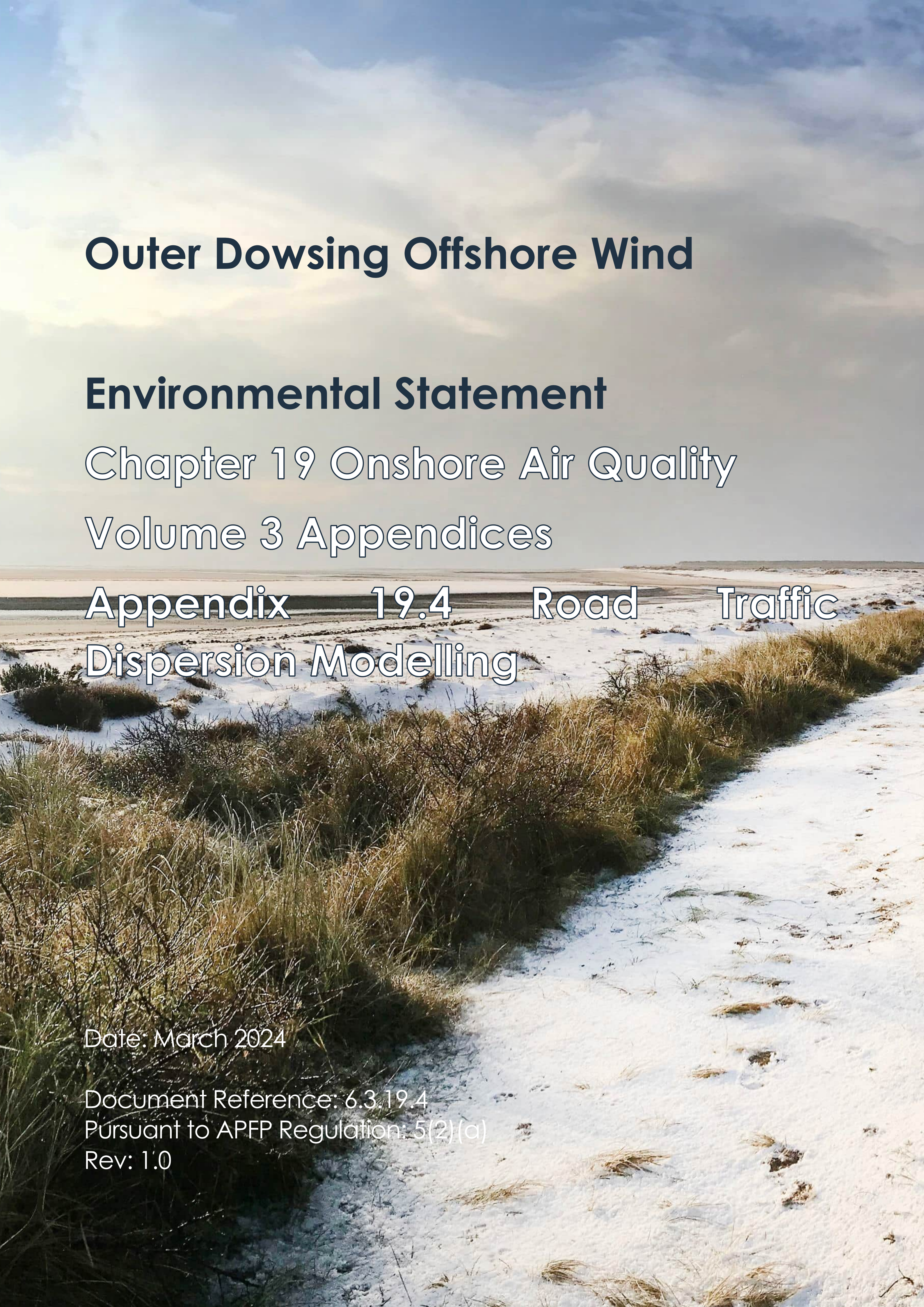

Outer Dowsing Offshore Wind

Environmental Statement

Chapter 19 Onshore Air Quality

Volume 3 Appendices

Appendix 19.4 Road Traffic Dispersion Modelling

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Rev No.	Date	Status / Reason for Issue	Author	Checked by	Reviewed by	Approved by
1.0	March 2024	DCO Application	SLR	SLR	Shepherd and Wedderburn	Outer Dowsing

Volume 3, Appendix 19.4: Road Traffic Dispersion Modelling

Outer Dowsing Offshore Wind Environmental Statement

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1.0	1 March 2024	SLR	GoBe	ODOW

Basis of Report

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Acronyms and Abbreviations

Acronym	Expanded name
$\mu g/m^3$	Micrograms per cubic metre
AADT	Annual Average Daily Traffic
APIS	Air Pollution Information System
AQAL	Air Quality Assessment Level
AQTAG	Air Quality Technical Advisory Group
BBC	Boston Borough Council
BC	Base Case
CERC	Cambridge Environmental Research Consultants
DCO	Development Consent Order
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DM	Do Minimum
DS	Do Something
EA	Environment Agency
ECC	Export Cable Corridor
EFT	Emission Factor Toolkit
EIA	Environmental Impact Assessment
ELDC	East Lindsey District Council
EPUK	Environmental Protection UK
HDV	Heavy Duty Vehicle
IAQM	Institute of Air Quality Management
LAQM.TG22	Local Air Quality Management Technical Guidance 2022
LDV	Light Duty Vehicle
LNR	Local Nature Reserve
LWS	Local Wildlife Site
LWT	Lincolnshire Wildlife Trust
NGR	National Grid Reference
NKDC	North Kesteven District Council
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NSIP	Nationally Significant Infrastructure Project
O&M	Operation and Maintenance
ODOW	Outer Dowsing Offshore Wind
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm or less

$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm (micrometres) or less
RMSE	Root Mean Square Error
SHDC	South Holland District Council
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
TG	Technical Guidance
UK	United Kingdom

Terminology

Term	Description
Baseline	The status of the environment at the time of assessment without the development in place.
Cumulative effects	The combined effect of the Project acting additively with the effects of other developments, on the same single receptor/resource.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for a Nationally Significant Infrastructure Project (NSIP).
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of the impact with the sensitivity of the receptor, in accordance with defined significance criteria.
EIA Regulations	Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.
Environmental Statement	The suite of documents that detail the processes and results of the EIA.
Impact	An impact to the receiving environment is defined as any change to its baseline condition, either adverse or beneficial.
Intertidal	Area where the ocean meets the land between high and low tides.
Landfall	The location at the land-sea interface where the offshore export cables and fibre optic cables will come ashore.
Mitigation	Mitigation measures are commitments made by the Project to reduce and/or eliminate the potential for significant effects to arise as a result of the Project. Mitigation measures can be embedded (part of the project design) or secondarily added to reduce impacts in the case of potentially significant effects.
Order Limits	The area subject to the application for development consent. The limits shown on the works plans within which the Project may be carried out.
Outer Dowsing Offshore Wind (ODOW)	The Project.
The Planning Inspectorate	The agency responsible for operating the planning process for Nationally Significant Infrastructure Projects (NSIPs).
The Project	Outer Dowsing Offshore Wind, an offshore wind generating station together with associated onshore and offshore infrastructure.
Receptor	A distinct part of the environment on which effects could occur and can be the subject of specific assessments. Examples of receptors include species (or

Term	Description
	groups) of animals or plants, people (often categorised further such as ‘residential’ or those using areas for amenity or recreation), watercourses etc.
Study area	Area(s) within which environmental impact may occur – to be defined on a receptor-by-receptor basis by the relevant technical specialist.

19.0 Road Traffic Dispersion Modelling

19.1 Introduction

1. To appropriately assess road traffic impacts associated with the construction phase of the onshore elements of Outer Dowsing Offshore Wind (ODOW) ('the Project') on sensitive receptors, detailed dispersion modelling has been undertaken using the Cambridge Environmental Research Consultants (CERC) ADMS-Roads v5 dispersion model, focussing on concentrations of nitrogen dioxide (NO_2), and particulate matter (PM_{10} and $PM_{2.5}$) for the following scenarios:

   - 2019 Base Case (BC) – Base flows for the year (2019);
   - 2027 Do Minimum (DM) – Future baseline flows for the earliest potential year construction will commence (2027), inclusive of any other relevant committed development flows; and
   - 2027 Do Something (DS) – 2027 DM flows, plus peak road traffic flows generated by ODOW onshore construction activities.

2. To disaggregate in-combination impacts on designated ecological sites, an additional modelled scenario was included for 2027; comprising future baseline flows without the addition of committed developments (i.e. 2027 DM minus committed development flows).

3. For the above future year scenarios (2027), concurrent emission factors and background (projected) pollutant concentrations have been used – representing the earliest date of potential construction.

4. To understand potential air quality impacts that may arise throughout the construction phase 2027 has been adopted for the purposes of dispersion modelling (i.e. earliest date of potential construction). The use of 2027 is believed to be conservative given the forecasted reductions in vehicle emission factors and background pollutant concentrations following the introduction of legislative and policy initiatives, alongside low emission technologies and fuels.

19.2 Traffic Inputs

5. Traffic data inputs used in support of the construction phase assessment has been informed by analysis undertaken and presented within Volume 1, Chapter 27: Traffic and Transport (document reference 6.1.27). Data has been supplemented from the

Department for Transport (DfT) traffic count website[1] where relevant and adjusted accordingly.

6. Construction road traffic flows have been calculated using the maximum consecutive 12 month (representing annual) average flow (Heavy Duty Vehicles (HDVs) and employees Light Duty Vehicles (LDVs) separately) across the construction programme. This Annual Average Daily Traffic (AADT) flow ensures the highest average period of construction has been captured for each section of the road network. This approach represents industry best practice and is preferable to averaging out road traffic values across the full onshore construction period to derive AADT flows, which would dilute the predicted datasets. Further, the approach assumes that the maximum consecutive 12-month vehicle flows generated throughout the whole construction phase occur under worst case air quality conditions (2027 vehicle emission factors and background pollutant concentrations) projected for the full construction period. This is considered conservative.

7. Traffic speeds were modelled at the relevant national speed limit for each road. However, where appropriate, the speeds have been reduced to simulate queues at junctions, traffic lights and other locations where queues or slower traffic are known to be an issue, in accordance with the Department for Environment, Food and Rural Affairs (Defra) Local Air Quality Management Technical Guidance (TG22) (LAQM.TG22). Traffic speeds have been assumed to be consistent across all the modelled scenarios.

8. The latest version of the Emission Factor Toolkit (EFT) version 11.0 developed by Defra[2] has been used to determine vehicle emission factors for input into the ADMS-Roads dispersion model, supporting each of the above scenarios.

9. To initially inform the spatial extent of the model, changes in traffic volumes on the local road network were compared to ecological and human screening thresholds (See Section 7.1 – Volume 1, Chapter 19: Onshore Air Quality (document reference 6.1.19)). Where relevant, neighbouring links were also included within the dispersion model to facilitate a robust assessment, rather than rely on their individual contributions being represented within the appropriate background datasets. As such, the spatial extent of

[1] DfT, Road Traffic Statistics website. https://roadtraffic.dft.gov.uk/ [accessed November 2023].

[2] Defra, EFT v11.0 (2021). https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.html [accessed November 2023].

the dispersion model is greater than the affected road network, as it includes road links which experience insignificant vehicle volumes as a result of the Project.

10. The traffic flows used for the future modelled assessment years (2027 DM and 2027 DS) include vehicle movements associated with relevant committed developments and live projects/plans in the assessment area for the assessment of cumulative effects (see Chapter 27 (document reference 6.1.27)). As such, the dispersion modelling exercise and associated outcomes are inherently cumulative in nature.

11. Details of the traffic flows used in this assessment are provided in Table 19.1[3], whilst the modelled roads in relation to the Order Limits are presented in Volume 2, Chapter 19: Onshore Air Quality Figure 19.2 (document reference 6.2.19.2).

Table 19.1: Traffic Data Used within the Assessment

Road Link	2019 BC		2027 DM		2027 DM-C		2027 DS	
	AADT	% HDV	AADT	% HDV	AADT	% HDV	AADT	% HDV
A16 north of A1028 / A1104	8,928	7.3	9,760	7.1	9,515	7.3	10,070	9.8
A158 west of A16	7,714	16.1	8,033	16.1	8,033	16.1	8,340	19.1
A16 between A158 and A1028	5,515	9.2	5,878	9.2	5,878	9.2	6,189	13.5
A17 (north of River Welland)	18,859	25.3	19,638	25.3	19,638	25.3	19,765	25.6
A17 (between A16 and A1121)	17,506	23.7	18,229	23.7	18,229	23.7	18,404	24.4
A17 (west of A1221)	23,548	13.1	25,097	13.1	25,097	13.1	25,302	13.7
A16 (south of Boston, north of Kirton)	22,100	17.2	23,345	17.2	23,012	17.2	23,429	17.3
A16 (south of Boston, south of Kirton)	22,100	17.2	23,138	17.4	23,012	17.2	23,334	17.9
A1121 between Boston and A17	8,562	7.2	9,257	7.1	9,125	7.2	9,317	7.6
A16 Boston	37,058	6.0	40,000	6.1	39,495	6.0	40,239	6.4
A16 between A52 (Boston) and A155	6,762	18.7	7,042	18.7	7,042	18.7	7,271	20.7
A16 between A155 and A158	9,364	8.1	9,980	8.1	9,980	8.1	10,206	9.8
A158 between A1028 and A16	11,604	3.8	12,367	3.8	12,367	3.8	12,589	5.3
A1028 between A158 and A16	6,019	4.8	6,415	4.8	6,415	4.8	6,619	7.7
A158 Skegness Road (west of ECC)	13,005	14.9	13,542	14.9	13,542	14.9	13,832	16.5
A158 Skegness Road (east of ECC)	13,005	14.9	13,542	14.9	13,542	14.9	13,617	15.4

[3] Following completion of the air quality modelling, minor changes to the Project construction traffic flows were identified, therefore impacting the 2027 DS scenario. It is noted that these changes do not impact the overall screening assessment for both human and ecological receptors, i.e. all relevant road links and receptors/designated ecological sites have been included in the detailed assessment where required. Given this, and the conservative nature of the derived traffic flows (Paragraph 6), it is not anticipated that the changes would impact the overall conclusions of the road traffic emissions assessment.

Road Link	2019 BC		2027 DM		2027 DM-C		2027 DS	
	AADT	% HDV	AADT	% HDV	AADT	% HDV	AADT	% HDV
A52 Wainfleet Road (east of Haltoft End)	11,616	15.4	12,400	15.0	12,096	15.4	12,671	16.3
A52 Wainfleet Road (west of Haltoft End)	11,616	15.4	12,400	15.0	12,096	15.4	12,672	16.3
A52 (Wrangle)	6,355	21.0	6,922	20.1	6,618	21.0	7,038	20.4
A52 (Holland Lane)	4,835	19.4	5,339	18.3	5,035	19.4	5,434	18.8
A52 (south of Low Road)	8,027	14.6	8,663	14.1	8,359	14.6	8,771	14.6
A52 (north of Low Road)	8,027	14.6	8,663	14.1	8,359	14.6	8,743	14.5
Lincoln Road Skegness	8,750	10.0	9,111	10.0	9,111	10.0	9,188	10.7
A52 Wainfleet Road Skegness	4,375	10.0	4,556	10.0	4,556	10.0	4,594	10.7
Ings Road	278	17.4	289	17.4	289	17.4	377	33.0
West End Road	557	24.3	579	24.3	579	24.3	667	32.2
B1192 Station Road	5,342	2.7	5,693	2.7	5,693	2.7	5,693	2.7
B1397 London Road	8,823	3.2	9,403	3.2	9,403	3.2	9,403	3.2
London Road / High Street (Boston)	6,245	2.0	6,656	2.0	6,656	2.0	6,656	2.0
South Square (Boston)	5,395	2.5	5,750	2.5	5,750	2.5	5,750	2.5
A1138 South End	694	36.3	740	36.3	740	36.3	740	36.3
A1137 Horncastle Road	7,476	3.0	7,968	3.0	7,968	3.0	7,968	3.0
A153 South Street	10,611	6.4	11,309	6.4	11,309	6.4	11,309	6.4
A153 Bull Ring / North Street	3,721	4.5	3,966	4.5	3,966	4.5	3,966	4.5
A52 between Marsh Lane and Skegness	3,825	13.7	4,228	12.9	3,983	13.7	4,233	12.9
A52 Liquorpond Street / Queen Street, Boston	14,531	4.7	15,992	4.9	15,487	4.7	16,086	5.3
A52 Sleaford Road, Boston	18,144	3.8	19,842	4.0	19,337	3.8	19,937	4.3
Station Road / Skeldyke Road / Nidd's Lane / Marsh Road	321	16.1	334	16.1	334	16.1	411	29.4
A17 (south of River Welland)	18,859	25.3	19,638	25.3	19,638	25.3	19,770	25.7
A16 (south of A17)	16,270	30.1	17,068	30.3	16,942	30.1	17,336	30.8
A16 Wide Bargate / Bargate Bridge / Spilsby Road	21,912	5.9	23,858	6.0	23,353	5.9	24,097	6.4

19.3 Non-Road Inputs

12. In addition to traffic inputs (described in Section 19.2), non-road inputs are incorporated into the detailed dispersion modelling assessment with application of the background datasets. These include non-road emission contributions (see Section 19.6).

13. It is recognised that committed development and projects/plans may become operable in the interim since the background datasets were published, and subsequent emission contributions would therefore not be included in the datasets.

14. To account for this, regulated non-road emissions (e.g. from combustion processes) associated with cumulative developments, as identified in Table 19.20 of Volume 1, Chapter 19: Onshore Air Quality (document reference 6.1.19), have also been considered to replicate future air quality conditions and impacts. These developments have been reviewed in-combination with the supporting assessment documentation to determine if emissions are predicted to interact with the sensitive receptors assessed within the road traffic dispersion modelling assessment – and therefore represent a potential cumulative effect.

15. From review of the cumulative developments and associated assessment documentation, the Boston Alternative Energy Facility (BAEF) is the only facility that could cause a potential cumulative impact from non-road emissions (e.g. from combustion processes). Outputs presented within the BAEF Air Quality ES Chapter and technical appendices have been used to facilitate the assessment. Emissions from BAEF have only been considered with respect to human receptors. Based on a review of application documentation, BAEF emissions will not interact with any of the designated ecological sites considered within the Project's road traffic modelling assessment. No further assessment is therefore necessary.

16. In relation to human receptors, a detailed assessment of road and non-road emissions generated during the construction and operational phases of the BAEF was undertaken to support the application. The impacts associated with pollutants NO_2, PM_{10} and $PM_{2.5}$ have the potential to interact with the impacts of the Project.

17. From review of results of the BAEF detailed assessment, the operational phase predicted higher pollutant concentrations of NO_2, PM_{10} and $PM_{2.5}$ when compared to the construction phase. Therefore, the BAEF operational phase results have been considered in combination with the Project's construction phase results to present a worst-case assessment scenario.

18. The pollutant concentration contours associated with the BAEF's operational phase (where available) have been reviewed and the maximum concentration at the point of overlap with the Project's study area extracted. This BAEF contribution has been added

as part of the background concentration and therefore forms part of the DM and DS scenario concentrations predicted in the Project's construction road traffic emissions assessment. The assessment is therefore inherently cumulative.

19. The annual mean contributions are summarised as follows:

- NO_2: the annual mean NO_2 contour of 0.5 – 1.0µg/m^3 is the maximum that interacts with the Project's study area. 1.0µg/m^3 has therefore been added as part of the NO_2 background concentration;
- PM_{10}: the annual mean PM_{10} contour of 0.04 – 0.06µg/m^3 is the maximum that potentially interacts with the Project's study area. 0.06µg/m^3 has therefore been added as part of the PM_{10} background concentration; and
- $PM_{2.5}$: an annual mean $PM_{2.5}$ contour was not available for the BAEF assessment, and instead the maximum Process Contribution predicted at the modelled human receptors (0.24µg/m^3) was applied in lieu. 0.24µg/m^3 has therefore been added as part of the $PM_{2.5}$ background concentration.

19.4 Meteorological Data

20. To calculate pollutant concentrations at identified sensitive receptor locations the dispersion model uses sequential hourly meteorological data, including wind direction, wind speed, temperature, cloud cover and stability, which exert significant influence over atmospheric dispersion.

21. The dispersion modelling has been undertaken using data from Wainfleet (Aut) meteorological station, located approximately 3.3km southeast from the Order Limits, and 2.4km from the modelled road network. Wainfleet (Aut) is the closest station to the study area and is considered representative of the majority of the study area; therefore, likely to reflect local meteorological conditions.

22. LAQM.TG22 recommends that meteorological data should have a percentage of usable hours greater than 85%. 2019 meteorological data from Wainfleet (Aut) meteorological station includes 8,760 lines of usable hourly data out of the total 8,760 for the year, i.e. 100% usable data. This is therefore suitable for the dispersion modelling exercise. A windrose of the 2019 data is presented in Plate 19.1.

23. Roughness length, z0, represents the aerodynamic effects of surface friction and is physically defined as the height at which the extrapolated surface layer wind profile trends to zero.

24. The modelled road network is situated in predominantly rural areas of Lincolnshire, however, also includes urban areas of Boston, Skegness, and Horncastle. Given the variance in land use types across the modelled domain, a variable surface roughness file has been used. The file covers an area of 64km x 72km at a 200m grid resolution across the modelled road network. The ADMS-Roads dispersion model interpolates the values between the gridded points.

25. A visualisation of the surface roughness file used in the modelling is presented in Plate 19.2.

26. A minimum Monin-Obukhov Length value of 10 has been used for both the dispersion and meteorological measurement sites.

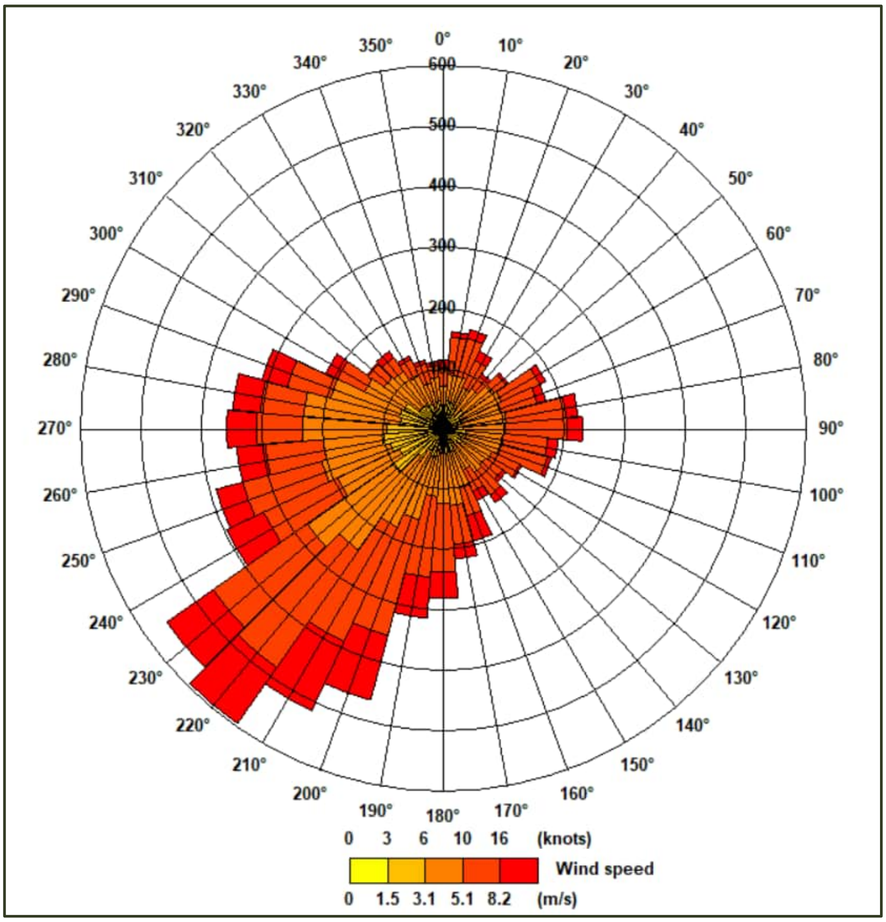

Plate 19.1: Windrose from Wainfleet Aut (2019)

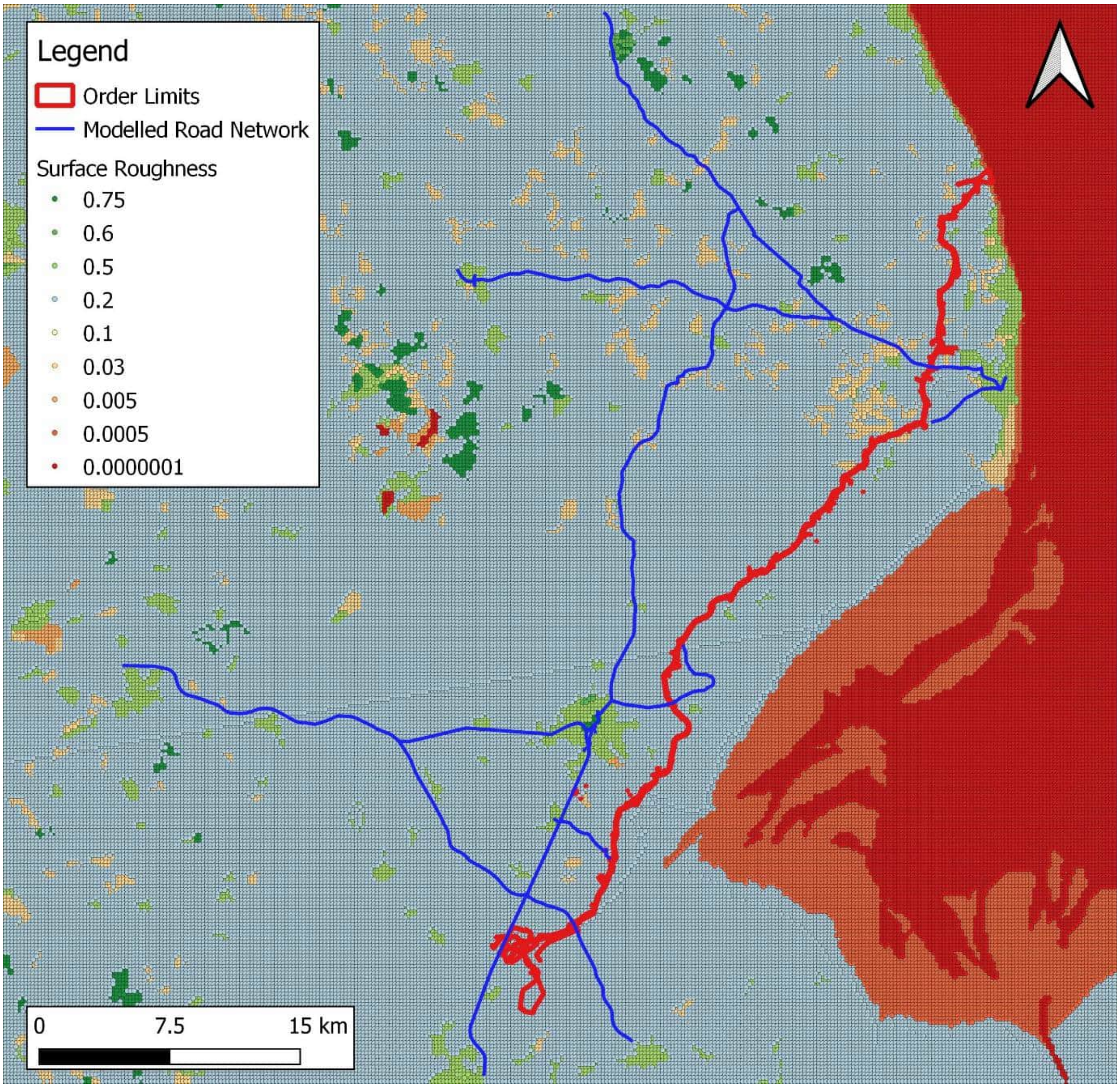

Plate 19.2: Modelled Variable Surface Roughness File

19.5 Sensitive Receptors

19.5.1 Human Receptors

27. Human receptors considered in the assessment of emissions from peak construction phase road traffic volumes generated by the Project are detailed in Table 19.2.

28. Receptors are representative of worst-case exposure locations at existing residential properties relative to the extent of the affected road network (See Section 19.7 – Volume 1, Chapter 19: Onshore Air Quality for details of the applied screening thresholds), selected in accordance with LAQM.TG22. All receptors were considered in relation to exposure at breathing height relative to the adjacent road, at ground level, (i.e. 1.5m).

29. The receptors have been grouped by Local Authority – East Lindsey District Council (ELDC), Boston Borough Council (BBC), North Kesteven District Council (NKDC) and South Holland District Council (SHDC). Their locations are illustrated in Volume 2, Chapter 19: Onshore Air Quality Figure 19.2 (document reference 6.2.19.2). Whilst the Order Limits does not interact with NKDC, construction vehicle movements generated along the A17 are above the applied human screening thresholds and therefore require further assessment.

Table 19.2: Human Receptor Locations Considered

ID	X	Y	Height (m)	Verification Zone
ELDC				
R1	533718	384693	1.5	B
R2	533874	383262	1.5	B
R3	533975	382620	1.5	B
R4	534023	382266	1.5	B
R5	535510	379578	1.5	B
R6	535492	379545	1.5	B
R7	535700	379299	1.5	B
R8	536600	378228	1.5	B
R9	536816	377932	1.5	B
R10	538020	376995	1.5	B
R11	538054	376983	1.5	B
R12	538058	376942	1.5	B
R13	538137	376864	1.5	B
R14	538833	376412	1.5	B
R15	540261	374818	1.5	B
R16	540790	374428	1.5	B
R17	540281	368197	1.5	B
R18	540076	368312	1.5	B
R19	539810	368467	1.5	B
R20	539627	368499	1.5	B
R21	538407	368980	1.5	B
R22	538386	369016	1.5	B
R23	538361	369012	1.5	B
R24	538067	369258	1.5	B
R25	535233	369304	1.5	B
R26	535224	369340	1.5	B

ID	X	Y	Height (m)	Verification Zone
R27	534817	369577	1.5	B
R28	534635	369611	1.5	B
R29	534537	369615	1.5	B
R30	534347	369619	1.5	B
R31	534160	369635	1.5	B
R32	529209	370009	1.5	B
R33	528683	369923	1.5	B
R34	528463	369936	1.5	B
R35	528395	369894	1.5	B
R36	527824	369836	1.5	B
R37	526996	369572	1.5	B
R38	526896	369528	1.5	B
R39	526767	369515	1.5	B
R40	526782	369539	1.5	B
R41	526443	369616	1.5	B
R42	526533	369579	1.5	B
R43	526228	369563	1.5	B
R44	526245	369583	1.5	B
R45	526081	369543	1.5	B
R46	540967	369372	1.5	B
R47	540678	370101	1.5	B
R48	540666	370230	1.5	B
R49	540698	370219	1.5	B
R50	540511	370885	1.5	B
R51	540388	371658	1.5	B
R52	540683	373403	1.5	B
R118	534528	347917	1.5	B
R119	534967	348722	1.5	B
R120	535222	349380	1.5	B
R121	535232	349515	1.5	B
R122	535284	350855	1.5	B
R123	535160	351203	1.5	B
R124	535144	351464	1.5	B
R125	535118	351781	1.5	B
R126	535161	351949	1.5	B
R127	535161	352145	1.5	B
R128	535140	352207	1.5	B

ID	X	Y	Height (m)	Verification Zone
R129	535098	352836	1.5	B
R130	535057	352993	1.5	B
R131	534902	354752	1.5	B
R132	534456	356013	1.5	B
R133	534464	356122	1.5	B
R134	534428	356267	1.5	B
R135	534446	356332	1.5	B
R136	534367	356632	1.5	B
R137	534365	356737	1.5	B
R138	534343	356925	1.5	B
R139	534376	357339	1.5	B
R140	537403	363616	1.5	B
R141	537670	363635	1.5	B
R142	537737	363701	1.5	B
R143	537740	363928	1.5	B
R144	539699	365939	1.5	B
R145	539698	366493	1.5	B
R146	540560	367973	1.5	B
R147	542432	368073	1.5	B
R148	543624	367641	1.5	B
R149	544193	367474	1.5	B
R150	545670	367410	1.5	B
R151	545337	368754	1.5	B
R152	542073	372180	1.5	B
R153	541948	372567	1.5	B
R154	546907	367280	1.5	B
R155	537737	363701	1.5	B
R165	547396	367029	1.5	B
R166	547616	366880	1.5	B
R167	525870	369462	1.5	B
R168	525421	369635	1.5	B
R169	525335	369690	1.5	B
R170	536613	361338	1.5	B
R171	536668	361715	1.5	B
R177	525967	369492	1.5	B
R178	536616	361574	1.5	B
R179	536573	361110	1.5	B

ID	X	Y	Height (m)	Verification Zone
R180	534678	358844	1.5	B
BBC				
R53	528713	334217	1.5	B
R54	524899	336826	1.5	B
R55	524704	336927	1.5	B
R56	524688	337015	1.5	B
R57	524630	337198	1.5	B
R58	524541	337634	1.5	B
R59	524500	337728	1.5	B
R60	522468	341583	1.5	B
R61	522301	342114	1.5	B
R62	522235	342222	1.5	B
R63	521815	342788	1.5	B
R64	521837	342835	1.5	B
R65	521744	342917	1.5	B
R66	521642	343017	1.5	B
R67	521642	343026	1.5	B
R68	521172	343428	1.5	B
R69	520822	343565	1.5	B
R83	529233	334751	1.5	B
R84	530061	336385	1.5	B
R85	530603	337580	1.5	B
R86	530564	337665	1.5	B
R87	530765	338091	1.5	B
R88	530837	338234	1.5	B
R89	530894	338407	1.5	B
R90	530995	338518	1.5	B
R91	530943	338495	1.5	B
R92	532471	343611	1.5	A
R93	532513	343716	1.5	A
R94	532595	343660	1.5	A
R95	532558	343695	1.5	A
R96	532473	343738	1.5	A
R97	532512	343659	1.5	A
R98	532333	343846	1.5	A
R99	532161	343986	1.5	A
R100	521806	343001	1.5	B

ID	X	Y	Height (m)	Verification Zone
R101	532657	343690	1.5	A
R102	532860	343753	1.5	A
R103	532874	343798	1.5	A
R104	532977	344054	1.5	A
R105	533122	344505	1.5	A
R106	533111	344540	1.5	A
R107	533223	344627	1.5	A
R108	533249	344646	1.5	A
R109	533267	344629	1.5	A
R110	533884	345381	1.5	B
R111	533890	345430	1.5	B
R112	533919	345503	1.5	B
R113	533887	346415	1.5	B
R114	533927	346466	1.5	B
R115	534084	347146	1.5	B
R116	534129	347296	1.5	B
R117	534348	347590	1.5	B
R156	534040	345350	1.5	B
R157	536641	345055	1.5	B
R158	536941	345093	1.5	B
R159	537707	345420	1.5	B
R161	531802	332326	1.5	B
R162	531870	332174	1.5	B
R172	533042	344104	1.5	A
R173	533187	344316	1.5	A
R174	533115	344455	1.5	A
R175	539765	346541	1.5	B
R176	531975	331902	1.5	B
R181	532920	343900	1.5	A
R182	533114	344398	1.5	A
R183	533557	344982	1.5	B
R184	535855	344998	1.5	B
R185	538203	345671	1.5	B
R186	533159	344302	1.5	A
R187	533733	345145	1.5	B
NKDC				
R70	520408	343759	1.5	B

ID	X	Y	Height (m)	Verification Zone
R71	520243	343863	1.5	B
R72	519926	344028	1.5	B
R73	519691	344122	1.5	B
R74	519623	344152	1.5	B
R75	519602	344184	1.5	B
R76	518766	344449	1.5	B
R77	516298	344073	1.5	B
R78	516218	344104	1.5	B
R79	512624	344661	1.5	B
R80	511859	344675	1.5	B
R81	509795	345629	1.5	B
R82	506530	347334	1.5	B
SHDC				
R160	526590	328718	1.5	B
R163	532715	330372	1.5	B
R164	533574	328083	1.5	B

19.5.2 Ecological Receptors

30. As documented in Volume 1, Chapter 19: Onshore Air Quality (document reference 6.1.19), Table 19.3 details the extent of ecological designations (with sensitive qualifying features) located within 200m of road links projected to experience developmental-generated vehicle movements requiring detailed assessment. These comprise one Site of Special Scientific Interest (SSSI), one Local Nature Reserve (LNR) and 29 Local Wildlife Sites (LWS) / Lincolnshire Wildlife Trust reserves (LWT).

31. Their locations are illustrated in Figure 19.3 in Volume 2, Chapter 19: Onshore Air Quality (document reference 6.2.19.3).

Table 19.3: Designated Ecological Sites Considered Within the Modelling Assessment

ID	Name	Designation
ER1	Candlesby Hill	SSSI
ER5	South Thoresby Warren	LNR
ER6	A16 Road Verge, Burwell North	LWS
ER7	A16 Road Verge, Dalby Bar	LWS
ER8	A16 Road Verge, White Pit	LWS
ER9	A16 Road Verges, Green Man Plantation	LWS
ER10	A16 Verges North of the River Glen	LWS

ID	Name	Designation
ER11	Banovallum House	LWT
ER12	Bluestone Heath Road Verges, East	LWS
ER13	Calceby Beck, Furze Closes to A16	LWS
ER14	Callow Carr	LWS
ER15	Candlesby Hill Quarry	LWT
ER16	Chalk Pit Lane Verges, Candlesby	LWS
ER17	Cowdyke Plantation	LWS
ER18	Dawber Lane Road Verges	LWS
ER20	Gunby Meadow	LWS
ER21	Gunby Park	LWS
ER22	Hagworthingham Meadow	LWS
ER25	Hobhole Drain, Baker's Bridge South	LWS
ER26	Horncastle Canal Grassland	LWS
ER28	Ketsby Beck, Ketsby to Calceby	LWS
ER29	Mill Lane Road Verges	LWS
ER31	Pinchbeck Marsh	LWS
ER32	Pinfold Lane, White Pit	LWS
ER33	Risegate Eau	LWS
ER34	River Glen Corridor	LWS
ER35	River Lymn (Partney Bridge to Mill Bridge)	LWS
ER36	Riverdale Meadow, Hagworthingham	LWS
ER41	Thunker Hollow Road Verge	LWS
ER43	Vernatt's Drain	LWS
ER46	Welton le Marsh Quarry Verges	LWS

32. All receptors have assumed a height of 0m and are represented in the model using gridded and polygon boundary receptors (within 200m of the affected road) to identify the maximum modelled impact.

33. Details of baseline conditions for the above designations is provided in Section 19.9.

19.6 Background Datasets

19.6.1 Ambient Concentrations

34. In the absence of locally representative background monitoring sites across the modelled domain, annual mean background concentrations used for the purposes of the assessment have been obtained from the Defra supplied background maps (2018 reference year), based on the 1km grid squares which cover the dispersion model

domain, as presented in Table 19.4. Defra supplied background concentration estimates were utilised for the purposes of the ecological road traffic modelling assessment (where appropriate) to maintain consistency with the verification procedure and incorporate the future projection of concentration estimates.

35. To avoid double counting of potential background sources already contained within the ADMS-Roads dispersion model, relevant sources were removed from the appropriate background map grid square. This was limited to the removal of 'Primary A Road In' across the assessment study area.

36. As the relationship between NO_2 and nitrogen oxides (NO_x) is not linear, the NO_2 Adjustment for NO_x Sector Removal Tool[4] has been used – in accordance with LAQM.TG22.

Table 19.4: Defra Mapped Background Pollutant Concentrations

Grid Square (X, Y)	Year	Annual Mean Concentration (µg/m³)			
		NO_x	NO_2	PM_{10}	$PM_{2.5}$
533500, 384500	2019	11.6	8.9	15.6	8.6
	2027	8.9	6.9	14.6	7.8
533500, 383500	2019	11.1	8.5	15.6	8.5
	2027	8.6	6.7	14.6	7.7
533500, 382500	2019	10.8	8.3	15.5	8.5
	2027	8.4	6.6	14.5	7.7
534500, 382500	2019	10.8	8.3	15.0	8.4
	2027	8.5	6.6	14.0	7.5
535500, 379500	2019	11.1	8.5	15.3	8.5
	2027	8.6	6.7	14.3	7.7
536500, 378500	2019	11.0	8.4	15.5	8.5
	2027	8.6	6.7	14.5	7.7
536500, 377500	2019	10.7	8.2	15.3	8.4
	2027	8.4	6.6	14.2	7.6
538500, 376500	2019	11.1	8.5	15.1	8.5
	2027	8.7	6.8	14.1	7.6
540500, 374500	2019	11.2	8.6	15.5	8.5
	2027	8.7	6.8	14.5	7.7

[4] Defra NO_2 Adjustment for NO_x Sector Removal Tool (v8.0).

Grid Square (X, Y)	Year	Annual Mean Concentration (µg/m^3)			
		NO_x	NO_2	PM_{10}	$PM_{2.5}$
540500, 368500	2019	11.2	8.6	15.5	8.6
	2027	8.7	6.8	14.4	7.7
539500, 368500	2019	11.0	8.5	15.7	8.6
	2027	8.6	6.7	14.7	7.8
538500, 368500	2019	10.8	8.3	15.7	8.6
	2027	8.5	6.6	14.7	7.8
538500, 369500	2019	10.8	8.3	15.7	8.6
	2027	8.5	6.6	14.6	7.8
535500, 369500	2019	10.9	8.4	15.6	8.6
	2027	8.5	6.7	14.6	7.8
534500, 369500	2019	11.0	8.5	15.8	8.7
	2027	8.6	6.7	14.8	7.9
529500, 370500	2019	10.8	8.3	15.7	8.6
	2027	8.5	6.6	14.6	7.8
528500, 369500	2019	11.2	8.6	15.8	8.7
	2027	8.7	6.8	14.8	7.8
527500, 369500	2019	11.7	8.9	16.0	8.8
	2027	9.1	7.1	14.9	8.0
526500, 369500	2019	12.8	9.8	15.0	8.8
	2027	9.9	7.7	13.9	7.9
540500, 369500	2019	11.0	8.4	14.9	8.4
	2027	8.6	6.7	13.9	7.6
540500, 370500	2019	10.9	8.4	15.4	8.5
	2027	8.5	6.7	14.3	7.7
540500, 371500	2019	10.9	8.4	15.2	8.4
	2027	8.5	6.7	14.1	7.6
540500, 373500	2019	10.9	8.4	15.6	8.5
	2027	8.6	6.7	14.6	7.7
528500, 334500	2019	10.9	8.4	17.1	9.5
	2027	8.1	6.4	16.0	8.6
524500, 336500	2019	10.1	7.8	16.3	9.0
	2027	7.8	6.1	15.3	8.2
524500, 337500	2019	10.5	8.1	16.7	9.2
	2027	7.9	6.2	15.7	8.4
522500, 341500	2019	10.5	8.1	16.4	9.0
	2027	8.0	6.3	15.4	8.2

Grid Square (X, Y)	Year	Annual Mean Concentration (µg/m^3)			
		NO_x	NO_2	PM_{10}	$PM_{2.5}$
522500, 342500	2019	10.2	7.9	16.2	8.9
	2027	7.8	6.2	15.2	8.1
521500, 342500	2019	10.2	7.9	16.1	8.9
	2027	7.8	6.1	15.1	8.0
521500, 343500	2019	11.1	8.5	16.5	9.1
	2027	8.3	6.5	15.5	8.2
520500, 343500	2019	11.2	8.6	16.6	9.1
	2027	8.3	6.5	15.6	8.3
519500, 344500	2019	11.1	8.5	16.6	9.1
	2027	8.2	6.5	15.6	8.3
518500, 344500	2019	11.1	8.5	16.6	9.1
	2027	8.2	6.5	15.6	8.3
516500, 344500	2019	11.1	8.6	16.6	9.1
	2027	8.3	6.5	15.6	8.3
512500, 344500	2019	11.0	8.5	16.6	9.1
	2027	8.2	6.4	15.6	8.3
511500, 344500	2019	10.5	8.1	16.4	9.0
	2027	7.9	6.2	15.4	8.1
509500, 345500	2019	11.9	9.1	16.7	9.1
	2027	8.9	7.0	15.7	8.3
506500, 347500	2019	12.2	9.3	17.2	9.4
	2027	9.0	7.0	16.2	8.6
529500, 334500	2019	11.2	8.7	16.9	9.4
	2027	8.3	6.5	15.8	8.5
530500, 336500	2019	11.0	8.4	16.5	9.2
	2027	8.3	6.5	15.4	8.3
530500, 337500	2019	11.4	8.8	16.7	9.3
	2027	8.6	6.8	15.6	8.4
530500, 338500	2019	12.0	9.2	15.3	9.1
	2027	9.2	7.1	14.2	8.2
532500, 343500	2019	17.7	13.1	15.5	9.8
	2027	13.4	10.2	14.2	8.8
532500, 344500	2019	16.2	12.1	14.8	9.4
	2027	12.6	9.6	13.7	8.5
533500, 344500	2019	16.6	12.3	14.9	9.5
	2027	12.6	9.6	13.8	8.6

Grid Square (X, Y)	Year	Annual Mean Concentration (µg/m^3)			
		NO_x	NO_2	PM_{10}	$PM_{2.5}$
533500, 345500	2019	15.0	11.2	15.0	9.1
	2027	11.8	9.0	13.8	8.1
533500, 346500	2019	11.6	8.9	16.4	9.2
	2027	9.1	7.1	15.3	8.3
534500, 347500	2019	11.0	8.4	16.2	9.0
	2027	8.6	6.7	15.1	8.2
534500, 348500	2019	10.8	8.3	16.1	9.0
	2027	8.5	6.6	15.1	8.1
535500, 349500	2019	10.7	8.3	16.2	9.0
	2027	8.4	6.6	15.1	8.1
535500, 350500	2019	11.2	8.6	15.0	8.7
	2027	8.7	6.8	13.9	7.9
535500, 351500	2019	10.8	8.3	16.3	8.9
	2027	8.5	6.6	15.3	8.1
535500, 352500	2019	10.6	8.2	16.0	8.8
	2027	8.3	6.5	15.0	8.0
534500, 354500	2019	10.3	7.9	15.9	8.8
	2027	8.1	6.4	14.8	7.9
534500, 356500	2019	10.8	8.3	15.8	8.8
	2027	8.5	6.6	14.7	8.0

19.6.2 Deposition Fluxes

37. Habitat specific background deposition rates have been obtained from the UK Air Pollution Information System (APIS)[5] website, based on the 1km grid squares which cover the modelled area. Further detail on these datasets can be found in Section 19.9.

19.7 Model Outputs

19.7.1 Ambient Concentrations

38. The background pollutant values have been used in conjunction with the concentrations predicted by the ADMS-Roads model to calculate predicted total annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ for each respective scenario.

[5] https://www.apis.ac.uk/ [accessed November 2023].

39. For the prediction of annual mean NO_2 concentrations for all modelled scenarios at receptor locations, the road NO_x contributions (adjusted as per Section 19.6.1) have been converted to total NO_2 following the methodology in LAQM.TG22 using the latest version of Defra's NO_x to NO_2 conversion tool (v8.1)[6]. The modelled NO_2 road contribution was then added to the appropriate NO_2 background concentration value to obtain an overall total annual mean NO_2 concentration.

40. For the prediction of short-term NO_2 impacts, LAQM.TG22 advises that it is valid to assume that exceedances of the 1-hour mean Air Quality Assessment Level (AQAL) for NO_2 are unlikely to occur where the annual mean NO_2 concentration is <60µg/m^3. This approach has thus been adopted for the purposes of this assessment, at relevant receptor locations with an applicable exposure period.

41. For the prediction of short-term PM_{10}, LAQM.TG22 provides an empirical relationship between the annual mean and the number of exceedances of the 24-hour mean AQAL for PM_{10} that can be calculated as follows:

$$\textit{No. 24-hour mean exceedances} = -18.5 + 0.00145 \times \textit{annual mean}^3 + (206/\textit{annual mean})$$

42. This relationship has thus been adopted to determine whether exceedances of the short-term PM_{10} AQAL are likely in this assessment.

43. Verification of the ADMS-Roads assessment has been undertaken as per Section 19.10. All results presented in the assessment are those calculated following the process of model verification, as detailed in Section 19.10.

19.7.2 Deposition Fluxes

44. Road dry deposition fluxes were calculated from the adjusted road-NO_2 using empirical methods provided within the Environment Agency's (EA) Air Quality Technical Advisory Group's (AQTAG) guidance[7], which are subsequently recommended within the IAQM's ecological guidance.

[6] Defra NOx to NO2 Calculator v8.1 (2020), available at https://laqm.defra.gov.uk/air-quality/air-quality-assessment/no2-adjustment-for-nox-sector-removal-tool/.

[7] AQTAG06 – Technical Guidance on detailed modelling approach for an appropriate assessment for emissions to air. Environment Agency, March 2014 version.

45. In recognition of the NO_x to NO_2 non-linear relationship (calculated using the NO_x to NO_2 conversion tool), the road NO_2 contribution used for screening was derived through subtraction of the total NO_2 modelled concentration from the scenarios discussed in Section 19.1, as it is not considered appropriate to process individual contributions of NO_2 from different development aspects.

46. Road dry deposition fluxes were calculated using the following equation:

47. Dry deposition flux (μg/m^2/s) = ground level concentration (μg/m^3) x deposition velocity (m/s)

48. The applied deposition velocities for the relevant chemical species are provided in Table 19.5. These velocities vary, dependant on land use.

Table 19.5: Applied Deposition Velocities

Chemical Species	Recommended Deposition Velocity (m/s)	
NO_2	Grassland	0.0015
	Woodland	0.0030

19.7.2.1 Critical Loads – Nutrient Nitrogen

49. For the assessment of nutrient nitrogen, the predicted road deposition rates were converted from μg/m^2/s to units of kgN/ha/year using a standard conversion factor of 95.9.

19.7.2.2 Critical Loads – Acidification

50. For the assessment of acidification, the predicted road deposition rates were converted to units of equivalents (keq/ha/year), which is a measure of how acidifying the chemical species can be, by multiplying the dry deposition flux (μg/m^2/s) by the standard conversion factor of 6.84.

51. The calculation of the process contribution of nitrogen to the critical load function has been carried out according to the Critical Load Function Tool guidance on APIS[8], to determine which compound is the primary contributor to acidity in the local setting, where:

[8] APIS, Critical Load Function Tool – Guidance, http://www.apis.ac.uk/clf-guidance [accessed November 2023].

- CLmaxS — the maximum critical load of sulphur, above which the deposition of sulphur alone would be considered to lead to an exceedance;
- ClminN — a measure of the ability of a system to "consume" deposited nitrogen (e.g. via immobilisation and uptake of the deposited nitrogen); and
- ClmaxN — the maximum critical load of acidifying nitrogen, above which the deposition of nitrogen alone would be considered to lead to an exceedance.

52. Given that sulphur vehicular emissions have not been calculated within this assessment (as standard practice for UK assessments – given the use of low sulphur fuels), the above acid critical load function has only considered inputs of nitrogen solely relative to '$CL_{max}N$'.

19.8 Uncertainty

53. Dispersion modelling is inherently uncertain and is principally reliant on the accuracy and representativity of its inputs. In acknowledgement of this, the ADMS-Roads dispersion model has been verified with the latest representative publicly available local monitoring data – as collected by BBC, ELDC, and SHDC.

54. Following verification, all model output statistical parameters (used to evaluate model performance and uncertainty) are within LAQM.TG22 prescribed tolerances (Section 19.10.1).

55. In addition, there is a widely acknowledged disparity between emission factors and ambient monitoring data. To help minimise any associated uncertainty when forming conclusions from the results, this assessment has utilised the latest EFT version 11.0 utilising COPERT 5.3 emission factors, and associated tools/datasets published by Defra.

56. 2027 has been adopted for the purposes of assessing the maximum consecutive 12-month average vehicle flows generated throughout the whole construction phase. Adoption of 2027 air quality conditions (2027 vehicle emission factors and background pollutant concentrations) for the full construction period (i.e. up to 51-months) is industry best practice and conservative in recognition of the forecasted reductions in vehicle emission factors and background pollutant concentrations, which may occur within the 51-month construction phase, following the introduction of legislative and policy initiatives, alongside low emission technologies/vehicles. Use of these variables in combination will likely exaggerate resultant concentrations and effects relative to what may occur in reality.

19.9 Ecological Baseline Conditions

57. Critical Loads and background conditions vary at each ecological designation (based upon geography, sensitivity and interest features). APIS has been used to provide details of baseline conditions at the assessed ecological designations requiring detailed assessment. APIS is a support tool for the assessment of potential effects of air pollutants on habitats and species, developed in partnership by the UK conservation agencies and regulatory agencies and the Centre for Ecology and Hydrology.

58. APIS provides details of habitats and corresponding Critical Loads/baseline rates for international and national ecological designations. For the assessment of locally important designations, Critical Loads/deposition rates were obtained via the 'search by location' function via APIS – requiring the location (NGR coordinate) and primary habitat type to be defined. Details of the applied assessed primary habitat type present at each designation were provided by the project Ecologist based upon information provided by the Lincolnshire Wildlife Trust Biological Records Centre and professional judgement.

19.9.1 Critical Levels

59. Table 19.6 details the applied baseline annual mean NO_x Critical Level conditions at each assessed ecological designation. The maximum background concentration for covering each designation has been reported.

60. As discussed in Section 19.6.1, Defra supplied 1km background concentration estimates were utilised in the ecological road traffic modelling assessment. These datasets have been adjusted as per Section 19.6.1.

Table 19.6: Baseline Annual Mean NO_x Critical Level Conditions at Ecological Receptors

Site*	NO_x Annual Mean Concentration ($\mu g/m^3$)	
	Critical Level	2027 Adjusted Defra Max Background
ER1	30	10.2
ER5	30	8.4
ER6	30	8.3
ER7	30	8.4
ER8	30	8.4
ER9	30	8.4
ER10	30	7.5
ER11	30	9.2

Site*	NO_x Annual Mean Concentration (µg/m^3)	
	Critical Level	2027 Adjusted Defra Max Background
ER12	30	8.4
ER13	30	8.4
ER14	30	8.4
ER15	30	10.2
ER16	30	8.5
ER17	30	8.4
ER18	30	8.4
ER20	30	8.4
ER21	30	8.4
ER22	30	8.4
ER25	30	8.9
ER26	30	9.2
ER28	30	8.4
ER29	30	8.5
ER31	30	9.0
ER32	30	8.5
ER33	30	7.5
ER34	30	7.4
ER35	30	8.6
ER36	30	8.4
ER41	30	8.4
ER43	30	9.0
ER46	30	8.5
Table note: * Name and designation of each site is provided in Table 19.3.		

19.9.2 Critical Loads

61. Where Critical Loads and baseline deposition values vary spatially (i.e. reported as 1km grid squares), worst case values reported across the whole assessed designation have been used (e.g. min Critical Loads). This approach assumes that the location of maximum impact coincides with the location of greatest sensitivity in terms of baseline and is recommended by APIS guidance[8] to facilitate a conservative assessment.

19.9.2.1 Nutrient Nitrogen

62. Table 19.7 details the applied baseline nutrient nitrogen Critical Load conditions at each assessed ecological designation.

63. Nutrient nitrogen Critical Loads are habitat/species specific (derived from a range of experimental studies) available via APIS. Given that critical loads are often reported in ranges in relation to eutrophication, representing the upper and lower bounds where impacts are perceptible, those values which facilitate a worst-case assessment have been used (i.e. minimum critical load for nutrient nitrogen deposition).

Table 19.7: Baseline Nutrient Nitrogen Critical Load Conditions at Ecological Receptors

Site	Nitrogen Class/Habitat	Critical Load	Baseline
		Min – Max (kgN/ha/yr)	
ER1	Semi-dry Perennial calcareous grassland (basic meadow steppe)	10 - 20	16.6 - 16.8
	Carpinus and Quercus mesic deciduous forest	15 - 20	28.5 - 28.8
ER5	Broadleaved, Mixed and Yew Woodland	10 - 15	26.5
ER6	Calcareous Grassland	10 - 20	16.0
ER7	Calcareous Grassland	10 - 20	17.0 - 17.1
ER8	Calcareous Grassland	10 - 20	15.7 - 15.9
ER9	Calcareous Grassland	10 - 20	15.8 - 16
ER10	Neutral Grassland	10 - 20	16.2 - 16.3
ER11	Neutral Grassland	10 - 20	16.7
ER12	Calcareous Grassland	10 - 20	16.1
ER13	Broadleaved, Mixed and Yew Woodland	10 - 15	26.5 - 26.9
ER14	Broadleaved, Mixed and Yew Woodland	10 - 15	28.9
ER15	Calcareous Grassland	10 - 20	16.6 - 16.8
	Broadleaved, Mixed and Yew Woodland	10 - 15	28.5 - 28.8
ER16	Calcareous Grassland	10 - 20	16.8
ER17	Broadleaved, Mixed and Yew Woodland	10 - 15	26.2
ER18	Neutral Grassland	10 - 20	16.8
ER20	Neutral Grassland	10 - 20	16.5
ER21	Neutral Grassland	10 - 20	16.7
ER22	Acid Grassland	6 - 10	17.5
ER25	Calcareous / Neutral Grassland	10 - 20	16.1 - 16.2
ER26	Neutral Grassland	10 - 20	16.7
ER28	Broadleaved, Mixed and Yew Woodland	10 - 15	26.5
ER29	Calcareous Grassland	10 - 20	16.8
ER31	Calcareous Grassland	10 - 20	16.3
ER32	Calcareous Grassland	10 - 20	15.6 - 15.7
ER33	Neutral Grassland	10 - 20	16.1 - 16.2

Site	Nitrogen Class/Habitat	Critical Load	Baseline
		Min – Max (kgN/ha/yr)	
ER34	Neutral Grassland	10 - 20	16.2
ER35	Calcareous Grassland	10 - 20	17.4 - 17.5
ER36	Acid Grassland	6 - 10	17.5
ER41	Calcareous Grassland	10 - 20	17.2 - 17.4
ER43	Neutral Grassland	10 - 20	16.3
ER46	Calcareous Grassland	10 - 20	16.6 - 16.9
Table note: * Name and designation of each site is provided in Table 19.3.			

19.9.2.2 Acidification

64. Table 19.8 details the applied baseline acidification Critical Load conditions at each assessed ecological designation.

65. Acidification Critical Loads are dependent on soil chemistry, as well as habitat type. In the UK, empirical Critical Loads have been assigned at a 1km grid square resolution based upon the mineralogy and chemistry of the dominant soil series present in the grid square, as provided on APIS. Where there is spatial variation in these Critical Loads across an ecological designation, the minimum values have been reported.

Table 19.8: Baseline Acidification Critical Load Conditions at Ecological Receptors

Site	Acidity Class/Habitat	Critical Load			Max Background	
		CLmaxS	CLminN	CLmaxN	N	S
		(keq/ha/yr)				
ER1	Calcareous grassland (using base cation)	4.0	0.9	4.9	1.0	1.2
	Unmanaged Broadleafed/Coniferous Woodland	1.4	0.1	1.7	1.9	2.1
ER5	Broadleaved, Mixed and Yew Woodland	1.5	0.1	1.7	1.7	1.9
ER6	Calcareous Grassland	4.0	0.9	4.9	0.9	1.2
ER7	Calcareous Grassland	4.0	0.9	4.9	1.0	1.2
ER8	Calcareous Grassland	4.0	0.9	4.9	0.9	1.1
ER9	Calcareous Grassland	4.0	0.9	4.9	0.9	1.2
ER10	Neutral Grassland	4.0	1.1	5.1	1.1	1.2
ER11	Neutral Grassland	4.0	0.9	4.9	1.0	1.2
ER12	Calcareous Grassland	4.0	0.9	4.9	0.9	1.2

Site	Acidity Class/Habitat	Critical Load			Max Background	
		CLmaxS	CLminN	CLmaxN	N	S
		(keq/ha/yr)				
ER13	Broadleaved, Mixed and Yew Woodland	1.4	0.1	1.7	1.7	1.9
ER14	Broadleaved, Mixed and Yew Woodland	10.7	0.1	10.9	1.8	2.1
ER15	Calcareous Grassland	4.0	0.9	4.9	1.0	1.2
	Broadleaved, Mixed and Yew Woodland	1.4	0.1	1.7	1.9	2.1
ER16	Calcareous Grassland	4.0	0.9	4.9	1.0	1.2
ER17	Broadleaved, Mixed and Yew Woodland	10.8	0.1	10.9	1.6	1.9
ER18	Neutral Grassland	4.0	0.9	4.9	1.0	1.2
ER20	Neutral Grassland	4.0	1.1	5.0	1.0	1.2
ER21	Neutral Grassland	4.0	1.1	5.0	1.0	1.2
ER22	Acid Grassland	0.4	0.2	0.7	1.0	1.3
ER25	Neutral Grassland	4.0	1.1	5.0	1.1	1.2
ER26	Neutral Grassland	4.0	0.9	4.9	1.0	1.2
ER28	Broadleaved, Mixed and Yew Woodland	1.4	0.4	1.8	1.6	1.9
ER29	Calcareous Grassland	4.0	0.9	4.9	1.0	1.2
ER31	Calcareous Grassland	4.0	1.1	5.0	1.1	1.2
ER32	Calcareous Grassland	4.0	0.9	4.9	0.9	1.1
ER33	Neutral Grassland	4.0	1.1	5.0	1.1	1.2
ER34	Neutral Grassland	4.0	1.1	5.0	1.1	1.2
ER35	Calcareous Grassland	4.0	1.1	5.0	1.1	1.3
ER36	Acid Grassland	0.4	0.2	0.7	1.0	1.3
ER41	Calcareous Grassland	4.0	0.9	4.9	1.0	1.2
ER43	Neutral Grassland	4.0	1.1	5.0	1.1	1.2
ER46	Calcareous Grassland	4.0	0.9	4.9	1.0	1.2

Table note:
* Name and designation of each site is provided in Table 19.3.

19.10 Model Verification

66. The ADMS-Roads dispersion model has been widely validated for this type of assessment and is specifically listed in LAQM.TG22 as an accepted dispersion model.

67. Model validation undertaken by the software developer (CERC) will not have included validation in the vicinity of the modelled domain. It is therefore necessary to perform a

comparison of modelled results with local monitoring data at relevant locations. This process of verification attempts to minimise modelling uncertainty and systematic error by correcting modelled results by an adjustment factor to gain greater confidence in the final results.

68. Prior to undertaking model verification, model setup parameters and input data were reviewed to maximise the performance of the dispersion model in relation to the real-world conditions.

69. Consistent with advice provided by Defra to local authorities across England, 2019 has been used for the purposes of model verification as this relates to the most recent year of monitoring data available which has not been impacted by the COVID-19 pandemic. Use of monitoring data recorded in 2020/2021 for the purposes of model verification introduces an element of uncertainty into the final adjusted modelled predictions, as monitoring conditions experienced for the majority of 2020/2021 are not deemed to be representative of long-term baseline conditions and could lead to a systematic underprediction at modelled receptor locations. 2022 monitoring data for BBC and ELDC has not yet been made publicly available and 2019 data therefore represents the most recent available dataset (not impacted by the COVID-19 pandemic).

19.10.1 NO_x / NO_2 Verification

70. NO_x/NO_2 verification relates to the comparison and adjustment of modelled road-NO_x (as output from the ADMS-Roads dispersion model), relative to monitored road-NO_x.

71. For NO_x/NO_2 model verification, 2019 BBC, ELDC, and SHDC monitoring data has been used for those roadside locations situated adjacent to a modelled link i.e. where traffic data exists (Table 19.9). The locations of the verification monitors are illustrated in Figure 19.2 in Volume 2, Chapter 19: Onshore Air Quality (document reference 6.2.19.2).

Table 19.9: Local Monitoring Data Used for Model Verification

Local Authority	Site ID	X	Y	2019 Monitored NO_2 Concentration ($\mu g/m^3$)	2019 Data Capture (%)
BBC	1	532575	343696	49.2	92.0
BBC	3	532470	343736	46.5	100.0
BBC	4	532331	343848	39.8	100.0
BBC	5	532859	343760	34.8	92.0

Local Authority	Site ID	X	Y	2019 Monitored NO_2 Concentration ($\mu g/m^3$)	2019 Data Capture (%)
BBC	16	532855	343719	30.1	100.0
BBC	17	532877	343690	30.5	83.0
BBC	8	533112	344476	31.3	100.0
BBC	9	533251	344642	37.0	100.0
BBC	20	532744	343719	41.6	100.0
BBC	12	532168	343987	28.9	100.0
BBC	21	532024	344060	29.0	100.0
BBC	14	533226	344624	35.8	100.0
BBC	22	532544	343702	35.9	67.0
ELDC	SK4	556380	363363	22.7	58.0
ELDC	SK1/SK2/SK3	556355	363295	28.7	100.0
ELDC	H1	526075	369545	34.3	100.0
ELDC	H2	526028	369528	25.9	92.0
ELDC	H4	526007	369585	25.0	100.0
BBC	18	532600	342737	33.8	100.0
BBC	19	532630	342760	27.5	100.0
SHDC	SH5	526585	328726	12.8	100.0

72. As NO_2 concentrations are solely reported using diffusion tubes, NO_x was back calculated using the latest version of Defra's NO_x to NO_2 Calculator (v8.1). The NO_x to NO_2 Calculator was also used to calculate road-NO_2 from modelled road-NO_x (as output from the ADMS-Roads dispersion model).

73. Verification was completed using the 2019 Defra background mapped concentrations (2018 reference year) for the relevant 1km grid squares (i.e. those within which the model verification sites are located), with those already modelled sources removed, to avoid duplication. This was limited to removal of 'Primary A Road In' across the assessment study area.

19.10.1.1Initial Verification – All Monitors

74. Initial comparison of the modelled vs. monitored road NO_x contribution at all relevant verification locations outlined in Table 19.9 is provided in Table 19.10. An initial adjustment factor of 3.489 has been derived, based on a linear regression forced through zero, as shown in Plate 19.3.

Table 19.10: NO_x/NO_2 Model Verification – Initial (3.489)

Site ID	Monitored Road NO_x ($\mu g/m^3$)	Modelled Road NO_x ($\mu g/m^3$)	Ratio (Monitored vs. Modelled Road NO_x)	Adjustment Factor	Adjusted Modelled Total NO_2 ($\mu g/m^3$)	Monitored Total NO_2 ($\mu g/m^3$)	% Difference (Adjusted Modelled NO_2 vs Monitored NO_2)
1	80.5	17.3	4.7	3.489	40.9	49.2	-16.9
3	73.8	15.1	4.9		37.6	46.5	-19.1
4	57.8	14.2	4.1		36.2	39.8	-9.1
5	46.5	12.6	3.7		33.6	34.8	-3.4
16	36.3	5.3	6.9		21.3	30.1	-29.2
17	37.1	3.9	9.5		18.8	30.5	-38.3
8	39.5	22.3	1.8		47.9	31.3	52.9
9	52.0	8.2	6.3		26.1	37.0	-29.4
20	62.0	12.4	5.0		33.4	41.6	-19.8
12	33.8	6.1	5.5		22.9	28.9	-20.9
21	34.0	6.1	5.5		22.8	29.0	-21.3
14	49.3	8.7	5.7		27.0	35.8	-24.7
22	48.9	20.0	2.4		44.8	35.9	24.9
SK4	22.3	7.9	2.8		25.3	22.7	11.4
SK1/SK2/SK3	34.6	5.8	5.9		21.7	28.7	-24.4
H1	50.0	12.3	4.1		31.1	34.3	-9.3
H2	32.0	8.5	3.8		24.7	25.9	-4.6
H4	30.2	6.9	4.4		21.9	25.0	-12.4
18	43.8	17.0	2.6		40.6	33.8	20.1
19	30.4	9.2	3.3		28.3	27.5	2.8
SH5	9.7	12.1	0.8		29.0	12.8	126.5

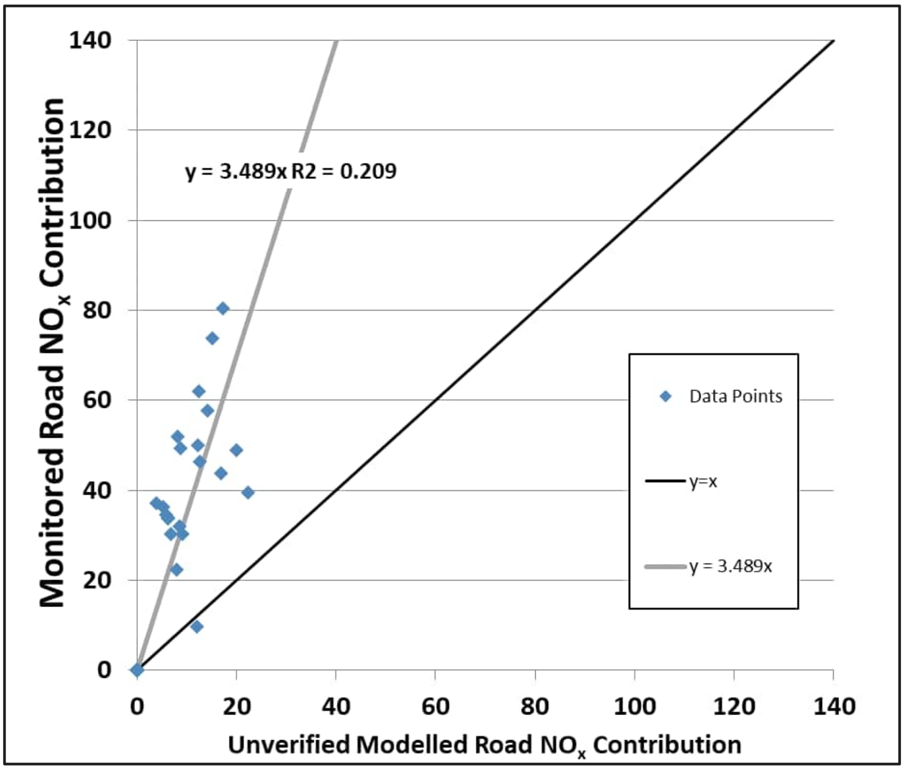

Plate 19.3: Comparison of Modelled vs. Monitored Road NO_x Contribution – Initial (3.489)

75. LAQM.TG22 states that:

"*In order to provide more confidence in the model predictions and the decisions based on these, the majority of results should be within 25% of the monitored concentrations as a minimum, preferably within 10%*".

76. The difference between modelled vs. monitored NO_2 concentrations was outside the ±25% recommended tolerance at five locations (16, 17, 8, 9 and SH5), however inside ±25% and/or ±10% at the remaining sixteen locations.

77. Although modelled concentrations were within the LAQM.TG22 recommended tolerances at most of the verification locations, there is a clear difference in model performance at others. A review of the monitoring locations (and surrounding modelled environments) was therefore undertaken to further refine the dispersion model.

78. Upon review, monitors 16, 17, 22 and SK1/SK2/SK3 and SH5 were removed from the verification exercise for the following reasons:

- BBC monitors 16 and 17 — these monitors are located adjacent to the Buoy Yard car park, off the A1138 South End in Boston. From review of satellite and street view imagery, in addition to the car park there is an area of unofficial parking adjacent to the River Witham. The car park and parking areas are not specifically included within the dispersion model; and such locations are likely to give rise to additional emissions which are typical of the associated vehicle movements. A large underprediction at monitors 16 and 17 is therefore likely attributed to the representation of the locations within the dispersion model and how real-world conditions are not exactly mirrored given the lack of inputs (e.g. car park flows);

- BBC monitor 22 – monitor 22 is located adjacent to a roundabout in Boston; where the A16 John Adams Way, A52 Liquorpond Street and the A16 Spalding Road meet. This is a central location within the Haven Bridge Air Quality Management Area (AQMA), and therefore elevated NO_2 concentrations may be anticipated. From review of satellite and street view imagery, monitor 22 is located behind a large hedge which is approximately 8m deep between the kerb of the roundabout and the monitor. The hedge height is similar to the monitor; however, this has the potential to fluctuate. It is logical to suspect that the hedge is having a bearing on monitored concentrations at this location. As such a feature is not represented within the dispersion model, this is likely to explain the large overprediction at monitor 22 in the verification exercise as the influence of the hedge is not captured;
- ELDC monitor SK1/SK2/SK3 — the monitor is located outside The Red Lion pub, adjacent to the A52 one-way gyratory in Skegness. The B1451 Lumley Road joins the gyratory approximately 25m south of monitor SK1/SK2/SK3 and is one of the main routes to the beach front. The B1451 has not been included within the dispersion model, due to a lack of available baseline traffic data. The model underprediction is therefore likely attributed to the missing contribution of the B1451 from the model. Furthermore, along the front of the pub there are several benches provided as outdoor seating for customers, directly below monitor SK1/SK2/SK3. This potentially introduces a localised pollutant source (e.g. from smoking), which is interacting with the monitor, and this would not be represented within the dispersion model; and
- SHDC monitor SH5 – based on a review of satellite imagery and street view alongside details within SHDC's 2020 ASR, the location of SH5 could not be verified. Further, the description of the monitoring location and the NGR did not match. On this basis, SH5 was removed from the verification exercise.

79. The verification exercise was repeated with the above monitors removed to refine the dispersion model.

19.10.1.2 Remaining Relevant Monitors – Removal of 16, 17, 22, SK1/SK2/SK3 and SH5

80. Comparison of the modelled vs. monitored road NO_x contribution at the remaining relevant verification locations is detailed in Table 19.11. An adjustment factor of 3.708 has been derived, based on a linear regression forced through zero, as shown in Plate 19.4

Table 19.11: NO_x/NO_2 Model Verification – Remaining Relevant Monitors (3.708)

Site ID	Monitored Road NO_x (µg/m^3)	Modelled Road NO_x (µg/m^3)	Ratio (Monitored vs. Modelled Road NO_x)	Adjustment Factor	Adjusted Modelled Total NO_2 (µg/m^3)	Monitored Total NO_2 (µg/m^3)	% Difference (Adjusted Modelled NO_2 vs Monitored NO_2)
1	80.5	17.3	4.7	3.708	42.5	49.2	-13.7
3	73.8	15.1	4.9		39.1	46.5	-16.0
4	57.8	14.2	4.1		37.5	39.8	-5.7
5	46.5	12.6	3.7		34.9	34.8	0.2
8	39.5	22.3	1.8		49.8	31.3	59.1
9	52.0	8.2	6.3		27.0	37.0	-27.0
20	62.0	12.4	5.0		34.6	41.6	-16.8
12	33.8	6.1	5.5		23.5	28.9	-18.6
21	34.0	6.1	5.5		23.5	29.0	-18.9
14	49.3	8.7	5.7		27.9	35.8	-22.2
SK4	22.3	7.9	2.8		26.1	22.7	15.1
H1	50.0	12.3	4.1		32.4	34.3	-5.7
H2	32.0	8.5	3.8		25.6	25.9	-1.1
H4	30.2	6.9	4.4		22.7	25.0	-9.3
18	43.8	17.0	2.6		42.2	33.8	24.8
19	30.4	9.2	3.3		29.2	27.5	6.3

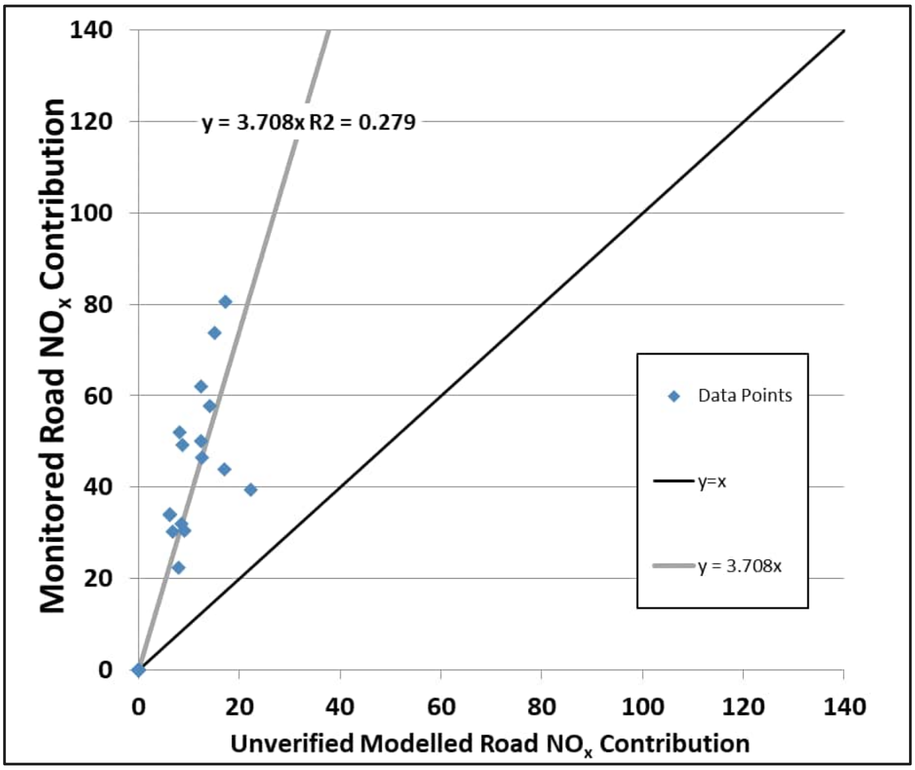

Plate 19.4: Comparison of Modelled vs. Monitored Road NO_x Contribution – Remaining Relevant Monitors (3.708)

81. The difference between modelled vs. monitored NO_2 concentrations was outside the ±25% recommended tolerance at two location in Boston (8 and 9), although within the LAQM.TG22 recommended tolerances at the remaining verification locations. The difference in model performance across the modelled domain and specifically, the large underpredictions observed in central Boston are assumed to be a function of the differences in surrounding modelled environments and associated characteristics. A further review of this was undertaken to further refine the dispersion model.

82. Based on this review and associated differences in local environments (i.e. within central Boston vs outside Boston) and model performance, a zonal verification approach was investigated to provide more confidence in model predictions. The zonal verification approach is detailed in the following sections.

19.10.1.3Central Boston Initial

83. In relation to a potential zonal verification approach, monitoring locations within central Boston were initially considered given their similar setting and exposure to similar traffic flows/mix, and similar model performance (highlighted in Table 19.11).

84. Comparison of the modelled vs. monitored road NO_x contribution at the verification locations within central Boston is detailed in Table 19.12. An adjustment factor of 3.891 has been derived, based on a linear regression forced through zero, as shown in Plate 19.5.

Table 19.12: NO_x/NO_2 Model Verification – Central Boston Initial (3.891)

Site ID	Monitored Road NO_x (µg/m³)	Modelled Road NO_x (µg/m³)	Ratio (Monitored vs. Modelled Road NO_x)	Adjustment Factor	Adjusted Modelled Total NO_2 (µg/m³)	Monitored Total NO_2 (µg/m³)	% Difference (Adjusted Modelled NO_2 vs Monitored NO_2)
1	80.5	17.3	4.7	3.891	43.8	49.2	-11.0
3	73.8	15.1	4.9		40.3	46.5	-13.4
4	57.8	14.2	4.1		38.7	39.8	-2.8
5	46.5	12.6	3.7		35.9	34.8	3.1
9	52.0	8.2	6.3		27.8	37.0	-25.0
20	62.0	12.4	5.0		35.6	41.6	-14.4
12	33.8	6.1	5.5		24.1	28.9	-16.7
21	34.0	6.1	5.5		24.1	29.0	-17.0
14	49.3	8.7	5.7		28.6	35.8	-20.0
8	39.5	22.3	1.8		51.4	31.3	64.2

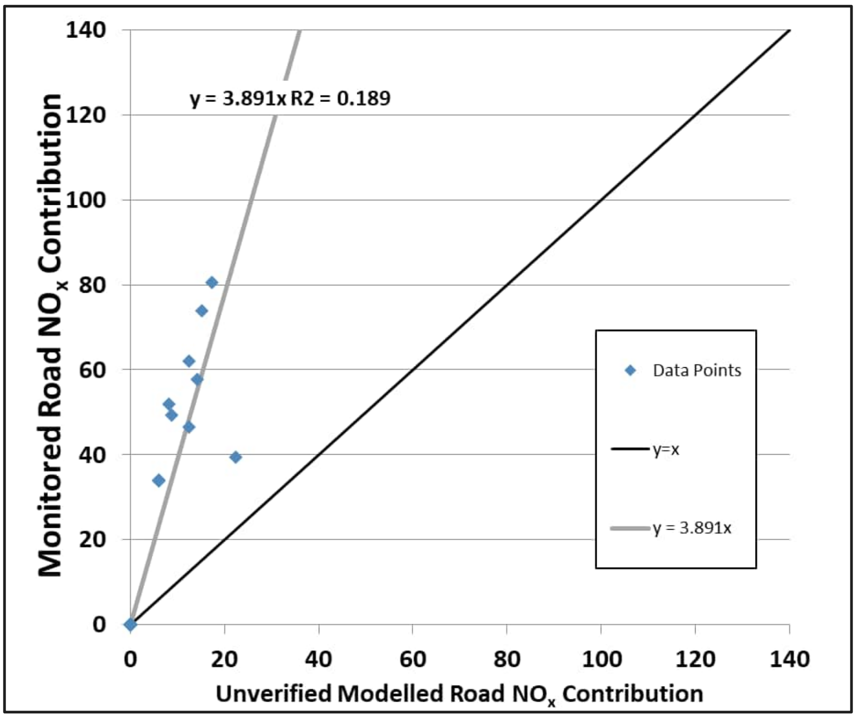

Plate 19.5: Comparison of Modelled vs. Monitored Road NOx Contribution – Central Boston Initial (3.891)

85. As noted in Table 19.12, the difference between the adjusted modelled NO_2 and monitored NO_2 is within the ±25% and/or within the ±10% ideal LAQM.TG22 tolerance at all verification locations apart from 8.

86. In addition, a verification factor of 3.891 reduces the Root Mean Square Error (RMSE) from a value of 20.2µg/m^3 to 8.3µg/m^3. As the RMSE is not within the ideal LAQM.TG22 prescribed limit (±10% of the annual mean AQAL), further adjustments were required.

19.10.1.4Central Boston Final – Domain A

87. A review of verification location 8 was undertaken due to the clear difference in model performance, relative to the other locations within central Boston. Monitoring location 8 is located at the roadside of Bargate Roundabout in Boston. Its location was distance validated using satellite imagery and street view, and the model inputs at this location were reviewed to ensure the real-world environment was correctly represented in the model.

88. The difference between the adjusted modelled NO_2 and monitored NO_2 remained outside of ±25% at monitoring location 8. BBC monitor 8 was therefore removed from the

verification exercise. Given the ratio of monitored vs. modelled road NO_x at monitor 8 was much less than the ratios at the other monitors within central Boston, this approach was considered conservative as removal of monitor 8 increases the overall adjustment factor and therefore increases the final adjusted modelled concentrations.

89. Comparison of the modelled vs. monitored road NO_x contribution at the verification locations within central Boston, following the removal of 8 is detailed in Table 19.13. An adjustment factor of 4.728 has been derived, based on a linear regression forced through zero, as shown in Plate 19.6.

Table 19.13: NO_x/NO_2 Model Verification – Central Boston Final – Domain A (4.728)

Site ID	Monitored Road NO_x (µg/m³)	Modelled Road NO_x (µg/m³)	Ratio (Monitored vs. Modelled Road NO_x)	Adjustment Factor	Adjusted Modelled Total NO_2 (µg/m³)	Monitored Total NO_2 (µg/m³)	% Difference (Adjusted Modelled NO_2 vs Monitored NO_2)
1	80.5	17.3	4.7	4.728	49.7	49.2	1.0
3	73.8	15.1	4.9		45.6	46.5	-2.0
4	57.8	14.2	4.1		43.7	39.8	9.9
5	46.5	12.6	3.7		40.5	34.8	16.4
9	52.0	8.2	6.3		31.0	37.0	-16.2
20	62.0	12.4	5.0		40.2	41.6	-3.4
12	33.8	6.1	5.5		26.6	28.9	-7.9
21	34.0	6.1	5.5		26.6	29.0	-8.3
14	49.3	8.7	5.7		32.1	35.8	-10.4

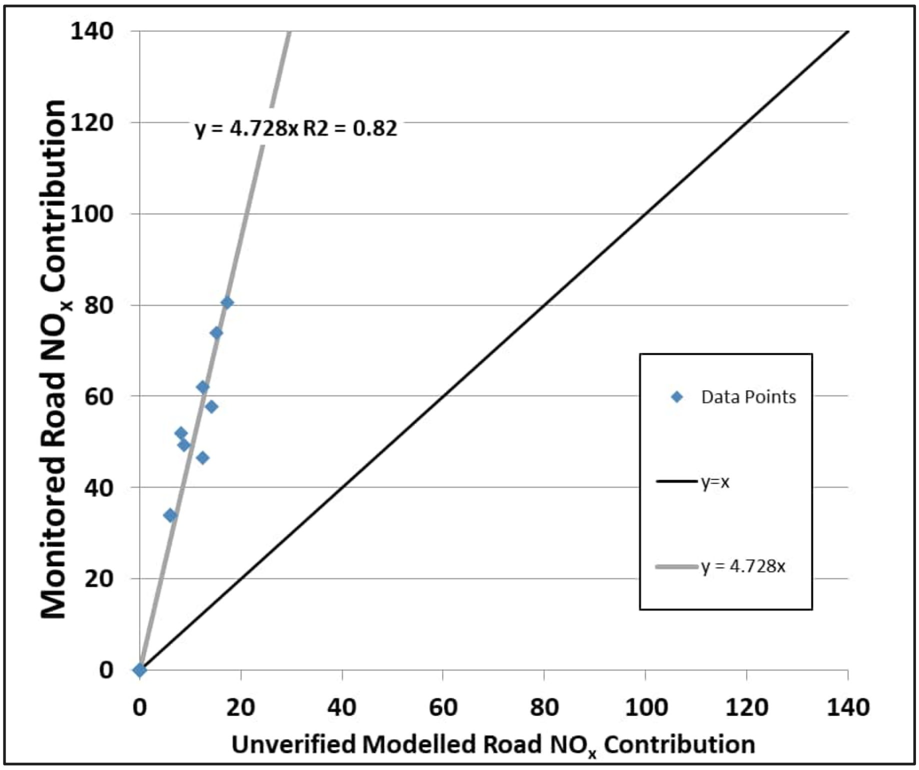

Plate 19.6: Comparison of Modelled vs. Monitored Road NOx Contribution – Central Boston Final – Domain A (4.728)

90. As noted in Table 19.13, the difference between the adjusted modelled NO_2 and monitored NO_2 is within the ±25% and/or within the ±10% ideal LAQM.TG22 tolerance at all verification locations.

91. In addition, a verification factor of 4.728 reduces the Root Mean Square Error (RMSE) from a value of 21.1µg/m^3 to 3.5µg/m^3 – within the ideal LAQM.TG (22) prescribed limit (10% of the annual mean AQAL). On this basis, the derived verification factor (4.278) was considered acceptable and was subsequently applied to all road-NOx concentrations predicted within central Boston – assigned verification Domain A in Table 19.2.

19.10.1.5Outside Central Boston – Domain B

92. Comparison of the modelled vs. monitored road NO_x contribution at all other verification locations (i.e. outside central Boston) following the removal of verification locations detailed in Section 19.10.1.1 is presented in Table 19.14. An adjustment factor of 3.253 has been derived, based on a linear regression forced through zero, as shown in Plate 19.7.

Table 19.14: NO_x/NO_2 Model Verification – Outside Central Boston – Domain B (3.253)

Site ID	Monitored Road NO_x (µg/m^3)	Modelled Road NO_x (µg/m^3)	Ratio (Monitored vs. Modelled Road NO_x)	Adjustment Factor	Adjusted Modelled Total NO_2 (µg/m^3)	Monitored Total NO_2 (µg/m^3)	% Difference (Adjusted Modelled NO_2 vs Monitored NO_2)
18	43.8	17.0	2.6	3.253	38.9	33.8	15.0
19	30.4	9.2	3.3		27.2	27.5	-1.0
H1	50.0	12.3	4.1		29.8	34.3	-13.3
H2	32.0	8.5	3.8		23.7	25.9	-8.4
H4	30.2	6.9	4.4		21.1	25.0	-15.6
SK4	22.3	7.9	2.8		24.4	22.7	7.3

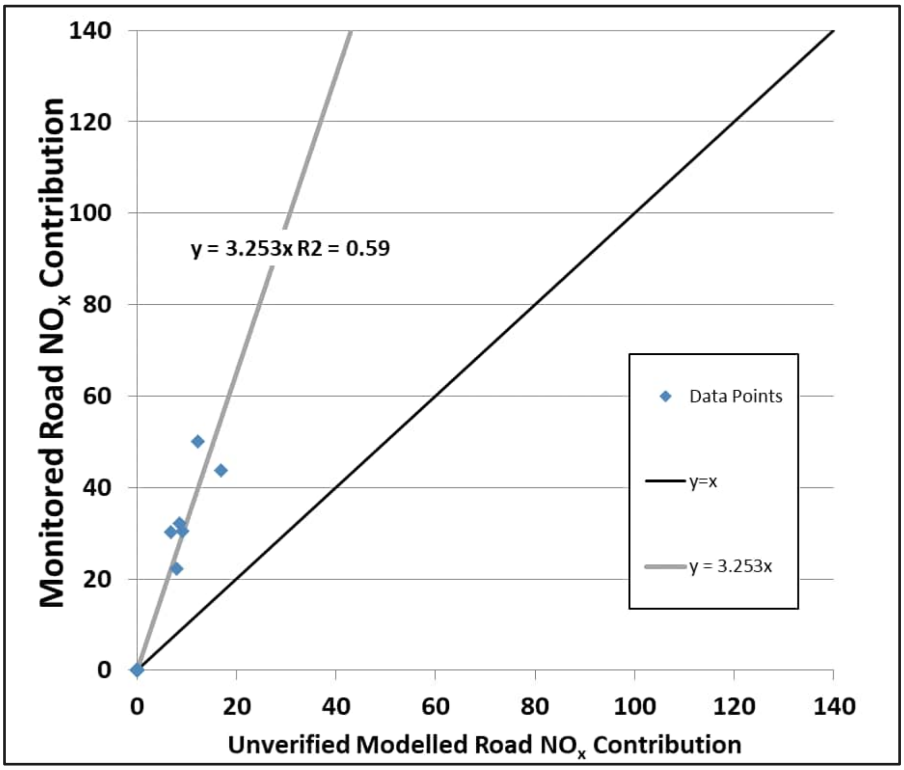

Plate 19.7: Comparison of Modelled vs. Monitored Road NOx Contribution – Outside Central Boston – Domain B (3.253)

93. As noted in Table 19.14, the difference between the adjusted modelled NO_2 and monitored NO_2 is within the ±25% and/or within the ±10% ideal LAQM.TG22 tolerance at all verification locations.

94. In addition, a verification factor of 3.253 reduces the Root Mean Square Error (RMSE) from a value of 12.7µg/m^3 to 3.4µg/m^3 – within the ideal LAQM.TG (22) prescribed limit (10% of the annual mean AQAL). On this basis, the derived verification factor (3.523)

was considered acceptable and was subsequently applied to all road-NOx concentrations predicted outside of central Boston – assigned verification Domain B in Table 19.2.

19.10.2 PM_{10} / $PM_{2.5}$ Verification

95. The adjustment factor of 4.728 for locations within central Boston (Domain A) and 3.253 for all locations outside central Boston (Domain B) has been applied to road-PM_{10} and $PM_{2.5}$ concentrations (as output of the ADMS-Roads dispersion model), following the recommendations of LAQM.TG22, in the absence of local particulate monitoring.

19.11 Modelling Results

19.11.1 Human Receptors

96. Results have been grouped by Local Authority – ELDC, BBC, NKDC and SHDC.

19.11.1.1 NO_2 Modelling Results

97. Table 19.15 presents the annual mean NO_2 concentrations predicted at all assessed receptor locations of relevant exposure for the 2019 BC, 2027 DM and 2027 DS scenarios.

98. In accordance with Environmental Protection UK (EPUK) & Institute of Air Quality Management (IAQM) guidance '*Land-Use Planning & Development Control: Planning for Air Quality*', the impact of the construction phase of the Project on annual mean NO_2 concentrations at all relevant existing receptors is considered to be 'negligible'. Given the marginal increase in annual mean NO_2 concentrations associated with construction road traffic flows, and that there are no predicted exceedances of the annual mean NO_2 AQAL in the 2027 DS scenario, unmitigated effects associated with annual mean NO_2 concentrations at all assessed receptor locations are therefore considered to be **not significant** in terms of the EIA regulations.

99. The empirical relationship given in LAQM.TG22 states that exceedances of the 1-hour mean NO_2 AQAL are unlikely to occur where annual mean concentrations are <60μg/m^3. Annual mean NO_2 concentrations predicted at all receptor locations are well below this limit in the 2027 DS scenario. Therefore, it is unlikely that an exceedance of the 1-hour mean AQAL will occur. Effects associated with likely 1-hour mean NO_2 concentrations at all assessed receptor locations are therefore considered to be **not significant** in terms of the EIA regulations.

Table 19.15: Predicted Annual Mean NO_2 Concentrations – 2027 Construction Year

Receptor	Predicted Annual Mean NO_2 Concentration (µg/m^3)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
ELDC						
R1	12.8	9.6	9.7	0.1	24.3	Negligible
R2	13.2	9.8	9.9	0.2	24.8	Negligible
R3	11.2	8.9	8.9	0.1	22.3	Negligible
R4	12.5	9.5	9.5	0.1	23.8	Negligible
R5	15.5	10.9	11.0	0.4	27.5	Negligible
R6	12.6	9.5	9.6	0.2	24.0	Negligible
R7	15.7	11.0	11.1	0.4	27.8	Negligible
R8	16.2	11.1	11.2	0.2	28.0	Negligible
R9	12.0	9.2	9.3	0.1	23.3	Negligible
R10	12.9	9.7	9.8	0.2	24.5	Negligible
R11	16.2	11.2	11.3	0.3	28.3	Negligible
R12	12.9	9.7	9.7	0.2	24.3	Negligible
R13	16.4	11.3	11.4	0.3	28.5	Negligible
R14	16.5	11.3	11.4	0.3	28.5	Negligible
R15	17.0	11.5	11.6	0.3	29.0	Negligible
R16	17.7	11.8	12.0	0.3	30.0	Negligible
R17	15.7	10.4	10.5	0.2	26.3	Negligible
R18	13.7	9.6	9.7	0.2	24.3	Negligible
R19	14.0	9.8	9.8	0.2	24.5	Negligible
R20	15.1	10.2	10.3	0.2	25.8	Negligible
R21	13.8	9.7	9.8	0.3	24.5	Negligible
R22	17.5	11.1	11.3	0.5	28.3	Negligible
R23	13.4	9.5	9.6	0.3	24.0	Negligible
R24	16.7	10.8	10.9	0.4	27.3	Negligible
R25	12.8	9.3	9.3	0.2	23.3	Negligible
R26	16.7	10.7	10.9	0.3	27.3	Negligible
R27	16.1	10.5	10.7	0.4	26.8	Negligible
R28	15.2	10.2	10.4	0.4	26.0	Negligible
R29	16.7	10.8	11.0	0.5	27.5	Negligible
R30	15.4	10.3	10.4	0.4	26.0	Negligible
R31	14.2	9.8	9.9	0.2	24.8	Negligible
R32	13.1	9.4	9.4	0.2	23.5	Negligible
R33	14.1	9.8	9.9	0.2	24.8	Negligible

Receptor	Predicted Annual Mean NO_2 Concentration (µg/m^3)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R34	12.8	9.3	9.4	0.2	23.5	Negligible
R35	13.3	9.5	9.6	0.2	24.0	Negligible
R36	15.7	10.5	10.6	0.3	26.5	Negligible
R37	16.2	11.0	11.2	0.4	28.0	Negligible
R38	13.8	10.1	10.2	0.2	25.5	Negligible
R39	14.1	10.2	10.4	0.3	26.0	Negligible
R40	17.1	11.4	11.6	0.5	29.0	Negligible
R41	16.0	11.0	11.1	0.4	27.8	Negligible
R42	15.6	10.8	10.9	0.4	27.3	Negligible
R43	16.9	11.3	11.5	0.5	28.8	Negligible
R44	19.1	12.2	12.5	0.7	31.3	Negligible
R45	22.7	13.7	14.2	1.2	35.5	Negligible
R46	13.7	9.9	10.0	0.2	25.0	Negligible
R47	14.2	10.1	10.2	0.3	25.5	Negligible
R48	11.4	8.9	9.0	0.2	22.5	Negligible
R49	12.9	9.6	9.6	0.2	24.0	Negligible
R50	11.6	9.0	9.1	0.2	22.8	Negligible
R51	13.6	9.9	10.0	0.3	25.0	Negligible
R52	10.0	8.4	8.4	<0.1	21.0	Negligible
R118	14.4	9.9	10.0	0.2	25.0	Negligible
R119	13.6	9.5	9.6	0.2	24.0	Negligible
R120	13.9	9.6	9.7	0.2	24.3	Negligible
R121	15.6	10.2	10.3	0.3	25.8	Negligible
R122	17.0	10.9	11.1	0.4	27.8	Negligible
R123	13.4	9.5	9.6	0.3	24.0	Negligible
R124	18.1	11.2	11.4	0.5	28.5	Negligible
R125	12.1	9.0	9.1	0.2	22.8	Negligible
R126	14.7	10.0	10.1	0.3	25.3	Negligible
R127	15.7	10.3	10.4	0.4	26.0	Negligible
R128	14.2	9.7	9.8	0.3	24.5	Negligible
R129	16.6	10.6	10.8	0.4	27.0	Negligible
R130	12.7	9.2	9.2	0.2	23.0	Negligible
R131	12.2	8.9	9.0	0.2	22.5	Negligible
R132	13.2	9.4	9.5	0.2	23.8	Negligible
R133	17.0	10.8	11.0	0.4	27.5	Negligible

Receptor	Predicted Annual Mean NO_2 Concentration (µg/m^3)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R134	13.8	9.6	9.7	0.3	24.3	Negligible
R135	17.8	11.1	11.3	0.5	28.3	Negligible
R136	13.7	9.6	9.7	0.3	24.3	Negligible
R137	17.6	11.0	11.2	0.5	28.0	Negligible
R138	13.7	9.6	9.7	0.3	24.3	Negligible
R139	18.3	11.3	11.5	0.5	28.8	Negligible
R140	15.8	10.9	11.0	0.3	27.5	Negligible
R141	16.3	11.1	11.3	0.3	28.3	Negligible
R142	19.5	12.5	12.7	0.5	31.8	Negligible
R143	18.2	12.0	12.1	0.5	30.3	Negligible
R144	15.1	10.6	10.7	0.2	26.8	Negligible
R145	12.8	9.6	9.7	0.2	24.3	Negligible
R146	31.7	14.9	15.3	1.1	38.3	Negligible
R147	16.1	11.2	11.3	0.2	28.3	Negligible
R148	15.2	10.8	10.8	0.1	27.0	Negligible
R149	18.9	12.5	12.6	0.2	31.5	Negligible
R150	19.4	12.8	12.9	0.3	32.3	Negligible
R151	13.0	9.7	9.8	0.1	24.5	Negligible
R152	11.9	9.2	9.3	0.2	23.3	Negligible
R153	13.8	10.1	10.2	0.2	25.5	Negligible
R154	22.1	13.1	13.2	0.3	33.0	Negligible
R155	19.4	12.5	12.7	0.5	31.8	Negligible
R165	17.7	11.2	11.3	0.2	28.3	Negligible
R166	17.1	11.0	11.0	0.2	27.5	Negligible
R167	15.4	10.7	10.8	0.4	27.0	Negligible
R168	20.3	12.5	12.9	0.8	32.3	Negligible
R169	15.6	10.7	10.9	0.3	27.3	Negligible
R170	17.7	11.1	11.3	0.5	28.3	Negligible
R171	18.1	11.2	11.4	0.5	28.5	Negligible
R177	18.6	12.0	12.2	0.7	30.5	Negligible
R178	13.8	9.6	9.7	0.3	24.3	Negligible
R179	13.1	9.4	9.5	0.2	23.8	Negligible
R180	13.8	9.5	9.7	0.3	24.3	Negligible
BBC						
R53	16.3	10.9	10.9	<0.1	27.3	Negligible

Receptor	Predicted Annual Mean NO_2 Concentration (µg/m^3)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R54	16.9	11.3	11.4	0.1	28.5	Negligible
R55	12.7	9.4	9.4	<0.1	23.5	Negligible
R56	21.0	13.3	13.4	0.2	33.5	Negligible
R57	15.7	10.8	10.8	<0.1	27.0	Negligible
R58	19.8	12.7	12.8	0.1	32.0	Negligible
R59	15.9	10.8	10.9	<0.1	27.3	Negligible
R60	12.9	9.5	9.5	<0.1	23.8	Negligible
R61	15.7	10.8	10.8	0.1	27.0	Negligible
R62	16.5	11.1	11.2	0.1	28.0	Negligible
R63	12.8	9.8	9.8	<0.1	24.5	Negligible
R64	17.2	12.3	12.4	0.2	31.0	Negligible
R65	16.7	11.8	11.9	0.2	29.8	Negligible
R66	14.9	10.0	10.0	<0.1	25.0	Negligible
R67	16.1	10.5	10.5	0.1	26.3	Negligible
R68	25.7	14.4	14.5	0.2	36.3	Negligible
R69	23.7	13.6	13.7	0.2	34.3	Negligible
R83	15.9	10.2	10.2	<0.1	25.5	Negligible
R84	23.8	13.4	13.4	0.1	33.5	Negligible
R85	21.0	12.3	12.4	0.1	31.0	Negligible
R86	15.3	10.1	10.2	<0.1	25.5	Negligible
R87	17.8	11.3	11.3	<0.1	28.3	Negligible
R88	20.5	12.4	12.4	0.1	31.0	Negligible
R89	27.8	15.7	15.7	0.2	39.3	Negligible
R90	26.5	14.9	14.9	<0.1	37.3	Negligible
R91	22.1	13.0	13.0	<0.1	32.5	Negligible
R92	25.8	16.3	16.3	<0.1	40.8	Negligible
R93	46.0	26.8	27.0	0.5	67.5	Negligible
R94	41.9	24.2	24.3	0.3	60.8	Negligible
R95	64.4	35.5	35.8	0.5	89.5	Negligible
R96	33.6	20.7	20.8	0.4	52.0	Negligible
R97	43.2	24.3	24.4	0.3	61.0	Negligible
R98	27.0	17.6	17.7	0.2	44.3	Negligible
R99	28.4	18.3	18.4	0.3	46.0	Negligible
R100	15.0	10.4	10.4	<0.1	26.0	Negligible
R101	43.6	25.5	25.6	0.3	64.0	Negligible

Receptor	Predicted Annual Mean NO_2 Concentration (µg/m^3)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R102	39.5	23.4	23.5	0.3	58.8	Negligible
R103	40.9	24.1	24.2	0.3	60.5	Negligible
R104	35.3	21.2	21.3	0.2	53.3	Negligible
R105	60.6	32.8	33.1	0.6	82.8	Negligible
R106	47.5	26.5	26.7	0.5	66.8	Negligible
R107	34.2	20.6	20.7	0.4	51.8	Negligible
R108	34.4	20.7	20.9	0.4	52.3	Negligible
R109	39.5	23.4	23.6	0.5	59.0	Negligible
R110	19.8	13.7	13.8	0.2	34.5	Negligible
R111	17.5	12.5	12.6	0.2	31.5	Negligible
R112	18.2	12.7	12.8	0.2	32.0	Negligible
R113	12.3	9.4	9.4	0.1	23.5	Negligible
R114	16.6	10.9	11.0	0.3	27.5	Negligible
R115	12.8	9.3	9.4	0.2	23.5	Negligible
R116	13.1	9.4	9.4	0.2	23.5	Negligible
R117	15.0	10.1	10.2	0.2	25.5	Negligible
R156	22.1	13.6	13.7	0.4	34.3	Negligible
R157	20.4	12.6	12.7	0.3	31.8	Negligible
R158	20.4	12.6	12.7	0.4	31.8	Negligible
R159	18.8	11.8	12.0	0.3	30.0	Negligible
R161	15.3	9.7	9.7	<0.1	24.3	Negligible
R162	17.1	10.3	10.3	<0.1	25.8	Negligible
R172	38.4	22.6	22.7	0.2	56.8	Negligible
R173	44.6	25.9	26.0	0.3	65.0	Negligible
R174	57.0	31.7	31.9	0.5	79.8	Negligible
R175	26.3	14.8	15.1	0.6	37.8	Negligible
R176	16.2	9.9	9.9	<0.1	24.8	Negligible
R181	28.1	17.9	18.0	0.1	45.0	Negligible
R182	36.3	21.5	21.6	0.3	54.0	Negligible
R183	27.5	17.5	17.6	0.3	44.0	Negligible
R184	19.5	12.2	12.3	0.3	30.8	Negligible
R185	19.6	12.2	12.3	0.3	30.8	Negligible
R186	36.4	21.7	21.8	0.2	54.5	Negligible
R187	25.5	16.6	16.7	0.2	41.8	Negligible

Receptor	Predicted Annual Mean NO_2 Concentration ($\mu g/m^3$)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
NKDC						
R70	25.5	14.4	14.5	0.2	36.3	Negligible
R71	30.0	16.3	16.4	0.2	41.0	Negligible
R72	26.6	14.9	14.9	0.2	37.3	Negligible
R73	23.1	13.4	13.4	0.2	33.5	Negligible
R74	23.1	13.3	13.4	0.2	33.5	Negligible
R75	28.8	15.8	15.9	0.2	39.8	Negligible
R76	25.6	14.4	14.5	0.2	36.3	Negligible
R77	23.2	13.4	13.5	0.2	33.8	Negligible
R78	28.7	15.8	15.9	0.2	39.8	Negligible
R79	19.1	11.7	11.7	<0.1	29.3	Negligible
R80	17.0	10.8	10.8	0.1	27.0	Negligible
R81	32.8	17.9	17.9	0.2	44.8	Negligible
R82	17.6	11.3	11.4	<0.1	28.5	Negligible
SHDC						
R160	20.0	11.1	11.2	0.2	28.0	Negligible
R163	18.4	10.8	10.8	<0.1	27.0	Negligible
R164	32.1	15.7	15.7	0.2	39.3	Negligible

19.11.1.2 PM_{10} Modelling Results

100. Table 19.16 presents the annual mean PM_{10} concentrations predicted at all assessed receptor locations of relevant exposure for the 2019 BC, 2027 DM and 2027 DS scenarios.

101. In accordance with EPUK & IAQM guidance, the impact of the Project on annual mean PM_{10} concentrations at all relevant existing receptors is considered to be 'negligible'. Given the marginal increase in annual mean PM_{10} concentrations associated with construction road traffic flows, and that there are no predicted exceedances of the annual mean PM_{10} AQAL, unmitigated effects associated with annual mean PM_{10} concentrations at all assessed receptor locations are therefore considered to be **not significant** in terms of the EIA regulations.

102. Based upon the maximum predicted annual mean PM_{10} concentration of 25.0$\mu g/m^3$ (predicted at R95 in 2027 DS), this equates to 13-days where 24-hour mean PM_{10} concentrations are predicted to be greater than 50$\mu g/m^3$. This is well below the 35

permitted exceedances, and therefore the number of maximum exceedances is in compliance with the 24-hour mean AQAL. Effects associated with likely 24-hour mean PM_{10} concentrations at all assessed receptor locations are therefore considered to be **not significant** in terms of the EIA regulations.

Table 19.16: Predicted Annual Mean PM_{10} Concentrations – 2027 Construction Year

Receptor	Predicted Annual Mean PM_{10} Concentration (µg/m^3)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
ELDC						
R1	16.2	15.3	15.4	0.2	38.5	Negligible
R2	16.3	15.4	15.4	0.2	38.5	Negligible
R3	15.9	15.0	15.0	0.1	37.5	Negligible
R4	15.6	14.7	14.7	0.2	36.8	Negligible
R5	16.5	15.6	15.7	0.3	39.3	Negligible
R6	16.0	15.1	15.2	0.2	38.0	Negligible
R7	16.5	15.6	15.7	0.3	39.3	Negligible
R8	16.7	15.7	15.8	0.3	39.5	Negligible
R9	15.8	14.9	14.9	0.1	37.3	Negligible
R10	15.9	15.0	15.0	0.2	37.5	Negligible
R11	16.5	15.5	15.7	0.3	39.3	Negligible
R12	15.9	15.0	15.0	0.2	37.5	Negligible
R13	16.5	15.5	15.7	0.4	39.3	Negligible
R14	16.5	15.5	15.7	0.4	39.3	Negligible
R15	16.8	15.8	15.9	0.3	39.8	Negligible
R16	16.9	15.9	16.1	0.4	40.3	Negligible
R17	17.0	16.0	16.1	0.4	40.3	Negligible
R18	16.6	15.6	15.7	0.3	39.3	Negligible
R19	16.9	15.9	16.0	0.3	40.0	Negligible
R20	17.2	16.2	16.3	0.3	40.8	Negligible
R21	16.9	15.9	16.0	0.3	40.0	Negligible
R22	17.7	16.7	16.9	0.5	42.3	Negligible
R23	16.8	15.8	15.9	0.3	39.8	Negligible
R24	17.5	16.5	16.7	0.4	41.8	Negligible
R25	16.6	15.6	15.7	0.2	39.3	Negligible
R26	17.4	16.4	16.6	0.4	41.5	Negligible
R27	17.5	16.5	16.6	0.4	41.5	Negligible
R28	17.3	16.3	16.4	0.4	41.0	Negligible

Receptor	Predicted Annual Mean PM_{10} Concentration (µg/m^3)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R29	17.6	16.6	16.8	0.4	42.0	Negligible
R30	17.3	16.3	16.5	0.4	41.3	Negligible
R31	17.0	16.0	16.1	0.3	40.3	Negligible
R32	16.7	15.7	15.8	0.2	39.5	Negligible
R33	17.0	16.0	16.1	0.3	40.3	Negligible
R34	16.8	15.8	15.9	0.2	39.8	Negligible
R35	16.9	15.9	16.0	0.3	40.0	Negligible
R36	17.5	16.4	16.6	0.4	41.5	Negligible
R37	16.5	15.4	15.5	0.4	38.8	Negligible
R38	15.9	14.9	15.0	0.2	37.5	Negligible
R39	16.0	14.9	15.0	0.2	37.5	Negligible
R40	16.6	15.6	15.7	0.4	39.3	Negligible
R41	16.4	15.3	15.4	0.3	38.5	Negligible
R42	16.3	15.2	15.3	0.3	38.3	Negligible
R43	16.3	15.3	15.4	0.3	38.5	Negligible
R44	16.8	15.7	15.9	0.4	39.8	Negligible
R45	16.7	15.6	15.7	0.3	39.3	Negligible
R46	15.8	14.8	14.9	0.3	37.3	Negligible
R47	16.3	15.3	15.4	0.4	38.5	Negligible
R48	15.9	14.9	14.9	0.2	37.3	Negligible
R49	16.1	15.1	15.2	0.3	38.0	Negligible
R50	15.9	14.9	15.0	0.2	37.5	Negligible
R51	16.0	15.0	15.1	0.3	37.8	Negligible
R52	15.9	14.9	14.9	<0.1	37.3	Negligible
R118	17.5	16.5	16.6	0.2	41.5	Negligible
R119	17.3	16.3	16.4	0.2	41.0	Negligible
R120	17.4	16.4	16.5	0.2	41.3	Negligible
R121	17.8	16.8	16.9	0.3	42.3	Negligible
R122	16.6	15.6	15.7	0.3	39.3	Negligible
R123	17.3	16.2	16.3	0.2	40.8	Negligible
R124	18.1	17.1	17.2	0.3	43.0	Negligible
R125	17.0	16.0	16.0	0.1	40.0	Negligible
R126	17.5	16.5	16.6	0.2	41.5	Negligible
R127	17.5	16.4	16.5	0.2	41.3	Negligible
R128	17.2	16.1	16.2	0.2	40.5	Negligible

Receptor	Predicted Annual Mean PM_{10} Concentration (µg/m^3)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R129	17.6	16.6	16.7	0.3	41.8	Negligible
R130	16.9	15.9	15.9	0.1	39.8	Negligible
R131	16.7	15.7	15.7	0.1	39.3	Negligible
R132	16.7	15.7	15.7	0.2	39.3	Negligible
R133	17.4	16.4	16.5	0.3	41.3	Negligible
R134	16.8	15.8	15.8	0.2	39.5	Negligible
R135	17.6	16.5	16.6	0.3	41.5	Negligible
R136	16.8	15.7	15.8	0.2	39.5	Negligible
R137	17.5	16.5	16.6	0.3	41.5	Negligible
R138	16.8	15.7	15.8	0.2	39.5	Negligible
R139	17.6	16.5	16.7	0.3	41.8	Negligible
R140	17.9	16.9	17.0	0.2	42.5	Negligible
R141	17.9	16.9	17.0	0.2	42.5	Negligible
R142	18.5	17.5	17.7	0.3	44.3	Negligible
R143	18.2	17.3	17.4	0.3	43.5	Negligible
R144	16.9	15.9	16.0	0.2	40.0	Negligible
R145	16.5	15.6	15.6	0.1	39.0	Negligible
R146	19.5	17.3	17.6	0.6	44.0	Negligible
R147	16.2	15.2	15.2	0.2	38.0	Negligible
R148	15.7	14.8	14.8	0.2	37.0	Negligible
R149	15.8	14.8	14.9	0.3	37.3	Negligible
R150	16.4	15.4	15.5	0.3	38.8	Negligible
R151	15.8	14.8	14.9	0.2	37.3	Negligible
R152	15.8	14.8	14.9	0.1	37.3	Negligible
R153	16.4	15.4	15.5	0.2	38.8	Negligible
R154	17.6	16.6	16.7	0.4	41.8	Negligible
R155	18.5	17.5	17.7	0.3	44.3	Negligible
R165	16.7	15.7	15.8	0.3	39.5	Negligible
R166	16.2	15.2	15.3	0.2	38.3	Negligible
R167	15.6	14.6	14.7	0.2	36.8	Negligible
R168	16.5	15.4	15.6	0.5	39.0	Negligible
R169	15.9	14.8	15.0	0.3	37.5	Negligible
R170	17.5	16.5	16.6	0.3	41.5	Negligible
R171	17.6	16.6	16.7	0.3	41.8	Negligible
R177	15.9	14.8	14.9	0.3	37.3	Negligible

Receptor	Predicted Annual Mean PM_{10} Concentration (µg/m^3)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R178	16.8	15.8	15.8	0.2	39.5	Negligible
R179	16.7	15.7	15.7	0.2	39.3	Negligible
R180	17.0	16.0	16.1	0.2	40.3	Negligible
BBC						
R53	18.7	18.5	18.6	0.1	46.5	Negligible
R54	18.0	18.1	18.2	0.1	45.5	Negligible
R55	17.2	16.8	16.9	<0.1	42.3	Negligible
R56	19.2	19.8	19.9	0.2	49.8	Negligible
R57	18.2	18.1	18.2	0.1	45.5	Negligible
R58	19.0	19.4	19.5	0.2	48.8	Negligible
R59	18.2	18.2	18.2	0.1	45.5	Negligible
R60	17.3	16.9	16.9	<0.1	42.3	Negligible
R61	17.7	17.6	17.6	0.1	44.0	Negligible
R62	17.8	17.8	17.9	0.1	44.8	Negligible
R63	17.2	16.8	16.9	<0.1	42.3	Negligible
R64	18.2	18.4	18.5	0.2	46.3	Negligible
R65	18.1	18.1	18.1	0.2	45.3	Negligible
R66	18.1	17.2	17.2	<0.1	43.0	Negligible
R67	18.3	17.4	17.5	0.1	43.8	Negligible
R68	20.8	19.8	19.9	0.2	49.8	Negligible
R69	20.1	19.1	19.2	0.2	48.0	Negligible
R83	18.4	17.4	17.5	<0.1	43.8	Negligible
R84	19.9	18.9	18.9	0.2	47.3	Negligible
R85	19.4	18.3	18.4	0.1	46.0	Negligible
R86	18.1	17.0	17.1	<0.1	42.8	Negligible
R87	17.1	16.1	16.1	<0.1	40.3	Negligible
R88	17.8	16.6	16.7	0.1	41.8	Negligible
R89	18.7	17.6	17.7	<0.1	44.3	Negligible
R90	19.1	18.0	18.0	<0.1	45.0	Negligible
R91	18.0	16.9	16.9	<0.1	42.3	Negligible
R92	18.0	16.8	16.8	<0.1	42.0	Negligible
R93	21.0	19.9	20.0	0.2	50.0	Negligible
R94	21.2	20.0	20.1	0.1	50.3	Negligible
R95	26.1	24.9	25.1	0.3	62.8	Negligible
R96	18.8	17.6	17.7	0.1	44.3	Negligible

Receptor	Predicted Annual Mean PM_{10} Concentration (µg/m^3)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R97	20.9	19.6	19.7	0.1	49.3	Negligible
R98	17.6	16.4	16.5	<0.1	41.3	Negligible
R99	17.8	16.6	16.7	<0.1	41.8	Negligible
R100	18.1	17.3	17.4	<0.1	43.5	Negligible
R101	22.2	21.2	21.2	0.2	53.0	Negligible
R102	21.2	20.2	20.2	0.2	50.5	Negligible
R103	21.6	20.5	20.6	0.2	51.5	Negligible
R104	20.2	19.2	19.2	0.2	48.0	Negligible
R105	25.5	24.0	24.2	0.4	60.5	Negligible
R106	22.2	20.9	21.0	0.3	52.5	Negligible
R107	19.2	18.1	18.2	0.2	45.5	Negligible
R108	19.3	18.3	18.4	0.2	46.0	Negligible
R109	20.5	19.5	19.6	0.3	49.0	Negligible
R110	16.6	15.5	15.6	0.1	39.0	Negligible
R111	16.2	15.1	15.2	0.1	38.0	Negligible
R112	16.5	15.3	15.4	0.2	38.5	Negligible
R113	17.1	16.1	16.2	0.1	40.5	Negligible
R114	18.1	17.1	17.2	0.3	43.0	Negligible
R115	17.2	16.1	16.2	0.2	40.5	Negligible
R116	17.2	16.2	16.3	0.2	40.8	Negligible
R117	17.7	16.6	16.7	0.3	41.8	Negligible
R156	18.6	17.6	17.7	0.3	44.3	Negligible
R157	19.0	18.0	18.1	0.3	45.3	Negligible
R158	19.0	18.0	18.1	0.3	45.3	Negligible
R159	18.9	17.9	18.0	0.3	45.0	Negligible
R161	18.5	17.4	17.4	<0.1	43.5	Negligible
R162	18.9	17.8	17.8	<0.1	44.5	Negligible
R172	21.0	20.0	20.1	0.2	50.3	Negligible
R173	22.3	21.4	21.5	0.2	53.8	Negligible
R174	25.3	24.2	24.3	0.3	60.8	Negligible
R175	19.9	18.9	19.0	0.4	47.5	Negligible
R176	18.3	17.2	17.2	<0.1	43.0	Negligible
R181	18.7	17.5	17.6	<0.1	44.0	Negligible
R182	20.1	19.1	19.1	0.2	47.8	Negligible
R183	18.0	17.0	17.1	0.2	42.8	Negligible

Receptor	Predicted Annual Mean PM_{10} Concentration (µg/m^3)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R184	18.9	17.9	18.0	0.3	45.0	Negligible
R185	18.8	17.8	17.9	0.3	44.8	Negligible
R186	20.2	19.2	19.3	0.2	48.3	Negligible
R187	17.9	16.9	16.9	0.2	42.3	Negligible
NKDC						
R70	20.6	19.6	19.7	0.2	49.3	Negligible
R71	21.7	20.7	20.9	0.3	52.3	Negligible
R72	20.9	19.9	20.0	0.2	50.0	Negligible
R73	20.0	19.0	19.1	0.2	47.8	Negligible
R74	20.0	19.0	19.1	0.2	47.8	Negligible
R75	21.4	20.5	20.6	0.3	51.5	Negligible
R76	20.6	19.6	19.7	0.2	49.3	Negligible
R77	20.0	19.1	19.1	0.2	47.8	Negligible
R78	21.4	20.5	20.6	0.3	51.5	Negligible
R79	19.0	18.1	18.1	0.1	45.3	Negligible
R80	18.4	17.5	17.5	0.1	43.8	Negligible
R81	21.2	20.1	20.2	0.2	50.5	Negligible
R82	18.7	17.7	17.7	<0.1	44.3	Negligible
SHDC						
R160	19.3	18.2	18.3	0.2	45.8	Negligible
R163	19.1	18.1	18.1	<0.1	45.3	Negligible
R164	22.8	21.6	21.7	0.2	54.3	Negligible

19.11.1.3 $PM_{2.5}$ Modelling Results

103. Table 19.17 presents the annual mean $PM_{2.5}$ concentrations predicted at all assessed receptor locations of relevant exposure for the 2019 BC, 2027 DM and 2027 DS scenarios.

104. In accordance with EPUK & IAQM guidance, the impact of the Project on annual mean $PM_{2.5}$ concentrations at all relevant existing receptors is considered to be 'negligible'. Given the marginal increase in annual mean $PM_{2.5}$ concentrations associated with construction road traffic flows, and that there are no predicted exceedances of the annual mean $PM_{2.5}$ AQAL, unmitigated effects associated with annual mean $PM_{2.5}$ concentrations at all assessed receptor locations are therefore considered to be **not significant** in terms of the EIA regulations.

Table 19.17: Predicted Annual Mean $PM_{2.5}$ Concentrations – 2027 Construction Year

Receptor	Predicted Annual Mean $PM_{2.5}$ Concentration (µg/m^3)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
ELDC						
R1	9.0	8.4	8.4	0.2	42.0	Negligible
R2	9.0	8.4	8.4	0.2	42.0	Negligible
R3	8.7	8.1	8.2	0.1	41.0	Negligible
R4	8.7	8.1	8.2	0.2	41.0	Negligible
R5	9.2	8.6	8.7	0.4	43.5	Negligible
R6	8.9	8.3	8.4	0.2	42.0	Negligible
R7	9.2	8.6	8.7	0.4	43.5	Negligible
R8	9.3	8.6	8.7	0.3	43.5	Negligible
R9	8.8	8.2	8.2	0.2	41.0	Negligible
R10	8.9	8.3	8.4	0.2	42.0	Negligible
R11	9.3	8.6	8.7	0.4	43.5	Negligible
R12	8.9	8.3	8.4	0.2	42.0	Negligible
R13	9.3	8.7	8.7	0.4	43.5	Negligible
R14	9.3	8.7	8.7	0.4	43.5	Negligible
R15	9.3	8.7	8.7	0.4	43.5	Negligible
R16	9.4	8.7	8.8	0.4	44.0	Negligible
R17	9.5	8.8	8.8	0.4	44.0	Negligible
R18	9.2	8.5	8.6	0.3	43.0	Negligible
R19	9.3	8.7	8.7	0.3	43.5	Negligible
R20	9.5	8.8	8.9	0.4	44.5	Negligible
R21	9.3	8.7	8.7	0.3	43.5	Negligible
R22	9.8	9.1	9.2	0.5	46.0	Negligible
R23	9.3	8.6	8.7	0.3	43.5	Negligible
R24	9.7	9.0	9.1	0.5	45.5	Negligible
R25	9.2	8.5	8.6	0.2	43.0	Negligible
R26	9.7	9.0	9.1	0.5	45.5	Negligible
R27	9.7	9.0	9.1	0.4	45.5	Negligible
R28	9.6	8.9	9.0	0.4	45.0	Negligible
R29	9.7	9.1	9.2	0.5	46.0	Negligible
R30	9.6	8.9	9.0	0.4	45.0	Negligible
R31	9.4	8.8	8.8	0.3	44.0	Negligible
R32	9.2	8.5	8.6	0.3	43.0	Negligible
R33	9.4	8.7	8.8	0.3	44.0	Negligible

Receptor	Predicted Annual Mean $PM_{2.5}$ Concentration (µg/m^3)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R34	9.3	8.6	8.6	0.2	43.0	Negligible
R35	9.3	8.7	8.7	0.3	43.5	Negligible
R36	9.7	9.0	9.1	0.4	45.5	Negligible
R37	9.7	9.0	9.0	0.4	45.0	Negligible
R38	9.4	8.7	8.7	0.2	43.5	Negligible
R39	9.4	8.7	8.8	0.3	44.0	Negligible
R40	9.8	9.1	9.1	0.4	45.5	Negligible
R41	9.6	8.9	9.0	0.3	45.0	Negligible
R42	9.6	8.9	8.9	0.3	44.5	Negligible
R43	9.6	8.9	9.0	0.3	45.0	Negligible
R44	9.9	9.1	9.2	0.4	46.0	Negligible
R45	9.9	9.1	9.2	0.4	46.0	Negligible
R46	8.9	8.3	8.3	0.4	41.5	Negligible
R47	9.1	8.4	8.5	0.4	42.5	Negligible
R48	8.8	8.2	8.2	0.2	41.0	Negligible
R49	8.9	8.3	8.4	0.3	42.0	Negligible
R50	8.8	8.2	8.2	0.2	41.0	Negligible
R51	8.9	8.3	8.4	0.4	42.0	Negligible
R52	8.7	8.1	8.1	0.1	40.5	Negligible
R118	9.8	9.1	9.2	0.2	46.0	Negligible
R119	9.6	9.0	9.0	0.2	45.0	Negligible
R120	9.7	9.0	9.1	0.2	45.5	Negligible
R121	9.9	9.2	9.3	0.3	46.5	Negligible
R122	9.6	8.9	9.0	0.3	45.0	Negligible
R123	9.5	8.8	8.8	0.2	44.0	Negligible
R124	10.0	9.3	9.4	0.3	47.0	Negligible
R125	9.3	8.7	8.7	0.1	43.5	Negligible
R126	9.6	8.9	9.0	0.2	45.0	Negligible
R127	9.7	9.0	9.0	0.3	45.0	Negligible
R128	9.5	8.8	8.9	0.2	44.5	Negligible
R129	9.8	9.1	9.1	0.3	45.5	Negligible
R130	9.3	8.7	8.7	0.2	43.5	Negligible
R131	9.2	8.6	8.6	0.1	43.0	Negligible
R132	9.3	8.7	8.7	0.2	43.5	Negligible
R133	9.8	9.1	9.1	0.3	45.5	Negligible

Receptor	Predicted Annual Mean $PM_{2.5}$ Concentration (μg/m^3)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R134	9.4	8.7	8.8	0.2	44.0	Negligible
R135	9.8	9.1	9.2	0.3	46.0	Negligible
R136	9.4	8.7	8.8	0.2	44.0	Negligible
R137	9.8	9.1	9.2	0.3	46.0	Negligible
R138	9.4	8.7	8.8	0.2	44.0	Negligible
R139	9.8	9.1	9.2	0.3	46.0	Negligible
R140	9.7	9.0	9.1	0.3	45.5	Negligible
R141	9.6	9.0	9.0	0.2	45.0	Negligible
R142	10.0	9.4	9.4	0.4	47.0	Negligible
R143	9.9	9.2	9.3	0.3	46.5	Negligible
R144	9.4	8.8	8.8	0.2	44.0	Negligible
R145	9.2	8.6	8.6	0.1	43.0	Negligible
R146	10.9	9.5	9.6	0.6	48.0	Negligible
R147	9.1	8.5	8.5	0.2	42.5	Negligible
R148	9.0	8.3	8.4	0.2	42.0	Negligible
R149	9.2	8.5	8.6	0.3	43.0	Negligible
R150	9.4	8.7	8.8	0.3	44.0	Negligible
R151	8.9	8.2	8.3	0.2	41.5	Negligible
R152	8.8	8.1	8.2	0.2	41.0	Negligible
R153	9.0	8.4	8.4	0.3	42.0	Negligible
R154	10.1	9.4	9.5	0.4	47.5	Negligible
R155	10.0	9.3	9.4	0.4	47.0	Negligible
R165	9.6	8.8	8.9	0.3	44.5	Negligible
R166	9.3	8.6	8.7	0.3	43.5	Negligible
R167	9.2	8.5	8.6	0.3	43.0	Negligible
R168	9.7	9.0	9.1	0.5	45.5	Negligible
R169	9.3	8.7	8.7	0.3	43.5	Negligible
R170	9.6	9.0	9.0	0.3	45.0	Negligible
R171	9.7	9.0	9.1	0.3	45.5	Negligible
R177	9.3	8.7	8.7	0.3	43.5	Negligible
R178	9.2	8.6	8.6	0.2	43.0	Negligible
R179	9.1	8.5	8.5	0.2	42.5	Negligible
R180	9.4	8.7	8.8	0.2	44.0	Negligible
BBC						
R53	10.4	10.2	10.2	0.1	51.0	Negligible

Receptor	Predicted Annual Mean $PM_{2.5}$ Concentration (µg/m^3)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R54	10.0	9.9	9.9	0.2	49.5	Negligible
R55	9.6	9.2	9.2	<0.1	46.0	Negligible
R56	10.7	10.8	10.9	0.2	54.5	Negligible
R57	10.1	9.9	9.9	0.1	49.5	Negligible
R58	10.6	10.6	10.7	0.2	53.5	Negligible
R59	10.1	9.9	10.0	0.1	50.0	Negligible
R60	9.6	9.2	9.3	<0.1	46.5	Negligible
R61	9.8	9.6	9.6	0.1	48.0	Negligible
R62	9.9	9.7	9.7	0.1	48.5	Negligible
R63	9.5	9.2	9.2	<0.1	46.0	Negligible
R64	10.0	10.0	10.1	0.2	50.5	Negligible
R65	10.0	9.9	9.9	0.2	49.5	Negligible
R66	10.0	9.4	9.4	<0.1	47.0	Negligible
R67	10.1	9.5	9.5	0.1	47.5	Negligible
R68	11.5	10.8	10.8	0.2	54.0	Negligible
R69	11.1	10.4	10.4	0.2	52.0	Negligible
R83	10.3	9.6	9.6	<0.1	48.0	Negligible
R84	11.2	10.4	10.4	0.2	52.0	Negligible
R85	10.9	10.1	10.1	0.1	50.5	Negligible
R86	10.1	9.4	9.4	<0.1	47.0	Negligible
R87	10.1	9.4	9.4	<0.1	47.0	Negligible
R88	10.5	9.7	9.7	0.1	48.5	Negligible
R89	11.1	10.3	10.3	0.1	51.5	Negligible
R90	11.3	10.5	10.5	<0.1	52.5	Negligible
R91	10.6	9.9	9.9	<0.1	49.5	Negligible
R92	11.2	10.4	10.4	<0.1	52.0	Negligible
R93	13.1	12.2	12.2	0.2	61.0	Negligible
R94	13.1	12.2	12.2	0.2	61.0	Negligible
R95	16.0	14.9	15.0	0.3	75.0	Negligible
R96	11.8	10.9	10.9	0.1	54.5	Negligible
R97	13.0	12.0	12.0	0.1	60.0	Negligible
R98	11.1	10.2	10.2	<0.1	51.0	Negligible
R99	11.2	10.3	10.4	<0.1	52.0	Negligible
R100	10.0	9.5	9.5	<0.1	47.5	Negligible
R101	13.7	12.8	12.9	0.2	64.5	Negligible

Receptor	Predicted Annual Mean $PM_{2.5}$ Concentration (µg/m^3)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R102	13.1	12.3	12.3	0.2	61.5	Negligible
R103	13.3	12.5	12.5	0.2	62.5	Negligible
R104	12.5	11.7	11.7	0.2	58.5	Negligible
R105	15.6	14.5	14.5	0.4	72.5	Negligible
R106	13.7	12.7	12.8	0.3	64.0	Negligible
R107	12.0	11.2	11.3	0.2	56.5	Negligible
R108	12.0	11.3	11.3	0.2	56.5	Negligible
R109	12.7	12.0	12.0	0.3	60.0	Negligible
R110	10.0	9.3	9.3	0.1	46.5	Negligible
R111	9.8	9.0	9.1	0.1	45.5	Negligible
R112	9.9	9.2	9.2	0.2	46.0	Negligible
R113	9.6	8.9	9.0	0.1	45.0	Negligible
R114	10.2	9.5	9.5	0.3	47.5	Negligible
R115	9.6	8.9	8.9	0.2	44.5	Negligible
R116	9.6	8.9	9.0	0.2	45.0	Negligible
R117	9.9	9.2	9.2	0.3	46.0	Negligible
R156	10.7	10.0	10.0	0.3	50.0	Negligible
R157	10.6	9.9	10.0	0.3	50.0	Negligible
R158	10.6	9.9	10.0	0.3	50.0	Negligible
R159	10.4	9.7	9.8	0.3	49.0	Negligible
R161	10.3	9.6	9.6	<0.1	48.0	Negligible
R162	10.5	9.8	9.8	<0.1	49.0	Negligible
R172	13.0	12.2	12.2	0.2	61.0	Negligible
R173	13.8	13.0	13.0	0.2	65.0	Negligible
R174	15.5	14.5	14.6	0.4	73.0	Negligible
R175	11.2	10.4	10.5	0.4	52.5	Negligible
R176	10.2	9.5	9.5	<0.1	47.5	Negligible
R181	11.6	10.8	10.8	0.1	54.0	Negligible
R182	12.5	11.7	11.7	0.2	58.5	Negligible
R183	11.3	10.6	10.6	0.2	53.0	Negligible
R184	10.7	9.9	10.0	0.3	50.0	Negligible
R185	10.5	9.8	9.9	0.3	49.5	Negligible
R186	12.6	11.8	11.8	0.2	59.0	Negligible
R187	10.8	10.0	10.1	0.2	50.5	Negligible

Receptor	Predicted Annual Mean $PM_{2.5}$ Concentration (µg/m^3)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
NKDC						
R70	11.4	10.7	10.7	0.2	53.5	Negligible
R71	12.0	11.3	11.4	0.3	57.0	Negligible
R72	11.6	10.8	10.9	0.2	54.5	Negligible
R73	11.1	10.4	10.4	0.2	52.0	Negligible
R74	11.0	10.4	10.4	0.2	52.0	Negligible
R75	11.9	11.2	11.2	0.3	56.0	Negligible
R76	11.4	10.7	10.7	0.2	53.5	Negligible
R77	11.1	10.4	10.4	0.2	52.0	Negligible
R78	11.9	11.2	11.2	0.3	56.0	Negligible
R79	10.5	9.8	9.8	0.1	49.0	Negligible
R80	10.1	9.5	9.5	0.1	47.5	Negligible
R81	11.8	11.0	11.0	0.3	55.0	Negligible
R82	10.2	9.6	9.6	<0.1	48.0	Negligible
SHDC						
R160	10.9	10.2	10.2	0.2	51.0	Negligible
R163	10.7	9.9	9.9	<0.1	49.5	Negligible
R164	12.8	11.8	11.9	0.2	59.5	Negligible

19.11.2 Ecological Receptors

105. Results presented herein relate to the maximum modelled impact at each individual ecological designation requiring detailed assessment and as such, represents a conservative outlook. Multiple habitats have been considered where present, however, the maximum impact across the habitats is presented.

19.11.2.1 NO_x Critical Level Modelling Results

106. Table 19.18 presents the maximum modelled 2027 annual mean NO_x Critical Level (30µg/m^3) impacts at all applicable ecological receptor locations for initial screening.

107. At the SSSI (ER1), the maximum increases in annual mean NO_x concentrations as a result of the Project (both alone and in-combination) are predicted to be <1% of the Critical Level and impacts are concluded as negligible. Further assessment of impacts is therefore not required and resultant effects can be considered **not significant**.

108. At the local sites ER14, ER15, ER16, ER17, ER18, ER20, ER21, ER26, ER28, ER29, ER32, ER35 and ER36, the maximum increases in annual mean NO_x concentrations as a result of the Project (both alone and in-combination), are predicted to be <1% of the Critical Level and impacts are concluded as negligible. Further assessment of impacts is therefore not required and resultant effects can be considered **not significant**.

109. At the remaining local sites ER5, ER6, ER7, ER8, ER9, ER10, ER11, ER12, ER13, ER22, ER25, ER31, ER33, ER34, ER41, ER43 and ER46, the maximum increases in annual mean NO_x concentrations as a result of the Project (both alone and/or in-combination) are predicted to be >1% of the Critical Level. Further assessment of impacts is therefore required, as presented in Table 19.18.

Table 19.18: Maximum Predicted Annual Mean NO_x Impacts – 2027 Construction Year

ID	Designation	Maximum Modelled Contribution				Further Assessment?
		Project Alone		In-Combination		
		μg/m³	% of Critical Level	μg/m³	% of Critical Level	
ER1	SSSI	0.2	0.5	0.2	0.5	No
ER5	LNR	0.2	0.7	0.4	1.3	Yes
ER6	LWS	0.4	1.3	0.7	2.4	Yes
ER7	LWS	0.4	1.4	0.4	1.4	Yes
ER8	LWS	0.3	1.0	0.6	1.9	Yes
ER9	LWS	0.4	1.4	0.8	2.6	Yes
ER10	LWS	0.4	1.4	0.6	2.1	Yes
ER11	LWT	1.1	3.7	1.1	3.7	Yes
ER12	LWS	0.3	0.8	0.5	1.6	Yes
ER13	LWS	0.2	0.6	0.4	1.2	Yes
ER14	LWS	<0.1	0.1	<0.1	0.1	No
ER15	LWT	0.2	0.5	0.2	0.5	No
ER16	LWS	<0.1	0.1	<0.1	0.1	No
ER17	LWS	0.1	0.2	0.1	0.4	No
ER18	LWS	0.2	0.6	0.2	0.6	No
ER20	LWS	0.3	0.9	0.3	0.9	No
ER21	LWS	0.1	0.2	0.1	0.2	No
ER22	LWS	0.4	1.4	0.4	1.4	Yes
ER25	LWS	0.7	2.4	1.2	4.0	Yes
ER26	LWS	<0.1	0.1	<0.1	0.1	No

ID	Designation	Maximum Modelled Contribution				Further Assessment?
		Project Alone		In-Combination		
		µg/m³	% of Critical Level	µg/m³	% of Critical Level	
ER28	LWS	<0.1	0.1	<0.1	0.1	No
ER29	LWS	0.2	0.5	0.2	0.5	No
ER31	LWS	0.4	1.2	0.5	1.8	Yes
ER32	LWS	0.1	0.2	0.1	0.3	No
ER33	LWS	0.4	1.3	0.6	2.0	Yes
ER34	LWS	0.4	1.3	0.6	1.9	Yes
ER35	LWS	<0.1	0.1	<0.1	0.1	No
ER36	LWS	0.2	0.6	0.2	0.6	No
ER41	LWS	0.5	1.8	0.5	1.8	Yes
ER43	LWS	0.3	1.1	0.5	1.6	Yes
ER46	LWS	0.3	1.0	0.3	1.0	Yes

110. Where required, further assessment and calculation of the total maximum predicted annual mean NO_x concentrations for comparison against the Critical Level (30µg/m³) across the three model scenarios is presented in Table 19.19.

Table 19.19: Maximum Predicted Annual Mean NO_x Concentrations – 2027 Construction Year

ID	Designation	DM-C		DM		DS	
		µg/m³	% of Critical Level	µg/m³	% of Critical Level	µg/m³	% of Critical Level
ER5	LNR	15.6	51.9	15.7	52.5	15.9	53.1
ER6	LWS	21.8	72.8	22.2	74.0	22.6	75.2
ER7	LWS	17.8	59.3	17.8	59.3	18.2	60.7
ER8	LWS	19.1	63.7	19.4	64.6	19.7	65.6
ER9	LWS	23.0	76.7	23.4	78.0	23.8	79.4
ER10	LWS	34.0	113.4	34.2	114.1	34.6	115.5
ER11	LWT	22.7	75.5	22.7	75.5	23.8	79.2
ER12	LWS	17.4	58.1	17.7	58.9	17.9	59.7
ER13	LWS	15.2	50.7	15.4	51.3	15.6	52.0
ER22	LWS	19.4	64.6	19.4	64.6	19.8	66.0
ER25	LWS	31.3	104.3	31.8	106.0	32.5	108.4
ER31	LWS	31.9	106.4	32.1	107.0	32.5	108.2
ER33	LWS	32.4	108.1	32.6	108.8	33.0	110.1
ER34	LWS	31.8	106.1	32.0	106.8	32.4	108.1
ER41	LWS	21.8	72.6	21.8	72.6	22.3	74.4

ID	Designation	DM-C		DM		DS	
		µg/m³	% of Critical Level	µg/m³	% of Critical Level	µg/m³	% of Critical Level
ER43	LWS	29.0	96.5	29.1	97.0	29.4	98.1
ER46	LWS	19.8	66.1	19.8	66.1	20.1	67.2

111. At the majority of local sites requiring further assessment, no exceedances of the Critical Level (30µg/m³) are predicted across the three model scenarios (DM-C, DM and DS). Further assessment of impacts is therefore not required and resultant effects can be considered **not significant**.

112. Exceedances of the Critical Level are predicted at ER10, ER25, ER31, ER33 and ER34 (where the maximum modelled contributions are also >1% for both Project alone and in-combination). These exceedances occur across all three model scenarios and therefore occur in the future baseline regardless of the Project and/or committed developments and cumulative projects/plans coming forward.

113. In consultation with the Project Ecologist, the exceedances at each of the designated ecological sites were investigated and each is discussed in turn.

ER10

114. At ER10, A16 Verges North of the River Glen LWS, in all three model scenarios (2027 DM-C, DM and DS), the exceedances of the annual mean NO_x Critical Level occur at receptors on the edge of the designation which borders the roadside of the A16. At these exceedance locations, at approximately 2m into the designation concentrations fall to below the Critical Level and therefore only a peripheral strip is likely to be affected.

115. Furthermore, the exceedances only occur in the LWS area to the east of the carriageway, likely due to the prevailing wind direction and only for approximately two thirds of its length (exceedances are the red points in **Plate 19.8**). Given the above factors, and that only a small part of the wider site experiences exceedances, effects are considered not significant.

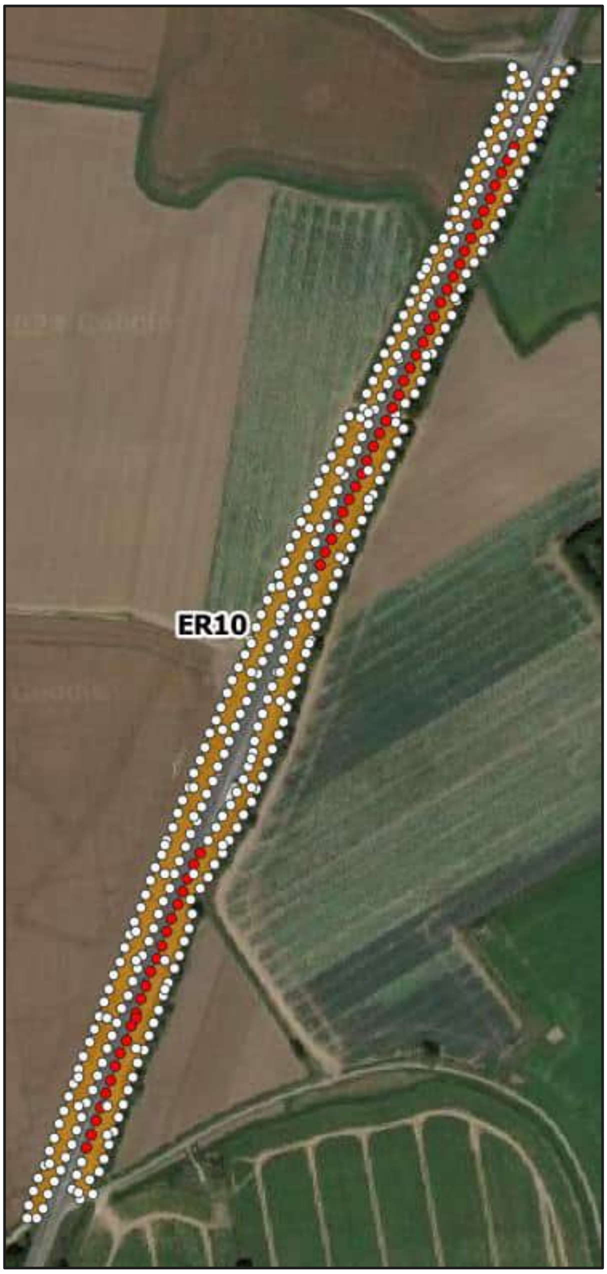

Plate 19.8: Modelled Exceedances of the NO_x Critical Level at ER10 in 2027 DS

ER25

116. At ER25, Hobhole Drain, Baker's Bridge South, in all three model scenarios (2027 DM-C, DM and DS), three modelled receptors are predicted to exceed the annual mean NO_x Critical Level of 30µg/m^3. From closer inspection, these receptors are located on the road/bridge over the LWS and not on the actual LWS habitat (exceedances are the red points in **Plate 19.9**). The concentrations north and south of these points decrease to below the Critical Level. On this basis, and as the habitat is not located on the bridge, associated effects can be considered not significant.

Plate 19.9: Modelled Exceedances of the NO_x Critical Level at ER25 in 2027 DS

ER31

117. At ER31, Pinchbeck Marsh LWS, in all three model scenarios (2027 DM-C, DM and DS), the exceedances of the annual mean NO_x Critical Level occur at receptors on the edge of the designation which borders the roadside of the A16. At these exceedance locations, at approximately 2m into the designation concentrations fall to below the Critical Level and therefore only a peripheral strip is likely to be affected.

118. Furthermore, the exceedances only occur in the LWS area to the northeast of the carriageway, likely due to the prevailing wind direction (exceedances are the red points in Plate 19.10). Given the above factors, and that only a small part of the wider site experiences exceedances, effects are considered not significant.

Plate 19.10: Modelled Exceedances of the NO_x Critical Level at ER31 in 2027 DS

ER33

119. At ER25, Risegate Eau LWS, in all three model scenarios (2027 DM-C, DM and DS), two modelled receptors are predicted to exceed the annual mean NO_x Critical Level of 30µg/m^3. From closer inspection, these receptors are located on the road/bridge over the LWS and not on the actual LWS habitat (exceedances are the red points in **Plate 19.11**). The concentrations east and west of these points decrease to below the Critical Level. On this basis, and as the habitat is not located on the bridge, associated effects can be considered not significant.

Plate 19.11: Modelled Exceedances of the NO_x Critical Level at ER33 in 2027 DS

ER34

120. At ER34, River Glen Corridor LWS, in all three model scenarios (2027 DM-C, DM and DS), two modelled receptors are predicted to exceed the annual mean NO_x Critical Level of 30µg/m^3. From closer inspection, these receptors are located on the road/bridge over the LWS and not on the actual LWS habitat (exceedances are the red points in **Plate 19.12**). The concentrations east and west of these points decrease to below the Critical Level. On this basis, and as the habitat is not located on the bridge, associated effects can be considered not significant.

Plate 19.12: Modelled Exceedances of the NO_x Critical Level at ER34 in 2027 DS

121. As discussed above, the effects in relation to the annual mean NO_x Critical Level at each of the designated ecological sites are determined as not significant.

19.11.2.2 Nutrient Nitrogen Critical Load Modelling Results

122. Table 19.20 presents the maximum modelled 2027 nutrient nitrogen Critical Load impacts at all applicable ecological receptor locations for initial screening.

123. At the SSSI (ER1), the maximum increases in nutrient nitrogen deposition as a result of the Project (both alone and in-combination) are predicted to be <1% of the minimum Critical Load and impacts are concluded as negligible. Further assessment of impacts is therefore not required and resultant effects can be considered **not significant**.

124. At the local sites, the maximum increases in nutrient nitrogen deposition as a result of the Project (both alone and in-combination) are predicted to be <1% of the minimum Critical Load and impacts are concluded as negligible. Further assessment of impacts is therefore not required and resultant effects can be considered **not significant**.

Table 19.20: Maximum Predicted Nutrient Nitrogen Impacts – 2027 Construction Year

ID	Designation	Critical Load Min (kgN/ha/yr)	Maximum Modelled Contribution			
			Project Alone		In-Combination	
			kgN/ha/yr	% of Min Critical Load	kgN/ha/yr	% of Min Critical Load
ER1	SSSI	15	0.03	0.2	0.03	0.2
ER5	LNR	10	0.03	0.3	0.06	0.6
ER6	LWS	10	0.03	0.3	0.05	0.5
ER7	LWS	10	0.03	0.3	0.03	0.3
ER8	LWS	10	0.02	0.2	0.04	0.4
ER9	LWS	10	0.03	0.3	0.06	0.6
ER10	LWS	10	0.03	0.3	0.04	0.4
ER11	LWT	10	0.08	0.8	0.08	0.8
ER12	LWS	10	0.02	0.2	0.04	0.4
ER13	LWS	10	0.03	0.3	0.05	0.5
ER14	LWS	10	0.01	0.1	0.01	0.1
ER15	LWT	10	0.03	0.3	0.03	0.3
ER16	LWS	10	<0.01	<0.1	<0.01	<0.1
ER17	LWS	10	0.01	0.1	0.02	0.2

ID	Designation	Critical Load Min (kgN/ha/yr)	Maximum Modelled Contribution			
			Project Alone		In-Combination	
			kgN/ha/yr	% of Min Critical Load	kgN/ha/yr	% of Min Critical Load
ER18	LWS	10	0.01	0.1	0.01	0.1
ER20	LWS	10	0.02	0.2	0.02	0.2
ER21	LWS	10	0.01	0.1	0.01	0.1
ER22	LWS	6	0.03	0.6	0.03	0.6
ER25	LWS	10	0.05	0.5	0.09	0.9
ER26	LWS	10	<0.01	<0.1	<0.01	<0.1
ER28	LWS	10	<0.01	<0.1	0.01	0.1
ER29	LWS	10	0.01	0.1	0.01	0.1
ER31	LWS	10	0.03	0.3	0.04	0.4
ER32	LWS	10	<0.01	<0.1	0.01	0.1
ER33	LWS	10	0.03	0.3	0.04	0.4
ER34	LWS	10	0.03	0.3	0.04	0.4
ER35	LWS	10	<0.01	<0.1	<0.01	<0.1
ER36	LWS	6	0.01	0.2	0.01	0.2
ER41	LWS	10	0.04	0.4	0.04	0.4
ER43	LWS	10	0.02	0.2	0.03	0.3
ER46	LWS	10	0.02	0.2	0.02	0.2

19.11.2.3 Acidification Critical Load Modelling Results

125. Table 19.21 presents the maximum modelled 2027 acidification Critical Load impacts at all applicable ecological receptor locations for initial screening.

126. At the SSSI (ER1), the maximum increases in nutrient nitrogen deposition as a result of the Project (both alone and in-combination) are predicted to be <1% of the minimum MaxN Critical Load and impacts are concluded as negligible. Further assessment of impacts is therefore not required and resultant effects can be considered **not significant**.

127. At the local sites, the maximum increases in nutrient nitrogen deposition as a result of the Project (both alone and in-combination) are predicted to be <1% of the minimum MaxN Critical Load and impacts are concluded as negligible. Further assessment of impacts is therefore not required and resultant effects can be considered **not significant**.

Table 19.21: Maximum Predicted Acidification Impacts – 2027 Construction Year

ID	Designation	MaxN Critical Load (keq/ha/yr)	Maximum Modelled Contribution			
			Project Alone		In-Combination	
			keq/ha/yr	% of MaxN Critical Load	keq/ha/yr	% of MaxN Critical Load
ER1	SSSI	1.7	<0.01	0.1	<0.01	0.1
ER5	LNR	1.7	<0.01	0.1	<0.01	0.3
ER6	LWS	4.9	<0.01	<0.1	<0.01	0.1
ER7	LWS	4.9	<0.01	<0.1	<0.01	<0.1
ER8	LWS	4.9	<0.01	<0.1	<0.01	0.1
ER9	LWS	4.9	<0.01	<0.1	<0.01	0.1
ER10	LWS	5.1	<0.01	<0.1	<0.01	0.1
ER11	LWT	4.9	0.01	0.1	0.01	0.1
ER12	LWS	4.9	<0.01	<0.1	<0.01	0.1
ER13	LWS	1.7	<0.01	0.1	<0.01	0.2
ER14	LWS	10.9	<0.01	<0.1	<0.01	<0.1
ER15	LWT	1.7	<0.01	0.1	<0.01	0.1
ER16	LWS	4.9	<0.01	<0.1	<0.01	<0.1
ER17	LWS	10.9	<0.01	<0.1	<0.01	<0.1
ER18	LWS	4.9	<0.01	<0.1	<0.01	<0.1
ER20	LWS	5.0	<0.01	<0.1	<0.01	<0.1
ER21	LWS	5.0	<0.01	<0.1	<0.01	<0.1
ER22	LWS	0.7	<0.01	0.4	<0.01	0.4
ER25	LWS	5.0	<0.01	0.1	0.01	0.1
ER26	LWS	4.9	<0.01	<0.1	<0.01	<0.1
ER28	LWS	1.8	<0.01	<0.1	<0.01	<0.1
ER29	LWS	4.9	<0.01	<0.1	<0.01	<0.1
ER31	LWS	5.0	<0.01	<0.1	<0.01	0.1
ER32	LWS	4.9	<0.01	<0.1	<0.01	<0.1
ER33	LWS	5.0	<0.01	<0.1	<0.01	0.1
ER34	LWS	5.0	<0.01	<0.1	<0.01	0.1
ER35	LWS	5.0	<0.01	<0.1	<0.01	<0.1
ER36	LWS	0.7	<0.01	0.2	<0.01	0.2
ER41	LWS	4.9	<0.01	0.1	<0.01	0.1
ER43	LWS	5.0	<0.01	<0.1	<0.01	<0.1
ER46	LWS	4.9	<0.01	<0.1	<0.01	<0.1

19.12 Conclusion

19.12.1 Human Receptors

128. Road traffic effects associated with the construction phase on concentrations of NO_2, PM_{10} and $PM_{2.5}$ at human receptor locations are found to be **not significant** in terms of the EIA regulations.

19.12.2 Ecological Receptors

129. In consideration of the outcomes of the assessment, road traffic impacts on all ecological designations can be considered negligible. Resultant effects are concluded to be **not significant** in terms of the EIA Regulations. No further assessment is therefore required.

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