GA Pet Food Partners

Liverpool Road, Bretherton

Air Quality Assessment for a Proposed Combined Heat and Power Plant

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RSK GENERAL NOTES

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Summary

An air quality assessment of proposed Combined Heat and Power Plant (CHP) Liverpool Road, within the Golden Acres (GA) Pet Food site in Preston has been undertaken with reference to existing air quality in the area and relevant air quality legislation, policy and guidance.

An assessment of construction phase impacts has been undertaken following the 2014 Institute of Air Quality Management (IAQM) guidance. Demolition does not form part of this development and was screened out. The potential risk of construction phase impacts and earthworks on local air quality was predicted to be negligible for dust soiling and human health, prior to the implementation of dust control measures. Trackout has a negligible to low risk on dust soiling and human health. Mitigation measures have been recommended to reduce the risk of dust and particulate matter being generated and re-suspended. With implementation of the appropriate measures, construction activities are not anticipated to have a significant impact on air quality.

The main potential air quality impact once the proposed development is operational considered to be emissions from the operation of the proposed CHP. An assessment of operational impacts has been undertaken using ADMS-5.2, an advanced atmospheric dispersion model developed for regulatory purposes, with the use of meteorological data predicted between 2013 and 2017 using the Global Forecast System (GFS). Buildings/structures have been included to account for the effects of downwash and terrain data also included. Concentrations of key air pollutants (nitrogen oxides (NO_x), nitrogen dioxides (NO_2) and carbon monoxide (CO)) have been predicted at discrete human and ecological receptor locations, as applicable. Sulphur dioxide (SO_2) and ammonia (NH_3) impacts have been considered for the scenarios where selective catalytic reduction (SCR) has been incorporated into the development.

The highest predicted impacts at any of the modelled off-site discrete receptor locations in any of the five modelled meteorological years have been reported and compared to the relevant Air Quality Strategy (AQS) objectives. There were no predicted exceedances of any of the objectives for humans at the modelled discrete receptor locations in any of the modelled meteorological years.

In order to assess the impact of increases in pollutant concentrations attributable to the proposed development on existing sensitive receptors, an impact assessment in accordance with the 2017 Environmental Protection UK (EPUK)-IAQM guidance was undertaken. The impact of the proposed development on all the pollutants considered at the modelled discrete human receptor locations was assessed as negligible .

The development was assessed as having a minimal impact at the majority of local ecologically sensitive sites, with regards to nitrogen and acid deposition, and ambient annual and daily mean NO_x concentrations. The greatest impact at an ecological site is predicted at the Leeds/Liverpool Canal Biological Heritage Site (BHS) and the River Douglas BHS for maxiumum daily NOx and nitrogen deposition, however when impacts are considered across the whole of this BHS the impacts are significantly reduced.

The assessment has concluded that taking the conservative nature of the assessment into account, the overall impact on local air quality is considered to be insignificant.

Abbreviations

APIS	Air Pollution Information System
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
BHS	Biological Heritage Site
CBC	Chorley Borough Council
CO	Carbon Monoxide
CHP	Combined Heat and power Plant
Defra	Department for Environment, Food and Rural Affairs
EA	Environment Agency
EC	European Commission
EPUK	Environmental Protection UK
EU	European Union
GA	Golden Acres
HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
LERN	Lancashire Environment Record Network
NAQS	National Air Quality Strategy
NH_3	Ammonia
NPPF	National Planning Policy Framework
NO_2	Nitrogen dioxide
NOx	Oxides of nitrogen
O_3	Ozone
PC	Process Contribution
PEC	Predicted Environmental Concentration
$PM_{2.5}$	Particulate matter of size fraction approximating to <2.5mm diameter
PM_{10}	Particulate matter of size fraction approximating to <10mm diameter
SO_2	Sulphur Dioxide
WLBC	West Lancashire Borough Council

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1 INTRODUCTION

1.1 Background

RSK Environment Ltd (RSK) was commissioned to undertake an air quality impact assessment of proposed combined heat and power plant (CHP), Liverpool Road, Bretherton (the proposed site).

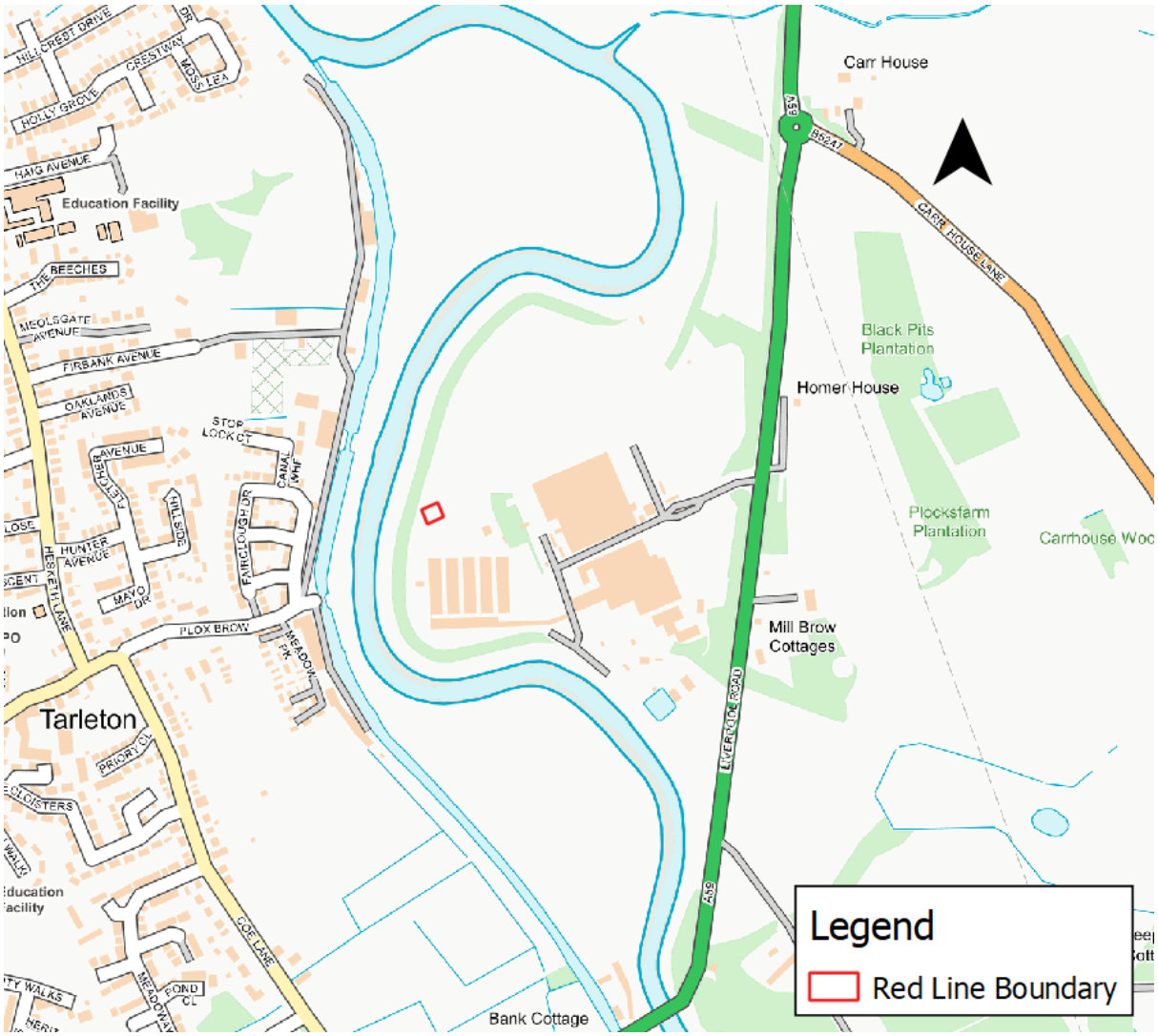
The proposed development involves a building approximately 0.05 ha in size, and the proposed site lies within the Golden Acres (GA) Pet Food site in Preston. The approximate grid reference of the centre of the proposed site is 345752, 420934. Figure 1.1 shows the site location including the red line boundary of the site. The proposed site falls within the jurisdiction of Chorley Borough Council (CBC) and directly adjacent to West Lancashire Borough Council (WLBC).

Potential impacts of the Combined Heat and Power Plant (CHP) has been assessed using an advanced air dispersion model. This report presents the findings of an assessment of existing/baseline air quality conditions and the predicted impacts from the proposed CHP once it is fully operational, as well as potential impacts during the construction phase.

1.2 Proposed Development

The proposed development is to be part of Golden Acre Pet Food Partners pet food manufacturing plant and consists of a new CHP which has been assumed to run constantly throughout the year. The fuel for the proposed CHP is natural gas with a thermal output of 3129kW.

Figure 1.1: Site Location Plan



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2 LEGISLATION, POLICY CONTEXT AND GUIDANCE

2.1 Air Quality Strategy

UK air quality policy is published under the umbrella of the Environment Act 1995, Part IV and specifically Section 80, the National Air Quality Strategy (NAQS). The latest *Air Quality Strategy for England, Scotland, Wales and Northern Ireland – Working Together for Clean Air*, published in July 2007 sets air quality standards and objectives for ten key air pollutants to be achieved between 2003 and 2020.

The Air Quality Framework Directive (1996) established a framework under which the European Commission (EC) could set limit or target values for specified pollutants. The directive identified several pollutants for which limit or target values have been, or will be set in subsequent 'daughter directives'. The framework and daughter directives were consolidated by Directive 2008/50/EC on Ambient Air Quality And Cleaner Air for Europe, which retains the existing air quality standards and introduces new objectives for fine particulates ($PM_{2.5}$).

2.1.1 Air Quality Standards

The air quality standards in the United Kingdom are derived from EC directives and are adopted into English law via the Air Quality (England) Regulations 2000 and Air Quality (England) Amendment Regulations 2002. The Air Quality Limit Values Regulations 2003 and subsequent amendments implement the Air Quality Framework Directive into English Law. Directive 2008/50/EC was translated into UK law in 2010 via the Air Quality Standards Regulations 2010.

The relevant[1] standards for England and Wales to protect human health and vegetation and ecosystems are summarised in Table 2.1: .

Table 2.1: : Air Quality Standards Relevant to the Proposed Development (referred to as Air Quality Strategy (AQS) objectives throughout report)

Substance	Averaging period	Exceedances allowed per year	Ground level concentration limit (µg/m^3)
Human Receptors			
Nitrogen dioxide (NO_2)	1 calendar year	N/A	40
	1 hour	18	200
Carbon Monoxide (CO)	8 hour running average across a 24 hour period	N/A	10000

[1] Relevance, in this case, is defined by the scope of the assessment.

Substance	Averaging period	Exceedances allowed per year	Ground level concentration limit (µg/m³)
SO_2	1-hour mean	24	350
	24-hour mean	3	125
	15-minute mean	25	266
Ecological Receptors			
Nitrogen oxides (NO_x)	1 year	N/A	30
SO_2	Annual mean	N/A	20
	Winter Mean	N/A	20

2.1.2 The Environment Act

The set AQS objectives are to be used in the review and assessment of air quality by local authorities under Section 82 of the Environment Act (1995). If exceedances are measured or predicted through the review and assessment process, the local authority must declare an Air Quality Management Area (AQMA) under Section 83 of the act, and produce an Air Quality Action Plan (AQAP) to outline how air quality is to be improved.

2.2 Planning Policy

The land use planning process is a key means of improving air quality, particularly in the long term, through the strategic location and design of new developments. Any air quality concern that relates to land use and its development can, depending on the details of the proposed development, be a material consideration in the determination of planning applications.

2.2.1 National Planning Policy Framework

In July 2018 the revised National Planning Policy Framework (NPPF) was published, superseding the previous 2012 NPPF with immediate effect. The NPPF includes a presumption in favour of sustainable development.

Section 11 of the NPPF deals with Conserving and Enhancing the Natural Environment, and states that the intention is that the planning system should prevent *"development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability" and goes on to state that 'new development [should be] appropriate for its location" and "the effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account."*

With specific regard to air quality, the NPPF states that:

> *"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, such as through traffic and travel management, and green infrastructure provision and enhancement. 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. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."*

2.2.2 Local Planning Policy

The Chorley Local Plan 2012 – 2026 (adopted 21st July 2015) mentions Policy 30, Air Quality of the Central Lancashire Adopted Core Strategy, Local Development Framework (2012).

Policy 30 – Air Quality aims to:

> *'Improve air quality through delivery of Green Infrastructure initiatives and through taking account of air quality when prioritising measures to reduce road traffic congestion.'*

The West Lancashire Local Plan 2012-2027 (adopted 16th October 2013) includes Policy GN3, Criteria for Sustainable Development which states:

> *"…proposals for development should:*
>
> *i. Be designed to minimise any reduction in air quality…*
>
> *… v. Minimise the risk from all types of pollution and contamination…"*

2.3 Guidance

2.3.1 Guidance on the Assessment of Dust from Demolition and Construction

The Institute of Air Quality Management (IAQM) published a guidance document in 2014 (Holman *et al.*, 2014) on the assessment of construction phase impacts. The guidance was produced to provide advice to developers, consultants and environmental health officers on how to assess the impacts arising from construction activities. The emphasis of the methodology is on classifying sites according to the risk of impacts (in terms of dust nuisance, PM_{10} impacts on public exposure and impact upon sensitive ecological receptors) and to identify mitigation measures appropriate to the level of risk identified.

2.3.2 Local Air Quality Management Review and Assessment Technical Guidance

The Department for Environment, Food and Rural Affairs (Defra) has published technical guidance for use by local authorities in their air quality review and assessment work. This guidance, referred to in this document as LAQM.TG(16), has been used where appropriate.

2.3.3 Land-Use Planning & Development Control: Planning for Air Quality

Environmental Protection UK (EPUK) and the IAQM jointly published a revised version of the guidance note 'Land-Use Planning & Development Control: Planning for Air Quality' in 2017 (herein the 'EPUK-IAQM' guidance) to facilitate the consideration of air quality in the land-use planning and developmental control process. It provides a framework for air quality considerations within local development control processes, promoting a consistent approach to the treatment of air quality issues within development control decisions.

The guidance includes a method for screening the requirement for an air quality assessment, undertaking the air quality assessment, the determination of the air quality impact associated with a development proposal and whether this impact is significant.

2.3.4 Environment Agency: Risk Assessments for Specific Activities: Environmental Permits

The Air Emissions section of this Environment Agency (EA) guidance has been referred to in the assessment of emissions to air from the proposed development, where appropriate. This EA guidance includes a number of Environmental Assessment Levels (EALs) for human receptors and target Predicted Environmental Concentrations (PECs) for ecological receptors. EALs and target PECs relevant to this assessment are presented in Table 2.2.

Table 2.2: EA Guidance EALs and Target PECs

Pollutant	Guidance EALs ($\mu g/m^3$)	Target PECs ($\mu g/m^3$)
Human Objectives		
1 hour CO	30,000	
Annual NH_3	180	
Hourly NH_3	2,500	
Ecological Objectives		
Daily NOx		75
Annual NH_3		1 (where lichens or bryophytes are present) 3 (where lichens or bryophytes are not present)

2.3.5 AQTAG06: Technical Guidance on Detailed Modelling Approach for an Appropriate Assessment for Emissions to Air

The AQTAG06 guidance provides technical guidance on how to approach detailed modelling of emissions to air when considering impacts on ecological receptors; of particular relevance to this assessment it includes guidance on the calculation of deposition fluxes to allow nitrogen and acid deposition to be assessed.

3 ASSESSMENT SCOPE & METHODOLOGY

3.1 Overall Approach

The approach taken for assessing the potential air quality impacts of the proposed development may be summarised as follows:

- Baseline characterisation of local air quality;
- Qualitative impact assessment of the construction phase of the development using the 2014 IAQM guidance;
- Quantitative assessment of air quality impacts during the operational phase of the proposed development using detailed dispersion modelling assessment of exhaust emissions from the proposed engines on human receptors and at ecologically sensitive sites;
- Recommendation of mitigation measures, where appropriate, to ensure any adverse effects on air quality are minimised; and,
- Identification of residual impacts resulting from the proposed development.

3.2 Baseline Characterisation

Existing or baseline air quality refers to the concentrations of relevant substances that are already present in ambient air. A desk-based study has been undertaken including a review of monitoring data available from CBC and WLBC and estimated background data from the LAQM Support website maintained by Defra. Background concentrations have been mapped by Defra at a grid resolution of 1x1km for the whole of the UK.

3.3 Construction Phase Assessment

3.3.1 Construction Dust and Particulate Matter

Construction works for the proposed development have the potential to lead to the release of fugitive dust and particulate matter. An assessment of the likely significant effects of construction phase dust and particulate matter at sensitive receptors has therefore been undertaken following the IAQM construction dust guidance.

In order to assess the potential impacts construction activities are divided into four types:

- Demolition;
- Earthworks;
- Construction; and

- Trackout[2].

Appendix A details how the 'dust emission magnitude' associated with each of these activities, is combined with the sensitivity of receptors (human or ecological), to determine the overall 'dusk risk'. Once the level of risk has been determined, then site specific mitigation proportionate to the level of risk can be identified.

3.3.2 Emissions to Air from Construction Traffic

Exhaust emissions from construction phase vehicles may have an impact on local air quality adjacent to the routes used by these vehicles to access the application site and in the vicinity of the application site itself. A qualitative assessment of their impact on local air quality has been undertaken using professional judgement and by considering the following:

- The potential number and type of construction traffic and plant likely to be generated by this phase of the Proposed Development;
- The number and proximity of sensitive receptors to the application site and along the likely routes to be used by construction vehicles; and
- The likely duration of the construction phase and the nature of the construction activities undertaken.

3.4 Operational Phase Assessment

3.4.1 Operational Phase Emissions from Proposed CHP Plant

As the proposed development is a CHP plant, detailed dispersion modelling was considered appropriate to assess the potential impacts on local air quality at sensitive receptors, once operational. The key air pollutants of concern for the operation of the proposed development are NO_x, NO_2 and CO. The proposed plant is natural gas fuelled, and existing boilers are also fuelled by natural gas. Natural gas is a clean-burning fuel and emits insignificant quantities of particulate matter, and hence the assessment PM_{10} is not required. It is understood that the proposed plant will include Selective Catalytic Reduction (SCR) and emission limits were also provided for SO_2 and NH_3 therefore they have also been included within this assessment.

As the development already has staff to be based at the site and due to the nature of the CHP plant, it is considered unlikely that there would be any significant increase in traffic related to the proposed development, and this has not been considered further within the assessment. RSK are not aware of any committed or consented developments in the area with significant emissions to air, and therefore it is proposed that the air quality impacts of this proposed development during the operational phase are considered in isolation.

[2] Trackout is defined as the transport of dust and dirt from the construction / demolition sites onto the public road network (or vehicles entering and leaving the site), where it may be deposited and then re-suspended by vehicles using the network.

The following subsections provide further information regarding input to the dispersion model including emissions sources, meteorological data and receptors/study area included.

3.4.2 Modelling Software

ADMS 5 (version 5.2.1) was used for assessing the air quality impacts of point source emissions during the operational phase of the proposed development.

3.4.3 Emission Sources

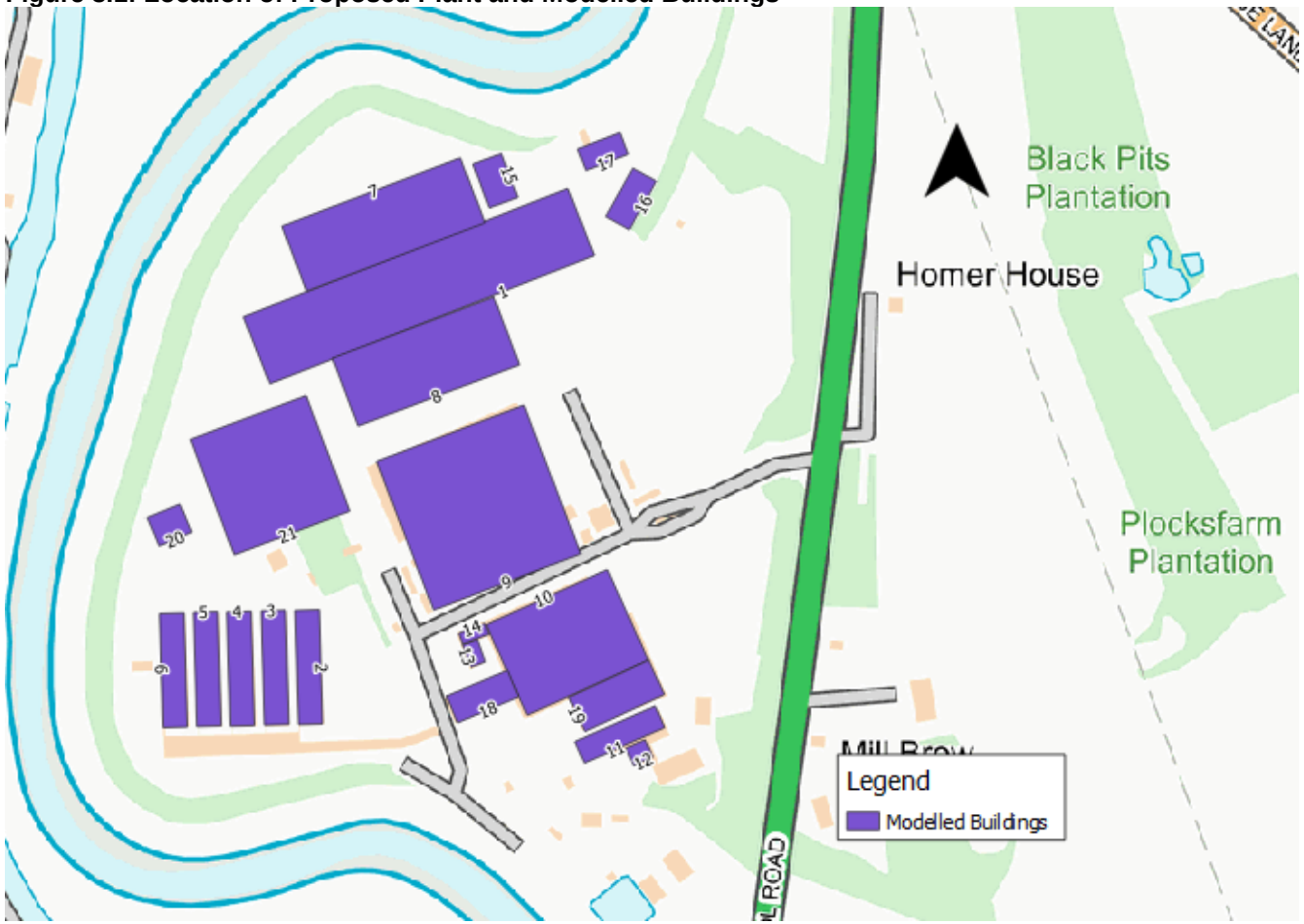
RSK was provided information on the physical and emissions parameters of the plant to be installed at site. It is understood that 3 existing boiler (>1MW) are already operational on-site, these have therefore been included in the modelling assessment as part of the baseline scenario and all future scenarios. One CHP engine (approximately 3.13MW) is proposed to be installed with one flue above roof level. Table 3.1 presents the physical and emission characteristics of the existing boilers and proposed CHP modelled within this assessment. The locations of these point sources are presented in Figure 3.1.

The emission rates for existing boilers were unknown and therefore emission limits for existing natural gas boilers from the Medium Combustion Plant (MCP) Directive were utilised along with known parameters to calculate the emission rates.

Table 3.1: Physical and Emission Characteristics of Point Sources included in the Assessment

Description	Existing 2490kW Beevor Boiler	Existing 2930kW Beevor Boiler	Existing 1700kW Robey Boiler	Proposed CHP (with SCR)
Stack height (m above ground level)	10	10	12	15
Stack diameter (m)	0.4	0.4	0.4	0.6
Stack exhaust temperature (°C)	375	372	410	386
Stack velocity (m/s)	19.02	20.44	10.98	22.47
Total nitrogen oxides emission rate (g/s)	0.2517	0.2718	0.1379	0.4061 (0.1543)
Total CO emission rate (g/s)	0.1113	0.1202	0.0610	1.7057 (0.1624)
Total SO_x emission rate (g/s)	N/A	N/A	N/A	(0.0244)
Total NH_3 emission rate (g/s)	N/A	N/A	N/A	(0.0081)

Figure 3.1: Location of Proposed Plant and Modelled Buildings



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The following scenarios have been modelled:

- **Baseline** – the scenario without the proposed development;
- **Proposed CHP with no SCR** – the scenario with the proposed CHP without selective catalytic reduction (SCR);
- **Proposed CHP with SCR** - the scenario with the proposed CHP with SCR; and,
- **Proposed CHP with SCR and additional building** - the scenario with the proposed CHP with SCR and an additional building (building 21) included.

It is understood that SCR will be included as part of the proposed development, so the scenario without the SCR is included for comparison purposes only. Building 21 is a proposed meat kitchen which is expected to be constructed in the future but is unlikely to happen for a few years yet. It has been included as a sensitivity test to ensure that once it is on-site it doesn't adversely affect the dispersion of the proposed CHP emissions

For all scenarios, operation of existing and proposed plant included within the model is assumed to be operational 24-hours per day, 365 days per year, with the exception of the Robey gas boiler which is a backup boiler. This runs occasionally when production demands. For a conservative approach, the modelling has assumed the Robey boiler runs constantly for 3 months during the winter period and off for the rest of the year.

3.4.4 Buildings

In order to capture the potential influence of buildings/structures on the dispersion profile of combustion emissions (e.g. building 'wake' and downwash effects), buildings surrounding the development and those proposed as part of the development were included in the dispersion model. The locations and heights of these buildings/structures are listed in Table 3.1. Figure 3.1 shows the location of the buildings.

Building 20 is the new building which will contain the proposed CHP. This is included in all models except the baseline model. Building 21 is included in the 'Proposed CHP with SCR and additional building' scenario. There are plans for this to be built in the future so it has been included within this assessment for a conservative approach.

Table 3.1: Building Details included in the Dispersion Model

Building	Grid Ref, X	Grid Ref, Y	Height, m
Existing Buildings			
1	345841.93	420790.85	4
2	345820.23	420790.55	4
3	345798.33	420789.85	4
4	345776.93	420789.65	4
5	345755.33	420788.95	4
6	345998.63	421133.40	19.4

Building	Grid Ref, X	Grid Ref, Y	Height, m
7	345929.82	421152.950	18.15
8	345951.25	421064.04	19.4
9	345970.49	420994.83	12
10	346023.89	420889.58	15
11	346054.55	420802.35	11
12	346048.11	420780.77	11
13	345940.69	420844.85	11
14	345945.58	420855.20	19
15	345956.13	421155.75	10
16	346040.25	421146.39	13
17	346031.92	421169.16	11
18	345967.26	420808.22	15
19	346050.27	420831.68	15
New/proposed buildings			
20	345729.79	420922.77	3.32
21	345831.20	421000.85	16

3.4.5 Meteorological Data

It is acknowledged that there are difficulties in sourcing representative weather data for this area using conventional weather recording stations. The meteorological data used in this study is obtained from assimilation and short-term forecast fields of the Numerical Weather Prediction (NWP) system known as the Global Forecast System (GFS).

The GFS is a spectral model and data are archived at a horizontal resolution of 0.25 degrees, which is approximately 25 km over the UK (formerly 0.5 degrees, or approximately 50 km). The GFS resolution adequately captures major topographical features and the broad-scale characteristics of the weather over the UK. Smaller scale topographical features may be included in the dispersion modelling by using the flow field module of ADMS (FLOWSTAR) using digital terrain data. The wind rose for the weather file, derived from data from the GFS data is shown in Appendix B. This shows the direction from which winds blows and illustrates the relative frequency of wind directions and wind speeds used in the modelling study.

3.4.6 Terrain

Ordnance Survey digital terrain data were included in the assessment to account for topographical features of the land covering the model domain.

3.4.7 Background Air Quality Data Used in the Modelling

Background NO_2 concentrations for the study area have been taken from the national maps provided by Defra. These maps provide estimated background concentrations for the whole of the UK at a grid resolution of 1km x1km, for 2015 to 2030. The maps assume that background concentrations will improve (i.e. reduce) over time, in line with

the predicted reduction in vehicle emissions as well as reductions in emissions from other sources. Due to the current uncertainty in the assumed reductions, background concentrations for 2018 have been considered rather than the anticipated opening year of the proposed development. This is considered a conservative approach.

Annual mean CO and SO_2 concentrations have been taken from the 2001 LAQM Support / UK-AIR background maps, as these are the latest datasets available for CO and SO_2. For this assessment it has been assumed that there has been no reduction in these background concentrations since 2001 to provide a worst-case assessment.

Background NOx, NH_3, acid deposition and nitrogen deposition values were taken from the Air Pollution Information System (APIS) website. The gird references and a habitat type for each ecological receptor were entered into the search tool in order to obtain background concentrations for the relevant grid squares foreach receptor.

Background concentrations used within the assessment are presented in the baseline section in Table 4.1 – 4.3.

3.4.8 Receptor Locations and Model Domain

Pollutant concentrations were predicted at a number of receptors at existing sensitive locations. Details of all specific receptors included in the modelling study are summarised in Table 3.2 and shown in Figure 3.2. All receptors were modelled at ground level to allow for a conservative assessment. Ecological data within 10km of the proposed CHP was provided by Lancashire Environment Record Network (LERN) and selected using the following criteria from the EA guidance '*Air emissions risk assessment for your environmental permit*' as follows:

- Special Protection Areas (SPAs), Special Areas of Conservation (SACs) or Ramsar sites (protected wetlands) within 10km of the site;
- Sites of Special Scientific Interest (SSSIs), local nature sites (ancient woods, Local Wildlife Sites (LWSs) and National and Local Nature Reserves) within 2km of the site.

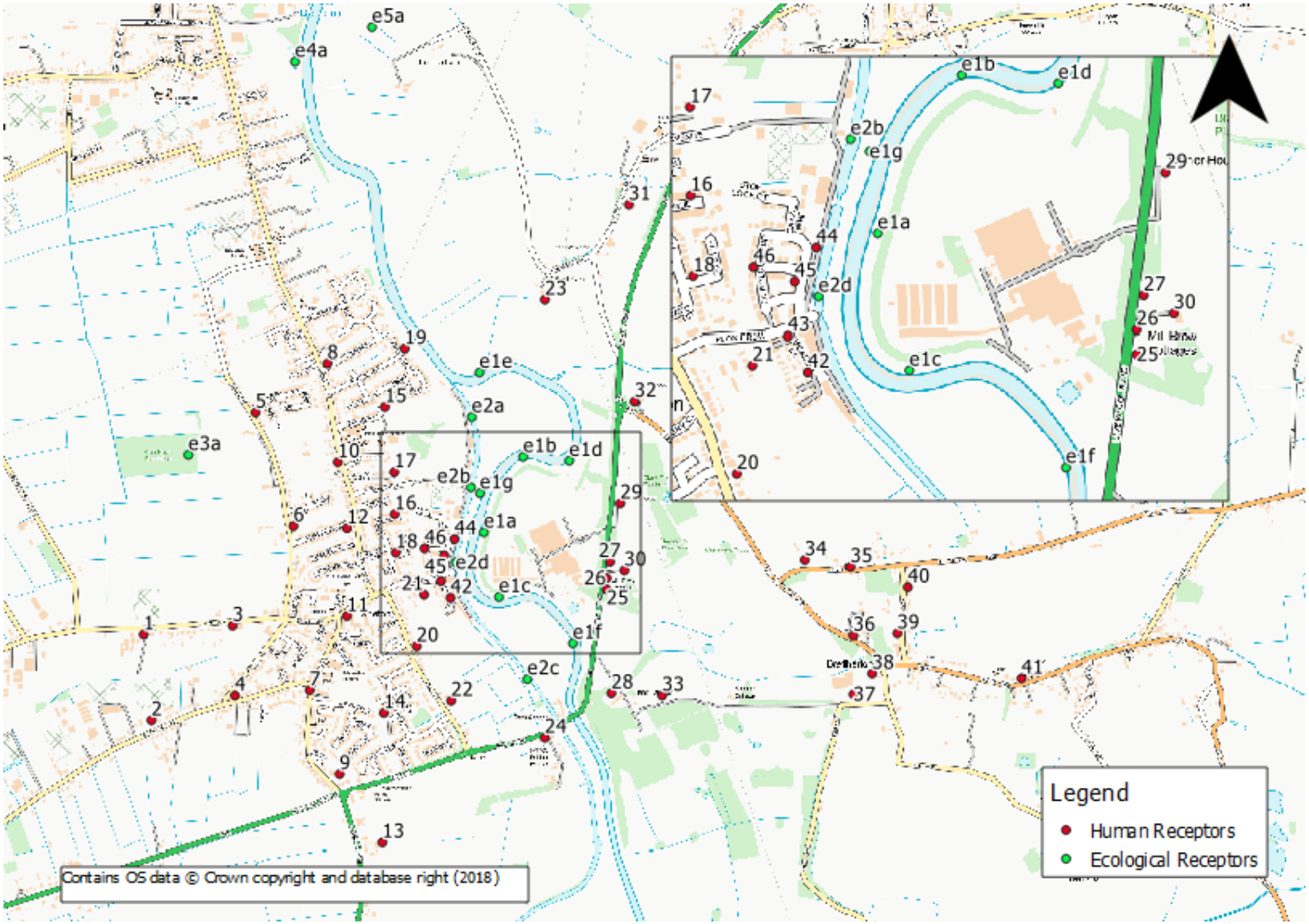
Furthermore, for the purpose of considering potential impacts at a greater number of locations by producing isopleths (pollution concentration contours), for the predicted annual and short-term concentrations, hypothetical grid receptors spaced at 50m covering approximately a domain of 4 x 4km approximately centres over the proposed site have also been included, with a more detailed grid of approximately 20m spacing covering a domain of approximately 2 by 2km. Concentrations were modelled at 1.5m for objectives relevant to human receptors and at ground level (0m) for objectives relevant to ecological receptors for these grids of receptors.

Table 3.2: Receptors Included in the Dispersion Modelling Assessment

Receptor ID	Receptor Location	Grid reference		Height Z
		X	Y	
Human Receptors				
R1	Gorse Lane	344457.50	420575.45	1.5
R2	Blackgate Lane	344486.08	420260.65	1.5
R3	Gorse Lane	344783.76	420607.46	1.5
R4	Blackgate Lane	344792.16	420351.26	1.5
R5	Carr Lane	344867.85	421390.06	1.5
R6	Sutton Lane	345007.07	420973.16	1.5
R7	Church Road	345066.10	420370.77	1.5
R8	Sutton Avenue	345131.39	421569.10	1.5
R9	Church Road	345176.01	420063.43	1.5
R10	Hesketh lane	345169.38	421207.68	1.5
R11	Gorse Lane	345203.02	420643.09	1.5
R12	Kearsley Avenue	345203.15	420965.21	1.5
R13	Liverpool Road	345332.96	419812.93	1.5
R14	Meadoway	345338.29	420287.33	1.5
R15	Haig Avenue	345342.09	421409.97	1.5
R16	Fletcher Avenue	345377.89	421016.52	1.5
R17	Meolsgate Avenue	345376.64	421171.05	1.5
R18	Hillside	345382.09	420875.31	1.5
R19	Merlecrest Drive	345414.82	421623.80	1.5
R20	Coe Lane	345458.58	420532.02	1.5
R21	Plox Brow	345485.91	420721.34	1.5
R22	Coe Lane	345585.18	420332.15	1.5
R23	Mill Hill Farm	345928.84	421803.87	1.5
R24	Banks Bridge House	345928.52	420196.80	1.5
R25	Liverpool Road	346155.27	420740.83	1.5
R26	Liverpool Road	346155.00	420781.89	1.5
R27	Liverpool Road	346167.55	420841.71	1.5
R28	Bank Hall Farm	346172.63	420359.87	1.5
R29	Homer House	346205.59	421056.34	1.5
R30	Liverpool Road	346220.31	420810.41	1.5
R31	Liverpool Old Road	346236.86	422152.18	1.5
R32	Carr House	346257.89	421430.04	1.5
R33	Bank Hall Farm	346358.89	420351.59	1.5
R34	North Road	346881.99	420848.81	1.5
R35	North Road	347043.72	420823.38	1.5
R36	Bretherton, Carr House Lane	347054.00	420571.46	1.5
R37	Eyes lane	347054.51	420355.85	1.5
R38	Bretherton, Carr House Lane	347122.94	420431.87	1.5
R39	Pompian Brow	347215.45	420579.72	1.5

Receptor	Receptor Location	Grid reference		Height
R40	Pompian Brow	347253.70	420748.69	1.5
R41	South Road, Education Facility	347670.87	420414.31	1.5
R42	Meadow Park	345582.80	420709.33	1.5
R43	Meadow Park	345547.83	420771.79	1.5
R44	Fairclough Drive	345597.35	420925.25	1.5
R45	Fairclough Drive	345559.84	420865.82	1.5
R46	Fairclough Drive	345487.44	420891.04	1.5
Ecological Receptors				
e1a	River Douglas Estuary (BHS)	345705.00	420950.00	0
e1b	River Douglas Estuary (BHS)	345849.00	421227.00	0
e1c	River Douglas Estuary (BHS)	345760.00	420713.00	0
e1d	River Douglas Estuary (BHS)	346018.00	421212.00	0
e1e	River Douglas Estuary (BHS)	345688.00	421536.00	0
e1f	River Douglas Estuary (BHS)	346031.00	420542.00	0
e1g	River Douglas Estuary (BHS)	345690.00	421093.00	0
e2a	Leeds/Liverpool Canal (BHS)	345660.00	421373.00	0
e2b	Leeds/Liverpool Canal (BHS)	345657.00	421115.00	0
e2c	Leeds/Liverpool Canal (BHS)	345864.00	420411.00	0
e2d	Leeds/Liverpool Canal (BHS)	345601.00	420839.00	0
e3a	Carr Heys Plantation (DWS)	344621.00	421234.00	0
e4a	Hesketh Bank Brickworks (BHS)	345012.00	422676.00	0
e5a	Disused Railway (BHS)	345294.00	422803.00	0

Figure 3.2: Modelled Receptor Locations



3.4.9 Processing Results and NO_x/NO_2 Chemistry

NO_x emitted to the atmosphere as a result of combustion will consist largely of nitric oxide (NO), a relatively innocuous substance. Once released into the atmosphere, NO is oxidised to NO_2, which is of concern with respect to health and other impacts. The proportion of NO converted to NO_2 depends on a number of factors including wind speed, distance from the source, solar irradiation and the availability of oxidants, such as O_3. The dispersion modelling exercise predicts concentrations of NO_x which subsequently require conversion to NO_2. The conversion rate of NO_x to NO_2 used in this assessment is 70% for long term emissions and 35% for short term emissions as per guidance provided by the advice note for conversion ratios for NOx and NO2 from the EA (date unknown).

The total pollutant concentrations (Predicted Environmental Concentrations (PECs)) are calculated from the Process Contribution (PC) as follows:

- Long term standards: PEC = PC + Background Concentration
- Short term standards: $PEC_{short\ term} = PC_{short\ term} + (2 \times Background_{long\ term})$.

Isopleths (i.e. pollution concentration contours), for the predicted annual and hourly mean NO_2 and annual mean NO_x concentrations (as NO_x is the main emission from the plant and likely to be closest to exceeding the relevant objectives), are presented in Appendix C, for the meteorological year in which the maximum concentrations were modelled at any of the off-site discrete receptor locations.

3.4.10 Nitrogen and Acid Deposition Calculations

Total annual mean NO_x concentrations, and acid and nitrogen deposition rates, were calculated at the identified discrete ecological receptor locations, District Wildlife Sites (DWS) and Biological Heritage Sites (BHS)[3] within 2km of the proposed development site. No Special Areas of Conservation (SACs), special protection areas (SPAs) and Ramsar sites were identified within 10km of the proposed development site, nor were there any Sites of Special Scientific Interest (SSSIs), ancient woods or National Nature Reserves (NNR) within 2km of the proposed development site.

The broad habitat types identifiable at each identified ecological site were determined using information sheets which were provided as by Lancashire Environment Record Network (LERN) and information available on the Air Pollution Information System (APIS) for the purpose of the nitrogen and acid deposition calculations. Where more than one habitat type was identified within each ecological site, it has been assumed that the habitat most sensitive to the development is represented at the modelled discrete receptor location, for a conservative assessment.

Background NO_x concentrations, the critical nitrogen deposition loading capacities, the nitrogen and sulphur acid deposition loading capacities, and background nitrogen and acid deposition rates, were obtained from the APIS website.

[3] DWS Equivalent to Local Nature Reserve. BHS equivalent to Local Wildlife Site.

The total NO_x concentrations have been compared to the annual mean environmental quality standard (EQS). The nitrogen deposition process contributions (PCs) were compared to the applicable minimum deposition critical loads. The acid deposition process contributions (PCs) were compared to the critical load functions (dependent on the nitrogen and sulphur deposition loading capacities), using the 'Critical Load Function tool' on the APIS website.

The relevant critical loads for nitrogen deposition, taken from APIS, at the identified ecological receptors are presented in Table 3.3.

Table 3.3: Critical Loads for Nitrogen Deposition

Receptor ID	Habitat	Critical Load Range (kgN/ha/yr)*
e1a	Rich Fen	15 - 30
e1b	Rich Fen	15 - 30
e1c	Rich Fen	15 - 30
e1d	Rich Fen	15 - 30
e1e	Rich Fen	15 - 30
e1f	Rich Fen	15 - 30
e1g	Rich Fen	15 - 30
e2a	Rich Fen	15 - 30
e2b	Rich Fen	15 - 30
e2c	Rich Fen	15 - 30
e2d	Rich Fen	15 - 30
e3a	Broadleaved deciduous woodland	10 - 20
e4a	Marsh (used rich fen for critical load range)	15 - 30
e5a	Neutral Grassland	20 - 30
*Lower critical load used in assessment for conservative assessment		

The acidification critical loads relevant to the ecosystems located within the vicinity of the site are presented in Table 3.4. Acid deposition calculations were only carried out for receptors e3a (Carr Heys Plantation) and e5a (disused railway) as the Leeds/Liverpool canal, River Douglas Estuary and Hesketh Bank Brickworks habitat types are classed as not sensitive to acid deposition on the APIS website.

Table 3.4: Critical Loads for Acidification

Receptor ID	Ecological Site	CLMinN (keqN/ha/yr)	CLMaxN (keqN/ha/yr)	CLMaxS (keqS/ha/yr)
e3a	Carr Heys Plantation	1.358	0.357	1.715
e5a	Disused Railway	4.00	1.071	5.071

3.5 Significance Criteria

3.5.1 Construction Phase

For the construction phase of the proposed development, the IAQM guidance regarding determination of a significant effect has been followed, where:

> *'IAQM recommends that significance is only assigned to the effect after considering the construction activity with mitigation. It is, therefore, important that the mitigation measures are defined in a form suitable for implementation by way of a planning condition or legal obligation within a section 106 agreement, and are included in a DMP or a more general Code of Construction Practice or Construction Environmental Management Plan.'*
>
> *'For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'.'*

The significance of effects of exhaust emissions arising from construction vehicles and on-site plant during the construction phase of the Proposed Development have been evaluated qualitatively using professional judgement and the principles of the significance criteria set out within the EPUK / IAQM guidance.

3.5.2 Operational Phase

The approach provided in the EPUK / IAQM guidance has been used within this assessment to assist in describing the air quality effects of the change in long-term pollutant concentrations as a result of the operation of the proposed plant.

This guidance recommends that the degree of an impact is described by expressing the magnitude of incremental change in pollutant concentration as a proportion of the relevant assessment level and examining this change in the context of the new total concentration and its relationship with the assessment criterion, as summarised in Table 3.5.

Table 3.5: Long-term Human Receptors – Impact Descriptors for Individual Receptors

Long term average concentration at receptor in assessment year	% Change in concentration relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% of less of AQAL	Negligible	Negligible	Slight	Moderate
79 – 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

Notes

AQAL = Air Quality Assessment Level, which for this assessment related to the UK Air Quality Strategy objectives.

Where the %change in concentrations is <0.5%, the change is described as 'Negligible' regardless of the concentration.

When defining the concentration as a percentage of the AQAL, 'without scheme' concentration should be used where there is a decrease in pollutant concentration and the 'with scheme;' concentration where there is an increase.

Where concentrations increase, the impact is described as adverse, and where it decreases as beneficial.

The EPUK / IAQM guidance notes that the criteria in Table 2 should be used to describe impacts at individual receptors and should be considered as a starting point to make a judgement on significance of effects, as other influences may need to be accounted for. The EPUK / IAQM guidance states that the assessment of overall significance should be based on professional judgement, taking into account several factors, including:

- The existing and future air quality in the absence of the development;
- The extent of exposure to the impacts; and
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

For short-term concentrations, the EPUK / IAQM guidance recommends that consideration of the EA screening criterion of can be used as a guide to determining whether the short-term Process Contribution (PC) is considered to be significant. The EA criteria is as follows:

- Initial screening of PC, if short-term PC is less than 10% of the relevant standard then the impact can be considered to be insignificant; and
- If short-term PC is greater than 10% of the relevant stand then consideration is given to whether the short-term PC is greater than 20% of the relevant standard minus twice the long-term background concentration.

In addition, when considering short-term concentrations from an elevated point source, the EPUK / IAQM guidance suggests that the severity of an impact can be determined using the criteria presented in Table 3.6.

Table 3.6: Severity of Impact for Short-Term Concentrations

% Change in Short Term PC as % of AQAL	Magnitude of Change	Severity of Impact
11-20%	Small	Slight
21-50%	Medium	Moderate
>51%	Large	Substantial

There is no current guidance on determining significance of impacts on ecological receptors in a planning context and therefore consideration has been given to criteria available from the EA for permitting assessment. For the long-term objectives, this is as follows:

- Initial screening of the Process Contribution (PC), if the PC is less than 1% of the relevant standard then the impact can be considered to be insignificant; and
- If PC is greater than 1% of the relevant standard then screening of Predicted Environmental Contribution (PEC) is considered, if the PEC, are less than 70% the impact can be considered to be insignificant.

See above for short-term guidance from the EA; this has been considered for short-term objectives for ecological receptors.

For nitrogen and acid deposition, results have been compared to the relevant critical loads (section 3.4.10) and the long-term EA criteria.

3.6 Uncertainties and Assumptions

The following uncertainties and assumptions were made in the air quality assessment:

- Estimated background data from the Defra LAQM website was used in the assessment for human receptors. It was used to look at backgrounds for NO_2, CO, and SO_2. For ecological receptors (and NH_3 for human receptors), the APIS website was used to determine background concentrations for NO_x, NH_3, nitrogen deposition and acid deposition likely to be applicable at each of the ecological receptor locations. It is assumed that these background concentrations are likely to be applicable for the lifetime of the development;
- Emission limits have been used for the plant and therefore the assessment results are considered likely to be conservative;
- There will be uncertainties introduced because the modelling has simplified real-world processes into a series of algorithms. For example, it has been assumed that wind conditions predicted by the Global Forecast System (GFS) in 2013-2017 were representative of wind conditions at the site. Furthermore, it has been assumed that the subsequent dispersion of emitted pollutants will conform to a Gaussian distribution in order to simplify the real-world dilution and dispersion conditions; and
- There is an element of uncertainty in all measured and modelled data. All values presented in this chapter are best possible estimates.

4 BASELINE AIR QUALITY CHARACTERISATION

Existing or baseline air quality refers to the concentrations of relevant substances that are already present in ambient air. These substances are emitted by various sources, including road traffic, industrial, domestic, agricultural and natural sources. Baseline air quality data employed in this study have been obtained from CBC, WLBC and from the LAQM Support website operated by Defra.

4.1 Local Authority Review and Assessment of Air Quality

There are no AQMAs in CBC. The closest AQMA to the site lies over 7km north east from the site. This is AQMA order 5 Leyland which was declared AQMA status in 2018 for exceedances of the annual mean NO_2 standard.

4.2 Baseline Monitoring Data

A review of the monitoring data available from the Chorley Council 2018 Annual Status Report and West Lancashire 2017 Annual Status report, shows there are no diffusions tubes in close proximity to the site. The closest diffusion tubes are approximately 10km away in distance and are located on main roads. These are not considered to be representative of the site.

4.3 LAQM Background Data

Estimated background air quality data is also available from the Local Air Quality Management (LAQM) website operated by the Department for Environment, Food & Rural Affairs (Defra) (http://laqm.defra.gov.uk). The Defra LAQM website provides estimated annual average background concentrations of NO_2 on a $1km^2$ grid basis.

Table 4.1 presents the estimated annual average background NO_2 concentrations at the proposed development site for 2018 and assumes no improvement. It also shows the annual average background CO and SO_2 concentrations from 2001. Grid square 345500, 420500 is where the proposed CHP plant is located. The estimated background concentrations are below the relevant UK Air Quality Strategy objectives.

Table 4.1: Defra LAQM Estimated Annual Average NO_2, SO_2 and CO Concentrations and APIS NO_x at Proposed Development Site

Grid Square		Discrete Receptors	2018 Annual Average NO_2 ($\mu g/m^3$)	2001 Annual Mean Concentration SO_2 ($\mu g/m^3$)	2001 Annual Mean Concentration CO ($\mu g/m^3$)
X	Y				
345500	**420500**	R6, R7, R9, R11, R12, R14, R18, R20, R21, R22, R24, R42, R43, R44, R45, R46	8.6	3.2	0.25
345500	**421500**	R8, R10, R13, R15, R16, R17, R19, R23	7.5	2.9	0.26
344500	**420500**	R1, R2, R3, R4	7.5	3.0	0.25
344500	**421500**	R5	6.8	2.8	0.25
346500	**420500**	R25, R26, R27, R28, R30, R33, R34	8.0	2.7	0.26
346500	**421500**	R29, R32	8.1	2.7	0.26
346500	**422500**	R31	8.1	2.7	0.26
347500	**420500**	R35, R36, R37, R38, R39, R40, R41	8.0	2.8	0.26
Air Quality Objective			**40**	**No annual mean objective**	**No annual mean objective**

Table 4.2 presents the estimated annual average background NOx and NH_3 concentrations at the proposed development site for the years 2013 - 2015. This information has been taken from the APIS website. The estimated NOx background concentrations are below the relevant UK Air Quality Strategy objectives and the estimated annual NH_3 values are well below the EA target mean.

Table 4.2: APIS Estimated Annual Average NO_x and NH_3 at Proposed Development Site

Grid Square		Discrete Receptors	2013 – 2015 Annual Average NOx ($\mu g/m^3$)	2013 – 2015 Annual Average NH_3 ($\mu g/m^3$)
X	Y			
345500	**420500**	R6, R7, R9, R11, R12, R14, R18, R20, R21, R22, R24, R42, R43, R44, R45, R46, e1a, e1c, e2c, e2d	14.6	2.7
345500	**421500**	R8, R10, R13, R15, R16, R17, R19, R23, e1b, e1e, e1g, e2a, e2b	13.1	2.7
345500	**422500**	E4a, e5a	12.2	2.7
344500	**420500**	R1, R2, R3, R4	N/A	2.7
344500	**421500**	R5, e3a	11.9	2.7
346500	**420500**	R25, R26, R27, R28, R30, R33, R34, e1f	13.6	2.7
346500	**421500**	R29, R32, e1d	13.7	2.7
346500	**422500**	R31	N/A	2.7
347500	**420500**	R35, R36, R37, R38, R39, R40, R41	N/A	2.7
Air Quality Objective			**30^**	**180***

Notes: ^air quality objective designated for the protection of vegetation and ecosystems. *Target mean only.

For the human and ecological receptors based on background concentrations from Defra and APIS and the site location, exceedance of the relevant human air quality objectives at the application site is considered unlikely.

Background nitrogen and acid deposition rates obtained from APIS for ecological receptors, used in this assessment, are presented in Table 4.3 and 4.4. The lower critical load range between 10 and– 20kgN/ha/yr for the receptors, and as all existing background concentrations are higher than 20kgN/ha/yr, they therefore exceed the lower critical load ranges.

For acid deposition, the background deposition also exceeds the critical load of 1.715 kgN/ha/yr.

Table 4.3: Background Nitrogen Deposition Rates used in the Assessment

Receptor ID	Ecological Site	Habitat	Existing Background Deposition Rate (kgN/ha/yr)
e1a	River Douglas Estuary (BHS)	Rich Fen	**22.96**
e1b	River Douglas Estuary (BHS)	Rich Fen	**22.96**

Receptor ID	Ecological Site	Habitat	Existing Background Deposition Rate (kgN/ha/yr)
e1c	River Douglas Estuary (BHS)	Rich Fen	**22.96**
e1d	River Douglas Estuary (BHS)	Rich Fen	**22.96**
e1e	River Douglas Estuary (BHS)	Rich Fen	**22.96**
e1f	River Douglas Estuary (BHS)	Rich Fen	**22.96**
e1g	River Douglas Estuary (BHS)	Rich Fen	**22.96**
e2a	Leeds/Liverpool Canal (BHS)	Rich Fen	**22.96**
e2b	Leeds/Liverpool Canal (BHS)	Rich Fen	**22.96**
e2c	Leeds/Liverpool Canal (BHS)	Rich Fen	**22.96**
e2d	Leeds/Liverpool Canal (BHS)	Rich Fen	**22.96**
e3a	Carr Heys Plantation (DWS)	Broadleaf deciduous woodland	**24.36**
e4a	Hesketh Bank Brickworks (BHS)	Marsh	**22.96**
e5a	Disused Railway (BHS)	Neutral Grassland	**22.96**
Bold text indicates an exceedance of the lower critical load range for this habitat			

Table 4.4: Background Acid Deposition Rates use in the Assessment

Receptor ID	Ecological Site	Existing Background Acid Deposition Rate (keq/ha/yr)	
		N	S
e3a	Carr Heys Plantation (DWS)	**1.74**	**0.25**
e5a	Disused Railway (BHS)	1.64	0.26
Bold text indicates an exceedance of the critical load for acidification for this habitat			

5 ASSESSMENT OF IMPACTS

5.1 Construction Phase

5.1.1 Construction Dust and Particulate Matter

Fugitive dust emissions arising from construction activities are likely to be variable in nature and will depend upon the type and extent of the activity, soil type and moisture, road surface conditions and weather conditions. Periods of dry weather combined with higher than average wind speeds have the potential to generate more dust.

Construction activities that are often the most significant potential sources of fugitive dust emissions are:

- Earth moving, due to the handling, storage and disposal of soil and subsoil materials;
- Construction aggregate usage, due to the transport, unloading, storage and use of dry and dusty materials (such as cement and sand);
- Movement of heavy site vehicles on dry or untreated haul routes; and,
- Movement of vehicles over surfaces where muddy materials have been transferred off-site (for example, on to public highways).

Fugitive dust arising from construction activities is mainly of a particle size greater than the PM_{10} fraction (that which can potentially impact upon human health), however it is noted that construction activities may contribute to local PM_{10} concentrations. Appropriate dust control measures can be highly effective for controlling emissions from potentially dust generating activities identified above, and adverse effects can be greatly reduced or eliminated.

5.1.2 Potential Dust Emission Magnitude

With reference to the IAQM criteria outlined in Appendix A, the dust emission magnitudes for earthworks, construction and trackout activities are summarised in Table 5.1. Where information is not yet known, a conservative approach has been adopted and professional judgement has been used based on the scale of the proposed development and experience of working on similar schemes. The proposed development involves no demolition works; demolition activities are therefore scoped out of the assessment and not considered further within this report. Trackout activities should be considered up to 200m from the site boundary (due to medium trackout risk) and it is assumed access will be via the A59 (Liverpool Road).

Table 5.1: Summary of Dust Emission Magnitudes (Before Mitigation)

Activity	IAQM Criteria	Dust Emission Magnitude
Demolition	N/A	
Earthworks	- The site is approximately 120m^2 and therefore it is <2,500m^2. - According to the British Geological Survey (BGS) website, Singleton Mudstone Member is the main type of bedrock. Boreholes situated near the site indicted clay and silty clay are present. Therefore the soil type includes potentially dusty soil. - Number of earthmoving vehicles is expected to be 1 i.e. <5. - No stockpiles are predicted to be created. - Any material moved would be minimal and <20,000 tonnes - Works are predicted to occur in during wetter months.	**Small**
Construction	- Total volume to be built is 396m^3 (purpose built container supplied by CHP supplier to house CHP and all auxiliary equipment) which is <25,000m^3 - A small amount of concrete batching is proposed. - When constructing concrete plinth for CHP container, there is potential for dusty materials to be produced. - No sandblasting is proposed.	**Small**
Trackout	- The number of heavy vehicles (>3.5t) per day in/out of the site is 4 (all in one day), therefore <10HDV. - The surface type is mostly concrete road areas, hardcore surfaces around construction area. - The extent of unpaved road length within the site is estimated to be 300-400m.	**Small - Medium**

5.1.3 Sensitivity of the Area

As per the IAQM guidance, the sensitivity of the area takes into account a number of factors, including:

- The sensitivity of individual receptors in the area;
- The proximity and number of those receptors;
- In the case of PM_{10}, the local background concentration; and,

- Site specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.

Consideration is given to human receptors within 350m of the proposed development site for earthworks/construction and 50m of the trackout boundary and ecological receptors within 50m of the site and trackout boundary.

Figure 5.1 and 5.2 show map indicating the earthworks/construction and trackout buffers respectively for identifying the sensitivity of the area and Table 5.2 presents the determined sensitivity of the area.

No designated ecological receptors have been identified within 50m of the application site boundary or the anticipated trackout route, therefore following the IAQM guidance ecological receptors have been screened out of the assessment and are not considered further.

Table 5.2: Sensitivity of the Area

Potential Impact		Sensitivity of the Surrounding Area		
		Earthworks	Construction	Trackout
Dust soiling	Receptor sensitivity	High	High	High
	Number of receptors	>100	>100	1-10
	Distance from the source	100-350m	100-350m	<20m
	Overall Sensitivity of the Area	**Low**	**Low**	**Medium**
Human health	Receptor sensitivity	High	High	High
	Annual mean PM_{10} concentration	<24 µg/m^3	<24 µg/m^3	<24 µg/m^3
	Number of receptors	>100	>100	1-10
	Distance from the source	100-350m	100-350m	<20m
	Overall Sensitivity of the Area	**Low**	**Low**	**Low**

Figure 5.1: Earthworks / Construction Activities Buffer Map

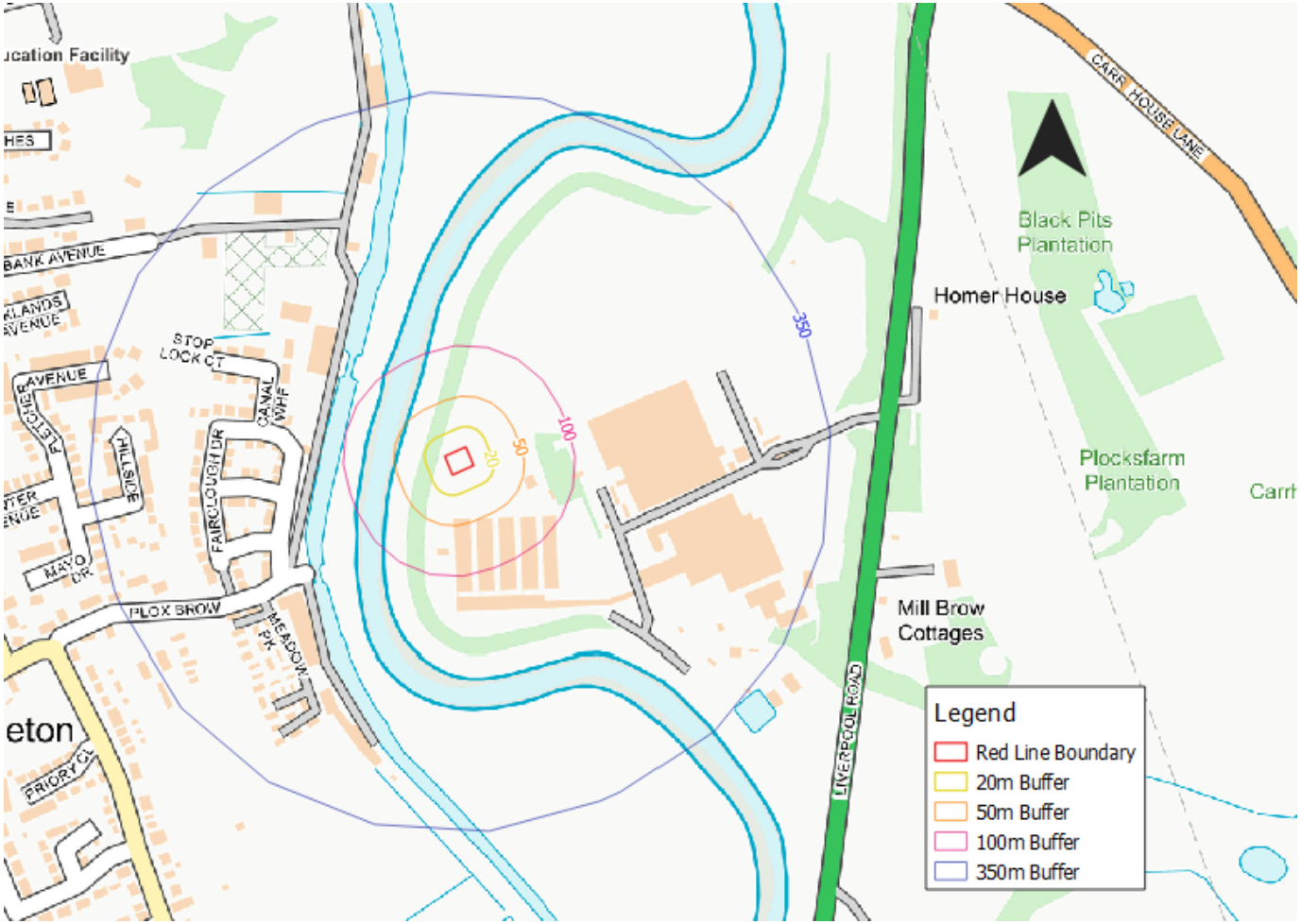


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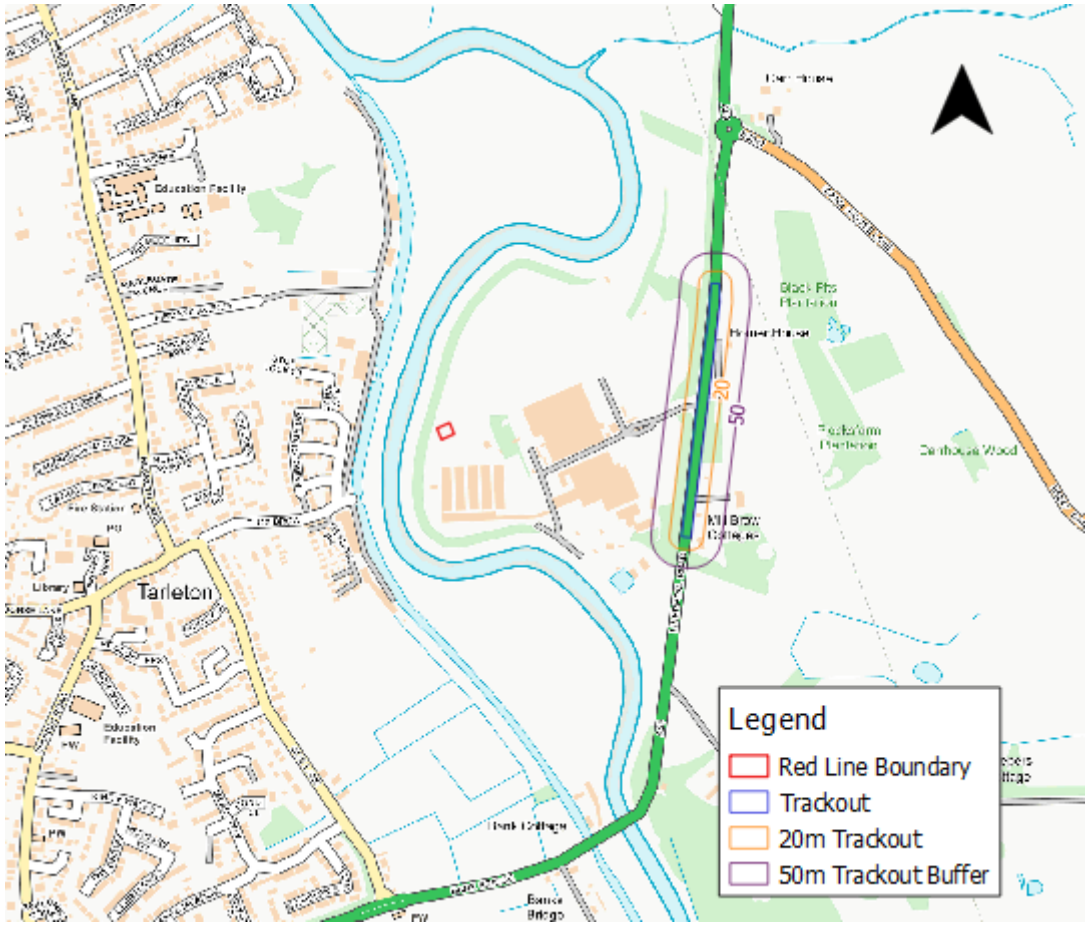
Figure 5.2: Trackout Buffer Map



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5.1.4 Risk of Impacts

The dust emission magnitudes from Table 5.1 have been combined with the sensitivity of the area from Table 5.2, to determine the risk of impacts of construction activities before mitigation, as summarised in Table 5.3. Based on these dusk risk categories, site specific mitigation measures have been defined as detailed in Section 6 and Appendix D.

Table 5.3: Summary of the Dust Risk from Construction Activities

Potential Impact	Dust Risk Impact		
	Earthworks	Construction	Trackout
Dust soiling	Negligible Risk	Negligible Risk	Negligible to Low Risk
Human health	Negligible Risk	Negligible Risk	Negligible to Low Risk

5.1.5 Exhaust Emissions from Construction Plant and Vehicles

The operation of vehicles and equipment powered by internal combustion engines results in the emission of exhaust gases containing pollutants including NO_x, PM_{10}, $PM_{2.5}$, volatile organic compounds, and CO. The quantities emitted depend on factors such as engine type, service history, pattern of usage and fuel composition.

Construction traffic will comprise haulage / construction vehicles and vehicles used for workers' trips to and from the application site. The greatest impact on air quality due to emission from construction phase vehicles will be in areas adjacent to the application site access and nearby road network. It is anticipated that construction traffic will access the application site via the A59 (Liverpool Road) which has a small number of sensitive receptors adjacent to it. The number of HDV movements associated with the works is estimated to be 4 vehicles all in one day (due to the short duration of the proposed works). Construction traffic flows are therefore expected to be well below the EPUK-IAQM criteria of 100 HDV movements (outside of an AQMA) and therefore it is considered unlikely to bring about any significant change in air quality.

The operation of site equipment and machinery during the construction phase will result in emissions to atmosphere of exhaust gases, but due to the construction works only occurring for a short duration and by implementing suitable controls and site management such emissions are unlikely to be significant (as per the LAQM.TG(16)).

5.2 Operational Phase

The main potential impact of the proposed development is considered to be exhaust emissions from the proposed CHP plant once operational on sensitive receptors in the area surrounding the proposed development site. The results of the modelling assessment are presented in the following subsections.

5.2.1 Dispersion Modelling Results

Human Receptors

Appendix E presents the full modelling results at the defined human receptor locations (for the highest concentrations presented across the 5 years of meteorological data). A summary of the key modelled results are detailed in this section.

The contour plots, for predicted annual and hourly mean NO_2 concentrations are presented in Appendix C, for the year in which the maximum PC was predicted across the modelled grid.

Maximum concentration results for discrete receptors and the modelled grids have been presented below for the baseline scenario and the 'with CHP and SCR' scenarios, along with a comparison of the change between the two (to consider the change in concentrations from the proposed CHP alone). Additional results have been presented for discrete receptors for comparison purposes as follows:

- With CHP, no SCR – it is understood that SCR will be included as part of the proposed development, so these results are considered for a comparison purpose only.
- With CHP and SCR and building 21 – Building 21 is a proposed meat kitchen which is expected to be constructed in the future but is unlikely to happen for a few years yet. It has been included as a sensitivity test to ensure that once it is on-site it doesn't adversely affect the dispersion of the proposed CHP emissions.

Baseline Results

Table 5.4 presents the maximum concentrations for the existing baseline scenario for relevant objectives for discrete human receptors and across the modelled grid locations. It is noted that the grid locations where maximum concentrations were predicted are all considered to not be relevant locations of exposure. Both the maximum PC and maximum PEC are presented along with the percentage of the relevant objective that the PC or PEC represents.

These results represent the existing operating scenario on-site and therefore the results are not discussed in detail but provide a baseline for which to compare the proposed development scenarios to (i.e. with the proposed CHP plant). It is noted that in the baseline scenario, the total predicted concentrations (i.e. PECs) do not exceed any of the relevant objectives/EALs at the discrete receptors or grid locations.

Table 5.4: Existing Baseline Results for the Maximum Predicted Pollutant Concentrations of the Five Years of Meteorological Data

Pollutant & Averaging Period	AQS Objective or EAL (µg/m^3)	Receptor ID or Location	PC (µg/m^3)	PC as % of Objective / EAL	PEC (µg/m^3)	PEC as % of Objective / EAL
MAXIMUM PREDICTED CONCENTRATION AT A SPECIFIC RECEPTOR						
Annual Mean NO_2	40	R26	1.4	3.5%	9.4	23.4%
99.79th Percentile of 1-Hour NO_2 Mean	200	R27 (highest for PC)	8.7	4.4%	24.7	12.3%
		R42 (highest for PEC)	8.1	4.0%	25.2	12.6%
Max 1-Hour CO	30,000	R42	16.0	0.1%	16.5	0.1%
Max Daily Running 8-hour Mean CO	10,000	R27	11.8	0.1%	12.3	0.1%
LOCATION OF MAXIMUM PREDICTED CONCENTRATION ACROSS GRID						
Annual Mean NO_2	40	*345902.50, 420766.62*	*6.0*	*15%*	*14.0*	*35%*
99.79th Percentile of 1-Hour NO_2 Mean	200	*345942.06, 420786.47*	*39.4*	*19.7%*	*55.4*	*27.7%*
Max 1-Hour CO	30,000	*345724.41, 420786.47*	*85.4*	*0.3%*	*85.9*	*0.3%*
Max Daily Running 8-hour Mean CO	10,000	*345843.12, 420786.47*	*60.6*	*0.6%*	*61.1*	*0.6%*

Note: Results are the maximum concentrations predicted from the five different years of meteorological data. *Italicised text* indicates results not at location of relevant exposure and therefore objective not applicable at this location

With Proposed CHP and no Selective Catalytic Reduction (SCR)

Table 5.5 presents the maximum concentrations for the 'with proposed CHP but without SCR' scenario for relevant objectives for discrete human receptors.

The maximum annual mean NO_2 concentrations predicted for the 'with proposed CHP but without SCR' scenario, was a PC of 1.8 µg/m^3 (4.5% of objective) at R26 and a PEC of 9.9 µg/m^3 (24.4% of the objective) at R44. By comparing the PC values against the PEC values, both the impacts can be classed as negligible as per the EPUK-IAQM guidance (Table 3.5).

For the receptors with the maximum hourly NO_2 mean (R26 and R27), the hourly CO mean (R44) and the 8 hour daily running CO mean (R44), they all have PC percentage values lower than 11% of the AQS objectives and therefore impacts can be classed as negligible, as per EPUK-IAQM guidance for short-term concentrations.

Table 5.5: 'With CHP and no SCR' Results for the Maximum Predicted Pollutant Concentrations of the Five Years of Meteorological Data

Pollutant & Averaging Period	AQS Objective or EAL (µg/m^3)	Receptor ID or Location	PC (µg/m^3)	PC as % of Objective / EAL	PEC (µg/m^3)	PEC as % of Objective / EAL
MAXIMUM PREDICTED CONCENTRATION AT A SPECIFIC RECEPTOR						
Annual Mean NO_2	40	R26 (highest for PC)	1.8	4.5%	9.8	24.4%
		R44 (Highest for PEC)	1.4	3.4%	9.9	24.8%
99.79th Percentile of 1-Hour NO_2 Mean	200	R26 & R27 (Highest for PC)	8.9	4.4%	24.8	12.4%
		R42 (highest for PEC)	8.1	4.0%	25.2	12.6%
Max 1-Hour CO	30,000	R44	52.4	0.2%	52.9	0.2%
Max Daily Running 8-hour Mean CO	10,000	R44	48.3	0.5%	48.8	0.5%

Note: Results are the maximum concentrations predicted from the five different years of meteorological data.

With Proposed CHP and SCR

Table 5.6 presents the maximum concentrations for the 'with proposed CHP and SCR' scenario for relevant objectives for discrete human receptors and across the modelled grid locations. It is noted that the grid locations where maximum concentrations were predicted are all considered to not be relevant locations of exposure. However, not with-standing this there are no exceedances of any of the pollutants over the grid modelled results.

The maximum annual mean NO_2 PC at a discrete receptor location, was predicted to be 1.6µg/m^3, at R26 on Liverpool Road, which is 3.9% of the objective. The PEC, i.e. the total annual mean NO_2 concentrations (including background data), was 9.6µg/m^3 at R44 on Fairclough Drive, and equates to approximately 24.0% of the objective for NO_2. By comparing these results against Table 3.5 impact descriptors for individual receptors in the EPUK-IAQM guidance, the impacts are negligible.

For the 1 hour mean NO_2 concentrations at the discrete receptor locations, the highest PC was predicted at R27, which is on Liverpool Road. The PC value was 8.8 µg/m^3 which is 4.4% of the objective; using the EPUK-IAQM guidance provided significance guidance for short term concentrations (Table 3.6) this magnitude of change would be classed as negligible.

For the maximum predicted concentrations at discrete receptors for CO, SO_2 and NH_3, there are no exceedances of the relevant objectives / EALs. Comparison of the

maximum PC and the PEC results predict negligible impacts of the proposed CHP plant with the SCR.

It can also be noted that the NO_2 and CO values at specific receptors are lower than the CHP plant without the SCR, which shows the SCR will help mitigate against emissions emitted.

Table 5.6: 'With CHP and SCR' Results for the Maximum Predicted Pollutant Concentrations of the Five Years of Meteorological Data

Pollutant & Averaging Period	AQS Objective / EAL ($\mu g/m^3$)	Receptor ID or Location	PC ($\mu g/m^3$)	PC as % of Objective / EAL	PEC ($\mu g/m^3$)	PEC as % of Objective / EAL
MAXIMUM PREDICTED CONCENTRATION AT A SPECIFIC RECEPTOR						
Annual Mean NO_2	40	R26 (highest for PC)	1.6	3.9%	9.5	23.8%
		R44 (highest for PEC)	1.0	2.6%	9.6	24.0%
99.79th Percentile of 1-Hour NO_2 Means	200	R27 (highest for PC)	8.8	4.4%	24.7	12.4%
		R42 (highest for PEC)	8.1	4.0%	25.2	12.6%
Max 1-Hour CO	30,000	R42	16.0	0.1%	16.5	0.1%
Max Daily Running 8-hour Mean CO	10,000	R27	11.9	0.1%	12.4	0.1%
99.9th Percentile of 15-minute mean SO_2	266	R44	0.9	0.3%	7.3	2.8%
99.9th Percentile of 15-minute mean SO_2	266	R43 (highest for PEC along with R44)	0.8	0.3%	7.3	2.8%
99.7th Percentile of 1-hour SO2	350	R44	0.7	0.2%	7.1	2.0%
99.2 Percentile of 24-hour SO2	125	R44	0.6	0.4%	7.0	5.6%
Annual Mean NH_3	180	R44	0.02	0.0%	2.7	1.5%
Max 1-Hour NH_3	2500	R43	0.25	0.0%	5.7	0.2%

Pollutant & Averaging Period	AQS Objective / EAL (µg/m^3)	Receptor ID or Location	PC (µg/m^3)	PC as % of Objective / EAL	PEC (µg/m^3)	PEC as % of Objective / EAL
LOCATION OF MAXIMUM PREDICTED CONCENTRATION ACROSS GRID						
Annual Mean NO_2	40	*345902.5, 420766.62 (highest for PC)*	*6.2*	*15.6%*	*14.2*	*35.6%*
99.79th Percentile of 1-Hour NO_2 Means	200	*345942.06, 420786.47*	*39.4*	*19.7%*	*55.4*	*27.7%*
Max 1-Hour CO	30,000	*345724.41, 420786.47*	*85.4*	*0.3%*	*85.9*	*0.3%*
Max Daily Running 8-hour Mean CO	10,000	*345843.12, 420786.47*	*60.6*	*0.6%*	*61.1*	*0.6%*
99.9th Percentile of 15-minute mean SO_2	266	*345744.19, 420905.5*	*3.0*	*1.1%*	*8.9*	*3.3%*
99.7th Percentile of 1-hour SO_2	350	*345724.41, 420885.66*	*1.9*	*0.5%*	*7.8*	*2.2%*
99.2th Percentile of 24-hour SO_2	125	*345704.62, 420865.81*	*1.0*	*0.8%*	*6.9*	*5.5%*
Annual Mean NH_3	180	*345882.72, 420885.66*	*0.03*	*0.0%*	*2.8*	*1.5%*
Max 1-Hour NH_3	2500	*345744.19, 420905.5*	*0.97*	*0.0%*	*6.4*	*0.3%*

Note: Results are the maximum concentrations predicted from the five different years of meteorological data. *Italicised text* indicates results not at location of relevant exposure and therefore objective not applicable at this location.

With Proposed CHP with SCR and Additional building

Table 5.7 presents the maximum concentrations for the 'with proposed CHP, SCR and additional building' scenario for relevant objectives for discrete human receptors.

Based on the maximum predicted PCs and PECs and IAQM-EPUK significance criteria, impacts are still considered to be negligible for all receptors and all pollutants with the new CHP and SCR and an additional building (a proposed meat kitchen) incorporated into the model.

Table 5.7: 'With Proposed CHP, SCR and Additional Building Results for the Maximum Predicted Pollutant Concentrations of the Five Years of Meteorological Data

Pollutant & Averaging Period	AQS Objective / EAL (µg/m^3)	Receptor ID or Location	PC (µg/m^3)	PC as % of Objective / EAL	PEC (µg/m^3)	PEC as % of Objective / EAL
MAXIMUM PREDICTED CONCENTRATION AT A SPECIFIC RECEPTOR						
Annual Mean NO_2	40	R26 (highest for PC)	1.6	4.0%	9.6	23.9%
		R44 (highest for PEC)	1.2	3.1%	9.8	24.4%
99.79th Percentile of 1-Hour NO_2 Mean	200	R27 (highest for PC)	8.8	4.4%	24.8	12.4%
		R42 (highest for PC)	8.1	4.0%	25.2	12.6%
Max 1- Hour CO	30,000	R42	16.0	0.1%	16.5	0.1%
Max Daily Running 8-hour Mean CO	10,000	R27	11.9	0.1%	12.4	0.1%
99.9th Percentile of 15-minute mean SO_2	266	R44	1.4	0.5%	7.8	2.9%
99.7th Percentile of 1-hour SO2	350	R44	1.0	0.3%	7.5	2.1%
99.2 Percentile of 24-hour SO2	125	R44	0.8	0.7%	7.3	5.8%
Annual Mean NH_3	180	R44	0.03	0.0%	2.8	1.5%
Max 1-Hour NH_3	2500	R44	0.4	0.0%	5.8	0.2%

Note: Results are the maximum concentrations predicted from the five different years of meteorological data.

Maximum Change with Development

Table 5.8 presents the maximum change in pollutant concentrations between the baseline scenario and the 'with CHP and SCR' scenario, i.e. the change in concentration from the proposed CHP with SCR. The percentage change relative to the objective / AQAL is approximately 0% when rounded to a whole number; considering the IAQM-EPUK significance criteria and the total predicted concentrations, the impact from the proposed development on local air quality is judged to be of negligible significance.

Table 5.8: Maximum Change of Pollutants Comparing the CHP With SCR Scenario to the Baseline Scenario

Pollutant & Averaging Period	AQS Objective / EAL (µg/m^3)	Receptor ID or Location	PEC (µg/m^3)	Maximum Change in Concentration (µg/m^3)	% Change to the objective/AQAL
MAXIMUM PREDICTED CONCENTRATION AT A SPECIFIC RECEPTOR					
Annual Mean NO_2	40	R26, R27 & R44	9.5, 9.4 & 9.6	+0.2	0%
99.79th Percentile of 1-Hour NO_2 Means	200	R14 & R28	20.3 & 19.1	+0.4	0%
Max 1-Hour CO	30,000	R28	6.2	+1.2	0%
Max Daily Running 8-hour Mean CO	10,000	R10	5.2	+1.5	0%

Note: Results are the maximum concentrations predicted from the five different years of meteorological data.

Ecological Receptors

Baseline

Table 5.9 presents the maximum concentrations for the existing baseline scenario for relevant objectives for discrete ecological receptors. The maximum PC at an ecological receptor for annual mean NOx exceeds the EA screening criteria of 1%, however the PEC is >70% and therefore the impacts of annual mean NO_x concentrations are considered to be of negligible significance. The maximum daily mean NO_x PC exceeds the EA screening criteria of 10% and the 20% criteria (as a percentage of the target standard minus twice the long-term background concentration). It is noted that the daily mean NOx standard is target value only from the EA guidance rather than a statutory air quality objective. These modelled concentrations are also considered to be conservative as they are based on emission limits for the plant rather than actual emissions and at worst-case locations within the BHS. The PEC value for daily NOx are below the target PEC from the EA guidance.

Table 5.9: Existing Baseline Results for the Maximum Predicted Pollutant Concentrations of the Five Years of Meteorological Data for Ecological Receptors

Pollutant & Averaging Period	AQS Objective / Target (µg/m^3)	Receptor ID or Location	PC (µg/m^3)	PC as % of Objective / Target	PEC (µg/m^3)	PEC as % of Objective / Target
MAXIMUM PREDICTED CONCENTRATION AT A SPECIFIC RECEPTOR						
Annual Mean NO_x	30	e1c	2.3	7.8%	17.0	56.6%
Max Daily Mean NO_x	75	e1c	30.8	41.1%	60.1	80.1%

Note: Results are the maximum concentrations predicted from the five different years of meteorological data

With Proposed CHP and no SCR

Table 5.10 presents the maximum concentrations for the proposed CHP without SCR scenario for relevant objectives for discrete ecological receptors. The maximum PC at an ecological receptor for annual mean NOx exceeds the EA screening criteria of 1%, however the PEC is >70% and therefore the impacts of annual mean NO_x concentrations are considered to be of negligible significance.

As discussed in the baseline section above, even though there are exceedances of the EA screening criteria for the daily NOx target, these results are considered to be conservative/worst-case and the total PEC remains below the EA target value.

Table 5.10: 'With CHP andno SCR Maximum Predicted Pollutant Concentrations of the Five Years of Meteorological Data for Ecological Receptors

Pollutant & Averaging Period	AQS Objective / Target (µg/m^3)	Receptor ID or Location	PC (µg/m^3)	PC as % of Objective / Target	PEC (µg/m^3)	PEC as % of Objective / Target
MAXIMUM PREDICTED CONCENTRATION AT A SPECIFIC RECEPTOR						
Annual Mean NO_x	30	e1c	2.7	9.1%	17.4	57.9%
Max Daily NO_x	75	e1c	30.8	41.1%	60.1	80.1%

Note: Results are the maximum concentrations predicted from the five different years of meteorological data

With Proposed CHP and SCR

Table 5.11 presents the maximum concentrations for the proposed CHP with SCR scenario for relevant objectives for discrete ecological receptors. The ecological receptors with the maximum values for annual mean NOx, SO_2 and NH_3 are below the relevant EA screening criteria and therefore considered to be insignificant.

As discussed in the baseline section above, even though there are exceedances of the EA screening criteria for the daily NO_x target, these results are considered to be conservative/worst-case and the total PEC remains below the EA target value.

There is a slight increase in the NOx concentration in comparison to the NOx baseline result, but these changes are <1% and therefore demonstrates that the proposed CHP with the SCR is predicted to have no significant impacts on the air quality at ecological receptors.

Table 5.11: 'With CHP and SCR' Ecological Results for the Maximum Predicted Pollutant Concentrations of the Five Years of Meteorological Data for Ecological Receptors

Pollutant & Averaging Period	AQS Objective / Target ($\mu g/m^3$)	Receptor ID or Location	PC ($\mu g/m^3$)	PC as % of Objective Target	PEC ($\mu g/m^3$)	PEC as % of Objective / Target
MAXIMUM PREDICTED CONCENTRATION AT A SPECIFIC RECEPTOR						
Annual Mean NO_x	30	e1c	2.5	8.3%	17.1	57.1%
Max Daily NO_x	75	e1c	30.8	41.1%	60.1	80.1%
Annual SO_2	20	e1g	0.06	0.3 %	0.49	0.02%
Winter SO_2	20	e1g	0.09	0.4%	0.52	2.6%
Annual Mean NH_3	3	e1g	0.02	0.7%	2.7	91.7%

Note: Results are the maximum concentrations predicted from the five different years of meteorological data

With Proposed CHP with SCR and additional building

Table 5.12 presents the maximum concentrations for the proposed CHP with SCR and the additional building scenario for relevant objectives for discrete ecological receptors. The ecological receptors with the maximum values for annual mean NOx, SO_2 and NH_3 are below the relevant EA screening criteria and therefore considered to be insignificant.

As discussed in the baseline section above, even though there are exceedances of the EA screening criteria for the daily NO_x target, these results are considered to be conservative/worst-case and the total PEC remains below the EA target value.

The values of the CHP with the building are slightly higher than the CHP without the building however, the increase is only slight and overall the emission increase is considered to be negligible.

Table 5.12 'With CHP and SCR and the Additional Building' Maximum Predicted Pollutant Concentrations of the Five Years of Meteorological Data for Ecological Receptors

Pollutant & Averaging Period	AQS Objective / Target (µg/m^3)	Receptor ID or Location	PC (µg/m^3)	PC as % of Objective / Target	PEC (µg/m^3)	PEC as % of Objective / Target
MAXIMUM PREDICTED CONCENTRATION AT A SPECIFIC RECEPTOR						
Annual Mean NO_x	30	e1c	2.5	8.4%	17.2	57.2%
Max Daily NO_x	75	e1c	30.8	41.1%	60.1	80.1%
Annual SO_2	20	e2d	0.1	0.3%	0.5	2.5%
Winter SO_2	20	e1g	0.1	0.4%	0.9	4.7%
Annual mean NH_3	3	e2d	0.0	0.7%	2.8	91.7%

Note: Results are the maximum concentrations predicted from the five different years of meteorological data

Nitrogen Deposition

Results obtained from the dispersion modelling have been used to calculate nitrogen deposition for the 'with CHP and SCR' scenario and results are summarised in Table 5.3.

Whilst the total nitrogen deposition exceeds the lower critical loads, this would be the case with or without the proposed development, i.e. background deposition (Table 3.3) are already in exceedance of the lower critical load.

The nitrogen deposition PC as a percentage of the lower critical load for the majority of ecological receptors are 1% or less so below the EA screening criteria. However, at receptors for e1c and e1g a PC of 2% is predicted. These modelled concentrations represent worst case locations within the designated ecological sites rather than an average representation across the whole site and the emission rates are based on limit values and therefore considered to be conservative.

Acid Deposition

The results obtained from the dispersion modelling for acid deposition have been input into the Critical Load Function Tool provided on the APIS website along with the critical load data for the habitat; results are presented in Table 5.14. The process contribution (PC) and predicted environmental concentration (PEC) have been presented as a percentage of the relevant critical load function.

Most receptors were screened out as the predominant habitat types are not sensitive to acid deposition based on APIS criteria. For e3a and e5a, the two receptors considered to be sensitive to acid deposition, the PCs as a percentage of the critical load function were both predicted to be 0%, therefore indicating that the process contribution has had a minimal impact on acidification at any of the ecosystems identified. The PEC as a

percentage of the critical load function exceeded 100% at both of these ecological receptors but this was due to the existing background acid deposition at these sites, with the PC predicted to be imperceptible at these sites (i.e. 0.0% to 1 decimal place).

Table 5.13: Nitrogen Deposition Contribution at Nearby Ecological Sites

Receptor ID	Receptor Location	Broad Habitat Type	PC from Dispersion Modelling kg N/ha/yr	PC as a Percentage of Lower Critical Load	Total deposition, kg N/ha/yr	Potential Critical Load Exceedance
e1a	River Douglas Estuary	Rich Fen	0.17	1%	23.13	154%
e1b	River Douglas Estuary	Rich Fen	0.14	1%	23.10	154%
e1c	River Douglas Estuary	Rich Fen	0.29	2%	23.25	155%
e1d	River Douglas Estuary	Rich Fen	0.11	1%	23.07	154%
e1e	River Douglas Estuary	Rich Fen	0.07	0%	23.03	154%
e1f	River Douglas Estuary	Rich Fen	0.13	1%	23.09	154%
e1g	River Douglas Estuary	Rich Fen	0.24	2%	23.20	155%
e2a	Leeds/Liverpool Canal	Rich Fen	0.10	1%	23.06	154%
e2b	Leeds/Liverpool Canal	Rich Fen	0.20	1%	23.16	154%
e2c	Leeds/Liverpool Canal	Rich Fen	0.07	0%	23.03	154%

Receptor ID	Receptor Location	Broad Habitat Type	PC from Dispersion Modelling kg N/ha/yr	PC as a Percentage of Lower Critical Load	Total deposition, kg N/ha/yr	Potential Critical Load Exceedance
e2d	Leeds/Liverpool Canal	Rich Fen	0.20	1%	23.16	154%
e3a	Carr Heys Planttaion	Broadleaved Deciduous Woodland	0.03	0%	24.39	244%
e4a	Hesketh Bank Brickworks	Marsh	0.01	0%	22.97	153%
e5a	Disused Railway	Neutral Grassland	0.01	0%	22.97	115%

Table 5.14: Acid Deposition Contribution at Nearby Ecological Sensitive Sites

Receptor ID	Receptor Location	Broad Habitat Type	Total Process Deposition N (keq N/ha/yr)	Total Process Deposition S (keq S/ha/yr)	PC as % of Critical Load Function	Background % of Critical Load Function (keq-ha yr)	Total PEC	PEC% of Critical Load Function
e3a	Carr Heys Plantation	Broadleaved deciduous woodland	0.002	0.0001	0%	116.0%	1.99	116.5%
e5a	Disused Railway	Neutral Grassland	0.001	0.0003	0%	37.5%	1.90	37.5%

5.2.2 Summary of Significance of Operational Phase Impacts

As identified above:

- There are no predicted exceedances of the annual mean NO_2 or NH3, or short-term NO_2 or CO, SO_2 or NH_3 AQSs at any of the discrete modelled human receptor locations in any of the scenarios;
- The impact from the proposed CHP plant at discrete human receptors was predicted to be negligible for all pollutants under all scenarios; and,
- The impacts on annual mean background NO_x concentrations, nitrogen and acid deposition at the designated ecologically sensitive sites are considered acceptable at the majority of ecological sites. The greatest impact at an ecological site is predicted at some parts of the River Douglas BHS and the Liverpool/Leeds Canal BHS for the maximum daily mean NOx concentrations and nitrogen deposition, however if impacts were considered across the whole of these BHSs the impacts would be significantly reduced. Furthermore, the predicted exceedances of EA screening criteria were for target values (rather than a statutory air quality objective) and the concentrations predicted are considered to be conservative as they are based on emission limits.

Taking the conservative nature of the assessment and the above results into consideration, the impact on local air quality is not considered to be significant.

6 MITIGATION MEASURES & RESIDUAL IMPACTS

6.1 Construction Phase

The dust emitting activities outlined in Section 5.1 can be effectively controlled by appropriate dust control measures and any adverse affects can be greatly reduced or eliminated.

During any construction works on site, GA Pet Foods already wet down access road areas during dry conditions and also have a wheel washer on site which can be used prior to vehicles exiting onto the A59, which will help to mititgate against dust impacts.

The dust risk categories identified have been used, along with professional judgement to recommend appropriate, site-specific mitigation measures, which are presented in Appendix D.

With the implementation of the proposed construction phase mitigation measures, the residual impacts are considered to be negligible.

6.2 Operational Phase

As this assessment has determined that the operational phase impacts on air quality are not significant, additional mitigation measures have not been recommended and the residual impacts are considered likely to be acceptable.

7 CONCLUSIONS

An air quality assessment of proposed Combined Heat and Power Plant (CHP) Liverpool Road, within the Golden Acres (GA) Pet Food site in Preston has been undertaken with reference to existing air quality in the area and relevant air quality legislation, policy and guidance.

An assessment of construction phase impacts has been undertaken following the 2014 Institute of Air Quality Management (IAQM) guidance. Demolition does not form part of this development and was screened out. The potential risk of construction phase impacts and earthworks on local air quality was predicted to be negligible for dust soiling and human health, prior to the implementation of dust control measures. Trackout has a negligible to low risk on dust soiling and human health. Mitigation measures have been recommended to reduce the risk of dust and particulate matter being generated and re-suspended. With implementation of the appropriate measures, construction activities are not anticipated to have a significant impact on air quality.

The main potential air quality impact once the proposed development is operational considered to be emissions from the operation of the proposed CHP. An assessment of operational impacts has been undertaken using ADMS-5.2, an advanced atmospheric dispersion model developed for regulatory purposes, with the use of meteorological data predicted between 2013 and 2017 using the Global Forecast System (GFS). Buildings/structures have been included to account for the effects of downwash and terrain data also included. Concentrations of key air pollutants (nitrogen oxides (NO_x), nitrogen dioxides (NO_2) and carbon monoxide (CO) have been predicted at discrete human and ecological receptor locations, as applicable. Sulphur dioxide (SO_2) and ammonia (NH_3) impacts have been considered for the scenarios where selective catalytic reduction (SCR) has been incorporated into the development.

The highest predicted impacts at any of the modelled off-site discrete receptor locations in any of the five modelled meteorological years have been reported and compared to the relevant Air Quality Strategy (AQS) objectives. There were no predicted exceedances of any of the objectives for humans at the modelled discrete receptor locations in any of the modelled meteorological years.

In order to assess the impact of increases in pollutant concentrations attributable to the proposed development on existing sensitive receptors, an impact assessment in accordance with the 2017 Environmental Protection UK (EPUK)-IAQM guidance was undertaken. The impact of the proposed development on all the pollutants considered at the modelled discrete human receptor locations was assessed as negligible.

The development was assessed as having a minimal impact at the majority of local ecologically sensitive sites, with regards to nitrogen and acid deposition, and ambient annual and daily mean NO_x concentrations. The greatest impact at an ecological site is

predicted at the Leeds/Liverpool Canal Biological Heritage Site (BHS) and the River Douglas BHS for maxiumum daily NOx and nitrogen deposition, however when impacts are considered across the whole of this BHS the impacts are significantly reduced.

The assessment has concluded that taking the conservative nature of the assessment into account, the overall impact on local air quality is considered to be insignificant.

8 REFERENCES

Air Quality (England) Regulations 2000, 928. London, Her Majesty's Stationery Office.

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APPENDIX A - CONSTRUCTION DUST ASSESSMENT METHODOLOGY

This appendix contains the construction dust assessment methodology used in the assessment.

To assess the potential impacts, construction activities are divided into demolition, earthworks, construction and trackout. The descriptors included in this section are based upon the IAQM 2014 guidance. The assessment follows the steps recommended in the guidance.

Step 1: Screen the requirement for assessment

The first step is to screen out the requirement for a construction dust assessment, this is usually a somewhat conservative level of screening. An assessment is usually required where there is:

- a 'human receptor' within:
  - 350m of the boundary of the site; or
  - 50m of the route used by construction vehicles on the public highway, up to 500m from the site entrance(s).
- an 'ecological receptor':
  - 50m of the boundary of the site; or
  - 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

Step 2A: Defining the Potential Dust Emission Magnitude

Demolition

The dust emission magnitude category for demolition is varied for each site in terms of timing, building type, duration and scale. Examples of the potential dust emission classes are provided in the guidance as follows:

- **Large**: Total building volume >50,000m^3, potentially dusty construction material, on-site crushing and screening, demolition activities >20m above ground level;
- **Medium**: Total building volume 20,000m^3 – 50,000m^3, potentially dusty construction material, demolition activities 10m – 20m above ground level; and,
- **Small**: Total building volume <20,000m^3, construction material with low potential for dust release, demolition activities <10m above ground, demolition during wetter months.

Earthworks

The dust emission magnitude category for earthworks is varied for each site in terms of timing, geology, topography and duration. Examples of the potential dust emission classes are provided in the guidance as follows:

- **Large**: Total site area >10,000m^2, potentially dusty soil type (e.g. clay), >10 heavy earth moving vehicles active at any one time, formation of bunds >8m in height, total material moved >100,000 tonnes;
- **Medium**: Total site area 2,500 – 10,000m^2, moderately dusty soil type (e.g. silt), 5 – 10 heavy earth moving vehicles active at any one time, formation of bunds 4 – 8m in height, total material moved 20,000 – 100,000 tonnes; and,

- **Small**: Total site area < 2,500m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4m in height, total material moved <10,000 tonnes, earthworks during wetter months.

Construction

The dust emission magnitude category for construction is varied for each site in terms of timing, building type, duration, and scale. Examples of the potential dust emissions classes are provided in the guidance as follows:

- **Large**: Total building volume >100,000m^3, piling, on site concrete batching;
- **Medium**: Total building volume 25,000 – 100,000m^3, potentially dusty construction material (e.g. concrete), piling, on site concrete batching; and,
- **Small**: Total building volume <25,000m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

Trackout

Factors which determine the dust emission magnitude class of trackout activities are vehicle size, vehicle speed, vehicle number, geology and duration. Examples of the potential dust emissions classes are provided in the guidance as follows:

- **Large**: >50 HDV (>3.5t) trips in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m;
- **Medium**: 10 – 50 HDV (>3.5t) trips in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 – 100m; and,
- **Small**: <10 HDV (>3.5t) trips in any one day, surface material with low potential for dust release, unpaved road length <50m.

Step 2B: Defining the Sensitivity of the Area

The sensitivity of the area is defined for dust soiling, human health and ecosystems. The sensitivity of the area takes into account the following factors:

- The specific sensitivities of receptors in the area;
- The proximity and number of those receptors;
- In the case of PM_{10}, the local background concentration; and,
- Site-specific factors, such as whether here are natural shelters such as trees, to reduce the risk of wind-blown dust.

Table A1 was used to define the sensitivity of different types of receptors to dust soiling, health effects and ecological effects.

Table A1: Sensitivity of the Area Surrounding the Site

Sensitivity of Area	Dust Soiling	Human Receptors	Ecological Receptors
High	• Users can reasonably expect an enjoyment of a high level of amenity. • The appearance, aesthetics or value of their property would be diminished by soiling. • The people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. • Examples include dwellings, museums and other culturally important collections, medium and long-term car parks and car showrooms.	• Locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day) • Examples include residential properties, hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.	• Locations with an international or national designation *and* the designated features may be affected by dust soiling. • Locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain. • Examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.
Medium	• Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home. • The appearance, aesthetics or value of their property could be diminished by soiling. • The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. • Examples include parks and places of work.	• Locations where the people exposed are workers and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). • Examples include office and shop workers, but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.	• Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown. • Locations with a national designation where the features may be affected by dust deposition. • Example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.
Low	• The enjoyment of amenity would not reasonably be expected. • Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling. • There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. • Examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.	• Locations where human exposure is transient. • Indicative examples include public footpaths, playing fields, parks and shopping streets.	• Locations with a local designation where the features may be affected by dust deposition. • Example is a local Nature Reserve with dust sensitive features.

Based on the sensitivities assigned of the different types of receptors surrounding the site and numbers of receptors within certain distances of the site, a sensitivity classification for the area can be defined for each. Tables A2 to A4 indicate the method used to determine the sensitivity of the area for dust soiling, human health and ecological impacts, respectively.

For trackout, as per the guidance, it is only considered necessary to consider trackout impacts up to 50m from the edge of the road.

Table A2: Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distances from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table A3: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Conc.	Number of Receptors	Distances from the Source (m)				
			<20	<50	<100	<200	<350
High	>32µg/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32µg/m^3	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32 µg/m^3	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28 µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24 µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Table A4: Sensitivity of the area to Ecological Impacts

Receptor Sensitivity	Distances from the Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Step 2C: Defining the Risk of Impacts

The final step is to use both the dust emission magnitude classification with the sensitivity of the area, to determine a potential risk of impacts for each construction activity, before the application of mitigation. Tables A5 to A7 indicate the method used to assign the level of risk for each construction activity.

Table A5: Risk of Dust Impacts from Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table A6: Risk of Dust Impacts from Earthworks/Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table A7: Risk of Dust Impacts from Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

APPENDIX B – WINDROSES

This appendix contains the windroses for the Global Forecast System (GFS) 2013 - 2017.

Figure B1 GFS Windrose for 2013

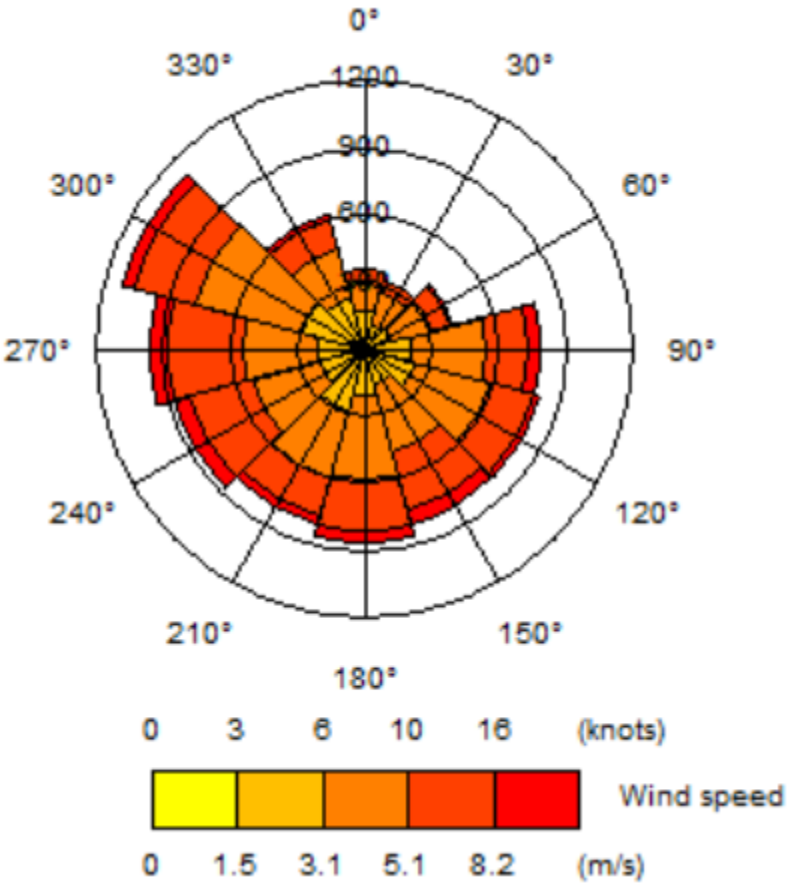


Figure B2 GFS Windrose for 2014

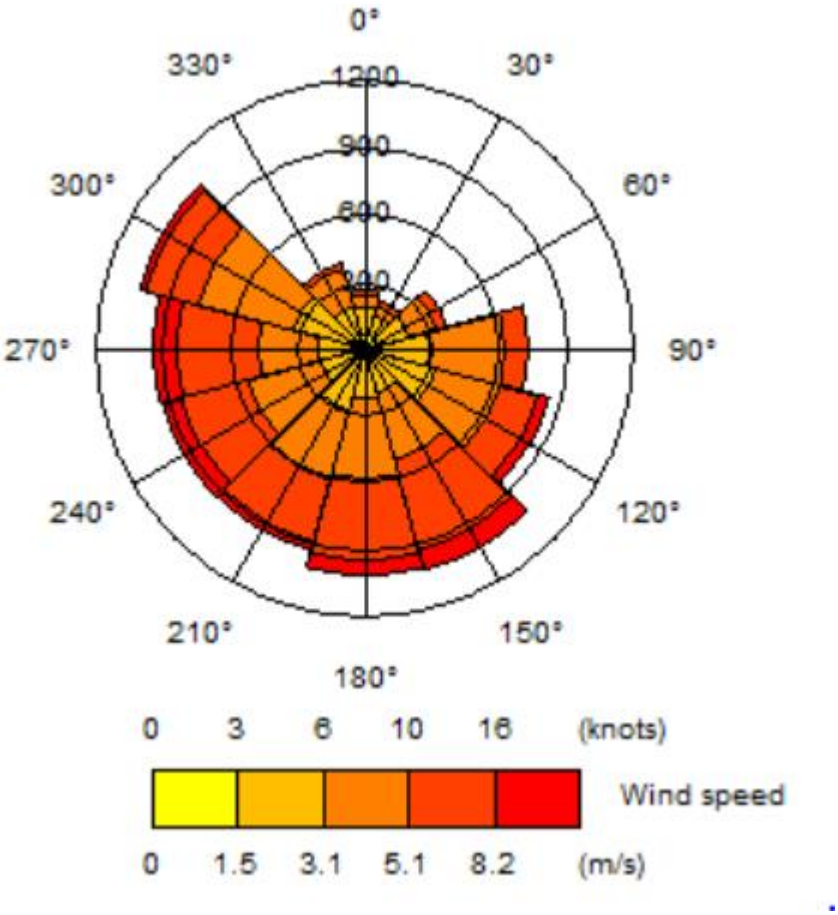


Figure B3 GFS Windrose for 2015

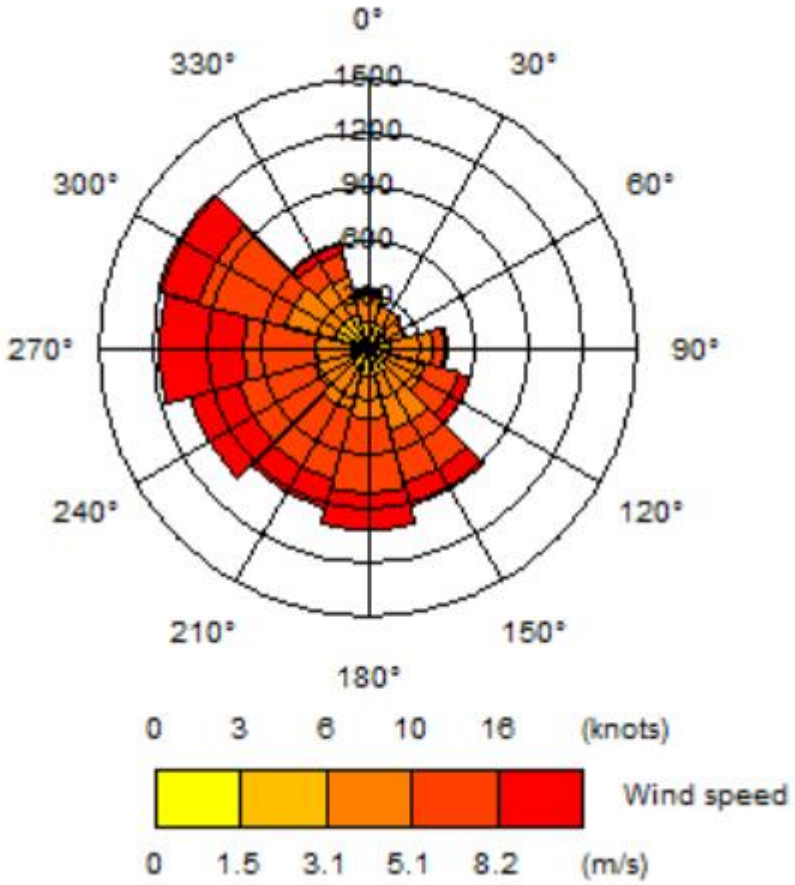


Figure B4 GFS Windrose for 2016

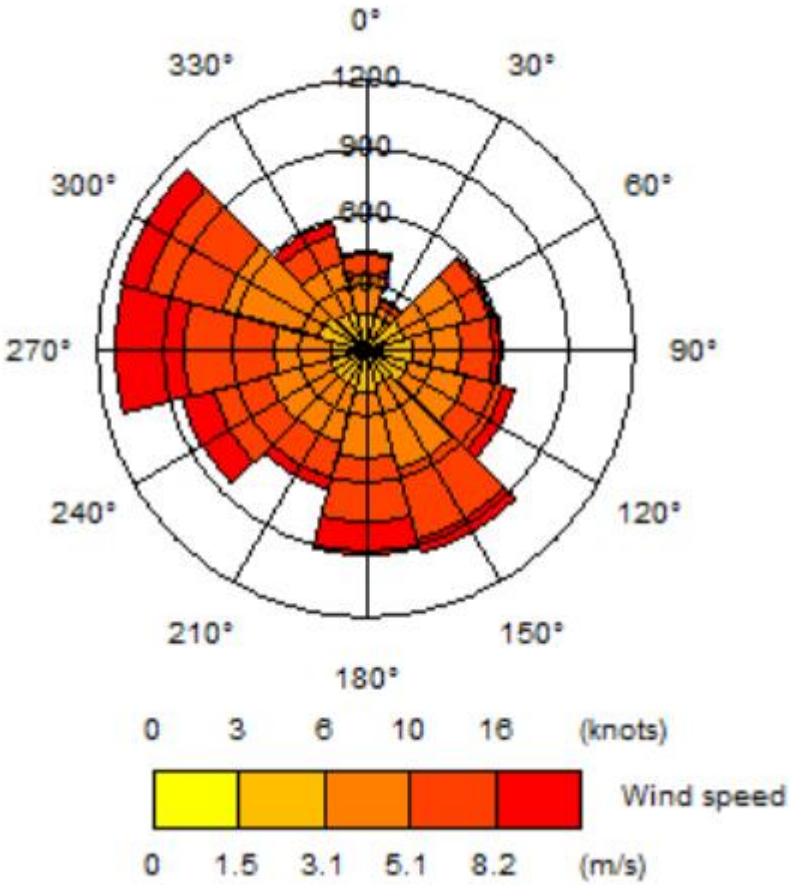
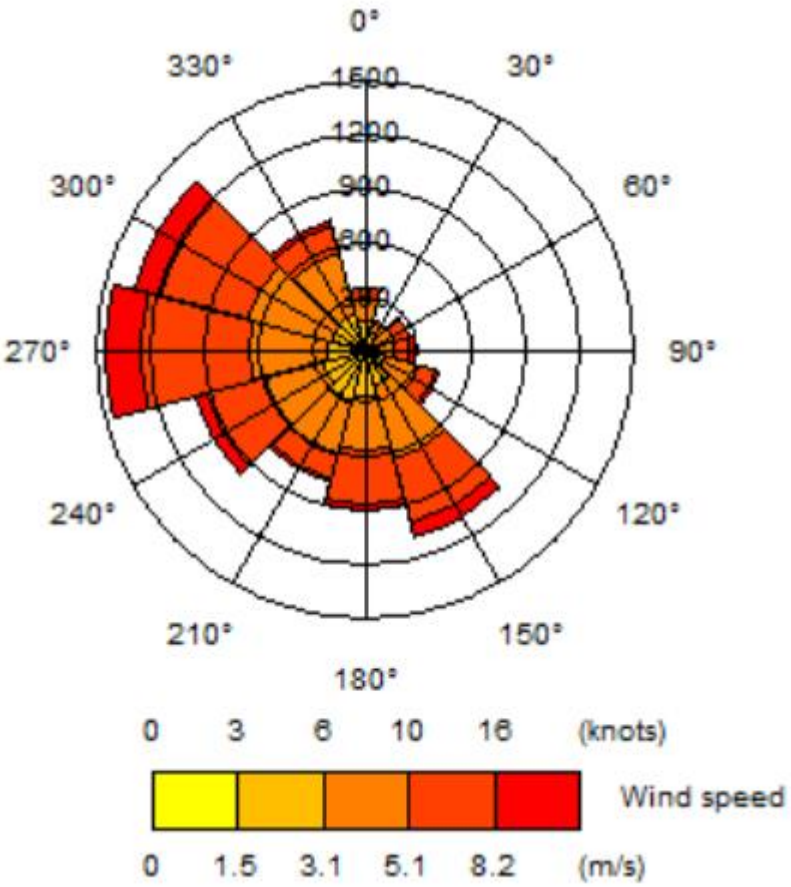


Figure B5 GFS Windrose for 2017



APPENDIX C – CONTOUR PLOTS SHOWING PREDICTED POLLUTANT CONCENTRATIONS

This annex contains contour plot (isopleths) illustrating the PC's and PEC's for the following scenarios:

Human

- Annual mean NO_2 – Baseline – 2017 Meteorological Data
- Annual mean NO_2 - CHP with SCR - 2017 Meteorological Data
- Hourly mean NO_2 baseline - 2016 Meteorological Data
- Hourly mean NO_2 - CHP with SCR - 2016 Meteorological Data

Ecological

- Annual mean NO_x -Bbaseline - 2017 Meteorological Data
- Annual mean NO_x - CHP with SCR - 2017 Meteorological Data
- Daily mean NO_x – Baseline 2016 Meteorological Data
- Daily mean NO_x - CHP with SCR - 2016 Meteorological Data

The data is based on the meteorological data year which achieved the worst predicted pollutant concentrations for a more conservative assessment.

Figure C1 The Process Contribution for the Annual Mean , NO_2 (µg/m^3), Baseline, 2017 Met Data – relevant for human receptor locations

Figure C2 The Predicted Environmental Concentration for the Annual Mean NO_2 (µg/m^3), Baseline , 2017 Met Data – relevant for human receptor locations

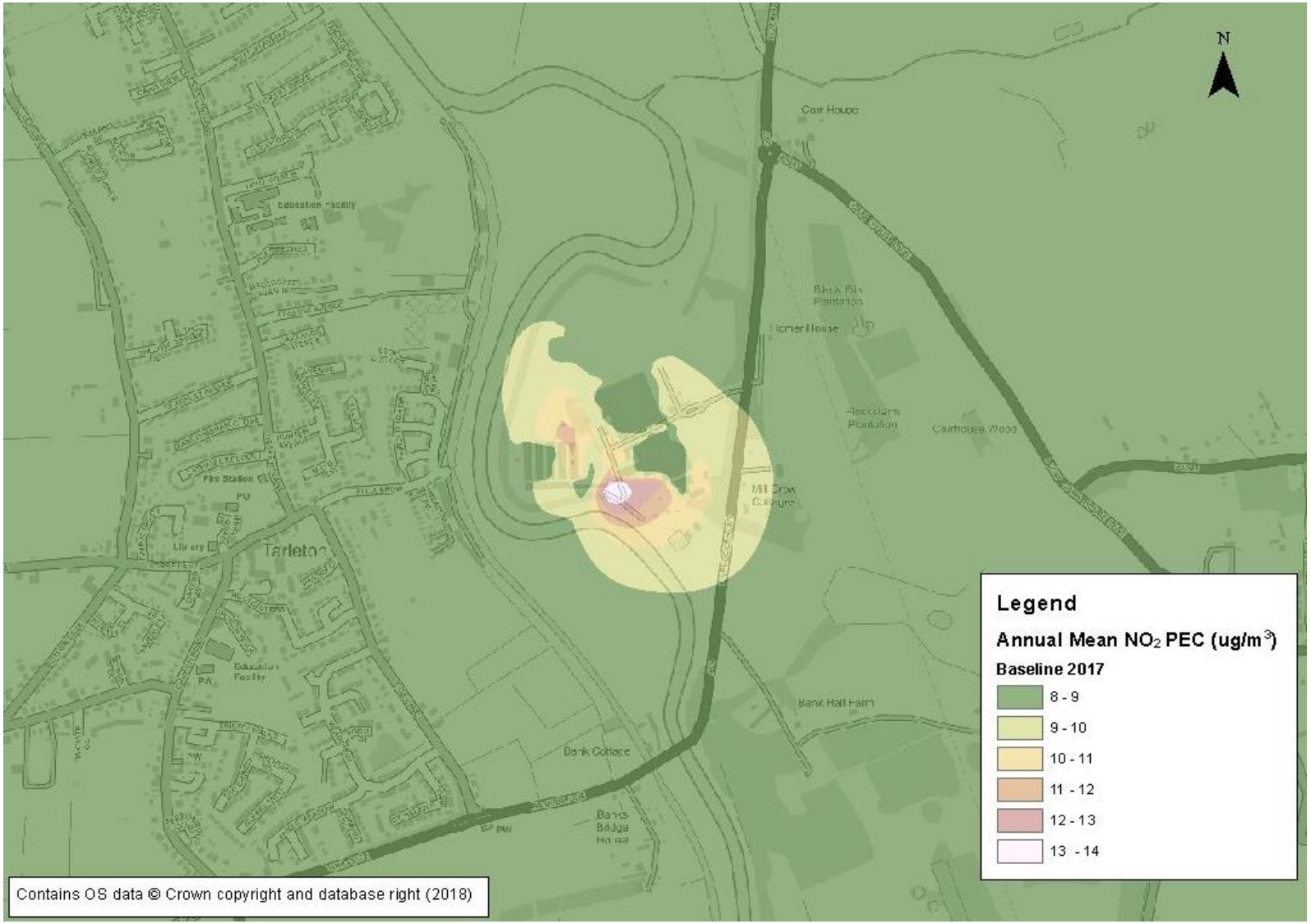


Figure C3 The Process Contribution for the Annual Mean, NO_2 (µg/m^3), With CHP and SCR Scenario, 2017 Met Data – relevant for human receptor locations

Figure C4 The Predicted Environmental Concentration for the Annual Mean NO_2 (µg/m^3), With CHP and SCR Scenario, 2017 Met Data – relevant for human receptor locations

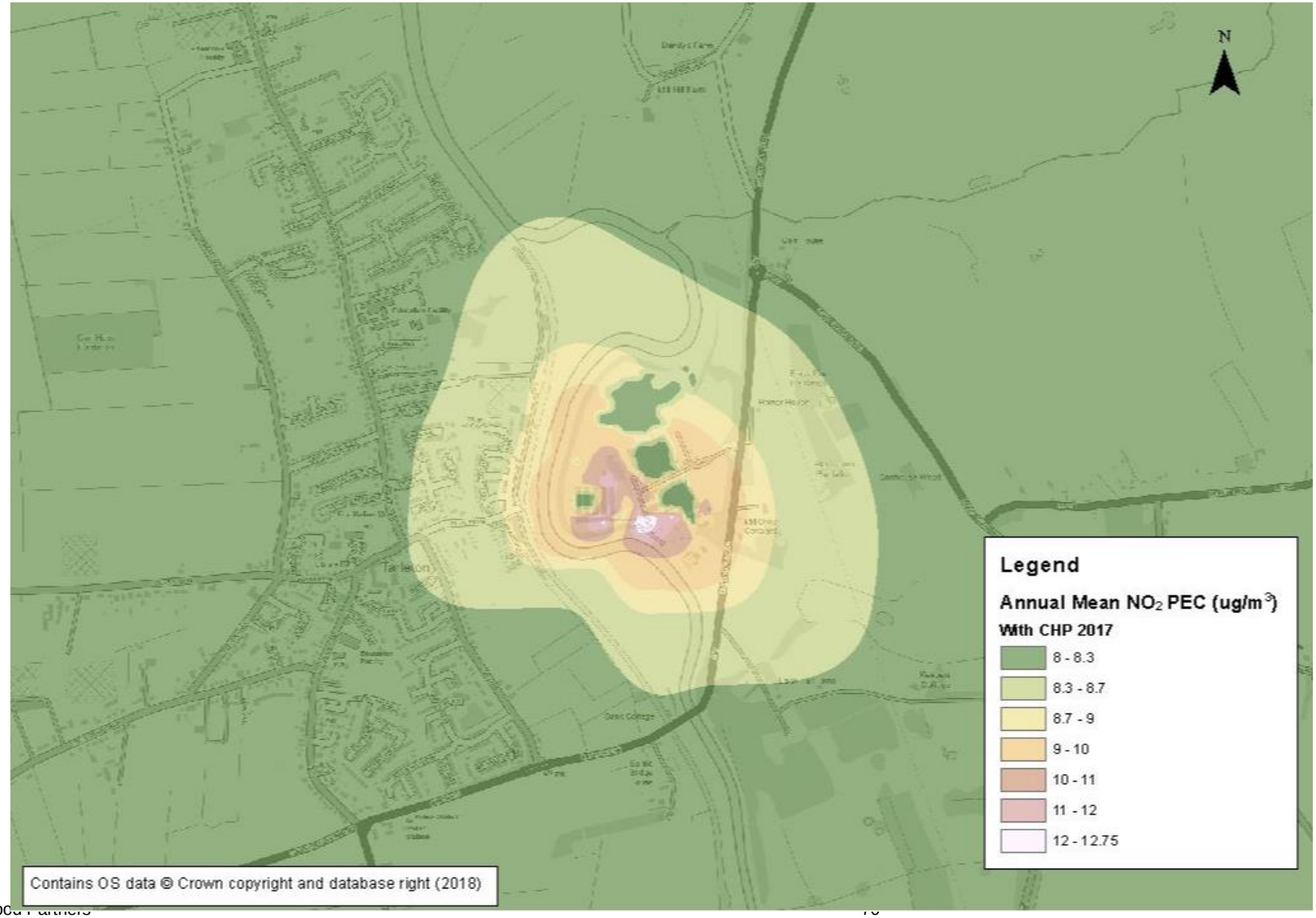


Figure C5 The Process Contribution for the Hourly Mean NO_2 (µg/m^3), Baseline, 2016 Met Data – relevant for human receptor locations

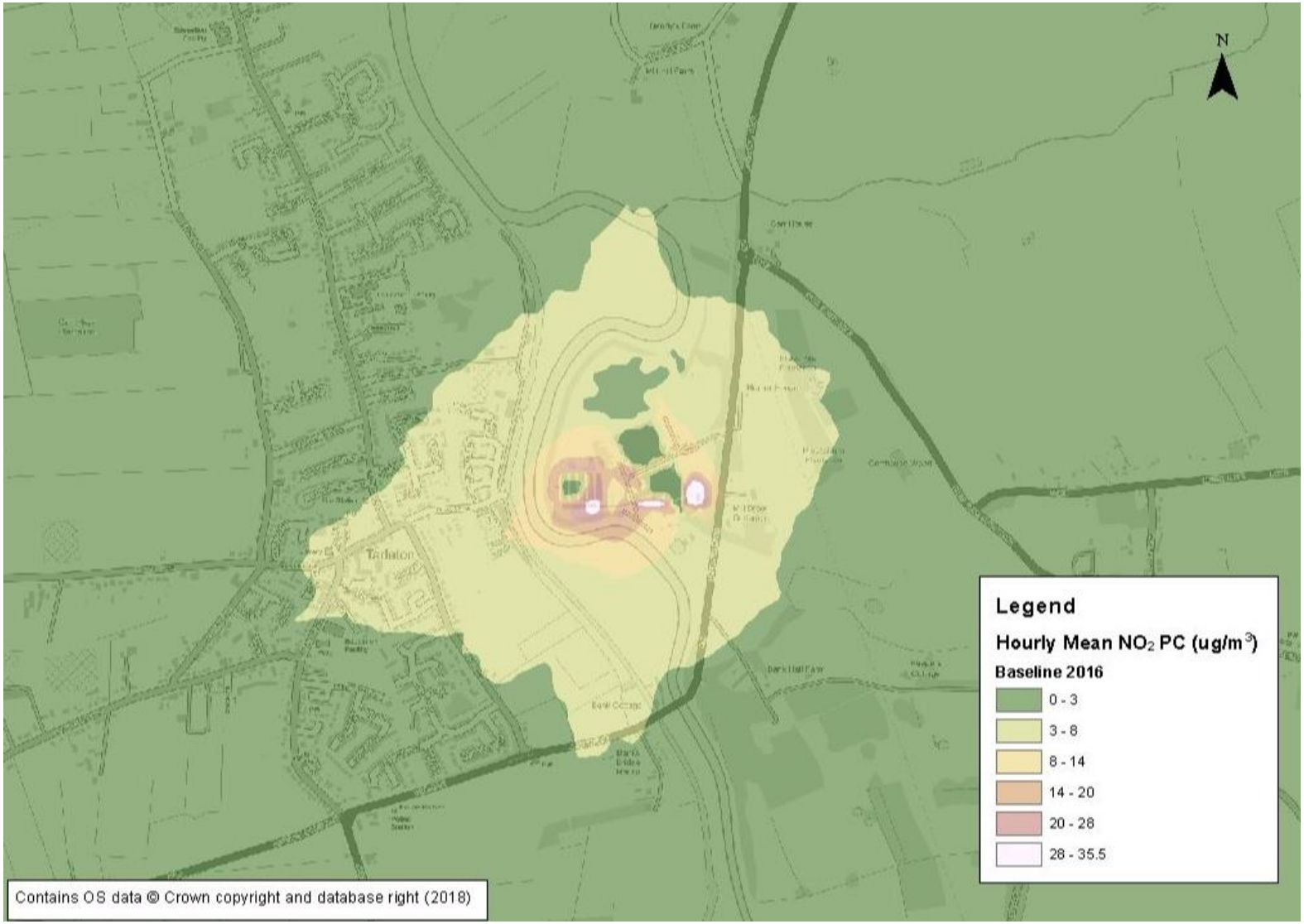


Figure C6 The Predicted Environmental Concentration for the Hourly Mean, NO_2 (µg/m^3), Baseline, 2016 Met Data – relevant for human receptor locations

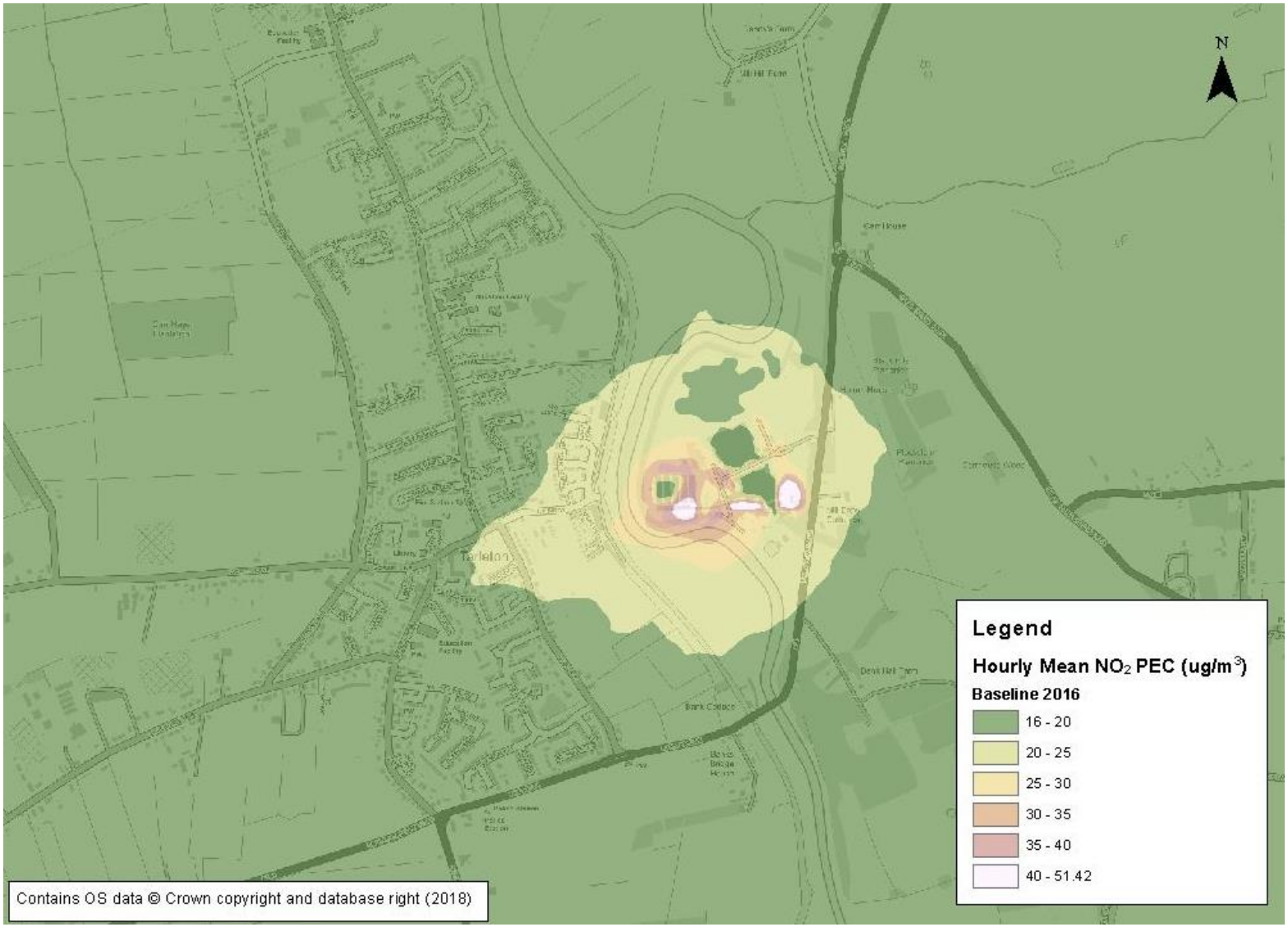


Figure C7 The Process Contribution for the Hourly Mean, NO_2 (µg/m^3), With CHP and SCR ,2016 Met Data – relevant for human receptor locations

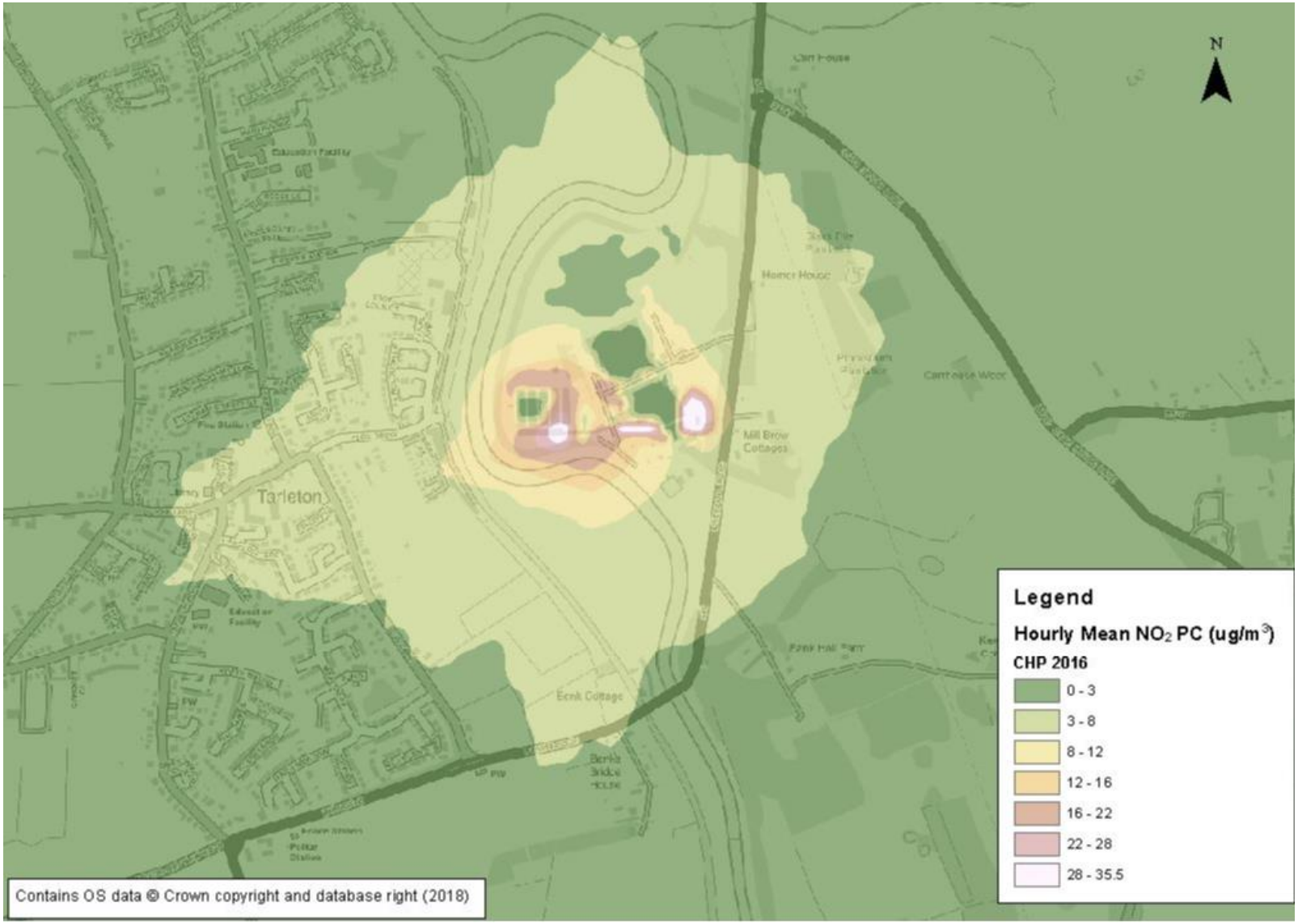


Figure C8 The Predicted Environmental Concentration for the Hourly Mean NO_2 (µg/m^3),With CHP and SCR, 2016 Met Data – relevant for human receptor locations

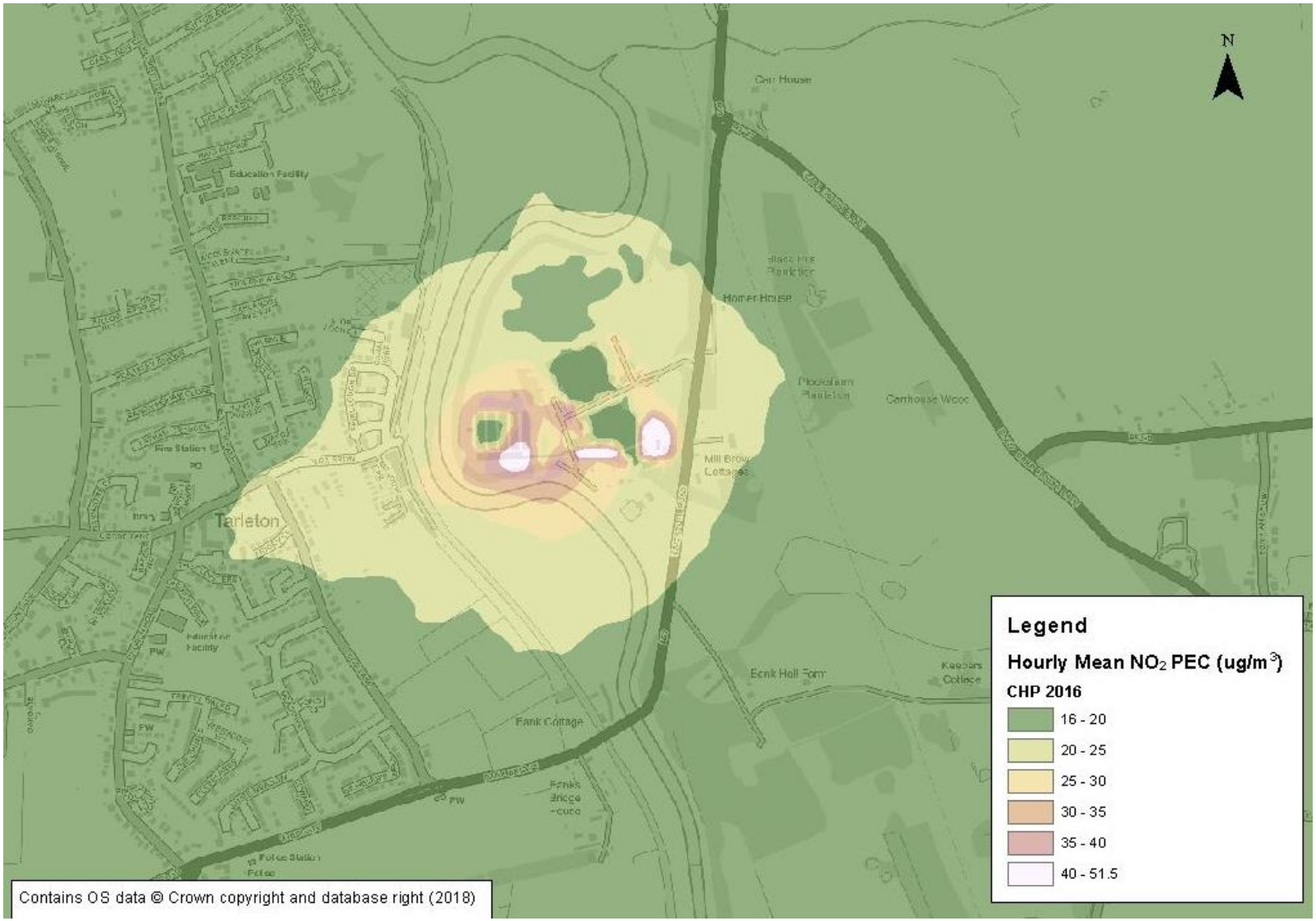


Figure C9 The Process Contribution for the Annual Mean NO_x (µg/m^3), Baseline, 2017 Met Data – relevant for ecological receptor locations

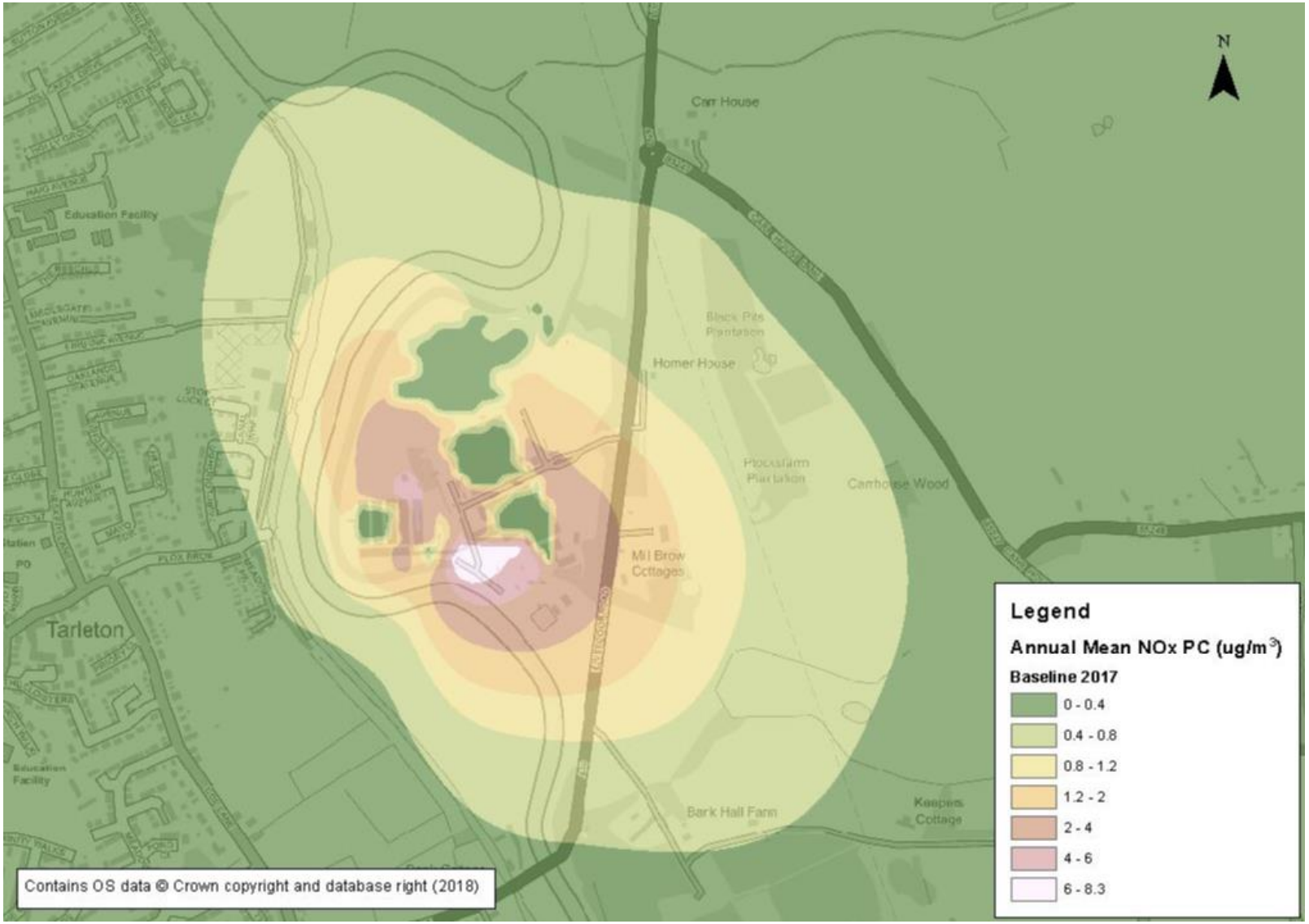


Figure C10 The Predicted Environmental Concentration for the Annual Mean NO_x (µg/m^3), Baseline, 2017 Met Data – relevant for ecological receptor locations

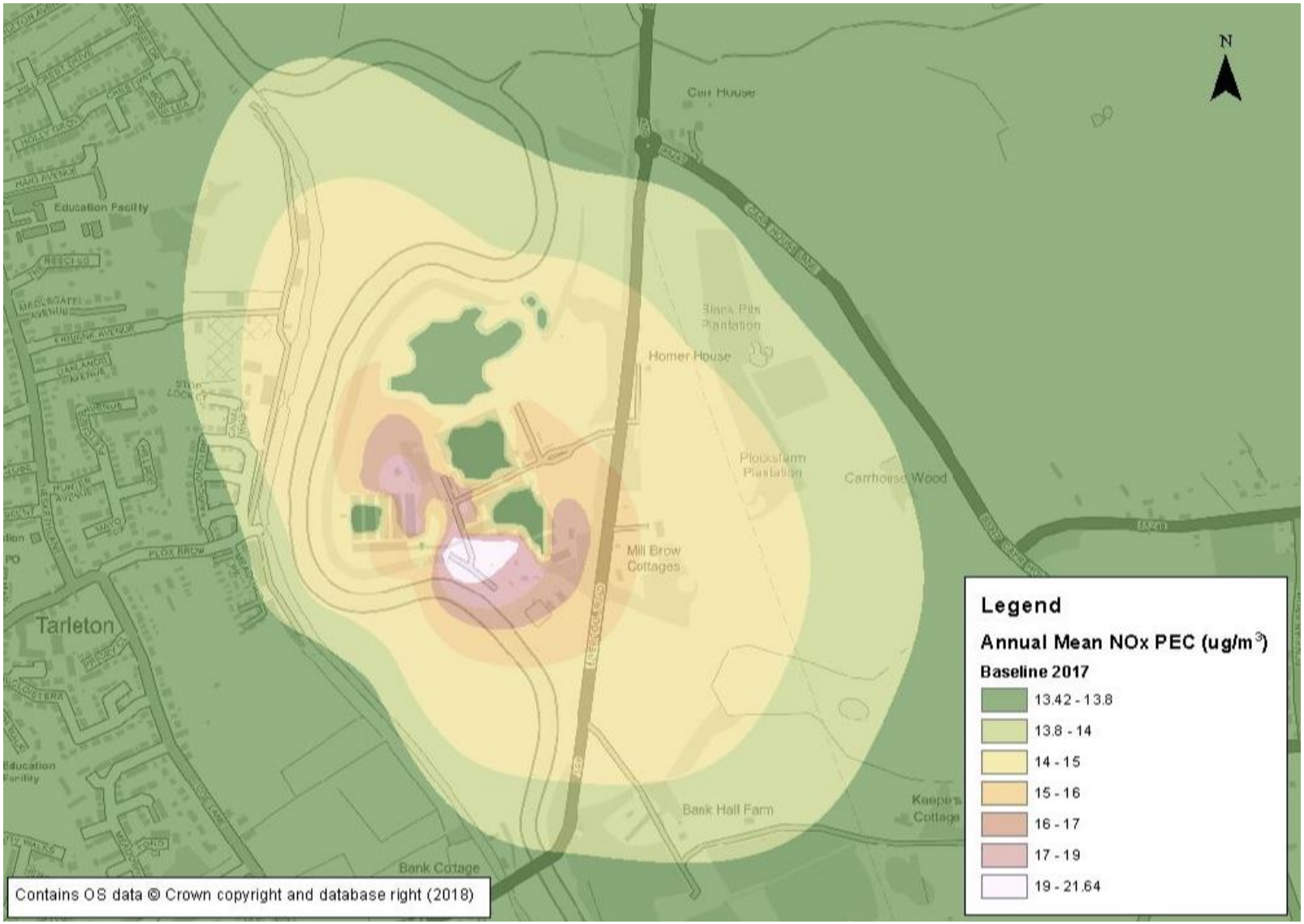


Figure C11 The Process Contribution for the Annual Mean NO_x (µg/m^3), CHP with SCR, 2017 Met Data – relevant for ecological receptor locations

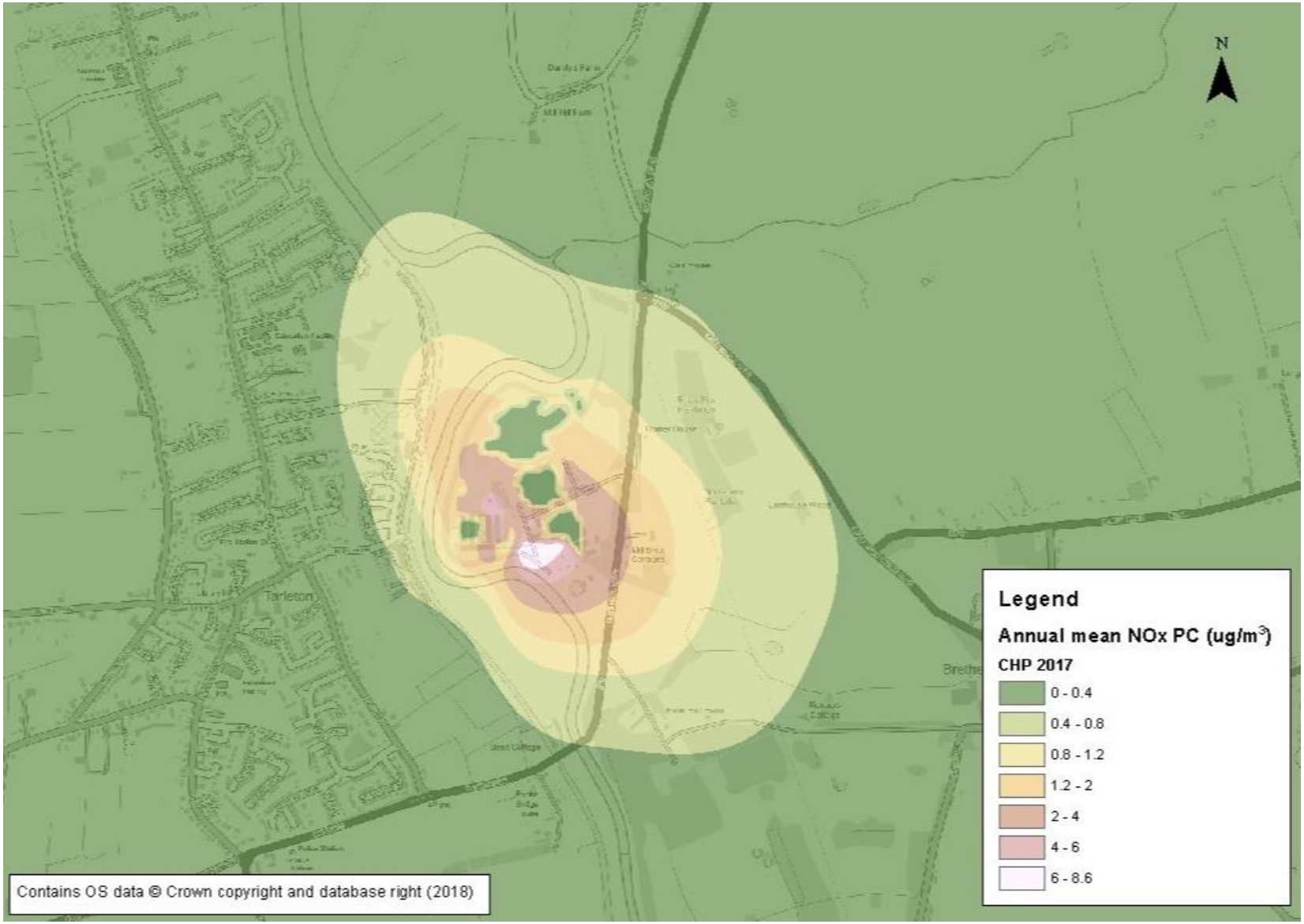


Figure C12 The Predicted Environmental Concentration for the Annual Mean NO_x (µg/m^3), With CHP and SCR, 2017 Met Data – relevant for ecological receptor locations

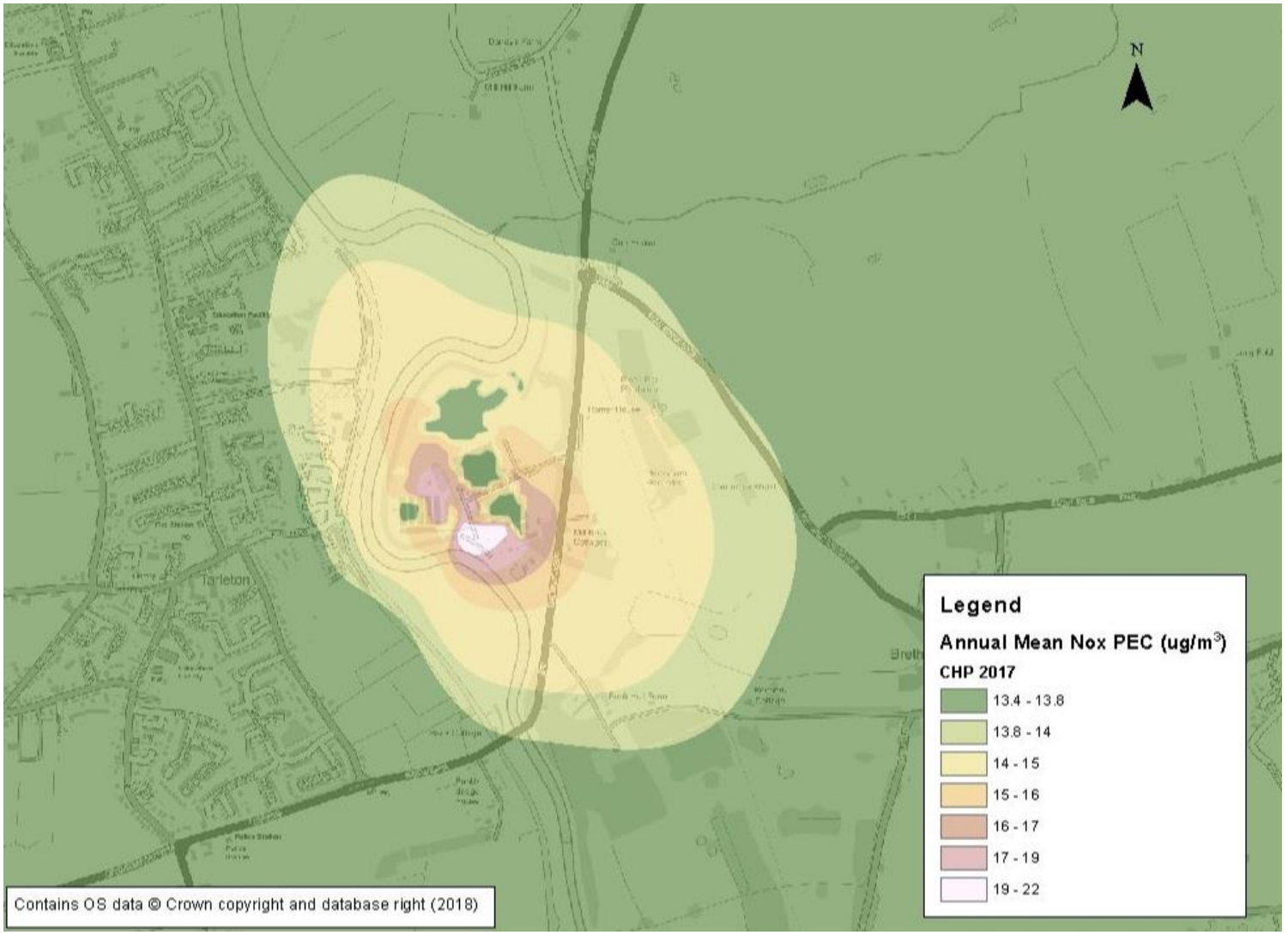


Figure C13 The Process Contribution for the Daily Mean NO_x (µg/m^3), Baseline, 2016 Met Data – relevant for ecological receptor locations

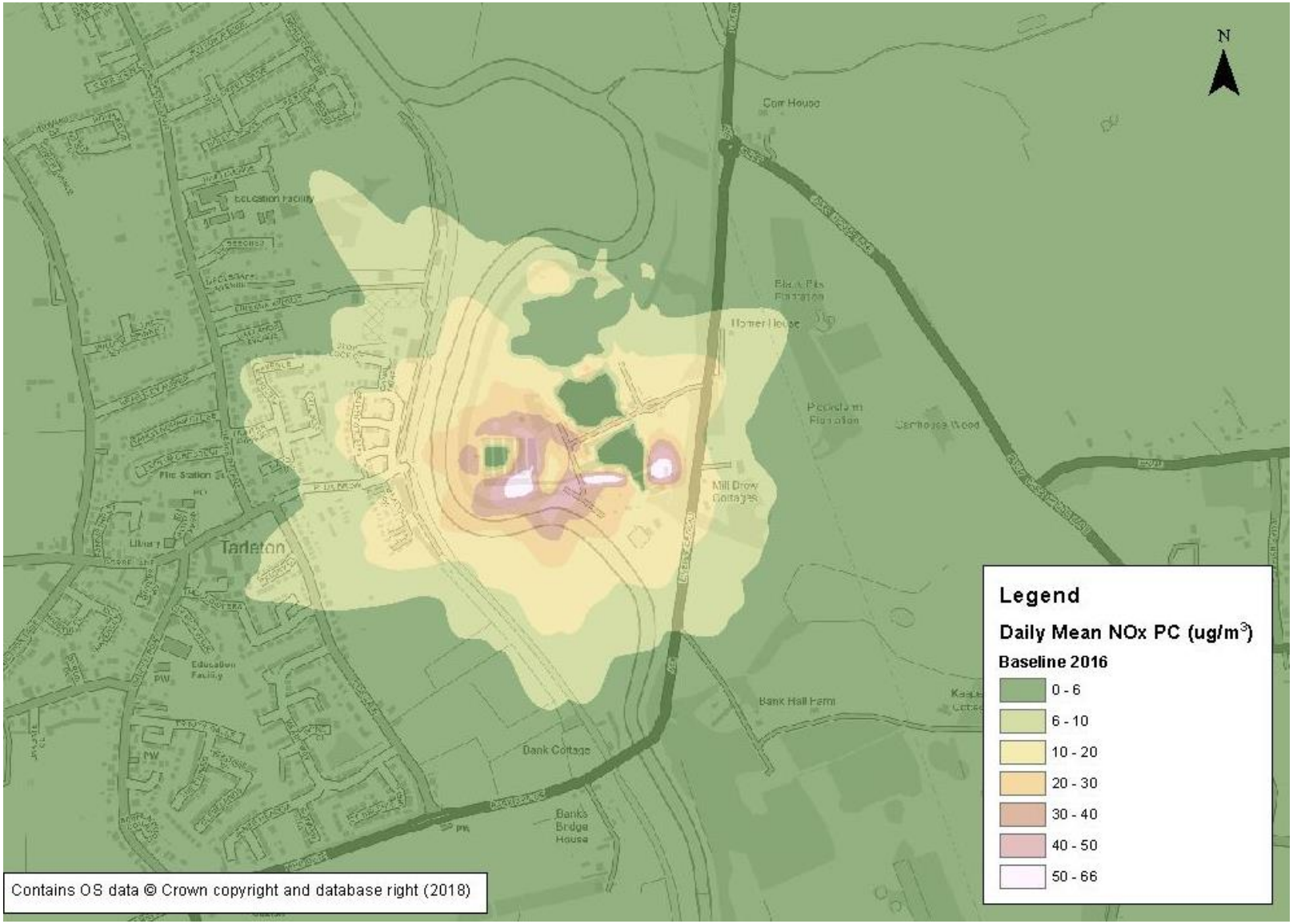


Figure C14 The Predicted Environmental Concentration for the Daily Mean NO_x (µg/m^3), Baseline, 2016 Met Data – relevant for ecological receptor locations

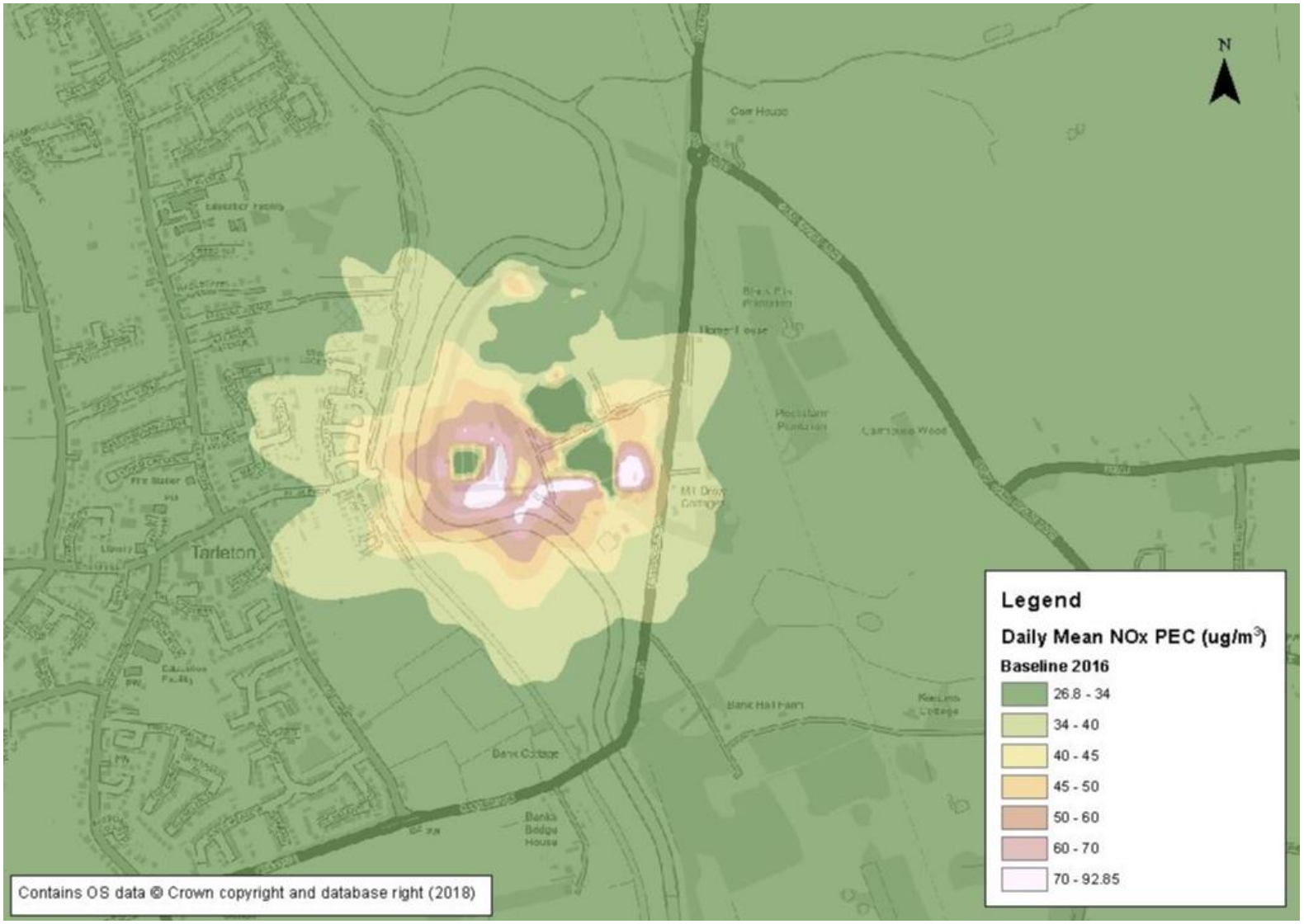


Figure C15 The Process Contribution for the Daily Mean NO_x (µg/m^3), With CHP and SCR, 2016 Met Data – relevant for ecological receptor locations

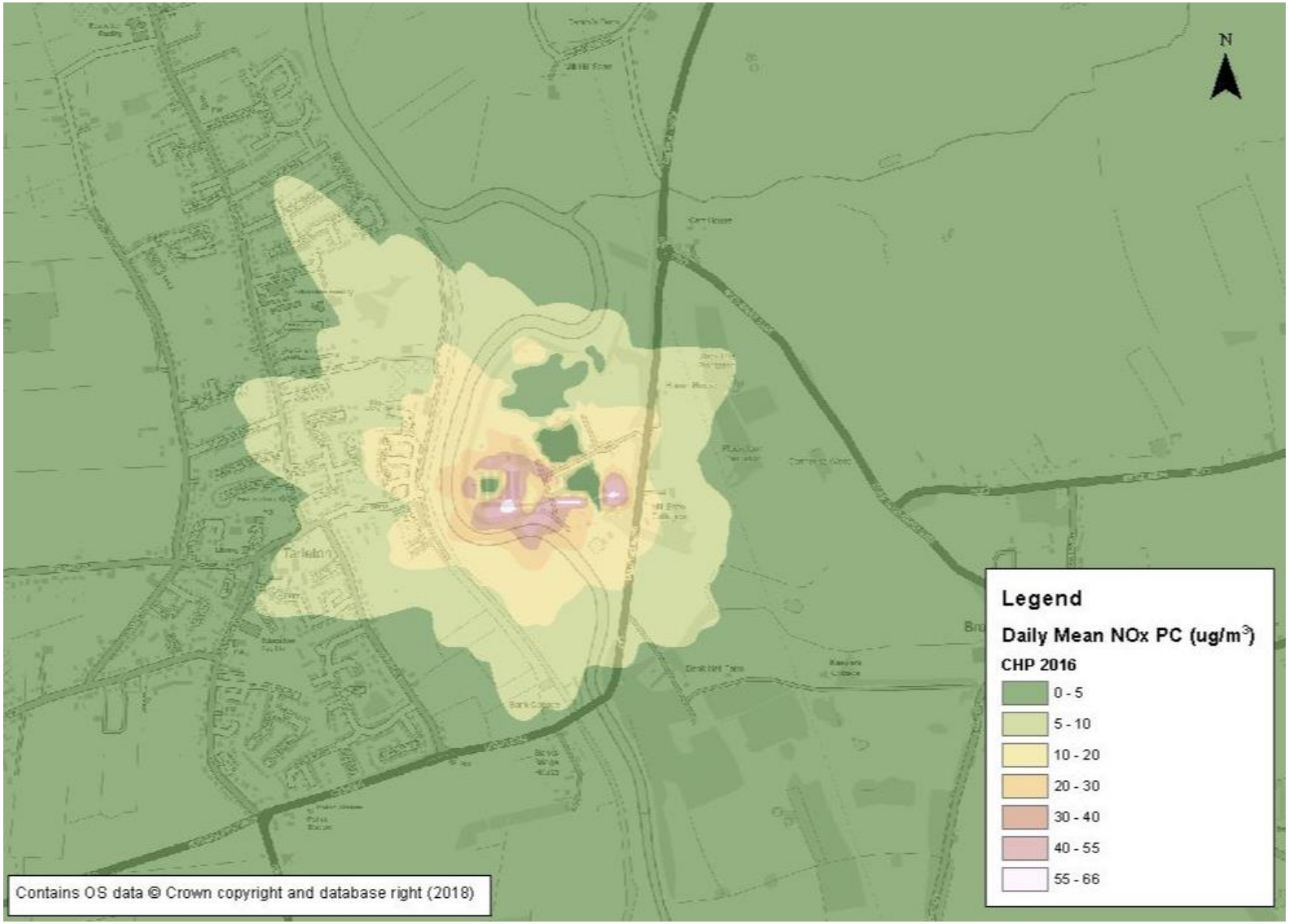
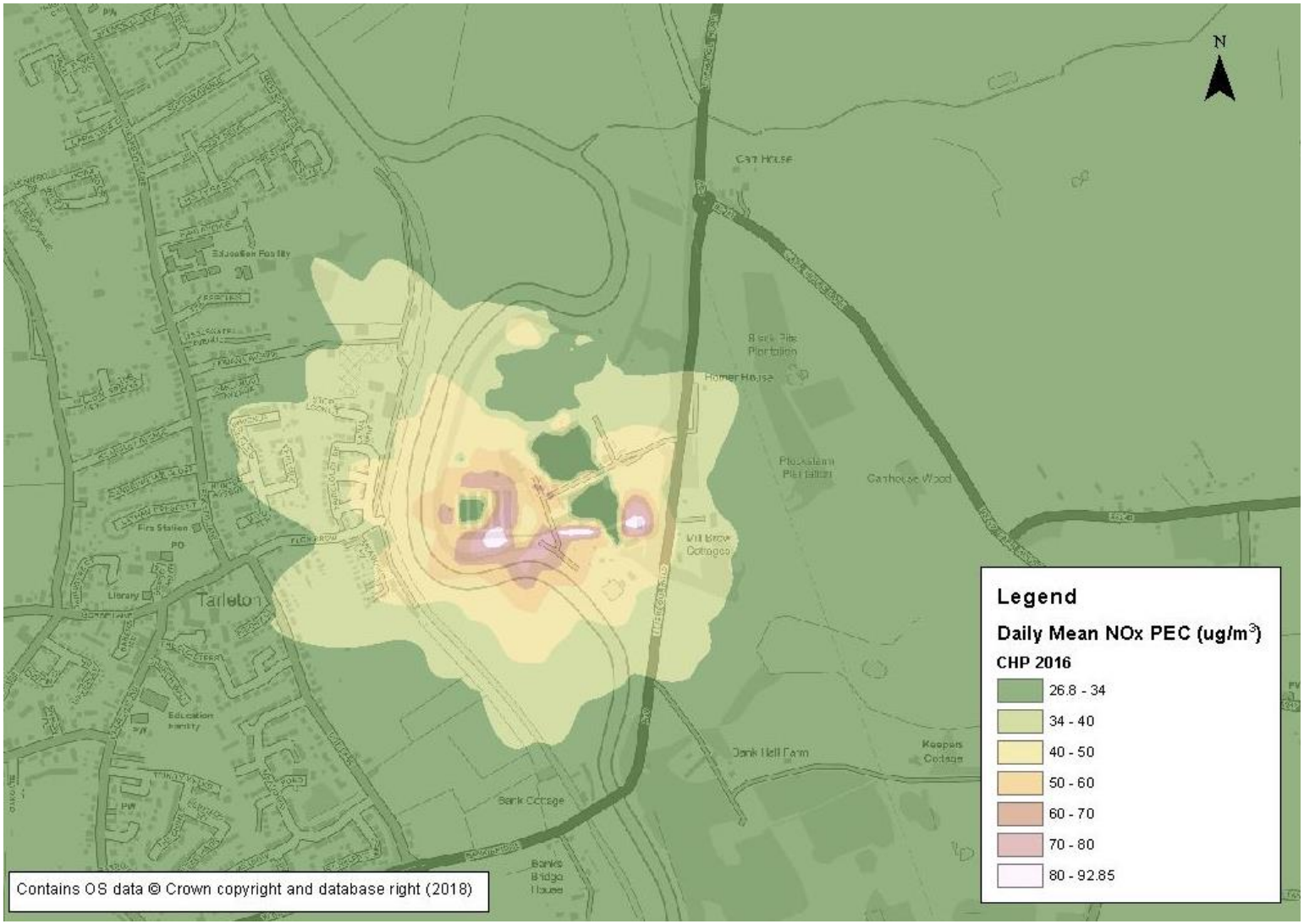


Figure C16 The Predicted Environmental Concentration for the Daily Mean NO_x (µg/m^3), With CHP and SCR, 2016 Met Data – relevant for ecological receptor locations



APPENDIX D - SITE SPECIFIC CONSTRUCTION PHASE RECOMMENDED MITIGATION MEASURES

The IAQM 2014 guidance divides site-specific mitigation measures are divided into general measures applicable to all sites, and measures specific to demolition, earthworks, construction and trackout. Depending on the level of risk assigned in relation to each type of construction activity, different mitigation is assigned. The method for assigning mitigation measures as detailed in the IAQM guidance has been used. For those 'general' mitigation measures, the greatest risk category assigned to the assessed construction activities should be applied. Therefore in this case, the 'low risk' 'general' site mitigation measures have been recommended, where appropriate taking into account the activities likely to occur at the site.

There are two categories of mitigation measure – 'highly recommended' and 'desirable', which are indicated according to the dust risk level identified in Table 5.3. Desirable measures are presented in *italics*. Professional judgement has also been used to only consider measures that could be applicable to this site.

Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
- Make the complaints log available to the local authority when asked.
- Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site or the action taken to resolve the situation in the log book.

Monitoring

- *Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority if asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.*
- Carry out regular site inspections to monitor compliance with any dust management plan, record inspection results, and make an inspection log available to the local authority when asked.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

Preparing and maintaining the site

- Plan site layout so that machinery and dust causing activities are located away from receptors as far as possible.

- Where appropriate, erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- *Fully enclose site specific operations where there is a high potential for dust production and the site is active for an extensive period.*
- Avoid site runoff of water or mud.
- *Keep site fencing, barriers and scaffolding clean using wet methods.*
- *Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.*
- *Cover, seed or fence stockpiles to prevent wind whipping.*

Operating Vehicles/Machinery

- Ensure all vehicles switch off engines when stationary - no idling vehicles.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
- *Impose and signpost a maximum-speed-limit of 15mph on surfaced and 10mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).*

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- *Ensure equipment is readily available on site to clean any dry spillages and clean up as soon as reasonably practicable after the event using wet clean methods.*

Waste Management

- Avoid bonfires or burning of waste materials.

Measures Specific to Trackout

- The site has a wheel washing system for vehicles accessing the A59.
- In dry conditions the access routes will be dampened down and will be regularly cleaned in any material is tracked onto them.
- *Avoid dry sweeping of large areas.*

- *Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.*
- *Record all inspections of haul routes and any subsequent action in a site log book.*

APPENDIX E - MODELLING OF OPERATIONAL PHASE – RESULTS

The tables below present the predicted maximum pollutant concentrations out of the five meteorological data years at each discrete human receptors for all scenarios modelled for all the pollutants considered in this assessment for human and ecological receptors.

Human Receptors

Table E1: Maximum Predicted NO_2 Baseline Concentrations

ID	Location		Max PC (Annual)	Max Annual Mean NO_2 (PEC at specific receptors)	Max PC (Hourly)	Max Hourly Mean NO_2
	X	Y				
R1	344457.5	420575.5	0.1	7.5	1.4	16.4
R2	344486.1	420260.6	0.1	7.5	1.6	16.5
R3	344783.8	420607.5	0.1	7.6	1.9	16.8
R4	344792.2	420351.3	0.1	7.5	2.2	17.1
R5	344867.9	421390.1	0.1	6.9	1.5	15.1
R6	345007.1	420973.2	0.2	8.7	2.0	19.1
R7	345066.1	420370.8	0.1	8.7	2.5	19.6
R8	345131.4	421569.1	0.1	7.6	1.6	16.5
R9	345176.0	420063.4	0.1	8.6	2.1	19.2
R10	345169.4	421207.7	0.2	7.7	2.1	17.1
R11	345203.0	420643.1	0.2	8.7	3.6	20.7
R12	345203.2	420965.2	0.3	8.8	2.8	19.9
R13	345333.0	419812.9	0.0	7.7	2.0	17.3
R14	345338.3	420287.3	0.1	8.6	2.8	19.9
R15	345342.1	421410.0	0.2	7.7	2.2	17.1
R16	345377.9	421016.5	0.3	7.8	3.1	18.1
R17	345376.6	421171.1	0.3	7.7	2.9	17.9
R18	345382.1	420875.3	0.4	9.0	3.5	20.6
R19	345414.8	421623.8	0.2	7.6	1.7	16.7
R20	345458.6	420532.0	0.2	8.8	4.4	21.5
R21	345485.9	420721.3	0.4	9.0	6.3	23.4
R22	345585.2	420332.1	0.1	8.7	3.2	20.3
R23	345928.8	421803.9	0.2	7.6	2.6	17.6
R24	345928.5	420196.8	0.2	8.7	3.2	20.3
R25	346155.3	420740.8	1.3	9.3	7.2	23.1
R26	346155.0	420781.9	1.4	9.4	8.5	24.4

ID	Location		Max PC (Annual)	Max Annual Mean NO_2 (PEC at specific receptors)	Max PC (Hourly)	Max Hourly Mean NO_2
	X	Y				
R27	346167.5	420841.7	1.2	9.2	8.7	24.7
R28	346172.6	420359.9	0.3	8.3	2.8	18.7
R29	346205.6	421056.3	0.6	8.7	4.9	21.1
R30	346220.3	420810.4	1.0	8.9	6.1	22.1
R31	346236.9	422152.2	0.1	8.2	1.7	17.9
R32	346257.9	421430.0	0.2	8.3	3.7	19.8
R33	346358.9	420351.6	0.3	8.3	2.5	18.4
R34	346882.0	420848.8	0.2	8.1	1.7	17.6
R35	347043.7	420823.4	0.1	7.6	1.5	16.4
R36	347054.0	420571.5	0.1	7.6	1.2	16.1
R37	347054.5	420355.8	0.1	7.6	1.3	16.2
R38	347122.9	420431.9	0.1	7.6	1.2	16.1
R39	347215.5	420579.7	0.1	7.6	1.1	16.0
R40	347253.7	420748.7	0.1	7.6	1.2	16.1
R41	347670.9	420414.3	0.1	7.5	0.8	15.7
R42	345582.8	420709.3	0.7	9.2	8.1	25.2
R43	345547.8	420771.8	0.7	9.2	6.0	23.1
R44	345597.3	420925.3	0.8	9.4	5.9	23.0
R45	345559.8	420865.8	0.8	9.4	5.5	22.6
R46	345487.4	420891.0	0.6	9.2	4.3	21.4
AQS Objective			**40**		**200**	

Table E2: Maximum Predicted NO_2 CHP no SCR Concentrations

ID	Location		Max PC (Annual)	Max Annual Mean NO_2 (PEC at specific receptors)	Max PC (Hourly)	Max Hourly Mean NO_2
	X	Y				
R1	344457.5	420575.5	0.1	7.6	1.7	16.6
R2	344486.1	420260.6	0.1	7.6	1.7	16.6
R3	344783.8	420607.5	0.1	7.6	2.2	17.1
R4	344792.2	420351.3	0.1	7.6	2.3	17.2
R5	344867.9	421390.1	0.2	7.0	2.2	15.8
R6	345007.1	420973.2	0.3	8.8	2.5	19.6
R7	345066.1	420370.8	0.2	8.7	3.0	20.1
R8	345131.4	421569.1	0.2	7.7	2.3	17.3
R9	345176.0	420063.4	0.1	8.6	2.9	20.0

ID	Location		Max PC (Annual)	Max Annual Mean NO_2 (PEC at specific receptors)	Max PC (Hourly)	Max Hourly Mean NO_2
	X	Y				
R10	345169.4	421207.7	0.3	7.8	2.9	17.8
R11	345203.0	420643.1	0.3	8.8	3.6	20.7
R12	345203.2	420965.2	0.4	9.0	3.1	20.2
R13	345333.0	419812.9	0.1	7.8	2.6	18.0
R14	345338.3	420287.3	0.1	8.7	3.5	20.6
R15	345342.1	421410.0	0.3	7.8	3.0	17.9
R16	345377.9	421016.5	0.6	8.1	4.0	18.9
R17	345376.6	421171.1	0.5	7.9	3.8	18.7
R18	345382.1	420875.3	0.6	9.2	3.7	20.8
R19	345414.8	421623.8	0.3	7.8	2.4	17.4
R20	345458.6	420532.0	0.3	8.9	4.8	22.0
R21	345485.9	420721.3	0.6	9.2	6.3	23.4
R22	345585.2	420332.1	0.2	8.7	4.0	21.1
R23	345928.8	421803.9	0.2	7.7	2.9	17.8
R24	345928.5	420196.8	0.2	8.8	3.4	20.6
R25	346155.3	420740.8	1.7	9.7	8.1	24.1
R26	346155.0	420781.9	1.8	9.8	8.9	24.8
R27	346167.5	420841.7	1.6	9.6	8.9	24.8
R28	346172.6	420359.9	0.5	8.4	3.6	19.6
R29	346205.6	421056.3	0.8	8.9	4.9	21.1
R30	346220.3	420810.4	1.3	9.3	6.4	22.4
R31	346236.9	422152.2	0.1	8.3	2.1	18.3
R32	346257.9	421430.0	0.4	8.5	4.1	20.3
R33	346358.9	420351.6	0.4	8.4	3.2	19.1
R34	346882.0	420848.8	0.3	8.2	2.2	18.1
R35	347043.7	420823.4	0.2	7.7	1.9	16.8
R36	347054.0	420571.5	0.2	7.6	1.7	16.6
R37	347054.5	420355.8	0.2	7.6	1.9	16.8
R38	347122.9	420431.9	0.2	7.6	1.7	16.6
R39	347215.5	420579.7	0.2	7.6	1.5	16.4
R40	347253.7	420748.7	0.2	7.6	1.6	16.5
R41	347670.9	420414.3	0.1	7.6	1.1	16.0
R42	345582.8	420709.3	0.8	9.4	8.1	25.2
R43	345547.8	420771.8	0.9	9.4	6.0	23.1
R44	345597.3	420925.3	1.4	9.9	6.1	23.2
R45	345559.8	420865.8	1.2	9.8	5.5	22.6
R46	345487.4	420891.0	0.9	9.5	4.5	21.6

ID	Location		Max PC (Annual)	Max Annual Mean NO_2 (PEC at specific receptors)	Max PC (Hourly)	Max Hourly Mean NO_2
	X	Y				
AQS Objective			**40**		**200**	

Table E3: Maximum Predicted NO_2 CHP with SCR Concentrations

ID	Location		Max PC (Annual)	Max Annual Mean NO_2 (PEC at specific receptors)	Max PC (Hourly)	Max Hourly Mean NO_2
	X	Y				
R1	344457.5	420575.5	0.1	7.5	1.5	16.5
R2	344486.1	420260.6	0.1	7.5	1.6	16.6
R3	344783.8	420607.5	0.1	7.6	2.0	17.0
R4	344792.2	420351.3	0.1	7.6	2.2	17.1
R5	344867.9	421390.1	0.1	6.9	1.7	15.3
R6	345007.1	420973.2	0.2	8.8	2.2	19.3
R7	345066.1	420370.8	0.1	8.7	2.6	19.7
R8	345131.4	421569.1	0.1	7.6	1.9	16.8
R9	345176.0	420063.4	0.1	8.6	2.2	19.3
R10	345169.4	421207.7	0.2	7.7	2.4	17.4
R11	345203.0	420643.1	0.2	8.8	3.6	20.7
R12	345203.2	420965.2	0.3	8.9	2.9	20.0
R13	345333.0	419812.9	0.1	7.7	2.2	17.5
R14	345338.3	420287.3	0.1	8.7	3.2	20.3
R15	345342.1	421410.0	0.2	7.7	2.5	17.4
R16	345377.9	421016.5	0.5	7.9	3.3	18.3
R17	345376.6	421171.1	0.3	7.8	3.2	18.2
R18	345382.1	420875.3	0.5	9.0	3.5	20.6
R19	345414.8	421623.8	0.2	7.7	2.0	17.0
R20	345458.6	420532.0	0.3	8.8	4.6	21.7
R21	345485.9	420721.3	0.5	9.1	6.3	23.4
R22	345585.2	420332.1	0.2	8.7	3.4	20.5
R23	345928.8	421803.9	0.2	7.7	2.7	17.7
R24	345928.5	420196.8	0.2	8.8	3.3	20.4
R25	346155.3	420740.8	1.5	9.4	7.5	23.4
R26	346155.0	420781.9	1.6	9.5	8.6	24.5
R27	346167.5	420841.7	1.4	9.4	8.8	24.7
R28	346172.6	420359.9	0.4	8.4	3.2	19.1
R29	346205.6	421056.3	0.7	8.7	4.9	21.1

ID	Location		Max PC (Annual)	Max Annual Mean NO_2 (PEC at specific receptors)	Max PC (Hourly)	Max Hourly Mean NO_2
	X	Y				
R30	346220.3	420810.4	1.1	9.1	6.2	22.2
R31	346236.9	422152.2	0.1	8.2	1.8	18.0
R32	346257.9	421430.0	0.3	8.4	3.9	20.1
R33	346358.9	420351.6	0.4	8.3	2.7	18.6
R34	346882.0	420848.8	0.2	8.2	1.8	17.7
R35	347043.7	420823.4	0.2	7.6	1.6	16.5
R36	347054.0	420571.5	0.2	7.6	1.4	16.3
R37	347054.5	420355.8	0.1	7.6	1.5	16.4
R38	347122.9	420431.9	0.1	7.6	1.4	16.3
R39	347215.5	420579.7	0.1	7.6	1.2	16.1
R40	347253.7	420748.7	0.1	7.6	1.4	16.3
R41	347670.9	420414.3	0.1	7.5	0.9	15.8
R42	345582.8	420709.3	0.7	9.3	8.1	25.2
R43	345547.8	420771.8	0.7	9.3	6.0	23.1
R44	345597.3	420925.3	1.0	9.6	6.0	23.1
R45	345559.8	420865.8	1.0	9.5	5.5	22.6
R46	345487.4	420891.0	0.7	9.3	4.4	21.5
AQS Objective			**40**		**200**	

Table E4: Maximum Predicted NO_2 CHP with SCR and New Building Concentrations

ID	Location		Max PC (Annual)	Max Annual Mean NO_2 (PEC at specific receptors)	Max PC (Hourly)	Max Hourly Mean NO_2
	X	Y				
R1	344457.5	420575.5	0.1	7.5	1.6	16.6
R2	344486.1	420260.6	0.1	7.5	1.8	16.7
R3	344783.8	420607.5	0.1	7.6	2.2	17.1
R4	344792.2	420351.3	0.1	7.6	2.4	17.3
R5	344867.9	421390.1	0.1	6.9	1.7	15.3
R6	345007.1	420973.2	0.2	8.8	2.4	19.5
R7	345066.1	420370.8	0.1	8.7	2.6	19.7
R8	345131.4	421569.1	0.1	7.6	1.9	16.8
R9	345176.0	420063.4	0.1	8.6	2.1	19.2
R10	345169.4	421207.7	0.2	7.7	2.5	17.4
R11	345203.0	420643.1	0.2	8.8	3.7	20.8
R12	345203.2	420965.2	0.3	8.9	3.0	20.1

ID	Location		Max PC (Annual)	Max Annual Mean NO_2 (PEC at specific receptors)	Max PC (Hourly)	Max Hourly Mean NO_2
	X	Y				
R13	345333.0	419812.9	0.1	7.7	2.0	17.4
R14	345338.3	420287.3	0.1	8.7	3.3	20.4
R15	345342.1	421410.0	0.2	7.7	2.5	17.4
R16	345377.9	421016.5	0.5	7.9	3.6	18.6
R17	345376.6	421171.1	0.4	7.8	3.2	18.2
R18	345382.1	420875.3	0.5	9.1	3.8	20.9
R19	345414.8	421623.8	0.2	7.7	2.0	17.0
R20	345458.6	420532.0	0.3	8.8	4.4	21.5
R21	345485.9	420721.3	0.5	9.1	6.4	23.5
R22	345585.2	420332.1	0.2	8.7	3.4	20.5
R23	345928.8	421803.9	0.2	7.7	2.8	17.8
R24	345928.5	420196.8	0.2	8.8	3.4	20.5
R25	346155.3	420740.8	1.5	9.5	7.5	23.5
R26	346155.0	420781.9	1.6	9.6	8.6	24.6
R27	346167.5	420841.7	1.4	9.4	8.8	24.8
R28	346172.6	420359.9	0.4	8.4	3.2	19.1
R29	346205.6	421056.3	0.7	8.8	4.9	21.1
R30	346220.3	420810.4	1.1	9.1	6.3	22.2
R31	346236.9	422152.2	0.1	8.2	1.8	18.0
R32	346257.9	421430.0	0.3	8.4	3.8	20.0
R33	346358.9	420351.6	0.4	8.3	2.8	18.7
R34	346882.0	420848.8	0.2	8.2	1.8	17.7
R35	347043.7	420823.4	0.2	7.6	1.6	16.5
R36	347054.0	420571.5	0.2	7.6	1.4	16.3
R37	347054.5	420355.8	0.1	7.6	1.5	16.5
R38	347122.9	420431.9	0.1	7.6	1.4	16.3
R39	347215.5	420579.7	0.1	7.6	1.3	16.2
R40	347253.7	420748.7	0.1	7.6	1.4	16.3
R41	347670.9	420414.3	0.1	7.5	1.0	15.9
R42	345582.8	420709.3	0.7	9.3	8.1	25.2
R43	345547.8	420771.8	0.8	9.3	6.1	23.2
R44	345597.3	420925.3	1.2	9.8	6.2	23.3
R45	345559.8	420865.8	1.1	9.6	5.7	22.8
R46	345487.4	420891.0	0.8	9.3	4.6	21.7
AQS Objective			**40**		**200**	

Table E5: Maximum Predicted CO Baseline Concentrations

ID	Location		Max PC (1 Hour)	Max PEC 1 Hour CO	Max PC (8 Hour)	Max Daily Running 8-hour Mean CO (PEC)
	X	Y				
R1	344457.5	420575.5	3.2	3.7	1.8	2.3
R2	344486.1	420260.6	3.2	3.7	2.2	2.7
R3	344783.8	420607.5	4.6	5.1	2.3	2.8
R4	344792.2	420351.3	4.3	4.8	3.0	3.5
R5	344867.9	421390.1	3.1	3.6	2.2	2.7
R6	345007.1	420973.2	3.9	4.4	2.7	3.2
R7	345066.1	420370.8	5.6	6.1	3.2	3.7
R8	345131.4	421569.1	3.0	3.5	2.1	2.6
R9	345176.0	420063.4	4.7	5.2	3.1	3.6
R10	345169.4	421207.7	4.1	4.6	3.1	3.7
R11	345203.0	420643.1	7.5	8.0	4.5	5.0
R12	345203.2	420965.2	5.1	5.6	3.2	3.7
R13	345333.0	419812.9	4.6	5.1	2.8	3.3
R14	345338.3	420287.3	6.0	6.5	4.5	5.0
R15	345342.1	421410.0	4.1	4.6	3.0	3.5
R16	345377.9	421016.5	5.0	5.7	4.3	4.8
R17	345376.6	421171.1	5.0	5.5	3.6	4.1
R18	345382.1	420875.3	6.5	7.0	4.2	4.7
R19	345414.8	421623.8	3.5	4.0	2.2	2.7
R20	345458.6	420532.0	8.8	9.3	5.8	6.3
R21	345485.9	420721.3	12.6	13.1	8.1	8.6
R22	345585.2	420332.1	8.6	9.1	5.3	5.8
R23	345928.8	421803.9	5.5	6.0	3.2	3.7
R24	345928.5	420196.8	6.4	6.9	3.6	4.1
R25	346155.3	420740.8	10.1	10.8	9.4	9.9
R26	346155.0	420781.9	12.4	12.9	10.9	11.4
R27	346167.5	420841.7	14.2	14.7	11.8	12.3
R28	346172.6	420359.9	4.5	5.0	3.9	4.4
R29	346205.6	421056.3	11.2	11.7	7.3	7.8
R30	346220.3	420810.4	11.6	12.1	8.4	8.9
R31	346236.9	422152.2	3.3	3.8	1.9	2.4
R32	346257.9	421430.0	5.8	6.3	5.3	5.8
R33	346358.9	420351.6	4.6	5.1	3.6	4.1
R34	346882.0	420848.8	5.9	6.4	2.6	3.1
R35	347043.7	420823.4	5.2	5.7	2.1	2.6
R36	347054.0	420571.5	2.7	3.3	1.7	2.2
R37	347054.5	420355.8	2.7	3.2	1.5	2.0
R38	347122.9	420431.9	2.7	3.2	1.5	2.0

ID	Location		Max PC (1 Hour)	Max PEC 1 Hour CO	Max PC (8 Hour)	Max Daily Running 8-hour Mean CO (PEC)
	X	Y				
R39	347215.5	420579.7	2.2	2.8	1.4	2.0
R40	347253.7	420748.7	3.9	4.4	1.3	1.8
R41	347670.9	420414.3	1.8	2.3	1.1	1.6
R42	345582.8	420709.3	16.0	16.5	11.5	12.0
R43	345547.8	420771.8	12.4	12.9	8.0	8.5
R44	345597.3	420925.3	8.3	8.8	7.8	8.4
R45	345559.8	420865.8	8.0	8.5	6.9	7.4
R46	345487.4	420891.0	6.8	7.3	5.5	6.0
AQS Objective			**30,000**		**10,000**	

Table E6: Maximum Predicted CO CHP with no SCR Concentrations

ID	Location		Max PC (1 Hour)	Max PEC 1 Hour CO	Max PC (8 Hour)	Max Daily Running 8-hour Mean CO (PEC)
	X	Y				
R1	344457.5	420575.5	13.0	13.5	9.5	10.0
R2	344486.1	420260.6	13.9	14.4	10.3	10.8
R3	344783.8	420607.5	15.1	15.6	11.2	11.7
R4	344792.2	420351.3	26.0	26.5	13.3	13.8
R5	344867.9	421390.1	17.3	17.8	17.3	17.8
R6	345007.1	420973.2	16.8	17.3	16.8	17.3
R7	345066.1	420370.8	37.4	37.9	20.2	20.7
R8	345131.4	421569.1	17.5	18.0	12.2	12.7
R9	345176.0	420063.4	31.4	31.9	19.0	19.5
R10	345169.4	421207.7	19.2	19.8	19.2	19.8
R11	345203.0	420643.1	29.4	29.9	14.4	14.9
R12	345203.2	420965.2	18.1	18.6	16.8	17.3
R13	345333.0	419812.9	21.6	22.1	14.4	14.9
R14	345338.3	420287.3	36.9	37.4	23.6	24.1
R15	345342.1	421410.0	21.5	22.0	14.5	15.0
R16	345377.9	421016.5	25.6	26.1	24.2	24.7
R17	345376.6	421171.1	23.0	23.5	21.6	22.1
R18	345382.1	420875.3	26.4	26.9	24.5	25.0
R19	345414.8	421623.8	18.0	18.5	13.0	13.5
R20	345458.6	420532.0	39.0	39.5	24.8	25.3
R21	345485.9	420721.3	45.0	45.5	34.2	34.7
R22	345585.2	420332.1	24.1	24.6	20.4	21.0
R23	345928.8	421803.9	12.9	13.4	9.4	9.9

ID	Location		Max PC (1 Hour)	Max PEC 1 Hour CO	Max PC (8 Hour)	Max Daily Running 8-hour Mean CO (PEC)
	X	Y				
R24	345928.5	420196.8	18.9	19.4	13.2	13.7
R25	346155.3	420740.8	27.0	27.5	24.0	24.5
R26	346155.0	420781.9	27.1	27.6	25.7	26.3
R27	346167.5	420841.7	23.5	24.1	21.8	22.3
R28	346172.6	420359.9	25.5	26.0	14.5	15.0
R29	346205.6	421056.3	19.4	19.9	17.6	18.1
R30	346220.3	420810.4	21.6	22.1	20.2	20.7
R31	346236.9	422152.2	12.3	12.8	9.8	10.3
R32	346257.9	421430.0	25.6	26.1	19.4	19.9
R33	346358.9	420351.6	17.7	18.2	13.2	13.7
R34	346882.0	420848.8	16.5	17.0	9.3	9.8
R35	347043.7	420823.4	13.6	14.1	8.0	8.5
R36	347054.0	420571.5	13.1	13.7	8.0	8.5
R37	347054.5	420355.8	10.7	11.2	8.1	8.6
R38	347122.9	420431.9	10.3	10.8	7.9	8.4
R39	347215.5	420579.7	10.1	10.6	6.7	7.2
R40	347253.7	420748.7	9.5	10.0	6.5	7.0
R41	347670.9	420414.3	9.2	9.7	5.5	6.0
R42	345582.8	420709.3	47.7	48.2	34.0	34.5
R43	345547.8	420771.8	51.7	52.2	42.5	43.0
R44	345597.3	420925.3	52.4	52.9	48.3	48.8
R45	345559.8	420865.8	44.2	44.2	40.3	40.3
R46	345487.4	420891.0	36.2	36.2	33.3	33.3
AQS Objective			**30,000**		**10,000**	

Table E7: Maximum Predicted CO CHP with SCR Concentrations

ID	Location		Max PC (1 Hour)	Max PEC 1 Hour CO	Max PC (8 Hour)	Max Daily Running 8-hour Mean CO (PEC)
	X	Y				
R1	344457.5	420575.5	3.3	3.8	2.1	2.6
R2	344486.1	420260.6	3.3	3.8	2.5	3.0
R3	344783.8	420607.5	4.7	5.2	2.8	3.3
R4	344792.2	420351.3	4.4	4.9	3.2	3.7
R5	344867.9	421390.1	3.7	4.2	3.7	4.2
R6	345007.1	420973.2	4.4	4.9	3.9	4.4
R7	345066.1	420370.8	5.7	6.3	3.8	4.4
R8	345131.4	421569.1	3.9	4.4	2.9	3.4

ID	Location		Max PC (1 Hour)	Max PEC 1 Hour CO	Max PC (8 Hour)	Max Daily Running 8-hour Mean CO (PEC)
	X	Y				
R9	345176.0	420063.4	5.7	6.2	3.5	4.0
R10	345169.4	421207.7	4.7	5.2	4.7	5.2
R11	345203.0	420643.1	7.5	8.0	4.6	5.1
R12	345203.2	420965.2	5.2	5.7	4.4	4.9
R13	345333.0	419812.9	5.2	5.7	3.9	4.4
R14	345338.3	420287.3	7.0	7.5	4.6	5.1
R15	345342.1	421410.0	4.7	5.2	3.8	4.3
R16	345377.9	421016.5	5.8	6.2	5.1	5.6
R17	345376.6	421171.1	5.5	6.0	4.6	5.1
R18	345382.1	420875.3	6.5	7.0	4.7	5.3
R19	345414.8	421623.8	4.1	4.5	2.9	3.4
R20	345458.6	420532.0	8.8	9.3	6.3	6.8
R21	345485.9	420721.3	12.6	13.1	8.1	8.6
R22	345585.2	420332.1	9.3	9.9	5.8	6.3
R23	345928.8	421803.9	5.5	6.0	3.3	3.8
R24	345928.5	420196.8	6.4	6.9	4.2	4.7
R25	346155.3	420740.8	11.0	11.5	10.6	11.1
R26	346155.0	420781.9	12.4	12.9	11.3	11.8
R27	346167.5	420841.7	14.2	14.7	11.9	12.4
R28	346172.6	420359.9	5.7	6.2	4.8	5.3
R29	346205.6	421056.3	11.2	11.7	7.4	7.9
R30	346220.3	420810.4	11.7	12.2	8.5	9.0
R31	346236.9	422152.2	3.6	4.1	2.3	2.8
R32	346257.9	421430.0	6.2	6.7	5.4	5.9
R33	346358.9	420351.6	5.4	6.0	4.4	4.9
R34	346882.0	420848.8	5.9	6.4	2.9	3.4
R35	347043.7	420823.4	5.3	5.8	2.3	2.8
R36	347054.0	420571.5	3.5	4.0	2.2	2.7
R37	347054.5	420355.8	3.2	3.7	2.1	2.6
R38	347122.9	420431.9	3.1	3.6	2.0	2.5
R39	347215.5	420579.7	3.0	3.5	1.9	2.4
R40	347253.7	420748.7	3.9	4.4	1.7	2.2
R41	347670.9	420414.3	2.1	2.7	1.3	1.8
R42	345582.8	420709.3	16.0	16.5	11.5	12.0
R43	345547.8	420771.8	12.4	13.0	8.0	8.5
R44	345597.3	420925.3	8.3	8.8	7.9	8.4
R45	345559.8	420865.8	8.1	8.6	6.9	7.4
R46	345487.4	420891.0	6.9	7.4	5.6	6.1

ID	Location		Max PC (1 Hour)	Max PEC 1 Hour CO	Max PC (8 Hour)	Max Daily Running 8-hour Mean CO (PEC)
	X	Y				
AQS Objective			**30,000**		**10,000**	

Table E8: Maximum Predicted CO CHP with SCR and Building Concentrations

ID	Location		Max PC (1 Hour)	Max PEC 1 Hour CO	Max PC (8 Hour)	Max Daily Running 8-hour Mean CO (PEC)
	X	Y				
R1	344457.5	420575.5	4.6	5.1	2.4	2.9
R2	344486.1	420260.6	4.0	4.5	2.5	3.0
R3	344783.8	420607.5	5.8	6.3	3.3	3.8
R4	344792.2	420351.3	4.6	5.1	3.2	3.7
R5	344867.9	421390.1	3.8	4.3	3.5	4.0
R6	345007.1	420973.2	5.2	5.7	3.8	4.3
R7	345066.1	420370.8	5.6	6.1	3.9	4.4
R8	345131.4	421569.1	3.9	4.4	2.9	3.4
R9	345176.0	420063.4	5.7	6.2	3.4	3.9
R10	345169.4	421207.7	4.9	5.4	4.5	5.0
R11	345203.0	420643.1	7.7	8.2	5.3	5.8
R12	345203.2	420965.2	6.4	6.9	4.6	5.2
R13	345333.0	419812.9	5.2	5.7	3.5	4.0
R14	345338.3	420287.3	6.6	7.2	4.5	5.0
R15	345342.1	421410.0	4.8	5.3	3.8	4.3
R16	345377.9	421016.5	6.8	7.3	5.8	6.3
R17	345376.6	421171.1	5.6	6.1	4.6	5.1
R18	345382.1	420875.3	7.5	8.0	5.9	6.4
R19	345414.8	421623.8	4.0	4.5	2.9	3.4
R20	345458.6	420532.0	8.8	9.3	5.9	6.4
R21	345485.9	420721.3	12.6	13.1	8.5	9.0
R22	345585.2	420332.1	8.9	9.4	5.6	6.1
R23	345928.8	421803.9	5.4	5.9	3.5	4.0
R24	345928.5	420196.8	6.7	7.2	4.2	4.7
R25	346155.3	420740.8	11.2	11.7	10.8	11.3
R26	346155.0	420781.9	12.5	13.0	11.4	11.9
R27	346167.5	420841.7	14.2	14.7	11.9	12.4
R28	346172.6	420359.9	5.7	6.2	4.8	5.3
R29	346205.6	421056.3	11.2	11.7	7.4	7.9
R30	346220.3	420810.4	11.8	12.3	8.6	9.1
R31	346236.9	422152.2	3.7	4.3	2.2	2.7

ID	Location		Max PC (1 Hour)	Max PEC 1 Hour CO	Max PC (8 Hour)	Max Daily Running 8-hour Mean CO (PEC)
	X	Y				
R32	346257.9	421430.0	6.0	6.5	5.4	5.9
R33	346358.9	420351.6	5.6	6.1	4.6	5.1
R34	346882.0	420848.8	6.6	7.1	3.1	3.6
R35	347043.7	420823.4	5.8	6.3	2.4	2.9
R36	347054.0	420571.5	3.8	4.3	2.2	2.7
R37	347054.5	420355.8	3.4	3.9	2.2	2.7
R38	347122.9	420431.9	3.5	4.0	2.1	2.6
R39	347215.5	420579.7	3.2	3.8	1.9	2.5
R40	347253.7	420748.7	4.3	4.8	1.7	2.2
R41	347670.9	420414.3	2.3	2.8	1.5	2.0
R42	345582.8	420709.3	16.0	16.5	11.5	12.0
R43	345547.8	420771.8	12.4	13.0	8.3	8.8
R44	345597.3	420925.3	10.4	10.9	10.2	10.7
R45	345559.8	420865.8	8.7	9.1	7.9	8.4
R46	345487.4	420891.0	8.0	8.5	6.7	7.2
AQS Objective			**30,000**		**10,000**	

Table E9: Maximum Predicted SO_2 CHP with SCR Concentrations

ID	Location		Max PC (15 min)	Max 15 Min SO_2 (PEC)	Max PC (1 Hour)	Max 1 Hour SO_2 (PEC)	Max PC (24 Hour)	Max 24 Hour SO_2 (PEC)
	X	Y						
R1	344457.5	420575.5	0.2	6.1	0.1	6.0	0.0	5.9
R2	344486.1	420260.6	0.2	6.1	0.1	6.0	0.0	5.9
R3	344783.8	420607.5	0.2	6.1	0.1	6.0	0.1	6.0
R4	344792.2	420351.3	0.2	6.1	0.1	6.0	0.0	5.9
R5	344867.9	421390.1	0.2	5.7	0.1	5.7	0.1	5.6
R6	345007.1	420973.2	0.2	6.7	0.2	6.6	0.1	6.5
R7	345066.1	420370.8	0.4	6.9	0.2	6.6	0.1	6.5
R8	345131.4	421569.1	0.2	6.1	0.1	6.0	0.1	5.9
R9	345176.0	420063.4	0.3	6.8	0.2	6.6	0.1	6.5
R10	345169.4	421207.7	0.3	6.1	0.2	6.0	0.1	6.0
R11	345203.0	420643.1	0.3	6.8	0.2	6.6	0.1	6.6
R12	345203.2	420965.2	0.3	6.8	0.2	6.7	0.2	6.6
R13	345333.0	419812.9	0.3	6.0	0.1	5.8	0.0	5.7
R14	345338.3	420287.3	0.4	6.9	0.2	6.6	0.1	6.5
R15	345342.1	421410.0	0.3	6.1	0.2	6.0	0.1	6.0
R16	345377.9	421016.5	0.4	6.3	0.3	6.2	0.2	6.1
R17	345376.6	421171.1	0.4	6.2	0.3	6.1	0.2	6.0

ID	Location		Max PC (15 min)	Max 15 Min SO_2 (PEC)	Max PC (1 Hour)	Max 1 Hour SO_2 (PEC)	Max PC (24 Hour)	Max 24 Hour SO_2 (PEC)
	X	Y						
R18	345382.1	420875.3	0.5	6.9	0.3	6.8	0.2	6.7
R19	345414.8	421623.8	0.2	6.1	0.1	6.0	0.1	6.0
R20	345458.6	420532.0	0.5	7.0	0.3	6.7	0.1	6.6
R21	345485.9	420721.3	0.7	7.1	0.4	6.9	0.2	6.6
R22	345585.2	420332.1	0.3	6.8	0.2	6.6	0.1	6.5
R23	345928.8	421803.9	0.2	6.1	0.1	6.0	0.1	5.9
R24	345928.5	420196.8	0.2	6.7	0.2	6.6	0.1	6.5
R25	346155.3	420740.8	0.4	5.8	0.3	5.7	0.2	5.6
R26	346155.0	420781.9	0.4	5.8	0.3	5.7	0.2	5.6
R27	346167.5	420841.7	0.4	5.8	0.3	5.7	0.2	5.6
R28	346172.6	420359.9	0.2	5.7	0.2	5.6	0.1	5.5
R29	346205.6	421056.3	0.3	5.7	0.2	5.6	0.1	5.5
R30	346220.3	420810.4	0.3	5.8	0.3	5.7	0.2	5.6
R31	346236.9	422152.2	0.2	5.5	0.1	5.4	0.0	5.3
R32	346257.9	421430.0	0.4	5.8	0.3	5.6	0.1	5.5
R33	346358.9	420351.6	0.2	5.6	0.1	5.6	0.1	5.5
R34	346882.0	420848.8	0.2	5.6	0.1	5.5	0.0	5.5
R35	347043.7	420823.4	0.2	5.8	0.1	5.7	0.0	5.6
R36	347054.0	420571.5	0.1	5.7	0.1	5.7	0.0	5.6
R37	347054.5	420355.8	0.2	5.8	0.1	5.7	0.0	5.6
R38	347122.9	420431.9	0.1	5.7	0.1	5.7	0.0	5.6
R39	347215.5	420579.7	0.1	5.7	0.1	5.7	0.0	5.6
R40	347253.7	420748.7	0.1	5.7	0.1	5.7	0.0	5.6
R41	347670.9	420414.3	0.1	5.7	0.1	5.7	0.0	5.6
R42	345582.8	420709.3	0.7	7.1	0.5	6.9	0.3	6.7
R43	345547.8	420771.8	0.8	7.3	0.6	7.0	0.3	6.7
R44	345597.3	420925.3	0.9	7.3	0.7	7.1	0.6	7.0
R45	345559.8	420865.8	0.8	7.2	0.6	7.0	0.5	6.9
R46	345487.4	420891.0	0.6	7.1	0.5	6.9	0.3	6.8
AQS Objective			**266**		**350**		**125**	

Table E10: Maximum Predicted SO_2 CHP with SCR and Building Concentrations

ID	Location		Max PC (15 min)	Max 15 Min SO_2 (PEC)	Max PC (1 Hour)	Max 1 Hour SO_2 (PEC)	Max PC (24 Hour)	Max 24 Hour SO_2 (PEC)
	X	Y						
R1	344457.5	420575.5	0.2	6.1	0.1	6.0	0.0	5.9
R2	344486.1	420260.6	0.2	6.1	0.1	6.0	0.0	5.9
R3	344783.8	420607.5	0.3	6.2	0.2	6.1	0.1	6.0
R4	344792.2	420351.3	0.2	6.1	0.1	6.0	0.0	5.9
R5	344867.9	421390.1	0.2	5.8	0.1	5.7	0.1	5.6

ID	Location		Max PC (15 min)	Max 15 Min SO_2 (PEC)	Max PC (1 Hour)	Max 1 Hour SO_2 (PEC)	Max PC (24 Hour)	Max 24 Hour SO_2 (PEC)
	X	Y						
R6	345007.1	420973.2	0.5	6.9	0.3	6.7	0.1	6.5
R7	345066.1	420370.8	0.3	6.8	0.2	6.6	0.1	6.5
R8	345131.4	421569.1	0.2	6.1	0.1	6.0	0.1	5.9
R9	345176.0	420063.4	0.3	6.7	0.1	6.6	0.1	6.5
R10	345169.4	421207.7	0.4	6.2	0.2	6.1	0.1	6.0
R11	345203.0	420643.1	0.4	6.8	0.2	6.7	0.1	6.6
R12	345203.2	420965.2	0.5	7.0	0.3	6.8	0.2	6.6
R13	345333.0	419812.9	0.2	5.9	0.1	5.8	0.0	5.7
R14	345338.3	420287.3	0.4	6.8	0.2	6.6	0.1	6.5
R15	345342.1	421410.0	0.3	6.1	0.2	6.0	0.1	6.0
R16	345377.9	421016.5	0.6	6.5	0.4	6.3	0.2	6.1
R17	345376.6	421171.1	0.4	6.2	0.3	6.1	0.2	6.0
R18	345382.1	420875.3	0.6	7.1	0.4	6.9	0.2	6.7
R19	345414.8	421623.8	0.2	6.1	0.1	6.0	0.1	6.0
R20	345458.6	420532.0	0.4	6.9	0.3	6.7	0.1	6.6
R21	345485.9	420721.3	0.7	7.2	0.5	6.9	0.3	6.7
R22	345585.2	420332.1	0.4	6.8	0.2	6.6	0.1	6.5
R23	345928.8	421803.9	0.2	6.1	0.1	6.0	0.1	5.9
R24	345928.5	420196.8	0.2	6.7	0.2	6.6	0.1	6.5
R25	346155.3	420740.8	0.5	5.9	0.3	5.8	0.2	5.6
R26	346155.0	420781.9	0.5	5.9	0.4	5.8	0.2	5.6
R27	346167.5	420841.7	0.5	5.9	0.4	5.8	0.2	5.7
R28	346172.6	420359.9	0.2	5.7	0.2	5.6	0.1	5.5
R29	346205.6	421056.3	0.4	5.8	0.3	5.7	0.2	5.5
R30	346220.3	420810.4	0.4	5.9	0.3	5.7	0.2	5.6
R31	346236.9	422152.2	0.2	5.5	0.1	5.4	0.0	5.3
R32	346257.9	421430.0	0.4	5.7	0.2	5.6	0.1	5.5
R33	346358.9	420351.6	0.2	5.6	0.1	5.6	0.1	5.5
R34	346882.0	420848.8	0.2	5.7	0.1	5.6	0.0	5.5
R35	347043.7	420823.4	0.2	5.8	0.1	5.7	0.0	5.6
R36	347054.0	420571.5	0.2	5.8	0.1	5.7	0.0	5.6
R37	347054.5	420355.8	0.2	5.8	0.1	5.7	0.0	5.6
R38	347122.9	420431.9	0.2	5.8	0.1	5.7	0.0	5.6
R39	347215.5	420579.7	0.2	5.8	0.1	5.7	0.0	5.6
R40	347253.7	420748.7	0.2	5.8	0.1	5.7	0.0	5.6
R41	347670.9	420414.3	0.1	5.7	0.1	5.7	0.0	5.6
R42	345582.8	420709.3	0.8	7.2	0.5	7.0	0.3	6.7
R43	345547.8	420771.8	0.9	7.3	0.6	7.1	0.4	6.8
R44	345597.3	420925.3	1.4	7.8	1.0	7.5	0.8	7.3

ID	Location		Max PC (15 min)	Max 15 Min SO_2 (PEC)	Max PC (1 Hour)	Max 1 Hour SO_2 (PEC)	Max PC (24 Hour)	Max 24 Hour SO_2 (PEC)
	X	Y						
R45	345559.8	420865.8	1.1	7.5	0.8	7.2	0.6	7.0
R46	345487.4	420891.0	0.9	7.3	0.6	7.0	0.4	6.8
AQS Objective			**266**		**350**		**125**	

Table E11: Maximum Predicted NH_3 CHP with SCR Concentrations

ID	Location		Max PC (annual)	Max annual NH_3 (PEC)	Max PC (1 Hour)	Max 1 hour Mean NH_3 (PEC)
	X	Y				
R1	344457.5	420575.5	0.00	2.7	0.05	5.5
R2	344486.1	420260.6	0.00	2.7	0.06	5.5
R3	344783.8	420607.5	0.00	2.7	0.06	5.5
R4	344792.2	420351.3	0.00	2.7	0.12	5.6
R5	344867.9	421390.1	0.00	2.7	0.07	5.5
R6	345007.1	420973.2	0.00	2.7	0.07	5.5
R7	345066.1	420370.8	0.00	2.7	0.17	5.6
R8	345131.4	421569.1	0.00	2.7	0.07	5.5
R9	345176.0	420063.4	0.00	2.7	0.14	5.6
R10	345169.4	421207.7	0.00	2.7	0.08	5.5
R11	345203.0	420643.1	0.00	2.7	0.14	5.6
R12	345203.2	420965.2	0.00	2.7	0.08	5.5
R13	345333.0	419812.9	0.00	2.7	0.10	5.6
R14	345338.3	420287.3	0.00	2.7	0.16	5.6
R15	345342.1	421410.0	0.00	2.7	0.09	5.5
R16	345377.9	421016.5	0.01	2.7	0.11	5.6
R17	345376.6	421171.1	0.01	2.7	0.10	5.6
R18	345382.1	420875.3	0.01	2.7	0.12	5.6
R19	345414.8	421623.8	0.00	2.7	0.07	5.5
R20	345458.6	420532.0	0.00	2.7	0.18	5.6
R21	345485.9	420721.3	0.00	2.7	0.21	5.7
R22	345585.2	420332.1	0.00	2.7	0.10	5.6
R23	345928.8	421803.9	0.00	2.7	0.06	5.5
R24	345928.5	420196.8	0.00	2.7	0.07	5.5
R25	346155.3	420740.8	0.01	2.7	0.10	5.6
R26	346155.0	420781.9	0.01	2.7	0.10	5.6
R27	346167.5	420841.7	0.01	2.7	0.10	5.6
R28	346172.6	420359.9	0.00	2.7	0.11	5.6
R29	346205.6	421056.3	0.01	2.7	0.09	5.6
R30	346220.3	420810.4	0.01	2.7	0.09	5.6
R31	346236.9	422152.2	0.00	2.7	0.05	5.5
R32	346257.9	421430.0	0.00	2.7	0.11	5.6

ID	Location		Max PC (annual)	Max annual NH_3 (PEC)	Max PC (1 Hour)	Max 1 hour Mean NH_3 (PEC)
	X	Y				
R33	346358.9	420351.6	0.00	2.7	0.07	5.5
R34	346882.0	420848.8	0.00	2.7	0.06	5.5
R35	347043.7	420823.4	0.00	2.7	0.05	5.5
R36	347054.0	420571.5	0.00	2.7	0.05	5.5
R37	347054.5	420355.8	0.00	2.7	0.04	5.5
R38	347122.9	420431.9	0.00	2.7	0.04	5.5
R39	347215.5	420579.7	0.00	2.7	0.04	5.5
R40	347253.7	420748.7	0.00	2.7	0.04	5.5
R41	347670.9	420414.3	0.00	2.7	0.03	5.5
R42	345582.8	420709.3	0.00	2.7	0.21	5.7
R43	345547.8	420771.8	0.01	2.7	0.25	5.7
R44	345597.3	420925.3	0.02	2.7	0.24	5.7
R45	345559.8	420865.8	0.01	2.7	0.21	5.7
R46	345487.4	420891.0	0.01	2.7	0.17	5.6
AQS Objective			**180**		**2500**	

Table E12: Maximum Predicted NH_3 CHP with SCR and Building Concentrations

ID	Location		Max PC (annual)	Max annual NH_3 (PEC)	Max PC (1 Hour)	Max 1 hour Mean NH_3 (PEC)
	X	Y				
R1	344457.5	420575.5	0.00	2.7	0.1	5.5
R2	344486.1	420260.6	0.00	2.7	0.1	5.6
R3	344783.8	420607.5	0.00	2.7	0.1	5.6
R4	344792.2	420351.3	0.00	2.7	0.1	5.6
R5	344867.9	421390.1	0.00	2.7	0.1	5.5
R6	345007.1	420973.2	0.00	2.7	0.1	5.6
R7	345066.1	420370.8	0.00	2.7	0.1	5.6
R8	345131.4	421569.1	0.00	2.7	0.1	5.5
R9	345176.0	420063.4	0.00	2.7	0.1	5.6
R10	345169.4	421207.7	0.00	2.7	0.1	5.6
R11	345203.0	420643.1	0.00	2.7	0.2	5.6
R12	345203.2	420965.2	0.00	2.7	0.2	5.6
R13	345333.0	419812.9	0.00	2.7	0.1	5.5
R14	345338.3	420287.3	0.00	2.7	0.1	5.6
R15	345342.1	421410.0	0.00	2.7	0.1	5.5
R16	345377.9	421016.5	0.01	2.7	0.2	5.6
R17	345376.6	421171.1	0.01	2.7	0.1	5.6
R18	345382.1	420875.3	0.01	2.7	0.2	5.6
R19	345414.8	421623.8	0.00	2.7	0.1	5.5

ID	Location		Max PC (annual)	Max annual NH_3 (PEC)	Max PC (1 Hour)	Max 1 hour Mean NH_3 (PEC)
	X	Y				
R20	345458.6	420532.0	0.00	2.7	0.2	5.6
R21	345485.9	420721.3	0.01	2.7	0.2	5.7
R22	345585.2	420332.1	0.00	2.7	0.1	5.6
R23	345928.8	421803.9	0.00	2.7	0.1	5.5
R24	345928.5	420196.8	0.00	2.7	0.1	5.5
R25	346155.3	420740.8	0.01	2.7	0.1	5.6
R26	346155.0	420781.9	0.01	2.7	0.1	5.6
R27	346167.5	420841.7	0.01	2.7	0.1	5.6
R28	346172.6	420359.9	0.00	2.7	0.1	5.6
R29	346205.6	421056.3	0.01	2.7	0.1	5.6
R30	346220.3	420810.4	0.01	2.7	0.1	5.6
R31	346236.9	422152.2	0.00	2.7	0.0	5.5
R32	346257.9	421430.0	0.00	2.7	0.1	5.6
R33	346358.9	420351.6	0.00	2.7	0.1	5.5
R34	346882.0	420848.8	0.00	2.7	0.1	5.5
R35	347043.7	420823.4	0.00	2.7	0.1	5.5
R36	347054.0	420571.5	0.00	2.7	0.1	5.5
R37	347054.5	420355.8	0.00	2.7	0.0	5.5
R38	347122.9	420431.9	0.00	2.7	0.1	5.5
R39	347215.5	420579.7	0.00	2.7	0.1	5.5
R40	347253.7	420748.7	0.00	2.7	0.1	5.5
R41	347670.9	420414.3	0.00	2.7	0.0	5.5
R42	345582.8	420709.3	0.00	2.7	0.2	5.7
R43	345547.8	420771.8	0.01	2.7	0.3	5.7
R44	345597.3	420925.3	0.03	2.8	0.4	5.8
R45	345559.8	420865.8	0.02	2.7	0.3	5.7
R46	345487.4	420891.0	0.01	2.7	0.2	5.7
AQS Objective			**180**		**2500**	

Ecological Receptors

Table E13: Maximum Predicted NO_x Baseline Concentrations

ID	Location		Max PC (Annual)	Max Annual Mean NOx (PEC)	Max PC (Daily)	Max Hourly Mean NOx (PEC)
	X	Y				
e1a	345705.0	420950.0	1.74	16.38	19.60	48.88
e1b	345849.0	421227.0	0.92	14.06	7.98	34.26
e1c	345760.0	420713.0	2.34	16.98	30.80	60.08
e1d	346018.0	421212.0	0.82	14.54	9.58	37.02
e1e	345688.0	421536.0	0.39	13.53	4.69	30.97
e1f	346031.0	420542.0	1.15	14.74	10.10	37.28
e1g	345690.0	421093.0	1.10	14.24	11.00	37.28
e2a	345660.0	421373.0	0.53	13.67	5.28	31.56
e2b	345657.0	421115.0	0.89	14.03	9.12	35.40
e2c	345864.0	420411.0	0.42	15.06	8.37	37.65
e2d	345601.0	420839.0	1.51	16.15	18.10	47.38
e3a	344621.0	421234.0	0.13	12.07	2.04	25.92
e4a	345012.0	422676.0	0.08	12.29	1.50	25.92
e5a	345294.0	422803.0	0.09	12.30	1.36	25.78
AQS Objective			**30**		**75**	

Table E14: Maximum Predicted NO_x CHP no SCR Concentrations

ID	Location		Max PC (Annual)	Max Annual Mean NOx (PEC)	Max PC (Daily)	Max Hourly Mean NOx (PEC)
	X	Y				
e1a	345705.0	420950.0	1.89	16.53	20.20	49.48
e1b	345849.0	421227.0	1.45	14.59	11.34	37.62
e1c	345760.0	420713.0	2.73	17.37	30.79	60.07
e1d	346018.0	421212.0	1.34	15.06	11.00	38.44
e1e	345688.0	421536.0	0.64	13.78	5.91	32.19
e1f	346031.0	420542.0	1.46	15.05	13.20	40.38
e1g	345690.0	421093.0	2.07	15.21	17.41	43.69
e2a	345660.0	421373.0	0.92	14.06	7.89	34.17
e2b	345657.0	421115.0	1.74	14.88	15.83	42.11
e2c	345864.0	420411.0	0.58	15.22	9.84	39.12
e2d	345601.0	420839.0	2.03	16.67	18.10	47.38
e3a	344621.0	421234.0	0.22	12.16	3.20	27.08
e4a	345012.0	422676.0	0.13	12.34	1.99	26.41
e5a	345294.0	422803.0	0.14	12.35	1.94	26.36

ID	Location		Max PC (Annual)	Max Annual Mean NOx (PEC)	Max PC (Daily)	Max Hourly Mean NOx (PEC)
	X	Y				
AQS Objective			30		75	

Table E15: Maximum Predicted NO_x CHP with SCR Concentrations

ID	Location		Max PC (Annual)	Max Annual Mean NOx (PEC)	Max PC (Daily)	Max Hourly Mean NOx (PEC)
	X	Y				
e1a	345705.0	420950.0	1.79	16.43	19.85	49.13
e1b	345849.0	421227.0	1.12	14.26	9.26	35.54
e1c	345760.0	420713.0	2.49	17.13	30.79	60.07
e1d	346018.0	421212.0	1.02	14.74	10.12	37.56
e1e	345688.0	421536.0	0.48	13.62	5.15	31.43
e1f	346031.0	420542.0	1.27	14.86	11.29	38.47
e1g	345690.0	421093.0	1.46	14.60	13.06	39.34
e2a	345660.0	421373.0	0.68	13.82	6.27	32.55
e2b	345657.0	421115.0	1.21	14.35	11.67	37.95
e2c	345864.0	420411.0	0.48	15.12	8.93	38.21
e2d	345601.0	420839.0	1.71	16.35	18.09	47.37
e3a	344621.0	421234.0	0.16	12.10	2.48	26.36
e4a	345012.0	422676.0	0.10	12.31	1.69	26.11
e5a	345294.0	422803.0	0.11	12.32	1.58	26.00
AQS Objective			30		75	

Table E16: Maximum Predicted NO_x CHP with SCR and Building Concentrations

ID	Location		Max PC (Annual)	Max Annual Mean NOx (PEC)	Max PC (Daily)	Max Hourly Mean NOx (PEC)
	X	Y				
e1a	345705.0	420950.0	2.08	16.72	19.85	49.13
e1b	345849.0	421227.0	1.14	14.28	9.68	35.96
e1c	345760.0	420713.0	2.51	17.15	30.79	60.07
e1d	346018.0	421212.0	1.01	14.73	10.10	37.54
e1e	345688.0	421536.0	0.48	13.62	5.25	31.53
e1f	346031.0	420542.0	1.27	14.86	11.31	38.49
e1g	345690.0	421093.0	1.47	14.61	13.13	39.41
e2a	345660.0	421373.0	0.68	13.82	6.27	32.55
e2b	345657.0	421115.0	1.22	14.36	11.73	38.01
e2c	345864.0	420411.0	0.49	15.13	8.95	38.23
e2d	345601.0	420839.0	1.84	16.48	18.29	47.57
e3a	344621.0	421234.0	0.16	12.10	2.43	26.31
e4a	345012.0	422676.0	0.10	12.31	1.69	26.11

ID	Location		Max PC (Annual)	Max Annual Mean NOx (PEC)	Max PC (Daily)	Max Hourly Mean NOx (PEC)
	X	Y				
e5a	345294.0	422803.0	0.11	12.32	1.59	26.01
AQS Objective			**30**		**75**	

Table E17: Maximum Predicted SO_2 CHP with SCR Concentrations

ID	Location		Max PC (Annual)	Max Annual Mean SO_2 (PEC)	Max PC (Winter)	Max Winter Mean SO_2 (PEC)
	X	Y				
e1a	345705.0	420950.0	0.01	0.44	0.01	0.44
e1b	345849.0	421227.0	0.03	0.46	0.05	0.48
e1c	345760.0	420713.0	0.02	0.45	0.02	0.45
e1d	346018.0	421212.0	0.03	0.46	0.04	0.47
e1e	345688.0	421536.0	0.02	0.45	0.02	0.45
e1f	346031.0	420542.0	0.02	0.45	0.01	0.44
e1g	345690.0	421093.0	0.06	0.49	0.09	0.52
e2a	345660.0	421373.0	0.02	0.45	0.03	0.46
e2b	345657.0	421115.0	0.05	0.48	0.07	0.50
e2c	345864.0	420411.0	0.01	0.44	0.01	0.44
e2d	345601.0	420839.0	0.04	0.47	0.04	0.47
e3a	344621.0	421234.0	0.01	0.42	0.00	0.41
e4a	345012.0	422676.0	0.00	0.43	0.00	0.43
e5a	345294.0	422803.0	0.00	0.43	0.00	0.43
AQS Objective			**20**			

Table E18: Maximum Predicted SO_2 CHP with SCR and building Concentrations

ID	Location		Max PC (Annual)	Max Annual Mean SO_2 (PEC)	Max PC (Winter)	Max Winter Mean SO_2 (PEC)
	X	Y				
e1a	345705.0	420950.0	0.06	0.49	0.05	0.91
e1b	345849.0	421227.0	0.04	0.47	0.05	0.91
e1c	345760.0	420713.0	0.03	0.46	0.03	0.89
e1d	346018.0	421212.0	0.03	0.46	0.04	0.90
e1e	345688.0	421536.0	0.02	0.45	0.02	0.88
e1f	346031.0	420542.0	0.02	0.45	0.01	0.87
e1g	345690.0	421093.0	0.06	0.49	0.09	0.95
e2a	345660.0	421373.0	0.02	0.45	0.03	0.89
e2b	345657.0	421115.0	0.05	0.48	0.07	0.93
e2c	345864.0	420411.0	0.01	0.44	0.01	0.87
e2d	345601.0	420839.0	0.06	0.49	0.07	0.93
e3a	344621.0	421234.0	0.01	0.42	0.00	0.82

ID	Location		Max PC (Annual)	Max Annual Mean SO_2 (PEC)	Max PC (Winter)	Max Winter Mean SO_2 (PEC)
	X	Y				
e4a	345012.0	422676.0	0.00	0.43	0.00	0.86
e5a	345294.0	422803.0	0.00	0.43	0.00	0.86
AQS Objective			**20**			

Table E19: Maximum Predicted NH_3 CHP with SCR Concentrations

ID	Location		Max PC (Annual)	Max Annual Mean NH_3 (PEC)
	X	Y		
e1a	345705.0	420950.0	0.003	2.733
e1b	345849.0	421227.0	0.011	2.741
e1c	345760.0	420713.0	0.008	2.738
e1d	346018.0	421212.0	0.010	2.740
e1e	345688.0	421536.0	0.005	2.735
e1f	346031.0	420542.0	0.006	2.736
e1g	345690.0	421093.0	0.020	2.750
e2a	345660.0	421373.0	0.008	2.738
e2b	345657.0	421115.0	0.017	2.747
e2c	345864.0	420411.0	0.003	2.733
e2d	345601.0	420839.0	0.012	2.742
e3a	344621.0	421234.0	0.002	1.412
e4a	345012.0	422676.0	0.001	2.731
e5a	345294.0	422803.0	0.001	2.731
AQS Objective			**3**	

Table E20: Maximum Predicted NH_3 CHP with SCR and Building Concentrations

ID	Location		Max PC (Annual)	Max Annual Mean NH_3 (PEC)
	X	Y		
e1a	345705.0	420950.0	0.021	2.751
e1b	345849.0	421227.0	0.012	2.742
e1c	345760.0	420713.0	0.009	2.739
e1d	346018.0	421212.0	0.010	2.740
e1e	345688.0	421536.0	0.005	2.735
e1f	346031.0	420542.0	0.006	2.736
e1g	345690.0	421093.0	0.020	2.750
e2a	345660.0	421373.0	0.008	2.738
e2b	345657.0	421115.0	0.017	2.747
e2c	345864.0	420411.0	0.003	2.733
e2d	345601.0	420839.0	0.021	2.751

ID	Location		Max PC (Annual)	Max Annual Mean NH_3 (PEC)
	X	Y		
e3a	344621.0	421234.0	0.002	1.412
e4a	345012.0	422676.0	0.001	2.731
e5a	345294.0	422803.0	0.001	2.731
AQS Objective			**3**	

Our ref: RSK/443094-AQ-02(02)

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GA Pet Food Partners

Liverpool Road, Bretherton – Air Quality Assessment Addendum Report

1. BACKGROUND

This addendum report concerns additional air quality assessment work which RSK Environment Ltd (RSK) has been commissioned to undertake in relation to emissions from the proposed combined heat and power plant (CHP) at Liverpool Road, Bretherton. The proposed CHP plant lies within the Golden Acres (GA) Pet Food site in Preston. **Figure 1** in **Appendix A** shows the location and redline boundary of the CHP plant; the approximate grid reference of the centre of the site is 345752, 420934 (British National Grid).

In 2018, an air quality impact assessment (AQA) for the proposed CHP was undertaken by RSK (Ref: 443094-AQ-01(00)) ('the 2018 AQA'), to support an Environmental Permit variation application for this development and other improvements at the site. Following the submission, the following comment has been received from the Environment Agency (EA) regarding the air quality impact assessment:

'*There are ecological conservation sites within 10km of the site which have not been identified as receptors in the air quality impact assessment (Ribble & Alt Estuaries SPA and Ramsar, and Martin Mere SPA and Ramsar). Please resubmit the assessment with the predicted impacts at these receptors included*'

Therefore, this additional air quality assessment has been undertaken in response to the EA's comments. The following sections present the findings of predicted air quality impacts of the proposed CHP on the Ribble & Alt Estuaries Special Protection Area (SPA)/Ramsar and the Martin Mere SPA/Ramsar. This addendum report should be read in conjunction with the 2018 RSK air quality assessment report (Ref: 443094-AQ-01(00)), which is attached as **Appendix B.**

2. ASSESSMENT METHODOLOGY

2.1 Receptors Considered

As per the 2018 AQA, the method used to determine the annual and daily mean oxides of nitrogen (NO_x), potential for eutrophication due to nitrogen deposition and acidification potential was undertaken with reference to the 'Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air' (Environment Agency, 2014) ('the AQTAG06 guidance'). The criteria used by RSK to determine the potential significance of effects was also completed using the same ones as those listed in Section 3.5.5 of the 2018 AQA. Unless stated otherwise, no additional changes to the assessment methodology have been made.

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As requested by the EA, pollutant concentrations were predicted at a number of receptors at the Ribble & Alt Estuaries SPA/Ramsar and Martin Mere SPA/Ramsar. Details of the additional receptors included in this addendum report are summarised in Table 2.1 and shown in **Figure 2** in **Appendix A**.

Table 2.1 Additional Ecological Receptors Considered in this Addendum Report

Receptor ID	Receptor Location	Grid reference		Height Z
		X	Y	
e6a	Ribble & Alt Estuaries SPA/Ramsar	346515.59	427961.19	0
e6b		345920.19	426301.69	0
e6c		345629.31	425442.09	0
e6e		345322.59	425422.81	0
e6f		344935.5	425392.09	0
e6g		344161.5	426125.81	0
e6h		342712.09	426475	0
e6i		340964.5	425547	0
e6j		340999.09	424153.81	0
e6k		341515.5	422686.69	0
e6l		339017	422724.41	0
e6m		337317.31	420848.5	0
e7a	Martin Mere SPA/Ramsar	341480.19	414750.91	0
e7b		342251.5	415339.81	0
e7c		342539.31	414708.91	0
e7d		342633.09	414515.5	0

The relevant nitrogen deposition Critical Loads at the identified ecological receptors have been taken from the Air Pollution Information System (APIS), which are presented in Table 2.2.

Table 2.2: Critical Loads for Nitrogen Deposition

Receptor ID	Habitat	Critical Load Range (kgN/ha/yr)*
e6a	Coastal saltmarsh	20-30
e6b	Coastal saltmarsh	20-30
e6c	Coastal saltmarsh	20-30
e6e	Coastal saltmarsh	20-30
e6f	Coastal saltmarsh	20-30
e6g	Coastal saltmarsh	20-30
e6h	Coastal saltmarsh	20-30
e6i	Coastal saltmarsh	20-30

Receptor ID	Habitat	Critical Load Range (kgN/ha/yr)*
e6j	Coastal saltmarsh	20-30
e6k	Coastal and floodplain grazing marsh	20-30
e6l	Coastal saltmarsh	20-30
e6m	Coastal saltmarsh	20-30
e7a	Lowland fens	10-15
e7b	Lowland meadows	20-30
e7c	Lowland meadows	20-30
e7d	Lowland meadows	20-30
*Lower critical load used in assessment for conservative assessment		

Following a review of the APIS website, it is noted that the above habitat types are classed as not sensitive (effects are likely to be small) to acid deposition. Therefore, acid deposition calculations have been screened out from this addendum report.

2.2 Background Concentrations

Estimated annual mean background NO_x and NH_3 concentrations have been taken from the APIS website (for a 2015 – 2017 base year) and summarised in Table 2.3 as below.

Table 2.3 APIS Estimated Annual Average NO_x and NH_3 Concentrations at the Ecological Receptors Considered

Grid Reference		Discrete Receptors	Annual Average NOx (µg/m^3)	Annual Average NH_3 (µg/m^3)
X	Y			
346515.59	427961.19	e6a	9.93	3.8
345920.19	426301.69	e6b	9.54	3.8
345629.31	425442.09	e6c	9.49	3.8
345322.59	425422.81	e6e	9.49	3.8
344935.5	425392.09	e6f	9.22	2.61
344161.5	426125.81	e6g	9.37	2.61
342712.09	426475	e6h	9.27	2.61
340964.5	425547	e6i	8.44	2.61
340999.09	424153.81	e6j	8.25	1.72
341515.5	422686.69	e6k	9.01	1.72
339017	422724.41	e6l	8.39	0.97
337317.31	420848.5	e6m	12.51	0.97
341480.19	414750.91	e7a	9.04	1.95
342251.5	415339.81	e7b	9.2	1.72

Grid Reference		Discrete Receptors	Annual Average NOx (µg/m^3)	Annual Average NH_3 (µg/m^3)
X	Y			
342539.31	414708.91	e7c	9.5	1.95
342633.09	414515.5	e7d	9.5	1.95
Air Quality Objective (µg/m^3)			30	3

Background nitrogen deposition rates obtained from APIS website (for a 2015 – 2017 base year), are presented in Table 2.4.

Table 2.4: Background Nitrogen Deposition Rates

Receptor ID	Ecological Site	Habitat	Existing Background Deposition Rate (kgN/ha/yr)
e6a	Ribble & Alt Estuaries SPA/Ramsar	Coastal saltmarsh	27.3
e6b		Coastal saltmarsh	27.3
e6c		Coastal saltmarsh	27.3
e6e		Coastal saltmarsh	27.3
e6f		Coastal saltmarsh	21
e6g		Coastal saltmarsh	21
e6h		Coastal saltmarsh	21
e6i		Coastal saltmarsh	21
e6j		Coastal saltmarsh	16.24
e6k		Coastal and floodplain grazing marsh	16.24
e6l		Coastal saltmarsh	11.76
e6m		Coastal saltmarsh	11.76
e7a	Martin Mere SPA/Ramsar	Lowland fens	17.36
e7b		Lowland meadows	16.52
e7c		Lowland meadows	17.36
e7d		Lowland meadows	17.36

3. ASSESSMENT RESULTS

Details of assessment methodology and information regarding modelled scenarios can be found in the 2018 AQA, replicated in Appendix B. The following subsections presents the assessment results for potential air quality impacts at the Ribble & Alt Estuaries SPA/Ramsar and Martin Mere SPA/Ramsar.

3.1 S1 - Baseline Scenario

Table 3.1 presents the maximum predicted annual and daily NOx concentrations (from the five modelled meteorological years) for S1, at both the location where the PC was highest, and the location where the PEC was highest. The ecological receptors with the maximum values for annual mean NO_x and daily NO_x are below the relevant objective. The maximum PC for annual mean NO_x is below the EA screening criteria of 1% and therefore the impacts of annual mean NO_x concentrations are considered to be of negligible significance. The maximum daily mean NO_x PC is below the EA screening criteria of 10% and therefore the impacts of daily mean NO_x concentrations are considered to be negligible significance.

Table 3.1: Existing Baseline Results for the Maximum Predicted Pollutant Concentrations of the Five Years of Meteorological Data for Ecological Receptors

Pollutant & Averaging Period	AQS Objective / Target ($\mu g/m^3$)	Receptor ID or Location	PC ($\mu g/m^3$)	PC as % of Objective / Target	PEC ($\mu g/m^3$)	Receptor ID or location	PEC as % of Objective / Target
MAXIMUM PREDICTED CONCENTRATION AT A SPECIFIC RECEPTOR							
Annual Mean NO_x	30	E6f	0.03	0.1%	12.52	E6m	41.7%
Max Daily Mean NO_x	75	E6e	0.74	1.0%	25.21	E6m	33.6%

Note: Results are the maximum concentrations predicted from the five different years of meteorological data

3.2 S2 - With Proposed CHP Without SCR Scenario

Table 3.2 presents the maximum predicted annual and daily NOx concentrations (from the five modelled meteorological years) for S2, at both the location where the PC was highest, and the location where the PEC was highest. The ecological receptors with the maximum values for annual mean NO_x and daily NO_x are below the relevant objective. The maximum PC for annual mean NO_x is below the EA screening criteria of 1% and therefore the impacts of annual mean NO_x concentrations are considered to be of negligible significance. The maximum daily mean NO_x PC is below the EA screening criteria of 10% and therefore the impacts of daily mean NO_x concentrations are considered to be negligible significance.

Table 3.2: 'With CHP Without SCR Maximum Predicted Pollutant Concentrations of the Five Years of Meteorological Data for Ecological Receptors

Pollutant & Averaging Period	AQS Objective / Target ($\mu g/m^3$)	Receptor ID or Location	PC ($\mu g/m^3$)	PC as % of Objective / Target	PEC ($\mu g/m^3$)	Receptor ID or location	PEC as % of Objective / Target
MAXIMUM PREDICTED CONCENTRATION AT A SPECIFIC RECEPTOR							
Annual Mean NO_x	30	E6f	0.04	0.1%	12.52	E6m	41.7%
Max Daily Mean NO_x	75	E6e	1.08	1.4%	25.31	E6m	33.7%

Note: Results are the maximum concentrations predicted from the five different years of meteorological data

3.3 S3 - With Proposed CHP With SCR Scenario

Table 3.3 presents the maximum predicted annual and daily NOx concentrations, annual mean SO_2, winter mean SO_2 and annual mean NH_3 concentrations (from the five modelled meteorological years) for S3 (with selective catalytic reduction), at both the location where the PC was highest, and the location where the PEC was highest. The ecological receptors with the maximum values for annual mean NO_x, SO_2 and winter mean SO_2 are below the relevant objective and therefore considered to be insignificant. It is noted that whilst the maximum predicted annual mean NH_3 concentrations is above the annual mean objective of 3 µg/m^3, this is due to the background NH_3 concentrations at the receptor location already exceeding the annual mean objective. Given the maximum PC for annual mean NH_3 objective is well below the 1% screening criteria, the impacts of annual mean NH_3 concentrations arising from the CHP emissions are considered to be of negligible significance.

Table 3.3: 'With CHP With SCR' Ecological Results for the Maximum Predicted Pollutant Concentrations of the Five Years of Meteorological Data for Ecological Receptors

Pollutant & Averaging Period	AQS Objective / Target (µg/m^3)	Receptor ID or Location	PC (µg/m^3)	PC as % of Objective / Target	PEC (µg/m^3)	**Receptor ID or location**	PEC as % of Objective / Target
MAXIMUM PREDICTED CONCENTRATION AT A SPECIFIC RECEPTOR							
Annual Mean NO_x	30	E6f	0.03	0.1%	12.52	E6m	41.7%
Max Daily Mean NO_x	75	E6e	0.87	1.2%	25.25	E6m	33.7%
Annual Mean SO_2	20	E6f	0.0009	0.005%	2.33	E7c	11.65%
Winter Mean SO_2	20	E6f	0.0010	0.005%	2.33	E7c	11.65%
Annual Mean NH_3	3	E6f	0.0003	0.010%	3.80	E6e	126.68%

Note: Results are the maximum concentrations predicted from the five different years of meteorological data

3.4 S4 - With Proposed CHP with SCR and additional building

Table 3.4 presents the maximum predicted annual and daily NO_x concentrations, annual mean SO_2, winter mean SO_2 and annual mean NH_3 concentrations (from the five modelled meteorological years) for S4, at both the location where the PC was highest, and the location where the PEC was highest. The ecological receptors with the maximum values for annual mean NO_x, SO_2 and winter mean SO_2 are below the relevant objective and therefore considered to be insignificant. It is noted that the maximum predicted annual mean NH_3 concentrations is above the annual mean objective of 3 µg/m^3, but this is due to the background NH_3 concentrations at the receptor location already exceeding the annual mean objective. Given the maximum PC for annual mean NH_3 objective is well below the 1% screening criteria, the impacts of annual mean NH_3 concentrations are considered to be of negligible significance.

Table 3.4 'With CHP and SCR and the Additional Building' Maximum Predicted Pollutant Concentrations of the Five Years of Meteorological Data for Ecological Receptors

Pollutant & Averaging Period	AQS Objective / Target (µg/m^3)	Receptor ID or Location	PC (µg/m^3)	PC as % of Objective / Target	PEC (µg/m^3)	**Receptor ID or location**	PEC as % of Objective / Target
MAXIMUM PREDICTED CONCENTRATION AT A SPECIFIC RECEPTOR							

Pollutant & Averaging Period	AQS Objective / Target (µg/m$^{3)}$	Receptor ID or Location	PC (µg/m$^{3)}$	PC as % of Objective / Target	PEC (µg/m$^{3)}$	**Receptor ID or location**	PEC as % of Objective / Target
Annual Mean NO_x	30	E6f	0.03	0.1%	12.52	E6m	41.7%
Max Daily Mean NO_x	75	E6e	0.88	1.2%	25.24	E6m	33.7%
Annual Mean SO_2	20	E6e	0.0009	0.005%	2.33	E7c	11.65%
Winter Mean SO_2	20	E6e	0.0010	0.005%	2.33	E7c	11.65%
Annual Mean NH_3	3	E6f	0.0003	0.010%	3.80	E6e	126.68%

Note: Results are the maximum concentrations predicted from the five different years of meteorological data.

3.5 Nitrogen Deposition

Results obtained from the dispersion modelling have been used to calculate nitrogen deposition for the 'with CHP and SCR' scenario and results are summarised in Table 3.6.

As the 2018 AQA found that, at any of the discrete ecological receptor locations modelled, the largest annual NO_x PC was identified within the 2016 meteorological year, this year was used to identify the potential for air quality effects.

Whilst the total nitrogen deposition exceeds the lower critical loads, this would be the case with or without the proposed development because. background deposition is already in exceedance of the lower critical load.

The nitrogen deposition PC as a percentage of the lower critical load for all the ecological receptors considered in this addendum report are 1% or less, and therefore below the EA screening criteria referenced in Section 3.4.9 of the 2018 AQA.

Table 3.6: Nitrogen Deposition Contribution at the Ribble & Alt Estuaries SPA/Ramsar and Martin Mere SPA/Ramsar

Receptor ID	Receptor Location	Broad Habitat Type	PC from Dispersion Modelling (kgN/ha/yr)	PC as a Percentage of Lower Critical Load	Background deposition (kg N/ha/yr)	Total deposition kg N/ha/yr	Potential Critical Load Exceedance
e6a	Ribble & Alt Estuaries SPA/Ramsar	Coastal saltmarsh	0.0017	0.01%	27.300	27.302	137%
e6b		Coastal saltmarsh	0.0027	0.01%	27.300	27.303	137%
e6c		Coastal saltmarsh	0.0037	0.01%	27.300	27.304	137%
e6e		Coastal saltmarsh	0.0040	0.01%	27.300	27.304	137%
e6f		Coastal saltmarsh	0.0041	0.02%	21.000	21.004	105%
e6g		Coastal saltmarsh	0.0029	0.01%	21.000	21.003	105%

Receptor ID	Receptor Location	Broad Habitat Type	PC from Dispersion Modelling (kgN/ha/yr)	PC as a Percentage of Lower Critical Load	Background deposition (kg N/ha/yr)	Total deposition kg N/ha/yr	Potential Critical Load Exceedance
e6h		Coastal saltmarsh	0.0022	0.01%	21.000	21.002	105%
e6i		Coastal saltmarsh	0.0017	0.01%	21.000	21.002	105%
e6j		Coastal saltmarsh	0.0020	0.01%	16.240	16.242	81%
e6k		Coastal and floodplain grazing marsh	0.0029	0.02%	16.240	16.243	81%
e6l		Coastal saltmarsh	0.0017	0.01%	11.760	11.762	59%
e6m		Coastal saltmarsh	0.0012	0.01%	11.760	11.761	59%
e7a	Martin Mere SPA/Ramsar	Lowland fens	0.0009	0.00%	17.360	17.361	174%
e7b		Lowland meadows	0.0010	0.01%	16.520	16.521	83%
e7c		Lowland meadows	0.0008	0.00%	17.360	17.361	87%
e7d		Lowland meadows	0.0008	0.00%	17.360	17.361	87%

4. SUMMARY OF SIGNFICANCE

An additional air quality assessment has been undertaken to consider the potential impact of the proposed CHP at the Ribble & Alt Estuaries SPA/Ramsar and the Martin Mere SPA/Ramsar. The assessment has considered annual mean NO_x, annual mean NH_3, annual mean SO_2, winter mean SO_2 and daily mean NO_x concentrations for 5 scenarios.

The assessment indicates that, predicated annual mean NO_x, annual mean SO_2, winter mean SO_2 and daily mean NO_x concentrations will all be well below the relevant objectives with the proposed CHP in place. Therefore, it is concluded that the proposed CHP will have negligible impacts on annual mean NO_x, annual mean SO_2, winter mean SO_2 and daily mean NO_x concentrations. It is noted that for two of the modelled scenarios (i.e. S3 and S4), the maximum predicted annual mean NH_3 concentrations are above the annual mean objective of 3 µg/m^3. These exceedances are due to the elevated background NH_3 concentrations at the receptor locations already exceeding the annual mean objective. Given that the maximum PC for annual mean NH_3 contributions from the CHP are well below the 1% screening criteria, the impacts of annual mean NH_3 concentrations are considered to be of negligible significance.

Results obtained from the dispersion modelling have been used to calculate nitrogen deposition for the 'with CHP and SCR' scenario. Whilst the total nitrogen deposition exceeds the lower critical loads for receptor e6a-e6i, this is due to the background deposition which is already in exceedance of the lower critical load. The nitrogen deposition PC as a percentage of the lower critical load for all the ecological receptors considered in this addendum report

are well below the 1% EA screening criteria. Therefore, it is considered that the proposed CHP contribution will have a negligible impact on nitrogen deposition at the Ribble & Alt Estuaries SPA/Ramsar and the Martin Mere SPA/Ramsar.

Based on above, the proposed CHP is considered to have negligible impact on the Ribble & Alt Estuaries SPA/Ramsar and the Martin Mere SPA/Ramsar.

Yours sincerely,

For RSK Environment Ltd

Prepared by:	Reviewed by:
Erin Zhang	Daniel Mullick
Senior Air Quality Consultant	Senior Air Quality Consultant

Appendix A

Figure 1: Location of the Proposed Development Site

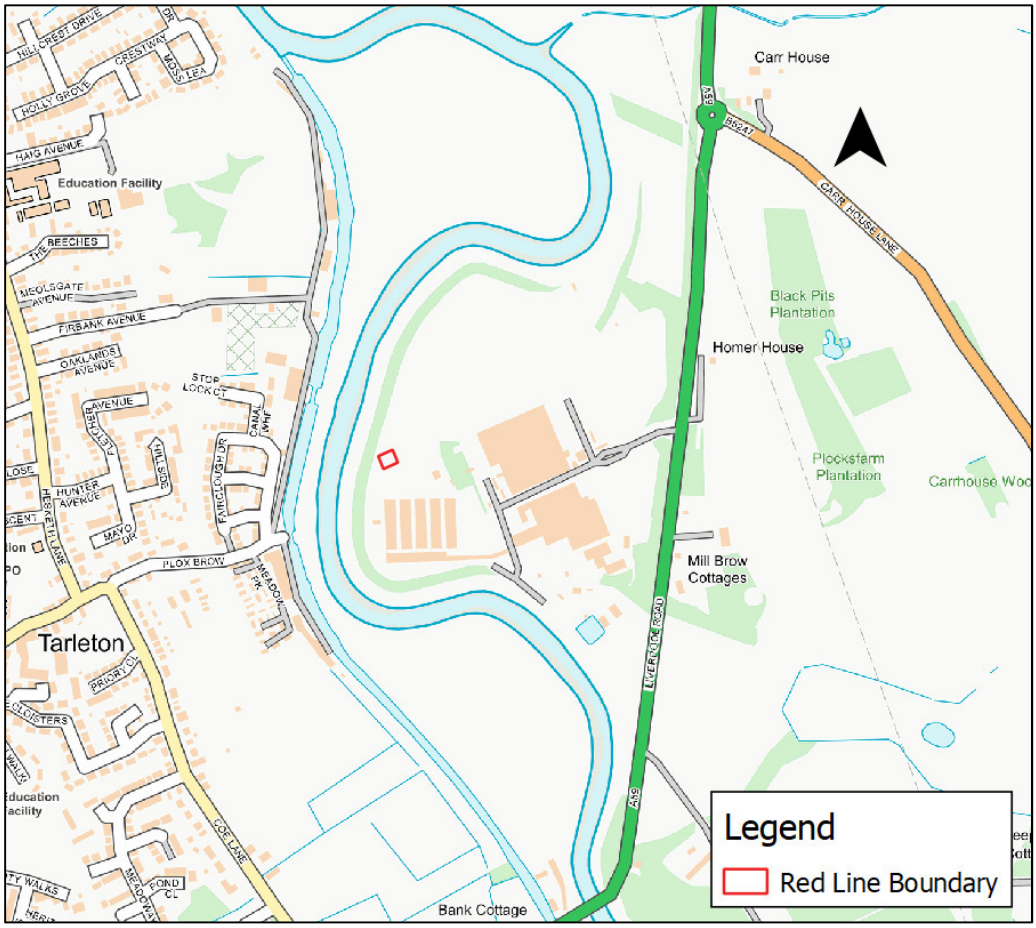

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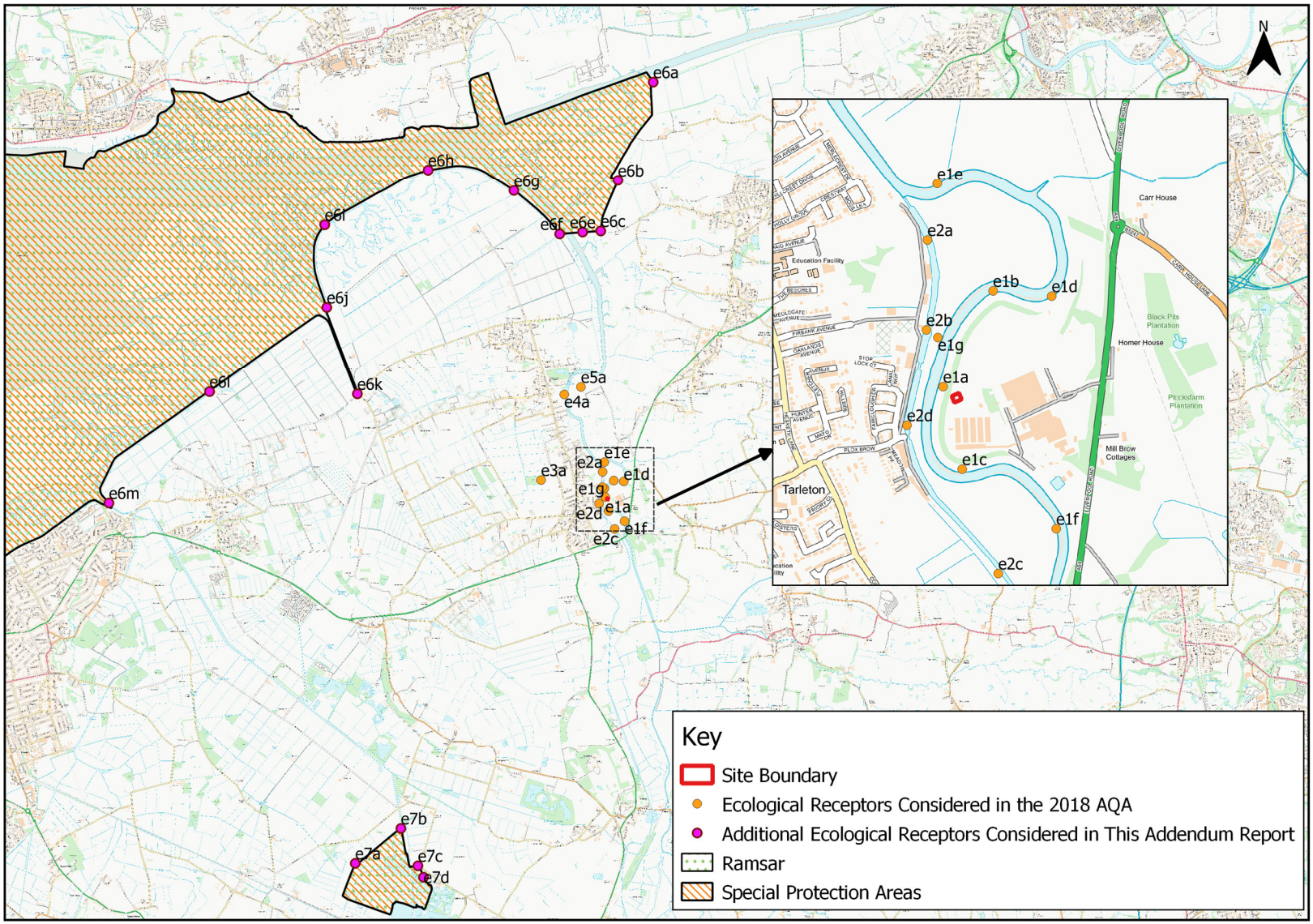
Figure 2: Additional Ecological Receptors Considered in this Addendum Report



Appendix B

2018 RSK Air Quality Assessment Report
Ref: 443094-AQ-01(01)

GA Pet Food Partners

Liverpool Road, Bretherton

Air Quality Assessment for a Proposed Combined Heat and Power Plant

443094-AQ-01(01)

November 2018

RSK GENERAL NOTES

Report No: 443094-AQ-01(01)

Title: Air Quality Assessment for a Proposed Combined Heat and Power Plant, Liverpool Road, Bretherton

Client: GA Pet Food Partners

Date: 28th November 2018

Office: Manchester

Status: Final

Authors	Emma Woodrow Graduate Air Quality Consultant	**Technical reviewer**	Anna McMahon Senior Air Quality Consultant
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Date:	29.11.2018	Date:	29.11.2018

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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK Group Ltd.

Summary

An air quality assessment of proposed Combined Heat and Power Plant (CHP) Liverpool Road, within the Golden Acres (GA) Pet Food site in Preston has been undertaken with reference to existing air quality in the area and relevant air quality legislation, policy and guidance.

An assessment of construction phase impacts has been undertaken following the 2014 Institute of Air Quality Management (IAQM) guidance. Demolition does not form part of this development and was screened out. The potential risk of construction phase impacts and earthworks on local air quality was predicted to be negligible for dust soiling and human health, prior to the implementation of dust control measures. Trackout has a negligible to low risk on dust soiling and human health. Mitigation measures have been recommended to reduce the risk of dust and particulate matter being generated and re-suspended. With implementation of the appropriate measures, construction activities are not anticipated to have a significant impact on air quality.

The main potential air quality impact once the proposed development is operational considered to be emissions from the operation of the proposed CHP. An assessment of operational impacts has been undertaken using ADMS-5.2, an advanced atmospheric dispersion model developed for regulatory purposes, with the use of meteorological data predicted between 2013 and 2017 using the Global Forecast System (GFS). Buildings/structures have been included to account for the effects of downwash and terrain data also included. Concentrations of key air pollutants (nitrogen oxides (NO_x), nitrogen dioxides (NO_2) and carbon monoxide (CO)) have been predicted at discrete human and ecological receptor locations, as applicable. Sulphur dioxide (SO_2) and ammonia (NH_3) impacts have been considered for the scenarios where selective catalytic reduction (SCR) has been incorporated into the development.

The highest predicted impacts at any of the modelled off-site discrete receptor locations in any of the five modelled meteorological years have been reported and compared to the relevant Air Quality Strategy (AQS) objectives. There were no predicted exceedances of any of the objectives for humans at the modelled discrete receptor locations in any of the modelled meteorological years.

In order to assess the impact of increases in pollutant concentrations attributable to the proposed development on existing sensitive receptors, an impact assessment in accordance with the 2017 Environmental Protection UK (EPUK)-IAQM guidance was undertaken. The impact of the proposed development on all the pollutants considered at the modelled discrete human receptor locations was assessed as negligible .

The development was assessed as having a minimal impact at the majority of local ecologically sensitive sites, with regards to nitrogen and acid deposition, and ambient annual and daily mean NO_x concentrations. The greatest impact at an ecological site is predicted at the Leeds/Liverpool Canal Biological Heritage Site (BHS) and the River Douglas BHS for maxiumum daily NOx and nitrogen deposition, however when impacts are considered across the whole of this BHS the impacts are significantly reduced.

The assessment has concluded that taking the conservative nature of the assessment into account, the overall impact on local air quality is considered to be insignificant.

Abbreviations

APIS	Air Pollution Information System
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
BHS	Biological Heritage Site
CBC	Chorley Borough Council
CO	Carbon Monoxide
CHP	Combined Heat and power Plant
Defra	Department for Environment, Food and Rural Affairs
EA	Environment Agency
EC	European Commission
EPUK	Environmental Protection UK
EU	European Union
GA	Golden Acres
HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
LERN	Lancashire Environment Record Network
NAQS	National Air Quality Strategy
NH_3	Ammonia
NPPF	National Planning Policy Framework
NO_2	Nitrogen dioxide
NOx	Oxides of nitrogen
O_3	Ozone
PC	Process Contribution
PEC	Predicted Environmental Concentration
$PM_{2.5}$	Particulate matter of size fraction approximating to <2.5mm diameter
PM_{10}	Particulate matter of size fraction approximating to <10mm diameter
SO_2	Sulphur Dioxide
WLBC	West Lancashire Borough Council

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1 INTRODUCTION

1.1 Background

RSK Environment Ltd (RSK) was commissioned to undertake an air quality impact assessment of proposed combined heat and power plant (CHP), Liverpool Road, Bretherton (the proposed site).

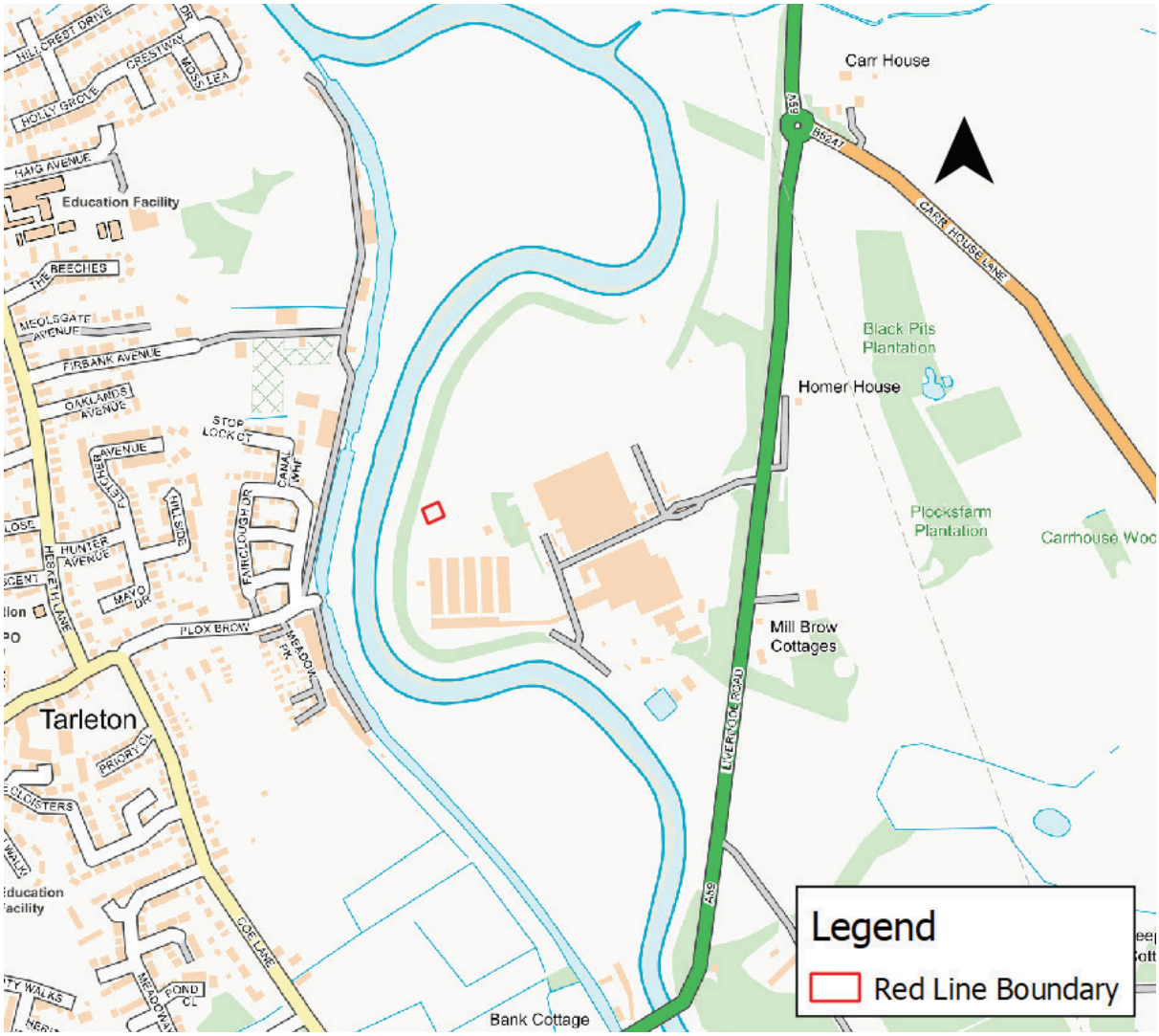
The proposed development involves a building approximately 0.05 ha in size, and the proposed site lies within the Golden Acres (GA) Pet Food site in Preston. The approximate grid reference of the centre of the proposed site is 345752, 420934. Figure 1.1 shows the site location including the red line boundary of the site. The proposed site falls within the jurisdiction of Chorley Borough Council (CBC) and directly adjacent to West Lancashire Borough Council (WLBC).

Potential impacts of the Combined Heat and Power Plant (CHP) has been assessed using an advanced air dispersion model. This report presents the findings of an assessment of existing/baseline air quality conditions and the predicted impacts from the proposed CHP once it is fully operational, as well as potential impacts during the construction phase.

1.2 Proposed Development

The proposed development is to be part of Golden Acre Pet Food Partners pet food manufacturing plant and consists of a new CHP which has been assumed to run constantly throughout the year. The fuel for the proposed CHP is natural gas with a thermal output of 3129kW.

Figure 1.1: Site Location Plan



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2 LEGISLATION, POLICY CONTEXT AND GUIDANCE

2.1 Air Quality Strategy

UK air quality policy is published under the umbrella of the Environment Act 1995, Part IV and specifically Section 80, the National Air Quality Strategy (NAQS). The latest *Air Quality Strategy for England, Scotland, Wales and Northern Ireland – Working Together for Clean Air*, published in July 2007 sets air quality standards and objectives for ten key air pollutants to be achieved between 2003 and 2020.

The Air Quality Framework Directive (1996) established a framework under which the European Commission (EC) could set limit or target values for specified pollutants. The directive identified several pollutants for which limit or target values have been, or will be set in subsequent 'daughter directives'. The framework and daughter directives were consolidated by Directive 2008/50/EC on Ambient Air Quality And Cleaner Air for Europe, which retains the existing air quality standards and introduces new objectives for fine particulates ($PM_{2.5}$).

2.1.1 Air Quality Standards

The air quality standards in the United Kingdom are derived from EC directives and are adopted into English law via the Air Quality (England) Regulations 2000 and Air Quality (England) Amendment Regulations 2002. The Air Quality Limit Values Regulations 2003 and subsequent amendments implement the Air Quality Framework Directive into English Law. Directive 2008/50/EC was translated into UK law in 2010 via the Air Quality Standards Regulations 2010.

The relevant[1] standards for England and Wales to protect human health and vegetation and ecosystems are summarised in Table 2.1: .

Table 2.1: : Air Quality Standards Relevant to the Proposed Development (referred to as Air Quality Strategy (AQS) objectives throughout report)

Substance	Averaging period	Exceedances allowed per year	Ground level concentration limit (µg/m^3)
Human Receptors			
Nitrogen dioxide (NO_2)	1 calendar year	N/A	40
	1 hour	18	200
Carbon Monoxide (CO)	8 hour running average across a 24 hour period	N/A	10000

[1] Relevance, in this case, is defined by the scope of the assessment.

Substance	Averaging period	Exceedances allowed per year	Ground level concentration limit (µg/m^3)
SO_2	1-hour mean	24	350
	24-hour mean	3	125
	15-minute mean	25	266
Ecological Receptors			
Nitrogen oxides (NO_x)	1 year	N/A	30
SO_2	Annual mean	N/A	20
	Winter Mean	N/A	20

2.1.2 The Environment Act

The set AQS objectives are to be used in the review and assessment of air quality by local authorities under Section 82 of the Environment Act (1995). If exceedances are measured or predicted through the review and assessment process, the local authority must declare an Air Quality Management Area (AQMA) under Section 83 of the act, and produce an Air Quality Action Plan (AQAP) to outline how air quality is to be improved.

2.2 Planning Policy

The land use planning process is a key means of improving air quality, particularly in the long term, through the strategic location and design of new developments. Any air quality concern that relates to land use and its development can, depending on the details of the proposed development, be a material consideration in the determination of planning applications.

2.2.1 National Planning Policy Framework

In July 2018 the revised National Planning Policy Framework (NPPF) was published, superseding the previous 2012 NPPF with immediate effect. The NPPF includes a presumption in favour of sustainable development.

Section 11 of the NPPF deals with Conserving and Enhancing the Natural Environment, and states that the intention is that the planning system should prevent *"development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability" and goes on to state that 'new development [should be] appropriate for its location" and "the effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account."*

With specific regard to air quality, the NPPF states that:

> *"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, such as through traffic and travel management, and green infrastructure provision and enhancement. 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. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."*

2.2.2 Local Planning Policy

The Chorley Local Plan 2012 – 2026 (adopted 21st July 2015) mentions Policy 30, Air Quality of the Central Lancashire Adopted Core Strategy, Local Development Framework (2012).

Policy 30 – Air Quality aims to:

> *'Improve air quality through delivery of Green Infrastructure initiatives and through taking account of air quality when prioritising measures to reduce road traffic congestion.'*

The West Lancashire Local Plan 2012-2027 (adopted 16th October 2013) includes Policy GN3, Criteria for Sustainable Development which states:

> *"…proposals for development should:*
>
> *i. Be designed to minimise any reduction in air quality…*
>
> *… v. Minimise the risk from all types of pollution and contamination…"*

2.3 Guidance

2.3.1 Guidance on the Assessment of Dust from Demolition and Construction

The Institute of Air Quality Management (IAQM) published a guidance document in 2014 (Holman *et al.*, 2014) on the assessment of construction phase impacts. The guidance was produced to provide advice to developers, consultants and environmental health officers on how to assess the impacts arising from construction activities. The emphasis of the methodology is on classifying sites according to the risk of impacts (in terms of dust nuisance, PM_{10} impacts on public exposure and impact upon sensitive ecological receptors) and to identify mitigation measures appropriate to the level of risk identified.

2.3.2 Local Air Quality Management Review and Assessment Technical Guidance

The Department for Environment, Food and Rural Affairs (Defra) has published technical guidance for use by local authorities in their air quality review and assessment work. This guidance, referred to in this document as LAQM.TG(16), has been used where appropriate.

2.3.3 Land-Use Planning & Development Control: Planning for Air Quality

Environmental Protection UK (EPUK) and the IAQM jointly published a revised version of the guidance note 'Land-Use Planning & Development Control: Planning for Air Quality' in 2017 (herein the 'EPUK-IAQM' guidance) to facilitate the consideration of air quality in the land-use planning and developmental control process. It provides a framework for air quality considerations within local development control processes, promoting a consistent approach to the treatment of air quality issues within development control decisions.

The guidance includes a method for screening the requirement for an air quality assessment, undertaking the air quality assessment, the determination of the air quality impact associated with a development proposal and whether this impact is significant.

2.3.4 Environment Agency: Risk Assessments for Specific Activities: Environmental Permits

The Air Emissions section of this Environment Agency (EA) guidance has been referred to in the assessment of emissions to air from the proposed development, where appropriate. This EA guidance includes a number of Environmental Assessment Levels (EALs) for human receptors and target Predicted Environmental Concentrations (PECs) for ecological receptors. EALs and target PECs relevant to this assessment are presented in Table 2.2.

Table 2.2: EA Guidance EALs and Target PECs

Pollutant	Guidance EALs ($\mu g/m^3$)	Target PECs ($\mu g/m^3$)
Human Objectives		
1 hour CO	30,000	
Annual NH_3	180	
Hourly NH_3	2,500	
Ecological Objectives		
Daily NOx		75
Annual NH_3		1 (where lichens or bryophytes are present) 3 (where lichens or bryophytes are not present)

2.3.5 AQTAG06: Technical Guidance on Detailed Modelling Approach for an Appropriate Assessment for Emissions to Air

The AQTAG06 guidance provides technical guidance on how to approach detailed modelling of emissions to air when considering impacts on ecological receptors; of particular relevance to this assessment it includes guidance on the calculation of deposition fluxes to allow nitrogen and acid deposition to be assessed.

3 ASSESSMENT SCOPE & METHODOLOGY

3.1 Overall Approach

The approach taken for assessing the potential air quality impacts of the proposed development may be summarised as follows:

- Baseline characterisation of local air quality;
- Qualitative impact assessment of the construction phase of the development using the 2014 IAQM guidance;
- Quantitative assessment of air quality impacts during the operational phase of the proposed development using detailed dispersion modelling assessment of exhaust emissions from the proposed engines on human receptors and at ecologically sensitive sites;
- Recommendation of mitigation measures, where appropriate, to ensure any adverse effects on air quality are minimised; and,
- Identification of residual impacts resulting from the proposed development.

3.2 Baseline Characterisation

Existing or baseline air quality refers to the concentrations of relevant substances that are already present in ambient air. A desk-based study has been undertaken including a review of monitoring data available from CBC and WLBC and estimated background data from the LAQM Support website maintained by Defra. Background concentrations have been mapped by Defra at a grid resolution of 1x1km for the whole of the UK.

3.3 Construction Phase Assessment

3.3.1 Construction Dust and Particulate Matter

Construction works for the proposed development have the potential to lead to the release of fugitive dust and particulate matter. An assessment of the likely significant effects of construction phase dust and particulate matter at sensitive receptors has therefore been undertaken following the IAQM construction dust guidance.

In order to assess the potential impacts construction activities are divided into four types:

- Demolition;
- Earthworks;
- Construction; and

- Trackout[2].

Appendix A details how the 'dust emission magnitude' associated with each of these activities, is combined with the sensitivity of receptors (human or ecological), to determine the overall 'dusk risk'. Once the level of risk has been determined, then site specific mitigation proportionate to the level of risk can be identified.

3.3.2 Emissions to Air from Construction Traffic

Exhaust emissions from construction phase vehicles may have an impact on local air quality adjacent to the routes used by these vehicles to access the application site and in the vicinity of the application site itself. A qualitative assessment of their impact on local air quality has been undertaken using professional judgement and by considering the following:

- The potential number and type of construction traffic and plant likely to be generated by this phase of the Proposed Development;
- The number and proximity of sensitive receptors to the application site and along the likely routes to be used by construction vehicles; and
- The likely duration of the construction phase and the nature of the construction activities undertaken.

3.4 Operational Phase Assessment

3.4.1 Operational Phase Emissions from Proposed CHP Plant

As the proposed development is a CHP plant, detailed dispersion modelling was considered appropriate to assess the potential impacts on local air quality at sensitive receptors, once operational. The key air pollutants of concern for the operation of the proposed development are NO_x, NO_2 and CO. The proposed plant is natural gas fuelled, and existing boilers are also fuelled by natural gas. Natural gas is a clean-burning fuel and emits insignificant quantities of particulate matter, and hence the assessment PM_{10} is not required. It is understood that the proposed plant will include Selective Catalytic Reduction (SCR) and emission limits were also provided for SO_2 and NH_3 therefore they have also been included within this assessment.

As the development already has staff to be based at the site and due to the nature of the CHP plant, it is considered unlikely that there would be any significant increase in traffic related to the proposed development, and this has not been considered further within the assessment. RSK are not aware of any committed or consented developments in the area with significant emissions to air, and therefore it is proposed that the air quality impacts of this proposed development during the operational phase are considered in isolation.

[2] Trackout is defined as the transport of dust and dirt from the construction / demolition sites onto the public road network (or vehicles entering and leaving the site), where it may be deposited and then re-suspended by vehicles using the network.

The following subsections provide further information regarding input to the dispersion model including emissions sources, meteorological data and receptors/study area included.

3.4.2 Modelling Software

ADMS 5 (version 5.2.1) was used for assessing the air quality impacts of point source emissions during the operational phase of the proposed development.

3.4.3 Emission Sources

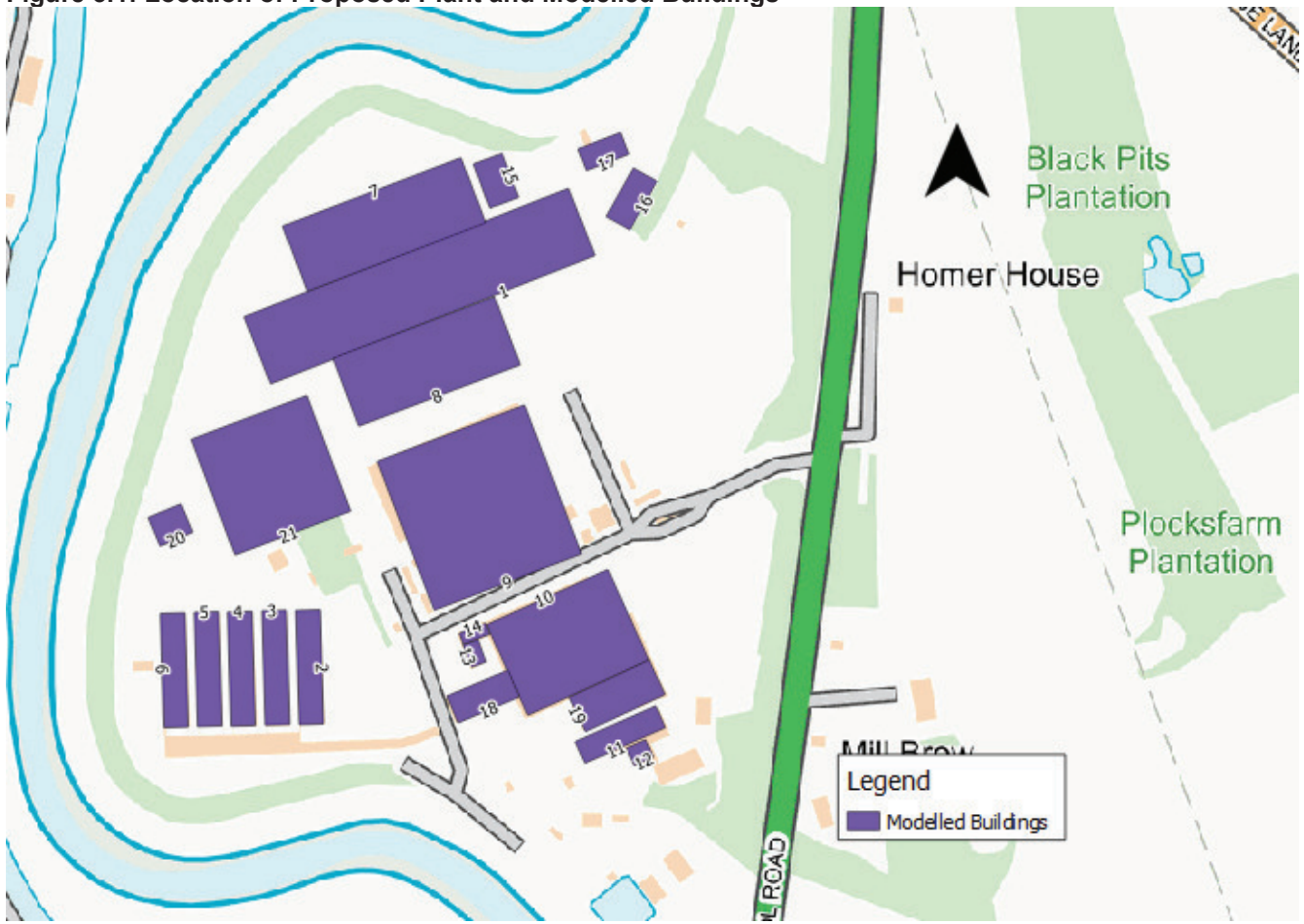
RSK was provided information on the physical and emissions parameters of the plant to be installed at site. It is understood that 3 existing boiler (>1MW) are already operational on-site, these have therefore been included in the modelling assessment as part of the baseline scenario and all future scenarios. One CHP engine (approximately 3.13MW) is proposed to be installed with one flue above roof level. Table 3.1 presents the physical and emission characteristics of the existing boilers and proposed CHP modelled within this assessment. The locations of these point sources are presented in Figure 3.1.

The emission rates for existing boilers were unknown and therefore emission limits for existing natural gas boilers from the Medium Combustion Plant (MCP) Directive were utilised along with known parameters to calculate the emission rates.

Table 3.1: Physical and Emission Characteristics of Point Sources included in the Assessment

Description	Existing 2490kW Beevor Boiler	Existing 2930kW Beevor Boiler	Existing 1700kW Robey Boiler	Proposed CHP (with SCR)
Stack height (m above ground level)	10	10	12	15
Stack diameter (m)	0.4	0.4	0.4	0.6
Stack exhaust temperature (°C)	375	372	410	386
Stack velocity (m/s)	19.02	20.44	10.98	22.47
Total nitrogen oxides emission rate (g/s)	0.2517	0.2718	0.1379	0.4061 (0.1543)
Total CO emission rate (g/s)	0.1113	0.1202	0.0610	1.7057 (0.1624)
Total SO_x emission rate (g/s)	N/A	N/A	N/A	(0.0244)
Total NH_3 emission rate (g/s)	N/A	N/A	N/A	(0.0081)

Figure 3.1: Location of Proposed Plant and Modelled Buildings



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The following scenarios have been modelled:

- **Baseline** – the scenario without the proposed development;
- **Proposed CHP with no SCR** – the scenario with the proposed CHP without selective catalytic reduction (SCR);
- **Proposed CHP with SCR** - the scenario with the proposed CHP with SCR; and,
- **Proposed CHP with SCR and additional building** - the scenario with the proposed CHP with SCR and an additional building (building 21) included.

It is understood that SCR will be included as part of the proposed development, so the scenario without the SCR is included for comparison purposes only. Building 21 is a proposed meat kitchen which is expected to be constructed in the future but is unlikely to happen for a few years yet. It has been included as a sensitivity test to ensure that once it is on-site it doesn't adversely affect the dispersion of the proposed CHP emissions

For all scenarios, operation of existing and proposed plant included within the model is assumed to be operational 24-hours per day, 365 days per year, with the exception of the Robey gas boiler which is a backup boiler. This runs occasionally when production demands. For a conservative approach, the modelling has assumed the Robey boiler runs constantly for 3 months during the winter period and off for the rest of the year.

3.4.4 Buildings

In order to capture the potential influence of buildings/structures on the dispersion profile of combustion emissions (e.g. building 'wake' and downwash effects), buildings surrounding the development and those proposed as part of the development were included in the dispersion model. The locations and heights of these buildings/structures are listed in Table 3.1. Figure 3.1 shows the location of the buildings.

Building 20 is the new building which will contain the proposed CHP. This is included in all models except the baseline model. Building 21 is included in the 'Proposed CHP with SCR and additional building' scenario. There are plans for this to be built in the future so it has been included within this assessment for a conservative approach.

Table 3.1: Building Details included in the Dispersion Model

Building	Grid Ref, X	Grid Ref, Y	Height, m
Existing Buildings			
1	345841.93	420790.85	4
2	345820.23	420790.55	4
3	345798.33	420789.85	4
4	345776.93	420789.65	4
5	345755.33	420788.95	4
6	345998.63	421133.40	19.4

Building	Grid Ref, X	Grid Ref, Y	Height, m
7	345929.82	421152.950	18.15
8	345951.25	421064.04	19.4
9	345970.49	420994.83	12
10	346023.89	420889.58	15
11	346054.55	420802.35	11
12	346048.11	420780.77	11
13	345940.69	420844.85	11
14	345945.58	420855.20	19
15	345956.13	421155.75	10
16	346040.25	421146.39	13
17	346031.92	421169.16	11
18	345967.26	420808.22	15
19	346050.27	420831.68	15
New/proposed buildings			
20	345729.79	420922.77	3.32
21	345831.20	421000.85	16

3.4.5 Meteorological Data

It is acknowledged that there are difficulties in sourcing representative weather data for this area using conventional weather recording stations. The meteorological data used in this study is obtained from assimilation and short-term forecast fields of the Numerical Weather Prediction (NWP) system known as the Global Forecast System (GFS).

The GFS is a spectral model and data are archived at a horizontal resolution of 0.25 degrees, which is approximately 25 km over the UK (formerly 0.5 degrees, or approximately 50 km). The GFS resolution adequately captures major topographical features and the broad-scale characteristics of the weather over the UK. Smaller scale topographical features may be included in the dispersion modelling by using the flow field module of ADMS (FLOWSTAR) using digital terrain data. The wind rose for the weather file, derived from data from the GFS data is shown in Appendix B. This shows the direction from which winds blows and illustrates the relative frequency of wind directions and wind speeds used in the modelling study.

3.4.6 Terrain

Ordnance Survey digital terrain data were included in the assessment to account for topographical features of the land covering the model domain.

3.4.7 Background Air Quality Data Used in the Modelling

Background NO_2 concentrations for the study area have been taken from the national maps provided by Defra. These maps provide estimated background concentrations for the whole of the UK at a grid resolution of 1km x1km, for 2015 to 2030. The maps assume that background concentrations will improve (i.e. reduce) over time, in line with

the predicted reduction in vehicle emissions as well as reductions in emissions from other sources. Due to the current uncertainty in the assumed reductions, background concentrations for 2018 have been considered rather than the anticipated opening year of the proposed development. This is considered a conservative approach.

Annual mean CO and SO_2 concentrations have been taken from the 2001 LAQM Support / UK-AIR background maps, as these are the latest datasets available for CO and SO_2. For this assessment it has been assumed that there has been no reduction in these background concentrations since 2001 to provide a worst-case assessment.

Background NOx, NH_3, acid deposition and nitrogen deposition values were taken from the Air Pollution Information System (APIS) website. The gird references and a habitat type for each ecological receptor were entered into the search tool in order to obtain background concentrations for the relevant grid squares foreach receptor.

Background concentrations used within the assessment are presented in the baseline section in Table 4.1 – 4.3.

3.4.8 Receptor Locations and Model Domain

Pollutant concentrations were predicted at a number of receptors at existing sensitive locations. Details of all specific receptors included in the modelling study are summarised in Table 3.2 and shown in Figure 3.2. All receptors were modelled at ground level to allow for a conservative assessment. Ecological data within 10km of the proposed CHP was provided by Lancashire Environment Record Network (LERN) and selected using the following criteria from the EA guidance '*Air emissions risk assessment for your environmental permit*' as follows:

- Special Protection Areas (SPAs), Special Areas of Conservation (SACs) or Ramsar sites (protected wetlands) within 10km of the site;
- Sites of Special Scientific Interest (SSSIs), local nature sites (ancient woods, Local Wildlife Sites (LWSs) and National and Local Nature Reserves) within 2km of the site.

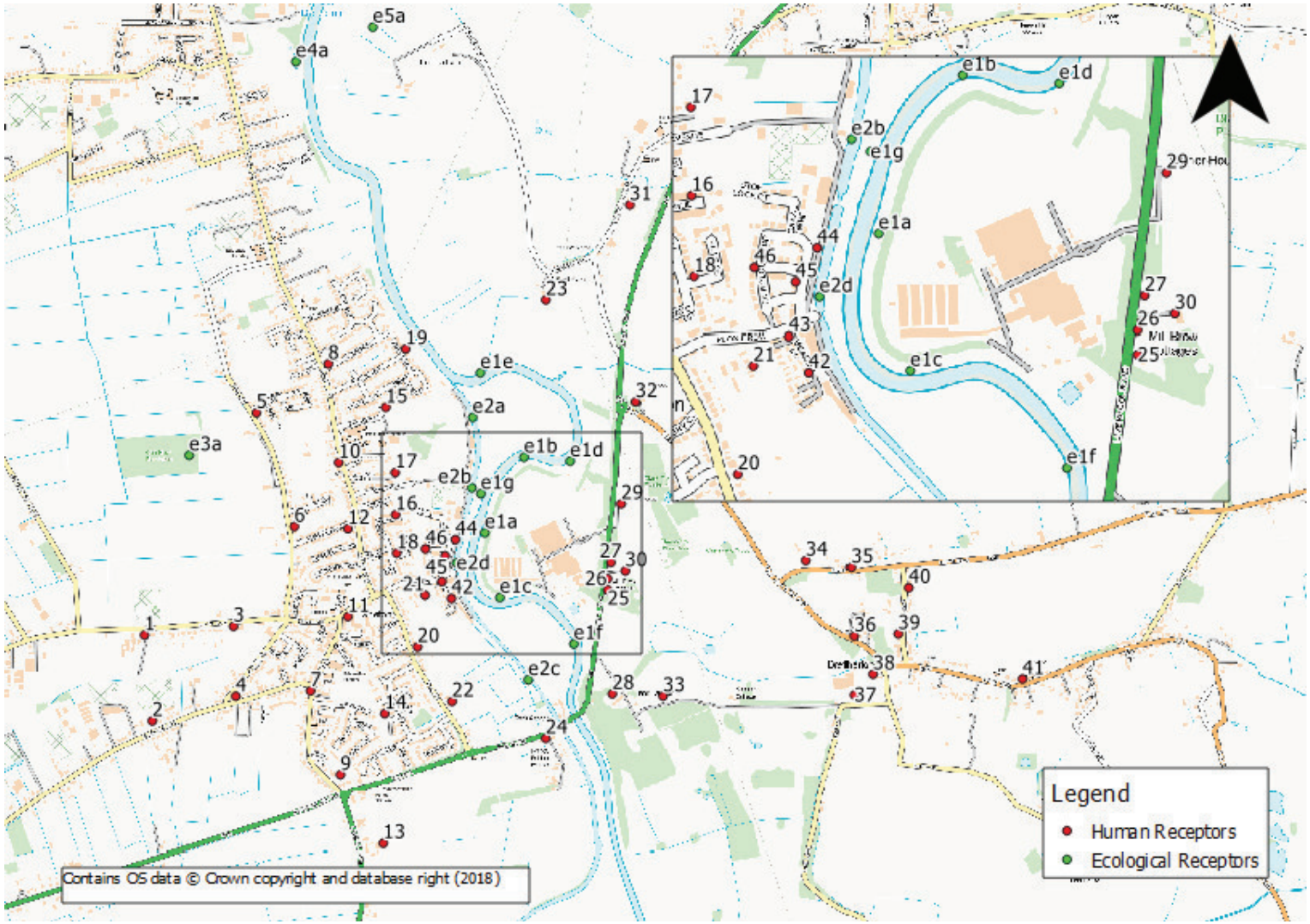
Furthermore, for the purpose of considering potential impacts at a greater number of locations by producing isopleths (pollution concentration contours), for the predicted annual and short-term concentrations, hypothetical grid receptors spaced at 50m covering approximately a domain of 4 x 4km approximately centres over the proposed site have also been included, with a more detailed grid of approximately 20m spacing covering a domain of approximately 2 by 2km. Concentrations were modelled at 1.5m for objectives relevant to human receptors and at ground level (0m) for objectives relevant to ecological receptors for these grids of receptors.

Table 3.2: Receptors Included in the Dispersion Modelling Assessment

Receptor ID	Receptor Location	Grid reference		Height
		X	Y	Z
Human Receptors				
R1	Gorse Lane	344457.50	420575.45	1.5
R2	Blackgate Lane	344486.08	420260.65	1.5
R3	Gorse Lane	344783.76	420607.46	1.5
R4	Blackgate Lane	344792.16	420351.26	1.5
R5	Carr Lane	344867.85	421390.06	1.5
R6	Sutton Lane	345007.07	420973.16	1.5
R7	Church Road	345066.10	420370.77	1.5
R8	Sutton Avenue	345131.39	421569.10	1.5
R9	Church Road	345176.01	420063.43	1.5
R10	Hesketh lane	345169.38	421207.68	1.5
R11	Gorse Lane	345203.02	420643.09	1.5
R12	Kearsley Avenue	345203.15	420965.21	1.5
R13	Liverpool Road	345332.96	419812.93	1.5
R14	Meadoway	345338.29	420287.33	1.5
R15	Haig Avenue	345342.09	421409.97	1.5
R16	Fletcher Avenue	345377.89	421016.52	1.5
R17	Meolsgate Avenue	345376.64	421171.05	1.5
R18	Hillside	345382.09	420875.31	1.5
R19	Merlecrest Drive	345414.82	421623.80	1.5
R20	Coe Lane	345458.58	420532.02	1.5
R21	Plox Brow	345485.91	420721.34	1.5
R22	Coe Lane	345585.18	420332.15	1.5
R23	Mill Hill Farm	345928.84	421803.87	1.5
R24	Banks Bridge House	345928.52	420196.80	1.5
R25	Liverpool Road	346155.27	420740.83	1.5
R26	Liverpool Road	346155.00	420781.89	1.5
R27	Liverpool Road	346167.55	420841.71	1.5
R28	Bank Hall Farm	346172.63	420359.87	1.5
R29	Homer House	346205.59	421056.34	1.5
R30	Liverpool Road	346220.31	420810.41	1.5
R31	Liverpool Old Road	346236.86	422152.18	1.5
R32	Carr House	346257.89	421430.04	1.5
R33	Bank Hall Farm	346358.89	420351.59	1.5
R34	North Road	346881.99	420848.81	1.5
R35	North Road	347043.72	420823.38	1.5
R36	Bretherton, Carr House Lane	347054.00	420571.46	1.5
R37	Eyes lane	347054.51	420355.85	1.5
R38	Bretherton, Carr House Lane	347122.94	420431.87	1.5
R39	Pompian Brow	347215.45	420579.72	1.5

Receptor	Receptor Location	Grid reference		Height
R40	Pompian Brow	347253.70	420748.69	1.5
R41	South Road, Education Facility	347670.87	420414.31	1.5
R42	Meadow Park	345582.80	420709.33	1.5
R43	Meadow Park	345547.83	420771.79	1.5
R44	Fairclough Drive	345597.35	420925.25	1.5
R45	Fairclough Drive	345559.84	420865.82	1.5
R46	Fairclough Drive	345487.44	420891.04	1.5
Ecological Receptors				
e1a	River Douglas Estuary (BHS)	345705.00	420950.00	0
e1b	River Douglas Estuary (BHS)	345849.00	421227.00	0
e1c	River Douglas Estuary (BHS)	345760.00	420713.00	0
e1d	River Douglas Estuary (BHS)	346018.00	421212.00	0
e1e	River Douglas Estuary (BHS)	345688.00	421536.00	0
e1f	River Douglas Estuary (BHS)	346031.00	420542.00	0
e1g	River Douglas Estuary (BHS)	345690.00	421093.00	0
e2a	Leeds/Liverpool Canal (BHS)	345660.00	421373.00	0
e2b	Leeds/Liverpool Canal (BHS)	345657.00	421115.00	0
e2c	Leeds/Liverpool Canal (BHS)	345864.00	420411.00	0
e2d	Leeds/Liverpool Canal (BHS)	345601.00	420839.00	0
e3a	Carr Heys Plantation (DWS)	344621.00	421234.00	0
e4a	Hesketh Bank Brickworks (BHS)	345012.00	422676.00	0
e5a	Disused Railway (BHS)	345294.00	422803.00	0

Figure 3.2: Modelled Receptor Locations



3.4.9 Processing Results and NO_x/NO_2 Chemistry

NO_x emitted to the atmosphere as a result of combustion will consist largely of nitric oxide (NO), a relatively innocuous substance. Once released into the atmosphere, NO is oxidised to NO_2, which is of concern with respect to health and other impacts. The proportion of NO converted to NO_2 depends on a number of factors including wind speed, distance from the source, solar irradiation and the availability of oxidants, such as O_3. The dispersion modelling exercise predicts concentrations of NO_x which subsequently require conversion to NO_2. The conversion rate of NO_x to NO_2 used in this assessment is 70% for long term emissions and 35% for short term emissions as per guidance provided by the advice note for conversion ratios for NOx and NO2 from the EA (date unknown).

The total pollutant concentrations (Predicted Environmental Concentrations (PECs)) are calculated from the Process Contribution (PC) as follows:

- Long term standards: PEC = PC + Background Concentration
- Short term standards: $PEC_{short\ term} = PC_{short\ term} + (2 \times Background_{long\ term})$.

Isopleths (i.e. pollution concentration contours), for the predicted annual and hourly mean NO_2 and annual mean NO_x concentrations (as NO_x is the main emission from the plant and likely to be closest to exceeding the relevant objectives), are presented in Appendix C, for the meteorological year in which the maximum concentrations were modelled at any of the off-site discrete receptor locations.

3.4.10 Nitrogen and Acid Deposition Calculations

Total annual mean NO_x concentrations, and acid and nitrogen deposition rates, were calculated at the identified discrete ecological receptor locations, District Wildlife Sites (DWS) and Biological Heritage Sites (BHS)[3] within 2km of the proposed development site. No Special Areas of Conservation (SACs), special protection areas (SPAs) and Ramsar sites were identified within 10km of the proposed development site, nor were there any Sites of Special Scientific Interest (SSSIs), ancient woods or National Nature Reserves (NNR) within 2km of the proposed development site.

The broad habitat types identifiable at each identified ecological site were determined using information sheets which were provided as by Lancashire Environment Record Network (LERN) and information available on the Air Pollution Information System (APIS) for the purpose of the nitrogen and acid deposition calculations. Where more than one habitat type was identified within each ecological site, it has been assumed that the habitat most sensitive to the development is represented at the modelled discrete receptor location, for a conservative assessment.

Background NO_x concentrations, the critical nitrogen deposition loading capacities, the nitrogen and sulphur acid deposition loading capacities, and background nitrogen and acid deposition rates, were obtained from the APIS website.

[3] DWS Equivalent to Local Nature Reserve. BHS equivalent to Local Wildlife Site.

The total NO_x concentrations have been compared to the annual mean environmental quality standard (EQS). The nitrogen deposition process contributions (PCs) were compared to the applicable minimum deposition critical loads. The acid deposition process contributions (PCs) were compared to the critical load functions (dependent on the nitrogen and sulphur deposition loading capacities), using the 'Critical Load Function tool' on the APIS website.

The relevant critical loads for nitrogen deposition, taken from APIS, at the identified ecological receptors are presented in Table 3.3.

Table 3.3: Critical Loads for Nitrogen Deposition

Receptor ID	Habitat	Critical Load Range (kgN/ha/yr)*
e1a	Rich Fen	15 - 30
e1b	Rich Fen	15 - 30
e1c	Rich Fen	15 - 30
e1d	Rich Fen	15 - 30
e1e	Rich Fen	15 - 30
e1f	Rich Fen	15 - 30
e1g	Rich Fen	15 - 30
e2a	Rich Fen	15 - 30
e2b	Rich Fen	15 - 30
e2c	Rich Fen	15 - 30
e2d	Rich Fen	15 - 30
e3a	Broadleaved deciduous woodland	10 - 20
e4a	Marsh (used rich fen for critical load range)	15 - 30
e5a	Neutral Grassland	20 - 30
*Lower critical load used in assessment for conservative assessment		

The acidification critical loads relevant to the ecosystems located within the vicinity of the site are presented in Table 3.4. Acid deposition calculations were only carried out for receptors e3a (Carr Heys Plantation) and e5a (disused railway) as the Leeds/Liverpool canal, River Douglas Estuary and Hesketh Bank Brickworks habitat types are classed as not sensitive to acid deposition on the APIS website.

Table 3.4: Critical Loads for Acidification

Receptor ID	Ecological Site	CLMinN (keqN/ha/yr)	CLMaxN (keqN/ha/yr)	CLMaxS (keqS/ha/yr)
e3a	Carr Heys Plantation	1.358	0.357	1.715
e5a	Disused Railway	4.00	1.071	5.071

3.5 Significance Criteria

3.5.1 Construction Phase

For the construction phase of the proposed development, the IAQM guidance regarding determination of a significant effect has been followed, where:

> *'IAQM recommends that significance is only assigned to the effect after considering the construction activity with mitigation. It is, therefore, important that the mitigation measures are defined in a form suitable for implementation by way of a planning condition or legal obligation within a section 106 agreement, and are included in a DMP or a more general Code of Construction Practice or Construction Environmental Management Plan.'*
>
> *'For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'.'*

The significance of effects of exhaust emissions arising from construction vehicles and on-site plant during the construction phase of the Proposed Development have been evaluated qualitatively using professional judgement and the principles of the significance criteria set out within the EPUK / IAQM guidance.

3.5.2 Operational Phase

The approach provided in the EPUK / IAQM guidance has been used within this assessment to assist in describing the air quality effects of the change in long-term pollutant concentrations as a result of the operation of the proposed plant.

This guidance recommends that the degree of an impact is described by expressing the magnitude of incremental change in pollutant concentration as a proportion of the relevant assessment level and examining this change in the context of the new total concentration and its relationship with the assessment criterion, as summarised in Table 3.5.

Table 3.5: Long-term Human Receptors – Impact Descriptors for Individual Receptors

Long term average concentration at receptor in assessment year	% Change in concentration relative to Air Quality Assessment Level (AQAL)			
	1	2-5	6-10	>10
75% of less of AQAL	Negligible	Negligible	Slight	Moderate
79 – 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

Notes

AQAL = Air Quality Assessment Level, which for this assessment related to the UK Air Quality Strategy objectives.

Where the %change in concentrations is <0.5%, the change is described as 'Negligible' regardless of the concentration.

When defining the concentration as a percentage of the AQAL, 'without scheme' concentration should be used where there is a decrease in pollutant concentration and the 'with scheme;' concentration where there is an increase.

Where concentrations increase, the impact is described as adverse, and where it decreases as beneficial.

The EPUK / IAQM guidance notes that the criteria in Table 2 should be used to describe impacts at individual receptors and should be considered as a starting point to make a judgement on significance of effects, as other influences may need to be accounted for. The EPUK / IAQM guidance states that the assessment of overall significance should be based on professional judgement, taking into account several factors, including:

- The existing and future air quality in the absence of the development;
- The extent of exposure to the impacts; and
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

For short-term concentrations, the EPUK / IAQM guidance recommends that consideration of the EA screening criterion of can be used as a guide to determining whether the short-term Process Contribution (PC) is considered to be significant. The EA criteria is as follows:

- Initial screening of PC, if short-term PC is less than 10% of the relevant standard then the impact can be considered to be insignificant; and
- If short-term PC is greater than 10% of the relevant stand then consideration is given to whether the short-term PC is greater than 20% of the relevant standard minus twice the long-term background concentration.

In addition, when considering short-term concentrations from an elevated point source, the EPUK / IAQM guidance suggests that the severity of an impact can be determined using the criteria presented in Table 3.6.

Table 3.6: Severity of Impact for Short-Term Concentrations

% Change in Short Term PC as % of AQAL	Magnitude of Change	Severity of Impact
11-20%	Small	Slight
21-50%	Medium	Moderate
>51%	Large	Substantial

There is no current guidance on determining significance of impacts on ecological receptors in a planning context and therefore consideration has been given to criteria available from the EA for permitting assessment. For the long-term objectives, this is as follows:

- Initial screening of the Process Contribution (PC), if the PC is less than 1% of the relevant standard then the impact can be considered to be insignificant; and
- If PC is greater than 1% of the relevant standard then screening of Predicted Environmental Contribution (PEC) is considered, if the PEC, are less than 70% the impact can be considered to be insignificant.

See above for short-term guidance from the EA; this has been considered for short-term objectives for ecological receptors.

For nitrogen and acid deposition, results have been compared to the relevant critical loads (section 3.4.10) and the long-term EA criteria.

3.6 Uncertainties and Assumptions

The following uncertainties and assumptions were made in the air quality assessment:

- Estimated background data from the Defra LAQM website was used in the assessment for human receptors. It was used to look at backgrounds for NO_2, CO, and SO_2. For ecological receptors (and NH_3 for human receptors), the APIS website was used to determine background concentrations for NO_x, NH_3, nitrogen deposition and acid deposition likely to be applicable at each of the ecological receptor locations. It is assumed that these background concentrations are likely to be applicable for the lifetime of the development;
- Emission limits have been used for the plant and therefore the assessment results are considered likely to be conservative;
- There will be uncertainties introduced because the modelling has simplified real-world processes into a series of algorithms. For example, it has been assumed that wind conditions predicted by the Global Forecast System (GFS) in 2013-2017 were representative of wind conditions at the site. Furthermore, it has been assumed that the subsequent dispersion of emitted pollutants will conform to a Gaussian distribution in order to simplify the real-world dilution and dispersion conditions; and
- There is an element of uncertainty in all measured and modelled data. All values presented in this chapter are best possible estimates.

4 BASELINE AIR QUALITY CHARACTERISATION

Existing or baseline air quality refers to the concentrations of relevant substances that are already present in ambient air. These substances are emitted by various sources, including road traffic, industrial, domestic, agricultural and natural sources. Baseline air quality data employed in this study have been obtained from CBC, WLBC and from the LAQM Support website operated by Defra.

4.1 Local Authority Review and Assessment of Air Quality

There are no AQMAs in CBC. The closest AQMA to the site lies over 7km north east from the site. This is AQMA order 5 Leyland which was declared AQMA status in 2018 for exceedances of the annual mean NO_2 standard.

4.2 Baseline Monitoring Data

A review of the monitoring data available from the Chorley Council 2018 Annual Status Report and West Lancashire 2017 Annual Status report, shows there are no diffusions tubes in close proximity to the site. The closest diffusion tubes are approximately 10km away in distance and are located on main roads. These are not considered to be representative of the site.

4.3 LAQM Background Data

Estimated background air quality data is also available from the Local Air Quality Management (LAQM) website operated by the Department for Environment, Food & Rural Affairs (Defra) (http://laqm.defra.gov.uk). The Defra LAQM website provides estimated annual average background concentrations of NO_2 on a $1km^2$ grid basis.

Table 4.1 presents the estimated annual average background NO_2 concentrations at the proposed development site for 2018 and assumes no improvement. It also shows the annual average background CO and SO_2 concentrations from 2001. Grid square 345500, 420500 is where the proposed CHP plant is located. The estimated background concentrations are below the relevant UK Air Quality Strategy objectives.

Table 4.1: Defra LAQM Estimated Annual Average NO_2, SO_2 and CO Concentrations and APIS NO_x at Proposed Development Site

Grid Square		Discrete Receptors	2018 Annual Average NO_2 ($\mu g/m^3$)	2001 Annual Mean Concentration SO_2 ($\mu g/m^3$)	2001 Annual Mean Concentration CO ($\mu g/m^3$)
X	Y				
345500	**420500**	R6, R7, R9, R11, R12, R14, R18, R20, R21, R22, R24, R42, R43, R44, R45, R46	8.6	3.2	0.25
345500	**421500**	R8, R10, R13, R15, R16, R17, R19, R23	7.5	2.9	0.26
344500	**420500**	R1, R2, R3, R4	7.5	3.0	0.25
344500	**421500**	R5	6.8	2.8	0.25
346500	**420500**	R25, R26, R27, R28, R30, R33, R34	8.0	2.7	0.26
346500	**421500**	R29, R32	8.1	2.7	0.26
346500	**422500**	R31	8.1	2.7	0.26
347500	**420500**	R35, R36, R37, R38, R39, R40, R41	8.0	2.8	0.26
Air Quality Objective			**40**	**No annual mean objective**	**No annual mean objective**

Table 4.2 presents the estimated annual average background NOx and NH_3 concentrations at the proposed development site for the years 2013 - 2015. This information has been taken from the APIS website. The estimated NOx background concentrations are below the relevant UK Air Quality Strategy objectives and the estimated annual NH_3 values are well below the EA target mean.

Table 4.2: APIS Estimated Annual Average NO_x and NH_3 at Proposed Development Site

Grid Square		Discrete Receptors	2013 – 2015 Annual Average NOx ($\mu g/m^3$)	2013 – 2015 Annual Average NH_3 ($\mu g/m^3$)
X	Y			
345500	**420500**	R6, R7, R9, R11, R12, R14, R18, R20, R21, R22, R24, R42, R43, R44, R45, R46, e1a, e1c, e2c, e2d	14.6	2.7
345500	**421500**	R8, R10, R13, R15, R16, R17, R19, R23, e1b, e1e, e1g, e2a, e2b	13.1	2.7
345500	**422500**	E4a, e5a	12.2	2.7
344500	**420500**	R1, R2, R3, R4	N/A	2.7
344500	**421500**	R5, e3a	11.9	2.7
346500	**420500**	R25, R26, R27, R28, R30, R33, R34, e1f	13.6	2.7
346500	**421500**	R29, R32, e1d	13.7	2.7
346500	**422500**	R31	N/A	2.7
347500	**420500**	R35, R36, R37, R38, R39, R40, R41	N/A	2.7
Air Quality Objective			**30^**	**180***

Notes: ^air quality objective designated for the protection of vegetation and ecosystems. *Target mean only.

For the human and ecological receptors based on background concentrations from Defra and APIS and the site location, exceedance of the relevant human air quality objectives at the application site is considered unlikely.

Background nitrogen and acid deposition rates obtained from APIS for ecological receptors, used in this assessment, are presented in Table 4.3 and 4.4. The lower critical load range between 10 and– 20kgN/ha/yr for the receptors, and as all existing background concentrations are higher than 20kgN/ha/yr, they therefore exceed the lower critical load ranges.

For acid deposition, the background deposition also exceeds the critical load of 1.715 kgN/ha/yr.

Table 4.3: Background Nitrogen Deposition Rates used in the Assessment

Receptor ID	Ecological Site	Habitat	Existing Background Deposition Rate (kgN/ha/yr)
e1a	River Douglas Estuary (BHS)	Rich Fen	**22.96**
e1b	River Douglas Estuary (BHS)	Rich Fen	**22.96**

Receptor ID	Ecological Site	Habitat	Existing Background Deposition Rate (kgN/ha/yr)
e1c	River Douglas Estuary (BHS)	Rich Fen	**22.96**
e1d	River Douglas Estuary (BHS)	Rich Fen	**22.96**
e1e	River Douglas Estuary (BHS)	Rich Fen	**22.96**
e1f	River Douglas Estuary (BHS)	Rich Fen	**22.96**
e1g	River Douglas Estuary (BHS)	Rich Fen	**22.96**
e2a	Leeds/Liverpool Canal (BHS)	Rich Fen	**22.96**
e2b	Leeds/Liverpool Canal (BHS)	Rich Fen	**22.96**
e2c	Leeds/Liverpool Canal (BHS)	Rich Fen	**22.96**
e2d	Leeds/Liverpool Canal (BHS)	Rich Fen	**22.96**
e3a	Carr Heys Plantation (DWS)	Broadleaf deciduous woodland	**24.36**
e4a	Hesketh Bank Brickworks (BHS)	Marsh	**22.96**
e5a	Disused Railway (BHS)	Neutral Grassland	**22.96**
Bold text indicates an exceedance of the lower critical load range for this habitat			

Table 4.4: Background Acid Deposition Rates use in the Assessment

Receptor ID	Ecological Site	Existing Background Acid Deposition Rate (keq/ha/yr)	
		N	S
e3a	Carr Heys Plantation (DWS)	**1.74**	**0.25**
e5a	Disused Railway (BHS)	1.64	0.26
Bold text indicates an exceedance of the critical load for acidification for this habitat			

5 ASSESSMENT OF IMPACTS

5.1 Construction Phase

5.1.1 Construction Dust and Particulate Matter

Fugitive dust emissions arising from construction activities are likely to be variable in nature and will depend upon the type and extent of the activity, soil type and moisture, road surface conditions and weather conditions. Periods of dry weather combined with higher than average wind speeds have the potential to generate more dust.

Construction activities that are often the most significant potential sources of fugitive dust emissions are:

- Earth moving, due to the handling, storage and disposal of soil and subsoil materials;
- Construction aggregate usage, due to the transport, unloading, storage and use of dry and dusty materials (such as cement and sand);
- Movement of heavy site vehicles on dry or untreated haul routes; and,
- Movement of vehicles over surfaces where muddy materials have been transferred off-site (for example, on to public highways).

Fugitive dust arising from construction activities is mainly of a particle size greater than the PM_{10} fraction (that which can potentially impact upon human health), however it is noted that construction activities may contribute to local PM_{10} concentrations. Appropriate dust control measures can be highly effective for controlling emissions from potentially dust generating activities identified above, and adverse effects can be greatly reduced or eliminated.

5.1.2 Potential Dust Emission Magnitude

With reference to the IAQM criteria outlined in Appendix A, the dust emission magnitudes for earthworks, construction and trackout activities are summarised in Table 5.1. Where information is not yet known, a conservative approach has been adopted and professional judgement has been used based on the scale of the proposed development and experience of working on similar schemes. The proposed development involves no demolition works; demolition activities are therefore scoped out of the assessment and not considered further within this report. Trackout activities should be considered up to 200m from the site boundary (due to medium trackout risk) and it is assumed access will be via the A59 (Liverpool Road).

Table 5.1: Summary of Dust Emission Magnitudes (Before Mitigation)

Activity	IAQM Criteria	Dust Emission Magnitude
Demolition	N/A	
Earthworks	- The site is approximately 120m^2 and therefore it is <2,500m^2. - According to the British Geological Survey (BGS) website, Singleton Mudstone Member is the main type of bedrock. Boreholes situated near the site indicted clay and silty clay are present. Therefore the soil type includes potentially dusty soil. - Number of earthmoving vehicles is expected to be 1 i.e. <5. - No stockpiles are predicted to be created. - Any material moved would be minimal and <20,000 tonnes - Works are predicted to occur in during wetter months.	**Small**
Construction	- Total volume to be built is 396m^3 (purpose built container supplied by CHP supplier to house CHP and all auxiliary equipment) which is <25,000m^3 - A small amount of concrete batching is proposed. - When constructing concrete plinth for CHP container, there is potential for dusty materials to be produced. - No sandblasting is proposed.	**Small**
Trackout	- The number of heavy vehicles (>3.5t) per day in/out of the site is 4 (all in one day), therefore <10HDV. - The surface type is mostly concrete road areas, hardcore surfaces around construction area. - The extent of unpaved road length within the site is estimated to be 300-400m.	**Small - Medium**

5.1.3 Sensitivity of the Area

As per the IAQM guidance, the sensitivity of the area takes into account a number of factors, including:

- The sensitivity of individual receptors in the area;
- The proximity and number of those receptors;
- In the case of PM_{10}, the local background concentration; and,

- Site specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.

Consideration is given to human receptors within 350m of the proposed development site for earthworks/construction and 50m of the trackout boundary and ecological receptors within 50m of the site and trackout boundary.

Figure 5.1 and 5.2 show map indicating the earthworks/construction and trackout buffers respectively for identifying the sensitivity of the area and Table 5.2 presents the determined sensitivity of the area.

No designated ecological receptors have been identified within 50m of the application site boundary or the anticipated trackout route, therefore following the IAQM guidance ecological receptors have been screened out of the assessment and are not considered further.

Table 5.2: Sensitivity of the Area

Potential Impact		Sensitivity of the Surrounding Area		
		Earthworks	Construction	Trackout
Dust soiling	Receptor sensitivity	High	High	High
	Number of receptors	>100	>100	1-10
	Distance from the source	100-350m	100-350m	<20m
	Overall Sensitivity of the Area	**Low**	**Low**	**Medium**
Human health	Receptor sensitivity	High	High	High
	Annual mean PM_{10} concentration	<24 µg/m^3	<24 µg/m^3	<24 µg/m^3
	Number of receptors	>100	>100	1-10
	Distance from the source	100-350m	100-350m	<20m
	Overall Sensitivity of the Area	**Low**	**Low**	**Low**

Figure 5.1: Earthworks / Construction Activities Buffer Map

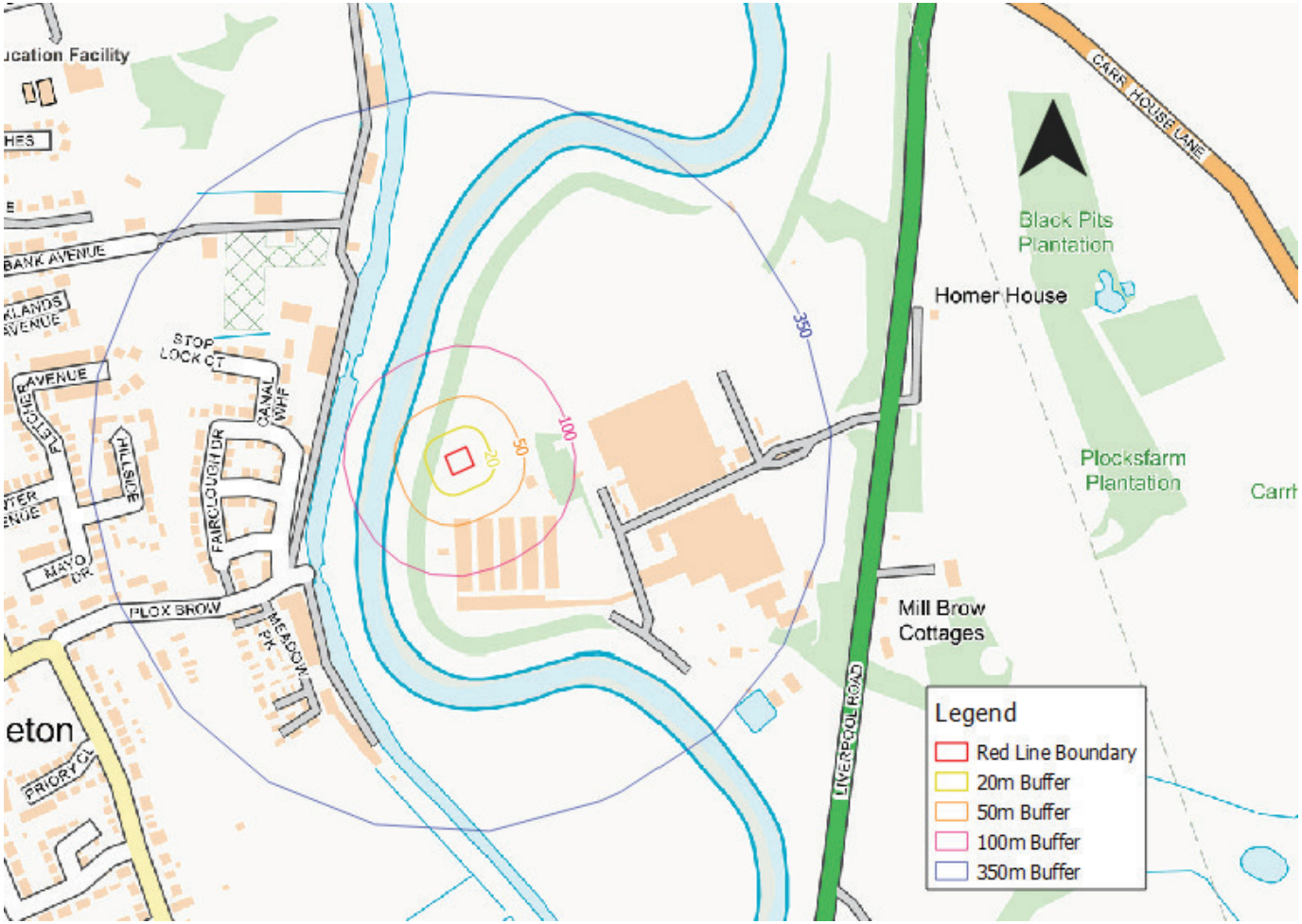


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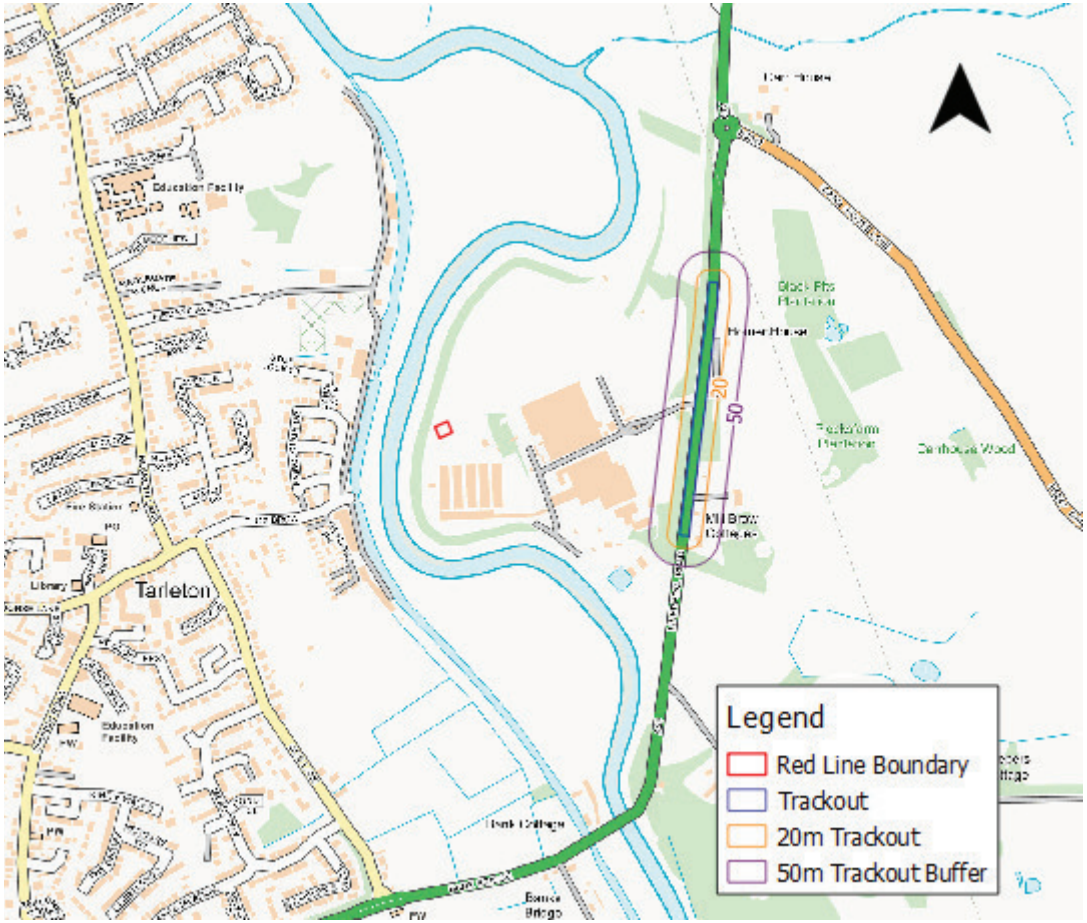
Figure 5.2: Trackout Buffer Map



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5.1.4 Risk of Impacts

The dust emission magnitudes from Table 5.1 have been combined with the sensitivity of the area from Table 5.2, to determine the risk of impacts of construction activities before mitigation, as summarised in Table 5.3. Based on these dusk risk categories, site specific mitigation measures have been defined as detailed in Section 6 and Appendix D.

Table 5.3: Summary of the Dust Risk from Construction Activities

Potential Impact	Dust Risk Impact		
	Earthworks	Construction	Trackout
Dust soiling	Negligible Risk	Negligible Risk	Negligible to Low Risk
Human health	Negligible Risk	Negligible Risk	Negligible to Low Risk

5.1.5 Exhaust Emissions from Construction Plant and Vehicles

The operation of vehicles and equipment powered by internal combustion engines results in the emission of exhaust gases containing pollutants including NO_x, PM_{10}, $PM_{2.5}$, volatile organic compounds, and CO. The quantities emitted depend on factors such as engine type, service history, pattern of usage and fuel composition.

Construction traffic will comprise haulage / construction vehicles and vehicles used for workers' trips to and from the application site. The greatest impact on air quality due to emission from construction phase vehicles will be in areas adjacent to the application site access and nearby road network. It is anticipated that construction traffic will access the application site via the A59 (Liverpool Road) which has a small number of sensitive receptors adjacent to it. The number of HDV movements associated with the works is estimated to be 4 vehicles all in one day (due to the short duration of the proposed works). Construction traffic flows are therefore expected to be well below the EPUK-IAQM criteria of 100 HDV movements (outside of an AQMA) and therefore it is considered unlikely to bring about any significant change in air quality.

The operation of site equipment and machinery during the construction phase will result in emissions to atmosphere of exhaust gases, but due to the construction works only occurring for a short duration and by implementing suitable controls and site management such emissions are unlikely to be significant (as per the LAQM.TG(16)).

5.2 Operational Phase

The main potential impact of the proposed development is considered to be exhaust emissions from the proposed CHP plant once operational on sensitive receptors in the area surrounding the proposed development site. The results of the modelling assessment are presented in the following subsections.

5.2.1 Dispersion Modelling Results

Human Receptors

Appendix E presents the full modelling results at the defined human receptor locations (for the highest concentrations presented across the 5 years of meteorological data). A summary of the key modelled results are detailed in this section.

The contour plots, for predicted annual and hourly mean NO_2 concentrations are presented in Appendix C, for the year in which the maximum PC was predicted across the modelled grid.

Maximum concentration results for discrete receptors and the modelled grids have been presented below for the baseline scenario and the 'with CHP and SCR' scenarios, along with a comparison of the change between the two (to consider the change in concentrations from the proposed CHP alone). Additional results have been presented for discrete receptors for comparison purposes as follows:

- With CHP, no SCR – it is understood that SCR will be included as part of the proposed development, so these results are considered for a comparison purpose only.
- With CHP and SCR and building 21 – Building 21 is a proposed meat kitchen which is expected to be constructed in the future but is unlikely to happen for a few years yet. It has been included as a sensitivity test to ensure that once it is on-site it doesn't adversely affect the dispersion of the proposed CHP emissions.

Baseline Results

Table 5.4 presents the maximum concentrations for the existing baseline scenario for relevant objectives for discrete human receptors and across the modelled grid locations. It is noted that the grid locations where maximum concentrations were predicted are all considered to not be relevant locations of exposure. Both the maximum PC and maximum PEC are presented along with the percentage of the relevant objective that the PC or PEC represents.

These results represent the existing operating scenario on-site and therefore the results are not discussed in detail but provide a baseline for which to compare the proposed development scenarios to (i.e. with the proposed CHP plant). It is noted that in the baseline scenario, the total predicted concentrations (i.e. PECs) do not exceed any of the relevant objectives/EALs at the discrete receptors or grid locations.

Table 5.4: Existing Baseline Results for the Maximum Predicted Pollutant Concentrations of the Five Years of Meteorological Data

Pollutant & Averaging Period	AQS Objective or EAL (µg/m^3)	Receptor ID or Location	PC (µg/m^3)	PC as % of Objective / EAL	PEC (µg/m^3)	PEC as % of Objective / EAL
MAXIMUM PREDICTED CONCENTRATION AT A SPECIFIC RECEPTOR						
Annual Mean NO_2	40	R26	1.4	3.5%	9.4	23.4%
99.79th Percentile of 1-Hour NO_2 Mean	200	R27 (highest for PC)	8.7	4.4%	24.7	12.3%
		R42 (highest for PEC)	8.1	4.0%	25.2	12.6%
Max 1-Hour CO	30,000	R42	16.0	0.1%	16.5	0.1%
Max Daily Running 8-hour Mean CO	10,000	R27	11.8	0.1%	12.3	0.1%
LOCATION OF MAXIMUM PREDICTED CONCENTRATION ACROSS GRID						
Annual Mean NO_2	40	*345902.50, 420766.62*	*6.0*	*15%*	*14.0*	*35%*
99.79th Percentile of 1-Hour NO_2 Mean	200	*345942.06, 420786.47*	*39.4*	*19.7%*	*55.4*	*27.7%*
Max 1-Hour CO	30,000	*345724.41, 420786.47*	*85.4*	*0.3%*	*85.9*	*0.3%*
Max Daily Running 8-hour Mean CO	10,000	*345843.12, 420786.47*	*60.6*	*0.6%*	*61.1*	*0.6%*

Note: Results are the maximum concentrations predicted from the five different years of meteorological data. *Italicised text* indicates results not at location of relevant exposure and therefore objective not applicable at this location

With Proposed CHP and no Selective Catalytic Reduction (SCR)

Table 5.5 presents the maximum concentrations for the 'with proposed CHP but without SCR' scenario for relevant objectives for discrete human receptors.

The maximum annual mean NO_2 concentrations predicted for the 'with proposed CHP but without SCR' scenario, was a PC of 1.8 µg/m^3 (4.5% of objective) at R26 and a PEC of 9.9 µg/m^3 (24.4% of the objective) at R44. By comparing the PC values against the PEC values, both the impacts can be classed as negligible as per the EPUK-IAQM guidance (Table 3.5).

For the receptors with the maximum hourly NO_2 mean (R26 and R27), the hourly CO mean (R44) and the 8 hour daily running CO mean (R44), they all have PC percentage values lower than 11% of the AQS objectives and therefore impacts can be classed as negligible, as per EPUK-IAQM guidance for short-term concentrations.

Table 5.5: 'With CHP and no SCR' Results for the Maximum Predicted Pollutant Concentrations of the Five Years of Meteorological Data

Pollutant & Averaging Period	AQS Objective or EAL (µg/m^3)	Receptor ID or Location	PC (µg/m^3)	PC as % of Objective / EAL	PEC (µg/m^3)	PEC as % of Objective / EAL
MAXIMUM PREDICTED CONCENTRATION AT A SPECIFIC RECEPTOR						
Annual Mean NO_2	40	R26 (highest for PC)	1.8	4.5%	9.8	24.4%
		R44 (Highest for PEC)	1.4	3.4%	9.9	24.8%
99.79th Percentile of 1-Hour NO_2 Mean	200	R26 & R27 (Highest for PC)	8.9	4.4%	24.8	12.4%
		R42 (highest for PEC)	8.1	4.0%	25.2	12.6%
Max 1-Hour CO	30,000	R44	52.4	0.2%	52.9	0.2%
Max Daily Running 8-hour Mean CO	10,000	R44	48.3	0.5%	48.8	0.5%

Note: Results are the maximum concentrations predicted from the five different years of meteorological data.

With Proposed CHP and SCR

Table 5.6 presents the maximum concentrations for the 'with proposed CHP and SCR' scenario for relevant objectives for discrete human receptors and across the modelled grid locations. It is noted that the grid locations where maximum concentrations were predicted are all considered to not be relevant locations of exposure. However, not with-standing this there are no exceedances of any of the pollutants over the grid modelled results.

The maximum annual mean NO_2 PC at a discrete receptor location, was predicted to be 1.6µg/m^3, at R26 on Liverpool Road, which is 3.9% of the objective. The PEC, i.e. the total annual mean NO_2 concentrations (including background data), was 9.6µg/m^3 at R44 on Fairclough Drive, and equates to approximately 24.0% of the objective for NO_2. By comparing these results against Table 3.5 impact descriptors for individual receptors in the EPUK-IAQM guidance, the impacts are negligible.

For the 1 hour mean NO_2 concentrations at the discrete receptor locations, the highest PC was predicted at R27, which is on Liverpool Road. The PC value was 8.8 µg/m^3 which is 4.4% of the objective; using the EPUK-IAQM guidance provided significance guidance for short term concentrations (Table 3.6) this magnitude of change would be classed as negligible.

For the maximum predicted concentrations at discrete receptors for CO, SO_2 and NH_3, there are no exceedances of the relevant objectives / EALs. Comparison of the

maximum PC and the PEC results predict negligible impacts of the proposed CHP plant with the SCR.

It can also be noted that the NO_2 and CO values at specific receptors are lower than the CHP plant without the SCR, which shows the SCR will help mitigate against emissions emitted.

Table 5.6: 'With CHP and SCR' Results for the Maximum Predicted Pollutant Concentrations of the Five Years of Meteorological Data

Pollutant & Averaging Period	AQS Objective / EAL ($\mu g/m^3$)	Receptor ID or Location	PC ($\mu g/m^3$)	PC as % of Objective / EAL	PEC ($\mu g/m^3$)	PEC as % of Objective / EAL
MAXIMUM PREDICTED CONCENTRATION AT A SPECIFIC RECEPTOR						
Annual Mean NO_2	40	R26 (highest for PC)	1.6	3.9%	9.5	23.8%
		R44 (highest for PEC)	1.0	2.6%	9.6	24.0%
99.79th Percentile of 1-Hour NO_2 Means	200	R27 (highest for PC)	8.8	4.4%	24.7	12.4%
		R42 (highest for PEC)	8.1	4.0%	25.2	12.6%
Max 1-Hour CO	30,000	R42	16.0	0.1%	16.5	0.1%
Max Daily Running 8-hour Mean CO	10,000	R27	11.9	0.1%	12.4	0.1%
99.9th Percentile of 15-minute mean SO_2	266	R44	0.9	0.3%	7.3	2.8%
99.9th Percentile of 15-minute mean SO_2	266	R43 (highest for PEC along with R44)	0.8	0.3%	7.3	2.8%
99.7th Percentile of 1-hour SO2	350	R44	0.7	0.2%	7.1	2.0%
99.2 Percentile of 24-hour SO2	125	R44	0.6	0.4%	7.0	5.6%
Annual Mean NH_3	180	R44	0.02	0.0%	2.7	1.5%
Max 1-Hour NH_3	2500	R43	0.25	0.0%	5.7	0.2%

Pollutant & Averaging Period	AQS Objective / EAL ($\mu g/m^3$)	Receptor ID or Location	PC ($\mu g/m^3$)	PC as % of Objective / EAL	PEC ($\mu g/m^3$)	PEC as % of Objective / EAL
LOCATION OF MAXIMUM PREDICTED CONCENTRATION ACROSS GRID						
Annual Mean NO_2	40	*345902.5, 420766.62 (highest for PC)*	*6.2*	*15.6%*	*14.2*	*35.6%*
99.79th Percentile of 1-Hour NO_2 Means	200	*345942.06, 420786.47*	*39.4*	*19.7%*	*55.4*	*27.7%*
Max 1-Hour CO	30,000	*345724.41, 420786.47*	*85.4*	*0.3%*	*85.9*	*0.3%*
Max Daily Running 8-hour Mean CO	10,000	*345843.12, 420786.47*	*60.6*	*0.6%*	*61.1*	*0.6%*
99.9th Percentile of 15-minute mean SO_2	266	*345744.19, 420905.5*	*3.0*	*1.1%*	*8.9*	*3.3%*
99.7th Percentile of 1-hour SO_2	350	*345724.41, 420885.66*	*1.9*	*0.5%*	*7.8*	*2.2%*
99.2th Percentile of 24-hour SO_2	125	*345704.62, 420865.81*	*1.0*	*0.8%*	*6.9*	*5.5%*
Annual Mean NH_3	180	*345882.72, 420885.66*	*0.03*	*0.0%*	*2.8*	*1.5%*
Max 1-Hour NH_3	2500	*345744.19, 420905.5*	*0.97*	*0.0%*	*6.4*	*0.3%*

Note: Results are the maximum concentrations predicted from the five different years of meteorological data. *Italicised text* indicates results not at location of relevant exposure and therefore objective not applicable at this location.

With Proposed CHP with SCR and Additional building

Table 5.7 presents the maximum concentrations for the 'with proposed CHP, SCR and additional building' scenario for relevant objectives for discrete human receptors.

Based on the maximum predicted PCs and PECs and IAQM-EPUK significance criteria, impacts are still considered to be negligible for all receptors and all pollutants with the new CHP and SCR and an additional building (a proposed meat kitchen) incorporated into the model.

Table 5.7: 'With Proposed CHP, SCR and Additional Building Results for the Maximum Predicted Pollutant Concentrations of the Five Years of Meteorological Data

Pollutant & Averaging Period	AQS Objective / EAL ($\mu g/m^3$)	Receptor ID or Location	PC ($\mu g/m^3$)	PC as % of Objective / EAL	PEC ($\mu g/m^3$)	PEC as % of Objective / EAL
MAXIMUM PREDICTED CONCENTRATION AT A SPECIFIC RECEPTOR						
Annual Mean NO_2	40	R26 (highest for PC)	1.6	4.0%	9.6	23.9%
		R44 (highest for PEC)	1.2	3.1%	9.8	24.4%
99.79th Percentile of 1-Hour NO_2 Mean	200	R27 (highest for PC)	8.8	4.4%	24.8	12.4%
		R42 (highest for PC)	8.1	4.0%	25.2	12.6%
Max 1- Hour CO	30,000	R42	16.0	0.1%	16.5	0.1%
Max Daily Running 8-hour Mean CO	10,000	R27	11.9	0.1%	12.4	0.1%
99.9th Percentile of 15-minute mean SO_2	266	R44	1.4	0.5%	7.8	2.9%
99.7th Percentile of 1-hour SO2	350	R44	1.0	0.3%	7.5	2.1%
99.2 Percentile of 24-hour SO2	125	R44	0.8	0.7%	7.3	5.8%
Annual Mean NH_3	180	R44	0.03	0.0%	2.8	1.5%
Max 1-Hour NH_3	2500	R44	0.4	0.0%	5.8	0.2%

Note: Results are the maximum concentrations predicted from the five different years of meteorological data.

Maximum Change with Development

Table 5.8 presents the maximum change in pollutant concentrations between the baseline scenario and the 'with CHP and SCR' scenario, i.e. the change in concentration from the proposed CHP with SCR. The percentage change relative to the objective / AQAL is approximately 0% when rounded to a whole number; considering the IAQM-EPUK significance criteria and the total predicted concentrations, the impact from the proposed development on local air quality is judged to be of negligible significance.

Table 5.8: Maximum Change of Pollutants Comparing the CHP With SCR Scenario to the Baseline Scenario

Pollutant & Averaging Period	AQS Objective / EAL ($\mu g/m^3$)	Receptor ID or Location	PEC ($\mu g/m^3$)	Maximum Change in Concentration ($\mu g/m^3$)	% Change to the objective/AQAL
MAXIMUM PREDICTED CONCENTRATION AT A SPECIFIC RECEPTOR					
Annual Mean NO_2	40	R26, R27 & R44	9.5, 9.4 & 9.6	+0.2	0%
99.79th Percentile of 1-Hour NO_2 Means	200	R14 & R28	20.3 & 19.1	+0.4	0%
Max 1-Hour CO	30,000	R28	6.2	+1.2	0%
Max Daily Running 8-hour Mean CO	10,000	R10	5.2	+1.5	0%

Note: Results are the maximum concentrations predicted from the five different years of meteorological data.

Ecological Receptors

Baseline

Table 5.9 presents the maximum concentrations for the existing baseline scenario for relevant objectives for discrete ecological receptors. The maximum PC at an ecological receptor for annual mean NOx exceeds the EA screening criteria of 1%, however the PEC is >70% and therefore the impacts of annual mean NO_x concentrations are considered to be of negligible significance. The maximum daily mean NO_x PC exceeds the EA screening criteria of 10% and the 20% criteria (as a percentage of the target standard minus twice the long-term background concentration). It is noted that the daily mean NOx standard is target value only from the EA guidance rather than a statutory air quality objective. These modelled concentrations are also considered to be conservative as they are based on emission limits for the plant rather than actual emissions and at worst-case locations within the BHS. The PEC value for daily NOx are below the target PEC from the EA guidance.

Table 5.9: Existing Baseline Results for the Maximum Predicted Pollutant Concentrations of the Five Years of Meteorological Data for Ecological Receptors

Pollutant & Averaging Period	AQS Objective / Target (µg/m^3)	Receptor ID or Location	PC (µg/m^3)	PC as % of Objective / Target	PEC (µg/m^3)	PEC as % of Objective / Target
MAXIMUM PREDICTED CONCENTRATION AT A SPECIFIC RECEPTOR						
Annual Mean NO_x	30	e1c	2.3	7.8%	17.0	56.6%
Max Daily Mean NO_x	75	e1c	30.8	41.1%	60.1	80.1%

Note: Results are the maximum concentrations predicted from the five different years of meteorological data

With Proposed CHP and no SCR

Table 5.10 presents the maximum concentrations for the proposed CHP without SCR scenario for relevant objectives for discrete ecological receptors. The maximum PC at an ecological receptor for annual mean NOx exceeds the EA screening criteria of 1%, however the PEC is >70% and therefore the impacts of annual mean NO_x concentrations are considered to be of negligible significance.

As discussed in the baseline section above, even though there are exceedances of the EA screening criteria for the daily NOx target, these results are considered to be conservative/worst-case and the total PEC remains below the EA target value.

Table 5.10: 'With CHP andno SCR Maximum Predicted Pollutant Concentrations of the Five Years of Meteorological Data for Ecological Receptors

Pollutant & Averaging Period	AQS Objective / Target (µg/m^3)	Receptor ID or Location	PC (µg/m^3)	PC as % of Objective / Target	PEC (µg/m^3)	PEC as % of Objective / Target
MAXIMUM PREDICTED CONCENTRATION AT A SPECIFIC RECEPTOR						
Annual Mean NO_x	30	e1c	2.7	9.1%	17.4	57.9%
Max Daily NO_x	75	e1c	30.8	41.1%	60.1	80.1%

Note: Results are the maximum concentrations predicted from the five different years of meteorological data

With Proposed CHP and SCR

Table 5.11 presents the maximum concentrations for the proposed CHP with SCR scenario for relevant objectives for discrete ecological receptors. The ecological receptors with the maximum values for annual mean NOx, SO_2 and NH_3 are below the relevant EA screening criteria and therefore considered to be insignificant.

As discussed in the baseline section above, even though there are exceedances of the EA screening criteria for the daily NO_x target, these results are considered to be conservative/worst-case and the total PEC remains below the EA target value.

There is a slight increase in the NOx concentration in comparison to the NOx baseline result, but these changes are <1% and therefore demonstrates that the proposed CHP with the SCR is predicted to have no significant impacts on the air quality at ecological receptors.

Table 5.11: 'With CHP and SCR' Ecological Results for the Maximum Predicted Pollutant Concentrations of the Five Years of Meteorological Data for Ecological Receptors

Pollutant & Averaging Period	AQS Objective / Target ($\mu g/m^3$)	Receptor ID or Location	PC ($\mu g/m^3$)	PC as % of Objective Target	PEC ($\mu g/m^3$)	PEC as % of Objective / Target
MAXIMUM PREDICTED CONCENTRATION AT A SPECIFIC RECEPTOR						
Annual Mean NO_x	30	e1c	2.5	8.3%	17.1	57.1%
Max Daily NO_x	75	e1c	30.8	41.1%	60.1	80.1%
Annual SO_2	20	e1g	0.06	0.3 %	0.49	0.02%
Winter SO_2	20	e1g	0.09	0.4%	0.52	2.6%
Annual Mean NH_3	3	e1g	0.02	0.7%	2.7	91.7%

Note: Results are the maximum concentrations predicted from the five different years of meteorological data

With Proposed CHP with SCR and additional building

Table 5.12 presents the maximum concentrations for the proposed CHP with SCR and the additional building scenario for relevant objectives for discrete ecological receptors. The ecological receptors with the maximum values for annual mean NOx, SO_2 and NH_3 are below the relevant EA screening criteria and therefore considered to be insignificant.

As discussed in the baseline section above, even though there are exceedances of the EA screening criteria for the daily NO_x target, these results are considered to be conservative/worst-case and the total PEC remains below the EA target value.

The values of the CHP with the building are slightly higher than the CHP without the building however, the increase is only slight and overall the emission increase is considered to be negligible.

Table 5.12 'With CHP and SCR and the Additional Building' Maximum Predicted Pollutant Concentrations of the Five Years of Meteorological Data for Ecological Receptors

Pollutant & Averaging Period	AQS Objective / Target ($\mu g/m^3$)	Receptor ID or Location	PC ($\mu g/m^3$)	PC as % of Objective / Target	PEC ($\mu g/m^3$)	PEC as % of Objective / Target
MAXIMUM PREDICTED CONCENTRATION AT A SPECIFIC RECEPTOR						
Annual Mean NO_x	30	e1c	2.5	8.4%	17.2	57.2%
Max Daily NO_x	75	e1c	30.8	41.1%	60.1	80.1%
Annual SO_2	20	e2d	0.1	0.3%	0.5	2.5%
Winter SO_2	20	e1g	0.1	0.4%	0.9	4.7%
Annual mean NH_3	3	e2d	0.0	0.7%	2.8	91.7%

Note: Results are the maximum concentrations predicted from the five different years of meteorological data

Nitrogen Deposition

Results obtained from the dispersion modelling have been used to calculate nitrogen deposition for the 'with CHP and SCR' scenario and results are summarised in Table 5.3.

Whilst the total nitrogen deposition exceeds the lower critical loads, this would be the case with or without the proposed development, i.e. background deposition (Table 3.3) are already in exceedance of the lower critical load.

The nitrogen deposition PC as a percentage of the lower critical load for the majority of ecological receptors are 1% or less so below the EA screening criteria. However, at receptors for e1c and e1g a PC of 2% is predicted. These modelled concentrations represent worst case locations within the designated ecological sites rather than an average representation across the whole site and the emission rates are based on limit values and therefore considered to be conservative.

Acid Deposition

The results obtained from the dispersion modelling for acid deposition have been input into the Critical Load Function Tool provided on the APIS website along with the critical load data for the habitat; results are presented in Table 5.14. The process contribution (PC) and predicted environmental concentration (PEC) have been presented as a percentage of the relevant critical load function.

Most receptors were screened out as the predominant habitat types are not sensitive to acid deposition based on APIS criteria. For e3a and e5a, the two receptors considered to be sensitive to acid deposition, the PCs as a percentage of the critical load function were both predicted to be 0%, therefore indicating that the process contribution has had a minimal impact on acidification at any of the ecosystems identified. The PEC as a

percentage of the critical load function exceeded 100% at both of these ecological receptors but this was due to the existing background acid deposition at these sites, with the PC predicted to be imperceptible at these sites (i.e. 0.0% to 1 decimal place).

Table 5.13: Nitrogen Deposition Contribution at Nearby Ecological Sites

Receptor ID	Receptor Location	Broad Habitat Type	PC from Dispersion Modelling kg N/ha/yr	PC as a Percentage of Lower Critical Load	Total deposition, kg N/ha/yr	Potential Critical Load Exceedance
e1a	River Douglas Estuary	Rich Fen	0.17	1%	23.13	154%
e1b	River Douglas Estuary	Rich Fen	0.14	1%	23.10	154%
e1c	River Douglas Estuary	Rich Fen	0.29	2%	23.25	155%
e1d	River Douglas Estuary	Rich Fen	0.11	1%	23.07	154%
e1e	River Douglas Estuary	Rich Fen	0.07	0%	23.03	154%
e1f	River Douglas Estuary	Rich Fen	0.13	1%	23.09	154%
e1g	River Douglas Estuary	Rich Fen	0.24	2%	23.20	155%
e2a	Leeds/Liverpool Canal	Rich Fen	0.10	1%	23.06	154%
e2b	Leeds/Liverpool Canal	Rich Fen	0.20	1%	23.16	154%
e2c	Leeds/Liverpool Canal	Rich Fen	0.07	0%	23.03	154%

Receptor ID	Receptor Location	Broad Habitat Type	PC from Dispersion Modelling kg N/ha/yr	PC as a Percentage of Lower Critical Load	Total deposition, kg N/ha/yr	Potential Critical Load Exceedance
e2d	Leeds/Liverpool Canal	Rich Fen	0.20	1%	23.16	154%
e3a	Carr Heys Planttaion	Broadleaved Deciduous Woodland	0.03	0%	24.39	244%
e4a	Hesketh Bank Brickworks	Marsh	0.01	0%	22.97	153%
e5a	Disused Railway	Neutral Grassland	0.01	0%	22.97	115%

Table 5.14: Acid Deposition Contribution at Nearby Ecological Sensitive Sites

Receptor ID	Receptor Location	Broad Habitat Type	Total Process Deposition N (keq N/ha/yr)	Total Process Deposition S (keq S/ha/yr)	PC as % of Critical Load Function	Background % of Critical Load Function (keq-ha yr)	Total PEC	PEC% of Critical Load Function
e3a	Carr Heys Plantation	Broadleaved deciduous woodland	0.002	0.0001	0%	116.0%	1.99	116.5%
e5a	Disused Railway	Neutral Grassland	0.001	0.0003	0%	37.5%	1.90	37.5%

5.2.2 Summary of Significance of Operational Phase Impacts

As identified above:

- There are no predicted exceedances of the annual mean NO_2 or NH3, or short-term NO_2 or CO, SO_2 or NH_3 AQSs at any of the discrete modelled human receptor locations in any of the scenarios;
- The impact from the proposed CHP plant at discrete human receptors was predicted to be negligible for all pollutants under all scenarios; and,
- The impacts on annual mean background NO_x concentrations, nitrogen and acid deposition at the designated ecologically sensitive sites are considered acceptable at the majority of ecological sites. The greatest impact at an ecological site is predicted at some parts of the River Douglas BHS and the Liverpool/Leeds Canal BHS for the maximum daily mean NOx concentrations and nitrogen deposition, however if impacts were considered across the whole of these BHSs the impacts would be significantly reduced. Furthermore, the predicted exceedances of EA screening criteria were for target values (rather than a statutory air quality objective) and the concentrations predicted are considered to be conservative as they are based on emission limits.

Taking the conservative nature of the assessment and the above results into consideration, the impact on local air quality is not considered to be significant.

6 MITIGATION MEASURES & RESIDUAL IMPACTS

6.1 Construction Phase

The dust emitting activities outlined in Section 5.1 can be effectively controlled by appropriate dust control measures and any adverse affects can be greatly reduced or eliminated.

During any construction works on site, GA Pet Foods already wet down access road areas during dry conditions and also have a wheel washer on site which can be used prior to vehicles exiting onto the A59, which will help to mititgate against dust impacts.

The dust risk categories identified have been used, along with professional judgement to recommend appropriate, site-specific mitigation measures, which are presented in Appendix D.

With the implementation of the proposed construction phase mitigation measures, the residual impacts are considered to be negligible.

6.2 Operational Phase

As this assessment has determined that the operational phase impacts on air quality are not significant, additional mitigation measures have not been recommended and the residual impacts are considered likely to be acceptable.

7 CONCLUSIONS

An air quality assessment of proposed Combined Heat and Power Plant (CHP) Liverpool Road, within the Golden Acres (GA) Pet Food site in Preston has been undertaken with reference to existing air quality in the area and relevant air quality legislation, policy and guidance.

An assessment of construction phase impacts has been undertaken following the 2014 Institute of Air Quality Management (IAQM) guidance. Demolition does not form part of this development and was screened out. The potential risk of construction phase impacts and earthworks on local air quality was predicted to be negligible for dust soiling and human health, prior to the implementation of dust control measures. Trackout has a negligible to low risk on dust soiling and human health. Mitigation measures have been recommended to reduce the risk of dust and particulate matter being generated and re-suspended. With implementation of the appropriate measures, construction activities are not anticipated to have a significant impact on air quality.

The main potential air quality impact once the proposed development is operational considered to be emissions from the operation of the proposed CHP. An assessment of operational impacts has been undertaken using ADMS-5.2, an advanced atmospheric dispersion model developed for regulatory purposes, with the use of meteorological data predicted between 2013 and 2017 using the Global Forecast System (GFS). Buildings/structures have been included to account for the effects of downwash and terrain data also included. Concentrations of key air pollutants (nitrogen oxides (NO_x), nitrogen dioxides (NO_2) and carbon monoxide (CO) have been predicted at discrete human and ecological receptor locations, as applicable. Sulphur dioxide (SO_2) and ammonia (NH_3) impacts have been considered for the scenarios where selective catalytic reduction (SCR) has been incorporated into the development.

The highest predicted impacts at any of the modelled off-site discrete receptor locations in any of the five modelled meteorological years have been reported and compared to the relevant Air Quality Strategy (AQS) objectives. There were no predicted exceedances of any of the objectives for humans at the modelled discrete receptor locations in any of the modelled meteorological years.

In order to assess the impact of increases in pollutant concentrations attributable to the proposed development on existing sensitive receptors, an impact assessment in accordance with the 2017 Environmental Protection UK (EPUK)-IAQM guidance was undertaken. The impact of the proposed development on all the pollutants considered at the modelled discrete human receptor locations was assessed as negligible.

The development was assessed as having a minimal impact at the majority of local ecologically sensitive sites, with regards to nitrogen and acid deposition, and ambient annual and daily mean NO_x concentrations. The greatest impact at an ecological site is

predicted at the Leeds/Liverpool Canal Biological Heritage Site (BHS) and the River Douglas BHS for maxiumum daily NOx and nitrogen deposition, however when impacts are considered across the whole of this BHS the impacts are significantly reduced.

The assessment has concluded that taking the conservative nature of the assessment into account, the overall impact on local air quality is considered to be insignificant.

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APPENDIX A - CONSTRUCTION DUST ASSESSMENT METHODOLOGY

This appendix contains the construction dust assessment methodology used in the assessment.

To assess the potential impacts, construction activities are divided into demolition, earthworks, construction and trackout. The descriptors included in this section are based upon the IAQM 2014 guidance. The assessment follows the steps recommended in the guidance.

Step 1: Screen the requirement for assessment

The first step is to screen out the requirement for a construction dust assessment, this is usually a somewhat conservative level of screening. An assessment is usually required where there is:

- a 'human receptor' within:
  - 350m of the boundary of the site; or
  - 50m of the route used by construction vehicles on the public highway, up to 500m from the site entrance(s).
- an 'ecological receptor':
  - 50m of the boundary of the site; or
  - 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

Step 2A: Defining the Potential Dust Emission Magnitude

Demolition

The dust emission magnitude category for demolition is varied for each site in terms of timing, building type, duration and scale. Examples of the potential dust emission classes are provided in the guidance as follows:

- **Large**: Total building volume >50,000m^3, potentially dusty construction material, on-site crushing and screening, demolition activities >20m above ground level;
- **Medium**: Total building volume 20,000m^3 – 50,000m^3, potentially dusty construction material, demolition activities 10m – 20m above ground level; and,
- **Small**: Total building volume <20,000m^3, construction material with low potential for dust release, demolition activities <10m above ground, demolition during wetter months.

Earthworks

The dust emission magnitude category for earthworks is varied for each site in terms of timing, geology, topography and duration. Examples of the potential dust emission classes are provided in the guidance as follows:

- **Large**: Total site area >10,000m^2, potentially dusty soil type (e.g. clay), >10 heavy earth moving vehicles active at any one time, formation of bunds >8m in height, total material moved >100,000 tonnes;
- **Medium**: Total site area 2,500 – 10,000m^2, moderately dusty soil type (e.g. silt), 5 – 10 heavy earth moving vehicles active at any one time, formation of bunds 4 – 8m in height, total material moved 20,000 – 100,000 tonnes; and,

- **Small**: Total site area < 2,500m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4m in height, total material moved <10,000 tonnes, earthworks during wetter months.

Construction

The dust emission magnitude category for construction is varied for each site in terms of timing, building type, duration, and scale. Examples of the potential dust emissions classes are provided in the guidance as follows:

- **Large**: Total building volume >100,000m^3, piling, on site concrete batching;
- **Medium**: Total building volume 25,000 – 100,000m^3, potentially dusty construction material (e.g. concrete), piling, on site concrete batching; and,
- **Small**: Total building volume <25,000m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

Trackout

Factors which determine the dust emission magnitude class of trackout activities are vehicle size, vehicle speed, vehicle number, geology and duration. Examples of the potential dust emissions classes are provided in the guidance as follows:

- **Large**: >50 HDV (>3.5t) trips in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m;
- **Medium**: 10 – 50 HDV (>3.5t) trips in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 – 100m; and,
- **Small**: <10 HDV (>3.5t) trips in any one day, surface material with low potential for dust release, unpaved road length <50m.

Step 2B: Defining the Sensitivity of the Area

The sensitivity of the area is defined for dust soiling, human health and ecosystems. The sensitivity of the area takes into account the following factors:

- The specific sensitivities of receptors in the area;
- The proximity and number of those receptors;
- In the case of PM_{10}, the local background concentration; and,
- Site-specific factors, such as whether here are natural shelters such as trees, to reduce the risk of wind-blown dust.

Table A1 was used to define the sensitivity of different types of receptors to dust soiling, health effects and ecological effects.

Table A1: Sensitivity of the Area Surrounding the Site

Sensitivity of Area	Dust Soiling	Human Receptors	Ecological Receptors
High	• Users can reasonably expect an enjoyment of a high level of amenity. • The appearance, aesthetics or value of their property would be diminished by soiling. • The people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. • Examples include dwellings, museums and other culturally important collections, medium and long-term car parks and car showrooms.	• Locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day) • Examples include residential properties, hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.	• Locations with an international or national designation *and* the designated features may be affected by dust soiling. • Locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain. • Examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.
Medium	• Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home. • The appearance, aesthetics or value of their property could be diminished by soiling. • The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. • Examples include parks and places of work.	• Locations where the people exposed are workers and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). • Examples include office and shop workers, but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.	• Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown. • Locations with a national designation where the features may be affected by dust deposition. • Example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.
Low	• The enjoyment of amenity would not reasonably be expected. • Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling. • There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. • Examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.	• Locations where human exposure is transient. • Indicative examples include public footpaths, playing fields, parks and shopping streets.	• Locations with a local designation where the features may be affected by dust deposition. • Example is a local Nature Reserve with dust sensitive features.

Based on the sensitivities assigned of the different types of receptors surrounding the site and numbers of receptors within certain distances of the site, a sensitivity classification for the area can be defined for each. Tables A2 to A4 indicate the method used to determine the sensitivity of the area for dust soiling, human health and ecological impacts, respectively.

For trackout, as per the guidance, it is only considered necessary to consider trackout impacts up to 50m from the edge of the road.

Table A2: Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distances from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table A3: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Conc.	Number of Receptors	Distances from the Source (m)				
			<20	<50	<100	<200	<350
High	>32µg/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32 µg/m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28 µg/m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32µg/m^3	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32 µg/m^3	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28 µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24 µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Table A4: Sensitivity of the area to Ecological Impacts

Receptor Sensitivity	Distances from the Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

Step 2C: Defining the Risk of Impacts

The final step is to use both the dust emission magnitude classification with the sensitivity of the area, to determine a potential risk of impacts for each construction activity, before the application of mitigation. Tables A5 to A7 indicate the method used to assign the level of risk for each construction activity.

Table A5: Risk of Dust Impacts from Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table A6: Risk of Dust Impacts from Earthworks/Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table A7: Risk of Dust Impacts from Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

APPENDIX B – WINDROSES

This appendix contains the windroses for the Global Forecast System (GFS) 2013 - 2017.

Figure B1 GFS Windrose for 2013

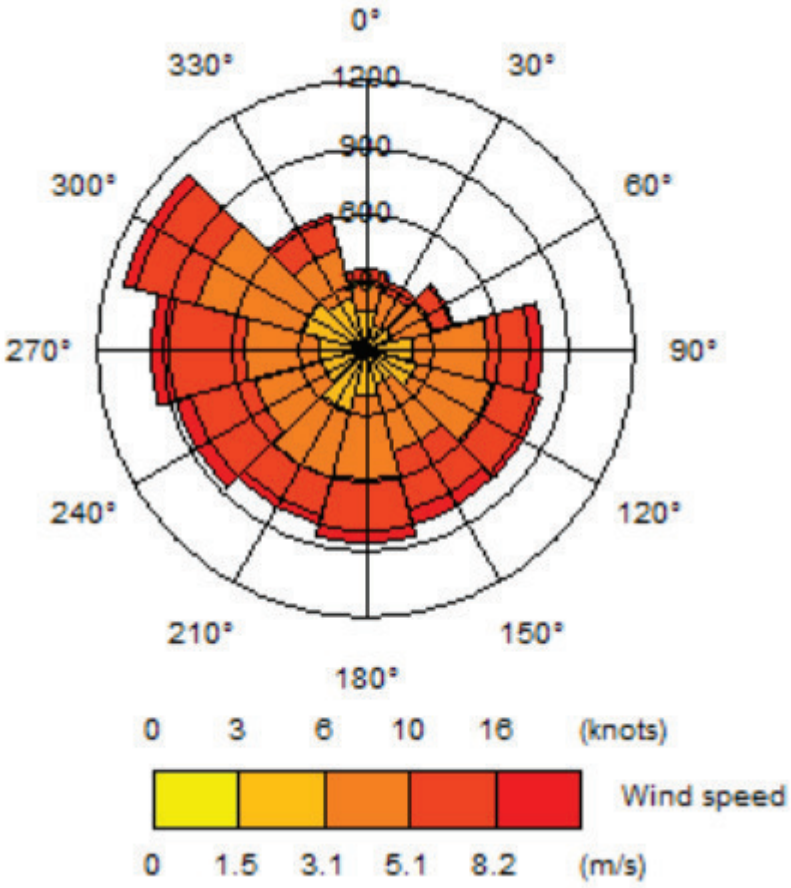


Figure B2 GFS Windrose for 2014

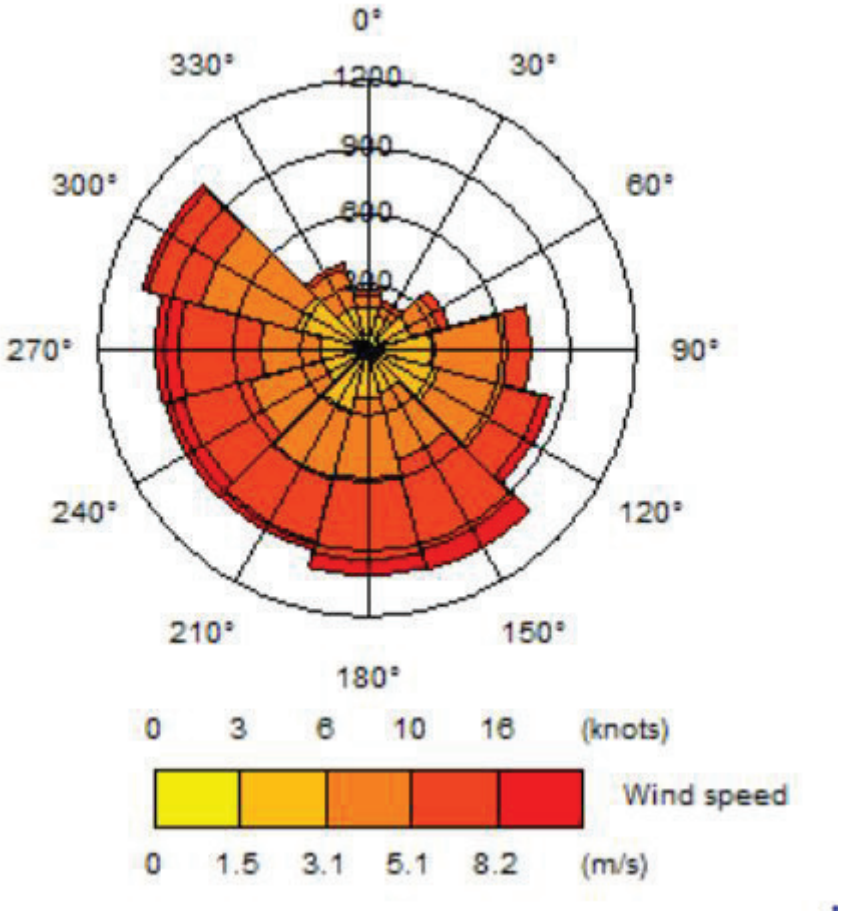


Figure B3 GFS Windrose for 2015

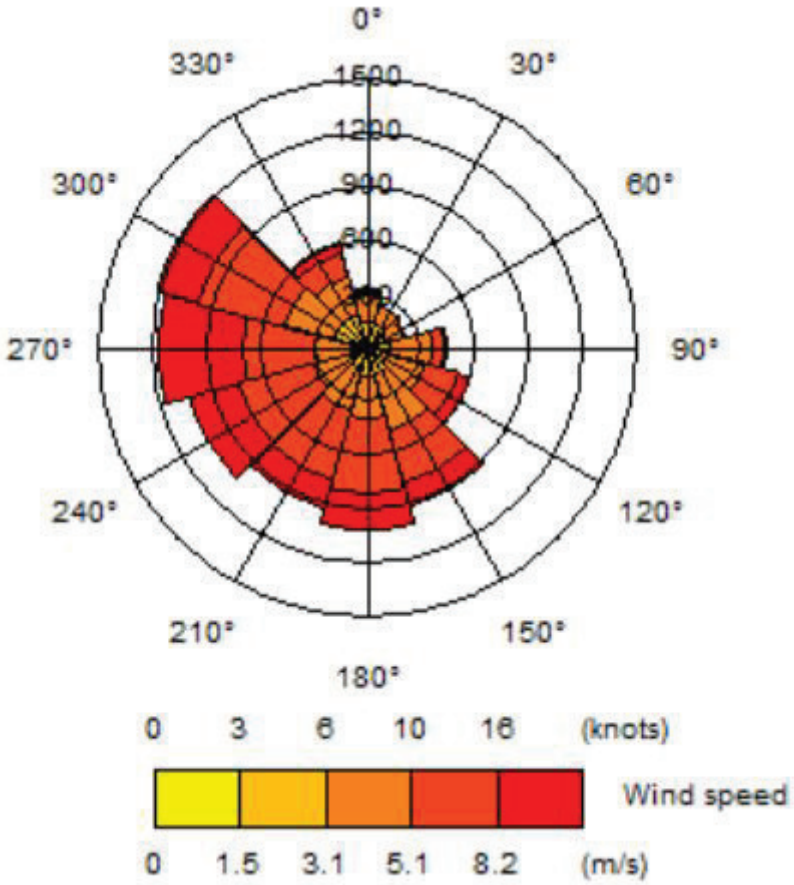


Figure B4 GFS Windrose for 2016

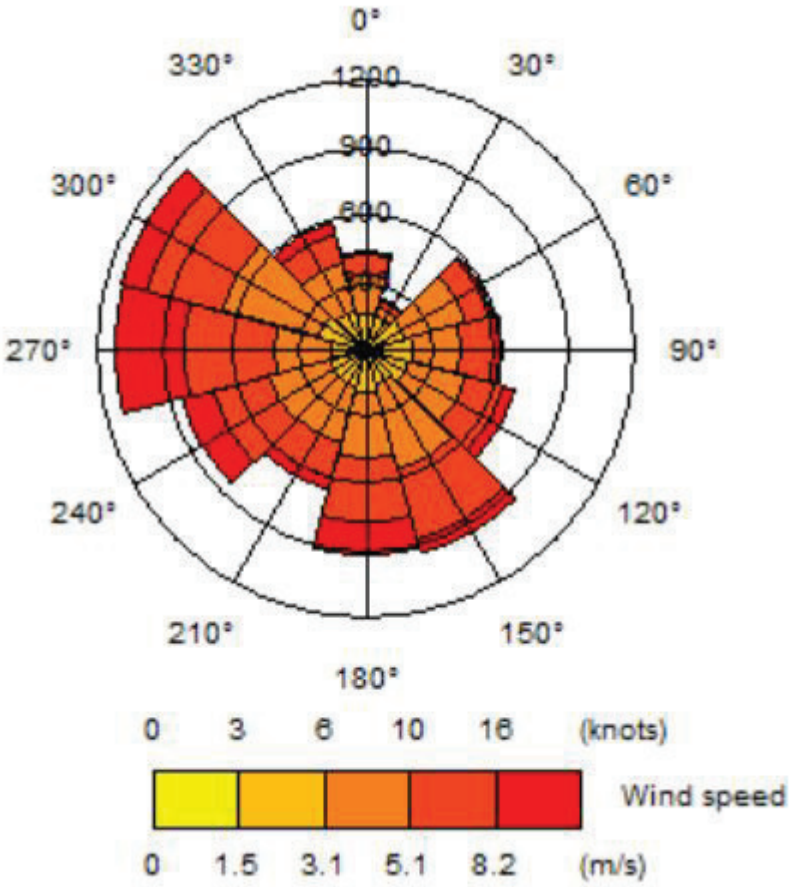
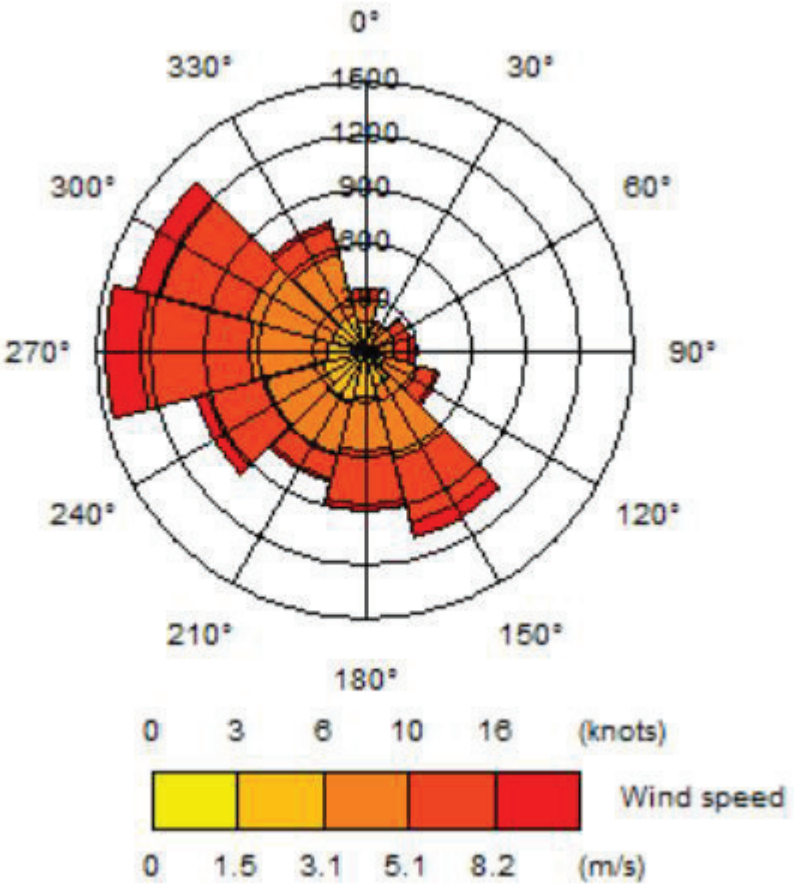


Figure B5 GFS Windrose for 2017



APPENDIX C – CONTOUR PLOTS SHOWING PREDICTED POLLUTANT CONCENTRATIONS

This annex contains contour plot (isopleths) illustrating the PC's and PEC's for the following scenarios:

Human

- Annual mean NO_2 – Baseline – 2017 Meteorological Data
- Annual mean NO_2 - CHP with SCR - 2017 Meteorological Data
- Hourly mean NO_2 baseline - 2016 Meteorological Data
- Hourly mean NO_2 - CHP with SCR - 2016 Meteorological Data

Ecological

- Annual mean NO_x -Bbaseline - 2017 Meteorological Data
- Annual mean NO_x - CHP with SCR - 2017 Meteorological Data
- Daily mean NO_x – Baseline 2016 Meteorological Data
- Daily mean NO_x - CHP with SCR - 2016 Meteorological Data

The data is based on the meteorological data year which achieved the worst predicted pollutant concentrations for a more conservative assessment.

Figure C1 The Process Contribution for the Annual Mean , NO_2 (µg/m^3), Baseline, 2017 Met Data – relevant for human receptor locations

Figure C2 The Predicted Environmental Concentration for the Annual Mean NO_2 (µg/m^3), Baseline , 2017 Met Data – relevant for human receptor locations

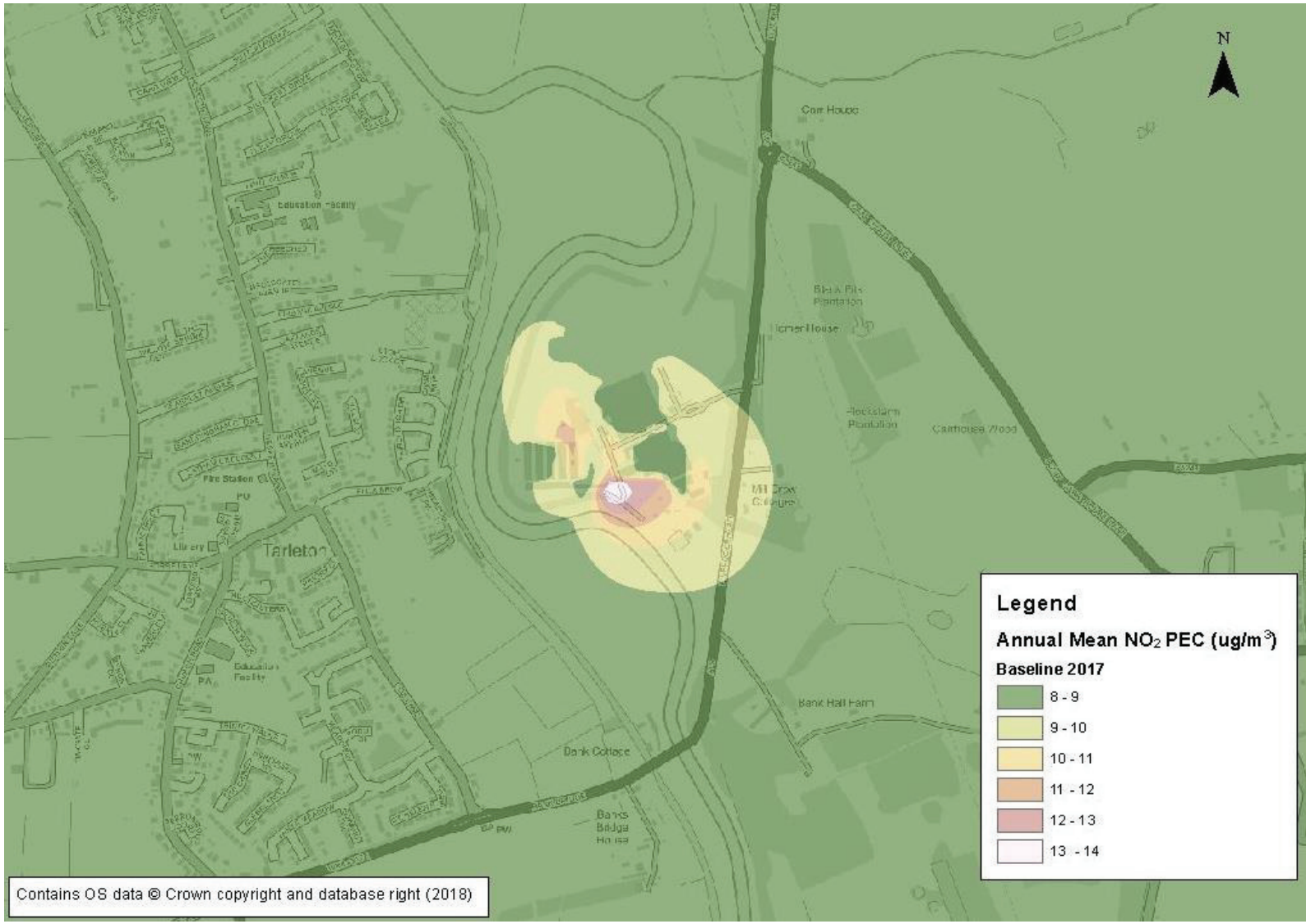


Figure C3 The Process Contribution for the Annual Mean, NO_2 (µg/m^3), With CHP and SCR Scenario, 2017 Met Data – relevant for human receptor locations

Figure C4 The Predicted Environmental Concentration for the Annual Mean NO_2 (µg/m^3), With CHP and SCR Scenario, 2017 Met Data – relevant for human receptor locations

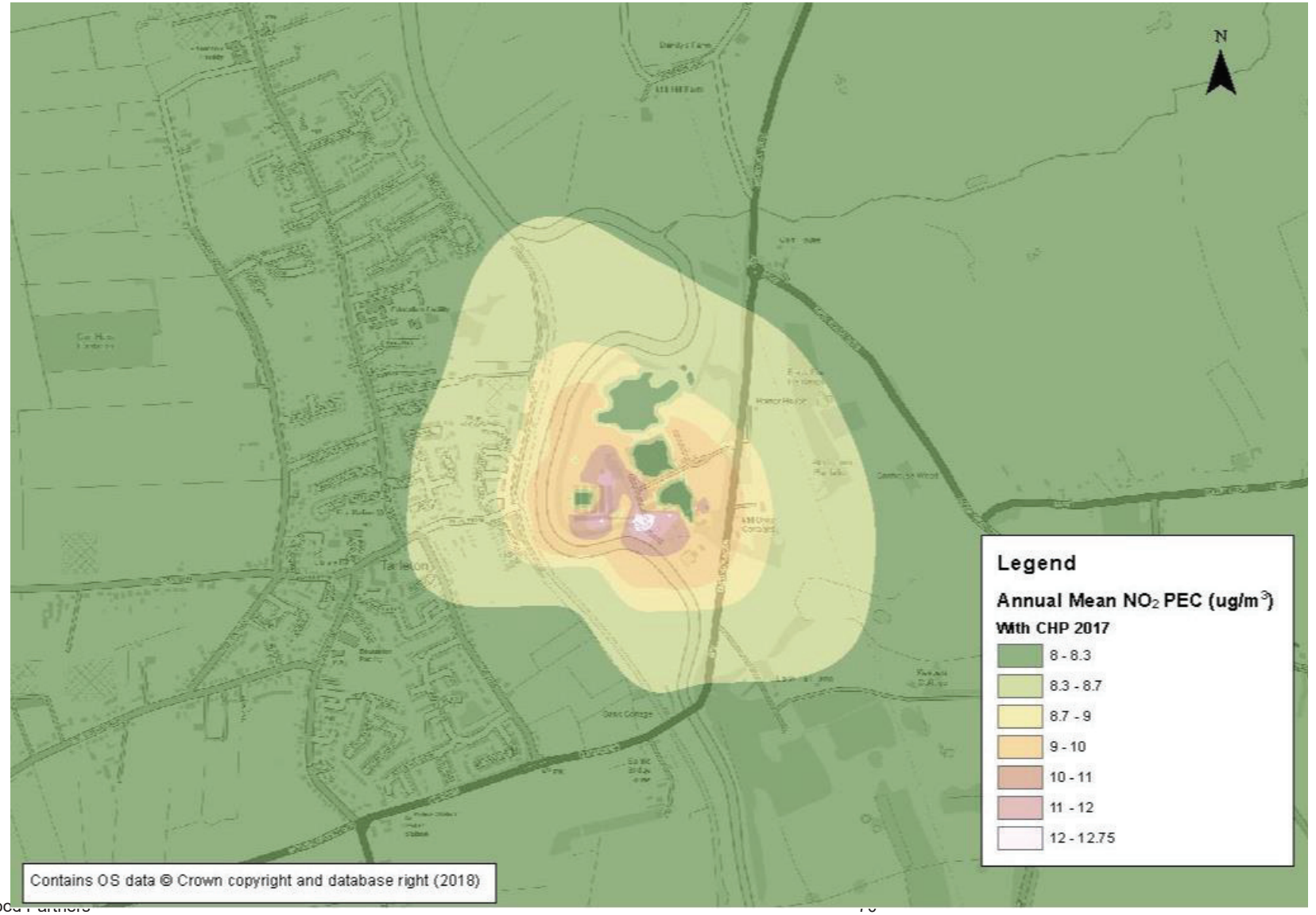


Figure C5 The Process Contribution for the Hourly Mean NO_2 (µg/m^3), Baseline, 2016 Met Data – relevant for human receptor locations

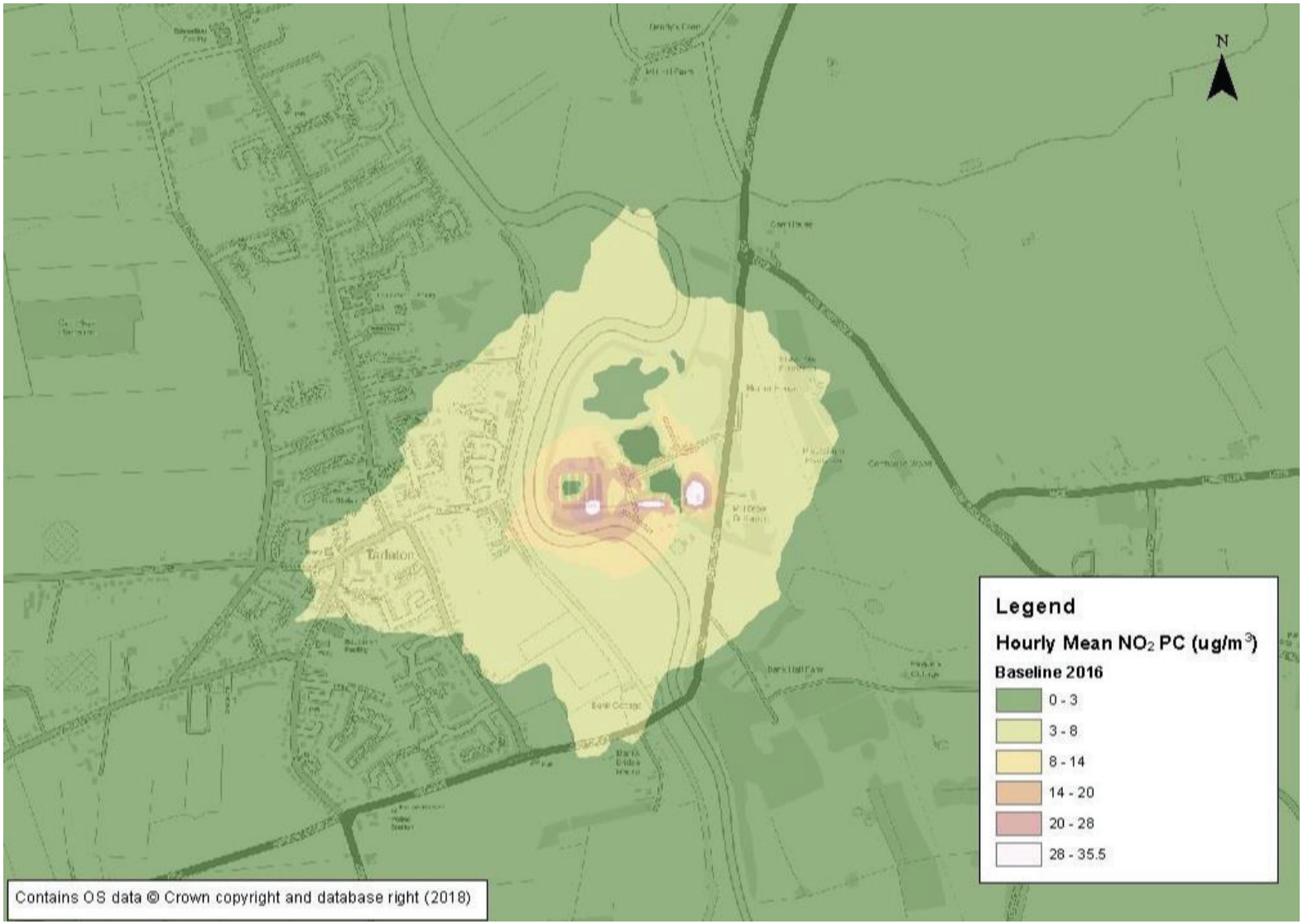


Figure C6 The Predicted Environmental Concentration for the Hourly Mean, NO_2 (µg/m^3), Baseline, 2016 Met Data – relevant for human receptor locations

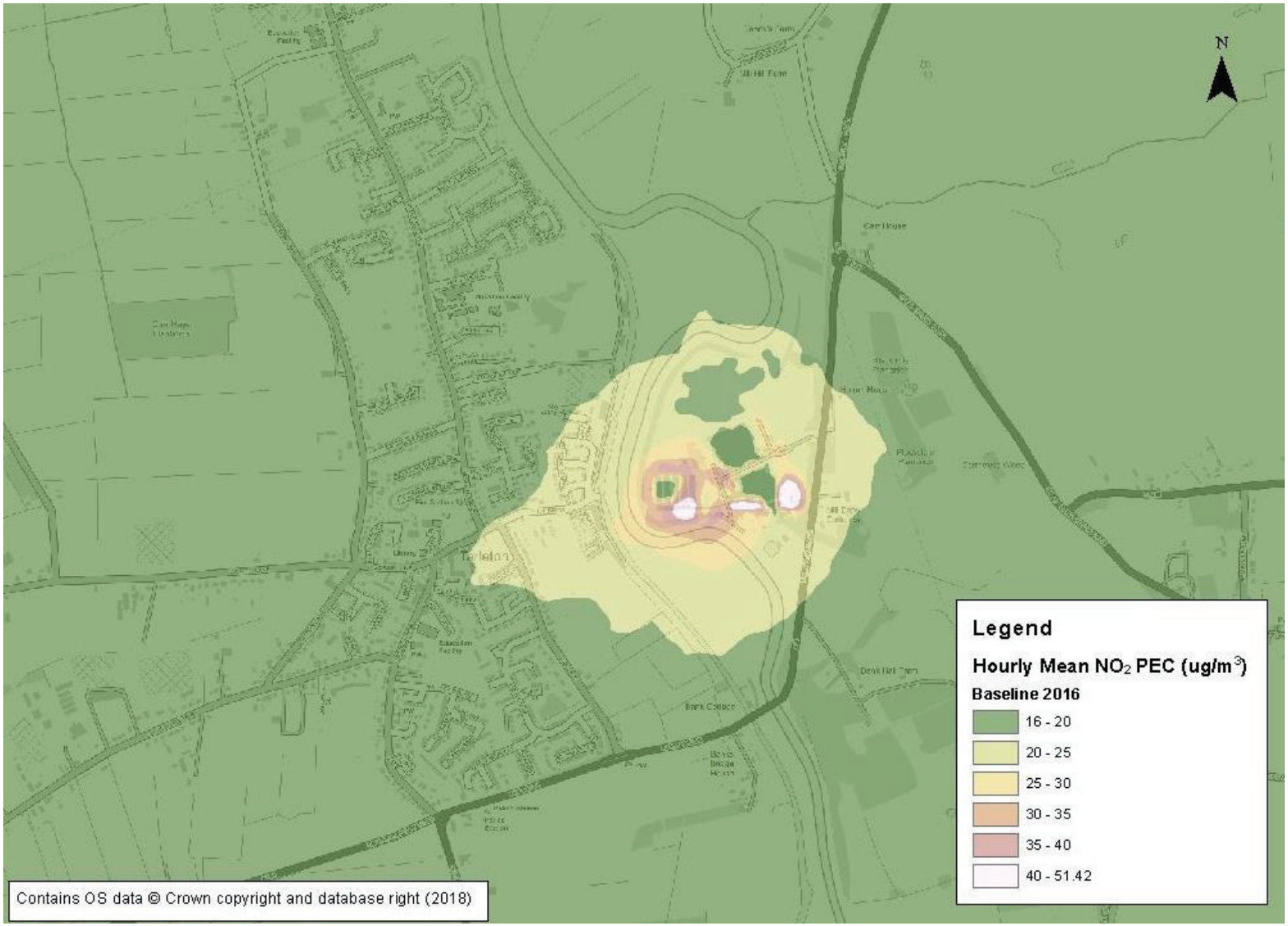


Figure C7 The Process Contribution for the Hourly Mean, NO_2 (µg/m^3), With CHP and SCR ,2016 Met Data – relevant for human receptor locations

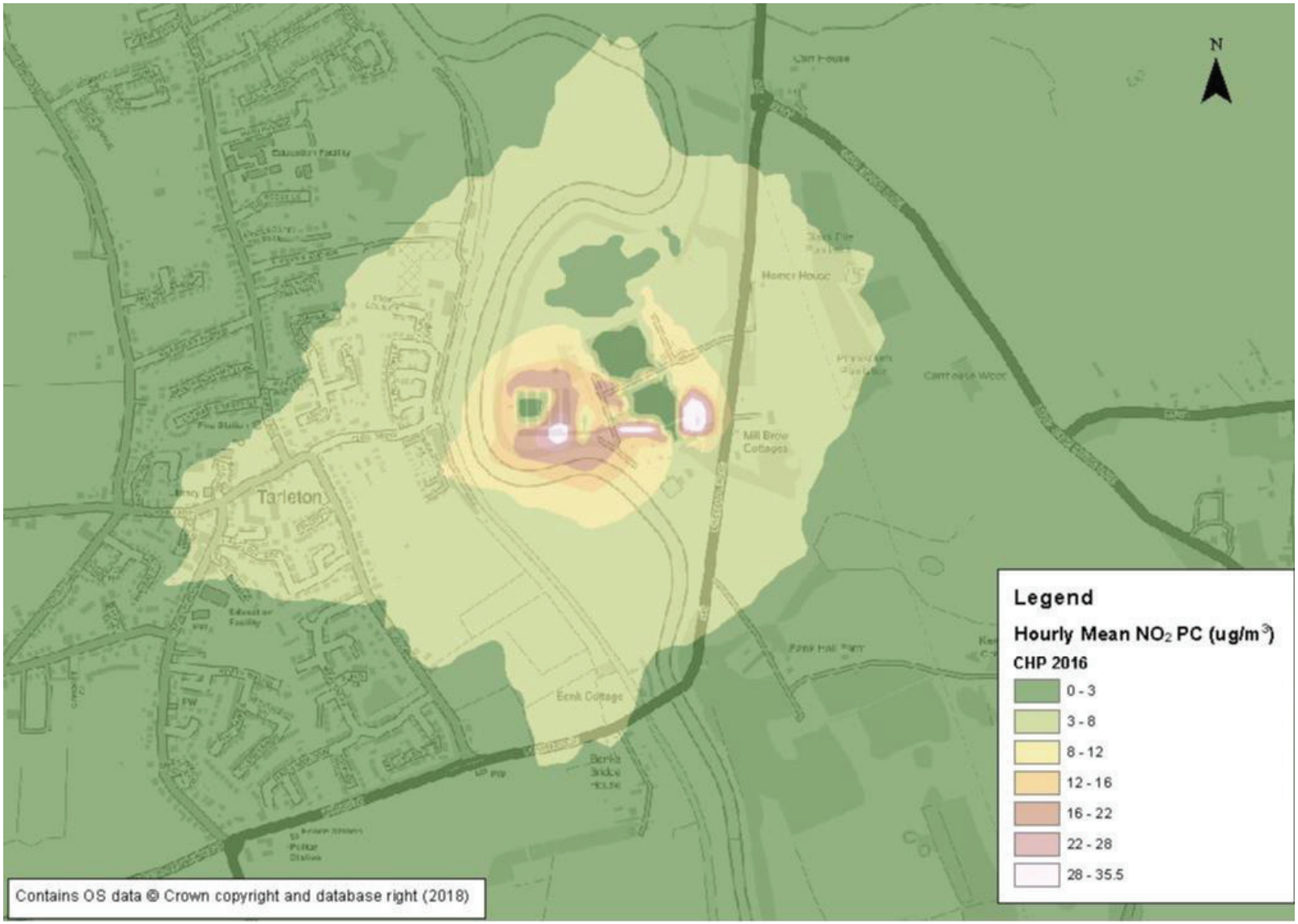


Figure C8 The Predicted Environmental Concentration for the Hourly Mean NO_2 (µg/m^3),With CHP and SCR, 2016 Met Data – relevant for human receptor locations

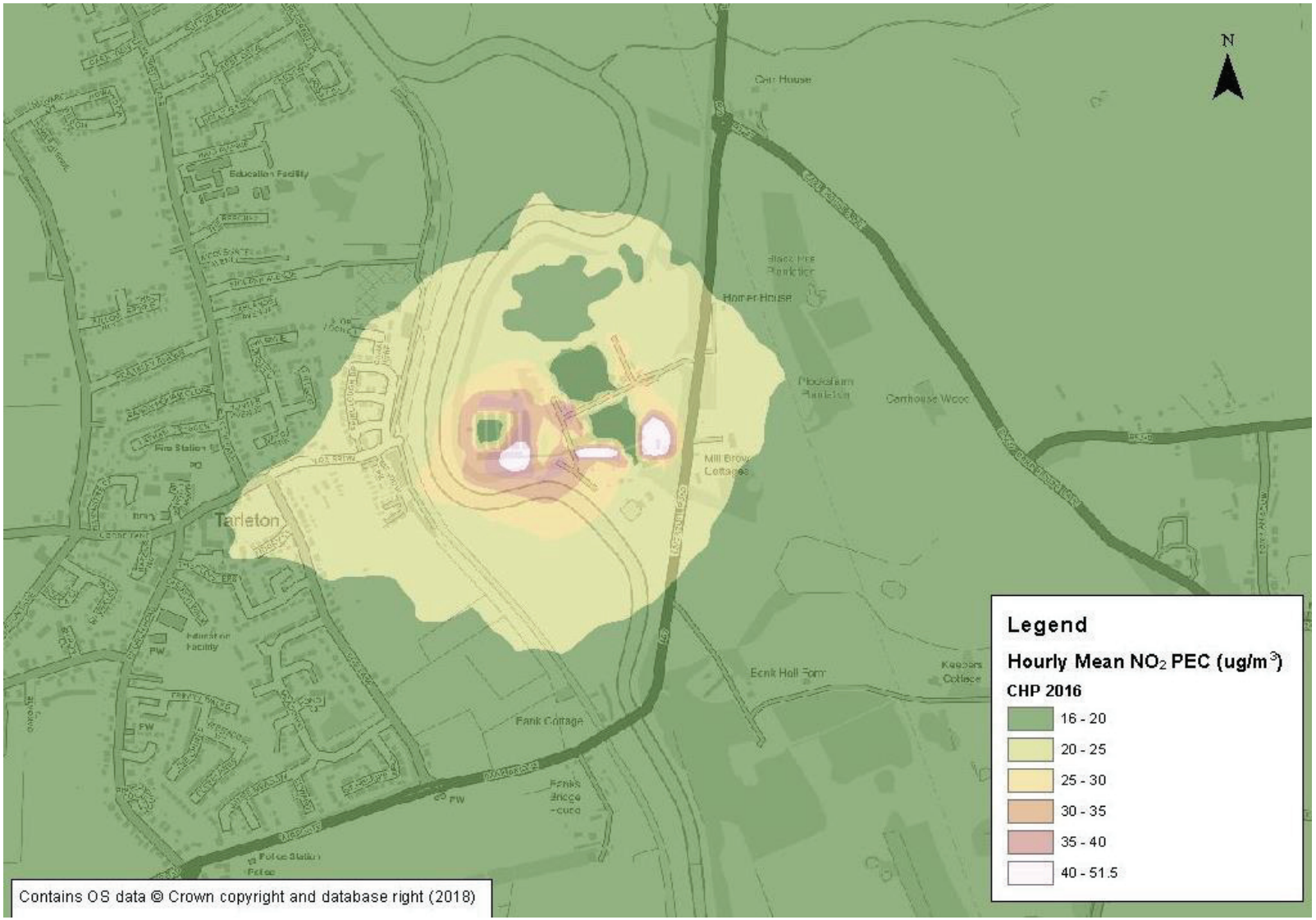


Figure C9 The Process Contribution for the Annual Mean NO_x (µg/m^3), Baseline, 2017 Met Data – relevant for ecological receptor locations

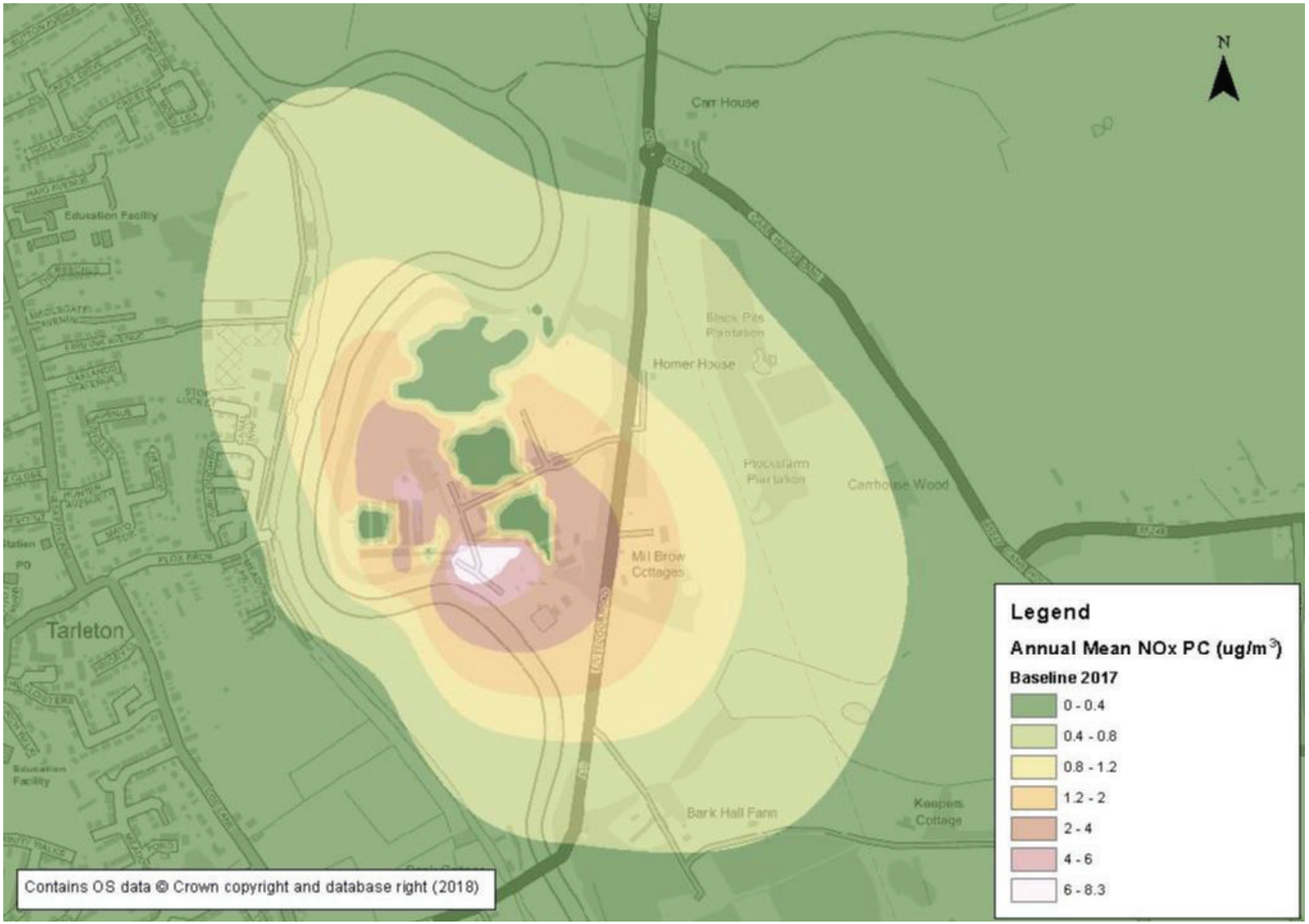


Figure C10 The Predicted Environmental Concentration for the Annual Mean NO_x ($\mu g/m^3$), Baseline, 2017 Met Data – relevant for ecological receptor locations

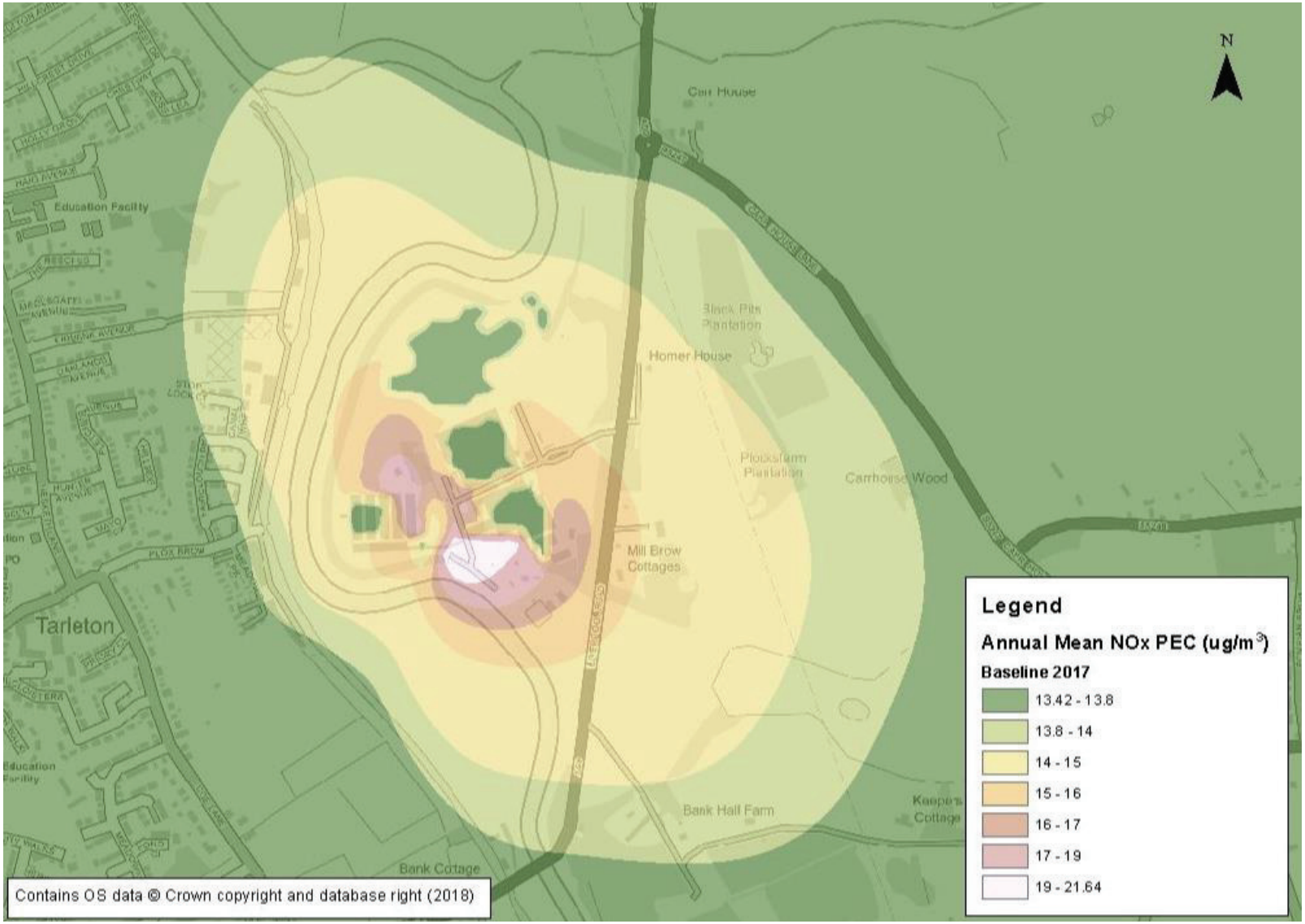


Figure C11 The Process Contribution for the Annual Mean NO_x (µg/m^3), CHP with SCR, 2017 Met Data – relevant for ecological receptor locations

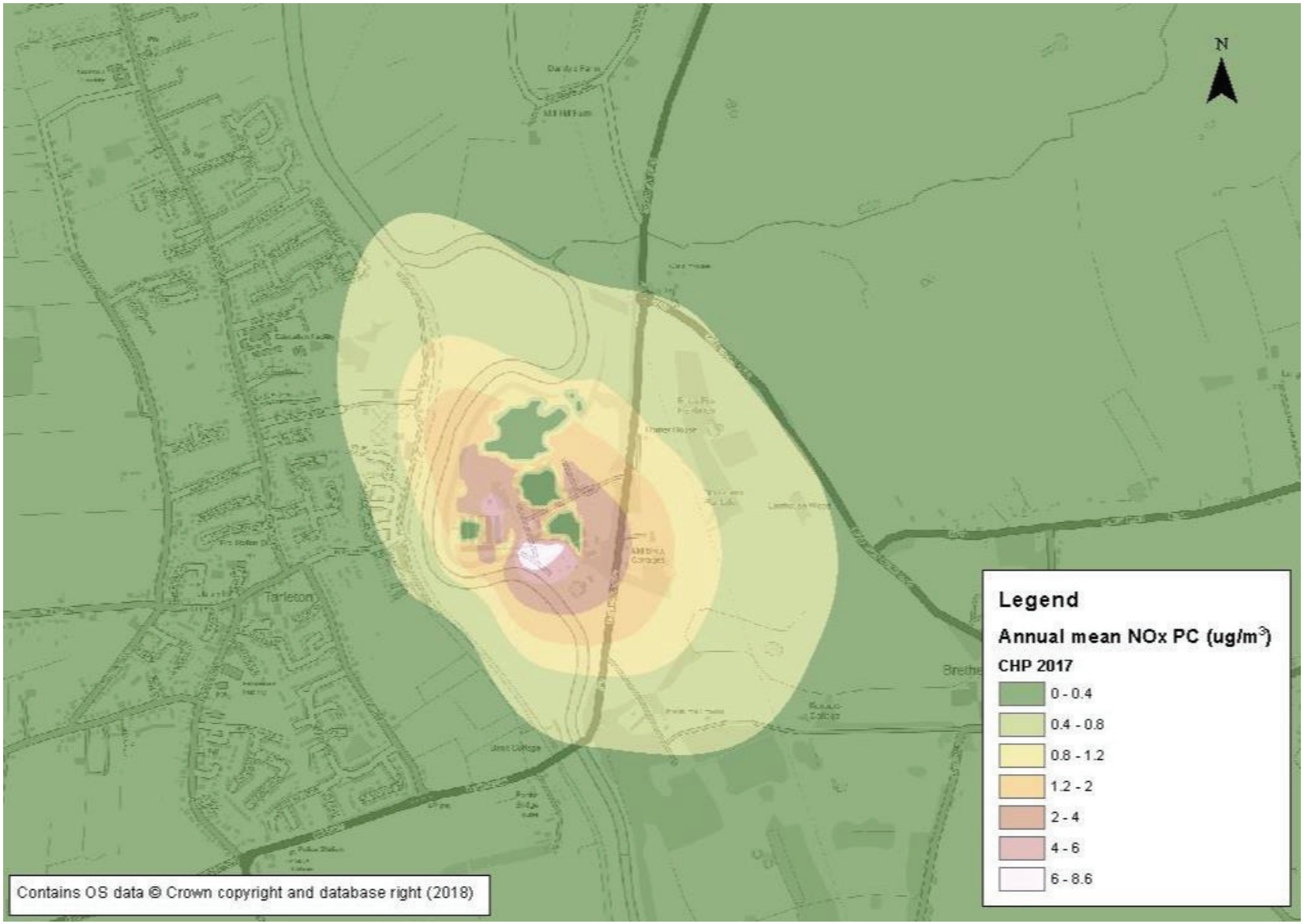


Figure C12 The Predicted Environmental Concentration for the Annual Mean NO_x (µg/m^3), With CHP and SCR, 2017 Met Data – relevant for ecological receptor locations

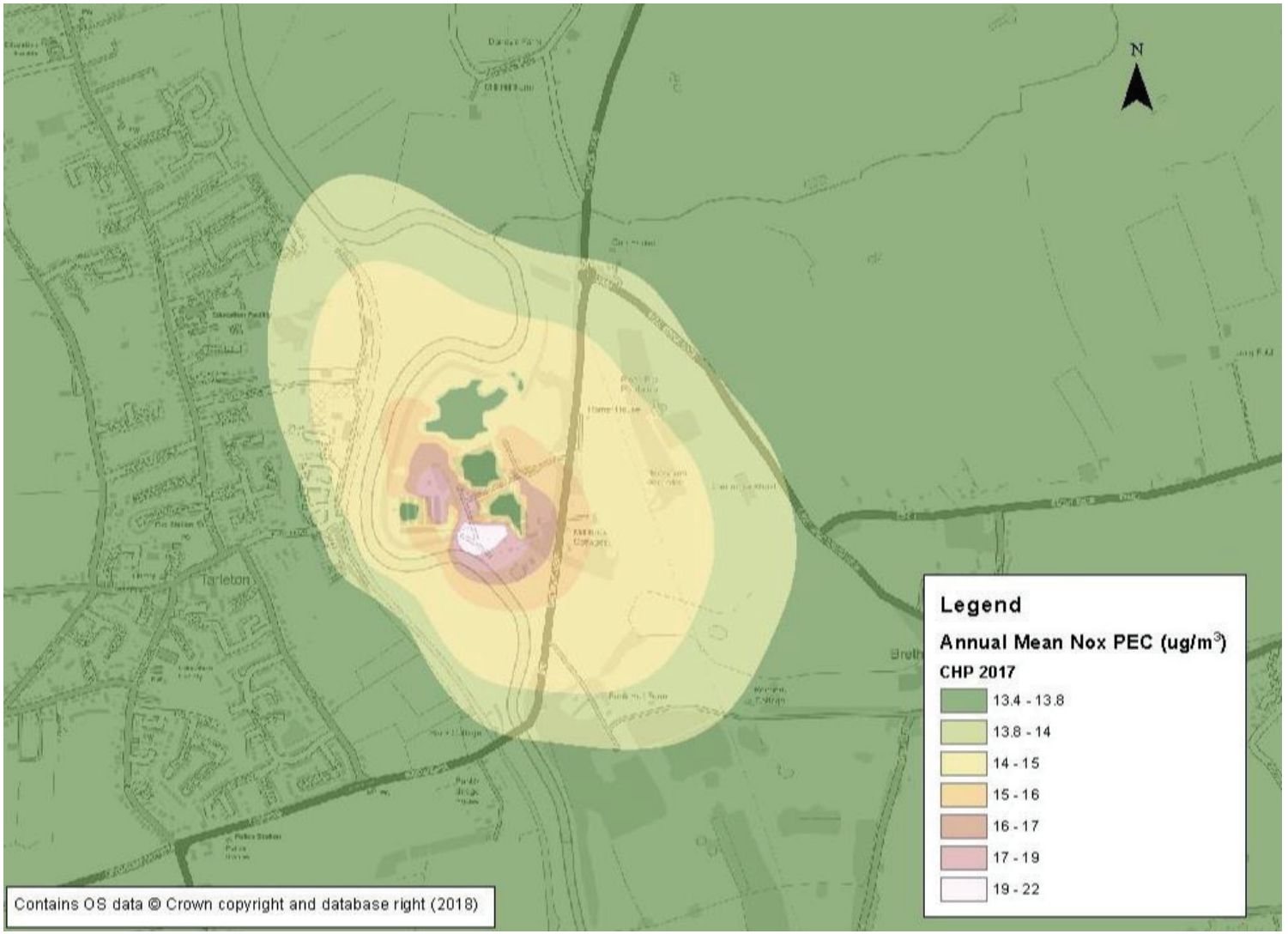


Figure C13 The Process Contribution for the Daily Mean NO_x (µg/m^3), Baseline, 2016 Met Data – relevant for ecological receptor locations

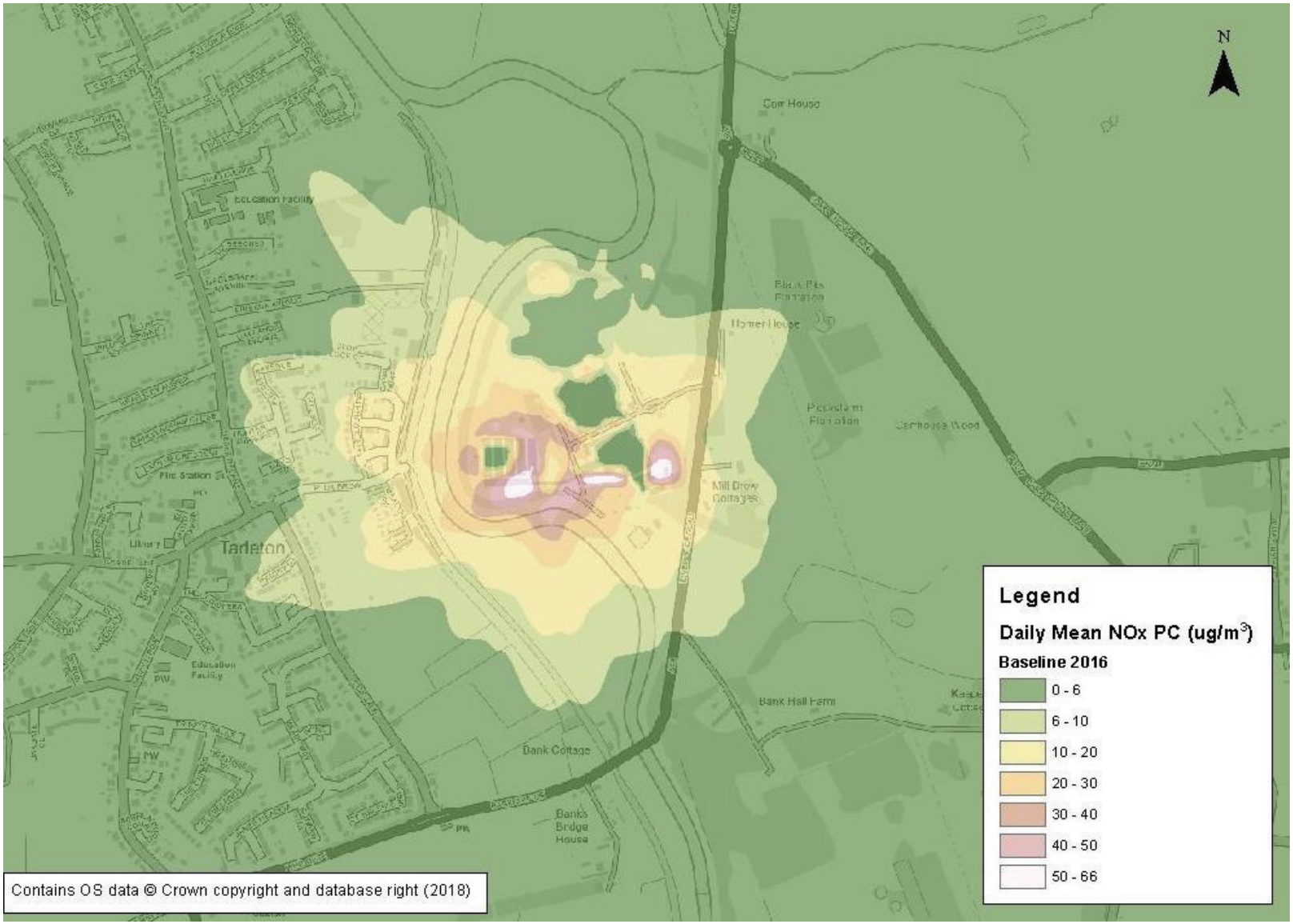


Figure C14 The Predicted Environmental Concentration for the Daily Mean NO_x (µg/m^3), Baseline, 2016 Met Data – relevant for ecological receptor locations

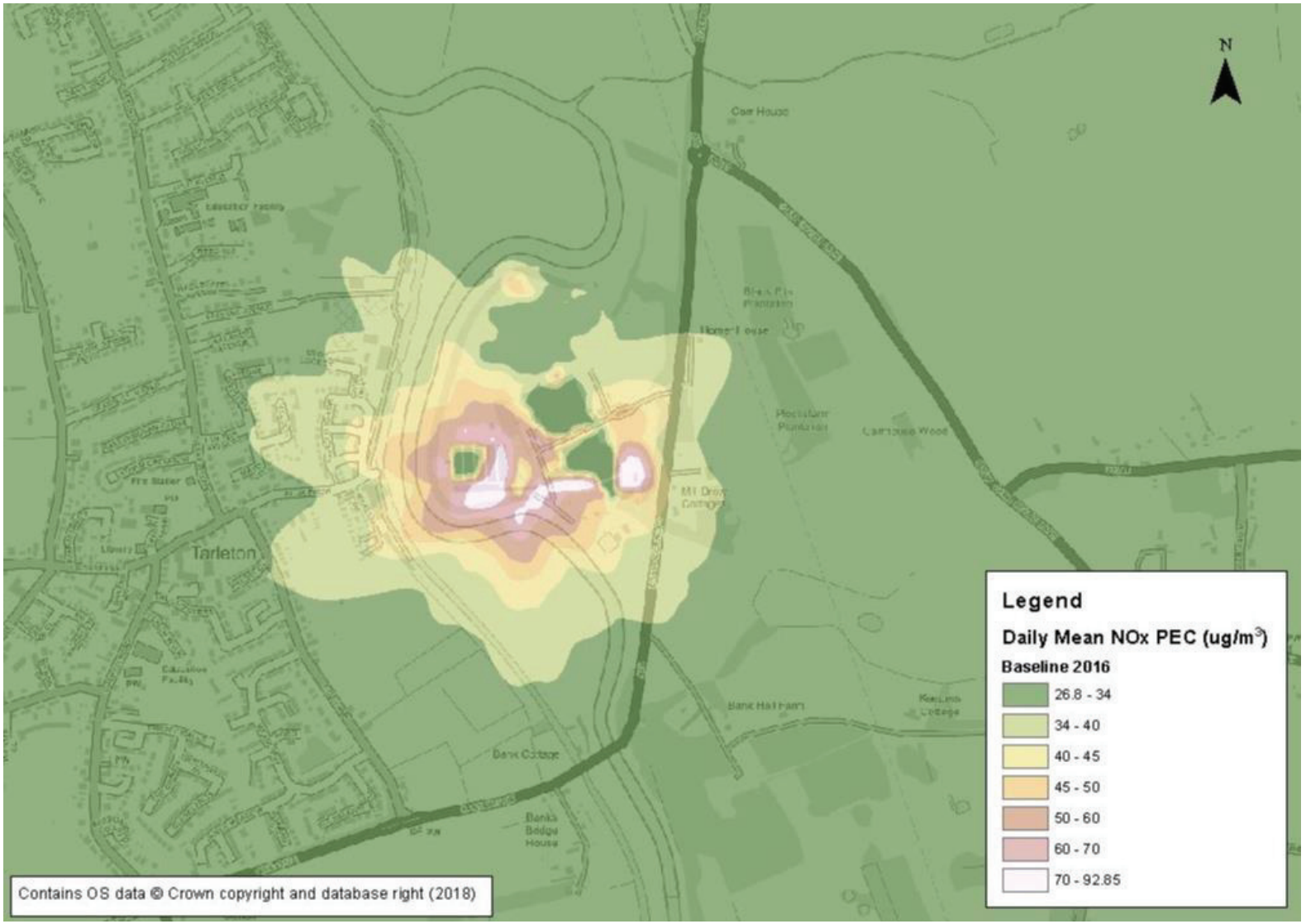


Figure C15 The Process Contribution for the Daily Mean NO_x (µg/m^3), With CHP and SCR, 2016 Met Data – relevant for ecological receptor locations

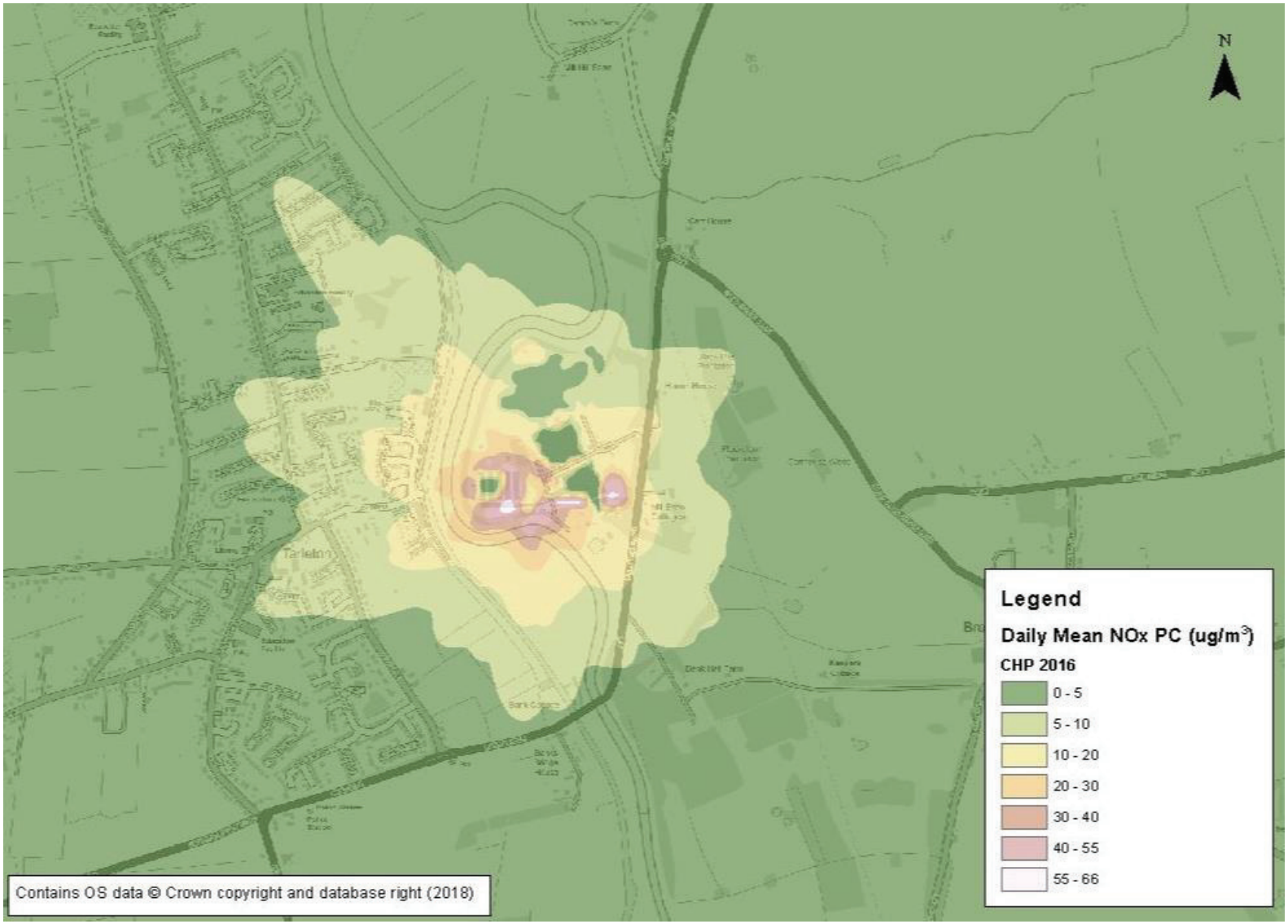
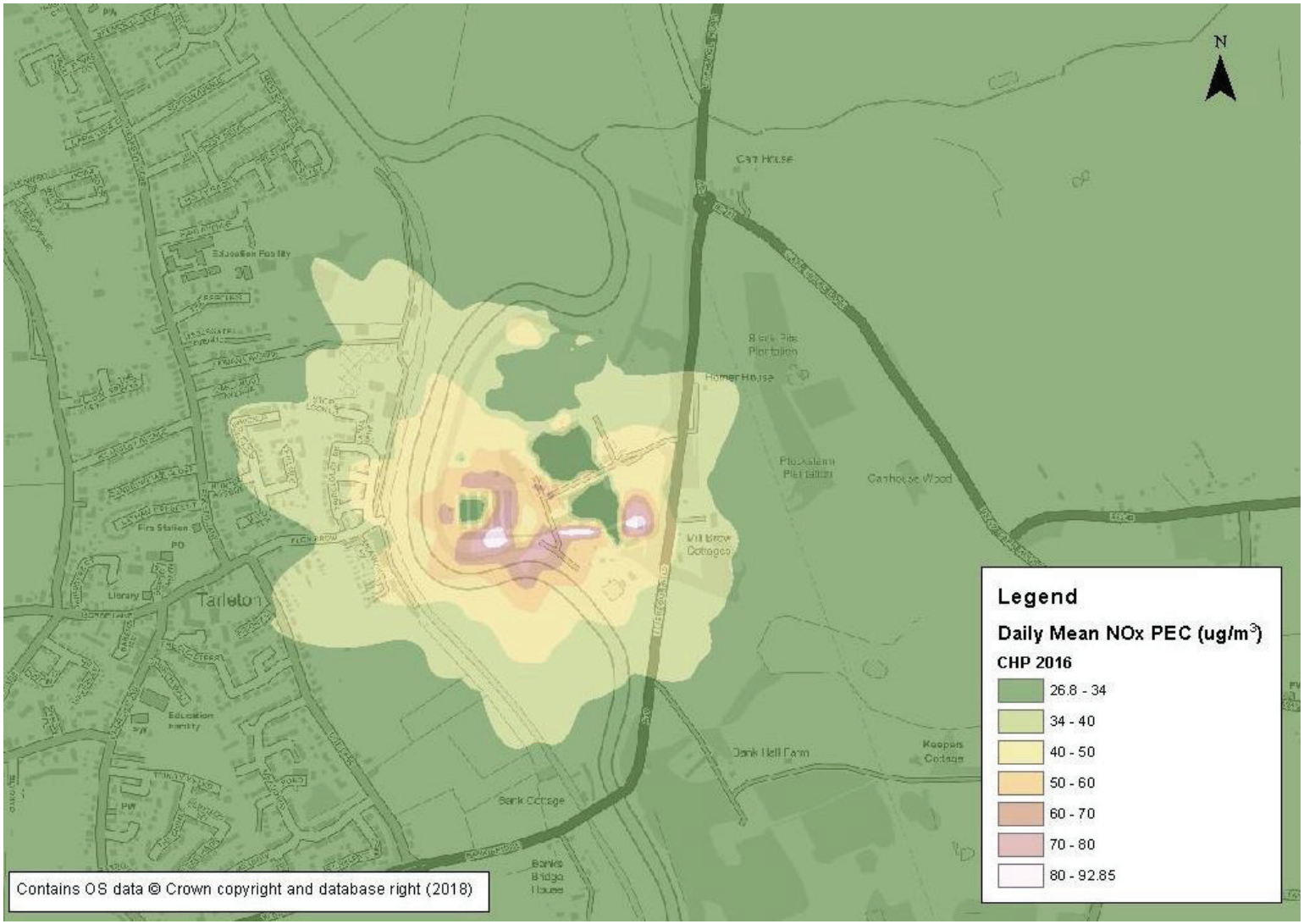


Figure C16 The Predicted Environmental Concentration for the Daily Mean NO_x (µg/m^3), With CHP and SCR, 2016 Met Data – relevant for ecological receptor locations



APPENDIX D - SITE SPECIFIC CONSTRUCTION PHASE RECOMMENDED MITIGATION MEASURES

The IAQM 2014 guidance divides site-specific mitigation measures are divided into general measures applicable to all sites, and measures specific to demolition, earthworks, construction and trackout. Depending on the level of risk assigned in relation to each type of construction activity, different mitigation is assigned. The method for assigning mitigation measures as detailed in the IAQM guidance has been used. For those 'general' mitigation measures, the greatest risk category assigned to the assessed construction activities should be applied. Therefore in this case, the 'low risk' 'general' site mitigation measures have been recommended, where appropriate taking into account the activities likely to occur at the site.

There are two categories of mitigation measure – 'highly recommended' and 'desirable', which are indicated according to the dust risk level identified in Table 5.3. Desirable measures are presented in *italics*. Professional judgement has also been used to only consider measures that could be applicable to this site.

Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.
- Make the complaints log available to the local authority when asked.
- Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site or the action taken to resolve the situation in the log book.

Monitoring

- *Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority if asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.*
- Carry out regular site inspections to monitor compliance with any dust management plan, record inspection results, and make an inspection log available to the local authority when asked.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.

Preparing and maintaining the site

- Plan site layout so that machinery and dust causing activities are located away from receptors as far as possible.

- Where appropriate, erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- *Fully enclose site specific operations where there is a high potential for dust production and the site is active for an extensive period.*
- Avoid site runoff of water or mud.
- *Keep site fencing, barriers and scaffolding clean using wet methods.*
- *Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.*
- *Cover, seed or fence stockpiles to prevent wind whipping.*

Operating Vehicles/Machinery

- Ensure all vehicles switch off engines when stationary - no idling vehicles.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
- *Impose and signpost a maximum-speed-limit of 15mph on surfaced and 10mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).*

Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.
- *Ensure equipment is readily available on site to clean any dry spillages and clean up as soon as reasonably practicable after the event using wet clean methods.*

Waste Management

- Avoid bonfires or burning of waste materials.

Measures Specific to Trackout

- The site has a wheel washing system for vehicles accessing the A59.
- In dry conditions the access routes will be dampened down and will be regularly cleaned in any material is tracked onto them.
- *Avoid dry sweeping of large areas.*

- *Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.*
- *Record all inspections of haul routes and any subsequent action in a site log book.*

APPENDIX E - MODELLING OF OPERATIONAL PHASE – RESULTS

The tables below present the predicted maximum pollutant concentrations out of the five meteorological data years at each discrete human receptors for all scenarios modelled for all the pollutants considered in this assessment for human and ecological receptors.

Human Receptors

Table E1: Maximum Predicted NO_2 Baseline Concentrations

ID	Location		Max PC (Annual)	Max Annual Mean NO_2 (PEC at specific receptors)	Max PC (Hourly)	Max Hourly Mean NO_2
	X	Y				
R1	344457.5	420575.5	0.1	7.5	1.4	16.4
R2	344486.1	420260.6	0.1	7.5	1.6	16.5
R3	344783.8	420607.5	0.1	7.6	1.9	16.8
R4	344792.2	420351.3	0.1	7.5	2.2	17.1
R5	344867.9	421390.1	0.1	6.9	1.5	15.1
R6	345007.1	420973.2	0.2	8.7	2.0	19.1
R7	345066.1	420370.8	0.1	8.7	2.5	19.6
R8	345131.4	421569.1	0.1	7.6	1.6	16.5
R9	345176.0	420063.4	0.1	8.6	2.1	19.2
R10	345169.4	421207.7	0.2	7.7	2.1	17.1
R11	345203.0	420643.1	0.2	8.7	3.6	20.7
R12	345203.2	420965.2	0.3	8.8	2.8	19.9
R13	345333.0	419812.9	0.0	7.7	2.0	17.3
R14	345338.3	420287.3	0.1	8.6	2.8	19.9
R15	345342.1	421410.0	0.2	7.7	2.2	17.1
R16	345377.9	421016.5	0.3	7.8	3.1	18.1
R17	345376.6	421171.1	0.3	7.7	2.9	17.9
R18	345382.1	420875.3	0.4	9.0	3.5	20.6
R19	345414.8	421623.8	0.2	7.6	1.7	16.7
R20	345458.6	420532.0	0.2	8.8	4.4	21.5
R21	345485.9	420721.3	0.4	9.0	6.3	23.4
R22	345585.2	420332.1	0.1	8.7	3.2	20.3
R23	345928.8	421803.9	0.2	7.6	2.6	17.6
R24	345928.5	420196.8	0.2	8.7	3.2	20.3
R25	346155.3	420740.8	1.3	9.3	7.2	23.1
R26	346155.0	420781.9	1.4	9.4	8.5	24.4

ID	Location		Max PC (Annual)	Max Annual Mean NO_2 (PEC at specific receptors)	Max PC (Hourly)	Max Hourly Mean NO_2
	X	Y				
R27	346167.5	420841.7	1.2	9.2	8.7	24.7
R28	346172.6	420359.9	0.3	8.3	2.8	18.7
R29	346205.6	421056.3	0.6	8.7	4.9	21.1
R30	346220.3	420810.4	1.0	8.9	6.1	22.1
R31	346236.9	422152.2	0.1	8.2	1.7	17.9
R32	346257.9	421430.0	0.2	8.3	3.7	19.8
R33	346358.9	420351.6	0.3	8.3	2.5	18.4
R34	346882.0	420848.8	0.2	8.1	1.7	17.6
R35	347043.7	420823.4	0.1	7.6	1.5	16.4
R36	347054.0	420571.5	0.1	7.6	1.2	16.1
R37	347054.5	420355.8	0.1	7.6	1.3	16.2
R38	347122.9	420431.9	0.1	7.6	1.2	16.1
R39	347215.5	420579.7	0.1	7.6	1.1	16.0
R40	347253.7	420748.7	0.1	7.6	1.2	16.1
R41	347670.9	420414.3	0.1	7.5	0.8	15.7
R42	345582.8	420709.3	0.7	9.2	8.1	25.2
R43	345547.8	420771.8	0.7	9.2	6.0	23.1
R44	345597.3	420925.3	0.8	9.4	5.9	23.0
R45	345559.8	420865.8	0.8	9.4	5.5	22.6
R46	345487.4	420891.0	0.6	9.2	4.3	21.4
AQS Objective			**40**		**200**	

Table E2: Maximum Predicted NO_2 CHP no SCR Concentrations

ID	Location		Max PC (Annual)	Max Annual Mean NO_2 (PEC at specific receptors)	Max PC (Hourly)	Max Hourly Mean NO_2
	X	Y				
R1	344457.5	420575.5	0.1	7.6	1.7	16.6
R2	344486.1	420260.6	0.1	7.6	1.7	16.6
R3	344783.8	420607.5	0.1	7.6	2.2	17.1
R4	344792.2	420351.3	0.1	7.6	2.3	17.2
R5	344867.9	421390.1	0.2	7.0	2.2	15.8
R6	345007.1	420973.2	0.3	8.8	2.5	19.6
R7	345066.1	420370.8	0.2	8.7	3.0	20.1
R8	345131.4	421569.1	0.2	7.7	2.3	17.3
R9	345176.0	420063.4	0.1	8.6	2.9	20.0

ID	Location		Max PC (Annual)	Max Annual Mean NO_2 (PEC at specific receptors)	Max PC (Hourly)	Max Hourly Mean NO_2
	X	Y				
R10	345169.4	421207.7	0.3	7.8	2.9	17.8
R11	345203.0	420643.1	0.3	8.8	3.6	20.7
R12	345203.2	420965.2	0.4	9.0	3.1	20.2
R13	345333.0	419812.9	0.1	7.8	2.6	18.0
R14	345338.3	420287.3	0.1	8.7	3.5	20.6
R15	345342.1	421410.0	0.3	7.8	3.0	17.9
R16	345377.9	421016.5	0.6	8.1	4.0	18.9
R17	345376.6	421171.1	0.5	7.9	3.8	18.7
R18	345382.1	420875.3	0.6	9.2	3.7	20.8
R19	345414.8	421623.8	0.3	7.8	2.4	17.4
R20	345458.6	420532.0	0.3	8.9	4.8	22.0
R21	345485.9	420721.3	0.6	9.2	6.3	23.4
R22	345585.2	420332.1	0.2	8.7	4.0	21.1
R23	345928.8	421803.9	0.2	7.7	2.9	17.8
R24	345928.5	420196.8	0.2	8.8	3.4	20.6
R25	346155.3	420740.8	1.7	9.7	8.1	24.1
R26	346155.0	420781.9	1.8	9.8	8.9	24.8
R27	346167.5	420841.7	1.6	9.6	8.9	24.8
R28	346172.6	420359.9	0.5	8.4	3.6	19.6
R29	346205.6	421056.3	0.8	8.9	4.9	21.1
R30	346220.3	420810.4	1.3	9.3	6.4	22.4
R31	346236.9	422152.2	0.1	8.3	2.1	18.3
R32	346257.9	421430.0	0.4	8.5	4.1	20.3
R33	346358.9	420351.6	0.4	8.4	3.2	19.1
R34	346882.0	420848.8	0.3	8.2	2.2	18.1
R35	347043.7	420823.4	0.2	7.7	1.9	16.8
R36	347054.0	420571.5	0.2	7.6	1.7	16.6
R37	347054.5	420355.8	0.2	7.6	1.9	16.8
R38	347122.9	420431.9	0.2	7.6	1.7	16.6
R39	347215.5	420579.7	0.2	7.6	1.5	16.4
R40	347253.7	420748.7	0.2	7.6	1.6	16.5
R41	347670.9	420414.3	0.1	7.6	1.1	16.0
R42	345582.8	420709.3	0.8	9.4	8.1	25.2
R43	345547.8	420771.8	0.9	9.4	6.0	23.1
R44	345597.3	420925.3	1.4	9.9	6.1	23.2
R45	345559.8	420865.8	1.2	9.8	5.5	22.6
R46	345487.4	420891.0	0.9	9.5	4.5	21.6

ID	Location		Max PC (Annual)	Max Annual Mean NO_2 (PEC at specific receptors)	Max PC (Hourly)	Max Hourly Mean NO_2
	X	Y				
AQS Objective			40		200	

Table E3: Maximum Predicted NO_2 CHP with SCR Concentrations

ID	Location		Max PC (Annual)	Max Annual Mean NO_2 (PEC at specific receptors)	Max PC (Hourly)	Max Hourly Mean NO_2
	X	Y				
R1	344457.5	420575.5	0.1	7.5	1.5	16.5
R2	344486.1	420260.6	0.1	7.5	1.6	16.6
R3	344783.8	420607.5	0.1	7.6	2.0	17.0
R4	344792.2	420351.3	0.1	7.6	2.2	17.1
R5	344867.9	421390.1	0.1	6.9	1.7	15.3
R6	345007.1	420973.2	0.2	8.8	2.2	19.3
R7	345066.1	420370.8	0.1	8.7	2.6	19.7
R8	345131.4	421569.1	0.1	7.6	1.9	16.8
R9	345176.0	420063.4	0.1	8.6	2.2	19.3
R10	345169.4	421207.7	0.2	7.7	2.4	17.4
R11	345203.0	420643.1	0.2	8.8	3.6	20.7
R12	345203.2	420965.2	0.3	8.9	2.9	20.0
R13	345333.0	419812.9	0.1	7.7	2.2	17.5
R14	345338.3	420287.3	0.1	8.7	3.2	20.3
R15	345342.1	421410.0	0.2	7.7	2.5	17.4
R16	345377.9	421016.5	0.5	7.9	3.3	18.3
R17	345376.6	421171.1	0.3	7.8	3.2	18.2
R18	345382.1	420875.3	0.5	9.0	3.5	20.6
R19	345414.8	421623.8	0.2	7.7	2.0	17.0
R20	345458.6	420532.0	0.3	8.8	4.6	21.7
R21	345485.9	420721.3	0.5	9.1	6.3	23.4
R22	345585.2	420332.1	0.2	8.7	3.4	20.5
R23	345928.8	421803.9	0.2	7.7	2.7	17.7
R24	345928.5	420196.8	0.2	8.8	3.3	20.4
R25	346155.3	420740.8	1.5	9.4	7.5	23.4
R26	346155.0	420781.9	1.6	9.5	8.6	24.5
R27	346167.5	420841.7	1.4	9.4	8.8	24.7
R28	346172.6	420359.9	0.4	8.4	3.2	19.1
R29	346205.6	421056.3	0.7	8.7	4.9	21.1

ID	Location		Max PC (Annual)	Max Annual Mean NO_2 (PEC at specific receptors)	Max PC (Hourly)	Max Hourly Mean NO_2
	X	Y				
R30	346220.3	420810.4	1.1	9.1	6.2	22.2
R31	346236.9	422152.2	0.1	8.2	1.8	18.0
R32	346257.9	421430.0	0.3	8.4	3.9	20.1
R33	346358.9	420351.6	0.4	8.3	2.7	18.6
R34	346882.0	420848.8	0.2	8.2	1.8	17.7
R35	347043.7	420823.4	0.2	7.6	1.6	16.5
R36	347054.0	420571.5	0.2	7.6	1.4	16.3
R37	347054.5	420355.8	0.1	7.6	1.5	16.4
R38	347122.9	420431.9	0.1	7.6	1.4	16.3
R39	347215.5	420579.7	0.1	7.6	1.2	16.1
R40	347253.7	420748.7	0.1	7.6	1.4	16.3
R41	347670.9	420414.3	0.1	7.5	0.9	15.8
R42	345582.8	420709.3	0.7	9.3	8.1	25.2
R43	345547.8	420771.8	0.7	9.3	6.0	23.1
R44	345597.3	420925.3	1.0	9.6	6.0	23.1
R45	345559.8	420865.8	1.0	9.5	5.5	22.6
R46	345487.4	420891.0	0.7	9.3	4.4	21.5
AQS Objective			**40**		**200**	

Table E4: Maximum Predicted NO_2 CHP with SCR and New Building Concentrations

ID	Location		Max PC (Annual)	Max Annual Mean NO_2 (PEC at specific receptors)	Max PC (Hourly)	Max Hourly Mean NO_2
	X	Y				
R1	344457.5	420575.5	0.1	7.5	1.6	16.6
R2	344486.1	420260.6	0.1	7.5	1.8	16.7
R3	344783.8	420607.5	0.1	7.6	2.2	17.1
R4	344792.2	420351.3	0.1	7.6	2.4	17.3
R5	344867.9	421390.1	0.1	6.9	1.7	15.3
R6	345007.1	420973.2	0.2	8.8	2.4	19.5
R7	345066.1	420370.8	0.1	8.7	2.6	19.7
R8	345131.4	421569.1	0.1	7.6	1.9	16.8
R9	345176.0	420063.4	0.1	8.6	2.1	19.2
R10	345169.4	421207.7	0.2	7.7	2.5	17.4
R11	345203.0	420643.1	0.2	8.8	3.7	20.8
R12	345203.2	420965.2	0.3	8.9	3.0	20.1

ID	Location		Max PC (Annual)	Max Annual Mean NO_2 (PEC at specific receptors)	Max PC (Hourly)	Max Hourly Mean NO_2
	X	Y				
R13	345333.0	419812.9	0.1	7.7	2.0	17.4
R14	345338.3	420287.3	0.1	8.7	3.3	20.4
R15	345342.1	421410.0	0.2	7.7	2.5	17.4
R16	345377.9	421016.5	0.5	7.9	3.6	18.6
R17	345376.6	421171.1	0.4	7.8	3.2	18.2
R18	345382.1	420875.3	0.5	9.1	3.8	20.9
R19	345414.8	421623.8	0.2	7.7	2.0	17.0
R20	345458.6	420532.0	0.3	8.8	4.4	21.5
R21	345485.9	420721.3	0.5	9.1	6.4	23.5
R22	345585.2	420332.1	0.2	8.7	3.4	20.5
R23	345928.8	421803.9	0.2	7.7	2.8	17.8
R24	345928.5	420196.8	0.2	8.8	3.4	20.5
R25	346155.3	420740.8	1.5	9.5	7.5	23.5
R26	346155.0	420781.9	1.6	9.6	8.6	24.6
R27	346167.5	420841.7	1.4	9.4	8.8	24.8
R28	346172.6	420359.9	0.4	8.4	3.2	19.1
R29	346205.6	421056.3	0.7	8.8	4.9	21.1
R30	346220.3	420810.4	1.1	9.1	6.3	22.2
R31	346236.9	422152.2	0.1	8.2	1.8	18.0
R32	346257.9	421430.0	0.3	8.4	3.8	20.0
R33	346358.9	420351.6	0.4	8.3	2.8	18.7
R34	346882.0	420848.8	0.2	8.2	1.8	17.7
R35	347043.7	420823.4	0.2	7.6	1.6	16.5
R36	347054.0	420571.5	0.2	7.6	1.4	16.3
R37	347054.5	420355.8	0.1	7.6	1.5	16.5
R38	347122.9	420431.9	0.1	7.6	1.4	16.3
R39	347215.5	420579.7	0.1	7.6	1.3	16.2
R40	347253.7	420748.7	0.1	7.6	1.4	16.3
R41	347670.9	420414.3	0.1	7.5	1.0	15.9
R42	345582.8	420709.3	0.7	9.3	8.1	25.2
R43	345547.8	420771.8	0.8	9.3	6.1	23.2
R44	345597.3	420925.3	1.2	9.8	6.2	23.3
R45	345559.8	420865.8	1.1	9.6	5.7	22.8
R46	345487.4	420891.0	0.8	9.3	4.6	21.7
AQS Objective			**40**		**200**	

Table E5: Maximum Predicted CO Baseline Concentrations

ID	Location		Max PC (1 Hour)	Max PEC 1 Hour CO	Max PC (8 Hour)	Max Daily Running 8-hour Mean CO (PEC)
	X	Y				
R1	344457.5	420575.5	3.2	3.7	1.8	2.3
R2	344486.1	420260.6	3.2	3.7	2.2	2.7
R3	344783.8	420607.5	4.6	5.1	2.3	2.8
R4	344792.2	420351.3	4.3	4.8	3.0	3.5
R5	344867.9	421390.1	3.1	3.6	2.2	2.7
R6	345007.1	420973.2	3.9	4.4	2.7	3.2
R7	345066.1	420370.8	5.6	6.1	3.2	3.7
R8	345131.4	421569.1	3.0	3.5	2.1	2.6
R9	345176.0	420063.4	4.7	5.2	3.1	3.6
R10	345169.4	421207.7	4.1	4.6	3.1	3.7
R11	345203.0	420643.1	7.5	8.0	4.5	5.0
R12	345203.2	420965.2	5.1	5.6	3.2	3.7
R13	345333.0	419812.9	4.6	5.1	2.8	3.3
R14	345338.3	420287.3	6.0	6.5	4.5	5.0
R15	345342.1	421410.0	4.1	4.6	3.0	3.5
R16	345377.9	421016.5	5.0	5.7	4.3	4.8
R17	345376.6	421171.1	5.0	5.5	3.6	4.1
R18	345382.1	420875.3	6.5	7.0	4.2	4.7
R19	345414.8	421623.8	3.5	4.0	2.2	2.7
R20	345458.6	420532.0	8.8	9.3	5.8	6.3
R21	345485.9	420721.3	12.6	13.1	8.1	8.6
R22	345585.2	420332.1	8.6	9.1	5.3	5.8
R23	345928.8	421803.9	5.5	6.0	3.2	3.7
R24	345928.5	420196.8	6.4	6.9	3.6	4.1
R25	346155.3	420740.8	10.1	10.8	9.4	9.9
R26	346155.0	420781.9	12.4	12.9	10.9	11.4
R27	346167.5	420841.7	14.2	14.7	11.8	12.3
R28	346172.6	420359.9	4.5	5.0	3.9	4.4
R29	346205.6	421056.3	11.2	11.7	7.3	7.8
R30	346220.3	420810.4	11.6	12.1	8.4	8.9
R31	346236.9	422152.2	3.3	3.8	1.9	2.4
R32	346257.9	421430.0	5.8	6.3	5.3	5.8
R33	346358.9	420351.6	4.6	5.1	3.6	4.1
R34	346882.0	420848.8	5.9	6.4	2.6	3.1
R35	347043.7	420823.4	5.2	5.7	2.1	2.6
R36	347054.0	420571.5	2.7	3.3	1.7	2.2
R37	347054.5	420355.8	2.7	3.2	1.5	2.0
R38	347122.9	420431.9	2.7	3.2	1.5	2.0

ID	Location		Max PC (1 Hour)	Max PEC 1 Hour CO	Max PC (8 Hour)	Max Daily Running 8-hour Mean CO (PEC)
	X	Y				
R39	347215.5	420579.7	2.2	2.8	1.4	2.0
R40	347253.7	420748.7	3.9	4.4	1.3	1.8
R41	347670.9	420414.3	1.8	2.3	1.1	1.6
R42	345582.8	420709.3	16.0	16.5	11.5	12.0
R43	345547.8	420771.8	12.4	12.9	8.0	8.5
R44	345597.3	420925.3	8.3	8.8	7.8	8.4
R45	345559.8	420865.8	8.0	8.5	6.9	7.4
R46	345487.4	420891.0	6.8	7.3	5.5	6.0
AQS Objective			**30,000**		**10,000**	

Table E6: Maximum Predicted CO CHP with no SCR Concentrations

ID	Location		Max PC (1 Hour)	Max PEC 1 Hour CO	Max PC (8 Hour)	Max Daily Running 8-hour Mean CO (PEC)
	X	Y				
R1	344457.5	420575.5	13.0	13.5	9.5	10.0
R2	344486.1	420260.6	13.9	14.4	10.3	10.8
R3	344783.8	420607.5	15.1	15.6	11.2	11.7
R4	344792.2	420351.3	26.0	26.5	13.3	13.8
R5	344867.9	421390.1	17.3	17.8	17.3	17.8
R6	345007.1	420973.2	16.8	17.3	16.8	17.3
R7	345066.1	420370.8	37.4	37.9	20.2	20.7
R8	345131.4	421569.1	17.5	18.0	12.2	12.7
R9	345176.0	420063.4	31.4	31.9	19.0	19.5
R10	345169.4	421207.7	19.2	19.8	19.2	19.8
R11	345203.0	420643.1	29.4	29.9	14.4	14.9
R12	345203.2	420965.2	18.1	18.6	16.8	17.3
R13	345333.0	419812.9	21.6	22.1	14.4	14.9
R14	345338.3	420287.3	36.9	37.4	23.6	24.1
R15	345342.1	421410.0	21.5	22.0	14.5	15.0
R16	345377.9	421016.5	25.6	26.1	24.2	24.7
R17	345376.6	421171.1	23.0	23.5	21.6	22.1
R18	345382.1	420875.3	26.4	26.9	24.5	25.0
R19	345414.8	421623.8	18.0	18.5	13.0	13.5
R20	345458.6	420532.0	39.0	39.5	24.8	25.3
R21	345485.9	420721.3	45.0	45.5	34.2	34.7
R22	345585.2	420332.1	24.1	24.6	20.4	21.0
R23	345928.8	421803.9	12.9	13.4	9.4	9.9

ID	Location		Max PC (1 Hour)	Max PEC 1 Hour CO	Max PC (8 Hour)	Max Daily Running 8-hour Mean CO (PEC)
	X	Y				
R24	345928.5	420196.8	18.9	19.4	13.2	13.7
R25	346155.3	420740.8	27.0	27.5	24.0	24.5
R26	346155.0	420781.9	27.1	27.6	25.7	26.3
R27	346167.5	420841.7	23.5	24.1	21.8	22.3
R28	346172.6	420359.9	25.5	26.0	14.5	15.0
R29	346205.6	421056.3	19.4	19.9	17.6	18.1
R30	346220.3	420810.4	21.6	22.1	20.2	20.7
R31	346236.9	422152.2	12.3	12.8	9.8	10.3
R32	346257.9	421430.0	25.6	26.1	19.4	19.9
R33	346358.9	420351.6	17.7	18.2	13.2	13.7
R34	346882.0	420848.8	16.5	17.0	9.3	9.8
R35	347043.7	420823.4	13.6	14.1	8.0	8.5
R36	347054.0	420571.5	13.1	13.7	8.0	8.5
R37	347054.5	420355.8	10.7	11.2	8.1	8.6
R38	347122.9	420431.9	10.3	10.8	7.9	8.4
R39	347215.5	420579.7	10.1	10.6	6.7	7.2
R40	347253.7	420748.7	9.5	10.0	6.5	7.0
R41	347670.9	420414.3	9.2	9.7	5.5	6.0
R42	345582.8	420709.3	47.7	48.2	34.0	34.5
R43	345547.8	420771.8	51.7	52.2	42.5	43.0
R44	345597.3	420925.3	52.4	52.9	48.3	48.8
R45	345559.8	420865.8	44.2	44.2	40.3	40.3
R46	345487.4	420891.0	36.2	36.2	33.3	33.3
AQS Objective			**30,000**		**10,000**	

Table E7: Maximum Predicted CO CHP with SCR Concentrations

ID	Location		Max PC (1 Hour)	Max PEC 1 Hour CO	Max PC (8 Hour)	Max Daily Running 8-hour Mean CO (PEC)
	X	Y				
R1	344457.5	420575.5	3.3	3.8	2.1	2.6
R2	344486.1	420260.6	3.3	3.8	2.5	3.0
R3	344783.8	420607.5	4.7	5.2	2.8	3.3
R4	344792.2	420351.3	4.4	4.9	3.2	3.7
R5	344867.9	421390.1	3.7	4.2	3.7	4.2
R6	345007.1	420973.2	4.4	4.9	3.9	4.4
R7	345066.1	420370.8	5.7	6.3	3.8	4.4
R8	345131.4	421569.1	3.9	4.4	2.9	3.4

ID	Location		Max PC (1 Hour)	Max PEC 1 Hour CO	Max PC (8 Hour)	Max Daily Running 8-hour Mean CO (PEC)
	X	Y				
R9	345176.0	420063.4	5.7	6.2	3.5	4.0
R10	345169.4	421207.7	4.7	5.2	4.7	5.2
R11	345203.0	420643.1	7.5	8.0	4.6	5.1
R12	345203.2	420965.2	5.2	5.7	4.4	4.9
R13	345333.0	419812.9	5.2	5.7	3.9	4.4
R14	345338.3	420287.3	7.0	7.5	4.6	5.1
R15	345342.1	421410.0	4.7	5.2	3.8	4.3
R16	345377.9	421016.5	5.8	6.2	5.1	5.6
R17	345376.6	421171.1	5.5	6.0	4.6	5.1
R18	345382.1	420875.3	6.5	7.0	4.7	5.3
R19	345414.8	421623.8	4.1	4.5	2.9	3.4
R20	345458.6	420532.0	8.8	9.3	6.3	6.8
R21	345485.9	420721.3	12.6	13.1	8.1	8.6
R22	345585.2	420332.1	9.3	9.9	5.8	6.3
R23	345928.8	421803.9	5.5	6.0	3.3	3.8
R24	345928.5	420196.8	6.4	6.9	4.2	4.7
R25	346155.3	420740.8	11.0	11.5	10.6	11.1
R26	346155.0	420781.9	12.4	12.9	11.3	11.8
R27	346167.5	420841.7	14.2	14.7	11.9	12.4
R28	346172.6	420359.9	5.7	6.2	4.8	5.3
R29	346205.6	421056.3	11.2	11.7	7.4	7.9
R30	346220.3	420810.4	11.7	12.2	8.5	9.0
R31	346236.9	422152.2	3.6	4.1	2.3	2.8
R32	346257.9	421430.0	6.2	6.7	5.4	5.9
R33	346358.9	420351.6	5.4	6.0	4.4	4.9
R34	346882.0	420848.8	5.9	6.4	2.9	3.4
R35	347043.7	420823.4	5.3	5.8	2.3	2.8
R36	347054.0	420571.5	3.5	4.0	2.2	2.7
R37	347054.5	420355.8	3.2	3.7	2.1	2.6
R38	347122.9	420431.9	3.1	3.6	2.0	2.5
R39	347215.5	420579.7	3.0	3.5	1.9	2.4
R40	347253.7	420748.7	3.9	4.4	1.7	2.2
R41	347670.9	420414.3	2.1	2.7	1.3	1.8
R42	345582.8	420709.3	16.0	16.5	11.5	12.0
R43	345547.8	420771.8	12.4	13.0	8.0	8.5
R44	345597.3	420925.3	8.3	8.8	7.9	8.4
R45	345559.8	420865.8	8.1	8.6	6.9	7.4
R46	345487.4	420891.0	6.9	7.4	5.6	6.1

ID	Location		Max PC (1 Hour)	Max PEC 1 Hour CO	Max PC (8 Hour)	Max Daily Running 8-hour Mean CO (PEC)
	X	Y				
AQS Objective			30,000		10,000	

Table E8: Maximum Predicted CO CHP with SCR and Building Concentrations

ID	Location		Max PC (1 Hour)	Max PEC 1 Hour CO	Max PC (8 Hour)	Max Daily Running 8-hour Mean CO (PEC)
	X	Y				
R1	344457.5	420575.5	4.6	5.1	2.4	2.9
R2	344486.1	420260.6	4.0	4.5	2.5	3.0
R3	344783.8	420607.5	5.8	6.3	3.3	3.8
R4	344792.2	420351.3	4.6	5.1	3.2	3.7
R5	344867.9	421390.1	3.8	4.3	3.5	4.0
R6	345007.1	420973.2	5.2	5.7	3.8	4.3
R7	345066.1	420370.8	5.6	6.1	3.9	4.4
R8	345131.4	421569.1	3.9	4.4	2.9	3.4
R9	345176.0	420063.4	5.7	6.2	3.4	3.9
R10	345169.4	421207.7	4.9	5.4	4.5	5.0
R11	345203.0	420643.1	7.7	8.2	5.3	5.8
R12	345203.2	420965.2	6.4	6.9	4.6	5.2
R13	345333.0	419812.9	5.2	5.7	3.5	4.0
R14	345338.3	420287.3	6.6	7.2	4.5	5.0
R15	345342.1	421410.0	4.8	5.3	3.8	4.3
R16	345377.9	421016.5	6.8	7.3	5.8	6.3
R17	345376.6	421171.1	5.6	6.1	4.6	5.1
R18	345382.1	420875.3	7.5	8.0	5.9	6.4
R19	345414.8	421623.8	4.0	4.5	2.9	3.4
R20	345458.6	420532.0	8.8	9.3	5.9	6.4
R21	345485.9	420721.3	12.6	13.1	8.5	9.0
R22	345585.2	420332.1	8.9	9.4	5.6	6.1
R23	345928.8	421803.9	5.4	5.9	3.5	4.0
R24	345928.5	420196.8	6.7	7.2	4.2	4.7
R25	346155.3	420740.8	11.2	11.7	10.8	11.3
R26	346155.0	420781.9	12.5	13.0	11.4	11.9
R27	346167.5	420841.7	14.2	14.7	11.9	12.4
R28	346172.6	420359.9	5.7	6.2	4.8	5.3
R29	346205.6	421056.3	11.2	11.7	7.4	7.9
R30	346220.3	420810.4	11.8	12.3	8.6	9.1
R31	346236.9	422152.2	3.7	4.3	2.2	2.7

ID	Location		Max PC (1 Hour)	Max PEC 1 Hour CO	Max PC (8 Hour)	Max Daily Running 8-hour Mean CO (PEC)
	X	Y				
R32	346257.9	421430.0	6.0	6.5	5.4	5.9
R33	346358.9	420351.6	5.6	6.1	4.6	5.1
R34	346882.0	420848.8	6.6	7.1	3.1	3.6
R35	347043.7	420823.4	5.8	6.3	2.4	2.9
R36	347054.0	420571.5	3.8	4.3	2.2	2.7
R37	347054.5	420355.8	3.4	3.9	2.2	2.7
R38	347122.9	420431.9	3.5	4.0	2.1	2.6
R39	347215.5	420579.7	3.2	3.8	1.9	2.5
R40	347253.7	420748.7	4.3	4.8	1.7	2.2
R41	347670.9	420414.3	2.3	2.8	1.5	2.0
R42	345582.8	420709.3	16.0	16.5	11.5	12.0
R43	345547.8	420771.8	12.4	13.0	8.3	8.8
R44	345597.3	420925.3	10.4	10.9	10.2	10.7
R45	345559.8	420865.8	8.7	9.1	7.9	8.4
R46	345487.4	420891.0	8.0	8.5	6.7	7.2
AQS Objective			**30,000**		**10,000**	

Table E9: Maximum Predicted SO_2 CHP with SCR Concentrations

ID	Location		Max PC (15 min)	Max 15 Min SO_2 (PEC)	Max PC (1 Hour)	Max 1 Hour SO_2 (PEC)	Max PC (24 Hour)	Max 24 Hour SO_2 (PEC)
	X	Y						
R1	344457.5	420575.5	0.2	6.1	0.1	6.0	0.0	5.9
R2	344486.1	420260.6	0.2	6.1	0.1	6.0	0.0	5.9
R3	344783.8	420607.5	0.2	6.1	0.1	6.0	0.1	6.0
R4	344792.2	420351.3	0.2	6.1	0.1	6.0	0.0	5.9
R5	344867.9	421390.1	0.2	5.7	0.1	5.7	0.1	5.6
R6	345007.1	420973.2	0.2	6.7	0.2	6.6	0.1	6.5
R7	345066.1	420370.8	0.4	6.9	0.2	6.6	0.1	6.5
R8	345131.4	421569.1	0.2	6.1	0.1	6.0	0.1	5.9
R9	345176.0	420063.4	0.3	6.8	0.2	6.6	0.1	6.5
R10	345169.4	421207.7	0.3	6.1	0.2	6.0	0.1	6.0
R11	345203.0	420643.1	0.3	6.8	0.2	6.6	0.1	6.6
R12	345203.2	420965.2	0.3	6.8	0.2	6.7	0.2	6.6
R13	345333.0	419812.9	0.3	6.0	0.1	5.8	0.0	5.7
R14	345338.3	420287.3	0.4	6.9	0.2	6.6	0.1	6.5
R15	345342.1	421410.0	0.3	6.1	0.2	6.0	0.1	6.0
R16	345377.9	421016.5	0.4	6.3	0.3	6.2	0.2	6.1
R17	345376.6	421171.1	0.4	6.2	0.3	6.1	0.2	6.0

ID	Location		Max PC (15 min)	Max 15 Min SO_2 (PEC)	Max PC (1 Hour)	Max 1 Hour SO_2 (PEC)	Max PC (24 Hour)	Max 24 Hour SO_2 (PEC)
	X	Y						
R18	345382.1	420875.3	0.5	6.9	0.3	6.8	0.2	6.7
R19	345414.8	421623.8	0.2	6.1	0.1	6.0	0.1	6.0
R20	345458.6	420532.0	0.5	7.0	0.3	6.7	0.1	6.6
R21	345485.9	420721.3	0.7	7.1	0.4	6.9	0.2	6.6
R22	345585.2	420332.1	0.3	6.8	0.2	6.6	0.1	6.5
R23	345928.8	421803.9	0.2	6.1	0.1	6.0	0.1	5.9
R24	345928.5	420196.8	0.2	6.7	0.2	6.6	0.1	6.5
R25	346155.3	420740.8	0.4	5.8	0.3	5.7	0.2	5.6
R26	346155.0	420781.9	0.4	5.8	0.3	5.7	0.2	5.6
R27	346167.5	420841.7	0.4	5.8	0.3	5.7	0.2	5.6
R28	346172.6	420359.9	0.2	5.7	0.2	5.6	0.1	5.5
R29	346205.6	421056.3	0.3	5.7	0.2	5.6	0.1	5.5
R30	346220.3	420810.4	0.3	5.8	0.3	5.7	0.2	5.6
R31	346236.9	422152.2	0.2	5.5	0.1	5.4	0.0	5.3
R32	346257.9	421430.0	0.4	5.8	0.3	5.6	0.1	5.5
R33	346358.9	420351.6	0.2	5.6	0.1	5.6	0.1	5.5
R34	346882.0	420848.8	0.2	5.6	0.1	5.5	0.0	5.5
R35	347043.7	420823.4	0.2	5.8	0.1	5.7	0.0	5.6
R36	347054.0	420571.5	0.1	5.7	0.1	5.7	0.0	5.6
R37	347054.5	420355.8	0.2	5.8	0.1	5.7	0.0	5.6
R38	347122.9	420431.9	0.1	5.7	0.1	5.7	0.0	5.6
R39	347215.5	420579.7	0.1	5.7	0.1	5.7	0.0	5.6
R40	347253.7	420748.7	0.1	5.7	0.1	5.7	0.0	5.6
R41	347670.9	420414.3	0.1	5.7	0.1	5.7	0.0	5.6
R42	345582.8	420709.3	0.7	7.1	0.5	6.9	0.3	6.7
R43	345547.8	420771.8	0.8	7.3	0.6	7.0	0.3	6.7
R44	345597.3	420925.3	0.9	7.3	0.7	7.1	0.6	7.0
R45	345559.8	420865.8	0.8	7.2	0.6	7.0	0.5	6.9
R46	345487.4	420891.0	0.6	7.1	0.5	6.9	0.3	6.8
AQS Objective			**266**		**350**		**125**	

Table E10: Maximum Predicted SO_2 CHP with SCR and Building Concentrations

ID	Location		Max PC (15 min)	Max 15 Min SO_2 (PEC)	Max PC (1 Hour)	Max 1 Hour SO_2 (PEC)	Max PC (24 Hour)	Max 24 Hour SO_2 (PEC)
	X	Y						
R1	344457.5	420575.5	0.2	6.1	0.1	6.0	0.0	5.9
R2	344486.1	420260.6	0.2	6.1	0.1	6.0	0.0	5.9
R3	344783.8	420607.5	0.3	6.2	0.2	6.1	0.1	6.0
R4	344792.2	420351.3	0.2	6.1	0.1	6.0	0.0	5.9
R5	344867.9	421390.1	0.2	5.8	0.1	5.7	0.1	5.6

ID	Location		Max PC (15 min)	Max 15 Min SO_2 (PEC)	Max PC (1 Hour)	Max 1 Hour SO_2 (PEC)	Max PC (24 Hour)	Max 24 Hour SO_2 (PEC)
	X	Y						
R6	345007.1	420973.2	0.5	6.9	0.3	6.7	0.1	6.5
R7	345066.1	420370.8	0.3	6.8	0.2	6.6	0.1	6.5
R8	345131.4	421569.1	0.2	6.1	0.1	6.0	0.1	5.9
R9	345176.0	420063.4	0.3	6.7	0.1	6.6	0.1	6.5
R10	345169.4	421207.7	0.4	6.2	0.2	6.1	0.1	6.0
R11	345203.0	420643.1	0.4	6.8	0.2	6.7	0.1	6.6
R12	345203.2	420965.2	0.5	7.0	0.3	6.8	0.2	6.6
R13	345333.0	419812.9	0.2	5.9	0.1	5.8	0.0	5.7
R14	345338.3	420287.3	0.4	6.8	0.2	6.6	0.1	6.5
R15	345342.1	421410.0	0.3	6.1	0.2	6.0	0.1	6.0
R16	345377.9	421016.5	0.6	6.5	0.4	6.3	0.2	6.1
R17	345376.6	421171.1	0.4	6.2	0.3	6.1	0.2	6.0
R18	345382.1	420875.3	0.6	7.1	0.4	6.9	0.2	6.7
R19	345414.8	421623.8	0.2	6.1	0.1	6.0	0.1	6.0
R20	345458.6	420532.0	0.4	6.9	0.3	6.7	0.1	6.6
R21	345485.9	420721.3	0.7	7.2	0.5	6.9	0.3	6.7
R22	345585.2	420332.1	0.4	6.8	0.2	6.6	0.1	6.5
R23	345928.8	421803.9	0.2	6.1	0.1	6.0	0.1	5.9
R24	345928.5	420196.8	0.2	6.7	0.2	6.6	0.1	6.5
R25	346155.3	420740.8	0.5	5.9	0.3	5.8	0.2	5.6
R26	346155.0	420781.9	0.5	5.9	0.4	5.8	0.2	5.6
R27	346167.5	420841.7	0.5	5.9	0.4	5.8	0.2	5.7
R28	346172.6	420359.9	0.2	5.7	0.2	5.6	0.1	5.5
R29	346205.6	421056.3	0.4	5.8	0.3	5.7	0.2	5.5
R30	346220.3	420810.4	0.4	5.9	0.3	5.7	0.2	5.6
R31	346236.9	422152.2	0.2	5.5	0.1	5.4	0.0	5.3
R32	346257.9	421430.0	0.4	5.7	0.2	5.6	0.1	5.5
R33	346358.9	420351.6	0.2	5.6	0.1	5.6	0.1	5.5
R34	346882.0	420848.8	0.2	5.7	0.1	5.6	0.0	5.5
R35	347043.7	420823.4	0.2	5.8	0.1	5.7	0.0	5.6
R36	347054.0	420571.5	0.2	5.8	0.1	5.7	0.0	5.6
R37	347054.5	420355.8	0.2	5.8	0.1	5.7	0.0	5.6
R38	347122.9	420431.9	0.2	5.8	0.1	5.7	0.0	5.6
R39	347215.5	420579.7	0.2	5.8	0.1	5.7	0.0	5.6
R40	347253.7	420748.7	0.2	5.8	0.1	5.7	0.0	5.6
R41	347670.9	420414.3	0.1	5.7	0.1	5.7	0.0	5.6
R42	345582.8	420709.3	0.8	7.2	0.5	7.0	0.3	6.7
R43	345547.8	420771.8	0.9	7.3	0.6	7.1	0.4	6.8
R44	345597.3	420925.3	1.4	7.8	1.0	7.5	0.8	7.3

ID	Location		Max PC (15 min)	Max 15 Min SO_2 (PEC)	Max PC (1 Hour)	Max 1 Hour SO_2 (PEC)	Max PC (24 Hour)	Max 24 Hour SO_2 (PEC)
	X	Y						
R45	345559.8	420865.8	1.1	7.5	0.8	7.2	0.6	7.0
R46	345487.4	420891.0	0.9	7.3	0.6	7.0	0.4	6.8
AQS Objective			**266**		**350**		**125**	

Table E11: Maximum Predicted NH_3 CHP with SCR Concentrations

ID	Location		Max PC (annual)	Max annual NH_3 (PEC)	Max PC (1 Hour)	Max 1 hour Mean NH_3 (PEC)
	X	Y				
R1	344457.5	420575.5	0.00	2.7	0.05	5.5
R2	344486.1	420260.6	0.00	2.7	0.06	5.5
R3	344783.8	420607.5	0.00	2.7	0.06	5.5
R4	344792.2	420351.3	0.00	2.7	0.12	5.6
R5	344867.9	421390.1	0.00	2.7	0.07	5.5
R6	345007.1	420973.2	0.00	2.7	0.07	5.5
R7	345066.1	420370.8	0.00	2.7	0.17	5.6
R8	345131.4	421569.1	0.00	2.7	0.07	5.5
R9	345176.0	420063.4	0.00	2.7	0.14	5.6
R10	345169.4	421207.7	0.00	2.7	0.08	5.5
R11	345203.0	420643.1	0.00	2.7	0.14	5.6
R12	345203.2	420965.2	0.00	2.7	0.08	5.5
R13	345333.0	419812.9	0.00	2.7	0.10	5.6
R14	345338.3	420287.3	0.00	2.7	0.16	5.6
R15	345342.1	421410.0	0.00	2.7	0.09	5.5
R16	345377.9	421016.5	0.01	2.7	0.11	5.6
R17	345376.6	421171.1	0.01	2.7	0.10	5.6
R18	345382.1	420875.3	0.01	2.7	0.12	5.6
R19	345414.8	421623.8	0.00	2.7	0.07	5.5
R20	345458.6	420532.0	0.00	2.7	0.18	5.6
R21	345485.9	420721.3	0.00	2.7	0.21	5.7
R22	345585.2	420332.1	0.00	2.7	0.10	5.6
R23	345928.8	421803.9	0.00	2.7	0.06	5.5
R24	345928.5	420196.8	0.00	2.7	0.07	5.5
R25	346155.3	420740.8	0.01	2.7	0.10	5.6
R26	346155.0	420781.9	0.01	2.7	0.10	5.6
R27	346167.5	420841.7	0.01	2.7	0.10	5.6
R28	346172.6	420359.9	0.00	2.7	0.11	5.6
R29	346205.6	421056.3	0.01	2.7	0.09	5.6
R30	346220.3	420810.4	0.01	2.7	0.09	5.6
R31	346236.9	422152.2	0.00	2.7	0.05	5.5
R32	346257.9	421430.0	0.00	2.7	0.11	5.6

ID	Location		Max PC (annual)	Max annual NH_3 (PEC)	Max PC (1 Hour)	Max 1 hour Mean NH_3 (PEC)
	X	Y				
R33	346358.9	420351.6	0.00	2.7	0.07	5.5
R34	346882.0	420848.8	0.00	2.7	0.06	5.5
R35	347043.7	420823.4	0.00	2.7	0.05	5.5
R36	347054.0	420571.5	0.00	2.7	0.05	5.5
R37	347054.5	420355.8	0.00	2.7	0.04	5.5
R38	347122.9	420431.9	0.00	2.7	0.04	5.5
R39	347215.5	420579.7	0.00	2.7	0.04	5.5
R40	347253.7	420748.7	0.00	2.7	0.04	5.5
R41	347670.9	420414.3	0.00	2.7	0.03	5.5
R42	345582.8	420709.3	0.00	2.7	0.21	5.7
R43	345547.8	420771.8	0.01	2.7	0.25	5.7
R44	345597.3	420925.3	0.02	2.7	0.24	5.7
R45	345559.8	420865.8	0.01	2.7	0.21	5.7
R46	345487.4	420891.0	0.01	2.7	0.17	5.6
AQS Objective			**180**		**2500**	

Table E12: Maximum Predicted NH_3 CHP with SCR and Building Concentrations

ID	Location		Max PC (annual)	Max annual NH_3 (PEC)	Max PC (1 Hour)	Max 1 hour Mean NH_3 (PEC)
	X	Y				
R1	344457.5	420575.5	0.00	2.7	0.1	5.5
R2	344486.1	420260.6	0.00	2.7	0.1	5.6
R3	344783.8	420607.5	0.00	2.7	0.1	5.6
R4	344792.2	420351.3	0.00	2.7	0.1	5.6
R5	344867.9	421390.1	0.00	2.7	0.1	5.5
R6	345007.1	420973.2	0.00	2.7	0.1	5.6
R7	345066.1	420370.8	0.00	2.7	0.1	5.6
R8	345131.4	421569.1	0.00	2.7	0.1	5.5
R9	345176.0	420063.4	0.00	2.7	0.1	5.6
R10	345169.4	421207.7	0.00	2.7	0.1	5.6
R11	345203.0	420643.1	0.00	2.7	0.2	5.6
R12	345203.2	420965.2	0.00	2.7	0.2	5.6
R13	345333.0	419812.9	0.00	2.7	0.1	5.5
R14	345338.3	420287.3	0.00	2.7	0.1	5.6
R15	345342.1	421410.0	0.00	2.7	0.1	5.5
R16	345377.9	421016.5	0.01	2.7	0.2	5.6
R17	345376.6	421171.1	0.01	2.7	0.1	5.6
R18	345382.1	420875.3	0.01	2.7	0.2	5.6
R19	345414.8	421623.8	0.00	2.7	0.1	5.5

ID	Location		Max PC (annual)	Max annual NH_3 (PEC)	Max PC (1 Hour)	Max 1 hour Mean NH_3 (PEC)
	X	Y				
R20	345458.6	420532.0	0.00	2.7	0.2	5.6
R21	345485.9	420721.3	0.01	2.7	0.2	5.7
R22	345585.2	420332.1	0.00	2.7	0.1	5.6
R23	345928.8	421803.9	0.00	2.7	0.1	5.5
R24	345928.5	420196.8	0.00	2.7	0.1	5.5
R25	346155.3	420740.8	0.01	2.7	0.1	5.6
R26	346155.0	420781.9	0.01	2.7	0.1	5.6
R27	346167.5	420841.7	0.01	2.7	0.1	5.6
R28	346172.6	420359.9	0.00	2.7	0.1	5.6
R29	346205.6	421056.3	0.01	2.7	0.1	5.6
R30	346220.3	420810.4	0.01	2.7	0.1	5.6
R31	346236.9	422152.2	0.00	2.7	0.0	5.5
R32	346257.9	421430.0	0.00	2.7	0.1	5.6
R33	346358.9	420351.6	0.00	2.7	0.1	5.5
R34	346882.0	420848.8	0.00	2.7	0.1	5.5
R35	347043.7	420823.4	0.00	2.7	0.1	5.5
R36	347054.0	420571.5	0.00	2.7	0.1	5.5
R37	347054.5	420355.8	0.00	2.7	0.0	5.5
R38	347122.9	420431.9	0.00	2.7	0.1	5.5
R39	347215.5	420579.7	0.00	2.7	0.1	5.5
R40	347253.7	420748.7	0.00	2.7	0.1	5.5
R41	347670.9	420414.3	0.00	2.7	0.0	5.5
R42	345582.8	420709.3	0.00	2.7	0.2	5.7
R43	345547.8	420771.8	0.01	2.7	0.3	5.7
R44	345597.3	420925.3	0.03	2.8	0.4	5.8
R45	345559.8	420865.8	0.02	2.7	0.3	5.7
R46	345487.4	420891.0	0.01	2.7	0.2	5.7
AQS Objective			**180**		**2500**	

Table E13: Maximum Predicted NO_x Baseline Concentrations

ID	Location		Max PC (Annual)	Max Annual Mean NOx (PEC)	Max PC (Daily)	Max Hourly Mean NOx (PEC)
	X	Y				
e1a	345705.0	420950.0	1.74	16.38	19.60	48.88
e1b	345849.0	421227.0	0.92	14.06	7.98	34.26
e1c	345760.0	420713.0	2.34	16.98	30.80	60.08
e1d	346018.0	421212.0	0.82	14.54	9.58	37.02
e1e	345688.0	421536.0	0.39	13.53	4.69	30.97
e1f	346031.0	420542.0	1.15	14.74	10.10	37.28
e1g	345690.0	421093.0	1.10	14.24	11.00	37.28
e2a	345660.0	421373.0	0.53	13.67	5.28	31.56
e2b	345657.0	421115.0	0.89	14.03	9.12	35.40
e2c	345864.0	420411.0	0.42	15.06	8.37	37.65
e2d	345601.0	420839.0	1.51	16.15	18.10	47.38
e3a	344621.0	421234.0	0.13	12.07	2.04	25.92
e4a	345012.0	422676.0	0.08	12.29	1.50	25.92
e5a	345294.0	422803.0	0.09	12.30	1.36	25.78
AQS Objective			**30**		**75**	

Table E14: Maximum Predicted NO_x CHP no SCR Concentrations

ID	Location		Max PC (Annual)	Max Annual Mean NOx (PEC)	Max PC (Daily)	Max Hourly Mean NOx (PEC)
	X	Y				
e1a	345705.0	420950.0	1.89	16.53	20.20	49.48
e1b	345849.0	421227.0	1.45	14.59	11.34	37.62
e1c	345760.0	420713.0	2.73	17.37	30.79	60.07
e1d	346018.0	421212.0	1.34	15.06	11.00	38.44
e1e	345688.0	421536.0	0.64	13.78	5.91	32.19
e1f	346031.0	420542.0	1.46	15.05	13.20	40.38
e1g	345690.0	421093.0	2.07	15.21	17.41	43.69
e2a	345660.0	421373.0	0.92	14.06	7.89	34.17
e2b	345657.0	421115.0	1.74	14.88	15.83	42.11
e2c	345864.0	420411.0	0.58	15.22	9.84	39.12
e2d	345601.0	420839.0	2.03	16.67	18.10	47.38
e3a	344621.0	421234.0	0.22	12.16	3.20	27.08
e4a	345012.0	422676.0	0.13	12.34	1.99	26.41
e5a	345294.0	422803.0	0.14	12.35	1.94	26.36

ID	Location		Max PC (Annual)	Max Annual Mean NOx (PEC)	Max PC (Daily)	Max Hourly Mean NOx (PEC)
	X	Y				
AQS Objective			30		75	

Table E15: Maximum Predicted NO_x CHP with SCR Concentrations

ID	Location		Max PC (Annual)	Max Annual Mean NOx (PEC)	Max PC (Daily)	Max Hourly Mean NOx (PEC)
	X	Y				
e1a	345705.0	420950.0	1.79	16.43	19.85	49.13
e1b	345849.0	421227.0	1.12	14.26	9.26	35.54
e1c	345760.0	420713.0	2.49	17.13	30.79	60.07
e1d	346018.0	421212.0	1.02	14.74	10.12	37.56
e1e	345688.0	421536.0	0.48	13.62	5.15	31.43
e1f	346031.0	420542.0	1.27	14.86	11.29	38.47
e1g	345690.0	421093.0	1.46	14.60	13.06	39.34
e2a	345660.0	421373.0	0.68	13.82	6.27	32.55
e2b	345657.0	421115.0	1.21	14.35	11.67	37.95
e2c	345864.0	420411.0	0.48	15.12	8.93	38.21
e2d	345601.0	420839.0	1.71	16.35	18.09	47.37
e3a	344621.0	421234.0	0.16	12.10	2.48	26.36
e4a	345012.0	422676.0	0.10	12.31	1.69	26.11
e5a	345294.0	422803.0	0.11	12.32	1.58	26.00
AQS Objective			30		75	

Table E16: Maximum Predicted NO_x CHP with SCR and Building Concentrations

ID	Location		Max PC (Annual)	Max Annual Mean NOx (PEC)	Max PC (Daily)	Max Hourly Mean NOx (PEC)
	X	Y				
e1a	345705.0	420950.0	2.08	16.72	19.85	49.13
e1b	345849.0	421227.0	1.14	14.28	9.68	35.96
e1c	345760.0	420713.0	2.51	17.15	30.79	60.07
e1d	346018.0	421212.0	1.01	14.73	10.10	37.54
e1e	345688.0	421536.0	0.48	13.62	5.25	31.53
e1f	346031.0	420542.0	1.27	14.86	11.31	38.49
e1g	345690.0	421093.0	1.47	14.61	13.13	39.41
e2a	345660.0	421373.0	0.68	13.82	6.27	32.55
e2b	345657.0	421115.0	1.22	14.36	11.73	38.01
e2c	345864.0	420411.0	0.49	15.13	8.95	38.23
e2d	345601.0	420839.0	1.84	16.48	18.29	47.57
e3a	344621.0	421234.0	0.16	12.10	2.43	26.31
e4a	345012.0	422676.0	0.10	12.31	1.69	26.11

ID	Location		Max PC (Annual)	Max Annual Mean NOx (PEC)	Max PC (Daily)	Max Hourly Mean NOx (PEC)
	X	Y				
e5a	345294.0	422803.0	0.11	12.32	1.59	26.01
AQS Objective			**30**		**75**	

Table E17: Maximum Predicted SO_2 CHP with SCR Concentrations

ID	Location		Max PC (Annual)	Max Annual Mean SO_2 (PEC)	Max PC (Winter)	Max Winter Mean SO_2 (PEC)
	X	Y				
e1a	345705.0	420950.0	0.01	0.44	0.01	0.44
e1b	345849.0	421227.0	0.03	0.46	0.05	0.48
e1c	345760.0	420713.0	0.02	0.45	0.02	0.45
e1d	346018.0	421212.0	0.03	0.46	0.04	0.47
e1e	345688.0	421536.0	0.02	0.45	0.02	0.45
e1f	346031.0	420542.0	0.02	0.45	0.01	0.44
e1g	345690.0	421093.0	0.06	0.49	0.09	0.52
e2a	345660.0	421373.0	0.02	0.45	0.03	0.46
e2b	345657.0	421115.0	0.05	0.48	0.07	0.50
e2c	345864.0	420411.0	0.01	0.44	0.01	0.44
e2d	345601.0	420839.0	0.04	0.47	0.04	0.47
e3a	344621.0	421234.0	0.01	0.42	0.00	0.41
e4a	345012.0	422676.0	0.00	0.43	0.00	0.43
e5a	345294.0	422803.0	0.00	0.43	0.00	0.43
AQS Objective			**20**			

Table E18: Maximum Predicted SO_2 CHP with SCR and building Concentrations

ID	Location		Max PC (Annual)	Max Annual Mean SO_2 (PEC)	Max PC (Winter)	Max Winter Mean SO_2 (PEC)
	X	Y				
e1a	345705.0	420950.0	0.06	0.49	0.05	0.91
e1b	345849.0	421227.0	0.04	0.47	0.05	0.91
e1c	345760.0	420713.0	0.03	0.46	0.03	0.89
e1d	346018.0	421212.0	0.03	0.46	0.04	0.90
e1e	345688.0	421536.0	0.02	0.45	0.02	0.88
e1f	346031.0	420542.0	0.02	0.45	0.01	0.87
e1g	345690.0	421093.0	0.06	0.49	0.09	0.95
e2a	345660.0	421373.0	0.02	0.45	0.03	0.89
e2b	345657.0	421115.0	0.05	0.48	0.07	0.93
e2c	345864.0	420411.0	0.01	0.44	0.01	0.87
e2d	345601.0	420839.0	0.06	0.49	0.07	0.93
e3a	344621.0	421234.0	0.01	0.42	0.00	0.82

ID	Location		Max PC (Annual)	Max Annual Mean SO_2 (PEC)	Max PC (Winter)	Max Winter Mean SO_2 (PEC)
	X	Y				
e4a	345012.0	422676.0	0.00	0.43	0.00	0.86
e5a	345294.0	422803.0	0.00	0.43	0.00	0.86
AQS Objective			**20**			

Table E19: Maximum Predicted NH_3 CHP with SCR Concentrations

ID	Location		Max PC (Annual)	Max Annual Mean NH_3 (PEC)
	X	Y		
e1a	345705.0	420950.0	0.003	2.733
e1b	345849.0	421227.0	0.011	2.741
e1c	345760.0	420713.0	0.008	2.738
e1d	346018.0	421212.0	0.010	2.740
e1e	345688.0	421536.0	0.005	2.735
e1f	346031.0	420542.0	0.006	2.736
e1g	345690.0	421093.0	0.020	2.750
e2a	345660.0	421373.0	0.008	2.738
e2b	345657.0	421115.0	0.017	2.747
e2c	345864.0	420411.0	0.003	2.733
e2d	345601.0	420839.0	0.012	2.742
e3a	344621.0	421234.0	0.002	1.412
e4a	345012.0	422676.0	0.001	2.731
e5a	345294.0	422803.0	0.001	2.731
AQS Objective			**3**	

Table E20: Maximum Predicted NH_3 CHP with SCR and Building Concentrations

ID	Location		Max PC (Annual)	Max Annual Mean NH_3 (PEC)
	X	Y		
e1a	345705.0	420950.0	0.021	2.751
e1b	345849.0	421227.0	0.012	2.742
e1c	345760.0	420713.0	0.009	2.739
e1d	346018.0	421212.0	0.010	2.740
e1e	345688.0	421536.0	0.005	2.735
e1f	346031.0	420542.0	0.006	2.736
e1g	345690.0	421093.0	0.020	2.750
e2a	345660.0	421373.0	0.008	2.738
e2b	345657.0	421115.0	0.017	2.747
e2c	345864.0	420411.0	0.003	2.733
e2d	345601.0	420839.0	0.021	2.751

ID	Location		Max PC (Annual)	Max Annual Mean NH_3 (PEC)
	X	Y		
e3a	344621.0	421234.0	0.002	1.412
e4a	345012.0	422676.0	0.001	2.731
e5a	345294.0	422803.0	0.001	2.731
AQS Objective			**3**	