OS X,Y)	
R1	Jubilee Farm	Residential	464462.8	385897.0
R2	Residential Property Retford Road	Residential	463312.6	386837.7
R3	10 Retford Road	Residential	462625.3	387069.1
R4	1 Whitehouse Mews	Residential	462543.2	387097.4
R5	5 Whitehouse Mews	Residential	462511.0	387091.1
R6	Blyth Craft Emporium	Residential	462491.9	387147.1
R7	Property Sheffield Road	Residential	462424.5	387177.3
R8	1 Bawtry Road	Residential	462503.8	387205.2

R9	Nornay Cottage	Residential	462427.5	387738.0
R10	Park Barn	Residential	462379.1	387106.2
R11	90 High Street	Residential	462503.4	387069.6
R12	The Limes	Residential	462544.6	386925.6
R13	Woodside	Residential	462716.9	386553.7
R14	79 Retford Road	Residential	463019.3	386952.1
R15	Fourways Cottage	Residential	462496.4	387097.9
R16	DT 36	Diffusion Tube	463020.8	386932.6
R17	Beechwood Farm	Residential	464426.2	384976.2
R18	Ranby Cottage Farm	Residential	465183.9	383943.2
R19	Billy Button Cottage	Residential	465240.3	386092.3
R20	Long Brecks Lane	Residential	463223.7	385745.3
R21	Belmont	Residential	464761.9	386812.5
R22	Double Acre	Residential	46482.16	396812.5
R23	Torworth Grange	Residential	465813.7	386199.2
R24	Old School House	Residential	465786.0	386291.7
R25	College Farm	Residential	465939.6	385541.2
R26	San Diego	Residential	465985.0	385276.0
R27	Woodlands	Residential	466060.8	385441.3
R28	Great North Rd properties	Residential	465972.7	385526.5
R29	Torworth	Residential	465677.0	386849.4
R30	Grange Farm	Residential	466083.7	384644.1
R31	Milestone Court	Residential	466163.2	384860.1
R32	Ye Olde Bell	Residential	466225.8	384553.1

Ecological Receptors

7.55 There are no European designated sites within 10km of the site, or SSSI's within 2km, however the Mattersey Marsh SSSI is located approximately 2.7km from the site.

7.56 There are also a further two locally designated sites within 2km of the site as summarised in Table 7- 6. The existing background concentrations and relevant critical loads for these receptors are presented in Appendix 7-1.

Table 7- 6
Potentially Sensitive Ecological Receptors

ID	Site	Designation	Habitat Type
ER1	Mattersey Hill Marsh	SSSI	Lowland Bogs (Mixed Marsh) Woodland
ER2	Tinker Lane	LWS	Grassland
ER3	Daneshill	LWS	A very rich mosaic of woodland, marsh and aquatic habitats

ASSESSMENT OF EFFECTS AND SIGNIFICANCE

Construction Dust

7.57 The potential impacts associated with deposited dust are related to potential nuisance effects, in which the distance from the source to the sensitive

receptor is crucial. The vast majority of particles responsible for annoyance are deposited within 100m of the source[11], and hence it is in this zone that the risk of impacts from dust is greatest.

7.58 The proposed activities at the Application Site with the greatest potential for dust generation associated with these activities have been identified as:

- Excavation and removal of material topsoil including storage and handling of material (during both construction and restoration);
- Construction and decommissioning (including restoration) of the site; and
- Onsite vehicle movements.

7.59 For all sources, the creation of dust would be highly dependent on the weather conditions. Higher wind speeds, increases the potential for the generation of airborne dust due to the suspension and entrainment of particles in airflow; rainfall however, has a suppressive effect on the generation of dust.

Initial Screening

7.60 As defined within the IAQM construction dust guidance, a dust assessment is required where there is:

- a human receptor with 350m of the site; or
- a human receptor within 50m of the access routes (up to 500m from the site entrance);
- an ecological receptor within 50m of the site; or
- an ecological receptor within 50m of the access routes (up to 500m from the site entrance).

7.61 Whilst there are no 'human receptors' within 350m of the site boundary or within 50m of the site access roads (assessed up to 500m from the site entrance, as a worst-case scenario), the Tinker Lane LWS is within 50m of the site access route (approximately 250m from the site).

7.62 Therefore an assessment of construction dust impacts has been undertaken as detailed in Appendix 7-1 in order to provide a robust assessment.

Earthworks (Site Construction Phase)

7.63 Earthworks onsite will involve the movement, removal, tipping and stockpiling of material within the site as well as laying the aggregate base and installation of a drainage system. The material is considered to be of a potentially dusty soil type as topsoil across the site will be removed and levelled. This is considered to be a friable material and therefore has the potential for dust emissions.

[11] Based upon research document - DETR, The Environmental Effects of Dust from Surface Mineral Workings (Dec 1995)

7.64 There will also be associated onsite HGV movements and therefore despite the small site area the potential magnitude of emissions from earthworks is considered to be 'large'.

Construction (Site Construction Phase)

7.65 The key issues when determining the dust emissions class for construction includes the building volumes, method of construction, materials and duration of build. Construction will involve the importation of staff welfare and office facilities as well as installation of drilling rig, ancillary equipment and pumps and generators.

7.66 These materials have a low dust generation potential and therefore the potential magnitude of emissions from construction is considered to be 'small'.

Trackout (all Phases)

7.67 Vehicle speed, size and number of movements are significant factors determining trackout of dust. Construction vehicles will access the site from a newly constructed access from the Retford Road and all construction phase movements would be via the A634 towards the A1.

7.68 The potential unmitigated magnitude of emissions from trackout is considered to be 'large' in terms of dust given the maximum number of vehicle movements.

Demolition (Decommissioning and Restoration phase)

7.69 The decommissioning of the site will involve the removal of the hardstanding and subsequent restoration with soils (including deposition and subsequent seeding and planting); additionally removal of fencing, office and staff welfare facilities and lighting infrastructure will be required.

7.70 Given the scale of the activities undertaken during the 'demolition' phase, the dust emission potential during demolition is classified as 'medium'

Receptor Sensitivity

7.71 The site is located within a rural area with a limited number (four) of residential receptors and ecological receptors within 1km of the site and is therefore classified as a 'low' sensitivity area to dust, PM_{10} and ecological effects.

Assessment Summary

7.72 A summary of the determined risk category and significance of effects with mitigation for each phase of the construction operation identified above for dust is presented within Table 7- 7.

Table 7- 8
Construction Phase Assessment Summary (No Mitigation Applied)

Source	Risk of Dust Effects	Risk of Human Health Effects	Risk of Ecological Effects
Earthworks	Low Risk	Low Risk	Low Risk
Construction	Negligible	Negligible	Negligible
Trackout	Low Risk	Low Risk	Low Risk
Demolition	Low Risk	Low Risk	Low Risk

Road Vehicle Emissions

7.73 The proposed development is predicted to generate a varying quantum of movements through the construction and operation as summarised in Appendix 7-1. A maximum 36 HGVs and 40 light vehicles are predicted during any one phase and therefore the development will generate additional emissions, such as NO_2 and PM_{10}, on the local and regional road networks.

7.74 Whilst this increase in vehicle movements is below both the IAQM and DMRB criteria for requiring an air quality assessment, a quantitative assessment (as detailed in Appendix 7-1) has been undertaken to respond to the Scoping response from BDC.

7.75 The predicted magnitude of impact on annual mean NO_2 concentrations ranges from imperceptible (<1% change in the annual mean AQO) to small (2-5% change in the annual mean AQO) and can be described as 'slight adverse' at two locations within the centre of Blyth and 'negligible' at all remaining receptor locations.

7.76 The predicted magnitude of impact on annual mean $PM_{2.5}$ concentrations is predicted to be imperceptible (<1% change in the annual mean AQO) and is described as 'negligible' at all receptor locations.

7.77 The modelling results indicate a 'negligible' impact on the short-term NO_2 and PM_{10} AQO at all receptor locations.

7.78 These modelling results are based on a worse case assumption of the maximum number of movements occurring throughout a whole year and with a 100% split north and south in Blyth. This is unlikely to occur and therefore the actual impact is considered to be 'negligible'.

7.79 Therefore the overall effect of road vehicle emissions on air quality is 'negligible' and is not considered to be significant.

Onsite Power Generation Plant Combustion Emissions

7.80 The detailed assessment of impacts of combustion emissions from the onsite power generation plant is detailed in the accompanying Technical Appendix 7-1 and an overview is presented in the following sections.

7.81 The pollutant emission rates of combustion pollutants from the generators (used to power the drilling rig and to provide onsite power) have been taken from manufacturer's data and modelled using the AERMOD dispersion model in accordance with EA guidance. Impacts have been predicted assuming that all onsite power generation plant run continuously for an entire year. In reality the drilling phase will last in the region of 4-months and therefore as per EA guidance it can be assumed that actual long-term impacts will be approximately a factor of three lower (i.e. <35%) than the predicted values.

Predicted Impacts on Air Quality

7.82 The detailed modelling indicates that the predicted impacts of CO (8-hour), PM_{10} (24-hour), $PM_{2.5}$ (annual) and Benzene (annual) were all less than 1% of the relevant AQO.

7.83 Given the low existing background concentration of these air pollutants in the area, the effect of the emissions of these pollutants from the onsite power generation plant are classified as 'negligible' and not significant.

Nitrogen dioxide

7.84 The predicted annual average nitrogen dioxide impacts at the discrete sensitive receptors locations were below 10% of the AQO at all except two receptors, where they were 10.4% and 16.6% of the AQO.

7.85 The predicted 1-hr mean (99.79%ile) nitrogen dioxide impacts at the discrete sensitive receptors locations were below 25% of the AQO at all except two receptors, where they were 30.2% and 43.1% of the AQO.

7.86 The extent of the area where predicted short-term impacts are greater than 50% of the AQO is limited to areas of farmland, footpaths and roads (i.e. not locations where members of the public would be regularly present).

7.87 The model is based on all onsite power generation plant operating continuously throughout the year, whereas the drill rig generators (which are the major source of combustion emissions) will only be operational for approximately 4-months (maximum). Therefore as per EA guidance the actual long-term NO_2 impacts at the discrete receptors will approximately one third of that predicted and less than 10% of the AQO. Short-term NO_2 impacts will be similarly less than predicted.

7.88 Given the magnitude of the predicted impacts, their short duration and the low current background NO_2 concentrations, the effect of the emissions of NO_2 from the onsite power generation plant on air quality are classified as 'slight adverse' and not significant.

Predicted Impacts on Ecological Receptors

Impacts on Mattersey Hill Marsh SSSI

7.89 The detailed modelling indicates that the predicted impacts of NOx (annual and 24-hour) and subsequent deposition (eutrophication) were in excess of 1% of the relevant critical levels and loads at the Mattersey Hill Marsh SSSI. Acidification impacts were less than 1% of the relevant critical load.

7.90 The model is based on an all onsite power generation plant operating continuously throughout the year, whereas the drill rig generators (which are the major source of combustion emissions) will only be operational for approximately 4-months (maximum). Therefore as per EA guidance the actual long-term NOx impacts at the Mattersey Hill Marsh SSSI will be approximately one third of the predicted level.

7.91 Therefore given the magnitude of the likely impacts and their short duration, the emissions of NOx from the onsite power generation plant are considered '*not likely to damage'* the Mattersey Hill Marsh SSSI and the effects are not considered to be significant.

Impacts on Local Wildlife Sites

7.92 The detailed modelling indicates that the predicted impacts of NOx (annual) and subsequent deposition (eutrophication and acidification) were below 100% of the relevant critical levels and loads at the nearby LWS's.

7.93 The predicted 24-hour NOx impact exceeds the critical level at the Tinker Lane LWS. The model is based on an all onsite power generation plant operating continuously throughout the year, whereas the drill rig generators (which are the major source of combustion emissions) will only be operational for approximately 4-months (maximum). Therefore, as per EA guidance the actual NOx impacts at the Tinker Lane LWS will be approximately one third of the predicted level..

7.94 Therefore, given the magnitude of the likely impacts and their short duration, the emissions of NOx from the onsite power generation plant are not considered to represent '*significant pollution'* at the nearby LWS's.

7.95 The effects are considered to be 'negligible' for the Daneshill LWS and 'slight adverse' for the Tinker Lane LWS and not significant during the operational period.

MITIGATION AND RESIDUAL EFFECTS

Construction (and Restoration) Dust

Mitigation Measures

7.96 All receptors identified have been assessed as having a low risk of impact from construction dust; however dust control measures in accordance with best practice shall be employed as detailed in Appendix 7-1.

Residual Effects

7.97 With the application of mitigation measures the effect is considered to be 'insignificant'.

Onsite Power Generation Plant Combustion Emissions

Mitigation Measures

7.98 The unmitigated impacts of combustion emissions from the onsite power generation plant do not exceed the AQOs at relevant receptor locations and are not considered to be significant.

7.99 However in order to reduce the impact, particularly of NOx and NO_2, which were classified as 'slight adverse', the operators have identified additional abatement measures.

7.100 Specifically the operators are proposing that additional abatement will be provided to the onsite power generation plant in line with the requirements of Stage IV of the NRMM regulations as detailed in Appendix 7-1.

Residual Effects

Predicted Impacts on Air Quality

7.101 The detailed modelling of the mitigated combustion emissions from the power generation plant indicates that the predicted impacts of CO (8-hour), PM_{10} (24-hour) $PM_{2.5}$ (annual) and Benzene (annual) were all significantly less than 1% of the relevant AQO.

7.102 The highest predicted 1-hr average NO_2 process contribution at a discrete receptor locations was predicted to be 17.2µg/m^3; 8.6% of the AQO. When background concentrations are added, this increases to 38.2µg/m^3; 19.1% of the AQO.

7.103 A comparison of the mitigated and unmitigated 1-hour NO_2 process contribution at discrete receptor locations is presented in Table 7-8 which illustrates the significant decrease in impacts as a result of the mitigation.

Table 7- 9
Predicted Mitigated and Unmitigated 1-hr mean (99.79%ile) NO_2 Impact (µg/m^3)

ID	Receptor	Unmitigated		Mitigated	
		µg/m^3	% of AQO	µg/m^3	% of AQO
R1	Jubilee Farm	60.4	30.2%	12.1	6.0%
R2	Residential Property Retford Road	24.7	12.4%	4.9	2.5%
R3	10 Retford Road	25.2	12.6%	5.2	2.5%
R4	1 Whitehouse Mews	24.5	12.3%	4.9	2.5%
R5	5 Whitehouse Mews	23.9	11.9%	4.8	2.4%
R6	Blyth Craft Emporium	25.0	12.5%	5.0	2.5%
R7	Property Sheffield Road	25.3	12.6%	5.1	2.5%
R8	1 Bawtry Road	25.4	12.7%	5.1	2.5%
R9	Nornay Cottage	22.4	11.2%	4.5	2.2%
R10	Park Barn	21.5	10.7%	4.3	2.1%
R11	90 High Street	23.9	11.9%	4.8	2.4%
R12	The Limes	22.5	11.3%	4.5	2.3%
R13	Woodside	23.7	11.9%	4.7	2.4%
R14	79 Retford Road	25.2	12.6%	5.0	2.5%
R15	Fourways Cottage	23.9	12.0%	4.8	2.4%
R16	DT 36	25.3	12.6%	5.1	2.5%
R17	Beechwood Farm	86.2	43.1%	17.2	8.6%
R18	Ranby Cottage Farm	43.6	21.8%	8.7	4.4%
R19	Billy Button Cottage	81.9	41.0%	16.4	8.2%
R20	Long Brecks Lane	29.2	14.6%	5.8	2.9%
R21	Belmont	41.1	20.5%	8.2	4.1%
R22	Double Acre	39.6	19.8%	7.9	4.0%
R23	Torworth Grange	42.1	21.1%	8.4	4.2%
R24	Old School House	41.6	20.8%	8.3	4.2%
R25	College Farm	48.2	24.1%	9.7	4.8%
R26	San Diego	53.9	26.9%	10.8	5.4%
R27	Woodlands	44.9	22.4%	9.0	4.5%
R28	Great North Rd properties	48.1	24.1%	9.6	4.8%
R29	Torworth	33.6	16.8%	6.7	3.4%
R30	Grange Farm	40.1	20.0%	8.0	4.0%
R31	Milestone Court	41.9	20.9%	8.4	4.2%
R32	Ye Olde Bell	60.4	30.2%	7.3	3.6%

7.104 The highest predicted average annual NO_2 process contribution at a discrete receptor was predicted to be 1.33µg/m^3; 3.3% of the AQO. When background concentrations are added, this increases to 11.8µg/m^3; 29.6% of the AQO.

7.105 A comparison of the mitigated and unmitigated annual mean NO_2 process contribution at discrete receptor locations is presented in Table 7-9 which illustrates the significant decrease in impacts as a result of the mitigation.

Table 7- 10
Predicted Mitigated and Unmitigated Annual mean NO_2 Impact (µg/m^3)

ID	Receptor	Unmitigated		Mitigated	
		µg/m^3	% of AQO	µg/m^3	% of AQO
R1	Jubilee Farm	2.76	6.9%	0.55	1.4%
R2	Residential Property Retford Road	0.79	2.0%	0.16	0.4%
R3	10 Retford Road	0.61	1.5%	0.12	0.3%
R4	1 Whitehouse Mews	0.58	1.5%	0.12	0.3%
R5	5 Whitehouse Mews	0.57	1.4%	0.11	0.3%
R6	Blyth Craft Emporium	0.58	1.4%	0.12	0.3%
R7	Property Sheffield Road	0.58	1.4%	0.12	0.3%
R8	1 Bawtry Road	0.60	1.5%	0.12	0.3%
R9	Nornay Cottage	0.59	1.5%	0.12	0.3%
R10	Park Barn	0.53	1.3%	0.11	0.3%
R11	90 High Street	0.56	1.4%	0.11	0.3%
R12	The Limes	0.52	1.3%	0.10	0.3%
R13	Woodside	0.49	1.2%	0.10	0.2%
R14	79 Retford Road	0.71	1.8%	0.14	0.4%
R15	Fourways Cottage	0.57	1.4%	0.11	0.3%
R16	DT 36	0.70	1.8%	0.14	0.4%
R17	Beechwood Farm	3.42	8.6%	0.68	1.7%
R18	Ranby Cottage Farm	2.59	6.5%	0.52	1.3%
R19	Billy Button Cottage	6.65	16.6%	1.33	3.3%
R20	Long Brecks Lane	0.55	1.4%	0.11	0.3%
R21	Belmont	2.66	6.6%	0.53	1.3%
R22	Double Acre	2.72	6.8%	0.54	1.4%
R23	Torworth Grange	3.66	9.1%	0.73	1.8%
R24	Old School House	3.48	8.7%	0.70	1.7%
R25	College Farm	3.31	8.3%	0.66	1.7%
R26	San Diego	4.17	10.4%	0.83	2.1%
R27	Woodlands	3.19	8.0%	0.64	1.6%
R28	Great North Rd properties	3.27	8.2%	0.65	1.6%
R29	Torworth	2.25	5.6%	0.45	1.1%
R30	Grange Farm	2.67	6.7%	0.53	1.3%
R31	Milestone Court	3.02	7.6%	0.60	1.5%
R32	Ye Olde Bell	2.24	5.6%	0.45	1.1%

7.106 Whilst emissions have been abated, the model is still based on all onsite power generation plant operating continuously throughout the year, whereas the drill rig generators (which are the major source of combustion emissions) will only be operational for approximately 4-months (maximum). Therefore as per EA guidance the actual long-term impacts will be approximately one third of the predicted level.

7.107 Given the low existing background concentration of air pollutants in the area, the effect of the mitigated emissions of combustion pollutants from the onsite power generation plant are classified as ‘negligible’ and not significant.

Predicted Impacts on Ecological Receptors

7.108 The detailed modelling of the mitigated combustion emissions from the power generation plant indicates that the predicted impacts of NOx (annual and 24-hour) and subsequent deposition (eutrophication and acidification) are not considered to be significant at any ecological receptor.

7.109 A comparison of the mitigated and unmitigated NOx process contribution to critical levels at sensitive ecological receptors is presented in Table 7-10 which illustrates the significant decrease in impacts as a result of the mitigation.

Table 7- 11
Mitigated and Unmitigated Process Contribution to NOx Critical Levels (µg/m^3)

ID	Site	NOx - annual				NOx – 24hr			
		Unmitigated		Mitigated		Unmitigated		Mitigated	
		PC	%CL	PC	%CL	PC	%CL	PC	%CL
ER1	Mattersey Hill Marsh SSSI	1.4	4%	0.3	1%	17.5	23%	3.5	5%
ER2	Tinker Lane LWS	8.8	29%	1.8	6%	301.0	401%	60.2	80%
ER3	Daneshill LWS	2.1	7%	0.4	1%	24.8	33%	5.0	7%

7.110 A comparison of the mitigated and unmitigated process contribution to deposition of Nitrogen (eutrophication) and acid (acidification) at sensitive ecological receptors is presented in Table 7-11 which illustrates the significant decrease in impacts as a result of the mitigation.

Table 7- 12
Mitigated and Unmitigated Process Contribution to Critical Loads (µg/m^3)

ID	Site	Nitrogen Deposition (kgN/ha/yr)				Acid Deposition (Keq/ha/yr)			
		Unmitigated		Mitigated		Unmitigated		Mitigated	
		PC	%CL	PC	%CL	PC	%CL	PC	%CL
ER1	Mattersey Hill Marsh SSSI	1.4	4%	0.3	1%	17.5	23%	3.5	5%
ER2	Tinker Lane LWS	8.8	29%	1.8	6%	301.0	401%	60.2	80%
ER3	Daneshill LWS	2.1	7%	0.4	1%	24.8	33%	5.0	7%

7.111 The emissions of NOx from the onsite power generation plant are therefore considered '*not likely to damage'* the Mattersey Hill Marsh SSSI and are not considered to represent '*significant pollution'* at the nearby LWS's.

7.112 Whilst emissions have been abated, the model is still based on all onsite power generation plant operating continuously throughout the year, whereas the drill rig generators (which are the major source of combustion emissions) will only be operational for approximately 4-months (maximum). Therefore as

per EA guidance the actual long-term impacts will be approximately one third of the predicted level.

7.113 Therefore given the magnitude of the likely impacts and their short duration, the emissions of NOx from the onsite power generation plant and the effects are classified as 'negligible' and not significant.

CUMULATIVE EFFECTS

7.114 The combined impacts of combustion emission from the mitigated onsite power generation plant and site traffic have been quantified by combining the outputs of both modelling assessments for both NOx and PM.

7.115 This indicates that the highest combined average annual NO_2 impact contribution at a discrete receptor was predicted to be 0.65µg/m^3; 1.6% of the AQO. When background values are added, this increases to 11.2µg/m^3; 27.9% of the AQO.

7.116 The highest combined average annual $PM_{2.5}$ process contribution at a discrete receptor was predicted to be 0.03µg/m^3; 0.1% of the AQO. When background values are added, this increases to 9.7µg/m^3; 24.2% of the AQO.

7.117 It is therefore considered that there are no significant cumulative effects as combined annual impacts of both NO_2 and $PM_{2.5}$ are both less than 30% of the relevant AQO.

7.118 Cumulative impacts at Tinker Lane LWS have been assessed by combining the maximum impacts from the onsite power generation plant with the traffic contribution. The predicted maximum combined impact exceeds 100% of the 24-hour NOx critical level; however, the maximum vehicle flows occur during the material import phase of the development and will not coincide with the operation of the onsite power generation plant.

7.119 Therefore given the magnitude of the likely impacts and their short duration (over a maximum period of 4 months), as per EA guidance the long-term impact from the onsite power generation plant will be approximately one third of the predicted level and therefore the cumulative effects of NOx are not considered to represent '*significant pollution'* at the nearby LWS's.

CONCLUSIONS

7.120 This assessment has considered the potential impacts of the proposed development of an exploratory well at Tinker Lane, between Blyth and Barnby Moor.

7.121 Impacts on air quality from the onsite power generation plant have been assessed in addition to emissions from road vehicles and construction dust.

7.122 A qualitative assessment of the potential dust impacts for the proposed development has been undertaken. Through good practice and implementation of appropriate mitigation measures, the release of dust during construction, operation, decommissioning and restoration would be effectively controlled and mitigated.

7.123 Road vehicle movements associated with the proposed development will generate emissions of pollutants and the potential air quality impacts associated with development traffic were quantified using the ADMS Roads dispersion model with NO_2 concentrations verified using monitoring data from the development locale.

7.124 The assessment determined that the development would result in an 'imperceptible' or 'small' contribution to NO_2 concentrations at receptors located in the centre of Blyth and that the overall effects can be classified as 'negligible'.

7.125 The emissions of combustion pollutants from the onsite power generation plant were quantified based on manufacturer's data relating to flow and pollutant concentrations. The impact of these emissions on sensitive receptor locations (human and ecological) were assessed using atmospheric dispersion modelling tools in accordance with EA guidance. To ensure a worst-case assessment was undertaken, the model assumed that all onsite power generation plant was operational for an entire year; in reality the drill rig generators will be operational for approximately 4-months and therefore as per EA guidance actual long-term impacts will be approximately one third of the predicted level.

7.126 The predicted impacts of combustion pollutants from the onsite power generation plant did not result in any predicted exceedance of the relevant AQO at sensitive residential properties. However, in order to reduce the impact, particularly of NOx and NO_2 which were classified as 'slight adverse', the operators have identified additional abatement measures as per 7.100.

7.127 Specifically, the operators are proposing that additional abatement (detailed at 7.100) will be provided to the onsite power generators in line with the requirements of Stage IV of the NRMM regulations.

7.128 The predicted impacts of the mitigated combustion pollutants from the onsite power generation plant are significantly reduced and the effect classified as 'negligible' and not significant.

7.129 Consideration of the potential combined impacts of combustion emissions from both the mitigated onsite power generation plant and road vehicles has been undertaken for receptors affected by both sources. This determined that there are no significant cumulative effects.

7.130 Therefore the conclusion of this assessment is that the proposed development will not have a significant adverse effect on air quality.