Outer Dowsing Offshore Wind

Preliminary Environmental Information Report

Volume 2, Appendix 19.4: Road Traffic Dispersion Modelling

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OUTER DOWSING OFFSHORE WIND

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PRELIMINARY ENVIRONMENTAL INFORMATION REPORT

VOLUME 2, APPENDIX 19.4:

ROAD TRAFFIC DISPERSION MODELLING

SLR Ref: 410.V05356.00013
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BASIS OF REPORT

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1.0 Road Traffic Dispersion Modelling Methodology

In order 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;
- 2027 Do Something (DS) – 2027 DM flows, plus peak road traffic flows generated by ODOW construction activities associated with the following onshore Export Cable Corridor (ECC) route options:
  - Weston Marsh (north of the A52); and
  - Weston Marsh (south of the A52).

The DS scenario associated with the Lincolnshire Node onshore ECC route option screened out of detailed assessment for both human and ecological receptors. This is due to road traffic flows (Project alone and in-combination) being below the relevant screening criteria on all affected road links.

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).

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.

To ensure potential air quality impacts that may arise throughout the construction phase are understood, 2027 has been adopted for the purposes of dispersion modelling (i.e. earliest date of potential construction). 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/fuels).

1.1 Traffic Inputs

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. Data has been supplemented from the Department for Transport (DfT) traffic count website[1] (where relevant) and adjusted accordingly – in line with the analysis undertaken as part of the transport assessment within Volume 1, Chapter 27: Traffic and Transport.

Construction road traffic flows have been calculated using the maximum consecutive 12 months (representing annual) flow (Heavy Duty Vehicles (HDVs) and employees Light Duty Vehicles (LDVs) separately) across the 36-month 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 is considered appropriate in comparison to averaging out road traffic values across the full onshore construction period to derive AADT flows, which would dilute the predicted datasets. This 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.

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

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.

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.

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 19.6 – Volume 1, Chapter 19: Onshore Air Quality). 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 the dispersion model is greater than the affected road network – as includes road links which may experience insignificant vehicle volumes.

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 Volume 1, Chapter 27: Traffic and Transport). As such, the dispersion modelling exercise and associated outcomes are inherently cumulative in nature.

Details of the traffic flows used in this assessment are provided in Table 1-1, whilst the modelled roads in relation to the Preliminary Environmental Information Report (PEIR) onshore red line boundary are presented in Volume 1, Chapter 19: Onshore Air Quality Figure 19.2.

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

Table 1-1
Traffic Data Used Within the Assessment

Link	2019 BC		2027 DM		2027 DS (Weston Marsh North)		2027 DS (Weston Marsh South)	
	AADT	% HDV	AADT	% HDV	AADT	% HDV	AADT	% HDV
A16 (north of A1028)	8,928	6.8	9,541	6.7	9,885	9.6	9,811	8.9
A158 (west of A16)	7,537	4.8	8,033	4.8	8,373	8.3	8,330	7.8
A16 (between A158 and A1028)	5,515	8.8	5,743	8.8	6,109	13.3	6,037	12.3
A17 (north of River Welland)	9,345	14.7	9,959	14.7	10,205	15.9	10,217	16.1
A17 (north of A16)	8,400	14.3	8,953	14.3	9,106	15.6	9,131	15.9
A17 (west of A1221)	23,548	12.8	24,521	12.8	24,769	13.5	24,820	13.7
A16 (south of Boston, south of Kirton)	21,592	5.1	23,138	5.4	23,393	5.8	23,438	6.0
A16 (south of Boston, north of Kirton)	21,592	5.1	23,401	5.3	23,591	5.4	23,637	5.6
A1121	8,562	7.0	9,047	6.9	9,140	7.5	9,166	7.8
A16 (Boston)	37,058	5.6	39,093	5.7	39,297	5.8	39,300	5.9
A16 (south of the A155)	6,607	5.5	7,042	5.5	7,345	8.5	7,178	6.5
A16 (north of the A155)	9,364	7.8	9,751	7.8	10,054	9.9	9,887	8.4
A158 (between A1028 and A16)	11,604	3.2	12,083	3.2	12,263	4.4	12,303	4.7
A1028	6,019	4.4	6,268	4.4	6,434	6.6	6,444	6.7
A158 Skegness Road (west of ECC)	12,707	4.4	13,542	4.4	13,861	6.2	13,884	6.4
A158 Skegness Road (east of ECC)	12,707	4.4	13,542	4.4	13,680	5.3	13,752	5.8
A52 Wainfleet Road (west of Haltoft End)	11,349	4.5	12,399	4.4	12,882	6.6	12,765	6.0
A52 Wainfleet Road (east of Haltoft End)	11,349	4.5	12,399	4.4	12,753	5.8	12,688	5.4
A52 (Wrangle)	6,210	6.2	6,922	5.9	7,092	6.4	7,211	7.9
A52 (Holland Lane)	4,724	5.7	5,338	5.4	5,555	6.9	5,609	8.0
A52 (Wainfleet)	7,843	4.3	8,663	4.2	8,911	5.4	8,969	6.2
A52 (east of Croft)	7,843	4.3	8,663	4.2	8,863	5.5	8,930	6.3

Link	2019 BC		2027 DM		2027 DS (Weston Marsh North)		2027 DS (Weston Marsh South)	
	AADT	% HDV	AADT	% HDV	AADT	% HDV	AADT	% HDV
Lincoln Road, Skegness	8,549	6.6	9,415	6.4	9,553	7.6	9,625	8.3
Lincoln Road, Skegness (one-way)	4,275	6.6	4,708	6.4	4,776	7.6	4,813	8.3
Ings Road	272	5.2	289	5.2	438	26.4	289	5.2
West End Road	545	7.2	579	7.2	728	19.5	579	7.2
Sea Lane (Staples Farm)	993	7.3	1,056	7.3	1,056	7.3	1,228	15.8
B1192 Station Road	5,342	2.2	5,563	2.2	5,563	2.2	5,563	2.2
B1397 London Road	8,823	2.1	9,187	2.1	9,187	2.1	9,187	2.1
London Road, Boston	6,245	1.7	6,503	1.7	6,503	1.7	6,503	1.7
South Square, Boston	5,395	0.6	5,618	0.6	5,618	0.6	5,618	0.6
A1138 South End	694	36.3	723	36.3	723	36.3	723	36.3
A1137 Horncastle Road	7,476	2.9	7,785	2.9	7,785	2.9	7,785	2.9
B1451 Castleton Boulevard	8,176	1.9	8,513	1.9	8,513	1.9	8,513	1.9
A153 South Street	10,611	5.7	11,049	5.7	11,049	5.7	11,049	5.7
A153 Bull Ring / North Street	3,721	4.4	3,875	4.4	3,875	4.4	3,875	4.4
A52 (between Marsh Lane and Skegness)	3,737	4.2	4,228	3.8	4,252	3.8	4,251	3.8
A52 Sleaford Road (from A16 to A1137)	14,531	4.4	15,262	4.4	15,356	4.7	15,381	4.9
A52 Sleaford Road (from A1137 to A1121)	18,144	3.6	19,024	3.6	19,118	3.9	19,143	4.0
TCC13 / Skeldyke Road	314	5.2	334	5.2	441	20.5	441	20.5

1.2 Meteorological Data

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.

The dispersion modelling has been undertaken using data from Wainfleet Aut meteorological station, located approximately 750m from the onshore PEIR boundary, and 2.3km 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.

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 Figure 1-1.

A surface roughness value of 0.4m has used to represent the dispersion site. A surface roughness value of 0.2m was used for the meteorological measurement site. The use of a variable surface roughness file will be considered at ES stage to take into account the variation in land uses across the modelled domain to refine model performance.

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

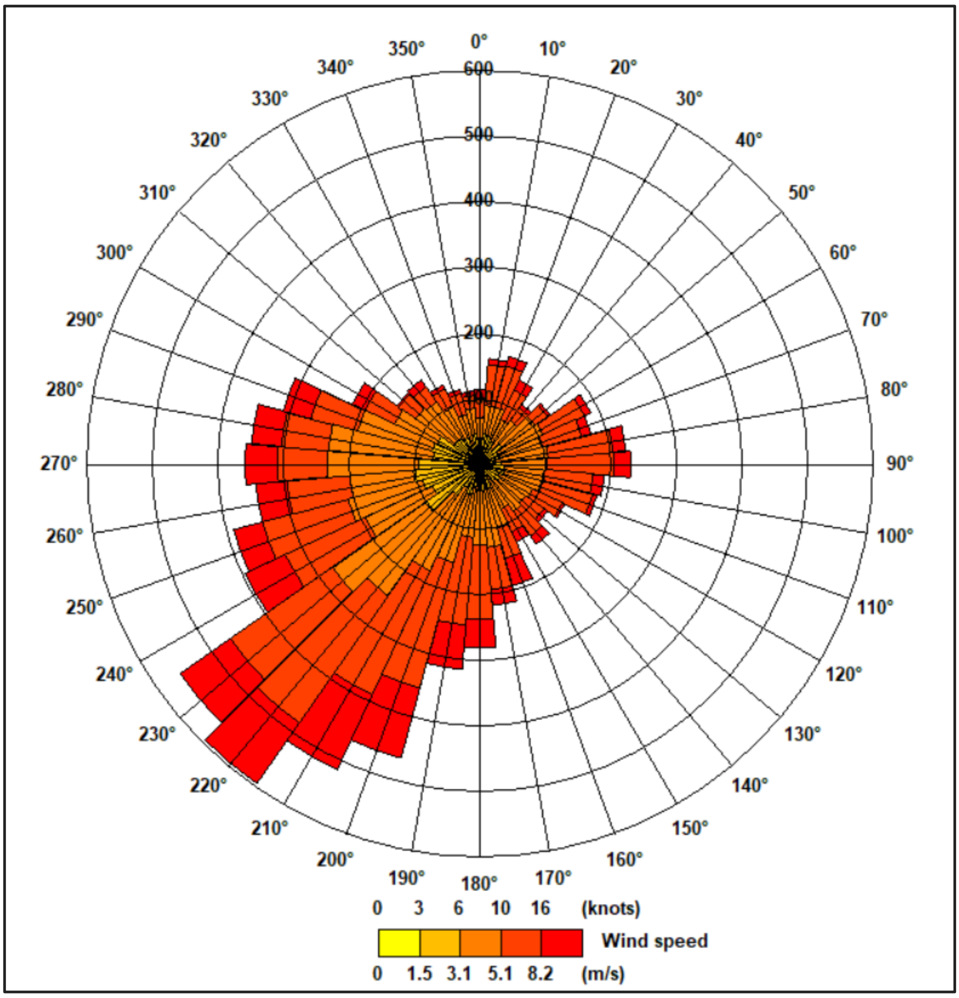

Figure 1-1
Windrose for Wainfleet Aut (2019)

1.3 Sensitive Receptors

1.3.1 Human Receptors

Human receptors considered in the assessment of emissions from peak construction phase road traffic volumes generated by the Project are detailed in Table 1-2.

Receptors are representative of worst-case exposure locations at existing residential properties relative to the extent of the affected road network (See Section 19.6 – 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.

The receptors have been grouped by Local Authority – East Lindsey District Council (ELDC), Boston Borough Council (BBC) or North Kesteven District Council (NKDC). Their locations are illustrated in Volume 1, Chapter 19: Onshore Air Quality Figure 19.2. Whilst the onshore PEIR boundary does not interact with NKDC, construction vehicle movements generated along the A17 are above the applied human screening thresholds and therefore require further assessment.

Human receptors have not been considered within South Holland District Council (SHDC). Construction vehicle movements generated along road links within SHDC do not require assessment, as fall below the relevant human screening thresholds. It is recognised that a OnSS option (Weston Marsh South) is located within SHDC – however, the extent of road traffic flows generated by construction activities do not require assessment, as vehicle movements fall below the relevant human screening thresholds. For example, the 24-hour AADT vehicle movements generated along the A17 (south of the River Welland - within SHDC) across all options considered is 76 LDVs and 86 HDVs. This is below the human screening thresholds relevant at this location (i.e. outside of an AQMA: 500 LDV and/or 100 HDV as 24-hour AADT).

It is recognised that the A17 (north of the River Welland) within BBC's jurisdiction has been modelled – as road traffic flows generated by onshore construction activities exceed the applied screening thresholds. This is due to the various construction accesses located north of the River Welland along the A17 causing a greater extent of localised vehicular traffic vs. south of the River Welland. The result of this is that the maximum vehicular flows generated by the construction phase of the Project fall above the threshold for assessment on the A17 to the north of the River Welland and below the threshold for assessment on the A17 to the south of the River Welland.

Table 1-2
Human Receptor Locations Considered

Receptor	X	Y	Height (m)
East Lindsey District Council			
R1	533718	384693	1.5
R2	533874	383262	1.5
R3	533975	382620	1.5
R4	534023	382266	1.5
R5	535510	379578	1.5
R6	535492	379545	1.5
R7	535700	379299	1.5
R8	536600	378228	1.5
R9	536816	377932	1.5
R10	538020	376995	1.5

Receptor	X	Y	Height (m)
R11	538054	376983	1.5
R12	538058	376942	1.5
R13	538137	376864	1.5
R14	538833	376412	1.5
R15	540261	374818	1.5
R16	540790	374428	1.5
R17	540281	368197	1.5
R18	540076	368312	1.5
R19	539810	368467	1.5
R20	539627	368499	1.5
R21	538407	368980	1.5
R22	538386	369016	1.5
R23	538361	369012	1.5
R24	538067	369258	1.5
R25	535233	369304	1.5
R26	535224	369340	1.5
R27	534817	369577	1.5
R28	534635	369611	1.5
R29	534537	369615	1.5
R30	534347	369619	1.5
R31	534160	369635	1.5
R32	529209	370009	1.5
R33	528683	369923	1.5
R34	528463	369936	1.5
R35	528395	369894	1.5
R36	527824	369836	1.5
R37	526996	369572	1.5
R38	526896	369528	1.5
R39	526767	369515	1.5
R40	526782	369539	1.5
R41	526443	369616	1.5
R42	526533	369579	1.5
R43	526228	369563	1.5
R44	526245	369583	1.5
R45	526081	369543	1.5
R46	540967	369372	1.5
R47	540678	370101	1.5

Receptor	X	Y	Height (m)
R48	540666	370230	1.5
R49	540698	370219	1.5
R50	540511	370885	1.5
R51	540388	371658	1.5
R52	540683	373403	1.5
R139	534528	347917	1.5
R140	534967	348722	1.5
R141	535222	349380	1.5
R142	535232	349515	1.5
R143	535284	350855	1.5
R144	535160	351203	1.5
R145	535144	351464	1.5
R146	535118	351781	1.5
R147	535161	351949	1.5
R148	535161	352145	1.5
R149	535140	352207	1.5
R150	535098	352836	1.5
R151	535057	352993	1.5
R152	534902	354752	1.5
R153	534456	356013	1.5
R154	534464	356122	1.5
R155	534428	356267	1.5
R156	534446	356332	1.5
R157	534367	356632	1.5
R158	534365	356737	1.5
R159	534343	356925	1.5
R160	534376	357339	1.5
R161	537403	363616	1.5
R162	537670	363635	1.5
R163	537737	363701	1.5
R164	537740	363928	1.5
R165	539699	365939	1.5
R166	539698	366493	1.5
R167	540560	367973	1.5
R168	542432	368073	1.5
R169	543624	367641	1.5
R170	544193	367474	1.5

Receptor	X	Y	Height (m)
R171	545670	367410	1.5
R172	545337	368754	1.5
R173	542073	372180	1.5
R174	541948	372567	1.5
R175	546907	367280	1.5
R176	553453	364567	1.5
R177	537737	363701	1.5
R178	554999	364451	1.5
R179	555200	364465	1.5
R180	555928	364257	1.5
R181	556448	363982	1.5
R182	556517	363972	1.5
R195	545724	353093	1.5
R196	546272	353095	1.5
R197	546807	353896	1.5
R198	547250	354205	1.5
R199	547945	355191	1.5
R200	548041	355286	1.5
R201	548682	356545	1.5
R202	549911	357672	1.5
R203	550863	360012	1.5
R204	550944	360168	1.5
R205	551744	360868	1.5
R206	551777	360926	1.5
R207	552681	361463	1.5
R208	553539	362046	1.5
R209	553806	362289	1.5
R210	554165	362678	1.5
R211	555360	363306	1.5
R212	555604	363302	1.5
R213	555687	363334	1.5
R214	555813	363359	1.5
R215	556364	363401	1.5
R216	556468	363616	1.5
R217	556548	363926	1.5
Boston Borough Council			
R53	529270	334030	1.5

Receptor	X	Y	Height (m)
R54	529512	333862	1.5
R55	529544	333806	1.5
R56	530893	333396	1.5
R57	531285	333200	1.5
R58	531608	332786	1.5
R59	531642	332642	1.5
R60	528713	334217	1.5
R61	524899	336826	1.5
R62	524704	336927	1.5
R63	524688	337015	1.5
R64	524630	337198	1.5
R65	524541	337634	1.5
R66	524500	337728	1.5
R67	522468	341583	1.5
R68	522301	342114	1.5
R69	522235	342222	1.5
R70	521815	342788	1.5
R71	521837	342835	1.5
R72	521744	342917	1.5
R73	521642	343017	1.5
R74	521697	343024	1.5
R75	521172	343428	1.5
R76	520822	343565	1.5
R90	529233	334751	1.5
R91	530061	336385	1.5
R92	530603	337580	1.5
R93	530564	337665	1.5
R94	530765	338091	1.5
R95	530837	338234	1.5
R96	530894	338407	1.5
R97	530995	338518	1.5
R98	530943	338495	1.5
R99	531092	338822	1.5
R100	531980	340843	1.5
R101	532491	341887	1.5
R102	532620	342325	1.5
R103	532601	342734	1.5

Receptor	X	Y	Height (m)
R104	532501	343139	1.5
R105	532467	343344	1.5
R106	532471	343611	1.5
R107	532545	343701	1.5
R108	532595	343660	1.5
R109	532558	343695	1.5
R110	532473	343738	1.5
R111	532512	343659	1.5
R112	532333	343846	1.5
R113	532161	343986	1.5
R114	532024	344052	1.5
R115	532039	344076	1.5
R116	531817	344041	1.5
R117	527493	343663	1.5
R118	526130	343763	1.5
R119	525410	343777	1.5
R120	525188	343721	1.5
R121	521806	343001	1.5
R122	532657	343690	1.5
R123	532860	343753	1.5
R124	532874	343798	1.5
R125	532977	344054	1.5
R126	533122	344505	1.5
R127	533111	344540	1.5
R128	533223	344627	1.5
R129	533249	344646	1.5
R130	533267	344629	1.5
R131	533884	345381	1.5
R132	533890	345430	1.5
R133	533919	345503	1.5
R134	533887	346415	1.5
R135	533927	346466	1.5
R136	534084	347146	1.5
R137	534129	347296	1.5
R138	534348	347590	1.5
R183	534040	345350	1.5
R184	536641	345055	1.5

Receptor	X	Y	Height (m)
R185	536941	345093	1.5
R186	537707	345420	1.5
R187	543028	351274	1.5
R188	543222	351261	1.5
R189	543443	351356	1.5
R190	543676	351469	1.5
R191	544034	351738	1.5
R192	544229	351935	1.5
R193	544298	352025	1.5
R194	544348	352051	1.5
R218	538134	348183	1.5
R219	538160	347894	1.5
R220	538203	347714	1.5
R221	538474	347126	1.5
R222	538820	346908	1.5
R223	539159	346857	1.5
R224	539439	346846	1.5
R225	544690	350655	1.5
R226	543968	351290	1.5
R227	531527	343944	1.5
North Kesteven District Council			
R77	520408	343759	1.5
R78	520243	343863	1.5
R79	519926	344028	1.5
R80	519691	344122	1.5
R81	519623	344152	1.5
R82	519602	344184	1.5
R83	518766	344449	1.5
R84	516298	344073	1.5
R85	516218	344104	1.5
R86	512624	344661	1.5
R87	511859	344675	1.5
R88	509795	345629	1.5
R89	506530	347334	1.5

1.3.2 Ecological Receptors

As documented in Volume 1, Chapter 19: Onshore Air Quality, Table 1-3 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 two Sites of Special Scientific Interest (SSSIs), one Local Nature Reserve (LNR) and 23 Local Wildlife Sites (LWS) / Lincolnshire Wildlife Trust reserves (LWT).

Their locations are illustrated in Volume 1, Chapter 19: Onshore Air Quality Figure 19.3.

Table 1-3
Sensitive Ecological Designations Considered Within the Modelling Assessment

ID	Name	Designation
ER4	Jenkins Carr	SSSI
ER5	Keal Carr	SSSI
ER6	South Thoresby Warren	LNR
ER7	A16 Road Verge, Burwell North	LWS
ER8	A16 Road Verge, Dalby Bar	LWS
ER9	A16 Road Verge, White Pit	LWS
ER10	A16 Road Verges, Green Man Plantation	LWS
ER12	Banovallum House	LWT
ER13	Bluestone Heath Road Verges, East	LWS
ER14	Calceby Beck, Furze Closes to A16	LWS
ER15	Callow Carr	LWS
ER18	Cowdyke Plantation	LWS
ER21	Gunby Meadow	LWS
ER22	Gunby Park	LWS
ER23	Hagworthingham Meadow	LWS
ER24	Hall Weir	LWS
ER26	Hobhole Drain, Baker's Bridge South	LWS
ER27	Horncastle Canal Grassland	LWS
ER29	Keal Carr, Keal Carr East and Keal Carr South	LWS / LWT
ER30	Ketsby Beck, Ketsby to Calceby	LWS
ER34	Pinfold Lane, White Pit	LWS
ER36	River Lymn (Partney Bridge to Mill Bridge)	LWS
ER37	Riverdale Meadow, Hagworthingham	LWS
ER39	South Forty Foot Drain	LWS
ER42	Thunker Hollow Road Verge	LWS
ER43	Vale Farm Meadow	LWS

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.

Details of baseline conditions for the above designations is provided in Section 2.0.

1.4 Background Datasets

1.4.1 Ambient Concentrations

In the absence of locally representative background monitoring sites, 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 1-4. The preference was to utilise the Defra supplied background concentration estimates for the purposes of the ecological road traffic modelling assessment rather than the Air Pollution Information System (APIS) datasets to maintain consistency with the verification procedure and incorporate the future projection of concentration estimates.

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.

As the relationship between NO_2 and nitrogen oxides (NO_x) is not linear, the NO_2 Adjustment for NO_x Sector Removal Tool[3] has been used – in accordance with LAQM.TG22.

Table 1-4
Defra Mapped Background Pollutant Concentrations

Grid Square (X, Y)	Year	Annual Mean Concentration (µg/m^3)			
		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
540500, 368500	2019	11.2	8.6	15.5	8.6
	2027	8.7	6.8	14.4	7.7

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

Grid Square (X, Y)	Year	Annual Mean Concentration (µg/m³)			
		NO_x	NO_2	PM_{10}	$PM_{2.5}$
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
529500, 334500	2019	11.2	8.7	16.9	9.4
	2027	8.3	6.5	15.8	8.5
529500, 333500	2019	10.5	8.1	16.7	9.3
	2027	7.9	6.2	15.6	8.4
530500, 333500	2019	10.6	8.2	16.8	9.4
	2027	8.0	6.3	15.8	8.5
531500, 333500	2019	10.3	8.0	16.5	9.2
	2027	7.9	6.2	15.5	8.4
531500, 332500	2019	10.6	8.2	16.8	9.4
	2027	8.0	6.3	15.8	8.5
528500, 334500	2019	10.9	8.4	17.1	9.5
	2027	8.1	6.4	16.0	8.6

Grid Square (X, Y)	Year	Annual Mean Concentration (µg/m^3)			
		NO_x	NO_2	PM_{10}	$PM_{2.5}$
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
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
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
531500, 338500	2019	11.1	8.5	16.3	9.2
	2027	8.5	6.7	15.2	8.3
531500, 340500	2019	12.1	9.2	16.6	9.3
	2027	9.2	7.2	15.5	8.4

Grid Square (X, Y)	Year	Annual Mean Concentration (µg/m^3)			
		NO_x	NO_2	PM_{10}	$PM_{2.5}$
532500, 341500	2019	13.0	9.9	16.1	9.2
	2027	9.9	7.7	15.0	8.3
532500, 342500	2019	17.1	12.6	15.4	9.3
	2027	13.0	9.8	14.3	8.4
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
531500, 344500	2019	13.2	10.0	14.7	9.2
	2027	10.2	7.9	13.6	8.3
527500, 343500	2019	10.6	8.2	16.1	8.9
	2027	8.1	6.4	15.1	8.1
526500, 343500	2019	10.6	8.1	16.2	9.0
	2027	8.1	6.4	15.1	8.1

1.4.2 Deposition Fluxes

Habitat specific background deposition rates have been obtained from the APIS website, based on the 1km grid squares which cover the modelled area. Further detail on these datasets can be found in Section 2.0.

1.5 Model Outputs

1.5.1 Ambient Concentrations

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.

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 1.4.1) 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)[4]. 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.

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.

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:

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

[4] Defra NO_x to NO_2 Calculator v8.1 (2020), available at https://laqm.defra.gov.uk/air-quality/air-quality-assessment/no2-adjustment-for-nox-sector-removal-tool/ [accessed April 2023].

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

Verification of the ADMS-Roads assessment has been undertaken as per Section 2.0. All results presented in the assessment are those calculated following the process of model verification, using an adjustment factor of 4.233.

1.5.2 Deposition Rates

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[5], which are subsequently recommended within the IAQM's ecological guidance.

In recognition of the NO_x to NO_2 non-linear relationship (facilitated by 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 1.0, as it is not considered appropriate to process individual contributions of NO_2 from different development aspects.

Road dry deposition fluxes were calculated using the following equation:

Dry deposition flux (µg/m²/s) = ground level concentration (µg/m³) x deposition velocity (m/s)

The applied deposition velocities for the relevant chemical species are provided in Table 1-5. These velocities vary, dependant on land use.

Table 1-5
Applied Deposition Velocities

Chemical Species	Recommended Deposition Velocity (m/s)	
NO_2	Grassland	0.0015
	Woodland	0.0300

Critical Loads – Nutrient Nitrogen

For the assessment of nutrient nitrogen, the predicted road deposition rates were converted from µg/m²/s to units of kgN/ha/year using a standard conversion factor of 95.9.

Critical Loads – Acidification

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/m²/s) by the standard conversion factor of 6.84.

The calculation of the process contribution of nitrogen to the critical load function has been carried out according to the guidance on APIS[6], to determine which compound is the primary contributor to acidity in the local setting, as evidenced in Figure 1-2, where:

- 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.

[5] AQTAG06 – Technical Guidance on detailed modelling approach for an appropriate assessment for emissions to air. Environment Agency, March 2014 version.
[6] http://www.apis.ac.uk/clf-guidance [accessed April 2023].

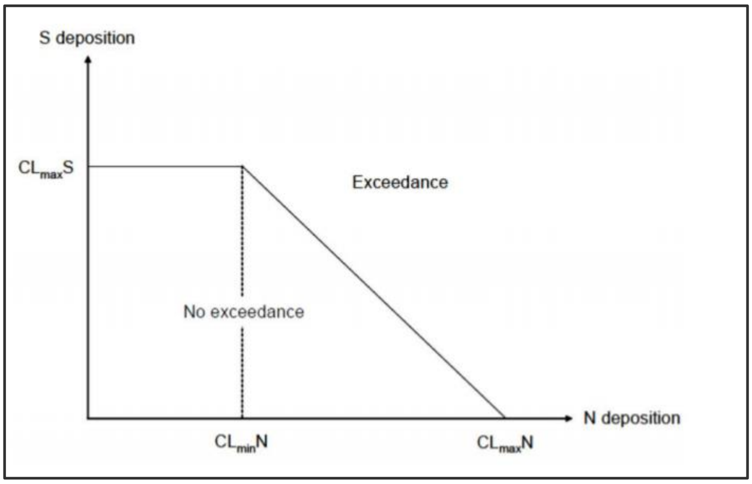

Figure 1-2
Acidification Critical Load Function

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 '$CL_{max}N$'.

1.6 Uncertainty

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 ELDC and BBC.

Following verification, all model output statistical parameters (used to evaluate model performance and uncertainty) are within LAQM.TG22 prescribed tolerances (Section 3.1).

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.

Furthermore, 2027 has been adopted for the purposes of assessing peak road traffic movements generated across the whole construction phase. This 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 in recognition of the forecasted reductions in vehicle emission factors and background pollutant concentrations (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.

2.0 Ecological Baseline Conditions

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.

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.

Where variables spatially vary (i.e. reported as 1km grid squares), worst case values reported across the whole assessed designation have been used (i.e. min Critical Loads/max background values). This approach assumes that the location of maximum impact coincides at the location of greatest sensitivity to facilitate a conservative assessment. Further detail is provided below.

2.1 Critical Levels

Table 2-1 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.

As discussed in Section 1.4.1, preference was to utilise the Defra supplied 1km background concentration estimates for the purposes of the ecological road traffic modelling assessment. These datasets have been adjusted as per Section 1.4.1.

Table 2-1
Baseline Annual Mean NO_x Critical Level Conditions at Ecological Receptors

Site*	NO_x Annual Mean Concentration (µg/m^3)	
	Critical Level	2027 Adjusted Defra (2018-Reference) Max Background
ER4	30	8.4
ER5	30	8.4
ER6	30	8.4
ER7	30	8.3
ER8	30	8.4
ER9	30	8.4
ER10	30	8.4
ER12	30	9.2
ER13	30	8.4
ER14	30	8.4
ER15	30	8.4
ER18	30	8.4
ER21	30	8.4
ER22	30	8.4

Site*	NO_x Annual Mean Concentration (µg/m^3)	
	Critical Level	2027 Adjusted Defra (2018-Reference) Max Background
ER23	30	8.4
ER24	30	8.3
ER26	30	8.9
ER27	30	9.2
ER29	30	8.4
ER30	30	8.4
ER34	30	8.5
ER36	30	8.6
ER37	30	8.4
ER39	30	7.7
ER42	30	8.4
ER43	30	8.5

Table note:
* Name and designation of each site is provided in Table 1-3.

2.2 Critical Loads

2.2.1 Nutrient Nitrogen

Table 2-2 details the applied baseline nutrient nitrogen Critical Load conditions at each assessed ecological designation. The maximum background dataset for each designation has been reported.

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).

The most sensitive habitat listed on APIS has been used to provide a worst-case assessment, documented below.

Table 2-2
Baseline Nutrient Nitrogen Critical Load Conditions at Ecological Receptors

Site*	Nitrogen Class/Habitat	Critical Load Range (Min – Max)	Critical Load Adopted	Max Background
		(kgN/ha/yr)		
ER4	Broadleaved Deciduous Woodland	10 - 20	10	40.2
ER5	Broadleaved Deciduous Woodland	10 - 20	10	40.1
ER6	Broadleaved, Mixed and Yew Woodland	10 - 20	10	33.1
ER7	Calcareous Grassland	15 - 25	15	20.2
ER8	Calcareous Grassland	15 - 25	15	20.7
ER9	Calcareous Grassland	15 - 25	15	19.7
ER10	Calcareous Grassland	15 - 25	15	19.7
ER12	Neutral Grassland	20 - 30	20	20.7

Site*	Nitrogen Class/Habitat	Critical Load Range (Min – Max)	Critical Load Adopted	Max Background
		(kgN/ha/yr)		
ER13	Broadleaved, Mixed and Yew Woodland	10 - 20	10	33.1
ER14	Fen, Marsh and Swamp	10 - 15	10	19.7
ER15	Broadleaved, Mixed and Yew Woodland	10 - 20	10	34.9
ER18	Broadleaved, Mixed and Yew Woodland	10 - 20	10	33.1
ER21	Neutral Grassland	20 - 30	20	21.4
ER22	Neutral Grassland	20 - 30	20	21.4
ER23	Acid Grassland	10 - 15	10	22.9
ER24	Broadleaved, Mixed and Yew Woodland	10 - 20	10	35.6
ER26	Calcareous Grassland	15 - 25	15	19.8
ER27	Neutral Grassland	20 - 30	20	20.7
ER29	Broadleaved, Mixed and Yew Woodland	10 - 20	10	41.8
ER30	Broadleaved, Mixed and Yew Woodland	10 - 20	10	33.1
ER34	Calcareous Grassland	15 - 25	15	19.7
ER36	Calcareous Grassland	15 - 25	15	21.8
ER37	Acid Grassland	10 - 15	10	22.9
ER39	Neutral Grassland	20 - 30	20	20.4
ER42	Calcareous Grassland	15 - 25	15	22.3
ER43	Neutral Grassland	20 - 30	20	22.9

Table note:
* Name and designation of each site is provided in Table 1-3.

2.2.2 Acidification

Table 2-3 details the applied baseline acidification Critical Load conditions at each assessed ecological designation. The maximum background dataset for each designation has been reported.

Acidification Critical Load are dependent on soil chemistry, as well as habitat type. In the UK, empirical Critical Load 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.

The most sensitive habitat listed on APIS has been used to provide a worst-case assessment, documented below.

Table 2-3
Baseline Acidification Critical Load Conditions at Ecological Receptors

Site*	Acidity Class/Habitat	Critical Load (Min)			Max Background	
		CLminN	CLmaxS	CLmaxN	N	S
		(keq/ha/yr)				
ER4	Acid grassland	0.14	0.43	0.65	2.85	0.16
ER5	Broadleaved/Coniferous Woodland	0.14	0.94	1.08	2.85	0.16

Site*	Acidity Class/Habitat	Critical Load (Min)			Max Background	
		CLminN	CLmaxS	CLmaxN	N	S
		(keq/ha/yr)				
ER6	Broadleaved, Mixed and Yew Woodland	0.14	1.54	1.69	2.36	0.18
ER7	Calcareous Grassland	0.86	4.00	4.86	1.44	0.16
ER8	Calcareous Grassland	0.86	4.00	4.86	1.48	0.14
ER9	Calcareous Grassland	0.46	4.00	4.86	1.41	0.15
ER10	Calcareous Grassland	0.86	4.00	4.86	1.41	0.15
ER12	Neutral Grassland	0.86	4.00	4.86	1.48	0.13
ER13	Calcareous Grassland	0.14	4.00	4.86	2.36	0.18
ER14	Not Sensitive	-	-	-	-	-
ER15	Broadleaved, Mixed and Yew Woodland	0.14	10.74	10.89	2.49	0.18
ER18	Broadleaved, Mixed and Yew Woodland	0.14	10.79	10.93	2.36	0.18
ER21	Neutral Grassland	1.07	4.00	5.07	1.52	0.14
ER22	Neutral Grassland	1.07	4.00	5.07	1.52	0.14
ER23	Acid Grassland	0.22	0.43	0.65	1.64	0.14
ER24	Broadleaved, Mixed and Yew Woodland	0.36	2.44	2.80	2.54	0.16
ER26	Calcareous Grassland	1.07	4.00	5.07	1.41	0.13
ER27	Neutral Grassland	0.86	4.00	4.86	1.48	0.13
ER29	Broadleaved, Mixed and Yew Woodland	0.14	0.94	1.08	2.98	0.15
ER30	Broadleaved, Mixed and Yew Woodland	0.36	1.42	1.78	2.36	0.18
ER34	Calcareous Grassland	0.86	4.00	4.86	1.41	0.15
ER36	Calcareous Grassland	1.07	4.00	5.07	1.56	0.13
ER37	Acid Grassland	0.22	0.43	0.65	1.64	0.14
ER39	Neutral Grassland	1.07	4.00	5.07	1.46	0.15
ER42	Calcareous Grassland	0.86	4.00	4.86	1.59	0.15
ER43	Neutral Grassland	1.07	4.00	5.07	1.64	0.14

Table note:
* Name and designation of each site is provided in Table 1-3.

3.0 Model Verification

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.

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.

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.

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 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 are not deemed to be representative of long-term baseline conditions and could lead to a systematic underprediction at modelled receptor locations.

3.1 NO_x/NO_2 Verification

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.

For NO_x/NO_2 model verification, 2019 LAQM BBC and ELDC monitoring data has been used for those roadside locations situated adjacent to a modelled link i.e. where traffic data exists (Table 3-1).

Table 3-1
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
BBC	3	532470	343736	46.5	100
BBC	4	532331	343848	39.8	100
BBC	5	532859	343760	34.8	92
BBC	16	532855	343719	30.1	100
BBC	17	532877	343690	30.5	83
BBC	8	533112	344476	31.3	100
BBC	9	533251	344642	37.0	100
BBC	20	532744	343719	41.6	100
BBC	12	532168	343987	28.9	100
BBC	21	532024	344060	29.0	100
BBC	14	533226	344624	35.8	100
BBC	22	532544	343702	35.9	67
ELDC	SK4	556380	363363	22.7	58
ELDC	SK1/SK2/SK3	556355	363295	28.7*	100
ELDC	H1	526075	369545	34.3	100

Local Authority	Site ID	X	Y	2019 Monitored NO_2 Concentration (µg/m^3)	2019 Data Capture (%)
ELDC	H2	526028	369528	25.9	92
ELDC	H4	526007	369585	25.0	100
BBC	18	532600	342737	33.8	100
BBC	19	532630	342760	27.5	100
Table note: *Represents a calculated mean 2019 concentration (given the triplicate location).					

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 facilitate the conversion of modelled road-NO_x (as output from the ADMS-Roads dispersion model) into road-NO_2.

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.

Initial comparison of the modelled vs. monitored road NO_x contribution at all relevant verification locations outlined in Table 3-1 is provided in Table 3-2. An initial adjustment factor of 4.043 has been derived, based on a linear regression forced through zero, as shown in Figure 3-1.

Table 3-2
NO_x/NO_2 Model Verification – Initial (4.043)

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	16.9	4.8	4.043	44.3	49.2	-10.0
3	73.8	15.9	4.6		42.7	46.5	-8.3
4	57.8	13.2	4.4		37.8	39.8	-5.0
5	46.5	12.7	3.7		36.9	34.8	6.1
16	36.3	5.3	6.8		22.9	30.1	-24.1
17	37.1	3.8	9.9		19.7	30.5	-35.6
8	39.5	10.0	3.9		31.8	31.3	1.4
9	52.0	13.2	3.9		37.6	37.0	1.6
20	62.0	12.5	5.0		36.6	41.6	-11.9
12	33.8	6.3	5.3		25.0	28.9	-13.7
21	34.0	6.3	5.4		24.9	29.0	-14.1
14	49.3	13.7	3.6		38.4	35.8	7.2
22	48.9	19.9	2.5		49.2	35.9	37.1
SK4	22.3	5.7	3.9		23.0	22.7	1.2
SK1/SK2/SK3	34.6	3.9	8.8		19.4	28.7	-32.5
H1	50.0	10.8	4.6		31.5	34.3	-8.3
H2	32.0	6.3	5.1		22.7	25.9	-12.3
H4	30.2	6.5	4.6		23.1	25.0	-7.6
18	43.8	14.5	3.0		40.3	33.8	19.3
19	30.4	8.0	3.8		28.4	27.5	3.1

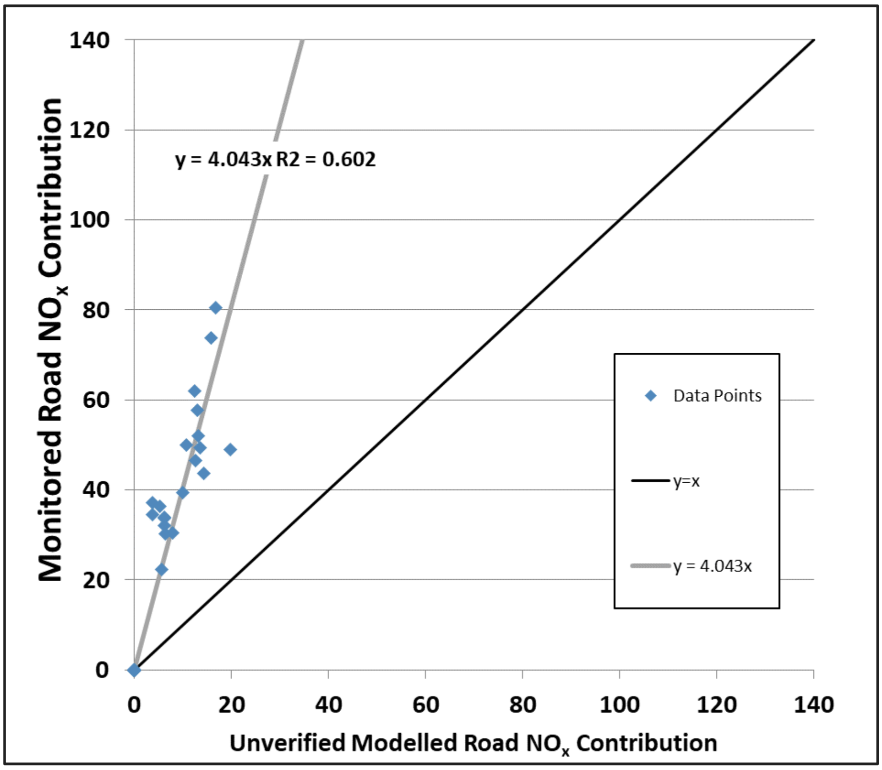

Figure 3-1
Comparison of Modelled vs. Monitored Road NO_x Contribution – Initial (4.043)

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%".*

The difference between modelled vs. monitored NO_2 concentrations was outside the 25% recommended tolerance at three locations (17, 22 and SK1/2/3), however inside 25% at the remaining seventeen locations and within the 10% ideal tolerance at eleven of these.

Although some of the modelled concentrations were within the LAQM.TG22 recommended tolerances at the majority of verification locations, there is a clear difference in model performance at others. For example, following adjustment with the initial factor (4.043), there are large underpredictions at monitors 16, 17 and SK1/2/3, and a large overprediction at monitor 22. A review of the monitoring locations (and surrounding modelled environments) was undertaken.

Upon review, monitors 16, 17, 22 and SK1/2/3 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 about 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; and

- ELDC monitor SK1/2/3 — 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 SK1/2/3, 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 SK1/2/3. 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.

The verification exercise was repeated with the above monitors removed. Comparison of the modelled vs. monitored road NO_x contributions for the remaining sixteen verification locations is provided in Table 3-3. An adjustment factor of 4.233 has been derived, based on a linear regression forced through zero, as shown in Figure 3-2. No further improvement to the ADMS-Roads dispersion model could be achieved.

Table 3-3
NO_x/NO_2 Model Verification – Final (4.233)

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	16.9	4.8	4.233	45.6	49.2	-7.3
3	73.8	15.9	4.6		43.9	46.5	-5.5
4	57.8	13.2	4.4		38.9	39.8	-2.3
5	46.5	12.7	3.7		38.0	34.8	9.2
8	39.5	10.0	3.9		32.6	31.3	4.2
9	52.0	13.2	3.9		38.7	37.0	4.6
20	62.0	12.5	5.0		37.7	41.6	-9.4
12	33.8	6.3	5.3		25.6	28.9	-11.6
21	34.0	6.3	5.4		25.5	29.0	-12.0
14	49.3	13.7	3.6		39.5	35.8	10.4
18	43.8	14.5	3.0		41.5	33.8	22.8
19	30.4	8.0	3.8		29.1	27.5	5.7
H1	50.0	10.8	4.6		32.4	34.3	-5.5
H2	32.0	6.3	5.1		23.3	25.9	-10.0
H4	30.2	6.5	4.6		23.7	25.0	-5.1
SK4	22.3	5.7	3.9		23.5	22.7	3.6

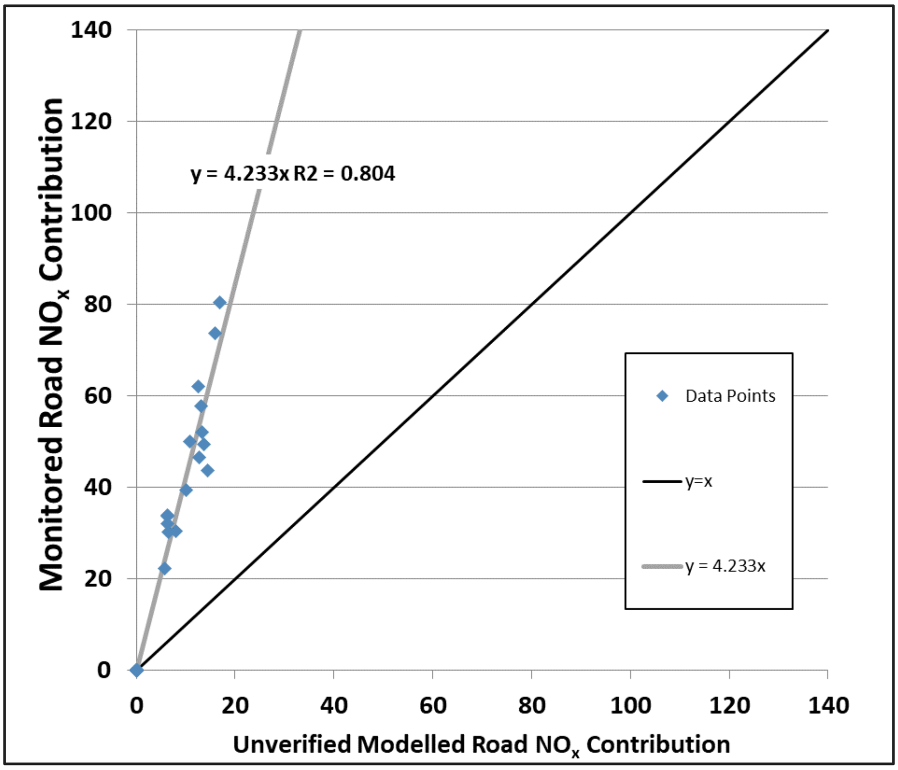

Figure 3-2
Comparison of Modelled vs. Monitored Road NO_x Contribution – Final (4.233)

As noted in Table 3-3, the difference between the adjusted modelled NO_2 and monitored NO_2 is within the ±25% recommended tolerance at all the verification locations, and within the 10% ideal LAQM.TG22 tolerance at twelve of these locations.

In addition, a verification factor of 4.233 reduces the Root Mean Square Error (RMSE) from a value of 17.9µg/m^3 to 3.2µg/m^3 – within the ideal LAQM.TG22 prescribed limit (10% of the annual mean AQAL). On this basis, the derived verification factor (4.233) was considered acceptable and was subsequently applied to all road-NO_x concentrations predicted (as output of the ADMS Roads dispersion model).

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

The adjustment factor of 4.233 has also been applied to road-PM_{10} and $PM_{2.5}$ concentrations (as output of the ADMS-Roads dispersion model) at all modelled receptor locations, following the recommendations of LAQM.TG22, in the absence of local particulate monitoring.

4.0 Modelling Results

4.1 Human Receptors

Results presented herein are the maximum associated with the modelled onshore ECC route options at each modelled receptor location. The results have been grouped by Local Authority – ELDC, BBC or NKDC.

4.1.1 NO_2 Modelling Results

Table 4-1 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.

Table 4-1
Predicted Annual Mean NO_2 Concentrations – 2027 Planned 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			
East Lindsey District Council						
R1	13.9	9.1	9.2	0.2	23.0	Negligible
R2	15.0	9.6	9.6	0.2	24.0	Negligible
R3	12.8	8.6	8.6	0.2	21.5	Negligible
R4	14.7	9.4	9.5	0.2	23.8	Negligible
R5	17.8	10.9	11.1	0.5	27.8	Negligible
R6	14.5	9.4	9.5	0.3	23.8	Negligible
R7	17.9	10.9	11.2	0.6	28.0	Negligible
R8	18.4	11.1	11.2	0.4	28.0	Negligible
R9	13.4	8.8	8.9	0.2	22.3	Negligible
R10	15.0	9.6	9.7	0.3	24.3	Negligible
R11	18.7	11.3	11.5	0.5	28.8	Negligible
R12	14.9	9.5	9.7	0.3	24.3	Negligible
R13	19.0	11.4	11.6	0.4	29.0	Negligible
R14	19.0	11.4	11.6	0.4	29.0	Negligible
R15	19.6	11.6	11.8	0.4	29.5	Negligible
R16	20.7	12.1	12.3	0.4	30.8	Negligible
R17	16.4	10.2	10.4	0.3	26.0	Negligible
R18	14.8	9.5	9.6	0.3	24.0	Negligible
R19	14.5	9.4	9.5	0.3	23.8	Negligible
R20	15.8	10.0	10.1	0.3	25.3	Negligible
R21	14.4	9.4	9.5	0.4	23.8	Negligible
R22	18.1	11.1	11.4	0.7	28.5	Negligible
R23	14.0	9.2	9.3	0.4	23.3	Negligible
R24	17.1	10.6	10.8	0.6	27.0	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			
R25	13.5	8.9	9.0	0.2	22.5	Negligible
R26	17.6	10.8	10.9	0.4	27.3	Negligible
R27	16.0	10.1	10.4	0.5	26.0	Negligible
R28	15.1	9.7	9.9	0.4	24.8	Negligible
R29	17.0	10.6	10.8	0.6	27.0	Negligible
R30	15.8	10.1	10.3	0.5	25.8	Negligible
R31	14.6	9.4	9.5	0.3	23.8	Negligible
R32	13.9	9.1	9.2	0.2	23.0	Negligible
R33	15.0	9.6	9.8	0.3	24.5	Negligible
R34	12.9	8.7	8.8	0.2	22.0	Negligible
R35	13.9	9.1	9.3	0.3	23.3	Negligible
R36	16.9	10.6	10.8	0.3	27.0	Negligible
R37	16.9	10.9	11.1	0.5	27.8	Negligible
R38	14.3	9.7	9.8	0.3	24.5	Negligible
R39	14.7	9.9	10.0	0.3	25.0	Negligible
R40	17.9	11.4	11.6	0.6	29.0	Negligible
R41	16.6	10.8	11.0	0.5	27.5	Negligible
R42	16.4	10.7	10.9	0.5	27.3	Negligible
R43	17.2	11.1	11.3	0.7	28.3	Negligible
R44	19.5	12.1	12.5	0.9	31.3	Negligible
R45	18.3	11.6	11.8	0.7	29.5	Negligible
R46	14.9	9.4	9.5	0.4	23.8	Negligible
R47	16.0	9.9	10.0	0.4	25.0	Negligible
R48	12.5	8.4	8.5	0.2	21.3	Negligible
R49	13.5	8.8	8.9	0.3	22.3	Negligible
R50	13.0	8.6	8.7	0.3	21.8	Negligible
R51	15.0	9.4	9.6	0.4	24.0	Negligible
R52	10.5	7.6	7.6	0.1	19.0	Negligible
R139	14.3	9.3	9.5	0.3	23.8	Negligible
R140	13.4	8.9	9.0	0.2	22.5	Negligible
R141	13.7	9.0	9.1	0.2	22.8	Negligible
R142	15.7	9.9	10.1	0.4	25.3	Negligible
R143	16.3	10.3	10.6	0.7	26.5	Negligible
R144	13.8	9.1	9.3	0.4	23.3	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			
R145	17.4	10.8	11.1	0.8	27.8	Negligible
R146	12.2	8.4	8.5	0.3	21.3	Negligible
R147	13.8	9.1	9.3	0.5	23.3	Negligible
R148	14.8	9.5	9.7	0.5	24.3	Negligible
R149	14.4	9.3	9.5	0.5	23.8	Negligible
R150	15.7	9.9	10.2	0.6	25.5	Negligible
R151	12.9	8.6	8.8	0.4	22.0	Negligible
R152	12.1	8.2	8.4	0.3	21.0	Negligible
R153	13.2	8.8	9.0	0.4	22.5	Negligible
R154	16.2	10.2	10.4	0.6	26.0	Negligible
R155	14.0	9.2	9.3	0.4	23.3	Negligible
R156	17.1	10.6	10.9	0.8	27.3	Negligible
R157	13.8	9.1	9.3	0.4	23.3	Negligible
R158	17.0	10.6	10.8	0.7	27.0	Negligible
R159	13.8	9.1	9.3	0.5	23.3	Negligible
R160	17.8	10.9	11.2	0.8	28.0	Negligible
R161	17.5	10.7	10.9	0.4	27.3	Negligible
R162	18.5	11.2	11.4	0.6	28.5	Negligible
R163	21.7	12.6	12.9	0.7	32.3	Negligible
R164	20.5	12.0	12.3	0.7	30.8	Negligible
R165	16.7	10.3	10.4	0.2	26.0	Negligible
R166	14.4	9.4	9.5	0.3	23.8	Negligible
R167	26.3	14.8	15.3	1.2	38.3	Negligible
R168	17.9	11.0	11.1	0.2	27.8	Negligible
R169	17.7	10.9	11.0	0.2	27.5	Negligible
R170	22.0	12.9	13.0	0.3	32.5	Negligible
R171	22.5	13.2	13.3	0.4	33.3	Negligible
R172	14.0	9.1	9.2	0.1	23.0	Negligible
R173	13.5	8.9	9.1	0.3	22.8	Negligible
R174	15.5	9.8	9.9	0.3	24.8	Negligible
R175	24.2	14.0	14.2	0.4	35.5	Negligible
R176	20.0	11.9	12.0	0.2	30.0	Negligible
R177	21.5	12.5	12.8	0.7	32.0	Negligible
R178	19.8	11.9	12.1	0.4	30.3	Negligible

Receptor	Predicted Annual Mean NO_2 Concentration (µg/m³)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R179	19.8	12.2	12.4	0.4	31.0	Negligible
R180	17.5	11.2	11.3	0.3	28.3	Negligible
R181	21.4	13.5	13.7	0.4	34.3	Negligible
R182	26.8	16.1	16.3	0.6	40.8	Negligible
R195	14.0	9.3	9.4	0.3	23.5	Negligible
R196	13.9	9.2	9.3	0.3	23.3	Negligible
R197	12.5	8.5	8.6	0.2	21.5	Negligible
R198	13.0	8.8	8.9	0.3	22.3	Negligible
R199	12.7	8.7	8.8	0.3	22.0	Negligible
R200	12.6	8.6	8.7	0.2	21.8	Negligible
R201	11.6	8.1	8.2	0.2	20.5	Negligible
R202	12.8	8.7	8.8	0.3	22.0	Negligible
R203	17.0	10.7	10.9	0.4	27.3	Negligible
R204	15.3	9.9	10.0	0.3	25.0	Negligible
R205	15.2	9.8	9.9	0.2	24.8	Negligible
R206	15.1	9.8	9.9	0.2	24.8	Negligible
R207	15.8	10.1	10.2	0.3	25.5	Negligible
R208	15.1	9.7	9.8	0.2	24.5	Negligible
R209	15.1	9.8	9.9	0.2	24.8	Negligible
R210	14.8	9.7	9.8	0.2	24.5	Negligible
R211	19.1	12.3	12.5	0.6	31.3	Negligible
R212	18.3	11.9	12.1	0.5	30.3	Negligible
R213	18.0	11.7	11.9	0.5	29.8	Negligible
R214	19.8	12.6	12.8	0.6	32.0	Negligible
R215	20.0	12.8	13.1	0.6	32.8	Negligible
R216	23.2	14.3	14.6	0.7	36.5	Negligible
R217	27.4	16.3	16.6	0.8	41.5	Negligible
Boston Borough Council						
R53	18.7	10.6	10.7	0.3	26.8	Negligible
R54	20.7	11.5	11.6	0.3	29.0	Negligible
R55	12.7	8.1	8.1	0.1	20.3	Negligible
R56	19.2	10.8	10.9	0.3	27.3	Negligible
R57	16.9	9.8	9.9	0.2	24.8	Negligible
R58	14.2	8.7	8.7	0.2	21.8	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			
R59	13.6	8.5	8.5	0.2	21.3	Negligible
R60	13.3	8.4	8.4	<0.1	21.0	Negligible
R61	14.2	8.7	8.8	0.1	22.0	Negligible
R62	11.7	7.7	7.7	<0.1	19.3	Negligible
R63	18.3	10.5	10.6	0.2	26.5	Negligible
R64	13.8	8.6	8.6	<0.1	21.5	Negligible
R65	17.3	10.0	10.1	0.2	25.3	Negligible
R66	15.0	9.1	9.1	0.1	22.8	Negligible
R67	12.3	8.0	8.1	<0.1	20.3	Negligible
R68	13.7	8.6	8.6	<0.1	21.5	Negligible
R69	14.3	8.8	8.8	0.1	22.0	Negligible
R70	12.8	8.2	8.2	0.1	20.5	Negligible
R71	16.1	9.6	9.6	0.2	24.0	Negligible
R72	17.0	9.9	10.0	0.2	25.0	Negligible
R73	17.5	10.2	10.3	0.2	25.8	Negligible
R74	19.2	10.9	11.0	0.2	27.5	Negligible
R75	32.8	17.0	17.1	0.3	42.8	Negligible
R76	28.6	15.0	15.1	0.3	37.8	Negligible
R90	15.5	9.5	9.5	<0.1	23.8	Negligible
R91	23.8	13.5	13.6	0.2	34.0	Negligible
R92	21.1	12.3	12.4	0.2	31.0	Negligible
R93	16.4	10.1	10.2	<0.1	25.5	Negligible
R94	19.8	11.9	11.9	0.1	29.8	Negligible
R95	23.4	13.6	13.6	0.2	34.0	Negligible
R96	30.9	17.4	17.5	0.4	43.8	Negligible
R97	27.9	15.8	15.9	0.2	39.8	Negligible
R98	24.9	14.3	14.4	0.2	36.0	Negligible
R99	19.8	11.8	11.8	0.1	29.5	Negligible
R100	19.6	11.9	11.9	0.1	29.8	Negligible
R101	26.1	15.1	15.2	0.2	38.0	Negligible
R102	27.4	16.6	16.7	0.2	41.8	Negligible
R103	54.0	30.4	30.7	0.6	76.8	Negligible
R104	27.3	16.8	16.9	0.2	42.3	Negligible
R105	26.6	16.4	16.5	0.2	41.3	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			
R106	24.2	15.2	15.3	0.2	38.3	Negligible
R107	53.7	29.6	29.9	0.7	74.8	Negligible
R108	38.4	21.9	22.1	0.3	55.3	Negligible
R109	61.1	33.6	33.9	0.7	84.8	Negligible
R110	32.3	18.9	19.1	0.5	47.8	Negligible
R111	40.2	22.9	23.1	0.4	57.8	Negligible
R112	26.4	16.1	16.2	0.4	40.5	Negligible
R113	29.2	17.4	17.6	0.4	44.0	Negligible
R114	25.5	15.6	15.7	0.3	39.3	Negligible
R115	32.1	18.7	18.9	0.5	47.3	Negligible
R116	27.8	16.1	16.2	0.3	40.5	Negligible
R117	16.8	10.1	10.2	0.1	25.5	Negligible
R118	17.7	10.5	10.6	0.1	26.5	Negligible
R119	15.5	9.5	9.5	<0.1	23.8	Negligible
R120	16.9	10.1	10.2	0.1	25.5	Negligible
R121	16.7	10.0	10.0	0.2	25.0	Negligible
R122	42.3	23.8	23.9	0.3	59.8	Negligible
R123	38.7	21.9	22.0	0.2	55.0	Negligible
R124	41.5	23.4	23.5	0.3	58.8	Negligible
R125	37.0	21.0	21.1	0.2	52.8	Negligible
R126	37.8	21.4	21.5	0.2	53.8	Negligible
R127	43.8	24.3	24.4	0.3	61.0	Negligible
R128	44.9	24.7	24.9	0.3	62.3	Negligible
R129	45.8	25.2	25.4	0.3	63.5	Negligible
R130	50.9	28.0	28.2	0.4	70.5	Negligible
R131	28.0	16.5	16.6	0.3	41.5	Negligible
R132	20.8	13.2	13.3	0.4	33.3	Negligible
R133	19.1	12.5	12.7	0.4	31.8	Negligible
R134	13.0	8.9	9.0	0.2	22.5	Negligible
R135	17.0	10.7	10.9	0.4	27.3	Negligible
R136	13.6	9.0	9.1	0.2	22.8	Negligible
R137	13.8	9.1	9.2	0.3	23.0	Negligible
R138	14.9	9.6	9.8	0.3	24.5	Negligible
R183	23.6	14.0	14.3	0.7	35.8	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			
R184	20.1	12.4	12.6	0.6	31.5	Negligible
R185	19.8	12.2	12.4	0.6	31.0	Negligible
R186	19.7	12.1	12.3	0.4	30.8	Negligible
R187	16.0	10.2	10.4	0.5	26.0	Negligible
R188	14.2	9.4	9.5	0.4	23.8	Negligible
R189	15.7	10.0	10.2	0.5	25.5	Negligible
R190	15.7	10.1	10.3	0.4	25.8	Negligible
R191	13.6	9.0	9.2	0.3	23.0	Negligible
R192	14.7	9.5	9.7	0.4	24.3	Negligible
R193	13.6	9.0	9.2	0.3	23.0	Negligible
R194	16.2	10.3	10.5	0.5	26.3	Negligible
R218	8.6	6.7	6.7	0.1	16.8	Negligible
R219	8.7	6.8	6.8	0.1	17.0	Negligible
R220	8.9	6.9	6.9	0.2	17.3	Negligible
R221	8.8	6.8	6.9	0.1	17.3	Negligible
R222	9.5	7.2	7.2	0.2	18.0	Negligible
R223	9.6	7.2	7.3	0.1	18.3	Negligible
R224	9.8	7.3	7.4	0.2	18.5	Negligible
R225	9.2	6.9	7.0	0.2	17.5	Negligible
R226	10.5	7.6	7.7	0.2	19.3	Negligible
R227	24.4	14.4	14.5	0.2	36.3	Negligible
North Kesteven District Council						
R77	29.3	15.3	15.4	0.3	38.5	Negligible
R78	35.6	18.2	18.4	0.4	46.0	Negligible
R79	30.8	16.0	16.1	0.3	40.3	Negligible
R80	27.9	14.7	14.8	0.3	37.0	Negligible
R81	27.8	14.7	14.8	0.2	37.0	Negligible
R82	34.0	17.4	17.6	0.3	44.0	Negligible
R83	30.9	16.0	16.1	0.3	40.3	Negligible
R84	27.7	14.6	14.7	0.2	36.8	Negligible
R85	34.1	17.5	17.6	0.3	44.0	Negligible
R86	21.2	11.7	11.8	0.2	29.5	Negligible
R87	19.3	10.9	10.9	0.1	27.3	Negligible
R88	39.9	20.3	20.4	0.3	51.0	Negligible

Receptor	Predicted Annual Mean NO_2 Concentration (µg/m³)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R89	20.7	11.7	11.7	0.1	29.3	Negligible

4.1.2 PM_{10} Modelling Results

Table 4-2 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.

Table 4-2
Predicted Annual Mean PM_{10} Concentrations – 2027 Planned Construction Year

Receptor	Predicted Annual Mean PM_{10} Concentration (µg/m³)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
East Lindsey District Council						
R1	16.4	15.4	15.5	0.2	38.8	Negligible
R2	16.6	15.5	15.6	0.3	39.0	Negligible
R3	16.1	15.1	15.2	0.2	38.0	Negligible
R4	15.9	14.9	15.0	0.3	37.5	Negligible
R5	16.9	15.8	16.0	0.4	40.0	Negligible
R6	16.3	15.3	15.4	0.3	38.5	Negligible
R7	16.9	15.9	16.1	0.4	40.3	Negligible
R8	17.0	15.9	16.1	0.4	40.3	Negligible
R9	16.0	15.0	15.1	0.2	37.8	Negligible
R10	16.2	15.2	15.3	0.3	38.3	Negligible
R11	16.9	15.8	16.0	0.5	40.0	Negligible
R12	16.2	15.2	15.3	0.3	38.3	Negligible
R13	16.9	15.9	16.1	0.5	40.3	Negligible
R14	16.9	15.9	16.1	0.5	40.3	Negligible
R15	17.2	16.1	16.3	0.5	40.8	Negligible
R16	17.3	16.2	16.5	0.5	41.3	Negligible
R17	16.6	15.5	15.7	0.4	39.3	Negligible
R18	16.4	15.3	15.4	0.3	38.5	Negligible
R19	16.6	15.5	15.7	0.3	39.3	Negligible
R20	16.8	15.7	15.9	0.4	39.8	Negligible
R21	16.6	15.6	15.7	0.3	39.3	Negligible
R22	17.2	16.2	16.4	0.6	41.0	Negligible
R23	16.6	15.5	15.7	0.3	39.3	Negligible
R24	17.0	16.0	16.2	0.5	40.5	Negligible
R25	16.4	15.3	15.4	0.3	38.5	Negligible

Receptor	Predicted Annual Mean PM_{10} Concentration ($\mu g/m^3$)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R26	17.0	15.9	16.1	0.5	40.3	Negligible
R27	17.0	16.0	16.1	0.4	40.3	Negligible
R28	16.8	15.8	16.0	0.4	40.0	Negligible
R29	17.1	16.1	16.3	0.5	40.8	Negligible
R30	17.0	15.9	16.1	0.4	40.3	Negligible
R31	16.7	15.6	15.7	0.3	39.3	Negligible
R32	16.5	15.4	15.5	0.3	38.8	Negligible
R33	16.8	15.7	15.8	0.3	39.5	Negligible
R34	16.5	15.4	15.5	0.2	38.8	Negligible
R35	16.7	15.6	15.7	0.3	39.3	Negligible
R36	17.2	16.0	16.2	0.4	40.5	Negligible
R37	16.1	15.0	15.2	0.4	38.0	Negligible
R38	15.7	14.6	14.7	0.3	36.8	Negligible
R39	15.8	14.7	14.8	0.3	37.0	Negligible
R40	16.3	15.2	15.4	0.5	38.5	Negligible
R41	16.1	15.0	15.1	0.4	37.8	Negligible
R42	16.1	15.0	15.1	0.4	37.8	Negligible
R43	16.1	15.0	15.1	0.4	37.8	Negligible
R44	16.4	15.3	15.5	0.5	38.8	Negligible
R45	16.1	15.0	15.2	0.3	38.0	Negligible
R46	15.9	14.8	15.0	0.4	37.5	Negligible
R47	16.5	15.4	15.6	0.5	39.0	Negligible
R48	16.0	14.9	15.1	0.3	37.8	Negligible
R49	16.2	15.1	15.2	0.3	38.0	Negligible
R50	16.1	15.0	15.1	0.3	37.8	Negligible
R51	16.2	15.1	15.3	0.4	38.3	Negligible
R52	15.9	14.9	14.9	0.1	37.3	Negligible
R139	17.1	16.0	16.1	0.3	40.3	Negligible
R140	16.9	15.9	16.0	0.2	40.0	Negligible
R141	17.0	15.9	16.1	0.3	40.3	Negligible
R142	17.3	16.3	16.4	0.4	41.0	Negligible
R143	16.1	15.1	15.2	0.4	38.0	Negligible
R144	17.1	16.0	16.1	0.2	40.3	Negligible
R145	17.6	16.6	16.8	0.4	42.0	Negligible

Receptor	Predicted Annual Mean PM_{10} Concentration (µg/m³)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R146	16.9	15.8	15.9	0.2	39.8	Negligible
R147	17.1	16.0	16.1	0.2	40.3	Negligible
R148	17.0	16.0	16.1	0.3	40.3	Negligible
R149	17.0	15.9	16.0	0.3	40.0	Negligible
R150	17.1	16.1	16.2	0.3	40.5	Negligible
R151	16.7	15.7	15.8	0.2	39.5	Negligible
R152	16.5	15.4	15.5	0.2	38.8	Negligible
R153	16.5	15.4	15.5	0.2	38.8	Negligible
R154	16.9	15.9	16.0	0.4	40.0	Negligible
R155	16.6	15.5	15.6	0.3	39.0	Negligible
R156	17.0	16.0	16.2	0.4	40.5	Negligible
R157	16.6	15.5	15.6	0.3	39.0	Negligible
R158	17.0	16.0	16.1	0.4	40.3	Negligible
R159	16.6	15.5	15.6	0.3	39.0	Negligible
R160	17.1	16.0	16.2	0.4	40.5	Negligible
R161	17.8	16.7	16.9	0.3	42.3	Negligible
R162	17.9	16.8	16.9	0.3	42.3	Negligible
R163	18.4	17.2	17.4	0.4	43.5	Negligible
R164	18.2	17.1	17.2	0.4	43.0	Negligible
R165	16.8	15.7	15.8	0.2	39.5	Negligible
R166	16.6	15.5	15.6	0.2	39.0	Negligible
R167	18.0	16.9	17.1	0.6	42.8	Negligible
R168	16.4	15.3	15.4	0.2	38.5	Negligible
R169	16.1	15.0	15.1	0.2	37.8	Negligible
R170	16.2	15.1	15.3	0.3	38.3	Negligible
R171	16.9	15.8	15.9	0.3	39.8	Negligible
R172	15.9	14.8	14.9	0.2	37.3	Negligible
R173	16.0	15.0	15.1	0.2	37.8	Negligible
R174	16.6	15.5	15.6	0.3	39.0	Negligible
R175	16.4	15.3	15.4	0.4	38.5	Negligible
R176	16.0	14.9	15.0	0.2	37.5	Negligible
R177	18.3	17.2	17.4	0.4	43.5	Negligible
R178	16.2	15.1	15.3	0.3	38.3	Negligible
R179	15.7	14.5	14.6	0.2	36.5	Negligible

Receptor	Predicted Annual Mean PM_{10} Concentration (µg/m³)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R180	15.3	14.2	14.3	0.2	35.8	Negligible
R181	14.8	13.7	13.8	0.2	34.5	Negligible
R182	15.9	14.8	15.0	0.4	37.5	Negligible
R195	17.0	16.0	16.1	0.3	40.3	Negligible
R196	16.4	15.4	15.5	0.3	38.8	Negligible
R197	16.2	15.2	15.3	0.2	38.3	Negligible
R198	16.6	15.6	15.7	0.2	39.3	Negligible
R199	15.0	14.0	14.1	0.2	35.3	Negligible
R200	15.4	14.4	14.5	0.2	36.3	Negligible
R201	15.8	14.8	14.9	0.2	37.3	Negligible
R202	16.6	15.5	15.6	0.2	39.0	Negligible
R203	15.8	14.8	14.9	0.3	37.3	Negligible
R204	15.6	14.5	14.6	0.3	36.5	Negligible
R205	16.5	15.5	15.6	0.2	39.0	Negligible
R206	16.5	15.4	15.5	0.2	38.8	Negligible
R207	16.4	15.3	15.4	0.3	38.5	Negligible
R208	15.8	14.8	14.9	0.2	37.3	Negligible
R209	15.8	14.8	14.9	0.2	37.3	Negligible
R210	15.8	14.8	14.9	0.2	37.3	Negligible
R211	15.9	14.4	14.6	0.4	36.5	Negligible
R212	15.8	14.3	14.4	0.3	36.0	Negligible
R213	15.7	14.2	14.3	0.3	35.8	Negligible
R214	16.1	14.6	14.7	0.4	36.8	Negligible
R215	14.2	13.1	13.2	0.2	33.0	Negligible
R216	15.0	13.9	14.1	0.4	35.3	Negligible
R217	15.9	14.8	14.9	0.4	37.3	Negligible
Boston Borough Council						
R53	18.7	17.6	17.7	0.2	44.3	Negligible
R54	18.9	17.8	17.9	0.3	44.8	Negligible
R55	17.5	16.4	16.5	0.1	41.3	Negligible
R56	18.8	17.7	17.8	0.3	44.5	Negligible
R57	18.1	17.0	17.0	0.2	42.5	Negligible
R58	17.9	16.9	16.9	0.1	42.3	Negligible
R59	17.9	16.8	16.8	0.1	42.0	Negligible

Receptor	Predicted Annual Mean PM_{10} Concentration (µg/m³)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R60	18.0	16.9	17.0	0.1	42.5	Negligible
R61	17.4	16.3	16.4	0.1	41.0	Negligible
R62	17.0	15.9	15.9	<0.1	39.8	Negligible
R63	18.4	17.3	17.4	0.2	43.5	Negligible
R64	17.7	16.6	16.6	0.1	41.5	Negligible
R65	18.2	17.2	17.2	0.2	43.0	Negligible
R66	17.9	16.8	16.8	0.2	42.0	Negligible
R67	17.1	16.0	16.1	<0.1	40.3	Negligible
R68	17.2	16.1	16.2	0.1	40.5	Negligible
R69	17.3	16.2	16.3	0.1	40.8	Negligible
R70	17.0	15.9	16.0	0.1	40.0	Negligible
R71	17.6	16.5	16.6	0.2	41.5	Negligible
R72	17.7	16.6	16.7	0.2	41.8	Negligible
R73	18.0	17.0	17.0	0.1	42.5	Negligible
R74	18.3	17.3	17.3	0.2	43.3	Negligible
R75	21.1	20.0	20.1	0.4	50.3	Negligible
R76	20.3	19.2	19.3	0.3	48.3	Negligible
R90	18.0	16.9	16.9	<0.1	42.3	Negligible
R91	18.8	17.6	17.7	0.2	44.3	Negligible
R92	18.5	17.4	17.4	0.1	43.5	Negligible
R93	17.8	16.7	16.7	<0.1	41.8	Negligible
R94	16.8	15.7	15.7	0.1	39.3	Negligible
R95	17.4	16.2	16.3	0.2	40.8	Negligible
R96	18.4	17.2	17.3	0.2	43.3	Negligible
R97	18.1	16.9	17.0	0.1	42.5	Negligible
R98	17.6	16.4	16.5	0.1	41.3	Negligible
R99	17.9	16.8	16.8	<0.1	42.0	Negligible
R100	18.1	17.0	17.0	<0.1	42.5	Negligible
R101	19.2	18.2	18.3	0.1	45.8	Negligible
R102	18.4	17.3	17.4	0.1	43.5	Negligible
R103	24.0	23.0	23.1	0.3	57.8	Negligible
R104	18.6	17.5	17.5	0.1	43.8	Negligible
R105	18.4	17.3	17.3	0.1	43.3	Negligible
R106	17.7	16.4	16.5	<0.1	41.3	Negligible

Receptor	Predicted Annual Mean PM_{10} Concentration (µg/m³)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R107	23.5	22.2	22.3	0.3	55.8	Negligible
R108	20.6	19.4	19.5	0.2	48.8	Negligible
R109	25.7	24.5	24.6	0.4	61.5	Negligible
R110	18.5	17.2	17.3	0.2	43.3	Negligible
R111	20.7	19.5	19.6	0.2	49.0	Negligible
R112	17.5	16.2	16.2	0.1	40.5	Negligible
R113	17.9	16.6	16.6	0.1	41.5	Negligible
R114	17.2	16.0	16.1	0.1	40.3	Negligible
R115	18.4	17.2	17.3	0.2	43.3	Negligible
R116	18.1	16.9	17.0	0.2	42.5	Negligible
R117	17.4	16.3	16.4	0.1	41.0	Negligible
R118	17.6	16.5	16.5	0.1	41.3	Negligible
R119	17.2	16.1	16.2	<0.1	40.5	Negligible
R120	17.4	16.3	16.4	0.1	41.0	Negligible
R121	17.8	16.8	16.8	0.1	42.0	Negligible
R122	21.9	20.7	20.8	0.2	52.0	Negligible
R123	21.0	19.8	19.9	0.1	49.8	Negligible
R124	21.8	20.5	20.6	0.2	51.5	Negligible
R125	20.6	19.5	19.5	0.2	48.8	Negligible
R126	20.0	18.8	18.9	0.1	47.3	Negligible
R127	21.3	20.1	20.1	0.1	50.3	Negligible
R128	21.6	20.3	20.4	0.2	51.0	Negligible
R129	21.9	20.7	20.8	0.2	52.0	Negligible
R130	23.2	22.1	22.2	0.2	55.5	Negligible
R131	18.3	17.1	17.2	0.2	43.0	Negligible
R132	16.9	15.7	15.8	0.3	39.5	Negligible
R133	16.6	15.5	15.6	0.3	39.0	Negligible
R134	17.0	15.9	16.0	0.2	40.0	Negligible
R135	17.7	16.6	16.7	0.4	41.8	Negligible
R136	17.0	15.9	16.0	0.2	40.0	Negligible
R137	17.0	16.0	16.1	0.3	40.3	Negligible
R138	17.2	16.1	16.3	0.3	40.8	Negligible
R183	18.9	17.9	18.1	0.6	45.3	Negligible
R184	18.3	17.2	17.4	0.5	43.5	Negligible

Receptor	Predicted Annual Mean PM_{10} Concentration ($\mu g/m^3$)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R185	18.2	17.2	17.3	0.4	43.3	Negligible
R186	18.5	17.4	17.5	0.3	43.8	Negligible
R187	17.0	16.0	16.1	0.3	40.3	Negligible
R188	16.8	15.8	15.8	0.2	39.5	Negligible
R189	17.0	16.0	16.1	0.3	40.3	Negligible
R190	17.1	16.1	16.2	0.3	40.5	Negligible
R191	16.3	15.3	15.4	0.2	38.5	Negligible
R192	16.5	15.5	15.6	0.3	39.0	Negligible
R193	16.9	15.9	16.0	0.2	40.0	Negligible
R194	17.3	16.3	16.5	0.3	41.3	Negligible
R218	16.1	15.1	15.1	0.1	37.8	Negligible
R219	16.2	15.1	15.2	<0.1	38.0	Negligible
R220	16.2	15.1	15.2	0.2	38.0	Negligible
R221	16.2	15.1	15.2	0.1	38.0	Negligible
R222	16.4	15.3	15.4	0.2	38.5	Negligible
R223	16.6	15.5	15.6	0.1	39.0	Negligible
R224	16.6	15.5	15.6	0.2	39.0	Negligible
R225	16.0	15.0	15.0	0.2	37.5	Negligible
R226	16.2	15.2	15.3	0.2	38.3	Negligible
R227	17.2	16.1	16.2	0.1	40.5	Negligible
North Kesteven District Council						
R77	20.5	19.3	19.4	0.3	48.5	Negligible
R78	21.8	20.6	20.8	0.4	52.0	Negligible
R79	20.8	19.6	19.8	0.3	49.5	Negligible
R80	20.2	19.1	19.2	0.3	48.0	Negligible
R81	20.2	19.1	19.2	0.3	48.0	Negligible
R82	21.5	20.3	20.4	0.4	51.0	Negligible
R83	20.8	19.6	19.8	0.3	49.5	Negligible
R84	20.2	19.1	19.2	0.3	48.0	Negligible
R85	21.5	20.3	20.5	0.4	51.3	Negligible
R86	18.9	17.8	17.9	0.2	44.8	Negligible
R87	18.4	17.3	17.4	0.2	43.5	Negligible
R88	21.3	20.0	20.1	0.4	50.3	Negligible
R89	18.8	17.6	17.7	0.1	44.3	Negligible

4.1.3 $PM_{2.5}$ Modelling Results

Table 4-3 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.

Table 4-3
Predicted Annual Mean $PM_{2.5}$ Concentrations – 2027 Planned 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			
East Lindsey District Council						
R1	9.1	8.2	8.3	0.2	33.2	Negligible
R2	9.1	8.3	8.3	0.2	33.2	Negligible
R3	8.9	8.0	8.1	0.2	32.4	Negligible
R4	8.9	8.1	8.1	0.2	32.4	Negligible
R5	9.4	8.6	8.7	0.4	34.8	Negligible
R6	9.1	8.3	8.3	0.3	33.2	Negligible
R7	9.5	8.6	8.7	0.4	34.8	Negligible
R8	9.5	8.6	8.7	0.4	34.8	Negligible
R9	8.9	8.0	8.1	0.2	32.4	Negligible
R10	9.1	8.3	8.3	0.3	33.2	Negligible
R11	9.5	8.6	8.7	0.4	34.8	Negligible
R12	9.1	8.3	8.3	0.3	33.2	Negligible
R13	9.6	8.7	8.8	0.5	35.2	Negligible
R14	9.5	8.6	8.8	0.5	35.2	Negligible
R15	9.6	8.6	8.7	0.4	34.8	Negligible
R16	9.7	8.7	8.8	0.5	35.2	Negligible
R17	9.3	8.4	8.4	0.4	33.6	Negligible
R18	9.1	8.2	8.3	0.3	33.2	Negligible
R19	9.2	8.3	8.4	0.3	33.6	Negligible
R20	9.3	8.4	8.5	0.3	34.0	Negligible
R21	9.2	8.3	8.4	0.3	33.6	Negligible
R22	9.6	8.7	8.8	0.5	35.2	Negligible
R23	9.2	8.3	8.4	0.3	33.6	Negligible
R24	9.5	8.6	8.7	0.4	34.8	Negligible
R25	9.1	8.2	8.2	0.2	32.8	Negligible
R26	9.4	8.5	8.6	0.4	34.4	Negligible
R27	9.4	8.6	8.7	0.4	34.8	Negligible
R28	9.3	8.5	8.6	0.3	34.4	Negligible
R29	9.5	8.6	8.8	0.4	35.2	Negligible

Receptor	Predicted Annual Mean $PM_{2.5}$ Concentration (µg/m³)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R30	9.4	8.5	8.6	0.4	34.4	Negligible
R31	9.2	8.4	8.4	0.3	33.6	Negligible
R32	9.1	8.2	8.3	0.2	33.2	Negligible
R33	9.3	8.4	8.4	0.3	33.6	Negligible
R34	9.1	8.2	8.3	0.2	33.2	Negligible
R35	9.2	8.3	8.4	0.3	33.6	Negligible
R36	9.6	8.6	8.7	0.4	34.8	Negligible
R37	9.5	8.6	8.7	0.4	34.8	Negligible
R38	9.3	8.4	8.4	0.2	33.6	Negligible
R39	9.3	8.4	8.5	0.3	34.0	Negligible
R40	9.6	8.7	8.8	0.4	35.2	Negligible
R41	9.5	8.6	8.7	0.4	34.8	Negligible
R42	9.5	8.6	8.7	0.4	34.8	Negligible
R43	9.5	8.6	8.7	0.3	34.8	Negligible
R44	9.7	8.8	8.9	0.5	35.6	Negligible
R45	9.5	8.6	8.7	0.3	34.8	Negligible
R46	9.0	8.1	8.2	0.4	32.8	Negligible
R47	9.2	8.3	8.4	0.5	33.6	Negligible
R48	8.9	8.0	8.1	0.2	32.4	Negligible
R49	9.0	8.1	8.2	0.3	32.8	Negligible
R50	8.9	8.0	8.1	0.3	32.4	Negligible
R51	9.1	8.2	8.3	0.4	33.2	Negligible
R52	8.7	7.9	7.9	0.1	31.6	Negligible
R139	9.6	8.7	8.7	0.3	34.8	Negligible
R140	9.4	8.6	8.6	0.2	34.4	Negligible
R141	9.5	8.6	8.7	0.2	34.8	Negligible
R142	9.7	8.8	8.9	0.3	35.6	Negligible
R143	9.4	8.5	8.6	0.3	34.4	Negligible
R144	9.4	8.5	8.6	0.2	34.4	Negligible
R145	9.7	8.8	8.9	0.4	35.6	Negligible
R146	9.3	8.4	8.4	0.2	33.6	Negligible
R147	9.4	8.5	8.6	0.2	34.4	Negligible
R148	9.4	8.6	8.6	0.3	34.4	Negligible
R149	9.4	8.5	8.6	0.3	34.4	Negligible

Receptor	Predicted Annual Mean $PM_{2.5}$ Concentration (µg/m³)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R150	9.5	8.6	8.7	0.3	34.8	Negligible
R151	9.3	8.4	8.4	0.2	33.6	Negligible
R152	9.1	8.3	8.3	0.2	33.2	Negligible
R153	9.2	8.4	8.4	0.2	33.6	Negligible
R154	9.5	8.6	8.7	0.3	34.8	Negligible
R155	9.3	8.4	8.5	0.2	34.0	Negligible
R156	9.6	8.7	8.8	0.4	35.2	Negligible
R157	9.3	8.4	8.5	0.2	34.0	Negligible
R158	9.6	8.7	8.8	0.4	35.2	Negligible
R159	9.3	8.4	8.5	0.2	34.0	Negligible
R160	9.6	8.7	8.8	0.4	35.2	Negligible
R161	9.7	8.7	8.8	0.3	35.2	Negligible
R162	9.7	8.8	8.8	0.3	35.2	Negligible
R163	10.0	9.0	9.1	0.4	36.4	Negligible
R164	9.9	8.9	9.0	0.3	36.0	Negligible
R165	9.4	8.5	8.5	0.2	34.0	Negligible
R166	9.3	8.4	8.4	0.2	33.6	Negligible
R167	10.1	9.1	9.3	0.5	37.2	Negligible
R168	9.3	8.4	8.4	0.2	33.6	Negligible
R169	9.2	8.3	8.3	0.2	33.2	Negligible
R170	9.5	8.5	8.6	0.3	34.4	Negligible
R171	9.7	8.8	8.8	0.3	35.2	Negligible
R172	8.9	8.0	8.1	0.2	32.4	Negligible
R173	8.9	8.0	8.1	0.2	32.4	Negligible
R174	9.2	8.3	8.3	0.2	33.2	Negligible
R175	9.6	8.6	8.7	0.4	34.8	Negligible
R176	9.4	8.4	8.5	0.2	34.0	Negligible
R177	10.0	9.0	9.1	0.4	36.4	Negligible
R178	9.6	8.7	8.7	0.2	34.8	Negligible
R179	9.8	8.8	8.9	0.2	35.6	Negligible
R180	9.6	8.7	8.7	0.2	34.8	Negligible
R181	9.6	8.7	8.7	0.2	34.8	Negligible
R182	10.3	9.3	9.4	0.3	37.6	Negligible
R195	9.4	8.6	8.6	0.3	34.4	Negligible

Receptor	Predicted Annual Mean $PM_{2.5}$ Concentration (µg/m³)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R196	9.3	8.4	8.5	0.3	34.0	Negligible
R197	9.2	8.3	8.4	0.2	33.6	Negligible
R198	9.3	8.4	8.5	0.2	34.0	Negligible
R199	8.9	8.0	8.0	0.2	32.0	Negligible
R200	8.9	8.1	8.1	0.2	32.4	Negligible
R201	9.0	8.1	8.2	0.1	32.8	Negligible
R202	9.3	8.4	8.5	0.2	34.0	Negligible
R203	9.3	8.4	8.4	0.3	33.6	Negligible
R204	9.1	8.2	8.3	0.2	33.2	Negligible
R205	9.3	8.4	8.5	0.2	34.0	Negligible
R206	9.3	8.4	8.5	0.2	34.0	Negligible
R207	9.3	8.4	8.5	0.2	34.0	Negligible
R208	9.1	8.2	8.3	0.2	33.2	Negligible
R209	9.1	8.2	8.3	0.2	33.2	Negligible
R210	9.2	8.3	8.3	0.2	33.2	Negligible
R211	10.1	8.8	8.9	0.3	35.6	Negligible
R212	10.0	8.7	8.8	0.3	35.2	Negligible
R213	10.0	8.7	8.7	0.3	34.8	Negligible
R214	10.2	8.9	9.0	0.3	36.0	Negligible
R215	9.3	8.3	8.4	0.2	33.6	Negligible
R216	9.7	8.8	8.8	0.3	35.2	Negligible
R217	10.2	9.3	9.3	0.3	37.2	Negligible
Boston Borough Council						
R53	10.5	9.5	9.6	0.2	38.4	Negligible
R54	10.6	9.6	9.7	0.3	38.8	Negligible
R55	9.8	8.9	8.9	<0.1	35.6	Negligible
R56	10.6	9.6	9.6	0.2	38.4	Negligible
R57	10.2	9.2	9.3	0.2	37.2	Negligible
R58	10.0	9.1	9.1	0.1	36.4	Negligible
R59	10.0	9.1	9.1	0.1	36.4	Negligible
R60	10.0	9.1	9.2	0.1	36.8	Negligible
R61	9.7	8.8	8.8	0.1	35.2	Negligible
R62	9.4	8.6	8.6	<0.1	34.4	Negligible
R63	10.3	9.3	9.4	0.2	37.6	Negligible

Receptor	Predicted Annual Mean $PM_{2.5}$ Concentration (µg/m³)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R64	9.8	8.9	8.9	0.1	35.6	Negligible
R65	10.2	9.2	9.3	0.2	37.2	Negligible
R66	9.9	9.0	9.1	0.1	36.4	Negligible
R67	9.4	8.6	8.6	<0.1	34.4	Negligible
R68	9.5	8.6	8.6	0.1	34.4	Negligible
R69	9.6	8.7	8.7	0.1	34.8	Negligible
R70	9.4	8.5	8.5	<0.1	34.0	Negligible
R71	9.7	8.8	8.9	0.2	35.6	Negligible
R72	9.8	8.9	9.0	0.2	36.0	Negligible
R73	10.0	9.1	9.1	0.1	36.4	Negligible
R74	10.2	9.3	9.3	0.1	37.2	Negligible
R75	11.9	10.8	10.9	0.3	43.6	Negligible
R76	11.4	10.3	10.4	0.3	41.6	Negligible
R90	10.1	9.1	9.2	<0.1	36.8	Negligible
R91	10.6	9.6	9.6	0.2	38.4	Negligible
R92	10.4	9.4	9.5	0.1	38.0	Negligible
R93	10.0	9.0	9.1	<0.1	36.4	Negligible
R94	10.0	9.0	9.1	0.1	36.4	Negligible
R95	10.3	9.3	9.4	0.1	37.6	Negligible
R96	11.0	9.9	10.0	0.2	40.0	Negligible
R97	10.8	9.8	9.8	0.1	39.2	Negligible
R98	10.5	9.5	9.5	0.1	38.0	Negligible
R99	10.2	9.2	9.2	<0.1	36.8	Negligible
R100	10.2	9.2	9.3	<0.1	37.2	Negligible
R101	11.1	10.1	10.1	0.1	40.4	Negligible
R102	11.0	10.1	10.1	0.1	40.4	Negligible
R103	14.3	13.3	13.3	0.3	53.2	Negligible
R104	11.6	10.6	10.6	0.1	42.4	Negligible
R105	11.5	10.5	10.5	0.1	42.0	Negligible
R106	11.1	10.0	10.0	<0.1	40.0	Negligible
R107	14.5	13.2	13.3	0.3	53.2	Negligible
R108	12.8	11.7	11.7	0.2	46.8	Negligible
R109	15.8	14.5	14.6	0.3	58.4	Negligible
R110	11.6	10.5	10.5	0.1	42.0	Negligible

Receptor	Predicted Annual Mean $PM_{2.5}$ Concentration (µg/m³)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R111	12.9	11.7	11.8	0.2	47.2	Negligible
R112	11.0	9.9	9.9	<0.1	39.6	Negligible
R113	11.2	10.1	10.1	0.1	40.4	Negligible
R114	10.8	9.8	9.8	0.1	39.2	Negligible
R115	11.5	10.5	10.5	0.2	42.0	Negligible
R116	11.1	10.1	10.2	0.1	40.8	Negligible
R117	9.7	8.8	8.8	0.1	35.2	Negligible
R118	9.8	8.9	8.9	0.1	35.6	Negligible
R119	9.6	8.7	8.7	<0.1	34.8	Negligible
R120	9.7	8.8	8.8	0.1	35.2	Negligible
R121	9.9	9.0	9.0	0.1	36.0	Negligible
R122	13.5	12.4	12.4	0.2	49.6	Negligible
R123	13.0	11.9	11.9	0.1	47.6	Negligible
R124	13.5	12.3	12.3	0.1	49.2	Negligible
R125	12.7	11.6	11.7	0.1	46.8	Negligible
R126	12.4	11.4	11.4	0.1	45.6	Negligible
R127	13.2	12.1	12.1	0.1	48.4	Negligible
R128	13.4	12.2	12.3	0.1	49.2	Negligible
R129	13.6	12.4	12.5	0.2	50.0	Negligible
R130	14.3	13.2	13.3	0.2	53.2	Negligible
R131	11.0	9.9	10.0	0.2	40.0	Negligible
R132	10.2	9.2	9.2	0.2	36.8	Negligible
R133	10.0	9.0	9.1	0.3	36.4	Negligible
R134	9.6	8.7	8.7	0.2	34.8	Negligible
R135	10.0	9.0	9.1	0.4	36.4	Negligible
R136	9.5	8.6	8.7	0.2	34.8	Negligible
R137	9.5	8.6	8.7	0.2	34.8	Negligible
R138	9.6	8.7	8.8	0.3	35.2	Negligible
R183	10.9	9.9	10.1	0.5	40.4	Negligible
R184	10.3	9.4	9.5	0.4	38.0	Negligible
R185	10.2	9.3	9.4	0.4	37.6	Negligible
R186	10.2	9.3	9.4	0.3	37.6	Negligible
R187	9.6	8.7	8.8	0.2	35.2	Negligible
R188	9.4	8.5	8.6	0.2	34.4	Negligible

Receptor	Predicted Annual Mean $PM_{2.5}$ Concentration (µg/m³)			% Change of AQAL	% of 2027 DS Relative to AQAL	EPUK & IAQM Impact Descriptor
	2019 BC	2027 DM	2027 DS			
R189	9.5	8.7	8.7	0.2	34.8	Negligible
R190	9.6	8.7	8.8	0.3	35.2	Negligible
R191	9.2	8.4	8.4	0.2	33.6	Negligible
R192	9.3	8.5	8.5	0.2	34.0	Negligible
R193	9.4	8.5	8.6	0.2	34.4	Negligible
R194	9.6	8.8	8.9	0.3	35.6	Negligible
R218	8.9	8.1	8.1	<0.1	32.4	Negligible
R219	9.0	8.1	8.2	<0.1	32.8	Negligible
R220	9.0	8.1	8.2	0.2	32.8	Negligible
R221	9.0	8.1	8.2	0.1	32.8	Negligible
R222	9.1	8.2	8.3	0.2	33.2	Negligible
R223	9.2	8.4	8.4	0.1	33.6	Negligible
R224	9.3	8.4	8.4	0.1	33.6	Negligible
R225	8.9	8.0	8.0	0.1	32.0	Negligible
R226	9.1	8.2	8.3	0.2	33.2	Negligible
R227	10.6	9.7	9.7	0.1	38.8	Negligible
North Kesteven District Council						
R77	11.5	10.4	10.5	0.3	42.0	Negligible
R78	12.3	11.2	11.3	0.4	45.2	Negligible
R79	11.7	10.6	10.7	0.3	42.8	Negligible
R80	11.3	10.3	10.4	0.3	41.6	Negligible
R81	11.3	10.3	10.3	0.3	41.2	Negligible
R82	12.1	11.0	11.1	0.3	44.4	Negligible
R83	11.7	10.6	10.7	0.3	42.8	Negligible
R84	11.3	10.3	10.3	0.3	41.2	Negligible
R85	12.1	11.0	11.1	0.4	44.4	Negligible
R86	10.5	9.5	9.6	0.2	38.4	Negligible
R87	10.2	9.3	9.3	0.1	37.2	Negligible
R88	12.0	10.8	10.9	0.3	43.6	Negligible
R89	10.3	9.4	9.4	0.1	37.6	Negligible

4.2 Ecological Receptors

Results presented herein relate to the maximum modelled impact of each individual ecological designation requiring detailed assessment (i.e. where impacts cannot be screened out), and as such, represents a conservative outlook. The maximum from the modelled onshore ECC route options has also been considered.

4.2.1 NO_x Critical Level Modelling Results

Table 4-4 presents the maximum modelled 2027 annual mean NO_x Critical Level (30µg/m^3) impacts at all applicable ecological receptor locations for initial screening.

Table 4-4
Maximum Predicted Annual Mean NO_x Impacts – 2027 Planned Construction Year

ID	Designation	Maximum Modelled Contribution			
		Project Alone		In-Combination	
		µg/m^3	% of Critical Level	µg/m^3	% of Critical Level
ER4	SSSI	0.2	0.8	0.2	0.8
ER5	SSSI	<0.1	0.1	<0.1	0.1
ER6	LNR	0.2	0.8	0.4	1.4
ER7	LWS	0.6	2.2	1.2	4.0
ER8	LWS	0.8	2.7	0.8	2.7
ER9	LWS	0.5	1.7	0.9	3.1
ER10	LWS	0.7	2.3	1.3	4.2
ER12	LWT	1.5	5.0	1.5	5.0
ER13	LWS	0.4	1.4	0.8	2.6
ER14	LWS	0.3	1.0	0.5	1.8
ER15	LWS	<0.1	0.1	<0.1	0.1
ER18	LWS	0.1	0.3	0.1	0.5
ER21	LWS	0.3	1.0	0.3	1.0
ER22	LWS	0.1	0.2	0.1	0.2
ER23	LWS	0.6	2.0	0.6	2.0
ER24	LWS	0.1	0.5	0.2	0.6
ER26	LWS	0.4	1.5	0.7	2.2
ER27	LWS	<0.1	0.1	<0.1	0.1
ER29	LWS / LWT	0.2	0.8	0.2	0.8
ER30	LWS	<0.1	0.1	<0.1	0.1
ER34	LWS	0.1	0.2	0.1	0.3
ER36	LWS	0.4	1.4	0.4	1.4
ER37	LWS	0.3	0.8	0.3	0.8
ER39	LWS	0.5	1.8	1.8	6.1
ER42	LWS	0.8	2.5	0.8	2.5
ER43	LWS	<0.1	0.1	<0.1	0.1

4.2.2 Nutrient Nitrogen Critical Load Modelling Results

Table 4-5 presents the maximum modelled 2027 nutrient nitrogen Critical Load impacts at all applicable ecological receptor locations for initial screening.

Table 4-5
Maximum Predicted Nutrient Nitrogen Impacts – 2027 Earliest Potential Construction Year

ID	Designation	Critical Load Min (Kg N/ha/yr)	Maximum Modelled Contribution			
			Project Alone		In-Combination	
			Kg N/ha/yr	% of Min Critical Load	Kg N/ha/yr	% of Min Critical Load
ER4	SSSI	0.65	<0.1	0.4	<0.1	0.4
ER5	SSSI	1.08	<0.1	0.1	<0.1	0.1
ER6	LNR	1.69	0.1	0.7	0.1	0.7
ER7	LWS	4.86	0.1	0.6	0.1	0.6
ER8	LWS	4.86	0.1	0.4	0.1	0.4
ER9	LWS	4.86	0.1	0.5	0.1	0.5
ER10	LWS	4.86	0.1	0.6	0.1	0.6
ER12	LWT	4.86	0.1	0.6	0.1	0.6
ER13	LWS	4.86	0.1	1.2	0.1	1.2
ER14	LWS	0.00	<0.1	0.4	<0.1	0.4
ER15	LWS	10.89	<0.1	0.1	<0.1	0.1
ER18	LWS	10.93	<0.1	0.2	<0.1	0.2
ER21	LWS	5.07	<0.1	0.1	<0.1	0.1
ER22	LWS	5.07	<0.1	<0.1	<0.1	<0.1
ER23	LWS	0.65	<0.1	0.4	<0.1	0.4
ER24	LWS	2.80	<0.1	0.3	<0.1	0.3
ER26	LWS	5.07	0.1	0.3	0.1	0.3
ER27	LWS	4.86	<0.1	<0.1	<0.1	<0.1
ER29	LWS / LWT	1.08	<0.1	0.3	<0.1	0.3
ER30	LWS	1.78	<0.1	0.1	<0.1	0.1
ER34	LWS	4.86	<0.1	0.1	<0.1	0.1
ER36	LWS	5.07	<0.1	0.2	<0.1	0.2
ER37	LWS	0.65	<0.1	0.2	<0.1	0.2
ER39	LWS	5.07	0.1	0.7	0.1	0.7
ER42	LWS	4.86	0.1	0.4	0.1	0.4
ER43	LWS	5.07	<0.1	<0.1	<0.1	<0.1

4.2.3 Acidification Critical Load Modelling Results

Table 4-6 presents the maximum modelled 2027 acidification Critical Load impacts at all applicable ecological receptor locations for initial screening.

Table 4-6
Maximum Predicted Acidification Impacts – 2027 Earliest Potential 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
ER4	SSSI	0.65	<0.1	0.9	<0.1	0.9
ER5	SSSI	1.08	<0.1	0.3	<0.1	0.4
ER6	LNR	1.69	<0.1	1.9	<0.1	3.3
ER7	LWS	4.86	<0.1	0.4	<0.1	0.7
ER8	LWS	4.86	<0.1	0.5	<0.1	0.5
ER9	LWS	4.86	<0.1	0.6	<0.1	1.1
ER10	LWS	4.86	<0.1	0.4	<0.1	0.8
ER12	LWT	4.86	<0.1	0.9	<0.1	0.9
ER13	LWS	4.86	<0.1	1.6	<0.1	2.9
ER14	LWS	-	-	-	-	-
ER15	LWS	10.89	<0.1	0.3	<0.1	0.4
ER18	LWS	10.93	<0.1	0.7	<0.1	1.2
ER21	LWS	5.07	<0.1	0.2	<0.1	0.2
ER22	LWS	5.07	<0.1	<0.1	<0.1	<0.1
ER23	LWS	0.65	<0.1	1.4	<0.1	1.4
ER24	LWS	2.80	<0.1	0.5	<0.1	0.5
ER26	LWS	5.07	<0.1	0.2	<0.1	0.3
ER27	LWS	4.86	<0.1	<0.1	<0.1	<0.1
ER29	LWS / LWT	1.08	<0.1	1.7	<0.1	1.7
ER30	LWS	1.78	<0.1	0.1	<0.1	0.2
ER34	LWS	4.86	<0.1	<0.1	<0.1	0.1
ER36	LWS	5.07	<0.1	0.2	<0.1	0.2
ER37	LWS	0.65	<0.1	0.6	<0.1	0.6
ER39	LWS	5.07	<0.1	0.3	<0.1	0.9
ER42	LWS	4.86	<0.1	0.5	<0.1	0.5
ER43	LWS	5.07	<0.1	<0.1	<0.1	<0.1

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