UK Capacity Reserve Ltd

STOR Generation Project, Traston Road, Newport

Detailed Air Quality Assessment

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RSK GENERAL NOTES

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Abbreviations

AERMOD	American Meteorological Society/United States Environmental Protection Agency Regulatory Model
APIS	Air Pollution Information System
AQAL	Air Quality Assessment Level
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQS	Air Quality Standard
CO	Carbon Monoxide
DECC	Department of Energy and Climate Change
DEFRA	Department for Environment, Food and Rural Affairs
EC	European Commission
EPUK	Environmental Protection UK
EQS	Environmental Quality Standard
EU	European Union
IAQM	Institute of Air Quality Management
LNR	Local Nature Reserve
MAGIC	Multi-Agency Geographic Information for the Countryside
NAQS	National Air Quality Strategy
NCC	Newport City Council
NPPF	National Planning Policy Framework
NO_2	Nitrogen Dioxide
NO_x	Oxides of Nitrogen
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
SAC	Special Area of Conservation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
STOR	Short Term Operating Reserve
UKCR	UK Capacity Reserve Ltd
UKPR	UK Power Reserve Ltd

Contents

1 INTRODUCTION

RSK Environment Limited (RSK) has been commissioned by UK Capacity Reserve (the client) to undertake an air quality impact assessment of a power generation plant at Traston Road, Newport (hereafter referred to as 'the site').

The site has an area of less than 0.5 ha, and is located to the south of Traston Road, Newport. The approximate grid reference of the site is 333050, 185705, which falls within the jurisdiction of Newport City Council (NCC). Figure A-1 within Appendix A shows the location including the site red line boundary.

The site comprises ten natural gas-fuelled engine generators, each with an approximate 2kW_e output. The generators are each contained within a soundproofed engine cell within a portal framed container. The plant are operational but now require an environmental permit under the Environmental Permitting (England and Wales) (Amendment) Regulations 2018 to transpose the requirements of the Medium Combustion Plant Directive (MCPD) EU/2015/2193 of 25 November 2015.

The plant generate electricity to serve the local area and provide power services to the National Grid via the local distribution network. The generating plant participate in the National Grid's Short-Term Operating Reserve (STOR) programme to provide balance to the National Grid during unexpected periods of high demand for electricity or where there are constraints on electricity available in England and Wales. STOR plant are not designed to operate continuously throughout the year. Over the last five years, the plant across UKPR's portfolio have operated for an average of 1500 hours per annum.

This report has been prepared to support the environmental permit application. It has sought to characterise existing baseline ambient air quality and to assess the air quality impacts of the plant on human and ecological receptors when operating at full capacity. Additionally, a second scenario has been assessed, which considers the cumulative impacts with the UK Power Reserve Ltd (UKPR) Solutia site in place. Figure A-2 in Appendix A shows the location of this adjacent site.

RSK previously produced the air quality assessment for the site to accompany the planning application submitted during 2014, which included cumulative assessment of three committed developments. However, at the time of writing it is understood that these previously considered committed developments have still not been built and are not operational and at the request of the client, a cumulative impact assessment of the development with any committed/consented developments in the Newport Docks area was not undertaken.

2 LEGISLATION AND POLICY CONTEXT

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 EU Air Quality Framework Directive (1996) established a framework under which the European Union (EU) 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 (AQSs)

The air quality standards (AQSs) in the United Kingdom are derived from European Commission (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 EU 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.

2.1.2 The Environment Act

The set 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 to meet the objectives under Section 84 of the Act.

2.1.3 Environmental Permitting Regulations (EPR)

Many industrial processes have the potential to release pollution to land, air and water, with the potential to pose a health risk to people as well as damaging the environment. To prevent this, many industrial processes are regulated under the EPR, which either set emissions limit values with which the installation must comply and/or requires best available techniques (BAT) to be used at the installation site.

The UK Environmental Permitting (England and Wales) Regulations 2018 is the latest update to the Regulations and brings the Medium Combustion Plant Directive (MCPD) (2015/2193/EC) into force in England and Wales.

2.2 Guidance

2.2.1 Air emissions risk assessment for your environmental permit (Environment Agency, 2016) ('the Defra and EA guidance')

This guidance, which was adopted in 2016, outlines a procedure which can be used to determine when detailed dispersion modelling is required and the elements which are required as part of detailed dispersion modelling assessment. A subsection of the guidance also outlines features of air quality assessment which should be submitted within the air quality assessment report. This report has been written with reference to this document and has been read in conjunction with the EA 2018 guidance below.

2.2.2 Emissions from specified generators: guidance on dispersion modelling for oxides of nitrogen assessment from specified generators (Environment Agency, 2018) ('the EA 2018 guidance')

This 'interim final' guidance outlines an approach to undertaking air quality assessments for plants requiring assessment under the EPR following transposition of the MCPD into English law. This assessment has been prepared with reference to the guidance, where appropriate, which refers to the processes involved in undertaking an air quality assessment and allows for differences in approach to be adopted based on different screening criteria. However, it should be noted that as the time of writing this guidance had not yet been finalised.

2.2.3 AQTAG06: Technical Guidance on Detailed Modelling Approach for an Appropriate Assessment for Emissions to Air (Environment Agency, 2014) ('AQTAG.06')

The AQTAG06 guidance, updated during 2014, provides technical guidance on how to approach detailed modelling of emissions to air when considering impacts on ecological receptors. It also includes a method which can be used to assess the potential impacts of the plant on nitrogen and acid deposition.

2.2.4 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 to identify locations where exposure can be considered 'relevant'. This is important as Directive 2008/50/EC indicates that the AQSs should not be applied at any locations situated within areas where members of the public do not have access and there is no fixed habitation. These definitions provide greater clarity than those specified in the EA 2018 guidance and broadly correlate such that these are considered more robust for use in an air quality assessment. The definitions identified in LAQM TG.16 are summarised in Table 2.1, below.

Table 2.1: Locations where AQSs should and should not be applied, replicated from LAQM TG.16

Averaging period	Locations where AQSs should be applied	Locations where AQSs should not be applied
Annual mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties. Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
24-hour mean and 8-hour mean	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties*	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
1-hour mean	All locations where the annual mean and: 24 and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably expected to spend one hour or longer.	Kerbside sites where the public would not be expected to have regular access.
15-minute mean	All locations where members of the public might reasonably be exposed for a period of 15 minutes.	N/A

Notes: Such locations should represent parts of the garden where relevant public exposure to pollutants is likely, for example where there is seating or play areas. It is unlikely that relevant public exposure to pollutants would occur at the extremities of the garden boundary, or in front gardens, although local judgement should always be applied.

In all cases, the AQSs should not be applied at locations where health and safety at work provisions exist and where members of the public do not have access.

3 ASSESSMENT SCOPE

3.1 Overall Approach

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

- Baseline characterisation of local air quality;
- Desk study review to confirm the location of nearby existing receptors that may be sensitive to changes in airborne pollutant concentrations as a result of emissions arising from the plant including a review of local mapping data and statutory ecological sites; and,
- Detailed dispersion modelling to predict the impact of emissions to air from the site and existing plant on local air quality at nearby sensitive receptors and across a modelled grid over the surrounding area for the following scenarios:
  1. "With Development" – with the development in place, but without adjacent UKPR Solutia site; and
  2. "With Cumulative Developments" – with the development in place, and with the adjacent UKPR Solutia site in place.

3.2 Baseline 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.

A desk-based study has been undertaken using data obtained from monitoring stations maintained by NCC and from the Local Air Quality Management (LAQM) support website operated by Defra.

3.3 Dispersion Modelling Assessment

Due to the emissions associated with the operation of the plant at the site, a detailed assessment has been undertaken of the emissions to air and the impact on local air quality at relative sensitive receptors in proximity to the site.

In the view of the unmanned nature of the plant, it is not considered that a significant traffic increase is likely, and this has not been assessed further.

Cumulative impacts of the adjacent UKPR Solutia site have been considered but no other committed/consented developments have been included in the modelling assessment at the request of the client as the three committed sites considered at the planning application stage are understood to still not have been built and are therefore assumed to not be operational.

3.4 Air Pollutants of Concern

The plant is natural gas fuelled. Natural gas is a clean-burning fuel and emits insignificant quantities of particulate matter, and hence the assessment of impacts has been undertaken in terms of nitrogen oxides (NO_x), nitrogen dioxide (NO_2) and carbon monoxide (CO).

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 for the pollutants of concern have been reviewed in the following subsections.

4.1 Presence of Air Quality Management Areas (AQMAs)

NCC have declared 11 AQMAs, all due to exceedances of the annual mean NO_2 concentration objective. The nearest to the site is the George Street AQMA, approximately 2.4km to the north-west. The development site is therefore not located within an AQMA.

4.2 Baseline Monitoring Data

According to the latest 2017 Air Quality Annual Status Report for NCC, it is understood that NCC undertook diffusion tube monitoring of NO_2 at 80 sites and automatic monitoring at two sites during 2016. The closest monitoring site is a kerbside diffusion tube, site ID NCC55 (116 Alexandra Road), approximately 1.6km north-west of the development site. This monitoring site is not deemed representative of conditions at the site due to its proximity with the A48 Usk Way Road. The annual mean concentration observed at NCC55 was 29.8µg/m^3 in 2016 which is below the AQS; annual mean NO_2 concentrations are expected to be significantly lower than this at the site due to the kerbside location of the monitoring site and proximity to A48 which is a different setting to the site.

4.3 LAQM Background Data

In addition to local monitoring data, estimated background air quality data are available from the LAQM Support website operated by Defra. The LAQM Support website provides estimated annual average background concentrations of nitrogen oxides (NO_x), NO_2 and CO on a 1km^2 grid basis.

The CO concentrations for 2001 were taken from the LAQM Support website and scaled in accordance with the instructions within the LAQM TG.16.

No exceedances of any of the annual mean NO_2 AQS were identified, and as the estimated annual mean CO concentrations presented are substantially lower than the 10,000µg/m^3, exceedances of the 8-hour rolling mean AQS for CO are also unlikely. As background concentration of NO_2 and CO are predicted to fall with time, exceedances of these AQSs would not be anticipated in future years.

Table 4-1 presents the annual mean NO_2 and CO concentrations from Defra background maps for the relevant grid square where the site is located.

Table 4-1: Estimated 2016 and 2019 Annual Average NO_2 and CO Concentrations derived from Defra LAQM Background Maps

Grid Square		Year	Annual Average NO_2 ($\mu g/m^3$)	Annual Average CO ($\mu g/m^3$)*
X	Y			
333050	**185500**	2016	17.28	117.6
		2019	16.02	119.8

Notes: Presented concentrations for 1 km^2 grid centered on 333500, 185500; approximate centre of development site is 333050,185705.
*Concentrations of CO were scaled from the estimated background concentrations for 2001 available on the UK-AIR website, using the yearly adjustment factors.

5 METHODOLOGY

5.1 Operational Impact Assessment

5.1.1 Modelling Software

The impact assessment of the site was undertaken using BREEZE AERMOD with a Geographical Information System (GIS) capability (Version 9.6.5).

5.1.2 Emission Sources and Operating profile

Table 5-1 presents the physical and emission characteristics of the generators at the Traston Road site, which are based on calculations provided by the client or the Cummins 2000GQNC generator set data sheet. There are ten Cummins 2000GQNC engines on site, which are designed to run on natural gas. The stack height from the ground has been modelled at 8m.

The client has advised that the engines at the site have been retuned to improve efficiency and as such the generators in this report have been modelled as having a maximum emissions rate of 500mgNOx/Nm^3 at 5% O2 (186mgNOx/Nm^3 at 15% O_2). It is understood that all other parameters quoted in the emissions specification (i.e. temperature, volumetric flow rate, etc.) would remain the same as stated in the generator specification.

It is understood that each flue has been fitted with a cowl, but exhaust gases would still discharge vertically and nominal diameter at the exit point is the same as the diameter through which gases are discharged from the generator prior to passing through the cowl base. Figure A-1 within Appendix A shows the location of the stacks in relation to the wider area.

Table 5-1: Physical and Emission Characteristics of Engine Sources - Traston Road

Description	Engine
Generator model	Cummins 2000GQNC
Stack height above ground level (m)	8m
Stack diameter (m)	0.5
Stack exhaust temperature (K)	724.15
Gas flow (m^3/s)	6.80
Actual stack exit velocity (m/s)	34.63
NO_x exhaust emissions rate (mg/Nm^3) @ 5% O_2	500
NO_x exhaust emissions rate (g/s) @ 5% O_2	0.93

Description	Engine
CO exhaust emissions rate (mg/Nm^3) @ 5% O_2	1670
CO exhaust emissions rate (g/s) @ 5% O_2	3.10
Stack Locations	333063.8 185701.5 333064.9 185696.9 333066.0 185692.2 333067.5 185687.2 333068.6 185682.3 333090.6 185708.7 333092.0 185703.7 333093.1 185699.1 333094.5 185694.3 333095.5 185689.1
Number of units	10

Table 5-2 presents the physical and emission characteristics of the generators at the UKPR Solutia site to be considered within scenario 2, as provided by UKPR.

Table 5-2: Physical and Emission Characteristics of Engine Sources - Solutia Site

Description	Engine
Generator model	Jenbacher J620GSE01 *Jenbacher J616GSE01* **Jenbacher JMS620E166**
Stack height above ground level (m)	16m *16m* **12m**
Stack diameter (m)	0.6 *0.6* **0.6**
Stack exhaust temperature (K)	708.5 *708.5* **708.5**
Gas flow (m^3/s)	8.98 *6.80* **10.05**
Actual stack exit velocity (m/s)	31.75 *24.04* **35.54**
NO_x exhaust emissions rate (mg/Nm^3) @ 15% O_2	190 *190*

Description	Engine
	190
NO_x exhaust emissions rate (g/s) @ 15% O_2	1.11 *0.84* **1.24**
CO exhaust emissions rate (mg/Nm^3)	350 *350* **350**
CO exhaust emissions rate (g/s)	2.05 *1.55* **2.29**
Stack Locations	333015.0, 185697.2 333014.8, 185701.5 333014.4, 185706.1 *333014.0, 185710.5* **333032.1, 185718.8** **333031.8, 185721.9**
Number of units	6
Operational hours per annum	1500

Figure A-2 in Appendix A shows the locations of stacks in relation to the wider area surrounding the site.

5.1.3 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 present on site, and surrounding the site, were included in the dispersion model. Off-site buildings were assessed in accordance with the EA 2018 guidance and based off estimated heights for LIDAR data available from Natural Resources Wales (NRW), which identified that none met the criteria for inclusion in the model. The adjacent Solutia off-site buildings were however included within the model as detailed below.

The locations and heights of these buildings/structures are listed in Table 5-3.

Table 5-3: Building Details included in the Air Quality Assessment

ID	Building	Grid Ref, X	Grid Ref, Y	Height, m
1	Solutia Main Building	333006.1	185713.9	12.0
2	Industrial Unit – Corporation Road	332946.8	185733.8	3.9
3	Industrial Unit – Traston Road	333067.5	185779.2	4.3

ID	Building	Grid Ref, X	Grid Ref, Y	Height, m
4	Industrial Unit – Traston Road	333080.8	185798.4	2.8
5	Industrial Unit – Traston Road	333100.1	185787.8	6.5
6	Industrial Unit – Traston Road	333034.3	185811.1	3.7
7	Industrial Unit – Traston Road	333059.1	186055.0	14.1
8	Generator 1 housing	333062.0	185702.7	5.3
9	Generator 2 housing	333063.4	185697.9	5.3
10	Generator 3 housing	333064.6	185693.2	5.3
11	Generator 4 housing	333065.9	185688.2	5.3
12	Generator 5 housing	333079.7	185707.2	5.3
13	Generator 6 housing	333080.9	185702.4	5.3
14	Generator 7 housing	333082.1	185697.5	5.3
15	Generator 8 housing	333083.4	185692.7	5.3
16	Generator 9 housing	333084.6	185687.9	5.3
17	HV/LV Switch Room	333070.0	185713.1	5.0
18	Store Room	333070.0	185716.1	2.6
19	Lube Oil Bulk	333083.9	185714.6	1.5
20	Lube Oil Bulk Storage Tank	333086.9	185715.2	1.5
21	Gas Reception Kiosk	333109.1	185701.0	3.2
22	DNO Metering House	333062.7	185725.4	5.0
23	Main Transfer Compound	333059.9	185712.4	3.9
24	Auxiliary Transformer	333065.7	185714.3	2.0
25	Generator 10 housing	333067.0	185683.4	5.3
26	Control Room	333083.1	185717.4	4.1
27	Solutia Radiator Bank	333038.7	185711.3	6.0
28	Solutia Side Building	333019.7	185723.1	7.9
29	Solutia Gas Kiosk	333004.6	185721.9	3.2

5.1.4 Meteorological Data

Hourly sequential meteorological data measured between 2016 and 2018 at the Rhoose (Cardiff) weather station has been employed in the assessment.

The maximum of the predicted pollutant concentrations with each of the three years of meteorological data have been reported. Figures B1 - B3, in Appendix B, show the wind rose of the 2016, 2017 and 2018 datasets measured at the Rhoose station.

5.1.5 Terrain

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

5.1.6 Discrete Receptors and Modelled Domain

5.1.6.1 Human Receptors

For the purposes of producing isopleths of ground level concentration contours, hypothetical grid receptors spaced at 50m covering approximately a domain of 2km x 2km approximately centred over the site location have been included. In order to capture the effects on a greater area, hypothetical grid receptors spaced at 250m covering approximately a domain of 20km x 20km approximately centred over the site location have also been included.

Details of all discrete human receptors included in the modelling study are summarised in Table 5--4 and illustrated in Figure A-3 in Appendix A. Each discrete human receptor was assumed to be 1.5m above ground level (i.e. close to 'breathing height').

Table 5-4: Human Receptors Included in the Dispersion Modelling Assessment

Receptor ID	Receptor Location	Grid reference	
		X	Y
H1	Lysaght Avenue	332767	186527
H2	Lysaght Gardens	332747	186777
H3	Lysaght Way,	332885	186656
H4	St. Andrew's Place	333235	186854
H5	Spytty Lane 1	333501	186718
H6	*Newport International Sports Village*	333526	186226
H7	*Newport Stadium*	333604	186529
H8	Traston Lane	333778	186314
H9	Nash Road	333948	186205

Receptor ID	Receptor Location	Grid reference	
		X	Y
H10	Lliswerry High School	334017	186288
H11	City of Newport Campus (Coleg Gwent)	334004	186408
H12	*Newport Ford*	*334195*	*185819*
H13	*Capitol Skoda*	*334302*	*185989*
H14	*Newport Sports Village*	*333458*	*186180*
H15	*Newport Motorcycle Training*	*332915*	*185805*
Note: *Italicised text indicates receptor is not at a location of relevant exposure for the annual mean NO_2 or 8-hour CO AQSs, and therefore only the 1-hour NO_2 AQS is applicable at these locations.*[1]			

5.1.6.2 Ecological Receptors

As per the advice received by the client from the EA, total annual mean NO_x concentrations should be calculated at discrete receptor locations within any Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites within 5km of the site, and at any Sites of Special Scientific Interest (SSSIs) within 2km of the site. RSK referred to the Multi-Agency Geographic Information for the Countryside (MAGIC) website to determine the presence of these sites within the identified distances.

Details of all discrete ecological receptors included in the modelling study are summarised in Table 5--5 and illustrated in Figure A-4 in Appendix A. Each discrete ecological receptor was assumed to be at ground level.

Table 5-5: Ecological Receptors Included in the Dispersion Modelling Assessment

Receptor ID	Receptor	Grid reference	
		X	Y
E01	Severn Estuary 1 (SSSI, SPA, SAC, Ramsar)	336714	183002
E02	Severn Estuary 2 (SSSI, SPA, SAC, Ramsar)	334949	182342
E03	Severn Estuary 3 (SSSI, SPA, SAC, Ramsar)	333304	182638
E04	Severn Estuary 4 (SSSI, SPA, SAC, Ramsar)	332024	183366
E05	Severn Estuary 5 (SSSI, SAC)	333121	184958
E06	Severn Estuary 6 (SSSI, SAC)	332831	185276

[1] Department for Environment Food & Rural Affairs, (2018) Local Air Quality Management Technical Guidance (LAQM TG.16)

Receptor ID	Receptor	Grid reference	
		X	Y
E07	Severn Estuary 7 (SSSI, SAC)	332647	185451
E08	Severn Estuary 8 (SSSI, SAC)	332409	185569
E09	Severn Estuary 9 (SSSI, SAC)	332249	185735
E10	Severn Estuary 11 (SSSI, SAC)	331911	186176
E11	Severn Estuary 11 (SSSI, SAC)	332466	186495
E12	Severn Estuary 12 (SSSI, SAC)	332839	186892
E13	Severn Estuary 13 (SSSI, SAC)	331301	188480
E14	Severn Estuary 14 (SSSI, SAC)	333718	189571
E15	Severn Estuary 15 (SSSI, SAC)	334687	190211
E16	Gwent Levels 1 (SSSI)	335007	186454
E17	Gwent Levels 2 (SSSI)	335082	185733
E18	Gwent Levels 3 (SSSI)	335005	185438
E19	Gwent Levels 4 (SSSI)	334508	185092
E20	Gwent Levels 5 (SSSI)	334294	184566
E21	Gwent Levels 6 (SSSI)	333901	183981

5.1.7 Background Air Quality Data Used in the Modelling

5.1.7.1 Human Receptors

Table 5-6 details background concentrations used for discrete human receptors within the assessment.

Table 5-6: Background NO_2 and CO used in the Dispersion Modelling Assessment

Receptor ID	Annual Average NO_2 (µg/m^3)	Annual Average CO (µg/m^3)	NO_2 source
H1	16.2	140	UK-AIR 2017
H2	16.2	140	UK-AIR 2017
H3	16.2	140	UK-AIR 2017
H4	15.7	133	UK-AIR 2017
H5	29.8	133	Diffusion Tube NCC55 2016 monitoring data (latest data available from NCC's website

Receptor ID	Annual Average NO_2 (µg/m^3)	Annual Average CO (µg/m^3)	NO_2 source
			at the time of modelling assessment)
H6	15.7	133	UK-AIR 2017
H7	15.7	133	UK-AIR 2017
H8	15.7	133	UK-AIR 2017
H9	15.7	133	UK-AIR 2017
H10	22.4	124	UK-AIR 2017
H11	22.4	124	UK-AIR 2017
H12	11.8	114	UK-AIR 2017
H13	11.8	114	UK-AIR 2017
H14	15.7	133	UK-AIR 2017
H15	14.3	125	UK-AIR 2017

The nearest urban background monitoring location to the development site is located approximately 3.9km away at St Julian's School (Site ID NCC37 and NCC38). Due to the distance from the site, these tubes were not considered appropriate for use as background concentrations, therefore the Defra UK-AIR background for the grid square in which the receptor falls was applied. For a conservative assessment, receptor H5, however, has been assigned an annual mean NO_2 background concentration of 29.8µg/m^3 as observed at diffusion tube site ID NCC55. Receptor H5 is located further from the A48 Spytty Road however it was deemed appropriate to go with the more conservative monitored concentration rather than using Defra UK-AIR concentrations, as the receptor is within approximately 25m of the A48.

Annual mean CO concentrations have been derived from average of the 2001 LAQM Support/ UK-AIR background maps for the grid square that the receptor falls in. Concentrations for 2001 were used and scaled in accordance with the instructions within LAQM TG.16.

5.1.7.2 Ecological Receptors

Table 5-6 details background concentrations used for ecological receptors within the assessment.

Table 5-6: Background NO_x, Nitrogen Deposition and Acid Deposition used in the Dispersion Modelling Assessment

Receptor ID	Broad Habitat Type	Annual Average NO_x ($\mu g/m^3$)	Background Nitrogen Deposition (kg N/ha/yr)	Background Acid Deposition (kg N/ha/yr)	
				Nitrogen	Sulphur
E01	Coastal saltmarsh	10.38	11.90	N/A	
E02	Coastal saltmarsh	11.66	12.74		
E03	Coastal saltmarsh	12.86	12.74		
E04	Coastal saltmarsh	13.17	12.74		
E05	Coastal saltmarsh	14.41	12.74		
E06	Coastal saltmarsh	19.88	17.64		
E07	Coastal saltmarsh	19.88	17.64		
E08	Coastal saltmarsh	19.88	17.64		
E09	Coastal saltmarsh	19.88	17.64		
E10	Coastal saltmarsh	23.69	17.64		
E11	Coastal saltmarsh	22.77	17.64		
E12	Coastal saltmarsh	22.77	17.64		
E13	Coastal saltmarsh	31.78	17.64		
E14	Coastal saltmarsh	25.91	17.64		
E15	Coastal saltmarsh	16.79	19.32		
E16	Broadleaved, Mixed and Yew Woodland	18.67	25.76	1.84	0.30
E17	Broadleaved, Mixed and Yew Woodland	13.85	25.76	1.84	0.30
E18	Broadleaved, Mixed and Yew Woodland	13.85	25.76	1.84	0.30
E19	Broadleaved, Mixed and Yew Woodland	16.03	28.28	2.02	0.36
E20	Broadleaved, Mixed and Yew Woodland	12.88	20.16	1.44	0.29
E21	Broadleaved, Mixed and Yew Woodland	13.08	20.16	1.44	0.29

Background NO_x concentrations were taken from UK-AIR background concentrations for the grid square the receptor falls in. Nitrogen and acid deposition values were taken from the Air Pollution Information System (APIS) search by location tool and broad habitat type was determined using habitat information on the MAGIC website. Receptors E01-E15

are classed as coastal saltmarsh, for which the APIS website advises that *'there is no comparable acid critical load class for which the CL function is calculated'*. Therefore, background acid deposition values are not relevant for this assessment.

5.1.8 Processing of Results

NO_x emitted to the atmosphere as a result of combustion will consist largely of nitric oxide (NO). 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 for comparison with objectives for human health. The long and short-term predicted NO_x Process Contributions (PCs) have been converted to the respective NO_2 concentrations using 70% for long-term emissions and 35% for short term emissions based on 'worst case' conversion criteria referenced by the Environment Agency[2]. For comparison with the NO_x objectives for ecological health, the results do not need to be converted as above.

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

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

The results of the dispersion modelling assessment are discussed in Section 6.

Isopleths, or pollution concentration contours, for annual average and hourly NO_2 along with annual average and 24-hourly NO_x predicted concentrations, are presented in Appendix C. The contour plots presented consider the highest result predicted at each receptor location from the three meteorological years modelled. The contour plots have used average background concentrations across the modelled domain.

5.1.9 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 (E01-E21). The contribution of NO_2 emitted by the plant to nitrogen and acid deposition on sensitive ecological receptors has been determined by following the methodology set out in AQTAG06 (EA, 2014).

The total annual mean NO_x concentrations have been compared to the annual mean Air Quality Strategy objective. The nitrogen deposition process contributions (PCs) were compared to the applicable nitrogen deposition lower critical loads. The acid deposition process contributions (PCs) were compared to the critical load functions, using the 'Critical Load Function tool' on the APIS website.

[2] Environment Agency, (n.d.). CONVERSION RATIOS FOR NO_X AND NO_2.

5.2 Assessment Objectives and Limits

The relevant[3] objectives for England and Wales to protect human health and ecosystems are summarised below in Table 5-7.

Table 5-7: Air Quality Objectives Relevant to the Development

Substance	Averaging period	AQS / EAL (µg/m^3)
For the Protection of Human Health		
Nitrogen dioxide (NO_2)	Annual mean	40
	99.79th percentile of hourly means	200 (18 exceedances allowed per year)
Carbon monoxide (CO)	Maximum daily 8-hour mean	10,000
For the Protection of Vegetation and Ecosystems		
Nitrogen oxides (NO_x)	Annual mean	30
	24-hour mean	75

5.2.1 Nitrogen Deposition

The relevant critical loads for nitrogen deposition, taken from APIS, at the identified ecological receptors are presented in Table 5-8.

Table 5-8: Critical Loads for Nitrogen Deposition

Receptor ID	Habitat	Critical Load (kgN/ha/yr)*
E01-E15	Coastal Saltmarsh	20-30
E16-E21	Broadleaved, Mixed and Yew Woodland	10-20
*Lower critical load used in assessment for conservative assessment		

5.2.2 Acidification

The acidification critical loads for E16-E21 are presented in Table 5-9. For the remaining discrete ecological receptors, the APIS website advises *'there is no comparable acid critical load class for which the CL function is calculated'.*

Table 5-9: Critical Loads for Acidification

Receptor ID	Ecological Site	CLMinN (keqN/ha/yr)	CLMaxN (keqN/ha/yr)	CLMaxS (keqS/ha/yr)
E16, E17, E21	Gwent Levels	10.959	0.357	11.316
E18	Gwent Levels	11.002	0.357	11.359

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

Receptor ID	Ecological Site	CLMinN (keqN/ha/yr)	CLMaxN (keqN/ha/yr)	CLMaxS (keqS/ha/yr)
E19	Gwent Levels	10.930	0.357	11.287
E20	Gwent Levels	10.925	0.357	11.282

5.3 Significance Criteria

The significance of the PC arising from the plant has been determined using the criteria outlined in the Defra & EA (2016) guidance. These are intended for use in interpreting the results of an air quality screening assessment to determine whether further detailed modelling is required, but they provide a useful guide to the significance of an impact in the absence of any agreed criteria relating to the assessment of impacts from dispersion modelling.

However, the PCs have also been viewed in context of the 'headspace' between predicted pollutant concentrations and the applicable AQS, whether they represent 'relevant exposure' and of the number of exceedances of any screening criteria which are exceeded.

Based on the Defra and EA 2016 screening criteria, the PC from the plant can be considered to be insignificant if the following primary criteria are met:

- The short-term PC is less than 10% of the short-term AQS / environmental assessment level (EAL); and
- The long-term PC is less than 1% of the long-term AQS / EAL.

If these criteria are met then the impact can be considered to be insignificant, if the criteria aren't met, then the secondary stage criteria can be used, which are:

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

If both the second stage criteria are met, then the impact can be considered to be insignificant. However, if the criteria are not met, this does not necessarily mean an impact is significant and consideration has been given as to whether the PEC exceeds the relevant standards and consideration of the conservative nature of this assessment.

5.4 Uncertainties and Assumptions

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

- Estimated background data from NCC and the Defra LAQM website was used in the assessment. It is assumed that these background concentrations are likely to be applicable for the lifetime of the development, which is considered to be a conservative assumption;

- 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 measured at the Rhoose station for 2016 to 2018 were representative of wind conditions at and around 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;
- Long-term emissions were modelled over the whole year, and the results for the plant were multiplied by 0.171 to reflect that the plant are expected to operate for no more than 1,500 hours per annum. This was considered more appropriate than applying a variable emissions profile, as it allows for meteorological conditions over an entire year to be appropriately captured;
- To assess compliance with the hourly mean NO_2 AQS the 99.14th percentile of hourly mean NO_2 concentrations was modelled. This would allow for 27 exceedances per annum. This percentile was determined for the 5% distribution and indicates that there is only a 5% chance that the hourly mean AQS would be exceeded more than the permissible 18 times per annum, should the plant operate for 1500 hours per annum. This was considered more appropriate than applying a variable emissions profile, as it allows for meteorological conditions over an entire year to be appropriately captured;
- For assessing compliance with the 8-hourly CO and 24-hourly NO_x AQS, both pollutants have been modelling for continuous operation, a conservative approach as in reality the plant is expected to operate no more than 1,500 hours per year; and,
- It is assumed that the adjacent UKPR Solutia site will operate for no more than 1500 hours per annum; and
- There is an element of uncertainty in all measured and modelled data. All values presented in this report are considered reasonable estimates.

6 RESULTS

6.1 Operational Phase

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

The contour plots presented in Appendix C consider the highest result predicted at each receptor location from the three meteorological years modelled.

6.2 Scenario 1 – With Development

6.2.1 Human Receptors

The maximum concentration predicted across the three modelled meteorological years at each modelled discrete receptor location are shown in Table 6-1.

Regarding the annual and hourly mean NO_2 concentrations and 8-hour mean CO concentrations, both the PC and PEC are presented along with the percentage of the relevant AQS that the PC or PEC represents. Moreover, the short-term PCs for human health have been presented along with the percentage the short-term AQS minus twice the long-term background concentration, in accordance with Defra & EA 2016 guidance.

Table 6-1: Predicted Pollution Concentrations at Discrete Human Receptors – Scenario 1

Pollutant & Averaging Period	AQS (µg/m^3)	Location	PC (µg/m^3)	PC as % of Objective	PC as % of Objective minus twice long-term background concentrations	PEC (µg/m^3)	PEC as % of Objective
Annual Mean NO_2	**40**	H1	0.17	0.44%	N/A	16.42	41.04%
		H2	0.12	0.31%		16.37	40.91%
		H3	0.15	0.38%		16.39	40.99%
		H4	0.14	0.34%		15.79	39.48%
		H5	0.14	0.36%		29.94	74.86%
		H6	*0.32*	*0.81%*		*15.98*	*39.95%*
		H7	*0.18*	*0.44%*		*15.83*	*39.58%*
		H8	0.22	0.56%		15.88	39.71%
		H9	0.24	0.60%		15.90	39.74%
		H10	0.20	0.49%		22.64	56.60%
		H11	0.17	0.41%		22.57	56.41%
		H12	*0.38*	*0.96%*		*12.19*	*30.48%*
		H13	*0.27*	*0.67%*		*12.07*	*30.19%*
		H14	*0.38*	*0.96%*		*16.04*	*40.10%*
		H15	*1.67*	*4.17%*		*15.98*	*39.96%*
99.14th Percentile of 1-Hour NO_2 Means	**200**	H1	12.85	6.43%	7.67%	45.34	22.67%
		H2	9.19	4.60%	5.49%	41.68	20.84%
		H3	10.74	5.37%	6.41%	43.22	21.61%
		H4	9.51	4.76%	5.64%	40.83	20.41%
		H5	9.60	4.80%	6.84%	69.20	34.60%

Pollutant & Averaging Period	AQS (µg/m^3)	Location	PC (µg/m^3)	PC as % of Objective	PC as % of Objective minus twice long-term background concentrations	PEC (µg/m^3)	PEC as % of Objective
		H6	19.49	9.74%	11.55%	50.80	25.40%
		H7	12.11	6.06%	7.18%	43.43	21.71%
		H8	12.47	6.23%	7.39%	43.79	21.89%
		H9	11.69	5.84%	6.93%	43.00	21.50%
		H10	10.21	5.11%	6.58%	55.10	27.55%
		H11	9.12	4.56%	5.88%	53.92	26.96%
		H12	12.10	6.05%	6.86%	35.71	17.86%
		H13	10.11	5.06%	5.73%	33.73	16.86%
		H14	22.05	11.03%	13.07%	53.36	26.68%
		H15	104.24	52.12%	60.83%	132.87	66.43%
8-hour running mean CO (across 24-hour period)	**10,000**	H1	114	1.14%	1.17%	395	3.95%
		H2	93	0.93%	0.96%	374	3.74%
		H3	96	0.96%	0.98%	376	3.76%
		H4	92	0.92%	0.95%	359	3.59%
		H5	82	0.82%	0.84%	349	3.49%
		H6	*165*	*1.65%*	*1.69%*	*432*	*4.32%*
		H7	*100*	*1.00%*	*1.02%*	*367*	*3.67%*
		H8	142	1.42%	1.46%	409	4.09%
		H9	110	1.10%	1.13%	376	3.76%
		H10	87	0.87%	0.89%	335	3.35%
		H11	105	1.05%	1.08%	353	3.53%
		H12	*95*	*0.95%*	*0.97%*	*322*	*3.22%*

Pollutant & Averaging Period	AQS (µg/m^3)	Location	PC (µg/m^3)	PC as % of Objective	PC as % of Objective minus twice long-term background concentrations	PEC (µg/m^3)	PEC as % of Objective
		H13	*83*	*0.83%*	*0.85%*	*310*	*3.10%*
		H14	*205*	*2.05%*	*2.11%*	*472*	*4.72%*
		H15	*1131*	*11.31%*	*11.60%*	*1381*	*13.81%*
Italicised text indicates results not at location of relevant exposure and therefore objective not applicable at this location. Percentage calculations based on unrounded numbers.							

Table 6-2 below shows the maximum concentrations predicted at discrete relevant receptor locations, as well as the maximum concentration predicted within the modelled grid. Both the maximum PC and maximum PEC are presented along with the percentage of the relevant AQS that the PC or PEC represents.

Table 6-2: Maximum Predicted Pollutant Concentrations – Scenario 1

Pollutant & Averaging Period	AQS (µg/m^3)	Location	PC (µg/m^3)	PC as % of Objective	PEC (µg/m^3)	PEC as % of Objective
Maximum Predicted Concentration at Specific Receptor						
Annual Mean NO_2	**40**	H9 (max PC)	0.24	0.60%	15.90	39.74%
		H5 (max PEC)	0.14	0.36%	29.94	74.86%
99.14th Percentile of 1-Hour NO_2 Means	**200**	H15	104.24	52.12%	132.87	66.43%
8-hour running mean CO (across 24-hour period)	**10,000**	H8	142	1.42%	409	4.09%
Location of Maximum Predicted Concentration						
Annual Mean NO_2	**40**	*333153, 185708 (max PC)*	*10.32*	*28.81%*	*27.23*	*68.08%*
		333501, 186718 (max PEC)	0.14	0.36%	29.94	74.86%
99.14th Percentile of 1-Hour NO_2 Means	**200**	*333153, 185708*	*249.47*	*124.74%*	*283.29*	*141.64%*
8-hour running mean CO (across 24-hour period)	**10,000**	*333153, 185708*	*2346*	*23.47%*	*2586*	*25.86%*

Italicised text indicates results not at location of relevant exposure and therefore objective not applicable at this location.

Percentage calculations based on unrounded numbers.

Nitrogen Dioxide

As shown on Table 6-1, annual mean NO_2 PCs are below 1% of the AQS at all relevant discrete receptor locations and therefore considered to be insignificant. Furthermore, the operation of the site does not cause any exceedance of the annual mean NO_2 AQS when the PECs are considered.

Predicted PCs of 1-hour mean NO_2 concentration are below 10% of the AQS at all discrete receptors except H14 and H15 and the PCs are also below 20% of the 1-hour mean NO_2 AQS level minus twice the long-term NO_2 background concentration, except

at H15. However, all predicted 1-hour mean NO_2 PECs at discrete receptors including H14 and H15 are well below the AQS.

There are a small number of exceedances of the 1-hour mean NO_2 AQS within the modelled grid that lie within the grassland that surrounds the south of the site and on Traston Road, as shown by Figure C-2 in Appendix C. It is not expected that members of the public would remain at any of the locations for a period of 1 hour, such that the land is not considered to be a location of relevant exposure as per the LAQM TG.16 definitions[4].

Carbon Monoxide

Table 6-1 and Table 6-2 respectively show that the predicted 8-hour mean CO concentrations resulting from the operation of the site were below the 8-hour rolling mean AQS for CO. All 8-hour CO PCs are less than 20% of the short-term AQS minus twice the long-term background concentration, therefore can be assumed to be insignificant.

6.2.2 Ecological Receptors

As shown on Table 6-3, PECs of both annual mean and 24-hour mean (100th percentile) NO_x concentrations at any of the discrete ecological receptor locations are not predicted to result in any exceedances of the AQS or EAL.

[4] Department for Environment Food & Rural Affairs, (2018) Local Air Quality Management Technical Guidance (TG16)

Table 6-3: Predicted Pollution Concentrations at Discrete Ecological Receptors – Scenario 1

Pollutant & Averaging Period	AQS / EAL (µg/m^3)	Receptor ID	PC (µg/m^3)	PC as % of Objective	PC as % of Objective minus twice long-term background concentrations	PEC (µg/m^3)	PEC as % of Objective
Annual Mean NO_x	**30**	E01	0.16	0.53%	N/A	10.54	35.14%
		E02	0.08	0.28%		11.74	39.14%
		E03	0.07	0.24%		12.94	43.12%
		E04	0.09	0.30%		13.26	44.20%
		E05	0.22	0.73%		14.63	48.76%
		E06	0.53	1.78%		20.41	68.03%
		E07	1.58	5.25%		21.45	71.51%
		E08	0.85	2.83%		20.73	69.09%
		E09	0.43	1.45%		20.31	67.70%
		E10	0.28	0.93%		23.97	79.88%
		E11	0.26	0.88%		23.04	76.79%
		E12	0.16	0.53%		22.93	76.44%
		E13	0.06	0.19%		31.83	106.11%
		E14	0.04	0.12%		25.95	86.50%
		E15	0.03	0.09%		16.82	56.06%
		E16	0.14	0.46%		18.80	62.68%
		E17	0.24	0.79%		14.08	46.94%
		E18	0.27	0.89%		14.11	47.04%
		E19	0.51	1.70%		16.54	55.14%
		E20	0.36	1.18%		13.24	44.13%
		E21	0.12	0.41%		13.21	44.02%
24-Hour NO_x	**75**	E01	9.43	12.57%	17.39%	30.20	40.26%

Pollutant & Averaging Period	AQS / EAL (µg/m^3)	Receptor ID	PC (µg/m^3)	PC as % of Objective	PC as % of Objective minus twice long-term background concentrations	PEC (µg/m^3)	PEC as % of Objective
		E02	7.44	9.92%	14.39%	30.75	41.00%
		E03	6.61	8.82%	13.42%	32.34	43.12%
		E04	10.27	13.69%	21.10%	36.61	48.82%
		E05	32.67	43.55%	70.73%	61.48	81.97%
		E06	56.55	75.39%	160.42%	96.30	128.40%
		E07	93.30	124.40%	264.70%	133.05	177.40%
		E08	59.48	79.30%	168.73%	99.23	132.30%
		E09	37.78	50.38%	107.19%	77.53	103.38%
		E10	24.29	32.38%	87.90%	71.66	95.54%
		E11	18.65	24.87%	63.32%	64.20	85.60%
		E12	13.42	17.90%	45.57%	58.97	78.63%
		E13	5.54	7.39%	48.43%	69.10	92.13%
		E14	3.12	4.16%	13.46%	54.95	73.26%
		E15	2.44	3.25%	5.88%	36.02	48.03%
		E16	7.68	10.24%	20.39%	45.01	60.02%
		E17	10.08	13.44%	21.30%	37.77	50.36%
		E18	8.52	11.36%	18.01%	36.21	48.28%
		E19	22.66	30.21%	52.78%	54.73	72.97%
		E20	19.79	26.39%	40.20%	45.56	60.75%
		E21	10.36	13.81%	21.21%	36.52	48.70%
Percentage calculations based on unrounded numbers.							

As shown in Table 6-3 one exceedance of the annual mean NO_x AQS is predicted at receptor E13. The UK-AIR background concentration for the grid square receptor E13 is located within is 31.78 µg/m^3, which exceeds the AQS without the operation of the site. The PC as a % of the annual mean NO_x AQS at E13 is predicted to be 0.19% therefore <1% and the site is deemed to have an insignificant impact on the annual mean NO_x concentrations at ecological receptors.

Furthermore, as shown in Table 6-3, 24-hour mean (100th percentile) NO_x PECs at receptors E06 – E09 exceed the AQS. Exceedances are also seen at relevant locations within the grid, as illustrated by Figure C-4 in Appendix C. However, it should be noted that the detailed modelling undertaken has assumed that the plant would be operating continuously throughout the year, as percentiles for actual operating hours cannot be generated for 24-hour periods using the hypergeometric distribution method. In reality, the plant will run for a significantly lower proportion of the year (up to 1,500 hours), and the predicted daily average NO_x concentrations are considered to be an overestimate.

6.2.2.1 Nitrogen Deposition

Results obtained from the dispersion modelling have been used to calculate nitrogen deposition, based on the maximum concentration for any of the modelled discrete ecological receptor locations at the designated ecologically sensitive sites considered within the assessment; results are summarised in Table 6-4.

The highest PC as a percentage of the critical load is 1.026% predicted within the Gwent Levels SSSI, indicating that the PC would have minimal impact on nitrogen deposition at any of the ecosystems assessed.

6.2.2.2 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 6-5. The PCs and PECs generated by the operation of the site have been presented as a percentage of the relevant critical load function. For several of the ecological receptors, the impact of the plant emissions on acid deposition could not be determined as the APIS website advises *'there is no comparable acid critical load class for which the CL function is calculated'*. However, the acid deposition PCs are all below 0.011 keq/ha/year, so it is unlikely that there would be any significant effects on acid deposition at the surrounding ecosystems.

The highest PC as a percentage of the minimum critical load function was 0.1% at the Gwent Levels SSSI, therefore indicating that the process contribution would have minimal impact on acidification at any of the ecosystems identified.

Table 6-4: Nitrogen Deposition at Ecological Sites – Scenario 1

Receptor ID	Receptor	Broad Habitat Type	PC (kg N/ha/yr)	Background (kg N/ha/yr)	Total N Deposition (kg N/ha/yr)	Lower Critical Load	Process Contribution as a % of Lower Critical Load
E01	Severn Estuary 1	Coastal saltmarsh	0.016	11.900	11.916	20	0.080%
E02	Severn Estuary 2	Coastal saltmarsh	0.008	12.740	12.748	20	0.042%
E03	Severn Estuary 3	Coastal saltmarsh	0.007	12.740	12.747	20	0.037%
E04	Severn Estuary 4	Coastal saltmarsh	0.009	12.740	12.749	20	0.045%
E05	Severn Estuary 5	Coastal saltmarsh	0.022	12.740	12.762	20	0.111%
E06	Severn Estuary 6	Coastal saltmarsh	0.054	17.640	17.694	20	0.269%
E07	Severn Estuary 7	Coastal saltmarsh	0.159	17.640	17.799	20	0.794%
E08	Severn Estuary 8	Coastal saltmarsh	0.086	17.640	17.726	20	0.428%
E09	Severn Estuary 9	Coastal saltmarsh	0.044	17.640	17.684	20	0.219%
E10	Severn Estuary 11	Coastal saltmarsh	0.028	17.640	17.668	20	0.141%
E11	Severn Estuary 11	Coastal saltmarsh	0.027	17.640	17.667	20	0.133%
E12	Severn Estuary 12	Coastal saltmarsh	0.016	17.640	17.656	20	0.080%
E13	Severn Estuary 13	Coastal saltmarsh	0.006	17.640	17.646	20	0.029%
E14	Severn Estuary 14	Coastal saltmarsh	0.004	17.640	17.644	20	0.019%
E15	Severn Estuary 15	Coastal saltmarsh	0.003	19.320	19.323	20	0.013%
E16	Gwent Levels 1	Broadleaved, Mixed and Yew Woodland	0.028	25.760	25.788	10	0.280%
E17	Gwent Levels 2	Broadleaved, Mixed and Yew Woodland	0.048	25.760	25.808	10	0.476%
E18	Gwent Levels 3	Broadleaved, Mixed and Yew Woodland	0.054	25.760	25.814	10	0.536%
E19	Gwent Levels 4	Broadleaved, Mixed and Yew Woodland	0.103	28.280	28.383	10	1.026%
E20	Gwent Levels 5	Broadleaved, Mixed and Yew Woodland	0.072	20.160	20.232	10	0.716%
E21	Gwent Levels 6	Broadleaved, Mixed and Yew Woodland	0.025	20.160	20.185	10	0.247%

Table 6-5: Acid Deposition at Ecological Sites – Scenario 1

Receptor ID	Receptor Location	Broad Habitat Type	Process Nitrogen Acid Deposition (keq/ha/yr)	Background Acid Deposition (keq/ha/yr)		Maximum Critical Load (Sulphur) (keq/ha/yr)	Minimum Critical Load (Nitrogen) (keq/ha/yr)	Maximum Critical Load (Nitrogen) (keq/ha/yr)	Process Contribution as a % of lower critical load	
				Nitrogen	Sulphur				PC	PEC
E16	Gwent Levels 1	Broadleaved, Mixed and Yew Woodland	0.002	1.84	0.30	10.959	0.357	11.316	0.0%	18.9%
E17	Gwent Levels 2	Broadleaved, Mixed and Yew Woodland	0.003	1.84	0.30	10.959	0.357	11.316	0.0%	18.9%
E18	Gwent Levels 3	Broadleaved, Mixed and Yew Woodland	0.004	1.84	0.30	11.002	0.357	11.359	0.0%	18.8%
E19	Gwent Levels 4	Broadleaved, Mixed and Yew Woodland	0.007	2.02	0.36	10.930	0.357	11.287	0.1%	21.2%
E20	Gwent Levels 5	Broadleaved, Mixed and Yew Woodland	0.005	1.44	0.29	10.925	0.357	11.282	0.1%	15.4%
E21	Gwent Levels 6	Broadleaved, Mixed and Yew Woodland	0.002	1.44	0.29	10.959	0.357	11.316	0.0%	15.3%

6.2.3 Overall Significance of Operating Plant on Air Quality

As identified above:

- There are no predicted exceedances of PECs for annual or 1-hour mean NO_2 nor 8-hour CO AQSs at any relevant discrete receptor locations in any of the scenarios;
- One exceedance of the annual mean NO_x AQS is predicted at receptor E13, Severn Estuary 13. The UK-AIR background concentration for the grid square receptor E13 is located within is 31.78 µg/m^3, which exceeds the AQS without the operation of the site. The PC as a % of the annual mean NO_x standard is predicted to be 0.19% therefore the site is deemed to have an insignificant impact at this receptor.
- 24-hour (100th percentile) NO_x concentrations at receptors E06 – E09 and at relevant locations within the grid exceed the AQS. However, it should be noted that the detailed modelling undertaken has assumed that the plant would be operating continuously throughout the year, as percentiles for actual operating hours cannot be generated for 24-hour periods using the hypergeometric distribution method. In reality, the plant will run for a significantly lower proportion of the year (up to 1,500 hours), and the predicted daily average NO_x concentrations are considered to be an overestimation.
- The process contribution is deemed to have minimal impact on both acidification and nitrogen deposition at all of the ecosystems identified.

In light of the above, the air quality impact from the operation of the site is not considered to be significant such that mitigation measures have not been recommended.

6.3 Scenario 2 – Cumulative Developments

6.3.1 Human Receptors

The maximum concentration predicted across the three modelled meteorological years at each modelled discrete receptor location are shown in Table 6-6 below for the combined operation of both the UKCR site and the UKPR Solutia site.

Regarding the annual and hourly mean NO_2 concentrations and 8-hour mean CO concentrations, both the PC and PEC are presented along with the percentage of the relevant AQS that the PC or PEC represents. Moreover, the short-term PCs for human health have been presented along with the percentage the short-term AQS minus twice the long-term background concentration, in accordance with Defra & EA 2016 guidance.

Table 6-6: Predicted Pollution Concentrations at Discrete Human Receptors – Scenario 2

Pollutant & Averaging Period	AQS (µg/m^3)	Location	PC (µg/m^3)	PC as % of Objective	PC as % of Objective minus twice long-term background concentrations	PEC (µg/m^3)	PEC as % of Objective
Annual Mean NO_2	**40**	H1	0.28	0.69%	N/A	16.52	41.30%
		H2	0.20	0.49%		16.44	41.10%
		H3	0.25	0.63%		16.49	41.23%
		H4	0.22	0.56%		15.88	39.70%
		H5	0.23	0.58%		30.03	75.08%
		H6	*0.52*	*1.30%*		*16.18*	*40.45%*
		H7	*0.29*	*0.72%*		*15.94*	*39.86%*
		H8	0.36	0.90%		16.02	40.05%
		H9	0.39	0.98%		16.05	40.12%
		H10	0.32	0.80%		22.77	56.91%
		H11	0.27	0.67%		22.67	56.67%
		H12	*0.62*	*1.56%*		*12.43*	*31.08%*
		H13	*0.44*	*1.10%*		*12.25*	*30.61%*
		H14	*0.62*	*1.55%*		*16.27*	*40.69%*
		H15	*2.98*	*7.44%*		*17.29*	*43.22%*
99.14th Percentile of 1-Hour NO_2 Means	**200**	H1	19.68	9.84%	11.75%	52.17	26.08%
		H2	14.87	7.43%	8.88%	47.35	23.68%
		H3	16.74	8.37%	9.99%	49.22	24.61%
		H4	15.11	7.56%	8.96%	46.42	23.21%
		H5	15.80	7.90%	11.26%	75.40	37.70%
		H6	29.65	14.83%	17.58%	60.97	30.48%
		H7	19.30	9.65%	11.44%	50.61	25.31%

Pollutant & Averaging Period	AQS (µg/m^3)	Location	PC (µg/m^3)	PC as % of Objective	PC as % of Objective minus twice long-term background concentrations	PEC (µg/m^3)	PEC as % of Objective
		H8	19.74	9.87%	11.70%	51.06	25.53%
		H9	18.73	9.36%	11.10%	50.04	25.02%
		H10	16.29	8.15%	10.50%	61.18	30.59%
		H11	15.32	7.66%	9.87%	60.12	30.06%
		H12	18.53	9.27%	10.51%	42.15	21.07%
		H13	15.68	7.84%	8.89%	39.29	19.64%
		H14	35.19	17.59%	20.86%	66.50	33.25%
		H15	164.32	82.16%	95.89%	192.95	96.48%
8-hour running mean CO (across 24-hour period)	**10,000**	H1	151	1.51%	1.56%	432	4.32%
		H2	118	1.18%	1.21%	399	3.99%
		H3	133	1.33%	1.37%	414	4.14%
		H4	124	1.24%	1.28%	391	3.91%
		H5	113	1.13%	1.16%	380	3.80%
		H6	*215*	*2.15%*	*2.21%*	*482*	*4.82%*
		H7	*139*	*1.39%*	*1.42%*	*405*	*4.05%*
		H8	184	1.84%	1.89%	451	4.51%
		H9	146	1.46%	1.50%	413	4.13%
		H10	118	1.18%	1.21%	366	3.66%
		H11	135	1.35%	1.39%	384	3.84%
		H12	*124*	*1.24%*	*1.27%*	*351*	*3.51%*
		H13	*108*	*1.08%*	*1.10%*	*335*	*3.35%*
		H14	*270*	*2.70%*	*2.77%*	*537*	*5.37%*
		H15	*1449*	*14.49%*	*14.86%*	*1699*	*16.99%*

Pollutant & Averaging Period	AQS (µg/m^3)	Location	PC (µg/m^3)	PC as % of Objective	PC as % of Objective minus twice long-term background concentrations	PEC (µg/m^3)	PEC as % of Objective
Italicised text indicates results not at location of relevant exposure and therefore objective not applicable at this location. Percentage calculations based on unrounded numbers.							

Table 6-7 below shows the maximum concentrations predicted at discrete relevant receptor locations, as well as the maximum concentration predicted within the modelled grid. Both the maximum PC and maximum PEC are presented along with the percentage of the relevant AQS that the PC or PEC represents.

Table 6-7: Maximum Predicted Pollutant Concentrations – Scenario 2

Pollutant & Averaging Period	AQS (µg/m^3)	Location	PC (µg/m^3)	PC as % of Objective	PEC (µg/m^3)	PEC as % of Objective
Maximum Predicted Concentration at Specific Receptor						
Annual Mean NO_2	**40**	H9 (max PC)	0.39	0.98%	16.05	40.12%
		H5 (max PEC)	0.23	0.58%	30.03	75.08%
99.14th Percentile of 1-Hour NO_2 Means	**200**	H15	164.32	82.16%	192.95	96.48%
8-hour running mean CO (across 24-hour period)	**10,000**	H8	184	1.84%	451	4.51%
Location of Maximum Predicted Concentration						
Annual Mean NO_2	***40***	*333153, 185708*	*15.58*	*38.96%*	*32.49*	*81.23%*
99.14th Percentile of 1-Hour NO_2 Means	***200***	*333153, 185708*	*320.92*	*160.46%*	*354.73*	*177.36%*
8-hour running mean CO (across 24-hour period)	***10,000***	*333153, 185708*	*2695*	*26.95%*	*2935*	*29.35%*
Italicised text indicates results not at location of relevant exposure and therefore objective not applicable at this location. Percentage calculations based on unrounded numbers.						

Nitrogen Dioxide

As shown on Table 6-6, annual mean NO_2 PCs from the two adjacent sites combined are below 1% of the AQS at all relevant discrete receptor locations and therefore considered to be insignificant. Furthermore, the operation of the site and the UKPR Solutia site does not cause any exceedance of the annual mean NO_2 AQS when the PECs are considered.

Predicted PCs of 1-hour mean NO_2 concentration are all below 10% of the AQS at all discrete receptors except H6, H14 and H15 and the PCs are below 20% of the 1-hour mean NO_2 AQS level minus twice the long-term NO_2 background concentration, except at H14 and H15. However, all predicted 1-hour mean NO_2 PECs at discrete receptors are below the 1-hour mean NO_2 AQS and therefore the operation of both adjacent sites does not cause any exceedances of this objective.

There are a number of exceedances of the 1-hour mean NO_2 AQS within the modelled grid that lie within the grassland that surrounds the south of the site and on Traston Road, as shown by Figure C-6 in Appendix C. Further exceedances are observed at the industrial/docking site south east of the UKPR Solutia site however It is not expected that members of the public would remain at any of the locations for a period of 1 hour, such that the land is not considered to be a locations of relevant exposure as per the LAQM TG.16 definitions[5].

Carbon Monoxide

Table 6-6 and Table 6-7 respectively show that the predicted 8-hour mean CO concentrations resulting from the operation of the site and the adjacent UKPR Solutia site were below the 8-hour rolling mean AQS for CO. All 8-hour CO PCs are less than 20% of the short-term AQS minus twice the long-term background concentration, therefore can be assumed to be insignificant.

6.3.2 Ecological Receptors

As shown on Table 6-8, PECs of both annual mean and 24-hour mean (100th percentile) NO_x concentrations at any of the discrete ecological receptor locations are not predicted to result in any exceedances of the AQS or the EAL, respectively.

[5] Department for Environment Food & Rural Affairs, (2018) Local Air Quality Management Technical Guidance (TG16)

Table 6-8: Predicted Pollution Concentrations at Discrete Ecological Receptors – Scenario 2

Pollutant & Averaging Period	AQS / EAL (µg/m^3)	Receptor ID	PC (µg/m^3)	PC as % of Objective	PC as % of Objective minus twice long-term background concentrations	PEC (µg/m^3)	PEC as % of Objective
Annual Mean NO_x	**30**	E01	0.25	0.82%	N/A	10.63	35.43%
		E02	0.13	0.42%		11.78	39.28%
		E03	0.11	0.35%		12.97	43.23%
		E04	0.13	0.44%		13.30	44.34%
		E05	0.32	1.07%		14.73	49.09%
		E06	0.79	2.63%		20.66	68.88%
		E07	2.61	8.71%		22.49	74.96%
		E08	1.42	4.73%		21.29	70.98%
		E09	0.69	2.31%		20.57	68.57%
		E10	0.45	1.49%		24.13	80.45%
		E11	0.41	1.37%		23.18	77.28%
		E12	0.26	0.87%		23.03	76.78%
		E13	0.09	0.31%		31.87	106.23%
		E14	0.06	0.20%		25.97	86.58%
		E15	0.04	0.14%		16.83	56.11%
		E16	0.23	0.75%		18.89	62.97%
		E17	0.39	1.29%		14.23	47.45%
		E18	0.43	1.44%		14.28	47.60%
		E19	0.78	2.61%		16.82	56.06%
		E20	0.52	1.75%		13.41	44.70%
		E21	0.18	0.60%		13.26	44.21%
24-Hour NO_x	**75**	E01	14.54	19.39%	26.81%	35.31	47.07%
		E02	10.17	13.56%	19.68%	33.49	44.65%

Pollutant & Averaging Period	AQS / EAL (µg/m^3)	Receptor ID	PC (µg/m^3)	PC as % of Objective	PC as % of Objective minus twice long-term background concentrations	PEC (µg/m^3)	PEC as % of Objective
		E03	9.39	12.52%	19.05%	35.12	46.82%
		E04	16.41	21.88%	33.72%	42.75	57.00%
		E05	43.99	58.65%	95.25%	72.80	97.07%
		E06	72.99	97.32%	207.08%	112.75	150.33%
		E07	161.01	214.68%	456.79%	200.76	267.68%
		E08	100.39	133.85%	284.81%	140.14	186.86%
		E09	64.40	85.87%	182.71%	104.15	138.87%
		E10	37.92	50.56%	137.24%	85.29	113.72%
		E11	28.56	38.08%	96.98%	74.11	98.81%
		E12	20.79	27.72%	70.58%	66.34	88.45%
		E13	8.36	11.14%	73.00%	71.91	95.88%
		E14	3.88	5.18%	16.75%	55.71	74.28%
		E15	3.61	4.81%	8.71%	37.19	49.59%
		E16	11.98	15.97%	31.80%	49.31	65.75%
		E17	15.21	20.28%	32.16%	42.91	57.21%
		E18	12.35	16.46%	26.10%	40.04	53.39%
		E19	34.98	46.64%	81.48%	67.05	89.40%
		E20	27.81	37.08%	56.50%	53.58	71.44%
		E21	15.52	20.69%	31.77%	41.68	55.57%
Percentage calculations based on unrounded numbers.							

As shown in Table 6-8 one exceedance of the annual mean NO_x AQS is predicted at receptor E13. The UK-AIR background concentration for the grid square receptor E13 is located within is 31.78 µg/m^3, which exceeds the AQS without the operation of the site or the adjacent UKPR Solutia site. The combined PC as a % of the annual mean NO_x standard is predicted to be 0.31% therefore the site and the UKPR Solutia site are deemed to have an insignificant impact on the annual mean NO_x concentrations at ecological receptors.

Furthermore, as shown in Table 6-8, 24-hour mean (100th percentile) NO_x PECs at receptors E06 – E10 exceed the AQS. Exceedances are also seen at relevant locations within the grid, as illustrated by Figure C-8 in Appendix C. However, it should be noted that the detailed modelling undertaken has assumed that the plant would be operating continuously throughout a year, as percentiles for actual operating hours cannot be generated for 24-hour periods using the hypergeometric distribution method. In reality, the plant will run for significantly lower proportion of the year (up to 1,500 hours), and the predicted daily average NO_x concentration are considered to be an overestimation.

6.3.2.1 Nitrogen Deposition

Results obtained from the dispersion modelling have been used to calculate nitrogen deposition, based on the maximum concentration for any of the modelled discrete ecological receptor locations at the designated ecologically sensitive sites considered within the assessment; results are summarised in Table 6-9. The highest PC as a percentage of the critical load is 1.577% predicted within the Gwent Levels SSSI indicating that the combined PC of the two sites would have a minimal impact on nitrogen deposition at any of the ecosystems assessed.

6.3.2.2 Acid Deposition

The results obtained from the dispersion modelling for acid deposition for the operation of the two adjacent sites 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 6-5. The PCs and PECs generated by the site and the UKPR Solutia site have been presented as a percentage of the relevant critical load function. For several of the ecological receptors, the impact on acid deposition could not be determined as the APIS website advises '*there is no comparable acid critical load class for which the CL function is calculated*'. However, the acid deposition PCs are all below 0.019 keq/ha/year, so it is unlikely that there would be any significant effects on acid deposition at the surrounding ecosystems.

The highest PC as a percentage of the critical load function was 0.1% at the Gwent Levels SSSI, therefore indicating that the PC from the operation of the two adjacent sites has a minimal impact on acidification at any of the ecosystems identified.

Table 6-9: Nitrogen Deposition at Ecological Sites – Scenario 2

Receptor ID	Receptor	Broad Habitat Type	PC (kg N/ha/yr)	Background (kg N/ha/yr)	Total N Deposition (kg N/ha/yr)	Lower Critical Load	Process Contribution as a % of Lower Critical Load
E01	Severn Estuary 1	Coastal saltmarsh	0.025	11.900	11.925	20	0.124%
E02	Severn Estuary 2	Coastal saltmarsh	0.013	12.740	12.753	20	0.064%
E03	Severn Estuary 3	Coastal saltmarsh	0.011	12.740	12.751	20	0.053%
E04	Severn Estuary 4	Coastal saltmarsh	0.013	12.740	12.753	20	0.066%
E05	Severn Estuary 5	Coastal saltmarsh	0.032	12.740	12.772	20	0.161%
E06	Severn Estuary 6	Coastal saltmarsh	0.079	17.640	17.719	20	0.397%
E07	Severn Estuary 7	Coastal saltmarsh	0.263	17.640	17.903	20	1.317%
E08	Severn Estuary 8	Coastal saltmarsh	0.143	17.640	17.783	20	0.715%
E09	Severn Estuary 9	Coastal saltmarsh	0.070	17.640	17.710	20	0.350%
E10	Severn Estuary 10	Coastal saltmarsh	0.045	17.640	17.685	20	0.226%
E11	Severn Estuary 11	Coastal saltmarsh	0.041	17.640	17.681	20	0.207%
E12	Severn Estuary 12	Coastal saltmarsh	0.026	17.640	17.666	20	0.131%
E13	Severn Estuary 13	Coastal saltmarsh	0.009	17.640	17.649	20	0.046%
E14	Severn Estuary 14	Coastal saltmarsh	0.006	17.640	17.646	20	0.030%
E15	Severn Estuary 15	Coastal saltmarsh	0.004	19.320	19.324	20	0.021%
E16	Gwent Levels 1	Broadleaved, Mixed and Yew Woodland	0.046	25.760	25.806	10	0.455%
E17	Gwent Levels 2	Broadleaved, Mixed and Yew Woodland	0.078	25.760	25.838	10	0.779%
E18	Gwent Levels 3	Broadleaved, Mixed and Yew Woodland	0.087	25.760	25.847	10	0.874%
E19	Gwent Levels 4	Broadleaved, Mixed and Yew Woodland	0.158	28.280	28.438	10	1.577%
E20	Gwent Levels 5	Broadleaved, Mixed and Yew Woodland	0.106	20.160	20.266	10	1.057%
E21	Gwent Levels 6	Broadleaved, Mixed and Yew Woodland	0.036	20.160	20.196	10	0.361%

Table 6-10: Acid Deposition at Ecological Sites – Scenario 2

Receptor ID	Receptor Location	Broad Habitat Type	Process Nitrogen Deposition (keq/ha/yr)	Background Deposition (keq/ha/yr)		Maximum Critical Load (Sulphur) (keq/ha/yr)	Minimum Critical Load (Nitrogen) (keq/ha/yr)	Maximum Critical Load (Nitrogen) (keq/ha/yr)	Process Contribution as a % of lower critical load	
				Nitrogen	Sulphur				PC	PEC
E16	Gwent Levels 1	Broadleaved, Mixed and Yew Woodland	0.003	1.84	0.30	10.959	0.357	11.316	0.0%	18.9%
E17	Gwent Levels 2	Broadleaved, Mixed and Yew Woodland	0.006	1.84	0.30	10.959	0.357	11.316	0.1%	19.0%
E18	Gwent Levels 3	Broadleaved, Mixed and Yew Woodland	0.006	1.84	0.30	11.002	0.357	11.359	0.1%	18.9%
E19	Gwent Levels 4	Broadleaved, Mixed and Yew Woodland	0.011	2.02	0.36	10.930	0.357	11.287	0.1%	21.2%
E20	Gwent Levels 5	Broadleaved, Mixed and Yew Woodland	0.008	1.44	0.29	10.925	0.357	11.282	0.1%	15.4%
E21	Gwent Levels 6	Broadleaved, Mixed and Yew Woodland	0.003	1.44	0.29	10.959	0.357	11.316	0.0%	15.3%

6.3.3 Overall Significance of Operating Plant on Air Quality

As identified above:

- There are no predicted exceedances of the PECs for annual or 1-hour mean NO_2, nor 8-hour CO AQSs at any relevant discrete receptor locations (as per the LAQM TG.16 definitions[6]) in the cumulative impact scenario of the operation of the two adjacent sites;
- One exceedance of the annual mean NO_x AQS is predicted at receptor E13. The UK-AIR background concentration for the grid square receptor E13 is located within is 31.78 µg/m^3, which exceeds the AQS. The PC as a % of the annual mean NO_x standard is predicted to be 0.31% therefore the operation of the site and the adjacent UKPR Solutia site are deemed to have an insignificant impact;
- 24-hour mean (100th percentile) NO_x concentrations at receptors E06 – E10 and at relevant locations within the grid exceed the AQS. However, it should be noted that the detailed modelling undertaken has assumed that the plant would be operating continuously throughout a year, as percentiles for actual operating hours cannot be generated for 24-hour periods using the hypergeometric distribution method. In reality, the plant will run for a significantly lower proportion of the year (up to 1,500 years), and the predicted 24-hour mean NO_x concentrations are considered to be an overestimation.
- The process contribution is deemed to have minimal on both acidification and nitrogen deposition at all of the ecosystems identified.

In light of the above, the air quality impact from the combined impact of the operation of both the site and the adjacent UKPR Solutia site is not considered to be significant such that mitigation measures have not been recommended.

[6] Department for Environment Food & Rural Affairs, (2018) Local Air Quality Management Technical Guidance (TG16)

7 SUMMARY AND CONCLUSIONS

An assessment of air quality impacts of the power generating plant at Traston Road, Newport has been undertaken with reference to existing air quality in the area and relevant air quality legislation, policy and guidance.

The potential impact of the gas-fired plant on local air quality has been assessed using AERMOD, an advanced dispersion model developed for regulatory purposes, and used meteorological data measured between 2016 and 2018 at the Rhoose (Cardiff) weather station. Buildings/structures to account for downwash effects have been included in the air dispersion model. Concentrations of the key air pollutants (NO_2, NO_x and CO) have been predicted at existing sensitive human receptors (such as residences) and ecological receptors and hypothetical gridded receptors at a regular spacing of 50m covering the modelled domain of size 4km x 4km and 250m covering 20km x 20km approximately centred over the electricity generating plant. Background concentrations were used in combination with the predicted PC from the operation of the plant in order to determine the total PEC for each pollutant and relevant averaging period. It is understood that the plant is operated in accordance with the emissions parameters specified in Section 5.1.2 of this report.

The results have been compared to screening criteria from the Defra and EA guidance, with some exceedances of this criteria predicted; however the guidance notes this criteria should be used to determine whether detailed dispersion modelling is required (which has already been undertaken within this report) and goes on to recommend the PEC results are compared to relevant environmental standards.

The highest predicted impacts at any of the modelled off-site discrete receptor locations representative of relevant exposure in any of the three modelled meteorological years have been reported and compared to the relevant AQSs or EALs (i.e. annual and hourly mean NO_2 concentrations, annual and 24-hourly mean NO_x concentrations and 8-hourly mean CO concentrations) under two scenarios.

For scenario 1, considering the development alone, there were no predicted exceedances of the annual and hourly mean NO_2 or 8-hourly CO AQSs at any of the relevant modelled discrete human receptor locations in any of the modelled meteorological years. Receptor E13 was predicted to exceed the annual mean NO_x AQS, however the background concentration demonstrates that this location already exceeds the AQS, and the PC is insignificant at 0.19%. Receptors E06-E09 and relevant locations within the grid were predicted to exceed the 24-hourly mean NO_x AQS. However, it should be noted that the modelling undertaken has assumed that the plant would be operating continuously throughout the year. In reality, the plant will run for a significantly lower proportion of the year (up to 1,500 hours), and the predicted daily average NO_x concentrations are considered to be an overestimation. No significant impact on nitrogen or acid deposition on ecosystems in the surrounding area is expected.

For scenario 2, considering the cumulative impact scenario of the operation of the development and the adjacent UKPR Solutia site, there were no predicted exceedances of the annual and hourly mean NO_2 or 8-hourly CO AQSs at any of the relevant modelled discrete receptor locations in any of the modelled meteorological years. Again, receptor E13 was predicted to exceed the annual mean NO_x AQS, however again this was due to the existing background concentration, and the cumulative PC is still insignificant at 0.31% of the AQS. Receptors E06-E10 and relevant locations within the grid were predicted to exceed the 24-hourly mean NO_x AQS. However, as explained above, the predicted daily average NO_x concentration is likely to be an overestimation. No significant impact on nitrogen or acid deposition on ecosystems in the surrounding area is expected.

With consideration of the highly conservative approach to the assessment for short-term standards, and noting that the 24-hourly mean NO_x AQS is only a target value, it is determined that the operational phase impacts on local air quality are not significant. Additional mitigation measures have not been recommended and the residual impacts are considered likely to be acceptable.

8 REFERENCES

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APPENDIX A
FIGURES

This appendix contains the following figures for use with this report:

Figure A-1: Site Location Plan

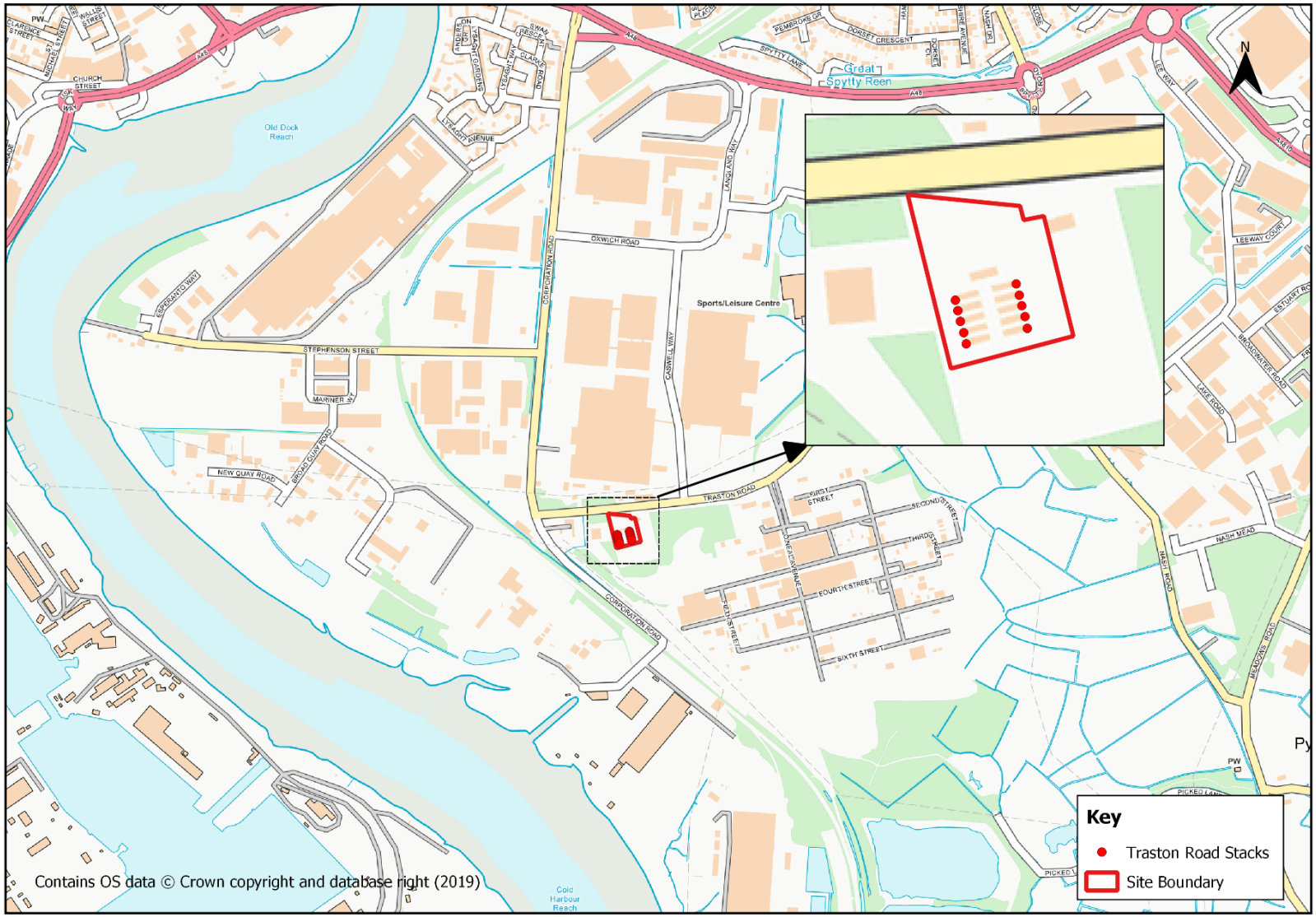


Figure A-2: Cumulative Site Location Plan

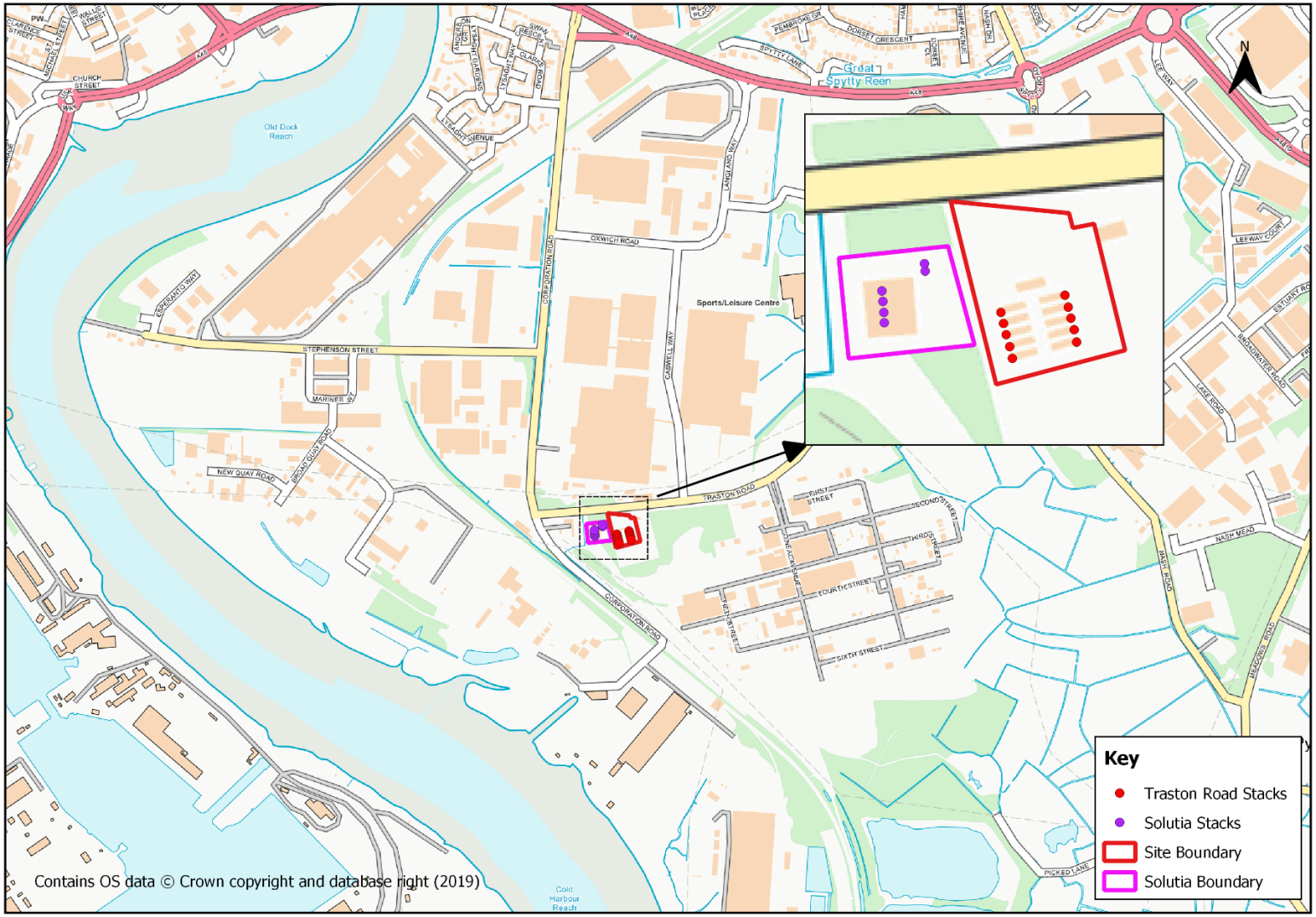


Figure A-3: Discrete Human Receptor Locations

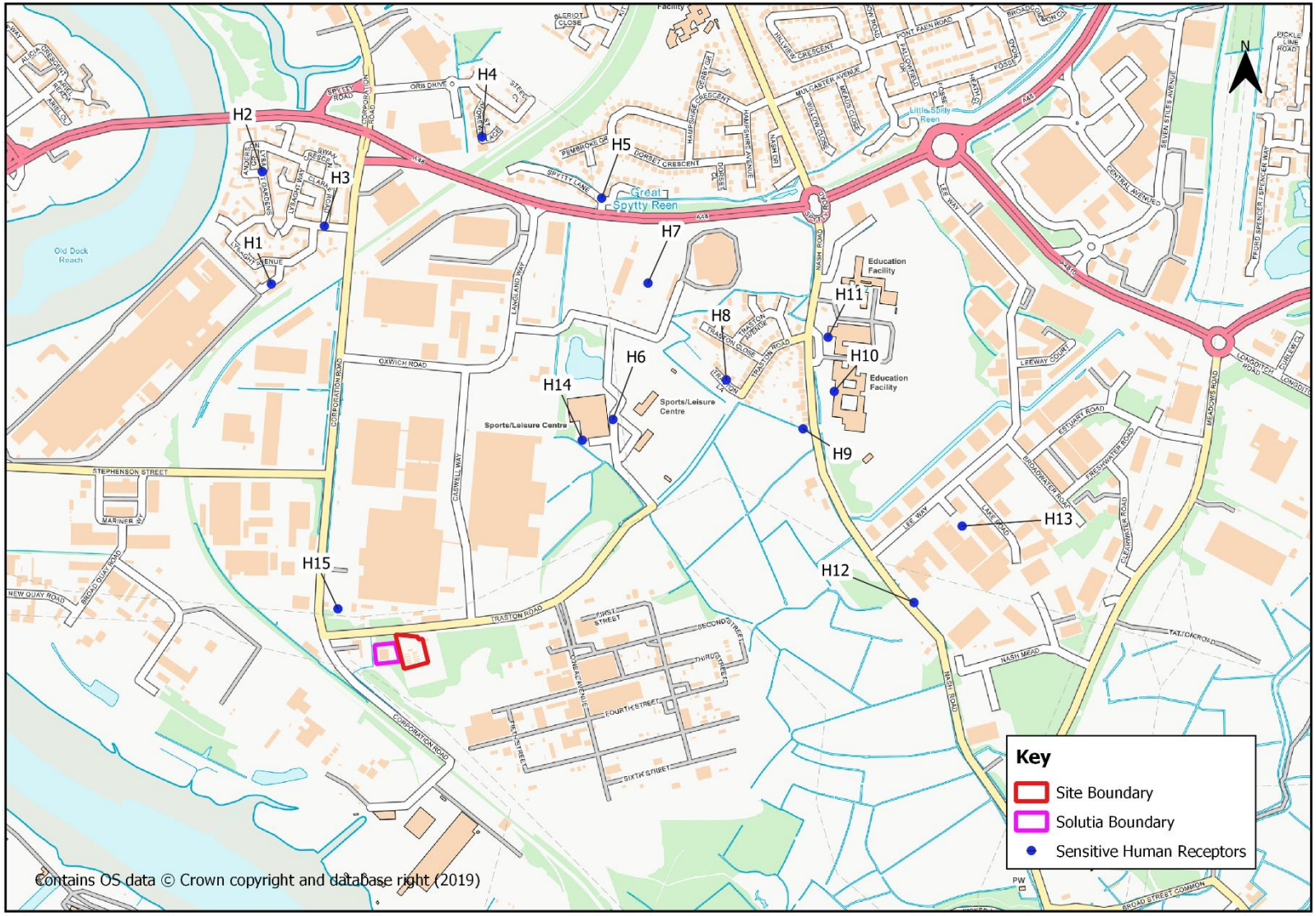
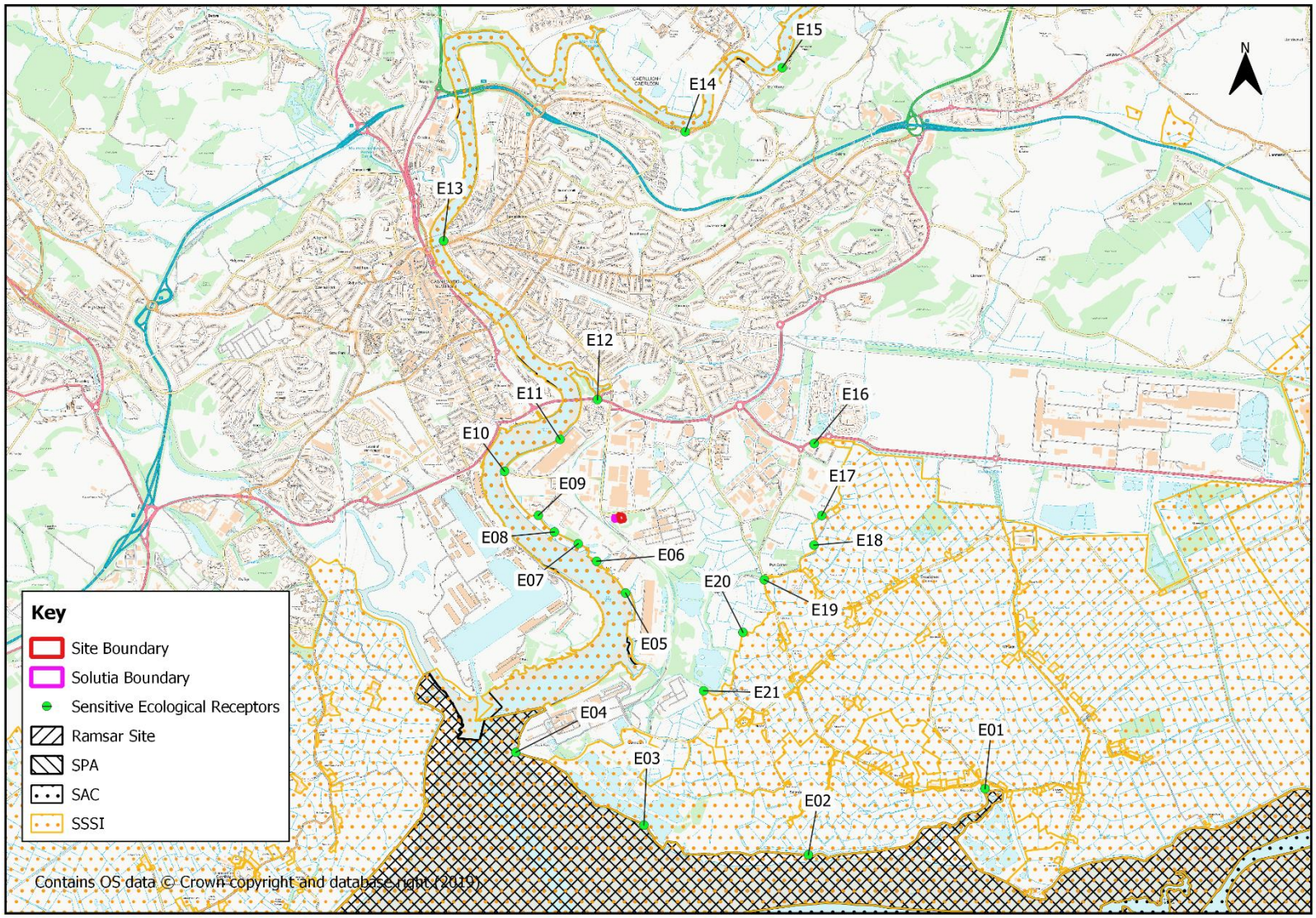


Figure A-4: Discrete Ecological Receptor Locations



APPENDIX B
WINDROSES

This appendix contains the following figures for use with this report:

Figure B-1: Windrose for the Rhoose Weather Station 2016

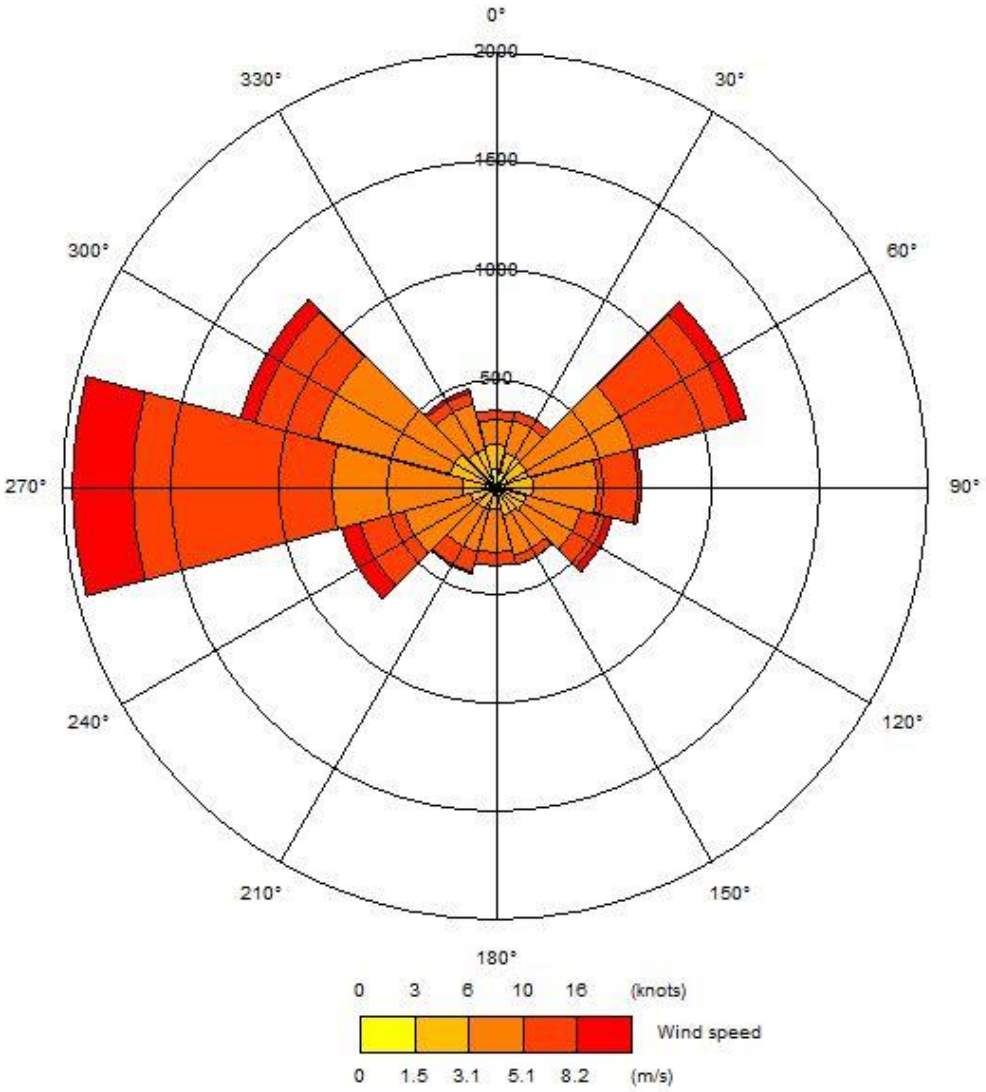


Figure B-2: Windrose for the Rhoose Weather Station 2017

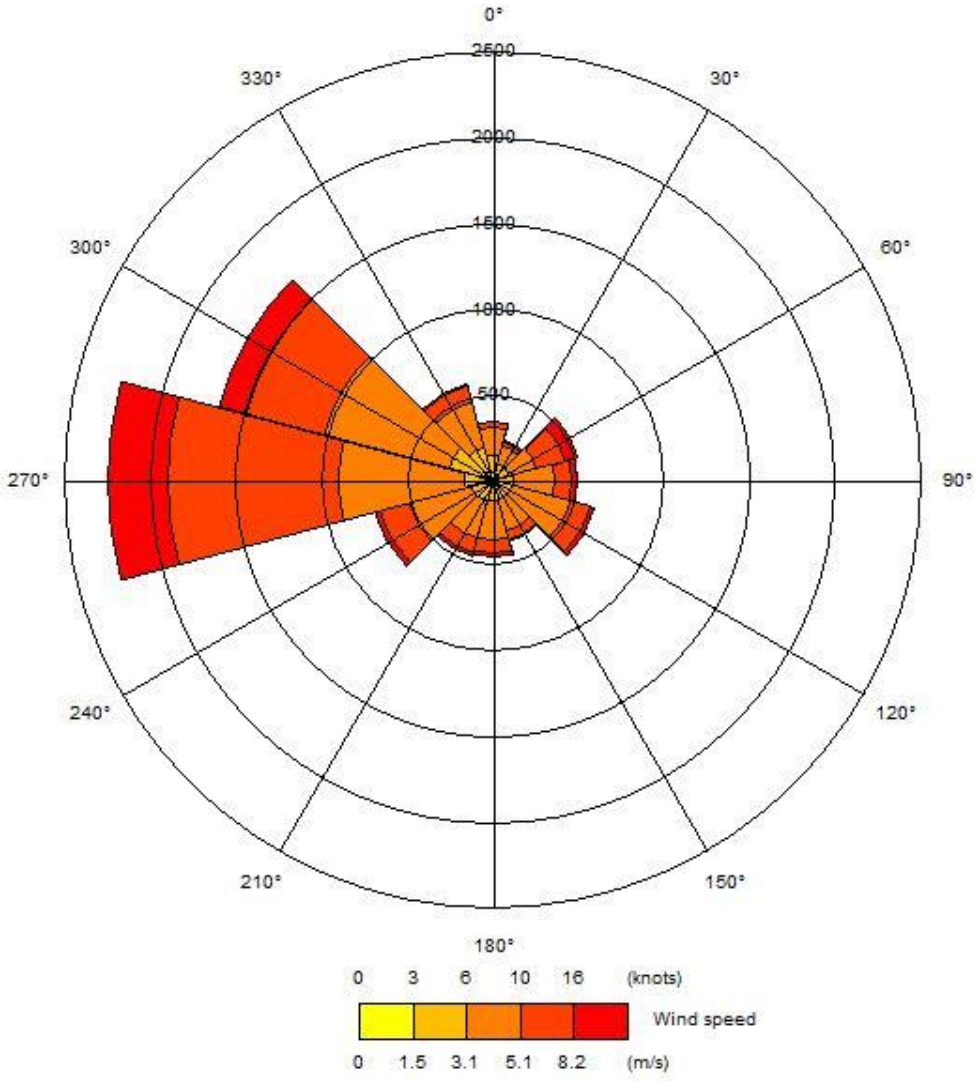
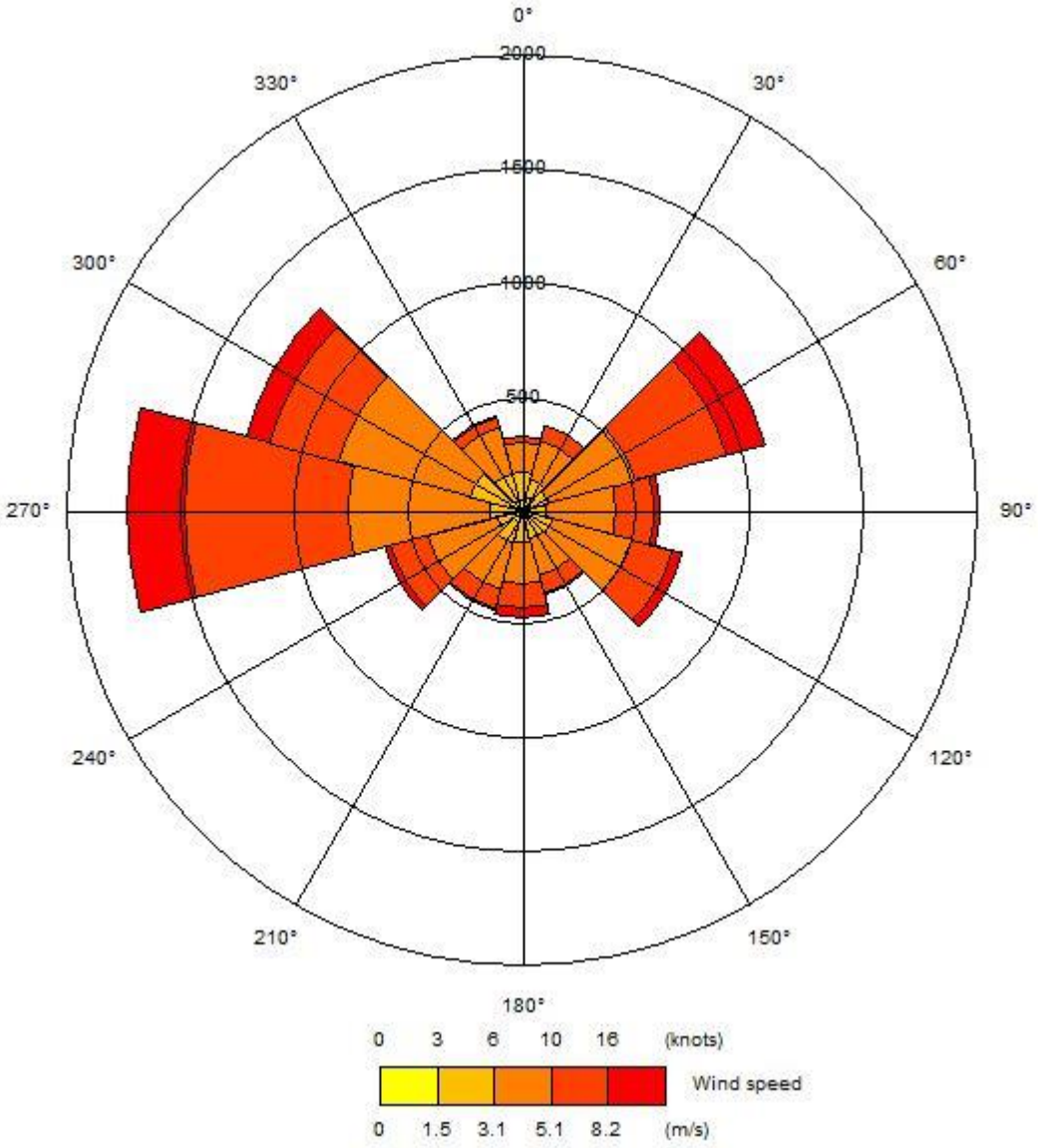


Figure B-3: Windrose for the Rhoose Weather Station 2018



APPENDIX C
CONTOUR PLOTS

This annex contains contour plot (isopleths) illustrating the dispersion profiles of emission components released from the plant. The data is based on the meteorological data year which experienced the highest pollutant concentrations.

Figure C-1: Scenario 1 Predicted Annual Mean NO_2 Concentrations (µg/m^3) PEC – relevant for human receptor locations

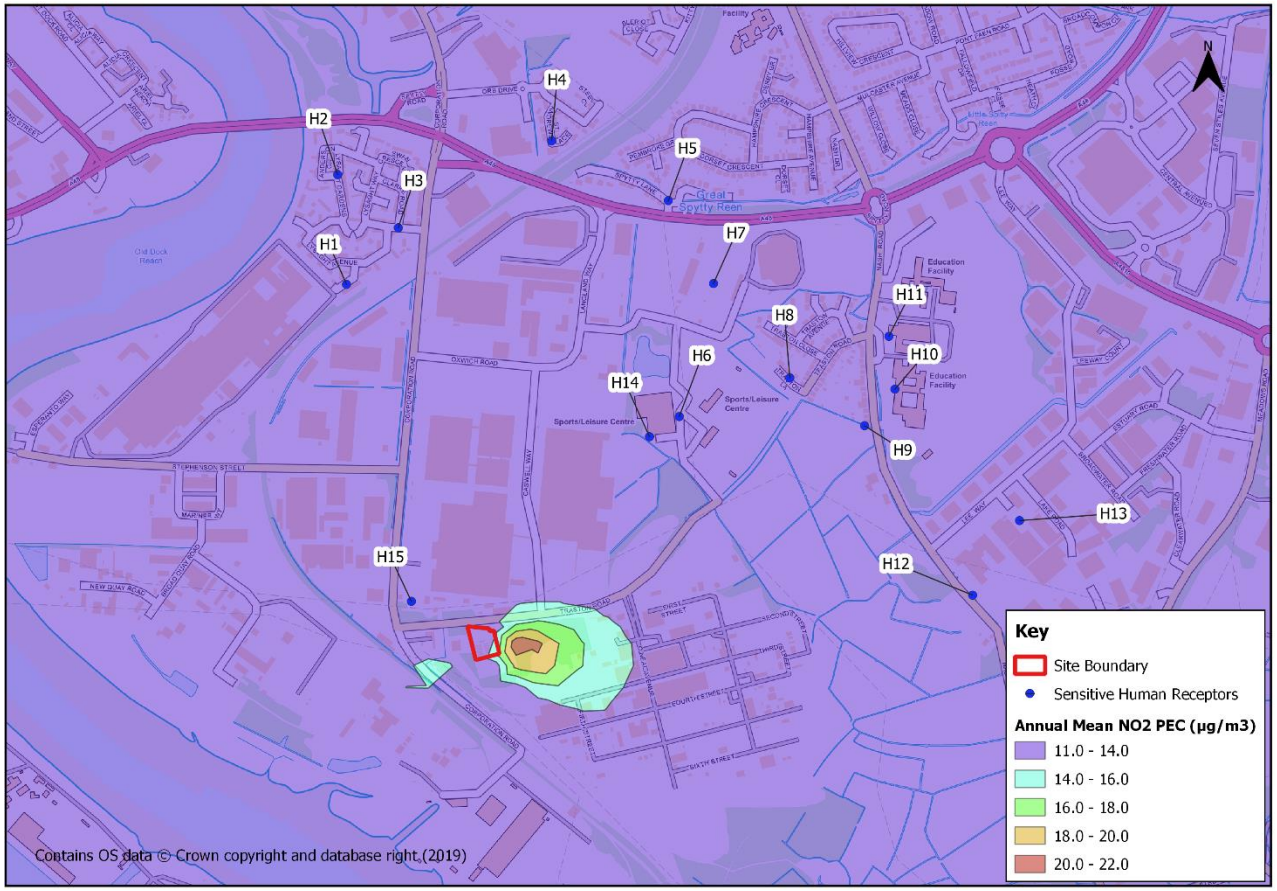


Figure C-2: Scenario 1 Predicted 99.79th Percentile of Hourly NO_2 Concentrations (µg/m³) PEC – relevant for human receptor locations

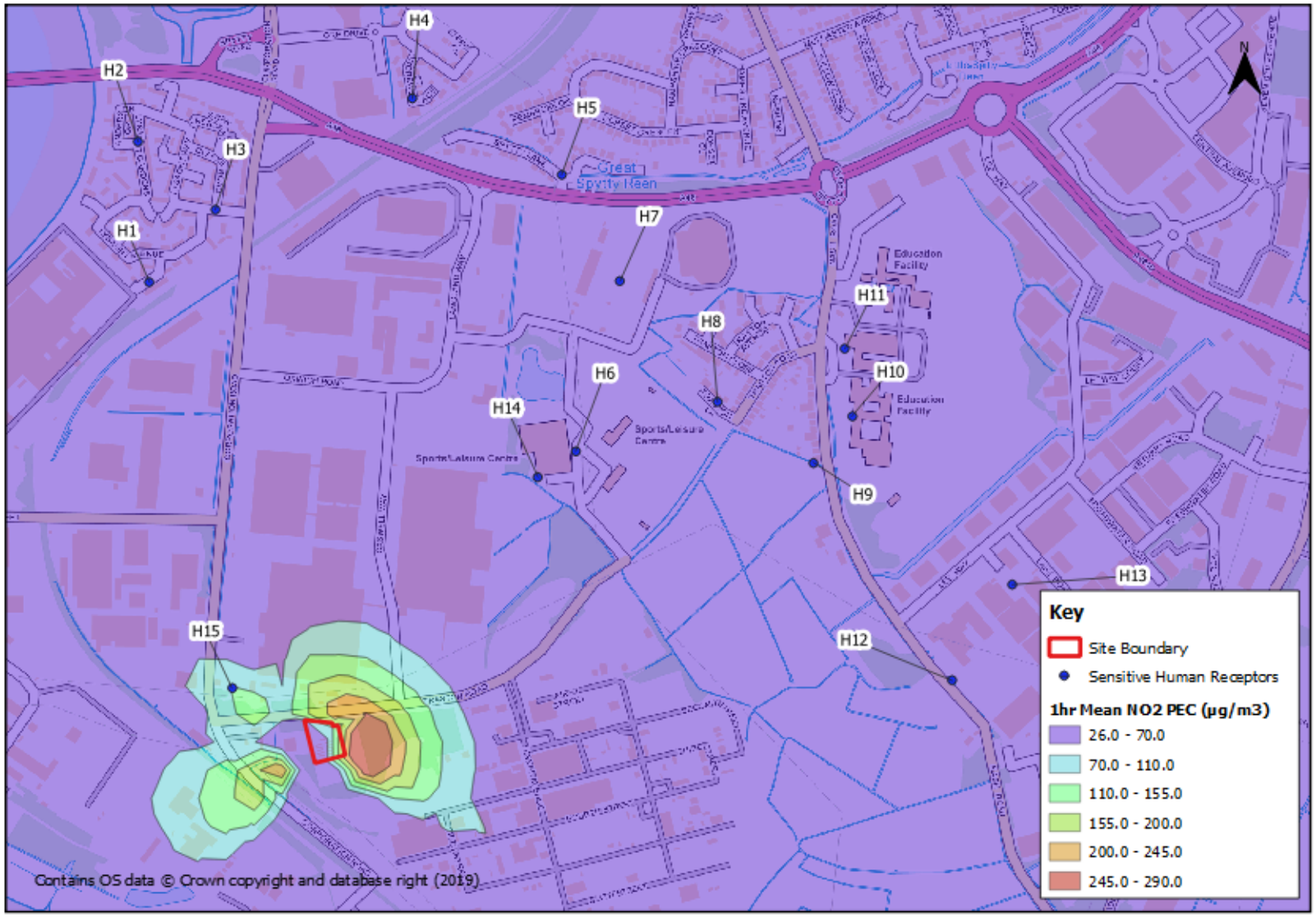


Figure C-3: Scenario 1 Predicted Annual Mean NO_x Concentrations (µg/m^3) PEC – relevant for ecological receptor locations

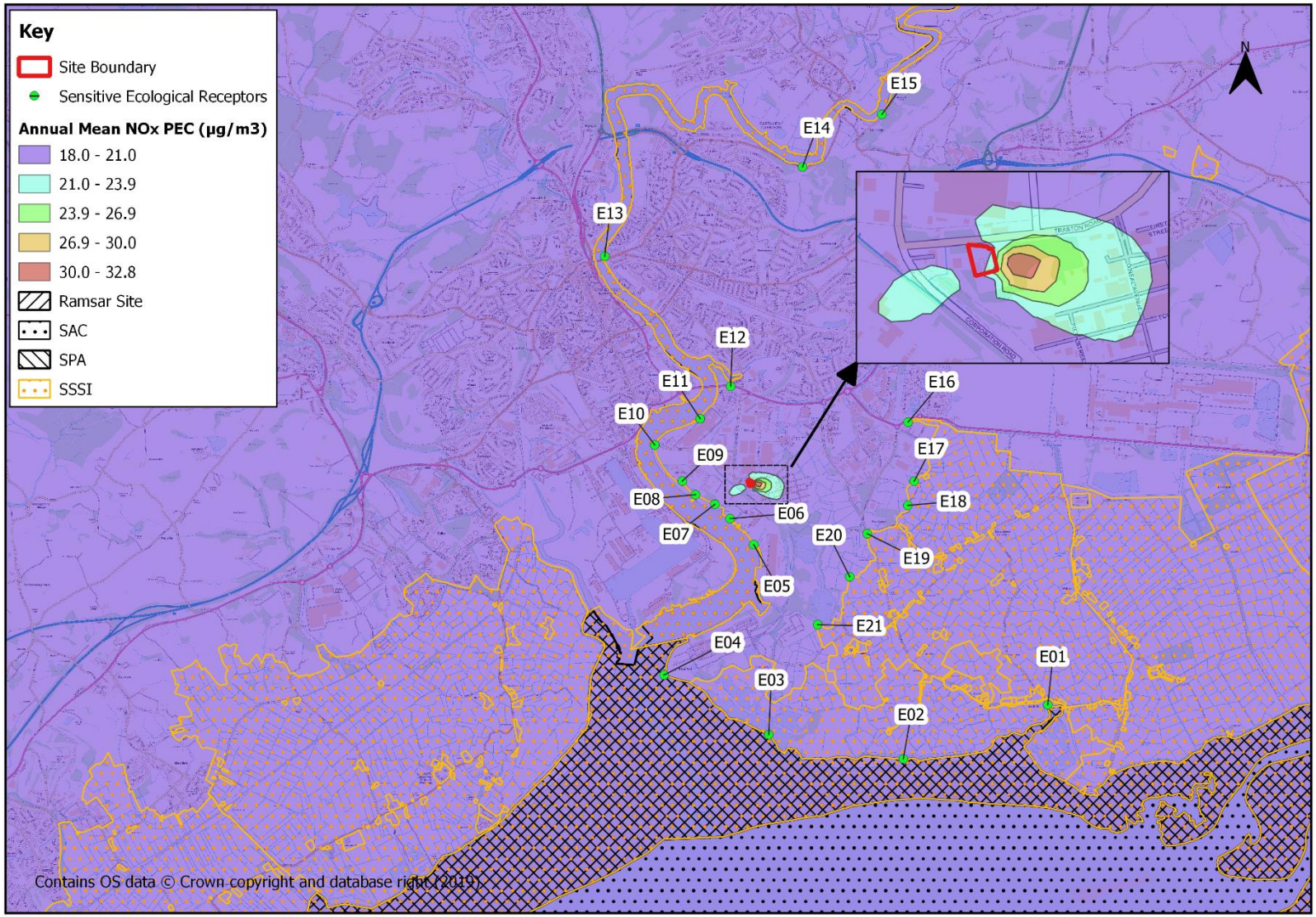


Figure C-4: Scenario 1 Predicted 24-hourly Mean NO_x Concentrations (µg/m^3) PEC – relevant for ecological receptor locations

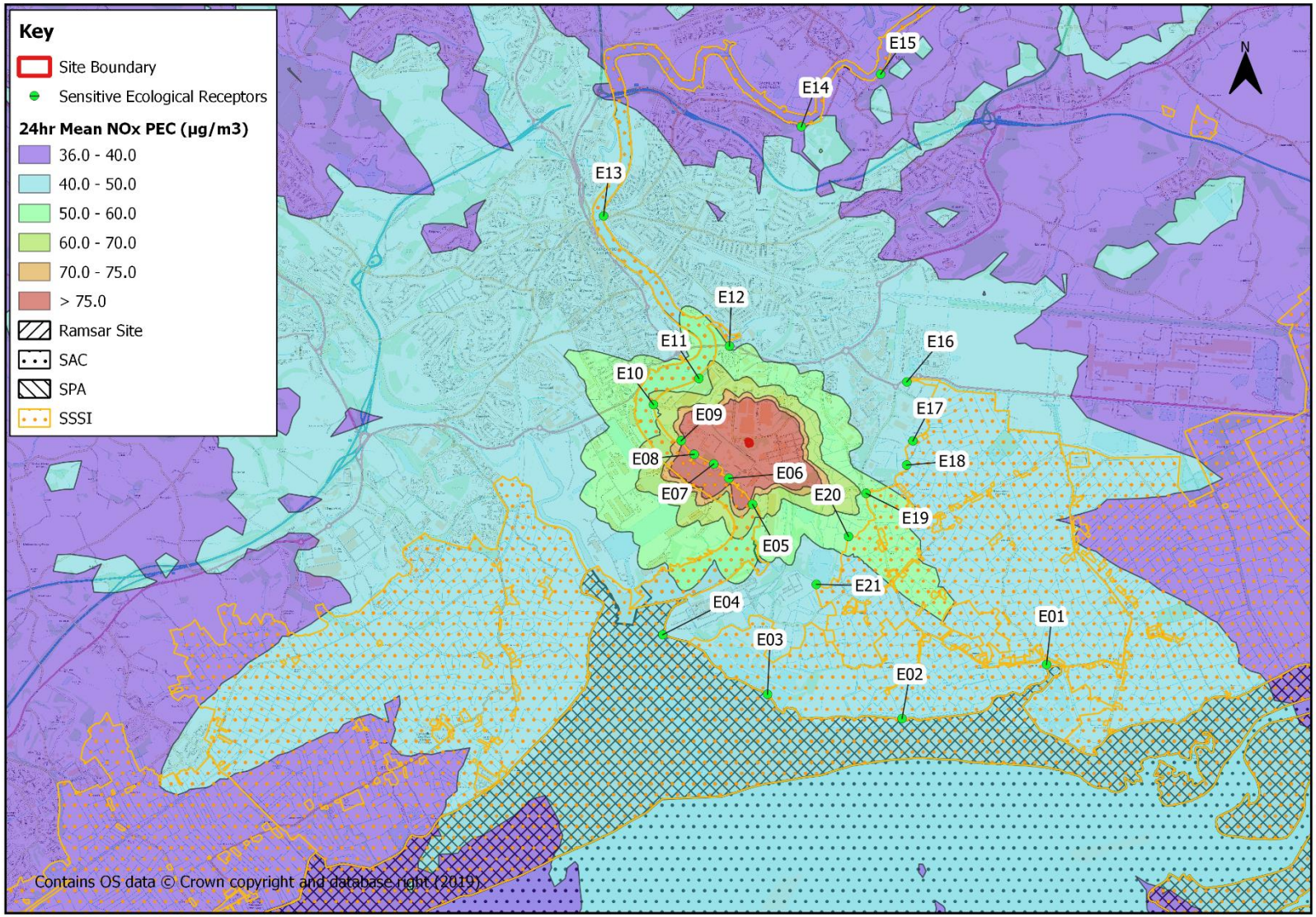


Figure C-5: Scenario 2 Predicted Annual Mean NO_2 Concentrations (µg/m^3) PEC – relevant for human receptor locations

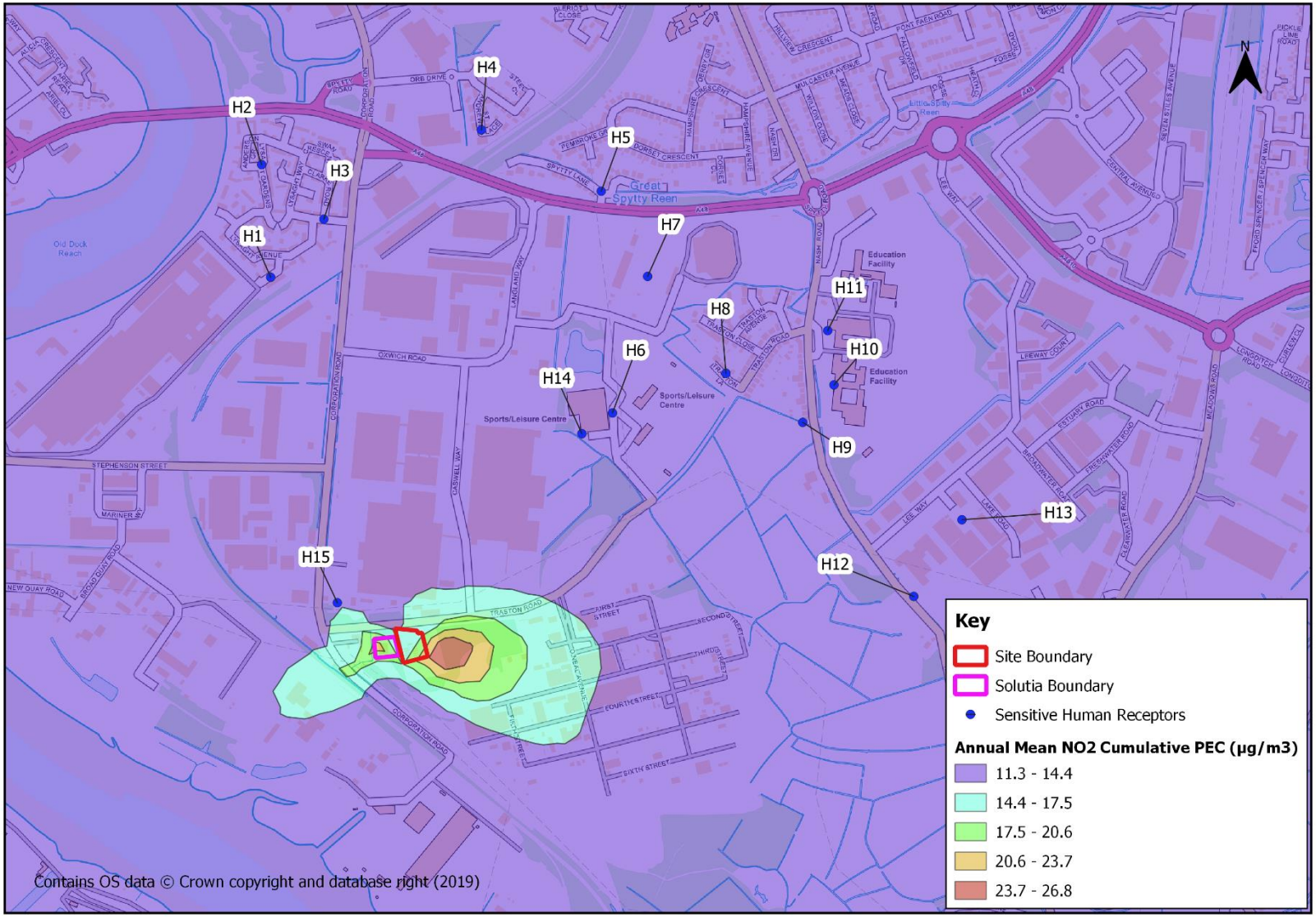


Figure C-6: Scenario 2 Predicted 99.79th Percentile of Hourly NO_2 Concentrations (µg/m³) PEC – relevant for human receptor locations

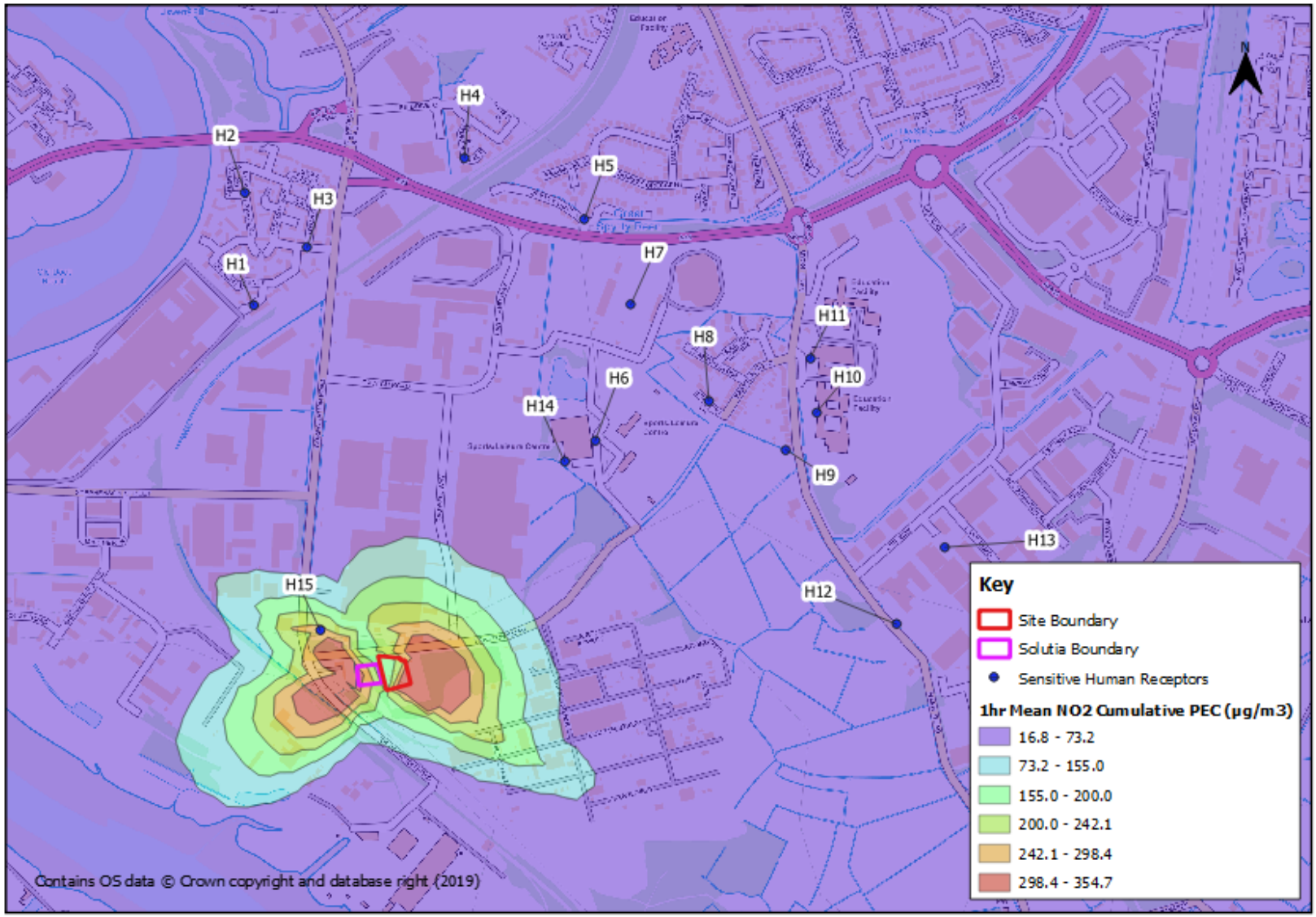


Figure C-7: Scenario 2 Predicted Annual Mean NO_x Concentrations (µg/m^3) PEC – relevant for ecological receptor locations

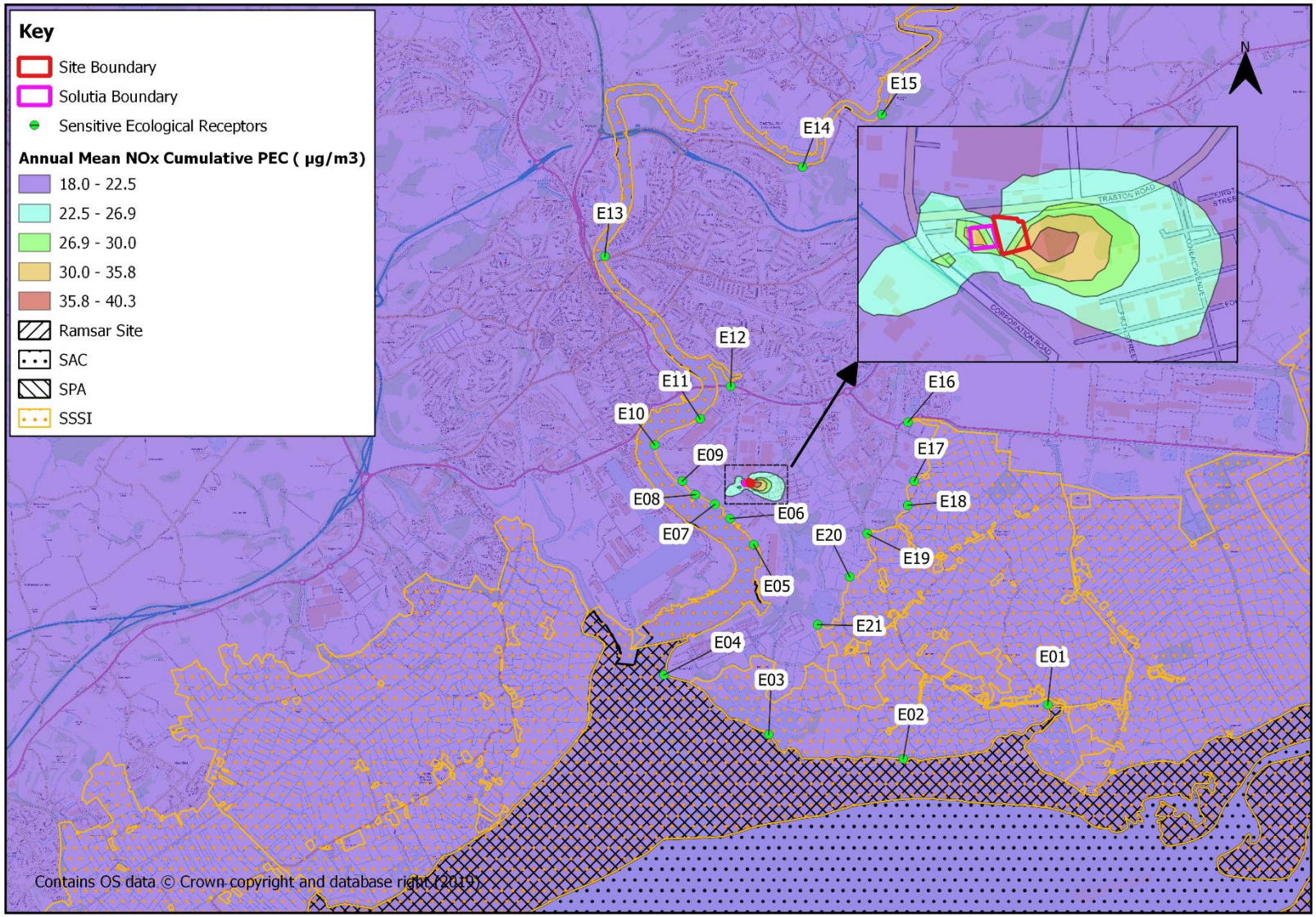


Figure C-8: Scenario 2 Predicted 24-hourly Mean NO_x Concentrations (µg/m^3) PEC – relevant for ecological receptor locations